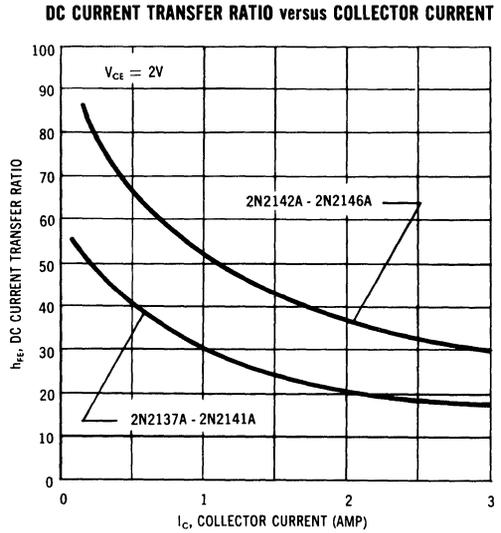
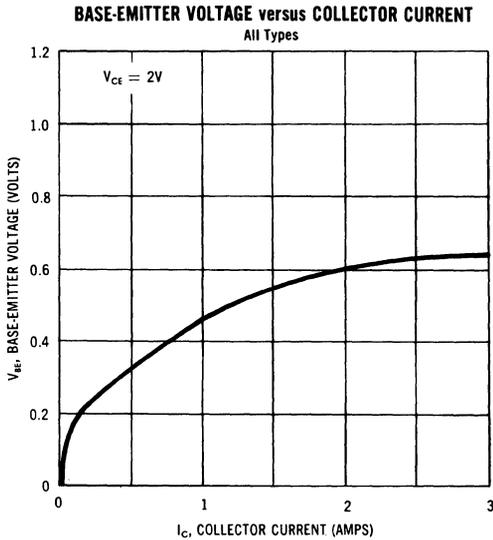


## 2N2137 thru 2N2146 (continued)

### INPUT & TRANSFER CHARACTERISTICS



## 2N2152 thru 2N2154 (GERMANIUM)

## 2N2156 thru 2N2158

CASE 5  
(TO-36)



PNP germanium power transistors for high-power, high-gain applications in high-reliability industrial equipment.

### MAXIMUM RATINGS

Rating	Symbol	2N2152 2N2156	2N2153 2N2157	2N2154 2N2158	Unit
Collector-Emitter Voltage	$V_{CEO}$	30	45	60	Vdc
Collector-Emitter Voltage	$V_{CES}$	45	60	75	Vdc
Collector-Base Voltage	$V_{CB}$	45	60	75	Vdc
Emitter-Base Voltage	$V_{EB}$	25	30	40	Vdc
Collector Current	$I_C$	30			Adc
Total Device Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$	$P_D$	170			Watts
		0.5			$W/^\circ C$
Operating Junction Temperature Range	$T_J$	-65 to +110			$^\circ C$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$\theta_{JC}$	0.5	$^\circ C/W$

**2N2152 thru 2N2154 2N2156 thru 2N2158 (continued)**
**ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  unless otherwise noted)**

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Breakdown Voltage* ( $I_C = 1.0 \text{ A dc}, I_B = 0$ )	$BV_{CEO}^*$	30	-	-	Vdc
2N2152, 2N2156		45	-	-	
2N2153, 2N2157		60	-	-	
2N2154, 2N2158					
Collector-Emitter Breakdown Voltage* ( $I_C = 300 \text{ mA dc}, V_{BE} = 0$ )	$BV_{CES}^*$	45	-	-	Vdc
2N2152, 2N2156		60	-	-	
2N2153, 2N2157		75	-	-	
2N2154, 2N2158					
Floating Potential ( $V_{CB} = 45 \text{ V dc}, I_E = 0$ )	$V_{EBF}$	-	-	1.0	Vdc
2N2152, 2N2156					
( $V_{CB} = 60 \text{ V dc}, I_E = 0$ )		-	-	1.0	
2N2153, 2N2157					
( $V_{CB} = 75 \text{ V dc}, I_E = 0$ )		-	-	1.0	
2N2154, 2N2158					
Collector Cutoff Current ( $V_{CB} = 2 \text{ V}, I_E = 0$ )	$I_{CBO}$	-	0.08	0.2	mA dc
( $V_{CB} = 45 \text{ V dc}, I_E = 0$ )		-	0.9	4.0	
2N2152, 2N2156					
( $V_{CB} = 60 \text{ V dc}, I_E = 0$ )		-	0.9	4.0	
2N2153, 2N2157					
( $V_{CB} = 75 \text{ V dc}, I_E = 0$ )		-	0.9	4.0	
2N2154, 2N2158					
( $V_{CB} = V_{CB(max)}, I_E = 0, T_C = 71^\circ\text{C}$ )		-	4.0	15	
Emitter Cutoff Current ( $V_{BE} = 25 \text{ V dc}, I_C = 0$ )	$I_{EBO}$	-	0.2	4.0	mA dc
( $V_{BE} = 30 \text{ V dc}, I_C = 0$ )		-	0.2	4.0	
( $V_{BE} = 40 \text{ V dc}, I_C = 0$ )		-	0.2	4.0	
( $V_{BE} = V_{EB(max)}, I_C = 0, T_C = 71^\circ\text{C}$ )		-	2.7	15	
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 5.0 \text{ A dc}, V_{CB} = 2 \text{ V dc}$ )	$h_{FE}$	50	75	100	-
2N2152, 2N2153, 2N2154		80	105	160	
2N2156, 2N2157, 2N2158					
( $I_C = 15 \text{ A dc}, V_{CB} = 2 \text{ V dc}$ )		25	47	-	
2N2152, 2N2153, 2N2154		40	63	-	
2N2156, 2N2157, 2N2158					
( $I_C = 25 \text{ A dc}, V_{CB} = 2 \text{ V dc}$ )		15	38	-	
Collector-Emitter Saturation Voltage ( $I_C = 5.0 \text{ A dc}, I_B = 500 \text{ mA dc}$ )	$V_{CE(sat)}$	-	0.06	0.1	Vdc
( $I_C = 25 \text{ A dc}, I_B = 2 \text{ A dc}$ )		-	0.2	0.3	
Base-Emitter On Voltage ( $I_C = 5.0 \text{ A dc}, I_B = 500 \text{ mA dc}$ )	$V_{BE(on)}$	-	0.65	1.0	Vdc
( $I_C = 25 \text{ A dc}, I_B = 2 \text{ A dc}$ )		-	1.0	2.0	
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Common-Emitter Cutoff Frequency ( $I_C = 5.0 \text{ A dc}, V_{CE} = 6.0 \text{ V dc}$ )	$f_{\alpha e}$	2.0	2.7	-	kHz

