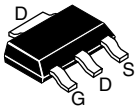
Power MOSFET

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	

SOT-223



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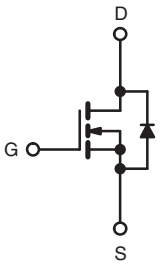


N-Channel MOSFET

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	SOT-223
Lead (Pb)-free and Halogen-free	SiHLL014-GE3	SiHLL014TR-GE3
Lead (Pb)-free	IRLL014PbF	IRLL014TRPbF[a]
	SiHLL014-E3	SiHLL014T-E3[a]

Note

a. See device orientation.

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	W/°C
Linear Derating Factor (PCB Mount)[e]				0.017	
Single Pulse Avalanche Energy[b]			E_{AS}	100	mJ
Repetitive 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	

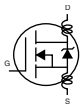
Notes

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} ≤ 10 A, dI/dt ≤ 90 A/µs, V_{DD} ≤ V_{DS}, T_J ≤ 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 °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	$\Delta V_{DS}/T_J$	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)					

Notes

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

b. Pulse width ≤ 300 µs; duty cycle ≤ 2 %.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

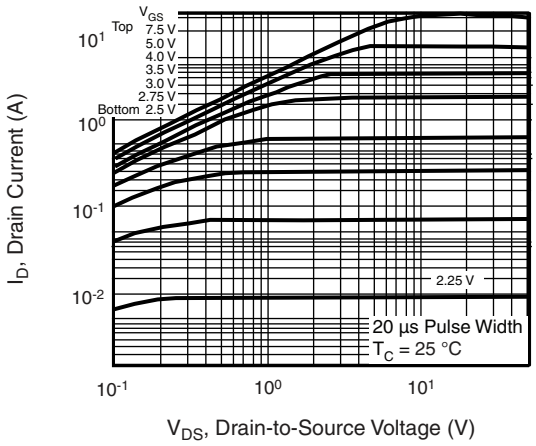


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

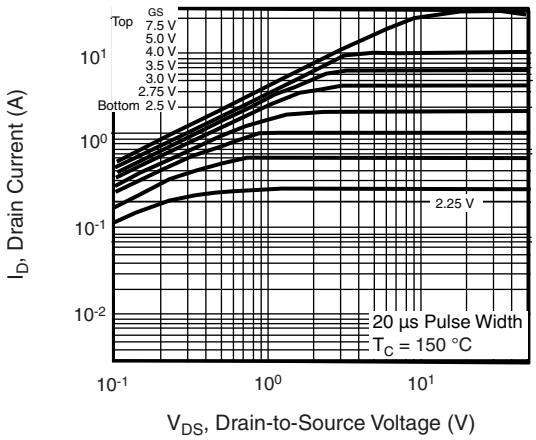


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

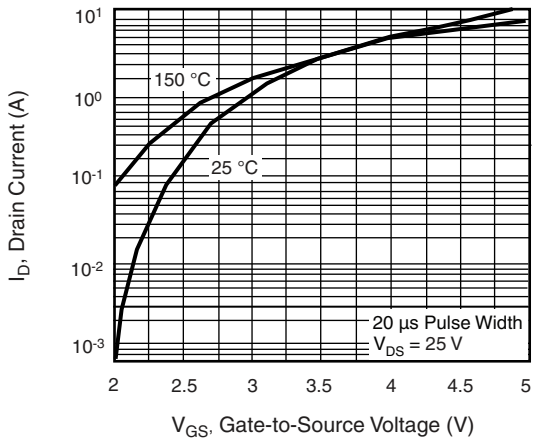


Fig. 3 - Typical Transfer Characteristics

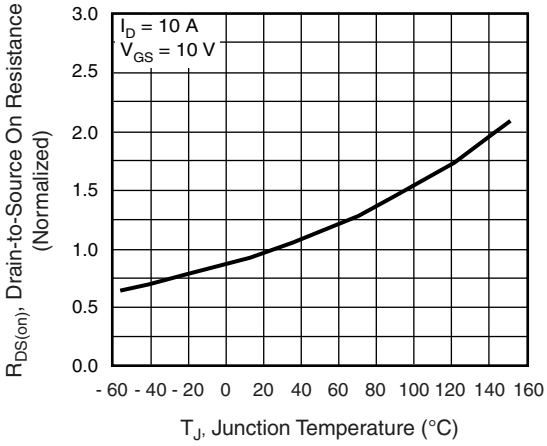


Fig. 4 - Normalized On-Resistance vs. Temperature

