

MSF9N90

900V N-Channel MOSFET

Description

The MSF9N90 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

- RDS(on) (Max 1.4 Ω)@VGS=10V
- Gate Charge (Typical 47nC)
- Improved dv/dt Capability, High Ruggedness
- 100% Avalanche Tested
- Maximum Junction Temperature Range (150°C)
- RoHS compliant package

Application

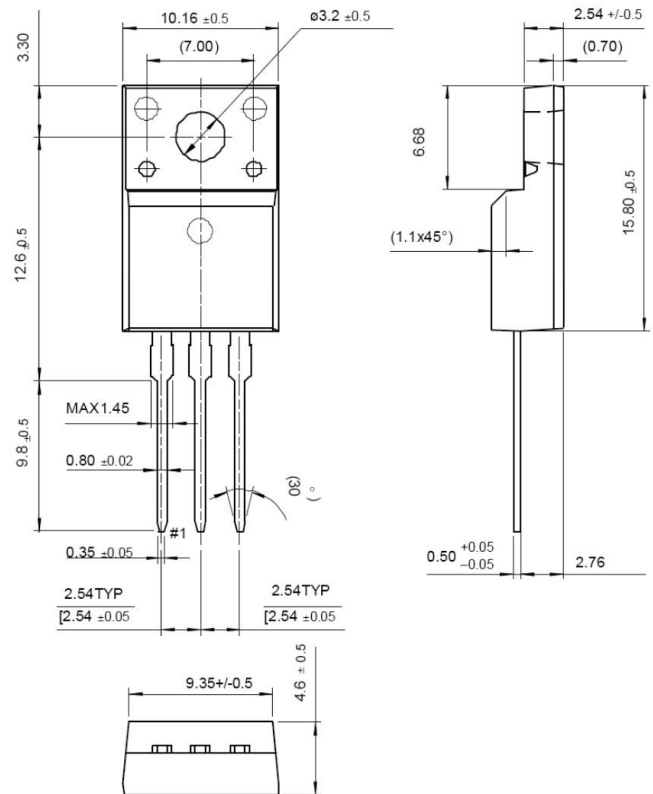
- Adapter
- Switching Mode Power Supply

Packing & Order Information

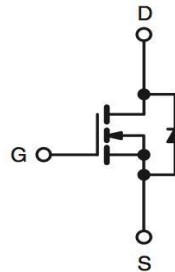
50/Tube ; 1,000/Box



RoHS
COMPLIANT



Graphic symbol



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Value	Unit
V _{DSS}	Drain-Source Voltage	900	V
V _{GS}	Gate-Source Voltage	±30	V
I _D	Drain Current -Continuous (TC=25°C)	9	A
	Drain Current -Continuous (TC=100°C)	6	A
I _{DM}	Drain Current Pulsed	36	A
E _{AS}	Single Pulsed Avalanche Energy	900	mJ
E _{AR}	Repetitive Avalanche Energy	28	mJ
dV/dt	Peak Diode Recovery dV/dt	4.0	V/ns
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to +150	°C

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

Symbol	Parameter	Value	Unit
P _D	Power Dissipation (TC = 25 °C)	280	W
	Power Dissipation (TC = 100 °C)	2.22	W/°C
T _L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	°C

- Drain current limited by maximum junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	Max.	Units
R _{θJC}	Junction-to-Case	3.5	°C/W
R _{θJA}	Junction-to-Ambient	62.5	

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
V _{GS}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	3.0	--	5.0	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 4.5 A	--	1.1	1.4	Ω

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250μA	900	--	--	V
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	--	1.05	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 900 V, V _{GS} = 0 V V _{DS} = 720 V, V _C = 125°C	--	--	10 100	μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30 V, V _{DS} = 0 V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -30 V, V _{DS} = 0 V	--	--	-100	nA

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
C _{ISS}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, F = 1.0MHz	--	2200	--	pF
C _{OSS}	Output Capacitance		--	180	--	pF
C _{RSS}	Reverse Transfer Capacitance		--	15	--	pF

