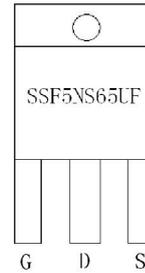


Main Product Characteristics

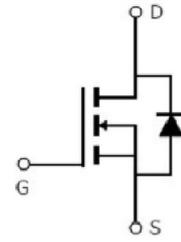
V_{DSS}	650V
$R_{DS(on)}$	0.9 Ω (typ.)
I_D	5A ①



TO-220F



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
- Lead free product



Description

The SSF5NS65UF series MOSFETs is a new technology, which combines an innovative super junction technology and advance 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, $V_{GS} @ 10V$	5 ①	A
$I_D @ TC = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	3.1①	
I_{DM}	Pulsed Drain Current ②	15	
$P_D @ TC = 25^\circ C$	Power Dissipation ③	28	W
	Linear Derating Factor	0.224	W/°C
V_{DS}	Drain-Source Voltage	650	V
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy @ L=100mH	144	mJ
I_{AS}	Avalanche Current @ L=100mH	1.7	A
$T_J \quad T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +150	°C

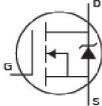
Thermal Resistance

Symbol	Characteristics	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ③	—	4.4	$^{\circ}C/W$
$R_{\theta JA}$	Junction-to-ambient ($t \leq 10s$) ④	—	80	$^{\circ}C/W$

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

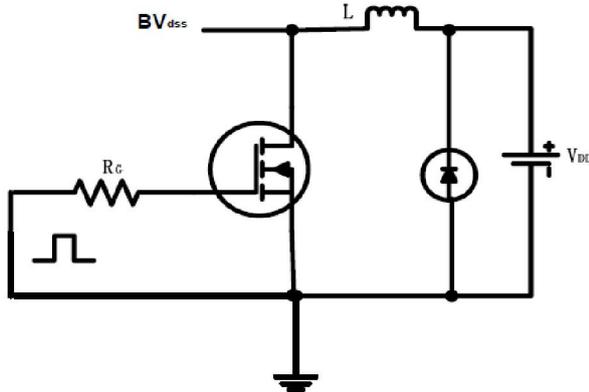
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	650	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	0.9	1.2	Ω	$V_{GS}=10V, I_D = 1A$ $T_J = 125^{\circ}C$
		—	2.0	—		
		—	1.0	1.4	Ω	$V_{GS}=10V, I_D = 2.8A$ $T_J = 125^{\circ}C$
		—	2.6	—		
$V_{GS(th)}$	Gate threshold voltage	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu A$ $T_J = 125^{\circ}C$
		—	2.5	—		
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	$V_{DS} = 650V, V_{GS} = 0V$ $T_J = 125^{\circ}C$
		—	—	50		
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 30V$
		—	—	-100		$V_{GS} = -30V$
Q_g	Total gate charge	—	10	—	nC	$I_D = 5A,$ $V_{DS}=200V,$ $V_{GS} = 10V$
Q_{gs}	Gate-to-Source charge	—	2.0	—		
Q_{gd}	Gate-to-Drain("Miller") charge	—	2.4	—		
$t_{d(on)}$	Turn-on delay time	—	9.1	—	ns	$V_{GS}=10V, V_{DS} = 400V,$ $R_{GEN}=10.2\Omega, I_D = 1.5A$
t_r	Rise time	—	5.8	—		
$t_{d(off)}$	Turn-Off delay time	—	23	—		
t_f	Fall time	—	14	—		
C_{iss}	Input capacitance	—	353	—	pF	$V_{GS} = 0V$ $V_{DS} = 100V$ $f = 1MHz$
C_{oss}	Output capacitance	—	18	—		
C_{rss}	Reverse transfer capacitance	—	2.9	—		

Source-Drain Ratings and Characteristics

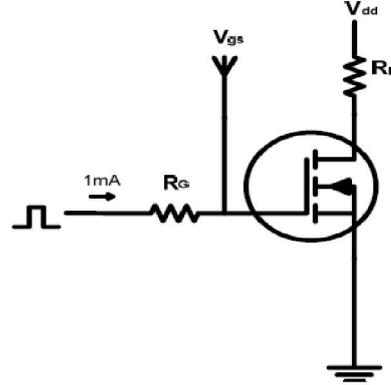
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	5 ①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	15	A	
V_{SD}	Diode Forward Voltage	—	0.8	1.2	V	$I_S=2.8A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	—	97	—	nS	$T_J = 25^{\circ}C, I_F = 1.5A,$ $di/dt = 100A/\mu s$
Q_{rr}	Reverse Recovery Charge	—	431	—	nC	

