

# MSD2N70

## 700V N-Channel MOSFET

### Description

The MSD2N70 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-252 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
- RoHS compliant package

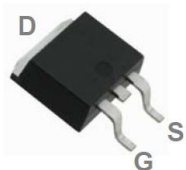
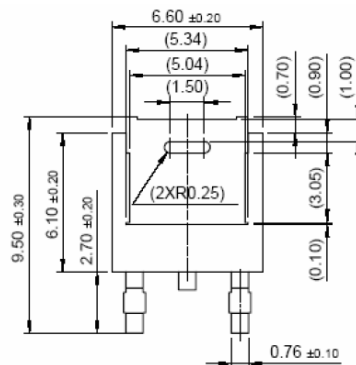
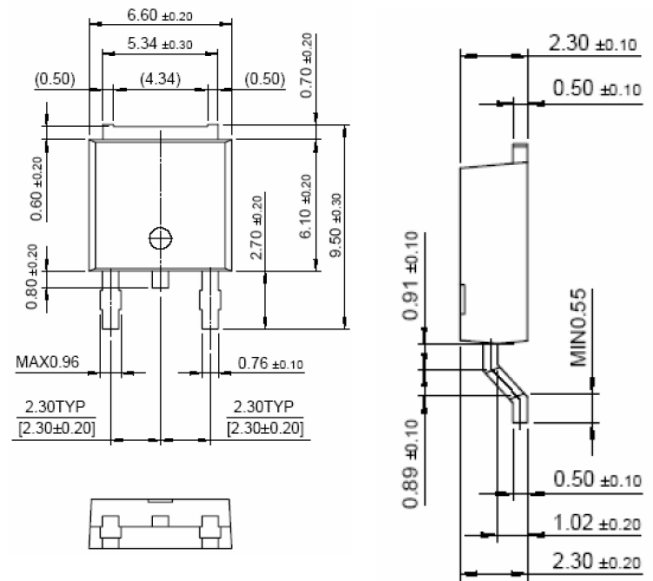
### Application

- Adapter
- Switching Mode Power Supply

### Packing & Order Information

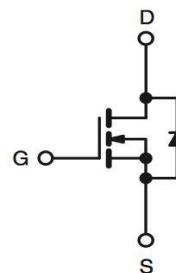
Part No./ T : 2,500/Reel

Part No./ R : 80/Tube , 4,000/Box



**RoHS  
COMPLIANT**

### Graphic symbol



## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-Source Voltage	700	V
V <sub>GS</sub>	Gate-Source Voltage	±30	V
I <sub>D</sub>	Continuous Drain Current @ TC=25°C	1.6	A
	Continuous Drain Current @ TC=70°C	1.0	A
I <sub>DM</sub>	Pulsed Drain Current	6	A

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

Symbol	Parameter	Value	Unit
EAS	Single Pulsed Avalanche Energy	110	mJ
EAR	Repetitive Avalanche Energy	4.4	mJ
I <sub>AR</sub>	Continuous Source Current (Diode Conduction) <sup>a</sup>	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
	Power Dissipation (TC=100°C)	0.22	W
T <sub>J</sub> /T <sub>STG</sub>	Operating Junction and Storage Temperature	-55 to +150	°C

#### NOTE:

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

#### Thermal Characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Maximum	Units
R <sub>thjc</sub>	Typical thermal resistance	2.87	°C/W
R <sub>θJA</sub>	Typical thermal resistance	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> = 10V, I <sub>D</sub> = 0.8 A	--	5.5	6.0	Ω
BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	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, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C			100	
I <sub>GSSF</sub>	V <sub>DS</sub> = 30 V, V <sub>DS</sub> = 0 V			100	nA
I <sub>GSSR</sub>	V <sub>DS</sub> = -30 V, V <sub>DS</sub> = 0 V	--	--	-100	nA

