

# MSF9N70

## 700V N-Channel MOSFET

### Description

The MSF9N70 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-220F package is universally preferred for all commercial-industrial applications

### Features

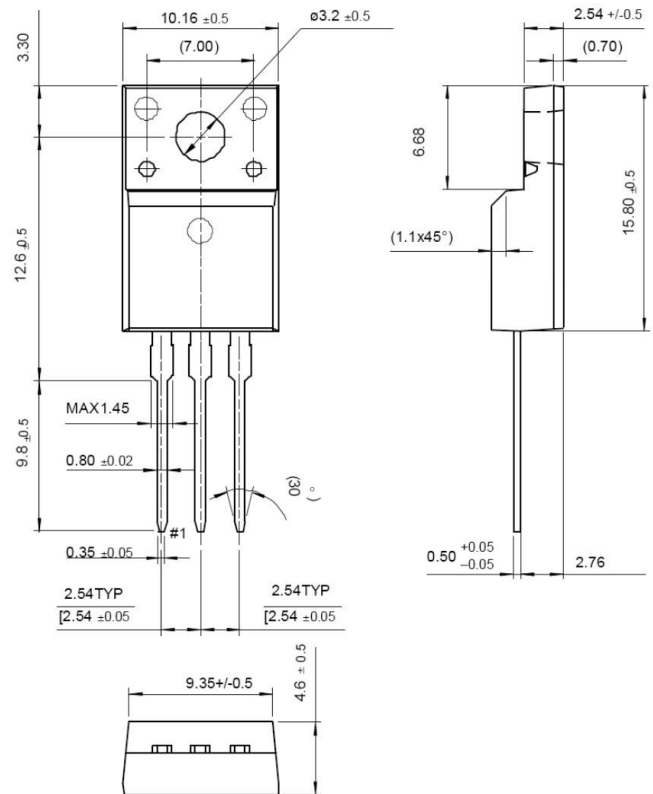
- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

### Application

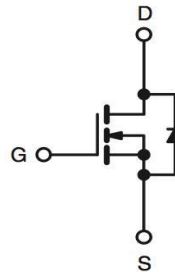
- Adapter
- Switching Mode Power Supply

### Packing & Order Information

50/Tube ; 1,000/Box



### Graphic symbol



**RoHS  
COMPLIANT**

## 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>	Drain Current -Continuous (TC=25°C)	9	A
	Drain Current -Continuous (TC=100°C)	5.4	A
I <sub>DM</sub>	Drain Current Pulsed	40	A
E <sub>AS</sub>	Single Pulsed Avalanche Energy	658	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy	17.8	mJ
dV/dt	Peak Diode Recovery dV/dt	4.5	V/ns

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

Symbol	Parameter	Value	Unit
P <sub>D</sub>	Power Dissipation (TC = 25 °C)	35	W
	Power Dissipation (TC = 100 °C)	0.30	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150	°C

Note:

1. Pulse width limited by maximum junction temperature
2. L = 15mH, I<sub>AS</sub> = 9.0A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω , Starting T<sub>J</sub> = 25°C
3. I<sub>SD</sub> ≤ 9.0A, di/dt ≤ 200A/us, V<sub>DD</sub> ≤ BVDSS, Starting T<sub>J</sub> = 25°C
4. Pulse Test : Pulse Width ≤ 300us, Duty Cycle ≤ 2%
5. Essentially independent of operating temperature.

