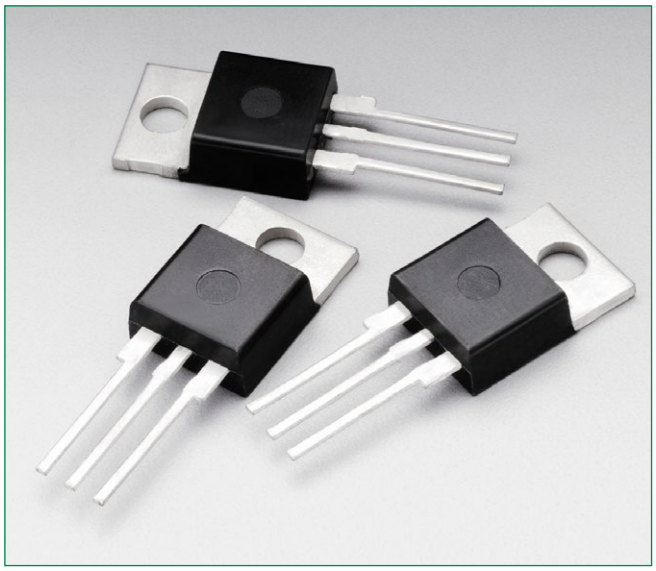
THE DATASHEET OF

MAC15NG

MAC15M, MAC15N



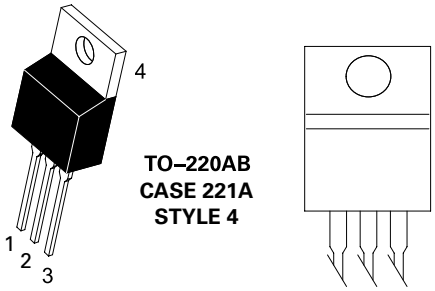
Description

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

Features

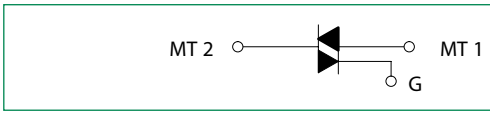
- Blocking Voltage to 800 Volts
- On-State Current Rating of 15 Amperes RMS at 80°C
- Uniform Gate Trigger Currents in Three Modes
- High Immunity to dv/dt – 250 V/μs minimum at 125°C
- Minimizes Snubber Networks for Protection
- Industry Standard TO–220 Package
- High Commutating di/dt – 9.0 A/ms minimum at 125°C
- Operational in Three Quadrants, Q1, Q2, and Q3
- These Devices are Pb–Free and are RoHS Compliant

Pin Out



TO–220AB
CASE 221A
STYLE 4

Functional Diagram



Additional Information

Datasheet | **Resources** | **Samples**

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Maximum Ratings (T_J = 25°C unless otherwise noted)

Rating		Symbol	Value	Unit
Peak Repetitive Off-State Voltage (Note 1) (Gate Open, Sine Wave 50 to 60 Hz, T_J = -25° to 100°C)	MAC15A6G MAC15-8G MAC15A8G	V_{DRM}, V_{RRM}	600 800 800	V
On-State RMS Current (Full Cycle Sine Wave, 50 to 60 Hz, T_C = 80°C)		$I_{T\ (RMS)}$	15	A
Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, T_C= 125°C)		I_{TSM}	150	A
Circuit Fusing Consideration (t = 8.3 ms)		I^2t	93	A²sec
Peak Gate Power (T_C = +80°C, Pulse Width = 1.0 µs)		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 +125	°C
Storage Temperature Range		T_{stg}	-40 to +125	°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. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

Thermal Characteristics

Rating		Symbol	Value	Unit
Thermal Resistance,	Junction–to–Case (AC) Junction–to–Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.0 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds		T_L	260	°C

Electrical Characteristics - OFF (T_J = 25°C unless otherwise noted ; Electricals apply in both directions)

Characteristic		Symbol	Min	Typ	Max	Unit
Peak Repetitive Blocking Current ($V_D = V_{DRM} = V_{RRM}$; Gate Open)	T_J = 25°C	I_{DRM}, I_{RRM}	-	-	0.01	mA
	T_J = 125°C		-	-	2.0	