#### Dynamic Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
C <sub>ISS</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, F = 1.0MHz	--	340	445	pF
C <sub>OSS</sub>		--	45	60	pF
C <sub>RSS</sub>		--	7.5	10	pF
t <sub>d(on)</sub>	V <sub>DS</sub> = 350 V, I <sub>D</sub> = 1.6 A, R <sub>G</sub> = 25 Ω	--	10	20	ns
t <sub>r</sub>		--	25	50	ns
t <sub>d(off)</sub>		--	20	40	ns
t <sub>f</sub>		--	25	50	ns

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#### Dynamic Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
$Q_g$	$V_{DS} = 560 \text{ V}, I_D = 1.6 \text{ A},$ $V_{GS} = 10 \text{ V}$	--	10.5	14	nC
$Q_{gs}$		--	2.0	--	
$Q_{gd}$		--	4.0	--	

#### Source-Drain Diode Characteristics

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

#### NOTE:

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.  $I_{SD} \leq 1.6 \text{ A}, di/dt \leq 300 \text{ A}/\mu\text{s}, V_{DD} \leq BVDSS,$  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

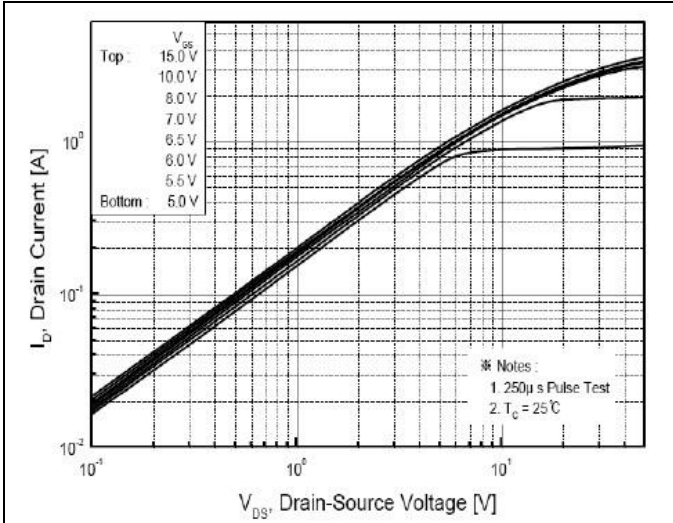


FIG.1-ON REGION CHARACTERISTICS

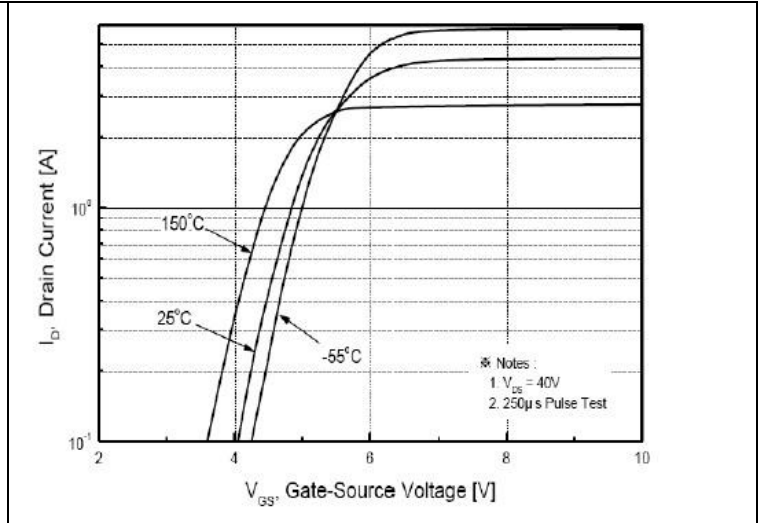


FIG.2-TRANSFER CHARACTERISTICS

