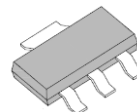


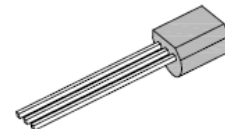
## 600V/1.2A Power MOSFET (N-Channel)

### General Description

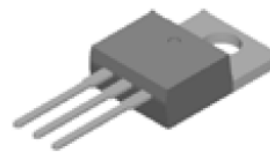
- MSU1N60 is a N-Channel enhancement mode power MOSFET with advanced technology. It is designed to have better characteristics, such as fast switching time, low gate charge, minimized on-state resistance and withstanding high energy pulse in the avalanche and commutation modes. These devices are well suited for high efficiency switching mode power supply applications.
- MSU1N60 are available in SOT-223, TO-92, TO-220, TO-220F, DPAK (TO-252) and IPAK (TO-251) packages.



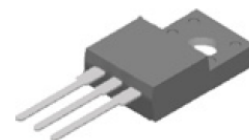
SOT-223



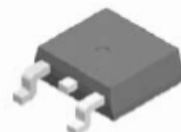
TO-92



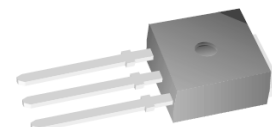
TO-220



TO-220F



DPAK  
(TO-252)



IPAK  
(TO-251)

### Features

- $R_{DS(ON)} \leq 11.5\Omega @ V_{GS}=10V$
- Ultra low gate charge (Typ.5.0nC)
- Low  $C_{rss}$  (Typ.3.0pF)
- Fast switching capability
- Avalanche energy tested
- Improved dv/dt capability, high ruggedness
- RoHS Compliance and Halogen free

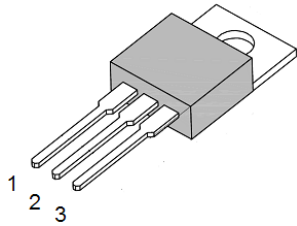


HALOGEN  
**FREE**

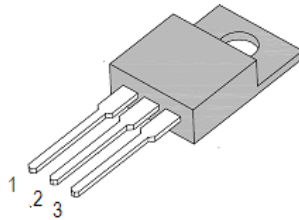
# 600V/1.2A POWER MOSFET (N-Channel)

MSU1N60

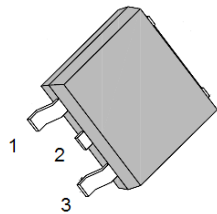
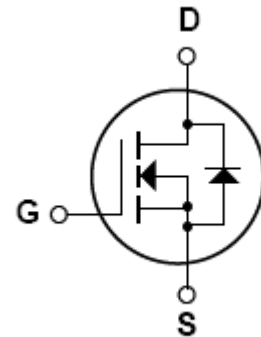
## Pin Configuration and Symbol



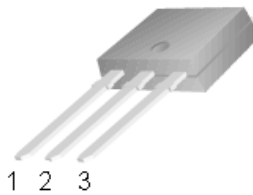
1: GATE 2: DRAIN 3: SOURCE  
**TO-220**



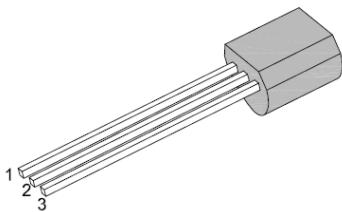
1: GATE 2: DRAIN 3: SOURCE  
**TO-220F**



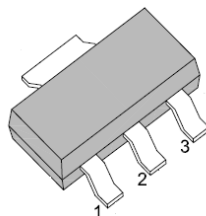
1: GATE 2: DRAIN 3: SOURCE  
**DPAK (TO-252)**



1: GATE 2: DRAIN 3: SOURCE  
**IPAK (TO-251)**



1: GATE 2: DRAIN 3: SOURCE  
**TO-92**



1: GATE 2: DRAIN 3: SOURCE  
**SOT-223**

# 600V/1.2A POWER MOSFET (N-Channel)

## MSU1N60

### 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		1.2	A
<b>I<sub>DM</sub></b>	Drain Current -Pulsed (note1)		4.8	A
<b>E<sub>AS</sub></b>	Avalanche Energy	Single Pulsed (Note2)	50	mJ
<b>E<sub>AR</sub></b>		Repetitive (Note1)	4.0	
<b>I<sub>AR</sub></b>	Avalanche Current (note1)		1.2	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	40	W
		TO-220F	21	
		IPAK(TO-251)/DPAK(TO-252)	28	
		TO-92	1	
<b>R<sub>θJA</sub></b>	Thermal Resistance (Junction-to-Ambient)	TO-220/ TO-220F	62.5	°C/ W
		IPAK(TO-251)/DPAK(TO-252)	110	
		TO-92	140	
<b>R<sub>θJC</sub></b>	Thermal Resistance (Junction-to-Case)	TO-220	3.13	°C/ W
		TO-220F	5.95	
		IPAK(TO-251)/DPAK(TO-252)	4.53	
<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=60mH, I<sub>AS</sub>=1.0A, V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C

3: I<sub>sd</sub>≤1.2A, di/dt≤200A/μs, V<sub>DD</sub>≤V<sub>BR(DSS)</sub>, Starting T<sub>J</sub>=25°C

