NPN - 2N6515, 2N6517; PNP - 2N6520

High Voltage Transistors

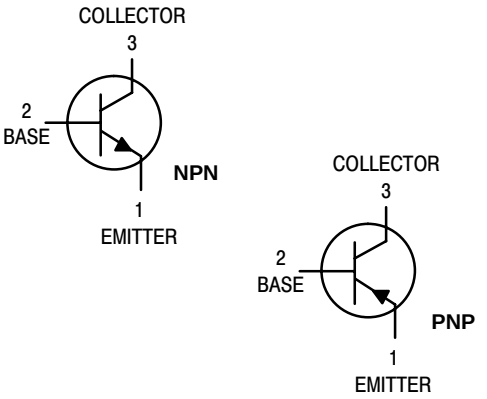
NPN and PNP

ON Semiconductor®

http://onsemi.com

Features

- Voltage and Current are Negative for PNP Transistors
- These are Pb−Free Devices*



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector − Emitter Voltage 2N6515 2N6517, 2N6520	V_{CEO}	 250 350	Vdc
Collector − Base Voltage 2N6515 2N6517, 2N6520	V_{CBO}	 250 350	Vdc
Emitter − Base Voltage 2N6515, 2N6517 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°C Derate above 25°C	P_D	625 5.0	mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	1.5 12	W mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +150	°C

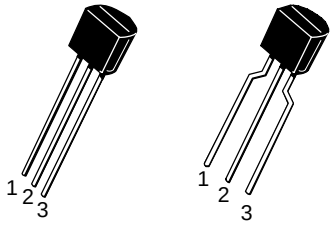
THERMAL CHARACTERISTICS

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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

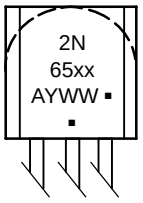
TO−92
CASE 29
STYLE 1



STRAIGHT LEAD
BULK PACK

BENT LEAD
TAPE & REEL
AMMO PACK

MARKING DIAGRAM



xx = 15, 17, or 20
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Breakdown Voltage (Note 1)		$V_{(BR)CEO}$			Vdc
(I_C = 1.0 mAdc, I_B = 0)	2N6515		250	−	
	2N6517, 2N6520		350	−	
Collector−Base Breakdown Voltage		$V_{(BR)CBO}$			Vdc
(I_C = 100 μAdc, I_E = 0)	2N6515		250	−	
	2N6517, 2N6520		350	−	
Emitter−Base Breakdown Voltage		$V_{(BR)EBO}$			Vdc
(I_E = 10 μAdc, I_C = 0)	2N6515, 2N6517		6.0	−	
	2N6520		5.0	−	
Collector Cutoff Current		I_{CBO}			nAdc
(V_{CB} = 150 Vdc, I_E = 0)	2N6515		−	50	
(V_{CB} = 250 Vdc, I_E = 0)	2N6517, 2N6520		−	50	
Emitter Cutoff Current		I_{EBO}			nAdc
(V_{EB} = 5.0 Vdc, I_C = 0)	2N6515, 2N6517		−	50	
(V_{EB} = 4.0 Vdc, I_C = 0)	2N6520		−	50	
ON CHARACTERISTICS (Note 1)					
DC Current Gain		h_{FE}			−
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)	2N6515		35	−	
	2N6517, 2N6520		20	−	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)	2N6515		50	−	
	2N6517, 2N6520		30	−	
(I_C = 30 mAdc, V_{CE} = 10 Vdc)	2N6515		50	300	
	2N6517, 2N6520		30	200	
(I_C = 50 mAdc, V_{CE} = 10 Vdc)	2N6515		45	220	
	2N6517, 2N6520		20	200	
(I_C = 100 mAdc, V_{CE} = 10 Vdc)	2N6515		25	−	
	2N6517, 2N6520		15	−	
Collector−Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)			−	0.30	
(I_C = 20 mAdc, I_B = 2.0 mAdc)			−	0.35	
(I_C = 30 mAdc, I_B = 3.0 mAdc)			−	0.50	
(I_C = 50 mAdc, I_B = 5.0 mAdc)			−	1.0	
Base−Emitter Saturation Voltage		$V_{BE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)			−	0.75	
(I_C = 20 mAdc, I_B = 2.0 mAdc)			−	0.85	
(I_C = 30 mAdc, I_B = 3.0 mAdc)			−	0.90	
Base−Emitter On Voltage		$V_{BE(on)}$	−	2.0	Vdc
(I_C = 100 mAdc, V_{CE} = 10 Vdc)					
SMALL−SIGNAL CHARACTERISTICS					
Current−Gain − Bandwidth Product (Note 1)		f_T	40	200	MHz
(I_C = 10 mAdc, V_{CE} = 20 Vdc, f = 20 MHz)					
Collector−Base Capacitance		C_{cb}	−	6.0	pF
(V_{CB} = 20 Vdc, I_E = 0, f = 1.0 MHz)					
Emitter−Base Capacitance		C_{eb}			pF
(V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	2N6515, 2N6517		−	80	
	2N6520		−	100	
SWITCHING CHARACTERISTICS					
Turn−On Time		t_{on}	−	200	μs
(V_{CC} = 100 Vdc, $V_{BE(off)}$ = 2.0 Vdc, I_C = 50 mAdc, I_{B1} = 10 mAdc)					
Turn−Off Time		t_{off}	−	3.5	μs
(V_{CC} = 100 Vdc, I_C = 50 mAdc, I_{B1} = I_{B2} = 10 mAdc)					

