MSF4N60L

600V N-Channel MOSFET

Description

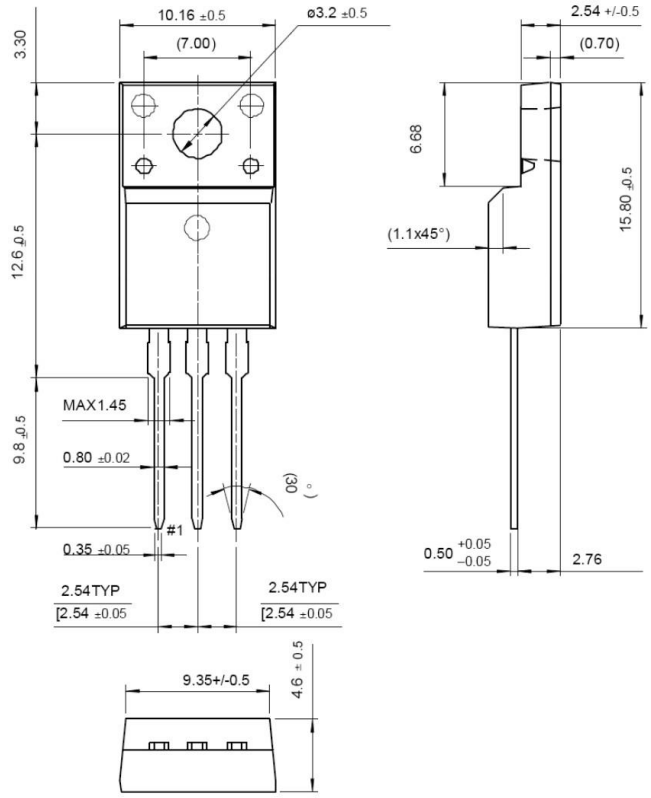
The MSF4N60L is a N-channel enhancement-mode MOSFET , providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness. The TO-220F package is universally preferred for all commercial-industrial applications

Features

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

Application (500V-600V)

- Open Framed Power Supply
- Adapter
- STB

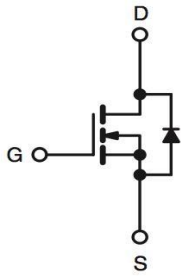


Packing & Order Information

50/Tube ; 1,000/Box

RoHS COMPLIANT

Graphic symbol



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	600	V
V_{GS}	Gate-Source Voltage	±30	V
I_D	Drain Current -Continuous (TC=25°C)	4.5	A
	Drain Current -Continuous (TC=100°C)	2.6	A
I_{DM}	Drain Current Pulsed	18	A
I_{AR}	Avalanche Current	4.0	A
E_{AS}	Single Pulsed Avalanche Energy	48	mJ
E_{AR}	Repetitive Avalanche Energy	3.1	mJ
dv/dt	Peak Diode Recovery dv/dt	4.5	V/ns

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Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	°C
TPKG	Maximum Temperature for Soldering @ Package Body for 10 seconds	260	°C
P_D	Total Power Dissipation (TC = 25 °C)	31	W
	Derating Factor above 25 °C	0.25	W/°C
T_{STG}	Operating and Storage Temperature Range	-55 to +150	°C
T_J	Storage Temperature	150	°C

Notes;

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS}=4A, V_{DD}=50V, L=7mH, V_G=10V, Starting T_J=25℃
3. I_{SD}≦4A, di/dt≦200A/μs,V_{DD}≦BV_{DSS}, Starting T_J=25℃

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

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

Static Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V , I_D = 250μA	600	--	--	V
ΔBV_{DSS} /ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	--	0.6	--	V/°C
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS},I_D = 250μA	2.0	--	4.0	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600 V , V_{GS} = 0 V V_{DS} = 480 V , T_C = 125°C	--	--	1 10	μA
I_{GSS}	Gate-Body Leakage Forward	V_{GS} = ±30	--	--	±100	nA
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V,I_D = 3.5 A	--	0.9	1.4	Ω

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	--	1482	--	pF
C_{OSS}	Output Capacitance		--	121.7	--	pF
C_{RSS}	Reverse Transfer Capacitance		--	14	--	pF

