

MSF10N40

400V N-Channel MOSFET

Description

The MSF10N40 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

- Originative New Design
- Very Low Intrinsic Capacitances
- Excellent Switching Characteristics
- 10.5A, 400V, $R_{DS(on)} = 0.55\Omega$ @ $V_{GS} = 10\text{ V}$
- Extended Safe Operating Area
- Low gate charge (typ 30nC)
- 100% Avalanche Tested
- RoHS compliant package

Application

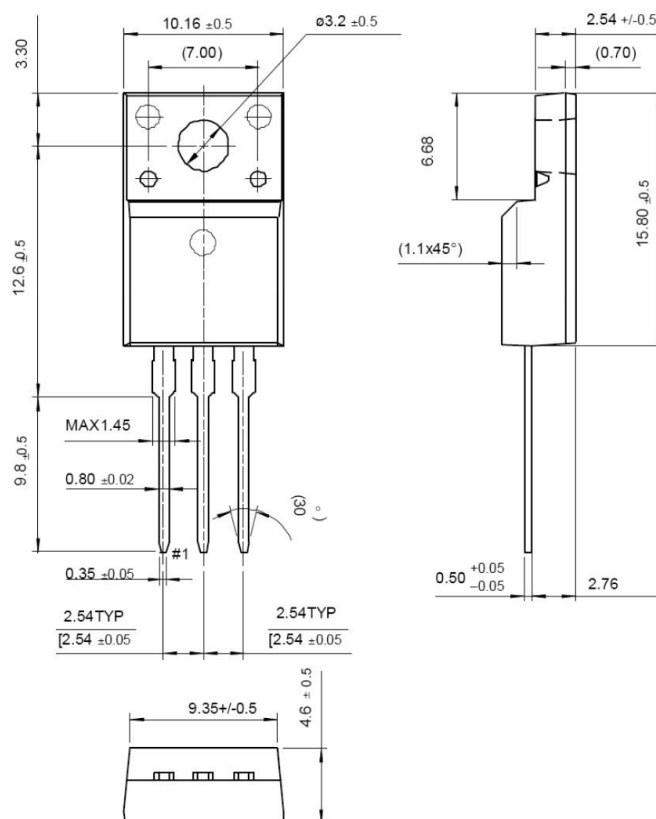
- Power Factor Correction
- LCD TV Power
- Full and Half Bridge Power

Packing & Order Information

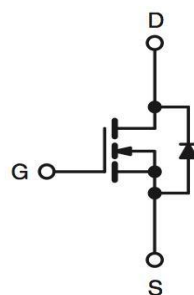
50/Tube ; 1,000/Box



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	400	V
V_{GS}	Gate-Source Voltage	± 30	V
I_D	Drain Current -Continuous (TC=25°C)	10.5	A
	Drain Current -Continuous (TC=100°C)	6.6	A
I_{DM}	Drain Current Pulsed	402	A
E_{AS}	Single Pulsed Avalanche Energy	378	mJ
I_{AR}	Avalanche Current	9.2	A
E_{AR}	Repetitive Avalanche Energy	13.9	mJ

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

Symbol	Parameter	Value	Unit
dV/dt	Peak Diode Recovery dV/dt	4.5	V/ns
P _D	Power Dissipation (TC = 25 °C)	45.5	W
	Derate above 25°C	0.36	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to +150	°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 characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Max.	Units
R _{θJC}	Junction-to-Case	2.25	°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} =10V, I _D =3A	--	1.95	2.4	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	--	1.03	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =900V , V _{GS} = 0 V V _{DS} =720V , T _C = 125°C	--	--	10 100	μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} =30V , V _{DS} =0 V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} =-30V , V _{DS} =0 V	--	--	-100	nA

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
C _{ISS}	Input Capacitance	V _{DS} =25V, V _{GS} =0V, f=1.0MHz	--	1500	2010	pF
C _{OSS}	Output Capacitance		--	145	190	pF
C _{RSS}	Reverse Transfer Capacitance		--	15	20	pF

