2N6298 thru 2N6301
See Page 3-157
2N6303 — See Page 3-32

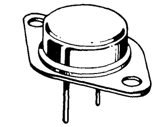
2N6306
2N6307, 2N6308

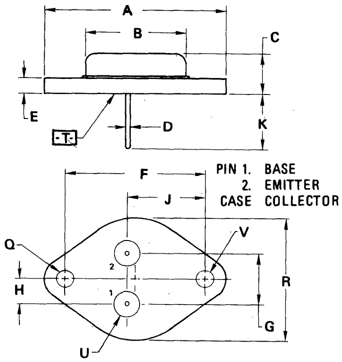
HIGH VOLTAGE NPN SILICON POWER TRANSISTORS

. . . designed for high voltage inverters, switching regulators and line-operated amplifier applications. Especially well suited for switching power supply applications in associated consumer products.

- High Collector-Base Voltage —
  V_{CB} = 500 Vdc – 2N6306
  = 600 Vdc – 2N6307
  = 700 Vdc – 2N6308
- Excellent DC Current Gain @ I_C = 3.0 Adc
  h_{FE} = 15 - 75 – 2N6306, 2N6307
  = 12 - 60 – 2N6308
- Low Collector-Emitter Saturation Voltage @ I_C = 3.0 Adc
  $V_{CE(sat)}$ = 0.8 Vdc (Max) – 2N6306
  = 1.0 Vdc (Max) – 2N6307
  = 1.5 Vdc (Max) – 2N6308
- Current Gain Bandwidth Product —
  f_T = 5.0 MHz (Min) @ I_C = 0.3 Adc

**8 AMPERE
POWER TRANSISTORS
NPN SILICON
250-300-350 VOLTS
125 WATTS**





NOTES:
1. DIMENSIONS Q AND V ARE DATUMS.
2. -T- IS SEATING PLANE AND DATUM.
3. POSITIONAL TOLERANCE FOR MOUNTING HOLE Q:
   | ⌖ | ϕ0.13 (0.005) Ⓜ | T | V Ⓜ |
   FOR LEADS:
   | ⌖ | ϕ0.13 (0.005) Ⓜ T | V Ⓜ | Q Ⓜ |
4. DIMENSIONS AND TOLERANCES PER ANSI Y14.5, 1973.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	–	39.37	–	1.550
B	–	21.08	–	0.830
C	6.35	7.62	0.250	0.300
D	0.97	1.09	0.038	0.043
E	1.40	1.78	0.055	0.070
F	30.15 BSC		1.187 BSC	
G	10.92 BSC		0.430 BSC	
H	5.46 BSC		0.215 BSC	
J	16.89 BSC		0.665 BSC	
K	11.18	12.19	0.440	0.480
Q	3.81	4.19	0.150	0.165
R	–	26.67	–	1.050
U	4.83	5.33	0.190	0.210
V	3.81	4.19	0.150	0.165

**CASE 1-05
TO-204AA**

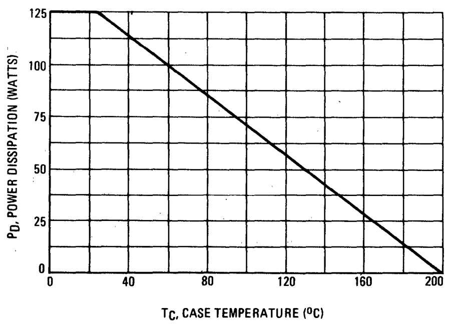
*MAXIMUM RATINGS

Rating	Symbol	2N6306	2N6307	2N6308	Unit
Collector-Base Voltage	V_{CB}	500	600	700	Vdc
Collector-Emitter Voltage	V_{CEO}	250	300	350	Vdc
Emitter-Base Voltage	V_{EB}	← 8.0 →			Vdc
Collector Current — Continuous Peak	I_C	← 8.0 → 16			Adc
Base Current	I_B	← 4.0 →			Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	← 125 → 0.714			Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	← -65 to +200 →			°C

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	1.4	°C/W

*Indicates JEDEC Registered Data.

