MAC4DLM

Sensitive Gate Triacs

Silicon Bidirectional Thyristors

Designed for high volume, low cost, industrial and consumer applications such as motor control; process control; temperature, light and speed control.

Features

- Small Size Surface Mount DPAK Package
- Passivated Die for Reliability and Uniformity
- Four−Quadrant Triggering
- Blocking Voltage to 600 V
- On−State Current Rating of 4.0 Amperes RMS at 93°C
- Low Level Triggering and Holding Characteristics
- Epoxy Meets UL 94 V−0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V
  Machine Model, C > 400 V
- Pb−Free Packages are Available

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

Rating	Symbol	Value	Unit
Peak Repetitive Off−State Voltage (Note 1) (T_J = −40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open)	V_{DRM}, V_{RRM}	600	V
On−State RMS Current (Full Cycle Sine Wave, 60 Hz, T_C = 93°C)	$I_{T(RMS)}$	4.0	A
Peak Non-Repetitive Surge Current (One Full Cycle, 60 Hz, T_J = 110°C)	I_{TSM}	40	A
Circuit Fusing Consideration (t = 8.3 msec)	I^2t	6.6	A^2sec
Peak Gate Power (Pulse Width ≤ 10 μsec, T_C = 93°C)	P_{GM}	2.0	W
Average Gate Power (t = 8.3 msec, T_C = 93°C)	$P_{G(AV)}$	1.0	W
Peak Gate Current (Pulse Width ≤ 20 μsec, T_C = 93°C)	I_{GM}	4.0	A
Peak Gate Voltage (Pulse Width ≤ 20 μsec, T_C = 93°C)	V_{GM}	5.0	V
Operating Junction Temperature Range	T_J	−40 to 110	°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 device are exceeded.

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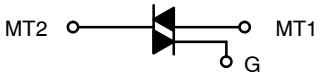
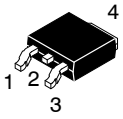
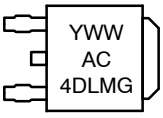
TRIACS
4.0 AMPERES RMS
600 VOLTS

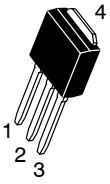


MARKING DIAGRAMS

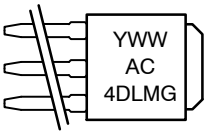


DPAK
CASE 369C
STYLE 6





DPAK−3
CASE 369D
STYLE 6



Y = Year
WW = Work Week
AC4DLM = Device Code
G = Pb−Free Package

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

ORDERING INFORMATION

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

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August, 2010 − Rev. 5

Publication Order Number:
MAC4DLM/D

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance – Junction–to–Case – Junction–to–Ambient – Junction–to–Ambient (Note 2)	 $R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	 3.5 88 80	°C/W
Maximum Lead Temperature for Soldering Purposes (Note 3)	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 = 110°C	I_{DRM}, I_{RRM}	 – –	 – –	 0.01 2.0	mA
ON CHARACTERISTICS					
Peak On–State Voltage (Note 4) – (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(–) MT2(–), G(+)	I_{GT}	 – – – –	 1.8 2.1 2.4 4.2	 3.0 3.0 3.0 5.0	mA
Gate Trigger Voltage (Continuous dc) (V_D = 12 V, R_L = 100 Ω) MT2(+), G(+) MT2(+), G(–) MT2(–), G(–) MT2(–), G(+)	V_{GT}	 0.5 0.5 0.5 0.5	 0.62 0.57 0.65 0.74	 1.3 1.3 1.3 1.3	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(+)	V_{GD}	 0.1	 0.4	 –	V
Holding Current (V_D = 12 V, Gate Open, Initiating Current = ±200 mA)	I_H	 –	 1.5	 15	mA
Latching Current MT2(+), G(+) (V_D = 12 V, I_G = 5.0 mA) MT2(+), G(–) (V_D = 12 V, I_G = 5.0 mA) MT2(–), G(–) (V_D = 12 V, I_G = 5.0 mA) MT2(–), G(+) (V_D = 12 V, I_G = 10 mA)	I_L	 – – – –	 1.75 5.2 2.1 2.2	 10 10 10 10	mA
DYNAMIC CHARACTERISTICS					
Rate of Change of Commutating Current (V_D = 200 V, I_{TM} = 1.8 A, Commutating dv/dt = 1.0 V/μsec, T_J = 110°C, f = 250 Hz, CL = 5.0 μfd, LL = 80 mH, RS = 56 Ω, CS = 0.03 μfd) With snubber see Figure 11	di/dt(c)	–	3.0	–	A/ms
Critical Rate of Rise of Off–State Voltage (V_D = 0.67 X Rated V_{DRM}, Exponential Waveform, Gate Open, T_J = 110°C)	dv/dt	10	–	–	V/μs

