


# 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><br>( $T_J = -40$ to $+125^\circ\text{C}$ , Sine Wave 50 to 60 Hz, Gate Open)                                             | $V_{\text{DRM}}$ ,<br>$V_{\text{RRM}}$ |                 | Volts                |
| MAC223A6FP                                                                                                                                                                |                                        | 400             |                      |
| MAC223A8FP                                                                                                                                                                |                                        | 600             |                      |
| MAC223A10FP                                                                                                                                                               |                                        | 800             |                      |
| On-State RMS Current ( $T_C = +80^\circ\text{C}$ ) <sup>(2)</sup><br>Full Cycle Sine Wave 50 to 60 Hz                                                                     | $I_{\text{T(RMS)}}$                    | 25              | Amps                 |
| Peak Non-repetitive Surge Current<br>(One Full Cycle, 60 Hz, $T_C = 80^\circ\text{C}$ )<br>Preceded and followed by rated current                                         | $I_{\text{TSM}}$                       | 250             | Amps                 |
| Circuit Fusing ( $t = 8.3$ ms)                                                                                                                                            | $I^2t$                                 | 260             | $\text{A}^2\text{s}$ |
| Peak Gate Power<br>( $t \leq 2$ $\mu\text{sec}$ ; $T_C = +80^\circ\text{C}$ )                                                                                             | $P_{\text{GM}}$                        | 20              | Watts                |
| Average Gate Power<br>( $t = 8.3$ ms; $T_C = +80^\circ\text{C}$ )                                                                                                         | $P_{\text{G(AV)}}$                     | 0.5             | Watt                 |
| Peak Gate Current<br>( $t \leq 2$ $\mu\text{sec}$ ; $T_C = +80^\circ\text{C}$ )                                                                                           | $I_{\text{GM}}$                        | 2.0             | Amps                 |
| Peak Gate Voltage<br>( $t \leq 2$ $\mu\text{sec}$ ; $T_C = +80^\circ\text{C}$ )                                                                                           | $V_{\text{GM}}$                        | $\pm 10$        | Volts                |
| RMS Isolation Voltage ( $T_A = 25^\circ\text{C}$ ,<br>Relative Humidity $\leq 20\%$ )  | $V_{\text{(ISO)}}$                     | 1500            | Volts                |
| Operating Junction Temperature                                                                                                                                            | $T_J$                                  | $-40$ to $+125$ | $^\circ\text{C}$     |
| Storage Temperature Range                                                                                                                                                 | $T_{\text{stg}}$                       | $-40$ to $+150$ | $^\circ\text{C}$     |
| Mounting Torque                                                                                                                                                           | —                                      | 8.0             | in. lb.              |


(1)  $V_{\text{DRM}}$  and  $V_{\text{RRM}}$  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.

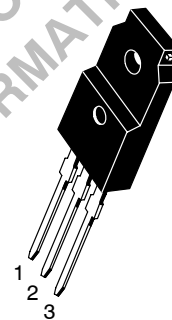
(2) The case temperature reference point for all  $T_C$  measurements is a point on the center lead of the package as close as possible to the plastic body.



ON Semiconductor

<http://onsemi.com>

**ISOLATED TRIAC **  
**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 | $^{\circ}\text{C/W}$ |
| Thermal Resistance, Case to Sink                                              | $R_{\theta CS}$ | 2.2 | $^{\circ}\text{C/W}$ |
| Thermal Resistance, Junction to Ambient                                       | $R_{\theta JA}$ | 60  | $^{\circ}\text{C/W}$ |
| Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds | $T_L$           | 260 | $^{\circ}\text{C}$   |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

