

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

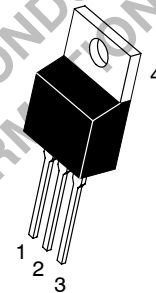
TRIACS
25 AMPERES RMS
400 thru 800 VOLTS



MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ 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)	V_{DRM} , V_{RRM}	400 600 800	Volts
On-State Current RMS Full Cycle Sine Wave 50 to 60 Hz ($T_C = 80^\circ\text{C}$)	$I_{T(RMS)}$	25	A
Peak Non-repetitive Surge Current (One Full Cycle, 60 Hz, $T_C = 80^\circ\text{C}$) Preceded and followed by rated current	I_{TSM}	250	A
Circuit Fusing ($t = 8.3$ ms)	I^2t	260	A^2s
Peak Gate Current ($t \leq 2.0$ μsec ; $T_C = +80^\circ\text{C}$)	I_{GM}	2.0	A
Peak Gate Voltage ($t \leq 2.0$ μsec ; $T_C = +80^\circ\text{C}$)	V_{GM}	± 10	Volts
Peak Gate Power ($t \leq 2.0$ μsec ; $T_C = +80^\circ\text{C}$)	P_{GM}	20	Watts
Average Gate Power ($T_C = 80^\circ\text{C}$, $t = 8.3$ ms)	$P_{G(AV)}$	0.5	Watts
Operating Junction Temperature Range	T_J	-40 to 125	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to 150	$^\circ\text{C}$
Mounting Torque	—	8.0	in. lb.

(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.



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.

MAC223A6, MAC223A8, MAC223A10

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	μA
	$T_J = 125^{\circ}C$	I_{RRM}	—	—	2.0	mA

ON CHARACTERISTICS

Peak On-State Voltage ($I_{TM} = \pm 35$ A Peak, Pulse Width ≤ 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 = ± 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	—	μs

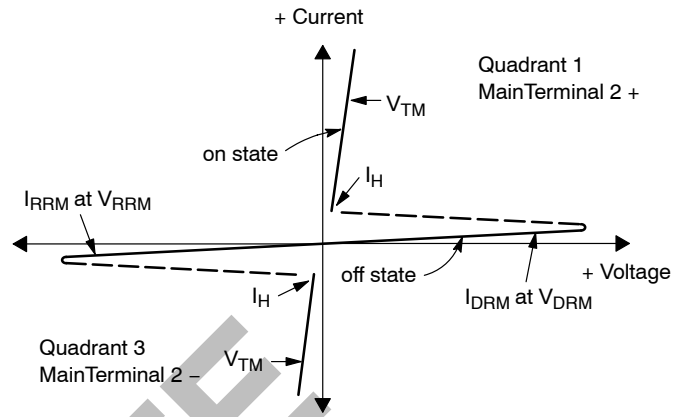
DYNAMIC CHARACTERISTICS

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/ μs
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/ μs

