

# High-Power NPN Silicon Transistor

... for use in power amplifier and switching circuits applications.

- Low Collector–Emitter Saturation Voltage –  
 $V_{CE(sat)} = 0.75 \text{ Vdc (Max) @ } I_C = 10 \text{ Adc}$

## \*MAXIMUM RATINGS

Rating	Symbol	2N5302	Unit
Collector–Emitter Voltage	$V_{CEO}$	60	Vdc
Collector–Base Voltage	$V_{CB}$	60	Vdc
Collector Current – Continuous	$I_C$	30	Adc
Base Current	$I_B$	7.5	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	200 1.14	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200	$^\circ\text{C}$

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$\theta_{JC}$	0.875	$^\circ\text{C/W}$
Thermal Resistance, Case to Ambient	$\theta_{CA}$	34	$^\circ\text{C/W}$

\*Indicates JEDEC Registered Data.

**2N5302**

**30 AMPERE  
POWER TRANSISTOR  
NPN SILICON  
60 VOLTS  
200 WATTS**

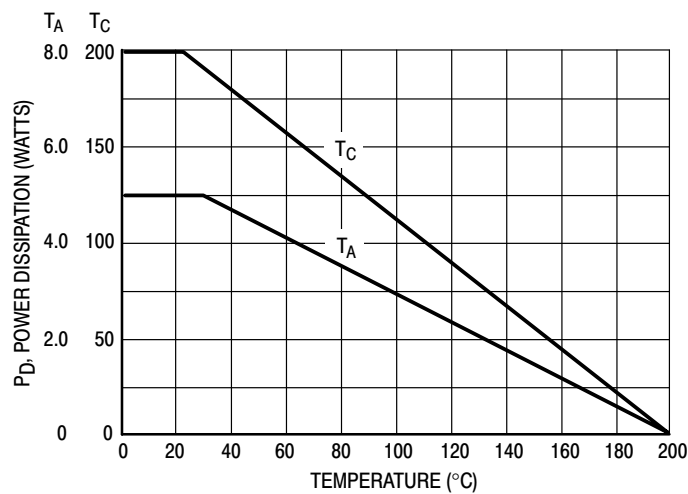
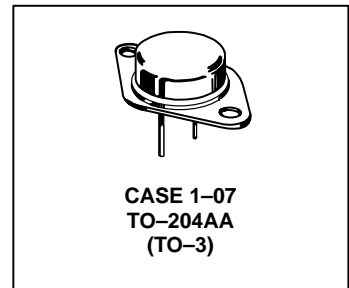


Figure 1. Power Temperature Derating Curve

# 2N5302

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>*OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (Note 1) (I <sub>C</sub> = 200 mA, I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	60	–	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 60 Vdc, I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	5.0	mA
Collector Cutoff Current (V <sub>CE</sub> = 60 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc)	I <sub>CEx</sub>	–	1.0	mA
Collector Cutoff Current (V <sub>CE</sub> = 60 Vdc, V <sub>EB(off)</sub> = 1.5 Vdc, T <sub>C</sub> = 150°C)	I <sub>CEx</sub>	–	10	mA
Collector Cutoff Current (V <sub>CB</sub> = 80 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	–	1.0	mA
Emitter Cutoff Current (V <sub>BE</sub> = 5.0 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	–	5.0	mA

### ON CHARACTERISTICS

DC Current Gain (Note 1) *(I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 2.0 Vdc) *(I <sub>C</sub> = 15 A, V <sub>CE</sub> = 2.0 Vdc) (I <sub>C</sub> = 30 A, V <sub>CE</sub> = 4.0 Vdc)	h <sub>FE</sub>	40 15 5.0	– 60 –	–
*Collector–Emitter Saturation Voltage (Note 1) (I <sub>C</sub> = 10 A, I <sub>B</sub> = 1.0 A) (I <sub>C</sub> = 20 A, I <sub>B</sub> = 2.0 A) (I <sub>C</sub> = 30 A, I <sub>B</sub> = 6.0 A)	V <sub>CE(sat)</sub>	– – –	0.75 2.0 3.0	Vdc
*Base Emitter Saturation Voltage (Note 1) (I <sub>C</sub> = 10 A, I <sub>B</sub> = 1.0 A) (I <sub>C</sub> = 15 A, I <sub>B</sub> = 1.5 A) (I <sub>C</sub> = 20 A, I <sub>B</sub> = 2.0 A)	V <sub>BE(sat)</sub>	– – –	1.7 1.8 2.5	Vdc
*Base–Emitter On Voltage (Note 1) (I <sub>C</sub> = 15 A, V <sub>CE</sub> = 2.0 Vdc) (I <sub>C</sub> = 30 A, V <sub>CE</sub> = 4.0 Vdc)	V <sub>BE(on)</sub>	– –	1.7 3.0	Vdc

