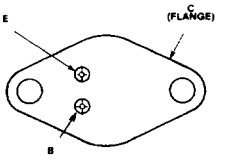
15-A SwitchMax II Power Transistors

High-Voltage N-P-N Types for Off-Line Power Supplies and Other High-Voltage Switching Applications

Features:
- *Fast switching speed*
- *High-voltage ratings:* V_{CEV} *= 650 V to 750 V*
- *Low* $V_{CE}(sat)$ *at* I_C *= 15 A*

Applications:
- *Off-line power supplies*
- *High-voltage inverters*
- *Switching regulators*

TERMINAL DESIGNATIONS



JEDEC TO-204AA

The RCA MJ13090 and MJ13091 SwitchMax II series of silicon n-p-n power transistors feature high-voltage capability, fast switching speeds, and low saturation voltages, together with high safe-operating-area (SOA) ratings. They are specially designed for off-line power supplies, converter circuits, and pulse-width-modulated regulators. These high-voltage, high-speed transistors are tested for parameters that are essential to the design of high-power switching circuits. Switching times, including inductive turn-off time, and saturation voltages are specified at 100°C to provide information necessary for worst-case design.

The MJ13090 and MJ13091 transistors are supplied in steel JEDEC TO-204AA hermetic packages.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

	MJ13090	MJ13091	
V_{CEV}			
V_{BE} = -1.5 V	650	750	V
V_{CEO}	400	450	V
V_{EBO}	6		V
I_C	15		A
I_{CM}	20		A
I_B	5		A
I_{BM}	10		A
P_T			
@ T_C = 25°C	175		W
@ T_C = 100°C	100		W
T_C above 25°C, derate linearly	1		W/°C
T_{stg}, T_J	-65 to +200		°C
T_L			
At distance ≥ ⅛ in. (3.17 mm) from seating plane for 10 s max.	275		°C
$R_{\theta JC}$	1		°C/W

ELECTRICAL CHARACTERISTICS at T_C = 25°C unless otherwise noted

CHARACTERISTIC				LIMITS Min.	LIMITS Typ.	LIMITS Max.	UNITS
OFF CHARACTERISTICS[1]							
Collector-Emitter Sustaining Voltage I_C = 100 mA, I_B = 0	MJ13090 MJ13091	$V_{CEO}(sus)$		400 450	— —	— —	V dc
Collector Cutoff Current		I_{CEV}					
V_{CEV} = Rated Value, $V_{BE}(off)$ = 1.5 V dc				—	—	0.5	mA dc
V_{CEV} = Rated Value, $V_{BE}(off)$ = 1.5 V dc, T_C = 100°C				—	—	2.5	
Collector Cutoff Current V_{CE} = Rated V_{CEV}, R_{BE} = 50 Ω, T_C = 100°C		I_{CER}		—	—	3	mA dc
Emitter Cutoff Current V_{EB} = 6 V dc, I_C = 0		I_{EBO}		—	—	1	mA dc
SECOND BREAKDOWN							
Second Breakdown Collector Current with Base Forward Biased		$I_{s/b}$		See Fig. 1			
Clamped Inductive SOA with Base Reverse Biased		RBSOA		See Fig. 2			
ON CHARACTERISTICS[1]							
Collector-Emitter Saturation Voltage		$V_{CE}(sat)$					
I_C = 10 A dc, I_B = 2 A dc				—	—	1	
I_C = 15 A dc, I_B = 3 A dc				—	—	3	V dc
I_C = 10 A dc, I_B = 2 A dc, T_C = 100°C				—	—	2	
Base-Emitter Saturation Voltage		$V_{BE}(sat)$					
I_C = 10 A dc, I_B = 2 A dc				—	—	1.5	V dc
I_C = 10 A dc, I_B = 2 A dc, T_C = 100°C				—	—	1.5	
DC Current Gain I_C = 10 A dc, V_{CE} = 3 V dc		h_{FE}		8	—	—	
DYNAMIC CHARACTERISTICS							
Output Capacitance V_{CB} = 10 V dc, I_E = 0, f_{test} = 1 kHz		C_{ob}		—	—	350	pF
SWITCHING CHARACTERISTICS							
Resistive Load							
Delay Time	V_{CC} = 250 V dc, I_C = 10 A dc,		t_d	—	0.03	0.05	μs
Rise Time	I_{B1} = 1.25 A dc, t_p = 30 μs,		t_r	—	0.13	0.5	
Storage Time	Duty Cycle≤2%, $V_{BE}(off)$ = 5 V dc		t_s	—	0.55	2.5	
Fall Time			t_f	—	0.1	0.5	
Inductive Load, Clamped							
Storage Time			t_{sv}	—	0.8	3	μs
Fall Time	$I_{C(pk)}$ = 10 A,	T_J = 100°C	t_{fi}	—	0.15	0.3	
Crossover Time	I_{B1} = 1.25 A dc,		t_c	—	0.175	0.4	
Storage Time	$V_{BE}(off)$= 5 V dc,		t_{sv}	—	0.5	—	
Fall Time	$V_{CE(pk)}$ = 250 V	T_J = 25°C	t_{fi}	—	0.1	—	
Crossover Time			t_c	—	0.15	—	

