NPN POWER TRANSISTORS

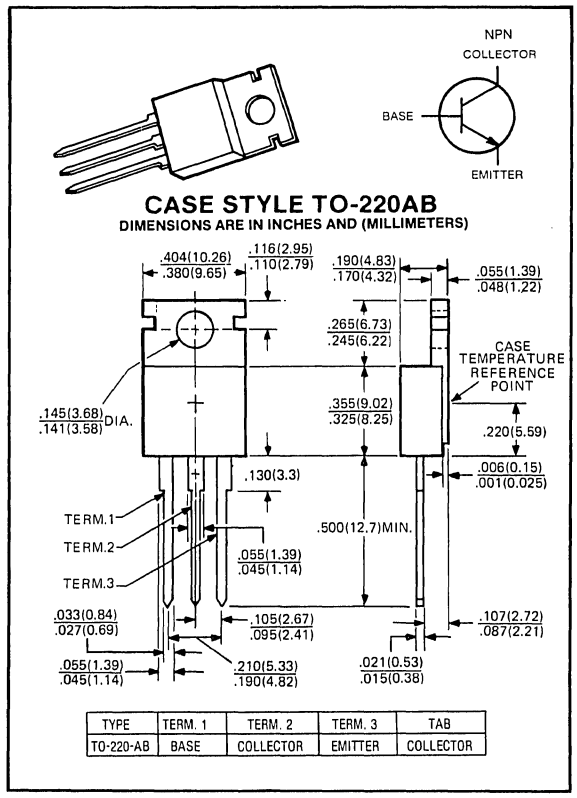
MJE13008

300 VOLTS
12 AMP, 100 WATTS

Designed for switching regulator, DC-DC converter, AC-DC inverter, high voltage, high speed switching applications.

Features:

- $V_{CEO(sus)}$ = 300V (Min).
- V_{CEV} = 600V blocking capability
- Excellent switching time: t_r = 1 μs (Max.), t_f = 0.7 μs (Max.)



TYPE	TERM. 1	TERM. 2	TERM. 3	TAB
TO-220-AB	BASE	COLLECTOR	EMITTER	COLLECTOR

maximum ratings (T_A = 25°C) (unless otherwise specified)

RATING		SYMBOL	MJE13008	UNITS
Collector-Emitter Voltage		V_{CEO}	300	Volts
Collector-Emitter Voltage		V_{CEV}	600	Volts
Emitter Base Voltage		V_{EBO}	9	Volts
Collector Current — Continuous Pulse		I_C I_{CP}	12 24	A
Base Current — Continuous Pulse		I_B I_{BP}	6 12	A
Emitter Current — Continuous Pulse		I_E I_{EP}	18 36	A
Collector Power Dissipation Derate above 25°C	T_A = 25°C	P_C	2 16	Watts mW/°C
Collector Power Dissipation Derate above 25°C	T_C = 25°C	P_C	100 800	Watts mW/°C
Operating and Storage Junction Temperature Range		T_J, T_{STG}	-65 to +150	°C

thermal characteristics

Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.25	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	62.5	°C/W
Maximum Lead Temperature for Soldering Purpose: ⅛" from Case for 5 Seconds	T_L	275	°C

