

## TRIACS Silicon Bidirectional Thyristors

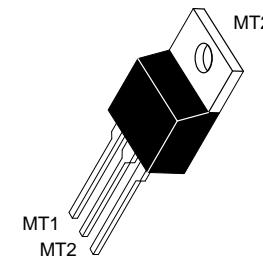
Designed for high performance full-wave ac control applications where high noise immunity and high commutating di/dt are required.

- Blocking Voltage to 800 Volts
- On-State Current Rating of 8.0 Amperes RMS at 100°C
- Uniform Gate Trigger Currents in Three Modes
- High Immunity to dv/dt — 500 V/μs minimum at 125°C
- Minimizes Snubber Networks for Protection
- Industry Standard TO-220AB Package
- High Commutating di/dt — 6.5 A/ms minimum at 125°C

### MAC9 SERIES\*

\*Motorola preferred devices

TRIACS  
8.0 AMPERES RMS  
400 thru 800  
VOLTS



CASE 221A-06  
(TO-220AB)  
Style 4

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

Symbol	Parameter	Value	Unit
$V_{DRM}$	Peak Repetitive Off-State Voltage (1) (−40 to 125°C, Sine Wave, 50 to 60 Hz, Gate Open)	MAC9D 400	Volts
		MAC9M 600	
		MAC9N 800	
$I_T(\text{RMS})$	On-State RMS Current (60 Hz, $T_C = 100^\circ\text{C}$ )	8.0	A
$I_{TSM}$	Peak Non-repetitive Surge Current (One Full Cycle, 60 Hz, $T_J = 125^\circ\text{C}$ )	80	A
$I^2t$	Circuit Fusing Consideration ( $t = 8.3 \text{ ms}$ )	26	$\text{A}^2\text{sec}$
$P_{GM}$	Peak Gate Power (Pulse Width $\leq 1.0 \mu\text{s}$ , $T_C = 80^\circ\text{C}$ )	16	Watts
$P_{G(AV)}$	Average Gate Power ( $t = 8.3 \text{ ms}$ , $T_C = 80^\circ\text{C}$ )	0.35	Watts
$T_J$	Operating Junction Temperature Range	−40 to +125	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	−40 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

$R_{\theta JC}$ $R_{\theta JA}$	Thermal Resistance — Junction to Case — Junction to Ambient	2.2 62.5	$^\circ\text{C}/\text{W}$
$T_L$	Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	260	$^\circ\text{C}$

(1)  $V_{DRM}$  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.

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

## MAC9 SERIES

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

Symbol	Characteristic	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
$I_{DRM}$	Peak Repetitive Blocking Current ( $V_D = \text{Rated } V_{DRM}$ , Gate Open)	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$	— —	— —	0.01 2.0 mA

## ON CHARACTERISTICS

$V_{TM}$	Peak On-State Voltage* ( $I_{TM} = \pm 11 \text{ A Peak}$ )	—	1.2	1.6	Volts
$I_{GT}$	Continuous Gate Trigger Current ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ ) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-)	10 10 10	16 18 22	50 50 50	mA
$I_H$	Hold Current ( $V_D = 12 \text{ V}$ , Gate Open, Initiating Current = $\pm 150 \text{ mA}$ )	—	30	50	mA
$I_L$	Latch Current ( $V_D = 24 \text{ V}$ , $I_G = 50 \text{ mA}$ ) MT2(+), G(+); MT2(-), G(-) MT2(+), G(-)	— —	20 30	50 80	mA
$V_{GT}$	Gate Trigger Voltage ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ ) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-)	0.5 0.5 0.5	0.69 0.77 0.72	1.5 1.5 1.5	Volts

## DYNAMIC CHARACTERISTICS

$(di/dt)_C$	Rate of Change of Commutating Current* See Figure 10. ( $V_D = 400 \text{ V}$ , $I_{TM} = 4.4 \text{ A}$ , Commutating $dv/dt = 18 \text{ V}/\mu\text{s}$ , Gate Open, $T_J = 125^\circ\text{C}$ , $f = 250 \text{ Hz}$ , No Snubber)	$C_L = 10 \mu\text{F}$ $L_L = 40 \text{ mH}$	6.5	—	—	A/ms
$dv/dt$	Critical Rate of Rise of Off-State Voltage ( $V_D = \text{Rated } V_{DRM}$ , Exponential Waveform, Gate Open, $T_J = 125^\circ\text{C}$ )	500	—	—	—	V/ $\mu\text{s}$

\*Indicates Pulse Test: Pulse Width  $\leq 2.0 \text{ ms}$ , Duty Cycle  $\leq 2\%$ .