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Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Time	$V_{DS} = 450\text{ V}, I_D = 9\text{ A},$ $R_G = 25\ \Omega$	--	60	--	ns
t_r	Turn-On Time		--	130	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	110	--	ns
t_f	Turn-Off Fall Time		--	80	--	ns
Q_g	Total Gate Charge	$V_{DS} = 720\text{ V}, I_D = 10\text{ A},$ $V_{GS} = 9\text{ V}$	--	47	--	nC
Q_{gs}	Gate-Source Charge		--	15	--	nC
Q_{gd}	Gate-Drain Charge		--	20	--	nC

Source-Drain Diode Maximum Ratings and Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
I_S	Continuous Source-Drain Diode Forward Current		--	--	9	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	35	
V_{SD}	Source-Drain Diode Forward Voltage	$I_S = 9\text{ A}, V_{GS} = 0\text{ V}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$I_S = 9\text{ A}, V_{GS} = 0\text{ V}$ $diF/dt = 100\text{ A}/\mu\text{s}$	--	550	--	ns
Q_{rr}	Reverse Recovery Charge		--	6.5	--	μC

Notes;

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L=21\text{mH}, I_{AS}=9.0\text{A}, V_{DD}=50\text{V}, R_G=25\Omega,$ Starting $T_J=25^\circ\text{C}$
3. $I_{SD} \leq 9.0\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS},$ 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

