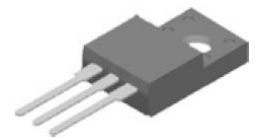


## 600V/7.4A Power MOSFET (N-Channel)

### General Description

- MSU7N60 is a N-Channel enhancement mode power MOSFET with advanced technology. It is designed to have better characteristics, such as fast switching time, low gate charge, minimized on-state resistance and withstanding high energy pulse in the avalanche and commutation modes. These devices are well suited for high efficiency switching mode power supply applications.
- MSU7N60 are available in TO-220 and TO-220F packages.



TO-220F

### Features

- $R_{DS(ON)} \leq 1.0\Omega @ V_{GS}=10V$
- Ultra low gate charge (Typ. 29nC)
- Low Crss (Typ. 16pF)
- Fast switching capability
- 100% Avalanche energy tested
- Improved dv/dt capability, high ruggedness
- RoHS Compliance and Halogen free



HALOGEN  
**FREE**

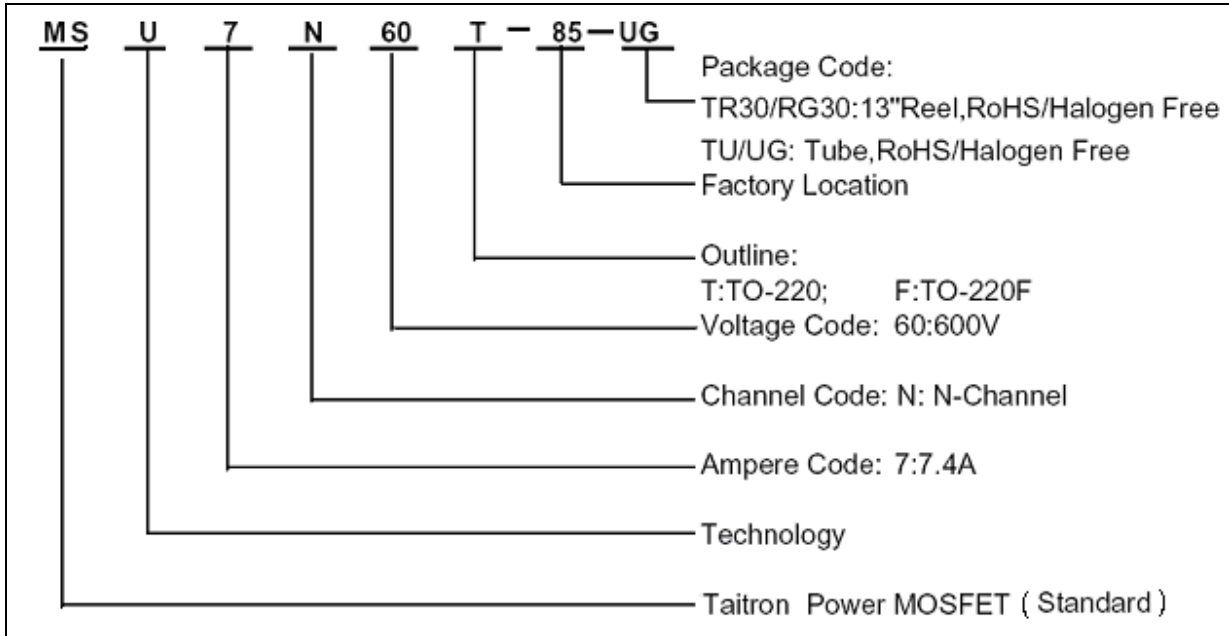
### Application

- DC to DC Converter
- Adapter
- SMPS Application.

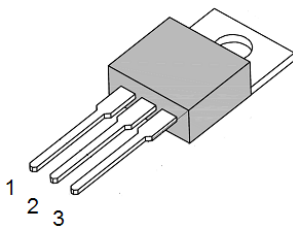
# 600V/7.4A POWER MOSFET (N-Channel)