#### 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	2.5		4.5	V
*R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10 V , I <sub>D</sub> = 4.75 A	--	0.8	1.0	mΩ
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		0.6		
I <sub>DSS</sub>	V <sub>DS</sub> = 700 V , V <sub>GS</sub> = 0 V V <sub>DS</sub> = 560 V , V <sub>GS</sub> = 0 V , T <sub>J</sub> = 125°C	--	--	1 10	uA
G <sub>FS</sub>	V <sub>DS</sub> = 30 V , V <sub>GS</sub> = 0 V			100	nA
I <sub>GSS</sub>	V <sub>DS</sub> = -30 V , V <sub>GS</sub> = 0 V	--	--	-100	nA

#### Dynamic Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
Q <sub>g</sub>	V <sub>DS</sub> = 520 V, I <sub>D</sub> = 10 A, V <sub>GS</sub> = 10 V	--	48	58	nC
Q <sub>gs</sub>		--	7.0	--	
Q <sub>gd</sub>		--	18	--	
t <sub>d(on)</sub>	V <sub>DS</sub> = 325 V, I <sub>D</sub> = 10 A, R <sub>G</sub> = 25 Ω	--	25	55	ns
t <sub>r</sub>		--	70	150	ns
t <sub>d(off)</sub>		--	140	300	ns
t <sub>f</sub>		--	80	165	ns
C <sub>ISS</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0MHz	--	1650	2050	pF
C <sub>OSS</sub>		--	165	217	pF
C <sub>RSS</sub>		--	18	25	pF

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### Source-Drain Diode Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
$I_S$		--	--	10	A
$I_{SM}$		--	--	40	
$V_{SD}$	$I_F = 10\text{ A} , V_{GS} = 0$	--	--	1.4	V
$t_{rr}$	$I_F = 10\text{ A} , V_{GS} = 0 , dI_F/dt=100\text{A}/\mu\text{s}$	--	430	--	ns
$Q_{rr}$		--	4.3	--	nC

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#### ■ Characteristics Curve

