

P-Channel 200V (D-S) MOSFET

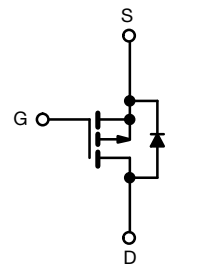
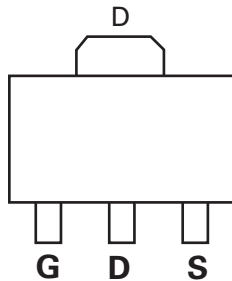
PRODUCT SUMMARY		
V _{DS} (V)	-200	
R _{DS(on)} (Ω)	V _{GS} = -10 V	2.0
Q _g max. (nC)	29	
Q _{gs} (nC)	5.4	
Q _{gd} (nC)	15	
Configuration	Single	

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



P-Channel MOSFET

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	-2.5	A
		T _C = 100 °C	-1.8	
Pulsed Drain Current ^a	I _{DM}	-7	W/°C	
Linear Derating Factor		0.59		
Linear Derating Factor (PCB mount) ^e		0.025		
Single Pulse Avalanche Energy ^b	E _{AS}	300	mJ	
Avalanche Current ^a	I _{AR}	-3.4	A	
Repetitive Avalanche Energy ^a	E _{AR}	5.4	mJ	
Maximum Power Dissipation	P _D	T _C = 25 °C	64	W
Maximum Power Dissipation (PCB mount) ^e		T _A = 25 °C	2.7	
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		

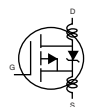

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- V_{DD} = -50 V, starting T_J = 25 °C, L = 17 mH, R_g = 25 Ω, I_{AS} = -6.5 A (see fig. 12).
- I_{SD} ≤ -6.5 A, di/dt ≤ 120 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 150 °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	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

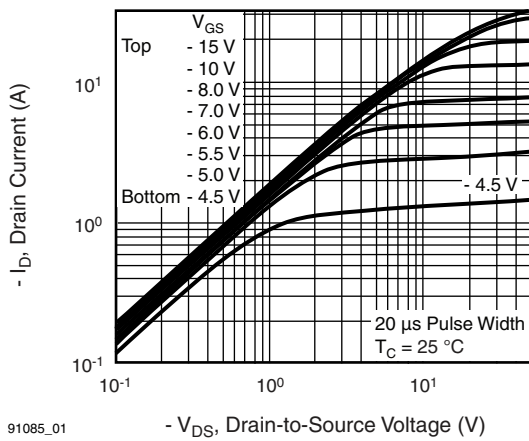
a. When mounted on 1" square PCB (FR-4 or G-10 material).

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}	$V_{GS} = 0, I_D = -250\ \mu\text{A}$	-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/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-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	$V_{GS} = -10\ \text{V}, I_D = -1.5\ \text{A}, V_{DS} = -160\ \text{V}$, 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	$t_{d(on)}$	$V_{DD} = -100\ \text{V}, I_D = -1.5\ \text{A}, R_g = 12\ \Omega, R_D = 15\ \Omega$, 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}	$T_J = 25\text{ }^\circ\text{C}, I_S = -1.5\ \text{A}, V_{GS} = 0\ \text{V}^b$	-	-	-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

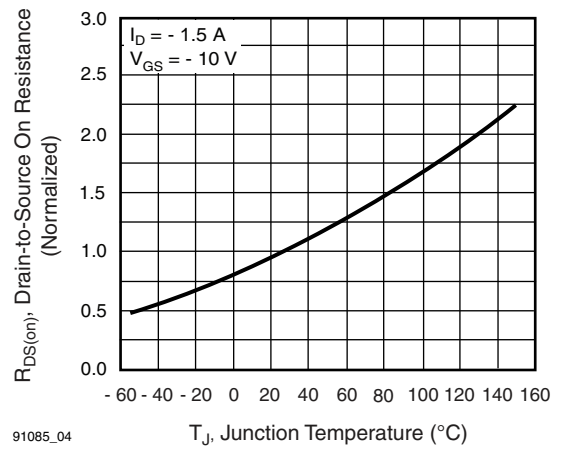
- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width $\leq 300\ \mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



