HIGH VOLTAGE/HIGH SPEED
NPN POWER TRANSISTORS

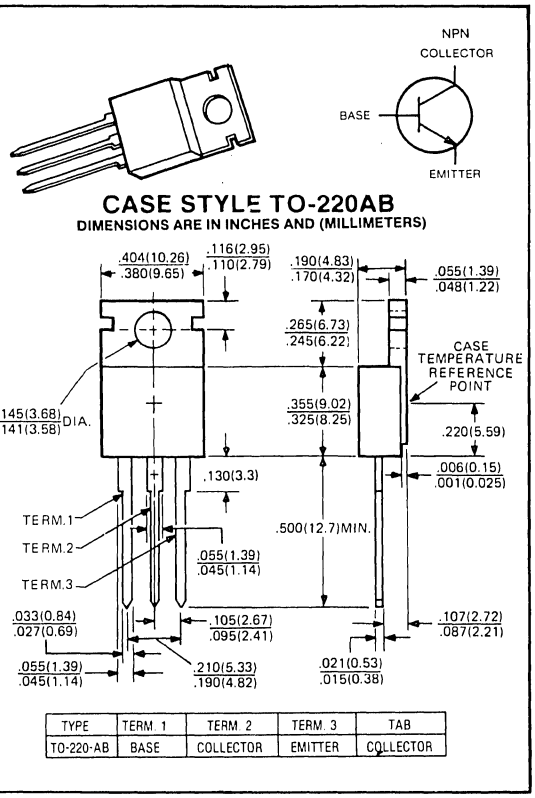
MJE13070
MJE13071

400-450 VOLTS
5 AMP, 80 WATTS

The MJE13070 and MJE13071 are high-voltage, high-speed power switching transistors, designed for use with inductive circuits, including: switching regulators, inverters, solenoid and relay drivers, motor controls, deflection circuits and other line-operated switching applications.

Features:

- Fast Turn-Off Times:
  100 ns inductive fall time @ 25°C (Typ)
  150 ns inductive crossover time @ 25°C (Typ)
  400 ns inductive storage time @ 25°C (Typ)
- Operating temperature range -65 to +150°C
- 100°C Performance Specified for:
  Switching times with inductive loads —
  50 ns inductive fall time (Typ)
  Saturation voltages
  Leakage currents



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

RATING	SYMBOL	MJE13070	MJE13071	UNITS
Collector-Emitter Voltage	V_{CEO}	400	450	Volts
Collector-Emitter Voltage	V_{CEV}	650	750	Volts
Emitter Base Voltage	V_{EB}	6.0	6.0	Volts
Collector Current — Continuous Peak (Repetitive)(1)	I_C I_{CM}	5.0 8.0	5.0 8.0	A
Base Current — Continuous Peak (Non-Repetitive)(1)	I_B I_{BM}	2.0 4.0	2.0 4.0	A
Total Power Dissipation @ Tc = 25°C @ Tc = 100°C Derate above 25°C	P_D	80 32 0.64	80 32 0.64	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150	-65 to +150	°C

thermal characteristics

Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.56	1.56	°C/W
Maximum Lead Temperature for Soldering Purpose: 1/8" from Case for 5 Seconds	T_L	260	260	°C

(1) Pulse Test: Pulse Width = 5ms. Duty Cycle ≤ 10%.

