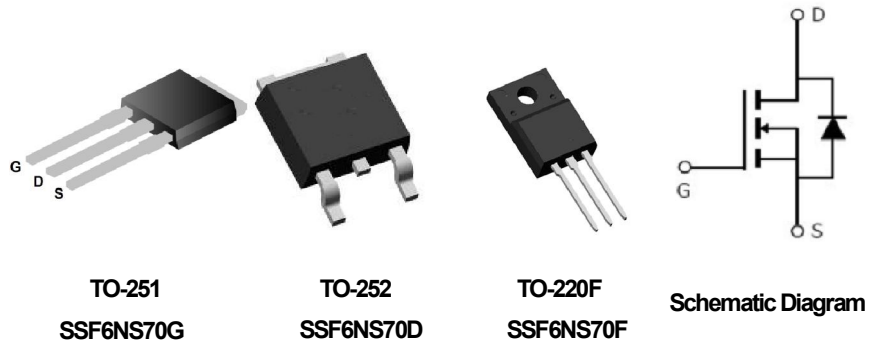


Main Product Characteristics

V_{DS}	700V
$R_{DS(on)}$	1.2 Ω (typ.)
I_D	5.2A ①



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 SSF6NS70G/D/F series MOSFET is a new technology, which combines an innovative 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°C	Continuous Drain Current, V _{GS} @ 10V		5.2 ①	A
I _D @ TC = 100°C	Continuous Drain Current, V _{GS} @ 10V		3.2①	
I _{DM}	Pulsed Drain Current ②		15.6	
P _D @TC = 25°C	Power Dissipation ③	For TO-251/TO-252 package	50	W
		For TO-220F package	31.2	
	Linear Derating Factor	For TO-251/TO-252 package	0.4	W/°C
		For TO-220F package	0.25	
V _{DS}	Drain-Source Voltage		700	V
V _{GS}	Gate-to-Source Voltage		± 30	V
E _{AS}	Single Pulse Avalanche Energy @ L=22.4mH		54	mJ
I _{AR}	Avalanche Current @ L=22.4mH		2.2	A
T _J T _{STG}	Operating Junction and Storage Temperature Range		-55 to +150	°C

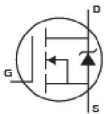
Thermal Resistance

Symbol	Characteristics		Typ.	Max.	Units
R _{θJC}	Junction-to-case ③	For TO-251/TO-252 package	—	2.5	°C/W
		For TO-220F package	—	4	
R _{θJA}	Junction-to-ambient (t ≤ 10s) ④	For TO-251/TO-252 package	—	75	°C/W
		For TO-220F package	—	80	

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

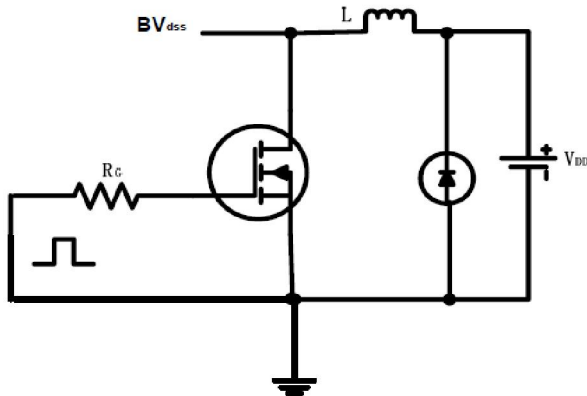
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	700	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	1.2	1.4	Ω	$V_{GS}=10\text{V}, I_D = 1\text{A}$
		—	2.9	—		$T_J = 125^{\circ}\text{C}$
$V_{GS(th)}$	Gate threshold voltage	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
		—	2.8	—		$T_J = 125^{\circ}\text{C}$
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	$V_{DS} = 700\text{V}, V_{GS} = 0\text{V}$
		—	—	50		$T_J = 125^{\circ}\text{C}$
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 30\text{V}$
		—	—	-100		$V_{GS} = -30\text{V}$
Q_g	Total gate charge	—	8.3	—	nC	$I_D = 4\text{A},$ $V_{DS}=100\text{V},$ $V_{GS} = 10\text{V}$
Q_{gs}	Gate-to-Source charge	—	2.3	—		
Q_{gd}	Gate-to-Drain("Miller") charge	—	2.6	—		
$t_{d(on)}$	Turn-on delay time	—	10.1	—	ns	$V_{GS}=10\text{V}, V_{DS} = 380\text{V},$ $R_{GEN}=18\Omega, I_D = 4.5\text{A}$
t_r	Rise time	—	18.4	—		
$t_{d(off)}$	Turn-Off delay time	—	16.8	—		
t_f	Fall time	—	14.8	—		
C_{iss}	Input capacitance	—	272	—	pF	$V_{GS} = 0\text{V}$
C_{oss}	Output capacitance	—	168	—		$V_{DS} = 25\text{V}$
C_{rss}	Reverse transfer capacitance	—	3.14	—		$f = 1\text{MHz}$

