

# N-CHANNEL MOSFET

## SI5N60

**4 Amps, 600Volts**

### N-CHANNEL MOSFET

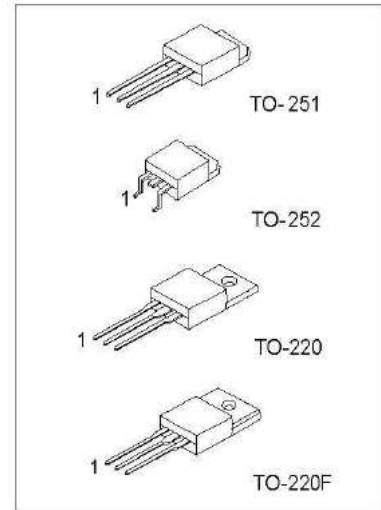
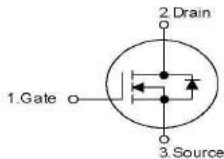
#### DESCRIPTION

The SI5N60 is a high voltage MOSFET and is designed to have better characteristics such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies .PWM motor controls, high efficient DC to DC converters and bridge circuits.

#### FEATURES

- $R_{DS(ON)}=2.5\ \Omega @V_{GS}=10V$
- Ultra Low gate charge(typical 15.0nC)
- Low reverse transfer capacitance( $C_{RSS}$ =typical 8.0pF)
- Fast switching capability
- Avalanche energy specified
- Improved dv/dt capability,high ruggedness

#### SYMBOL



\*Pb-free plating product number: 2N60L

#### ORDERING INFORMATION

Order Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
5N60-TA3-T	5N60L-TA3-T	TO-220	G	D	S	Tube
5N60-TF3-T	5N60L-TF3-T	TO-220F	G	D	S	Tube
5N60-TM3-T	5N60L-TM3-T	TO-251	G	D	S	Tube
5N60-TN3-R	5N60L-TN3-R	TO-252	G	D	S	Tape Reel
5N60-TN3-T	5N60L-TN3-T	TO-252	G	D	S	Tube

Note:Pin Assignment: G:Gate D:Drain S:Source

<p>5N60L-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Plating</p>	<p>(1)T:Tube,R:Tape Reel (2)TA3:TO220,TF3:TO-220F,TM3:TO-251,TN3:TO-252 (3)L:Lead Free Plating Blank: Pb/Sn</p>
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#### ABSOLUTE MAXIMUM RATINGS ( $T_c=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	PATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	600	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V
Avalanche Current(Note 2)	$I_{AP}$	4.4	A
Drain Current	$I_D$	$T_c=25^\circ C$	4.0
		$T_c=100^\circ C$	2.5
Drain Current Pulsed(Note 2)	$I_{DP}$	16	A

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Avalanche Energy	Repetitive(Note 2)	$E_{AR}$	260	mJ
	Single Pulse(Note 3)	$E_{AS}$	10.6	mJ
Peak Diode Recovery dv/dt(Note 4)		dv/dt	4.5	v/ns
Total Power Dissipation	$T_c=25^\circ\text{C}$	$P_D$	75	W
	Derate above $25^\circ\text{C}$		0.59	w/ $^\circ\text{C}$
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-55~+150	$^\circ\text{C}$

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged

Absolute maximum ratings are stress ratings only and functional device operation is not implied

2. Repetitive Rating: Pulse width limited by maximum junction temperature

### THERMAL DATA

PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Thermal Resistance Junction-Ambient	TO-251	$\theta_{JA}$	83	$^\circ\text{C}/\text{W}$
	TO-252		83	
	TO-220		62.5	
	TO-220F		62.5	
Thermal Resistance Junction-Case	TO-251	$\theta_{JC}$	2.5	
	TO-252		2.5	
	TO-220		1.18	
	TO-220F		3.47	

### ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNI	
<b>Off Characteristics</b>							
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu\text{A}$	600			V	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V$			10	$\mu\text{A}$	
		$V_{DS}=480V, T_c=125^\circ\text{C}$			100	$\mu\text{A}$	
Gate-Body Leakage Current	Forward	$I_{GSS}$	$V_{GS}=30V, V_{DS}=0V$		100	nA	
	Reverse			$V_{GS}=-30V, V_{DS}=0V$		-100	nA
Breakdown Voltage Temperature	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu\text{A}$		0.6		V/ $^\circ\text{C}$	
<b>On Characteristics</b>							
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.0		4.0	V	
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{DS}=10V, I_D=2.2A$			2.5	$\Omega$	
Forward Transconductance	$g_{FS}$	$V_{DS}=100V, I_D=2.4A$ (Note 1)	2.9			S	
<b>Dynamic Characteristics</b>							
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$		520	670	pF	
Output Capacitance	$C_{OSS}$				70	90	pF
Reverse Transfer Capacitance	$C_{RSS}$				8	11	pF

### ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Switching Characteristics</b>						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=300V, I_D=4.0A, R_G=25\Omega$ (Note 1, 2)		13	35	ns
Rise Time	$t_R$			45	100	ns
Turn-Off Delay Time	$t_{D(OFF)}$			25	60	ns
Fall Time	$t_F$			35	80	ns
Total Gate Charge	$Q_G$	$V_{DS}=480V, V_{GS}=10V, I_D=4.0A$		15	20	nC

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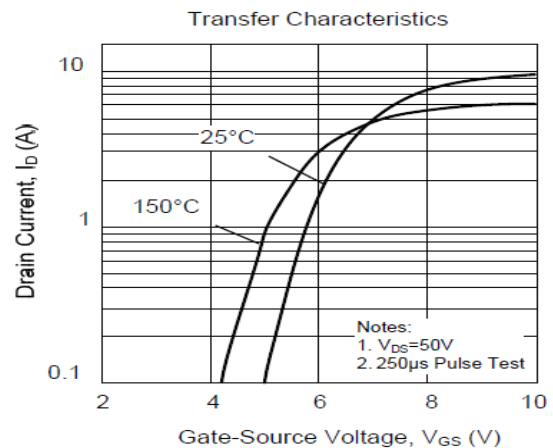
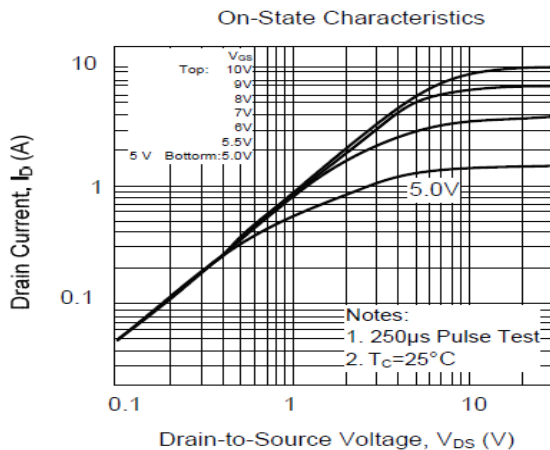
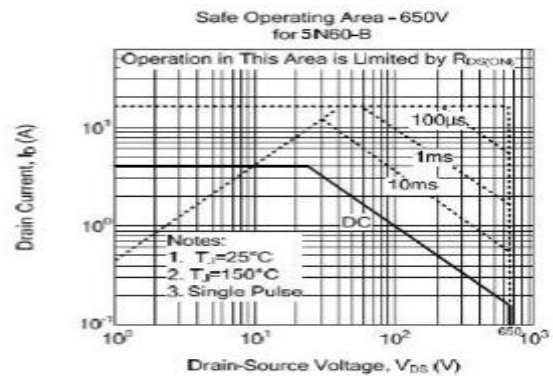
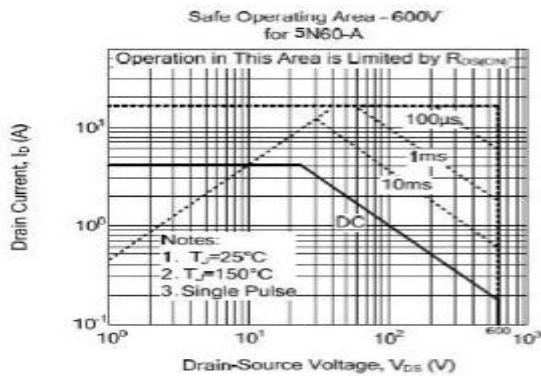
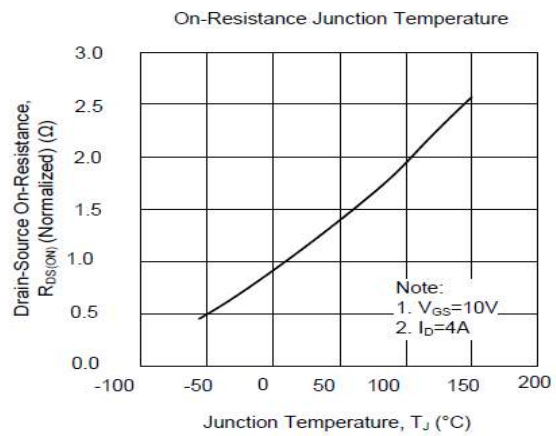
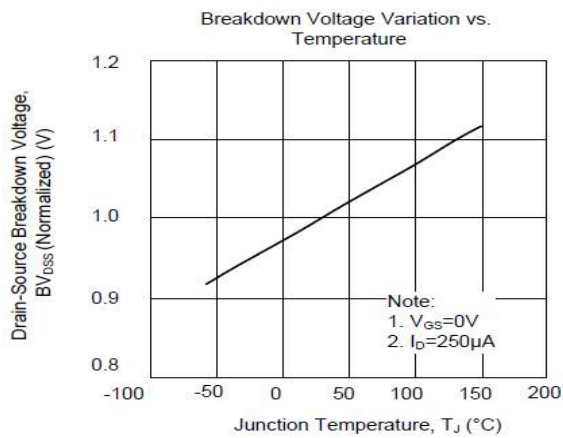
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Gate-Source Charge	$Q_{GS}$	(Note1,2)	3.4	nC
Gate-Drain Charge	$Q_{GD}$		7.1	nC
<b>Drain-Source Diode Characteristics</b>				
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_{SD}=4.4A$	1.4	V
Continuous Drain-Source Current	$I_{SD}$		4.4	A
Pulsed Drain-Source Current	$I_{SM}$		17.6	A
Reverse Recovery Time	$t_{RR}$	$V_{GS}=0V, I_{SD}=4.4A,$	250	ns
Reverse Recovery Charge	$Q_{RR}$	$di/dt=100A/\mu A$	1.5	$\mu C$

