

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)

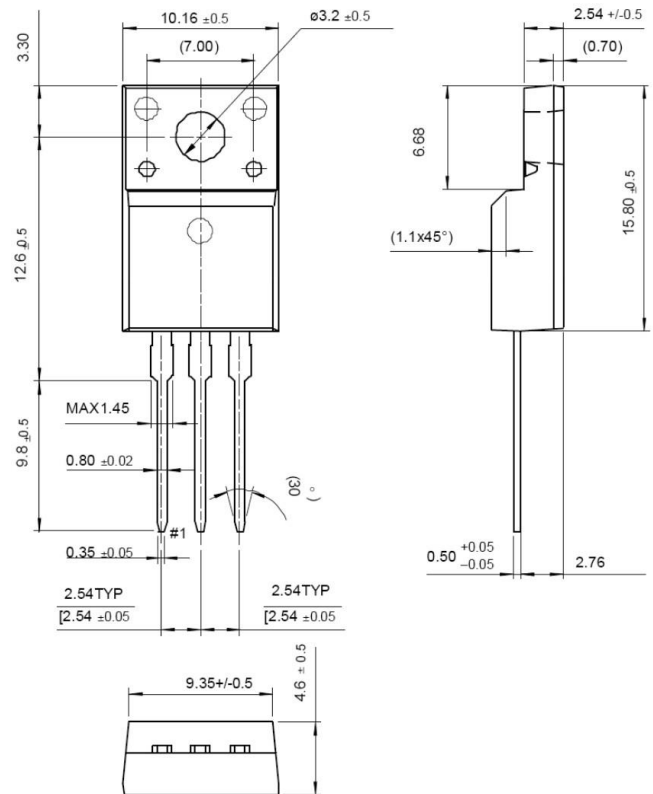
- Open Framed Power Supply
- Adapter
- STB

Packing & Order Information

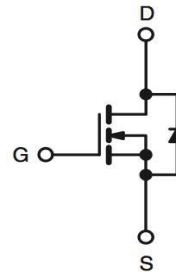
50/Tube ; 1,000/Box



**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 ($T_C = 25\text{ °C}$)	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 $T_J=25\text{ °C}$
3. $I_{SD}\leq 4A$, $di/dt\leq 200A/\mu s$, $V_{DD}\leq BV_{DSS}$, Starting $T_J=25\text{ °C}$

Thermal Characteristics ($T_c=25\text{ °C}$ 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	$V_{GS} = 0\text{ V}$, $I_D = 250\mu A$	600	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25°C	--	0.6	--	V/°C
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu A$	2.0	--	4.0	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{ V}$, $V_{GS} = 0\text{ V}$ $V_{DS} = 480\text{ V}$, $T_C = 125\text{ °C}$	--	--	1 10	μA
I_{GSS}	Gate-Body Leakage Forward	$V_{GS} = \pm 30$	--	--	± 100	nA
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}$, $I_D = 3.5\text{ A}$	--	0.9	1.4	Ω

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
C_{ISS}	Input Capacitance	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$	--	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	$V_{DS} = 300\text{ V}, I_D = 7\text{ A},$ $R_G = 25\ \Omega, V_{GS} = 10\text{ V}$	--	10	30	ns
t_r	Turn-On Time		--	40	80	ns
$t_{d(off)}$	Turn-Off Delay Time		--	40	100	ns
t_f	Turn-Off Fall Time		--	50	90	ns
Q_g	Total Gate Charge	$V_{DS} = 300\text{ V}, I_D = 7\text{ A},$ $V_{GS} = 10\text{ V}$	--	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		$V_D = V_G = 0$	--	--	4.0	A
I_{SM}		$V_S = 1.3\text{ V}$	--	--	16	
V_{SD}		$I_S = 4\text{ A}, V_{GS} = 0\text{ V}$	--	0.85	1.0	V
t_{rr}		$I_F = 7\text{ A}, V_{GS} = 0\text{ V}$	--	350	--	ns
Q_{rr}		$diF/dt = 100\text{ A}/\mu\text{s}$	--	3.3	--	μC

Notes;

1. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$

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■ Characteristics Curve

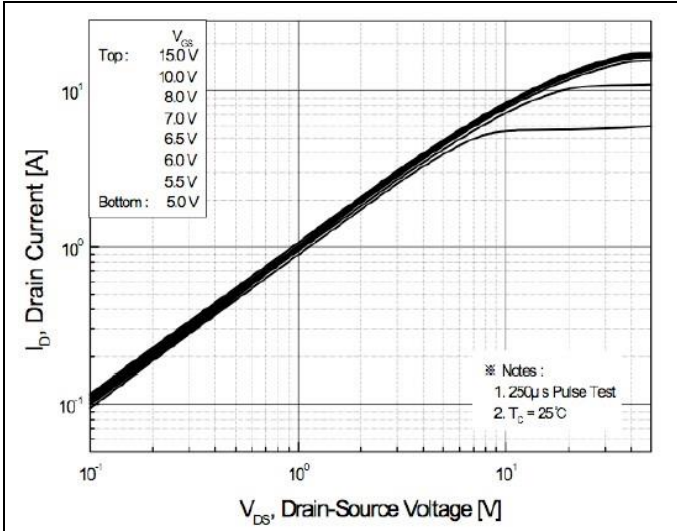


FIG.1-ON REGION CHARACTERISTICS

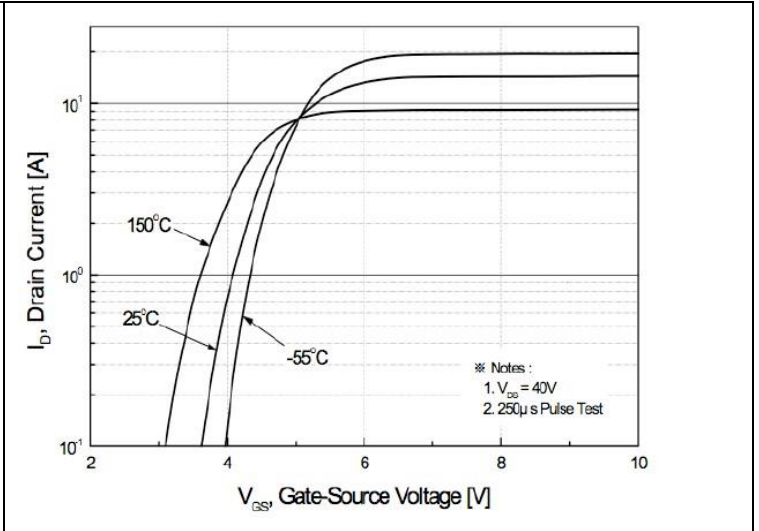


FIG.2-TRANSFER CHARACTERISTICS

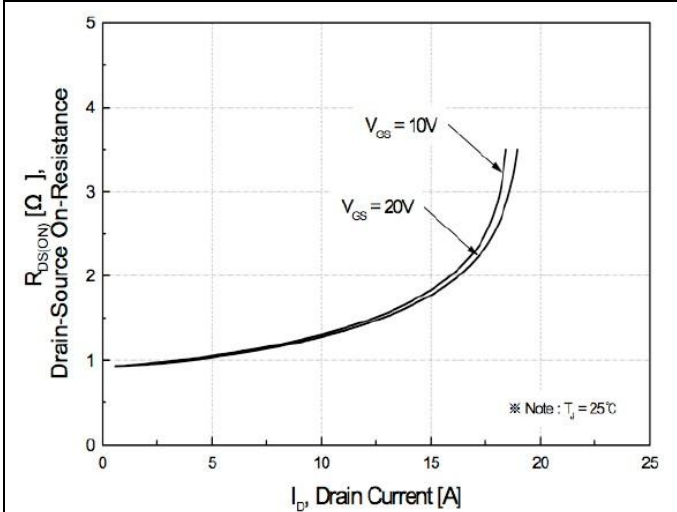


