

# 15-A SwitchMax II Power Transistors

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

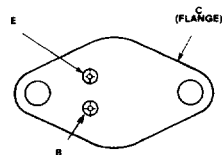
**Features:**

- Fast switching speed
- High-voltage ratings:  
V<sub>CEV</sub> = 650 V to 750 V
- Low V<sub>CE(sat)</sub> at I<sub>C</sub> = 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 para-

meters 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.

**2**  
POWER TRANSISTORS

**MAXIMUM RATINGS, Absolute-Maximum Values:**

	MJ13090	MJ13091	
V <sub>CEV</sub>	650	750	V
V <sub>BE</sub> = -1.5 V	400	450	V
V <sub>CEO</sub>	6	6	V
V <sub>EBO</sub>	15	15	A
I <sub>C</sub>	20	20	A
I <sub>CM</sub>	5	5	A
I <sub>B</sub>	10	10	A
I <sub>BM</sub>	175	175	W
P <sub>T</sub>	100	100	W
@ T <sub>C</sub> = 25°C	1	1	W/°C
@ T <sub>C</sub> = 100°C	-65 to +200	-65 to +200	°C
T <sub>stg</sub> , T <sub>J</sub>	275	275	°C
T <sub>L</sub>	1	1	°C/W
At distance ≥ 1/8 in. (3.17 mm) from seating plane for 10 s max.			
R <sub>θJC</sub>			

# MJ13090, MJ13091

ELECTRICAL CHARACTERISTICS at  $T_c = 25^\circ\text{C}$  unless otherwise noted

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

<sup>1</sup>Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

