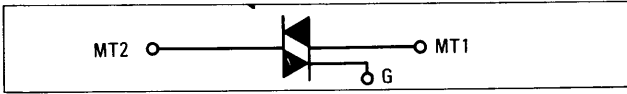


MAC77-1 thru MAC77-8



SILICON BIDIRECTIONAL THYRISTORS

... designed primarily for full-wave ac control applications, such as light dimmers, 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 anode voltage with positive or negative gate triggering. [MT2(+)-G(+), MT2(-)-G(-)]

- All Diffused and Passivated Junctions for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermopad[▲] Construction for Low Thermal Resistance, High Heat Dissipation and Durability

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Repetitive Peak Off-State Voltage, Note 1 ($T_J = 110^\circ\text{C}$) MAC77-1	V_{DRM}	25	Volts
-2		50	
-3		100	
-4		200	
-5		300	
-6		400	
-7		500	
-8		600	
On-State Current RMS ($T_C = 83^\circ\text{C}$)	$I_T(\text{RMS})$	4.0	Amp
Peak Surge Current (One Full cycle, 60 Hz, $T_J = -40$ to $+110^\circ\text{C}$)	I_{TSM}	30	Amp
Circuit Fusing Considerations ($T_J = -40$ to $+110^\circ\text{C}$, $t = 1.0$ to 8.3 ms)	I^2t	3.6	A^2s
Peak Gate Power	P_{GM}	10	Watts
Average Gate Power	$P_{G(AV)}$	0.5	Watt
Peak Gate Current	I_{GM}	2.0	Amp
Operating Junction Temperature Range	T_J	-40 to +110	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to +150	$^\circ\text{C}$
Mounting Torque (M 2.6 Screw), Note 2	-	0.07	mkg

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	3.5	$^\circ\text{C}/\text{W}$
Thermal Resistance, Case to Ambient	θ_{CA}	65	$^\circ\text{C}/\text{W}$

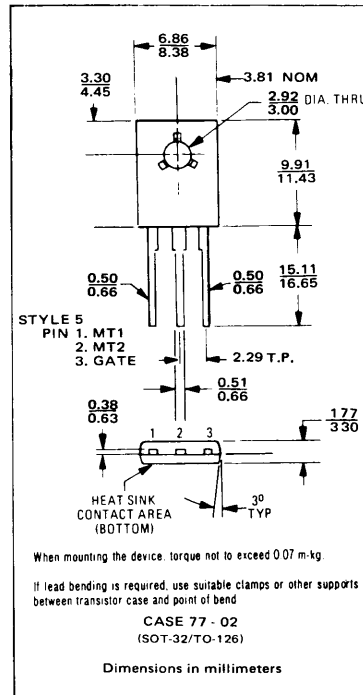
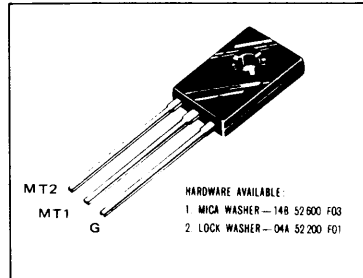
NOTES:

1. Ratings apply for open gate conditions. Thyristor devices shall not be tested with a constant current source for blocking capability such that the voltage applied exceeds the rated blocking voltage.
2. Torque rating applies with use of torque washer (Shakeproof WD19523 or equivalent). Mounting torque in excess of 0.07mkg does not appreciably lower case-to-sink thermal resistance. Main terminal 2 and heat-sink contact pad are common.

For soldering purposes (either terminal connection or device mounting), soldering temperatures shall not exceed $+225^\circ\text{C}$. For optimum results, an activated flux (oxide removing) is recommended.

[▲]Trademark of Motorola Inc.

