2N5302

High-Power NPN Silicon Transistor

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

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

***MAXIMUM RATINGS** (T_J = 25°C unless otherwise noted)

Rating	Symbol	2N5302	Unit
Collector−Emitter Voltage	V_{CEO}	60	Vdc
Collector−Base Voltage	V_{CB}	60	Vdc
Collector Current − Continuous (Note 1)	I_C	30	Adc
Base Current	I_B	7.5	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	200 1.14	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	θ_{JC}	0.875	°C/W
Thermal Resistance, Case−to−Ambient	θ_{CA}	34	°C/W

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

*Indicates JEDEC Registered Data.

1. Pulse Test: Pulse Width = 5 μs, Duty Cycle ≤ 10%.

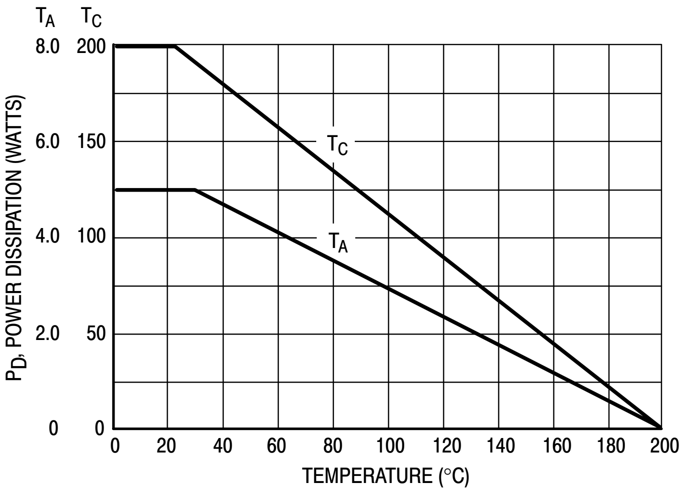

Figure 1. Power Temperature Derating Curve

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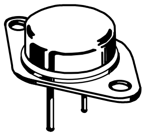
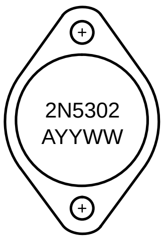
30 AMPERE POWER TRANSISTOR NPN SILICON 60 VOLTS 200 WATTS



TO−204AA (TO−3)
CASE 1−07
STYLE 1

MARKING DIAGRAM



A	= Location Code
YY	= Year
WW	= Work Week

ORDERING INFORMATION

Device	Package	Shipping
2N5302	TO−204	100 Units/Tray

December, 2004 − Rev. 1

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

Characteristic		Symbol	Min	Max	Unit
***OFF CHARACTERISTICS**					
Collector−Emitter Sustaining Voltage (Note 1) (I_C = 200 mAdc, I_B = 0)		$V_{CEO(sus)}$	60	–	Vdc
Collector Cutoff Current (V_{CE} = 60 Vdc, I_B = 0)		I_{CEO}	–	5.0	mAdc
Collector Cutoff Current (V_{CE} = 60 Vdc, $V_{EB(off)}$ = 1.5 Vdc)		I_{CEX}	–	1.0	mAdc
Collector Cutoff Current (V_{CE} = 60 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)		I_{CEX}	–	10	mAdc
Collector Cutoff Current (V_{CB} = 80 Vdc, I_E = 0)		I_{CBO}	–	1.0	mAdc
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	–	5.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (Note 1) *(I_C = 1.0 Adc, V_{CE} = 2.0 Vdc) *(I_C = 15 Adc, V_{CE} = 2.0 Vdc) (I_C = 30 Adc, V_{CE} = 4.0 Vdc)		h_{FE}	40 15 5.0	– 60 –	–
*Collector−Emitter Saturation Voltage (Note 1) (I_C = 10 Adc, I_B = 1.0 Adc) (I_C = 20 Adc, I_B = 2.0 Adc)2 (I_C = 30 Adc, I_B = 6.0 Adc)		$V_{CE(sat)}$	– – –	0.75 2.0 3.0	Vdc
*Base Emitter Saturation Voltage (Note 1) (I_C = 10 Adc, I_B = 1.0 Adc) (I_C = 15 Adc, I_B = 1.5 Adc) (I_C = 20 Adc, I_B = 2.0 Adc)		$V_{BE(sat)}$	– – –	1.7 1.8 2.5	Vdc
*Base−Emitter On Voltage (Note 1) (I_C = 15 Adc, V_{CE} = 2.0 Vdc) (I_C = 30 Adc, V_{CE} = 4.0 Vdc)		$V_{BE(on)}$	– –	1.7 3.0	Vdc
***DYNAMIC CHARACTERISTICS**					
Current−Gain − Bandwidth Product (I_C = 1.0 Adc, V_{CE} = 10 Vdc, f = 1.0 MHz)		f_T	2.0	–	MHz
Small−Signal Current Gain (I_C = 1.0 Adc, V_{CE} = 10 Vdc, f = 1.0 kHz)		h_{fe}	40	–	–
***SWITCHING CHARACTERISTICS**					
Rise Time	(V_{CC} = 30 Vdc, I_C = 10 Adc, I_{B1} = I_{B2} = 1.0 Adc)	t_r	–	1.0	μs
Storage Time		t_s	–	2.0	μs
Fall Time		t_f	–	1.0	μs