Test Circuits and Waveforms

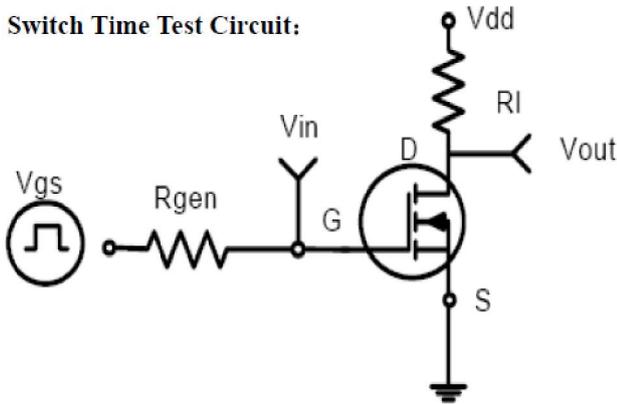
EAS test circuits:



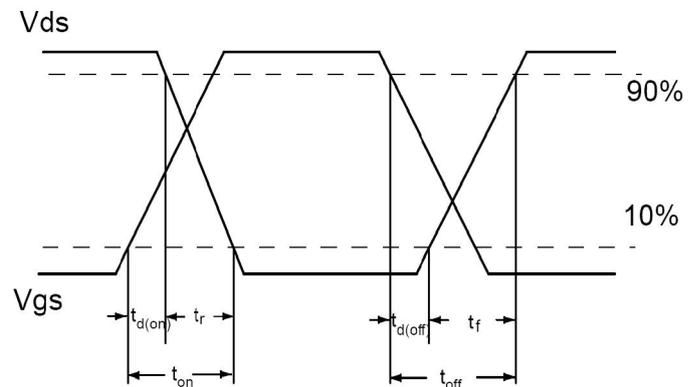
Gate charge test circuit:



Switch Time Test Circuit:



