

# MAC15 Series

Preferred Device

## Triacs

### Silicon Bidirectional Thyristors

Designed primarily for full-wave ac control applications, such as solid-state relays, 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.

- Blocking Voltage to 800 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 Three Modes (MAC15 Series) or Four Modes (MAC15A Series)
- Device Marking: Logo, Device Type, e.g., MAC15A6, Date Code

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

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage <sup>(1)</sup> ( $T_J = -40$ to $+125^\circ\text{C}$ , Sine Wave 50 to 60 Hz, Gate Open) MAC15A6 MAC15-8, MAC15A8 MAC15-10, MAC15A10	$V_{DRM}$ , $V_{RRM}$	400 600 800	Volts
Peak Gate Voltage (Pulse Width $\leq 1.0 \mu\text{sec}$ ; $T_C = 90^\circ\text{C}$ )	$V_{GM}$	10	Volts
On-State Current RMS Full Cycle Sine Wave 50 to 60 Hz ( $T_C = +90^\circ\text{C}$ )	$I_T(\text{RMS})$	15	A
Circuit Fusing Consideration ( $t = 8.3 \text{ ms}$ )	$I^2t$	93	$\text{A}^2\text{s}$
Peak Non-repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, $T_C = +80^\circ\text{C}$ ) Preceded and followed by rated current	$I_{TSM}$	150	A
Peak Gate Power ( $T_C = +80^\circ\text{C}$ , Pulse Width = $1.0 \mu\text{s}$ )	$P_{GM}$	20	Watts
Average Gate Power ( $T_C = +80^\circ\text{C}$ , $t = 8.3 \text{ ms}$ )	$P_{G(AV)}$	0.5	Watts
Peak Gate Current (Pulse Width $\leq 1.0 \mu\text{sec}$ ; $T_C = 90^\circ\text{C}$ )	$I_{GM}$	2.0	A
Operating Junction Temperature Range	$T_J$	-40 to +125	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-40 to +150	$^\circ\text{C}$

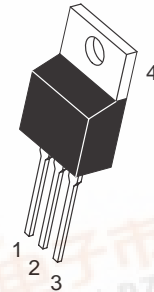
(1)  $V_{DRM}$  and  $V_{RRM}$  for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.



ON Semiconductor

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



TO-220AB  
CASE 221A  
STYLE 4

#### PIN ASSIGNMENT

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

#### ORDERING INFORMATION

Device	Package	Shipping
MAC15-8	TO220AB	500/Box
MAC15-10	TO220AB	500/Box
MAC15A6	TO220AB	500/Box
MAC15A8	TO220AB	500/Box
MAC15A10	TO220AB	500/Box

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



## MAC15 Series

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance — Junction to Case — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.0 62.5	$^{\circ}C/W$
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	$^{\circ}C$

### ELECTRICAL CHARACTERISTICS ( $T_C = 25^{\circ}C$ unless otherwise noted; Electricals apply in both directions)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Peak Blocking Current ( $V_D = \text{Rated } V_{DRM}, V_{RRM}$ ; Gate Open)	$I_{DRM}$ , $I_{RRM}$	— —	— —	10 2.0	$\mu A$ mA
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### ON CHARACTERISTICS

Peak On-State Voltage <sup>(1)</sup> ( $I_{TM} = \pm 21$ A Peak)	$V_{TM}$	—	1.3	1.6	Volts
Gate Trigger Current (Continuous dc) ( $V_D = 12$ Vdc, $R_L = 100$ Ohms) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) "A" SUFFIX ONLY	$I_{GT}$	— — — —	— — — —	50 50 50 75	mA
Gate Trigger Voltage (Continuous dc) ( $V_D = 12$ Vdc, $R_L = 100$ Ohms) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) "A" SUFFIX ONLY	$V_{GT}$	— — — —	0.9 0.9 1.1 1.4	2 2 2 2.5	Volts
Gate Non-Trigger Voltage ( $V_D = 12$ V, $R_L = 100$ Ohms, $T_J = 110^{\circ}C$ ) MT2(+), G(+); MT2(-), G(-); MT2(+), G(-) MT2(-), G(+) "A" SUFFIX ONLY	$V_{GD}$	0.2 0.2	— —	— —	Volts
Holding Current ( $V_D = 12$ Vdc, Gate Open, Initiating Current = $\pm 200$ mA)	$I_H$	—	6.0	40	mA
Turn-On Time ( $V_D = \text{Rated } V_{DRM}$ , $I_{TM} = 17$ A) ( $I_{GT} = 120$ mA, Rise Time = $0.1 \mu s$ , Pulse Width = $2 \mu s$ )	$t_{gt}$	—	1.5	—	$\mu s$

