

P-Channel Enhancement Mode Power MOSFET

Description

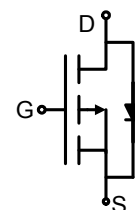
The HM2305PR uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

General Features

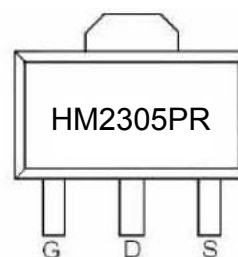
- $V_{DS} = -20V, I_D = -5.1A$
 $R_{DS(ON)} < 75m\Omega @ V_{GS} = -2.5V$
 $R_{DS(ON)} < 52m\Omega @ V_{GS} = -4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

- PWM applications
- Load switch
- Power management



Schematic diagram



SOT-89-3L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM2305PR	HM2305PR	SOT-89-3L	Ø180mm	8 mm	3000 units

Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	-20	V
Gate-Source Voltage		V_{GS}	± 12	V
Continuous Drain Current	$T_C = 25^\circ C$	I_D	-5.1	A
	$T_C = 70^\circ C$		-3.2	
	$T_A = 25^\circ C$		-3	
	$T_A = 70^\circ C$		-2.3	
Drain Current - Pulsed (Note 1)		I_{DM}	-15	A
Maximum Power Dissipation		P_D	1.7	W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	74	$^\circ C/W$
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Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-20	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-20V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.45	-0.7	-1.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-5.1A$	-	39	52	m Ω
		$V_{GS}=-2.5V, I_D=-3A$	-	58	75	
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-2A$	6	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=-4V, V_{GS}=0V,$ $F=1.0MHz$	-	740	-	PF
Output Capacitance	C_{oss}		-	290	-	PF
Reverse Transfer Capacitance	C_{rss}		-	190	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-4V, I_D=-3.3A,$ $R_L=-1.2\Omega, V_{GEN}=-4.5V, R_g=1\Omega$	-	12	-	nS
Turn-on Rise Time	t_r		-	35	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	nS
Turn-Off Fall Time	t_f		-	10	-	nS
Total Gate Charge	Q_g	$V_{DS}=-4V, I_D=-5.1A, V_{GS}=-4.5V$	-	7.8	-	nC
Gate-Source Charge	Q_{gs}		-	1.2	-	nC
Gate-Drain Charge	Q_{gd}		-	1.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-1.6A$	-	-	-1.2	V
Diode Forward Current (Note 2)	I_S		-	-	1.6	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

