MAC15 Series

Triacs

Silicon Bidirectional Thyristors

Designed primarily for full-wave ac control applications, such as solid−state relays, motor controls, heating controls and power supplies; or wherever full−wave silicon gate controlled solid−state devices are needed. Triac type thyristors switch from a blocking to a conducting state for either polarity of applied main terminal voltage with positive or negative gate triggering.

Features

- Blocking Voltage to 800 V
- All Diffused and Glass Passivated Junctions for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance, High Heat Dissipation and Durability
- Gate Triggering Guaranteed in Three Modes (MAC15 Series) or Four Modes (MAC15A Series)
- These Devices are Pb−Free and are RoHS Compliant*

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

Rating	Symbol	Value	Unit
Peak Repetitive Off−State Voltage Note 1 (T_J = −40 to +125°C, Sine Wave 50 to 60 Hz, Gate Open) MAC15A6G MAC15−8G, MAC15A8G MAC15−10G, MAC15A10G	V_{DRM}, V_{RRM}	 400 600 800	V
Peak Gate Voltage (Pulse Width ≤ 1.0 μsec; T_C = 90°C)	V_{GM}	10	V
On−State Current RMS; Full Cycle Sine Wave 50 to 60 Hz (T_C = +90°C)	$I_{T(RMS)}$	15	A
Circuit Fusing Consideration (t = 8.3 ms)	I^2t	93	A^2s
Peak Non−Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, T_C = +80°C) Preceded and Followed by Rated Current	I_{TSM}	150	A
Peak Gate Power (T_C = +80°C, Pulse Width = 1.0 μs)	P_{GM}	20	W
Average Gate Power (T_C = +80°C, t = 8.3 ms)	$P_{G(AV)}$	0.5	W
Peak Gate Current (Pulse Width ≤ 1.0 μsec; T_C = 90°C)	I_{GM}	2.0	A
Operating Junction Temperature Range	T_J	−40 to +125	°C
Storage Temperature Range	T_{stg}	−40 to +150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

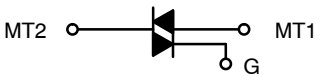
1. V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

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

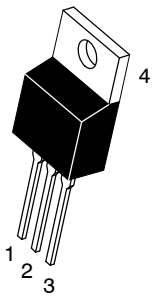
ON Semiconductor®

http://onsemi.com

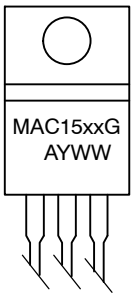
TRIACS
15 AMPERES RMS
400 thru 800 VOLTS



MARKING DIAGRAM



TO−220AB
CASE 221A
STYLE 4



MAC15xx = Specific Device Code
xx = See Table on Page 2
A = Assembly Location (Optional)*
Y = Year
WW = Work Week
G = Pb−Free Package

* The Assembly Location code (A) is optional. In cases where the Assembly Location is stamped on the package the assembly code may be blank.

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

ORDERING INFORMATION

See detailed ordering, marking, and shipping information in the package dimensions section on page 2 of this data sheet.

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 Blocking Current (V_D = Rated V_{DRM}, V_{RRM}; Gate Open)	T_J = 25°C T_J = 125°C	I_{DRM}, I_{RRM}	− −	− −	10 2.0	μA mA
ON CHARACTERISTICS						
Peak On−State Voltage Note 2 (I_{TM} = ±21 A Peak)		V_{TM}	−	1.3	1.6	V
Gate Trigger Current (Continuous dc) (V_D = 12 Vdc, R_L = 100 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−) MT2(−), G(+) “A” SUFFIX ONLY		I_{GT}	 − − − −	 − − − −	 50 50 50 75	mA
Gate Trigger Voltage (Continuous dc) (V_D = 12 Vdc, R_L = 100 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−) MT2(−), G(+) “A” SUFFIX ONLY		V_{GT}	 − − − −	 0.9 0.9 1.1 1.4	 2 2 2 2.5	V
Gate Non−Trigger Voltage (V_D = 12 V, R_L = 100 Ω) T_J = 110°C) MT2(+), G(+); MT2(−), G(−); MT2(+), G(−) MT2(−), G(+) “A” SUFFIX ONLY		V_{GD}	 0.2 0.2	 − −	 − −	V
Holding Current (V_D = 12 Vdc, Gate Open, Initiating Current = ±200 mA)		I_H	−	6.0	40	mA
Turn-On Time (V_D = Rated V_{DRM}, I_{TM} = 17 A) (I_{GT} = 120 mA, Rise Time = 0.1 μs, Pulse Width = 2 μs)		t_{gt}	−	1.5	−	μs
DYNAMIC CHARACTERISTICS						
Critical Rate of Rise of Commutation Voltage (V_D = Rated V_{DRM}, I_{TM} = 21 A, Commutating di/dt = 7.6 A/ms, Gate Unenergized, T_C = 80°C)		dv/dt(c)	−	5.0	−	V/μs

