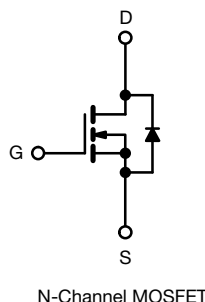
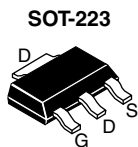


Power MOSFET



FEATURES

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



RoHS
COMPLIANT
HALOGEN
FREE
Available

Marking code: FC

PRODUCT SUMMARY		
V _{DS} (V)	200	
R _{DS(on)} (Ω)	V _{GS} = 10 V	1.5
Q _g (Max.) (nC)	8.2	
Q _{gs} (nC)	1.8	
Q _{gd} (nC)	4.5	
Configuration	Single	

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	SiHFL210TR-GE3 ^a
	IRFL210TRPbF-BE3 ^{a, b}
Lead (Pb)-free	IRFL210TRPbF ^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}	200	V
Gate-source voltage			V _{GS}	± 20	
Continuous drain current	V _{GS} at 10 V	T _C = 25 °C	I _D	0.96	A
		T _C = 100 °C		0.6	
Pulsed drain current ^a			I _{DM}	7.7	
Linear derating factor				0.025	W/°C
Linear derating factor (PCB mount) ^e				0.017	
Single pulse avalanche energy ^b			E _{AS}	50	mJ
Avalanche current ^a			I _{AR}	0.96	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	5.0	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} = 50 V, starting T_J = 25 °C, L = 81 mH, R_G = 25 Ω, I_{AS} = 0.96 A (see fig. 12)
c. I_{SD} ≤ 3.3 A, dI/dt ≤ 70 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}	-	-	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	-	60	

