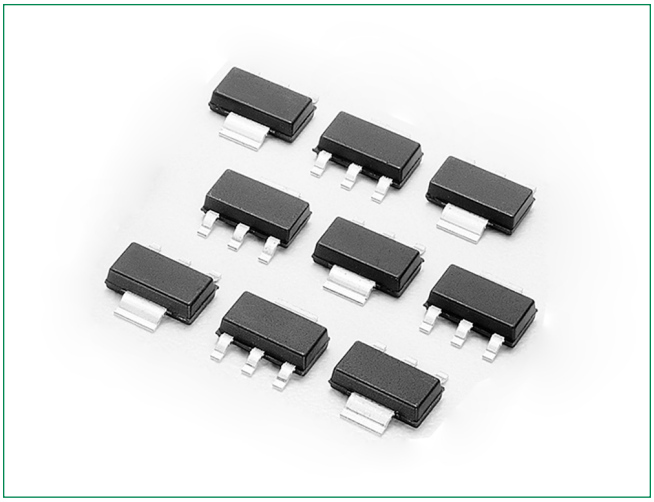
Z0103MN, Z0107MN, Z0109MN



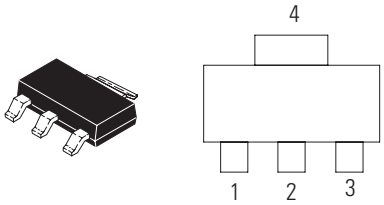
Description

Designed for use in solid state relays, MPU interface, TTL logic and other light industrial or consumer applications. Supplied in surface mount package for use in automated manufacturing.

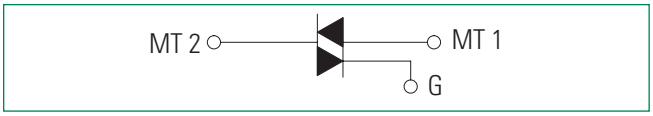
Features

- Sensitive Gate Trigger Current in Four Trigger Modes
- Blocking Voltage to 600 V
- Glass Passivated Surface for Reliability and Uniformity
- Surface Mount Package
- These are Pb–Free Devices

Pin Out



Functional Diagram



Additional Information

Resources

Revised: TK.10/04/21

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

Rating	Symbol	Value	Unit
Peak Repetitive Off–State Voltage (Note 1) (R_{GK} = I_K, T_J – 40 to +125°C, Sine Wave, 50 to 60 Hz)	V_{DRM}, V_{RRM}	600	V
On-State RMS Current (Full Sine Wave 50 to 60 Hz; T_C = 80°C)	$I_{T\ (RMS)}$	1.0	A
Peak Non–repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, T_C = 25°C)	$I_{T\ (RMS)}$	8.0	A
Circuit Fusing Considerations (t = 8.3 ms)	I^2t	0.4	A2s
Average Gate Power (T_C = 80°C, t ≤ 8.3 ms)	$P_{G(AV)}$	1.0	W
Peak Gate Current (t ≤ 20 s, T_J = +125°C)	I_{GM}	1.0	A
Operating Junction Temperature Range @ Rated V_{RRM} and V_{DRM}	T_J	-40 to +110	°C
Storage Temperature Range	T_{stg}	-40 to +150	°C

Thermal Characteristics

Rating	Symbol	Value	Unit
Thermal Resistance, Junction–to–Ambient PCB Mounted per Figure 1	$R_{\theta JA}$	156	°C/W
Thermal Resistance, Junction–to–Tab Measured on MT2 Tab Adjacent to Epoxy	$R_{\theta JT}$	25	°C/W
Maximum Device Temperature for Soldering Purposes for 10 Secs Maximum	T_L	260	°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.