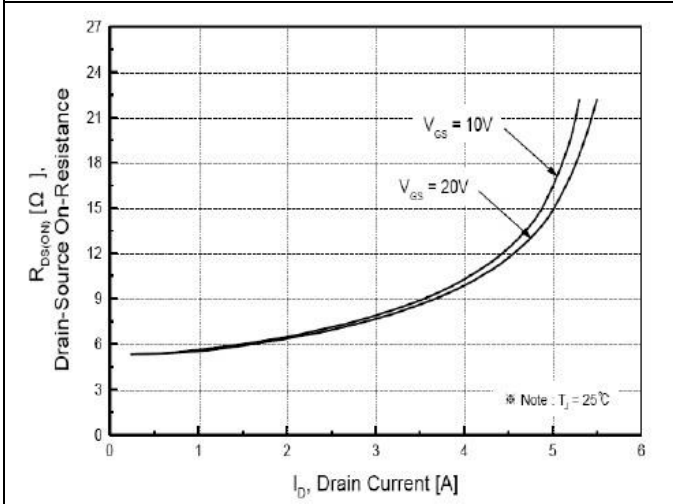


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

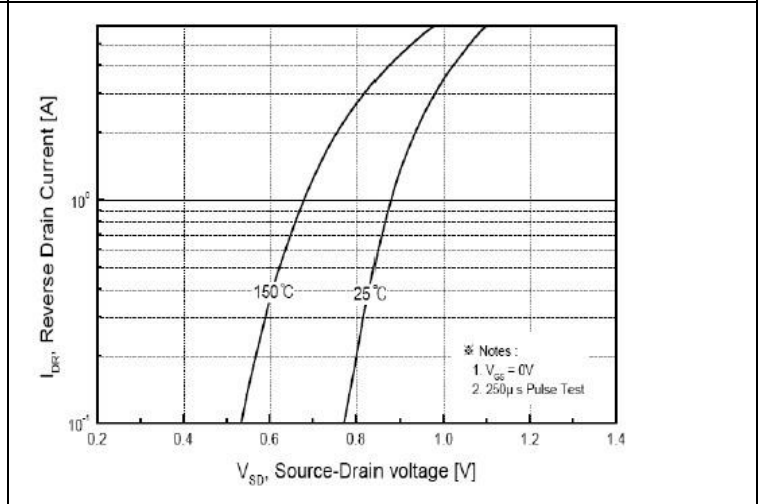


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

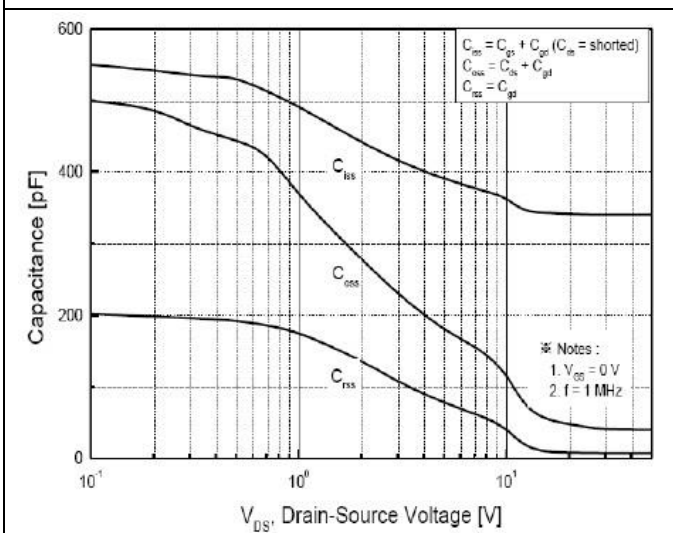


FIG.5-CAPACITANCE CHARACTERISTICS

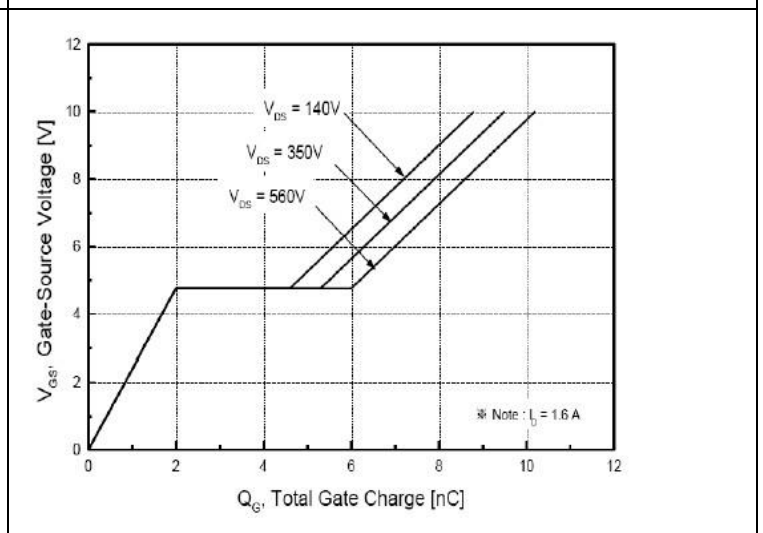
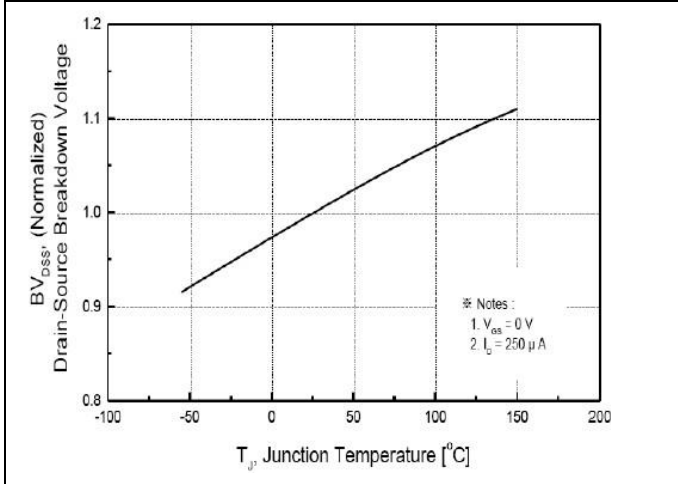


FIG.6-GATE CHARGE CHARACTERISTICS

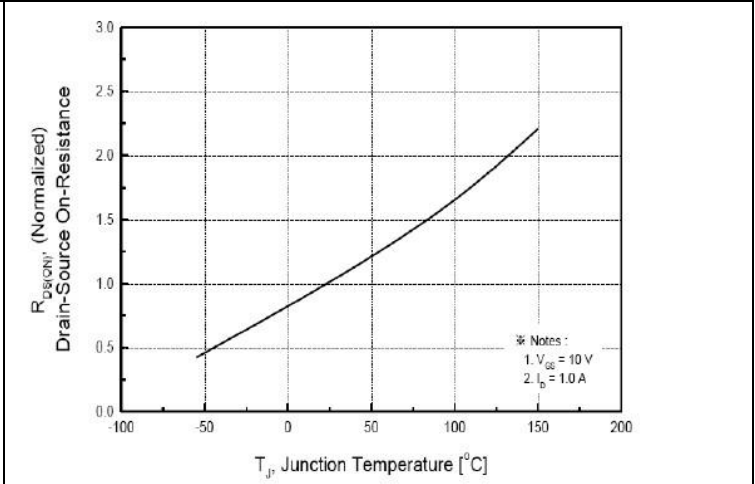
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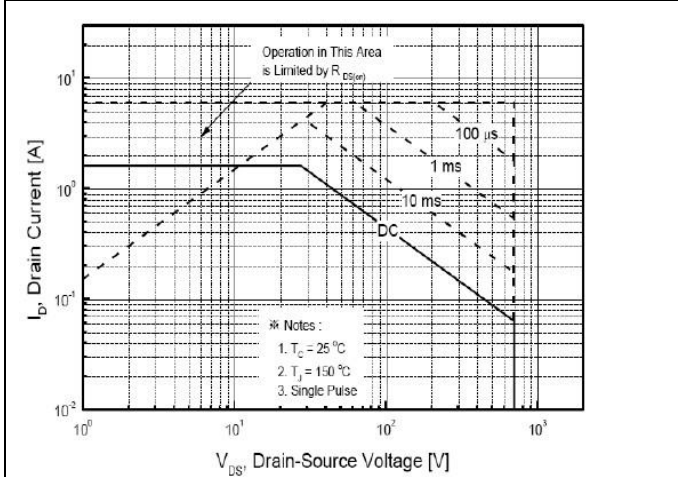
#### Characteristics Curve



