

# MAC223A6, MAC223A8, MAC223A10

Preferred Device



**ON Semiconductor**

<http://onsemi.com>

## Triacs

### Silicon Bidirectional Thyristors

Designed primarily for full-wave ac control applications such as lighting systems, heater controls, motor controls and power supplies; or wherever full-wave silicon-gate-controlled devices are needed.

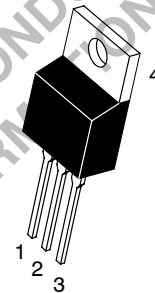
- Off-State Voltages to 800 Volts
- All Diffused and Glass Passivated Junctions for Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Thermal Resistance and High Heat Dissipation
- Gate Triggering Guaranteed in Four Modes
- Device Marking: Logo, Device Type, e.g., MAC223A6, Date Code

**TRIACS**  
**25 AMPERES RMS**  
**400 thru 800 VOLTS**



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

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage <sup>(1)</sup> (T <sub>J</sub> = -40 to 125°C, Sine Wave 50 to 60 Hz, Gate Open)	V <sub>DRM</sub> , V <sub>RRM</sub>	400 600 800	Volts
On-State Current RMS Full Cycle Sine Wave 50 to 60 Hz (T <sub>C</sub> = 80°C)	I <sub>T(RMS)</sub>	25	A
Peak Non-repetitive Surge Current (One Full Cycle, 60 Hz, T <sub>C</sub> = 80°C) Preceded and followed by rated current	I <sub>TSM</sub>	250	A
Circuit Fusing (t = 8.3 ms)	I <sup>2</sup> t	260	A <sup>2</sup> s
Peak Gate Current (t ≤ 2.0 μsec; T <sub>C</sub> = +80°C)	I <sub>GM</sub>	2.0	A
Peak Gate Voltage (t ≤ 2.0 μsec; T <sub>C</sub> = +80°C)	V <sub>GM</sub>	± 10	Volts
Peak Gate Power (t ≤ 2.0 μsec; T <sub>C</sub> = +80°C)	P <sub>GM</sub>	20	Watts
Average Gate Power (T <sub>C</sub> = 80°C, t = 8.3 ms)	P <sub>G(AV)</sub>	0.5	Watts
Operating Junction Temperature Range	T <sub>J</sub>	-40 to 125	°C
Storage Temperature Range	T <sub>stg</sub>	-40 to 150	°C
Mounting Torque	—	8.0	in. lb.



**TO-220AB**  
**CASE 221A**  
**STYLE 4**

#### PIN ASSIGNMENT

1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	Main Terminal 2

#### ORDERING INFORMATION

Device	Package	Shipping
MAC223A6	TO220AB	500/Box
MAC223A8	TO220AB	500/Box
MAC223A10	TO220AB	500/Box

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

(1) 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.

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## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.2	$^{\circ}C/W$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	60	$^{\circ}C/W$
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	$^{\circ}C$

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^{\circ}C$ unless otherwise indicated; Electricals apply in both directions)

Characteristic	Symbol	Min	Typ	Max	Unit
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## OFF CHARACTERISTICS

Peak Repetitive Blocking Current ( $V_D = \text{Rated } V_{DRM}, V_{RRM}; \text{ Gate Open}$ )	$T_J = 25^{\circ}C$	$I_{DRM}$	—	—	10	$\mu A$
	$T_J = 125^{\circ}C$	$I_{RRM}$	—	—	2.0	mA

## ON CHARACTERISTICS

Peak On-State Voltage ( $I_{TM} = \pm 35$ A Peak, Pulse Width $\leq 2$ ms, Duty Cycle $\leq 2\%$ )	$V_{TM}$	—	1.4	1.85	Volts
Gate Trigger Current (Continuous dc) ( $V_D = 12$ V, $R_L = 100 \Omega$ ) MT2(+), G(+); MT2(-), G(-); MT(+), G(-) MT2(-), G(+)	$I_{GT}$	—	20 30	50 75	mA
Gate Trigger Voltage (Continuous dc) ( $V_D = 12$ V, $R_L = 100 \Omega$ ) MT2(+), G(+); MT2(-), G(-); MT(+), G(-) MT2(-), G(+)	$V_{GT}$	—	1.1 1.3	2.0 2.5	Volts
Gate Non-trigger Voltage ( $V_D = 12$ V, $T_J = 125^{\circ}C$ , $R_L = 100 \Omega$ ) All Quadrants	$V_{GD}$	0.2	0.4	—	Volts
Holding Current ( $V_D = 12$ Vdc, Gate Open, Initiating Current = $\pm 200$ mA)	$I_H$	—	10	50	mA
Turn-On Time ( $V_D = \text{Rated } V_{DRM}, I_{TM} = 35$ A Peak, $I_G = 200$ mA)	$t_{gt}$	—	1.5	—	$\mu s$

