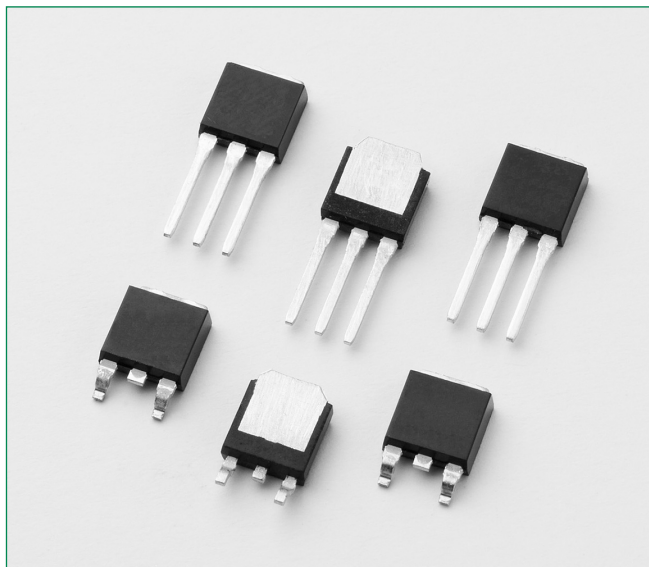


MCR12DSM, MCR12DSN



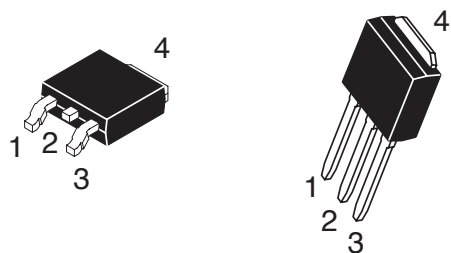
Description

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 Surface 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
- Pb-Free Packages are Available

Pin Out



Functional Diagram



Additional Information



Datasheet



Resources



Samples

Maximum Ratings ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage (Note 1) ($T_C = -40$ to $+110^\circ\text{C}$, Sine Wave, 50 to 60 Hz, $R_{GK} = 1\text{ k}\Omega$) MCR12DSM MCR12DSN	V_{DRM} V_{RRM}	600 800	V
On-State RMS Current (180° Conduction Angles; $T_C = 75^\circ\text{C}$)	I_{TM}	12	A
Average On-State Current (180° Conduction Angles; $T_C = 75^\circ\text{C}$)	$I_{\text{T(AV)}}$	7.6	A
Non-Repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, $T_J = 110^\circ\text{C}$)	I_{TSM}	100	A
Circuit Fusing Consideration ($t = 8.3\text{ ms}$)	I^2t	41	A ² sec
Forward Peak Gate Power (Pulse Width $\leq 1.0\text{ }\mu\text{sec}$, $T_C = 75^\circ\text{C}$)	P_{GM}	5.0	W
Forward Average Gate Power ($t = 8.3\text{ ms}$, $T_C = 75^\circ\text{C}$)	$P_{\text{G(AV)}}$	0.5	W
Forward Peak Gate Current (Pulse Width $\leq 1.0\text{ }\mu\text{sec}$, $T_C = 75^\circ\text{C}$)	I_{GM}	2.0	A
Operating Junction Temperature Range	T_J	-40 to +110	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to +150	$^\circ\text{C}$

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	$R_{\theta\text{JC}}$	3.0	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta\text{JA}}$	88	
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta\text{JA}}$	80	
Maximum Lead Temperature for Soldering Purposes (Note 3)	T_L	260	$^\circ\text{C}$

Electrical Characteristics - OFF ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Peak Repetitive Forward or Reverse Blocking Current ($V_{AK} = \text{Rated } V_{DRM}$ or V_{RRM} , $R_{GK} = 1.0 \text{ k}\Omega$)	$T_J = 25^\circ\text{C}$	I_{DRM}	-	-	10	μA
	$T_J = 110^\circ\text{C}$	I_{RRM}	-	-	500	