# 600V/1.2A POWER MOSFET (N-Channel)

## MSU1N60

### 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	-	0.4	-	V/°C	$I_D=250\mu A$	
$I_{DSS}$	Drain-Source leakage Current	-	-	10	$\mu A$	$V_{DS}=600V, V_{GS}=0V$	
$I_{GSS}$	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>							
$V_{GS(th)}$	Gate-Source Threshold Voltage	2.0	-	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$	
$R_{DS(on)}$	Static Drain-Source On-State Resistance	-	9.3	11.5	$\Omega$	$V_{GS}=10V, I_D=0.6A$	
<b>DYNAMIC CHARACTERISTICS</b>							
$C_{iss}$	Input Capacitance	-	120	150	pF	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$	
$C_{oss}$	Output Capacitance	-	20	25	pF		
$C_{rss}$	Reverse Transfer Capacitance	-	3.0	4.0	pF		
<b>SWITCHING CHARACTERISTICS</b>							
$t_d(on)$	Turn-on Delay Time	-	5	20	nS	$V_{DD}=300V, I_D=1.2A, R_G=50\Omega$ (Note 4, 5)	
$t_r$	Turn-on Rise Time	-	25	60	nS		
$t_d(off)$	Turn-off Delay Time	-	7	25	nS		
$t_f$	Turn-off Fall Time	-	25	60	nS		
$Q_g$	Total Gate Charge	-	5.0	6.0	nC	$V_{DS}=480V, I_D=1.2A, V_{GS}=10V$ (Note 4, 5)	
$Q_{gs}$	Gate-Source Charge	-	1.0	-	nC		
$Q_{gd}$	Gate-Drain Charge	-	2.6	-	nC		
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>							
$V_{SD}$	Drain-Source Diode Forward Voltage	-	-	1.4	V	$V_{GS}=0V, I_S=1.2A$	
$I_S$	Maximum Continuous Drain-Source Diode Forward Current	-	-	1.2	A	-	
$I_{SM}$	Maximum Pulse Drain-Source Diode Forward Current	-	-	4.8	A	-	
$t_{rr}$	Reverse Recovery Time	-	160	-	nS	$V_{GS}=0V, I_S=1.2A$ $di_F/dt=100A/us$ (Note4)	
$Q_{rr}$	Reverse Recovery Charge	-	0.3	-	$\mu C$		

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

5: Essentially independent of operating temperature

### Typical Characteristics Curves

Fig.1- Drain Current vs. Source to Drain Voltage

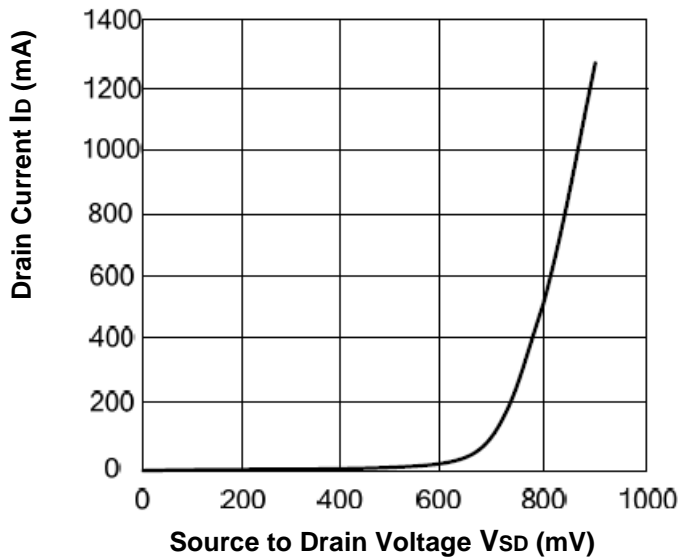


Fig.2- Drain-Source On-State Resistance Characteristic

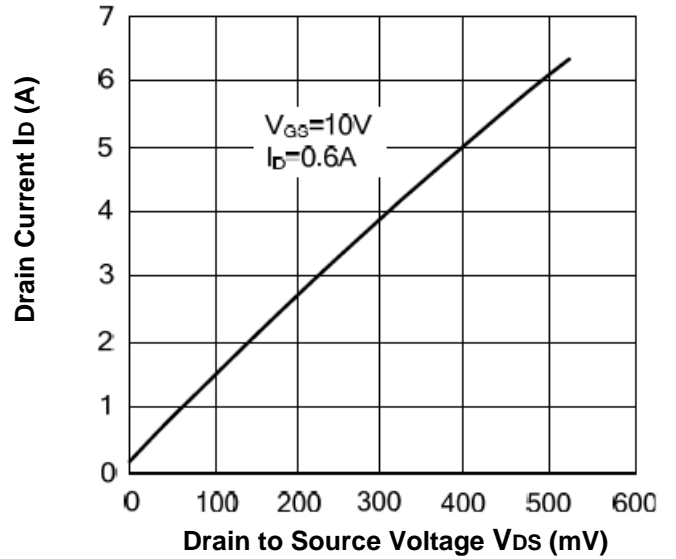


Fig.3- Drain Current vs. Gate Threshold Voltage

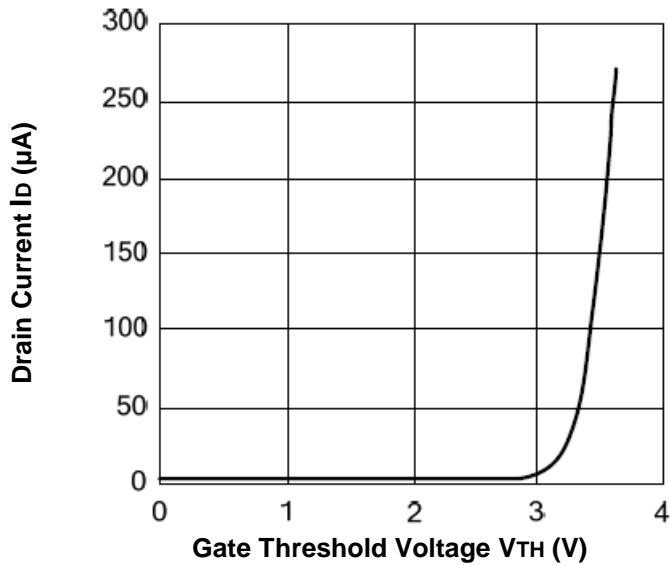
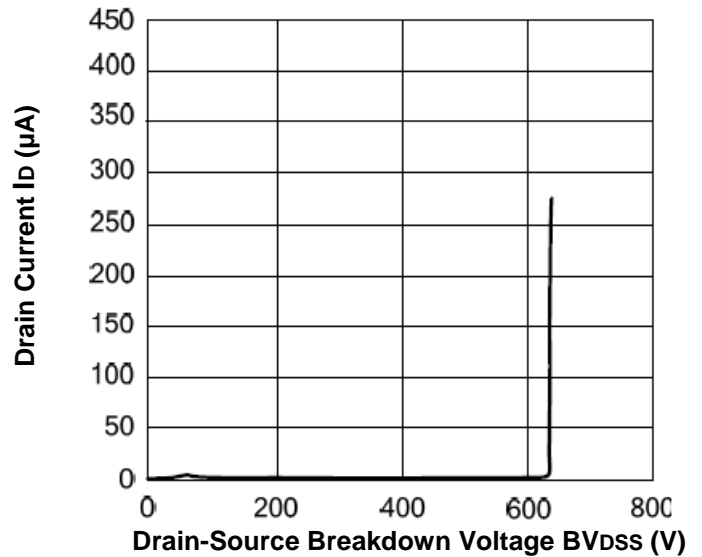