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

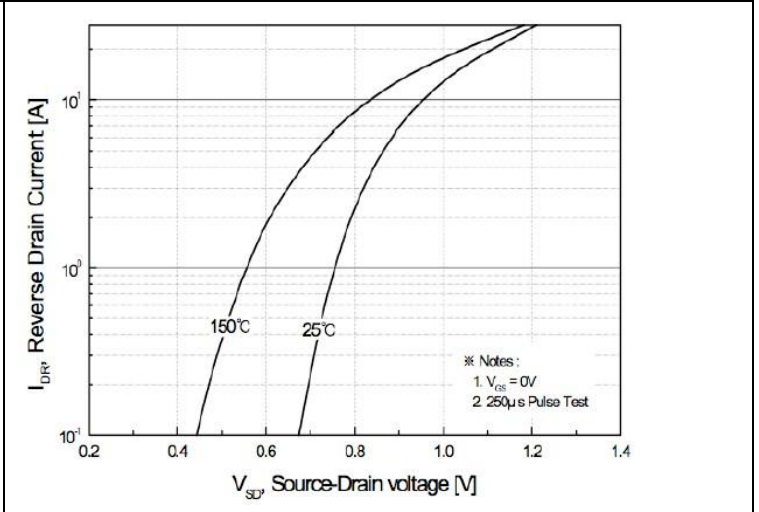


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

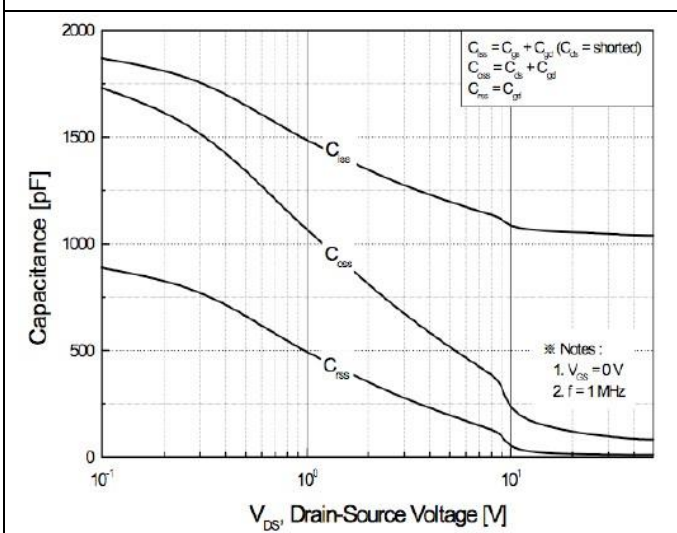


FIG.5-CAPACITANCE CHARACTERISTICS

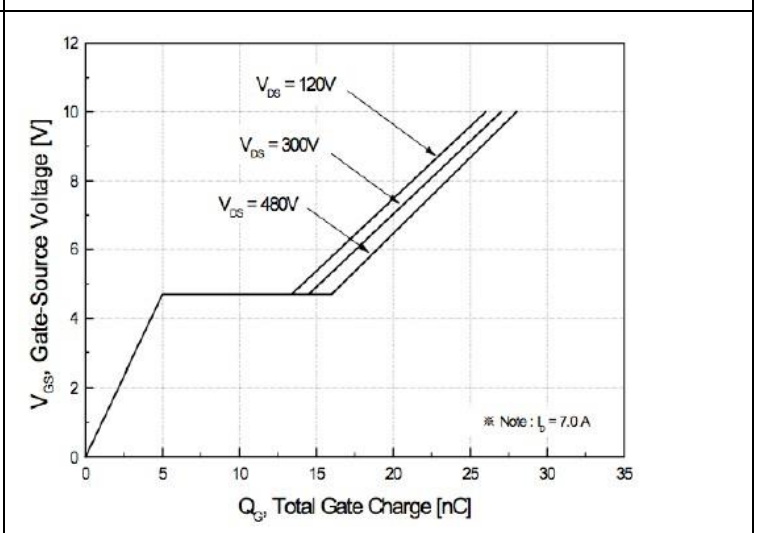


FIG.6-GATE CHARGE CHARACTERISTICS