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

CHARACTERISTIC		SYMBOL	MIN	TYP	MAX	UNIT
off characteristics[1]						
Collector-Emitter Sustaining Voltage (I_C = 100mA, I_B = 0)	MJE13070 MJE13071	$V_{CEO(sus)}$	400 450	— —	— —	Volts
Collector Cutoff Current (V_{CEV} = Rated Value, $V_{BE(off)}$ = 1.5V) (V_{CEV} = Rated Value, $V_{BE(off)}$ = 1.5V, T_C = 100°C)		I_{CEV}	 — —	 — —	 0.5 2.5	mA
Collector Cutoff Current (V_{CE} = Rated V_{CEV}, R_{BE} = 50Ω, T_C = 100°C)		I_{CER}	—	—	3.0	mA
Emitter Cutoff Current (V_{EB} = 6.0V, I_C = 0)		I_{EBO}	—	—	1.0	mA
second breakdown						
Second Breakdown with Base Forward Biased		$I_{S/b}$	SEE FIGURE 12			
Clamped Inductive SOA with Base Reversed Bias		RBSOA	SEE FIGURE 13			
on characteristics[1]						
DC Current Gain (I_C = 3.0A, V_{CE} = 5.0V)		h_{FE}	8.0	—	—	—
Collector-Emitter Saturation Voltage (I_C = 3.0A, I_B = 0.6A) (I_C = 5.0A, I_B = 1.0A) (I_C = 3.0A, I_B = 0.6A, T_C = 100°C)		$V_{CE(sat)}$	 — — —	 — — —	 1.0 3.0 2.0	V
Base-Emitter Saturation Voltage (I_C = 3.0A, I_B = 0.6A) (I_C = 3.0A, I_B = 0.6A, T_C = 100°C)		$V_{BE(sat)}$	 — —	 — —	 1.5 1.5	V
dynamic characteristics						
Output Capacitance (V_{CB} = 10V, I_E = 0A, f_{test} = 1.0 kHz)		C_{ob}	—	—	250	pF
switching characteristics						
Resistive Load						
Delay Time	(V_{CC} = 250V, I_C = 3.0A	t_d	—	0.03	0.05	μs
Rise Time	I_{B1} = 0.4A, t_p = 30 μs	t_r	—	0.10	0.40	
Storage Time	Duty Cycle < 2%, $V_{BE(OFF)}$ = 5.0V)	t_s	—	0.40	1.50	
Fall Time		t_f	—	.175	0.50	
Inductive Load, Clamped						
Storage Time	$I_{C(pk)}$ = 3.0A	t_{sv}	—	0.70	2.0	μs
Crossover Time	I_{B1} = 0.4A (T_J = 100°C)	t_c	—	0.28	0.50	
Fall Time	$V_{BE(off)}$ = 5.0V	t_{fi}	—	0.15	0.30	
Storage Time	$V_{CE(PK)}$ = 250V	t_{sv}	—	0.40	—	
Crossover Time	(T_J = 25°C)	t_c	—	0.15	—	
Fall Time		t_{fi}	—	0.10	—	

