ON Semiconductor

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MAC224A Series

Preferred Device

Triacs

Silicon Bidirectional Thyristors

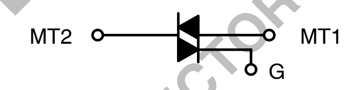
Designed primarily for full-wave ac control applications such as lighting systems, heater controls, motor controls and power supplies.

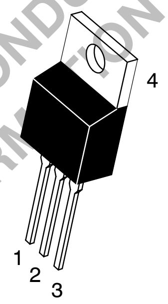
- Blocking Voltage to 800 Volts
- All Diffused and Glass-Passivated Junctions for Parameter Uniformity and Stability
- Gate Triggering Guaranteed in Four Modes
- High Current and Surge Ratings
- Device Marking: Logo, Device Type, e.g., MAC224A4, Date Code

ON Semiconductor

http://onsemi.com

TRIACS
40 AMPERES RMS
200 thru 800 VOLTS





TO−220AB
CASE 221A
STYLE 4

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

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

Rating	Symbol	Value	Unit
Peak Repetitive Off−State Voltage[1] (T_J = −40 to 125°C, Sine Wave 50 to 60 Hz, Gate Open) MAC224A4 MAC224A6 MAC224A8 MAC224A10	V_{DRM}, V_{RRM}	 200 400 600 800	Volts
On−State RMS Current (T_C = 75°C)[2] (Full Cycle Sine Wave 50 to 60 Hz)	$I_{T(RMS)}$	40	A
Peak Non−repetitive Surge Current (One Full Cycle, 60 Hz, T_J = 125°C)	I_{TSM}	350	A
Circuit Fusing Considerations (t = 8.3 ms)	I^2t	500	A^2s
Peak Gate Current (Pulse Width ≤ 2.0 μsec; T_C = 75°C)	I_{GM}	±2.0	A
Peak Gate Voltage (Pulse Width ≤ 2.0 μsec; T_C = 75°C)	V_{GM}	±10	Volts
Peak Gate Power (Pulse Width ≤ 2.0 μsec; T_C = 75°C)	P_{GM}	20	Watts
Average Gate Power (T_C = 75°C, t = 8.3 ms)	$P_{G(AV)}$	0.5	Watts
Operating Junction Temperature Range	T_J	−40 to 125	°C
Storage Temperature Range	T_{stg}	−40 to 150	°C
Mounting Torque	—	8.0	in. lb.

(1) V_{DRM}, 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.

(2) This device is rated for use in applications subject to high surge conditions. Care must be taken to insure proper heat sinking when the device is to be used at high sustained currents. (See Figure 1 for maximum case temperatures.)

ORDERING INFORMATION

Device	Package	Shipping
MAC224A4	TO220AB	500/Box
MAC224A6	TO220AB	500/Box
MAC224A8	TO220AB	500/Box
MAC224A10	TO220AB	500/Box

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

August, 2006 − Rev. 2

THERMAL CHARACTERISTICS

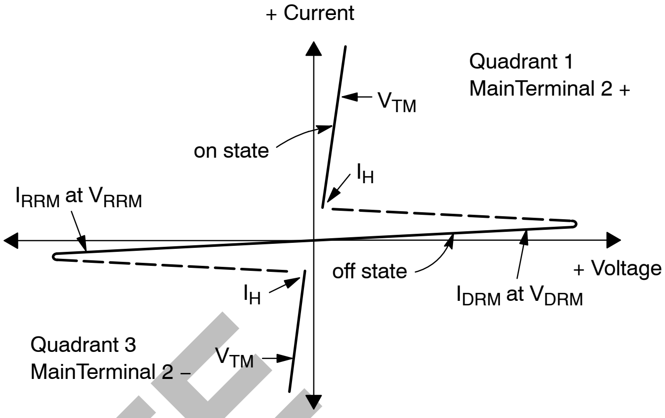
Characteristic	Symbol	Value	Unit
Thermal Resistance — Junction to Case	$R_{\theta JC}$	1.0	°C/W
— Junction to Ambient	$R_{\theta JA}$	60	
Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 10 Seconds	T_L	260	°C