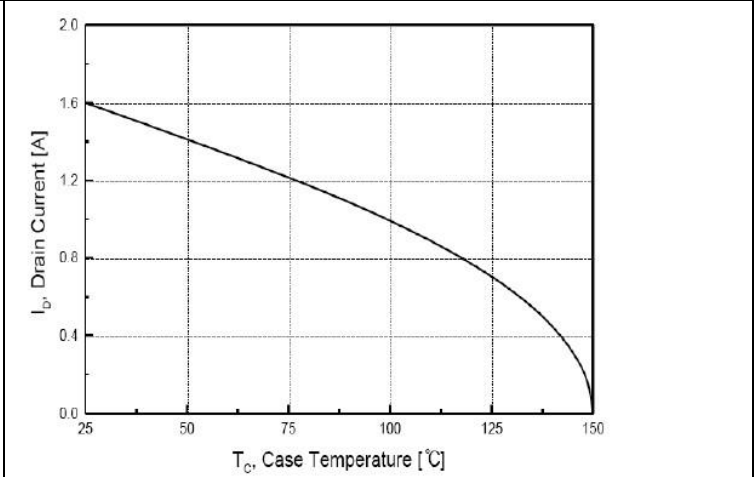
**FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE**



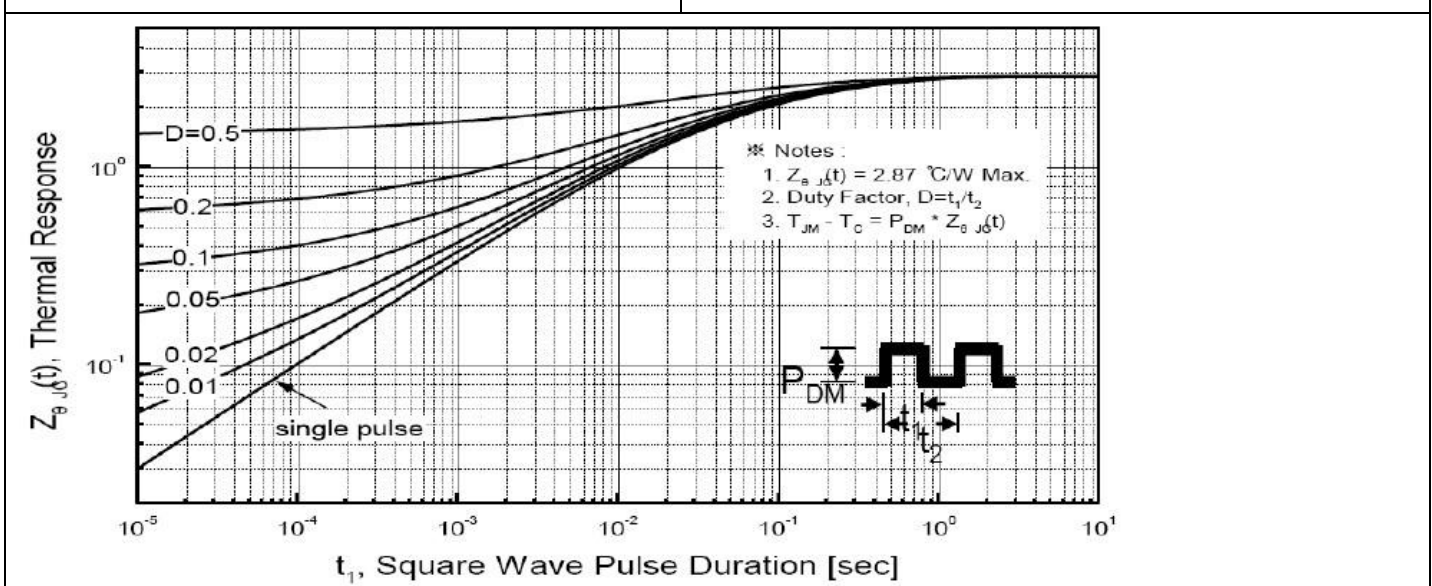
**FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE**