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 $T_A = 25^\circ\text{C}$

Typical Electrical and Thermal Characteristics

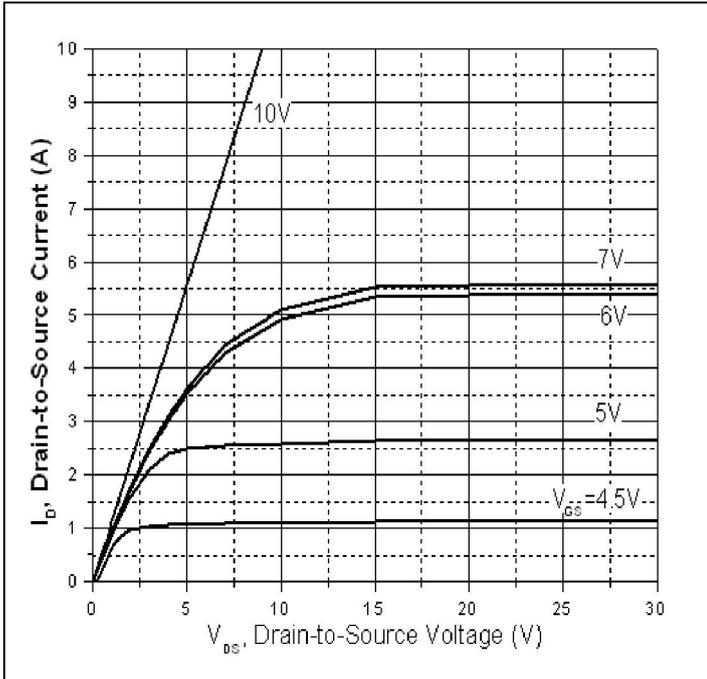


Figure 1: Typical Output Characteristics

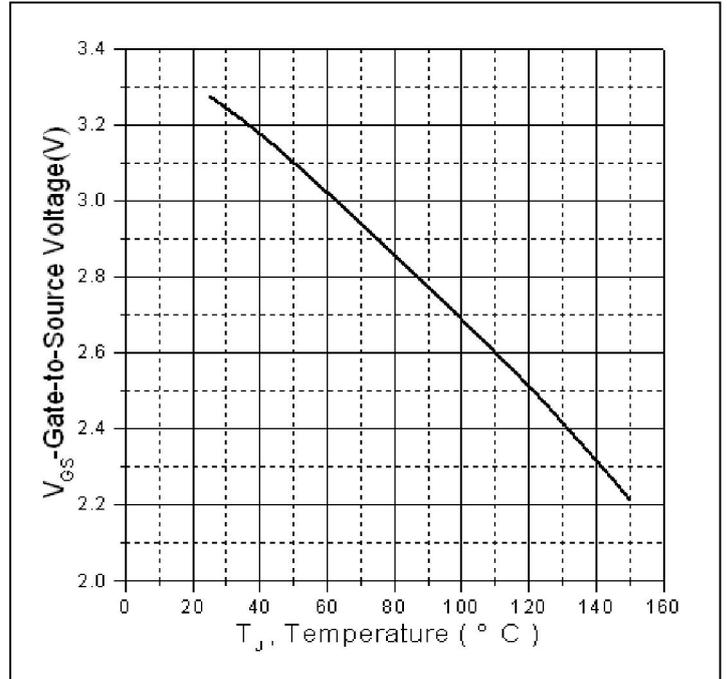


Figure 2: Gate to source cut-off voltage

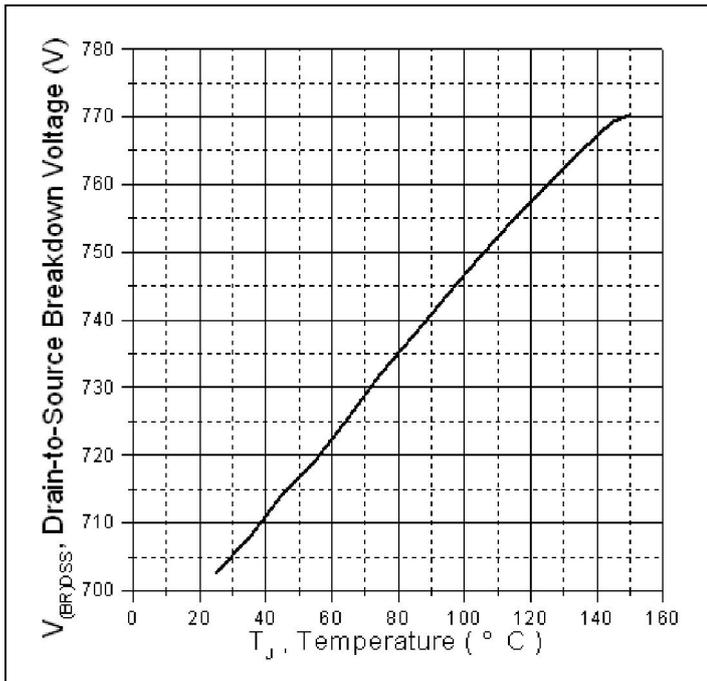


Figure 3: Drain-to-Source Breakdown Voltage Vs. Case Temperature

