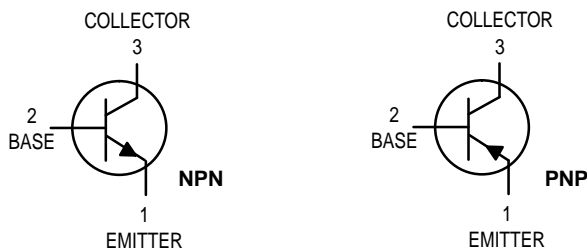


High Voltage Transistors



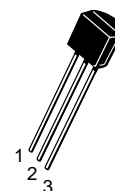
NPN
2N6515
thru 2N6517*
PNP
2N6519
2N6520*

Voltage and current are negative
for PNP transistors

*Motorola Preferred Device

MAXIMUM RATINGS

Rating	Symbol	2N6515	2N6516 2N6519	2N6517 2N6520	Unit
Collector–Emitter Voltage	V_{CEO}	250	300	350	Vdc
Collector–Base Voltage	V_{CBO}	250	300	350	Vdc
Emitter–Base Voltage 2N6515, 2N6516, 2N6517 2N6519, 2N6520	V_{EBO}	6.0 5.0			Vdc
Base Current	I_B	250			mAdc
Collector Current — Continuous	I_C	500			mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	625 5.0			mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	1.5 12			Watts mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–55 to +150			$^\circ\text{C}$



CASE 29–04, STYLE 1
TO–92 (TO–226AA)

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ⁽¹⁾ ($I_C = 1.0 \text{ mAdc}, I_E = 0$)	$V_{(BR)CEO}$	250 300 350	— — —	Vdc
Collector–Base Breakdown Voltage ($I_C = 100 \mu\text{Adc}, I_E = 0$)	$V_{(BR)CBO}$	250 300 350	— — —	Vdc
Emitter–Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$)	$V_{(BR)EBO}$	6.0 5.0	— —	Vdc

1. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

Preferred devices are Motorola recommended choices for future use and best overall value.

NPN 2N6515 thru 2N6517 PNP 2N6519 2N6520

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS (Continued)				
Collector Cutoff Current ($V_{CB} = 150\text{ Vdc}, I_E = 0$) ($V_{CB} = 200\text{ Vdc}, I_E = 0$) ($V_{CB} = 250\text{ Vdc}, I_E = 0$)	I_{CBO}	—	50	nAdc
			50	
			50	
Emitter Cutoff Current ($V_{EB} = 5.0\text{ Vdc}, I_C = 0$) ($V_{EB} = 4.0\text{ Vdc}, I_C = 0$)	I_{EBO}	—	50	nAdc
			50	

ON CHARACTERISTICS⁽¹⁾

DC Current Gain ($I_C = 1.0\text{ mAdc}, V_{CE} = 10\text{ Vdc}$)	h_{FE}	35	—	—
		30	—	
		20	—	
($I_C = 10\text{ mAdc}, V_{CE} = 10\text{ Vdc}$)		50	—	
		45	—	
		30	—	
($I_C = 30\text{ mAdc}, V_{CE} = 10\text{ Vdc}$)		50	300	
		45	270	
		30	200	
($I_C = 50\text{ mAdc}, V_{CE} = 10\text{ Vdc}$)		45	220	
		40	200	
		20	200	
($I_C = 100\text{ mAdc}, V_{CE} = 10\text{ Vdc}$)		25	—	
		20	—	
		15	—	
Collector–Emitter Saturation Voltage ($I_C = 10\text{ mAdc}, I_B = 1.0\text{ mAdc}$) ($I_C = 20\text{ mAdc}, I_B = 2.0\text{ mAdc}$) ($I_C = 30\text{ mAdc}, I_B = 3.0\text{ mAdc}$) ($I_C = 50\text{ mAdc}, I_B = 5.0\text{ mAdc}$)	$V_{CE(sat)}$	—	0.30	Vdc
			0.35	
			0.50	
			1.0	
Base–Emitter Saturation Voltage ($I_C = 10\text{ mAdc}, I_B = 1.0\text{ mAdc}$) ($I_C = 20\text{ mAdc}, I_B = 2.0\text{ mAdc}$) ($I_C = 30\text{ mAdc}, I_B = 3.0\text{ mAdc}$)	$V_{BE(sat)}$	—	0.75	Vdc
			0.85	
			0.90	
Base–Emitter On Voltage ($I_C = 100\text{ mAdc}, V_{CE} = 10\text{ Vdc}$)	$V_{BE(on)}$	—	2.0	Vdc

SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product ⁽¹⁾ ($I_C = 10\text{ mAdc}, V_{CE} = 20\text{ Vdc}, f = 20\text{ MHz}$)	f_T	40	200	MHz
Collector–Base Capacitance ($V_{CB} = 20\text{ Vdc}, I_E = 0, f = 1.0\text{ MHz}$)	C_{cb}	—	6.0	pF
Emitter–Base Capacitance ($V_{EB} = 0.5\text{ Vdc}, I_C = 0, f = 1.0\text{ MHz}$)	C_{eb}	—	80	pF
			100	

SWITCHING CHARACTERISTICS

Turn–On Time ($V_{CC} = 100\text{ Vdc}, V_{BE(off)} = 2.0\text{ Vdc}, I_C = 50\text{ mAdc}, I_{B1} = 10\text{ mAdc}$)	t_{on}	—	200	μs
Turn–Off Time ($V_{CC} = 100\text{ Vdc}, I_C = 50\text{ mAdc}, I_{B1} = I_{B2} = 10\text{ mAdc}$)	t_{off}	—	3.5	μs

1. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

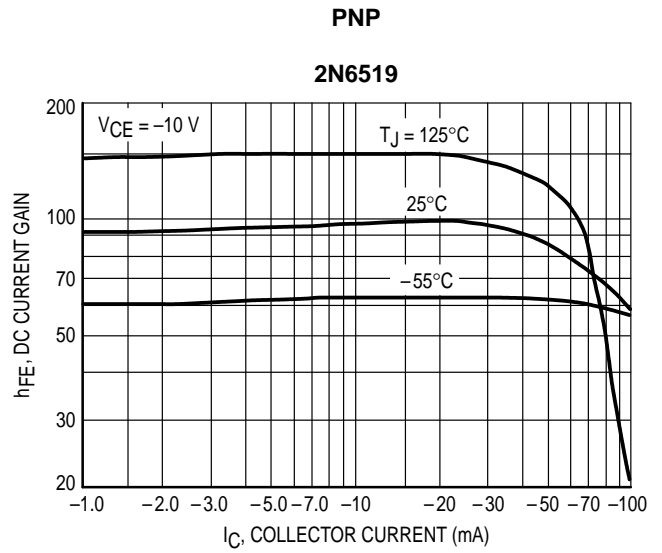
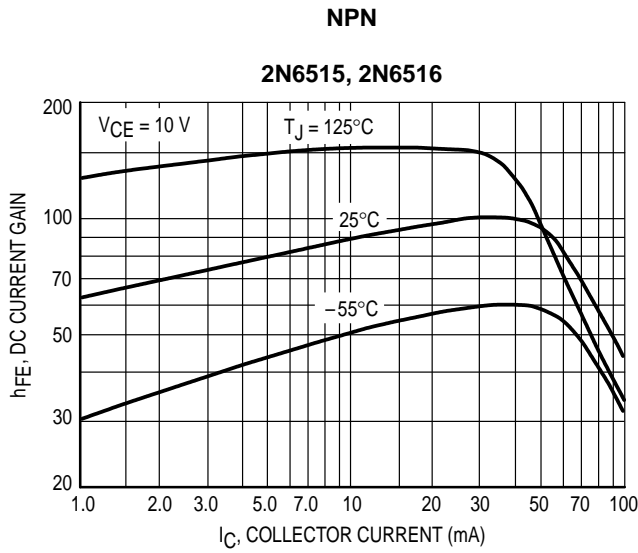