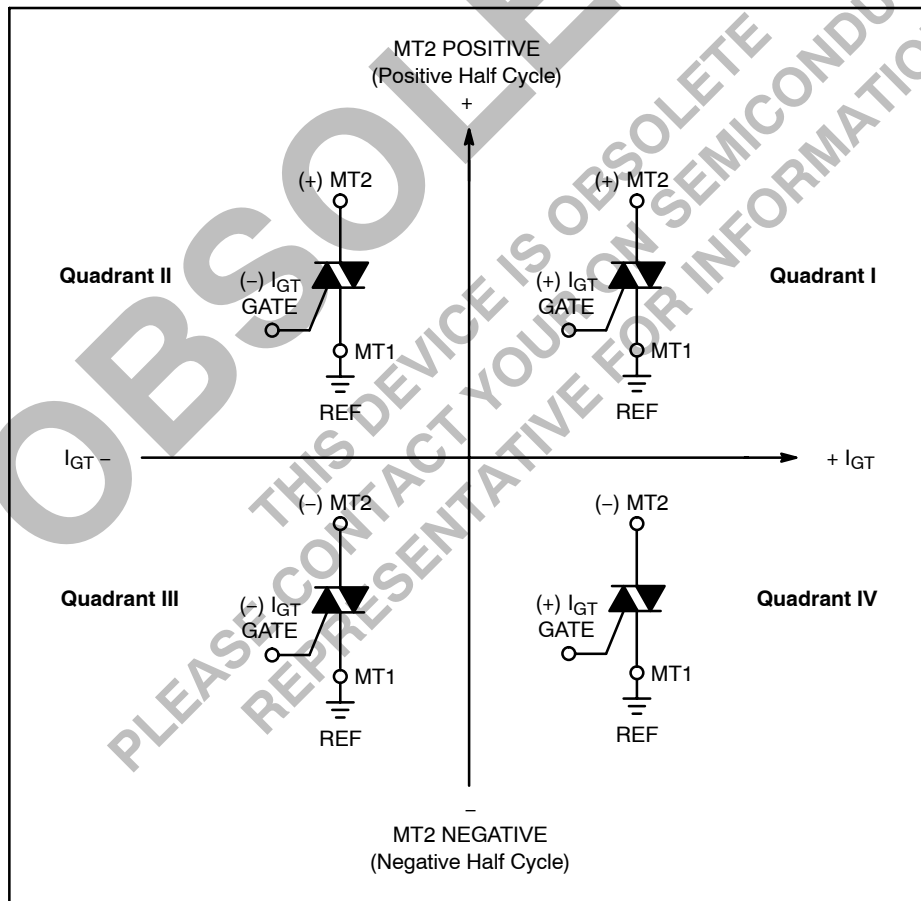
MAC223A6, MAC223A8, MAC223A10

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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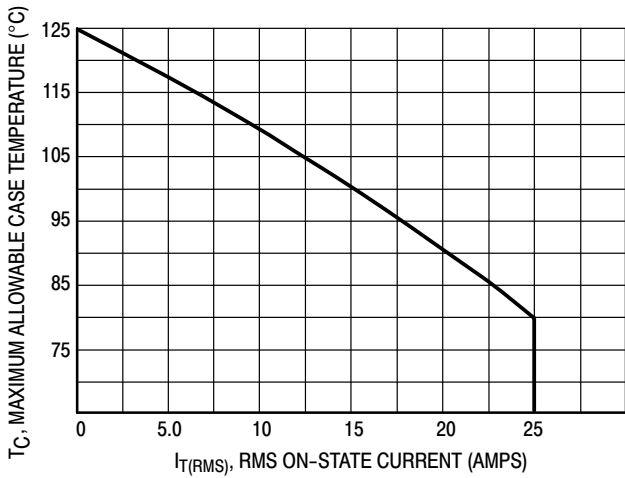


