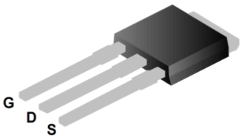
Main Product Characteristics:

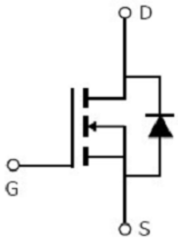
V_{DSS}	700V
$R_{DS}(on)$	1.23Ω (typ.)
I_D	5A ①



TO-251
SSF5NS70G

TO-252
SSF5NS70D

TO-220F
SSF5NS70F



Schematic diagram

Features and Benefits:

Feathers:

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

Description:

The SSF5NS70G/D/F series MOSFETs is a new technology, which combines an innovative technology and advance process. This new technology achieves low Rdson, 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 ①	A
I_D @ TC = 100°C	Continuous Drain Current, V_{GS} @ 10V		3.1①	
I_{DM}	Pulsed Drain Current ②		15	
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

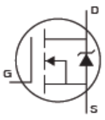
Thermal Resistance

Symbol	Characterizes		Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ③	For TO-251/TO-252 package	—	2.5	℃/W
		For TO-220F package	—	4	
$R_{\theta JA}$	Junction-to-ambient (t ≤ 10s) ④	For TO-251/TO-252 package	—	75	℃/W
		For TO-220F package	—	80	

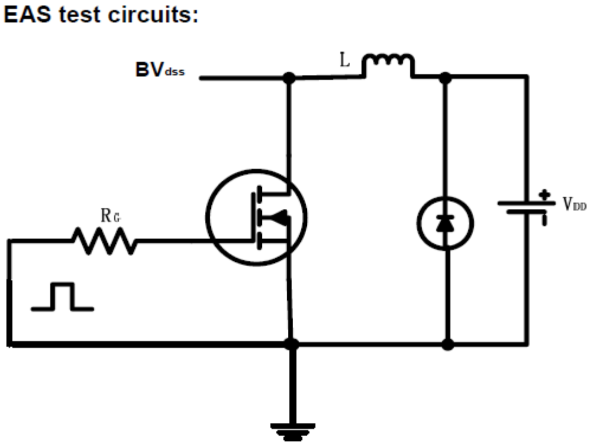
Electrical Characterizes @T_A=25℃ unless otherwise specified

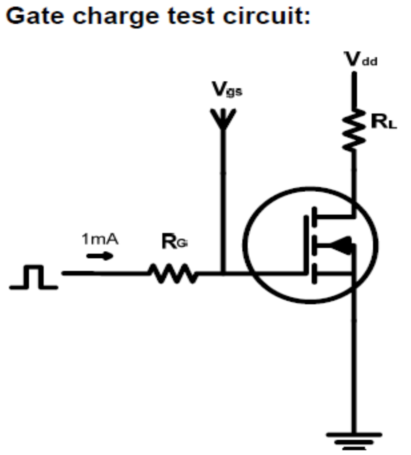
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	700	—	—	V	V_{GS} = 0V, I_D = 250μA
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	1.23	1.4	Ω	V_{GS}=10V,I_D = 1A
		—	2.9	—		T_J = 125°C
$V_{GS(th)}$	Gate threshold voltage	2	—	4	V	V_{DS} = V_{GS}, I_D = 250μA
		—	2.8	—		T_J = 125°C
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	V_{DS} = 700V,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	—	8.3	—	nC	I_D = 4A, V_{DS}=100V, V_{GS} = 10V
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}=10V, V_{DS} =380V, R_{GEN}=18Ω,I_D =4.5A
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} = 0V V_{DS} = 25V f = 1MHz
C_{oss}	Output capacitance	—	168	—		
C_{rss}	Reverse transfer capacitance	—	3.14	—		

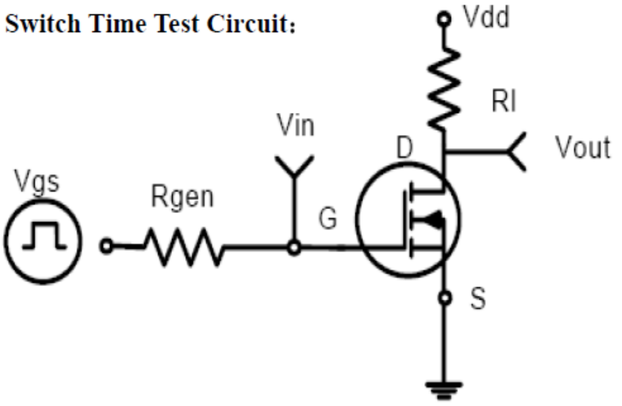
Source-Drain Ratings and Characteristics

