

# TRIACS

## Silicon Bidirectional Thyristors

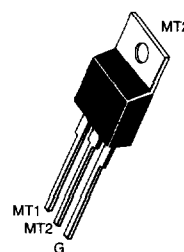
Designed for high performance full-wave ac control applications where high noise immunity and high commutating dv/dt are required.

- Blocking Voltage to 800 Volts
- On-State Current Rating of 8.0 Amperes RMS at 80°C
- Uniform Gate Trigger Currents in Three Modes
- High Immunity to dv/dt — up to 500 V/μs minimum at 125°C with the "G" Series
- High Commutating dv/dt(c) — 10 V/μs minimum at 70°C with the "G" Series
- Minimizes Snubber Networks for Protection
- Industry Standard TO-220AB Package

### MAC137 MAC137G SERIES\*

\*Motorola Preferred Devices

TRIACs  
8.0 AMPERES RMS  
500 THRU 800  
VOLTS



TO-220AB  
CASE 221A-04

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#### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

Ratings	Symbol	Value	Unit
Peak Repetitive Off-State Voltage, Note 1 (T <sub>J</sub> = -40 to 125°C, Gate Open, Half Sine Wave, 50 to 60 Hz)	V <sub>DRM</sub>	500 600 700 800	Volts
On-State RMS Current (One Full Cycle, 60 Hz, T <sub>C</sub> = 80°C)	I <sub>T(RMS)</sub>	8.0	Amps
Peak Non-Repetitive Surge Current (One Full Cycle, 60 Hz, T <sub>C</sub> = 125°C)	I <sub>TSM</sub>	60	Amps
Circuit Fusing Consideration (t = 8.3 ms)	I <sup>2</sup> t	15	A <sup>2</sup> sec
Peak Gate Power (Pulse Width ≤ 1.0 μs, T <sub>C</sub> = 80°C)	P <sub>GM</sub>	10	Watts
Average Gate Power (t = 8.3 ms, T <sub>C</sub> = 80°C)	P <sub>G(AV)</sub>	0.5	Watts
Operating Junction Temperature Range	T <sub>J</sub>	-40 to +125	°C
Storage Temperature Range	T <sub>stg</sub>	-40 to +150	°C

#### THERMAL CHARACTERISTICS

Thermal Resistance — Junction to Case	R <sub>θJC</sub>	2.0	°C/W
— Junction-to-Ambient	R <sub>θJA</sub>	62.5	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 5 sec.	T <sub>L</sub>	260	°C

Note 1: V<sub>DRM</sub> 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.

## MAC137 • MAC137G Series

### ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristics	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Peak Repetitive Forward Blocking Current (V <sub>D</sub> = Rated V <sub>DRM</sub> , Gate Open)	I <sub>DRM</sub>	—	—	0.1 2.0	mA
					T <sub>J</sub> = 25°C T <sub>J</sub> = 125°C
<b>ON CHARACTERISTICS</b>					
Peak On-State Voltage* (I <sub>TM</sub> = 10 A)	V <sub>TM</sub>	—	—	1.6	Volts
Continuous Gate Trigger Current (V <sub>D</sub> = 12 V, R <sub>L</sub> = 12 Ω)	I <sub>GT</sub>	—	—	35 50 70 100	mA
MT2(+), G(+); MT2(+), G(-); MT2(-), G(-)	MAC137 Series				
MT2(+), G(+); MT2(+), G(-); MT2(-), G(-)	MAC137G Series				
MT2(-), G(+)	MAC137 Series				
MT2(-), G(+)	MAC137G Series				
Hold Current (V <sub>D</sub> = 12 V, Gate Open, Initiating Current = ±150 mA)	I <sub>H</sub>	—	—	20	mA
Latch Current (V <sub>D</sub> = 24 V, I <sub>G</sub> = 100 mA)	I <sub>L</sub>	—	—	30 100 110 45 60	mA
MT2(+), G(+); MT2(+), G(-)	All Types				
MT2(+), G(-)	MAC137 Series				
MT2(+), G(-)	MAC137G Series				
MT2(-), G(+)	MAC137 Series				
MT2(-), G(+)	MAC137G Series				
Gate Trigger Voltage (V <sub>D</sub> = 12 V, R <sub>L</sub> = 12 Ω) All Modes	V <sub>GT</sub>	—	—	1.5	Volts
<b>DYNAMIC CHARACTERISTICS</b>					
Critical Rate of Rise of Commutation Voltage (V <sub>D</sub> = Rated V <sub>DRM</sub> , Commutating di/dt = 3.4 A/μs, Gate Open, T <sub>C</sub> = 70°C)	dv/dt(c)	— 10	10 —	— —	V/μs
					MAC137 Series MAC137G Series
Critical Rate of Rise of Off-State Voltage (V <sub>D</sub> = Rated V <sub>DRM</sub> , Exponential Waveform, Gate Open, T <sub>C</sub> = 125°C)	dv/dt	200 500	— —	— —	V/μs
					MAC137 Series MAC137G Series

\*Indicates Pulse Test: Pulse Width ≤ 2.0 ms, Duty Cycle ≤ 2%.

