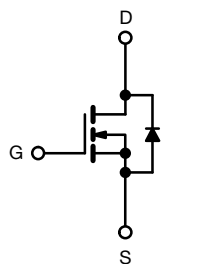
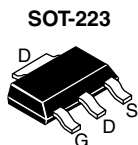


Power MOSFET



N-Channel MOSFET

Marking code: LA

PRODUCT SUMMARY		
V_{DS} (V)	60	
$R_{DS(on)}$ (Ω)	$V_{GS} = 5.0$ V	0.20
Q_g max. (nC)	8.4	
Q_{gs} (nC)	3.5	
Q_{gd} (nC)	6.0	
Configuration	Single	

FEATURES

- Surface-mount
- Available in tape and reel
- Dynamic dV/dt rating
- Logic-level gate drive
- $R_{DS(on)}$ specified at $V_{GS} = 4$ V and 5 V
- 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-mounting 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.

ORDERING INFORMATION	
Package	SOT-223
Lead (Pb)-free and halogen-free	SiHLL014TR-GE3
	IRLL014TRPbF-BE3 a, b
Lead (Pb)-free	IRLL014TRPbF a

Notes

- a. See device orientation
b. "BE3" denotes alternate manufacturing location

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-source voltage			V _{DS}	60	V
Gate-source voltage			V _{GS}	± 10	
Continuous drain current	V _{GS} at 10 V	T _C = 25 °C	I _D	2.7	A
		T _C = 100 °C		1.7	
Pulsed drain current ^a			I _{DM}	22	
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}	2.7	A
Repetitive avalanche energy ^a			E _{AR}	0.31	mJ
Maximum power dissipation	T _C = 25 °C		P _D	3.1	W
Maximum power dissipation (PCB mount) ^e	T _A = 25 °C			2.0	
Peak diode recovery dv/dt ^c			dV/dt	4.5	V/ns
Operating junction and storage temperature range			T _J , T _{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) ^d	For 10 s			300	

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
b. $V_{DD} = 25$ V, starting $T_J = 25$ °C, $L = 16$ mH, $R_g = 25$ Ω , $I_{AS} = 2.7$ A (see fig. 12)
c. $I_{SD} \leq 10$ A, $dI/dt \leq 90$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °C
d. 1.6 mm from case
e. 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)