TRIACS (THYRISTORS) 4 AMPERES RMS 25 THRU 600 VOLTS



MAC 77-1 thru MAC 77-8 (continued)

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

Characteristic	Symbol	Min	Typ	Max	Unit
Peak Blocking Current (Either Direction) Rated V_{DRM} @ $T_J = 110^{\circ}\text{C}$, Gate Open	I_{DRM}	—	—	2.0	mA
On-State Voltage (Either Direction) $I_{TM} = 6.0$ A Peak	V_{TM}	—	1.4	2.0	Volts
Gate Trigger Current, Continuous dc Main Terminal Voltage = 12 Vdc, $R_L = 100$ ohms MT2(+)(G+); MT2(-)(G-)	I_{GT}	—	—	30	mA
Gate Trigger Voltage, Continuous dc Main Terminal Voltage = 12 Vdc, $R_L = 100$ ohms MT2(+)(G+), MT2(-)(G-)	V_{GT}	—	1.1	2.0	Volts
Gate Trigger Voltage, Continuous dc Main Terminal Voltage = Rated V_{DRM} , $R_L = 10$ k ohms, $T_J = 110^{\circ}\text{C}$ MT2(+)(G+), MT2(-)(G-)	V_{GD}	0.2	—	—	Volts
Holding Current (Either Direction) Main Terminal Voltage = 12 Vdc, Gate Open, Initiating Current = 100 mA	I_H	—	—	30	mA
Turn-On Time $I_{TM} = 14$ Adc, $I_{GT} = 100$ mA	t_{on}	—	1.5	—	μs
Blocking Voltage Application Rate at Commutation @ V_{DRM} , $T_J = 85^{\circ}\text{C}$, Gate Energized, 4.0 A RMS	dv/dt	—	5.0	—	$\text{V}/\mu\text{s}$

FIGURE 1 – AVERAGE CURRENT DERATING

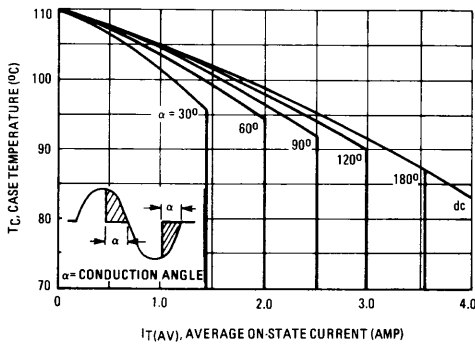


FIGURE 2 – RMS CURRENT DERATING

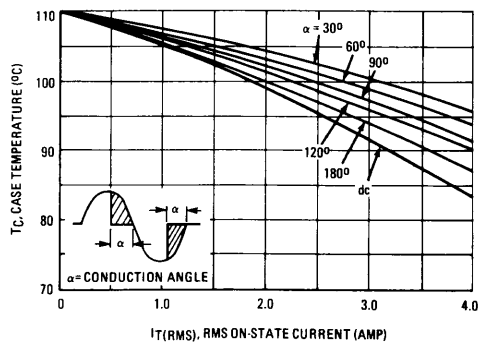


FIGURE 3 – POWER DISSIPATION

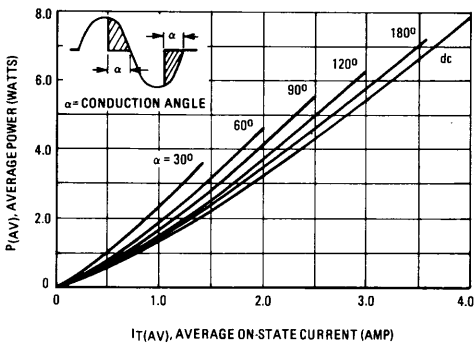
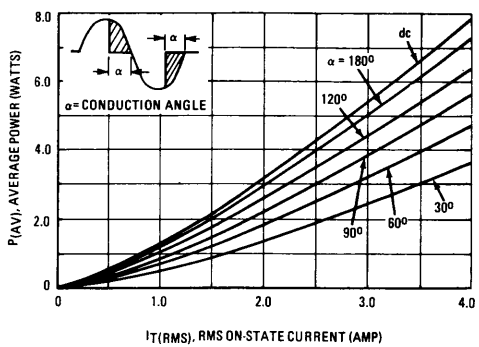


FIGURE 4 – POWER DISSIPATION



MAC222 series MAC222A series



SILICON BIDIRECTIONAL TRIODE THYRISTORS

... designed primarily for full-wave ac control applications such as light dimmers, motor controls, heating controls, and power supplies; or wherever full-wave silicon-gate-controlled solid-state devices are needed.