Note

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

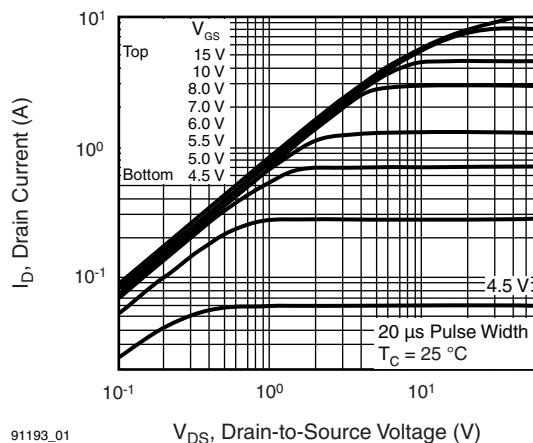
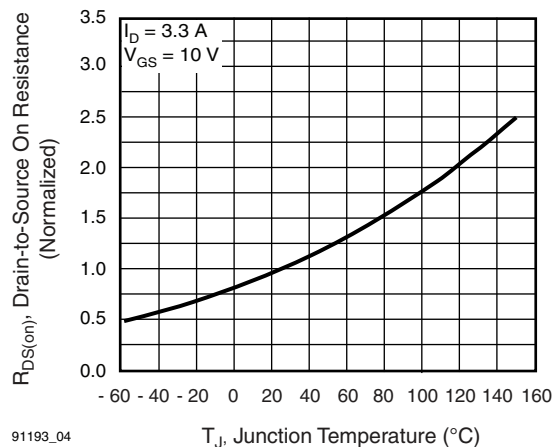
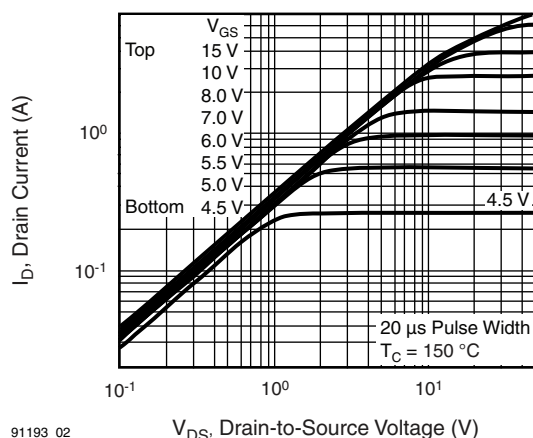
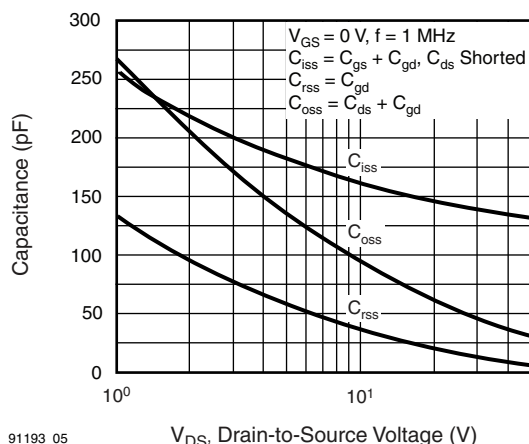
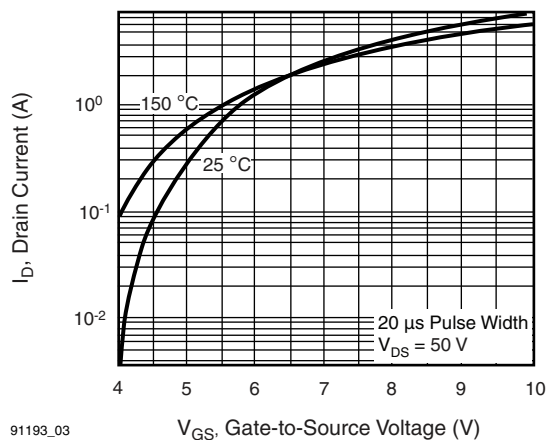
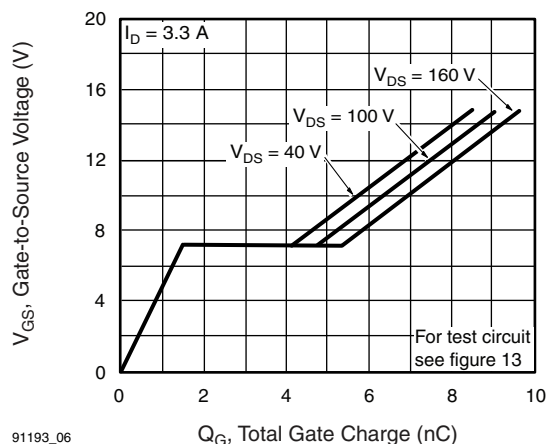
SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

