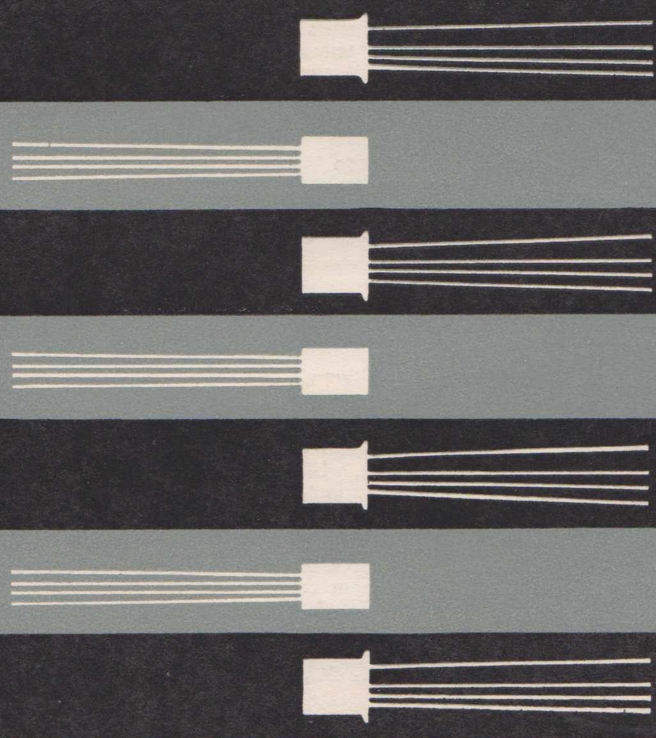
# AWV DRIFT TRANSISTORS



*Your best choice for*

## HF *to* VHF

Now commercially available for high-frequency applications in industrial and entertainment applications.

# A.W.V. Drift Transistors—A New Concept In Design For High-Frequency Applications

## About the Name Drift

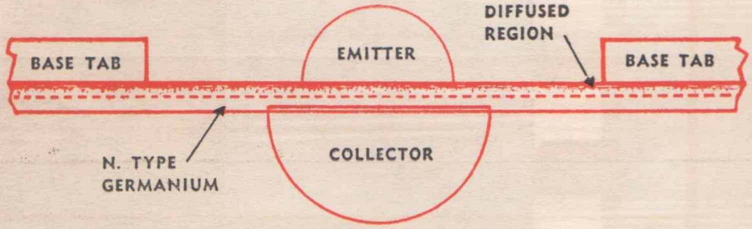
The word DRIFT is a well-known term in physics used to describe the motion of charged particles in ionized gases under the influence of an impressed electric field. Charged particles move much faster in a given direction by "drifting" in an electric field than they can by random diffusion in the absence of an electric field. In keeping with the analogy between the drift phenomena in gaseous discharges and in semiconductors, the word *'Drift'* is applied to transistors which incorporate a "built-in" accelerating field.

The electric field in A.W.V. "Drift" transistors, which literally propels the charge carriers from emitter to the collector, is achieved by the graded distribution of an impurity in the germanium base region. This "built-in" accelerating field, a feature not available in conventional transistor designs, results in greatly decreased transit time and therefore a much higher upper frequency limit.

## The Drift Principle

The successful use of the drift field principle lies in the critically accurate control of impurity distribution in the base region during manufacture. The density of the impurity distribution in the base decreases exponentially from very high values at the emitter to low values at the collector. The impurity distribution introduces a constant electric "drift" field which accelerates (propels) the charge carriers through the base region. Compared with the performance of conventional transistors, in which the charge carriers move by means of diffusion—a comparatively slow process because of its random nature—the acceleration of charge carriers by the "drift" field represents a major improvement. Because of the accelerating field in the A.W.V. Drift transistor, the transit time of the charge carriers is substantially less than the transit time of the carriers in a conventional transistor. This results in greatly increased high frequency performance.

Cross-sectional view of the A.W.V. drift-transistor structure.




