

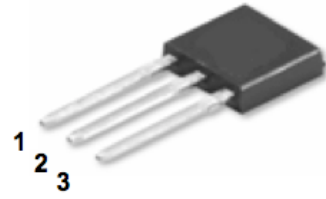
## GENERAL DESCRIPTION

The MSU6N70 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

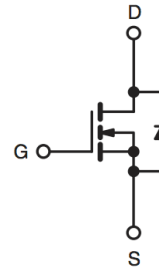
## FEATURES

- 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	700	V
$V_{GS}$	Gate to Source Voltage	$\pm 30$	V
$I_D$	Continuous Drain Current(@ $T_C = 25\text{ }^\circ\text{C}$ )	6.0	A
	Continuous Drain Current(@ $T_C = 100\text{ }^\circ\text{C}$ )	4.8	A
$I_{DM}$	Drain Current Pulsed	28	A
$E_{AS}$	Single Pulsed Avalanche Energy	230	mJ
$I_{AR}$	Avalanche Current	7.0	A
$E_{AR}$	Repetitive Avalanche Energy	14.7	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(@ $T_C = 25\text{ }^\circ\text{C}$ )	48	W
	Derating Factor above $25\text{ }^\circ\text{C}$	0.38	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.  $I_{AS} \leq 6\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $L = 7\text{mH}$ ,  $V_G = 10\text{V}$ , starting  $T_J = +25^\circ\text{C}$ .
3.  $I_{SD} \leq 6\text{A}$ ,  $dI/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BVDSS$ , starting  $T_J = +25^\circ\text{C}$ .



# MSU6N70 700V N-Channel MOSFET

## Thermal Characteristics

Symbol	Parameter	Value			Units
		Min.	Typ.	Max.	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	-	2.6	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	-	-	62.5	$^{\circ}C/W$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0 V,$ $I_D = 250 \mu A$	700	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature coefficient	$I_D = 250 \mu A,$ referenced to $25^{\circ}C$	-	0.70	-	$V/^{\circ}C$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS},$ $I_D = 250 \mu A$	2.0	-	4.0	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS} = 700 V,$ $V_{GS} = 0 V$	-	-	1	$\mu A$
		$V_{DS} = 560 V,$ $T_C = 125^{\circ}C$	-	-	10	$\mu A$
$I_{GSS}$	Gate-Source Leakage, Forward	$V_{GS} = \pm 30$	-	-	$\pm 100$	nA
$R_{DS(on)}$	Static Drain-Source On-state Resistance	$V_{GS} = 10 V,$ $I_D = 3.0 A$	-	1.2	1.5	$\Omega$

## Dynamic Characteristics

$Q_g$	Total Gate Charge	ID=6A, VDD=560V, VGS=10V	-	29	-	nC
$Q_{gs}$	Gate-Source Charge		-	4.7	-	
$Q_{gd}$	Gate-Drain Charge (Miller Charge)		-	12.5	-	
$t_{d(on)}$	Turn-on Delay Time	ID=6A, VDD=350V, VGS=10V RG=10 $\Omega$	-	20	-	ns
$t_r$	Rise Time		-	50	-	
$t_{d(off)}$	Turn-off Delay Time		-	80	-	
$t_f$	Fall Time		-	70	-	
$C_{iss}$	Input Capacitance	VGS=0V, VDS=25V, f=1MHz	-	1482	-	pF
$C_{oss}$	Output Capacitance		-	121.7	-	
$C_{rss}$	Reverse Transfer Capacitance		-	14	-	



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Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Source-Drain Diode</b>						
VSD		IS=6.0A, VGS=0V	-	-	1.4	V
IS		VD=VG=0, VS=1.3V	-	-	7.0	A
ISM			-	-	28	A
trr		VGS=0, IF=7A, dI/dt=100A/us	-	350	-	ns
Qrr			-	3.3	-	uC

