

Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	850	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	2.2
Q_g (Max.) (nC)	120	
Q_{gs} (nC)	16	
Q_{gd} (nC)	67	
Configuration	Single	

FEATURES

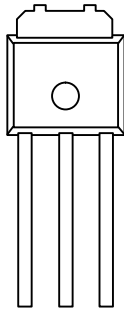
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Isolated Central Mounting Hole
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC



Available

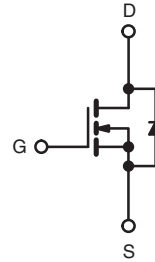
RoHS*
 COMPLIANT

TO-251



G D S

Top View

Drain Connected to
Drain-Tab

N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	850	V
Gate-Source Voltage			V_{GS}	± 20	
Continuous Drain Current	V_{GS} at 10 V	$T_C = 25\text{ }^{\circ}\text{C}$	I_D	5.0	A
		$T_C = 100\text{ }^{\circ}\text{C}$		3.5	
Pulsed Drain Current ^a			I_{DM}	20	
Linear Derating Factor				1.2	W/ $^{\circ}\text{C}$
Single Pulse Avalanche Energy ^b			E_{AS}	500	mJ
Repetitive Avalanche Current ^a			I_{AR}	5.0	A
Repetitive Avalanche Energy ^a			E_{AR}	15	mJ
Maximum Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$		P_D	150	W
Peak Diode Recovery dV/dt^c			dV/dt	1.5	V/ns
Operating Junction and Storage Temperature Range			T_J, T_{stg}	- 55 to + 150	$^{\circ}\text{C}$
Soldering Recommendations (Peak Temperature)	for 10 s			300 ^d	
Mounting Torque	6-32 or M3 screw			10	
				1.1	

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 42\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 4.7\text{ A}$ (see fig. 12).
- $I_{SD} \leq 4.7\text{ A}$, $dI/dt \leq 110\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.

THERMAL RESISTANCE RATINGS

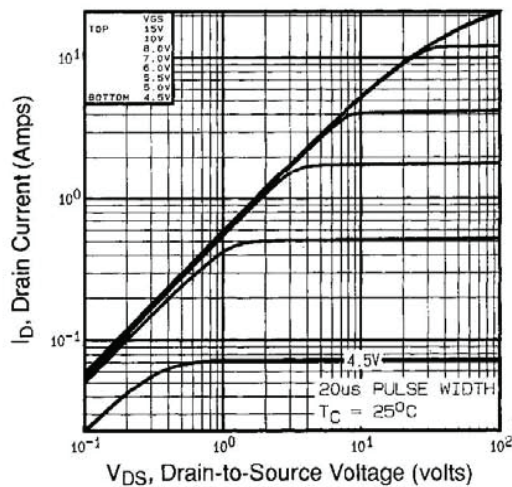
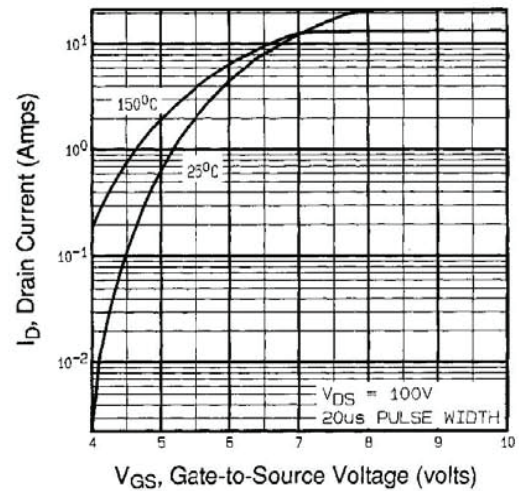
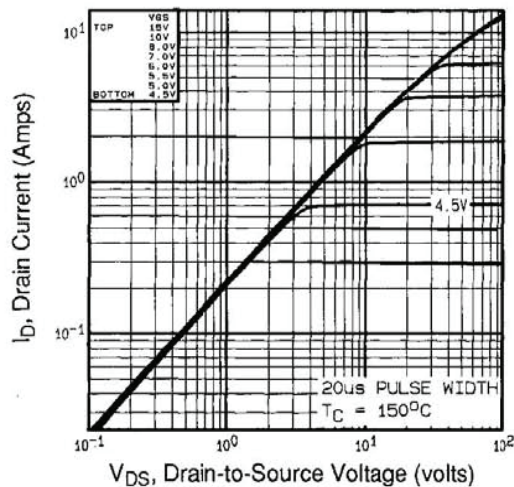
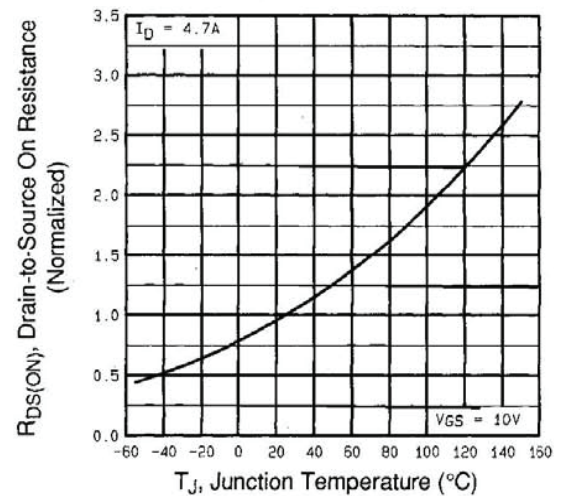
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	40	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.24	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.83	

