

# Triacs

## Silicon Bidirectional Thyristors

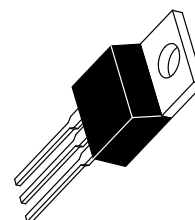
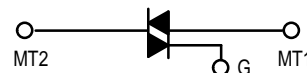
... designed primarily for full-wave ac control applications such as lighting systems, heater controls, motor controls and power supplies; or wherever full-wave silicon-gate-controlled devices are needed.

- Off-State Voltages to 800 Volts
- All Diffused and Glass Passivated Junctions for Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Thermal Resistance and High Heat Dissipation
- Gate Triggering Guaranteed in Four Modes

## MAC223A Series

Motorola preferred devices

**TRIACs**  
**25 AMPERES RMS**  
**400 thru 800 VOLTS**



**CASE 221A-07**  
**(TO-220AB)**  
**STYLE 4**

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

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage ( $T_J = -40$ to $125^\circ\text{C}$ ) <sup>(1)</sup> (1/2 Sine Wave 50 to 60 Hz, Gate Open)	$V_{\text{DRM}}$	400 600 800	Volts
On-State RMS Current ( $T_C = 80^\circ\text{C}$ ) (Full Cycle Sine Wave 50 to 60 Hz)	$I_{\text{T(RMS)}}$	25	Amps
Peak Non-repetitive Surge Current (One Full Cycle, 60 Hz, $T_C = 80^\circ\text{C}$ , preceded and followed by rated current)	$I_{\text{TSM}}$	250	Amps
Circuit Fusing ( $t = 8.3$ ms)	$I^2t$	260	$\text{A}^2\text{s}$
Peak Gate Current ( $t \leq 2$ $\mu\text{s}$ )	$I_{\text{GM}}$	2	Amps
Peak Gate Voltage ( $t \leq 2$ $\mu\text{s}$ )	$V_{\text{GM}}$	$\pm 10$	Volts
Peak Gate Power ( $t \leq 2$ $\mu\text{s}$ )	$P_{\text{GM}}$	20	Watts
Average Gate Power ( $T_C = 80^\circ\text{C}$ , $t \leq 8.3$ ms)	$P_{\text{G(AV)}}$	0.5	Watts
Operating Junction Temperature Range	$T_J$	$-40$ to $125$	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{stg}}$	$-40$ to $150$	$^\circ\text{C}$
Mounting Torque	—	8	in. lb.

1.  $V_{\text{DRM}}$  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.

## MAC223A Series

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.2	$^{\circ}\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	60	$^{\circ}\text{C/W}$

### ELECTRICAL CHARACTERISTICS ( $T_C = 25^{\circ}\text{C}$ and either polarity of MT2 to MT1 voltage unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Peak Blocking Current <sup>(1)</sup> ( $V_D = \text{Rated } V_{DRM}$ ) $T_J = 25^{\circ}\text{C}$ $T_J = 125^{\circ}\text{C}$	$I_{DRM}$	— —	— —	10 2	$\mu\text{A}$ $\text{mA}$
Peak On-State Voltage ( $I_{TM} = 35 \text{ A Peak}$ , Pulse Width $\leq 2 \text{ ms}$ , Duty Cycle $\leq 2\%$ )	$V_{TM}$	—	1.4	1.85	Volts
Gate Trigger Current (Continuous dc) ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ ) MT2(+), G(+); MT2(-), G(-); MT(+), G(-) MT2(-), G(+) "A" SUFFIX ONLY	$I_{GT}$	— —	20 30	50 75	$\text{mA}$
Gate Trigger Voltage (Continuous dc) ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ ) MT2(+), G(+); MT2(-), G(-); MT(+), G(-) MT2(-), G(+) "A" SUFFIX ONLY ( $V_D = \text{Rated } V_{DRM}$ , $T_J = 125^{\circ}\text{C}$ , $R_L = 10 \text{ k}$ ) MT(+), G(+); MT2(-), G(-); MT2(+), G(-) MT2(-), G(+) "A" SUFFIX ONLY	$V_{GT}$	— — 0.2 0.2	1.1 1.3 0.4 0.4	2 2.5 — —	Volts
Holding Current ( $V_D = 12 \text{ V}$ , $I_{TM} = 200 \text{ mA}$ , Gate Open)	$I_H$	—	10	50	$\text{mA}$
Gate Controlled Turn-On Time ( $V_D = \text{Rated } V_{DRM}$ , $I_{TM} = 35 \text{ A Peak}$ , $I_G = 200 \text{ mA}$ )	$t_{gt}$	—	1.5	—	$\mu\text{s}$
Critical Rate of Rise of Off-State Voltage ( $V_D = \text{Rated } V_{DRM}$ , Exponential Waveform, $T_C = 125^{\circ}\text{C}$ )	$dv/dt$	—	40	—	$\text{V}/\mu\text{s}$
Critical Rate of Rise of Commutation Voltage ( $V_D = \text{Rated } V_{DRM}$ , $I_{TM} = 35 \text{ A Peak}$ , Commutating $di/dt = 12.6 \text{ A/ms}$ , Gate Unenergized, $T_C = 80^{\circ}\text{C}$ )	$dv/dt(c)$	—	5	—	$\text{V}/\mu\text{s}$

