MAC212A8, MAC212A10

Preferred Device

Triacs

Silicon Bidirectional Thyristors

Designed primarily for full-wave ac control applications, such as light dimmers, motor controls, heating controls and power supplies; or wherever full-wave silicon gate controlled solid-state devices are needed. Triac type thyristors switch from a blocking to a conducting state for either polarity of applied anode voltage with positive or negative gate triggering.

Features

- Blocking Voltage to 800 Volts
- All Diffused and Glass Passivated Junctions for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance, High Heat Dissipation and Durability
- Gate Triggering Guaranteed in Four Modes
- 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 +125°C, Sine Wave 50 to 60 Hz, Gate Open) MAC212A8 MAC212A10	V_{DRM}, V_{RRM}	600 800	V
On-State RMS Current (T_C = +85°C) Full Cycle Sine Wave 50 to 60 Hz	$I_{T(RMS)}$	12	A
Peak Non−repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, T_C = +25°C) Preceded and followed by rated current	I_{TSM}	100	A
Circuit Fusing Considerations (t = 8.3 ms)	I^2t	40	A^2s
Peak Gate Power (T_C = +85°C, Pulse Width = 10 μs)	P_{GM}	20	W
Average Gate Power (T_C = +85°C, t = 8.3 ms)	$P_{G(AV)}$	0.35	W
Peak Gate Current (T_C = +85°C, Pulse Width = 10 μs)	I_{GM}	2.0	A
Operating Junction Temperature Range	T_J	−40 to +125	°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.

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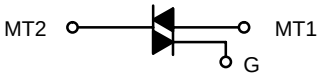
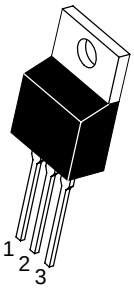
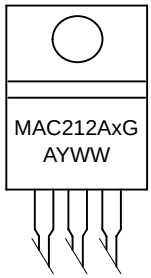
TRIACS
12 AMPERES RMS
600 thru 800 VOLTS





TO−220AB
CASE 221A−07
STYLE 4

MARKING DIAGRAM



x = 8 or 10
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
MAC212A8D	TO−220AB	500 Units / Box
MAC212A8DG	TO−220AB (Pb−Free)	500 Units / Box
MAC212A10	TO−220AB	500 Units / Box
MAC212A10G	TO−220AB (Pb−Free)	500 Units / Box

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

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December, 2005 − Rev. 2
Publication Order Number:
MAC212A8/D

THERMAL CHARACTERISTICS

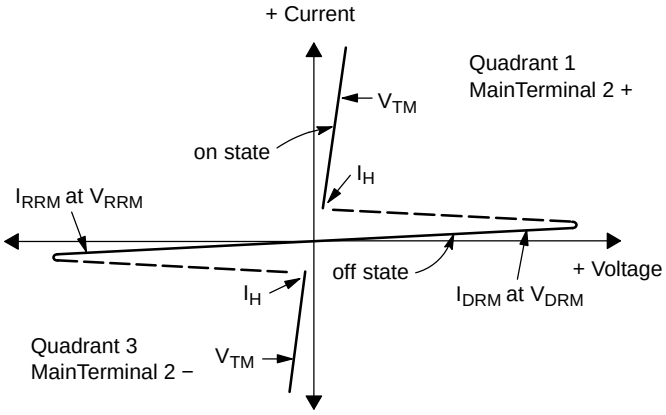
Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case Junction−to−Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.0 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 10 Secs	T_L	260	°C