MAC137 • MAC137G Series

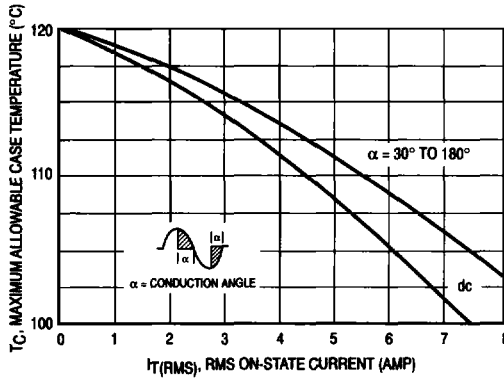


Figure 1. Current Derating

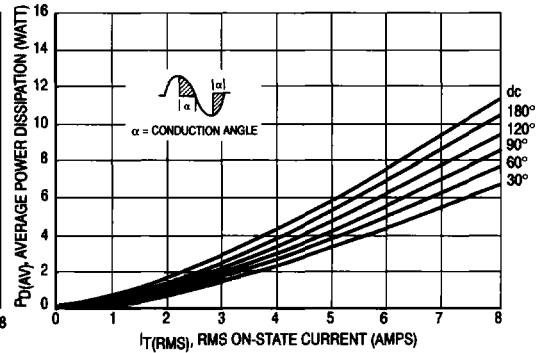


Figure 2. Power Dissipation

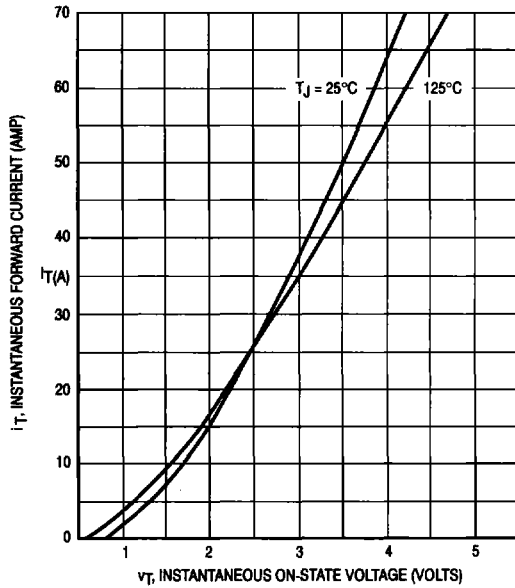
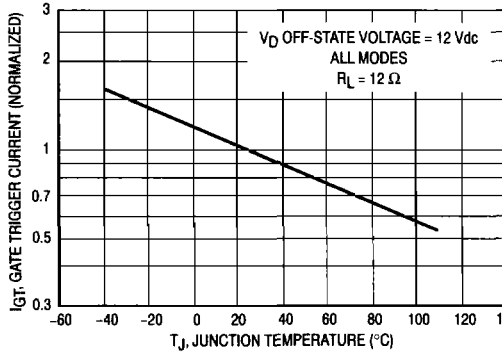
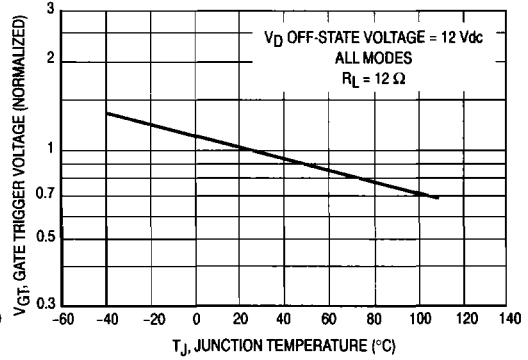


