

# MAC223A6FP, MAC223A8FP, MAC223A10FP

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; 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
-  Indicates UL Registered — File #E69369
- Device Marking: Logo, Device Type, e.g., MAC223A6FP, Date Code

**MAXIMUM RATINGS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage <sup>(1)</sup> ( $T_J = -40$ to $+125^\circ\text{C}$ , Sine Wave 50 to 60 Hz, Gate Open)	$V_{DRM}$ , $V_{RRM}$		Volts
MAC223A6FP MAC223A8FP MAC223A10FP		400 600 800	
On-State RMS Current ( $T_C = +80^\circ\text{C}$ ) <sup>(2)</sup> Full Cycle Sine Wave 50 to 60 Hz	$I_{T(\text{RMS})}$	25	Amps
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	Amps
Circuit Fusing ( $t = 8.3$ ms)	$I^2t$	260	$\text{A}^2\text{s}$
Peak Gate Power ( $t \leq 2 \mu\text{sec}$ ; $T_C = +80^\circ\text{C}$ )	$P_{GM}$	20	Watts
Average Gate Power ( $t = 8.3$ ms; $T_C = +80^\circ\text{C}$ )	$P_{G(AV)}$	0.5	Watt
Peak Gate Current ( $t \leq 2 \mu\text{sec}$ ; $T_C = +80^\circ\text{C}$ )	$I_{GM}$	2.0	Amps
Peak Gate Voltage ( $t \leq 2 \mu\text{sec}$ ; $T_C = +80^\circ\text{C}$ )	$V_{GM}$	$\pm 10$	Volts
RMS Isolation Voltage ( $T_A = 25^\circ\text{C}$ , Relative Humidity $\leq 20\%$ ) 	$V_{(\text{ISO})}$	1500	Volts
Operating Junction Temperature	$T_J$	-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.

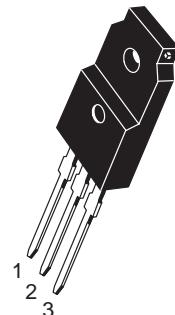
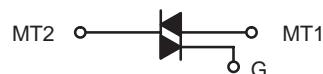
(2) The case temperature reference point for all  $T_C$  measurements is a point on the center lead of the package as close as possible to the plastic body.



**ON Semiconductor**

<http://onsemi.com>

**ISOLATED TRIAC (RU)**  
**25 AMPERES RMS**  
**400 thru 800 VOLTS**



**ISOLATED TO-220 Full Pack  
CASE 221C  
STYLE 3**

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

## ORDERING INFORMATION

Device	Package	Shipping
MAC223A6FP	ISOLATED TO220FP	500/Box
MAC223A8FP	ISOLATED TO220FP	500/Box
MAC223A10FP	ISOLATED TO220FP	500/Box

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

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## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.2	°C/W
Thermal Resistance, Case to Sink	$R_{\theta CS}$	2.2	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	60	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit
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## OFF CHARACTERISTICS

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

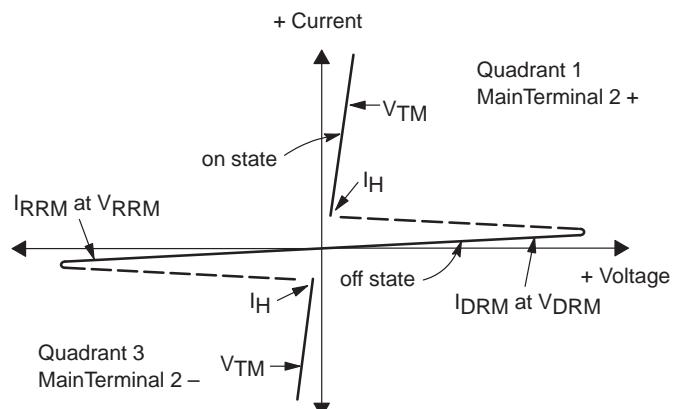
Peak On-State Voltage ( $I_{TM} = \pm 35$ A Peak, Pulse Width $\leq 2$ ms; Duty Cycle $\leq 2\%$ )	$V_{TM}$	—	1.4	1.85	Volts
Gate Trigger Current (Continuous dc) ( $V_D = 12$ V, $R_L = 100 \Omega$ ) MT2(+), G(+); MT2(−), G(−); MT2(+), G(−) MT2(−), G(+)	$I_{GT}$	— —	20 30	50 75	mA
Gate Trigger Voltage (Continuous dc) ( $V_D = 12$ V, $R_L = 100 \Omega$ ) MT2(+), G(+); MT2(−), G(−); MT2(+), G(−) MT2(−), G(+)	$V_{GT}$	— —	1.1 1.3	2.0 2.5	Volts
Gate Non-trigger Voltage ( $V_D = 12$ V, $T_J = 125^\circ\text{C}$ , $R_L = 100 \Omega$ ) 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
Gate Controlled Turn-On Time ( $V_D$ = Rated VDRM, $I_{TM} = 35$ A Peak, $I_G = 200$ mA)	$t_{gt}$	—	1.5	—	μs

