

## MSW16N50

### 500V N-Channel MOSFET

#### Description

This latest technology has been especially designed to minimize on-state resistance, have a high rugged avalanche characteristics. These devices are well suited for high efficiency switch mode power supplies.

#### Features

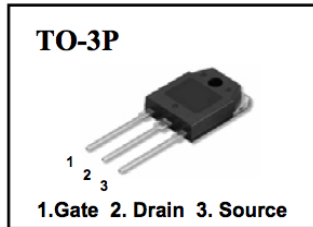
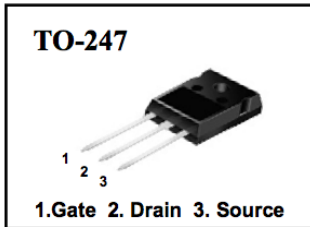
- Originative New Design
- Very Low Intrinsic Capacitances
- Excellent Switching Characteristics
- 100% EAS Test
- Extended Safe Operating Area
- RoHS compliant package

#### Application

- High current, High speed switching
- PFC (Power Factor Correction)
- SMPS (Switched Mode Power Supplies)

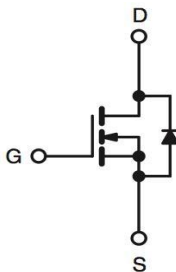
#### Packing & Order Information

30/Tube ; 540/Box

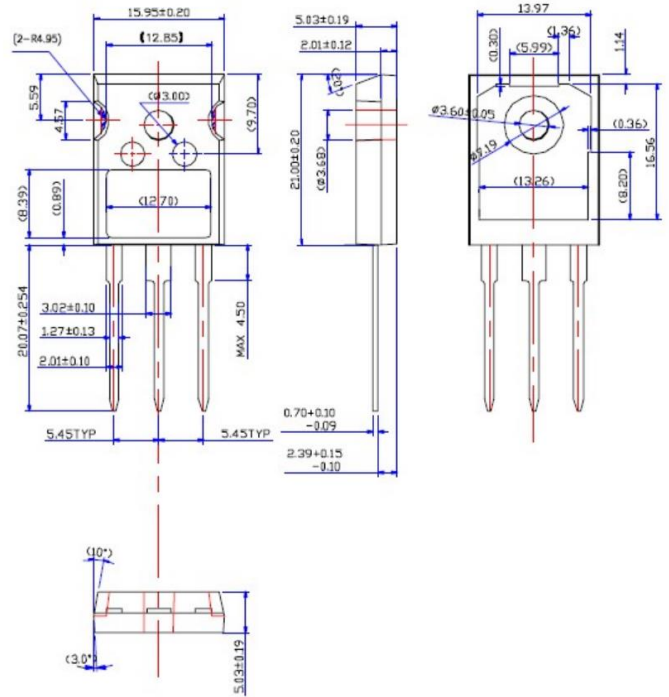


**RoHS**  
COMPLIANT

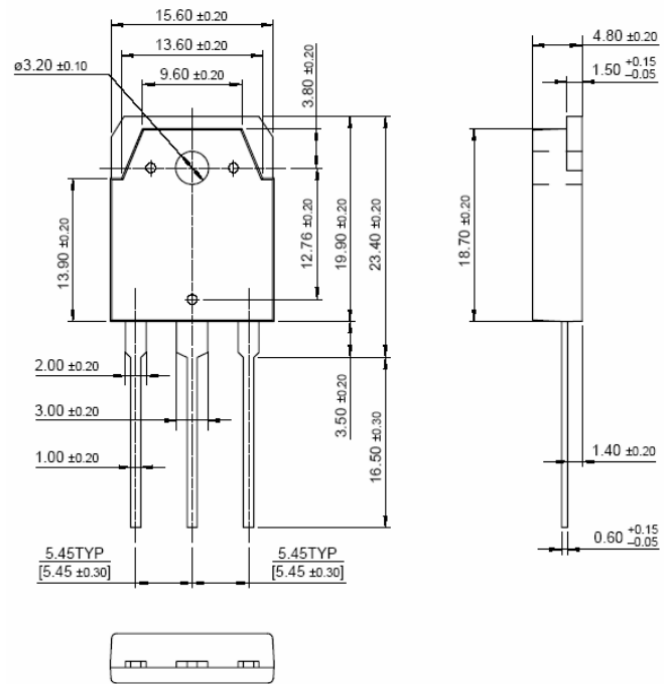
#### Graphic symbol



#### TO-247



#### TO-3P



# MSW16N50

## 500V N-Channel MOSFET

### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-Source Voltage	500	V
V <sub>GS</sub>	Gate-Source Voltage	±30	V
I <sub>D</sub>	Drain Current -Continuous (TC=25°C)	16	A
	Drain Current -Continuous (TC=100°C)	10	A
I <sub>DM</sub>	Drain Current Pulsed	64	A
E <sub>AS</sub>	Single Pulsed Avalanche Energy	896	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy	20.5	mJ
P <sub>D</sub>	Power Dissipation (TC = 25 °C)	205	W
	- Derate above 25°C	2.1	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +175	°C

#### Note:

1. Pulse width limited by maximum junction temperature
2. Duty cycle ≤ 1%

#### Thermal Resistance Characteristics

Symbol	Parameter	Max.	Units
R <sub>thjc</sub>	Typical thermal resistance	0.64	°C/W
R <sub>θJA</sub>		40	