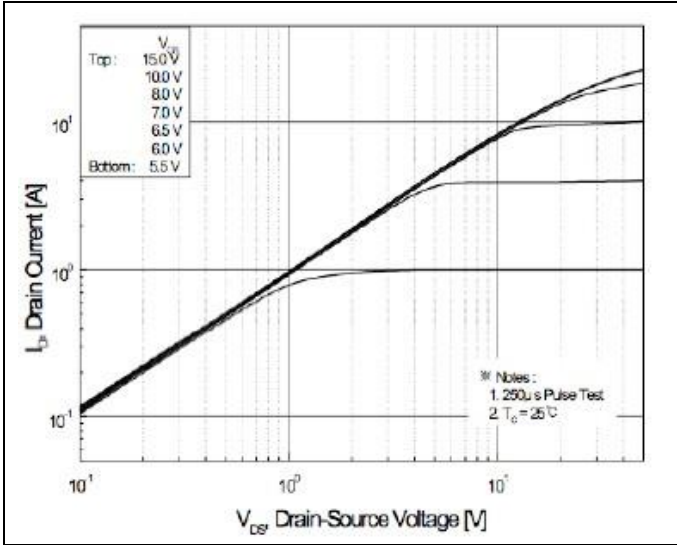


FIG.1-ON REGION CHARACTERISTICS

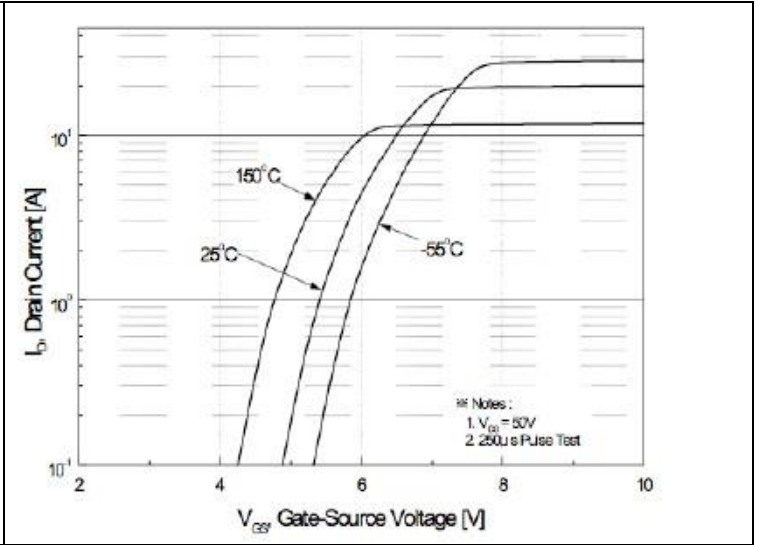


FIG.2-TRANSFER CHARACTERISTICS

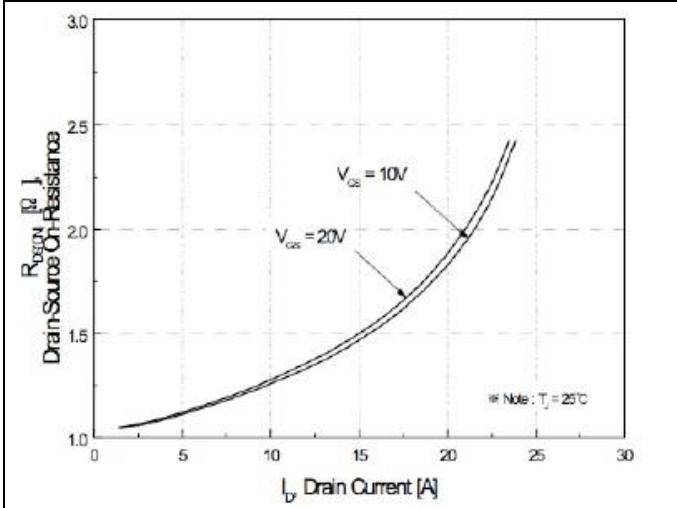


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

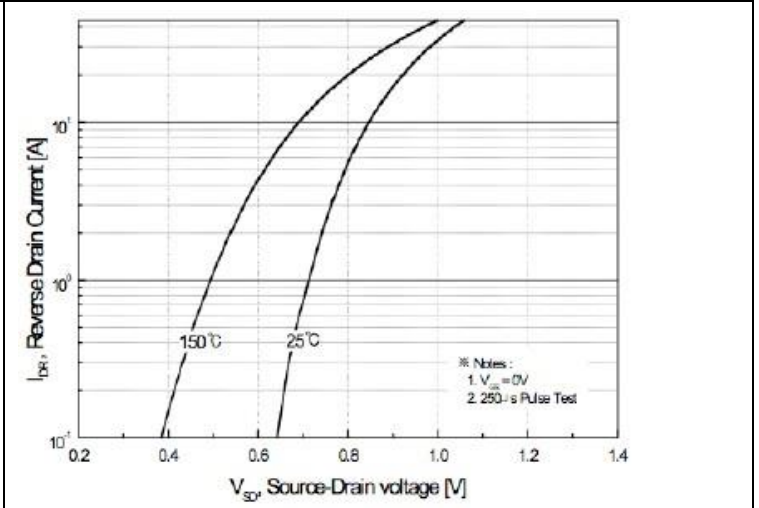


