HIGH SPEED
NPN POWER TRANSISTORS

MJH13090
MJH13091

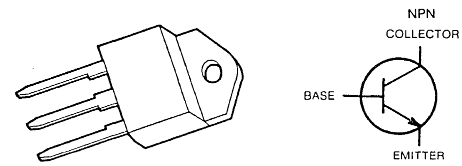
400 & 450 VOLTS
15 AMPS, 125 WATTS

The MJH13090 and MJH13091 transistors are designed for high-voltage, high-speed power switching in inductive circuits where fall time is critical. They are particularly suited for line operated switch-mode applications such as:

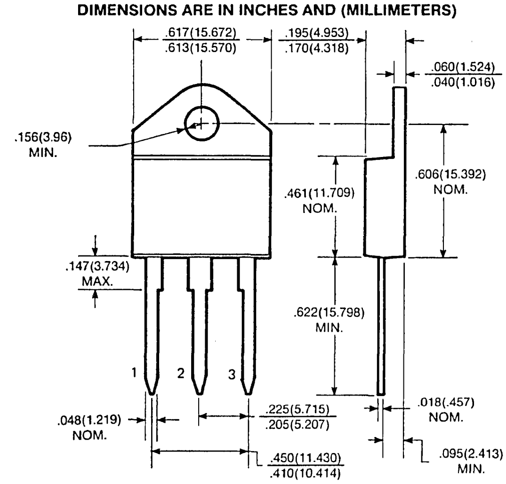
Features:

- Switching regulators
- Inverters
- Solenoid and Relay drivers
- Motor Controls
- Deflection circuits

100°C Performance Specified for:
  Reverse-Biased SOA with inductive loads
  Switching times with inductive loads —
   50 ns inductive fall time (Typ)
  Saturation voltages
  Leakage currents



CASE STYLE TO-218
DIMENSIONS ARE IN INCHES AND (MILLIMETERS)



TYPE	TERM. 1	TERM. 2	TERM. 3	TAB
TO-218	BASE	COLLECTOR	EMITTER	COLLECTOR

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

RATING	SYMBOL	MJH13090	MJH13091	UNITS
Collector-Emitter Voltage	V_{CEO}	400	450	Volts
Collector-Emitter Voltage	V_{CEV}	650	750	Volts
Emitter Base Voltage	V_{EBO}	6	6	Volts
Collector Current — Continuous Peak (Repetitive)(1)	I_C I_{CM}	15 20	15 20	A
Base Current — Continuous Peak (Non-Repetitive)(1)	I_B I_{BM}	5 10	5 10	A
Total Power Dissipation @ Tc = 25°C @ Tc = 100°C Derate above 25°C	P_D	125 50 1	125 50 1	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to +150	-55 to +150	°C

thermal characteristics

Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.0	1.0	°C/W
Maximum Lead Temperature for Soldering Purpose: ⅛" from Case for 5 Seconds	T_L	275	275	°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)	MJH13090 MJH13091	$V_{CEO(sus)}$	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} = Rate V_{CEV}, R_{BE} = 50Ω, T_C = 100° C)		I_{CER}	—	—	3	mA
Emitter Cutoff Current (V_{EB} = 6V, I_C = 0)		I_{EBO}	—	—	1	mA
second breakdown						
Second Breakdown with Base Forward Biased		FBSOA	SEE FIGURE 12			
Clamped Inductive SOA with Base Reversed Bias		RBSOA	SEE FIGURE 13			
on characteristics						
DC Current Gain (I_C = 10A, V_{CE} = 3V)		h_{FE}	8.0	—	—	—
Collector-Emitter Saturation Voltage (I_C = 10A, I_B = 2A) (I_C = 15A, I_B = 3A) (I_C = 10A, I_B = 2A, T_C = 100° C)		$V_{CE(sat)}$	— — —	— — —	1 3 2	V
Base-Emitter Saturation Voltage (I_C = 10A, I_B = 2A) (I_C = 10A, I_B = 2A, T_C = 100° C)		$V_{BE(sat)}$	— —	— —	1.5 1.5	V