#### Static Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
V <sub>GS</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	3.0	--	5.0	V
*R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 8 A	--	0.3	0.38	Ω
BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250μA	500	--	--	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> = 250μA, Referenced to 25°C	--	0.5	--	V/°C
I <sub>DSS</sub>	V <sub>DS</sub> = 500 V, V <sub>GS</sub> = 0 V	--	--	1	uA
	V <sub>DS</sub> = 400 V, V <sub>GS</sub> = 0 V, V <sub>C</sub> = 125°C	--	--	10	
I <sub>GSS</sub>	V <sub>GS</sub> = ±30	--	--	±100	nA

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Dynamic Characteristics					
Symbol	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	$V_{DS} = 250\text{ V}, I_D = 16\text{ A},$ $R_G = 25\ \Omega$	--	50	115	ns
$t_r$		--	180	396	ns
$t_{d(off)}$		--	130	273	ns
$t_f$		--	100	220	ns
$Q_g$	$V_{DS} = 400\text{ V}, I_D = 16\text{ A},$ $V_{GS} = 10\text{ V}$	--	60	78	nC
$Q_{gs}$		--	14	18	nC
$Q_{gd}$		--	28	36	nC
$C_{ISS}$	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $F = 1.0\text{MHz}$	--	2300	2990	pF
$C_{OSS}$		--	330	429	pF
$C_{RSS}$		--	35	46	pF
$I_S$		--	--	16	A
$I_{SM}$		--	--	64	
$V_{SD}$	$I_S = I_F, V_{GS} = 0\text{ V}$	--	--	1.5	V
$t_{rr}$	$I_S = I_F, diF/dt = 100\text{A}/\mu\text{s}$	--	340	--	ns
$Q_{rr}$		--	3.4	--	uC

### Notes;

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 7\text{mH}, I_{AS} = 16\text{A}, V_{DD} = 50\text{V}, R_G = 25\ \Omega,$  Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 16\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS},$  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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### 500V N-Channel MOSFET

