

Main Product Characteristics:

V_{DSS}	680V
$R_{DS(on)}$	0.36ohm(typ.)
I_D	11A


TO220

Marking and pin Assignment

Schematic diagram
Features and Benefits:
Features:

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


Description:

The SSF11NS65 series MOSFETs is a new technology, which combines an innovative super junction technology and advanced 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
$I_D @ TC = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ①	11	A
$I_D @ TC = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ ①	7	
I_{DM}	Pulsed Drain Current②	44	
$P_D @ TC = 25^\circ C$	Power Dissipation③	162	W
	Linear Derating Factor	1.5	W/°C
V_{DS}	Drain-Source Voltage	680	V
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy @ L=22.5mH	281	mJ
I_{AS}	Avalanche Current @ L=22.5mH	5	A
$T_J T_{STG}$	Operating Junction and Storage Temperature Range	-55 to + 150	°C

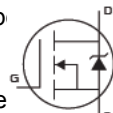
Thermal Resistance

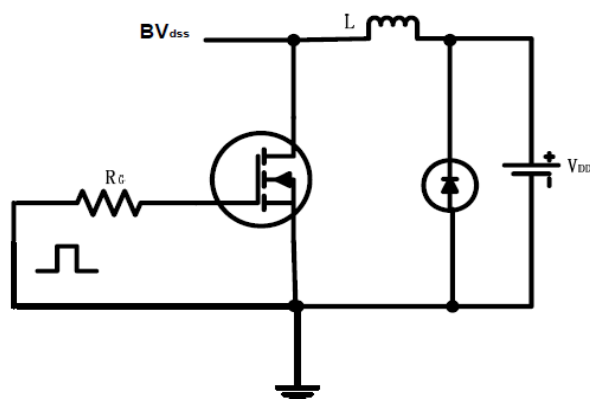
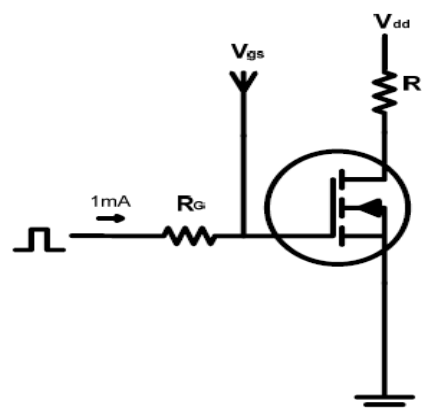
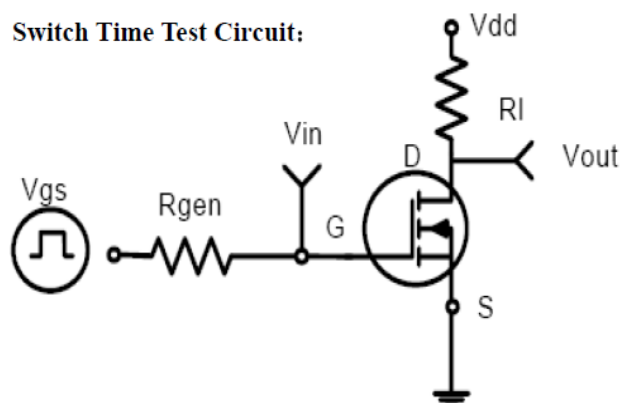
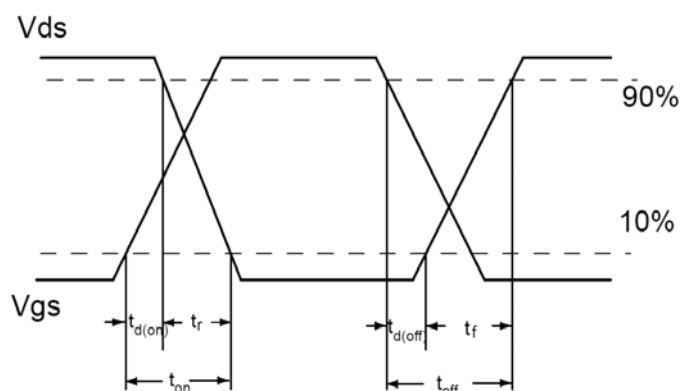
Symbol	Characterizes	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ^③	—	0.77	°C/W
$R_{\theta JA}$	Junction-to-ambient ($t \leq 10s$) ^④	—	62	°C/W
	Junction-to-Ambient (PCB mounted, steady-state) ^④	—	40	°C/W