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

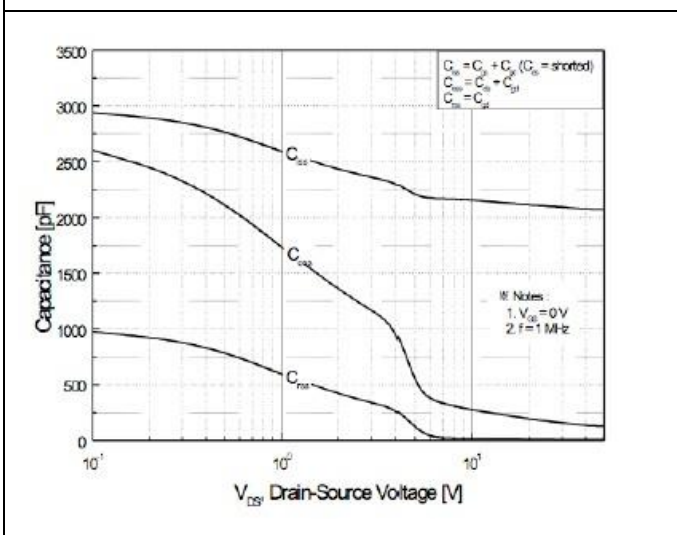


FIG.5-CAPACITANCE CHARACTERISTICS

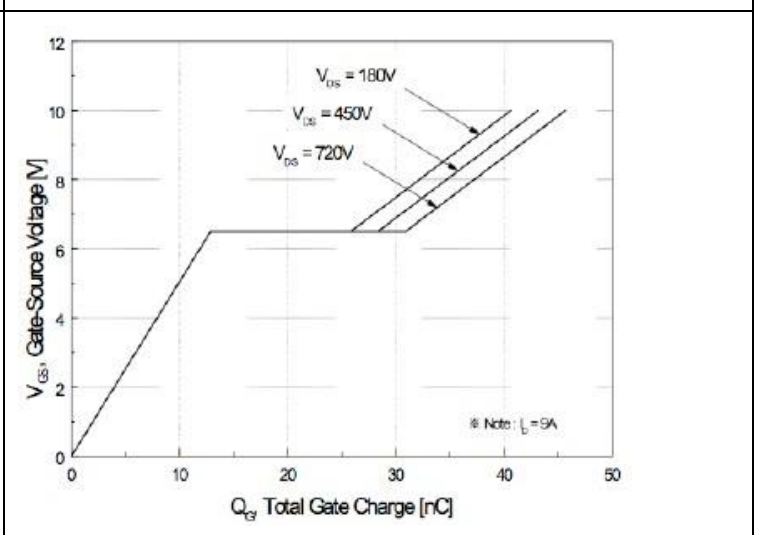


FIG.6-GATE CHARGE CHARACTERISTICS

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■ Characteristics Curve