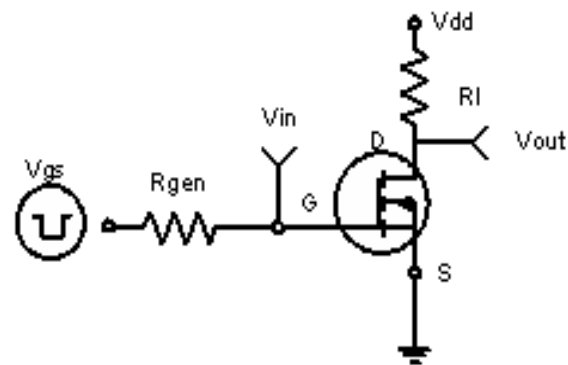


Figure 1: Switching Test Circuit

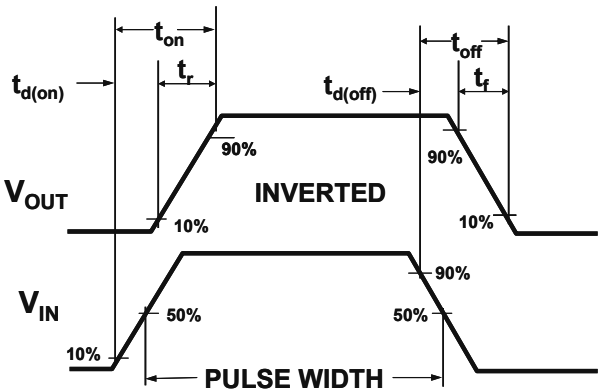


Figure 2: Switching Waveforms

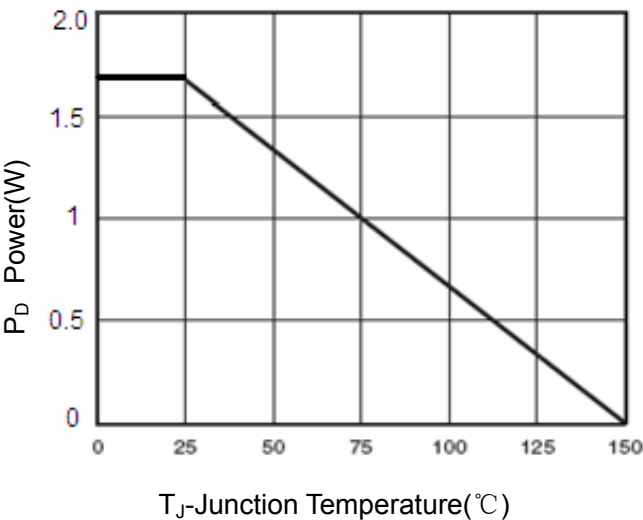


Figure 3 Power Dissipation

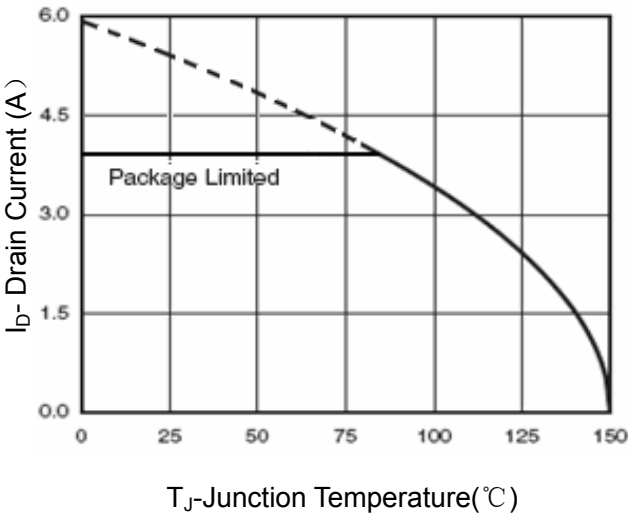


Figure 4 Drain Current