switching characteristics

			SYMBOL	MIN	TYP	MAX	UNIT
Resistive Load							
Delay Time	V_{CC} = 250V, I_C = 10A		t_d	—	0.03	0.05	μs
Rise Time	I_{B1} = I_{B2} = 1.25A,		t_r	—	0.13	0.5	
Storage Time	t_p = 30 μsec		t_s	—	0.55	2.5	
Fall Time			t_f	—	0.10	0.5	
Inductive Load, Clamped							
Storage Time	$I_{CC(PK)}$ = 10A	(T_J = 100° C)	t_{sv}	—	0.8	3	μs
Crossover Time	I_{B1} = 1.25A		t_c	—	.175	.4	
Fall Time	$V_{BE(OFF)}$ = 5V		t_{fi}	—	.15	.3	
Storage Time	$V_{CE(PK)}$ = 250V	(T_J = 25° C)	t_{sv}	—	.50	—	
Crossover Time			t_c	—	.15	—	
Fall Time			t_{fi}	—	.10	—	

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

TYPICAL ELECTRICAL CHARACTERISTICS

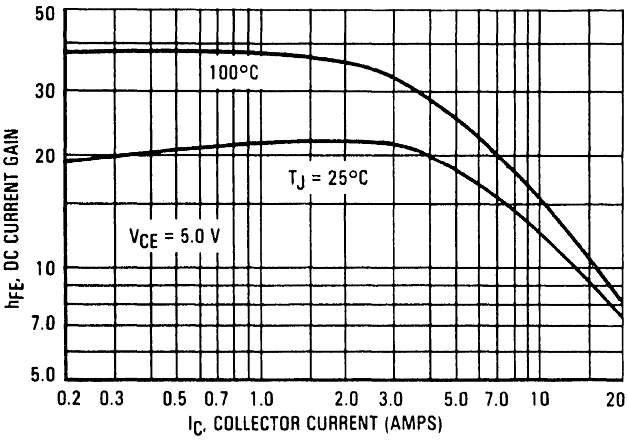


FIGURE 1 — DC CURRENT GAIN

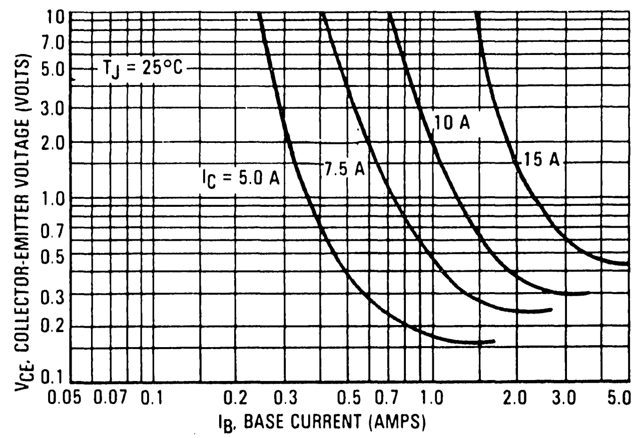


FIGURE 2 — COLLECTOR SATURATION REGION

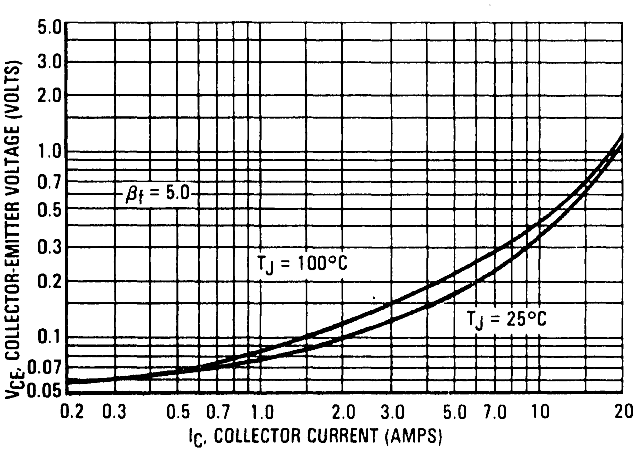


FIGURE 3 — COLLECTOR-EMITTER SATURATION VOLTAGE

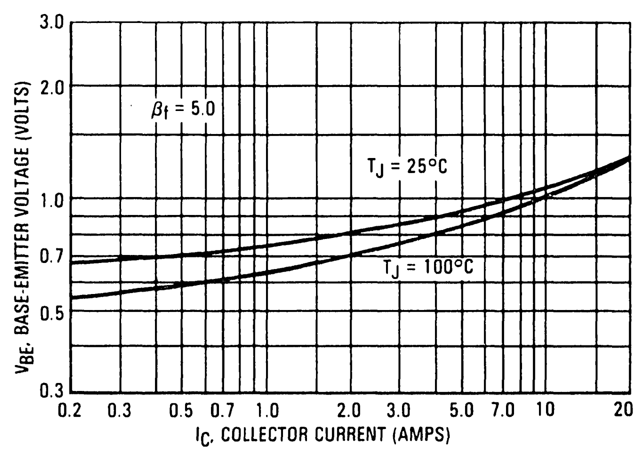


FIGURE 4 — BASE-EMITTER VOLTAGE

