

# MSF7N60

## 600V N-Channel MOSFET

### Description

The MSF7N60 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

- Open Framed Power Supply
- Adapter
- STB

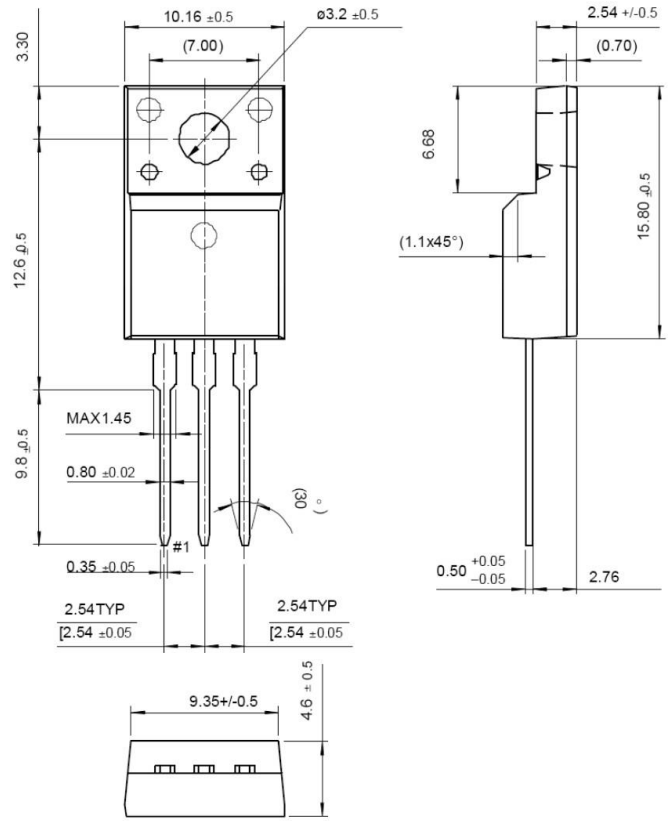
### Packing & Order Information

50/Tube ; 1,000/Box

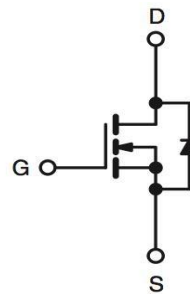


**RoHS**  
COMPLIANT

**HALOGEN**  
**FREE**  
Available



### Graphic symbol



## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V <sub>DSS</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)	7.0	A
	Drain Current -Continuous (TC=100°C)	4.4	A
I <sub>DM</sub>	Drain Current Pulsed	21	A
E <sub>AS</sub>	Single Pulsed Avalanche Energy	48	mJ
I <sub>AR</sub>	Avalanche Current	7.0	A

## MSF7N60

### 600V N-Channel MOSFET

#### Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
$E_{AR}$	Repetitive Avalanche Energy	3.1	mJ
dv/dt	Peak Diode Recovery dv/dt	4.5	V/ns
$P_D$	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
$T_L$	Maximum lead temperature for soldering purposes, 1/8" from case for 10 seconds	300	°C
TPKG	Maximum Temperature for Soldering @ Package Body for 10 seconds	260	°C
$T_J$	Storage Temperature	150	°C

Note:

- 1.Repetitive rating; pulse width limited by maximum junction temperature.
2.  $I_{AS} \leq 7A$ ,  $V_{DD} = 50V$ ,  $L = 7mH$ ,  $V_G = 10V$ , starting  $T_J = +25^\circ C$ .
3.  $I_{SD} \leq 7A$ ,  $di/dt \leq 200A/\mu s$ ,  $V_{DD} \leq BVDSS$ , starting  $T_J = +25^\circ C$ .