Fig.4- Drain Current vs. Drain-Source Breakdown Voltage



### TEST CIRCUIT AND WAVEFORMS

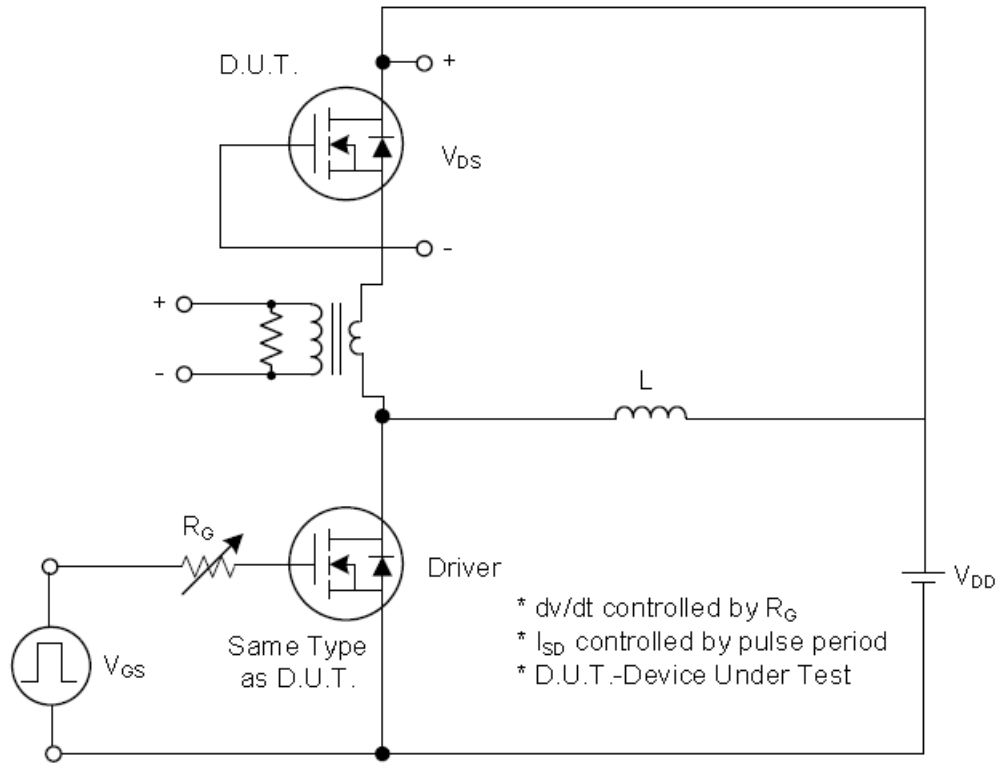


Fig.5- Peak Diode Recovery  $dv/dt$  Test Circuit

# 600V/1.2A POWER MOSFET (N-Channel)

MSU1N60

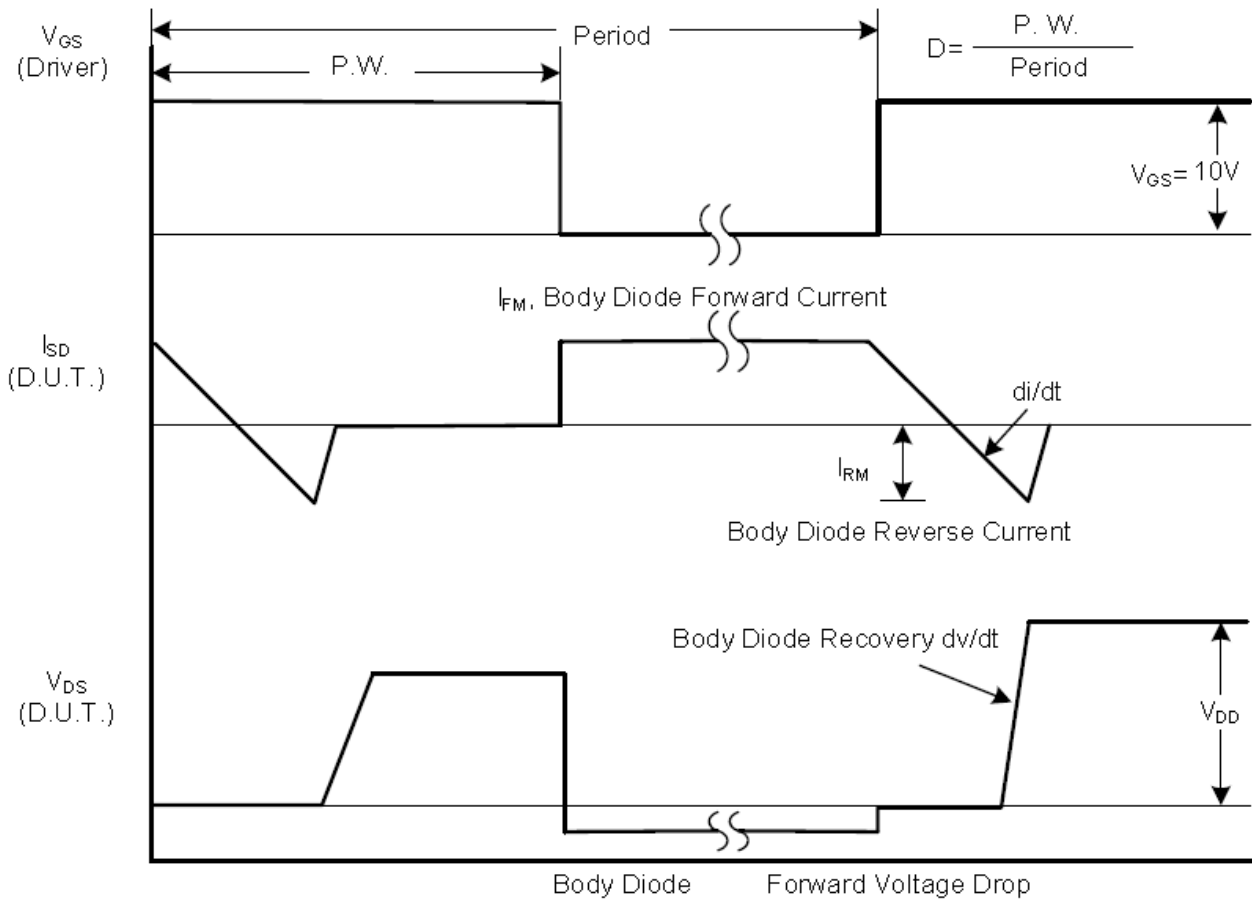


