

# MS 10N60

## 600V N-Channel MOSFET

### Description

The MS13N50 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-220AB package is universally preferred for all commercial-industrial applications

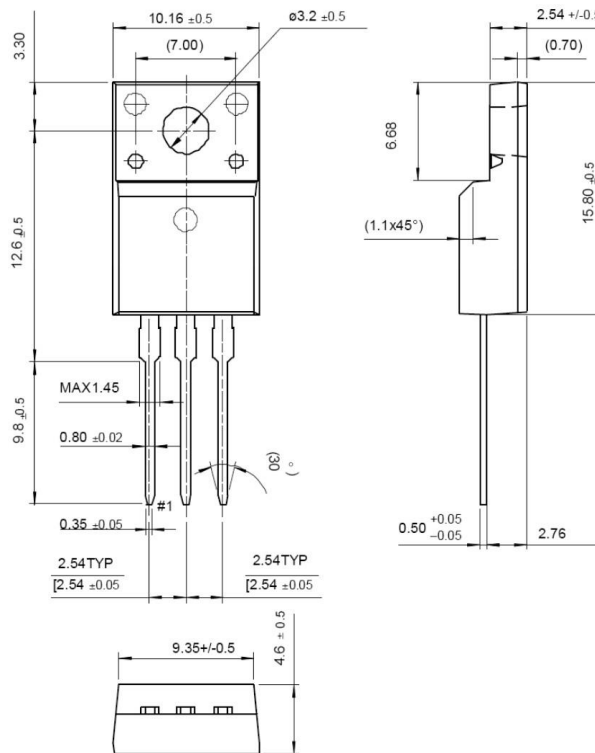
### Features

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

**Package type :** TO-220AB

### Packing & Order information

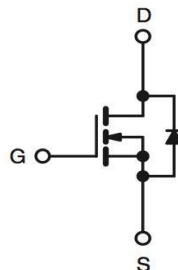
Shipping : 50/Tube ; 1,000/Box



Graphic symbol



**RoHS  
COMPLIANT**



## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-Source Voltage	600	V
V <sub>GS</sub>	Gate-Source Voltage	±30	V
I <sub>D</sub>	Drain Current -Continuous (TC=25°C)	9.5	A
	Drain Current -Continuous (TC=100°C)	5.7	A
I <sub>DM</sub>	Drain Current -Pulsed	38	A
E <sub>AS</sub>	Avalanche Energy	700	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy	15.6	mJ
dv/dt	Peak Diode Recovery dv/dt	4.5	V/ns
P <sub>D</sub>	Power Dissipation (TC=25°C)	50	W
	Power Dissipation (TC=100°C)	0.38	W/°C
T <sub>J</sub> /T <sub>STG</sub>	Operating Junction and Storage Temperature	-55 to +150	°C

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NOTE:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS}=9.5A$ ,  $V_{DD}=50V$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ C$
3.  $I_{SD}\leq 9.5A$ ,  $di/dt\leq 300A/\mu s$ ,  $V_{DD}\leq BVDSS$ , Starting  $T_J=25^\circ C$
4. Pulse test : Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating temperature

#### Static Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
$BV_{DSS}$	$V_{GS} = 0 V$ , $I_D = 250\mu A$	600	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	$I_D=250\mu A$ , Referenced to $25^\circ C$	--	0.70	--	
$V_{GS}$	$V_{DS} = V_{GS}$ , $I_D = 250\mu A$	2.0		4.0	V
$*R_{DS(ON)}$	$V_{GS} = 10 V$ , $I_D = 4.75 A$	--	0.6	0.73	$\Omega$
$I_{DSS}$	$V_{DS} = 600 V$ , $V_{GS} = 0 V$ $V_{DS} = 480 V$ , $V_{GS} = 0 V$ , $T_J= 125^\circ C$	--	--	1 10	$\mu A$
$I_{GSSF}$	$V_{GS} = 30 V$ , $V_{DS} = 0 V$	--	--	100	nA
$I_{GSSR}$	$V_{GS} = -30 V$ , $V_{DS} = 0 V$	--	--	-100	nA

