




2N1545-2N1641


TYPE	MATERIAL	POLARITY	REPLACE- MENT	PAGE NUMBER	USE	MAXIMUM RATINGS					ELECTRICAL CHARACTERISTICS									
						P <sub>D</sub> @ 25°C	T <sub>J</sub> °C	V <sub>CB</sub> (volts)	V <sub>CE-</sub> (volts)	Subscript	h <sub>FE</sub> @ I <sub>C</sub>		V <sub>CE(SAT)</sub> @ I <sub>C</sub>		h <sub>fr</sub>	Subscript	f <sub>T</sub> Units	Subscript		
											(min)	(max)	Units	Units						
2N1545	G	P		7-64	LPA	90W	C	100	60	45	S	75	150	3.0A	0.2	3.0A			1.0K	E
2N1545A	G	P		7-64	LPA	90W	C	100	60	45	S	75	150	3.0A	0.2	3.0A			3.0K	E
2N1546	G	P		7-64	LPA	90W	C	100	80	60	S	75	150	3.0A	0.2	3.0A			1.0K	E
2N1546A	G	P		7-64	LPA	90W	C	100	80	60	S	75	150	3.0A	0.2	3.0A			3.0K	E
2N1547	G	P		7-64	LPA	90W	C	100	100	75	S	75	150	3.0A	0.2	3.0A			1.0K	E
2N1547A	G	P		7-64	LPA	90W	C	100	100	75	S	75	150	3.0A	0.2	3.0A			3.0K	E
2N1548	G	P		7-64	LPA	90W	C	100	120	90	S	75	150	3.0A	0.2	3.0A			1.0K	E
2N1549	G	P		7-67	LPA	90W	C	100	40	30	S	10	30	10A	1.0	10A				
2N1549A	G	P		7-67	LPA	90W	C	100	40	30	S	10	30	10A	1.0	10A			5.0K	E
2N1550	G	P		7-67	LPA	90W	C	100	60	45	S	10	30	10A	1.0	10A				
2N1550A	G	P		7-67	LPA	90W	C	100	60	45	S	10	30	10A	1.0	10A			5.0K	E
2N1551	G	P		7-67	LPA	90W	C	100	80	60	S	10	30	10A	1.0	10A				
2N1551A	G	P		7-67	LPA	90W	C	100	80	60	S	10	30	10A	1.0	10A			5.0K	E
2N1552	G	P		7-67	LPA	90W	C	100	100	75	S	10	30	10A	1.0	10A				
2N1552A	G	P		7-67	LPA	90W	C	100	100	75	S	10	30	10A	1.0	10A			5.0K	E
2N1553	G	P		7-67	LPA	90W	C	100	40	30	S	30	60	10A	0.5	10A			1.0K	E
2N1553A	G	P		7-67	LPA	90W	C	100	40	20	O	30	60	10A	0.5	10A			3.0K	E
2N1554	G	P		7-67	LPA	90W	C	100	60	45	S	30	60	10A	0.5	10A			1.0K	E
2N1554A	G	P		7-67	LPA	90W	C	100	60	30	O	30	60	10A	0.5	10A			3.0K	E
2N1555	G	P		7-67	LPA	90W	C	100	80	60	S	30	60	10A	0.5	10A			1.0K	E
2N1555A	G	P		7-67	LPA	90W	C	100	80	40	O	30	60	10A	0.5	10A			3.0K	E
2N1556	G	P		7-67	LPA	90W	C	100	100	75	S	30	60	10A	0.5	10A			1.0K	E
2N1556A	G	P		7-67	LPA	90W	C	100	100	50	O	30	60	10A	0.5	10A			3.0K	E
2N1557	G	P		7-67	LPA	90W	C	100	40	30	S	50	100	10A	0.4	10A			1.0K	E
2N1557A	G	P		7-67	LPA	90W	C	100	40	20	O	50	100	10A	0.5	10A			3.0K	E
2N1558	G	P		7-67	LPA	90W	C	100	60	45	S	50	100	10A	0.4	10A			1.0K	E
2N1558A	G	P		7-67	LPA	90W	C	100	60	30	O	50	100	10A	0.5	10A			3.0K	E
2N1559	G	P		7-67	LPA	90W	C	100	80	60	S	50	100	10A	0.4	10A			1.0K	E
2N1559A	G	P		7-67	LPA	90W	C	100	80	40	O	50	100	10A	0.5	10A			3.0K	E
2N1560	G	P		7-67	LPA	90W	C	100	100	75	S	50	100	10A	0.4	10A			1.0K	E
2N1560A	G	P		7-67	LPA	90W	C	100	100	50	O	50	100	10A	0.5	10A			3.0K	E
2N1561	G	P		9-24	RFA	250M	A	100	25	15	O				3.0	200M				
2N1562	G	P		9-24	RFA	250M	A	100	25	15	O				4.0	200M				