#### Typical Characteristics

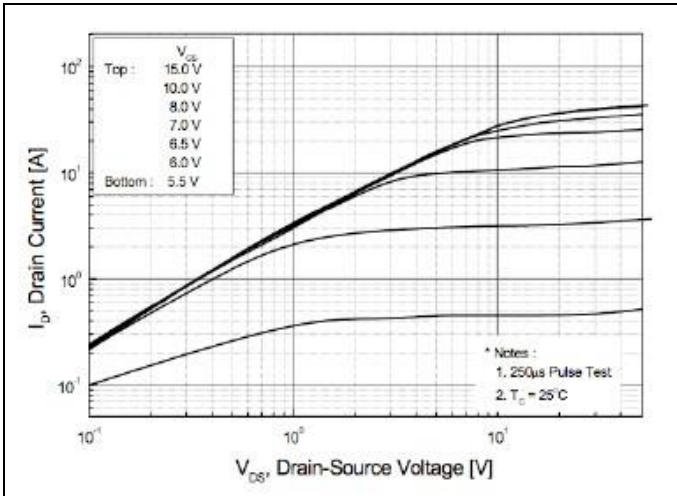


FIG.1-ON REGION CHARACTERISTICS

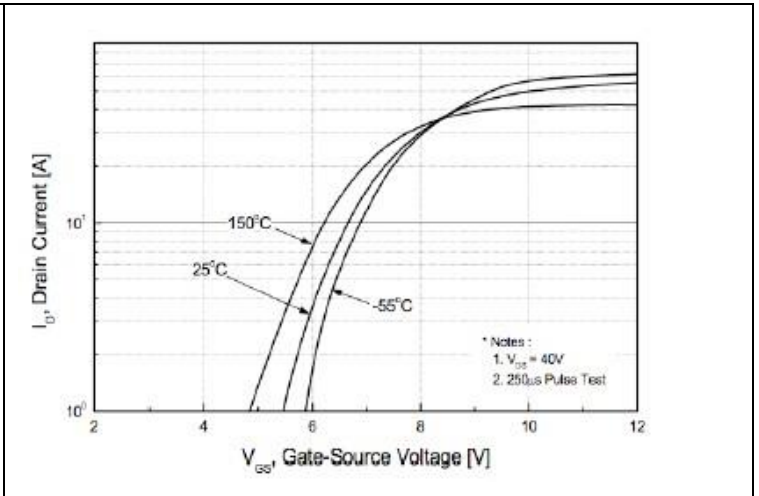


FIG.2-TRANSFER CHARACTERISTICS

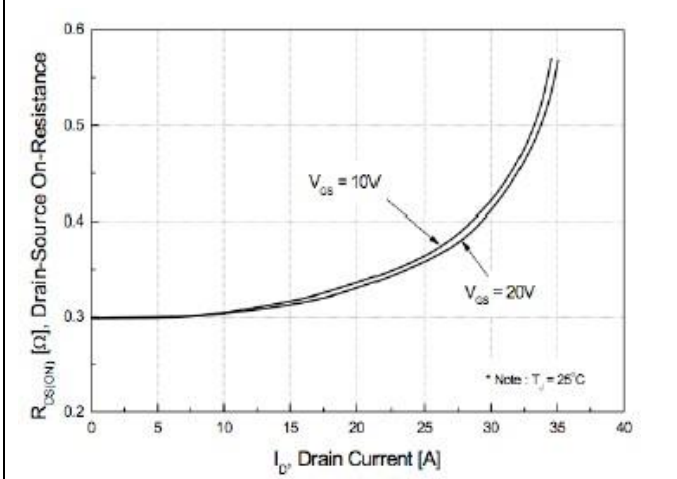


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