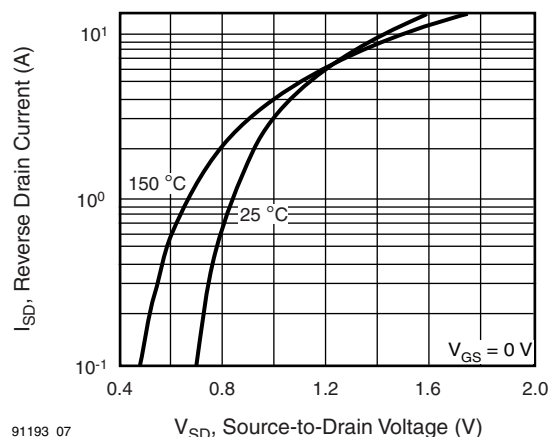
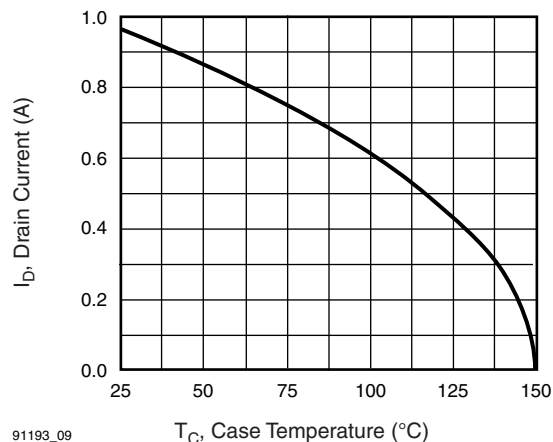
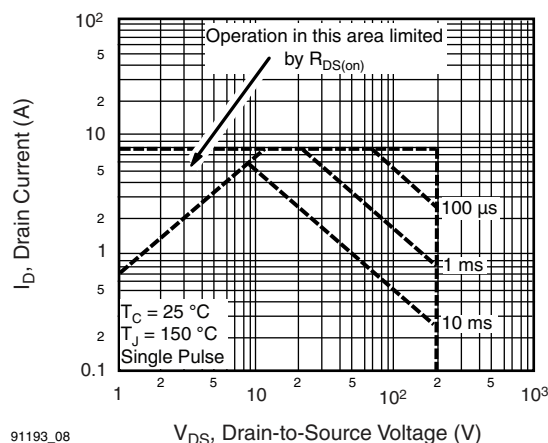
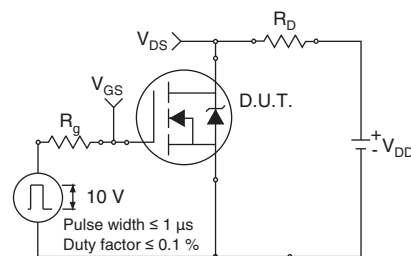
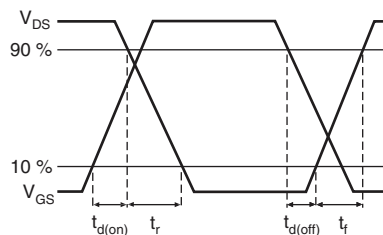
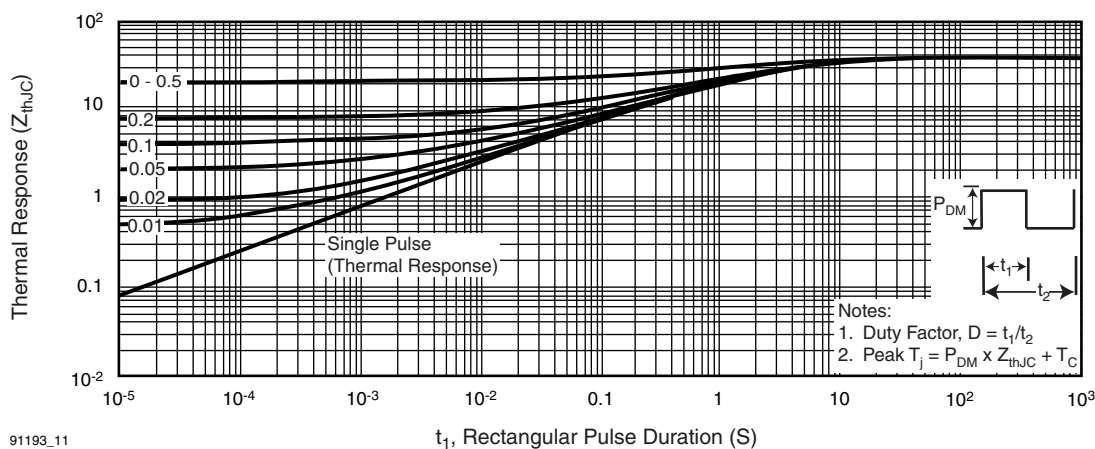
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$		200	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$		-	0.30	-	V/ $^\circ\text{C}$
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}	$V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	25	μA
		$V_{DS} = 160\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$		-	-	250	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 0.58\text{ A}^b$	-	-	1.5	Ω
Forward transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 0.58\text{ A}$		0.51	-	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5		-	140	-	pF
Output capacitance	C_{oss}			-	53	-	
Reverse transfer capacitance	C_{rss}			-	15	-	
Total gate charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 3.3\text{ A}$, $V_{DS} = 160\text{ V}$, see fig. 6 and 13 b	-	-	8.2	nC
Gate-source charge	Q_{gs}			-	-	1.8	
Gate-drain charge	Q_{gd}			-	-	4.5	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 100\text{ V}$, $I_D = 3.3\text{ A}$, $R_g = 24\text{ }\Omega$, $R_D = 30\text{ }\Omega$, see fig. 10 b		-	8.2	-	ns
Rise time	t_r			-	17	-	
Turn-off delay time	$t_{d(off)}$			-	14	-	
Fall time	t_f			-	8.9	-	
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 		-	-	0.96	A
Pulsed diode forward current ^a	I_{SM}			-	-	7.7	
Body diode voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}$, $I_S = 0.96\text{ A}$, $V_{GS} = 0\text{ V}^b$		-	-	2.0	V
Body diode reverse recovery time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}$, $I_F = 3.3\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^b$		-	150	310	ns
Body diode reverse recovery charge	Q_{rr}			-	0.60	1.4	μC
Forward turn-on time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