Figure 1. RMS Current Derating

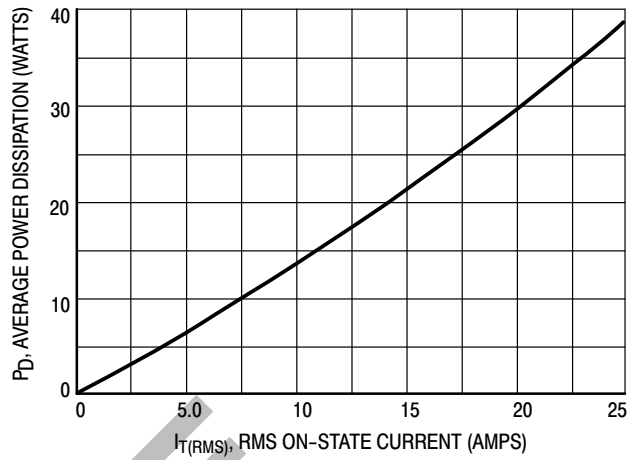


Figure 2. On-State Power Dissipation

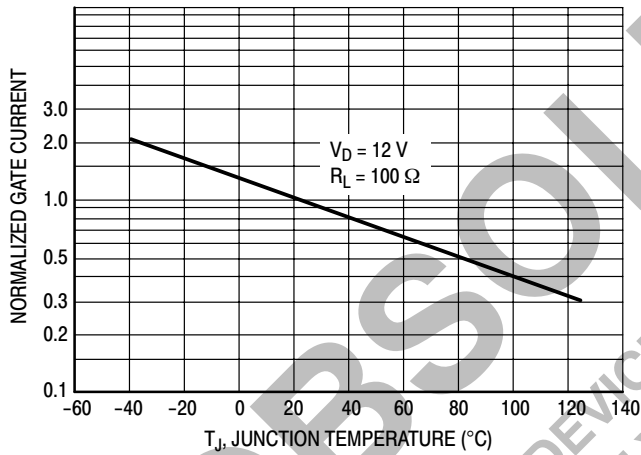


Figure 3. Typical Gate Trigger Current

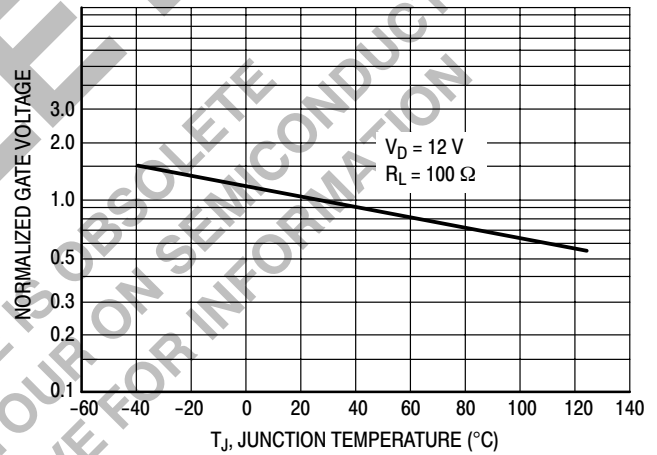


Figure 4. Typical Gate Trigger Voltage

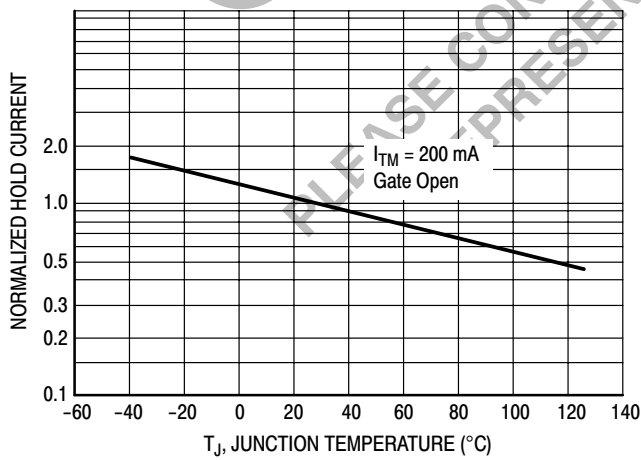


Figure 5. Typical Hold Current

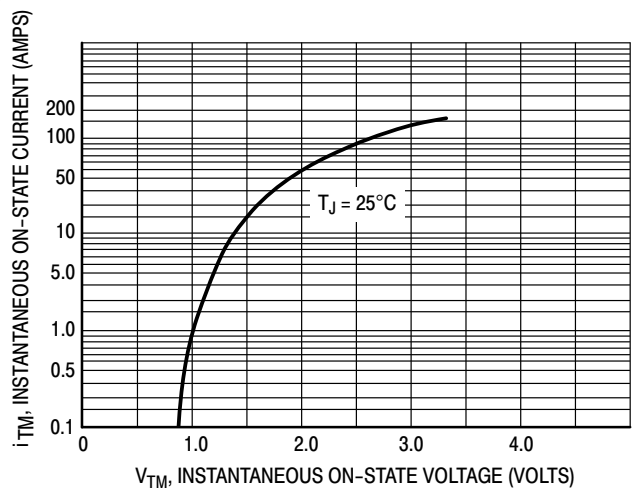
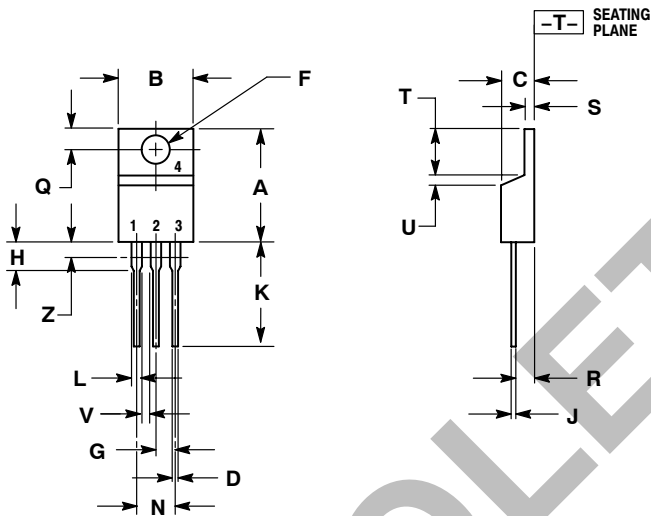


Figure 6. Typical On-State Characteristics

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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