## MSU7N60

### Ordering Information

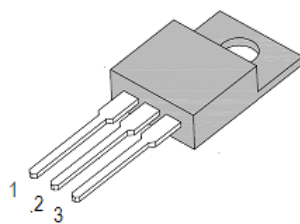


### Pin Configuration and Symbol



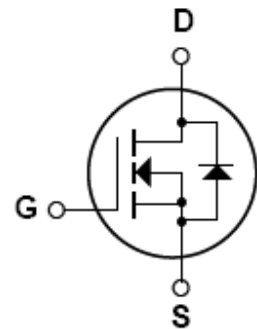
1: GATE 2: DRAIN 3:SOURCE

**TO-220**



1: GATE 2: DRAIN 3:SOURCE

**TO-220F**



# 600V/7.4A POWER MOSFET (N-Channel)

## MSU7N60

### Absolute Maximum Ratings ( $T_C=25^{\circ}\text{C}$ unless otherwise specified, Note)

Symbol	Description	Ratings	Unit
<b>V<sub>DSS</sub></b>	Drain-Source Voltage	600	V
<b>V<sub>GSS</sub></b>	Gate-Source Voltage	± 30	V
<b>I<sub>D</sub></b>	Drain Current -Continuous	7.4	A
<b>I<sub>DM</sub></b>	Drain Current -Pulsed (note1)	29.6	A
<b>E<sub>AS</sub></b>	Avalanche Energy	Single Pulsed (Note2)	mJ
<b>E<sub>AR</sub></b>		Repetitive (Note1)	
<b>I<sub>AR</sub></b>	Avalanche Current (note1)	7.4	A
<b>dv/dt</b>	Peak Diode Recovery dv/dt (note3)	4.5	V/ns
<b>P<sub>D</sub></b>	Power Dissipation	TO-220	W
		TO-220F	
<b>R<sub>θJA</sub></b>	Thermal Resistance (Junction-to-Ambient)	TO-220	°C/ W
		TO-220F	
<b>R<sub>θJC</sub></b>	Thermal Resistance (Junction-to-Case)	TO-220	°C/ W
		TO-220F	
<b>T<sub>J</sub></b>	Junction Temperature	+150	° C
<b>T<sub>STG</sub></b>	Storage Temperature Range	-55 to +150	° C

Note: Absolute maximum ratings indicate limits beyond which damage to the device may occur.  
For guarantee specification and test conditions, see the Electrical Characteristics.  
The guaranteed specification apply only for the test conditions listed.

Note1: Repetitive Rating: Pulse width limited by maximum junction temperature

2: L=19.5mH, I<sub>AS</sub>=7.4A, V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C

3: I<sub>sd</sub>≤7.4A, di/dt≤200A/us, V<sub>DD</sub>≤V<sub>BR(DSS)</sub>, Starting T<sub>J</sub>=25°C

# 600V/7.4A POWER MOSFET (N-Channel)

## MSU7N60

### Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions	
<b>OFF CHARACTERISTICS</b>							
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	600	-	-	V	$V_{GS}=0V, I_D=250\mu A$	
$\Delta V_{(BR)DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	-	0.67	-	V/ $^\circ\text{C}$	$I_D=250\mu A$ , referenced to $25^\circ\text{C}$	
$I_{DSS}$	Drain-Source leakage Current	-	-	1	$\mu A$	$V_{DS}=600V, V_{GS}=0V$	
$I_{GSS}$	Gate-Source leakage Current	Forward	-	-	100	nA	$V_{GS}=30V, V_{DS}=0V$
		Reverse	-	-	-100	nA	$V_{GS}=-30V, V_{DS}=0V$
<b>ON CHARACTERISTICS</b>							
$R_{DS(ON)}$	Static Drain-Source On-State Resistance	-	-	1.0	$\Omega$	$V_{GS}=10.0V, I_D=3.7A$	
$V_{GS(th)}$	Gate-Source Threshold Voltage	2.0	-	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$	
<b>DYNAMIC CHARACTERISTICS</b>							
$C_{iss}$	Input Capacitance	-	-	1400	pF	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$	
$C_{oss}$	Output Capacitance	-	-	180	pF		
$C_{rss}$	Reverse Transfer Capacitance	-	16	21	pF		
<b>SWITCHING CHARACTERISTICS</b>							
$t_d(on)$	Turn-on Delay Time	-	-	70	nS	$V_{DD}=300V, I_D=7.4A, R_G=25\Omega$ (Note 4, 5)	
$t_r$	Turn-on Rise Time	-	-	170	nS		
$t_d(off)$	Turn-off Delay Time	-	-	140	nS		
$t_f$	Turn-off Fall Time	-	-	130	nS		
$Q_g$	Total Gate Charge	-	29	38	nC	$V_{DS}=480V, I_D=7.4A, V_{GS}=10V$ (Note 4, 5)	
$Q_{gs}$	Gate-Source Charge	-	7	-	nC		
$Q_{gd}$	Gate-Drain Charge	-	14.5	-	nC		
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>							
$V_{SD}$	Drain-Source Diode Forward Voltage	-	-	1.4	V	$V_{GS}=0V, I_S=7.4A$	
$I_S$	Maximum Continuous Drain-Source Diode Forward Current	-	-	7.4	A	-	
$I_{SM}$	Maximum Pulse Drain-Source Diode Forward Current	-	-	29.6	A	-	
$t_{rr}$	Reverse Recovery Time	-	320	-	nS	$V_{GS}=0V, I_S=7.4A, di_F/dt=100A/\mu s$ (Note4)	
$Q_{rr}$	Reverse Recovery Charge	-	2.4	-	$\mu C$		