#### Dynamic Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
$Q_g$	$V_{DS} = 480 V, I_D = 9.5 A$ , $V_{GS} = 10 V$	--	44	57	nC
$Q_{gs}$		--	6.7	--	
$Q_{gd}$		--	18.5	--	
$t_{d(on)}$	$V_{DS} = 300 V$ , $I_D = 9.5 A$ , $R_G = 25 \Omega$	--	23	55	ns
$t_r$		--	69	150	ns
$t_{d(off)}$		--	144	300	ns
$t_f$		--	77	165	ns
$C_{ISS}$	$V_{DS} = 25 V$ , $V_{GS} = 0 V$ , $f=1.0MHz$	--	1570	2040	pF
$C_{OSS}$		--	166	215	pF
$C_{RSS}$		--	18	24	pF

#### Source-Drain Diode Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
$I_S$		--	--	9.5	A
$I_{SM}$		--	--	38	
$V_{SD}$	$I_S = 9.5 A$ , $V_{GS}=0$	--	--	1.4	V
$t_{rr}$	$I_S = 9.5 A$ , $V_{GS}=0$ , $dI_F/dt=100A/\mu s$	--	420	--	nS
$Q_{rr}$		--	4.2	--	$\mu C$

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#### ■ Characteristics Curve

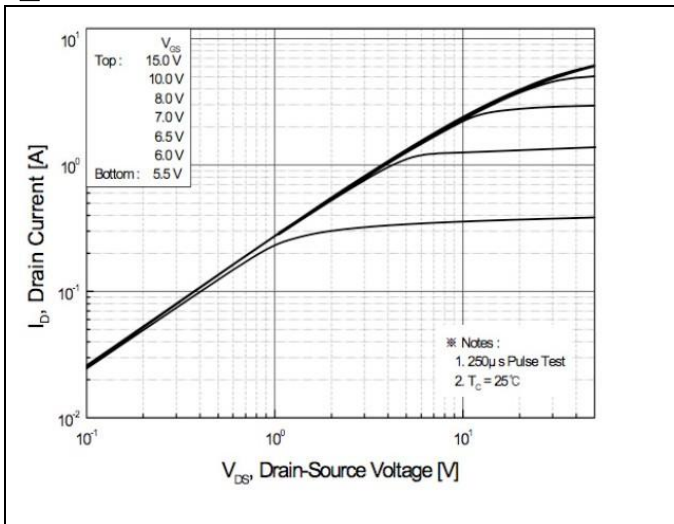


FIG.1-ON REGION CHARACTERISTICS

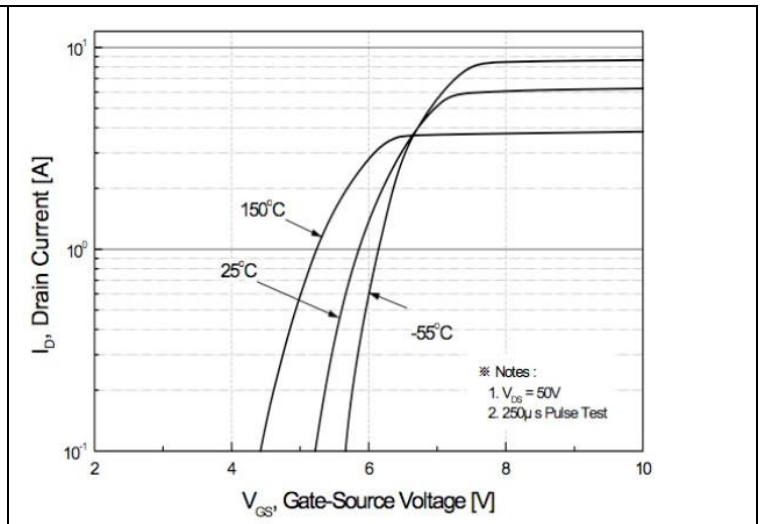


FIG.2-TRANSFER CHARACTERISTICS

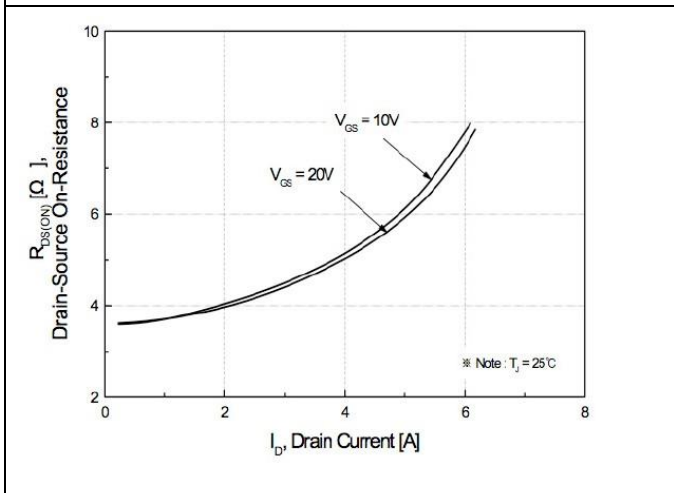


