MAC12SM, MAC12SN

Preferred Device

Sensitive Gate Triacs

Silicon Bidirectional Thyristors

Designed for industrial and consumer applications for full wave control of AC loads such as appliance controls, heater controls, motor controls, and other power switching applications.

Features

- Sensitive Gate Allows Triggering by Microcontrollers and other Logic Circuits
- Blocking Voltage to 800 Volts
- On-State Current Rating of 12 Amperes RMS at 70°C
- High Surge Current Capability − 90 Amperes
- Rugged, Economical TO−220AB Package
- Glass Passivated Junctions for Reliability and Uniformity
- Maximum Values of I_{GT}, V_{GT} and I_H Specified for Ease of Design
- High Commutating di/dt − 8.0 A/ms Minimum at 110°C
- Immunity to dV/dt − 15 V/μsec Minimum at 110°C
- Operational in Three Quadrants: Q1, Q2, and Q3
- Pb−Free Packages are Available*

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off−State Voltage (Note 1) (T_J = −40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open) MAC12SM MAC12SN	V_{DRM}, V_{RRM}	 600 800	V
On-State RMS Current (All Conduction Angles; T_C = 70°C)	$I_{T(RMS)}$	12	A
Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, T_J = 110°C)	I_{TSM}	90	A
Circuit Fusing Consideration (t = 8.33 ms)	I^2t	33	A^2sec
Peak Gate Power (Pulse Width = 1.0 μsec, T_C = 70°C)	P_{GM}	16	W
Average Gate Power (t = 8.3 msec, T_C = 70°C)	$P_{G(AV)}$	0.35	W
Operating Junction Temperature Range	T_J	−40 to 110	°C
Storage Temperature Range	T_{stg}	−40 to 150	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

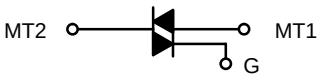
1. (V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

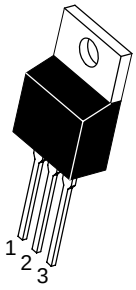
ON Semiconductor®

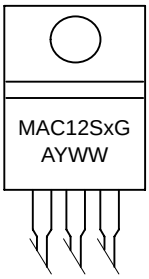
http://onsemi.com

TRIACS
12 AMPERES RMS
600 thru 800 VOLTS



MARKING DIAGRAM





TO−220AB
CASE 221A−09
STYLE 4

x = M, or N
A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

PIN ASSIGNMENT	
1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	Main Terminal 2

ORDERING INFORMATION

Device	Package	Shipping
MAC12SM	TO−220AB	50 Units / Rail
MAC12SMG	TO−220AB (Pb−Free)	50 Units / Rail
MAC12SN	TO−220AB	50 Units / Rail
MAC12SNG	TO−220AB (Pb−Free)	50 Units / Rail

Preferred devices are recommended choices for future use and best overall value.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case Junction−to−Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.2 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 10 Seconds	T_L	260	°C