Fig.6- Peak diode Recovery dv/dt Waveform

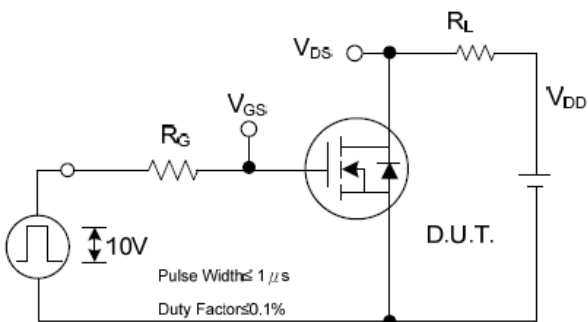


Fig.7- Switching Test Circuit

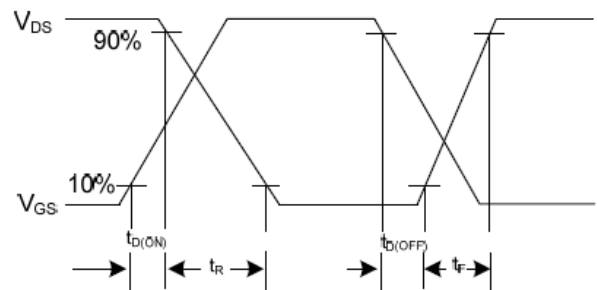
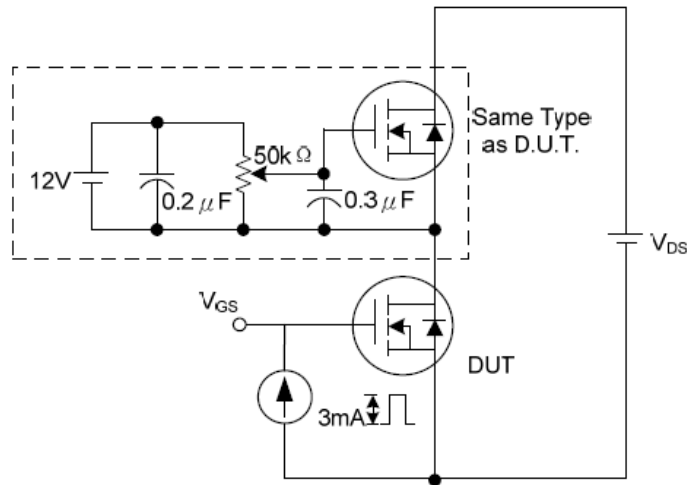
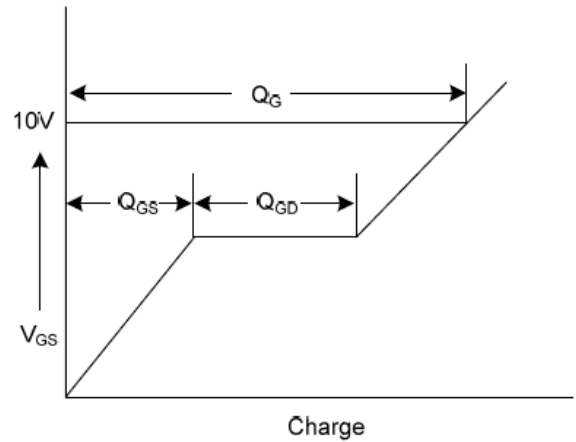