#### Thermal characteristics

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

#### Off Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\mu A$	2.0	--	4.0	V
* $R_{DS(ON)}$	$V_{GS} = 10 V$ , $I_D = 3.5 A$	--	0.85	1.2	$\Omega$
$BV_{DSS}$	$V_{GS} = 0 V$ , $I_D = 250\mu A$	600	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	$I_D = 250\mu A$ , Referenced to 25°C	--	0.6	--	V/°C
$I_{DSS}$	$V_{DS} = 600 V$ , $V_{GS} = 0 V$	--	--	1	$\mu A$
	$V_{DS} = 480 V$ , $V_C = 125^\circ C$	--	--	10	
$I_{GSS}$	$V_{GS} = \pm 30$	--	--	$\pm 100$	nA

#### Dynamic Characteristics

Symbol	Test Conditions	Min	Typ.	Max.	Units
$C_{ISS}$	$V_{DS} = 25 V$ , $V_{GS} = 0 V$ , $f = 1.0MHz$	--	1482	--	pF
$C_{OSS}$		--	121.7	--	pF
$C_{RSS}$		--	14	--	pF

## MSF7N60

600V N-Channel MOSFET

Dynamic Characteristics					
Symbol	Test Conditions	Min	Typ.	Max.	Units
$Q_g$	$V_{DG} = 300\text{ V}, I_D = 7\text{ A},$ $V_{GS} = 10\text{ V}$	--	28	37	nC
$Q_{gs}$		--	4.7	--	nC
$Q_{gd}$		--	11	--	nC
$t_{d(on)}$	$V_{DS} = 400\text{ V}, I_D = 7\text{ A},$ $R_G = 25\ \Omega, V_{GS} = 10\text{ V}$	--	10	30	ns
$t_r$		--	35	80	ns
$t_{d(off)}$		--	45	100	ns
$t_f$		--	40	90	ns

Dynamic Characteristics					
Symbol	Test Conditions	Min	Typ.	Max.	Units
$C_{ISS}$	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	1500	2010	pF
$C_{OSS}$		--	145	190	pF
$C_{RSS}$		--	13	20	pF

Source-Drain Diode Characteristics					
Symbol	Test Conditions	Min	Typ.	Max.	Units
$I_S$	$V_G = V_D = 0$ $V_S = 13\text{ V}$	--	--	7	A
$I_{SM}$		--	--	28	
$V_{SD}$	$I_S = 7\text{ A}, V_{GS} = 0\text{ V}$	--	--	1.4	V
$t_{rr}$	$I_F = 7\text{ A}, V_{GS} = 0\text{ V}, dI_F/dt = 100\text{ A}/\mu\text{s}$	--	350	--	ns
$Q_{rr}$		--	3.3	--	uC

