Mullard Book 1 Part 3, 1983 Diodes

Mullard

technical handbook

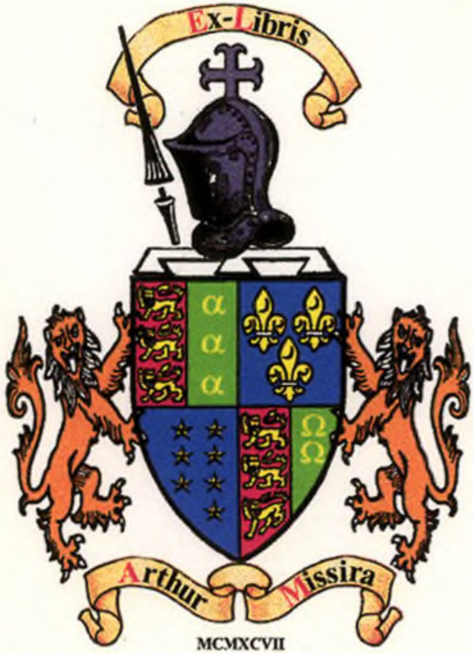
Book 1

Semiconductor devices

Part 3

Diodes

1983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DIODES

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Book 1 Part 3

Semiconductor devices

Diodes

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The Mullard technical handbook system. . .

The Mullard Technical Handbook is made up of four sets of Books, each comprising several parts:-

Book 1 (light blue)	Semiconductor Devices
Book 2 (orange)	Valves and Tubes
Book 3 (green)	Components, Materials and Assemblies
Book 4 (purple or dark blue)	Integrated Circuits

Book 1, Semiconductor Devices, comprises the following parts:-

Part 1a	Small-signal transistors
Part 1b	Low-frequency power transistors
Part 1c	Field-effect transistors
Part 1d	Microminiature semiconductors for hybrid circuits
Part 2a	R.F. wideband devices
Part 2b	R.F. power devices
Part 3	Diodes
Part 4	Power diodes, thyristors and triacs
Part 5	Microwave transistors, diodes and sub-assemblies
Part 6	Optoelectronic devices

......a comprehensive data library

Most of the devices for which full data is given in these books are those around which we would recommend equipment to be designed. Where appropriate, other types no longer recommended for new equipment designs but generally available for equipment production, are listed separately. Data sheets for these types may be obtained on request. Older devices for which data may be obtained on request are also included in the index of the appropriate part of each book.

Because the Technical Handbook system forms a comprehensive data reference library the current Mullard Quick Reference Guides should always be consulted for details of the Mullard preferred range.

The data contained in these books is as accurate and up to date as possible at the time of going to press. It must be understood, however, that no guarantee can be given on the availability of the various devices, or that their specifications may not be changed before the next edition is published.

Each part is reviewed regularly, and revised and re-issued where necessary. Revisions to previous data are indicated by an arrow in the margin.

Requests for copies of Quick Reference Guides and individual data sheets (please quote the type number) should be sent to:-

Technical Publications Department, Mullard Limited, New Road, Mitcham, Surrey CR4 4XY. Telex 22194.

Prices and availability information for Mullard components should be obtained from Mullard House, or from one of the Mullard Distributors listed on the back cover.

The Mullard Data Base

For the equipment designer, technical information on electronic components is vital. Mullard market the widest range of components in the U.K., supported by a comprehensive information service – the Mullard Data Base.

Brief details are given here. For further information and an order form, please write to:-

Technical Publications Dept.
Mullard Limited,
New Road, Mitcham,
Surrey CR4 4XY.

Regular Publications

Mullard Bulletin

A must for designers, this bi-monthly, newspaper-style publication briefly describes new components and offers further information on subjects of interest.

Consumer Electronics

A review, in newspaper style, published every four months. Articles and features of interest to those in the consumer electronics industry, with emphasis on television technology and allied subjects.

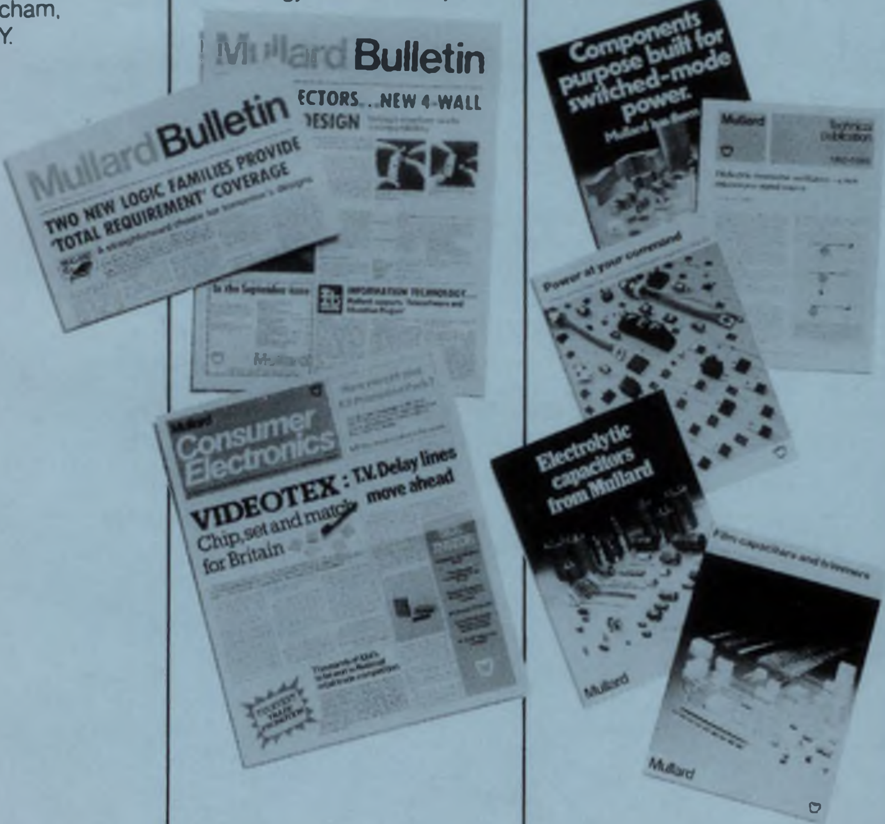
Technical Brochures and Range Leaflets

Mullard publish hundreds of different brochures on components and their application. Make sure your name is on the mailing list for the Mullard Bulletin, which describes and offers new publications.

Prestel too!

Mullard publications may also be ordered directly through PRESTEL.

The Mullard data base begins on page 556201.



Electronic Components and Applications

A quarterly technical journal covering, in depth, developments in electronics based on the work of Philips, Signetics and Mullard laboratories. Please ask for a sample copy and subscription form.

Quick reference guides

All products marketed by Mullard are listed alpha-numerically and described briefly in these guides. Part 1 covers passive components, discrete semiconductors, and valves and tubes; Part 2 deals with integrated circuits, including Signetics.

Technical Data Service

This service provides detailed, up-to-date information on the characteristics and performance of Mullard components.

Subscribers to any or all of the four handbook sections receive all relevant handbooks, looseleaf binders, monthly mailings of new data sheets, and new handbook parts as they are published.

For those not wishing to subscribe to the Data Service, handbook parts can be purchased individually.

Individual data sheets are available free-of-charge, and can be obtained by quoting the type number.

Products approved to CECC available on request:

Specification No.	Type No.
CECC 50 001 – 020	CV8308, CV8805
CECC 50 001 – 021	BAW62 CV7367, CV7368, CV7756 CV7757, CV8617, CV9637 1N914, 1N916, 1N4148 1N4446, 1N4448
CECC 50 001 – 022	BAV18, BAV19, BAV20, BAV21 BAX16, BAX17 CV8790
CECC 50 001 – 026	BA314 PO33
CECC 50 001 – 037	CV9638
CECC 50 001 – 038	CV7875
CECC 50 005 – 005	BZX79 series CV7138 to CV7146 CV7099 to CV7106
CECC 50 005 – 010	BZV85 series
CECC 50 005 – 017	BZT03 series
CECC 50 008 – 015	BYW54, BYW55, BYW56 CVA7026 to CVA7030 CVA7476

BZY88 series to BS9305-N041 is no longer available – replaced by CECC 50 005 – 005, BZX79 series.

WHISKERLESS DIODES

Outline: DO-35

	type	V_R max. V	I_F max. mA	I_{FRM} max. mA	t_{rr} max. ns	C_d max. pF	V_F max. V at	I_F mA
general purpose	BA316	10	100	225	4	2	1.1	100
	BA317	30	100	225	4	2	1.1	100
	BA318	50	100	225	4	2	1.1	100
	BAV10	60	300	600	6	2.5	1.25	500
	BAW62	75	200	450	4	2	1	100
	BAX13	50	75	150	4	3	1.53	75
	BAX16	150	200	300	120	10	1.5	200
	BAX17	200	200	300	120	10	1.2	200
	OA200	50	160	250	typ. 3.5	25	1.15	30
	OA202	150	160	250	typ. 3.5	25	1.15	30
	1N914	75	75	225	4	4	1	10
	1N916	75	75	225	4	2	1	10
	1N4148	75	200	450	4	4	1	10
	1N4446	75	200	450	4	4	1	20
	1N4448	75	200	450	4	4	1	100
high speed; high voltage	BAV18	50	250	625	50	5	1.25	200
	BAV19	100	250	625	50	5	1.25	200
	BAV20	150	250	625	50	5	1.25	200
	BAV21	200	250	625	50	5	1.25	200
for telephony applications	BAX12A	90	400	800	50	35	1	200
	CV7367	100	75	450	5	2.8	1	10
	CV7368	100	75	450	5	1.5	1	10
	CV7756	75	75	450	8	4	1	10
	CV7757	75	75	450	8	2	1	10
	CV7875	150	150	750	–	35	1.2	100
	CV8617	20	75	450	–	6	1.5	50
	CV8790	150	150	625	–	10	1.2	100
	CV9637	75	100	450	5	2.8	1.2	100
	CV9638	65	200	750	70	15	0.9	200
general purpose avalanche	BAS11	300	350	2000	1000	10 typ.	1.1	300

VOLTAGE REGULATOR DIODES

Stabistors

type	working voltage (nom.) V	P_{tot} at T_{amb} max. mW	°C	I_{FRM} max. mA	outline
BA314	0.7	–	–	250	DO-35
BZV46-1V5	1.5	250	55	120	DO-35
BZV46-2V0	2	250	55	80	DO-35

Voltage regulator diodes (low power)

type	working voltage range V	P_{tot} at T_{amb} max. mW	°C	I_{FRM} max. mA	outline
BZT03	9.1 to 270	3.25 W	25	–	SOD-57
BZV85	3.6 to 75	1300	25	250	DO-41
BZW03	7.5 to 270	6 W	25	–	SOD-64
BZX61*	7.5 to 130	1300	25	1000	DO-15
	150 to 200	1000	25	1000	DO-15
BZX79	2.4 to 75	400	50	250	DO-35
BZX87	5.1 to 75	1750	25	400	SOD-51
BZY88*	2.7 to 33	400	50	250	DO-7
				$I_{F(AV)}$ max.	
CV7138	3.3				
CV7139	3.6				
CV7140	3.9	400	25	200	DO-35
CV7141	4.3				
CV7099	4.7				
CV7100	5.1				
CV7101	5.6				
CV7102	6.2	400	25	200	DO-35
CV7103	6.8				
CV7104	7.5				
CV7105	8.2				
CV7142	9.1				
CV7143	10.0	400	25	200	DO-35
CV7144	11.0				
CV7145	12.0				
CV7146	13.0	400	25	200	DO-35
CV7106	15.0				

*Available for current production only; not recommended for new designs.

VOLTAGE REFERENCE DIODES

voltage tolerance ± 5% Outline: DO-34

type	reference voltage at I_Z V (nom)	mA	I_{ZM} max (I_{ZRM}) mA	$\|S_Z\|$ max. %/°C	at I_Z mA	r_{diff} at I_Z max. Ω	mA
BZX90				0.01			
BZX91				0.005			
BZX92	6.5	7.5	50	0.002	7.5	15	7.5
BZX93				0.001			
BZX94				0.0005			
1N821				0.01			
1N823				0.005			
1N825	6.2	7.5	50	0.002	7.5	15	7.5
1N827				0.001			
1N829				0.0005			
BZV10				0.01			
BZV11				0.005			
BZV12	6.5	2	50	0.002	2	50	2
BZV13				0.001			
BZV14				0.0005			

RECTIFIER DIODES

	type	$I_{F(AV)max}$ mA	$V_{RRM\,max}$ V	outline
general purpose	BYX10*	360	1600	DO-14
	CVA7026	750	100	SOD-57
	CVA7027		200	
	CVA7028		400	
	CVA7029		600	
	CVA7030		800	
	CVA7476**		1200	
	1N4001G	1000	50	SOD-57
	1N4002G		100	
	1N4003G		200	
	1N4004G		400	
	1N4005G		600	
	1N4006G		800	
	1N4007G		1000	
controlled avalanche	BYW54	2000	600	SOD-57
	BYW55	2000	800	SOD-57
	BYW56	2000	1000	SOD-57
	CV8308	250	60	SOD-57
	CV8805	250	150	SOD-57
fast soft recovery	BYV95A	1500	200	SOD-57
	B		400	
	C		600	
	BYV96D	1500	800	SOD-57
	E		1000	
	BYW95A	3000	200	SOD-64
	B		400	
	C		600	
	BYW96D	3000	800	SOD-64
	E		1000	
ultra fast soft-recovery	BYV27– 50	2000	50	SOD-57
	–100		100	
	–150		150	
	–200		200	
	BYV28– 50	3500	50	SOD-64
	–100		100	
	–150		150	
	–200		200	

* Available for current production only; not recommended for new designs.

** Controlled avalanche

RECTIFIER DIODES (Cont.)

Parallel efficiency diodes

	type	I_{FWM} max A	V_{RRM} max V	outline
	BY448	4	1500	SOD-57
	BY458	4	1200	SOD-57
	BY228	5	1500	SOD-64
	BY438	5	1200	SOD-64

E.H.T. rectifiers

	type	$I_{F(AV)}$ max mA	V_{RRM} max kV	outline
soft recovery	BY476*	2.5	18	SOD-56
	BY509	4	15	SOD-61
	BY584	85	1.8	SOD-61A

SCHOTTKY-BARRIER DIODES

Outline: DO-34

	type	V_R max. V	I_F max. mA	C_d max. pF	at V_R V	t_{rr} max. ns	V_F max. mV	at I_F mA
u.h.f. mixer	BA481	4	30	1.1	0	–	400	1
switching	BAT81	40	30	1.6	1	1	410	1
	BAT82	50						
	BAT83	60						
	BAT85	30	100	10	1	5	400	10

*Available for current production only; not recommended for new designs.

MICROMINIATURE DIODES

Switching diodes — Outline : SOT-23

	type	V_R max. V	I_F max. mA	t_{rr} max. ns	C_d max. pF	V_F max. mV	at I_F mA
high-speed	BAS16	75	250	6	2	855	10
general purpose	BAS19	100	200	50	5	1000	100
	BAS20	150	200	50	5	1000	100
	BAS21	200	200	50	5	1000	100
Schottky-barrier	BAT17	4	30	–	1	600	10
band switch	BAT18	35	100	–	1	1200	100
common cathode double diode	BAV70	70	250	6	1.5	855	10
two diodes in series	BAV99	70	250	6	1.5	855	10
common anode double diode	BAW56	70	250	6	2	855	10

Low-voltage stabilizer — Outline : SOT-23

	type	I_{FRM} max. mA	C_d max. pF	S_F typ. mV/K	V_F mV	at I_F mA
general purpose	BAS17	250	140	−1.8	730–810	5
					870–960	100

Variable capacitance diodes — Outline : SOT-23

	type	V_R max. V	I_F max. mA	C_d pF	at V_R V	r_D max. Ω	I_R max. nA	at V_R V
v.h.f. tuning	BBY31	28	20	typ. 11.5	3	1.2	50	28
				1.8–2.8	25			
	BBY40	28	20	26–32	3	0.6	50	28
				4.3–6	25			

Voltage regulator diodes; tolerance : ± 5%

	type	range V	P_{tot} max. mW	I_{FRM} max. mA	V_F max. V	at I_F mA	outline
general purpose	BZV49	2.4–75	1000	250	1	50	SOT-89
	BZX84	2.4–75	350	250	0.9	10	SOT-23

TUNER DIODES

Variable capacitance diodes

	type	outline	V_R max. V	C_d pF	at V_R V	C_d ratio at V_R .V/..V	
a.f.c.	BB119	DO-35	15	20-25	4	>1.3	4/10
radio a.m.	BB212	TO-92	12	500-620	0.5	>22.5	0.5/8
television v.h.f.	BB809	DO-34	28	4.5-5.6	25	>5	3/25
	BB405G	DO-34	28	1.8-2.5	25	>4.3	3/25
television u.h.f.	BB405B	DO-34	28	2.0-2.3	25	>4.8	3/25
Band switching diodes						r_D (Ω)	at I_F (mA)
a.m. switching	BA223	DO-34	20	<3.5	6	<1.5	10
v.h.f. switching	BA243	DO-35	20	<2.0	15	<1.0	10
	BA244	DO-35	20	<2.0	15	<0.5	10
	BA482	DO-34	35	<1.2	3	<0.7	3
	BA483	DO-34	35	<1.0	3	<1.2	3

All television varicaps are supplied in matched sets.

Over the voltage range 0.5 V to 28 V the diodes are capacitance matched to within 3%: BB405B; BB405G

GERMANIUM SMALL SIGNAL DIODES

(MAINTENANCE TYPES)

Gold bonded diodes Outline : DO-7

	type	V_R max. V	I_F max. mA	I_{FRM} max. mA	t_{rr} max. ns	C_d max. pF	V_F max. V	at I_F mA
general purpose	AAZ15	75	140	250	–	2	1.1	250
	AAZ17	50	140	250	–	2	1.1	250
general purpose and switching	OA47	25	110	150	70	3.5	1.1	150

A

GENERAL SECTION

Type designation
Rating systems
Colour codes
Packing
Mounting and soldering
Microminiature diodes (soldering recommendations and thermal characteristics)

PRO ELECTRON TYPE DESIGNATION CODE FOR SEMICONDUCTOR DEVICES

This type designation code applies to discrete semiconductor devices – as opposed to integrated circuits –, multiples of such devices and semiconductor chips.

A basic type number consists of:

TWO LETTERS FOLLOWED BY A SERIAL NUMBER

FIRST LETTER

The first letter gives information about the material used for the active part of the devices.

A. GERMANIUM or other material with band gap of 0,6 to 1,0 eV.
B. SILICON or other material with band gap of 1,0 to 1,3 eV.
C. GALLIUM-ARSENIDE or other material with band gap of 1,3 eV or more.
R. COMPOUND MATERIALS (e.g. Cadmium-Sulphide).

SECOND LETTER

The second letter indicates the function for which the device is primarily designed.

A. DIODE; signal, low power
B. DIODE; variable capacitance
C. TRANSISTOR; low power, audio frequency ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
D. TRANSISTOR; power, audio frequency ($R_{th\ j\text{-}mb} \leqslant 15\ ^{o}C/W$)
E. DIODE; tunnel
F. TRANSISTOR; low power, high frequency ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
G. MULTIPLE OF DISSIMILAR DEVICES – MISCELLANEOUS; e.g. oscillator
H. DIODE; magnetic sensitive
L. TRANSISTOR; power, high frequency ($R_{th\ j\text{-}mb} \leqslant 15\ ^{o}C/W$)
N. PHOTO-COUPLER
P. RADIATION DETECTOR; e.g. high sensitivity phototransistor
Q. RADIATION GENERATOR; e.g. light-emitting diode (LED)
R. CONTROL AND SWITCHING DEVICE; e.g. thyristor, low power ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
S. TRANSISTOR; low power, switching ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
T. CONTROL AND SWITCHING DEVICE; e.g. thyristor, power ($R_{th\ j\text{-}mb} \leqslant 15\ ^{o}C/W$)
U. TRANSISTOR; power, switching ($R_{th\ j\text{-}mb} \leqslant 15\ ^{o}C/W$)
X. DIODE: multiplier, e.g. varactor, step recovery
Y. DIODE; rectifying, booster
Z. DIODE; voltage reference or regulator (transient suppressor diode, with third letter W)

SERIAL NUMBER

Three figures, running from 100 to 999, for devices primarily intended for consumer equipment.
One letter (Z, Y, X, etc.) and two figures, running from 10 to 99, for devices primarily intended for industrial/professional equipment.
This letter has no fixed meaning except W, which is used for transient suppressor diodes.

VERSION LETTER

It indicates a minor variant of the basic type either electrically or mechanically. The letter never has a fixed meaning, except letter R, indicating reverse voltage, e.g. collector to case or anode to stud.

SUFFIX

Sub-classification can be used for devices supplied in a wide range of variants called associated types. Following sub-coding suffixes are in use:

1. VOLTAGE REFERENCE and VOLTAGE REGULATOR DIODES: *ONE LETTER and ONE NUMBER*
   The LETTER indicates the nominal tolerance of the Zener (regulation, working or reference) voltage
   A. 1% (according to IEC 63: series E96)
   B. 2% (according to IEC 63: series E48)
   C. 5% (according to IEC 63: series E24)
   D. 10% (according to IEC 63: series E12)
   E. 20% (according to IEC 63: series E6)
   The number denotes the typical operating (Zener) voltage related to the nominal current rating for the whole range.
   The letter 'V' is used instead of the decimal point.

2. TRANSIENT SUPPRESSOR DIODES: *ONE NUMBER*
   The NUMBER indicates the maximum recommended continuous reversed (stand-off) voltage V_R. The letter 'V' is used as above.

3. CONVENTIONAL and CONTROLLED AVALANCHE RECTIFIER DIODES and THYRISTORS: *ONE NUMBER*
   The NUMBER indicates the rated maximum repetitive peak reverse voltage (V_{RRM}) or the rated repetitive peak off-state voltage (V_{DRM}), whichever is the lower. Reversed polarity is indicated by letter R, immediately after the number.

4. RADIATION DETECTORS: *ONE NUMBER,* preceded by a hyphen (–)
   The NUMBER indicates the depletion layer in μm. The resolution is indicated by a version LETTER.

5. ARRAY OF RADIATION DETECTORS and GENERATORS: *ONE NUMBER,* preceded by a stroke (/).
   The NUMBER indicates how many basic devices are assembled into the array.

RATING SYSTEMS

The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

DEFINITIONS OF TERMS USED

Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note
This definition excludes inductors, capacitors, resistors and similar components.

Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note
Limiting conditions may be either maxima or minima.

Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note
The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

PRO ELECTRON COLOUR CODING SYSTEM FOR PROFESSIONAL SMALL SIGNAL DIODES

Letter combination-background colour

BAV - green
BAW - blue
BAX - black
BAS - orange

Figure combination-colour bands

0 - black
1 - brown
2 - red
3 - orange
4 - yellow
5 - green
6 - blue
7 - violet
8 - grey
9 - white

The cathode side is indicated by a broad band which is at the same time the first digit of the figure combination.

Note: For BA types see individual type publications.

JEDEC assigned type numbers

(EIA-standard RS-236-B; June, 1963)

1. Prefix identification

The prefix identification consisting of a first number symbol and the letter "N" shall not be indicated in the coding.

2. Banding systems

The sequence number consisting of a two, three, or four digit number after the letter "N" may be coded as follows:

2.1 Two-digit sequence numbers shall consist of a first black band and the sequence number in second and third bands of the colours indicated in Table 1. If a suffix letter is required, it shall be indicated with a fourth band as indicated in Table 1.

2.2 Three-digit sequence numbers shall consist of the sequence number in first, second, and third bands of the colours indicated in Table 1. If a suffix letter is required, it shall be indicated with a fourth band as indicated in Table 1.

2.3 Four-digit sequence numbers shall consist of the sequence number in four bands of the colours indicated in Table 1.
If a suffix letter is required it shall be indicated as the fifth band.

3. Cathode identification and reading sequence

3.1 A double-width band shall be used as the first band reading from cathode to anode ends.

3.2 An alternative method is provided where equal width bands may be used. The bands shall be clearly grouped toward the cathode end, and shall be read from cathode to anode ends.

3.3 Either of the above colour banding methods may be used in stead of the cathode designating symbol or other marking.

4. Colour bands

The sequence numbers of the type numbers and suffix letters shall be indicated by the colours in Table 1.

TABLE 1

NUMBER	COLOUR	SUFFIX LETTER
0	black	not applicable
1	brown	A
2	red	B
3	orange	C
4	yellow	D
5	green	E
6	blue	F
7	violet	G
8	grey	H
9	white	J

BANDOLIER AND REEL SPECIFICATION FOR AXIAL-TAPED DIODES

This specification concerns all axial-leaded diodes in this handbook.

The taped and reeled products fulfil the requirements of IEC 286-1: Tape packaging of components with axial leads on continuous tapes.

Dimensions in mm

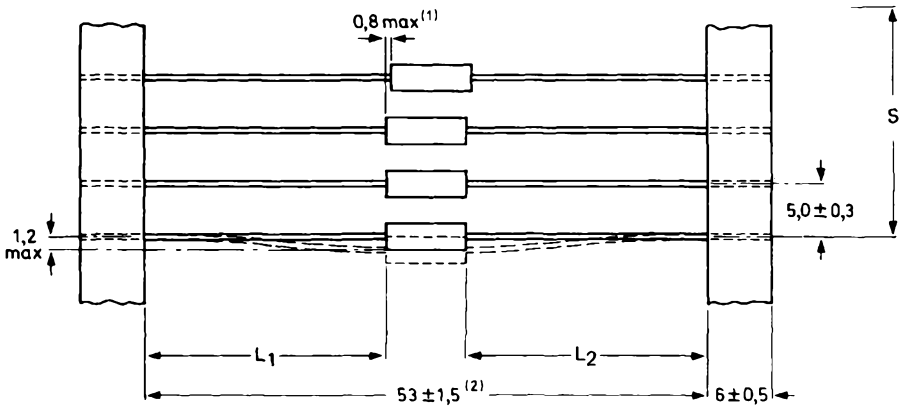


Fig. 1 Configuration of bandolier.

The red tape indicates the diode cathode side.

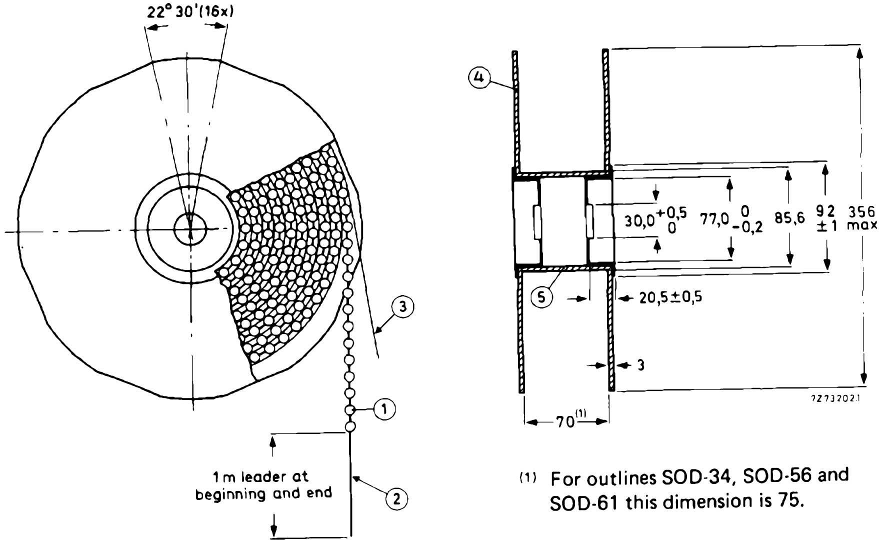
1. Displacement between any two diodes; for DO-34 maximum 0,4.
2. For outlines SOD-34, SOD-56 and SOD-61 this dimension is 58 ± 2.

The cumulative space (S) measured over ten spacings = 50 ± 2.

The diodes are centred so that $|L_1 - L_2| \leqslant 1,2$ mm.

A black marker is printed on the white tape of the bandolier every 50 diodes.

The axial taping specification described above is compatible with automatic insertion equipment as manufactured by Universal, U.S.M. (Dynapert) and M.E.I. (Panasert).



(1) For outlines SOD-34, SOD-56 and SOD-61 this dimension is 75.

Fig. 2 Reel dimensions (mm) for axial-leaded components.

(1) Diode
(2) Bandolier
(3) Paper
(4) Flange
(5) Cylinder

outline		quantity per reel
SOD-27	DO-35	10 000
SOD-34	–	5 000
SOD-51	–	5 000
SOD-56	–	4 000
SOD-57	–	5 000
SOD-61	–	7 000
SOD-64	–	4 000
SOD-66	DO-41	5 000
SOD-68	DO-34	10 000

BANDOLIER AND REEL SPECIFICATION FOR RADIAL-TAPED DIODES

Dimensions in mm

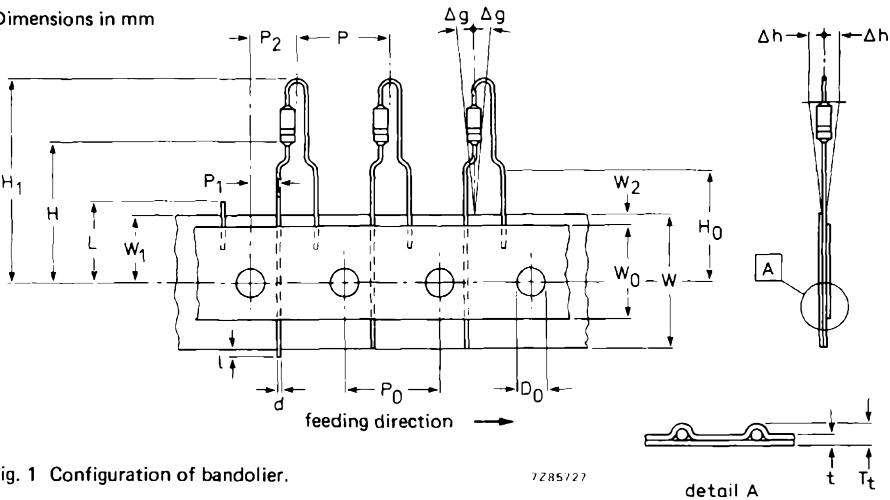


Fig. 1 Configuration of bandolier.

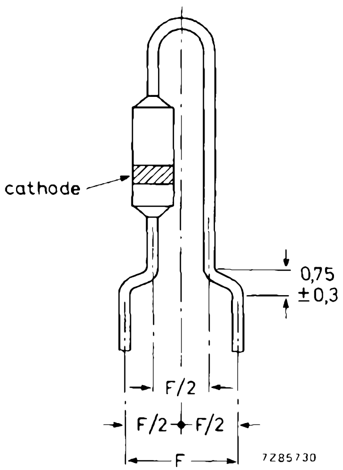


Fig. 2 Detail configuration of component shape.

break force of carrier tape > 15 N
extraction force > 5 N

$\Sigma\Delta P_0$	= deviation of 20 spacings	± 1
F	= lead-to-lead distance	$5{,}08 \begin{smallmatrix}+0{,}6 \\ -0{,}1\end{smallmatrix}$
H_1	= top of component to tape centre	< 27,5
H	= bottom of component to tape centre	19 ± 1
H_0	= lead-wire clinch height	16 ± 0,5
L	= length of cropped lead	< 11
ℓ	= lead-wire protrusion	< 1
P	= pitch of components	12,7 ± 1
P_2	= feed hole centre to the middle of the leads	6,35 ± 1
P_1	= feed hole centre to lead	3,81 ± 0,7
P_0	= feed hole pitch	12,7 ± 0,3
T_t	= total tape thickness	< 1,5
t	= thickness tape + hold down tape	0,7 ± 0,2
D_0	= feed hole diameter	4 ± 0,2
W_2	= hold down tape position	0 to 1,5
W_0	= hold down tape width	> 12,5
W_1	= feed hole position	9 ± 0,5
W	= tape width	$18 \begin{smallmatrix}+1{,}0 \\ -0{,}5\end{smallmatrix}$
Δ_g	= component alignment	$0 + 5^0$
Δ_h	= component alignment	± 2

This specification concerns radial-taped diodes in DO-34 and DO-35 envelopes. The taped and reeled products fulfil the requirements of IEC 286-2: Tape packaging of components with unidirectional leads.

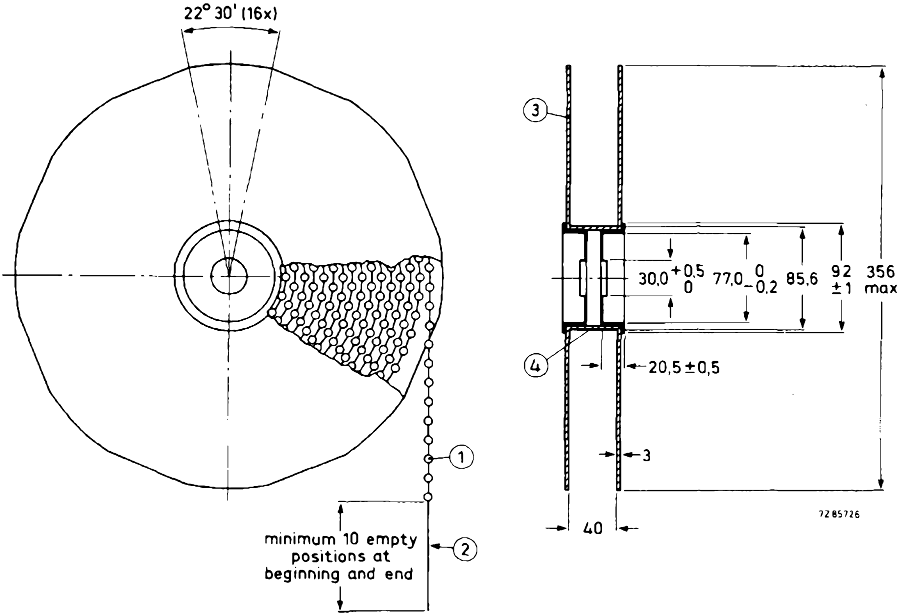


Fig. 3 Reel dimensions (mm) for radial-taped diodes.

(1) Diode
(2) Bandolier
(3) Flange
(4) Cylinder

Quantity per reel for DO-34 and DO-35 encapsulations 5000 diodes.

The diodes can be delivered on request with anode-leading (+ leading) or with cathode-leading (– leading) configuration.

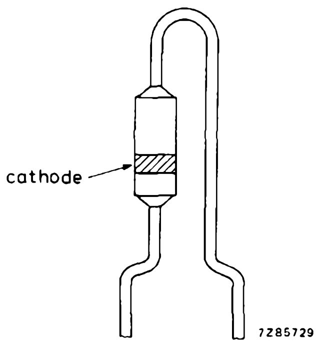


Fig. 4 + leading.

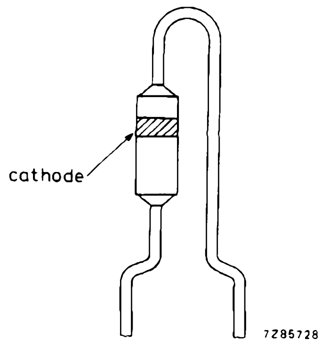


Fig. 5 – leading.

RULES FOR MOUNTING AND SOLDERING

Introduction

Excessive forces or temperatures applied to a diode may cause serious damage to the diode. To avoid damage when soldering and mounting the following rules should be followed.

General

Perpendicular forces on the body of the diode must be avoided.

Avoid sudden forces on the leads or body. These forces often are much higher than allowed.

High acceleration forces as a result of any shock (dropping on a hard surface for instance) must be prevented.

Bending

During bending the leads must be supported between body or stud and bending point.

Axial forces on the body during the bending process must not exceed 20 N.

Bending the leads through 90^{o} is allowed at any distance from the body when it is possible to support the leads during bending without contacting the envelope or weldings.

Bending close to the body or stud without supporting the leads only is allowed if the bend radius is greater than 0,5 mm.

Twisting

Twisting the leads is allowed at any distance from the body or stud if the lead is properly clamped between body or stud and twisting point.

Without clamping, twisting the leads is only allowed at a distance of greater than 3 mm from the body; the torque angle must not exceed 30^{o}.

Straightening

Straightening the leads is allowed if the applied pulling force in the axial direction does not exceed 20 N and the total duration is not longer than 5 seconds.

Soldering

Avoid any force on the body or leads during or just after soldering.

Do not correct the position of an already soldered device by pushing, pulling or twisting the body.

Prevent fast cooling after soldering.

Maximum allowable soldering time and minimum distance soldering point to seal for several envelopes

			Hand iron soldering mounted *otherwise than on printed-circuit board* (max. solder temp.: 300 °C)		Hand iron soldering, dip, wave or other bath soldering, *mounted on printed-circuit board* (max. solder temp.: 300 °C)	
			time s	distance mm	time s	distance mm
SOD-27	DO-35	glass	3	0,5	5	0,5
SOD-40	DO-15	plastic	3	5,0	3	5,0
SOD-51	–	glass	3	3,0	5	3,0
SOD-56	–	plastic	3	2,0	5	2,0
SOD-57	–	glass	3	0,5	5	0,5
SOD-61	–	glass	3	2,0	5	2,0
SOD-64	–	glass	3	0,5	5	0,5
SOD-66	DO-41	glass	3	3,0	5	3,0
SOD-68	DO-34	glass	3	0,5	5	0,5
TO-18	–	metal	3	0,5	5	0,5
TO-92	–	plastic	3	2,5	5	2,5

MOUNTING

If the rules for mounting and soldering are observed properly, the following mounting or process methods are allowed:

- Preheating of the printed circuit board before soldering, up to a maximum of 100 °C.
- Flat mounting with the diode body in direct contact with the printed circuit board with or without metal tracks on both sides and/or plated-through holes.
- Flat mounting with the diode body in direct contact with hot spots or hot tracks during soldering.
- Upright mounting with the diode body in direct contact with the printed circuit board if the body is not in contact with metal tracks or plated-through holes.

General

Parts of the general mounting and soldering rules can be overruled by individual type mounting and soldering rules, mentioned with the type description.

SOLDERING RECOMMENDATIONS
SOT-23, SOT-143 AND SOT-89 ENVELOPES

SOT-23, SOT-143 and SOT-89 devices are ideally suited for placement onto thick and thin film substrates and printed circuit boards.

To assure reliable and consistent connections particular attention should be paid to:

1. **Flux**

   A non-active flux is recommended. Where active fluxes are employed, great care in subsequent substrate cleaning must be exercised.

2. **Metal-alloy solder or solder paste**

   Correct choice of solder alloy or solder paste to be employed e.g. 62% Sn, 36% Pb, 2% Ag or 60% Sn/40% Pb. Any paste used should contain at least 85% metal dry weight.

3. **Soldering temperature**

   This will vary according to the actual method employed.

REFLOW SOLDERING

The preferred technique for mounting microminiature components on hybrid thick and thin-film is the method of reflow soldering.

The tags of SOT-23, SOT-143 and SOT-89 envelopes are pre-tinned and the best results are obtained if a similar solder is applied to the corresponding soldering areas on the substrate. This can be done by either dipping the substrate in a solder bath or by screen printing a solder paste.
The maximum temperature of the leads or tab during the soldering cycle should not exceed 285 ^{o}C.
The most economic method of soldering is a process in which all different components are soldered simultaneously for example SOT-23, SOT-143 or SOT-89 devices, capacitors and resistors.

Having first been fluxed, all components are positioned on the substrate. The slight adhesive force of the flux is sufficient to keep the components in place. Solder paste contains a flux and has therefore good inherent adhesive properties which eases positioning of the components.

With the components in position the substrate is heated to a point where the solder begins to flow. This can be done on a heating plate or on a conveyor belt running through an infrared tunnel. The maximum allowed temperature of the plastic body of a device must be kept below 280 ^{o}C during the soldering cycle. For further temperature behaviour during the soldering process see Figs 2 and 3.

The surface tension of the liquid solder tends to draw the tags of the device towards the centre of the soldering area and has thus a correcting effect on slight mispositionings. However, if the layout leaves something to be desired the same effect can result in undesirable shifts; particularly if the soldering areas on the substrate and the components are not concentrally arranged. This problem can be solved using a standard contact pattern, which leaves sufficient scope for the self-positioning effect (see Figs 4 and 5).

After cooling the connections may be visually inspected and, where necessary, repaired with a light soldering iron. Finally any remaining flux must be removed carefully.

IMMERSION SOLDERING

Where a complete substrate or printed circuit board is immersed in solder:

a. The temperature of the soldering bath should not exceed 280 °C.
b. The duration of the soldering cycle should not exceed 10 seconds.
c. Forced cooling may be applied (see Fig. 1).

HAND SOLDERING

It is possible to solder microminiature devices with a light hand-held soldering iron, but this method has obvious drawbacks and should therefore be restricted to laboratory use and/or incidental repairs on production circuits.

1. It is time-consuming and expensive.
2. The device cannot be positioned accurately and therefore the connecting tags may come into contact with the substrate and damage it.
3. There is a great risk of breaking either substrate or even internal connections inside the encapsulation.
4. The envelope may be damaged by the iron.

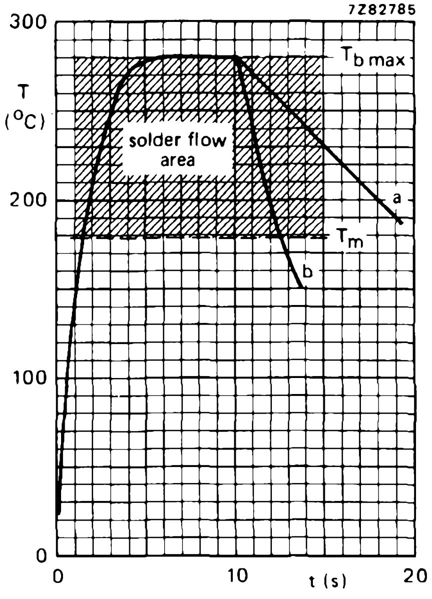
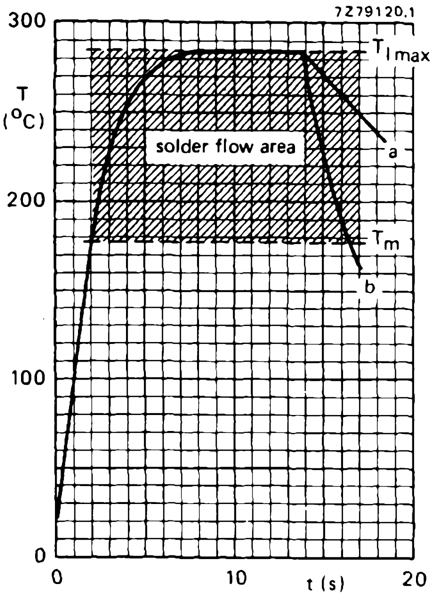


Fig. 1 Device temperature during *immersion* soldering.

Maximum time of immersion in soldering bath is 10 seconds at an ambient temperature of 25 °C.
a = free convection cooling; b = forced cooling.
$T_{b\,max}$ = maximum bath temperature (280 °C).
T_m = melting temperature of solder (179 °C).



a = free convection cooling.

b = permissible forced cooling.

$T_{l\,max}$ = Maximum lead or tab temperature = 285 °C.

T_m = Melting point of the solder is 179 °C.

T_{amb} = 25 °C.

Time of heat supply:
without preheating max. 14 s
with preheating max. 10 s

Maximum time of preheating 45 s

Fig. 2 Reflow soldering without preheating.

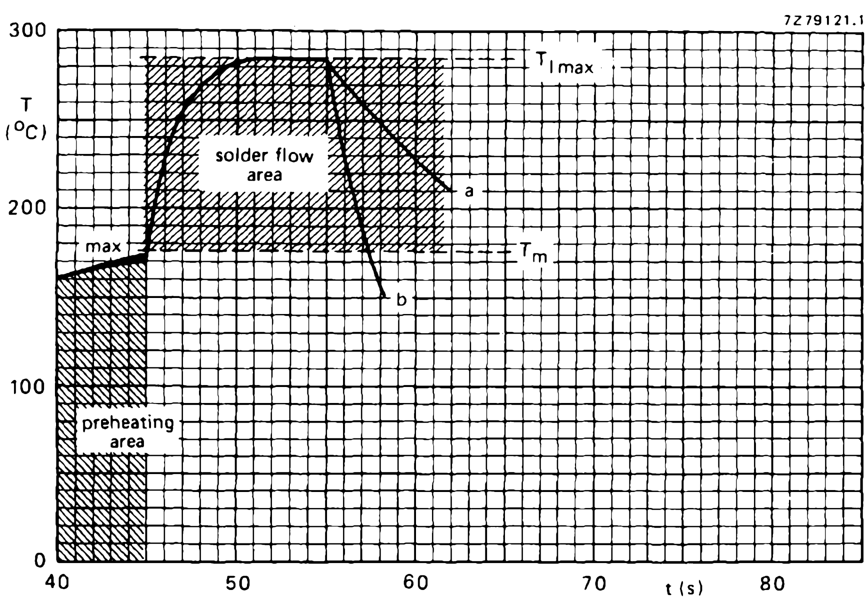


Fig. 3 Reflow soldering with preheating.

Minimum required dimensions of metal connection pads on hybrid thick and thin-film substrates.

Dimensions in mm

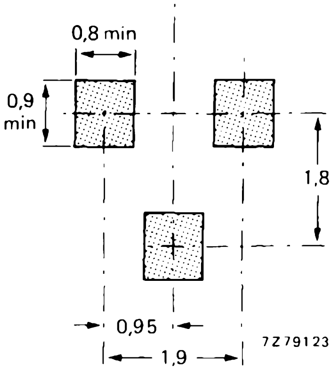


Fig. 4 SOT-23 pattern.

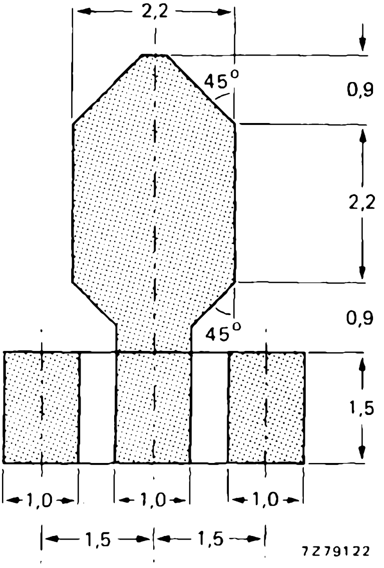


Fig. 5 SOT-89 pattern.

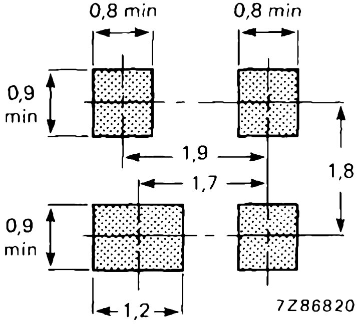


Fig. 6 SOT-143 pattern.

THERMAL CHARACTERISTICS
OF SOT-23 AND SOT-143 ENVELOPES

The heat generated in a semiconductor chip normally flows by various paths to the surroundings (ambient).

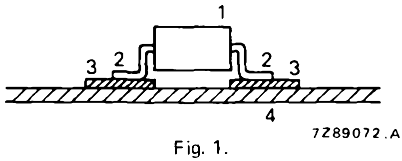


Fig. 1.

1. Heat radiation from the envelope to ambient (1).
   This heat transfer can be neglected when the envelope is mounted on a substrate or printed circuit board.
2. Heat transmission via leads (2) soldering points (3) and substrate (4).

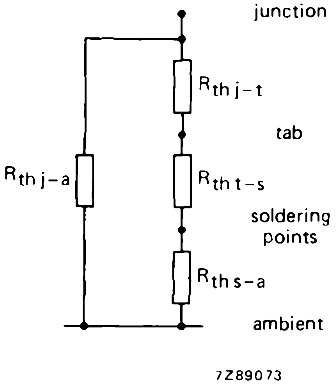


Fig. 2 Thermal behaviour of heat flow when the device is mounted on a substrate or printed circuit board.

$R_{th\ j\text{-}t}$ = Thermal resistance from junction to tab.

$R_{th\ t\text{-}s}$ = Thermal resistance from tab to soldering points.

$R_{th\ s\text{-}a}$ = Thermal resistance from soldering points to ambient.

$R_{th\ j\text{-}a}$ = Thermal resistance from junction to ambient.

Heat transfer directly from envelope to ambient

This depends on the difference between the temperatures of envelope and the surroundings. When the device is mounted on a substrate or printed circuit board direct heat flow can usually be neglected in relation to the heat flow via leads and substrate.
Thus the thermal model can be as in Fig. 3.

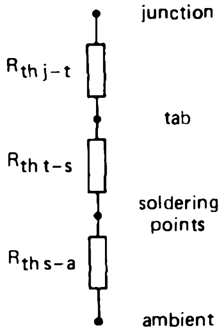


Fig. 3 Basic thermal model.

Heat transfer from junction to tab

This is an internal heat transfer and has been measured for SOT-23 envelopes. In general, for low-power diodes it is: 60 K/W

Heat transfer from tab to soldering points

This value has also been measured for SOT-23 with $P_{tot} < 350$ mW:	280	K/W
for types of semiconductors in a SOT-143 envelopes this value is:	310	K/W

Heat transfer from soldering points to ambient

This depends on the shape and material of tracks and substrate. In figures 4 and 5 standard mounting conditions are given to set up the maximum power ratings for SOT-23 encapsulation.

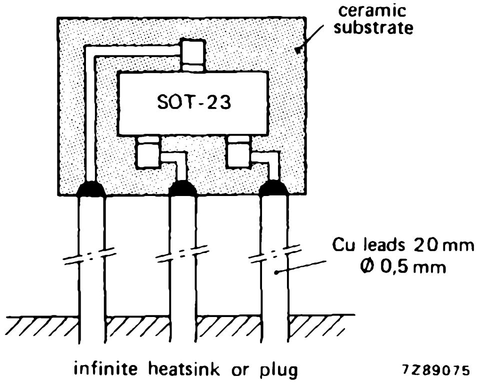


Fig. 4 Test circuit SOT-23 mounting conditions on a ceramic substrate.

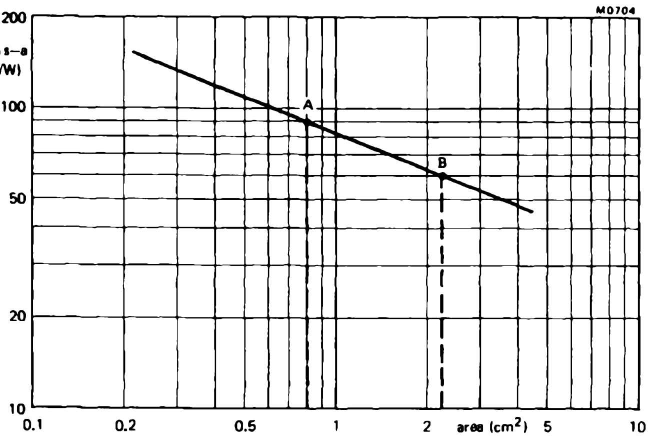


Fig. 5 Heat transfer from soldering points to ambient.

Point A on the curve in Fig. 5 is for an area of the ceramic substrate of 8 mm x 10 mm x 0,7 mm for the maximum rating of all high-frequency, low-frequency and switching transistors and also for all diodes in SOT-23 encapsulation.
Point B on the curve in Fig. 5 is for an area of the ceramic substrate of 15 mm x 15 mm x 0,7 mm for the maximum rating of low-frequency medium-power semiconductors.

The values for the thermal resistance from junction to tab, and tab to soldering points, are mentioned on page 2 and Fig. 5.

The formula for devices in SOT-23 with one crystal can be generalized:

$$T_j = P\,(R_{th\ j\text{-}t} + R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb}$$

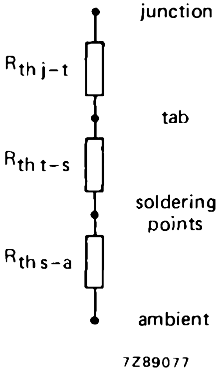


Fig. 6 Thermal model of SOT-23 envelopes with one crystal.

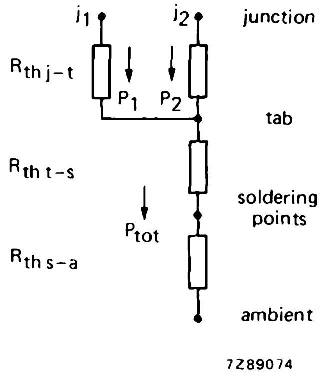


Fig. 7 Thermal model of SOT-23 envelopes with two crystals (double diode).

The formulae for devices with two crystals (double diodes) are:

$$T_{tab} = P_{tot} \cdot (R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb} = P_{tot}\,(280 + 90) + T_{amb}$$

$$T_{j1} = (P_1 \times R_{th\ j\text{-}t}) + T_{tab} = P_1 \cdot 60 + T_{tab}$$

$$T_{j2} = (P_2 \times R_{th\ j\text{-}t}) + T_{tab} = P_2 \cdot 60 + T_{tab}$$

As mentioned on page 2:

$R_{th\ j\text{-}t}$ for diodes is 60 K/W.

$R_{th\ s\text{-}a}$ (area 8 mm x 10 mm x 0,7 mm) = 90 K/W.

$R_{th\ t\text{-}s}$ for all semiconductors in SOT-23 = 280 K/W.

Thus:

$$T_{j1} = 60\,P_1 + 370\,P_{tot} + T_{amb}.$$

$$T_{j2} = 60\,P_2 + 370\,P_{tot} + T_{amb}.$$

SILICON WHISKERLESS DIODES

B

10 V, 30 V and 50 V GENERAL PURPOSE DIODES

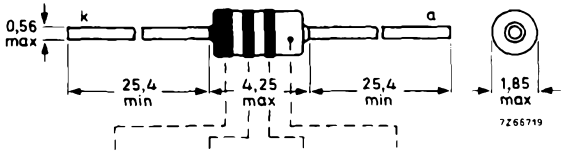
Silicon planar epitaxial diodes in DO-35 envelopes intended for general purpose applications.
They have reverse voltages up to 10 V for BA316, 30 V for BA317 and 50 V for BA318.

QUICK REFERENCE DATA

			BA316	BA317	BA318	
Continuous reverse voltage	V_R	max.	10	30	50	V
Repetitive peak forward current	I_{FRM}	max.		225		mA
Storage temperature	T_{stg}			−65 to +200		^oC
Junction temperature	T_j	max.		200		^oC
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=		0,60		$^oC/mW$
Forward voltage at I_F = 1,0 mA	V_F	<		700		mV
I_F = 10 mA	V_F	<		850		mV
I_F = 100 mA	V_F	<		1100		mV
Diode capacitance at V_R = 0; f = 1 MHz	C_d	<		2		pF
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<		4		ns

MECHANICAL DATA Dimensions in mm

DO-35



BA316:	orange	brown	blue	natural
BA317:	orange	brown	violet	natural
BA318:	orange (cathode)	brown	grey	natural

The diodes may be either type-branded or colour coded.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltage

			BA316	BA317	BA318	
Continuous reverse voltage	V_R	max.	10	30	50	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	100	mA	1)
Forward current (d.c.)	I_F	max.	100	mA	
Repetitive peak forward current	I_{FRM}	max.	225	mA	
Non-repetitive peak forward current					
t = 1 μs	I_{FSM}	max.	2000	mA	
t = 1 s	I_{FSM}	max.	500	mA	

Temperatures

Storage temperature	T_{stg}		−65 to +200	^oC
Junction temperature	T_j	max.	200	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,60	$^oC/mW$

CHARACTERISTICS $T_j = 25\ ^oC$

Forward voltage

I_F = 1,0 mA	V_F	<	700	mV
I_F = 10 mA	V_F	<	850	mV
I_F = 100 mA	V_F	<	1100	mV

Reverse current

			BA316	BA317	BA318	
V_R = 10 V	I_R	<	200	50	-	nA
V_R = 30 V	I_R	<	-	200	50	nA
V_R = 50 V	I_R	<	-	-	200	nA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	2	pF

1) For sinusoidal operation see page 6. For pulse operation see pages 4 and 5.

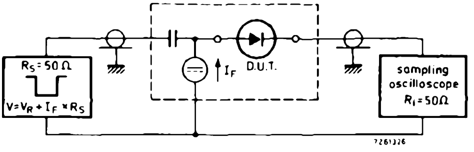
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

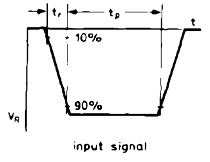
Reverse recovery time when switched from

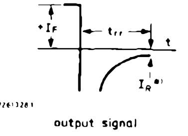
$I_F = 10$ mA to $I_R = 60$ mA; $R_L = 100\ \Omega$;

Measured at $I_R = 1$ mA t_{rr} < 4 ns

Test circuit and waveforms:



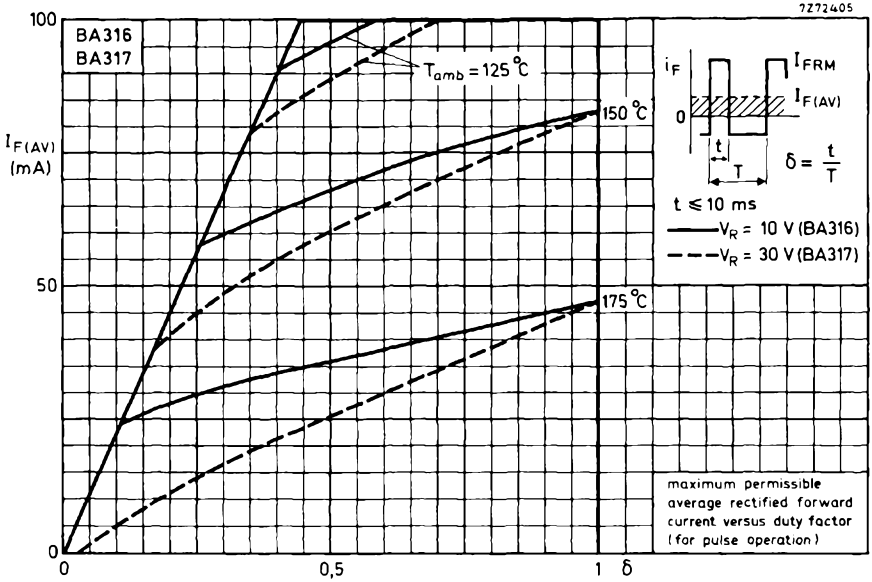


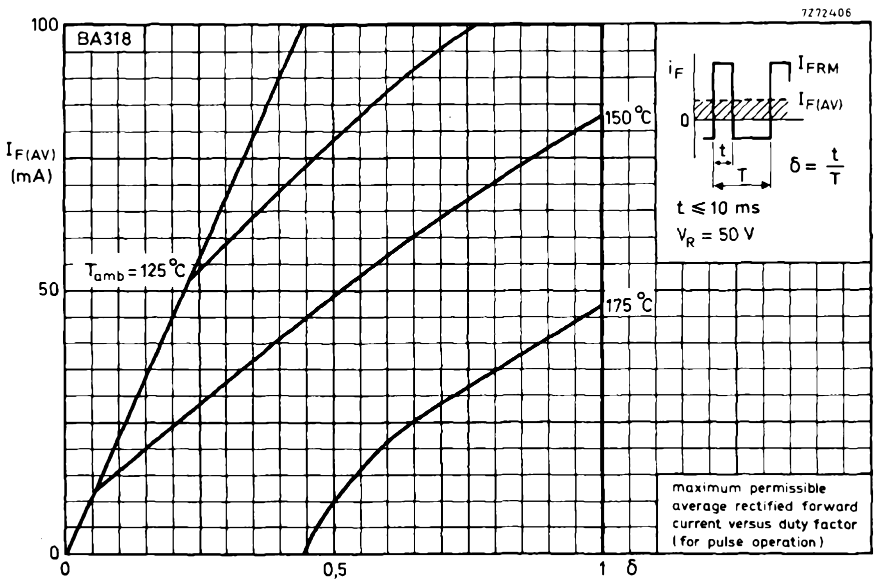


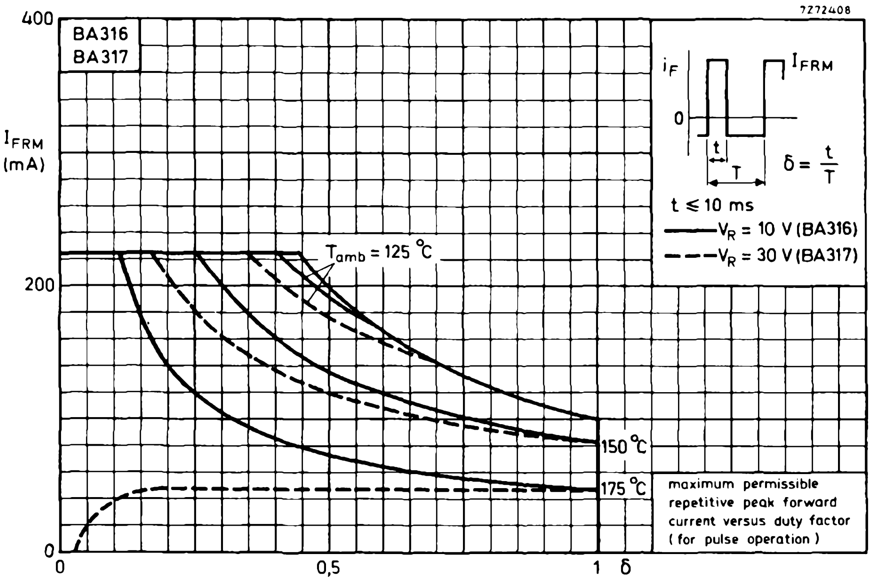
Input signal :	Rise time of the reverse pulse	$t_r = 0,6$ ns	*) $I_R = 1$ mA
	Reverse pulse duration	$t_p = 100$ ns	
	Duty factor	$\delta = 0,05$	

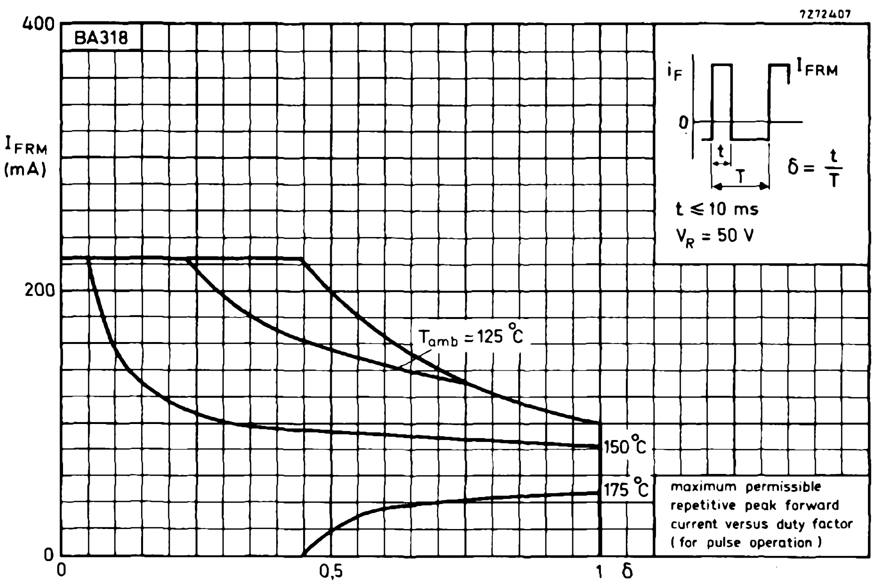
Oscilloscope: Rise time $t_r = 0,35$ ns

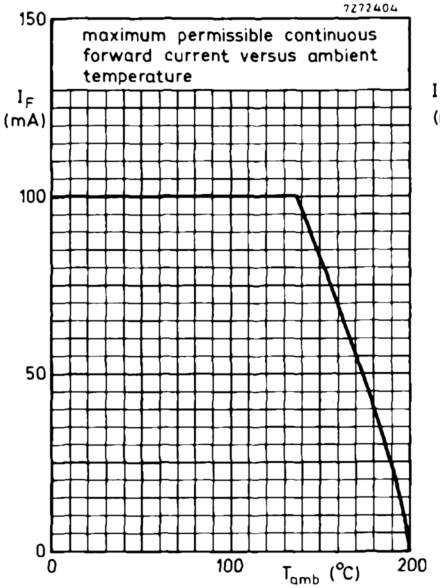
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

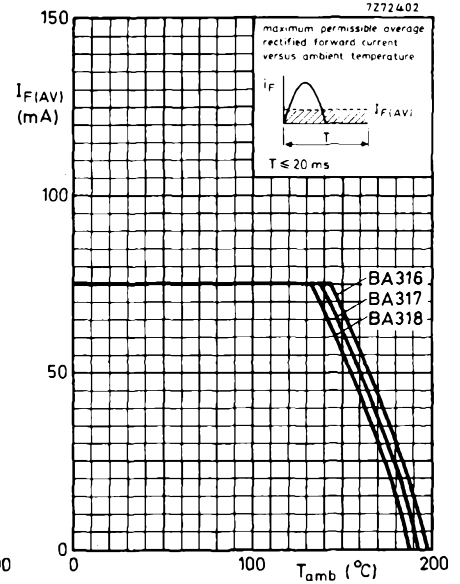

7Z72405
BA316
BA317
T_{amb} = 125 °C
150 °C
175 °C
$I_{F(AV)}$ (mA)
100
50
0
0
0,5
1 δ
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
δ = t/T
t ≤ 10 ms
V_R = 10 V (BA316)
V_R = 30 V (BA317)
maximum permissible average rectified forward current versus duty factor (for pulse operation)

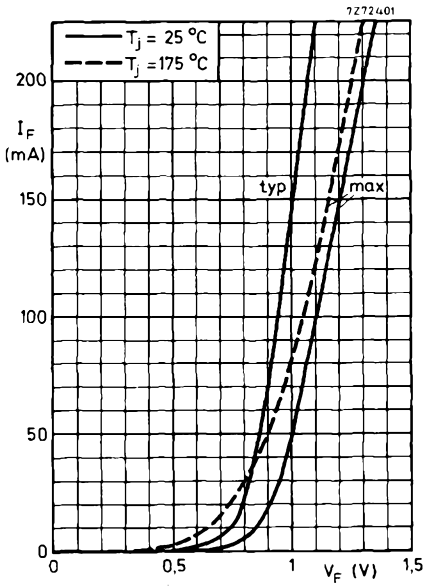

7Z72406
BA318
T_{amb} = 125 °C
150 °C
175 °C
$I_{F(AV)}$ (mA)
100
50
0
0
0,5
1 δ
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
δ = t/T
t ≤ 10 ms
V_R = 50 V
maximum permissible average rectified forward current versus duty factor (for pulse operation)

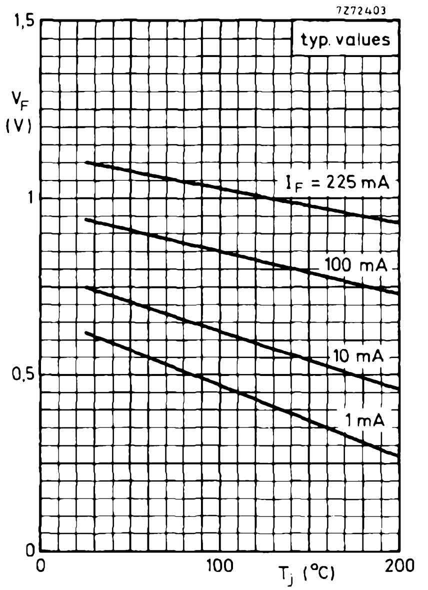

7Z72408
BA316
BA317
400
200
0
I_{FRM}
(mA)
i_F
I_{FRM}
0
t
T
δ = t/T
t ⩽ 10 ms
V_R = 10 V (BA316)
V_R = 30 V (BA317)
T_{amb} = 125 °C
150 °C
175 °C
maximum permissible
repetitive peak forward
current versus duty factor
(for pulse operation)
0
0,5
1 δ

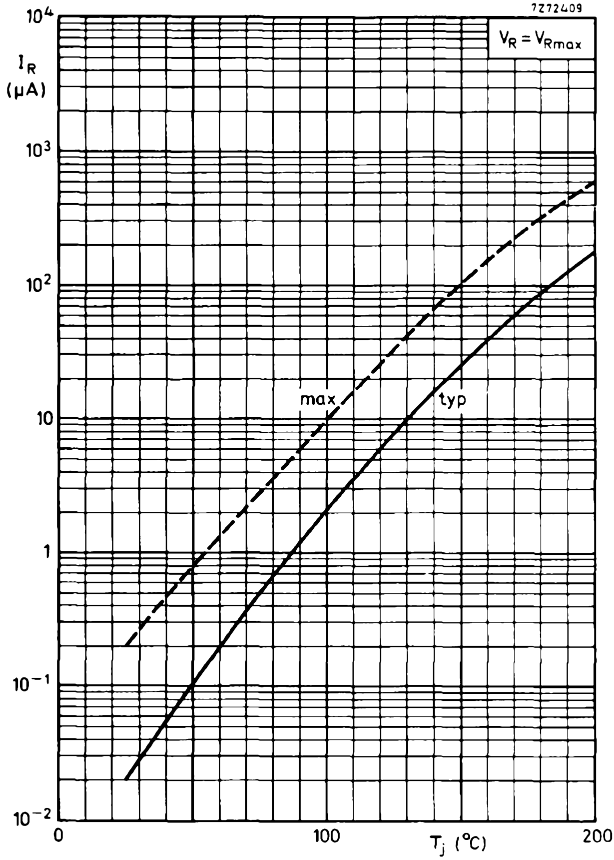

7Z72407
BA318
400
200
0
I_{FRM}
(mA)
i_F
I_{FRM}
0
t
T
δ = t/T
t ⩽ 10 ms
V_R = 50 V
T_{amb} = 125 °C
150 °C
175 °C
maximum permissible
repetitive peak forward
current versus duty factor
(for pulse operation)
0
0,5
1 δ


7Z72404
maximum permissible continuous forward current versus ambient temperature
150
I_F (mA)
100
50
0
0
100
T_{amb} (°C)
200


7Z72402
maximum permissible average rectified forward current versus ambient temperature
i_F
$I_{F(AV)}$
T
T ≤ 20 ms
150
$I_{F(AV)}$ (mA)
100
BA316
BA317
BA318
50
0
0
100
T_{amb} (°C)
200


7Z72401
T_j = 25 °C
T_j = 175 °C
200
I_F (mA)
150
typ
max
100
50
0
0
0,5
1
V_F (V)
1,5


7Z72403
1,5
typ. values
V_F (V)
1
I_F = 225 mA
100 mA
0,5
10 mA
1 mA
0
0
100
T_j (°C)
200


7Z72409
$V_R = V_{Rmax}$
I_R (μA)
10^4
10^3
10^2
10
1
10^{-1}
10^{-2}
max
typ
0
100
200
T_j (°C)

SILICON GLASS PASSIVATED AVALANCHE DIODE

Diode in a DO-35 envelope. It is primarily intended for general purpose applications, e.g. scan and flyback rectifiers, protection diodes etc. in television circuits. An advantage of this diode is its capability of absorbing reverse transient energy.

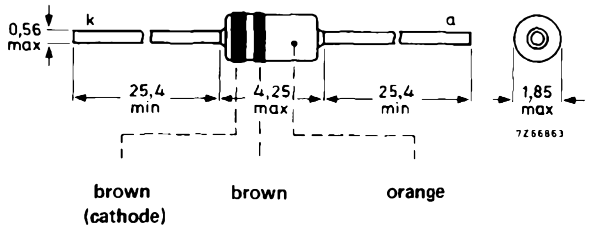
QUICK REFERENCE DATA

Working reverse voltage	V_{RW}	max.	300	V
Average rectified forward current	$I_{F(AV)}$	max.	300	mA
Non-repetitive peak forward current	I_{FSM}	max.	4	A
Repetitive peak reverse power dissipation	P_{RRM}	max.	75	W
Reverse recovery time	t_{rr}	<	1	μs

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-35 (SOD-27).



The diodes may be either type-branded or colour-coded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Working reverse voltage	V_{RW}	max.	300	V
Continuous reverse voltage (see Fig. 8)	V_R	max.	300	V
Forward current (d.c.)	I_F	max.	350	mA
Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	300	mA
Repetitive peak forward current				
t = 10 ms; f = 50 Hz	I_{FRM}	max.	900	mA
δ = 0,1; f = 15 kHz	I_{FRM}	max.	2	A
Non-repetitive peak forward current				
(t = 10 ms; half sine-wave) T_j = 150 °C prior to surge	I_{FSM}	max.	4	A
(t = 10 μs; square wave) T_j = 150 °C prior to surge	I_{FSM}	max.	30	A
Repetitive peak reverse current				
t = 10 μs (square wave; f = 50 Hz) T_{amb} = 25 °C	I_{RRM}	max.	150	mA
Repetitive peak reverse power dissipation				
t = 10 μs (square wave; f = 50 Hz) T_{amb} = 25 °C	P_{RRM}	max.	75	W
Storage temperature	T_{stg}	−65 to + 150		°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on printed board at 8 mm lead length	$R_{th\ j\text{-}a}$	=	0,34	°C/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage				
I_F = 300 mA	V_F	<	1,1	V
I_F = 900 mA	V_F	<	1,3	V
Reverse avalanche breakdown voltage				
I_R = 100 μA	$V_{(BR)R}$	>	300	V
Reverse current				
V_R = 300 V	I_R	<	100	nA
V_R = 300 V; T_j = 125 °C *	I_R	<	20	μA
Diode capacitance at f = 1 MHz				
V_R = 0	C_d	typ.	10	pF
V_R = 50 V	C_d	typ.	1,5	pF
Reverse recovery when switched from I_{FM} = 400 mA to V_R = 30 V; with $-dI_F/dt$ = 400 mA/μs				
Recovery charge	Q_s	typ.	70	nC
Recovery time	t_{rr}	<	1	μs
Maximum slope of reverse recovery current when switched from I_{FM} = 400 mA to V_R = 30 V; with $-dI_F/dt$ = 400 mA/μs	$\lvert dI_R/dt \rvert$	typ.	2,0	A/μs

* Pulse measurement only.

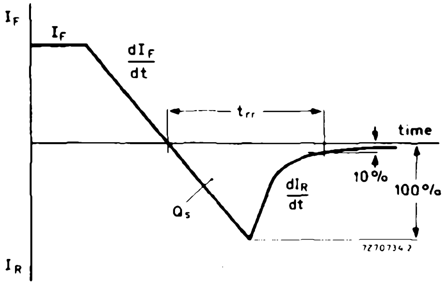


Fig. 2 Definitions of Q_s, t_{rr} and dI_R/dt.

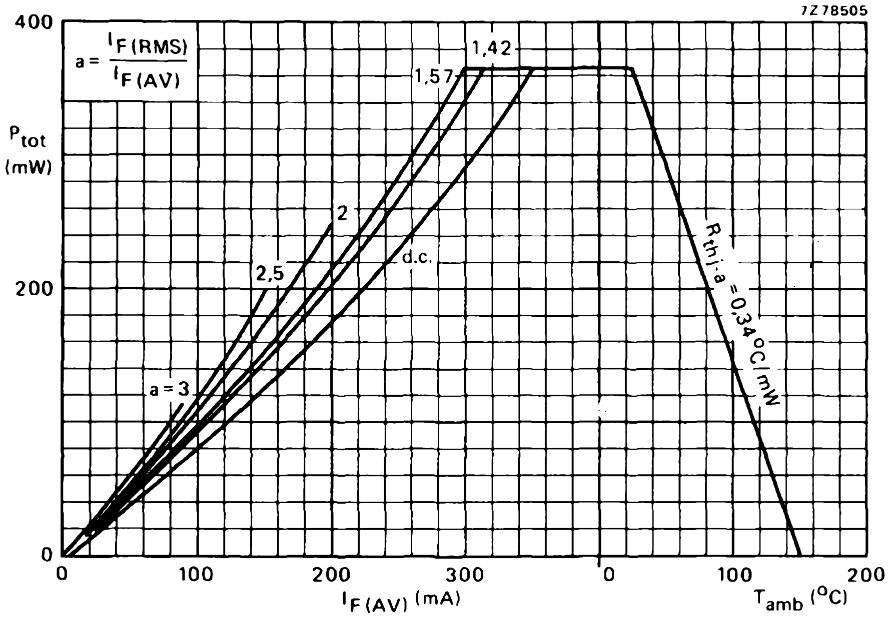


Fig. 3.

From the left-hand graph the total power dissipation can be found as a function of the average output current.

The parameter $a = \frac{I_{F(RMS)}}{I_{F(AV)}}$ depends on $n\omega R_L C_L$ and $\frac{R_t + r_{diff}}{nR_L}$ and can be found from existing graphs.

Once the power dissipation is known, the maximum permissible ambient temperature follows from the right-hand graph.

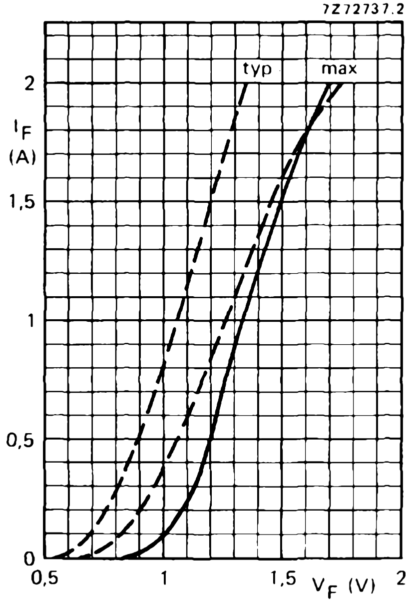


Fig. 4 —— $T_j = 25\ ^oC$; – – – $T_j = 150\ ^oC$.

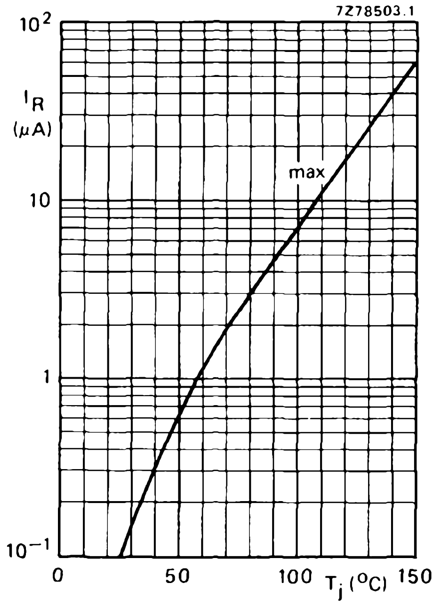


Fig. 5 $V_R = 300$ V.

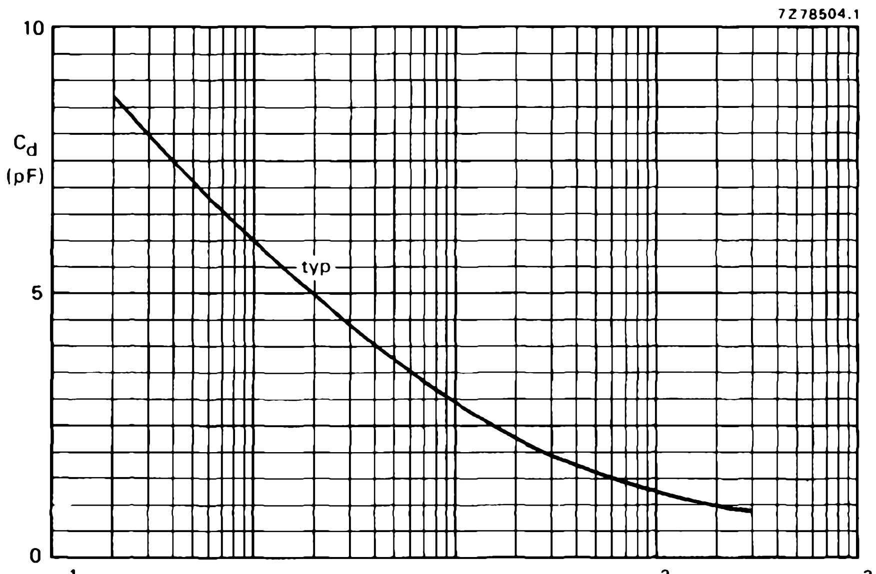


Fig. 6 f ≈ 1 MHz; $T_j = 25\ ^oC$.

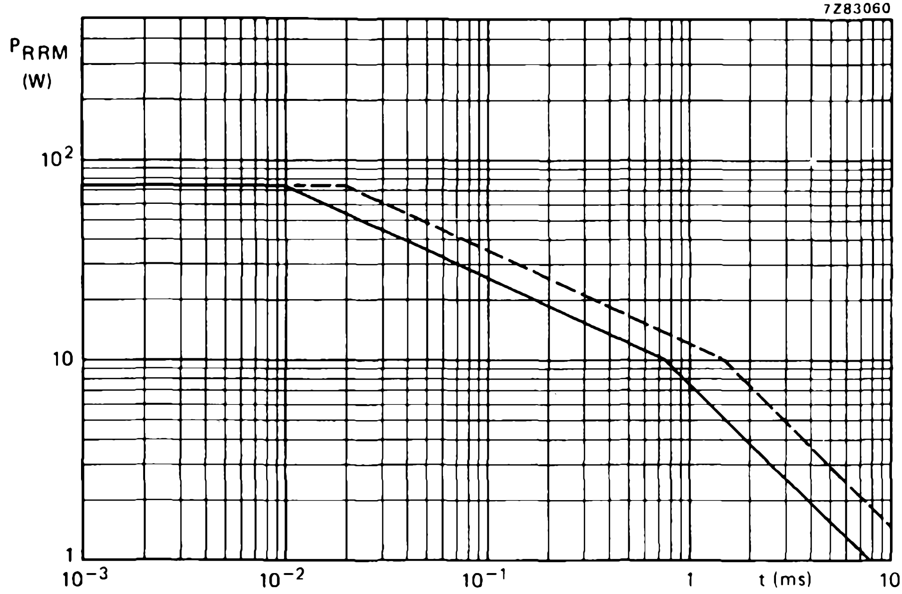


Fig. 7 Maximum permissible repetitive peak reverse power as a function of pulse duration. $T \geqslant 20$ ms; $T_j = 25$ °C. ——— rectangular waveform, $\delta \leqslant 0{,}01$; – – – triangular waveform, $\delta \leqslant 0{,}02$.

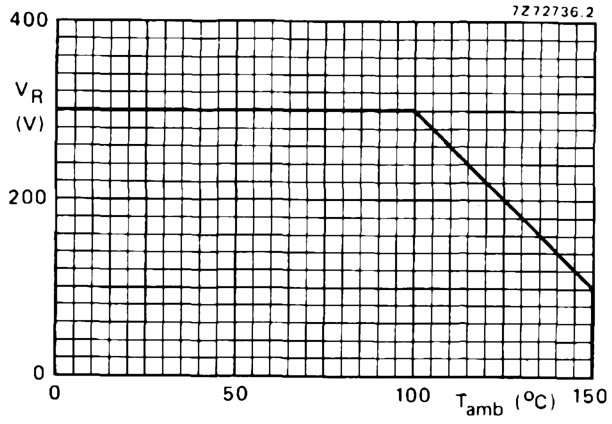


Fig. 8 Maximum permissible continuous reverse voltage versus ambient temperature.

ULTRA-HIGH-SPEED DIODE

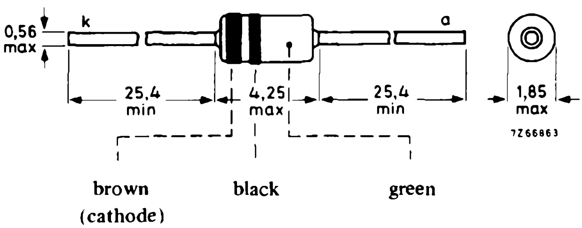
Silicon planar epitaxial, ultra-high-speed, high-conductance diode in a DO-35 envelope. The BAV10 is primarily intended for core gating in very fast memories.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	60	V
Repetitive peak reverse voltage	V_{RRM}	max.	60	V
Repetitive peak forward current	I_{FRM}	max.	600	mA
Junction temperature	T_j	max.	200	^oC
Forward voltage at I_F = 200 mA	V_F	<	1,0	V
Reverse recovery time when switched from I_F = 400 mA to I_R = 400 mA; R_L = 100 Ω; measured at I_R = 40 mA	t_{rr}	<	6	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	50	pC

MECHANICAL DATA

Dimensions in mm

DO-35



The diodes may be either type-branded or colour-coded.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Continuous reverse voltage	V_R	max.	60	V	
Repetitive peak reverse voltage	V_{RRM}	max.	60	V	[1]

Currents

Average rectified forward current	$I_{F(AV)}$	max.	300	mA	[2]
Forward current (d.c.)	I_F	max.	300	mA	
Repetitive peak forward current	I_{FRM}	max.	600	mA	
Non-repetitive peak forward current t = 1 μs	I_{FSM}	max.	4000	mA	
t = 1 s	I_{FSM}	max.	1000	mA	

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j\text{-}a}$	=	0,5	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 10 mA	V_F	<	0,75	V
I_F = 200 mA	V_F	<	1,00	V
I_F = 200 mA; T_j = 100 °C	V_F	<	0,95	V
I_F = 500 mA	V_F	<	1,25	V

Reverse current

V_R = 60 V	I_R	<	100	nA
V_R = 60 V; T_j = 150 °C	I_R	<	100	μA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	2,5	pF

[1]) Measured at zero life time at I_R = 10 μA; V_R = 75 V.

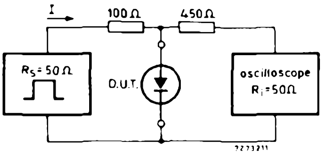
[2]) For sinusoidal operation see page 6. For pulse operation see page 5.

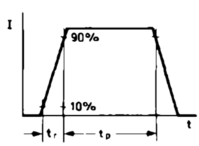
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Forward recovery voltage when switched to

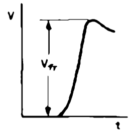
I_F = 400 mA; t_{r1} = 30 ns	V_{fr}	<	2,0	V
I_F = 400 mA; t_{r2} = 100 ns	V_{fr}	<	1,5	V

Test circuit and waveforms:





input signal



output signal

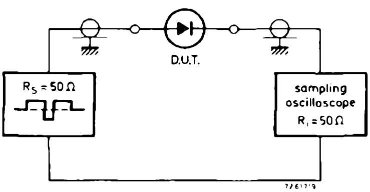
Input signal :	1st rise time of the forward pulse	t_{r1}	=	30 ns
	2nd rise time of the forward pulse	t_{r2}	=	100 ns
	Forward current pulse duration	t_p	=	300 ns
	Duty factor	δ	=	0,01
Oscilloscope:	Rise time	t_r	=	0,35 ns
	Input capacitance	C_i	≤	1 pF

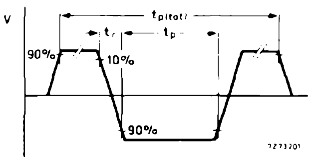
Circuit capacitance C ≤ 20 pF (C = C_i + parasitic capacitance)

Reverse recovery time when switched from

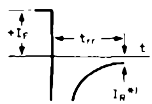
I_F = 400 mA to I_R = 400 mA; R_L = 100 Ω;
measured at I_R = 40 mA t_{rr} < 6 ns

Test circuit and waveforms:





input signal



output signal

Input signal :	Total pulse duration	$t_{p(tot)}$	=	0,2 µs	*) I_R = 40 mA
	Duty factor	δ	=	0,0025	
	Rise time of the reverse pulse	t_r	=	0,6 ns	
	Reverse pulse duration	t_p	=	30 ns	
Oscilloscope:	Rise time	t_r	=	0,35 ns	

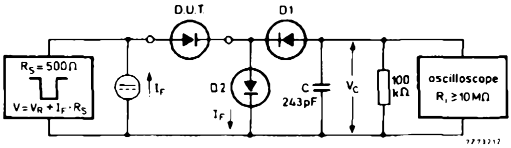
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

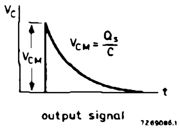
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Recovery charge when switched from

I_F = 10 mA to V_R = 5 V; R_L = 500 Ω Q_s < 50 pC

Test circuit and waveform:





D1 = BAW62

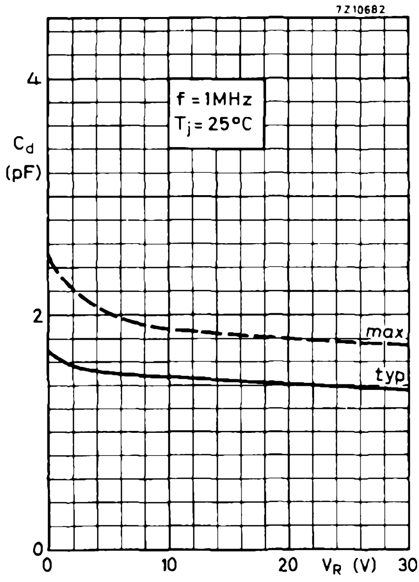
D2 = diode with minority carrier life time at 10 mA: < 200 ps

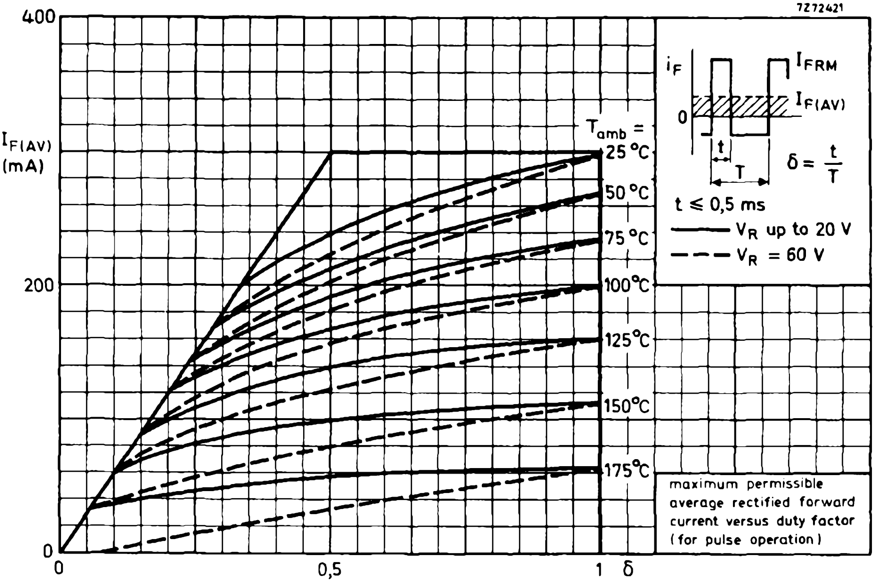
Input signal : Rise time of the reverse pulse t_r = 2 ns

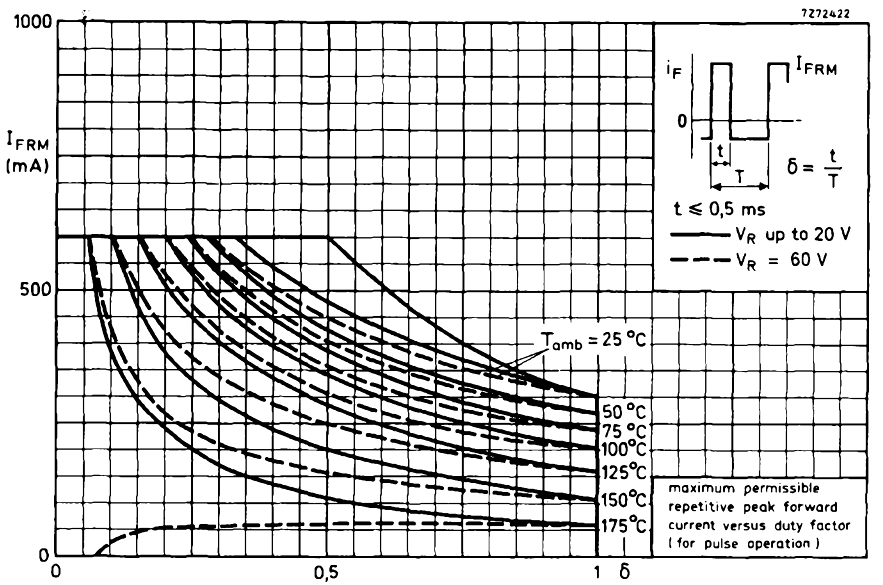
Reverse pulse duration t_p = 400 ns

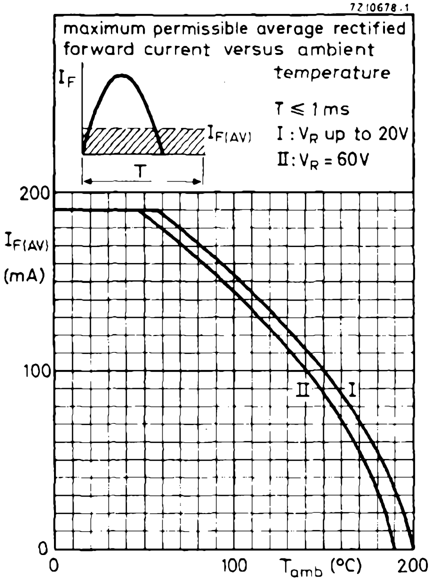
Duty factor δ = 0, 02

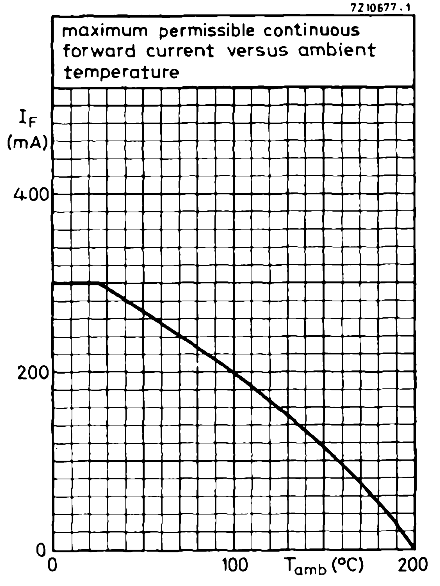
Circuit capacitance C ≤ 7 pF (C = oscilloscope input capacitance + parasitic capacitance)

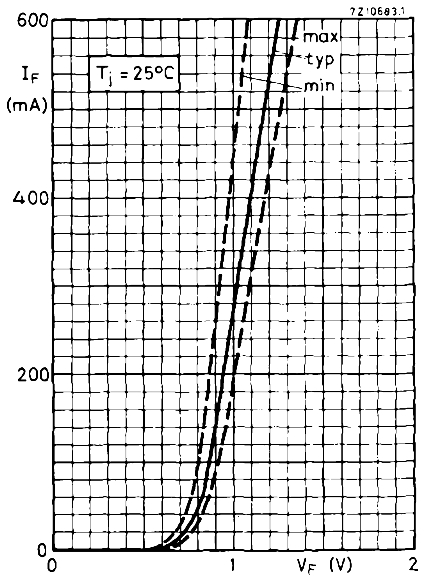


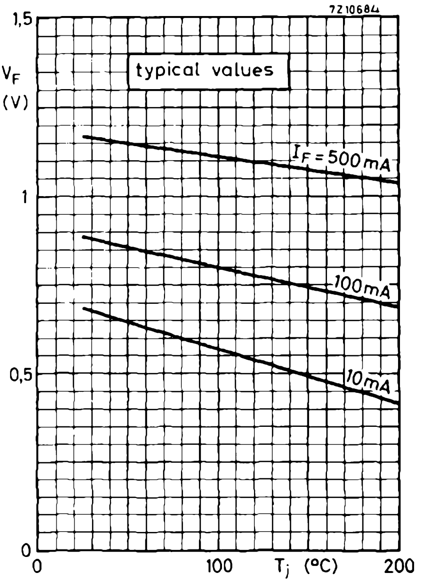

7Z72421
400
200
0
$I_{F(AV)}$
(mA)
0
0,5
1 δ
T_{amb} =
25 °C
50 °C
75 °C
100°C
125°C
150°C
175°C
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
$\delta = \frac{t}{T}$
t ≤ 0,5 ms
V_R up to 20 V
V_R = 60 V
maximum permissible
average rectified forward
current versus duty factor
(for pulse operation)

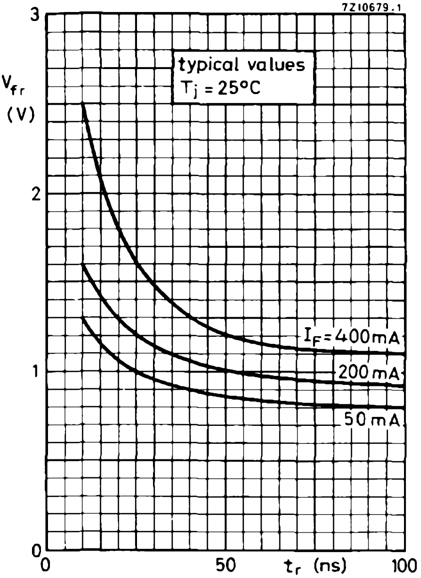

7Z72422
1000
500
0
I_{FRM}
(mA)
0
0,5
1 δ
T_{amb} = 25 °C
50 °C
75 °C
100°C
125°C
150°C
175°C
i_F
I_{FRM}
0
t
T
$\delta = \frac{t}{T}$
t ≤ 0,5 ms
V_R up to 20 V
V_R = 60 V
maximum permissible
repetitive peak forward
current versus duty factor
(for pulse operation)

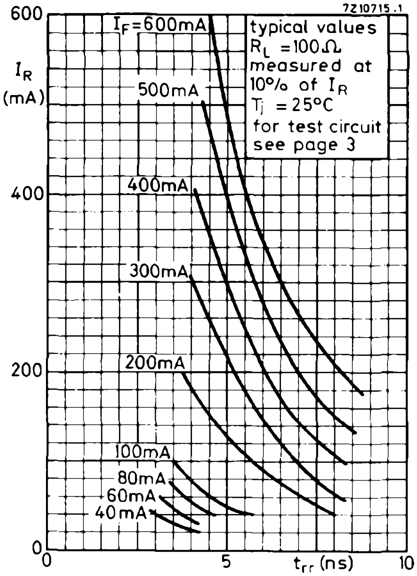

7Z10678.1
maximum permissible average rectified forward current versus ambient temperature
I_F
$I_{F(AV)}$
T
T ≤ 1 ms
I : V_R up to 20V
II : V_R = 60V
200
$I_{F(AV)}$
(mA)
100
0
0
100
T_{amb} (°C)
200
II
I

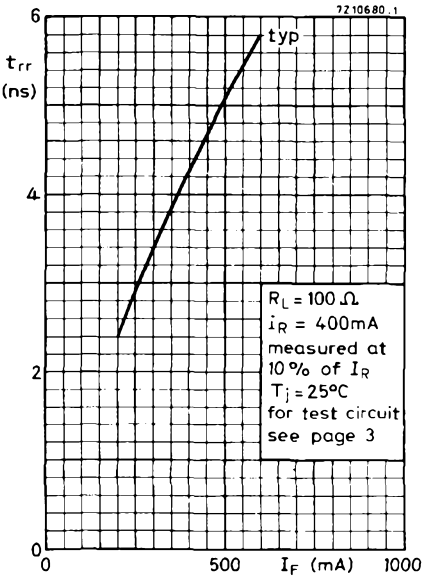

7Z10677.1
maximum permissible continuous forward current versus ambient temperature
I_F
(mA)
400
200
0
0
100
T_{amb} (°C)
200

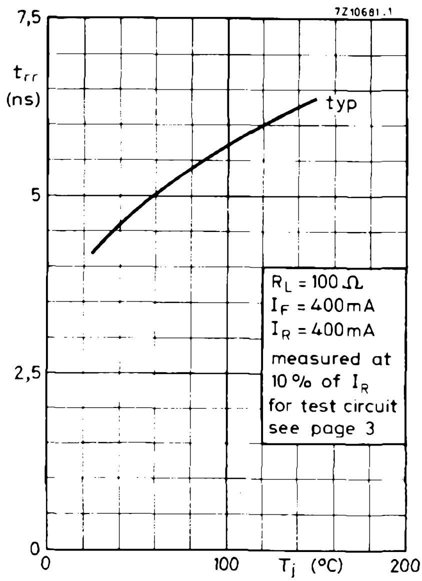

7Z10683.1
600
I_F
(mA)
400
200
0
T_j = 25°C
max
typ
min
0
1
V_F (V)
2

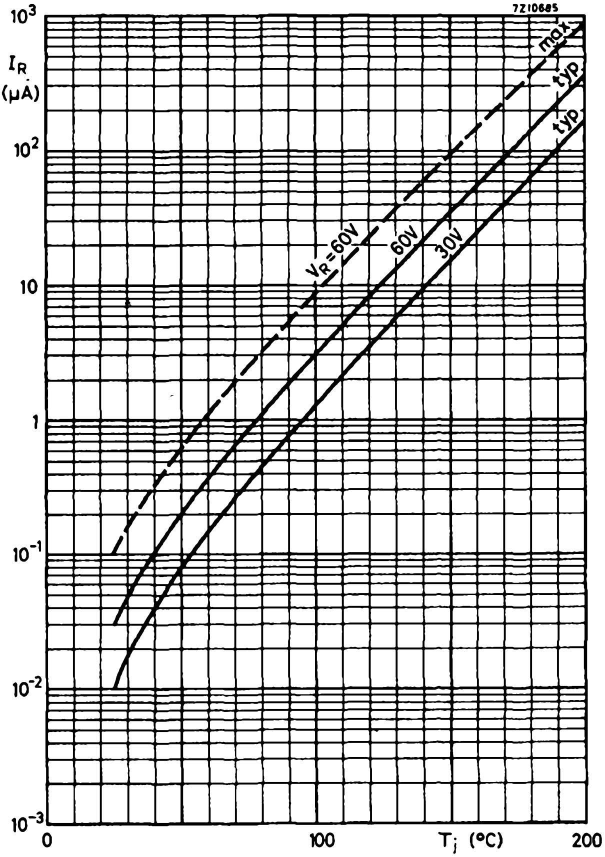

7Z10684
1,5
V_F
(V)
1
0,5
0
typical values
I_F = 500 mA
100 mA
10 mA
0
100
T_j (°C)
200


7Z10679.1
typical values
$T_j = 25°C$
V_{fr}
(V)
$I_F = 400mA$
200 mA
50 mA
0
1
2
3
0
50
t_r (ns)
100


7Z10715.1
typical values
$R_L = 100\Omega$
measured at
10% of I_R
$T_j = 25°C$
for test circuit
see page 3
I_R
(mA)
$I_F = 600mA$
500mA
400mA
300mA
200mA
100mA
80mA
60mA
40mA
0
200
400
600
0
5
t_{rr} (ns)
10


7Z10680.1
typ
t_{rr}
(ns)
$R_L = 100\Omega$
$i_R = 400mA$
measured at
10% of I_R
$T_j = 25°C$
for test circuit
see page 3
0
2
4
6
0
500
I_F (mA)
1000


7Z10681.1
typ
t_{rr}
(ns)
$R_L = 100\Omega$
$I_F = 400mA$
$I_R = 400mA$
measured at
10% of I_R
for test circuit
see page 3
0
2,5
5
7,5
0
100
T_j (°C)
200


7Z10685
10^3
I_R
(μA)
10^2
10
1
10^{-1}
10^{-2}
10^{-3}
0
100
T_j (°C)
200
max
typ.
typ.
V_R=60V
60V
30V

GENERAL PURPOSE DIODES

Silicon planar epitaxial diodes in DO-35 envelopes; intended for switching and general purposes in industrial equipment e.g. oscilloscopes, digital voltmeters and video output stages in colour television.

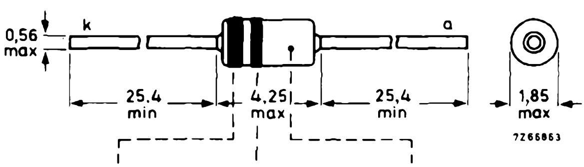
QUICK REFERENCE DATA

			BAV18	BAV19	BAV20	BAV21	
Continuous reverse voltage	V_R	max.	50	100	150	200	V
Forward current (d.c.)	I_F	max.	250				mA
Junction temperature	T_j	max.	175				°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,375				K/mW
Forward voltage at I_F = 100 mA	V_F	<	1,0				V
Reverse current at $V_R = V_{Rmax}$	I_R	<	100				nA
Diode capacitance at V_R = 0; f = 1 MHz	C_d	typ.	1,5				pF
		<	5,0				pF
Reverse recovery time when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	50				ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-27 (DO-35).



BAV18:	brown	grey	green
BAV19:	brown	white	green
BAV20:	red	black	green
BAV21:	red	brown	green
	(cathode)		

Diodes may be either type-branded or colour coded.

Products approved to CECC 50 001-022, available on request.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

			BAV18	BAV19	BAV20	BAV21	
Continuous reverse voltage	V_R	max.	50	100	150	200	V
Repetitive peak reverse voltage	V_{RRM}	max.	60	120	200	250	V

Currents

Average rectified forward current	$I_{F(AV)}$	max.	250	mA	1)
Forward current (d.c.)	I_F	max.	250	mA	
Repetitive peak forward current	I_{FRM}	max.	625	mA	
Non-repetitive peak forward current					
$t < 1$ s ; $T_j = 25\ ^oC$	I_{FSM}	max.	1	A	
$t = 1\ \mu s$; $T_j = 25\ ^oC$	I_{FSM}	max.	5	A	

Power dissipation

Total power dissipation up to $T_{amb} = 25\ ^oC$	P_{tot}	max.	400	mW

Temperatures

Storage temperature	T_{stg}	-65 to +175		^oC
Junction temperature	T_j	max.	175	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,375	$^oC/mW$

1) For sinusoidal operation see page 6. For pulse operation see pages 4 and 5.

CHARACTERISTICS

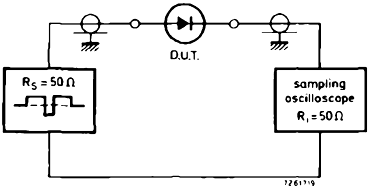
T_j = 25 °C unless otherwise specified

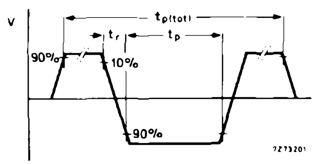
Forward voltage				
I_F = 100 mA	V_F	<	1,0	V
I_F = 200 mA	V_F	<	1,25	V

Reverse breakdown voltage			BAV18	BAV19	BAV20	BAV21		
I_R = 100 μA	$V_{(BR)R}$	>	60	120	200	250	V	1)

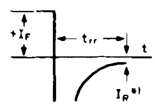
Reverse current				
$V_R = V_{Rmax}$	I_R	<	100	nA
$V_R = V_{Rmax}$; T_j = 150 °C; pulse conditions	I_R	<	100	μA
Differential resistance				
I_F = 10 mA	r_{diff}	typ.	5	Ω
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	typ. <	1,5 5,0	pF pF
Reverse recovery time when switched from				
I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	50	ns

Test circuit and waveforms:





input signal



output signal

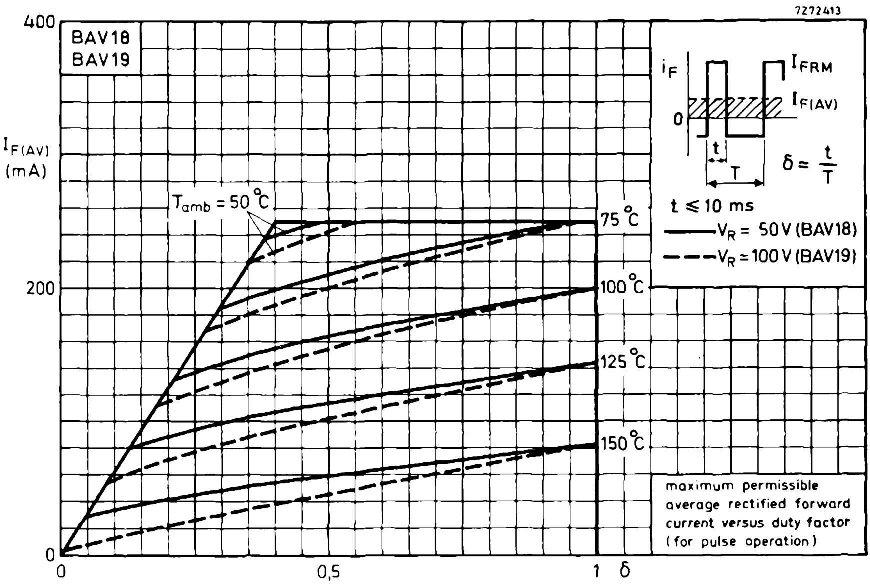
Input signal	: Total pulse duration	$t_{p(tot)}$	=	2 μs
	Duty factor	δ	=	0,0025
	Rise time of the reverse pulse	t_r	=	0,6 ns
	Reverse pulse duration	t_p	=	100 ns
Oscilloscope:	Rise time	t_r	=	0,35 ns

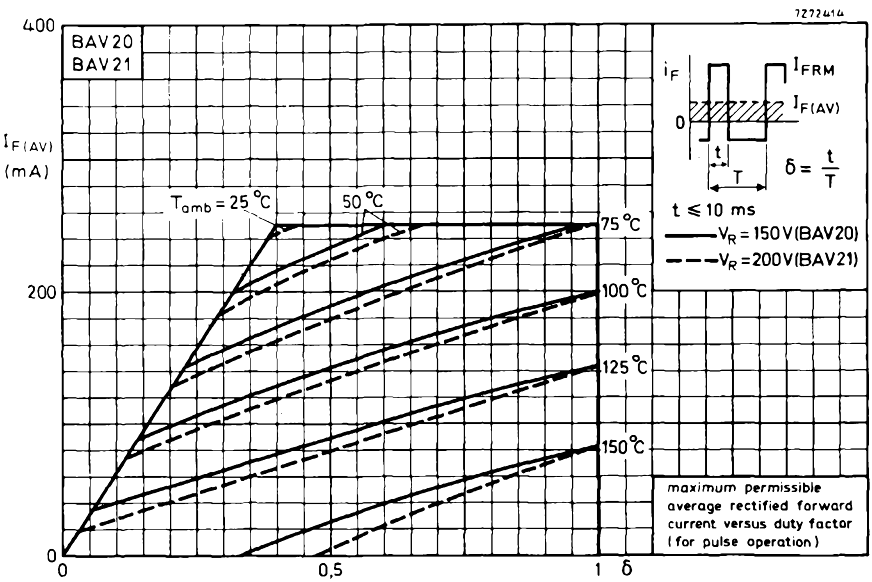
*) I_R = 3 mA

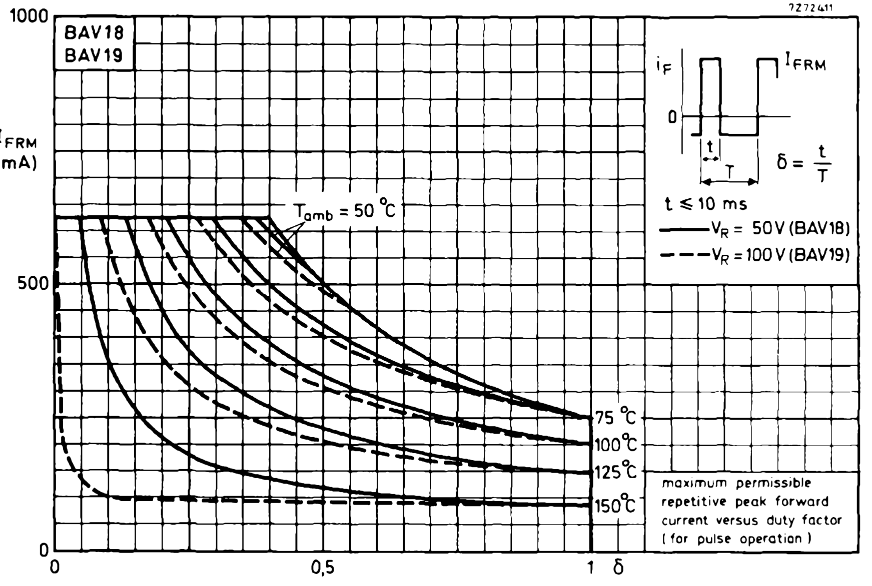
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

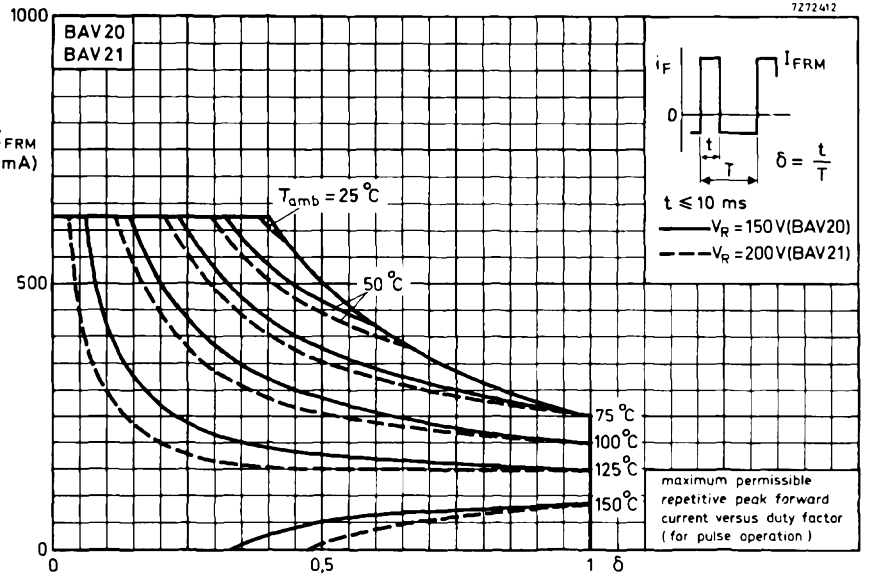
---

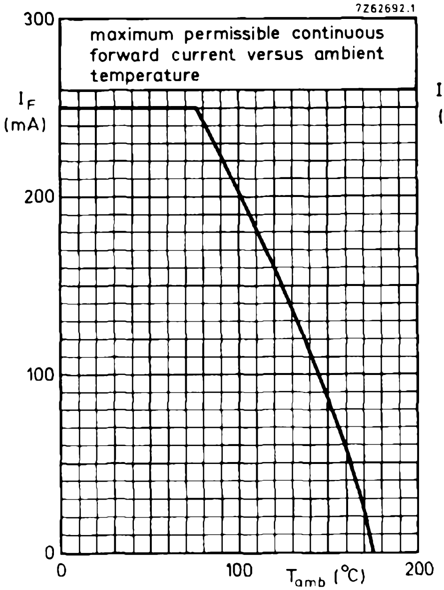
1) At zero life time, measured under pulse conditions to avoid excessive dissipation and voltage limited at 275 V.