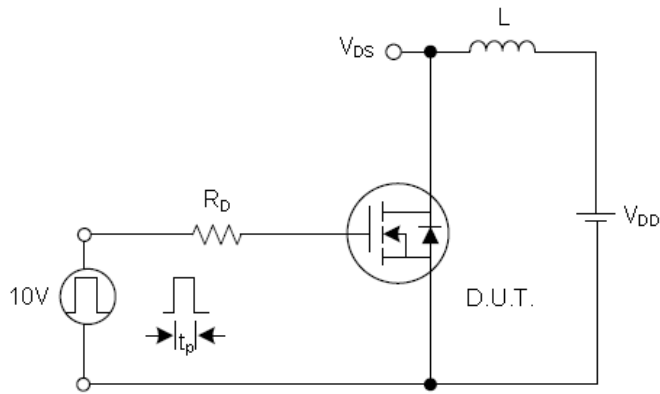
Fig.8- Switching Waveform



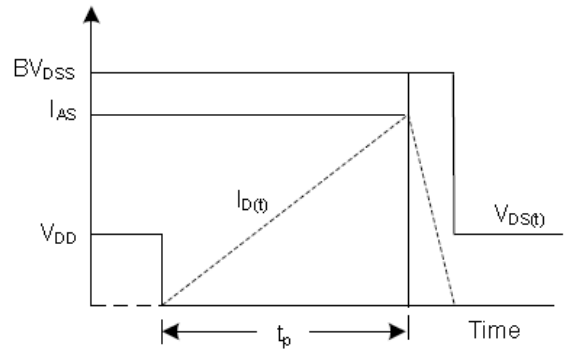
**Fig.9- Gate Charge Test Circuit**



**Fig.10- Gate Charge Waveform**



**Fig.11- Unclamped Inductive Switching Test Circuit**



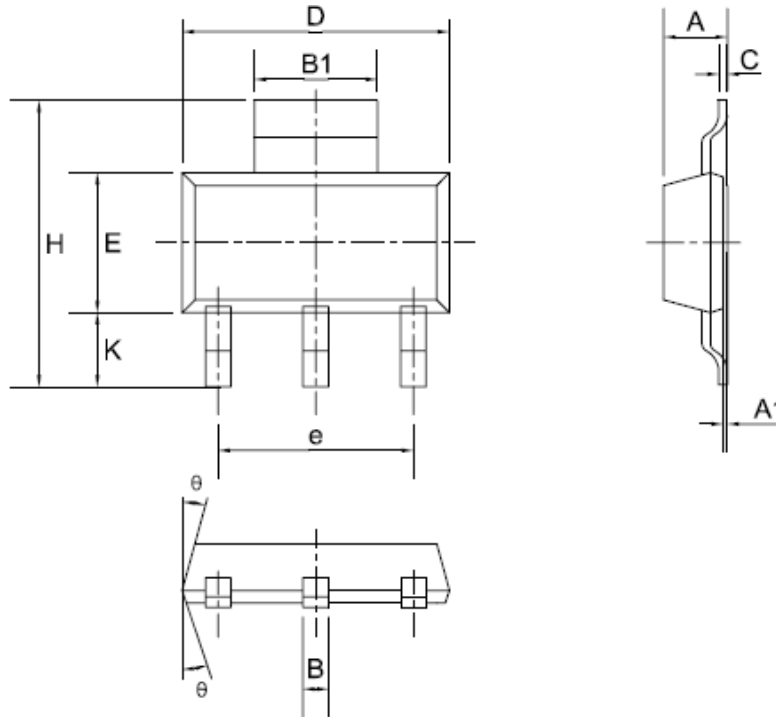
**Fig.12 Unclamped Inductive Switching Waveform**



# 600V/1.2A POWER MOSFET (N-Channel)

## MSU1N60

Dimensions in mm ( inch)

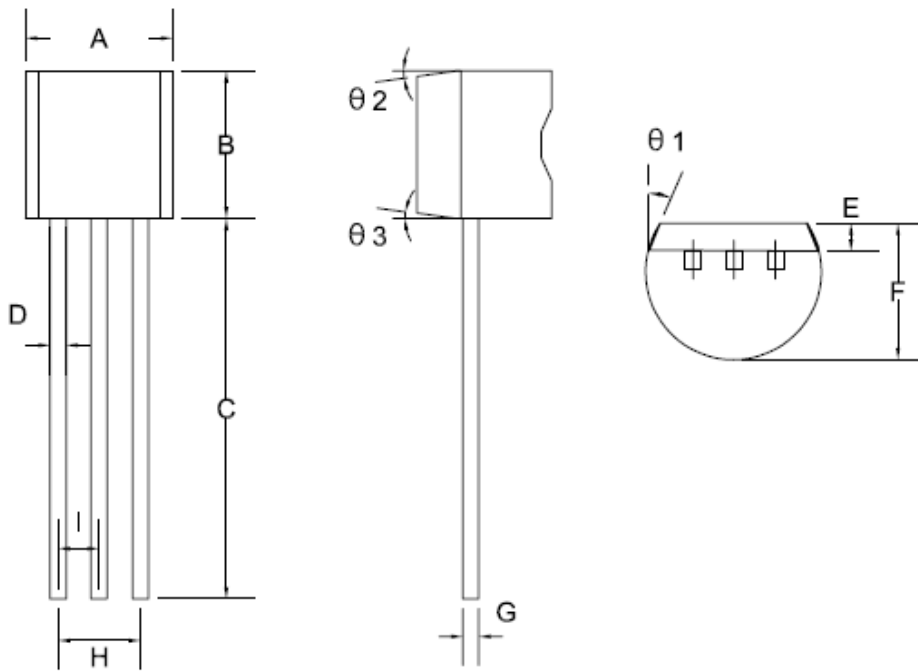


Symbol	Dimensions In Millimeters			Dimensions In Inches		
	M/n	Nom	Max	M/n	Nom	Max
A	1,50	1,65	1,80	0,059	0,065	0,071
A1	0,02	0,05	0,10	0,001	0,002	0,004
B	0,60	0,70	0,80	0,024	0,028	0,031
B1	2,90	3,00	3,15	0,114	0,118	0,124
C	0,25	0,30	0,35	0,010	0,012	0,014
D	6,30	6,50	6,70	0,248	0,256	0,264
E	3,30	3,50	3,70	0,130	0,138	0,146
e	4,50	4,60	4,70	0,177	0,181	0,185
H	6,70	7,00	7,30	0,264	0,276	0,287
K	1,50	1,75	2,00	0,059	0,069	0,079
θ	0°	—	13°	0°	—	13°

