DIGITRON™ Semiconductors

High-reliability discrete products
and engineering services since 1977

MAC997 SERIES

BIDIRECTIONAL THYRISTORS

FEATURES

- Available as “HR” (high reliability) screened per MIL-PRF-19500, JANTX level. Add “HR” suffix to base part number.
- Available as non-RoHS (Sn/Pb plating), standard, and as RoHS by adding “-PBF” suffix.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak repetitive off-state voltage[1] (T_J = -40 to +110°C, sine wave 50 to 60Hz, gate open) MAC997A6, MAC997B6 MAC997A8, MAC997B8	V_{DRM}	 400 600	Volts
RMS on-state current (Full cycle sine wave 50 to 60Hz, T_C = 50°C)	$I_{T(RMS)}$	0.8	Amps
Peak non-repetitive surge current (1 cycle, sine wave, 60 Hz, T_C = 110°C)	I_{TSM}	8.0	Amps
Circuit fusing considerations (t = 8.3ms)	I^2t	0.26	A^2s
Peak gate voltage (t ≤ 2.0µs, T_C = 80°C)	V_{GM}	5.0	Volts
Peak gate power (t ≤ 2.0µs, T_C = 80°C)	P_{GM}	5.0	Watts
Average gate power (t ≤ 8.3ms, T_C = 80°C)	$P_{G(AV)}$	0.1	Watts
Peak gate current (t ≤ 2.0µs, T_C = 80°C)	I_{GM}	1.0	Amps
Operating junction temperature range	T_J	-40 to +110	°C
Storage temperature range	T_{stg}	-40 to +150	°C

Note 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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Maximum	Unit
Thermal resistance, junction to case	$R_{\Theta JC}$	75	°C/W
Thermal resistance, junction to ambient	$R_{\Theta JA}$	200	°C/W

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ELECTRICAL CHARACTERISTICS @ 25°C unless otherwise noted

Characteristic	Symbol	Min	Typ.	Max	Unit
Peak blocking current					
(V_D = Rated V_{DRM}, V_{RRM}, gate open @ T_J = 25°C)	I_{DRM}, I_{RRM}	-	-	10	µA
(V_D = Rated V_{DRM}, V_{RRM}, gate open @ T_J = 110°C)		-	-	100	
Peak on-state voltage	V_{TM}				Volts
(I_{TM} = ±0.85A peak, pulse width ≤ 2.0ms, duty cycle ≤ 2%)		-	-	1.9	
Gate trigger current (continuous dc)					
(V_D = 12V, R_L = 100Ω)					
MAC997A6, MAC997A8					
MT2(+),G(+)		-	-	5.0	
(MT2(+),G(-)		-	-	5.0	
MT2(-),G(-)		-	-	5.0	
MT2(-),G(+)	I_{GT}	-	-	7.0	mA
MAC997B6, MAC997B8					
MT2(+),G(+)		-	-	3.0	
MT2(+),G(-)		-	-	3.0	
MT2(-),G(-)		-	-	3.0	
MT2(-),G(+)		-	-	5.0	
Latching current					
(V_D = 12V, I_G = 10mA)					
All types					
MT2(+),G(+)	I_L	-	1.6	15	mA
MT2(+),G(-)		-	10.5	20	
MT2(-),G(-)		-	1.5	15	
MT2(-),G(+)		-	2.5	15	
Gate trigger voltage (continuous dc)	V_{GT}				Volts
(V_D = 12V, R_L = 100Ω)					
All types					
MT2(+),G(+)		-	0.66	2.0	
MT2(+),G(-)		-	0.77	2.0	
MT2(-),G(-)		-	0.84	2.0	
MT2(-),G(+)		-	0.88	2.5	
Gate non-trigger voltage	V_{GD}				Volts
(V_D = 12V, R_L = 100Ω, T_J = 110°C)					
All four quadrants		0.1	-	-	
Holding current	I_H				mA
(V_D = 12V, initiating current = 200mA, gate open)		-	1.5	10	
Turn-on time	t_{gt}				µs
(V_D = Rated V_{DRM}, I_{TM} = 1.0A pk, I_G = 25mA)		-	2.0	-	
Rate of change of commutating current	di/dt(c)				A/ms
(V_D = 400V, I_{TM} = 0.84A, commutating dv/dt = 1.5V/µs, gate open, T_J = 110°C, f = 250Hz, with snubber)		1.6	-	-	
Critical rate of rise of off-state voltage	dv/dt				V/µs
(V_D = Rated V_{DRM}, exponential waveform, gate open, T_J = 110°C)		20	60	-	