## DYNAMIC CHARACTERISTICS

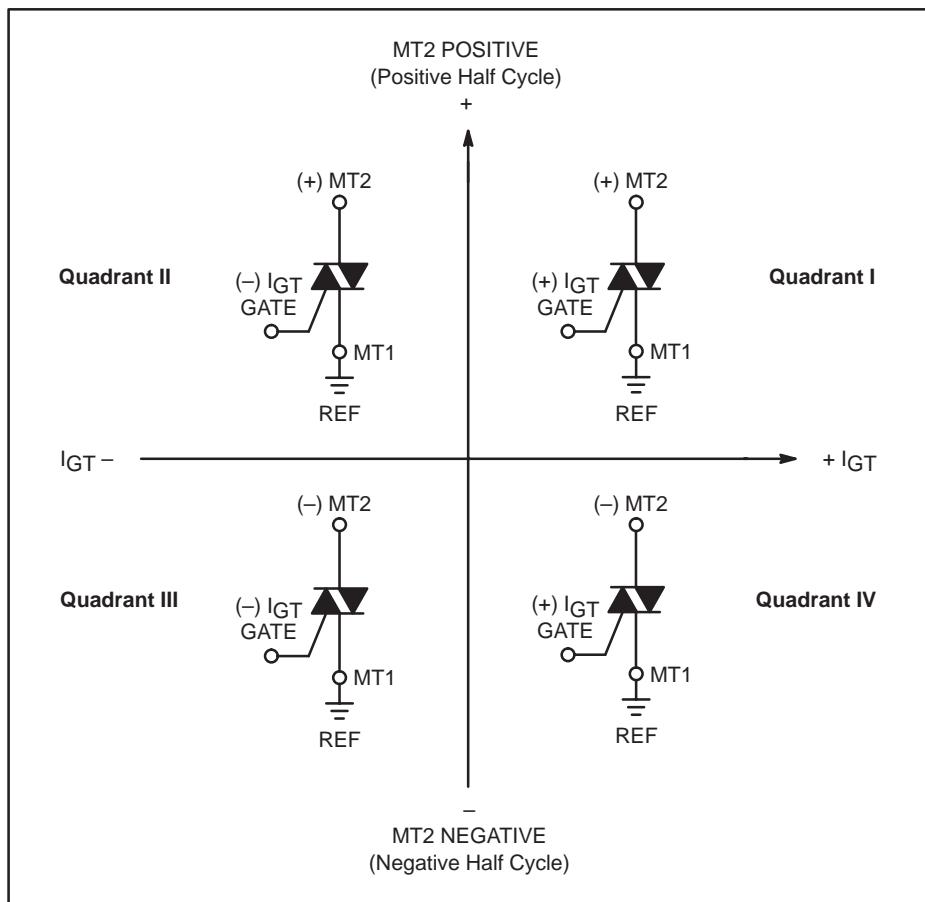
Critical Rate of Rise of Off-State Voltage ( $V_D$ = Rated VDRM, Exponential Waveform, $T_C = 125^\circ\text{C}$ )	$dv/dt$	—	40	—	V/μs
Critical Rate of Rise of Commutation Voltage ( $V_D$ = Rated VDRM, $I_{TM} = 35$ A Peak, Commutating $di/dt = 12.6$ A/ms, Gate Unenergized, $T_C = 80^\circ\text{C}$ )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

