MAC228A Series

Preferred Device

Sensitive Gate Triacs

Silicon Bidirectional Thyristors

Designed primarily 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.

Features

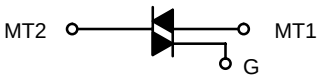
- Pb−Free Packages are Available
- Sensitive Gate Triggering in 3 Modes for AC Triggering on Sinking Current Sources
- Four Mode Triggering for Drive Circuits that Source Current
- All Diffused and Glass−Passivated Junctions for Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance and High Heat Dissipation
- Center Gate Geometry for Uniform Current Spreading

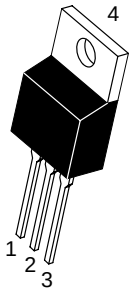
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ON Semiconductor®

http://onsemi.com

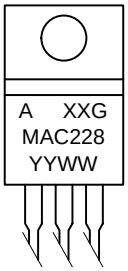
TRIACS
8 AMPERES RMS
200 − 800 VOLTS





TO−220AB
CASE 221A
STYLE 4

MARKING DIAGRAM



X = 4, 6, 8, or 10
YY = Year
WW = Work Week
G = Pb−Free

ORDERING INFORMATION

Device	Package	Shipping†
MAC228A4	TO−220	500 Units/Box
MAC228A6	TO−220	500 Units/Box
MAC228A8	TO−220	500 Units/Box
MAC228A8G	TO−220 (Pb−Free)	500 Units/Box
MAC228A10	TO−220	500 Units/Box
MAC228A10G	TO−220 (Pb−Free)	500 Units/Box

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

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

Characteristic		Symbol	Value	Unit
Peak Repetitive Off−State Voltage, (Note 1) (T_J = −40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open)	MAC228A4 MAC228A6 MAC228A8 MAC228A10	V_{DRM}, V_{RRM}	 200 400 600 800	V
On-State RMS Current, (T_C = 80°C) − Full Cycle Sine Wave 50 to 60 Hz		$I_{T(RMS)}$	8.0	A
Peak Non−Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, T_J = 110°C)		I_{TSM}	80	A
Circuit Fusing Considerations, (t = 8.3 ms)		I^2t	26	A^2s
Peak Gate Current, (t ≤ 2 μs, T_C = 80°C)		I_{GM}	±2.0	A
Peak Gate Voltage, (t ≤ 2 μs, T_C = 80°C)		V_{GM}	±10	V
Peak Gate Power, (t ≤ 2 μs, T_C = 80°C)		P_{GM}	20	W
Average Gate Power, (t ≤ 8.3 ms, T_C = 80°C)		$P_{G(AV)}$	0.5	W
Operating Junction Temperature Range		T_J	−40 to 110	°C
Storage Temperature Range		T_{stg}	−40 to 150	°C
Mounting Torque		−	8.0	in lb

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

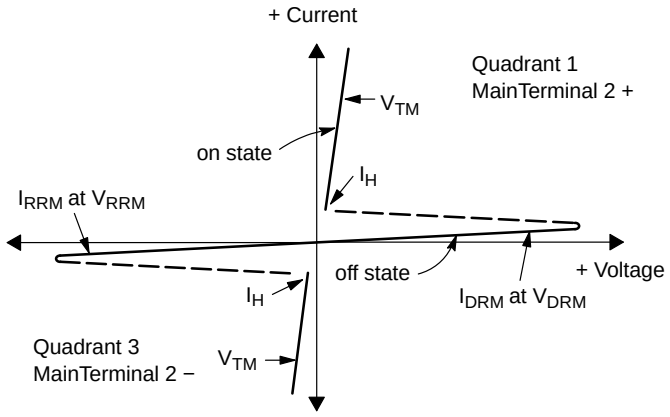
Characteristic	Symbol	Value	Unit
Thermal Resistance − Junction−to−Case	$R_{\theta JC}$	2.0	°C/W
Thermal Resistance − Junction−to−Ambient	$R_{\theta JA}$	62.5	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 10 Seconds	T_L	260	°C

