MAC4DLM

Preferred Device

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.

- 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
- Device Marking: Device Type with "M'' truncated, e.g., MAC4DLM: AC4DLM, Date Code

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

Rating	Symbol	Value	Unit
Peak Repetitive Off–State Voltage (1) (T_J = –40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open) MAC4DLM	V_{DRM}, V_{RRM}	600	Volts
On–State RMS Current (Full Cycle Sine Wave, 60 Hz, T_C = 93°C)	$I_{T(RMS)}$	4.0	Amps
Peak Non-Repetitive Surge Current (One Full Cycle, 60 Hz, T_J = 110°C)	I_{TSM}	40	Amps
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}	0.5	Watts
Average Gate Power (t = 8.3 msec, T_C = 93°C)	$P_{G(AV)}$	0.1	Watts
Peak Gate Current (Pulse Width ≤ 10 μsec, T_C = 93°C)	I_{GM}	0.2	Amps
Peak Gate Voltage (Pulse Width ≤ 10 μsec, T_C = 93°C)	V_{GM}	5.0	Volts
Operating Junction Temperature Range	T_J	–40 to 110	°C
Storage Temperature Range	T_{stg}	–40 to 150	°C

(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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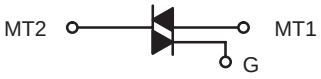
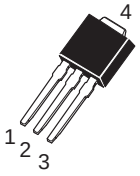
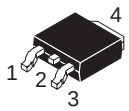
TRIACS
4.0 AMPERES RMS
600 VOLTS





D–PAK
CASE 369
STYLE 6



D–PAK
CASE 369A
STYLE 6

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

ORDERING INFORMATION

Device	Package	Shipping
MAC4DLMT4	DPAK 369A	16mm Tape and Reel (2.5K/Reel)
MAC4DLM–1	DPAK 369	75 Units/Rail

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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance — Junction to Case — Junction to Ambient — Junction to Ambient (1)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	3.5 88 80	°C/W
Maximum Lead Temperature for Soldering Purposes (2)	T_L	260	°C

(1) Surface mounted on minimum recommended pad size.
(2) 1/8″ from case for 10 seconds.

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 (1) (I_{TM} = ±6.0 A)		V_{TM}	—	1.3	1.6	Volts
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	Volts
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	 —	Volts
Holding Current (V_D = 12 V, Gate Open, Initiating Current = ±200 mA)		I_H	—	1.5	15	mA
Latching Current MT2(+), G(+) MT2(+), G(–) MT2(–), G(–) MT2(–), G(+)	(V_D = 12 V, I_G = 5.0 mA) (V_D = 12 V, I_G = 5.0 mA) (V_D = 12 V, I_G = 5.0 mA) (V_D = 12 V, I_G = 10 mA)	I_L	 — — — —	 1.75 5.2 2.1 2.2	 10 10 10 10	mA

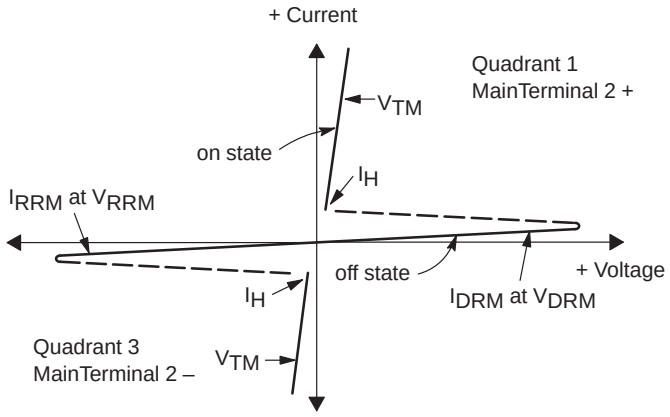
DYNAMIC CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
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