- 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 and High Heat Dissipation
- Gate Triggering Guaranteed in Three Modes (MAC222 series) or Four Modes (MAC222A series)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit				
Repetitive Peak Off-State Voltage, Note 1 (1/2 Sine Wave, 50 to 60 Hz, Gate Open) ($T_J = -40$ to $+125^\circ\text{C}$)	VDRM	-1 25 -2 50 -3 100 -4 200 -5 300 -6 400 -7 500 -8 600 -9 700 -10 800	Volts				
				MAC222			
				MAC222A			
				On-State Current RMS ($T_C = 90^\circ\text{C}$) (Full Cycle Sine Wave, 50 to 60 Hz)	$I_{T(RMS)}$	8.0	Amp
				Peak Non-Repetitive Surge Current (One Full Cycle, 60 Hz, $T_J = +95^\circ\text{C}$)	I_{TSM}	80	Amp
				Circuit Fusing Considerations ($T_J = -40$ to $+125^\circ\text{C}$, $t = 1.0$ to 8.3 ms)	I^2t	40	A^2s
				Peak Gate Current ($t \leq 2.0 \mu\text{s}$)	I_{GM}	2.0	Amp
				Peak Gate Voltage ($t \leq 2.0 \mu\text{s}$)	V_{GM}	10	Volts
				Peak Gate Power ($t \leq 2.0 \mu\text{s}$)	P_{GM}	20	Watt
				Average Gate Power ($T_C = +90^\circ\text{C}$, $t = 8.3$ ms)	$P_{G(AV)}$	0.5	Watt
Operating Junction Temperature Range	T_J	-40 to $+125$	$^\circ\text{C}$				
Storage Temperature Range	T_{stg}	-40 to $+150$	$^\circ\text{C}$				
Mounting Torque	-	8.0	in-lb				

THERMAL CHARACTERISTICS

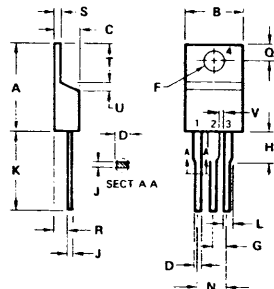
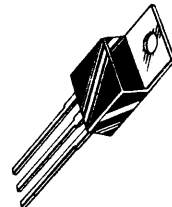
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.2	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	60	$^\circ\text{C/W}$

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

Thermowatt is a trademark of Motorola Inc.

TRIACS (THYRISTORS)

8 AMPERES RMS
25-800 VOLTS



STYLE 4:

- PIN 1: MT1
- 2: MT2
- 3: GATE
- 4: MT2

NOTE
1. DIM. L & H APPLIES
TO ALL LEADS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	15.11	15.75	0.595	0.620
B	9.85	10.29	0.380	0.405
C	4.06	4.82	0.160	0.190
D	0.64	0.89	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.41	2.67	0.095	0.105
H	2.79	3.30	0.110	0.130
J	0.36	0.56	0.014	0.022
K	12.70	14.27	0.500	0.562
L	1.14	1.27	0.045	0.050
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.14	1.39	0.045	0.055
T	5.97	6.48	0.235	0.255
U	0.76	1.27	0.030	0.050
V	1.14	-	0.045	-