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

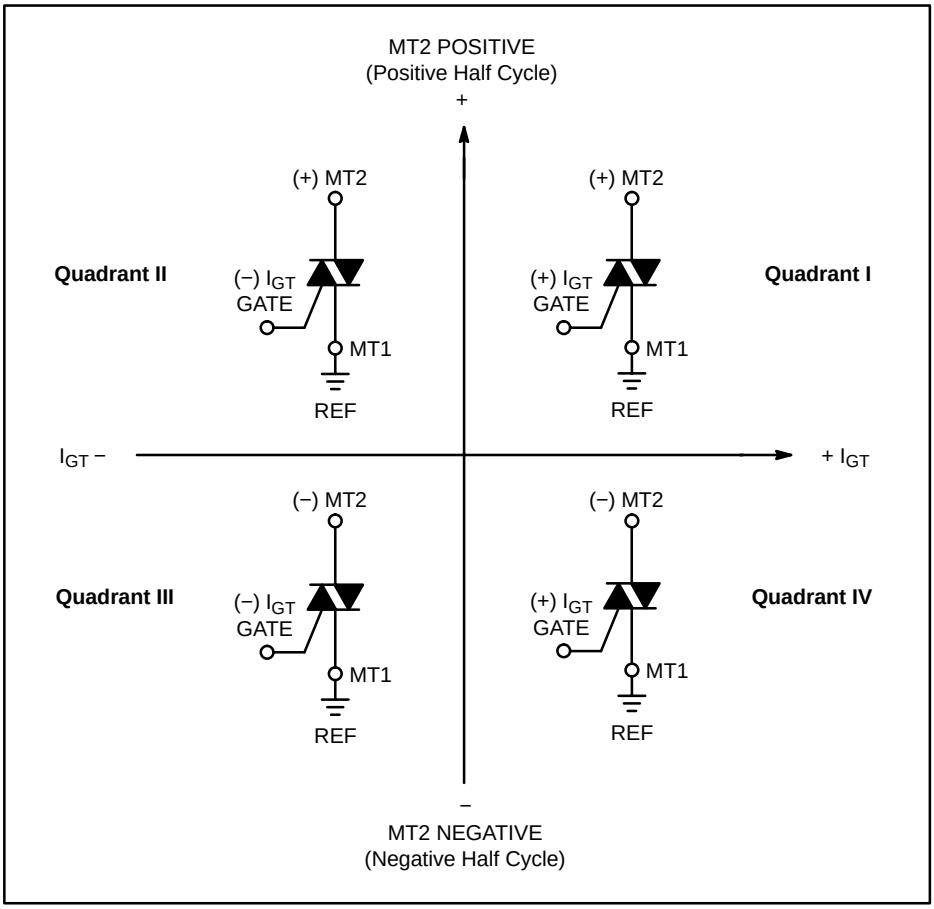
Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Peak Repetitive Blocking Current, (V_D = Rated V_{DRM}, V_{RRM}; Gate Open)	T_J = 25°C T_J = 110°C	I_{DRM}, I_{RRM}	− −	− −	10 2.0	μA mA
ON CHARACTERISTICS						
Peak On-State Voltage, (I_{TM} = ±11 A Peak, Pulse Width ≤ 2 ms, Duty Cycle ≤ 2%)		V_{TM}	−	−	1.8	V
Gate Trigger Current (Continuous DC), (V_D = 12 V, R_L = 100 Ω) MT2(+), G(+); MT2(+), G(−); MT2(−), G(−) MT2(−), G(+)		I_{GT}	 − −	 − −	 5.0 10	mA
Gate Trigger Voltage (Continuous DC), (V_D = 12 V, R_L = 100 Ω) MT2(+), G(+); MT2(+), G(−); MT2(−), G(−) MT2(−), G(+)		V_{GT}	 − −	 − −	 2.0 2.5	V
Gate Non−Trigger Voltage (Continuous DC), (V_D = 12 V, T_C = 110°C, R_L = 100 Ω) All Four Quadrants		V_{GD}	0.2	−	−	V
Holding Current, (V_D = 12 Vdc, Initiating Current = ±200 mA, Gate Open)		I_H	−	−	15	mA
Gate−Controlled Turn−On Time, (V_D = Rated V_{DRM}, I_{TM} = 16 A Peak, I_G = 30 mA)		t_{gt}	−	1.5	−	μs
DYNAMIC CHARACTERISTICS						
Critical Rate of Rise of Off-State Voltage, (V_D = Rated V_{DRM}, Exponential Waveform, T_C = 110°C)		dv/dt	−	25	−	V/μs
Critical Rate of Rise of Commutation Voltage, (V_D = Rated V_{DRM}, I_{TM} = 11.3 A, Commutating di/dt = 4.1 A/ms, Gate Unenergized, T_C = 80°C)		dv/dt(c)	−	5.0	−	V/μs