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Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Time	$V_{DS}=450\text{ V}, I_D=6\text{ A}, R_G=25\Omega$	--	40	80	ns
t_r	Turn-On Time		--	120	240	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	120	ns
t_f	Turn-Off Fall Time		--	70	140	ns
Q_g	Total Gate Charge	$V_{DS}=720\text{ V}, I_D=6\text{ A}, V_{GS}=10\text{ V}$	--	33	45	nC
Q_{gs}	Gate-Source Charge		--	10	--	nC
Q_{gd}	Gate-Drain Charge		--	13	--	nC

Source-Drain Diode Maximum Ratings and Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
I_S	Continuous Source-Drain Diode Forward Current		--	--	6.0	A
I_{SM}	ISM Pulsed Source-Drain Diode Forward Current		--	--	24.0	
V_{SD}	Source-Drain Diode Forward Voltage	$I_S=6\text{ A}, V_{GS}=0\text{ V}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$I_S=6\text{ A}, V_{GS}=0\text{ V}$ $diF/dt=100\text{ A}/\mu\text{s}$	--	780	--	ns
Q_{rr}	Reverse Recovery Charge		--	9.0	--	μC

Notes;

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L=34\text{ mH}, I_{AS}=6\text{ A}, V_{DD}=50\text{ V}, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. $I_{SD}\leq 6\text{ A}, di/dt\leq 200\text{ A}/\mu\text{s}, V_{DD}\leq BV_{DSS}$, 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