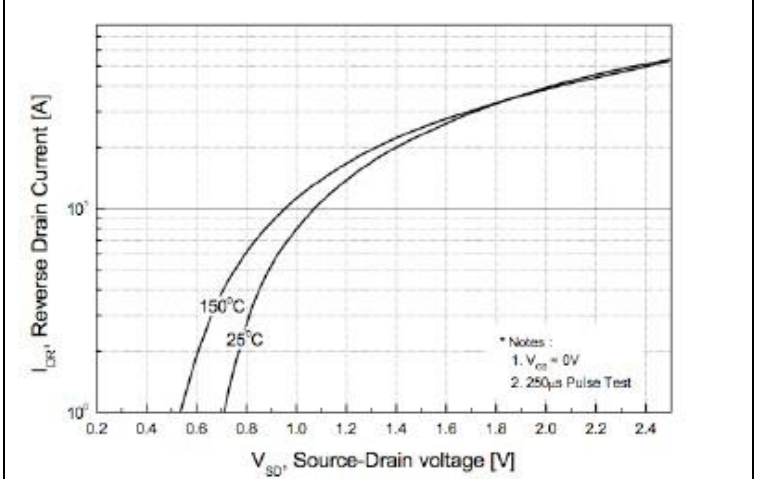


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

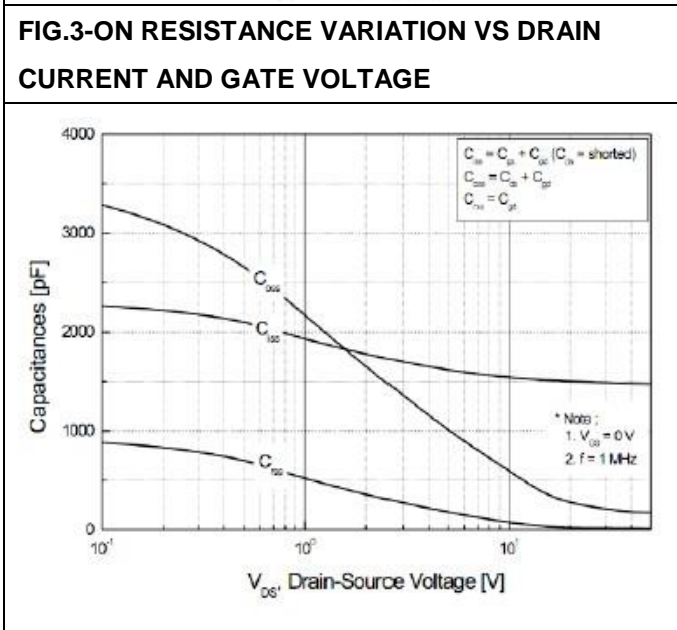


FIG.5-CAPACITANCE CHARACTERISTICS

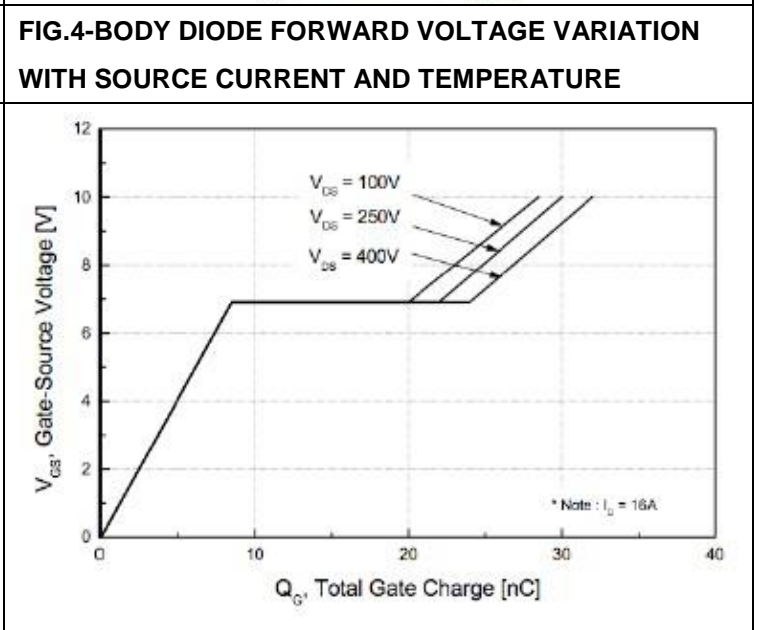
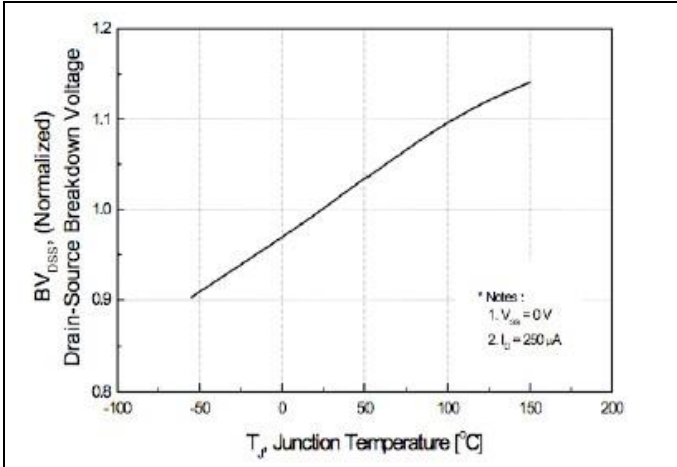