2. These ratings are applicable when surface mounted on the minimum pad sizes recommended.
3. 1/8″ from case for 10 seconds.
4. Pulse Test: Pulse Width ≤ 2.0 msec, Duty Cycle ≤ 2%.

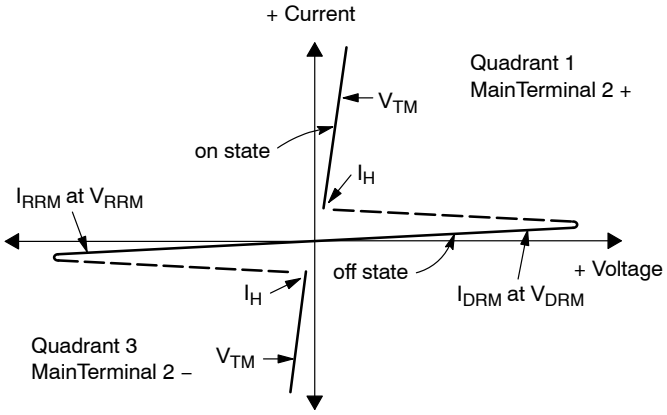
ORDERING INFORMATION

Device	Package Type	Package	Shipping†
MAC4DLM–001	DPAK–3	369D	75 Units / Rail
MAC4DLM–001G	DPAK–3 (Pb–Free)	369D	75 Units / Rail
MAC4DLMT4	DPAK	369C	2500 / Tape & Reel
MAC4DLMT4G	DPAK (Pb–Free)	369C	2500 / Tape & Reel

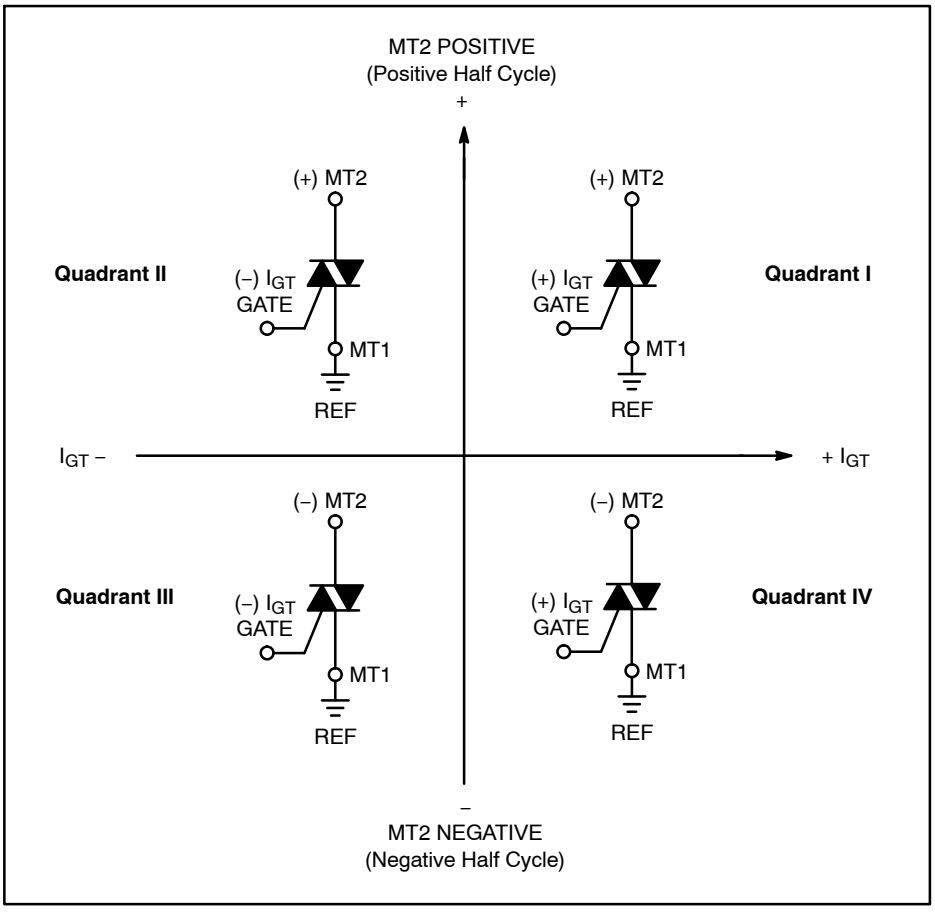
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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.