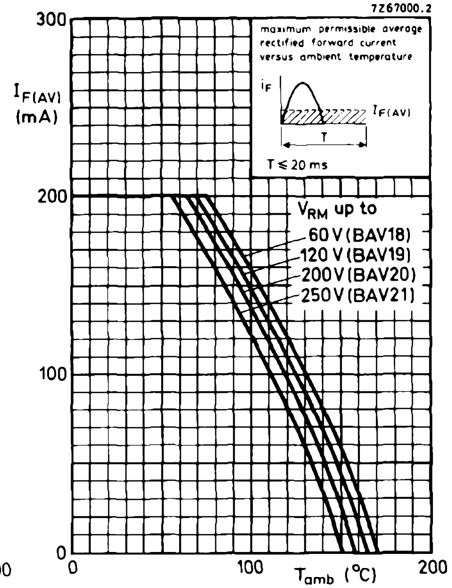

7Z72413
BAV18
BAV19
$I_{F(AV)}$
(mA)
400
200
0
0
0,5
1
δ
T_{amb} = 50 °C
75 °C
100 °C
125 °C
150 °C
i_F
I_{FRM}
$I_{F(AV)}$
t
T
$\delta = \frac{t}{T}$
t ⩽ 10 ms
V_R = 50 V (BAV18)
V_R = 100 V (BAV19)
maximum permissible average rectified forward current versus duty factor (for pulse operation)

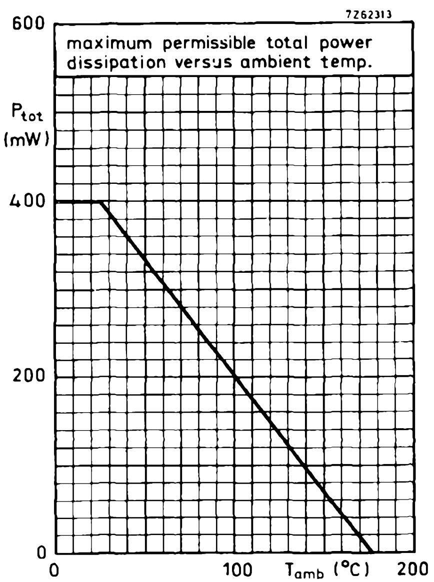

7Z72414
BAV20
BAV21
$I_{F(AV)}$
(mA)
400
200
0
0
0,5
1
δ
T_{amb} = 25 °C
50 °C
75 °C
100 °C
125 °C
150 °C
i_F
I_{FRM}
$I_{F(AV)}$
t
T
$\delta = \frac{t}{T}$
t ⩽ 10 ms
V_R = 150 V (BAV20)
V_R = 200 V (BAV21)
maximum permissible average rectified forward current versus duty factor (for pulse operation)

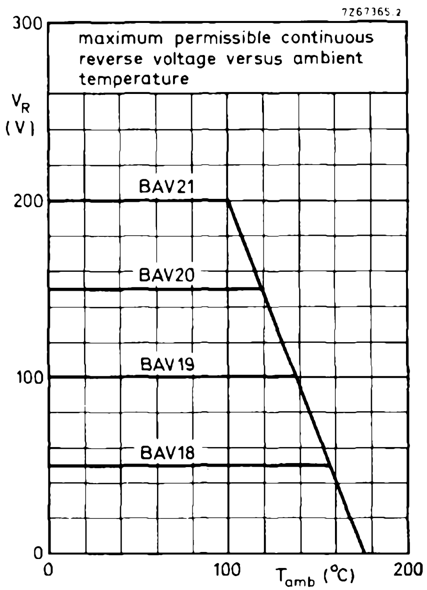

7Z72411
BAV18
BAV19
1000
500
0
I_{FRM} (mA)
0
0,5
1 δ
T_{amb} = 50 °C
75 °C
100 °C
125 °C
150 °C
i_F
I_{FRM}
0
t
T
δ = t/T
t ≤ 10 ms
V_R = 50 V (BAV18)
V_R = 100 V (BAV19)
maximum permissible repetitive peak forward current versus duty factor (for pulse operation)

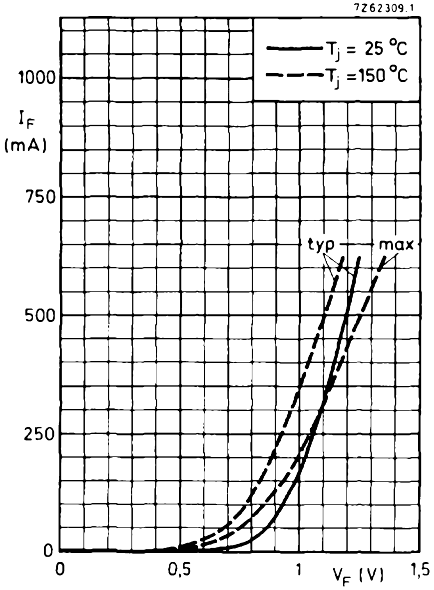

7Z72412
BAV20
BAV21
1000
500
0
I_{FRM} (mA)
0
0,5
1 δ
T_{amb} = 25 °C
50 °C
75 °C
100 °C
125 °C
150 °C
i_F
I_{FRM}
0
t
T
δ = t/T
t ≤ 10 ms
V_R = 150 V (BAV20)
V_R = 200 V (BAV21)
maximum permissible repetitive peak forward current versus duty factor (for pulse operation)

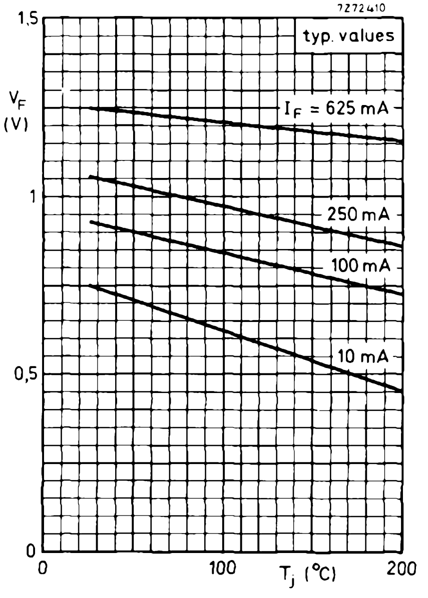

7Z62692.1
maximum permissible continuous forward current versus ambient temperature
I_F (mA)
300
200
100
0
0
100
T_{amb} (°C)
200

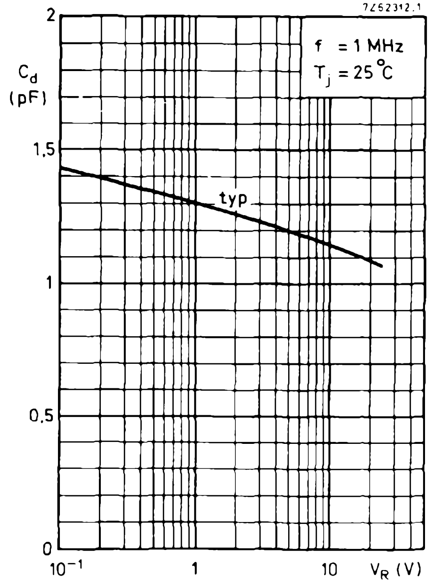

7Z67000.2
maximum permissible average rectified forward current versus ambient temperature
$I_{F(AV)}$ (mA)
i_F
$I_{F(AV)}$
T
T ≤ 20 ms
V_{RM} up to
60 V (BAV18)
120 V (BAV19)
200 V (BAV20)
250 V (BAV21)
300
200
100
0
0
100
T_{amb} (°C)
200

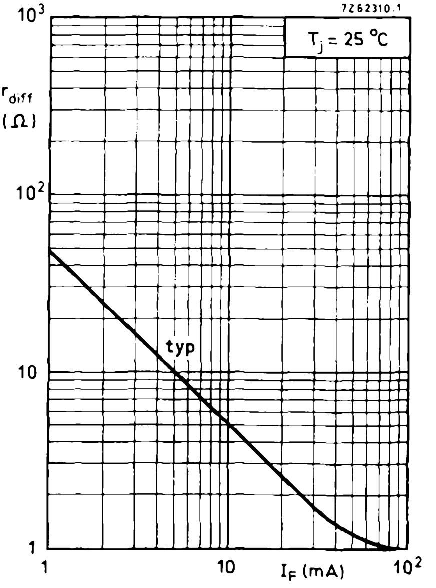

7Z62313
maximum permissible total power dissipation versus ambient temp.
P_{tot} (mW)
600
400
200
0
0
100
T_{amb} (°C)
200

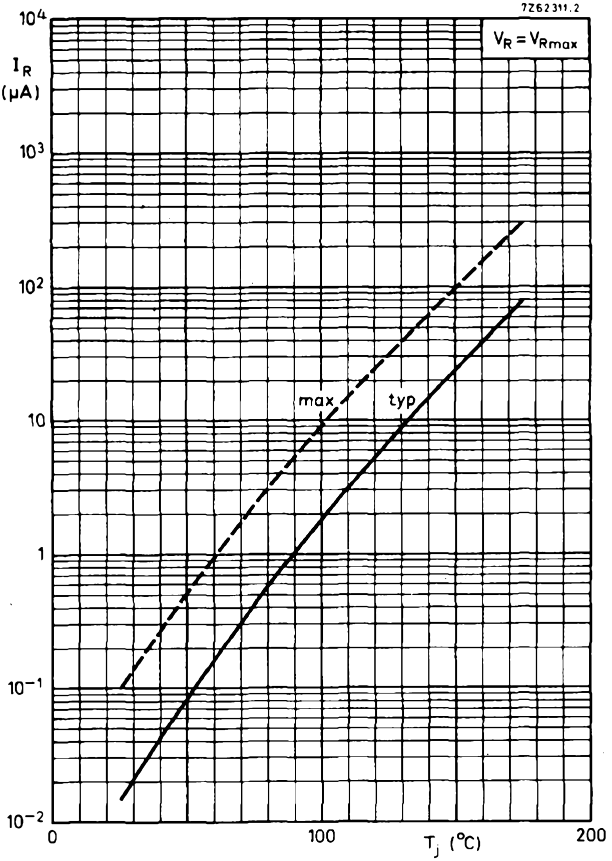

7Z67365.2
maximum permissible continuous reverse voltage versus ambient temperature
V_R (V)
BAV21
BAV20
BAV19
BAV18
300
200
100
0
0
100
T_{amb} (°C)
200


7Z62309.1
T_j = 25 °C
T_j = 150 °C
typ
max
1000
750
500
250
0
I_F (mA)
0
0,5
1
1,5
V_F (V)


7Z72410
typ. values
I_F = 625 mA
250 mA
100 mA
10 mA
1,5
1
0,5
0
V_F (V)
0
100
200
T_j (°C)


7Z62312.1
f = 1 MHz
T_j = 25 °C
typ
2
1,5
1
0,5
0
C_d (pF)
10^{-1}
1
10
V_R (V)


7Z62310.1
T_j = 25 °C
typ
10^3
10^2
10
1
r_{diff} (Ω)
1
10
10^2
I_F (mA)


7Z62311.2
$V_R = V_{Rmax}$
I_R (μA)
10^4
10^3
10^2
10
1
10^{-1}
10^{-2}
max
typ
0
100
200
T_j (°C)

HIGH-SPEED SILICON DIODE

Planar epitaxial high-speed diode in a DO-35 envelope. The BAW62 is primarily intended for fast logic applications.

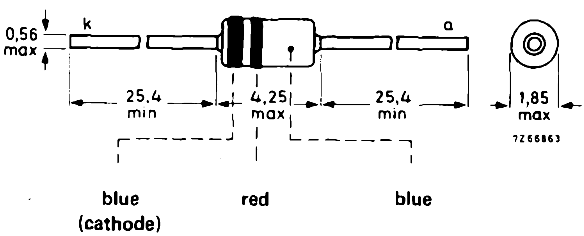
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	75	V
Repetitive peak forward current	I_{FRM}	max.	450	mA
Junction temperature	T_j	max.	200	°C
Forward voltage at I_F = 100 mA	V_F	<	1	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4	ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-27 (DO-35).



Diodes may be either type-branded or colour-coded.

Products, approved to CECC 50 001-021, available on request.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Continuous reverse voltage	V_R	max.	75	V	
Repetitive peak reverse voltage	V_{RRM}	max.	75	V	1)

Currents

Average rectified forward current	$I_{F(AV)}$	max.	150	mA	2)
Forward current (d.c.)	I_F	max.	200	mA	
Repetitive peak forward current	I_{FRM}	max.	450	mA	
Non-repetitive peak forward current; t = 1 μs	I_{FSM}	max.	2000	mA	
t = 1 s	I_{FSM}	max.	500	mA	

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air at maximum lead length	$R_{th\ j\text{-}a}$	=	0,6	°C/mW

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltages

I_F = 5 mA	V_F		0,62 to 0,75	V
I_F = 100 mA	V_F	<	1,00	V
I_F = 100 mA; T_j = 100 °C	V_F	<	0,93	V

Reverse currents

V_R = 20 V	I_R	<	25	nA
V_R = 20 V; T_j = 150 °C	I_R	<	50	μA
V_R = 50 V	I_R	<	200	nA
V_R = 75 V	I_R	<	5	μA
V_R = 75 V; T_j = 150 °C	I_R	<	100	μA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	<	2	pF

1) Measured at zero life time at I_R = 100 μA; V_R > 100 V.

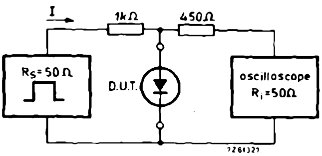
2) For sinusoidal operation see page 6. For pulse operation see page 5.

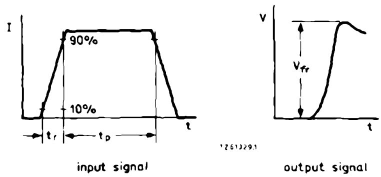
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Forward recovery voltage when switched to

$I_F = 50$ mA; $t_r = 20$ ns V_{fr} < 2,5 V

Test circuit and waveforms:





Input signal	: Rise time of the forward pulse	t_r	=	20 ns
	Forward current pulse duration	t_p	=	120 ns
	Duty factor	δ	=	0,01

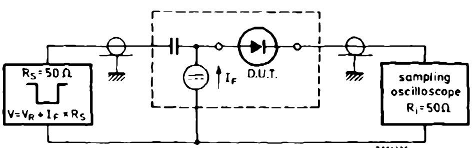
Oscilloscope : Rise time t_r = 0,35 ns

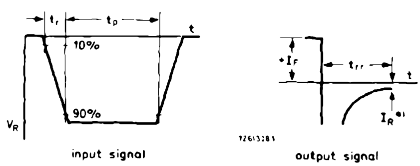
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Reverse recovery time when switched from

$I_F = 10$ mA to $I_R = 10$ mA; $R_L = 100\ \Omega$;
measured at $I_R = 1$ mA t_{rr} < 4 ns

Test circuit and waveforms:





Input signal	: Rise time of the reverse pulse	t_r	=	0,6 ns	*) $I_R = 1$ mA
	Reverse pulse duration	t_p	=	100 ns	
	Duty factor	δ	=	0,05	

Oscilloscope: Rise time t_r = 0,35 ns

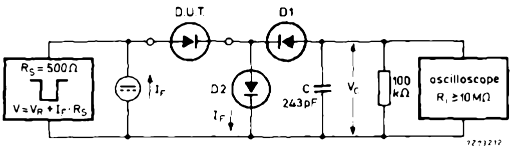
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

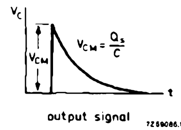
CHARACTERISTICS (continued) T_j = 25 ^oC

Recovery charge when switched from

I_F = 10 mA to V_R = 5 V; R_L = 500 Ω Q_s typ. 50 pC

Test circuit and waveform:





D1 = D2 = BAW62

Input signal :	Rise time of the reverse pulse	t_r	=	2 ns
	Reverse pulse duration	t_p	=	400 ns
	Duty factor	δ	=	0, 02

Circuit capacitance C ≤ 7 pF (C = oscilloscope input capacitance + parasitic capacitance)

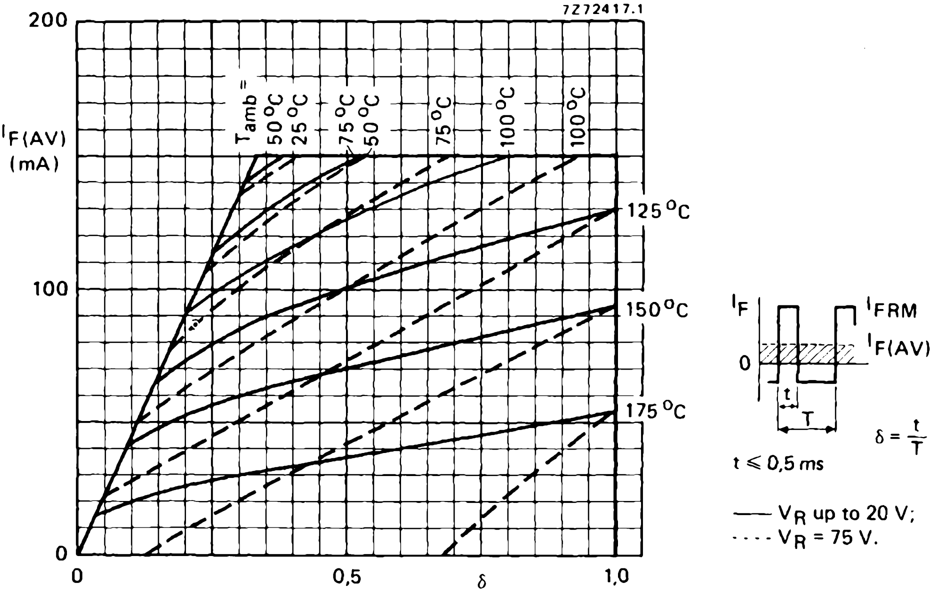


Fig. 8 Maximum permissible average rectified forward current as a function of the duty factor (pulse operated).

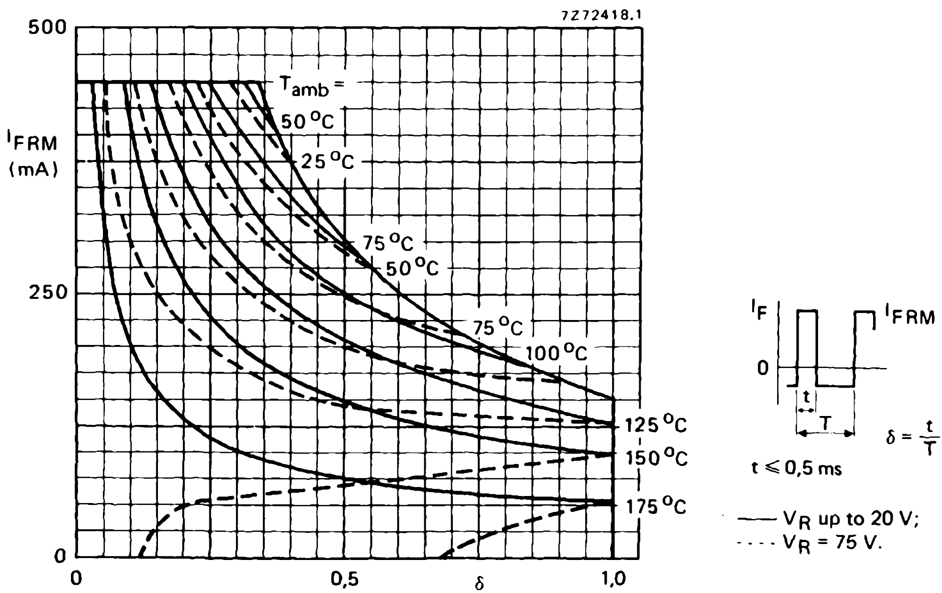


Fig. 9 Maximum permissible repetitive peak forward current as a function of the duty factor (pulse operated).

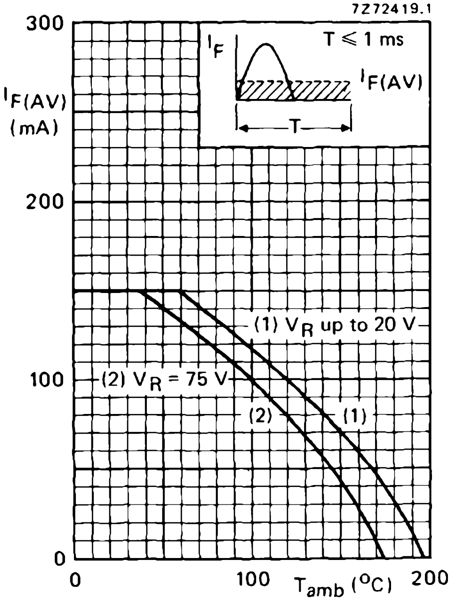


Fig. 10 Maximum permissible average rectified forward current.

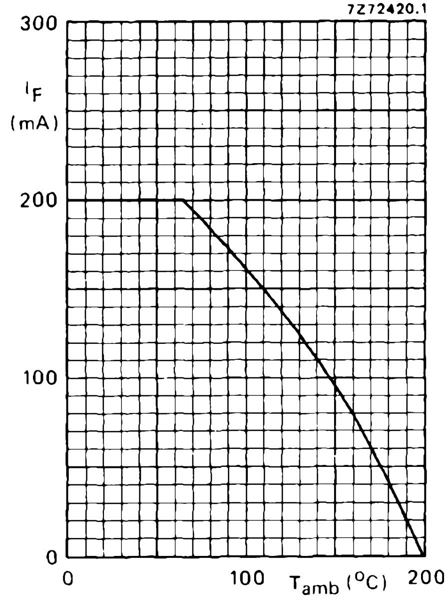


Fig. 11 Maximum permissible continuous forward current.

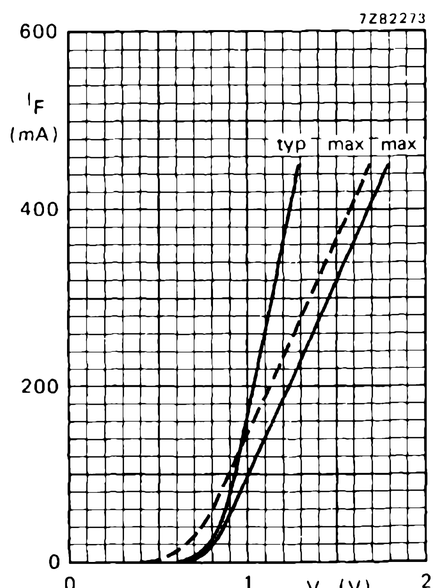


Fig. 12 Forward current as a function forward voltage. —— T_j = 25 °C; – – – T_j = 175 °C.

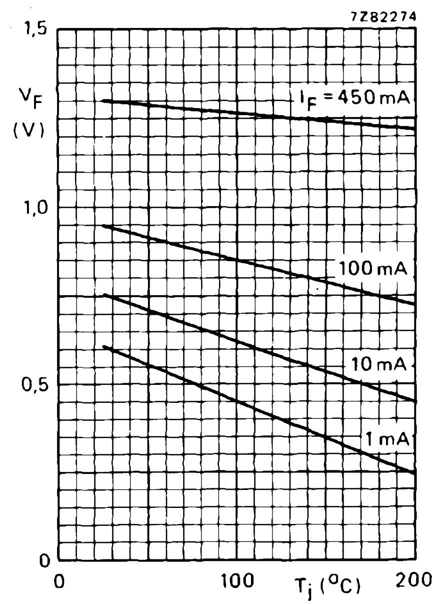
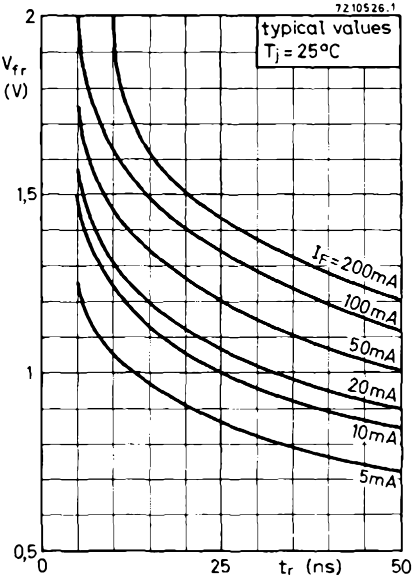
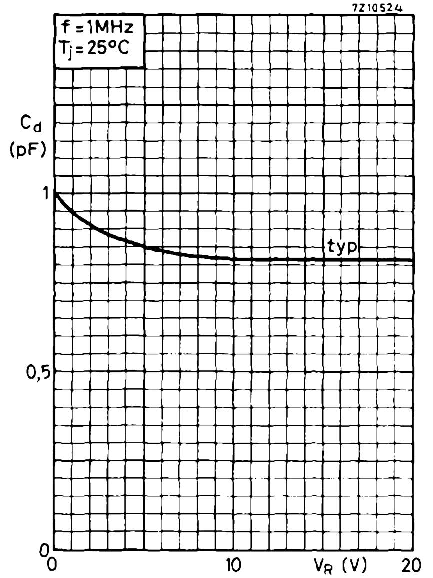
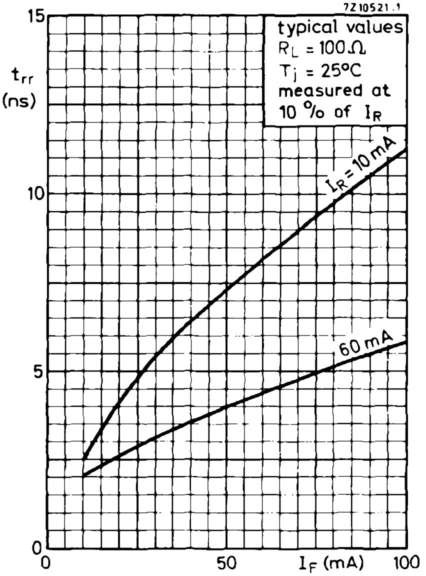
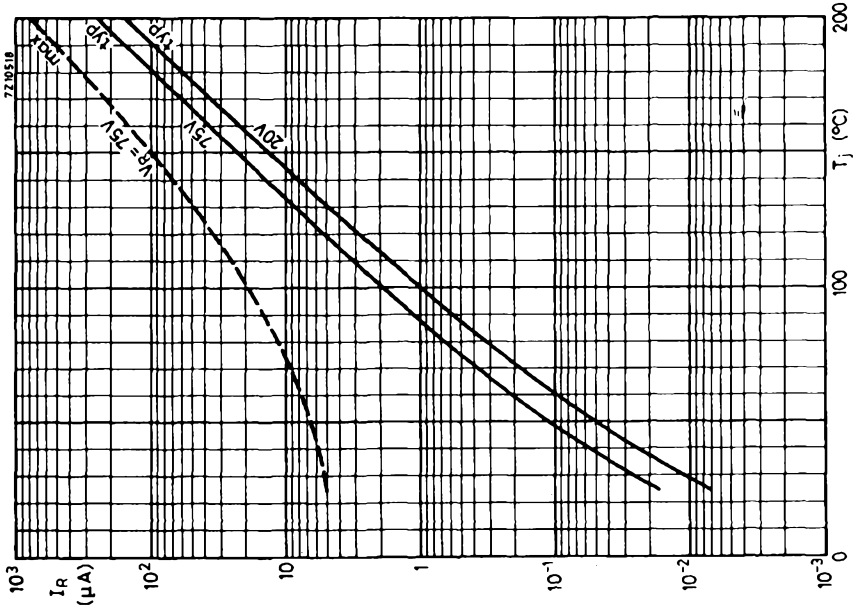


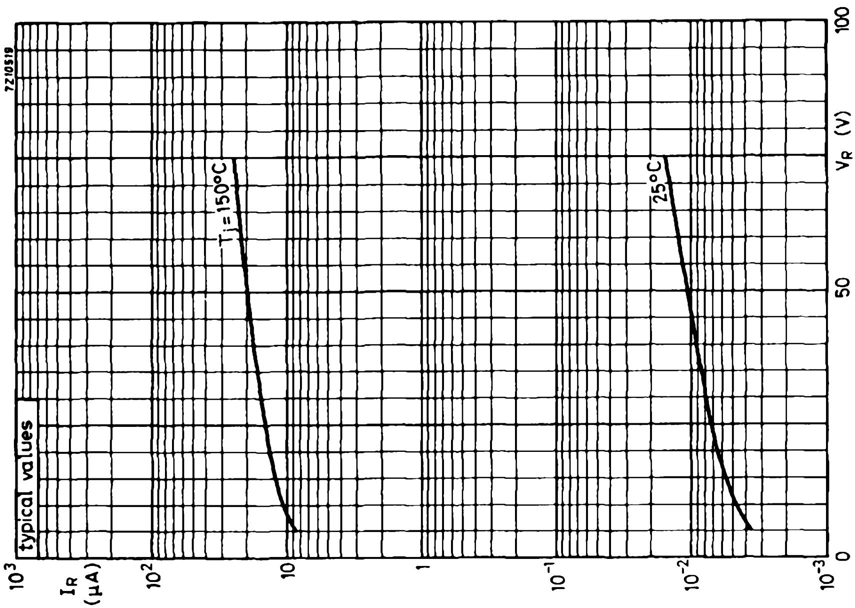
Fig. 13 Typical values forward voltage as a function of junction temperature.


7Z10526.1
typical values
T_j = 25°C
V_{fr} (V)
2
1,5
1
0,5
0
25
t_r (ns)
50
I_F = 200mA
100mA
50mA
20mA
10mA
5mA


7Z10524
f = 1MHz
T_j = 25°C
C_d (pF)
1
0,5
0
10
V_R (V)
20
typ


7Z10521.1
typical values
R_L = 100 Ω
T_j = 25°C
measured at
10 % of I_R
t_{rr} (ns)
15
10
5
0
50
I_F (mA)
100
I_R = 10 mA
60 mA


7Z10518
max
typ
typ
VR = 75V
75V
20V
IR (μA)
Tj (°C)
10^3
10^2
10
1
10^-1
10^-2
10^-3
0
100
200


7Z10519
typical values
Tj = 150°C
25°C
IR (μA)
VR (V)
10^3
10^2
10
1
10^-1
10^-2
10^-3
0
50
100

SILICON PLANAR EPITAXIAL CONTROLLED-AVALANCHE DIODE

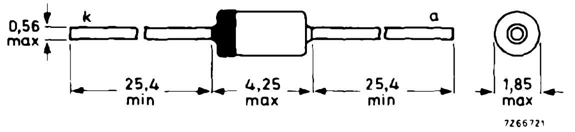
Diode in a DO-35 envelope primarily intended for switching inductive loads in semi-electronic telephone exchanges.

QUICK REFERENCE DATA				
Repetitive peak forward current	I_{FRM}	max.	0,8	A
Repetitive peak reverse energy $t_p \geq 50$ µs; $f \leq 20$ Hz; $T_j = 25$ °C	E_{RRM}	max.	5,0	mJ
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,38	°C/mW
Forward voltage at $I_F = 200$ mA	V_F	<	1,00	V
Reverse avalanche breakdown voltage $I_R = 100$ µA	$V_{(BR)R}$	120 to 175		V
Reverse recovery time when switched from $I_F = 30$ mA to $I_R = 30$ mA; $R_L = 100\ \Omega$; measured at $I_R = 3$ mA	t_{rr}	<	50	ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-27 (DO-35).



The diodes may be either type-branded or colour-coded.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltage

Continuous reverse voltage	V_R	max.	90	V	(1)

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	0,4	A
Forward current (d.c.)	I_F	max.	0,4	A
Repetitive peak forward current	I_{FRM}	max.	0,8	A
Non-repetitive peak forward current				
$t = 1\ \mu s$; $T_j = 25\ ^oC$ prior to surge	I_{FSM}	max.	6,0	A
$t = 1\ s$; $T_j = 25\ ^oC$ prior to surge	I_{FSM}	max.	1,5	A
Repetitive peak reverse current	I_{RRM}	max.	0,6	A

Reverse energy

Repetitive peak reverse energy $t_p \geq 50\ \mu s$; $f \leq 20$ Hz; $T_j = 25\ ^oC$	E_{RRM}	max.	5,0	mJ

Temperatures

Storage temperature	T_{stg}	−65 to +200		^oC
Junction temperature	T_j	max.	200	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,38	$^oC/mW$
From junction to ambient in free air $T_{lead} = 25\ ^oC$ at 8 mm from the body	$R_{th\ j\text{-}a}$	=	0,30	$^oC/mW$

(1) It is allowed to exceed this value as described on page 4. Care should be taken not to exceed the I_{RRM} rating.

CHARACTERISTICS T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 10 mA	V_F	<	0,75	V
I_F = 50 mA	V_F	<	0,84	V
I_F = 100 mA	V_F	<	0,90	V
I_F = 200 mA	V_F	<	1,00	V
I_F = 400 mA	V_F	<	1,25	V

Reverse avalanche breakdown voltage

I_R = 100 μA	$V_{(BR)R}$	120 to 175		V

Reverse current

V_R = 90 V	I_R	<	100	nA
V_R = 90 V; T_j = 150 °C	I_R	<	100	μA

Diode capacitance

V_R = 0; f = 1 MHz	C_d	typ.	15	pF
		<	35	pF

Reverse recovery time when switched from

I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	50	ns

Test circuit and waveforms:

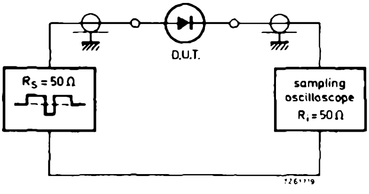


Fig. 2.

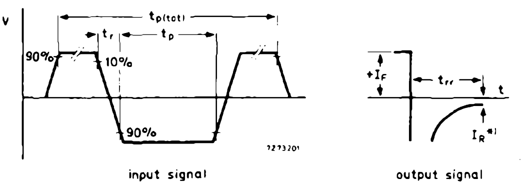


Fig. 3.

Input signal :	Total pulse duration	$t_{p(tot)}$	= 2 μs	*) I_R = 3 mA
	Duty factor	δ	= 0,0025	
	Rise time of the reverse pulse	t_r	= 0,6 ns	
	Reverse pulse duration	t_p	= 100 ns	
Oscilloscope :	Rise time	t_r	= 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Reverse voltages higher than the V_R ratings are allowed, provided:

a. the transient energy $\leqslant$ 7,5 mJ at $P_{RRM} \leqslant$ 30 W; T_j = 25 °C
   the transient energy $\leqslant$ 5 mJ at $P_{RRM} \leqslant$ 120 W; T_j = 25 °C (see Fig. 8).

b. T $\geqslant$ 5 ms; $\delta \leqslant$ 0,01 (rectangular waveform)
   $\delta \leqslant$ 0,02 (triangular waveform).

With increasing temperature, the maximum permissible transient energy must be decreased by 0,03 mJ/°C.

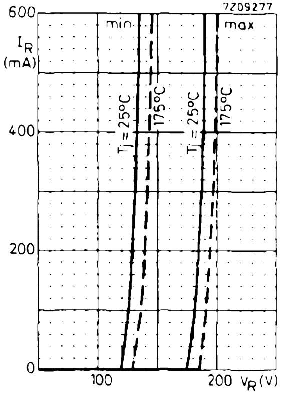


Fig. 4.

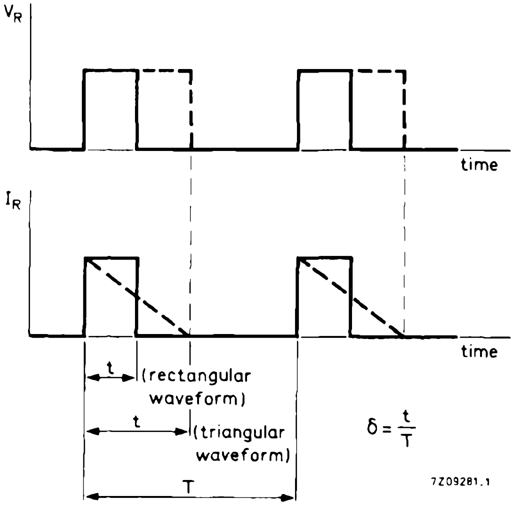


Fig. 5.

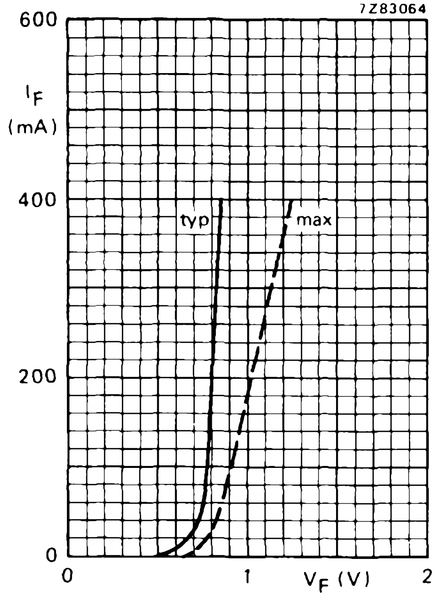


Fig. 6 I_F as a function of V_F at T_j = 25 °C.

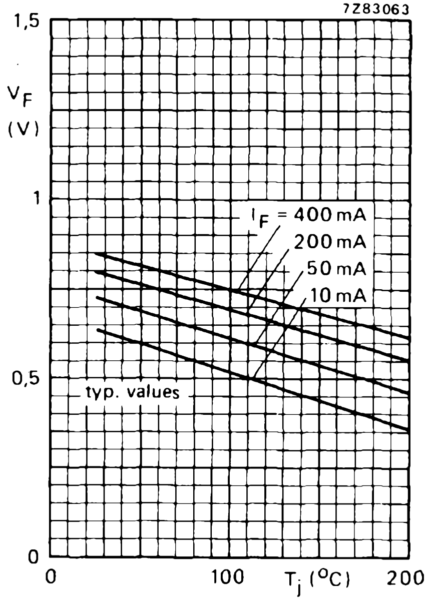


Fig. 7 V_F as a function of T_j.

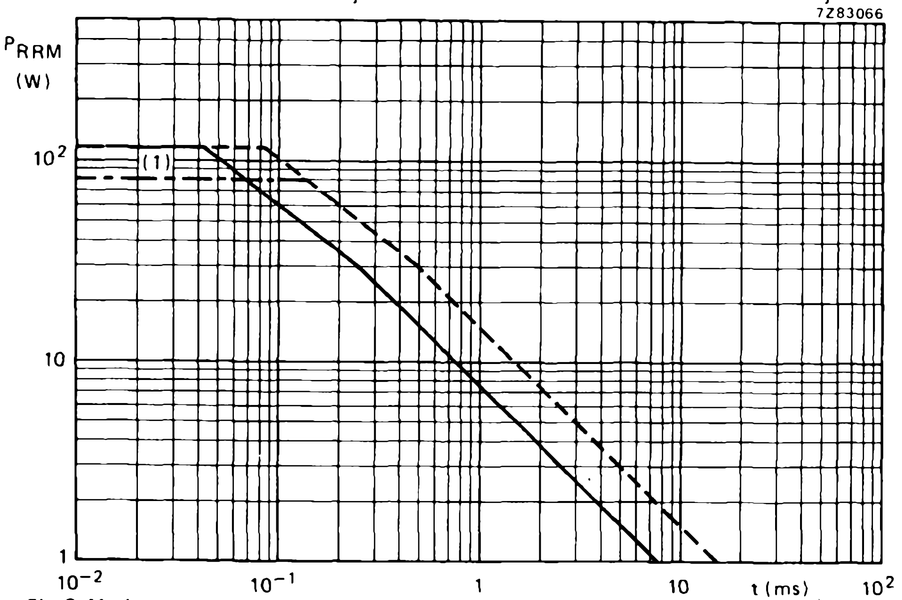


Fig. 8 Maximum permissible repetitive peak reverse power as a function of the pulse duration $T \geq 50$ ms; T_j = 25 °C. —— rectangular waveform; $\delta \leq 0{,}01$; – – – triangular waveform; $\delta \leq 0{,}02$.
(1) Limited by I_{RRM} = 600 mA.

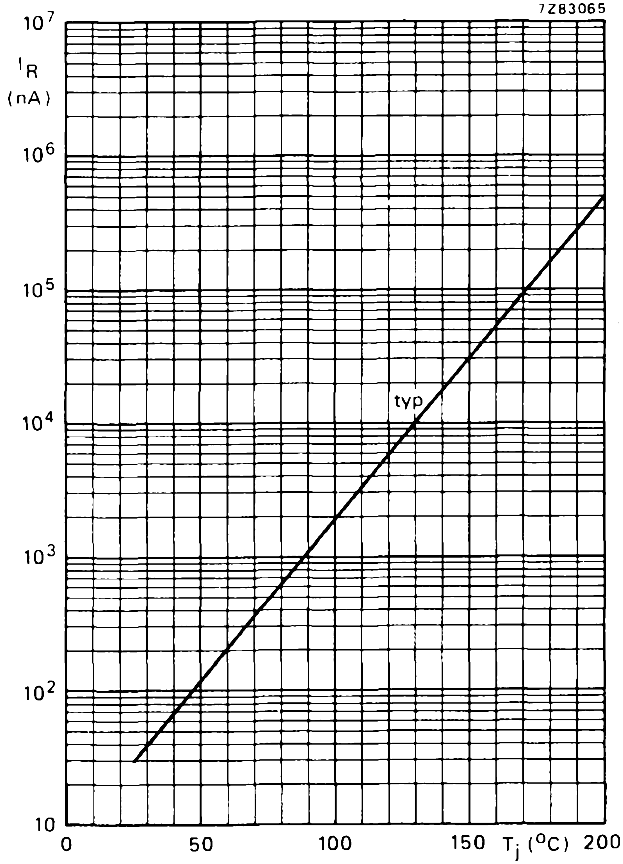


Fig. 9 Typical values reverse current as a function of junction temperature at V_R = 90 V.

SILICON OXIDE PASSIVATED DIODE

Whiskerless diode in a glass subminiature envelope.
The BAX13 is primarily intended for general purpose applications.

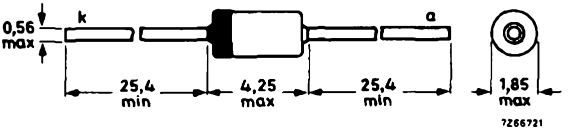
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	50	V
Repetitive peak forward current	I_{FRM}	max.	150	mA
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,60	°C/mW
Forward voltage at I_F = 20 mA	V_F	<	1,0	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω measured at I_R = 1 mA	t_{rr}	<	4	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	45	pC

MECHANICAL DATA

Dimensions in mm

DO - 35



The coloured end indicates the cathode
The diodes may be type-branded or colour coded.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Continuous reverse voltage	V_R	max.	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	50	V

Currents

Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	75	mA [1]
Forward current (d.c.)	I_F	max.	75	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current $t = 1\ \mu s$	I_{FSM}	max.	2000	mA
$t = 1\ s$	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,60	°C/mW

CHARACTERISTICS $T_j = 25\ ^oC$ unless otherwise specified

Forward voltage

$I_F = 2$ mA	V_F	<	0,7	V
$I_F = 10$ mA; $T_j = 100\ ^oC$	V_F	<	0,8	V
$I_F = 20$ mA	V_F	<	1,0	V [2]
$I_F = 75$ mA	V_F	<	1,53	V [2]

Reverse current

$V_R = 10$ V	I_R	<	25	nA
$V_R = 10$ V; $T_j = 150\ ^oC$	I_R	<	10	μA
$V_R = 25$ V	I_R	<	50	nA
$V_R = 50$ V	I_R	<	200	nA
$V_R = 50$ V; $T_j = 150\ ^oC$	I_R	<	25	μA

Diode capacitance (see also page 7)

$V_R = 0$; $f = 1$ MHz	C_d	<	3	pF

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[1]) For sinusoidal operation see page 5.
For pulse operation see page 6.

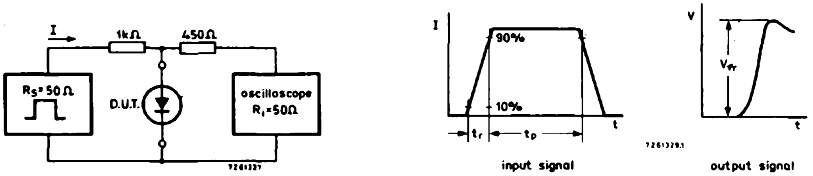
[2]) Measured under pulse conditions to avoid excessive dissipation.

CHARACTERISTICS (continued) T_j = 25 °C

Forward recovery voltage (see also page 7)

At t_r > 20 ns, V_{fr} will not exceed V_F corresponding to I_F = 1 to 75 mA

Test circuit and waveforms :



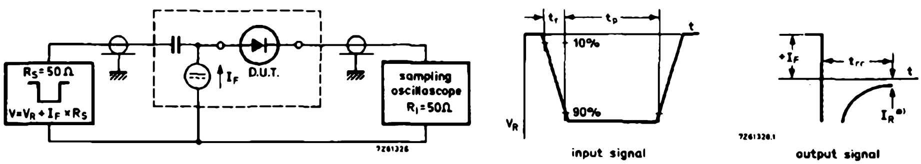
Input signal :	Rise time of the forward pulse	t_r = 20 ns
	Forward current pulse duration	t_p = 120 ns
	Duty factor	δ = 0,01
Oscilloscope :	Rise time	t_r = 0, 35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Reverse recovery time when switched from

I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA t_{rr} < 6 ns [1])
I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA t_{rr} < 4 ns

Test circuit and waveforms :



Input signal :	Rise time of the reverse pulse	t_r = 0,6 ns	*) I_R = 1 mA
	Reverse pulse duration	t_p = 100 ns	
	Duty factor	δ = 0,05	
Oscilloscope :	Rise time	t_r = 0, 35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

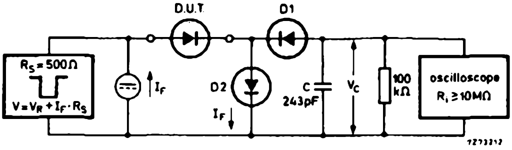
1) See also page 8.

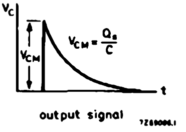
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Recovery charge when switched from

$I_F = 10$ mA to $V_R = 5$ V; $R_L = 500\ \Omega$ Q_s < 45 pC

Test circuit and waveform:

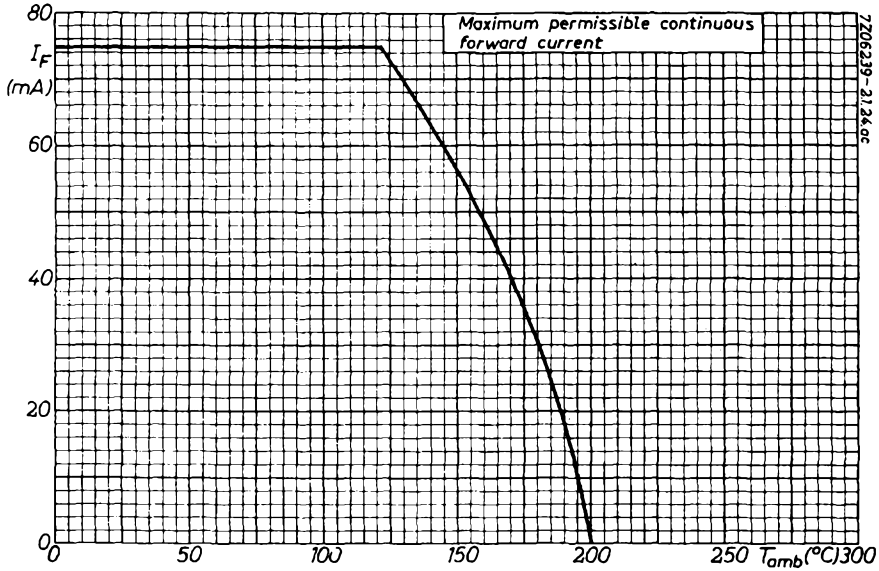


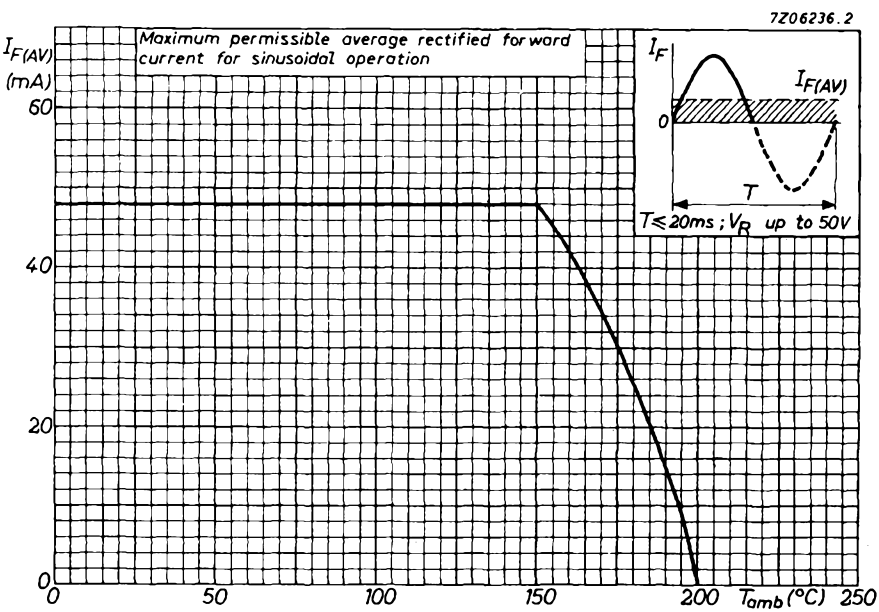


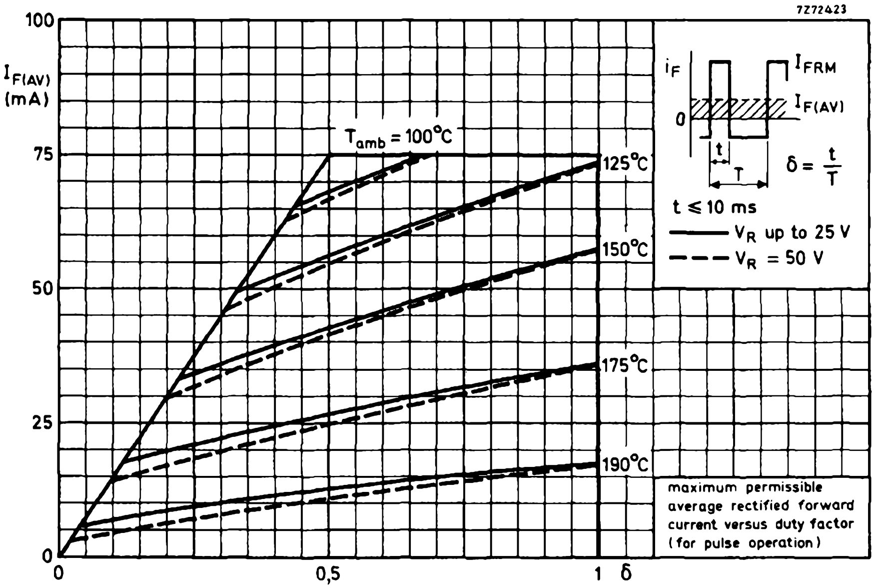
D1 = D2 = BAW62

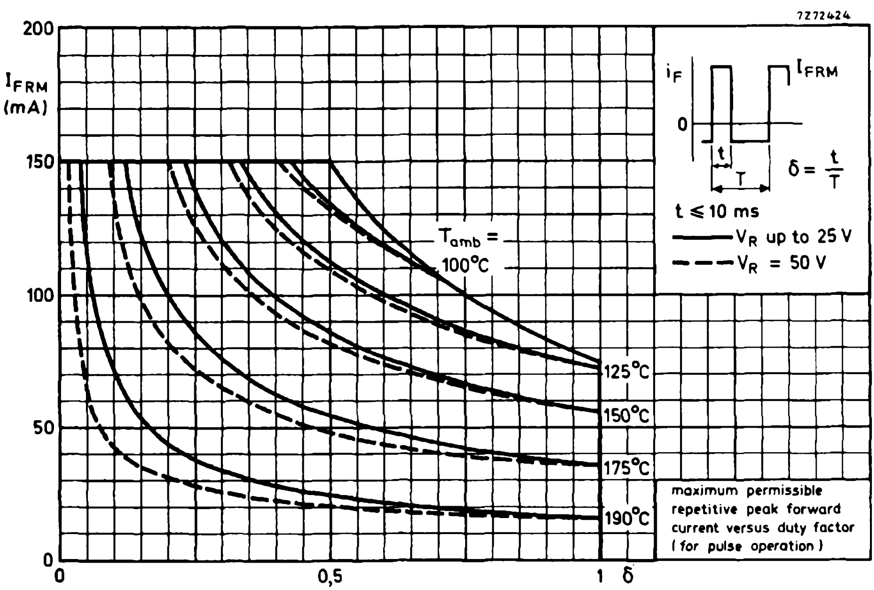
Input signal:	Rise time of the reverse pulse	t_r = 2 ns
	Reverse pulse duration	t_p = 400 ns
	Duty factor	δ = 0,02

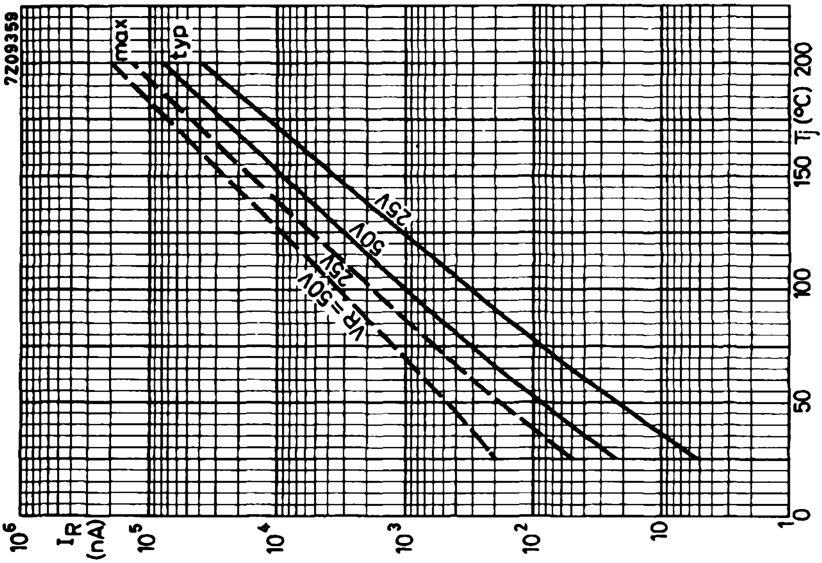
Circuit capacitance C ≤ 7 pF (C = oscilloscope input capacitance + parasitic capacitance)

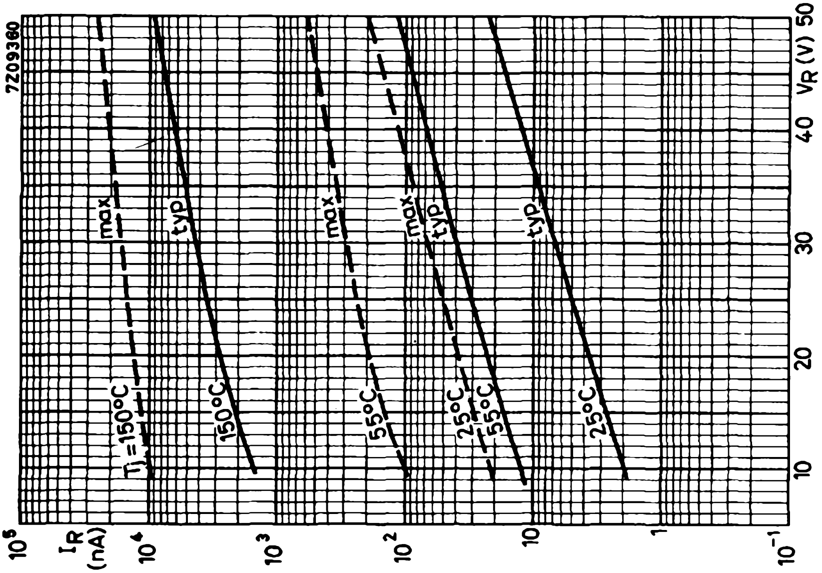

Maximum permissible continuous forward current
7Z06239-21.24.aC
I_F (mA)
80
60
40
20
0
0
50
100
150
200
250
T_{amb} (°C)
300

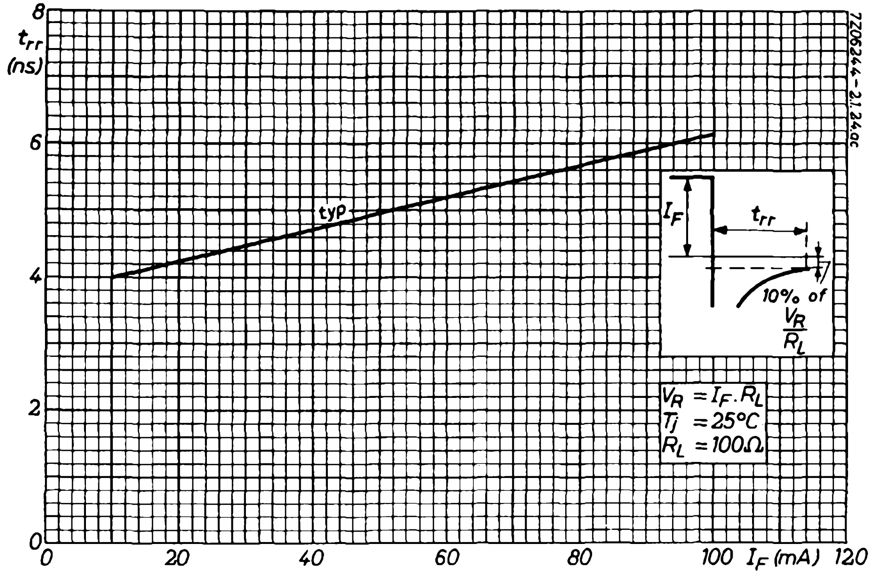

7Z06236.2
Maximum permissible average rectified forward current for sinusoidal operation
$I_{F(AV)}$ (mA)
60
40
20
0
0
50
100
150
200
T_{amb} (°C)
250
I_F
$I_{F(AV)}$
0
T
$T \leq 20$ ms ; V_R up to 50V

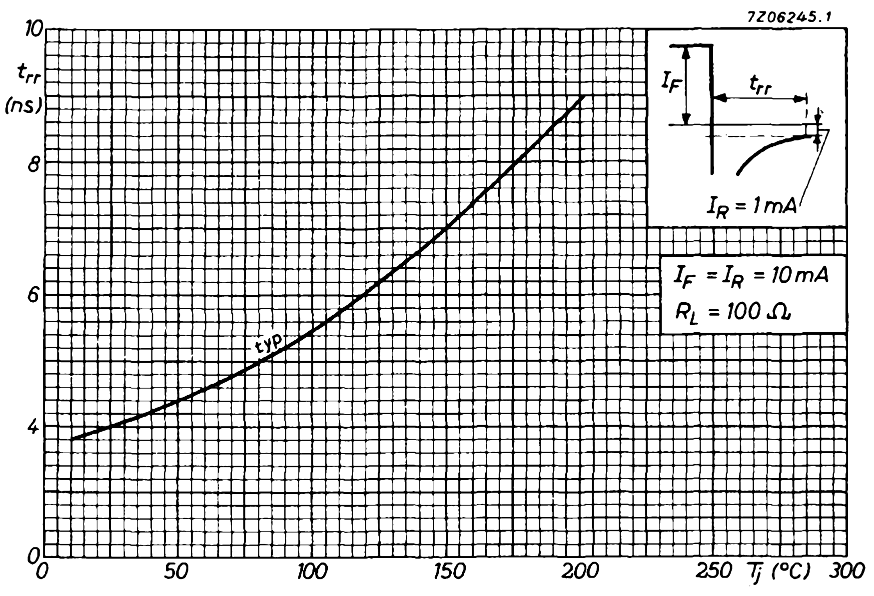

7Z72423
100
$I_{F(AV)}$ (mA)
75
50
25
0
0
0,5
1 δ
T_{amb} = 100°C
125°C
150°C
175°C
190°C
i_F
I_{FRM}
$I_{F(AV)}$
0
t
T
δ = t/T
t ≤ 10 ms
V_R up to 25 V
V_R = 50 V
maximum permissible average rectified forward current versus duty factor (for pulse operation)

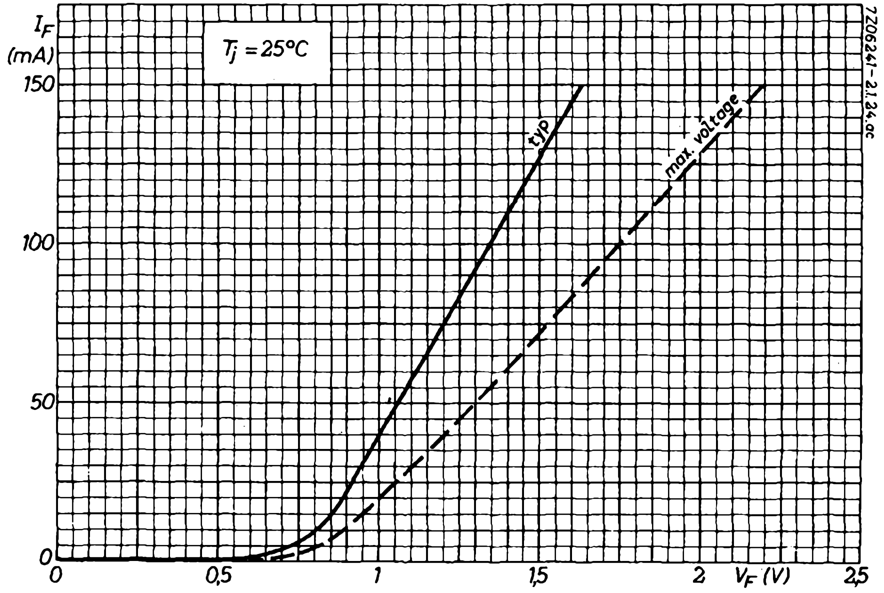

7Z72424
200
I_{FRM} (mA)
150
100
50
0
0
0,5
1 δ
T_{amb} = 100°C
125°C
150°C
175°C
190°C
i_F
I_{FRM}
0
t
T
δ = t/T
t ≤ 10 ms
V_R up to 25 V
V_R = 50 V
maximum permissible repetitive peak forward current versus duty factor (for pulse operation)

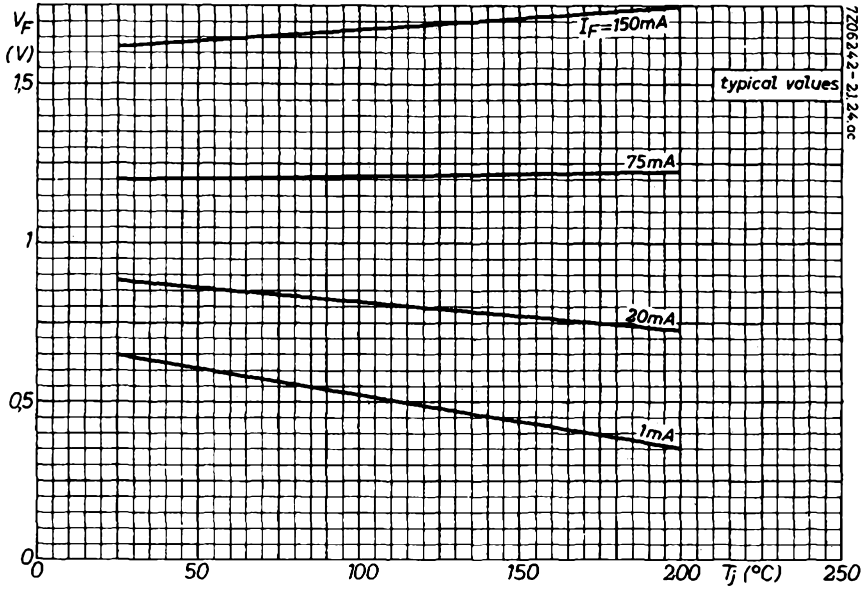

7Z09359
max
typ
25V
50V
25V
VR = 50V
IR (nA)
10^6
10^5
10^4
10^3
10^2
10
1
0
50
100
150
200
Tj (°C)


7Z09360
max
typ
Tj = 150°C
150°C
55°C
25°C
55°C
25°C
IR (nA)
10^5
10^4
10^3
10^2
10
1
10^-1
10
20
30
40
50
VR (V)


7Z06244-2.1.24.0C
8
t_{rr}
(ns)
6
4
2
0
typ
I_F
t_{rr}
10% of $\frac{V_R}{R_L}$
$V_R = I_F.R_L$
$T_j = 25°C$
$R_L = 100 \Omega$
0
20
40
60
80
100
I_F (mA)
120


7Z06245.1
10
t_{rr}
(ns)
8
6
4
0
typ
I_F
t_{rr}
$I_R = 1 mA$
$I_F = I_R = 10 mA$
$R_L = 100 \Omega$
0
50
100
150
200
250
T_j (°C)
300


I_F (mA)
T_j = 25°C
typ
max. voltage
V_F (V)
7Z06241-2.1.24.ac
0
0,5
1
1,5
2
2,5
50
100
150


V_F (V)
I_F=150mA
typical values
75mA
20mA
1mA
T_j (°C)
7Z06242-2.1.24.ac
0
0,5
1
1,5
50
100
150
200
250

SILICON WHISKERLESS DIODES

Whiskerless diffused silicon diodes intended for general purpose industrial applications.

QUICK REFERENCE DATA

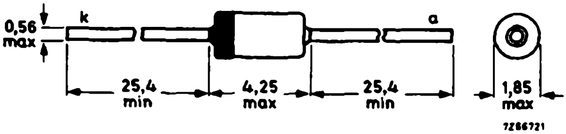
		BAX16	BAX17	
V_R max.		150	200	V
V_F max.	$I_F = 100mA$	1.3	-	V
	$I_F = 200mA$	-	1.2	V
I_{FRM} max.		300		mA
t_{rr} max. (when switched from $I_F = 30mA$ to $V_R = 3.0V$)		120		ns
Q_s max. (when switched from $I_F = 10mA$ to $V_R = 5.0V$		0.7		nC

Unless otherwise stated, data is applicable to both types

OUTLINE AND DIMENSIONS

Dimensions in mm

DO-35



The coloured end indicates the cathode
The diodes may be either type-branded or colour-coded.

Products approved to CECC 50 001-022, available on request.

RATINGS

Limiting values of operation according to the absolute maximum system.

Electrical		BAX16	BAX17	
V_R	Max. continuous reverse voltage	150	200	V
V_{RRM}	Max. repetitive peak reverse voltage	150	200	V
$I_{F(AV)}$	Max. average forward current (averaging time = 20ms)	200		mA
I_F	Max. continuous forward current	200		mA
I_{FRM}	Max. repetitive peak forward current	300		mA
I_{FSM}	Max. non-repetitive peak forward current			
	max. duration 1.0μs	2500		mA
	max. duration 1.0s	500		mA
Temperature				
T_{stg} range		-65 to +200		°C
T_j max.		+200		°C

THERMAL CHARACTERISTIC

$R_{th(j\text{-}amb)}$	0.50	degC/mW

ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ C$ unless otherwise stated)

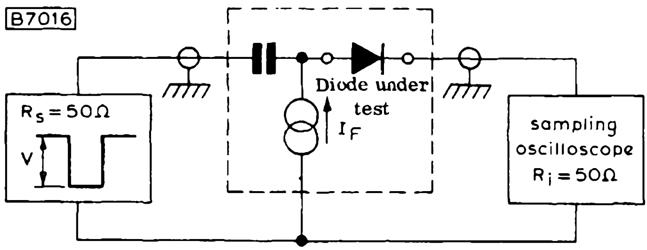
		BAX16 Max.	BAX17 Max.	
V_F	Forward voltage			
	$I_F = 1.0mA$	0.65	0.65	V
	$I_F = 10mA$, $T_j = 100^\circ C$	0.85	0.75	V
	†$I_F = 100mA$	1.3*	1.1	V
	†$I_F = 200mA$	1.5	1.2*	V
	†$I_F = 200mA$, $T_j = 175^\circ C$	1.4	1.2	V
I_R	Reverse current			
	$V_R = 50V$	25	25	nA
	$V_R = 50V$, $T_j = 150^\circ C$	25	25	μA
	$V_R = 150V$	100*	100*	nA
	$V_R = V_{RRM}$ max., $T_j = 150^\circ C$	100	100	μA
C_d	Diode capacitance			
	$V_R = 0$, $f = 1.0MHz$	10	10	pF

*These are the characteristics which are recommended for acceptance testing purposes.

†Measured under pulse conditions to prevent excessive dissipation.

		Typ.	Max.	
t_{rr}	Reverse recovery time when switched from $I_F = 30mA$ to $V_R = 3.0V$, $R_L = 100\Omega$ measured at $I_R = 1.0mA$	70	120	ns

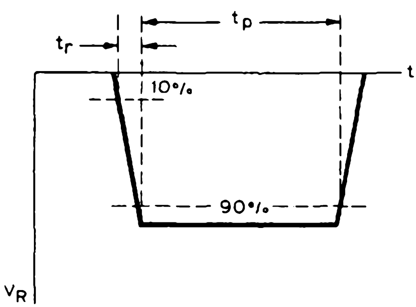
Test circuit



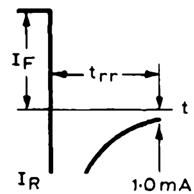
Circuit capacitance≤1.0pF (C.R.O. + stray capacitance)
C.R.O. rise time = 0.35ns
$V = V_R + I_F \times R_s$

Input pulse

t_r	Rise time	0.6	ns
t_p	Pulse duration	100	ns
d	Duty cycle	0.05	

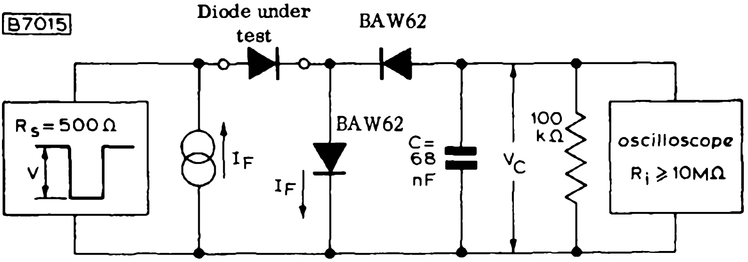


Output waveform



		Max.	
Q_s	Recovered charge when switched from $I_F = 10mA$ to $V_R = 5.0V$, $R_L = 500\Omega$	0.7*	nC

Test circuit

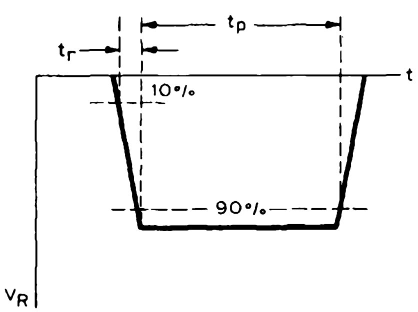


Circuit capacitance ≤30pF (C.R.O. + stray capacitance)

$$V = V_R + I_F \times R_s$$

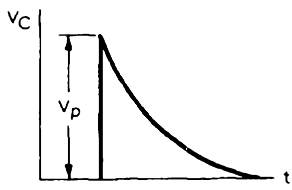
Input pulse

t_r	Rise time	15	ns
t_p	Pulse duration	35	μs
f	Frequency	25	kHz

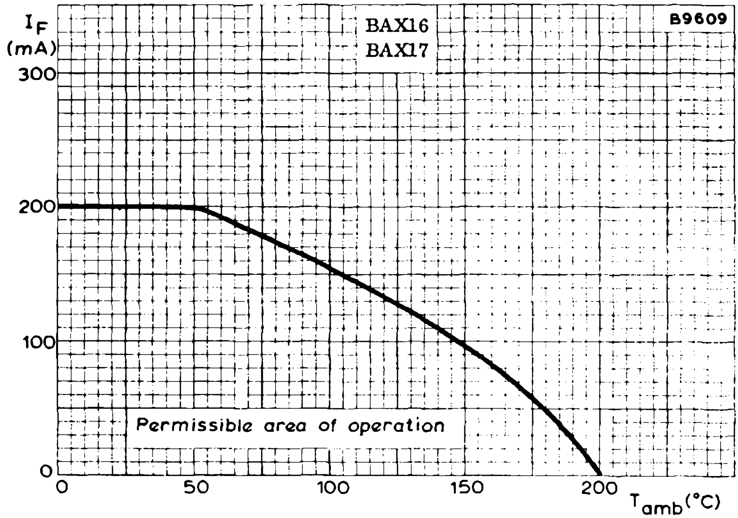


Output waveform

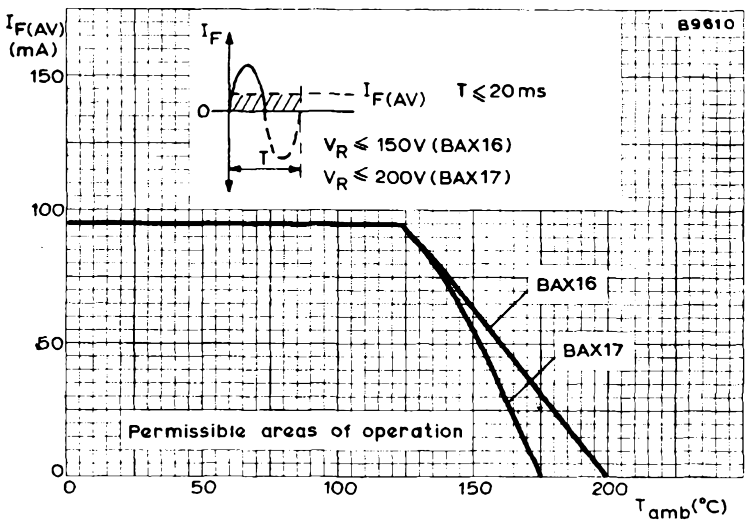
$$V_p = \frac{Q_s}{C}$$



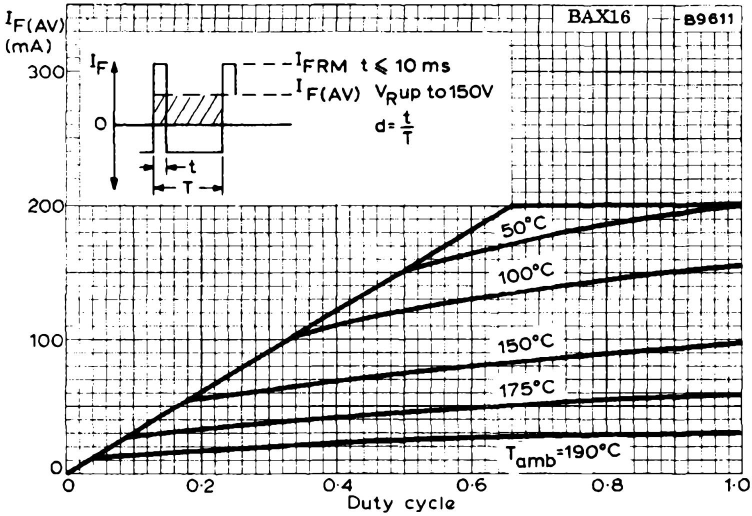
*These are the characteristics which are recommended for acceptance testing purposes.



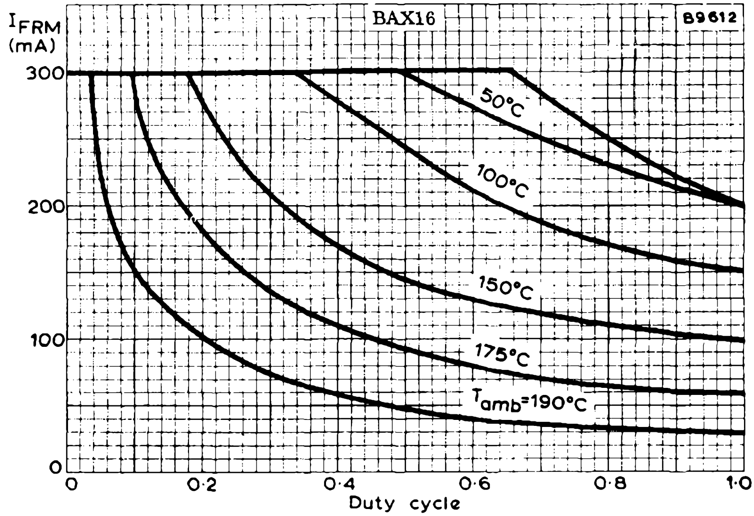
CONTINUOUS FORWARD CURRENT PLOTTED AGAINST AMBIENT TEMPERATURE



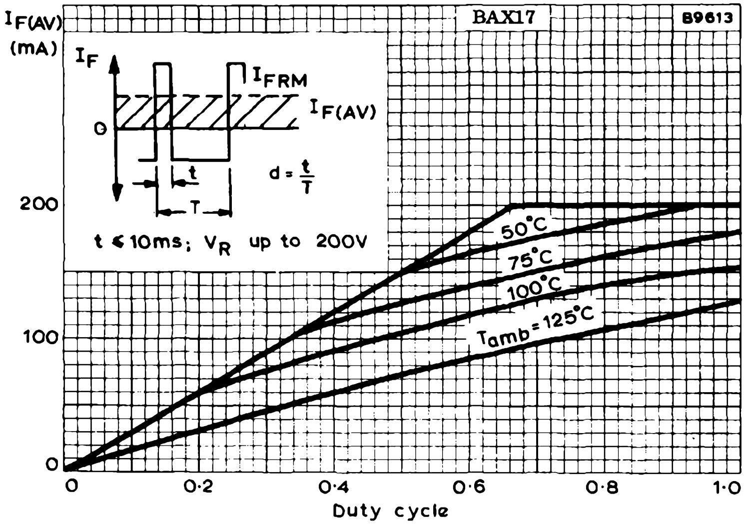
AVERAGE RECTIFIED FORWARD CURRENT PLOTTED AGAINST AMBIENT TEMPERATURE



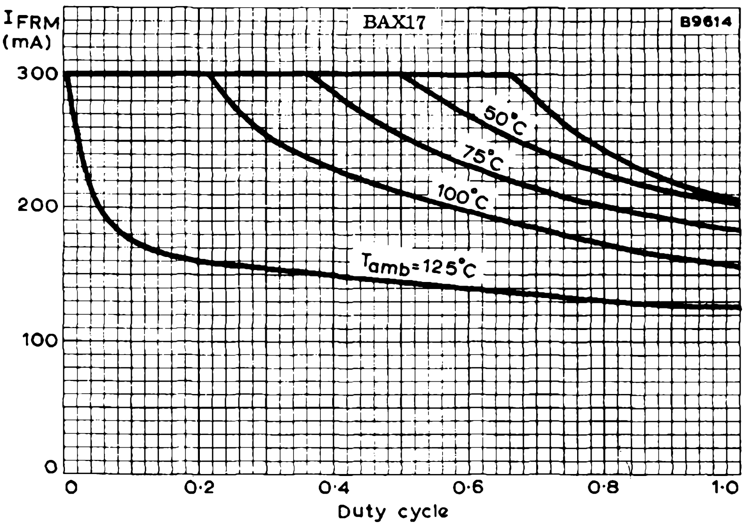
MAXIMUM PERMISSIBLE AVERAGE FORWARD CURRENT
PLOTTED AGAINST DUTY CYCLE



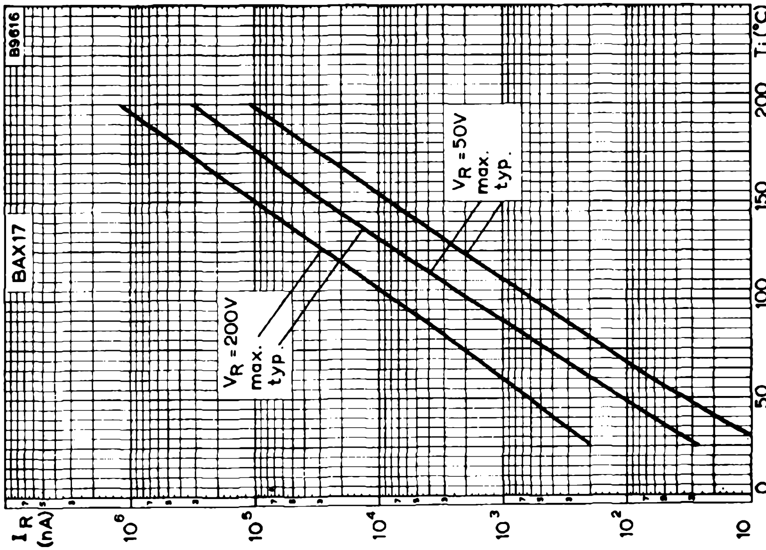
MAXIMUM PERMISSIBLE REPETITIVE PEAK FORWARD CURRENT
PLOTTED AGAINST DUTY CYCLE

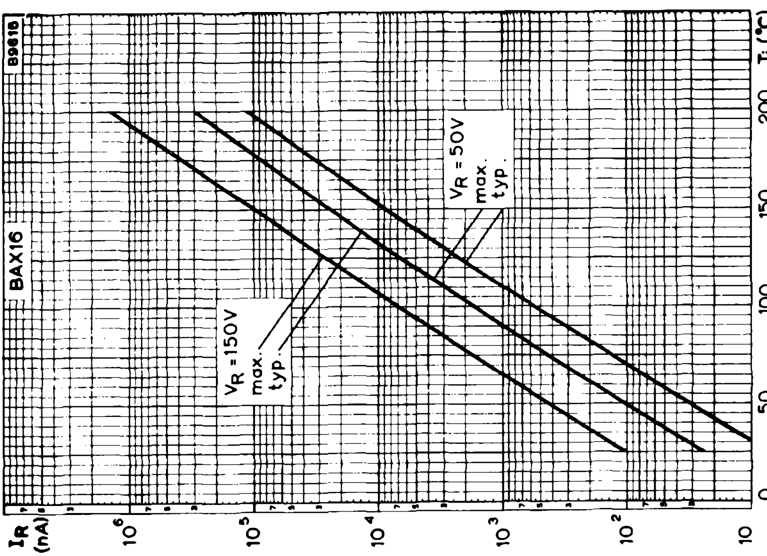


MAXIMUM PERMISSIBLE AVERAGE FORWARD CURRENT
PLOTTED AGAINST DUTY CYCLE

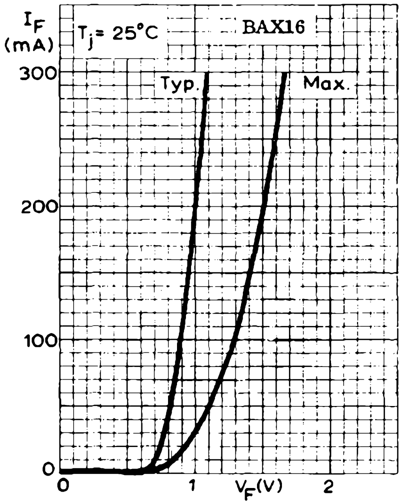


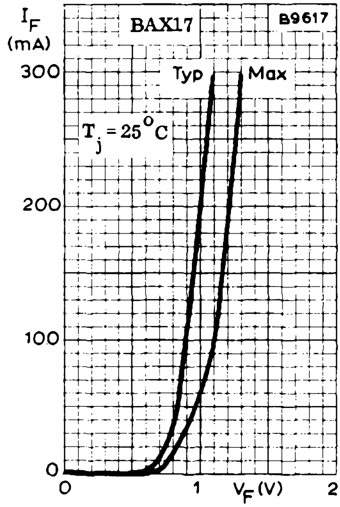
MAXIMUM PERMISSIBLE REPETITIVE PEAK FORWARD CURRENT
PLOTTED AGAINST DUTY CYCLE



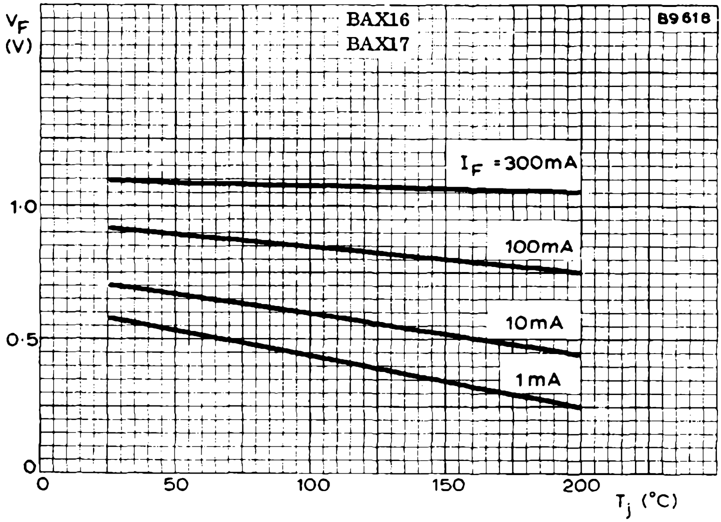


REVERSE CURRENT PLOTTED AGAINST JUNCTION TEMPERATURE
WITH REVERSE VOLTAGE AS A PARAMETER

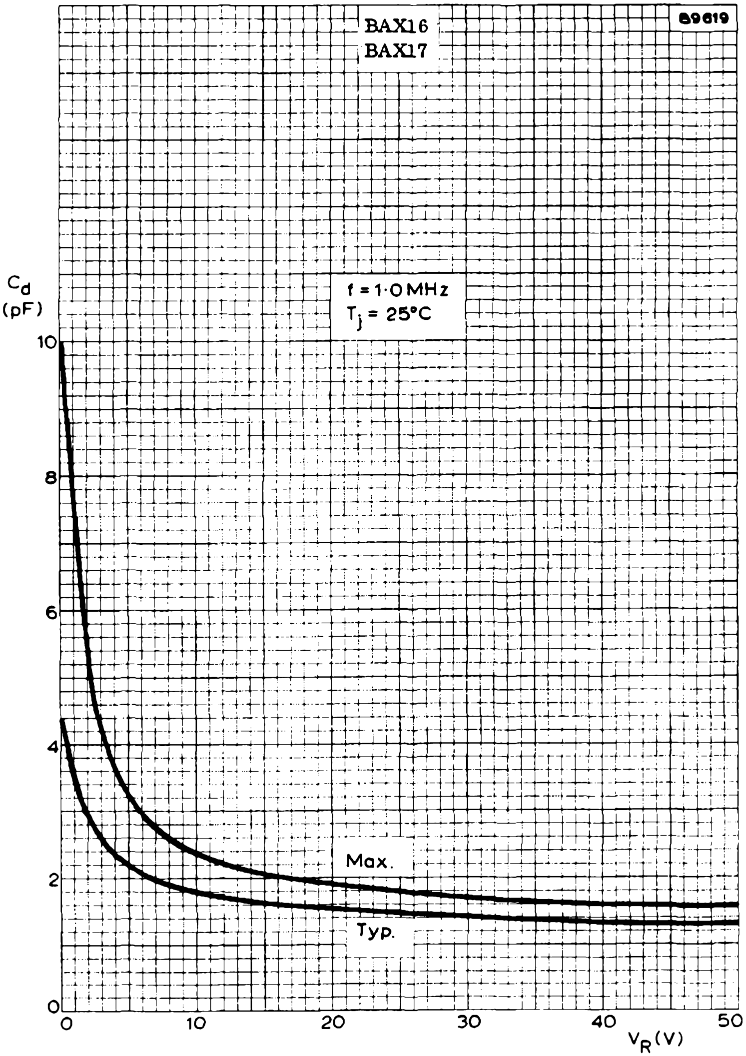




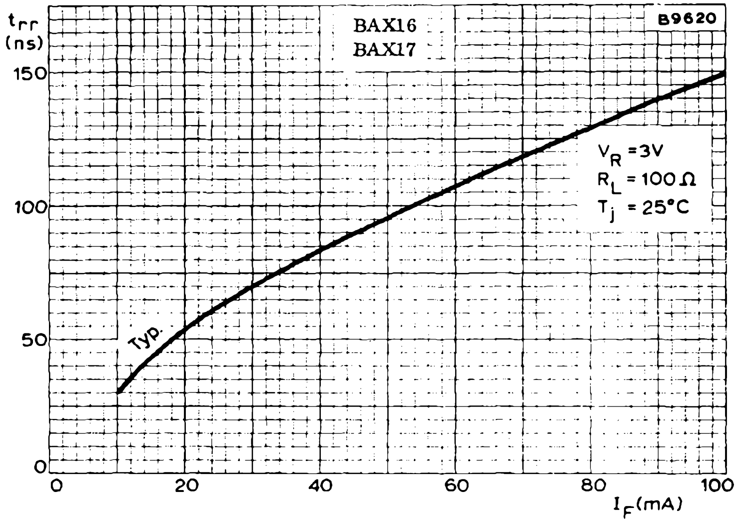
FORWARD CHARACTERISTICS

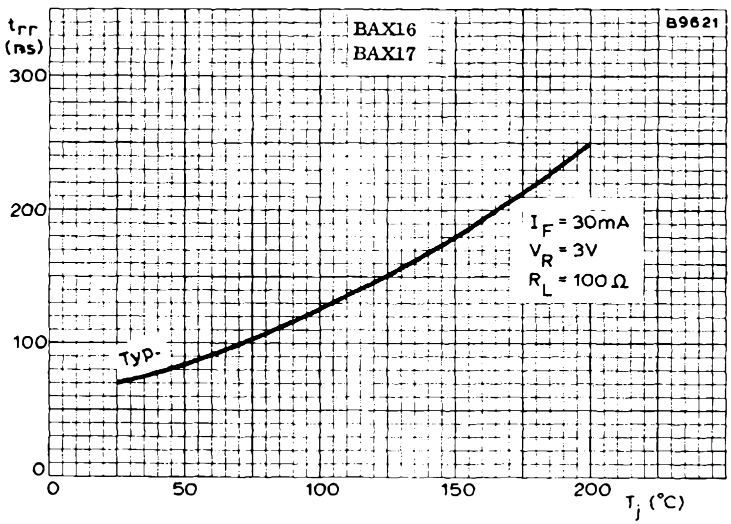


TYPICAL FORWARD VOLTAGE PLOTTED AGAINST JUNCTION TEMPERATURE WITH FORWARD CURRENT AS A PARAMETER



DIODE CAPACITANCE PLOTTED AGAINST REVERSE VOLTAGE





REVERSE RECOVERY TIME PLOTTED AGAINST FORWARD CURRENT AND JUNCTION TEMPERATURE

HIGH-SPEED SILICON DIODES

Planar epitaxial high-speed diodes in DO-35 envelopes, primarily intended for telephony applications.

RATINGS

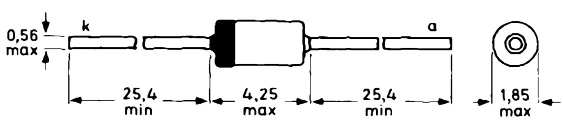
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	see page 2	
Forward current (d.c.; see also derating curves)	I_F	max.	100	mA
Repetitive peak forward current;				
t_p = 10 ms; δ = 0.5	I_{FRM}	max.	450	mA
Non-repetitive peak forward current;				
t_p = 1 s	I_{FSM}	max.	500	mA
t_p = 1 μs	I_{FSM}	max.	2	A
Junction temperature	T_j	max.	200	^oC
Operating ambient temperature (see also derating curves)	T_{amb}		−65 to +175	^oC
Storage temperature	T_{stg}		−65 to +200	^oC

MECHANICAL DATA

Dimensions in mm

Fig.1 DO-35



Diodes may be either type-branded or clour-coded.

Products approved to CECC 50 001−021 (specification available on request).

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise stated
For design and use purposes – these limits must not be exceeded.

		CV9637	CV8617	CV7756 CV7757	CV7367 CV7368	
Reverse current						
t_p = 5 ms; δ = 0.1; V_R = 100 V	I_{RM}	–	–	–	<100	μA
V_R = 75 V	I_R	<0.8	–	<5.0	<5.0	μA
T_{amb} = 150 °C; V_R = 75 V	I_R	–	–	–	<100	μA
V_R = 20 V	I_R	–	<125	<25	<25	nA
T_{amb} = 100 °C; V_R = 20 V	I_R	–	<10	–	–	μA
T_{amb} = 150 °C; V_R = 20 V	I_R	–	–	<50	<50	μA
Forward voltage						
t_p = 300 μs; δ = 0.02; I_F = 100 mA	V_F	<1200	–	–	–	mV
I_F = 50 mA	V_F	–	<1500	–	–	mV
I_F = 10 mA	V_F	650–870	–	<1000	<1000	mV
I_F = 1 mA	V_F	500–700	500–750	–	–	mV
Capacitance						
V_R = 0; f = 1 MHz; CV7756, 7367	C_{tot}	–	–	<4.0	<4.0	pF
CV7757, 7368	C_{tot}	–	–	<2.0	<2.0	pF
V_R = 1 V; f = 1 MHz	C_{tot}	<2.8	<6.0	–	–	pF
V_R = 1.5 V; f = 1 MHz; CV7367	C_{tot}	–	–	–	<2.8	pF
CV7368	C_{tot}	–	–	–	<1.5	pF
Reverse recovery time						
I_F = 10 mA; I_{RM} = 10 mA; measured at I_R = 1 mA	t_{rr}	<5.0	–	<8.0	<5.0	ns
Recovered charge						
I_F = 1 mA; V_R = 10 V; t_p = 1 μs	Q_s	–	<100	–	–	pC
I_F = 10 mA; V_R = 5 V; R_L = 500 Ω; t_r = 5 ns; t_p = 400 ns; f = 50 Hz	Q_s	<75	–	–	–	pC
Forward recovery voltage						
I_F = 50 mA; t_r = 2 ns; t_p = 100 ns; f = 100 kHz	V_{fr}	–	–	–	<5.0	V

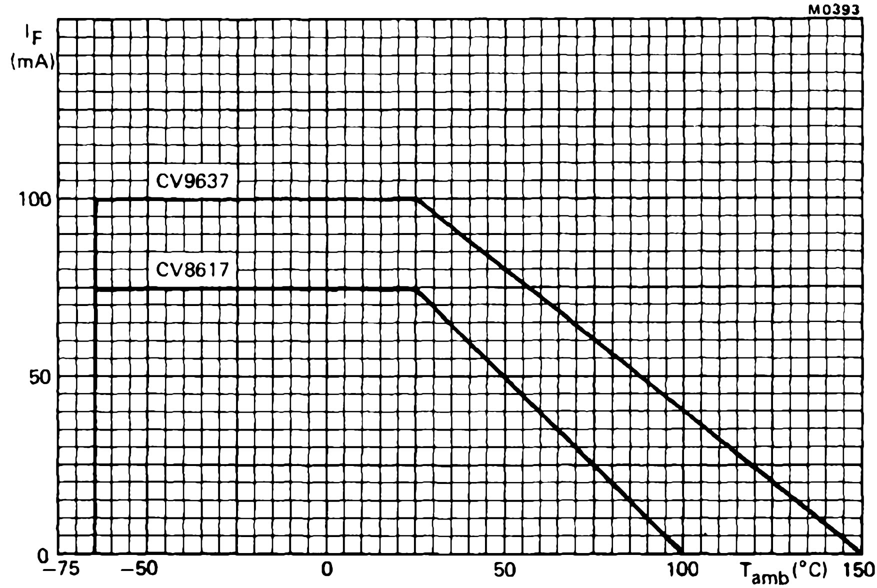


Fig.2 Maximum allowable continuous forward current versus ambient temperature.

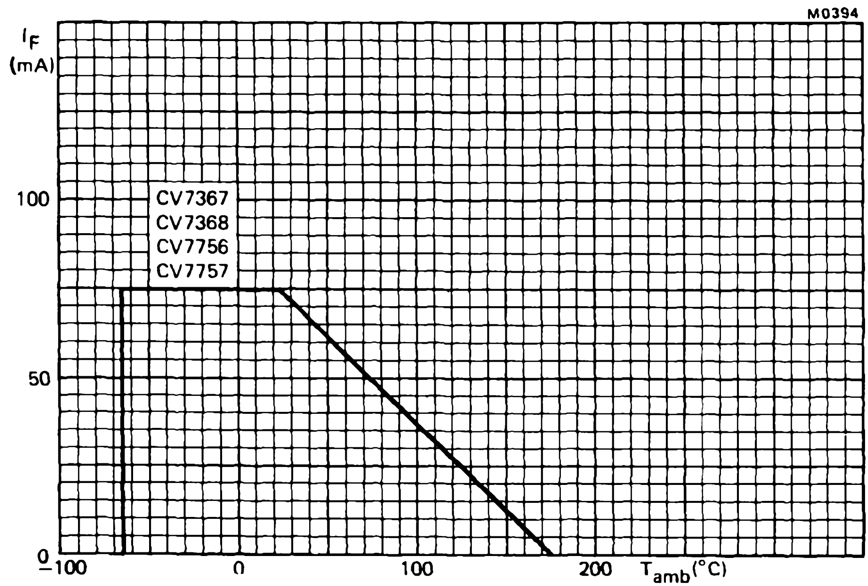


Fig.3 Maximum allowable continuous forward current versus ambient temperature.

SILICON AVALANCHE DIODE

Silicon avalanche diode in a DO–35 glass envelope, intended for telephony applications.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

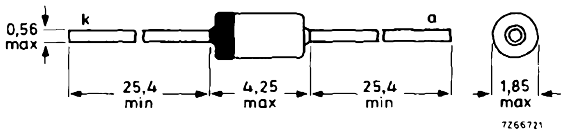
Continuous reverse voltage	V_R	max.	150	V
Repetitive peak reverse voltage	V_{RRM}	max.	see note	
Forward current (d.c.; see also derating curve, Fig. 2)	I_F	max.	150	mA
Repetitive peak forward current; $t_p \leq 10$ ms; $\delta \leq 0.2$	I_{FRM}	max.	750	mA
Repetitive peak reverse power dissipation (see also derating curve, Fig. 3)	P_{RRM}	max.	60	W
Junction temperature	T_j	max.	100	°C
Operating ambient temperature	T_{amb}	–55 to +100		°C
Storage temperature	T_{stg}	–55 to +100		°C

Note: The repetitive peak reverse voltage may be higher than V_R, provided the allowed peak reverse power dissipation will not be exceeded.

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO–35



Diodes may be either type-branded or colour-coded.

Products approved to CECC 50 001-038 (specification available on request).

THERMAL CHARACTERISTIC

Thermal resistance, junction to ambient	$R_{th\ j\text{-}a}$	=	0.38	°C/mW

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise stated.

Reverse current				
V_R = 150 V	I_R	<	100	nA
V_R = 150 V; T_{amb} = 100 °C	I_R	<	5.0	μA
Forward voltage				
I_F = 100 mA; t_p = 300 μs; $\delta \leqslant 0.02$	V_F	<	1.2	V
I_F = 15 mA; t_p = 300 μs; $\delta \leqslant 0.02$	V_F	>	0.65	V
I_F = 0.1 mA	V_F	<	0.75	V
Capacitance				
V_R = 1 V; f = 1 MHz	C_{tot}	<	35	pF

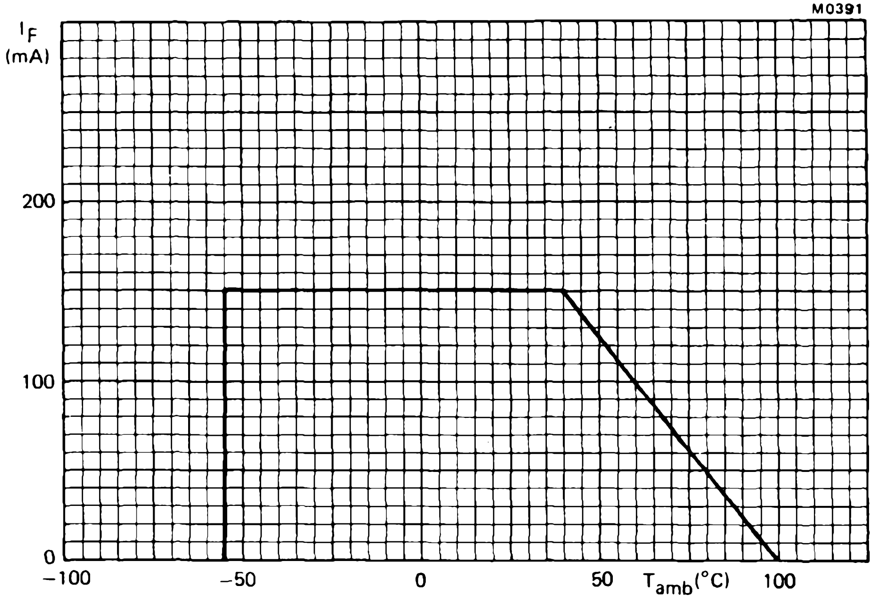


Fig. 2 Maximum allowable continuous forward current versus ambient temperature.

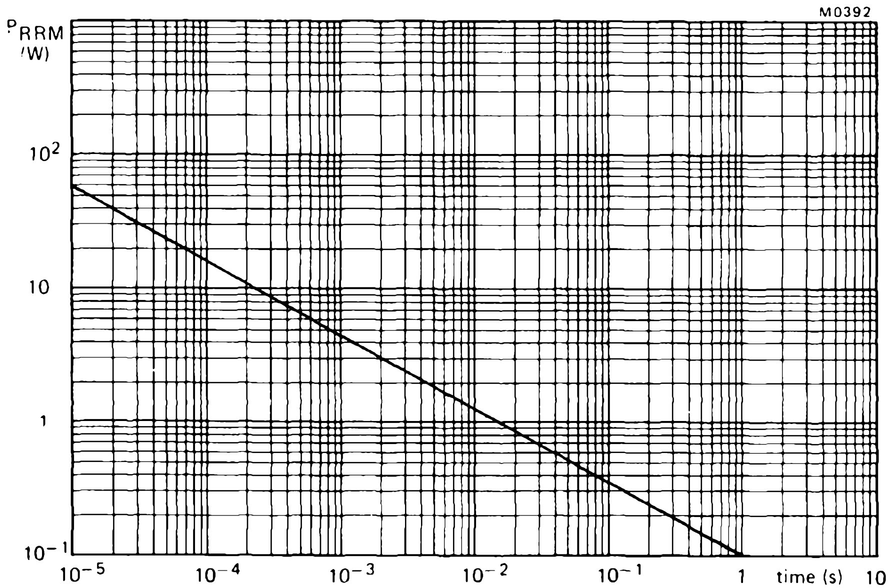


Fig. 3 Maximum repetitive peak reverse power dissipation versus conduction time of the diode; T_{amb} = 0 to +55 °C; P_F = 0; pulse repetition frequency is such that mean reverse power does not exceed 100 mW.

PLANAR EPITAXIAL SILICON DIODE

Planar epitaxial diode in a DO–35 envelope, primarily intended for telephony applications.

RATINGS

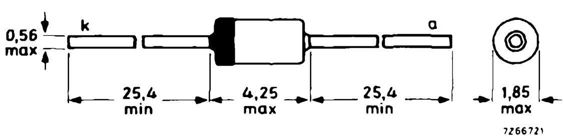
Limiting values in accordance with the Absolute Maximum System (IEC134).

Continuous reverse voltage (see also derating curve, Fig. 3)	V_R	max.	150	V
Repetitive peak reverse voltage	V_{RRM}	max.	150	V
Forward current (d.c.; see also derating curve, Fig. 2)	I_F	max.	150	mA
Repetitive peak forward current (t_p = 10 ms; δ = 0.5)	I_{FRM}	max.	625	mA
Junction temperature	T_j	max.	150	°C
Operating ambient temperature	T_{amb}		–55 to +150	°C
Storage temperature	T_{stg}		–55 to +150	°C

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO–35



Diodes may be either type-branded or colour-coded.

Products approved to CECC 50 001-022 (specification available on request).

THERMAL CHARACTERISTIC

Thermal resistance, junction to ambient	$R_{th\ j\text{-}a}$	=	375	°C/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise stated

Reverse current				
V_R = 150 V	I_R	<	0.1	μA
V_R = 150 V; T_{amb} = 100 °C	I_R	<	5.0	μA
Forward voltage				
I_F = 100 mA; t_p = 300 μs; δ = 0.02	V_F	<	1.2	V
I_F = 15 mA	V_F	>	0.65	V
I_F = 0.1 mA	V_F	<	0.75	V
Capacitance				
V_R = 1 V; f = 1 MHz	C_{tot}	<	10	pF

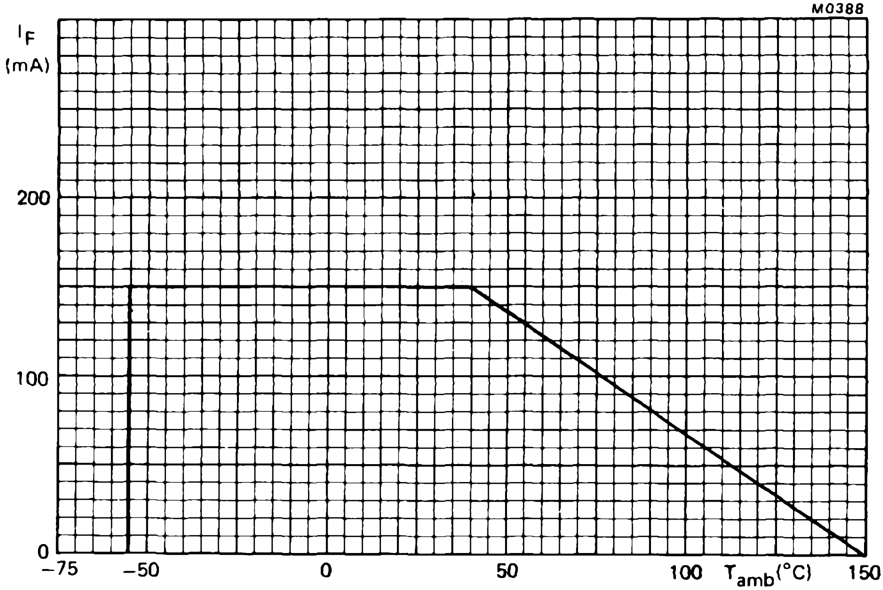


Fig. 2 Maximum allowable continuous forward current versus ambient temperature.

