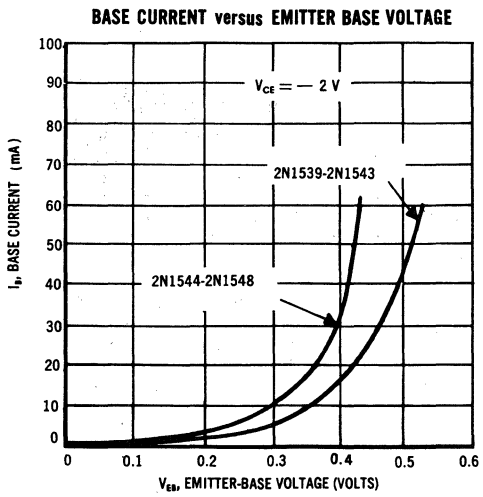
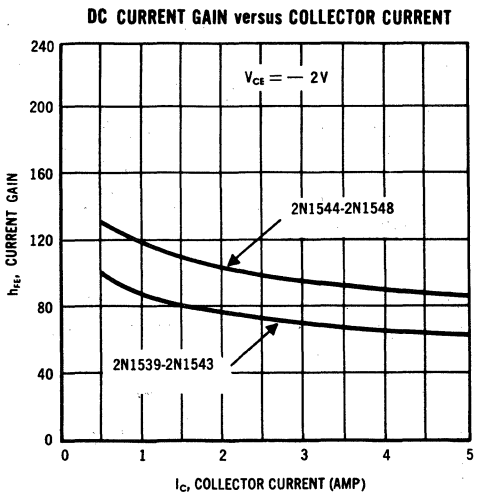
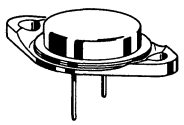
## 2N1539 thru 2N1548 (continued)



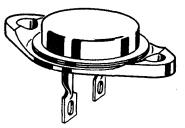

# 2N1549, A thru 2N1560, A (GERMANIUM)

PNP germanium power transistors for switching and amplifier applications in high-reliability equipment.



CASE 11A
(TO-3 modified)

For units with solder lugs attached, specify devices MP1549, A etc. (TO-41 package)



CASE 4-04
(TO-41)

**MAXIMUM RATINGS** Apply to corresponding "Hi-Rel" Series also

| Rating | Symbol | 2N1549 2N1553 2N1557 | 2N1550 2N1554 2N1558 | 2N1551 2N1555 2N1559 | 2N1552 2N1556 2N1560 | Units |
|---|---|---|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEX}$ | 40 | 60 | 80 | 100 | Vdc |
| Collector-Emitter Voltage | $V_{CES}$* | 30 | 45 | 60 | 75 | Vdc |
| Collector-Emitter Voltage | $V_{CEO}$* | 20 | 30 | 40 | 50 | Vdc |
| Collector-Base Voltage | $V_{CB}$ | 40 | 60 | 80 | 100 | Vdc |
| Emitter-Base Voltage | $V_{EB}$ | 20 | 30 | 40 | 50 | Vdc |
| Collector Current (Continuous) | $I_C$ | 15 | | | | Amp |
| Collector Current (Peak) | $I_C$ | 20 | | | | Amp |
| Collector Junction Temperature | $T_J$ | -65 to +110 | | | | °C |
| Collector Dissipation (25°C Case Temp.) | $P_D$ | 106 | | | | Watts |
| Thermal Resistance | $\theta_{JC}$ | 0.8 | | | | °C/W |

*To avoid excessive heating of collector junction, perform this test with a sweep method.

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C unless otherwise noted)

Characteristics apply to corresponding A type numbers also.