CASE 221A-02
TO-220 AB

MAC222 series • MAC222A series

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 (Note 1) ($V_D = \text{Rated } V_{DRM}, T_J = 125^\circ\text{C}$)	I_{DRM}	—	—	2.0	mA
Peak On-State Voltage ($I_{TM} = 11 \text{ A Peak; Pulse Width} < 2.0 \text{ ms, Duty Cycle} \leq 2.0\%$)	V_{TM}	—	—	1.55	Volt
Gate Trigger Current, Continuous dc ($V_D = 12 \text{ Vdc, } R_L = 100 \Omega$) MT2(+), G(+); MT2(+), G(-); MT2(-), G(-) All Types MT2(-), G(+) MAC222A series	I_{GT}	— —	— —	50 75	mA
Gate Trigger Voltage, Continuous dc ($V_D = 12 \text{ Vdc, } R_L = 100 \Omega$) MT2(+), G(+); MT2(-), G(-); MT2(+), G(-) All Types MT2(-), G(+) MAC222A series ($V_D = \text{Rated } V_{DRM}, T_J = 125^\circ\text{C, } R_L = 10 \text{ k}\Omega$) MT2(+), G(+); MT2(+), G(-); MT2(-), G(-) All Types MT2(-), G(+) MAC222A series	V_{GT}	— — 0.2 0.2	— — — —	— 2.0 — —	Volt
Holding Current ($V_D = 12 \text{ Vdc, } I_{TM} = 200 \text{ mA, Gate Open}$)	I_H	—	—	40	mA
Turn-On Time, Gate Controlled ($V_D = \text{Rated } V_{DRM}, I_{TM} = 11 \text{ A Peak, } I_G = 120 \text{ mA}$)	t_{gt}	—	1.5	—	μs
Critical Rate of Rise of Off-State Voltage ($V_D = \text{Rated } V_{DRM}, \text{Exponential Waveform, } T_C = 125^\circ\text{C}$)	dv/dt	—	10	—	$\text{V}/\mu\text{s}$
Critical Rate of Rise of Commutation Voltage ($V_D = \text{Rated } V_{DRM}, I_{TM} = 11 \text{ A Peak, Commutating } di/dt = 4.3 \text{ A}/\mu\text{s, Gate Unenergized, } T_C = 90^\circ\text{C}$)	$dv/dt(c)$	—	5.0	—	$\text{V}/\mu\text{s}$

NOTE 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 — CURRENT DERATING

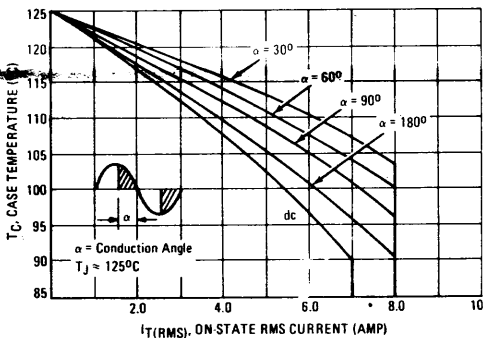
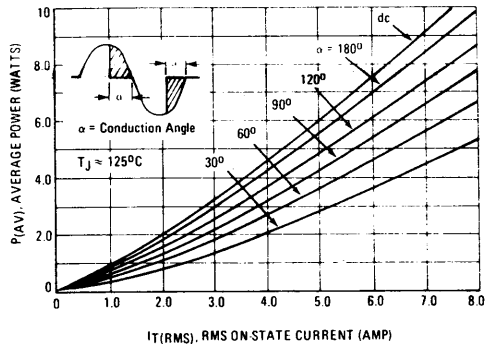


FIGURE 2 — ON-STATE POWER DISSIPATION



Triacs

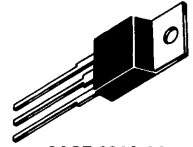
Silicon Bidirectional Thyristors

... designed for full-wave ac control applications primarily in industrial environments needing noise immunity.

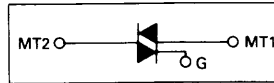
- Guaranteed High Commutation Voltage
 $dv/dt = 500 \text{ V}/\mu\text{s}$ Min @ $T_C = 25^\circ\text{C}$
- High Blocking Voltage — V_{DRM} to 800 V
- Photo Glass Passivated Junction for Improved Power Cycling Capability and Reliability

