

Main Product Characteristics

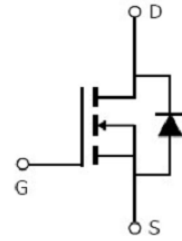
V_{DSS}	600V
$R_{DS(on)}$	0.36 Ω (typ.)
I_D	11A



TO-220



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 SSF11NS60 combines an innovative super junction technology and advanced process. This technology achieves low $R_{ds(on)}$, energy savings, high reliability and uniformity, superior power density and space saving.

Absolute Max Ratings

Symbol	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}^{\text{①}}$	11	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}^{\text{①}}$	7	
I_{DM}	Pulsed Drain Current ^②	44	
$P_D @ T_C = 25^\circ\text{C}$	Power Dissipation ^③	162	W
	Linear Derating Factor	1.5	W/ $^\circ\text{C}$
V_{DS}	Drain-Source Voltage	600	V
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy @ $L=22.5\text{mH}$	281	mJ
I_{AS}	Avalanche Current @ $L=22.5\text{mH}$	5	A
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

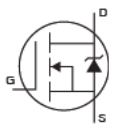
Thermal Resistance

Symbol	Characteristics	Typ.	Max.	Units
R _{θJC}	Junction-to-Case ^③	—	0.77	°C/W
R _{θJA}	Junction-to-Ambient (t ≤ 10s) ^④	—	62	°C/W

Electrical Characteristics (T_A=25°C unless otherwise specified)

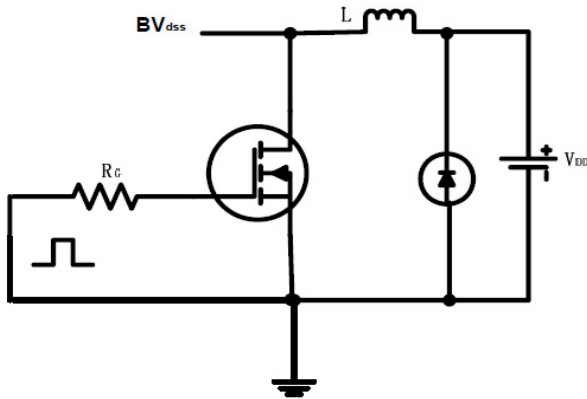
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	600	—	—	V	V _{GS} = 0V, I _D = 250μA
R _{DS(on)}	Static Drain-to-Source On-resistance	—	0.36	0.41	Ω	V _{GS} =10V, I _D = 5.5A
		—	0.88	—		T _J = 125°C
V _{GS(th)}	Gate Threshold Voltage	2	—	4	V	V _{DS} = V _{GS} , I _D = 250μA
		—	2.46	—		T _J = 125°C
I _{DSS}	Drain-to-Source Leakage Current	—	—	1	μA	V _{DS} = 600V, V _{GS} = 0V
		—	—	50		T _J = 125°C
I _{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V _{GS} = 30V
		—	—	-100		V _{GS} = -30V
Q _g	Total Gate Charge	—	28.41	—	nC	I _D = 11A,
Q _{gs}	Gate-to-Source Charge	—	6.64	—		V _{DS} =480V,
Q _{gd}	Gate-to-Drain("Miller") Charge	—	12.34	—		V _{GS} = 10V
t _{d(on)}	Turn-on Delay Time	—	12.85	—	ns	V _{GS} =10V, V _{DS} =300V,
t _r	Rise Time	—	9.45	—		R _L =54.5Ω,
t _{d(off)}	Turn-Off Delay Time	—	30.40	—		R _{GEN} =4.7Ω
t _f	Fall Time	—	6.30	—		I _D =5.5A
C _{iss}	Input Capacitance	—	824.8	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	78.06	—		V _{DS} = 50V
C _{rss}	Reverse Transfer Capacitance	—	2.75	—		f = 600KHz

