

# MSF5N60

## N-Channel Enhancement Mode Power MOSFET

### Description

The MSF5N60 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

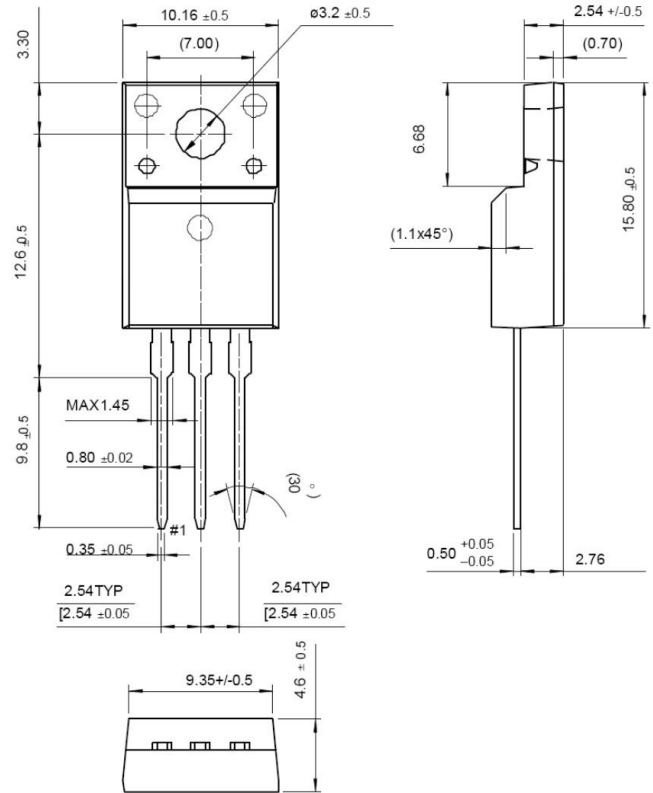
- Open Framed Power Supply
- Adapter
- STB

### Packing & Order Information

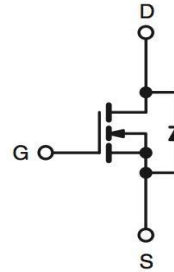
50/Tube ; 1,000/Box



**RoHS  
COMPLIANT**



### Graphic symbol



## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings			
Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	600	V
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V
$I_D$	Drain Current -Continuous (TC=25°C)	4.5	A
	Drain Current -Continuous (TC=100°C)	2.6	A
$I_{DM}$	Drain Current Pulsed	18	A
$I_{AR}$	Avalanche Current	4.5	A
$E_{AS}$	Single Pulsed Avalanche Energy	58.6	mJ
$E_{AR}$	Repetitive Avalanche Energy	10	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$	4.5	V/ns

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#### Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
$T_L$	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	°C
TPKG	Maximum Temperature for Soldering @ Package Body for 10 seconds	260	°C
$P_D$	Total Power Dissipation ( $T_C=25^\circ\text{C}$ )	33	W
	Derating Factor above 25 °C	0.26	W/°C
$T_{STG}$	Operating and Storage Temperature Range	-55 to +150	°C
$T_J$	Storage Temperature	150	°C

#### Notes;

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS}=4.5\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $L=7\text{mH}$ ,  $V_G=10\text{V}$ , Starting  $T_J=25^\circ\text{C}$
3.  $I_{SD}\leq 4.5\text{A}$ ,  $di/dt\leq 100\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

#### Thermal Characteristics ( $T_c=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.75	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	

#### Static Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$	600	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.6	--	V/°C
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	2.0	--	4.0	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{V}$ , $V_{GS} = 0\text{V}$ $V_{DS} = 480\text{V}$ , $T_C = 125^\circ\text{C}$	--	--	1 10	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Forward	$V_{GS} = \pm 30$	--	--	$\pm 100$	nA
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}$ , $I_D = 3.0\text{A}$	--	1.8	2.3	$\Omega$

#### Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$Q_g$	Total Gate Charge	$V_{DS} = 300\text{V}$ , $I_D = 4.5\text{A}$ , $V_{GS} = 10\text{V}$	--	16	--	nC
$Q_{gs}$	Gate-Source Charge		--	3.3	--	nC
$Q_{gd}$	Gate-Drain Charge		--	6.2	--	nC

