

MJ16010, MJ16012, MJH16010, MJH16012

5-A **SwitchMax II** Power Transistors

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

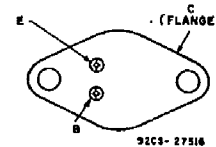
Features:

- Fast switching speed
- High-voltage ratings.
 $V_{CEV} = 850\text{ V}$
- Low $V_{CE}(sat)$ at $I_c = 10\text{ A}$

Applications:

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

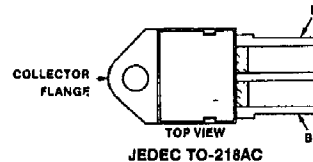
TERMINAL DESIGNATIONS



MJ16010
MJ16012

JEDEC TO-204AA

(200 mil diameter pin isolation)



MJH16010
MJH16012

JEDEC TO-218AC

92CS-40257

The MJ16010, MJ16012, MJH16010, and MJH16012 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 MJ16010 and MJ16012 transistors are supplied in steel JEDEC TO-204AA hermetic packages. The MJH16010 and MJH16012 transistors are supplied in JEDEC TO-218AC plastic packages.

MAXIMUM RATINGS, Absolute-Maximum Values:

	MJ16010 MJ16012	MJH16010 MJH16012	
V_{CEV}	850	450	V
$V_{BE} = -1.5\text{ V}$	6	6	V
V_{CEO}	10	10	V
V_{EBC}	15	15	A
$I_C(sat)$	20	20	A
I_C	10	10	A
I_{CM}	15	15	A
I_B	15	15	A
I_{BM}	15	15	A
P_T			
@ $T_c = 25^\circ\text{C}$	175	135	W
@ $T_c = 100^\circ\text{C}$	100	53.8	W
T_c above 25°C , derate linearly	1	1.08	W/°C
T_{stg} , T_j	-65 to 200	-65 to 150	°C
T_L			
At distance $\geq 1/8"$ in. (3.17 mm) from seating plane for 10 s max		235	°C
T_c			
At distance $\geq 1/16"$ in. (1.58 mm) from seating plane for 10 s max	235		°C
$R_{\theta JC}$	1	0.93	°C/W



NJ Semi-Conductors reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by NJ Semi-Conductors is believed to be both accurate and reliable at the time of going to press. However, NJ Semi-Conductors assumes no responsibility for any errors or omissions discovered in its use. NJ Semi-Conductors encourages customers to verify that datasheets are current before placing orders.

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MJ16010, MJH16010

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)	V _{CEQ(sus)}	450	—	—	Vdc		
Collector Cutoff Current (V _{CEV} = 850 Vdc, V _{BE(off)} = 1.5 Vdc) (V _{CEV} = 850 Vdc, V _{BE(off)} = 1.5 Vdc, T _C = 100°C)	I _{CEV}	—	—	0.25 1.6	mA _{dc}		
Collector Cutoff Current (V _{CE} = 850 Vdc, R _{BE} = 50 Ω, T _C = 100°C)	I _{CER}	—	—	2.6	mA _{dc}		
Emitter Cutoff Current (V _{EB} = 6.0 Vdc, I _C = 0)	I _{EBO}	—	—	1.0	mA _{dc}		
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)							
Collector-Emitter Saturation Voltage (I _C = 5.0 Adc, I _B = 0.7 Adc) (I _C = 10 Adc, I _B = 1.3 Adc) (I _C = 10 Adc, I _B = 1.3 Adc, T _C = 100°C)	V _{CE(sat)}	—	0.5 1.0 —	2.5 3.0 3.0	Vdc		
Base-Emitter Saturation Voltage (I _C = 10 Adc, I _B = 1.3 Adc) (I _C = 10 Adc, I _B = 1.3 Adc, T _C = 100°C)	V _{BE(sat)}	—	1.0 —	1.5 1.5	Vdc		
DC Current Gain (I _C = 15 Adc, V _{CE} = 5.0 Vdc)	h _{FE}	5.0	—	—	—		
DYNAMIC CHARACTERISTICS							
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f _{test} = 1.0 kHz)	C _{ob}	—	—	400	pF		
SWITCHING CHARACTERISTICS							
Resistive Load							
Delay Time	(I _C = 10 Adc, V _{CC} = 250 Vdc, I _{B1} = 1.3 Adc, PW = 30 μs, Duty Cycle ≤ 2.0%)	(I _{B2} = 2.6 Adc, R _B = 1.6 Ω) (V _{BE(off)} = 5.0 Vdc)	t _d	—	40	—	ns
Rise Time			t _r	—	100	—	
Storage Time			t _s	—	1400	—	
Fall Time			t _f	—	140	—	
Storage Time			t _{sv}	—	800	—	
Fall Time			t _{fv}	—	100	—	
Inductive Load							
Storage Time	(I _C = 10 Adc, I _{B1} = 1.3 Adc, V _{BE(off)} = 5.0 Vdc, V _{CE(pk)} = 400 Vdc)	(T _C = 100°C) (T _C = 150°C)	t _{sv}	—	800	1800	ns
Fall Time			t _{fv}	—	50	200	
Crossover Time			t _c	—	100	250	
Storage Time			t _{sv}	—	860	—	
Fall Time			t _{fv}	—	40	—	
Crossover Time			t _c	—	80	—	