FIGURE 1 — POWER DERATING



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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1)		$V_{CEO(sus)}$			Vdc
(I_C = 100 mAdc, I_B = 0)	2N6306		250	–	
	2N6307		300	–	
	2N6308		350	–	
Collector Cutoff Current (V_{CE} = Rated V_{CEO}, I_B = 0)		I_{CEO}	–	0.5	mAdc
Collector Cutoff Current		I_{CEX}			mAdc
(V_{CE} = 500 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N6306		–	0.5	
(V_{CE} = 600 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N6307		–	0.5	
(V_{CE} = 700 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N6308		–	0.5	
(V_{CE} = 450 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)	2N6306		–	2.5	
(V_{CE} = 550 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)	2N6307		–	2.5	
(V_{CE} = 650 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)	2N6308		–	2.5	
Emitter Cutoff Current (V_{BE} = 8.0 Vdc, I_C = 0)		I_{EBO}	–	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (1)		h_{FE}			–
(I_C = 3.0 Adc, V_{CE} = 5.0 Vdc)	2N6306, 2N6307		15	75	
	2N6308		12	60	
(I_C = 8.0 Adc, V_{CE} = 5.0 Vdc)	2N6306, 2N6307		4.0	–	
	2N6308		3.0	–	
Collector-Emitter Saturation Voltage (1)		$V_{CE(sat)}$			Vdc
(I_C = 3.0 Adc, I_B = 0.6 Adc)	2N6306		–	0.8	
	2N6307		–	1.0	
	2N6308		–	1.5	
(I_C = 8.0 Adc, I_B = 2.0 Adc)	2N6306, 2N6307		–	5.0	
(I_C = 8.0 Adc, I_B = 2.67 Adc)	2N6308		–	5.0	
Base-Emitter Saturation Voltage (1)		$V_{BE(sat)}$			Vdc
(I_C = 8.0 Adc, I_B = 2.0 Adc)	2N6306, 2N6307		–	2.3	
(I_C = 8.0 Adc, I_B = 2.67 Adc)	2N6308		–	2.5	
Base-Emitter On Voltage (1)		$V_{BE(on)}$			Vdc
(I_C = 3.0 Adc, V_{CE} = 5.0 Vdc)	2N6306, 2N6307		–	1.3	
	2N6308		–	1.5	
Second Breakdown Energy (Figure 2) ($I_{C(PK)}$ = 3.0 Adc, L = 40 mH, R_{BE} = 3 kΩ, V_{BB2} = 1.5 Vdc)		$E_{s/b}$	–	180	mJ
DYNAMIC CHARACTERISTICS					
Current Gain – Bandwidth Product (2) (I_C = 0.3 Adc, V_{CE} = 10 Vdc, f_{test} = 1.0 MHz)		f_T	5.0	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)		C_{ob}	–	250	pF
SWITCHING CHARACTERISTICS					
Rise Time (V_{CC} = 125 Vdc, I_C = 3.0 Adc, I_B = 0.6 Adc)		t_r	–	0.6	µs
Storage Time (3) (V_{CC} = 125 Vdc, I_C = 3.0 Adc, I_{B1} = 0.6 Adc, I_{B2} = 1.5 Adc)		t_s			µs
	Pulse Width = 25 µs		–	1.6	
	Pulse Width = 5.0 µs		–	0.8	
Fall Time (V_{CC} = 125 Vdc, I_C = 3.0 Adc, I_{B1} = 0.6 Adc, I_{B2} = 1.5 Adc)		t_f	–	0.4	µs

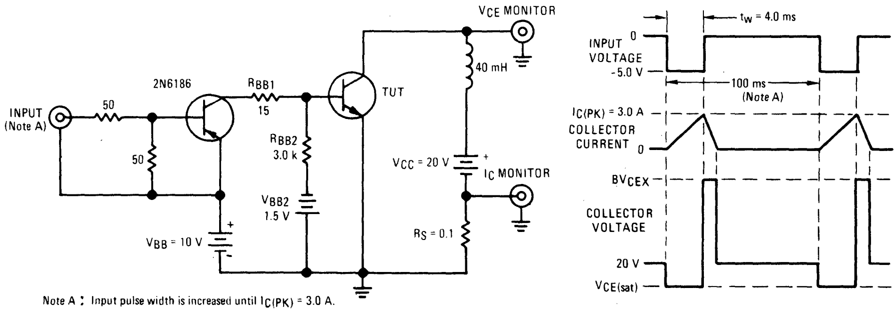
(1) Pulse Test: Pulse Width ≤300 µs; Duty Cycle = 2.0%

(2) $f_T = |h_{fe}| \bullet f_{test}$

(3) "On" time is 25 µs. t_s decreases with shorter pulse widths, being approximately 50% of the values shown at a 5.0 µs pulse width.