Electrical Characteristics - ON ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Peak Reverse Gate Blocking Voltage, ($I_{GR} = 10 \mu\text{A}$)		V_{GRM}	10	12.5	18	V
Peak Reverse Gate Blocking Current, ($V_{GR} = 10 \text{ V}$)		I_{GT}	-	-	1.2	μA
Peak Forward On-State Voltage (Note 5), ($I_{TM} = 20 \text{ A}$)		V_{TM}	-	1.3	1.9	V
Gate Trigger Voltage (Note 6) ($V_{AK} = 12 \text{ Vdc}$; $R_L = 100 \Omega$, $T_C = 110^\circ$)	$T_J = 25^\circ\text{C}$	I_{GT}	5.0	12	200	μA
	$T_J = -40^\circ\text{C}$		-	-	1.5	
Gate Trigger Voltage (Continuous dc) (Note 6) ($V_{AK} = 12 \text{ V}$; $R_L = 100 \Omega$)	$T_J = 25^\circ\text{C}$	V_{GT}	0.45	0.65	1.0	V
	$T_J = -40^\circ\text{C}$		-	-	1.5	
	$T_J = 110^\circ\text{C}$		0.2	-	-	
Holding Current ($V_D = 12 \text{ V}$, Initiating Current = 200 mA, $R_{GK} = 1 \text{ k}\Omega$)	$T_J = 25^\circ\text{C}$	I_H	0.5	1.0	6.0	mA
	$T_J = -40^\circ\text{C}$		-	-	10	
Latching Current ($V_D = 12 \text{ V}$, $I_G = 2.0 \text{ mA}$, $R_{GK} = 1 \text{ k}\Omega$)	$T_J = 25^\circ\text{C}$	I_L	0.5	1.0	6.0	mA
	$T_J = -40^\circ\text{C}$		-	-	10	
Peak Reverse Gate Blocking Current ($V_{GR} = 10 \text{ V}$)		I_{RGM}	-	-	1.2	μA
Turn-On Time (Source Voltage = 12 V, $R_S = 6.0 \text{ k}\Omega$, $I_T = 16 \text{ A(pk)}$, $R_{GK} = 1.0 \text{ k}\Omega$) ($V_D = \text{Rated } V_{DRM}$, Rise Time = 20 ns, Pulse Width = 10 μs)		tgt	-	2.0	5.0	μs

Dynamic Characteristics

Characteristic	Symbol	Min	Typ	Max	Unit
Critical Rate of Rise of Off-State Voltage ($V_D = \text{Rated } V_{DRM}$, $R_{GK} = 1 \text{ k}\Omega$, Exponential Waveform, Gate Open, $T_c = 110^\circ\text{C}$)	dv/dt	–	10	–	$\text{V}/\mu\text{s}$
Repetitive Critical Rate of Rise of On-State Current ($C_f = 60 \text{ Hz}$, $I_{PK} = 30 \text{ A}$, $PW = 100 \mu\text{s}$, $diG/dt = 1 \text{ A}/\mu\text{s}$)	di/dt	–	–	100	$\text{A}/\mu\text{s}$

- These ratings are applicable when surface mounted on the minimum pad sizes recommended.
- 1/8" from case for 10 seconds.
- Ratings apply for negative gate voltage or $R_{GK} = 1.0 \text{ k}\Omega$. 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.
- Pulse Test: Pulse Width $\leq 2.0 \text{ msec}$, Duty Cycle $\leq 2\%$.
- R_{GK} current not included in measurement.