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}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$		850	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = 1\text{ mA}$		-	1.0	-	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}	$V_{DS} = 850\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	100	μA
		$V_{DS} = 680\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$		-	-	500	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 2.8\text{ A}^b$	-	2.2	-	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 2.8\text{ A}^b$		2.5	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5		-	1600	-	pF
Output Capacitance	C_{oss}			-	180	-	
Reverse Transfer Capacitance	C_{rss}			-	63	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 4.7\text{ A}$, $V_{DS} = 425\text{ V}$, see fig. 6 and 13 ^b	-	-	120	nC
Gate-Source Charge	Q_{gs}			-	-	16	
Gate-Drain Charge	Q_{gd}			-	-	67	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 425\text{ V}$, $I_D = 4.7\text{ A}$, $R_g = 9.1\text{ }\Omega$, $R_D = 95\text{ }\Omega$, see fig. 10 ^b		-	15	-	ns
Rise Time	t_r			-	36	-	
Turn-Off Delay Time	$t_{d(off)}$			-	110	-	
Fall Time	t_f			-	32	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact		-	5.0	-	nH
Internal Source Inductance	L_S			-	13	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	4.7	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	19	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = 4.7\text{ A}$, $V_{GS} = 0\text{ V}^b$		-	-	1.8	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = 4.7\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^b$		-	510	770	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	2.2	3.3	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, $T_C = 25\text{ }^{\circ}\text{C}$