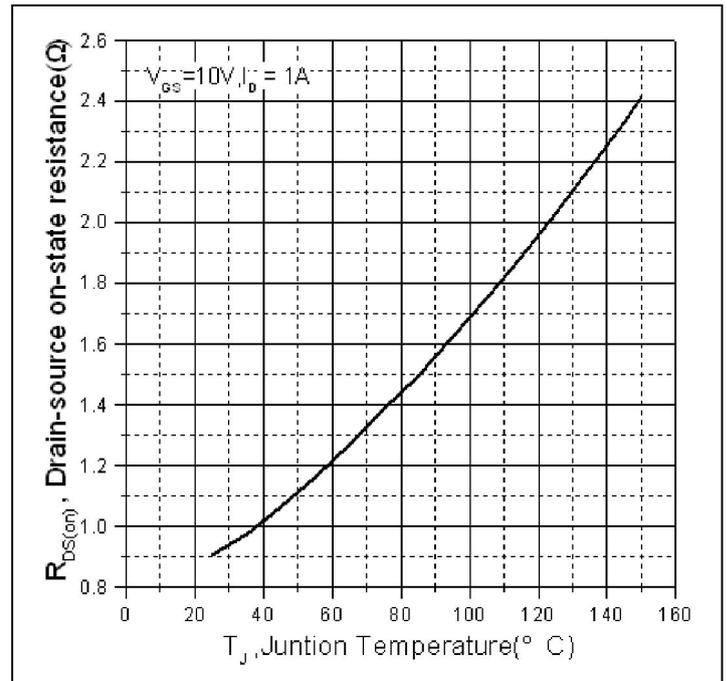


Figure 4: Normalized On-Resistance Vs. Case Temperature

Typical Electrical and Thermal Characteristics

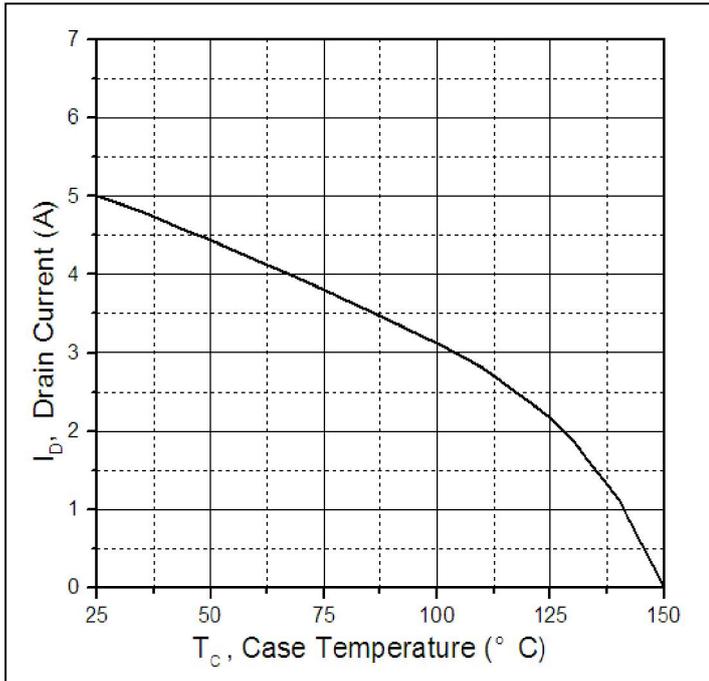


Figure 5. Maximum Drain Current Vs. Case Temperature

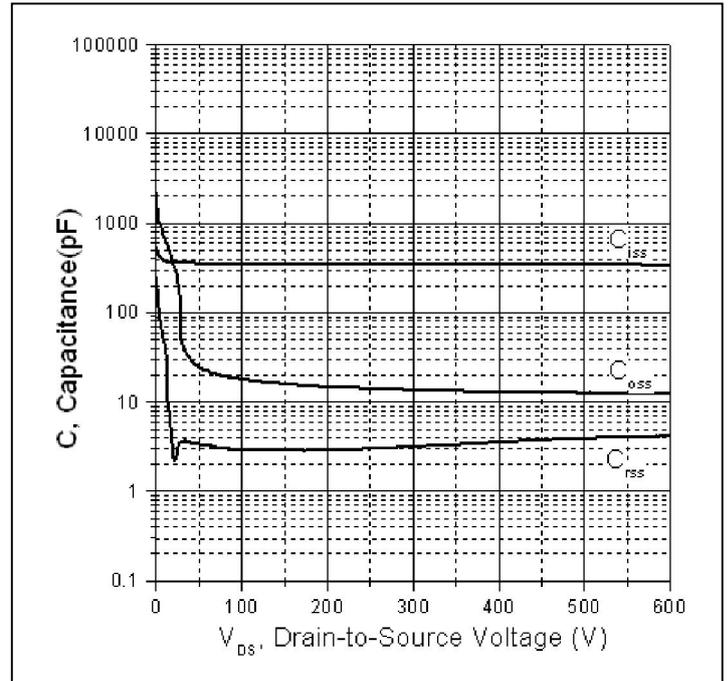


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

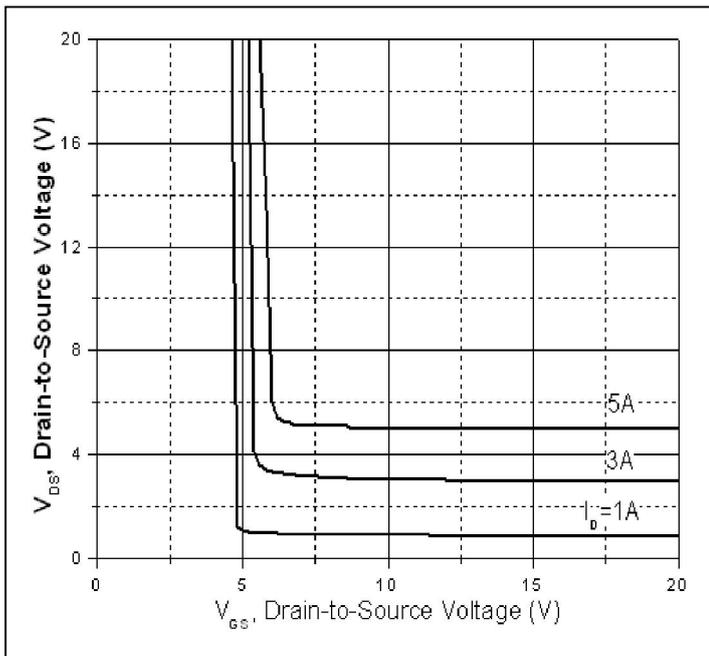
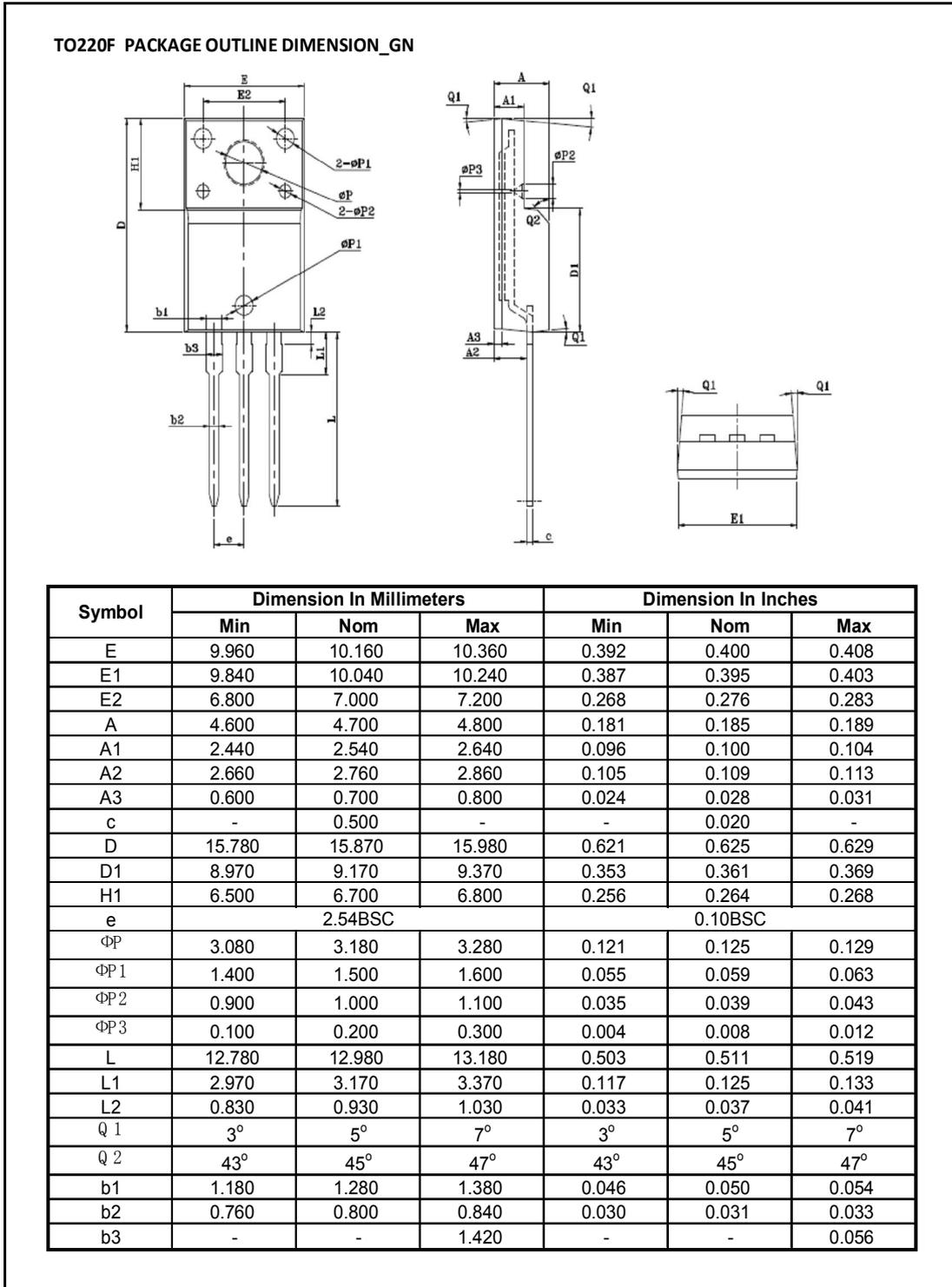


Figure 7. Drain-to-Source Voltage Vs. Gate-to-Source Voltage

Mechanical Data





Ordering and Marking Information

Device Marking: SSF5NS65UF

Package (Available)

TO-220F

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-220F	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 $V_{\text{DSS}}/V_{\text{CES}}/V_{\text{R}}$	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