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

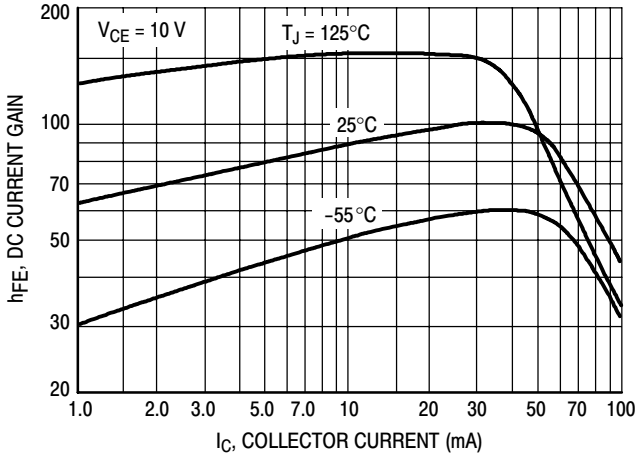


Figure 1. DC Current Gain
NPN 2N6515

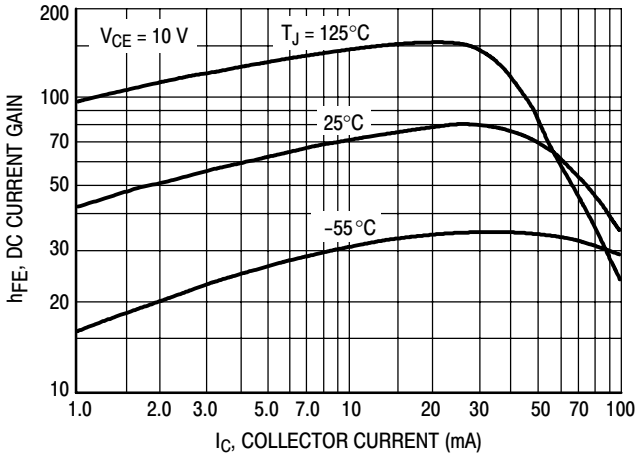


Figure 2. DC Current Gain
NPN 2N6517

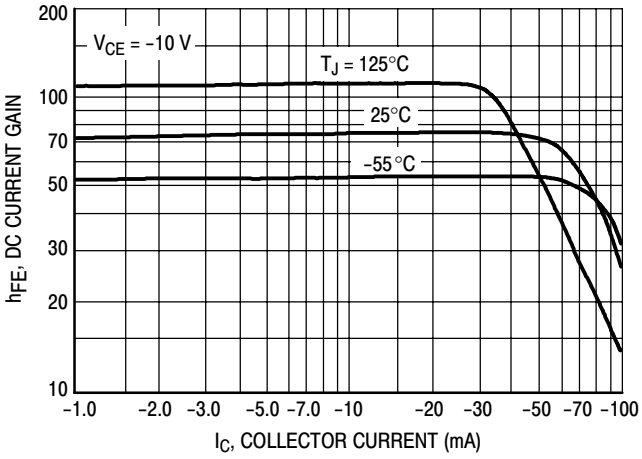


Figure 3. DC Current Gain
PNP 2N6520

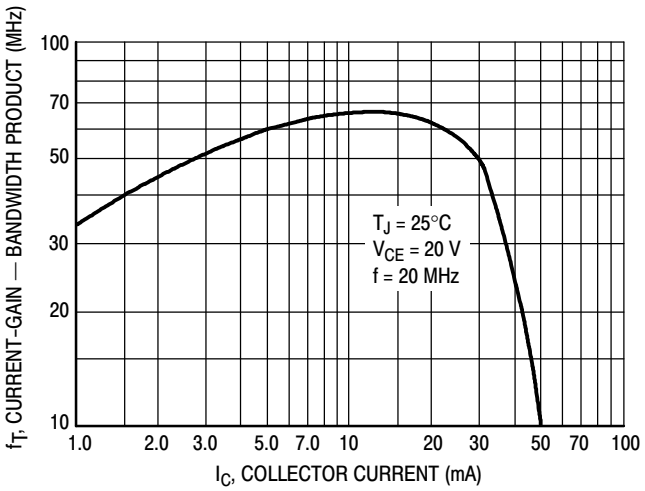


Figure 4. Current−Gain − Bandwidth Product
NPN 2N6515, 2N6517

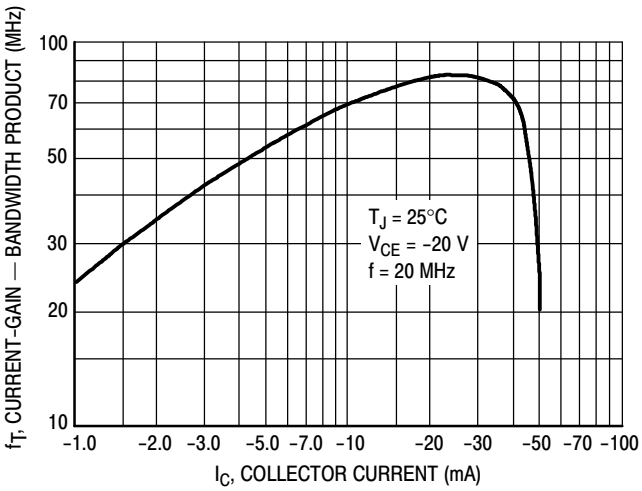