### \*DYNAMIC CHARACTERISTICS

Current–Gain – Bandwidth Product (I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 10 Vdc, f = 1.0 MHz)	f <sub>T</sub>	2.0	–	MHz
Small–Signal Current Gain (I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 10 Vdc, f = 1.0 kHz)	h <sub>fe</sub>	40	–	–

### \*SWITCHING CHARACTERISTICS

Rise Time	(V <sub>CC</sub> = 30 Vdc, I <sub>C</sub> = 10 A, I <sub>B1</sub> = I <sub>B2</sub> = 1.0 A)	t <sub>r</sub>	–	1.0	μs
Storage Time		t <sub>s</sub>	–	2.0	μs
Fall Time		t <sub>f</sub>	–	1.0	μs

\*Indicates JEDEC Registered Data.

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

### SWITCHING TIME EQUIVALENT TEST CIRCUITS

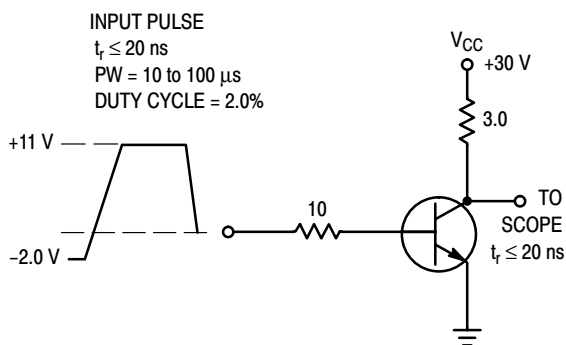


Figure 2. Turn–On time

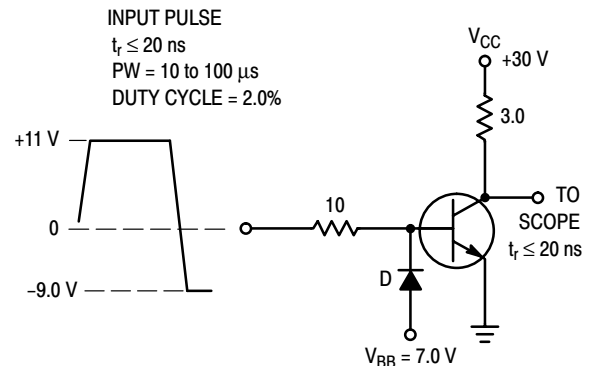


Figure 3. Turn–Off time

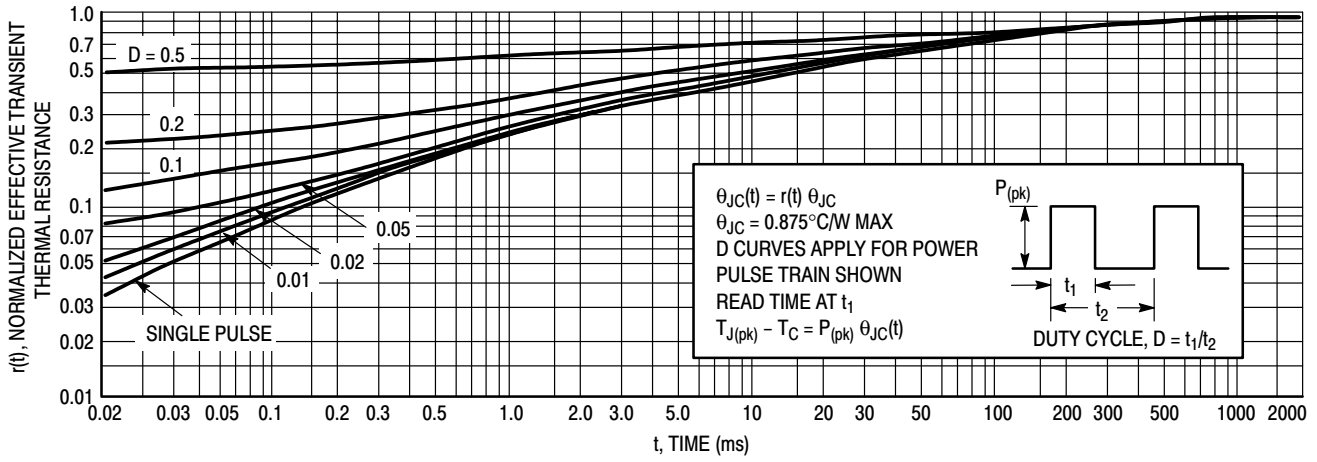


Figure 4. Thermal Response

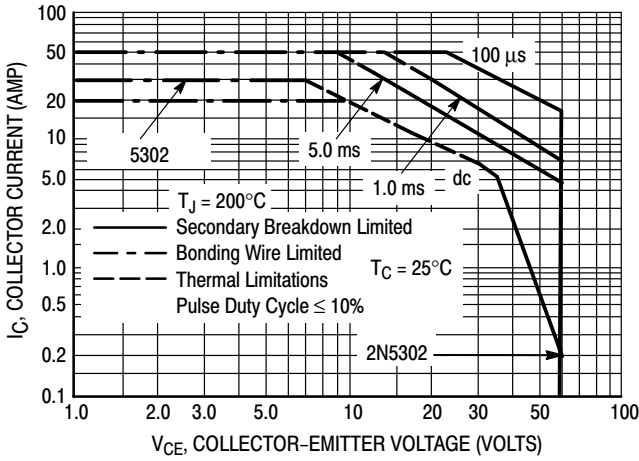


Figure 5. Active-Region Safe Operating Area

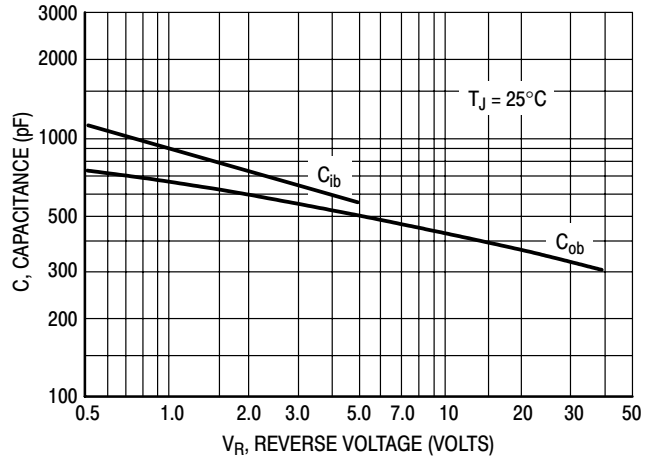


Figure 6. Capacitance versus Voltage

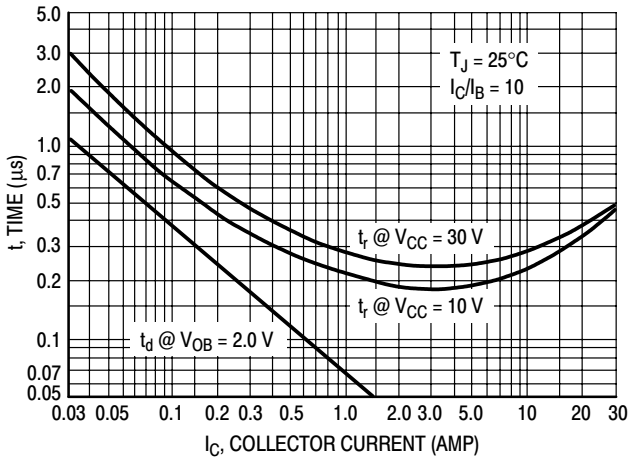


Figure 7. Turn-On Time