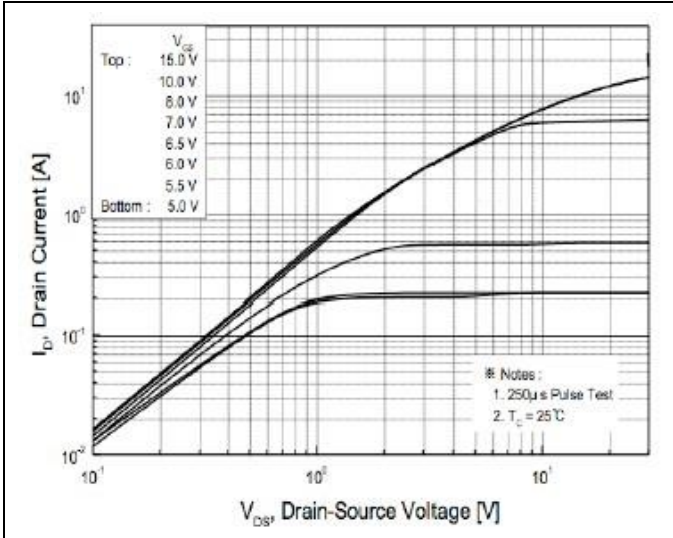


FIG.1-ON REGION CHARACTERISTICS

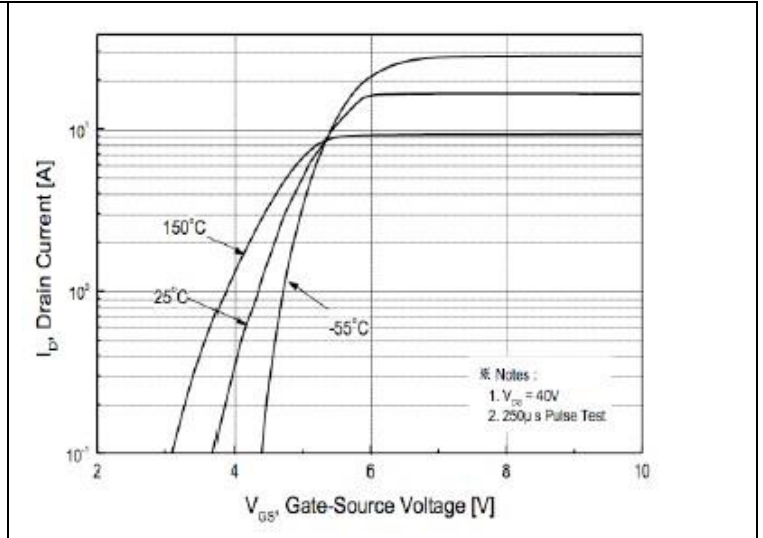


FIG.2-TRANSFER CHARACTERISTICS

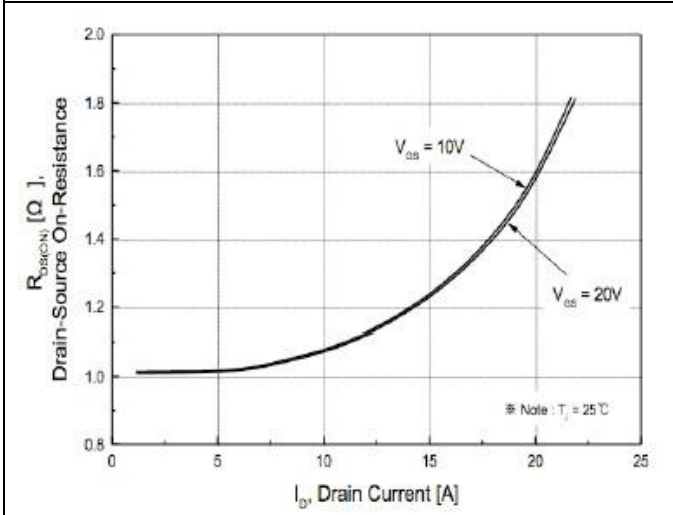


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

