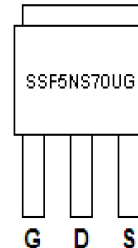


Main Product Characteristics

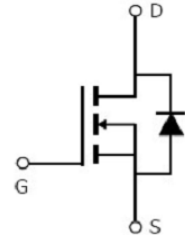
V_{DS}	700V
$R_{DS(on)}$	1.0 Ω (typ.)
I_D	5A ①



TO-251 (IPAK)



Marking and Pin
Assignment



Schematic Diagram

Features and Benefits

- High dv/dt and avalanche capabilities
- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance



Description

The SSF5NS70UG series MOSFETs is a new technology, which combines an innovative technology and advance process. This new technology achieves low $R_{DS(on)}$, energy saving, high reliability and uniformity, superior power density and space saving.

Absolute Max Rating

Symbol	Parameter	Max.	Units
I_D @ TC = 25°C	Continuous Drain Current, V_{GS} @ 10V	5 ①	A
I_D @ TC = 100°C	Continuous Drain Current, V_{GS} @ 10V	3.1①	
I_{DM}	Pulsed Drain Current ②	15	
P_D @TC = 25°C	Power Dissipation ③	28	W
	Linear Derating Factor	0.224	W/°C
V_{DS}	Drain-Source Voltage	700	V
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy @ L=100mH	180	mJ
I_{AS}	Avalanche Current @ L=100mH	1.9	A
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C

Thermal Resistance

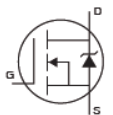
Symbol	Characteristics	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ③	—	4.4	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-ambient ($t \leq 10\text{s}$) ④	—	62	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics @ $T_A=25^{\circ}\text{C}$ unless otherwise specified