electrical characteristics (T_C = 25° C) (unless otherwise specified)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
off characteristics[1]					
Collector-Emitter Voltage (I_C = 10mA, I_B = 0)	$V_{CEO(sus)}$	300	—	—	Volts
Collector Cutoff Current (V_{CE} = 600V, V_{BE} = -1.5V) (V_{CE} = 600V, V_{BE} = -1.5V, T_C = 100° C)	I_{CEV}	— —	— —	1 5	mA
Emitter Cutoff Current (V_{EB} = 9V, I_C = 0)	I_{EBO}	—	—	1	mA
second breakdown					
Second Breakdown with Base Forward Biased	FBSOA	SEE FIGURE 1			
Clamped Inductive SOA with Base Reversed Bias	RBSOA	SEE FIGURE 2			
on characteristics[1]					
DC Current Gain (I_C = 5A, V_{CE} = 5V) (I_C = 8A, V_{CE} = 5V)	h_{FE}	8 6	— —	40 30	—
Collector-Emitter Saturation Voltage (I_C = 5A, I_B = 1A) (I_C = 8A, I_B = 1.6A) (I_C = 12A, I_B = 3A) (I_C = 8A, I_B = 1.6A, T_C = 100° C)	$V_{CE(sat)}$	— — — —	— — — —	1 1.5 3 2	V
Base-Emitter Saturation Voltage (I_C = 5A, I_B = 1A) (I_C = 8A, I_B = 1.6A) (I_C = 8A, I_B = 1.6A, T_C = 100° C)	$V_{BE(sat)}$	— — —	— — —	1.2 1.6 1.5	V
dynamic characteristics					
Output Capacitance (V_{CB} = 10V, I_E = 0, f = 0.1 MHz)	C_{ob}	—	130	—	pF
Current Gain — Bandwidth Product (I_C = 500mA, V_{CE} = 10V, f_{test} = 1.0 MHz)	f_T	4	—	—	MHz
switching characteristics					
Resistive Load					
Delay Time	(V_{CC} = 125V, I_C = 8A	t_d	—	—	0.1	μs
Rise Time	I_{B1} = -I_{B2} = 1.6A, t_p = 25 μs	t_r	—	—	1	
Storage Time	Duty Cycle < 1%)	t_s	—	—	3	
Fall Time		t_f	—	—	0.7	
Inductive Load, Clamped						
Storage Time	(I_C = 8A, V_{clamp} = 300V	t_{sv}	—	—	2.3	μs
Crossover Time	I_{B1} = 1.6A, $V_{BE(off)}$ = -5V, T_C = 100° C)	t_c	—	—	0.7	

(1) Pulse Test: Pulse Width - 300μs Duty Cycle ≤ 2%.

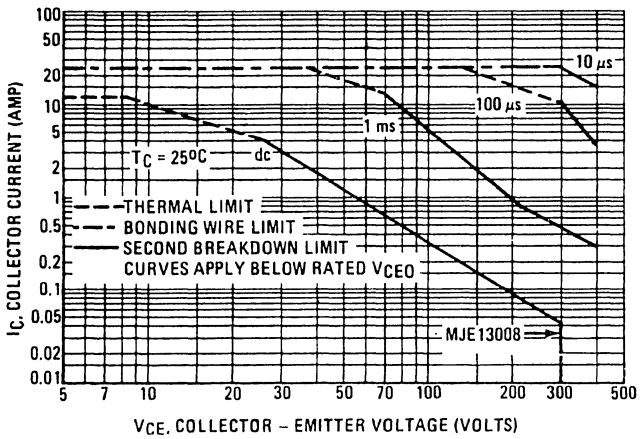


FIGURE 1 – FORWARD BIAS SAFE OPERATING AREA

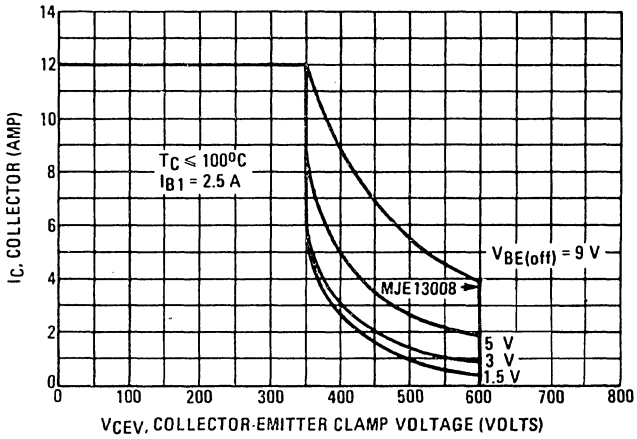


FIGURE 2 – REVERSE BIAS SWITCHING SAFE OPERATING AREA

The Safe Operating Area figures shown in Figures 1 and 2 are specified ratings for these devices under the test conditions shown.