Note 4: Pulse test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$

5: Essentially independent of operating temperature

# 600V/7.4A POWER MOSFET (N-Channel)

MSU7N60

## Typical Characteristics Curves

Fig.1- On-Region Characteristics

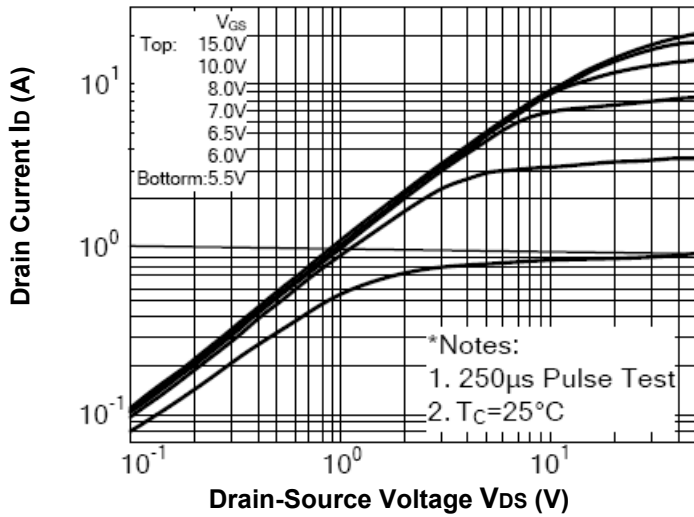


Fig.2- Transfer Characteristics

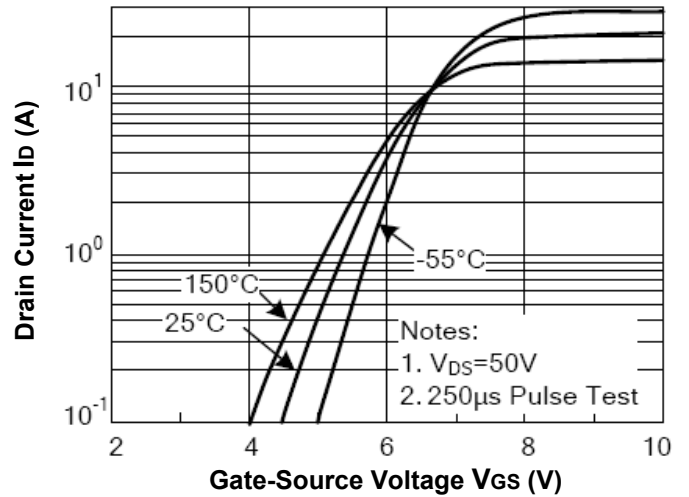


Fig.3- On-Resistance Variation Vs. Drain Current and Gate Voltage

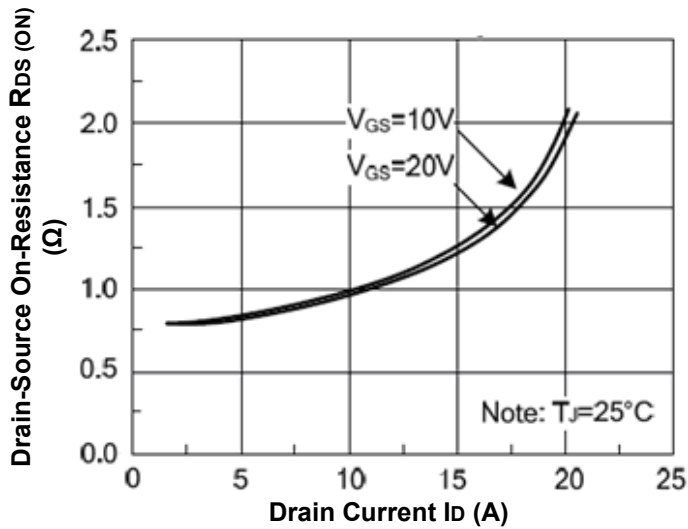
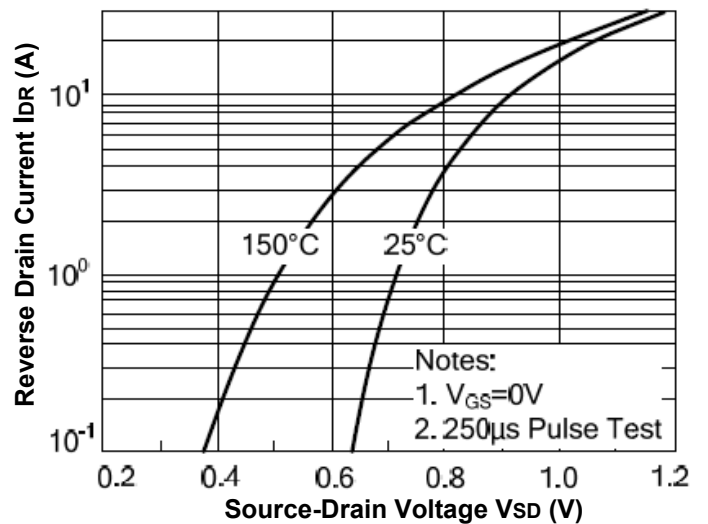