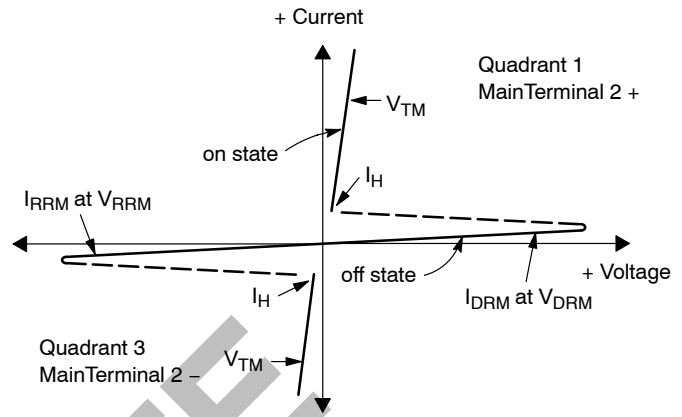
## DYNAMIC CHARACTERISTICS

Critical Rate of Rise of Off-State Voltage ( $V_D = \text{Rated } V_{DRM}$ , Exponential Waveform, $T_C = 125^{\circ}C$ )	dv/dt	—	40	—	V/ $\mu s$
Critical Rate of Rise of Commutation Voltage ( $V_D = \text{Rated } V_{DRM}$ , $I_{TM} = 35$ A Peak, Commutating di/dt = 12.6 A/ms, Gate Unenergized, $T_C = 80^{\circ}C$ )	dv/dt(c)	—	5.0	—	V/ $\mu s$