2N1564	S	N	2N2218	8-108	AFA	600M	A	175	80	60	O	15	50	5.0M	1.0	10M		20	E	E
2N1565	S	N	2N2218	8-108	AFA	600M	A	175	80	60	O	30	100	5.0M	1.0	10M		40	E	E
2N1566	S	N	2N2219	8-108	AFA	600M	A	175	80	60	O	60	200	5.0M	1.0	10M		80	E	E
2N1566A	S	N	2N2219	8-108	AFA	600M	A	175	80	60	O	60	200	5.0M	0.95	10M		80	E	E
2N1572	S	N			AFA	600M	A	175	125	80	O	15	50	5.0M	1.0	10M		20	E	E
2N1573	S	N			AFA	600M	A	175	125	80	O	30	100	5.0M	1.0	10M		40	E	E
2N1574	S	N			AFA	600M	A	175	125	80	O	60	200	5.0M	1.0	10M		80	E	E
2N1585	G	N			RFA	750M	A	100	25	10	O	20		10M						
2N1586	S	N			AFA	125M	A	85	15	10	O	5.0	27	1.0M	1.5	5.0M		9.0	E	E
2N1587	S	N			AFA	125M	A	85	30	20	O	5.0	27	1.0M	1.5	5.0M		9.0	E	E
2N1588	S	N			AFA	125M	A	85	60	40	O	5.0	27	1.0M	1.5	5.0M		9.0	E	E
2N1589	S	N			AFA	125M	A	85	15	10	O	20	75	1.0M	1.5	5.0M		25	E	E
2N1590	S	N			AFA	125M	A	85	30	20	O	20	75	1.0M	1.5	5.0M		25	E	E
2N1591	S	N			AFA	125M	A	85	60	40	O	20	75	1.0M	1.5	5.0M		25	E	E
2N1592	S	N			AFA	125M	A	85	15	10	O	40	210	1.0M	1.5	5.0M		70	E	E
2N1593	S	N			AFA	125M	A	85	30	20	O	40	210	1.0M	1.5	5.0M		70	E	E
2N1594	S	N			AFA	125M	A	85	60	40	O	40	210	1.0M	1.5	5.0M		70	E	E
2N1595	S	N			AFA	125M	A	85	60	40	O	40	210	1.0M	1.5	5.0M		70	E	E
thru 2N1604	Thyristors, see Table on Page 1-154																			
2N1605	G	N			MSS	150M	A	100	25	24	O	40		20M	0.15	12M			4.0M	B
2N1605A	G	N			MSS	0.2W	A	100	40	40	O	40		20M	0.15	12M			4.0M	B
2N1606	G	P			HSS	100M	A	140	10	10	S	6.0	30	15M	0.15	5.0M			7.2M	T
2N1607	G	P			HSS	100M	A	140	10	10	S	6.0	30	15M	0.15	5.0M			10M	T
2N1608	G	P			HSS	100M	A	140	10	10	S	6.0	30	15M	0.15	5.0M			25M	T
2N1609	G	P	2N2140	7-78	LPA			95	80	60	O	30	75	100M	1.0	500M				
2N1610	G	P	2N2145	7-78	LPA			95	80	60	O	50	125	100M	0.6	500M				
2N1611	G	P	2N2138	7-78	LPA			95	60	40	O	30	75	100M	1.0	500M				
2N1612	G	P	2N2143	7-78	LPA			95	60	40	O	50	125	100M	0.6	500M				
2N1613	S	N		8-90	MSA			200	75	50	R	40	120	150M	1.5	150M		30	E	E
2N1613A	S	N	2N2218	8-108	MSA	1.0W	A	200	120	55	R	40	120	150M	1.0	150M		30	E	E
2N1613B	S	N			MSA	1.0W	A	200	120	55	R	40	120	150M	0.2	150M		30	E	E
2N1614	G	P	2N1924	6-37	MSA	240M	A	100	65	40	R	18	43	20M	0.13	20M			500K	B
2N1615	S	N			RFA	5.5M	A	200	100	100	O	25		5.0M	5.0	50M			2.0M	T
2N1616	S	N	2N3487	7-115	HPA	60W	C	175	60	60	O	15	75	2.0A	2.0	2.0A			3.0M	T
2N1616A	S	N	2N3487	7-115	LPA	85W	C	200	60	60	O	20	60	2.0A	1.0	2.0A			3.0M	T
2N1617	S	N	2N3487	7-115	HPA	60W	C	175	80	80	V	15	75	2.0A	2.0	2.0A			3.0M	T
2N1617A	S	N	2N3487	7-115	LPA	85W	C	200	80	70	O	20	60	2.0A	1.0	2.0A			3.0M	T
2N1618	S	N	2N3488	7-115	HPA	80W	C	175	100	100	V	15	75	2.0A	2.0	2.0A			3.0M	T
2N1618A	S	N	2N3488	7-																


