

# TRIACS

## Silicon Bidirectional Thyristors

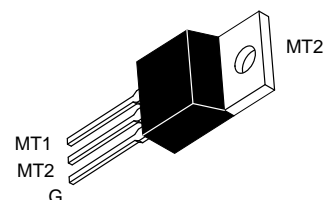
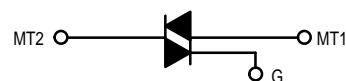
Designed for high performance full-wave ac control applications where high noise immunity and high commutating di/dt are required.

- Blocking Voltage to 800 Volts
- On-State Current Rating of 15 Amperes RMS at 80°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 — 9.0 A/ms minimum at 125°C

## MAC16 SERIES\*

\*Motorola preferred devices

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



**CASE 221A-09**  
**(TO-220AB)**  
**Style 4**

### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Value	Unit
V <sub>DRM</sub>	Peak Repetitive Off-State Voltage (1) (-40 to 125°C, Sine Wave, 50 to 60 Hz, Gate Open)	MAC16D 400 MAC16M 600 MAC16N 800	Volts
I <sub>T(RMS)</sub>	On-State RMS Current (60 Hz, T <sub>C</sub> = 80°C)	15	A
I <sub>TSM</sub>	Peak Non-repetitive Surge Current (One Full Cycle, 60 Hz, T <sub>J</sub> = 125°C)	150	A
I <sup>2</sup> t	Circuit Fusing Consideration (t = 8.3 ms)	93	A <sup>2</sup> sec
P <sub>GM</sub>	Peak Gate Power (Pulse Width ≤ 1.0 μs, T <sub>C</sub> = 80°C)	20	Watts
P <sub>G(AV)</sub>	Average Gate Power (t = 8.3 ms, T <sub>C</sub> = 80°C)	0.5	Watts
T <sub>J</sub>	Operating Junction Temperature Range	-40 to +125	°C
T <sub>stg</sub>	Storage Temperature Range	-40 to +150	°C

### THERMAL CHARACTERISTICS

R <sub>θJC</sub> R <sub>θJA</sub>	Thermal Resistance — Junction to Case — Junction to Ambient	2.0 62.5	°C/W
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	260	°C

(1) V<sub>DRM</sub> 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.



## MAC16 SERIES

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

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

### ON CHARACTERISTICS

$V_{\text{TM}}$	Peak On-State Voltage* ( $I_{\text{TM}} = \pm 21 \text{ A Peak}$ )	—	1.2	1.6	Volts
$I_{\text{GT}}$	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
$I_{\text{H}}$	Hold Current ( $V_D = 12 \text{ V}$ , Gate Open, Initiating Current = $\pm 150 \text{ mA}$ )	—	20	50	mA
$I_{\text{L}}$	Latch Current ( $V_D = 24 \text{ V}$ , $I_{\text{G}} = 50 \text{ mA}$ ) MT2(+), G(+) MT2(+), G(–) MT2(–), G(–)	— — —	33 36 33	50 80 50	mA
$V_{\text{GT}}$	Gate Trigger Voltage ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ ) MT2(+), G(+) MT2(+), G(–) MT2(–), G(–)	0.5 0.5 0.5	0.75 0.72 0.82	1.5 1.5 1.5	Volts

### DYNAMIC CHARACTERISTICS

$(di/dt)_C$	Rate of Change of Commutating Current* See Figure 10. ( $V_D = 400 \text{ V}$ , $I_{\text{TM}} = 6.0 \text{ A}$ , Commutating $dv/dt = 24 \text{ V}/\mu\text{s}$ , Gate Open, $T_J = 125^\circ\text{C}$ , $f = 250 \text{ Hz}$ , No Snubber)	9.0	—	—	A/ms
$dv/dt$	Critical Rate of Rise of Off-State Voltage ( $V_D = \text{Rated } V_{\text{DRM}}$ , 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  $\leq 2\%$ .