1. Ratings apply for open gate conditions. Devices shall not be tested with a constant current source for blocking voltage such that the voltage applied exceeds the rated blocking voltage.

FIGURE 1 – RMS CURRENT DERATING

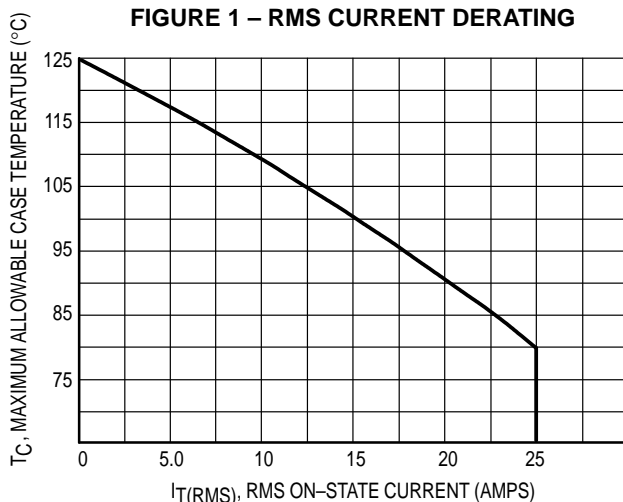


FIGURE 2 – ON-STATE POWER DISSIPATION

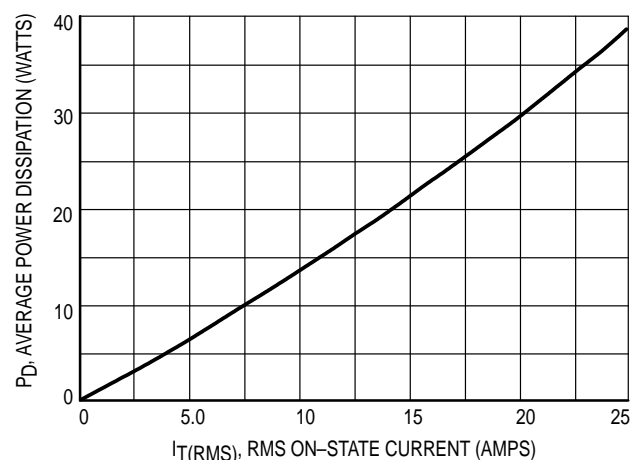


FIGURE 3 – GATE TRIGGER CURRENT

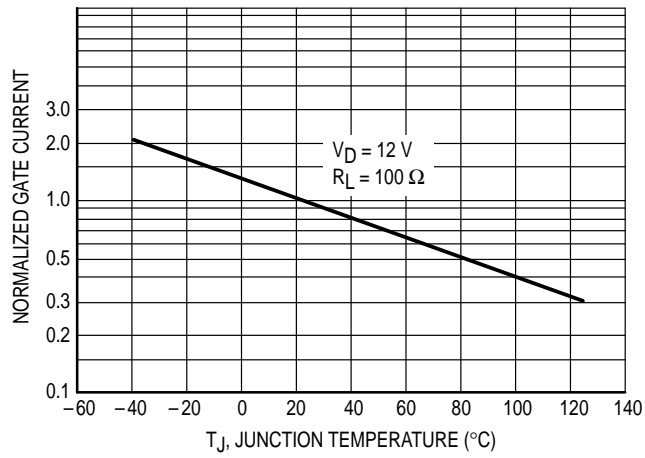