*Indicates JEDEC Registered Data.

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

SWITCHING TIME EQUIVALENT TEST CIRCUITS

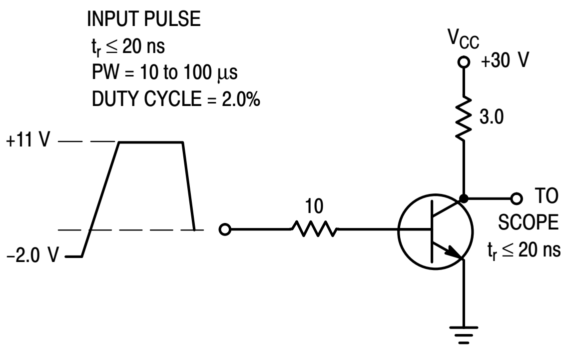


Figure 2. Turn−On time

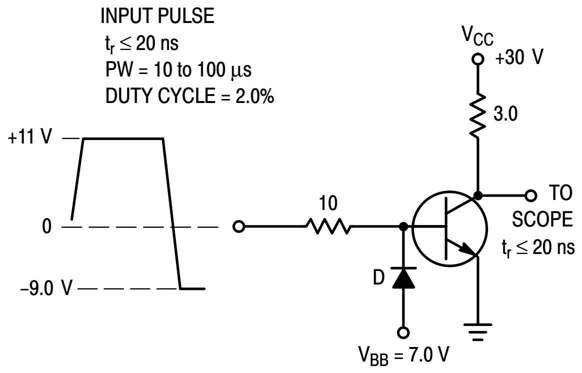


Figure 3. Turn−Off time

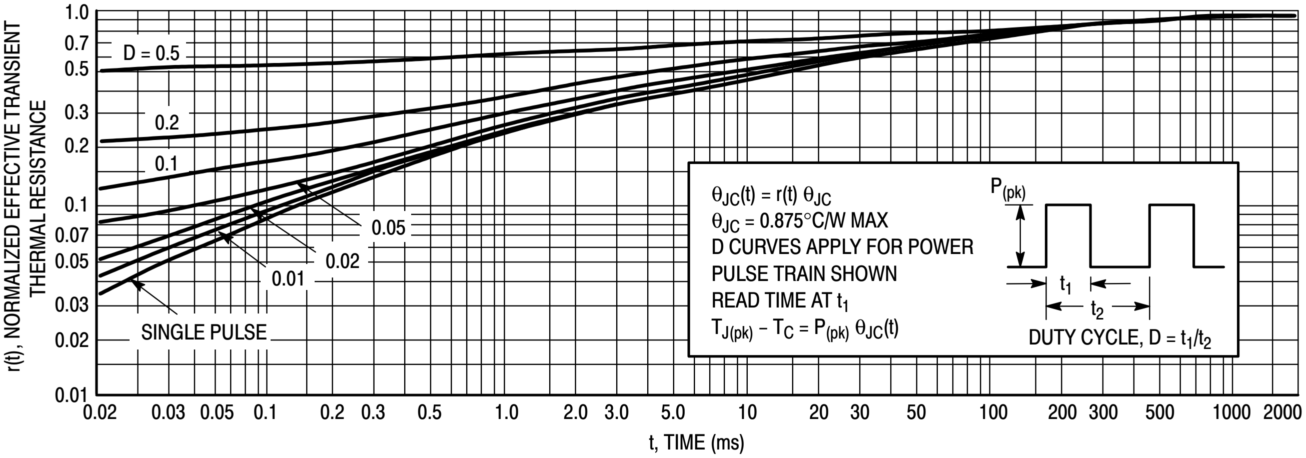


Figure 4. Thermal Response