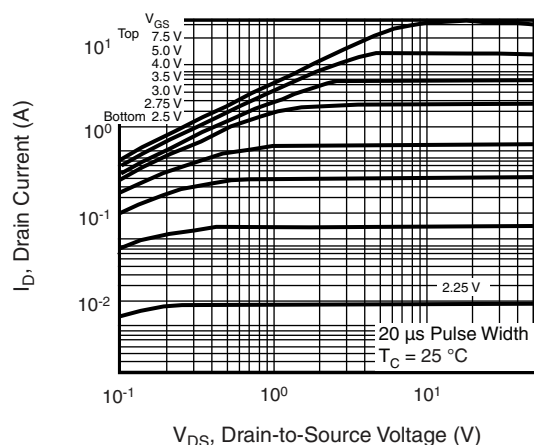
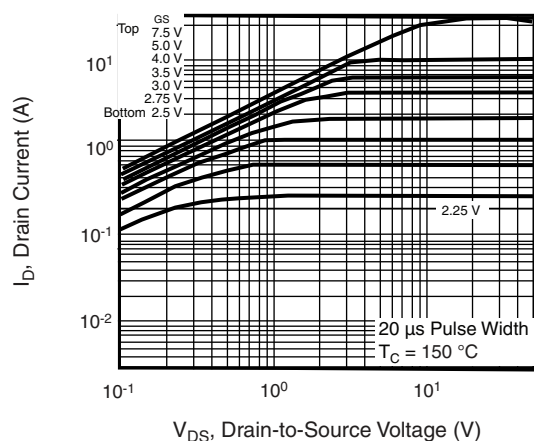
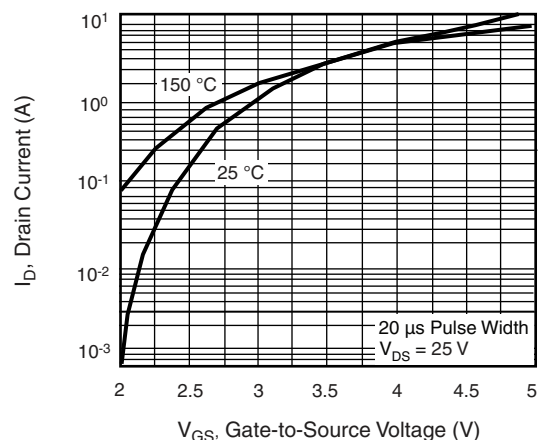
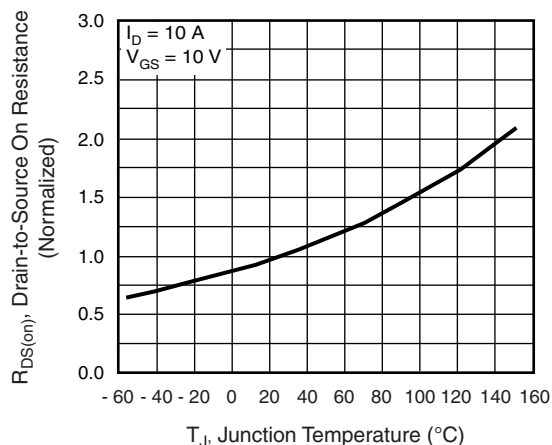
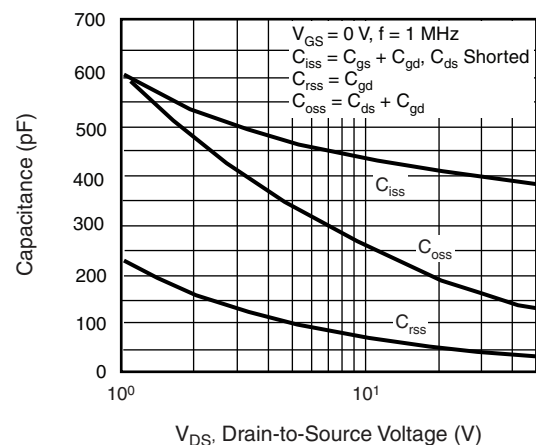
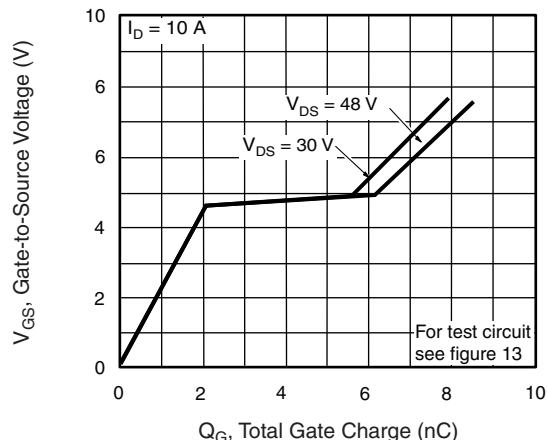
SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