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

2. Essentially Independent of Operating Temperature

### TYPICAL CHARACTERISTICS

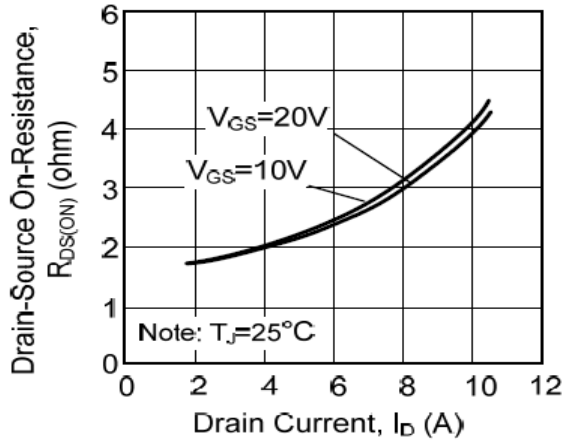


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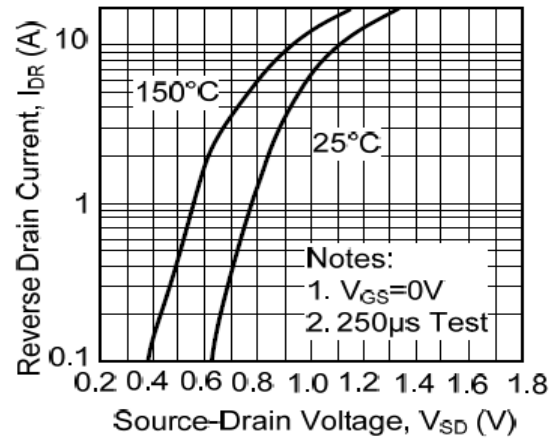
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### TYPICAL PERFORMANCE CHARACTERISTICS(cont)