FIGURE 4 – GATE TRIGGER VOLTAGE

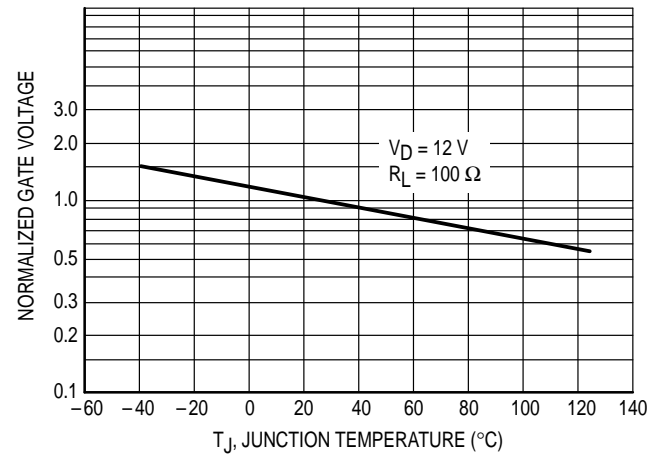


FIGURE 5 – HOLD CURRENT

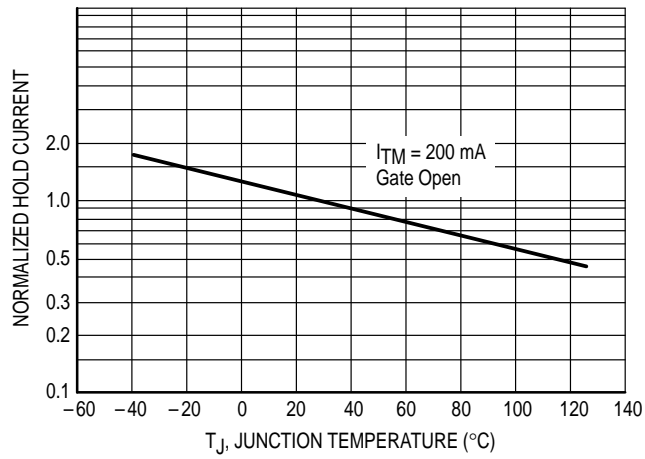
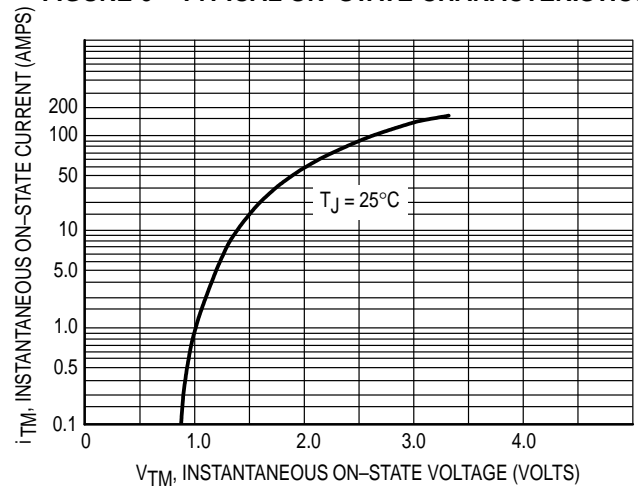
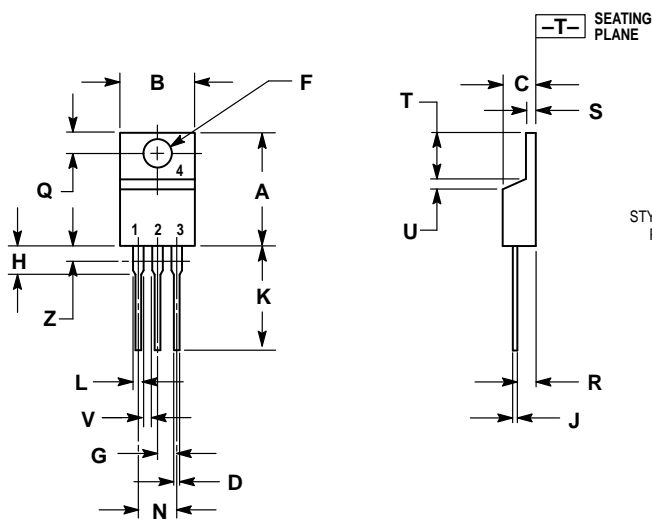


FIGURE 6 – TYPICAL ON-STATE CHARACTERISTICS



## PACKAGE DIMENSIONS




## 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

CASE 221A-07  
(TO-220AB)  
ISSUE Z

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MAC223A/D