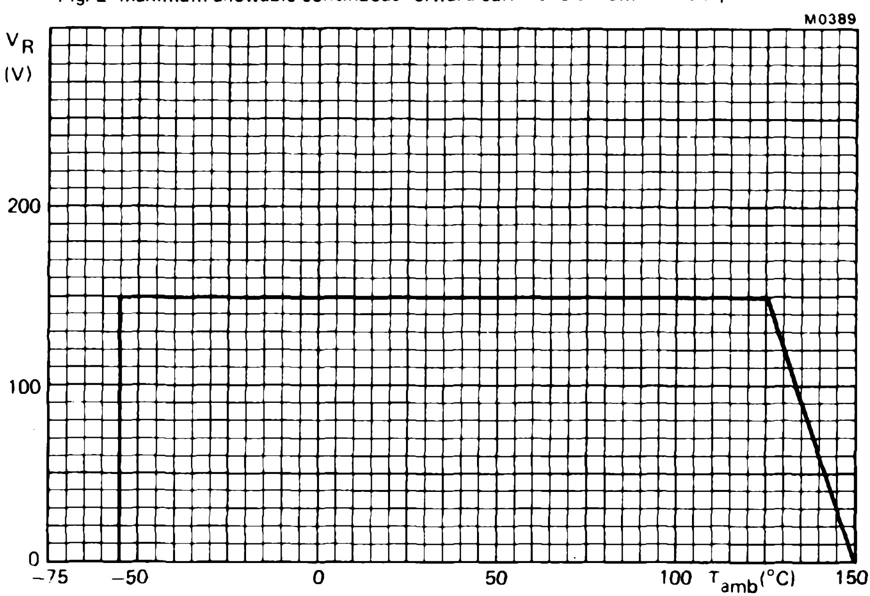


Fig. 3 Maximum allowable continuous reverse voltage versus ambient temperature.

HIGH-SPEED SILICON DIODE

Planar epitaxial high-speed diode in DO–35 envelope, primarily intended for telephony applications.

RATINGS

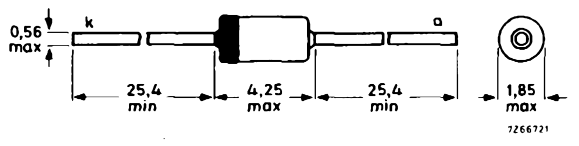
Limiting values in accordance with the Absolute Maximum System (IEC134)

Continuous reverse voltage	V_R	max.	65	V
Forward current (d.c.; see also derating curve)	I_F	max.	200	mA
Repetitive peak forward current t_p = 100 μs; δ = 0.1	I_{FRM}	max.	750	mA
Non-repetitive peak forward current; t_p = 10 μs	I_{FSM}	max.	15	A
Junction temperature	T_j	max.	150	^oC
Operating ambient temperature (see also derating curve)	T_{amb}		0 to 150	^oC
Storage temperature	T_{stg}		0 to 150	^oC

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO–35



Diodes may be either type-branded or colour-coded.

Products approved to CECC 50 001-037 (specification available on request).

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise stated

Reverse current				
V_R = 65 V	I_R	<	10	μA
V_R = 65 V; T_{amb} = 100 °C	I_R	<	50	μA
V_R = 50 V	I_R	<	0.1	μA
Forward voltage				
I_F = 500 mA; t_p = 300 μs; $\delta \leqslant 0.02$	V_F		900–1200	mV
I_F = 200 mA; t_p = 300 μs; $\delta \leqslant 0.02$	V_F		750–950	mV
I_F = 200 mA	V_F	<	900	mV
I_F = 30 mA	V_F	<	790	mV
I_F = 1 mA	V_F		500–700	mV
Capacitance				
V_R = 0; f = 1 MHz	C_{tot}	<	15	pF
Reverse recovery time				
I_F = 200 mA; I_{RM} = 200 mA; measured at I_R = 20 mA	t_{rr}	<	70	ns

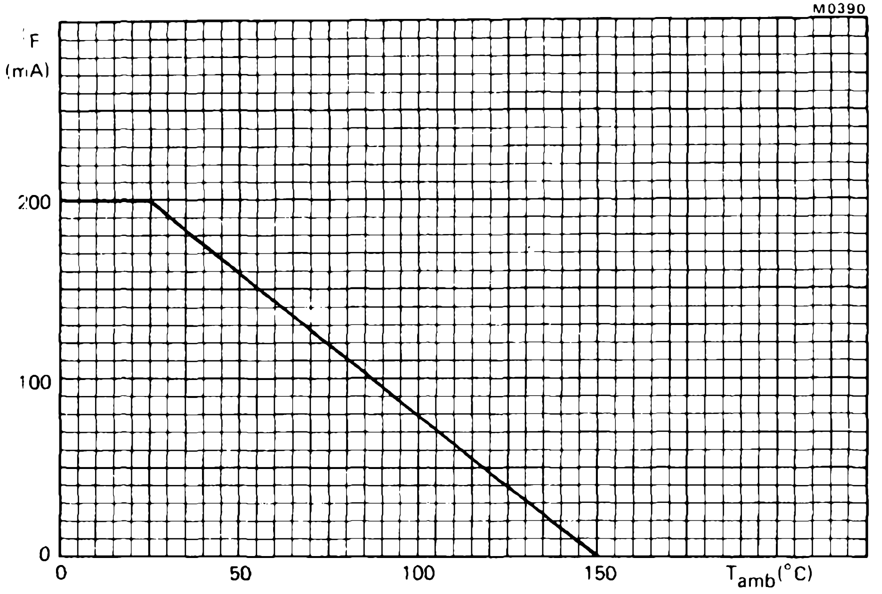


Fig. 2 Maximum allowable continuous forward current versus ambient temperature.

SILICON DIODES

Silicon general purpose diodes in all-glass DO-35 envelopes.

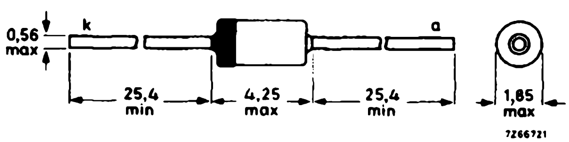
QUICK REFERENCE DATA

			OA200	OA202	
Continuous reverse voltage	V_R	max.	50	150	V
Repetitive peak forward current	I_{FRM}	max.	250		mA
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,4		°C/mW
Forward voltage I_F = 30 mA; T_{amb} = 25 °C	V_F	typ.	0,9		V
Reverse recovery time when switched from I_F = 30 mA to V_R = 35 V; R_L = 2,5 kΩ; measured at I_R = 4 mA	t_{rr}	typ.	3,5		μs

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-27 (DO-35).



The diodes are type-branded; the cathode being indicated by a coloured band.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	OA200	V_R	max.	50		V
	OA202	V_R	max.	150		V
				T_{amb} = 25 °C	T_{amb} = 125 °C	
Average rectified forward current (averaged over any 20 ms period)		$I_{F(AV)}$	max.	160	48	mA
Average forward current for sinusoidal operation		$I_{F(AV)}$	max.	80	40	mA
Forward current (d.c.; see page 4)		I_F	max.	160	48	mA
Repetitive peak forward current		I_{FRM}	max.	250	125	mA
Storage temperature		T_{stg}		−55 to + 125		°C
Operating junction temperature		T_j	max.	150		°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,4	°C/mW

CHARACTERISTICS

				T_{amb} = 25 °C	T_{amb} = 125 °C	
Forward voltage						
I_F = 0,1 mA		V_F	typ.	0,52	–	V
			<	0,62	0,30	V
I_F = 10 mA		V_F	typ.	0,80	–	V
			<	0,96	0,65	V
I_F = 30 mA		V_F	typ.	0,90	–	V
			<	1,15	0,80	V
Reverse current						
$V_R = V_{Rmax}$	OA200	I_R	typ.	0,02	1	µA
			<	0,10	10	µA
	OA202	I_R	typ.	0,01	0,5	µA
			<	0,10	10	µA
Diode capacitance at T_{amb} = 25 °C						
V_R = 0,75 V; f = 0,5 MHz		C_d	typ.	10		pF
			<	25		pF

CHARACTERISTICS (continued)

T_{amb} = 25 °C

Reverse recovery current when switched from
I_F = 5 mA to V_R = 5 V; R_L = 2,5 kΩ;

measured at t_{rr} = 3,5 μs	I_R	typ.	1,2 mA
measured at t_{rr} = 10 μs	I_R	typ.	35 μA

Reverse recovery current when switched from
I_F = 30 mA to V_R = 35 V; R_L = 2,5 kΩ

measured at t_{rr} = 3,5 μs	I_R	typ.	4 mA
measured at t_{rr} = 10 μs	I_R	typ.	230 μA

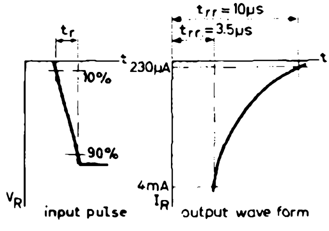


Fig. 2 Waveforms.

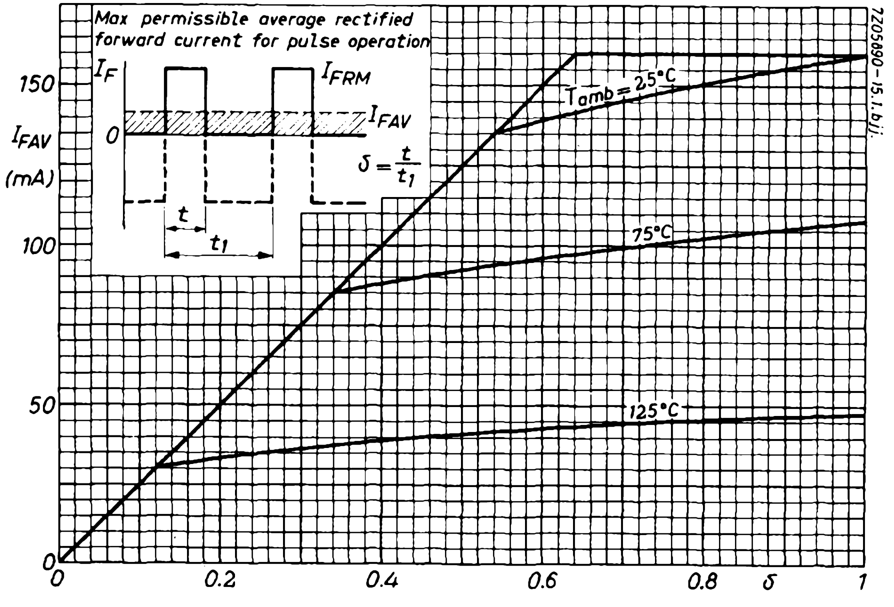


Fig. 3.

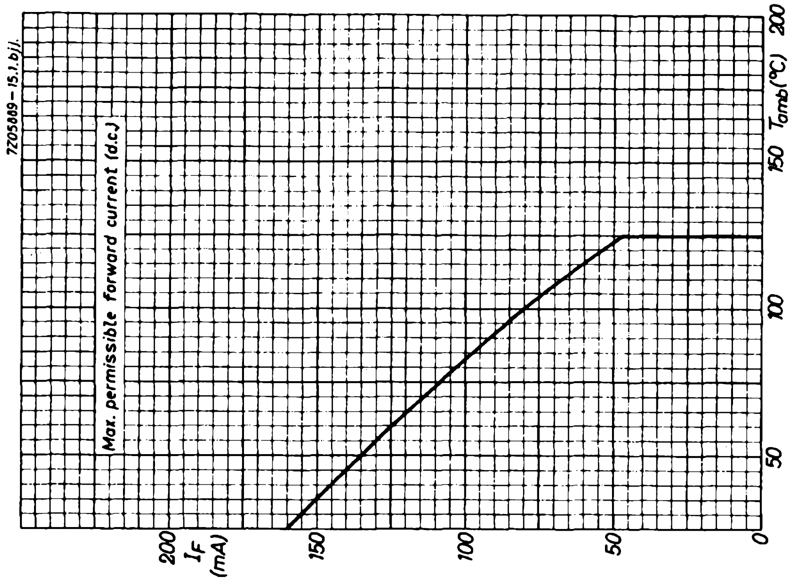

7Z05889-15.1.bjl.
Max. permissible forward current (d.c.)
I_F (mA)
200
150
100
50
0
50
100
150
200
T_{amb}(°C)

Fig. 5.

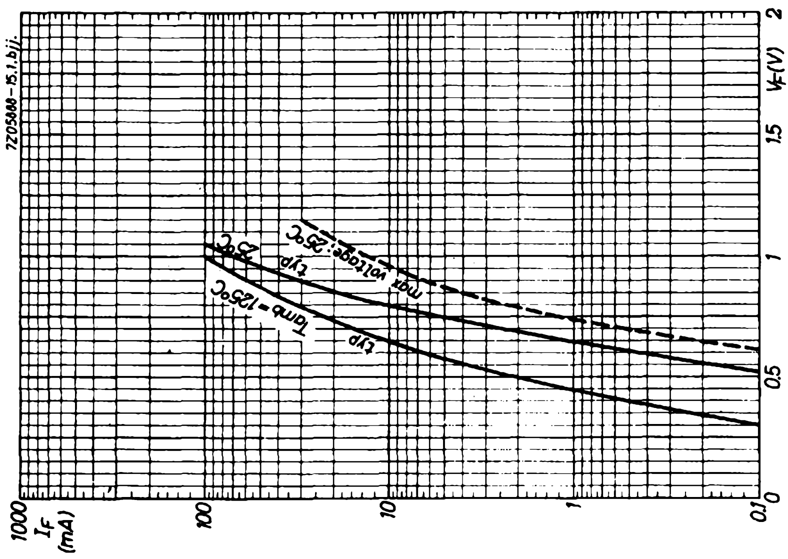

7Z05888-15.1.bjl.
1000
I_F (mA)
100
10
1
0.1
0
0.5
1
1.5
2
V_F(V)
typ T_{amb}=125°C
typ 25°C
max voltage: 25°C

Fig. 4.

HIGH-SPEED SILICON DIODES

Planar epitaxial diodes intended for general purpose applications.

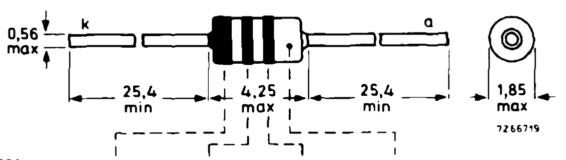
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	75 V
Repetitive peak reverse voltage	V_{RRM}	max.	100 V
Repetitive peak forward current	I_{FRM}	max.	225 mA
Forward voltage I_F = 10 mA	V_F	<	1 V
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-27 (DO-35).



1N914:	**white**	**brown**	**yellow**	**natural**
1N916:	**white (cathode)**	**brown**	**blue**	**natural**

The diodes may be either type-branded or colour-coded.

Products approved to CECC 50 001-21 available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	75 V
Repetitive peak reverse voltage	V_{RRM}	max.	100 V
Average rectified forward current (averaged over any 20 ms period)			
T_{amb} = 25 °C	$I_{F(AV)}$	max.	75 mA
T_{amb} = 150 °C	$I_{F(AV)}$	max.	10 mA
Forward current (d.c.)	I_F	max.	75 mA
Repetitive peak forward current	I_{FRM}	max.	225 mA
Non-repetitive peak forward current (t = 1 s)	I_{FSM}	max.	500 mA
Total power dissipation	P_{tot}	max.	250 mW
Storage temperature	T_{stg}	−65 to + 200	°C
Operating ambient temperature	T_{amb}	−65 to + 175	°C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltages			
I_F = 10 mA	V_F	$<$	1 V
Reverse avalanche breakdown voltage			
I_R = 100 μA	$V_{(BR)R}$	$>$	100 V
Reverse currents			
V_R = 20 V	I_R	$<$	25 nA
V_R = 75 V	I_R	$<$	5 μA
V_R = 20 V; T_j = 150 °C	I_R	$<$	50 μA
Diode capacitance			
V_R = 0; f = 1 MHz			
1N914	C_d	$<$	4 pF
1N916	C_d	$<$	2 pF
Forward recovery voltage			
when switched to I_F = 50 mA; t_r = 20 ns	V_{fr}	$<$	2,5 V

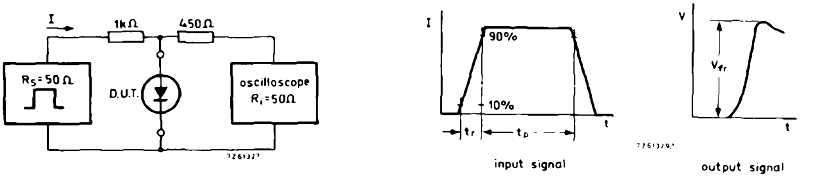
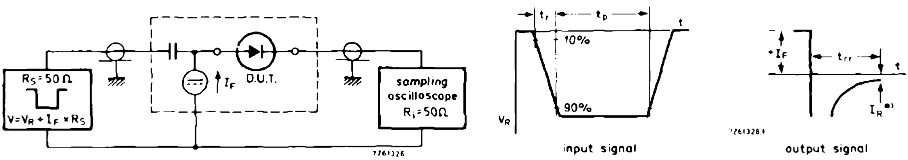


Fig. 2 Test circuit and waveforms forward recovery voltage. Input signal: Rise time of the forward pulse, t_r = 20 ns; forward current pulse duration, t_p = 120 ns; duty factor, d = 0,01. Oscilloscope rise time, t_r = 0,35 ns. Circuit capacitance < 1 pF (oscilloscope input capacitance and parasitic capacitance).

Reverse recovery time when switched from		1N914	1N916	
I_F = 10 mA to I_R = 10 mA, R_L = 100 Ω, measured at I_R = 1 mA	t_{rr}	8	–	ns
I_F = 10 mA to I_R = 60 mA, R_L = 100 Ω, measured at I_R = 1 mA	t_{rr}	4	4	ns



* I_R = 1 mA

Fig. 3 Test circuit and waveform reverse recovery time. Input signal: Rise time of the reverse pulse, t_r = 0,6 ns; reverse pulse duration, t_p = 100 ns; duty factor, d = 0,05. Oscilloscope rise time, t_r = 0,35 ns. Circuit capacitance < 1 pF (oscilloscope input capacitance + parasitic capacitance).

Rectifying efficiency
f = 100 MHz; $V_{i(rms)}$ = 2 V η > 45 %

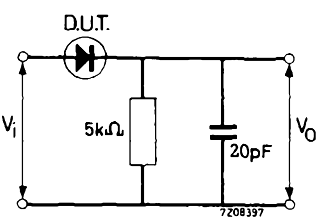


Fig. 4 Test circuit. $\eta = \dfrac{V_O}{V_{i(rms)}\sqrt{2}}$

HIGH-SPEED SILICON DIODES

Whiskerless diodes in subminiature DO-35 envelopes.
These diodes are primarily intended for fast logic applications.

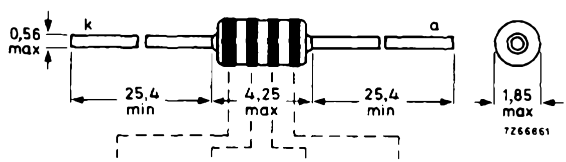
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	75 V
Repetitive peak reverse voltage	V_{RRM}	max.	75 V
Repetitive peak forward current	I_{FRM}	max.	450 mA
Forward voltage **1N4148**: I_F = 10 mA **1N4446**: I_F = 20 mA **1N4448**: I_F = 100 mA	V_F	<	1 V
Reverse recovery time when switched from I_F = 10 mA to I_R = 60 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	4 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-27 (DO-35).



1N4148:	yellow	brown	yellow	grey
1N4446:	yellow	yellow	yellow	blue
1N4448:	yellow (cathode)	yellow	yellow	grey

The diodes may be either type-branded or colour-coded.

Products, available to CECC 50 001-021, available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	75	V
Average rectified forward current	$I_{F(AV)}$	max.	150	mA
Forward current (d.c.)	I_F	max.	200	mA
Repetitive peak forward current	I_{FRM}	max.	450	mA
Non-repetitive peak forward current				
t = 1 μs	I_{FSM}	max.	2000	mA
t = 1 s	I_{FSM}	max.	500	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	500	mW
Derating factor			2,85	mW/°C
Storage temperature	T_{stg}	−65 to + 200		°C
Junction temperature	T_j	max.	200	°C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

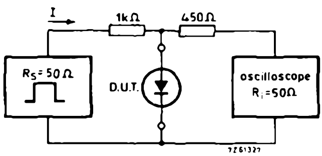
Forward voltages					
1N4148: I_F = 10 mA **1N4446:** I_F = 20 mA **1N4448:** I_F = 100 mA		V_F	<	1	V
1N4448: I_F = 5 mA		V_F	0,62 to 0,72		V
Reverse avalanche breakdown voltage					
I_R = 100 μA		$V_{(BR)R}$	>	100	V
I_R = 5 μA		$V_{(BR)R}$	>	75	V
Reverse currents					
V_R = 20 V		I_R	<	25	nA
V_R = 20 V; T_j = 100 °C	**1N4448**	I_R	<	3	μA
V_R = 20 V; T_j = 150 °C		I_R	<	50	μA
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	<	4	pF

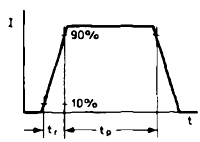
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Forward recovery voltage when switched to

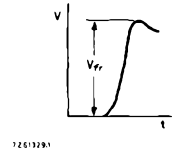
$I_F = 50$ mA; $t_r = 20$ ns V_{fr} < 2,5 V

Test circuit and waveforms :





input signal



output signal

Input signal :	Rise time of the forward pulse	t_r = 20 ns
	Forward current pulse duration	t_p = 120 ns
	Duty factor	δ = 0,01
Oscilloscope :	Rise time	t_r = 0,35 ns

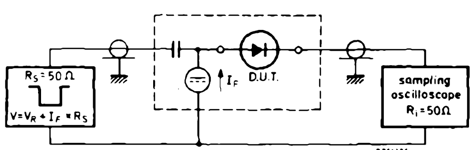
Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

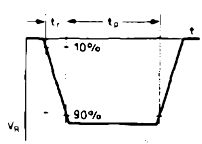
Reverse recovery time when switched from

$I_F = 10$ mA to $I_R = 60$ mA; $R_L = 100\ \Omega$;

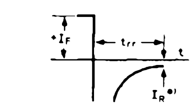
measured at $I_R = 1$ mA t_{rr} < 4 ns

Test circuit and waveforms :





input signal



output signal

Input signal :	Rise time of the reverse pulse	t_r = 0,6 ns	*) I_R = 1 mA
	Reverse pulse duration	t_p = 100 ns	
	Duty factor	δ = 0,05	
Oscilloscope :	Rise time	t_r = 0,35 ns	

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

VOLTAGE REGULATOR DIODES
(Low power)

C

LOW VOLTAGE STABISTOR

Silicon planar epitaxial diode in DO-35 envelope. This diode is intended for low voltage stabilizing e.g. bias stabilizer in class-B output stages, clipping, clamping and meter protection.

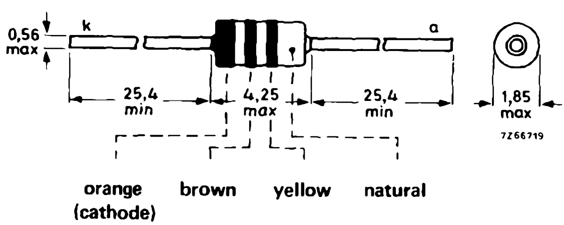
QUICK REFERENCE DATA

Repetitive peak forward current	I_{FRM}	max.	250	mA
Storage temperature	T_{stg}		−65 to + 200	°C
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient	$R_{th\ j\text{-}a}$	=	0,38	°C/mW
Forward voltage				
I_F = 0,1 mA	V_F		610 to 690	mV
I_F = 1,0 mA	V_F		680 to 760	mV
I_F = 10 mA	V_F		750 to 830	mV
I_F = 100 mA	V_F		870 to 960	mV
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	<	140	pF

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-35 (SOD-27).



The diodes may be either type-branded or colour-coded.

Products approved to CECC 50 001-026 available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Repetitive peak forward current	I_{FRM}	max.	250 mA
Storage temperature	T_{stg}		−65 to + 200 °C
Junction temperature	T_j	max.	200 °C

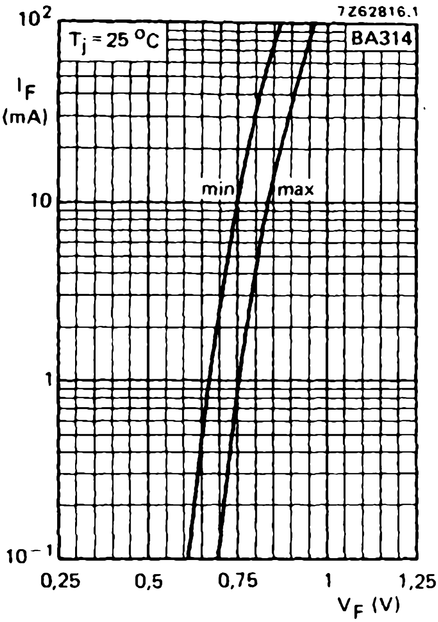
THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,38 °C/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage			
I_F = 0,1 mA	V_F		610 to 690 mV
I_F = 1,0 mA	V_F		680 to 760 mV
I_F = 5,0 mA	V_F		730 to 810 mV
I_F = 10 mA	V_F		750 to 830 mV
I_F = 100 mA	V_F		870 to 960 mV
Reverse current			
V_R = 4 V	I_R	<	5 μA
Temperature coefficient			
I_F = 1 mA	S_F	typ.	−1,8 mV/°C
Differential resistance at f = 1 kHz			
I_F = 1 mA	r_{diff}	typ.	30 Ω
I_F = 10 mA	r_{diff}	typ. <	3,5 Ω 6,0 Ω
Diode capacitance			
V_R = 0; f = 1 MHz	C_d	<	140 pF


7Z62816.1
10^2
$T_j = 25\ ^oC$
BA314
I_F (mA)
10
min
max
1
10^{-1}
0,25
0,5
0,75
1
1,25
V_F (V)

REGULATOR DIODES

Glass passivated diodes in hermetically sealed axial-leaded glass envelopes. They are intended for use as voltage regulator and transient suppressor diode in medium power regulation and transient suppression circuits.

The series consists of BZT03-C9V1 to BZT03-C270.

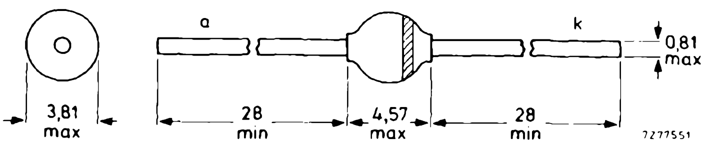
QUICK REFERENCE DATA

			voltage regulator	transient suppressor	
Working voltage range	V_Z	nom.	9,1 to 270		V
Stand-off voltage	V_R			7,5 to 220	V
Total power dissipation	P_{tot}	max.	3,25		W
Non-repetitive peak reverse power dissipation $T_j = 25\ ^{\circ}C$; $t_p = 100\ \mu s$	P_{ZSM}	max.		600	W

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-57.



The marking band indicates the cathode.

The diodes are type-branded

Products approved to CECC 50 005-017 available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Total power dissipation				
T_{tp} = 25 °C; lead length 10 mm	P_{tot}	max.	3,25	W
T_{amb} = 45 °C; p.c.b. mounting (Fig. 2)	P_{tot}	max.	1,3	W
Repetitive peak reverse power dissipation	P_{ZRM}	max.	10	W
Non-repetitive peak reverse power dissipation				
t_p = 100 μs square pulse; T_j = 25 °C (prior to surge)	P_{ZSM}	max.	600	W
Storage temperature	T_{stg}	−65 to + 175		°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

Influence of mounting method (see also page 6, operating notes)

1. Thermal resistance from junction to tie-point at a lead length of 10 mm	$R_{th\ j\text{-}tp}$	=	46	K/W
2. Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 μm; Fig. 2	$R_{th\ j\text{-}a}$	=	100	K/W

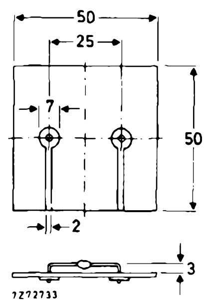


Fig. 2 Mounted on a printed-circuit board.

CHARACTERISTICS

Forward voltage				
I_F = 0,5 A; T_j = 25 °C	V_F	<	1,2	V

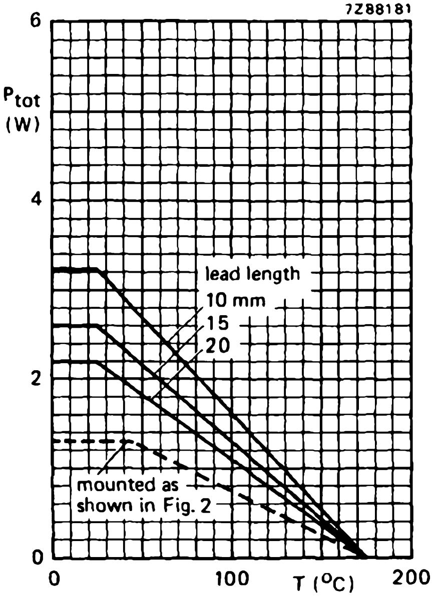


Fig. 3 Maximum total power dissipation as a function of temperature.
—— = T_{tp}; – – – – = T_{amb}; Fig. 2.

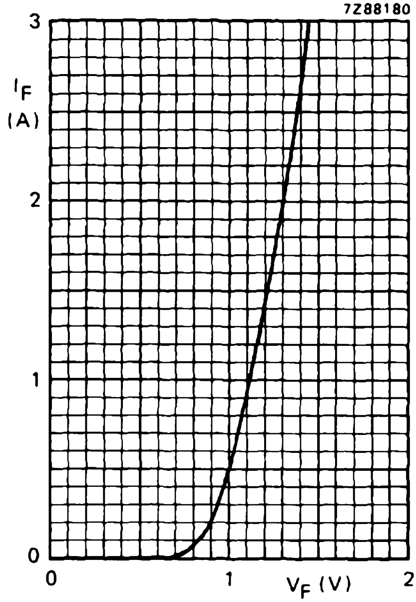


Fig. 4 Typical forward voltage drop T_j = 25 ^oC.

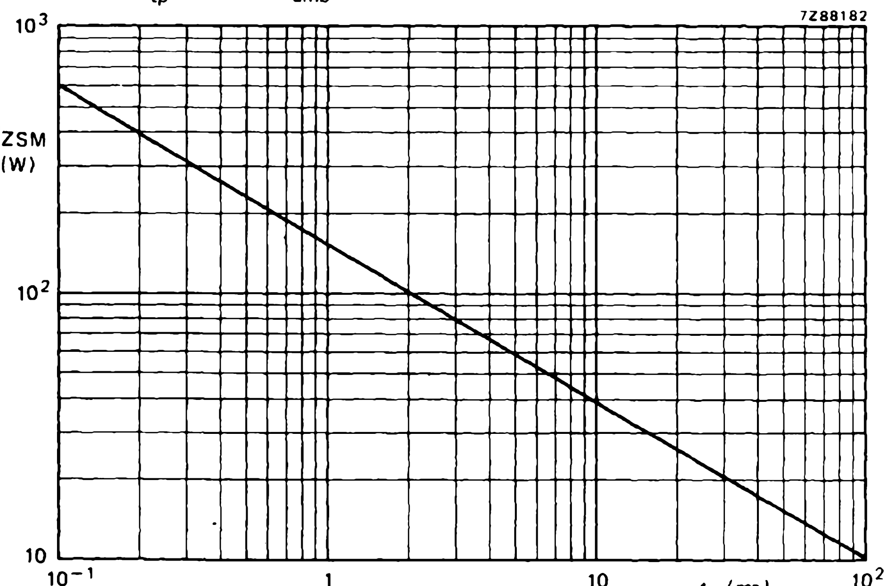


Fig. 5 Maximum non-repetitive peak reverse power dissipation; square current pulse; T_j = 25 ^oC prior to surge.

CHARACTERISTICS when used as voltage regulator diodes; $T_j = 25\ ^{o}C$

BZT03-XXXX	working voltage V_Z V			differential resistance r_{diff} Ω		temperature coefficient S_Z %/K		test current I_Z mA	reverse current I_R µA	at reverse voltage V_R V
	min.	typ.	max.	typ.	max.	min.	max.		max.	
C9V1	8,5	9,1	9,6	2	4	0,03	0,08	50	10	6,8
C10	9,4	10,0	10,6	2	4	0,05	0,09	50	5	7,5
C11	10,4	11,0	11,6	4	7	0,05	0,10	50	4	8,2
C12	11,4	12,0	12,7	4	7	0,05	0,10	50	3	9,1
C13	12,4	13,0	14,1	5	10	0,05	0,10	50	2	10
C15	13,8	15,0	15,6	5	10	0,05	0,10	50	1	11
C16	15,3	16,0	17,1	6	15	0,06	0,11	25	1	12
C18	16,8	18,0	19,1	6	15	0,06	0,11	25	1	13
C20	18,8	20,0	21,2	6	15	0,06	0,11	25	1	15
C22	20,8	22,0	23,3	6	15	0,06	0,11	25	1	16
C24	22,8	24,0	25,6	7	15	0,06	0,11	25	1	18
C27	25,1	27,0	28,9	7	15	0,06	0,11	25	1	20
C30	28	30	32	8	15	0,06	0,11	25	1	22
C33	31	33	35	8	15	0,06	0,11	25	1	24
C36	34	36	38	21	40	0,06	0,11	10	1	27
C39	37	39	41	21	40	0,06	0,11	10	1	30
C43	40	43	46	24	45	0,07	0,12	10	1	33
C47	44	47	50	24	45	0,07	0,12	10	1	36
C51	48	51	54	25	60	0,07	0,12	10	1	39
C56	52	56	60	25	60	0,07	0,12	10	1	43
C62	58	62	66	25	80	0,08	0,13	10	1	47
C68	64	68	72	25	80	0,08	0,13	10	1	51
C75	70	75	79	30	100	0,08	0,13	10	1	56
C82	77	82	87	30	100	0,08	0,13	10	1	62
C91	85	91	96	60	200	0,09	0,13	5	1	68
C100	94	100	106	60	200	0,09	0,13	5	1	75
C110	104	110	116	80	250	0,09	0,13	5	1	82
C120	114	120	127	80	250	0,09	0,13	5	1	91
C130	124	130	141	110	300	0,09	0,13	5	1	100
C150	138	150	156	130	300	0,09	0,13	5	1	110
C160	153	160	171	150	350	0,09	0,13	5	1	120
C180	168	180	191	180	400	0,09	0,13	5	1	130
C200	188	200	212	200	500	0,09	0,13	5	1	150
C220	208	220	233	350	750	0,09	0,13	2	1	160
C240	228	240	256	400	850	0,09	0,13	2	1	180
C270	251	270	289	450	1000	0,09	0,13	2	1	200

CHARACTERISTICS when used as transient suppressor diodes; T_j = 25 °C

clamping voltage t_p = 500 μs exp. pulse $V_{(CL)R}$ V	at	non-repetitive peak reverse current I_{RSM} A	reverse current at recommended stand-off voltage I_R μA	V_R V	BZT03-XXXX
max.			max.		
11,5		10	50	7,5	C9V1
12,7		10	10	8,2	C10
14,1		10	5	9,1	C11
15,5		10	5	10	C12
16,9		10	5	11	C13
19,6		10	5	12	C15
21,1		10	5	13	C16
24		10	5	15	C18
24		5	5	16	C20
27		5	5	18	C22
30		5	5	20	C24
34		5	5	22	C27
38		5	5	24	C30
43		5	5	27	C33
48		5	5	30	C36
47		2	5	33	C39
53		2	5	36	C43
59		2	5	39	C47
64		2	5	43	C51
72		2	5	47	C56
80		2	5	51	C62
89		2	5	56	C68
97		2	5	62	C75
108		2	5	68	C82
121		2	5	75	C91
120		1	5	82	C100
135		1	5	91	C110
150		1	5	100	C120
165		1	5	110	C130
194		1	5	120	C150
209		1	5	130	C160
240		1	5	150	C180
240		0,5	5	160	C200
271		0,5	5	180	C220
300		0,5	5	200	C240
343		0,5	5	220	C270

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

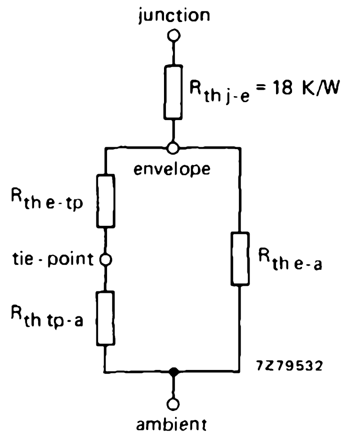


Fig. 6 Thermal model.

By using this thermal model any temperature can be calculated.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

thermal resistance	lead length					unit
	5	10	15	20	25	mm
$R_{th\,e\text{-}tp}$	15	30	45	60	75	K/W
$R_{th\,e\text{-}a}$	580	445	350	290	245	K/W

The thermal resistance between tie-point and ambient depends on the mounting method. For components on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness $\geq 40\ \mu m$, the following values apply:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\,tp\text{-}a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm^2 per lead $R_{th\,tp\text{-}a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm^2 per lead $R_{th\,tp\text{-}a}$ is 45 K/W.

LOW VOLTAGE STABISTORS

Silicon planar integrated voltage regulator diodes, intended for low power clipping, level shifting, voltage regulation and temperature stabilization of transistor base-emitter biasing network. The stabistors operate in the forward mode thus the cathode must be adjacent to the negative connection.

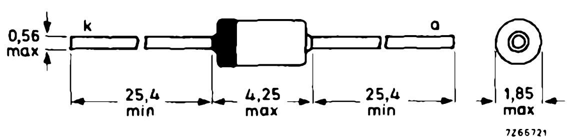
QUICK REFERENCE DATA

			BZV46−1V5	2V0	
Regulation voltage ranges	V_F	>	1,35	2,00	V
		<	1,55	2,30	V
Continuous reverse voltage	V_R	max.	4	4	V
Repetitive peak forward current	I_{FRM}	max.	120	80	mA
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	250	250	mW
Differential resistance I_F = 5 mA; f = 1 kHz	r_{diff}	<	20	30	Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD−27 (DO−35).



Cathode indicated by coloured end.

The diodes are type-branded

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BZV46–1V5	2V0	
Continuous reverse voltage	V_R	max.	4	4	V
Repetitive peak reverse voltage	V_{RRM}	max.	4	4	V
Repetitive peak forward current	I_{FRM}	max.	120	80	mA
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	250		mW
Storage temperature	T_{stg}		−65 to + 150		°C
Junction temperature	T_j	max.	150		°C

THERMAL RESISTANCE

From junction to ambient in free air — see Fig. 2

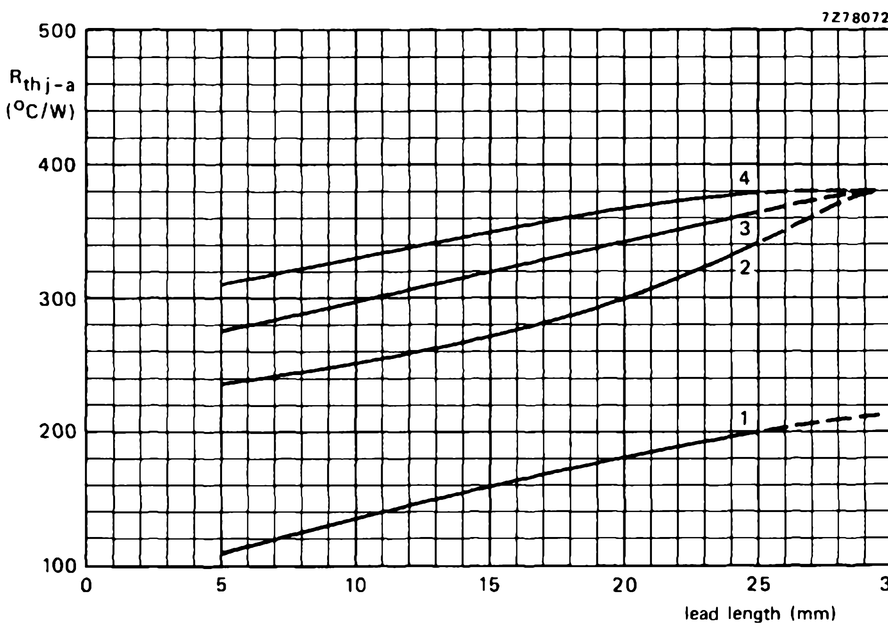


Fig. 2 Thermal resistance as a function of the lead length for various mounting.

curve	mounting
1	Infinite heatsink at end of lead.
2	Typical printed-circuit board with large area of copper (> 100 mm²).
3	Tag mounting.
4	Typical printed-circuit board with small area of copper (< 50 mm²).

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			BZV46–1V5	2V0	
Regulation voltage ranges I_F = 5 mA	V_F	>	1,35	2,00	V
		<	1,55	2,30	V
Temperature coefficient at I_F = 5 mA	S_F	typ.	−3,65	−5,60	mV/°C
Differential resistance at f = 1 kHz; I_F = 5 mA	r_{diff}	<	20	30	Ω
Reverse current V_R = 4 V	I_R	<	500	500	nA

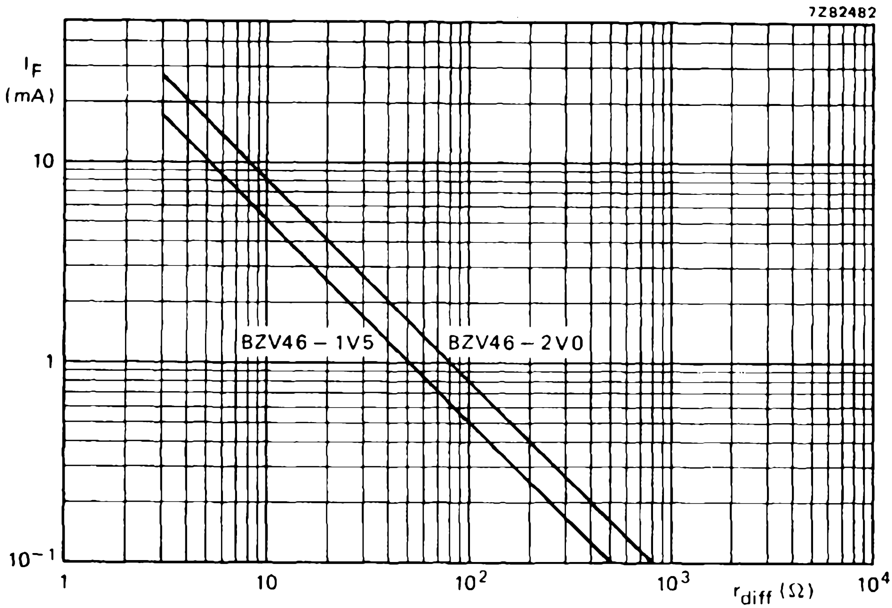


Fig. 3 Typical values; T_j = 25 °C.

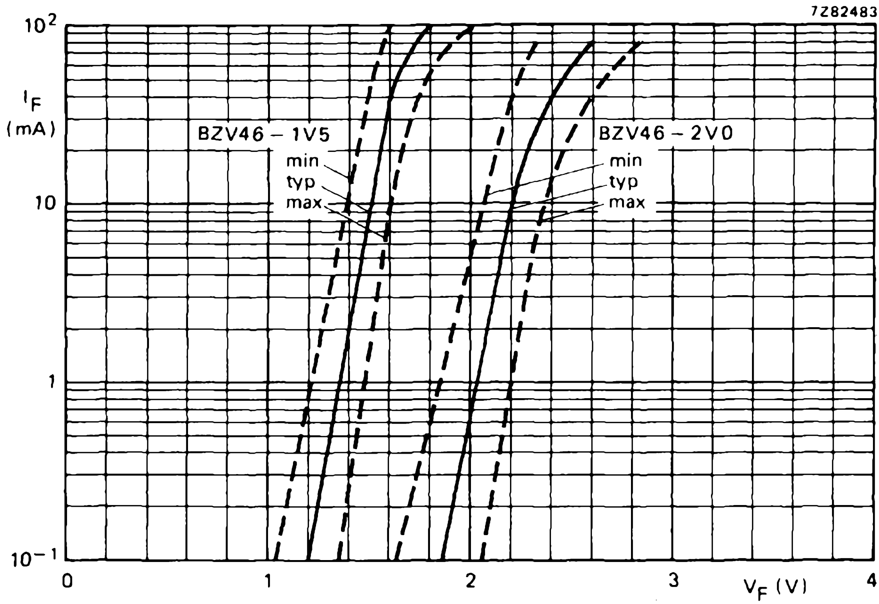


Fig. 4 Regulation characteristics at T_j = 25 °C.

VOLTAGE REGULATOR DIODES

Silicon planar voltage regulator diodes in hermetically sealed DO-41 glass envelopes intended for stabilization purposes. The series covers the normalized E24 (± 5%) range of nominal working voltages ranging from 3.6 V to 75 V.

QUICK REFERENCE DATA

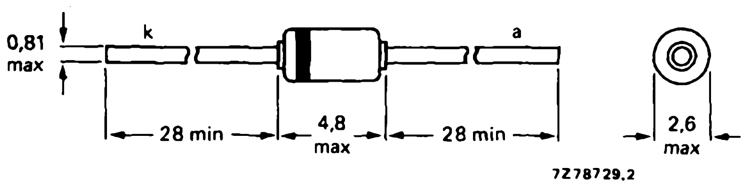
Working voltage range	V_Z	nom.	3.6 to 75	V
Total power dissipation	P_{tot}	max.	1.3	W*
Non-repetitive peak reverse power dissipation t_p = 100 μs; T_j = 25 °C	P_{ZSM}	max.	60	W
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to tie-point	$R_{th\ j\text{-}tp}$	=	110	°C/W*

* If leads are kept at T_{tp} = 55 °C at 4 mm from body.

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-41 (SOD-66).



Cathode indicated by coloured band.

The diodes are type-branded

Products approved to CECC 50 005-010 available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Working current (d.c.)	I_Z	limited by $P_{tot\ max}$		
Non-repetitive peak reverse current t_p = 10 ms; half sine-wave; T_{amb} = 25 °C	I_{ZSM}	see table below		
Repetitive peak forward current	I_{FRM}	max.	250	mA
Total power dissipation (see also Fig.2)	P_{tot}	max.	1.30	W*
		max.	1	W**
Non-repetitive peak reverse power dissipation t_p = 100 μs; T_j = 25 °C	P_{ZSM}	max.	60	W
Storage temperature	T_{stg}		−65 to + 200	°C
Junction temperature	T_j	max.	200	°C

BZV85—. . . .	Non-repetitive peak reverse current I_{ZSM} (mA) max.	BZV85—. . .	Non-repetitive peak reverse current I_{ZSM} (mA) max.
C3V6	2000	C18	600
C3V9	1950	C20	540
C4V3	1850	C22	500
C4V7	1800	C24	450
C5V1	1750	C27	400
C5V6	1700	C30	380
C6V2	1620	C33	350
C6V8	1550	C36	320
C7V5	1500	C39	296
C8V2	1400	C43	270
C9V1	1340	C47	246
C10	1200	C51	226
C11	1100	C56	208
C12	1000	C62	186
C13	900	C68	171
C15	760	C75	161
C16	700		

THERMAL RESISTANCE

From junction to tie-point	$R_{th\ j\text{-}tp}$	=	110	°C/W*
From junction to ambient mounted on a printed-circuit board	$R_{th\ j\text{-}a}$	=	175	°C/W**

* If the temperature of the leads at 4 mm from the body are kept up to T_{tp} = 55 °C.

** Measured in still air up to T_{amb} = 25 °C and mounted on printed-circuit board with lead length of 10 mm and print copper area of 1 cm² per lead.

CHARACTERISTICS

$T_j = 25\ ^oC$

Forward voltage at $I_F = 50$ mA | V_F < 1.0 V

BZV85–. . . .	working voltage E24 (± 5%) V_Z (V) at I_{Ztest} min.	nom.	max.	test current I_{Ztest} (mA)	differential resistance r_{diff} (Ω) at I_{Ztest} max.	temperature coefficient S_Z (mV/^{o}C) at I_{Ztest} min.	max.	reverse current I_R (nA) at V_R max.	test voltage V_R (V)
C3V6	3.4	3.6	3.8	60	15	typ. –2.4		50 000	1.0
C3V9	3.7	3.9	4.1	60	15	typ. –2.2		10 000	1.0
C4V3	4.0	4.3	4.6	50	13	typ. –1.4		5000	1.0
C4V7	4.4	4.7	5.0	45	13	typ. –0.7		3000	1.0
C5V1	4.8	5.1	5.4	45	10	–0.5	2.2	3000	2.0
C5V6	5.2	5.6	6.0	45	7	0	2.7	2000	2.0
C6V2	5.8	6.2	6.6	35	4	0.6	3.6	2000	3.0
C6V8	6.4	6.8	7.2	35	3.5	1.3	4.3	2000	4.0
C7V5	7.0	7.5	7.9	35	3	2.5	5.5	1000	4.5
C8V2	7.7	8.2	8.7	25	5	3.1	6.1	700	5.0
C9V1	8.5	9.1	9.6	25	5	3.8	7.2	700	6.5
C10	9.4	10	10.6	25	8	4.7	8.5	200	7.0
C11	10.4	11	11.6	20	10	5.3	9.3	200	7.7
C12	11.4	12	12.7	20	10	6.3	10.8	200	8.4
C13	12.4	13	14.1	20	10	7.4	12.0	200	9.1
C15	13.8	15	15.6	15	15	8.9	13.6	50	10.5
C16	15.3	16	17.1	15	15	10.7	15.4	50	11.0
C18	16.8	18	19.1	15	20	11.8	17.1	50	12.5
C20	18.8	20	21.2	10	24	13.6	19.1	50	14.0
C22	20.8	22	23.3	10	25	16.6	22.1	50	15.5
C24	22.8	24	25.6	10	30	18.3	24.3	50	17
C27	25.1	27	28.9	8	40	20.1	27.5	50	19
C30	28	30	32	8	45	22.4	32.0	50	21
C33	31	33	35	8	45	24.8	35.0	50	23
C36	34	36	38	8	50	27.2	39.9	50	25
C39	37	39	41	6	60	29.6	43.0	50	27
C43	40	43	46	6	75	34.0	48.3	50	30
C47	44	47	50	4	100	37.4	52.5	50	33
C51	48	51	54	4	125	40.8	56.5	50	36
C56	52	56	60	4	150	46.8	63.0	50	39
C62	58	62	66	4	175	52.2	72.5	50	43
C68	64	68	72	4	200	60.5	81.0	50	48
C75	70	75	80	4	225	66.5	88.0	50	53

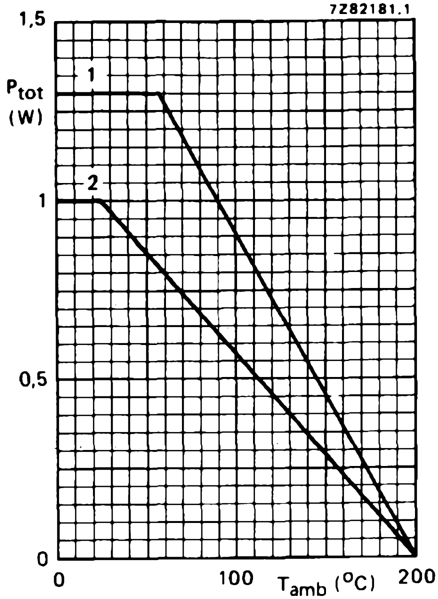


Fig. 2 Maximum permissible power dissipation versus ambient temperature.

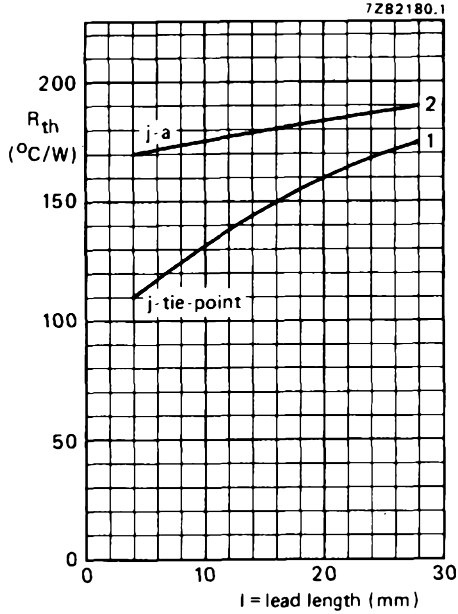


Fig. 3 Thermal resistance versus lead length.

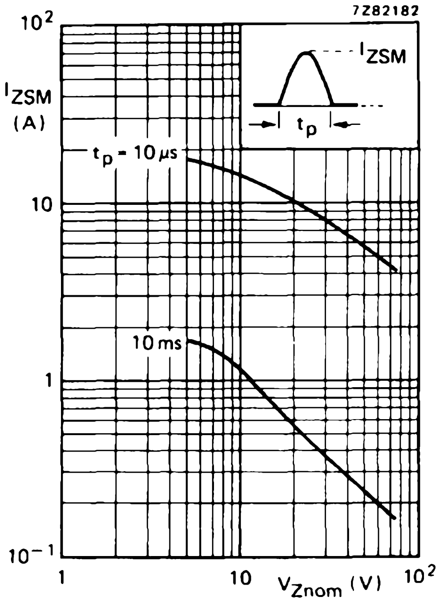


Fig. 4 Half sine-wave; T_{amb} = 25 °C.

Mounting methods (see Figs 2 and 3)

1. To tie-points (lead length = 4 mm in Fig. 2).
2. Mounted on a printed-circuit board (with lead length of 10 mm in Fig. 2) and print copper area of 1 cm² per lead.

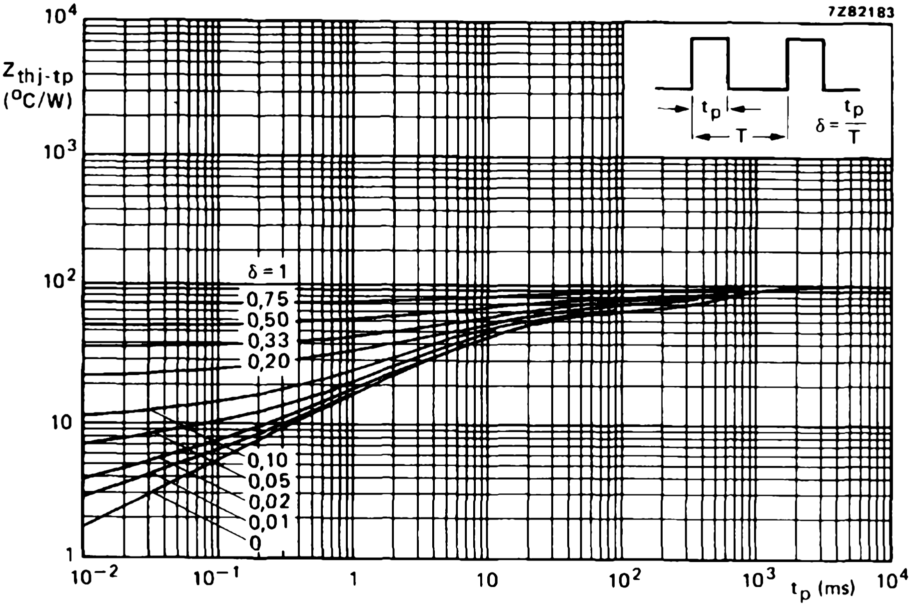


Fig. 5 Thermal impedance from junction to tie-point with a lead length of 4 mm.

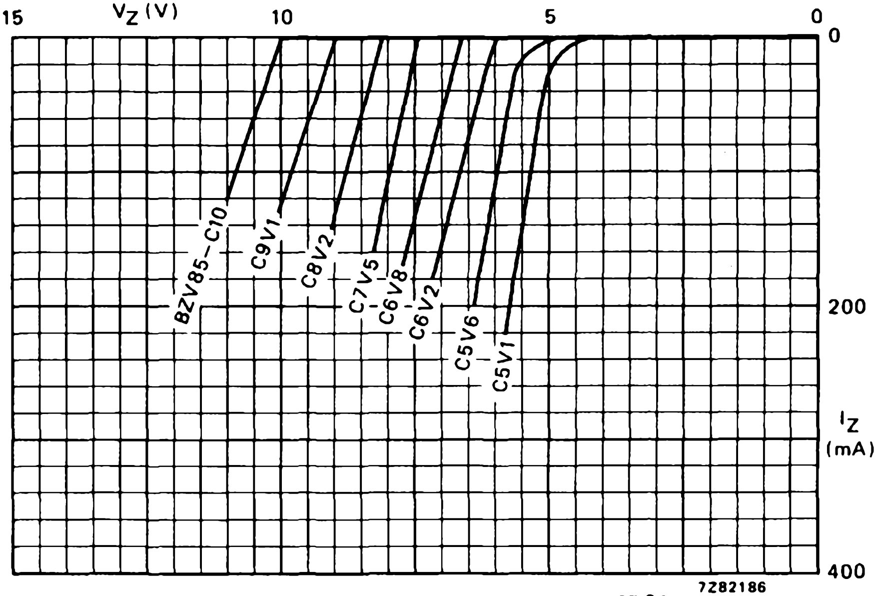


Fig. 6 Static characteristics; typical values; T_{amb} = 25 °C.

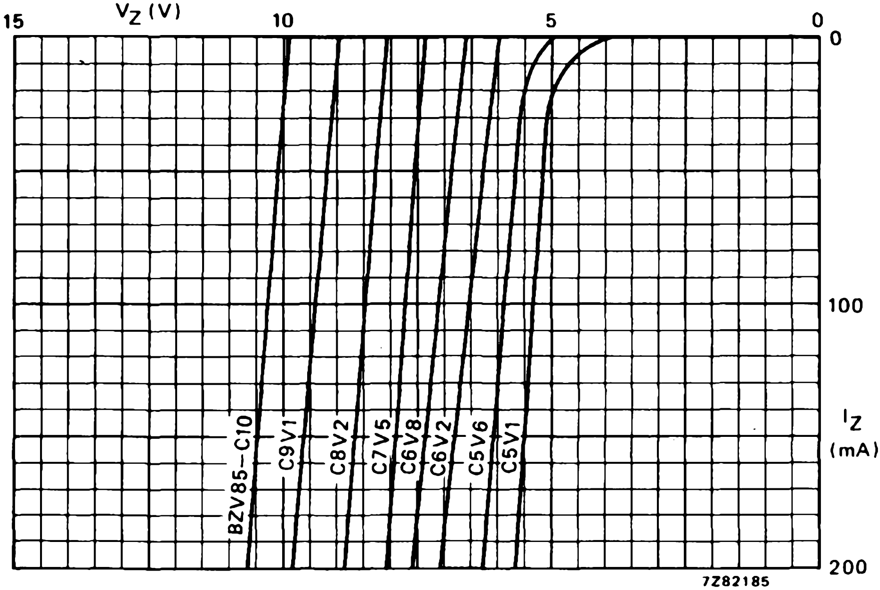


Fig. 7 Dynamic characteristics; typical values; T_j = 25 °C.

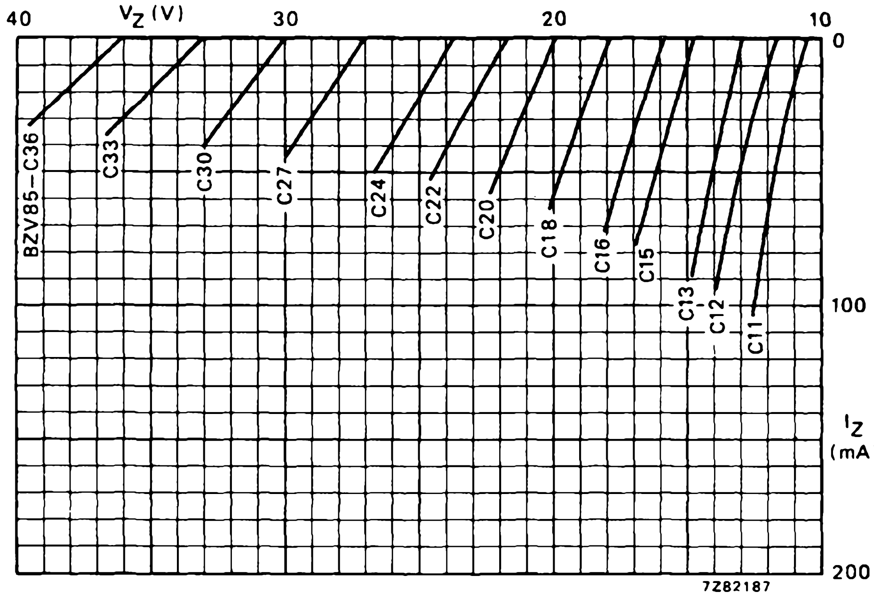


Fig. 8 Static characteristics; typical values; T_{amb} = 25 °C.

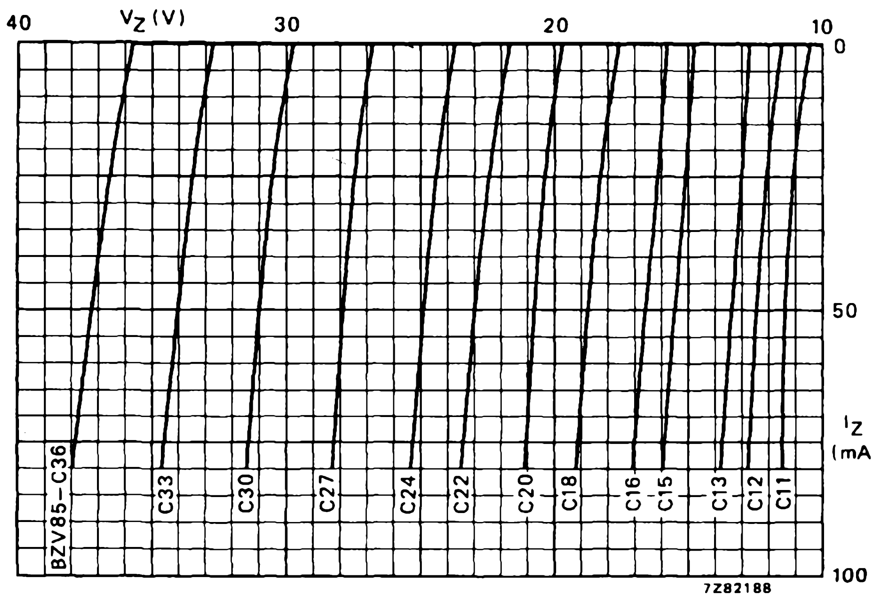


Fig. 9 Dynamic characteristics; typical values; T_j = 25 °C.

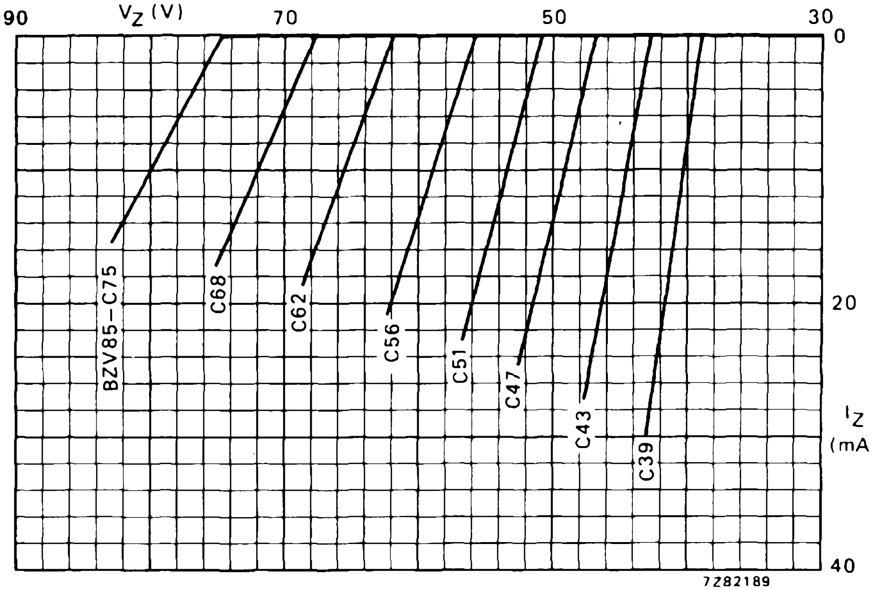


Fig. 10 Static characteristics; typical values; T_{amb} = 25 °C.

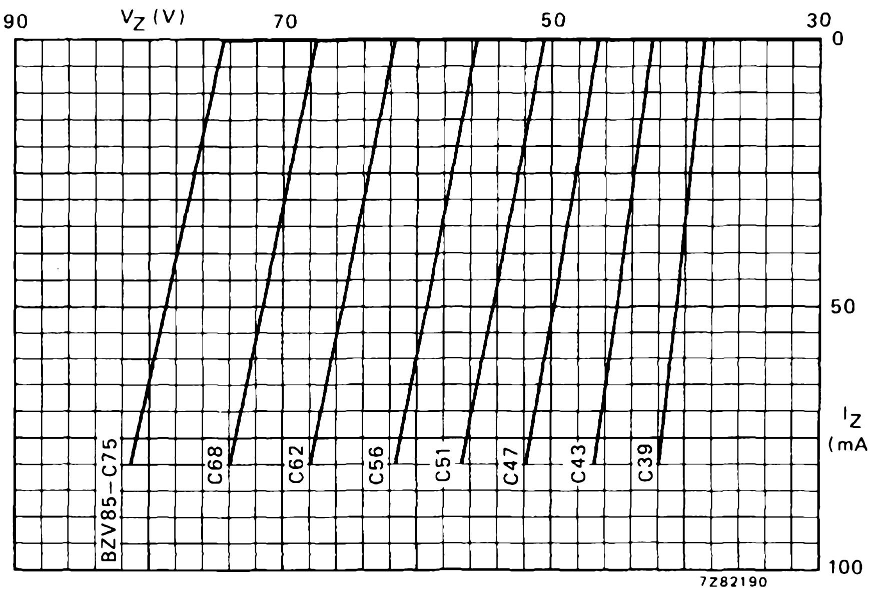


Fig. 11 Dynamic characteristics; typical values; T_j = 25 °C.

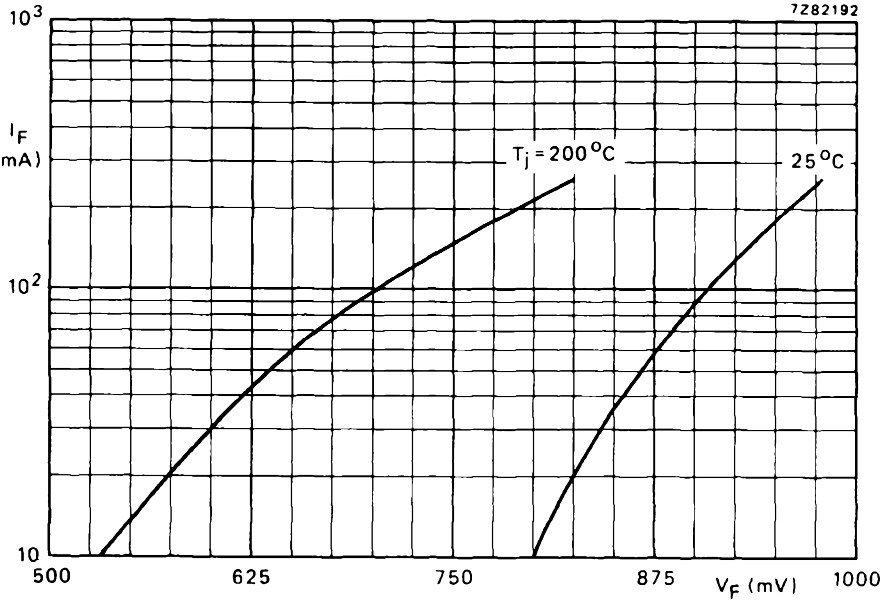


Fig. 12 Typical values.

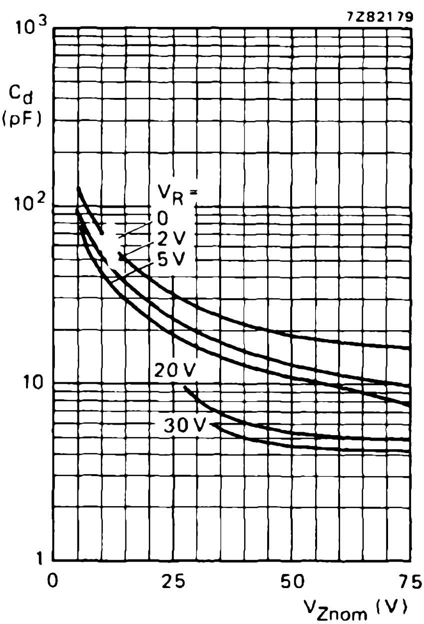


Fig. 13 f = 1 MHz; T_j = 25 ^oC; typical values.

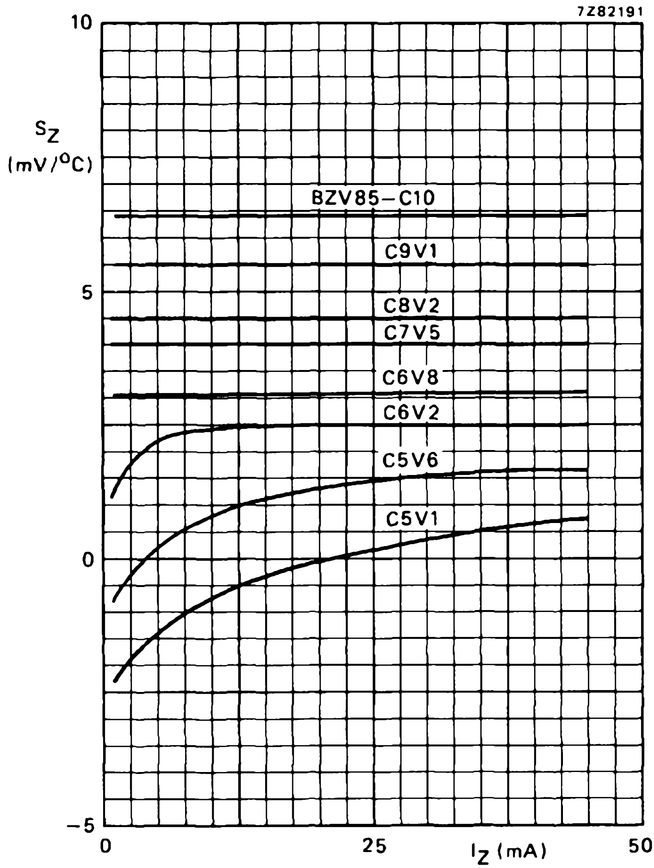


Fig. 14 T_j = 25 °C to 150 °C; typical values.

For types above 7,5 V the temperature coefficient is independent of current and can be read from the table on page 3.

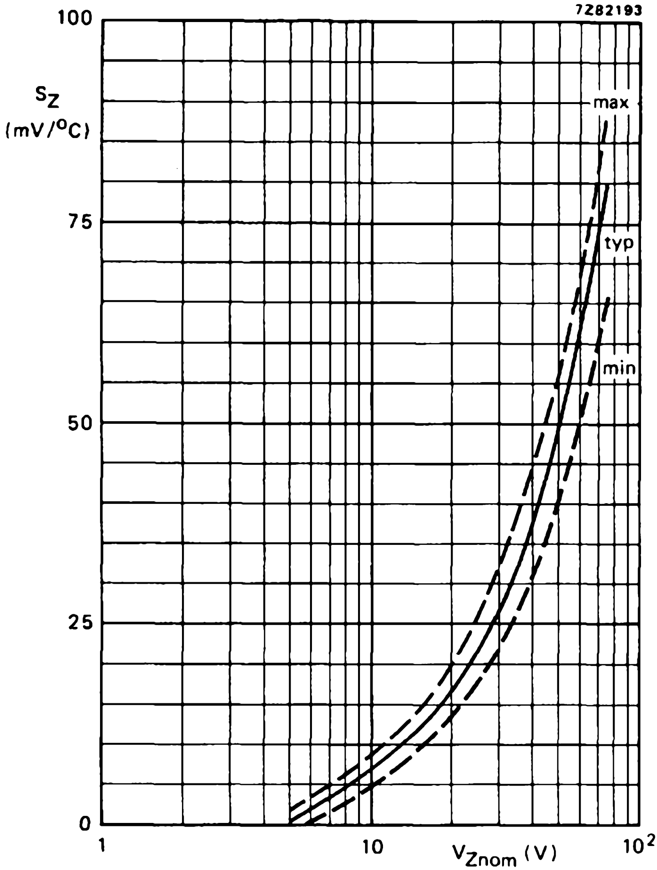


Fig. 15 $I_Z = I_{Ztest}$; T_j = 25 °C to 150 °C.

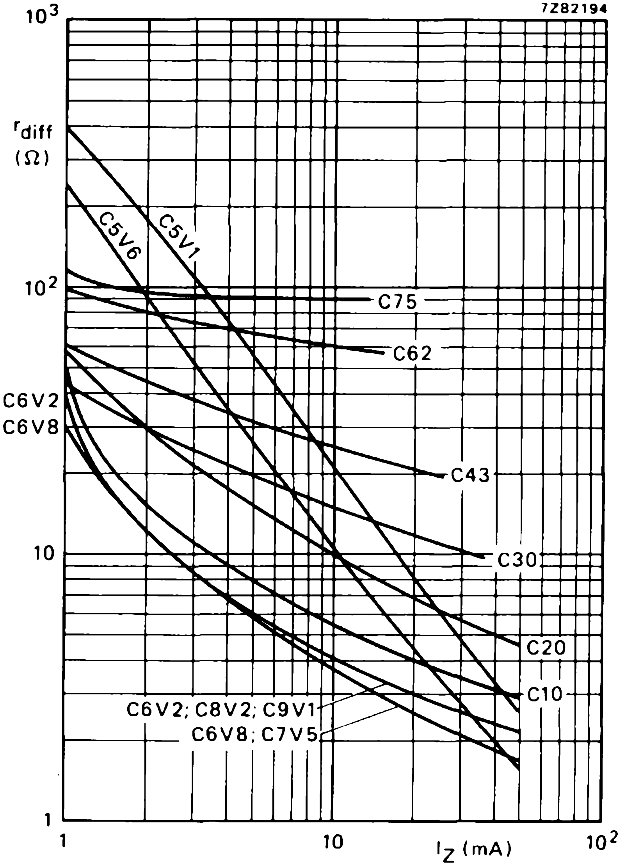


Fig. 16 f = 1 kHz; T_j = 25 °C; typical values.

REGULATOR DIODES

Glass passivated diodes in hermetically sealed axial-leaded glass envelopes. They are intended for use as voltage regulator and transient suppressor diodes in medium power regulation and transient suppression circuits.
The series consists of the following types: BZW03-C7V5 to BZW03-C270 with a tolerance of ± 5% (international standard E24).

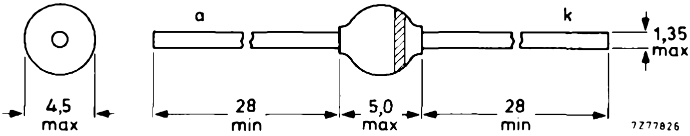
QUICK REFERENCE DATA

			voltage regulator	transient suppressor	
Working voltage range	V_Z	nom.	7.5 to 270		V
Stand-off voltage	V_R			6.2 to 220	V
Total power dissipation	P_{tot}	max.	6		W
Non-repetitive peak reverse power dissipation T_j = 25 °C; t_p = 100 μs	P_{RSM}	max.		1000	W

MECHANICAL DATA

Dimensions in mm

Fig.1 SOD-64



The marking band indicates the cathode.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Total power dissipation				
T_{tp} = 25 °C; lead length 10 mm	P_{tot}	max.	6	W
T_{amb} = 45 °C; p.c.b. mounting (Fig.2)	P_{tot}	max.	1.75	W
Repetitive peak reverse power dissipation	P_{ZRM}	max.	20	W
Non-repetitive peak reverse power dissipation				
t_p = 100 μs square pulse; T_j = 25 °C prior to surge	P_{RSM}	max.	1000	W
exponential pulse, waveform 10/1000 (Fig.3)	P_{RSM}	max.	500	W
Non-repetitive peak reverse current				
T_j = 25 °C prior to surge;				
Exponential 10/1000 pulse (Fig.3)	I_{RSM}	max.	see page 5	
Storage temperature	T_{stg}		−65 to +175	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

Influence of mounting method (see also page 6, operating notes)

1. Thermal resistance from junction to tie-point at a lead length of 10 mm	$R_{th\ j\text{-}tp}$	=	25	°C/W
2. Thermal resistance from junction to ambient when mounted on a 1.5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 μm; Fig.2	$R_{th\ j\text{-}a}$	=	75	°C/W

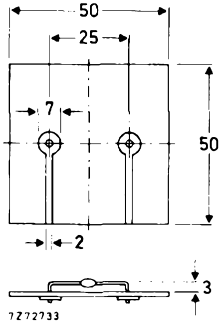


Fig.2 Mounted on a printed-circuit board.

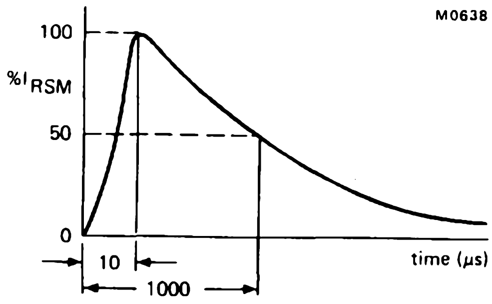


Fig.3 Pulse waveform 10/1000.

CHARACTERISTICS

Forward voltage				
I_F = 1 A; T_j = 25 °C	V_F	<	1.2	V

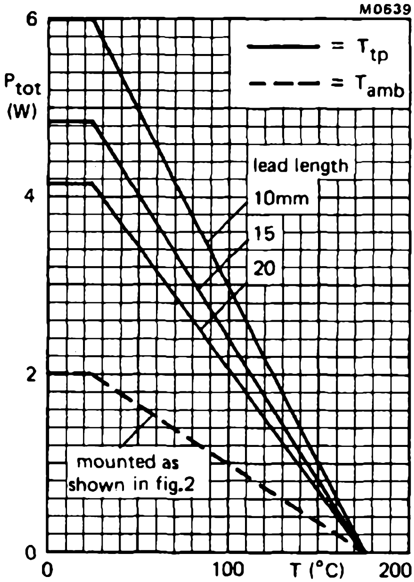


Fig.4 Maximum total power dissipation as a function of temperature.

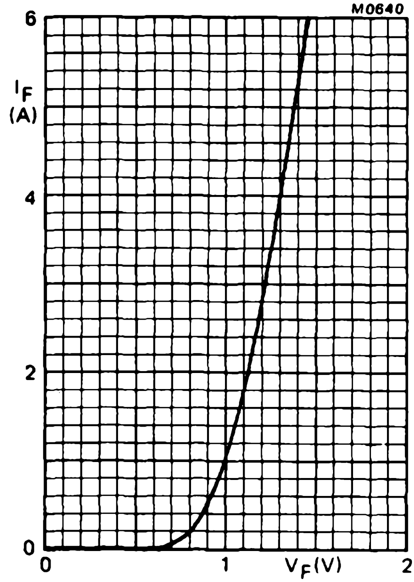


Fig.5 Typical forward voltage drop T_j = 25 °C

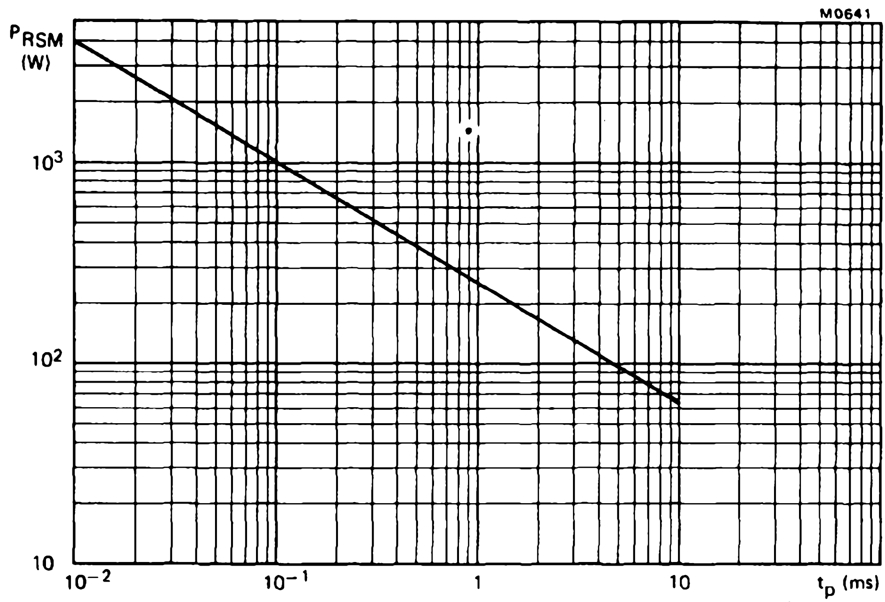


Fig.6 Maximum non-repetitive peak reverse power dissipation; square current pulse; T_j = 25 °C prior to surge.

CHARACTERISTICS when used as voltage regulator diodes; T_j = 25 °C

BZW03-	working voltage V_Z V			differential resistance r_{diff} Ω		temperature coefficient S_Z %/°C		test current I_Z mA	reverse current I_R µA	at reverse voltage V_R V
	min.	nom.	max.	typ.	max.	min.	max.		max.	
C7V5	7.0	7.5	7.9	0.7	1.5	0	0.07	175	1500	5.6
C8V2	7.7	8.2	8.7	0.8	1.5	0.03	0.08	150	1200	6.2
C9V1	8.5	9.1	9.6	0.9	2	0.03	0.08	150	40	6.8
C10	9.4	10.0	10.6	1	2	0.05	0.09	125	20	7.5
C11	10.4	11.0	11.6	1.1	2.5	0.05	0.10	125	15	8.2
C12	11.4	12.0	12.7	1.1	2.5	0.05	0.10	100	10	9.1
C13	12.4	13.0	14.1	1.2	2.5	0.05	0.10	100	4	10
C15	13.8	15.0	15.6	1.2	2.5	0.05	0.10	75	2	11
C16	15.3	16.0	17.1	1.3	2.5	0.06	0.11	75	2	12
C18	16.8	18.0	19.1	1.3	2.5	0.06	0.11	65	2	13
C20	18.8	20.0	21.2	1.5	3	0.06	0.11	65	2	15
C22	20.8	22.0	23.3	1.6	3.5	0.06	0.11	50	2	16
C24	22.8	24.0	25.6	1.8	3.5	0.06	0.11	50	2	18
C27	25.1	27.0	28.9	2.5	5	0.06	0.11	50	2	20
C30	28	30	32	4	8	0.06	0.11	40	2	22
C33	31	33	35	5	10	0.06	0.11	40	2	24
C36	34	36	38	6	11	0.06	0.11	30	2	27
C39	37	39	41	7	14	0.06	0.11	30	2	30
C43	40	43	46	10	20	0.07	0.12	30	2	33
C47	44	47	50	12	25	0.07	0.12	25	2	36
C51	48	51	54	14	27	0.07	0.12	25	2	39
C56	52	56	60	18	35	0.07	0.12	20	2	43
C62	58	62	66	20	42	0.08	0.13	20	2	47
C68	64	68	72	22	44	0.08	0.13	20	2	51
C75	70	75	79	25	45	0.08	0.13	20	2	56
C82	77	82	87	30	65	0.08	0.13	15	2	62
C91	85	91	96	40	75	0.09	0.13	15	2	68
C100	94	100	106	45	90	0.09	0.13	12	2	75
C110	104	110	116	65	125	0.09	0.13	12	2	82
C120	114	120	127	90	170	0.09	0.13	10	2	91
C130	124	130	141	100	190	0.09	0.13	10	2	100
C150	138	150	156	150	260	0.09	0.13	8	2	110
C160	153	160	171	180	350	0.09	0.13	8	2	120
C180	168	180	191	210	430	0.09	0.13	5	2	130
C200	188	200	212	250	500	0.09	0.13	5	2	150
C220	208	220	233	350	700	0.09	0.13	5	2	160
C240	228	240	256	450	900	0.09	0.13	5	2	180
C270	251	270	289	600	1200	0.09	0.13	5	2	200

CHARACTERISTICS **when used as transient suppressor diodes;** T_j = 25 °C

clamping voltage t_p = 1 ms (10/1000 pulse) $V_{(CL)R}$ V	at	non-repetitive peak reverse current I_{RSM} A	reverse current at recommended stand-off voltage I_R μA	V_R V	BZW03-
max.		max.	max.		
11.3		44.2	3000	6.2	C7V5
12.3		40.6	2400	6.8	C8V2
13.3		37.6	100	7.5	C9V1
14.8		34	40	8.2	C10
15.7		31.8	30	9.1	C11
17		29.4	20	10	C12
18.9		26.4	10	11	C13
20.9		23.9	10	12	C15
22.9		21.8	10	13	C16
25.6		19.5	10	15	C18
28.4		17.6	10	16	C20
31		16.1	10	18	C22
33.8		14.8	10	20	C24
38.1		13.1	10	22	C27
42.2		11.8	10	24	C30
46.2		10.8	10	27	C33
50.1		10.0	10	30	C36
54.1		9.2	10	33	C39
60.7		8.2	10	36	C43
65.5		7.6	10	39	C47
70.8		7.0	10	43	C51
78.6		6.3	10	47	C56
86.5		5.8	10	51	C62
94.4		5.3	10	56	C68
103.5		4.8	10	62	C75
114		4.3	10	68	C82
126		3.9	10	75	C91
139		3.6	10	82	C100
152		3.3	10	91	C110
167		3.0	10	100	C120
185		2.7	10	110	C130
204		2.4	10	120	C150
224		2.2	10	130	C160
249		2.0	10	150	C180
276		1.8	10	160	C200
305		1.6	10	180	C220
336		1.5	10	200	C240
380		1.3	10	220	C270

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

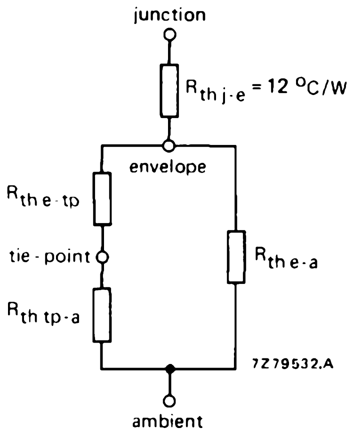


Fig. 7

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

lead length	5	10	15	20	25	mm
$R_{th\,e\text{-}tp}$	7	14	21	28	35	°C/W
$R_{th\,e\text{-}a}$	410	300	230	185	155	°C/W

The thermal resistance between tie-point and ambient depends on the mounting method; for mounting on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness ≥ 40 μm, the following values apply:

1. Mounting similar to method given in Fig. 2: $R_{th\,tp\text{-}a}$ = 70 °C/W.
2. Mounted on a printed-circuit board with a copper laminate (per lead) of:

   1 cm^2 $R_{th\,tp\text{-}a}$ = 55 °C/W
   2,25 cm^2 $R_{th\,tp\text{-}a}$ = 45 °C/W

Note
Any temperature can be calculated by using the dissipation graph (Fig. 4) and the above thermal model.

VOLTAGE REGULATOR DIODES

Plastic encapsulated silicon diodes intended for general purpose use as medium power voltage regulators. They are suitable for use as transient suppressor diodes.

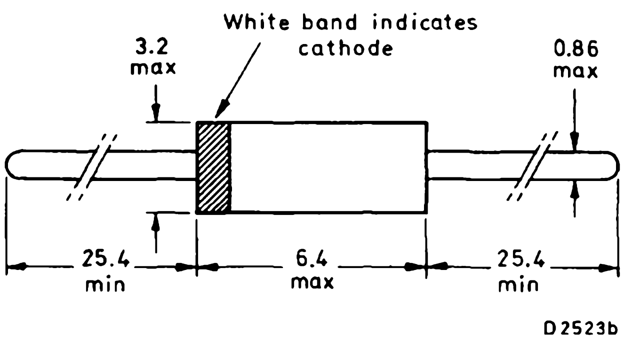
QUICK REFERENCE DATA

Working voltage range (5 PERCENT, Ref. B.S. 3494, appendix C)	V_Z	nom.	7.5 to 200	V
Total power dissipation; $T_{amb} \leq 25\ ^oC$				
BZX61–C7V5 to C130	P_{tot}	max.	1.3	W
BZX61–C150 to C200	P_{tot}	max.	1.0	W
Repetitive peak reverse power dissipation	P_{ZRM}	max.	6	W
Non-repetitive peak reverse power dissipation $t = 100\ \mu s$; $T_{amb} = 25\ ^oC$	P_{ZSM}	max.	300	W

MECHANICAL DATA

Dimensions in mm

Fig.1 DO–15; the diodes are type branded



For operation as a voltage regulator diode the positive voltage is connected to the lead adjacent to the white band.

Available for current production only; for new designs, successors BZV85 or BZT03 are recommended.

The sealing of this plastic envelope fulfils the accelerated damp heat test, according to I.E.C. recommendation 68-2 (test D, severity IV, 6 cycles).

RATINGS

Limiting values of operation in accordance with the Absolute Maximum System (IEC134)

Repetitive peak forward current	I_{FRM}	max.	1	A
Total power dissipation up to T_{amb} = 25 °C				
BZX61–C7V5 to C130	P_{tot}	max.	1.3	W
BZX61–C150 to C200	P_{tot}	max.	1.0	W
Repetitive peak reverse power dissipation	P_{ZRM}	max.	6	W
Non-repetitive peak reverse power dissipation				
t = 100 μs; T_{amb} = –55 to +25 °C	P_{ZSM}	max.	300	W
Storage temperature	T_{stg}		–65 to +175	°C
Junction temperature				
BZX61–C7V5 to C130	T_j	max.	175	°C
BZX61–C150 to C200	T_j	max.	150	°C

THERMAL RESISTANCE

see pages 6, 8

CHARACTERISTICS

T_j = 25 °C

Forward voltage

I_F = 100 mA V_F < 1.1 V

BZX61–...	working voltage V_Z (V) at I_{Ztest} = 20 mA			differential resistance r_{diff} (Ω) at I_{Ztest} = 20 mA	temperature coefficient S_Z (%/°C) at I_{Ztest} = 20 mA	reverse current I_R (μA) at V_R (V)		clamping voltage at t_p = 1 ms; 80 W $V_{CL(R)}$ (V)
	min.	nom.	max.	max.	typ.	max.		typ.
C7V5	7.0	7.5	7.9	5.0	+0.04	5	3	9.9
C8V2	7.7	8.2	8.7	7.5	+0.04	5	3	10.9
C9V1	8.5	9.1	9.6	8.0	+0.05	5	5	12.0
C10	9.4	10	10.6	8.5	+0.05	5	7	13.3
C11	10.4	11	11.6	9.0	+0.05	5	7	14.5
C12	11.4	12	12.7	9.0	+0.05	5	8	15.9
C13	12.4	13	14.1	10	+0.05	5	9	17.6
C15	13.8	15	15.6	14	+0.06	5	10	19.5

CHARACTERISTICS (continued)

$T_j = 25\ ^{o}C$

BZX61–..	working voltage V_Z (V)			differential resistance r_{diff} (Ω)	temperature coefficient S_Z (%/°C)	reverse current I_R (μA) at V_R(V)		clamping voltage at t_p = 1 ms; 80 W $V_{CL(R)}$ (V)
	at I_{Ztest} = 10 mA			at I_{Ztest} = 10 mA	at I_{Ztest} = 10 mA			
	min.	nom.	max.	max.	typ.	max.		typ.
C16	15.3	16	17.1	16	+0.06	5	11	21.4
C18	16.8	18	19.1	20	+0.06	5	13	23.9
C20	18.8	20	21.2	22	+0.06	5	14	26.5
C22	20.8	22	23.3	23	+0.06	5	15	29.1
C24	22.7	24	25.9	25	+0.06	5	17	32.4
C27	25.1	27	28.9	35	+0.06	5	19	36.1
C30	28	30	32	40	+0.07	5	21	40.0
C33	31	33	35	45	+0.07	5	23	43.8
C36	34	36	38	50	+0.07	5	25	47.5
	at I_{Ztest} = 5 mA			at I_{Ztest} = 5 mA	at I_{Ztest} = 5 mA			
C39	37	39	41	60	+0.07	5	27	51.2
C43	40	43	46	70	+0.08	5	30	57.5
C47	44	47	50	80	+0.08	5	33	62.5
C51	48	51	54	95	+0.08	5	36	67.5
C56	52	56	60	105	+0.08	5	39	75.0
C62	58	62	66	110	+0.08	5	43	82.5
C68	64	68	72	120	+0.08	5	48	90.0
C75	70	75	79	145	+0.08	5	52	98.8
C82	77	82	87	175	+0.09	5	55	108.8
C91	85	91	96	200	+0.09	5	60	120.0
C100	94	100	106	220	+0.09	5	66	132.5
C110	104	110	116	250	+0.09	5	70	145.0
C120	114	120	127	270	+0.10	5	80	158.8
C130	124	130	141	300	+0.10	5	90	176.2
	at I_{Ztest} = 2 mA			at I_{Ztest} = 2 mA	at I_{Ztest} = 2 mA			
C150	138	150	156	950	+0.11	5	100	195.0
C160	153	160	171	1000	+0.11	5	110	213.8
C180	168	180	191	1100	+0.11	5	120	238.8
C200	188	200	212	1250	+0.11	5	140	265.0

OPERATING NOTES

Dissipation and heatsink considerations

a) Steady-state conditions

The maximum allowable steady-state dissipation P_s is given by the relationship:—

$$P_{s\ max.} = \frac{T_{j\ max} - T_{amb}}{R_{th\ j\text{-}a}}$$

Where $T_{j\ max}$ is the maximum permissible operating junction temperature,

T_{amb} is the ambient temperature,

$R_{th\ j\text{-}a}$ is the total thermal resistance between junction and ambient.

b) Pulse conditions (see Fig.2)

The maximum pulse power P_m max. is given by the formula

$$P_{m\ max.} = \frac{(T_{j\ max} - T_{amb}) - (P_s \cdot R_{th\ j\text{-}a})}{Z_{th}}$$

Where P_s is the steady-state dissipation, excluding that in the pulses,

Z_{th} is the effective transient thermal resistance of the device between junction and ambient and is a function of the pulse duration t and duty cycle δ (see Fig.7).

δ is the duty cycle and is equal to the pulse duration t divided by the periodic time T.

The steady-state power P_s when biased in the zener direction at a given zener current can be found from Fig.6. With the additional pulsed power dissipation $P_{m\ max}$ calculated from the above expression, the total peak zener power dissipation P_{tot} is $P_s + P_{m\ max}$. From Fig.6 the peak zener current at P_{tot} can now be read.
For pulse durations longer than the temperature stabilisation time of the diode t_{stab}, the maximum allowable pulse power is equal to the steady-state power P_s max. The temperature stabilisation time for the BZX61 is 100s (see Fig.7).

OPERATING NOTES (contd.)

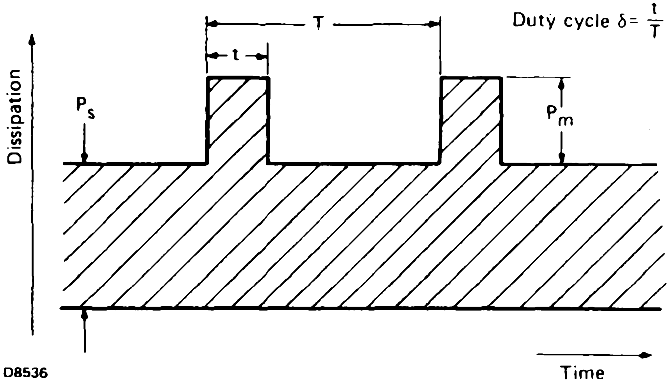


Fig.2

SOLDERING RECOMMENDATIONS

At a maximum iron temperature of 300 °C, the maximum permissible soldering time is 3 seconds, provided that the soldering spot is at least 5 mm from the seal.

DIP SOLDERING

At a maximum solder temperature of 300 °C, the maximum permissible soldering time is 3 seconds, provided that the soldering spot is at least 5 mm from the seal.

Note: If the diode is in contact with the printed board the maximum permissible temperature of the point of contact is 125 °C.

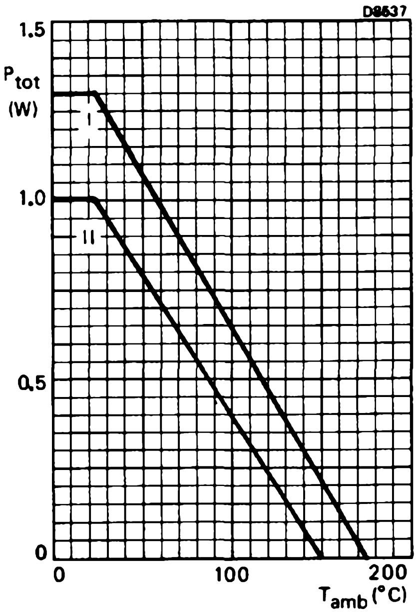


Fig.3 Continuous power rating.

For types in excess of 130 V the continuous reverse dissipation should be kept within the area II.

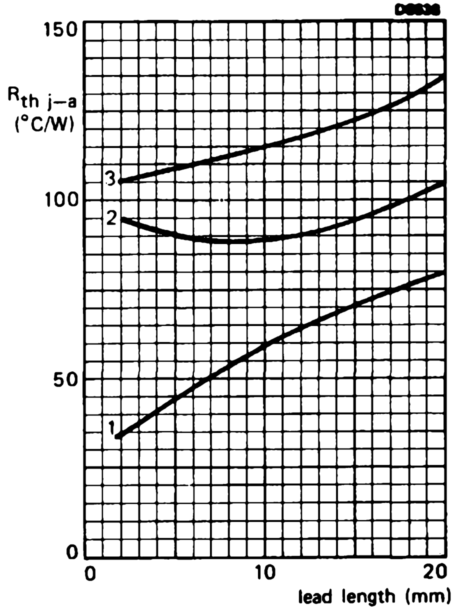


Fig.4 Mounting methods

1. Infinite heatsink at end of lead.
2. Typical printed circuit board with large area of copper (1 cm² per lead).
3. Tag mounting.

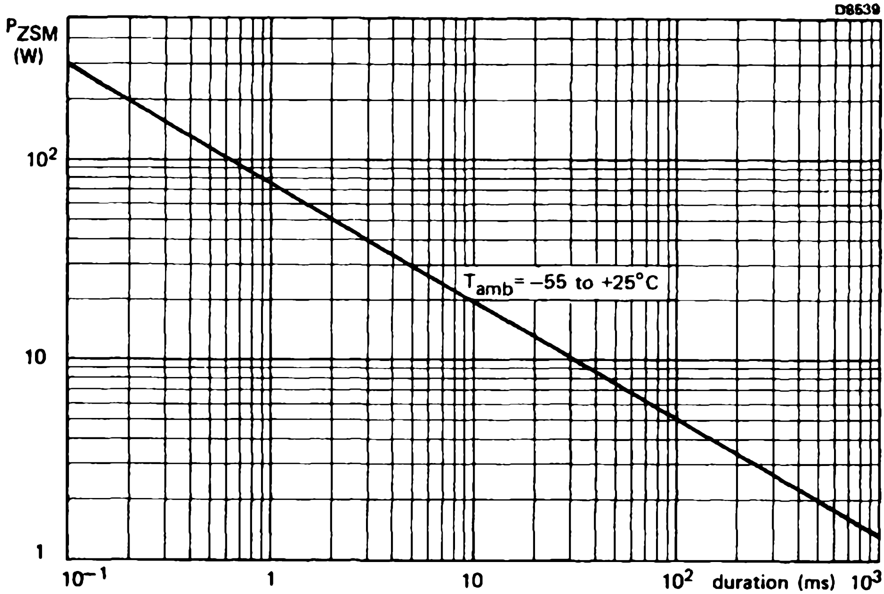

D8539
P_{ZSM} (W)
10^2
10
1
T_{amb} = −55 to +25°C
10^{-1}
1
10
10^2
duration (ms)
10^3

Fig.5

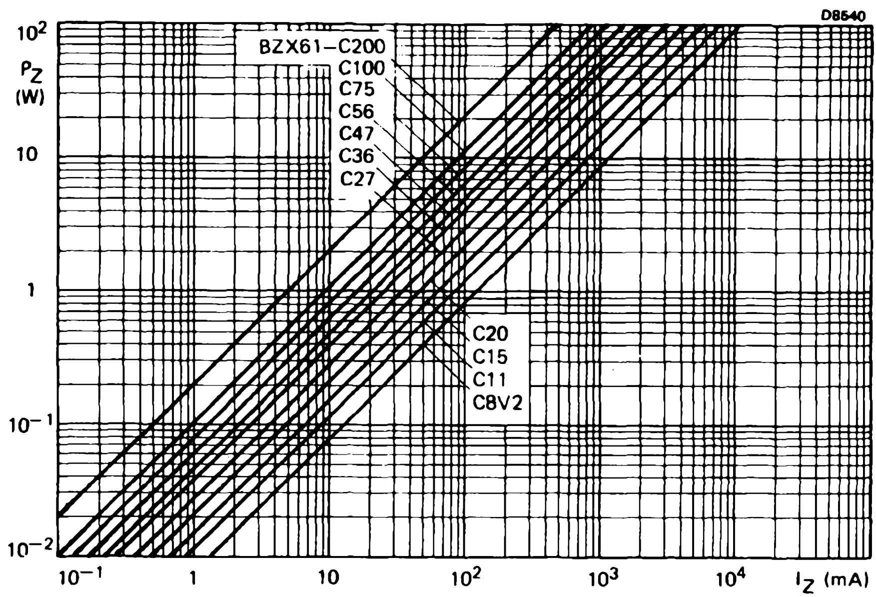

D8540
10^2
P_Z (W)
10
1
10^{-1}
10^{-2}
BZX61−C200
C100
C75
C56
C47
C36
C27
C20
C15
C11
C8V2
10^{-1}
1
10
10^2
10^3
10^4
I_Z (mA)

Fig.6

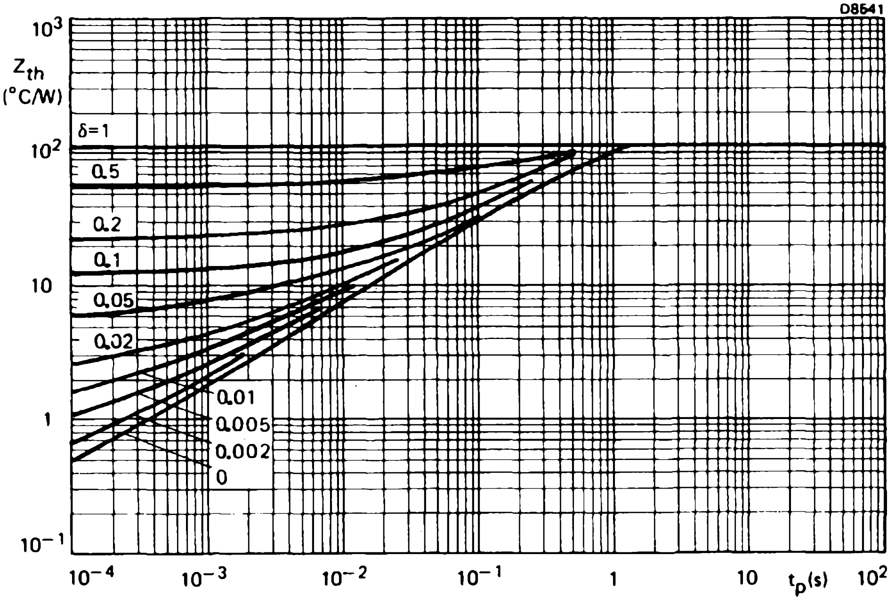
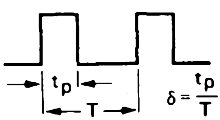

D8541
10^3
Z_{th}
(°C/W)
δ=1
10^2
0.5
0.2
0.1
10
0.05
0.02
0.01
1
0.005
0.002
0
10^{-1}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
1
10
t_p(s)
10^2

Fig.7


t_p
T
$\delta = \frac{t_p}{T}$

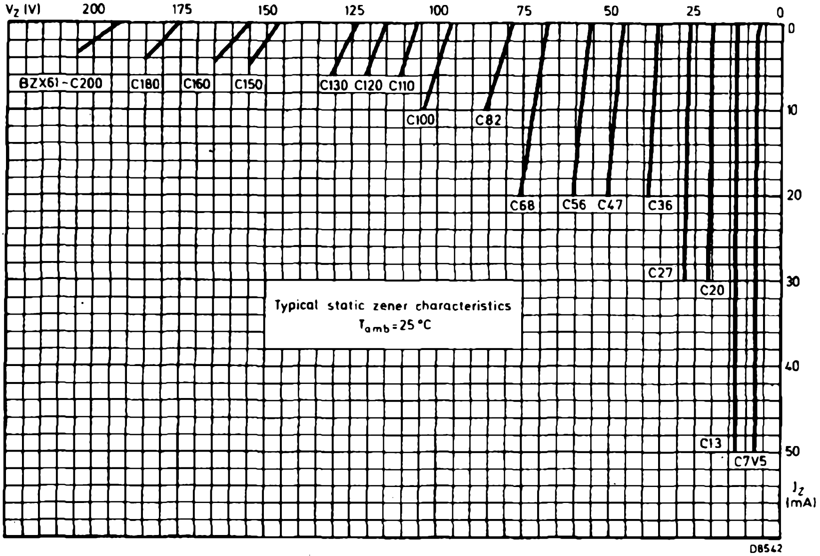

V_Z (V)
200
175
150
125
100
75
50
25
0
BZX61-C200
C180
C160
C150
C130 C120 C110
C100
C82
C68
C56 C47
C36
C27
C20
C13
C7V5
Typical static zener characteristics
T_{amb} = 25 °C
0
10
20
30
40
50
I_Z (mA)
D8542

Fig.8

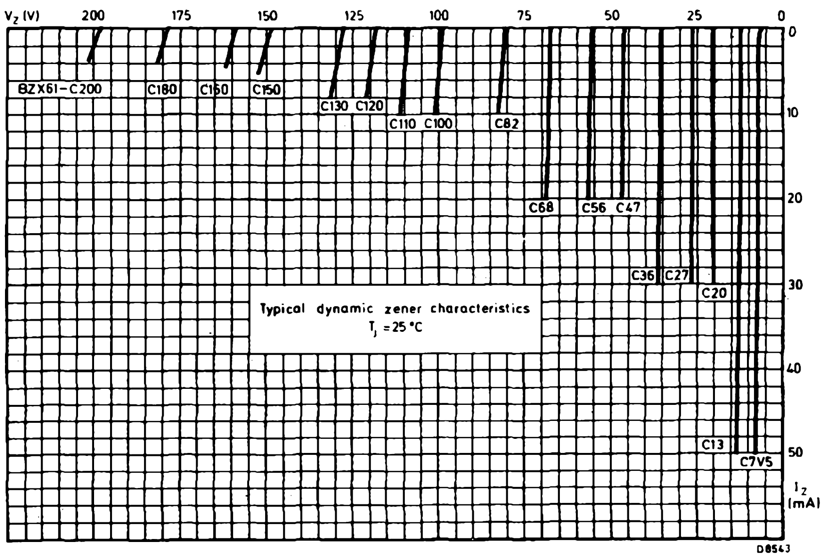

V_Z (V)
200
175
150
125
100
75
50
25
0
BZX61-C200
C180
C160
C150
C130 C120
C110 C100
C82
C68
C56 C47
C36
C27
C20
C13
C7V5
Typical dynamic zener characteristics
T_j = 25 °C
0
10
20
30
40
50
I_Z (mA)
D8543

Fig.9

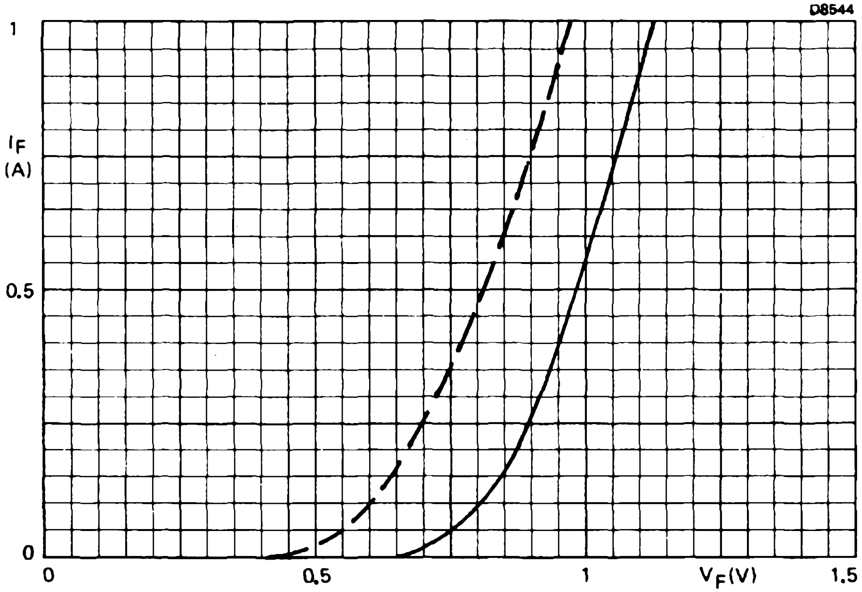


Fig.10 Typical values; —— T_j = 25 °C; – – – T_j = 150 °C

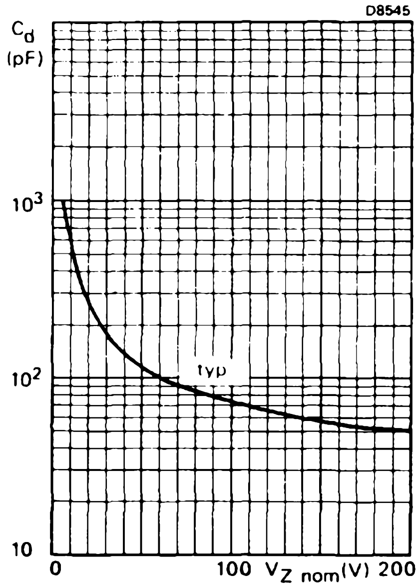


Fig.11 V_R = 2 V; f = 500 kHz; T_{amb} = 25 °C

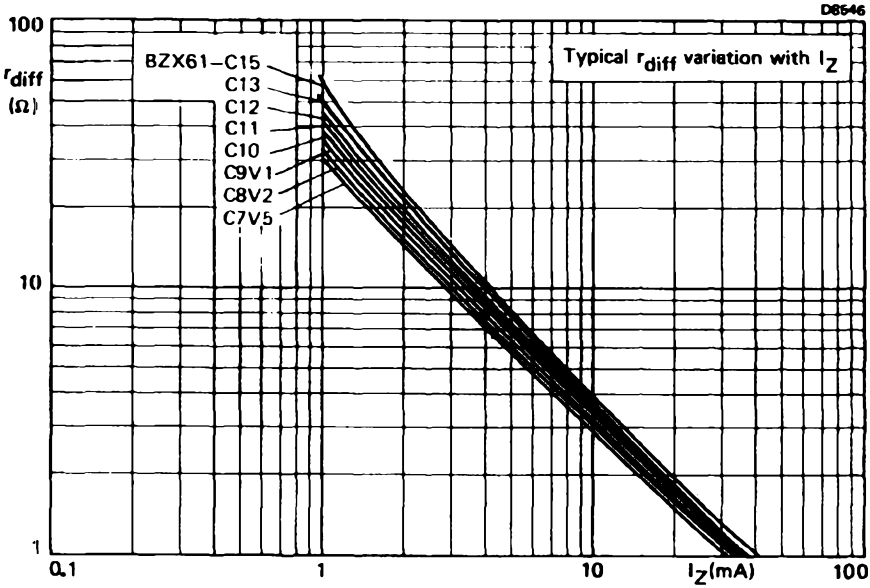


Fig.12 T_j = 25 °C; f = 1 kHz

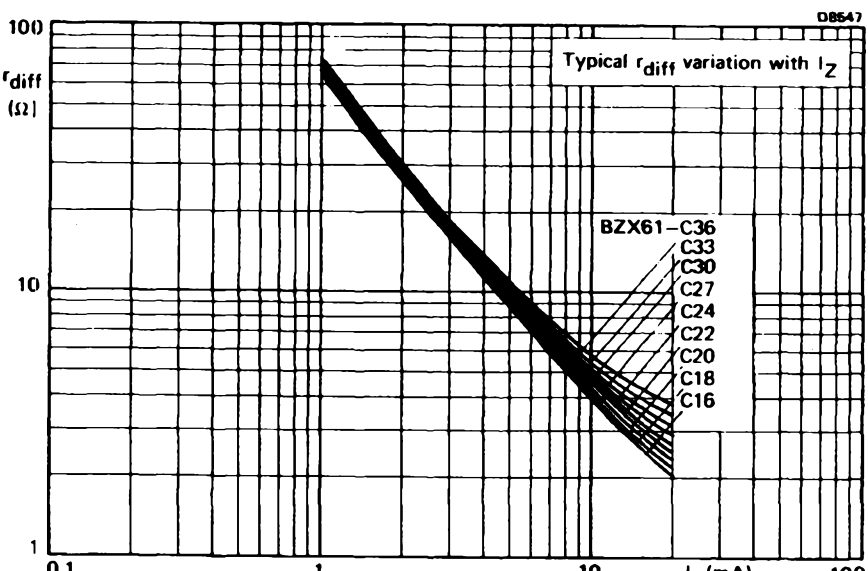


Fig.13 T_j = 25 °C; f = 1 kHz

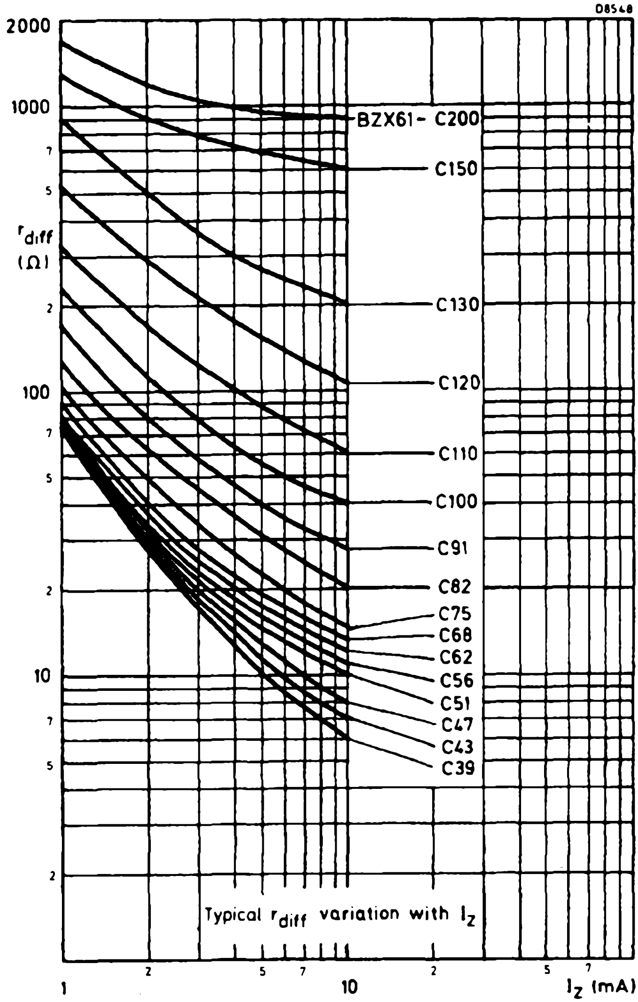


Fig.14 $T_j = 25\ ^oC$; f = 1 kHz

VOLTAGE REGULATOR DIODES

Silicon planar diodes in DO-35 envelopes intended for use as low voltage stabilizers or voltage references. They are available in two series; one to the international standardized E24 (± 5%) range and the other with ± 2% tolerance on working voltage. Each series consists of 37 types with nominal working voltages ranging from 2,4 V to 75 V.