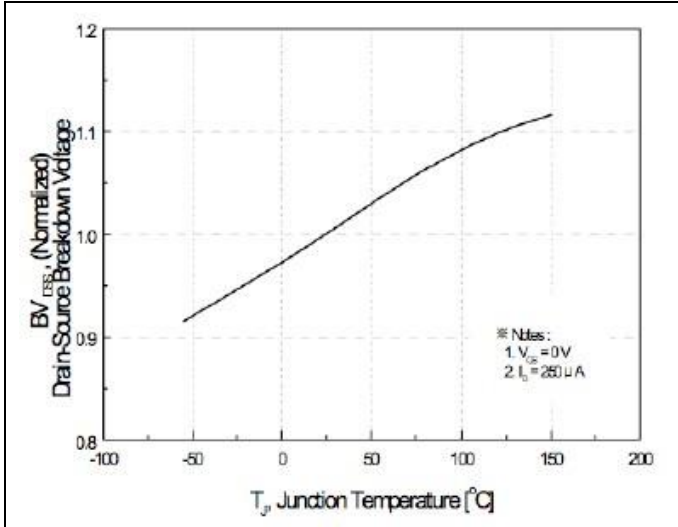


FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

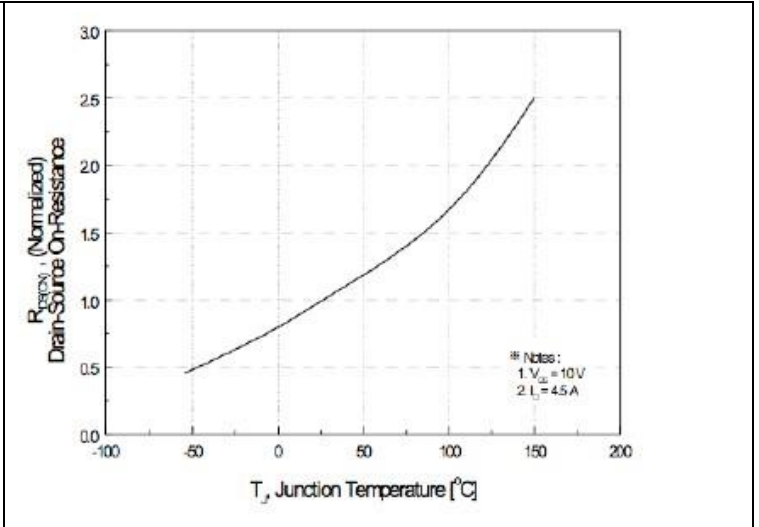


FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE

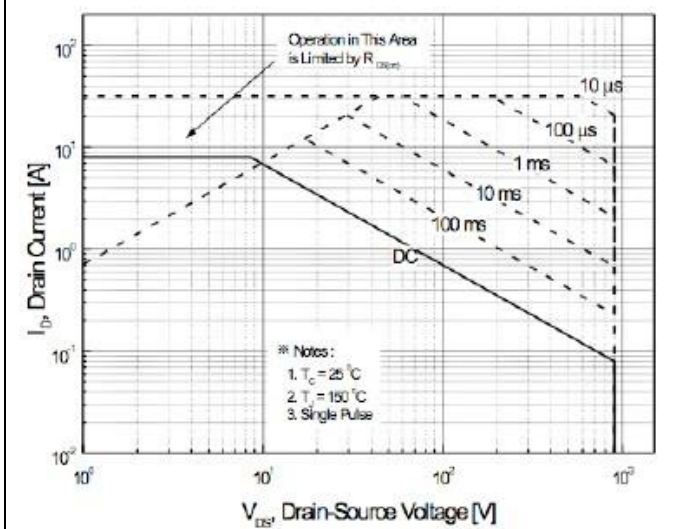


FIG.9-MAXIMUM SAFE OPERATING AREA