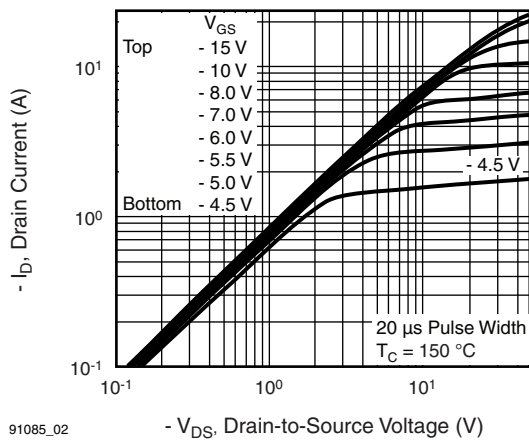
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Fig. 1 - Typical Output Characteristics, T_C = 25 °C



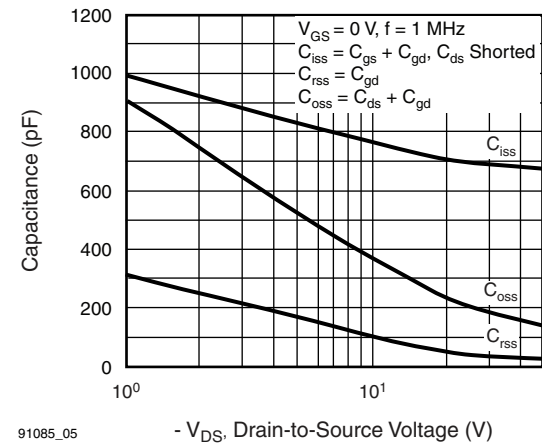
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Fig. 4 - Normalized On-Resistance vs. Temperature



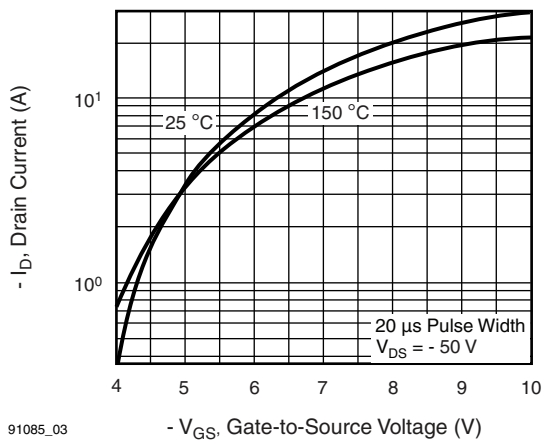
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Fig. 2 - Typical Output Characteristics, T_C = 150 °C



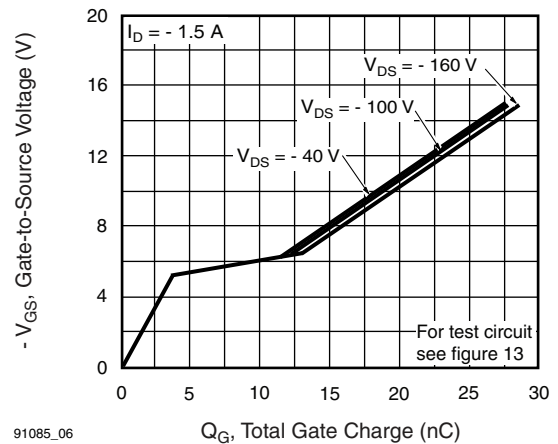
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Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



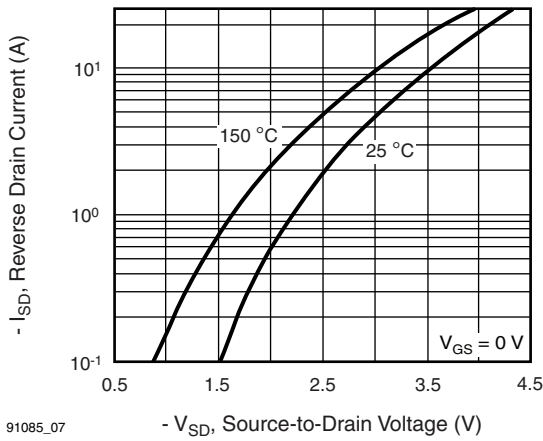
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Fig. 3 - Typical Transfer Characteristics