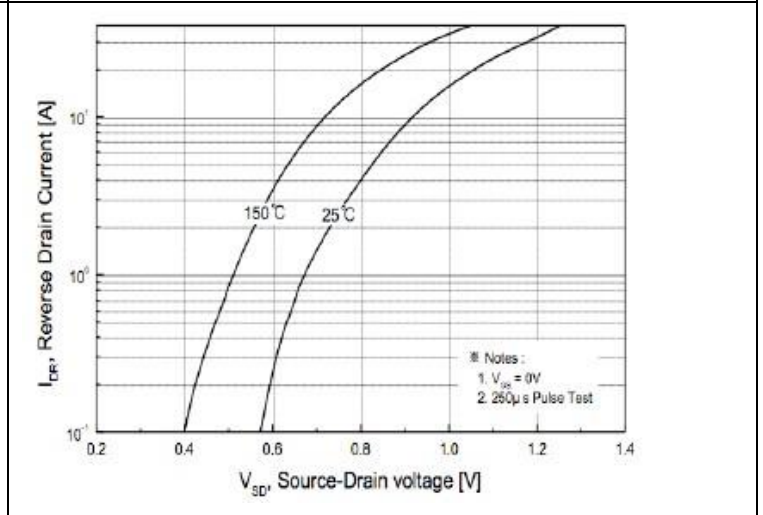


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

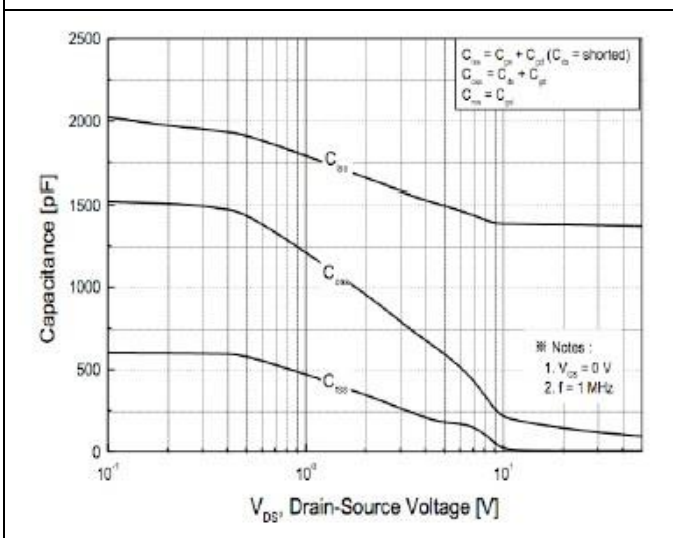


FIG.5-CAPACITANCE CHARACTERISTICS

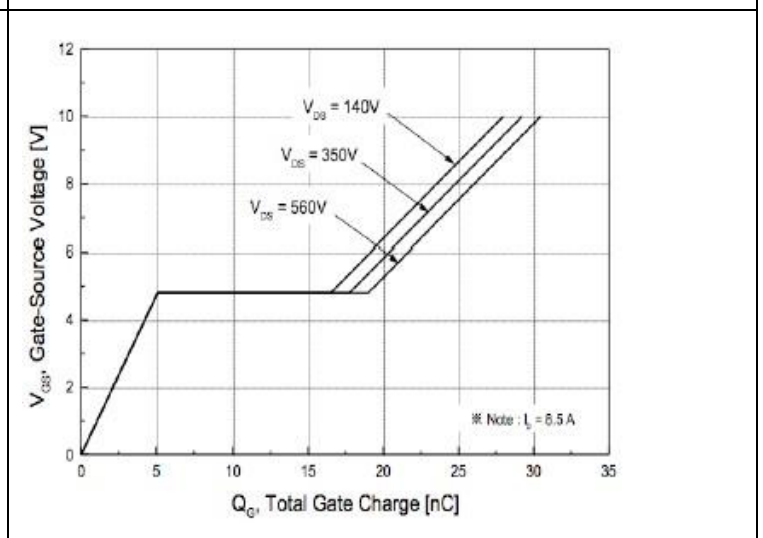
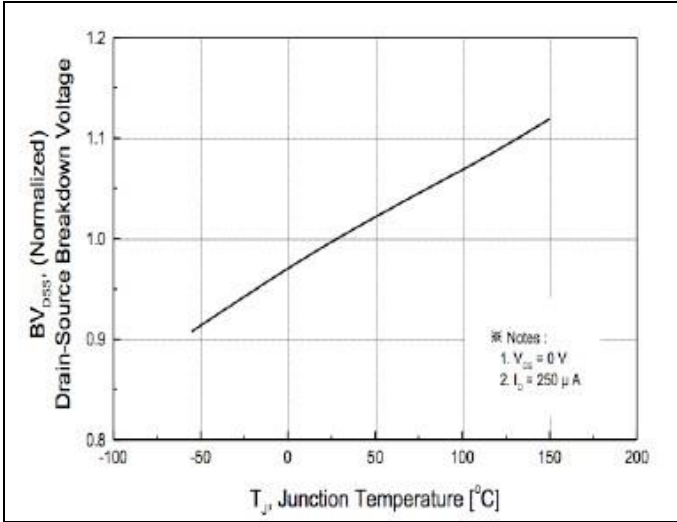