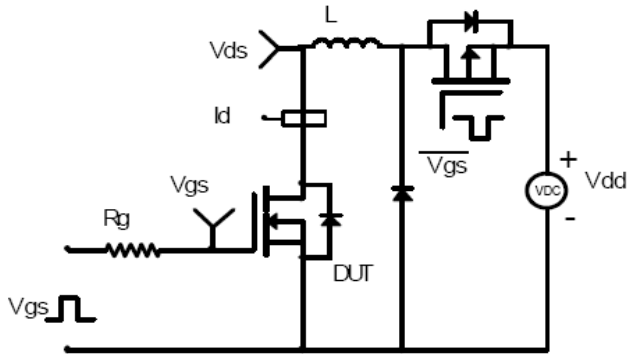
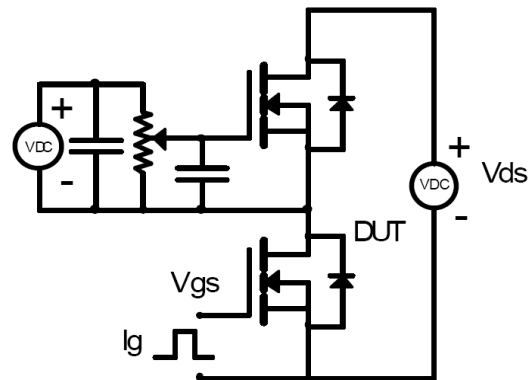
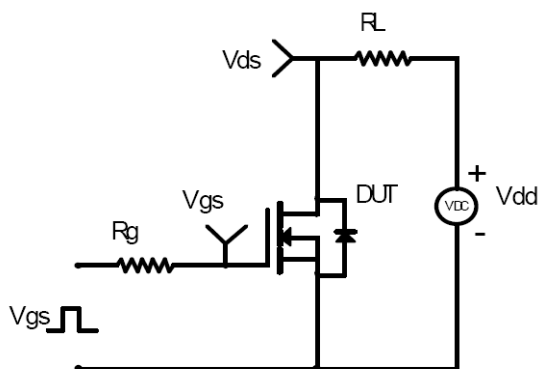
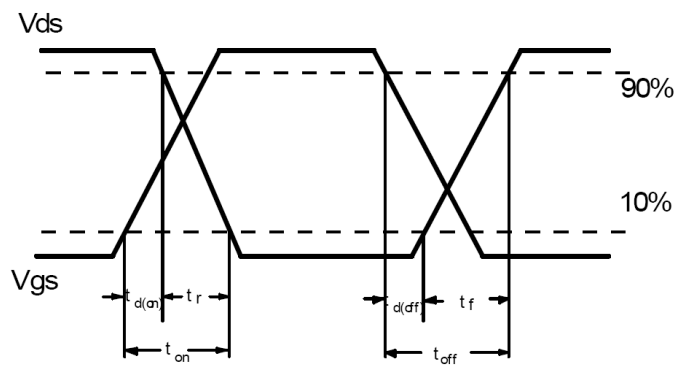
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	700	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	1.0	1.2	Ω	$V_{GS}=10\text{V}, I_D = 1\text{A}$
		—	2.4	—		$T_J = 125^{\circ}\text{C}$
		—	1.2	1.4	Ω	$V_{GS}=10\text{V}, I_D = 2.8\text{A}$
		—	3.2	—		$T_J = 125^{\circ}\text{C}$
$V_{GS(th)}$	Gate threshold voltage	3	—	5	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
		—	3.4	—		$T_J = 125^{\circ}\text{C}$
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	$V_{DS} = 700\text{V}, V_{GS} = 0\text{V}$
		—	—	50		$T_J = 125^{\circ}\text{C}$
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 30\text{V}$
		—	—	-100		$V_{GS} = -30\text{V}$
Q_g	Total gate charge	—	9.7	—	nC	$I_D = 5\text{A},$ $V_{DS}=200\text{V},$ $V_{GS} = 10\text{V}$
Q_{gs}	Gate-to-Source charge	—	1.9	—		
Q_{gd}	Gate-to-Drain("Miller") charge	—	2.3	—		
$t_{d(on)}$	Turn-on delay time	—	10	—	ns	$V_{GS}=10\text{V}, V_{DS} = 400\text{V},$ $R_{GEN}=10.2\Omega, I_D = 1.5\text{A}$
t_r	Rise time	—	6.7	—		
$t_{d(off)}$	Turn-Off delay time	—	20	—		
t_f	Fall time	—	16	—		
C_{iss}	Input capacitance	—	361	—	pF	$V_{GS} = 0\text{V}$
C_{oss}	Output capacitance	—	16	—		$V_{DS} = 100\text{V}$
C_{rss}	Reverse transfer capacitance	—	2.6	—		$f = 1\text{MHz}$

Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	5 ①	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode)	—	—	15	A	
V_{SD}	Diode Forward Voltage	—	0.84	1.2	V	$I_S=2.8\text{A}, V_{GS}=0\text{V}$
t_{rr}	Reverse Recovery Time	—	118	—	nS	$T_J = 25^{\circ}\text{C}, I_F = 1.5\text{A},$ $di/dt = 100\text{A}/\mu\text{s}$
Q_{rr}	Reverse Recovery Charge	—	607	—	nC	



Test circuits and Waveforms

EAS Test Circuit

Gate charge test circuit

Switching Time Test Circuit

Switching Waveforms


Notes:

- ① Calculated continuous current based on maximum allowable junction temperature.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$

