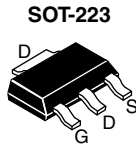


Power MOSFET



P-Channel MOSFET

FEATURES

- Surface-mount
- Available in tape and reel
- Dynamic dv/dt rating
- Repetitive avalanche rated
- P-channel
- Fast switching
- Ease of paralleling
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
Available

DESCRIPTION

Third generation power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOT-223 package is designed for surface-mount using vapor phase, infrared, or wave soldering techniques. Its unique package design allows for easy automatic pick-and-place as with other SOT or SOIC packages but has the added advantage of improved thermal performance due to an enlarged tab for heatsinking. Power dissipation of greater than 1.25 W is possible in a typical surface mount application.

Marking code: FF

PRODUCT SUMMARY		
V_{DS} (V)	-100	
$R_{DS(on)}$ (Ω)	$V_{GS} = -10$ V	1.2
Q_g max. (nC)	8.7	
Q_{gs} (nC)	2.2	
Q_{gd} (nC)	4.1	
Configuration	Single	

ORDERING INFORMATION	
Package	SOT-223
Lead (Pb)-free and halogen-free	SiHFL9110TR-GE3 ^a IRFL9110TRPbF-BE3 ^{a, b}
Lead (Pb)-free	IRFL9110TRPbF ^a

Notes

- See device orientation
- “-BE3” denotes alternate manufacturing location

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)				
PARAMETER	SYMBOL		LIMIT	UNIT
Drain-source voltage	V_{DS}		-100	V
Gate-source voltage	V_{GS}		± 20	
Continuous drain current	V_{GS} at -10 V	$T_C = 25^\circ\text{C}$	-1.1	A
		$T_C = 100^\circ\text{C}$	-0.69	
Pulsed drain current ^a	I_{DM}		-8.8	W/ $^\circ\text{C}$
Linear derating factor			0.025	
Linear derating factor (PCB mount) ^e			0.017	
Single pulse avalanche energy ^b	E_{AS}		100	mJ
Avalanche current ^a	I_{AR}		-1.1	A
Repetitive avalanche energy ^a	E_{AR}		0.31	mJ
Maximum power dissipation	$T_C = 25^\circ\text{C}$	P_D	3.1	W
Maximum power dissipation (PCB mount) ^e	$T_A = 25^\circ\text{C}$		2.0	
Peak diode recovery dv/dt ^c	dv/dt		-5.5	V/ns
Operating junction and storage temperature range	T_J, T_{stg}		-55 to +150	$^\circ\text{C}$
Soldering recommendations (peak temperature) ^d	For 10 s		300	

Notes



- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- $V_{DD} = -25$ V, starting $T_J = 25^\circ\text{C}$, $L = 7.7$ mH, $R_g = 25 \Omega$, $I_{AS} = -4.4$ A (see fig. 12)
- $I_{SD} \leq -4.4$ A, $di/dt \leq -75$ A/ μs , $V_{DD} \leq V_{DS}$, $T_J \leq 150^\circ\text{C}$
- 1.6 mm from case
- When mounted on 1" square PCB (FR-4 or G-10 material)



THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Maximum junction-to-ambient (PCB mount) ^a	R_{thJA}	-	-	60	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	-	40	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material)

SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$		-100	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = -1\text{ mA}$		-	-0.091	-	V/°C
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$		-2.0	-	-4.0	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}$		-	-	-100	μA
		$V_{DS} = -80\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$		-	-	-500	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$	$I_D = -0.66\text{ A}^b$	-	-	1.2	Ω
Forward transconductance	g_{fs}	$V_{DS} = -50\text{ V}, I_D = -0.66\text{ A}$		0.82	-	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V},$ $V_{DS} = -25\text{ V},$ $f = 1.0\text{ MHz}$, see fig. 5		-	200	-	pF
Output capacitance	C_{oss}			-	94	-	
Reverse transfer capacitance	C_{rss}			-	18	-	
Total gate charge	Q_g	$V_{GS} = -10\text{ V}$	$I_D = -4.0\text{ A}, V_{DS} = -80\text{ V},$ see fig. 6 and 13 ^b	-	-	8.7	nC
Gate-source charge	Q_{gs}			-	-	2.2	
Gate-drain charge	Q_{gd}			-	-	4.1	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -50\text{ V}, I_D = -4.0\text{ A},$ $R_g = 24\text{ }\Omega, R_D = 11\text{ }\Omega$, see fig. 10 ^b		-	10	-	ns
Rise time	t_r			-	27	-	
Turn-off delay time	$t_{d(off)}$			-	15	-	
Fall time	t_f			-	17	-	
Internal drain inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 		-	4.0	-	nH
Internal source inductance	L_S			-	6.0	-	
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	-1.1	A
Pulsed diode forward current ^a	I_{SM}			-	-	-8.8	
Body diode voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = -1.1\text{ A}, V_{GS} = 0\text{ V}^b$		-	-	-5.5	V
Body diode reverse recovery time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = -4.0\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}^b$		-	80	160	ns
Body diode reverse recovery charge	Q_{rr}			-	0.15	0.30	μC
Forward turn-on time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
 b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\text{ }\%$