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

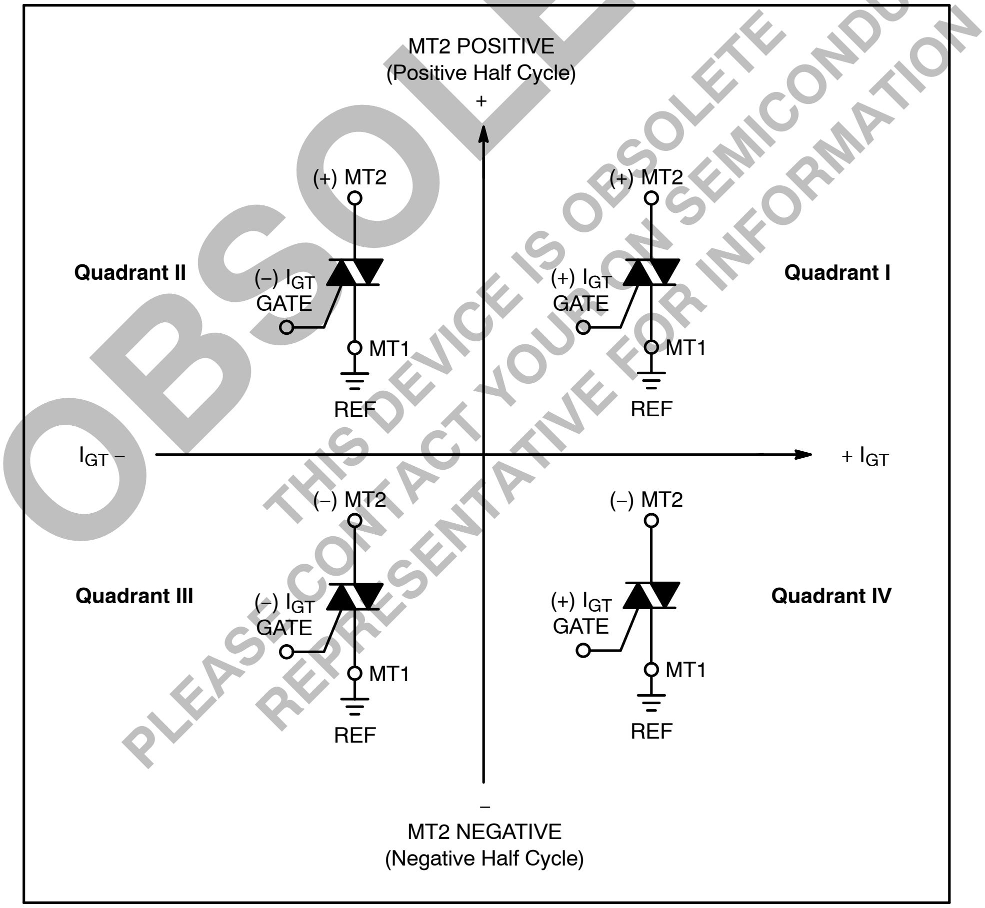
Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Peak Repetitive Blocking Current (Rated V_{DRM}, V_{RRM}; Gate Open) T_J = 25°C	I_{DRM}, I_{RRM}	—	—	10	μA
T_J = 125°C		—	—	2.0	mA
ON CHARACTERISTICS					
Peak On−State Voltage (I_{TM} = ±56 A Peak, Pulse Width ≤ 2 ms, Duty Cycle ≤ 2%)	V_{TM}	—	1.4	1.85	Volts
Gate Trigger Current (Continuous dc) (V_D = 12 V, R_L = 100 Ω)	I_{GT}				mA
MT2(+), G(+); MT2(+), G(−); MT2(+), G(−)		—	25	50	
MT2(−), G(+)		—	40	75	
Gate Trigger Voltage (Continuous dc) (V_D = 12 V, R_L = 100 Ω)	V_{GT}				Volts
MT2(+), G(+); MT2(−), G(−); MT(+), G(−)		—	1.1	2.0	
MT2(−), G(+)		—	1.3	2.5	
Gate Non-Trigger Voltage (V_D = 12 V, T_J = 125°C, R_L = 100 Ω) All Quadrants	V_{GD}	0.2	—	—	Volts
Holding Current (V_D = 12 Vdc, Gate Open, Initiating Current = ±200 mA)	I_H	—	30	75	mA
Gate Controlled Turn-On Time (V_D = Rated V_{DRM}, I_{TM} = 56 A Peak, I_G = 200 mA)	t_{gt}	—	1.5	—	μs
DYNAMIC CHARACTERISTICS					
Critical Rate of Rise of Off-State Voltage (V_D = Rated V_{DRM}, Exponential Waveform, T_C = 125°C)	dv/dt	—	50	—	V/μs
Critical Rate of Rise of Commutation Voltage (V_D = Rated V_{DRM}, I_{TM} = 56 A Peak, Commutating di/dt = 20.2 A/ms, Gate Unenergized, T_C = 75°C)	dv/dt(c)	—	5.0	—	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.