Fig.4- Body Diode Forward Voltage Variation Vs. Source Current and Temperature



# 600V/7.4A POWER MOSFET (N-Channel)

## MSU7N60

Fig.5- Capacitance Characteristics

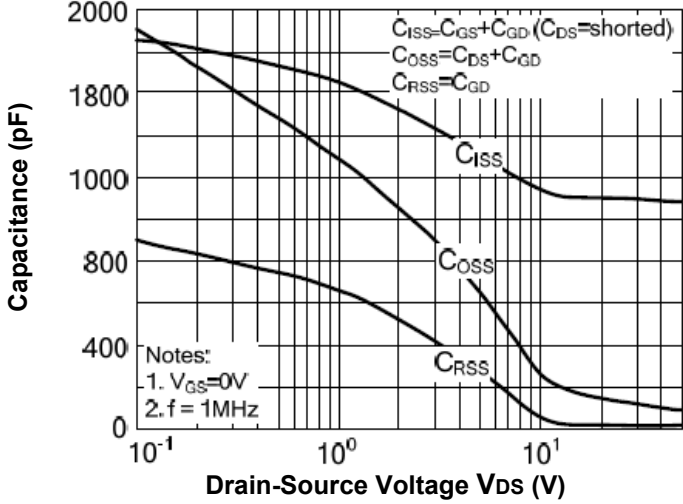


Fig.6- Maximum Safer Operating Area

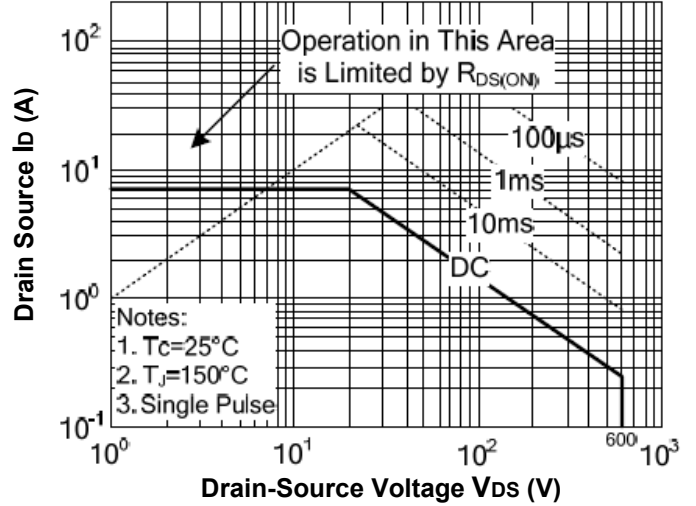


Fig.7- Breakdown Voltage Variation Vs. Temperature

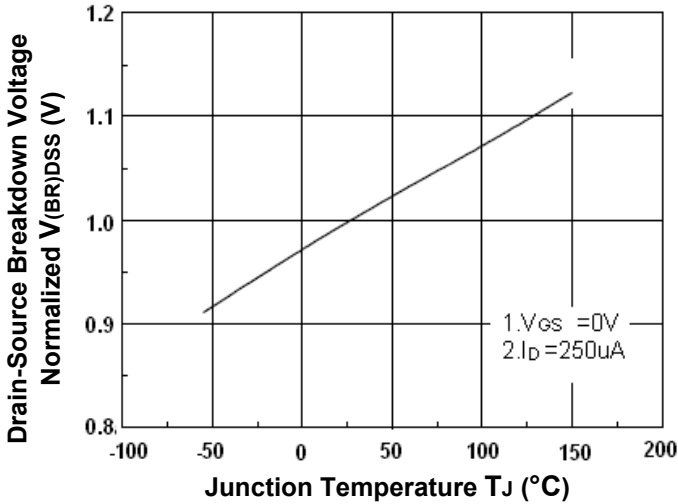
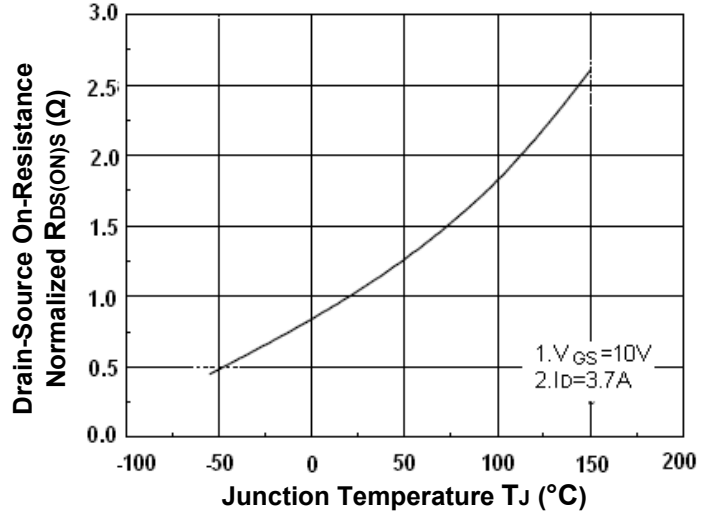