## GERMANIUM POWER TRANSISTOR SELECTOR GUIDE (continued)


<b>10 - AMP</b> $P_o = 85 \text{ W}$ $f_r = 0.7 \text{ MHz}$ $*P_o = 56 \text{ W}$ $*f_r = 1.0 \text{ MHz}$	<b>HIGH-VOLTAGE LOW-SATURATION SWITCH</b> 	$h_{FE}$ $I_c = 3 \text{ A}$ $V_{CE} = 2 \text{ V}$	$V_{CEO}$	80 V	120 V	160 V	$V_{CES}$	
			$V_{CE}$	80 V	120 V	160 V	200 V	320 V
		20-50 20 min *		2N2526	2N2527	2N2528	MP3730*	MP3731*


<b>15 - AMP</b> $P_o = 170 \text{ W}$ $f_r = 0.3 \text{ MHz}$	<b>GENERAL PURPOSE SWITCH AND AMPLIFIER</b> 	$h_{FE}$ $I_c = 5 \text{ A}$ $V_{CE} = 2 \text{ V}$	$V_{CES}$	40 V	50 V	70 V	80 V	
			$V_{CE}$	40 V	50 V	70 V	80 V	
		20-40		2N2078	2N2077	2N2076	2N2075	
35-70		2N2082	2N2081	2N2080	2N2079			

<b>15 - AMP</b> $P_o = 150 \text{ W}$ $f_r = 0.3 \text{ MHz}$	<b>GENERAL PURPOSE SWITCH AND AMPLIFIER</b> 	$h_{FE}$ $I_c = 5 \text{ A}$ $V_{CE} = 2 \text{ V}$	$V_{CES}$	40 V	45 V	50 V	70 V	80 V
			$V_{CE}$	40 V	50 V	60 V	80 V	100 V
		20-40		2N441	2N442	2N443		
25-50					2N174	2N1100		
35-70		2N277	2N278	2N173	2N1099			

