New Jersey Semi-Conductor Products, Inc.

20 STERN AVE.
SPRINGFIELD, NEW JERSEY 07081
U.S.A.

TELEPHONE: (973) 376-2922
(212) 227-6005
FAX: (973) 376-8960

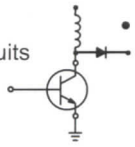
MJ16010
MJW16010
MJ16012*
MJW16012*

Designer's™ Data Sheet

SWITCHMODE Series NPN Silicon Power Transistors

These transistors are designed for high–voltage, high–speed, power switching in inductive circuits where fall time is critical. They are particularly suited for line–operated switchmode applications. The MJ16012 and MJW16012 are selected high gain versions of the MJ16010 and MJW16010 for applications where drive current is limited.

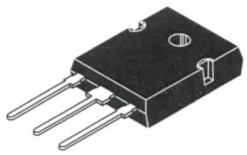
- Switching Regulators
- Inverters
- Solenoids
- Relay Drivers
- Motor Controls
- Deflection Circuits



- Fast Turn–Off Times — T_C = 100°C
  - 50 ns Inductive Fall Time (Typ)
  - 90 ns Inductive Crossover Time (Typ)
  - 800 ns Inductive Storage Time (Typ)
- 100°C Performance Specified for:
  - Reverse–Biased SOA with Inductive Loads
  - Switching Times with Inductive Loads
  - Saturation Voltages
  - Leakage Currents

15 AMPERE
NPN SILICON
POWER TRANSISTORS
450 VOLTS
135 AND 175 WATTS

(TO–3)
MJ16010
MJ16012



TO–247AE
MJW16010
MJW16012

MAXIMUM RATINGS

Rating	Symbol	MJ16010 MJ16012	MJW16010 MJW16012	Unit
Collector–Emitter Voltage	V_{CEO}	450		Vdc
Collector–Emitter Voltage	V_{CEV}	850		Vdc
Emitter–Base Voltage	V_{EB}	6.0		Vdc
Collector Current — Continuous — Peak (1)	I_C I_{CM}	15 20		Adc
Base Current — Continuous — Peak (1)	I_B I_{BM}	10 15		Adc
Total Device Dissipation @ T_C = 25°C @ T_C = 100°C Derate above 25°C	P_D	 1 75 100 1.0	 135 53 8 1.11	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to 200	−55 to 150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max		Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.0	0.93	°C/W
Lead Temperature for Soldering Purposes, 1/8″ from Case for 5 Seconds	T_L	275		°C

(1) Pulse Test: Pulse Width ≤ 50 μs, Duty Cycle ≥ 10%

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (Table 2) (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) (V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 100°C)	I_{CEV}	 — —	 — —	 0.25 1.5	mAdc
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}	—	—	10	mAdc
SECOND BREAKDOWN					
Second Breakdown Collector Current with Base Forward Biased	$I_{S/b}$	See Figure 15			
Clamped Inductive SOA with Base Reverse Biased	RBSOA	See Figure 16			
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)	$V_{CE(sat)}$	 — — —	 — — —	 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)	$V_{BE(sat)}$	 — —	 — —	 1.5 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 (Table 1)							
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_{B2} = 1.6 Ω)	t_d	—	20	—	ns
Rose Time			t_r	—	200	—	
Storage Time			t_s	—	1200	—	
Fall Time			t_f	—	200	—	
Storage Time		($V_{BE(off)}$ = 5.0 Vdc)	t_s	—	650	—	
Fall Time			t_f	—	80	—	
Inductive Load (Table 2)							
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	—	90	250	
Storage Time		(T_C = 150°C)	t_{sv}	—	1050	—	
Fall Time			t_{fi}	—	70	—	
Crossover Time			t_c	—	120	—	

(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							
Collector–Emitter Sustaining Voltage (Table 2) (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) (V_{CEV} = 850 Vdc, $V_{BE(off)}$ = 1.5 Vdc. T_C = 100°C)			I_{CEV}	 — —	 — —	 0.25 1.5	mAdc
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}	—	—	10	mAdc
SECOND BREAKDOWN							
Second Breakdown Collector Current with Base Forward Biased			$I_{S/b}$	See Figure 15			
Clamped Inductive SOA with Base Reverse Biased			RBSOA	See Figure 16			
ON CHARACTERISTICS (1)							
Collector–Emitter Saturation Voltage (I_C = 5.0 Adc, I_B = 0.7 Adc) (I_C = 10 Adc, I_B = 1.0 Adc) (I_C = 10 Adc, I_B = 1.0 Adc, T_C = 100°C)			$V_{CE(sat)}$	 — — —	 — — —	 2.5 3.0 3.0	Vdc
Base–Emitter Saturation Voltage (I_C = 10 Adc, I_B = 1.0 Adc) (I_C = 10 Adc, I_B = 1.0 Adc, T_C = 100°C)			$V_{BE(sat)}$	 — —	 — —	 1.5 1.5	Vdc
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							
Resistive Load (Table 1)							
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_{B2} = 1.6 Ω)	t_d	—	20	—	ns
Rose Time			t_r	—	200	—	
Storage Time			t_s	—	900	—	
Fall Time			t_f	—	150	—	
Storage Time		($V_{BE(off)}$ = 5.0 Vdc)	t_s	—	500	—	
Fall Time			t_f	—	40	—	
Inductive Load (Table 2)							
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}	—	650	1500	ns
Fall Time			t_{fi}	—	30	150	
Crossover Time			t_c	—	50	200	
Storage Time		(T_C = 150°C)	t_{sv}	—	850	—	
Fall Time			t_{fi}	—	30	—	
Crossover Time			t_c	—	70	—	

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