(1) Pulse Test. Pulse Width = 300 μs. Duty Cycle ≤ 2.0%

MJ16012, MJH16012

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS (1)

Collector-Emitter Sustaining Voltage (I _C = 100 mA, I _B = 0)	V _{CE(sus)}	450	—	—	V _{dc}
Collector Cutoff Current (V _{CEV} = 850 V _{dc} , V _{BE(off)} = 1.5 V _{dc}) (V _{CEV} = 850 V _{dc} , V _{BE(off)} = 1.5 V _{dc} , T _C = 100°C)	I _{CEV}	—	—	0.25	mA _{dc}
		—	—	1.5	
Collector Cutoff Current (V _{CE} = 850 V _{dc} , R _{BE} = 50 Ω, T _C = 100°C)	I _{CER}	—	—	2.5	mA _{dc}
Emitter Cutoff Current (V _{EB} = 6.0 V _{dc} , I _C = 0)	I _{EBO}	—	—	1.0	mA _{dc}

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)

Collector-Emitter Saturation Voltage (I _C = 5.0 A _{dc} , I _B = 0.5 A _{dc}) (I _C = 10 A _{dc} , I _B = 1.0 A _{dc}) (I _C = 10 A _{dc} , I _B = 1.0 A _{dc} , T _C = 100°C)	V _{CE(sat)}	—	—	2.5 3.0 3.0	V _{dc}
Base-Emitter Saturation Voltage (I _C = 10 A _{dc} , I _B = 1.0 A _{dc}) (I _C = 10 A _{dc} , I _B = 1.0 A _{dc} , T _C = 100°C)	V _{BE(sat)}	—	—	1.5	V _{dc}
		—	—	1.6	
DC Current Gain (I _C = 15 A _{dc} , V _{CE} = 5.0 V _{dc})	h _{FE}	7.0	—	—	—

DYNAMIC CHARACTERISTICS

Output Capacitance (V _{CB} = 10 V _{dc} , I _E = 0, f _{test} = 1.0 kHz)	C _{ob}	—	—	400	pF
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SWITCHING CHARACTERISTICS

Resistive Load							
Delay Time	(I _C = 10 A _{dc} , V _{CC} = 250 V _{dc} , I _{B1} = 1.0 A _{dc} , PW = 30 μs, Duty Cycle ≤ 2.0%)	(I _{B2} = 2.0 A _{dc} , R _B = 1.6 Ω)	t _d	—	40	—	ns
Rise Time			t _r	—	100	—	
Storage Time			t _s	—	1400	—	
Fall Time			t _f	—	140	—	
Storage Time			t _s	—	600	—	
Fall Time			t _f	—	100	—	
Inductive Load							
Storage Time	(I _C = 10 A _{dc} , I _{B1} = 1.0 A _{dc} , V _{BE(off)} = 5.0 V _{dc} , V _{CE(pk)} = 400 V _{dc})	(T _C = 100°C)	t _{sv}	—	800	1500	ns
Fall Time			t _{fi}	—	50	150	
Crossover Time			t _c	—	100	200	
Storage Time			t _{sv}	—	860	—	
Fall Time			t _{fi}	—	40	—	
Crossover Time			t _c	—	80	—	

(1) Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2.0%