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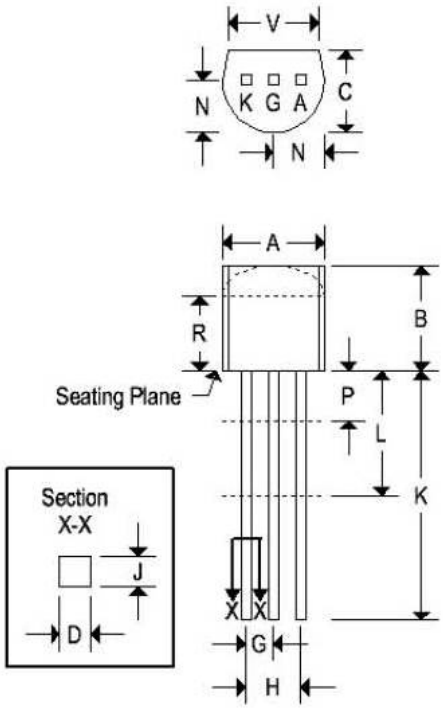
Repetitive critical rate of rise of on-state current (pulse width = 20µs, I_{PKmax} = 15A, di_G/dt = 1A/µs, f = 60Hz)	di/dt	-	-	10	A/µs

MECHANICAL CHARACTERISTICS

Case	TO-92
Marking	Alpha-numeric
Pin out	See below



	TO-92			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.175	0.205	4.450	5.200
B	0.170	0.210	4.320	5.330
C	0.125	0.165	3.180	4.190
D	0.016	0.022	0.410	0.550
F	0.016	0.019	0.410	0.480
G	0.045	0.055	1.150	1.390
H	0.095	0.105	2.420	2.660
J	0.015	0.020	0.390	0.500
K	0.500	-	12.700	-
L	0.250	-	6.350	-
N	0.080	0.105	2.040	2.660
P	-	0.100	-	2.540
R	0.115	-	2.930	-
V	0.135	-	3.430	-

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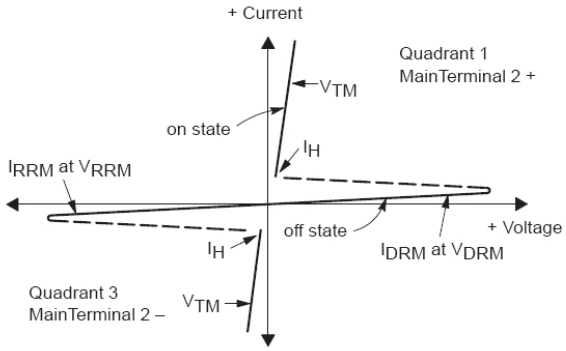
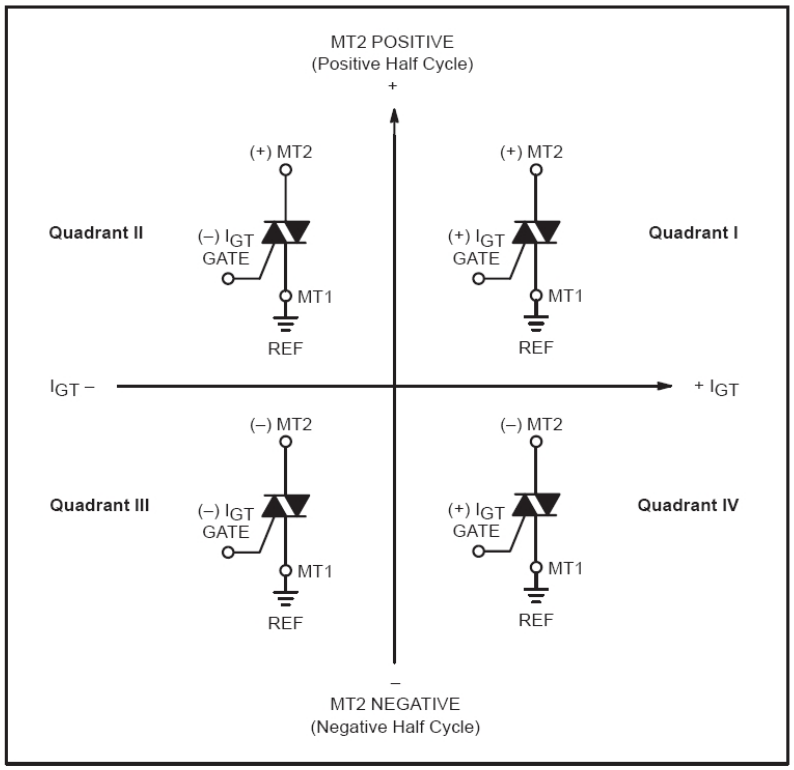
Voltage Current Characteristic of Triacs
(Bidirectional Device)

