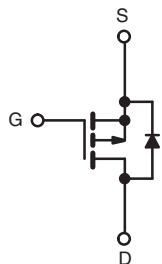
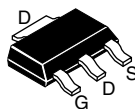


Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	- 60	
$R_{DS(on)}$ (Ω)	$V_{GS} = - 10$ V	0.50
Q_g (Max.) (nC)	12	
Q_{gs} (nC)	3.8	
Q_{gd} (nC)	5.1	
Configuration	Single	

SOT-223


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-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	SiHFL9014-GE3	SiHFL9014TR-GE3
Lead (Pb)-free	IRFL9014PbF	IRFL9014TRPbF ^a
	SiHFL9014-E3	SiHFL9014T-E3 ^a

Note

a. See device orientation.

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	- 60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current	V_{GS} at - 10 V	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
Pulsed Drain Current ^a	I_{DM}	- 14	W/ $^\circ\text{C}$
Linear Derating Factor		0.025	
Linear Derating Factor (PCB Mount) ^e		0.017	
Single Pulse Avalanche Energy ^b	E_{AS}	140	mJ
Repetitive Avalanche Current ^a	I_{AR}	- 1.8	A
Repetitive Avalanche Energy ^a	E_{AR}	0.31	mJ
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	W
Maximum Power Dissipation (PCB Mount) ^e		$T_A = 25^\circ\text{C}$	
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	$^\circ\text{C}$
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 $T_J = 25^\circ\text{C}$, $L = 50$ mH, $R_g = 25\ \Omega$, $I_{AS} = - 1.8$ A (see fig. 12).
- $I_{SD} \leq - 6.7$ A, $dI/dt \leq 90$ 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).

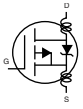
**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient (PCB Mount) ^a	R_{thJA}	-	60	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	40	

Note

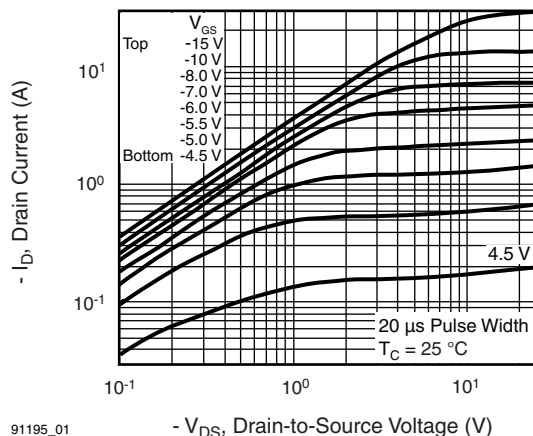
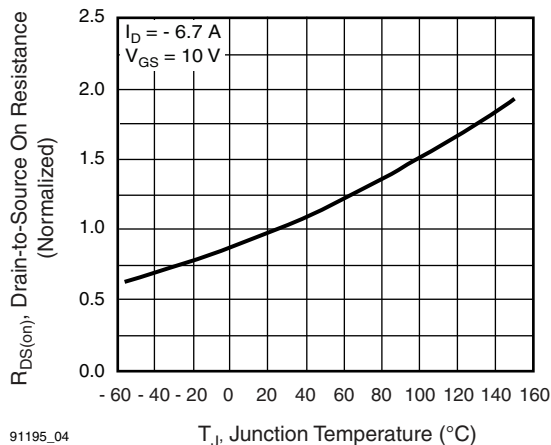
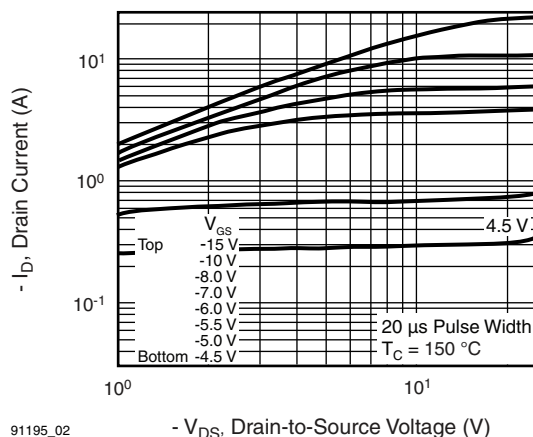
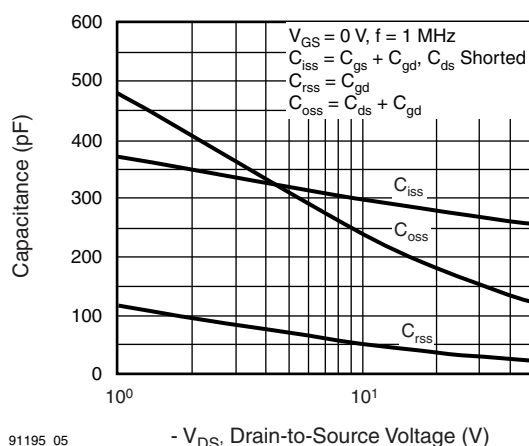
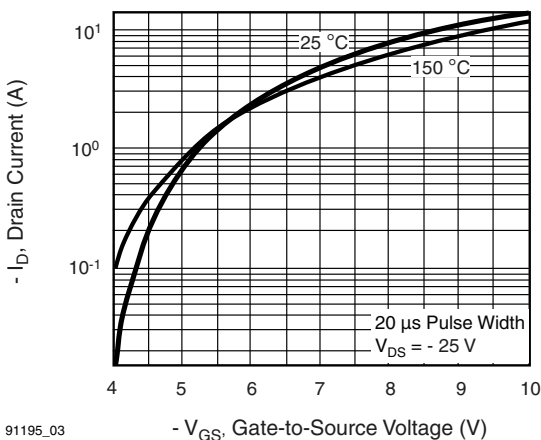
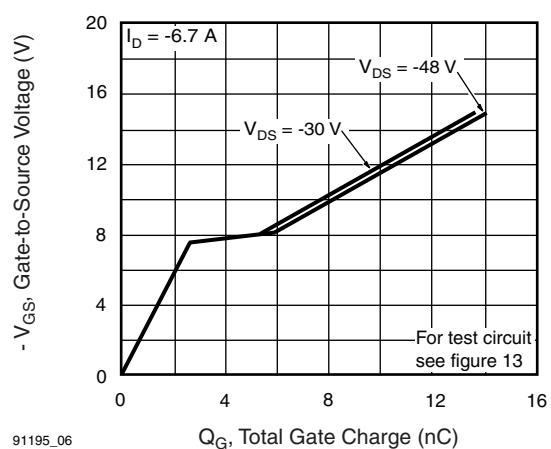
a. When mounted on 1" square PCB (FR-4 or G-10 material).

