

# MSU2N70

## 700V N-Channel MOSFET

### Description

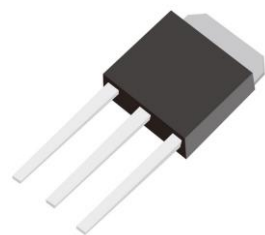
The MSU2N70 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness. The TO-251 package is universally preferred for all commercial-industrial applications

### Features

- 100% EAS Test
- Rugged Gate Oxide Technology
- Extremely Low Intrinsic Capacitances
- Remarkable Switching Characteristics
- Unequalled Gate Charge: 10.5 nC (Typ.)
- Extended Safe Operating Area
- Lower RDS(ON) : 5.5 Ω (Typ.) @VGS=10V
- Extremely Low Intrinsic Capacitances
- RoHS compliant package

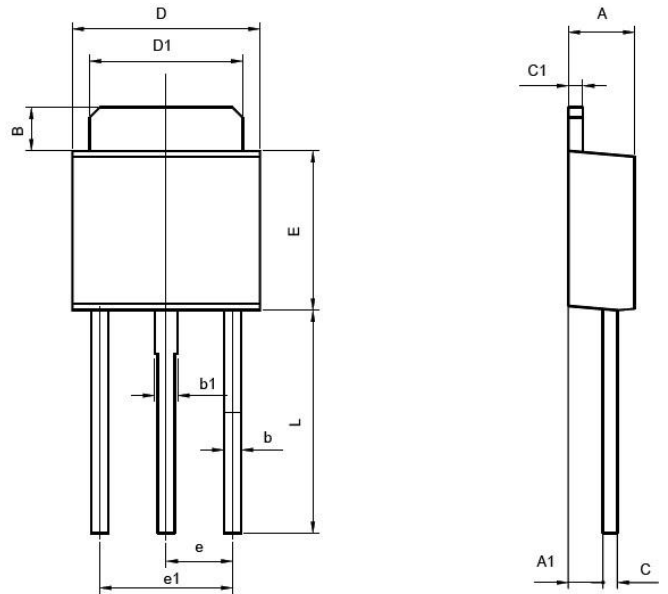
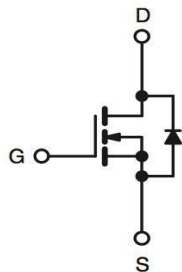
### Packing & Order Information

80/Tube ; 4,000/Box



**RoHS  
COMPLIANT**

Graphic symbol



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

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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

##### Absolute Maximum Ratings (Tc=25°C unless otherwise noted)

Symbol	Parameter	Value	Unit
V <sub>DSS</sub>	Drain-Source Voltage	700	V
V <sub>GS</sub>	Gate-Source Voltage	±30	V
I <sub>D</sub>	Drain Current -Continuous (TC=25°C)	1.6	A
	Drain Current -Continuous (TC=100°C)	1.0	A
I <sub>DM</sub>	Drain Current Pulsed	6	A
E <sub>AS</sub>	Single Pulsed Avalanche Energy	110	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy	4.4	mJ
I <sub>AR</sub>	Avalanche Current	1.6	A
dV/dt	Peak Diode Recovery dV/dt	5.5	V/ns
P <sub>D</sub>	Power Dissipation (TC = 25 °C)	44	W
	- Derate above 25°C	0.22	W/°C
T <sub>J</sub> ,T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150	°C

##### NOTE:

1. Repetitive rating; pulse width limited by maximum junction temperature.

##### Thermal Resistance Characteristics

Symbol	Parameter	Max.	Units
R <sub>θjc</sub>	Junction-to-Case	1.72	°C/W
R <sub>θJA</sub>	Junction-to-Ambient	83.3	

##### Thermal Resistance Characteristics

Symbol	Parameter	Max.	Units
R <sub>thjc</sub>	Typical thermal resistance	2.87	°C/W
R <sub>θJA</sub>		55*	

\* When mounted on the minimum pad size recommended (PCB Mount)