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.

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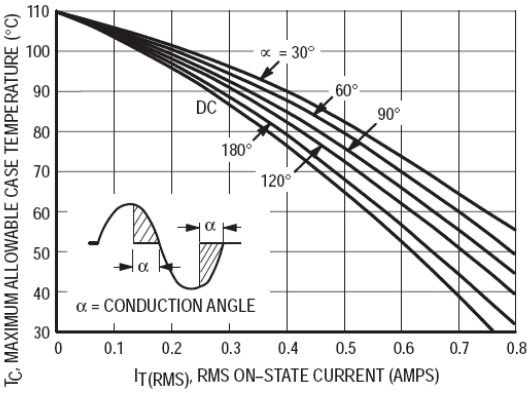

Figure 1. RMS Current Derating

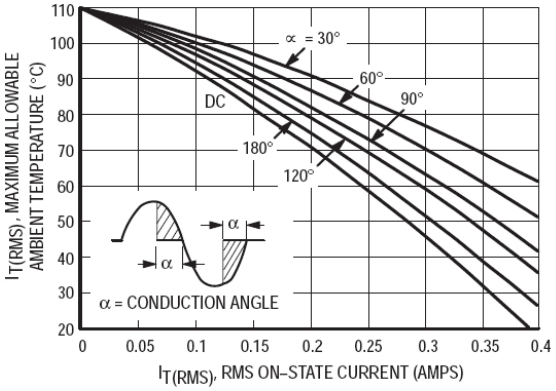

Figure 2. RMS Current Derating

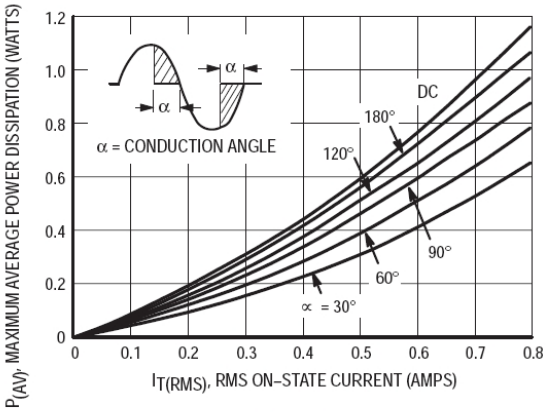

Figure 3. Power Dissipation

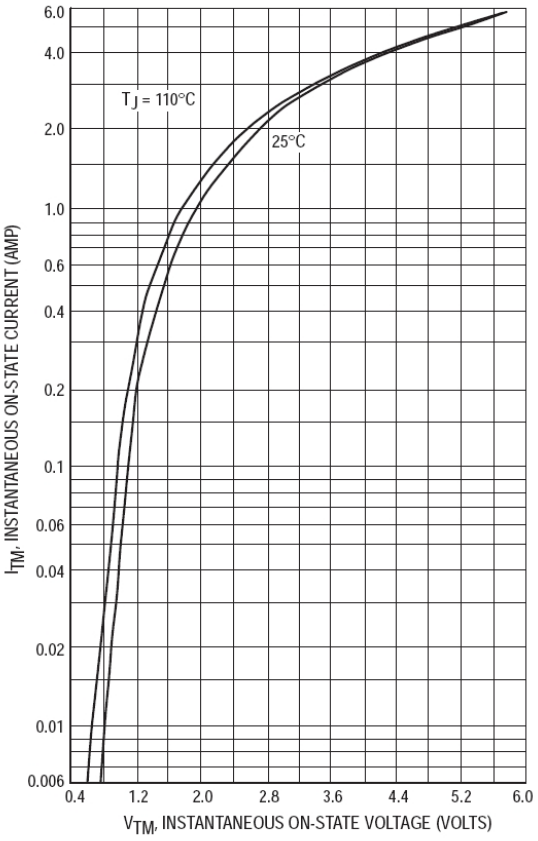

Figure 4. On–State Characteristics

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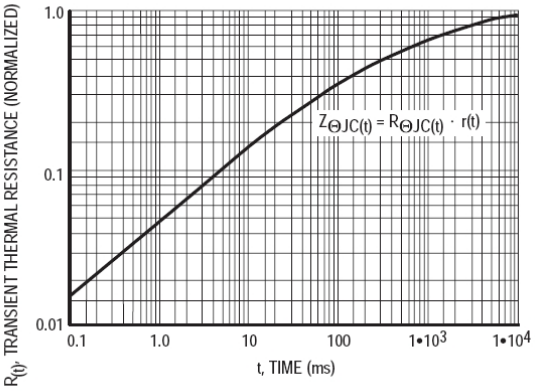