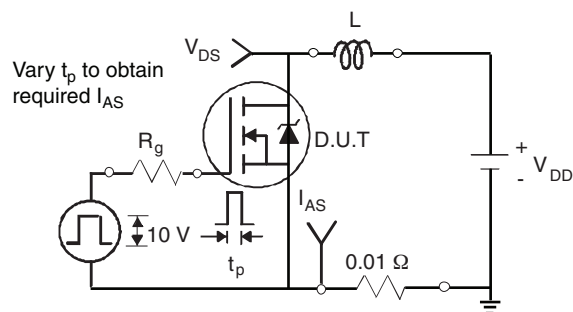
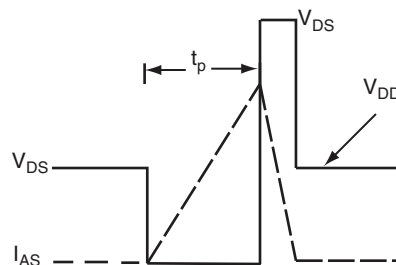
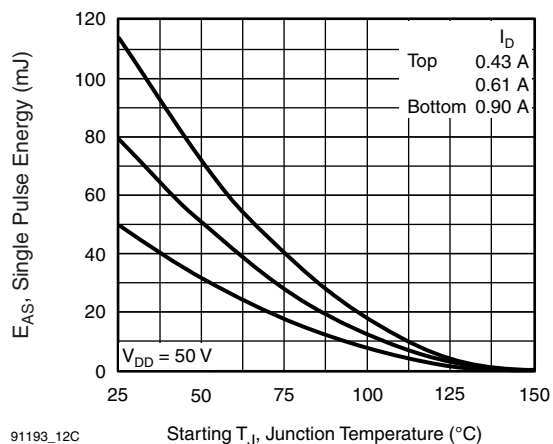
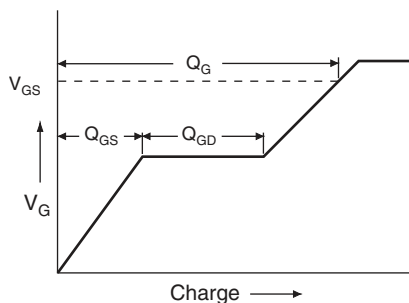
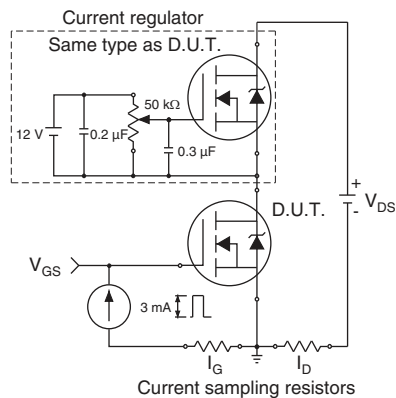
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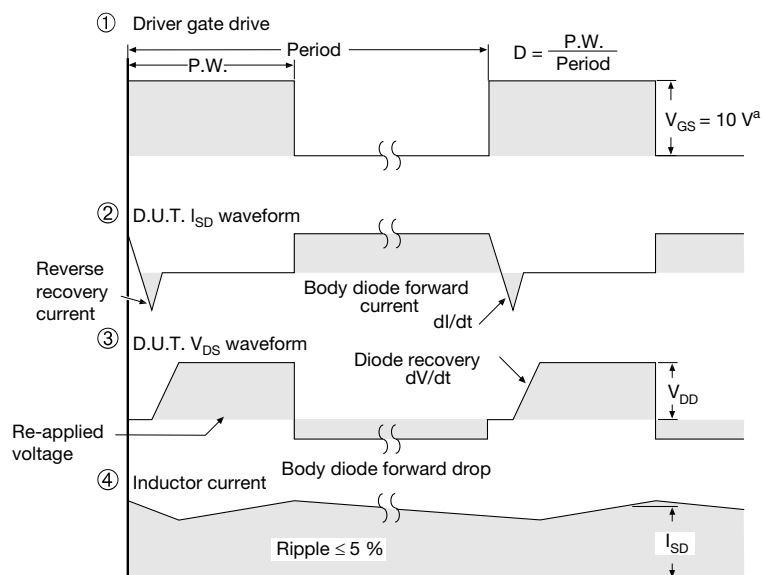
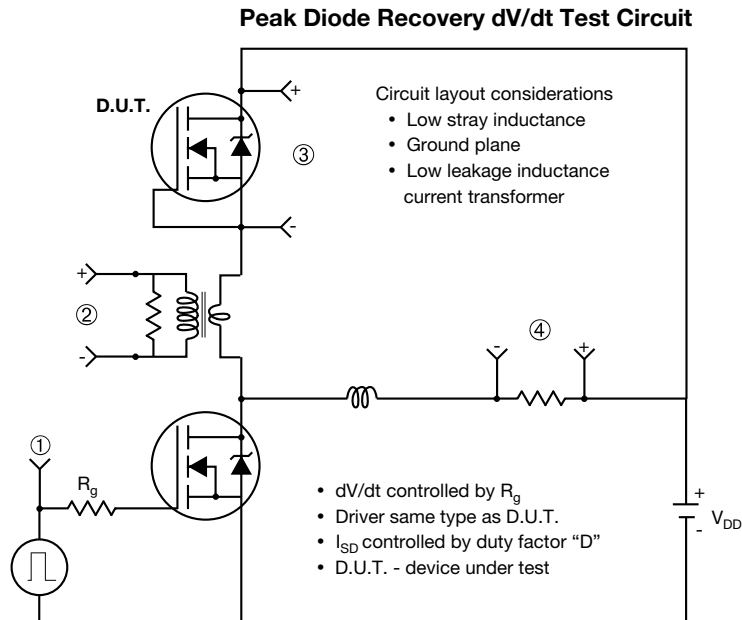
a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)