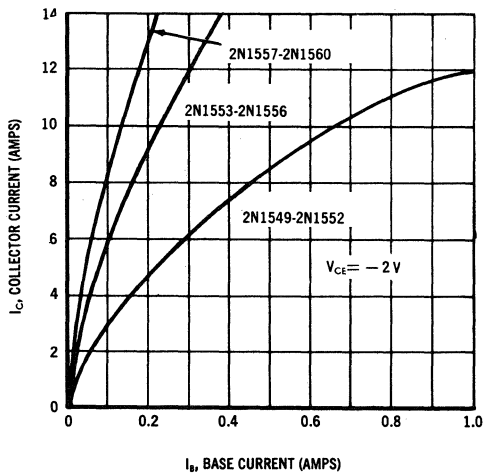
| Characteristic | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|
| Collector-Base Cutoff Current | | $I_{CBO1}$ | | | mA |
| ($V_{CB}$ = 25 V) | 2N1549, 2N1553, 2N1557 | | - | 3.0 | |
| ($V_{CB}$ = 40 V) | 2N1550, 2N1554, 2N1558 | | - | 3.0 | |
| ($V_{CB}$ = 55 V) | 2N1551, 2N1555, 2N1559 | | - | 3.0 | |
| ($V_{CB}$ = 65 V) | 2N1552, 2N1556, 2N1560 | | - | 3.0 | |
| Collector-Base Cutoff Current | | $I_{CBO}$ | | | mA |
| ($V_{CB}$ = 2 V) | | | - | 0.2 | |
| ($V_{CB}$ = 1/2 $BV_{CES}$ rating; $T_C$ = +90°C) | | | - | 20 | |
| Emitter-Base Cutoff Current | | $I_{EBO}$ | | | mA |
| ($V_{EB}$ = 12 V) | | | - | 0.5 | |
| Collector-Emitter Breakdown Voltage | | $BV_{CES}$ | | | volts |
| ($I_C$ = 300 mA) | | | | | |
| | 2N1549, 2N1553, 2N1557 | | 30 | - | |
| | 2N1550, 2N1554, 2N1558 | | 45 | - | |
| | 2N1551, 2N1555, 2N1559 | | 60 | - | |
| | 2N1552, 2N1556, 2N1560 | | 75 | - | |
| Collector-Emitter Leakage Current | | $I_{CEX}$ | | | mA |
| ($V_{BE}$ = 1.0 V, $V_{CE}$ @ rated $BV_{CBO}$) | | | - | 20 | |
| Collector-Emitter Breakdown Voltage* | | $BV_{CEO}$* | | | volts |
| ($I_C$ = 300 mA, $I_B$ = 0) | | | | | |
| | 2N1549, 2N1553, 2N1557 | | 20 | - | |
| | 2N1550, 2N1554, 2N1558 | | 30 | - | |
| | 2N1551, 2N1555, 2N1559 | | 40 | - | |
| | 2N1552, 2N1556, 2N1560 | | 50 | - | |
| Collector-Base Breakdown Voltage | | $BV_{CBO}$ | | | volts |
| ($I_C$ = 20 mA) | | | | | |
| | 2N1549, 2N1553, 2N1557 | | 40 | - | |
| | 2N1550, 2N1554, 2N1558 | | 60 | - | |
| | 2N1551, 2N1555, 2N1559 | | 80 | - | |
| | 2N1552, 2N1556, 2N1560 | | 100 | - | |
| Current Gain | | $h_{FE1}$ | | | - |
| ($V_{CE}$ = 2.0 V, $I_C$ = 10 A) | | | | | |
| | 2N1549 - 2N1552 | | 10 | 30 | |
| | 2N1553 - 2N1556 | | 30 | 60 | |
| | 2N1557 - 2N1560 | | 50 | 100 | |
| Base-Emitter Drive Voltage | | $V_{BE}$ | | | volts |
| ($I_C$ = 10 A, $I_B$ = 1.0 A) | | | | | |
| | 2N1549 - 2N1552 | | - | 1.3 | |
| | 2N1553 - 2N1556 | | - | 1.0 | |
| | 2N1557 - 2N1560 | | - | 0.85 | |
| Collector Saturation Voltage | | $V_{CE(sat)}$ | | | volts |
| ($I_C$ = 10 A, $I_B$ = 1.0 A) | 2N1549 - 2N1552 | | - | 1.0 | |
| | 2N1553 - 2N1556 | | - | 0.7 | |
| | 2N1557 - 2N1560 | | - | 0.5 | |

*To avoid excessive heating of collector junction, perform this test with a sweep method.