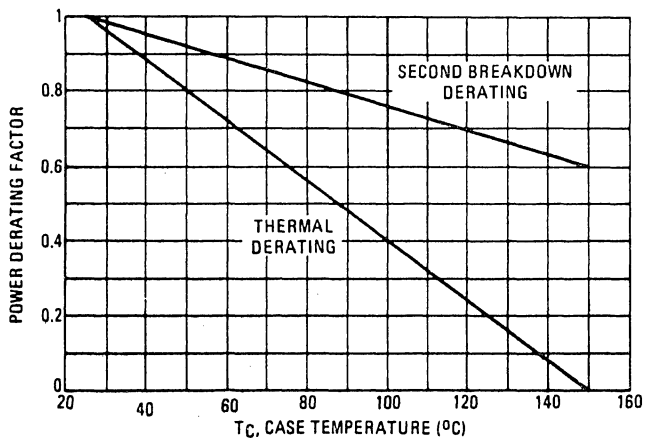


FIGURE 3 – FORWARD BIAS POWER DERATING

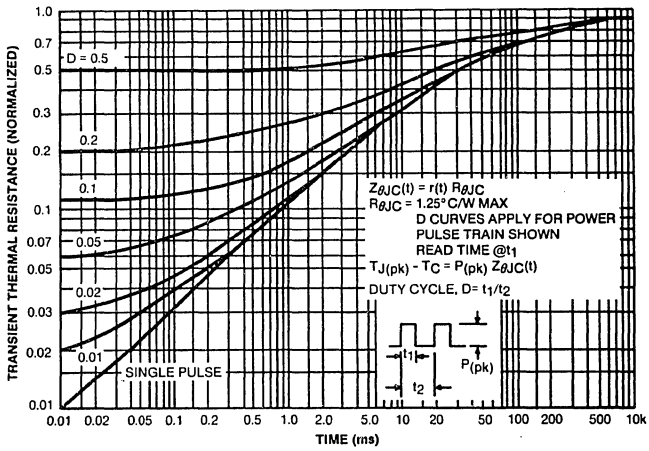


FIGURE 4 TYPICAL THERMAL RESPONSE [($Z_{\theta JC}(t)$]