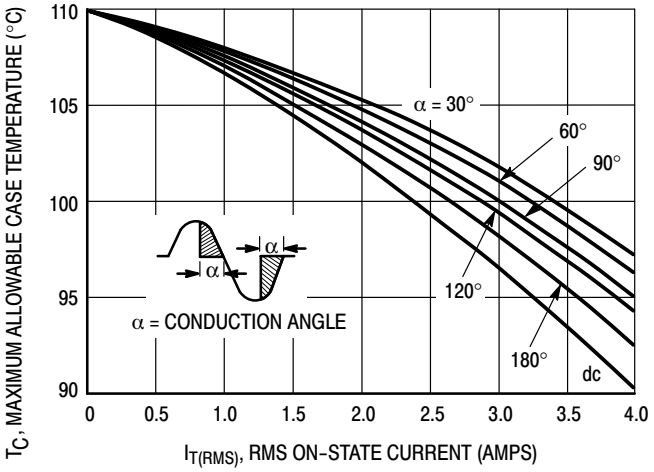


Figure 1. RMS Current Derating

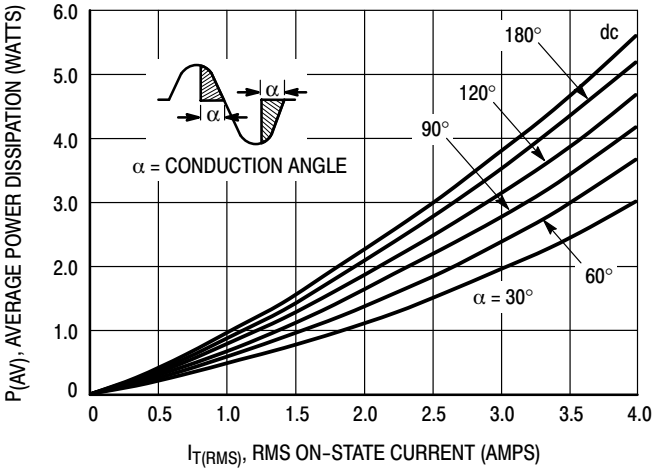


Figure 2. On−State Power Dissipation

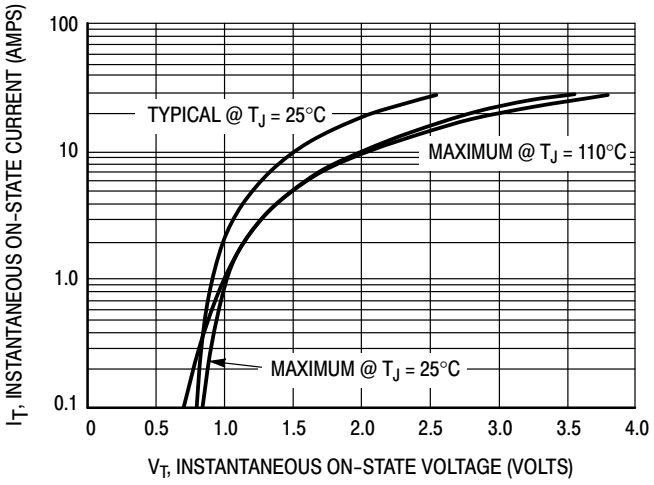


Figure 3. On−State Characteristics

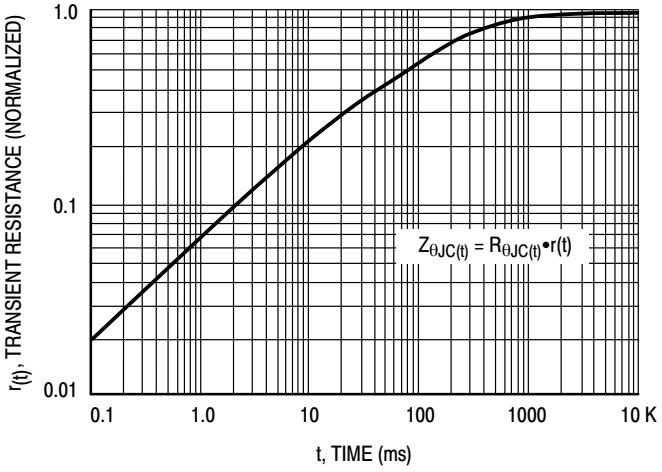


Figure 4. Transient Thermal Response