Source-Drain Ratings and Characteristics

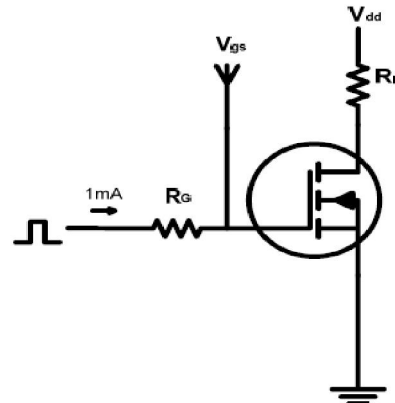
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	5.2 ①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	15.6	A	
V_{SD}	Diode Forward Voltage	—	0.84	1.2	V	$I_S=2.8\text{A}, V_{GS}=0\text{V}$
t_{rr}	Reverse Recovery Time	—	284	—	nS	$T_J = 25^{\circ}\text{C}, I_F = I_S,$ $di/dt = 100\text{A}/\mu\text{s}$
Q_{rr}	Reverse Recovery Charge	—	1395	—	nC	

Test Circuits and Waveforms

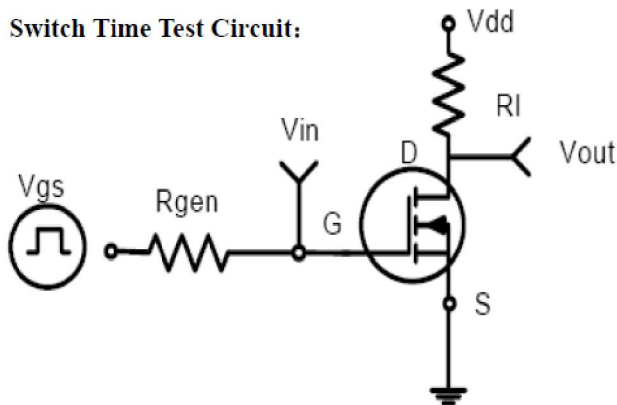
EAS test circuits:



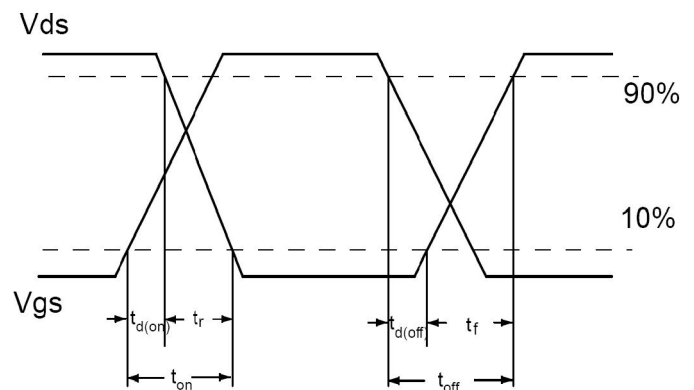
Gate charge test circuit:



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

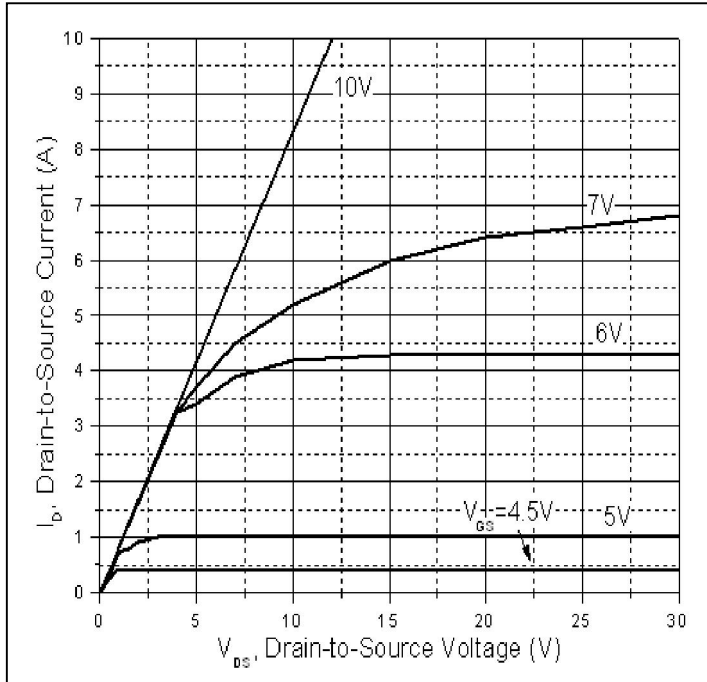


Figure 1: Typical Output Characteristics

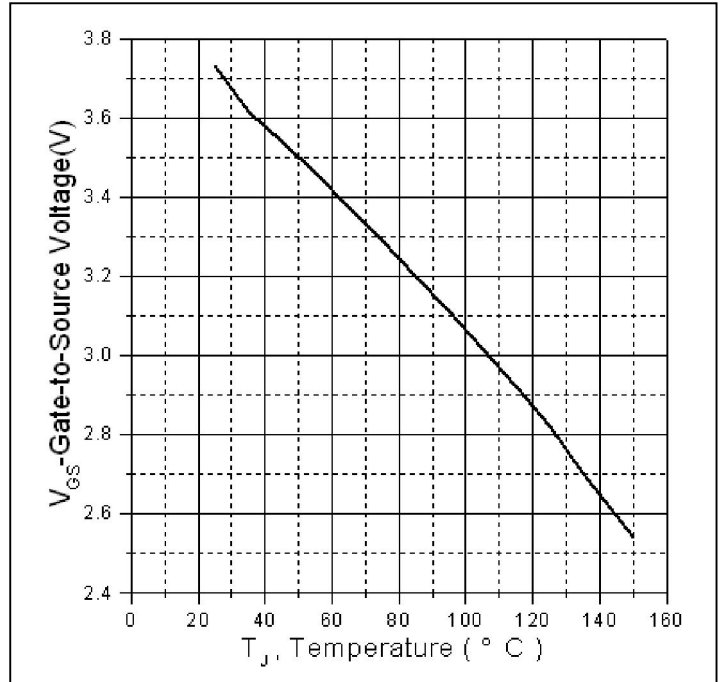


Figure 2: Gate to source cut-off voltage

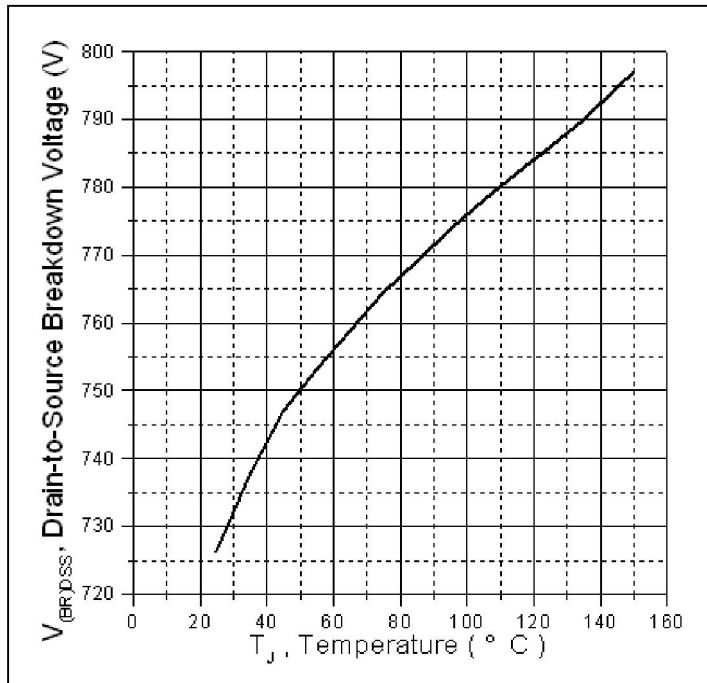


Figure 3: Drain-to-Source Breakdown Voltage Vs. Case Temperature

