MCR12DSM, MCR12DSN

Sensitive Gate Silicon Controlled Rectifiers

Reverse Blocking Thyristors

Designed for high volume, low cost, industrial and consumer applications such as motor control; process control; temperature, light and speed control; CDI (Capacitive Discharge Ignition); and small engines.

Features

- Small Size
- Passivated Die for Reliability and Uniformity
- 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
- These are Pb−Free Devices

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 Hz to 60 Hz) MCR12DSM MCR12DSN	V_{DRM}, V_{RRM}	 600 800	V
On−State RMS Current (180° Conduction Angles; T_C = 75°C)	$I_{T(RMS)}$	12	A
Average On−State Current (180° Conduction Angles; T_C = 75°C)	$I_{T(AV)}$	7.6	A
Peak Non-Repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, T_J = 110°C)	I_{TSM}	100	A
Circuit Fusing Consideration (t = 8.3 msec)	I^2t	41	A^2sec
Forward Peak Gate Power (Pulse Width ≤ 10 μsec, T_C = 75°C)	P_{GM}	5.0	W
Forward Average Gate Power (t = 8.3 msec, T_C = 75°C)	$P_{G(AV)}$	0.5	W
Forward Peak Gate Current (Pulse Width ≤ 10 μsec, T_C = 75°C)	I_{GM}	2.0	A
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. 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 device are exceeded.

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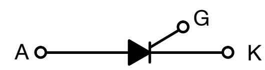
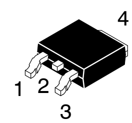
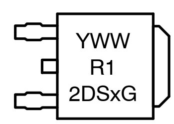
SCRs
12 AMPERES RMS
600 − 800 VOLTS

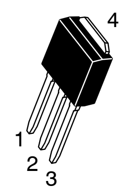


MARKING DIAGRAMS

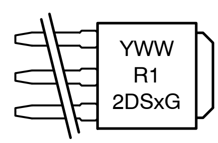


DPAK
CASE 369C
STYLE 4





IPAK
CASE 369D
STYLE 4



Y	=	Year
WW	=	Work Week
R12DSx	=	Device Code x= M or N
G	=	Pb−Free Package

PIN ASSIGNMENT	
1	Cathode
2	Anode
3	Gate
4	Anode

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance,– Junction–to–Case – Junction–to–Ambient – Junction–to–Ambient (Note 2)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	2.2 88 80	°C/W
Maximum Lead Temperature for Soldering Purposes (Note 3)	T_L	260	°C