Figure 3. Maximum On-State Characteristics

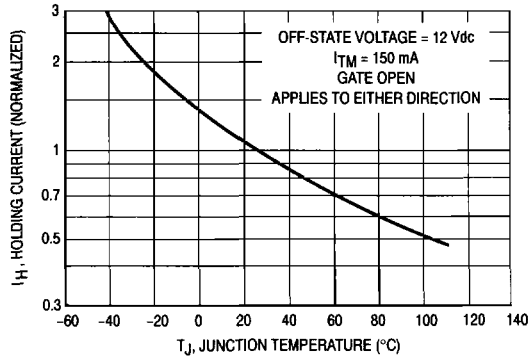
## MAC137 • MAC137G Series



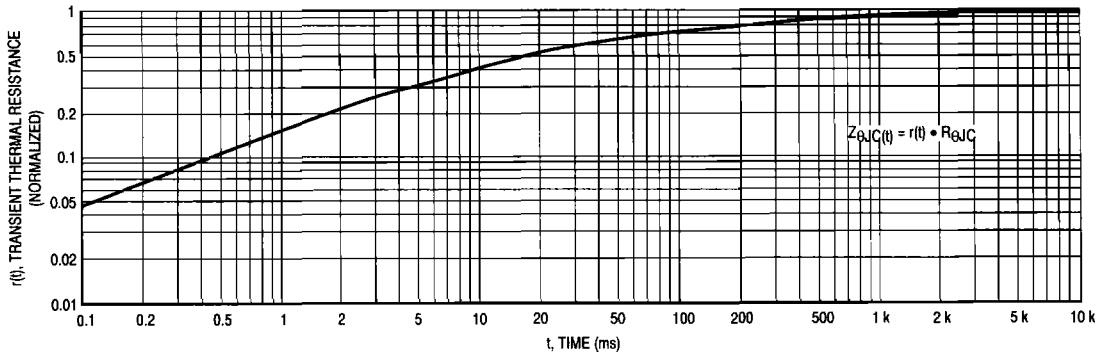
**Figure 4. Typical Gate Trigger Current**



**Figure 5. Typical Gate Trigger Voltage**



**Figure 6. Typical Holding Current**



**Figure 7. Thermal Response**

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MAC137 • MAC137G Series

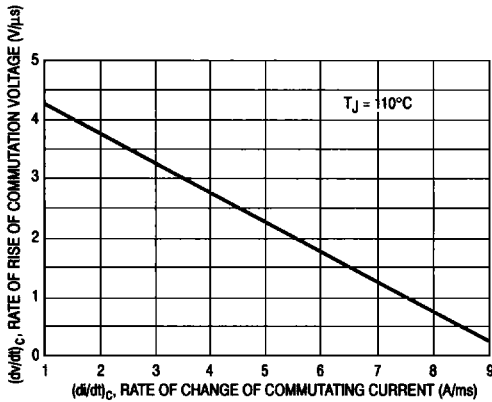


Figure 8. Critical Rate of Rise of Commutation Voltage versus Rate of Change of Current

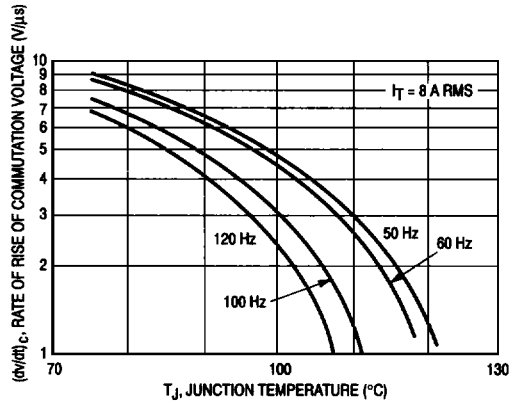


Figure 9. Minimum Commutating  $dv/dt$  versus Junction Temperature

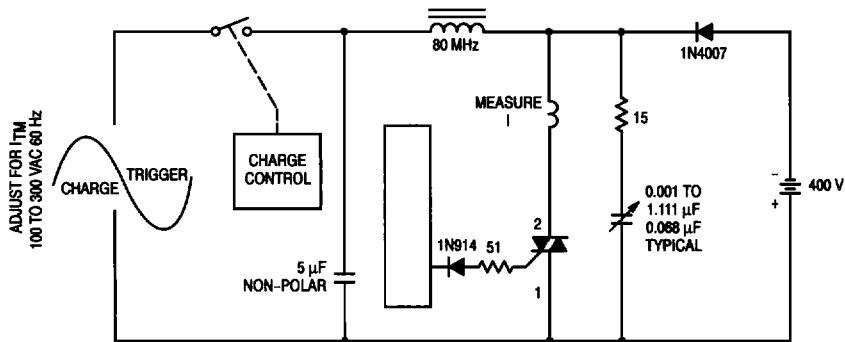


Figure 10. Simplified Q1  $(dv/dt)_c$  Test Circuit  
(See AN1048 for Additional Information)

Characteristic	Symbol	Min	Unit
Critical Rate of Rise of Commutation Voltage $f = 250 \text{ Hz}$ , $I_{TM} = 2.26 \text{ A}$ , $(di/dt)_c = 3.39 \text{ A/ms}$ On-State Current Duration = 2.0 ms, $V_{DRM} = 400 \text{ V}$ $T_{case} = 110^\circ\text{C}$ Gate Unenergized Gate Source Resistance = 150 $\Omega$	$dv/dt(c)$	3.0	V/ $\mu\text{s}$

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