Source-Drain Ratings and Characteristics

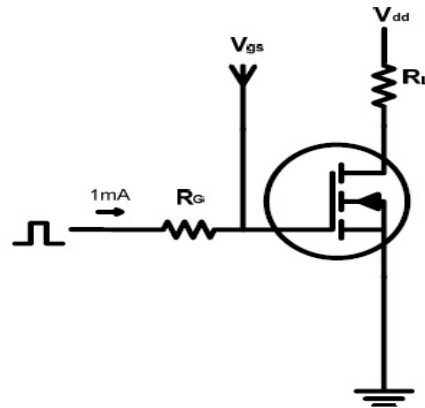
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	11	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode)	—	—	44	A	
V _{SD}	Diode Forward Voltage	—	—	1.5	V	I _S =11A, V _{GS} =0V
t _{rr}	Reverse Recovery Time	—	313	—	ns	T _J = 25°C, I _F = 11A, di/dt =
Q _{rr}	Reverse Recovery Charge	—	2.97	—	uC	100A/μs

Test Circuits and Waveforms

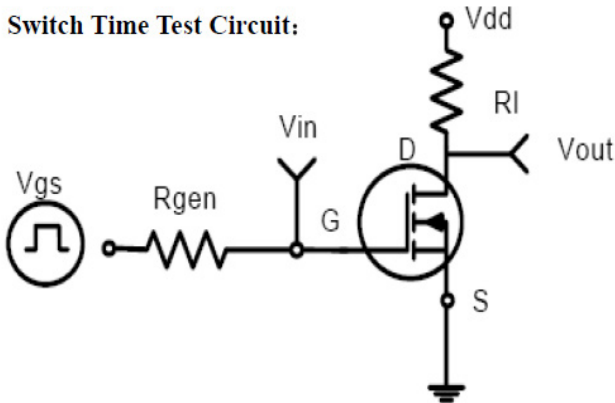
EAS test circuits:



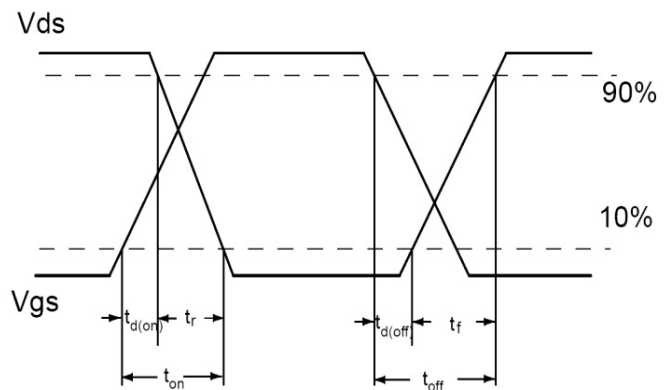
Gate charge test circuit:



Switch Time Test Circuit:



Switching Waveforms:



Notes:

- ① The maximum current rating is limited by bond-wires.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation P_D 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 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$