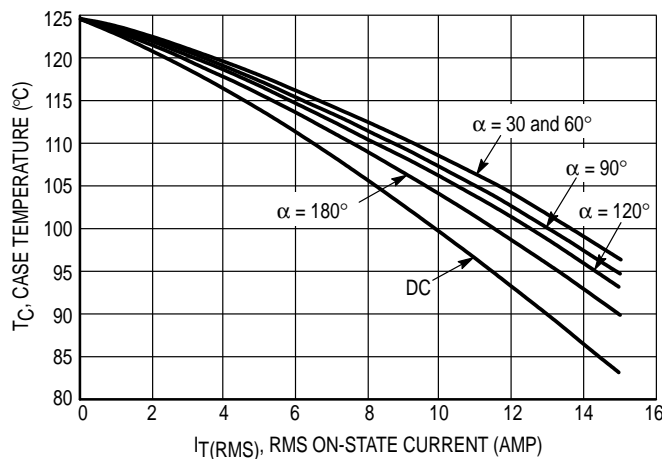


Figure 1. RMS Current Derating

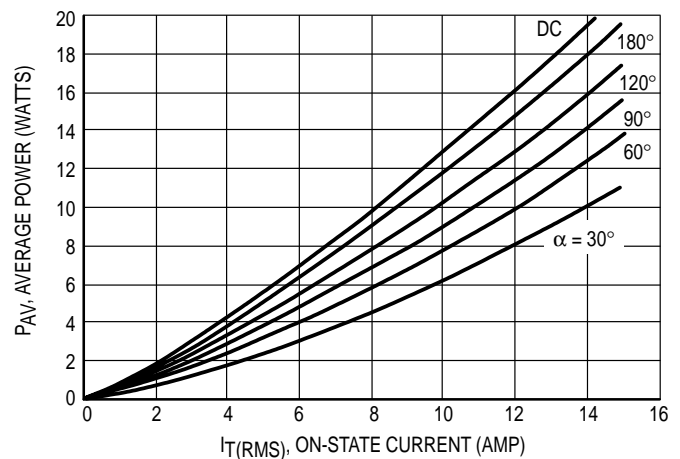


Figure 2. On-State Power Dissipation

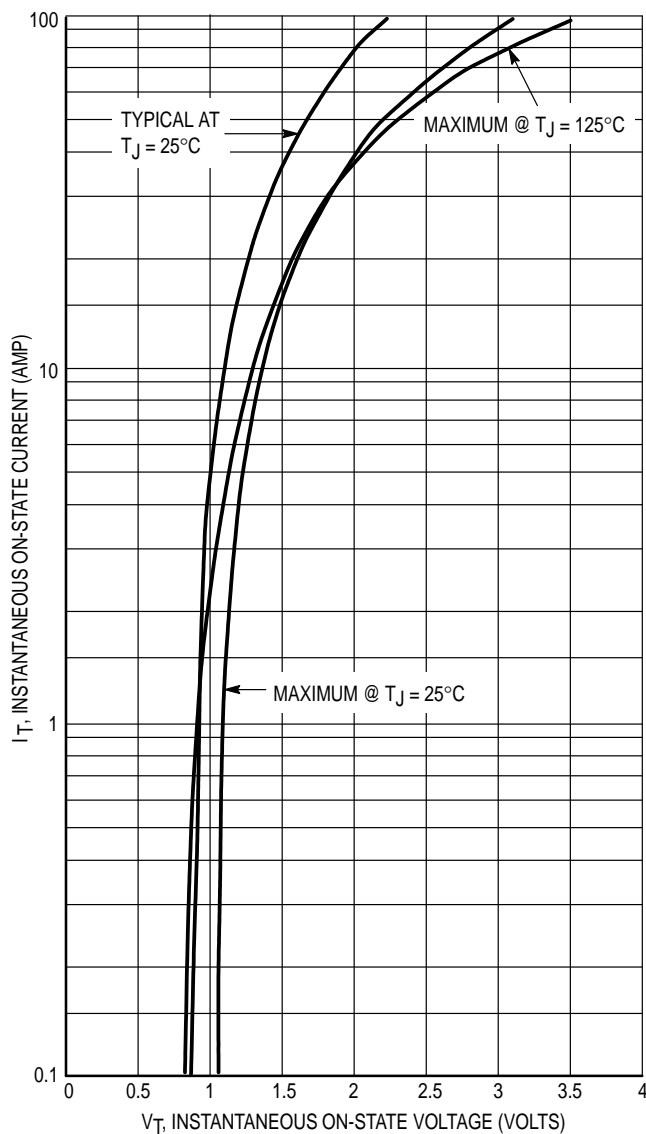


Figure 3. On-State Characteristics

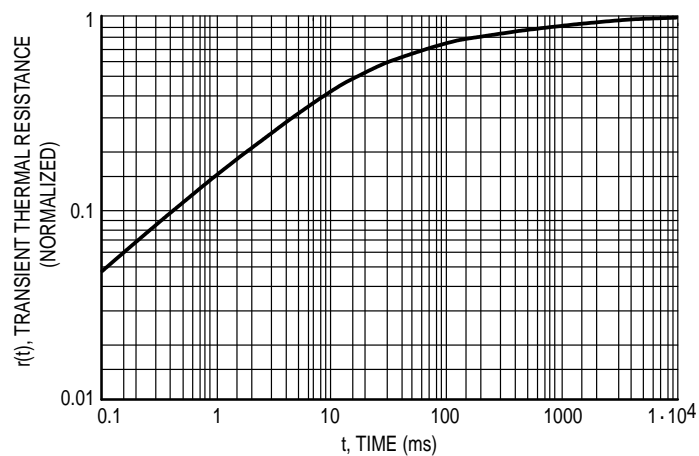


Figure 4. Thermal Response