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

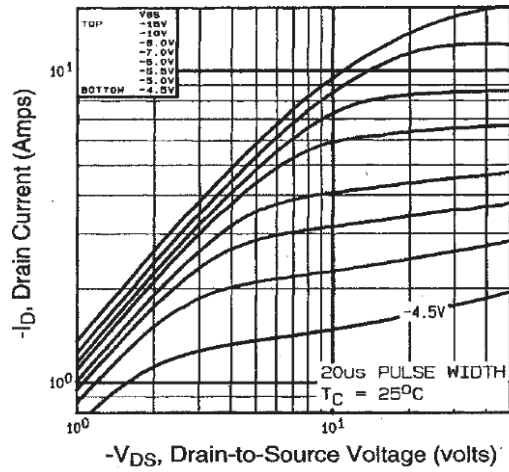


Fig. 1 - Typical Output Characteristics

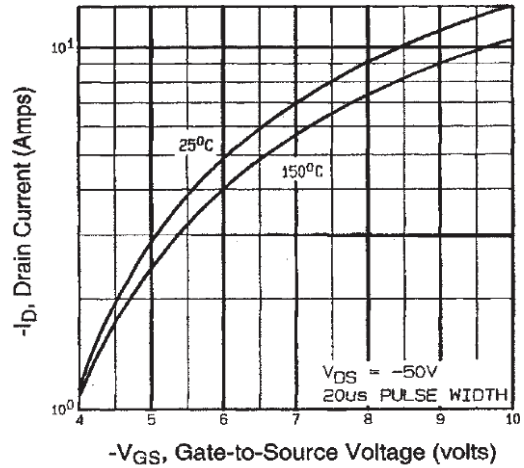


Fig. 3 - Typical Transfer Characteristics

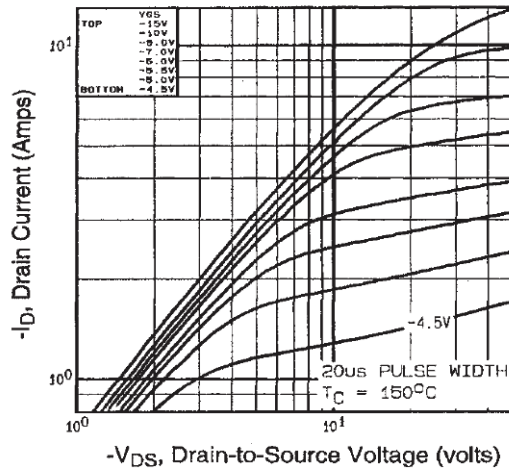


Fig. 2 - Typical Output Characteristics

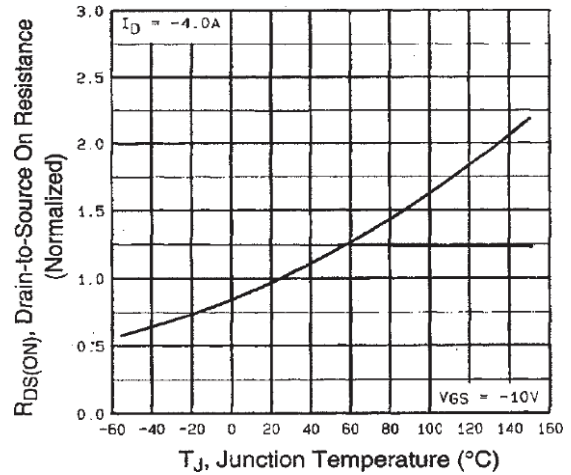


Fig. 4 - Normalized On-Resistance vs. Temperature

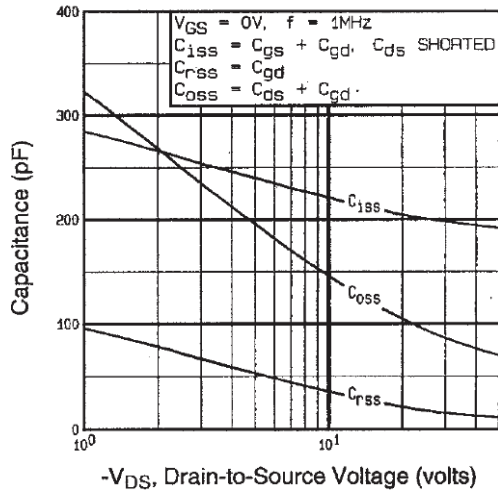


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

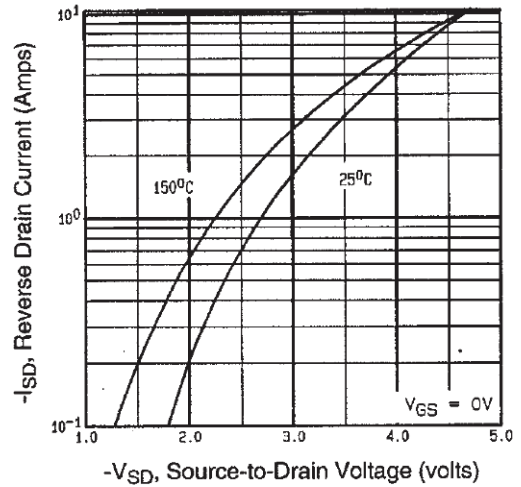


Fig. 7 - Typical Source-Drain Diode Forward Voltage

