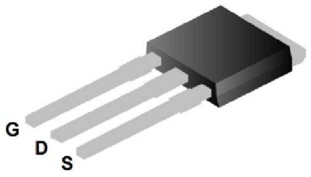
SSF4N60G

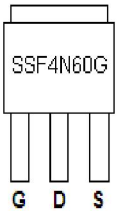
600V N-Channel MOSFET

Main Product Characteristics

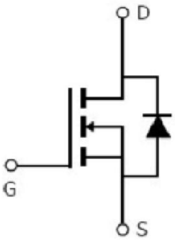
V_{DSS}	600V
$R_{DS}(on)$	1.85Ω (typ.)
I_D	4A



TO-251



Marking and Pin Assignment



Schematic Diagram

Features and Benefits

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 150℃ operating temperature
- Lead free product

Description

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

Absolute Max Rating

Symbol	Parameter	Max.	Units
I_D @ TC = 25°C	Continuous Drain Current, V_{GS} @ 10V①	4	A
I_D @ TC = 100°C	Continuous Drain Current, V_{GS} @ 10V①	2.5	
I_{DM}	Pulsed Drain Current②	16	
P_D @TC = 25°C	Power Dissipation③	77	W
	Linear Derating Factor	0.62	W/°C
V_{DS}	Drain-Source Voltage	600	V
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy @ L=25.9mH	117	mJ
I_{AS}	Avalanche Current @ L=25.9mH	3	A
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C

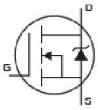
Thermal Resistance

Symbol	Characteristics	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case③	—	1.61	℃/W
$R_{\theta JA}$	Junction-to-ambient (t ≤ 10s) ④	—	110	℃/W

Electrical Characteristics @T_A=25℃ unless otherwise specified

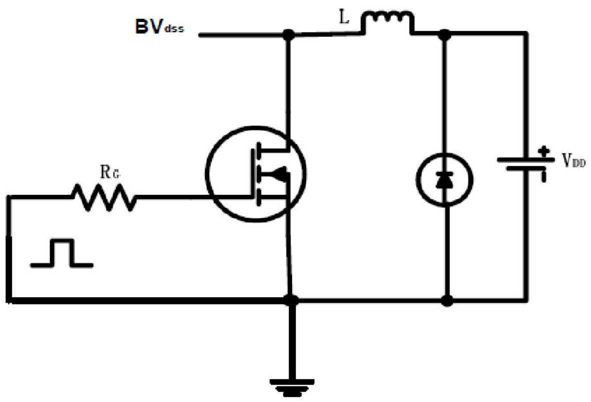
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	600	—	—	V	V_{GS} = 0V, ID = 250μA
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	1.85	2.4	Ω	V_{GS}=10V,I_D = 2A
		—	4.36	—		T_J = 125℃
$V_{GS(th)}$	Gate threshold voltage	2	—	4	V	V_{DS} = V_{GS}, I_D = 250μA
		—	2.36	—		T_J = 125℃
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	V_{DS} = 600V,V_{GS} = 0V
		—	—	50		T_J = 125℃
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	V_{GS} =30V
		—	—	-100		V_{GS} = -30V
Q_g	Total gate charge	—	8.2	—	nC	I_D = 4A,
Q_{gs}	Gate-to-Source charge	—	2.6	—		V_{DS}=480V,
Q_{gd}	Gate-to-Drain("Miller") charge	—	3.0	—		V_{GS} = 10V
$t_{d(on)}$	Turn-on delay time	—	10.8	—	ns	V_{GS}=10V, VDS=300V, R_{GEN}=25Ω, ID=4A
t_r	Rise time	—	12.7	—		
$t_{d(off)}$	Turn-Off delay time	—	38.8	—		
t_f	Fall time	—	19.3	—		
C_{iss}	Input capacitance	—	653	—	pF	V_{GS} = 0V
C_{oss}	Output capacitance	—	56	—		V_{DS} = 25V
C_{rss}	Reverse transfer capacitance	—	5	—		f = 1MHz

Source-Drain Ratings and Characteristics

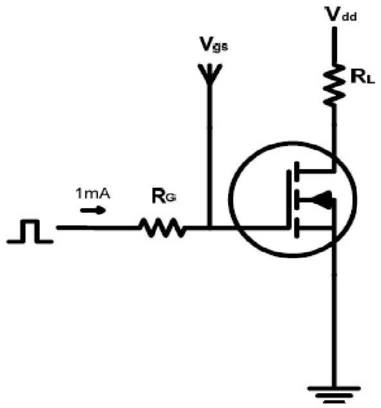
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	4	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	16	A	
V_{SD}	Diode Forward Voltage	—	—	1.4	V	I_S=4A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	—	431.3	—	nS	T_J = 25°C, I_F =4A,
Q_{rr}	Reverse Recovery Charge	—	1955	—	nC	di/dt = 100A/μs