Electrical Characteristics - ON (T_J = 25°C unless otherwise noted; Electricals apply in both directions)

Characteristic		Symbol	Min	Typ	Max	Unit
Peak On–State Voltage (Note 2) (I_{TM} = ±21 A Peak)		V_{TM}	–	1.2	1.6	V
Gate Trigger Current (Continuous dc) (V_D = 12 V, R_L = 100 Ω)	MT2(+), G(+)	I_{GT}	5.0	13	35	mA
	MT2(+), G(–)		5.0	16	35	
	MT2(–), G(–)		5.0	18	35	
Gate Trigger Voltage (Continuous dc) (V_D = 12 V, R_L = 100 Ω)	MT2(+), G(+)	V_{GT}	0.5	0.75	1.5	V
	MT2(+), G(–)		0.5	0.72	1.5	
	MT2(–), G(–)		0.5	0.82	1.5	
Latching Current (V_D = 24 V, I_G = 35 mA)	MT2(+), G(+)	V_{GD}	–	33	50	V
	MT2(+), G(–)		–	36	80	
	MT2(–), G(–)		–	33	50	
Holding Current (V_D = 12 V_{dc}, Gate Open, Initiating Current = ±200 mA))		I_H	–	20	40	mA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

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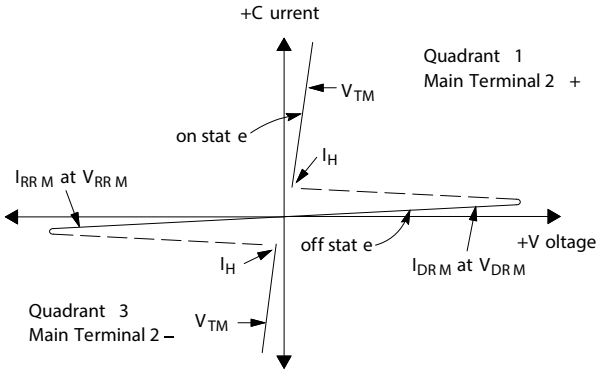
Dynamic Characteristics

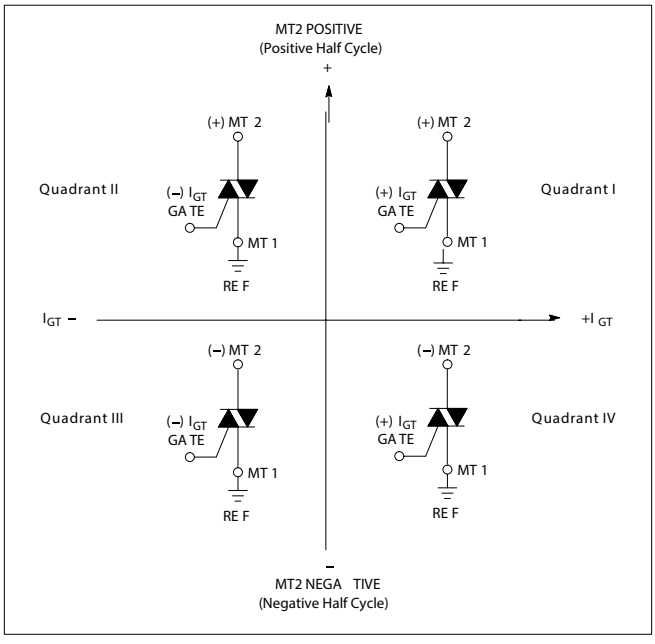
Characteristic	Symbol	Min	Typ	Max	Unit
Rate of Change of Commutating Current; See Figure 10. (V_D = 400 V, I_{TM} = 6.0 A, Commutating dv/dt = 24 V/µs, C_L = 10 µF Gate Open, TJ = 125°C, f = 250 Hz, No Snubber) L_L = 40 mH	dV/dt	9.0	-	–	A/ms
Critical Rate of Rise of Off-State Voltage (V_D = Rated V_{DRM}, Exponential Waveform, Gate Open, TJ = 125°C)	dV/dt	250	-	–	V/µs