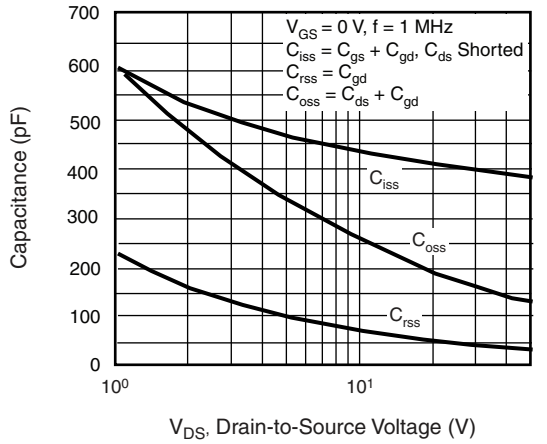


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

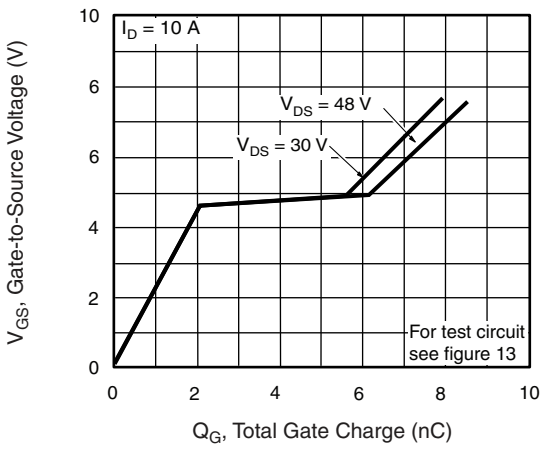


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

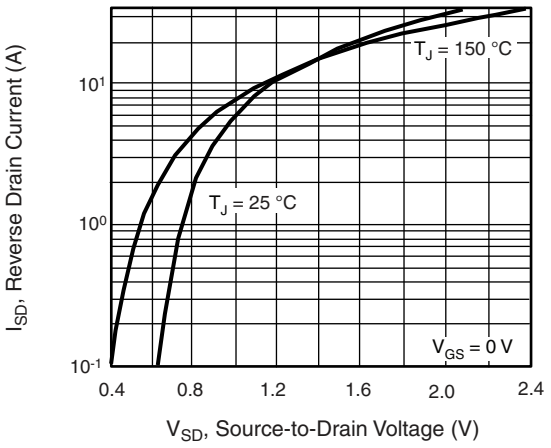


Fig. 7 - Typical Source-Drain Diode Forward Voltage

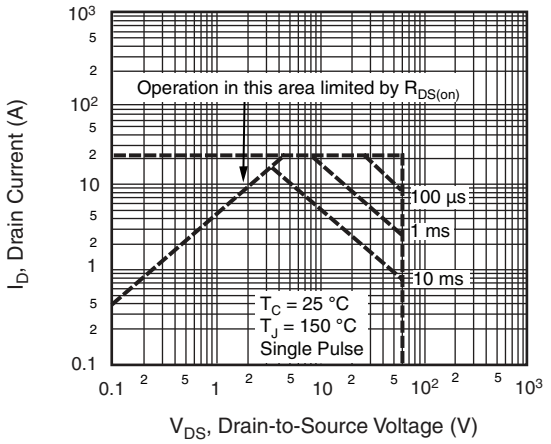


Fig. 8 - Maximum Safe Operating Area

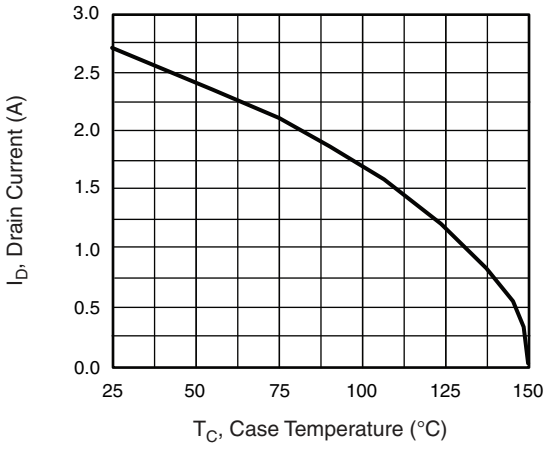


Fig. 9 - Maximum Drain Current vs. Case Temperature

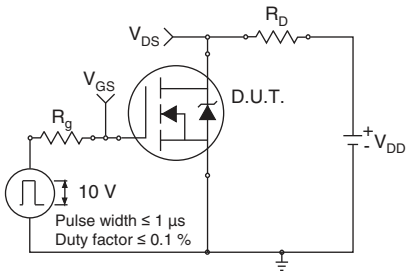


Fig. 10a - Switching Time Test Circuit

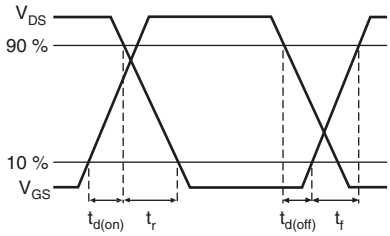


Fig. 10b - Switching Time Waveforms

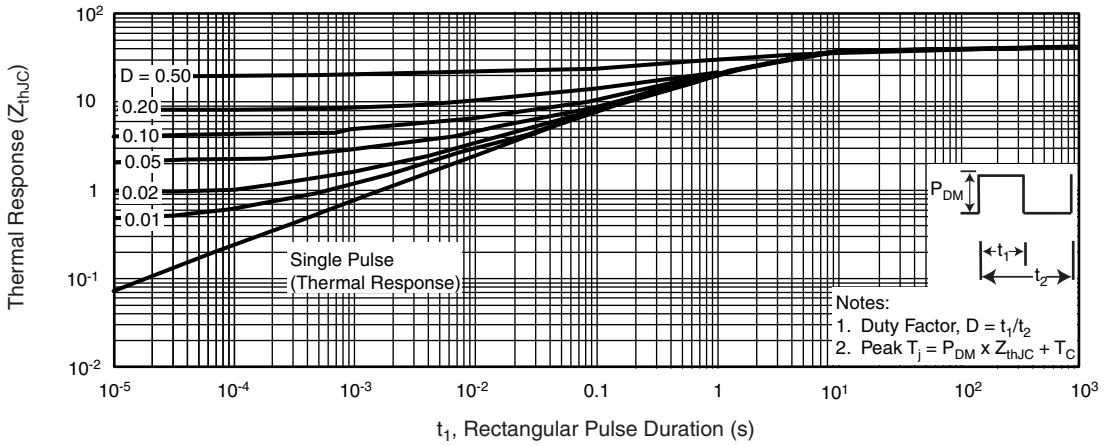


Fig. 10 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

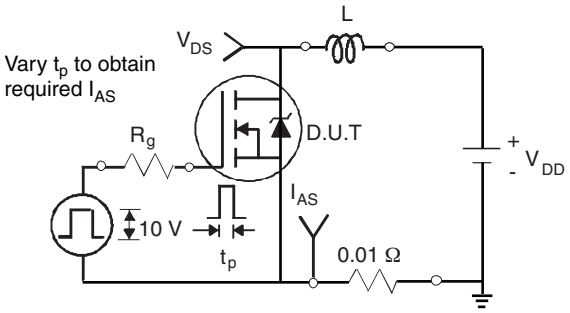