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

• Characteristic Curves

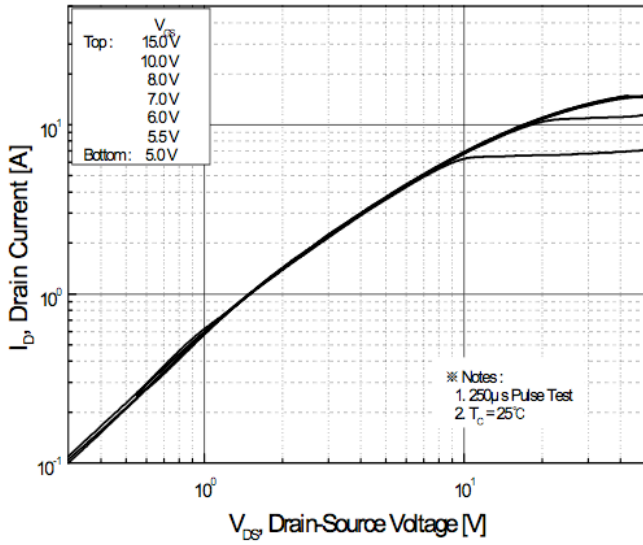


Figure 1. On Region Characteristics

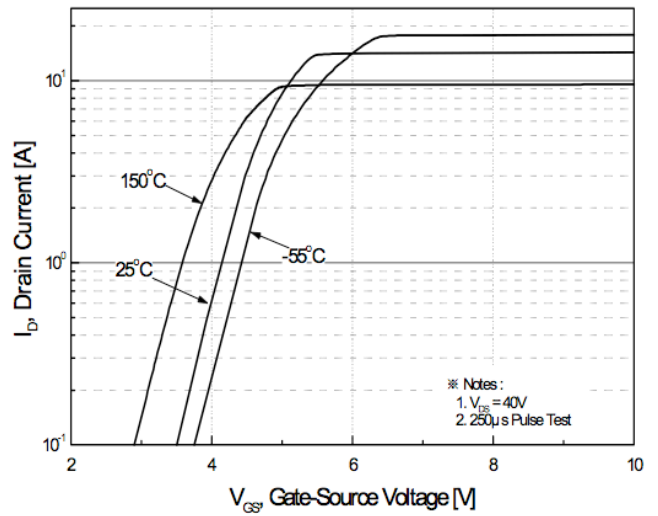


Figure 2. Transfer Characteristics

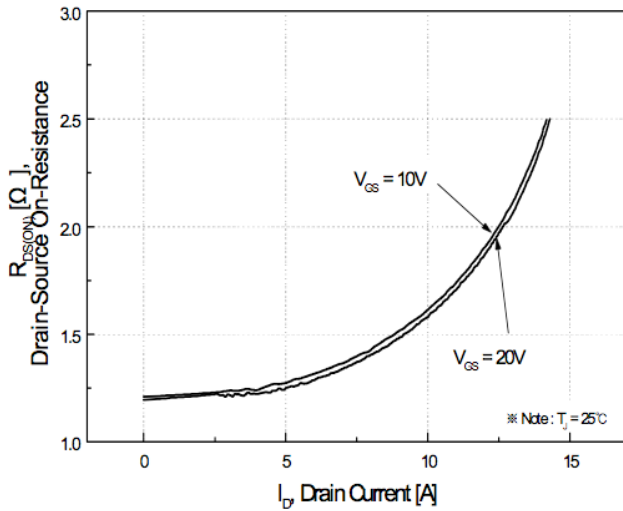


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

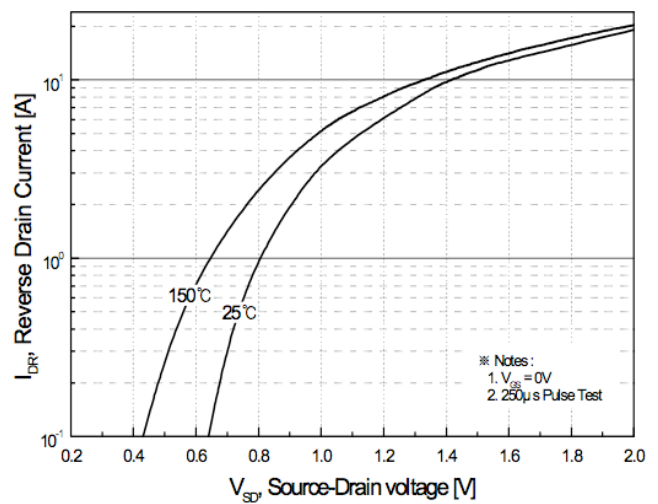


