

Silicon Bidirectional Triode Thyristors

... designed for use in solid state relays, MPU interface, TTL logic and any other light industrial or consumer application. Supplied in an inexpensive TO-92 package which is readily adaptable for use in automatic insertion equipment.

- One-Piece, Injection-Molded Unibloc Package
- Sensitive Gate Triggering in Four Trigger Modes for all possible Combinations of Trigger Sources, and Especially for Circuits that Source Gate Drives
- All Diffused and Glassivated Junctions for Maximum Uniformity of Parameters and Reliability

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

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage (Gate Open, $T_J = -40$ to $+110^\circ\text{C}$)(1) 1/2 Sine Wave 50 to 60 Hz, Gate Open MAC97-4, MAC97A4 MAC97-6, MAC97A6 MAC97-8, MAC97A8	V_{DRM}	200 400 600	Volts
On-State RMS Current Full Cycle Sine Wave 50 to 60 Hz ($T_C = +50^\circ\text{C}$)	$I_T(\text{RMS})$	0.8	Amp
Peak Non-repetitive Surge Current (One Full Cycle, 60 Hz, $T_A = 110^\circ\text{C}$)	I_{TSM}	8.0	Amps
Circuit Fusing Considerations $T_J = -40$ to $+110^\circ\text{C}$ ($t = 8.3$ ms)	I^2t	0.26	A^2s
Peak Gate Voltage ($t \leq 2.0$ μs)	V_{GM}	5.0	Volts
Peak Gate Power ($t \leq 2.0$ μs)	P_{GM}	5.0	Watts
Average Gate Power ($T_C = 80^\circ\text{C}$, $t \leq 8.3$ ms)	$P_{G(AV)}$	0.1	Watt
Peak Gate Current ($t \leq 2.0$ μs)	I_{GM}	1.0	Amp
Operating Junction Temperature Range	T_J	-40 to +110	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	75	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$

(1) V_{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.

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

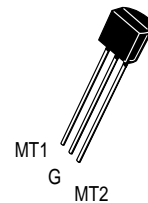
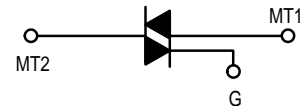
REV 2

MAC97,A IMPROVED SERIES

(Device Date Code
9625 and Up)

Motorola preferred devices

TRIACs
0.8 AMPERE RMS
200 — 600 VOLTS



CASE 29-04
TO-226AA, STYLE 12
(TO-92)

MAC97,A IMPROVED 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 ⁽¹⁾ ($V_D = \text{Rated } V_{DRM}$, $T_J = 110^\circ\text{C}$, Gate Open)	I_{RRM}	—	—	0.1	mA
Peak On-State Voltage (Either Direction) ($I_{TM} = 1.1 \text{ A Peak}$; Pulse Width $\leq 2.0 \text{ ms}$, Duty Cycle $\leq 2.0\%$)	V_{TM}	—	—	1.65	Volts
Gate Trigger Current (Continuous dc) ($V_D = 12 \text{ Vdc}$, $R_L = 100 \text{ Ohms}$) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) MAC97 MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) MAC97A	I_{GT}	— — — — — — — — — —	— — — — — — — — — —	10 10 10 10 5.0 5.0 5.0 7.0	mA
Gate Trigger Voltage, (Continuous dc) ($V_D = 12 \text{ Vdc}$, $R_L = 100 \text{ Ohms}$) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) ($V_D = \text{Rated } V_{DRM}$, $R_L = 10 \text{ k Ohms}$, $T_J = 110^\circ\text{C}$) MT2(+), G(+); MT2(-), G(-); MT2(+), G(-) MT2(-), G(+) All Types	V_{GT}	— — — — 0.1 0.1	— — — — — —	2.0 2.0 2.0 2.5 — —	Volts
Holding Current ($V_D = 12 \text{ Vdc}$, $I_{TM} = 200 \text{ mA}$, Gate Open)	I_H	—	—	5.0	mA
Gate Controlled Turn-On Time ($V_D = \text{Rated } V_{DRM}$, $I_{TM} = 1.0 \text{ A pk}$, $I_G = 25 \text{ mA}$)	t_{gt}	—	2.0	—	μs
Critical Rate-of-Rise of Commutation Voltage ($f = 250 \text{ Hz}$, $I_{TM} = 1.0 \text{ A}$, Commutating $di/dt = 1.5 \text{ A/mS}$, On-State Current Duration = 2.0 mS, $V_{DRM} = 200 \text{ V}$, Gate Unenergized, $T_C = 110^\circ\text{C}$, Gate Source Resistance = 150 Ω , See Figure 13)	dv/dt_c	1.5	—	—	$\text{V}/\mu\text{s}$
Critical Rate-of-Rise of Off State Voltage ($V_{pk} = \text{Rated } V_{DRM}$, $T_C = 110^\circ\text{C}$, Gate Open, Exponential Method)	dv/dt	10	—	—	$\text{V}/\mu\text{s}$