Fig.8- On Resistance Variation Vs. Temperature



TEST CIRCUIT AND WAVEFORM

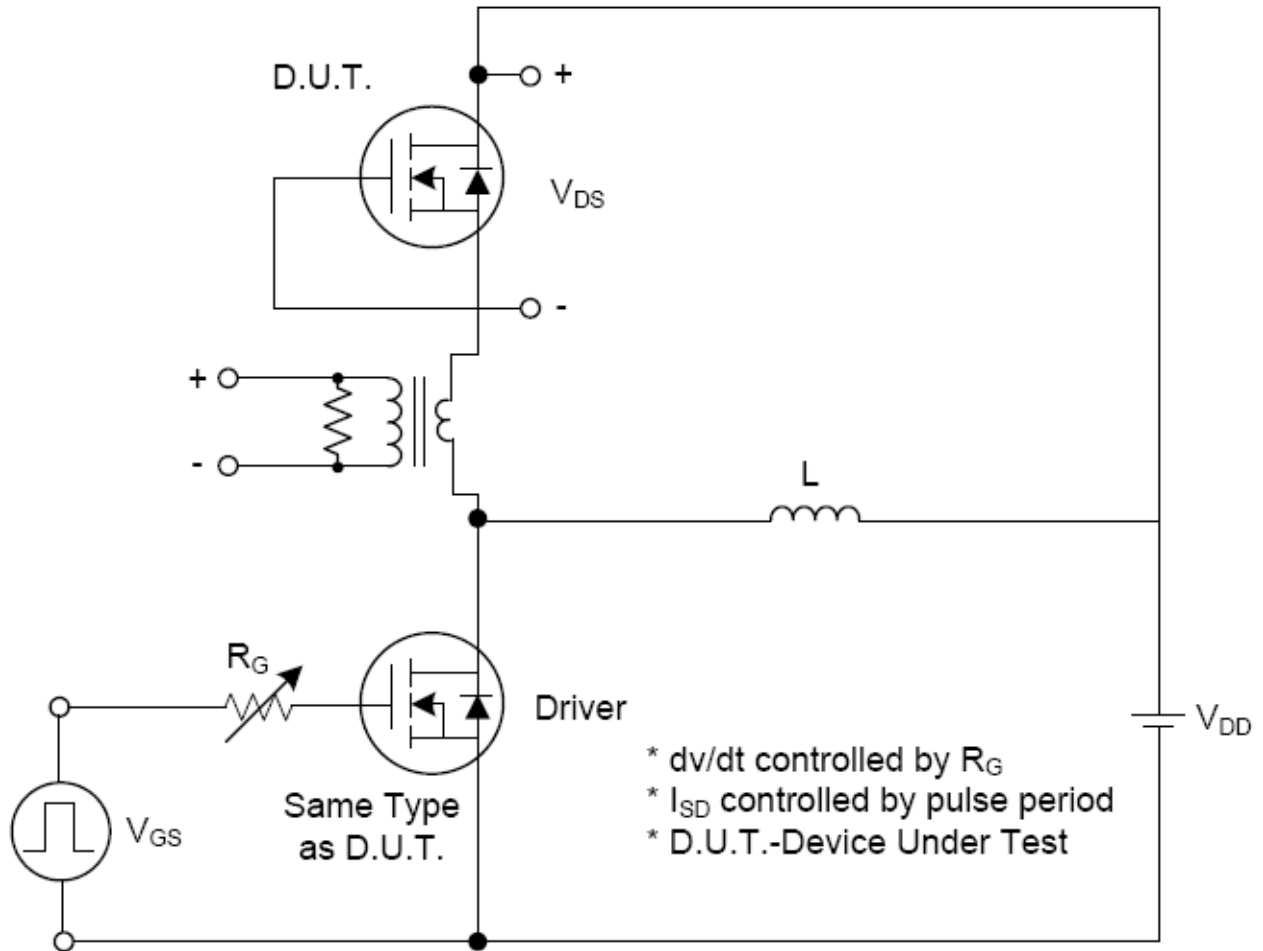


Fig.9- Peak Diode Recovery  $dv/dt$  Test Circuit

# 600V/7.4A POWER MOSFET (N-Channel)

MSU7N60

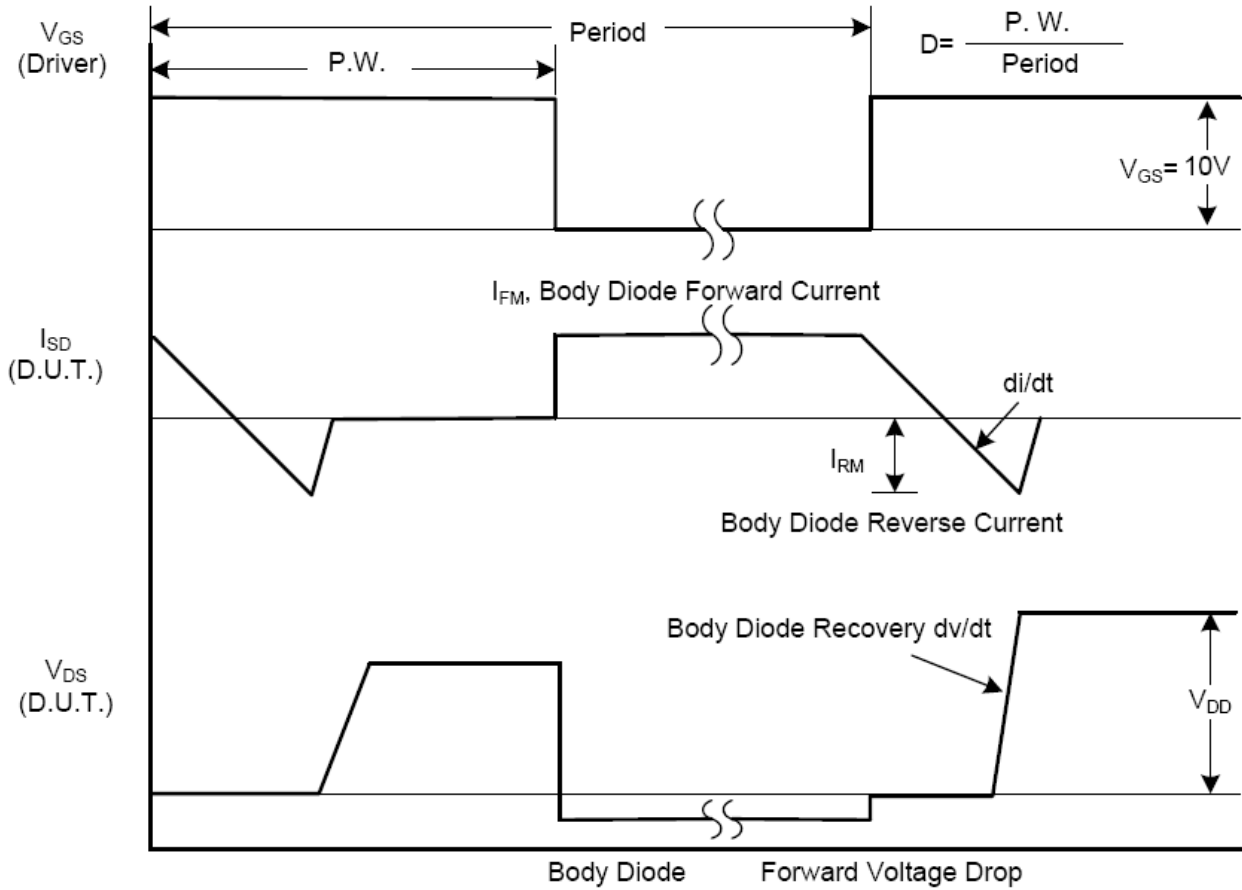