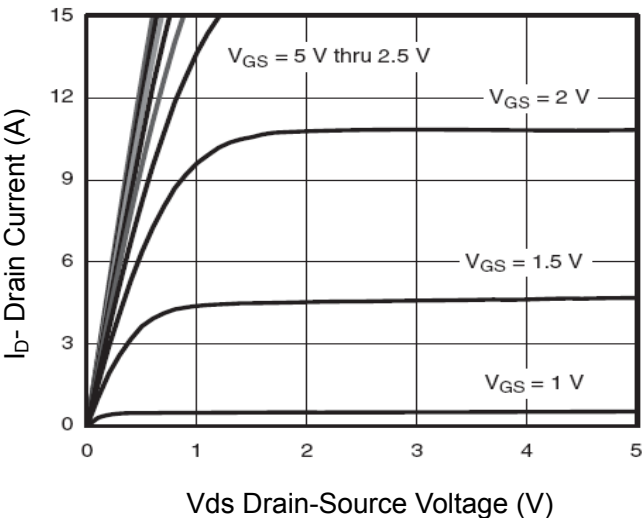


Figure 5 Output Characteristics

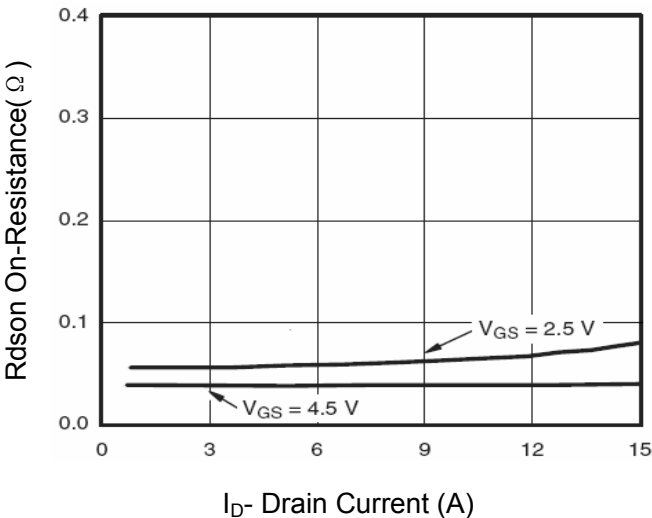


Figure 6 Drain-Source On-Resistance

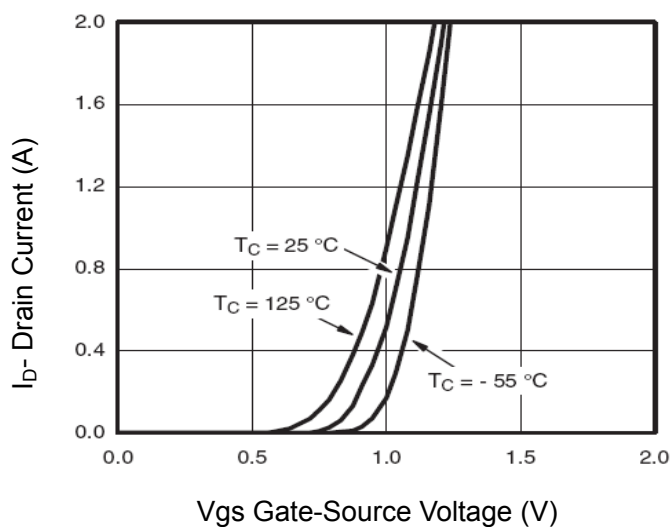


Figure 7 Transfer Characteristics

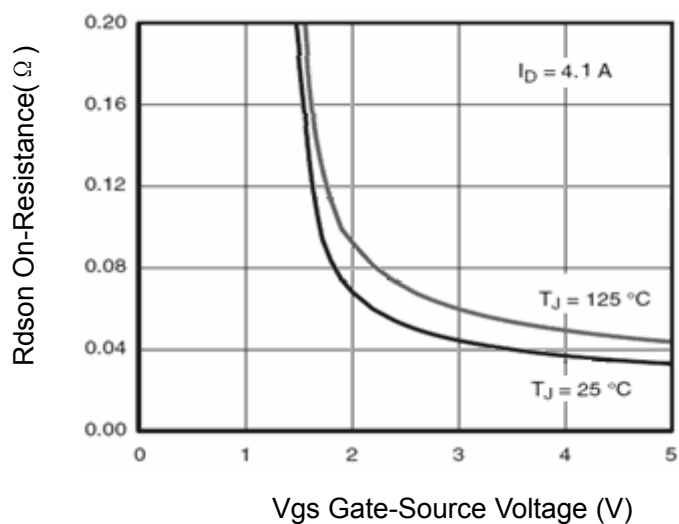


Figure 9 $R_{DS(on)}$ vs V_{GS}

