

# 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	$^\circ\text{C}$

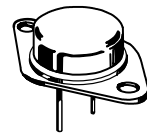
## THERMAL CHARACTERISTICS

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**



**CASE 1-07  
TO-204AA  
(TO-3)**

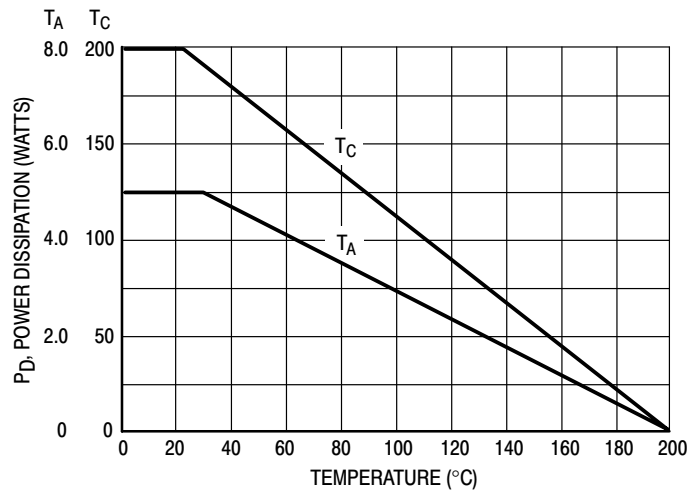


Figure 1. Power Temperature Derating Curve

# 2N5302

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

Characteristic	Symbol	Min	Max	Unit
<b>*OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (Note 1) ( $I_C = 200\text{ mA}$ , $I_B = 0$ )	$V_{CE(sus)}$	60	–	Vdc
Collector Cutoff Current ( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	–	5.0	mA
Collector Cutoff Current ( $V_{CE} = 60\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ )	$I_{CEX}$	–	1.0	mA
Collector Cutoff Current ( $V_{CE} = 60\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )	$I_{CEX}$	–	10	mA
Collector Cutoff Current ( $V_{CB} = 80\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	1.0	mA
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	5.0	mA

## ON CHARACTERISTICS

DC Current Gain (Note 1) *( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ Vdc}$ ) *( $I_C = 15\text{ A}$ , $V_{CE} = 2.0\text{ Vdc}$ ) ( $I_C = 30\text{ A}$ , $V_{CE} = 4.0\text{ Vdc}$ )	$h_{FE}$	40 15 5.0	– 60 –	–
*Collector–Emitter Saturation Voltage (Note 1) ( $I_C = 10\text{ A}$ , $I_B = 1.0\text{ A}$ ) ( $I_C = 20\text{ A}$ , $I_B = 2.0\text{ A}$ ) ( $I_C = 30\text{ A}$ , $I_B = 6.0\text{ A}$ )	$V_{CE(sat)}$	– – –	0.75 2.0 3.0	Vdc
*Base Emitter Saturation Voltage (Note 1) ( $I_C = 10\text{ A}$ , $I_B = 1.0\text{ A}$ ) ( $I_C = 15\text{ A}$ , $I_B = 1.5\text{ A}$ ) ( $I_C = 20\text{ A}$ , $I_B = 2.0\text{ A}$ )	$V_{BE(sat)}$	– – –	1.7 1.8 2.5	Vdc
*Base–Emitter On Voltage (Note 1) ( $I_C = 15\text{ A}$ , $V_{CE} = 2.0\text{ Vdc}$ ) ( $I_C = 30\text{ A}$ , $V_{CE} = 4.0\text{ Vdc}$ )	$V_{BE(on)}$	– –	1.7 3.0	Vdc

## \*DYNAMIC CHARACTERISTICS

Current–Gain – Bandwidth Product ( $I_C = 1.0\text{ A}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ MHz}$ )	$f_T$	2.0	–	MHz
Small–Signal Current Gain ( $I_C = 1.0\text{ A}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	40	–	–

## \*SWITCHING CHARACTERISTICS

Rise Time	$(V_{CC} = 30\text{ Vdc}$ , $I_C = 10\text{ A}$ , $I_{B1} = I_{B2} = 1.0\text{ A}$ )	$t_r$	–	1.0	$\mu\text{s}$
Storage Time		$t_s$	–	2.0	$\mu\text{s}$
Fall Time		$t_f$	–	1.0	$\mu\text{s}$

\*Indicates JEDEC Registered Data.