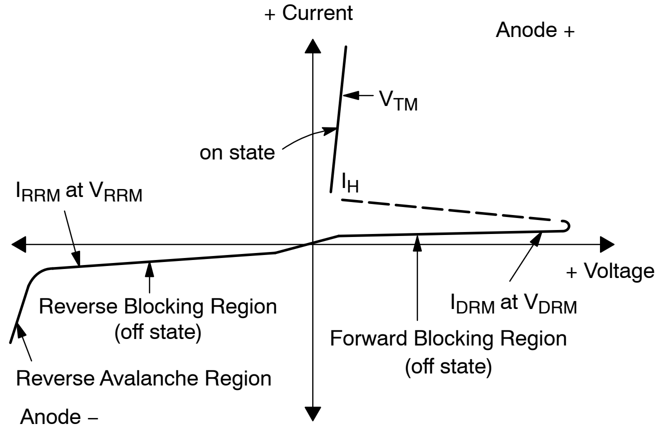
ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristics	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Peak Repetitive Forward or Reverse Blocking Current (Note 4) (V_{AK} = Rated V_{DRM} or V_{RRM}; R_{GK} = 1.0 KΩ) T_J = 25°C T_J = 110°C	I_{DRM}, I_{RRM}	 – –	 – –	 10 500	μA
ON CHARACTERISTICS					
Peak Reverse Gate Blocking Voltage, (I_{GR} = 10 μA)	V_{GRM}	10	12.5	18	V
Peak Reverse Gate Blocking Current, (V_{GR} = 10 V)	I_{GRM}	–	–	1.2	μA
Peak Forward On–State Voltage (Note 5), (I_{TM} = 20 A)	V_{TM}	–	1.3	1.9	V
Gate Trigger Current (Continuous dc) (Note 6) (V_D = 12 V, R_L = 100 Ω) T_J = 25°C T_J = −40°C	I_{GT}	 5.0 –	 12 –	 200 300	μA
Gate Trigger Voltage (Continuous dc) (Note 6) (V_D = 12 V, R_L = 100 Ω) T_J = 25°C T_J = −40°C T_J = 110°C	V_{GT}	 0.45 – 0.2	 0.65 – –	 1.0 1.5 –	V
Holding Current (V_D = 12 V, Initiating Current = 200 mA, R_{GK} = 1 kΩ) T_J = 25°C T_J = −40°C	I_H	 0.5 –	 1.0 –	 6.0 10	mA
Latching Current (V_D = 12 V, I_G = 2.0 mA, R_{GK} = 1 kΩ) T_J = 25°C T_J = −40°C	I_L	 0.5 –	 1.0 –	 6.0 10	mA
Turn–On Time (Source Voltage = 12 V, R_S = 6.0 KΩ, I_T = 16 A(pk), R_{GK} = 1.0 KΩ) (V_D = Rated V_{DRM}, Rise Time = 20 ns, Pulse Width = 10 μs)	tgt	 –	 2.0	 5.0	μs
DYNAMIC CHARACTERISTICS					
Critical Rate of Rise of Off–State Voltage (V_D = 0.67 x Rated V_{DRM}, Exponential Waveform, R_{GK} = 1.0 KΩ, T_J = 110°C)	dv/dt	 2.0	 10	 –	V/μs
Critical Rate of Rise of On–State Current (I_{PK} = 50 A, P_W = 40 μsec, diG/dt = 1 A/μsec, I_{GT} = 10 mA)	di/dt	 –	 50	 100	A/μs

2. These ratings are applicable when surface mounted on the minimum pad sizes recommended.
3. 1/8″ from case for 10 seconds.
4. Ratings apply for negative gate voltage or R_{GK} = 1.0 kΩ. Devices shall not have a positive gate voltage concurrently with a negative voltage on the anode. Devices should not be tested with a constant current source for forward and reverse blocking capability such that the voltage applied exceeds the rated blocking voltage.
5. Pulse Test: Pulse Width ≤ 2.0 msec, Duty Cycle ≤ 2%.
6. R_{GK} current not included in measurement.

Voltage Current Characteristic of SCR

Symbol	Parameter
V_{DRM}	Peak Repetitive Off State Forward Voltage
I_{DRM}	Peak Forward Blocking Current
V_{RRM}	Peak Repetitive Off State Reverse Voltage
I_{RRM}	Peak Reverse Blocking Current
V_{TM}	Peak On State Voltage
I_H	Holding Current