Voltage Current Characteristic of SCR

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

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Figure 1. RMS Current Derating

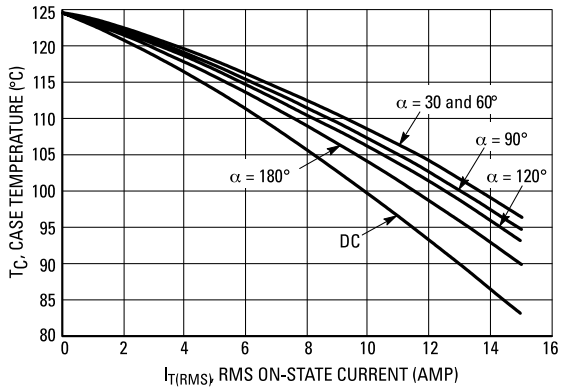

Figure 2. On-State Power Dissipation

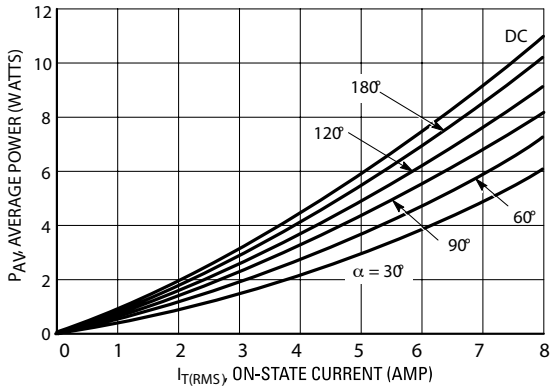

Figure 3. On–State Characteristics

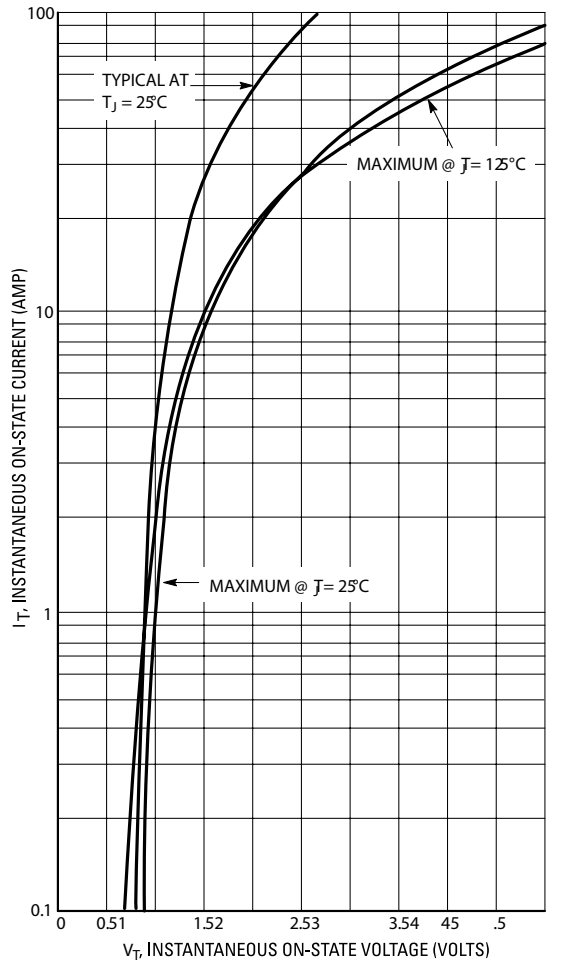

Figure 4. Thermal Response