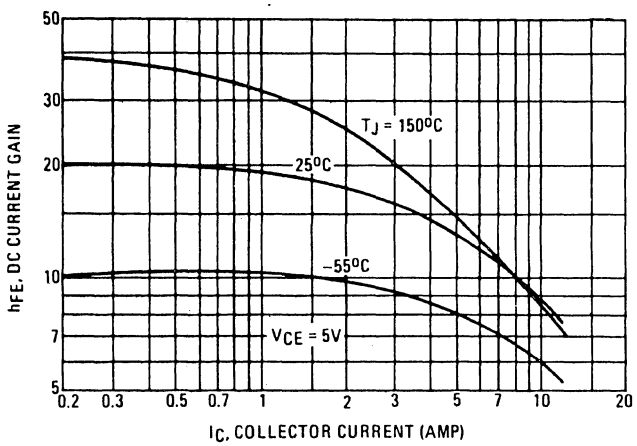


FIGURE 5 –DC CURRENT GAIN

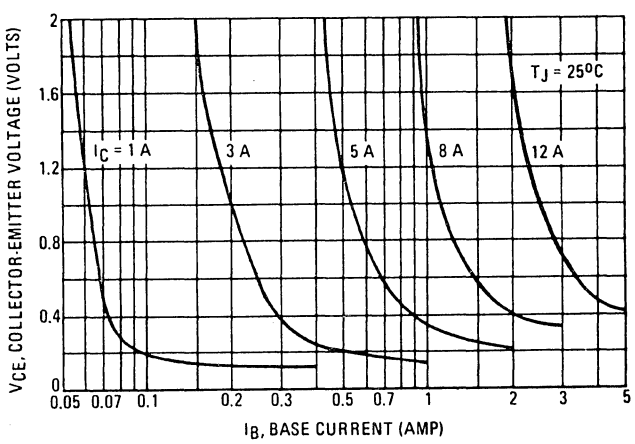


FIGURE 6 – COLLECTOR SATURATION REGION

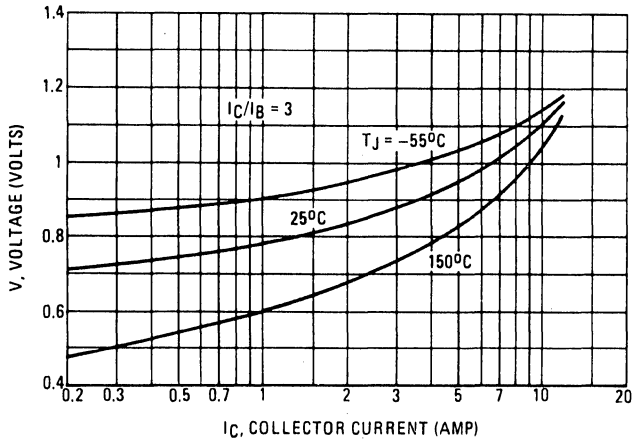


FIGURE 7 – BASE-EMITTER SATURATION VOLTAGE

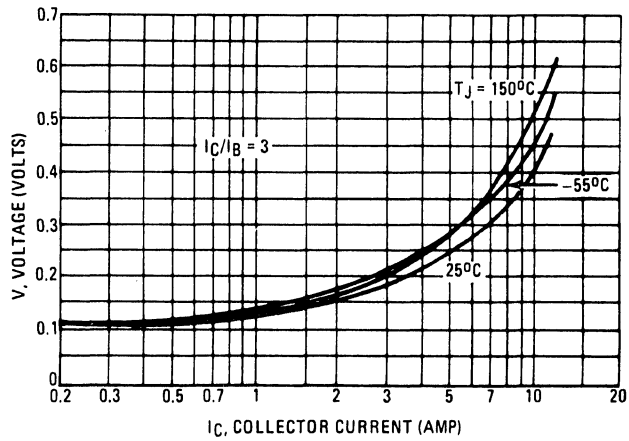


FIGURE 8 – COLLECTOR-EMITTER SATURATION VOLTAGE

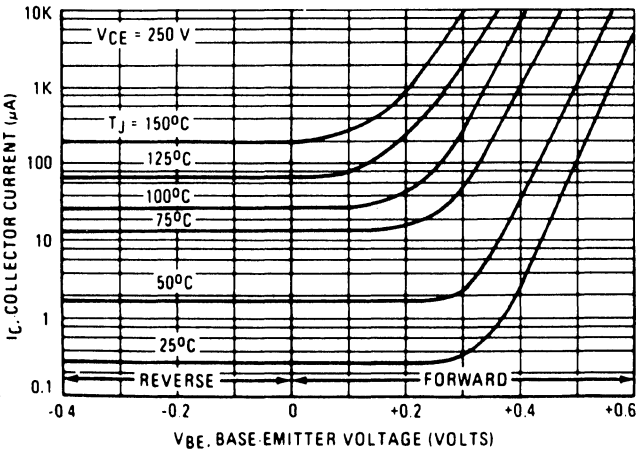


FIGURE 9 – COLLECTOR CUTOFF REGION

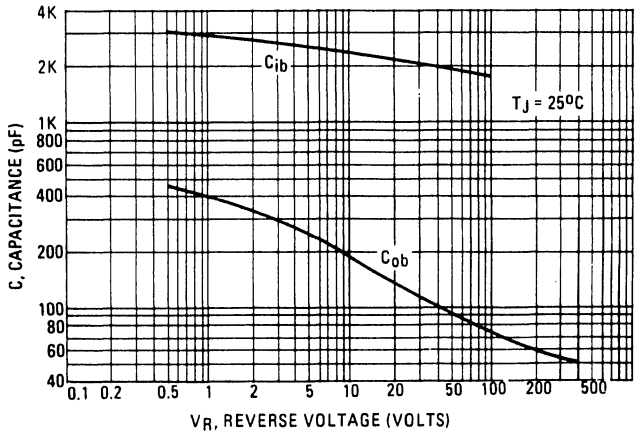