Figure 5. Current−Gain − Bandwidth Product
PNP 2N6520

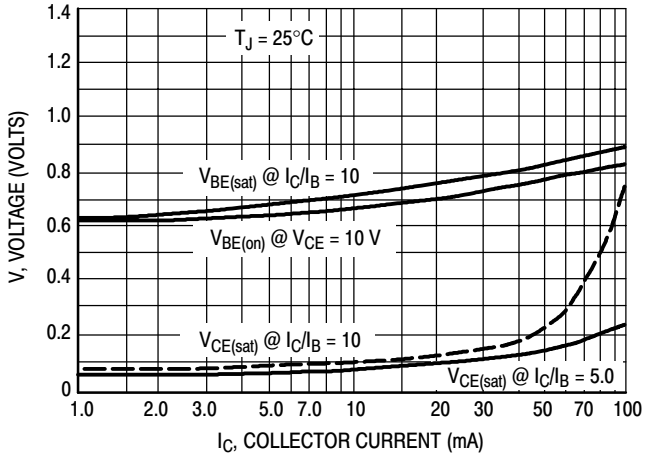


Figure 6. “On” Voltages
NPN 2N6515, 2N6517

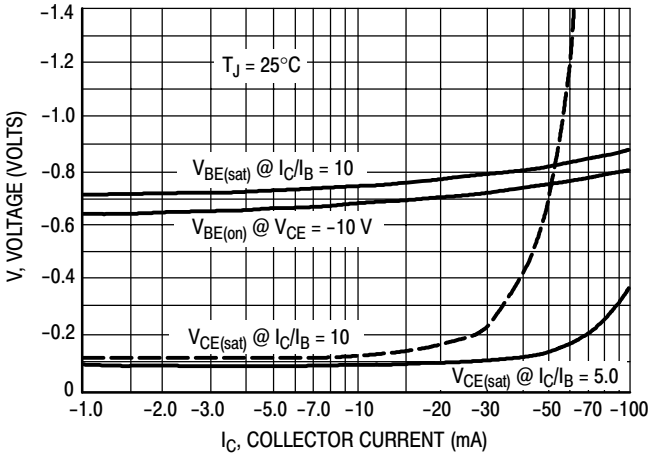


Figure 7. “On” Voltages
PNP 2N6520

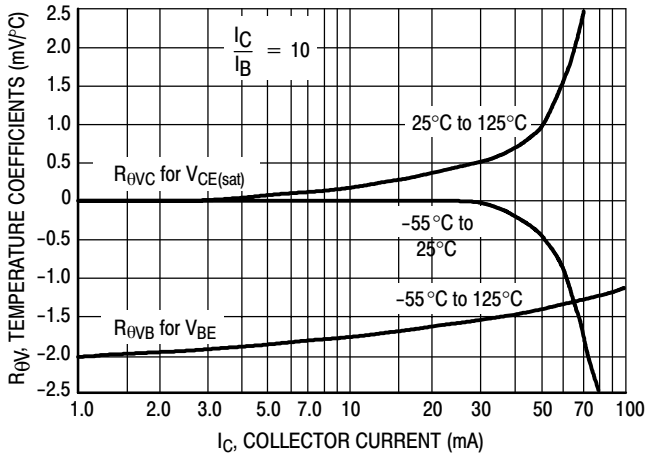


Figure 8. Temperature Coefficients
NPN 2N6515, 2N6517

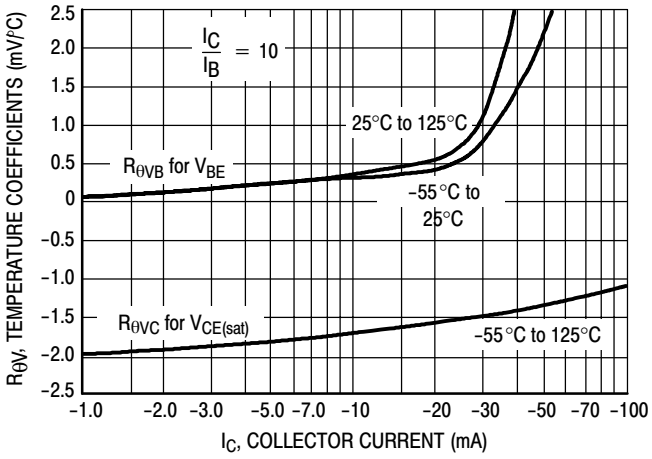


Figure 9. Temperature Coefficients
PNP 2N6520

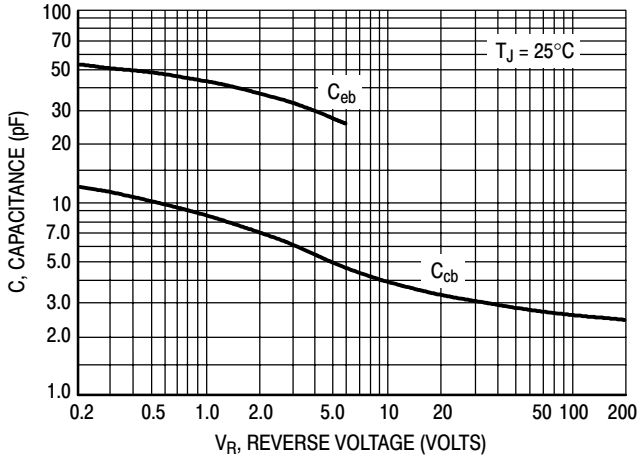