Typical electrical and thermal characteristics

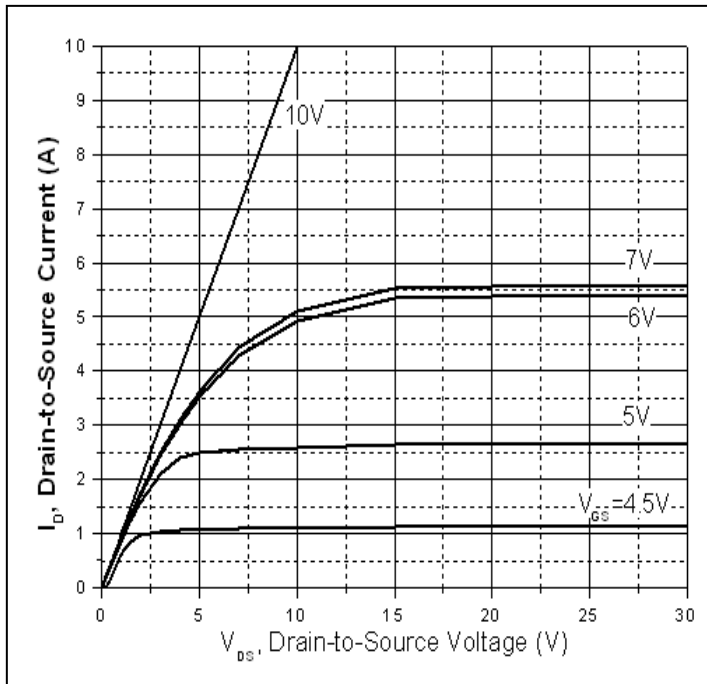


Figure 1: Typical Output Characteristics

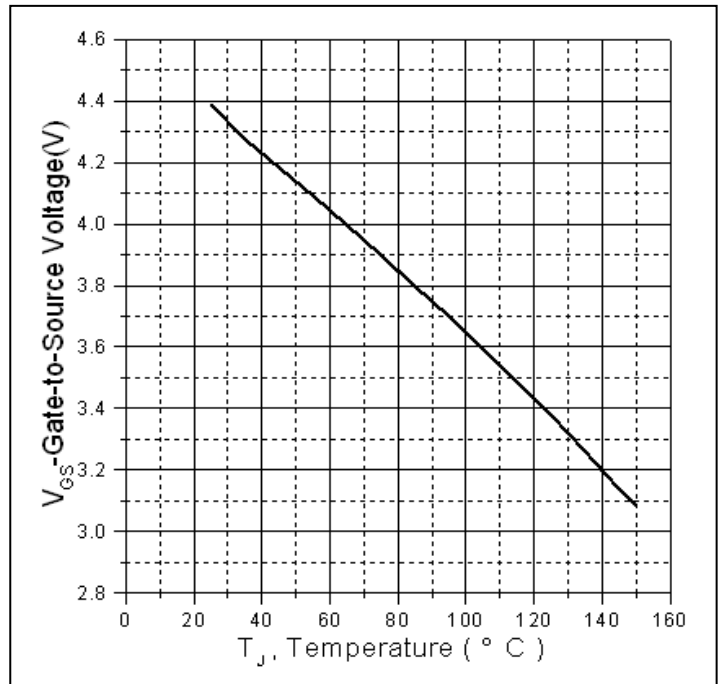


Figure 2: Gate to source cut-off voltage