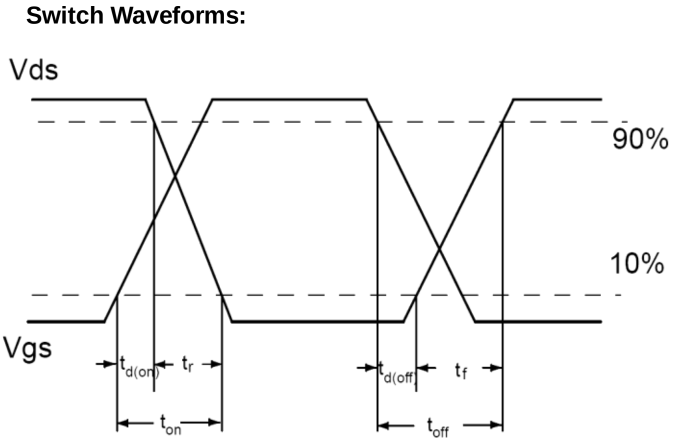
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	5 ①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	15	A	
V_{SD}	Diode Forward Voltage	—	0.84	1.2	V	I_S=2.8A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	—	284	—	nS	T_J = 25°C, I_F = I_S, di/dt = 100A/μs
Q_{rr}	Reverse Recovery Charge	—	1395	—	nC	

Test circuits and Waveforms


EAS test circuits:


Gate charge test circuit:


Switch Time Test Circuit:


Switch Waveforms:

Notes:

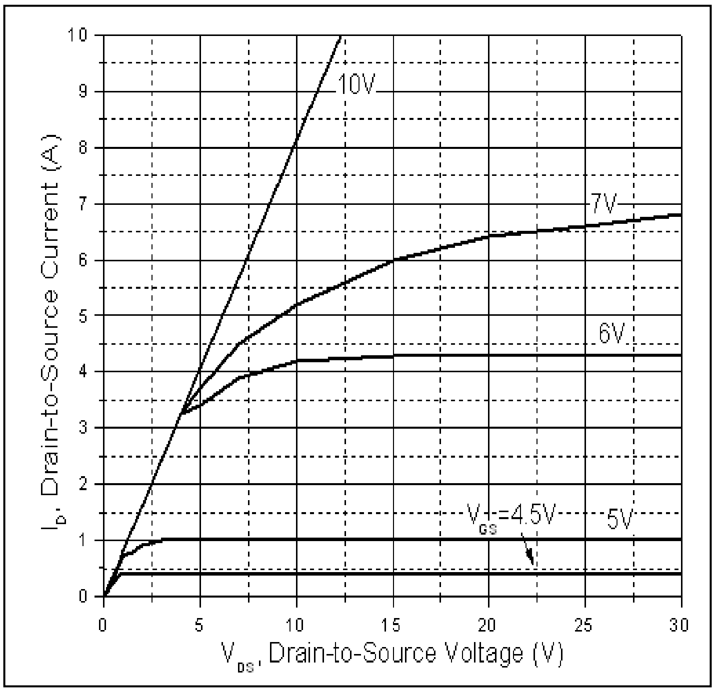
①Calculated continuous current based on maximum allowable junction temperature.

②Repetitive rating; pulse width limited by max. junction temperature.

③The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.

