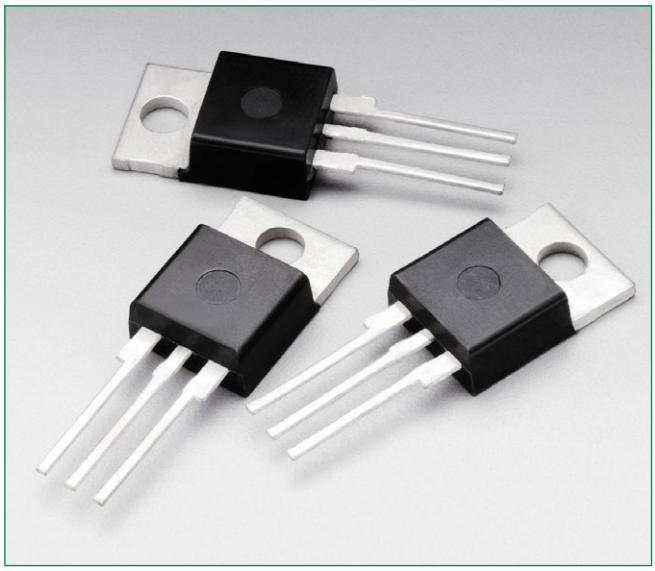
# MAC228A



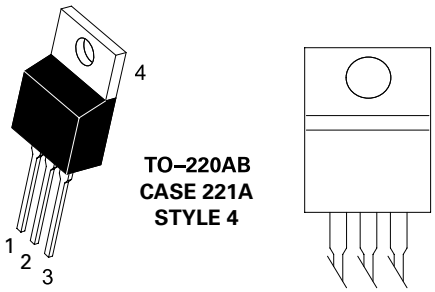
## Description

Designed primarily for industrial and consumer applications for full–wave control of AC loads such as appliance controls, heater controls, motor controls, and other power switching applications.

## Features

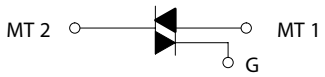
- Sensitive Gate Triggering in 3 Modes for AC Triggering on Sinking Current Sources
- Four Mode Triggering for Drive Circuits that Source Current
- All Diffused and Glass–Passivated Junctions for Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance and High Heat Dissipation
- Center Gate Geometry for Uniform Current Spreading
- These Devices are Pb–Free and are RoHS Compliant

## Pin Out




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

## Functional Diagram




## Additional Information

**Datasheet** | **Resources** | **Samples**


Revised: 07/02/19

## Maximum Ratings ($T_J$ = 25°C unless otherwise noted)

| Rating | | Symbol | Value | Unit |
|---|---|---|---|---|
| Peak Repetitive Off–State Voltage (Note 1)<br>(– 40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open) | MAC228A4<br>MAC228A6<br>MAC228A8<br>MAC228A10 | $V_{DRM}$, $V_{RRM}$ | 200<br>400<br>600<br>800 | V |
| On-State RMS Current ($T_C$ = 80°C) Full Cycle Sine Wave, 50 to 60 Hz | | $I_{T\ (RMS)}$ | 8.0 | A |
| Peak Non-Repetitive Surge Current<br>(One Full Cycle Sine Wave, 60 Hz, TJ = 110°C) | | $I_{TSM}$ | 80 | A |
| Circuit Fusing Consideration (t = 8.3 ms) | | $I^2t$ | 26 | $A^2$sec |
| Peak Gate Current, (t ≤ 2 s, $T_C$ = 80°C) | | $I_{GM}$ | ±2.0 | A |
| Peak Gate Voltage, (t ≤ 2 s, TC = 80°C) | | $V_{GM}$ | ±10 | V |
| Peak Gate Power (t ≤ 2 µs, $T_C$ = 80°C) | | $P_{GM}$ | 20 | W |
| Average Gate Power (t ≤ 8.3 ms, $T_C$ = 80°C) | | $P_{G\ (AV)}$ | 0.5 | W |
| 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 |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. $V_{DRM}$ and $V_{RRM}$ for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

## Thermal Characteristics

| Rating | | Symbol | Value | Unit |
|---|---|---|---|---|
| Thermal Resistance, | Junction–to–Case (AC)<br>Junction–to–Ambient | $R_{\theta JC}$<br>$R_{\theta JA}$ | 2.0<br>62.5 | °C/W |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | | $T_L$ | 260 | °C |

## Electrical Characteristics - OFF ($T_J$ = 25°C unless otherwise noted ; Electricals apply in both directions)

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Peak Repetitive Blocking Current<br>($V_D$ = $V_{DRM}$ = $V_{RRM}$; Gate Open) | $T_J$ = 25°C | $I_{DRM}$, $I_{RRM}$ | - | - | 1.0 | mA |
| | $T_J$ = 125°C | | - | - | 2.0 | |