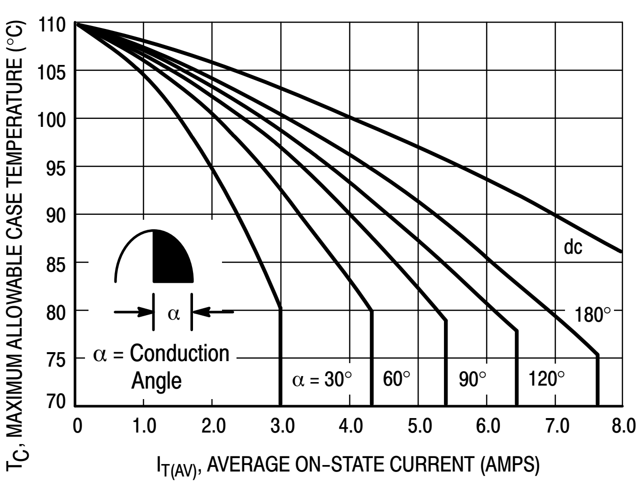


Figure 1. Average Current Derating

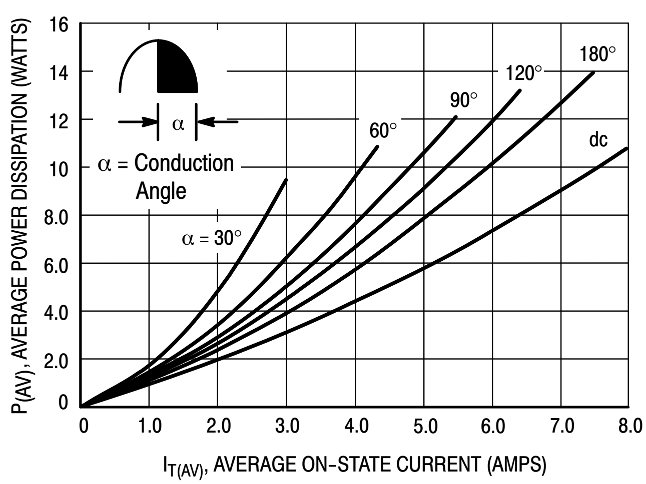


Figure 2. On−State Power Dissipation

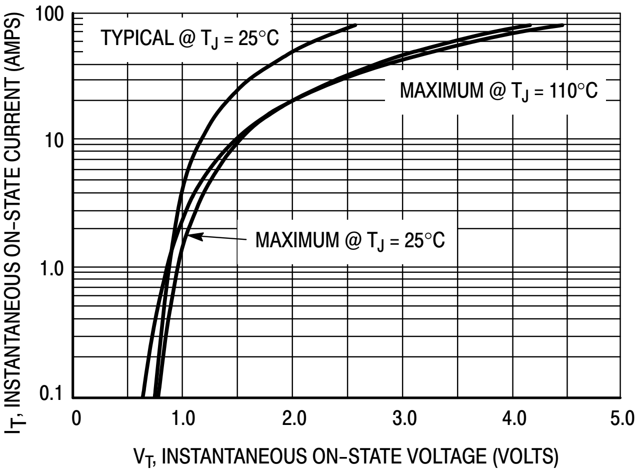


Figure 3. On−State Characteristics

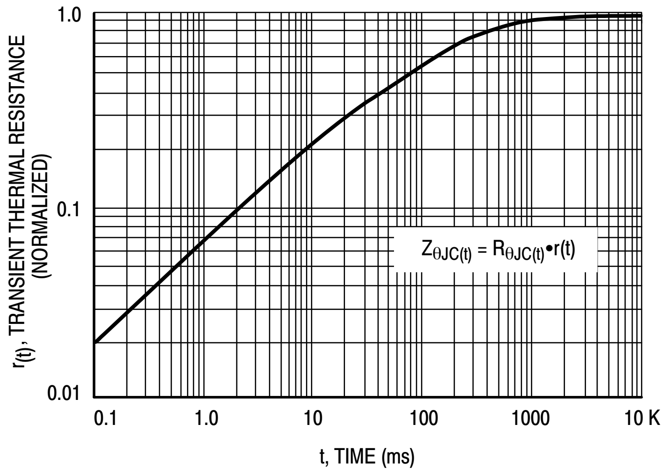


Figure 4. Transient Thermal Response

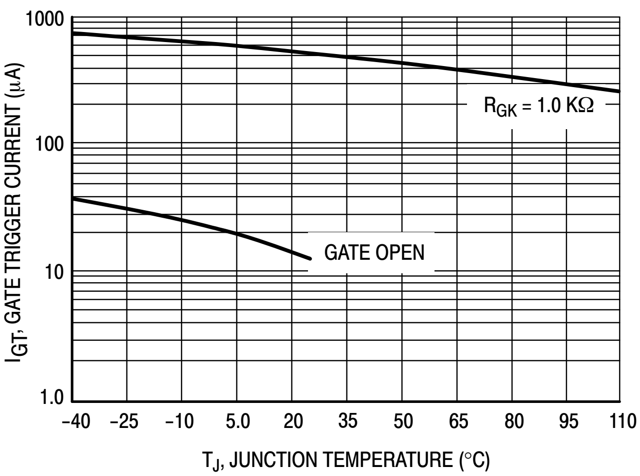