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Dynamic Characteristics						
Symbol	**Parameter**	**Test Conditions**	**Min**	**Typ.**	**Max.**	**Units**
$t_{d(on)}$	Turn-On Time	V_{DS} = 300 V, I_D = 7 A, R_G = 25 Ω , V_{GS} = 10 V	--	10	30	ns
t_r	Turn-On Time		--	40	80	ns
$t_{d(off)}$	Turn-Off Delay Time		--	40	100	ns
tf	Turn-Off Fall Time		--	50	90	ns
Q_g	Total Gate Charge	V_{DS} = 300 V,I_D = 7 A, V_{GS} = 10 V	--	28	37	nC
Q_{gs}	Gate-Source Charge		--	4.7	--	nC
Q_{gd}	Gate-Drain Charge		--	11	--	nC

Source-Drain Diode						
Symbol	**Parameter**	**Test Conditions**	**Min**	**Typ.**	**Max.**	**Units**
I_S		V_D = V_G = 0 V_S = 1.3 V	--	--	4.0	A
I_{SM}			--	--	16	
V_{SD}		I_S = 4 A , V_{GS} = 0 V	--	0.85	1.0	V
t_{rr}		I_F = 7 A , V_{GS} = 0 V diF/dt=100A/μs	--	350	--	ns
Q_{rr}			--	3.3	--	μC

Notes;