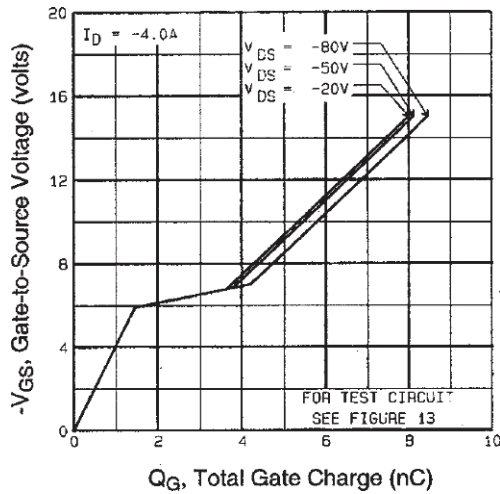


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

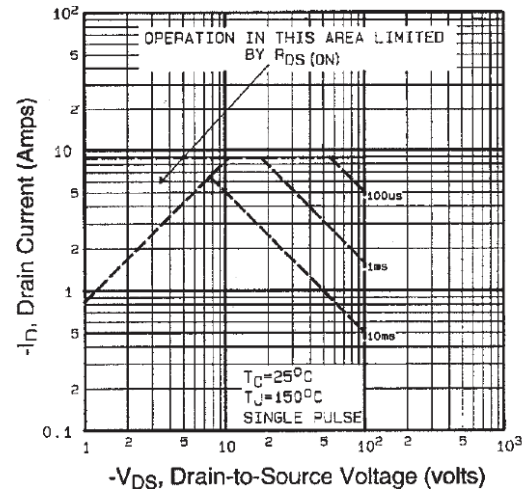


Fig. 8 - Maximum Safe Operating Area

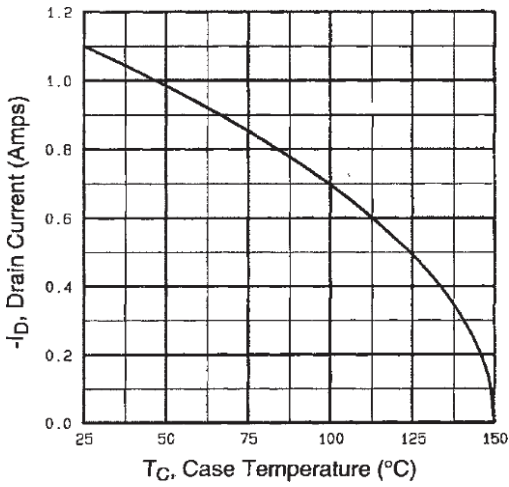


Fig. 9 - Maximum Drain Current vs. Case Temperature

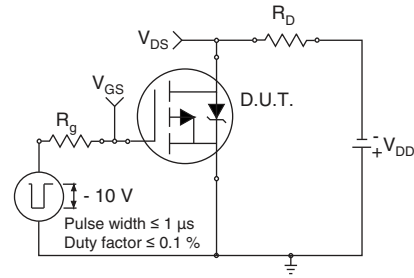


Fig. 10a - Switching Time Test Circuit

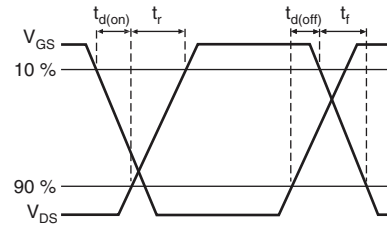


Fig. 10b - Switching Time Waveforms

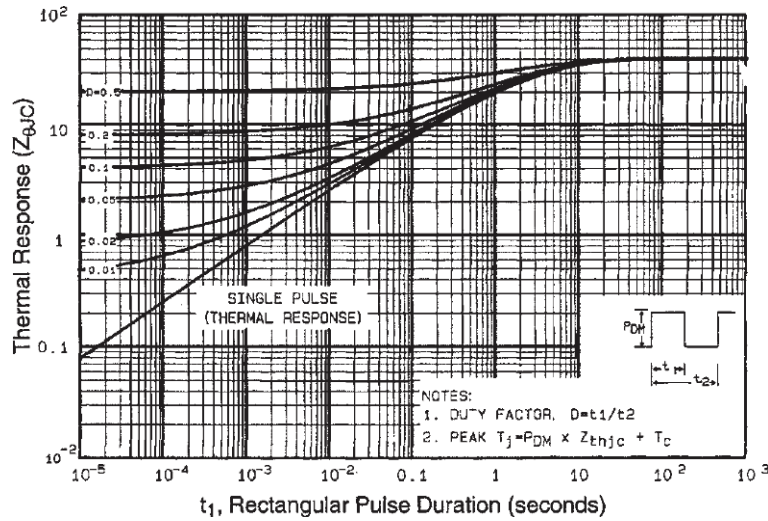


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

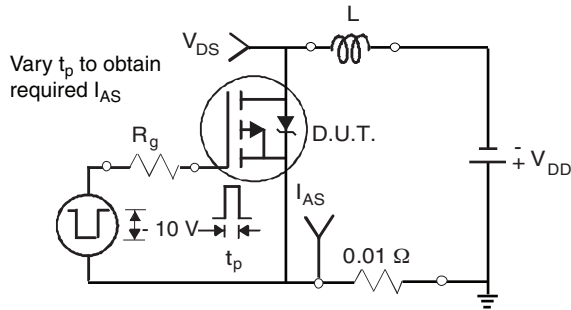


Fig. 12a - Unclamped Inductive Test Circuit