Figure 10. Capacitance
NPN 2N6515, 2N6517

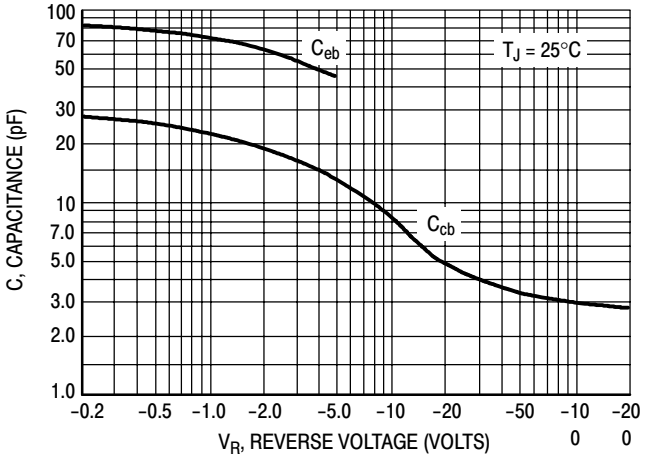


Figure 11. Capacitance
PNP 2N6520

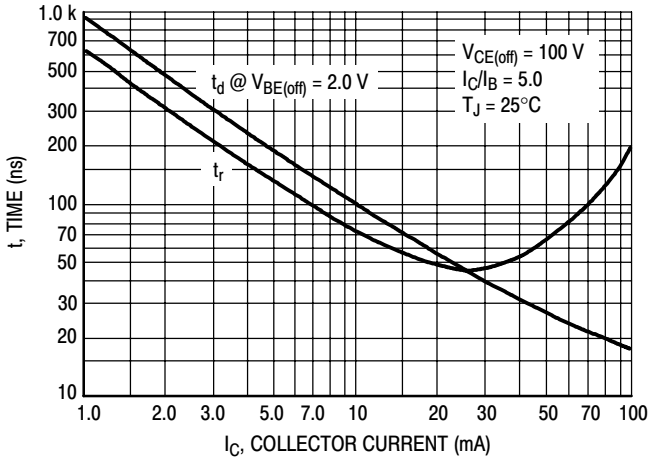


Figure 12. Turn−On Time
NPN 2N6515, 2N6517

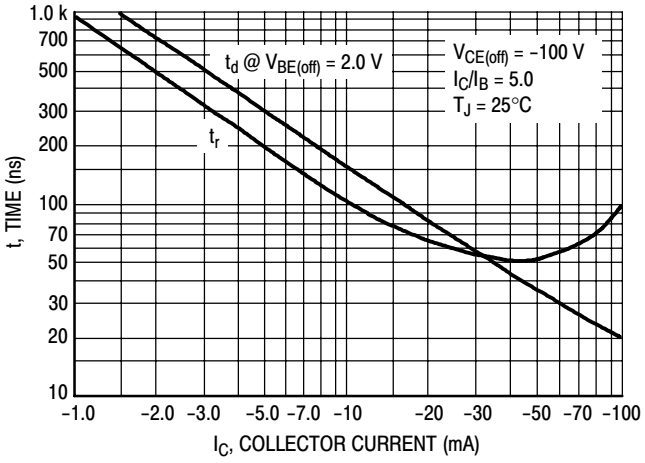


Figure 13. Turn−On Time
PNP 2N6520

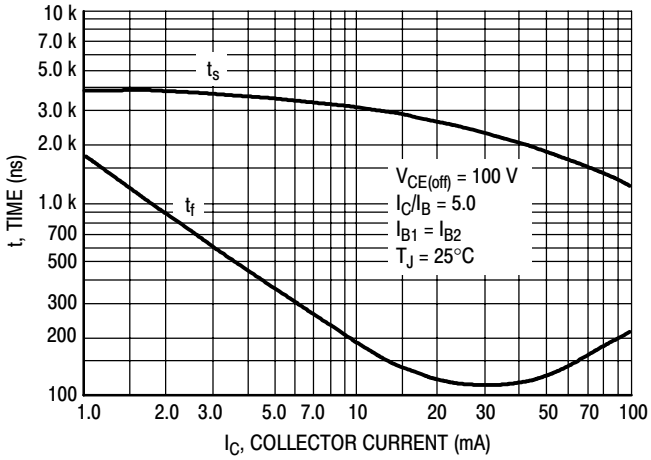


Figure 14. Turn−Off Time
NPN 2N6515, 2N6517

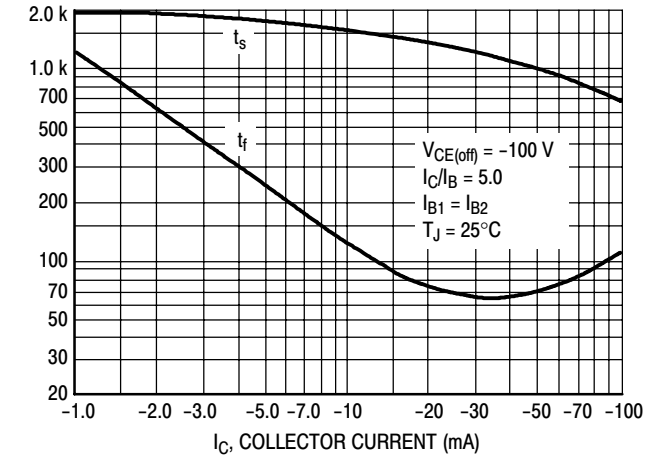


Figure 15. Turn−Off Time
PNP 2N6520