Figure 5. Transient Thermal Response

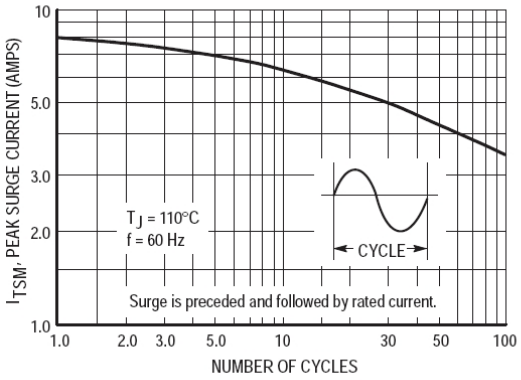

Figure 6. Maximum Allowable Surge Current

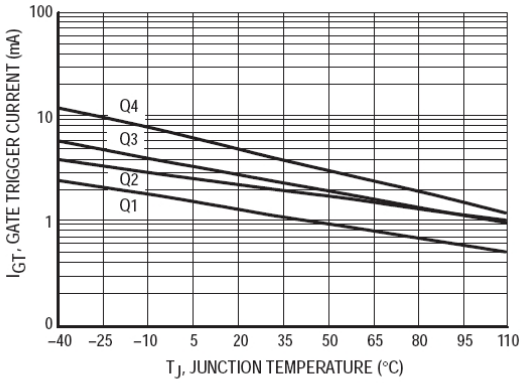

Figure 7. Typical Gate Trigger Current versus Junction Temperature

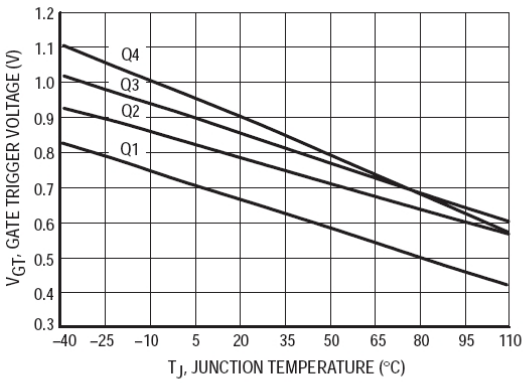

Figure 8. Typical Gate Trigger Voltage versus Junction Temperature

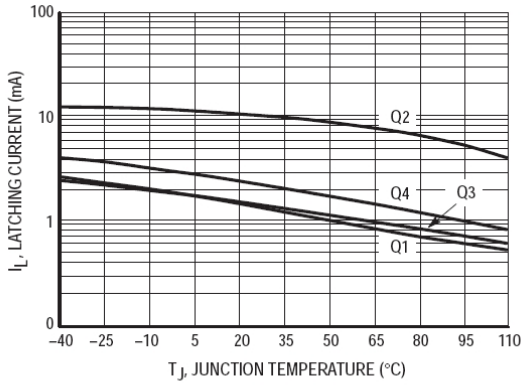

Figure 9. Typical Latching Current versus Junction Temperature