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

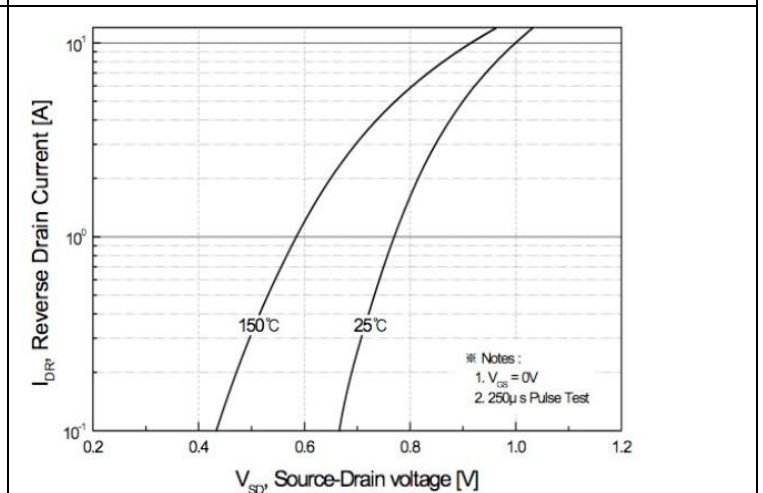


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

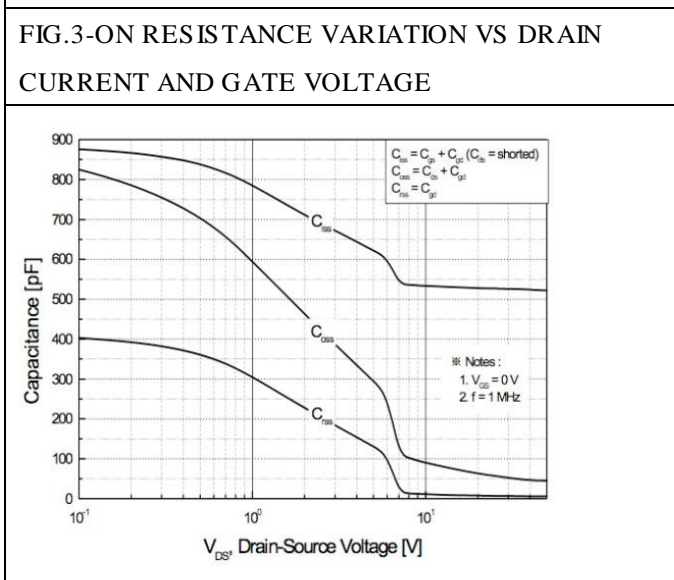


FIG.5-CAPACITANCE CHARACTERISTICS

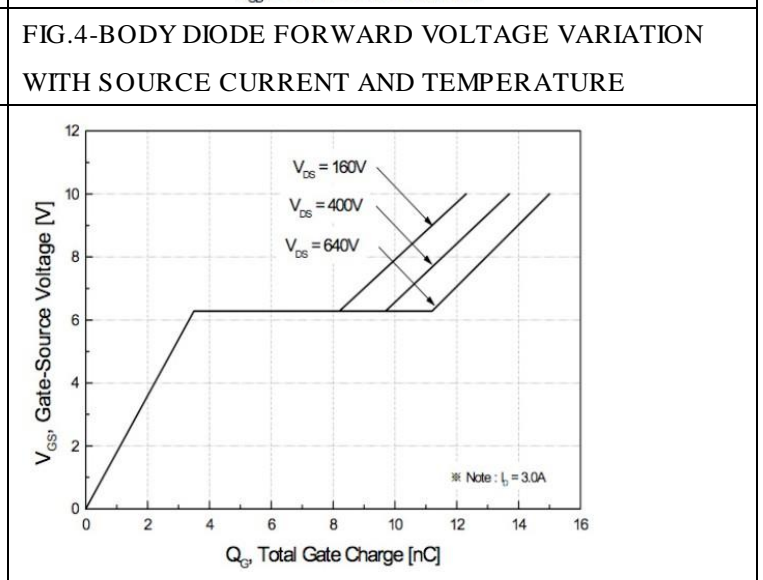


FIG.6-GATE CHARGE CHARACTERISTICS

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#### Characteristics Curve

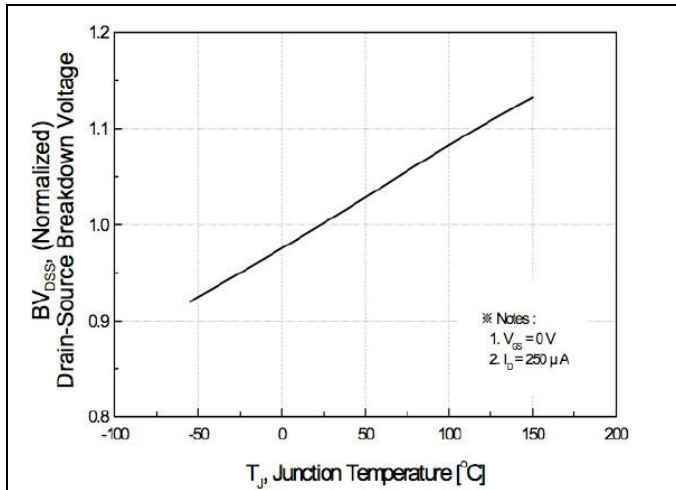


FIG. 7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

