

Power MOSFET



ROHS
COMPLIANT
HALOGEN
FREE
Available

PRODUCT SUMMARY		
V_{DS} (V)	60	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V	0.20
Q_g max. (nC)	11	
Q_{gs} (nC)	3.1	
Q_{gd} (nC)	5.8	
Configuration	Single	

FEATURES

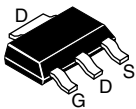
- Surface mount
- Available in tape and reel
- Dynamic dV/dt rating
- Fast switching
- Ease of paralleling
- Simple drive requirements
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

DESCRIPTION

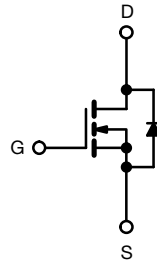
Third generation power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

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.

SOT-223



Marking code: FA



N-Channel MOSFET

ORDERING INFORMATION	
Package	SOT-223
Lead (Pb)-free and Halogen-free	SiHFL014TR-GE3 ^a
Lead (Pb)-free	IRFL014TRPbF ^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}		± 20	
Continuous Drain Current	V_{GS} at 10 V	I_D	$T_C = 25$ °C	A
			$T_C = 100$ °C	
Pulsed Drain Current ^a	I_{DM}		22	W/°C
Linear Derating Factor			0.025	
Linear Derating Factor (PCB mount) ^e			0.017	
Single Pulse Avalanche Energy ^b	E_{AS}		100	mJ
Maximum Power Dissipation	$T_C = 25$ °C		P_D	W
	$T_A = 25$ °C			
Maximum Power Dissipation (PCB mount) ^e			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

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25$ V, starting $T_J = 25$ °C, $L = 16$ mH, $R_g = 25$ Ω , $I_{AS} = 2.7$ A (see fig. 12).
- $I_{SD} \leq 10$ A, $dI/dt \leq 90$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		60	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$		-	0.068	-	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}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$		-	-	25	μA
		$V_{DS} = 48\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 1.6\text{ A}^b$	-	-	0.20	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 25\text{ V}, I_D = 1.6\text{ A}$		1.9	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V},$ $V_{DS} = 25\text{ V},$ $f = 1.0\text{ MHz}$, see fig. 5		-	300	-	μF
Output Capacitance	C_{oss}			-	160	-	
Reverse Transfer Capacitance	C_{rss}			-	29	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 10\text{ A}, V_{DS} = 48\text{ V},$ see fig. 6 and 13 ^b	-	-	11	nC
Gate-Source Charge	Q_{gs}			-	-	3.1	
Gate-Drain Charge	Q_{gd}			-	-	5.8	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, I_D = 10\text{ A},$ $R_g = 24\text{ }\Omega, R_D = 2.7\text{ }\Omega$, see fig. 10 ^b		-	10	-	ns
Rise Time	t_r			-	50	-	
Turn-Off Delay Time	$t_{d(off)}$			-	13	-	
Fall Time	t_f			-	19	-	
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}	$T_J = 25\text{ }^\circ\text{C}, I_S = 2.7\text{ A}, V_{GS} = 0\text{ V}^b$		-	-	1.6	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = 10\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}^b$		-	70	140	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.20	0.40	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)