Figure 1. DC Current Gain

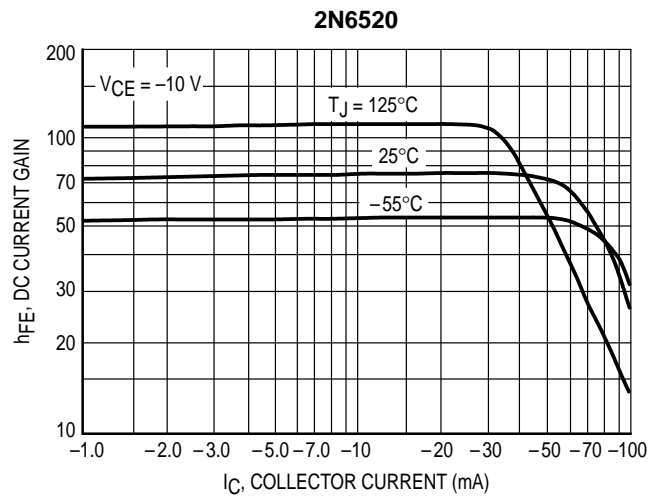
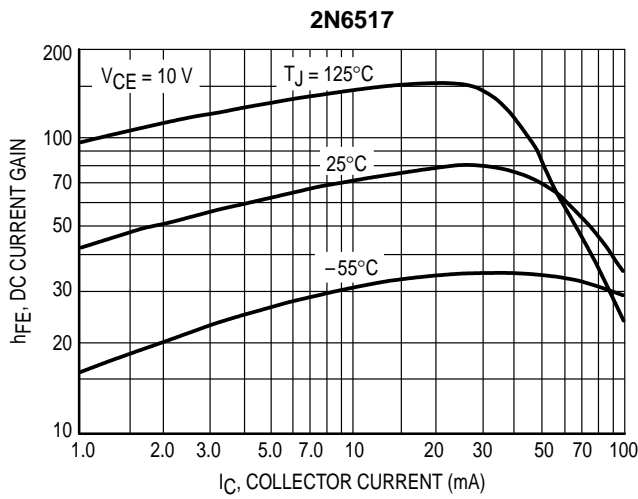


Figure 2. DC Current Gain

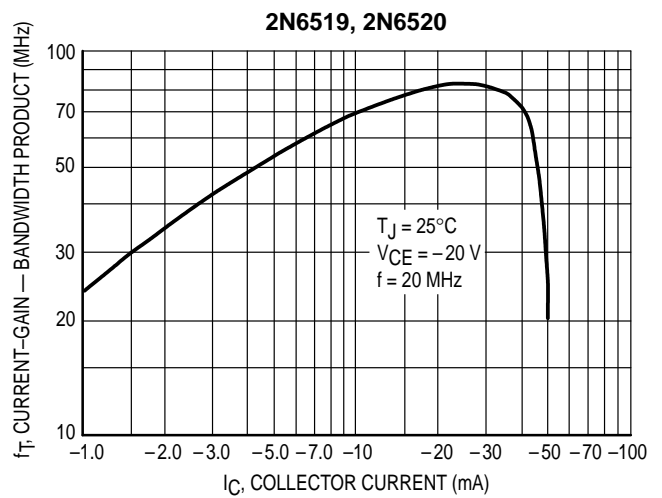
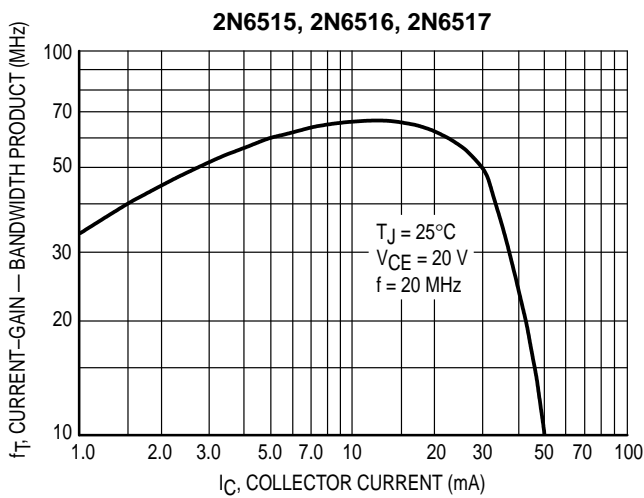
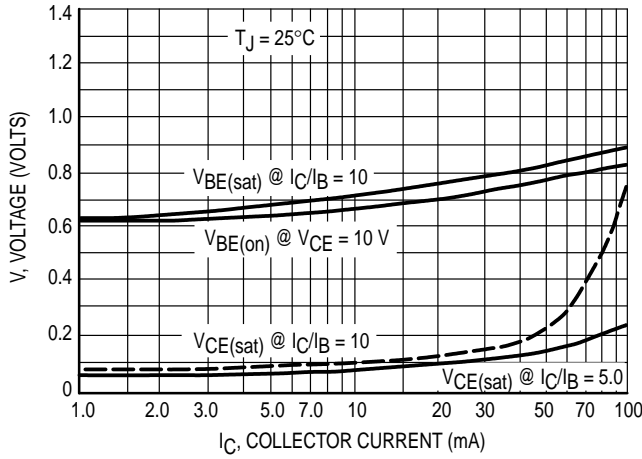


