

Main Product Characteristics:

V_{DSS}	610V
$R_{DS(on)}$	0.27ohm(typ.)
I_D	15A ^①


TO220F

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 SSF18NS60F series MOSFETs is a new technology, which combines an innovative super junction technology and advance process. This new technology achieves low Rdson, 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	15 ^①	A
I_D @ TC = 100°C	Continuous Drain Current, V_{GS} @ 10V	9.4 ^①	
I_{DM}	Pulsed Drain Current ^②	60	
P_D @TC = 25°C	Power Dissipation ^③	32.8	W
	Linear Derating Factor	0.26	W/°C
V_{DS}	Drain-Source Voltage	610	V
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS}	Single Pulse Avalanche Energy @ L=22.5mH	180	mJ
I_{AS}	Avalanche Current @ L=22.5mH	4	A
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C

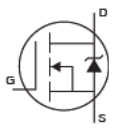
Thermal Resistance

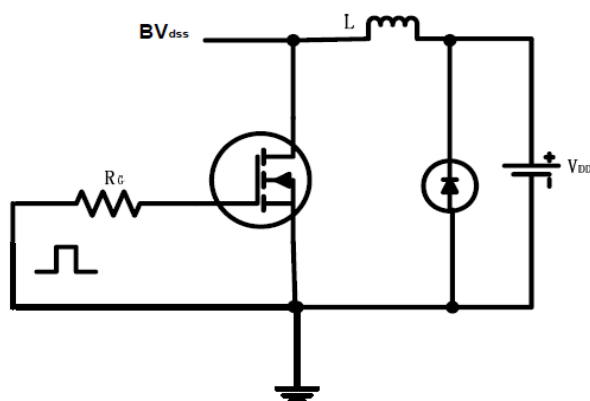
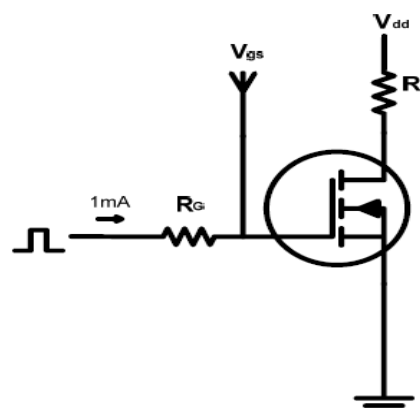
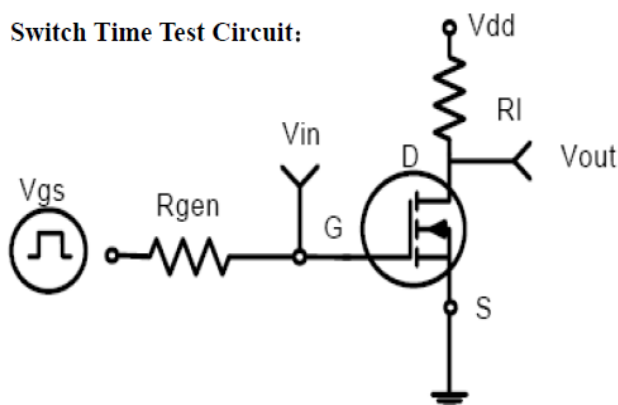
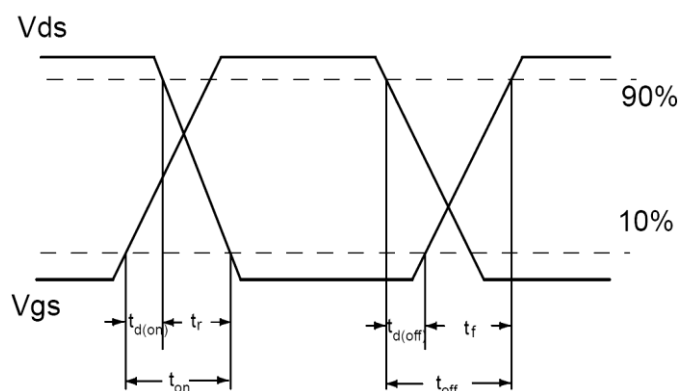
Symbol	Characterizes	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ③	—	3.8	$^{\circ}C/W$
$R_{\theta JA}$	Junction-to-ambient ($t \leq 10s$) ④	—	80	$^{\circ}C/W$