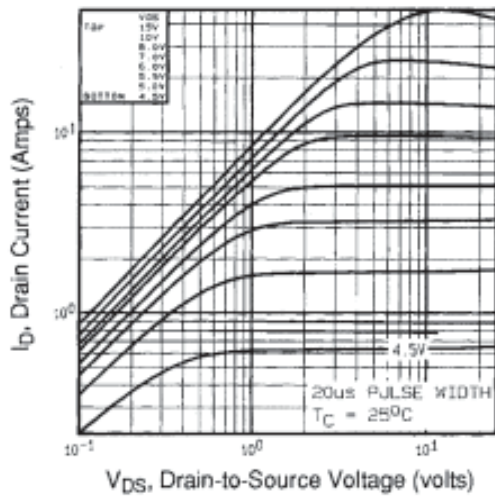


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

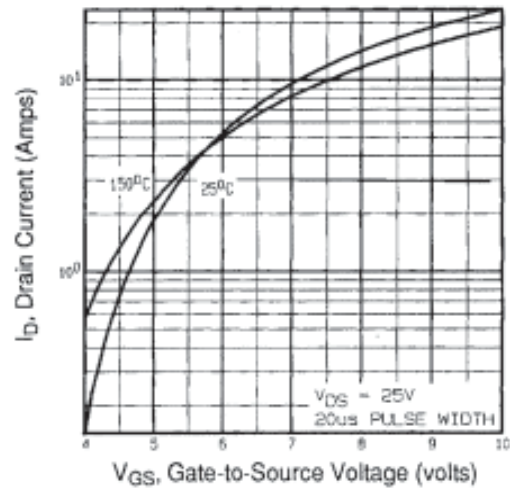


Fig. 3 - Typical Transfer Characteristics

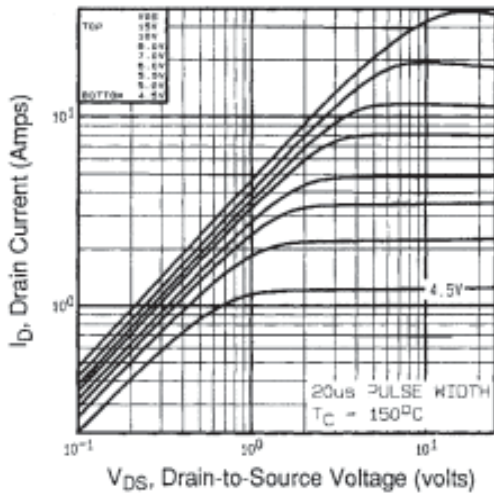


Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

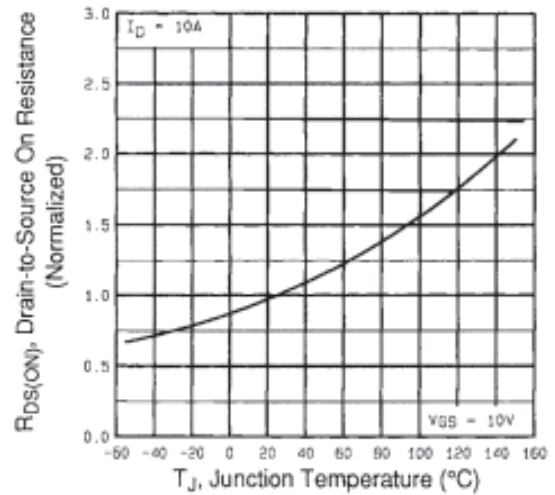


Fig. 4 - Normalized On-Resistance vs. Temperature

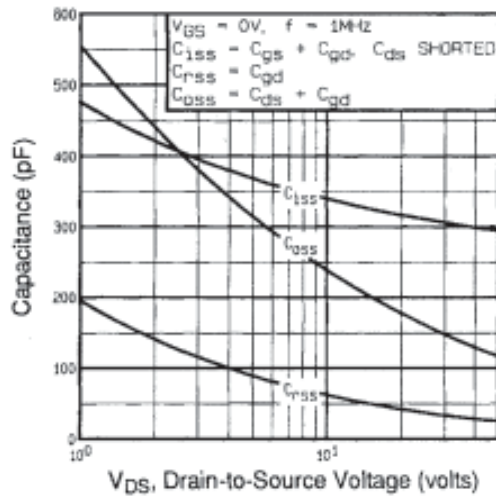


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