FIG.6-GATE CHARGE CHARACTERISTICS

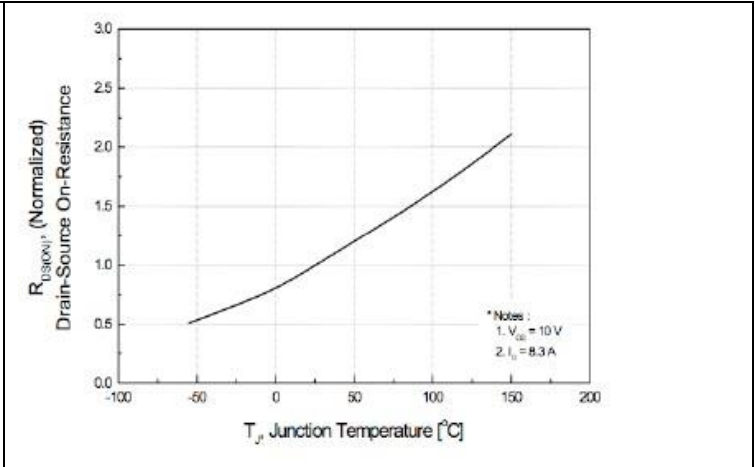
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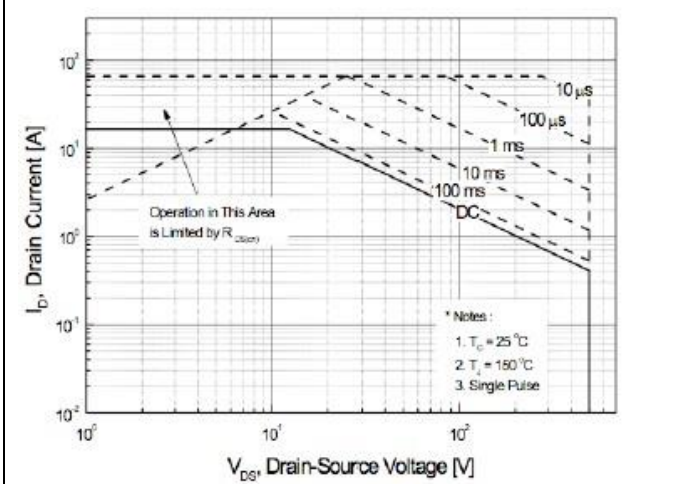
#### ■ Typical Characteristics



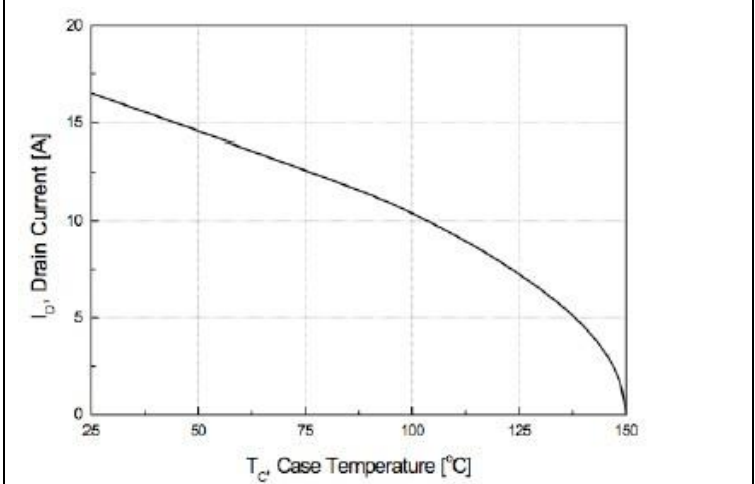
**FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE**