##### Static Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
V <sub>GS</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0	--	4.0	V
*R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10 V , I <sub>D</sub> = 1 A	--	5.5	6.0	Ω
BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V , I <sub>D</sub> =250μA	700	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	I <sub>D</sub> = 250μA, Referenced to 25°C	--	0.7	--	
I <sub>DSS</sub>	V <sub>DS</sub> = 700 V , V <sub>GS</sub> = 0 V	--	--	10	uA
	V <sub>DS</sub> = 560 V , T <sub>C</sub> = 125°C	--	--	100	
I <sub>GSSF</sub>	V <sub>GS</sub> = 30 V , V <sub>DS</sub> = 0 V	--	--	100	nA
I <sub>GSSR</sub>	V <sub>GS</sub> = -30 V , V <sub>DS</sub> = 0 V	--	--	-100	nA

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Dynamic Characteristics					
Symbol	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	$V_{DS} = 350 \text{ V}, I_D = 1.6 \text{ A},$ $R_G = 25 \Omega$	--	10	20	ns
$t_r$		--	25	50	ns
$t_{d(off)}$		--	20	40	ns
$t_f$		--	25	50	ns
$Q_g$	$V_{DS} = 560 \text{ V}, I_D = 1.6 \text{ A},$ $V_{GS} = 10 \text{ V}$	--	10.5	14	nC
$Q_{gs}$		--	2.0	--	nC
$Q_{gd}$		--	4.0	--	nC
$C_{ISS}$	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ $F = 1.0 \text{ MHz}$	--	340	445	pF
$C_{OSS}$		--	45	60	pF
$C_{RSS}$		--	7.5	10	pF

Source-Drain Diode Maximum Ratings and Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$I_S$			--	--	1.6	A
$I_{SM}$			--	--	6	
$V_{SD}$	$I_S = 1.6 \text{ A}, V_{GS} = 0 \text{ V}$		--	--	1.5	V
$t_{rr}$	$I_S = 1.6 \text{ A}, V_{GS} = 0 \text{ V}$		--	250	--	ns
$Q_{rr}$	$di/dt = 100 \text{ A}/\mu\text{s}$		--	1.2	--	uC

Notes ;

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS}=1.6\text{A}, V_{DD}=50\text{V}, R_G=25\text{W},$  Starting  $T_J=25^\circ\text{C}$
3.  $I_{SD}\leq 1.6\text{A}, di/dt\leq 300\text{A}/\mu\text{s}, V_{DD}\leq BV_{DSS},$  Starting  $T_J=25^\circ\text{C}$
4. Pulse Test: Pulse Width  $\leq 300 \mu\text{s},$  Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature

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#### Characteristics Curve

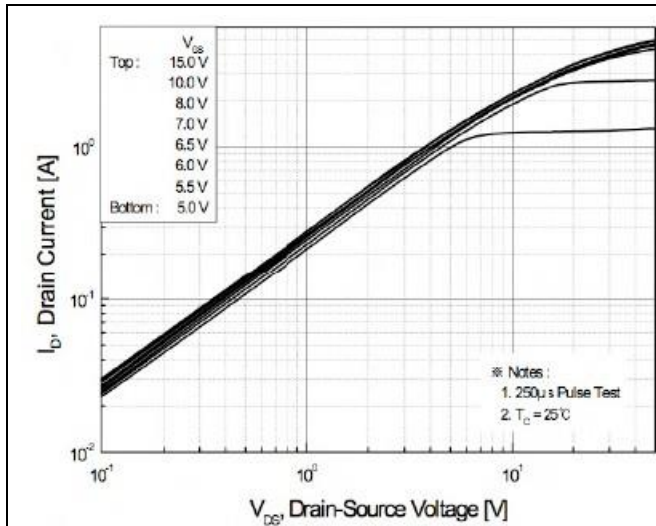


FIG.1-ON REGION CHARACTERISTICS

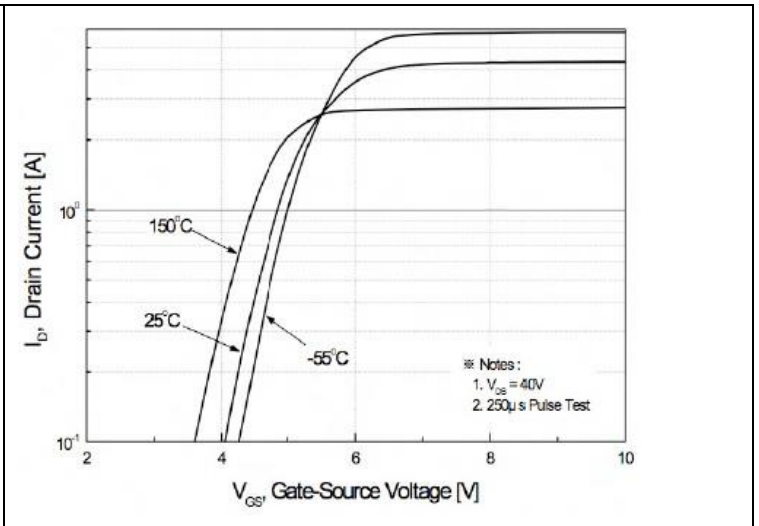


FIG.2-TRANSFER CHARACTERISTICS

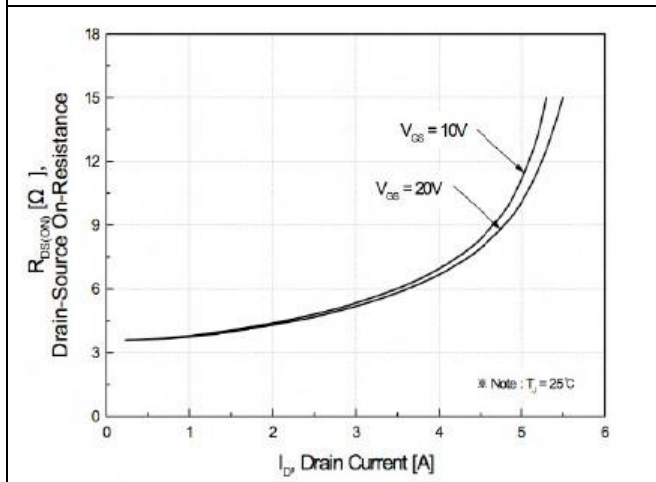


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