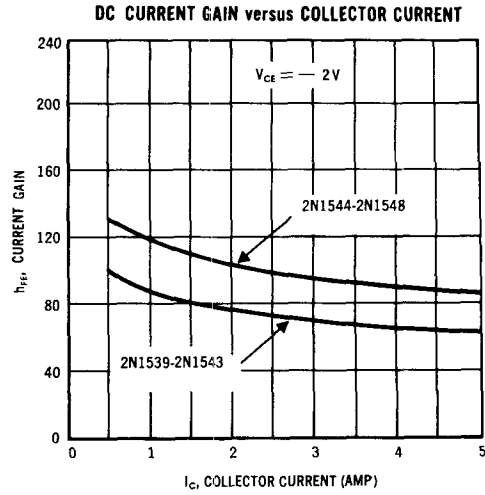
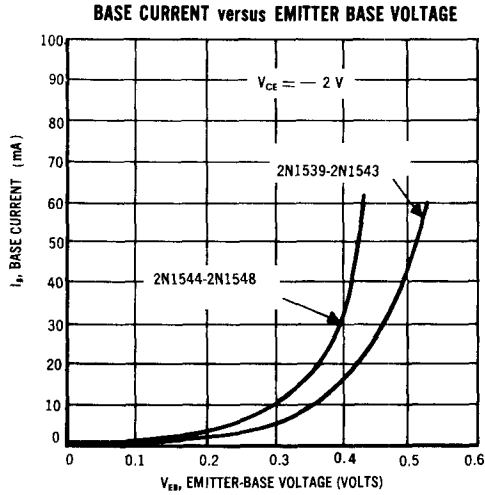
<b>15 - AMP</b> $P_o = 106 \text{ W}$	<b>HIGH-FREQUENCY SWITCH AND AMPLIFIER</b> 	$h_{FE}$ $I_c = 10 \text{ A}$ $V_{CE} = 2 \text{ V}$	$V_{CES}$	30 V	45 V	60 V	75 V	
			$V_{CE}$	40 V	60 V	80 V	100 V	
		10-30 $f_r = 0.55 \text{ MHz}$		2N1549	2N1550	2N1551	2N1552	
30-60 $f_r = 0.4 \text{ MHz}$		2N1553	2N1554	2N1555	2N1556			
50-100 $f_r = 0.4 \text{ MHz}$		2N1557	2N1558	2N1559	2N1560			

<b>20 - AMP</b> $P_o = 85 \text{ W}$ $f_r = 18 \text{ MHz}$	<b>HIGH-SPEED SWITCH</b> 	$h_{FE}$ $I_c = 10 \text{ A}$ $V_{CE} = 2 \text{ V}$	$V_{CEO}$	50 V		75 V		100 V
			$V_{CE}$	80 V		120 V		140 V
		25-100		2N2832		2N2833		2N2834

<b>25 - AMP</b> $P_o = 106 \text{ W}$ $f_r = 0.4 \text{ MHz}$	<b>HIGH DC GAIN SWITCH</b> 	$h_{FE}$ $I_c = 25 \text{ A}$ $V_{CE} = 1 \text{ V}$	$V_{CES}$	35 V		60 V		75 V
			$V_{CE}$	50 V		80 V		100 V
		15-65		2N1162		2N1164		2N1166
		2N1163†		2N1165†		2N1167†		

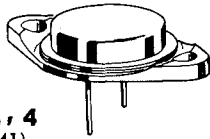
<b>25 - AMP</b> $P_o = 75 \text{ W}$ $f_r = 10 \text{ MHz}$	<b>HIGH DC GAIN LOW-SATURATION SWITCH</b> 	$h_{FE}$ $I_c = 5 \text{ A}$ $V_{CE} = 2 \text{ V}$	$V_{CE(sat)}$		0.5 V			
			$V_{CE}$		15 V			
		200-800				2N2912		

**2N1539 thru 2N1548** (continued)



**2N1549, A thru 2N1560, A (GERMANIUM)**  
**2N1549A JAN thru 2N1556A JAN**  
**2N1560A JAN AVAILABLE)**

**$V_{CB} = 40-100 V$**   
 **$I_C = 15 A$**   
 **$P_D = 106W$**



**CASE 3, 4**  
(TO-3, 41)

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

For units with solder lugs attached, specify devices MP1549A etc. (TO-41 package)