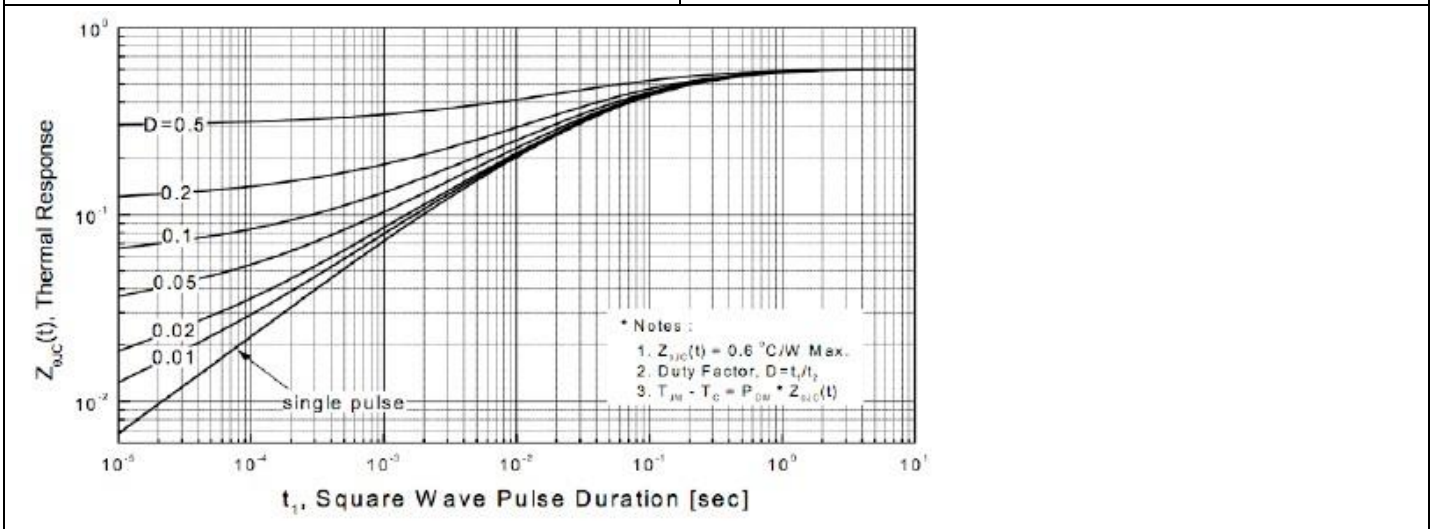
**FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE**