Fig. 12a - Unclamped Inductive Test Circuit

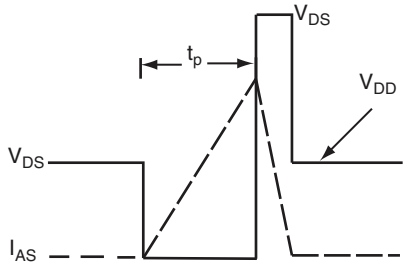


Fig. 12b - Unclamped Inductive Waveforms

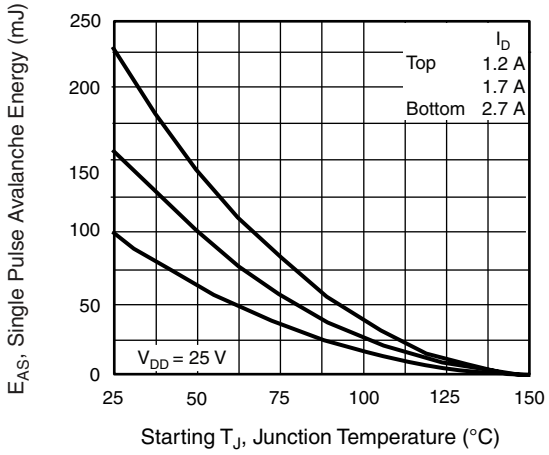


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

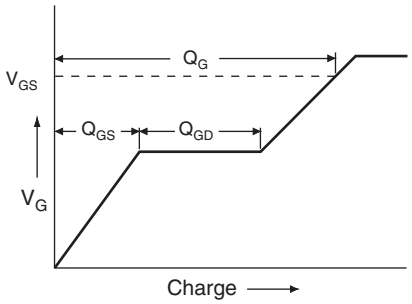


Fig. 13b - Basic Gate Charge Waveform

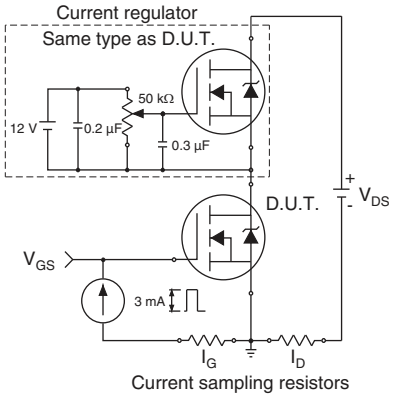
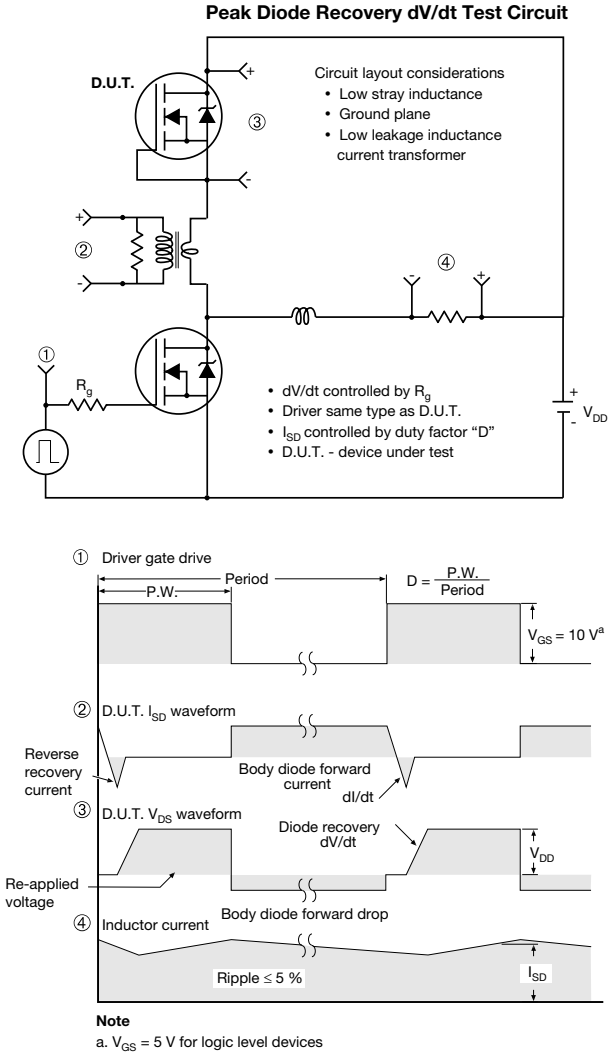


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



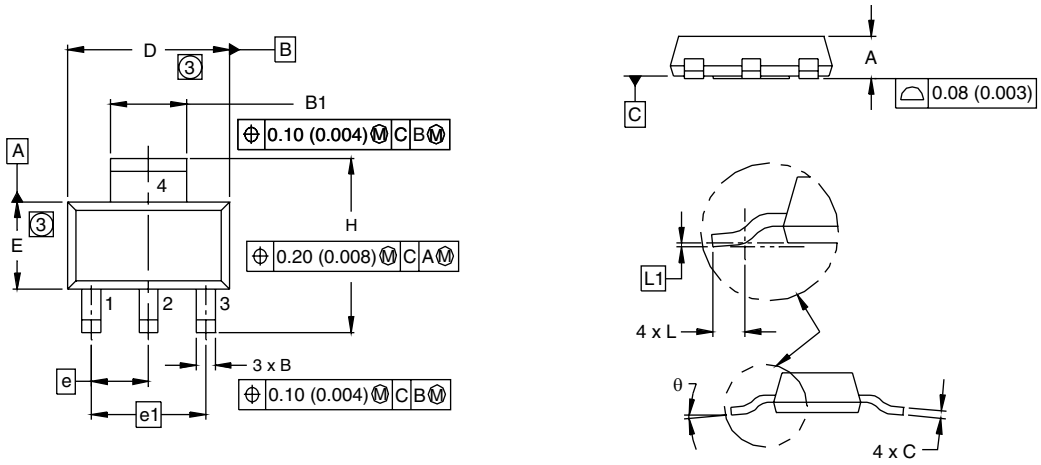
Note

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

Fig. 14 - For N-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?91319.

SOT-223 (HIGH VOLTAGE)



	MILLIMETERS		INCHES	
DIM.	**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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