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

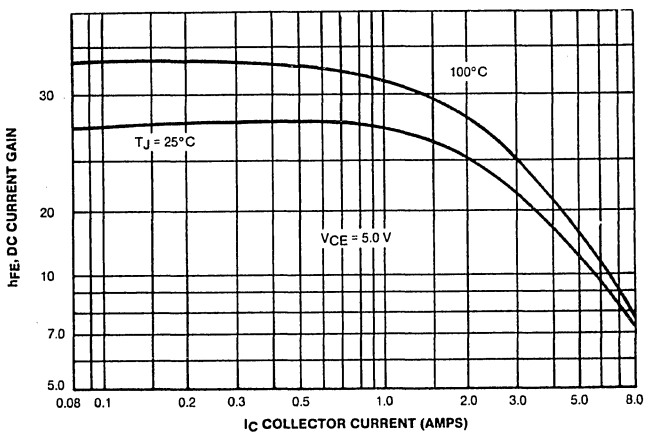


FIGURE 1 — DC CURRENT GAIN

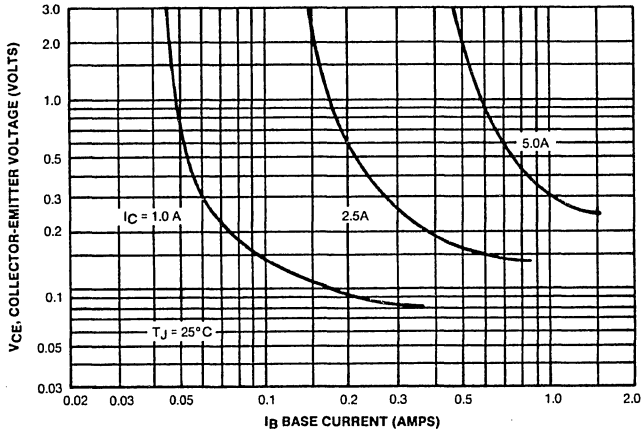


FIGURE 2 — COLLECTOR SATURATION REGION

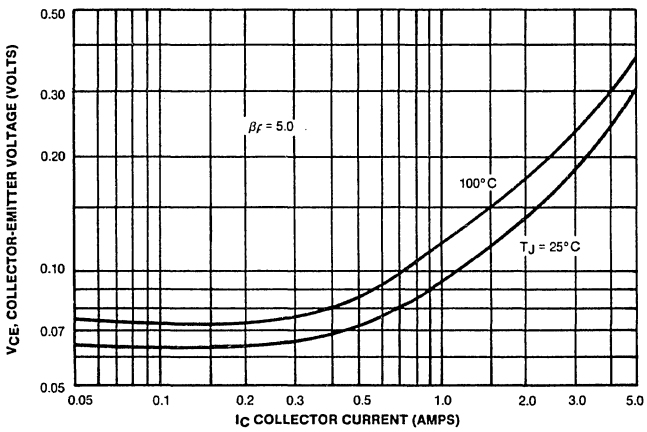


FIGURE 3 — COLLECTOR-EMITTER SATURATION VOLTAGE

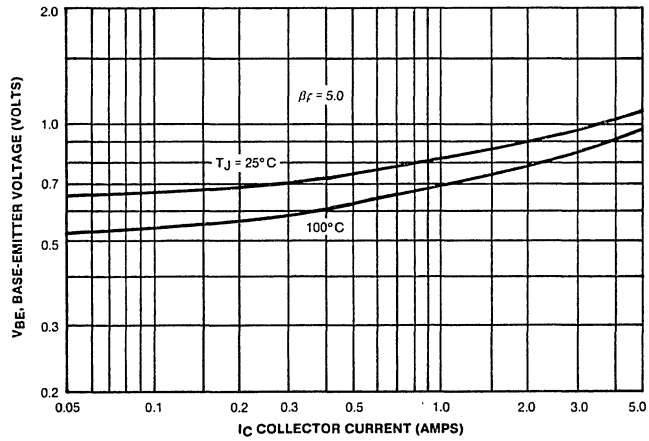


FIGURE 4 — BASE-EMITTER VOLTAGE

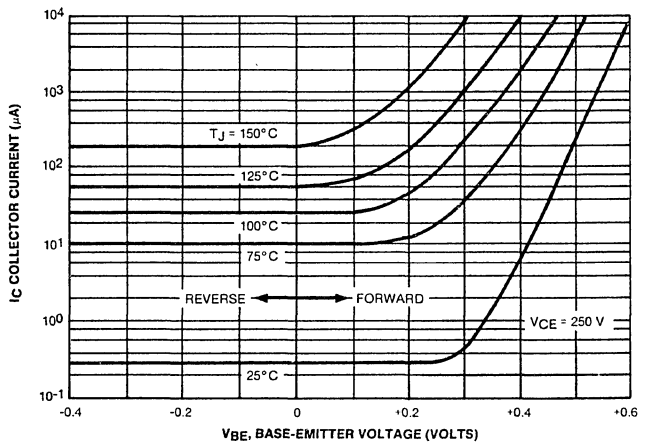


