# N-P-N GERMANIUM MEDIUM POWER TRANSISTOR

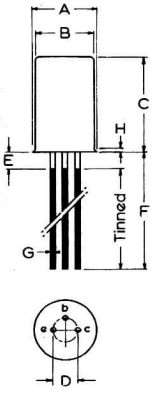
# AC176

Germanium n-p-n high gain alloy junction transistor for audio applications. Primarily intended for use in mains operated audio amplifiers with class 'B' output stages.

| QUICK REFERENCE DATA | | |
|---|---|---|
| $V_{CB}$ max. ($I_E$ = 0) | 32 | V |
| $V_{CE}$ max. (cut-off) | 32 | V |
| $I_{CM}$ max. | 1.0 | A |
| $P_{tot}$ max. | 700 | mW |
| $h_{FE}$ ($I_E$ = -500mA, $V_{CB}$ = 0) | 52-180 | |
| $f_{hfe}$ ($I_E$ = -10mA, $V_{CB}$ = 2.0V) | >10 | kc/s |

OUTLINE AND DIMENSIONS

Conforming to J.E.D.E.C. TO-1
V.A.S.C.A. SO-21/SB3-10




| | Millimetres | | |
|---|---|---|---|
| | Min. | Nom. | Max. |
| A | - | - | 6.5 |
| B | - | - | 6.1 |
| C | - | - | 9.4 |
| D | - | 1.8 | - |
| E | - | - | 1.5 |
| F | 38 | - | - |
| G | - | 0.43 | - |

RATINGS

Limiting values of operation according to the absolute maximum system.

**Electrical**

| | | |
|---|---|---|
| $V_{CBM}$ max. ($I_E = 0$) | 32 | V |
| $V_{CEM}$ max. (cut-off) | 32 | V |
| $V_{CEM}$ max. ($I_C = 0.5A$, $R_B = 27\Omega$, $R_E = 2.2\Omega$) | 25.5 | V |
| $V_{CEM}$ max. ($I_B = 0$, $T_j \leq 55^oC$, see page C6) | 20 | V |
| $V_{EBM}$ max. | 5.0 | V |
| $I_C$ max. | 1.0 | A |
| *$I_{C(AV)}$ max. | 350 | mA |
| $I_{BM}$ max. | 40 | mA |
| *$I_{B(AV)}$ max. | 40 | mA |
| $P_{tot}$ max. | 700 | mW |

*Maximum averaging time = 20ms

**Temperature**

| | | |
|---|---|---|
| $T_{stg}$ min. | -55 | $^oC$ |
| $T_{stg}$ max. | 75 | $^oC$ |
| $T_j$ max. (continuous operation) | 90 | $^oC$ |

THERMAL CHARACTERISTICS

| | | | |
|---|---|---|---|
| $\Theta_{j\text{-case}}$ | | 40 | deg C/W |
| $\Theta_{j\text{-amb}}$ | (in free air) | 300 | deg C/W |
| $\Theta_{j\text{-amb}}$ | (in free air with cooling clips as on page D4) | 150 | deg C/W |
| $\Theta_{j\text{-amb}}$ | (with cooling clip mounted on heatsink of at least $12.5cm^2$) | 80 | deg C/W |

# N-P-N GERMANIUM MEDIUM POWER TRANSISTOR

# AC176

ELECTRICAL CHARACTERISTICS ($T_{amb}$ = 25°C unless otherwise stated)

| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $I_{CBO}$ | Collector cut-off current | | | | |
| | $V_{CB}$ = 10V, $I_E$ = 0 | - | 12.5 | 30 | μA |
| | $V_{CB}$ = 10V, $I_E$ = 0, $T_j$ = 90°C | - | 1.2 | 2.75 | mA |
| $I_B$ | Base current | | | | |
| | $V_{CB}$ = 0, $I_E$ = -0.5A | 2.8 | - | 9.5 | mA |
| $I_{EBO}$ | Emitter cut-off current | | | | |
| | $V_{EB}$ = 5.0V, $I_C$ = 0, $T_j$ = 90°C | - | - | 2.25 | mA |
| $V_{BE}$ | Base-emitter voltage | | | | |
| | $V_{CB}$ = 10V, $I_E$ = -5.0mA | 120 | 135 | 150 | mV |
| | $V_{CB}$ = 0, $I_E$ = -0.5A | - | - | 650 | mV |
| | $V_{CB}$ = 0, $I_E$ = -1.0A | - | - | 1.1 | V |
| $V_{CE(knee)}$ | Collector-emitter knee voltage | | | | |
| | $I_C$ = 800mA | - | 500 | 650 | mV |
| $h_{FE}$ | Large signal forward current transfer ratio | | | | |
| | $I_E$ = -50mA, $V_{CB}$ = 0 | 52 | - | - | |
| | $I_E$ = -500mA, $V_{CB}$ = 0 | 52 | 100 | 180 | |
| | $I_E$ = -1.0A, $V_{CB}$ = 0 | 45 | 83 | 165 | |
| $f_{hfe}$ | Common emitter cut-off frequency | 10 | - | - | kc/s |
| | Small signal loaded common emitter forward current transfer ratio linearity $V_{CE}$ = 14V, $R_L$ = 16Ω | | | | |
| | $\frac{A_i \text{ at } I_C = 0.75A}{A_i \text{ max.}}$ | 0.33 | 0.42 | - | |
| $f_T$ | Transition frequency | | | | |
| | $I_E$ = -10mA, $V_{CB}$ = 2.0V | 1.0 | - | - | Mc/s |

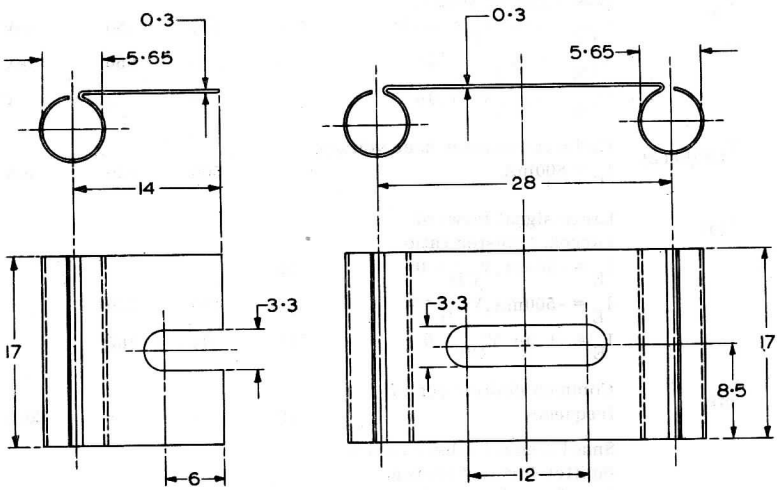
CHARACTERISTICS FOR MATCHED PAIRS OF AC176

| | | | | |
|---|---|---|---|---|
| $\frac{h_{FEL1}}{h_{FEL2}}$ | Ratio of large signal forward current transfer ratio of the two transistors $I_E = -500mA, V_{CB} = 0$ | - | - | 1.2 |

SOLDERING AND WIRING RECOMMENDATIONS

1. When using a soldering iron, transistors may be soldered directly into the circuit, but heat conducted to the junction should if possible be kept to a minimum by the use of a thermal shunt.
2. Transistors 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 may exceed the maximum storage temperature for a period not greater than 2 minutes, provided that it at no time exceeds 115°C. These recommendations apply to a transistor mounted flush on a board having punched-through holes, or spaced at least 1.5mm away from a board having plated-through holes.
3. Care should be taken not to bend the leads nearer than 1.5mm from the seal.