\*To avoid excessive heating of the collector junction, perform these tests with an oscilloscope.

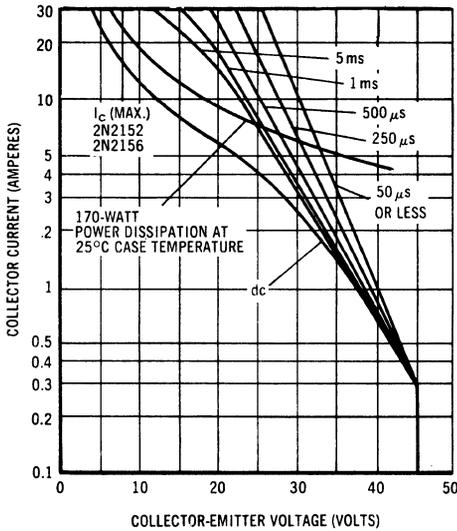
## 2N2152 thru 2N2154 , 2N2156 thru 2N2158 (continued)

### SAFE OPERATING AREAS

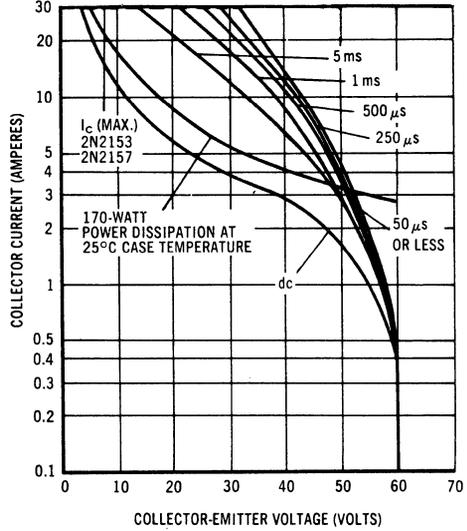
The Safe Operating Area Curves indicate  $I_C$  —  $V_{CE}$  limits below which the device will not go into secondary breakdown. Collector load lines for specific circuits must fall within the applicable Safe Area to avoid causing a collector-emitter short.

(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.