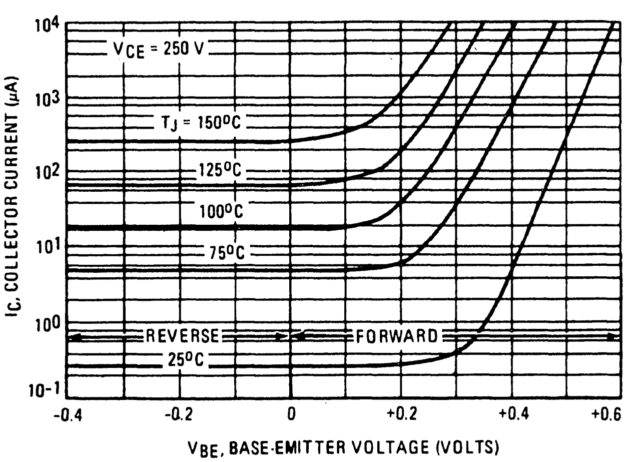


FIGURE 5 — COLLECTOR CUTOFF REGION

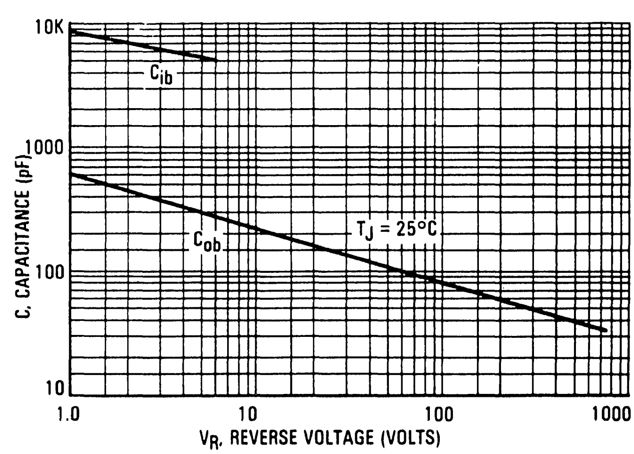


FIGURE 6 — CAPACITANCE

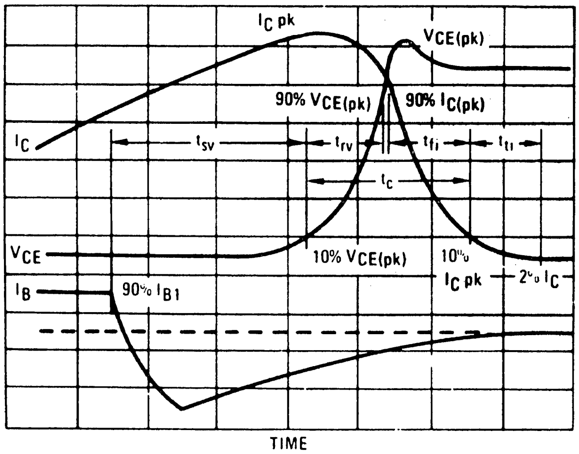


FIGURE 7 — INDUCTIVE SWITCHING MEASUREMENTS

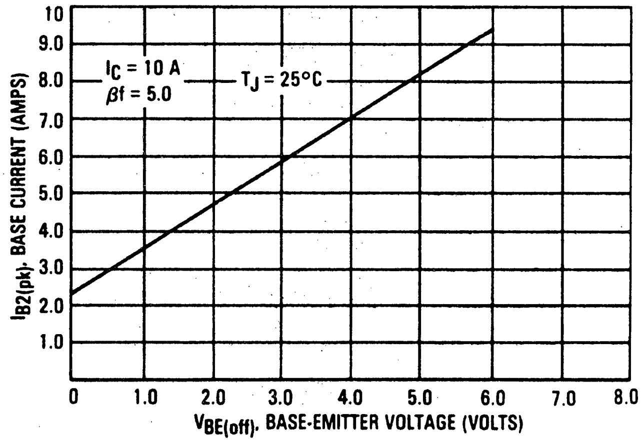


FIGURE 8 — PEAK REVERSE CURRENT

INDUCTIVE SWITCHING

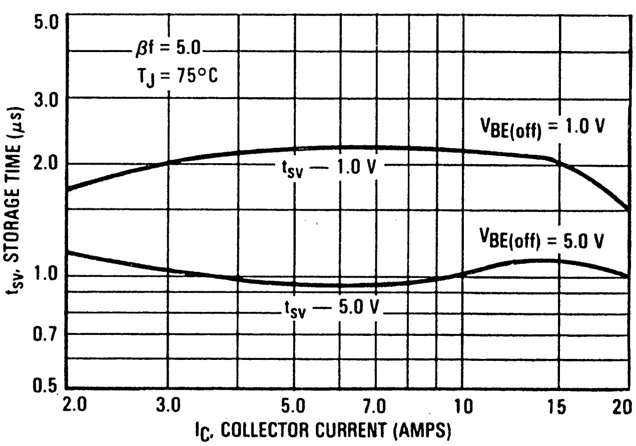


FIGURE 9 — STORAGE TIME

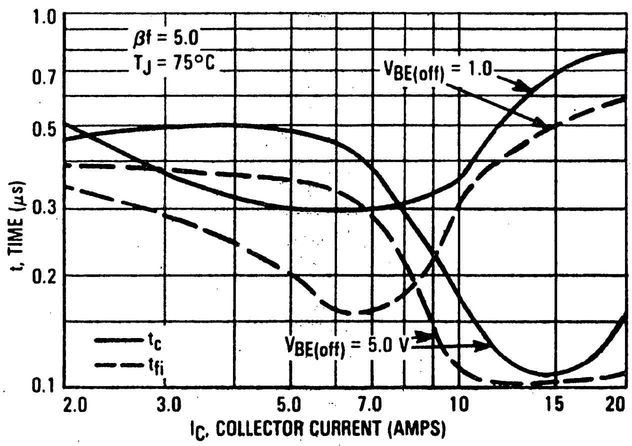


FIGURE 10 — CROSSOVER AND FALL TIMES