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

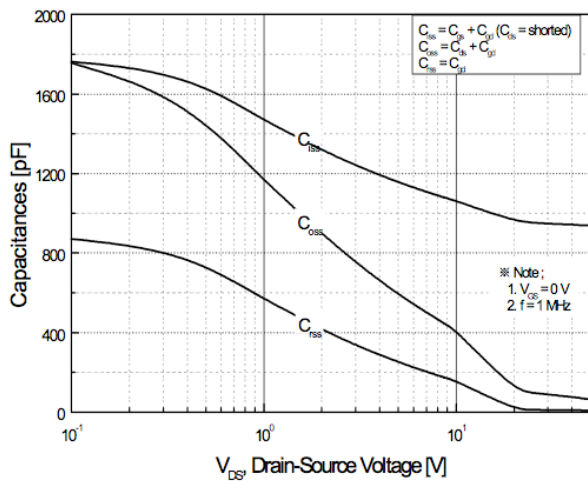


Figure 5. Capacitance Characteristics

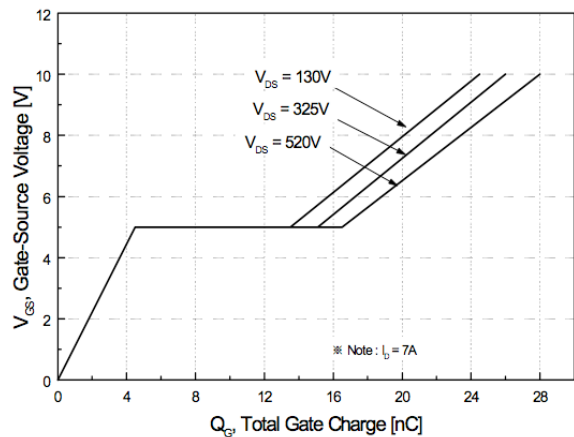


Figure 6. Gate Charge Characteristics

• Characteristic Curves

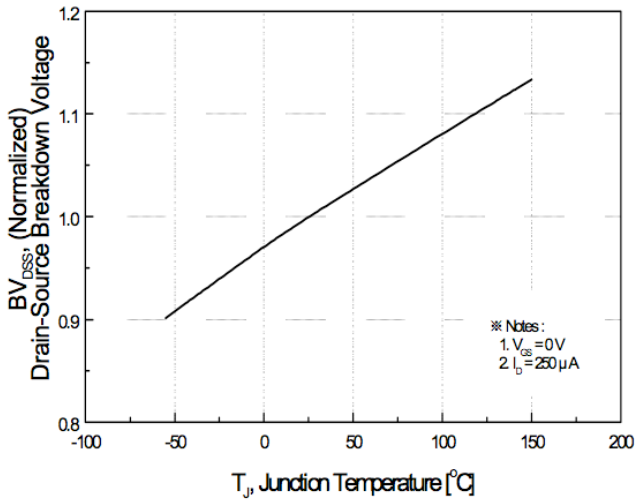


Figure 7. Breakdown Voltage Variation vs. Temperature

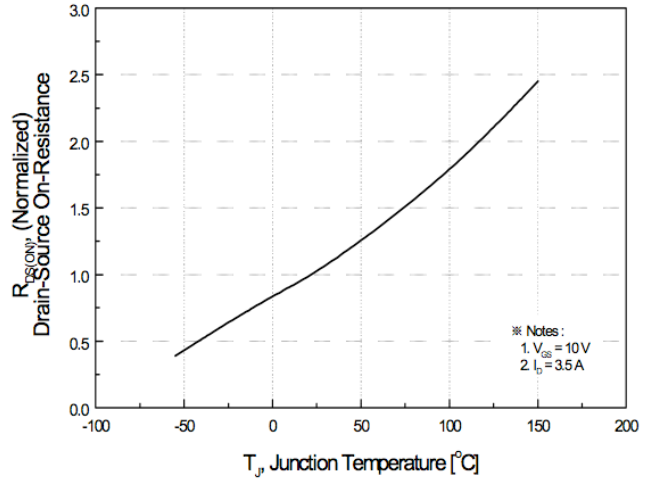