Figure 3. Current-Gain — Bandwidth Product

NPN

2N6515, 2N6516, 2N6517



PNP

2N6519, 2N6520

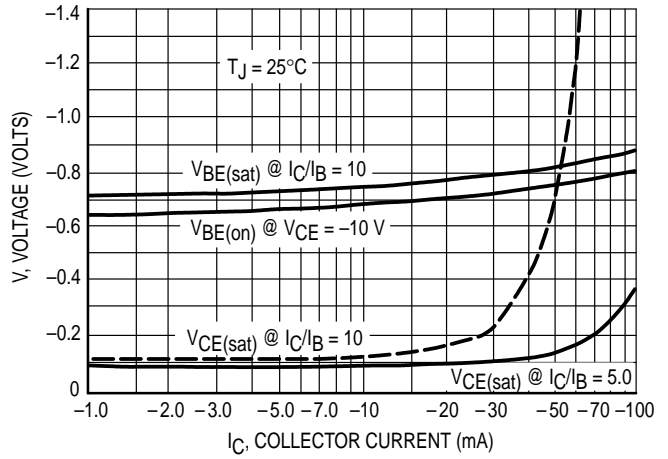
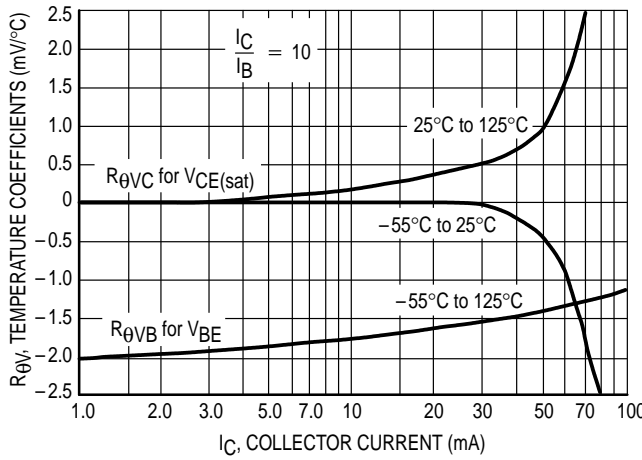


Figure 4. "On" Voltages

2N6515, 2N6516, 2N6517



2N6519, 2N6520

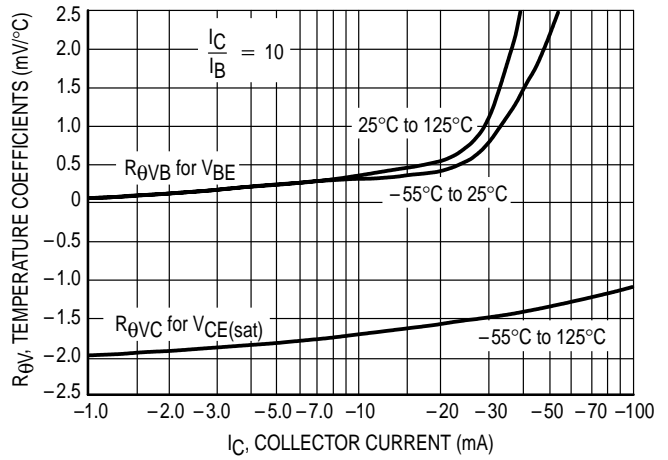
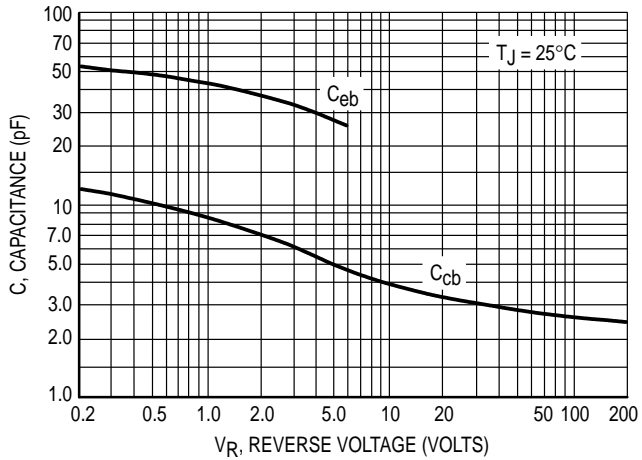