## OFF CHARACTERISTICS

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

## ON CHARACTERISTICS

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

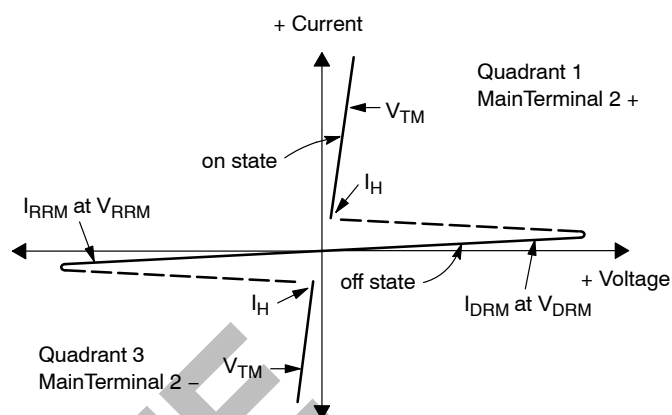
## DYNAMIC CHARACTERISTICS

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

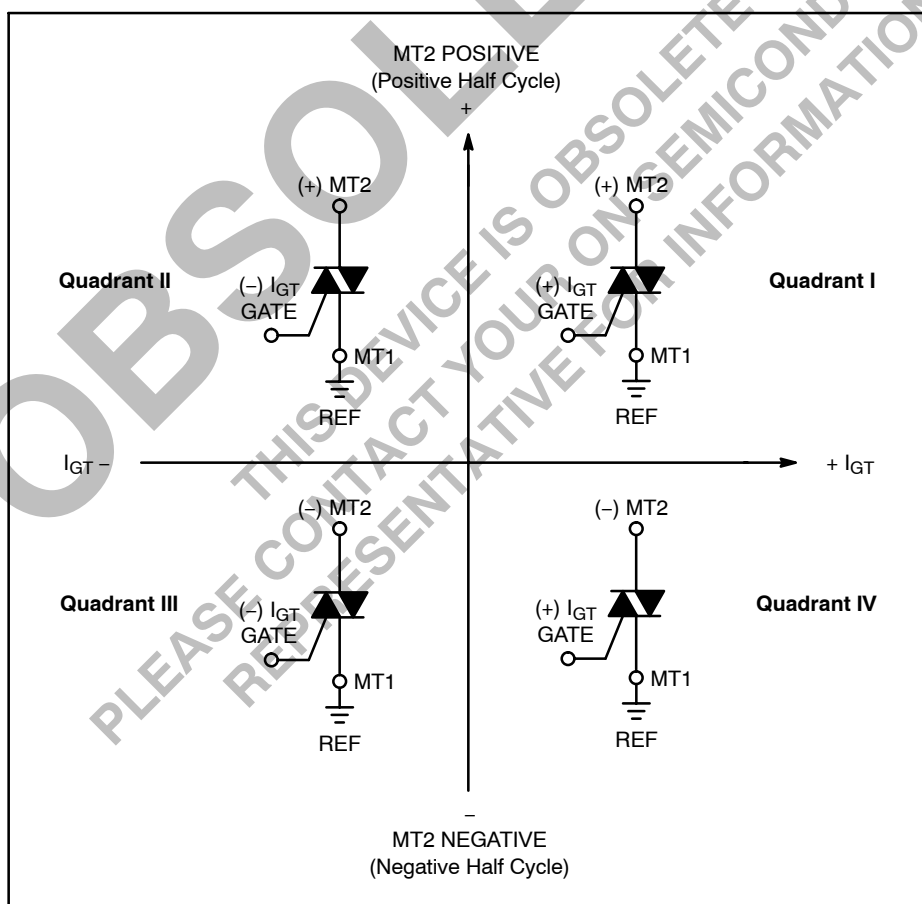
## MAC223A6FP, MAC223A8FP, MAC223A10FP

### 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.

# MAC223A6FP, MAC223A8FP, MAC223A10FP

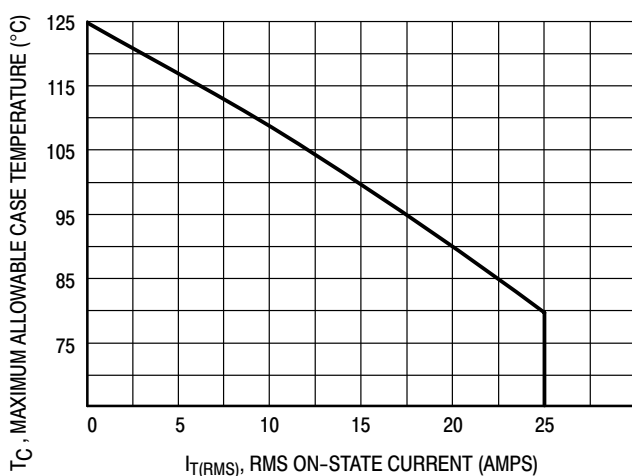


Figure 1. RMS Current Derating

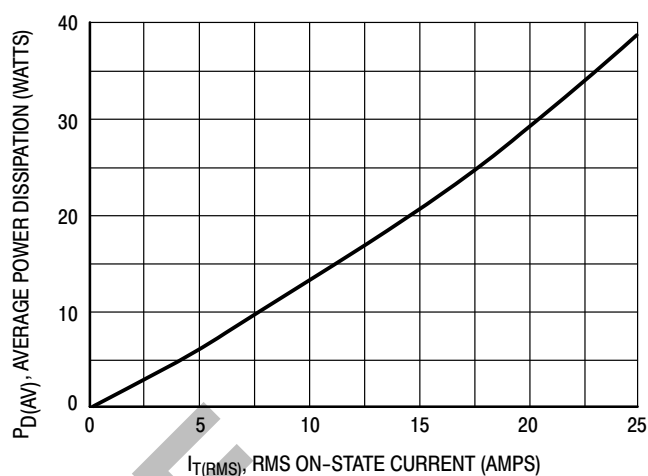