Figure 8. On-Resistance Variation vs. Temperature

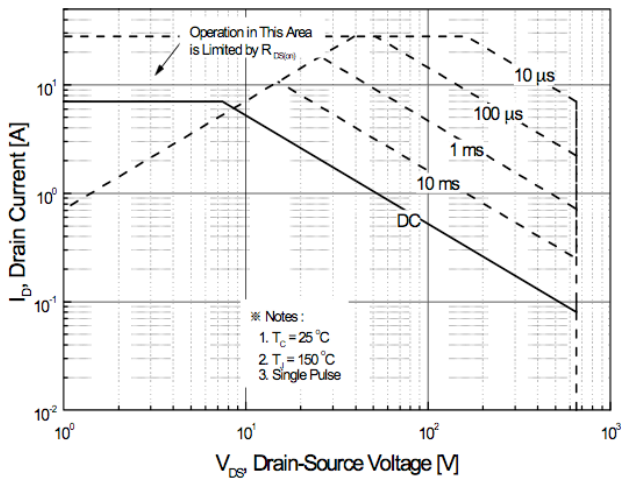


Figure 9. Maximum Safe Operating Area

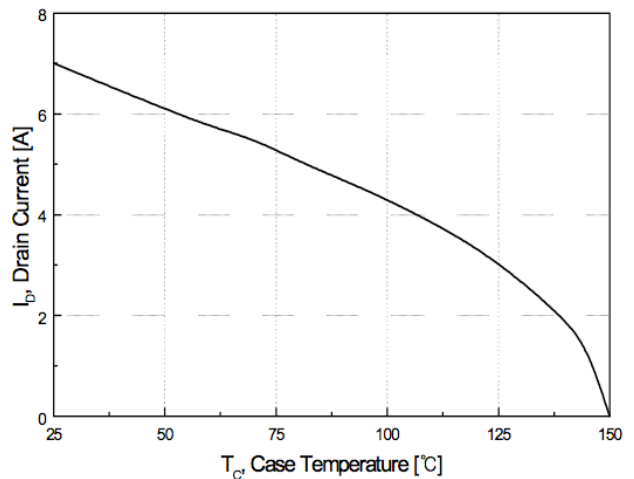


Figure 10. Maximum Drain Current vs. Case Temperature

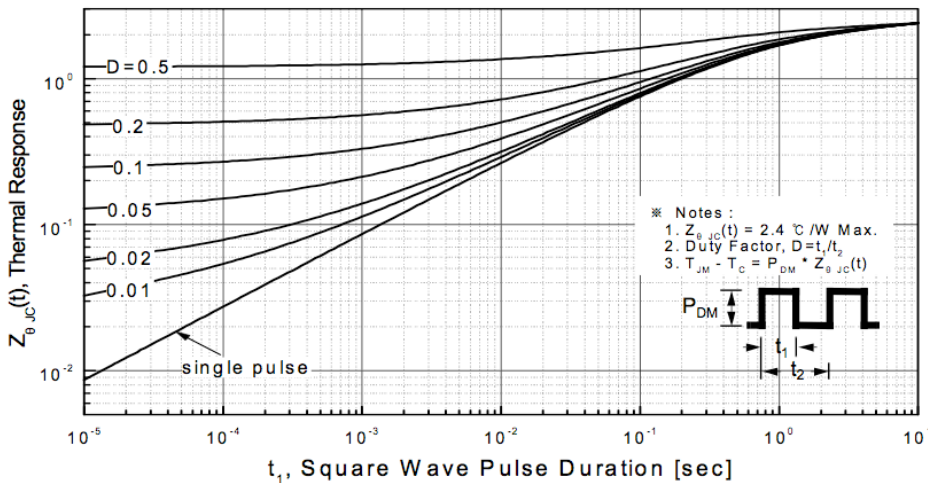
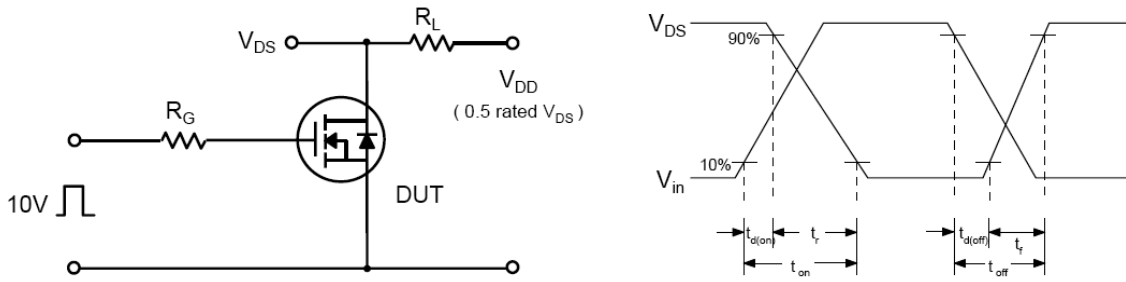
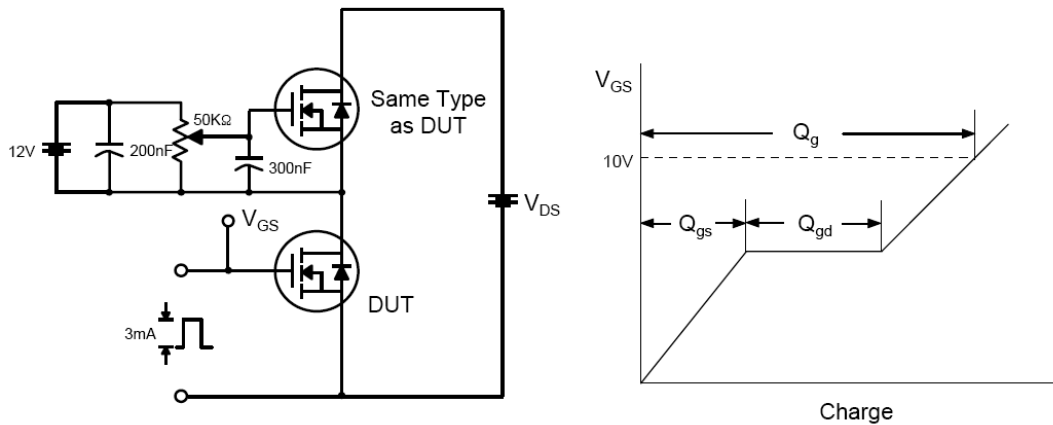


