ON Semiconductor

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MAC4SM, MAC4SN

Preferred Device

Sensitive Gate Triacs

Silicon Bidirectional Thyristors

Designed for industrial and consumer applications for full wave control of ac loads such as appliance controls, heater controls, motor controls, and other power switching applications.

- Sensitive Gate Allows Triggering by Microcontrollers and other Logic Circuits
- High Immunity to dv/dt — 50 V/μs Minimum at 125°C
- Commutating di/dt — 3.0 A/ms Minimum at 125°C
- Minimum and Maximum Values of I_{GT}, V_{GT} and I_H Specified for Ease of Design
- On-State Current Rating of 4 Amperes RMS at 100°C
- High Surge Current Capability — 40 Amperes
- Blocking Voltage to 800 Volts
- Rugged, Economical TO220AB Package
- Operational in Three Quadrants: Q1, Q2, and Q3
- Device Marking: Logo, Device Type, e.g., MAC4SM, Date Code

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off−State Voltage[1] (T_J = −40 to 125°C, Sine Wave, 50 to 60 Hz, Gate Open) MAC4SM MAC4SN	V_{DRM}, V_{RRM}	 600 800	Volts
On-State RMS Current (Full Cycle Sine Wave, 60 Hz, T_C = 100°C)	$I_{T(RMS)}$	4.0	Amps
Peak Non-Repetitive Surge Current (One Full Cycle, 60 Hz, T_J = 125°C)	I_{TSM}	40	Amps
Circuit Fusing Consideration (t = 8.33 ms)	I^2t	6.6	A^2sec
Peak Gate Power (Pulse Width ≤ 1.0 μs, T_C = 100°C)	P_{GM}	0.5	Watt
Average Gate Power (t = 8.3 ms, T_C = 100°C)	$P_{G(AV)}$	0.1	Watt
Operating Junction Temperature Range	T_J	−40 to +125	°C
Storage Temperature Range	T_{stg}	−40 to +150	°C

(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.

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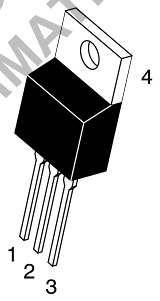
TRIACS
4 AMPERES RMS
600 thru 800 VOLTS



TO−220AB
CASE 221A
STYLE 4

PIN ASSIGNMENT	
1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	Main Terminal 2

ORDERING INFORMATION

Device	Package	Shipping
MAC4SM	TO220AB	50 Units/Rail
MAC4SN	TO220AB	50 Units/Rail

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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance — Junction to Case — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.2 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 10 Seconds	T_L	260	°C

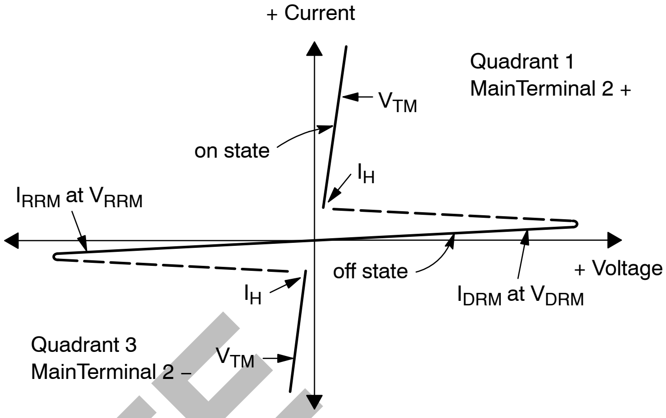
ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted; Electricals apply in both directions)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Peak Repetitive Blocking Current (V_D = Rated V_{DRM}, V_{RRM}; Gate Open) T_J = 25°C T_J = 125°C	I_{DRM}, I_{RRM}	 — —	 — —	 0.01 2.0	mA
ON CHARACTERISTICS					
Peak On-State Voltage(1) (I_{TM} = ±6.0 A)	V_{TM}	—	1.3	1.6	V
Gate Trigger Current (Continuous dc) (V_D = 12 V, R_L = 100 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)	I_{GT}	 2.9 2.9 2.9	 4.0 4.7 6.0	 10 10 10	mA
Holding Current (V_D = 12 V, Gate Open, Initiating Current = ±200 mA)	I_H	2.0	5.0	15	mA
Latching Current (V_D = 12 V, I_G = 10 mA) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)	I_L	 — — —	 6.0 15 6.0	 30 30 30	mA
Gate Trigger Voltage (Continuous dc) (V_D = 12 V, R_L = 100 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)	V_{GT}	 0.5 0.5 0.5	 0.7 .65 0.7	 1.3 1.3 1.3	V
DYNAMIC CHARACTERISTICS					
Rate of Change of Commutating Current (V_D = 400 V, I_{TM} = 3.5 A, Commutating dv/dt = 10 V/μs, Gate Open, T_J = 125°C, f = 500 Hz, C_L = 5.0 μF, L_L = 20 mH, No Snubber)	$(di/dt)_c$	3.0	4.0	—	A/ms
Critical Rate of Rise of Off-State Voltage (V_D = 0.67 x Rated V_{DRM}, Exponential Waveform, Gate Open, T_J = 125°C)	dv/dt	50	150	—	V/μs
Repetitive Critical Rate of Rise of On-State Current IPK = 50 A; PW = 40 μsec; diG/dt = 200 mA/μsec; f = 60 Hz	di/dt	—	—	10	A/μs