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Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Time	$V_{DS} = 300 V, I_D = 4.5 A,$ $R_G = 10 \Omega, V_{GS} = 10 V$	--	9.6	--	ns
$t_r$	Turn-On Time		--	12.2	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	22.3	--	ns
$t_f$	Turn-Off Fall Time		--	14.8	--	ns
$C_{ISS}$	Input Capacitance	$V_{DS} = 25 V, V_{GS} = 0 V,$ $f = 1.0MHz$	--	700	--	pF
$C_{OSS}$	Output Capacitance		--	86	--	pF
$C_{RSS}$	Reverse Transfer Capacitance		--	20	--	pF

Source-Drain Diode						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$I_S$		$V_D = V_G = 0$	--	--	4.5	A
$I_{SM}$		$V_S = 1.3 V$	--	--	18	
$V_{SD}$		$I_S = 4.5 A, V_{GS} = 0 V$	--	--	1.5	V
$t_{rr}$		$I_F = 4.5 A, V_{GS} = 0 V$	--	320	--	ns
$Q_{rr}$		$diF/dt = 100A/\mu s$	--	2.7	--	$\mu C$

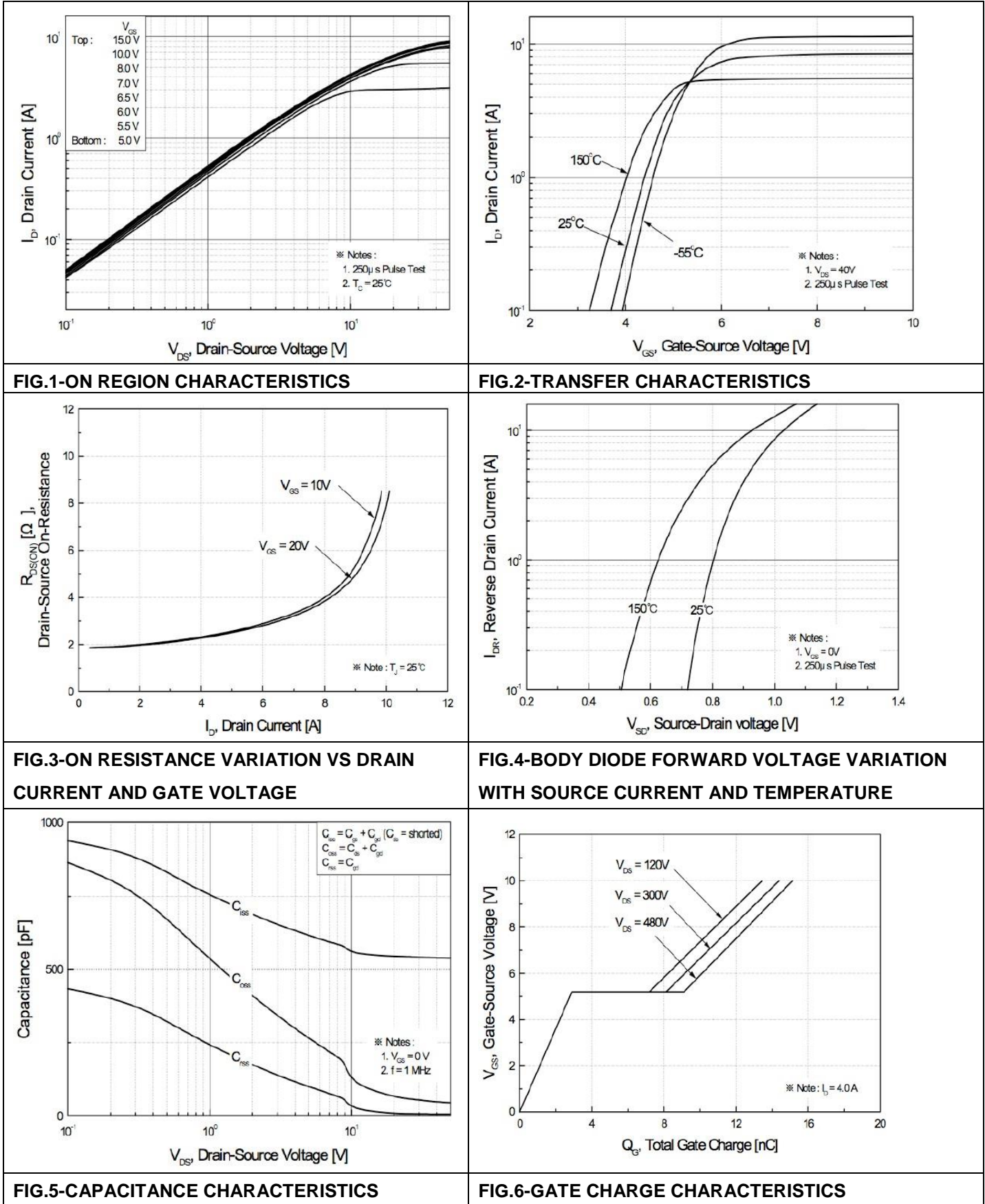
#### Notes;

1. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$

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## N-Channel Enhancement Mode Power MOSFET

### ■ Characteristics Curve



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### N-Channel Enhancement Mode Power MOSFET

#### ■ Characteristics Curve

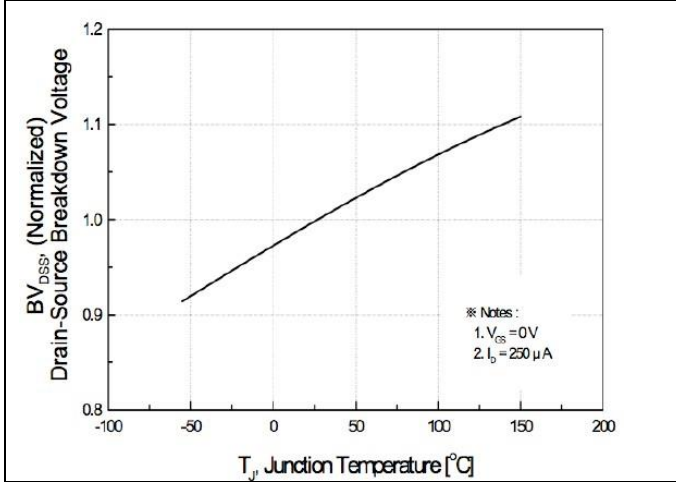


FIG.7-BREAKDOWN VOLTAGE VARIATION VS TEMPERATURE