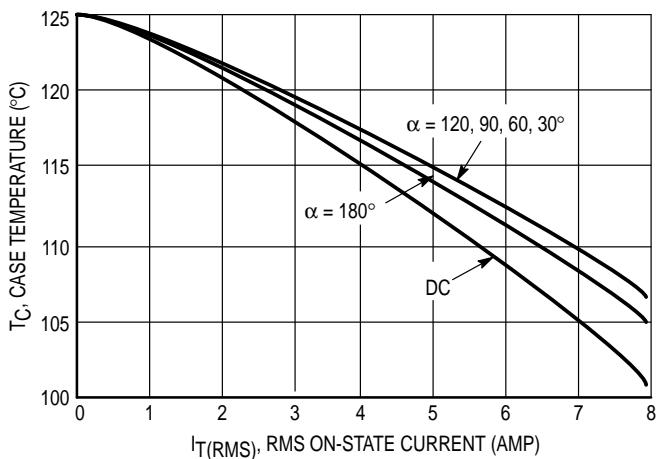


Figure 1. RMS Current Derating

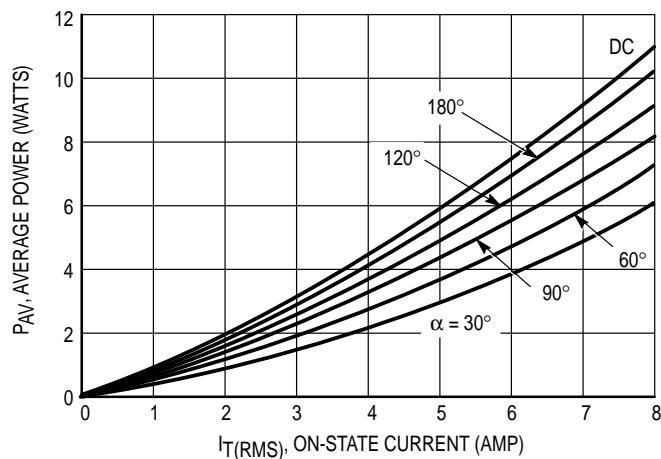


Figure 2. On-State Power Dissipation

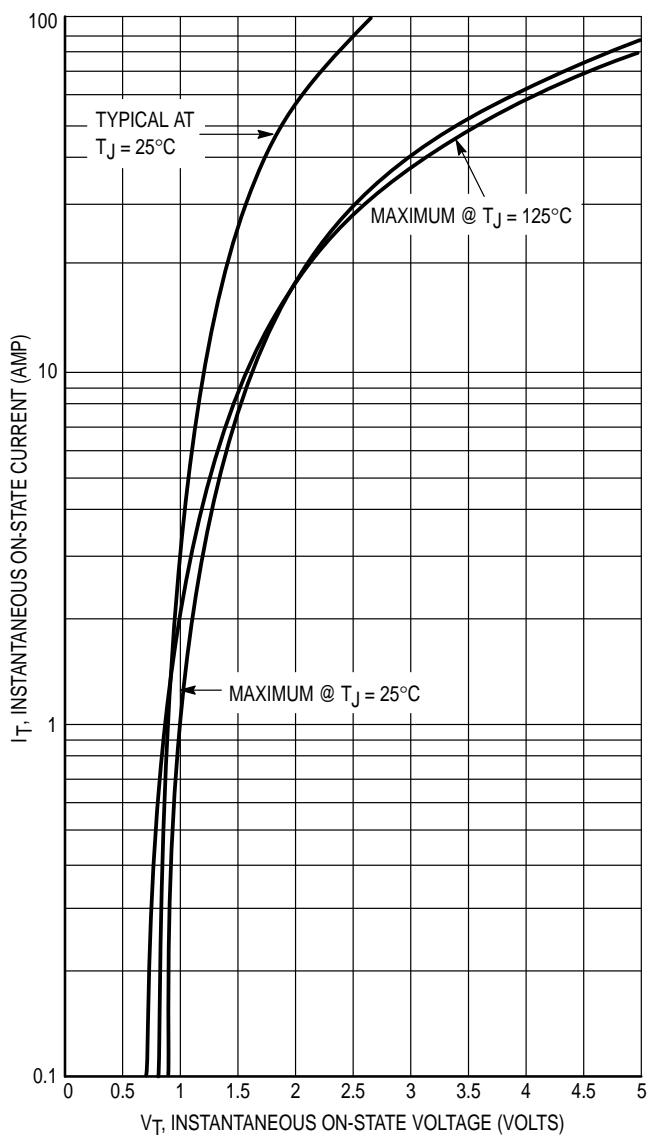


Figure 3. On-State Characteristics

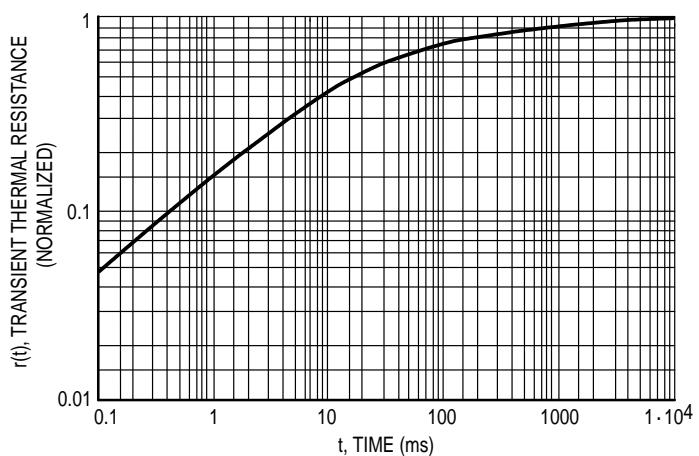


Figure 4. Thermal Response