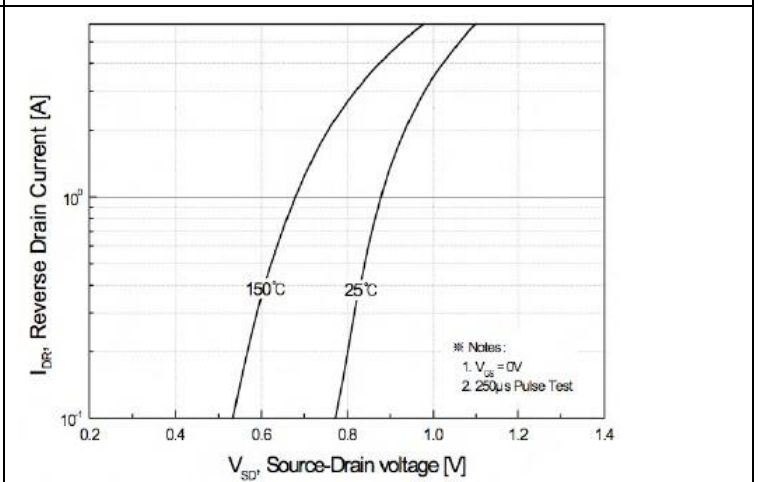


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

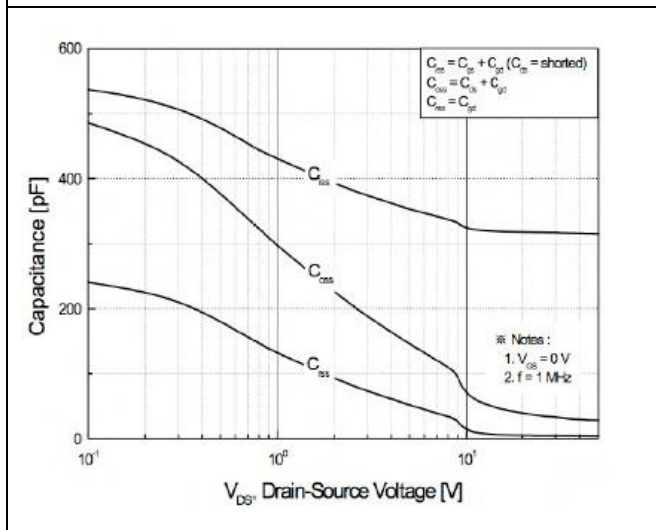


FIG.5-CAPACITANCE CHARACTERISTICS

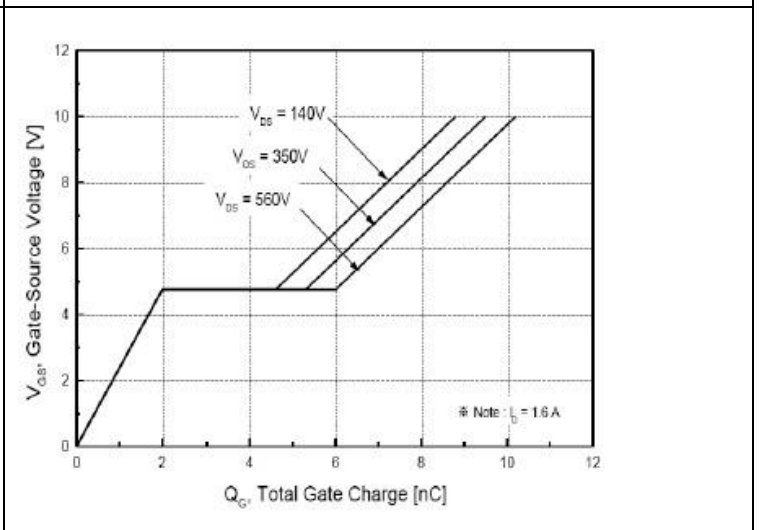


FIG.6-GATE CHARGE CHARACTERISTICS