Electrical Characteristics - OFF (T_J = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Peak Repetitive Forward or Reverse Blocking Current (Note 3) (V_{AK} = Rated V_{DRM} or V_{RRM}, R_{GK} = 1000 kΩ	T_J = 25°C	I_{DRM},	-	-	5.0	µA
	T_J = 125°C		-	-	500	

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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 (I_{TM} = ±11 A Peak, Pulse Width ≤2 ms, Duty Cycle ≤2%)		V_{TM}	–	–	1.8	V
Z0103MN Gate Trigger Current (Continuous dc) (V_D = 12 V, R_L = 30 Ohms)	MT2(+), G(+)	I_{GT}	0.15	–	3.0	mA
	MT2(+), G(–)		0.15	–	3.0	
	MT2(–), G(–)		0.15	–	3.0	
	MT2(–), G(+)		0.25	–	5.0	
Z0107MN Gate Trigger Current (Continuous dc) (V_D = 12 V, R_L = 30 Ohms)	MT2(+), G(+)	I_{GT}	0.15	–	5.0	mA
	MT2(+), G(–)		0.15	–	5.0	
	MT2(–), G(–)		0.15	–	5.0	
	MT2(–), G(+)		0.25	–	7.0	
Z0109MN Gate Trigger Current (Continuous dc) (VD = 12 V, RL = 30 Ohms)	MT2(+), G(+)	I_{GT}	0.15	–	10	mA
	MT2(+), G(–)		0.15	–	10	
	MT2(–), G(–)		0.15	–	10	
	MT2(–), G(+)		0.25	–	10	
Z0103MN Latching Current (V_D = 12 V, $_{IG}$ = 1.2 x I_{GT}) ALL TYPES	MT2(+), G(+)	I_L	–	–	7.0	mA
	MT2(+), G(–)		–	–	15	
	MT2(–), G(–)		–	–	7.0	
	MT2(–), G(+)		–	–	7.0	
Z0107MN Latching Current (V_D = 12 V, $_{IG}$ = 1.2 x I_{GT}) ALL TYPES	MT2(+), G(+)	I_L	–	–	10	mA
	MT2(+), G(–)		–	–	20	
	MT2(–), G(–)		–	–	10	
	MT2(–), G(+)		–	–	10	
Z0109MN Latching Current (V_D = 12 V, $_{IG}$ = 1.2 x I_{GT}) ALL TYPES	MT2(+), G(+)	I_L	–	–	15	mA
	MT2(+), G(–)		–	–	25	
	MT2(–), G(–)		–	–	15	
	MT2(–), G(+)		–	–	15	

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

Gate Trigger Voltage (Continuous dc) (V_D = 12 Vdc, R_L = 30 Ohms)	V_{GT}	–	–	1.3	V
Gate–Controlled Turn–On Time, (V_D = Rated V_{DRM}, I_{TM} = 16 A Peak, I_G = 30 mA)	t_{gt}	0.2	–	10	µs

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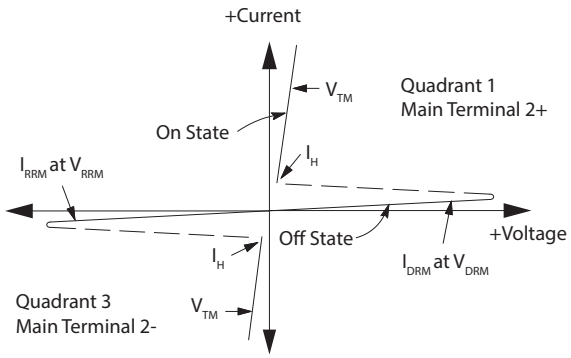
Dynamic Characteristics

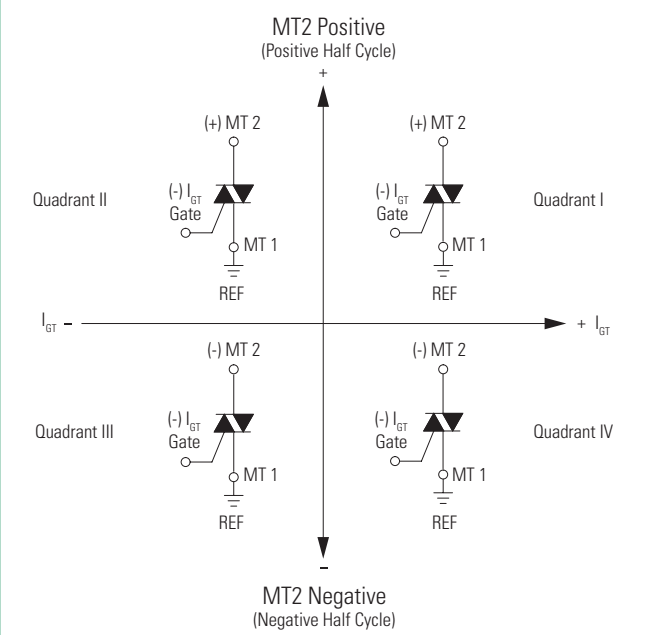
Characteristic		Symbol	Min	Typ	Max	Unit
Rate of Change of Commutating Current (V_D = 400 V, I_{TM} = 0.84 A, Commutating dv/dt = 1.5 V/µs, Gate Open, T_J = 110°C, f = 250 Hz, with Snubber)		dv/dt	1.6	–	–	A/ms
Critical Rate of Rise of On–State Current (T_C = 110°C, I_G = 2 x I_{GT}, R_{GK} = 1 kΩ)	Z0103MN	di/dt	10	30	_	V/µs
	Z0107MN		20	60	_	
	Z0109MN		50	75	_	
Repetitive Critical Rate of Rise of On–State Current, T_J = 125°C Pulse Width = 20 µs, IPKmax = 15 A, diG/dt = 1 A/µs, f = 60 Hz			–	–	20	A/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