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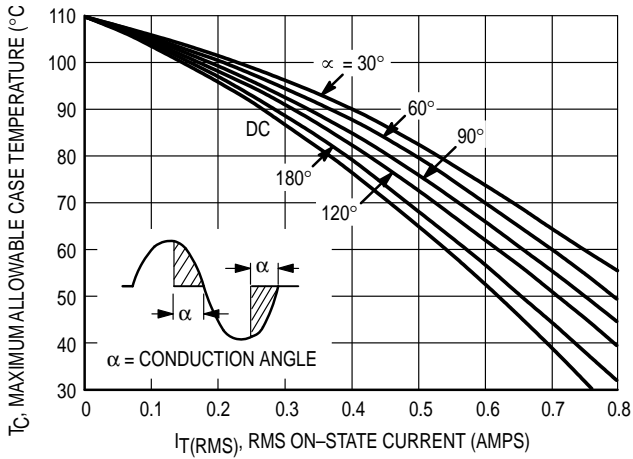


Figure 1. RMS Current Derating

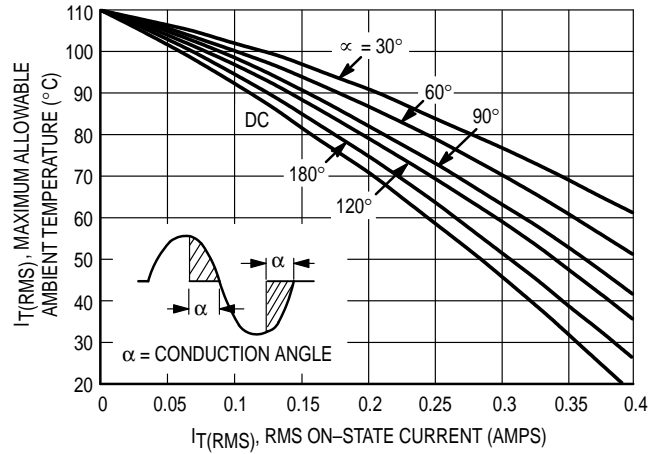


Figure 2. RMS Current Derating

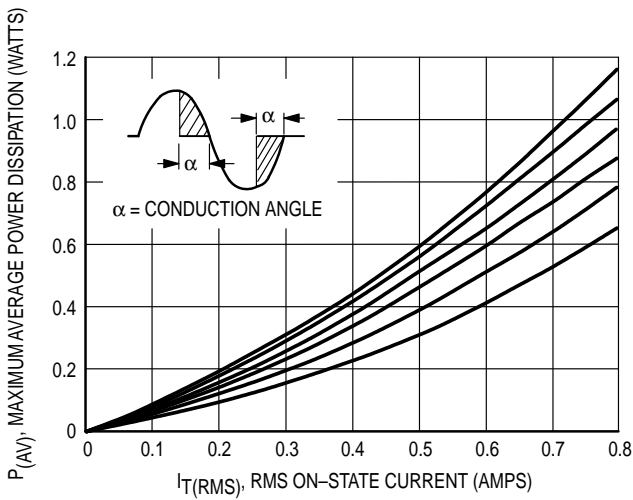


Figure 3. Power Dissipation

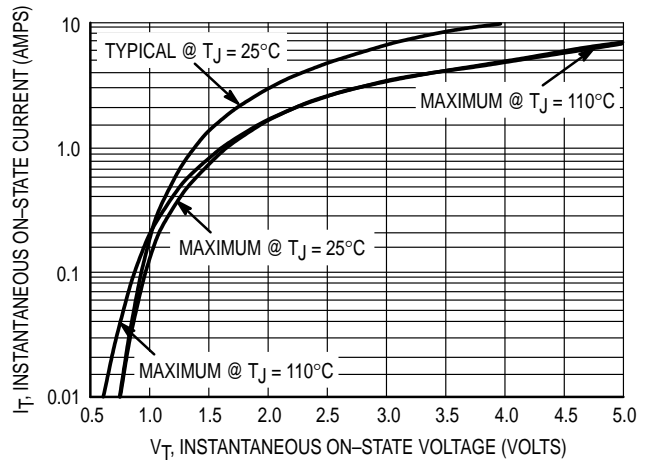