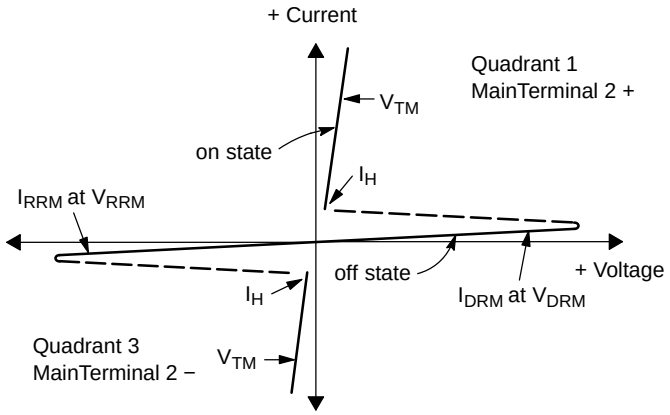
ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted; Electricals apply in both directions)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Peak Repetitive Blocking Current (V_D = Rated V_{DRM}, V_{RRM}; Gate Open) T_J = 25°C T_J = 110°C	I_{DRM}, I_{RRM}	− −	− −	0.01 2.0	mA
ON CHARACTERISTICS					
Peak On-State Voltage (Note 2) (I_{TM} = ±17 A)	V_{TM}	−	−	1.85	V
Gate Trigger Current (Continuous dc) (V_D = 12 V, R_L = 100 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)	I_{GT}	 − − −	 1.5 2.5 2.7	 5.0 5.0 5.0	mA
Holding Current (V_D = 12 V, Gate Open, Initiating Current = ±200 mA)	I_H	−	2.5	10	mA
Latching Current (V_D = 12 V, I_G = 5 mA) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)	I_L	 − − −	 3.0 5.0 3.0	 15 20 15	mA
Gate Trigger Voltage (Continuous dc) (V_D = 12 V, R_L = 100 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)	V_{GT}	 0.45 0.45 0.45	 0.68 0.62 0.67	 1.5 1.5 1.5	V
DYNAMIC CHARACTERISTICS					
Critical Rate of Change of Commutating Current (V_D = 400 V, I_{TM} = 3.5 A, Commutating dV/dt = 10 V/μs, Gate Open, T_J = 110°C, f = 500 Hz, Snubber: Cs = 0.01 μf, Rs = 15 Ω)	$(di/dt)_c$	8.0	10	−	A/ms
Critical Rate of Rise of Off-State Voltage (V_D = 67% V_{DRM}, Exponential Waveform, R_{GK} = 1 KΩ, T_J = 110°C)	dV/dt	15	40	−	V/μs
Repetitive Critical Rate of Rise of On-State Current IPK = 50 A; PW = 40 μsec; diG/dt = 1 A/μsec; Igt = 100 mA; f = 60 Hz	di/dt	−	−	10	A/μs

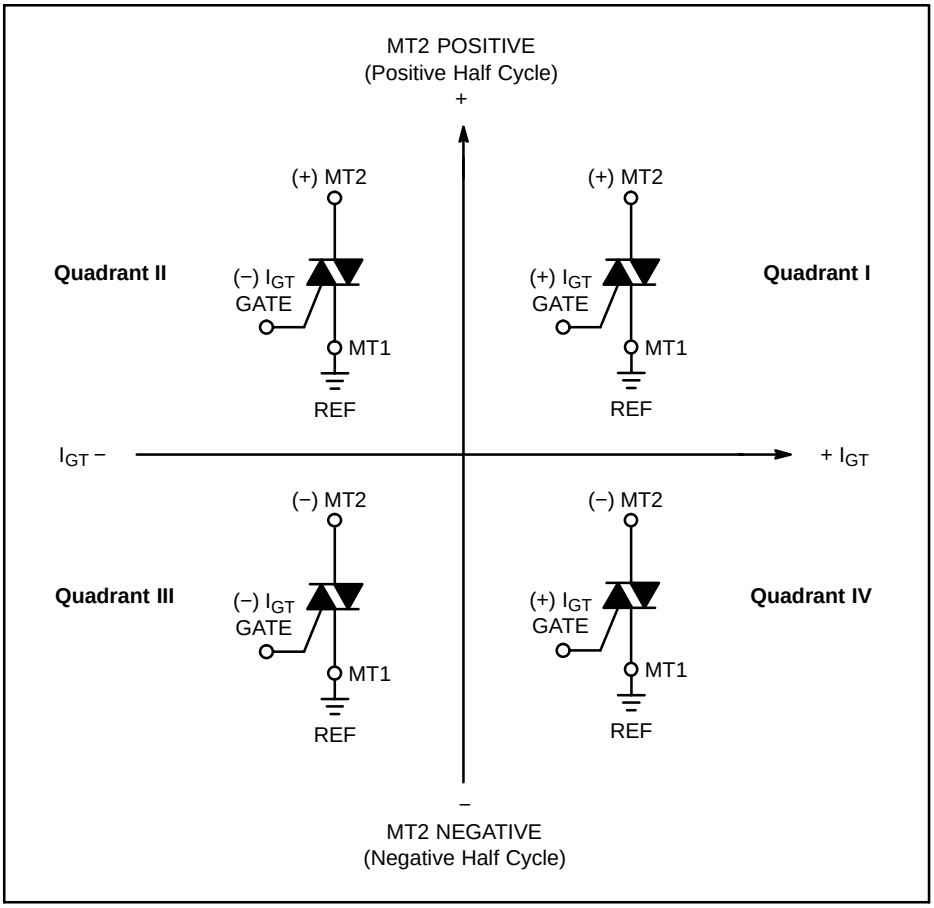
2. Pulse Test: Pulse Width ≤ 2.0 ms, Duty Cycle ≤ 2%.