OUTLINE AND DIMENSIONS OF COOLING CLIP




Nominal dimensions in mm

B3121

Type a.
Part No.56227

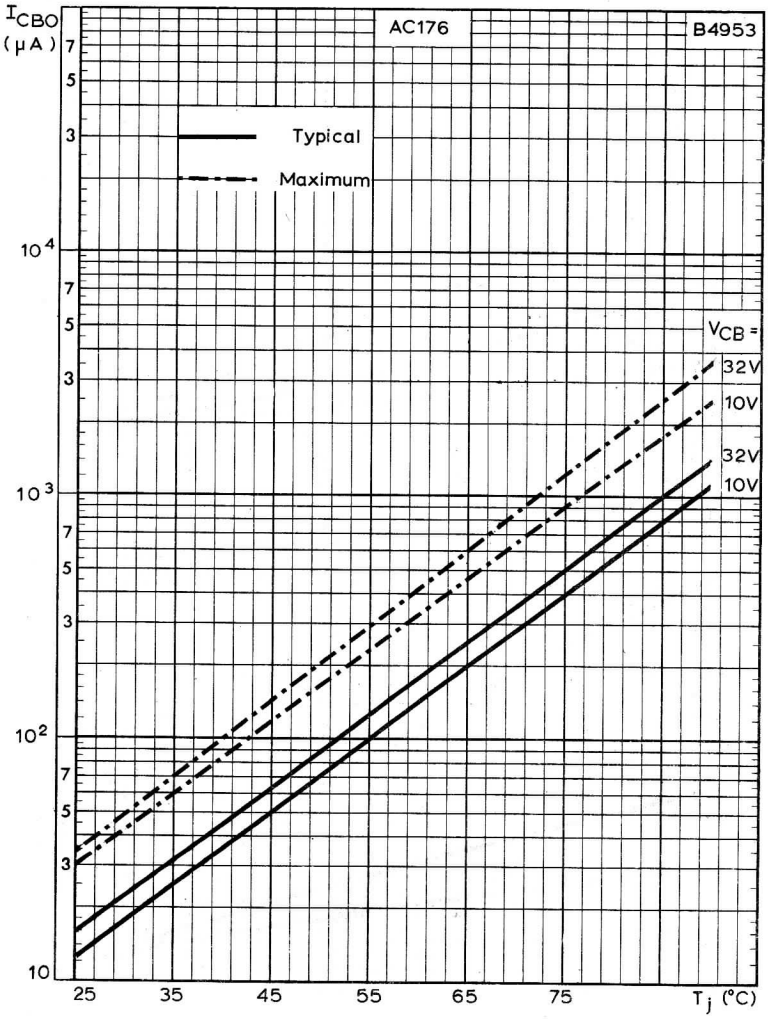
Type b.
Part No.56226

NOTE - Fitting of cooling clip

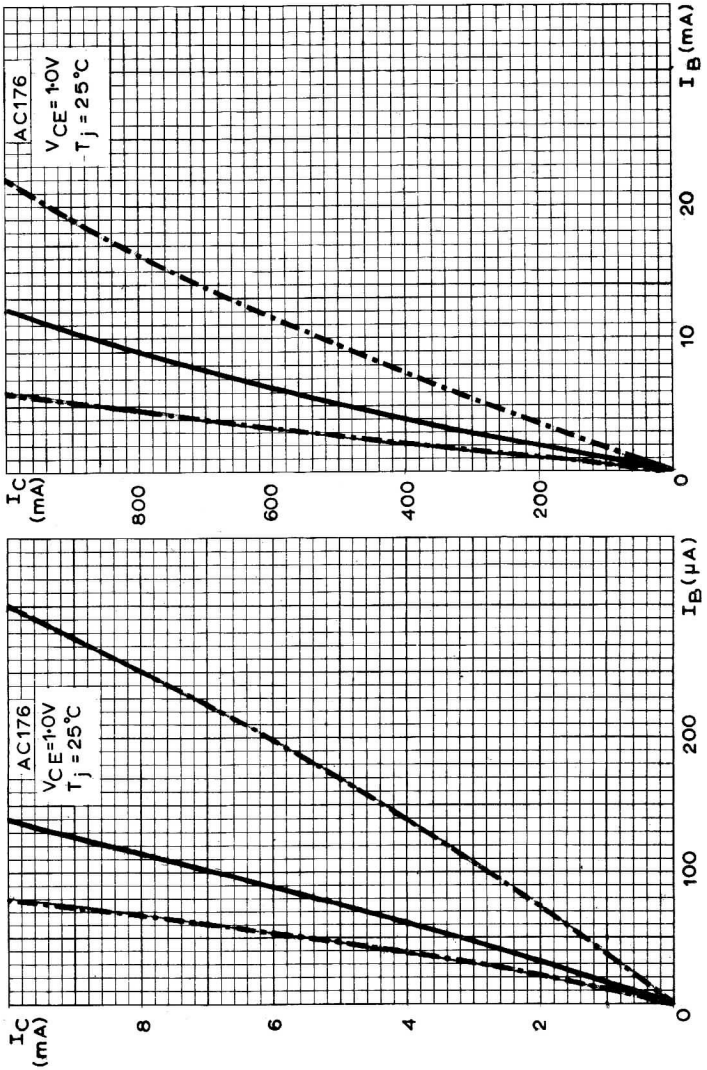
To ensure good thermal contact with the transistor envelope, the cooling clips should not be distorted by forcing it over the "belling" at the base of the transistor.