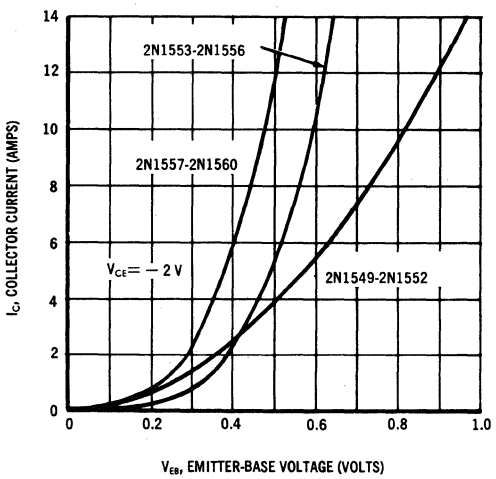
## ELECTRICAL CHARACTERISTICS (continued)

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Transconductance ($V_{CE}$ = 2.0 V, $I_C$ = 10 A) | $g_{FE}$ | | | mhos |
| 2N1549 - 2N1552 | | 6.0 | 18 | |
| 2N1553 - 2N1556 | | 8.0 | 30 | |
| 2N1557 - 2N1560 | | 12 | 40 | |
| Frequency Cutoff | $f_{ae}$ | Typ | | kHz |
| 2N1549 - 2N1552 | | 10 | | |
| 2N1553 - 2N1556 | | 6.0 | | |
| 2N1557 - 2N1560 | | 5.0 | | |

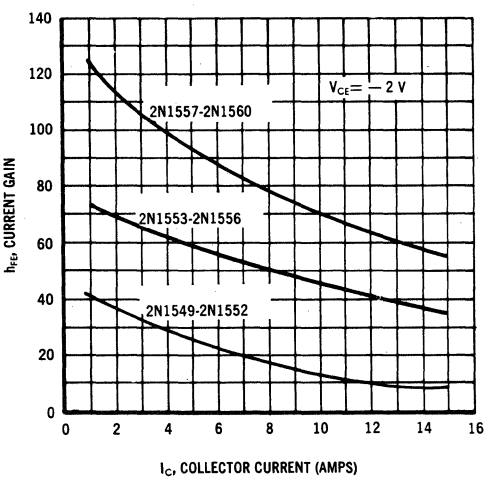
**COLLECTOR CURRENT versus BASE CURRENT**