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

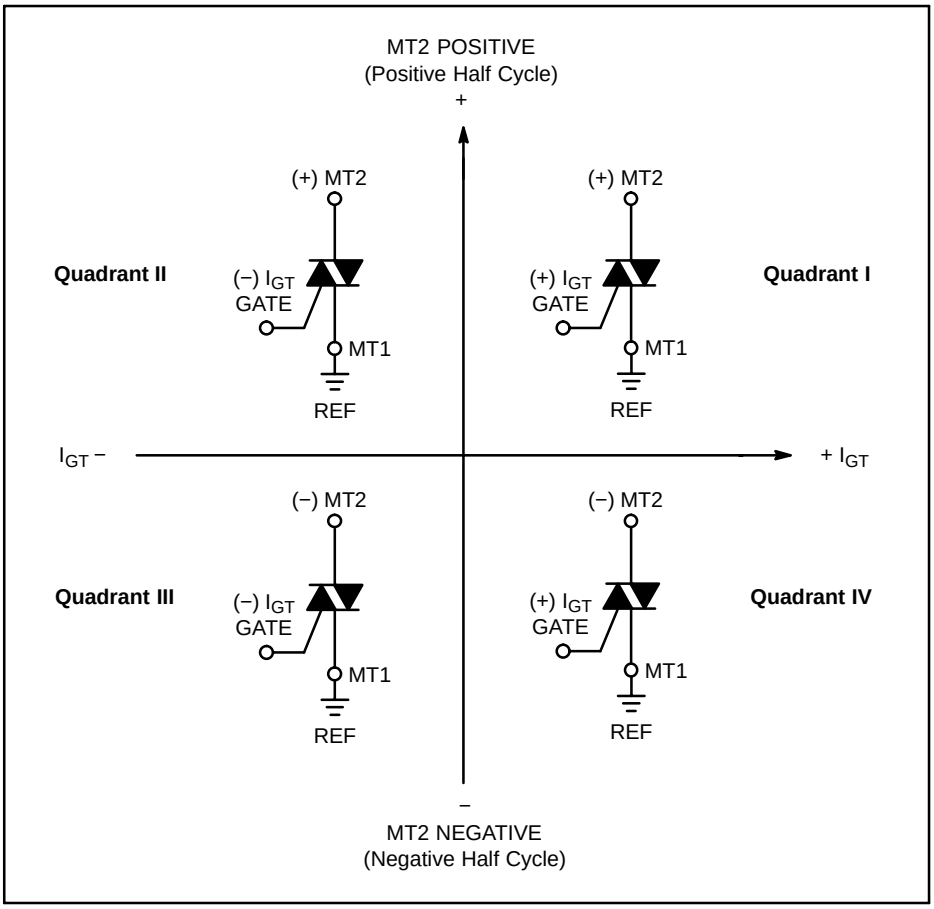
Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Peak Repetitive Blocking Current (V_D = Rated V_{DRM}, V_{RRM}; Gate Open) T_J = 25°C T_J = +125°C	I_{DRM}, I_{RRM}	 – –	 – –	 10 2.0	 μA mA
ON CHARACTERISTICS					
Peak On-State Voltage I_{TM} = ±17 A Peak; Pulse Width = 1 to 2 ms, Duty Cycle ≤ 2%	V_{TM}	–	1.3	1.75	V
Gate Trigger Current (Continuous dc) (Main Terminal Voltage = 12 Vdc, R_L = 100 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−) MT2(−), G(+)	I_{GT}	 – – – –	 12 12 20 35	 50 50 50 75	mA
Gate Trigger Voltage (Continuous dc) (Main Terminal Voltage = 12 Vdc, R_L = 100 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−) MT2(−), G(+)	V_{GT}	 – – – –	 0.9 0.9 1.1 1.4	 2.0 2.0 2.0 2.5	V
Gate Non−Trigger Voltage (Continuous dc) (Main Terminal Voltage = 12 V, R_L = 100 Ω, T_J = +125°C) All Four Quadrants	V_{GD}	 0.2	 –	 –	V
Holding Current (Main Terminal Voltage = 12 Vdc, Gate Open, Initiating Current = ±200 mA)	I_H	–	6.0	50	mA
Turn-On Time (V_D = Rated V_{DRM}, I_{TM} = 17 A, I_{GT} = 120 mA, Rise Time = 0.1 μs, Pulse Width = 2 μs)	t_{gt}	–	1.5	–	μs
DYNAMIC CHARACTERISTICS					
Critical Rate of Rise of Commutation Voltage (V_D = Rated V_{DRM}, I_{TM} = 17 A, Commutating di/dt = 6.1 A/ms, Gate Unenergized, T_C = +85°C)	$dv/dt_{(c)}$	–	5.0	–	V/μs
Critical Rate of Rise of Off-State Voltage (V_D = Rated V_{DRM}, Exponential Voltage Rise, Gate Open, T_C = +85°C)	dv/dt	–	100	–	V/μs