Figure 5. Temperature Coefficients

2N6515, 2N6516, 2N6517



2N6519, 2N6520

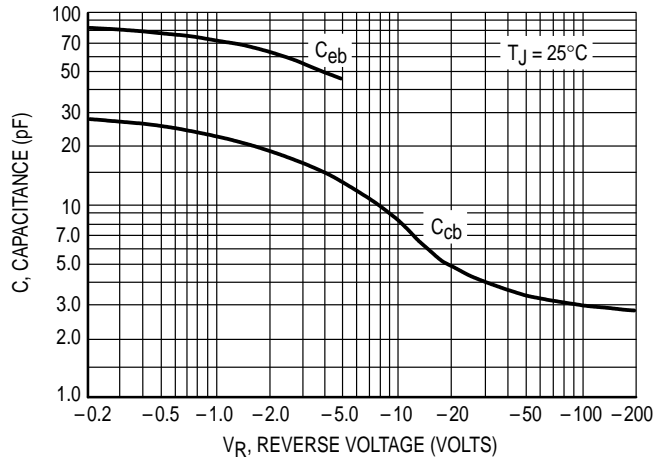


Figure 6. Capacitance

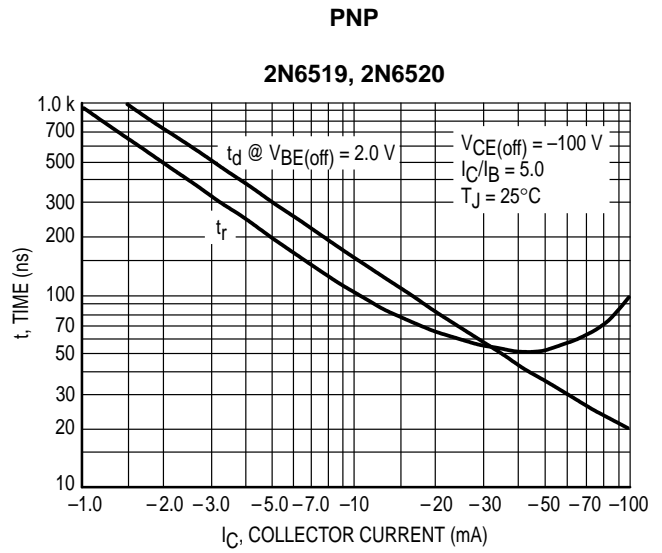
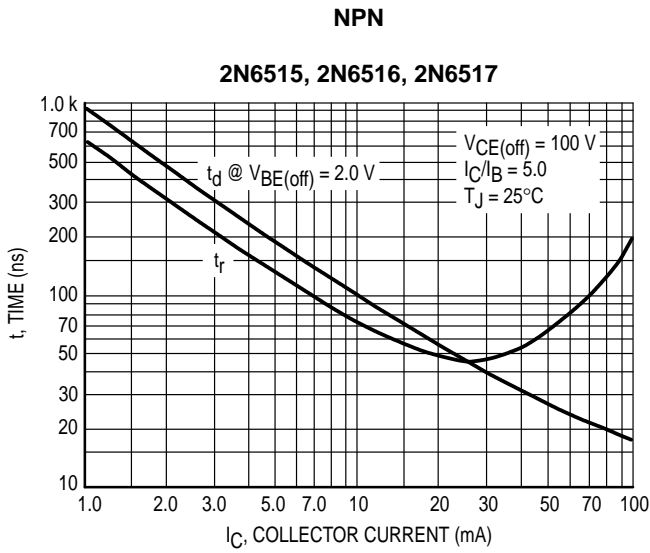


Figure 7. Turn-On Time

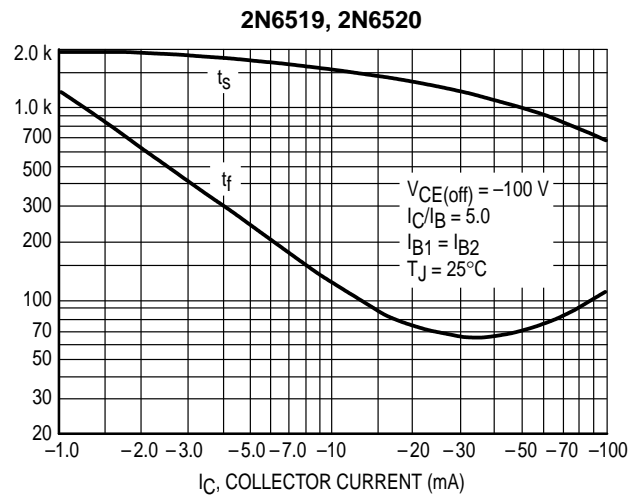
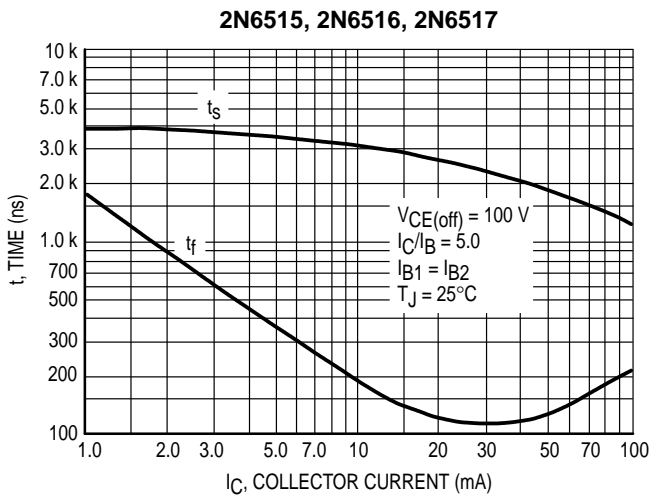


Figure 8. Turn-Off Time

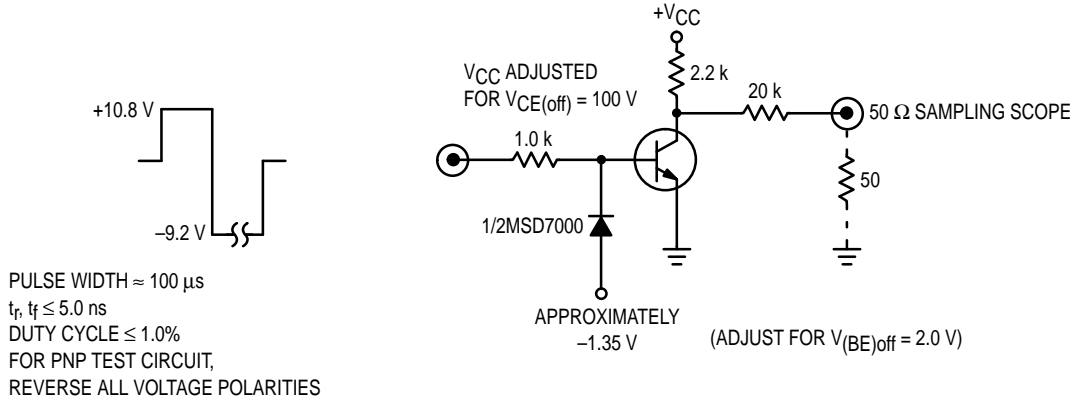


Figure 9. Switching Time Test Circuit

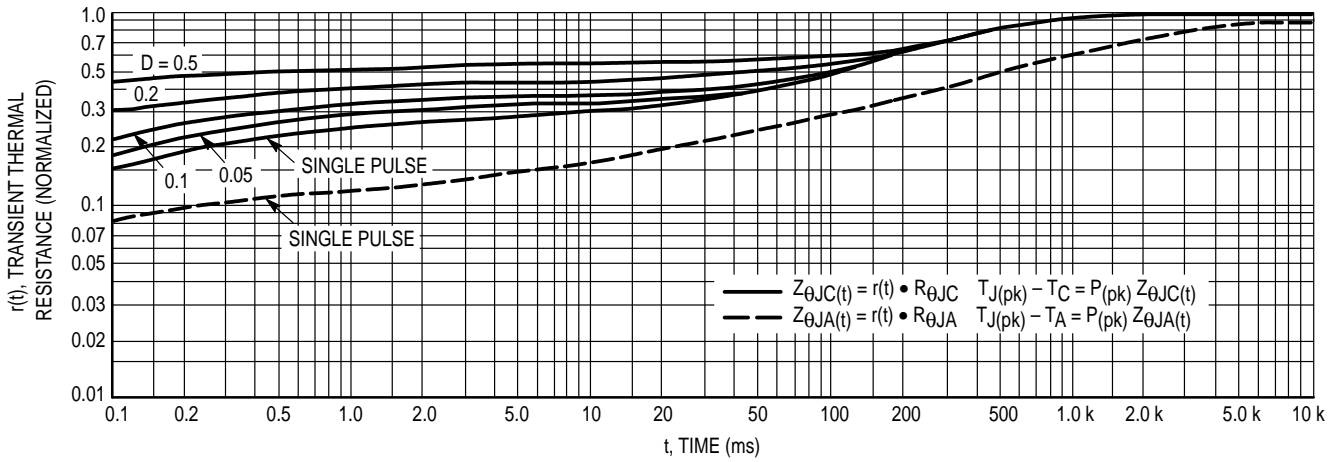


Figure 10. Thermal Response

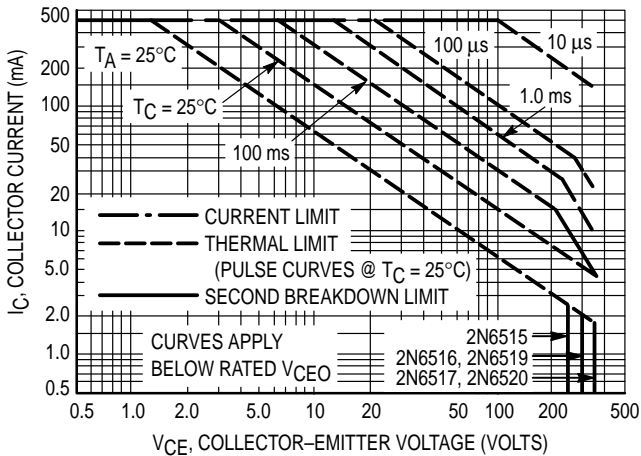
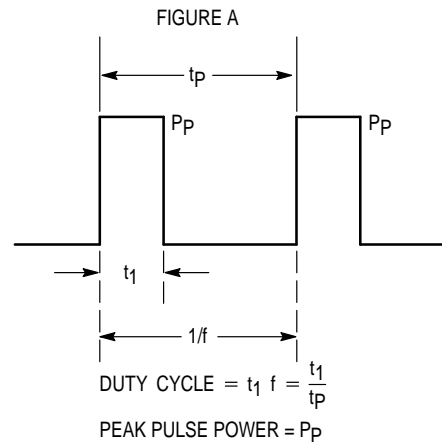
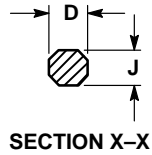
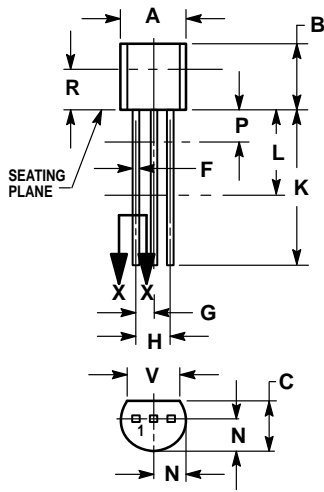


Figure 11. Active Region Safe Operating Area



Design Note: Use of Transient Thermal Resistance Data

PACKAGE DIMENSIONS




CASE 029-04
(TO-226AA)
ISSUE AD

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
 4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K. MINIMUM LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	—	12.70	—
L	0.250	—	6.35	—
N	0.080	0.105	2.04	2.66
P	—	0.100	—	2.54
R	0.115	—	2.93	—
V	0.135	—	3.43	—

- STYLE 1:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

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