Voltage Current Characteristic of Triacs (Bidirectional Device)

Symbol	Parameter
V_{DRM}	Peak Repetitive Forward Off State Voltage
I_{DRM}	Peak Forward Blocking Current
V_{RRM}	Peak Repetitive Reverse Off State Voltage
I_{RRM}	Peak Reverse Blocking Current
V_{TM}	Maximum On State Voltage
I_H	Holding Current



Quadrant Definitions for a Triac



All polarities are referenced to MT1.
With in−phase signals (using standard AC lines) quadrants I and III are used.

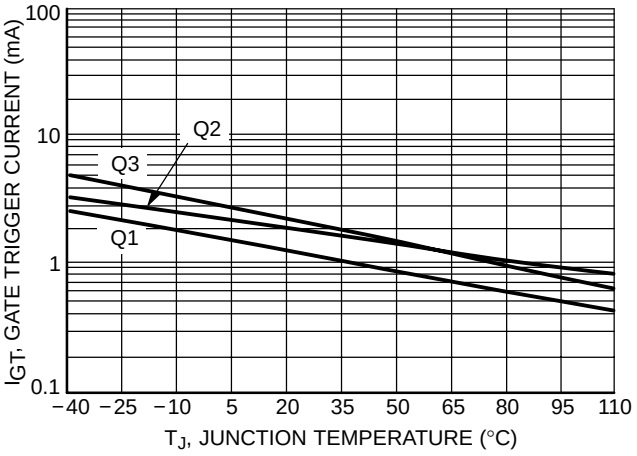


Figure 1. Typical Gate Trigger Current versus Junction Temperature

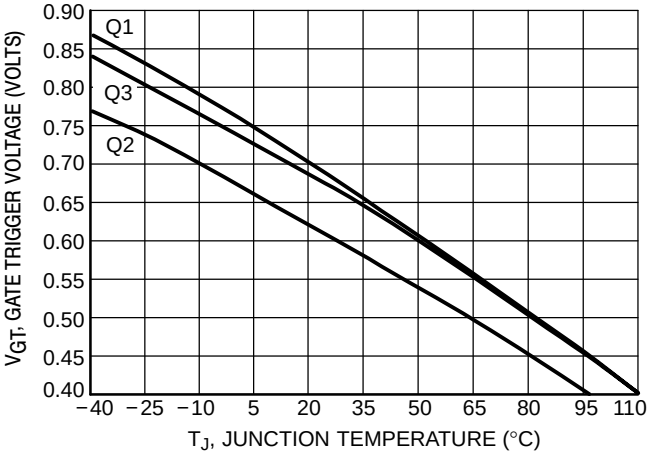


Figure 2. Typical Gate Trigger Voltage versus Junction Temperature

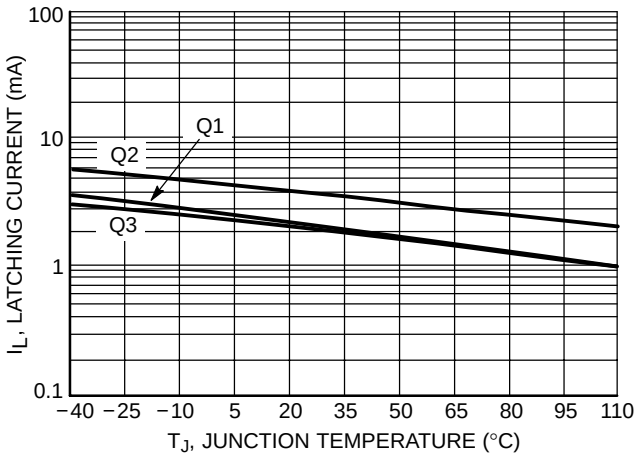


Figure 3. Typical Latching Current versus Junction Temperature

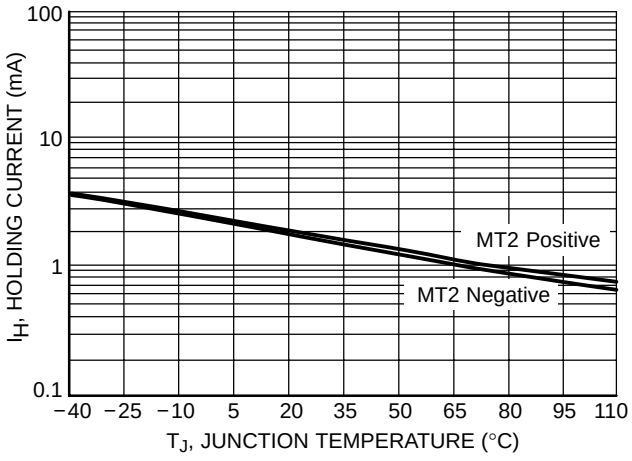


Figure 4. Typical Holding Current versus Junction Temperature

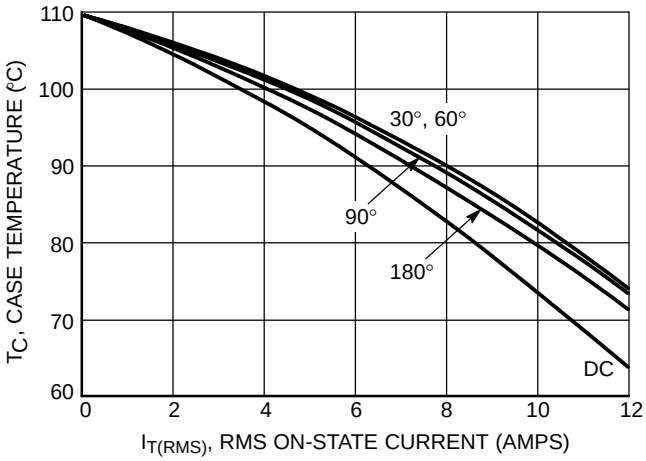