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.

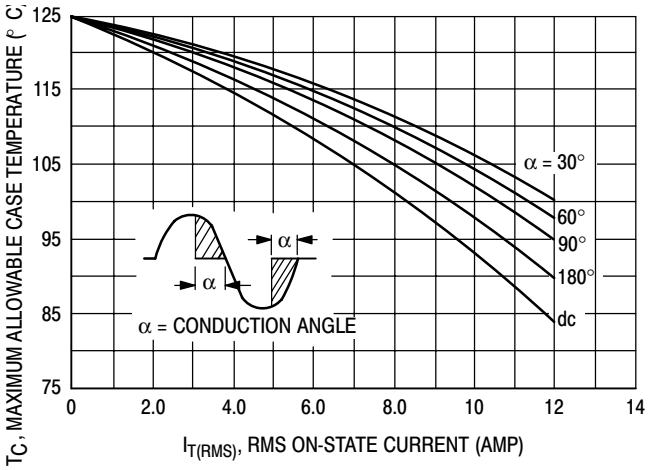


Figure 1. Current Derating

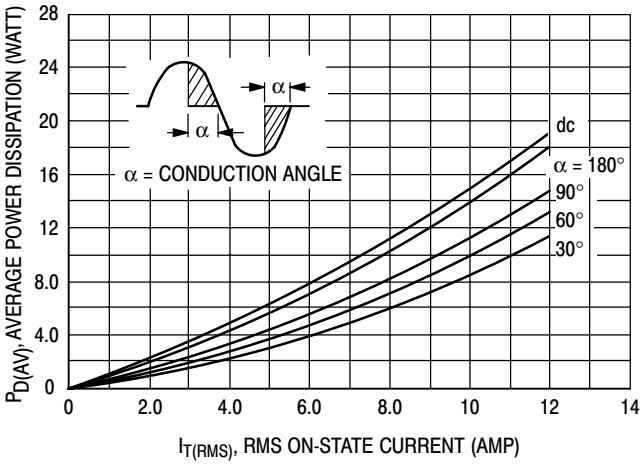


Figure 2. Power Dissipation

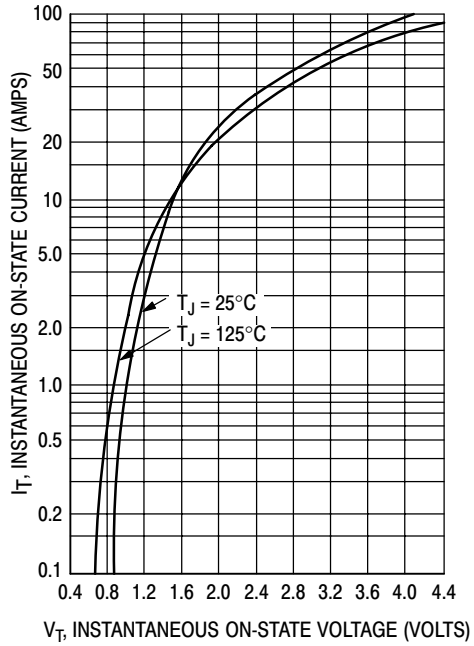


Figure 3. Maximum On−State Voltage Characteristics

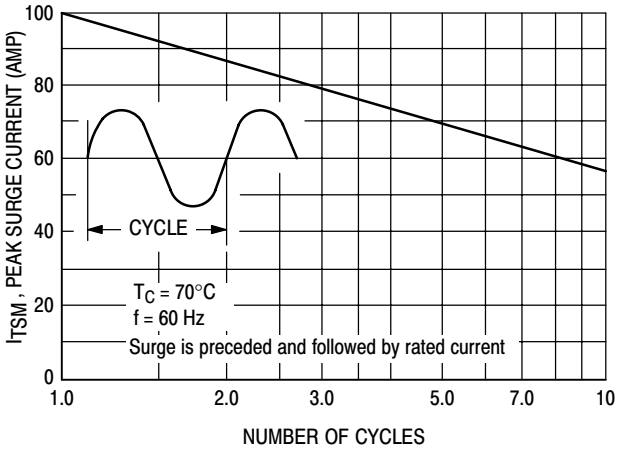