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

## SWITCHING TIME EQUIVALENT TEST CIRCUITS

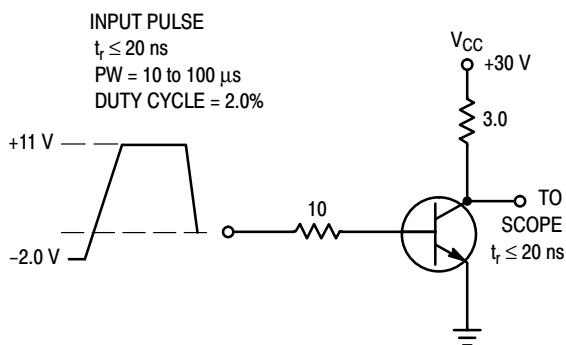


Figure 2. Turn–On time

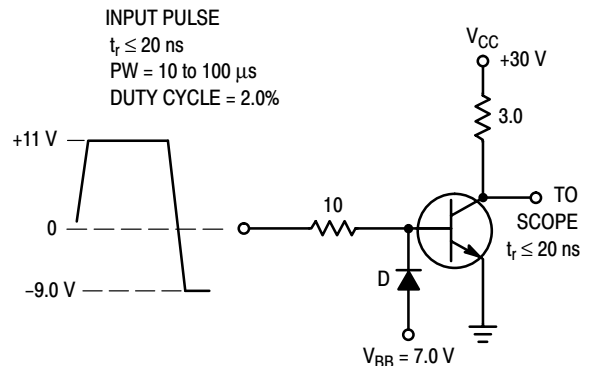


Figure 3. Turn–Off time

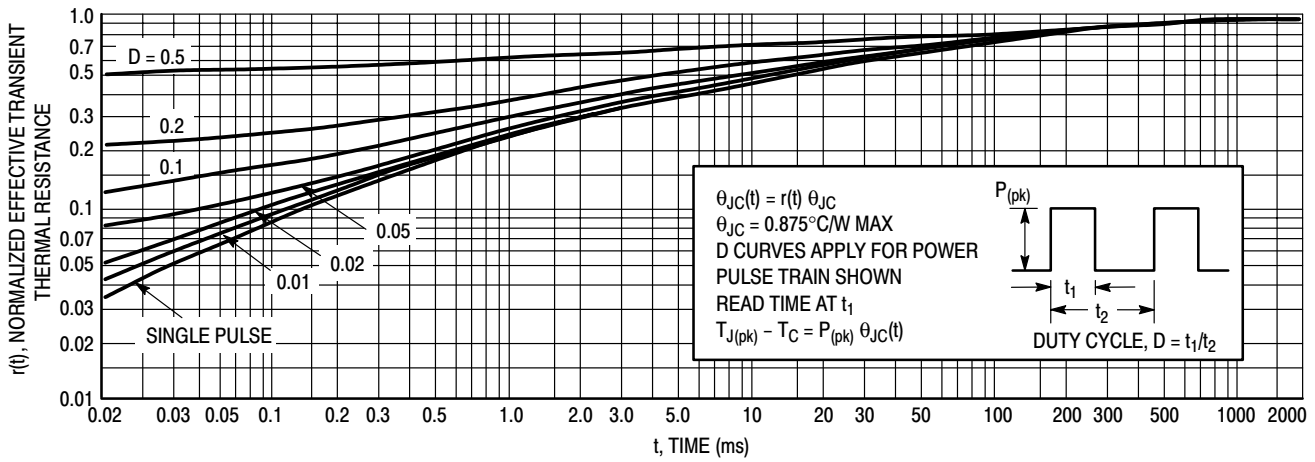


Figure 4. Thermal Response