MAC321 Series

TRIACs
20 AMPERES RMS
200 thru 800 VOLTS



CASE 221A-04
(TO-220AB)
STYLE 4



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Repetitive Peak Off-State Voltage, Note 1 ($T_J = -40$ to $+125^\circ\text{C}$) MAC321-4 -6 -8 -10	V_{DRM}	200 400 600 800	Volts
Peak Gate Voltage	V_{GM}	10	Volts
On-State Current RMS ($T_C = +75^\circ\text{C}$) Full Cycle Sine Wave 50 to 60 Hz	$I_{\text{T(RMS)}}$	20	Amp
Peak Surge Current (One Full Cycle, 60 Hz, $T_C = +75^\circ\text{C}$) preceded and followed by Rated Current	I_{TSM}	150	Amp
Circuit Fusing Considerations ($t = 8.3$ ms)	I^2t	93	A^2s
Peak Gate Power ($T_C = +75^\circ\text{C}$, Pulse Width = $2.0 \mu\text{s}$)	P_{GM}	20	Watts
Average Gate Power ($T_C = +75^\circ\text{C}$, $t = 8.3$ ms)	$P_{\text{G(AV)}}$	0.5	Watt
Peak Gate Current	I_{GM}	2.0	Amp
Operating Junction Temperature Range	T_J	-40 to +125	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta\text{JC}}$	1.8	$^\circ\text{C}/\text{W}$

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

3

MAC321 Series

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

Characteristic	Symbol	Min	Typ	Max	Unit
Peak Blocking Current (Either Direction) Rated V_{DRM} , Gate Open $T_J = 25^\circ\text{C}$ $T_J = +125^\circ\text{C}$	I_{DRM}	— —	— —	10 2.0	μA mA
Peak On-State Voltage (Either Direction) $I_{TM} = 28 \text{ A Peak}$; Pulse Width $\leq 2.0 \text{ ms}$, Duty Cycle $\leq 2.0\%$	V_{TM}	—	1.4	1.7	Volts
Gate Trigger Current (Continuous dc) Main Terminal Voltage = 12 Vdc, $R_L = 100 \text{ Ohms}$ MT2(+), G(+) MT2(+), G(-) MT2(-), G(-)	I_{GT}	— — —	— — —	100 100 100	mA
Gate Trigger Voltage (Continuous dc) Main Terminal Voltage = 12 Vdc, $R_L = 100 \text{ Ohms}$ MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) Main Terminal Voltage = Rated V_{DRM} , $R_L = 10 \text{ k}\Omega$, $T_J = +125^\circ\text{C}$ MT2(+), G(+); MT2(-), G(-); MT2(+), G(-)	V_{GT}	— — — 0.2	— — — —	2.0 2.0 2.0 —	Volts
Holding Current (Either Direction) Main Terminal Voltage = 12 Vdc, Gate Open, Initiating Current = 200 mA	I_H	—	—	100	mA
Turn-On Time Rated V_{DRM} , $I_{TM} = 28 \text{ A}$, $I_{GT} = 120 \text{ mA}$, Rise Time = $0.1 \mu\text{s}$, Pulse Width = $2.0 \mu\text{s}$	t_{gt}	—	1.5	—	μs
Critical Rate of Rise of Off-State Voltage $V_D = \text{Rated } V_{DRM}$, Exponential Voltage Rise, Gate Open $T_J = 25^\circ\text{C}$ $T_J = +125^\circ\text{C}$	$dv/dt(s)$	500 200	— —	— —	$\text{V}/\mu\text{s}$