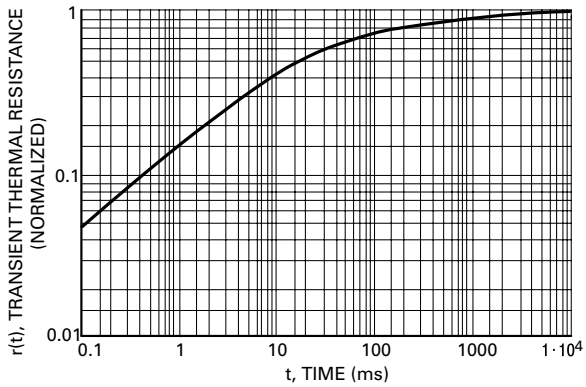

Figure 5. Hold Current Variation

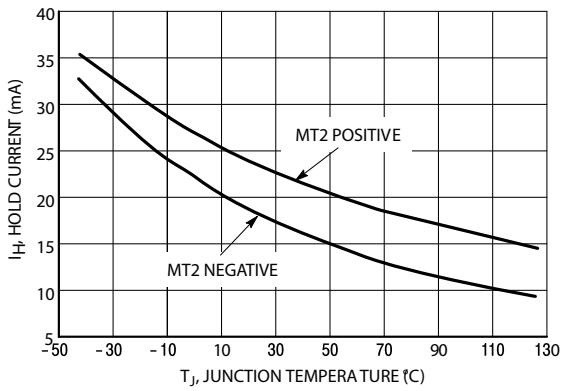

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Figure 6. Gate Trigger Current Variation

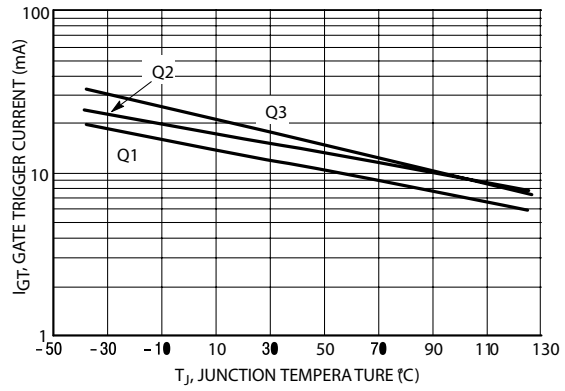


Figure 7. Gate Trigger Voltage Variation

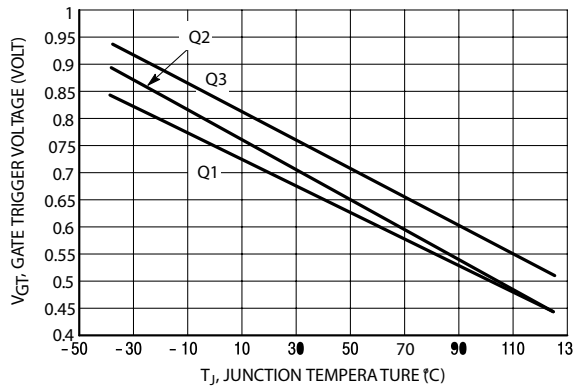


Figure 8. Critical Rate of Rise of Off-State Voltage (Exponential)