Test Circuits and Waveforms

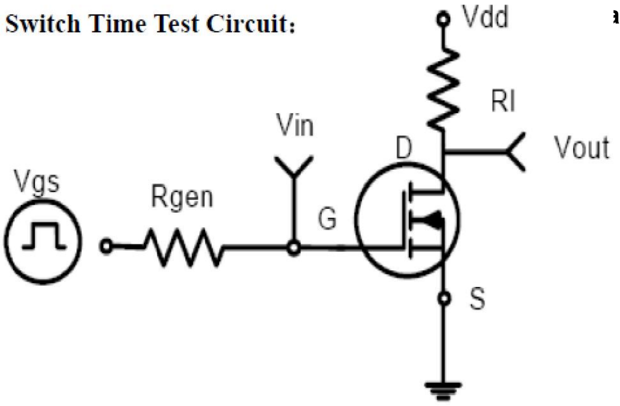
EAS test circuits:



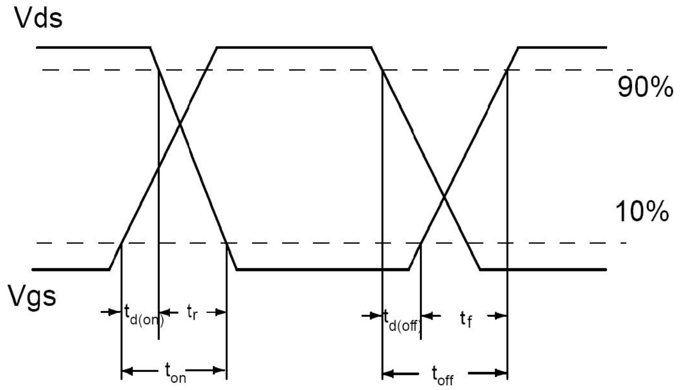
Gate charge test circuit:



Switch Time Test Circuit:



aveforms:



Notes:

①The maximum current rating is limited by bond-wires.

②Repetitive rating; pulse width limited by max. junction temperature.

③The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.

④The value of $R_{\theta JA}$ is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with TA =25°C

Typical Electrical and Thermal Characteristics

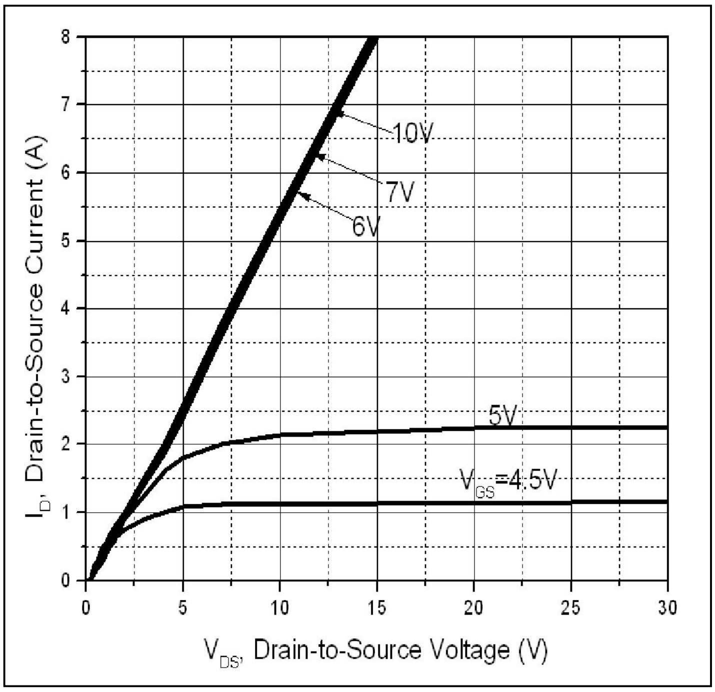


Figure 1: Typical Output Characteristics

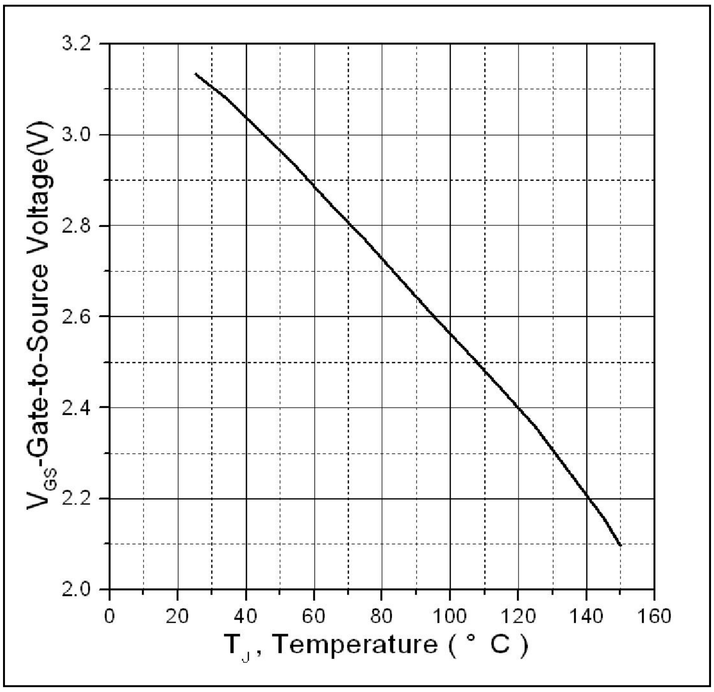


Figure 2. Gate to source cut-off voltage

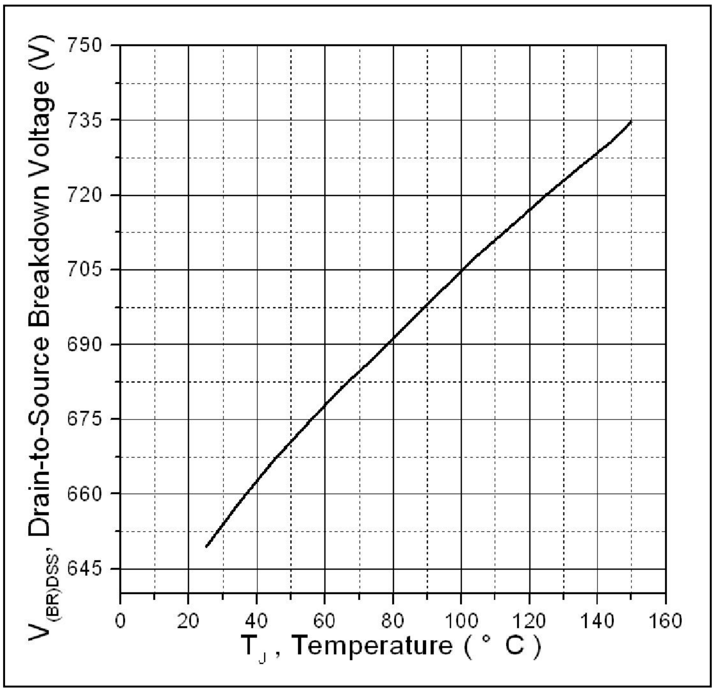


Figure 3. Drain-to-Source Breakdown Voltage Vs. Case Temperature

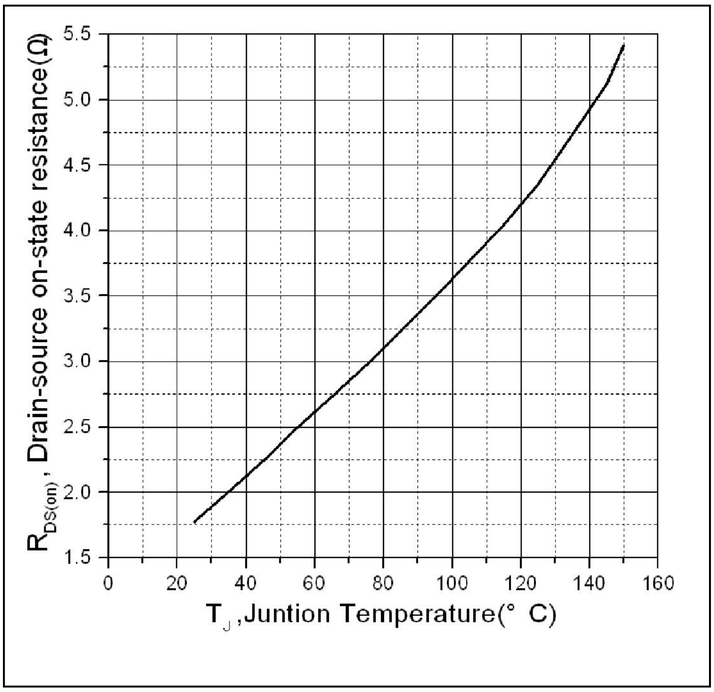
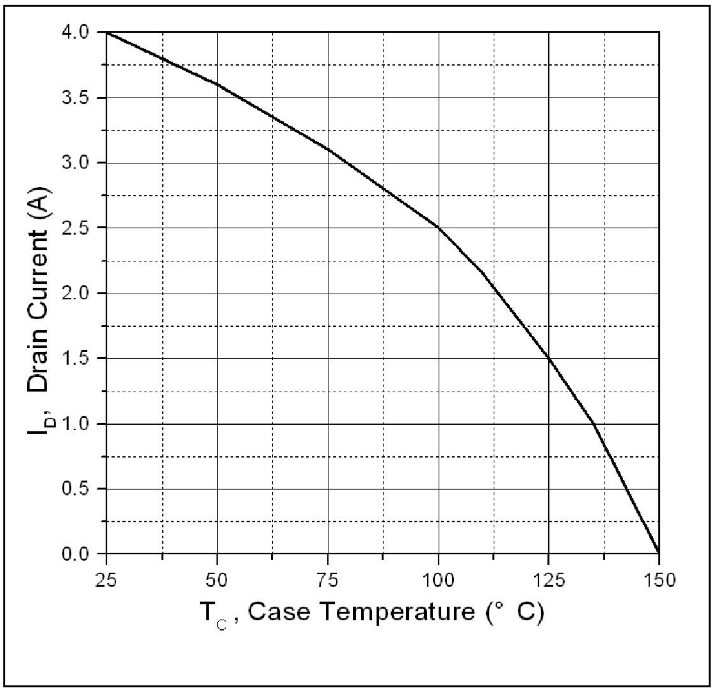