3

TYPICAL CHARACTERISTICS

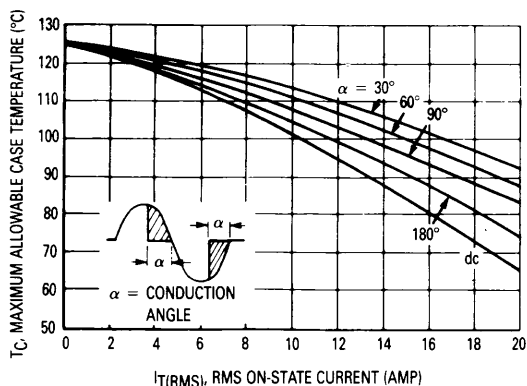


Figure 1. RMS Current Derating

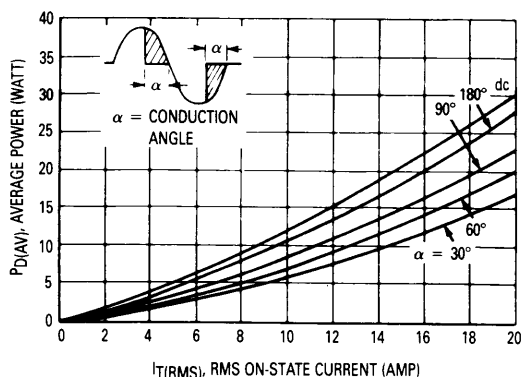


Figure 2. On-State Power Dissipation

MC321 Series

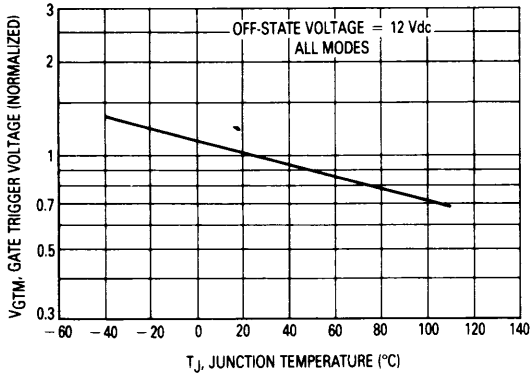


Figure 3. Typical Gate Trigger Voltage

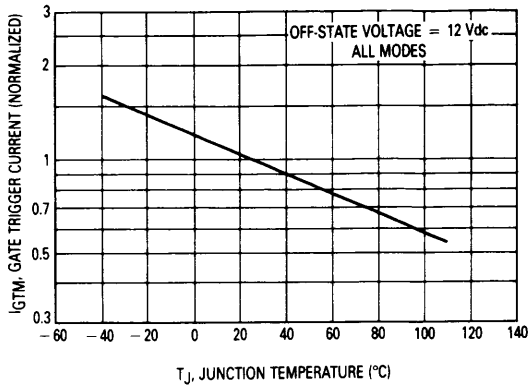


Figure 4. Typical Gate Trigger Current

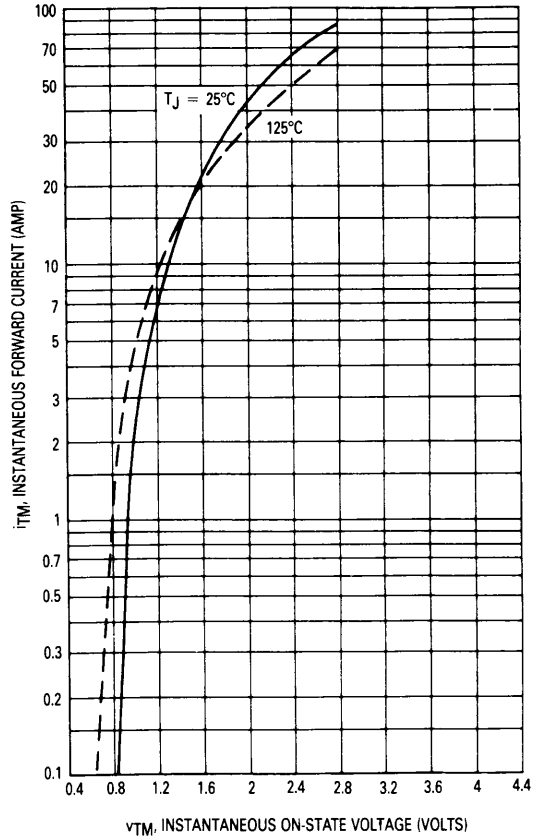


Figure 5. Maximum On-State Characteristics

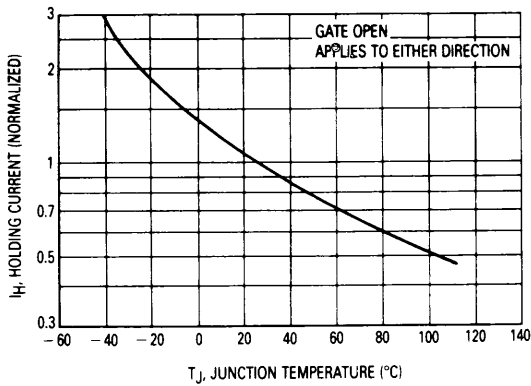


Figure 6. Typical Holding Current

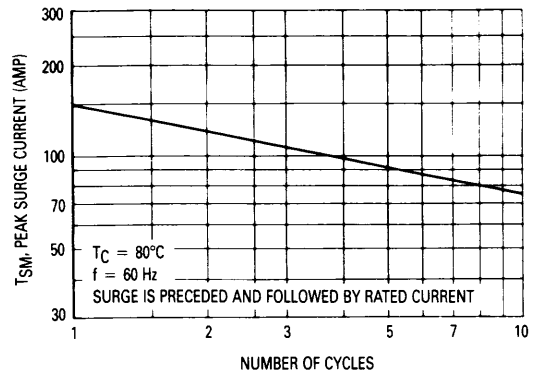


Figure 7. Maximum On-Repetitive Surge Current

MAC321 Series

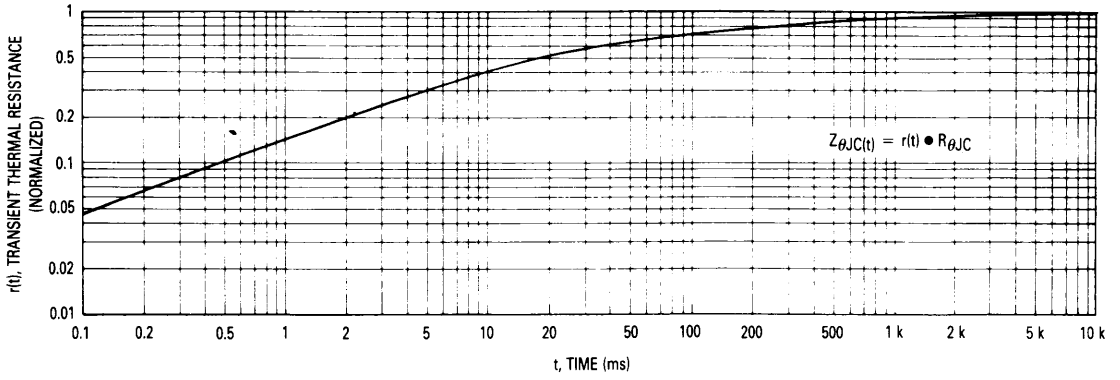


Figure 8. Thermal Response

3

MAC 525
MAC 525 A

Product Preview

SILICON BIDIRECTIONAL TRIODE THYRISTORS

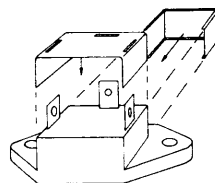
The MAC525,A is designed primarily for industrial and consumer applications, for full-wave control of ac load such as appliance control, power supplies, solid state relays, heating control, motor control, welding equipment and power switching systems.