FIGURE 5 — COLLECTOR CUTOFF REGION

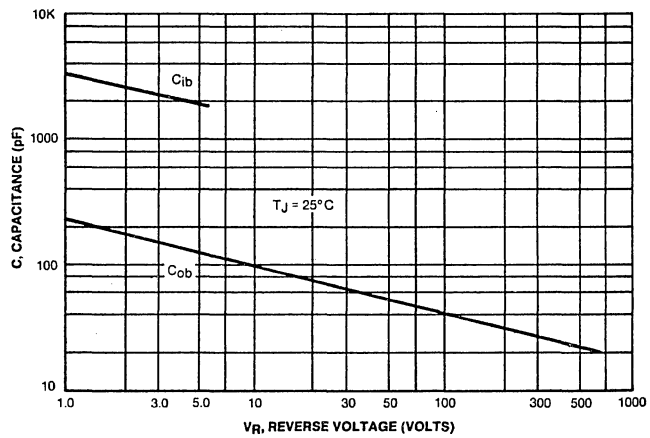


FIGURE 6 — CAPACITANCE

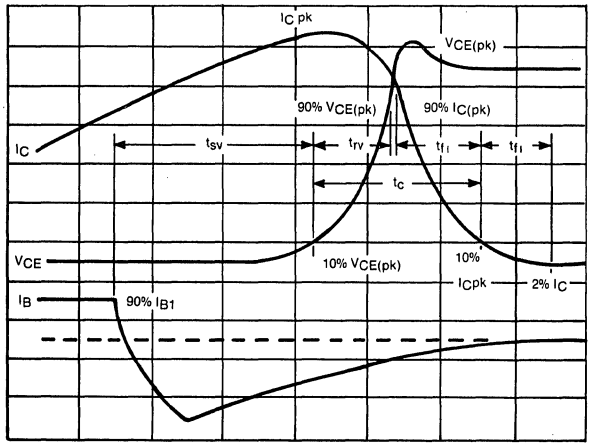


FIGURE 7 — INDUCTIVE SWITCHING MEASUREMENTS

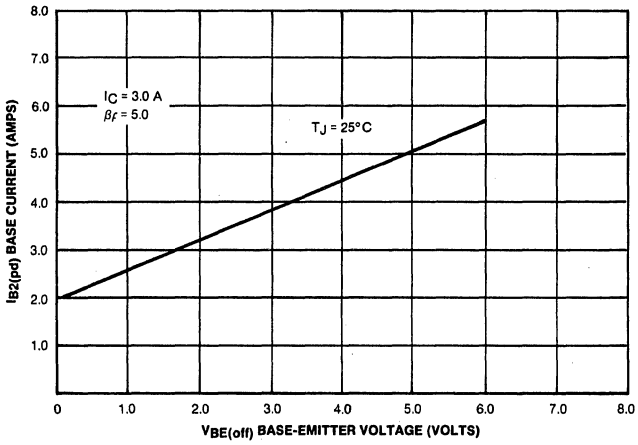


FIGURE 8 — PEAK REVERSE CURRENT

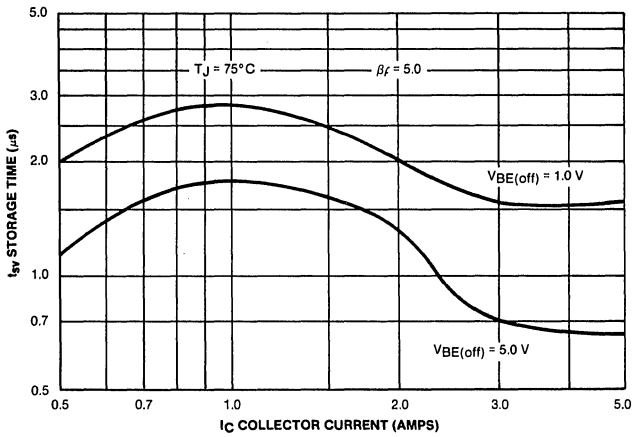


FIGURE 9 — STORAGE TIME

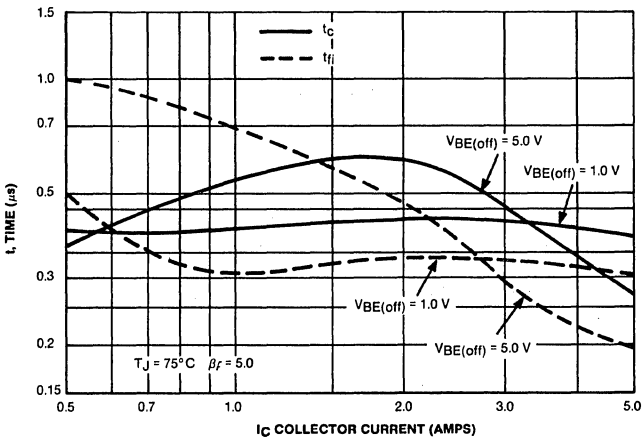