FIG.6-GATE CHARGE CHARACTERISTICS

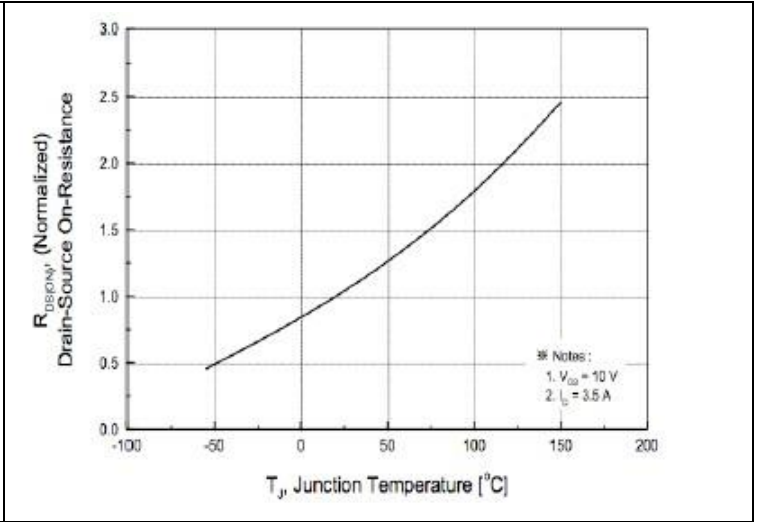
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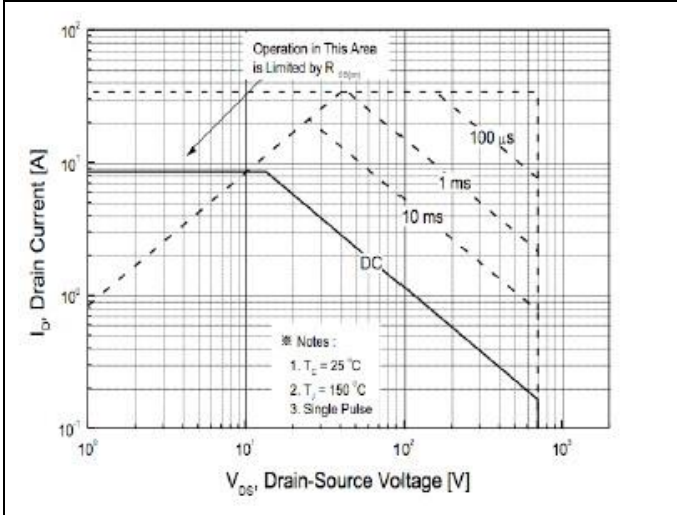
#### ■ Characteristics Curve



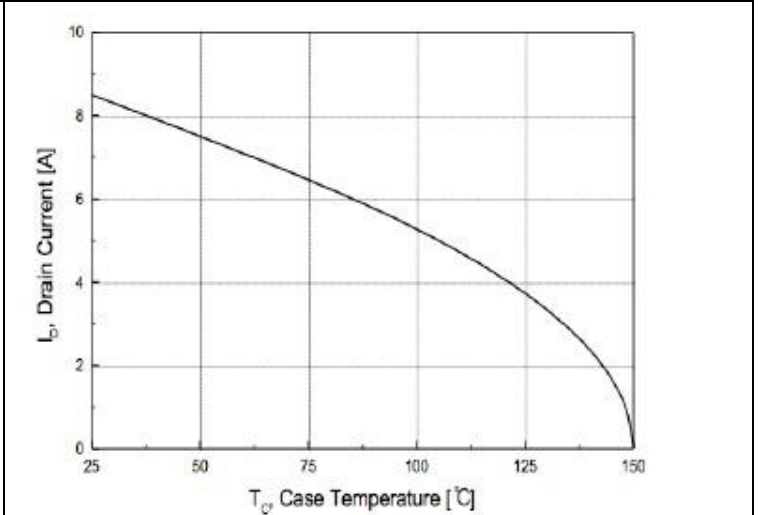
**FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE**



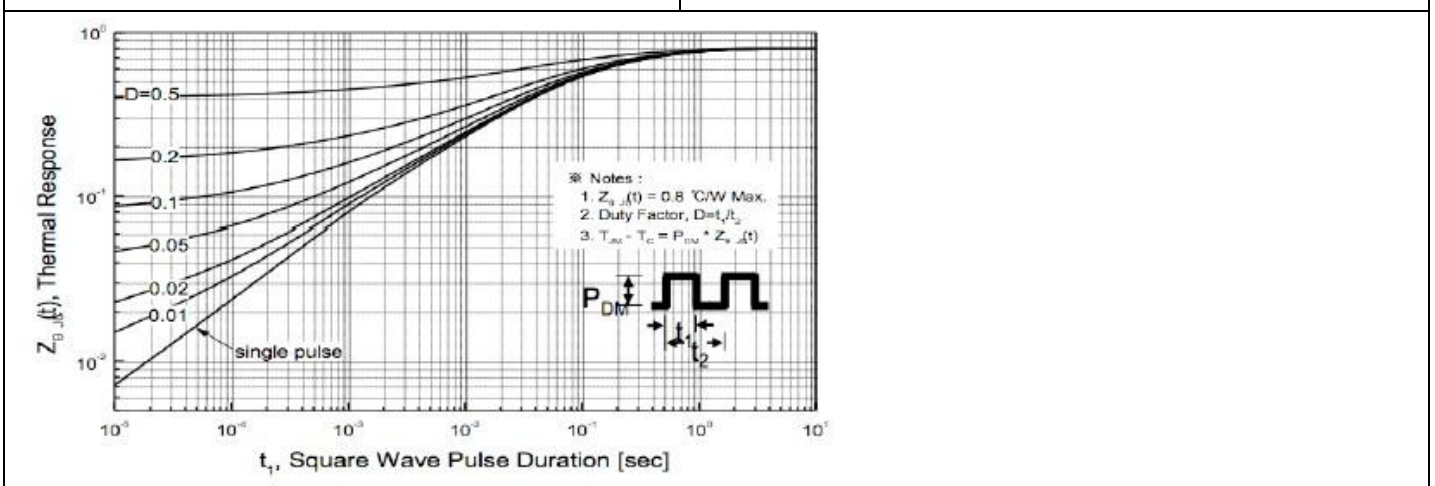
**FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE**