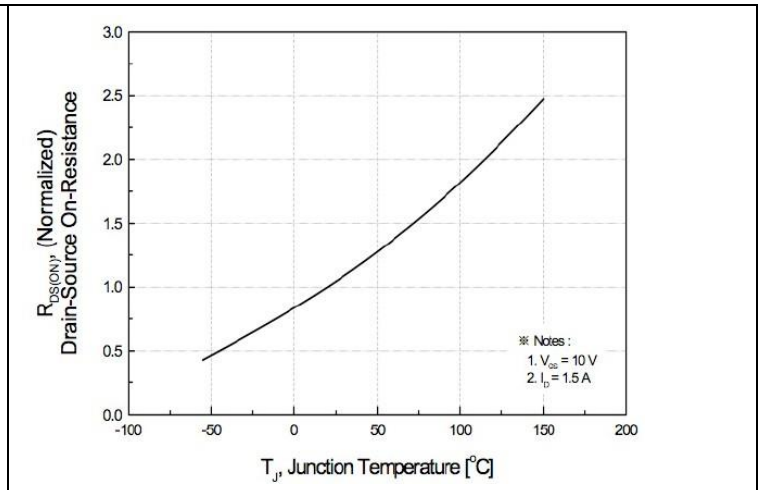


FIG. 8-ON-RESISTANCE VARIATION VS TEMPERATURE

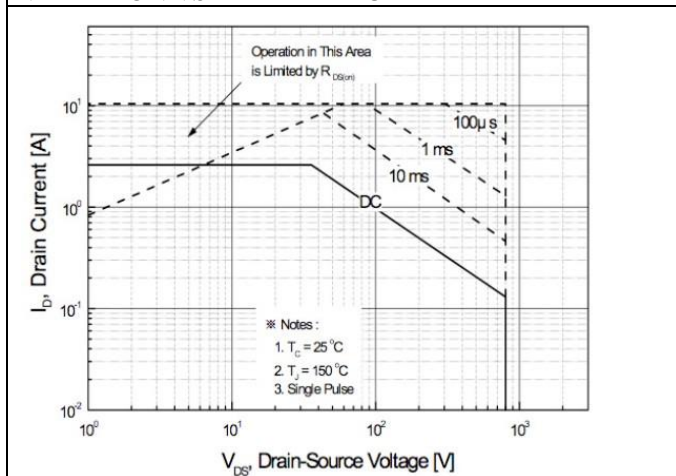


FIG. 9-MAXIMUM SAFE OPERATING AREA

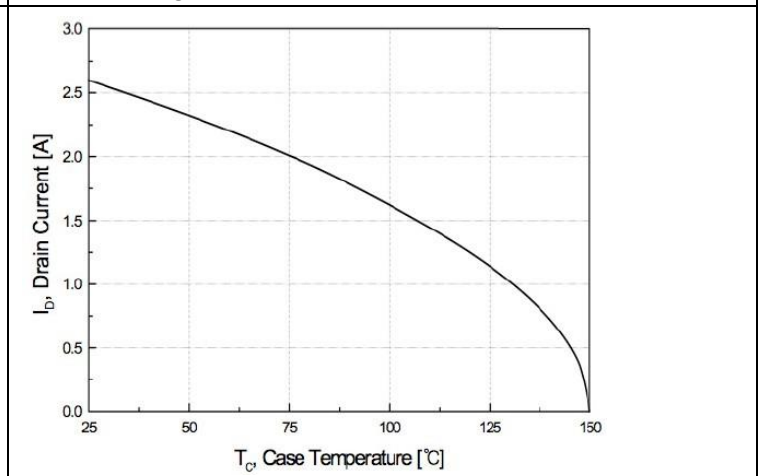


FIG. 10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

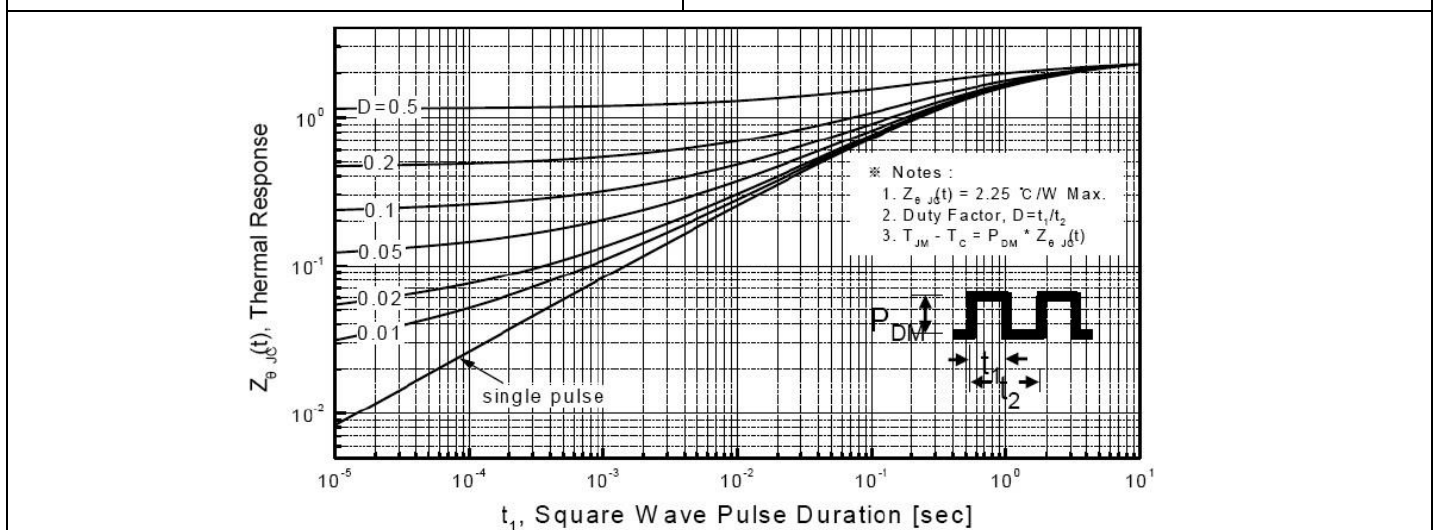


FIG. 11-TRANSIENT THERMAL RESPONSE CURVE

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#### ■ Characteristics Test Circuit & Waveform