**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

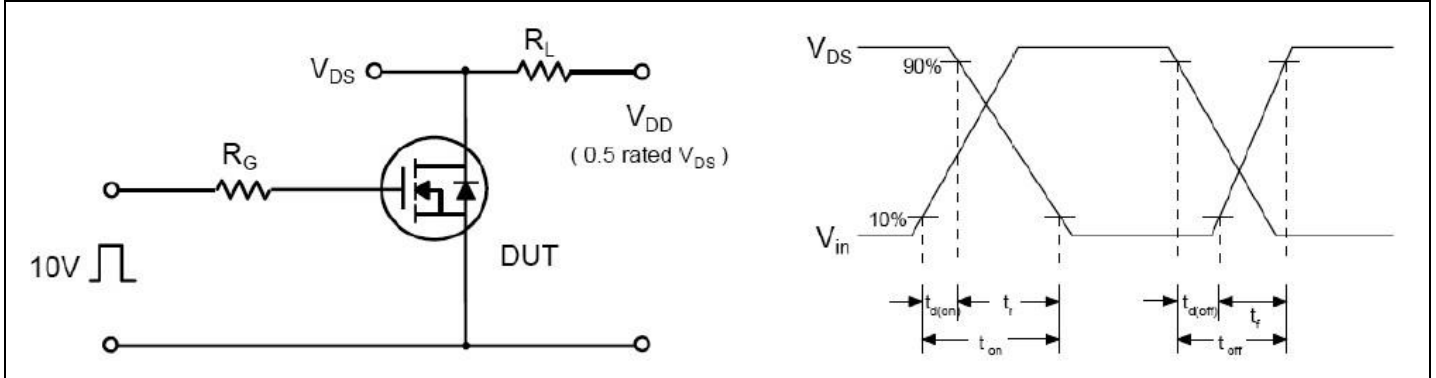


Fig 12. Resistive Switching Test Circuit & Waveforms

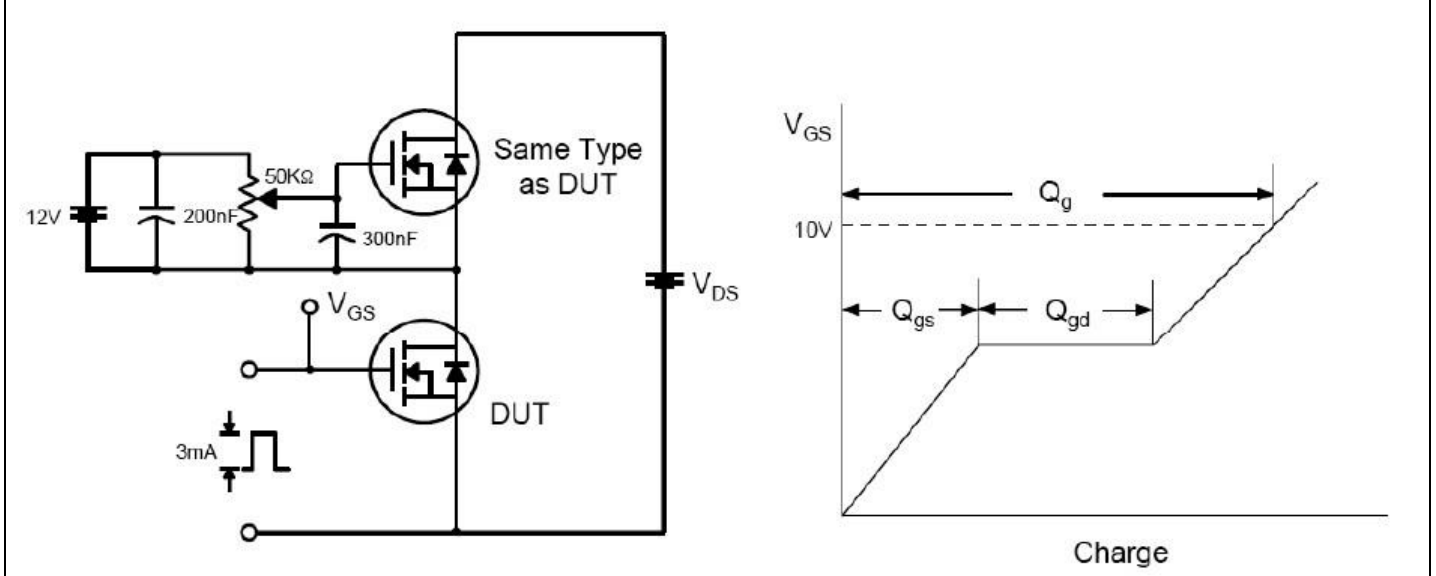