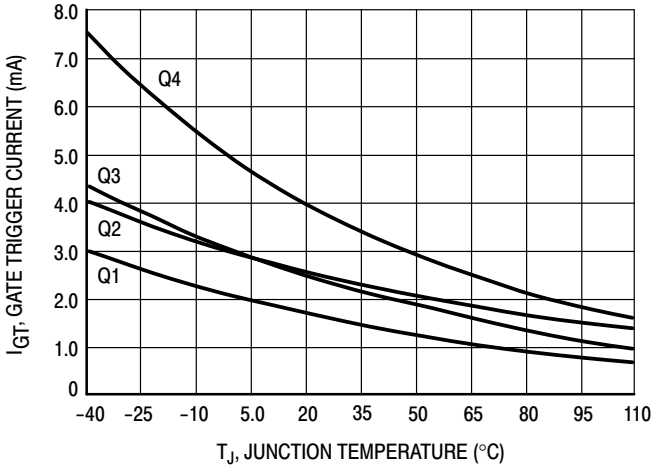


Figure 5. Typical Gate Trigger Current versus Junction Temperature

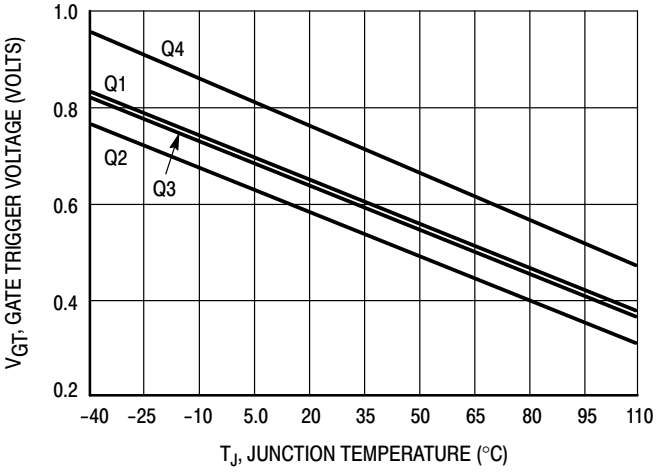


Figure 6. Typical Gate Trigger Voltage versus Junction Temperature

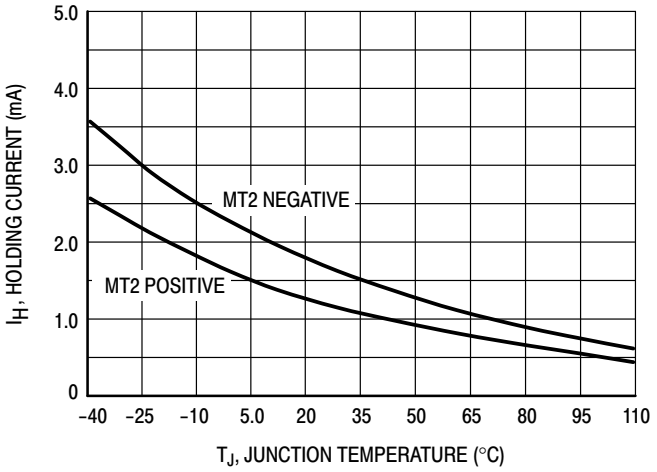


Figure 7. Typical Holding Current versus Junction Temperature