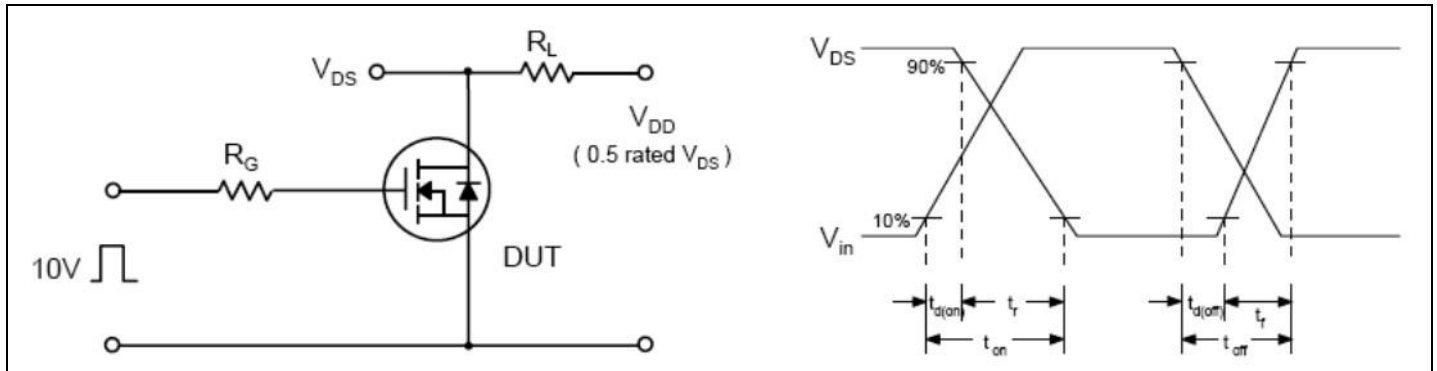


FIG.12-RESISTIVE SWITCHING TEST CIRCUIT & WAVEFORMS

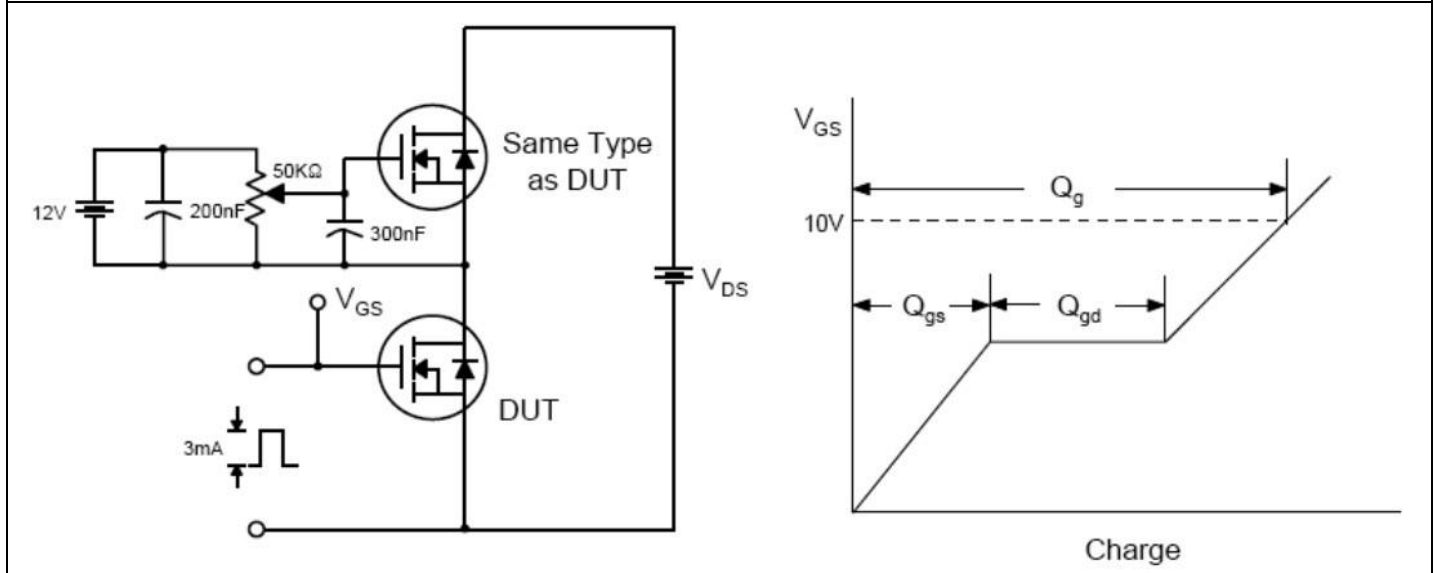


FIG.13-GATE CHARGE TEST CIRCUIT & WAVEFORM