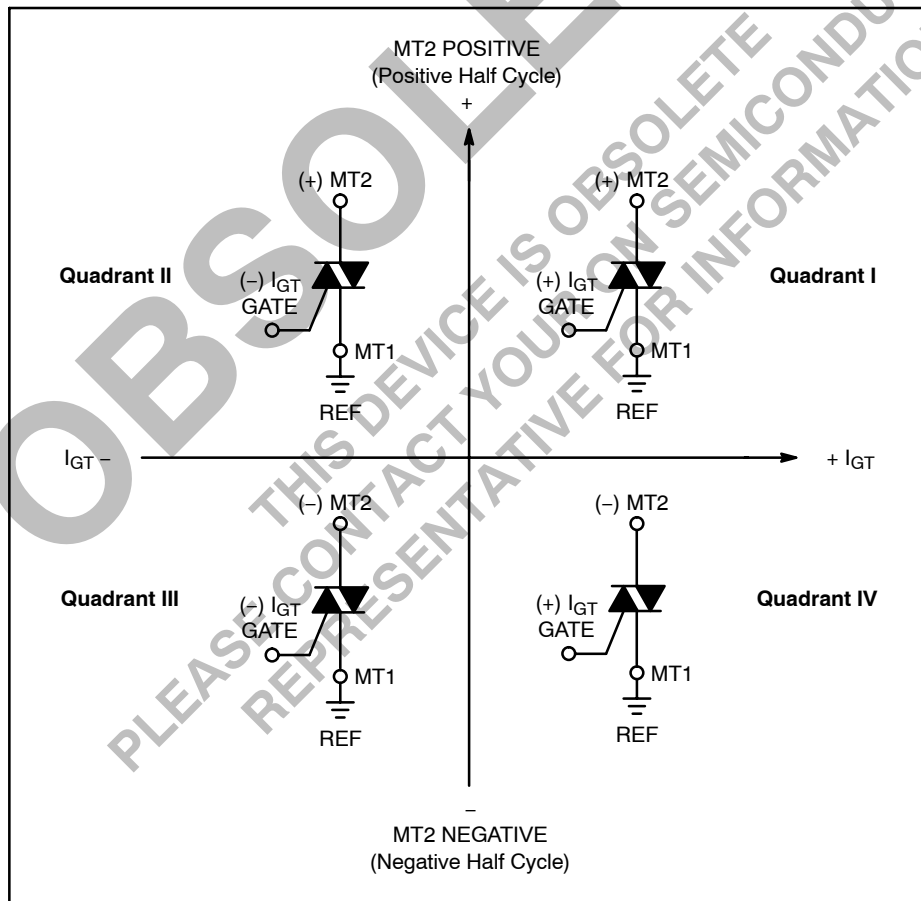
# MAC223A6, MAC223A8, MAC223A10

## 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.

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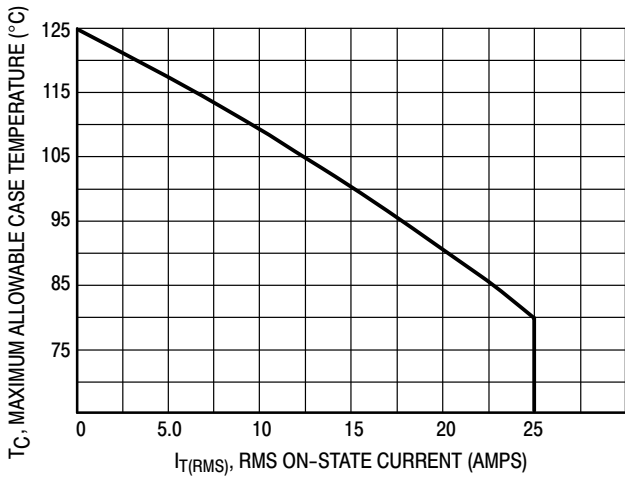


