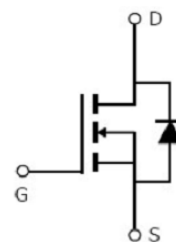


**Main Product Characteristics:**

$V_{DSS}$	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

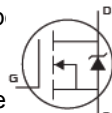
## Thermal Resistance

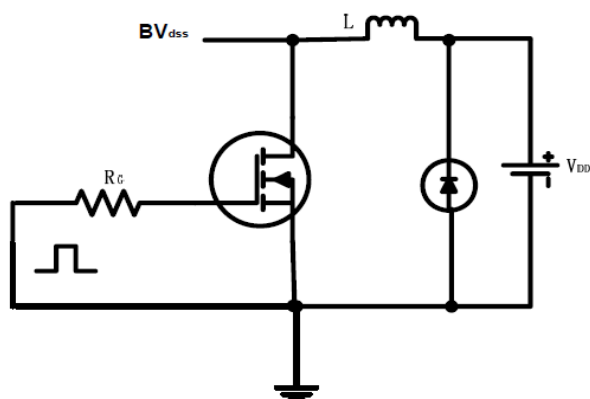
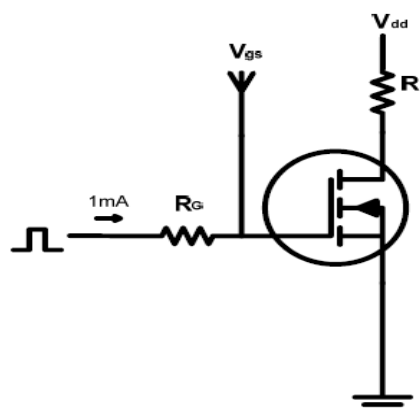
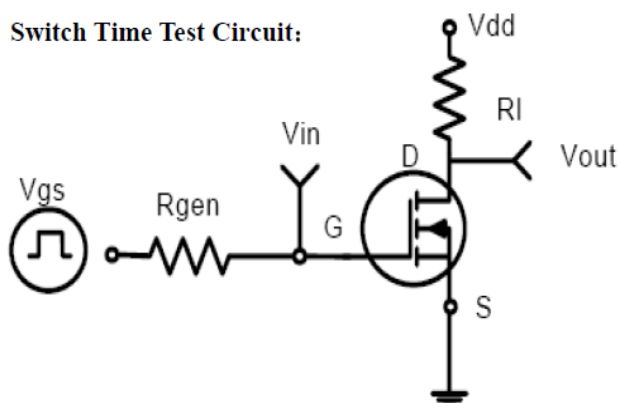
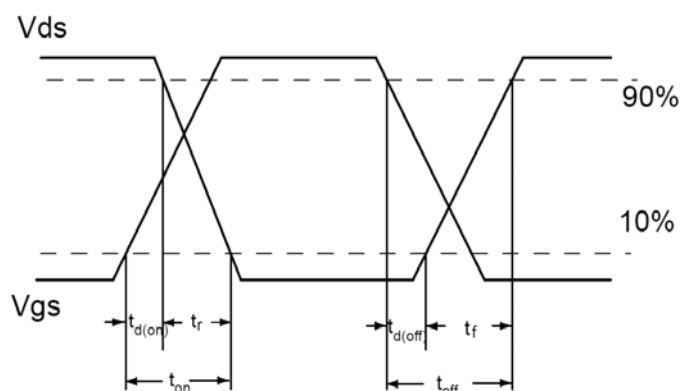
Symbol	Characterizes	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-case <sup>③</sup>	—	0.77	°C/W
R <sub>θJA</sub>	Junction-to-ambient (t ≤ 10s) <sup>④</sup>	—	62	°C/W
	Junction-to-Ambient (PCB mounted, steady-state) <sup>④</sup>	—	40	°C/W