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

## MSF7N60

600V N-Channel MOSFET

### ■ Characteristics Curve

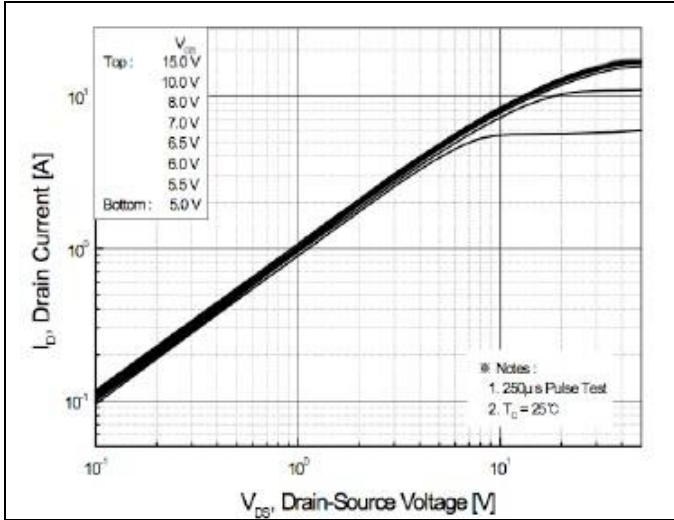


FIG.1-ON REGION CHARACTERISTICS

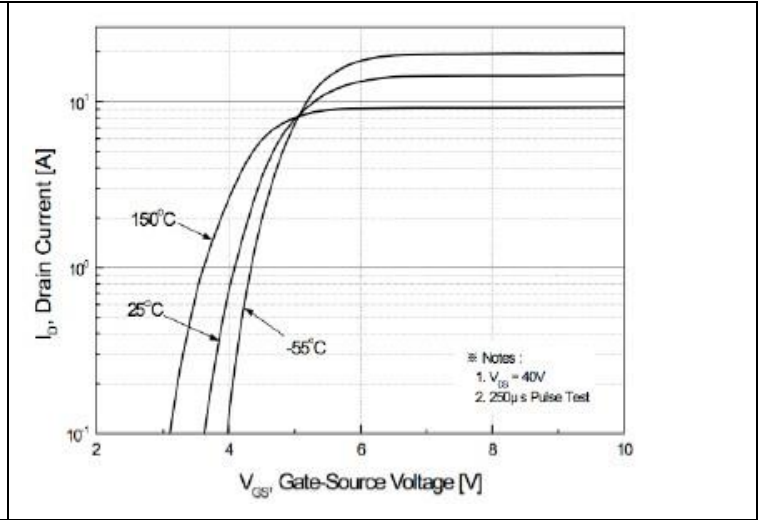


FIG.2-TRANSFER CHARACTERISTICS

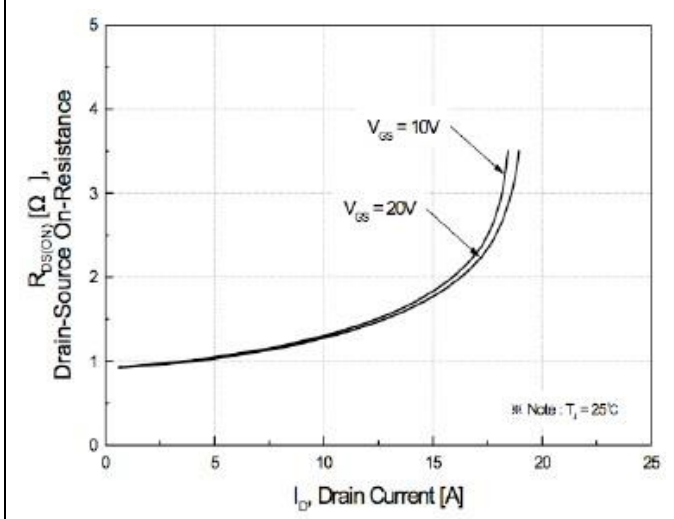


FIG.3-ON RESISTANCE VARIATION VS DRAIN CURRENT AND GATE VOLTAGE

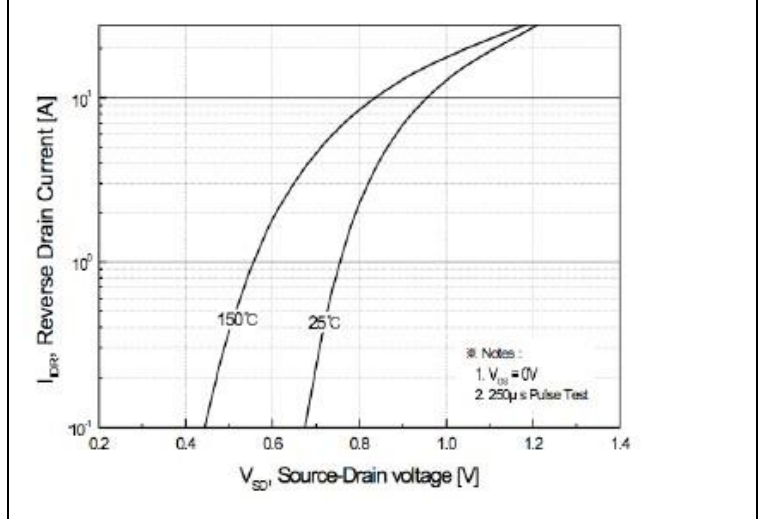


