# MAC223A6, MAC223A8, MAC223A10

**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
- Device Marking: Logo, Device Type, e.g., MAC223A6, Date Code

**MAXIMUM RATINGS** ($T_J$ = 25°C unless otherwise noted)

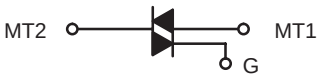
| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak Repetitive Off–State Voltage(1) ($T_J$ = –40 to 125°C, Sine Wave 50 to 60 Hz, Gate Open)<br>MAC223A6<br>MAC223A8<br>MAC223A10 | $V_{DRM}$, $V_{RRM}$ | <br>400<br>600<br>800 | Volts |
| On–State Current RMS Full Cycle Sine Wave 50 to 60 Hz ($T_C$ = 80°C) | $I_{T(RMS)}$ | 25 | A |
| Peak Non–repetitive Surge Current (One Full Cycle, 60 Hz, $T_C$ = 80°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 ($t \le 2.0$ µsec; $T_C$ = +80°C) | $I_{GM}$ | 2.0 | A |
| Peak Gate Voltage ($t \le 2.0$ µsec; $T_C$ = +80°C) | $V_{GM}$ | ±10 | Volts |
| Peak Gate Power ($t \le 2.0$ µsec; $T_C$ = +80°C) | $P_{GM}$ | 20 | Watts |
| Average Gate Power ($T_C$ = 80°C, t = 8.3 ms) | $P_{G(AV)}$ | 0.5 | Watts |
| Operating Junction Temperature Range | $T_J$ | –40 to 125 | °C |
| Storage Temperature Range | $T_{stg}$ | –40 to 150 | °C |
| Mounting Torque | — | 8.0 | in. lb. |

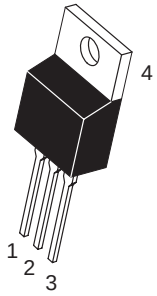
(1) $V_{DRM}$ and $V_{RRM}$ for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

ON Semiconductor

http://onsemi.com

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




**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.

## THERMAL CHARACTERISTICS

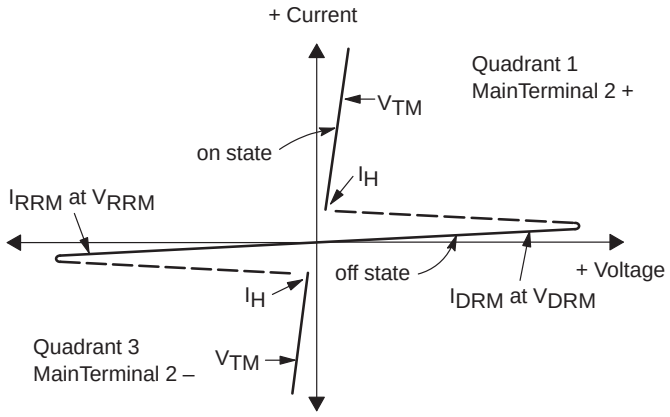
| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 1.2 | °C/W |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 60 | °C/W |
| Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 10 Seconds | $T_L$ | 260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