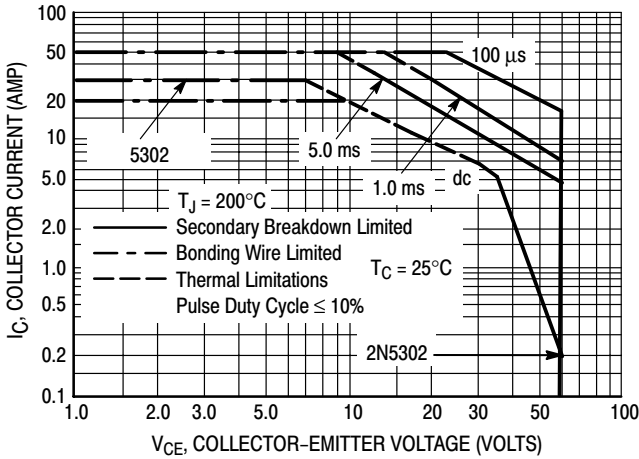


Figure 5. Active-Region Safe Operating Area

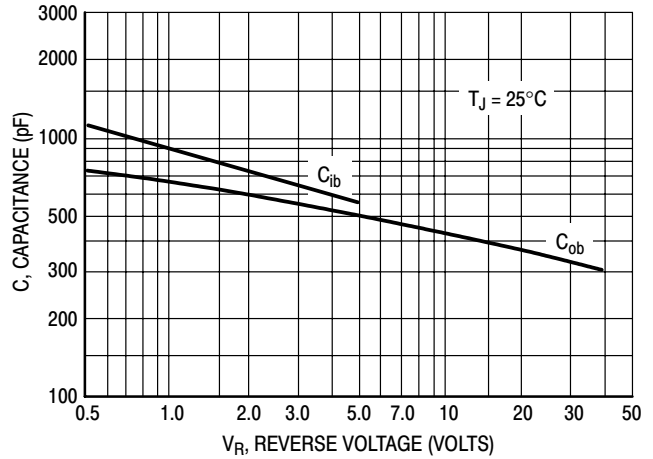


Figure 6. Capacitance versus Voltage

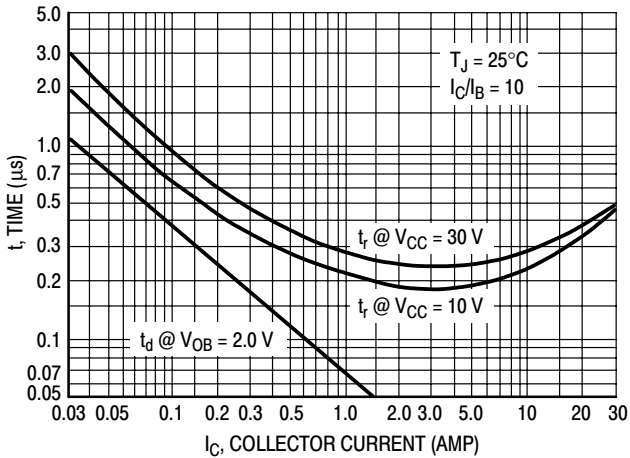


Figure 7. Turn-On Time

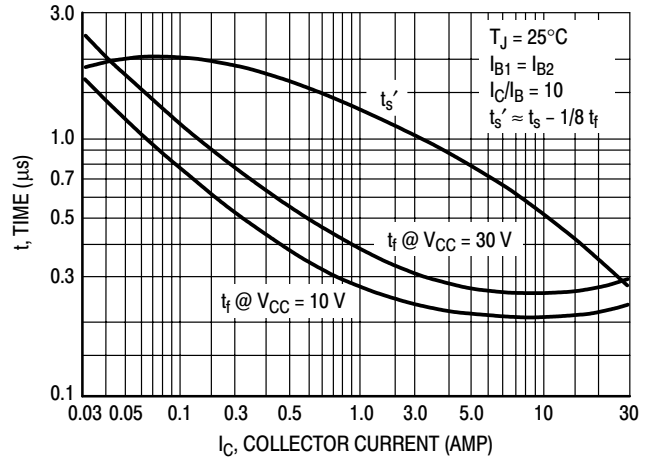


Figure 8. Turn-Off Time

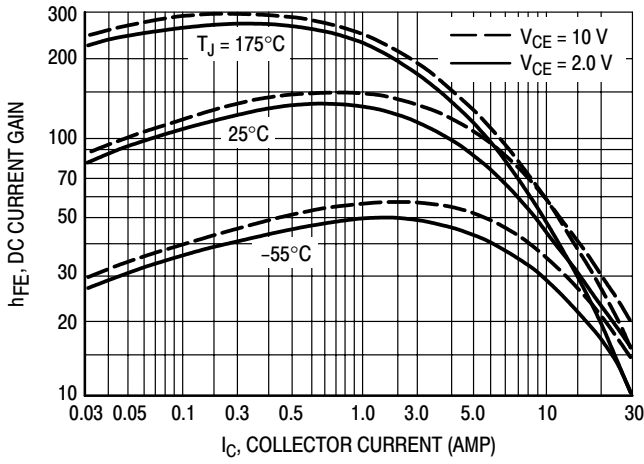


