

ISP14EP15LM-VB Datasheet

P-Channel 200V (D-S)MOSFET

PRODUCT SUMMARY

V_{DS} (V)	-200	
$R_{DS(on)}$ (Ω)	$V_{GS} = -10\text{ V}$	2.0
Q_g max. (nC)	29	
Q_{gs} (nC)	5.4	
Q_{gd} (nC)	15	
Configuration	Single	

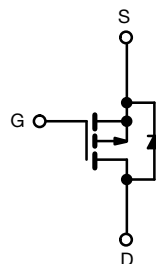
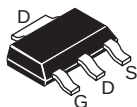
FEATURES

- Surface mount
- Available in tape and reel
- Dynamic dV/dt rating
- Repetitive avalanche rated
- P-channel
- Fast switching
- Ease of paralleling



RoHS*
Available
HALOGEN
FREE
Available

SOT-223



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ }^\circ\text{C}$, 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	$T_C = 25\text{ }^\circ\text{C}$	A
		$T_C = 100\text{ }^\circ\text{C}$	
Pulsed Drain Current ^a	I_{DM}	-10	
Linear Derating Factor		0.59	W/ $^\circ\text{C}$
Linear Derating Factor (PCB mount) ^e		0.025	
Single Pulse Avalanche Energy ^b	E_{AS}	500	mJ
Avalanche Current ^a	I_{AR}	-6.4	A
Repetitive Avalanche Energy ^a	E_{AR}	7.4	mJ
Maximum Power Dissipation	P_D	$T_C = 25\text{ }^\circ\text{C}$	W
Maximum Power Dissipation (PCB mount) ^e		$T_A = 25\text{ }^\circ\text{C}$	
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	$^\circ\text{C}$
Soldering Recommendations (Peak temperature) ^d	for 10 s	300	

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
 b. $V_{DD} = -50\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 17\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = -6.5\text{ A}$ (see fig. 12).
 c. $I_{SD} \leq -6.5\text{ A}$, $dI/dt \leq 120\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
 d. 1.6 mm from case.
 e. When mounted on 1" square PCB (FR-4 or G-10 material).

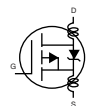
THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Ambient (PCB mount) ^a	R_{thJA}	-	40	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.7	

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}	$V_{GS} = 0$, $I_D = -250\text{ }\mu\text{A}$	-200	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = -1\text{ mA}$	-	-0.24	-	V/ $^{\circ}\text{C}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	-1.5	-	-4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$	-	-	± 10	μA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -200\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	-100	μA
		$V_{DS} = -160\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	-	-500	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$, $I_D = -1.0\text{ A}$ ^b	-	2.00	-	Ω
Forward Transconductance	g_{fs}	$V_{DS} = -50\text{ V}$, $I_D = -1.0\text{ A}$ ^b	2.8	-	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5	-	700	-	pF
Output Capacitance	C_{oss}		-	200	-	
Reverse Transfer Capacitance	C_{rss}		-	40	-	
Total Gate Charge	Q_g	$V_{GS} = -10\text{ V}$, $I_D = -3.5\text{ A}$, $V_{DS} = -160\text{ V}$, see fig. 6 and 13 ^b	-	-	29	nC
Gate-Source Charge	Q_{gs}		-	-	5.4	
Gate-Drain Charge	Q_{gd}		-	-	15	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -100\text{ V}$, $I_D = -3.5\text{ A}$, $R_g = 12\text{ }\Omega$, $R_D = 15\text{ }\Omega$, see fig. 10 ^b	-	12	-	ns
Rise Time	t_r		-	27	-	
Turn-Off Delay Time	$t_{d(off)}$		-	28	-	
Fall Time	t_f		-	24	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 	-	4.5	-	nH
Internal Source Inductance	L_S		-	7.5	-	
Gate Input Resistance	R_g	$f = 1\text{ MHz}$, open drain	0.6	-	3.7	Ω
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	-2	A
Pulsed Diode Forward Current ^a	I_{SM}		-	-	-4	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = -3.5\text{ A}$, $V_{GS} = 0\text{ V}$ ^b	-	-	-6.5	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = -3.5\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$ ^b	-	200	300	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	1.9	2.9	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)