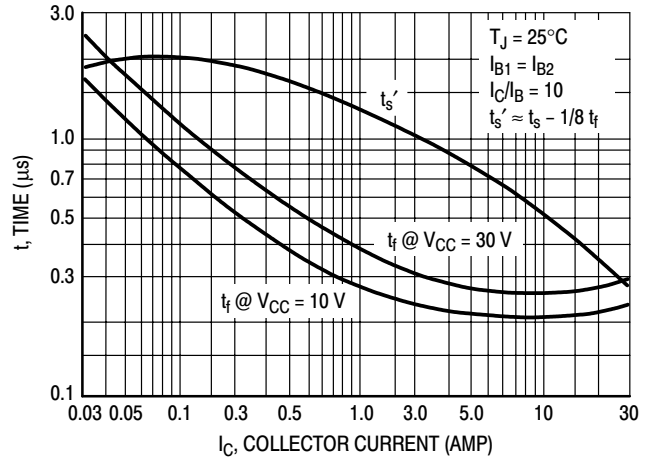


Figure 8. Turn-Off Time

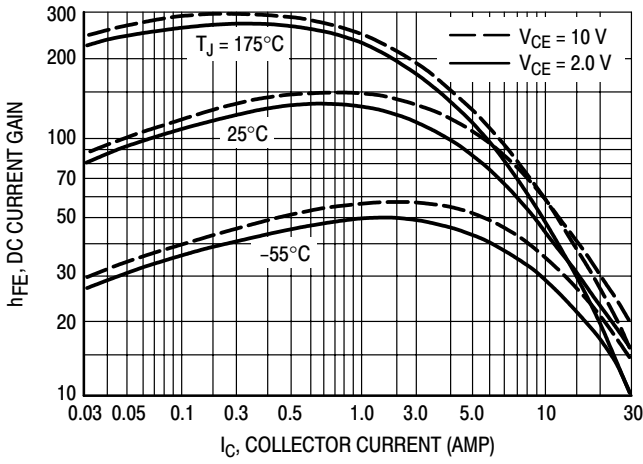


Figure 9. DC Current Gain

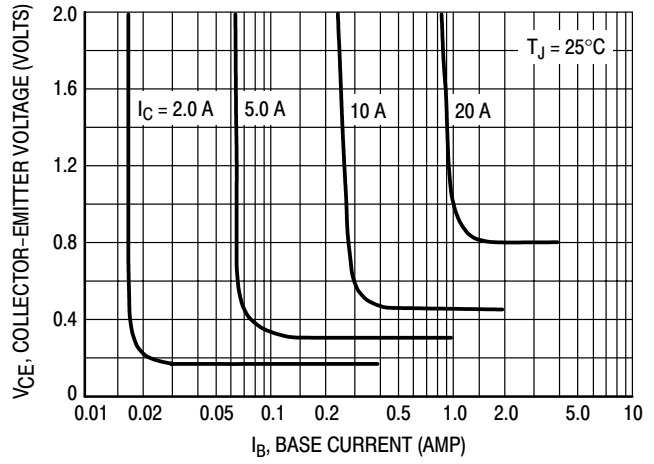


Figure 10. Collector Saturation Region

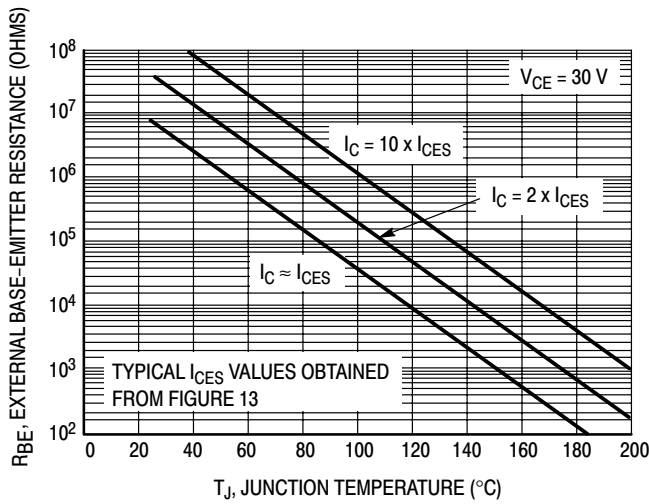


Figure 11. Effects of Base-Emitter Resistance

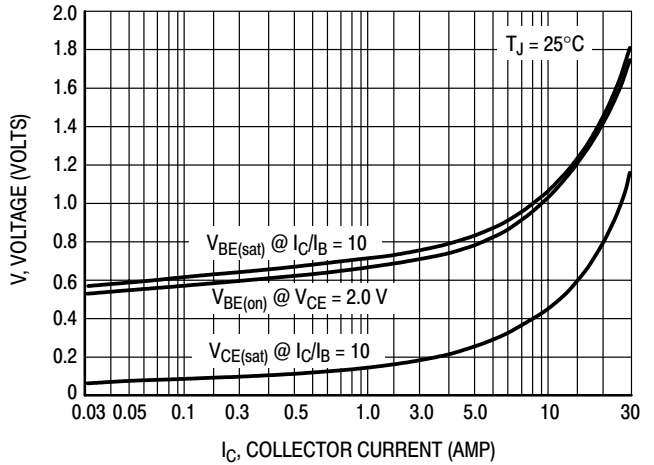


Figure 12. "On" Voltages

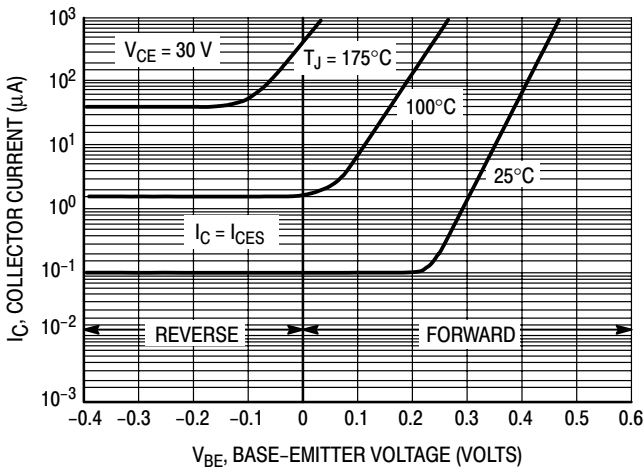


Figure 13. Collector Cut-Off Region

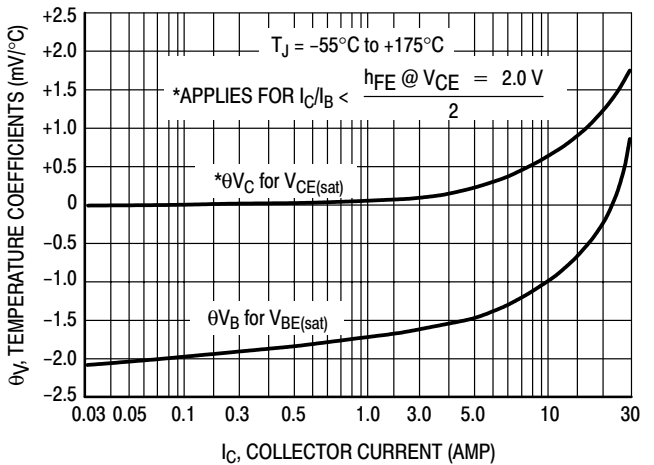
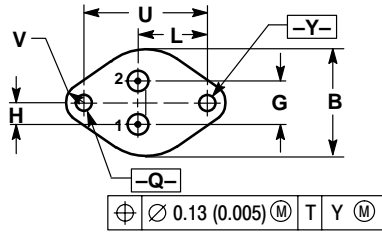
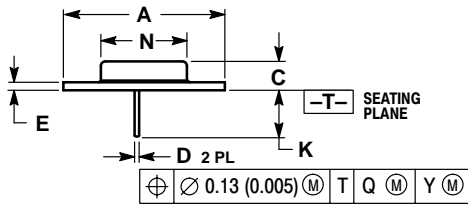


Figure 14. Temperature Coefficients

# 2N5302

## PACKAGE DIMENSIONS

### TO-204 (TO-3) CASE 1-07 ISSUE Z




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.550 REF		39.37 REF	
B	---	1.050	---	26.67
C	0.250	0.335	6.35	8.51
D	0.038	0.043	0.97	1.09
E	0.055	0.070	1.40	1.77
G	0.430 BSC		10.92 BSC	
H	0.215 BSC		5.46 BSC	
K	0.440	0.480	11.18	12.19
L	0.665 BSC		16.89 BSC	
N	---	0.830	---	21.08
Q	0.151	0.165	3.84	4.19
U	1.187 BSC		30.15 BSC	
V	0.131	0.188	3.33	4.77

**Notes**

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