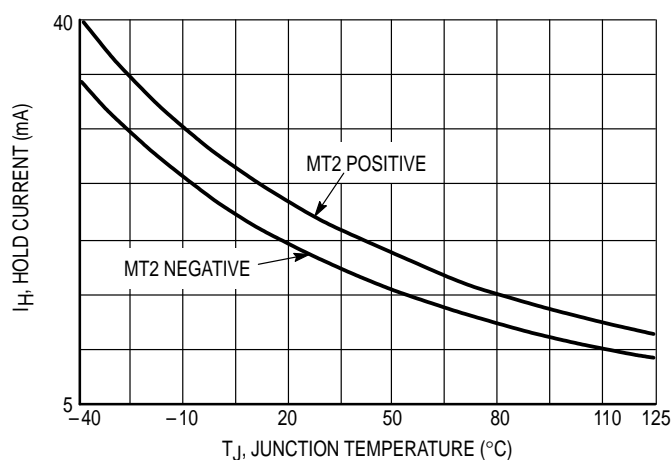


Figure 5. Hold Current Variation

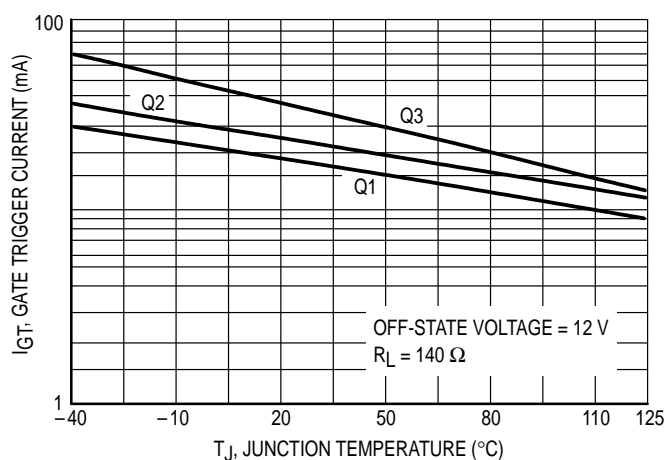


Figure 6. Gate Trigger Current Variation

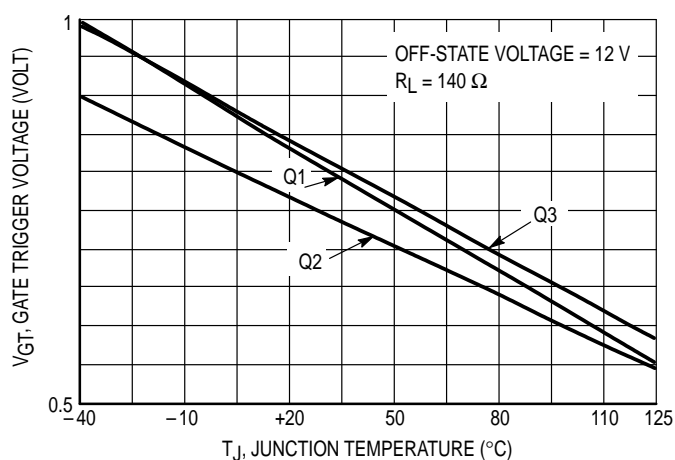
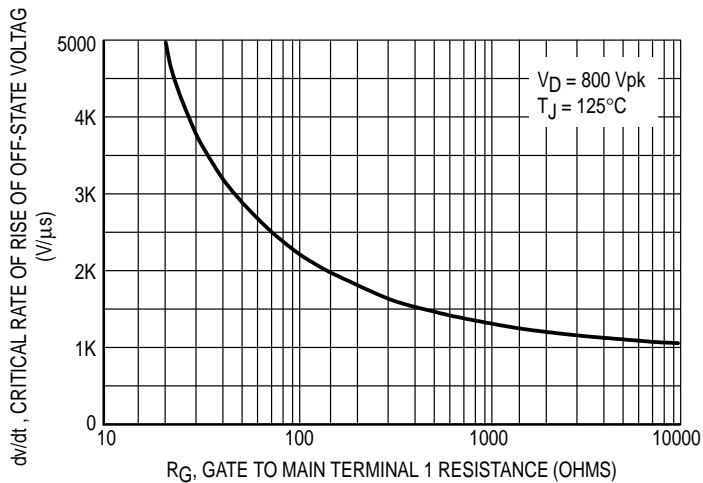
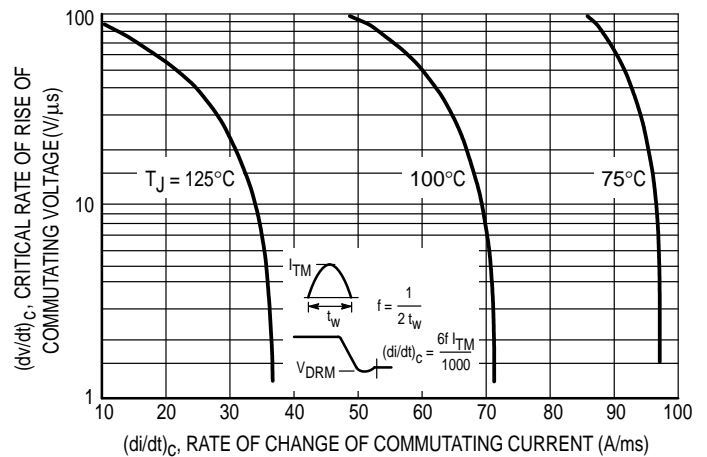