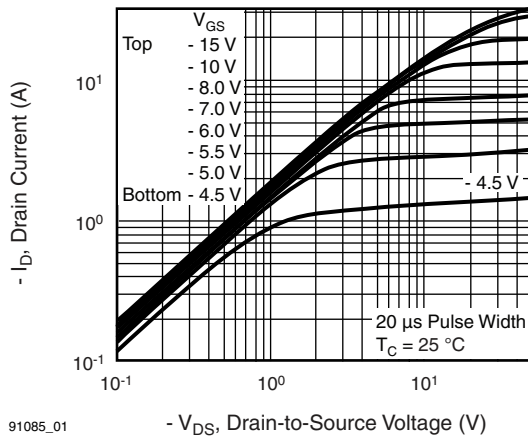


Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ °C}$

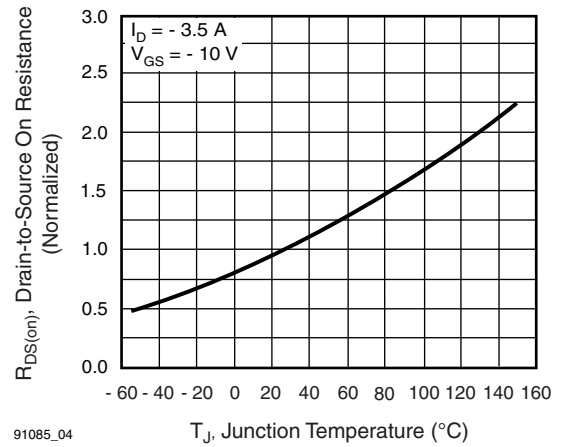


Fig. 4 - Normalized On-Resistance vs. Temperature

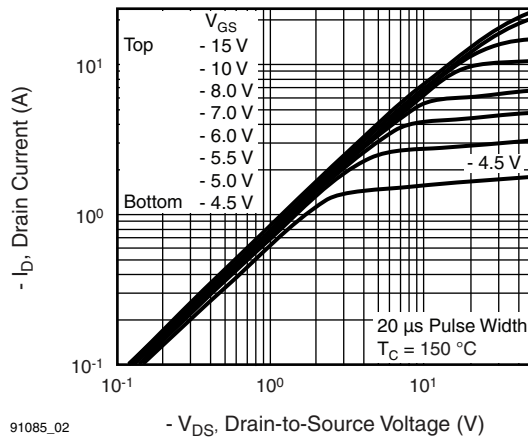


Fig. 2 - Typical Output Characteristics, $T_C = 150\text{ °C}$

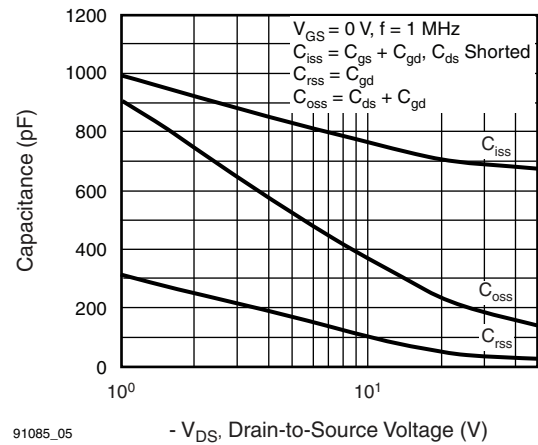


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

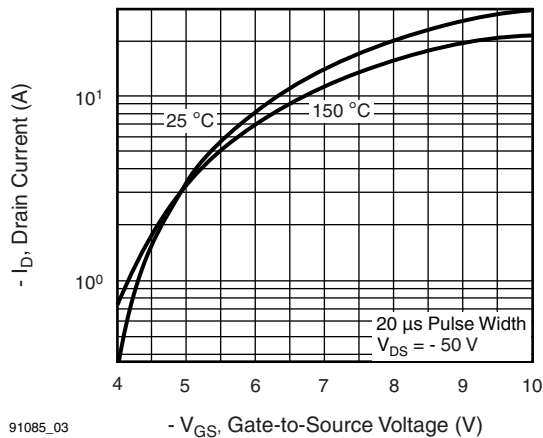