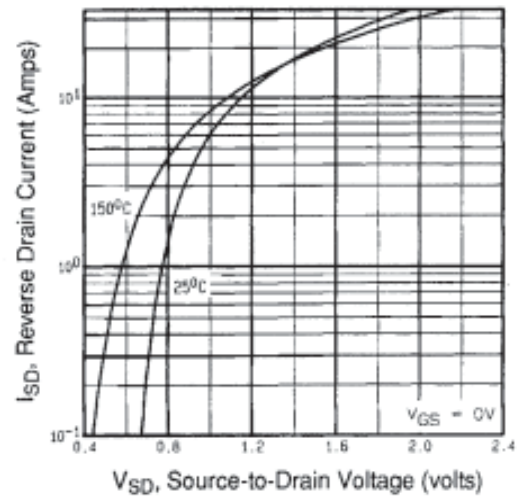


Fig. 7 - Typical Source-Drain Diode Forward Voltage

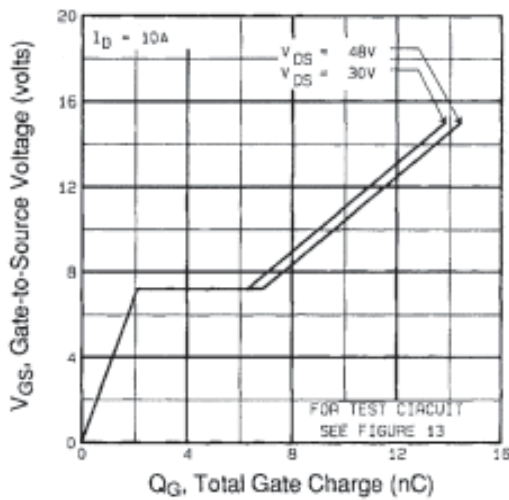


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

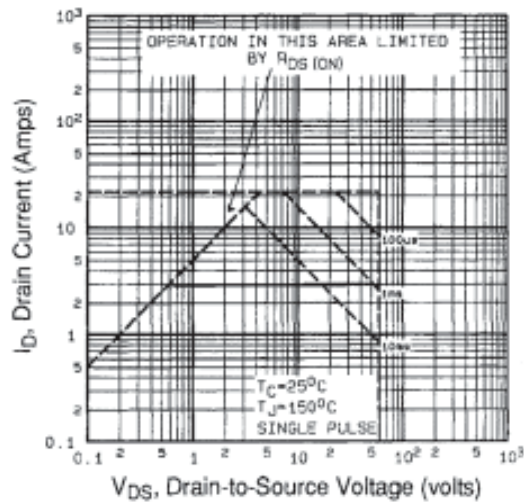


Fig. 8 - Maximum Safe Operating Area

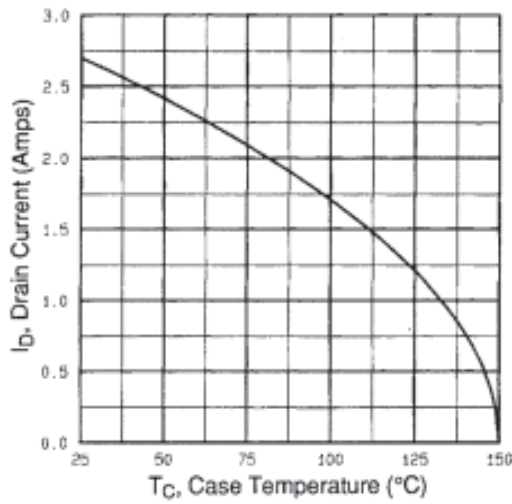


Fig. 9 - Maximum Drain Current vs. Case Temperature

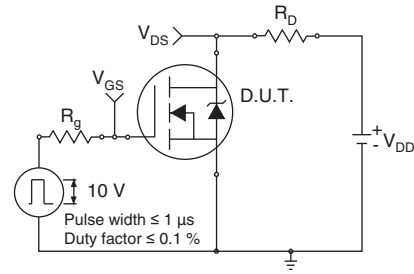


Fig. 10a -Switching Time Test Circuit