## Electrical Characteristics - ON ($T_J$ = 25°C unless otherwise noted; Electricals apply in both directions)

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Peak On–State Voltage ($I_{TM}$ = ±11 A Peak, Pulse Width ≤2 ms, Duty Cycle ≤2%) | | $V_{TM}$ | – | – | 1.8 | V |
| Gate Trigger Current (Continuous dc)<br>($V_D$ = 12 V, $R_L$ = 100 Ohms) | MT2(+), G(+) | $I_{GT}$ | – | – | 5.0 | mA |
| | MT2(+), G(–) | | – | – | 5.0 | |
| | MT2(–), G(–) | | – | – | 5.0 | |
| | MT2(–), G(+) | | – | – | 10 | |
| Gate Trigger Voltage (Continuous dc)<br>($V_D$ = 12 V, $R_L$ = 100 Ω) | MT2(+), G(+) | $V_{GT}$ | – | – | 2.0 | V |
| | MT2(+), G(–) | | – | – | 2.0 | |
| | MT2(–), G(–) | | – | – | 2.0 | |
| | MT2(–), G(+) | | – | – | 2.5 | |
| Gate Non–Trigger Voltage (Continuous DC), ($V_D$ = 12 V, $T_C$ = 110°C, $R_L$ = 100 Ω) All Four Quadrants | | $V_{GD}$ | 0.2 | – | – | V |
| Holding Current ($V_D$ = 12 $V_{dc}$, Gate Open, Initiating Current = ±200 mA)) | | $I_H$ | – | – | 15 | mA |
| Gate–Controlled Turn–On Time,<br>($V_D$ = Rated $V_{DRM}$, $I_{TM}$ = 16 A Peak, $I_G$ = 30 mA) | | $t_{gt}$ | – | 1.5 | – | µs |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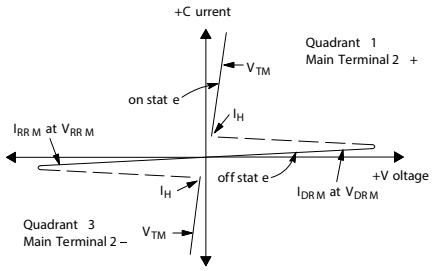
## Dynamic Characteristics

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Critical Rate of Rise of Commutation Voltage ($V_D$ = Rated $V_{DRM}$, $I_{TM}$ = 11.3 A, Commutating di/dt = 4.1 A/ms, Gate Unenergized, $T_C$ = 80°C) | (di/dt)c | – | 5.0 | – | A/ms |
| Critical Rate of Rise of Off-State Voltage ($V_D$ = Rated $V_{DRM}$, Exponential Waveform, Gate Open, $T_C$ = 110°C) | dv/dt | – | 25 | – | V/µs |

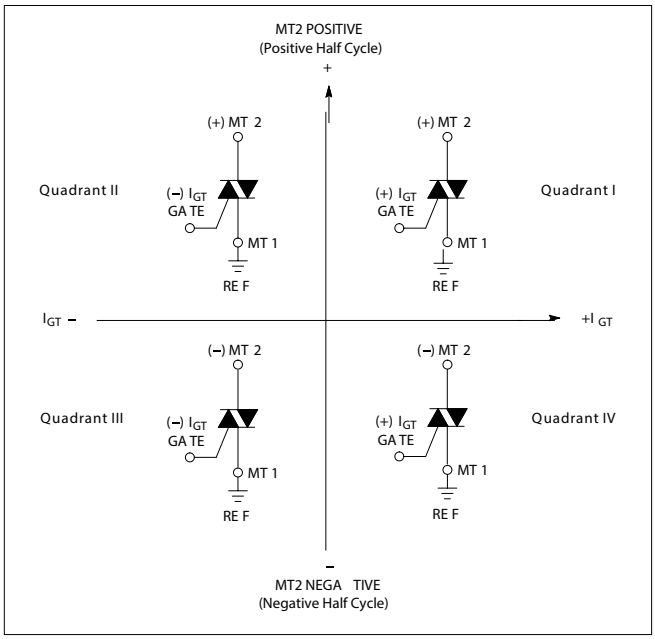
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## Voltage Current Characteristic of SCR