# N-P-N GERMANIUM MEDIUM POWER TRANSISTOR

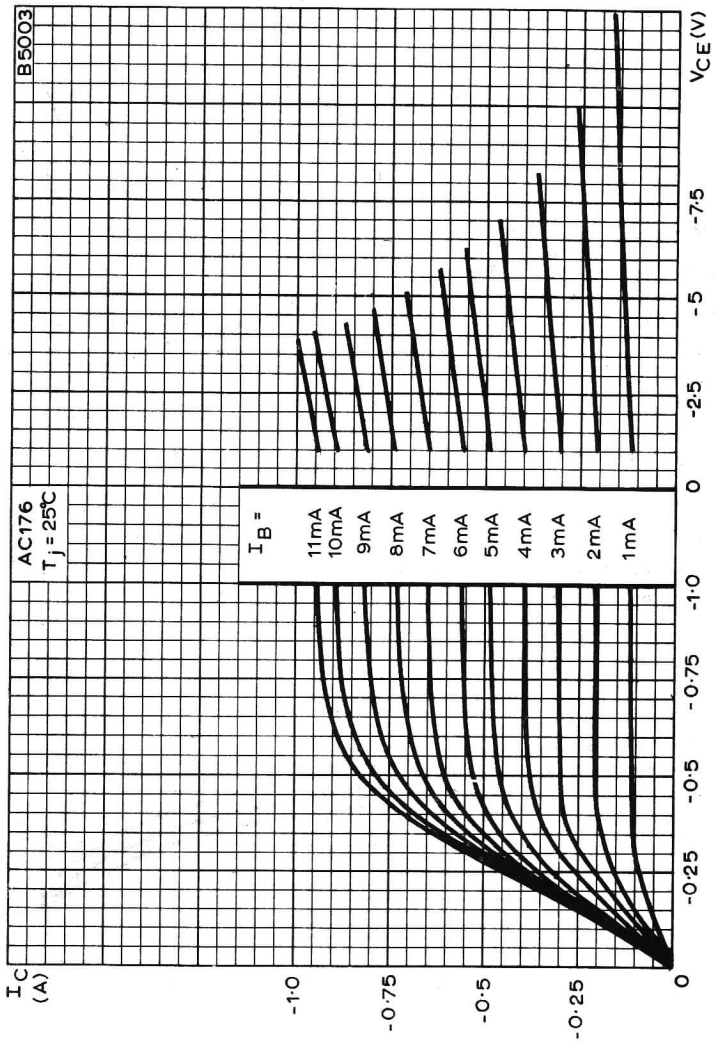
# AC176



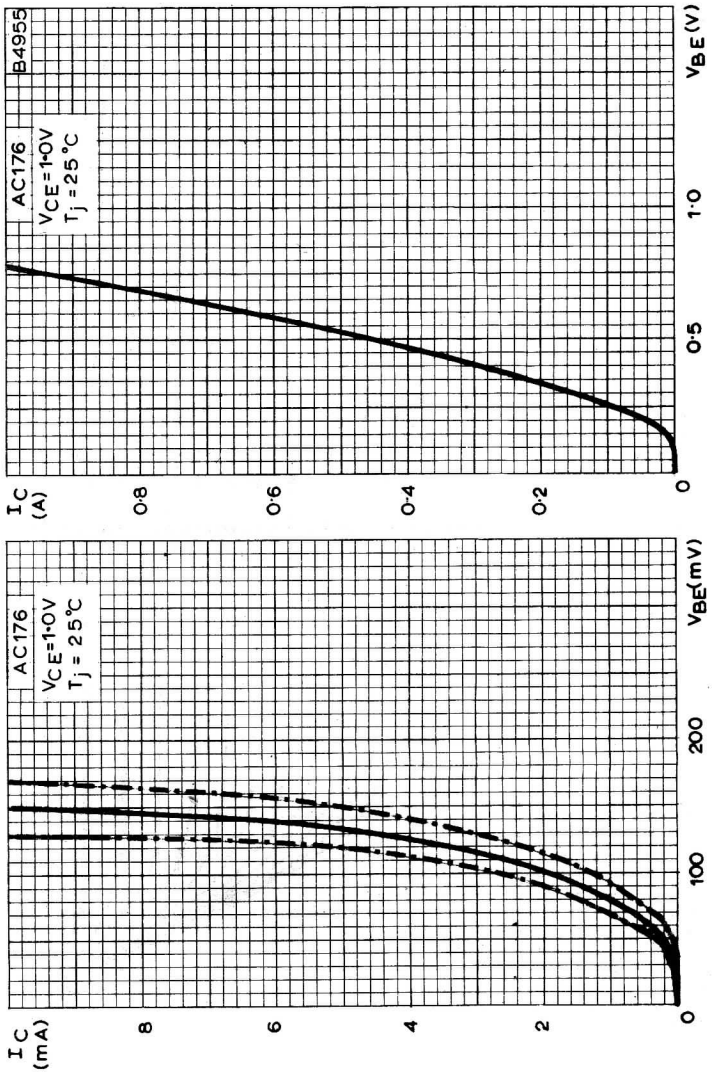

COLLECTOR CUT-OFF CURRENT PLOTTED AGAINST JUNCTION TEMPERATURE WITH COLLECTOR-BASE VOLTAGE AS A PARAMETER