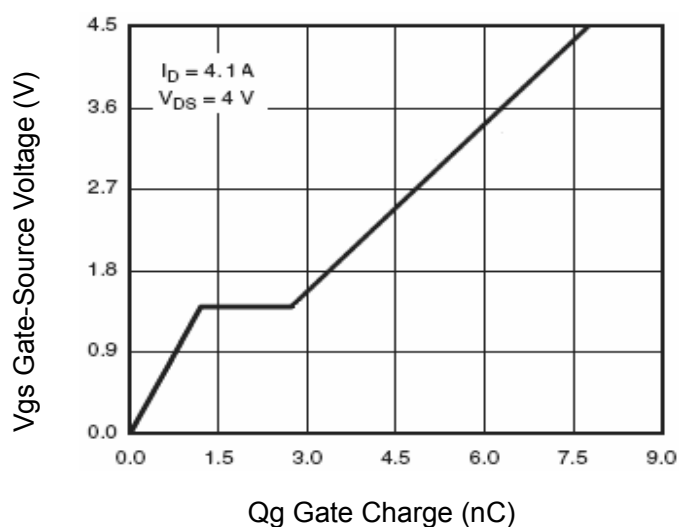


Figure 11 Gate Charge

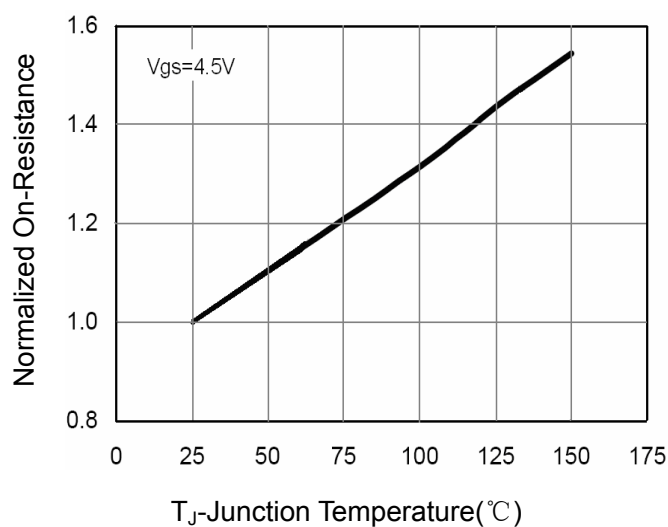


Figure 8 Drain-Source On-Resistance

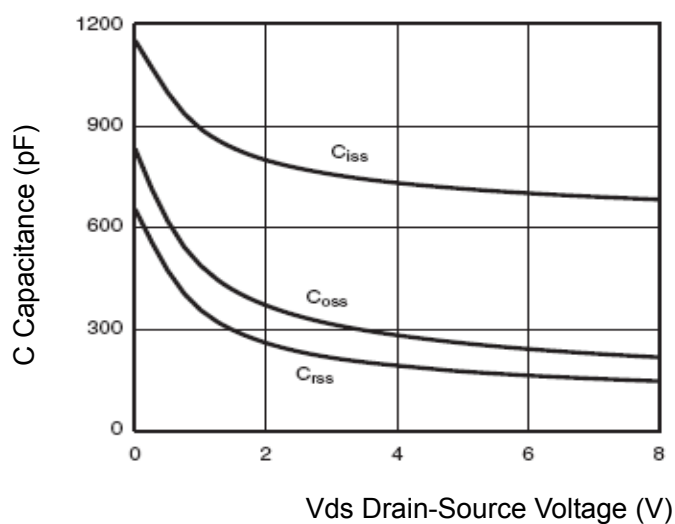


Figure 10 Capacitance vs V_{DS}

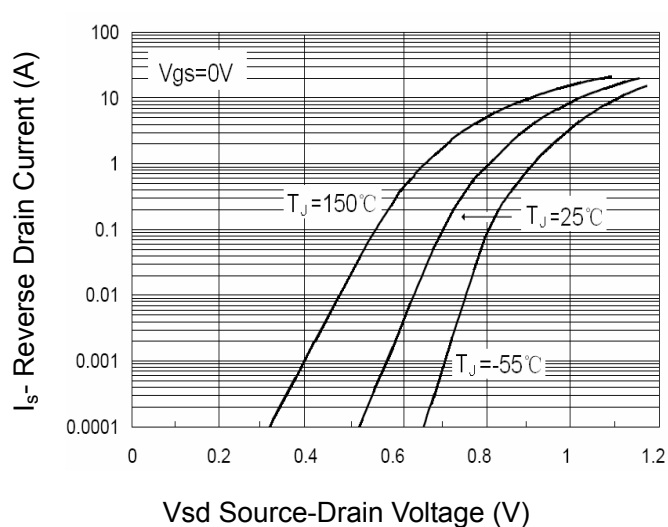


Figure 12 Source- Drain Diode Forward