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

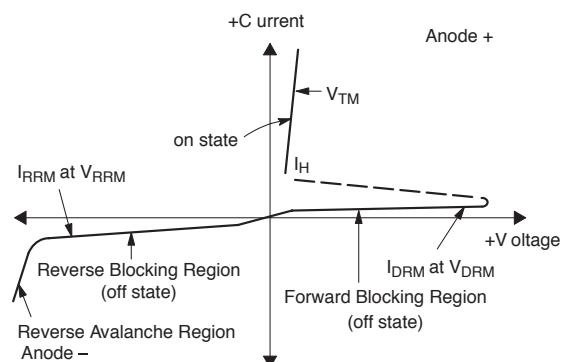


Figure 1. Average Current Derating

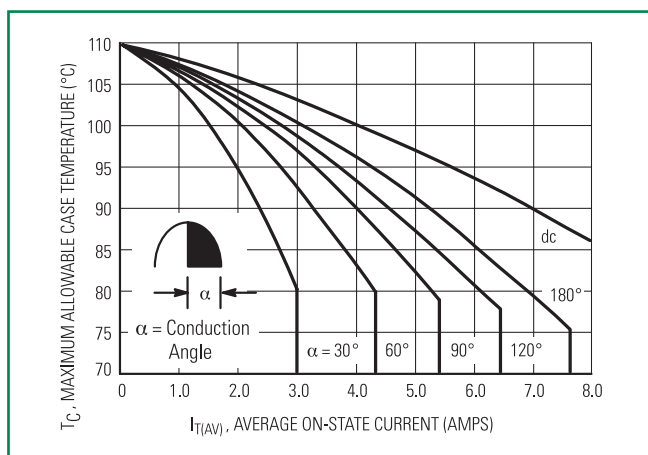


Figure 2. On-State Power Dissipation

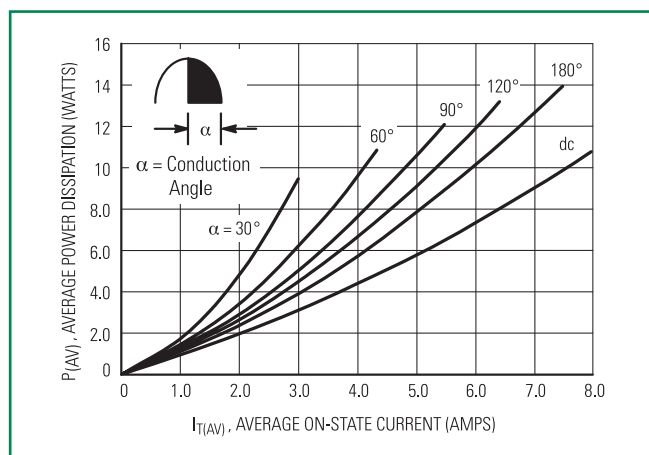


Figure 3. On-State Characteristics

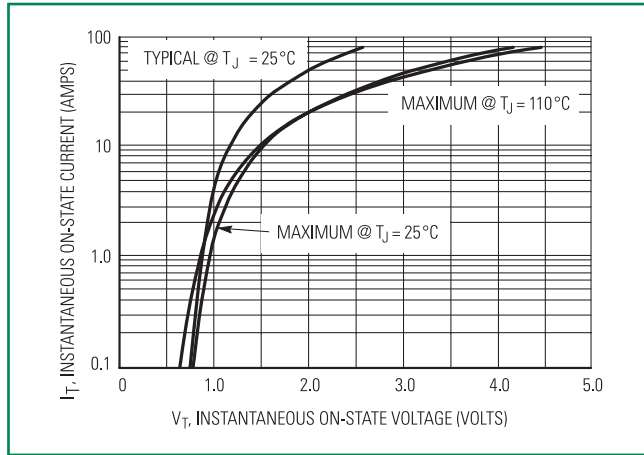


Figure 4. Transient Thermal Response

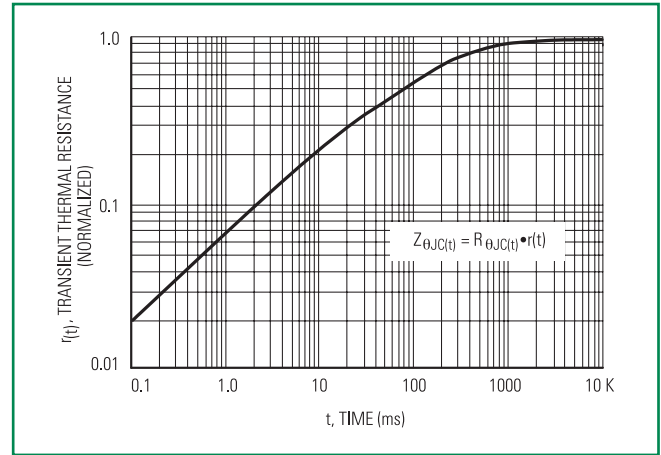