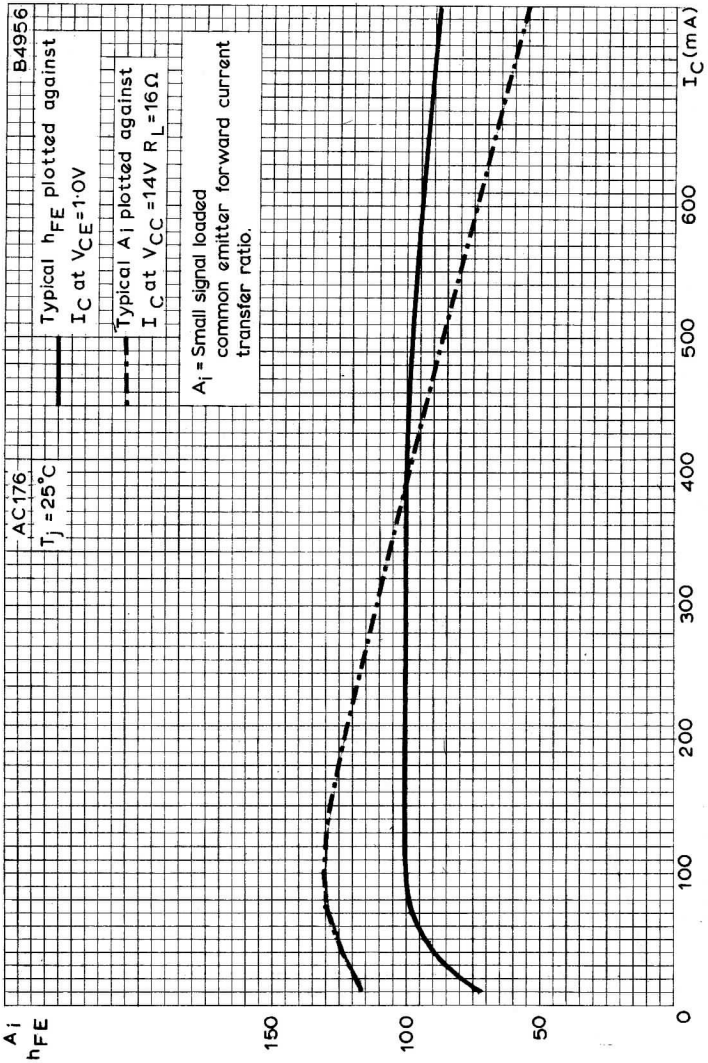

TRANSFER CHARACTERISTICS FOR LOW AND HIGH COLLECTOR CURRENTS



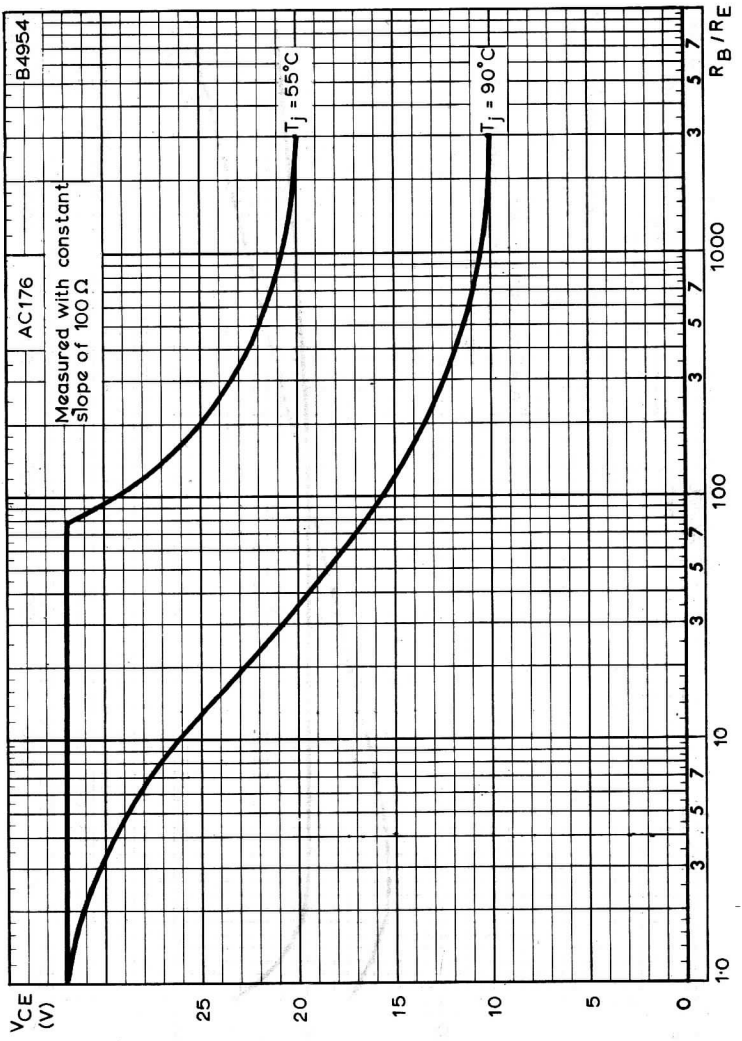

TYPICAL OUTPUT CHARACTERISTICS. $T_j = 25^oC$




INPUT CHARACTERISTICS FOR LOW AND HIGH COLLECTOR CURRENTS




TYPICAL LARGE SIGNAL FORWARD CURRENT TRANSFER RATIO AND TYPICAL LOADED SMALL SIGNAL FORWARD CURRENT TRANSFER RATIO PLOTTED AGAINST COLLECTOR CURRENT




MAXIMUM COLLECTOR-EMITTER VOLTAGE PLOTTED AGAINST RATIO OF $R_B/R_E$