### DYNAMIC CHARACTERISTICS

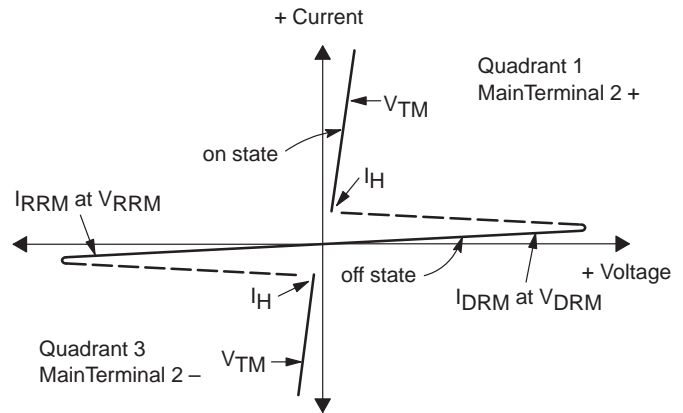
Critical Rate of Rise of Commutation Voltage ( $V_D = \text{Rated } V_{DRM}$ , $I_{TM} = 21$ A, Commutating $di/dt = 7.6$ A/ms, Gate Unenergized, $T_C = 80^{\circ}C$ )	$dv/dt(c)$	—	5.0	—	V/ $\mu s$
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(1) Pulse Test: Pulse Width  $\leq 2.0$  ms, Duty Cycle  $\leq 2\%$ .