Figure 4. On-State Characteristics

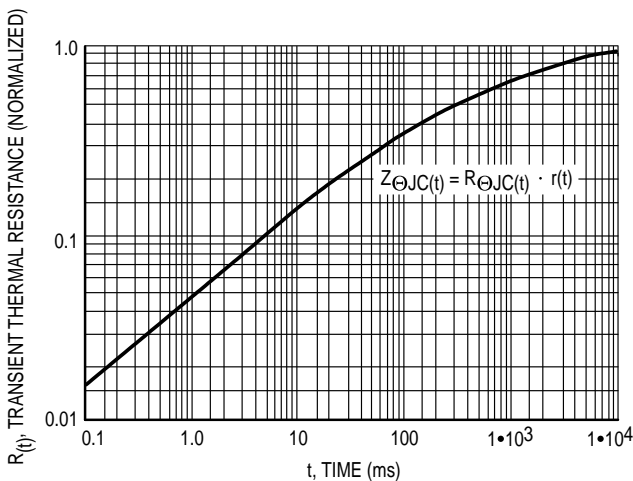


Figure 5. Transient Thermal Response

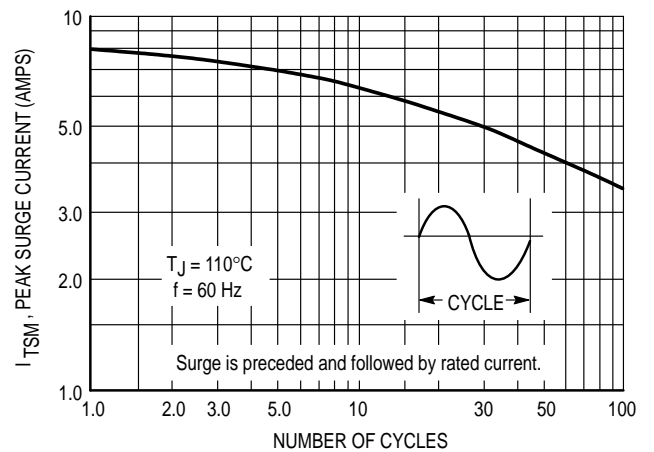


Figure 6. Maximum Allowable Surge Current

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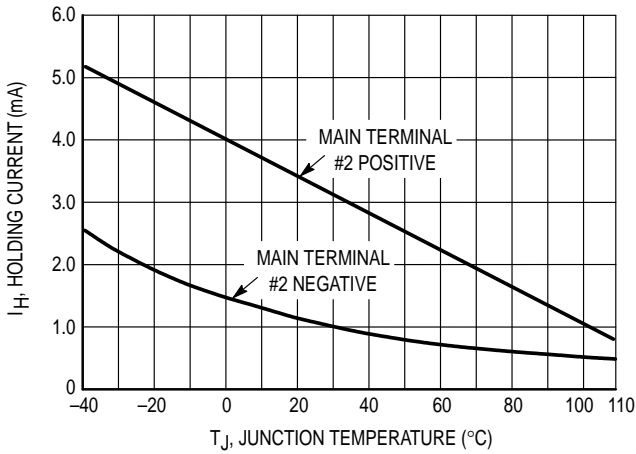