Fig. 3 - Typical Transfer Characteristics

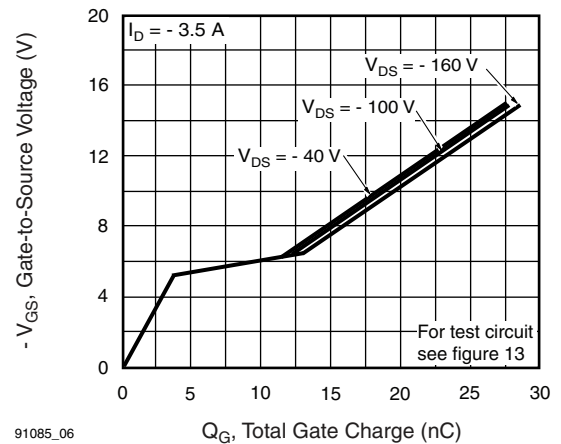


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

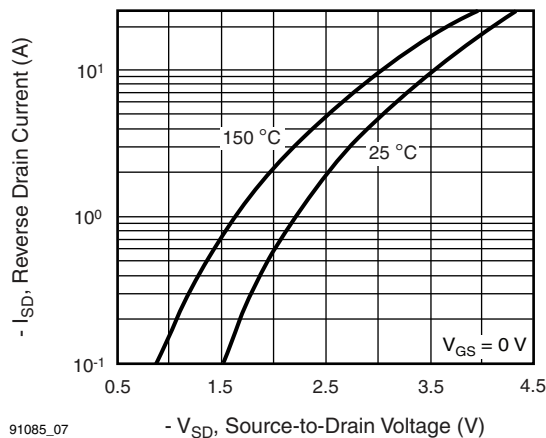


Fig. 7 - Typical Source-Drain Diode Forward Voltage

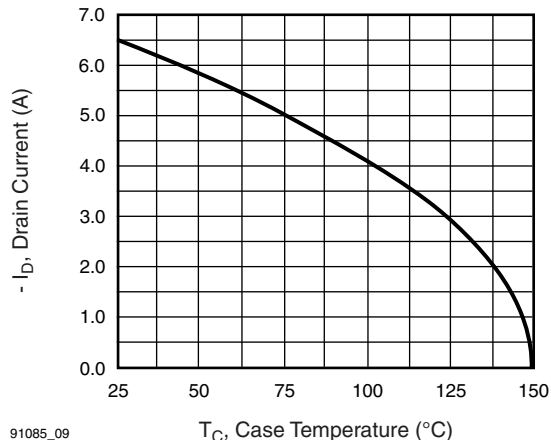


Fig. 9 - Maximum Drain Current vs. Case Temperature

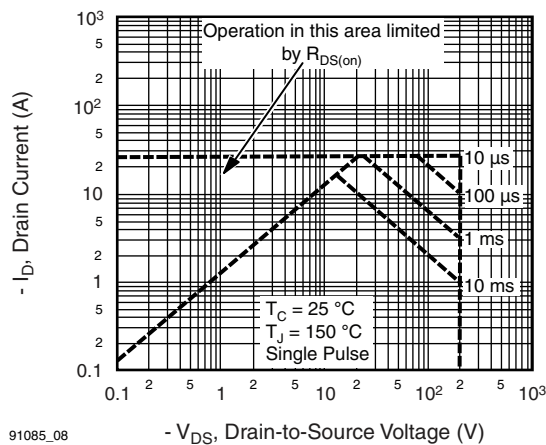


Fig. 8 - Maximum Safe Operating Area

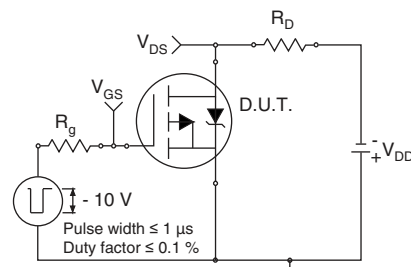