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■ Characteristics Curve

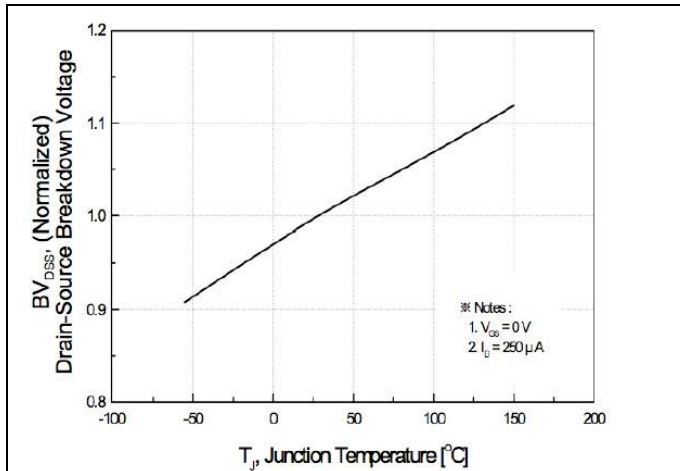


FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

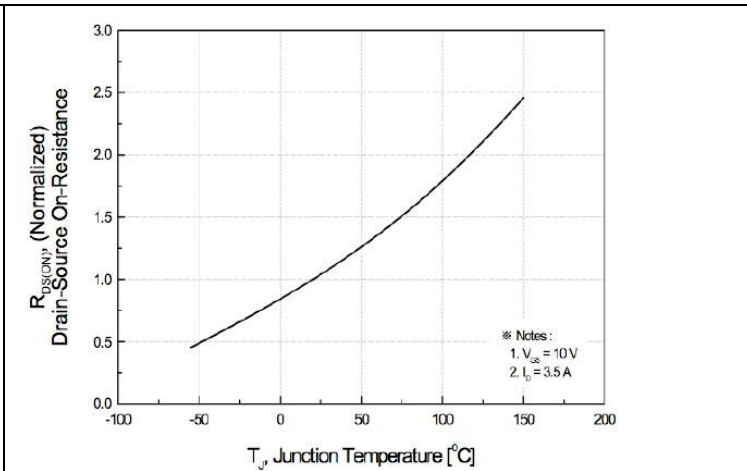


FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE

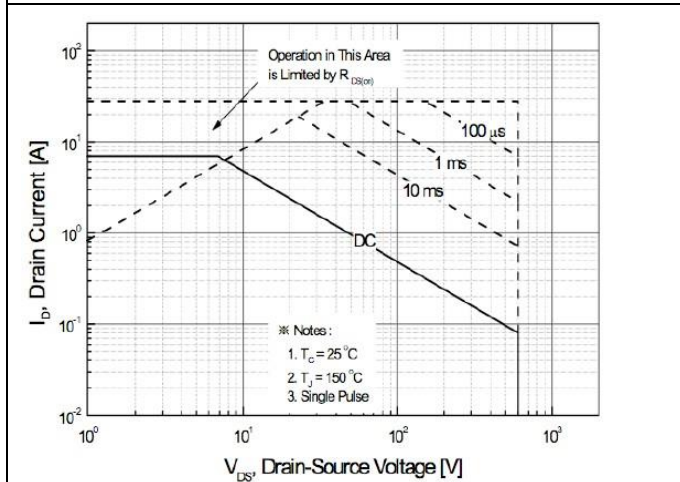