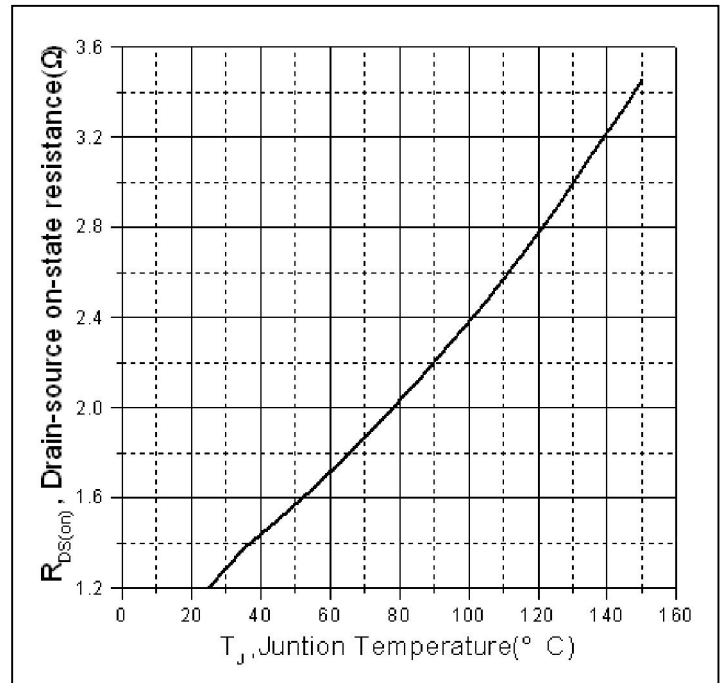


Figure 4: Normalized On-Resistance Vs. Case Temperature

Typical Electrical and Thermal Characteristics

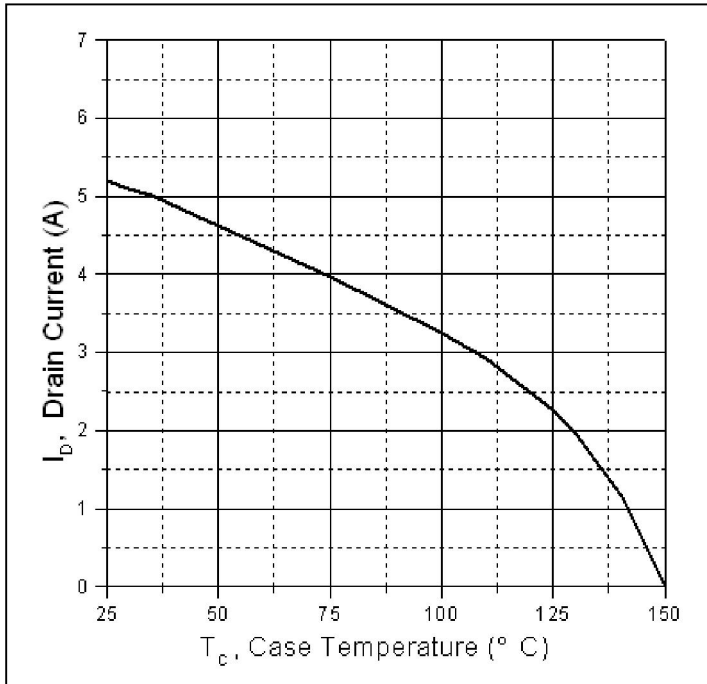


Figure 5. Maximum Drain Current Vs. Case Temperature

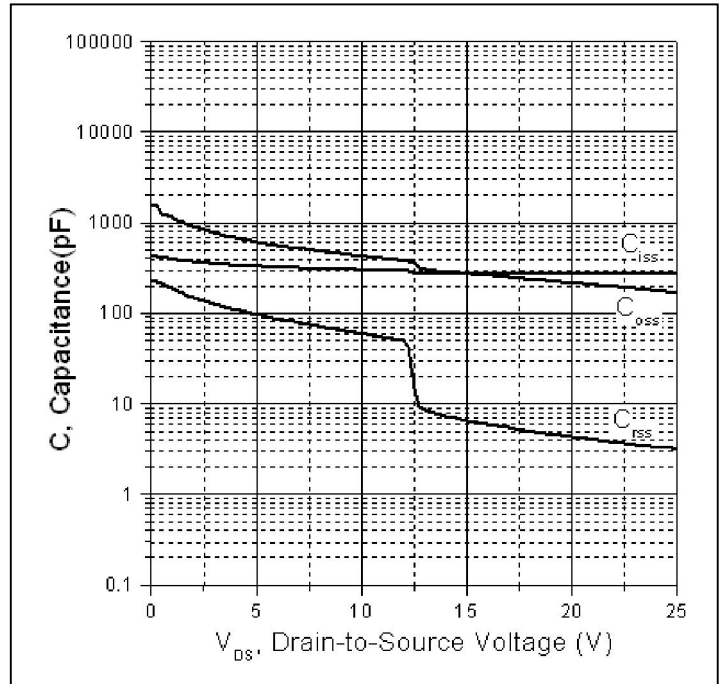
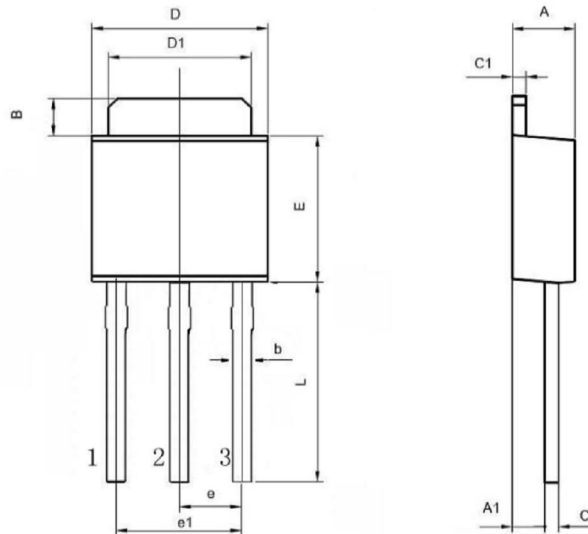