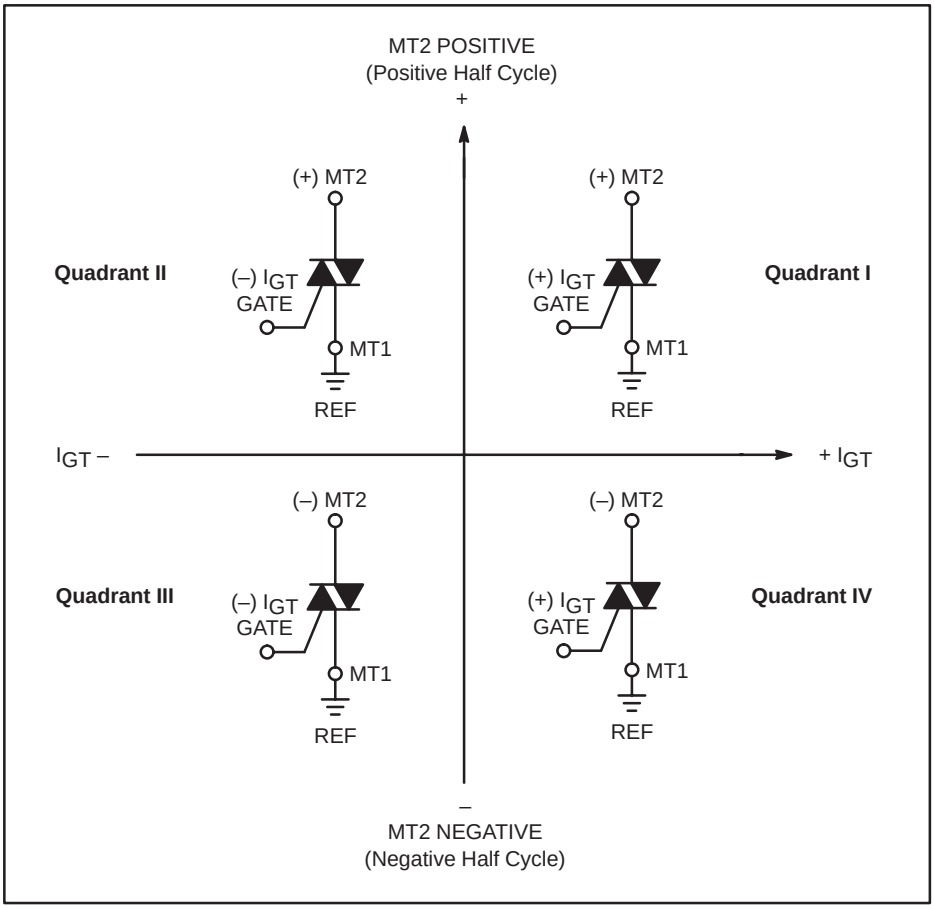
(1) Pulse Test: Pulse Width ≤ 2.0 msec, Duty Cycle ≤ 2%.

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.