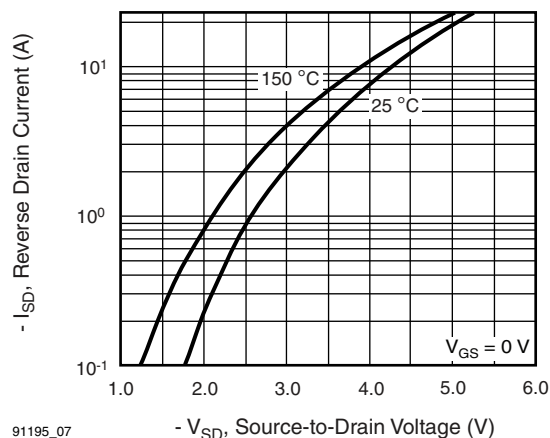
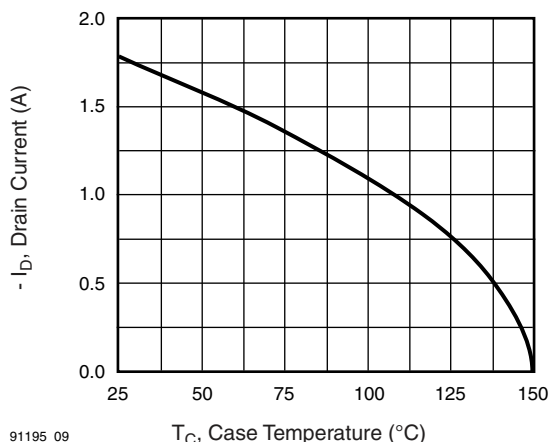
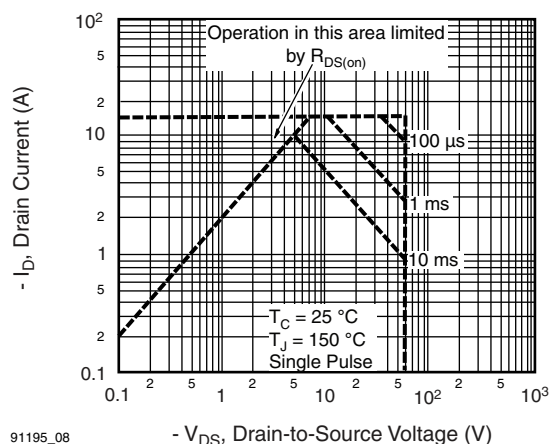
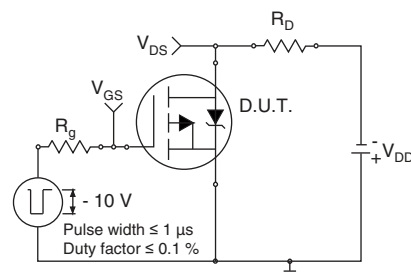
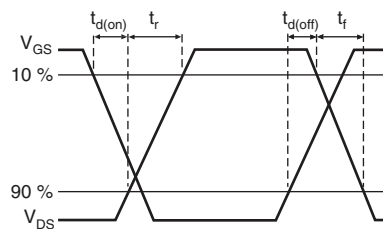
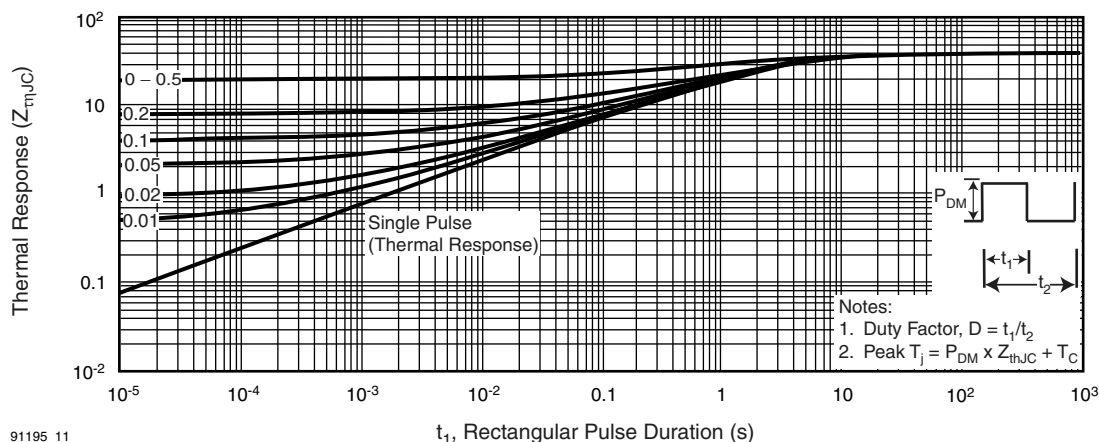
SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