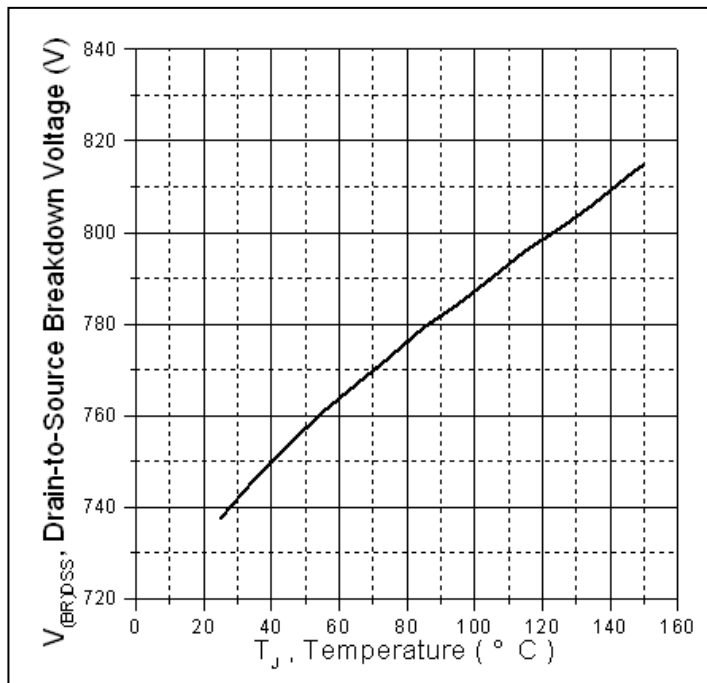


Figure 3: Drain-to-Source Breakdown Voltage Vs. Case Temperature

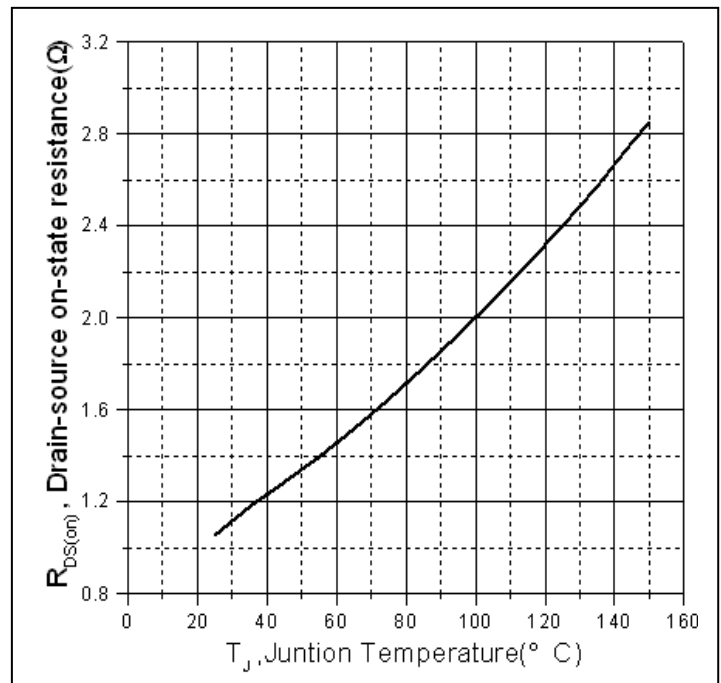


Figure 4: Normalized On-Resistance Vs. Case Temperature ($V_{GS}=10V, I_D = 1A$)