## "Drift" Transistors Provide Superior Performance

The high impurity density in the base near the emitter results in a *low base resistance,* while the low impurity density near the collector contributes to *low collector capacitance* and results in a high collector breakdown voltage. The extremely low value of collector capacitance makes neutralization unnecessary in most applications and permits the design of simple and economical circuits.

The combination of low base resistance, high collector breakdown voltage, low collector capacitance, and short transit time, makes possible the design of high-power gain, high-frequency circuits with excellent operating stability and good automatic-gain control capabilities over a wide range of input signal levels.

## Shielding Minimizes Interlead Capacitance

The A.W.V. Drift transistors described in this booklet have four flexible leads and are hermetically sealed in metal cases. The fourth lead is connected to the case internally to minimize interlead capacitance and reduce coupling to adjacent circuit components. These important design features contribute to the usefulness of Drift transistors in high-frequency circuits, particularly in those industrial and commercial applications where low feedback capacitance is an important design consideration.

# Features of A.W.V. Drift Transistors in High-Frequency Applications

- low base resistance
- high output resistance for increased gain
- low feedback capacitance
- high alpha-cutoff frequency
- controlled input and output characteristics
- controlled power gain characteristics to insure unit-to-unit interchangeability
- rugged mechanical construction
- excellent stability
- exceptional uniformity of characteristics

# Design benefits include:

- high input-circuit efficiency
- excellent high-frequency operating stability
- good signal-to-noise ratio
- good automatic-gain-control capabilities over a wide range of input-signal levels

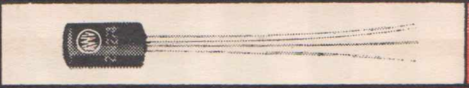
A.W.V. Drift transistors *are germanium p-n-p alloy-junction types which are specifically designed and controlled for operation in mass-produced electronic equipment operating at frequencies up into the VHF band.*

**2N384**

VHF Type. Up to 250 Mc/s in rf oscillator circuits; 100-Mc/s alpha-cutoff frequency. Especially well-suited for such applications as: rf oscillators and amplifiers in compact mobile communications equipment for commercial and industrial use. Also useful in IF amplifiers, low-level video amplifers, mixer-oscillators, in radio and TV receivers, and pulse amplifiers and high-speed switching devices of electronic computers.

**2N247**

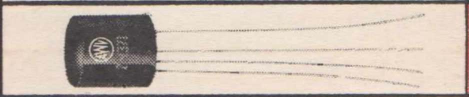
Designed for use in rf amplifiers, mixer oscillators, and intermediate-frequency amplifiers in industrial and commercial equipment and in entertainment-type receivers operating at frequencies covering the AM Broadcast Band and up into the short-wave band. 30-Mc/s alpha-cutoff frequency; frequency for unity power amplification, 132 Mc/s.



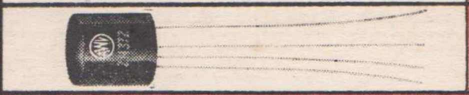
**2N274**

Same electrically as the 2N247 but smaller in size and intended for compact commercial and industrial equipment in which space requirements are a primary consideration.

**2N370**



**2N371**

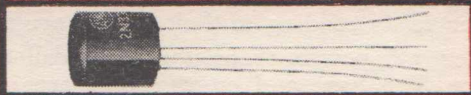


**2N372**

The 2N370 is designed for rf amplifier service; the 2N371 for rf oscillator service; and the 2N372 for rf mixer service. Together, these three transistors comprise an excellent complement for high-gain rf tuners in industrial and entertainment type communication equipment operating at frequencies up to 23 Mc/s.

**2N373**

Designed for 455 Kc/s amplifier service; power gain 34 dB without neutralizing.



**2N374**

Designed for use in mixer-oscillator service; conversion power gain, 40 dB.

**2N544**

For 535 to 1620 Kc/s amplifier service. Neutralized power gain 30.4 dB at 1.5 Mc/s.