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

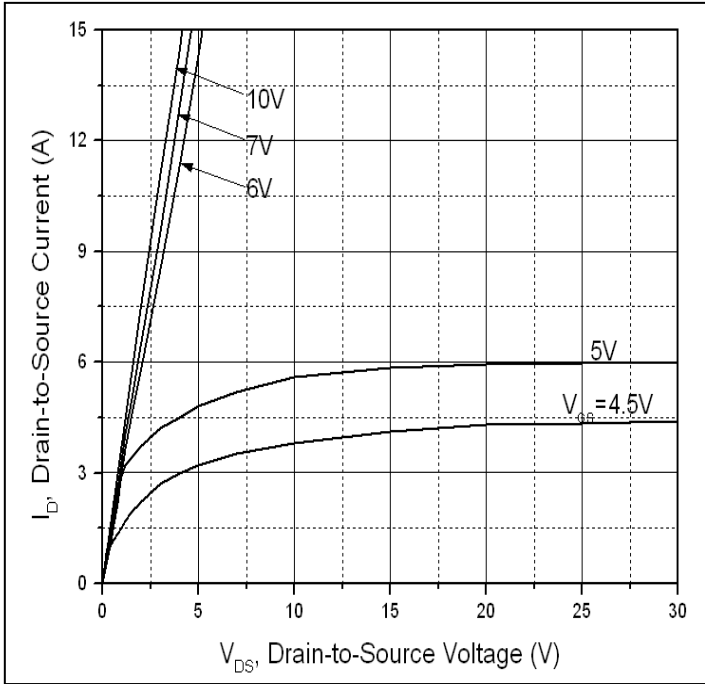
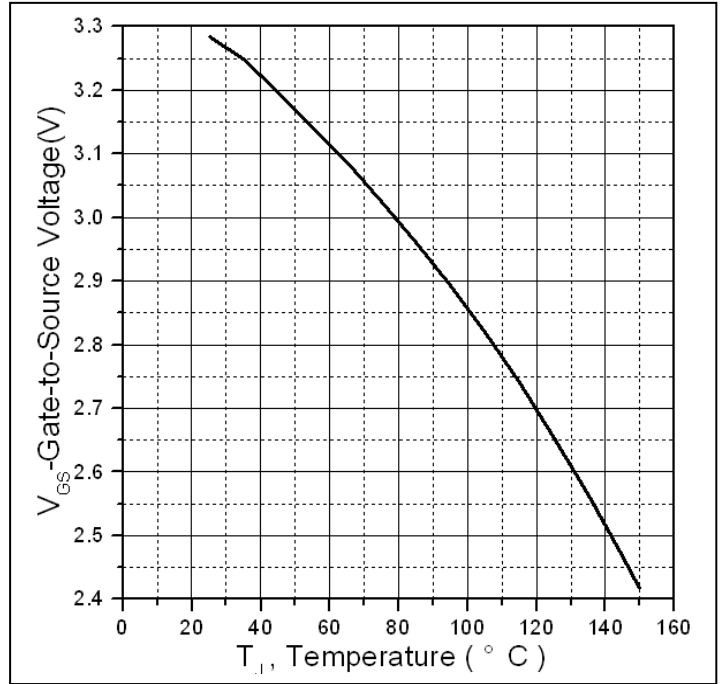
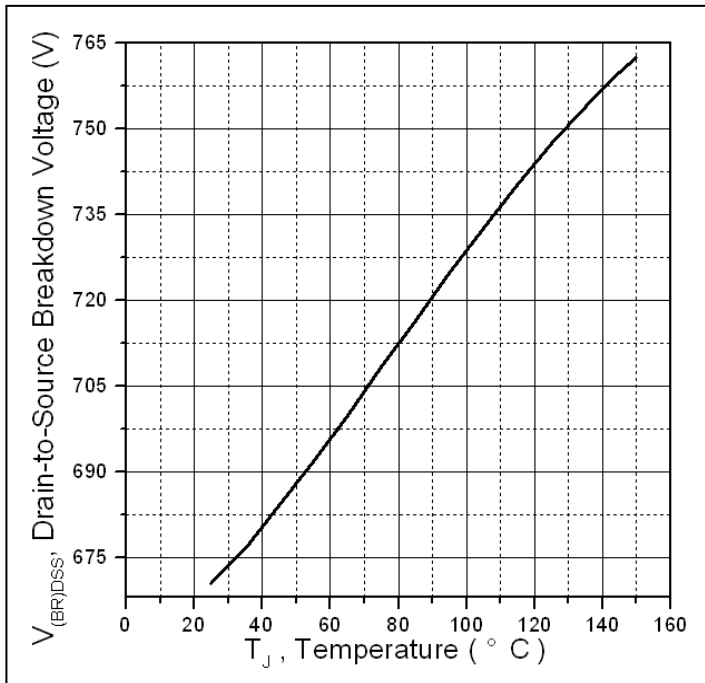
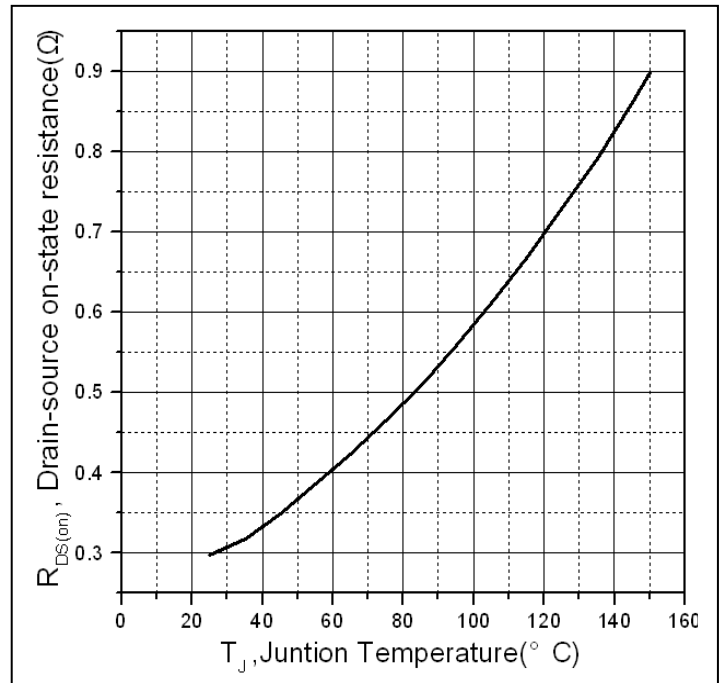
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	610	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	0.27	0.35	Ω	$V_{GS}=10V, I_D = 9.4A$
		—	0.73	—		$T_J = 125^{\circ}C$
$V_{GS(th)}$	Gate threshold voltage	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
		—	2.66	—		$T_J = 125^{\circ}C$
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	$V_{DS} = 600V, V_{GS} = 0V$
		—	—	50		$T_J = 125^{\circ}C$
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 30V$
		—	—	-100		$V_{GS} = -30V$
Q_g	Total gate charge	—	27.0	—	nC	$I_D = 10A,$
Q_{gs}	Gate-to-Source charge	—	6.3	—		$V_{DS}=480V,$
Q_{gd}	Gate-to-Drain("Miller") charge	—	13.7	—		$V_{GS} = 10V$
$t_{d(on)}$	Turn-on delay time	—	12.3	—	nS	$V_{GS}=10V, V_{DS} = 480V,$
t_r	Rise time	—	24.3	—		$R_L=40\Omega,$
$t_{d(off)}$	Turn-Off delay time	—	27.1	—		$R_{GEN}=4.1\Omega$
t_f	Fall time	—	19.7	—		$I_D = 12A$
C_{iss}	Input capacitance	—	949	—	pF	$V_{GS} = 0V$
C_{oss}	Output capacitance	—	783	—		$V_{DS} = 25V$
C_{rss}	Reverse transfer capacitance	—	11	—		$f = 400KHz$

Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	15 ①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	60	A	
V_{SD}	Diode Forward Voltage	—	0.89	1.3	V	$I_S=15A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	—	313	—	nS	$T_J = 25^{\circ}C, I_F = 15A, di/dt =$
Q_{rr}	Reverse Recovery Charge	—	3	—	μC	100A/ μs

Test circuits and Waveforms
EAS test circuits:

Gate charge test circuit:

Switch Time Test Circuit:

Switch 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 $T_A = 25^\circ C$
- ⑤ These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)} = 150^\circ C$.