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

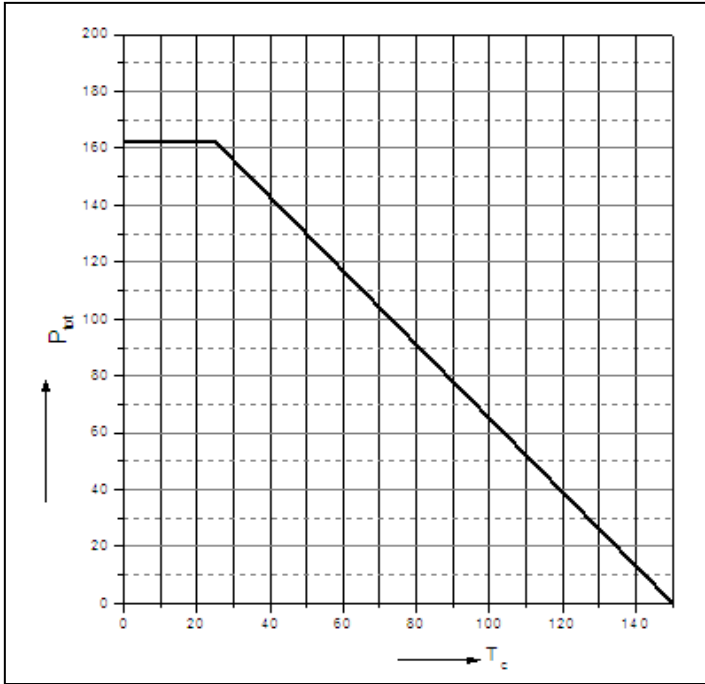
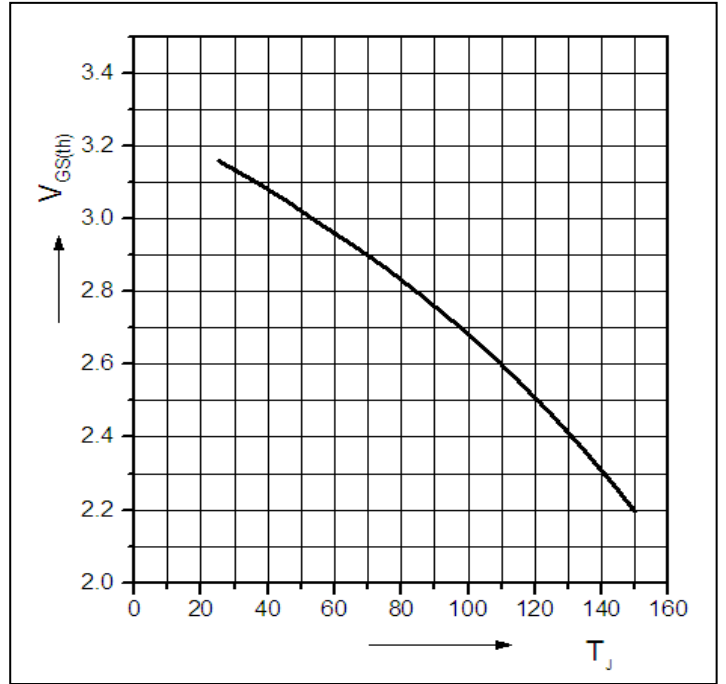
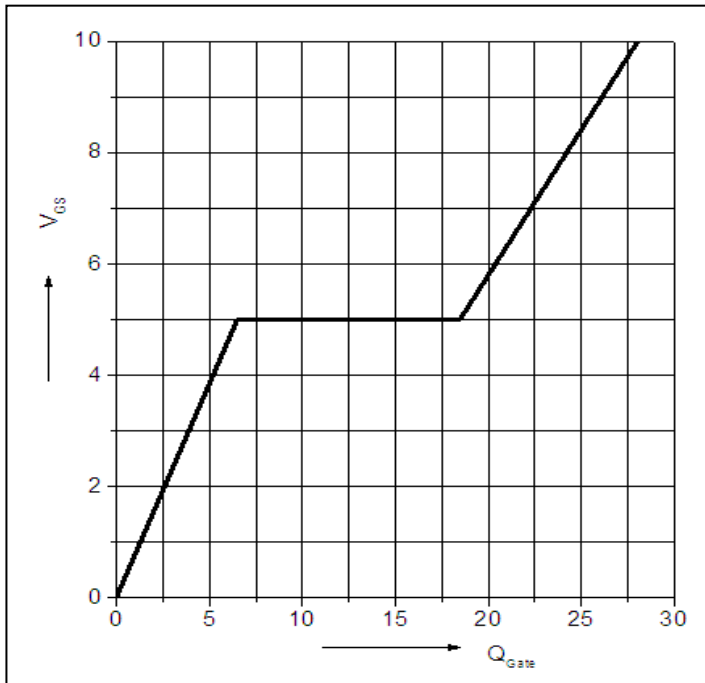
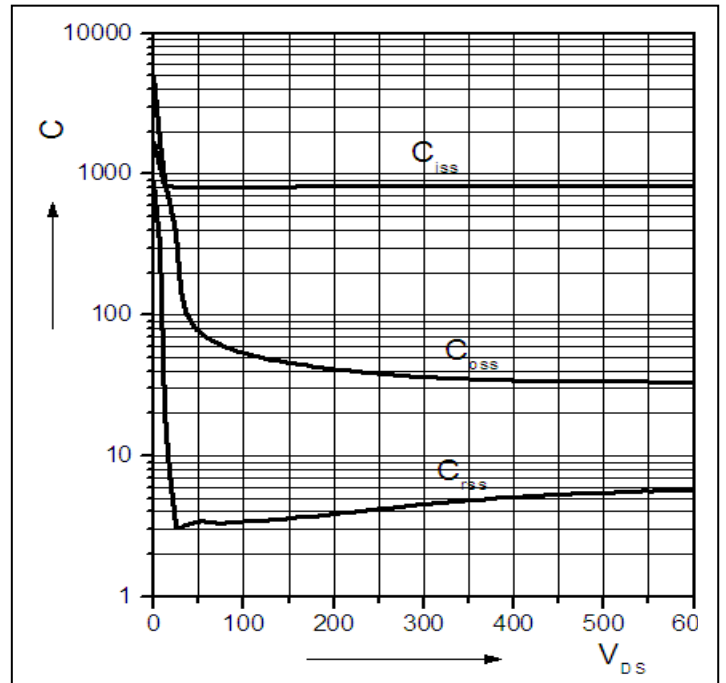
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	680	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	0.36	0.41	Ω	$V_{GS}=10V, I_D = 5.5A$
		—	0.88	—		$T_J = 125^\circ\text{C}$
$V_{GS(th)}$	Gate threshold voltage	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
		—	2.46	—		$T_J = 125^\circ\text{C}$
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	$V_{DS} = 650V, V_{GS} = 0V$
		—	—	50		$T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 30V$
		-100	—	—		$V_{GS} = -30V$
Q_g	Total gate charge	—	28.41	—	nC	$I_D = 11A,$ $V_{DS}=480V,$ $V_{GS} = 10V$
Q_{gs}	Gate-to-Source charge	—	6.64	—		
Q_{gd}	Gate-to-Drain("Miller") charge	—	12.34	—		
$t_{d(on)}$	Turn-on delay time	—	12.85	—	ns	$V_{GS}=10V, V_{DS}=300V,$ $R_L=54.5\Omega,$ $R_{GEN}=4.7\Omega$ $I_D=5.5A$
t_r	Rise time	—	9.45	—		
$t_{d(off)}$	Turn-Off delay time	—	30.40	—		
t_f	Fall time	—	6.30	—		
C_{iss}	Input capacitance	—	824.8	—	pF	$V_{GS} = 0V$ $V_{DS} = 50V$ $f = 600\text{KHz}$
C_{oss}	Output capacitance	—	78.06	—		
C_{rss}	Reverse transfer capacitance	—	2.75	—		

Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	11	A	MOSFET symb 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	$T_J = 25^\circ\text{C}, I_F = 11A, di/dt =$
Q_{rr}	Reverse Recovery Charge	—	2.98.	—	μC	100A/ μs

Test circuits and Waveforms
EAS test circuits:

Gate charge test circuit:

Switch Time Test Circuit:

Switch 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 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 1in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$
- 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 $T_{J(MAX)} = 150^\circ\text{C}$.
- ⑥ The maximum current rating is limited by bond-wires.

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

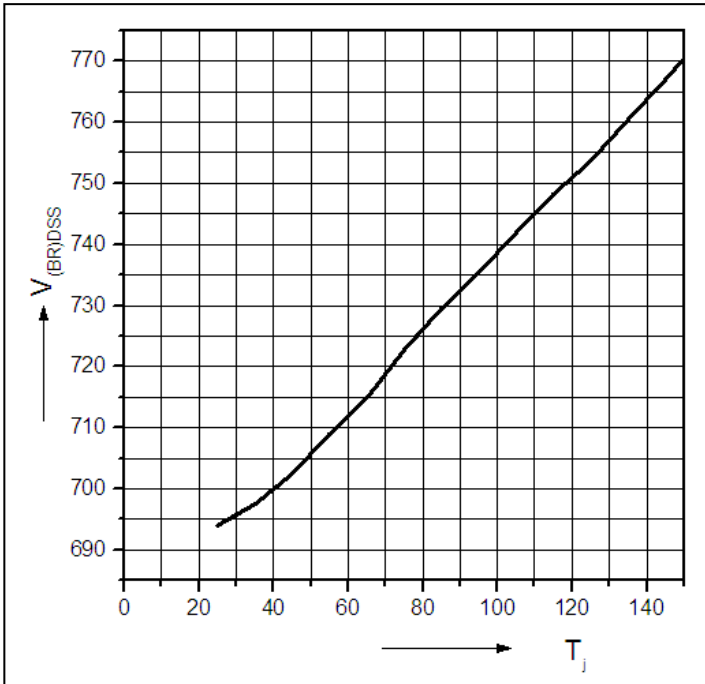


Figure 5. Drain-source breakdown voltage

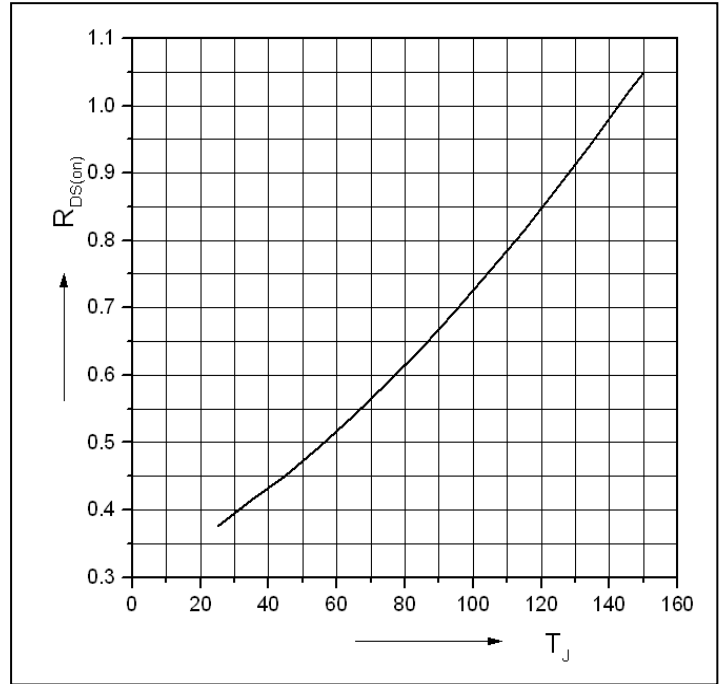
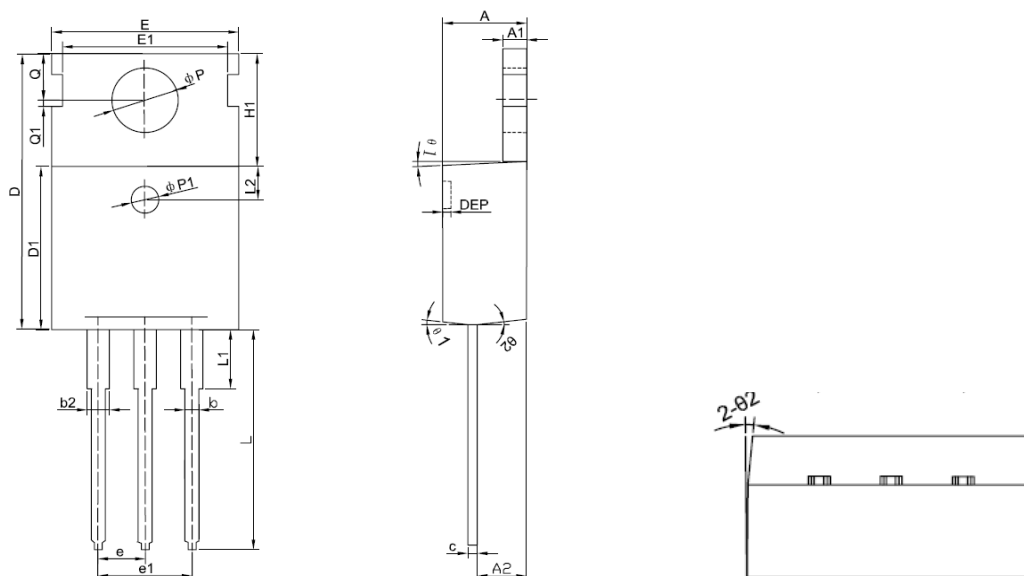


Figure 6. Drain-source on-state resistance

Mechanical Data:
TO220 PACKAGE OUTLINE DIMENSION


Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
A	4.400	4.550	4.700	0.173	0.179	0.185
A1	1.270	1.300	1.330	0.050	0.051	0.052