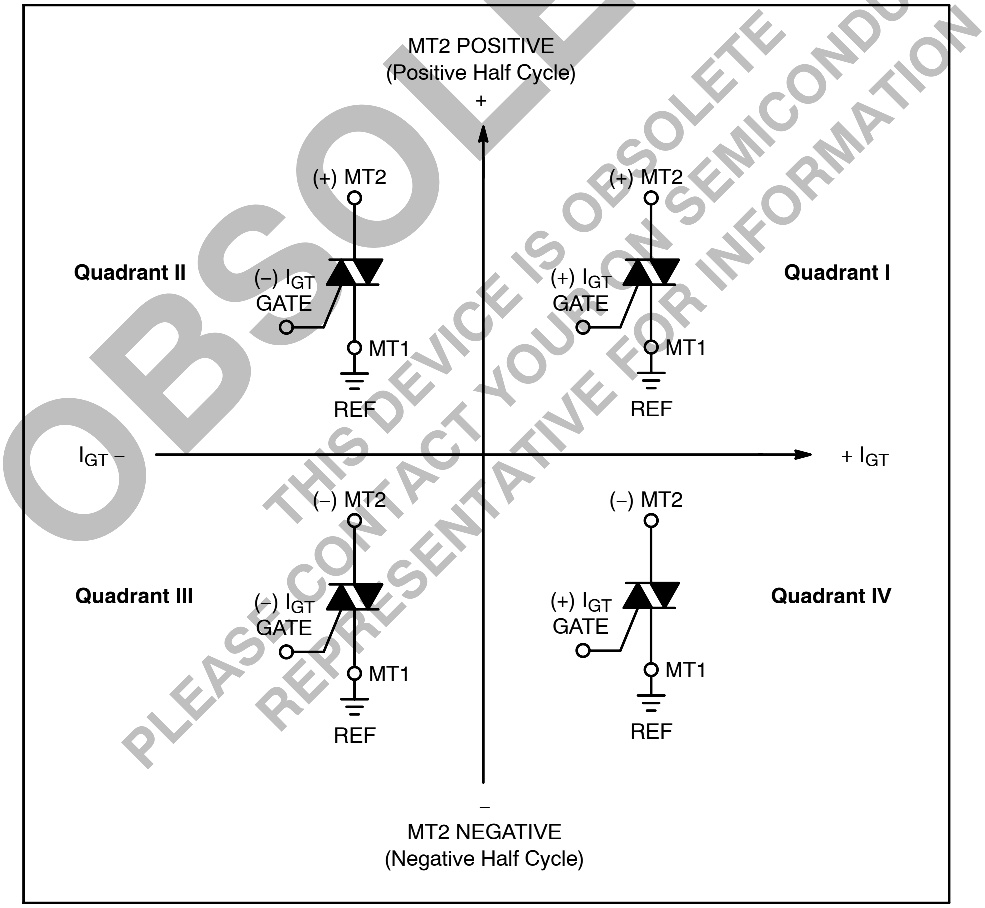
(1) Pulse Test: Pulse Width ≤ 2.0 ms, Duty Cycle ≤ 2%.

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.

