DIGITRON™ Semiconductors

High-reliability discrete products
and engineering services since 1977

MAC97(A)(B) 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, ½ sine wave 50 to 60Hz, gate open)			
MAC97-1, MAC97A-1, MAC97B-1	V_{DRM}	30	Volts
MAC97-2, MAC97A-2, MAC97B-2		60	
MAC97-3, MAC97A-3, MAC97B-3		100	
MAC97-4, MAC97A-4, MAC97B-4		200	
MAC97-5, MAC97A-5, MAC97B-5		300	
MAC97-6, MAC97A-6, MAC97B-6		400	
MAC97-7, MAC97A-7, MAC97B-7		500	
MAC97-8, MAC97A-8, MAC97B-8		600	
RMS on-state current (full sine wave, 50 to 60Hz, T_C = 50°C)	$I_{T(RMS)}$	0.6	Amps
Peak non-repetitive surge current (1 cycle, 60 Hz, T_C = 110°C)	I_{TSM}	8.0	Amps
Circuit fusing considerations (T_J = -40 to +110°C, t = 8.3ms)	I^2t	0.26	A^2s
Peak gate voltage (t ≤ 2.0µs)	V_{GM}	5.0	Volts
Peak gate power (t ≤ 2.0µs)	P_{GM}	5.0	Watts
Average gate power (T_C = 80°C, t = 8.3ms)	$P_{G(AV)}$	0.1	Watts
Peak gate current (t ≤ 2.0µs)	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} for all types can be applied on a continuous basis. Blocking voltage 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 [2] (Rated V_{DRM} @ T_J = 110°C)	I_{DRM}	-	-	0.1	mA
Peak on-state voltage (either direction) (I_{TM} = 0.85A peak, pulse width ≤ 2 ms, duty cycle ≤ 2%)	V_{TM}	-	-	1.9	Volts
Gate trigger voltage (continuous dc) (V_D = 12V, R_L = 100Ω)					
MT2(+),G(+)		-	-	2.0	
MT2(+),G(-)		-	-	2.0	
MT2(-),G(-)	V_{GT}	-	-	2.0	Volts
MT2(-),G(+)		-	-	2.5	
(V_D = Rated V_{DRM}, R_L = 10kΩ, T_J = 110°C)					
MT2(+),G(+); MT2(+),G(-); MT2(-),G(-)		0.1	-	-	
MT2(-),G(+)		0.1	-	-	
Holding current (either direction) (V_D = 12V, gate open, I_T = 200mA)	I_H	-	-	10	mA
Gate controlled turn on time (V_D = rated V_{DRM}, I_{TM} = 1.0A peak, I_G = 25mA)	t_{gt}	-	2.0	-	µs
Critical rate of rise of commutation voltage (V_D = Rated V_{DRM}, I_{TM} = 0.84µA peak, commutating di/dt = 0.32A/ms, gate unenergized, T_C = 50°C)	dv/dt(c)	-	5	-	V/µs
Critical rate of rise of off-state voltage (V_D = Rated V_{DRM}, exponential waveform, T_C = 110°C)	dv/dt	-	25	-	V/µs

Note 2: Ratings apply for open gate conditions. Thyristor devices shall not be tested with a constant current source for blocking voltage such that the voltage applied exceeds the rated blocking voltage.

Quadrant and polarity	MAC SERIES			Unit
	97	97A	97B	
I **MT2(+), G(+)**	10	5.0	3.0	mA
II **MT2(+), G(-)**	10	5.0	3.0	mA
III **MT2(-), G(-)**	10	5.0	3.0	mA
IV **MT2(-), G(+)**	10	7.0	5.0	mA

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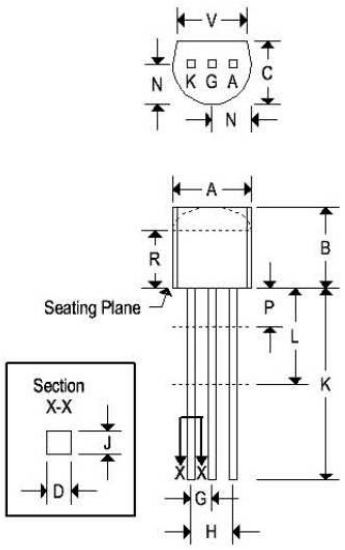
MECHANICAL CHARACTERISTICS