QUICK REFERENCE DATA

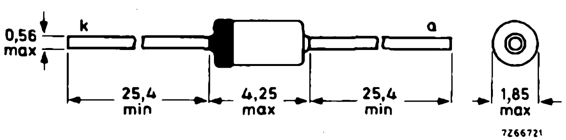
Working voltage range	V_Z	nom.	2,4 to 75	V
Total power dissipation	P_{tot}	max.	500	mW *
Non-repetitive peak reverse power dissipation	P_{ZSM}	max.	30	W
Junction temperature	T_j	max.	200	^oC
Thermal resistance from junction to tie-point	$R_{th\ j\text{-}tp}$	=	0,30	$^oC/mW$

* If leads are kept at T_{tp} = 50 ^oC at 8 mm from body.

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-35.



Cathode indicated by coloured band.

The diodes are type-branded

Products approved to CECC 50 005-005, available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	250	mA
Repetitive peak forward current	I_{FRM}	max.	250	mA
Total power dissipation	P_{tot}	max.	500	mW *
		max.	400	mW **
Non-repetitive peak reverse power dissipation $t = 100\ \mu s$; $T_j = 150\ ^{o}C$	P_{ZSM}	max.	30	W
Storage temperature	T_{stg}		−65 to + 200	^{o}C
Junction temperature	T_j	max.	200	^{o}C

THERMAL RESISTANCE

From junction to tie-point	$R_{th\ j\text{-}tp}$	=	0,30	$^{o}C/mW$ *
From junction to ambient	$R_{th\ j\text{-}a}$	=	0,38	$^{o}C/mW$ **

CHARACTERISTICS

$T_j = 25\ ^{o}C$

Forward voltage $I_F = 10$ mA		V_F	<	0,9	V
Reverse current					
BZX79-.2V4	$V_R = 1$ V	I_R	<	50	μA
.2V7	$V_R = 1$ V	I_R	<	20	μA
.3V0	$V_R = 1$ V	I_R	<	10	μA
.3V3	$V_R = 1$ V	I_R	<	5	μA
.3V6	$V_R = 1$ V	I_R	<	5	μA
.3V9	$V_R = 1$ V	I_R	<	3	μA
.4V3	$V_R = 1$ V	I_R	<	3	μA
.4V7	$V_R = 2$ V	I_R	<	3	μA
.5V1	$V_R = 2$ V	I_R	<	2	μA
.5V6	$V_R = 2$ V	I_R	<	1	μA
.6V2	$V_R = 4$ V	I_R	<	3	μA
.6V8	$V_R = 4$ V	I_R	<	2	μA
.7V5	$V_R = 5$ V	I_R	<	1	μA
.8V2	$V_R = 5$ V	I_R	<	700	nA
.9V1	$V_R = 6$ V	I_R	<	500	nA
.10	$V_R = 7$ V	I_R	<	200	nA
.11 to .13	$V_R = 8$ V	I_R	<	100	nA
.15 to .75	$V_R = 0{,}7\ V_{Znom}$	I_R	<	50	nA

. = B for 2% tolerance

. = C for E24 (± 5%) tolerance

* If leads are kept at $T_{tp} = 50\ ^{o}C$ at 8 mm from body. For the types 2V4 and 2V7 the power
* dissipation is limited by $T_{j\ max} = 150\ ^{o}C$.

** In still air at maximum lead length up to $T_{amb} = 50\ ^{o}C$.

T_j = 25 °C

E24 (± 5%) logarithmic range (for ± 2% tolerance range see page 5).

BZX79-...	working voltage V_Z (V) at I_{Ztest} = 5 mA		differential resistance r_{diff} (Ω) at I_{Ztest} = 5 mA		temperature coefficient S_Z (mV/°C) at I_{Ztest} = 5 mA			diode capacitance C_d(pF); f = 1 MHz V_R = 0	
	min.	max.	typ.	max.	min.	typ.	max.	typ.	max.
C2V4	2,2	2,6	70	100	−3,5	−1,6	0	375	450
C2V7	2,5	2,9	75	100	−3,5	−2,0	0	350	450
C3V0	2,8	3,2	80	95	−3,5	−2,1	0	350	450
C3V3	3,1	3,5	85	95	−3,5	−2,4	0	325	450
C3V6	3,4	3,8	85	90	−3,5	−2,4	0	300	450
C3V9	3,7	4,1	85	90	−3,5	−2,5	0	300	450
C4V3	4,0	4,6	80	90	−3,5	−2,5	0	275	450
C4V7	4,4	5,0	50	80	−3,5	−1,4	0,2	125	180
C5V1	4,8	5,4	40	60	−2,7	−0,8	1,2	125	180
C5V6	5,2	6,0	15	40	−2,0	1,2	2,5	125	180
C6V2	5,8	6,6	6	10	0,4	2,3	3,7	90	130
C6V8	6,4	7,2	6	15	1,2	3,0	4,5	85	110
C7V5	7,0	7,9	6	15	2,5	4,0	5,3	80	100
C8V2	7,7	8,7	6	15	3,2	4,6	6,2	75	95
C9V1	8,5	9,6	6	15	3,8	5,5	7,0	70	90
C10	9,4	10,6	8	20	4,5	6,4	8,0	70	90
C11	10,4	11,6	10	20	5,4	7,4	9,0	65	85
C12	11,4	12,7	10	25	6,0	8,4	10,0	65	85
C13	12,4	14,1	10	30	7,0	9,4	11,0	60	80
C15	13,8	15,6	10	30	9,2	11,4	13,0	55	75
C16	15,3	17,1	10	40	10,4	12,4	14,0	52	75
C18	16,8	19,1	10	45	12,4	14,4	16,0	47	70
C20	18,8	21,2	15	55	14,4	16,4	18,0	36	60
C22	20,8	23,3	20	55	16,4	18,4	20,0	34	60
C24	22,8	25,6	25	70	18,4	20,4	22,0	33	55
	at I_{Ztest} = 2 mA		at I_{Ztest} = 2 mA		at I_{Ztest} = 2 mA				
C27	25,1	28,9	25	80	21,4	23,4	25,3	30	50
C30	28,0	32,0	30	80	24,4	26,6	29,4	27	50
C33	31,0	35,0	35	80	27,4	29,7	33,4	25	45
C36	34,0	38,0	35	90	30,4	33,0	37,4	23	45
C39	37,0	41,0	40	130	33,4	36,4	41,2	21	45
C43	40,0	46,0	45	150	37,6	41,2	46,6	21	40
C47	44,0	50,0	50	170	42,0	46,1	51,8	19	40
C51	48,0	54,0	60	180	46,6	51,0	57,2	19	40
C56	52,0	60,0	70	200	52,2	57,0	63,8	18	40
C62	58,0	66,0	80	215	58,8	64,4	71,6	17	35
C68	64,0	72,0	90	240	65,6	71,7	79,8	17	35
C75	70,0	79,0	95	255	73,4	80,2	88,6	16,5	35

$T_j = 25\ ^oC$

E24 (± 5%) logarithmic range (for ± 2% tolerance range see page 6).

BZX79-...	working voltage V_Z (V) at I_Z = 1 mA			differential resistance r_{diff} (Ω) at I_Z = 1 mA		working voltage V_Z (V) at I_Z = 20 mA			differential resistance r_{diff} (Ω) at I_Z = 20 mA	
	min.	nom.	max.	typ.	max.	min.	nom.	max.	typ.	max.
C2V4	1,7	1,9	2,1	275	600	2,6	2,9	3,2	25	50
C2V7	1,9	2,2	2,4	300	600	3,0	3,3	3,6	25	50
C3V0	2,1	2,4	2,7	325	600	3,3	3,6	3,9	25	50
C3V3	2,3	2,6	2,9	350	600	3,6	3,9	4,2	20	40
C3V6	2,7	3,0	3,3	375	600	3,9	4,2	4,5	20	40
C3V9	2,9	3,2	3,5	400	600	4,1	4,4	4,7	15	30
C4V3	3,3	3,6	4,0	410	600	4,4	4,7	5,1	15	30
C4V7	3,7	4,2	4,7	425	500	4,5	5,0	5,4	8	15
C5V1	4,2	4,7	5,3	400	480	5,0	5,4	5,9	6	15
C5V6	4,8	5,4	6,0	80	400	5,2	5,7	6,3	4	10
C6V2	5,6	6,1	6,6	40	150	5,8	6,3	6,8	3	6
C6V8	6,3	6,7	7,2	30	80	6,4	6,9	7,4	2,5	6
C7V5	6,9	7,4	7,9	30	80	7,0	7,6	8,0	2,5	6
C8V2	7,6	8,1	8,7	40	80	7,7	8,3	8,8	3	6
C9V1	8,4	9,0	9,6	40	100	8,5	9,2	9,7	4	8
C10	9,3	9,9	10,6	50	150	9,4	10,1	10,7	4	10
C11	10,2	10,9	11,6	50	150	10,4	11,1	11,8	5	10
C12	11,2	11,9	12,7	50	150	11,4	12,1	12,9	5	10
C13	12,3	12,9	14,0	50	170	12,5	13,1	14,2	5	15
C15	13,7	14,9	15,5	50	200	13,9	15,1	15,7	6	20
C16	15,2	15,9	17,0	50	200	15,4	16,1	17,2	6	20
C18	16,7	17,9	19,0	50	225	16,9	18,1	19,2	6	20
C20	18,7	19,9	21,1	60	225	18,9	20,1	21,4	7	20
C22	20,7	21,9	23,2	60	250	20,9	22,1	23,4	7	25
C24	22,7	23,9	25,5	60	250	22,9	24,1	25,7	7	25
	at I_Z = 0,1 mA			at I_Z = 0,5 mA		at I_Z = 10 mA			at I_Z = 10 mA	
C27	25,0	26,9	28,9	65	300	25,2	27,1	29,3	10	45
C30	27,8	29,9	32,0	70	300	28,1	30,1	32,4	15	50
C33	30,8	32,9	35,0	75	325	31,1	33,1	35,4	20	55
C36	33,8	35,9	38,0	80	350	34,1	36,1	38,4	25	60
C39	36,7	38,9	41,0	80	350	37,1	39,1	41,5	25	70
C43	39,7	42,9	46,0	85	375	40,1	43,1	46,5	25	80
C47	43,7	46,8	50,0	85	375	44,1	47,1	50,5	30	90
C51	47,6	50,8	54,0	90	400	48,1	51,1	54,6	35	100
C56	51,5	55,7	60,0	100	425	52,1	56,1	60,8	45	110
C62	57,4	61,7	66,0	120	450	58,2	62,1	67,0	60	120
C68	63,4	67,7	72,0	150	475	64,2	68,2	73,2	75	130
C75	69,4	74,7	79,0	170	500	70,3	75,3	80,2	90	140

T_j = 25 °C
± 2% tolerance range.

BZX79-...	working voltage V_Z (V) at I_{Ztest} = 5 mA		differential resistance r_{diff} (Ω) at I_{Ztest} = 5 mA		temperature coefficient S_Z (mV/°C) at I_{Ztest} = 5 mA			diode capacitance C_d(pF); f = 1 MHz V_R = 0	
	min.	max.	typ.	max.	min.	typ.	max.	typ.	max.
B2V4	2,35	2,45	70	100	−2,6	−1,6	−0,6	375	450
B2V7	2,65	2,75	75	100	−3,0	−2,0	−1,0	350	450
B3V0	2,94	3,06	80	95	−3,0	−2,1	−1,2	350	450
B3V3	3,23	3,37	85	95	−3,2	−2,4	−1,5	325	450
B3V6	3,53	3,67	85	90	−3,2	−2,4	−1,5	300	450
B3V9	3,82	3,98	85	90	−3,2	−2,5	−1,5	300	450
B4V3	4,21	4,39	80	90	−3,2	−2,5	−1,2	275	450
B4V7	4,61	4,79	50	80	−2,0	−1,4	−0,8	125	180
B5V1	5,00	5,20	40	60	−1,6	−0,8	0,5	125	180
B5V6	5,49	5,71	15	40	−0,7	1,2	2,2	125	180
B6V2	6,08	6,32	6	10	1,0	2,3	3,2	90	130
B6V8	6,66	6,94	6	15	2,0	3,0	4,0	85	110
B7V5	7,35	7,65	6	15	3,0	4,0	4,8	80	100
B8V2	8,04	8,36	6	15	3,6	4,6	5,5	75	95
B9V1	8,92	9,28	6	15	4,3	5,5	6,5	70	90
B10	9,80	10,20	8	20	5,2	6,4	7,4	70	90
B11	10,80	11,20	10	20	6,2	7,4	8,5	65	85
B12	11,80	12,20	10	25	7,0	8,4	9,5	65	85
B13	12,70	13,30	10	30	7,8	9,4	10,5	60	80
B15	14,70	15,30	10	30	10,0	11,4	12,4	55	75
B16	15,70	16,30	10	40	10,9	12,4	13,5	52	75
B18	17,60	18,40	10	45	12,8	14,4	15,6	47	70
B20	19,60	20,40	15	55	14,8	16,4	17,6	36	60
B22	21,60	22,40	20	55	16,8	18,4	19,6	34	60
B24	23,50	24,50	25	70	18,7	20,4	21,6	33	55
	at I_{Ztest} = 2 mA		at I_{Ztest} = 2 mA		at I_{Ztest} = 2 mA				
B27	26,50	27,50	25	80	21,4	23,4	25,3	30	50
B30	29,40	30,60	30	80	24,4	26,6	29,0	27	50
B33	32,30	33,70	35	80	27,4	29,7	32,5	25	45
B36	35,30	36,70	35	90	30,4	33,0	36,0	23	45
B39	38,20	39,80	40	130	33,4	36,4	40,0	21	45
B43	42,10	43,90	45	150	38,0	41,2	45,0	21	40
B47	46,10	47,90	50	170	42,5	46,1	50,0	19	40
B51	50,00	52,00	60	180	47,0	51,0	55,0	19	40
B56	54,90	57,10	70	200	52,5	57,0	62,0	18	40
B62	60,80	63,20	80	215	59,0	64,4	69,0	17	35
B68	66,60	69,40	90	240	66,0	71,7	77,0	17	35
B75	73,50	76,50	95	255	74,0	80,2	86,0	16,5	35

T_j = 25 °C

± 2% tolerance range.

BZX79-...	working voltage V_Z (V) at I_Z = 1 mA nom.	differential resistance r_{diff} (Ω) at I_Z = 1 mA typ.	max.	working voltage V_Z (V) at I_Z = 20 mA nom.	differential resistance r_{diff} (Ω) at I_Z = 20 mA typ.	max.
B2V4	1,9	275	600	2,9	25	50
B2V7	2,2	300	600	3,3	25	50
B3V0	2,4	325	600	3,6	25	50
B3V3	2,6	350	600	3,9	20	40
B3V6	3,0	375	600	4,2	20	40
B3V9	3,2	400	600	4,4	15	30
B4V3	3,6	410	600	4,7	15	30
B4V7	4,2	425	500	5,0	8	15
B5V1	4,7	400	480	5,4	6	15
B5V6	5,4	80	400	5,7	4	10
B6V2	6,1	40	150	6,3	3	6
B6V8	6,7	30	80	6,9	2,5	6
B7V5	7,4	30	80	7,6	2,5	6
B8V2	8,1	40	80	8,3	3	6
B9V1	9,0	40	100	9,2	4	8
B10	9,9	50	150	10,1	4	10
B11	10,9	50	150	11,1	5	10
B12	11,9	50	150	12,1	5	10
B13	12,9	50	170	13,1	5	15
B15	14,9	50	200	15,1	6	20
B16	15,9	50	200	16,1	6	20
B18	17,9	50	225	18,1	6	20
B20	19,9	60	225	20,1	7	20
B22	21,9	60	250	22,1	7	25
B24	23,9	60	250	24,1	7	25
	at I_Z = 0,1 mA	at I_Z = 0,5 mA		at I_Z = 10 mA	at I_Z = 10 mA	
B27	26,9	65	300	27,1	10	45
B30	29,9	70	300	30,1	15	50
B33	32,9	75	325	33,1	20	55
B36	35,9	80	350	36,1	25	60
B39	38,9	80	350	39,1	25	70
B43	42,9	85	375	43,1	25	80
B47	46,8	85	375	47,1	30	90
B51	50,8	90	400	51,1	35	100
B56	55,7	100	425	56,1	45	110
B62	61,7	120	450	62,1	60	120
B68	67,7	150	475	68,2	75	130
B75	74,7	170	500	75,3	90	140

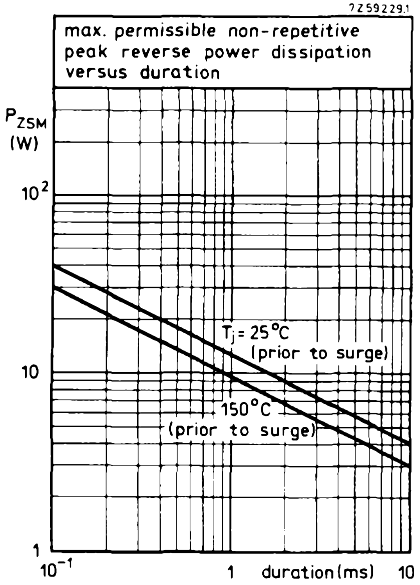

7Z59229.1
max. permissible non-repetitive peak reverse power dissipation versus duration
P_{ZSM} (W)
10^2
10
1
T_j = 25 °C (prior to surge)
150 °C (prior to surge)
10^{-1}
1
duration (ms)
10

Fig. 2.

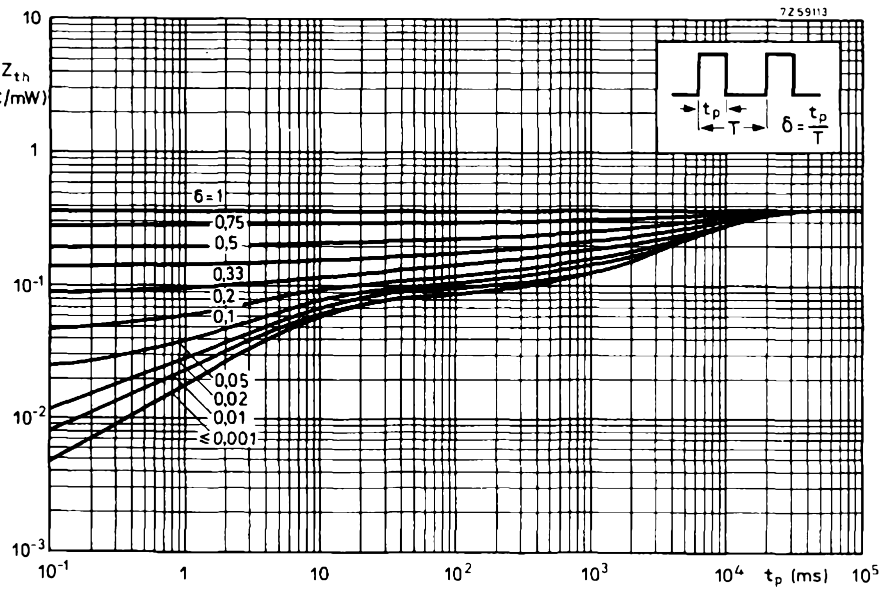

7Z59113
Z_{th} (°C/mW)
10
1
10^{-1}
10^{-2}
10^{-3}
δ = 1
0,75
0,5
0,33
0,2
0,1
0,05
0,02
0,01
≤ 0,001
t_p
T
$\delta = \frac{t_p}{T}$
10^{-1}
1
10
10^2
10^3
10^4
t_p (ms)
10^5

Fig. 3.

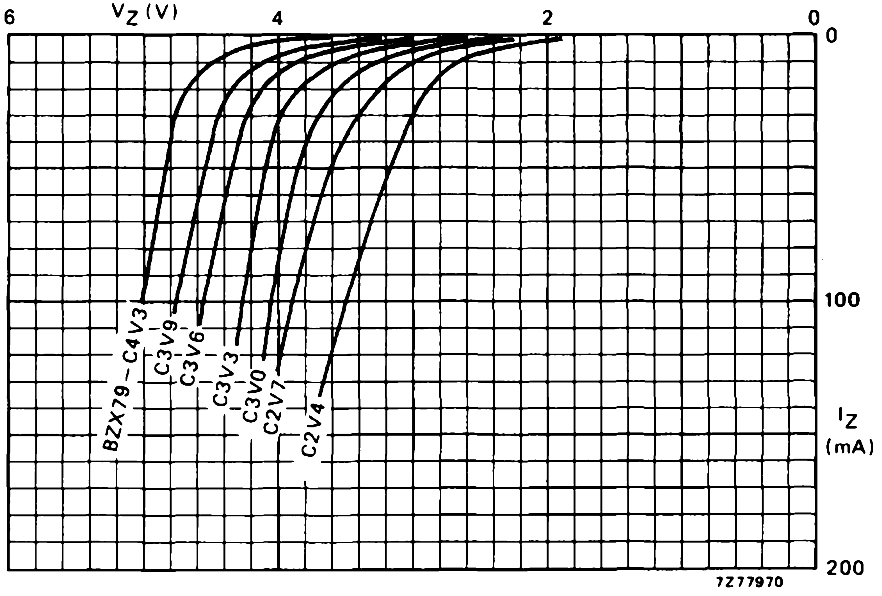


Fig. 4 Static characteristics; typical values; T_{amb} = 25 ^{o}C.

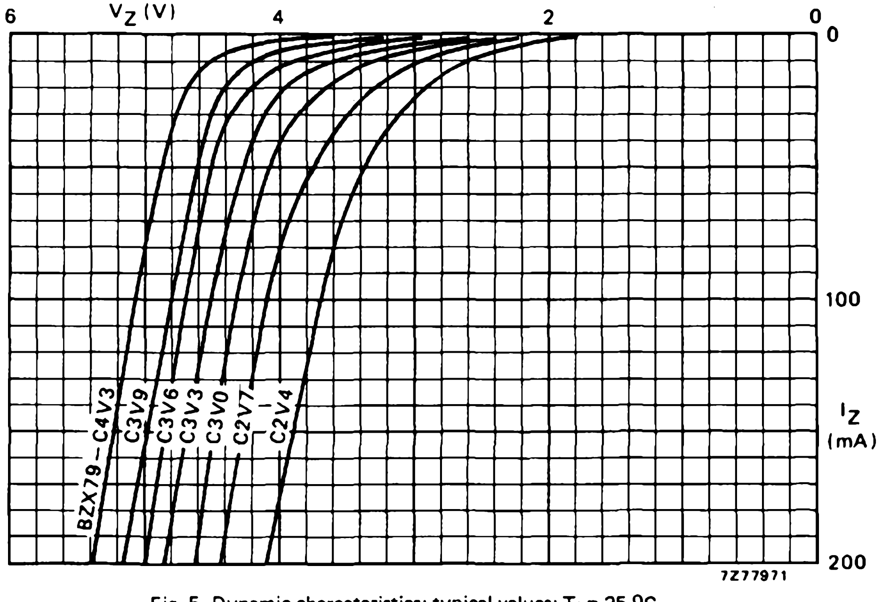


Fig. 5 Dynamic characteristics; typical values; T_j = 25 ^{o}C.

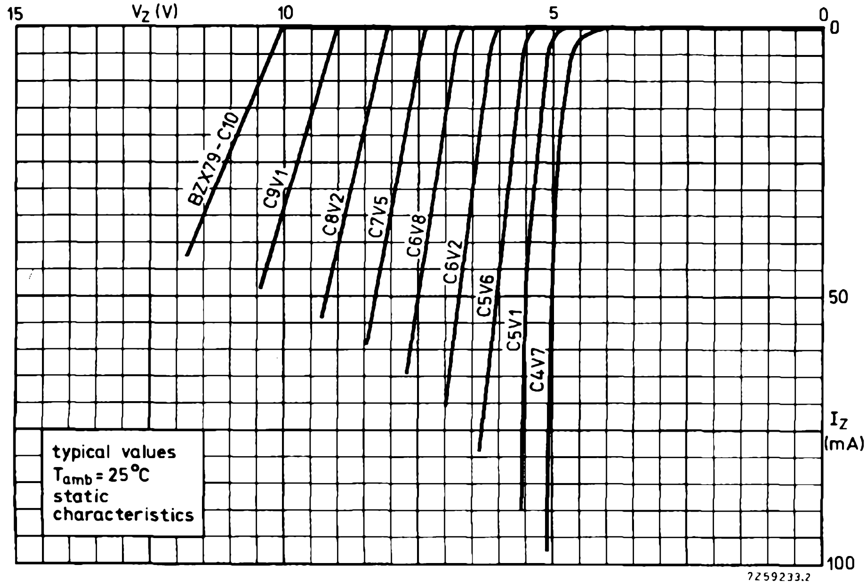

15
V_Z (V)
10
5
0
0
50
100
I_Z (mA)
BZX79-C10
C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
typical values
T_{amb} = 25 °C
static
characteristics
7Z59233.2

Fig. 6.

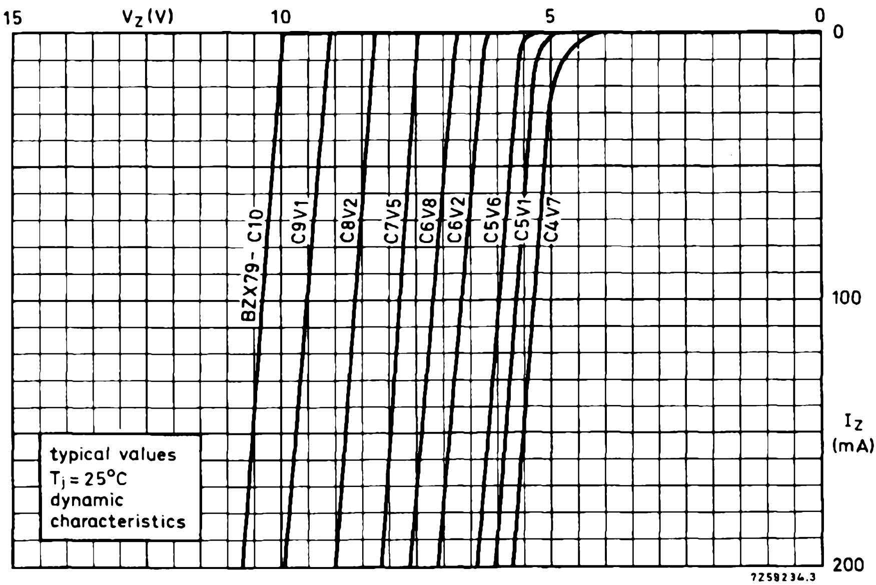

15
V_Z (V)
10
5
0
0
100
200
I_Z (mA)
BZX79- C10
C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
typical values
T_j = 25 °C
dynamic
characteristics
7Z59234.3

Fig. 7.

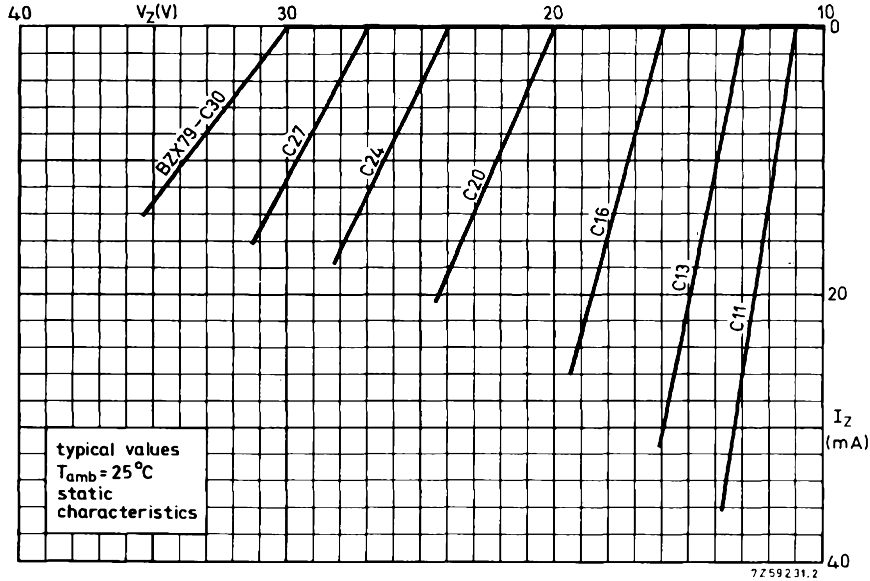

40
V_Z(V)
30
20
10
0
20
40
I_Z (mA)
BZX79-C30
C27
C24
C20
C16
C13
C11
typical values
T_{amb} = 25 °C
static
characteristics
7Z59231.2

Fig. 8.

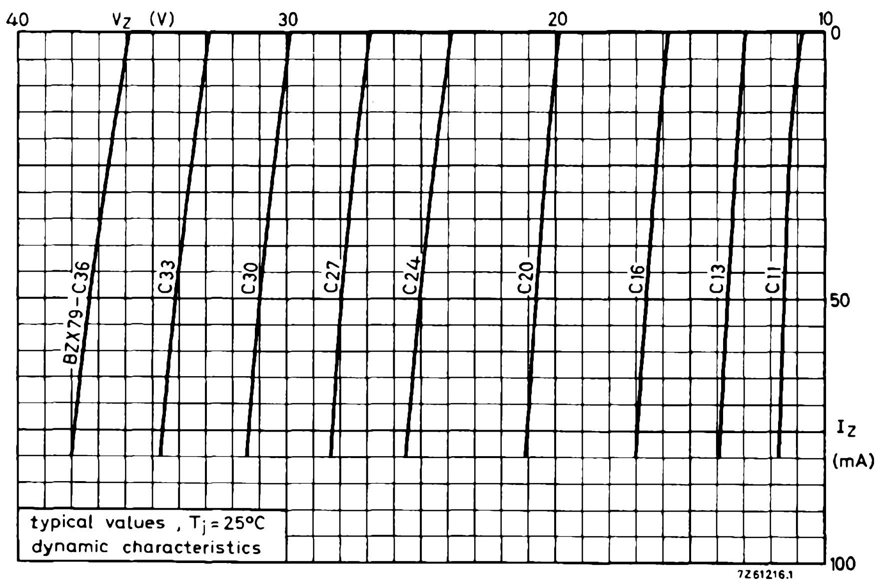

40
V_Z (V)
30
20
10
0
50
100
I_Z (mA)
BZX79-C36
C33
C30
C27
C24
C20
C16
C13
C11
typical values , T_j = 25 °C
dynamic characteristics
7Z61216.1

Fig. 9.

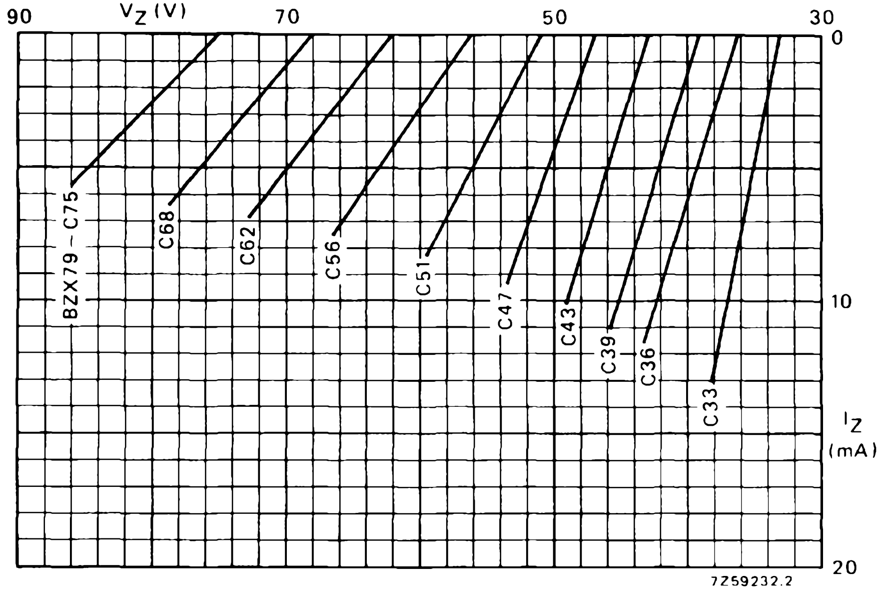


Fig. 10 Static characteristics; typical values; T_{amb} = 25 °C.

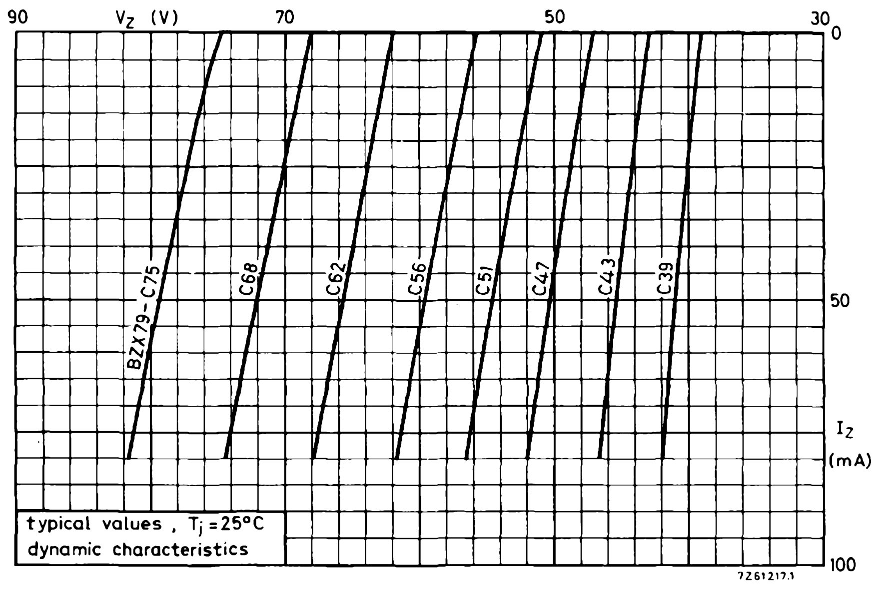


Fig. 11.

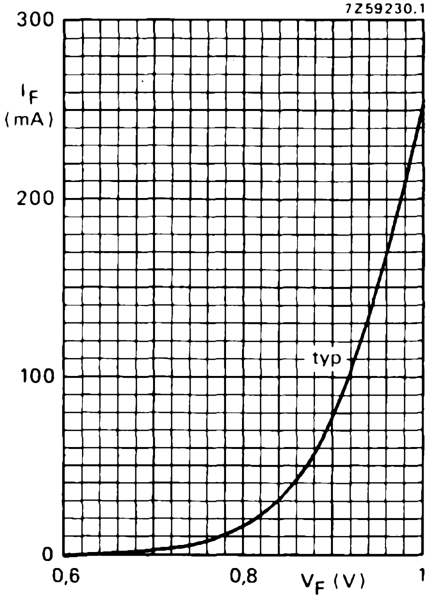


Fig. 12 T_j = 25 °C.

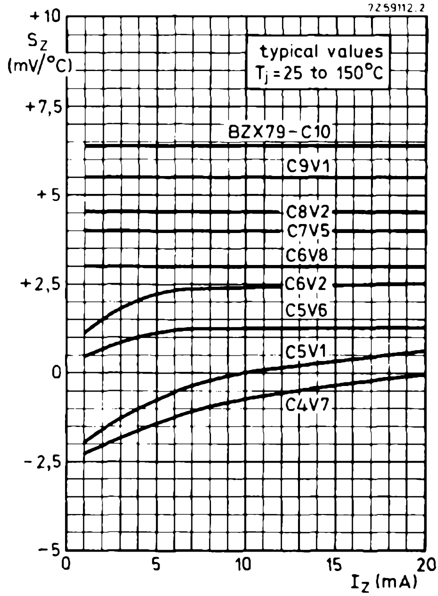


Fig. 13.

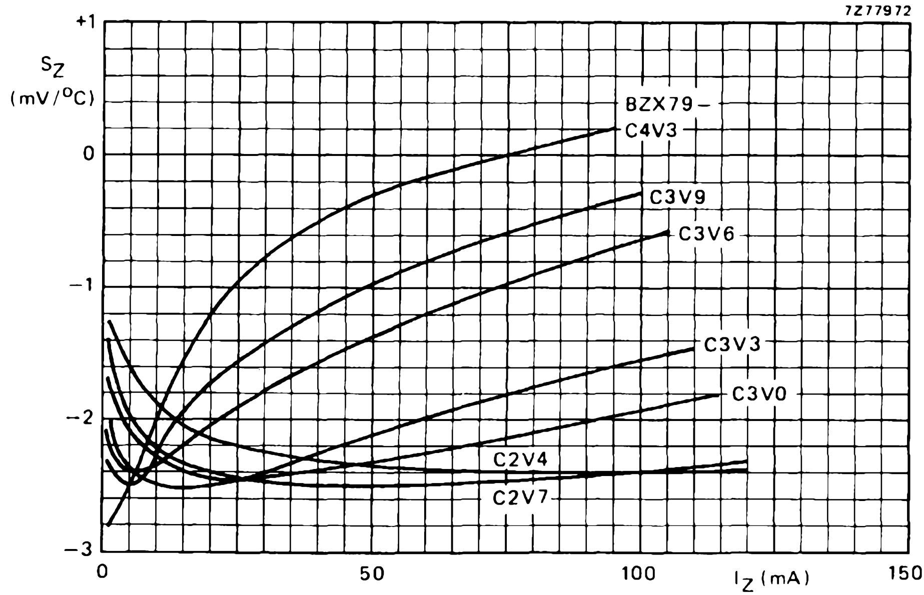


Fig. 14 Typical values; T_j = 25 to 150 °C.

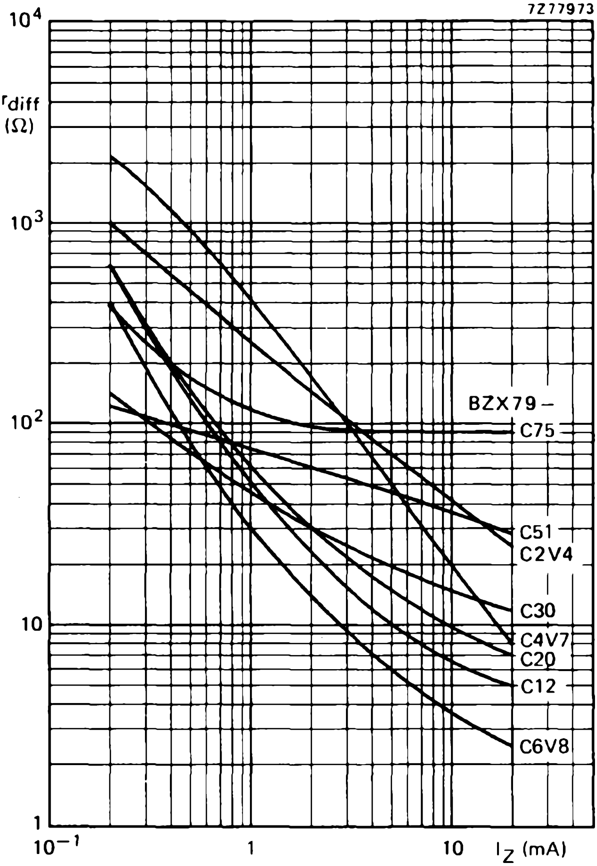


Fig. 15 Typical values; T_j = 25 °C; f = 1 kHz.

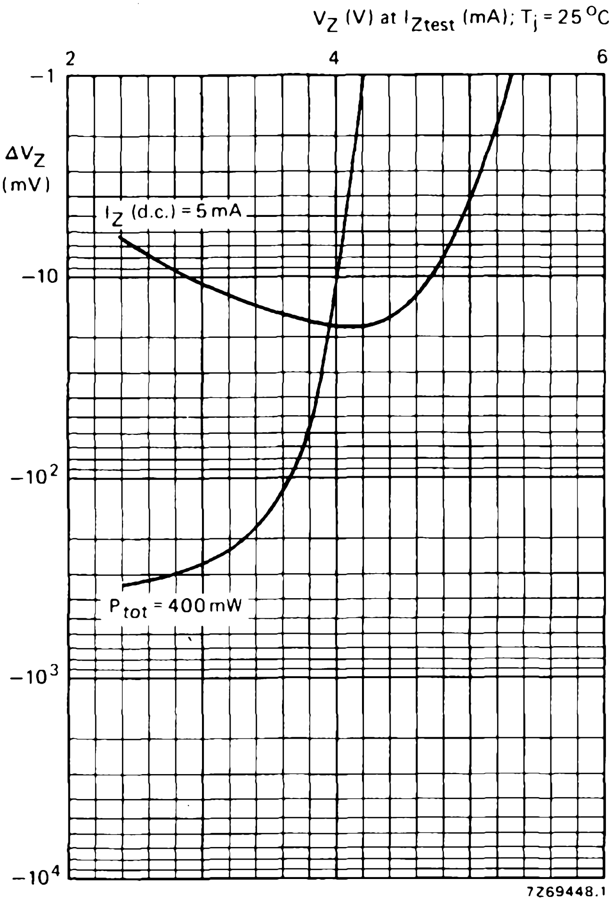


Fig. 16 Typical change of working voltage under operating conditions at T_{amb} = 25 °C.

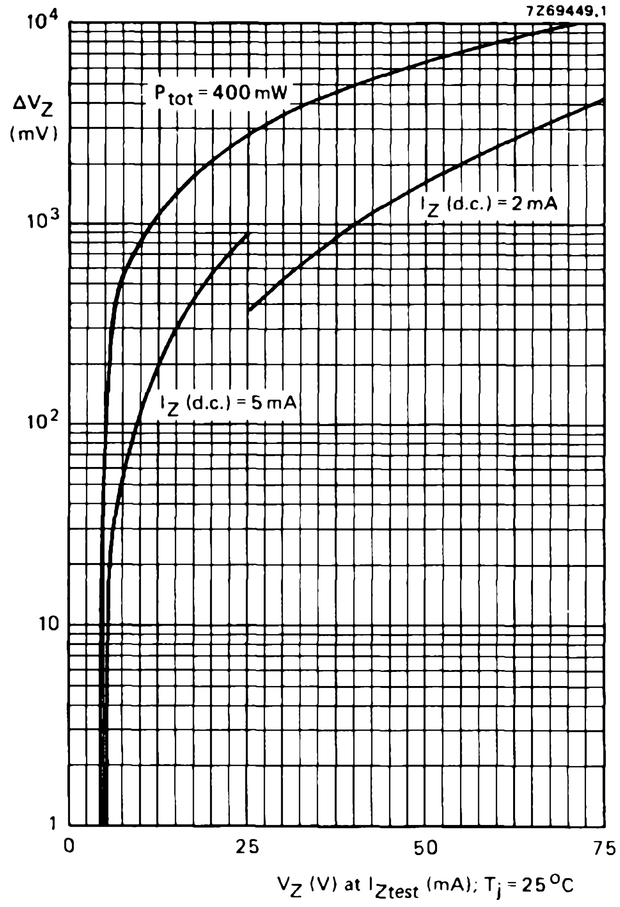


Fig. 17 Typical change of working voltage under operating conditions at $T_{amb} = 25\ ^oC$.

SILICON PLANAR VOLTAGE REGULATOR DIODES

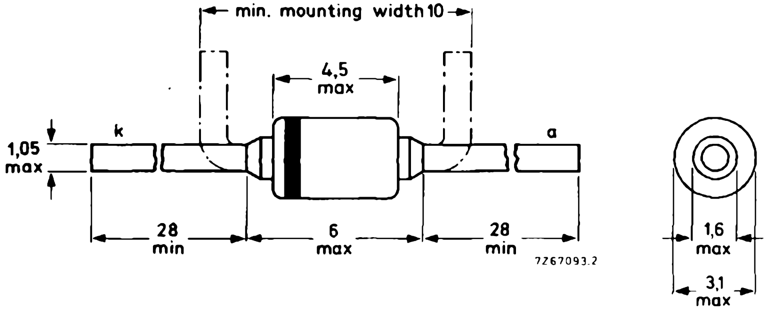
Silicon planar voltage regulator diodes in hermetically sealed glass envelopes intended for stabilization purposes.
The series covers the normalized range of nominal working voltages from 5.1 V to 75 V with a tolerance of ±5% (international standard E24).

QUICK REFERENCE DATA				
Working voltage range	V_Z	nom.	5,1 to 75	V
Working voltage tolerance (E24)			±5	%
Total power dissipation	P_{tot}	max.	2,75	W
Junction temperature	T_j	max.	200	°C

MECHANICAL DATA

Dimensions in mm

SOD-51



Cathode indicated by coloured band

The diodes are type-branded

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Currents

Working current (d.c.)	I_Z	limited by P_{tot} max		
Repetitive peak working current	I_{ZRM}	limited by P_{ZRMmax}		
Repetitive peak forward current	I_{FRM}	max.	400	mA

Power dissipation (see also graphs on pages 5 and 6)

Total power dissipation	P_{tot}	max.	1,5	W 1)
		max.	2,75	W 2)
Repetitive peak reverse power dissipation up to T_{amb} = 175 °C; t_p = 100 µs; δ = 0,001	P_{ZRM}	max.	7,5	W
Non-repetitive peak reverse power dissipation up to T_{amb} = 25 °C; t_p = 100 µs	P_{ZSM}	max.	100	W

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE (see also graphs on pages 5 and 6)

From junction to ambient when soldered to tags at max. lead length	$R_{th\ j\text{-}a}$	max.	117	°C/W

CHARACTERISTICS T_j = 25 °C

Forward voltage at I_F = 0,2 A	V_F	<	1	V

Reverse current

BZX87-C5V1	V_R = 2 V	I_R	<	10	µA
C5V6	V_R = 2 V	I_R	<	5	µA
C6V2	V_R = 2 V	I_R	<	3	µA
C6V8	V_R = 3 V	I_R	<	1,5	µA
C7V5	V_R = 3 V	I_R	<	0,6	µA
C8V2	V_R = 3 V	I_R	<	0,4	µA
C9V1	V_R = 5 V	I_R	<	0,3	µA
C10 to C75	$V_R = \frac{2}{3} V_{Znom}$	I_R	<	0,2	µA

1) Measured in still air up to T_{amb} = 25 °C and mounted to solder tags at maximum lead length.

2) If the temperature of the leads at 10 mm from the body is kept at 25 °C.

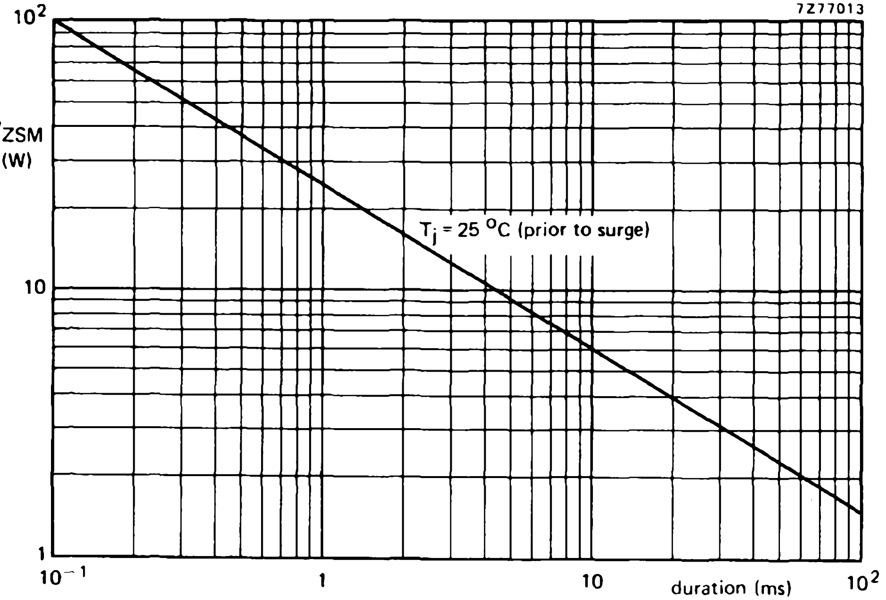
CHARACTERISTICS (continued)

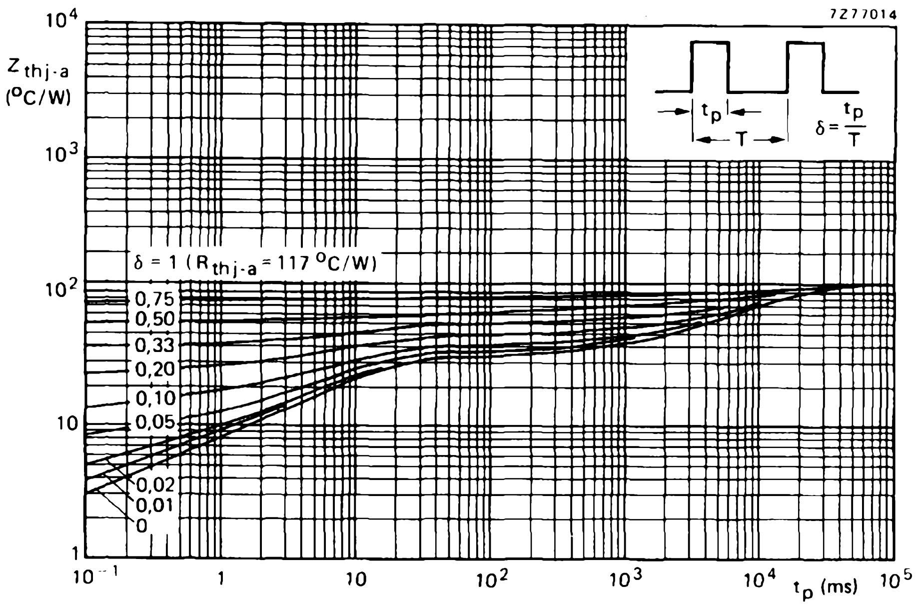
$T_j = 25\ ^oC$

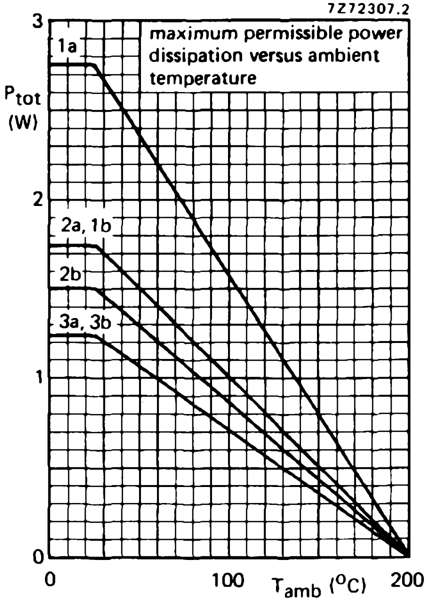
	Working voltage V_Z (V)		Temperature coefficient S_Z (mV/^oC)			Differential resistance r_{diff} (Ω)		Diode capacitance C_d (pF) at f = 1 MHz	
	at I_Z = 50 mA		**at I_Z = 50 mA**			**at I_Z = 50 mA**		**V_R = 0**	
BZX87-....	min.	max.	min.	typ.	max.	typ.	max.	typ.	max.
C5V1	4.8	5.4	-1.5	0	1.5	4	10	200	250
C5V6	5.2	6.0	-0.2	1.5	2.5	2	5	180	225
C6V2	5.8	6.6	1,5	2.4	3.3	1.5	3	350	400
	at I_Z = 20 mA		**at I_Z = 20 mA**			**at I_Z = 20 mA**			
C6V8	6.4	7.2	2.2	3,1	3.9	1	3	300	350
C7V5	7.0	7.9	2.8	3.8	4.7	1	3	270	310
C8V2	7.7	8.7	3.5	4,5	5,5	1,5	4	250	280
C9V1	8.5	9.6	4.3	5.4	6.5	2	4	210	250
C10	9,4	10,6	5.2	6,3	7,5	2	5	190	230
C11	10.4	11.6	6.2	7,4	8.6	3	5	170	220
C12	11.4	12.7	7.2	8.4	9.8	3	6	165	200
C13	12.4	14.1	8.2	9,4	11,2	3	7	165	200
C15	13,8	15.6	9,6	11.4	12.8	4	10	160	190
	at I_Z = 10 mA		**at I_Z = 10 mA**			**at I_Z = 10 mA**			
C16	15,3	17.1	11,1	12,5	14.4	4	10	140	180
C18	16.8	19,1	12,6	14,5	16.6	5	15	120	160
C20	18,8	21.2	14,6	16.6	18.8	5	15	110	150
C22	20.8	23,3	16,6	18,6	20,9	5	20	100	135
C24	22,8	25,6	18,6	20,7	23,4	6	20	95	130
C27	25,1	28,9	21,0	23.8	26,8	7	25	90	120
C30	28	32	23,8	26.9	30,6	8	25	80	110
C33	31	35	26,6	30,0	34,2	10	30	75	95
C36	34	38	29,6	33,4	38,0	10	35	70	90
	at I_Z = 5 mA		**at I_Z = 5 mA**			**at I_Z = 5 mA**			
C39	37	41	32,6	37,0	41.6	15	40	65	80
C43	40	46	36,0	41.6	47,6	15	50	62	75
C47	44	50	40,4	46,1	52,6	20	60	60	75
C51	48	54	44.6	51.0	57.6	30	70	55	70
C56	52	60	49,2	56.6	64,8	35	80	52	65
C62	58	66	56,0	63,4	72,0	40	90	50	60
C68	64	72	62.4	70.4	79,2	45	110	46	58
C75	70	79	69,2	78,4	88.0	45	125	44	55

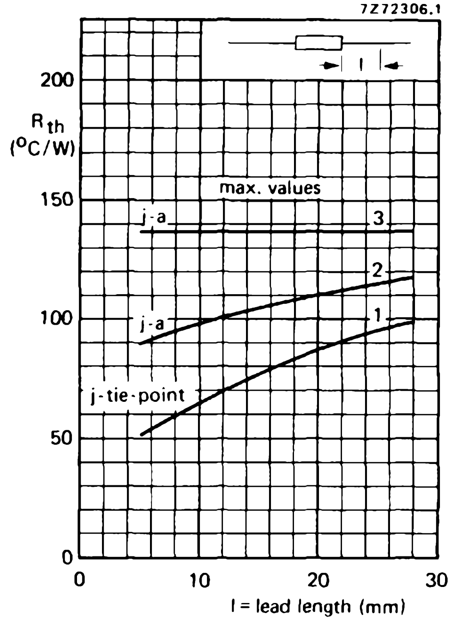
CHARACTERISTICS (continued) T_j = 25 °C

	Working voltage V_Z (V) at I_Z = 1 mA			Differential resistance r_{diff} (Ω) at I_Z = 1 mA		Working voltage V_Z (V) at I_Z = 100 mA			Differential resistance r_{diff} (Ω) at I_Z = 100 mA	
BZX87-....	min.	nom.	max.	typ.	max.	min.	nom.	max.	typ.	max.
C5V1	3,3	3,8	4,3	425	500	4,9	5,2	5,5	1,2	2,5
C5V6	4,1	5,3	5,8	400	500	5,3	5,7	6,1	1,0	2,0
C6V2	5,6	6,0	6,5	40	200	5,9	6,3	6,7	0,8	2,0
C6V8	6,3	6,7	7,1	40	120	6,5	6,9	7,3	0,6	2,0
C7V5	6,9	7,4	7,8	20	100	7,1	7,6	8,0	0,5	1,5
C8V2	7,6	8,1	8,6	20	100	7,8	8,3	8,8	0,5	1,5
C9V1	8,4	9,0	9,6	25	100	8,6	9,2	9,8	0,8	2,0
C10	9,3	9,9	10,5	30	120	9,5	10,1	10,8	0,8	2,0
C11	10,3	10,9	11,5	30	120	10,5	11,1	11,8	0,8	2,0
C12	11,2	11,9	12,6	30	150	11,5	12,1	12,9	1,0	2,0
C13	12,2	12,9	14,0	30	150	12,5	13,1	14,3	1,2	2,5
C15	13,6	14,9	15,4	30	150	13,9	15,1	15,8	1,2	2,5
	at I_Z = 1 mA			at I_Z = 1 mA		at I_Z = 50 mA			at I_Z = 50 mA	
C16	15,2	15,9	17,0	30	150	15,4	16,1	17,3	1,2	3,0
C18	16,7	17,9	19,0	30	150	16,9	18,1	19,3	2,0	5,0
C20	18,7	19,9	21,1	30	150	19,0	20,2	21,5	2,5	6,0
C22	20,7	21,9	23,2	30	150	21,0	22,2	23,7	2,5	6,0
C24	22,6	23,9	25,5	30	150	23,0	24,2	26,0	3,0	8,0
C27	24,9	26,9	28,8	30	150	25,3	27,2	29,2	4,0	8,0
C30	27,8	29,9	31,9	30	150	28,2	30,2	32,5	4,0	8,0
C33	29,8	32,9	34,9	30	150	31,2	33,3	35,5	5,0	10
C36	33,8	35,9	37,9	30	150	34,2	36,3	38,5	5,0	10
C39	36,8	38,9	40,9	40	150	37,5	39,5	42,0	6,0	12
C43	39,8	42,9	45,9	50	150	40,5	43,5	47,0	8	15
C47	43,8	46,9	49,9	55	200	44,5	47,5	51,0	10	20
C51	47,8	50,9	53,8	60	200	48,5	51,8	55,5	12	25
C56	51,8	55,9	59,8	60	200	52,5	56,8	61,5	15	30
C62	57,6	61,8	65,8	70	200	58,5	62,8	67,5	16	30
C68	63,5	67,6	71,7	80	225	65,0	69,0	74,0	18	35
C75	69,3	74,5	78,6	100	250	73,0	77,5	84,0	20	35


7Z77013
10^2
P_{ZSM}
(W)
T_j = 25 °C (prior to surge)
10
1
10^{-1}
1
10
duration (ms)
10^2


7Z77014
10^4
$Z_{thj\text{-}a}$
(°C/W)
t_p
T
$\delta = \frac{t_p}{T}$
10^3
δ = 1 ($R_{thj\text{-}a}$ = 117 °C/W)
10^2
0,75
0,50
0,33
0,20
0,10
0,05
10
0,02
0,01
0
1
10^{-1}
1
10
10^2
10^3
10^4
t_p (ms)
10^5

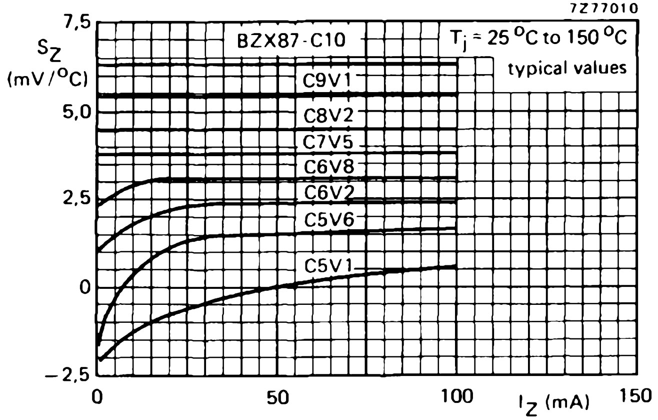


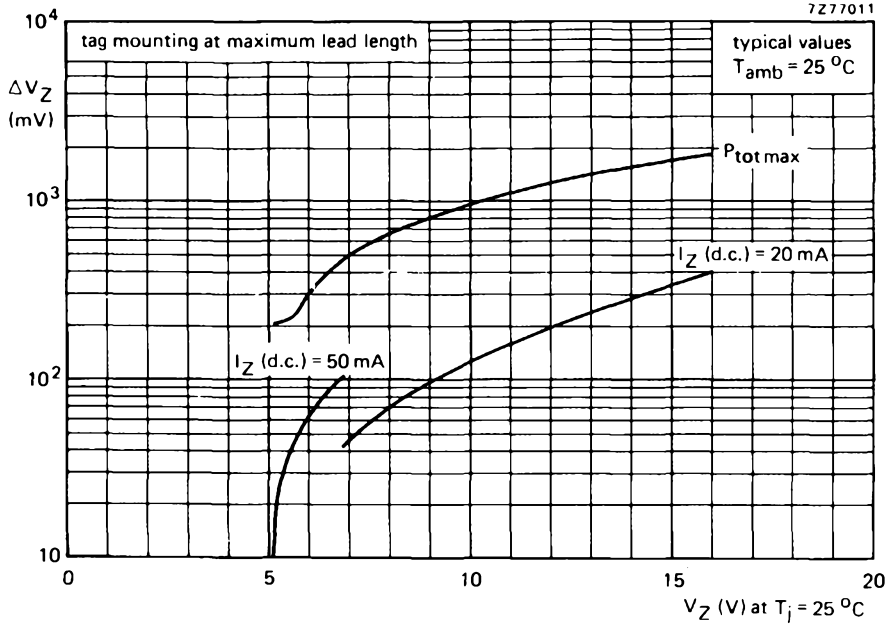


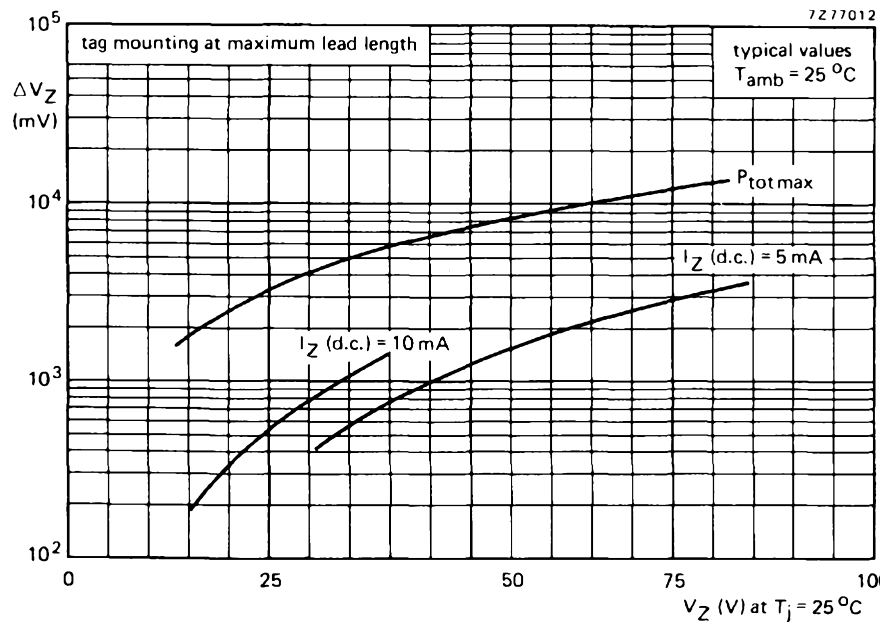
MOUNTING METHODS

1. to tie-points
2. to solder tags
3. on a printed-circuit board with minimum soldering area necessary for good electrical conductance

a. lead length = 10 mm
b. at maximum lead length




7Z77011
tag mounting at maximum lead length
typical values
T_{amb} = 25 °C
ΔV_Z (mV)
$P_{tot\,max}$
I_Z (d.c.) = 20 mA
I_Z (d.c.) = 50 mA
10^4
10^3
10^2
10
0
5
10
15
20
V_Z (V) at T_j = 25 °C


7Z77012
tag mounting at maximum lead length
typical values
T_{amb} = 25 °C
ΔV_Z (mV)
$P_{tot\,max}$
I_Z (d.c.) = 5 mA
I_Z (d.c.) = 10 mA
10^5
10^4
10^3
10^2
0
25
50
75
100
V_Z (V) at T_j = 25 °C

VOLTAGE REGULATOR DIODES

Silicon diodes in all-glass DO-7 envelope intended for voltage stabilization purposes. The series consists of 27 types with nominal working voltages ranging from 2,7 V to 33 V within the normalized E24 (± 5%) range

QUICK REFERENCE DATA

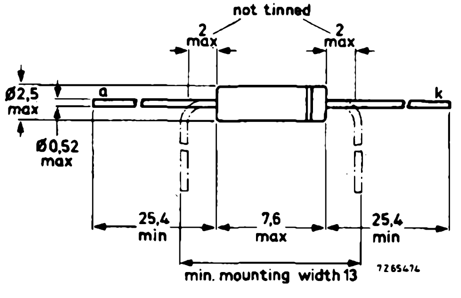
Working voltage range	V_Z	nom.	2,7 to 33	V
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW
Non-repetitive peak reverse power dissipation T_j = 25 °C; t = 10 µs	P_{ZSM}	max.	1,1	kW
Operating junction temperature	T_j	max.	200	°C
Thermal resistance from junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,37	°C/mW

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-7.

The diodes are type-branded



Cathode indicated by coloured band

For operation as a voltage regulator diode the positive voltage is connected to the lead adjacent to the white band.

Available for current production only; for new designs, successors BZX79 are recommended.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Forward current (d.c.)	I_F	max.	250 mA
Repetitive peak forward current	I_{FRM}	max.	250 mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400 mW
Non-repetitive peak reverse power dissipation T_j = 25 °C; t = 10 µs	P_{ZSM}	max.	1,1 kW
Storage temperature	T_{stg}	−65 to + 175	°C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,37 °C/mW

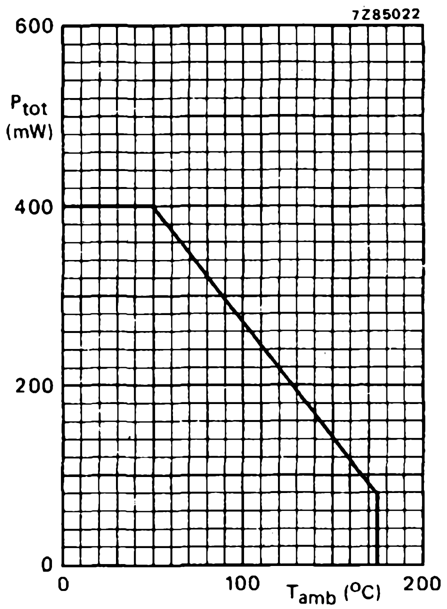


Fig. 2 Power derating curve.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 10 mA V_F < 0,9 V

BZY88-. . .	working voltage V_Z at I_Z = 1 mA				temperature coefficient S_Z at I_Z = 1 mA				differential resistance r_{diff} at I_Z = 1 mA			
	min.	nom.	max.		min.	typ.	max.		min.	typ.	max.	
C2V7	1,9	2,15	2,4	V	−4,5	−1,7	−0,6	mV/°C	260	310	390	Ω
C3V0	2,1	2,4	2,7	V	−5,0	−1,8	−0,6	mV/°C	280	340	420	Ω
C3V3	2,4	2,75	3,0	V	−4,5	−1,9	−0,5	mV/°C	300	360	440	Ω
C3V6	2,7	3,0	3,3	V	−4,5	−2,05	−0,5	mV/°C	380	410	430	Ω
C3V9	3,0	3,3	3,6	V	−3,5	−2,4	−0,5	mV/°C	380	410	430	Ω
C4V3	3,3	3,6	3,9	V	−2,7	−2,25	−0,5	mV/°C	340	410	430	Ω
C4V7	3,7	4,1	4,3	V	−2,5	−2,0	−0,3	mV/°C	360	390	420	Ω
C5V1	4,3	4,65	5,0	V	−2,1	−1,9	−0,3	mV/°C	300	340	370	Ω
C5V6	4,8	5,3	5,7	V	−1,8	−1,4	0	mV/°C	160	310	350	Ω
C6V2	5,7	5,9	6,5	V	0	+1,6	+3,0	mV/°C	10	100	250	Ω
C6V8	6,3	6,7	6,9	V	+2	+3,2	+3,7	mV/°C	5,0	15	70	Ω
C7V5	7,0	7,45	7,8	V	+3	+4,2	+5,9	mV/°C	4,0	8,6	20	Ω
C8V2	7,8	8,1	8,5	V	+4,3	+5,0	+6,0	mV/°C	4,0	10	20	Ω
C9V1	8,55	9,0	9,5	V	+4,5	+6,0	+7,0	mV/°C	7,0	12	24	Ω
C10	9,3	9,9	10,5	V	+6,0	+6,6	+7,0	mV/°C	5,0	20	50	Ω
C11	10,3	10,9	11,5	V	+7,1	+8,3	+9,0	mV/°C	5,0	25	70	Ω
C12	11,3	11,9	12,5	V	+7,6	+8,7	+9,2	mV/°C	10	25	80	Ω
C13	12,3	12,9	13,0	V	+9,1	+10,1	+11,1	mV/°C	10	25	90	Ω
C15	13,8	14,9	15,5	V	+11	+12,5	+13	mV/°C	19	35	95	Ω
C16	15,3	15,8	16,9	V	+12	+13	+14	mV/°C	20	45	100	Ω
C18	16,7	17,8	18,9	V	+14	+15	+16,5	mV/°C	20	50	120	Ω
C20	18,7	19,8	21,0	V	+16	+17	+18,5	mV/°C	20	60	140	Ω
C22	20,6	21,8	23,1	V	+17	+19	+21	mV/°C	25	70	150	Ω
C24	22,5	23,8	25,7	V	+19	+21	+23	mV/°C	30	85	200	Ω
C27	24,7	26,6	28,5	V	+21	+22,5	+25	mV/°C	35	90	300	Ω
C30	27,5	29,5	31,5	V	+22	+24	+29	mV/°C	50	180	350	Ω
C33	29,5	32,5	34,5	V	+23	+26	+35	mV/°C	60	250	450	Ω

CHARACTERISTICS (continued)

T_j = 25 °C unless otherwise specified

BZY88-...	working voltage V_Z at I_Z = 5 mA				temperature coefficient S_Z at I_Z = 5 mA				differential resistance r_{diff} at I_Z = 5 mA			
	min.	nom.	max.		min.	typ.	max.		min.	typ.	max.	
C2V7	2,5	2,7	2,9	V	−4,0	−2,2	−0,6	mV/°C	68	80	120	Ω
C3V0	2,8	3,0	3,2	V	−4,5	−2,4	−0,6	mV/°C	70	84	120	Ω
C3V3	3,1	3,3	3,5	V	−4,0	−2,3	−0,5	mV/°C	70	86	110	Ω
C3V6	3,4	3,6	3,8	V	−3,5	−2,0	−0,5	mV/°C	65	76	105	Ω
C3V9	3,7	3,9	4,1	V	−2,5	−2,05	−0,5	mV/°C	60	76	100	Ω
C4V3	4,0	4,3	4,6	V	−2,5	−1,8	−0,5	mV/°C	55	70	90	Ω
C4V7	4,4	4,7	5,0	V	−2,0	−1,55	0	mV/°C	49	62	85	Ω
C5V1	4,8	5,1	5,4	V	−1,75	−1,2	0	mV/°C	34	46	75	Ω
C5V6	5,2	5,6	6,0	V	−1,5	−0,2	+1,0	mV/°C	10	22	55	Ω
C6V2	5,8	6,2	6,6	V	+0,5	+2,0	+3,5	mV/°C	1,0	7,0	27	Ω
C6V8	6,4	6,8	7,2	V	+2,3	+3,2	+3,8	mV/°C	0,5	3,0	15	Ω
C7V5	7,0	7,5	7,9	V	+3,1	+4,2	+5,9	mV/°C	0,5	3,0	15	Ω
C8V2	7,7	8,2	8,7	V	+4,2	+5,0	+6,0	mV/°C	0,9	3,5	20	Ω
C9V1	8,5	9,1	9,6	V	+4,8	+6,0	+7,0	mV/°C	1,0	4,75	25	Ω
C10	9,4	10	10,6	V	+6,0	+7,0	+7,5	mV/°C	2,0	5,0	25	Ω
C11	10,4	11	11,6	V	+7,0	+8,7	+9,1	mV/°C	3,0	7,0	25	Ω
C12	11,4	12	12,7	V	+8,5	+9,0	+9,6	mV/°C	4,0	8,0	35	Ω
C13	12,4	13	14,1	V	+10	+10,5	+11,5	mV/°C	4,0	10	35	Ω
C15	13,8	15	15,6	V	+12	+12,5	+14	mV/°C	4,0	15	35	Ω
C16	15,3	16	17,1	V	+12	+13	+14	mV/°C	5,0	20	40	Ω
C18	16,8	18	19,1	V	+14	+15	+18	mV/°C	7,0	25	45	Ω
C20	18,8	20	21,2	V	+16	+17	+19	mV/°C	10	30	50	Ω
C22	20,8	22	23,3	V	+17	+19	+21	mV/°C	15	35	60	Ω
C24	22,7	24	25,9	V	+20	+21	+24	mV/°C	20	40	75	Ω
C27	25,1	27	28,9	V	+22	+23,5	+27	mV/°C	25	50	85	Ω
C30	28	30	32	V	+25	+26	+29	mV/°C	30	60	95	Ω
C33	31	33	35	V	+27	+28	+36	mV/°C	35	75	120	Ω

BZY88-...	working voltage V_Z at I_Z = 20 mA				temperature coefficient S_Z at I_Z = 20 mA				differential resistance r_{diff} at I_Z = 20 mA			
	min.	nom.	max.		min.	typ.	max.		min.	typ.	max.	
C2V7	3,0	3,25	3,5	V	−3,5	−2,4	−0,6	mV/°C	18	22	26	Ω
C3V0	3,3	3,6	3,9	V	−3,5	−2,5	−0,6	mV/°C	17	21	24	Ω
C3V3	3,5	4	4,2	V	−3,3	−2,4	−0,5	mV/°C	16	20	22	Ω
C3V6	3,9	4,2	4,4	V	−2,5	−1,55	−0,5	mV/°C	16	18	20	Ω
C3V9	4,2	4,45	4,65	V	−2,4	−1,55	−0,5	mV/°C	14	16	18	Ω
C4V3	4,45	4,7	4,95	V	−2,0	−1,5	−0,5	mV/°C	13	15	17	Ω
C4V7	4,9	5,1	5,3	V	−1,5	−0,85	0	mV/°C	12	15	17	Ω
C5V1	5,1	5,35	5,7	V	−1,5	−0,8	0	mV/°C	4,0	7,0	11	Ω
C5V6	5,45	5,75	6,1	V	−1,0	+1,0	+3,0	mV/°C	1,5	4,0	8,0	Ω
C6V2	5,95	6,4	6,7	V	+1,0	+2,2	+4,0	mV/°C	0,8	1,4	3,1	Ω
C6V8	6,6	6,9	7,25	V	+2,8	+3,2	+3,8	mV/°C	0,7	1,3	3,0	Ω
C7V5	7,2	7,65	7,95	V	+2,5	+4,2	+5,9	mV/°C	0,5	1,6	5,0	Ω
C8V2	7,9	8,4	8,75	V	+4,0	+5,0	+6,0	mV/°C	0,9	1,8	6,0	Ω
C9V1	8,7	9,4	9,7	V	+5,0	+6,0	+7,0	mV/°C	1,0	1,85	7,0	Ω
C10	9,5	10,1	10,8	V	+7,0	+7,3	+7,5	mV/°C	1,0	2,0	8,0	Ω
C11	10,5	11,1	11,8	V	+8,5	+9,1	+9,5	mV/°C	1,0	3,0	10	Ω
C12	11,6	12,2	12,8	V	+8,9	+9,6	+10,3	mV/°C	2,0	3,5	25	Ω
C13	12,6	13,2	14,3	V	+11	+11,5	+12,5	mV/°C	2,0	4,5	25	Ω
C15	14,1	15,3	15,9	V	+12	+13,5	+14,5	mV/°C	2,0	6,0	25	Ω
C16	15,6	16,3	17,4	V	+13	+14	+15	mV/°C	5,0	10	30	Ω
C18	17,2	18,4	19,6	V	+15	+16	+18	mV/°C	5,0	12	30	Ω
C20	19,3	20,5	21,9	V	+17,5	+18,5	+20,5	mV/°C	5,0	15	35	Ω
C22	21,3	22,6	24,1	V	+19	+20,5	+22,5	mV/°C	10	18	35	Ω
C24	23,3	24,7	26,7	V	+20	+23	+25	mV/°C	10	20	40	Ω
C27	25,8	28,1	30,1	V	+23	+25,5	+28	mV/°C	10	25	45	Ω
C30	29,0	31,3	33,4	V	+25	+28	+32	mV/°C	10	35	50	Ω
C33	32,0	34,5	36,6	V	+27	+30	+38	mV/°C	10	45	60	Ω

CHARACTERISTICS (continued)

T_j = 25 °C unless otherwise specified

BZY88-...	typ. C_d V_R = 3 V	reverse current I_R at V_R =	typ.	max.		typ. noise voltage ** I_Z = 1 mA	I_Z = 5 mA	
C2V7	490 pF *	1 V	4	25	μA	22	12	μV r.m.s.
C3V0	430 pF *	1 V	2	5	μA	20	11	μV r.m.s.
C3V3	380 pF *	1 V	0,51	3,0	μA	19	10	μV r.m.s.
C3V6	360 pF *	1 V	0,25	3,0	μA	18	9	μV r.m.s.
C3V9	335 pF	1 V	0,11	3,0	μA	16	8	μV r.m.s.
C4V3	270 pF	1 V	0,1	3,0	μA	15	8	μV r.m.s.
C4V7	290 pF	2 V	0,25	3,0	μA	14	7	μV r.m.s.
C5V1	275 pF	2 V	0,15	1,0	μA	13	8	μV r.m.s.
C5V6	260 pF	2 V	0,6	1,0	μA	13	9	μV r.m.s.
C6V2	240 pF	2 V	0,1	1,0	μA	14	10	μV r.m.s.
C6V8	220 pF	3 V	0,025	1,0	μA	25	15	μV r.m.s.
C7V5	190 pF	3 V	15	500	nA	33	20	μV r.m.s.
C8V2	150 pF	3 V	11	400	nA	55	28	μV r.m.s.
C9V1	140 pF	5 V	8	400	nA	79	35	μV r.m.s.
C10	110 pF	7 V	–	2,5	μA	87	43	μV r.m.s.
C11	90 pF	7 V	–	2,5	μA	92	48	μV r.m.s.
C12	80 pF	8 V	–	2,5	μA	100	50	μV r.m.s.
C13	65 pF	9 V	–	2,5	μA	110	52	μV r.m.s.
C15	60 pF	10 V	–	2,5	μA	120	54	μV r.m.s.
C16	55 pF	10 V	–	2,5	μA	135	56	μV r.m.s.
C18	50 pF	13 V	–	2,5	μA	160	58	μV r.m.s.
C20	45 pF	14 V	–	2,5	μA	210	60	μV r.m.s.
C22	43 pF	15 V	–	2,5	μA	255	62	μV r.m.s.
C24	42 pF	17 V	–	2,5	μA	290	65	μV r.m.s.
C27	40 pF	19 V	–	2,5	μA	320	69	μV r.m.s.
C30	35 pF	21 V	–	2,5	μA	350	73	μV r.m.s.
C33	32 pF	23 V	–	2,5	μA	380	78	μV r.m.s.

* Diode capacitance at V_R = 2 V.

** Noise voltage measured using a bandwidth ± 3 dB of 10 Hz to 50 kHz.

OPERATING NOTES

1. Dissipation and heatsink considerations

a. Steady-state conditions

The maximum allowable steady-state dissipation $P_{s\,max}$ is given by the relationship

$$P_{s\,max} \approx \frac{T_{j\,max} - T_{amb}}{R_{th\,j\text{-}a}}$$

where: $T_{j\,max}$ is the maximum permissible operating junction temperature;
T_{amb} is the ambient temperature;
$R_{th\,j\text{-}a}$ is the total thermal resistance from junction to ambient.

b. Pulse conditions (see Fig. 3)

The maximum allowable additional pulse power $P_{m\,max}$ is given by the formula

$$P_{m\,max} = \frac{(T_{j\,max} - T_{amb}) - (P_s \cdot R_{th\,j\text{-}a})}{Z_{th}}$$

where: P_s is the steady-state dissipation, excluding that in the pulses;
Z_{th} is the effective transient thermal resistance of the device from junction to ambient. It is a function of the pulse duration t and duty factor δ (see Fig. 9);
δ is the duty factor and is equal to the pulse duration t divided by the periodic time T.

The steady-state power P_s when biased in the zener direction at a given zener current can be found from Fig. 18. With the additional pulsed power dissipation $P_{m\,max}$ calculated from the above expression, the total repetitive peak zener power dissipation $P_{ZRM} = P_s + P_{m\,max}$. From Fig. 18 the corresponding maximum repetitive peak zener current at P_{ZRM} can now be read. For pulse durations longer than the temperature stabilization time of the diode t_{stab}, the maximum allowable repetitive peak dissipation P_{ZRM} is equal to the maximum steady-state power $P_{s\,max}$. The temperature stabilization for the BZY88series is 100 s (see Fig. 9).

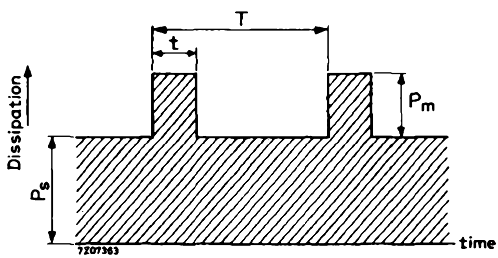


Fig. 3.

OPERATING NOTES (continued)

Example

The following example illustrates how to calculate the maximum permissible repetitive peak zener current of a BZY88-C7V5 zener diode mounted in free air at a maximum ambient temperature of 60 °C. The steady-state zener current is 10 mA, the duty factor $\delta = 0{,}1$ and the pulse duration $t = 1$ ms.

The steady-state dissipation P_s at a zener current is 10 mA (from Fig. 18) = 76 mW.
The thermal resistance from junction to ambient $R_{th\ j\text{-}a} = 0{,}31$ °C/mW.
The thermal impedance Z_{th} with a duty factor $\delta = 0{,}1$ and a pulse duration $t = 1$ ms (from Fig. 9).

$$Z_{th} = 41{,}5\ ^{\circ}\mathrm{C/W}.$$

The maximum additional pulse power dissipation

$$P_{m\,max} = \frac{(T_{j\,max} - T_{amb}) - P_s \cdot R_{th\ j\text{-}a}}{Z_{th}}$$

If $P_s = 76$ mW, $Z_{th} = 41{,}5$ °C/W,

$$P_{m\,max} = \frac{(200-60) - (0{,}076 \times 310)}{41{,}5} = 2{,}8\ \mathrm{W}$$

therefore, the total repetitive peak power dissipation,

$$P_{ZRM} = 0{,}076 + 2{,}8 = 2{,}88\ \mathrm{W}.$$

From Fig. 18 the corresponding repetitive peak zener current is 350 mA.

2. Zener characteristics

The basic characteristic of a zener diode is the dynamic zener characteristic, that is, the variation of zener voltage when a current pulse is applied in the reverse direction. The slope of this characteristic is r_Z. Typical dynamic characteristics at $T_j = 25$ and 150 °C are given on pages 12 and 13 for each type of diode. Because of the temperature sensitivity of the zener characteristics, the dynamic characteristics at any other operating temperature will be displaced from those at $T_j = 25$ °C by a voltage corresponding to $S_Z \times (T_n - 25)$ °C, where S_Z is the temperature coefficient of the diode and T_n is a nominal operating temperature (Figs 4 and 5).

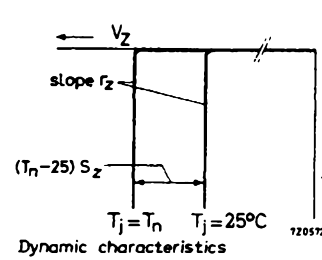


Fig. 4 Dynamic characteristics.

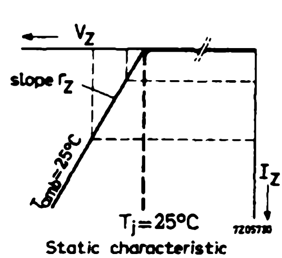


Fig. 5 Static characteristics.

The static characteristic of the diode is obtained by connecting the steady-state zener voltages at various direct zener currents and may, therefore, be used to determine the operating point at any zener current. This is shown above. The slope of the static characteristic will depend on

(1) the differential resistance, r_z;
(2) the rise in junction temperature due to internal dissipation and the thermal resistance from junction to ambient, $V_Z . I_Z . R_{th\ j\text{-}a}$;
(3) the temperature coefficient of the diode, S_Z.

From the above, the static slope resistance r_Z is found to be

$$r_Z = r_z + V_Z \cdot R_{th\ j\text{-}a} \cdot S_Z$$

where r_z is the differential resistance, V_Z is the steady-state zener voltage and is equal to

$$\frac{V_Z'}{1 - I_Z \cdot R_{th\ j\text{-}a} \cdot S_Z}$$

V_Z' being the zener voltage at $T_j = T_n$ at the working current I_Z.

The position of this static characteristic in relation to the dynamic characteristic at T_j = 25 °C is dependent on the ambient temperature and the temperature coefficient, the low-current voltage being displaced by

$$S_Z \times (T_n - 25)\ {}^{o}C$$

from the low current voltage, V_{ZO} on the dynamic characteristic at T_j = 25 °C (see Fig. 6).

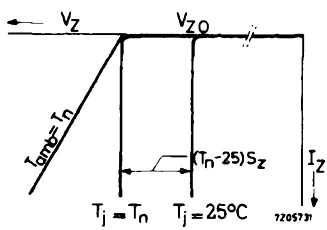


Fig. 6 Example for positive S_Z.

OPERATING NOTES (continued)

Figure 7 shows typical dynamic characteristics at T_j = 25, 150 and a nominal temperature, T_n °C. It also shows static characteristics at ambient temperatures of 25 and T_n °C.

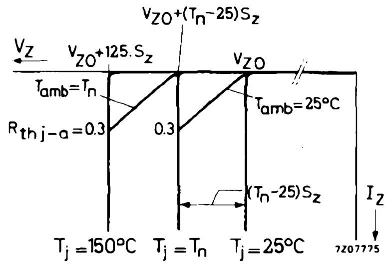


Fig. 7 Example for positive S_Z.

Typical static characteristics for each type of diode are given on page 14. These curves were obtained with the device mounted in free air at an ambient temperature of 25 °C.

The slope resistance for pulse operation can be calculated by incorporating the thermal impedance Z_{th} into the formula for r_Z. Curves of Z_{th} plotted against pulse duration and duty factor are given in Fig. 9.

3. When using a soldering iron, the diode may be soldered directly into a circuit, but heat conducted to the junction should be kept to a minimum by use of a thermal shunt.
4. Diodes may be dip-soldered at a solder temperature of 245 °C for a maximum soldering time of 5 seconds. The case temperature during dip-soldering must not at any time exceed the maximum storage temperature. These recommendations apply to a diode with the anode end mounted flush on the board with punched-through holes. For mounting the cathode end onto the board the diode must be spaced 5 mm from the underside of the printed circuit board in the case of punched-through holes or 5 mm from the top of the board for plated-through holes.
5. Care should be taken not to bend the leads nearer than 1,5 mm from the seals.

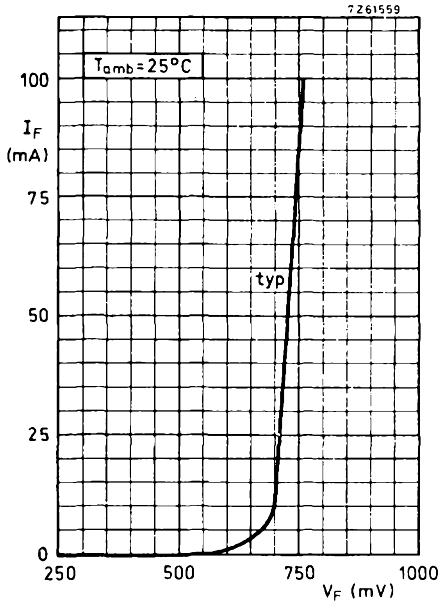


Fig. 8.

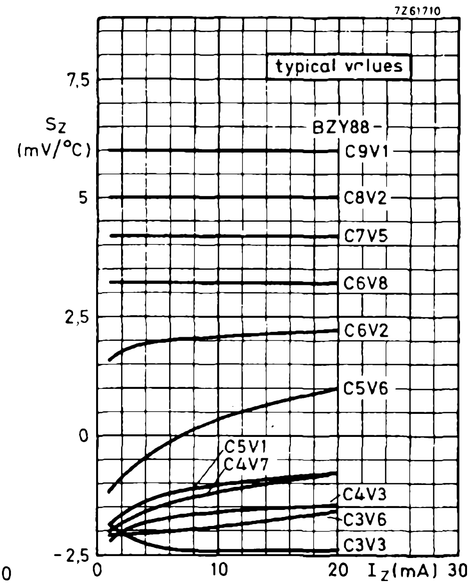


Fig. 9.

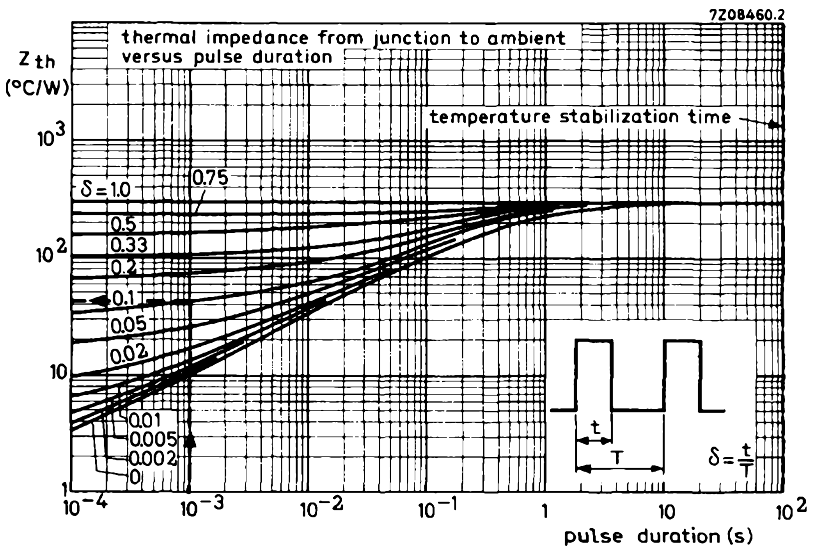


Fig. 10.

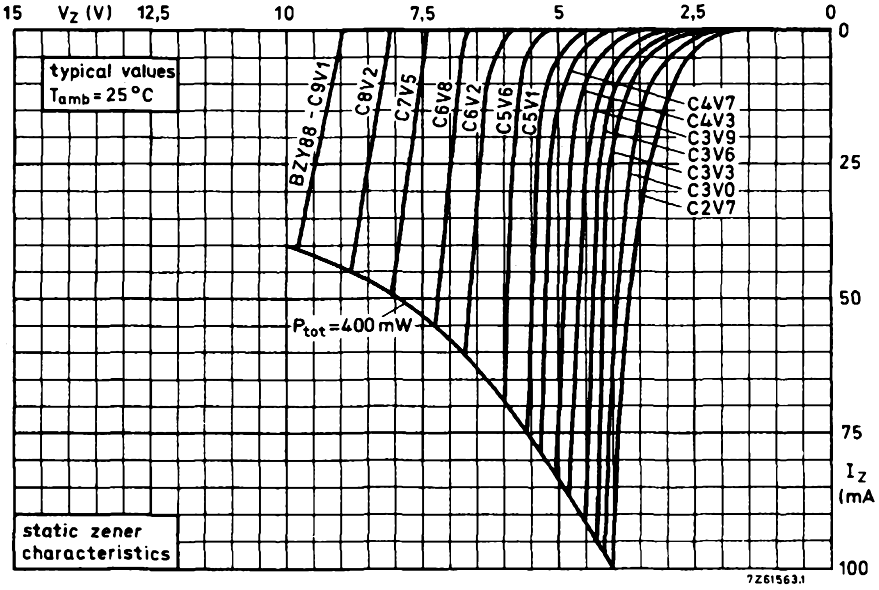

15
V_Z (V)
12,5
10
7,5
5
2,5
0
typical values
T_{amb} = 25 °C
BZY88 - C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
C4V3
C3V9
C3V6
C3V3
C3V0
C2V7
P_{tot} = 400 mW
static zener
characteristics
0
25
50
75
I_Z
(mA)
100
7Z61563.1

Fig. 11.

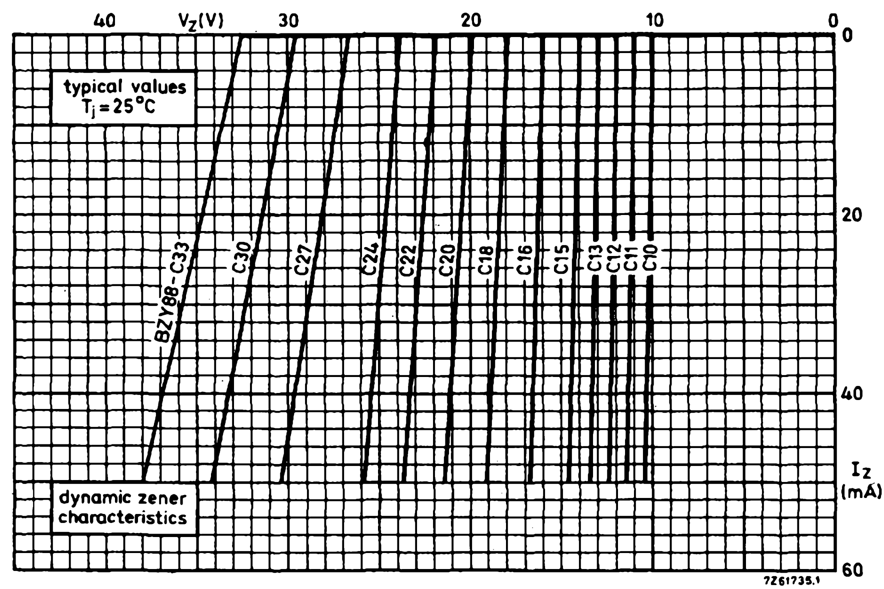

40
V_Z(V)
30
20
10
0
typical values
T_j = 25 °C
BZY88-C33
C30
C27
C24
C22
C20
C18
C16
C15
C13
C12
C11
C10
dynamic zener
characteristics
0
20
40
I_Z
(mA)
60
7Z61735.1

Fig. 12.

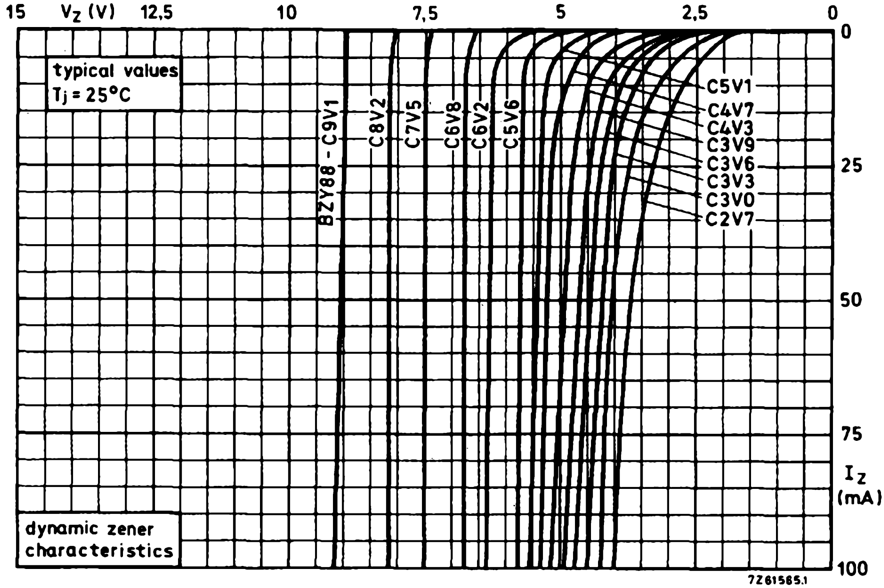

15
V_Z (V)
12,5
10
7,5
5
2,5
0
typical values
T_j = 25°C
BZY88 - C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
C4V3
C3V9
C3V6
C3V3
C3V0
C2V7
0
25
50
75
I_Z (mA)
100
dynamic zener characteristics
7Z61565.1

Fig. 13.

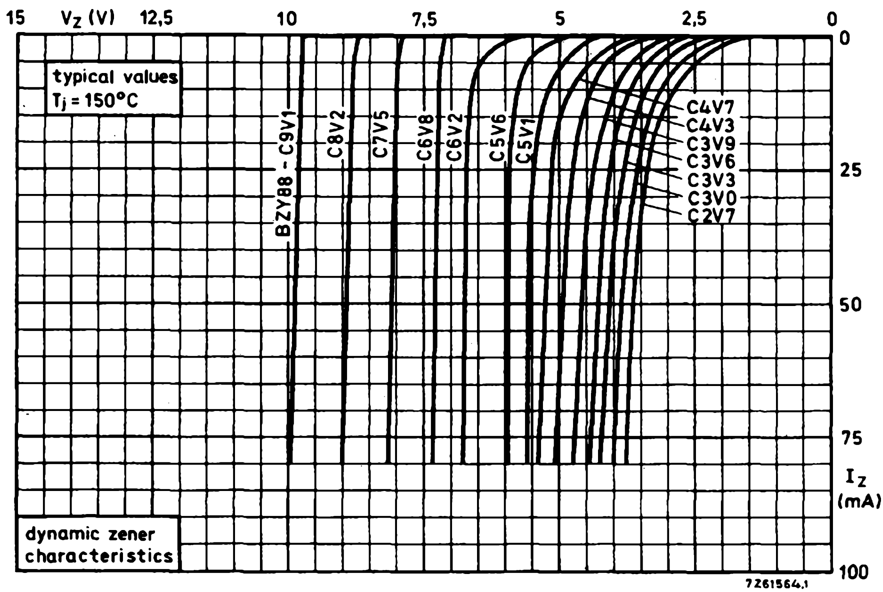

15
V_Z (V)
12,5
10
7,5
5
2,5
0
typical values
T_j = 150°C
BZY88 - C9V1
C8V2
C7V5
C6V8
C6V2
C5V6
C5V1
C4V7
C4V3
C3V9
C3V6
C3V3
C3V0
C2V7
0
25
50
75
I_Z (mA)
100
dynamic zener characteristics
7Z61564.1

Fig. 14.

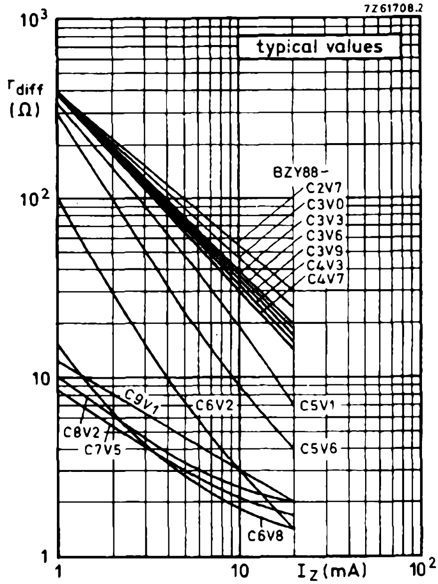


Fig. 15.

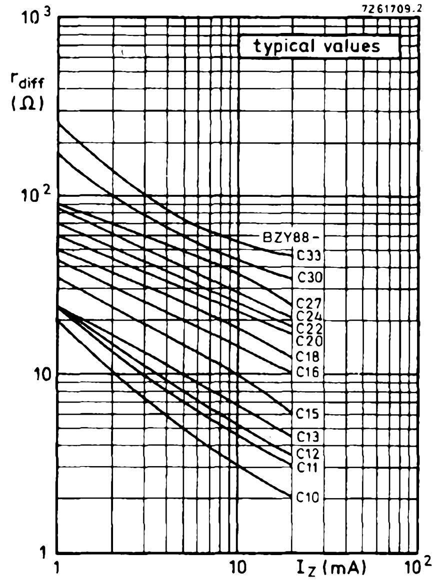


Fig. 16.

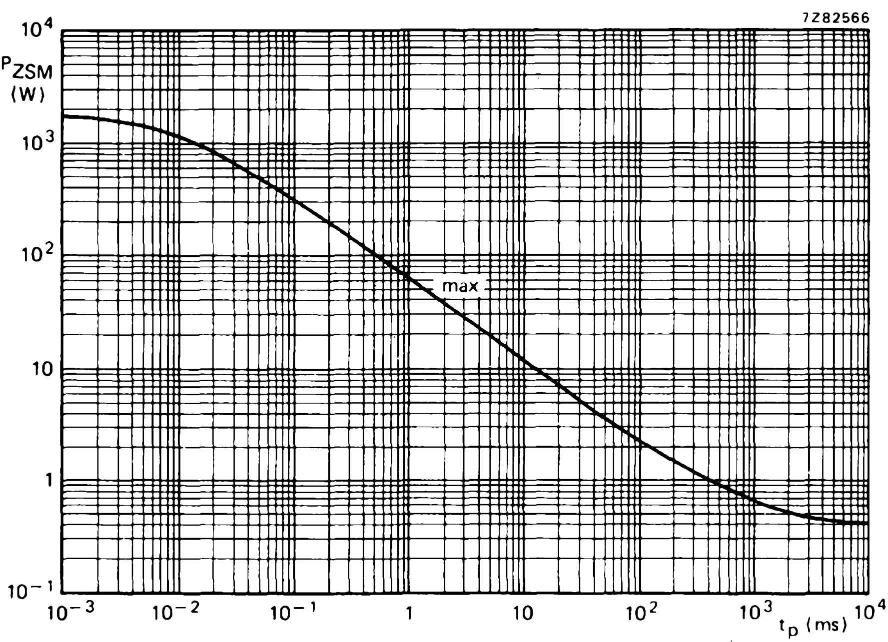


Fig. 17 Non-repetitive surge pulse power as a function of pulse duration. Rectangular pulse: 2 pulses per minute; T_j = 25 °C.

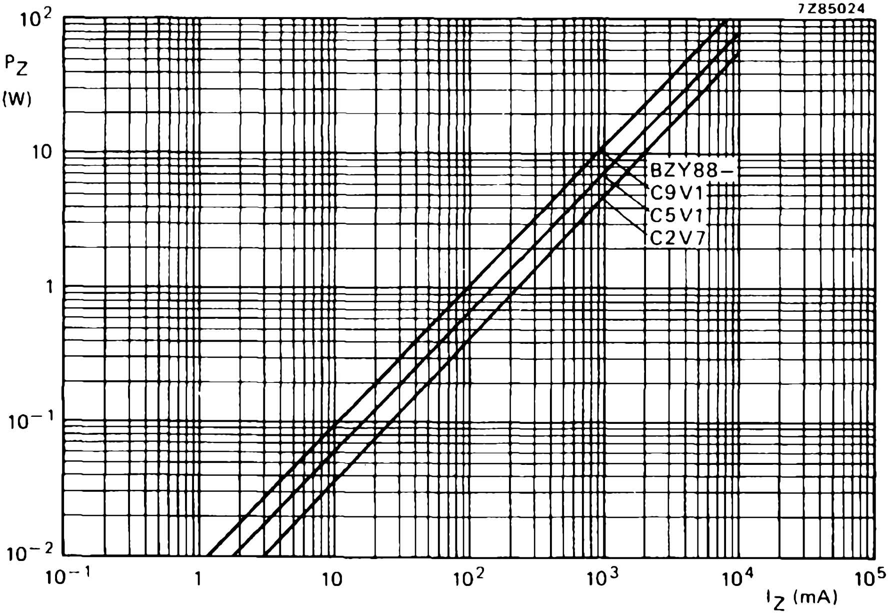

7Z85024
10^2
P_Z (W)
10
1
10^{-1}
10^{-2}
10^{-1}
1
10
10^2
10^3
10^4
10^5
I_Z (mA)
BZY88–
C9V1
C5V1
C2V7

Fig. 18.

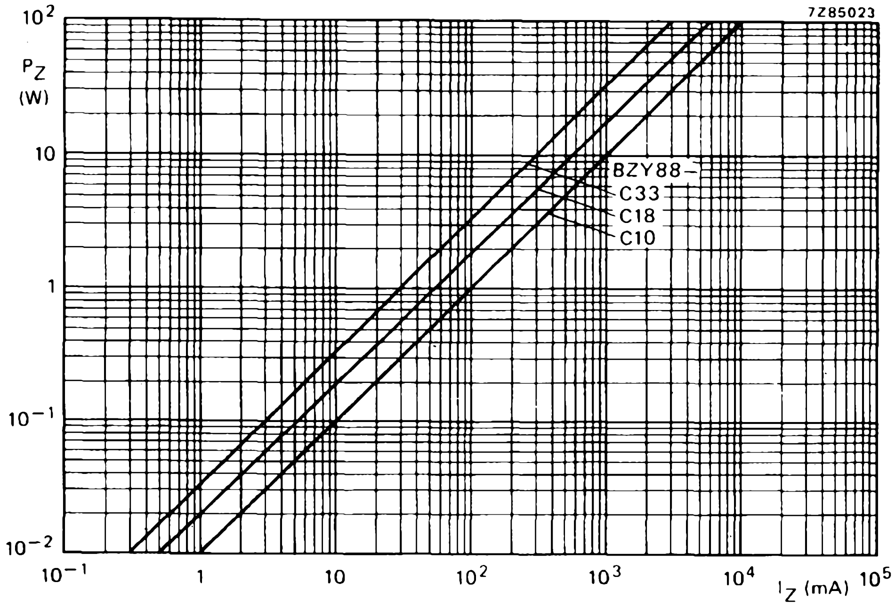

7Z85023
10^2
P_Z (W)
10
1
10^{-1}
10^{-2}
10^{-1}
1
10
10^2
10^3
10^4
10^5
I_Z (mA)
BZY88–
C33
C18
C10

Fig. 19.