FIG.4-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

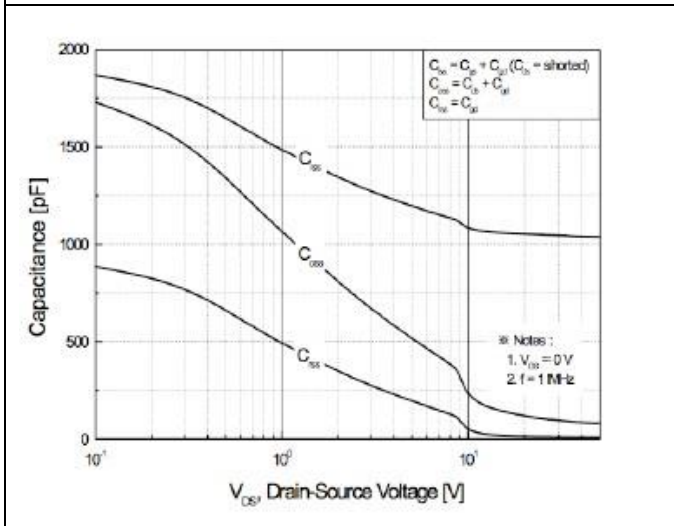


FIG.5-CAPACITANCE CHARACTERISTICS

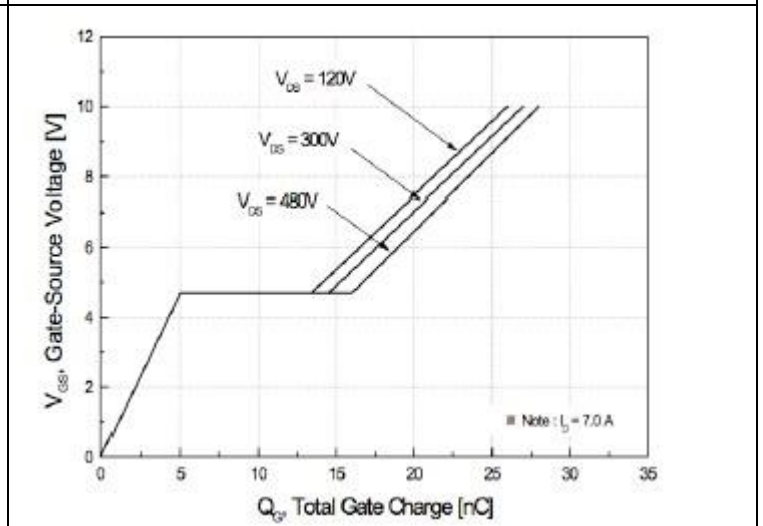


FIG.6-GATE CHARGE CHARACTERISTICS

## MSF7N60

600V N-Channel MOSFET

■ Characteristics Curve

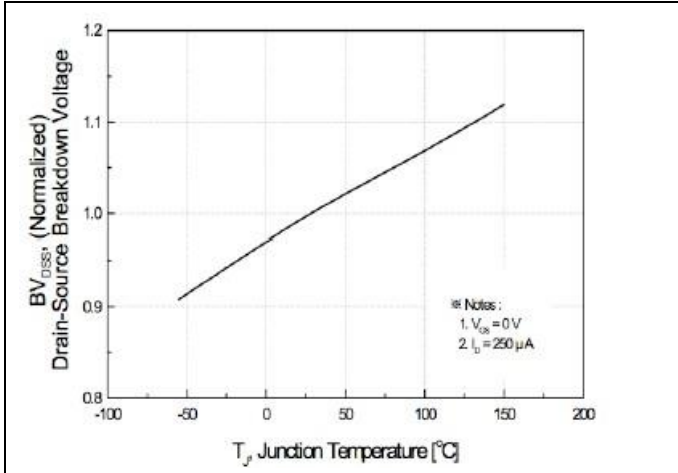


FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

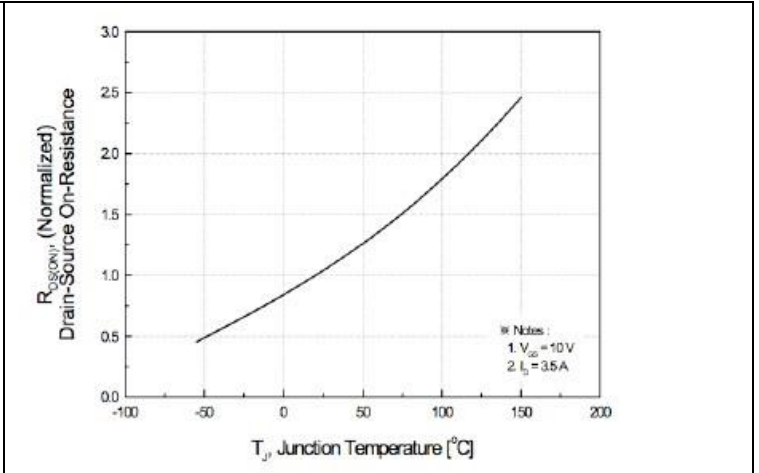


FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE

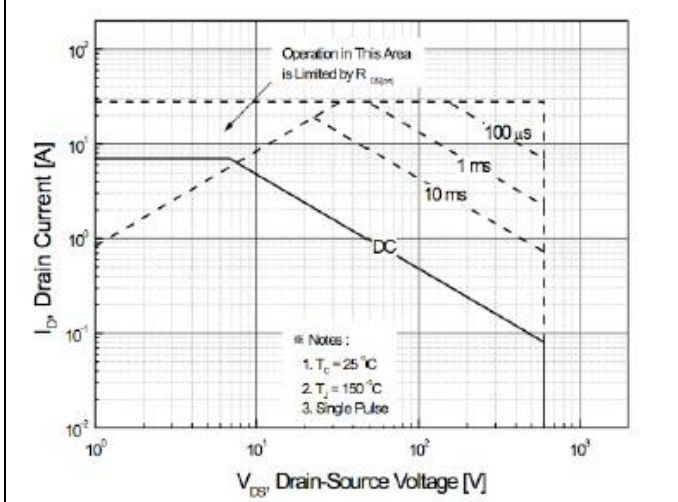


FIG.9-MAXIMUM SAFE OPERATING AREA

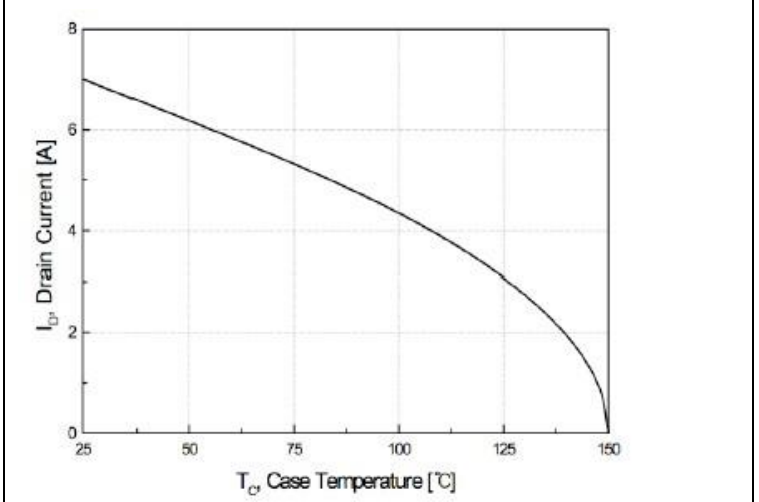


FIG.10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

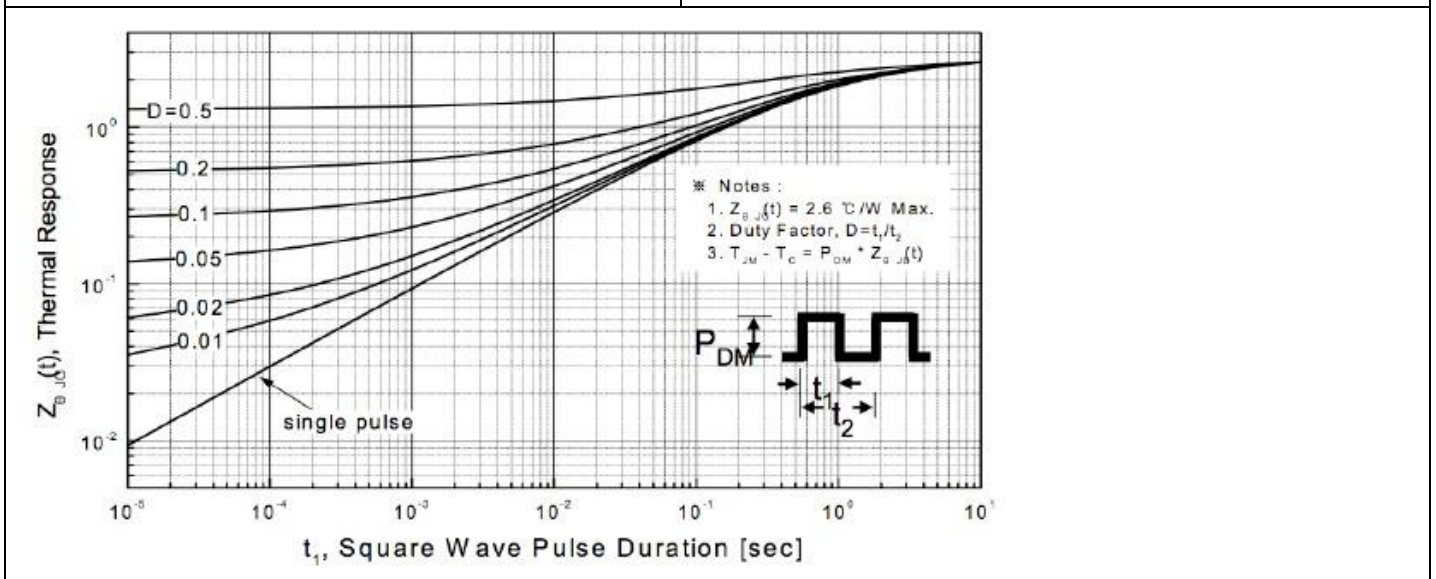


FIG.11-TRANSIENT THERMAL RESPONSE CURVE



## MSF7N60

600V N-Channel MOSFET

■ Characteristics Test Circuit & Waveform

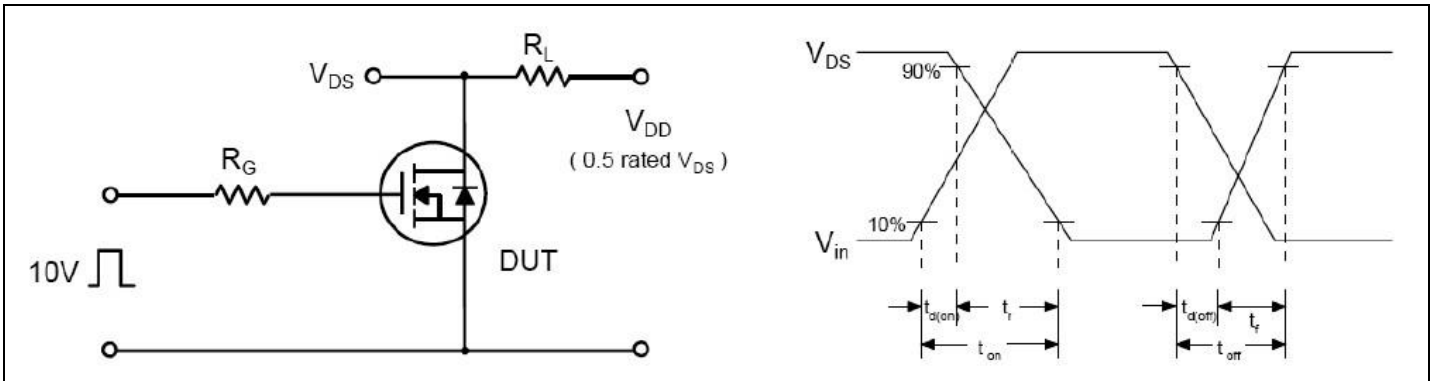