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#### Characteristics Curve

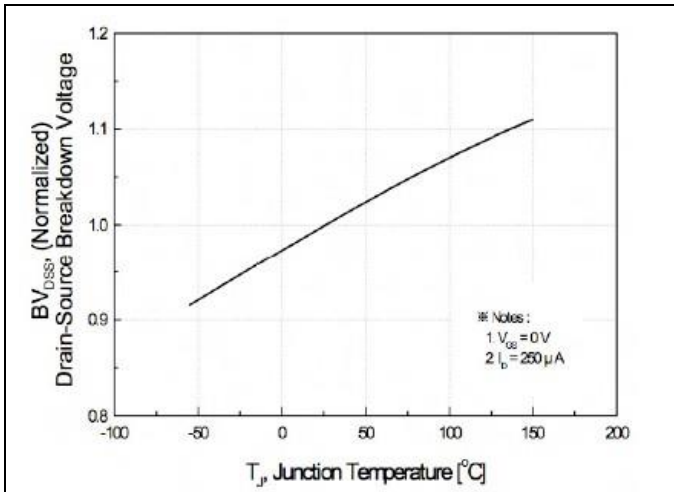


FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

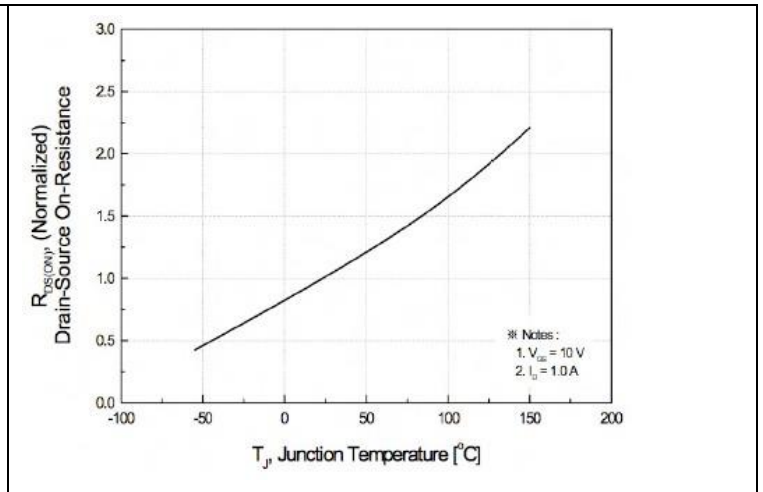


FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE

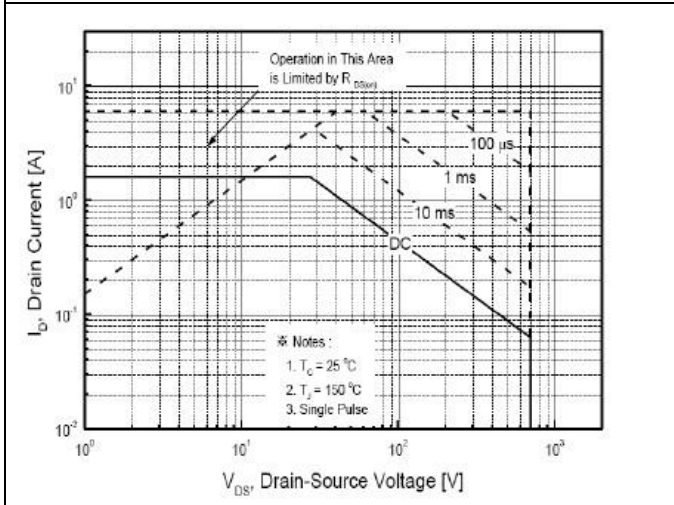