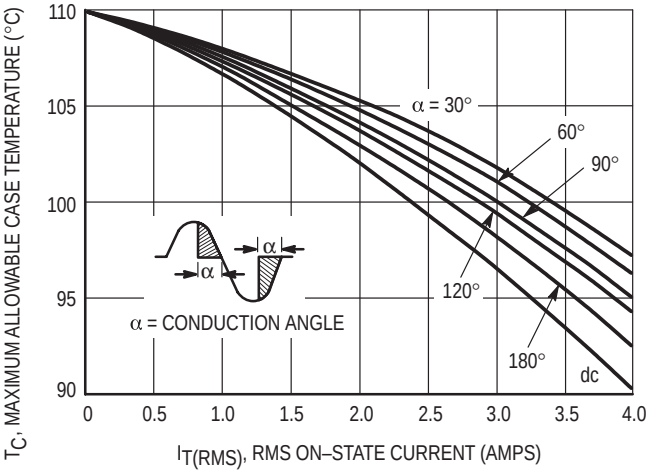


Figure 1. RMS Current Derating

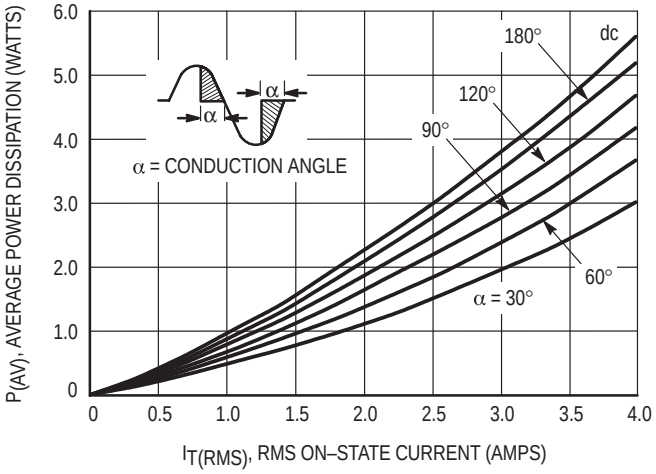


Figure 2. On–State Power Dissipation

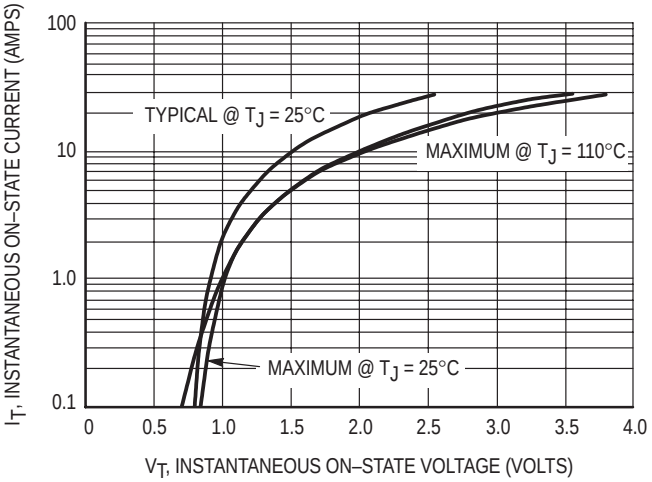


Figure 3. On–State Characteristics

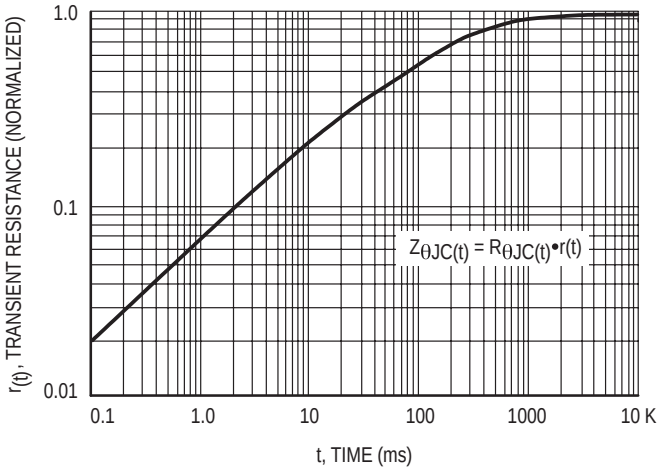


Figure 4. Transient Thermal Response

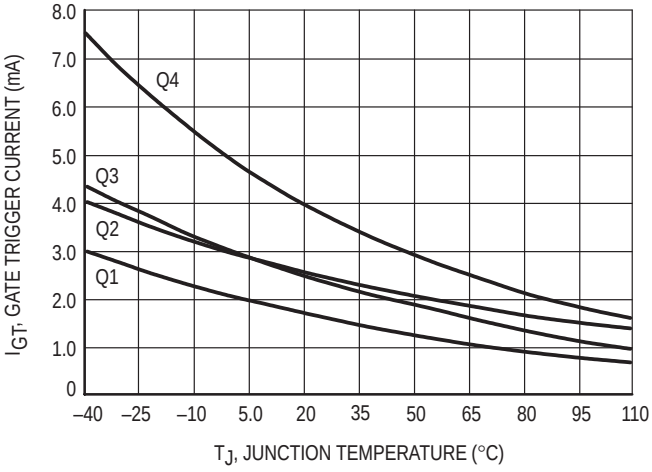


Figure 5. Typical Gate Trigger Current versus Junction Temperature

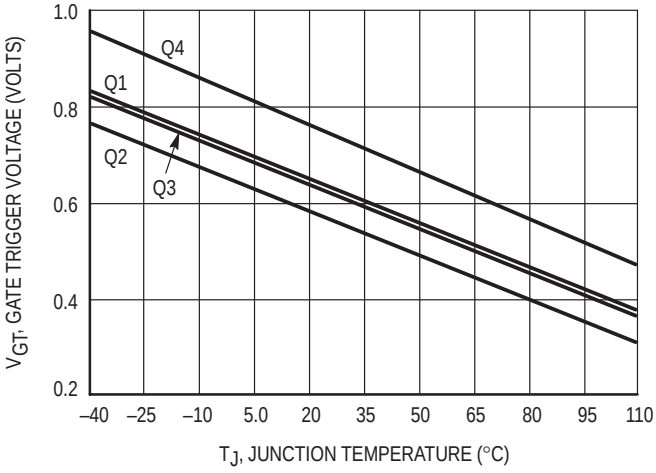


