

## N-Channel 100-V (D-S) MOSFET

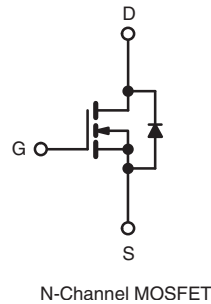
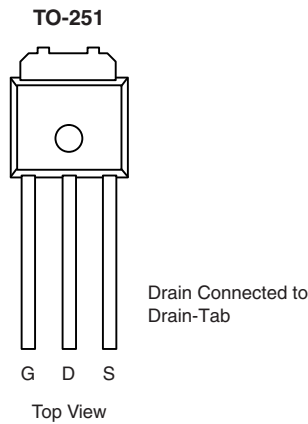
PRODUCT SUMMARY		
$V_{DS}$ (V)	100	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10\text{ V}$	0.20
$Q_g$ (Max.) (nC)	16	
$Q_{gs}$ (nC)	4.4	
$Q_{gd}$ (nC)	7.7	
Configuration	Single	

### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Available in Tape and Reel
- Dynamic  $dV/dt$  Rating
- Repetitive Avalanche Rated
- 175 °C Operating Temperature
- Fast Switching
- Ease of Paralleling



**RoHS\***  
Available  
**HALOGEN**  
**FREE**  
Available

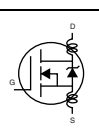



ABSOLUTE MAXIMUM RATINGS ( $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	$V_{DS}$	100	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current	$V_{GS}$ at 10 V	$T_C = 25\text{ }^\circ\text{C}$	12	A
		$T_C = 100\text{ }^\circ\text{C}$	7.5	
Pulsed Drain Current <sup>a</sup>		37	W/ $^\circ\text{C}$	
Linear Derating Factor		0.40		
Linear Derating Factor (PCB Mount)		0.025		
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	200	mJ	
Avalanche Currenta	$I_{AR}$	9.2	A	
Repetitive Avalanche Energy <sup>a</sup>	$E_{AR}$	6.0	mJ	
Maximum Power Dissipation		$T_C = 25\text{ }^\circ\text{C}$	60	W
		$T_A = 25\text{ }^\circ\text{C}$	3.7	
Peak Diode Recovery $dV/dt$ <sup>c</sup>	$dV/dt$	5.5	V/ns	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 175	$^\circ\text{C}$	
Soldering Recommendations (Peak Temperature)	For 10 s	300 <sup>d</sup>		

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25\text{ V}$ , starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 3.5\text{ mH}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 9.2\text{ A}$  (see fig. 12).
- $I_{SD} \leq 9.2\text{ A}$ ,  $dI/dt \leq 110\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 175\text{ }^\circ\text{C}$ .

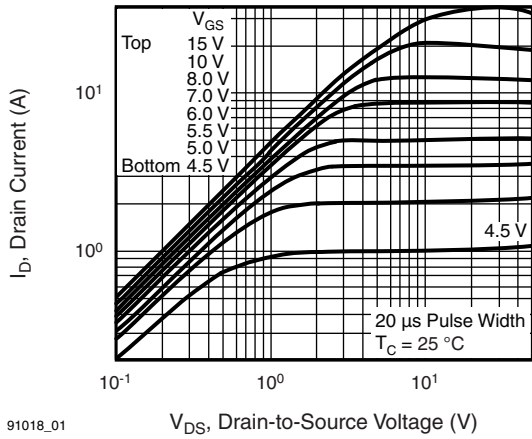
THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	62	°C/W
Maximum Junction-to-Ambient (PCB Mount) <sup>a</sup>	$R_{thJA}$	-	40	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	2.5	

SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0, I_D = 250 \mu A$		100	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, $I_D = 1 \text{ mA}$		-	0.13	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250 \mu A$		1.0	-	3.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}$		-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$		-	-	25	$\mu A$
		$V_{DS} = 80 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 150 \text{ °C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 5.5 \text{ A}^b$	-	0.20	-	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 50 \text{ V}, I_D = 5.5 \text{ A}^b$		2.7	-	-	S
<b>Dynamic</b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1.0 \text{ MHz}, \text{ see fig. 5}$		-	360	-	$\mu F$
Output Capacitance	$C_{oss}$			-	150	-	
Reverse Transfer Capacitance	$C_{rss}$			-	34	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10 \text{ V}$	$I_D = 9.2 \text{ A}, V_{DS} = 80 \text{ V}, \text{ see fig. 6 and 13}^b$	-	-	16	nC
Gate-Source Charge	$Q_{gs}$			-	-	4.4	
Gate-Drain Charge	$Q_{gd}$			-	-	7.7	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 50 \text{ V}, I_D = 9.2 \text{ A}, R_g = 18 \Omega, R_D = 5.2 \Omega, \text{ see fig. 10}^b$		-	8.8	-	ns
Rise Time	$t_r$			-	30	-	
Turn-Off Delay Time	$t_{d(off)}$			-	19	-	
Fall Time	$t_f$			-	20	-	
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	-	
<b>Drain-Source Body Diode Characteristics</b>							
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	9.2	A
Pulsed Diode Forward Current <sup>a</sup>	$I_{SM}$			-	-	37	
Body Diode Voltage	$V_{SD}$	$T_J = 25 \text{ °C}, I_S = 9.2 \text{ A}, V_{GS} = 0 \text{ V}^b$		-	-	1.8	V
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25 \text{ °C}, I_F = 9.2 \text{ A}, dI/dt = 100 \text{ A}/\mu s^b$		-	110	260	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			-	0.53	1.3	$\mu C$
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )					

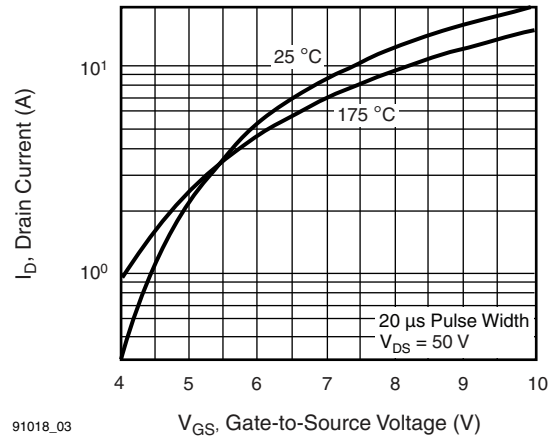
**Notes**

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

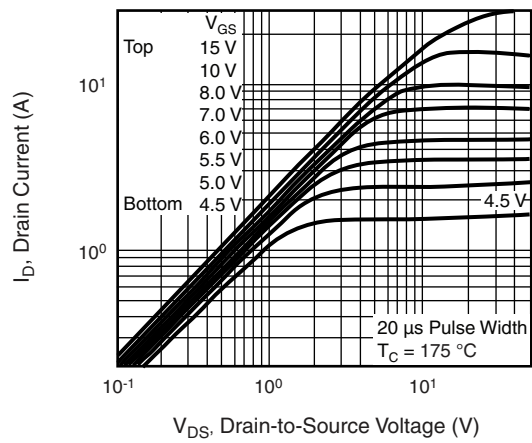
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



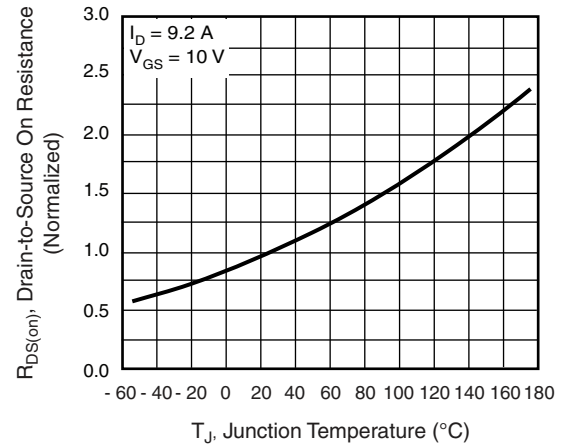
**Fig. 1 - Typical Output Characteristics,  $T_C = 25\text{ °C}$**