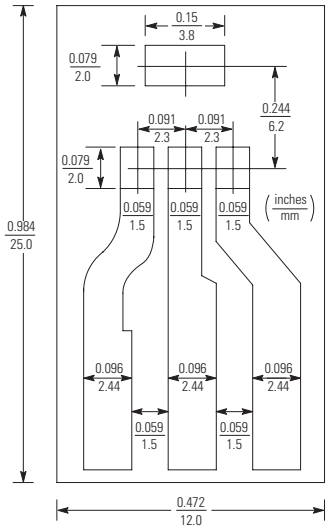


Quadrant Definitions for a Triac



All Polarities are referenced to MT1.
With in-phase signals (using standard AC lines) quadrants I and III are used

Figure 1. PCB for Thermal Impedance and Power Testing of SOT-223



BOARD MOUNTED VERTICALLY IN CINCH 8840 EDGE CONNECTOR.
BOARD THICKNESS = 65 MIL., FOIL THICKNESS = 2.5 MIL.
MATERIAL: G10 FIBERGLASS BASE EPOXY

Figure 2. On-State Characteristics

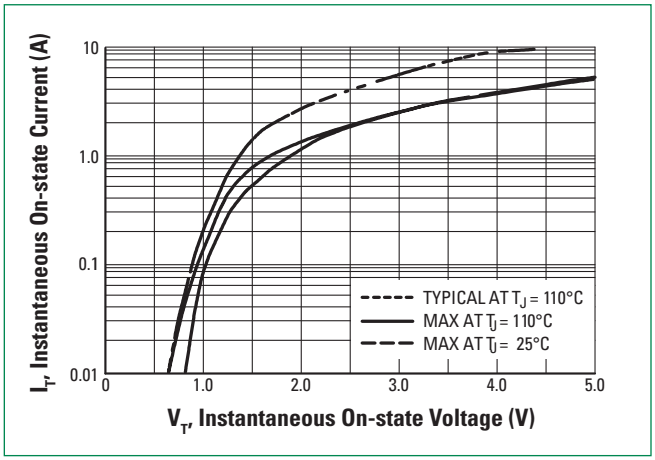


Figure 3. Junction to Ambient Thermal Resistance vs Copper Tab Area

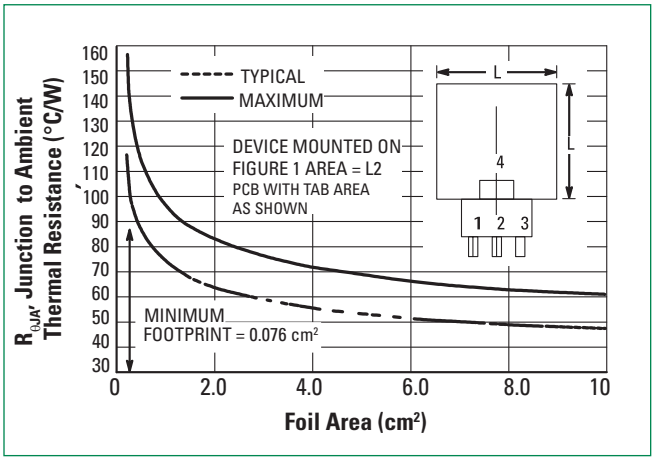


Figure 4. Current Derating, Minimum Pad Size Reference: Ambient Temperature

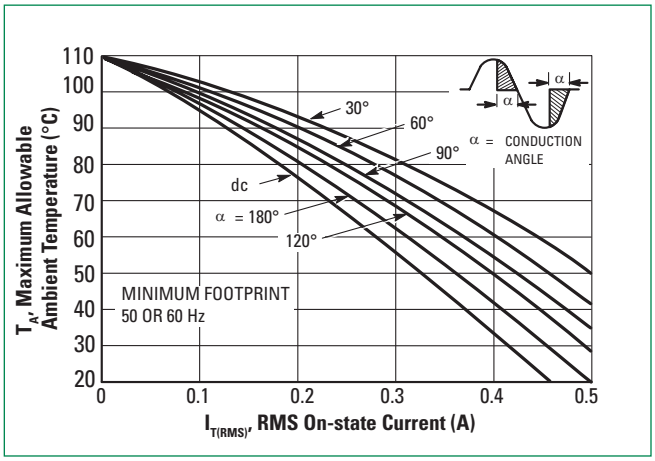


Figure 5. Current Derating, 1.0 cm Square Pad Reference: Ambient Temperature