Figure 9. DC Current Gain

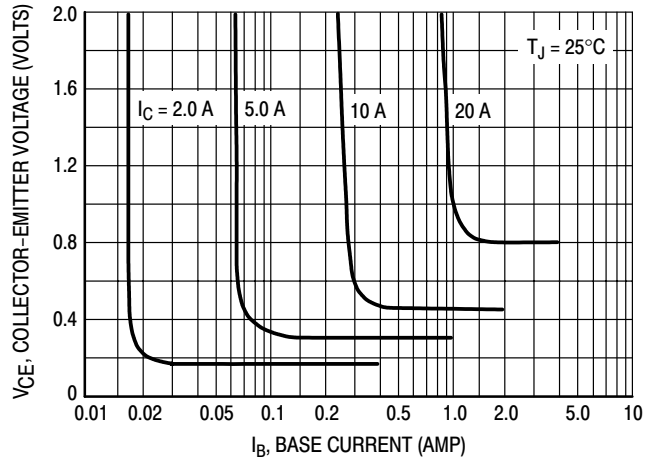


Figure 10. Collector Saturation Region

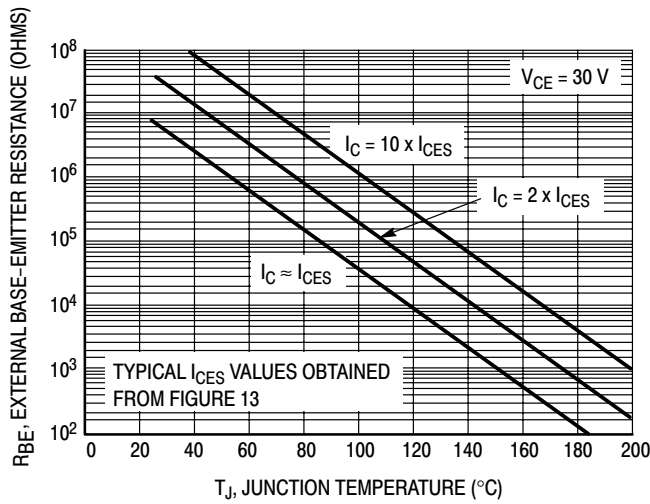


Figure 11. Effects of Base-Emitter Resistance

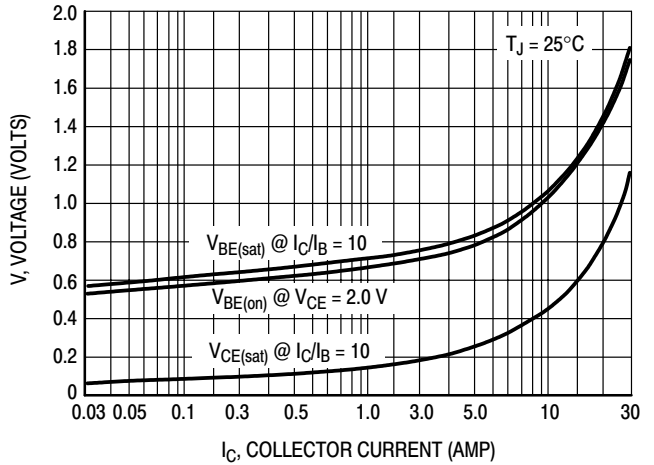


Figure 12. "On" Voltages

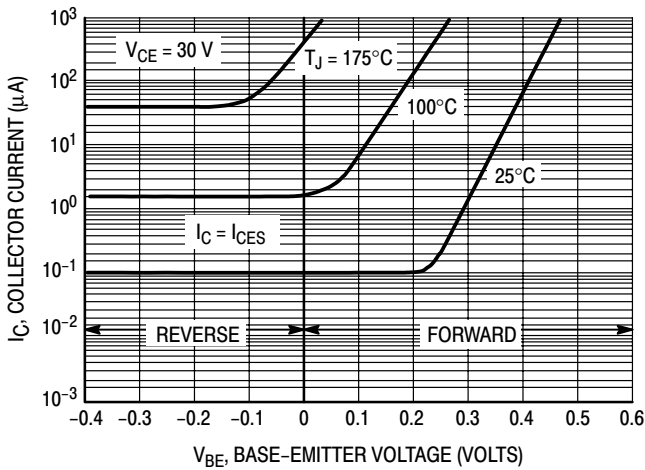