## ELECTRICAL CHARACTERISTICS ($T_C$ = 25°C unless otherwise indicated; Electricals apply in both directions)

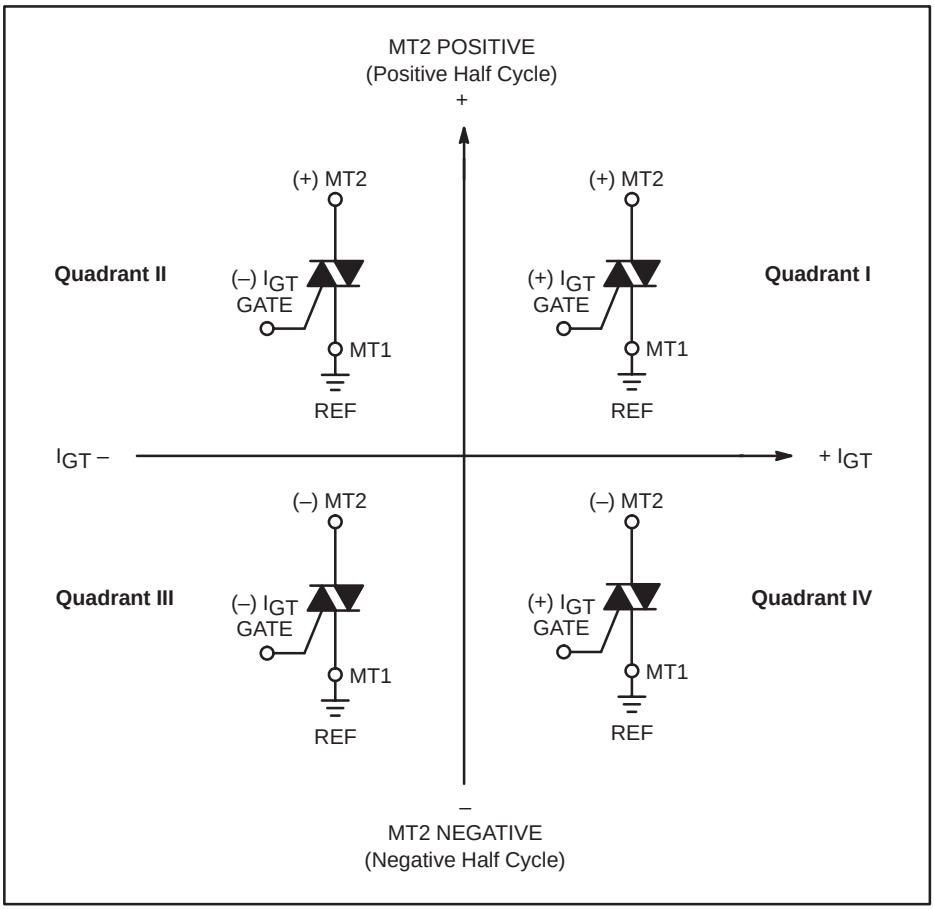
| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Peak Repetitive Blocking Current<br>($V_D$ = Rated $V_{DRM}$, $V_{RRM}$; Gate Open) | $T_J$ = 25°C<br>$T_J$ = 125°C | $I_{DRM}$,<br>$I_{RRM}$ | —<br>— | —<br>— | 10<br>2.0 | μA<br>mA |
| **ON CHARACTERISTICS** | | | | | | |
| Peak On–State Voltage ($I_{TM}$ = ±35 A Peak, Pulse Width ≤ 2 ms, Duty Cycle ≤ 2%) | | $V_{TM}$ | — | 1.4 | 1.85 | Volts |
| Gate Trigger Current (Continuous dc)<br>($V_D$ = 12 V, $R_L$ = 100 Ω)<br>MT2(+), G(+); MT2(–), G(–); MT(+), G(–)<br>MT2(–), G(+) | | $I_{GT}$ | <br><br>—<br>— | <br><br>20<br>30 | <br><br>50<br>75 | mA |
| Gate Trigger Voltage (Continuous dc)<br>($V_D$ = 12 V, $R_L$ = 100 Ω)<br>MT2(+), G(+); MT2(–), G(–); MT(+), G(–)<br>MT2(–), G(+) | | $V_{GT}$ | <br><br>—<br>— | <br><br>1.1<br>1.3 | <br><br>2.0<br>2.5 | Volts |
| Gate Non–trigger Voltage<br>($V_D$ = 12 V, $T_J$ = 125°C, $R_L$ = 100 Ω)<br>All Quadrants | | $V_{GD}$ | 0.2 | 0.4 | — | Volts |
| Holding Current<br>($V_D$ = 12 Vdc, Gate Open, Initiating Current = ±200 mA) | | $I_H$ | — | 10 | 50 | mA |
| Turn–On Time<br>($V_D$ = 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<br>($V_D$ = Rated $V_{DRM}$, Exponential Waveform, $T_C$ = 125°C) | | dv/dt | — | 40 | — | V/μs |
| Critical Rate of Rise of Commutation Voltage<br>($V_D$ = Rated $V_{DRM}$, $I_{TM}$ = 35 A Peak, Commutating di/dt = 12.6 A/ms, Gate Unenergized, $T_C$ = 80°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.