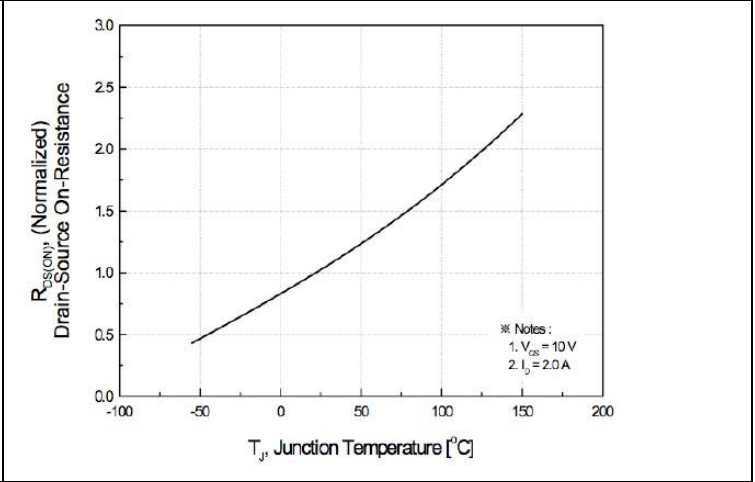


FIG.8-ON-RESISTANCE VARIATION VS TEMPERATURE

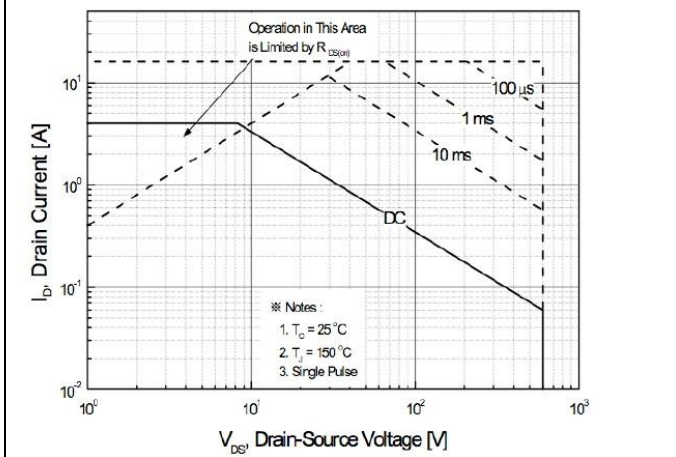


FIG.9-MAXIMUM SAFE OPERATING AREA

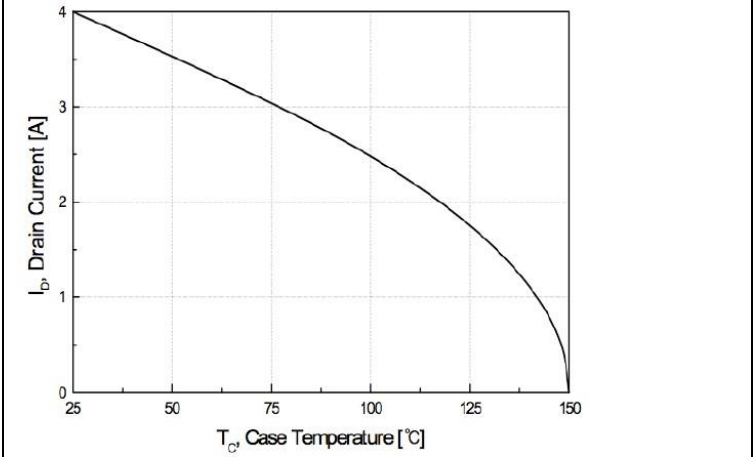


FIG.10-MAXIMUM DRAIN CURRENT VS CASE TEMPERATURE

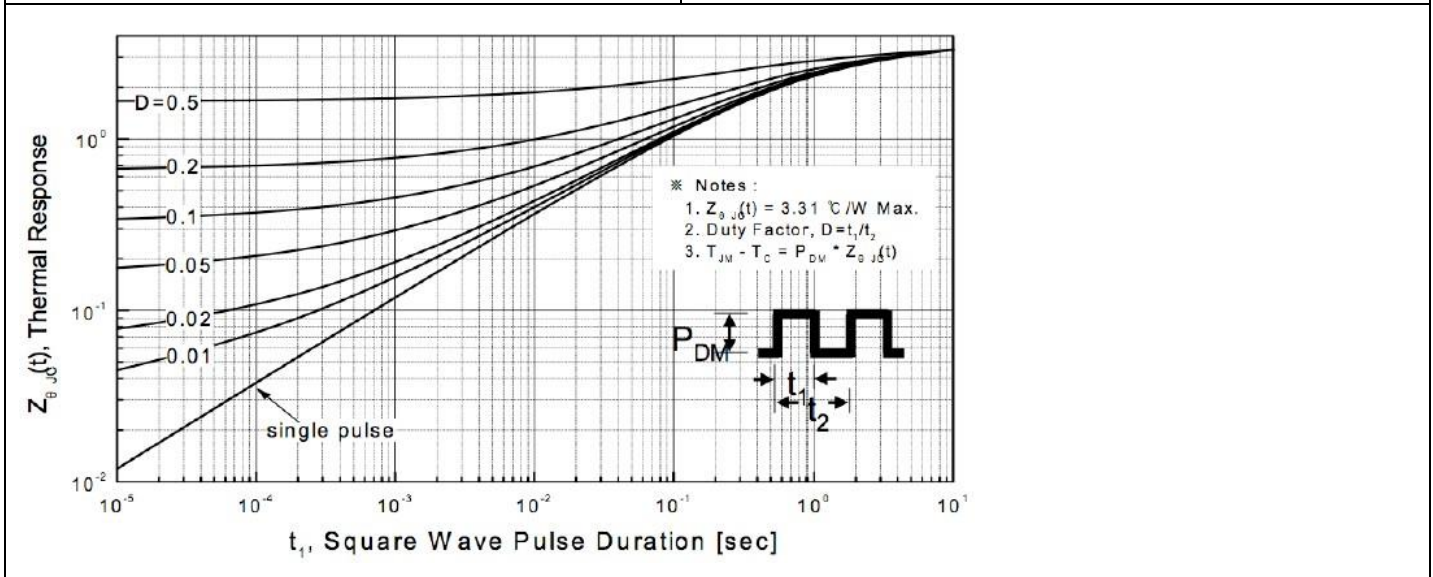


FIG.11-TRANSIENT THERMAL RESPONSE CURVE

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