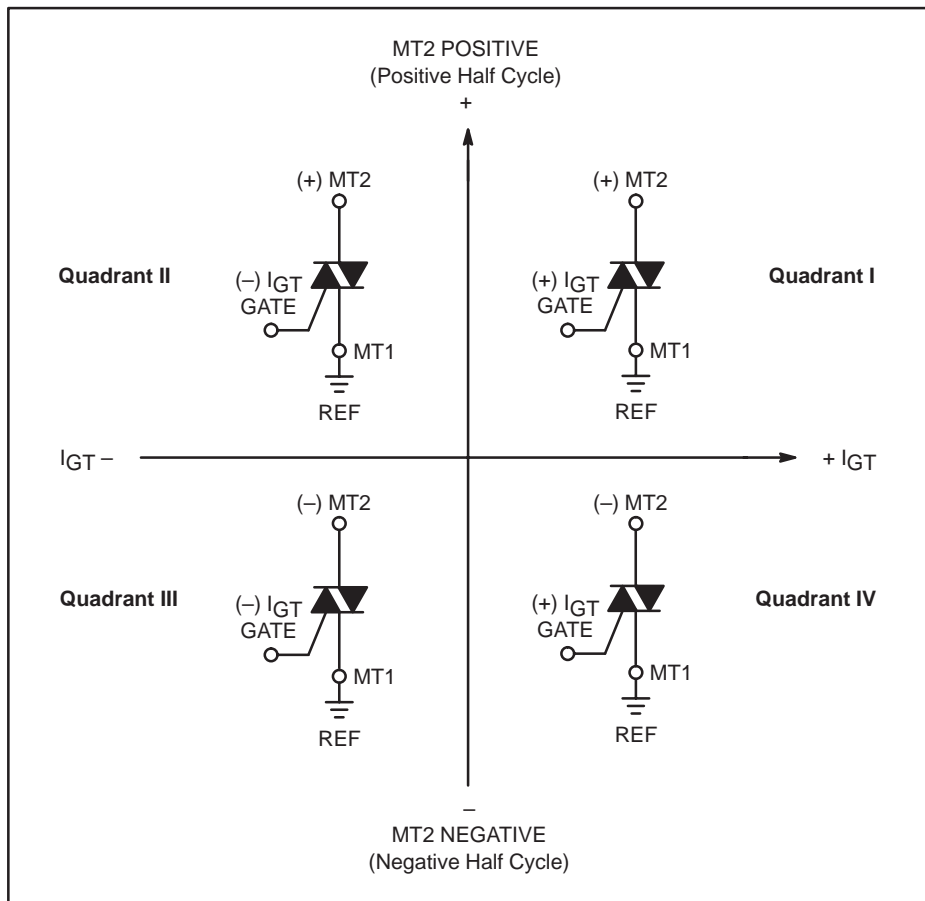
## MAC15 Series

### 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.

## MAC15 Series

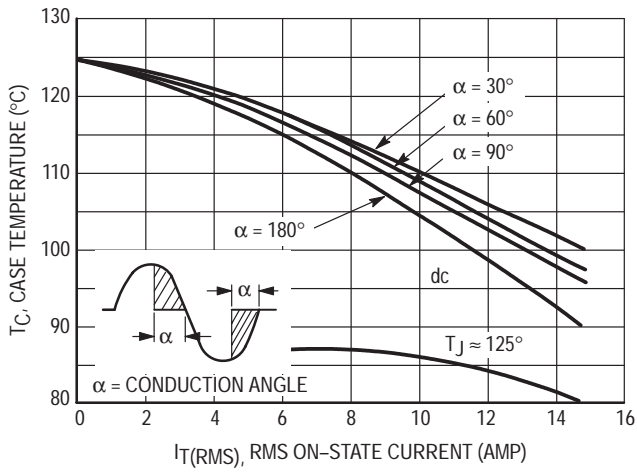


Figure 1. RMS Current Derating

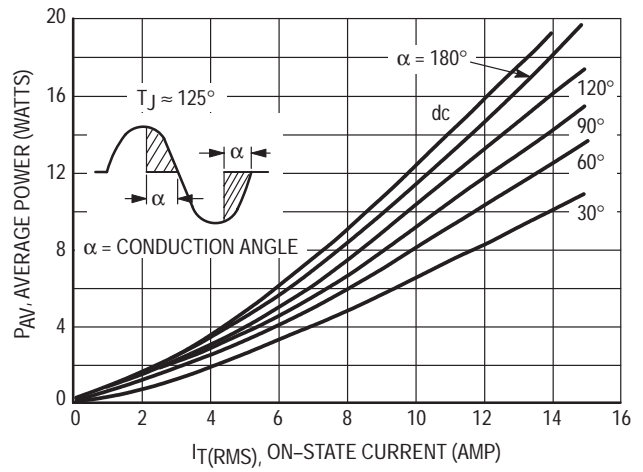


Figure 2. On-State Power Dissipation

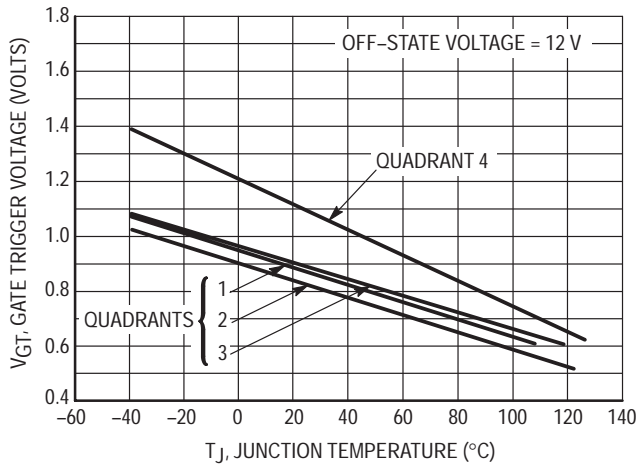


Figure 3. Typical Gate Trigger Voltage