Figure 6. Typical Gate Trigger Voltage versus Junction Temperature

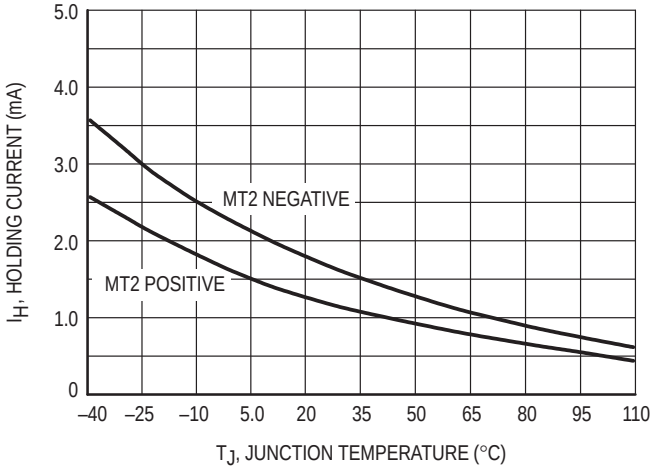


Figure 7. Typical Holding Current versus Junction Temperature

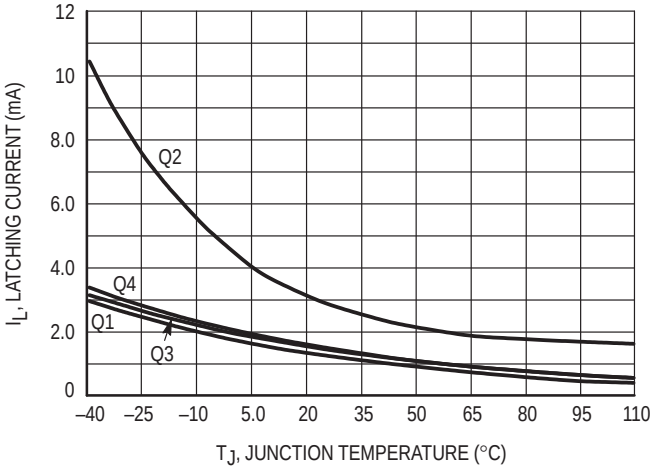


Figure 8. Typical Latching Current versus Junction Temperature

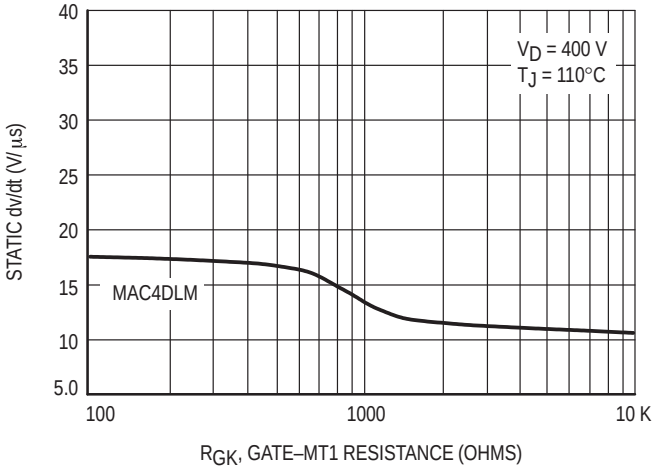


Figure 9. Minimum Exponential Static dv/dt versus Gate–MT1 Resistance

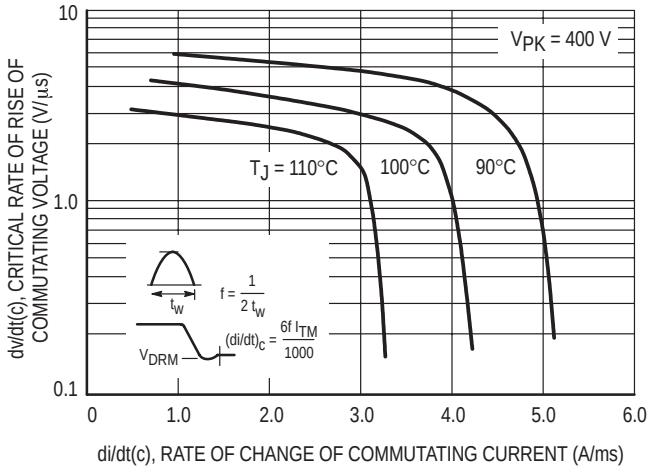
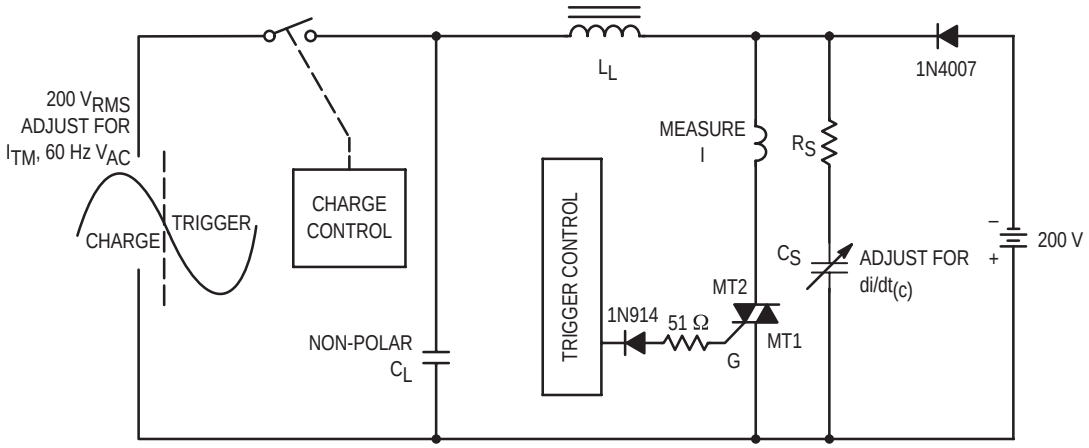