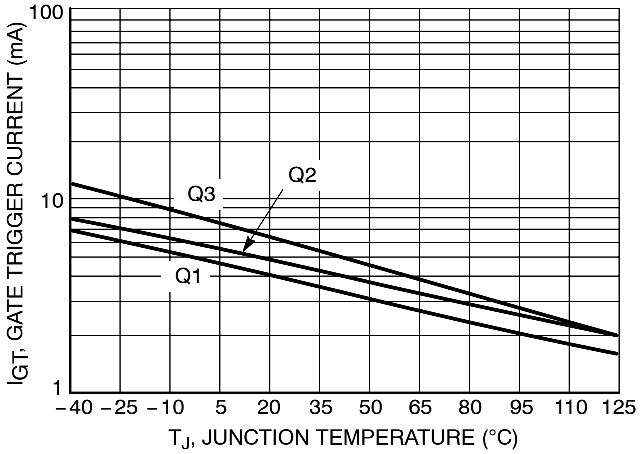


Figure 1. Typical Gate Trigger Current versus Junction Temperature

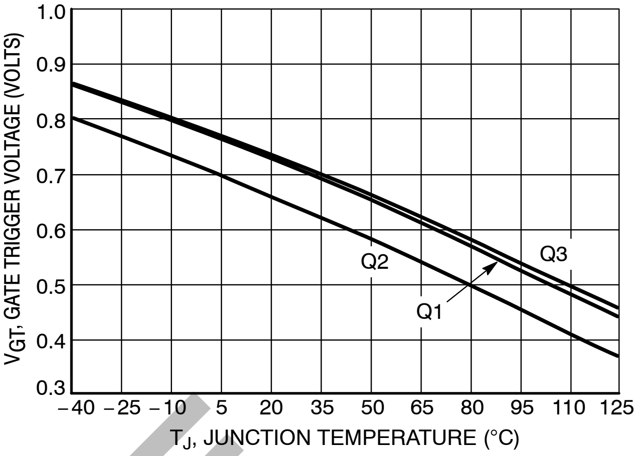


Figure 2. Typical Gate Trigger Voltage versus Junction Temperature

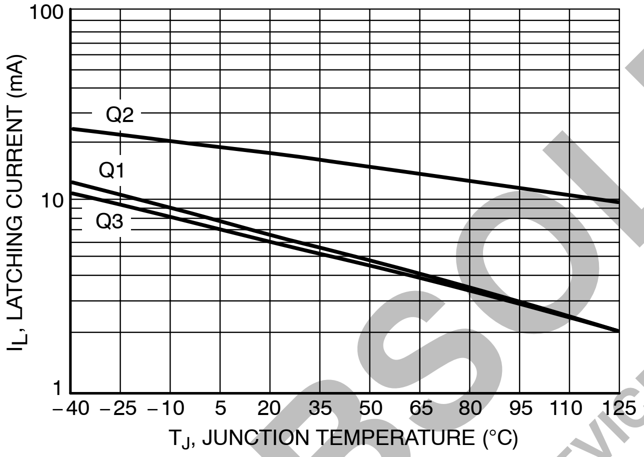


Figure 3. Typical Latching Current versus Junction Temperature

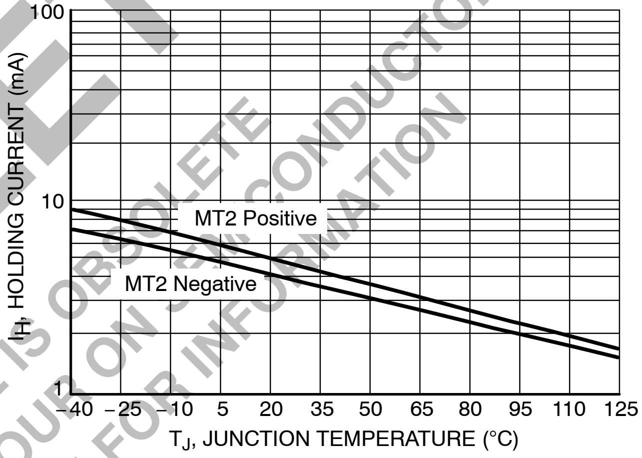


Figure 4. Typical Holding Current versus Junction Temperature

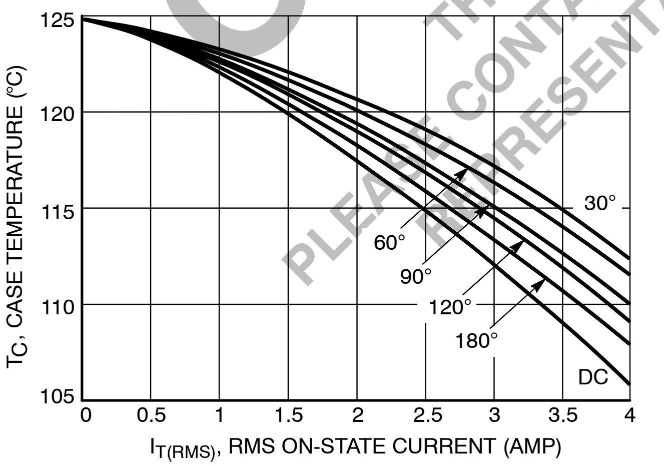


Figure 5. Typical RMS Current Derating

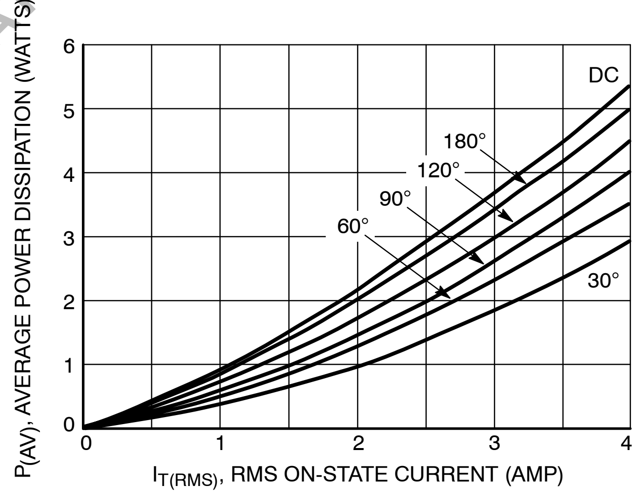