**SOT-223**

# 600V/1.2A POWER MOSFET (N-Channel)

## MSU1N60

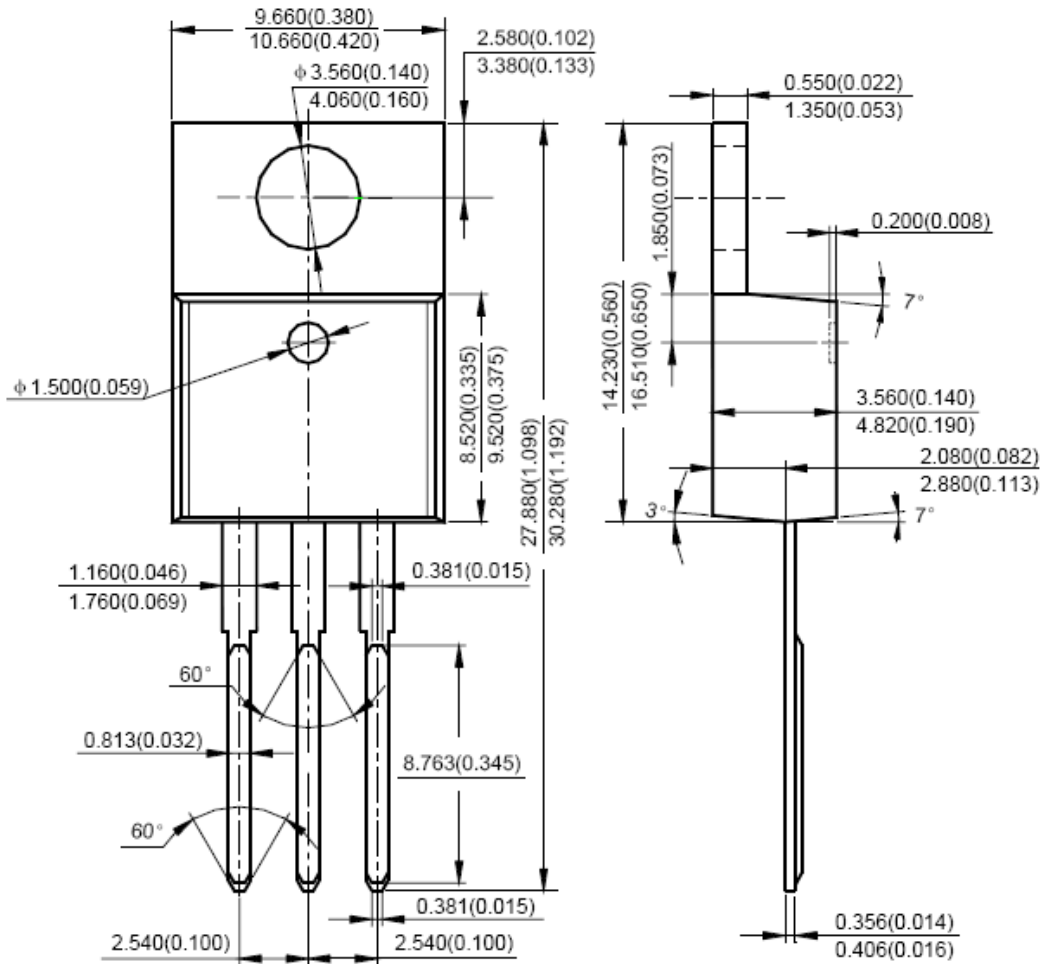


Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	4.33	4.58	4.83	0.170	0.180	0.190
B	4.33	4.58	4.83	0.170	0.180	0.190
C	14.07	14.47	14.87	0.554	0.570	0.585
D	0.34	0.44	0.54	0.013	0.017	0.021
E	0.92	1.02	1.12	0.036	0.040	0.044
F	3.36	3.56	3.76	0.132	0.140	0.148
G	0.34	0.44	0.54	0.013	0.017	0.021
H	2.42	2.54	2.66	0.095	0.100	0.105
I	1.15	1.27	1.39	0.045	0.050	0.055
$\theta 1$	0°	5°	15°	0°	5°	15°
$\theta 2$	0°	2°	8°	0°	2°	8°
$\theta 3$	0°	2°	8°	0°	2°	8°