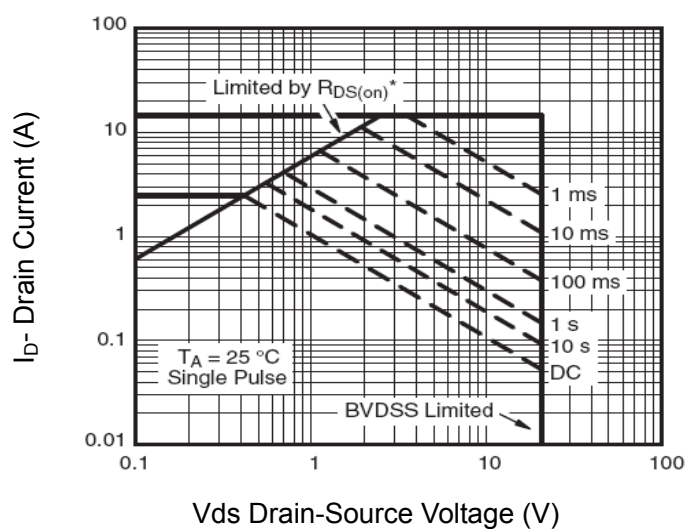


Figure 13 Safe Operation Area

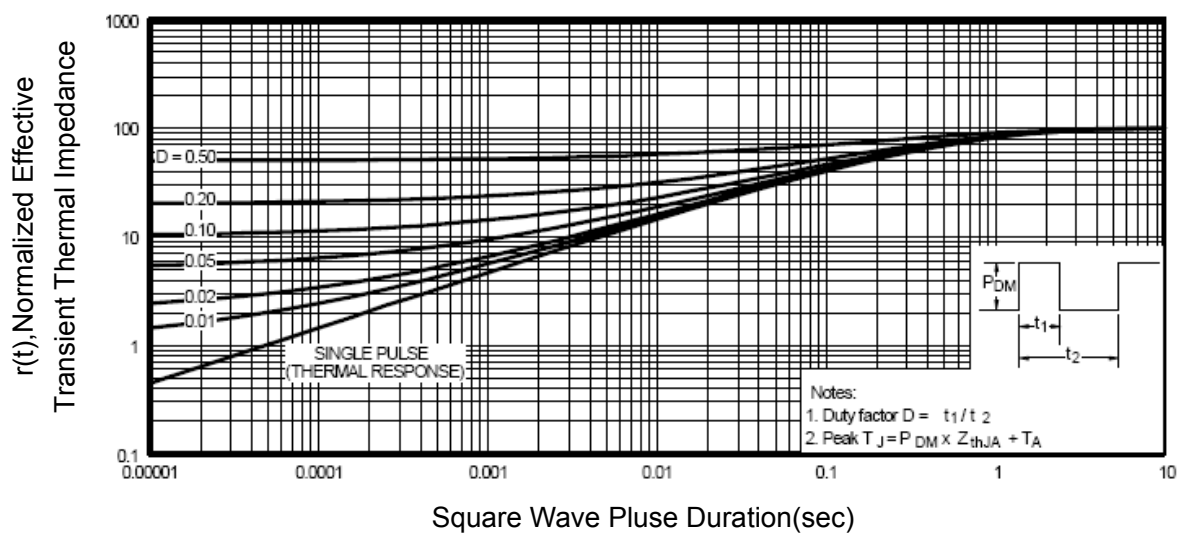
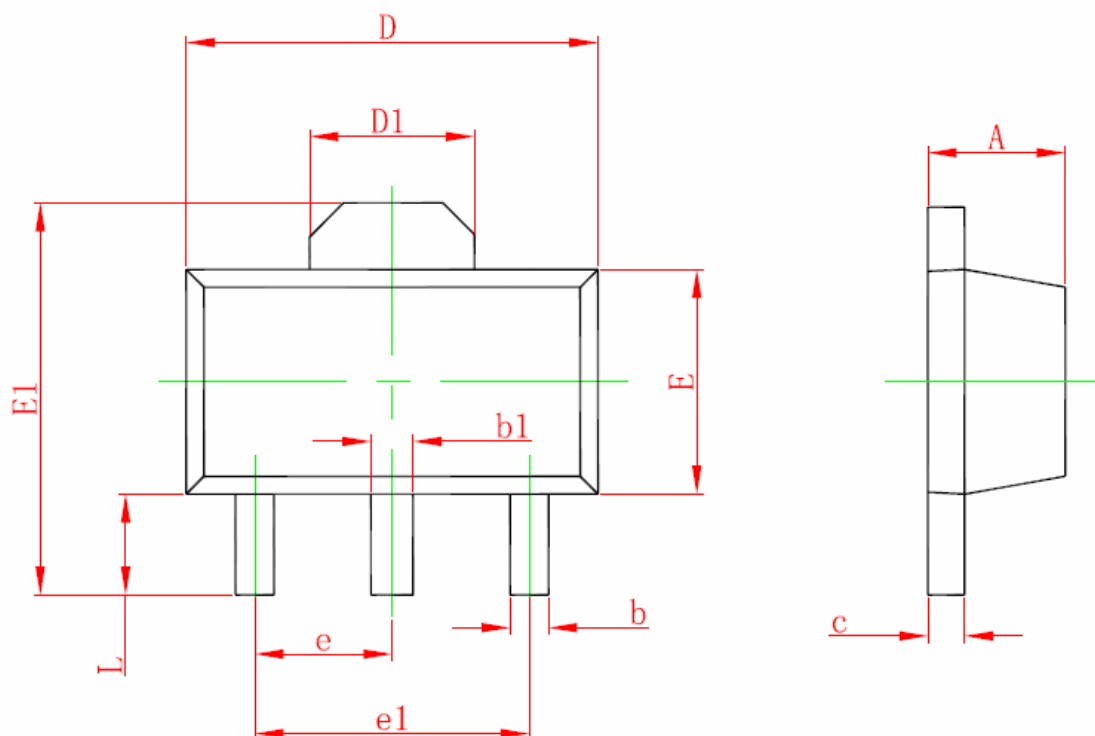


Figure 14 Normalized Maximum Transient Thermal Impedance

SOT-89-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.