**Fig. 3 - Typical Transfer Characteristics**



**Fig. 2 - Typical Output Characteristics,  $T_C = 175\text{ °C}$**



**Fig. 4 - Normalized On-Resistance vs. Temperature**

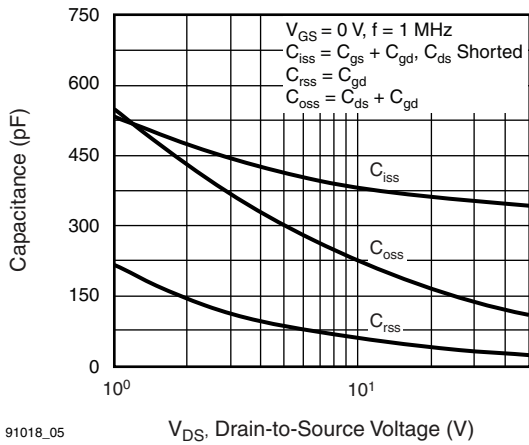


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

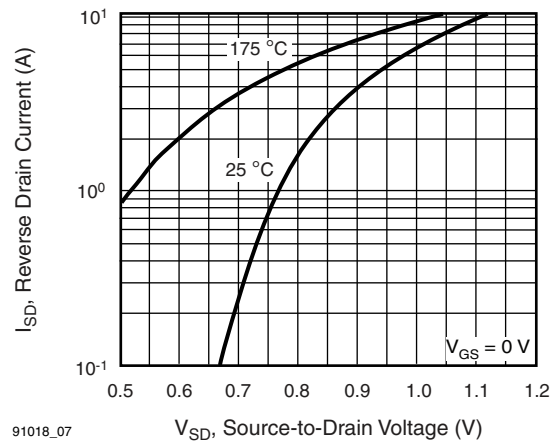


Fig. 7 - Typical Source-Drain Diode Forward Voltage

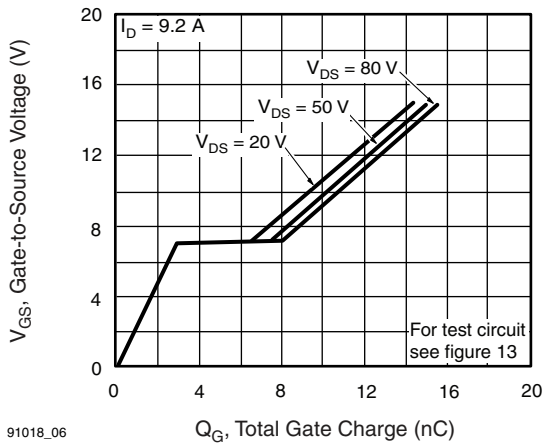