Figure 10. Critical Rate of Rise of Commutating Voltage

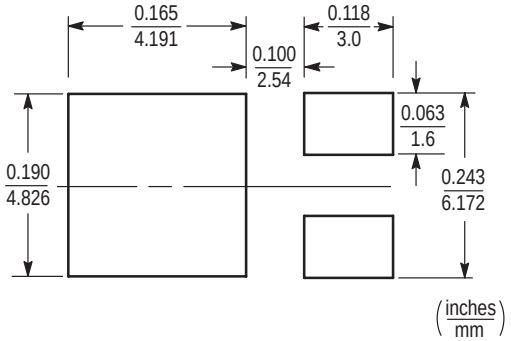


Note: Component values are for verification of rated $(di/dt)_c$. See AN1048 for additional information.

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

MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

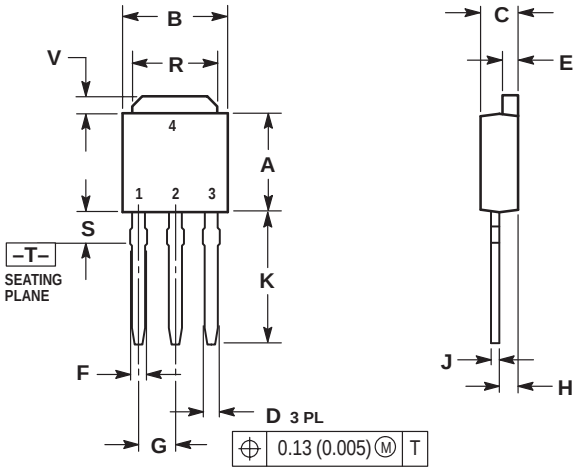
Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to insure proper solder connection interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.



DPAK

PACKAGE DIMENSIONS

D–PAK
CASE 369–07
ISSUE L

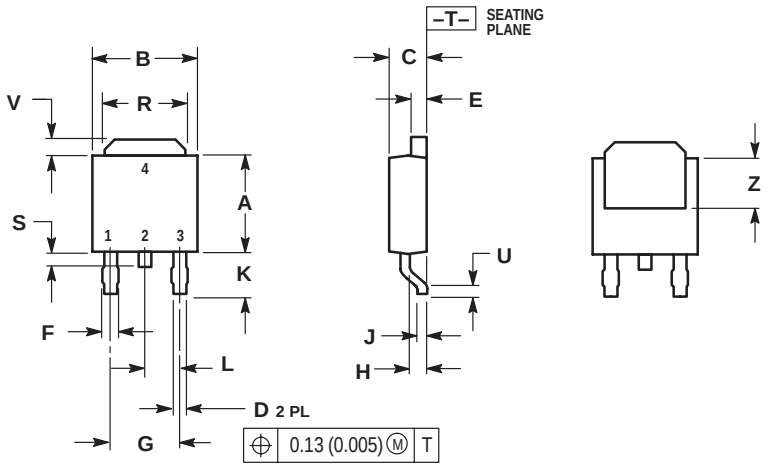


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.235	0.250	5.97	6.35
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	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
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	0.175	0.215	4.45	5.46
S	0.050	0.090	1.27	2.28
V	0.030	0.050	0.77	1.27

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

D–PAK
CASE 369A–13
ISSUE Z



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C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
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	0.175	0.215	4.45	5.46
S	0.020	0.050	0.51	1.27
U	0.020	—	0.51	—
V	0.030	0.050	0.77	1.27
Z	0.138	—	3.51	—

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

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