A2	2.590	2.690	2.790	0.102	0.106	0.110
b	0.770	-	0.900	0.030	-	0.035
b2	1.230	-	1.360	0.048	-	0.054
c	0.480	0.500	0.520	0.019	0.020	0.020
D	15.100	15.400	15.700	-	0.606	-
D1	9.000	9.100	9.200	0.354	0.358	0.362
DEP	0.050	0.285	0.520	0.002	0.011	0.020
E	10.060	10.160	10.260	0.396	0.400	0.404
E1	-	8.700	-	-	0.343	-
ΦP1	1.400	1.500	1.600	0.055	0.059	0.063
e	2.54BSC			0.1BSC		
e1	5.08BSC			0.2BSC		
H1	6.100	6.300	6.500	0.240	0.248	0.256
L	12.750	12.960	13.170	0.502	0.510	0.519
L1	-	-	3.950	-	-	0.156
L2	1.85REF			0.073REF		
ΦP	3.570	3.600	3.630	0.141	0.142	0.143
Q	2.730	2.800	2.870	0.107	0.110	0.113
Q1	-	0.200	-	-	0.008	-
Θ1	5 ⁰	7 ⁰	9 ⁰	5 ⁰	7 ⁰	9 ⁰
Θ2	1 ⁰	3 ⁰	5 ⁰	1 ⁰	3 ⁰	5 ⁰

Ordering and Marking Information
Device Marking: SSF11NS65
Package (Available)
TO220
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
TO220	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 175°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)	$T_j=150^{\circ}\text{C}$ or 175°C @ 100% of Max V_{GSS}	168 hours 500 hours 1000 hours	3 lots x 77 devices

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