Fig 13. Gate Charge Test Circuit & Waveform

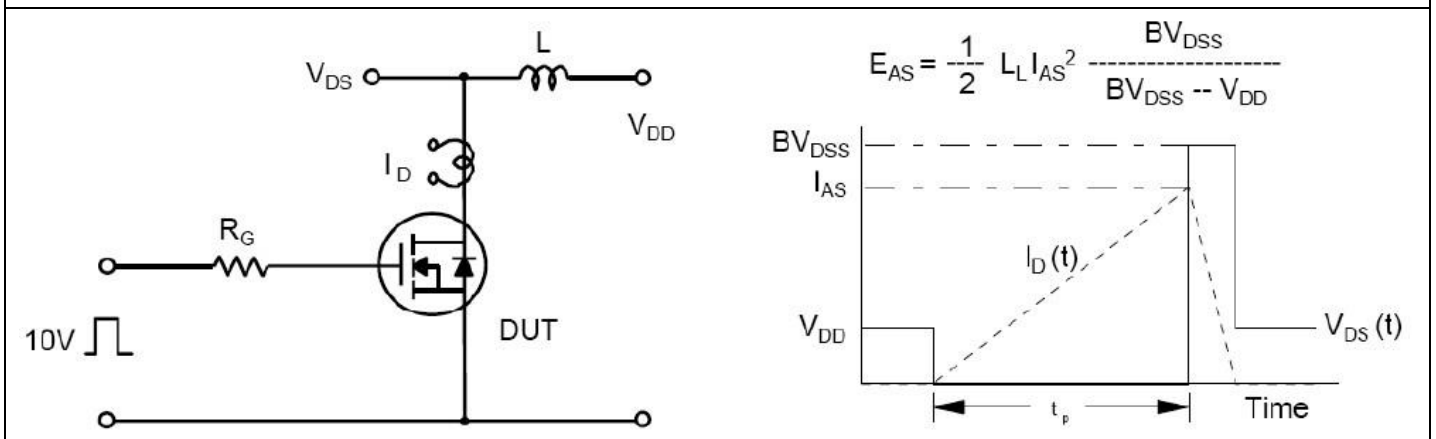


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