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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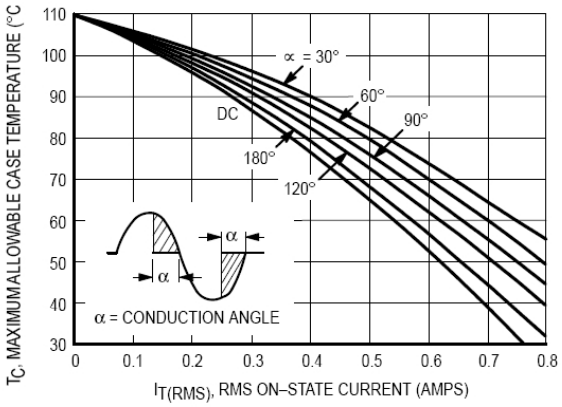

Figure 1. RMS Current Derating

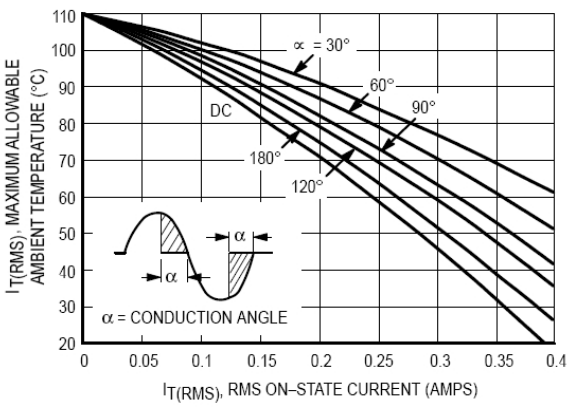

Figure 2. RMS Current Derating

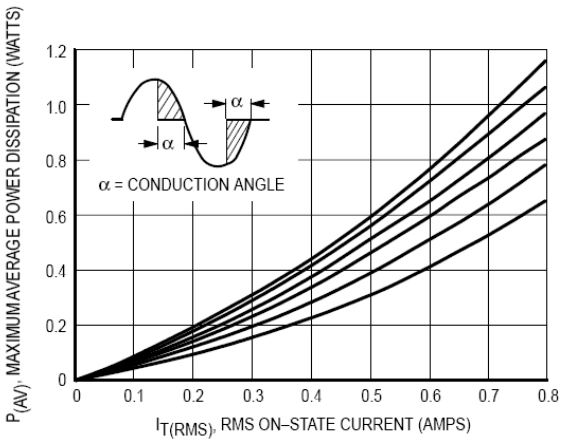

Figure 3. Power Dissipation

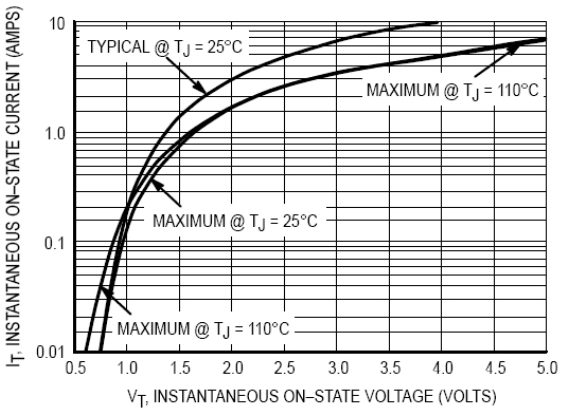

Figure 4. On–State Characteristics

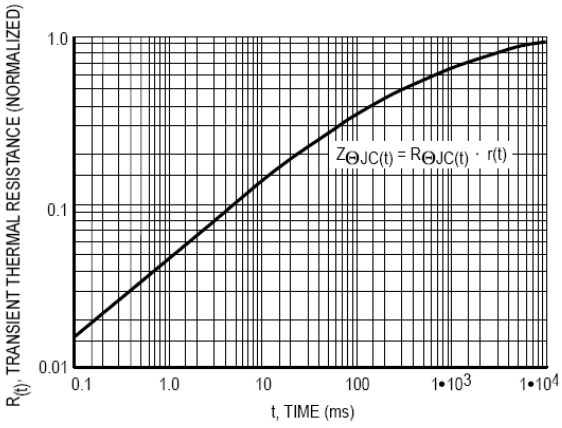

Figure 5. Transient Thermal Response

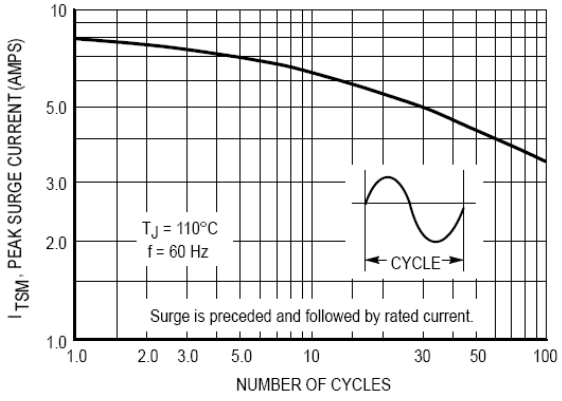

Figure 6. Maximum Allowable Surge Current

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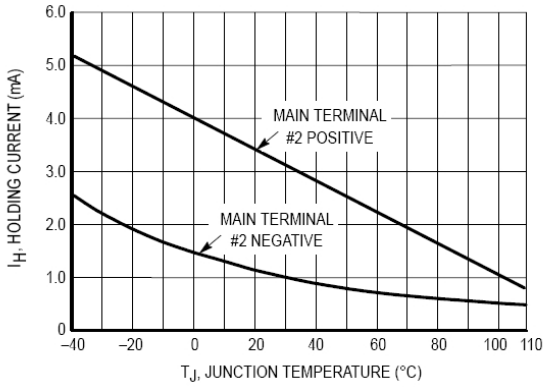