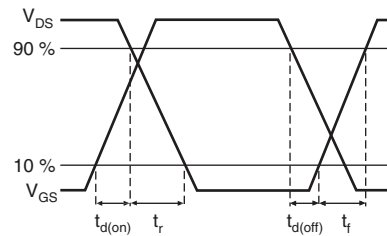


Fig. 10b -Switching Time Waveforms

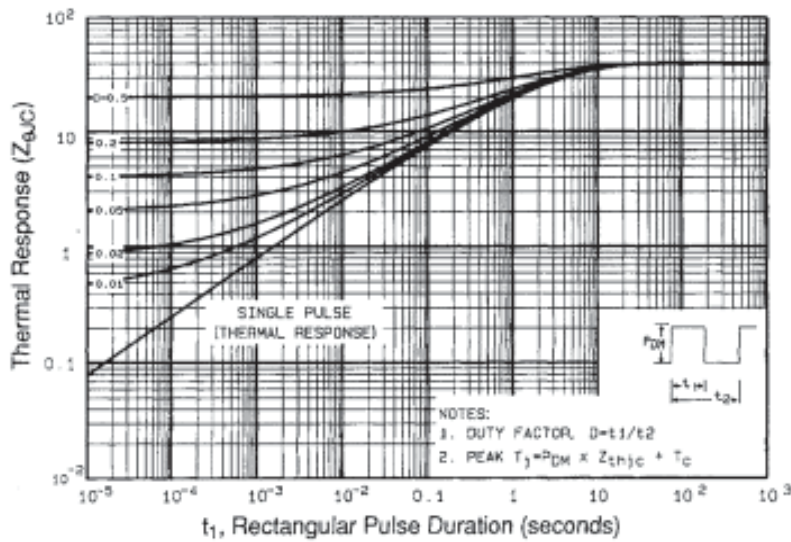


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

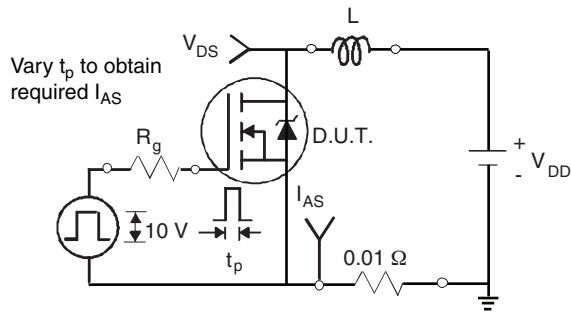


Fig. 12a - Unclamped Inductive Test Circuit

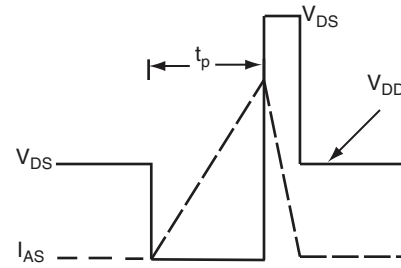


Fig. 12b - Unclamped Inductive Waveforms

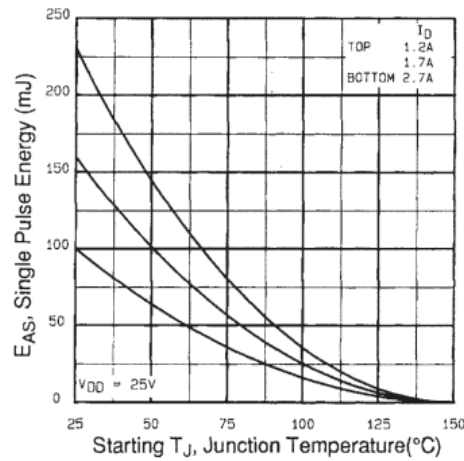


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