VOLTAGE REGULATOR DIODES

Silicon planar regulator diodes in DO-35 envelopes, intended for use as low-voltage stabilisers or voltage references. The series consists of types with nominal working voltages ranging from 3.3 to 15 V.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134).

Average forward current	$I_{F(AV)}$	max.	200	mA

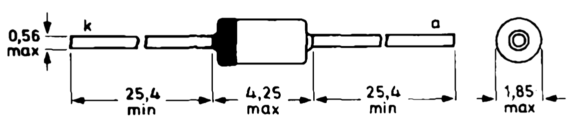
type number	$I_{Zmax.}$ (mA)	type number	$I_{Zmax.}$ (mA)
CV7138	100	CV7105	45
CV7139	95	CV7142	40
CV7140	90	CV7143	38
CV7141	85	CV7144	34
CV7099	80	CV7145	32
CV7100	70	CV7146	28
CV7101	65	CV7106	25
CV7102	60		
CV7103	55		
CV7104	50		

Power dissipation (see also derating curve, Fig.2)	P_{tot}	max.	400	mW
Operating ambient temperature	T_{amb}		−65 to +150	^oC
Storage temperature	T_{stg}		−65 to +200	^oC

MECHANICAL DATA

Dimensions in mm

Fig.1 DO-35



Cathode indicated by coloured band.
The diodes are type-branded.

Products approved to CECC 50 005–005 (specification available on request).

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise stated

	working voltage*					differential resistance	
	V_Z (V) at $I_{Z\ test}$ = 5 mA			V_Z (V) at $I_{Z\ test}$ = 1 mA		r_{diff} (Ω) at $I_{Z\ test}$ = 5 mA	r_{diff} (Ω) at $I_{Z\ test}$ = 1 mA
	min.	nom.	max.	min.	max.	max.	max.
CV7138	3.1	3.3	3.5	2.1	3.0	120	600
CV7139	3.4	3.6	3.8	2.4	3.3	110	600
CV7140	3.7	3.9	4.1	2.8	3.7	100	600
CV7141	4.0	4.3	4.5	3.3	4.2	90	600
CV7099	4.4	4.7	5.0	3.6	4.6	85	500
CV7100	4.8	5.1	5.4	4.2	5.1	80	480
CV7101	5.3	5.6	6.0	4.6	5.4	75	400
CV7102	5.8	6.2	6.6	5.1	6.5	40	150
CV7103	6.4	6.8	7.2	6.0	7.2	15	80
CV7104	7.1	7.5	7.9	6.7	7.9	15	80
CV7105	7.7	8.2	8.7	7.4	8.7	15	80
CV7142	8.6	9.1	9.6	8.3	9.6	15	100
CV7143	9.4	10.0	10.6	9.1	10.6	20	150
CV7144	10.4	11.0	11.6	10.4	11.5	40	150
CV7145	11.4	12.0	12.6	11.1	12.5	60	150
CV7146	12.4	13.0	14.1	12.0	14.1	75	170
CV7106	13.9	15.0	15.6	13.6	15.4	90	200

* t_p = 300 μs; $\delta \leqslant 2\%$.

CHARACTERISTICS (continued)

T_{amb} = 25 °C unless otherwise stated.

	temperature coefficient* $\lvert S_Z \rvert$ (%/°C) at $I_{Z\,test}$ = 5 mA min.	max.	reverse current I_R (mA) max.	I_R (mA) T_{amb} = 100 °C max.	at V_R (V)
CV7138	−0.1	−0.04	500	1000	2.0
CV7139	−0.1	−0.03	250	500	2.0
CV7140	−0.09	−0.02	100	200	2.0
CV7141	−0.08	−0.00	50	100	2.0
CV7099	−0.07	+0.01	400	800	3.3
CV7100	−0.055	+0.03	250	500	3.9
CV7101	−0.035	+0.045	250	500	4.3
CV7102	−0.015	+0.06	150	300	4.7
CV7103	+0.005	+0.075	150	300	5.6
CV7104	+0.02	+0.085	100	200	6.2
CV7105	+0.035	+0.095	100	200	6.8
CV7142	+0.03	+0.1	50	200	7.5
CV7143	+0.03	+0.1	50	200	8.2
CV7144	+0.03	+0.1	20	200	9.1
CV7145	+0.04	+0.11	20	200	10.0
CV7146	+0.04	+0.11	20	200	11.0
CV7106	+0.04	+0.11	20	200	12.0

*T_{amb} = 25 to 60 °C; t_p = 300 μs; $\delta \leq$ 2%.

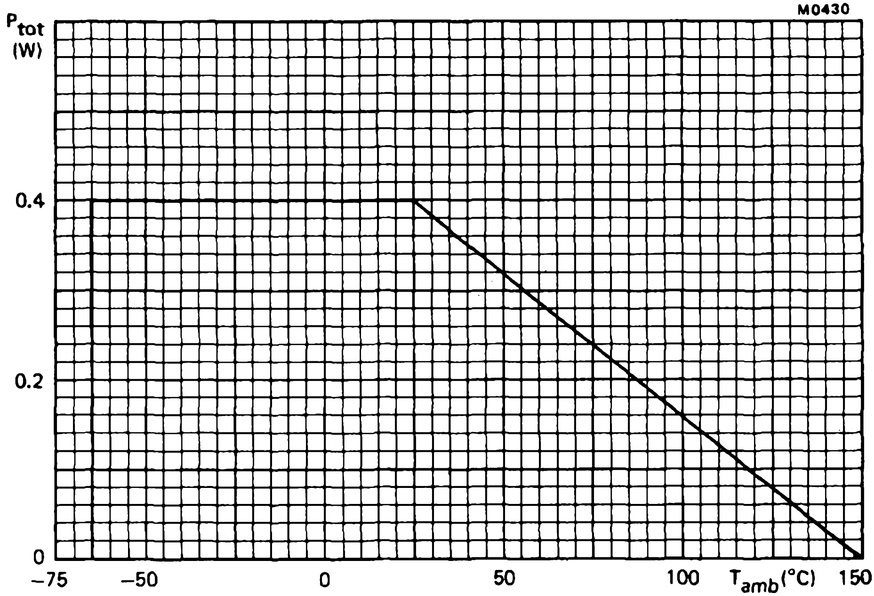


Fig.2 Maximum allowable power dissipation versus ambient temperature.

VOLTAGE REFERENCE DIODES

D

VOLTAGE REFERENCE DIODES

The BZV10 to 14 are temperature compensated voltage reference diodes in a DO-34 envelope. They are primarily intended for use as voltage reference sources in measuring instruments such as digital voltmeters.

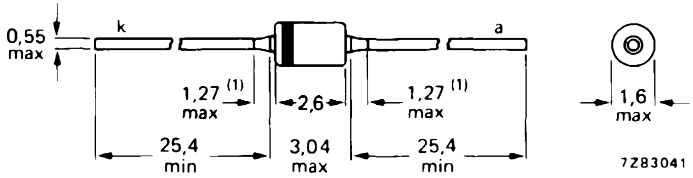
QUICK REFERENCE DATA

			min.	nom.	max.	
Reference voltage at I_Z = 2,0 mA		V_{ref}	6,175	6,5	6,825	V
Temperature coefficient at I_Z = 2,0 mA						
(see notes 1 and 2 on page 3 and	BZV10	$\lvert S_Z \rvert$		< 0,01		%/K
the graph on page 4)	BZV11	$\lvert S_Z \rvert$		< 0,005		%/K
	BZV12	$\lvert S_Z \rvert$		< 0,002		%/K
	BZV13	$\lvert S_Z \rvert$		< 0,001		%/K
	BZV14	$\lvert S_Z \rvert$		< 0,0005		%/K
Operating ambient temperature		T_{amb}		0 to + 70		°C

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-34 (SOD-68).



(1) Lead diameter in this zone uncontrolled.

Cathode indicated by coloured band.

The diodes are type-branded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Working current (d.c.)	I_Z	max.	50 mA
Working current (peak value)	I_{ZM}	max.	50 mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400 mW
Storage temperature	T_{stg}		−65 to +200 °C
Operating ambient temperature	T_{amb}		0 to +70 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,375 K/mW

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

			min.	nom.	max.	
Reference voltage at I_Z = 2,0 mA		V_{ref}	6,175	6,5	6,825	V

Reference voltage excursion at I_Z = 2,0 mA*

Ambient temperature test points: 0; +25 °C and +70 °C (see notes 1 and 2 on the next page)	BZV10	$\|\Delta V_{ref}\|$	<	46,0	mV
	BZV11	$\|\Delta V_{ref}\|$	<	23,0	mV
	BZV12	$\|\Delta V_{ref}\|$	<	9,0	mV
	BZV13	$\|\Delta V_{ref}\|$	<	4,6	mV
	BZV14	$\|\Delta V_{ref}\|$	<	2,3	mV

Temperature coefficient at I_Z = 2,0 mA* (see notes 1 and 2 on the next page)	BZV10	$\|S_Z\|$	<	± 0,01	%/K
	BZV11	$\|S_Z\|$	<	± 0,005	%/K
	BZV12	$\|S_Z\|$	<	± 0,002	%/K
	BZV13	$\|S_Z\|$	<	± 0,001	%/K
	BZV14	$\|S_Z\|$	<	± 0,0005	%/K

Differential resistance at I_Z = 2,0 mA	r_{diff}	typ.	30	Ω
		<	50	Ω

* For accuracy of I_Z see Fig. 3.

Notes

1. I_Z tolerance and stability of I_Z.

   The quoted values of ΔV_{ref} are based on a constant current I_Z. Two factors can cause V_{ref} to change, namely the differential resistance r_{diff} and the temperature coefficient S_Z.

   a. As the max. r_{diff} of the device can be 50 Ω, a change of 0,01 mA in the current through the reference diode will result in a ΔV_{ref} of 0,01 mA x 50 Ω = 0,5 mV. This level of ΔV_{ref} is not significant on a BZV10 ($\Delta V_{ref} < 46$ mV), it is however very significant on a BZV14 ($\Delta V_{ref} < 2{,}3$ mV).

   b. The temperature coefficient of the reference voltage S_Z is a function of I_Z. Reference diodes are classified at the specified test current and the S_Z of the reference diode will be different at the different levels of I_Z. The absolute value of I_Z is important, however, the stability of I_Z, once the level has been set, is far more significant. This applies particularly to the BZV13 and BZV14. The effect of I_Z stability on S_Z is shown in Fig. 3.

2. Voltage excursion (ΔV_{ref} and temperature coefficient).

   All reference diodes are characterized by the 'box method'. This guarantees a maximum voltage excursion (ΔV_{ref}) over the specified temperature range, at the specified test current (I_Z), verified by tests at indicated temperature points within the range. V_Z is measured and recorded at each temperature specified. The ΔV_{ref} between the highest and lowest values must not exceed the maximum ΔV_{ref} given. The temperature coefficient, therefore is given only as a reference; but may be derived from:

$$S_Z = \frac{(V_{ref\,1} - V_{ref\,2}) \times 100}{(T_{amb2} - T_{amb1}) \times V_{ref\,nom}} \ \%/\mathrm{K}.$$

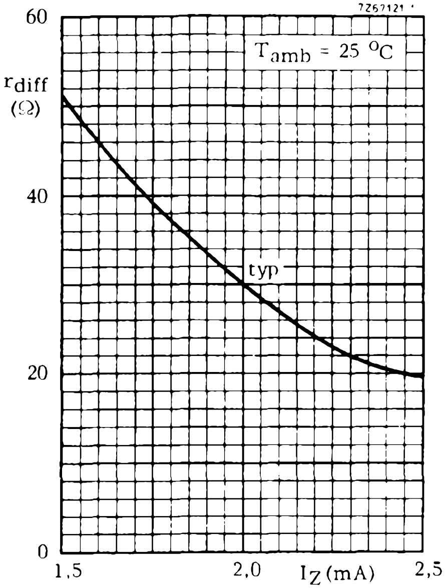


Fig. 2 Typical values differential resistance.

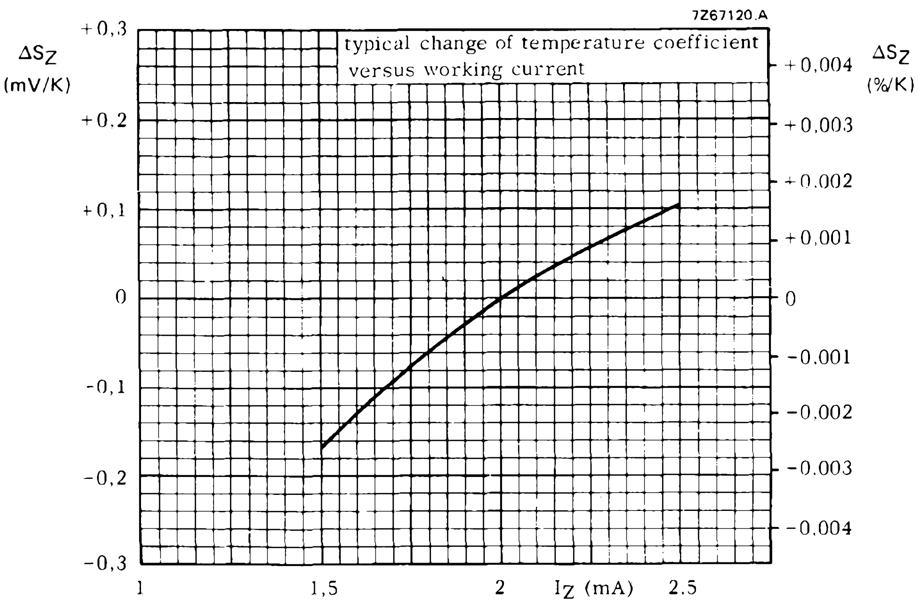


Fig. 3 Typical change of temperature coefficient.

VOLTAGE REFERENCE DIODES

Voltage reference diodes in a whiskerless glass envelope. They have a very low temperature coefficient and are primarily intended for use as reference sources.

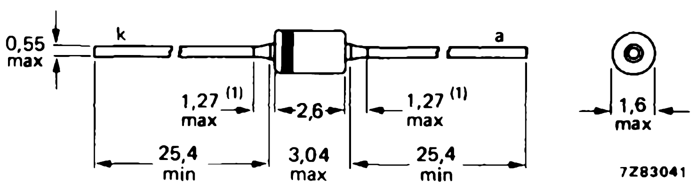
QUICK REFERENCE DATA

			min.	typ.	max.	
Reference voltage at I_Z = 7,5 mA		V_{ref}	6,2	6,5	6,8	V
Temperature coefficient at I_Z = 7,5 mA *	BZX90:	$\lvert S_Z \rvert$	<	0,01		%/°C
	BZX91:	$\lvert S_Z \rvert$	<	0,005		%/°C
	BZX92:	$\lvert S_Z \rvert$	<	0,002		%/°C
	BZX93:	$\lvert S_Z \rvert$	<	0,001		%/°C
	BZX94:	$\lvert S_Z \rvert$	<	0,0005		%/°C
Operating ambient temperature		T_{amb}	−55	to + 100		°C

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-34 (SOD-68).



(1) Lead diameter in this zone uncontrolled.

Cathode indicated by coloured band.

The diodes are type-branded.

* For accuracy of I_Z see graphs on page 5.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Working current (d.c.)	I_Z	max.	50	mA
Working current (peak value)	I_{ZM}	max.	50	mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW
Storage temperature	T_{stg}	−65 to	+ 200	°C
Operating ambient temperature	T_{amb}	−55 to	+ 100	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,4	°C/mW

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

			min.	nom.	max.	
Reference voltage at I_Z = 7,5 mA		V_{ref}	6,2	6,5	6,8	V
Reference voltage excursion at I_Z = 7,5 mA * T_{amb} = −55 to + 100 °C	BZX90:	$\|\Delta V_{ref}\|$	<	100		mV
	BZX91:	$\|\Delta V_{ref}\|$	<	50		mV
	BZX92:	$\|\Delta V_{ref}\|$	<	20		mV
	BZX93:	$\|\Delta V_{ref}\|$	<	10		mV
	BZX94:	$\|\Delta V_{ref}\|$	<	5		mV
Temperature coefficient at I_Z = 7,5 mA * T_{amb} = −55 to + 100 °C	BZX90:	$\|S_Z\|$	<	0,01		%/°C
	BZX91:	$\|S_Z\|$	<	0,005		%/°C
	BZX92:	$\|S_Z\|$	<	0,002		%/°C
	BZX93:	$\|S_Z\|$	<	0,001		%/°C
	BZX94:	$\|S_Z\|$	<	0,0005		%/°C
Differential resistance at I_Z = 7,5 mA		r_{diff}	<	15		Ω

NOTE

The temperature coefficient (S_Z) of the reference voltage (V_{ref}) is obtained from the following equation:

$$S_Z = \frac{V_{ref1} - V_{ref2}}{(T_{amb2} - T_{amb1}) \times V_{ref\,nom}} \times 100\ \%/^{\circ}C$$

* For accuracy of I_Z see graphs on page 5.

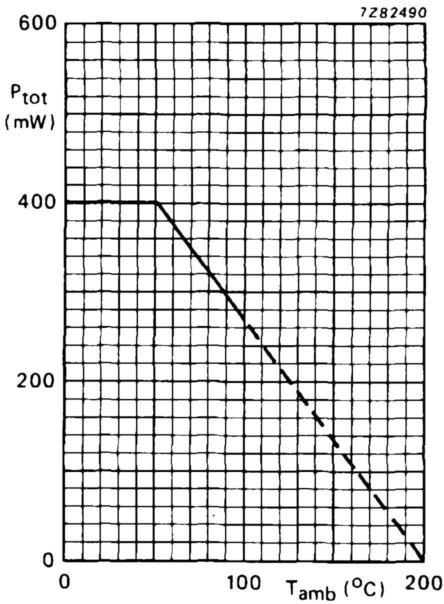


Fig. 2.

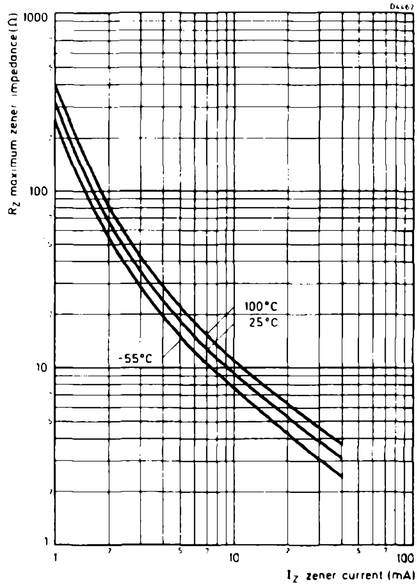


Fig. 3.

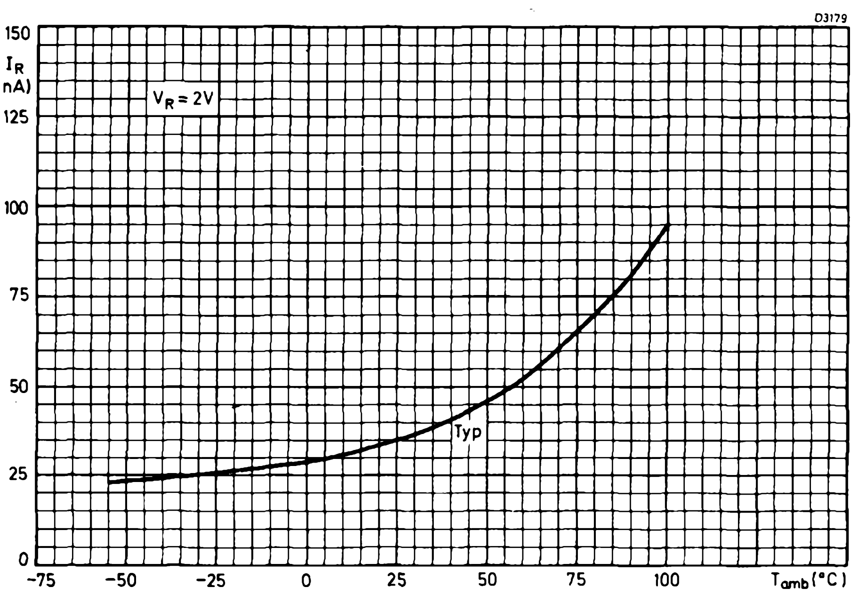


Fig. 4.

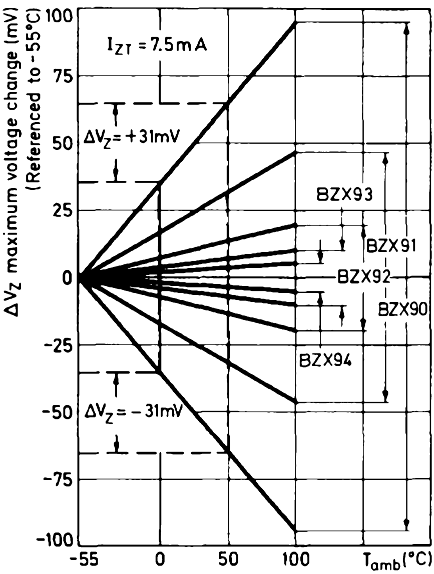


Fig. 5.

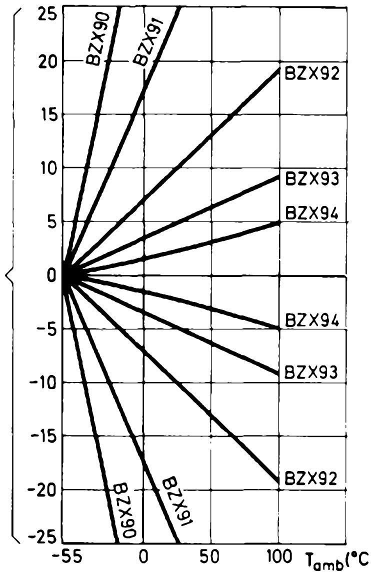


Fig. 6.

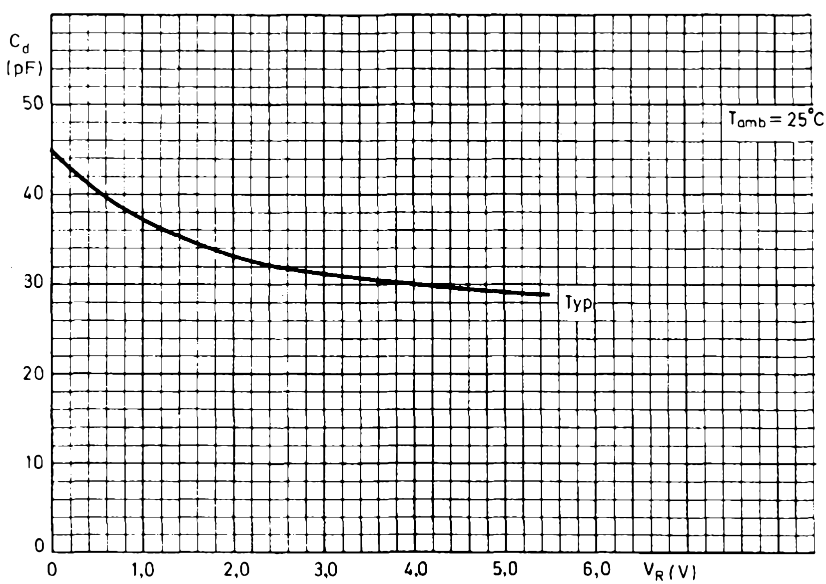


Fig. 7.

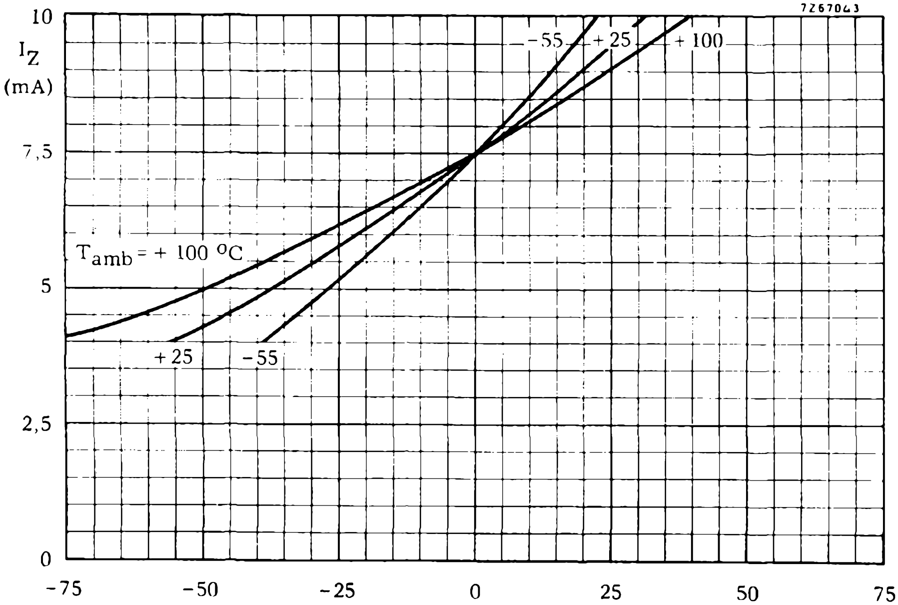


Fig. 8 Max. ΔV_{ref} (mV) (referenced to I_Z = 7,5 mA).

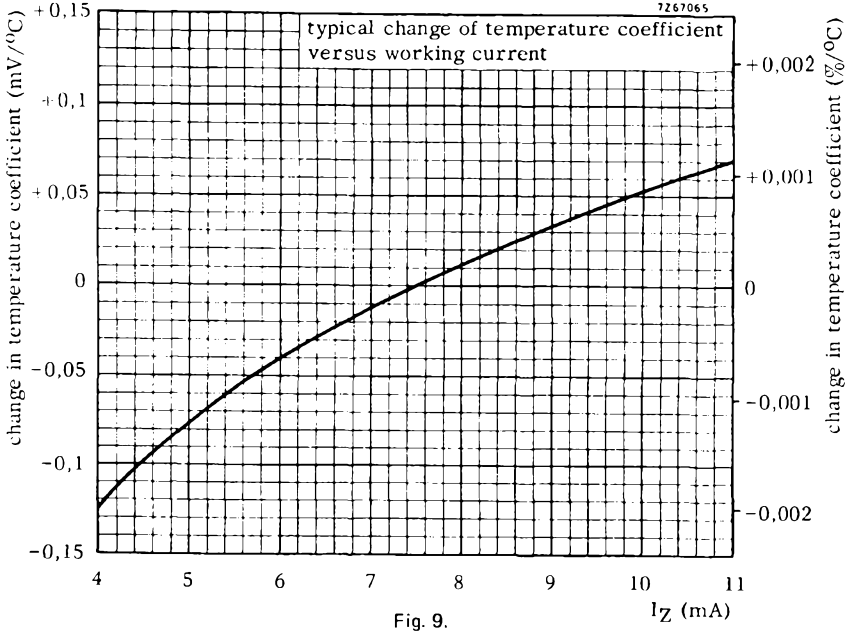


Fig. 9.

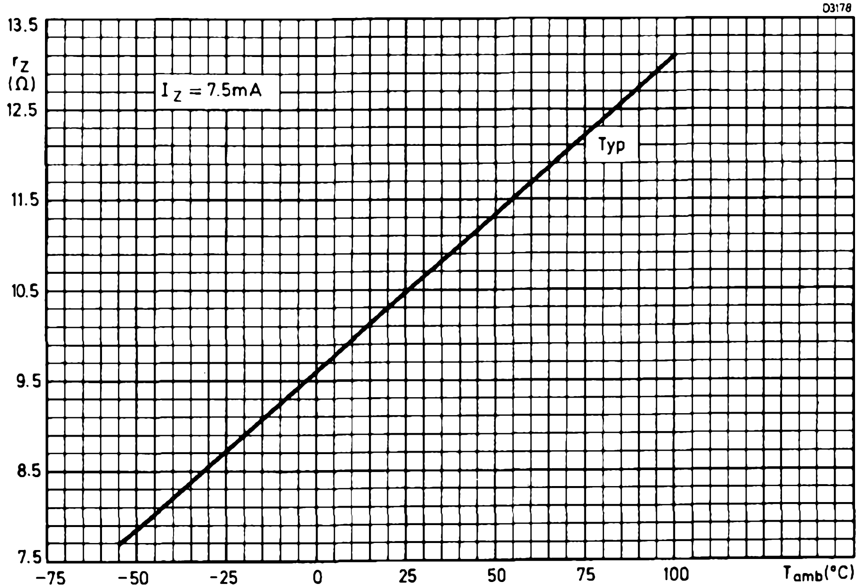

D3178
13.5
r_Z (Ω)
12.5
11.5
10.5
9.5
8.5
7.5
$I_Z = 7.5mA$
Typ
−75
−50
−25
0
25
50
75
100
T_{amb}(°C)

Fig. 10.

VOLTAGE REFERENCE DIODES

Voltage reference diodes in a DO-34 envelope. They have a very low temperature coefficient and are primarily intended for use as voltage reference sources in measuring instruments such as digital voltmeters.

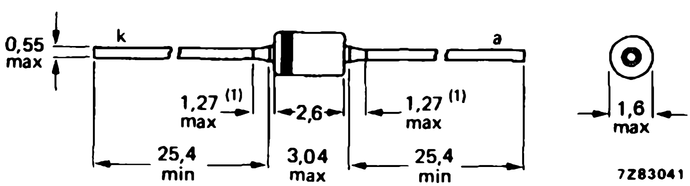
QUICK REFERENCE DATA

				min.	nom.	max.	
Reference voltage at I_Z = 7,5 mA		V_{ref}		5,89	6,20	6,51	V
Effective temperature coefficient at I_Z = 7,5 mA* (see notes 1 and 2 on page 3 and the graphs on pages 4 and 5)	1N821	$\|S_Z\|$	<			0,01	%/K
	1N823	$\|S_Z\|$	<			0,005	%/K
	1N825	$\|S_Z\|$	<			0,002	%/K
	1N827	$\|S_Z\|$	<			0,001	%/K
	1N829	$\|S_Z\|$	<			0,0005	%/K
Operating ambient temperature		T_{amb}			−55 to + 100		°C

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-34 (SOD-68).



(1) Lead diameter in this zone uncontrolled.

Cathode indicated by coloured band

The diodes are type-branded.

* For accuracy of I_Z see graphs on pages 4 and 5.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Working current (d.c.)	I_Z	max.	50	mA
Working current (peak value)	I_{ZM}	max.	50	mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	400	mW
Storage temperature	T_{stg}		−65 to + 200	°C
Operating ambient temperature	T_{amb}		−55 to + 100	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,375	K/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			min.	nom.	max.	
Reference voltage at I_Z = 7,5 mA		V_{ref}	5,89	6,20	6,51	V

Reference voltage excursion at I_Z = 7,5 mA* ambient temperature test points: −55; + 25; + 75; + 100 °C (see notes 1 and 2 on page 3 and the graphs on pages 4 and 5)	1N821	$\|\Delta V_{ref}\|$	<	96	mV
	1N823	$\|\Delta V_{ref}\|$	<	48	mV
	1N825	$\|\Delta V_{ref}\|$	<	19	mV
	1N827	$\|\Delta V_{ref}\|$	<	9	mV
	1N829	$\|\Delta V_{ref}\|$	<	5	mV
Effective temperature coefficient at I_Z = 7,5 mA* (see notes 1 and 2 on page 3 and the graphs on pages 4 and 5)	1N821	$\|S_Z\|$	<	0,01	%/K
	1N823	$\|S_Z\|$	<	0,005	%/K
	1N825	$\|S_Z\|$	<	0,002	%/K
	1N827	$\|S_Z\|$	<	0,001	%/K
	1N829	$\|S_Z\|$	<	0,0005	%/K
Differential resistance at I_Z = 7,5 mA 1N821 to 1N829		r_{diff}	<	15	Ω

* For accuracy of I_Z see graphs on pages 4 and 5.

Notes

1. I_Z tolerance and stability of I_Z.

   The quoted values of ΔV_{ref} are based on a constant current I_Z. Two factors can cause V_{ref} to change, namely the differential resistance r_{diff} and the temperature coefficient S_Z.

   a. As the max. r_{diff} of the device can be 15 Ω, a change of 0,01 mA in the current through the reference diode will result in a ΔV_{ref} of 0,01 mA x 15 Ω = 0,15 mV. This level of ΔV_{ref} is not significant on a 1N821 ($\Delta V_{ref} < 96$ mV), it is however very significant on a 1N829 ($\Delta V_{ref} < 5$ mV).

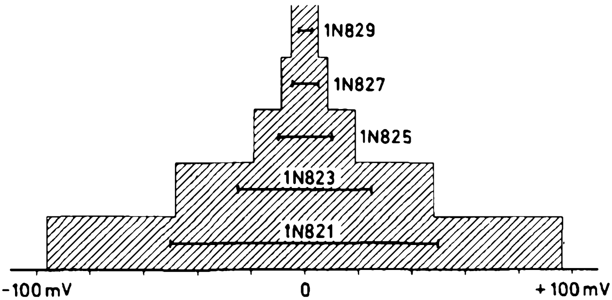
   b. The temperature coefficient of the reference voltage S_Z is a function of I_Z. Reference diodes are classified at the specified test current and the S_Z of the reference diode will be different at different levels of I_Z. The absolute value of I_Z is important, however, the stability of I_Z, once the level has been set, is far more significant. This applies particularly to the 1N829.

      The effect of I_Z stability on S_Z is shown in the graph on page 5.

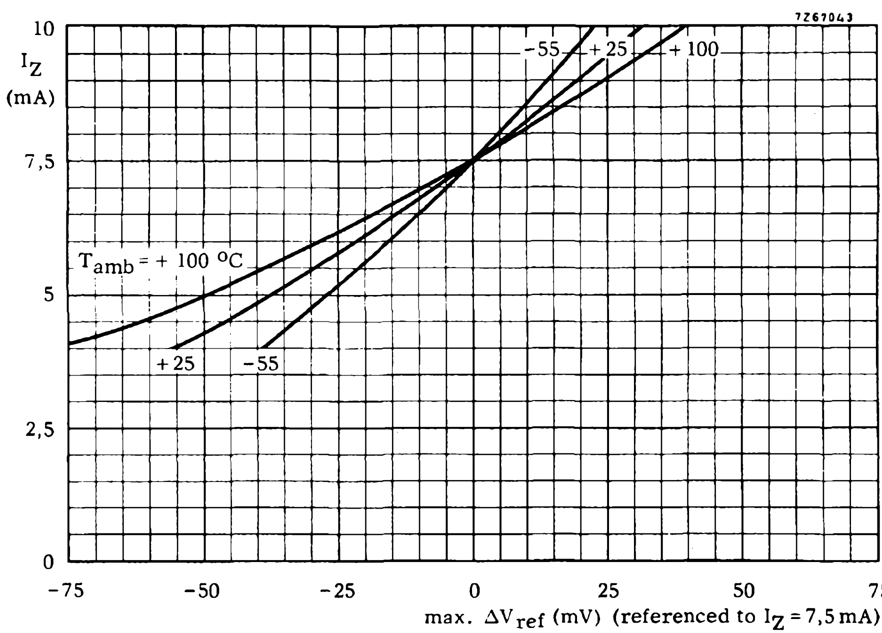
2. Voltage excursion (ΔV_{ref} and temperature coefficient).

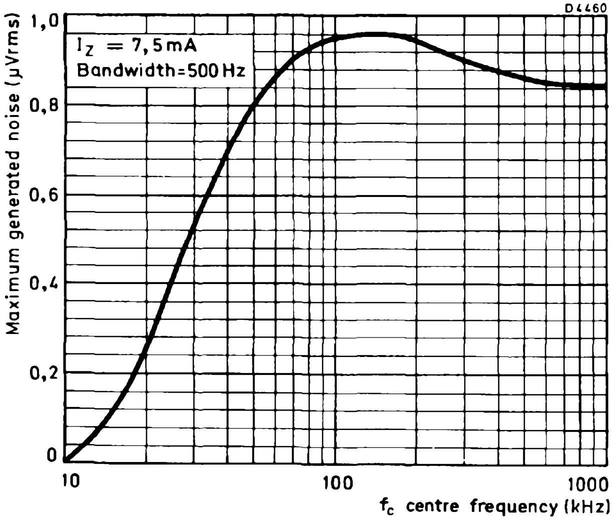
   All reference diodes are characterized by the 'box method'. This guarantees a maximum voltage excursion (ΔV_{ref}) over the specified temperature range, at the specified test current (I_Z), verified by tests at indicated temperature points within the range. V_Z is measured and recorded at each temperature specified. The ΔV_{ref} between the highest and lowest values must not exceed the maximum ΔV_{ref} given. The temperature coefficient, therefore is given only as a reference; but may be derived from:

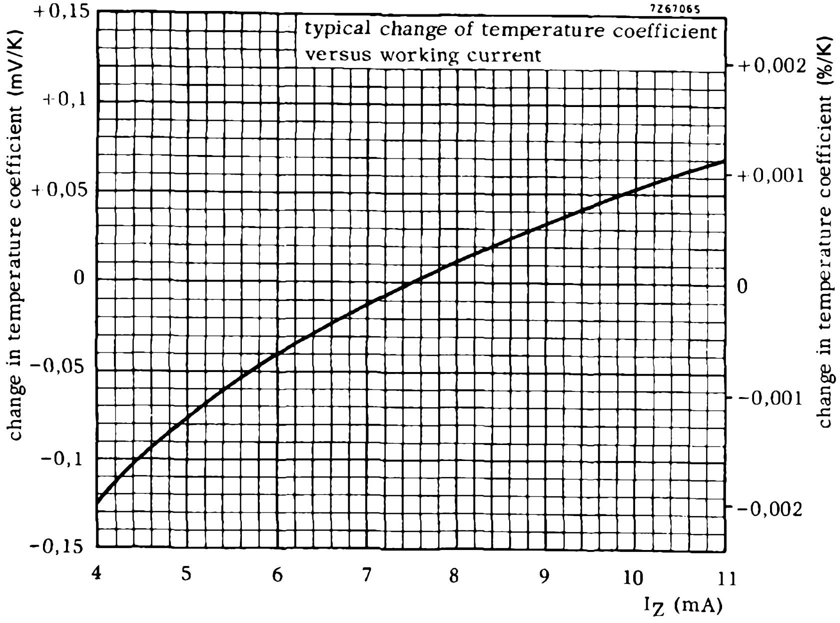
$$S_Z = \frac{(V_{ref\ 1} - V_{ref\ 2}) \times 100}{(T_{amb\ 2} - T_{amb\ 1}) \times V_{ref\ nom}} \ \%/K$$

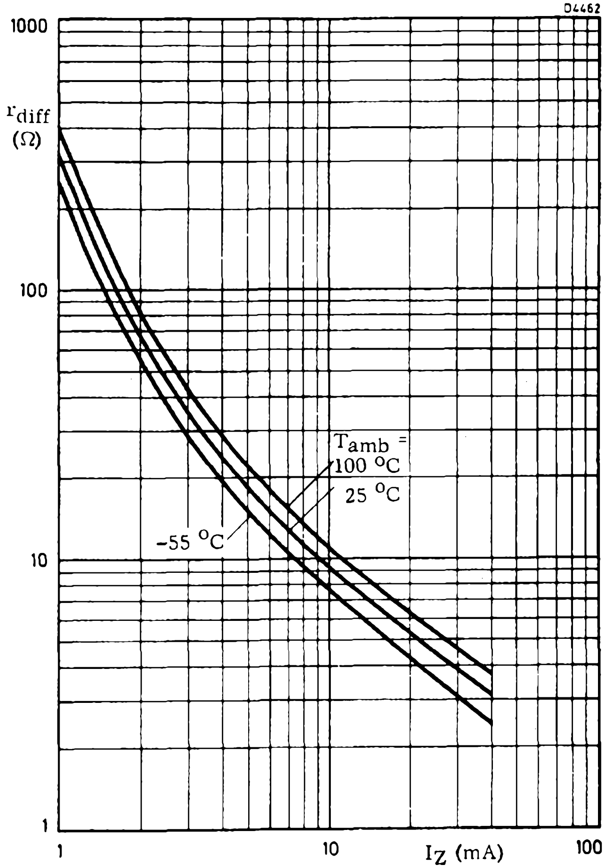


Maximum reference voltage variation (line section) caused by temperature variations within the range from −55 °C to + 100 °C at a constant working current of 7,5 mA. The voltage variations may shift horizontally within the shaded area. The zero point may vary from 5890 mV to 6510 mV and differs from diode to diode.




D4460
I_Z = 7,5 mA
Bandwidth = 500 Hz
Maximum generated noise (μVrms)
1,0
0,8
0,6
0,4
0,2
0
10
100
1000
f_c centre frequency (kHz)


7Z67065
typical change of temperature coefficient
versus working current
change in temperature coefficient (mV/K)
+0,15
+0,1
+0,05
0
−0,05
−0,1
−0,15
change in temperature coefficient (%/K)
+0,002
+0,001
0
−0,001
−0,002
4
5
6
7
8
9
10
11
I_Z (mA)


D4462
1000
100
10
1
r_{diff} (Ω)
1
10
100
I_Z (mA)
T_{amb} =
100 °C
25 °C
-55 °C

RECTIFIER DIODES
(Low power)

E

PARALLEL EFFICIENCY DIODES

Double-diffused passivated rectifier diodes in hermetically sealed axial-leaded glass envelopes, intended for use as efficiency diodes in transistorized horizontal deflection circuits of television receivers. The devices feature high reverse voltage capability with controlled recovery time.

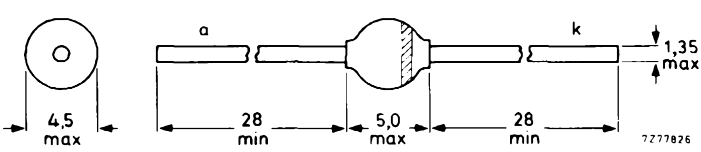
QUICK REFERENCE DATA

			BY438	BY228	
Repetitive peak reverse voltage	V_{RRM}	max.	1200	1500	V
Working peak forward current	I_{FWM}	max.	5		A
Repetitive peak forward current	I_{FRM}	max.	10		A
Total reverse recovery time	t_{tot}	<	20		μs

MECHANICAL DATA

Dimensions in mm

Fig.1 SOD-64.



The marking band indicates the cathode.

The diodes are type branded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BY438	BY228	
Non-repetitive peak reverse voltage during flashover of picture tube	V_{RSM}	max.	1300	1650	V
Repetitive peak reverse voltage	V_{RRM}	max.	1200	1500	V
Working reverse voltage	V_{RW}	max.	1200	1500	V
Working peak forward current	I_{FWM}	max.		5	A
Repetitive peak forward current	I_{FRM}	max.		10	A
Non-repetitive peak forward current $t = 10$ ms; half sine-wave; $T_j = 140\ ^oC$ prior to surge; with reapplied V_{RWmax}	I_{FSM}	max.		50	A
Storage temperature	T_{stg}			−65 to +175	^oC
Junction temperature	T_j	max.		140	^oC

THERMAL RESISTANCE

Influence of mounted method

1. Thermal resistance from junction to tie-point at a lead length of 10 mm — $R_{th\ j\text{-}tp}$ = 25 K/W
2. Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 μm; Fig. 2 — $R_{th\ j\text{-}a}$ = 75 K/W

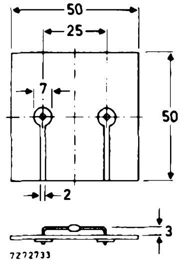


Fig. 2.

CHARACTERISTICS

Forward voltage * $I_F = 5$ A; $T_j = 25\ ^oC$	V_F	<	1,5	V*
Reverse current $V_R = V_{RWmax}$; $T_j = 140\ ^oC$	I_R	<	200	μA
Total reverse recovery time when switched from $I_F = 1$ A; $-dI_F/dt = 0{,}05$ A/μs; $T_j = 140\ ^oC$	t_{tot}	<	20	μs
Forward recovery time when switched to $I_F = 5$ A with $t_r = 0{,}1\ \mu$s; $T_j = 140\ ^oC$	t_{fr}	<	1	μs

* Measured under pulse conditions to avoid excessive dissipation.

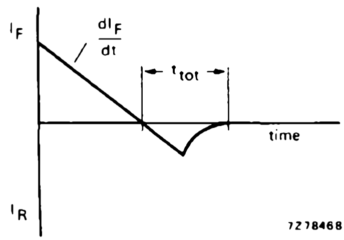


Fig. 3 Definition of t_{tot}.

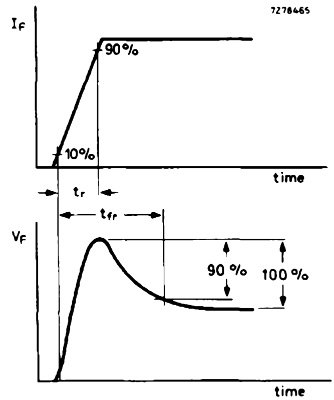


Fig. 4 Definition of t_{fr}.

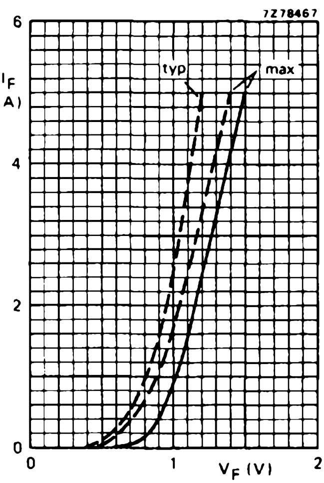


Fig. 5 —— T_j = 25 °C;
– – – T_j = 140 °C.

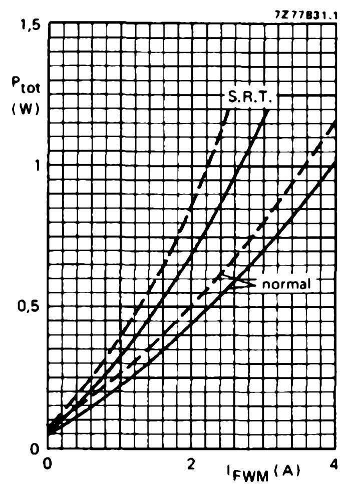


Fig. 6 P_{tot} = power dissipation including switching losses:
– – – – 819 lines; ——— 625 lines;
S.R.T. = self regulating time-base circuit;
normal = conventional deflection circuit or high-voltage E–W modulator circuit;
I_{FWM} is the nominal diode current, for tolerances and spreads 25% safety margin is taken into account.

APPLICATION INFORMATION

In designing horizontal deflection circuits, allowance has to be made for component and operating spreads, in order not to exceed any Absolute Maximum Rating.
Extensive analysis have shown that for the working peak forward current and reverse voltage the total allowance need not to be higher than 25%. For that reason the dissipation graph (Fig. 6) is based on the nominal I_{FWM}; 25% safety margin for tolerance and spreads is taken into account.

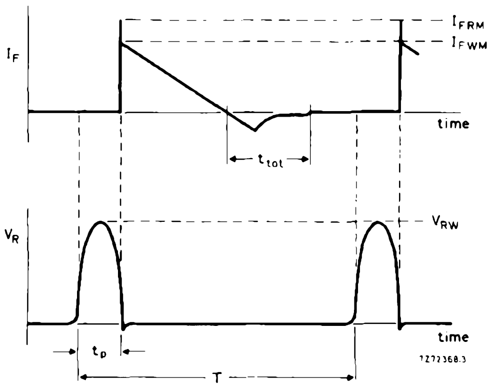


Fig. 7 Basic waveforms.

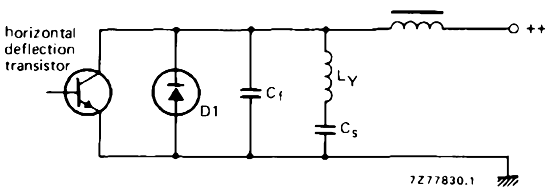


Fig.8 Basic conventional horizontal deflection circuit.
D1 = BY228 or BY438.

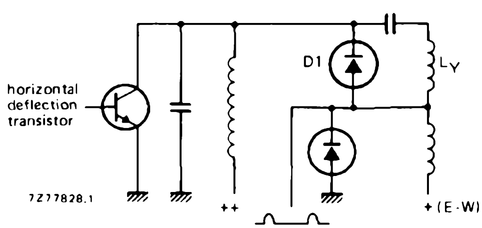


Fig.9 Basic high-voltage E—W modulator circuit.
D1 = BY228 or BY438.

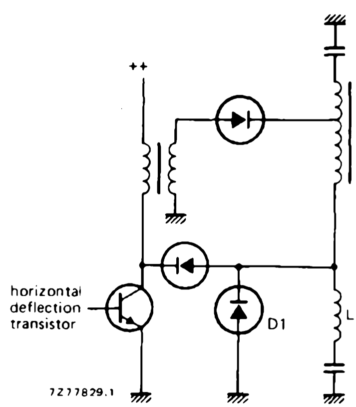


Fig. 10 Basic self-regulating time base circuit (S.R.T.).
D1 = BY228 or BY438.

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

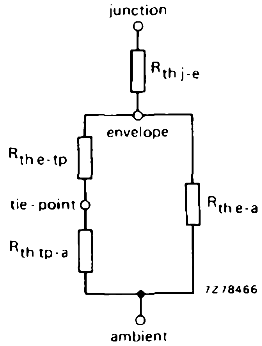


Fig. 11 Thermal model. $R_{th\ j\text{-}e} = 12$ K/W.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

lead length	5	10	15	20	25	mm
$R_{th\ e\text{-}tp}$	7	14	21	28	35	K/W
$R_{th\ e\text{-}a}$	410	300	230	185	155	K/W

The thermal resistance between tie-point and ambient depends on the mounting method; for mounting on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness ⩾ 40 μm, the following values apply:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\ tp\text{-}a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm^2 per lead $R_{th\ tp\text{-}a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm^2 per lead $R_{th\ tp\text{-}a}$ is 45 K/W.

Note
Any temperature can be calculated by using the dissipation graph (Fig. 6) and the above thermal model.

PARALLEL EFFICIENCY DIODES

Double-diffused passivated rectifier diodes in hermetically sealed axial-leaded glass envelopes, intended for use as efficiency diodes in transistorized horizontal deflection circuits and PPS (power-pack system) circuits of television receivers. The devices feature high reverse voltage capability with controlled recovery time.

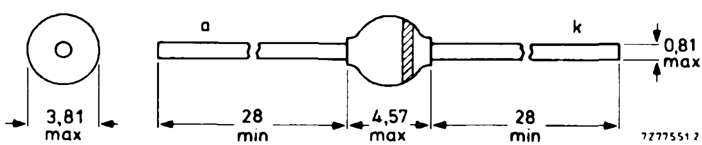
QUICK REFERENCE DATA

			BY458	BY448	
Repetitive peak reverse voltage	V_{RRM}	max.	1200	1500	V
Working peak forward current	I_{FWM}	max.	4		A
Repetitive peak forward current	I_{FRM}	max.	8		A
Total reverse recovery time	t_{tot}	<	20		μs

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-57.



The marking band indicates the cathode.

The diodes are type-branded.

RATINGS

Limiting valu. in accordance with the Absolute Maximum System (IEC 134)

			BY458	BY448	
Non-repetitive peak reverse voltage during flashover of picture tube	V_{RSM}	max.	1300	1650	V
Repetitive peak reverse voltage	V_{RRM}	max.	1200	1500	V
Working peak forward current	I_{FWM}	max.	4		A
Repetitive peak forward current	I_{FRM}	max.	8		A
Non-repetitive peak forward current $t = 10$ ms; half sine-wave; $T_j = 140$ °C prior to surge; with reapplied V_{RRMmax}	I_{FSM}	max.	30		A
Storage temperature	T_{stg}		−65 to +175		°C
Operating junction temperature	T_j	max.	140		°C

THERMAL RESISTANCE

Influence of mounting method (see also OPERATING NOTES and Fig. 11)

The quoted value of $R_{th\,j\text{-}a}$ should be used only when no leads of other dissipating components run to the same tie-points.

Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 μm; Fig. 2 $R_{th\,j\text{-}a}$ = 100 °C/W

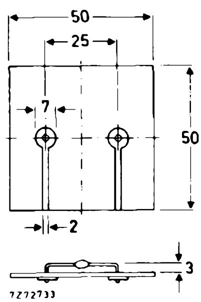


Fig. 2.

MOUNTING AND SOLDERING NOTES

Introduction

Excessive forces or temperatures applied to a diode may cause serious damage to the diode. To avoid damage when soldering and mounting, the following rules have to be followed.

Bending

During bending, the leads must be supported between body and bending point. Axial forces on the body during the bending process must not exceed 50 N. Perpendicular force on the body must be avoided as much as possible, however, if present, it shall not exceed 10 N. Bending the leads through 90° is allowed at any distance from the studs when it is possible to support the leads during the bending without contacting envelope or solder joints.

Twisting

Twisting the leads is allowed at any distance from the body if the lead is properly clamped between stud and twisting point. Without clamping, twisting is allowed only at a distance > 5 mm from the studs, the torque-angle must not exceed 30°.

Soldering

The minimum distance of soldering point to stud is 2 mm, the maximum allowed solder temperature is 300 °C, and the soldering time must not be longer than 10 seconds.

Prevent fast cooling after soldering.

When the device has to be mounted with straight or short-cropped leads, the leads should be soldered individually; bent leads may be soldered simultaneously. Do not correct the position of an already soldered device by pushing, pulling or twisting the body.

CHARACTERISTICS

Forward voltage $I_F = 3$ A; $T_j = 25$ °C	V_F	<	1,6 V*
Reverse current $V_R = V_{RRMmax}$; $T_j = 140$ °C	I_R	<	200 μA
Total reverse recovery time when switched from $I_F = 1$ A; $-dI_F/dt = 0,05$ A/μs; $T_j = 140$ °C	t_{tot}	<	20 μs

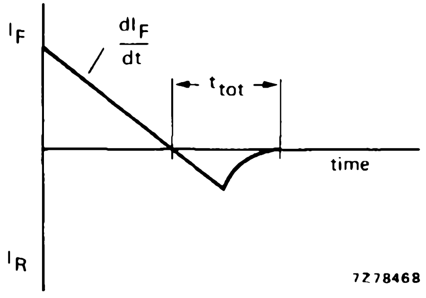


Fig. 3 Definition of t_{tot}.

* Measured under pulse conditions to avoid excessive dissipation.

CHARACTERISTICS (continued)

Forward recovery time when switched to I_F = 4 A with t_r = 0,1 μs; T_j = 140 °C	t_{fr}	<	1 μs

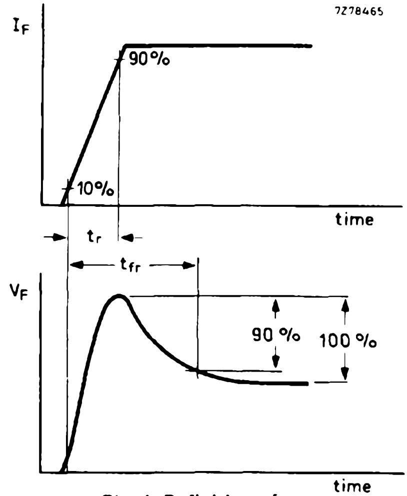


Fig. 4 Definition of t_{fr}.

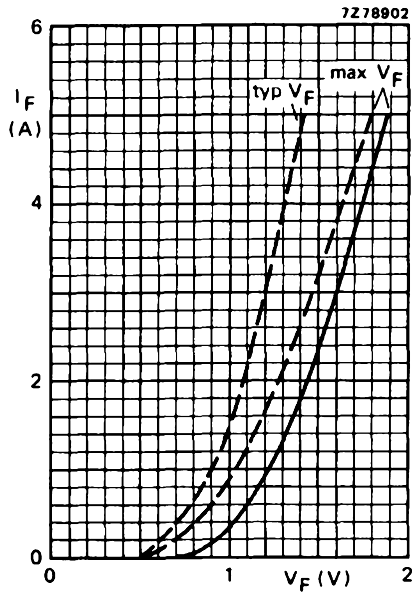


Fig. 5 —— T_j = 25 °C; – – – T_j = 140 °C.

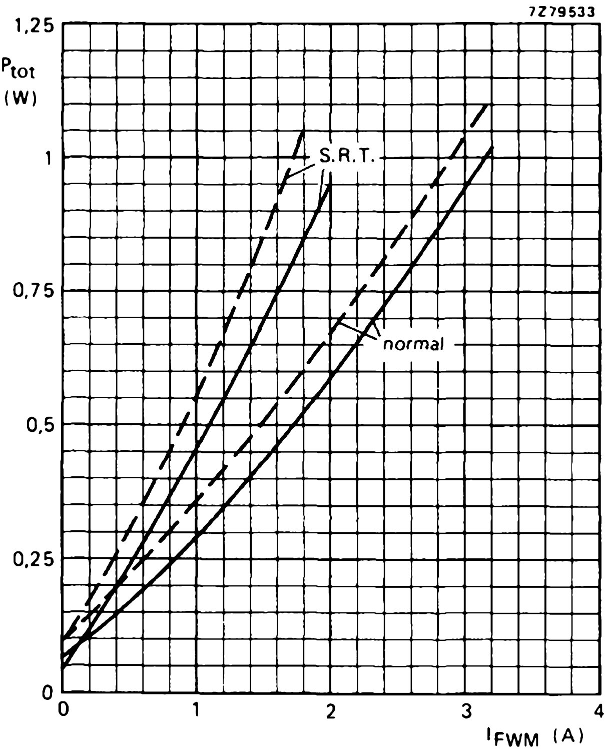


Fig. 6 P_{tot} = maximum power dissipation including switching losses; - - - 819 lines; —— 625 lines; S.R.T. = self regulating time-base circuit; normal = conventional deflection circuit or high-voltage E-W modulator circuit; I_{FWM} = the nominal peak diode current, for tolerances and spreads 25% safety margin is taken into account.

APPLICATION INFORMATION

In designing horizontal deflection circuits, allowance has to be made for component and operating spreads, in order not to exceed any Absolute Maximum Rating.
Extensive analysis have shown that for the working peak forward current and reverse voltage the total allowance need not to be higher than 25%. For that reason the dissipation graph (Fig. **6**) is based on the nominal I_{FWM}; 25% safety margin for tolerance and spreads is taken into account.

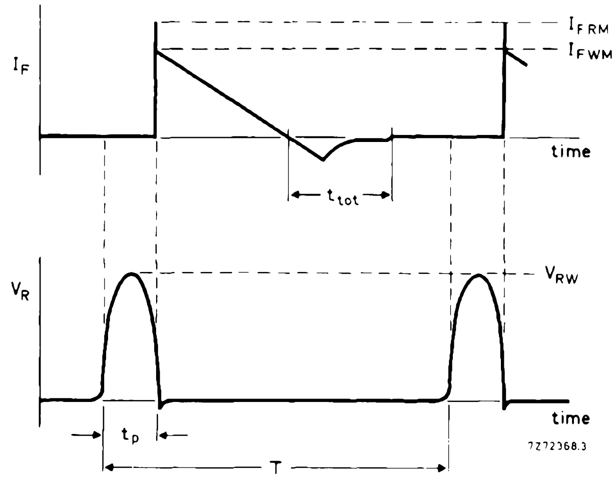


Fig. **7** Basic waveforms.

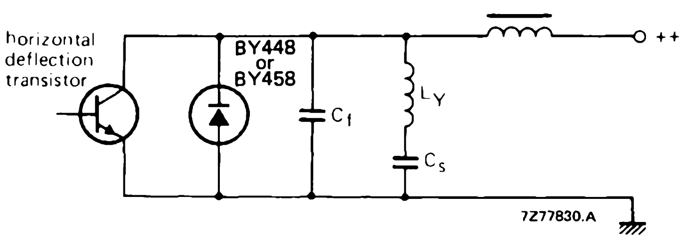


Fig. **8** Basic conventional horizontal deflection circuit.

APPLICATION INFORMATION (continued)

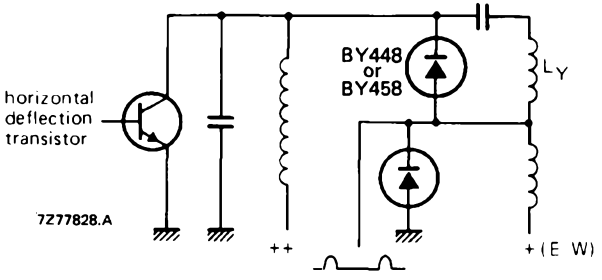


Fig. 9 Basic high-voltage E–W modulator circuit.

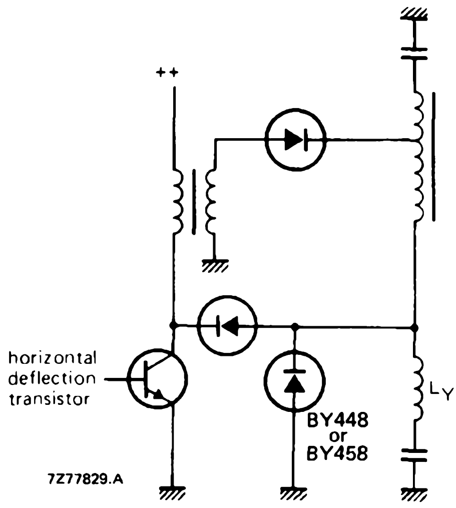


Fig. 10 Basic self-regulating time base circuit (S.R.T.).

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

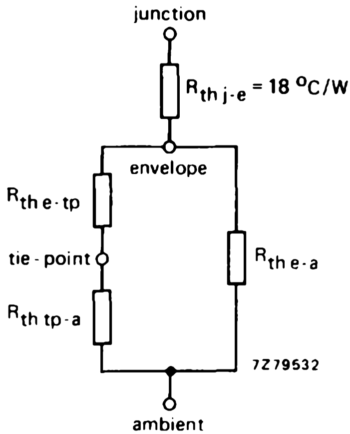


Fig. 11.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

lead length	5	10	15	20	25	mm
$R_{th\,e\text{-}tp}$	15	30	45	60	75	°C/W
$R_{th\,e\text{-}a}$	580	445	350	290	245	°C/W

The thermal resistance between tie-point and ambient depends on the mounting method; for mounting on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness ≥ 40 μm, the following values apply:

1. Mounting similar to method given on page 2: $R_{th\,tp\text{-}a}$ = 70 °C/W.
2. Mounted on a printed-circuit board with a copper laminate (per lead) of:
   1 cm^2 $R_{th\,tp\text{-}a}$ = 55 °C/W.
   2,25 cm^2 $R_{th\,tp\text{-}a}$ = 45 °C/W.

Note
Any temperature can be calculated by using the dissipation graph (Fig. 6) and the above thermal model.

SILICON E.H.T. SOFT-RECOVERY RECTIFIER DIODES

E.H.T. rectifier diodes in plastic envelopes intended for high-voltage multipliers and for use in tiny vision black-and-white television receivers. Because of the smallness of the envelope, the diodes should be potted when used at voltages above 9 kV, see page 3.

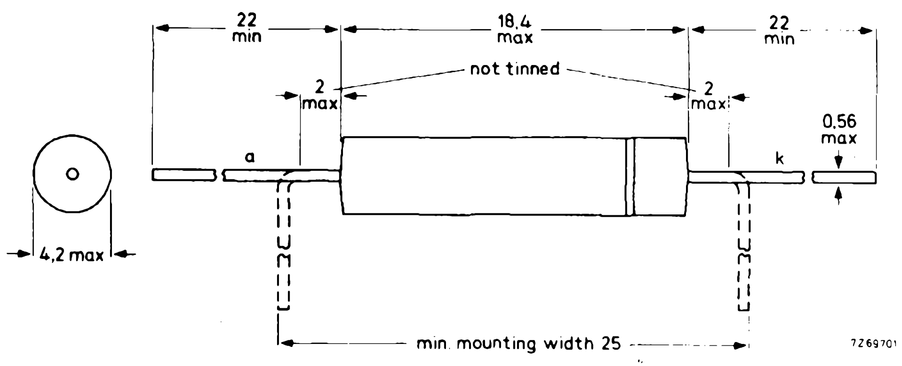
QUICK REFERENCE DATA

Working reverse voltage	V_{RW}	max	16	kV
Repetitive peak reverse voltage	V_{RRM}	max	18	kV
Average forward current	$I_{F(AV)}$	max	2,5	mA
Junction temperature	T_j	max	100	^oC
Reverse recovery				
Recovery charge	Q_s	typ	2,5	nC
Recovery time	t_{rr}	typ	0,4	μs

MECHANICAL DATA

Dimensions in mm

SOD-56



Available for current production only; not recommended for new designs.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Working reverse voltage	V_{RW}	max	16 kV
Repetitive peak reverse voltage	V_{RRM}	max	18 kV
Non-repetitive peak reverse voltage ($t \leqslant 10$ ms)	V_{RSM}	max	21 kV

Currents

Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max	2,5 mA
Repetitive peak forward current	I_{FRM}	max	500 mA *

Temperatures

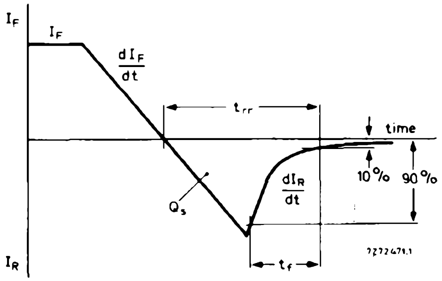
Storage temperature	T_{stg}		−65 to +100 °C
Junction temperature	T_j	max	100 °C

CHARACTERISTICS

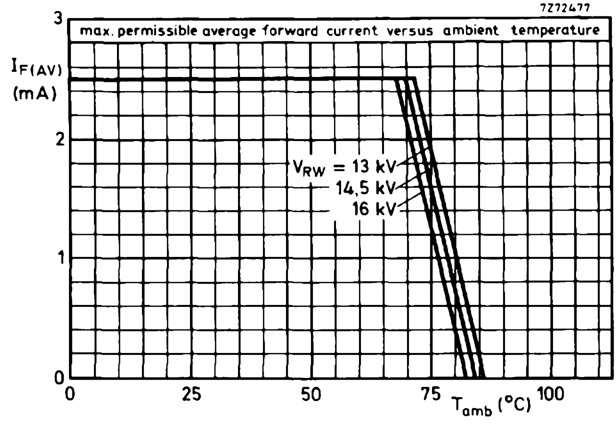
Forward voltage at I_F = 100 mA; T_j = 100 °C	V_F	<	44 V
Reverse current at V_R = 15 kV; T_j = 100 °C	I_R	<	5 μA

Reverse recovery when switched from
I_F = 200 mA to V_R = 100 V with
$-dI_F/dt$ = 200 mA/μs; T_j = 25 °C

Recovery charge	Q_s	typ	2,5 nC
Recovery time	t_{rr}	typ	0,4 μs
Fall time	t_f	>	0,15 μs

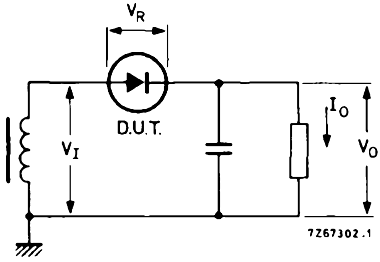


* The rectifier can withstand peak currents occurring at flashover in the picture tube.

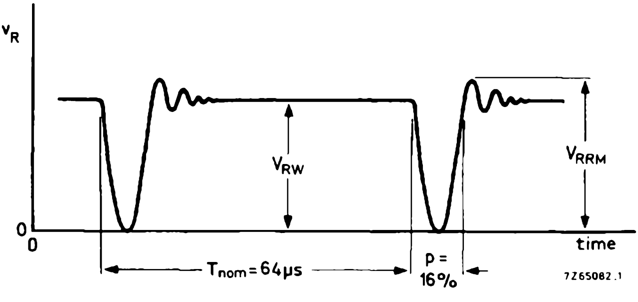


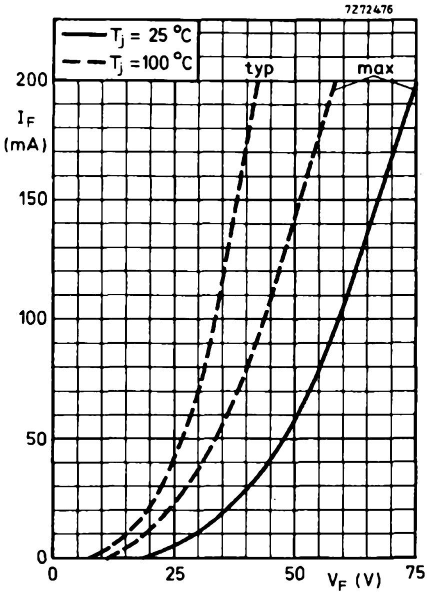
When used at voltages above 9 kV diode should be potted in such a way that $R_{th\ j\text{-}a}$ is less than 120 °C/W.

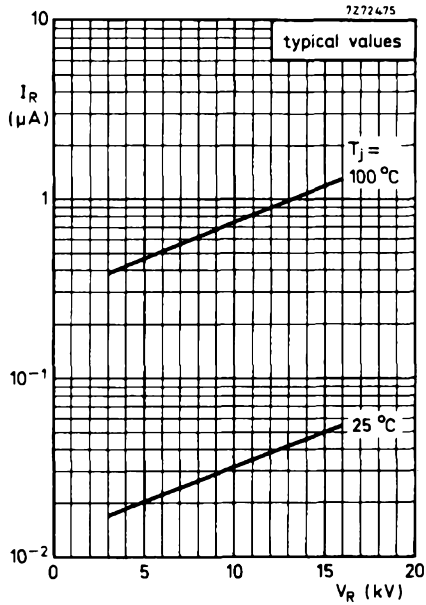
Typical operating circuit



Typical applied voltage




7272476
T_j = 25 °C
T_j = 100 °C
typ
max
I_F (mA)
200
150
100
50
0
0
25
50
75
V_F (V)


7272475
typical values
I_R (μA)
10
1
10^{-1}
10^{-2}
T_j = 100 °C
25 °C
0
5
10
15
20
V_R (kV)

SILICON E.H.T. SOFT-RECOVERY RECTIFIER DIODE

E.H.T. rectifier diode in a glass envelope intended for use in high-voltage applications such as multipliers, e.g. tripler circuits. The device features non-snap-off characteristics. Because of the smallness of the envelope, the diodes should be used in a suitable insulating medium (resin, oil or special arrangements in test-cases).

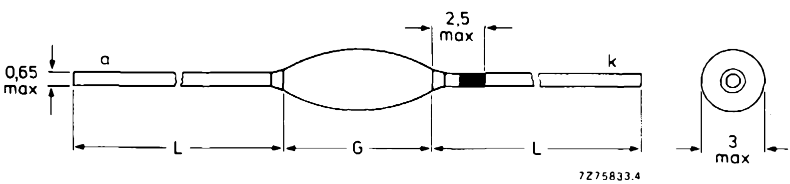
QUICK REFERENCE DATA

Working reverse voltage	V_{RW}	max.	11,5 kV
Repetitive peak reverse voltage	V_{RRM}	max.	15 kV
Average forward current	$I_{F(AV)}$	max.	4 mA
Junction temperature	T_j	max.	120 °C
Reverse recovery charge	Q_s	<	1 nC
Reverse recovery time	t_{rr}	typ.	0,2 μs

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-61.
L = min. 29; G = max. 8,2.



The cathode is indicated by a purple band on the lead.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134).

Working reverse voltage	V_{RW}	max.	11,5 kV
Repetitive peak reverse voltage	V_{RRM}	max.	12,5 kV
Repetitive peak reverse voltage; $t = 1$ min; $T_{amb} = 25\ ^oC$	V_{RRM}	max.	15 kV
Non-repetitive peak reverse voltage; $t \leqslant 10$ ms	V_{RSM}	max.	15 kV
Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	4 mA
Repetitive peak forward current	I_{FRM}	max.	500 mA*
Storage temperature	T_{stg}		−65 to +120 ^oC
Junction temperature	T_j	max.	120 ^oC

CHARACTERISTICS

Forward voltage $I_F = 100$ mA; $T_j = 120\ ^oC$	V_F	<	43 V**
Reverse current $V_R = 11,5$ kV; $T_j = 120\ ^oC$	I_R	<	3 μA
Reverse recovery when switched from $I_F = 100$ mA to $V_R \geqslant 100$ V with $-dI_F/dt = 200$ mA/μs; $T_j = 25\ ^oC$			
recovery charge	Q_s	<	1 nC
recovery time	t_{rr}	typ.	0,2 μs
fall time	t_f	>	0,1 μs

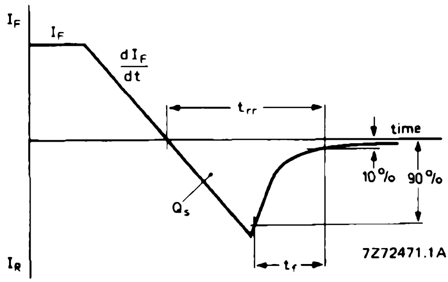


Fig. 2 Definitions of Q_s, t_{rr} and t_f.

* The device can withstand peak currents occurring at flashover in the picture tube.

** Measured under pulse conditions to avoid excessive dissipation.

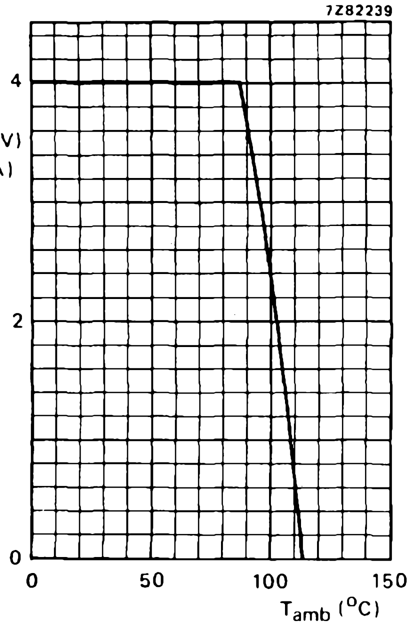


Fig. 3 Maximum permissible average forward current as a function of ambient temperature. $V_R = V_{RWmax}$. The device should be mounted in such a way that $R_{th\ j\text{-}a} \leq 120\ ^oC/W$.

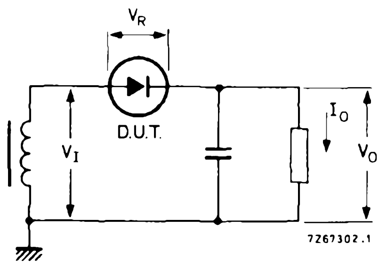


Fig. 4 Typical operation circuit.

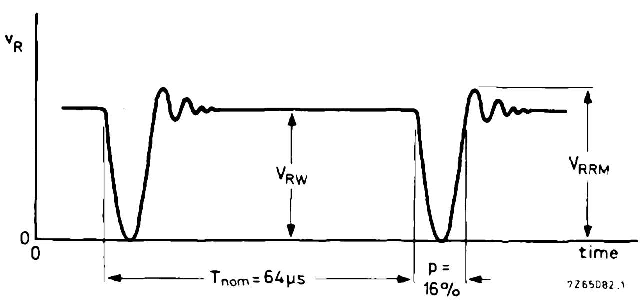


Fig. 5 Typical applied voltage.

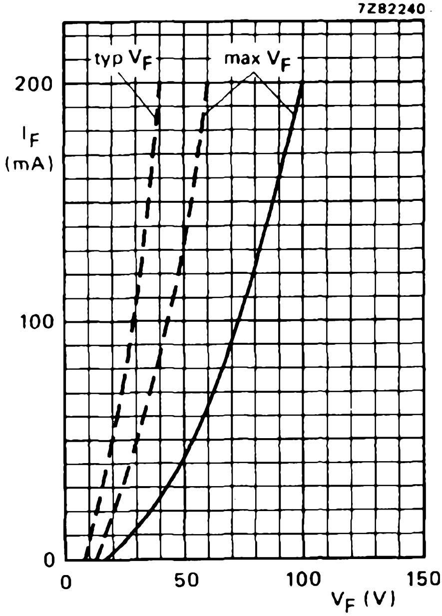


Fig. 6 —— T_j = 25 °C; - - - T_j = 120 °C.

HIGH VOLTAGE SOFT RECOVERY RECTIFIER DIODE

Glass-passivated rectifier diode in hermetically sealed axial-lead glass envelope. For high voltage applications such as grid 2 supply in colour television picture tubes and as general purpose rectifiers for high frequencies. The diode has non-snap-off characteristics.

QUICK REFERENCE DATA

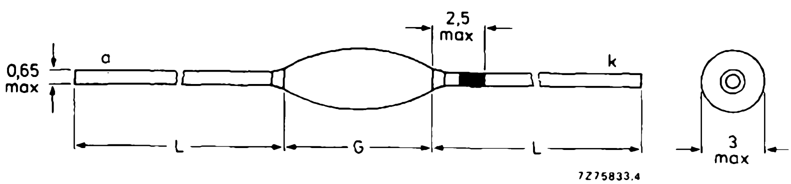
Working reverse voltage	V_{RW}	max.	1500 V
Repetitive peak reverse voltage	V_{RRM}	max.	1800 V
Average forward current	$I_{F(AV)}$	max.	85 mA
Repetitive peak forward current	I_{FRM}	max.	800 mA
Junction temperature	T_j	max.	120 °C
Reverse recovery charge	Q_s	<	1,0 nC

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-61A.

G = max. 4,9; L = min. 32,5.



The cathode is indicated by a black band on the lead.
Diodes are type branded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134).

Working reverse voltage	V_{RW}	max.	1500 V
Repetitive peak reverse voltage	V_{RRM}	max.	1800 V
Non-repetitive peak reverse voltage	V_{RSM}	max.	1800 V
Average forward current (averaged over any 20 ms)			
T_{tp} = 25 °C; lead length = 10 mm	$I_{F(AV)}$	max.	85 mA
T_{amb} = 60 °C; p.c.b. mounting see Fig. 2	$I_{F(AV)}$	max.	50 mA
Repetitive peak forward current	I_{FRM}	max.	800 mA
Non-repetitive peak forward current $t < 10$ ms, half sinewave, $T_j = T_{j\,max}$ prior to surge	I_{FSM}	max.	5 A
Storage temperature	T_{stg}		−65 to +120 °C
Junction temperature	T_j	max.	120 °C

THERMAL RESISTANCE

From junction to ambient when mounted on a 1,5 mm thick epoxy-glass p.c.b.; Cu-thickness > 40 μm; see Fig. 2	$R_{th\,j\text{-}a}$	=	155 K/W

CHARACTERISTICS

Forward voltage * I_F = 100 mA; T_j = 120 °C	V_F	<	8,5 V
Reverse current $V_R = V_{RW}$; T_j = 120 °C	I_R	<	3 μA
Reverse recovery when switched from I_F = 100 mA to V_R > 100 V with $-dI_F/dt$ = 200 mA/μs; T_j = 25 °C			
recovery charge	Q_s	<	1 nC
recovery time	t_{rr}	typ.	0,2 μs
fall time	t_f	>	0,1 μs

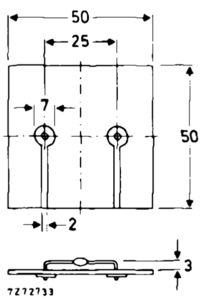


Fig. 2 Device mounted on a printed circuit board.

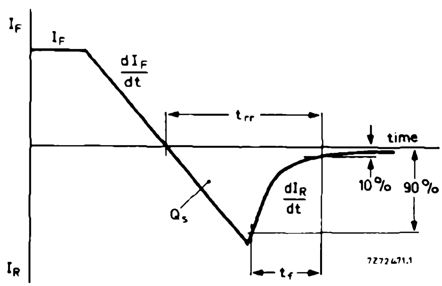


Fig. 3 Definitions of Q_s, t_{rr} and t_f.

* Measured under pulse conditions to avoid excessive dissipation.

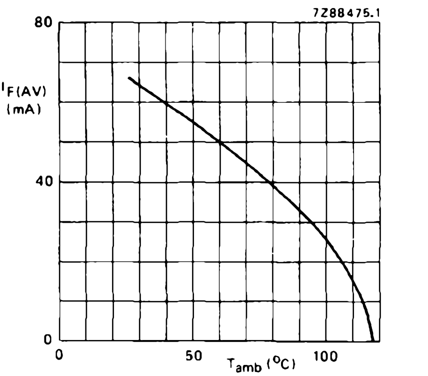


Fig. 4 Maximum permissible average forward current as a function of the ambient temperature; $V_R = V_{RWmax}$; a = 1,42, mounting Fig. 2.

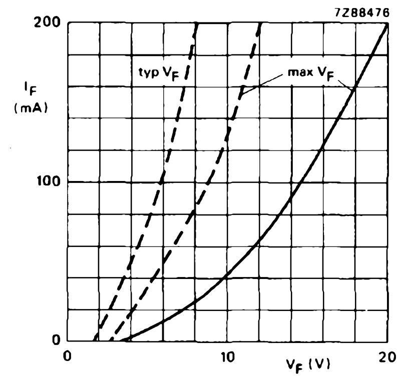


Fig. 5 —— T_j = 25 °C; ---- T_j = 120 °C.

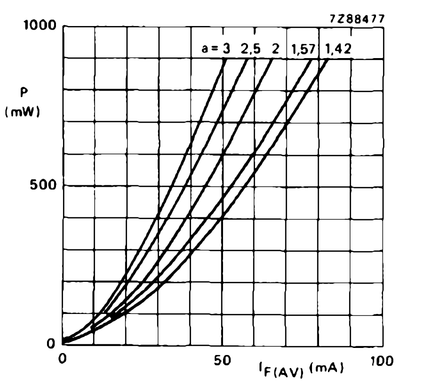


Fig. 6 Steady state power dissipation (forward plus leakage current but excluding switching losses) as a function of average forward current.

a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; δ = 0,5.

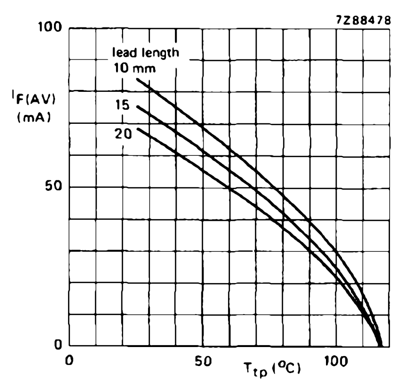


Fig. 7 Maximum average forward current as a function of the tie-point temperature; the curves include losses due to reverse leakage.

a = 1,42; $V_R = V_{RWmax}$; δ = 0,5*.

* Figs 4 and 7 apply to switched mode application.

APPLICATION INFORMATION

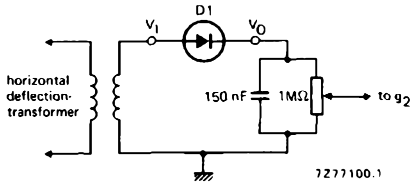


Fig. 8 Basic circuit for voltage supply of grid 2 incolour television picture tubes. D_1 = BY584. Stable continuous operation is ensured at an ambient temperature up to 70 °C.

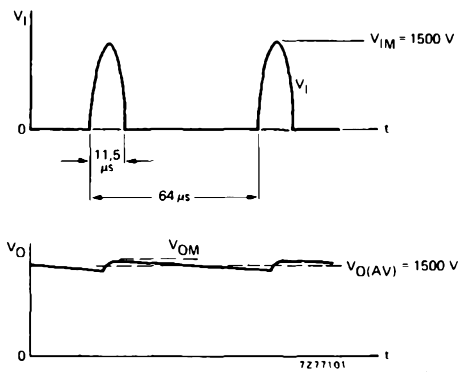


Fig. 9 Waveform.

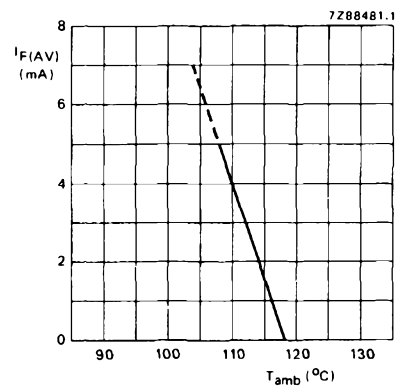


Fig. 10 Maximum permissible average forward current as a function of ambient temperature. V_R = 1500 V; diode used in circuit Fig. 8 mounted as in Fig. 2.

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

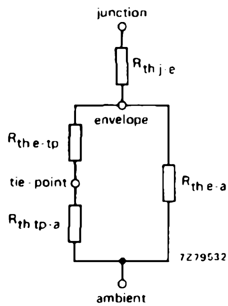


Fig. 11 Thermal model. $R_{th\ j\text{-}e}$ = 35 K/W.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

lead length	5	10	15	20	25	mm
$R_{th\ e\text{-}tp}$	38	76	114	152	190	K/W
$R_{th\ e\text{-}a}$	750	560	410	330	280	K/W

The thermal resistance between tie-point and ambient depends on the mounting method; for mounting on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness $\geqslant$ 40 μm, the following values apply:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\ tp\text{-}a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm^2 per lead $R_{th\ tp\text{-}a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm^2 per lead $R_{th\ tp\text{-}a}$ is 45 K/W.

Note
Any temperature can be calculated by using the dissipation graph (Fig. 6) and the above thermal model.

EPITAXIAL AVALANCHE DIODES

Glass passivated epitaxial rectifier diodes in hermetically sealed axial-leaded glass envelopes. They feature low forward voltage drop, very fast recovery, very low stored charge, non-snap-off switching characteristics and are capable of absorbing reverse transient energy (e.g. during flashover in a picture tube). These properties make the diodes very suitable for use in switched-mode power supplies and in general high-frequency circuits, where low conduction and switching losses are essential.

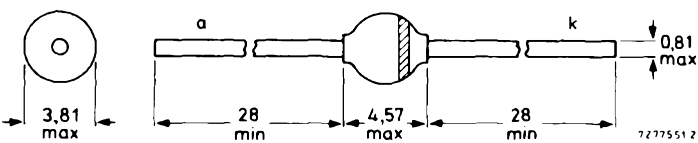
QUICK REFERENCE DATA

			BYV27-50	100	150	200	
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	150	200	V
Continuous reverse voltage	V_R	max.	50	100	150	200	V
Average forward current	$I_{F(AV)}$	max.		2			A
Non-repetitive peak reverse energy	E_{RSM}	max.		40			mJ
Reverse recovery time	t_{rr}	<		25			ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-57.



The marking band indicates the cathode.

The diodes are type-branded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BYV27-50	100	150	200	
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	150	200	V
Continuous reverse voltage	V_R	max.	50	100	150	200	V

Average forward current (switching losses negligible up to 200 kHz) square wave; $\delta = 0,5$				
$T_{tp} = 85\ ^oC$; lead length = 10 mm	$I_{F(AV)}$	max.	2	A
$T_{amb} = 60\ ^oC$; Fig. 2	$I_{F(AV)}$	max.	1,3	A
Repetitive peak forward current	I_{FRM}	max.	15	A
Non-repetitive peak forward current ($t = 10$ ms; half sine-wave) $T_j = T_{j\,max}$ prior to surge; with reapplied V_{RRM}	I_{FSM}	max.	50	A
Non-repetitive peak reverse avalanche energy; $I_R = 600$ mA; prior to surge; with inductive load switched off:				
at $T_j = 25\ ^oC$	E_{RSM}	max.	40	mJ
at $T_j = T_{j\,max}$	E_{RSM}	max.	20	mJ
Storage temperature	T_{stg}		−65 to + 175	^oC
Junction temperature	T_j	max.	175	^oC

THERMAL RESISTANCE

Influence of mounting method

1. Thermal resistance from junction to tie-point at a lead length of 10 mm	$R_{th\,j\text{-}tp}$	=	46	K/W
2. Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness $\geqslant 40\ \mu m$; Fig. 2	$R_{th\,j\text{-}a}$	=	100	K/W

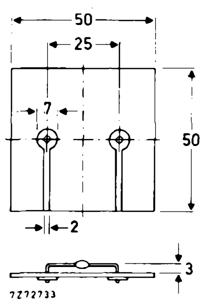


Fig. 2 Mounted on a printed-circuit board.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			BYV27-50	100	150	200	
Reverse avalanche breakdown voltage I_R = 0,1 mA	$V_{(BR)R}$		55	110	165	220	V
Forward voltage* I_F = 3 A; $T_j = T_{j\,max}$	V_F	<	0,88				V
I_F = 3 A	V_F	<	1,07				V
Reverse current $V_R = V_{RRMmax}$; T_j = 25 °C	I_R	<	1				μA
$V_R = V_{RRMmax}$; T_j = 165 °C	I_R	<	150				μA
Reverse recovery time when switched from I_F = 0,5 A to I_R = 1 A; measured at I_R = 0,25 A for definition see Figs 3 and 4	t_{rr}	<	25				ns

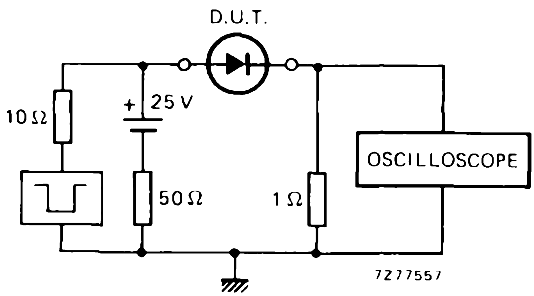


Fig. 3 Test circuit.
Input impedance oscilloscope 1 MΩ; 22 pF. Rise time ≤ 7 ns.
Source impedance 50 Ω. Rise time ≤ 15 ns.

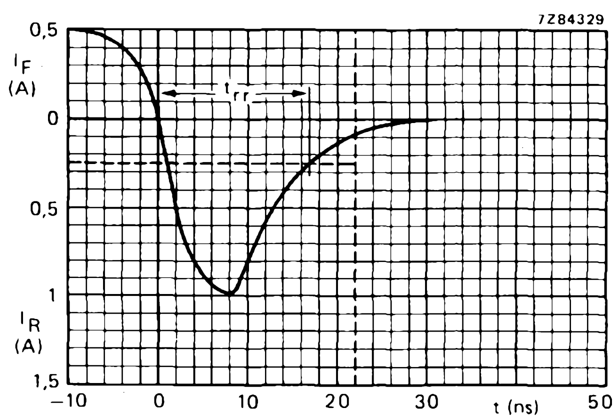


Fig. 4 Reverse recovery time characteristic.

* Measured under pulse conditions to avoid excessive dissipation.

Reverse recovery when switched from
I_F = 1 A to $V_R \geqslant$ 30 V with
$-dI_F/dt$ = 20 A/μs (see Fig. 5)

recovered charge	Q_s	<	15 nC
recovery time	t_{rr}	<	50 ns

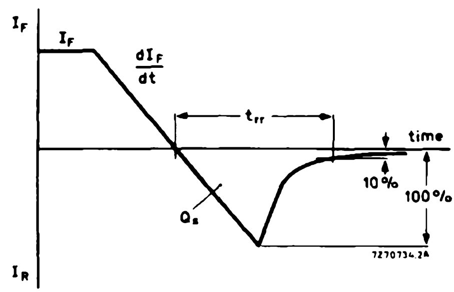


Fig. 5 Definitions of t_{rr} and Q_s.

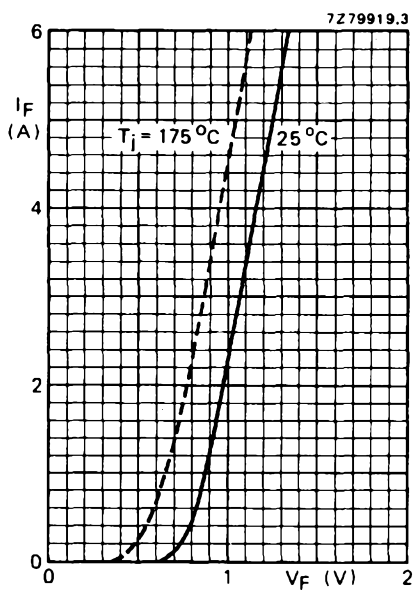


Fig. 6 Forward current as a function of the maximum forward voltage.

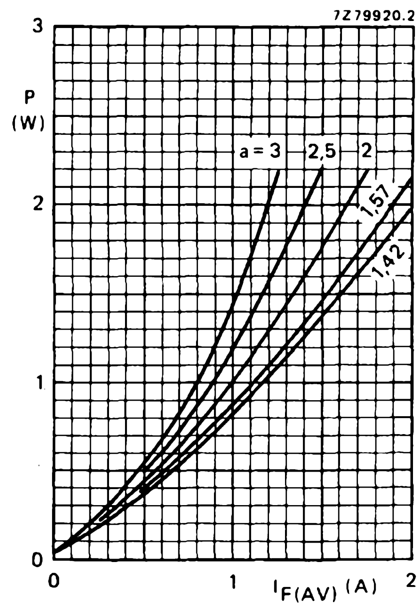


Fig. 7 a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRMmax}$. Pulsed reverse voltage; δ = 0,5.
(Including reverse current losses and switching losses up to f = 200 kHz).

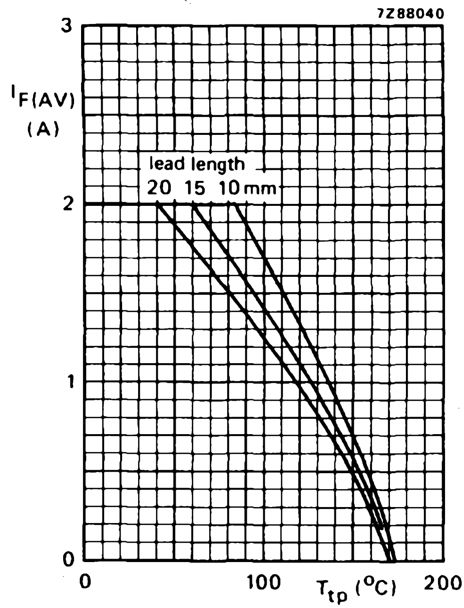


Fig. 8 Maximum average forward current.
The curves include losses due to reverse current and switching up to f = 200 kHz.
Pulsed reverse voltage, δ = 0,5.
$V_R = V_{RRMmax}$.
Square wave current, a = 1,42.

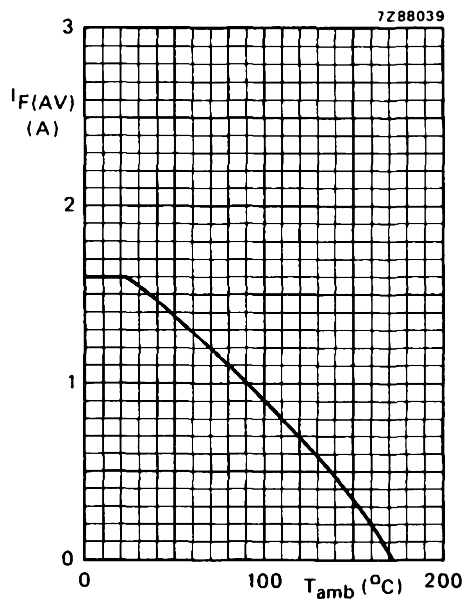


Fig. 9 Maximum average forward current.
The curve includes losses due to reverse current and switching up to f = 200 kHz.
Mounting method see Fig. 2.
Pulsed reverse voltage, δ = 0,5
$V_R = V_{RRMmax}$.
Square wave current, a = 1,42.

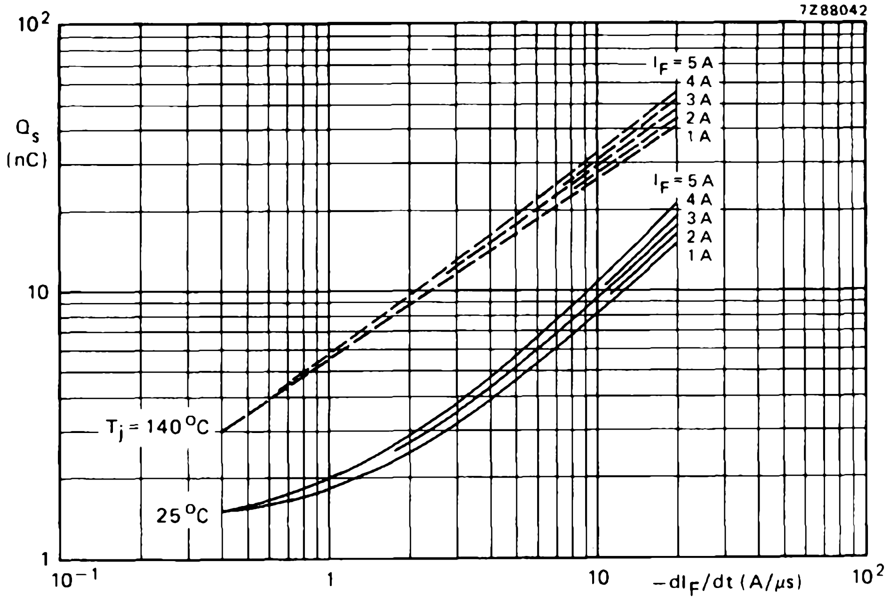


Fig. 10 Maximum values reverse recovery charge. For definition see Fig. 5.

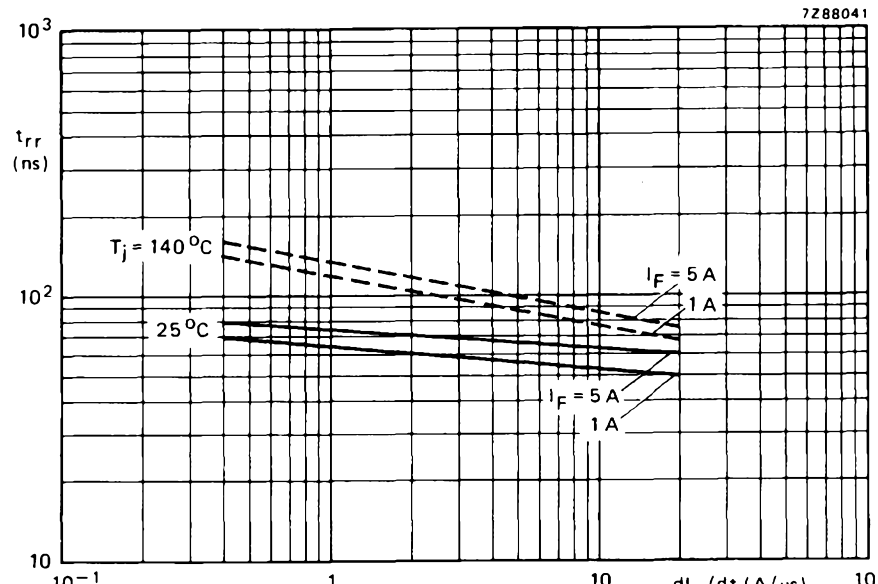


Fig. 11 Maximum values reverse recovery time. For definition see Fig. 5.

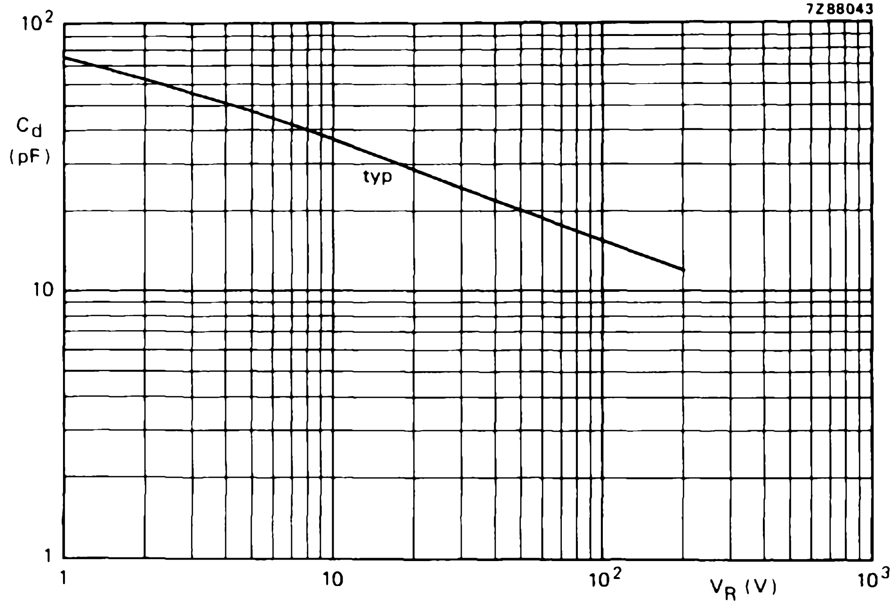


Fig. 12 Typical values diode capacitance at f = 1 MHz; T_j = 25 °C.

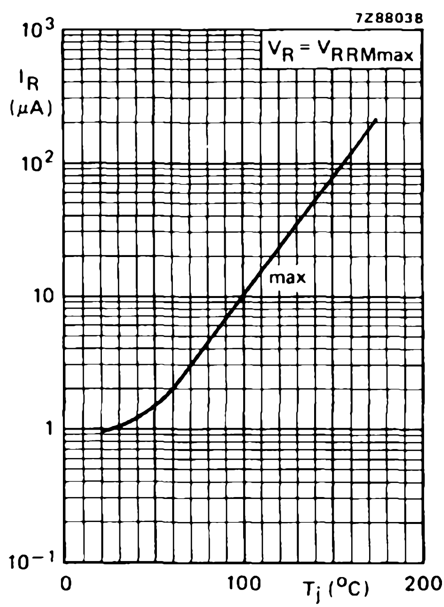


Fig. 13 Maximum values reverse current.

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

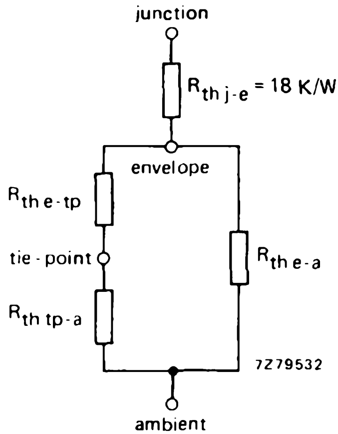


Fig. 14 Thermal model.

By using this thermal model and the dissipation graph (Fig. 7) any temperature can be calculated.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

thermal resistance	lead length					unit
	5	10	15	20	25	mm
$R_{th\,e\text{-}tp}$	15	30	45	60	75	K/W
$R_{th\,e\text{-}a}$	580	445	350	290	245	K/W

The thermal resistance between tie-point and ambient depends on the mounting method.
For components on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness $\geq 40\ \mu m$:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\,tp\text{-}a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm^2 per lead $R_{th\,tp\text{-}a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm^2 per lead $R_{th\,tp\text{-}a}$ is 45 K/W.

EPITAXIAL AVALANCHE DIODES

Glass passivated epitaxial rectifier diodes in hermetically sealed axial-leaded glass envelopes. They feature low forward voltage drop, very fast recovery, very low stored charge, non-snap-off switching characteristics and are capable of absorbing reverse transient energy (e.g. during flashover in a picture tube). These properties make the diodes very suitable for use in switched-mode power supplies and in general in high-frequency circuits, where low conduction and switching losses are essential.

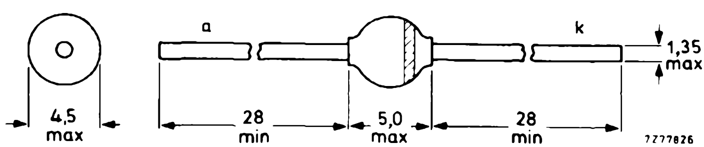
QUICK REFERENCE DATA

			BYV28-50	100	150	200	
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	150	200	V
Continuous reverse voltage	V_R	max.	50	100	150	200	V
Average forward current	$I_{F(AV)}$	max.	3,5				A
Non-repetitive peak reverse energy	E_{RSM}	max.	40				mJ
Reverse recovery time	t_{rr}	<	30				ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-64.



The marking band indicates the cathode.

The diodes are type-branded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BYV28-50	100	150	200	
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	150	200	V
Continuous reverse voltage	V_R	max.	50	100	150	200	V

Average forward current (averaged over any 20 ms period)				
T_{tp} = 85 ^oC; lead length = 10 mm	$I_{F(AV)}$	max.	3,5	A
T_{amb} = 60 ^oC; p.c.b. mounting (see Fig. 2)	$I_{F(AV)}$	max.	1,9	A
Repetitive peak forward current	I_{FRM}	max.	25	A
Non-repetitive peak forward current (t = 10 ms; half sine-wave) $T_j = T_{j\,max}$ prior to surge; with reapplied V_{RRM}	I_{FSM}	max.	90	A
Non-repetitive peak reverse avalanche energy; I_R = 600 mA; with inductive load switched off				
prior to surge; T_j = 25 ^oC	E_{RSM}	max.	40	mJ
prior to surge; $T_j = T_{j\,max}$	E_{RSM}	max.	20	mJ
Storage temperature	T_{stg}		−65 to +175	^oC
Junction temperature	T_j	max.	175	^oC

THERMAL RESISTANCE

Influence of mounting method

1. Thermal resistance from junction to tie-point at a lead length of 10 mm	$R_{th\,j\text{-}tp}$	=	25	K/W
2. Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 µm; Fig. 2	$R_{th\,j\text{-}a}$	=	75	K/W

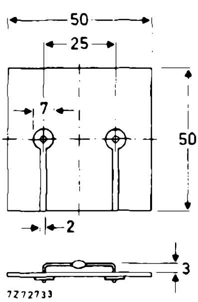


Fig. 2 Mounted on a printed-circuit board.

CHARACTERISTICS

T_j = 25 °C, unless otherwise specified

			BYV28-50	100	150	200	
Reverse avalanche breakdown voltage I_R = 0,1 mA	$V_{(BR)R}$	>	55	110	165	220	V
Forward voltage* I_F = 5 A;	V_F	<		1,10			V
I_F = 5 A; $T_j = T_{j\,max}$	V_F	<		0,89			V
Reverse current $V_R = V_{RRMmax}$; T_j = 25 °C	I_R	<		1			μA
$V_R = V_{RRMmax}$; T_j = 165 °C	I_R	<		150			μA
Reverse recovery time when switched from I_F = 0,5 A to I_R = 1 A; measured at I_R = 0,25 A for definition see Figs 3 and 4	t_{rr}	<		30			ns

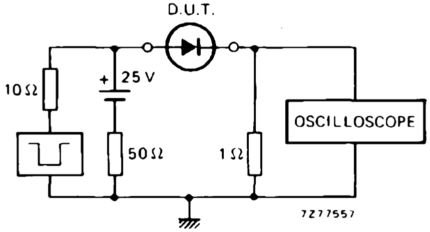


Fig. 3 Test circuit.
Input impedance oscilloscope 1 MΩ; 22 pF; Rise time ⩽ 7 ns.
Source impedance 50 Ω. Rise time ⩽ 15 ns.

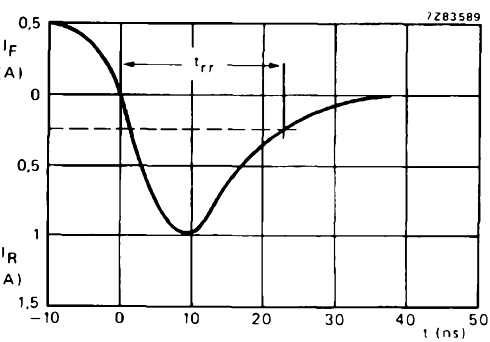


Fig. 4 Reverse recovery time characteristic.

* Measured under pulse conditions to avoid excessive dissipation.

Reverse recovery when switched from
$I_F = 1$ A to $V_R \geqslant 30$ V with
$-dI_F/dt = 20$ A/μs (see Fig. 5)

recovered charge	Q_s	<	20 nC
recovery time	t_{rr}	<	50 ns

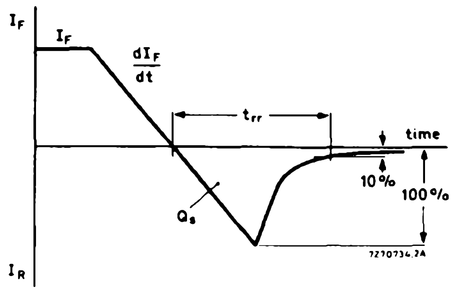


Fig. 5 Definitions of t_{rr} and Q_s.

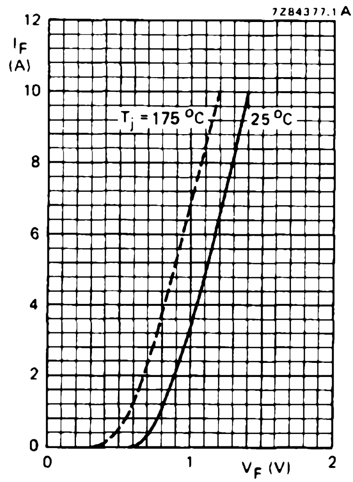


Fig. 6 Forward current as a function of the maximum forward voltage.

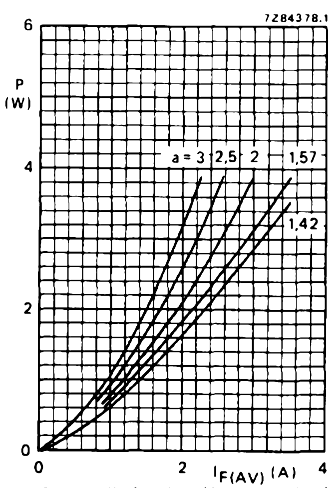


Fig. 7 Power dissipation (forward plus leakage current) as a function of the average forward current. Pulsed reverse voltage; $\delta = 50\%$.
$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRMmax}$.

