

High Voltage Transistors

MAXIMUM RATINGS

Rating	Symbol	2N6515	2N6517 2N6520	Unit
Collector–Emitter Voltage	V_{CEO}	250	350	Vdc
Collector–Base Voltage	V_{CBO}	250	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		$^\circ\text{C}$

THERMAL CHARACTERISTICS

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

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

Characteristic	Symbol	Min	Max	Unit
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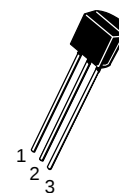
OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ⁽¹⁾ ($I_C = 1.0\text{ mAdc}$, $I_B = 0$)	2N6515 2N6517, 2N6520	$V_{(BR)CEO}$	250 350	– –	Vdc
Collector–Base Breakdown Voltage ($I_C = 100\text{ }\mu\text{Adc}$, $I_E = 0$)	2N6515 2N6517, 2N6520	$V_{(BR)CBO}$	250 350	– –	Vdc
Emitter–Base Breakdown Voltage ($I_E = 10\text{ }\mu\text{Adc}$, $I_C = 0$)	2N6515, 2N6517 2N6520	$V_{(BR)EBO}$	6.0 5.0	– –	Vdc

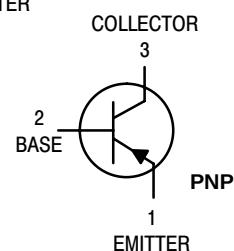
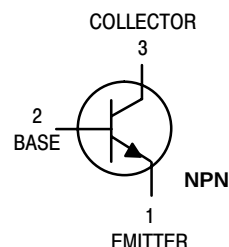
1. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

NPN
2N6515
2N6517
PNP
2N6520

Voltage and current are negative
for PNP transistors



CASE 29–04, STYLE 1
TO–92 (TO–226AA)



NPN 2N6515 2N6517 PNP 2N6520

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

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS (Continued)

Collector Cutoff Current ($V_{CB} = 150\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 250\text{ Vdc}$, $I_E = 0$)	2N6515 2N6517, 2N6520	I_{CBO}	– –	50 50	nAdc
Emitter Cutoff Current ($V_{EB} = 5.0\text{ Vdc}$, $I_C = 0$) ($V_{EB} = 4.0\text{ Vdc}$, $I_C = 0$)	2N6515, 2N6517 2N6520	I_{EBO}	– –	50 50	nAdc

ON CHARACTERISTICS(1)

DC Current Gain ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 30\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 50\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	2N6515 2N6517, 2N6520 2N6515 2N6517, 2N6520 2N6515 2N6517, 2N6520 2N6515 2N6517, 2N6520 2N6515 2N6517, 2N6520	h_{FE}	35 20 50 30 50 30 45 20 25 15	– – – – 300 200 220 200 – –	–
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 0.35 0.50 1.0	Vdc
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 0.85 0.90	Vdc
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 ($V_{EB} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)	2N6515, 2N6517 2N6520	C_{eb}	– –	80 100	pF

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 $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