Fig. 10a - Switching Time Test Circuit

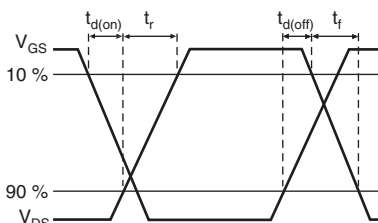


Fig. 10b - Switching Time Waveforms

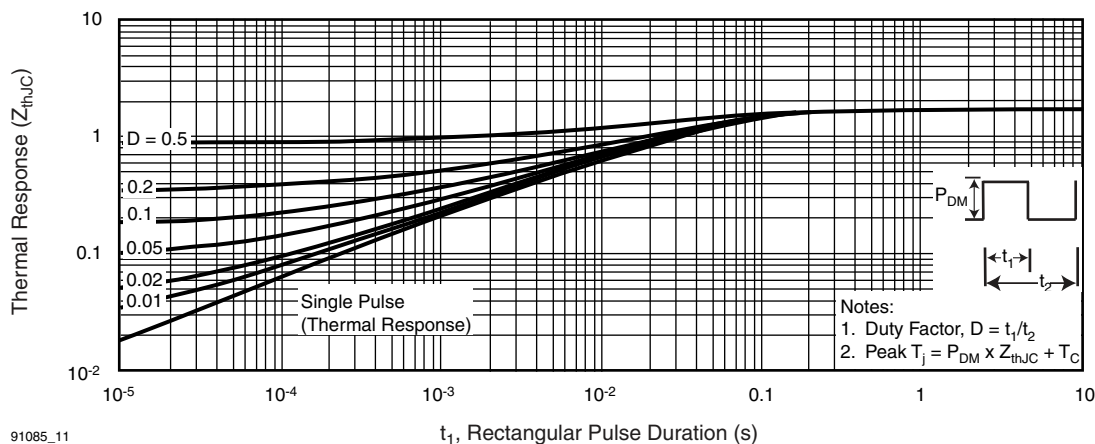


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

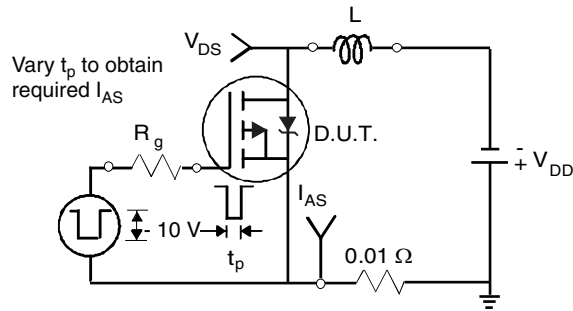


Fig. 12a - Unclamped Inductive Test Circuit

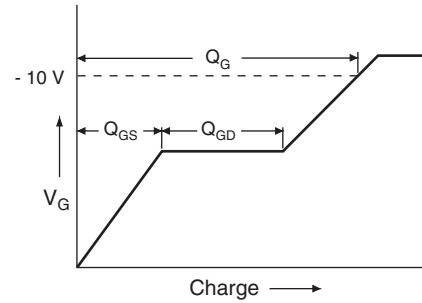


Fig. 13a - Basic Gate Charge Waveform

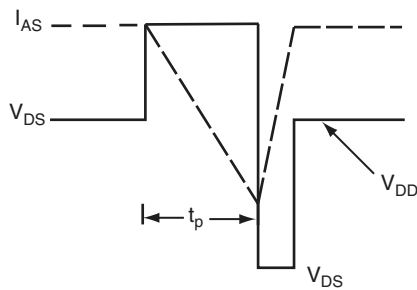


Fig. 12b - Unclamped Inductive Waveforms