Fig.10- Peak diode Recovery  $dv/dt$  Waveform

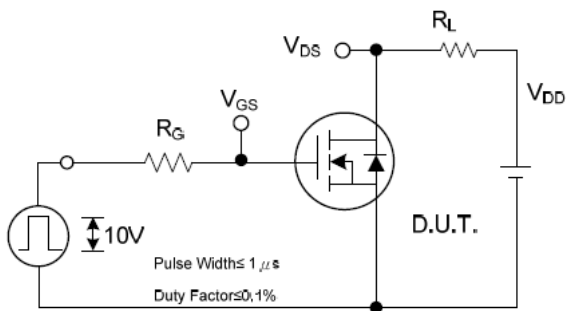


Fig.11- Switching Test Circuit

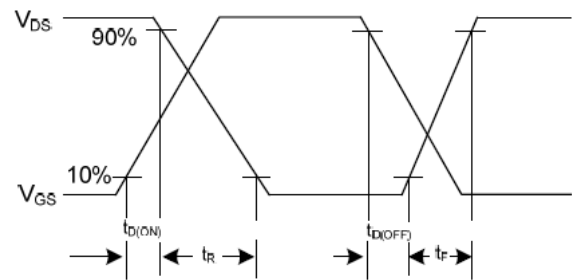


Fig.12- Switching Waveform



# 600V/7.4A POWER MOSFET (N-Channel)

MSU7N60

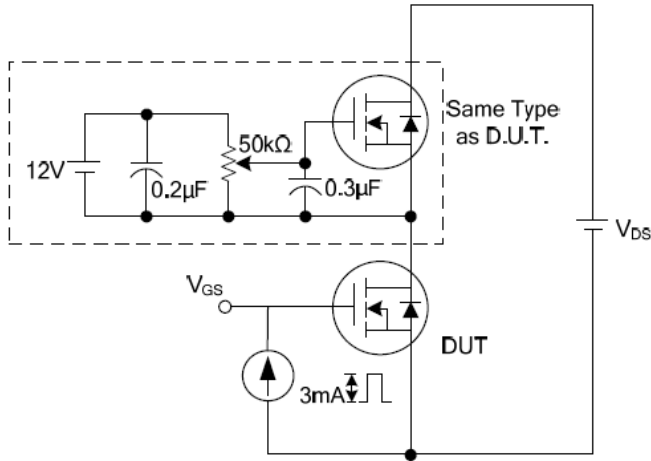