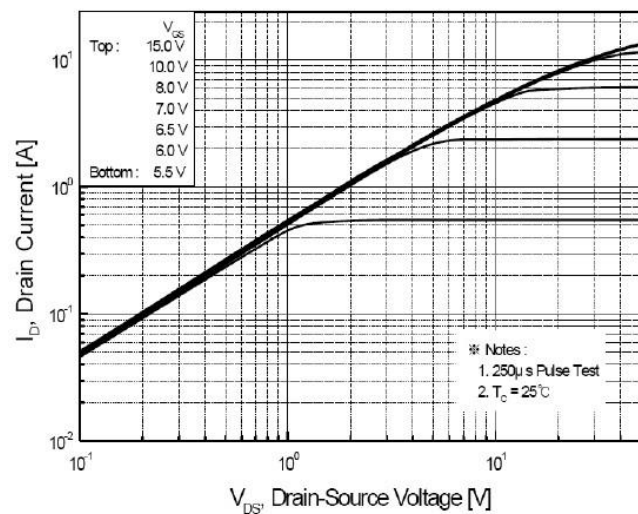


FIG.1-ON REGION CHARACTERISTICS

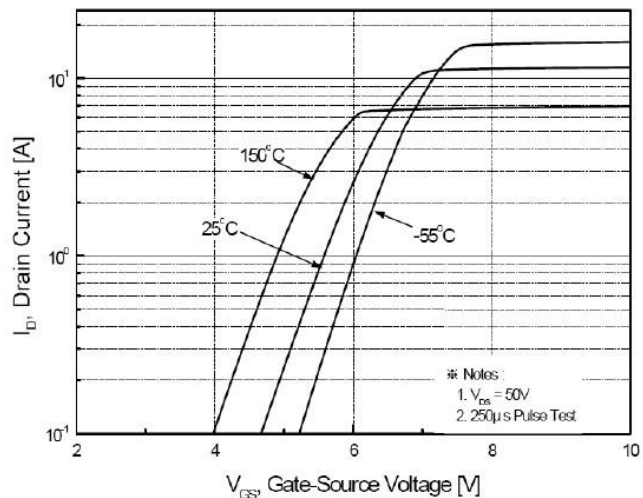


FIG.2-TRANSFER CHARACTERISTICS

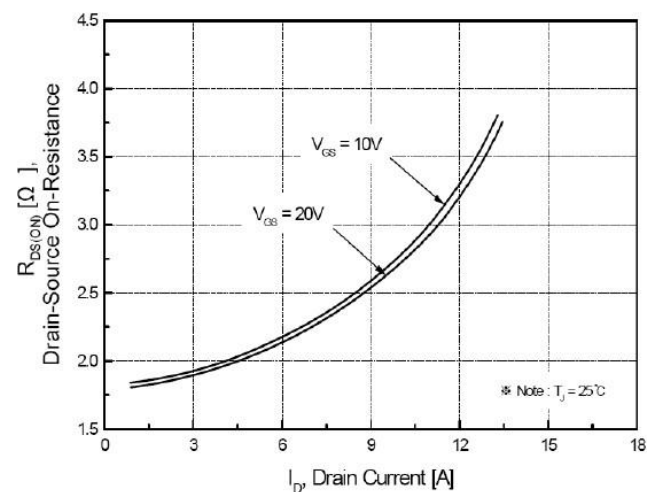


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

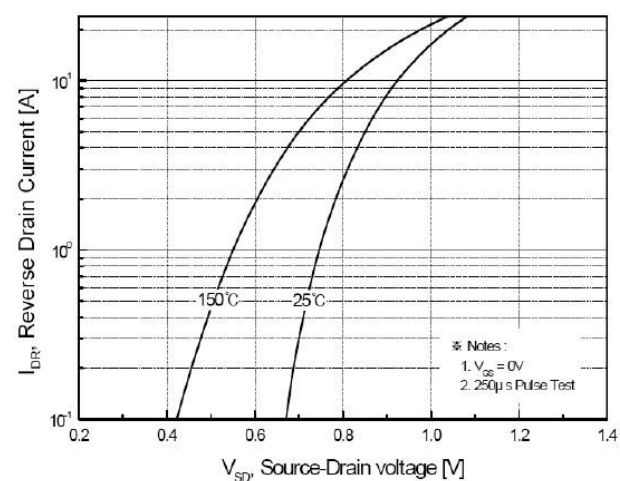


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

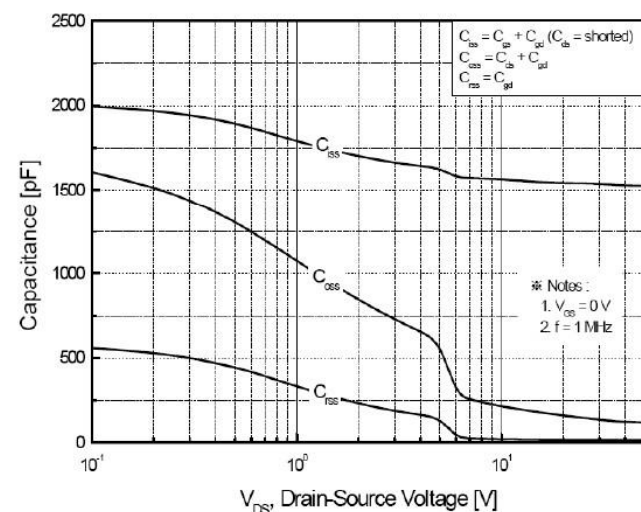


