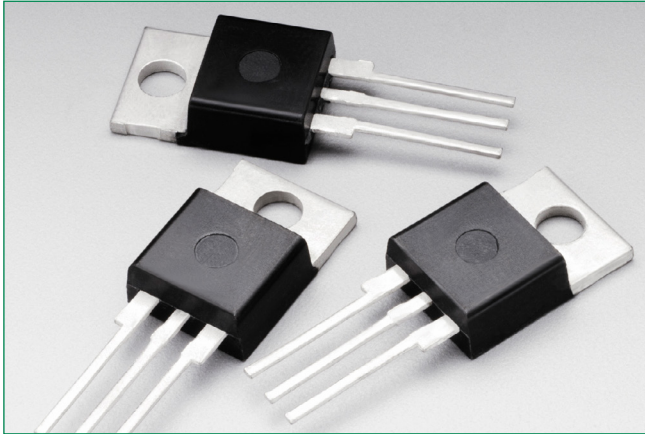


MAC210A8, MAC210A10

Triacs – 400V - 800V



Description

Designed primarily for full-wave AC control applications, such as light dimmers, motor controls, heating controls and power supplies; or wherever full-wave silicon gate controlled solid-state devices are needed. Triac type thyristors switch from a blocking to a conducting state for either polarity of applied main terminal voltage with positive or negative gate triggering.

Features

- Blocking Voltage to 600 Volts
- All Diffused and Glass Passivated Junctions for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance, High Heat Dissipation and Durability
- Gate Triggering Guaranteed in Four Modes (Quadrants)
- Pb-Free Packages are Available

Additional Information



Resources

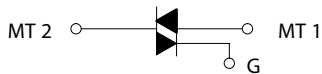


Accessories

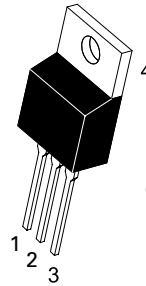


Samples

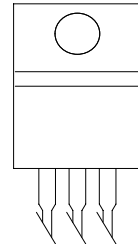
Functional Diagram



Pin Out



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



MAC210A8, MAC210A10

Triacs – 400V - 800V

Maximum Ratings ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Rating | Symbol | Value | Unit |
|--|--------------------------------------|-------------|--------------------|
| Peak Repetitive Off-State Voltage (Note 1) (– 40 to 125°C, Sine Wave, 50 to 60 Hz, Gate Open) | V_{DRM} V_{RRM} | 600 800 | V |
| On-State RMS Current (Full Cycle Sine Wave, 50 to 60 Hz, $T_C = 70^\circ\text{C}$) | $I_T(\text{RMS})$ | 10 | A |
| Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, $T_C = +25^\circ\text{C}$) Preceded and followed by rated current | I_{TSM} | 100 | A |
| Circuit Fusing Consideration ($t = 8.3$ ms) | I^2t | 40 | A ² sec |
| Peak Gate Power ($T_C = +70^\circ\text{C}$, Pulse Width = 10 μs) | P_{GM} | 20 | W |
| Average Gate Power ($t = 8.3$ ms, $T_C = 70^\circ\text{C}$) | $P_{\text{G(AV)}}$ | 0.35 | W |
| Peak Gate Current ($T_C = +70^\circ\text{C}$, Pulse Width = 10 s) | I_{GM} | 2.0 | A |
| Operating Junction Temperature Range | T_J | -40 to +125 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -40 to +150 | $^\circ\text{C}$ |

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) Junction-to-Ambient | $R_{\theta\text{JC}}$ $R_{\theta\text{JA}}$ | 2.0 62.5 | $^\circ\text{C/W}$ |
| Maximum Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

Electrical Characteristics - OFF ($T_J = 25^\circ\text{C}$ unless otherwise noted ; Electricals apply in both directions)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|--|--------------------------------------|-----|-----|-----|---------------|
| Peak Repetitive Blocking Current ($V_D = V_{\text{DRM}} = V_{\text{RRM}}$; Gate Open) | I_{DRM} I_{RRM} | - | - | 10 | μA |
| | | - | - | 2.0 | mA |

