# **Sensitive Gate Triacs**

# **Silicon Bidirectional Thyristors**

Designed primarily 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 Triggering in 3 Modes for AC Triggering on Sinking Current Sources
- Four Mode Triggering for Drive Circuits that Source Current
- All Diffused and Glass-Passivated Junctions for Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance and High Heat Dissipation
- Center Gate Geometry for Uniform Current Spreading
- These Devices are Pb-Free and are RoHS Compliant\*



### ON Semiconductor®

http://onsemi.com

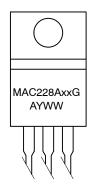
# TRIACS 8 AMPERES RMS 200 - 800 VOLTS



# MARKING DIAGRAM



TO-220AB CASE 221A STYLE 4



xx = 4, 6, 8, or 10

A = Assembly Location (Optional)\*

Y = Year
WW = Work Week
G = Pb-Free Package

#### **ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

<sup>\*</sup> The Assembly Location code (A) is optional. In cases where the Assembly Location is stamped on the package the assembly code may be blank.

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

# **MAXIMUM RATINGS** (T<sub>J</sub> = 25°C unless otherwise noted)

Characteristic	Sym	bol Value	Unit
Peak Repetitive Off–State Voltage <sup>,</sup> (Note 1) (T <sub>J</sub> = -40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open)	MAC228A4 V <sub>RF</sub> MAC228A6 MAC228A8 IAC228A10		V
On-State RMS Current, (T <sub>C</sub> = 80°C) - Full Cycle Sine Wave 50 to 60 Hz	I <sub>T(RI</sub>	MS) 8.0	А
Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, T <sub>J</sub> = 110°C)		M 80	А
Circuit Fusing Considerations, (t = 8.3 ms)	J <sup>2</sup>	26	A <sup>2</sup> s
Peak Gate Current, (t $\leq$ 2 $\mu$ s, T <sub>C</sub> = 80°C)	l <sub>Gr</sub>	±2.0	А
Peak Gate Voltage, (t $\leq$ 2 $\mu$ s, T <sub>C</sub> = 80°C)	V <sub>G</sub>	M ± 10	V
Peak Gate Power, (t $\leq$ 2 $\mu$ s, T <sub>C</sub> = 80°C)	P <sub>G</sub>	M 20	W
Average Gate Power, (t $\leq$ 8.3 ms, T <sub>C</sub> = 80°C)	$P_{G(i)}$	<sub>4V)</sub> 0.5	W
Operating Junction Temperature Range	T,	-40 to 11	0 °C
Storage Temperature Range	T <sub>st</sub>	g –40 to 15	0 °C
Mounting Torque		8.0	in lb

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance - Junction-to-Case	$R_{ heta JC}$	2.0	°C/W
Thermal Resistance – Junction-to-Ambient		62.5	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	°C

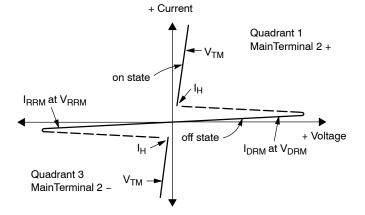
# **ELECTRICAL CHARACTERISTICS** (T<sub>C</sub> = 25°C unless otherwise noted; Electricals apply in both directions)

Characteristic	Symbol	Min	Тур	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 <sub>DRM</sub> , I <sub>RRM</sub>	-	-	10 2.0	μA mA
ON CHARACTERISTICS	<u>.</u>				
Peak On-State Voltage, (I $_{TM}$ = $\pm$ 11 A Peak, Pulse Width $\leq$ 2 ms, Duty Cycle $\leq$ 2%)	$V_{TM}$	-	_	1.8	V
Gate Trigger Current (Continuous DC), (V <sub>D</sub> = 12 V, R <sub>L</sub> = 100 $\Omega$ ) MT2(+), G(+); MT2(+), G(-); MT2(-), G(-) MT2(-), G(+)	I <sub>GT</sub>	- -	- -	5.0 10	mA
Gate Trigger Voltage (Continuous DC), (V <sub>D</sub> = 12 V, R <sub>L</sub> = 100 $\Omega$ ) MT2(+), G(+); MT2(+), G(-); MT2(-), G(-) MT2(-), G(+)	V <sub>GT</sub>	- -	- -	2.0 2.5	V
Gate Non–Trigger Voltage (Continuous DC), (V <sub>D</sub> = 12 V, T <sub>C</sub> = 110 $^{\circ}$ C, R <sub>L</sub> = 100 $\Omega$ ) All Four Quadrants	$V_{GD}$	0.2	-	-	V
Holding Current, ( $V_D$ = 12 Vdc, Initiating Current = $\pm$ 200 mA, Gate Open)	I <sub>H</sub>	-	-	15	mA
Gate-Controlled Turn-On Time, (V <sub>D</sub> = Rated V <sub>DRM</sub> , I <sub>TM</sub> = 16 A Peak, I <sub>G</sub> = 30 mA)	t <sub>gt</sub>	_	1.5	-	μS
DYNAMIC CHARACTERISTICS		-			
Critical Rate of Rise of Off-State Voltage, $(V_D = Rated\ V_{DRM},\ Exponential\ Waveform,\ T_C = 110^{\circ}C)$	dv/dt	_	25	_	V/μs
Critical Rate of Rise of Commutation Voltage, ( $V_D$ = Rated $V_{DRM}$ , $I_{TM}$ = 11.3 A, Commutating di/dt = 4.1 A/ms, Gate Unenergized, $T_C$ = 80°C)	dv/dt(c)	-	5.0	-	V/μs