Fig.13- Gate Charge Test Circuit

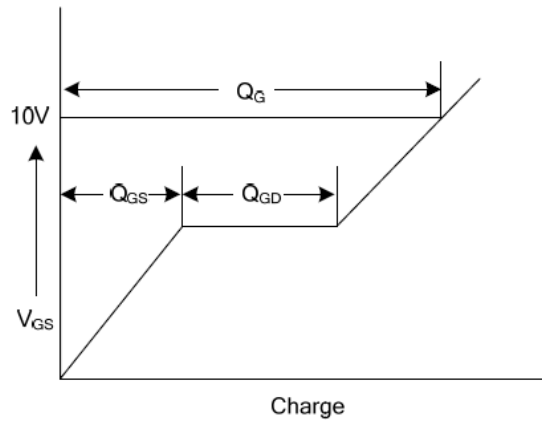


Fig.14- Gate Charge Waveform

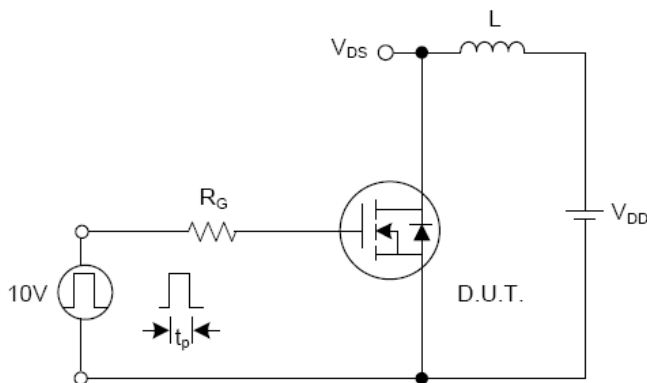


Fig.15- Unclamped Inductive Switching Test Circuit

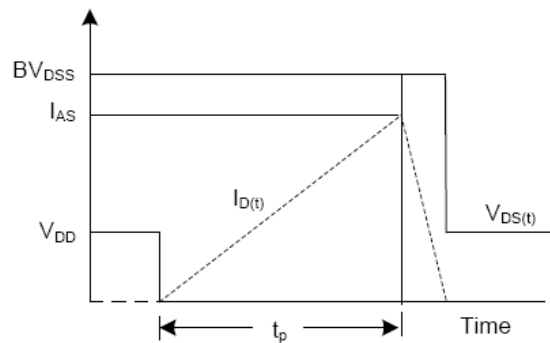
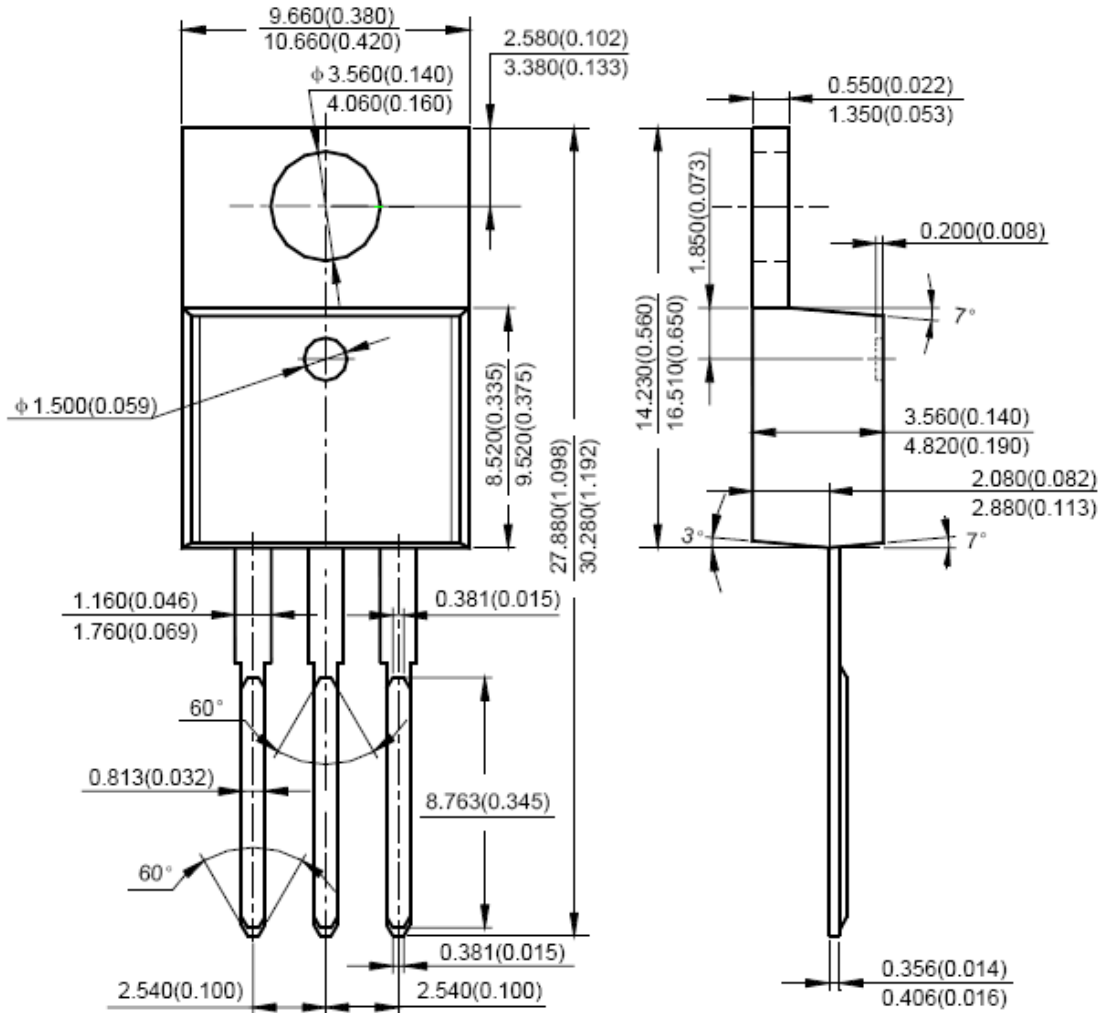