1. Pulse Test: Pulse Width ≦ 300μs, Duty Cycle≦ 2%

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■Characteristics Curve

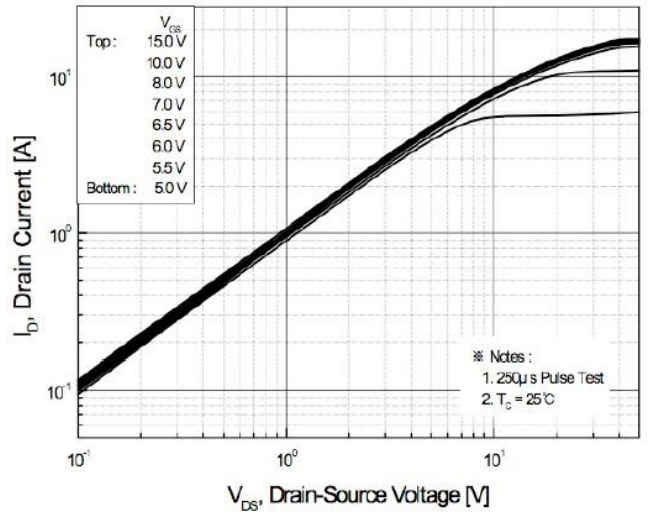

FIG.1-ON REGION CHARACTERISTICS

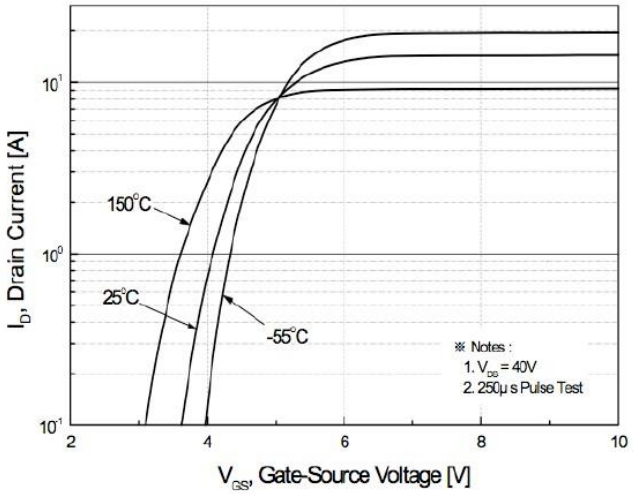

FIG.2-TRANSFER CHARACTERISTICS

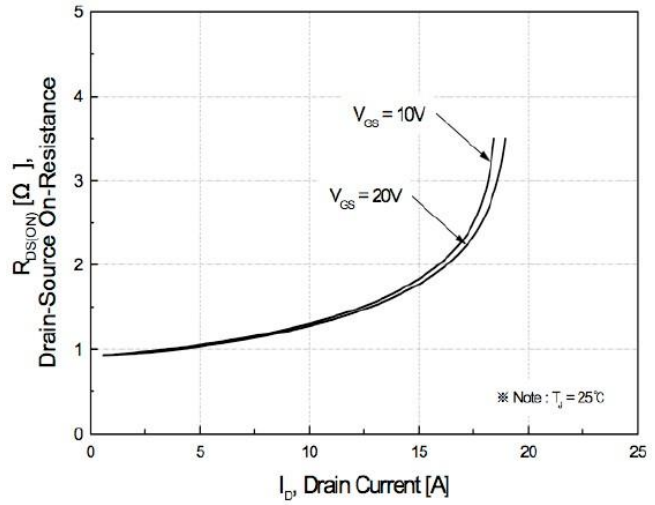

FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

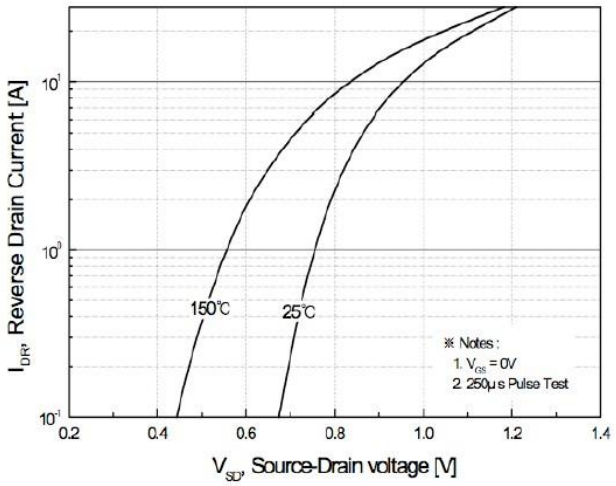

FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

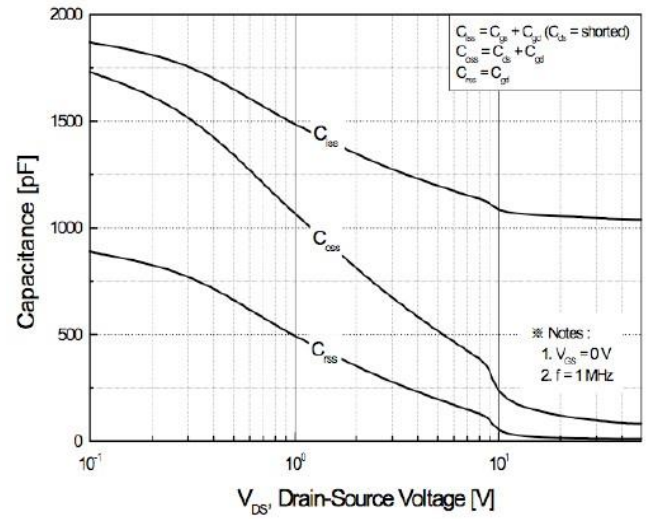

FIG.5-CAPACITANCE CHARACTERISTICS

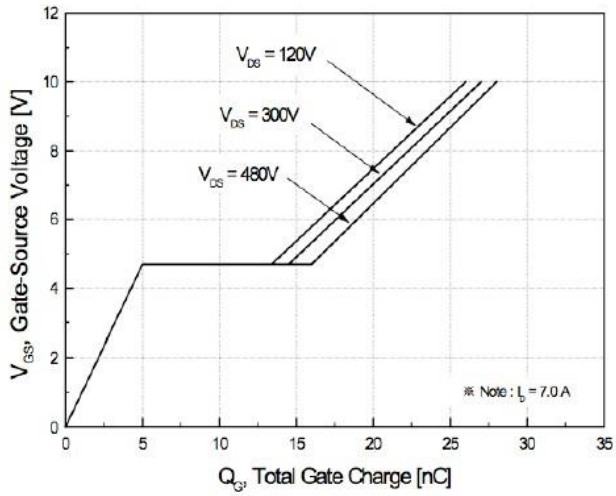

FIG.6-GATE CHARGE CHARACTERISTICS

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■Characteristics Curve

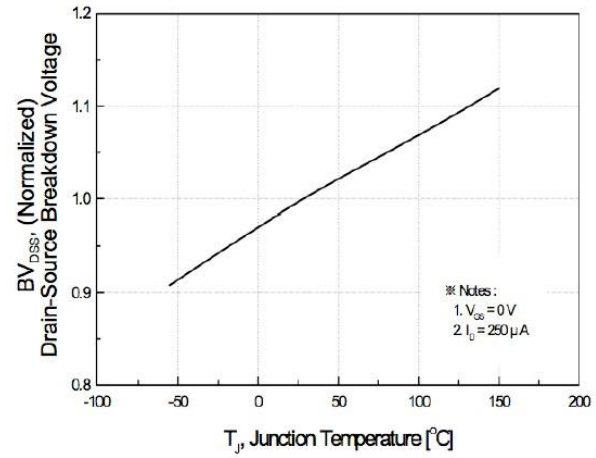

FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

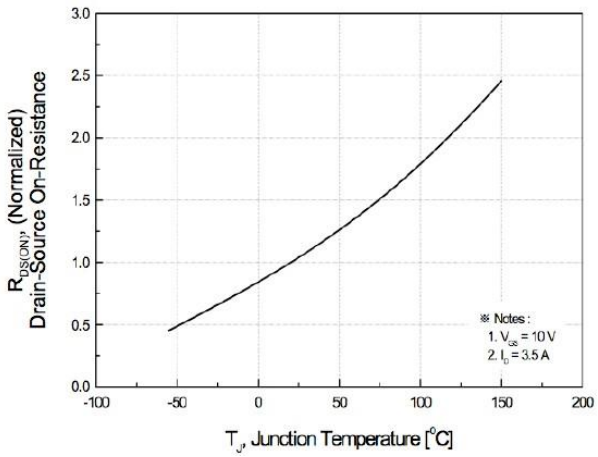

FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE

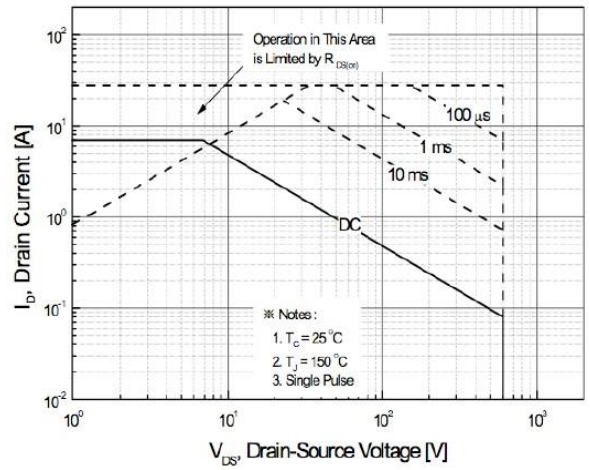

FIG.9-MAXIMUM SAFE OPERATING AREA

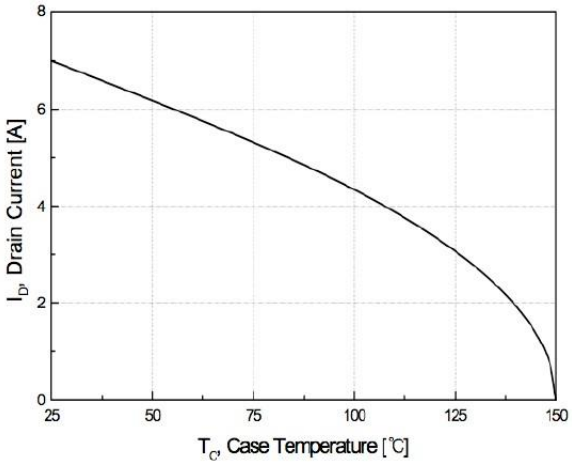

FIG.10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

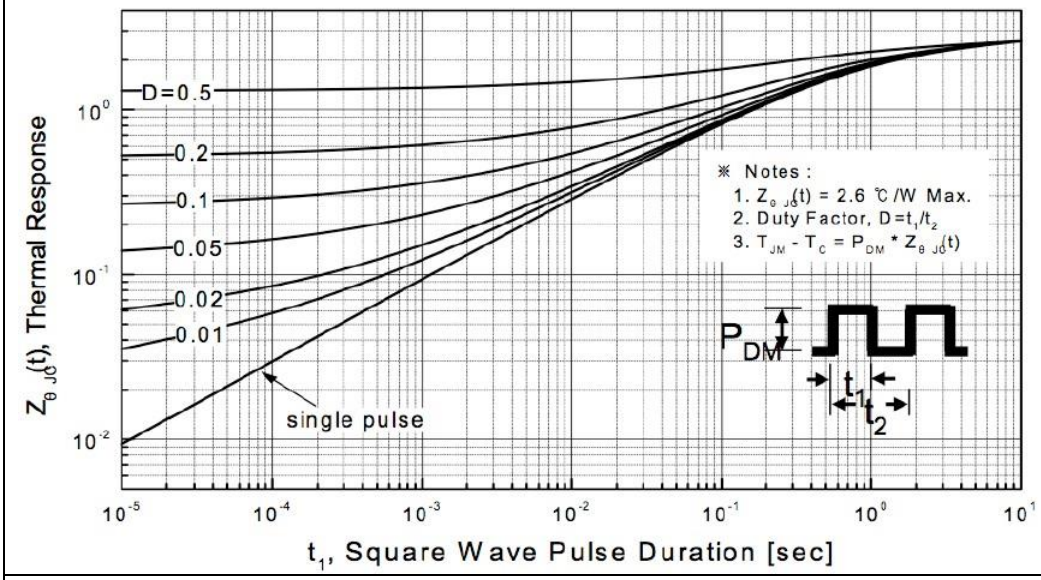

FIG.11-TRANSIENT THERMAL RESPONSE CURVE

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■Characteristics Test Circuit & Waveform