FIG.5-CAPACITANCE CHARACTERISTICS

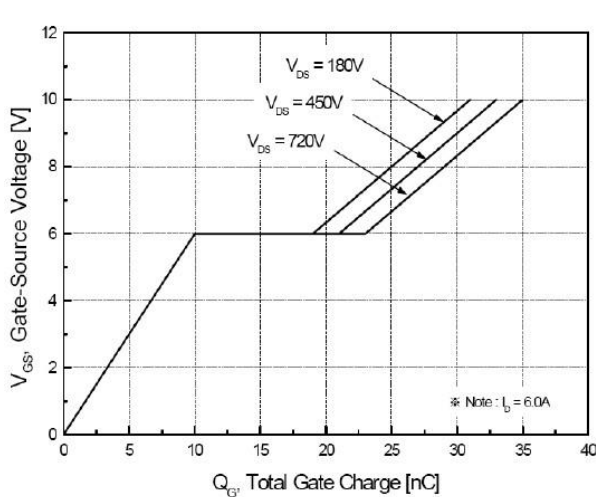


FIG.6-GATE CHARGE CHARACTERISTICS

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■ Characteristics Curve

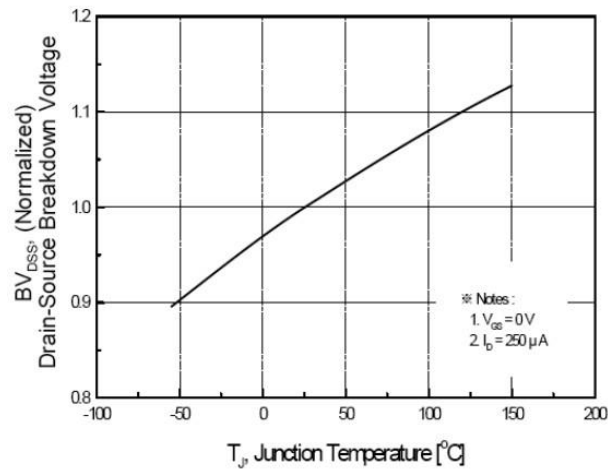


FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

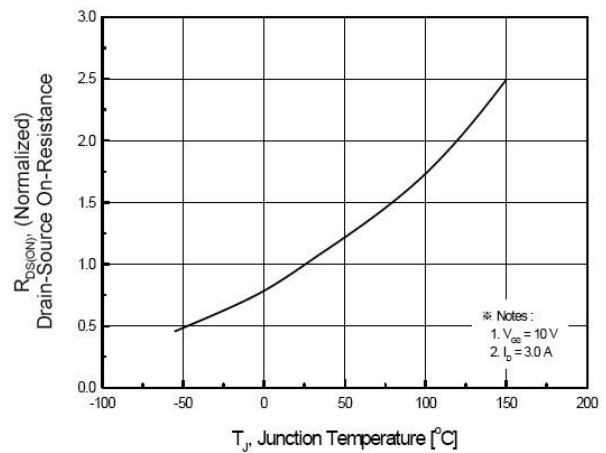


FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE

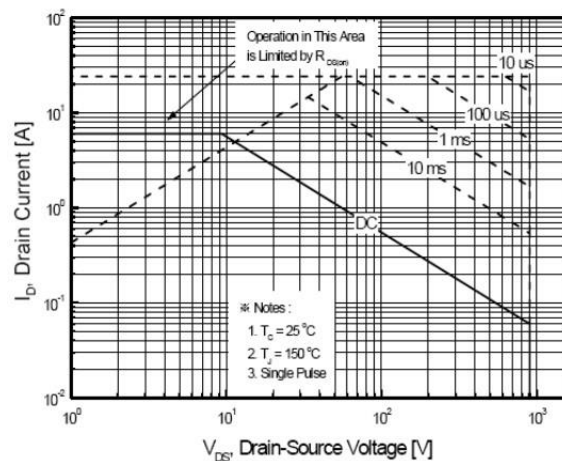


FIG.9-MAXIMUM SAFE OPERATING AREA

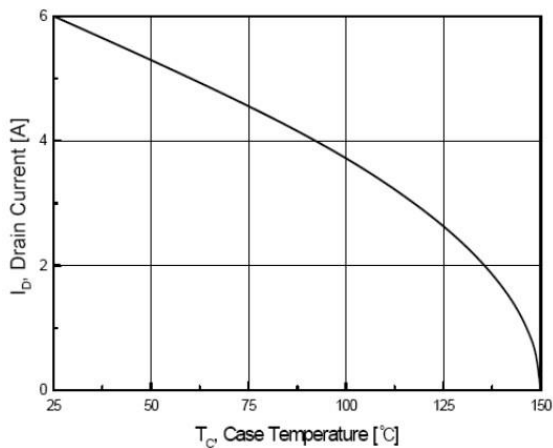


FIG.10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

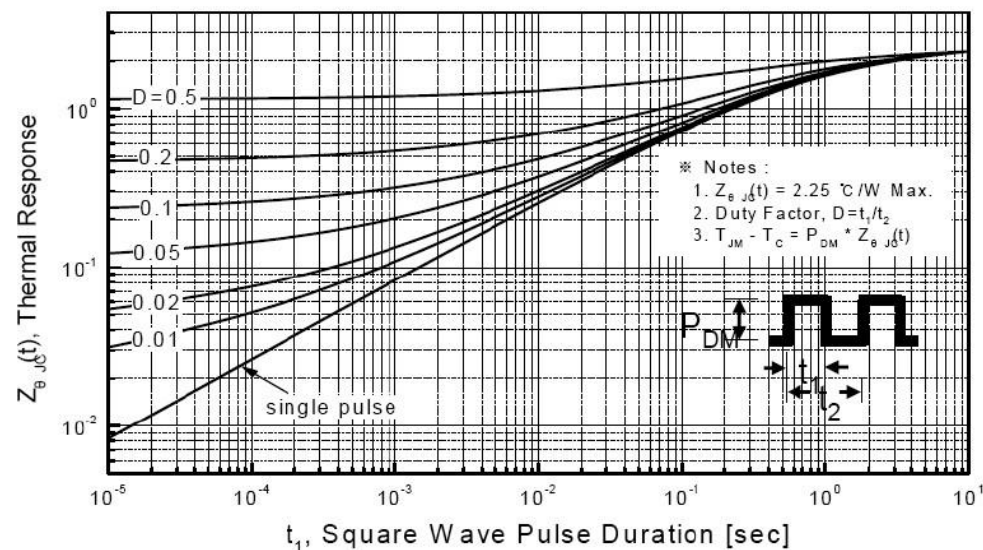


FIG.11-TRANSIENT THERMAL RESPONSE CURVE

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■ Characteristics Test Circuit & Waveform