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

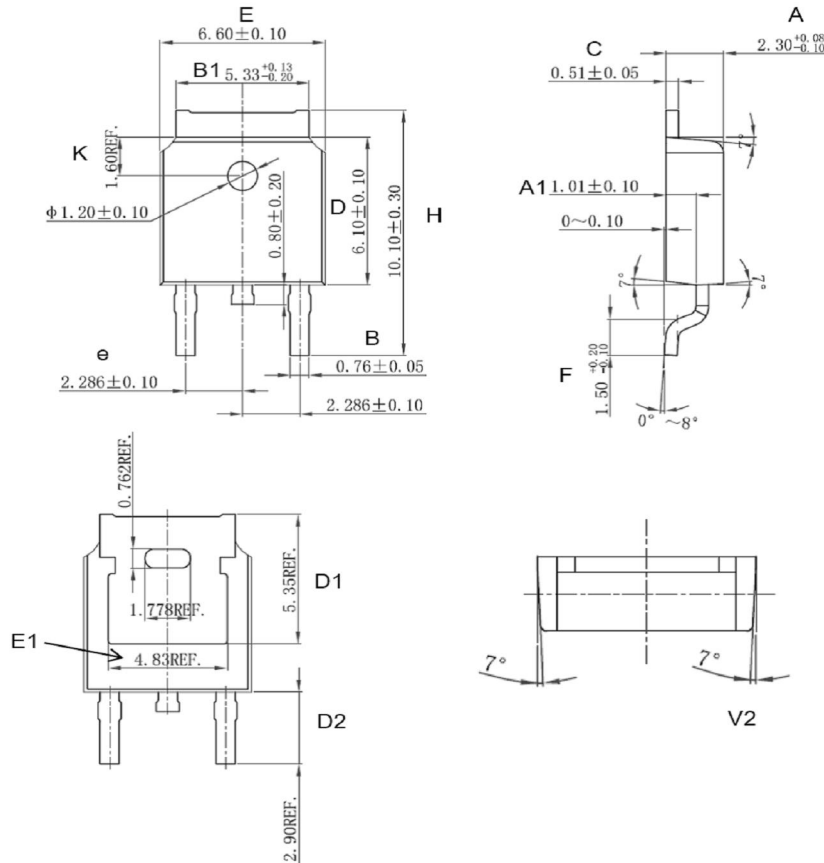
Mechanical Data

TO-251 PACKAGE OUTLINE DIMENSION



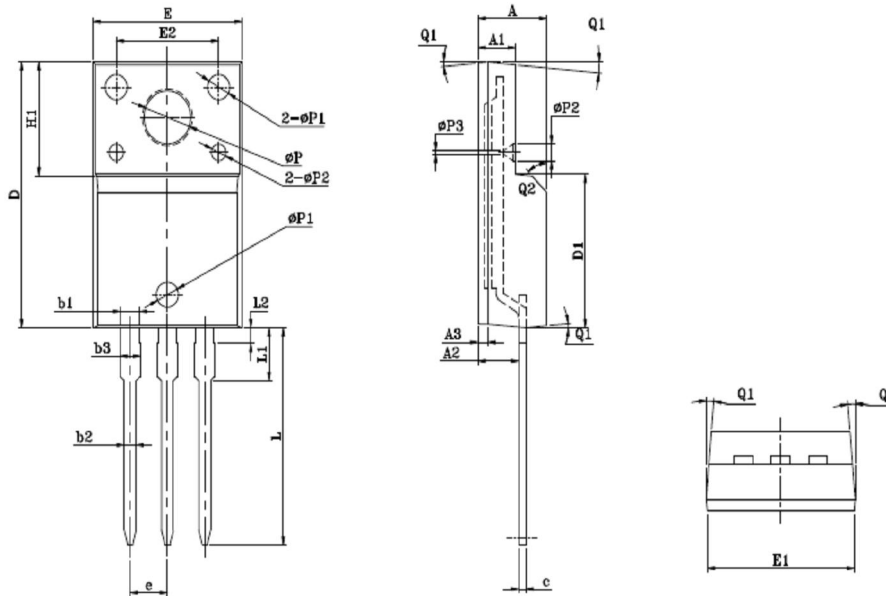
Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
A	2.200	-	2.400	0.087	-	0.094
A1	0.950	-	1.150	0.037	-	0.045
B	0.950	-	1.250	0.037	-	0.049
b	0.500	-	0.700	0.020	-	0.028
c	0.450	-	0.550	0.018	-	0.022
c1	0.450	-	0.550	0.018	-	0.022
D	6.450	-	6.750	0.254	-	0.266
D1	5.200	-	5.400	0.205	-	0.213
E	5.950	-	6.250	0.234	-	0.246
e	2.240	-	2.340	0.088	-	0.092
e1	4.430	-	4.730	0.174	-	0.186
L	9.000	-	9.400	0.354	-	0.370

TO-252 PACKAGE OUTLINE DIMENSION



Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
A	2.200	2.300	2.380	0.087	0.091	0.094
A1	0.910	1.010	1.110	0.036	0.040	0.044
B	0.710	0.760	0.810	0.028	0.030	0.032
B1	5.130	5.330	5.460	0.202	0.210	0.215
C	0.460	0.510	0.560	0.018	0.020	0.022
D	6.000	6.100	6.200	0.236	0.240	0.244
D1	5.350 (REF)			0.211 (REF)		
D2	2.900 (REF)			0.114 (REF)		
E	6.500	6.600	6.700	0.256	0.260	0.264
E1	4.83 (REF)			0.190 (REF)		
e	2.186	2.286	2.386	0.086	0.090	0.094
H	9.800	10.100	10.400	0.386	0.398	0.409
F	1.400	1.500	1.700	0.055	0.059	0.067
K	1.600 (REF)			0.063 (REF)		
V2	8° (REF)			8° (REF)		