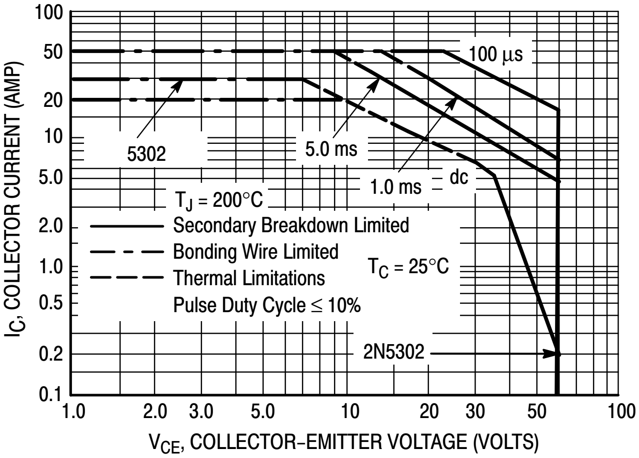


Figure 5. Active−Region Safe Operating Area

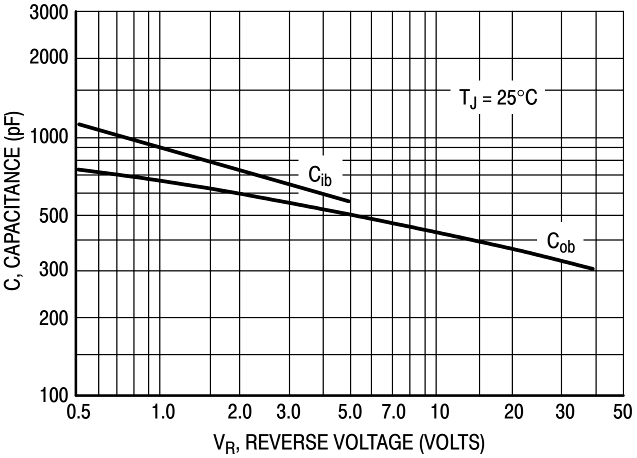


Figure 6. Capacitance versus Voltage

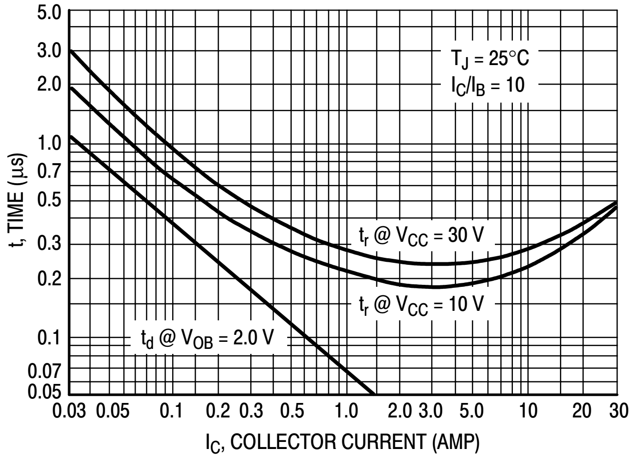


Figure 7. Turn−On Time

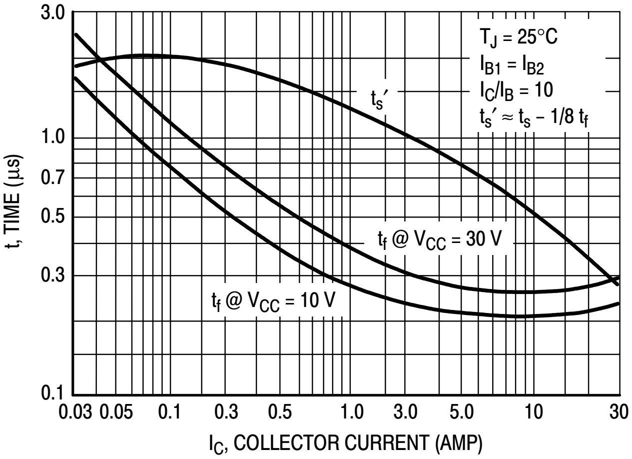


Figure 8. Turn−Off Time

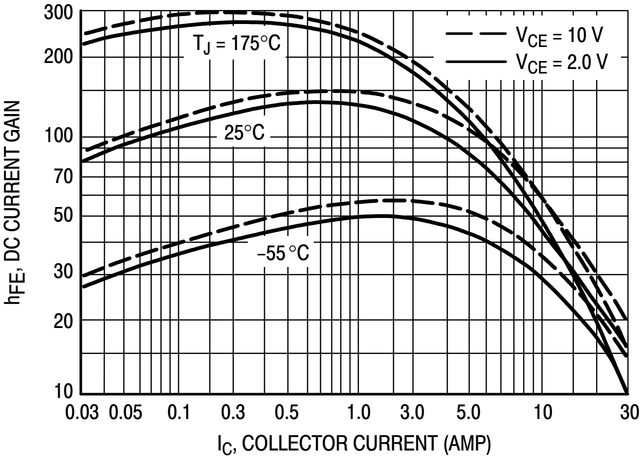


Figure 9. DC Current Gain