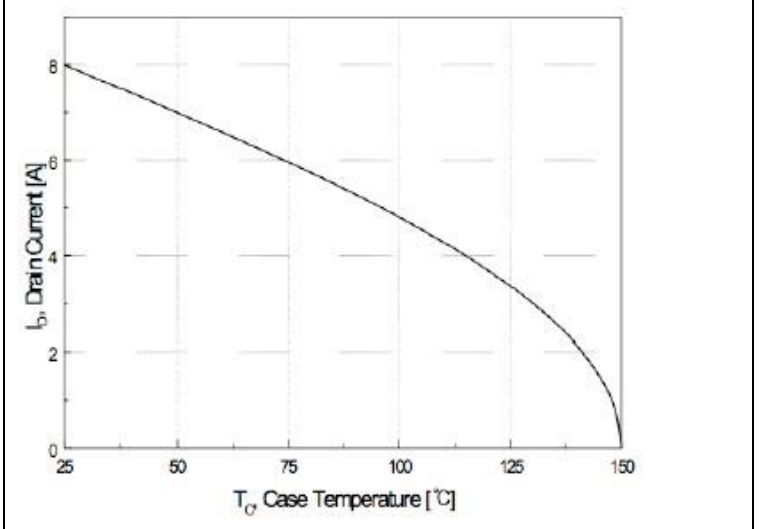


FIG.10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

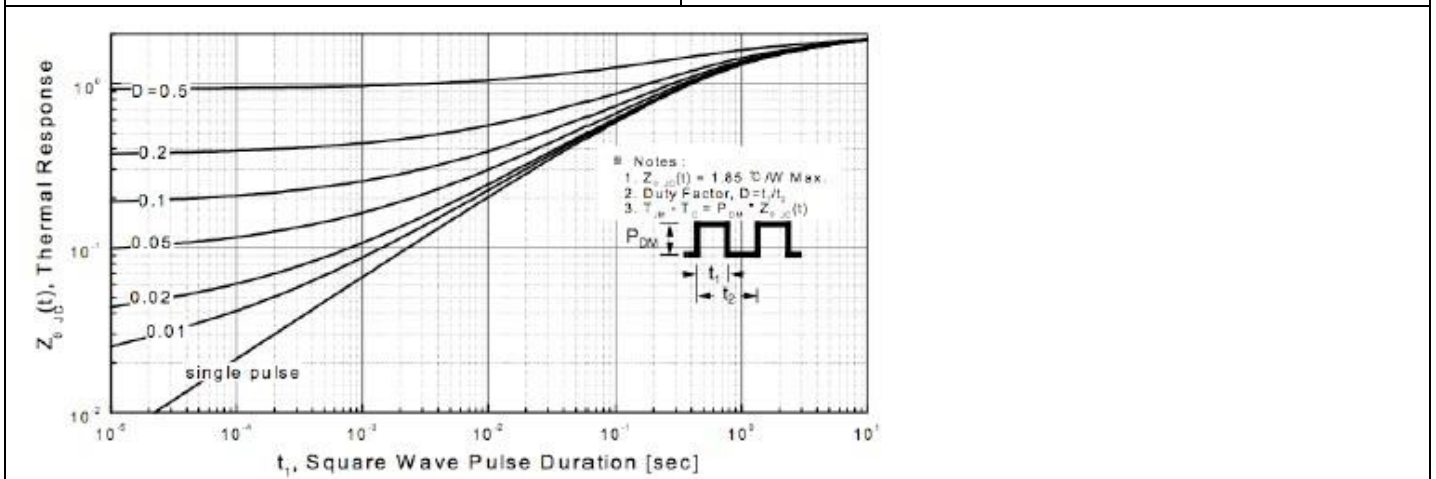


FIG.11-TRANSIENT THERMAL RESPONSE CURVE

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■ Characteristics Test Circuit & Waveform