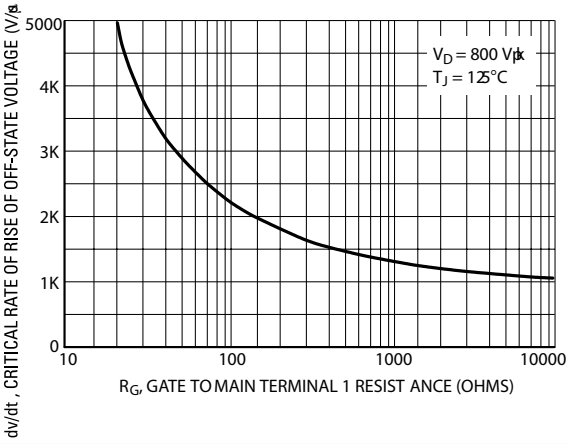


Figure 9. Critical Rate of Rise of Commutating Voltage

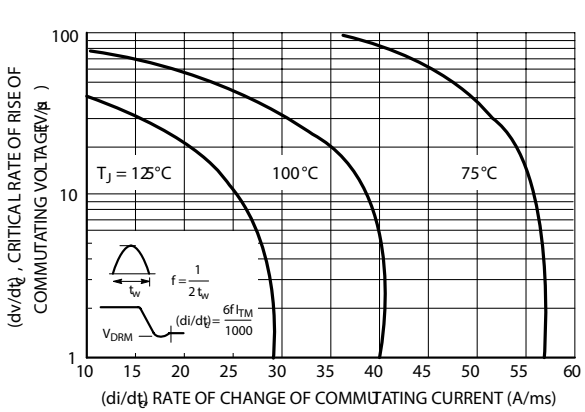
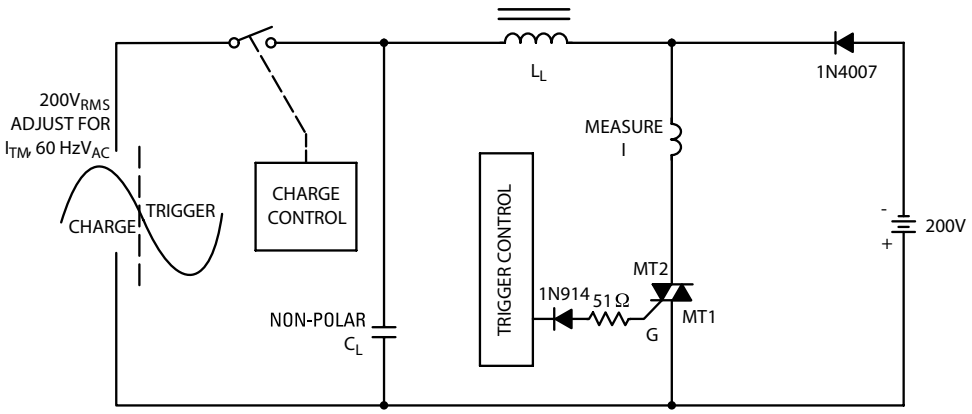


Figure 10. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Current (di/dt)



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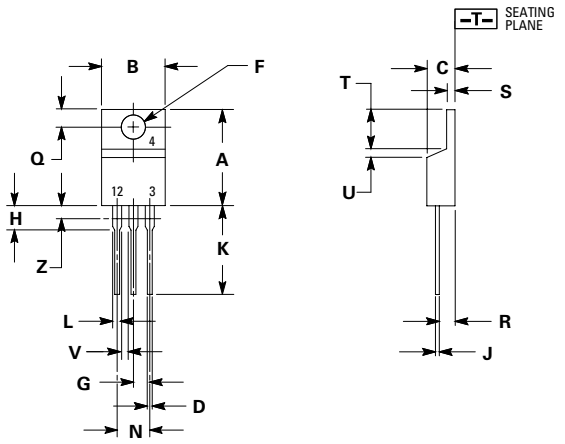
Thyristors

Surface Mount – 400V - 800V > MAC15 Series

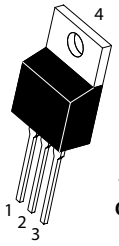
Dimensions



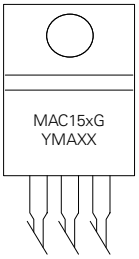
Dim	Inches		Millimeters	
	Min	Max	Min	Max
A	0.590	0.620	14.99	15.75
B	0.380	0.420	9.65	10.67
C	0.178	0.188	4.52	4.78
D	0.025	0.035	0.64	0.89
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.41	2.67
H	0.110	0.130	2.79	3.30
J	0.018	0.024	0.46	0.61
K	0.540	0.575	13.72	14.61
L	0.060	0.075	1.52	1.91
N	0.195	0.205	4.95	5.21
Q	0.105	0.115	2.67	2.92
R	0.085	0.095	2.16	2.41
S	0.045	0.060	1.14	1.52
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

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.

Part Marking System



TO–220AB
CASE 221A
STYLE 12



x =M or N
Y =Year
M =Month
A =Assembly Site
XX =Lot Serial Code
G =Pb-Free Package

Pin Assignment	
1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	No Connection

Ordering Information

Device	Package	Shipping
MAC15MG	TO-220AB (Pb-Free)	500 Units / Rail
MAC15NG		

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- Alternative Solution
- Excess Inventory Management