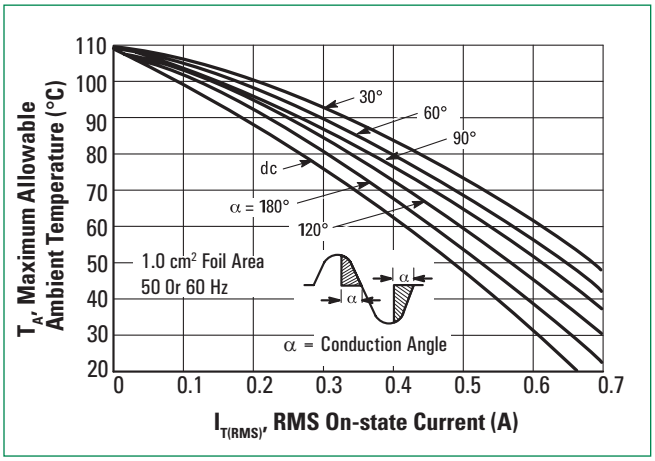


Figure 6. Current Derating, 2.0 cm Square Pad Reference: Ambient Temperature

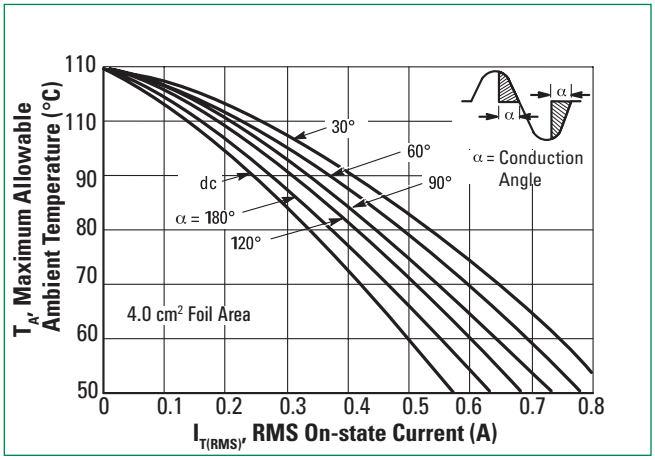


Figure 7. Current Derating Reference: MT2 Tab

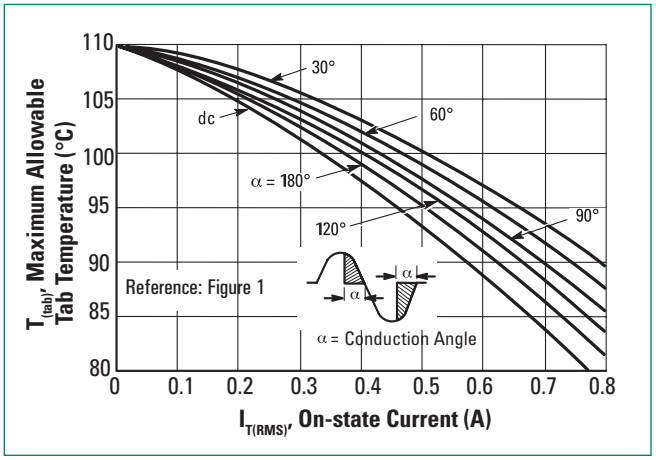


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Figure 8. Power Dissipation

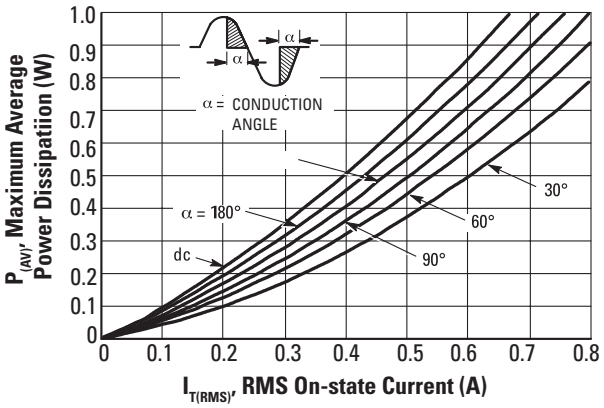


Figure 9. Thermal Response, Device Mounted on Figure 1 Printed Circuit Board

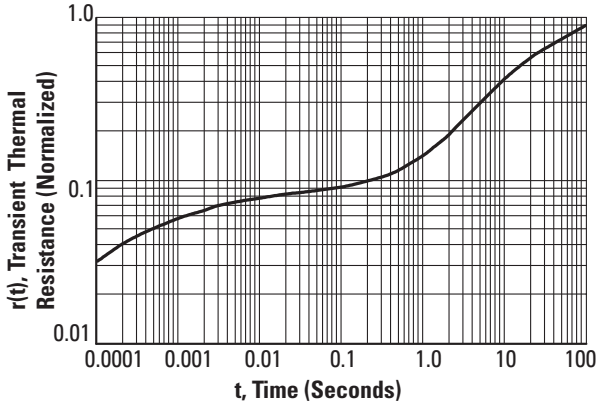
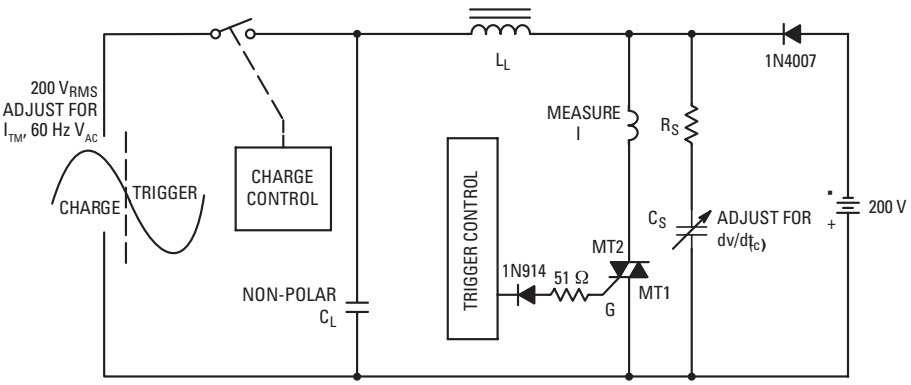


Figure 10. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Voltage (dv/dt)c



Note: Component values are for verification of rated $(dv/dt)_c$. See AN1048 for additional information.

Figure 11. Typical Commutating dv/dt vs Current Crossing Rate and Junction Temperature