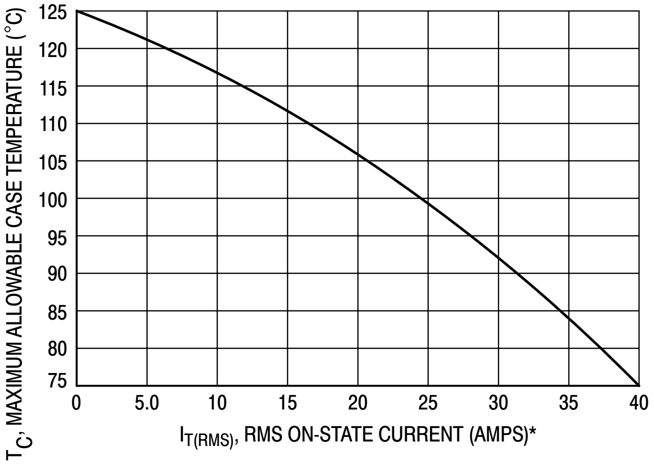


Figure 1. RMS Current Derating

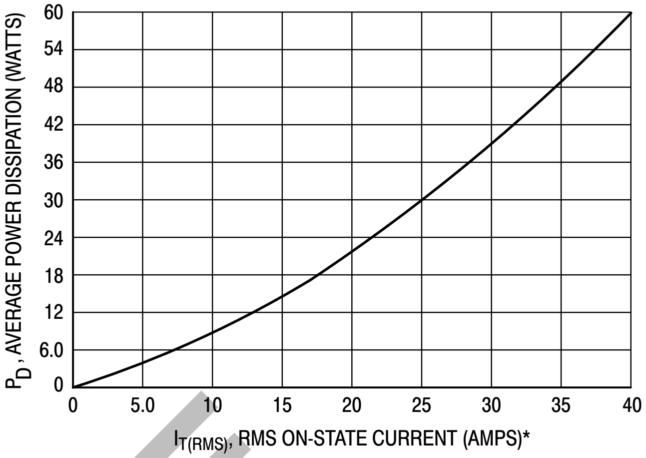


Figure 2. On−State Power Dissipation

*This device is rated for use in applications subject to high surge conditions. Care must be taken to insure proper heat sinking when the device is to be used at high sustained currents.