**TO-92**

# 600V/1.2A POWER MOSFET (N-Channel)

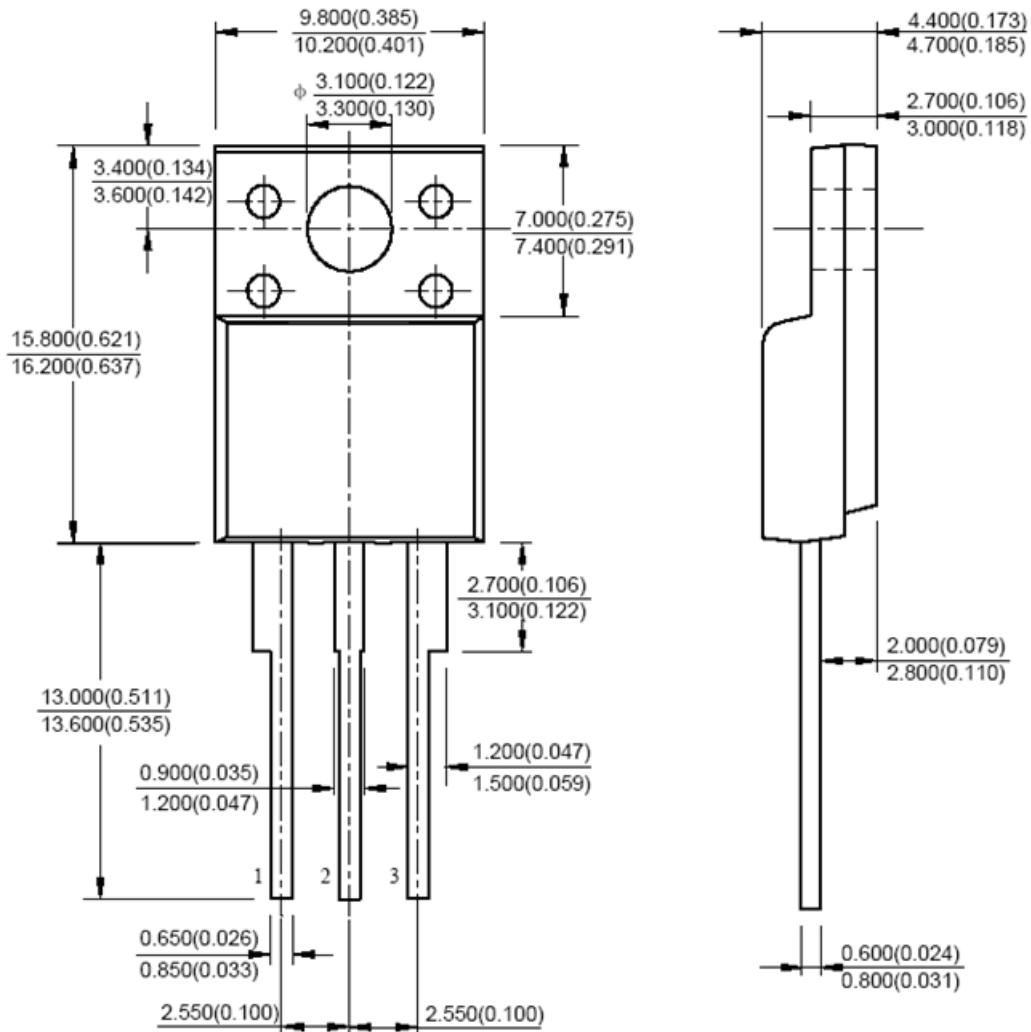
## MSU1N60



TO-220

# 600V/1.2A POWER MOSFET (N-Channel)

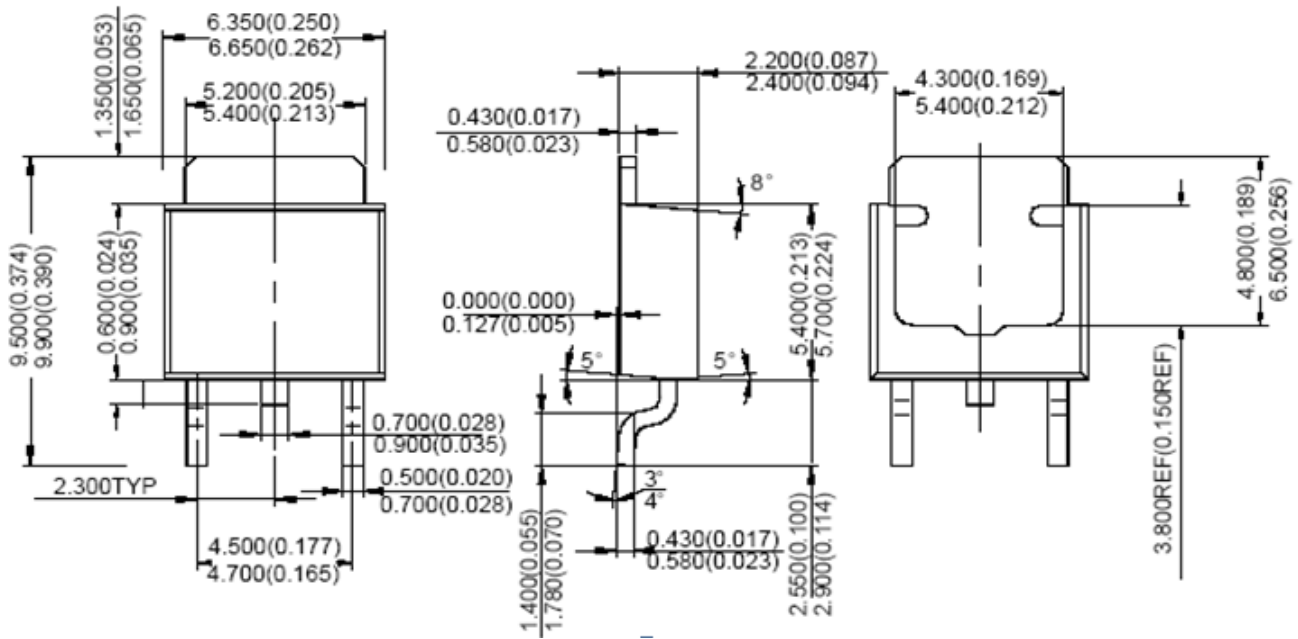
## MSU1N60



TO-220F

# 600V/1.2A POWER MOSFET (N-Channel)

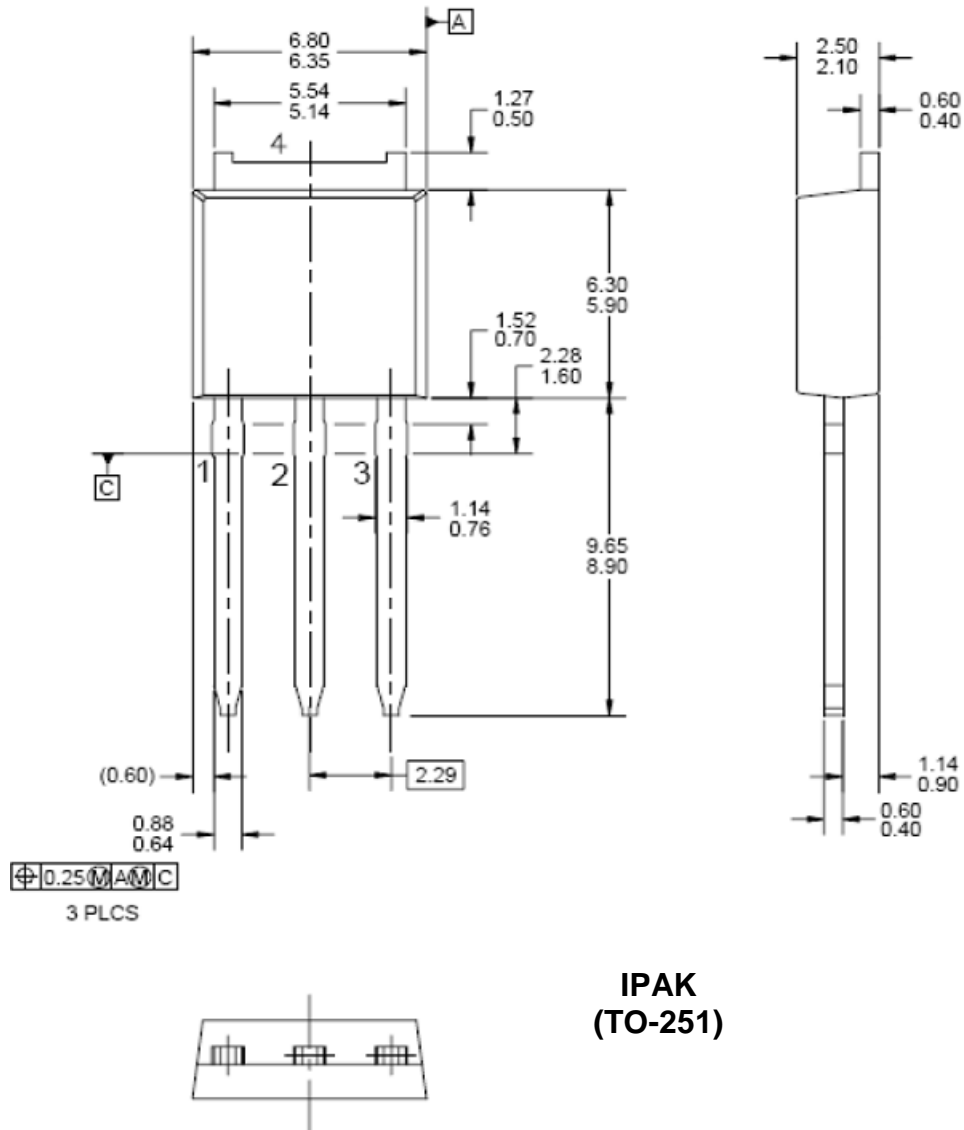
## MSU1N60



**DPAK  
(TO-252)**

# 600V/1.2A POWER MOSFET (N-Channel)

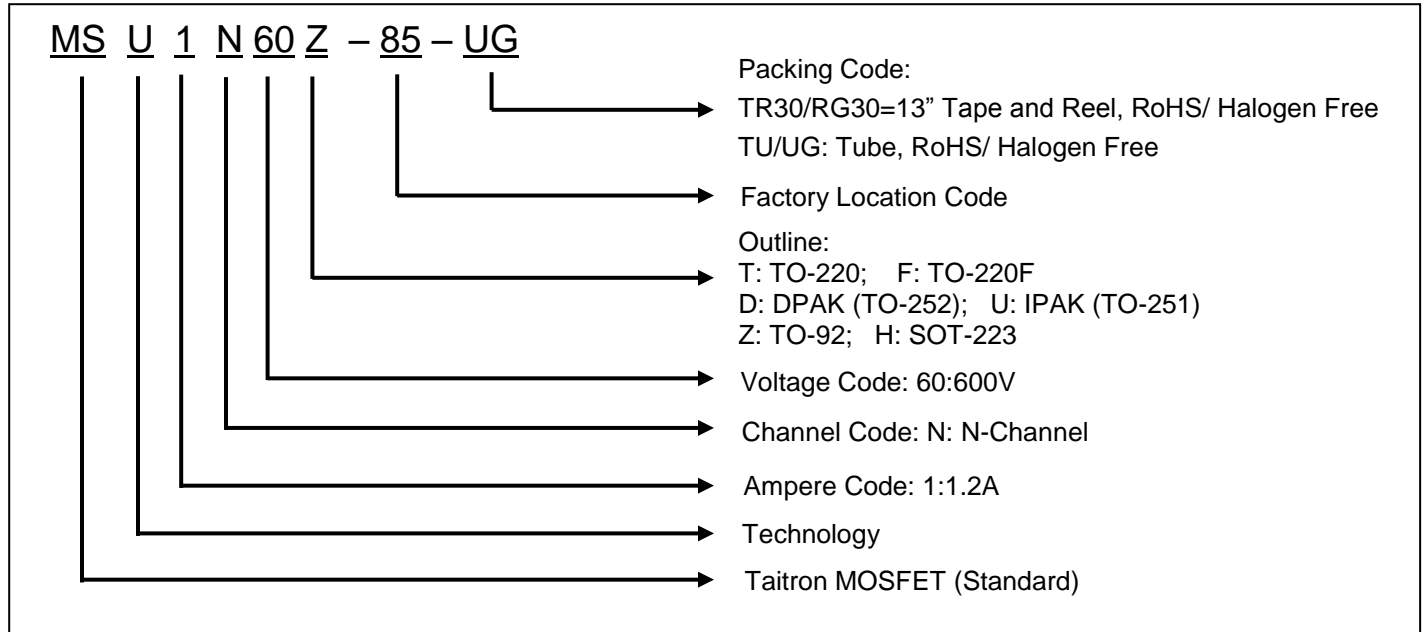
## MSU1N60



# 600V/1.2A POWER MOSFET (N-Channel)

## MSU1N60

### Ordering Information



### How to contact us

#### US HEADQUARTERS

28040 WEST HARRISON PARKWAY, VALENCIA, CA 91355-4162

Tel: (800)-TAITRON (800)-824-8766 (661)-257-6060

Fax: (800)-TAITFAX (800)-824-8329 (661)-257-6415

Email: [taitron@taitroncomponents.com](mailto:taitron@taitroncomponents.com)

Http://[www.taitroncomponents.com](http://www.taitroncomponents.com)

#### TAITRON COMPONENTS MEXICO, S.A .DE C.V.

BOULEVARD CENTRAL 5000 INTERIOR 5 PARQUE INDUSTRIAL ATITALAQUIA, HIDALGO

C.P. 42970 MEXICO

Tel: +52-55-5560-1519

Fax: +52-55-5560-2190

#### TAITRON COMPONENTS INCORPORATED TAIWAN, TAIPEI

6F., No.190, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 23146, Taiwan R.O.C.

Tel: 886-2-2913-6238

Fax: 886-2-2913-6239

#### TAITRON COMPONETS INCORPORATED, SHANGHAI REPRESENTATIVE OFFICE

METROBANK PLAZA, 1160 WEST YAN'AN ROAD, SUITE 1503, SHANGHAI, 200052, CHINA

Tel: +86-21-5424-9942

Fax: +86-21-5424-9931