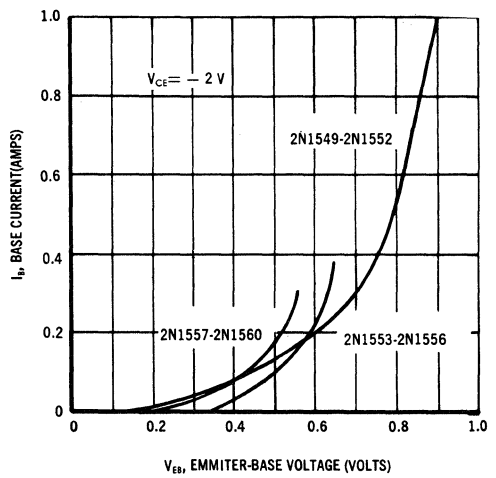

**COLLECTOR CURRENT versus EMITTER-BASE VOLTAGE**




**CURRENT GAIN versus COLLECTOR CURRENT**



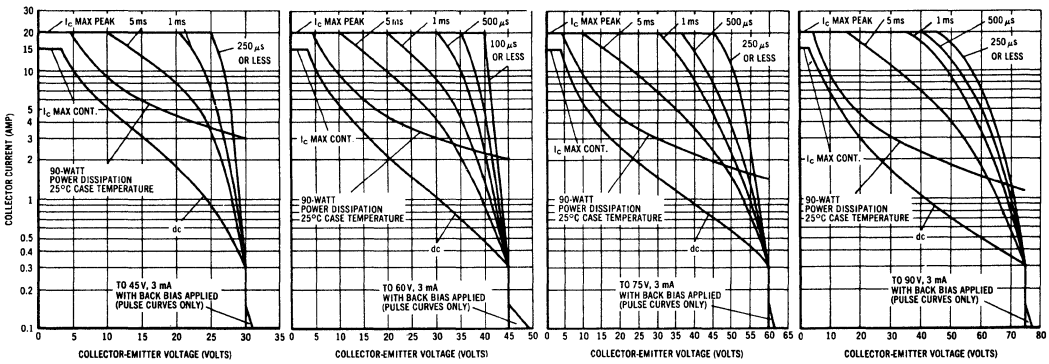

**BASE CURRENT versus EMITTER-BASE VOLTAGE**



## SAFE OPERATING AREAS

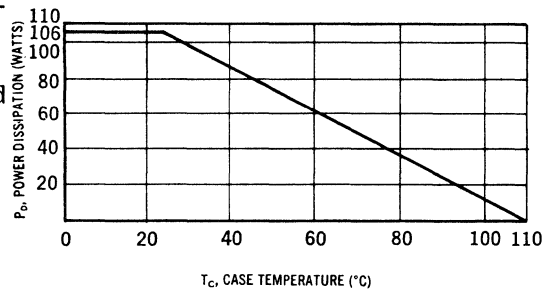
The Safe Operating Area Curves indicate $I_C$ — $V_{CE}$ limits below which the device will not go into secondary breakdown. Collector load lines for specific circuits must fall within the applicable Safe Area to avoid causing a collector-emitter short. (Duty cycle of the excursions make no significant change in these safe areas.) To insure operation below the maximum $T_J$, the power-temperature derating curve must be observed for both steady state and pulse power conditions.

**2N1549, 2N1553, 2N1557** **2N1550, 2N1554, 2N1558** **2N1551, 2N1555, 2N1559** **2N1552, 2N1556, 2N1560**

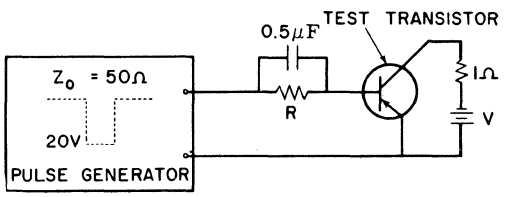



## POWER-TEMPERATURE DERATING CURVE

The maximum continuous power is related to maximum junction temperature, by the thermal resistance factor. For dc or frequencies below 25 Hz the transistor must be operated within the constant $P_D = Vc \times Ic$ hyperbolic curve. This curve has a value of 106 watts at case temperatures of 25°C and is 0 watts at 110°C with a linear relation between the two temperatures such that $P_D$ allowable $= \frac{110^{\circ} - Tc}{0.8}$




## SWITCHING TIME MEASURING UNIT




| Devices | Conditions* | | | Typical Switching Times | | |
|---|---|---|---|---|---|---|
| | $I_C$ (Amp) | V (Volts) | R (ohms) | $t_d + t_r$ (μs) | $t_s$ (μs) | $t_f$ (μs) |
| 2N1549 -52 | 10 | 10 | 10 | 5 | 2 | 10 |
| 2N1553 -56 | 10 | 10 | 30 | 10 | 5 | 25 |
| 2N1557 -60 | 10 | 10 | 50 | 10 | 5 | 25 |

*Input Pulse Repetition Rate = 2 kHz, Pulse Width = 50 μs