FIG.9-MAXIMUM SAFE OPERATING AREA

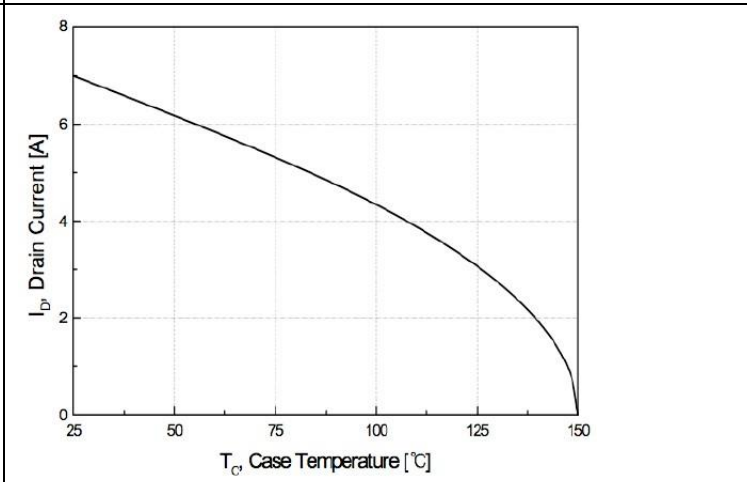


FIG.10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

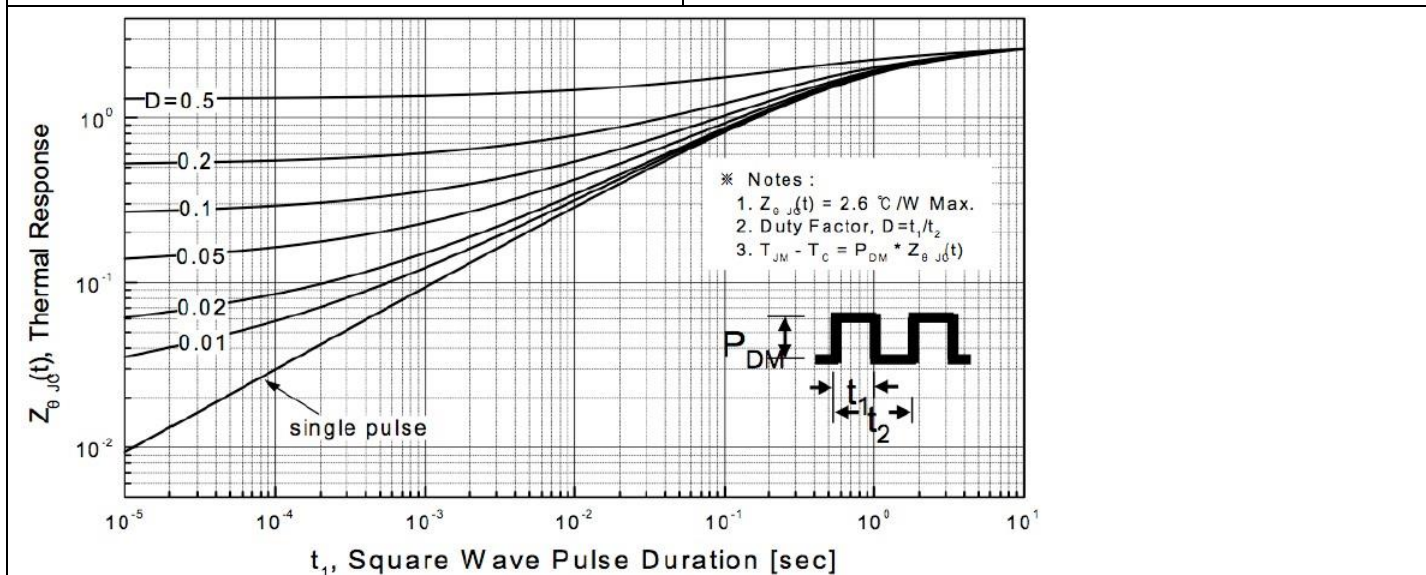


FIG.11-TRANSIENT THERMAL RESPONSE CURVE

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■ Characteristics Test Circuit & Waveform