FIGURE 10 — CROSSOVER AND FALL TIMES

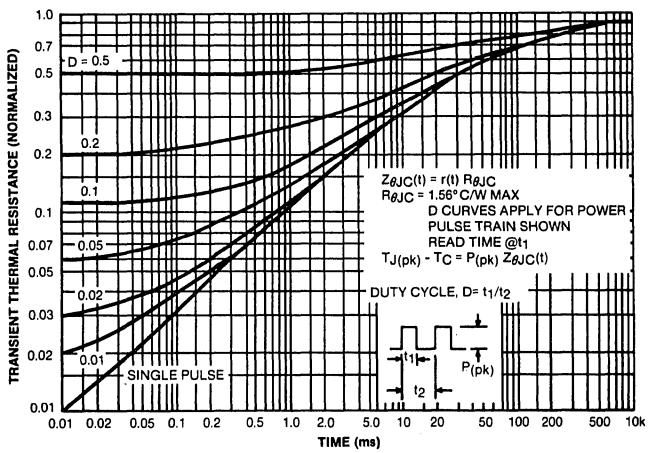


FIGURE 11 TYPICAL THERMAL RESPONSE [($Z_{\theta JC}(t)$]

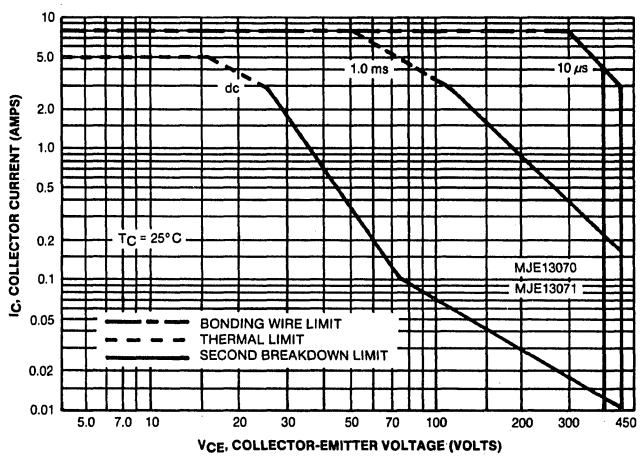


FIGURE 12 MAXIMUM FORWARD BIAS SAFE OPERATING AREA

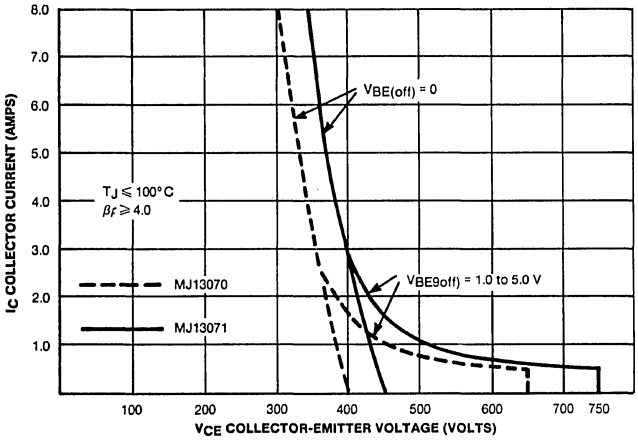


FIGURE 13 — MAXIMUM RATED REVERSE BIAS SAFE OPERATING AREA

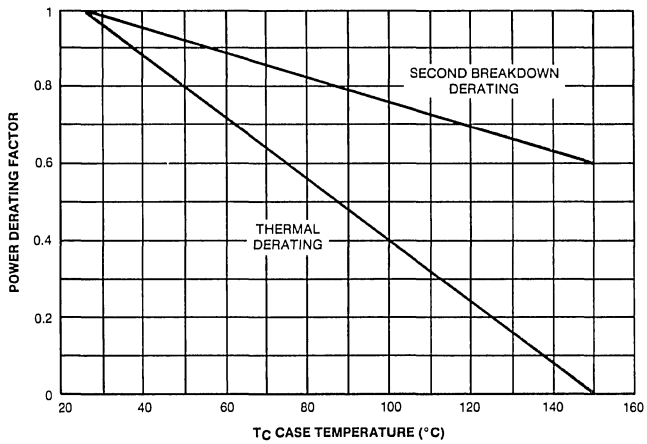


FIGURE 14 — POWER DERATING