Figure 2. On-State Power Dissipation

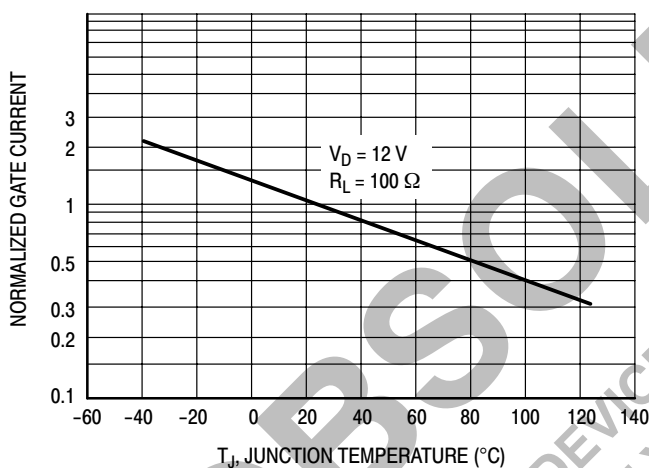


Figure 3. Typical Gate Trigger Current

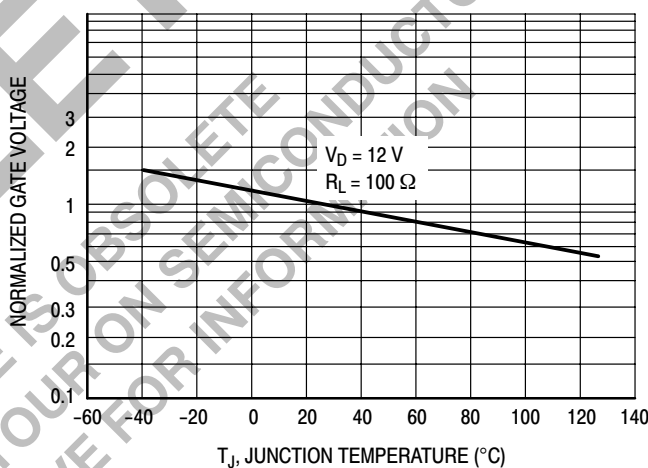


Figure 4. Typical Gate Trigger Voltage

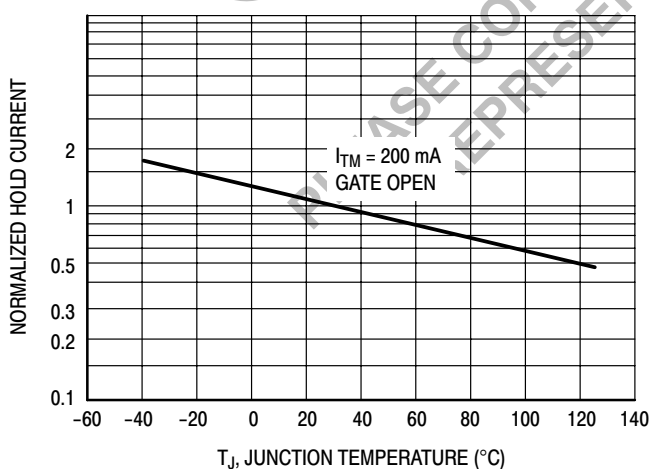


Figure 5. Typical Hold Current

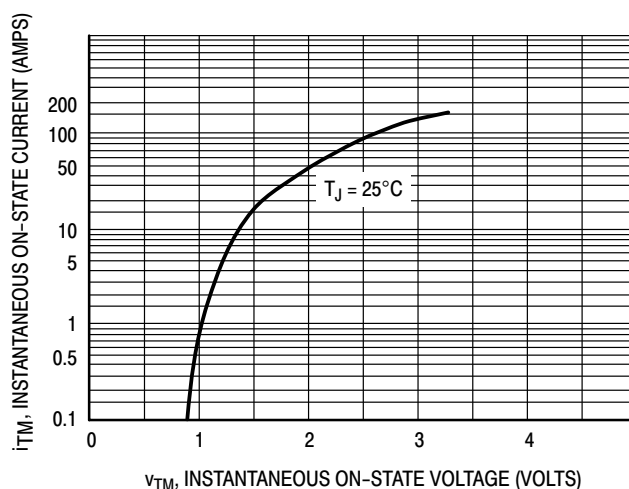


Figure 6. Typical On-State Characteristics

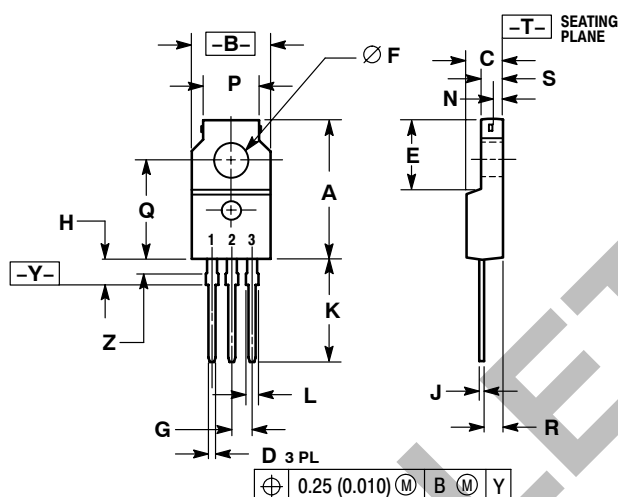
# MAC223A6FP, MAC223A8FP, MAC223A10FP

## 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:  
PIN 1. MT 1  
2. MT 2  
3. GATE

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