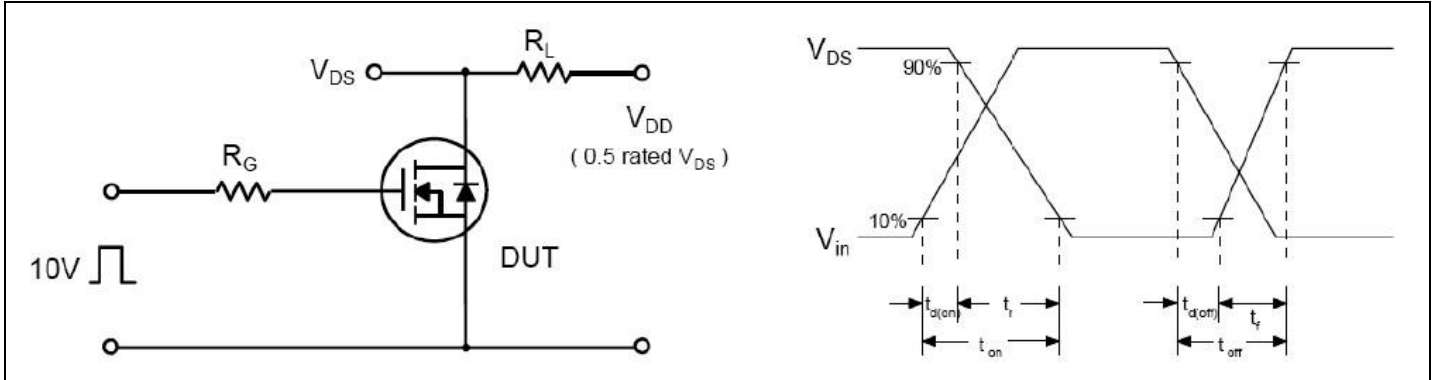


Fig 12. Resistive Switching Test Circuit & Waveforms

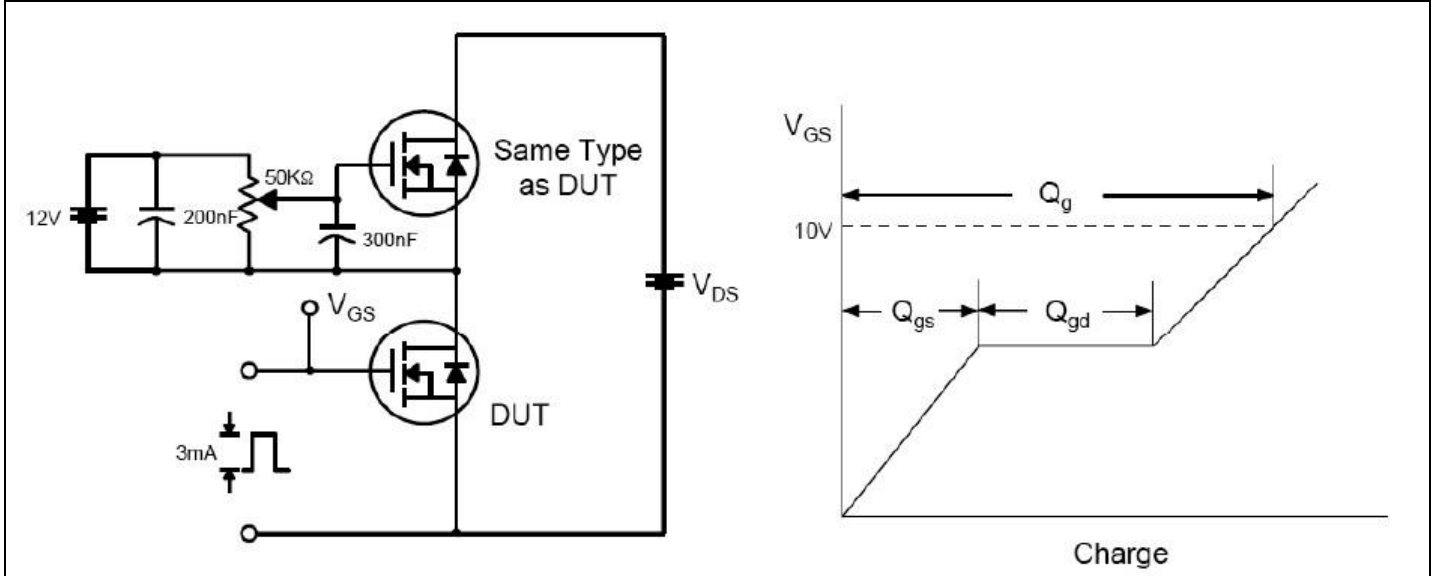


Fig 13. Gate Charge Test Circuit & Waveform

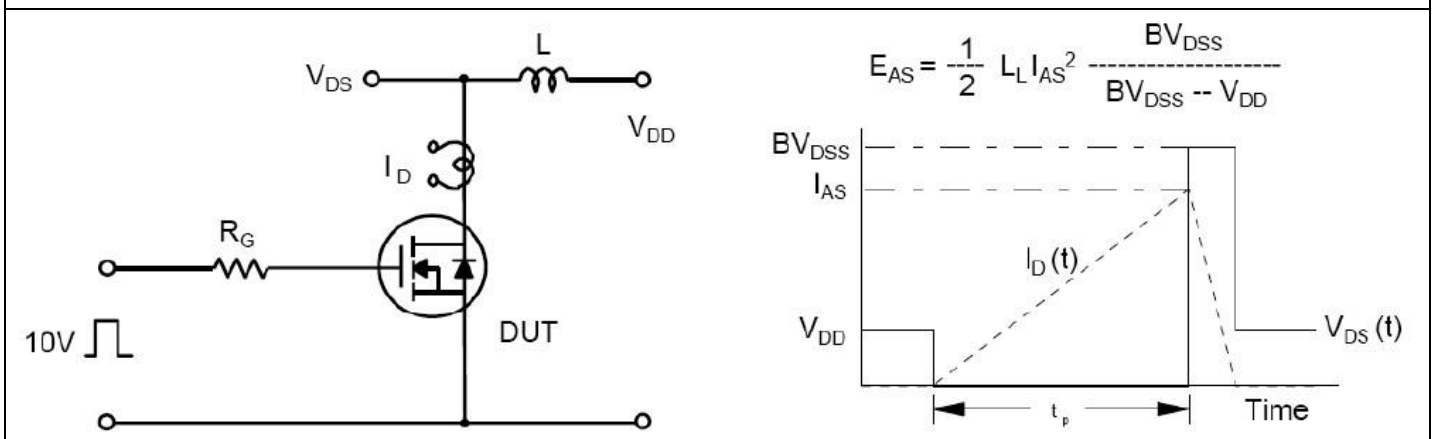