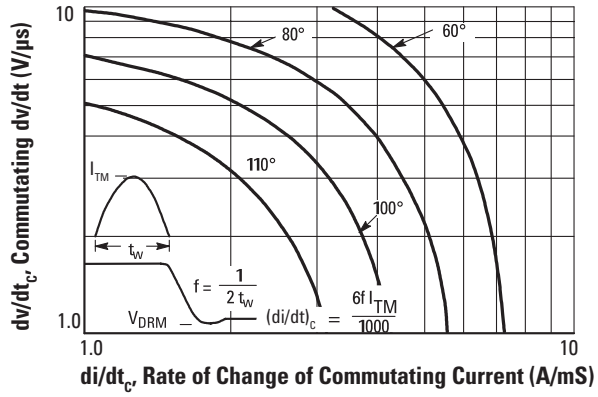


Figure 12. Typical Commutating dv/dt vs Junction Temperature at 0.8 Amps RMS

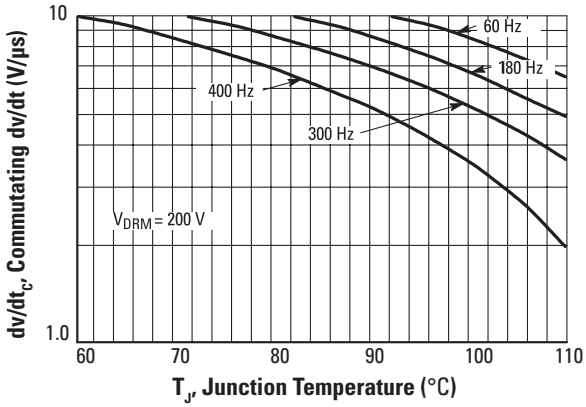


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Figure 13. Exponential Static dv/dt versus Gate – Main Terminal 1 Resistance