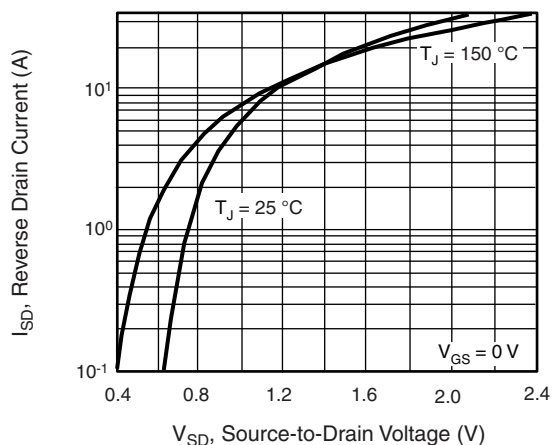
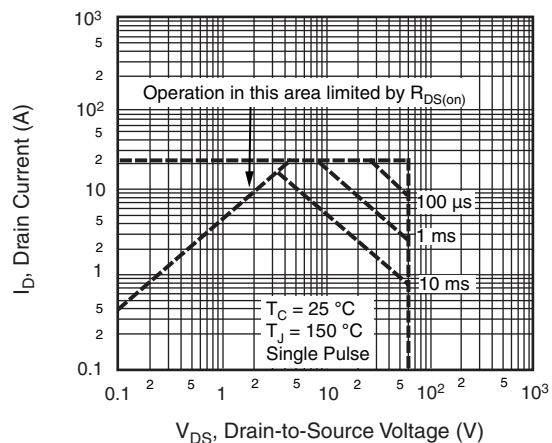
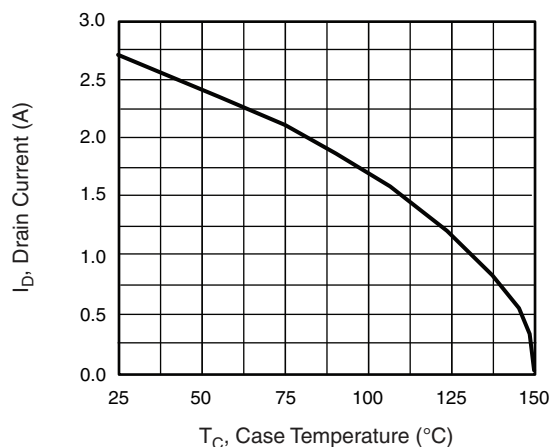
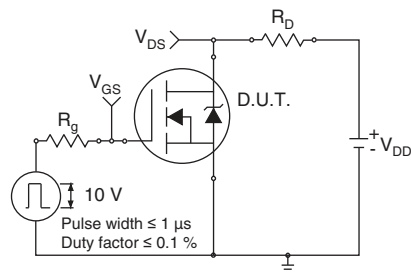
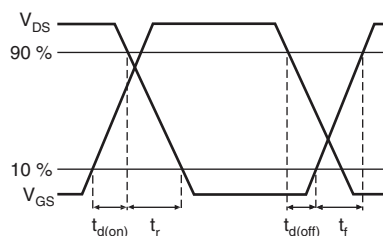
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		60	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	0.073	-	V/°C
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		1.0	-	2.0	V
Gate-source leakage	I _{GSS}	V _{GS} = ± 10 V		-	-	± 100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V		-	-	25	μA
		V _{DS} = 48 V, V _{GS} = 0 V, T _J = 125 °C		-	-	250	
Drain-source on-state resistance	R _{DS(on)}	V _{GS} = 5.0 V	I _D = 1.6 A ^b	-	-	0.20	Ω
		V _{GS} = 4.0 V	I _D = 1.4 A ^b	-	-	0.28	
Forward transconductance	g _{fs}	V _{DS} = 25 V, I _D = 1.6 A		3.2	-	-	S
Dynamic							
Input capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1.0 MHz, see fig. 5		-	400	-	pF
Output capacitance	C _{oss}			-	170	-	
Reverse transfer capacitance	C _{rss}			-	42	-	
Total gate charge	Q _g	V _{GS} = 5.0 V	I _D = 10 A, V _{DS} = 48 V, see fig. 6 and 13 ^b	-	-	8.4	nC
Gate-source charge	Q _{gs}			-	-	3.5	
Gate-drain charge	Q _{gd}			-	-	6.0	
Turn-on delay time	t _{d(on)}	V _{DD} = 30 V, I _D = 10 A, R _g = 12 Ω, R _D = 2.8 Ω, see fig. 10 ^b		-	9.3	-	ns
Rise time	t _r			-	110	-	
Turn-off delay time	t _{d(off)}			-	17	-	
Fall time	t _f			-	26	-	
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		-	-	2.7	A
Pulsed diode forward current ^a	I _{SM}			-	-	22	
Body diode voltage	V _{SD}	T _J = 25 °C, I _S = 2.7 A, V _{GS} = 0 V ^b		-	-	1.6	V
Body diode reverse recovery time	t _{rr}	T _J = 25 °C, I _F = 10 A, dI/dt = 100 A/μs ^b		-	65	130	ns
Body diode reverse recovery charge	Q _{rr}			-	0.33	0.65	μC
Forward turn-on time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L _S and L _D)					