Fig.16- Unclamped Inductive Switching Waveform

# 600V/7.4A POWER MOSFET (N-Channel)

## MSU7N60

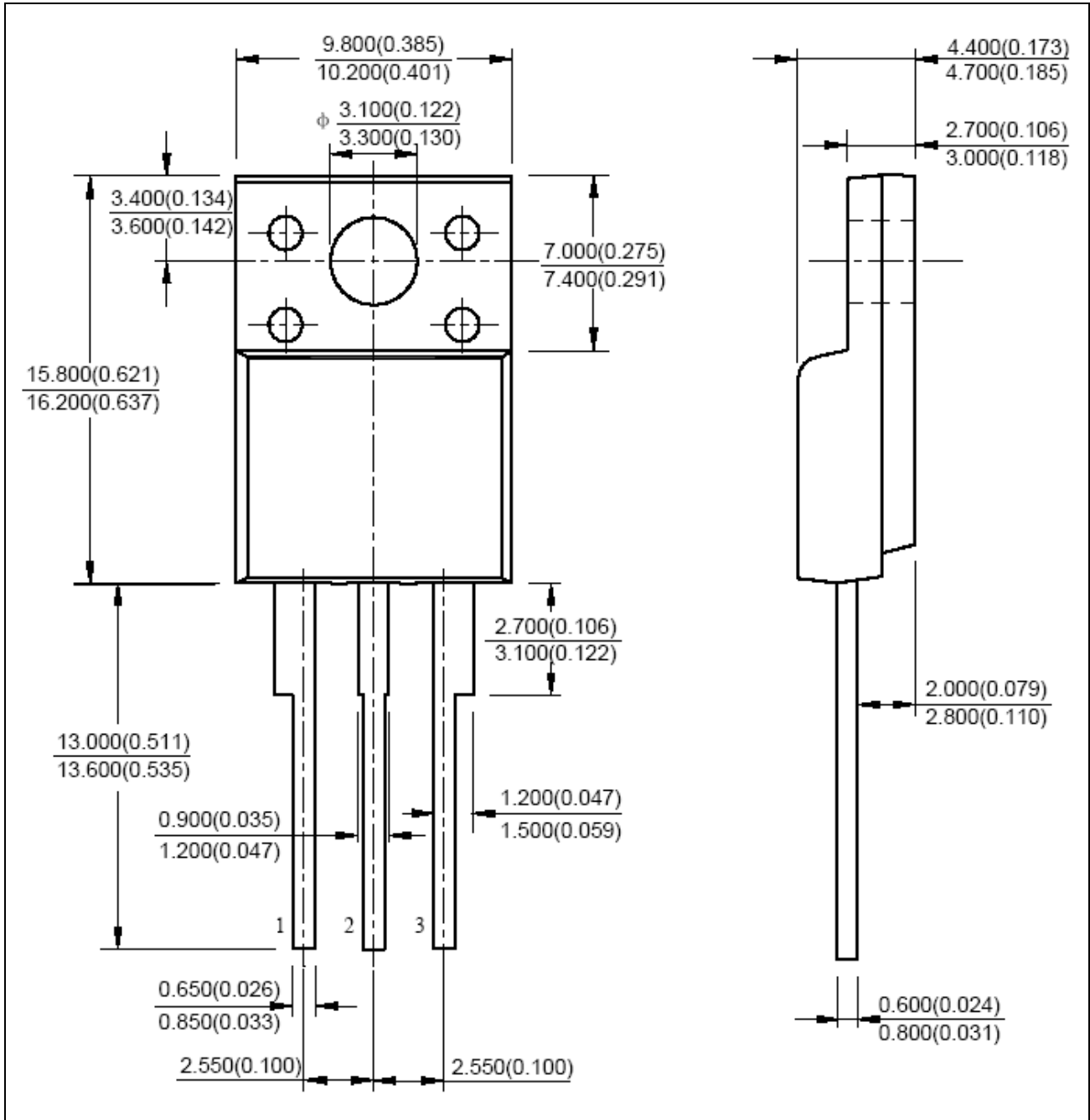
### Dimensions in mm ( inch)



TO-220

# 600V/7.4A POWER MOSFET (N-Channel)

## MSU7N60



TO-220F

# 600V/7.4A POWER MOSFET (N-Channel)

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**MSU7N60**

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