TO220F PACKAGE OUTLINE DIMENSION_GN



Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
E	9.960	10.160	10.360	0.392	0.400	0.408
E1	9.840	10.040	10.240	0.387	0.395	0.403
E2	6.800	7.000	7.200	0.268	0.276	0.283
A	4.600	4.700	4.800	0.181	0.185	0.189
A1	2.440	2.540	2.640	0.096	0.100	0.104
A2	2.660	2.760	2.860	0.105	0.109	0.113
A3	0.600	0.700	0.800	0.024	0.028	0.031
c	-	0.500	-	-	0.020	-
D	15.780	15.870	15.980	0.621	0.625	0.629
D1	8.970	9.170	9.370	0.353	0.361	0.369
H1	6.500	6.700	6.800	0.256	0.264	0.268
e	2.54BSC			0.10BSC		
φP	3.080	3.180	3.280	0.121	0.125	0.129
φP1	1.400	1.500	1.600	0.055	0.059	0.063
φP2	0.900	1.000	1.100	0.035	0.039	0.043
φP3	0.100	0.200	0.300	0.004	0.008	0.012
L	12.780	12.980	13.180	0.503	0.511	0.519
L1	2.970	3.170	3.370	0.117	0.125	0.133
L2	0.830	0.930	1.030	0.033	0.037	0.041
Q 1	3°	5°	7°	3°	5°	7°
Q 2	43°	45°	47°	43°	45°	47°
b1	1.180	1.280	1.380	0.046	0.050	0.054
b2	0.760	0.800	0.840	0.030	0.031	0.033
b3	-	-	1.420	-	-	0.056



SSF6NS70G/D/F

700V N-Channel MOSFET

Ordering and Marking Information

Device Marking: SSF6NS70G/D/F

Package (Available)

TO-251(IPAK)/TO-252(DPAK)/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-251	80	60	4800	5	24000
TO-252	75	48	3600	5	18000
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