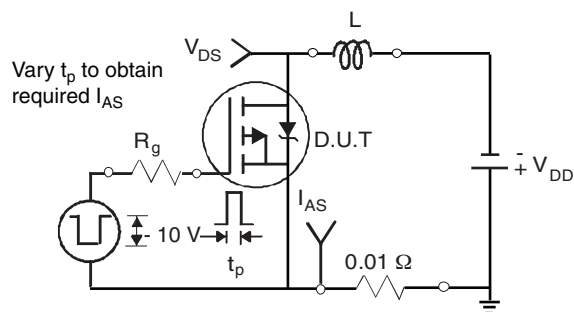
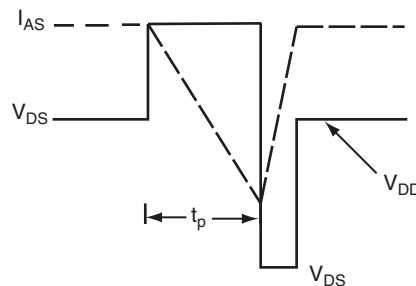
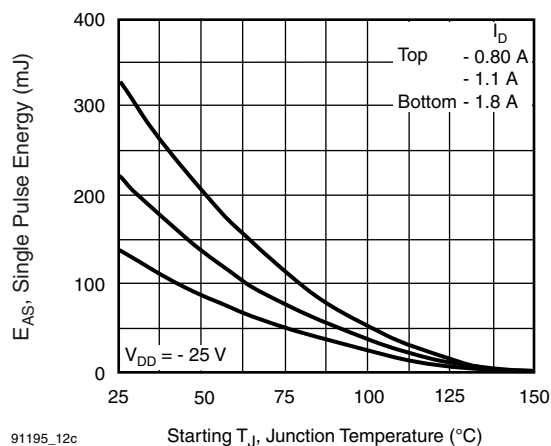
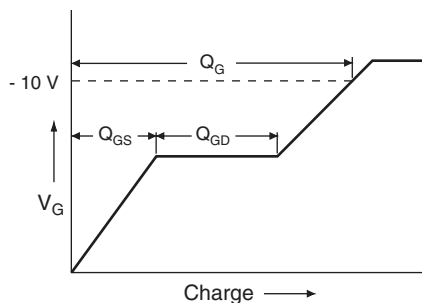
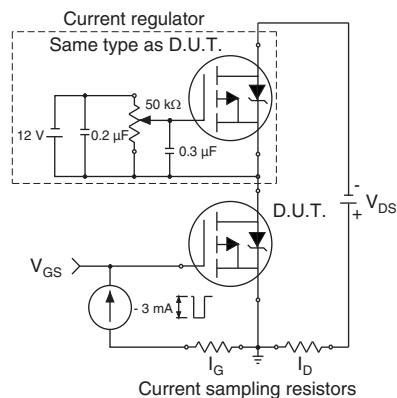
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT		
Static									
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$		- 60	-	-	V		
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = 1\text{ mA}$		-	- 0.059	-	V/ $^{\circ}\text{C}$		
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}	$V_{DS} = - 60\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	- 100	μA		
		$V_{DS} = - 48\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$		-	-	- 500			
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = - 10\text{ V}$	$I_D = 1.1\text{ A}^b$	-	-	0.50	Ω		
Forward Transconductance	g_{fs}	$V_{DS} = - 25\text{ V}$, $I_D = 1.1\text{ A}^b$		1.3	-	-	S		
Dynamic									
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5		-	270	-	pF		
Output Capacitance	C_{oss}			-	170	-			
Reverse Transfer Capacitance	C_{rss}			-	31	-			
Total Gate Charge	Q_g	$V_{GS} = - 10\text{ V}$	$I_D = - 6.7\text{ A}$, $V_{DS} = - 48\text{ V}$, see fig. 6 and 13 ^b	-	-	12	nC		
Gate-Source Charge	Q_{gs}			-	-	3.8			
Gate-Drain Charge	Q_{gd}			-	-	5.1			
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = - 30\text{ V}$, $I_D = - 6.7\text{ A}$, $R_g = 24\text{ }\Omega$, $R_D = 4.0\text{ }\Omega$, see fig. 10 ^b		-	11	-	ns		
Rise Time	t_r			-	63	-			
Turn-Off Delay Time	$t_{d(off)}$			-	9.6	-			
Fall Time	t_f			-	31	-			
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				-	-	- 1.8	A
Pulsed Diode Forward Current ^a	I_{SM}					-	-	- 14	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = - 1.8\text{ A}$, $V_{GS} = 0\text{ V}^b$		-	-	- 5.5	V		
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = - 6.7\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^b$		-	80	160	ns		
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.096	0.19	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 $\leq 2\%$.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