Figure 5. Typical Gate Trigger Current versus Junction Temperature

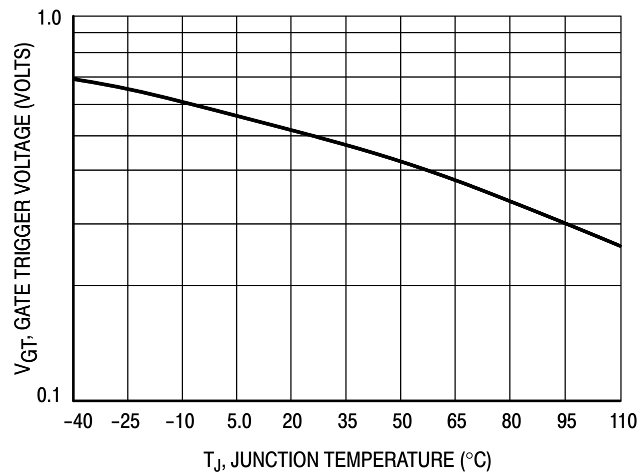


Figure 6. Typical Gate Trigger Voltage versus Junction Temperature

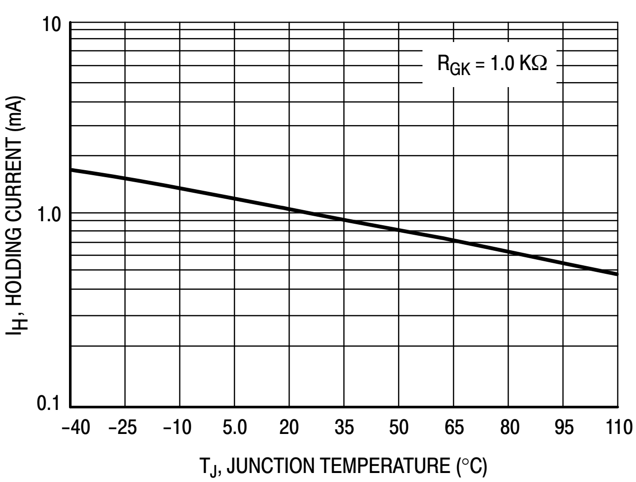


Figure 7. Typical Holding Current versus Junction Temperature

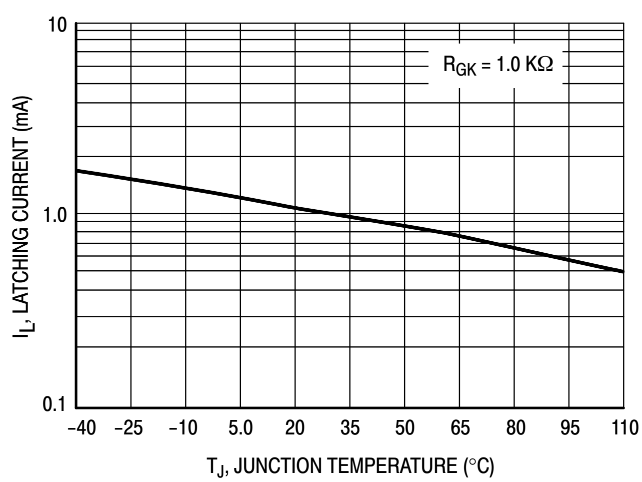


Figure 8. Typical Latching Current versus Junction Temperature