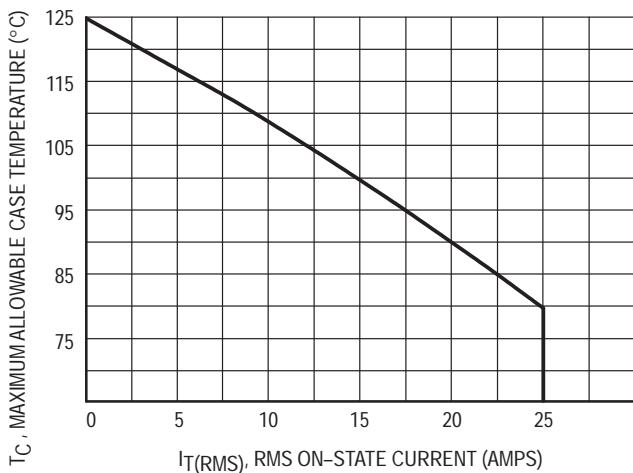


**Quadrant Definitions for a Triac**

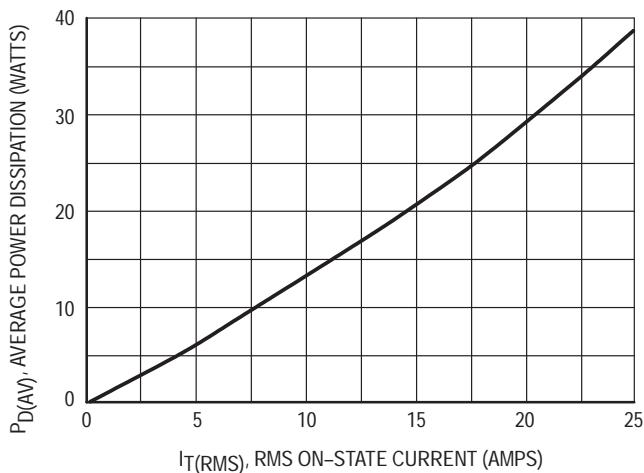


All polarities are referenced to MT1.  
With in-phase signals (using standard AC lines) quadrants I and III are used.

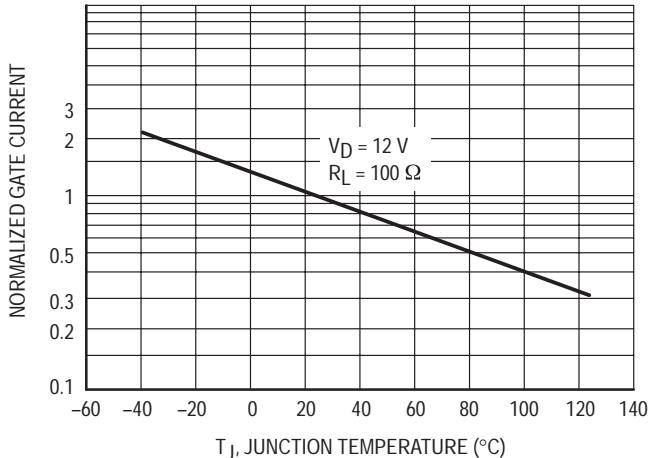
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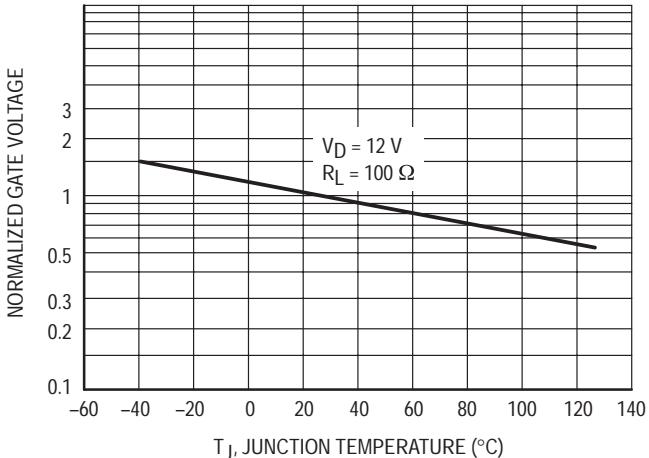
**Figure 1. RMS Current Derating**