*Indicates JEDEC Registered Data.

FIGURE 2 – SECOND BREAKDOWN ENERGY TEST CIRCUIT AND WAVEFORMS



Note A: Input pulse width is increased until $I_{C(PK)}$ = 3.0 A.

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FIGURE 3 — THERMAL RESPONSE

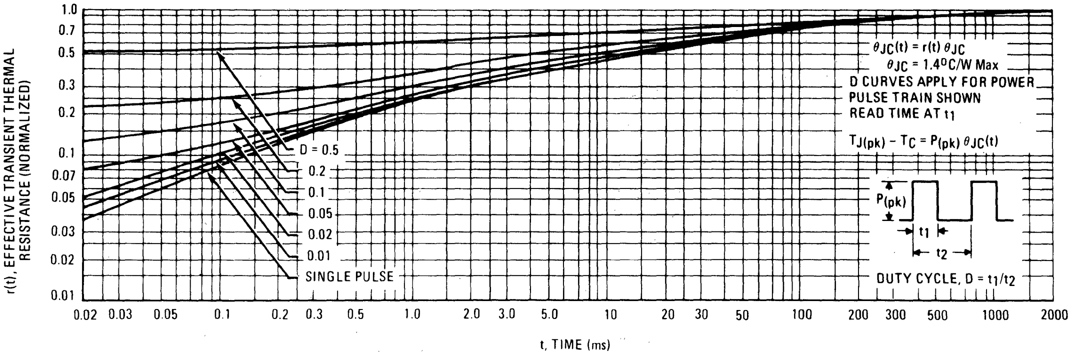
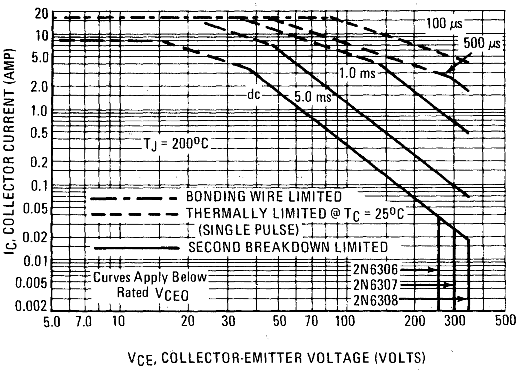


FIGURE 4 — ACTIVE-REGION SAFE OPERATING AREA



There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C-V_{CE} limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 4 is based on $T_{J(pk)} = 200^\circ C$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 200^\circ C$. $T_{J(pk)}$ may be calculated from the data in Figure 3. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

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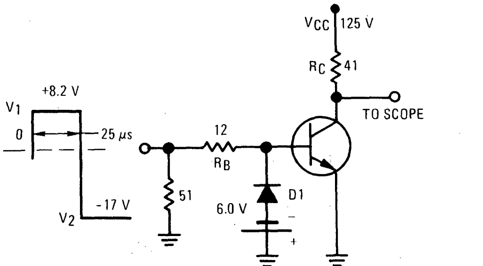
FIGURE 5 — SWITCHING TIMES TEST CIRCUIT



DUTY CYCLE 1%
$t_r, t_f \leq 10$ ns
D_1 – 1N3879
COLLECTOR-BASE JUNCTION

FOR DATA IN FIGURE 6,
R_B & R_C ARE VARIED TO OBTAIN
DESIRED TEST CONDITIONS. D_1
OMITTED AND V_2 REDUCED TO
5.0 V FOR t_d and t_r MEASUREMENTS