Figure 5. Typical Gate Trigger Current vs Junction Temperature

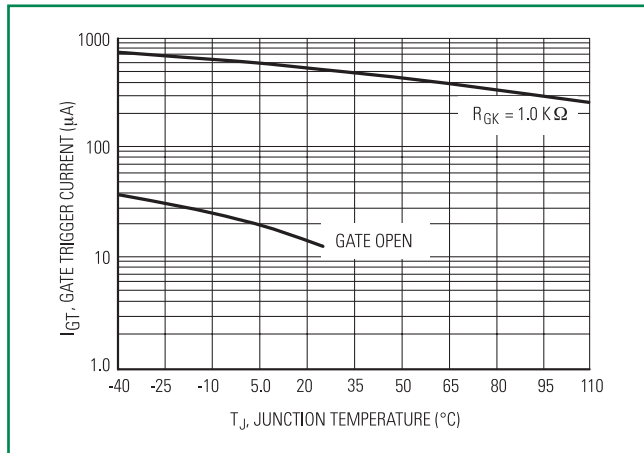


Figure 6. Typical Gate Trigger Voltage vs Junction Temperature

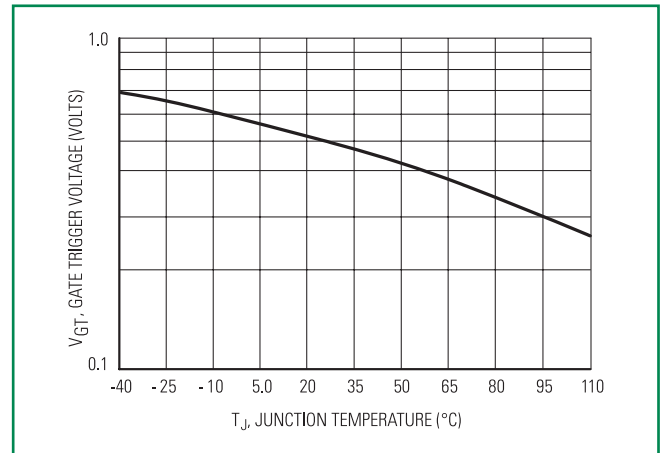


Figure 7. Typical Holding Current vs Junction Temperature

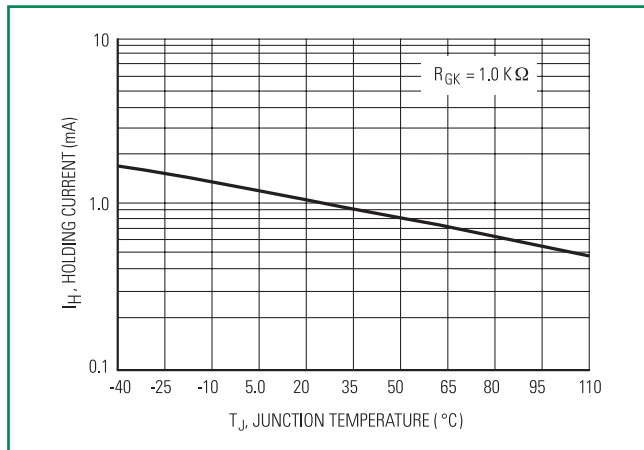


Figure 8. Typical Latching Current vs Junction Temperature

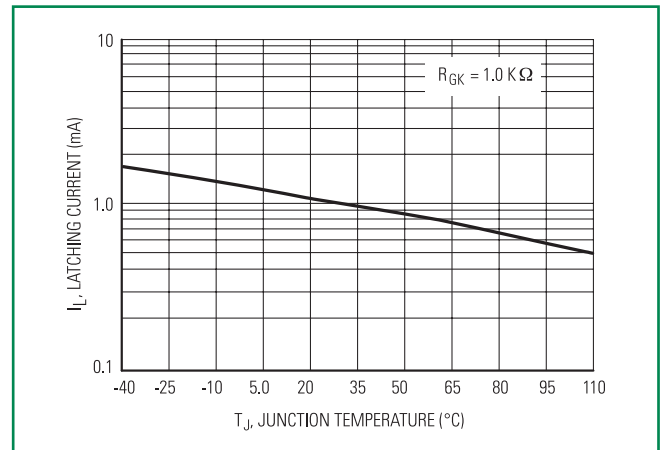