**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

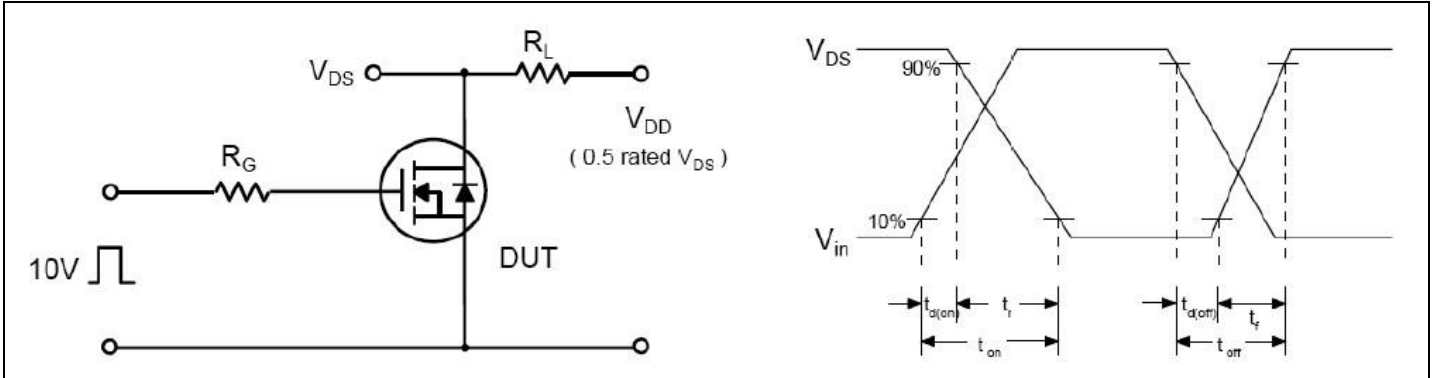


Fig 12. Resistive Switching Test Circuit & Waveforms

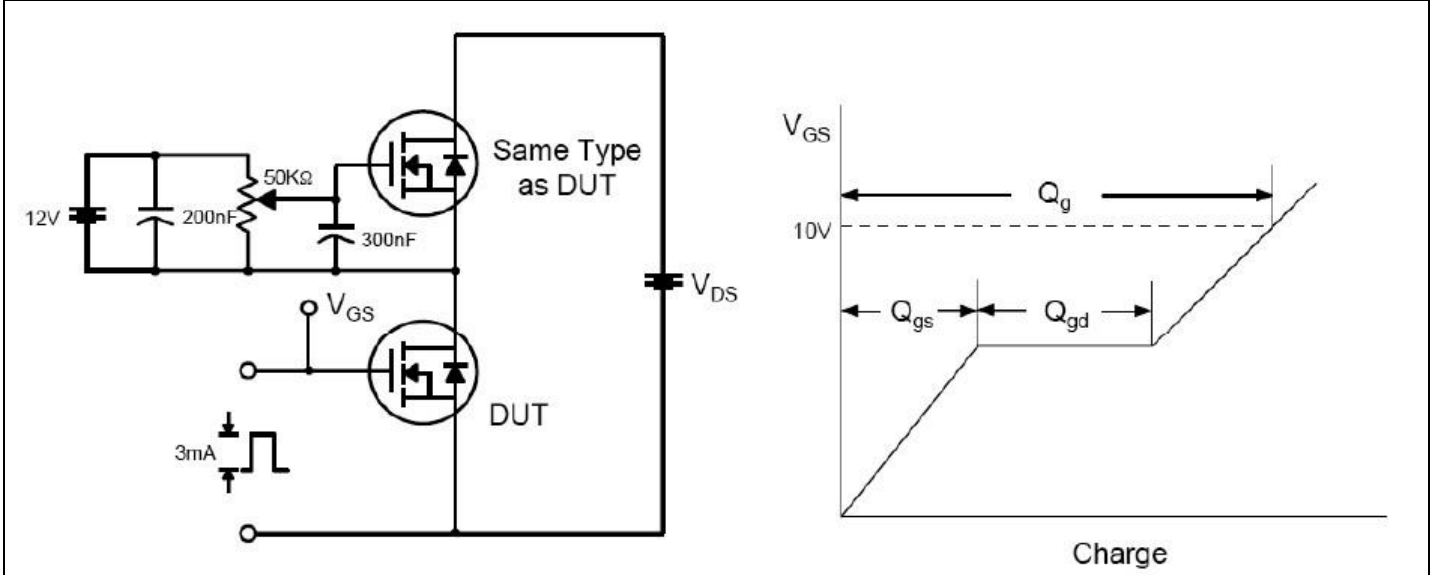


Fig 13. Gate Charge Test Circuit & Waveform

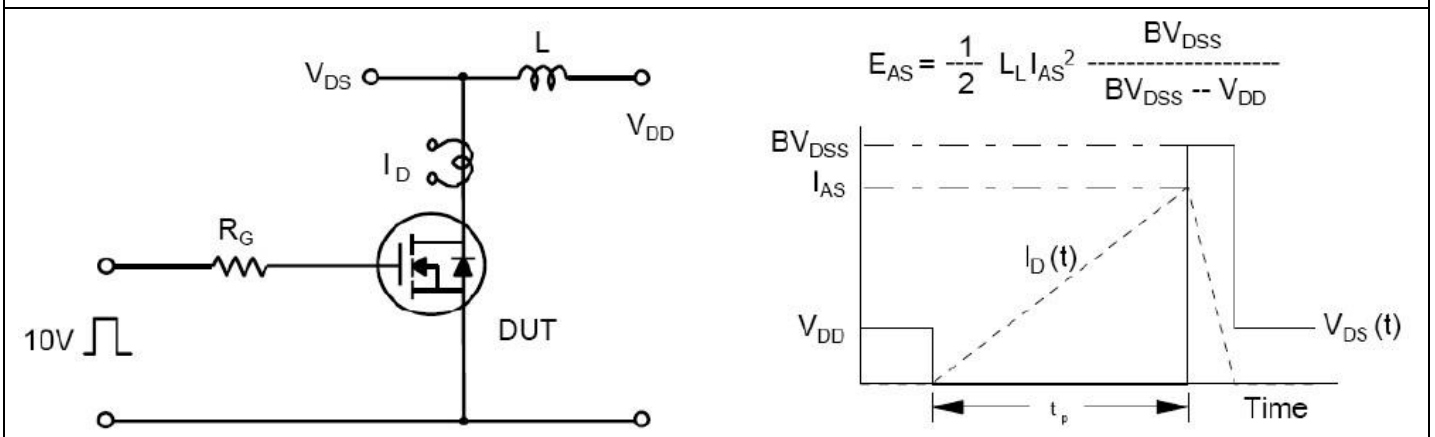