**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	15	15	15	Amp
Collector Current (Peak)	$I_C$	20	20	20	20	Amp
Collector Junction Temperature	$T_J$	-65 to +110				$^{\circ}C$
Collector Dissipation (25 C Case Temp.)	$P_D$	106	106	106	106	Watts
Thermal Resistance	$\theta_{JC}$	0.8				$^{\circ}C/W$

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

**2N1549 thru 2N1560 (continued)**

**ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  unless otherwise noted)**

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

Characteristics apply to corresponding A type numbers also.

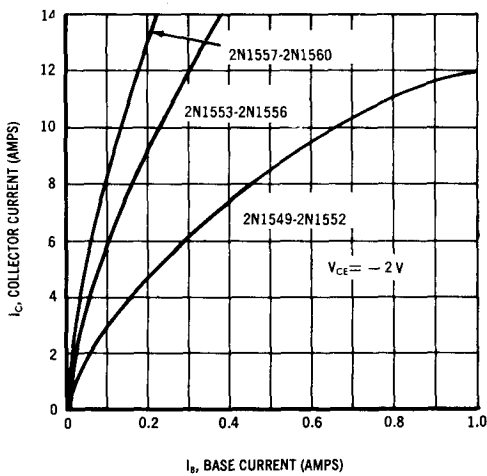
\*To avoid excessive heating of collector junction, perform this test with a sweep method.

**2N1549 thru 2N1560** (continued)

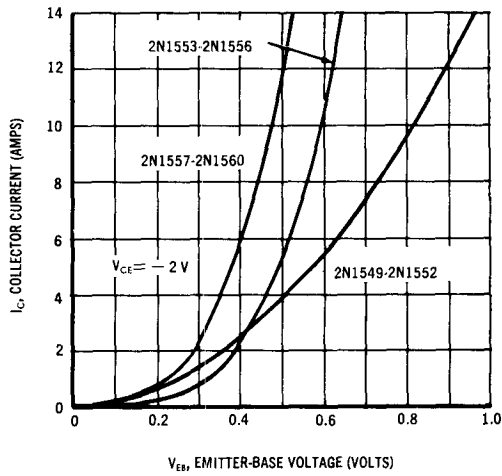
**ELECTRICAL CHARACTERISTICS** (continued)

Characteristic	Symbol	Min	Max	Unit	
Transconductance ( $V_{CE} = 2.0 \text{ V}$ , $I_C = 10 \text{ A}$ )	$g_{FE}$			mhos	
		2N1549 - 2N1552	6		18
		2N1553 - 2N1556	8		30
		2N1557 - 2N1560	12		40
Frequency Cutoff	$f_{ae}$		Typ	kHz	
		2N1549 - 2N1552	10		
		2N1553 - 2N1556	6		
		2N1557 - 2N1560	5		

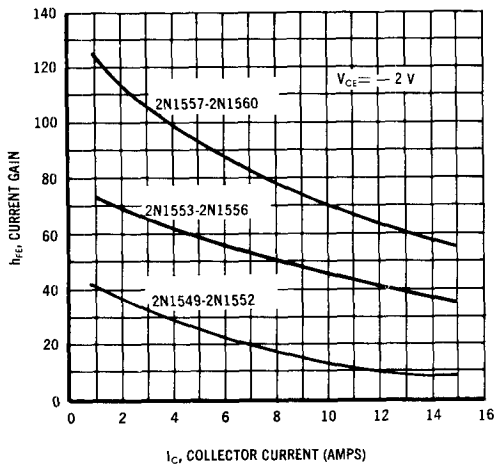
**COLLECTOR CURRENT versus BASE CURRENT**