**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

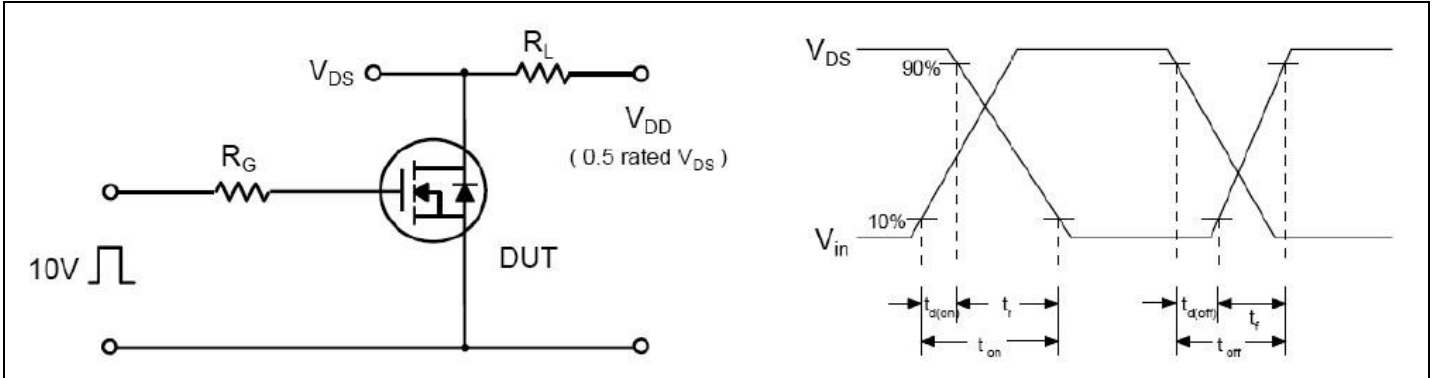


Fig 12. Resistive Switching Test Circuit & Waveforms

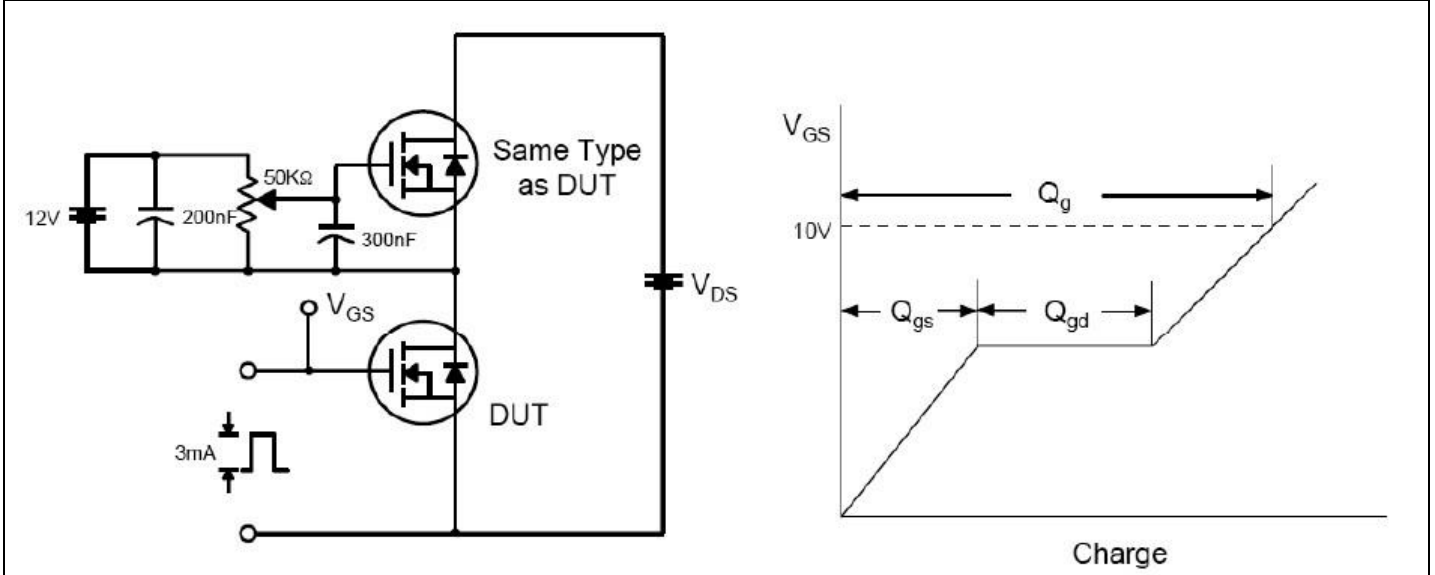