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

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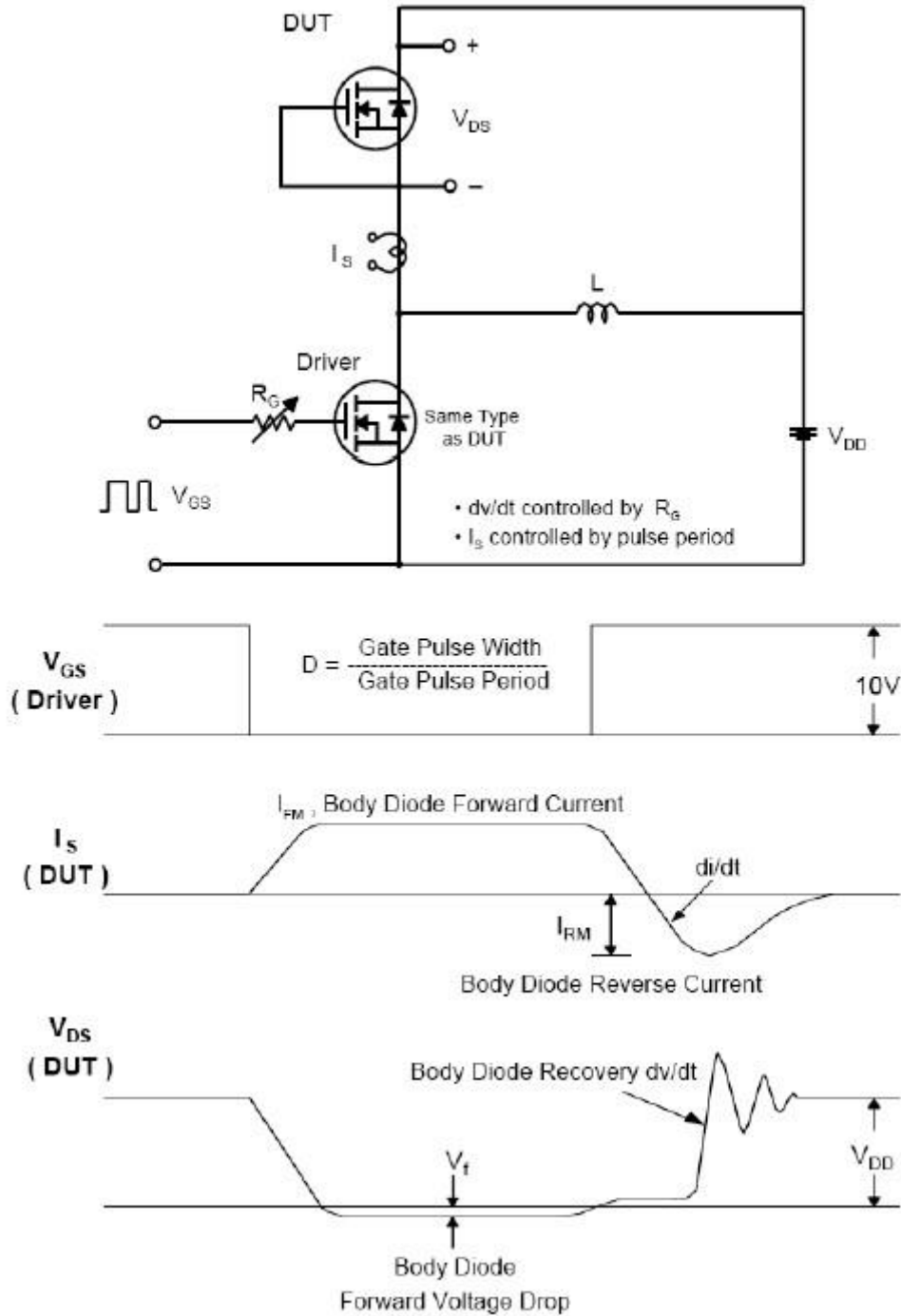


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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