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

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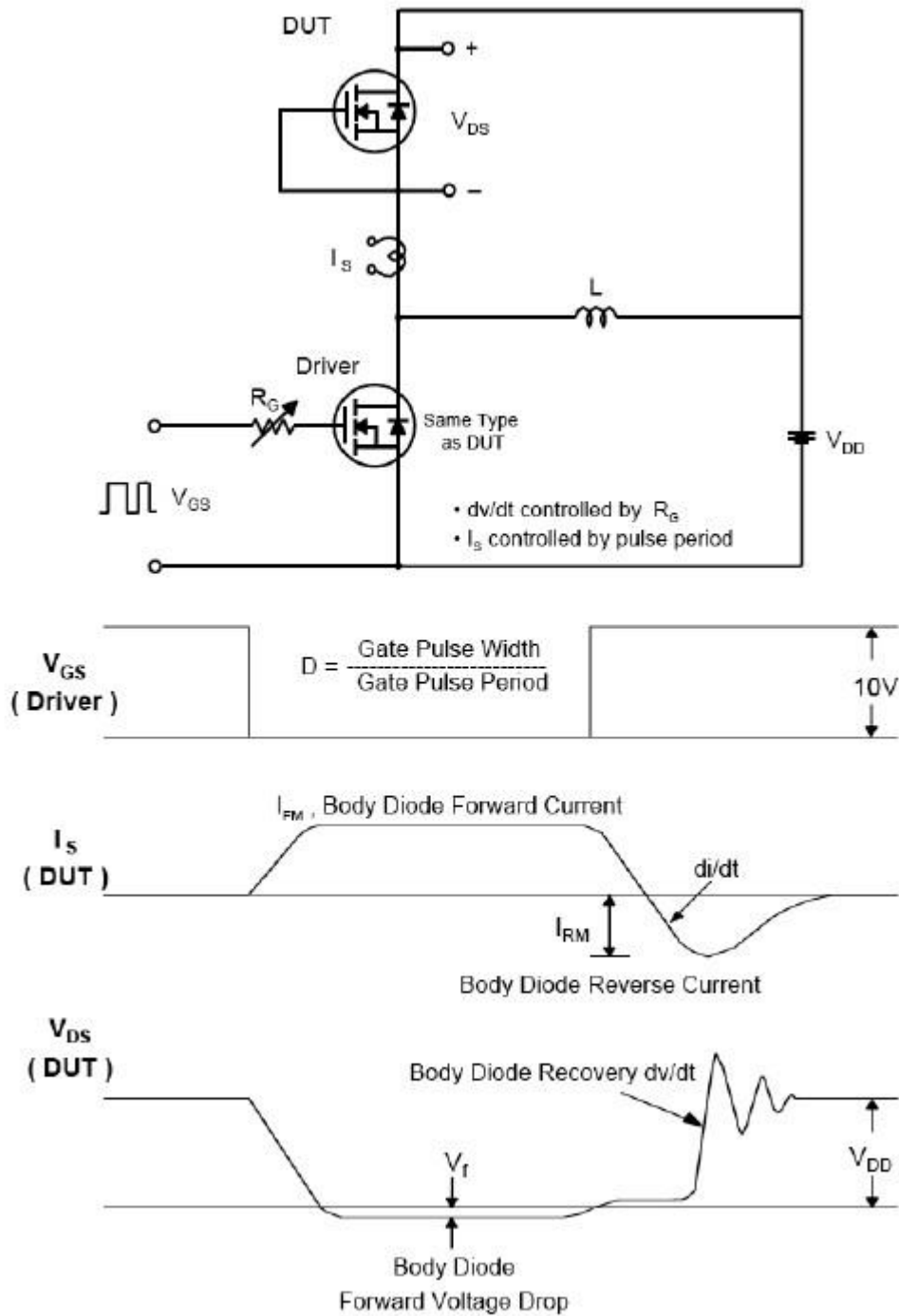


Fig 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

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