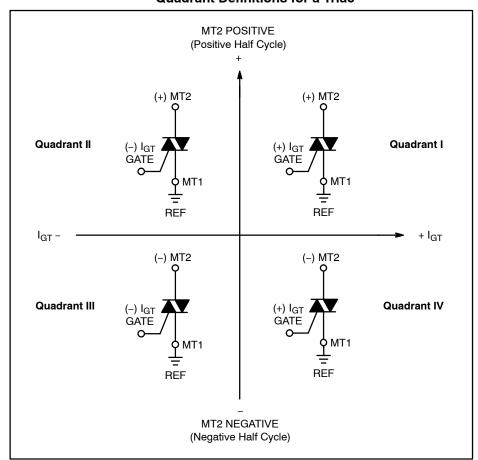
V<sub>DRM</sub> and V<sub>RRM</sub> for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

# Voltage Current Characteristic of Triacs (Bidirectional Device)

0	<b>.</b>
Symbol	Parameter
$V_{DRM}$	Peak Repetitive Forward Off State Voltage
I <sub>DRM</sub>	Peak Forward Blocking Current
$V_{RRM}$	Peak Repetitive Reverse Off State Voltage
I <sub>RRM</sub>	Peak Reverse Blocking Current
$V_{TM}$	Maximum On State Voltage
I <sub>H</sub>	Holding Current

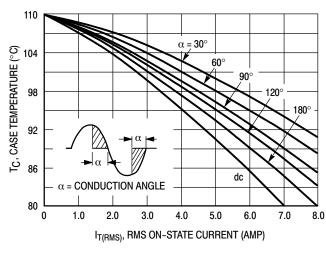


# **Quadrant Definitions for a Triac**



All polarities are referenced to MT1.

With in-phase signals (using standard AC lines) quadrants I and III are used.



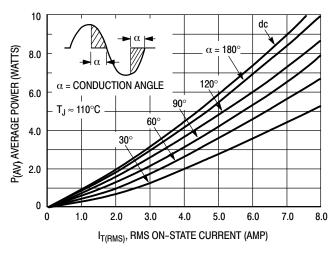


Figure 1. RMS Current Derating

Figure 2. On-State Power Dissipation

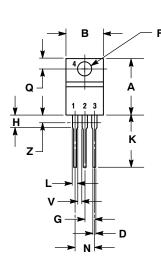
# **ORDERING INFORMATION**

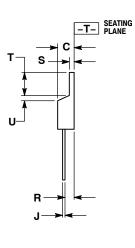
Device	Package	Shipping $^{\dagger}$	
MAC228A4	TO-220	500 Units / Bulk	
MAC228A4G	TO-220 (Pb-Free)	500 Units / Bulk	
MAC228A6	TO-220	500 Units / Bulk	
MAC228A6G	TO-220 (Pb-Free)	500 Units / Bulk	
MAC228A6T	TO-220	50 Units / Rail	
MAC228A6TG	TO-220 (Pb-Free)	50 Units / Rail	
MAC228A8	TO-220	500 Units / Bulk	
MAC228A8G	TO-220 (Pb-Free)	500 Units / Bulk	
MAC228A8T	TO-220	50 Units / Rail	
MAC228A8TG	TO-220 (Pb-Free)	50 Units / Rail	
MAC228A10	TO-220	500 Units / Bulk	
MAC228A10G	TO-220 (Pb-Free)	500 Units / Bulk	

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

#### PACKAGE DIMENSIONS

TO-220 CASE 221A-09 ISSUE AG





#### NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI
   MARKATANA 1000
- Y14.5M, 1982. 2. CONTROLLING DIMENSION: INCH.
- DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
Α	0.570	0.620	14.48	15.75
В	0.380	0.405	9.66	10.28
С	0.160	0.190	4.07	4.82
D	0.025	0.036	0.64	0.91
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
Н	0.110	0.161	2.80	4.10
J	0.014	0.025	0.36	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
٧	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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