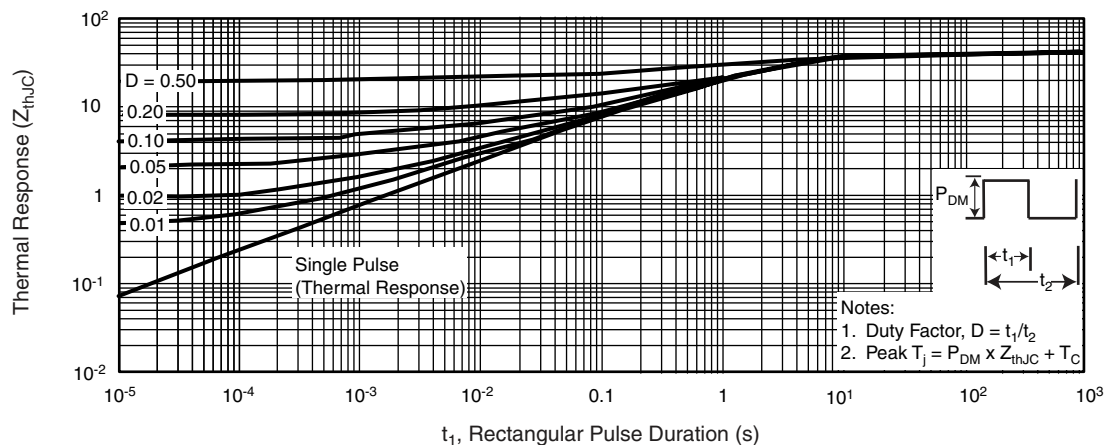
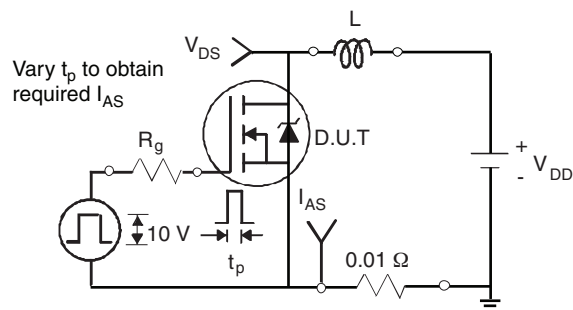
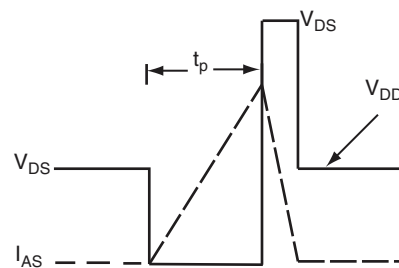
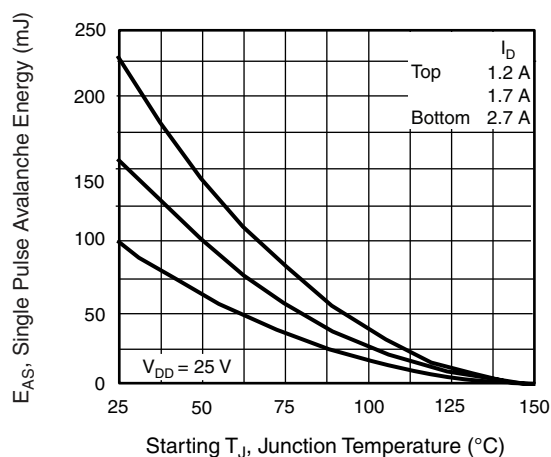
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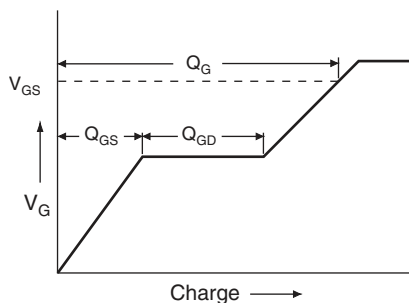
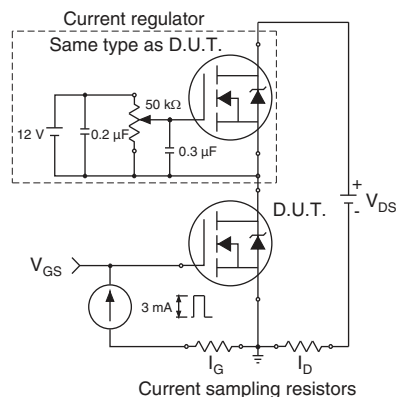
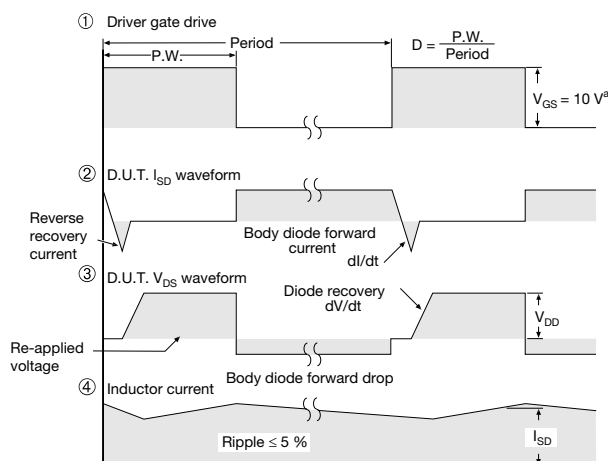
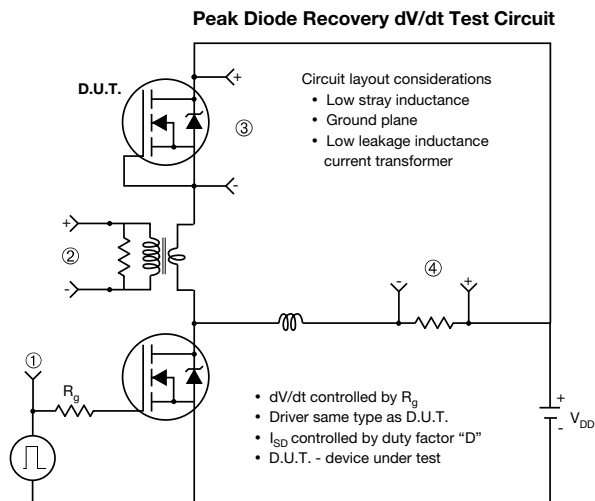
a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)