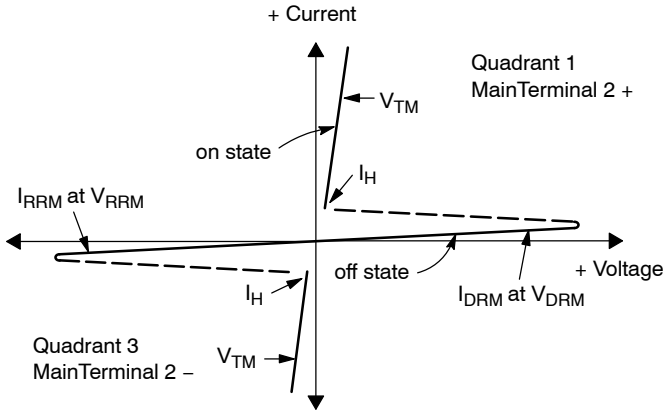
2. Pulse Test: Pulse Width ≤ 2.0 ms, Duty Cycle ≤ 2%.

ORDERING INFORMATION

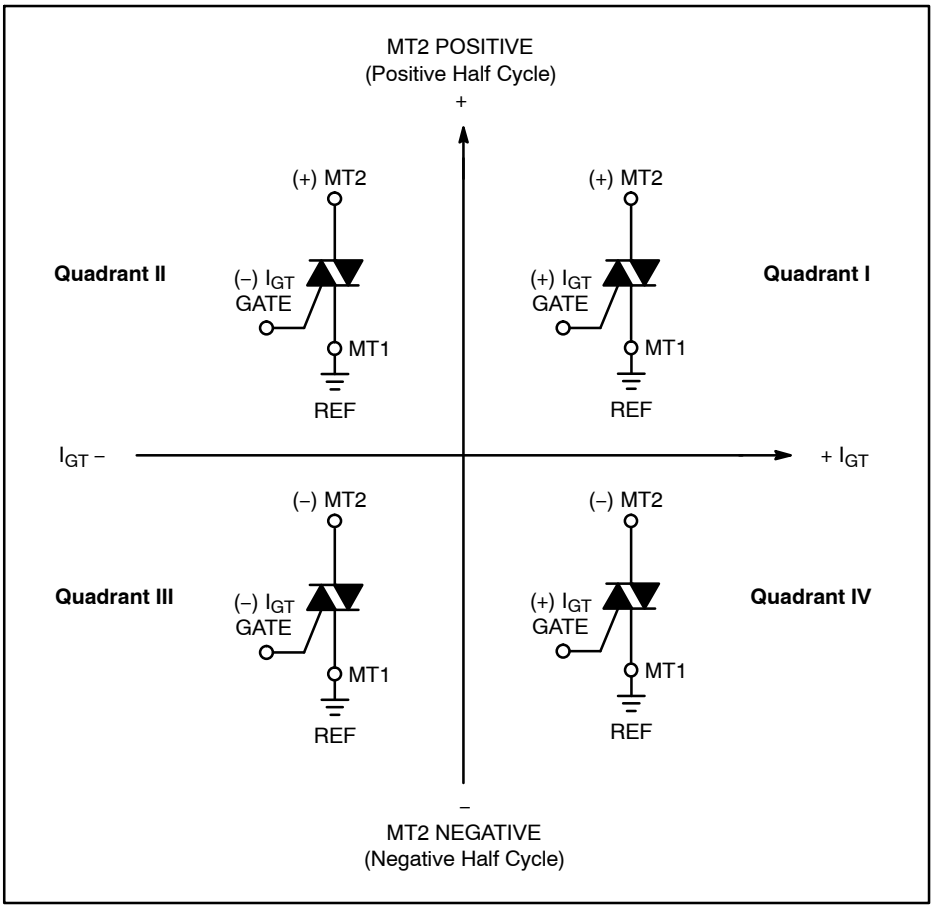
Device	Device Marking	Package	Shipping
MAC15−8G	MAC15−8	TO−220AB (Pb−Free)	500 Units Bulk
MAC15−10G	MAC1510	TO−220AB (Pb−Free)	
MAC15A6G	MAC15A6	TO−220AB (Pb−Free)	
MAC15A8G	MAC15A8	TO−220AB (Pb−Free)	
MAC15A10G	MAC15A10	TO−220AB (Pb−Free)	