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.

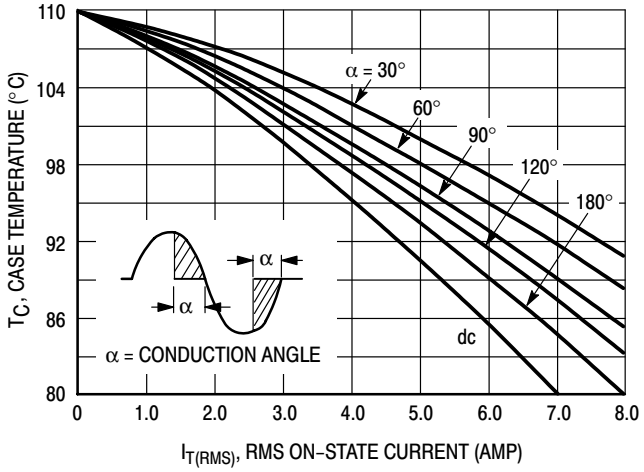


Figure 1. RMS Current Derating

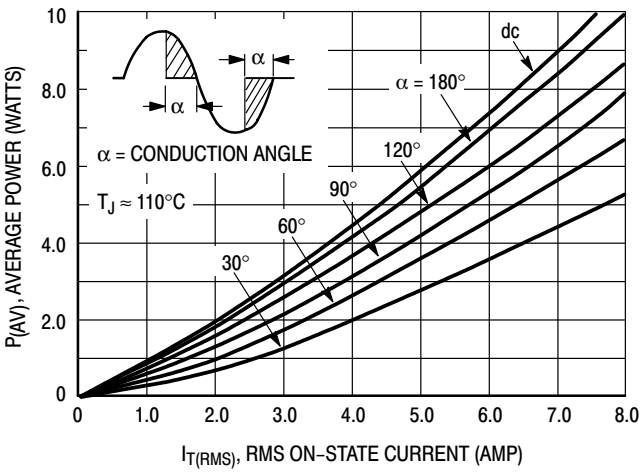
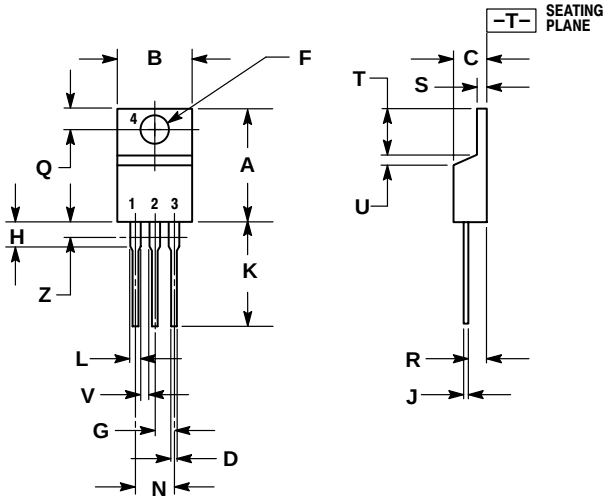


Figure 2. On−State Power Dissipation

PACKAGE DIMENSIONS

TO−220
PLASTIC
CASE 221A−09
ISSUE AA



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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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MAC228A/D