Figure 13. Collector Cut-Off Region

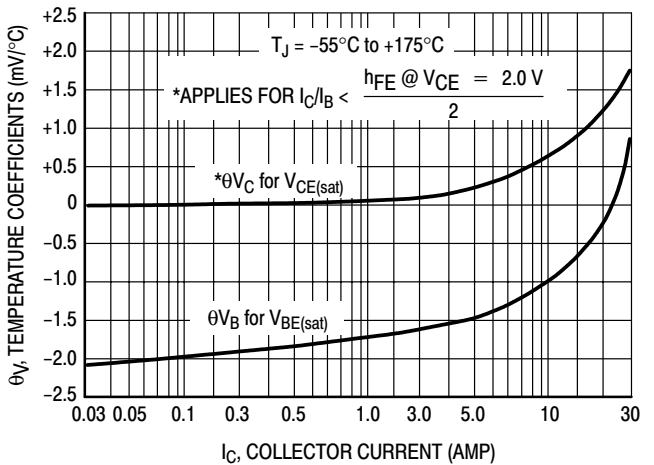
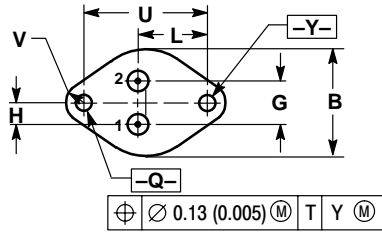
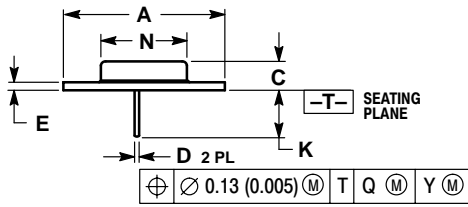


Figure 14. Temperature Coefficients

# 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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