Figure 7. Typical Holding Current Variation

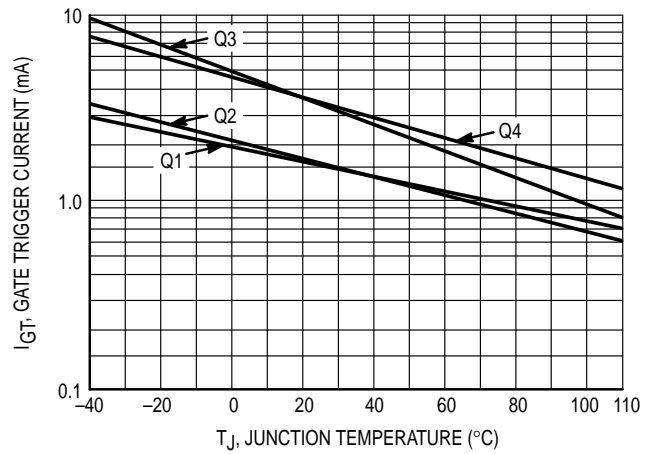


Figure 8. Typical Gate Trigger Current Variation

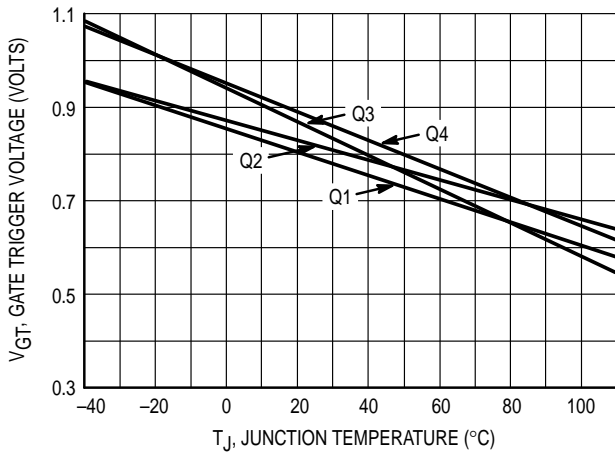


Figure 9. Gate Trigger Voltage Variation

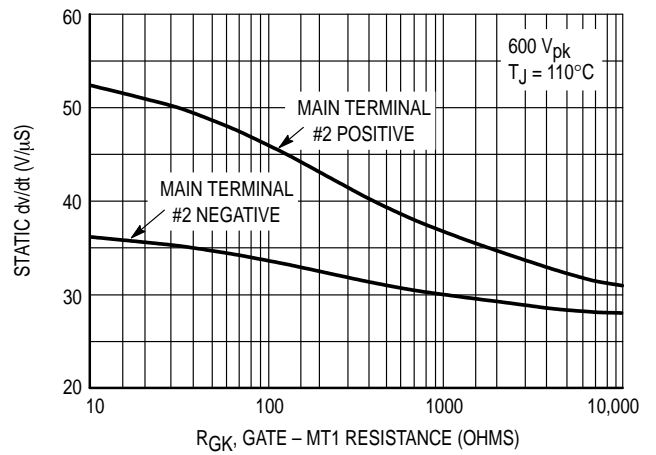


Figure 10. Exponential Static dv/dt versus Gate - MT1 Resistance

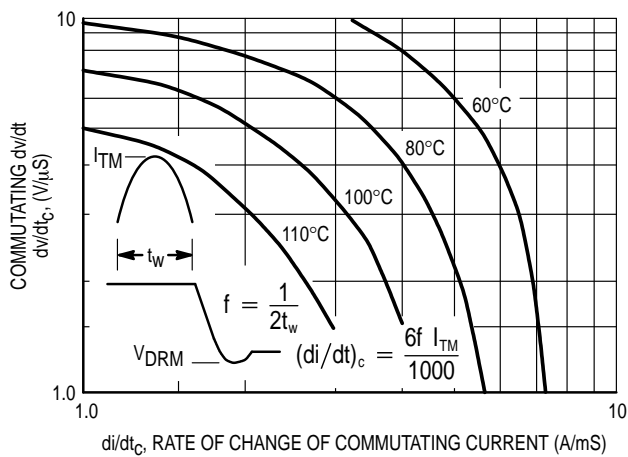


Figure 11. Typical Commutating dv/dt versus Current Crossing Rate and Junction Temperature