## Electrical Characterizes @T<sub>A</sub>=25°C unless otherwise specified

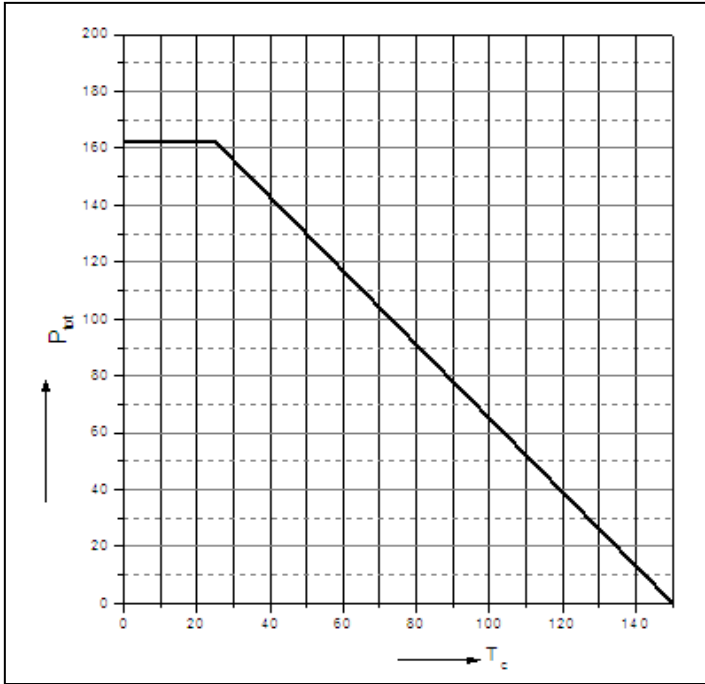
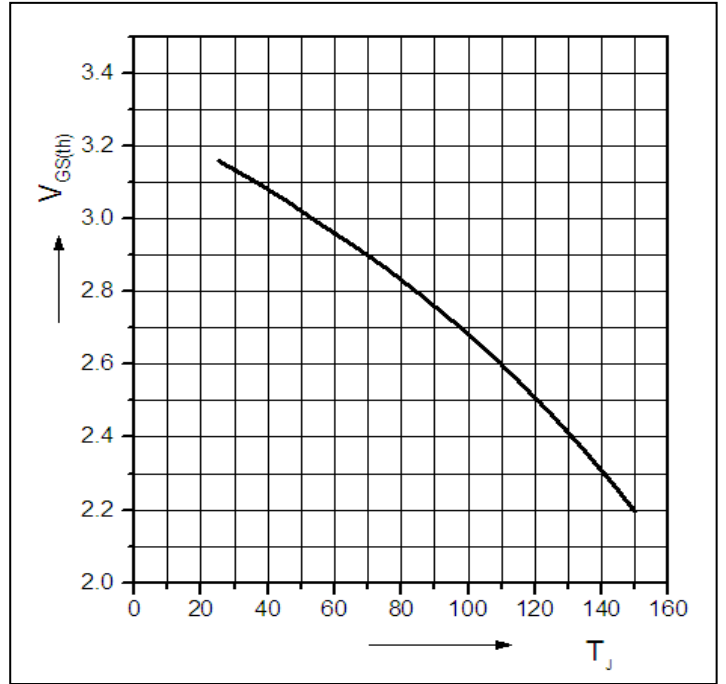
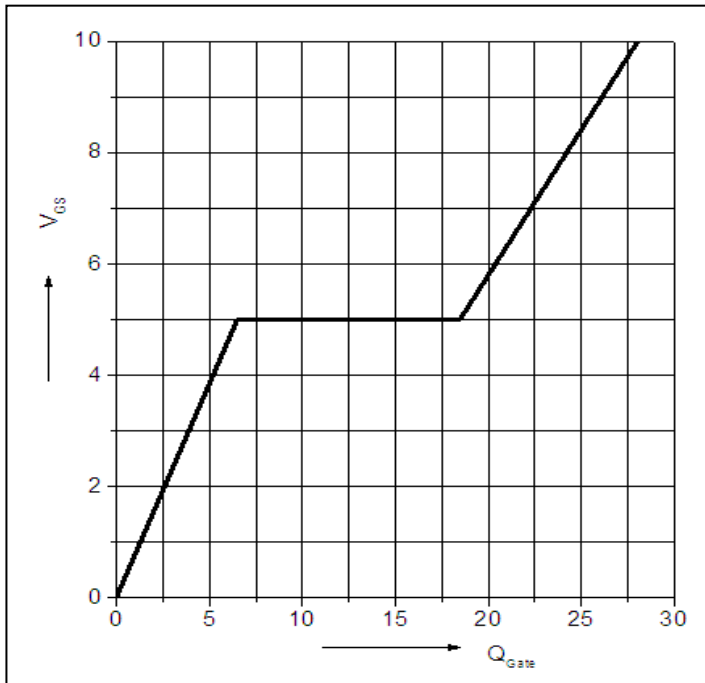
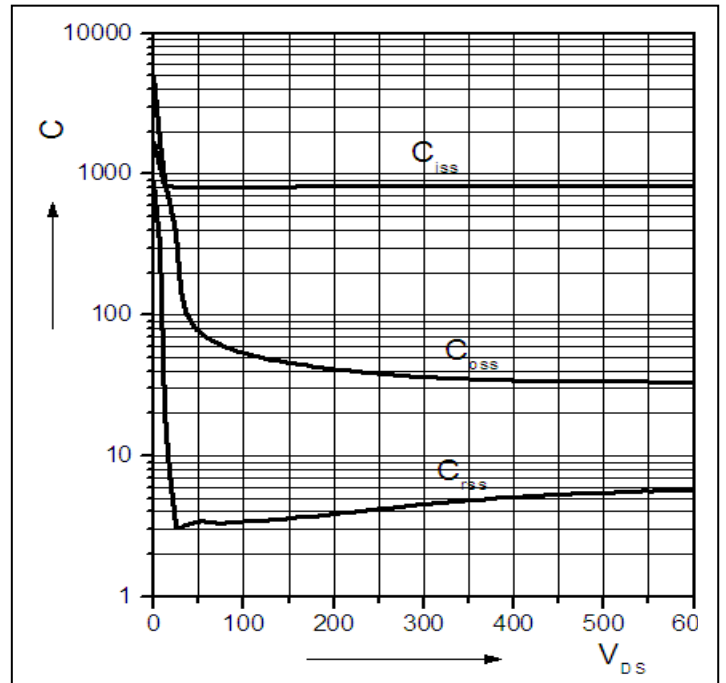
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source breakdown voltage	680	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
R <sub>DS(on)</sub>	Static Drain-to-Source on-resistance	—	0.36	0.41	Ω	V <sub>GS</sub> =10V, I <sub>D</sub> = 5.5A T <sub>J</sub> = 125°C
		—	0.88	—		
V <sub>GS(th)</sub>	Gate threshold voltage	2	—	4	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA T <sub>J</sub> = 125°C
		—	2.46	—		
I <sub>DSS</sub>	Drain-to-Source leakage current	—	—	1	μA	V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V T <sub>J</sub> = 125°C
		—	—	50		