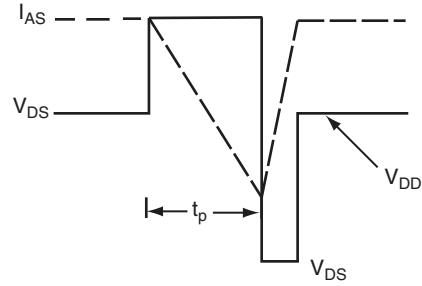


Fig. 12b - Unclamped Inductive Waveforms

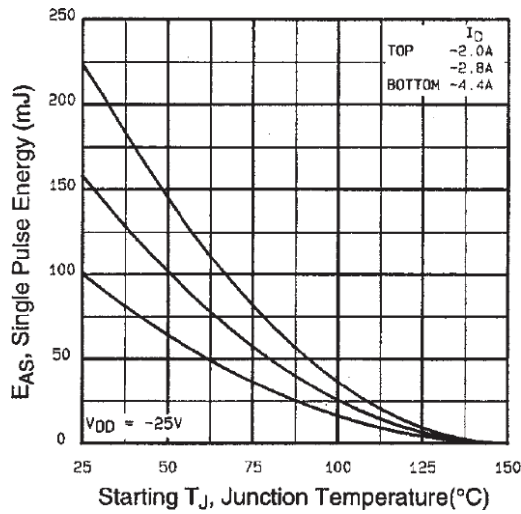


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

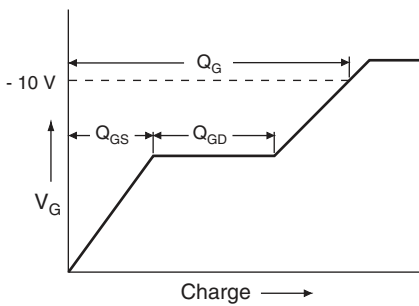


Fig. 13a - Basic Gate Charge Waveform

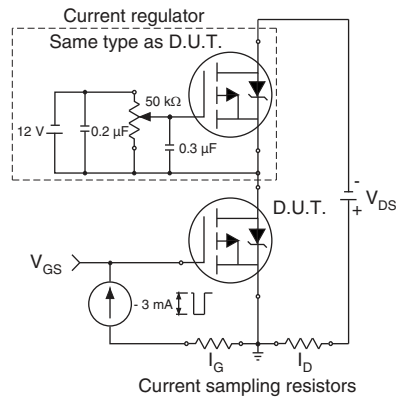
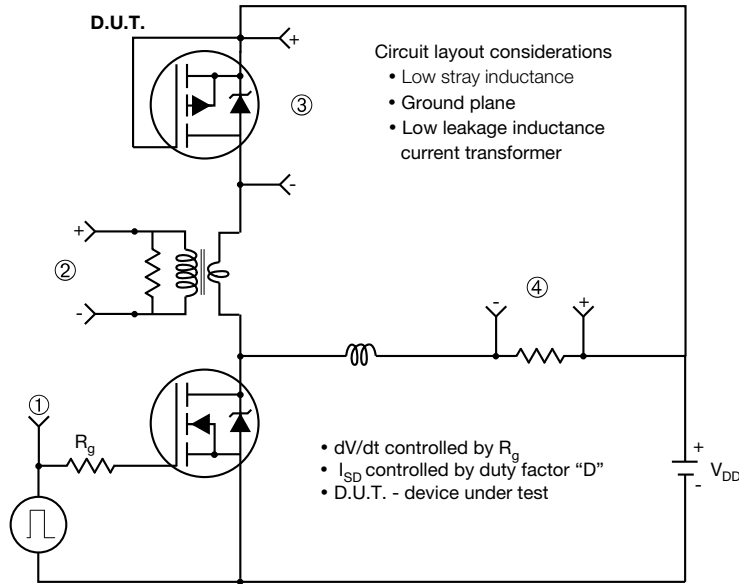
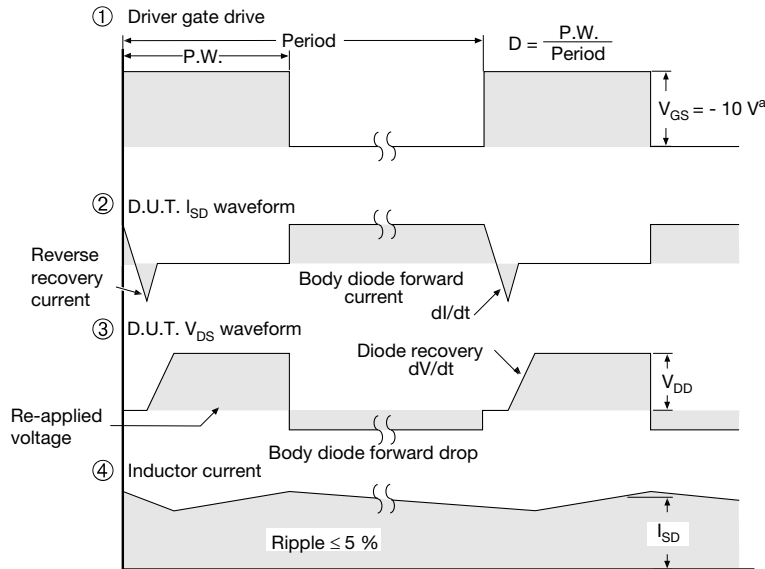


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Note
• Compliment N-Channel of D.U.T. for driver



Note
a. $V_{GS} = -5 V$ for logic level and $-3 V$ drive devices

Fig. 14 - For P-Channel

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?91196.

SOT-223 (HIGH VOLTAGE)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.55	1.80	0.061	0.071
B	0.65	0.85	0.026	0.033
B1	2.95	3.15	0.116	0.124
C	0.25	0.35	0.010	0.014
D	6.30	6.70	0.248	0.264
E	3.30	3.70	0.130	0.146
e	2.30 BSC		0.0905 BSC	
e1	4.60 BSC		0.181 BSC	
H	6.71	7.29	0.264	0.287
L	0.91	-	0.036	-
L1	0.061 BSC		0.0024 BSC	
θ	-	10'	-	10'

ECN: S-82109-Rev. A, 15-Sep-08
DWG: 5969

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension do not include mold flash.
4. Outline conforms to JEDEC outline TO-261AA.



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