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. Temperature

Figure 4: Normalized On-Resistance Vs. Case Temperature

Typical electrical and thermal characteristics

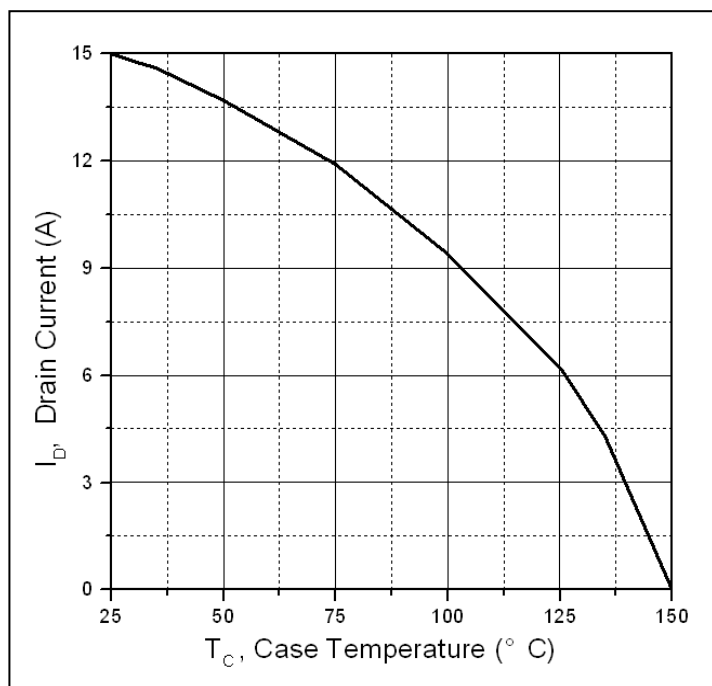


Figure 5. Maximum Drain Current Vs. Case Temperature

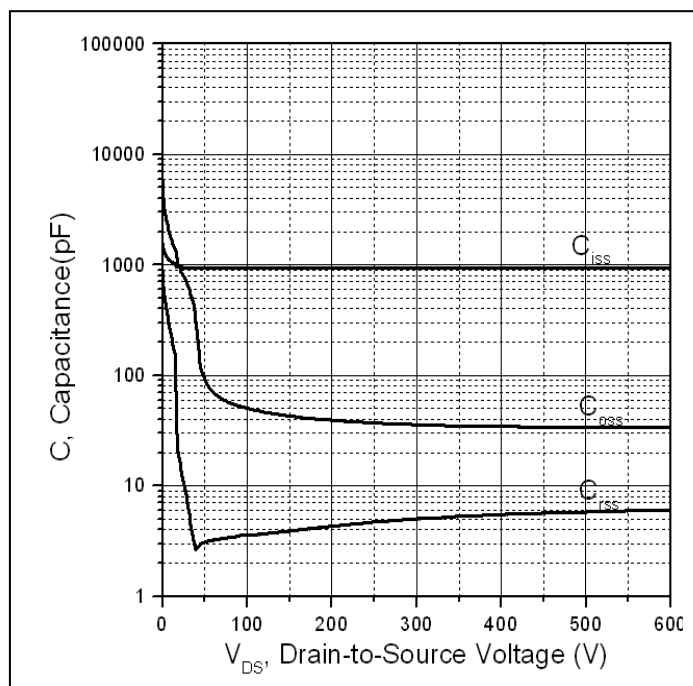
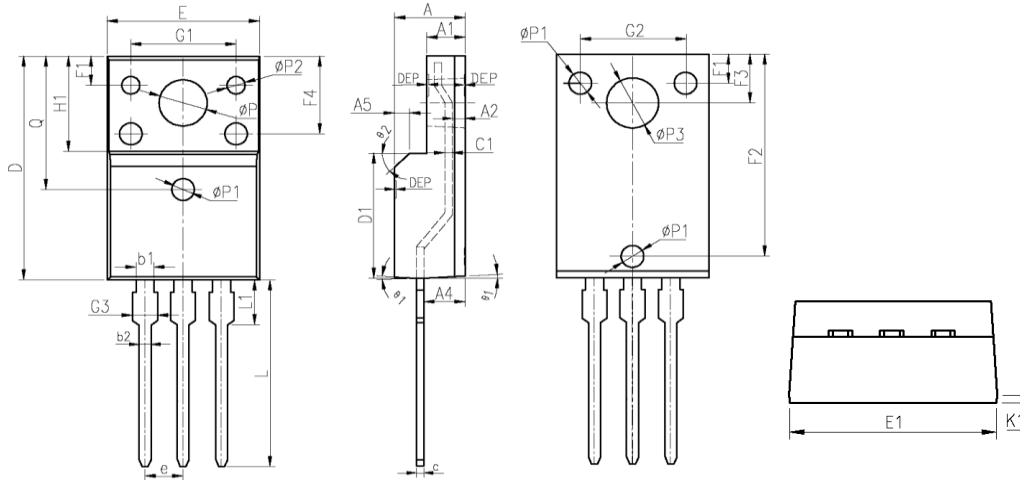