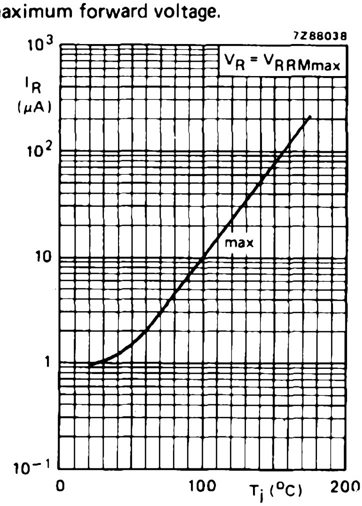


Fig. 8 Reverse current as a function of the junction temperature

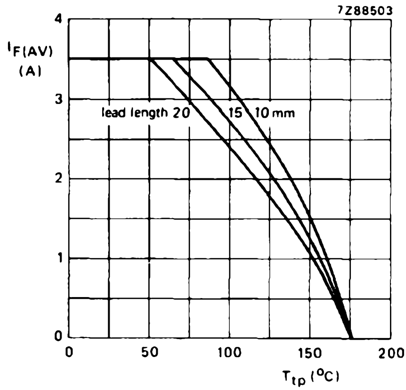


Fig. 9 Maximum average forward current. The curves include losses due to reverse current and switching up to f = 200 kHz.
Pulsed reverse voltage; δ = 0,5 $V_R = V_{RRM\,max}$.
Square-wave current; a = 1,42.

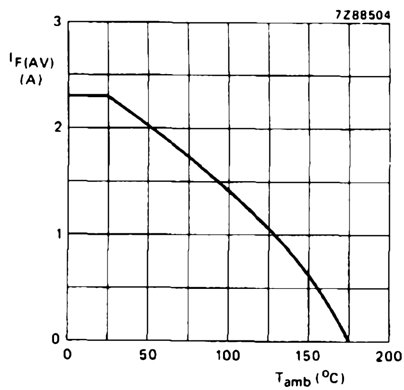


Fig. 10 Maximum average forward current. The curve includes losses due to reverse current and switching up to f = 200 kHz; mounting method see Fig. 2.
Pulsed reverse voltage; δ = 0,5 $V_R = V_{RRM\,max}$.
Square-wave current; a = 1,42.

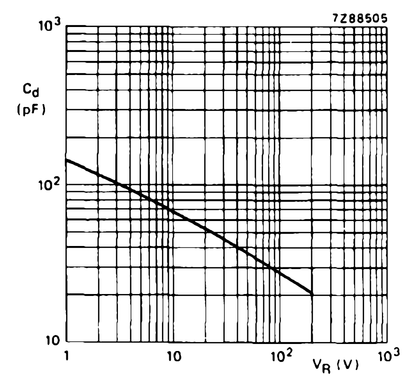


Fig. 11 Typical values diode capacitance at f = 1 MHz. T_j = 25 °C.

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

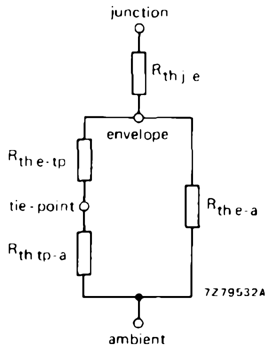


Fig. 12 Thermal model. $R_{th\ j\text{-}e}$ = 12 K/W.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

thermal resistance	lead length					unit
	5	10	15	20	25	mm
$R_{th\ e\text{-}tp}$	7	14	21	28	35	K/W
$R_{th\ e\text{-}a}$	410	300	230	185	155	K/W

The thermal resistance between tie-point and ambient depends on the mounting method; for mounting on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness ≥ 40 μm, the following values apply:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\ tp\text{-}a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm² per lead $R_{th\ tp\text{-}a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm² per lead $R_{th\ tp\text{-}a}$ is 45 K/W.

Note
Any temperature can be calculated by using the dissipation graph (Fig. 7) and the above model.

AVALANCHE FAST SOFT-RECOVERY RECTIFIER DIODES

Glass passivated rectifier diodes in hermetically sealed axial-leaded glass envelopes. They are intended for television and industrial applications, such as switched-mode power supplies, scan rectifiers in TV receivers, and also for use in inverter and converter applications. The devices feature non-snap-off (soft-recovery) switching characteristics and are capable of absorbing reverse transient energy (e.g. during flashover in the picture tube).

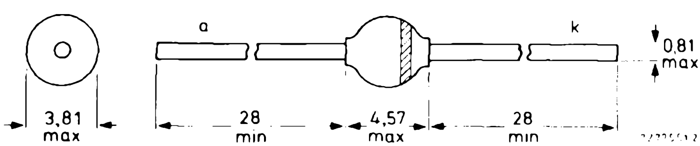
QUICK REFERENCE DATA

			BYV95A	B	C	
Repetitive peak reverse voltage	V_{RRM}	max.	200	400	600	V
Continuous reverse voltage	V_R	max.	200	400	600	V
Average forward current	$I_{F(AV)}$	max.		1,5		A
Non-repetitive peak forward current	I_{FSM}	max.		35		A
Non-repetitive peak reverse energy	E_{RSM}	max.		10		mJ
Reverse recovery time	t_{rr}	<		250		ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-57.



The marking band indicates the cathode.

The diodes are type-branded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BYV95A	B	C	
Repetitive peak reverse voltage	V_{RRM}	max.	200	400	600	V
Continuous reverse voltage	V_R	max.	200	400	600	V
Average forward current (averaged over any 20 ms period)						
T_{tp} = 65 °C; lead length 10 mm	$I_{F(AV)}$	max.		1,5		A
T_{amb} = 65 °C; Fig. 2	$I_{F(AV)}$	max.		0,8		A
Repetitive peak forward current	I_{FRM}	max.		10		A
Non-repetitive peak forward current (t = 10 ms; half sine-wave) $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RRMmax}$	I_{FSM}	max.		35		A
Non-repetitive peak reverse avalanche energy; I_R = 400 mA; $T_j = T_{j\,max}$ prior to surge; with inductive load switched off	E_{RSM}	max.		10		mJ
Storage temperature	T_{stg}			−65 to + 175		°C
Operating junction temperature	T_j	max.		175		°C

THERMAL RESISTANCE

Influence of mounting method

1. Thermal resistance from junction to tie-point at a lead length of 10 mm	$R_{th\ j\text{-}tp}$	=	46	°C/W
2. Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 μm; Fig. 2	$R_{th\ j\text{-}a}$	=	100	°C/W

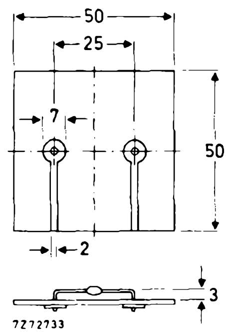


Fig. 2 Mounted on a printed-circuit board.

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

			BYV95A	B	C	
Forward voltage						
$I_F = 3\ A$	V_F	<	1,6	1,6	1,6	V *
$I_F = 3\ A;\ T_j = T_{j\,max}$	V_F	<	1,35	1,35	1,35	V *
Reverse avalanche breakdown voltage						
$I_R = 0,1\ mA$	$V_{(BR)R}$	>	300	500	700	V
Reverse current						
$V_R = V_{RRMmax};\ T_j = 165\ ^oC$	I_R	<		150		μA
Reverse recovery when switched from $I_F = 1\ A$ to $V_R \geqslant 30\ V$ with $-dI_F/dt = 20\ A/\mu s$						
recovered charge	Q_s	<		250		nC
recovery time	t_{rr}	<		250		ns
Maximum slope of reverse recovery current when switched from $I_F = 1\ A$ to $V_R \geqslant 30\ V$ with $-dI_F/dt = 1\ A/\mu s$	$\lvert dI_R/dt \rvert$	<		6		A/μs

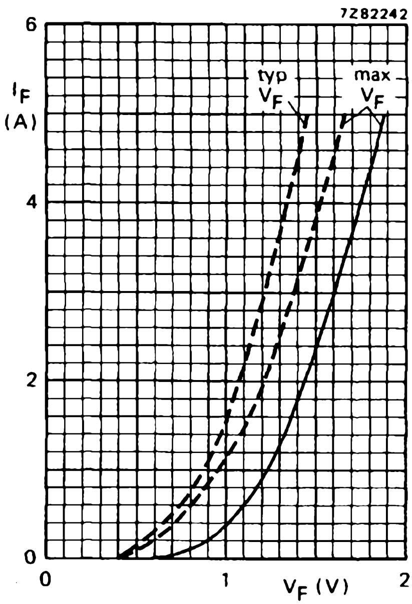


Fig. 3 —— $T_j = 25\ ^oC$; – – – $T_j = T_{j\,max}$.

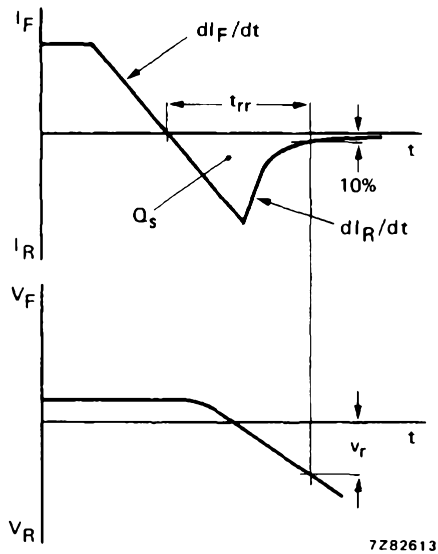


Fig. 4 Definitions.

* Measured under pulse conditions to avoid excessive dissipation.

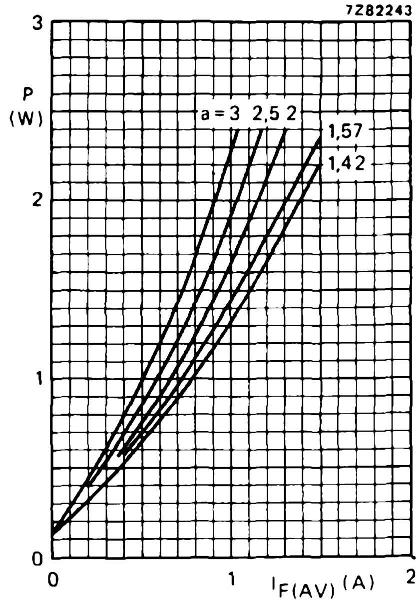
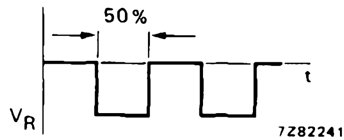


Fig. 5 Steady state power dissipation (forward plus leakage current) excluding switching losses as a function of the average forward current.

The graph is for switched-mode application.

$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRMmax}$



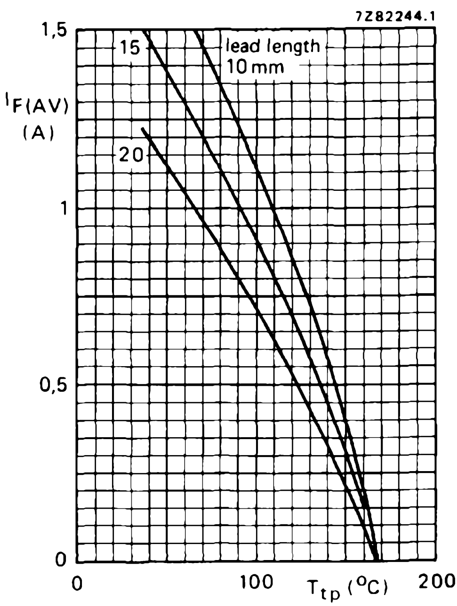


Fig. 6 Maximum average forward current as a function of the tie-point temperature; the curves include losses due to reverse leakage.

The graph is for switched-mode application; $V_R = V_{RRMmax}$; $\delta = 50\%$; a = 1,57.

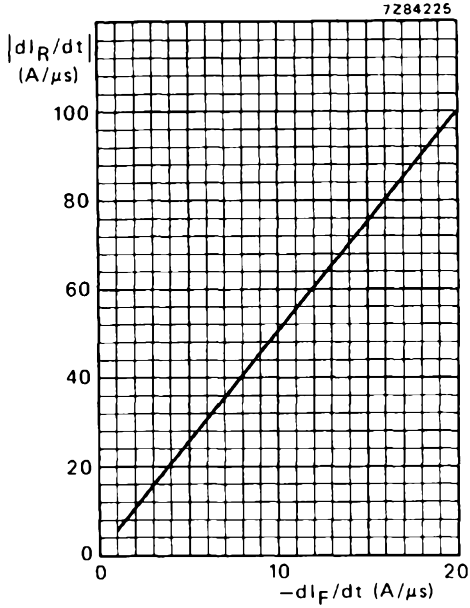


Fig. 7 Maximum slope of reverse recovery current. T_j = 25 °C

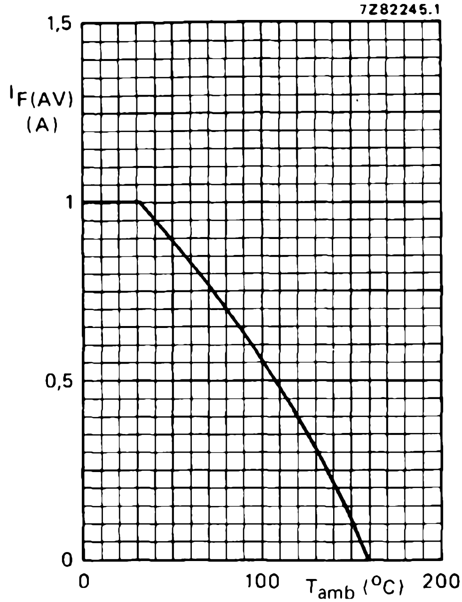


Fig. 8 Maximum average forward current as a function of the ambient temperature; the curve includes losses due to reverse leakage. Mounting method see Fig. 2.
The graph is for switched-mode application.
$V_R = V_{RRMmax}$; δ = 50%; a = 1,57.

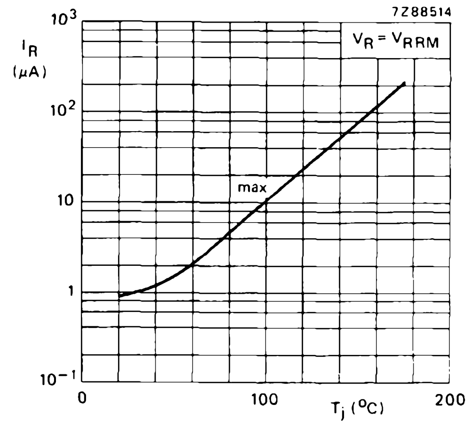


Fig. 9 Reverse current as a function of junction temperature. $V_R = V_{RRM}$.

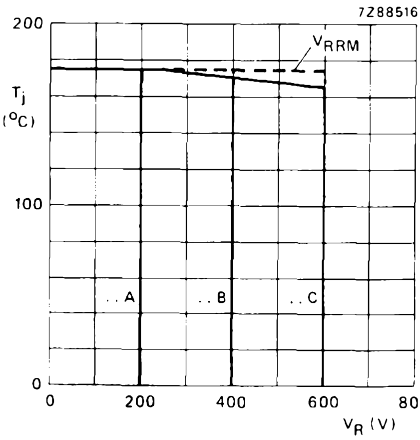


Fig. 10 Maximum junction temperature as a function of reverse voltage.

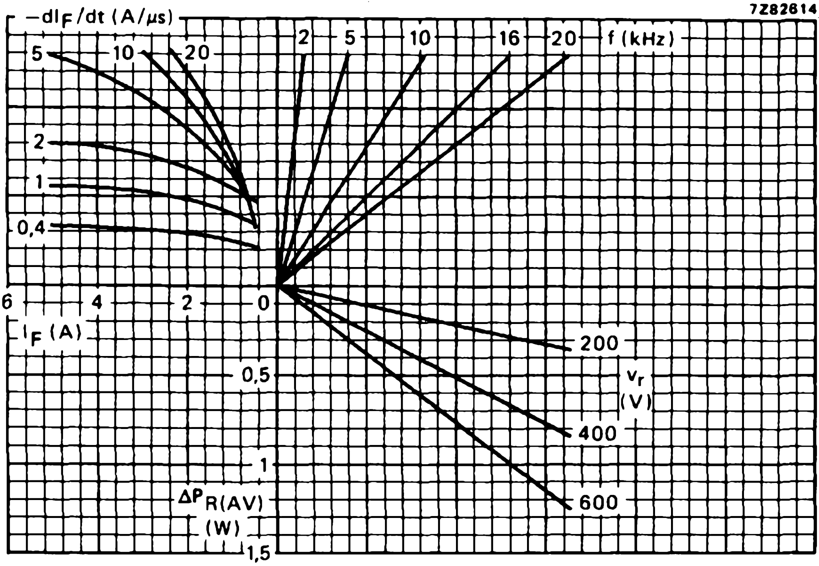


Fig. 11 Nomogram: power loss ($\Delta P_{R(AV)}$) due to switching only. To be added to steady state power losses (see also Fig. 4).

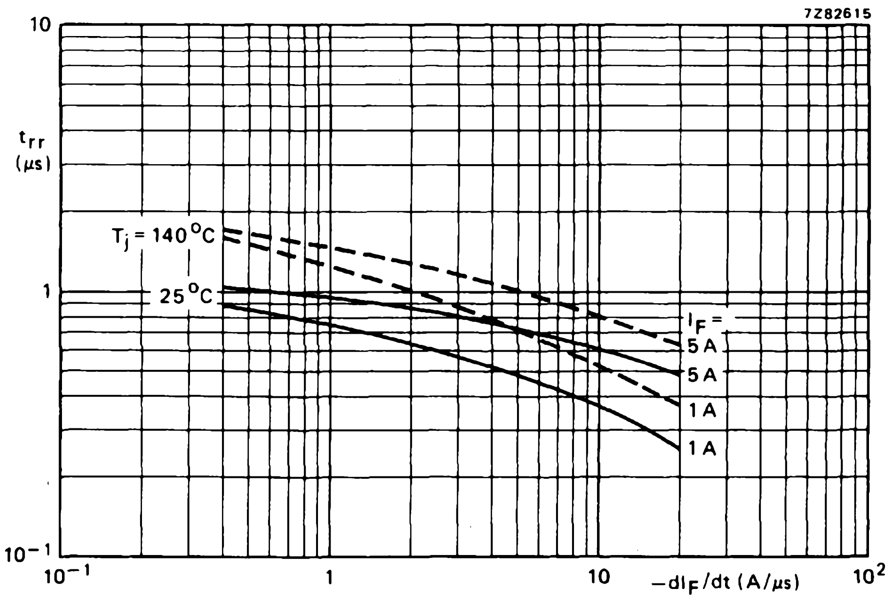


Fig. 12 Maximum values (see also Fig. 4).

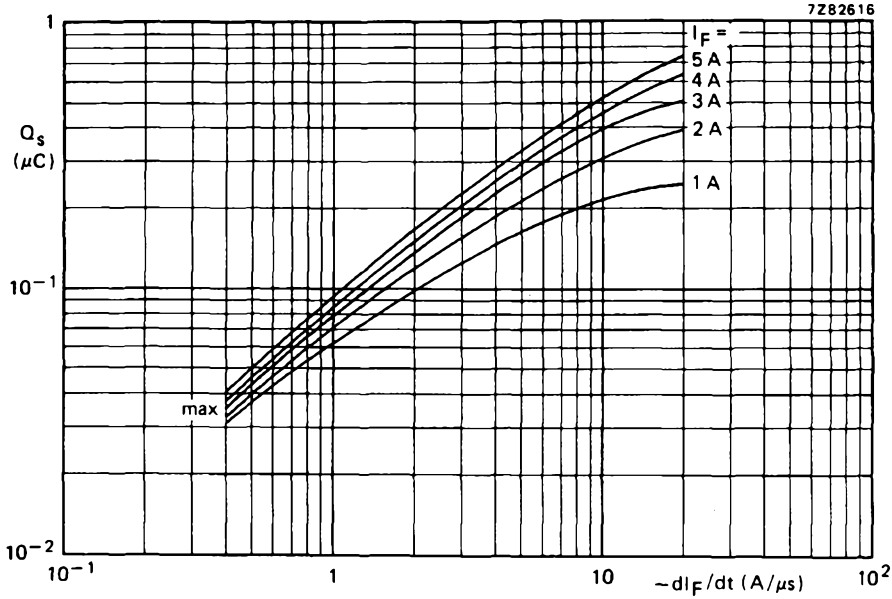


Fig. 13 Maximum values at T_j = 25 °C (see also Fig. 4).

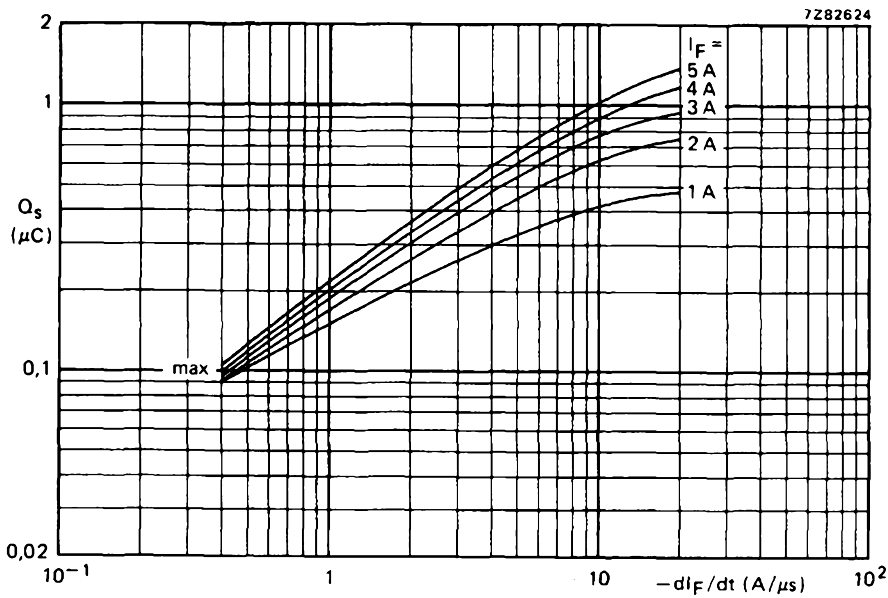


Fig. 14 Maximum values at T_j = 140 °C (see also Fig. 4).

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

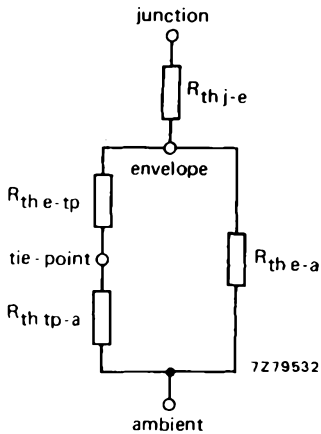


Fig. 15 Thermal model $R_{th\ j-e}$ = 18 K/W.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

lead length	5	10	15	20	25	mm
$R_{th\ e-tp}$	15	30	45	60	75	K/W
$R_{th\ e-a}$	580	445	350	290	245	K/W

The thermal resistance between tie-point and ambient depends on the mounting method; for mounting on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness ⩾ 40 μm, the following values apply:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\ tp-a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm² per lead $R_{th\ tp-a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm² per lead $R_{th\ tp-a}$ is 45 K/W.

Note
Any temperature can be calculated by using the dissipation graph (Fig. 5) and the above thermal model.

AVALANCHE FAST SOFT-RECOVERY RECTIFIER DIODES

Glass passivated rectifier diodes in hermetically sealed axial-leaded glass envelopes. They are intended for television and industrial applications, such as switched-mode power supplies, scan rectifiers in TV receivers, and also for use in inverter and converter applications. The devices feature non-snap-off (soft-recovery) switching characteristics and are capable of absorbing reverse transient energy (e.g. during flashover in the picture tube).

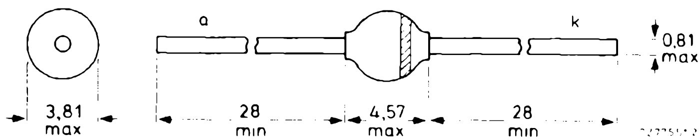
QUICK REFERENCE DATA

			BYV96D	BYV96E	
Repetitive peak reverse voltage	V_{RRM}	max.	800	1000	V
Continuous reverse voltage	V_R	max.	800	1000	V
Average forward current	$I_{F(AV)}$	max.	1,5		A
Non-repetitive peak forward current	I_{FSM}	max.	35		A
Non-repetitive peak reverse energy	E_{RSM}	max.	10		mJ
Reverse recovery time	t_{rr}	<	300		ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-57.



The marking band indicates the cathode.

The diodes are type-branded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BYV96D	BYV96E	
Repetitive peak reverse voltage	V_{RRM}	max.	800	1000	V
Continuous reverse voltage	V_R	max.	800	1000	V
Average forward current (averaged over any 20 ms period)					
→ T_{tp} = 55 °C; lead length 10 mm	$I_{F(AV)}$	max.	1,5		A
→ T_{amb} = 55 °C; Fig. 2	$I_{F(AV)}$	max.	0,8		A
Repetitive peak forward current	I_{FRM}	max.	10		A
Non-repetitive peak forward current (t = 10 ms; half sine-wave) $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RRM\,max}$	I_{FSM}	max.	35		A
Non-repetitive peak reverse avalanche energy; I_R = 400 mA; $T_j = T_{j\,max}$ prior to surge; with inductive load switched off	E_{RSM}	max.	10		mJ
Storage temperature	T_{stg}		−65 to + 175		°C
→ Operating junction temperature	T_j	max.	175		°C

THERMAL RESISTANCE

Influence of mounting method

1. Thermal resistance from junction to tie-point at a lead length of 10 mm — $R_{th\,j\text{-}tp}$ = 46 K/W
2. Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 μm; Fig. 2 — $R_{th\,j\text{-}a}$ = 100 K/W

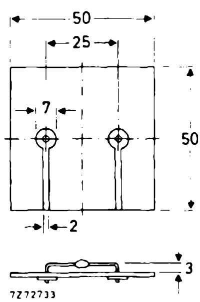


Fig. 2 Mounted on a printed-circuit board.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			BYV96D	BYV96E	
Forward voltage					
I_F = 3 A	V_F	<	1,6	1,6	V*
I_F = 3 A; $T_j = T_{j\,max}$	V_F	<	1,35	1,35	V*
Reverse avalanche breakdown voltage					
I_R = 0,1 mA	$V_{(BR)R}$	>	900	1100	V
Reverse current					
$V_R = V_{RRM\,max}$; T_j = 165 °C	I_R	<	150		μA
Reverse recovery when switched from I_F = 1 A to $V_R \geq 30$ V with $-dI_F/dt$ = 20 A/μs					
recovered charge	Q_s	<	400		nC
recovery time	t_{rr}	<	300		ns
Maximum slope of reverse recovery current when switched from I_F = 1 A to $V_R \geq 30$ V; $-dI_F/dt$ = 1 A/μs	$\lvert dI_R/dt \rvert$	<	5		A/μs

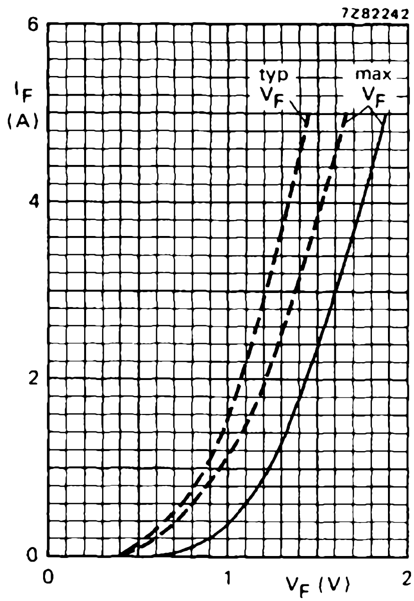


Fig. 3 —— T_j = 25 °C; – – – $T_j = T_{j\,max}$.

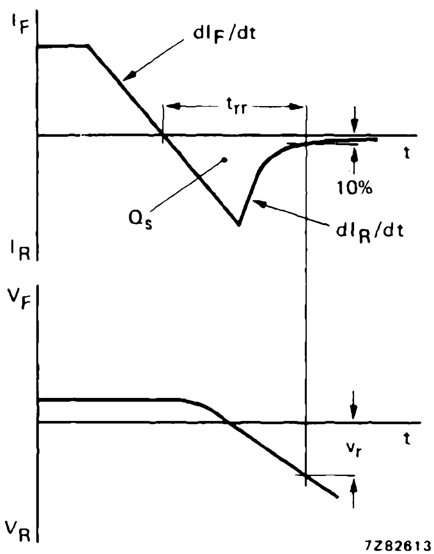


Fig. 4 Definitions of t_{rr} and Q_s.

* Measured under pulse conditions to avoid excessive dissipation.

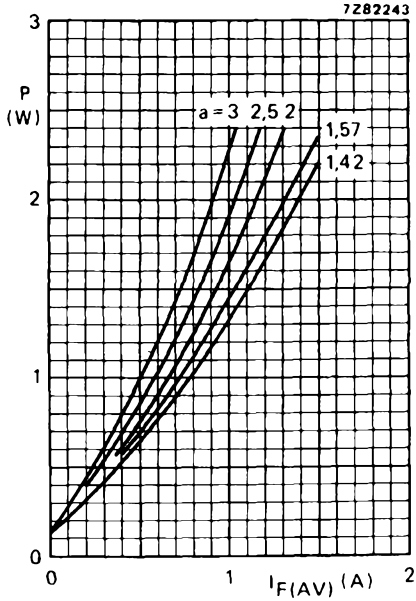
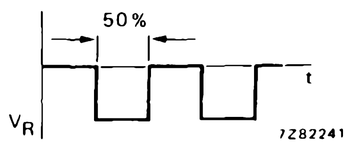


Fig. 5 Steady state power dissipation (forward plus leakage current) excluding switching losses as a function of the average forward current.
The graph is for switched-mode application.

$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRM}$ max



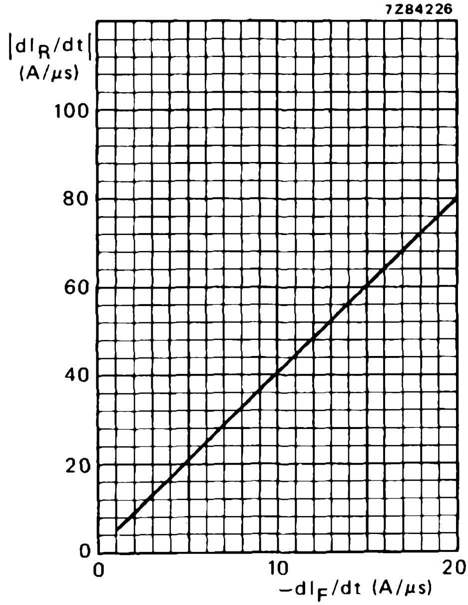


Fig. 6 Maximum slope of reverse recovery current. $T_j = 25\ ^oC$.

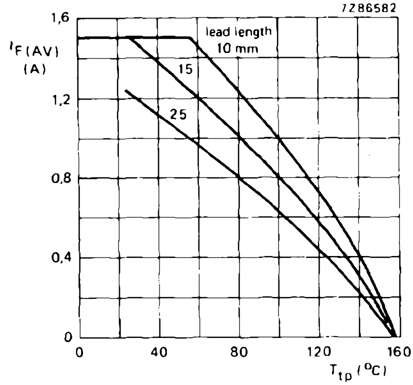


Fig. 7 Maximum average forward current as a function of the tie-point temperature; the curves include losses due to reverse leakage.

The graph is for switched-mode application; $V_R = V_{RRM\,max}$; δ = 50%; a = 1,57.

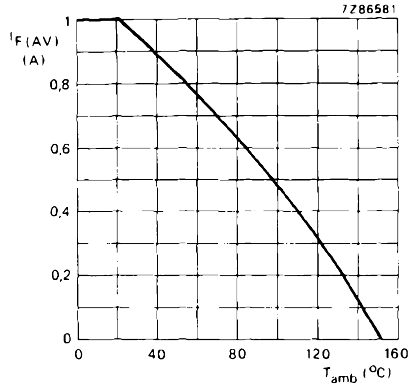


Fig. 8 Maximum average forward current as a function of the ambient temperature; the curve includes losses due to reverse leakage.
Mounting method see Fig. 2.

The graph is for switched-mode application. $V_R = V_{RRM\,max}$; δ = 50%; a = 1,57.

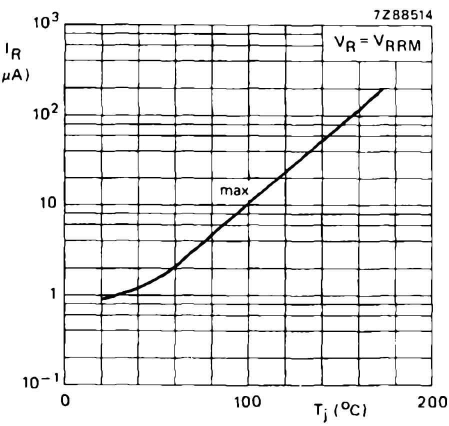


Fig. 9 Reverse current as a function of junction temperature. $V_R = V_{RRM max}$.

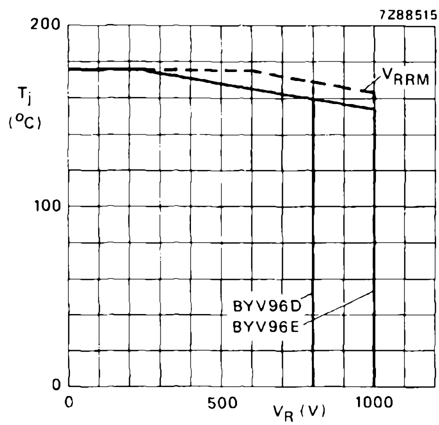


Fig. 10 Maximum values junction temperature.

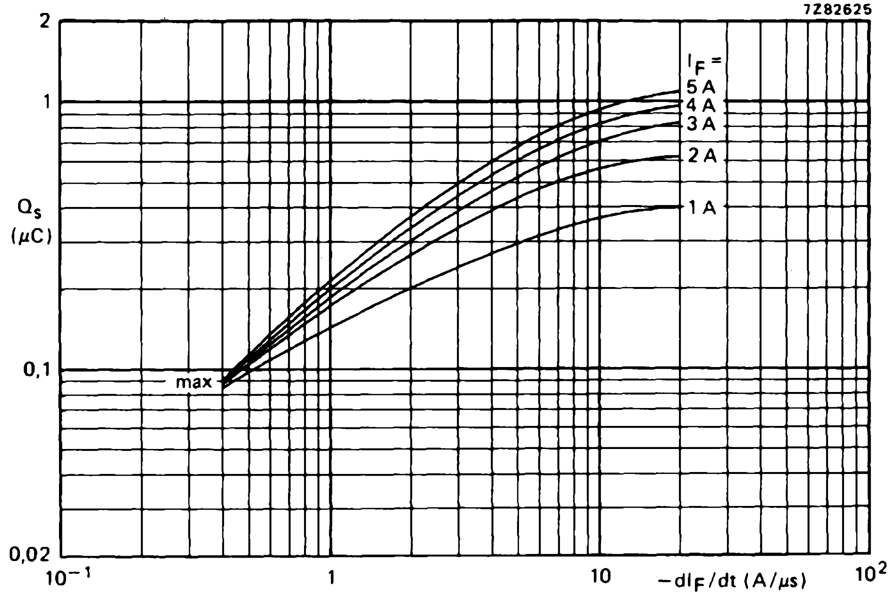


Fig. 11 Maximum values; T_j = 25 °C (see also Fig. 4).

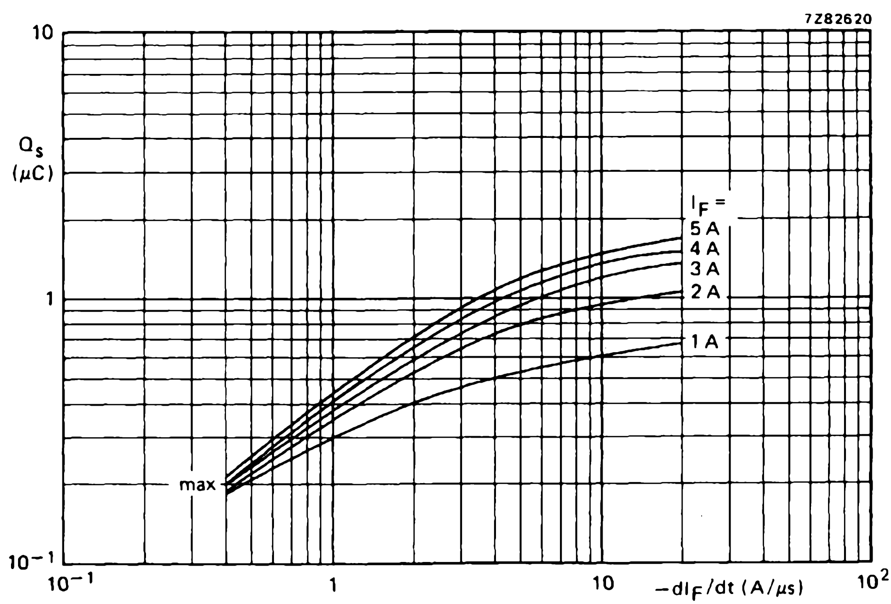


Fig. 12 Maximum values; T_j = 140 °C (see also Fig. 4).

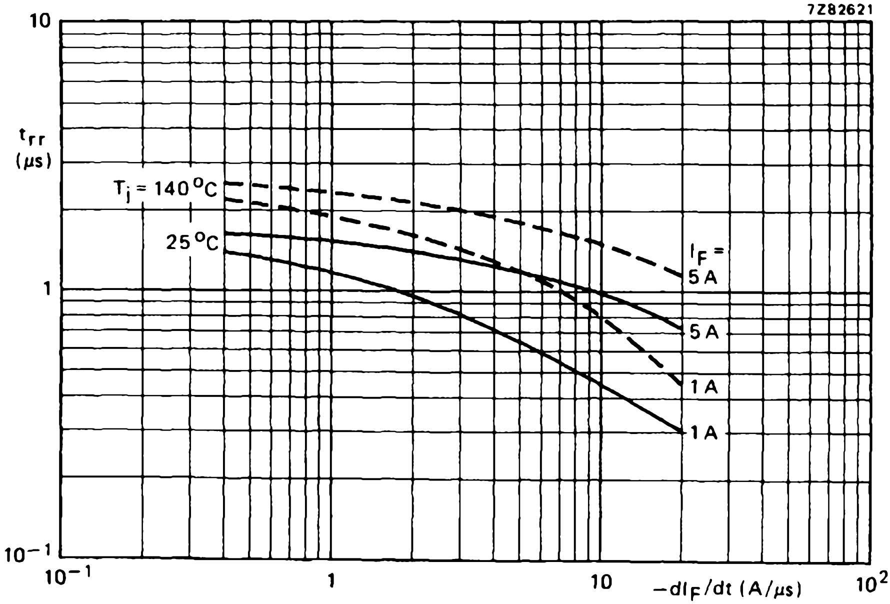


Fig. 13 Maximum values (see also Fig. 4).

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

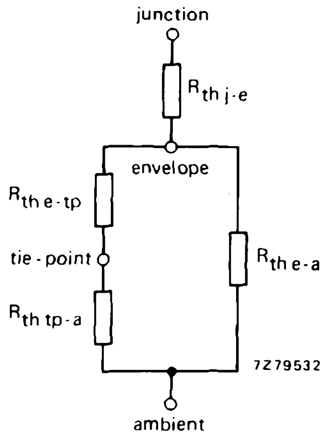


Fig. 14 Thermal model. $R_{th\ j\text{-}e}$ = 18 K/W.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

lead length	5	10	15	20	25	mm
$R_{th\ e\text{-}tp}$	15	30	45	60	75	K/W
$R_{th\ e\text{-}a}$	580	445	350	290	245	K/W

The thermal resistance between tie-point and ambient depends on the mounting method; for mounting on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness ⩾ 40 μm, the following values apply:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\ tp\text{-}a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm² per lead $R_{th\ tp\text{-}a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm² per lead $R_{th\ tp\text{-}a}$ is 45 K/W.

Note
Any temperature can be calculated by using the dissipation graph (Fig. 5) and the above thermal model.

CONTROLLED AVALANCHE RECTIFIER DIODES

Double-diffused glass passivated rectifier diodes in hermetically sealed axial-leaded glass envelopes, capable of absorbing reverse transients.

They are intended for rectifier applications in colour television circuits as well as general purpose applications in telephony equipment.

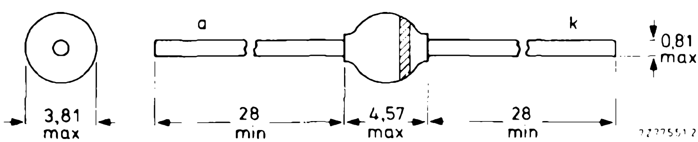
QUICK REFERENCE DATA

			BYW54	BYW55	BYW56	
Crest working reverse voltage	V_{RWM}	max.	600	800	1000	V
Reverse avalanche breakdown voltage	$V_{(BR)R}$	>	650	900	1100	V
		<	1000	1300	1600	V
Average forward current	$I_{F(AV)}$	max.	2	2	2	A
Non-repetitive peak forward current	I_{FSM}	max.		50		A
Non-repetitive peak reverse power dissipation	P_{RSM}	max.		1		kW
Junction temperature	T_j	max.		165		^oC

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-57.



The marking band indicates the cathode.

The diodes are type-branded.

Products approved to CECC 50 008-015 available on request.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BYW54	BYW55	BYW56	
Crest working reverse voltage	V_{RWM}	max.	600	800	1000	V
Continuous reverse voltage (Fig. 9)	V_R	max.	600	800	1000	V
Average forward current (averaged over any 20 ms period);						
→ T_{tp} = 35 °C; lead length 10 mm	$I_{F(AV)}$	max.		2		A
T_{amb} = 75 °C; Fig. 2 mounting	$I_{F(AV)}$	max.		0,8		A
Repetitive peak forward current	I_{FRM}	max.		12		A
Non-repetitive peak forward current (Figs 7 and 12) t = 10 ms, half sinewave	I_{FSM}	max.		50		A
Non-repetitive peak reverse power dissipation (t = 20 μs; half sine-wave); $T_j = T_{j\,max}$ prior to surge	P_{RSM}	max.		1		kW
Non-repetitive peak reverse avalanche mode pulse energy; I_R = 1 A; $T_j = T_{j\,max}$ prior to surge; with inductive load switched off	E_{RSM}	max.		20		mJ
Storage temperature	T_{stg}			−65 to +175		°C
Junction temperature	T_j	max.		165		°C

→ THERMAL RESISTANCE

Influence of mounting method

1. Thermal resistance from junction to tie-point at a lead length of 10 mm	$R_{th\,j\text{-}tp}$	=	46	K/W
2. Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 μm; Fig. 2	$R_{th\,j\text{-}a}$	=	100	K/W

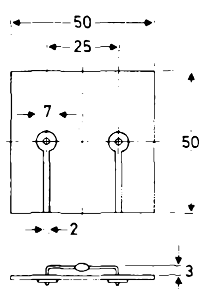


Fig. 2 Device mounted on a printed circuit board.

CHARACTERISTICS

			BYW54	BYW55	BYW56	
Forward voltage; $T_j = 25\ ^oC$ *						
$I_F = 1$ A	V_F	<	1	1	1	V
$I_F = 10$ A	V_F	<	1,65	1,65	1,65	V
Reverse avalanche breakdown voltage		>	650	900	1100	V
$I_R = 0,1$ mA; $T_j = 25\ ^oC$	$V_{(BR)R}$	<	1000	1300	1600	V
Reverse current						
$V_R = V_{RWM}$ max; $T_j = 25\ ^oC$**	I_R	<		1,0		μA
$V_R = V_{RWM}$ max; $T_j = 100\ ^oC$	I_R	<		10		μA
Reverse recovery charge when switched from $I_F = 1$ A to $V_R \geq 30$ V with $-dI_F/dt = 5$ A/μs; $T_j = 25\ ^oC$	Q_s	typ.		3		μC
Reverse recovery time when switched from $I_F = 1$ A to $V_R \geq 30$ V with $-dI_F/dt = 5$ A/μs; $T_j = 25\ ^oC$	t_{rr}	typ.		2,5		μs
Diode capacitance						
$V_R = 0$ V; f = 1 MHz; $T_j = 25\ ^oC$	C_d	typ.		50		pF

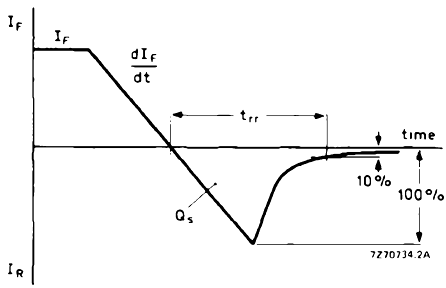


Fig. 3 Definitions of t_{rr} and Q_s.

* Measured under pulse conditions to avoid excessive dissipation.
** Illuminance ≤ 500 lux (daylight); relative humidity < 65%.

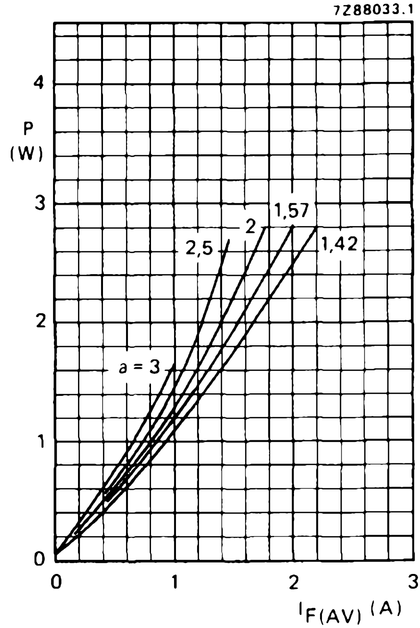


Fig. 4 Steady state power dissipation (forward plus leakage current excluding switching losses) as a function of the average forward current.

$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWMmax}$.

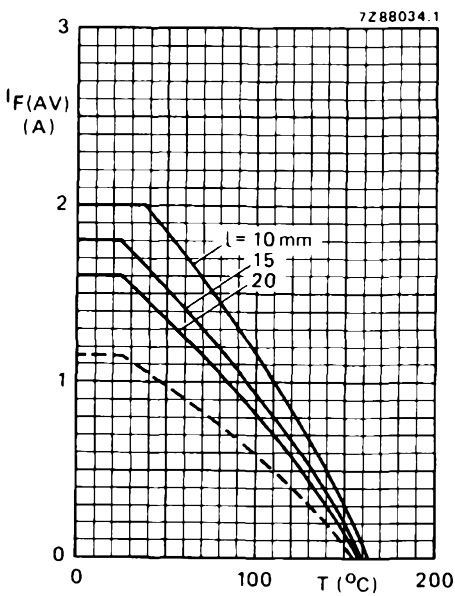


Fig. 5 Maximum average forward current as a function of the temperature.
The curves include losses due to reverse current.

$a = 1{,}57$; $V_R = V_{RWMmax}$; l = lead length
——— T = tie-point temperature
– – – – T = ambient temperature and device mounted as shown in Fig. 2.

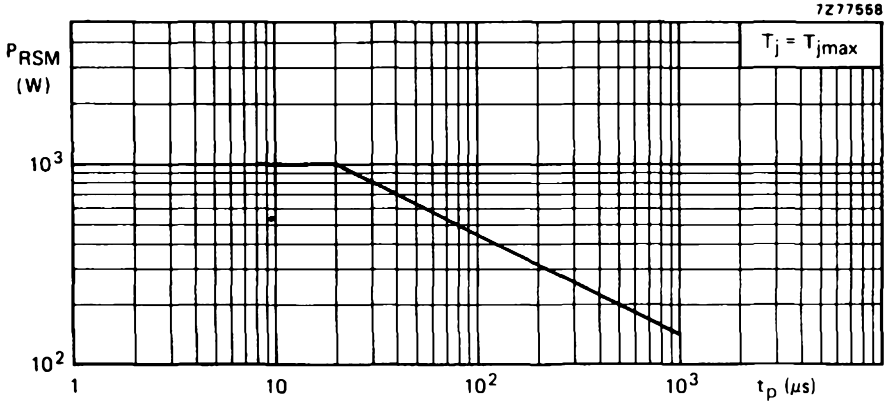
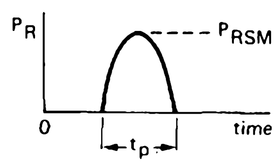


Fig. 6 Maximum permissible non-repetitive peak reverse power dissipation in the avalanche region.



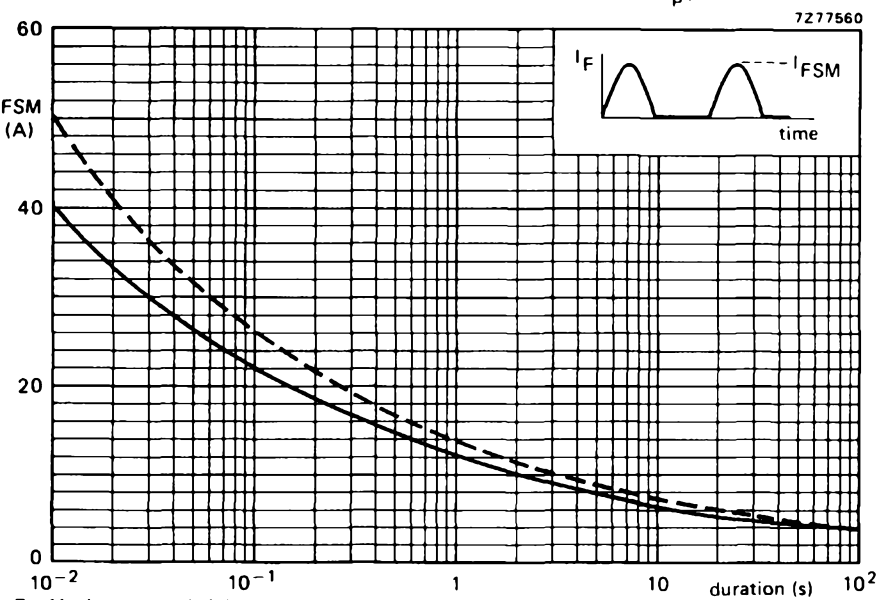


Fig. 7 Maximum permissible non-repetitive peak forward current based on sinusoidal currents (f = 50 Hz).

– – – – – T_j = 25 °C; V_R = 0.

———— $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RWM\,max}$.

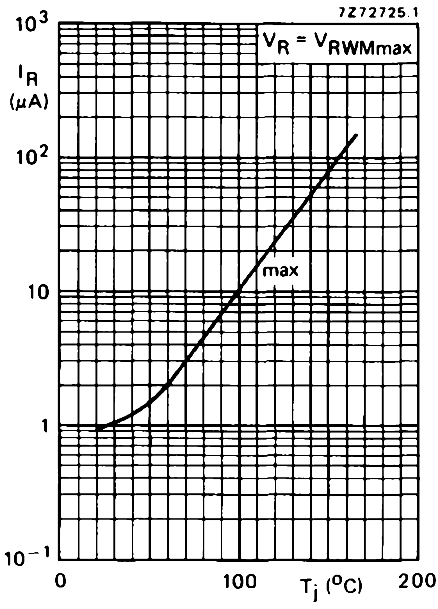


Fig. 8.

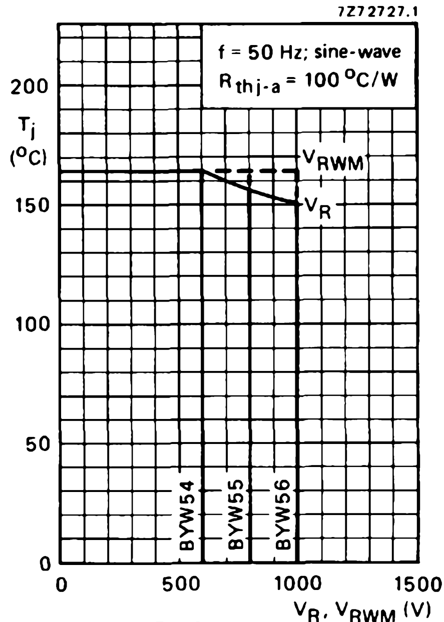


Fig. 9.

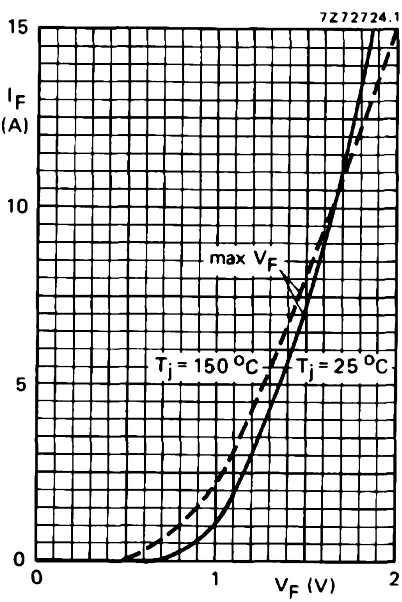


Fig. 10.

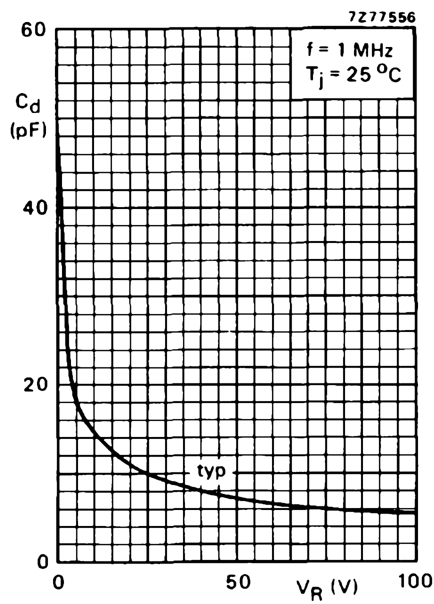


Fig. 11.

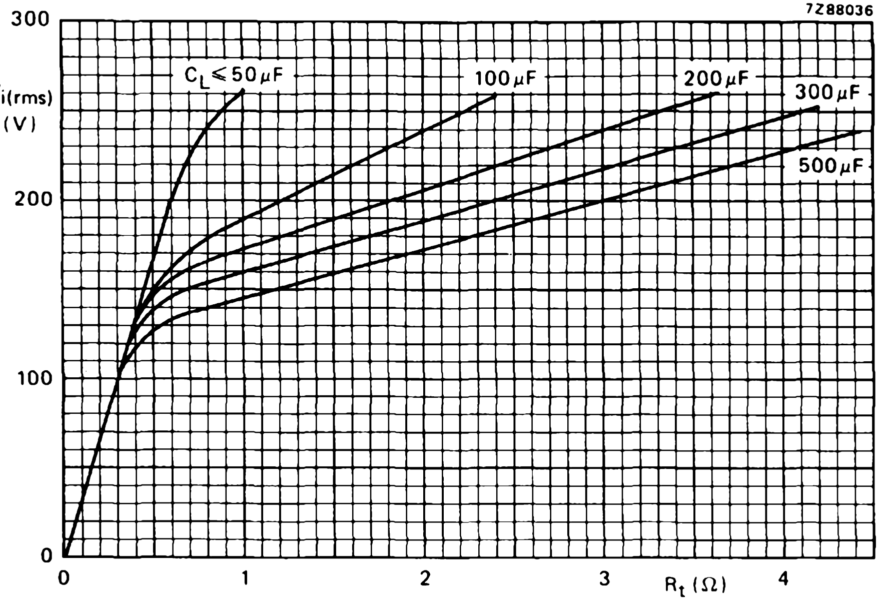


Fig. 12 Minimum values of series resistance (R_t), including the transformer resistance, required to limit the initial peak rectifier current with capacitive load. The possibility of the following spreads are taken into account: mains voltage + 10%; capacitance + 50%, resistance −10%.

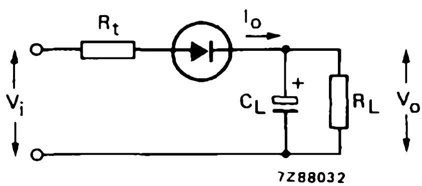


Fig. 13 Test circuit series resistance (R_t).

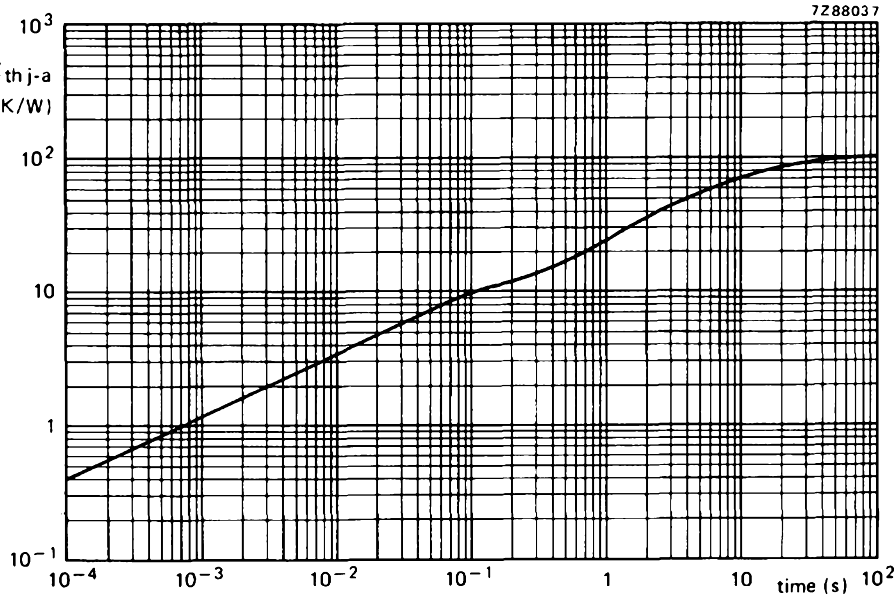


Fig. 14.
Device mounted on a printed circuit board (see Fig. 2).

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

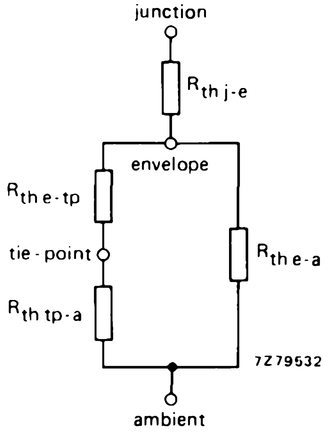


Fig. 15 Thermal model. ($R_{th\ j-e}$ = 18 K/W).

By using this thermal model and the dissipation graph (Fig. 4) any temperature can be calculated.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

thermal resistance	lead length					unit
	5	10	15	20	25	mm
$R_{th\ e\text{-}tp}$	15	30	45	60	75	K/W
$R_{th\ e\text{-}a}$	580	445	350	290	245	K/W

The thermal resistance between tie-point and ambient depends on the mounting method. For components on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness ⩾ 40 µm:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\ tp\text{-}a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm² per lead $R_{th\ tp\text{-}a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm² per lead $R_{th\ tp\text{-}a}$ is 45 K/W.

AVALANCHE FAST SOFT-RECOVERY RECTIFIER DIODES

Glass passivated rectifier diodes in hermetically sealed axial-leaded glass envelopes. They are intended for television and industrial applications, such as switched-mode power supplies, scan rectifiers, in TV receivers, and also for use in inverter and converter applications. The devices feature non-snap-off (soft-recovery) switching characteristics and are capable of absorbing reverse transient energy (e.g. during flashover in the picture tube).

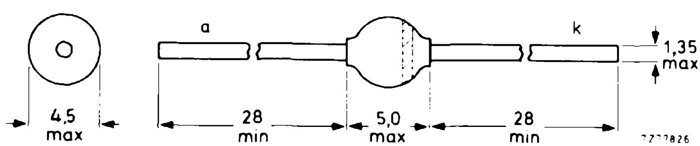
QUICK REFERENCE DATA

			BYW95A	B	C	
Repetitive peak reverse voltage	V_{RRM}	max.	200	400	600	V
Continuous reverse voltage	V_R	max.	200	400	600	V
Average forward current	$I_{F(AV)}$	max.		3		A
Non-repetitive peak forward current	I_{FSM}	max.		70		A
Non-repetitive peak reverse energy	E_{RSM}	max.		10		mJ
Reverse recovery time	t_{rr}	<		250		ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-64.



The marking band indicates the cathode.

The diodes are type-branded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BYW95A	B	C	
Repetitive peak reverse voltage	V_{RRM}	max.	200	400	600	V
Continuous reverse voltage	V_R	max.	200	400	600	V
Average forward current (averaged over any 20 ms period)						
→ T_{tp} = 60 °C; lead length 10 mm	$I_{F(AV)}$	max.		3		A
→ T_{amb} = 65 °C; Fig. 2	$I_{F(AV)}$	max.		1,25		A
Repetitive peak forward current	I_{FRM}	max.		15		A
Non-repetitive peak forward current (t = 10 ms; half sine-wave) $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RRMmax}$	I_{FSM}	max.		70		A
Non-repetitive peak reverse avalanche energy; I_R = 400 mA; $T_j = T_{j\,max}$ prior to surge; with inductive load switched off	E_{RSM}	max.		10		mJ
Storage temperature	T_{stg}			−65 to + 175		°C
→ Operating junction temperature	T_j	max.		175		°C

THERMAL RESISTANCE

Influence of mounting method

1. Thermal resistance from junction to tie-point at a lead length of 10 mm	$R_{th\,j\text{-}tp}$	=	25	K/W
2. Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 μm; Fig. 2	$R_{th\,j\text{-}a}$	=	75	K/W

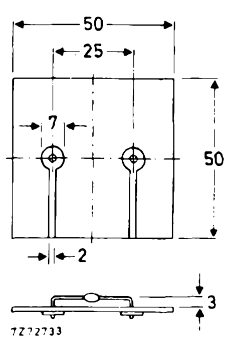


Fig. 2 Mounted on a printed-circuit board.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			BYW95A	B	C	
Forward voltage						
I_F = 5 A	V_F	<	1,5	1,5	1,5	V *
I_F = 5 A; $T_j = T_{j\,max}$	V_F	<	1,25	1,25	1,25	V *
Reverse avalanche breakdown voltage						
I_R = 0,1 mA	$V_{(BR)R}$	>	300	500	700	V
Reverse current						
$V_R = V_{RRMmax}$; T_j = 165 °C	I_R	<		150		μA
Reverse recovery when switched from I_F = 1 A to $V_R \geq$ 30 V with $-dI_F/dt$ = 20 A/μs						
recovered charge	Q_s	<		250		nC
recovery time	t_{rr}	<		250		ns
Maximum slope of reverse recovery current when switched from I_F = 1 A to $V_R \geq$ 30 V with $-dI_F/dt$ = 1 A/μs	$\lvert dI_R/dt \rvert$	<		6		A/μs

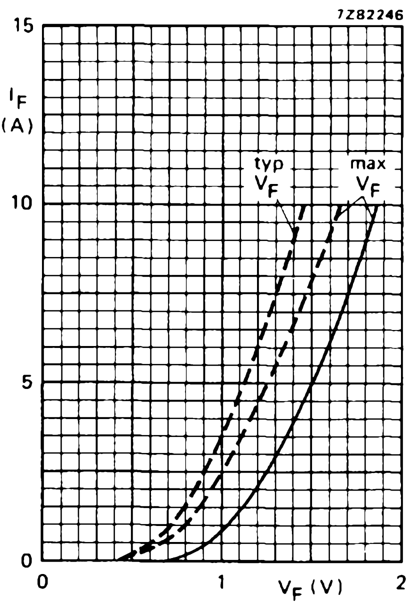


Fig. 3 —— T_j = 25 °C; – – – $T_j = T_{j\,max}$.

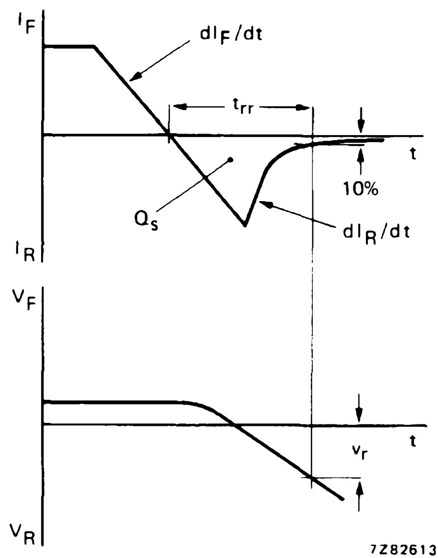


Fig. 4 Definitions.

* Measured under pulse conditions to avoid excessive dissipation.

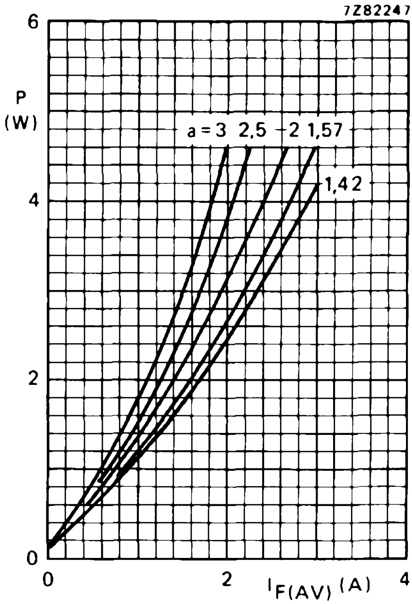


Fig. 5.

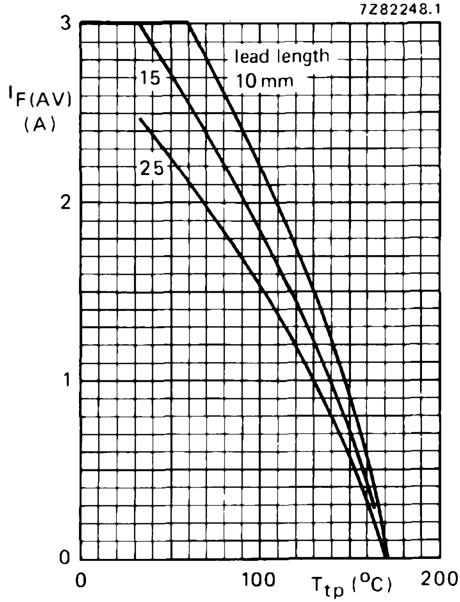


Fig. 6.

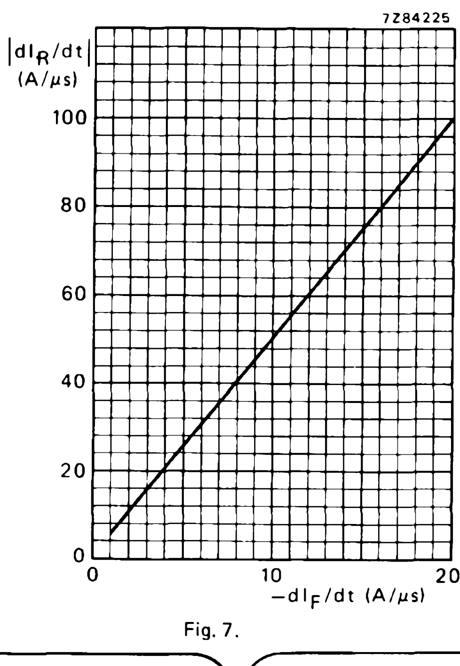


Fig. 7.

Fig. 5 Steady state power dissipation (forward plus leakage current) excluding switching losses as a function of the average forward current.

The graph is for switched-mode application.

$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRMmax}$

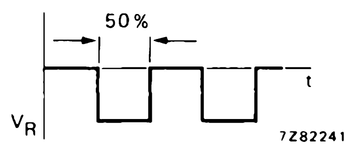


Fig. 6 Maximum average forward current as a function of the tie-point temperature; the curves include losses due to reverse leakage.

The graph is for switched-mode application; $V_R = V_{RRMmax}$; $\delta = 50\%$; a = 1,57.

Fig. 7 Maximum slope of reverse recovery current. $T_j = 25\ ^{\circ}C$.

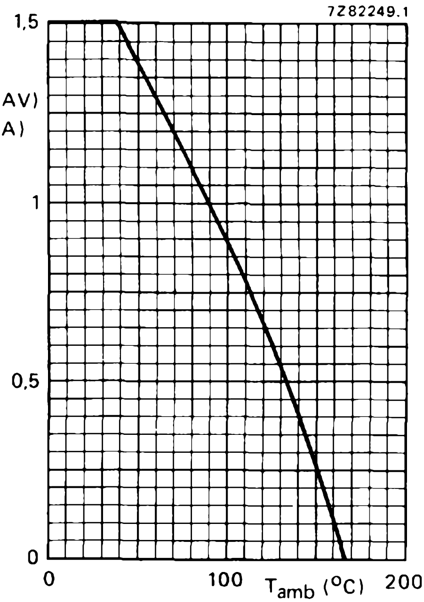


Fig. 8 Maximum average forward current as a function of the ambient temperature; the curve includes losses due to reverse leakage. Mounting method see Fig. 2.

The graph is for switched-mode application; $V_R = V_{RRMmax}$; δ = 50%; a = 1,57.

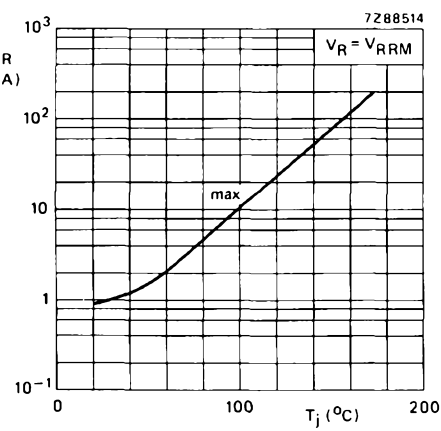


Fig. 9 Reverse current as a function of junction temperature. $V_R = V_{RRM\,max}$.

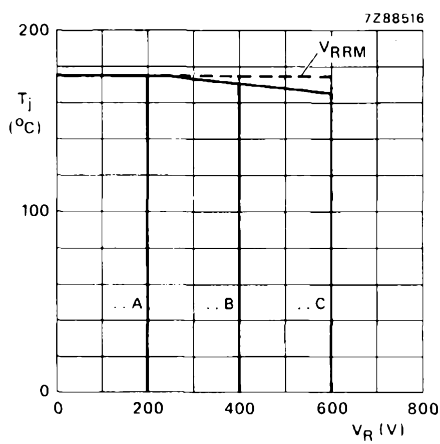


Fig. 10 Maximum values junction temperature as a function of reverse voltage.

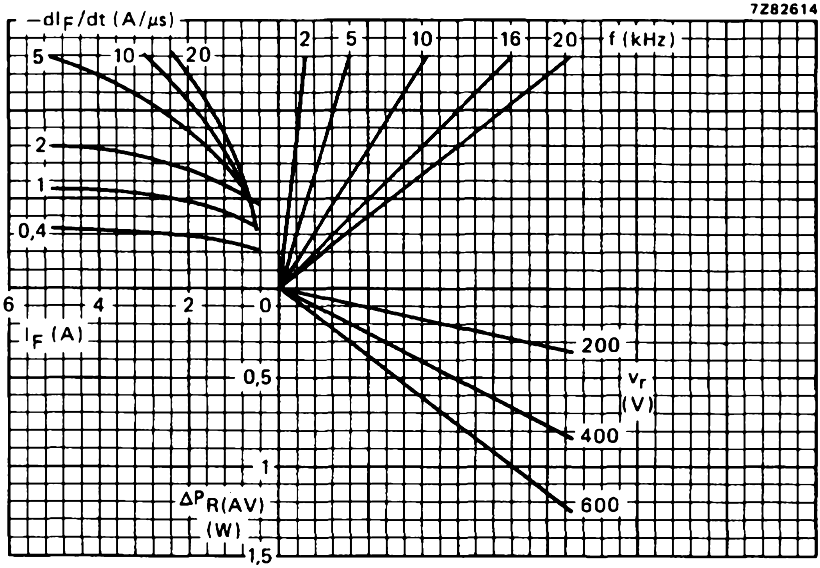


Fig. 11 Nomogram: power loss ($\Delta P_{R(AV)}$) due to switching only. To be added to steady state power losses (see also Fig. 4).

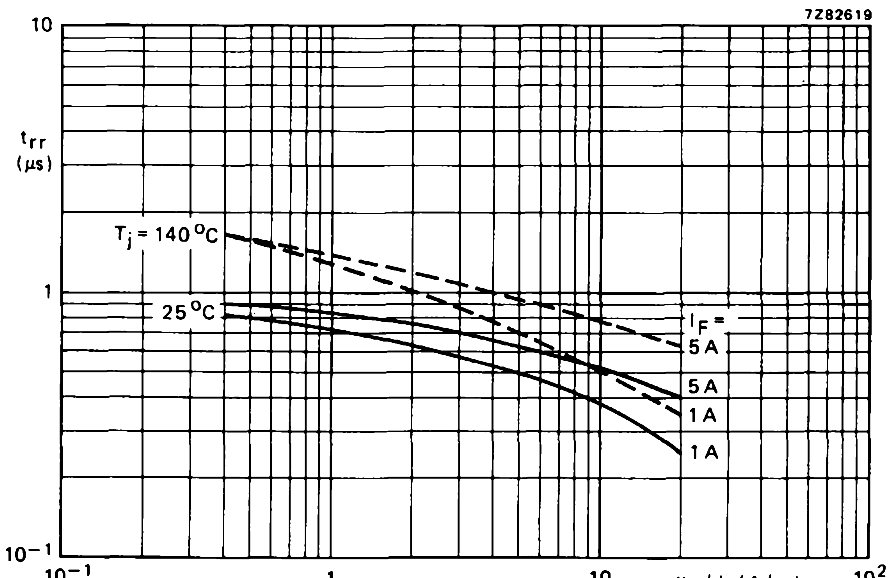


Fig. 12 Maximum values; for definitions see Fig. 4.

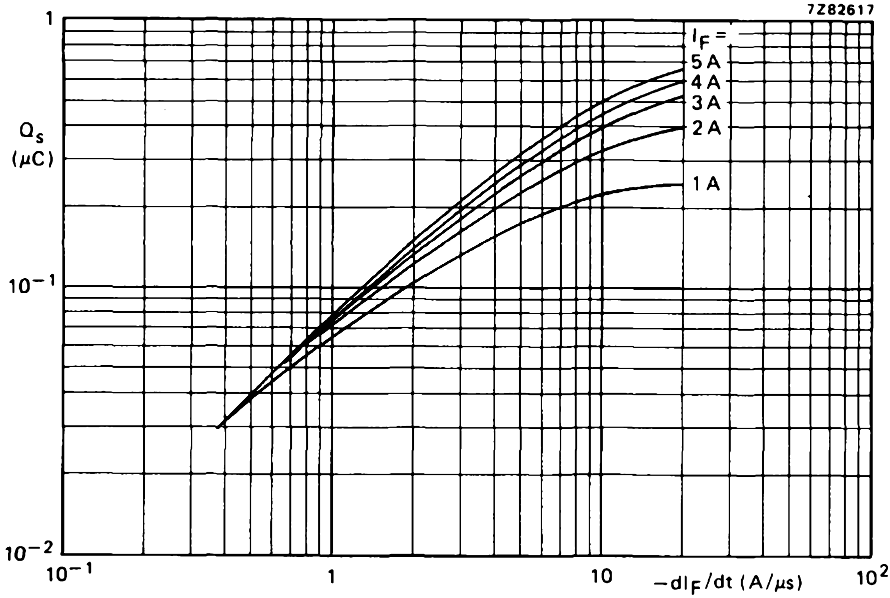


Fig. 13 Maximum values; T_j = 25 °C. For definitions see Fig. 4.

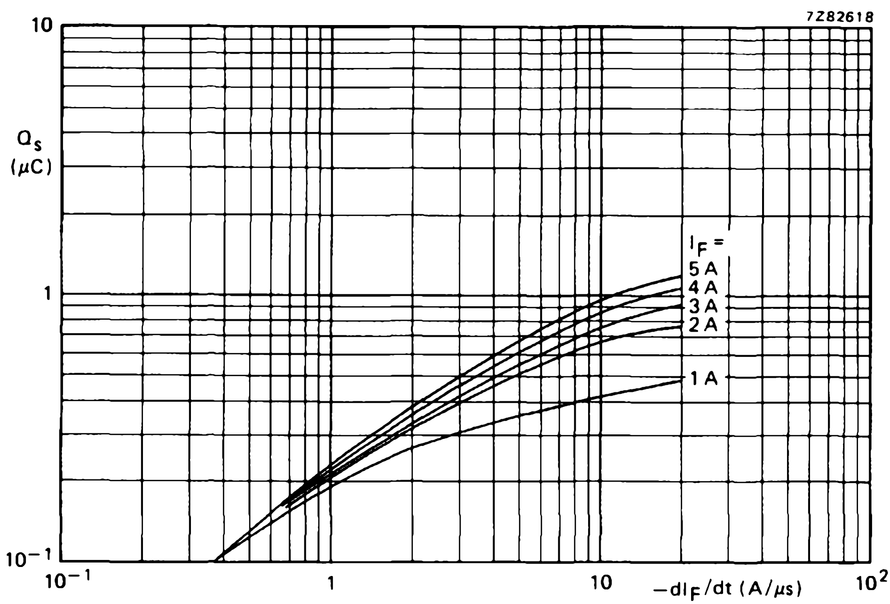


Fig. 14 Maximum values; T_j = 140 °C. For definitions see Fig. 4.

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

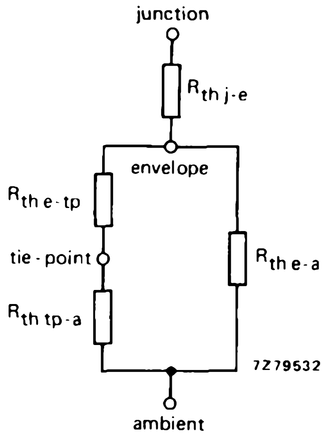


Fig. 15 Thermal model. $R_{th\,j\text{-}e}$ = 12 K/W.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

lead length	5	10	15	20	25	mm
$R_{th\,e\text{-}tp}$	7	14	21	28	35	K/W
$R_{th\,e\text{-}a}$	410	300	230	185	155	K/W

The thermal resistance between tie-point and ambient depends on the mounting method; for mounting on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness $\geqslant$ 40 μm, the following values apply:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\,tp\text{-}a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm^2 per lead $R_{th\,tp\text{-}a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm^2 per lead $R_{th\,tp\text{-}a}$ is 45 K/W.

Note
Any temperature can be calculated by using the dissipation graph (Fig. 5) and the above thermal model.

AVALANCHE FAST SOFT-RECOVERY RECTIFIER DIODES

Glass passivated rectifier diodes in hermetically sealed axial-leaded glass envelopes. They are intended for television and industrial applications, such as switched-mode power supplies, scan rectifiers, in TV receivers, and also for use in inverter and converter applications. The devices feature non-snap-off (soft-recovery) switching characteristics and are capable of absorbing reverse transient energy (e.g. during flashover in the picture tube).

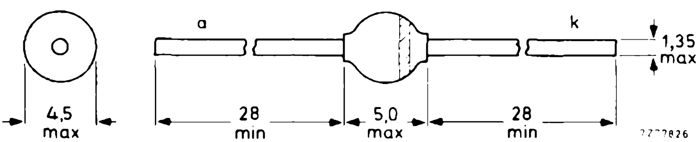
QUICK REFERENCE DATA

			BYW96D	BYW96E	
Repetitive peak reverse voltage	V_{RRM}	max.	800	1000	V
Continuous reverse voltage	V_R	max.	800	1000	V
Average forward current	$I_{F(AV)}$	max.	3		A
Non-repetitive peak forward current	I_{FSM}	max.	70		A
Non-repetitive peak reverse energy	E_{RSM}	max.	10		mJ
Reverse recovery time	t_{rr}	<	300		ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-64.



The marking band indicates the cathode.

The diodes are type-branded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BYW96D	BYW96E	
Repetitive peak reverse voltage	V_{RRM}	max.	800	1000	V
Continuous reverse voltage	V_R	max.	800	1000	V
Average forward current (averaged over any 20 ms period)					
T_{tp} = 50 °C; lead length 10 mm	$I_{F(AV)}$	max.	3		A
T_{amb} = 55 °C; Fig. 2	$I_{F(AV)}$	max.	1,25		A
Repetitive peak forward current	I_{FRM}	max.	15		A
Non-repetitive peak forward current (t = 10 ms; half sine-wave) $T_j = T_{j\,max}$ prior to surge; $V_R = V_{RRMmax}$	I_{FSM}	max.	70		A
Non-repetitive peak reverse avalanche energy; I_R = 400 mA; $T_j = T_{j\,max}$ prior to surge; with inductive load switched off	E_{RSM}	max.	10		mJ
Storage temperature	T_{stg}		−65 to + 175		°C
→ Operating junction temperature	T_j	max.	175		°C

THERMAL RESISTANCE

Influence of mounting method

1. Thermal resistance from junction to tie-point at a lead length of 10 mm — $R_{th\,j\text{-}tp}$ = 25 K/W
2. Thermal resistance from junction to ambient when mounted on a 1,5 mm thick epoxy-glass printed-circuit board; Cu-thickness ⩾ 40 μm; Fig. 2 — $R_{th\,j\text{-}a}$ = 75 K/W

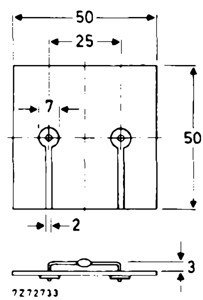


Fig. 2 Mounted on a printed-circuit board.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			BYW96D	BYW96E	
Forward voltage					
I_F = 5 A	V_F	<	1,5	1,5	V *
I_F = 5 A; T_j = $T_{j\,max}$	V_F	<	1,25	1,25	V *
Reverse avalanche breakdown voltage					
I_R = 0,1 mA	$V_{(BR)R}$	>	900	1100	V
Reverse current					
$V_R = V_{RRMmax}$; T_j = 165 °C	I_R	<	150		μA
Reverse recovery when switched from I_F = 1 A to $V_R \geqslant$ 30 V with $-dI_F/dt$ = 20 A/μs					
recovered charge	Q_s	<	400		nC
recovery time	t_{rr}	<	300		ns
Maximum slope of reverse recovery current when switched from I_F = 1 A to $V_R \geqslant$ 30 V with $-dI_F/dt$ = 1 A/μs	$\lvert dI_R/dt \rvert$	<	5		A/μs

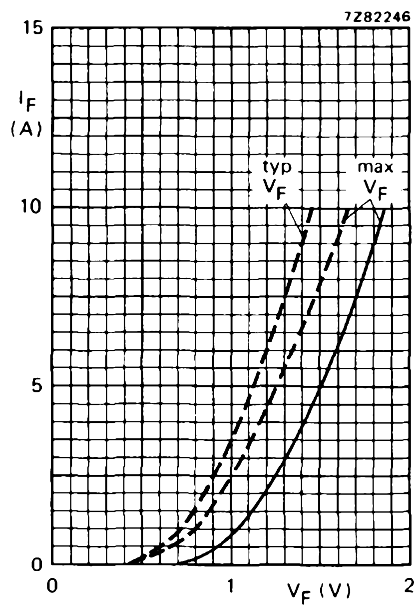


Fig. 3 —— T_j = 25 °C; – – – T_j = $T_{j\,max}$

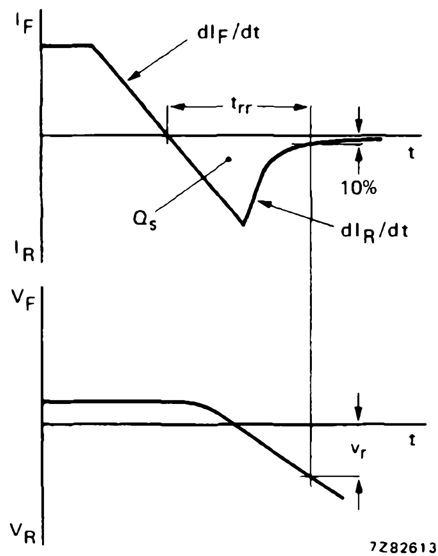


Fig. 4 Definitions.

* Measured under pulse conditions to avoid excessive dissipation.

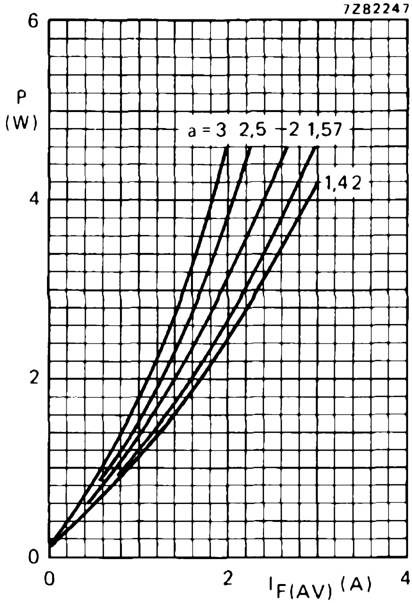
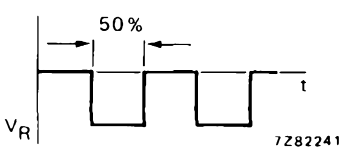


Fig. 5 Steady state power dissipation (forward plus leakage current) excluding switching losses as a function of the average forward current.

The graph is for switched-mode application.

$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRMmax}$



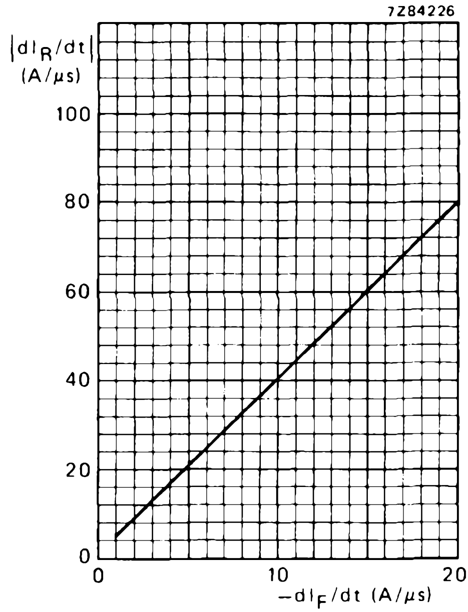


Fig. 6 Maximum slope of reverse recovery current. T_j = 25 °C.

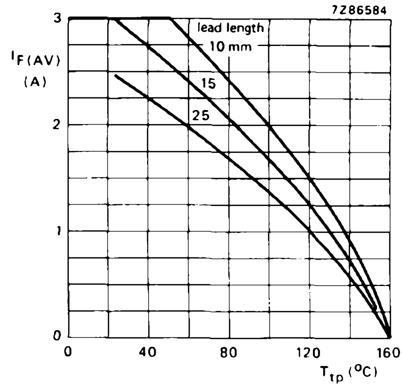


Fig. 7 Maximum average forward current as a function of the tie-point temperature; the curves include losses due to reverse leakage.

The graph is for switched-mode application; $V_R = V_{RRMmax}$; δ = 50%; a = 1,57.

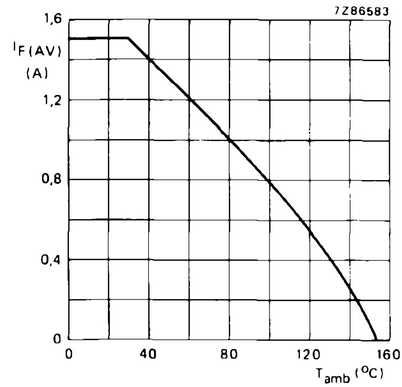


Fig. 8 Maximum average forward current as a function of the ambient temperature; the curve includes losses due to reverse leakage. Mounting method see Fig. 2.

The graph is for switched-mode application; $V_R = V_{RRMmax}$; δ = 50%; a = 1,57.

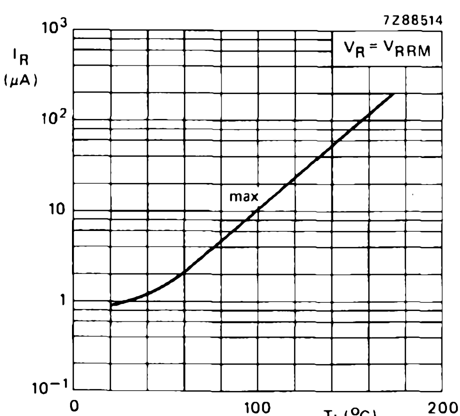


Fig. 9 Reverse current as a function of junction temperature. $V_R = V_{RRM\,max}$.

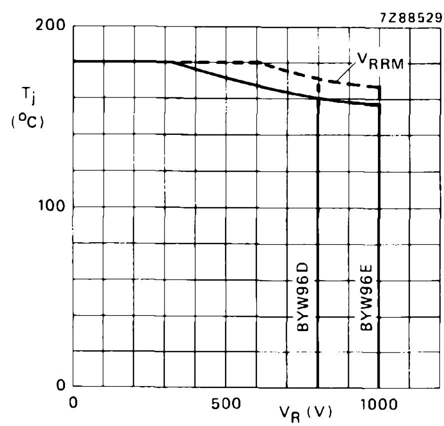


Fig. 10 Maximum values junction temperature as a function of reverse voltage.

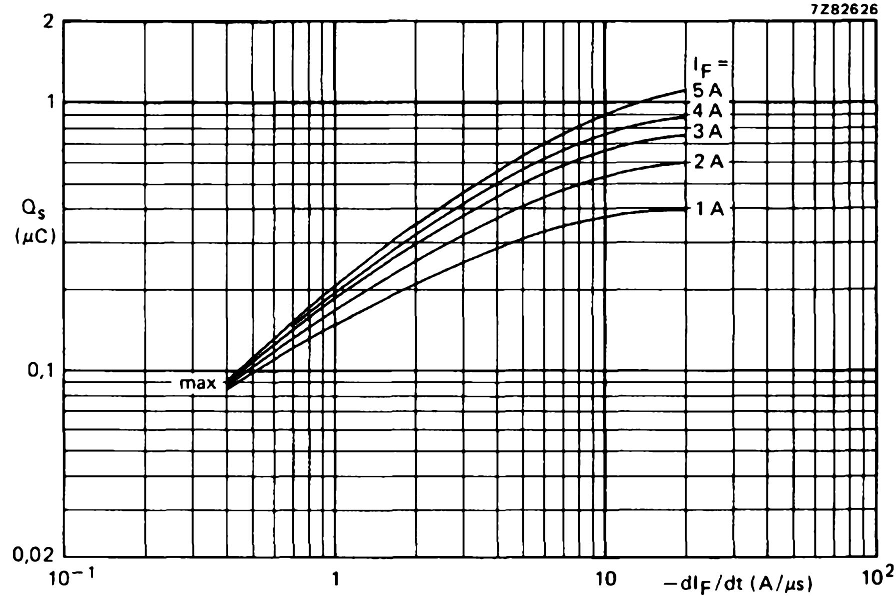


Fig. 11 Maximum values at T_j = 25 °C (see also Fig. 4).

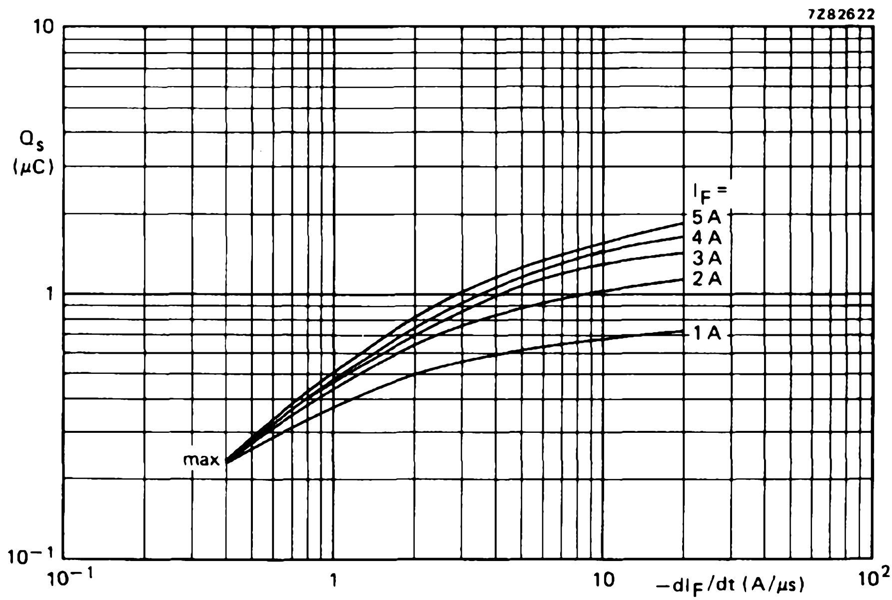


Fig. 12 Maximum values at T_j = 140 °C (see also Fig. 4).

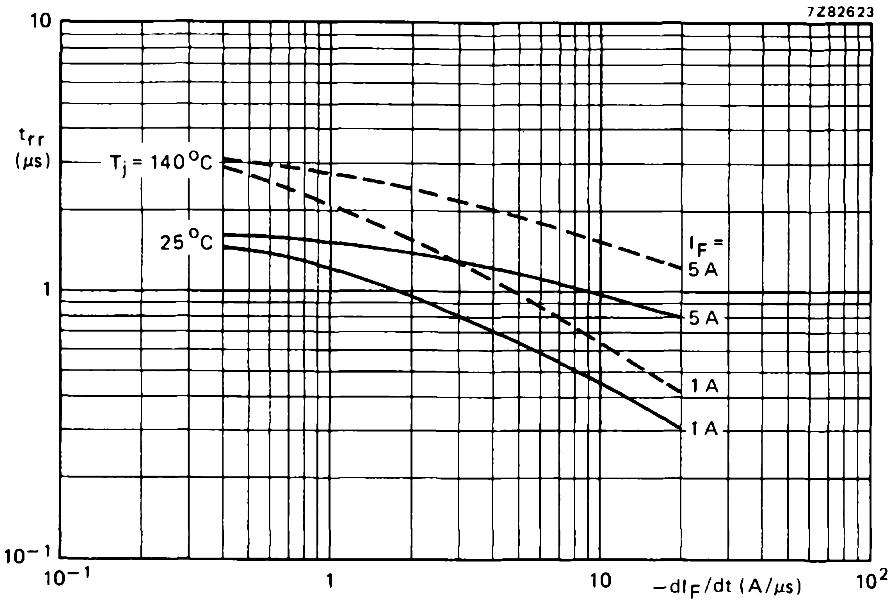


Fig. 13 Maximum values. For definitions see Fig. 4.

OPERATING NOTES

The various components of junction temperature rise above ambient, for mounting with symmetrical lead length, are illustrated below.

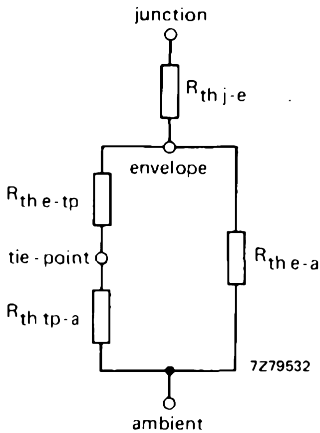


Fig. 14 Thermal model. $R_{th\ j\text{-}e}$ = 12 K/W.

The thermal resistances between envelope and tie-point, and between envelope and ambient depend on lead length.

lead length	5	10	15	20	25	mm
$R_{th\ e\text{-}tp}$	7	14	21	28	35	K/W
$R_{th\ e\text{-}a}$	410	300	230	185	155	K/W

The thermal resistance between tie-point and ambient depends on the mounting method; for mounting on a 1,5 mm thick epoxy-glass printed-circuit board with a copper-thickness $\geqslant 40\ \mu$ m, the following values apply:

1. Mounted as given in Fig. 2 the thermal resistance $R_{th\ tp\text{-}a}$ is 70 K/W.
2. Mounted with copper laminate of 1 cm^2 per lead $R_{th\ tp\text{-}a}$ is 55 K/W.
3. Mounted with copper laminate of 2,25 cm^2 per lead $R_{th\ tp\text{-}a}$ is 45 K/W.

Note
Any temperature can be calculated by using the dissipation graph (Fig. 5) and the above thermal model.

SILICON RECTIFIER DIODE

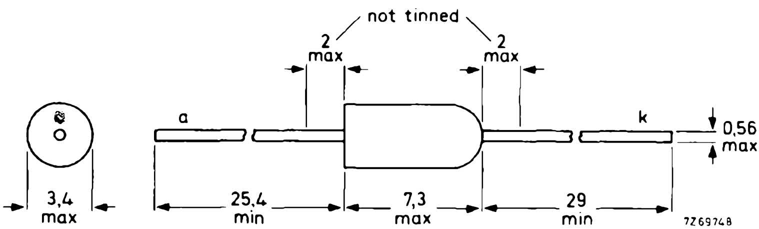
Double-diffused silicon diode in a DO-14 plastic envelope.
It is intended for low current rectifier applications.

QUICK REFERENCE DATA				
Repetitive peak reverse voltage	V_{RRM}	max.	1600	V
Average forward current	$I_{F(AV)}$	max.	0,5	A
Non-repetitive peak forward current	I_{FSM}	max.	15	A

MECHANICAL DATA

Dimensions in mm

DO-14



The rounded end indicates the cathode

The sealing of the plastic envelope withstands the accelerated damp heat test of IEC recommendation 68-2 (test D, severity IV, 6 cycles).

All information applies to frequencies up to 400 Hz.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Crest working reverse voltage	V_{RWM}	max.	800	V
Repetitive peak reverse voltage ($\delta \leq 0.01$)	V_{RRM}	max.	1600	V
Non-repetitive peak reverse voltage ($t < 10$ ms)	V_{RSM}	max.	1600	V

Currents

Average forward current (averaged over any 20 ms period) with R load; $V_{RWM} = V_{RWMmax}$	$I_{F(AV)}$	max.	0.36	A
$V_{RWM} = 60$ V	$I_{F(AV)}$	max.	0.5	A
Repetitive peak forward current	I_{FRM}	max.	3	A
Non-repetitive peak forward current ($t = 10$ ms; half-sine wave) $T_j = 150\ ^{o}C$ prior to surge	I_{FSM}	max.	15	A

Temperatures

Storage temperature	T_{stg}		-65 to + 150	^{o}C
Junction temperature	T_j	max.	150	^{o}C

CHARACTERISTICS

Forward voltage

$I_F = 2$ A; $T_j = 25\ ^{o}C$	V_F	<	1.6	V [1]

Reverse current

$V_R = 800$ V; $T_j = 125\ ^{o}C$	I_R	<	50	μA
$V_R = 800$ V; $T_j = 25\ ^{o}C$	I_R	<	1	μA

[1] Measured under pulse conditions to avoid excessive dissipation.

SILICON CONTROLLED AVALANCHE DIODES

Silicon controlled avalanche diodes in glass envelopes, intended for telephony applications.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134).

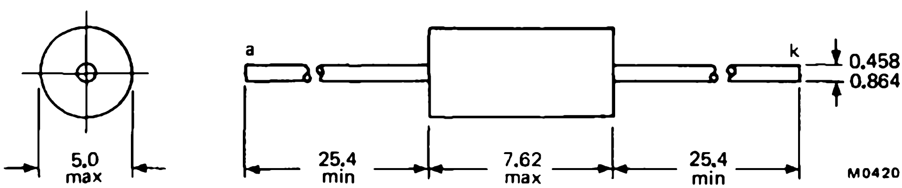
Continuous reverse voltage; CV8805	V_R	max.	150	V
CV8308	V_R	max.	60	V
Repetitive peak reverse voltage	V_{RRM}	max.	see note	
Forward current (d.c.) (see also derating curve, Fig. 3)	I_F	max.	250	mA
Repetitive peak forward current; $t_p \leqslant 10$ ms; $\delta \leqslant 0.025$	I_{FRM}	max.	10	A
Non-repetitive peak forward current half-sinewave; t = 10 ms	I_{FSM}	max.	20	A
Power dissipation (see also derating curve, Fig. 4)	P_{tot}	max.	250	mW
Repetitive peak reverse power dissipation	P_{RRM}	max.	see note	
Non-repetitive peak reverse power dissipation (duration 10 μs)	P_{RSM}	max.	600	W
Operating ambient temperature	T_{amb}		0 to 100	^oC
Storage temperature	T_{stg}		0 to 100	^oC

Note: The repetitive peak reverse voltage and the peak reverse current are limited by the peak reverse power dissipation (see Fig. 5).

MECHANICAL DATA

Dimensions in mm

Fig. 1



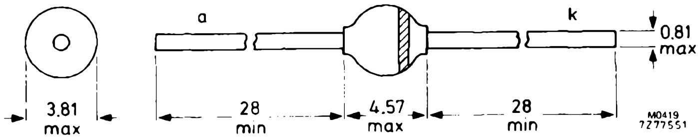
The standard registered CV8805, 8308 outline is as shown above. The Mullard outline, SOD—57, conforms fully with this. For details see page 2.

Products approved to CECC 50 001-020 (specification available on request).

CHARACTERISTICS

Dimensions in mm

Fig. 2 SOD–57



The marking band indicates the cathode

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise stated

Reverse current					
V_R = 150 V	CV8805	I_R	<	1.0	μA
V_R = 60 V	CV8308	I_R	<	1.0	μA
V_R = 150 V; T_{amb} = 100 °C;	CV8805	I_R	<	100	μA
V_R = 60 V; T_{amb} = 100 °C;	CV8308	I_R	<	100	μA
Forward voltage					
I_F = 250 mA	both types	V_F	<	0.9	V
I_F = 25 mA	both types	V_F	>	0.5	V
Avalanche breakdown voltage					
I_R = 1.0 mA	CV8805	$V_{(BR)R}$	>	200	V
	CV8805	$V_{(BR)R}$	<	280	V
I_R = 2.0 mA	CV8308	$V_{(BR)R}$	>	80	V
	CV8308	$V_{(BR)R}$	<	140	V
Capacitance					
V_R = 10 V; f = 1 MHz	both types	C_{tot}	<	150	pF

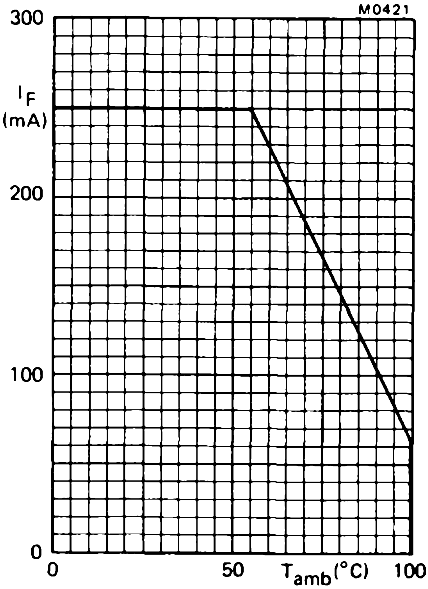


Fig. 3 Max. allowable forward current versus ambient temperature.

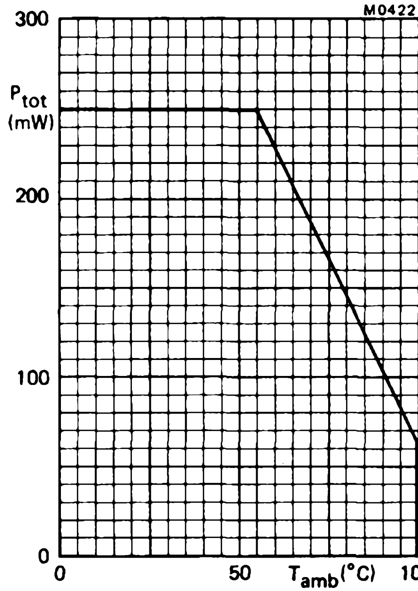


Fig. 4 Max. allowable power dissipation versus ambient temperature.

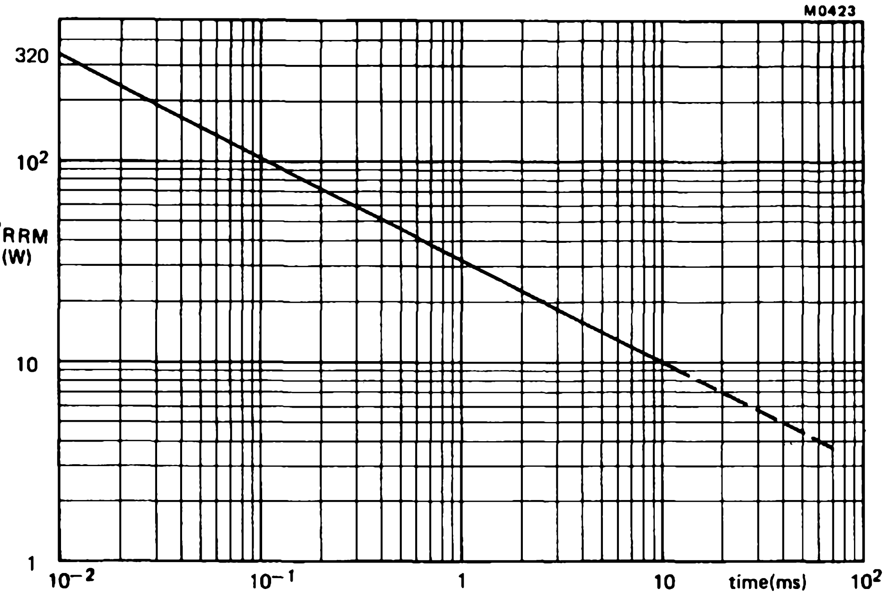


Fig. 5 Repetitive peak reverse power versus conduction time of the diode; $P_F = 0$; $T_{amb} = 0$ to +55 °C; The pulse repetition frequency is such that the mean reverse power does not exceed 250 mW.

SILICON AVALANCHE RECTIFIER DIODES

Silicon diodes in glass envelopes, capable of absorbing reverse transients, intended for general purpose applications.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

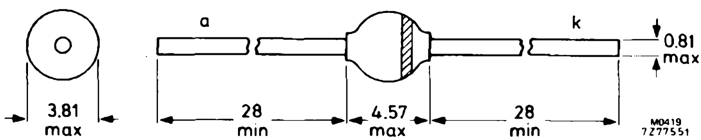
			CVA7026	7027	7028	7029	7030	7476	
Crest working reverse voltage	V_{RWM}	max.	100	200	400	600	800	1000	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	200	400	600	800	1200	V
Non-repetetive peak reverse voltage; $t \leqslant 10$ ms	V_{RSM}	max.	100	200	400	600	800	1200	V
Continuous reverse voltage (see Fig. 2)	V_R	max.	–	–	–	–	–	1000	V

Average forward current; sinusoidal conduction; resistive load; see derating curve, Fig. 3		$I_{F(AV)}$	max.	0.75	A
Repetitive peak forward current		I_{FRM}	max.	12	A
Non-repetitive peak forward current; t = 10 ms; half sinewave; without reapplied V_{RWMmax};	CVA7026–7030	I_{FSM}	max.	15	A
	CVA7476	I_{FSM}	max.	20	A
Operating ambient temperature;	CVA7026–7030	T_{amb}		–40 to +125	°C
	CVA7476	T_{amb}		–65 to +175	°C
Storage temperature;	CVA7026–7030	T_{stg}		–40 to +125	°C
	CVA7476	T_{stg}		–65 to +175	°C

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD–57



The marking band indicates the cathode

Products approved to CECC 50 008-015 (specification available on request).

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise stated

Reverse current					
at V_{RRMmax}	all types	I_R	<	20	μA
at V_{RRMmax}; T_{amb} = 125 °C	CVA7026 to 7030	I_R	<	300	μA
at V_{RRMmax}; T_{amb} = 175 °C	CVA7476	I_R	<	300	μA
Forward voltage					
I_F = 2.5 A		V_F	<	1.15	V
Breakdown voltage					
I_R = 0.5 mA	CVA7476	$V_{(BR)R}$	>	1250	V
	CVA7476	$V_{(BR)R}$	<	2000	V

NOTE

The CVA7026–7030 and CVA7476 are in some minor aspects specified differently from the types CV7026–7030 and CV7476. They are, however, regarded by the original approval authority as direct replacements and may be used as such.

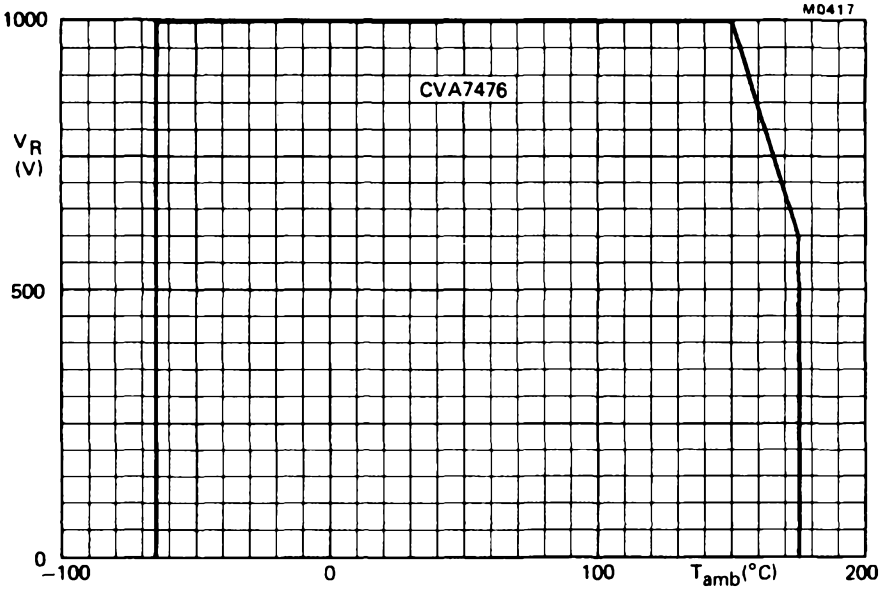


Fig. 2 Maximum continuous reverse voltage versus ambient temperature.

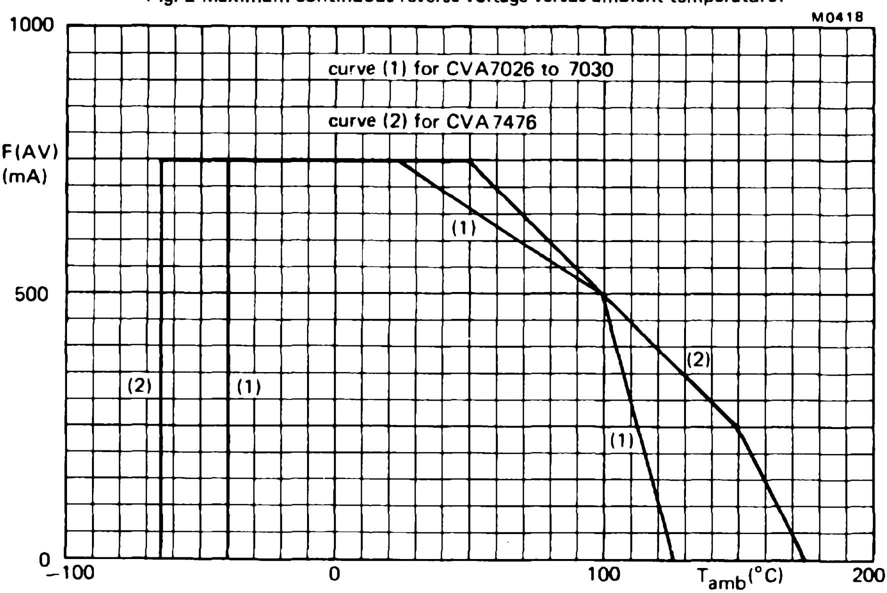


Fig.3 Maximum allowable average forward current versus ambient temperature.