Fig 13. Gate Charge Test Circuit & Waveform

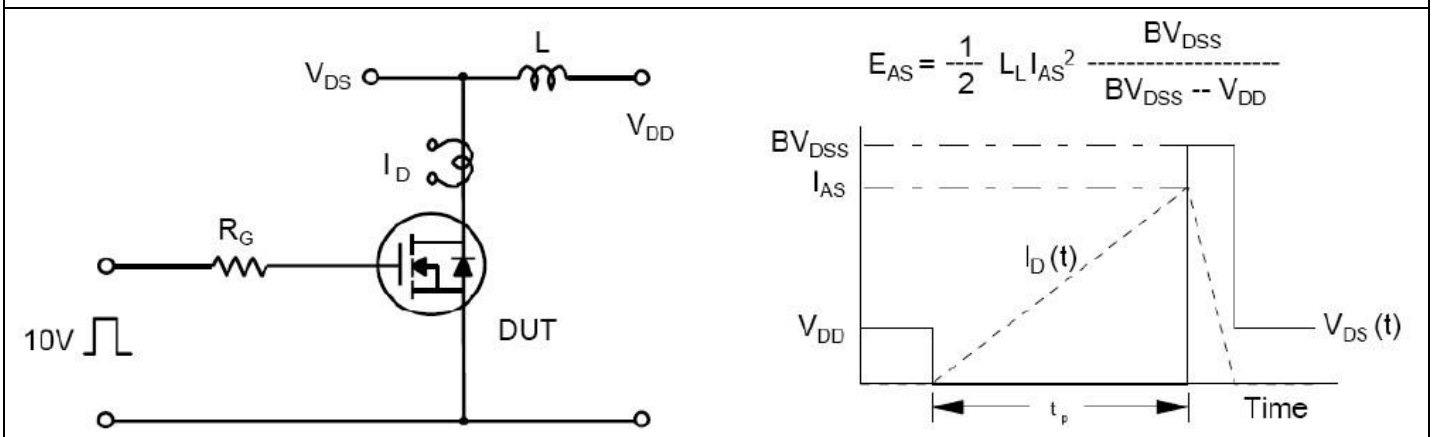


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