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.

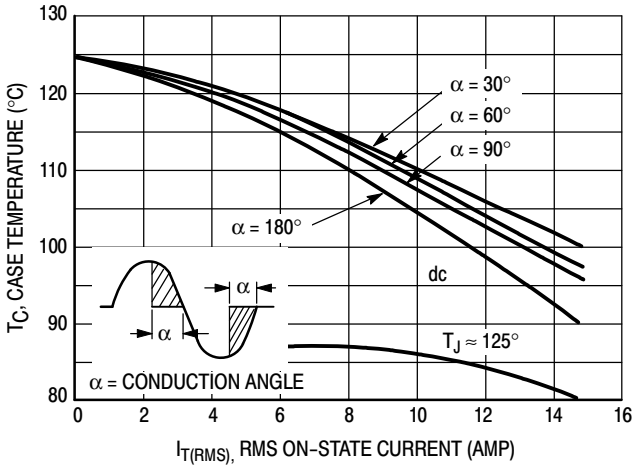


Figure 1. RMS Current Derating

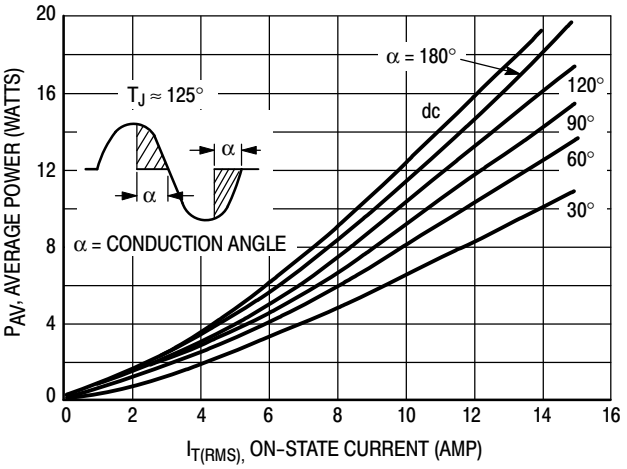


Figure 2. On−State Power Dissipation

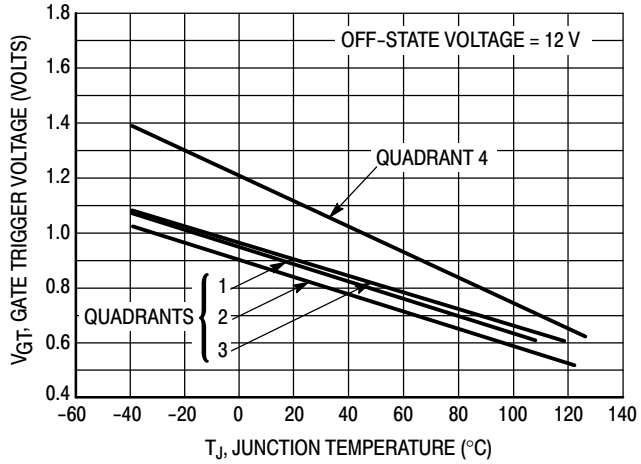


Figure 3. Typical Gate Trigger Voltage

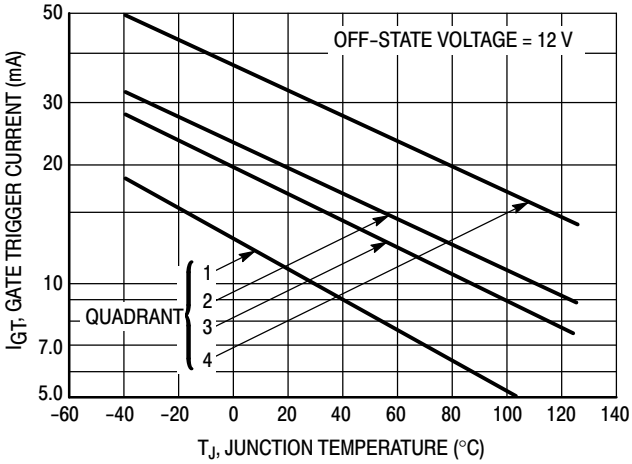