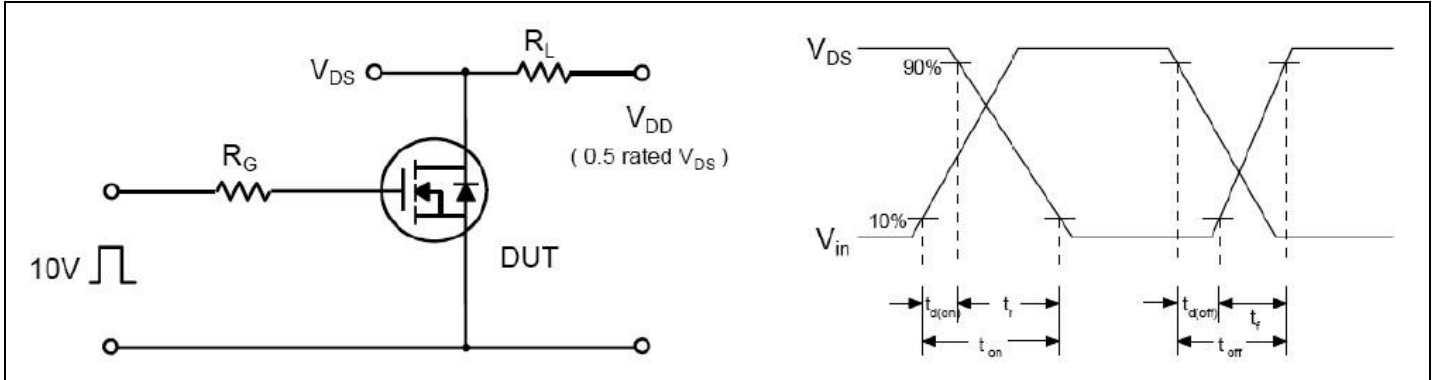


Fig 12. Resistive Switching Test Circuit & Waveforms

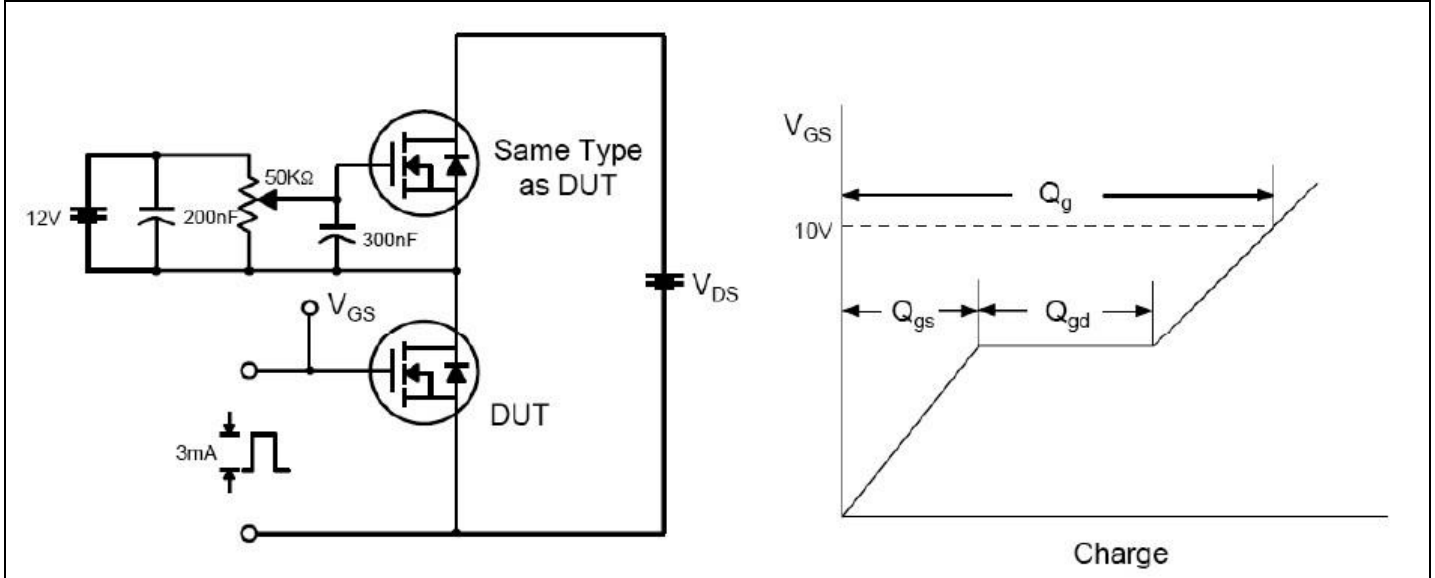


Fig 13. Gate Charge Test Circuit & Waveform

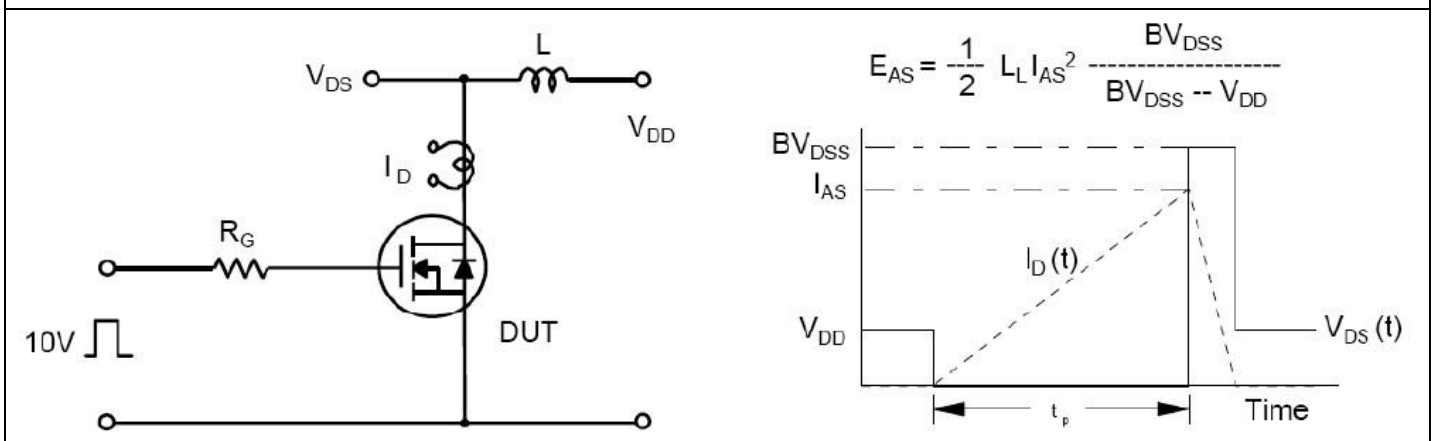