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

Mechanical Data:

TO220F PACKAGE OUTLINE DIMENSION



Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
E	10.040	10.200	10.360	0.395	0.402	0.408
A	4.500	4.700	4.900	0.177	0.185	0.193
A1	2.340	2.540	2.740	0.092	0.100	0.108
A2	0.950	1.050	1.150	0.037	0.041	0.045
A4	2.650	2.750	2.850	0.104	0.108	0.112
A5	1.00REF			0.039REF		
c	0.420	0.500	0.580	0.017	0.020	0.023
c1	0.420	0.500	0.580	0.017	0.020	0.023
D	15.670	15.870	16.070	0.617	0.625	0.633
Q	9.20REF			0.362REF		
H1	6.70REF			0.264REF		
e	2.54BSC			0.10BSC		
ϕP	3.183REF			0.125REF		
L	12.780	12.980	13.180	0.503	0.511	0.519
L1	3.250	3.450	3.650	0.128	0.136	0.144
D1	9.17REF			0.362REF		
ϕP1	1.400	1.500	1.600	0.055	0.059	0.063
ϕP2	1.150	1.200	1.250	0.045	0.047	0.049
ϕP3	3.45REF			0.136REF		
θ1	5°	7°	9°	5°	7°	9°
θ2	-	45°	-	-	45°	-
DEP	0.050	0.100	0.150	0.002	0.004	0.006
F1	1.900	2.000	2.100	0.075	0.079	0.083
F2	13.800	13.900	14.000	0.543	0.547	0.551
F3	3.200	3.300	3.400	0.126	0.130	0.134
F4	5.300	5.400	5.500	0.209	0.213	0.217
G1	6.600	6.700	6.800	0.260	0.264	0.268
G2	6.900	7.000	7.100	0.272	0.276	0.280
G3	1.100	1.300	1.500	0.043	0.051	0.059
E1	9.900	10.000	10.100	0.390	0.394	0.398
K1	0.650	0.700	0.750	0.026	0.028	0.030
b1	1.050	1.200	1.350	0.041	0.047	0.053
b2	0.700	0.800	0.850	0.028	0.031	0.033

Ordering and Marking Information
Device Marking: SSF18NS60F
Package (Available)
TO220F
Operating Temperature Range
C : -55 to 150 °C
Devices per Unit

Package Type	Units/Tube	Tubes/Inner Box	Units/Inner Box	InnerBoxes/ CartonBox	Units/Carton Box
TO220F	50	20	1000	6	6000

Reliability Test Program

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	$T_j=125^{\circ}\text{C}$ to 150°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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