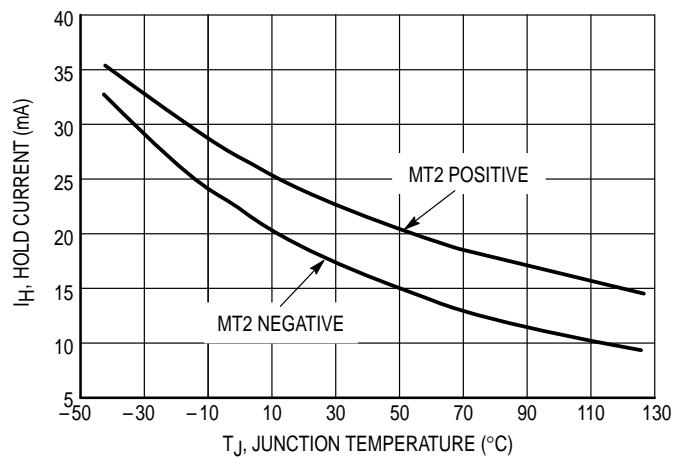


Figure 5. Hold Current Variation

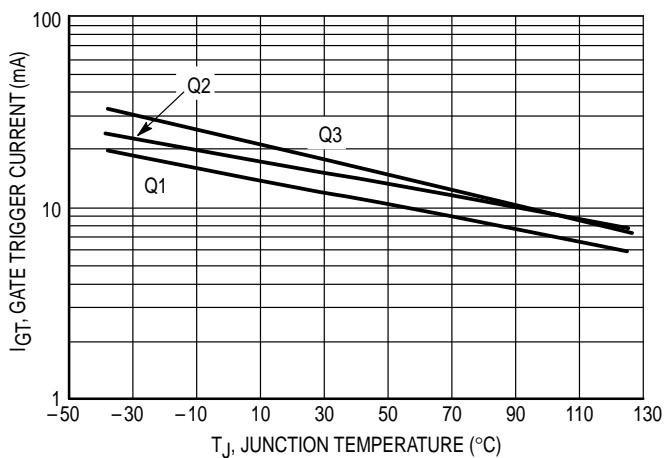


Figure 6. Gate Trigger Current Variation

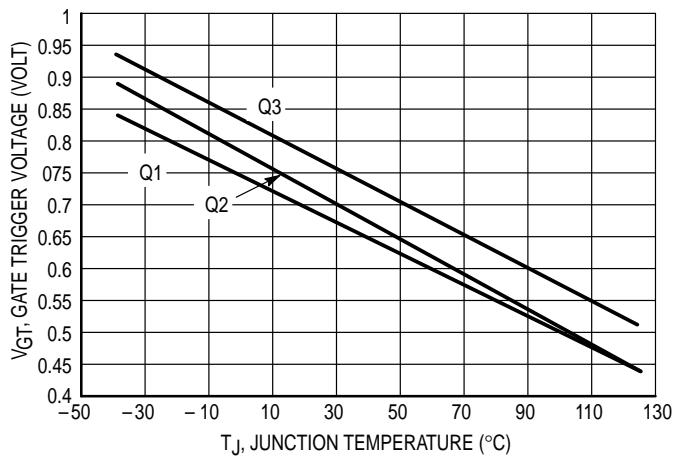
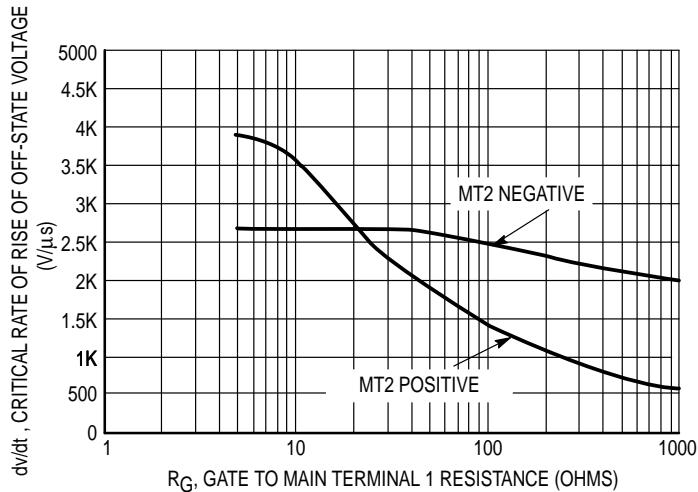
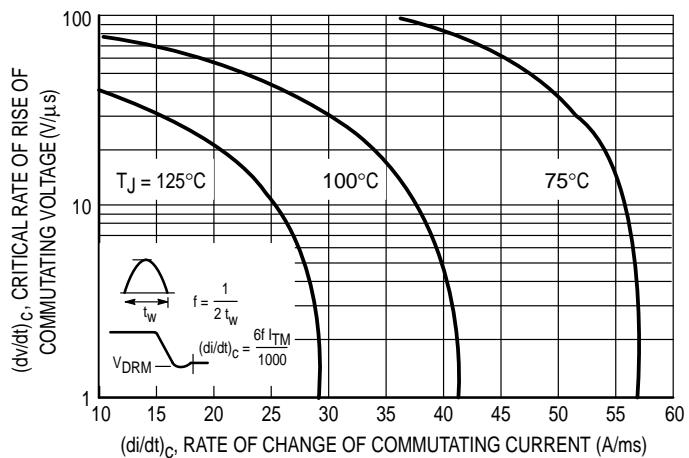