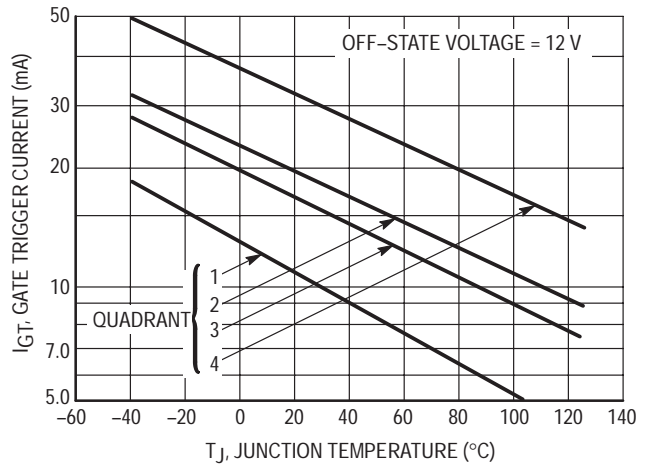


Figure 4. Typical Gate Trigger Current

# MAC15 Series

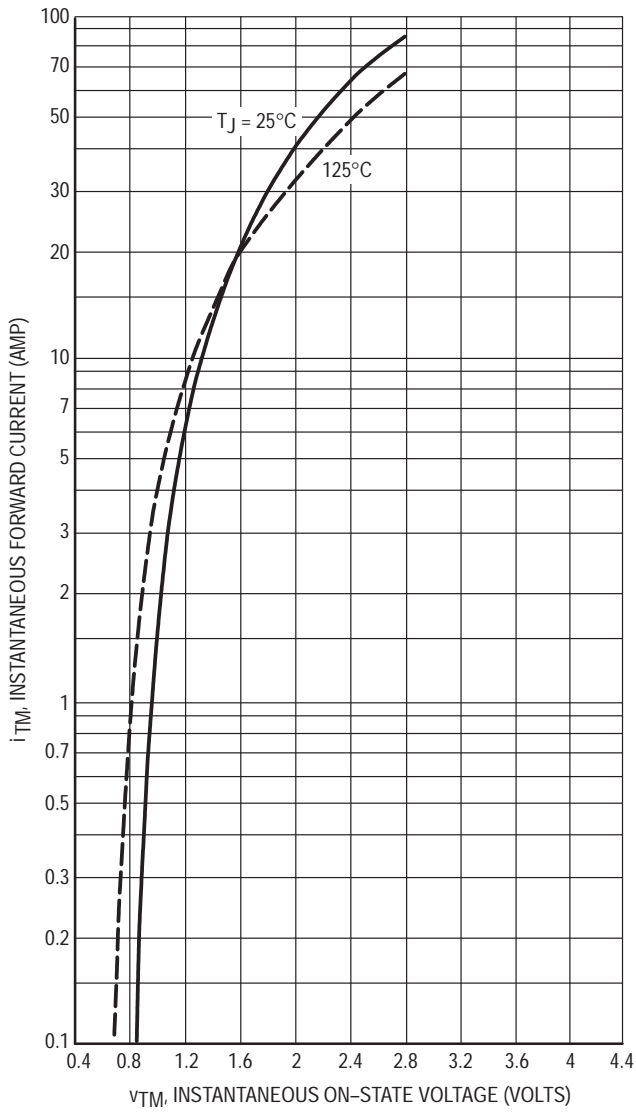


Figure 5. On-State Characteristics

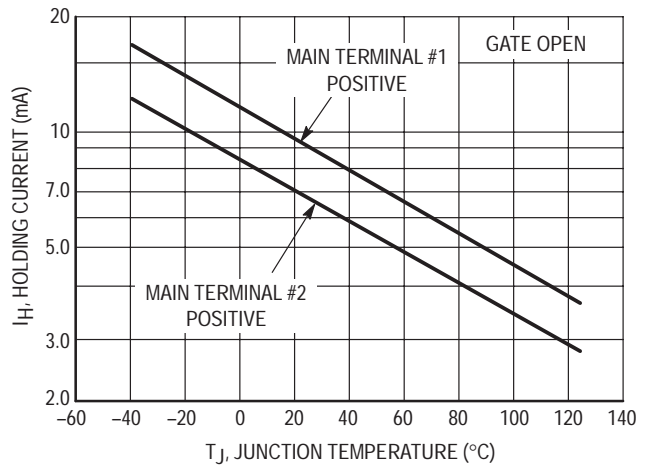


Figure 6. Typical Holding Current

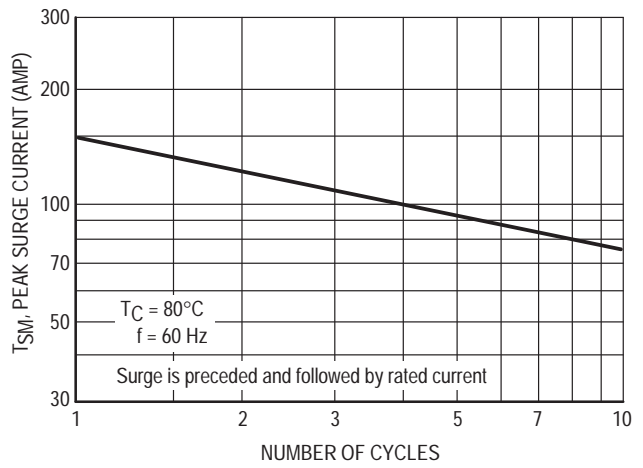


Figure 7. Maximum Non-Repetitive Surge Current