Fig. 3 - Typical Transfer Characteristics

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

Fig. 4 - Normalized On-Resistance vs. Temperature

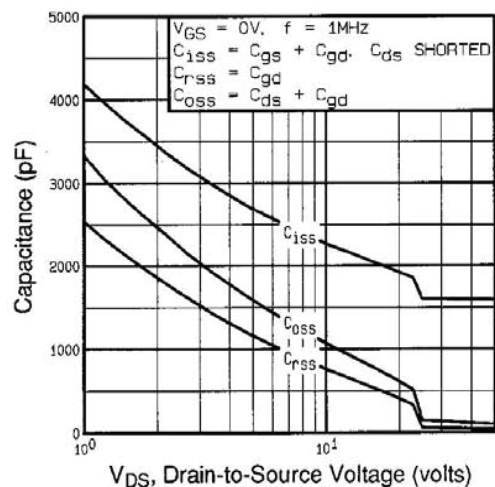


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

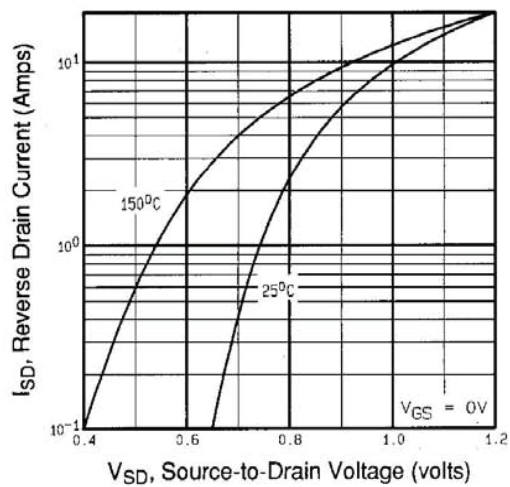


Fig. 7 - Typical Source-Drain Diode Forward Voltage

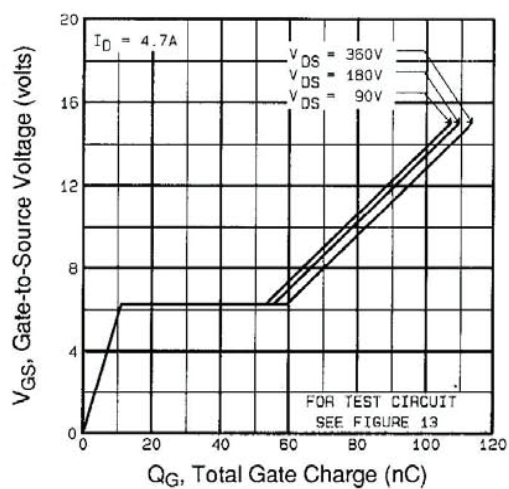


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

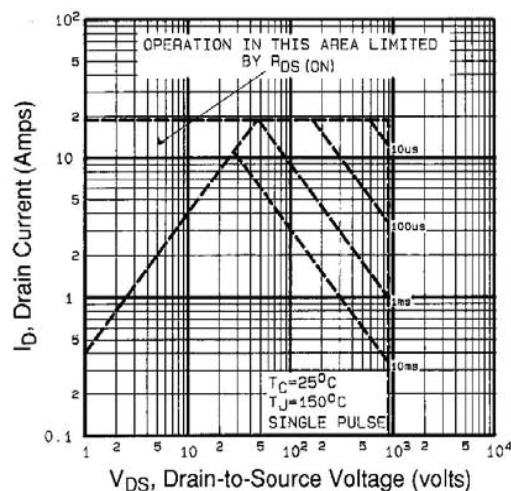


Fig. 8 - Maximum Safe Operating Area

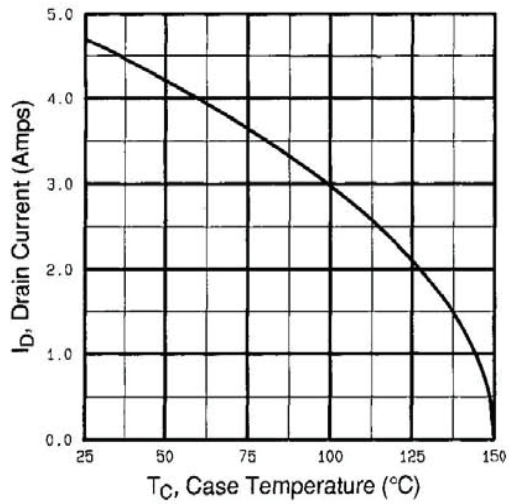


Fig. 9 - Maximum Drain Current vs. Case Temperature

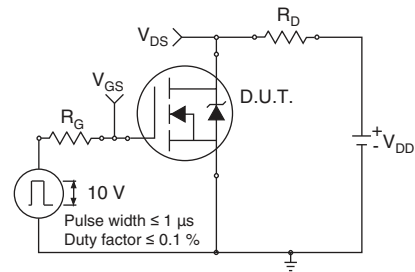


Fig. 10a - Switching Time Test Circuit

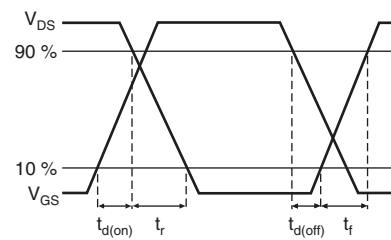


Fig. 10b - Switching Time Waveforms

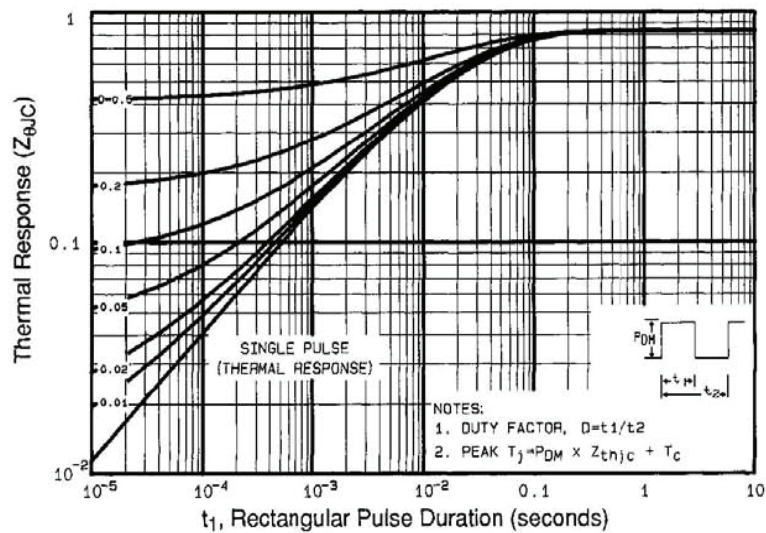


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

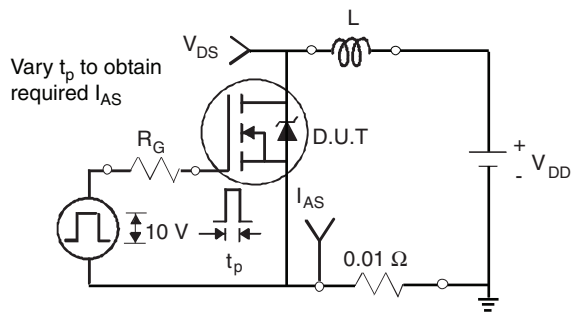


Fig. 12a - Unclamped Inductive Test Circuit

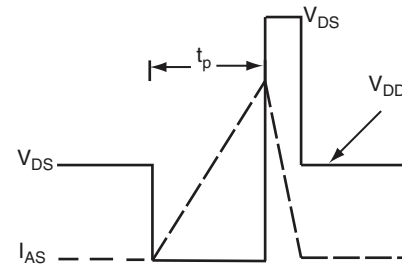


Fig. 12b - Unclamped Inductive Waveforms

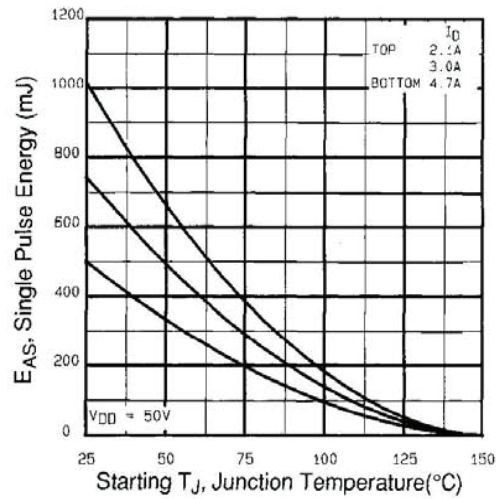


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

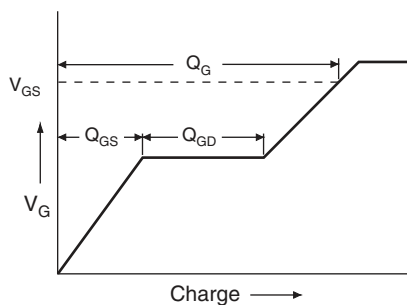


Fig. 13a - Basic Gate Charge Waveform

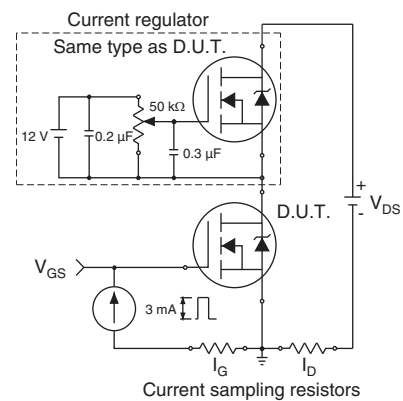
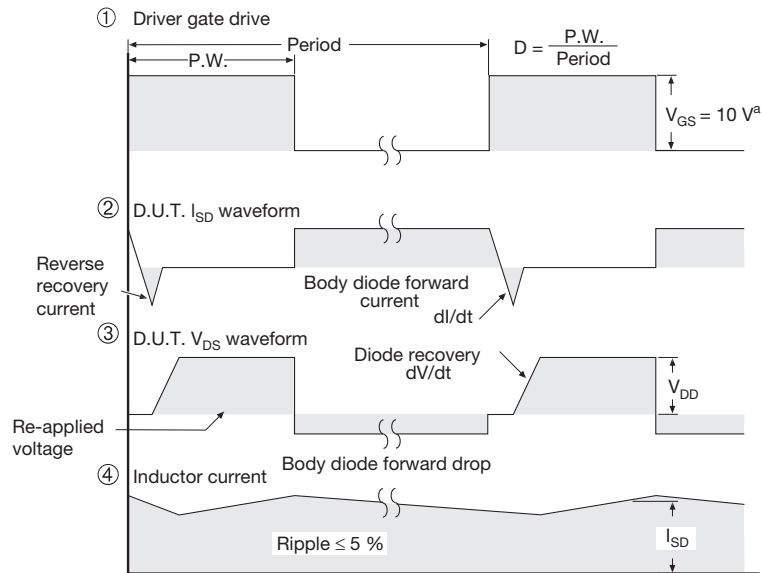
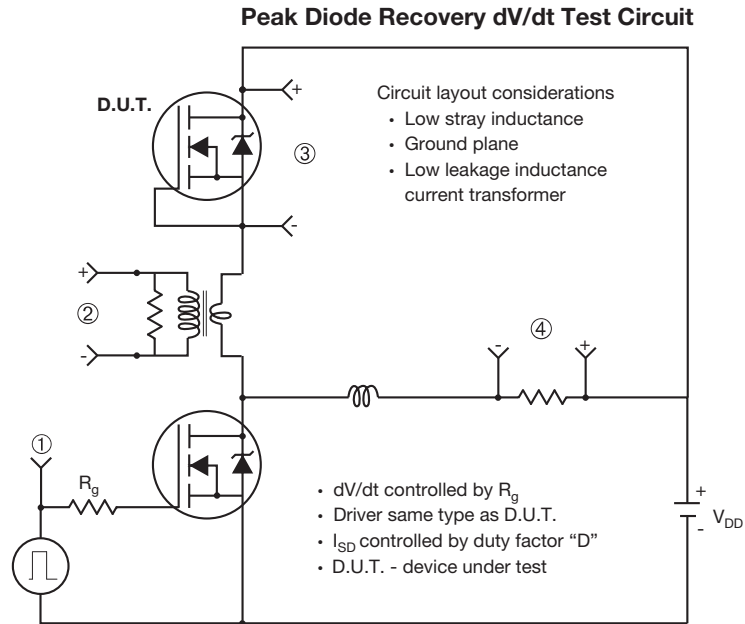


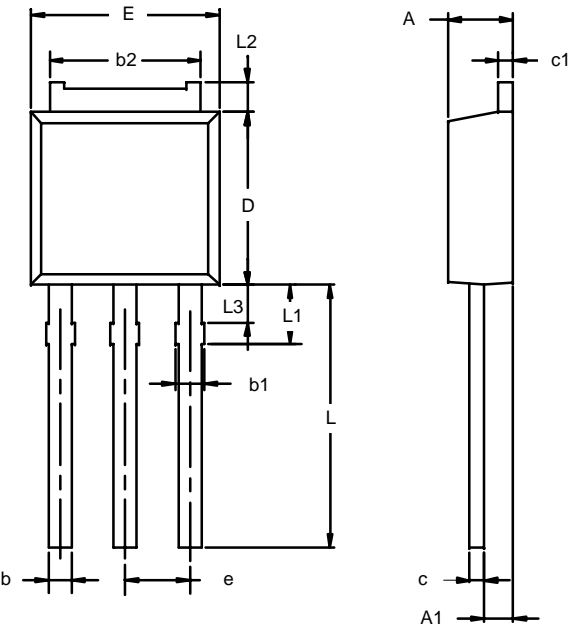
Fig. 13b - Gate Charge Test Circuit

**Note**

a. $V_{GS} = 5\text{ V}$ 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
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
b	0.71	0.89	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.43	0.206	0.214
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
E	6.48	6.73	0.255	0.265
e	2.28 BSC		0.090 BSC	
L	3.89	9.53	0.153	0.375
L1	1.91	2.28	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.045	0.060

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