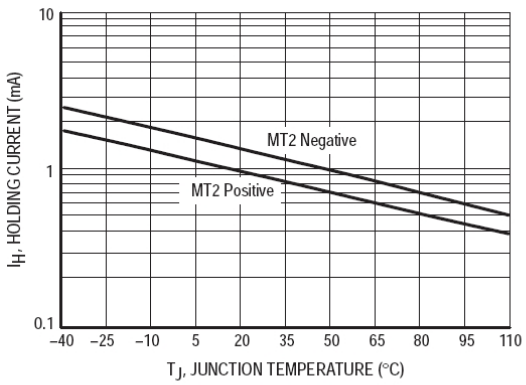

Figure 10. Typical Holding Current versus Junction Temperature

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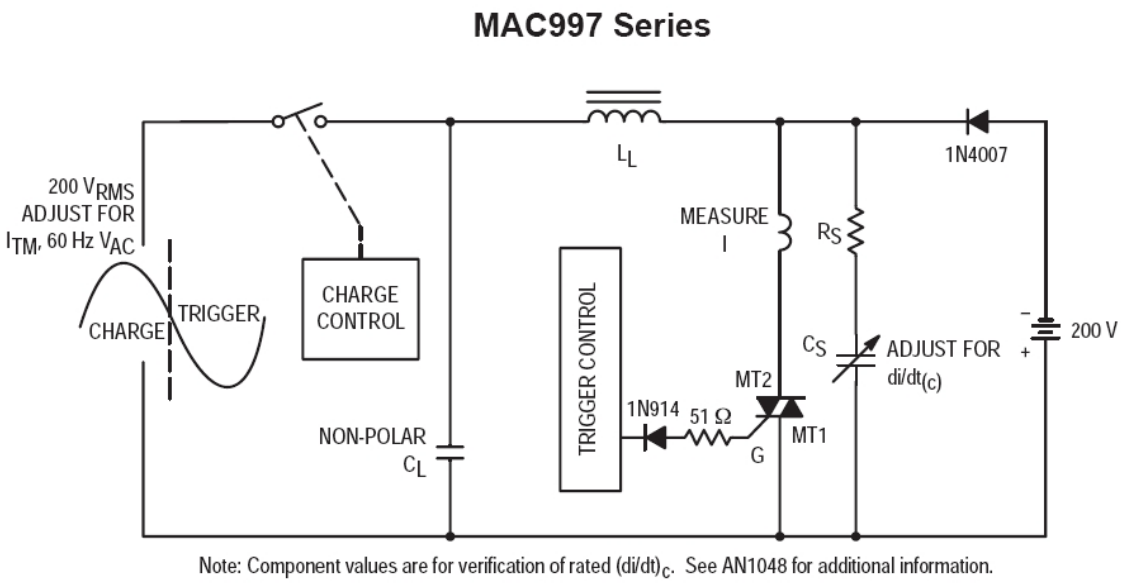

Note: Component values are for verification of rated $(di/dt)_c$. See AN1048 for additional information.

Figure 11. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Current $(di/dt)_c$