Figure 4. Typical Gate Trigger Current

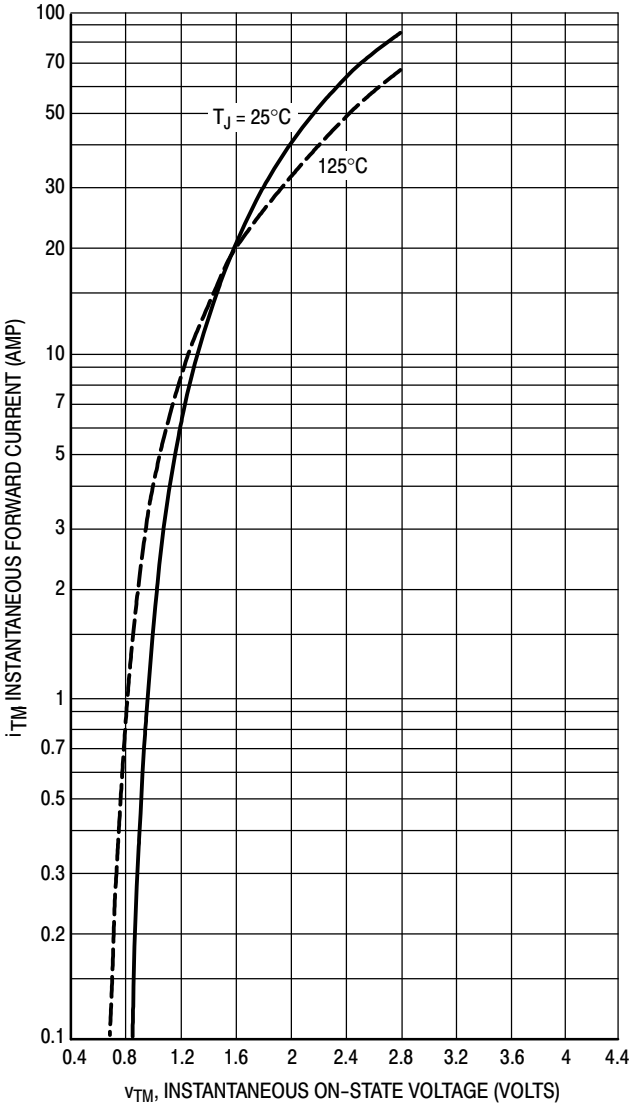


Figure 5. On−State Characteristics

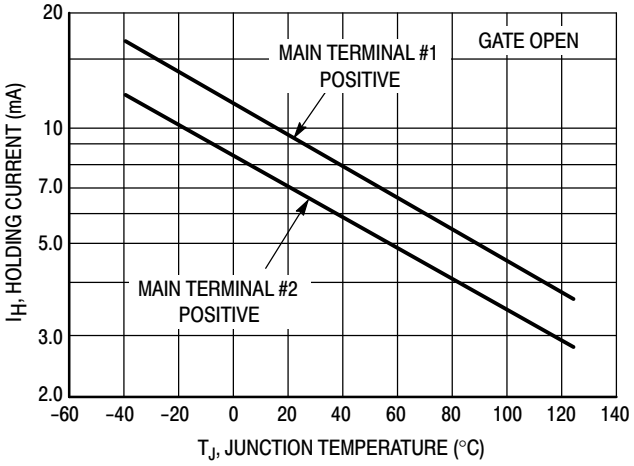


Figure 6. Typical Holding Current

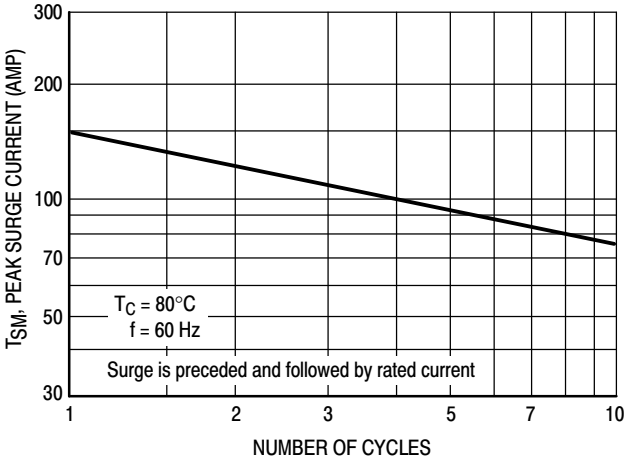


Figure 7. Maximum Non−Repetitive Surge Current

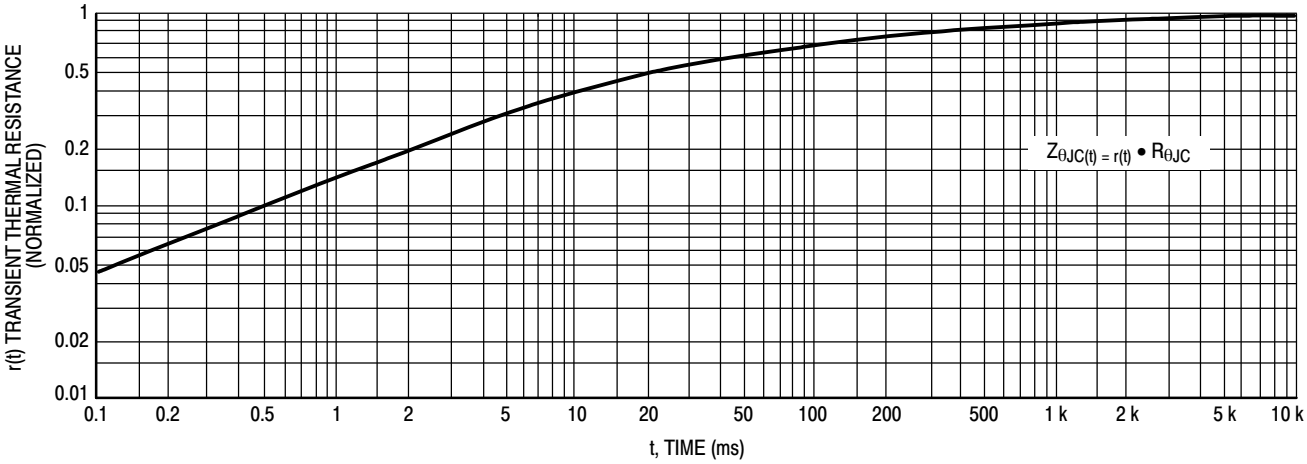
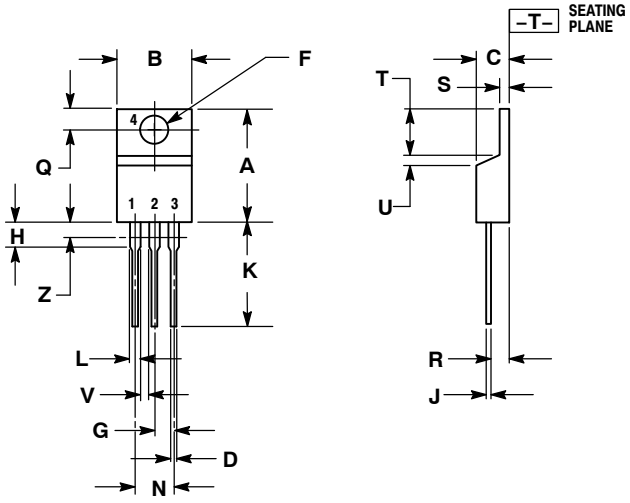


Figure 8. Thermal Response

PACKAGE DIMENSIONS

TO−220
CASE 221A−09
ISSUE AG



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	0.036	0.64	0.91
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.025	0.36	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:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

MAC15A4/D