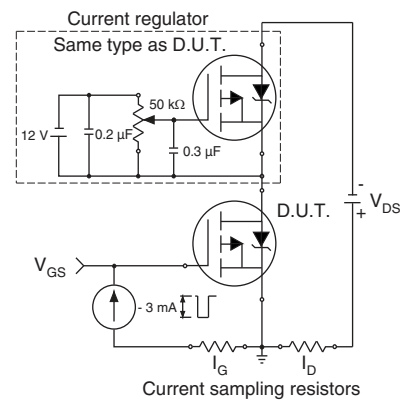


Fig. 13b - Gate Charge Test Circuit

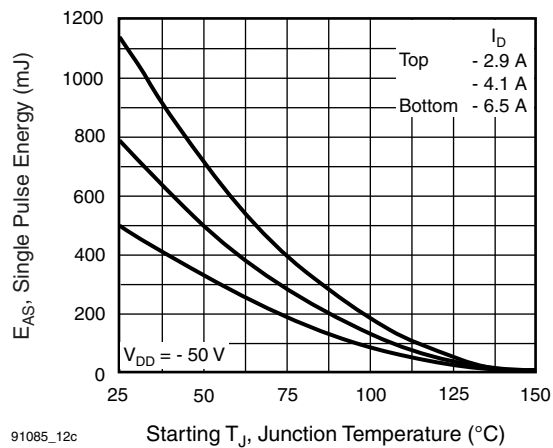


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

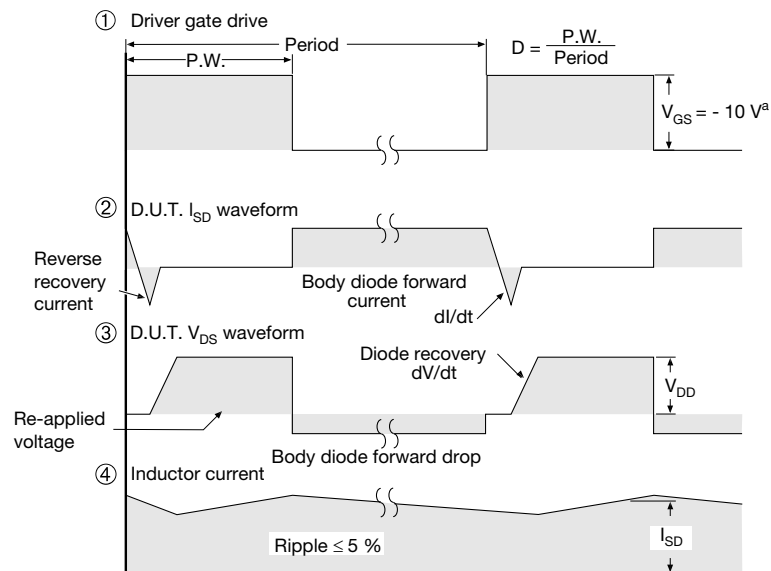
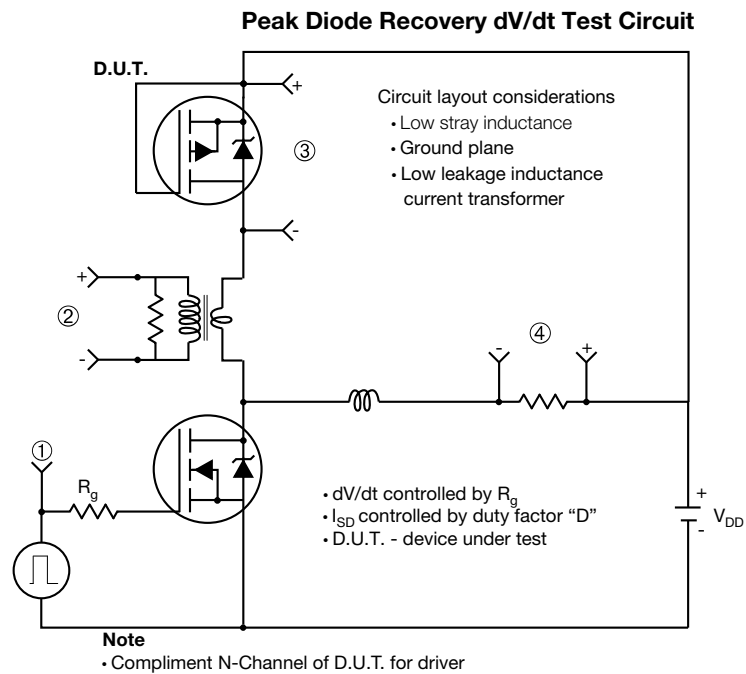
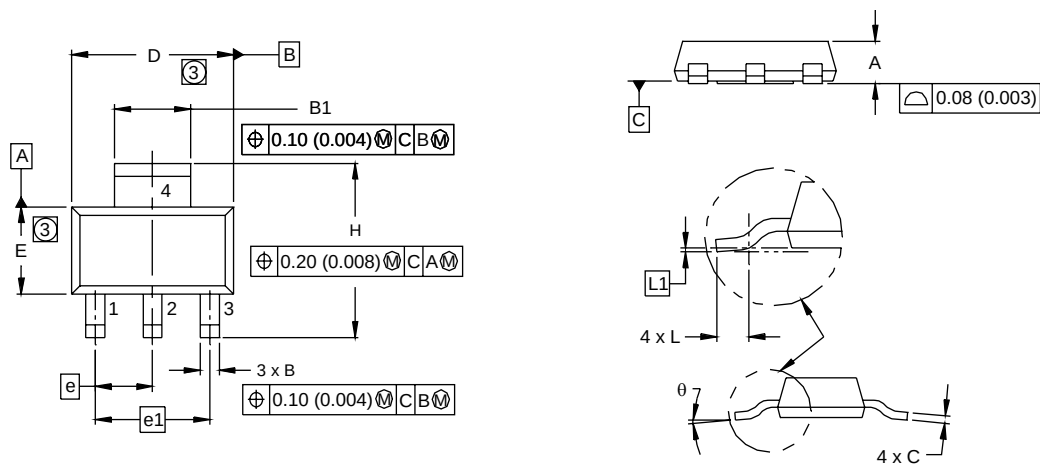


Fig. 14 - For P-Channel

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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