Fig 12. Resistive Switching Test Circuit & Waveforms

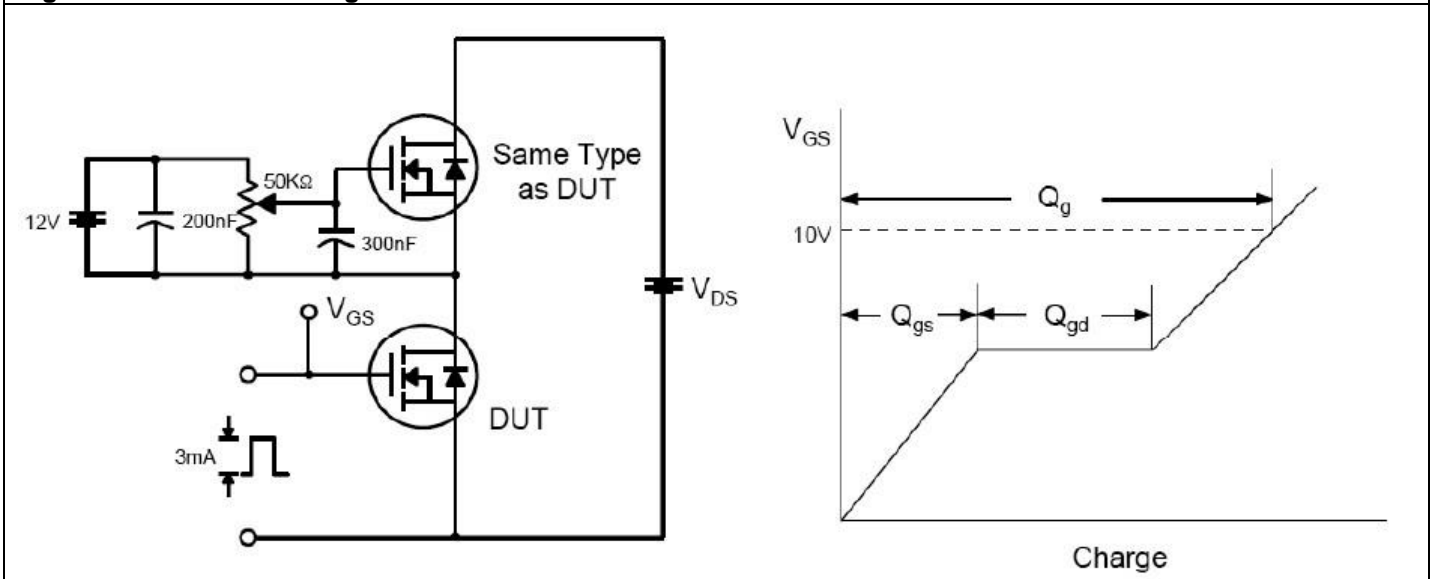


Fig 13. Gate Charge Test Circuit & Waveform

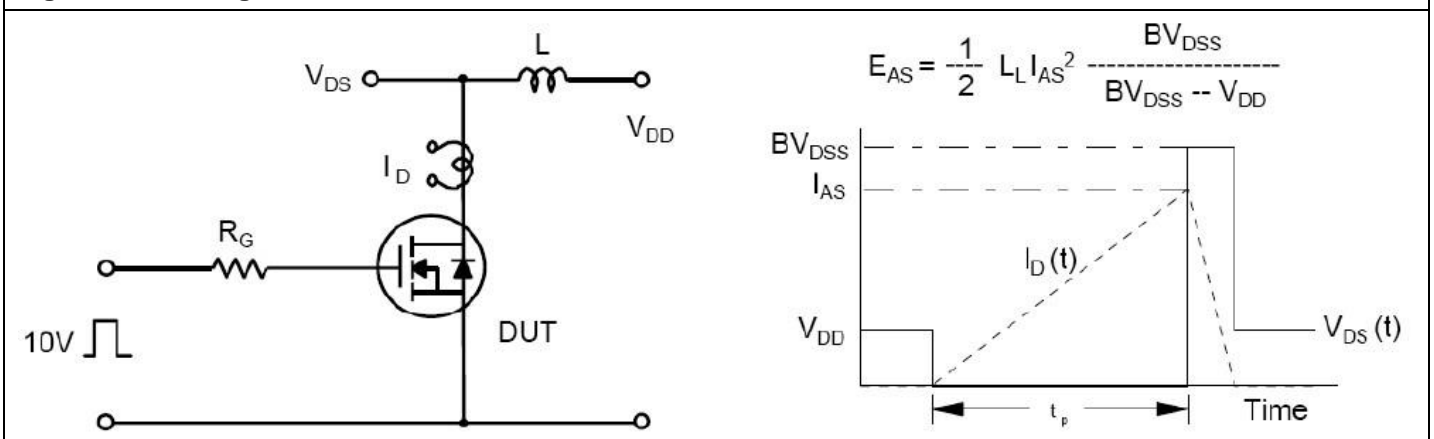


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

## MSF7N60

600V N-Channel MOSFET

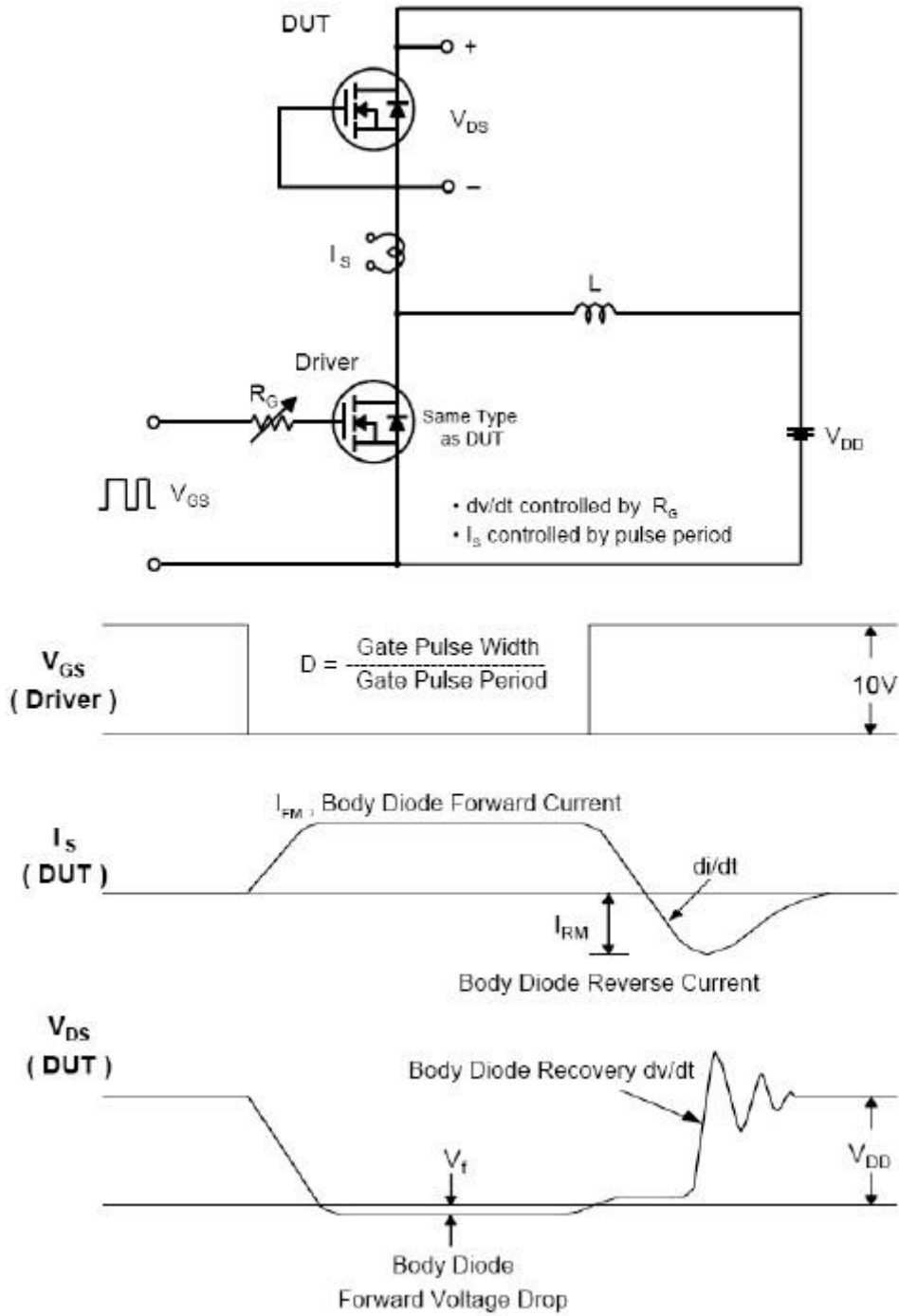


Fig 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

## MSF7N60

600V N-Channel MOSFET

### Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Bruckewell Technology Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Bruckewell"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product. Bruckewell makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Bruckewell disclaims

- (i) Any and all liability arising out of the application or use of any product.
- (ii) Any and all liability, including without limitation special, consequential or incidental damages.
- (iii) Any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Bruckewell's knowledge of typical requirements that are often placed on Bruckewell products in generic applications.

Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time.

Product specifications do not expand or otherwise modify Bruckewell's terms and conditions of purchase, including but not limited to the warranty expressed therein.