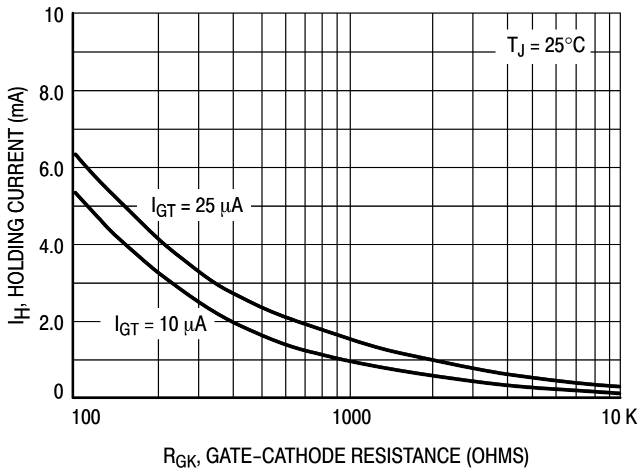


Figure 9. Holding Current versus Gate−Cathode Resistance

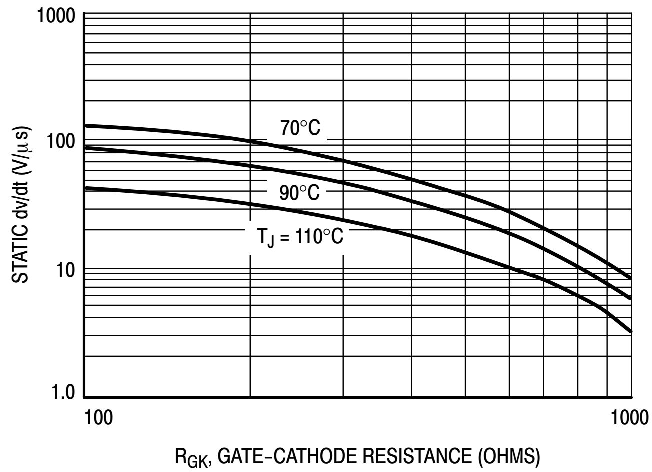


Figure 10. Exponential Static dv/dt versus Gate−Cathode Resistance and Junction Temperature

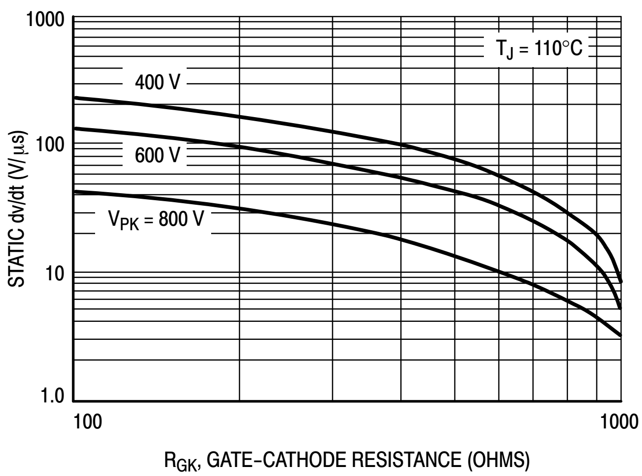


Figure 11. Exponential Static dv/dt versus Gate−Cathode Resistance and Peak Voltage