Figure 7. Gate Trigger Voltage Variation

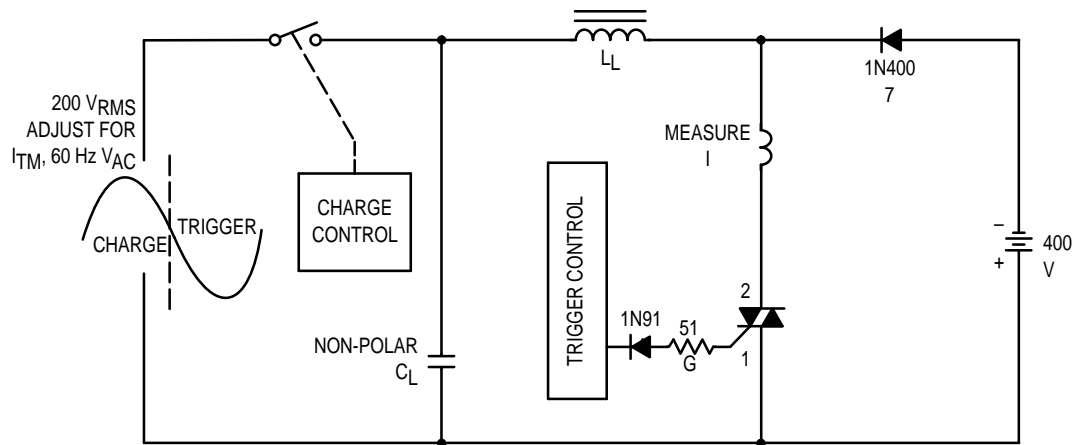
## MAC16 SERIES



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



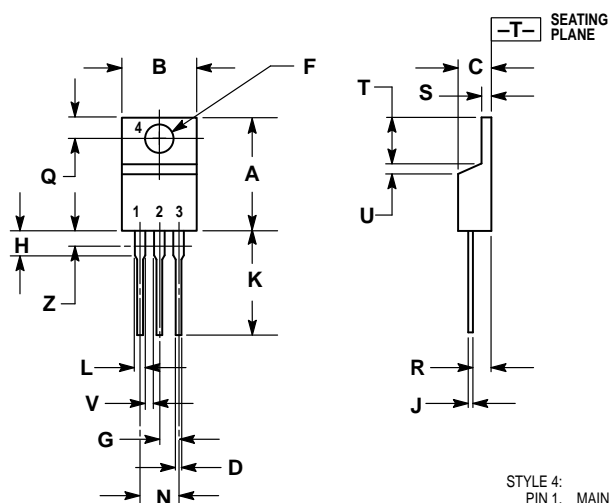
**Figure 9. Critical Rate of Rise of Commutating Voltage**



Note: Component values are for verification of rated  $(dv/dt)_c$ . See AN1048 for additional information.

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

## PACKAGE DIMENSIONS




STYLE 4:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. MAIN TERMINAL 2

- 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.

DIM	INCHES		MILLIMETERS	
	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	0.018	0.025	0.46	0.64
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

CASE 221A-09  
(TO-220AB)  
ISSUE Z

# NOTES

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## MAC16 SERIES

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4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan. 81-3-5487-8488

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**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre,  
2, Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.  
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**MOTOROLA**



**MAC16D/D**