Electrical Characteristics - ON ($T_J = 25^\circ\text{C}$ unless otherwise noted; Electricals apply in both directions)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|-----------------|-----|-----|------|---------------|
| Peak On-State Voltage ($I_{\text{TM}} = \pm 14$ A Peak; Pulse Width = 1 to 2 ms, Duty Cycle $\leq 2\%$) | V_{TM} | - | 1.2 | 1.65 | V |
| Gate Trigger Current (Continuous dc) ($V_D = 12 V_{\text{dc}}$, $R_L = 100$ Ohms) | MT2(+), G(+) | - | 12 | 50 | mA |
| | MT2(+), G(-) | - | 12 | 50 | |
| | MT2(-), G(-) | - | 20 | 50 | |
| | MT2(-), G(+) | - | 35 | 75 | |
| Gate Trigger Voltage (Continuous dc) ($V_D = 12 V_{\text{dc}}$, $R_L = 100$ Ω) | MT2(+), G(+) | - | 0.9 | 2.0 | V |
| | MT2(+), G(-) | - | 0.9 | 2.0 | |
| | MT2(-), G(-) | - | 1.1 | 2.0 | |
| | MT2(-), G(+) | - | 1.4 | 2.5 | |
| Holding Current ($V_D = 12 V_{\text{dc}}$, Gate Open, Initiating Current = ± 200 mA, $T_C = +25^\circ\text{C}$) | I_H | - | 6.0 | 50 | mA |
| Turn-On Time (Rated V_{DRM} , $I_{\text{TM}} = 14$ A) ($I_{\text{GT}} = 120$ mA, Rise Time = 0.1 s, Pulse Width = 2 s) | t_{gt} | - | 1.5 | - | μs |
| Gate Non-Trigger Voltage (Continuous dc) (Main Terminal Voltage = 12 V, $R_L = 100$, $T_J = +125^\circ\text{C}$) | V_{GD} | 0.2 | - | - | v |

MAC210A8, MAC210A10

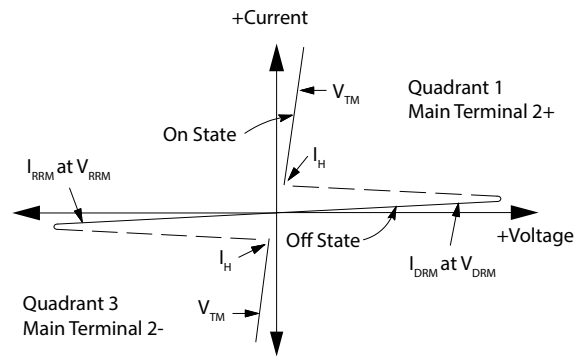
Triacs – 400V - 800V

Dynamic Characteristics

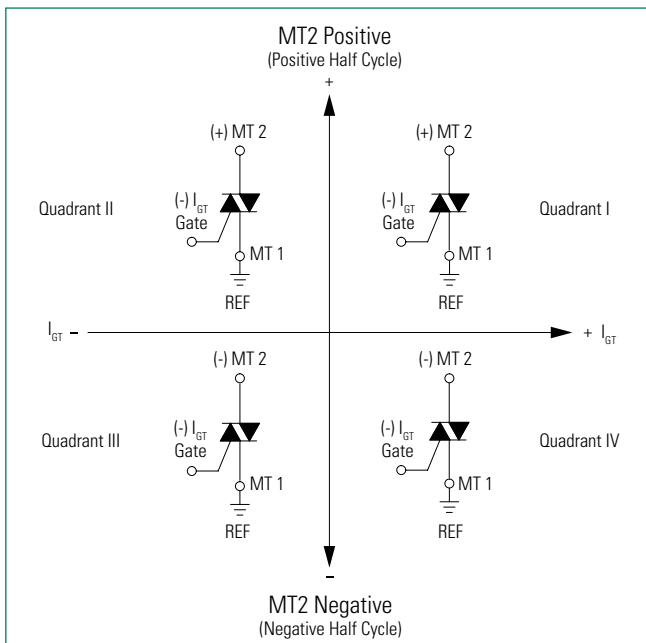
| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|------------|-----|-----|-----|------------------------|
| Critical Rate of Rise of Commutation Voltage ($V_D = \text{Rated } V_{DRM}$, $I_{TM} = 14 \text{ A}$, Commutating $di/dt = 5.0 \text{ A/ms}$, Gate Unenergized, $T_c = 70^\circ\text{C}$) | $di/dt(c)$ | – | 5.0 | – | $\text{V}/\mu\text{s}$ |
| Critical Rate of Rise of Off-State Voltage ($V_D = \text{Rated } V_{DRM}$, Exponential Waveform, Gate Open, $T_c = +70^\circ\text{C}$) | dv/dt | – | 100 | – | $\text{V}/\mu\text{s}$ |

