5-A *SwitchMax* II Power Transistors

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

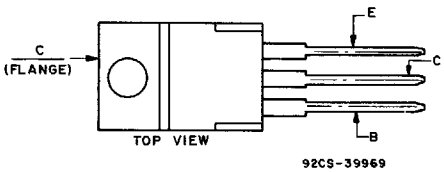
Features:

- *Fast switching speed*
- *High-voltage ratings:* V_{CEV} = 650 V to 750 V
- *Low* $V_{CE}(sat)$ *at* I_c = 5A

Applications:

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

TERMINAL DESIGNATIONS



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JEDEC TO-220AB

The MJE13070 and MJE13071 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, saturation voltages are specified at 100°C to provide information necessary for worst-case design.

These transistors are supplied in the JEDEC TO-220AB (VERSAWATT) plastic package.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

	MJE13070	MJE13071	
V_{CEV}			
V_{BE} = -1.5 V	650	750	V
V_{CEO}	400	450	V
V_{EBO}	6		V
I_C(sat)	5		A
I_C	5		A
I_{CM}	8		A
I_B	2		A
I_{BM}	4		A
P_T			
@ T_C = 25°C	80		W
@ T_C = 100°C	32		W
T_C above 25°C, derate linearly	0.64		W/°C
T_{stg} T_J	-65 to +150		°C
TL			
At distance ≥ 1/8" in. (3.17 mm) from seating plane for 10 s max	235		°C
$R_{\theta JC}$	1.56		°C/W

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

Characteristic			Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS (1)							
Collector-Emitter Sustaining Voltage (I_C = 100 mA, I_B = 0)	MJE13070		$V_{CEO(sus)}$	400	—	—	Vdc
	MJE13071			450	—	—	
Collector Cutoff Current (V_{CEV} = Rated Value, $V_{BE(off)}$ = 1.5 Vdc)			I_{CEV}	—	—	0.5	mAdc
(V_{CEV} = Rated Value, $V_{BE(off)}$ = 1.5 Vdc, T_C = 100°C)				—	—	2.5	
Collector Cutoff Current (V_{CE} = Rated V_{CEV}, R_{BE} = 50 Ω, T_C = 100°C)			I_{CER}	—	—	3.0	mAdc
Emitter Cutoff Current (V_{EB} = 6.0 Vdc, I_C = 0)			I_{EBO}	—	—	1 0	mAdc
SECOND BREAKDOWN							
Second Breakdown Collector Current with Base Forward Biased			$I_{S/b}$	See Figure 1			
Clamped Inductive SOA with Base Reverse Biased			RBSOA	See Figure 2			
ON CHARACTERISTICS (1)							
DC Current Gain (I_C = 3.0 Adc, V_{CE} = 5 0 Vdc			h_{FE}	8.0	—	—	—
Collector-Emitter Saturation Voltage			$V_{CE(sat)}$				Vdc
(I_C = 3.0 Adc, I_B = 0.6 Adc)				—	0.6	1 0	
(I_C = 5 0 Adc, I_B = 1 0 Adc)				—	2.0	3 0	
(I_C = 3 0 Adc, I_B = 0 6 Adc, T_C = 100°C)				—	—	2.0	
Base-Emitter Saturation Voltage			$V_{BE(sat)}$				Vdc
(I_C = 3 0 Adc, I_B = 0.6 Adc)				—	1.0	1.5	
(I_C = 3 0 Adc, I_B = 0.6 Adc, T_C = 100°C)				—	—	1 5	
DYNAMIC CHARACTERISTICS							
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f_{test} = 1 0 kHz)			C_{ob}	—	—	250	pF
SWITCHING CHARACTERISTICS							
Resistive Load							
Delay Time	(V_{CC} = 250 Vdc, I_C = 3 0 Adc, I_{B1} = 0 4 Adc, t_p = 30 μs, Duty Cycle ≤2%, $V_{BE(off)}$ = 5 0 Vdc)		t_d	—	0.03	0.05	μs
Rise Time			t_r	—	0.08	0 40	
Storage Time			t_s	—	0.33	1.50	
Fall Time			t_f	—	0.10	0 50	
Inductive Load, Clamped							
Storage Time	($I_{C(pk)}$ = 3 0 A, I_{B1} = 0 4 Adc, $V_{BE(off)}$ = 5 0 Vdc, $V_{CE(pk)}$ = 250 V)	(T_J = 100°C)	t_{sv}	—	0.70	2 0	μs
Crossover Time			t_c	—	0.08	0 50	
Fall Time			t_{fi}	—	0.05	0 30	
Storage Time		(T_J = 25°C)	t_{sv}	—	0.40	—	
Crossover Time			t_c	—	0.05	—	
Fall Time			t_{fi}	—	0.03	—	

(1) Pulse Test PW - 300 μs Duty Cycle ≤2%

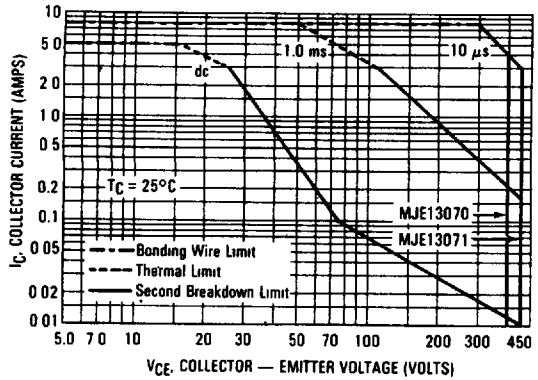

Fig. 1 — Maximum forward-bias safe-operating-areas for both types.

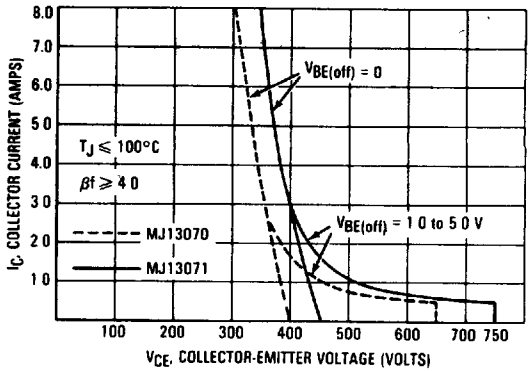

Fig. 2 — Maximum reverse-bias safe-operating-areas for both types.

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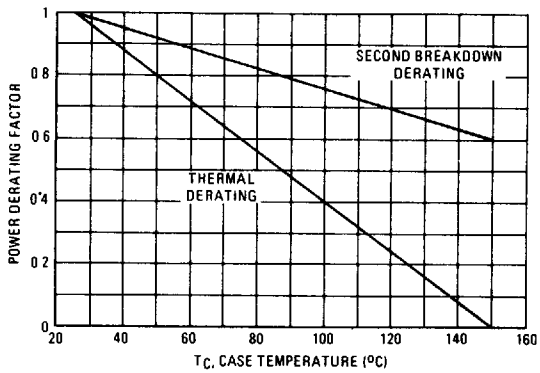

Fig. 3 — Dissipation and $I_{s/b}$ derating curves for both types.