SILICON DIFFUSED RECTIFIER DIODES

A range of silicon rectifier diodes for general purpose use.

QUICK REFERENCE DATA

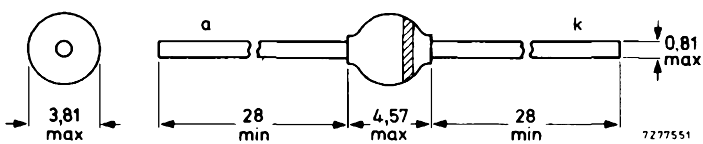
			1N4001G	4002G	4003G	4004G	4005G	4006G	4007G	
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	200	400	600	800	1000	V
Continuous reverse voltage	V_R	max.	50	100	200	400	600	800	1000	V

Average forward current	$I_{F(AV)}$	max.	1	A
Repetitive peak forward current	I_{FRM}	max.	10	A
Non-repetitive peak forward current	I_{FSM}	max.	30	A

MECHANICAL DATA

Dimensions in mm

Fig.1 SOD–57 The diodes are type branded.



band indicates cathode

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

			1N4001G	4002G	4003G	4004G	4005G	4006G	4007G	
Repetitive peak reverse voltage	V_{RRM}	max.	50	100	200	400	600	800	1000	V
Continuous reverse voltage	V_R	max.	50	100	200	400	600	800	1000	V

Currents

Average forward current (averaged over any 20 ms period)				
up to T_{amb} = 75 °C	$I_{F(AV)}$	max.	1	A
at T_{amb} = 100 °C	$I_{F(AV)}$	max.	0.75	A
Forward current (d.c.) up to T_{amb} = 75 °C	I_F	max.	1	A
Repetitive peak forward current	I_{FRM}	max.	10	A
Non-repetitive peak forward current (half-cycle sinewave, 60 Hz)	I_{FSM}	max.	30	A

Temperatures

Storage temperature	T_{stg}		−65 to +175	°C
Junction temperature	T_j	max.	175	°C

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise stated

Forward voltage I_F = 1 A d.c.	V_F	<	1.1	V
Full-cycle average forward voltage $I_{F(AV)}$ = 1 A	$V_{F(AV)}$	<	0.8	V
Reverse current				
$V_R = V_{Rmax}$; T_{amb} = 25 °C	I_R	<	10	μA
$V_R = V_{Rmax}$; T_{amb} = 100 °C	I_R	<	50	μA
Full-cycle average reverse current $V_R = V_{RRMmax}$; T_{amb} = 75 °C	$I_{R(AV)}$	<	30	μA

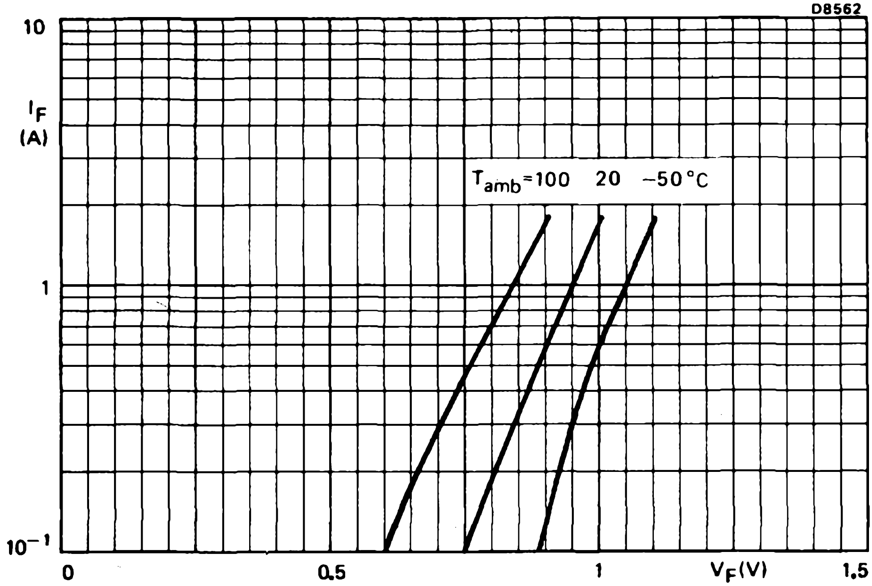


Fig.3 Typical values

Fig.4 Maximum permissible d.c. forward current

SCHOTTKY-BARRIER DIODES

F

U.H.F. MIXER DIODE

Silicon epitaxial Schottky barrier diode with low forward voltage in a DO-34 glass envelope. The diode is especially designed for u.h.f. mixer applications.

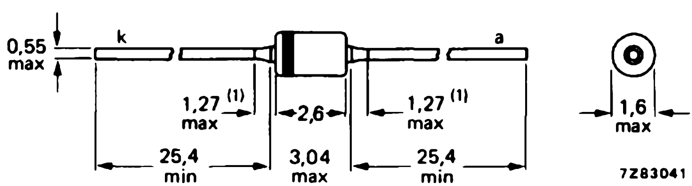
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	4	V
Forward current (d.c.)	I_F	max.	30	mA
Junction temperature	T_j	max.	125	^oC
Forward voltage $I_F = 1$ mA	V_F	max.	400	mV

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-68 (DO-34).



(1) Lead diameter in this zone uncontrolled.

The diodes are suitable for mounting on a 2 E (5,08 mm) pitch.

The cathode is indicated by a coloured band.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage $I_R = 10\ \mu A$	V_R	max.	4	V
Reverse voltage (peak value)	V_{RM}	max.	4	V
Forward current (d.c.)	I_F	max.	30	mA
Junction temperature	T_j	max.	125	^oC

CHARACTERISTICS

$T_{amb} = 25\ ^oC$ unless otherwise specified

Forward voltage				
$I_F = 1$ mA	V_F	<	400	mV
$I_F = 10$ mA	V_F	<	550	mV
Reverse current $V_R = 3$ V	I_R	<	2	μA
Diode capacitance $V_R = 0$; f = 1 MHz	C_d	<	1,1	pF
Noise figure at f = 900 MHz *	F	<	8	dB
Series resistance $I_F = 5$ mA; f = 1 kHz	r_s	<	16	Ω

* The local oscillator is adjusted for a diode current of 2 mA.
I.F. amplifier noise $F_{if} = 1{,}5$ dB; f = 35 MHz.

SCHOTTKY BARRIER SWITCHING DIODES

BAT81, 82 and 83 are Schottky barrier diodes in miniature DO-34 glass envelopes with an extra integral pn-junction for protection against excessive voltages such as static discharges. Typical uses are ultra-fast switching and detection.

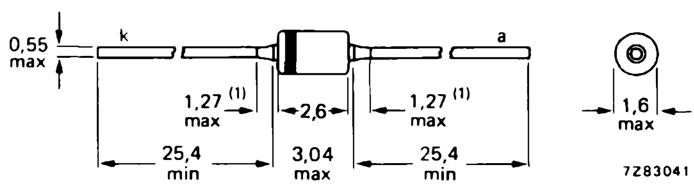
QUICK REFERENCE DATA

			BAT81	82	83	
Continuous reverse voltage	V_R	max.	40	50	60	V
Forward current (d.c.)	I_F	max.		30		mA
Junction temperature	T_j	max.		125		^oC
Diode capacitance at V_R = 1 V	C_d	<		1,6		pF

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-34 (SOD-68).



(1) Lead diameter in this zone uncontrolled.

The coloured band indicates the cathode.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BAT81	82	83	
Continuous reverse voltage	V_R	max.	40	50	60	V
Forward current (d.c.)	I_F	max.	30			mA
Non-repetitive peak forward current $t < 1$ s	I_{FSM}	max.	150			mA
Storage temperature	T_{stg}		−55 to + 150			°C
Junction temperature	T_j	max.	+ 125			°C

THERMAL RESISTANCE

From junction to ambient when mounted on a 1,5 mm thick epoxy-glass p.c.b.; Cu-thickness > 40 μm; see Fig. 2	$R_{th\ j\text{-}a}$	=	320	K/W

CHARACTERISTICS

$T_{amb} = 25\ ^oC$ unless otherwise specified

Forward voltage				
$I_F = 1$ mA	V_F	<	410	mV
$I_F = 15$ mA	V_F	<	1000	mV
Reverse current $V_R = 30$ V	I_R	<	200	nA
Reverse breakdown voltage $I_R = 10\ \mu A$	$V_{(BR)R}$	>	40 | 50 | 60	V
Diode capacitance $V_R = 1$ V; f = 1 MHz	C_d	<	1,6	pF
Reverse recovery* when switched from $I_F = 10$ mA to $I_R = 10$ mA; $R_L = 100\ \Omega$ measured at $I_R = 1$ mA	t_{rr}	<	1	ns

* Due to the lack of minority carrier injection reverse recovery time only depends on junction capacitance and circuit resistance.

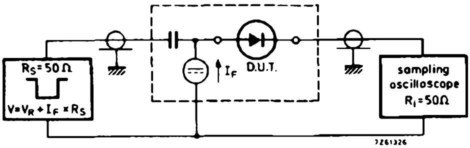


Fig. 2 Test circuit.

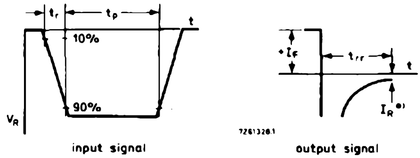


Fig. 3 Waveforms. * I_R = 1 mA.

Input signal

Rise time of the reverse pulse	t_r	=	0,6 ns
Reverse pulse duration	t_p	=	500 ns
Duty factor	δ	=	0,05

Oscilloscope

Rise time	t_r	=	0,35 ns

Circuit capacitance C ⩽ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

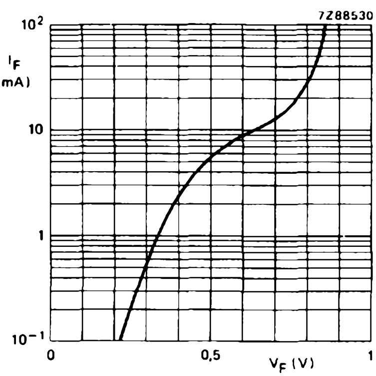


Fig. 4 Typical forward current as a function of forward voltage at T_{amb} = 25 °C.

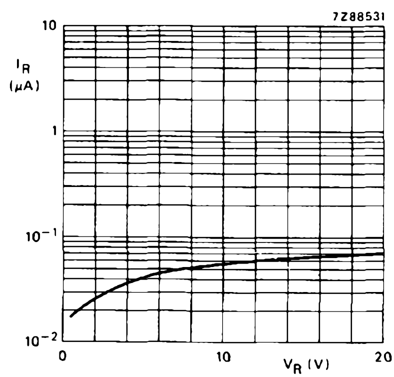


Fig. 5 Typical reverse current as a function of reverse voltage at T_{amb} = 25 °C.

DEVELOPMENT SAMPLE DATA

SCHOTTKY BARRIER SWITCHING DIODE

BAT85 is a Schottky barrier diode in miniature DO-34 glass envelope with an extra integral pn-junction for protection against excessive voltages such as static discharges. This diode replaces point contact and gold-bonded diodes.

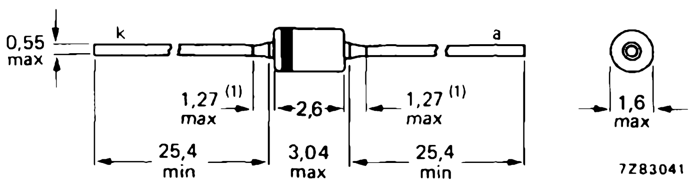
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	30	V
Forward current (d.c.)	I_F	max.	100	mA
Junction temperature	T_j	max.	125	°C
Storage temperature	T_{stg}	max.	−55 to 150	°C
Diode capacitance at V_R = 1 V	C_d	<	10	pF

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-34 (SOD-68).



(1) Lead diameter in this zone uncontrolled.

The coloured band indicates the cathode.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	30 V
Forward current (d.c.)	I_F	max.	100 mA
Repetitive peak forward current	I_{FRM}	max.	300 mA
Non-repetitive peak forward current $t < 1$ s	I_{FSM}	max.	600 mA
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 125 °C

THERMAL RESISTANCE

Measured on an infinite heatsink; at the leads 4 mm from the body $T_{amb} = 25\ ^{o}C$	$R_{th\ j\text{-}a}$	=	320 K/W

CHARACTERISTICS

$T_{amb} = 25\ ^{o}C$ unless otherwise specified

Forward voltage			
$I_F = 1$ mA	V_F	typ.	250 mV
$I_F = 10$ mA	V_F	<	400 mV
$I_F = 100$ mA	V_F	typ.	500 mV
		<	1000 mV
Reverse current $V_R = 25$ V	I_R	<	2 µA
Reverse breakdown voltage $I_R = 10$ µA	$V_{(BR)R}$	>	30 V
Diode capacitance $V_R = 1$ V, f = 1 MHz	C_d	<	10 pF
Reverse recovery time when switched from $I_F = 10$ mA to $I_R = 10$ mA, $R_L = 100\ \Omega$, measured at $I_R = 1$ mA	t_{rr}	<	5 ns

MICROMINIATURE DIODES

G

SILICON PLANAR EPITAXIAL HIGH-SPEED DIODE

Silicon epitaxial high-speed diode in a microminiature plastic envelope. It is intended for high-speed switching in hybrid thick and thin-film circuits.

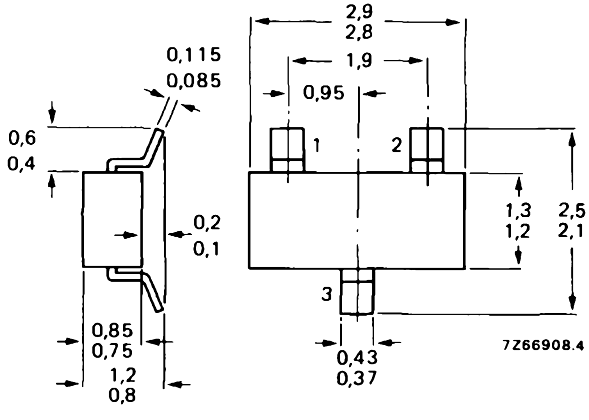
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	75 V
Repetitive peak reverse voltage	V_{RRM}	max.	85 V
Repetitive peak forward current	I_{FRM}	max.	250 mA
Junction temperature	T_j	max.	175 ^oC
Forward voltage at I_F = 50 mA	V_F	<	1,0 V
Reverse recovery time when switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	6 ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	45 pC

MECHANICAL DATA

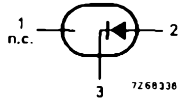
Dimensions in mm

Fig. 1 SOT-23.



Marking code

BAS16 = A6



See also *Soldering recommendations*.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	75	V
Repetitive peak reverse voltage	V_{RRM}	max.	85	V
Average rectified forward current ▲ (averaged over any 20 ms period)	$I_{F(AV)}$	max.	250	mA
Forward current (d.c.)	I_F	max.	250	mA
Repetitive peak forward current	I_{FRM}	max.	250	mA
Storage temperature	T_{stg}	−65 to +175		°C
Junction temperature	T_j	max.	175	°C

THERMAL CHARACTERISTICS *

$T_j = P \times (R_{th\,j\text{-}t} + R_{th\,t\text{-}s} + R_{th\,s\text{-}a}) + T_{amb}$

Thermal resistance

From junction to tab	$R_{th\,j\text{-}t}$	=	60	°C/W
From tab to soldering points	$R_{th\,t\text{-}s}$	=	280	°C/W
From soldering points to ambient **	$R_{th\,s\text{-}a}$	=	90	°C/W

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified.

Forward voltage				
$I_F = 1$ mA	V_F	<	715	mV
$I_F = 10$ mA	V_F	<	855	mV
$I_F = 50$ mA	V_F	<	1000	mV
$I_F = 150$ mA	V_F	<	1250	mV
Reverse current				
$V_R = 25$ V; $T_j = 150$ °C	I_R	<	30	µA
$V_R = 75$ V	I_R	<	1	µA
$V_R = 75$ V; $T_j = 150$ °C	I_R	<	50	µA
Diode capacitance $V_R = 0$; f = 1 MHz	C_d	<	2	pF
Forward recovery voltage (see also Fig. 2) when switched to $I_F = 10$ mA; $t_p = 20$ ns	V_{fr}	<	1,75	V
Reverse recovery time (see also Fig. 3) when switched from $I_F = 10$ mA to $I_R = 10$ mA; $R_L = 100\ \Omega$; measured at $I_R = 1$ mA	t_{rr}	<	6	ns
Recovery charge (see also Fig. 4) when switched from $I_F = 10$ mA to $V_R = 5$ V; $R_L = 500\ \Omega$	Q_s	<	45	pC

▲ Measured under pulse conditions. $t_p \leqslant 0{,}5$ ms. $I_{F(AV)} = 150$ mA, $t_{(av)} \leqslant 1$ ms, for sinusoidal operation.

* See *Thermal characteristics* in GENERAL SECTION.

** Device mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

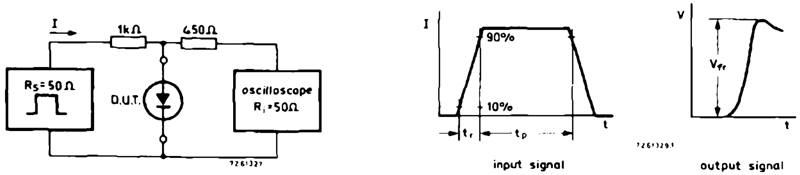


Fig. 2 Forward recovery voltage test circuit and waveforms.

Input signal: forward pulse rise time = t_r = 20 ns; forward current pulse duration t_p = 120 ns; duty factor = δ = 0,01.
Oscilloscope: rise time = t_r = 0,35 ns.
Circuit capacitance C ⩽ 1 pF (C = oscilloscope input capacitance + parasitic capacitance).

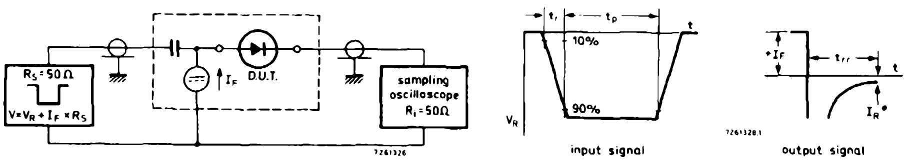


Fig. 3 Reverse recovery time test circuit and waveforms.

Input signal: reverse pulse rise time = t_r ≈ 0,6 ns; reverse pulse duration = t_p = 100 ns; duty factor = δ = 0,05. * t_{rr} up to I_R = 1 mA.
Oscilloscope: rise time = t_r = 0,35 ns.
Circuit capacitance C ⩽ 1 pF (C = oscilloscope input capacitance + parasitic capacitance).

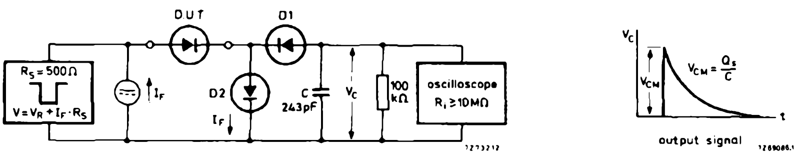


Fig. 4 Recovery charge test circuit and waveform.

D1 = BAW62; D2 = diode with minority carrier life time at 10 mA: < 200 ps
Input signal

Rise time of the reverse pulse	t_r	=	2 ns
Reverse pulse duration	t_p	=	400 ns
Duty factor	δ	=	0,02

Circuit capacitance C ⩽ 7 pF (C = oscilloscope input capacitance + parasitic capacitance).

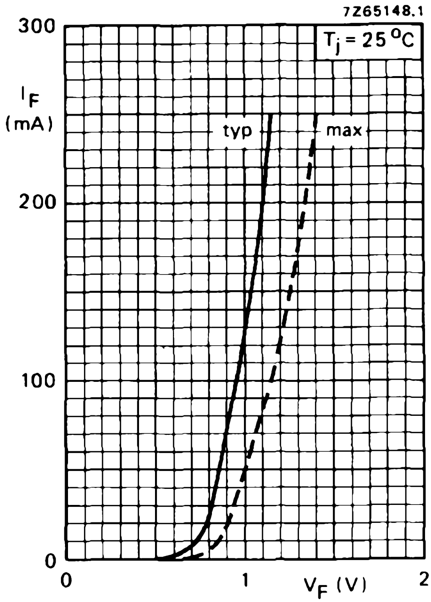


Fig. 5.

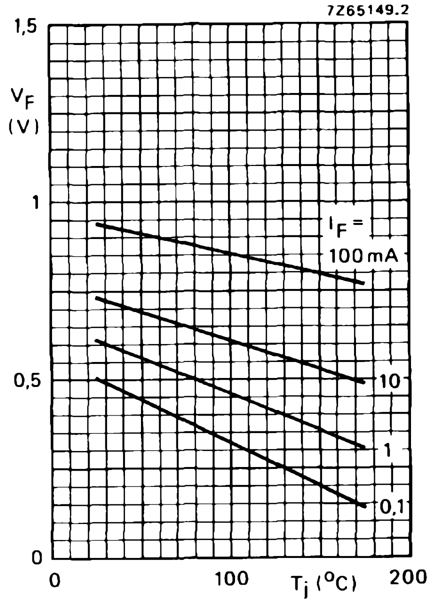


Fig. 6 Typical values.

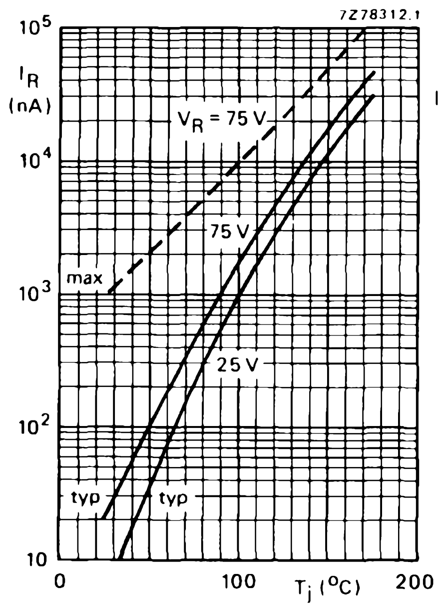


Fig. 7.

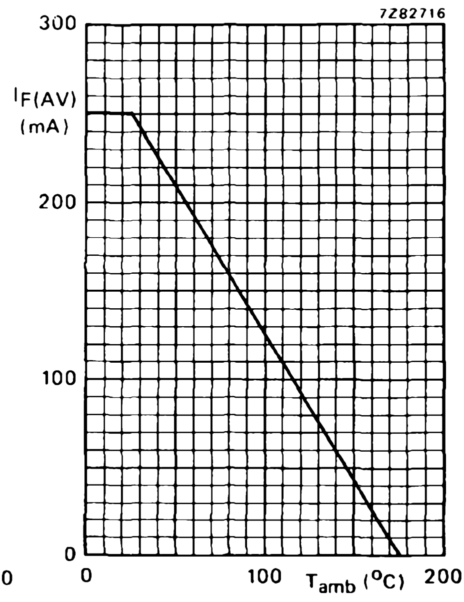


Fig. 8 Current derating curve.

LOW VOLTAGE STABISTOR

Silicon planar epitaxial diode in SOT-23 envelope. This diode is intended for low voltage stabilizing e.g. bias stabilizer in class-B output stages, clipping, clamping and meter protection.

QUICK REFERENCE DATA

Repetitive peak forward current	I_{FRM}	max.	250	mA
Storage temperature	T_{stg}	−65 to + 150		°C
Junction temperature	T_j	max.	150	°C
Forward voltage				
I_F = 0,1 mA	V_F		610 to 690	mV
I_F = 1,0 mA	V_F		680 to 760	mV
I_F = 10 mA	V_F		750 to 830	mV
I_F = 100 mA	V_F		870 to 960	mV
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	<	140	pF

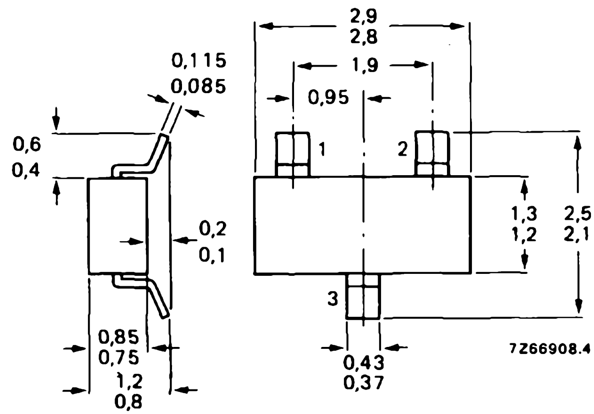
MECHANICAL DATA

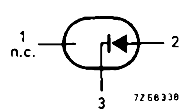
Dimensions in mm

Fig. 1 SOT-23.

Marking code

BAS17 = A91





See also chapter *Soldering Recommendations*.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Repetitive peak forward current	I_{FRM}	max.	250	mA
Storage temperature	T_{stg}		−65 to +150	°C
Junction temperature	T_j	max.	150	°C

THERMAL CHARACTERISTICS*

$T_j = P \times (R_{th\ j\text{-}t} + R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb}$

Thermal resistance

From junction to tab	$R_{th\ j\text{-}t}$	=	60	°C/W
From tab to soldering points	$R_{th\ t\text{-}s}$	=	280	°C/W
From soldering points to ambient**	$R_{th\ s\text{-}a}$	=	90	°C/W

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Forward voltage				
$I_F = 0.1$ mA	V_F		610 to 690	mV
$I_F = 1.0$ mA	V_F		680 to 760	mV
$I_F = 5.0$ mA	V_F		730 to 810	mV
$I_F = 10$ mA	V_F		750 to 830	mV
$I_F = 100$ mA	V_F		870 to 960	mV
Reverse current				
$V_R = 4$ V	I_R	<	5	μA
Temperature coefficient				
$I_F = 1$ mA	S_F	typ.	−1.8	mV/K
Diode capacitance				
$V_R = 0$; f = 1 MHz	C_d	<	140	pF

* See *Thermal characteristics* in GENERAL SECTION.
**Device mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm.

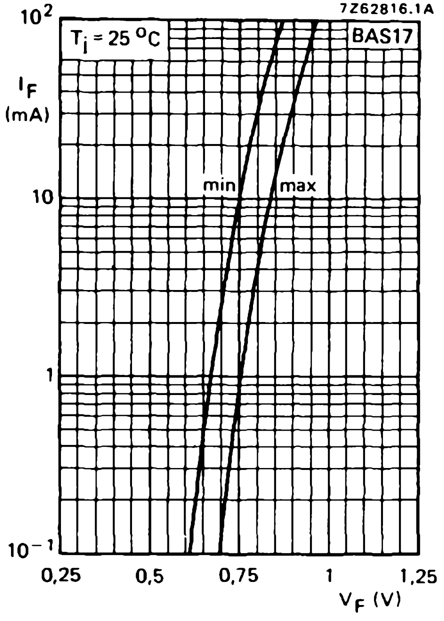


Fig. 2 Forward current as a function of forward voltage.

SILICON PLANAR EPITAXIAL HIGH-SPEED DIODES

Silicon epitaxial high-speed diodes in a microminiature plastic envelope. They are intended for switching and general purposes.

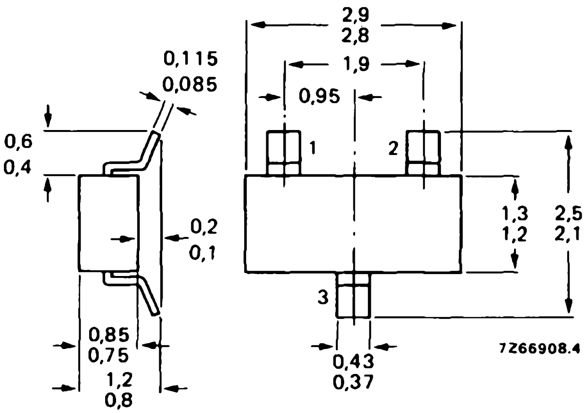
QUICK REFERENCE DATA

			BAS19	BAS20	BAS21	
Continuous reverse voltage	V_R	max.	100	150	200	V
Repetitive peak reverse voltage	V_{RRM}	max.	120	200	250	V
Repetitive peak forward current	I_{FRM}	max.		625		mA
Junction temperature	T_j	max.		150		°C
Forward voltage at I_F = 100 mA	V_F	<		1		V
Reverse recovery time when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω measured at I_R = 3 mA	t_{rr}	<		50		ns

MECHANICAL DATA

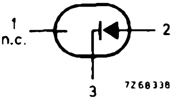
Dimensions in mm

Fig. 1 SOT-23.



Marking code

BAS19 = A8
BAS20 = A81
BAS21 = A82



See also *Soldering recommendations.*

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BAS19	BAS20	BAS21	
Continuous reverse volage	V_R	max.	100	150	200	V
Repetitive peak reverse voltage	V_{RRM}	max.	120	200	250	V
Average rectified forward current (1) (averaged over any 20 ms period)	$I_{F(AV)}$	max.		200		mA
Forward current (d.c.)	I_F	max.		200		mA
Repetitive peak forward current	I_{FRM}	max.		625		mA
Storage temperature	T_{stg}			−65 to +150		^oC
Junction temperature	T_j	max.		150		^oC
Total power dissipation up to T_{amb} = 25 ^oC	P_{tot}	max.		200		mW

THERMAL CHARACTERISTICS*

$T_j = P \times (R_{th\ j\text{-}t} + R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb}$

Thermal resistance				
From junction to tab	$R_{th\ j\text{-}t}$	=	60	$^oC/W$
From tab to soldering points	$R_{th\ t\text{-}s}$	=	280	$^oC/W$
From soldering points to ambient**	$R_{th\ s\text{-}a}$	=	90	$^oC/W$

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage				
I_F = 100 mA	V_F	<	1.0	V
I_F = 200 mA	V_F	<	1.25	V
Reverse breakdown voltage (1)				
BAS19; I_R = 100 μA	$V_{(BR)R}$	>	120	V
BAS20; I_R = 100 μA	$V_{(BR)R}$	>	200	V
BAS21; I_R = 100 μA (2)	$V_{(BR)R}$	>	250	V
Reverse current				
$V_R = V_{Rmax}$	I_R	<	100	nA
$V_R = V_{Rmax}$; T_j = 150 ^oC (1)	I_R	<	100	μA
Differential resistance				
I_F = 10 mA	r_{diff}	typ.	5	Ω
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	<	5	pF
Reverse recovery time (see Figs 2 and 3) when switched from I_F = 30 mA to I_R = 30 mA; R_L = 100 Ω; measured at I_R = 3 mA	t_{rr}	<	50	ns

* See *Thermal characteristics* in GENERAL SECTION.
** Device mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm.
(1) Measured under pulse conditions; Pulse time = $t_p \leqslant 0.3$ ms.
(2) At zero life time, measured under pulse conditions to avoid excessive dissipation and voltage limited to 275 V.

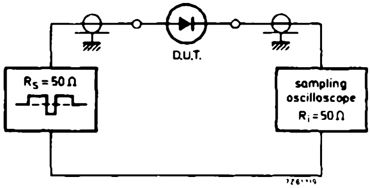


Fig. 2 Test circuit.

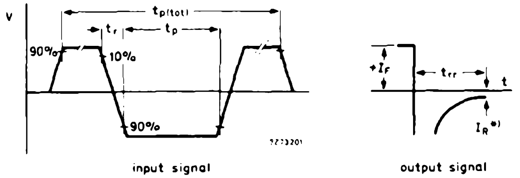


Fig. 3 Waveforms; I_R = 3 mA.

Input signal

total pulse duration	$t_{p(tot)}$	= 2 μs
duty factor	δ	= 0,0025
rise time of reverse pulse	t_r	= 0,6 ns
reverse pulse duration	t_p	= 100 ns

Oscilloscope

rise time	t_r	= 0,35 ns
circuit capacitance*	C	< 1 pF

*C = oscilloscope input capacitance + parasitic capacitance.

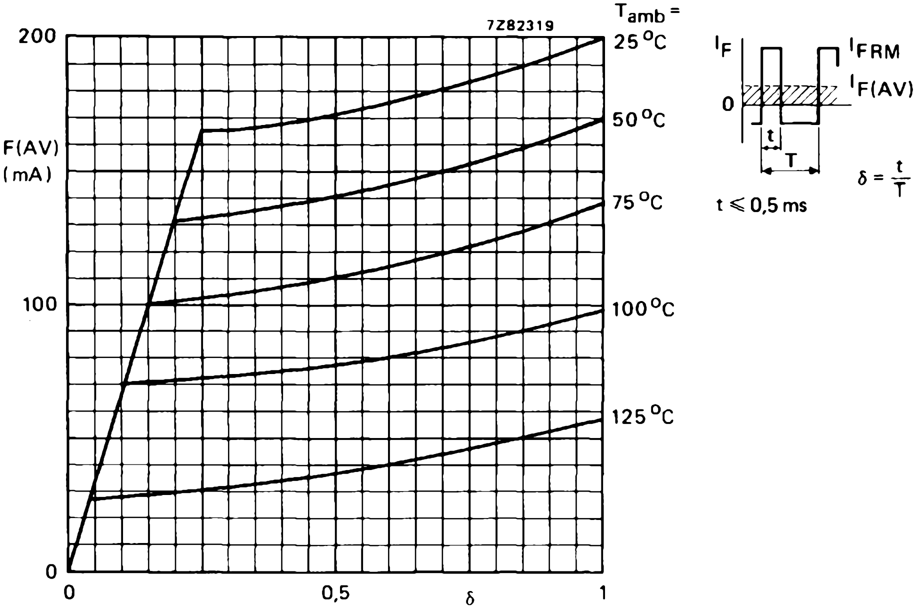


Fig. 4 BAS19; maximum permissible average rectified forward current for pulse operation as a function of the duty factor at V_R = 100 V.

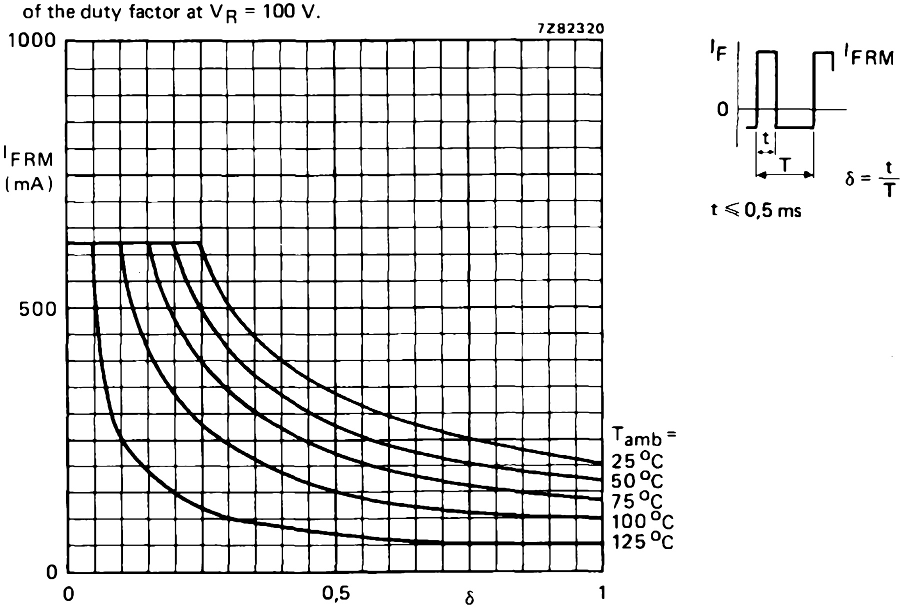


Fig. 5 BAS19; maximum permissible repetitive peak forward current for pulse operation as a function of the duty factor at V_R = 100 V.

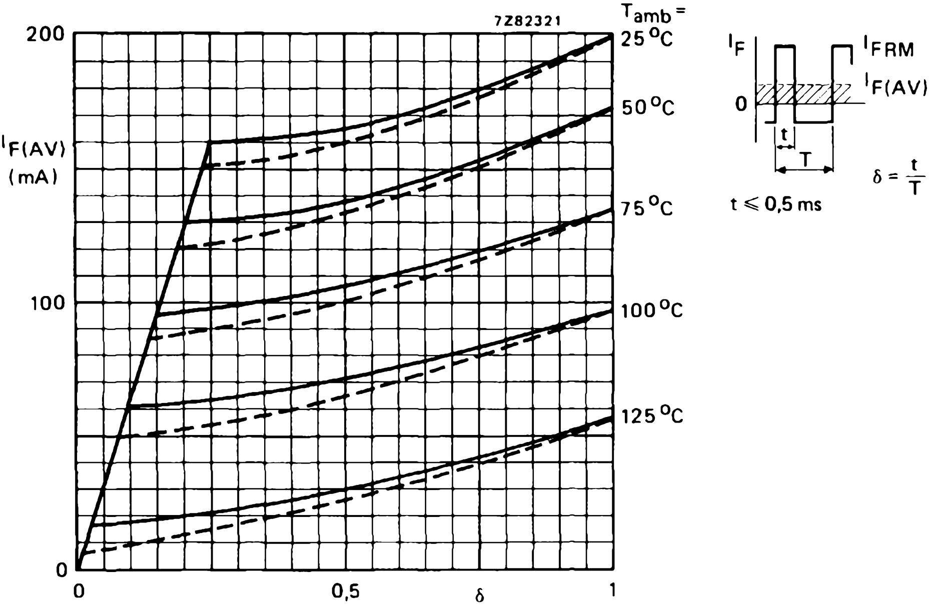


Fig. 6 BAS20/21; maximum permissible average rectified forward current for pulse operation as a function of the duty factor.

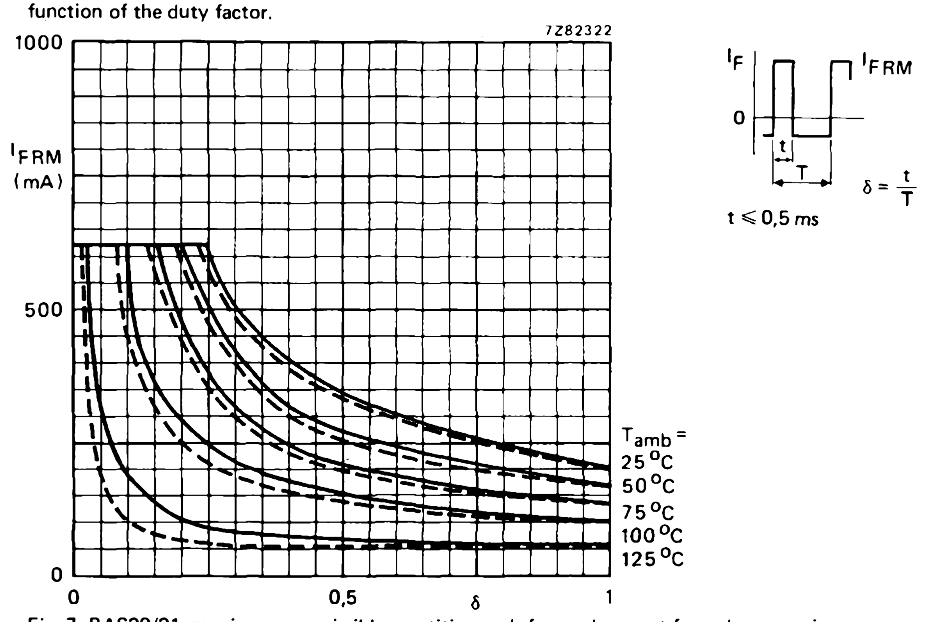


Fig. 7 BAS20/21; maximum permissible repetitive peak forward current for pulse operation as a function of the duty factor.

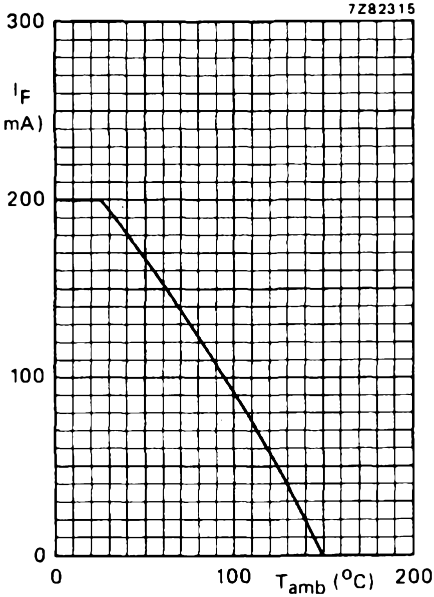


Fig. 8.

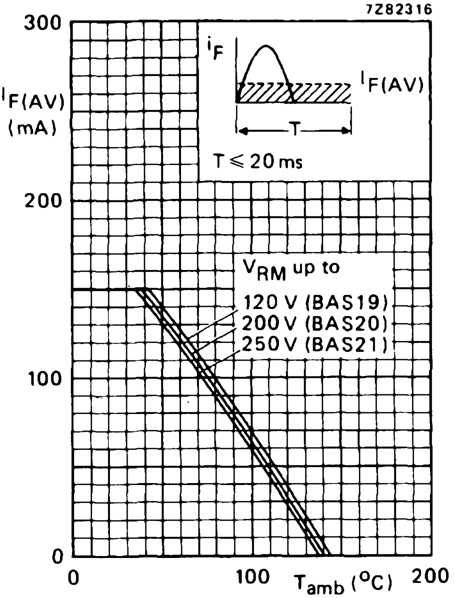


Fig. 9.

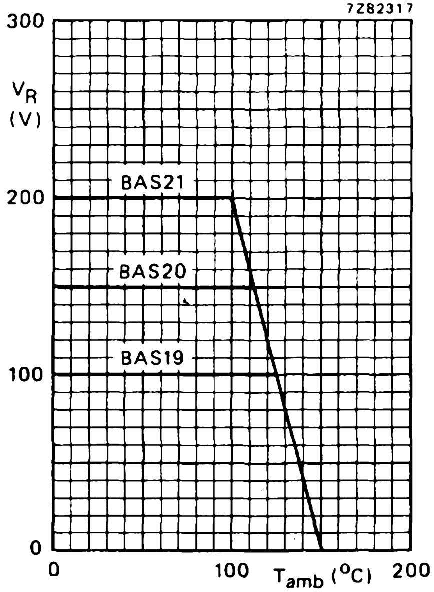


Fig. 10.

Fig. 8 Maximum permissible continuous forward current as a function of the ambient temperature.

Fig. 9 Maximum permissible average rectified forward current as a function of the ambient temperature.

Fig. 10 Maximum permissible continuous reverse voltage as a function of the ambient temperature.

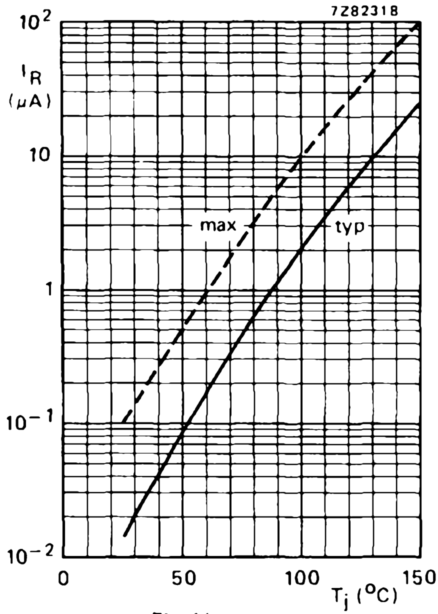


Fig. 11.

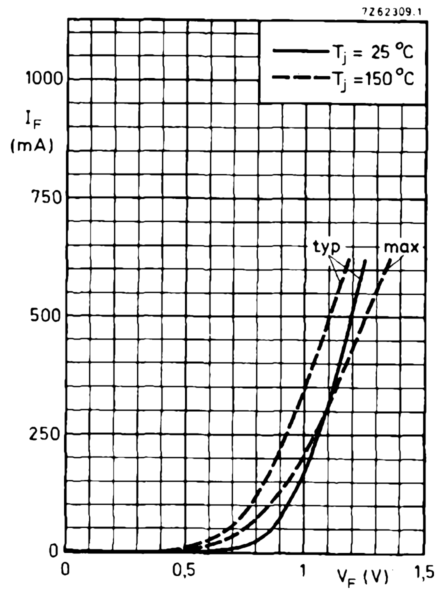


Fig. 12.

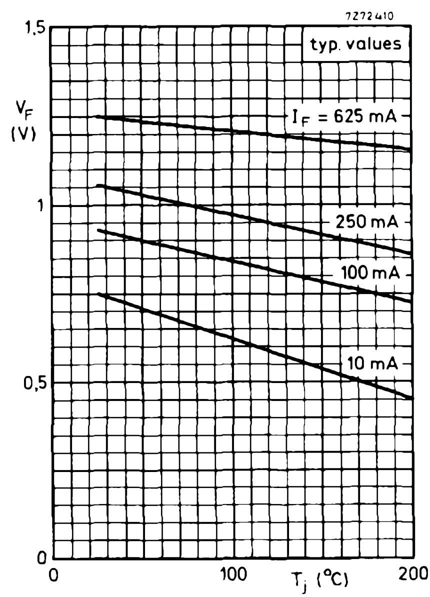


Fig. 13.

Fig. 11 Continuous reverse current as a function of the junction temperature.

Fig. 12 Forward current as a function of forward voltage.

Fig. 13 Forward voltage as a function of the junction temperature.

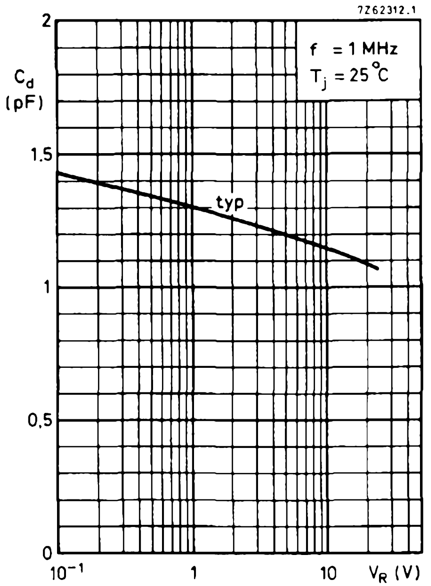

7Z62312.1
f = 1 MHz
T_j = 25 °C
C_d
(pF)
typ
2
1,5
1
0,5
0
10^{-1}
1
10
V_R (V)

Fig. 14.

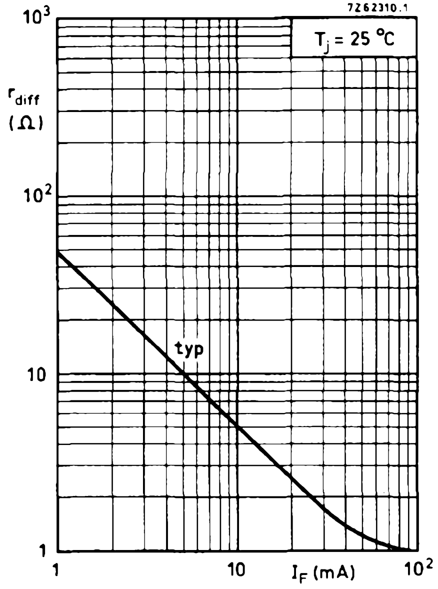

7Z62310.1
T_j = 25 °C
r_{diff}
(Ω)
typ
10^3
10^2
10
1
1
10
I_F (mA)
10^2

Fig. 15.

SCHOTTKY BARRIER DIODE

Silicon epitaxial diode in a microminiature plastic envelope. Intended for u.h.f. mixer and fast switching applications in thick and thin-film circuits.

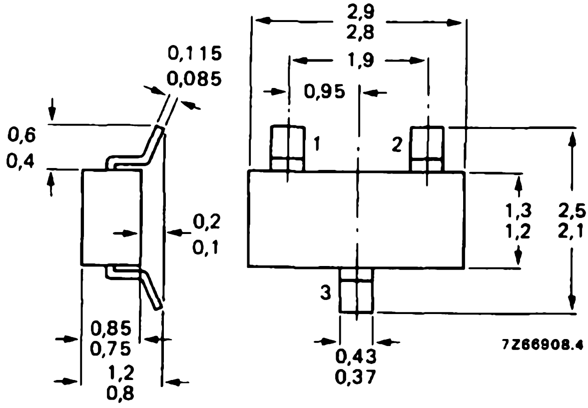
QUICK REFERENCE DATA

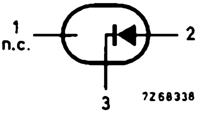
Continuous reverse voltage	V_R	max.	4	V
Forward current (d.c.)	I_F	max.	30	mA
Junction temperature	T_j	max.	100	^oC
Forward voltage at I_F = 10 mA	V_F	<	600	mV
Diode capacitance at V_R = 0; f = 1 MHz	C_d	<	1,0	pF
Noise figure at f = 900 MHz	F	<	8,0	dB

MECHANICAL DATA Dimensions in mm

Marking code
BAT17 = A3

Fig.1 SOT-23.





See also *Soldering recommendations.*

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	4	V
Forward current (d.c.)	I_F	max.	30	mA
Storage temperature	T_{stg}		−65 to +100	°C
Junction temperature	T_j	max.	100	°C

THERMAL CHARACTERISTICS*

$T_j = P \times (R_{th\,j\text{-}t} + R_{th\,t\text{-}s} + R_{th\,s\text{-}a}) + T_{amb}$

Thermal resistance

From junction to tab	$R_{th\,j\text{-}t}$	=	60	°C/W
From tab to soldering points	$R_{th\,t\text{-}s}$	=	280	°C/W
From soldering points to ambient**	$R_{th\,s\text{-}a}$	=	90	°C/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Reverse current				
V_R = 3V	I_R	<	0.25	μA
V_R = 3 V; T_{amb} = 60 °C	I_R	<	1.25	μA
Reverse breakdown voltage				
I_R = 10 μA	$V_{(BR)R}$	>	4	V
Forward voltage				
I_F = 0.1 mA	V_F	<	350	mV
I_F = 1.0 mA	V_F	<	450	mV
I_F = 10 mA	V_F	<	600	mV
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	<	1.0	pF
Noise figure at f = 900 MHz▲	F	<	8.0	dB
Series resistance at f = 1 kHz				
I_F = 5 mA	r_D	<	15	Ω

* See *Thermal characteristics* in GENERAL SECTION.

** Device mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm.

▲ The local oscillator is adjusted for a diode current of 2 mA. I.F. amplifier noise F_{if} = 1.5 dB; f = 35 MHz.

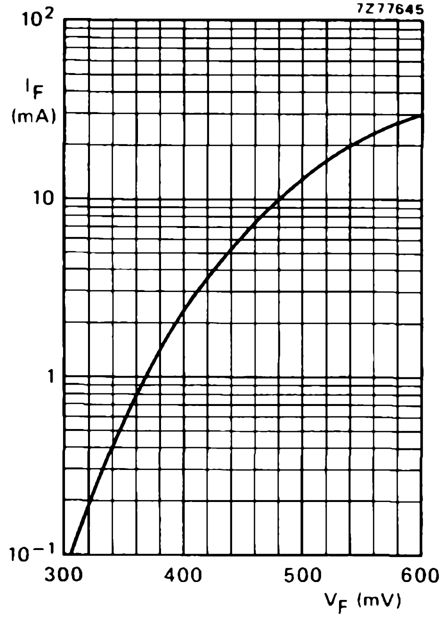


Fig. 2 Typical values.

SILICON PLANAR DIODE

Band switching diode in a microminiature plastic envelope. Intended for thick and thin-film circuits.

QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	35 V
Forward current (d.c.)	I_F	max.	100 mA
Junction temperature	T_j	max.	100 °C
Diode capacitance at f = 1 MHz V_R = 20 V	C_d	typ. <	0,8 pF 1,0 pF
Series resistance at f = 200 MHz I_F = 5 mA	r_D	typ. <	0,5 Ω 0,7 Ω

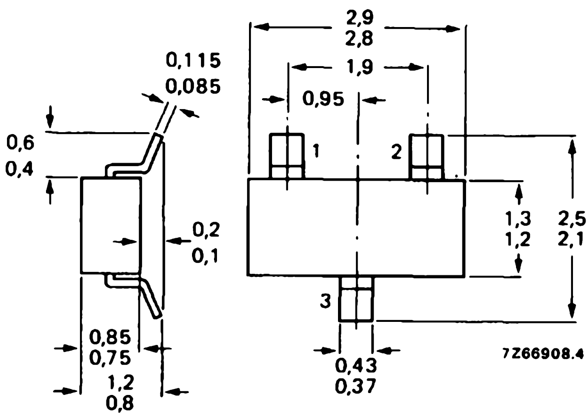
MECHANICAL DATA

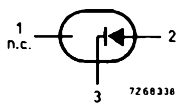
Dimensions in mm

Fig. 1 SOT-23.

Marking code

BAT18 = A2





RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	35	V
Forward current (d.c.)	I_F	max.	100	mA
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC

THERMAL CHARACTERISTICS*

$T_j = P \times (R_{th\ j\text{-}t} + R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb}$

Thermal resistance

From junction to tab	$R_{th\ j\text{-}t}$	=	60	$^oC/W$
From tab to soldering points	$R_{th\ t\text{-}s}$	=	280	$^oC/W$
From soldering points to ambient**	$R_{th\ s\text{-}a}$	=	90	$^oC/W$

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Forward voltage at $I_F = 100$ mA	V_F	<	1.2	V
Reverse current				
$V_R = 20$ V	I_R	<	100	nA
$V_R = 20$ V; $T_j = 60\ ^oC$	I_R	<	1	μA
Diode capacitance at f = 1 MHz	C_d	typ.	0.8	pF
$V_R = 20$ V		<	1.0	pF
Series resistance at f = 200 MHz	r_D	typ.	0.5	Ω
$I_F = 5$ mA		<	0.7	Ω

* See *Thermal characteristics* in GENERAL SECTION.

** Device mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm.

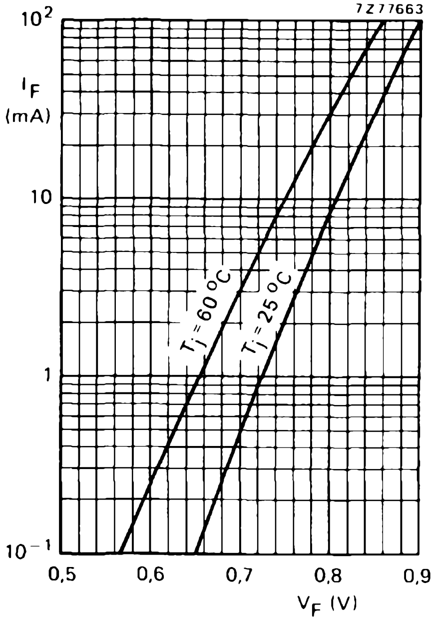


Fig. 2 Typical values.

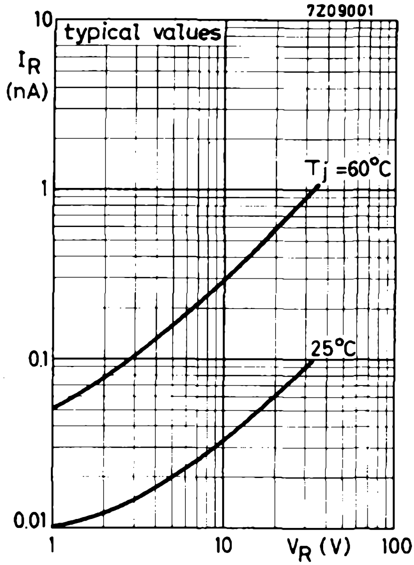


Fig. 3.

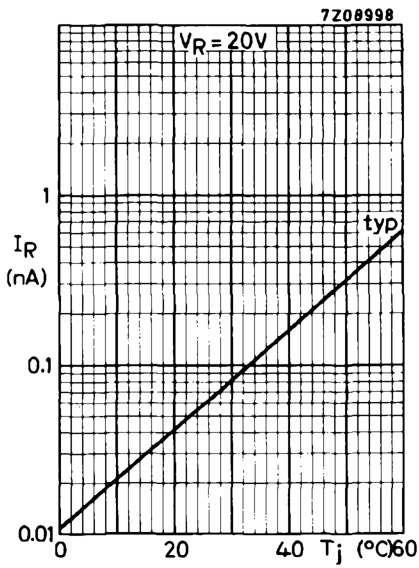


Fig. 4.

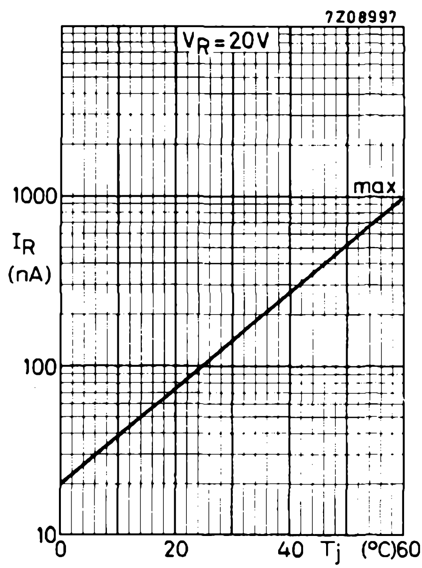


Fig. 5.

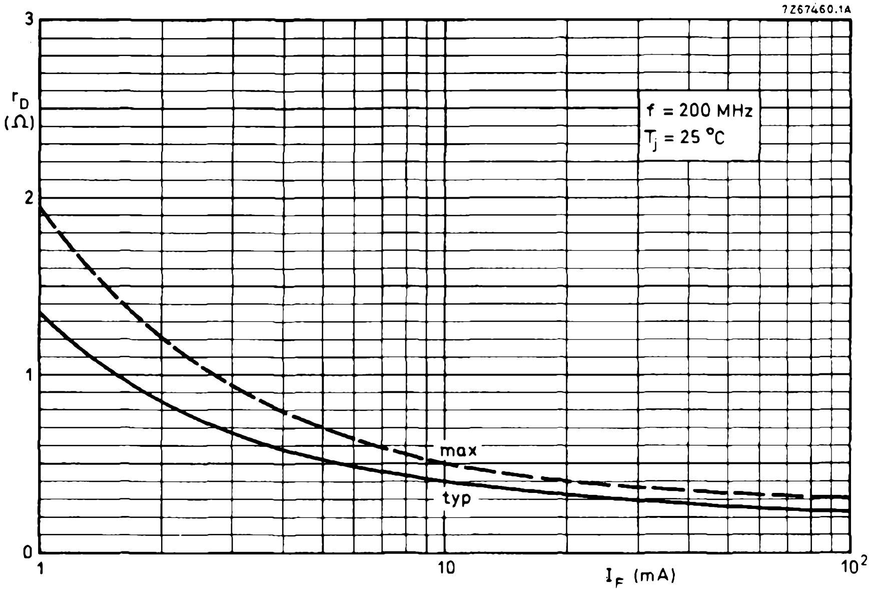


Fig. 6.

SILICON PLANAR EPITAXIAL HIGH-SPEED DIODES

The BAV70 consists of two diodes in a microminiature plastic envelope. The cathodes are commoned and the unit is intended for high-speed switching in thick and thin-film circuits.

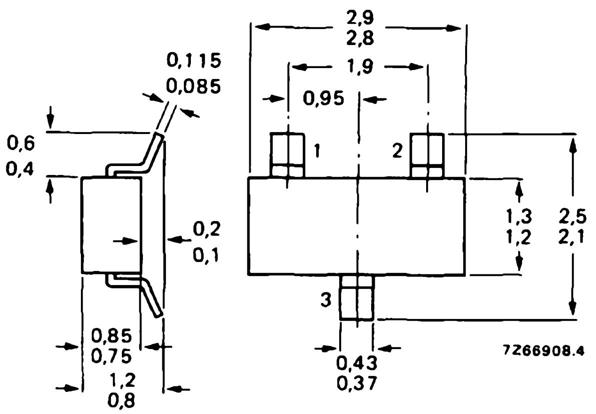
QUICK REFERENCE DATA (per diode)

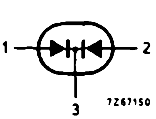
Continuous reverse voltage	V_R	max.	70	V
Repetitive peak reverse voltage	V_{RRM}	max.	70	V
Repetitive peak forward current	I_{FRM}	max.	250	mA
Junction temperature	T_j	max.	175	^oC
Forward voltage at I_F = 50 mA	V_F	<	1,0	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	6	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	45	pC

MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-23.

Marking code
BAV70 = A4





See also *Soldering recommendations.*

RATINGS (per diode)

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	70 V
Repetitive peak reverse voltage	V_{RRM}	max.	70 V
Average rectified forward current▲ (averaged over any 20 ms period)	$I_{F(AV)}$	max.	250 mA
Forward current (d.c.)	I_F	max.	250 mA
Repetitive peak forward current	I_{FRM}	max.	250 mA
Storage temperature	T_{stg}	−65 to +	175 °C
Junction temperature	T_j	max.	175 °C

THERMAL CHARACTERISTICS*

$T_{j1} = P_1\ (R_{th\ j\text{-}t}) + T_{tab}$
$T_{j2} = P_2\ (R_{th\ j\text{-}t}) + T_{tab}$
$T_{tab} = P_{tot}\ (R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb}$

Thermal resistance

From junction to tab	$R_{th\ j\text{-}t}$	=	60 °C/W
From tab to soldering points	$R_{th\ t\text{-}s}$	=	280 °C/W
From soldering points to ambient**	$R_{th\ s\text{-}a}$	=	90 °C/W

CHARACTERISTICS (per diode)

$T_j = 25\ ^oC$ unless otherwise specified

Forward voltage			
$I_F = 1$ mA	V_F	<	715 mV
$I_F = 10$ mA	V_F	<	855 mV
$I_F = 50$ mA	V_F	<	1000 mV
$I_F = 150$ mA	V_F	<	1250 mV
Reverse current			
$V_R = 25$ V; $T_j = 150\ ^oC$	I_R	<	60 μA
$V_R = 70$ V	I_R	<	5 μA
$V_R = 70$ V; $T_j = 150\ ^oC$	I_R	<	100 μA
Diode capacitance			
$V_R = 0$; f = 1 MHz	C_d	<	1,5 pF
Forward recovery voltage when switched to			
$I_F = 10$ mA; $t_r = 20$ ns	V_{fr}	<	1,75 V

▲ Measured under pulse conditions : pulse time $t_p \leqslant 0{,}5$ ms.
For sinusoidal operation $I_{F(AV)} = 150$ mA; averaging time $t_{(av)} \leqslant 1$ ms.

* See *Thermal characteristics* in GENERAL SECTION.

**Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

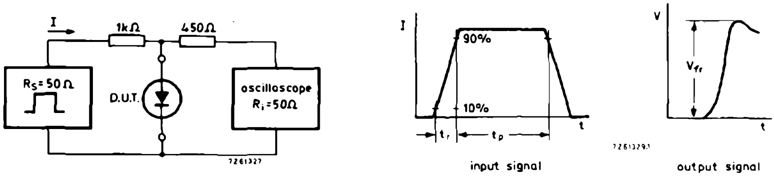


Fig. 2 Test circuit and waveforms; forward recovery voltage.

Input signal : Rise time of the forward pulse t_r = 20 ns; Forward current pulse duration t_p = 120 ns; Duty factor δ = 0,01

Oscilloscope : Rise time t_r = 0,35 ns

Circuit capacitance C $\leqslant$ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Reverse recovery time when switched from

I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω;

measured at I_R = 1 mA | t_{rr} | < | 6 | ns

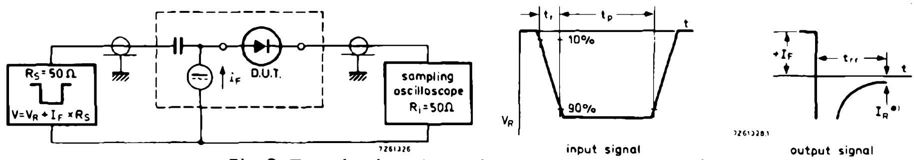


Fig. 3 Test circuit and waveforms; reverse recovery time.

*) I_R = 1 mA

Input signal : Rise time of the reverse pulse t_r = 0,6 ns; reverse pulse duration t_p = 100 ns; duty factor δ = 0,05

Oscilloscope : Rise time t_r = 0,35 ns

Circuit capacitance C $\leqslant$ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Recovery charge when switched from

I_F = 10 mA to V_R = 5 V; R_L = 500 Ω | Q_s | < | 45 | pC

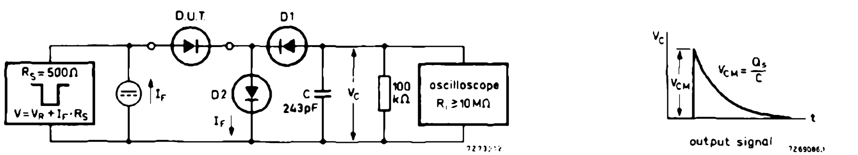


Fig. 4 Test circuit and waveform; recovery charge.

D1 = BAW62

D2 = diode with minority carrier life time at 10 mA: < 200 ps

Input signal : Rise time of the reverse pulse = t_r = 2 ns; Reverse pulse duration = t_p = 400 ns; Duty factor = δ = 0,02

Circuit capacitance C $\leqslant$ 7 pF (C = oscilloscope input capacitance + parasitic capacitance)

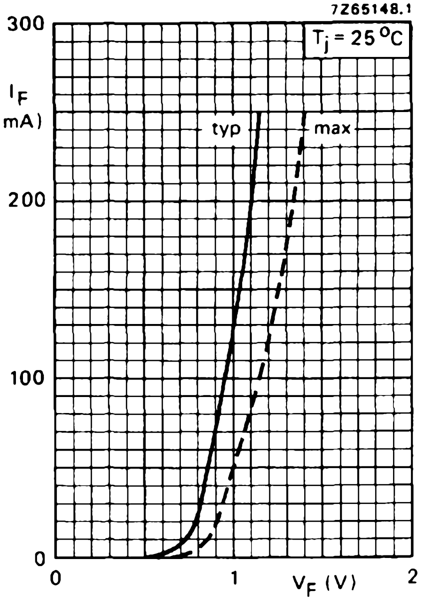


Fig. 5

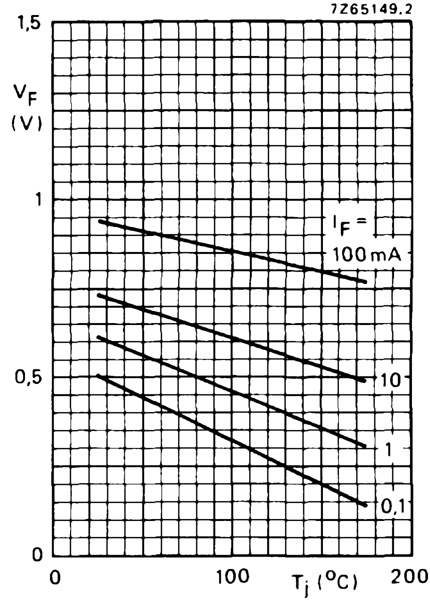


Fig. 6

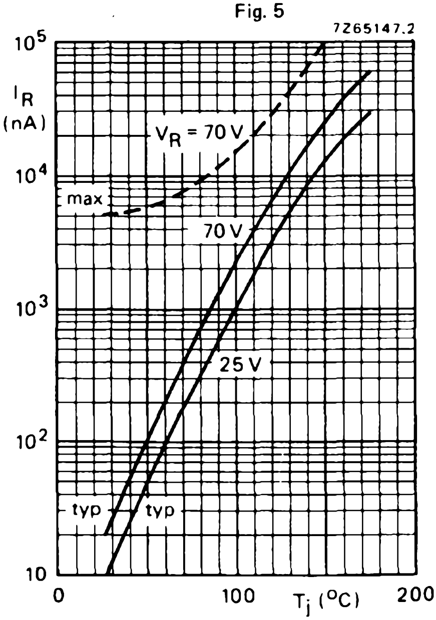


Fig. 7

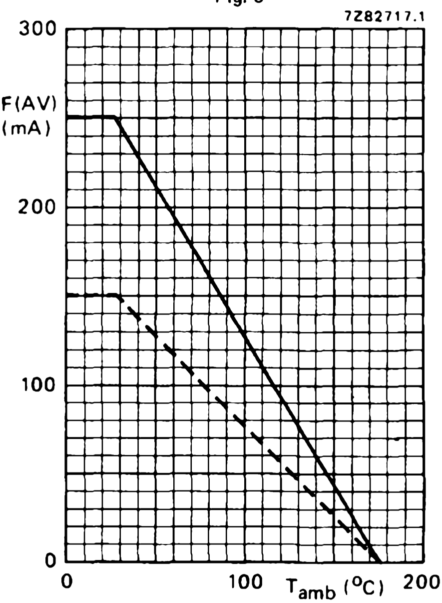


Fig. 8 ——— single diode
– – – – – double diode, equally loaded.

SILICON PLANAR EPITAXIAL HIGH-SPEED DIODES

The BAV99 consists of two diodes in a microminiature plastic envelope. The diodes are connected in series and the unit is intended for high-speed switching in thick and thin-film circuits.

QUICK REFERENCE DATA (per diode)

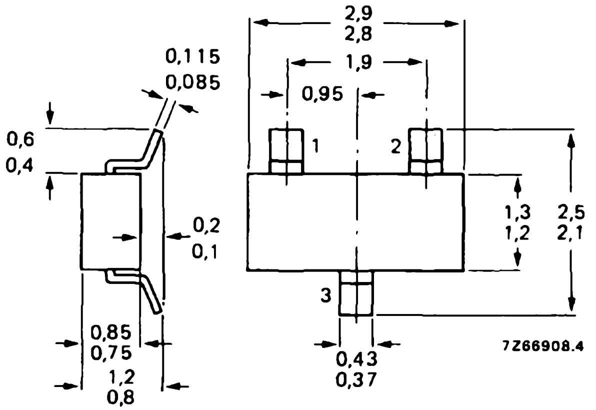
Continuous reverse voltage	V_R	max.	70	V
Repetitive peak reverse voltage	V_{RRM}	max.	70	V
Repetitive peak forward current	I_{FRM}	max.	250	mA
Junction temperature	T_j	max.	175	^oC
Forward voltage at I_F = 50 mA	V_F	<	1,0	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	6	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	45	pC

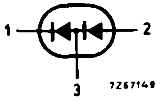
MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-23.

Marking code

BAV99 = A7





See also *Soldering recommendations.*

RATINGS (per diode)

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	70 V
Repetitive peak reverse voltage	V_{RRM}	max.	70 V
Average rectified forward current ▲ (averaged over any 20 ms period)	$I_{F(AV)}$	max.	250 mA
Forward current (d.c.)	I_F	max.	250 mA
Repetitive peak forward current	I_{FRM}	max.	250 mA
Storage temperature	T_{stg}	−65 to +175	°C
Junction temperature	T_j	max.	175 °C

THERMAL CHARACTERISTICS *

$T_{j1} = P_1 (R_{th\,j\text{-}t}) + T_{tab}$

$T_{j2} = P_2 (R_{th\,j\text{-}t}) + T_{tab}$

$T_{tab} = P_{tot} (R_{th\,t\text{-}s} + R_{th\,s\text{-}a}) + T_{amb}$

Thermal resistance

From junction to tab	$R_{th\,j\text{-}t}$	=	60 °C/W
From tab to soldering points	$R_{th\,t\text{-}s}$	=	280 °C/W
From soldering points to ambient **	$R_{th\,s\text{-}a}$	=	90 °C/W

CHARACTERISTICS (per diode)

$T_j = 25\ ^oC$ unless otherwise specified

Forward voltage			
$I_F = 1$ mA	V_F	<	715 mV
$I_F = 10$ mA	V_F	<	855 mV
$I_F = 50$ mA	V_F	<	1000 mV
$I_F = 150$ mA	V_F	<	1250 mV
Reverse current			
$V_R = 25$ V; $T_j = 150\ ^oC$	I_R	<	30 μA
$V_R = 70$ V	I_R	<	2,5 μA
$V_R = 70$ V; $T_j = 150\ ^oC$	I_R	<	50 μA
Diode capacitance			
$V_R = 0$; f = 1 MHz	C_d	<	1,5 pF
Forward recovery voltage when switched to			
$I_F = 10$ mA; $t_r = 20$ ns	V_{fr}	<	1,75 V

▲ Measured under pulse conditions: pulse time $t_p \leqslant 0{,}5$ ms.
For sinusoidal operation $I_{F(AV)} = 150$ mA; averaging time $t_{(av)} \leqslant 1$ ms.

* See *Thermal characteristics* in GENERAL SECTION.

** Device mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

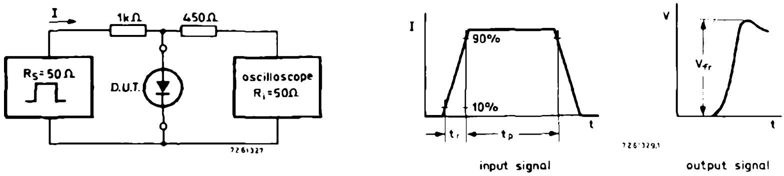


Fig. 2 Test circuit and waveforms; forward recovery voltage.

Input signal: Rise time of the forward pulse t_r = 20 ns;
Forward current pulse duration = t_p = 120 ns. Duty factor = δ = 0,01.
Oscilloscope: Rise time t_r = 0,35 ns.

Circuit capacitance C ⩽ 1 pF (C = oscilloscope input capacitance + parasitic capacitance).

Reverse recovery time when switched from
I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω;
measured at I_R = 1 mA $\quad t_{rr} \quad < \quad 6$ ns

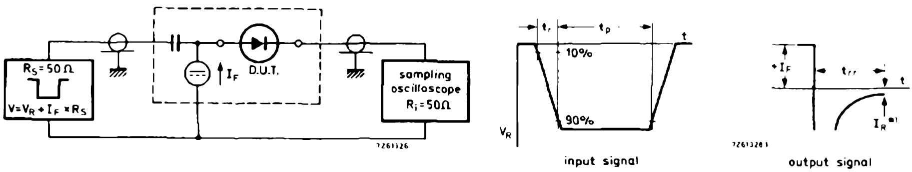


Fig. 3 Test circuit and waveforms; reverse recovery time.

Input signal: Rise time of the reverse pulse t_r = 0,6 ns $\quad$ *) I_R = 1 mA
Reverse pulse duration t_p = 100 ns. Duty factor δ = 0,05.
Oscilloscope: Rise time t_r = 0,35 ns.

Circuit capacitance C ⩽ 1 pF (C = oscilloscope input capacitance + parasitic capacitance).

Recovery charge when switched from
I_F = 10 mA to V_R = 5 V; R_L = 500 Ω $\quad Q_s \quad < \quad 45$ pC

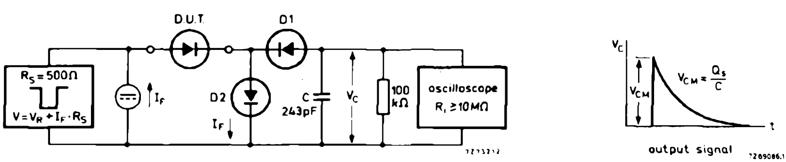


Fig. 4 Test and waveform; recovery charge.

D2 = diode with minority carrier life time at 10 mA: < 200 ps; D1 = BAW62.

Input signal: Rise time of the reverse pulse t_r = 2 ns
Reverse pulse duration t_p = 400 ns. Duty factor δ = 0,02.

Citcuit capacitance C ⩽ 7 pF (C = oscilloscope input capacitance + parasitic capacitance).

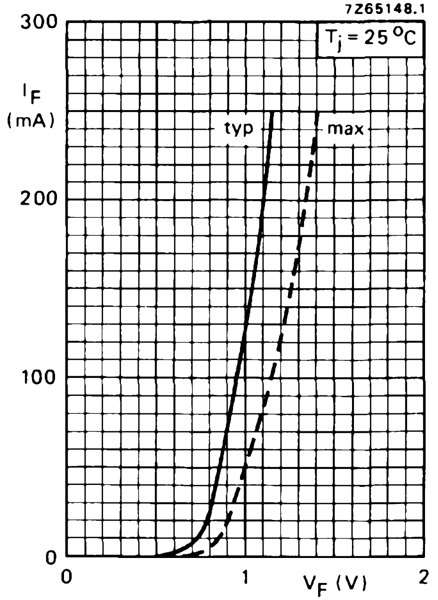


Fig. 5.

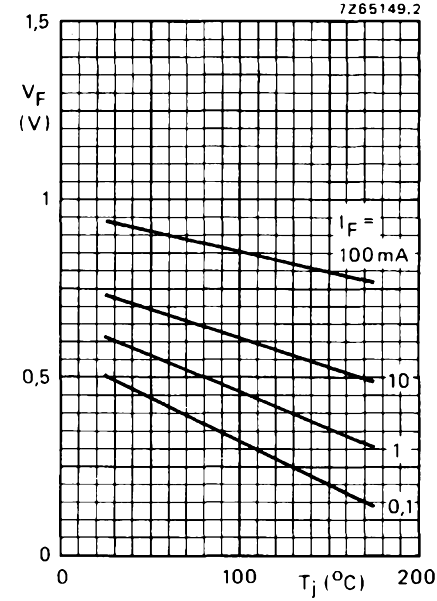


Fig. 6 Typical values.

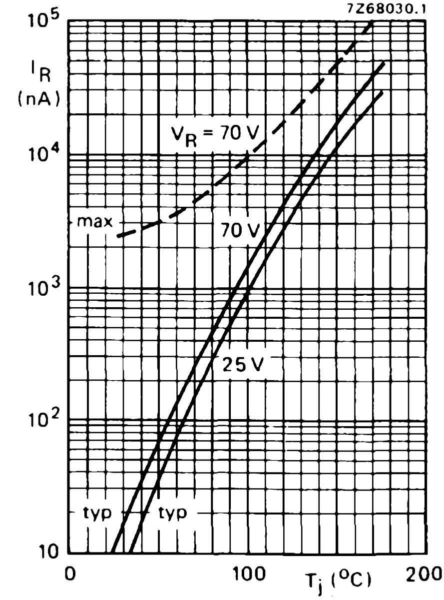


Fig. 7.

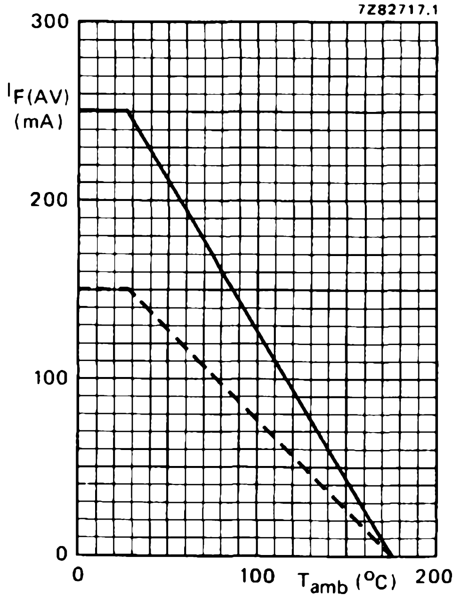


Fig. 8 ——— single diode
– – – – double diode; equally loaded.

SILICON PLANAR EPITAXIAL HIGH-SPEED DIODES

The BAW56 consists of two diodes in a microminiature plastic envelope. The anodes are commoned and the unit is intended for high-speed switching in thick and thin-film circuits.

QUICK REFERENCE DATA (per diode)

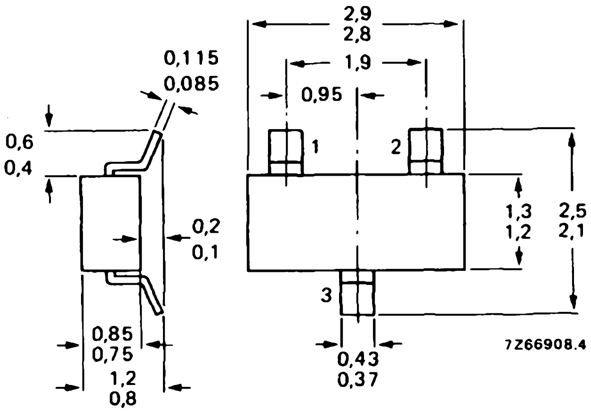
Continuous reverse voltage	V_R	max.	70	V
Repetitive peak reverse voltage	V_{RRM}	max.	70	V
Repetitive peak forward current	I_{FRM}	max.	250	mA
Junction temperature	T_j	max.	175	°C
Forward voltage at I_F = 50 mA	V_F	<	1,0	V
Reverse recovery time when switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	6	ns
Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	45	pC

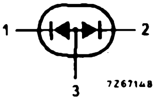
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-23.

Marking code
BAW56 = A1





See also *Soldering recommendations.*

RATINGS (per diode)

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	70 V
Repetitive peak reverse voltage	V_{RRM}	max.	70 V
Average rectified forward current ▲ (averaged over any 20 ms period)	$I_{F(AV)}$	max.	250 mA
Forward current (d.c.)	I_F	max.	250 mA
Repetitive peak forward current	I_{FRM}	max.	250 mA
Storage temperature	T_{stg}	−65 to +175	°C
Junction temperature	T_j	max.	175 °C

THERMAL CHARACTERISTICS *

$T_{j1} = P_1 (R_{th\ j\text{-}t}) + T_{tab}$

$T_{j2} = P_2 (R_{th\ j\text{-}t}) + T_{tab}$

$T_{tab} = P_{tot} (R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb}$

Thermal resistance

From junction to tab	$R_{th\ j\text{-}t}$	=	60 °C/W
From tab to soldering points	$R_{th\ t\text{-}s}$	=	280 °C/W
From soldering points to ambient **	$R_{th\ s\text{-}a}$	=	90 °C/W

CHARACTERISTICS (per diode)

$T_j = 25\ ^\circ C$ unless otherwise specified

Forward voltage			
$I_F = 1$ mA	V_F	<	715 mV
$I_F = 10$ mA	V_F	<	855 mV
$I_F = 50$ mA	V_F	<	1000 mV
$I_F = 150$ mA	V_F	<	1250 mV
Reverse current			
$V_R = 25$ V; $T_j = 150\ ^\circ C$	I_R	<	30 μA
$V_R = 70$ V	I_R	<	2,5 μA
$V_R = 70$ V; $T_j = 150\ ^\circ C$	I_R	<	50 μA
Diode capacitance			
$V_R = 0$; f = 1 MHz	C_d	<	2 pF
Forward recovery voltage when switched to			
$I_F = 10$ mA; $t_r = 20$ ns	V_{fr}	<	1,75 V

▲ Measured under pulse conditions: pulse time $t_p \leqslant 0{,}5$ ms.
For sinusoidal operation $I_{F(AV)} = 150$ mA; averaging time $t_{(av)} \leqslant 1$ ms.

* See *Thermal characteristics* in GENERAL SECTION.

** Device mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

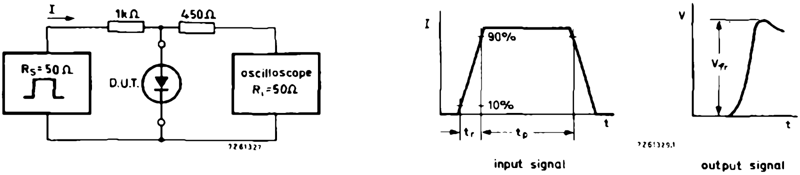


Fig. 2 Test circuit and waveforms; forward recovery voltage.

Input signal: Rise time of the forward pulse t_r = 20 ns
Forward current pulse duration t_p = 120 ns. Duty factor δ = 0,01
Oscilloscope: Rise time t_r = 0,35 ns.

Circuit capacitance C $\leqslant$ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Reverse recovery time when switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at $I_R \approx$ 1 mA	t_{rr}	<	6 ns

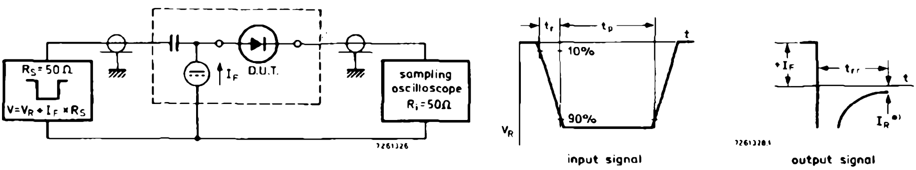


Fig. 3 Test circuit and waveforms; reverse recovery time.

*) I_R = 1 mA

Input signal: Rise time of the reverse pulse t_r = 0,6 ns
Reverse pulse duration t_p = 100 ns. Duty factor δ = 0,05.
Oscilloscope: Rise time t_r = 0,35 ns

Circuit capacitance C $\leqslant$ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

Recovery charge when switched from I_F = 10 mA to V_R = 5 V; R_L = 500 Ω	Q_s	<	45 pC

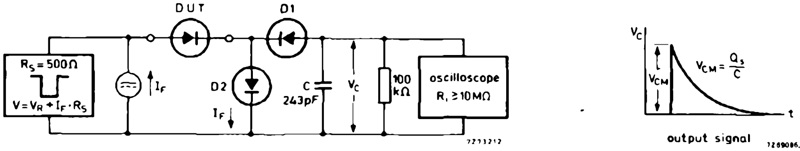


Fig. 4 Test circuit and waveform; recovery charge.

D2 = diode with minority carrier life time at 10 mA: < 200 ps. D1 = BAW62.

Input signal: Rise time of the reverse pulse t_r = 2 ns
Reverse pulse duration t_p = 400 ns. Duty factor δ = 0,02

Circuit capacitance C $\leqslant$ 7 pF (C = oscilloscope input capacitance + parasitic capacitance).

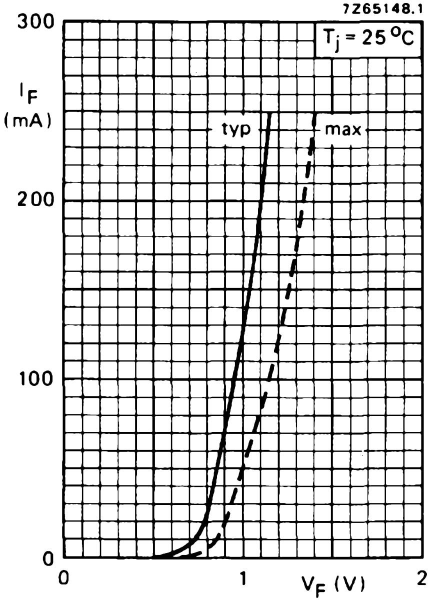


Fig. 5.

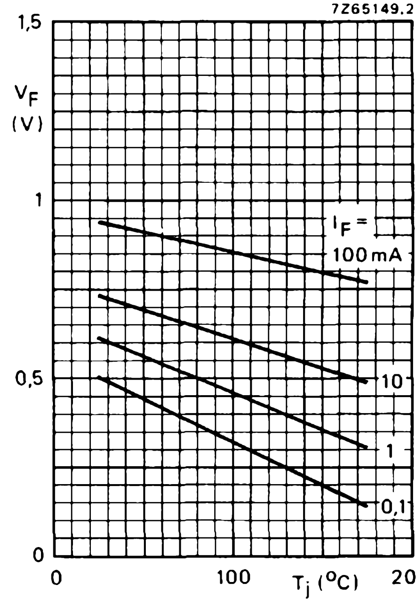


Fig. 6 Typical values.

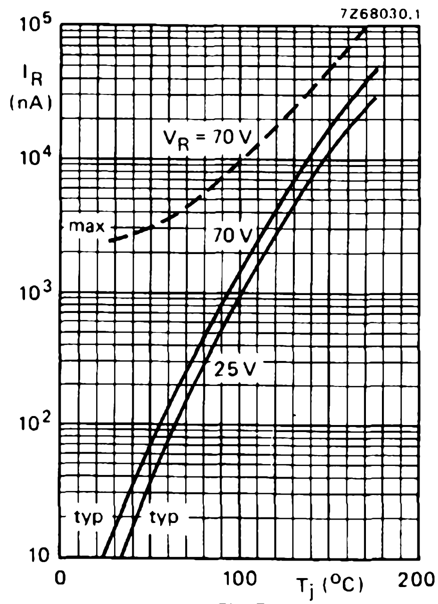


Fig. 7.

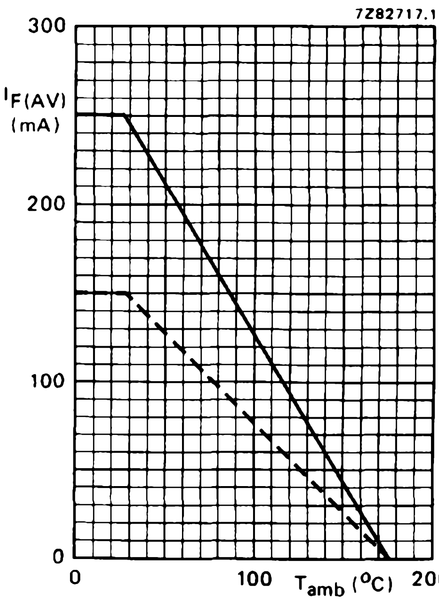


Fig. 8 ——— single diode;
– – – – double diode, equally loaded.

VARIABLE CAPACITANCE DIODE

Silicon planar variable capacitance diode in a microminiature envelope. It is intended for electronic tuning applications in thick and thin-film circuits.

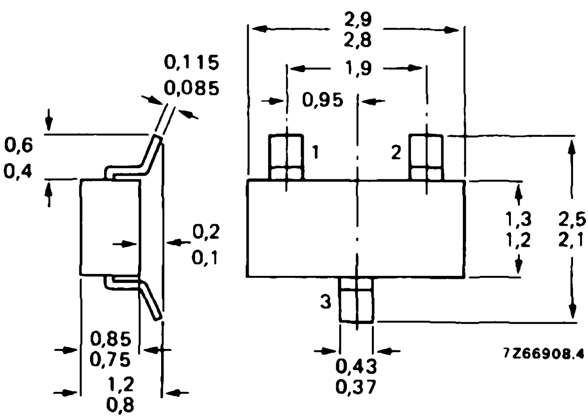
QUICK REFERENCE DATA

Reverse voltage	V_R	max.	28 V
Reverse current at V_R = 28 V	I_R	<	50 nA
Diode capacitance at f = 1 MHz V_R = 25 V	C_d		1,8 to 2,8 pF
Capacitance ratio at f = 1 MHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$	typ.	5
Series resistance at f = 470 MHz V_R = that value at which C_d = 9 pF	r_D	<	1,2 Ω

MECHANICAL DATA

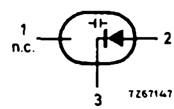
Dimensions in mm

Fig. 1 SOT-23.



Marking code

BBY31 = S1



See also *Soldering recommendations.*

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	28	V
Reverse voltage (peak value)	V_{RM}	max.	30	V
Forward current (d.c.)	I_F	max.	20	mA
Storage temperature	T_{stg}	–65 to +100		°C
Operating junction temperature	T_j	max.	85	°C

THERMAL CHARACTERISTICS*

$T_j = P \times (R_{th\ j\text{-}t} + R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb}$

Thermal resistance

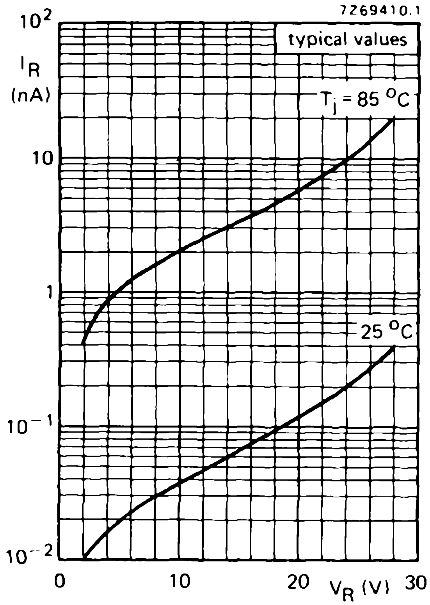
From junction to tab	$R_{th\ j\text{-}t}$	=	60	°C/W
From tab to soldering points	$R_{th\ t\text{-}s}$	=	280	°C/W
From soldering points to ambient**	$R_{th\ s\text{-}a}$	=	90	°C/W

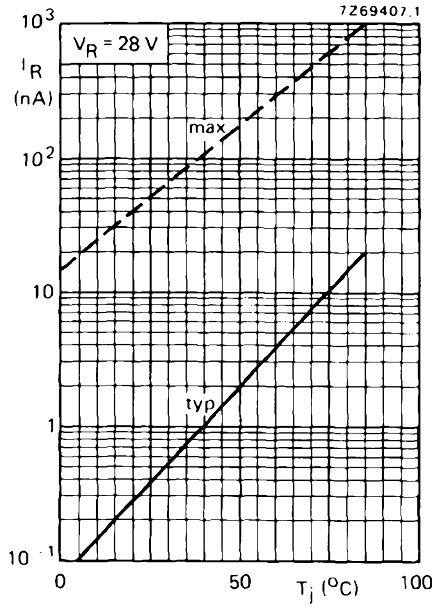
CHARACTERISTICS

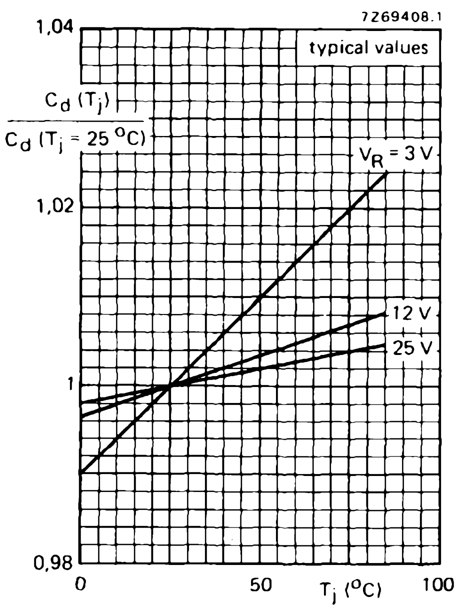
$T_j = 25\ ^oC$ unless otherwise specified

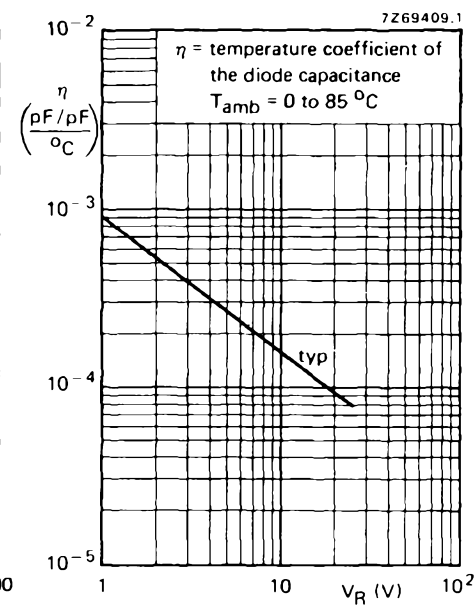
Reverse current				
$V_R = 28$ V	I_R	<	50	nA
$V_R = 28$ V; $T_j = 85\ ^oC$	I_R	<	1000	nA
Diode capacitance at f = 1 MHz				
$V_R = 1$ V	C_d	typ.	17.5	pF
$V_R = 3$ V	C_d	typ.	11.5	pF
$V_R = 25$ V	C_d		1.8 to 2.8	pF
Capacitance ratio at f = 1 MHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$	typ.	5	
Series resistance at f = 470 MHz and at that value of V_R at which $C_d = 9$ pF	r_D	<	1.2	Ω

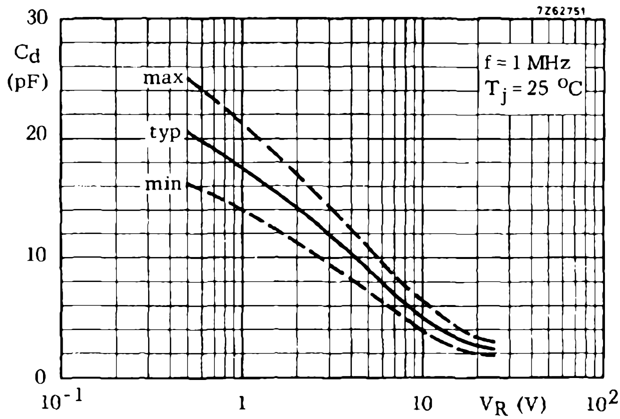
* See *Thermal characteristics* in GENERAL SECTION.
** Device mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm.


7Z69410.1
typical values
I_R (nA)
T_j = 85 °C
25 °C
V_R (V)


7Z69407.1
V_R = 28 V
I_R (nA)
max
typ
T_j (°C)


7Z69408.1
typical values
C_d (T_j) / C_d (T_j = 25 °C)
V_R = 3 V
12 V
25 V
T_j (°C)


7Z69409.1
η = temperature coefficient of the diode capacitance
T_{amb} = 0 to 85 °C
η (pF/pF / °C)
typ
V_R (V)


7Z62751
30
C_d
(pF)
20
10
0
max
typ
min
f = 1 MHz
T_j = 25 °C
10^{-1}
1
10
V_R (V)
10^2

SILICON PLANAR VARIABLE CAPACITANCE DIODE

The BBY40 is a variable capacitance diode in a plastic envelope intended for electronic tuning in v.h.f. television tuners with extended band I (FCC and OIRT-norm).

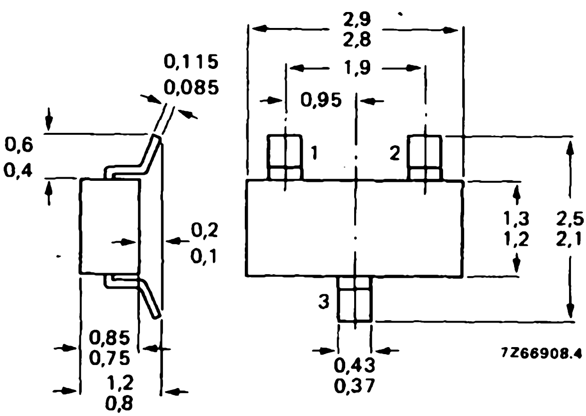
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	28 V
Reverse current at V_R = 28 V	I_R	<	50 nA
Diode capacitance at f = 1 MHz			
V_R = 3 V	C_d		26 to 32 pF
V_R = 25 V	C_d		4,3 to 6 pF
Capacitance ratio at f = 1 MHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$		5 to 6,5
Series resistance at f = 200 MHz			
V_R is that value at which C_d = 25 pF	r_D	<	0,6 Ω

MECHANICAL DATA

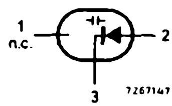
Dimensions in mm

Fig. 1 SOT-23.



Marking code

BBY40 = S2



See also *Soldering recommendations*.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Continuous reverse voltage	V_R	max.	28	V
Reverse voltage (repetitive peak value)	V_{RRM}	max.	30	V
Forward current (d.c.)	I_F	max.	20	mA
Storage temperature	T_{stg}		−55 to +100	°C
Operating junction temperature	T_j	max.	85	°C

THERMAL CHARACTERISTICS*

$T_j = P \times (R_{th\ j\text{-}t} + R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb}$

Thermal resistance

From junction to tab	$R_{th\ j\text{-}t}$	=	60	°C/W
From tab to soldering points	$R_{th\ t\text{-}s}$	=	280	°C/W
From soldering points to ambient**	$R_{th\ s\text{-}a}$	=	90	°C/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Reverse current		typ.	0.1	nA
V_R = 28 V	I_R	<	50	nA
V_R = 28 V; T_{amb} = 60 °C	I_R	<	500	nA
Diode capacitance at f = 1 MHz				
V_R = 3 V	C_d		26 to 32	pF
V_R = 25 V	C_d		4.3 to 6	pF
Capacitance ratio at f = 1 MHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$		5 to 6.5	
Series resistance at f = 200 MHz		typ.	0.4	Ω
V_R is that value at which C_d = 25 pF	r_D	<	0.6	Ω

* See *Thermal characteristics* in GENERAL SECTION.
** Device mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm.

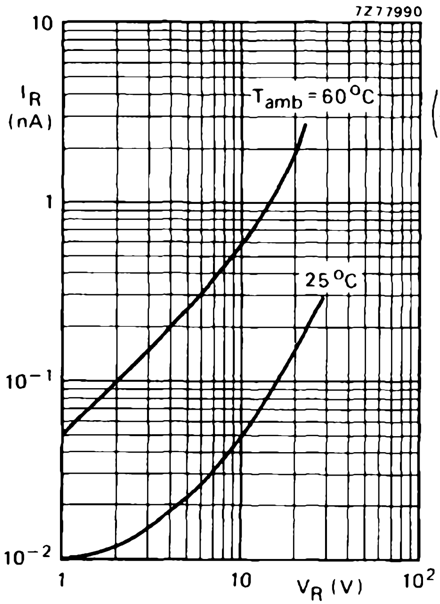


Fig. 2 Typical values

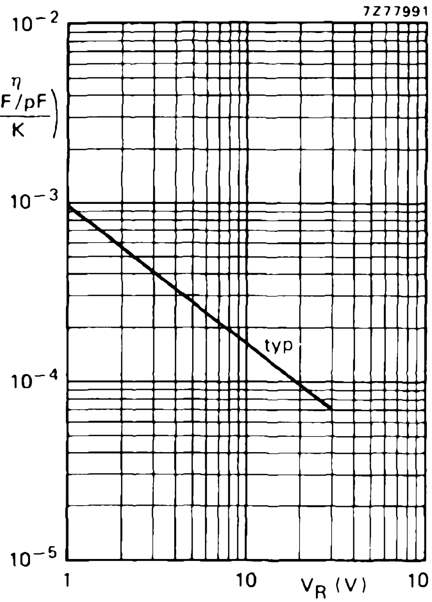


Fig. 3 Temperature coefficient of the diode capacitance; T_{amb} = 0 to 85 ^oC.

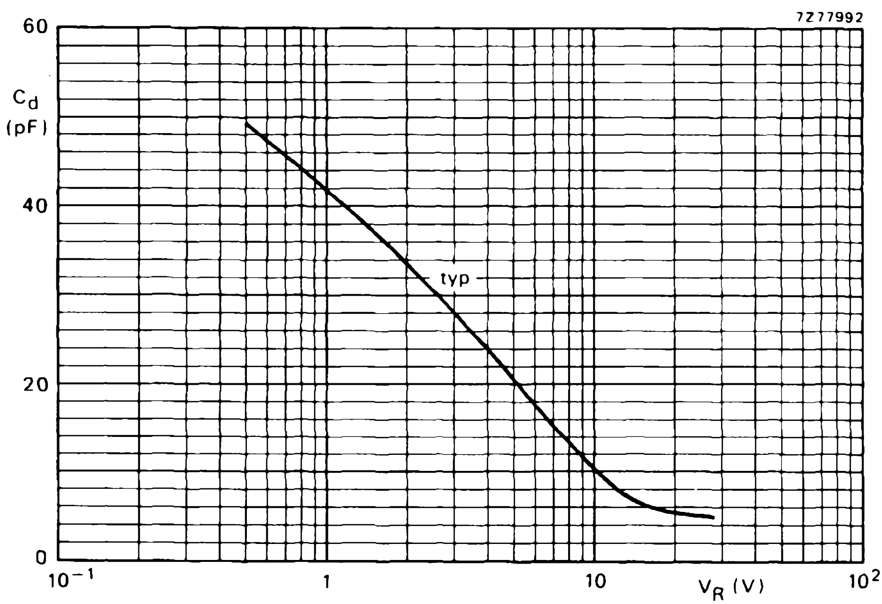


Fig. 4 f = 1 MHz; T_{amb} = 25 ^oC.

SILICON PLANAR VOLTAGE REGULATOR DIODES

Silicon planar voltage regulator diodes, in a SOT-89 plastic envelope, intended for stabilization applications in thick and thin-film circuits.

The series covers the normalized range of nominal working voltages from 2,4 V to 75 V with a tolerance of ± 5% (international standard E24 range).

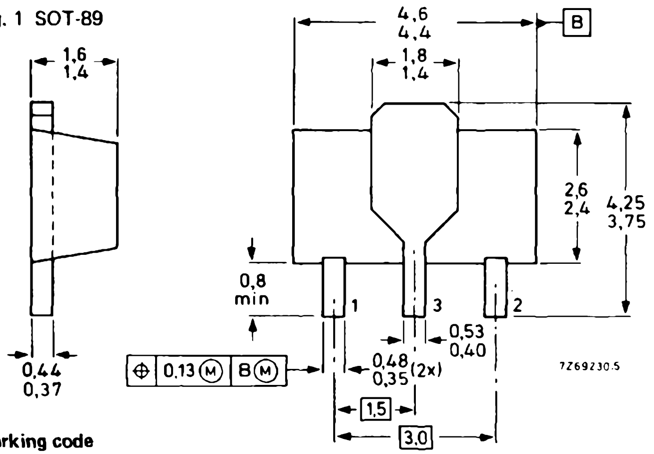
QUICK REFERENCE DATA

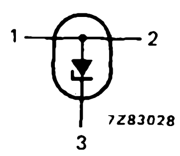
Working voltage range	V_Z	nom.	2,4 to 75	V
Working voltage tolerance (E24 range)			±5	%
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	1	W
Junction temperature	T_j	max.	150	°C

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-89





Marking code

BZV49-	C2V4 = 2Y4	C5V1 = 5Y1	C12 = 12Y	C33 = 33Y
	C2V7 = 2Y7	C5V6 = 5Y6	C13 = 13Y	C36 = 36Y
	C3V0 = 3Y0	C6V2 = 6Y2	C15 = 15Y	C39 = 39Y
	C3V3 = 3Y3	C6V8 = 6Y8	C16 = 16Y	C43 = 43Y
	C3V6 = 3Y6	C7V5 = 7Y5	C18 = 18Y	C47 = 47Y
	C3V9 = 3Y9	C8V2 = 8Y2	C20 = 20Y	C51 = 51Y
	C4V3 = 4Y3	C9V1 = 9Y1	C22 = 22Y	C56 = 56Y
	C4V7 = 4Y7	C10 = 10Y	C24 = 24Y	C62 = 62Y
		C11 = 11Y	C27 = 27Y	C68 = 68Y
			C30 = 30Y	C75 = 75Y

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Repetitive peak forward current	I_{FRM}	max.	250 mA
Average forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	250 mA
Working current (d.c.)	I_Z	limited by $P_{tot\,max}$	
Total power dissipation * up to T_{amb} = 25 °C	P_{tot}	max.	1 W
Non-repetitive peak reverse power dissipation * T_j = 25 °C; t_p = 100 μs	P_{ZSM}	max.	40 W
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to collector tab	$R_{th\,j\text{-}tab}$	=	15 K/W
From junction to ambient in free air *	$R_{th\,j\text{-}a}$	=	125 K/W

CHARACTERISTICS

T_j = 25 °C

Forward voltage I_F = 50 mA		V_F	<	1,0 V
Reverse current				
BZV49- C2V4	V_R = 1 V	I_R	<	50 μA
C2V7	V_R = 1 V	I_R	<	20 μA
C3V0	V_R = 1 V	I_R	<	10 μA
C3V3	V_R = 1 V	I_R	<	5 μA
C3V6	V_R = 1 V	I_R	<	5 μA
C3V9	V_R = 1 V	I_R	<	3 μA
C4V3	V_R = 1 V	I_R	<	3 μA
C4V7	V_R = 2 V	I_R	<	3 μA
C5V1	V_R = 2 V	I_R	<	2 μA
C5V6	V_R = 2 V	I_R	<	1 μA
C6V2	V_R = 4 V	I_R	<	3 μA
C6V8	V_R = 4 V	I_R	<	2 μA
C7V5	V_R = 5 V	I_R	<	1 μA
C8V2	V_R = 5 V	I_R	<	700 nA
C9V1	V_R = 6 V	I_R	<	500 nA
C10	V_R = 7 V	I_R	<	200 nA
C11 to C13	V_R = 8 V	I_R	<	100 nA
C15 to C75	V_R = 0,7 V_{Znom}	I_R	<	50 nA

* Device mounted on a ceramic substrate: area = 2,5 cm^2; thickness = 0,7 mm.