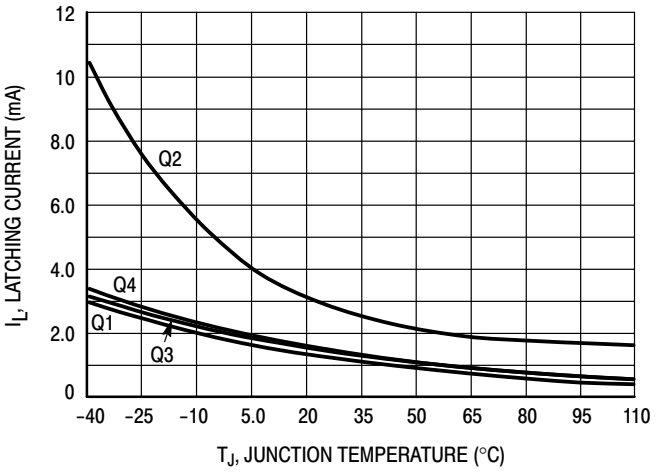


Figure 8. Typical Latching Current versus Junction Temperature

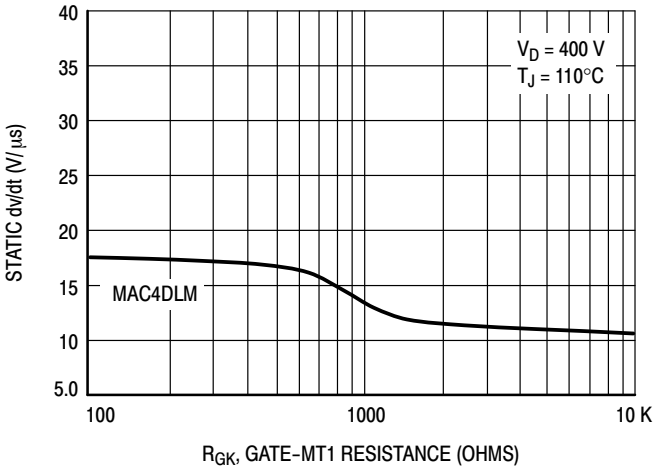


Figure 9. Minimum Exponential Static dv/dt versus Gate−MT1 Resistance

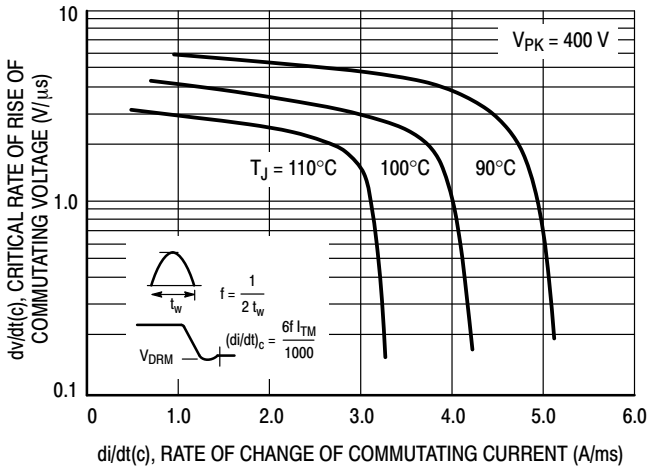
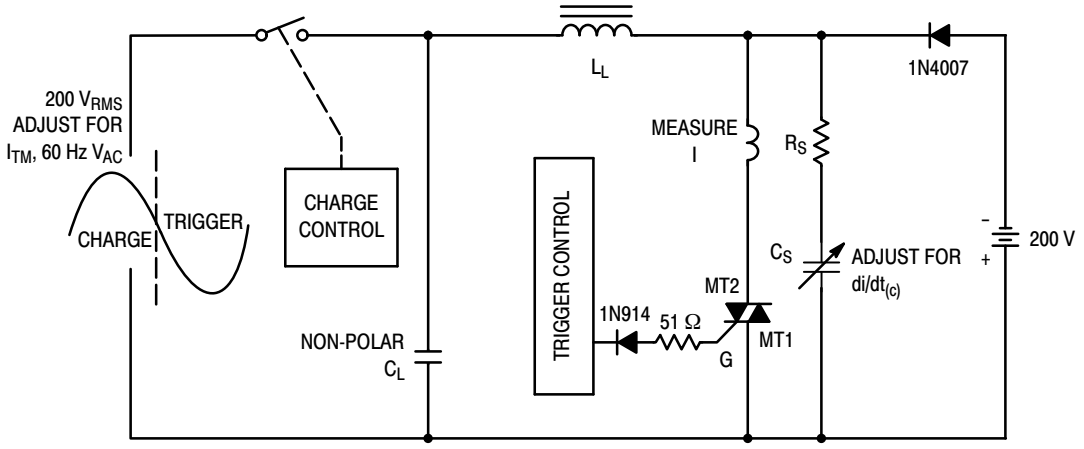