| 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 |

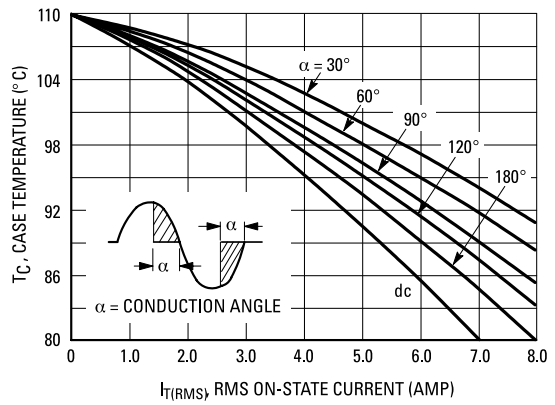



## Quadrant Definitions for a Triac

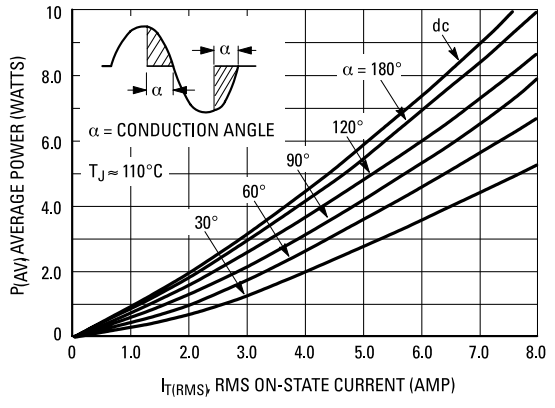



All polarities are referenced to MT1.
With in–phase signals (using standard AC lines) quadrants I and III are used

## Figure 1. Current Derating




## Figure 2. On–State Power Dissipation





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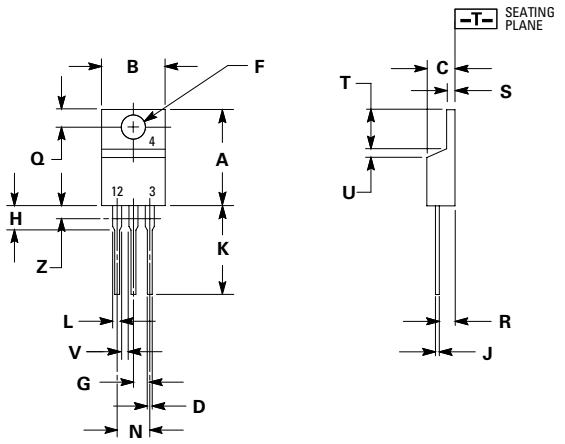
# Thyristors

## Surface Mount – 400V - 800V > MAC228A

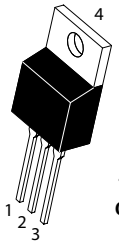
## Dimensions



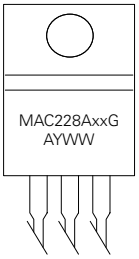

| Dim | Inches | | Millimeters | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.590 | 0.620 | 14.99 | 15.75 |
| B | 0.380 | 0.420 | 9.65 | 10.67 |
| C | 0.178 | 0.188 | 4.52 | 4.78 |
| D | 0.025 | 0.035 | 0.64 | 0.89 |
| F | 0.142 | 0.147 | 3.61 | 3.73 |
| G | 0.095 | 0.105 | 2.41 | 2.67 |
| H | 0.110 | 0.130 | 2.79 | 3.30 |
| J | 0.018 | 0.024 | 0.46 | 0.61 |
| K | 0.540 | 0.575 | 13.72 | 14.61 |
| L | 0.060 | 0.075 | 1.52 | 1.91 |
| N | 0.195 | 0.205 | 4.95 | 5.21 |
| Q | 0.105 | 0.115 | 2.67 | 2.92 |
| R | 0.085 | 0.095 | 2.16 | 2.41 |
| S | 0.045 | 0.060 | 1.14 | 1.52 |
| 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 |

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.

## Part Marking System




**TO–220AB**
**CASE 221A**
**STYLE 12**




xx = 4, 6, 8, or 10
A= Assembly Location (Optional)*
Y= Year
WW = Work Week
G = Pb–Free Package

| Pin Assignment | |
|---|---|
| 1 | Main Terminal 1 |
| 2 | Main Terminal 2 |
| 3 | Gate |
| 4 | No Connection |

## Ordering Information

| Device | Package | Shipping |
|---|---|---|
| MAC228A4G | TO-220AB (Pb-Free) | 500 Units/ Box |
| MAC228A6G | | 500 Units/ Box |
| MAC228A6TG | | 500 Units/ Box |
| MAC228A8G | | 500 Units/ Box |
| MAC228A8TG | | 500 Units/ Box |
| MAC228A10G | | 500 Units/ Box |

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- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
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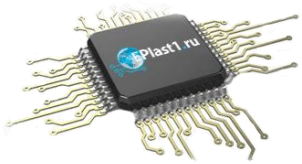
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

**Телефон:** 8 (812) 309 58 32 (многоканальный)
**Факс:** 8 (812) 320-02-42
**Электронная почта:** org@eplast1.ru
**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.