FIG.9-MAXIMUM SAFE OPERATING AREA

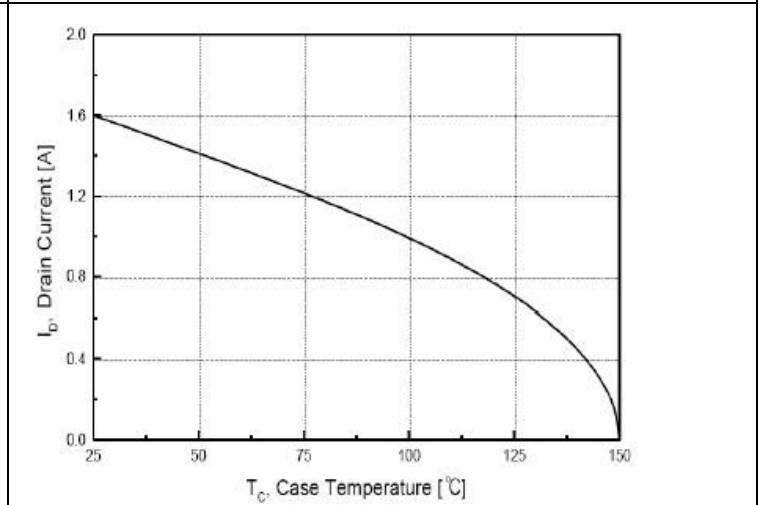


FIG.10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

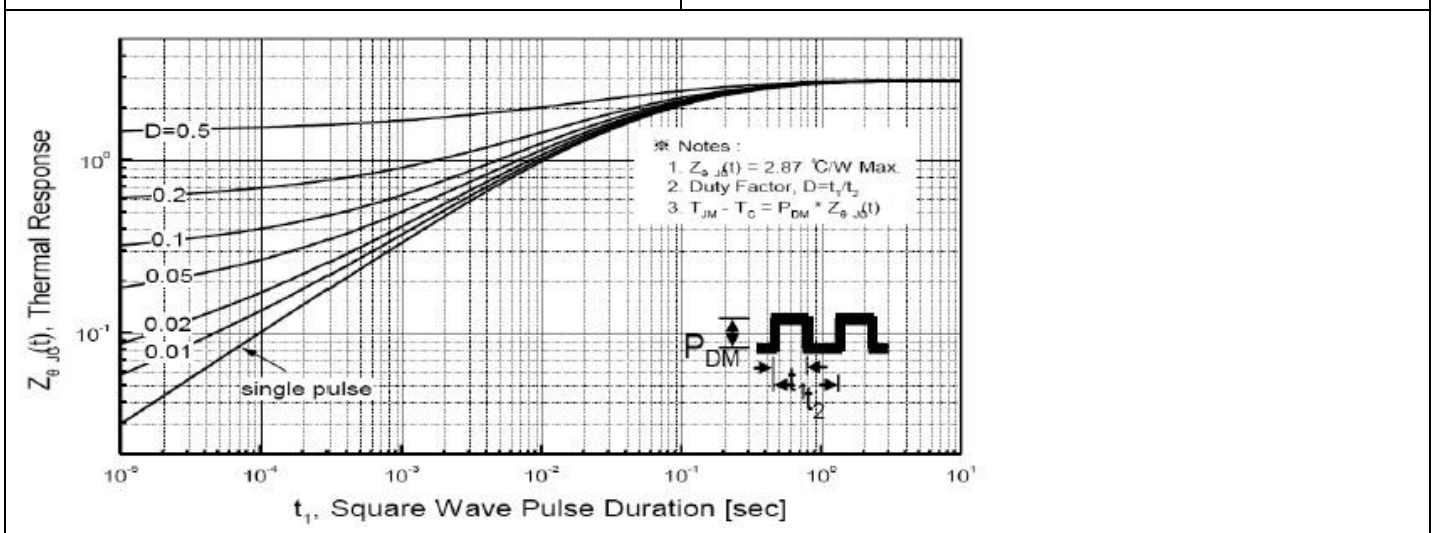


FIG.11-TRANSIENT THERMAL RESPONSE CURVE



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#### Characteristics Test Circuit & Waveform