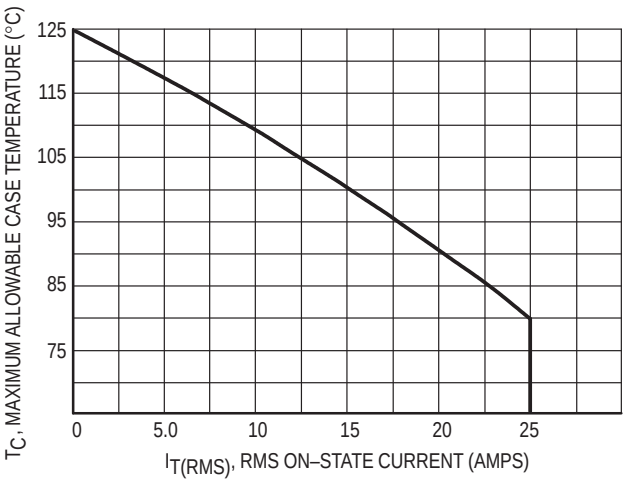



**Figure 1. RMS Current Derating**

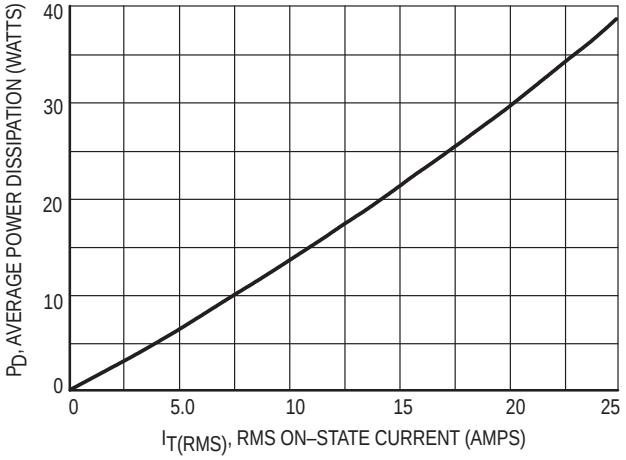



**Figure 2. On–State Power Dissipation**

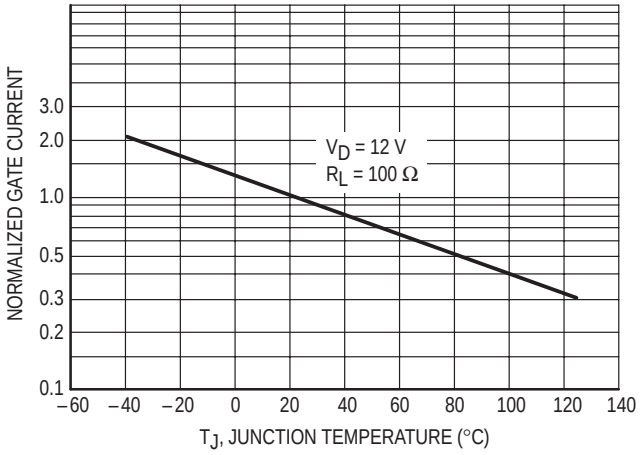



**Figure 3. Typical Gate Trigger Current**

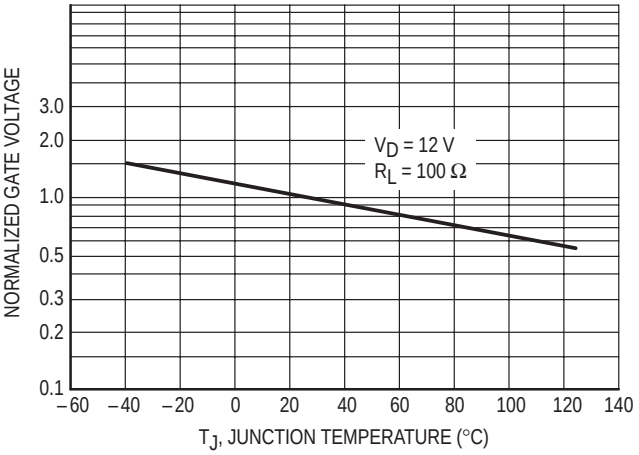



**Figure 4. Typical Gate Trigger Voltage**

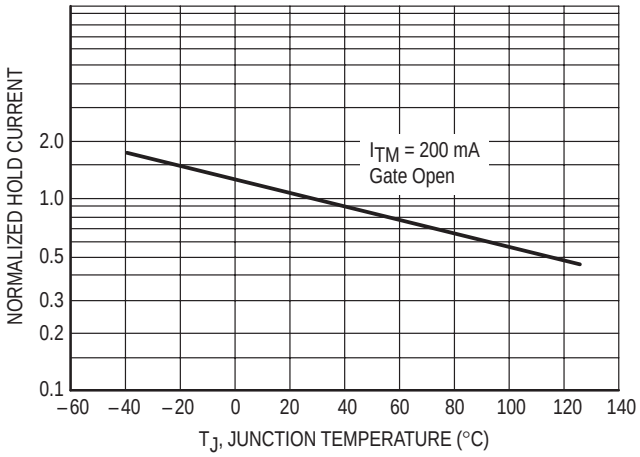