Figure 4. Maximum Non−Repetitive Surge Current

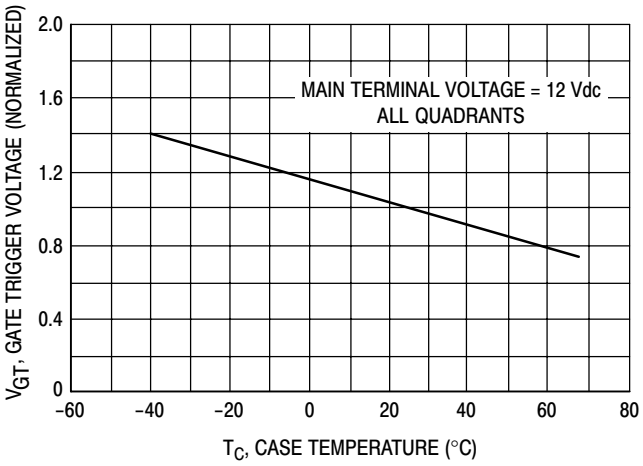


Figure 5. Typical Gate Trigger Voltage

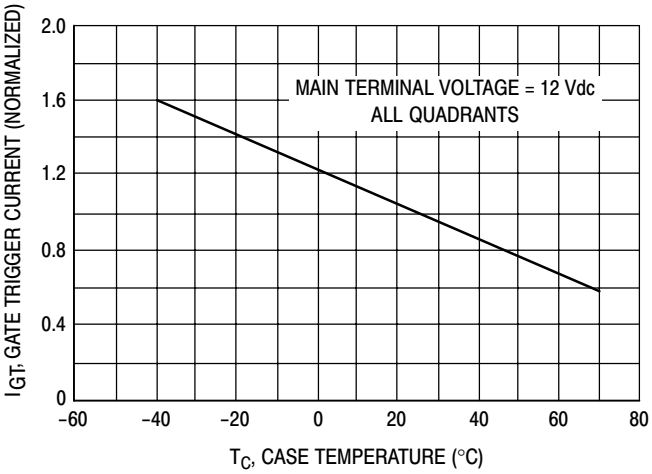


Figure 6. Typical Gate Trigger Current

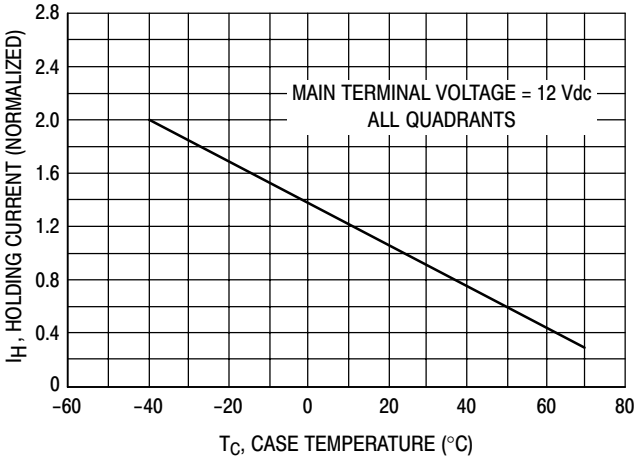


Figure 7. Typical Holding Current