Typical Electrical and Thermal Characteristics

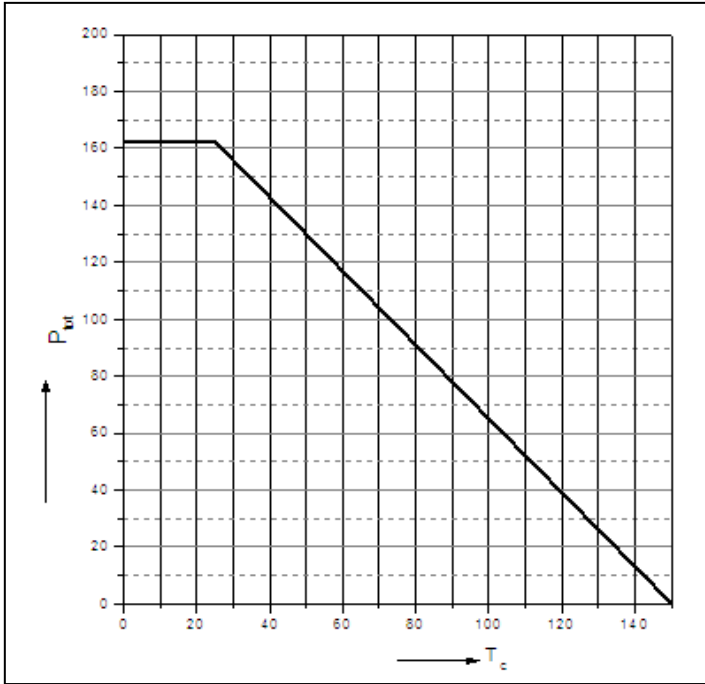


Figure 1. Power Dissipation

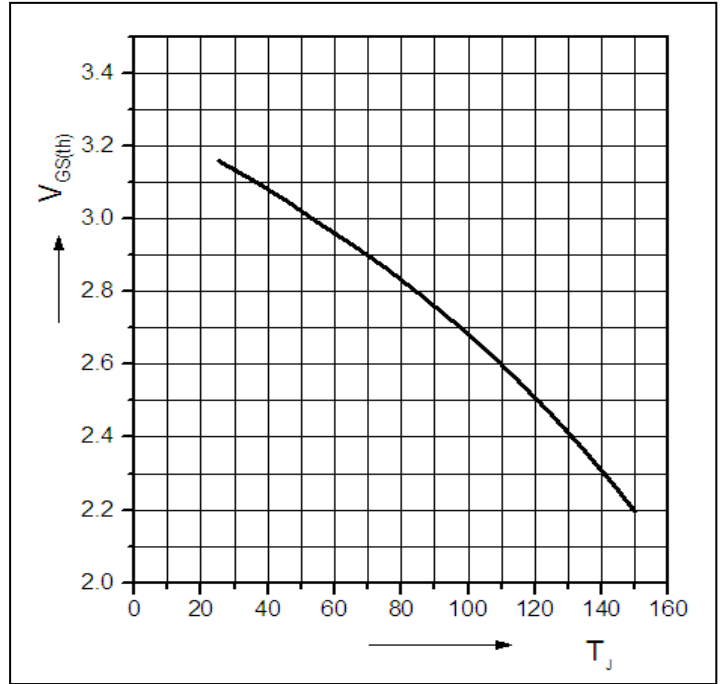


Figure 2. Typ. Gate to Source Cut-off Voltage

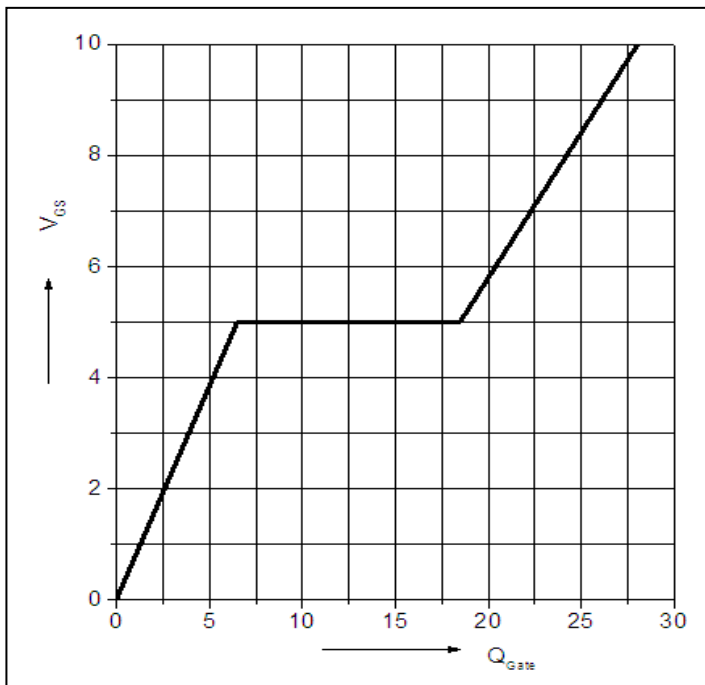


Figure 3. Typ. Gate Charge

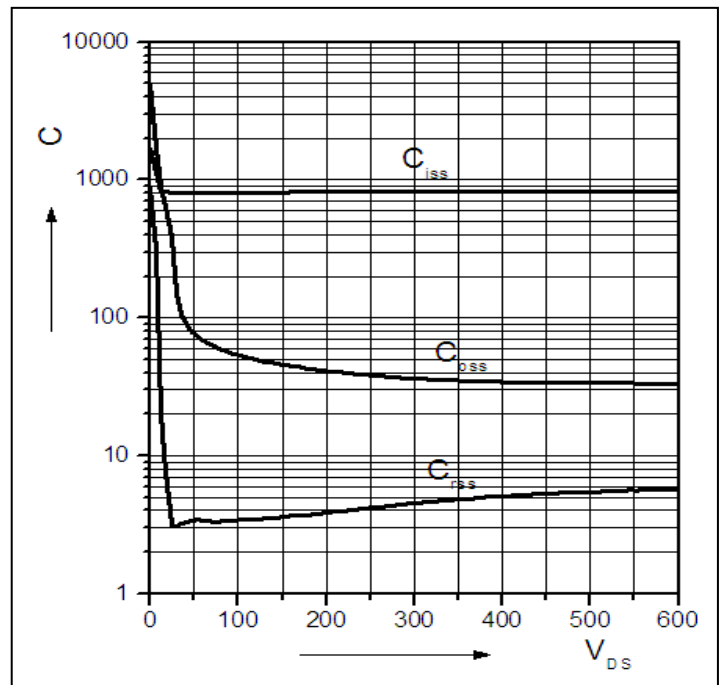


Figure 4. Typ. Capacitances