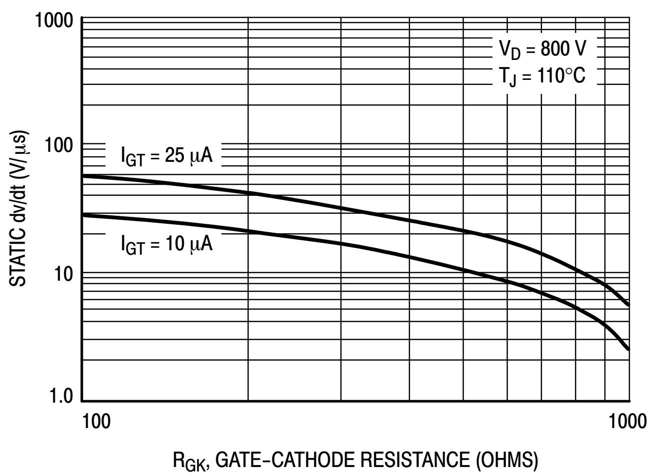


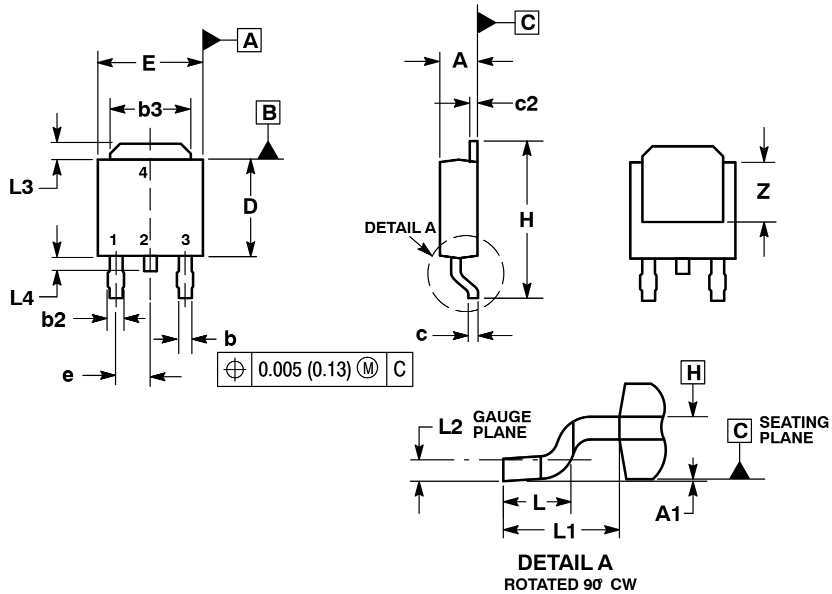
Figure 12. Exponential Static dv/dt versus Gate−Cathode Resistance and Gate Trigger Current Sensitivity

ORDERING INFORMATION

Device	Package Type	Package	Shipping†
MCR12DSMT4G	DPAK (Pb−Free)	369C	2500 / Tape & Reel
MCR12DSN−1G	IPAK (Pb−Free)	369D	75 Units / Rail
MCR12DSNT4G	DPAK (Pb−Free)	369C	2500 / Tape & Reel

PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE)
CASE 369C
ISSUE D

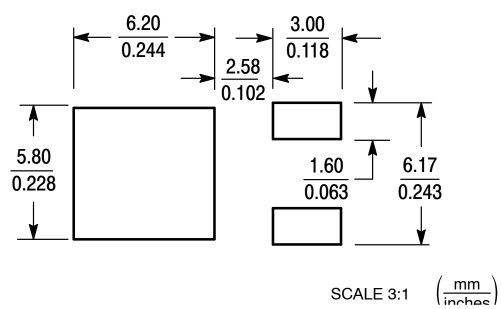


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090 BSC		2.29 BSC	
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108 REF		2.74 REF	
L2	0.020 BSC		0.51 BSC	
L3	0.035	0.050	0.89	1.27
L4	---	0.040	---	1.01
Z	0.155	---	3.93	---

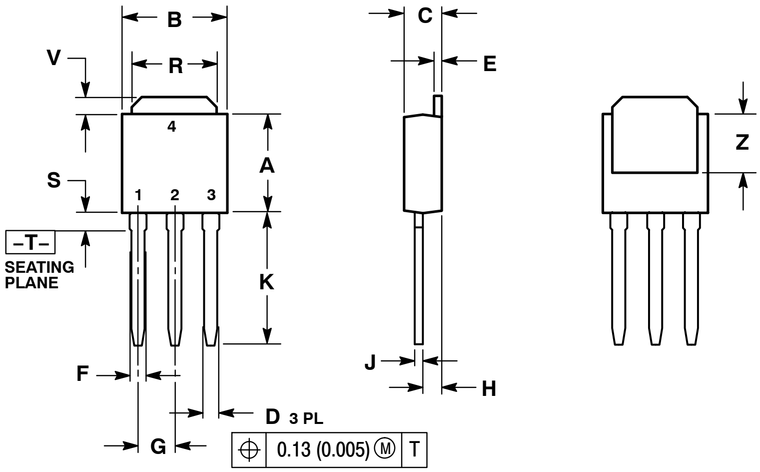
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

SOLDERING FOOTPRINT*



PACKAGE DIMENSIONS

IPAK
CASE 369D
ISSUE C



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	6.35
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	0.018	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 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE