

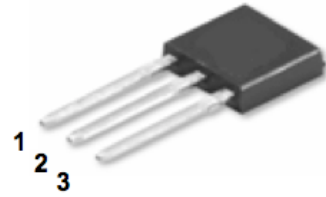
GENERAL DESCRIPTION

The MSU4N60 is a N-channel enhancement-mode MOSFET , providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness. The TO-251 package is universally preferred for all commercial-industrial applications

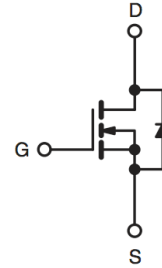
FEATURES

- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant / Halogen free package available

TO-251



1. Gate 2. Drain 3. Source



RoHS
COMPLIANT

HALOGEN
FREE
Available

Symbol	Parameter	Value	Units
V_{DSS}	Drain to Source Voltage	600	V
V_{GS}	Gate to Source Voltage	± 30	V
I_D	Continuous Drain Current(@ $T_C = 25\text{ }^\circ\text{C}$)	4.5	A
	Continuous Drain Current(@ $T_C = 100\text{ }^\circ\text{C}$)	2.6	A
I_{DM}	Drain Current Pulsed	18	A
E_{AS}	Single Pulsed Avalanche Energy	33	mJ
I_{AR}	Avalanche Current	4.0	A
E_{AR}	Repetitive Avalanche Energy	10	mJ
dv/dt	Peak Diode Recovery dv/dt	4.5	V/ns
T_L	Maximum Temperature for Soldering @ Lead at 0.125 in(0.318mm) from case for 10 seconds	300	$^\circ\text{C}$
TPKG	Maximum Temperature for Soldering @ Package Body for 10 seconds	260	$^\circ\text{C}$
P_D	Total Power Dissipation(@ $T_C = 25\text{ }^\circ\text{C}$)	31	W
	Derating Factor above $25\text{ }^\circ\text{C}$	0.25	W/ $^\circ\text{C}$
T_{STG}	Operating Junction Temperature	-55 ~ 150	$^\circ\text{C}$
T_J	Storage Temperature	150	$^\circ\text{C}$

Note:

- 1.Repetitive rating; pulse width limited by maximum junction temperature.
2. IAS=4A, VDD=50V, L=8mH, VG=10V, starting $T_J=+25^\circ\text{C}$.
3. ISD \leq 4A, di/dt \leq 100A/ μs , VDD \leq BVDSS, starting $T_J=+25^\circ\text{C}$.



MSU4N60 600V N-Channel MOSFET

Thermal Characteristics

Symbol	Parameter	Value			Units
		Min.	Typ.	Max.	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	-	2.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	-	-	50.0	°C/W

Electrical Characteristics ($T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	600	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$	-	0.60	-	V/°C
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2.0	-	4.0	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS} = 600\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 480\text{ V}$, $T_C = 125\text{ }^\circ\text{C}$	-	-	10	μA
I_{GSS}	Gate-Source Leakage, Forward	$V_{GS} = \pm 30$	-	-	± 100	nA
$R_{DS(ON)}$	Static Drain-Source On-state Resistance	$V_{GS} = 10\text{ V}$, $I_D = 2.25\text{ A}$	-	2.0	25	Ω

Dynamic Characteristics

Q_g	Total Gate Charge	$I_D = 4.5\text{ A}$,	-	16	-	nC
Q_{gs}	Gate-Source Charge	$V_{DD} = 480\text{ V}$,	-	2.5	-	
Q_{gd}	Gate-Drain Charge (Miller Charge)	$V_{GS} = 10\text{ V}$	-	6.5	-	
$t_{d(on)}$	Turn-on Delay Time	$I_D = 4.5\text{ A}$,	-	10	30	ns
t_r	Rise Time	$V_{DD} = 300\text{ V}$,	-	40	80	
$t_{d(off)}$	Turn-off Delay Time	$V_{GS} = 10\text{ V}$	-	40	100	
t_f	Fall Time	$R_G = 25\text{ }\Omega$	-	50	90	
C_{iss}	Input Capacitance	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	-	560	-	pF
C_{oss}	Output Capacitance		-	55	-	
C_{rss}	Reverse Transfer Capacitance		-	7	-	



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Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Source-Drain Diode						
VSD		IS=4.0A, VGS=0V	-	-	1.4	V
IS		VD=VG=0,	-	-	4.0	A
ISM			-	-	16	A
trr		VGS=0, IF=4A, dI/dt=100A/us	-	270	-	ns
Qrr			-	18	-	uC

*Pulse Test : Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$

- Characteristic Curves

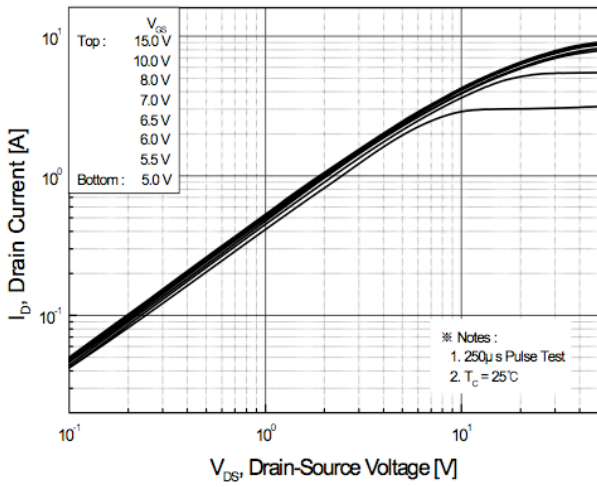


Figure 1. On Region Characteristics

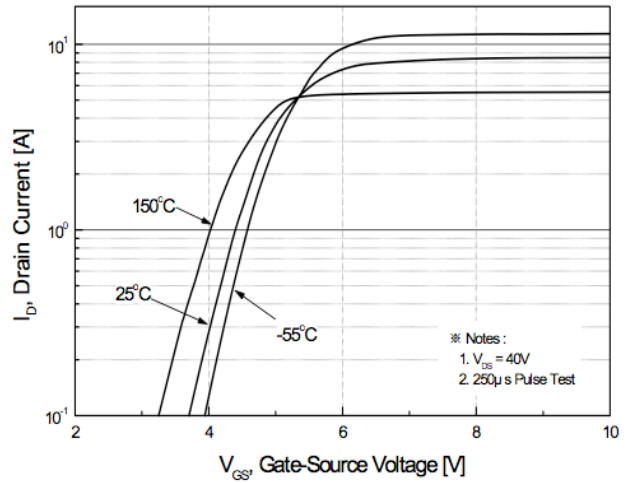


Figure 2. Transfer Characteristics

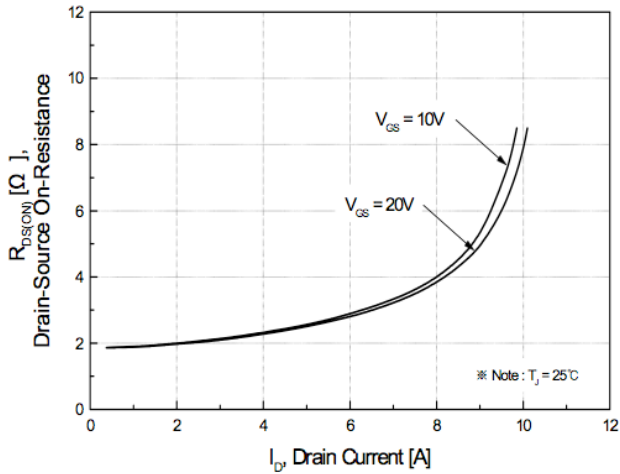


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

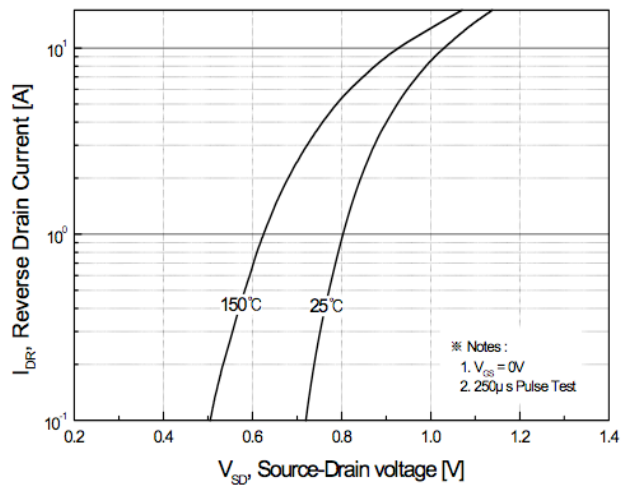


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

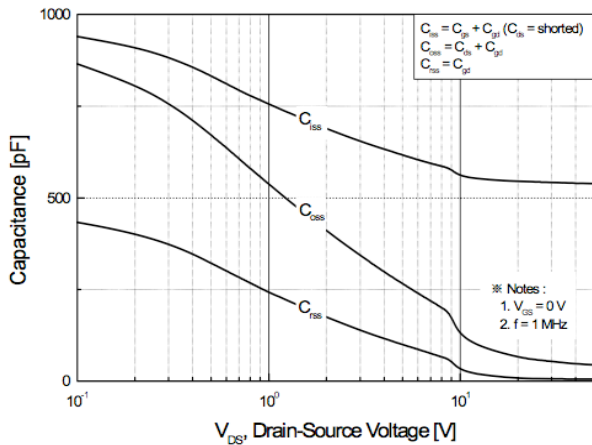


Figure 5. Capacitance Characteristics

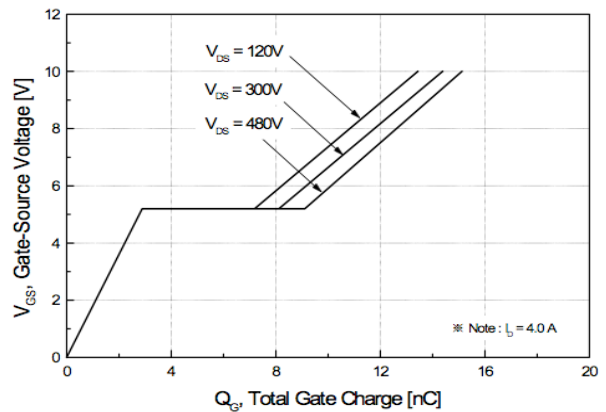


Figure 6. Gate Charge Characteristics

- Characteristic Curves

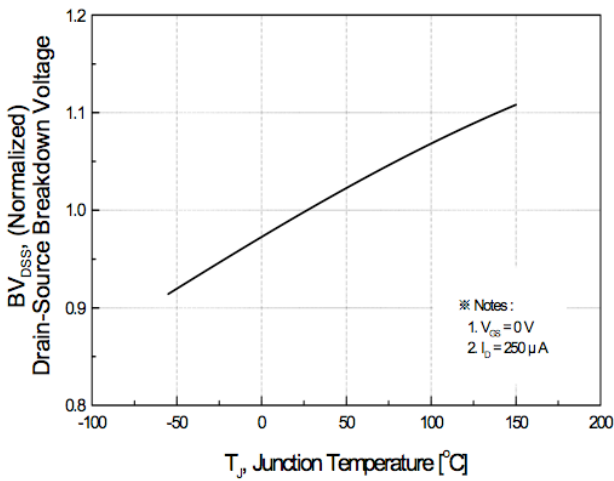


Figure 7. Breakdown Voltage Variation vs. Temperature

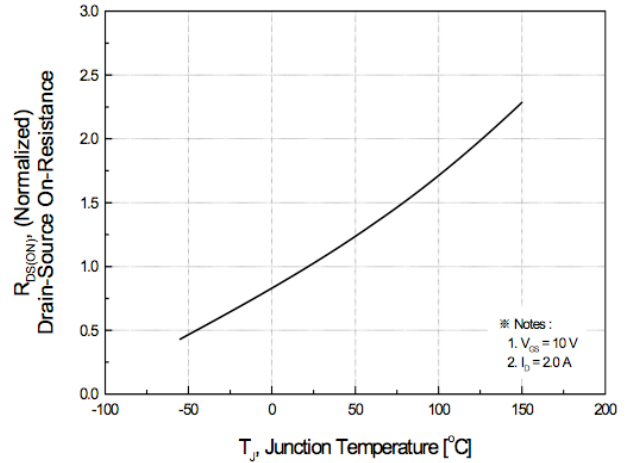


Figure 8. On-Resistance Variation vs. Temperature

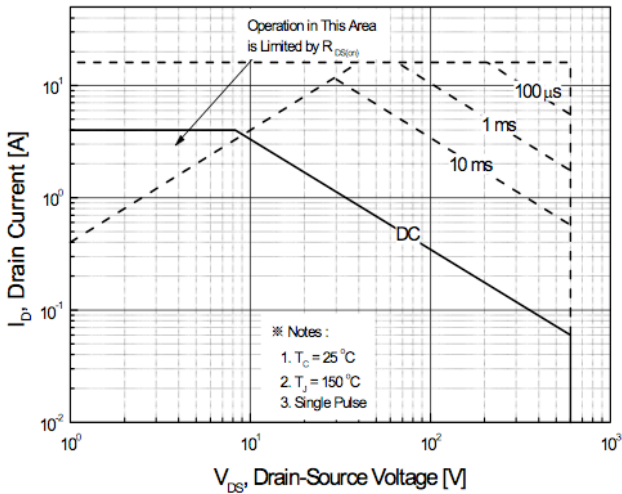


Figure 9. Maximum Safe Operating Area

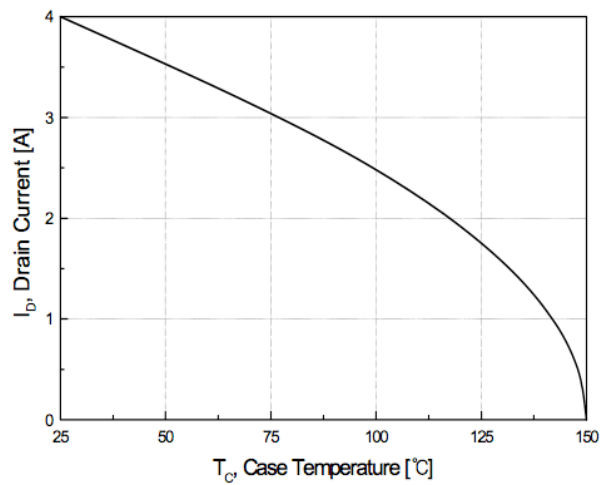


Figure 10. Maximum Drain Current vs. Case Temperature

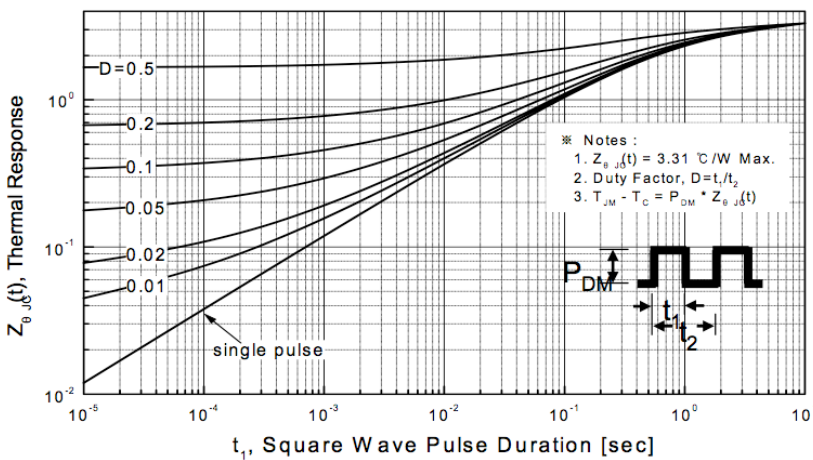


Figure 11. Transient Thermal Response Curve

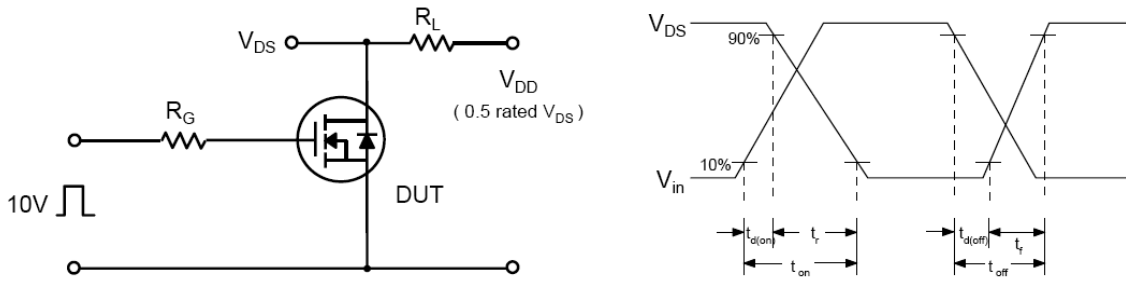


Fig 12. Resistive Switching Test Circuit & Waveforms

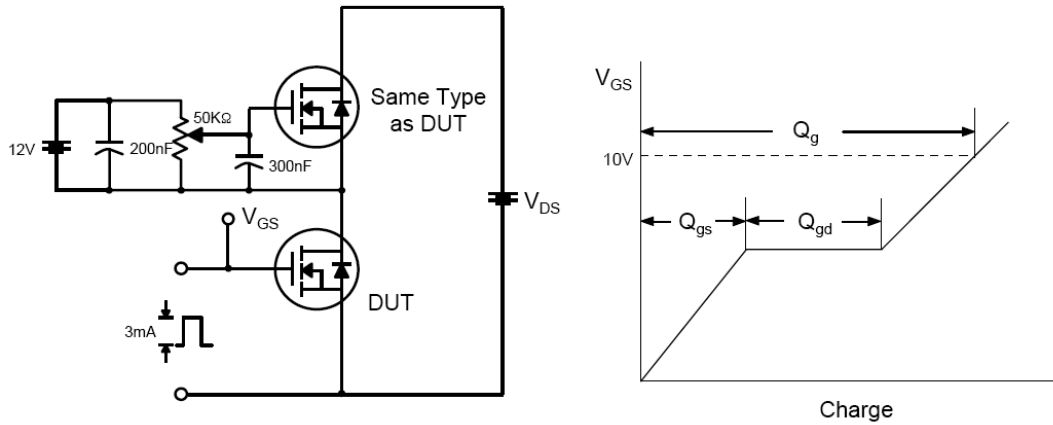


Fig 13. Gate Charge Test Circuit & Waveform

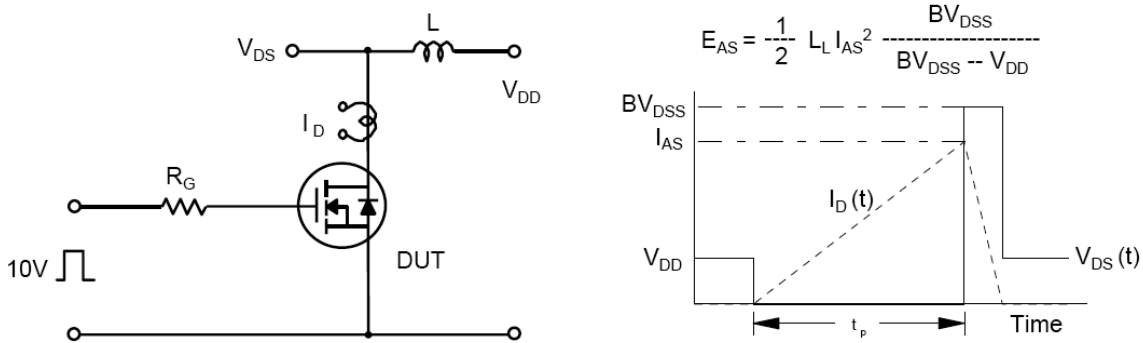


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

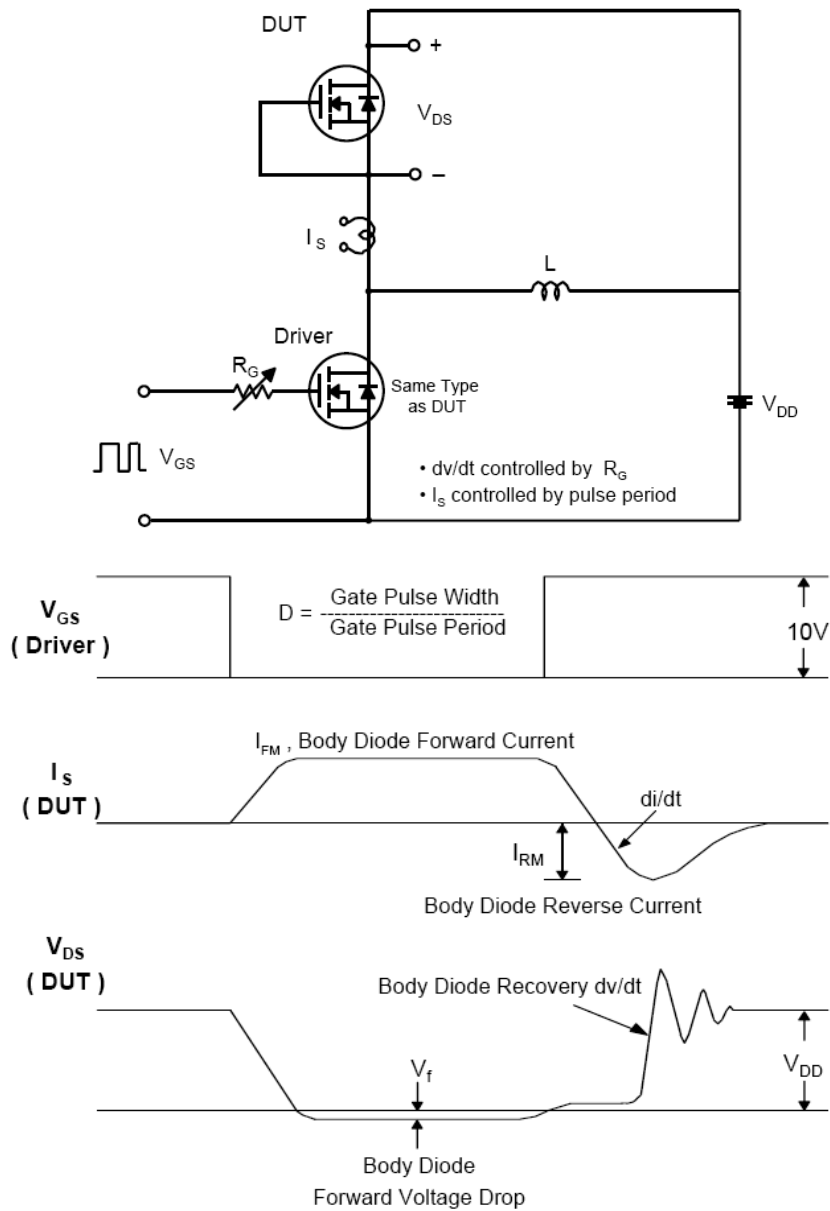
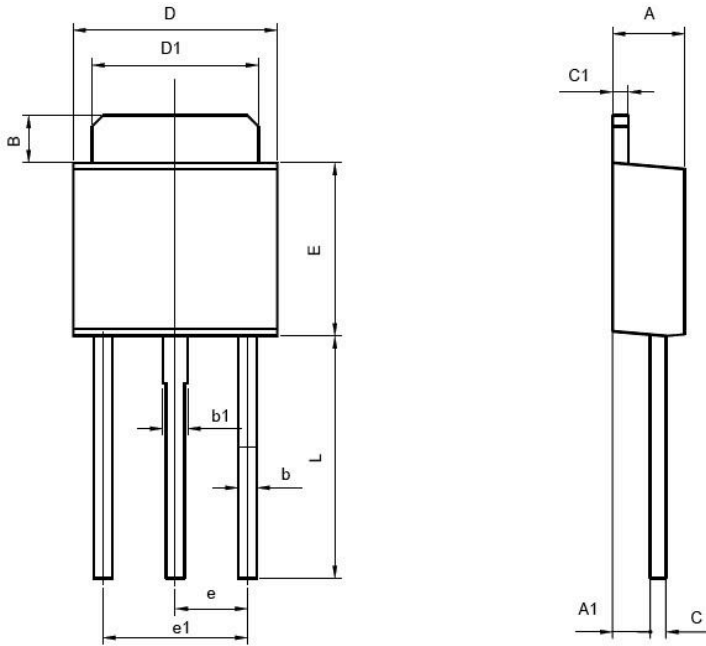


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Package Dimensions



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	min	max	min	max
A	2.15	2.45	0.85	0.96
A1	1.00	1.40	0.39	0.55
B	1.25	1.75	0.49	0.69
b	0.45	0.75	0.18	0.3
b1	0.65	0.95	0.26	0.37
C	0.38	0.64	0.15	0.25
C1	0.38	0.64	0.15	0.25
D	6.30	6.70	2.48	2.64
D1	5.10	5.50	2.01	2.17
E	5.30	5.70	2.09	2.24
e	2.3 (typ.)		0.91 (typ.)	
e1	4.4	4.8	1.73	1.89
L	7.4	8.0	2.91	3.15



MSU4N60 600V N-Channel MOSFET

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