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

Fig. 4 - Normalized On-Resistance vs. Temperature

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

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

Fig. 3 - Typical Transfer Characteristics

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


Fig. 7 - Typical Source-Drain Diode Forward Voltage

Fig. 9 - Maximum Drain Current vs. Case Temperature

Fig. 8 - Maximum Safe Operating Area

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

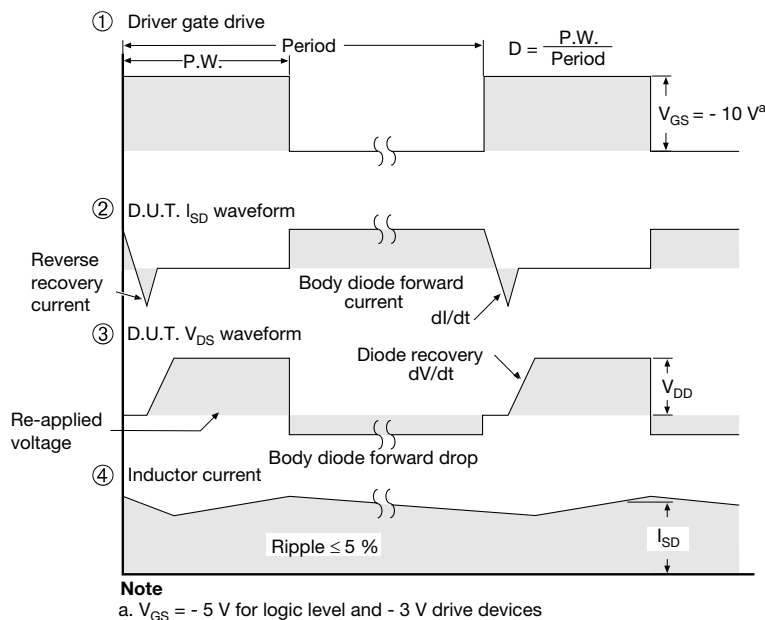
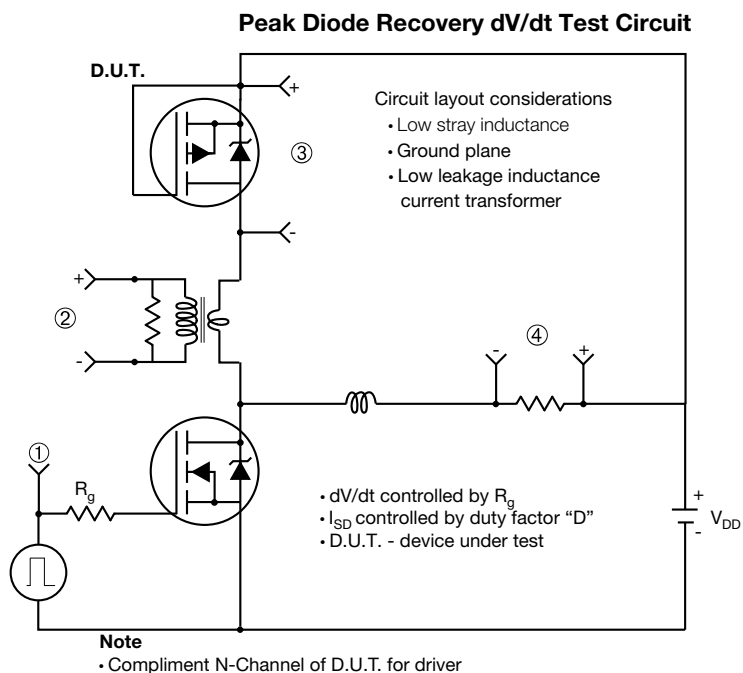
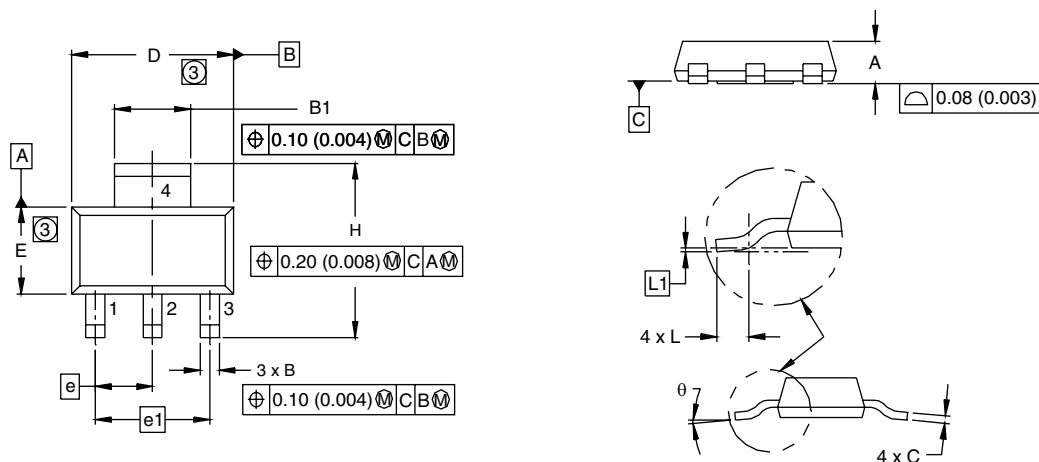


Fig. 14 - For P-Channel

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?91195.

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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