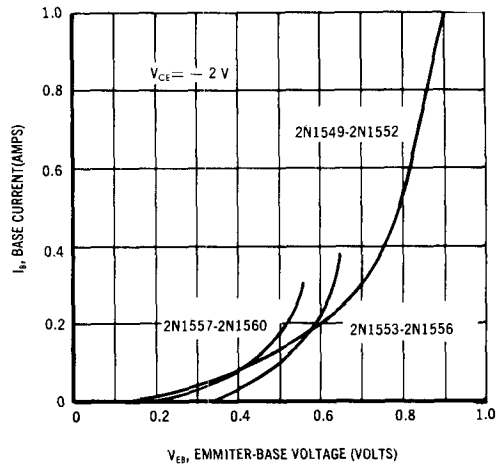
**COLLECTOR CURRENT versus EMITTER-BASE VOLTAGE**



**CURRENT GAIN versus COLLECTOR CURRENT**



**BASE CURRENT versus EMITTER-BASE VOLTAGE**

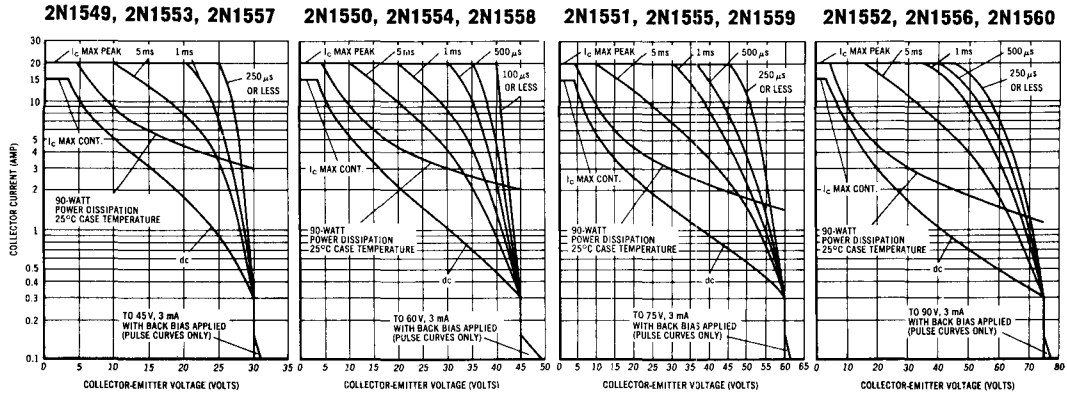


**2N1549 thru 2N1560 (continued)**

**SAFE OPERATING AREAS**

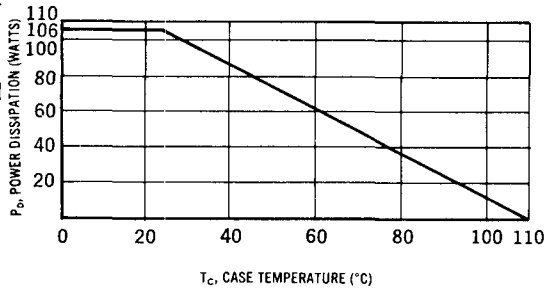
The Safe Operating Area Curves indicate  $I_C$  —  $V_{CE}$  limits below which the device will not go into secondary breakdown. Collector load lines for specific circuits must fall within the applicable Safe Area to avoid causing a collector-emitter short.

(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.



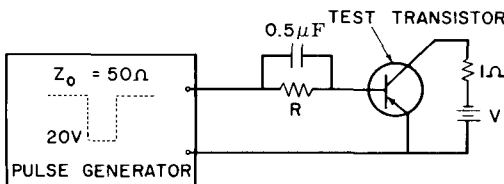
**POWER-TEMPERATURE DERATING CURVE**

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  $P_D = V_c \times I_c$  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 =  $110^\circ - T_c$



$$\frac{110^\circ - T_c}{0.8}$$

**SWITCHING TIME MEASURING UNIT**



Devices	Conditions*			Typical Switching Times		
	$I_C$ (Amp)	V (Volts)	R (ohms)	$t_d + t_r$ ( $\mu s$ )	$t_f$ ( $\mu s$ )	$t_r$ ( $\mu s$ )
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  $\mu s$