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

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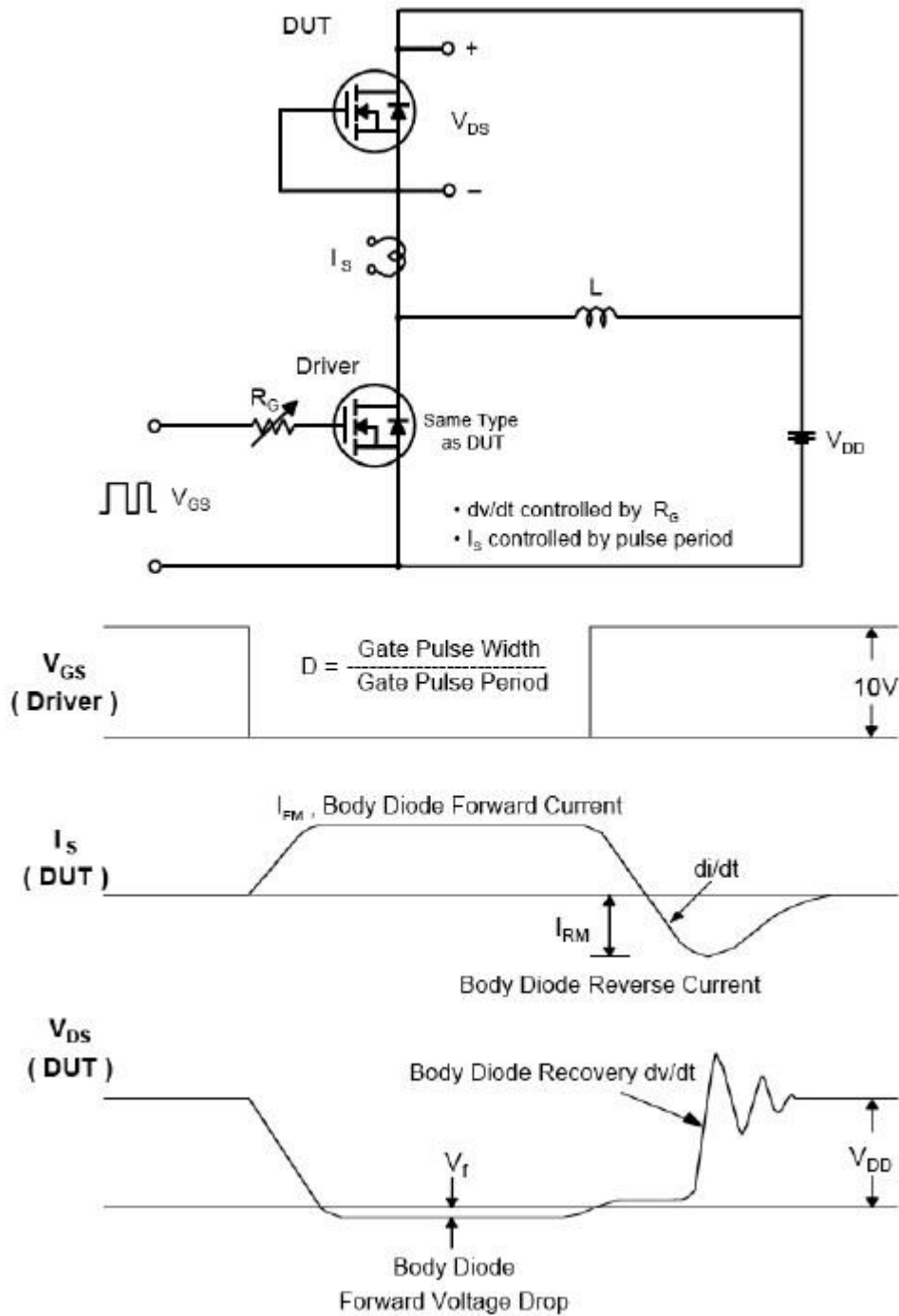


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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