[1]Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2%.

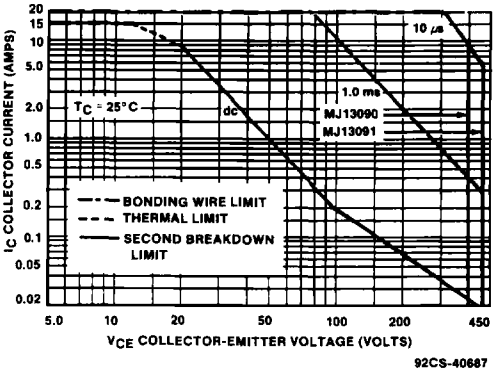


Fig. 1 - Maximum forward-bias safe-operating-areas for both types.

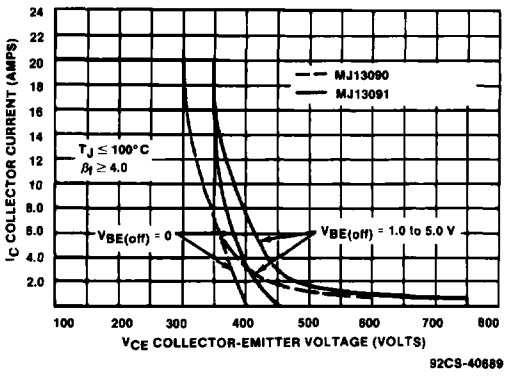


Fig. 2 - Maximum reverse-bias safe-operating-areas for both types.

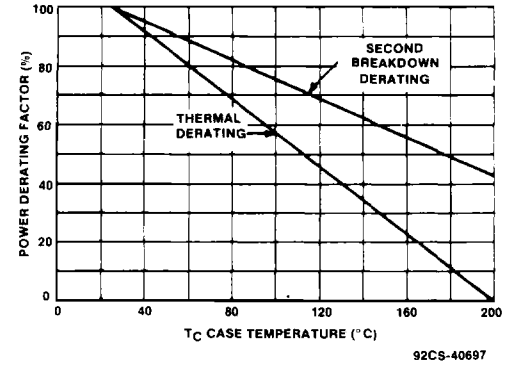


Fig. 3 - Dissipation and $I_{s/b}$ derating curves for both types.

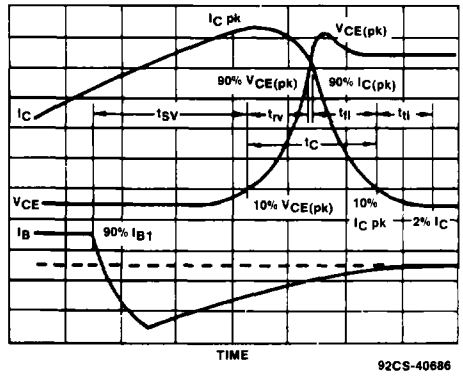


Fig. 4 - Inductive switching measurements display.