Figure 9. Holding Current vs Gate-Cathode Resistance

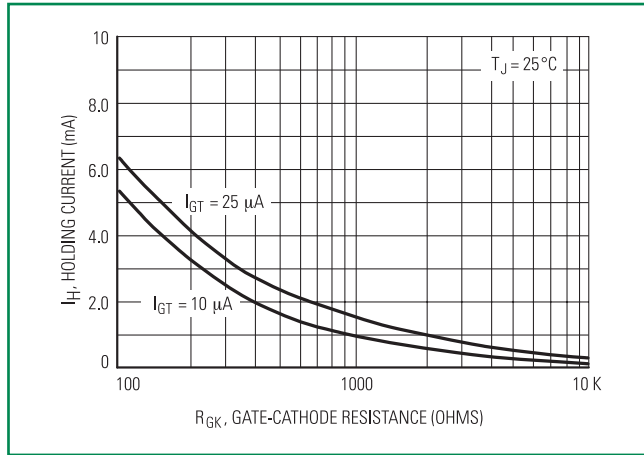


Fig.10 Exponential Static dv/dt vs Gate-Cathode Resistance & Junction Temp

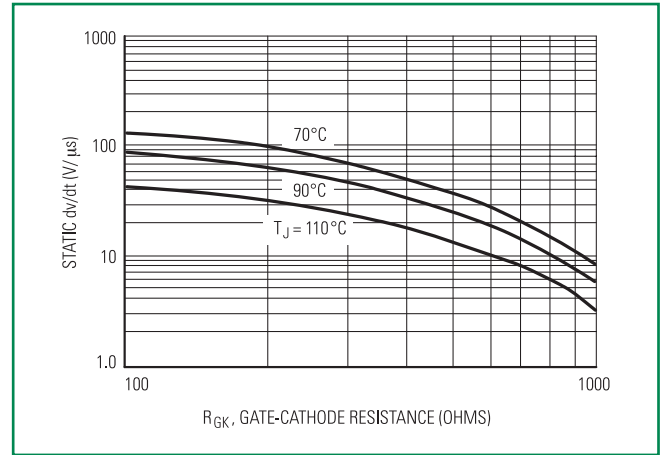


Figure 5. Typical Gate Trigger Current vs Junction Temperature

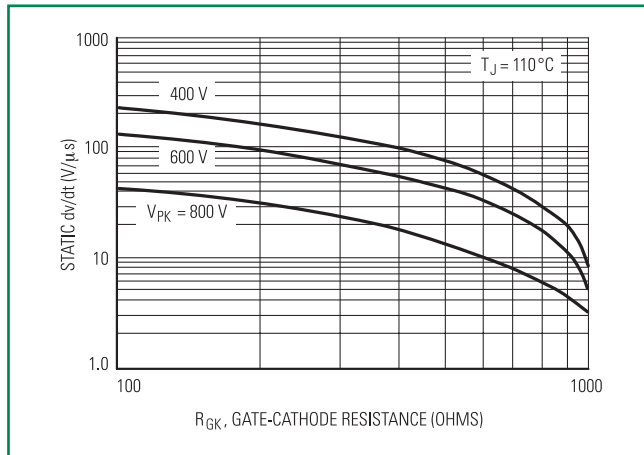
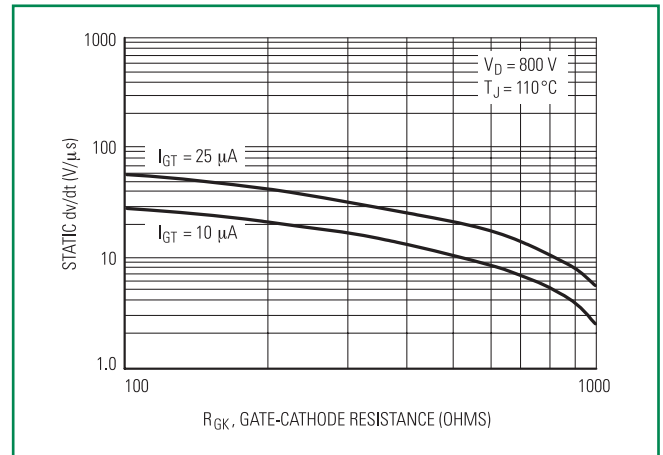
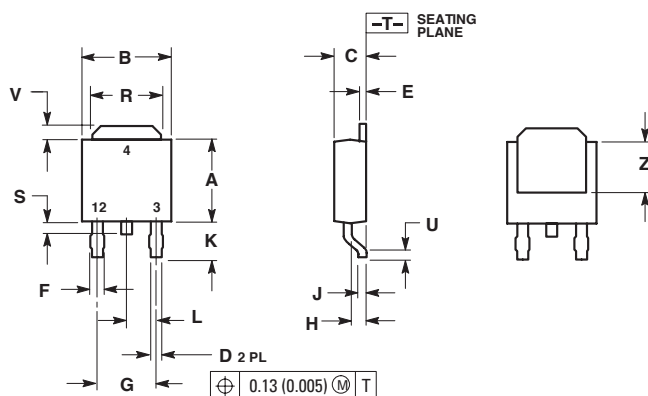