Figure 4: Normalized On-Resistance Vs. Case Temperature

Typical Electrical and Thermal Characteristics



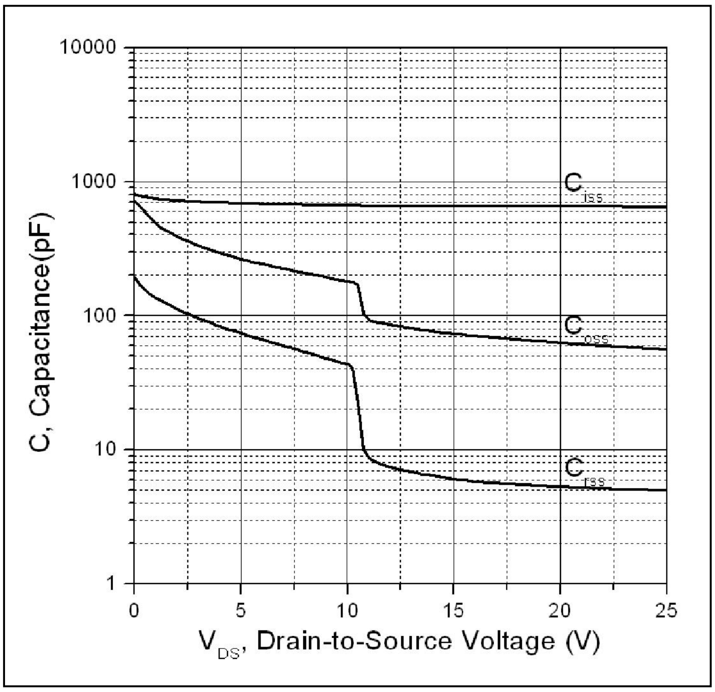
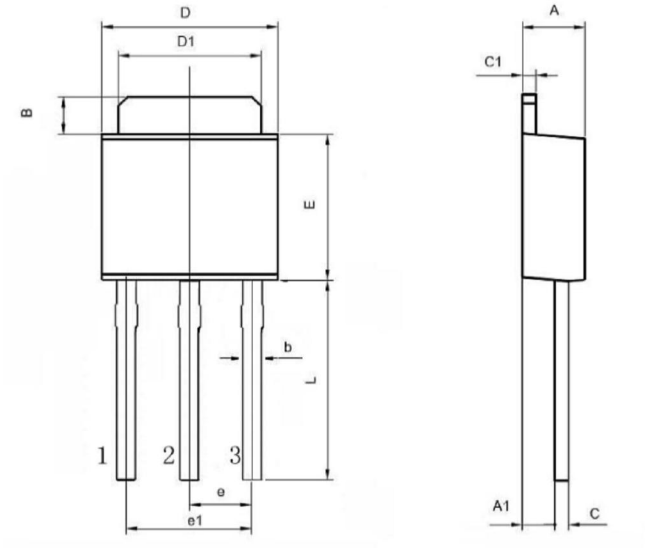


Figure 5. Maximum Drain Current Vs. Case Temperature

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: SSF4N60G

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	80	60	4800	5	24000

Reliability Test Program

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	T_j=125℃ to 150℃ @ 80% of Max V_{DSS}/V_{CES}/VR	168 hours 500 hours 1000 hours	3 lots x 77 devices
High Temperature Gate Bias(HTGB)	T_j=150℃ @ 100% of Max V_{GSS}	168 hours 500 hours 1000 hours	3 lots x 77 devices