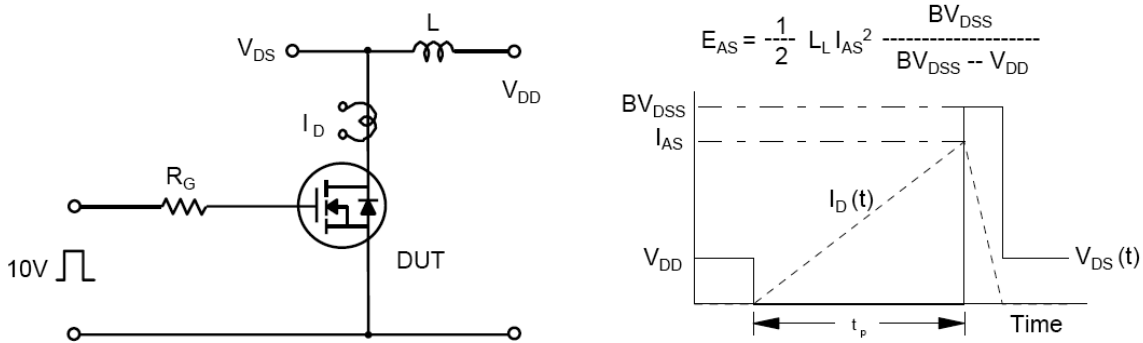
Figure 11. Transient Thermal Response Curve