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

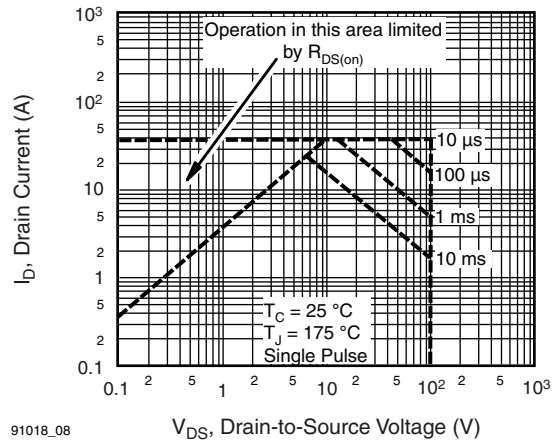
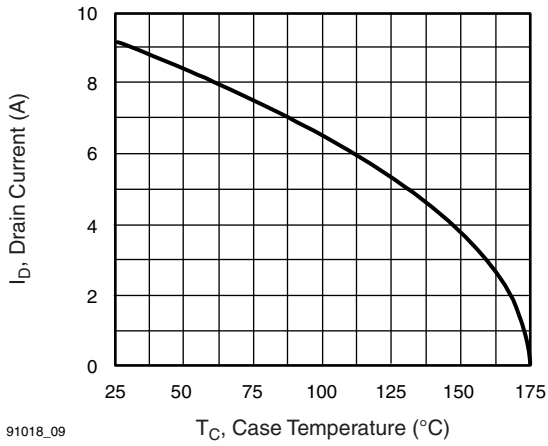


Fig. 8 - Maximum Safe Operating Area



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Fig. 9 - Maximum Drain Current vs. Case Temperature

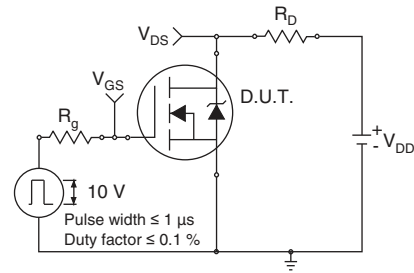


Fig. 10a - Switching Time Test Circuit

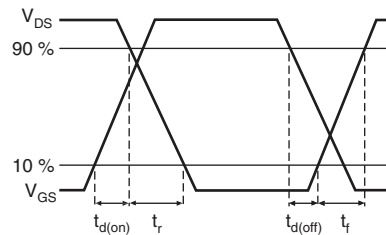
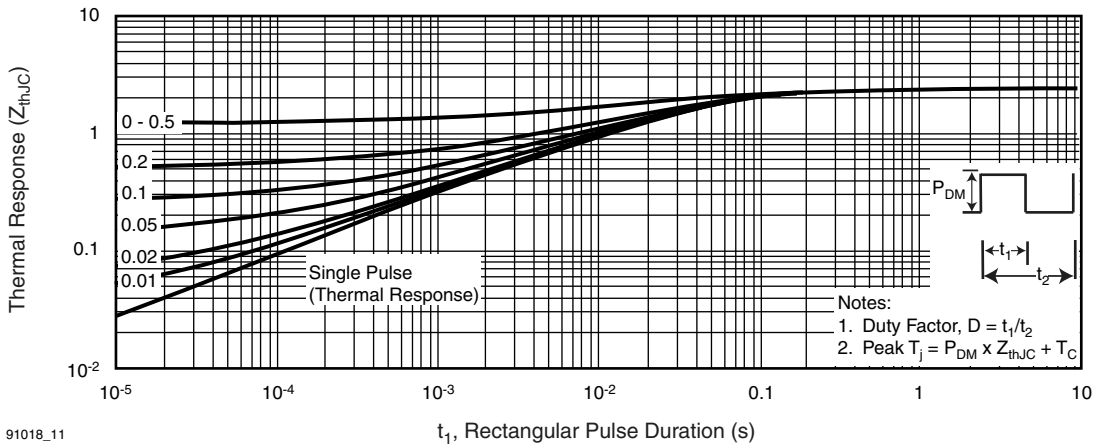