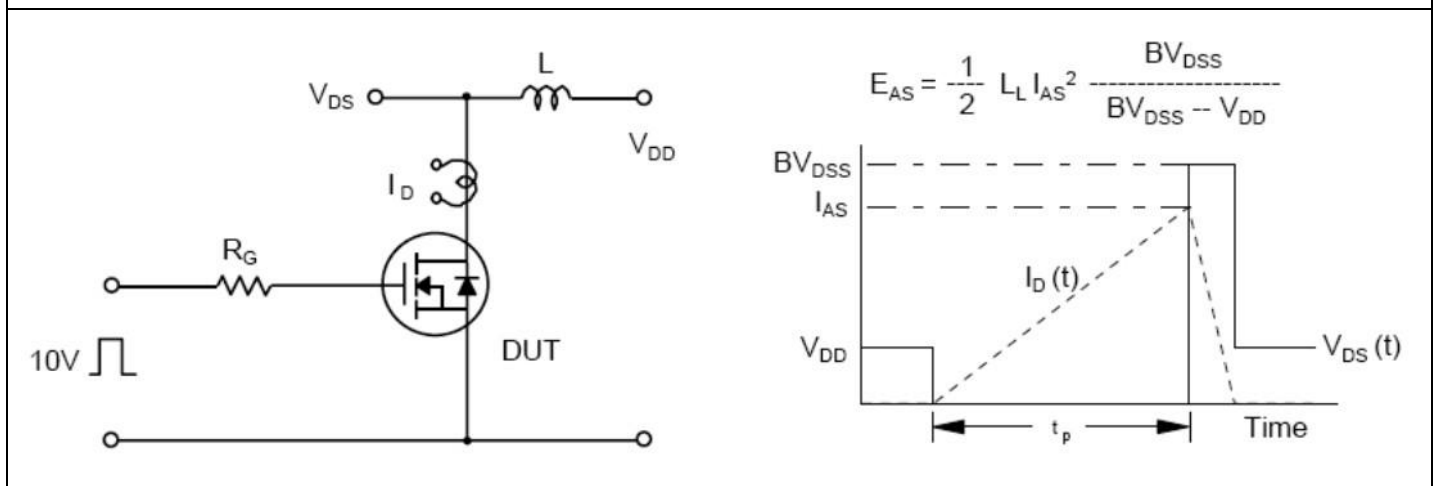


FIG.14-UNCLAMPED LINDUCTIVE SWITCHING TEST CIRCUIT & WAVEFORMS

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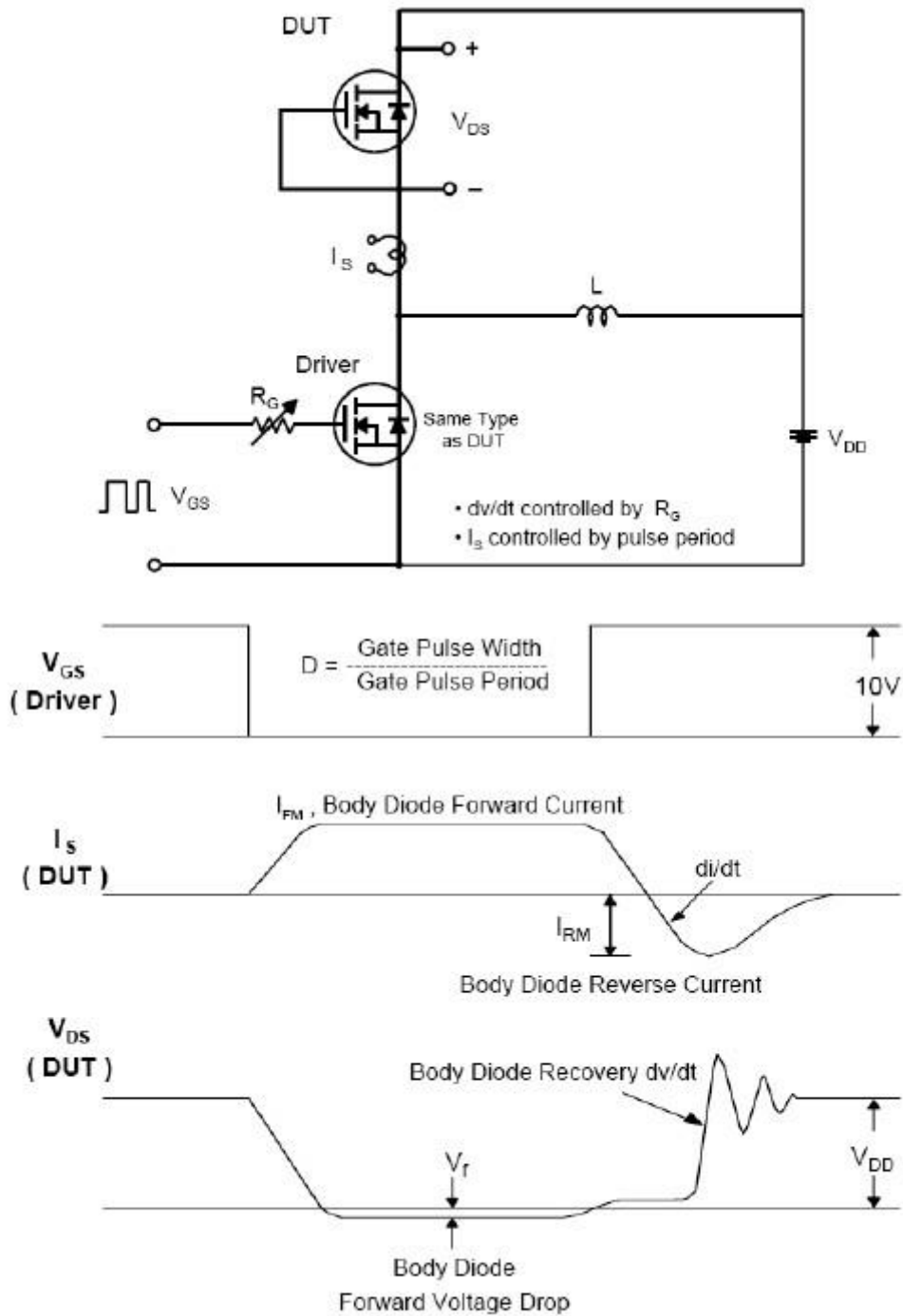


Fig 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

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#### Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE

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