Figure 6. Typical Gate Trigger Voltage vs Junction Temperature

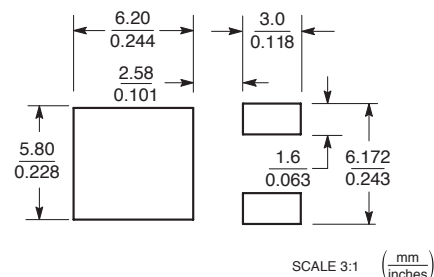


Dimensions

DPAK (SINGLE GAUGE) CASE 369C ISSUE D



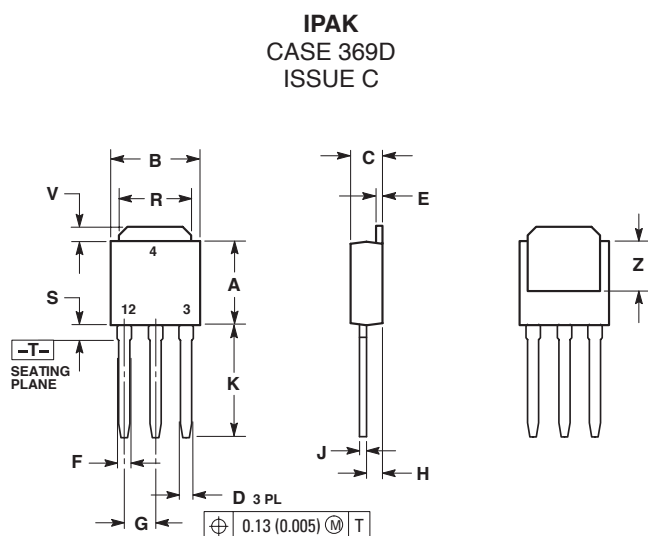
Soldering Footprint



Dim	Inches		Millimeters	
	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	---

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.
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 L3 Z 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.

Dimensions

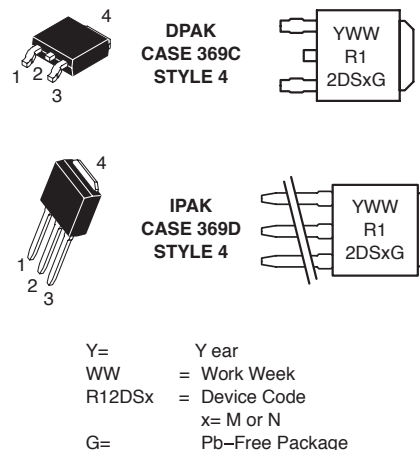


Dim	Inches		Millimeters	
	Min	Max	Min	Max
A	0.235	0.245	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

2. CONTROLLING DIMENSION: INCH.

Part Marking System



Pin Assignment

1	Cathode
2	Anode
3	Gate
4	Anode

Ordering Information

Device	Package		Shipping
MCR12DSMT4G	DPAK	369C	2500 Tape & Reel
MCR12DSN-1G		369C	75 Units / Rail
MCR12DSNT4G		369C	2500 Tape & Reel

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