NPN 2N6515 2N6517 PNP 2N6520

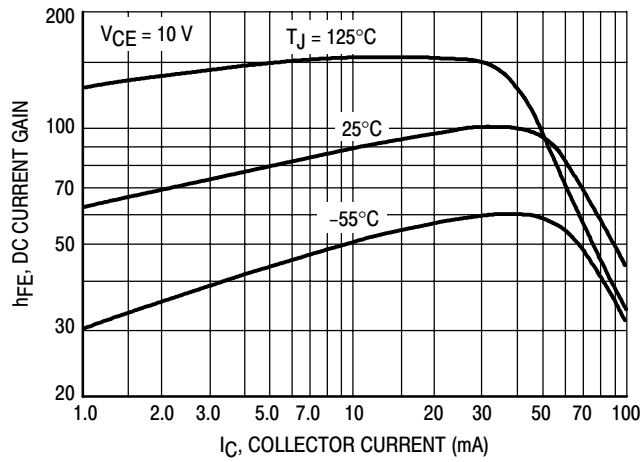


Figure 1. DC Current Gain – NPN 2N6515

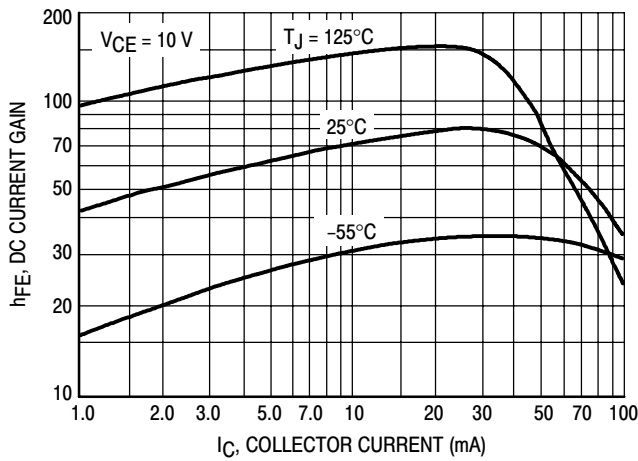


Figure 2. DC Current Gain – NPN 2N6517

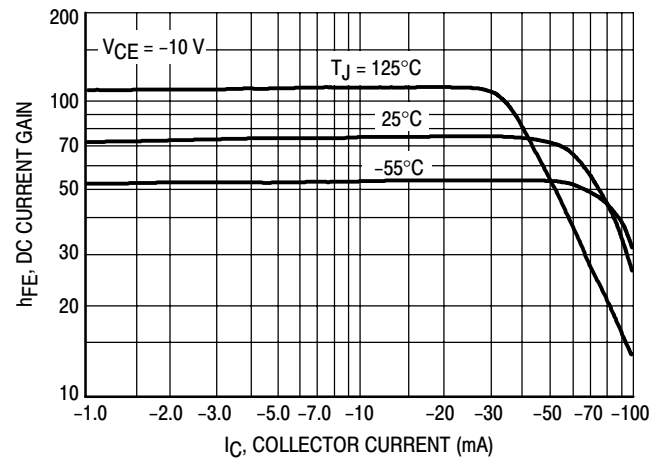


Figure 3. DC Current Gain – PNP 2N6520

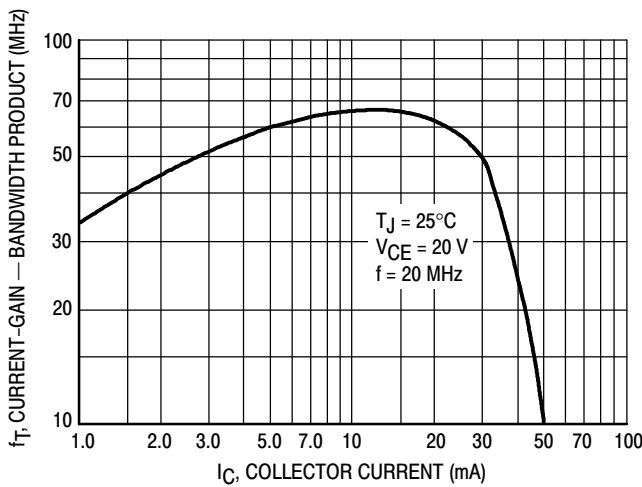


Figure 4. Current-Gain – Bandwidth Product – NPN 2N6515, 2N6517

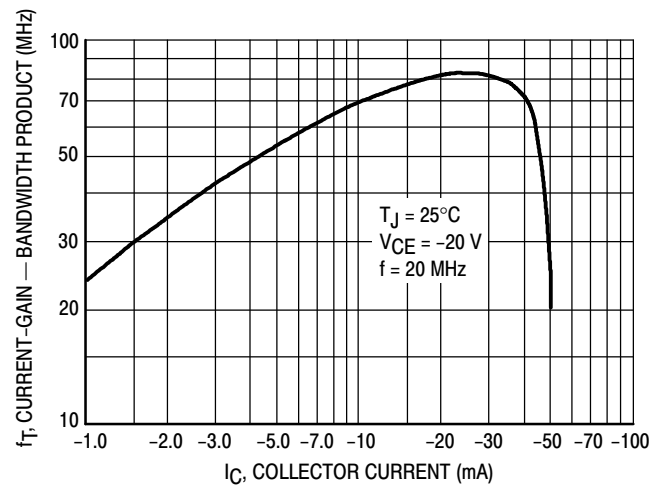


Figure 5. Current-Gain – Bandwidth Product – PNP 2N6520

NPN 2N6515 2N6517 PNP 2N6520

NPN

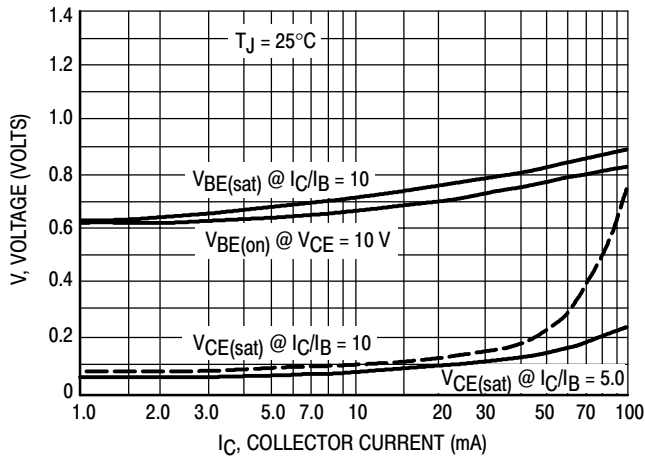


Figure 6. "On" Voltages – NPN 2N6515, 2N6517

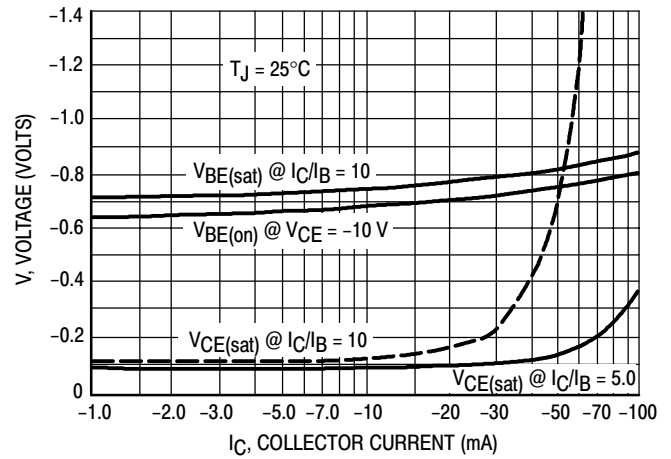


Figure 7. "On" Voltages – PNP 2N6520

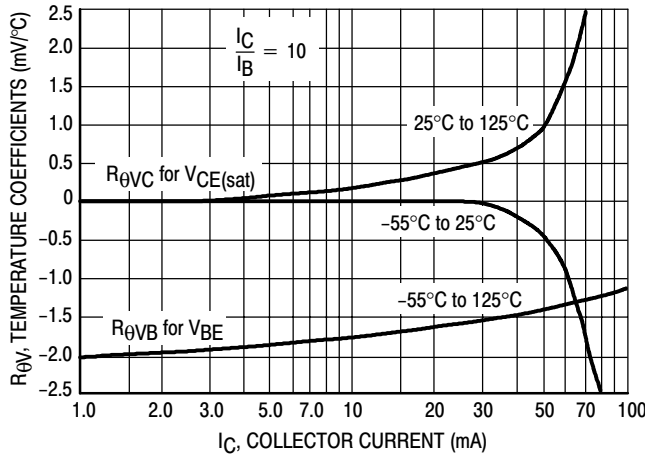


Figure 8. Temperature Coefficients – NPN 2N6515, 2N6517

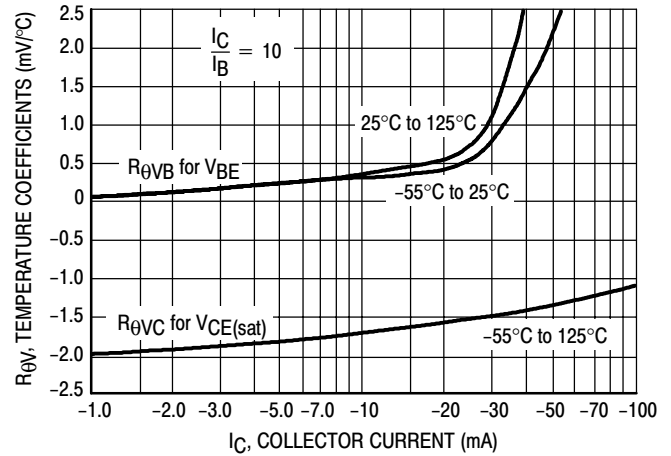


Figure 9. Temperature Coefficients – PNP 2N6520

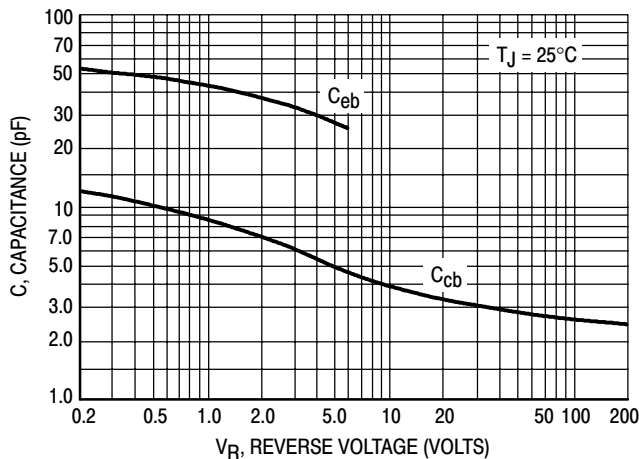


Figure 10. Capacitance – NPN 2N6515, 2N6517

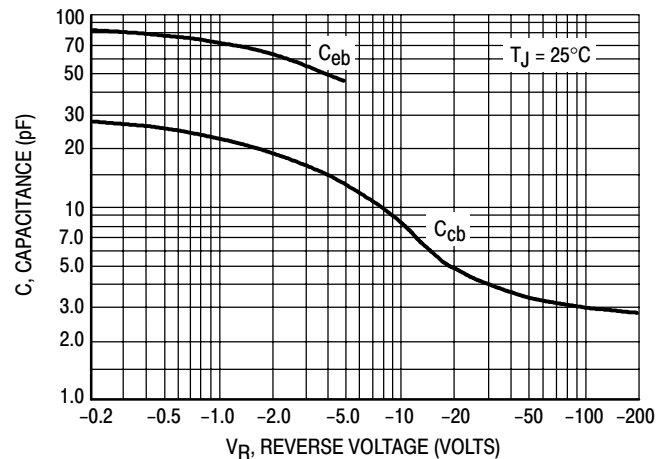


Figure 11. Capacitance – PNP 2N6520

NPN 2N6515 2N6517 PNP 2N6520

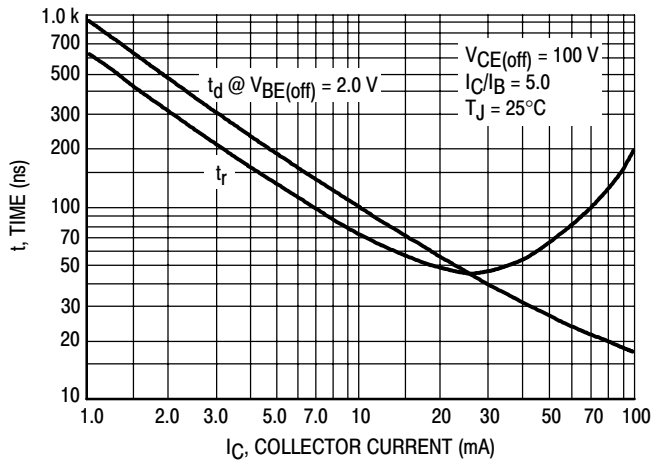


Figure 12. Turn-On Time – NPN 2N6515, 2N6517

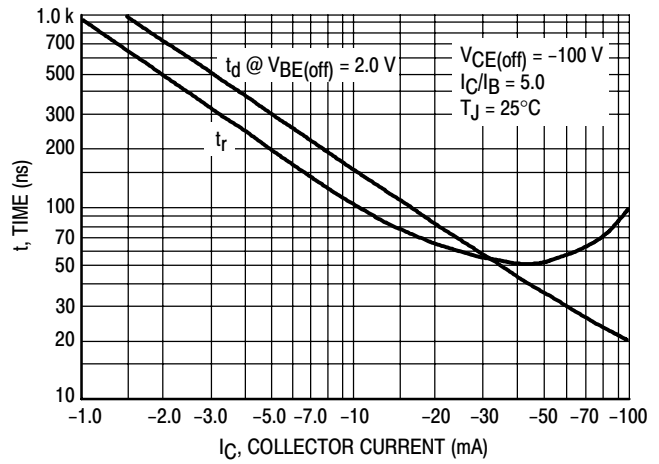


Figure 13. Turn-On Time – PNP 2N6520

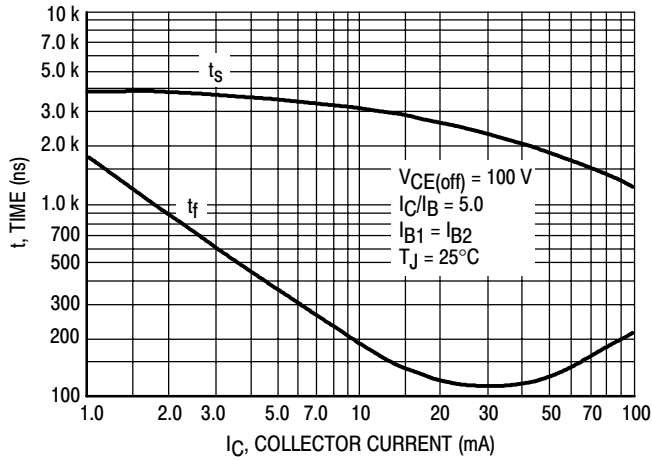


Figure 14. Turn-Off Time – NPN 2N6515, 2N6517

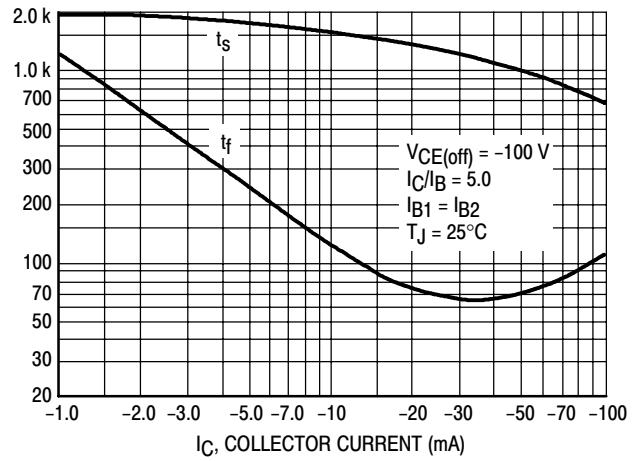


Figure 15. Turn-Off Time – PNP 2N6520

NPN 2N6515 2N6517 PNP 2N6520

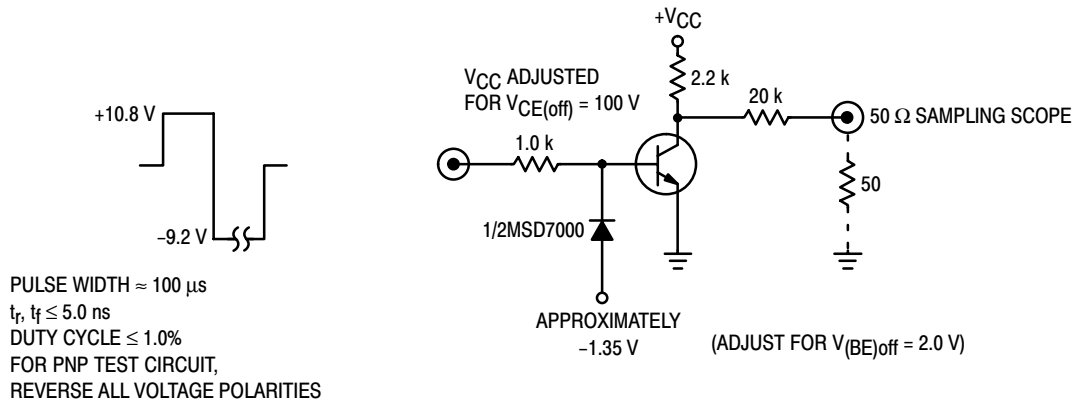


Figure 16. Switching Time Test Circuit

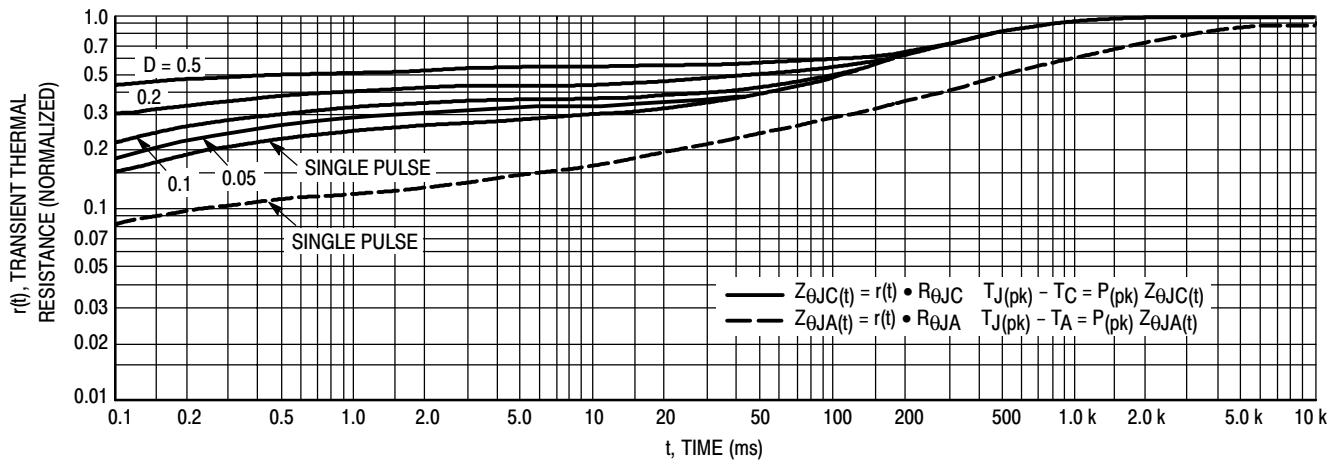


Figure 17. Thermal Response

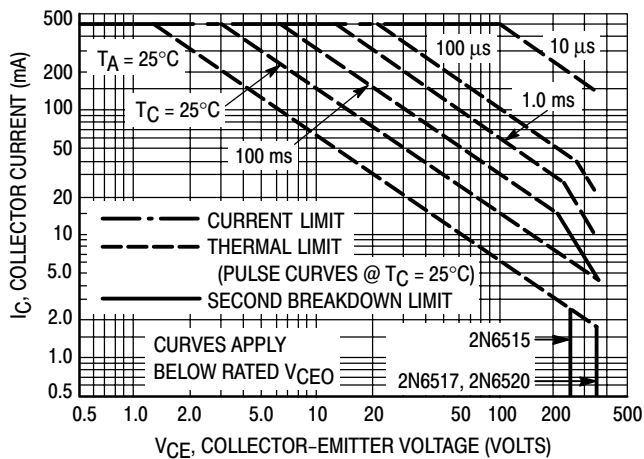
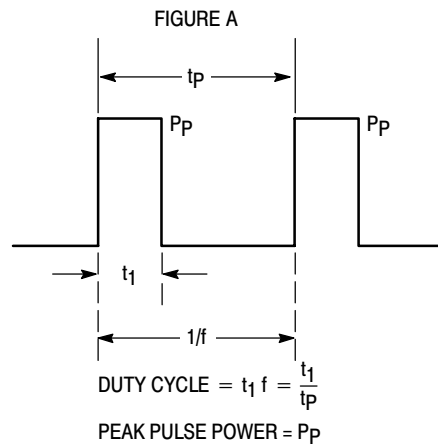


Figure 18. Active Region Safe Operating Area

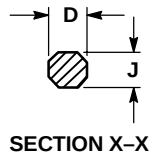
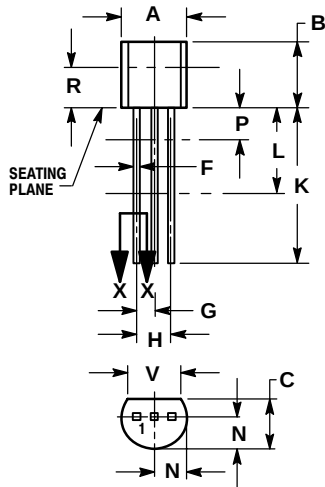


Design Note: Use of Transient Thermal Resistance Data

NPN 2N6515 2N6517 PNP 2N6520

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:

1. EMITTER
2. BASE
3. COLLECTOR

NPN 2N6515 2N6517 PNP 2N6520

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