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

MAC210A8, MAC210A10

Triacs – 400V - 800V

Figure 1.
Current Derating

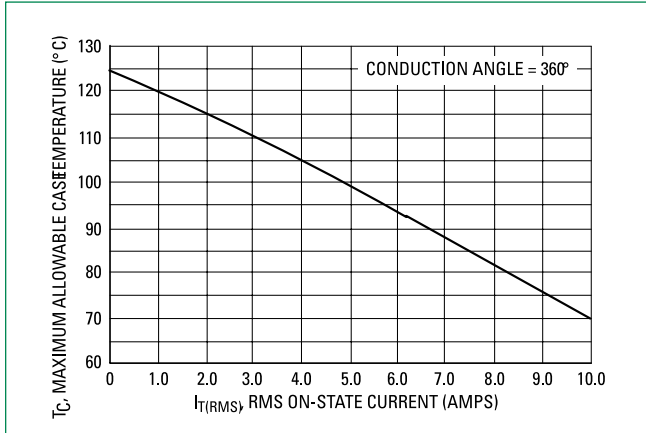


Figure 2.
Power Dissipation

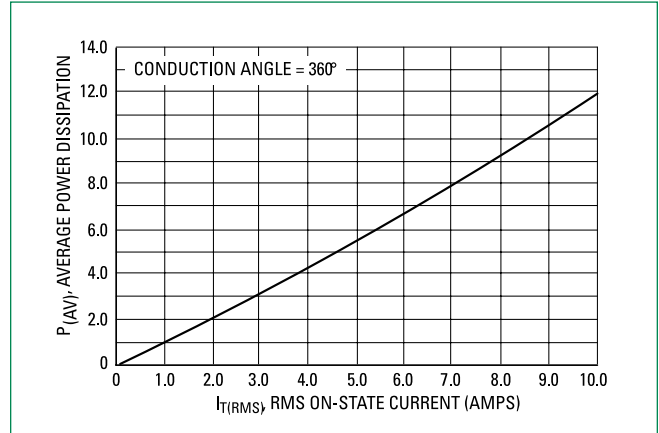


Figure 3.
Maximum On-State Characteristics

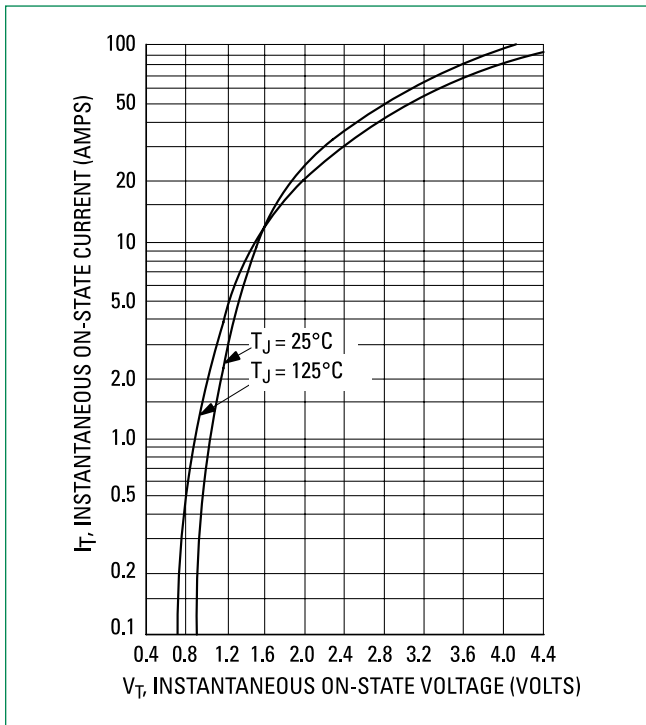


Figure 4.
Maximum Non-Repetitive Surge Current

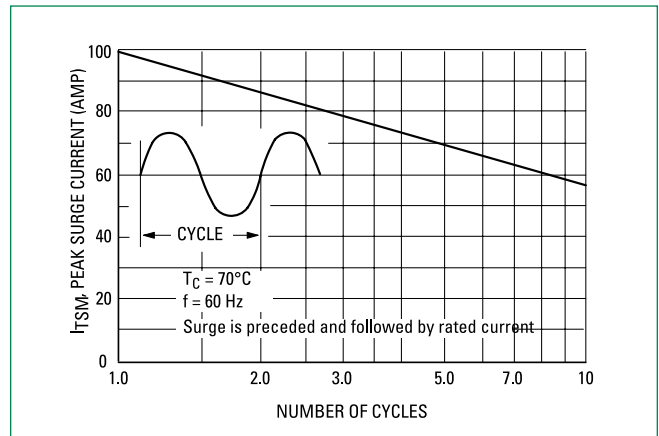
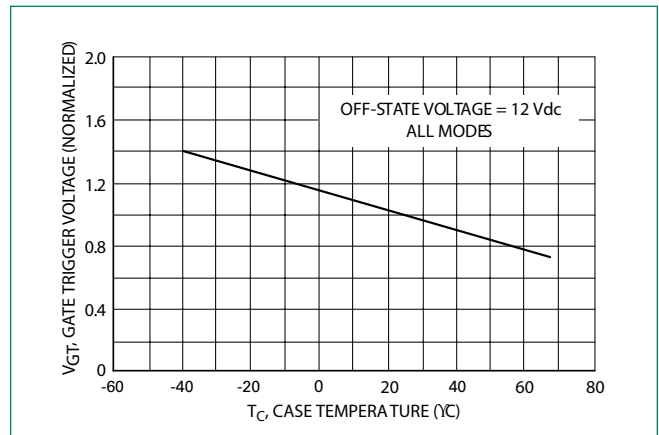


Figure 5.
Typical Gate Trigger Voltage



MAC210A8, MAC210A10

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Figure 6.
Typical Gate Trigger Current