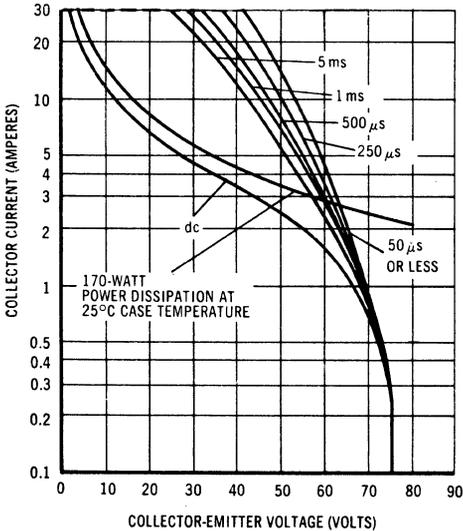
2N2152, 2N2156



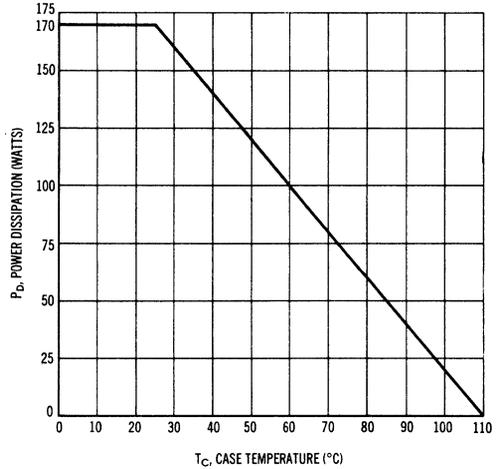
2N2153, 2N2157



2N2154, 2N2158



POWER-TEMPERATURE DERATING CURVE



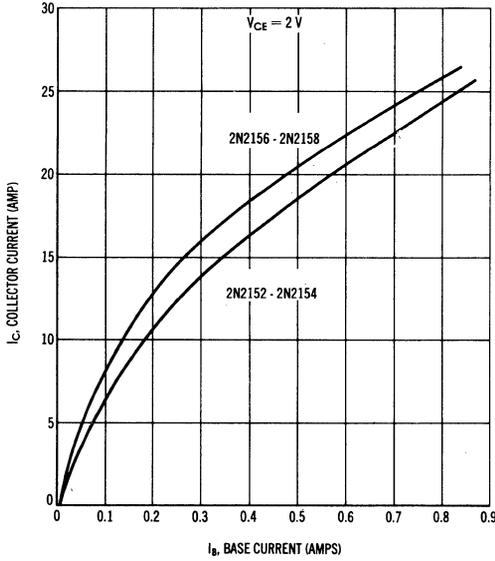
The maximum continuous power is related to maximum junction temperature by the thermal resistance factor. This curve has a value of 170 Watts at case temperatures of 25°C and is 0 Watts at 110°C with a linear relation between the two temperatures such that:

$$\text{allowable } P_D = \frac{110^\circ - T_c}{0.5}$$

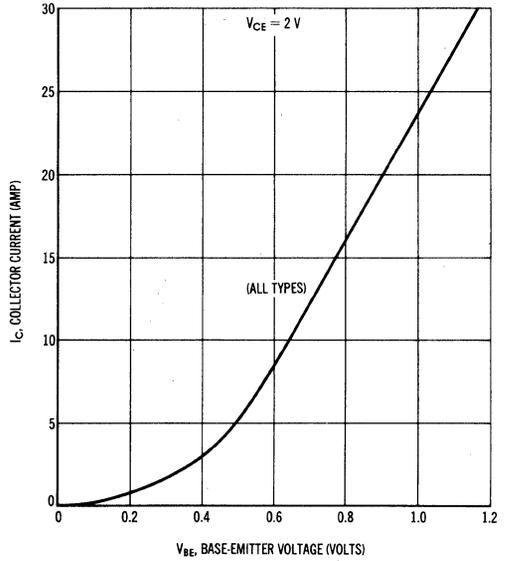
**2N2152 thru 2N2154 , 2N2156 thru 2N2158 (continued)**

**TYPICAL INPUT AND TRANSFER CHARACTERISTICS**

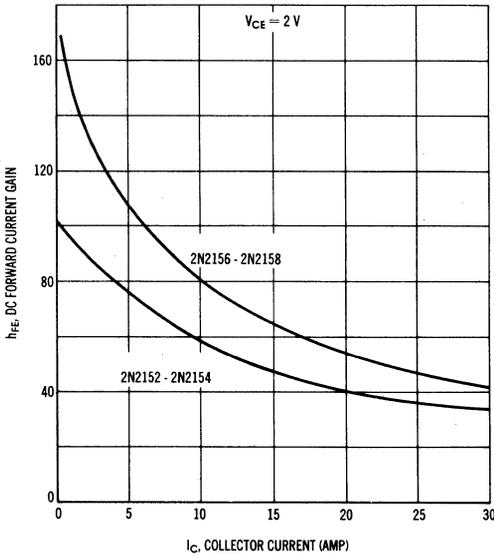
**COLLECTOR CURRENT  
versus BASE CURRENT**



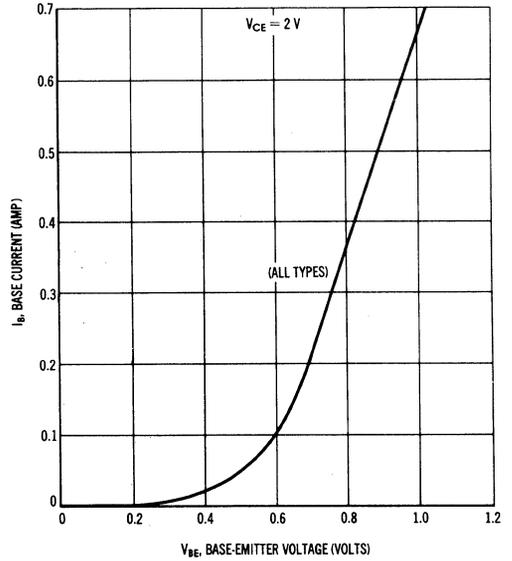
**COLLECTOR CURRENT  
versus BASE-EMITTER VOLTAGE**



**DC CURRENT GAIN  
versus COLLECTOR CURRENT**



**BASE CURRENT versus  
BASE-EMITTER VOLTAGE**



**2N2171** FOR SPECIFICATIONS, SEE 2N381 DATA.