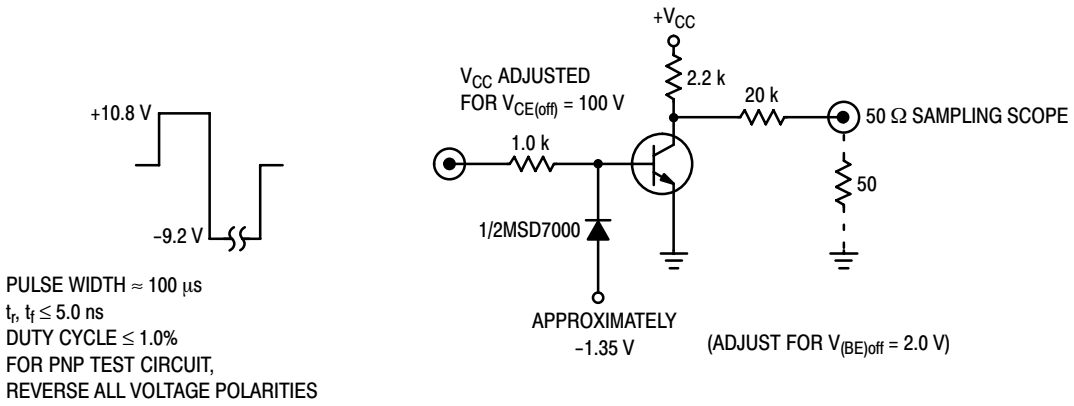


Figure 16. Switching Time Test Circuit

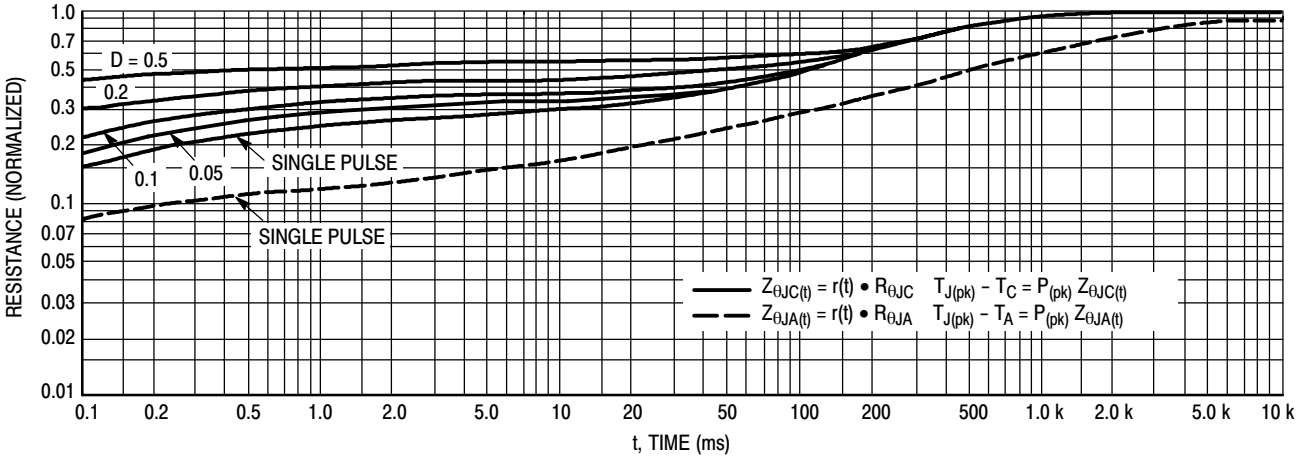


Figure 17. Thermal Response

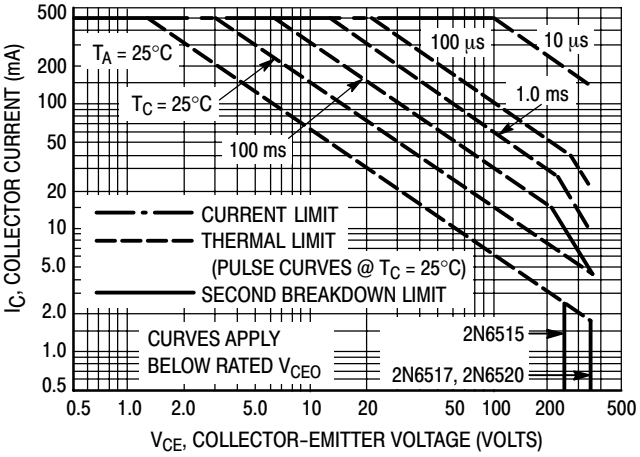
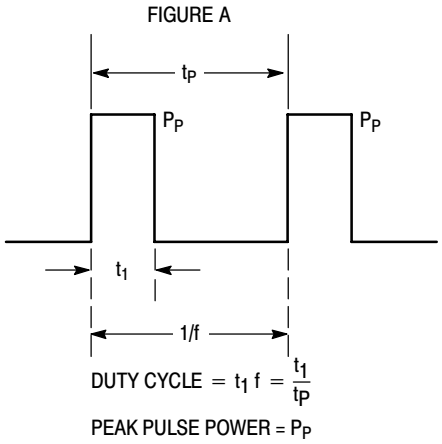


Figure 18. Active Region Safe Operating Area



Design Note: Use of Transient Thermal Resistance Data

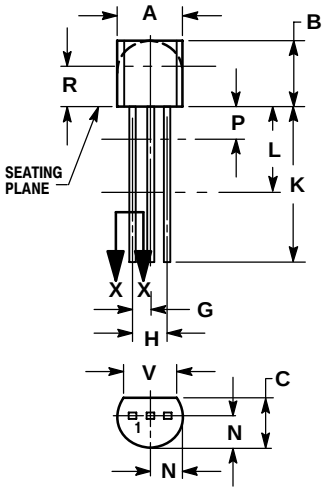
ORDERING INFORMATION

Device	Package	Shipping†