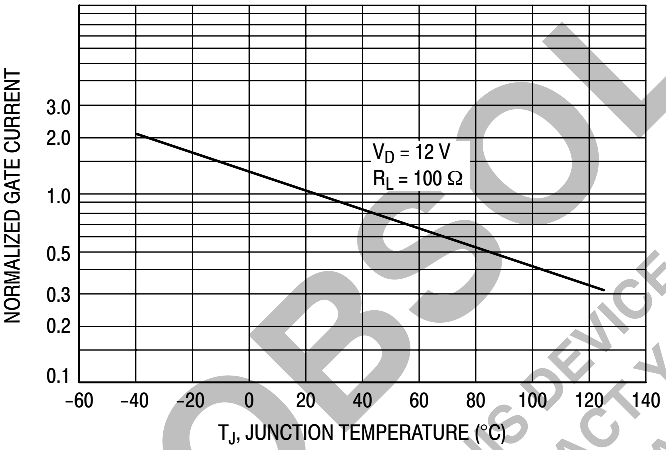


Figure 3. Typical Gate Trigger Current

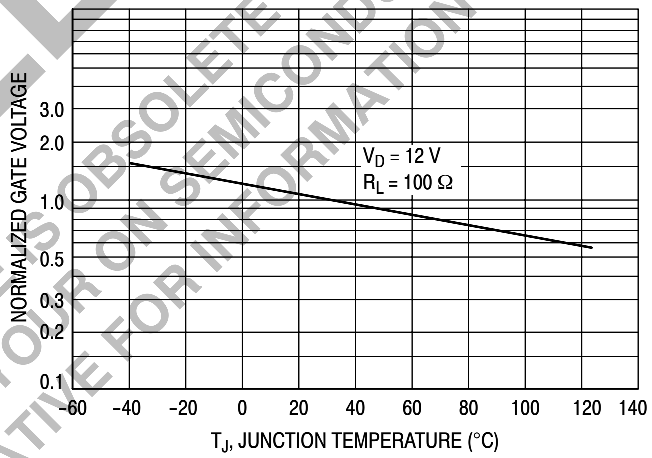


Figure 4. Typical Gate Trigger Voltage

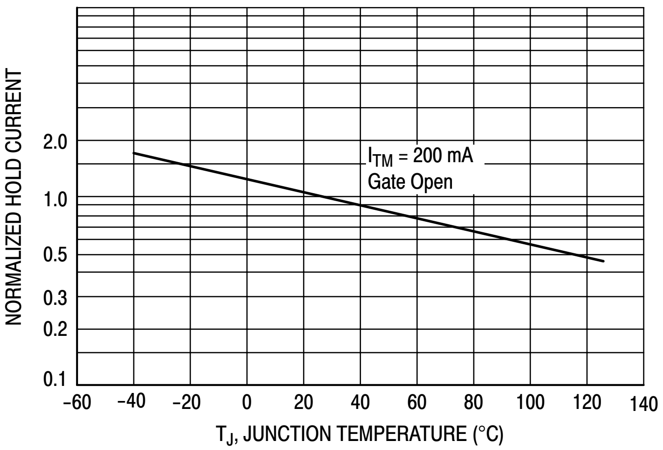


Figure 5. Typical Holding Current

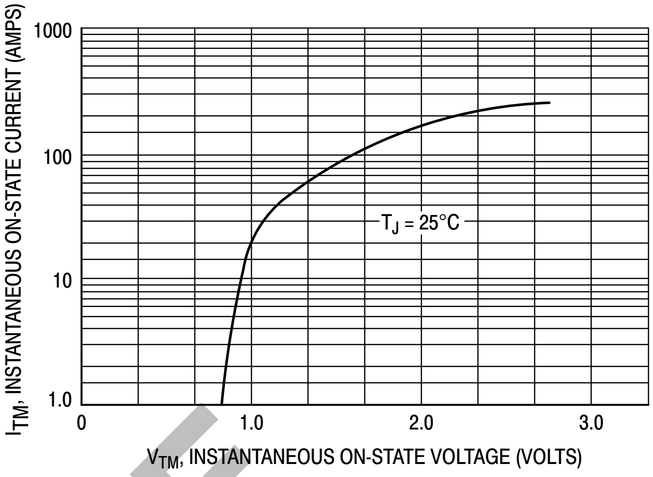


Figure 6. Typical On−State Characteristics