**Figure 5. Typical Hold Current**

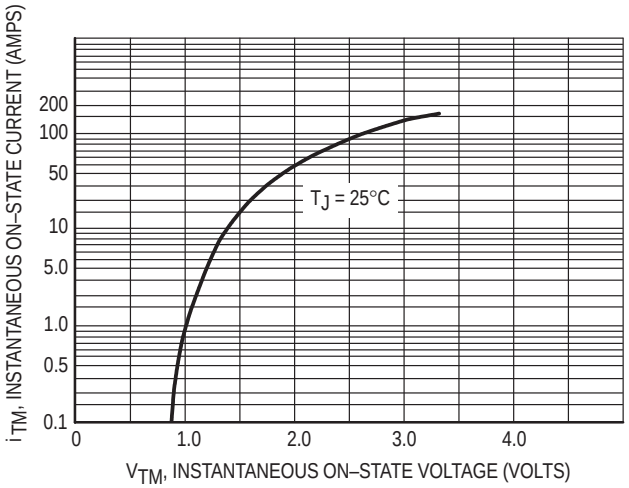
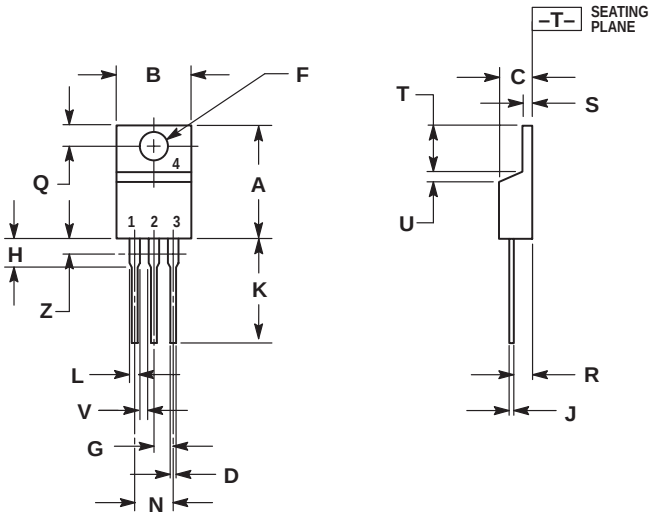



**Figure 6. Typical On–State Characteristics**

## PACKAGE DIMENSIONS

**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.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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

# Notes

# Notes

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