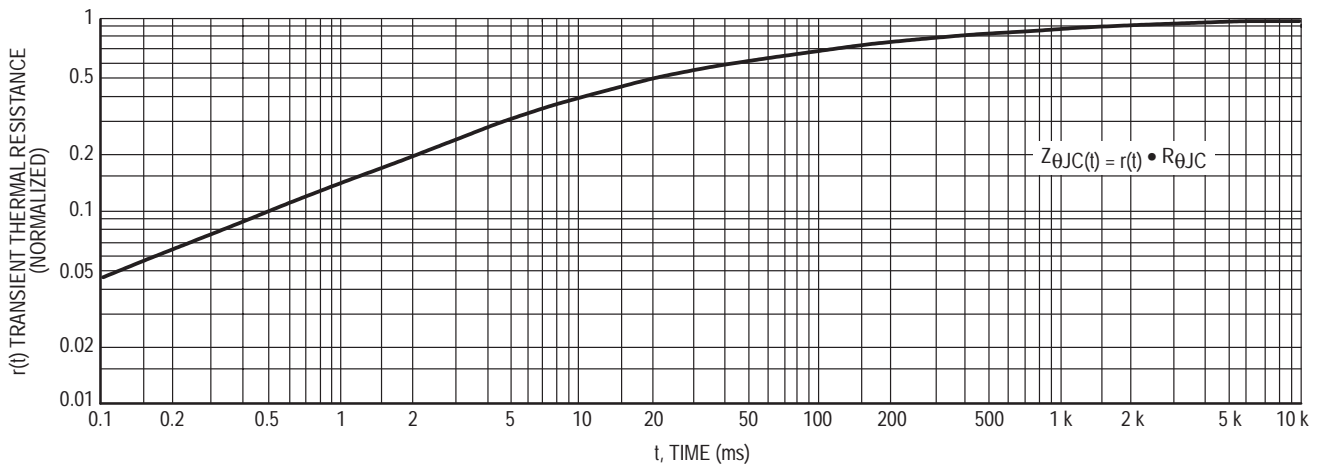
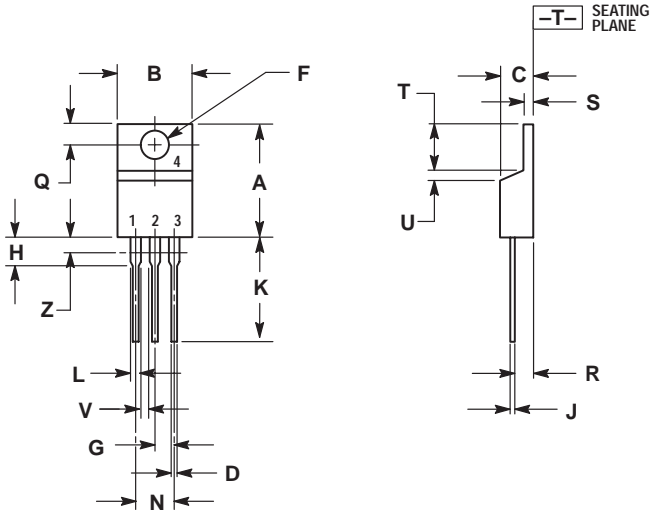


Figure 8. Thermal Response

# MAC15 Series

## 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.

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	0.014	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

## MAC15 Series

### Notes

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