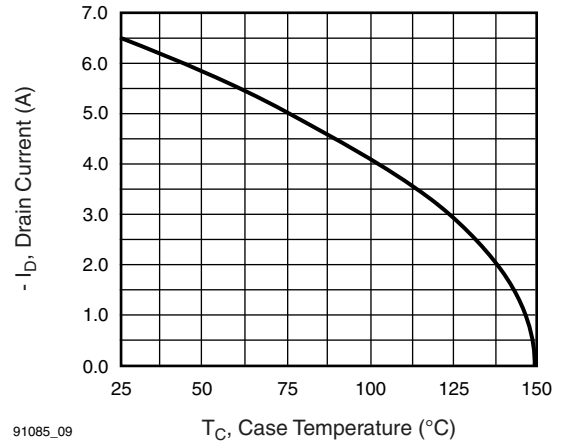
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Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage



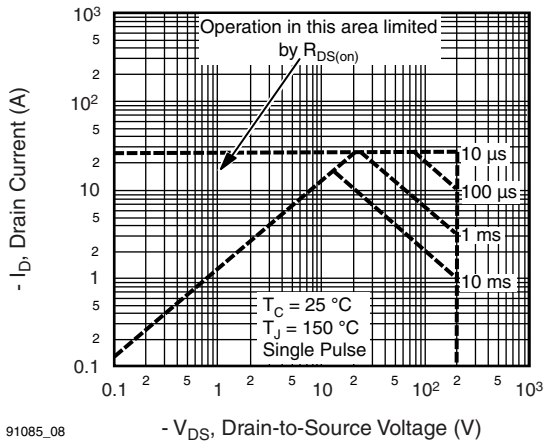
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Fig. 7 - Typical Source-Drain Diode Forward Voltage



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Fig. 9 - Maximum Drain Current vs. Case Temperature



91085_08

Fig. 8 - Maximum Safe Operating Area

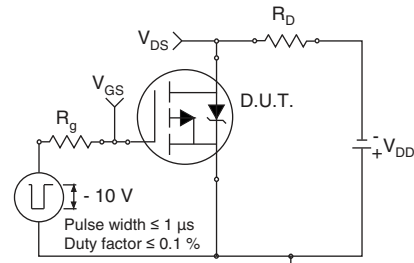


Fig. 10a - Switching Time Test Circuit

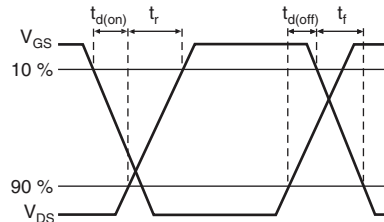
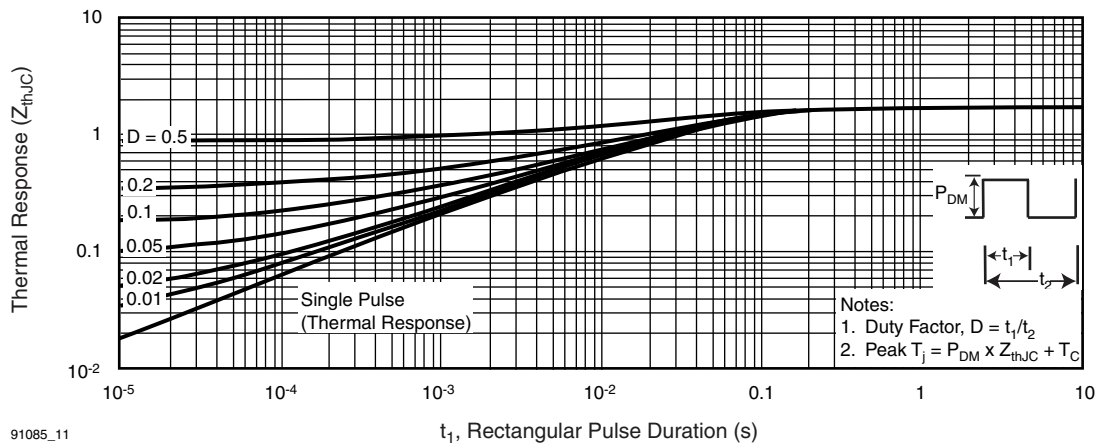


