

# DIGITRON SEMICONDUCTORS

## MAC224(A) SERIES

## SILICON BIDIRECTIONAL TRIODE THYRISTORS

40 AMPERES RMS

Available Non-RoHS (standard) or RoHS compliant (add PBF suffix).

Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.

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

RATING	SYMBOL	VALUE	UNIT
<b>Peak Repetitive Off-State Voltage</b> <sup>(1)</sup> ( $T_J = -40$ to $125^\circ\text{C}$ , $\frac{1}{2}$ Sine Wave 50 to 60 Hz, Gate Open) MAC224-4, MAC224A4 MAC224-5, MAC224A5 MAC224-6, MAC224A6 MAC224-7, MAC224A7 MAC224-8, MAC224A8 MAC224-9, MAC224A9 MAC224-10, MAC224A10	$V_{\text{DRM}}$	200 300 400 500 600 700 800	Volts
<b>On-State RMS Current</b> ( $T_C = 75^\circ\text{C}$ ) <sup>(2)</sup> (Full Cycle Sine Wave 50 to 60Hz)	$I_{\text{T(RMS)}}$	40	Amps
<b>Peak Non-repetitive surge Current</b> (One Full Cycle, 60Hz, $T_J = 125^\circ\text{C}$ )	$I_{\text{TSM}}$	350	Amps
<b>Circuit Fusing</b> ( $t = 8.3\text{ms}$ )	$I^2t$	500	$\text{A}^2\text{s}$
<b>Peak Gate Current</b> ( $t \leq 2 \mu\text{s}$ )	$I_{\text{GM}}$	$\pm 2$	Amps
<b>Peak Gate Voltage</b> ( $t \leq 2 \mu\text{s}$ )	$V_{\text{GM}}$	$\pm 10$	Volts
<b>Peak Gate Power</b> ( $t \leq 2 \mu\text{s}$ )	$P_{\text{GM}}$	20	Watts
<b>Average Gate Power</b> ( $T_C = 75^\circ\text{C}$ , $t \leq 8.3\text{ms}$ )	$P_{\text{G(AV)}}$	0.5	Watts
<b>Operating Junction Temperature Range</b>	$T_J$	-40 to 125	$^\circ\text{C}$
<b>Storage Temperature Range</b>	$T_{\text{stg}}$	-40 to 150	$^\circ\text{C}$
<b>Mounting Torque</b>	—	8	in. lb.

- $V_{\text{DRM}}$  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.
- This device is rated for use in applications subject to high surge conditions. Care must be taken to ensure proper heat sinking when the device is to be used at high sustained currents. (See figure 1 for maximum case temperatures.)

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
<b>Thermal Resistance, Junction to Case</b>	$R_{\theta\text{JC}}$	1	$^\circ\text{C}/\text{W}$
<b>Thermal Resistance, Junction to Ambient</b>	$R_{\theta\text{JA}}$	60	$^\circ\text{C}/\text{W}$

### 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
<b>Peak Blocking Current</b> (Rated $V_{\text{DRM}}$ , Gate Open) $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$	$I_{\text{DRM}}$	-	-	10 2	$\mu\text{A}$ mA
<b>Peak On-State Voltage</b> ( $I_{\text{TM}} = 56$ A Peak, Pulse Width $\leq 2\text{ms}$ , Duty Cycle $\leq 2\%$ )	$V_{\text{TM}}$	-	1.4	1.85	Volts
<b>Gate Trigger Current</b> (Continuous dc) ( $V_D = 12\text{V}$ , $R_L = 100 \Omega$ ) MT2 (+), G(+); MT2(-), G(-); MT2(+), G(-) MT2(-), G(+)"A" SUFFIX ONLY	$I_{\text{GT}}$	-	25 40	50 75	mA
<b>Gate Trigger Voltage</b> (Continuous dc) ( $V_D = 12\text{V}$ , $R_L = 100 \Omega$ ) MT2 (+), G(+); MT2(-), G(-); MT2(+), G(-) MT2(-), G(+)"A" SUFFIX ONLY	$V_{\text{GT}}$	-	1.1 1.3	2 2.5	Volts

# DIGITRON SEMICONDUCTORS

MAC224(A) SERIES

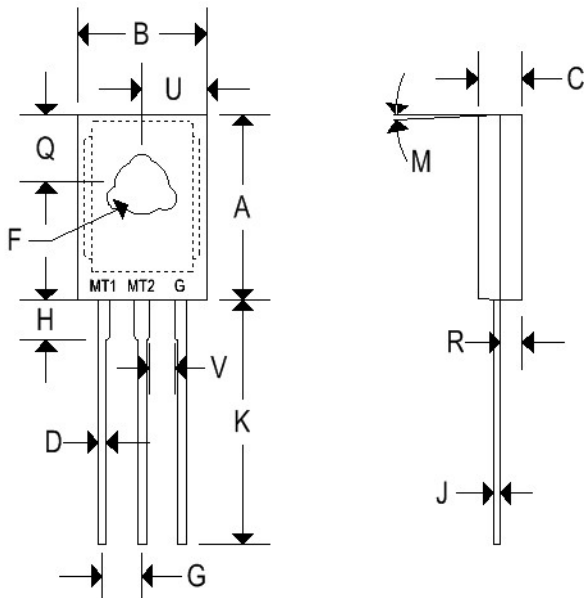
SILICON BIDIRECTIONAL TRIODE THYRISTORS  
40 AMPERES RMS