FIGURE 10 – CAPACITANCE

RESISTIVE SWITCHING PERFORMANCE

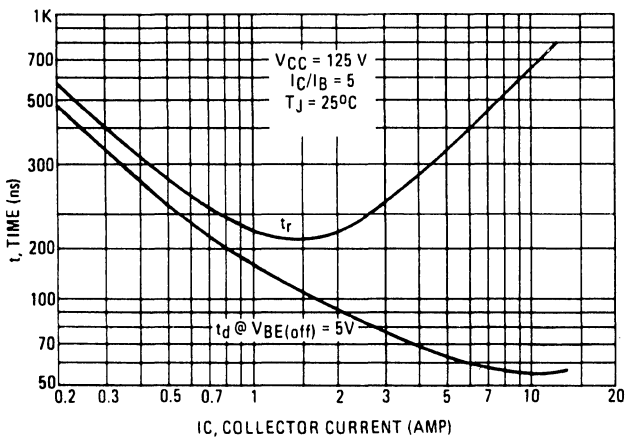


FIGURE 11 – TURN-ON TIME

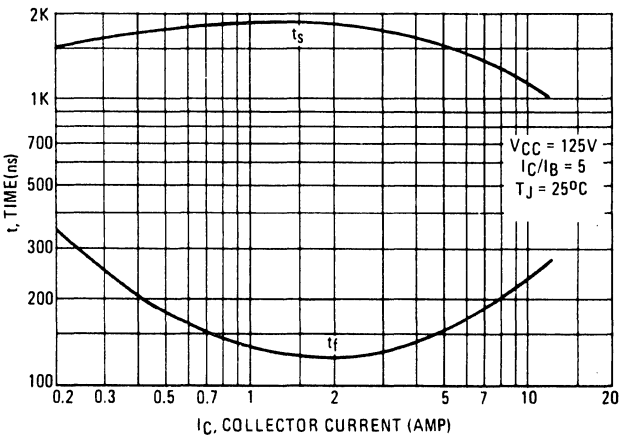


FIGURE 12 – TURN-OFF TIME

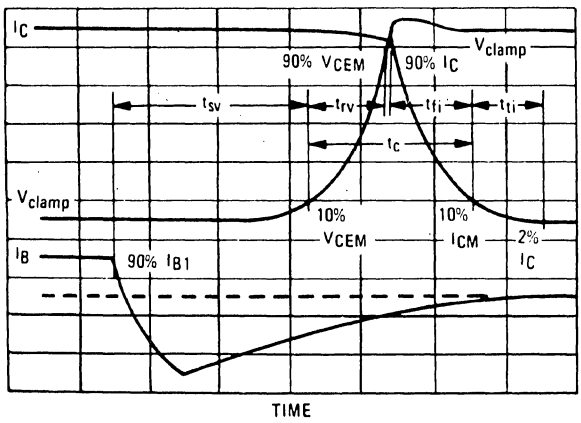


FIGURE 13 – INDUCTIVE SWITCHING MEASUREMENTS

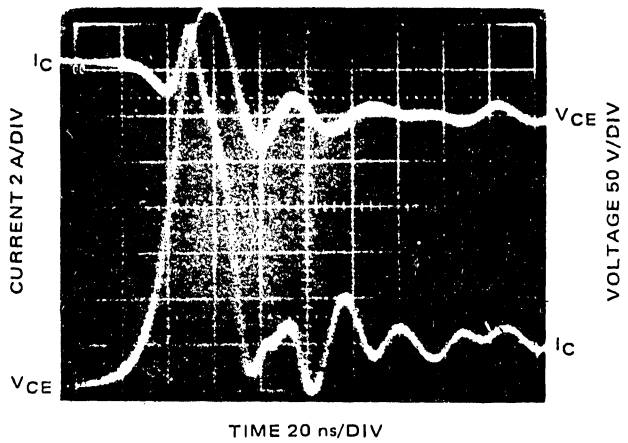


FIGURE 14 – TYPICAL INDUCTIVE SWITCHING WAVEFORMS
(at 300 V and 12 A with I_{B1} = 2.4 A and $V_{BE(off)}$ = 5 V)