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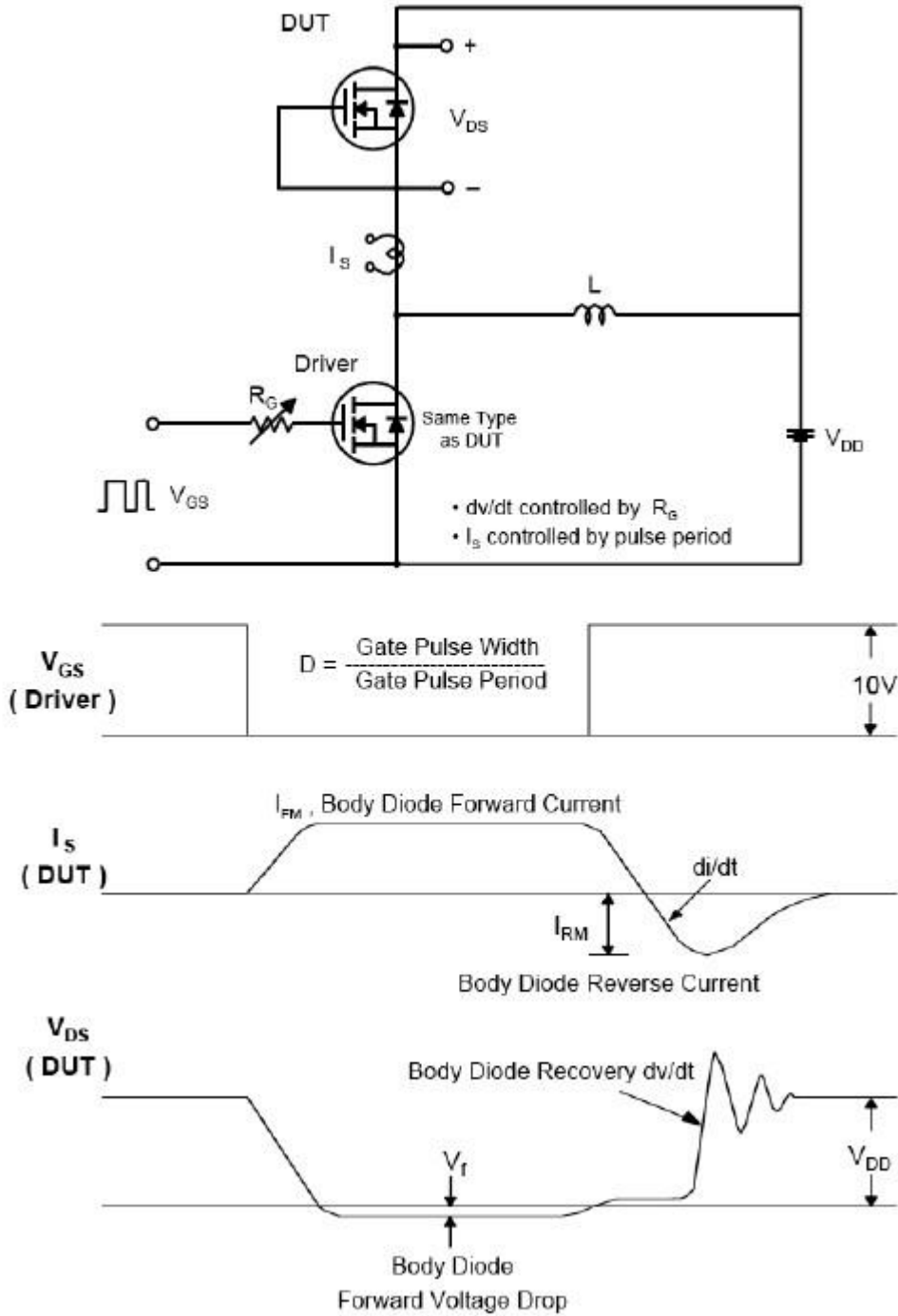


Fig 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

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