T_j = 25 °C

E24 logarithmic range (tolerance ± 5%)

BZV49-...	working voltage V_Z (V) at I_{Ztest} = 5 mA min.	max.	differential resistance r_{diff} (Ω) at I_{Ztest} = 5 mA typ.	max.	temperature coefficient S_Z (mV/K) at I_{Ztest} = 5 mA min.	typ.	max.	diode capacitance C_d(pF); f = 1 MHz V_R = 0 typ.	max.
C2V4	2,2	2,6	70	100	−3,5	−1,6	0	375	450
C2V7	2,5	2,9	75	100	−3,5	−2,0	0	350	450
C3V0	2,8	3,2	80	95	−3,5	−2,1	0	350	450
C3V3	3,1	3,5	85	95	−3,5	−2,4	0	325	450
C3V6	3,4	3,8	85	90	−3,5	−2,4	0	300	450
C3V9	3,7	4,1	85	90	−3,5	−2,5	0	300	450
C4V3	4,0	4,6	80	90	−3,5	−2,5	0	275	450
C4V7	4,4	5,0	50	80	−3,5	−1,4	0,2	130	180
C5V1	4,8	5,4	40	60	−2,7	−0,8	1,2	110	160
C5V6	5,2	6,0	15	40	−2,0	1,2	2,5	95	140
C6V2	5,8	6,6	6	10	0,4	2,3	3,7	90	130
C6V8	6,4	7,2	6	15	1,2	3,0	4,5	85	110
C7V5	7,0	7,9	6	15	2,5	4,0	5,3	80	100
C8V2	7,7	8,7	6	15	3,2	4,6	6,2	75	95
C9V1	8,5	9,6	6	15	3,8	5,5	7,0	70	90
C10	9,4	10,6	8	20	4,5	6,4	8,0	70	90
C11	10,4	11,6	10	20	5,4	7,4	9,0	65	85
C12	11,4	12,7	10	25	6,0	8,4	10,0	65	85
C13	12,4	14,1	10	30	7,0	9,4	11,0	60	80
C15	13,8	15,6	10	30	9,2	11,4	13,0	55	75
C16	15,3	17,1	10	40	10,4	12,4	14,0	52	75
C18	16,8	19,1	10	45	12,4	14,4	16,0	47	70
C20	18,8	21,2	15	55	14,4	16,4	18,0	36	60
C22	20,8	23,3	20	55	16,4	18,4	20,0	34	60
C24	22,8	25,6	25	70	18,4	20,4	22,0	33	55
	at I_{Ztest} = 2 mA		at I_{Ztest} = 2 mA		at I_{Ztest} = 2 mA				
C27	25,1	28,9	25	80	21,4	23,4	25,3	30	50
C30	28,0	32,0	30	80	24,4	26,6	29,4	27	50
C33	31,0	35,0	35	80	27,4	29,7	33,4	25	45
C36	34,0	38,0	35	90	30,4	33,0	37,4	23	45
C39	37,0	41,0	40	130	33,4	36,4	41,2	21	45
C43	40,0	46,0	45	150	37,6	41,2	46,6	21	40
C47	44,0	50,0	50	170	42,0	46,1	51,8	19	40
C51	48,0	54,0	60	180	46,6	51,0	57,2	19	40
C56	52,0	60,0	70	200	52,2	57,0	63,8	18	40
C62	58,0	66,0	80	215	58,8	64,4	71,6	17	35
C68	64,0	72,0	90	240	65,6	71,7	79,8	17	35
C75	70,0	79,0	95	255	73,4	80,2	88,6	16,5	35

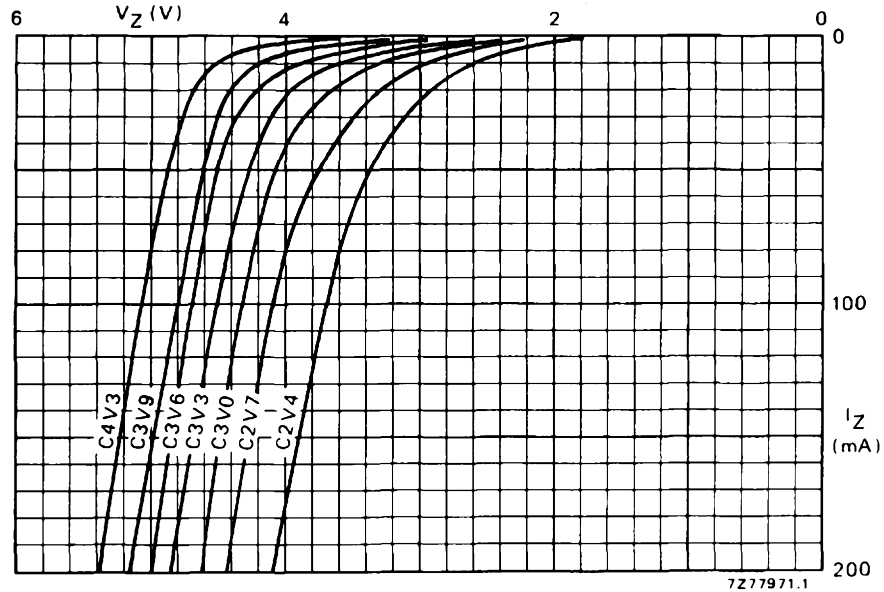


Fig. 2 Dynamic characteristics; typical values; T_j = 25 °C.

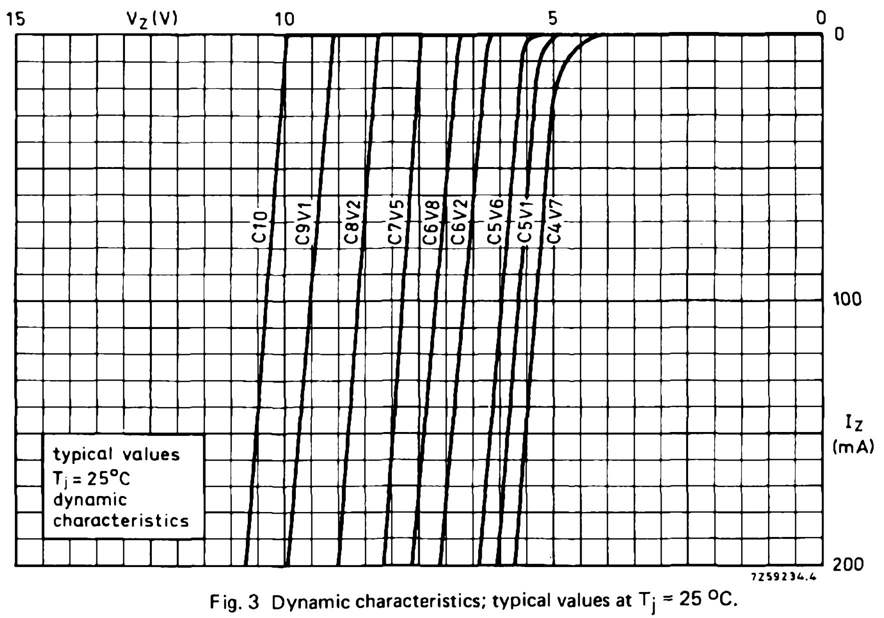


Fig. 3 Dynamic characteristics; typical values at T_j = 25 °C.

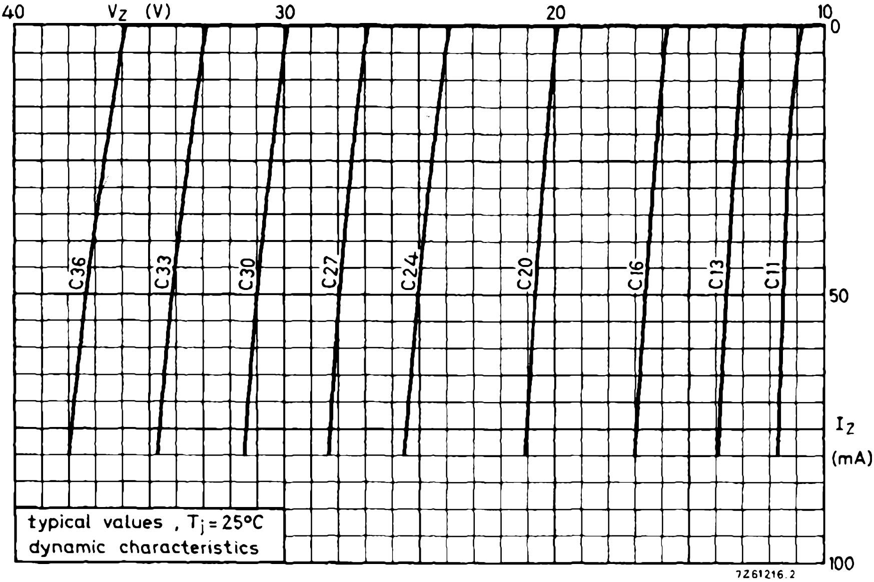


Fig. 4 Dynamic characteristics; typical values; T_j = 25 °C.

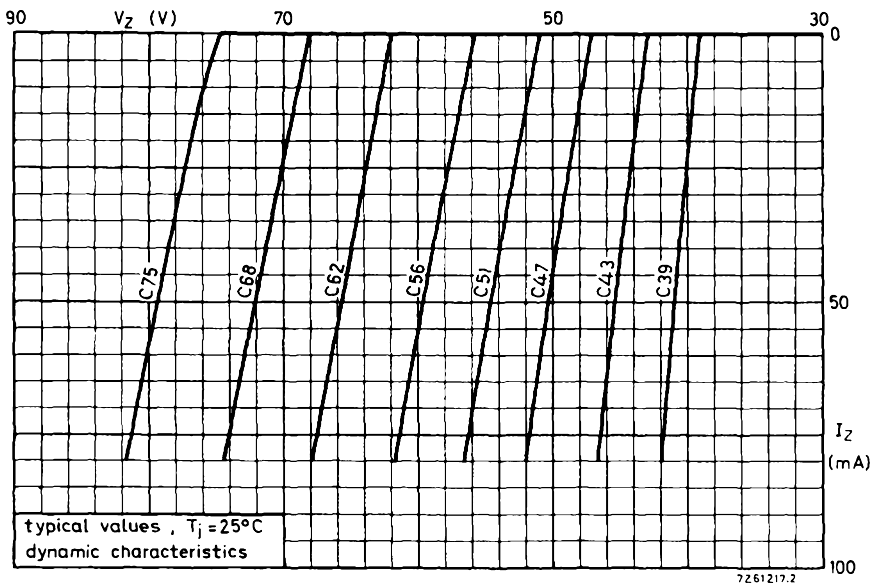


Fig. 5 Dynamic characteristics; typical values at T_j = 25 °C.

Model for calculating the static working voltage ($V_{Z\ stat}$).

This model can be derived from $V_{Z\ stat} = V_{Z\ dyn} + \Delta V_Z$ of which $V_{Z\ dyn}$ is given in the tables on page 3 and can be derived from the typical dynamic characteristic curves (Figs 2, 3, 4 and 5)
$\Delta V_Z = \Delta T \times S_Z$. For S_Z see tables and graphs S_Z versus T_j.
$\Delta T = P_{tot} \times R_{th\ j\text{-}a} = I_Z \times V_{Z\ dyn} \times R_{th\ j\text{-}a}$.
Following $\Delta V_Z = I_Z \times V_{Z\ dyn} \times R_{th\ j\text{-}a} \times S_Z$ and the model will be:

$$V_{Z\ stat} = V_{Z\ dyn} + I_Z \times V_{Z\ dyn} \times R_{th\ j\text{-}a} \times S_Z$$

Calculating example

BZV49-C24 mounted on a ceramic substrate of 7 x 5 x 0,6 mm; at $I_Z = 7$ mA.

$$V_{Z\ stat} = 24 + \left(\frac{7}{1000} \times 24 \times \frac{125}{1000} \times 20{,}3\right)$$

$$= 24 + 0{,}4 = 24{,}4 \text{ V}.$$

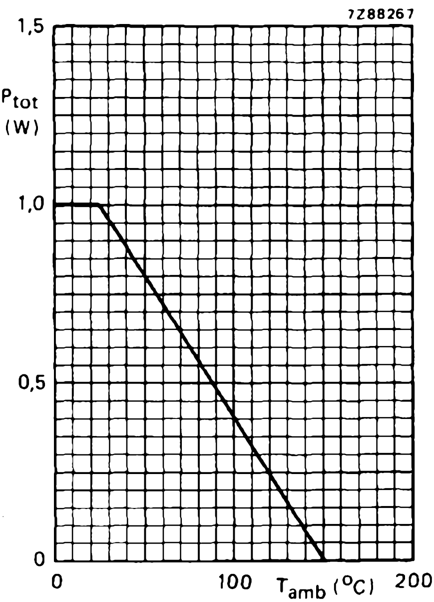


Fig. 6 Power derating curve.

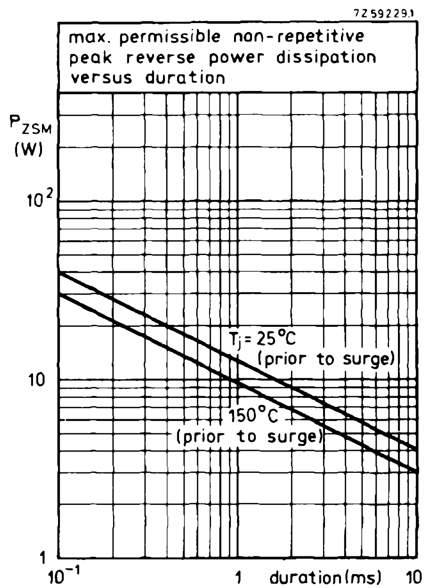


Fig. 7.

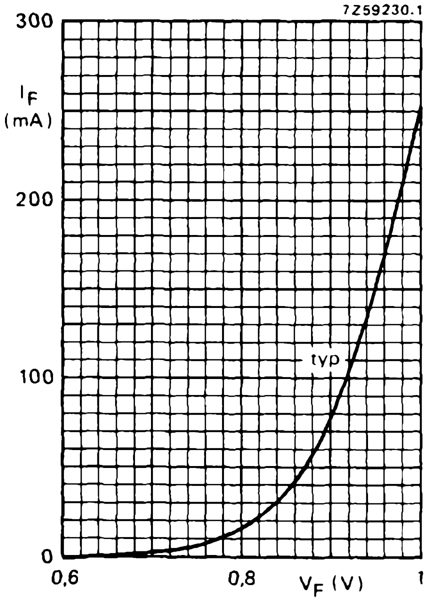


Fig. 8 $T_j = 25\ ^oC$.

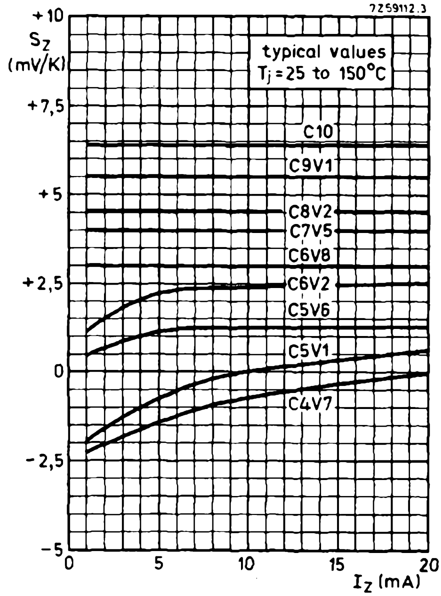


Fig. 9.

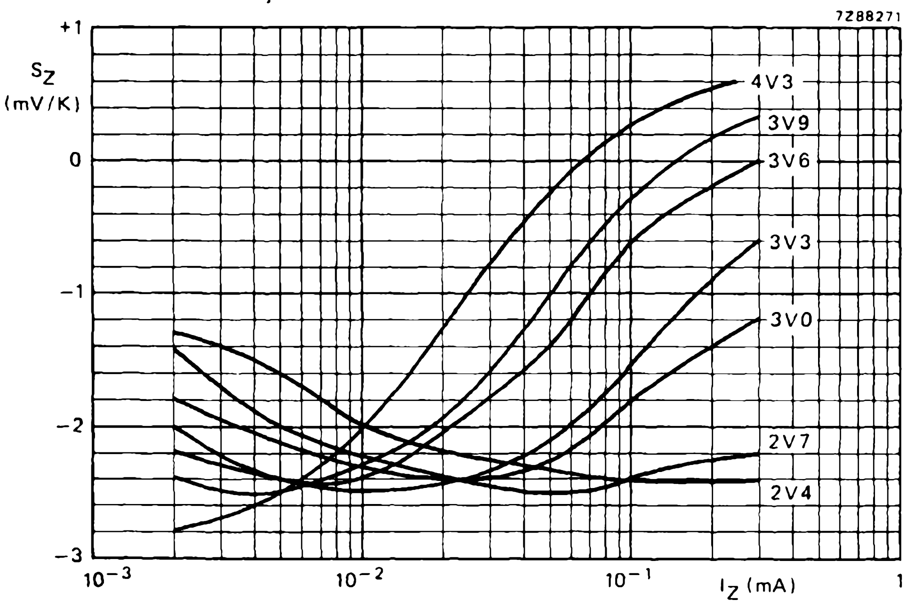


Fig. 10 Typical values temperature coefficient.

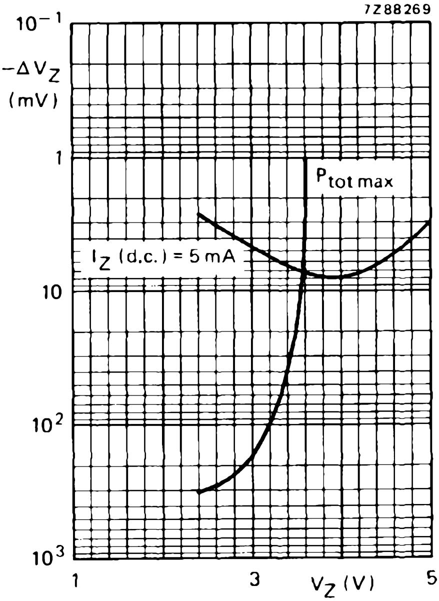


Fig. 11 Typical change of working voltage; $T_j = 25\ ^oC$.

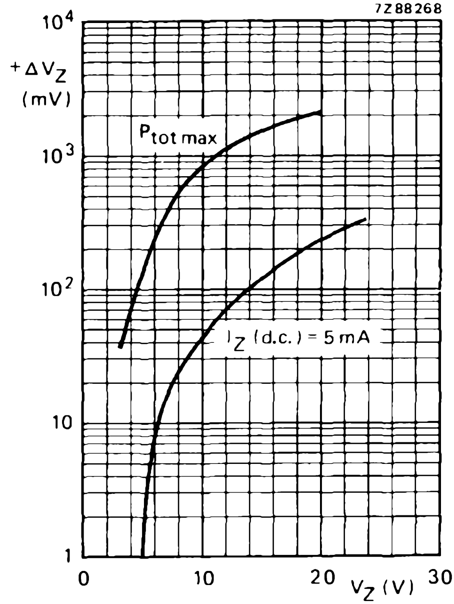


Fig. 12 Typical change of working voltage; $T_{amb} = 25\ ^oC$.

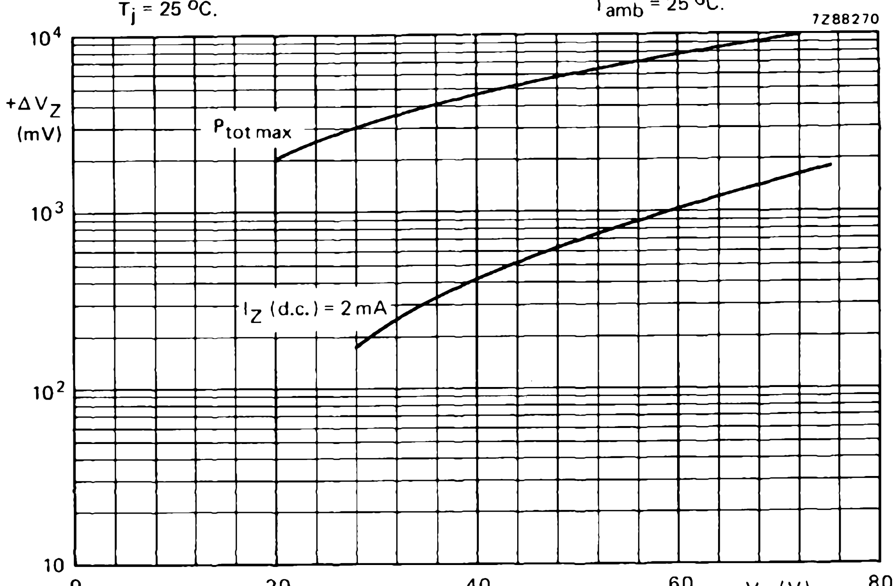


Fig. 13 Typical change of working voltage.

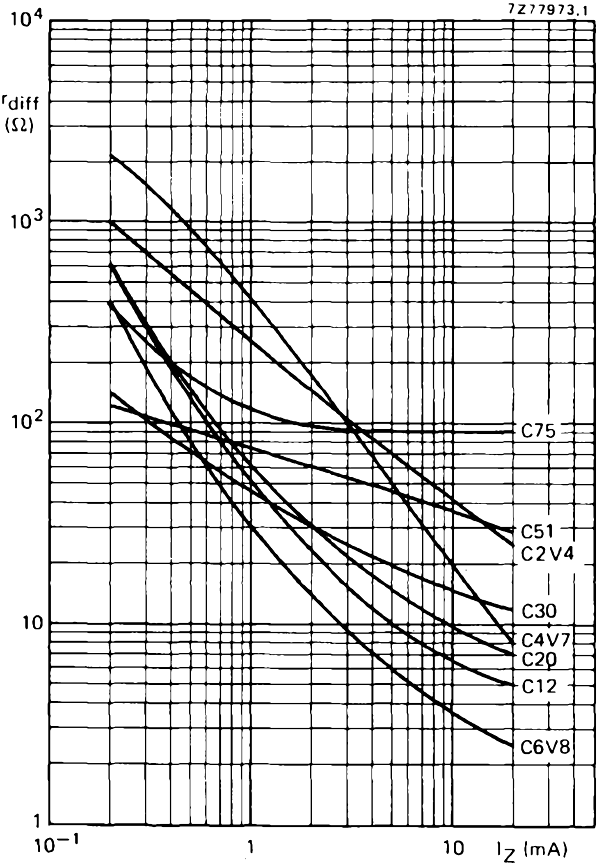


Fig. 14 Typical values; T_j = 25 °C; f = 1 kHz.

SILICON PLANAR VOLTAGE REGULATOR DIODES

Low power general purpose voltage regulator diodes in a microminiature plastic envelope intended for application in thick and thin-film circuits. The series covers the normalized range of nominal working voltages from 2,4 V to 75 V with a working voltage tolerance of ± 5%.

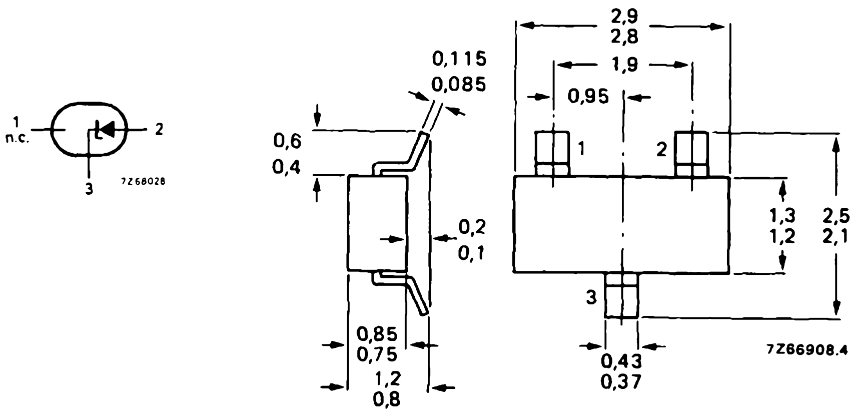
QUICK REFERENCE DATA

Working voltage range	V_Z	nom.	2,4 to 75	V
Working voltage tolerance			± 5	%
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	350	mW
Junction temperature	T_j	max.	175	°C

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-23.



See also *Soldering recommendations.*

Marking code

BZX84-C2V4 = Z11	BZX84-C5V6 = Z3	BZX84-C13 = Y3	BZX84-C33 = Y12
C2V7 = Z12	C6V2 = Z4	C15 = Y4	C36 = Y13
C3V0 = Z13	C6V8 = Z5	C16 = Y5	C39 = Y14
C3V3 = Z14	C7V5 = Z6	C18 = Y6	C43 = Y15
C3V6 = Z15	C8V2 = Z7	C20 = Y7	C47 = Y16
C3V9 = Z16	C9V1 = Z8	C22 = Y8	C51 = Y17
C4V3 = Z17	C10 = Z9	C24 = Y9	C56 = Y18
C4V7 = Z1	C11 = Y1	C27 = Y10	C62 = Y19
C5V1 = Z2	C12 = Y2	C30 = Y11	C68 = Y20
			C75 = Y21

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Repetitive peak forward current	I_{FRM}	max.	250	mA
Repetitive peak working current	I_{ZRM}	max.	250	mA
Total power dissipation up to T_{amb} = 25 °C**	P_{tot}	max.	350	mW
Storage temperature	T_{stg}	−65 to + 175		°C
Junction temperature	T_j	max.	175	°C

THERMAL CHARACTERISTICS*

$T_j = P \times (R_{th\ j\text{-}t} + R_{th\ t\text{-}s} + R_{th\ s\text{-}a}) + T_{amb}$

Thermal resistance

From junction to tab	$R_{th\ j\text{-}t}$	=	50	°C/W
From tab to soldering points	$R_{th\ t\text{-}s}$	=	280	°C/W
From soldering points to ambient**	$R_{th\ s\text{-}a}$	=	90	°C/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage

I_F = 10 mA		V_F	<	0,9	V

Reverse current

BZX84-C2V4	V_R = 1 V	I_R	<	50	μA
C2V7	V_R = 1 V	I_R	<	20	μA
C3V0	V_R = 1 V	I_R	<	10	μA
C3V3	V_R = 1 V	I_R	<	5	μA
C3V6	V_R = 1 V	I_R	<	5	μA
C3V9	V_R = 1 V	I_R	<	3	μA
C4V3	V_R = 1 V	I_R	<	3	μA
C4V7	V_R = 2 V	I_R	<	3	μA
C5V1	V_R = 2 V	I_R	<	2	μA
C5V6	V_R = 2 V	I_R	<	1	μA
C6V2	V_R = 4 V	I_R	<	3	μA
C6V8	V_R = 4 V	I_R	<	2	μA
C7V5	V_R = 5 V	I_R	<	1	μA
C8V2	V_R = 5 V	I_R	<	700	nA
C9V1	V_R = 6 V	I_R	<	500	nA
C10	V_R = 7 V	I_R	<	200	nA
C11	V_R = 8 V	I_R	<	100	nA
C12	V_R = 8 V	I_R	<	100	nA
C13	V_R = 8 V	I_R	<	100	nA
C15 to C75	V_R = 0,7 V_{Znom}	I_R	<	50	nA

* See *Thermal characteristics* in GENERAL SECTION.

** Device mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

BZX84-....	working voltage V_Z (V) at I_{Ztest} = 5 mA		differential resistance r_{diff} (Ω) at I_{Ztest} = 5 mA		temperature coefficient S_Z (mV/°C) at I_{Ztest} = 5 mA			diode capacitance C_d(pF); f = 1 MHz V_R = 0	
	min.	max.	typ.	max.	min.	typ.	max.	typ.	max.
C2V4	2,2	2,6	70	100	−3,5	−1,6	0	375	450
C2V7	2,5	2,9	75	100	−3,5	−2,0	0	350	450
C3V0	2,8	3,2	80	95	−3,5	−2,1	0	350	450
C3V3	3,1	3,5	85	95	−3,5	−2,4	0	325	450
C3V6	3,4	3,8	85	90	−3,5	−2,4	0	300	450
C3V9	3,7	4,1	85	90	−3,5	−2,5	0	300	450
C4V3	4,0	4,6	80	90	−3,5	−2,5	0	275	450
C4V7	4,4	5,0	50	80	−3,5	−1,4	0,2	130	180
C5V1	4,8	5,4	40	60	−2,7	−0,8	1,2	110	160
C5V6	5,2	6,0	15	40	−2,0	1,2	2,5	95	140
C6V2	5,8	6,6	6	10	0,4	2,3	3,7	90	130
C6V8	6,4	7,2	6	15	1,2	3,0	4,5	85	110
C7V5	7,0	7,9	6	15	2,5	4,0	5,3	80	100
C8V2	7,7	8,7	6	15	3,2	4,6	6,2	75	95
C9V1	8,5	9,6	6	15	3,8	5,5	7,0	70	90
C10	9,4	10,6	8	20	4,5	6,4	8,0	70	90
C11	10,4	11,6	10	20	5,4	7,4	9,0	65	85
C12	11,4	12,7	10	25	6,0	8,4	10,0	65	85
C13	12,4	14,1	10	30	7,0	9,4	11,0	60	80
C15	13,8	15,6	10	30	9,2	11,4	13,0	55	75
C16	15,3	17,1	10	40	10,4	12,4	14,0	52	75
C18	16,8	19,1	10	45	12,4	14,4	16,0	47	70
C20	18,8	21,2	15	55	14,4	16,4	18,0	36	60
C22	20,8	23,3	20	55	16,4	18,4	20,0	34	60
C24	22,8	25,6	25	70	18,4	20,4	22,0	33	55
	at I_Z = 2 mA		at I_Z = 2 mA		at I_Z = 2 mA				
	min.	max.	typ.	max.	min.	typ.	max.	typ.	max.
C27	25,1	28,9	25	80	21,4	23,4	25,3	30	50
C30	28,0	32,0	30	80	24,4	26,6	29,4	27	50
C33	31,0	35,0	35	80	27,4	29,7	33,4	25	45
C36	34,0	38,0	35	90	30,4	33,0	37,4	23	45
C39	37,0	41,0	40	130	33,4	36,4	41,2	21	45
C43	40,0	46,0	45	150	37,6	41,2	46,6	21	40
C47	44,0	50,0	50	170	42,0	46,1	51,8	19	40
C51	48,0	54,0	60	180	46,6	51,0	57,2	19	40
C56	52,0	60,0	70	200	52,2	57,0	63,8	18	40
C62	58,0	66,0	80	215	58,8	64,4	71,6	17	35
C68	64,0	72,0	90	240	65,6	71,7	79,8	17	35
C75	70,0	79,0	95	255	73,4	80,2	88,6	16,5	35

BZX84-....	working voltage V_Z (V) at I_Z = 1 mA			differential resistance r_{diff} (Ω) at I_Z = 1 mA		working voltage V_Z (V) at I_Z = 20 mA			differential resistance r_{diff} (Ω) at I_Z = 20 mA	
	min.	nom.	max.	typ.	max.	min.	nom.	max.	typ.	max.
C2V4	1,7	1,9	2,1	275	600	2,6	2,9	3,2	25	50
C2V7	1,9	2,2	2,4	300	600	3,0	3,3	3,6	25	50
C3V0	2,1	2,4	2,7	325	600	3,3	3,6	3,9	25	50
C3V3	2,3	2,6	2,9	350	600	3,6	3,9	4,2	20	40
C3V6	2,7	3,0	3,3	375	600	3,9	4,2	4,5	20	40
C3V9	2,9	3,2	3,5	400	600	4,1	4,4	4,7	15	30
C4V3	3,3	3,6	4,0	410	600	4,4	4,7	5,1	15	30
C4V7	3,7	4,2	4,7	425	500	4,5	5,0	5,4	8	15
C5V1	4,2	4,7	5,3	400	480	5,0	5,4	5,9	6	15
C5V6	4,8	5,4	6,0	80	400	5,2	5,7	6,3	4	10
C6V2	5,6	6,1	6,6	40	150	5,8	6,3	6,8	3	6
C6V8	6,3	6,7	7,2	30	80	6,4	6,9	7,4	2,5	6
C7V5	6,9	7,4	7,9	30	80	7,0	7,6	8,0	2,5	6
C8V2	7,6	8,1	8,7	40	80	7,7	8,3	8,8	3	6
C9V1	8,4	9,0	9,6	40	100	8,5	9,2	9,7	4	8
C10	9,3	9,9	10,6	50	150	9,4	10,1	10,7	4	10
C11	10,2	10,9	11,6	50	150	10,4	11,1	11,8	5	10
C12	11,2	11,9	12,7	50	150	11,4	12,1	12,9	5	10
C13	12,3	12,9	14,0	50	170	12,5	13,1	14,2	5	15
C15	13,7	14,9	15,5	50	200	13,9	15,1	15,7	6	20
C16	15,2	15,9	17,0	50	200	15,4	16,1	17,2	6	20
C18	16,7	17,9	19,0	50	225	16,9	18,1	19,2	6	20
C20	18,7	19,9	21,1	60	225	18,9	20,1	21,4	7	20
C22	20,7	21,9	23,2	60	250	20,9	22,1	23,4	7	25
C24	22,7	23,9	25,5	60	250	22,9	24,1	25,7	7	25
	at I_Z = 0,1 mA			at I_Z = 0,5 mA		at I_Z = 10 mA			at I_Z = 10 mA	
	min.	nom.	max.	typ.	max.	min.	nom.	max.	typ.	max.
C27	25,0	26,9	28,9	65	300	25,2	27,1	29,3	10	45
C30	27,8	29,9	32,0	70	300	28,1	30,1	32,4	15	50
C33	30,8	32,9	35,0	75	325	31,1	33,1	35,4	20	55
C36	33,8	35,9	38,0	80	350	34,1	36,1	38,4	25	60
C39	36,7	38,9	41,0	80	350	37,1	39,1	41,5	25	70
C43	39,7	42,9	46,0	85	375	40,1	43,1	46,5	25	80
C47	43,7	46,8	50,0	85	375	44,1	47,1	50,5	30	90
C51	47,6	50,8	54,0	90	400	48,1	51,1	54,6	35	100
C56	51,5	55,7	60,0	100	425	52,1	56,1	60,8	45	110
C62	57,4	61,7	66,0	120	450	58,2	62,1	67,0	60	120
C68	63,4	67,7	72,0	150	475	64,2	68,2	73,2	75	130
C75	69,4	74,7	79,0	170	500	70,3	75,3	80,2	90	140

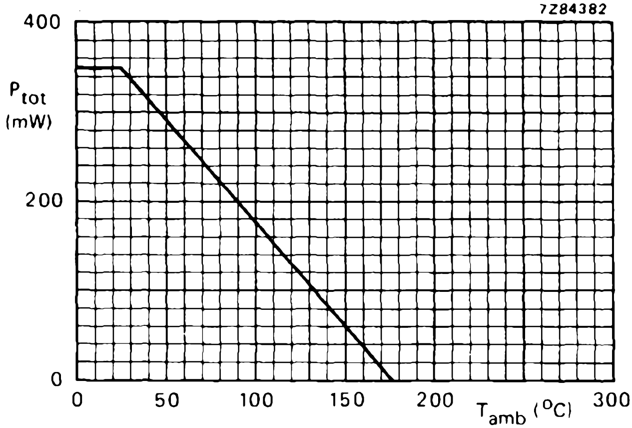


Fig. 2 Power derating curve.

Model for calculating the static working voltage ($V_{Z\ stat}$).

This model can be derived from $V_{Z\ stat} = V_{Z\ dyn} + \Delta V_Z$ of which $V_{Z\ dyn}$ is given in the tables on pages 3 and 4 and can be derived from the typical dynamic characteristic curves on pages 6 and 7.
$\Delta V_Z = \Delta T \times S_Z$. For S_Z see tables and graphs S_Z versus T_j.
$\Delta T = P_{tot} \times R_{th\ j\text{-}a} = I_Z \times V_{Z\ dyn} \times R_{th\ j\text{-}a}$.
Following $\Delta V_Z = I_Z \times V_{Z\ dyn} \times R_{th\ j\text{-}a} \times S_Z$ and the model will be:

$$V_{Z\ stat} = V_{Z\ dyn} + I_Z \times V_{Z\ dyn} \times R_{th\ j\text{-}a} \times S_Z$$

Calculating example

BZX84-C24 mounted on a ceramic substrate of 8 mm x 10 mm x 0.7 mm; at I_Z = 7 mA.

$$V_{Z\ stat} = 24 + \left(\frac{7}{1000} \times 24 \times \frac{420}{1000} \times 20.3\right)$$
$$= 24 + 1.43 = 25.43\ \text{V}.$$

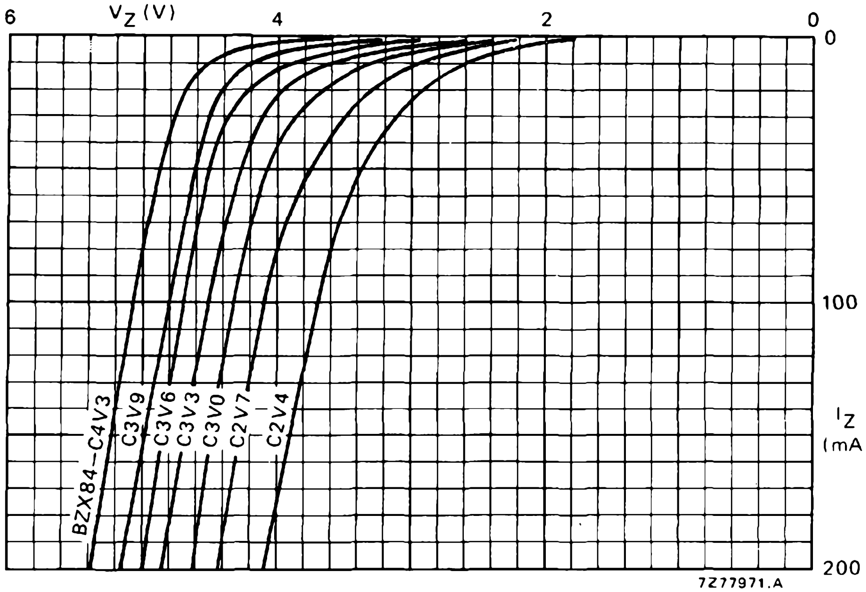


Fig. 3 Dynamic characteristics; typical values; T_j = 25 °C.

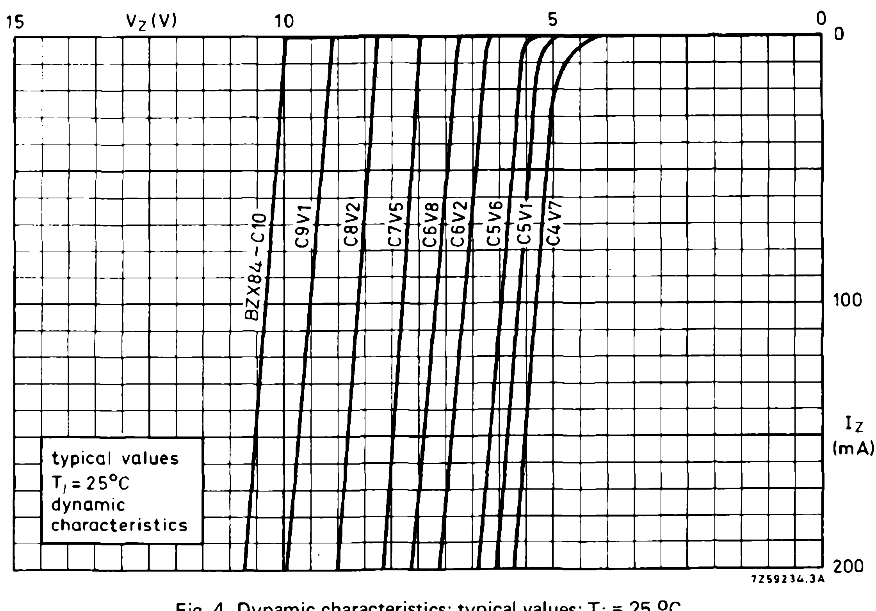


Fig. 4 Dynamic characteristics; typical values; T_j = 25 °C.

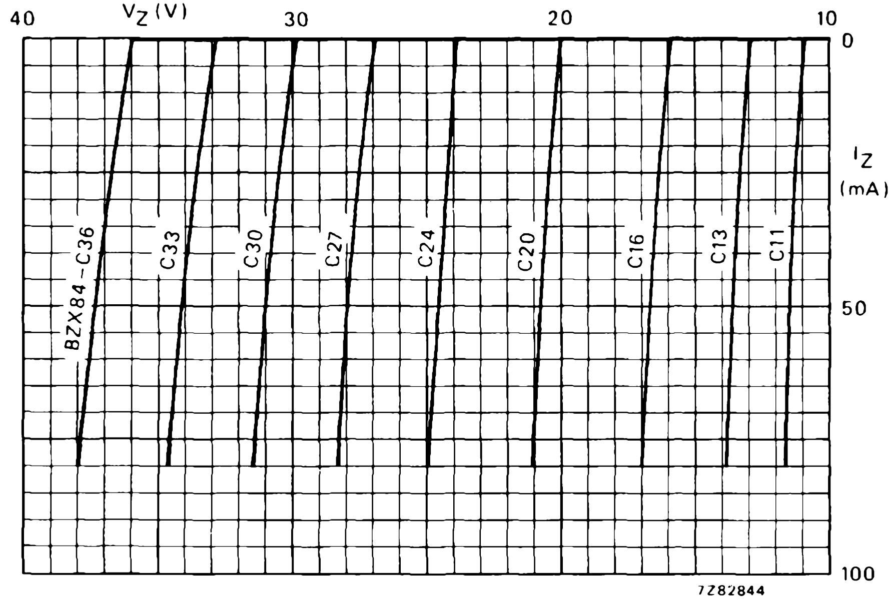


Fig. 5 Dynamic characteristics; typical values; T_j = 25 °C.

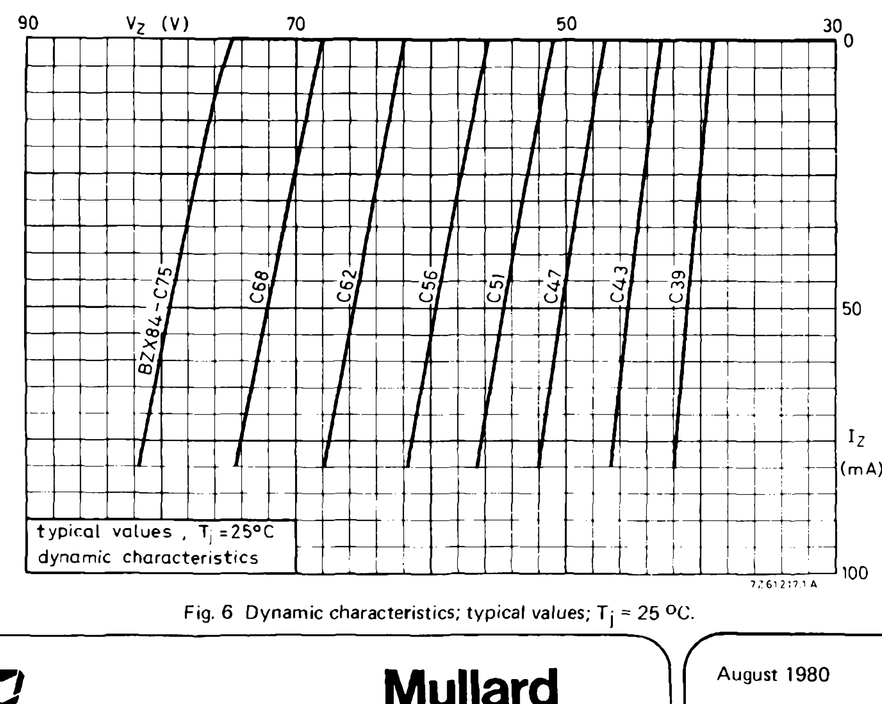


Fig. 6 Dynamic characteristics; typical values; T_j = 25 °C.

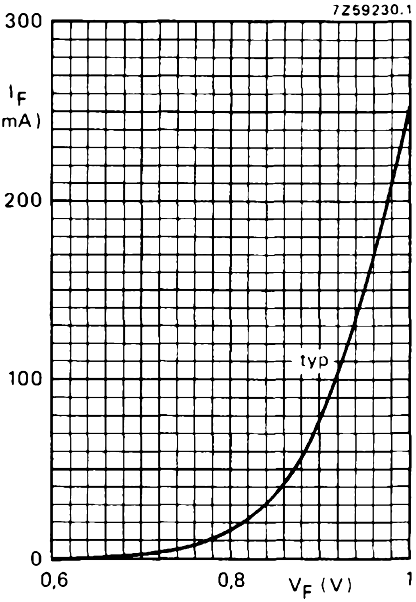


Fig. 7 Typical values at T_j = 25 °C.

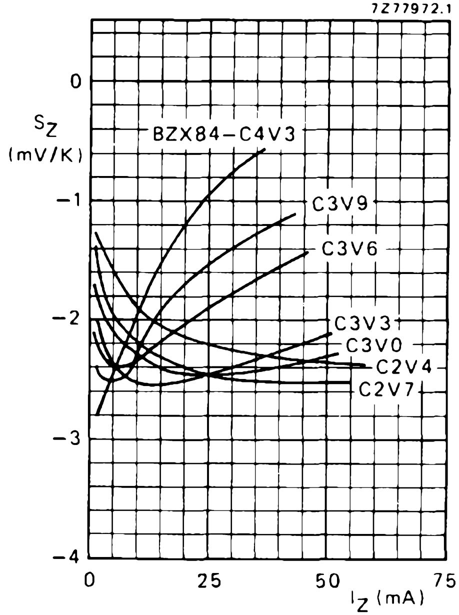


Fig. 8 Typical values; T_j = 25 to 175 °C.

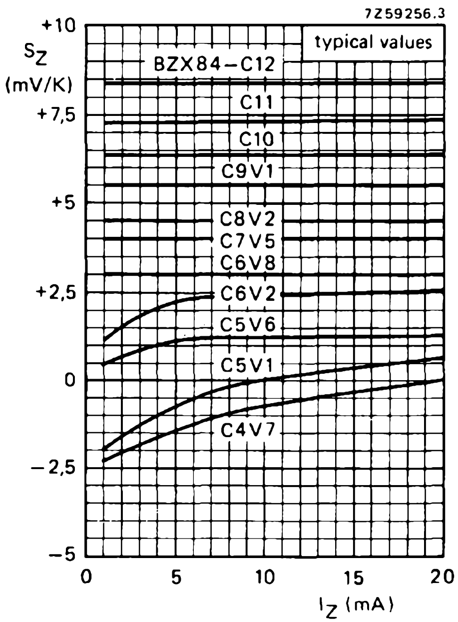


Fig. 9 Typical values; T_j = 25 to 175 °C.

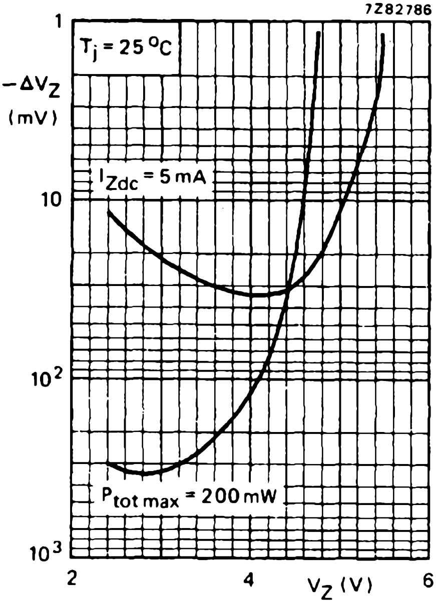


Fig. 10.

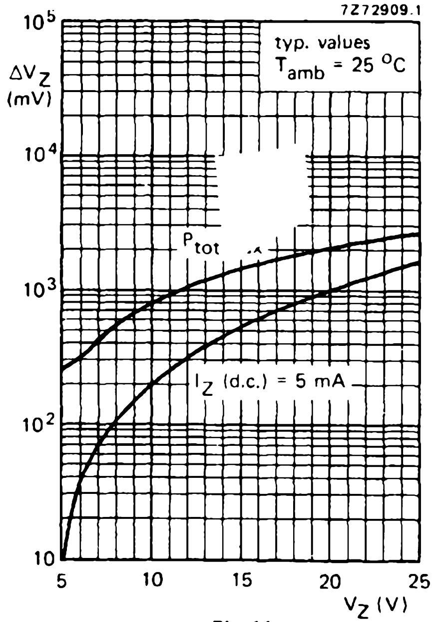


Fig. 11.

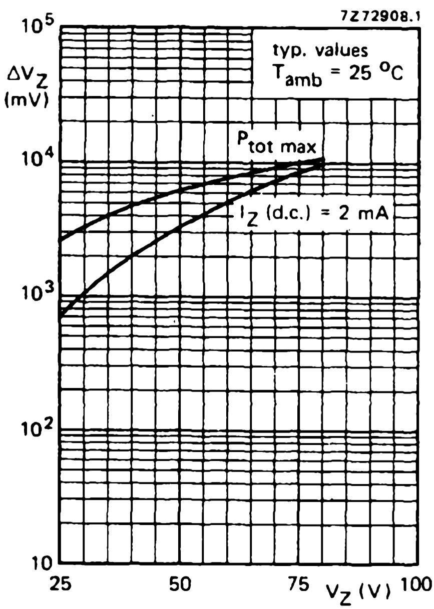


Fig. 12.

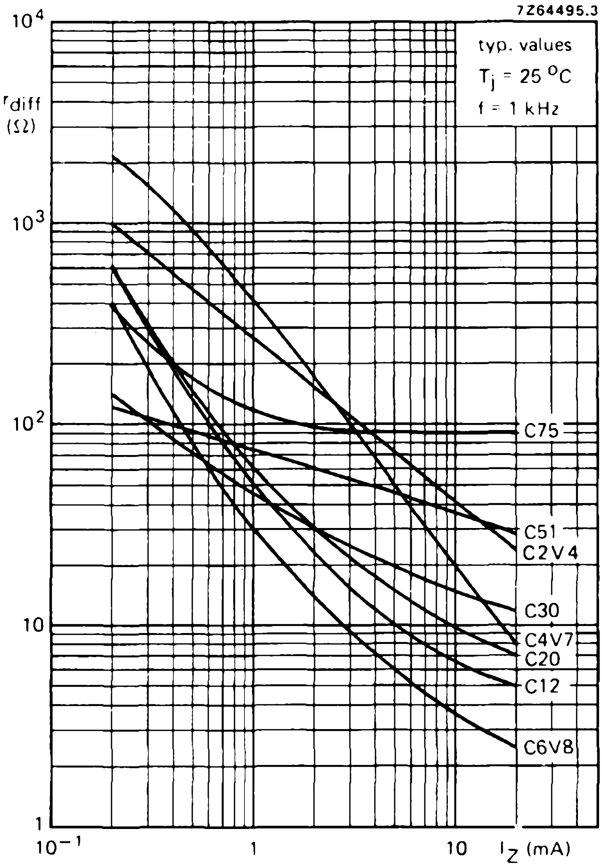

7Z64495.3
typ. values
T_j = 25 °C
f = 1 kHz
r_{diff}
(Ω)
10^4
10^3
10^2
10
1
10^{-1}
1
10
I_Z (mA)
C75
C51
C2V4
C30
C4V7
C20
C12
C6V8

Fig. 13.

TUNER DIODES

H

SILICON A.M. BAND SWITCHING DIODE

The BA223 is a switching diode in whiskerless glass encapsulation. It is intended for band switching in a.m. radio receivers.

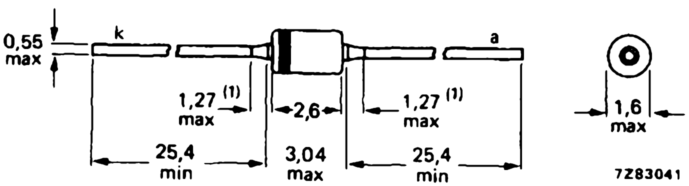
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	20 V
Forward current (d.c.)	I_F	max.	50 mA
Junction temperature	T_j	max.	150 °C
Diode capacitance at f = 1 MHz V_R = 6 V	C_d	<	3,5 pF
Series resistance at f = 1 MHz I_F = 10 mA	r_D	<	1,5 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-34 (SOD-68).



(1) Lead diameter in this zone uncontrolled.

Cathode indicated by coloured band.

The diodes may be either type-branded or colour-coded.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	20	V
Forward current (d.c.)	I_F	max.	50	mA
Storage temperature	T_{stg}		−55 to +150	°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,5	°C/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage				
I_F = 50 mA	V_F	<	1,0	V
Reverse current				
V_R = 20 V	I_R	<	100	nA
V_R = 20 V; T_j = 125 °C	I_R	<	20	µA
Diode capacitance at f = 1 MHz				
V_R = 6 V	C_d	<	3,5	pF
Series resistance at f = 1 MHz				
I_F = 10 mA	r_D	<	1,5	Ω

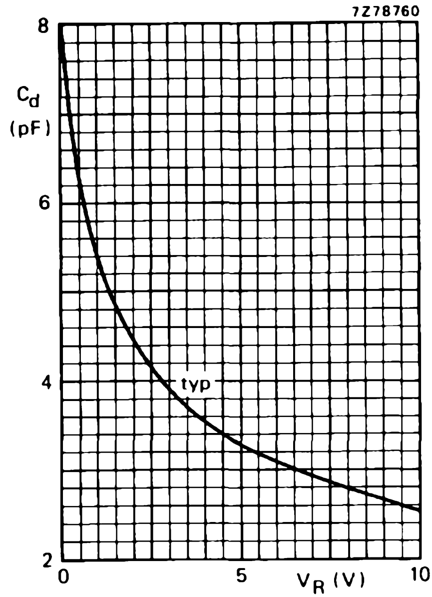


Fig. 2 f = 1 MHz; T_j = 25 °C.

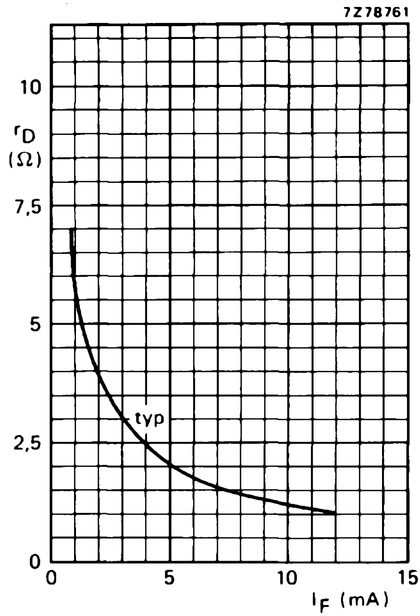


Fig. 3 f = 1 MHz; T_j = 25 °C.

SILICON PLANAR DIODES

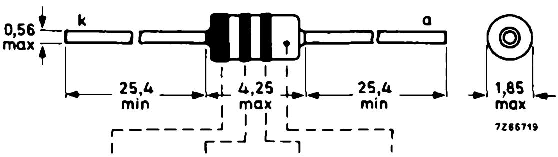
Switching diodes in a DO-35 envelope, intended for band switching in v.h.f. television tuners.

QUICK REFERENCE DATA					
Continuous reverse voltage	V_R		max.	20	V
Forward current (d.c.)	I_F		max.	100	mA
Junction temperature	T_j		max.	150	^oC
Diode capacitance at f = 1 to 100 MHz V_R = 15 V	C_d		typ. <	1,1 2	pF pF
			BA243	BA244	
Series resistance at f = 200 MHz I_F = 10 mA	r_D	typ <	0,7 1	0,4 0,5	Ω Ω

MECHANICAL DATA

Dimensions in mm

DO-35



BA243:	red (cathode)	yellow	orange	natural
BA244:	red (cathode)	yellow	yellow	natural

The diodes may be either type-branded or colour-coded.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltage

Continuous reverse voltage	V_R	max.	20	V

Current

Forward current (d.c.)	I_F	max.	100	mA

Temperatures

Storage temperature	T_{stg}		−55 to +150	°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

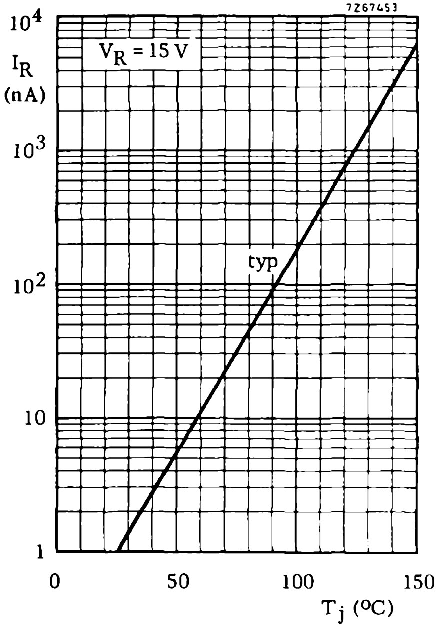
From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,6	°C/mW

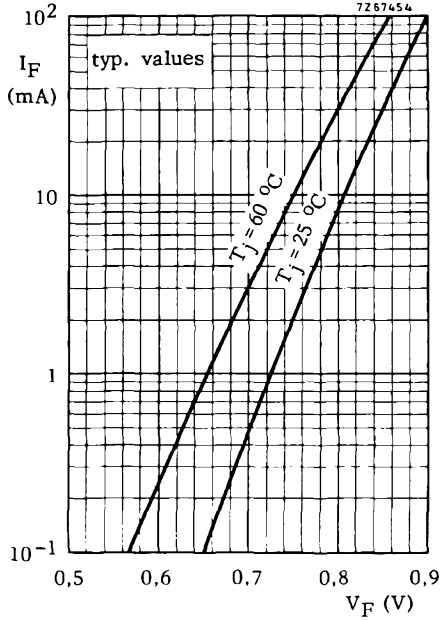
CHARACTERISTICS T_j = 25 °C unless otherwise specified

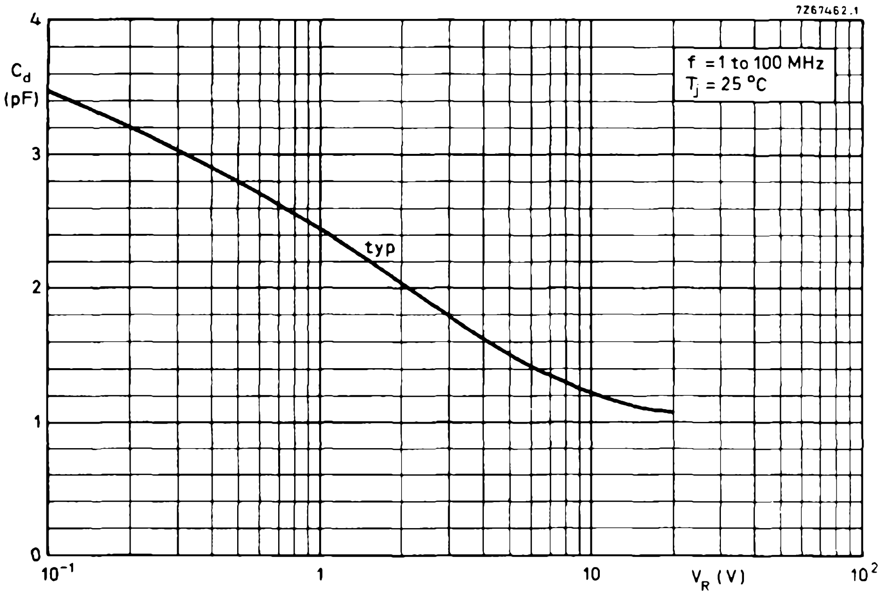
Forward voltage at I_F = 100 mA	V_F	<	1	V
Reverse current at V_R = 15 V	I_R	<	100	nA
V_R = 15 V; T_{amb} = 60 °C	I_R	<	1	µA
Diode capacitance at f = 1 to 100 MHz				
V_R = 15 V	C_d	typ.	1,1	pF
		<	2	pF
Relative capacitance variation due to reverse voltage variation at V_R = 7 to 20 V; f = 1 to 100 MHz related to V_R = 7 V	$\frac{\Delta C_d}{C_d \cdot \Delta V_R}$	typ.	1	%/V

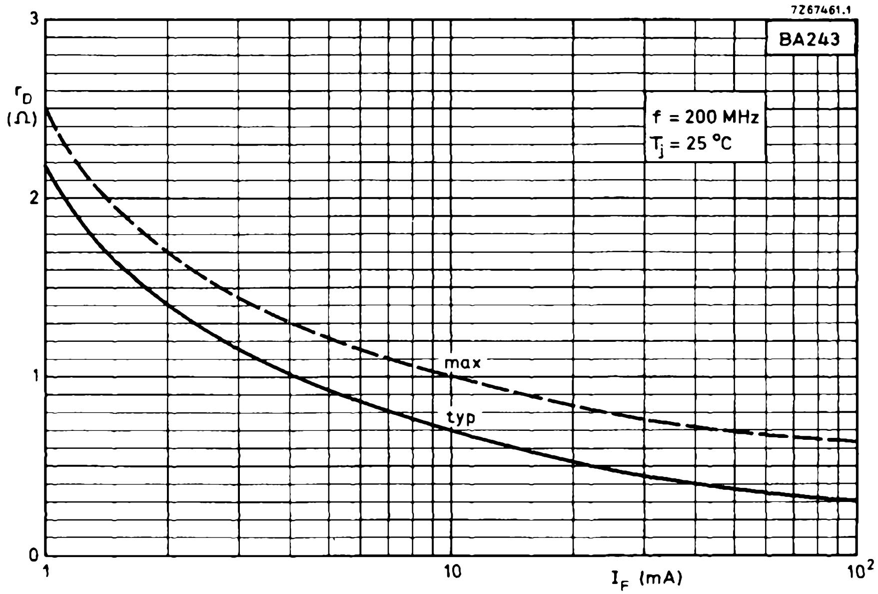
			BA243	BA244	
Series resistance at f = 200 MHz					
I_F = 10 mA	r_D	typ.	0,7	0,4	Ω
		<	1	0,5	Ω

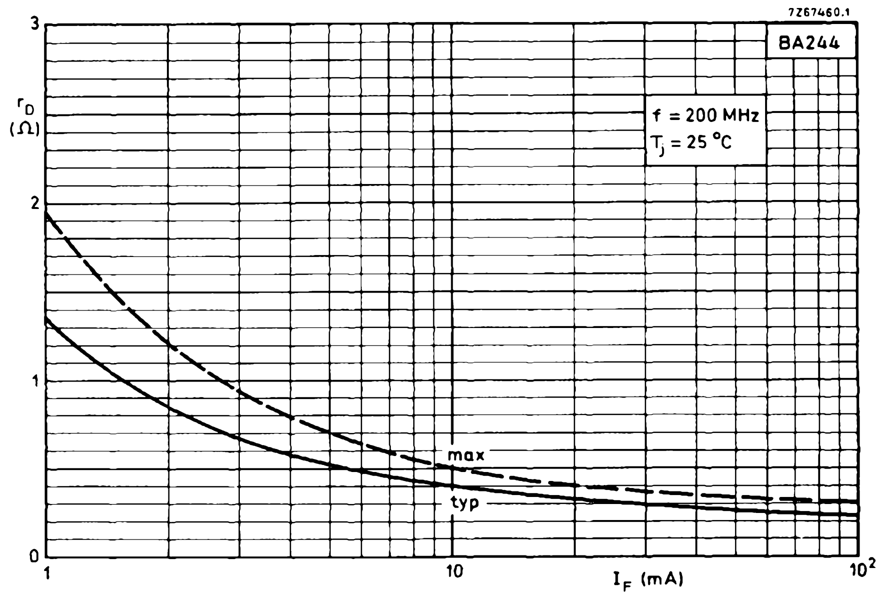
Relative series resistance variation due to forward current variation at I_F = 2 to 40 mA; f = 200 MHz related to I_F = 2 mA	$\frac{\Delta r_D}{r_D \cdot \Delta I_F}$	typ.	2	%/mA
Series inductance (measured on envelope)	L_s	typ.	2,5	nH


7Z67453
I_R (nA)
V_R = 15 V
typ
T_j (°C)


7Z67454
I_F (mA)
typ. values
T_j = 60 °C
T_j = 25 °C
V_F (V)


7Z67462.1
C_d (pF)
f = 1 to 100 MHz
T_j = 25 °C
typ
V_R (V)


7Z67461.1
BA243
r_D (Ω)
f = 200 MHz
T_j = 25 °C
max
typ
0
1
2
3
1
10
10^2
I_F (mA)


7Z67460.1
BA244
r_D (Ω)
f = 200 MHz
T_j = 25 °C
max
typ
0
1
2
3
1
10
10^2
I_F (mA)

SILICON PLANAR DIODES

Switching diodes in the subminiature DO-34 glass envelope, intended for band switching in v.h.f. television tuners. Special feature of the diodes is their low capacitance.

QUICK REFERENCE DATA

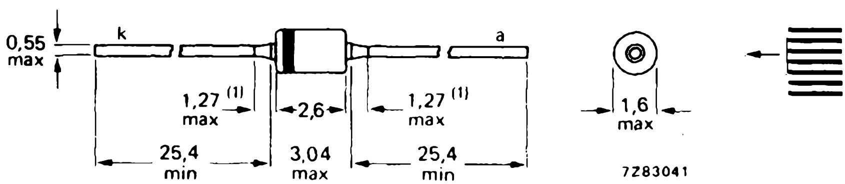
Continuous reverse voltage	V_R	max.	35 V
Forward current (d.c.)	I_F	max.	100 mA
Junction temperature	T_j	max.	150 °C

		BA482	BA483
Diode capacitance			
V_R = 3 V; f = 1 to 100 MHz	C_d	< 1,2	1,0 pF
Series resistance at f = 200 MHz			
I_F = 3 mA	r_D	< 0,7	1,2 Ω
I_F = 10 mA	r_D	typ. 0,4	0,5 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-68 (DO-34).



(1) Lead diameter in this zone uncontrolled.

Cathode indicated by coloured band.

BA482: red on a natural background.
BA483: orange on a natural background.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	35	V
Forward current (d.c.)	I_F	max.	100	mA
Storage temperature	T_{stg}	−65 to + 150		°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient mounted on printed board lead length = 5,0 mm	$R_{th\ j\text{-}a}$	=	0,6	°C/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 100 mA	V_F	<	1,2	V
Reverse current V_R = 20 V	I_R	<	100	nA
V_R = 20 V; T_{amb} = 75 °C	I_R	<	1	μA

			BA482	BA483
Diode capacitance V_R = 3 V; f = 1 to 100 MHz	C_d	typ.	0,8	0,7 pF
		<	1,2	1,0 pF
Series resistance at f = 200 MHz I_F = 3 mA	r_D	typ.	0,6	0,8 Ω
		<	0,7	1,2 Ω

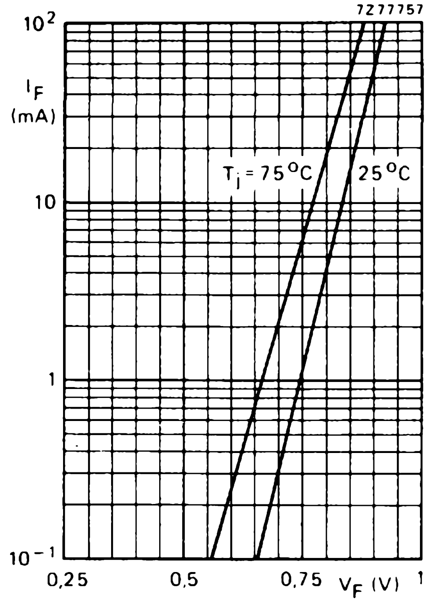


Fig. 2 Typical values.

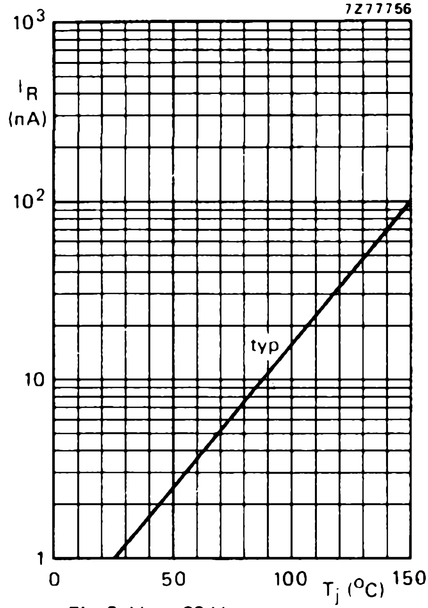


Fig. 3 $V_R = 20$ V.

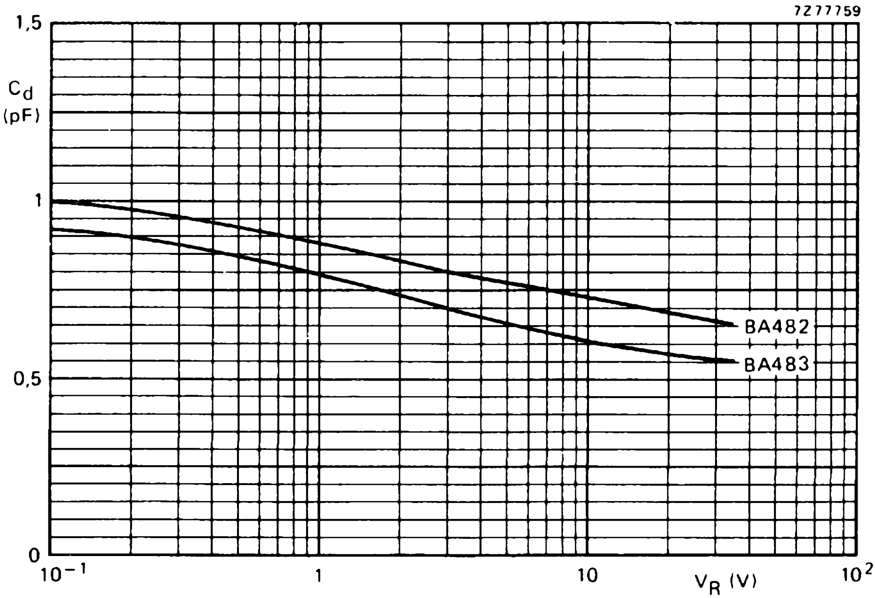


Fig. 4 Typical values; f = 1 to 100 MHz; $T_j = 25\ ^oC$.

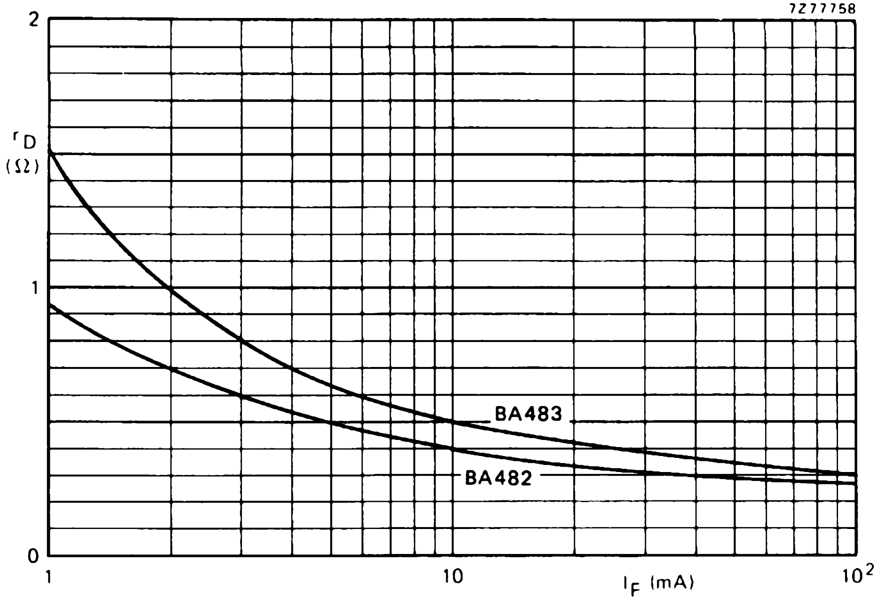


Fig. 5 Typical values; f = 200 MHz; T_j = 25 °C.

SILICON VARIABLE CAPACITANCE DIODE

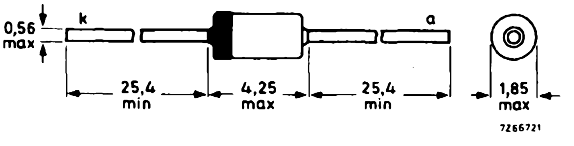
Planar-diffused diode in a DO-35 envelope intended for automatic frequency control in radio and television receivers.

QUICK REFERENCE DATA				
Continuous reverse voltage	V_R	max.	15	V
Junction temperature	T_j	max.	200	^oC
Reverse current at V_R = 15 V; T_j = 150 ^oC	I_R	<	2,0	μA
Diode capacitance at f = 1 MHz V_R = 4 V	C_d		20 to 25	pF
Capacitance ratio at f < 300 MHz	$\frac{C_d\ (V_R = 4\ V)}{C_d\ (V_R = 10\ V)}$	≥	1,3	
Series resistance at V_R = 4 V; f = 200 MHz	r_D	<	1,5	Ω

MECHANICAL DATA

Dimensions in mm

DO-35



The coloured band indicates the cathode

The diodes are type branded.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltage				
Continuous reverse voltage	V_R	max.	15	V
Current				
Forward current (d.c.)	I_F	max.	200	mA
Temperatures				
Storage temperature	T_{stg}		-65 to +200	^{o}C
Junction temperature	T_j	max.	200	^{o}C

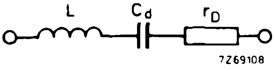
THERMAL RESISTANCE

From junction to ambient in free air

CHARACTERISTICS $T_j = 25\ ^{o}C$ unless otherwise specified

Reverse current				
$V_R = 15$ V; $T_j = 150\ ^{o}C$	I_R	<	2,0	μA
Forward voltage				
$I_F = 100$ mA	V_F	<	950	mV
Diode capacitance at f = 1 MHz				
$V_R = 4$ V	C_d		20 to 25	pF
Capacitance ratio at f < 300 MHz	$\frac{C_d\ (V_R = 4\ V)}{C_d\ (V_R = 10\ V)}$	≥	1,3	
Series resistance at f = 200 MHz				
$V_R = 4$ V	r_D	typ.	0,9	Ω
		<	1,5	Ω

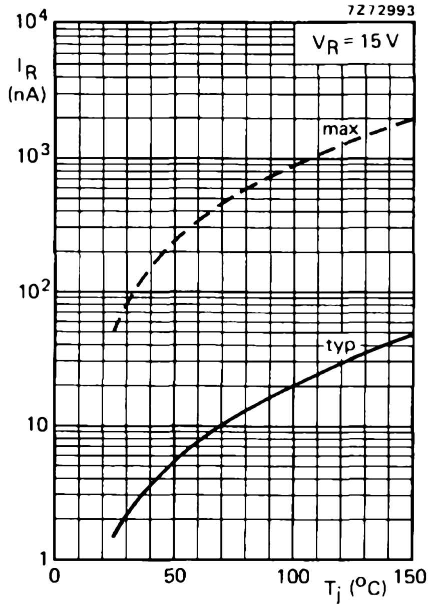
Simplified equivalent circuit:

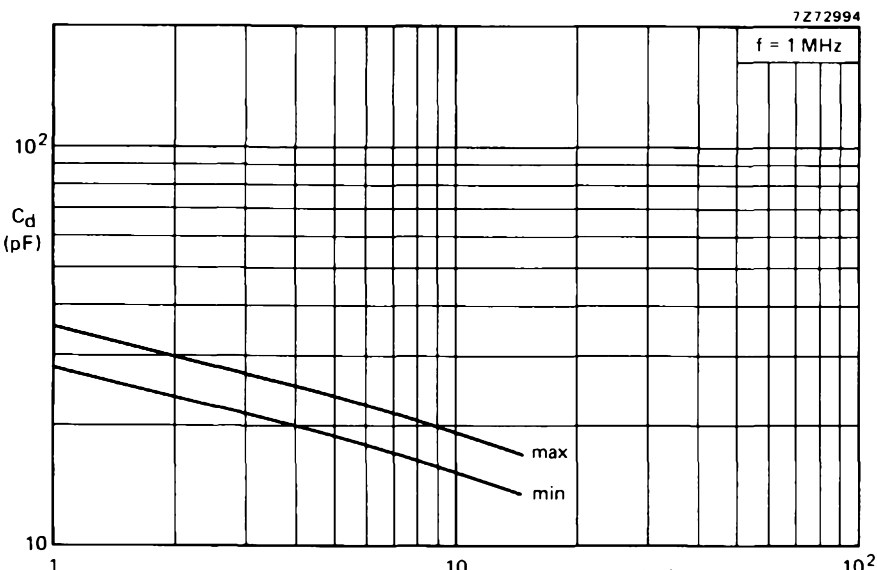


L = lead inductance ≈ 6 nH
r_D = series resistance
C_d = diode capacitance (see page 3)

frequency independent up to f = 300 MHz

These data apply for a distance of 10 mm between the two measuring points.


7Z72993
V_R = 15 V
I_R (nA)
10^4
10^3
10^2
10
1
max
typ
0
50
100
150
T_j (°C)


7Z72994
f = 1 MHz
C_d (pF)
10^2
10
max
min
1
10
10^2
V_R (V)

A.M. VARIABLE CAPACITANCE DOUBLE DIODES

The BB212 is a silicon mesa profiled epitaxial double tuning diode with common cathode in a plastic TO-92 variant.

A special feature is the low tuning voltage which makes the device particularly suited to car and domestic receivers in the L.W., M.W. and S.W. bands.

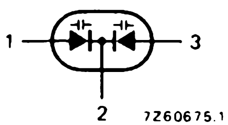
QUICK REFERENCE DATA

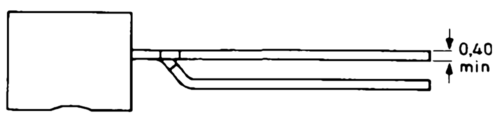
For each diode:			
Continuous reverse voltage	V_R	max.	12 V
Operating junction temperature	T_j	max.	85 °C
Reverse current at T_j = 25 °C V_R = 10 V	I_R	<	50 nA
Diode capacitance at f = 1 MHz V_R = 0,5 V	C_d		500 to 620 pF
V_R = 8,0 V	C_d	<	22 pF
Capacitance ratio at f = 1 MHz	$\frac{C_d\ (V_R = 0{,}5\ V)}{C_d\ (V_R = 8{,}0\ V)}$	>	22,5
Series resistance at f = 500 kHz V_R is that value at which C_d = 500 pF	r_s	<	2,5 Ω

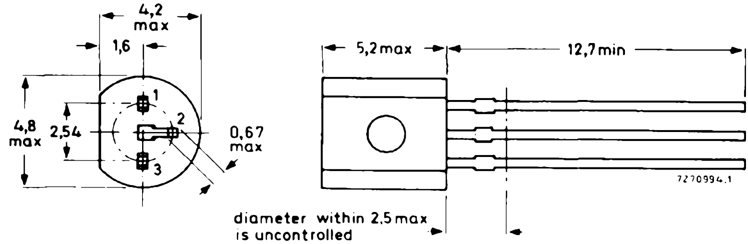
MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-92 variant.







The anode of the diode with the higher capacitance C_1 at V_R = 3 V, i.e. a more positive mismatch, is identified by a white dot.

RATINGS (for each diode)

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	12 V
Forward current (d.c.)	I_F	max.	100 mA
Storage temperature	T_{stg}	−55 to + 100	°C
Operating junction temperature	T_j	max.	85 °C

CHARACTERISTICS (for each diode)

$T_j = 25\ ^oC$ unless otherwise specified

Reverse current			
$V_R = 10$ V	I_R	<	50 nA
$V_R = 10$ V; $T_{amb} = 60\ ^oC$	I_R	<	200 nA
Diode capacitance at f = 1 MHz			
$V_R = 0{,}5$ V	C_d		500 to 620 pF
$V_R = 3{,}0$ V	C_d		140 to 280 pF
$V_R = 5{,}5$ V	C_d		40 to 90 pF
$V_R = 8{,}0$ V	C_d	<	22 pF
Capacitance ratio at f = 1 MHz	$\frac{C_d\ (V_R = 0{,}5\ V)}{C_d\ (V_R = 8{,}0\ V)}$	>	22,5
Series resistance at f = 500 MHz			
V_R is that value at which $C_d = 500$ pF	r_s	<	2,5 Ω
Temperature coefficient of the diode capacitance at f = 1 MHz; $T_{amb} = 25\ ^oC$ to $60\ ^oC$			
$V_R = 0{,}5$ V	η	typ.	0,054 %/K
$V_R = 8{,}0$ V	η	typ.	0,050 %/K

MATCHING PROPERTIES

The capacitance of the two diodes in their common envelope may differ within certain limits. The total, relative capacitance difference between the two diodes in one envelope may be found in Fig. 2. The anode a1 or a2 with the higher capacitance at $V_R = 3$ V, is identified by a white dot.

BASIC TOLERANCE

The relative deviation of the capacitance value at $V_R = 0{,}5$ V is maximum 3,5%.

$$k = \left| \frac{C_1\ (0{,}5\ V) - C_2\ (0{,}5\ V)}{C_2\ (0{,}5\ V)} \right| = < 3{,}5\%.$$

ADDITIONAL TOLERANCE

In the range of $V_R = 0{,}5$ to 8 V the following additional tolerances are valid.

$$S = \left| \left(\frac{C_1}{C_2}\right) V_R - \left(\frac{C_1}{C_2}\right) 0{,}5\ V \right| \qquad \left.\begin{array}{l} S < 2\% \text{ for } V_R = 0{,}5 \text{ to } 3\ V \\ S < 4\% \text{ for } V_R = 3 \text{ to } 5{,}5\ V \\ S < 6\% \text{ for } V_R = 5{,}5 \text{ to } 8\ V \end{array}\right\} \text{ see Fig. 2}$$

C_1 is the capacitance of a_1 when $a_1 > a_2$

C_1 is the capacitance of a_2 when $a_2 > a_1$

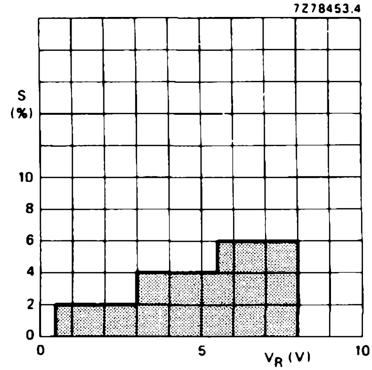


Fig. 2 The shaded area represents the maximum tolerance of the two diodes in one envelope as a function of the reverse voltage.

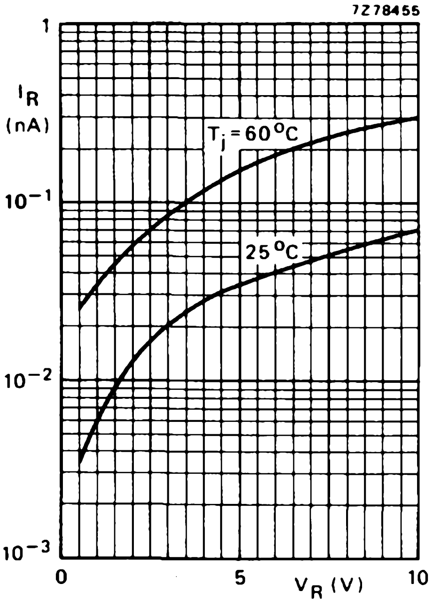


Fig. 3 Typical values.

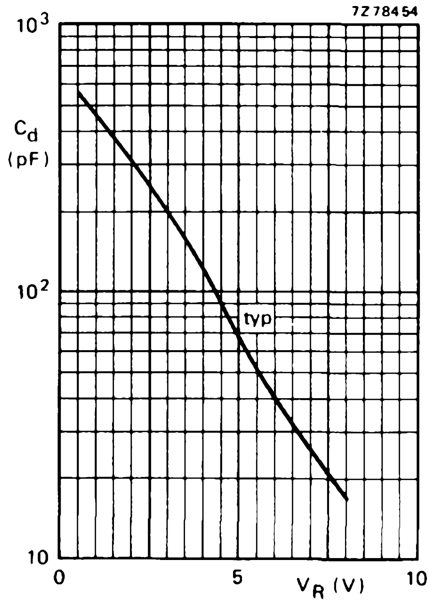


Fig. 4 f = 1 MHz.

VARIABLE CAPACITANCE DIODES

The BB405B and BB405G are silicon variable capacitance diodes in **hermetically sealed glass DO-34 envelopes.**

The BB405B is intended for u.h.f. tuning up to frequencies of 860 MHz. The BB405G is intended for v.h.f. tuning.

Diodes are supplied in matched sets and the capacitance difference between any two diodes in one set is less than 3% over the voltage range from 0,5 V to 28 V.

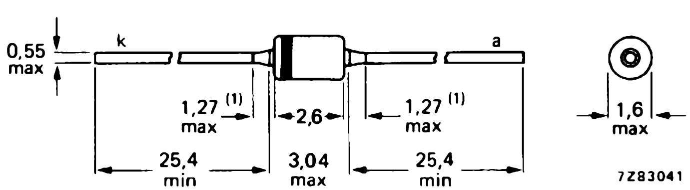
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.		28	V
Reverse current at V_R = 28 V	I_R	<		10	nA
			BB405B	**BB405G**	
Diode capacitance at f = 500 kHz V_R = 25 V	C_d	> <	2,0 2,3	1,8 2,5	pF pF
Capacitance ratio at f = 500 kHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$	> <	4,8 5,8	4,3 6,0	
Series resistance at f = 470 MHz V_R is that value at which C_d = 9 pF	r_s	<	0,8	1,2	Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-68 (DO-34).



(1) Lead diameter in this zone uncontrolled.

The diodes are suitable for mounting on a 2E (5,08 mm) pitch.

BB405B: white cathode ring; body black coloured

BB405G: additional green band.

Maximum soldering iron or solder bath temperature 300 °C; maximum soldering time 3 s. Distance from case is not critical, but the glass envelope must not come into contact with soldering iron.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	28	V
Reverse voltage (peak value)	V_{RM}	max.	30	V
Forward current (d.c.)	I_F	max.	20	mA
Storage temperature	T_{stg}		−55 to + 150	^oC
Operating junction temperature	T_j	max.	100	^oC

CHARACTERISTICS

T_{amb} = 25 ^oC unless otherwise specified

			BB405B	BB405G	
Reverse current					
V_R = 28 V	I_R	<	10	10	nA
V_R = 28 V; T_{amb} = 85 ^oC	I_R	<	200	200	nA
Diode capacitance at f = 500 kHz*					
V_R = 1 V	C_d	>	15,5	15,5	pF
V_R = 3 V	C_d	typ.	11,5	11,5	pF
V_R = 25 V	C_d	>	2,0	1,8	pF
		<	2,3	2,5	pF
Capacitance ratio at f = 500 kHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$	>	4,8	4,3	
		<	5,8	6,0	
Series resistance at f = 470 MHz and at that value of V_R at which C_d = 9 pF	r_s	<	0,8	1,2	Ω

* Matching: Devices are supplied on a bandolier with a space between matched sets (minimum quantity 120 devices, total divisible by 12; maximum quantity is 9000 per reel). Capacitance difference between any two diodes in one set is less than 3% over the voltage range from 0,5 V to 28 V.

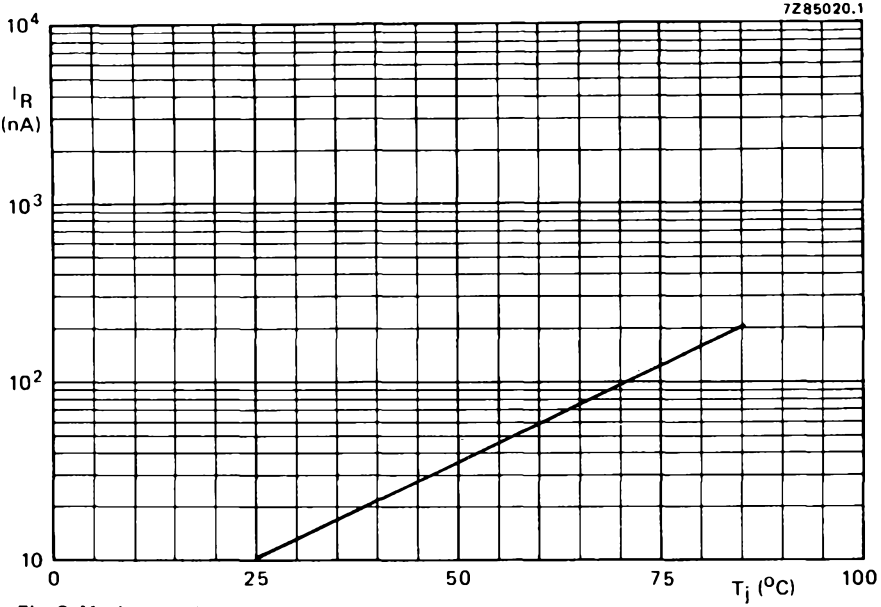


Fig. 2 Maximum values reverse current as a function of the junction temperature. V_R = 28 V.

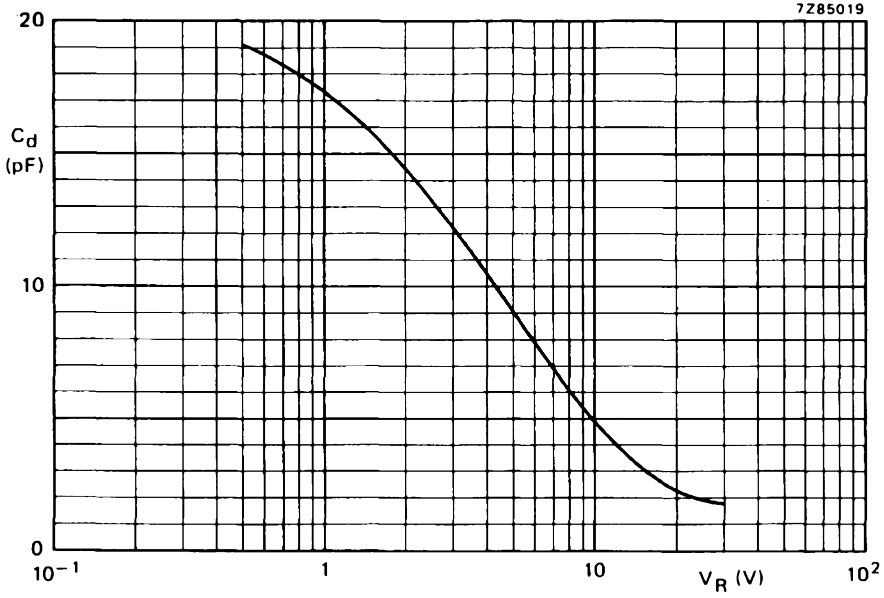


Fig. 3 Maximum values diode capacitance at f = 500 kHz.

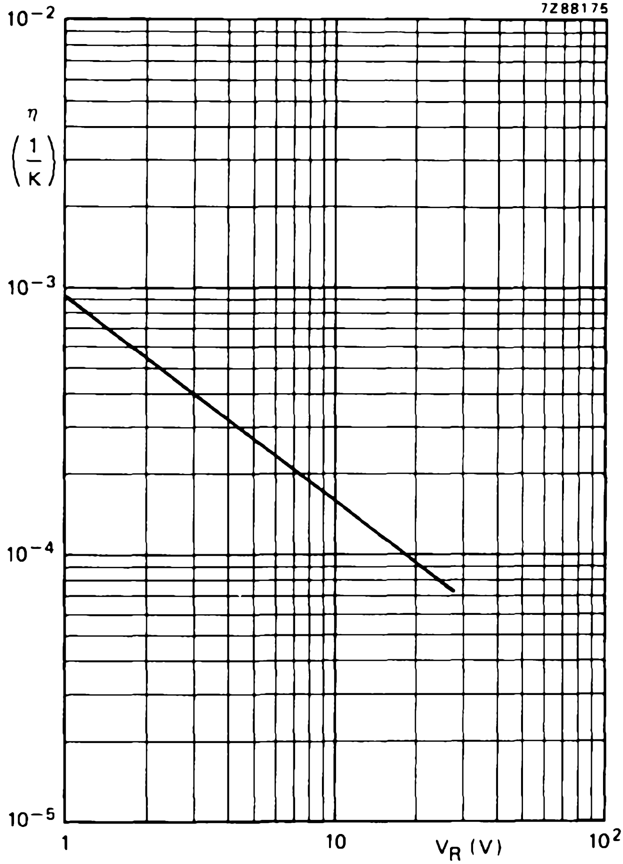


Fig. 4 Maximum values temperature coefficient as a function of reverse voltage. T_j = 0 to 85 °C.

SILICON PLANAR VARIABLE CAPACITANCE DIODE

The BB809 is a variable capacitance diode in a glass envelope intended for electronic tuning in v.h.f. television tuners with extended band I (FCC and OIRT-norm).

Diodes are supplied in matched sets (minimum 120 pieces and divisible by 12) and the capacitance difference between any two diodes in one set is less than 3% over the voltage range from 0,5 V to 28 V.

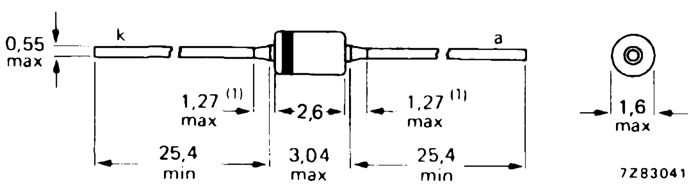
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	28 V
Reverse current at V_R = 28 V	I_R	<	10 nA
Diode capacitance at f = 500 kHz			
V_R = 3 V	C_d		26 to 32 pF
V_R = 25 V	C_d		4,5 to 5,6 pF
Capacitance ratio at f = 500 kHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$		5 to 6,5
Series resistance at f = 200 MHz			
V_R is that value at which C_d = 25 pF	r_s	<	0,6 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-68 (DO-34).



(1) Lead diameter in this zone uncontrolled.

Cathode indicated by yellow band.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	28 V
Reverse voltage (peak value)	V_{RM}	max.	30 V
Forward current (d.c.)	I_F	max.	20 mA
Storage temperature	T_{stg}	−55 to + 150	°C
Operating junction temperature	T_j	max.	100 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,6 °C/mW

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Reverse current			
V_R = 28 V	I_R	<	10 nA
V_R = 28 V; T_{amb} = 85 °C	I_R	<	200 nA
Diode capacitance at f = 500 kHz			
V_R = 3 V	C_d		26 to 32 pF
V_R = 25 V	C_d		4,5 to 5,6 pF
Capacitance ratio at f = 500 kHz	$\frac{C_d\ (V_R = 3\ V)}{C_d\ (V_R = 25\ V)}$		5 to 6,5
Series resistance at f = 200 MHz			
V_R is that value at which C_d = 25 pF	r_s	<	0,6 Ω
Relative capacitance difference between two diodes; V_R = 1 to 28 V	$\frac{\Delta C}{C}$	<	3 %

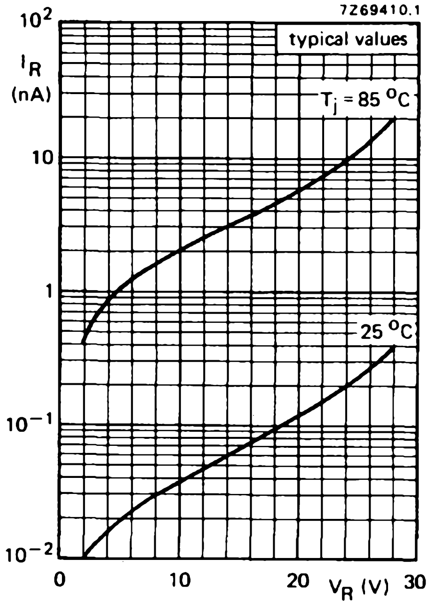


Fig. 2 Typical values.

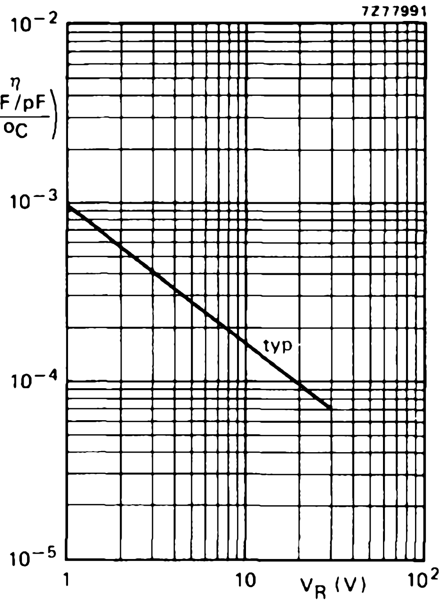


Fig. 3 Temperature coefficient of the diode capacitance; T_{amb} = 0 to 85 °C.

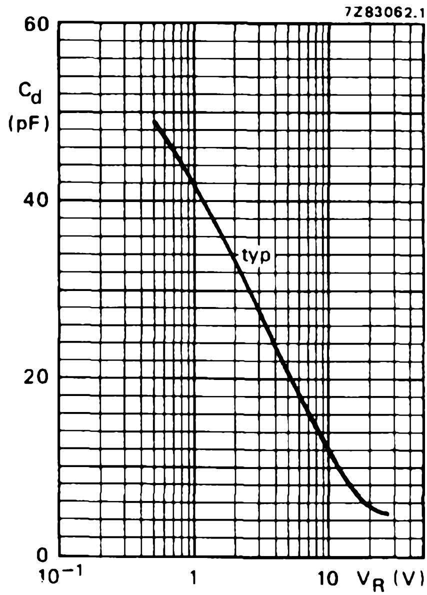


Fig. 4 f = 500 kHz; T_{amb} = 25 °C.

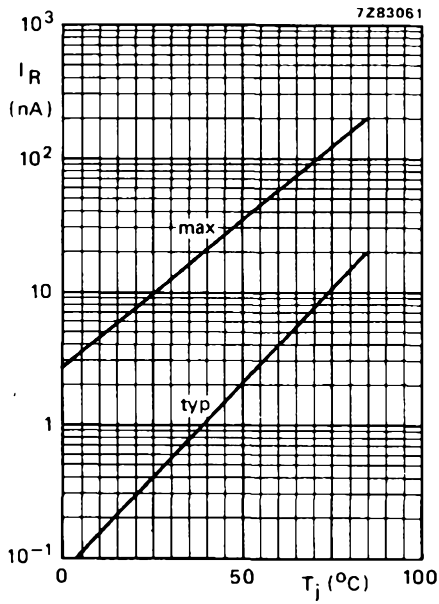


Fig. 5 V_R = 28 V.

GERMANIUM DIODES
Gold bonded

GOLD BONDED DIODES

Germanium diodes in all-glass DO-7 envelope, intended for switching applications and general purposes.

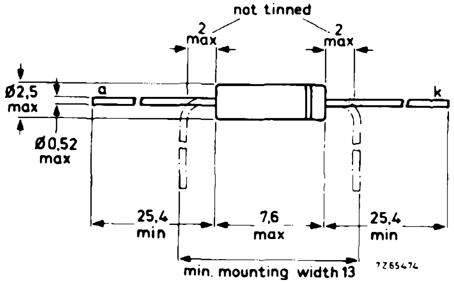
QUICK REFERENCE DATA

			AAZ15	AAZ17	
Continuous reverse voltage	V_R	max.	75	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	75	V
Forward current (d.c.)	I_F	max.	140	140	mA
Repetitive peak forward current	I_{FRM}	max.	250	250	mA
Junction temperature	T_j	max.	85	85	^oC
Forward voltage at I_F = 250 mA	V_F	<	1,1	1,1	V
Recovery charge when switched from I_F = 10 mA to V_R = 10 V	Q_s	<	1800	900	pC

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-7.



The diodes are type branded; the cathode being indicated by a coloured band.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

			AAZ15	AAZ17	
Continuous reverse voltage	V_R	max.	75	50	V
Repetitive peak reverse voltage	V_{RRM}	max.	100	75	V
Non-repetitive peak reverse voltage ($t < 1$ s)	V_{RSM}	max.	115	75	V

Currents

Forward current (d.c.)	I_F	max.	140	mA
Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	140	mA
Repetitive peak forward current	I_{FRM}	max.	250	mA
Non-repetitive peak forward current ($t < 1$ s)	I_{FSM}	max.	500	mA

Temperatures

Storage temperature	T_{stg}		-65 to +85	^oC
Junction temperature	T_j	max.	85	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\,j\text{-}a}$	=	0.55	$^oC/mW$

GOLD BONDED DIODE

Germanium diode in all-glass DO-7 envelope, intended for switching applications and general purposes.

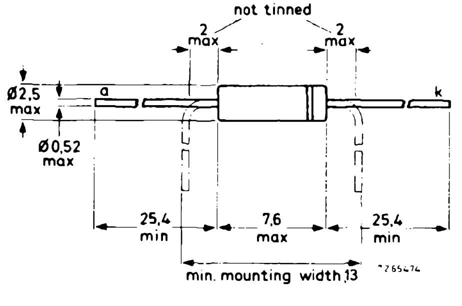
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	25	V
Repetitive peak reverse voltage	V_{RRM}	max.	25	V
Forward current (d.c.)	I_F	max.	110	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Junction temperature	T_j	max.	75	^oC
Forward voltage at I_F = 150 mA	V_F	<	1,1	V
Recovery charge when switched from I_F = 10 mA to V_R = 10 V	Q_s	<	600	pC

MECHANICAL DATA

Dimensions in mm

Fig. 1 DO-7.



The diodes are type-branded; the cathode being indicated by a coloured band.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Continuous reverse voltage	V_R	max.	25	V
Repetitive peak reverse voltage	V_{RRM}	max.	25	V
Non-repetitive peak reverse voltage ($t < 1$ s)	V_{RSM}	max.	30	V

Currents

Forward current (d.c.)	I_F	max.	110	mA
Average rectified forward current (averaged over any 20 ms period)	$I_{F(AV)}$	max.	110	mA
Repetitive peak forward current	I_{FRM}	max.	150	mA
Non-repetitive peak forward current ($t < 1$ s)	I_{FSM}	max.	200	mA

Temperatures

Storage temperature	T_{stg}		−65 to +75	°C
Junction temperature	T_j	max.	75	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\,j\text{-}a}$	=	0.55	°C/mW

PICOAMPERE DIODE

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PICOAMPERE DIODE

Silicon diode in a metal envelope. It has an extremely low leakage current over a wide temperature range combined with a low capacitance and is not sensitive to light. It is intended for clamping, holding, peak follower, time delay circuits as well as for logarithmic amplifiers and protection of insulated gate field-effect transistors.

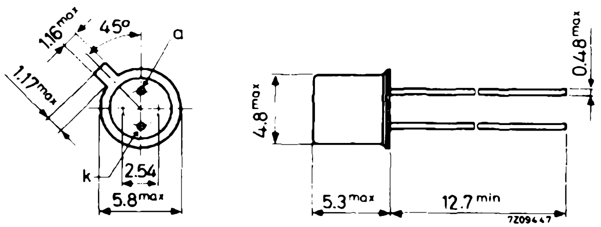
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	20	V
Forward current (d.c.)	I_F	max.	50	mA
Forward voltage at I_F = 10 mA	V_F	<	1,0	V
Reverse current				
V_R = 5 V; T_j = 25 °C	I_R	<	5	pA
V_R = 20 V; T_j = 25 °C	I_R	<	10	pA
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	<	1,3	pF

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-18 (except for the two leads)



Handle the device with care whilst soldering into the circuit. The extremely low leakage current can only be guaranteed when the bottom is free from solder flux or other contaminations.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	20 V
Repetitive peak reverse voltage	V_{RRM}	max.	35 V
Forward current (d.c. or average)	I_F	max.	50 mA
Repetitive peak forward current	I_{FRM}	max.	100 mA
Storage temperature	T_{stg}	−65 to + 125	°C
Junction temperature	T_j	max.	125 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	500 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage			
I_F = 10 mA	V_F	<	1,0 V
Reverse current			
V_R = 5 V	I_R	<	5 pA
V_R = 5 V; T_j = 80 °C	I_R	<	250 pA
V_R = 20 V	I_R	<	10 pA
Diode capacitance			
V_R = 0; f = 1 MHz	C_d	<	1,3 pF
Forward recovery voltage when switched to			
I_F = 10 mA	V_{fr}	<	1,25 V

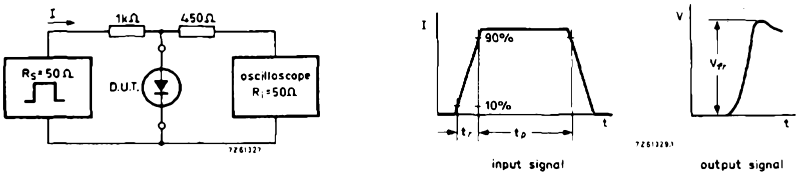


Fig. 2 Test circuit and waveforms.

Input signal			
Rise time of the forward pulse	t_r	≤	20 ns
Forward current pulse duration	t_p	=	300 ns
Duty factor	δ	=	0,01
Oscilloscope			
Rise time	t_r	=	0,35 ns
Input capacitance	C_i	≤	1 pF

Circuit capacitance C ≤ 20 pF (C = C_i + parasitic capacitance)

CHARACTERISTICS (continued)

Reverse recovery time when switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA	t_{rr}	<	600 ns

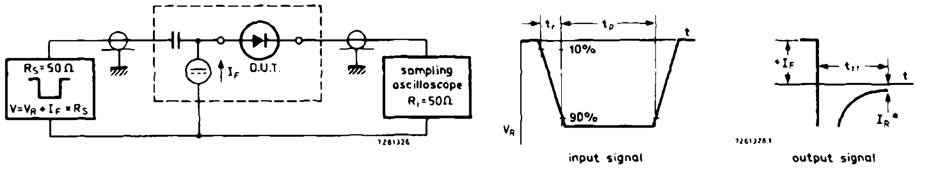


Fig. 3 Test circuit and waveforms. * I_R = 1 mA.

Input signal			
Rise time of the reverse pulse	t_r	=	0,6 ns
Reverse pulse duration	t_p	=	500 ns
Duty factor	δ	=	0,05
Oscilloscope			
Rise time	t_r	=	0,35 ns

Circuit capacitance C ≤ 1 pF (C = oscilloscope input capacitance + parasitic capacitance)

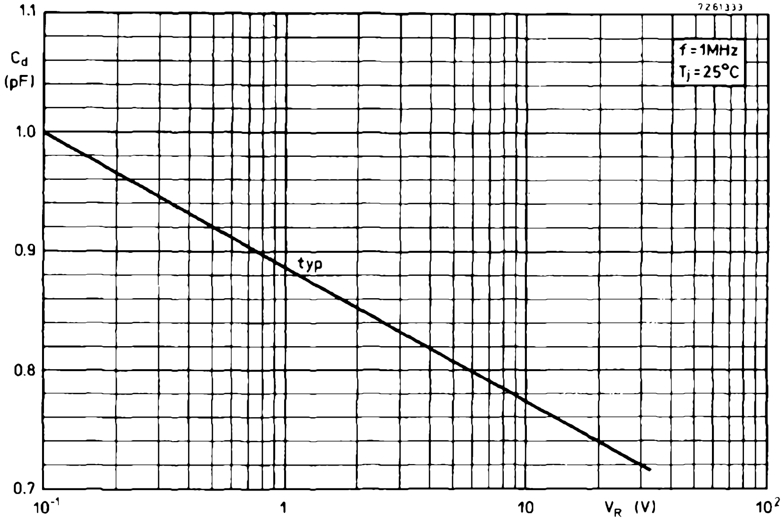

7261333
C_d
(pF)
1.1
1.0
0.9
0.8
0.7
f = 1MHz
T_j = 25°C
typ
10^{-1}
1
10
V_R (V)
10^2

Fig. 4.

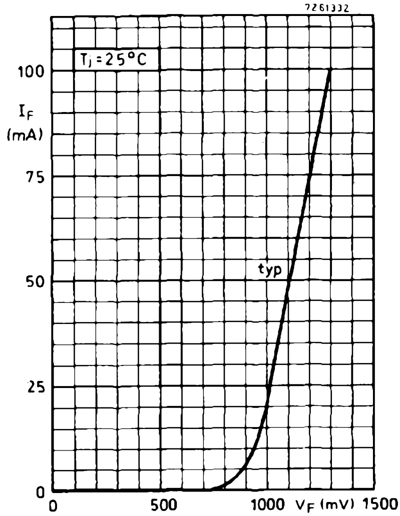

7261332
T_j = 25°C
I_F
(mA)
100
75
50
25
0
typ
0
500
1000
V_F (mV)
1500

Fig. 5.

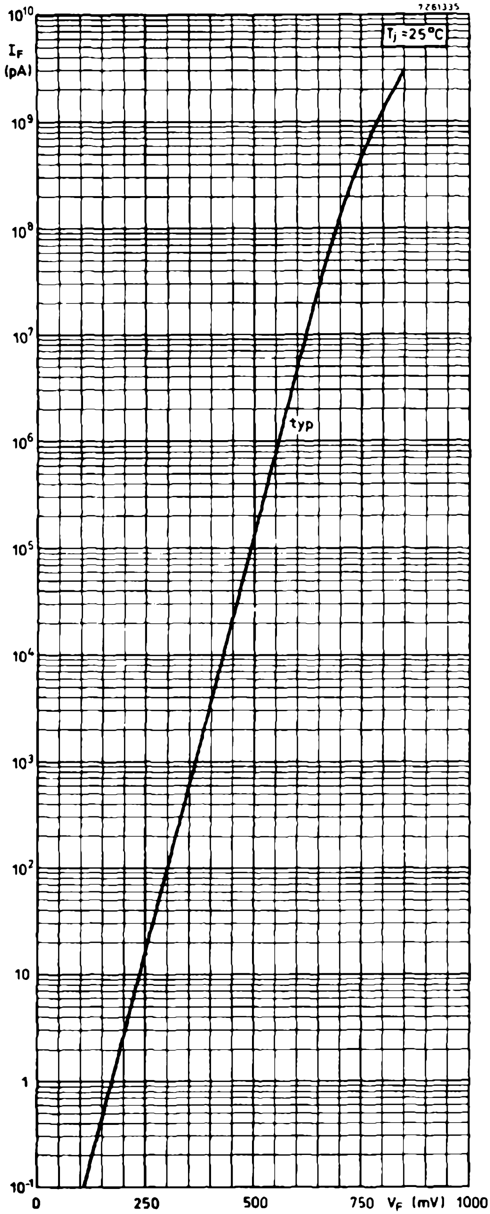

7Z61335
$T_j = 25\,^\circ C$
I_F (pA)
10^{10}
10^9
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10
1
10^{-1}
typ
0
250
500
750
V_F (mV)
1000

Fig. 6.

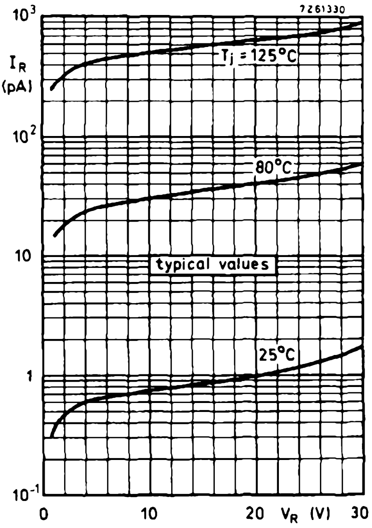

7261330
I_R (pA)
10^3
10^2
10
1
10^{-1}
$T_j = 125°C$
80°C
typical values
25°C
0
10
20
V_R (V)
30

Fig. 7.

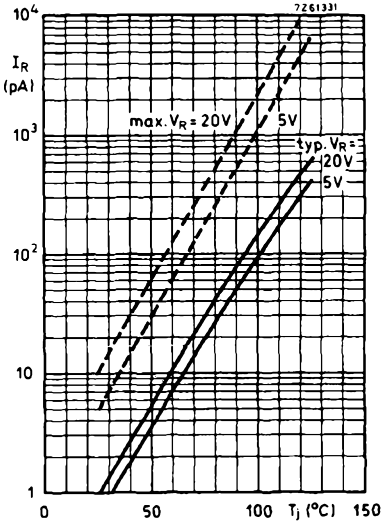

7261331
I_R (pA)
10^4
10^3
10^2
10
1
max. V_R = 20V
5V
typ. V_R =
20V
5V
0
50
100
T_j (°C)
150

Fig. 8.

INDEX

*Not recommended for the design of new equipment.

*Not recommended for the design of new equipment.

DIODES CONTENTS

Mullard

technical handbook

Book 1

Mullard Book 1 Part 3, 1983

Diodes

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