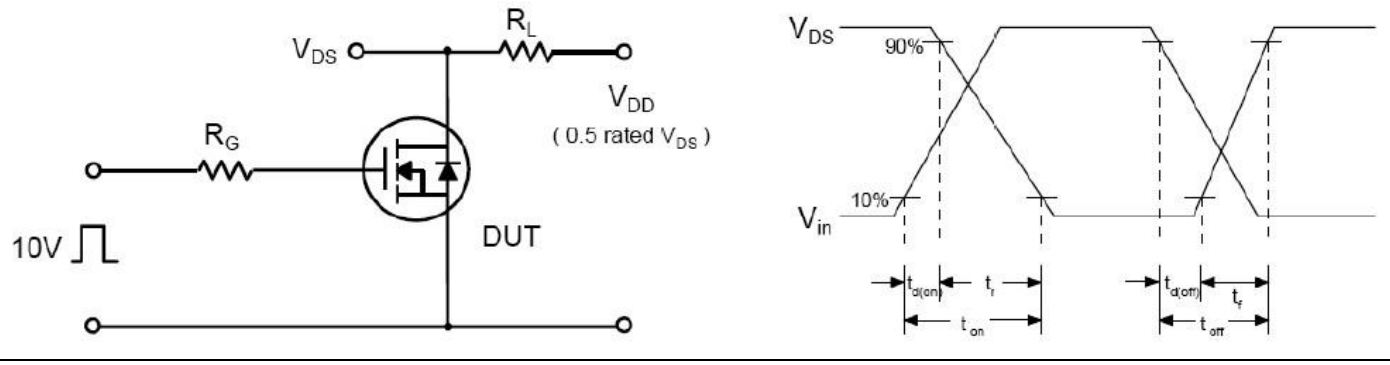

Fig 12. Resistive Switching Test Circuit & Waveforms

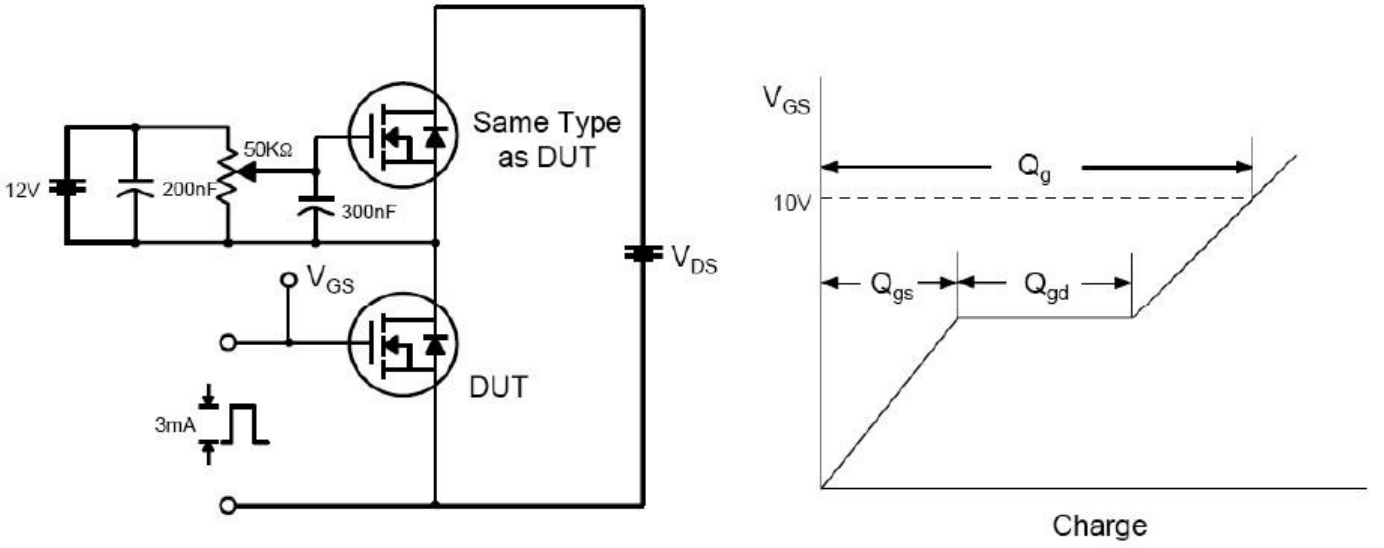

Fig 13. Gate Charge Test Circuit & Waveform

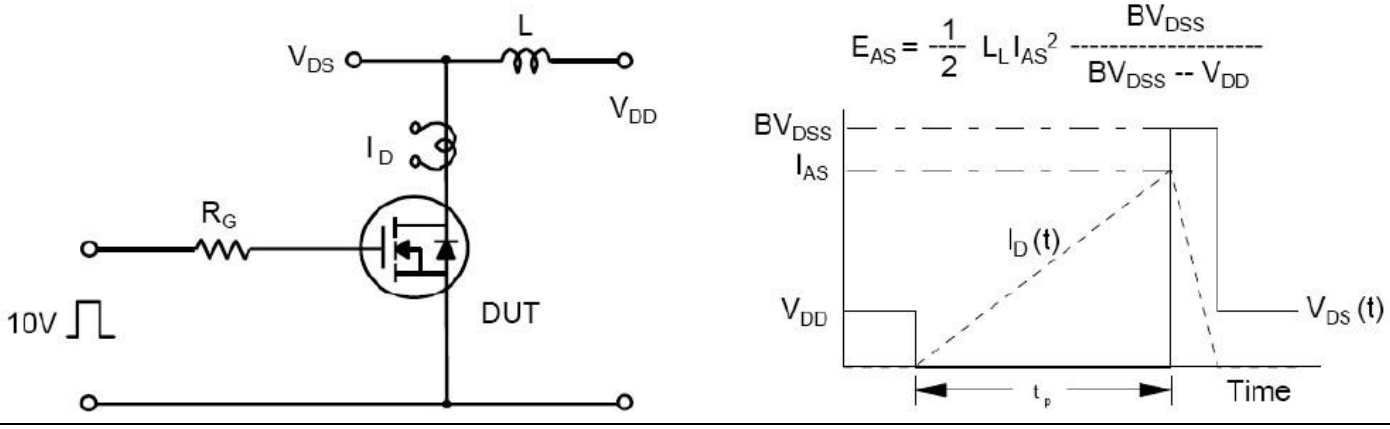

Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

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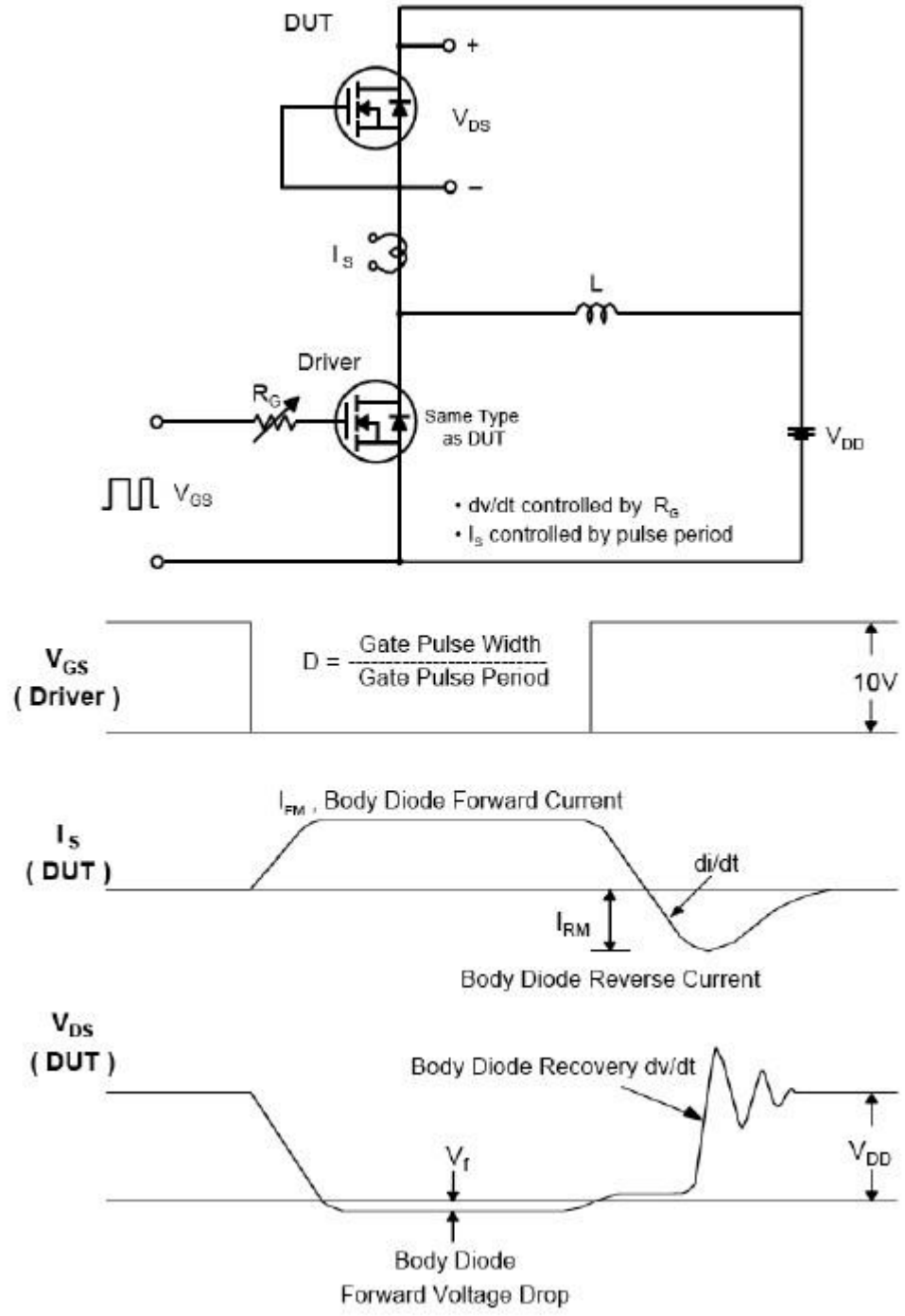

Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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