- Quick connect/disconnect terminal.
- Glass passivated and center gate geometry.
- Meet UL flammability and lead spacing requirement.
- Low cost solution.
- TO-3 base.

TRIAC

100 – 800V

25 Amp RMS



(Case number not yet allocated. TO3 base.)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Repetitive Off-Stage Voltage	V_{DRM}	100 200 300 400 500 600 700 800	Volts
– 3			
– 4			
– 5			
MAC525 – 6			
MAC525A – 7			
– 8			
– 9			
– 10			
On State RMS Current ($T_C = 80^\circ C$)			
Peak Non-Repetitive Surge Current	I_{TSM}	250	Amp
Circuit Fusing	I^2t	260	A^2s
Operating Junction Temperature Range	T_J	–40 to +125	$^\circ C$
Mounting Torque	–	6	in/lb

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ C$ unless otherwise noted)

Peak Blocking Current ($T_C = 125^\circ C$)	I_{DRM}	2.0	mA
Peak On-Stage Voltage ($I_{TM} = 35A$ Peak)	V_{TM}	1.6	mA
Peak Gate Current	I_{GT123} I_{GT4}	50	mA
($V_D = 12Vdc, R_L = 50\Omega$)		MAC525 MAC525A	75
Holding Current ($V_D = 12Vdc, Gate Open$)	I_H	50	mA