2N6515RLRMG	TO−92 (Pb−Free)	2000 Ammo Pack
2N6517G	TO−92 (Pb−Free)	5000 Unit / Bulk
2N6517RLRPG	TO−92 (Pb−Free)	2000 Ammo Pack
2N6520RLRAG	TO−92 (Pb−Free)	2000 Tape & Reel

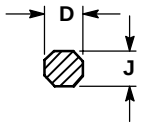
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

TO−92 (TO−226)
CASE 29−11
ISSUE AM



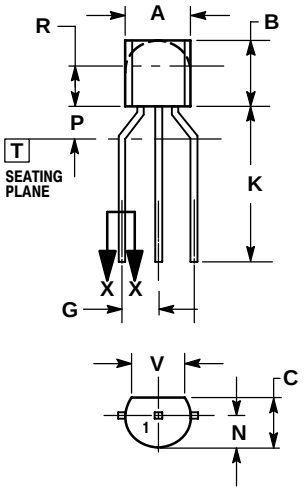
STRAIGHT LEAD
BULK PACK



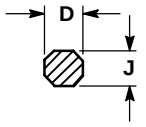
SECTION X−X

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

	INCHES		MILLIMETERS	
DIM	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	0.021	0.407	0.533
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	---



BENT LEAD
TAPE & REEL
AMMO PACK



SECTION X−X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	MILLIMETERS	
DIM	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

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

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