# DATA CHART ON A.W.V. DRIFT TRANSISTORS

| TYPE | CLASS OF SERVICE | LEAD ARRANGEMENT | MAXIMUM CASE DIMENSIONS Inches | | CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LENGTH | DIAMETER | DC Collector Volts | DC Emitter mA | Current Transfer Ratio at 1 Kc/s | Alpha Cutoff Frequency Mc/s | Power Gain dB | Noise Factor dB | Frequency For Unity Power Amplication Mc/s |
| **2N247** | Class A RF Amplifier | 4 Flexible Leads* | 0.375 | 0.36 | —9 | —1 | 60 | 30 | 45† | 8 | 132 |
| **2N274** | Class A RF Amplifier | 4 Flexible Leads* | 0.405 | 0.24 | —9 | —1 | 60 | 30 | 45† | 8 | 132 |
| **2N370** | Class A RF Amplifier | 4 Flexible Leads* | 0.375 | 0.36 | —12 | —1 | .60 | 30 | 50.5† | —— | 132 |
| **2N371** | RF Oscillator | 4 Flexible Leads* | 0.375 | 0.36 | —12 | —1 | 60 | 30 | —— | —— | 132 |
| **2N372** | RF Mixer | 4 Flexible Leads* | 0.375 | 0.36 | —12 | —1 | 60 | 30 | 50.5† | —— | 132 |
| **2N373** | Class A Amplifier | 4 Flexible Leads* | 0.375 | 0.36 | —12 | —1 | 60 | 30 | 39▲ | —— | —— |
| **2N374** | Mixer Oscillator | 4 Flexible Leads* | 0.375 | 0.36 | —12 | —1 | 60 | 30 | 40 | —— | —— |
| **2N384** | VHF Amplifier | 4 Flexible Leads* | 0.405 | 0.24 | —12 | —1.5 | 60 | 100 | 34 | —— | 250 |
| **2N544** | RF Class A Amplifier | 4 Flexible Leads* | 0.375 | 0.36 | —12 | —1 | 60 | 30 | 30.4▲ | —— | —— |

*One lead, connected internally to case, acts as a shield to minimize interlead capacitance and coupling to adjacent circuit components.
▲Useful gain—Circuit neutralised.

†Measured in a single-tuned unilateralized circuit matched to the generator and load impedances for maximum transfer of power (transformer insertion losses not included).

## *Preferred Range of AWV Transistors*

| | | | | |
|---|---|---|---|---|
| **2N217** | **2N247** | **2N301A** | **2N372** | **2N408** |
| **2N218** | **2N270** | **2N370** | **2N384** | **2N410** |
| **2N219** | **2N301** | **2N371** | **2N406** | **2N412** |

### NOTE

NEW TRANSISTORS ARE BEING CONSTANTLY DEVELOPED FOR THE RADIOTRON RANGE. ANNOUNCEMENTS OF THESE PRODUCTS ARE MADE REGULARLY IN "RADIOTRONICS".

## *Base Arrangements*

Where the pins or leads are arranged in line, the collector lead is separated from the other connections by an increased spacing. The emitter lead is at the other end of the line, with the base connection between the emitter and the collector, and closer to the first mentioned. If an interlead shield is used, the shielding lead is in the centre of the transistor base, between the base and collector leads.

Where the leads are disposed on the periphery of a circle, with uneven spacing, orientate the transistors so that viewing the underside, there are leads at 3 o'clock, 12 o'clock and 9 o'clock. The leads are then respectively collector, base and emitter.

In the case of the base arrangement of the 2N105, the three leads are evenly spaced on the periphery of a circle. The collector lead is identified with a red dot, and the other leads reading anti-clockwise are base and emitter.

For a-f power transistors the collector is connected to the metal case of the transistor. The base and emitter pins are identified by the letters B and E respectively, moulded into the underside of the transistors.

**AMALGAMATED WIRELESS VALVE CO. PTY. LTD.**

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SUPERFINE PRINT, SYDNEY.