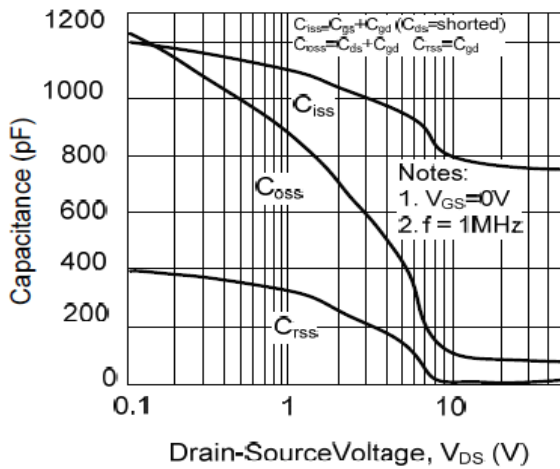
On-Resistance Variation vs. Drain Current and Gate Voltage



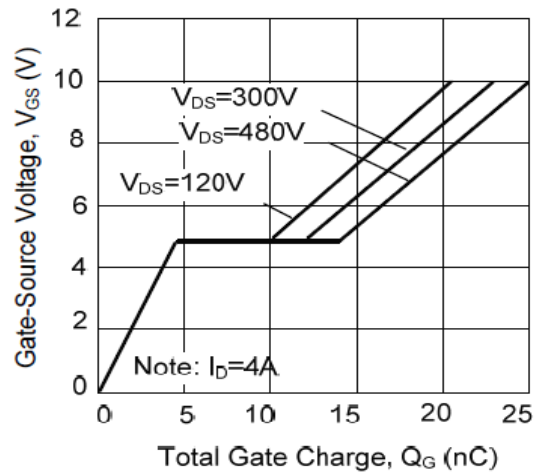
On State Current vs. Allowable Case Temperature



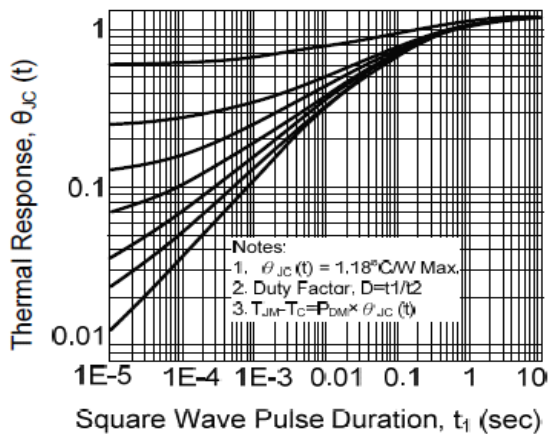
Capacitance Characteristics (Non-Repetitive)



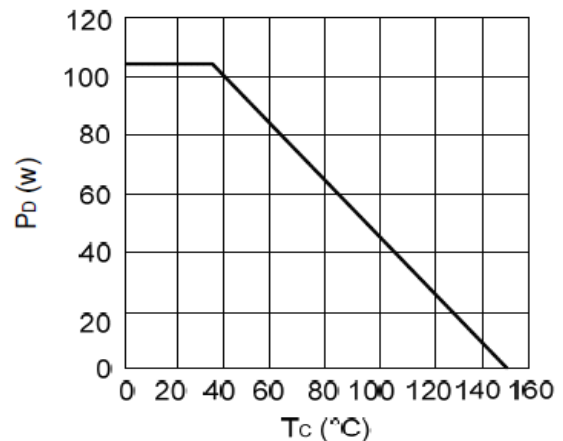
Gate Charge Characteristics



Transient Thermal Response Curve



Power Dissipation



## ■ TYPICAL CHARACTERISTICS(cont)

Maximum Drain Current vs. Case Temperature