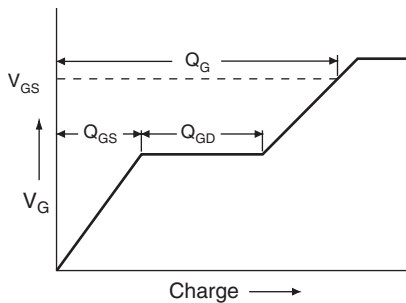


Fig. 13a - Basic Gate Charge Waveform

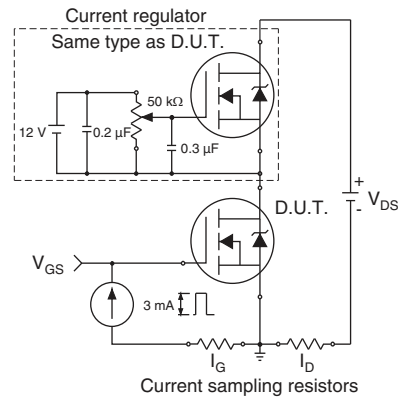
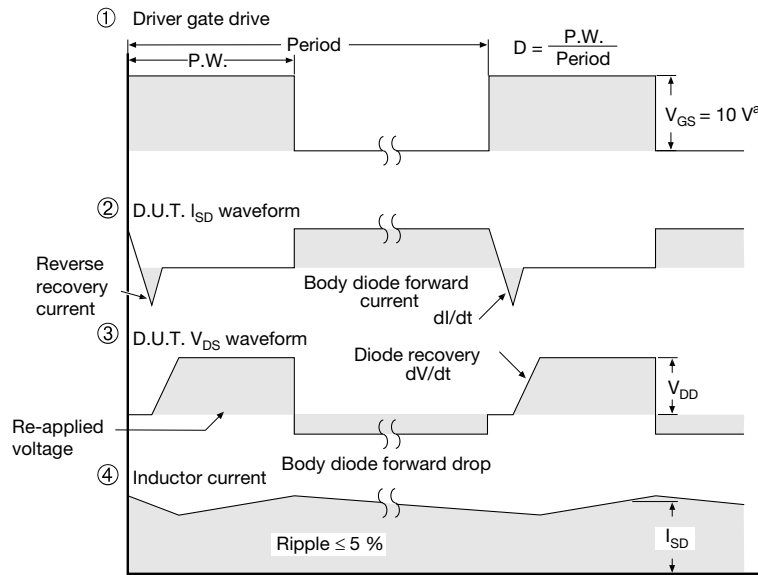
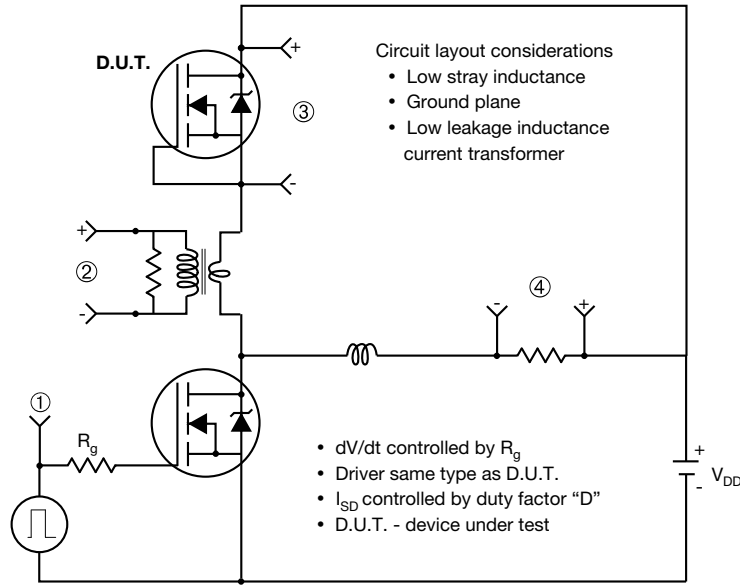


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



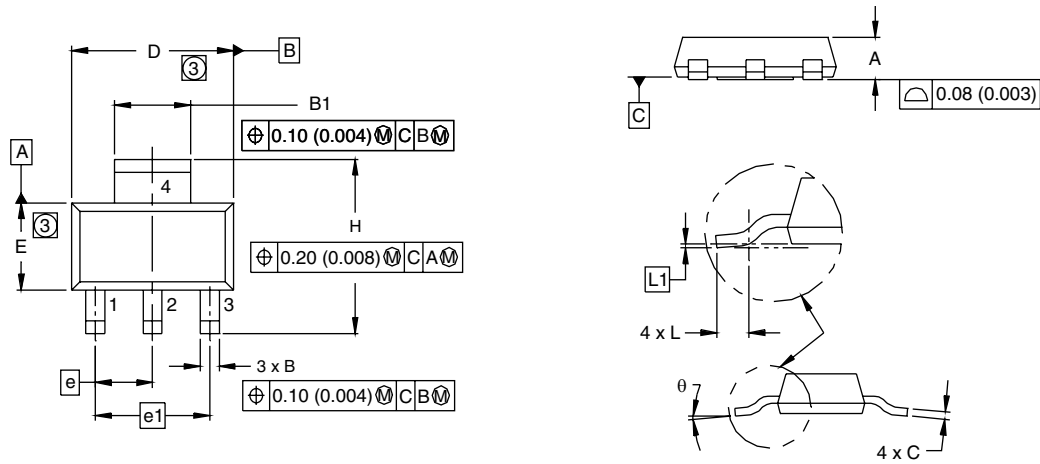
Note

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

Fig. 12 - 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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