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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

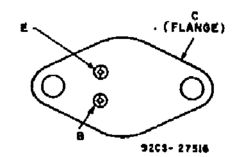
Features:

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

Applications:

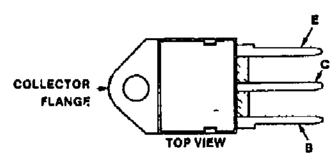
- *Off-line power supplies*
- *High-voltage inverters*
- *Switching regulators*

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}			
V_{BE} = -1.5 V	850	850	V
V_{CEO}	450	450	V
V_{EBO}	6	6	V
$I_C(sat)$	10	10	A
I_C	15	15	A
I_{CM}	20	20	A
I_B	10	10	A
I_{BM}	15	15	A
P_T			
@ T_C = 25°C	175	135	W
@ T_C = 100°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
TL			
At distance ≥ 1/8" in (3.17 mm) from seating plane for 10 s max		235	°C
T_L			
At distance ≥ 1/16" in. (1.58 mm) from seating plane for 10 s max	235		°C
$R_{θJC}$	1	0.93	°C/W

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)	$V_{CEO(sus)}$	450	—	—	Vdc
Collector Cutoff Current	I_{CEV}				mAdc
(V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc)		—	—	0.25	
(V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 100°C)		—	—	1.5	
Collector Cutoff Current (V_{CE} = 850 Vdc, R_{BE} = 50 Ω, T_C = 100°C)	I_{CER}	—	—	2.5	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)					
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$				Vdc
(I_C = 5.0 Adc, I_B = 0.7 Adc)		—	0.5	2.5	
(I_C = 10 Adc, I_B = 1.3 Adc)		—	1.0	3.0	
(I_C = 10 Adc, I_B = 1.3 Adc, T_C = 100°C)		—	—	3.0	
Base-Emitter Saturation Voltage	$V_{BE(sat)}$				Vdc
(I_C = 10 Adc, I_B = 1.3 Adc)		—	1.0	1.5	
(I_C = 10 Adc, I_B = 1.3 Adc, T_C = 100°C)		—	—	1.5	
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

Characteristic	Conditions		Symbol	Min	Typ	Max	Unit
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)	t_d	—	40	—	ns
Rise Time			t_r	—	100	—	
Storage Time			t_s	—	1400	—	
Fall Time			t_f	—	140	—	
Storage Time		($V_{BE(off)}$ = 5.0 Vdc)	t_s	—	600	—	
Fall Time			t_f	—	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_{sv}	—	800	1800	ns
Fall Time			t_{fi}	—	50	200	
Crossover Time			t_c	—	100	250	
Storage Time		(T_C = 150°C)	t_{sv}	—	860	—	
Fall Time			t_{fi}	—	40	—	
Crossover Time			t_c	—	80	—	

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

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)	$V_{CEO(sus)}$	450	—	—	Vdc
Collector Cutoff Current (V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	I_{CEV}	—	—	0.25	mAdc
(V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 100°C)		—	—	1.5	
Collector Cutoff Current (V_{CE} = 850 Vdc, R_{BE} = 50 Ω, T_C = 100°C)	I_{CER}	—	—	2.5	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)					
Collector-Emitter Saturation Voltage (I_C = 5.0 Adc, I_B = 0.5 Adc)	$V_{CE(sat)}$	—	—	2.5	Vdc
(I_C = 10 Adc, I_B = 1.0 Adc)		—	—	3.0	
(I_C = 10 Adc, I_B = 1.0 Adc, T_C = 100°C)		—	—	3.0	
Base-Emitter Saturation Voltage (I_C = 10 Adc, I_B = 1.0 Adc)	$V_{BE(sat)}$	—	—	1.5	Vdc
(I_C = 10 Adc, I_B = 1.0 Adc, T_C = 100°C)		—	—	1.5	
DC Current Gain (I_C = 15 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	7.0	—	—	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f_{test} = 1.0 kHz)	C_{ob}	—	—	400	pF

SWITCHING CHARACTERISTICS

Characteristic	Conditions		Symbol	Min	Typ	Max	Unit
Resistive Load							
Delay Time	(I_C = 10 Adc, V_{CC} = 250 Vdc, I_{B1} = 1.0 Adc, PW = 30 μs, Duty Cycle ≤ 2.0%)	(I_{B2} = 2.0 Adc, 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		($V_{BE(off)}$ = 5.0 Vdc)	t_s	—	600	—	
Fall Time			t_f	—	100	—	
Inductive Load							
Storage Time	(I_C = 10 Adc, I_{B1} = 1.0 Adc, $V_{BE(off)}$ = 5.0 Vdc, $V_{CE(pk)}$ = 400 Vdc)	(T_C = 100°C)	t_{sv}	—	800	1500	ns
Fall Time			t_{fi}	—	50	150	
Crossover Time			t_c	—	100	200	
Storage Time		(T_C = 150°C)	t_{sv}	—	860	—	
Fall Time			t_{fi}	—	40	—	
Crossover Time			t_c	—	80	—	

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