Typical electrical and thermal characteristics

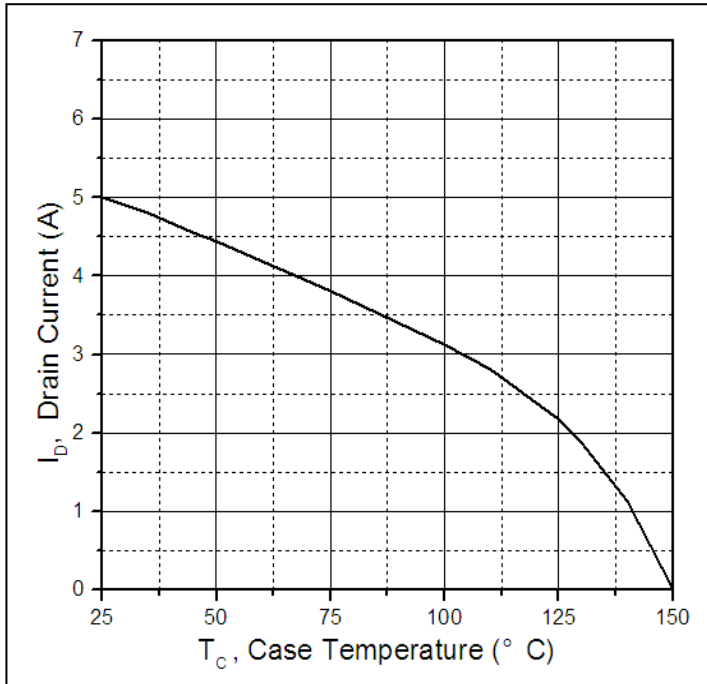


Figure 5. Maximum Drain Current Vs. Case Temperature

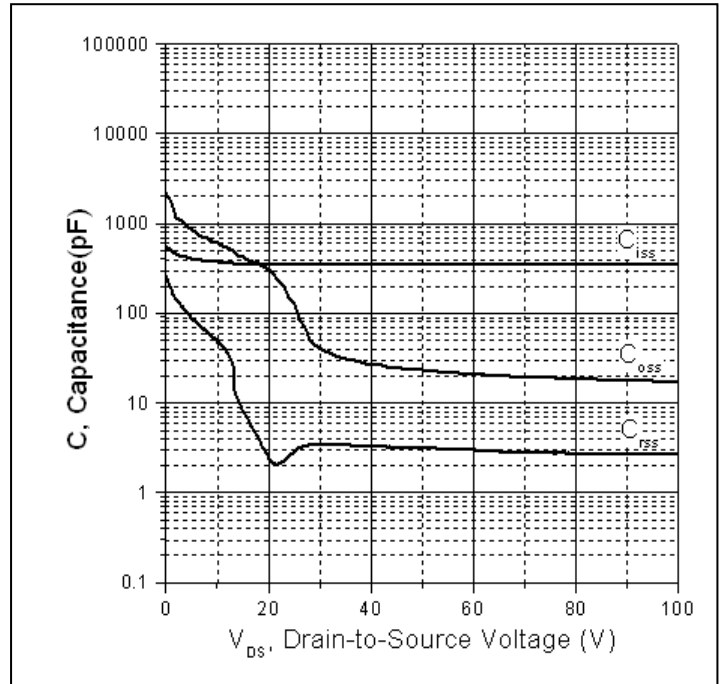
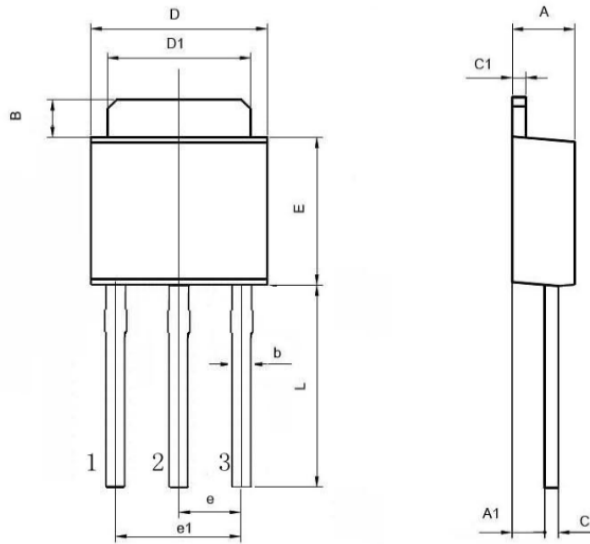


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

Mechanical Data:
TO-251 PACKAGE OUTLINE DIMENSION


Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
A	2.200	-	2.400	0.087	-	0.094
A1	0.950	-	1.150	0.037	-	0.045
B	0.950	-	1.250	0.037	-	0.049
b	0.500	-	0.700	0.020	-	0.028
c	0.450	-	0.550	0.018	-	0.022
c1	0.450	-	0.550	0.018	-	0.022
D	6.450	-	6.750	0.254	-	0.266
D1	5.200	-	5.400	0.205	-	0.213
E	5.950	-	6.250	0.234	-	0.246
e	2.240	-	2.340	0.088	-	0.092
e1	4.430	-	4.730	0.174	-	0.186
L	9.000	-	9.400	0.354	-	0.370

Ordering and Marking Information**Device Marking: SSF5NS70UG**

Package (Available)
TO-251(IPAK)
Operating Temperature Range
C : -55 to 150 °C

Devices per Unit

Package Type	Units/ Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes/Carton Box	Units/Carton Box
TO-251	75	60	4500	5	225000

Reliability Test Program

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	$T_j=150^{\circ}\text{C}$ @ 80% of Max $V_{DSS}/V_{CES}/V_R$	168 hours 500 hours 1000 hours	3 lots x 77 devices
High Temperature Gate Bias(HTGB)	$T_j=150^{\circ}\text{C}$ @ 100% of Max V_{GSS}	168 hours 500 hours 1000 hours	3 lots x 77 devices

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