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. 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

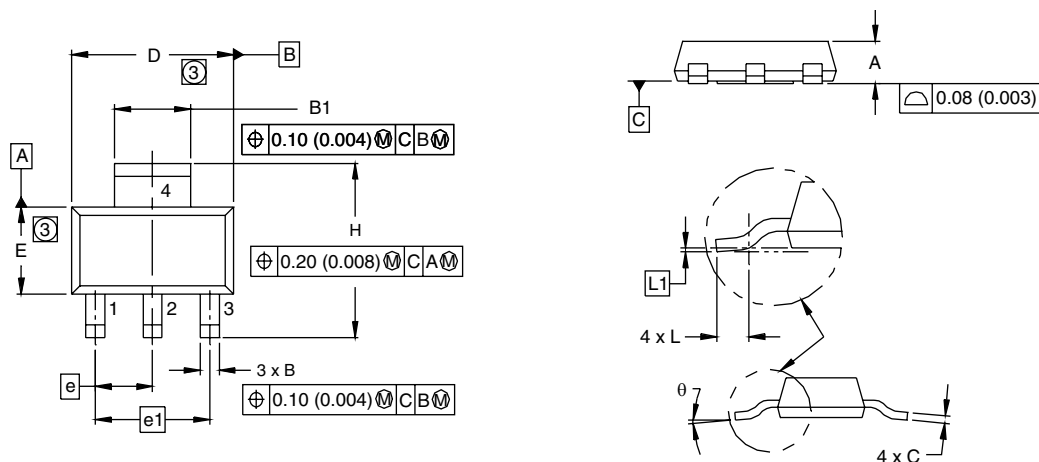

Note

a. $V_{GS} = 5\text{ V}$ 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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