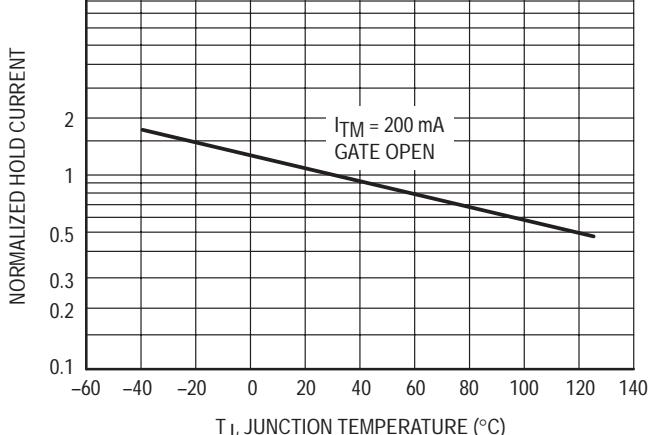
**Figure 2. On-State Power Dissipation**



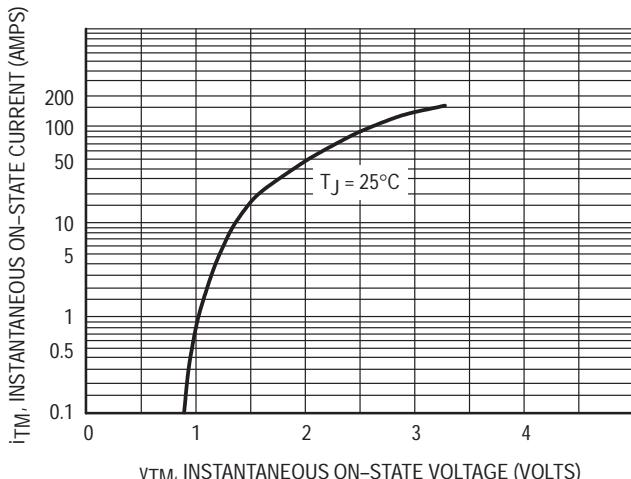
**Figure 3. Typical Gate Trigger Current**



**Figure 4. Typical Gate Trigger Voltage**

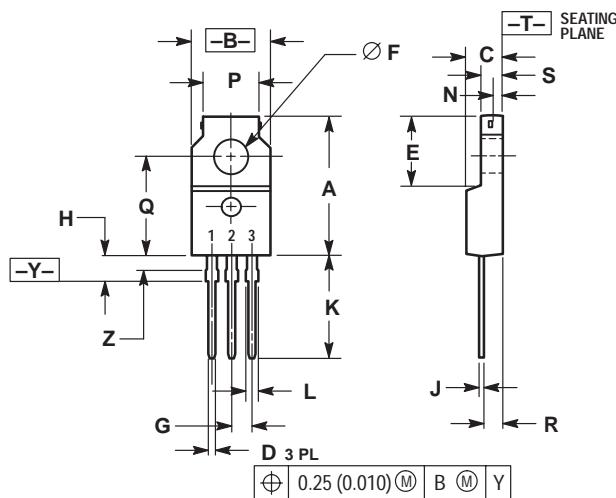


**Figure 5. Typical Hold Current**



**Figure 6. Typical On-State Characteristics**

## PACKAGE DIMENSIONS

ISOLATED TO-220 Full Pack  
CASE 221C-02  
ISSUE C

## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. LEAD DIMENSIONS UNCONTROLLED WITHIN DIMENSION Z.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.680	0.700	17.28	17.78
B	0.388	0.408	9.86	10.36
C	0.175	0.195	4.45	4.95
D	0.025	0.040	0.64	1.01
E	0.340	0.355	8.64	9.01
F	0.140	0.150	3.56	3.81
G	0.100 BSC		2.54 BSC	
H	0.110	0.155	2.80	3.93
J	0.018	0.028	0.46	0.71
K	0.500	0.550	12.70	13.97
L	0.045	0.070	1.15	1.77
N	0.049	—	1.25	—
P	0.270	0.290	6.86	7.36
Q	0.480	0.500	12.20	12.70
R	0.090	0.120	2.29	3.04
S	0.105	0.115	2.67	2.92
Z	0.070	0.090	1.78	2.28

## STYLE 3:

1. MT 1
2. MT 2
3. GATE

## Notes

## Notes

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