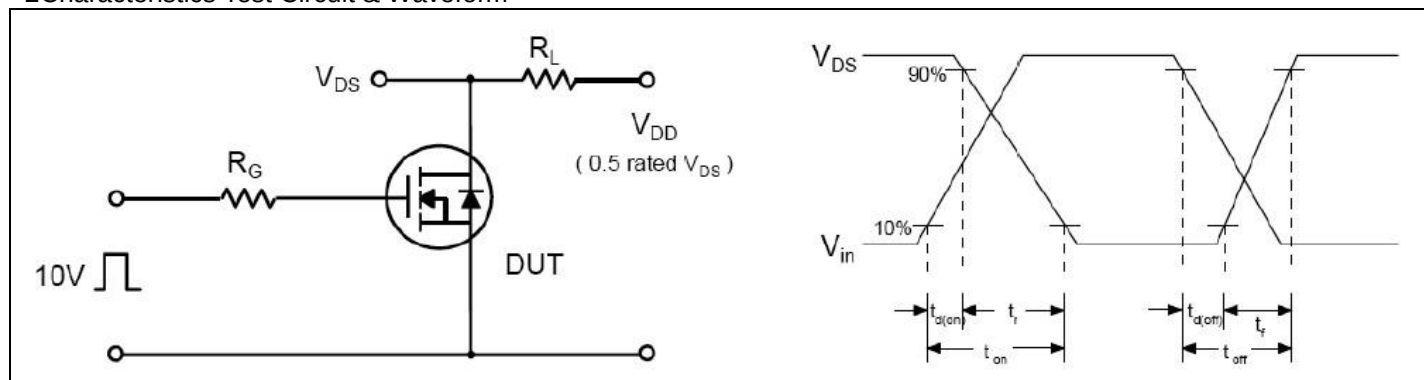


Fig 12. Resistive Switching Test Circuit & Waveforms

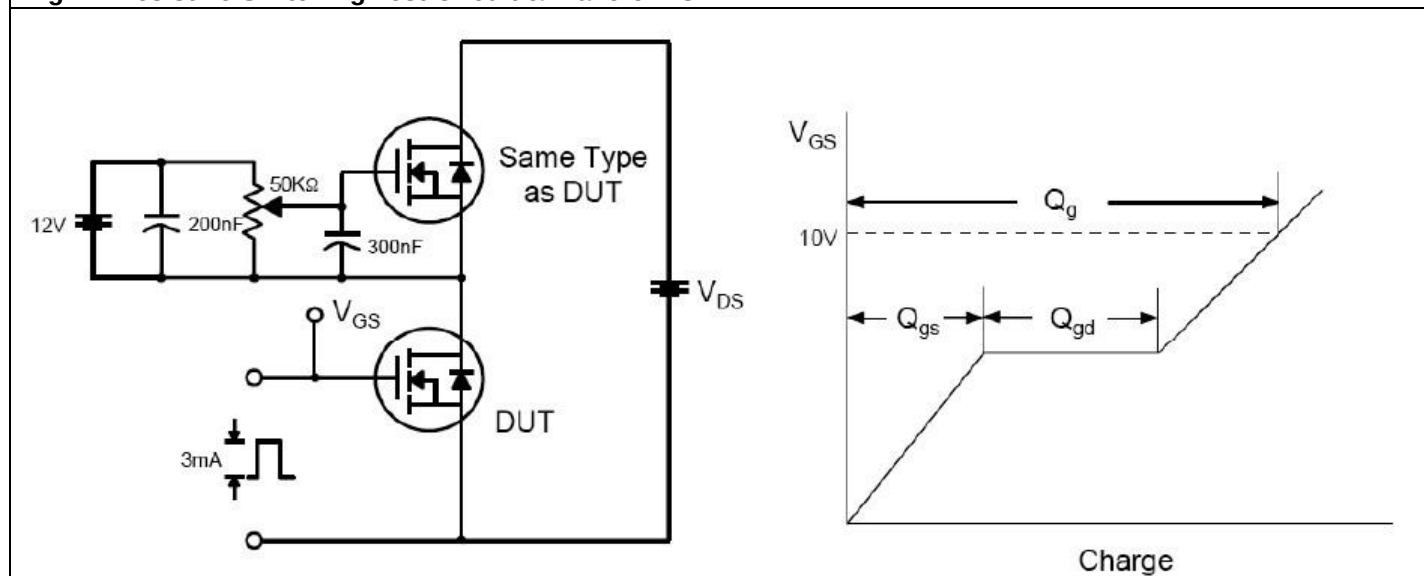


Fig 13. Gate Charge Test Circuit & Waveform

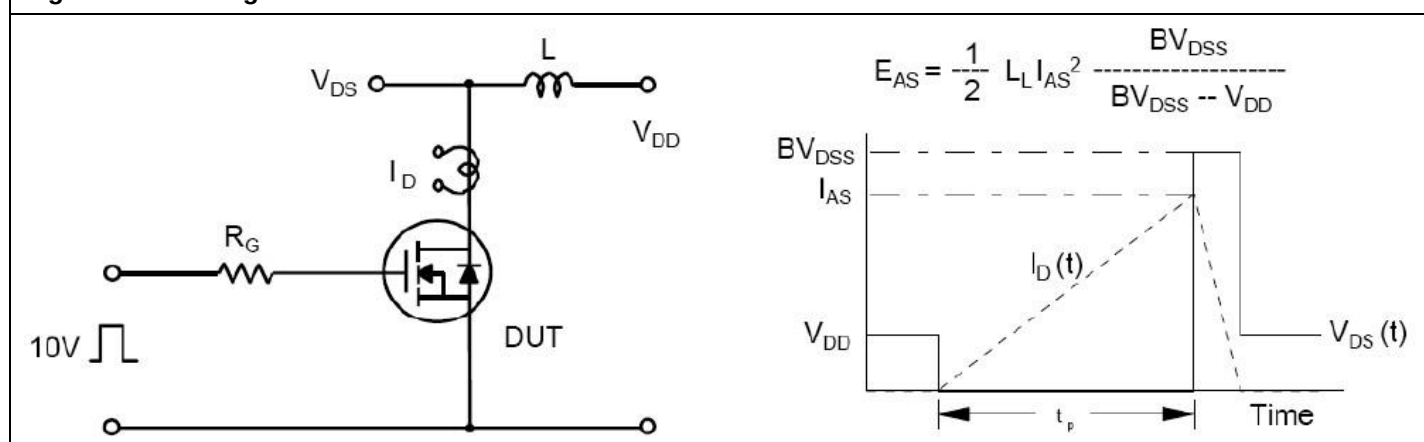


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

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