Figure 5. Typical RMS Current Derating

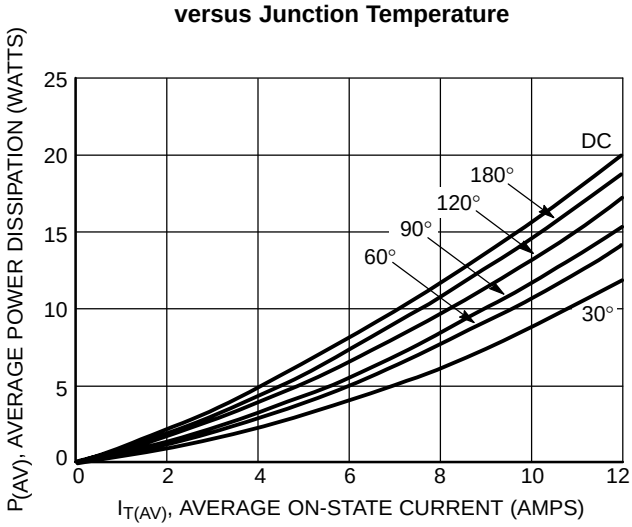


Figure 6. On-State Power Dissipation

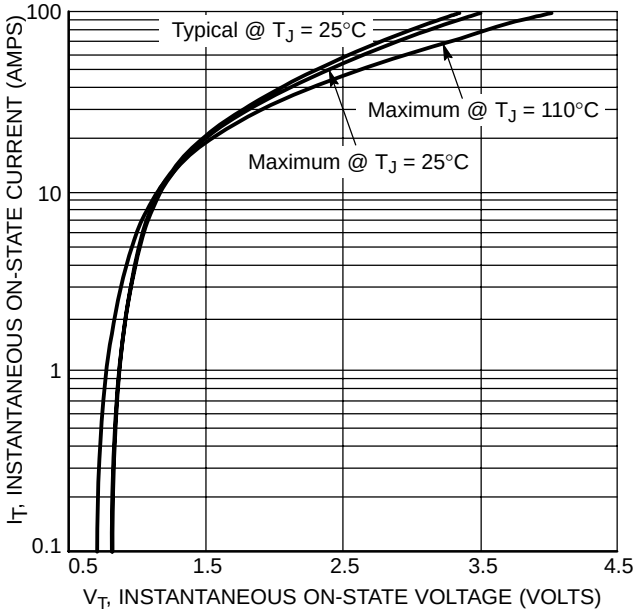


Figure 7. Typical On-State Characteristics

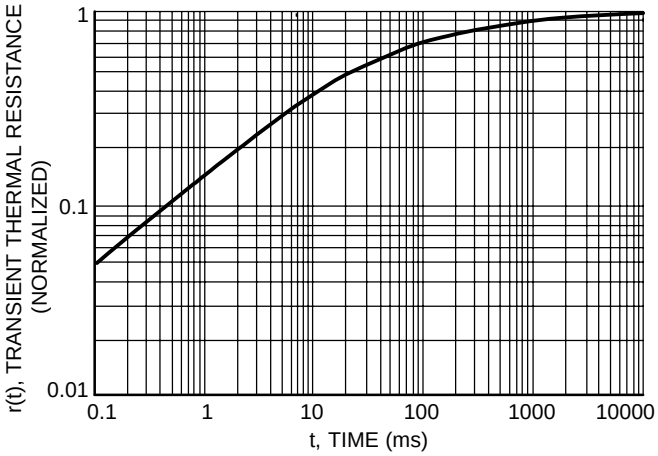
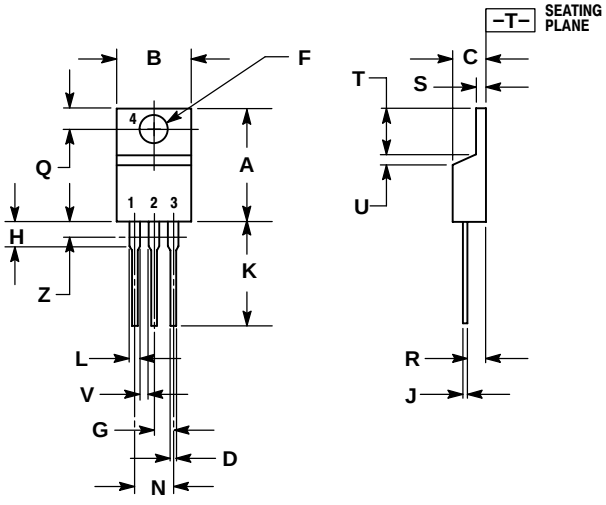


Figure 8. Typical Thermal Response

PACKAGE DIMENSIONS

TO−220AB
CASE 221A−09
ISSUE AA



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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