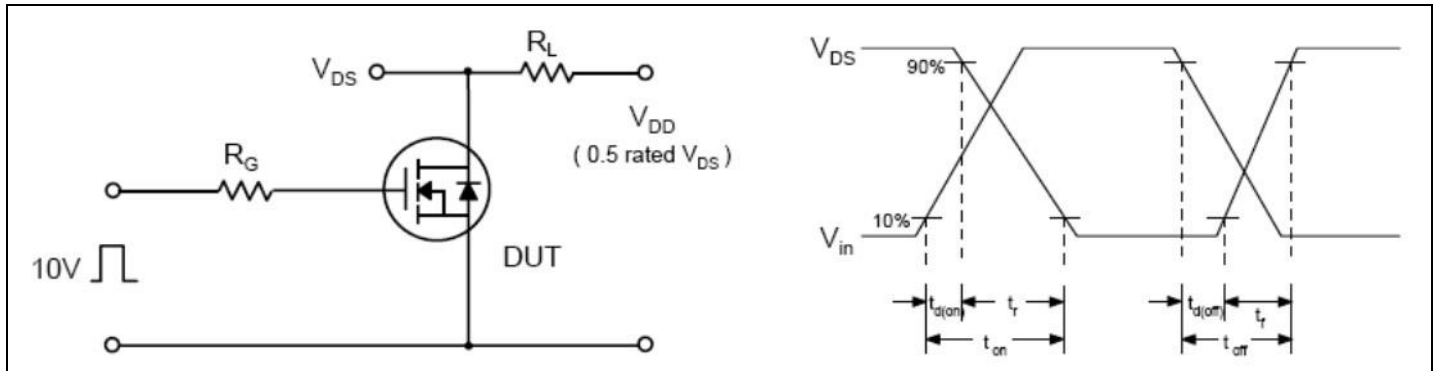


FIG.12-RESISTIVE SWITCHING TEST CIRCUIT & WAVEFORMS

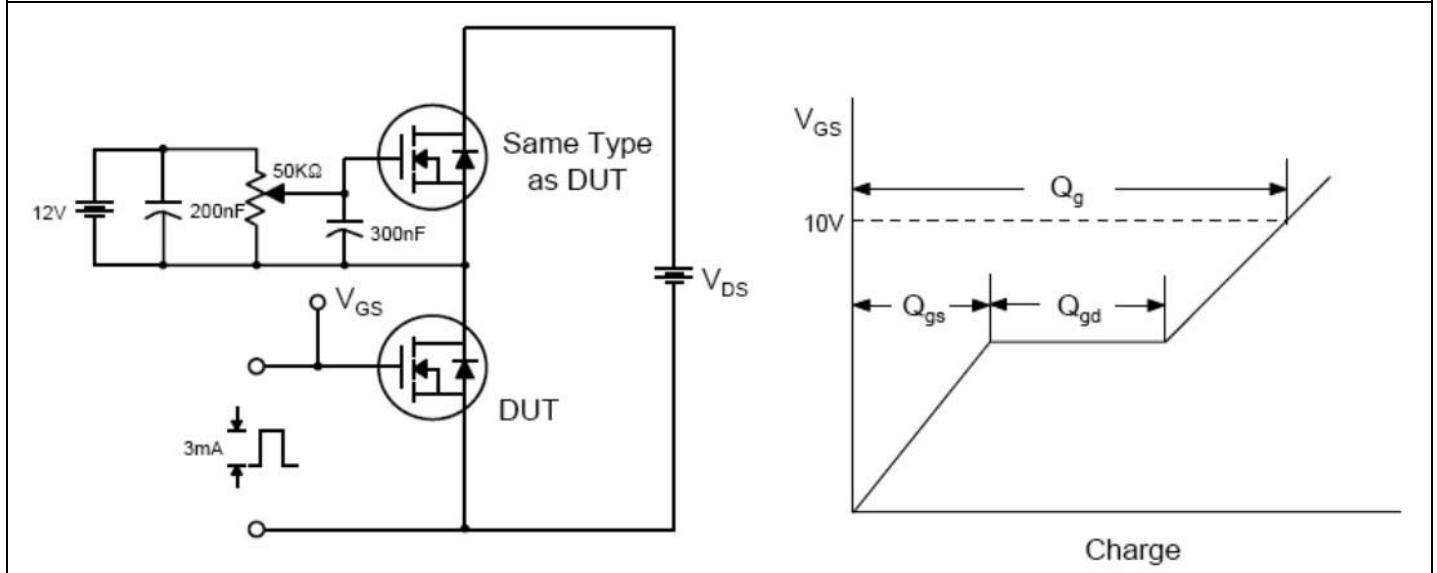


FIG.13-GATE CHARGE TEST CIRCUIT & WAVEFORM

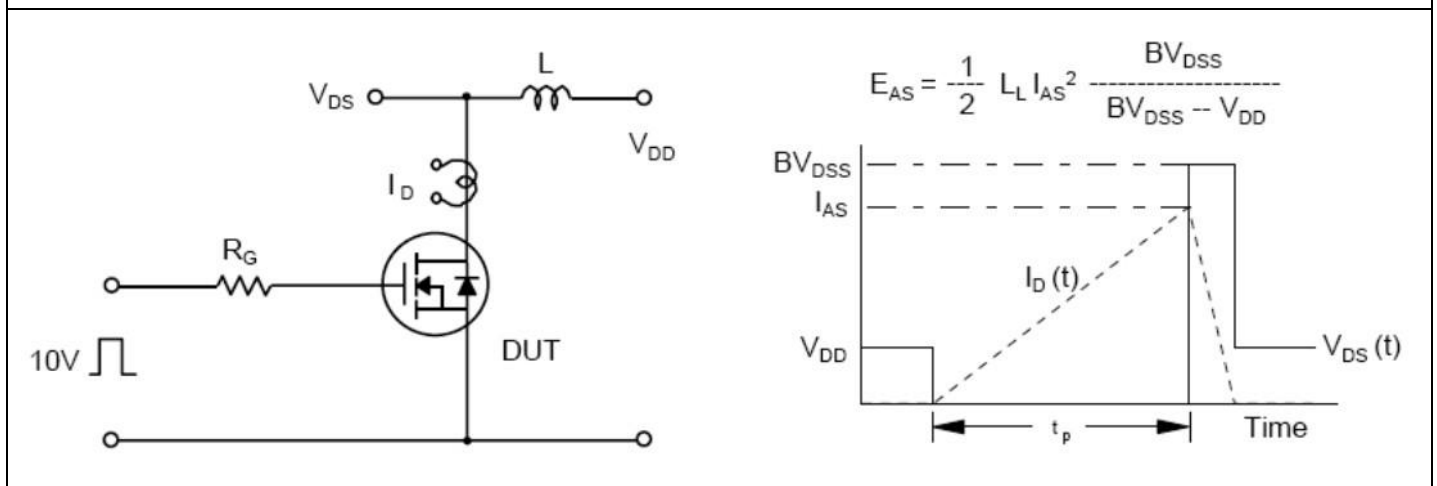


FIG.14-UNCLAMPED LINDUCTIVE SWITCHING TEST CIRCUIT & WAVEFORMS