**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
<b>Gate Non-Trigger Voltage</b> ( $V_D = \text{Rated } V_{\text{DRM}}, T_J = 125^\circ\text{C}, R_L = 10\text{k}$ ) MT2 (+), G(+); MT2(-), G(-); MT2(+), G(-) MT2(-), G(+)	$V_{\text{GD}}$	0.2 0.2	- -	- -	Volts
<b>Holding Current</b> ( $V_D = 12 \text{ Vdc}$ , Gate Open)	$I_H$	-	30	75	mA
<b>Gate Controlled Turn-On Time</b> ( $V_D = \text{Rated } V_{\text{DRM}}, I_{\text{TM}} = 56 \text{ A Peak}, I_G = 200 \text{ mA}$ )	$t_{\text{gt}}$	-	1.5	-	$\mu\text{s}$
<b>Critical Rate of Rise of Off-State Voltage</b> ( $V_D = \text{Rated } V_{\text{DRM}}$ , Exponential Waveform, $T_C = 125^\circ\text{C}$ )	dv/dt	-	50	-	V/ $\mu\text{s}$
<b>Critical Rate of Rise of Commutation Voltage</b> ( $V_D = \text{Rated } V_{\text{DRM}}, I_{\text{TM}} = 56 \text{ A Peak}$ , Commutating $di/dt = 20.2 \text{ A/ms}$ , Gate Unenergized, $T_C = 75^\circ\text{C}$ )	dv/dt(c)	-	5	-	V/ $\mu\text{s}$

## MECHANICAL CHARACTERISTIC

Case	TO-220AB
Marking	Body painted, alpha-numeric
Pin out	See below



	TO-220AB			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.575	0.620	14.600	15.750
B	0.380	0.405	9.650	10.290
C	0.160	0.190	4.060	4.820
D	0.025	0.035	0.640	0.890
F	0.142	0.147	3.610	3.730
G	0.095	0.105	2.410	2.670
H	0.110	0.155	2.790	3.930
J	0.014	0.022	0.360	0.560
K	0.500	0.562	12.700	14.270
L	0.045	0.055	1.140	1.390
N	0.190	0.210	4.830	5.330
Q	0.100	0.120	2.540	3.040
R	0.080	0.110	2.040	2.790
S	0.045	0.055	1.140	1.390
T	0.235	0.255	5.970	6.480
U	-	0.050	-	1.270
V	0.045	-	1.140	-
Z	-	0.080	-	2.030