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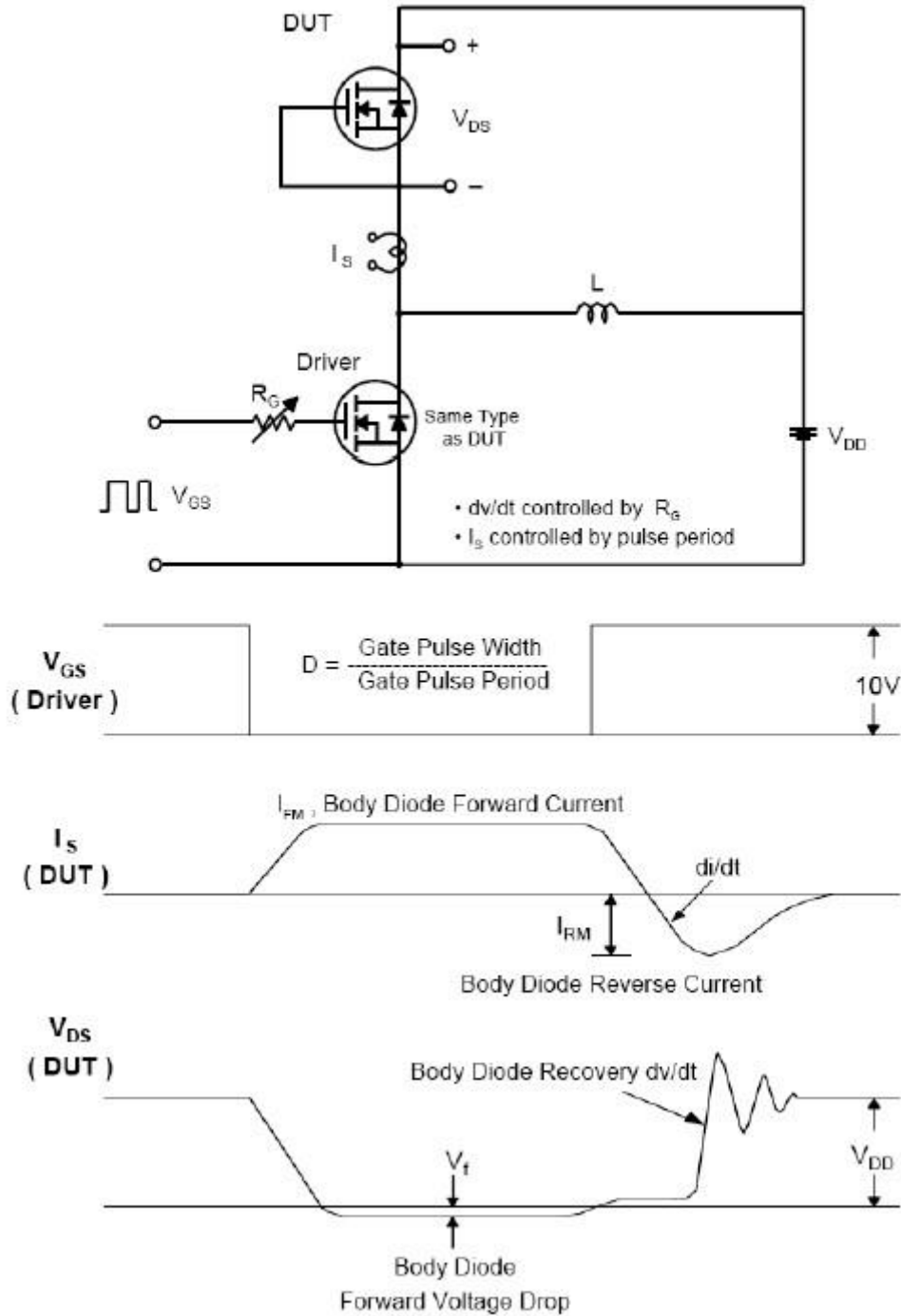


Fig 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

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