FIGURE 6 — TURN-ON AND TURN-OFF TIMES

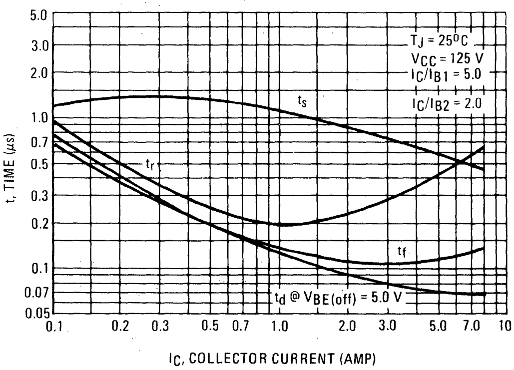


FIGURE 7 — DC CURRENT GAIN

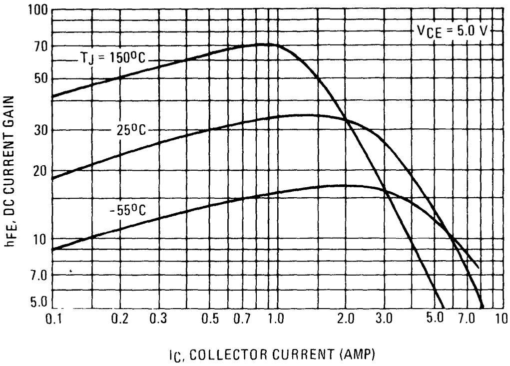


FIGURE 8 — COLLECTOR SATURATION REGION

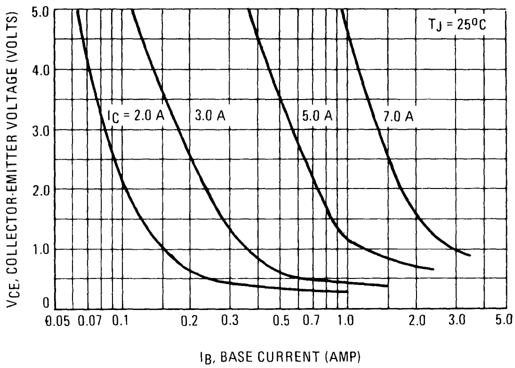


FIGURE 9 — "ON" VOLTAGES

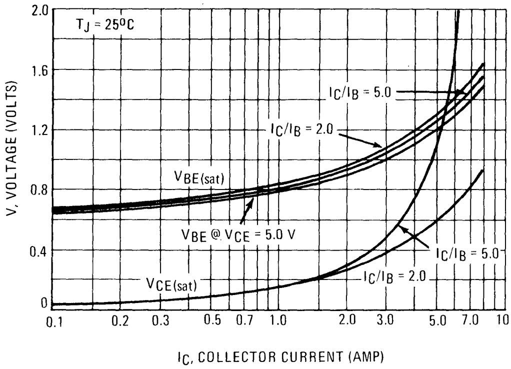


FIGURE 10 — TEMPERATURE COEFFICIENTS

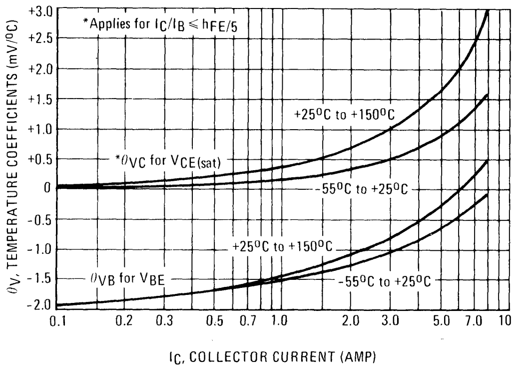


FIGURE 11 — COLLECTOR-CUTOFF REGION

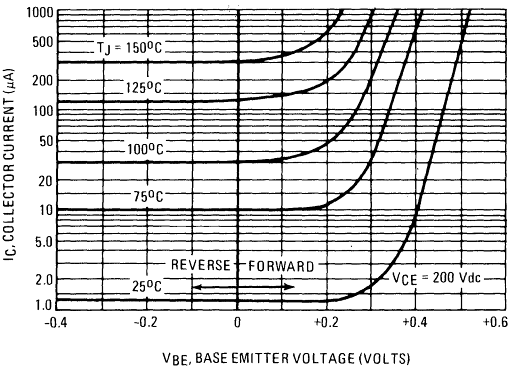
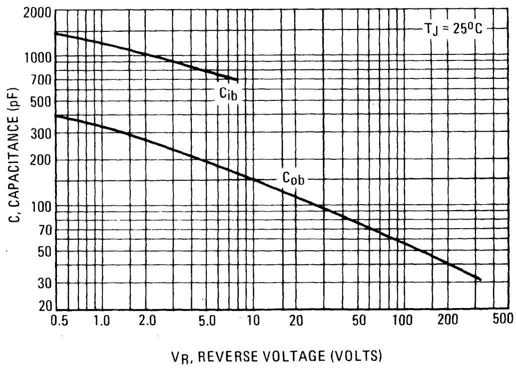


FIGURE 12 — CAPACITANCE



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