I <sub>GSS</sub>	Gate-to-Source forward leakage	—	—	100	nA	V <sub>GS</sub> = 30V
		-100	—	—		V <sub>GS</sub> = -30V
Q <sub>g</sub>	Total gate charge	—	28.41	—	nC	I <sub>D</sub> = 11A, V <sub>DS</sub> =480V, V <sub>GS</sub> = 10V
Q <sub>gs</sub>	Gate-to-Source charge	—	6.64	—		
Q <sub>gd</sub>	Gate-to-Drain("Miller") charge	—	12.34	—		
t <sub>d(on)</sub>	Turn-on delay time	—	12.85	—	ns	V <sub>GS</sub> =10V, V <sub>DS</sub> =300V, R <sub>L</sub> =54.5Ω, R <sub>GEN</sub> =4.7Ω I <sub>D</sub> =5.5A
t <sub>r</sub>	Rise time	—	9.45	—		
t <sub>d(off)</sub>	Turn-Off delay time	—	30.40	—		
t <sub>f</sub>	Fall time	—	6.30	—		
C <sub>iss</sub>	Input capacitance	—	824.8	—	pF	V <sub>GS</sub> = 0V V <sub>DS</sub> = 50V f = 600KHz
C <sub>oss</sub>	Output capacitance	—	78.06	—		
C <sub>rss</sub>	Reverse transfer capacitance	—	2.75	—		

## Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	11	A	MOSFET symb showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode)	—	—	44	A	
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.5	V	I <sub>S</sub> =11A, V <sub>GS</sub> =0V
t <sub>rr</sub>	Reverse Recovery Time	—	313	—	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 11A, di/dt =
Q <sub>rr</sub>	Reverse Recovery Charge	—	2.98.	—	uC	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

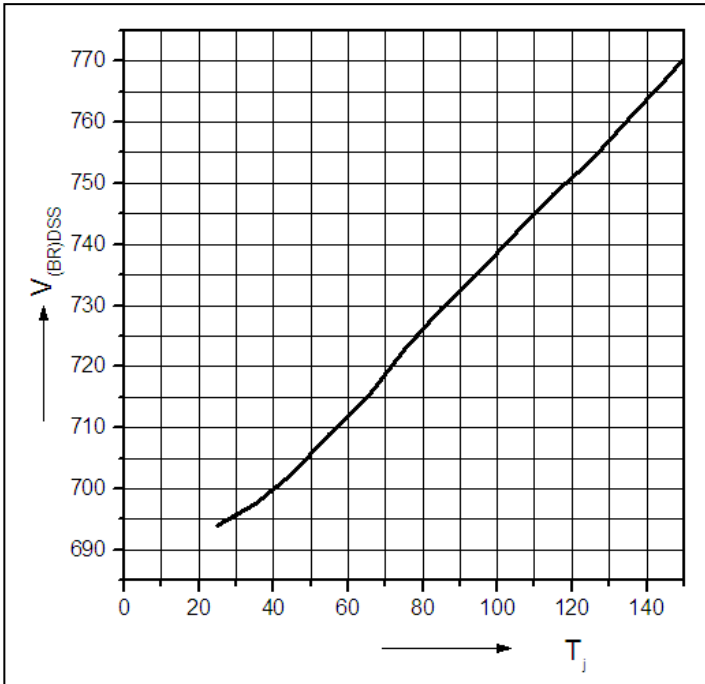


Figure 5. Drain-source breakdown voltage

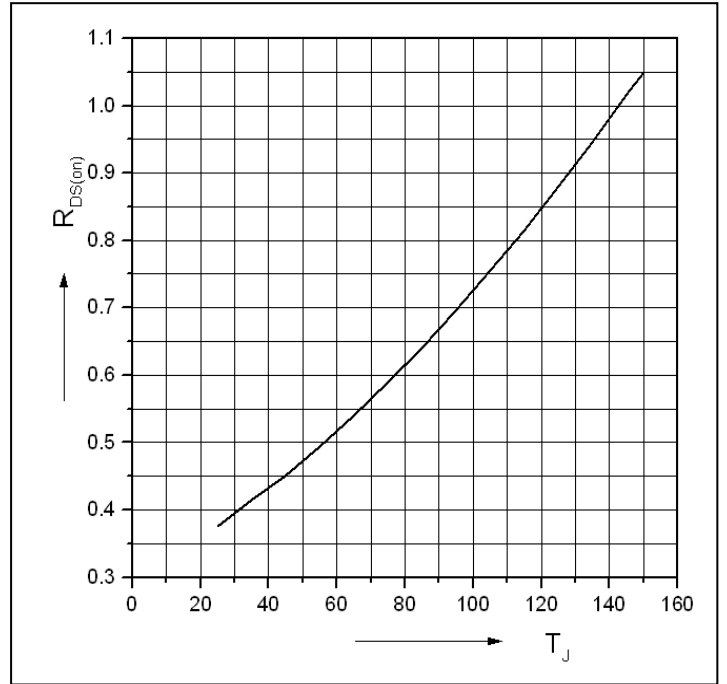
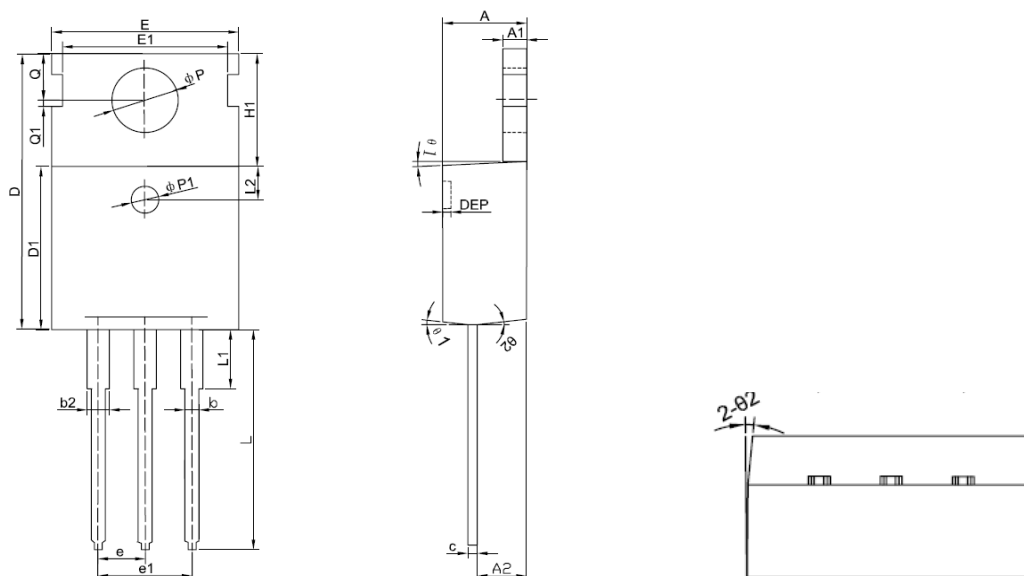


Figure 6. Drain-source on-state resistance

**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 <sup>0</sup>	7 <sup>0</sup>	9 <sup>0</sup>	5 <sup>0</sup>	7 <sup>0</sup>	9 <sup>0</sup>
Θ2	1 <sup>0</sup>	3 <sup>0</sup>	5 <sup>0</sup>	1 <sup>0</sup>	3 <sup>0</sup>	5 <sup>0</sup>

**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 $175^{\circ}\text{C}$ @ 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)	$T_j=150^{\circ}\text{C}$ or $175^{\circ}\text{C}$ @ 100% of Max $V_{GSS}$	168 hours 500 hours 1000 hours	3 lots x 77 devices

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**Customer Service****Worldwide Sales and Service:**

Sales@silikron.com

**Technical Support:**

Technical@silikron.com

**Suzhou Silikron Semiconductor Corp.**

11A, 428 Xinglong Street, Suzhou Industrial Park, P.R.China

**TEL:** (86-512) 62560688

**FAX:** (86-512) 65160705

**E-mail:** Sales@silikron.com