Typical Electrical and Thermal Characteristics

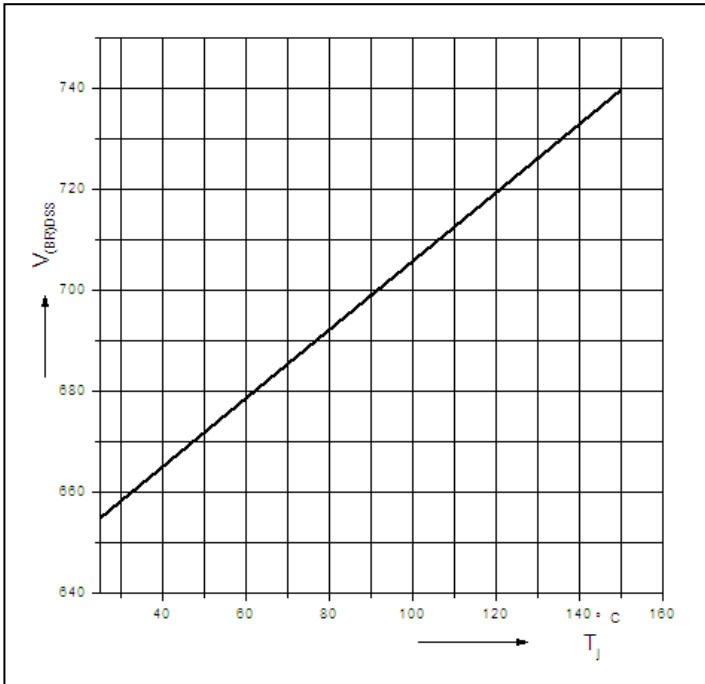


Figure 5. Drain-source Breakdown Voltage

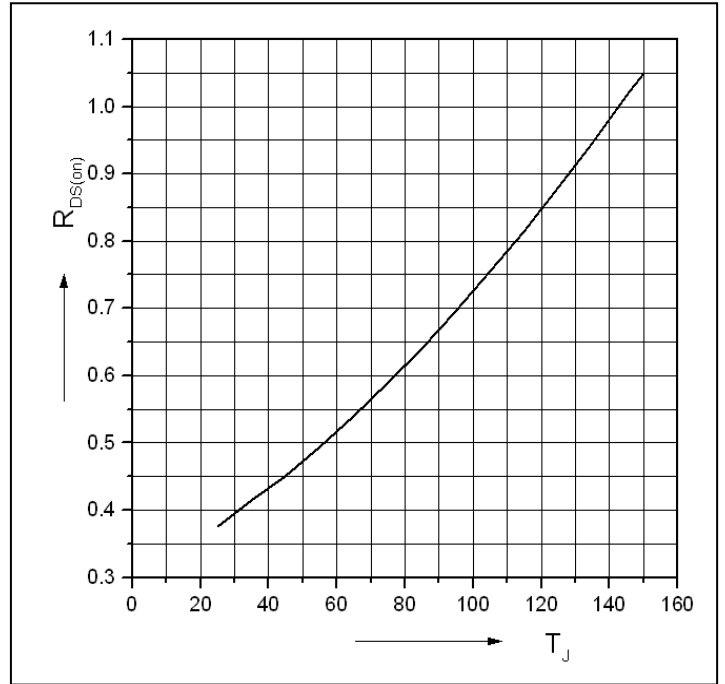
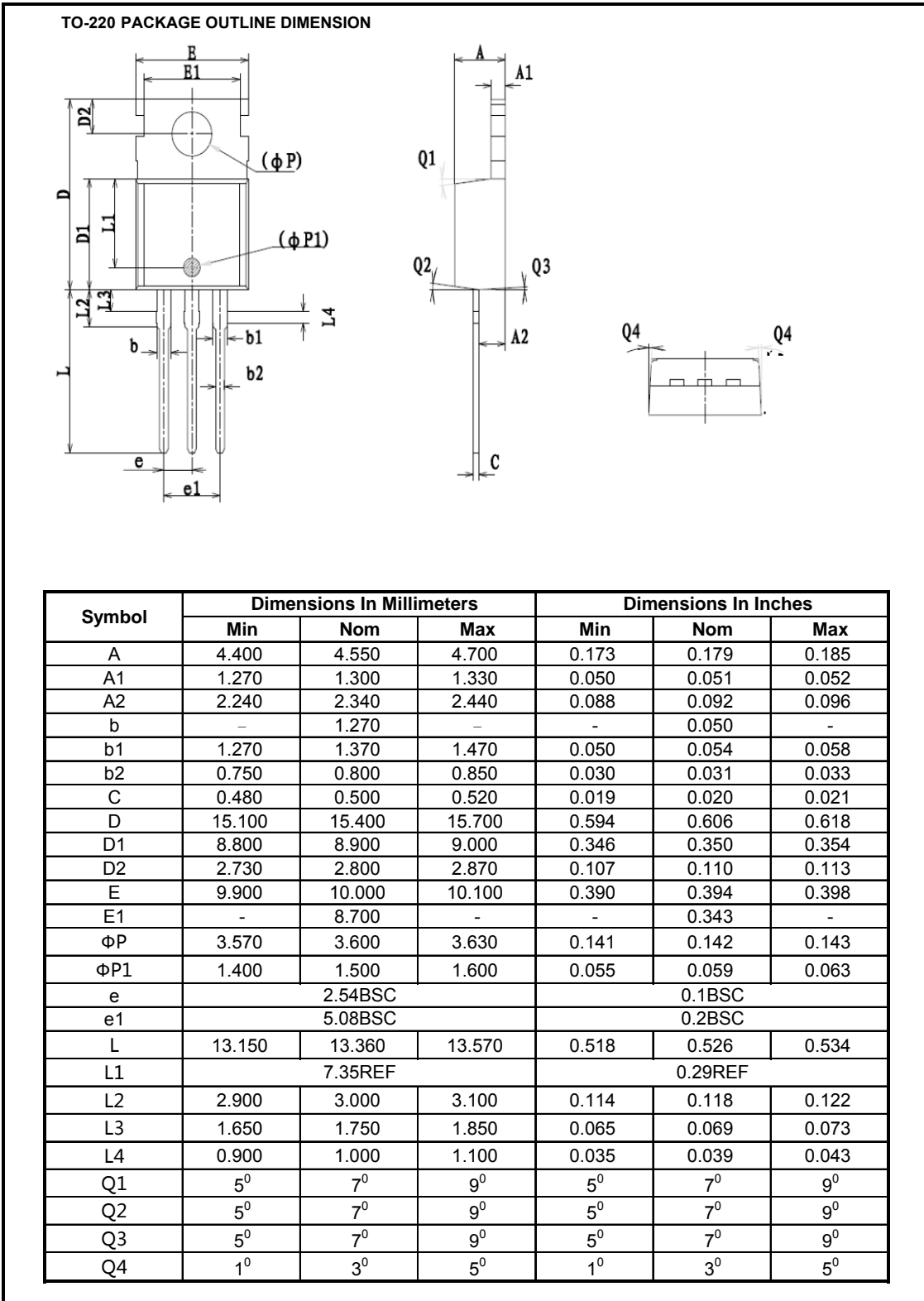


Figure 6. Drain-source On-state Resistance

Mechanical Data



Ordering and Marking Information

<p>Device Marking: SSF11NS60</p> <p style="text-align: center;">Package (Available) TO-220</p> <p style="text-align: center;">Operating Temperature Range C : -55 to 150 °C</p>
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Devices per Unit

Package Type	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes/Carton Box	Units/Carton Box
TO-220	50	20	1000	10	10000

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