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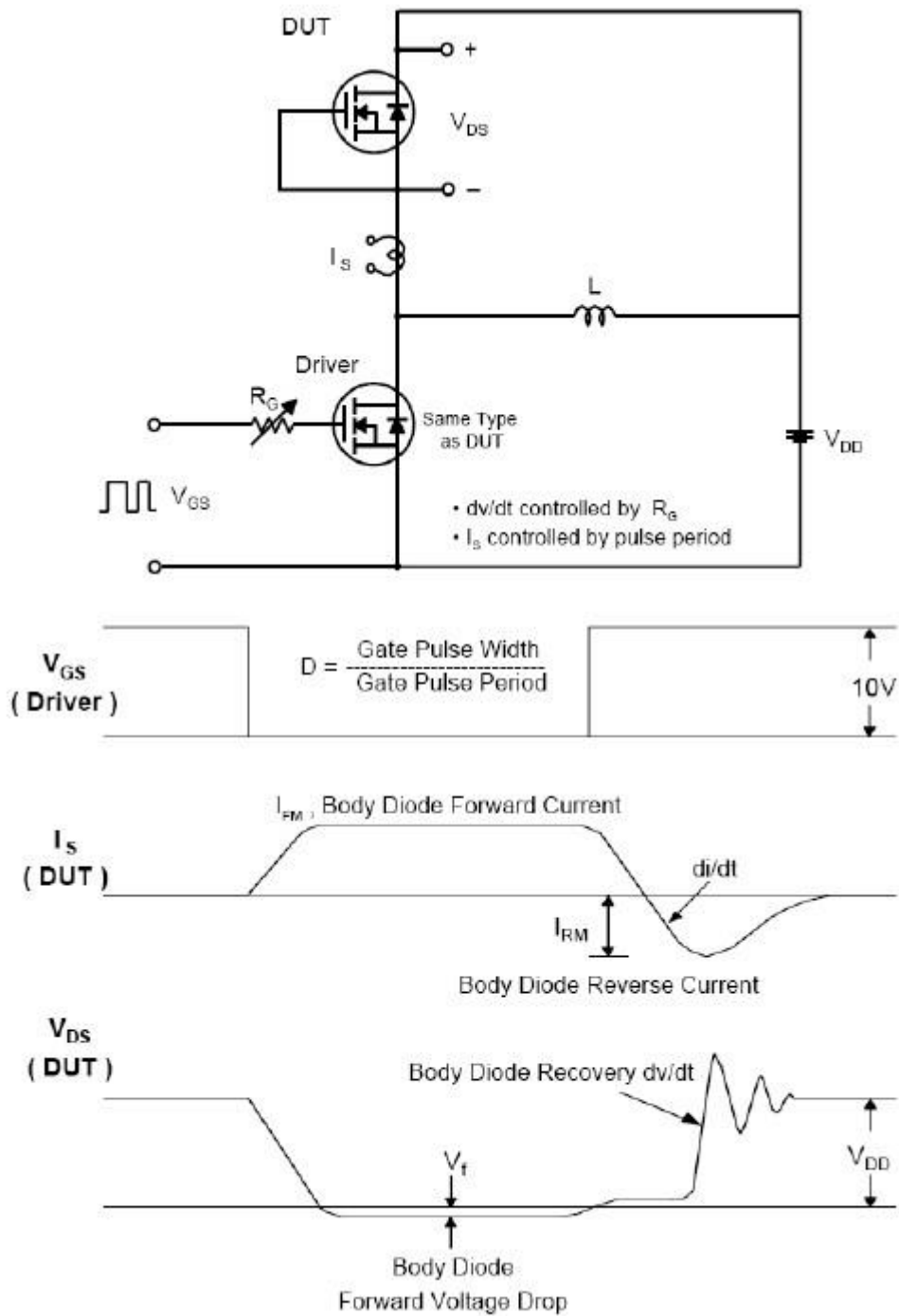


Fig 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

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#### Disclaimer

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