**Fig 12. Resistive Switching Test Circuit & Waveforms**



**Fig 13. Gate Charge Test Circuit & Waveform**



**Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms**

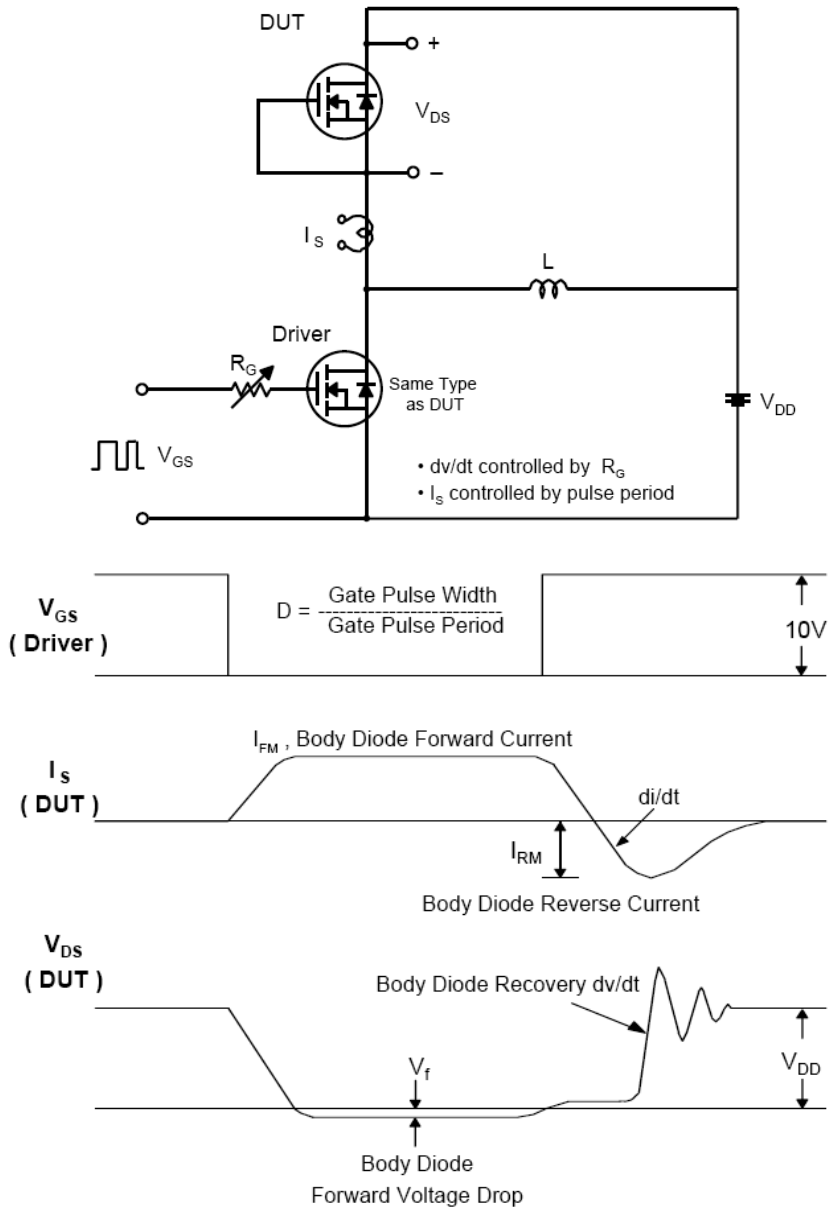
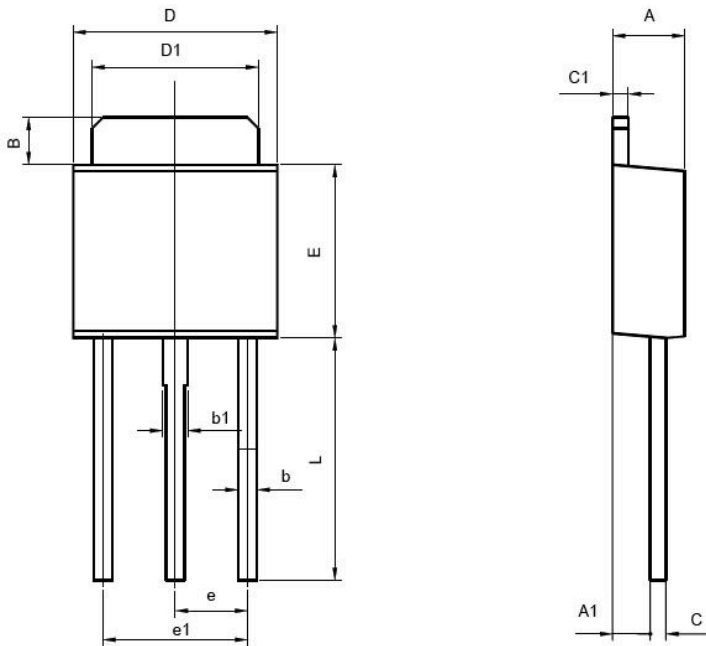


Fig 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

## Package Dimensions

Dimensions in Millimeters



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





# MSU6N70 700V N-Channel MOSFET

Legal Disclaimer Notice

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