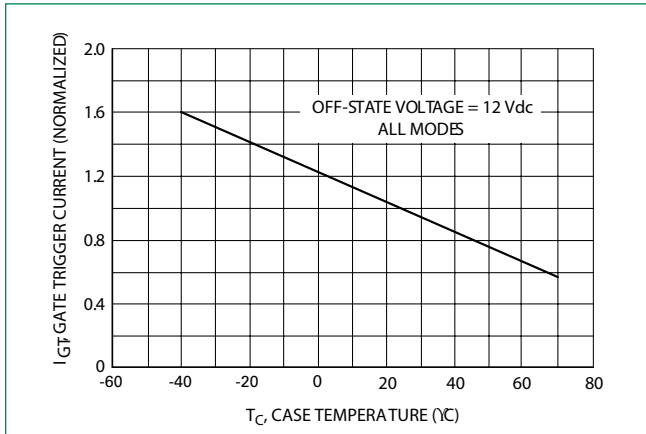


Figure 7.
Typical Holding Current

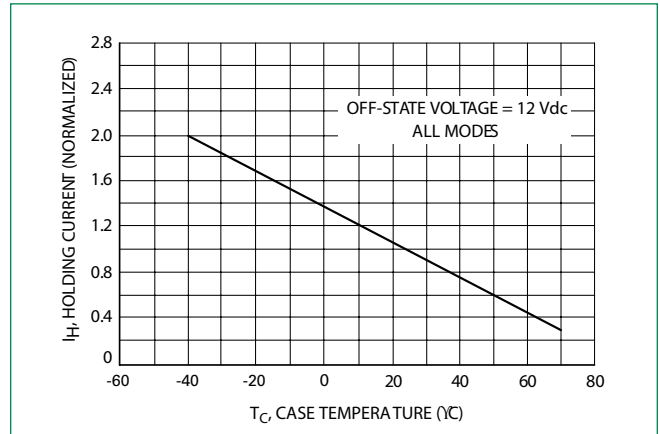
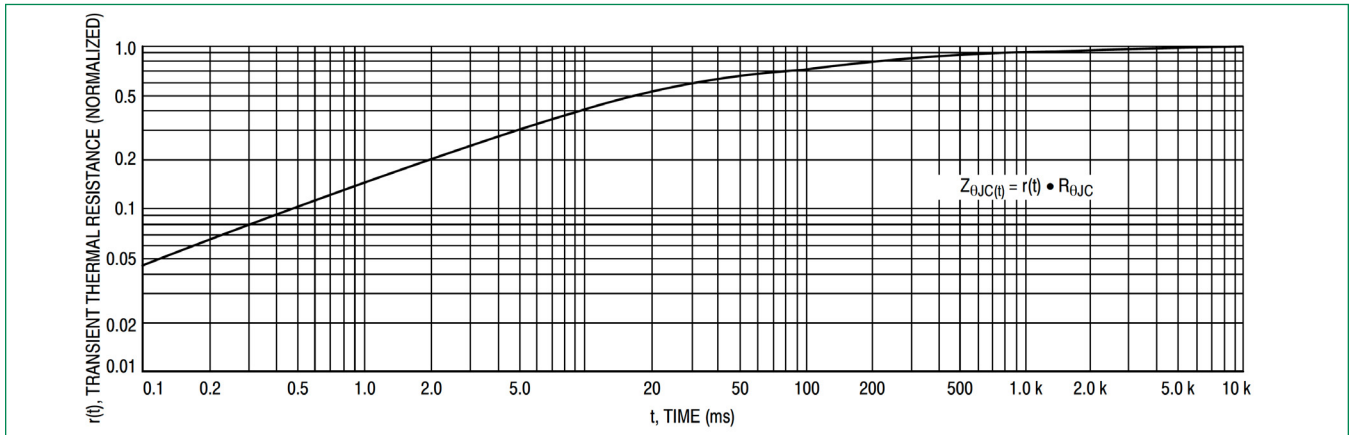


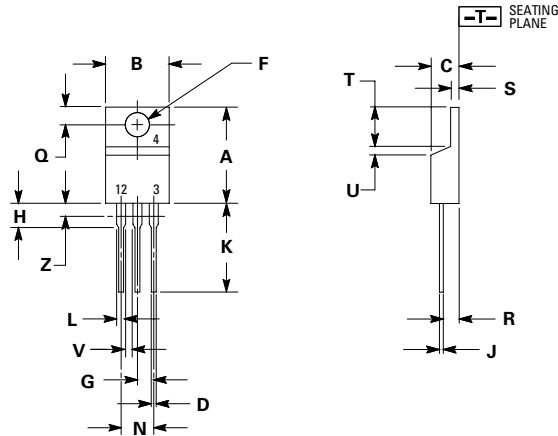
Figure 8.
Thermal Response



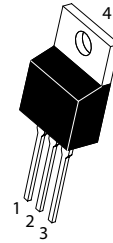
MAC210A8, MAC210A10

Triacs – 400V - 800V

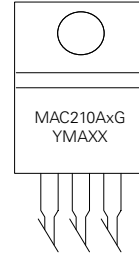
Dimensions



Part Marking System



TO-220AB
CASE 221A
STYLE 12



- x = 8 or 10
- Y = Year
- M = Month
- A = Assembly Site
- XX = Lot Serial Code
- G = Pb-Free Package

| 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.

Pin Assignment

| Pin | Assignment |
|-----|-----------------|
| 1 | Main Terminal 1 |
| 2 | Main Terminal 2 |
| 3 | Gate |
| 4 | Main Terminal 2 |

Ordering Information

| Device | Package | Shipping |
|------------|--------------------|-----------------|
| MAC210A8 | TO-220AB | 1000 Units/ Box |
| MAC210A8G | TO-220AB (Pb-Free) | |
| MAC210A10 | TO-220AB | |
| MAC210A10G | TO-220AB (Pb-Free) | |

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