Fig. 10b - Switching Time Waveforms



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

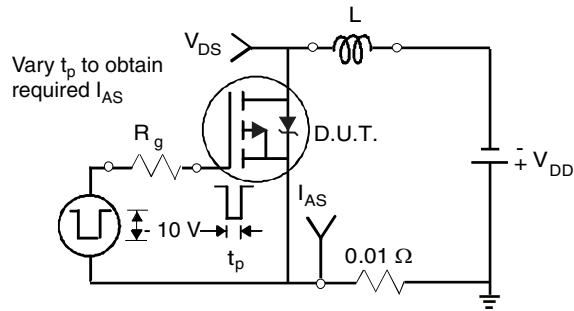


Fig. 12a - Unclamped Inductive Test Circuit

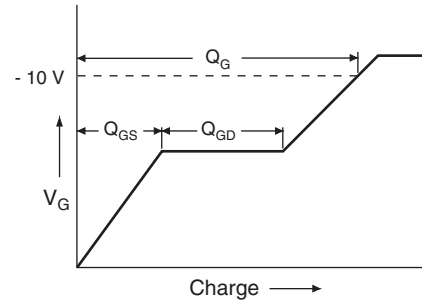


Fig. 13a - Basic Gate Charge Waveform

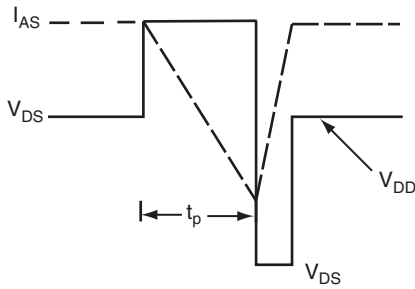


Fig. 12b - Unclamped Inductive Waveforms

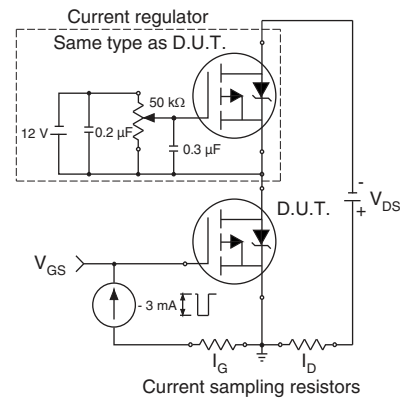


Fig. 13b - Gate Charge Test Circuit

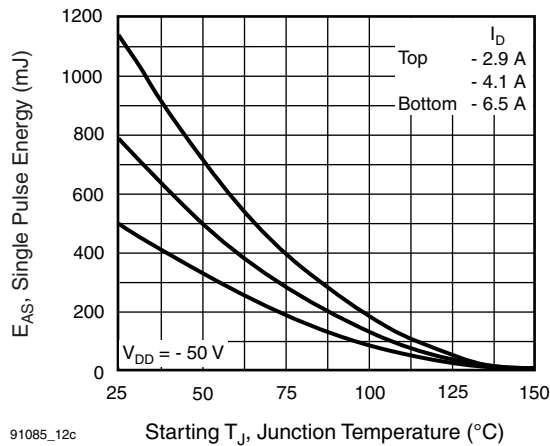
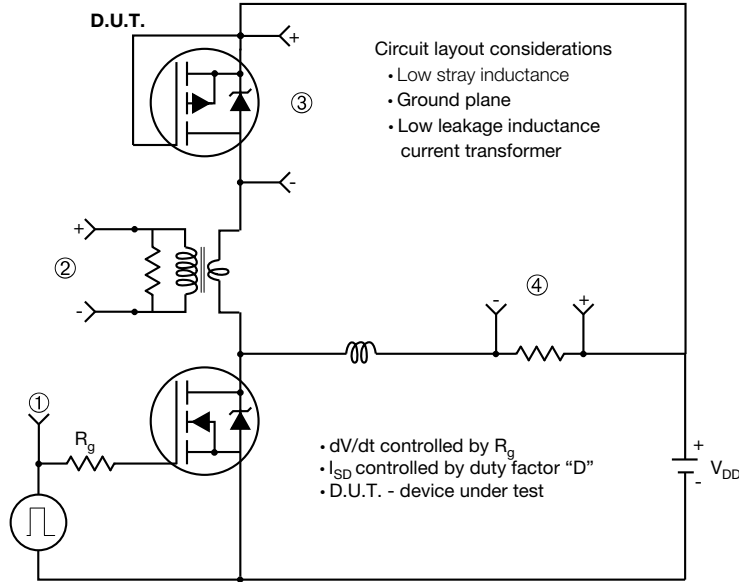
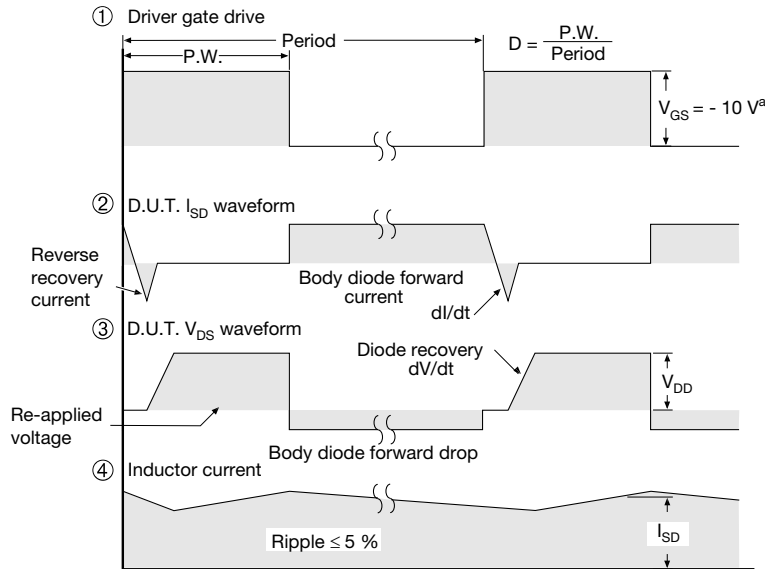