Figure 6. On-State Power Dissipation

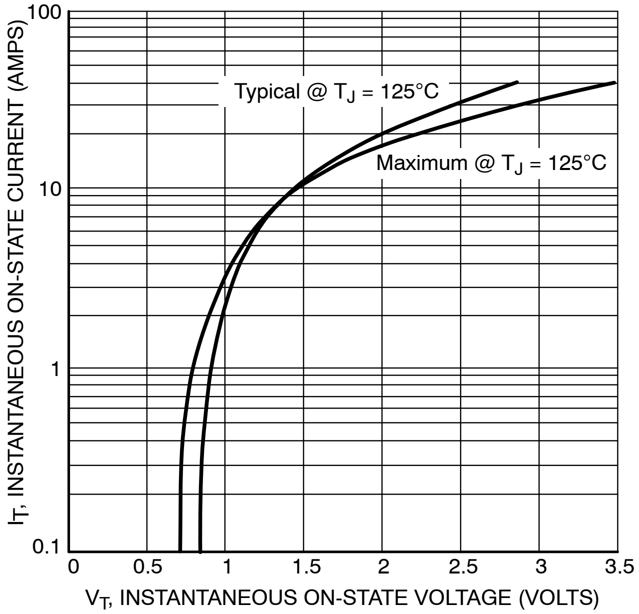


Figure 7. Typical On-State Characteristics

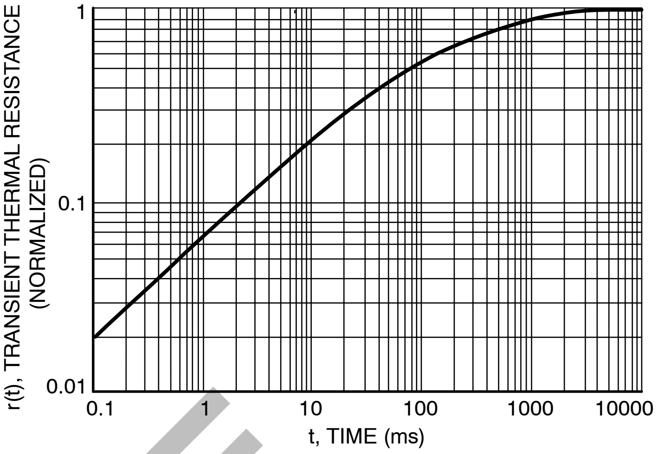


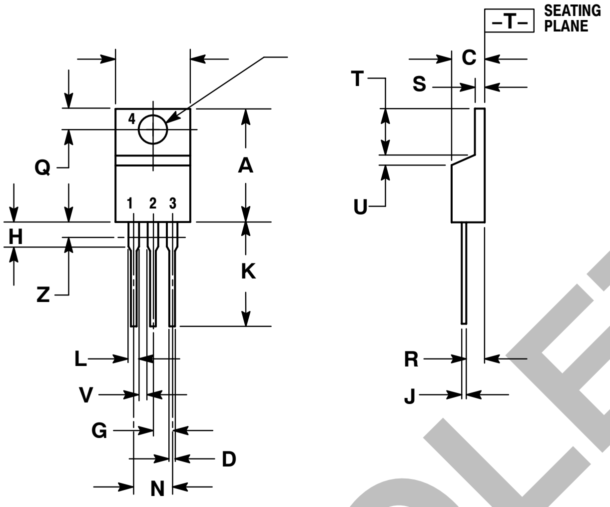
Figure 8. Typical Thermal Response

PACKAGE DIMENSIONS

TO−220AB

CASE 221A−09

ISSUE Z



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	**MIN**	**MAX**	**MIN**	**MAX**
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	−−−	1.15	−−−
Z	−−−	0.080	−−−	2.04

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

OBSOLETE
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