# DIGITRON SEMICONDUCTORS

MAC224(A) SERIES

SILICON BIDIRECTIONAL TRIODE THYRISTORS  
40 AMPERES RMS

FIGURE 1 – RMS CURRENT DERATING

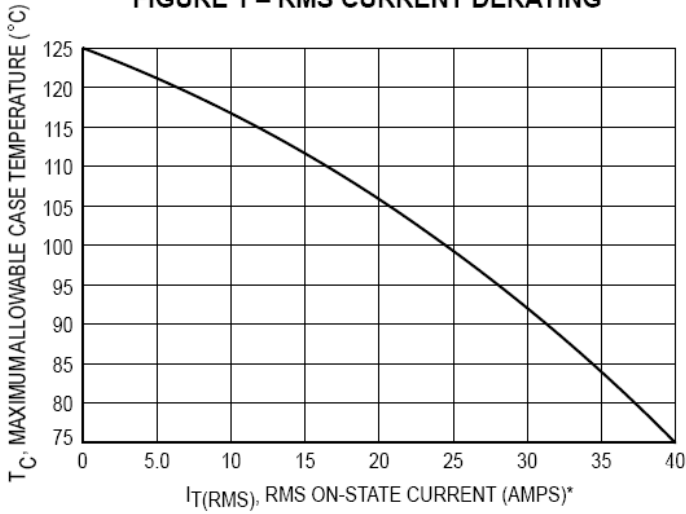


FIGURE 2 – ON-STATE POWER DISSIPATION

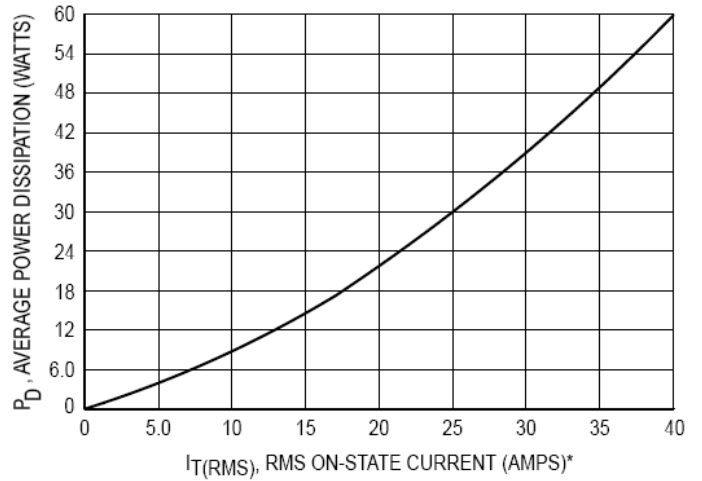


FIGURE 3 – GATE TRIGGER CURRENT

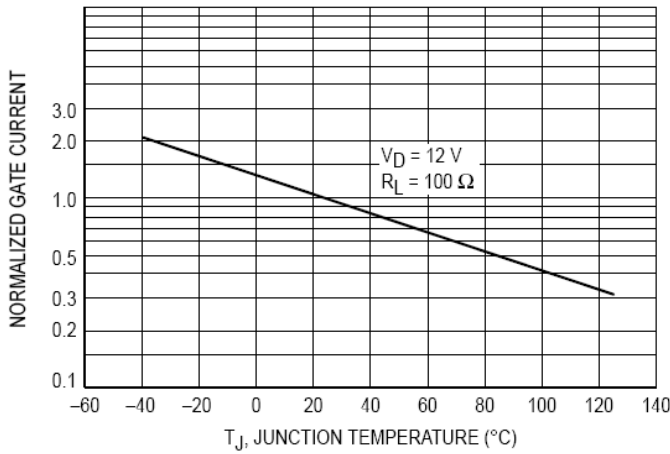


FIGURE 4 – GATE TRIGGER VOLTAGE

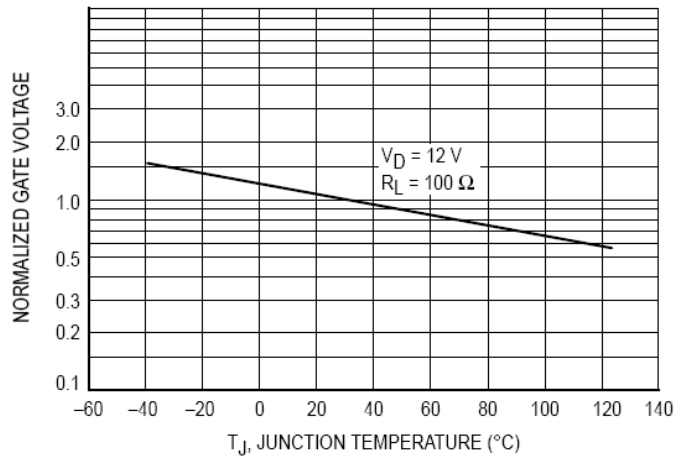


FIGURE 5 – HOLDING CURRENT

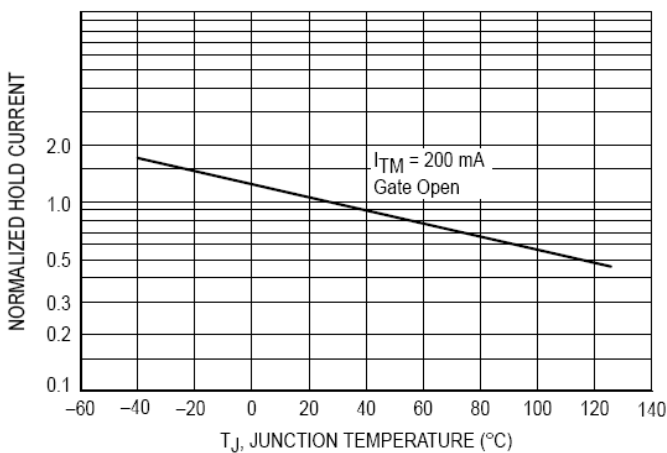
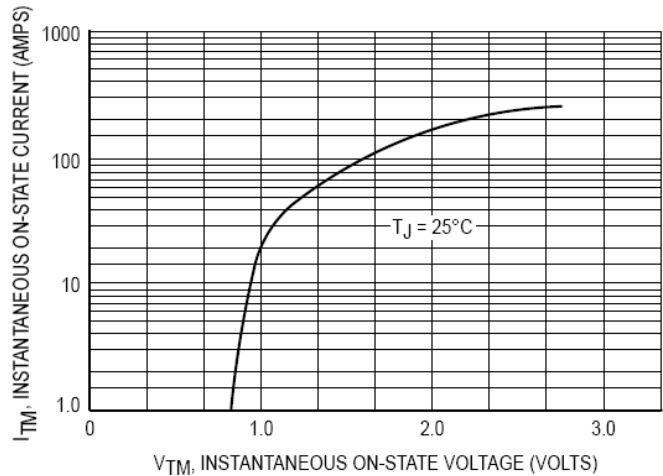


FIGURE 6 – TYPICAL ON-STATE CHARACTERISTICS



# DIGITRON SEMICONDUCTORS

MAC224(A) SERIES

SILICON BIDIRECTIONAL TRIODE THYRISTORS

40 AMPERES RMS

FIGURE 7 – THERMAL RESPONSE