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

Peak Diode Recovery dV/dt Test Circuit



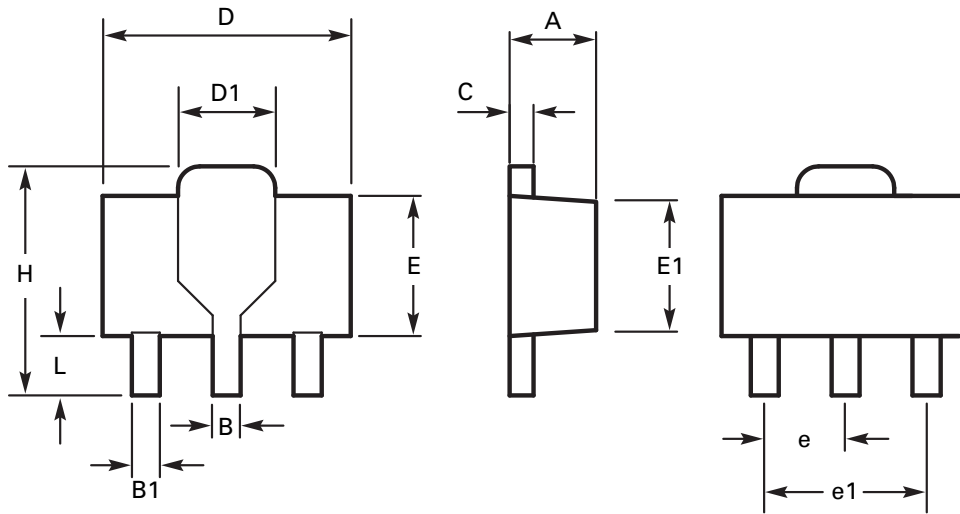
Note
• Compliment N-Channel of D.U.T. for driver



Note
a. $V_{GS} = -5 V$ for logic level and $-3 V$ drive devices

Fig. 14 - For P-Channel

Package outline - SOT89



DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	1.40	1.60	0.550	0.630	E	2.29	2.60	0.090	0.102
B	0.44	0.56	0.017	0.022	E1	2.13	2.29	0.084	0.090
B1	0.36	0.48	0.014	0.019	e	1.50 BSC		0.059 BSC	
C	0.35	0.44	0.014	0.017	e1	3.00 BSC		0.118 BSC	
D	4.40	4.60	0.173	0.181	H	3.94	4.25	0.155	0.167
D1	1.62	1.83	0.064	0.072	L	0.89	1.20	0.035	0.047

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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