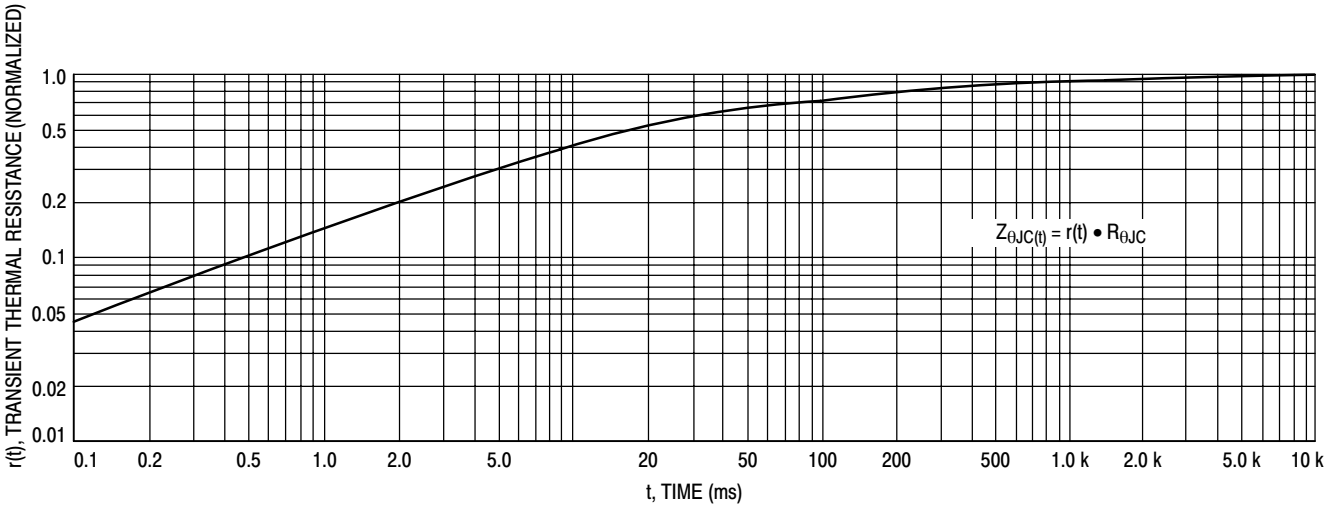
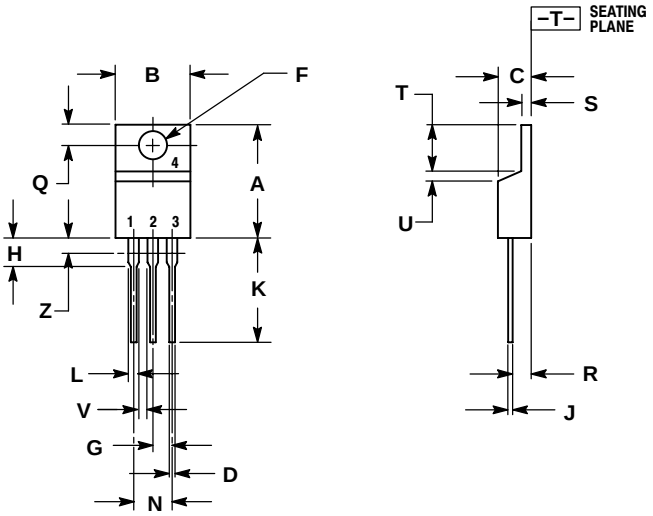


Figure 8. Thermal Response

PACKAGE DIMENSIONS

TO−220AB
CASE 221A−07
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	0.014	0.022	0.36	0.55
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

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