Figure 10. Critical Rate of Rise of Commutating Voltage

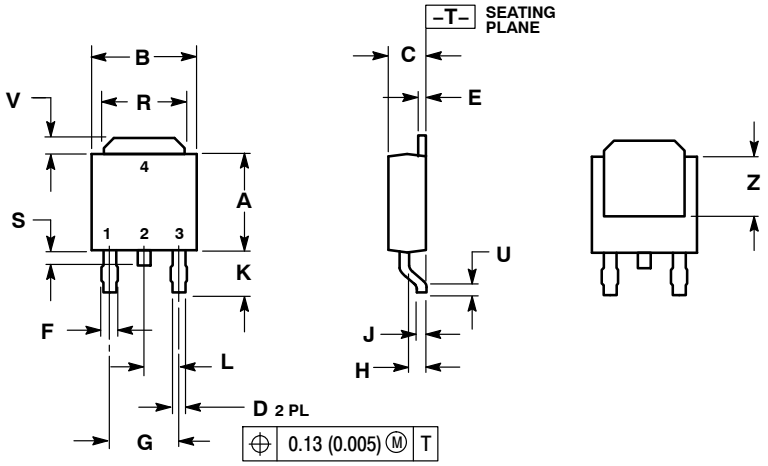


Note: Component values are for verification of rated $(di/dt)_c$. See AN1048 for additional information.

Figure 11. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Current $(di/dt)_c$

PACKAGE DIMENSIONS

DPAK
CASE 369C
ISSUE O

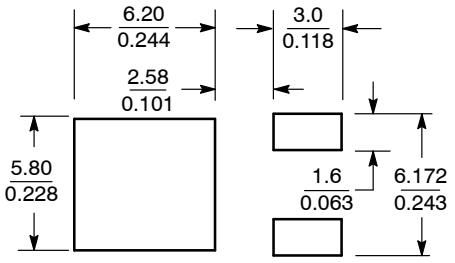


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	---	0.51	---
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

STYLE 6:
PIN 1. MT1
2. MT2
3. GATE
4. MT2

SOLDERING FOOTPRINT*

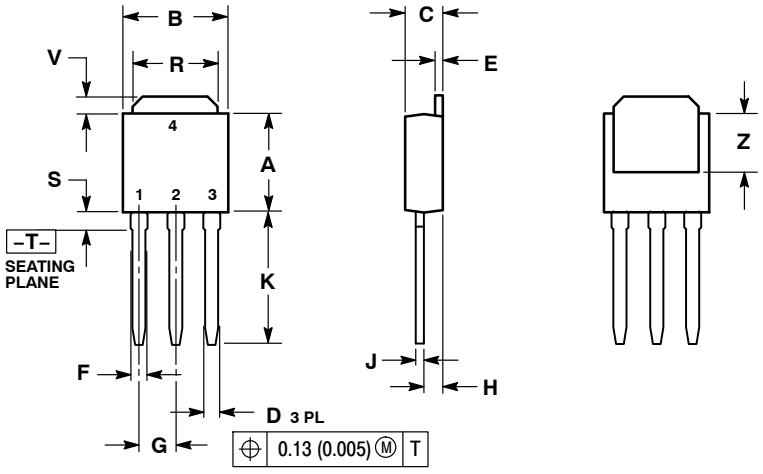


SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

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

PACKAGE DIMENSIONS

DPAK−3
CASE 369D−01
ISSUE B



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C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	−−−	3.93	−−−

STYLE 6:
PIN 1. MT1
2. MT2
3. GATE
4. MT2

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