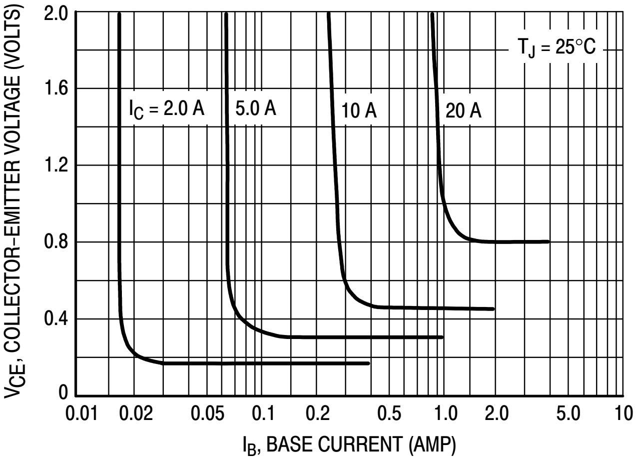


Figure 10. Collector Saturation Region

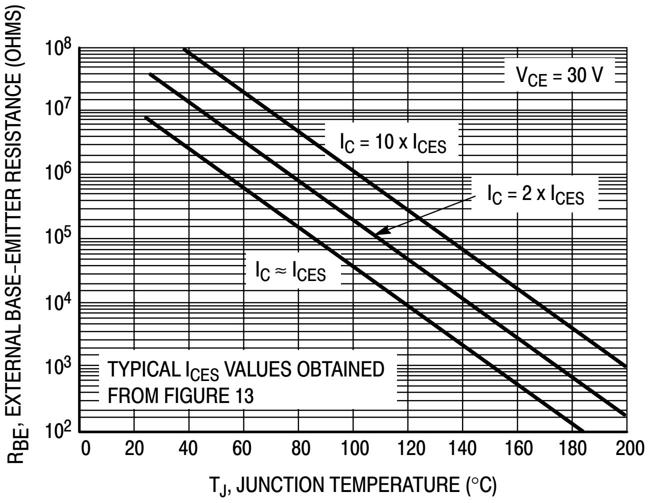


Figure 11. Effects of Base−Emitter Resistance

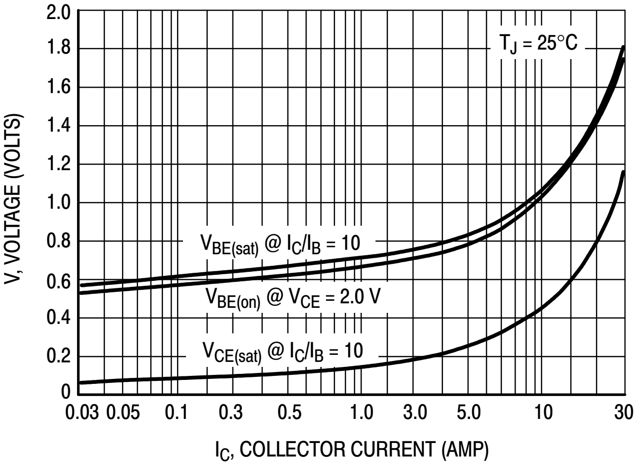


Figure 12. “On” Voltages

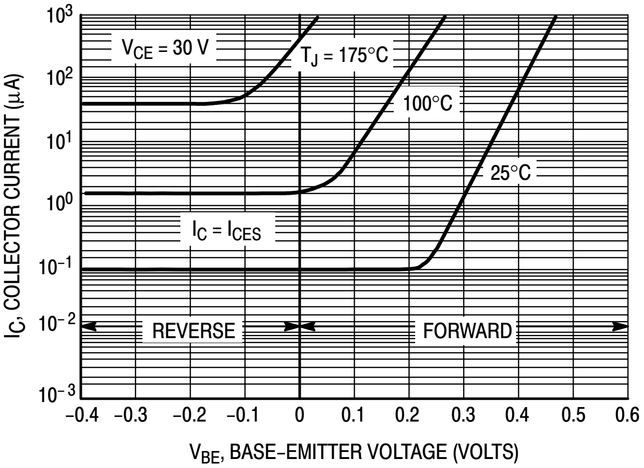


Figure 13. Collector Cut−Off Region