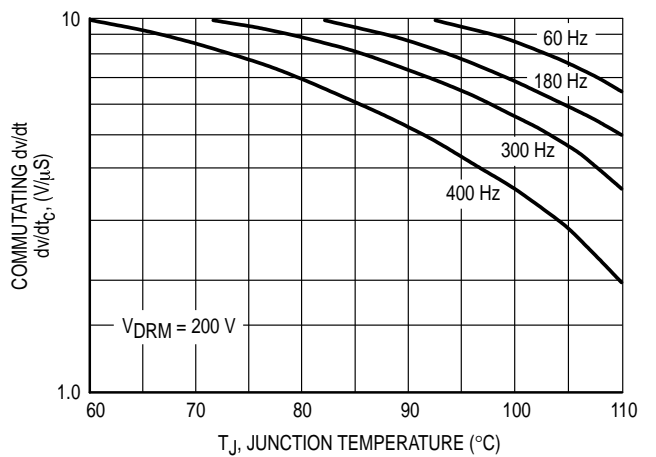
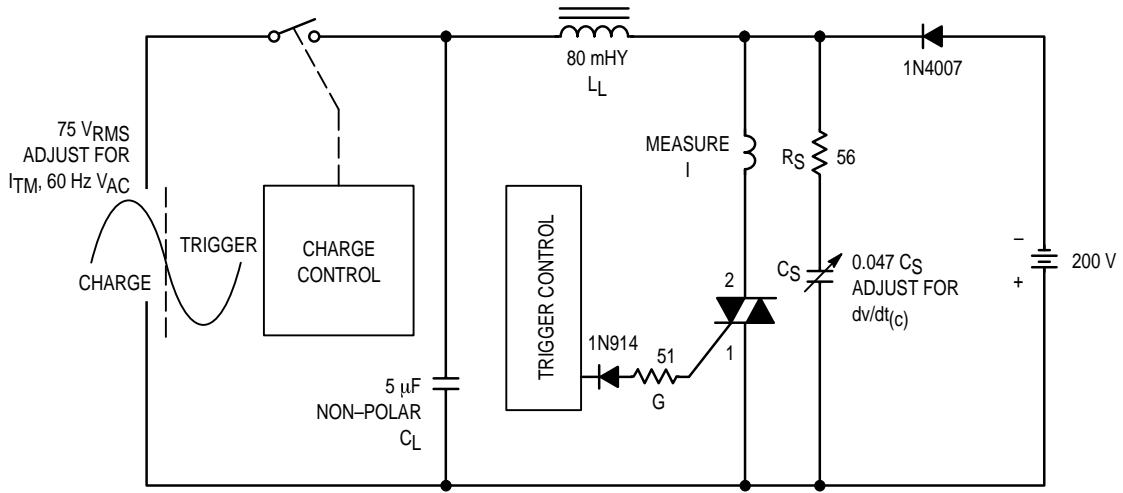


Figure 12. Typical Commutating dv/dt versus Junction Temperature at 0.8 Amps RMS

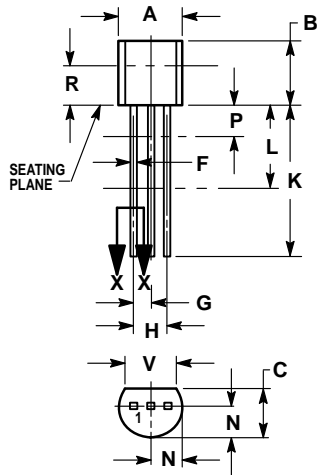


NOTE: Component values are for verification of rated (dv/dt)_c. See AN1048 for additional information.

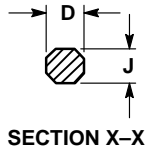
Figure 13. Simplified Q₁ (dv/dt)_c Test Circuit

MAC97,A IMPROVED SERIES

PACKAGE DIMENSIONS



STYLE 12:
 PIN 1. MAIN TERMINAL 1
 2. GATE
 3. MAIN TERMINAL 2



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
 4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	—	12.70	—
L	0.250	—	6.35	—
N	0.080	0.105	2.04	2.66
P	—	0.100	—	2.54
R	0.115	—	2.93	—
V	0.135	—	3.43	—

**CASE 29-04
 (TO-226AA)
 (TO-92)**

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MAC97/D