Figure 7. Typical Holding Current Variation

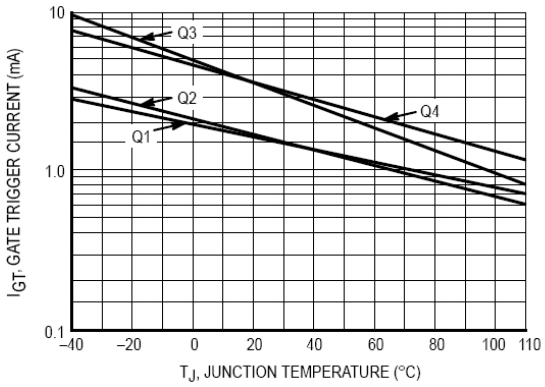


Figure 8. Typical Gate Trigger Current Variation

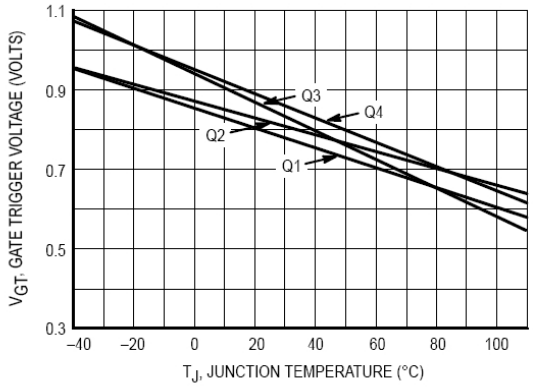


Figure 9. Gate Trigger Voltage Variation

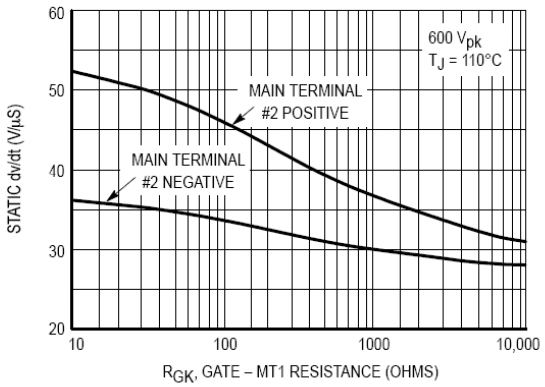


Figure 10. Exponential Static dv/dt versus Gate – MT1 Resistance

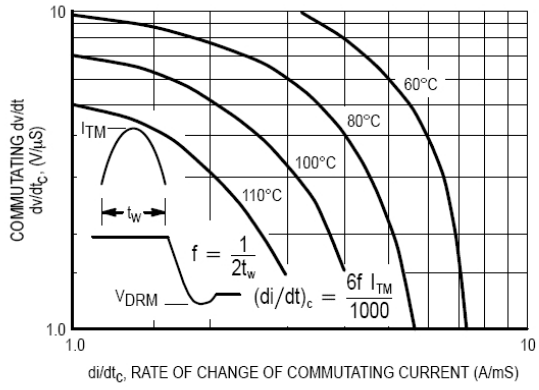