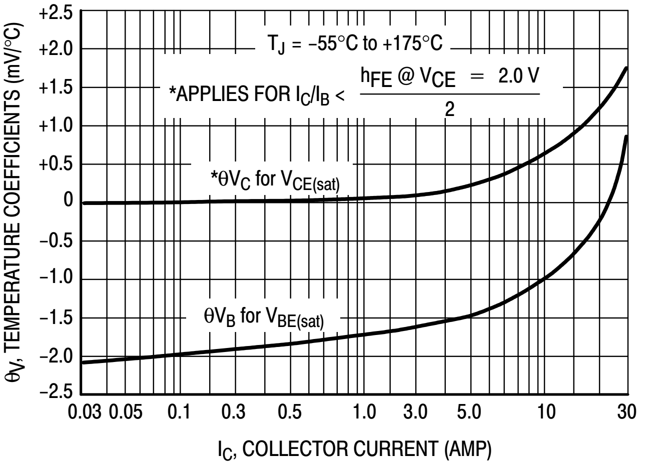
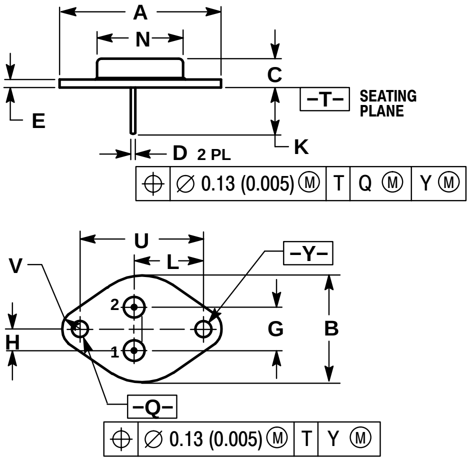


Figure 14. Temperature Coefficients

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.

	INCHES		MILLIMETERS	
DIM	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

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

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