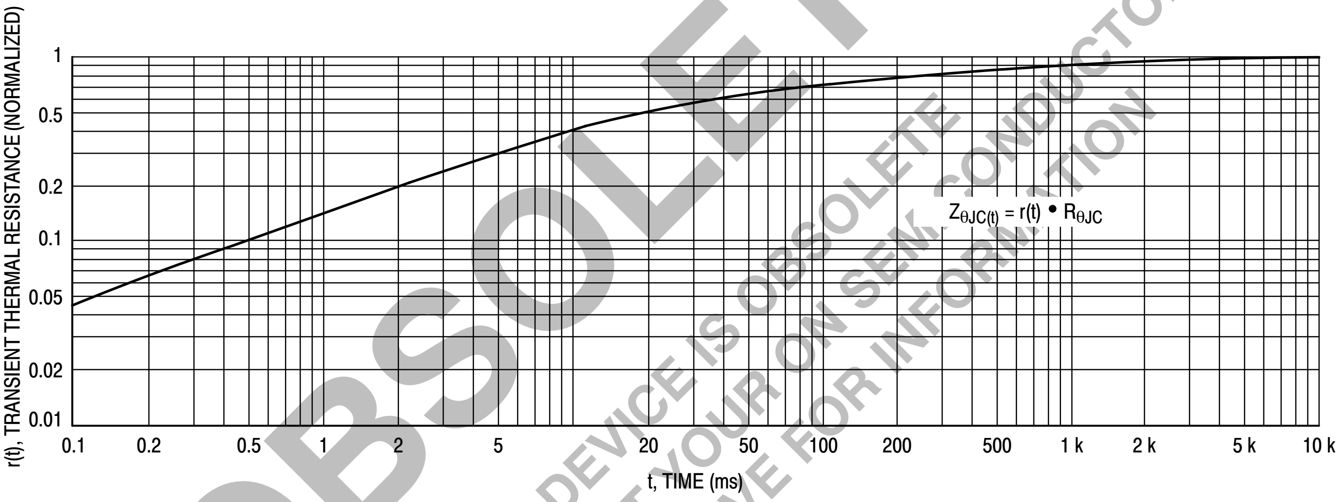
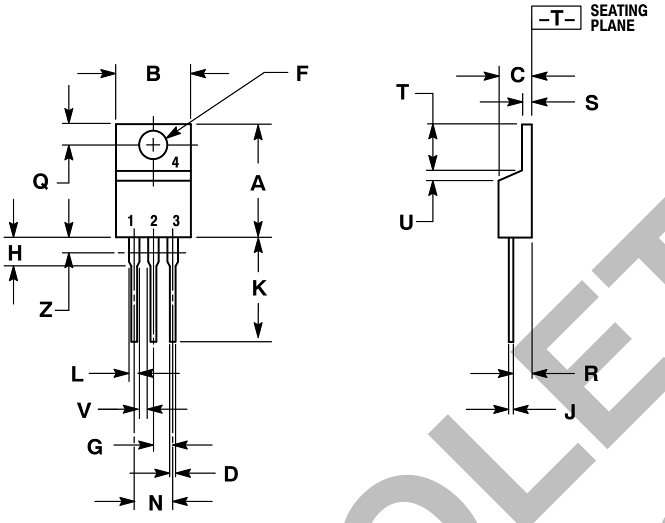


Figure 7. Thermal Response

PACKAGE DIMENSIONS

TO−220AB
CASE 221A−07
ISSUE Z



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.

DIM	INCHES		MILLIMETERS	
	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

OBSOLETE
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