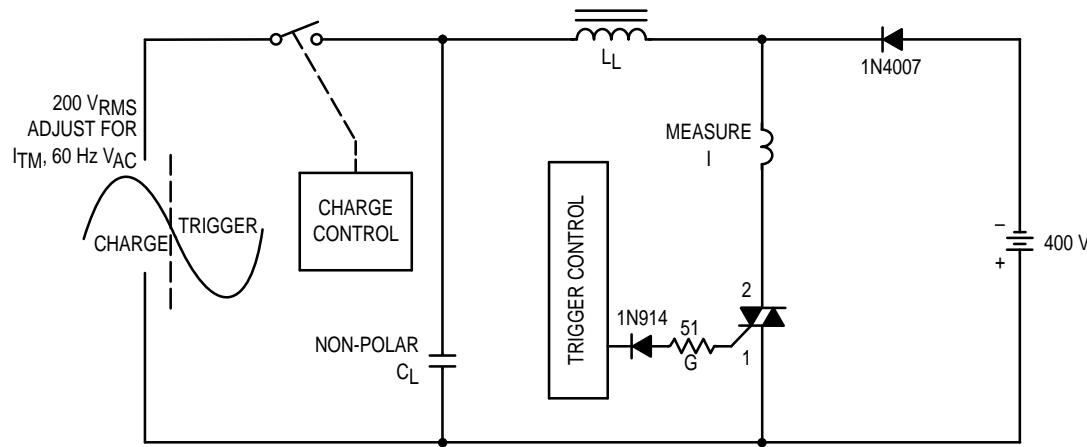
Figure 7. Gate Trigger Voltage Variation



**Figure 8. Critical Rate of Rise of Off-State Voltage (Exponential)**



**Figure 9. Critical Rate of Rise of Commutating Voltage**



**Figure 10. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Voltage**