b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

Fig. 3 - Typical Transfer Characteristics

Fig. 4 - Normalized On-Resistance vs. Temperature

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

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


Fig. 7 - Typical Source-Drain Diode Forward 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

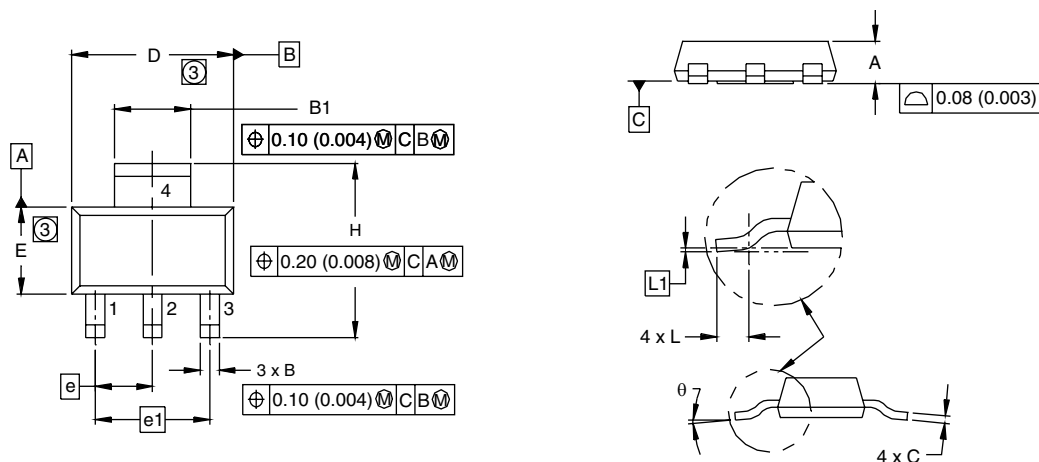

Fig. 13a - Basic Gate Charge Waveform

Fig. 13b - Gate Charge Test Circuit


Note
a. $V_{GS} = 5 V$ for logic level devices

Fig. 14 - For N-Channel

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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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