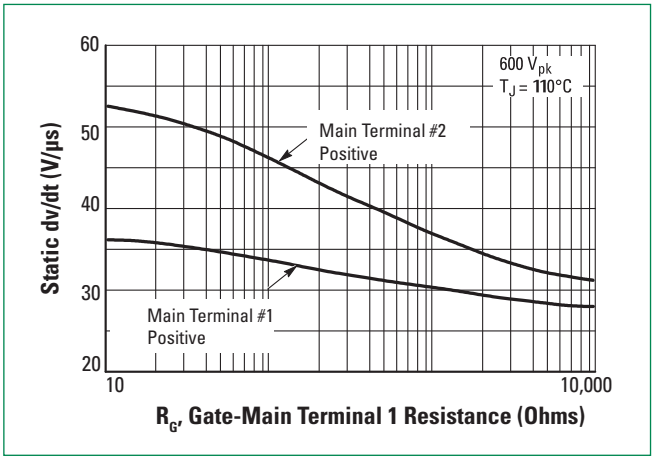


Figure 14. Typical Gate Trigger Current Variation

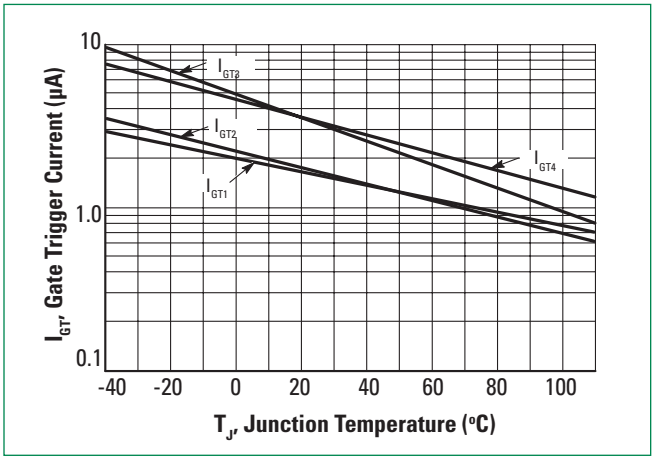


Figure 15. Typical Holding Current Variation

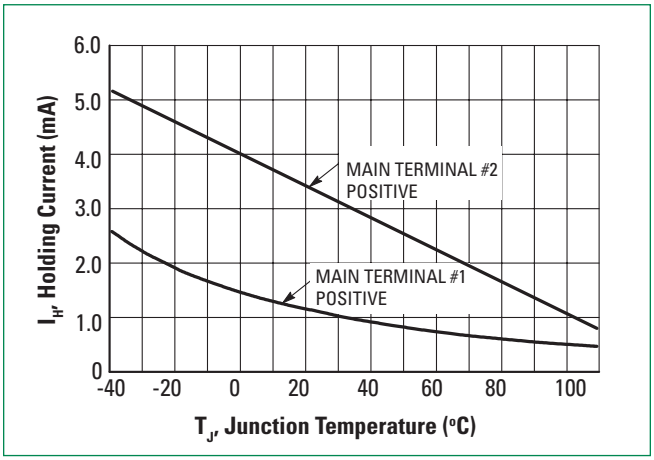
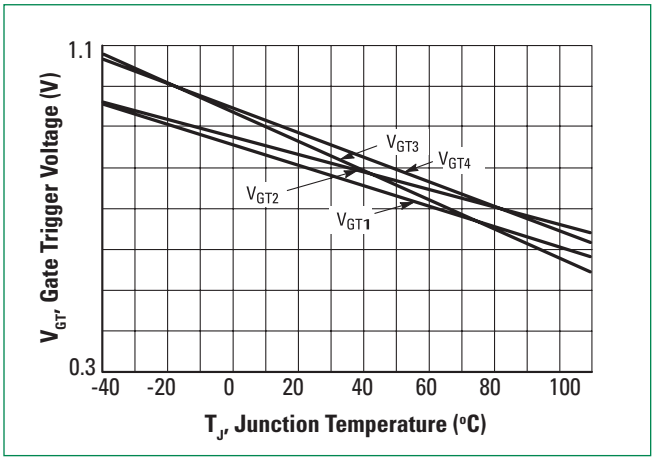


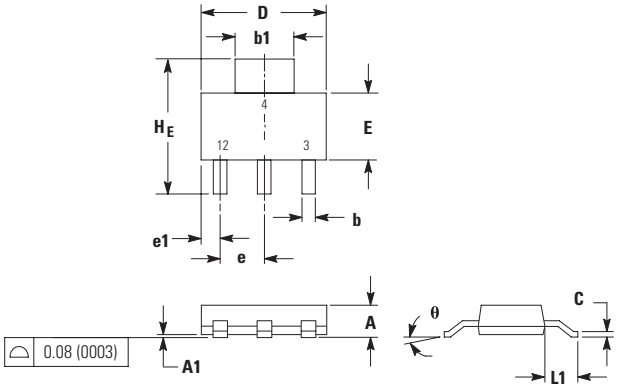
Figure 16. Gate Trigger Voltage Variation



Thyristors

Surface Mount – 600V > Z0103MN, Z0107MN, Z0109MN

Dimensions

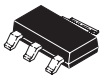


Dim	Inches			Millimeters		
	Min	Nom	Max	Min	Nom	Max
A	---	---	0.071	---	---	1.80
A1	0.001	0.003	0.005	0.02	0.07	0.13
b	0.026	0.030	0.033	0.66	0.75	0.84
b1	0.114	0.118	0.122	2.90	3.00	3.10
c	0.009	0.011	0.014	0.23	0.29	0.35
D	0.260	0.260	0.264	6.60	6.60	6.71