Figure 1. RMS Current Derating

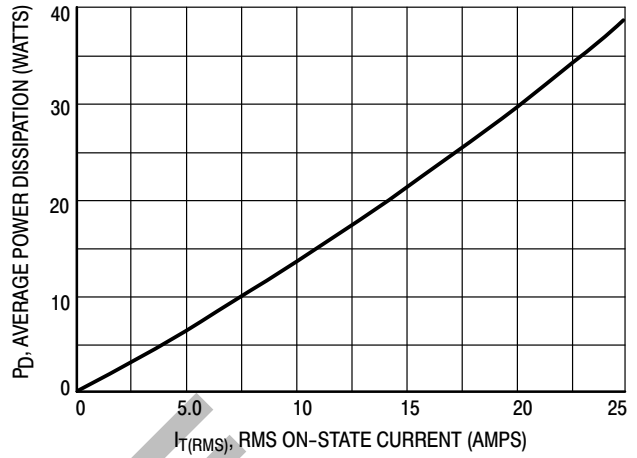


Figure 2. On-State Power Dissipation

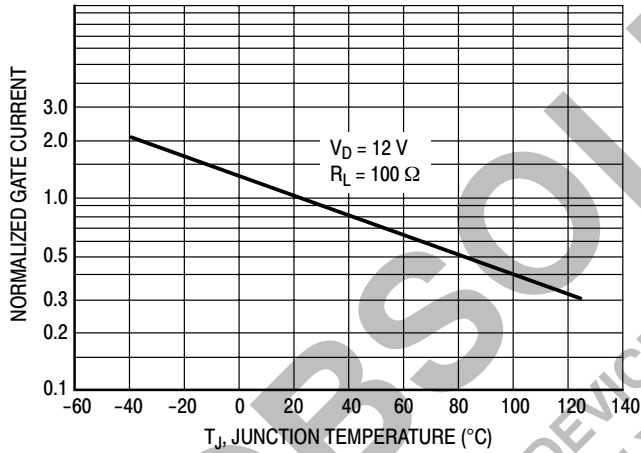


Figure 3. Typical Gate Trigger Current

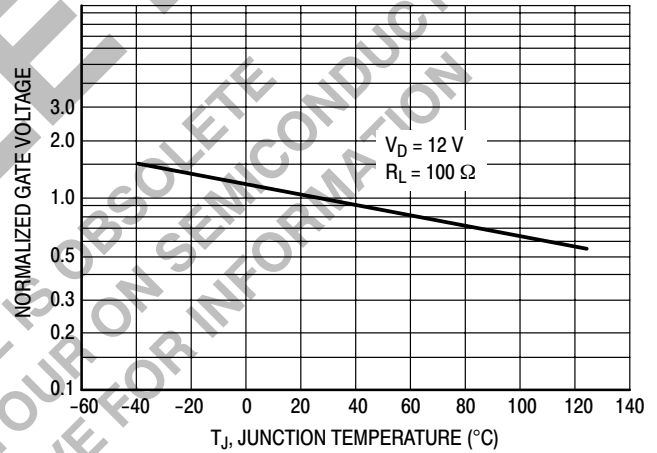


Figure 4. Typical Gate Trigger Voltage

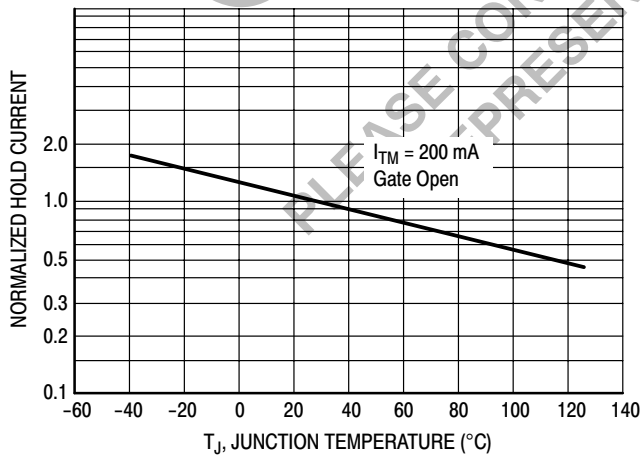


Figure 5. Typical Hold Current

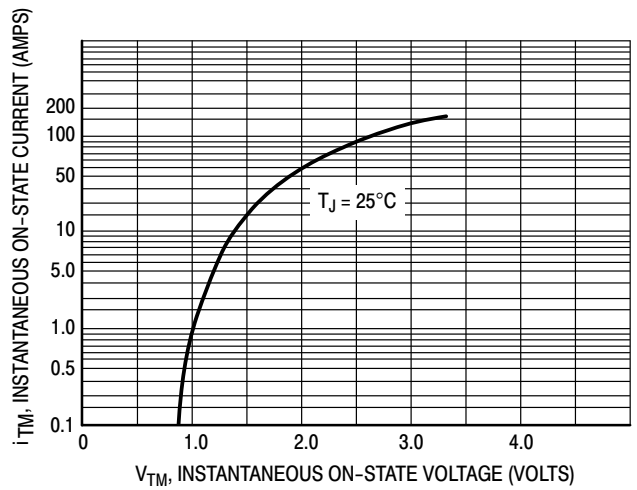
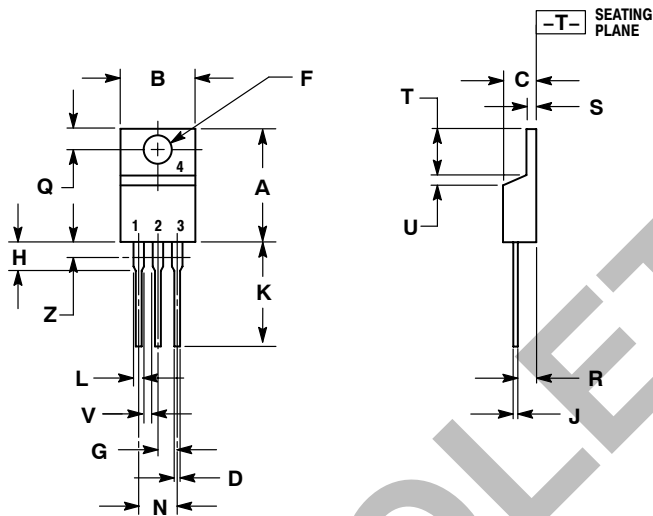


Figure 6. Typical On-State Characteristics

# MAC223A6, MAC223A8, MAC223A10

## 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

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