Figure 11. Typical Commutating dv/dt versus Current Crossing Rate and Junction Temperature

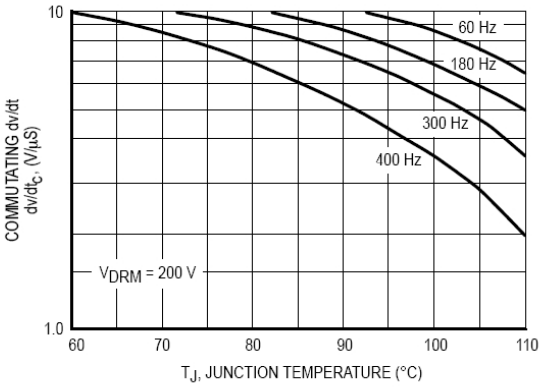
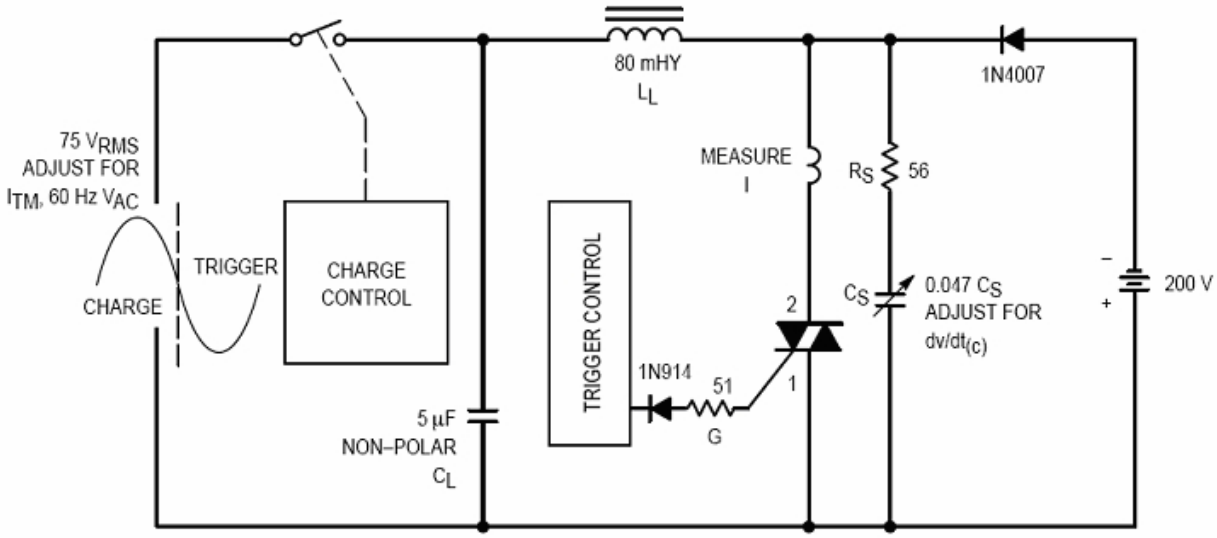


Figure 12. Typical Commutating dv/dt versus Junction Temperature at 0.8 Amps RMS



NOTE: Component values are for verification of rated $(dv/dt)_c$.

Figure 13. Simplified Q_1 $(dv/dt)_c$ Test Circuit