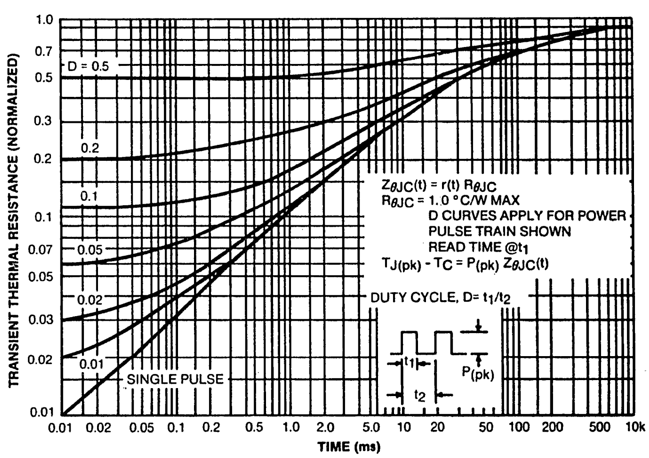


FIGURE 11 TYPICAL THERMAL RESPONSE [($Z_{\theta JC}(t)$)]

The Safe Operating Area figures shown in Figures 12 and 13 are specified for these devices under the test conditions shown.

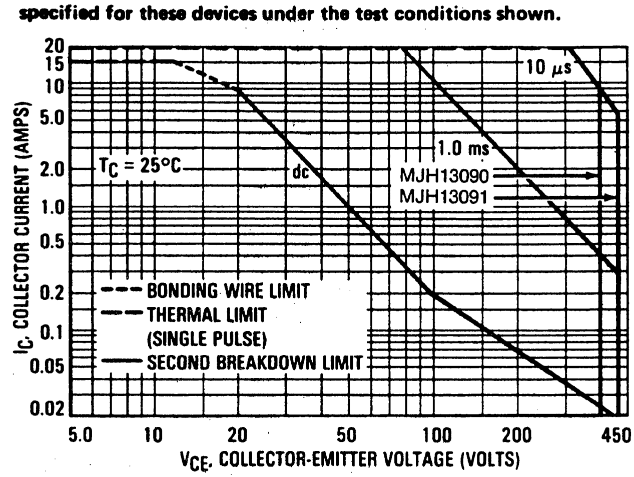


FIGURE 12 — FORWARD BIAS SAFE OPERATING AREA

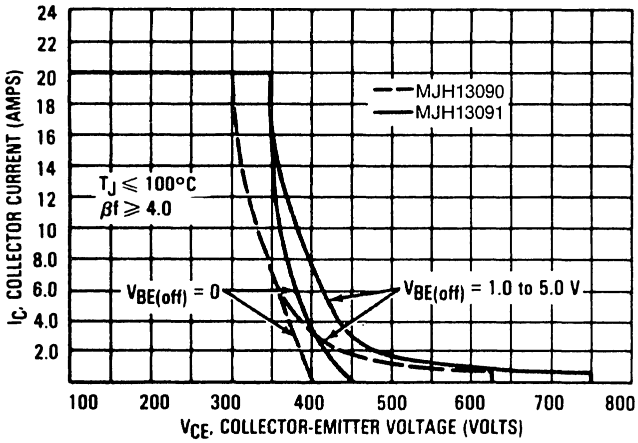


FIGURE 13 — REVERSE BIAS SAFE OPERATING AREA

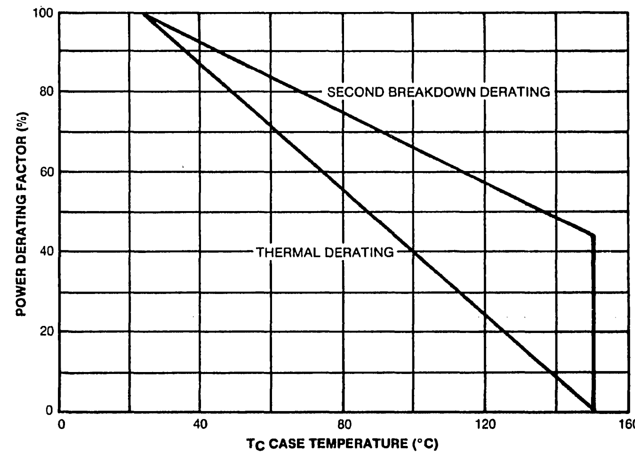


FIGURE 14 — POWER DERATING