E	0.130	0.138	0.146	3.30	3.50	3.70
e	---	0.091	---	---	2.30	---
e1	0.030	0.037	0.045	0.75	0.95	1.15
L1	0.059	0.069	0.079	1.50	1.75	2.00
HE	0.264	0.276	0.287	6.7	7.00	7.3
ø	0°	---	10°	0°	---	10°

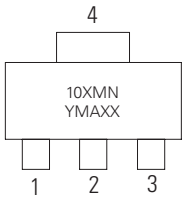
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

Pin Assignment	
1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	Main Terminal 2

Part Marking System

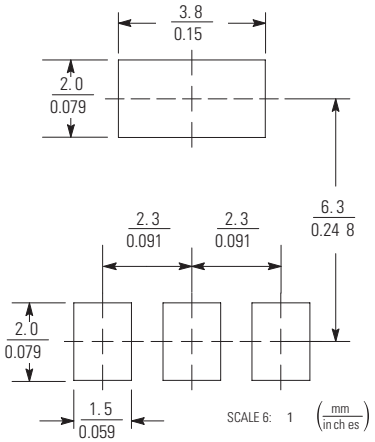


SOT-223
Case 318E
Style 11



10XMN	=Device Code
x	=D, M, or N
Y	=Year
M	=Month
A	=Assembly Site
XX	=Lot Serial Code
G	=Pb-Free Package

Soldering Footprint



Ordering Information

Device	Package	Shipping
Z0103MNT1G	SOT-223 (Pb-Free)	1000 / Tape & Reel
Z0107MNT1G	SOT-223 (Pb-Free)	
Z0109MNT1G	SOT-223 (Pb-Free)	