Fig. 10b - Switching Time Waveforms



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

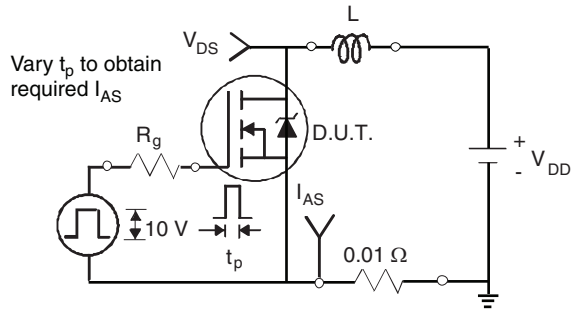


Fig. 12a - Unclamped Inductive Test Circuit

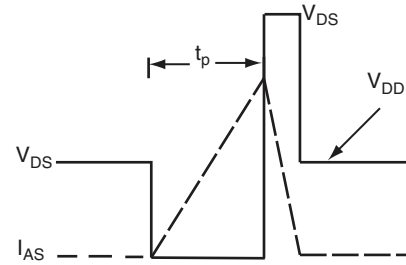


Fig. 12b - Unclamped Inductive Waveforms

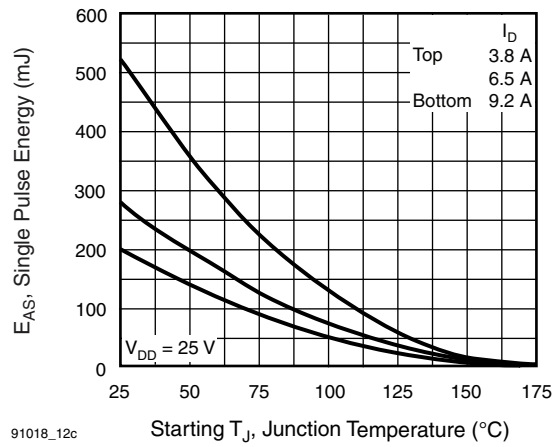


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

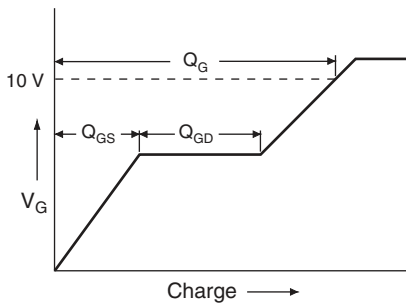


Fig. 13a - Basic Gate Charge Waveform

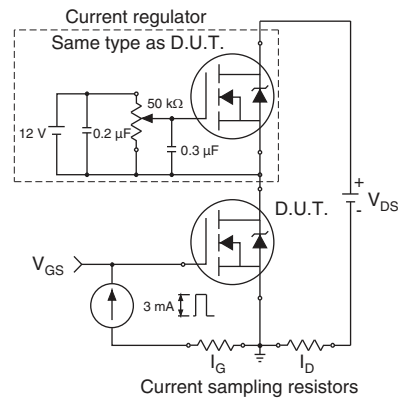
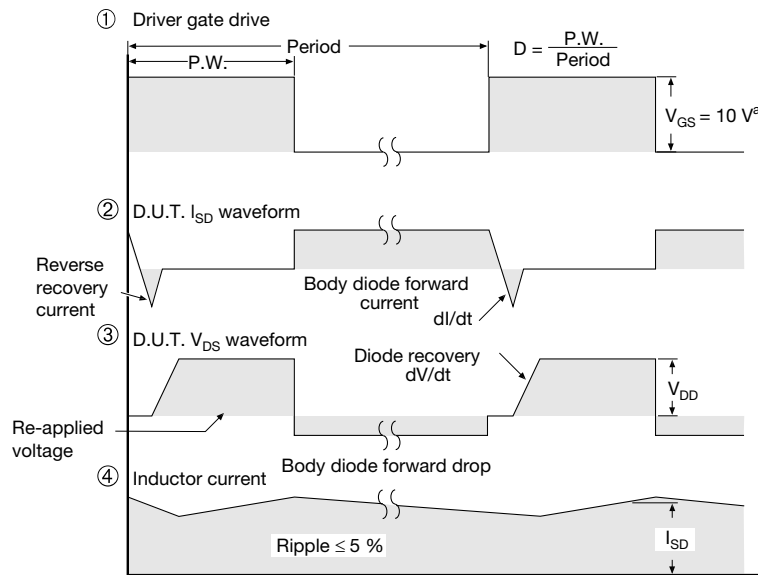
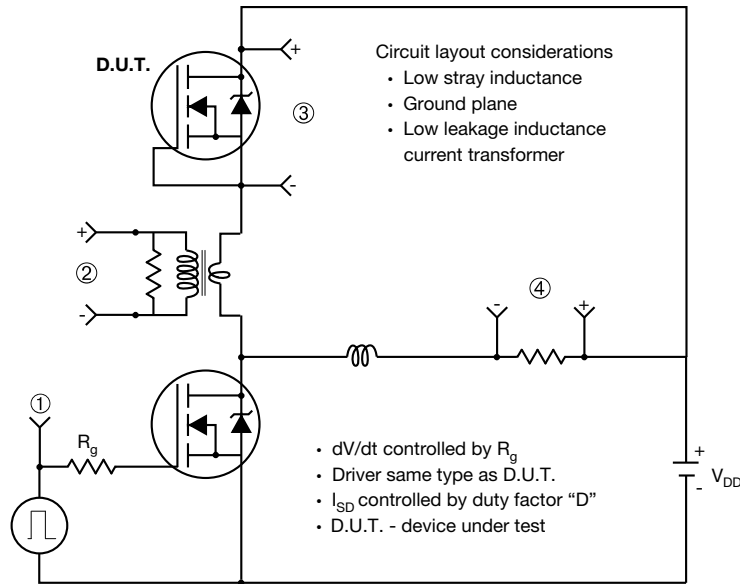


Fig. 13b - Gate Charge Test Circuit

**Peak Diode Recovery dV/dt Test Circuit**

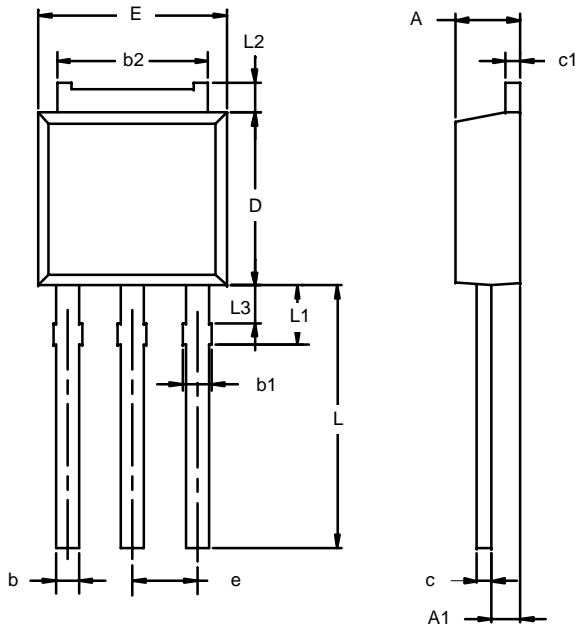


**Note**

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

**Fig. 14 - For N-Channel**

**TO-251AA**



Note: Dimension L3 is for reference only.

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
<b>A</b>	2.21	2.38	0.087	0.094
<b>A1</b>	0.89	1.14	0.035	0.045
<b>b</b>	0.71	0.89	0.028	0.035
<b>b1</b>	0.76	1.14	0.030	0.045
<b>b2</b>	5.23	5.43	0.206	0.214
<b>c</b>	0.46	0.58	0.018	0.023
<b>c1</b>	0.46	0.58	0.018	0.023
<b>D</b>	5.97	6.22	0.235	0.245
<b>E</b>	6.48	6.73	0.255	0.265
<b>e</b>	2.28 BSC		0.090 BSC	
<b>L</b>	3.89	9.53	0.153	0.375
<b>L1</b>	1.91	2.28	0.075	0.090
<b>L2</b>	0.89	1.27	0.035	0.050
<b>L3</b>	1.15	1.52	0.045	0.060



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