④The 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 TA =25°C

Typical electrical and thermal characteristics



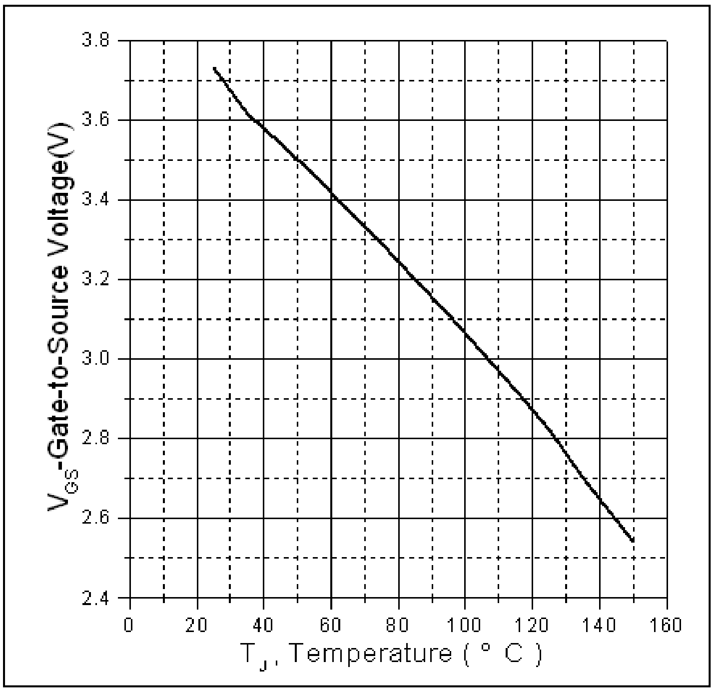
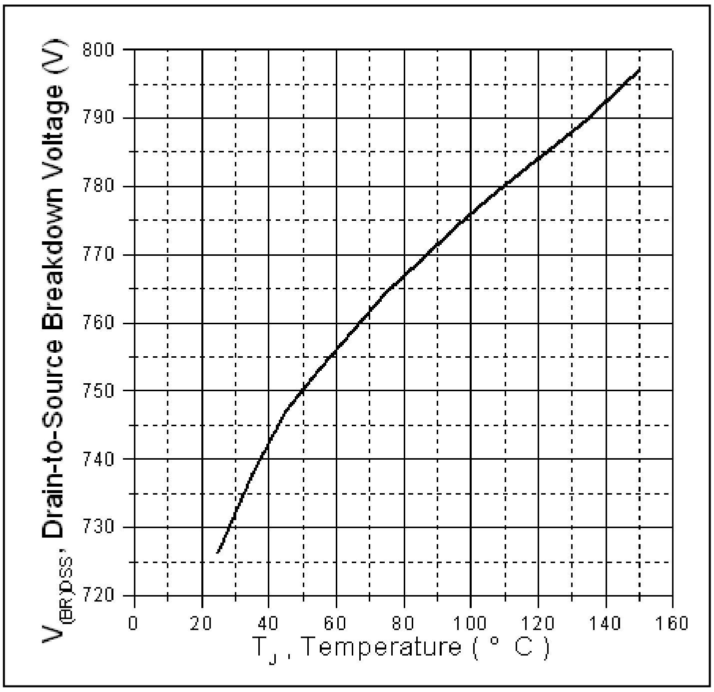


Figure 1: Typical Output Characteristics

Figure 2. Gate to source cut-off voltage



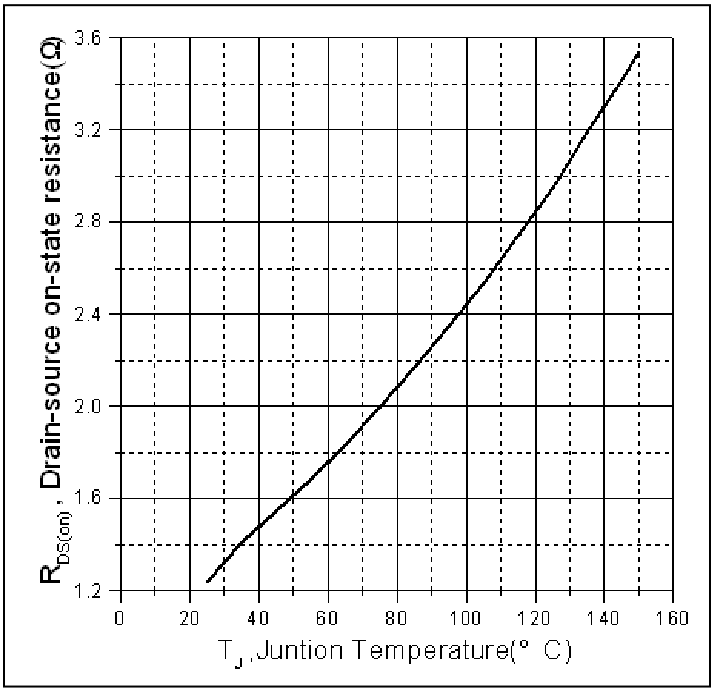


Figure 3. Drain-to-Source Breakdown Voltage Vs. Case Temperature

Figure 4: Normalized On-Resistance Vs. Case Temperature

Typical electrical and thermal characteristics

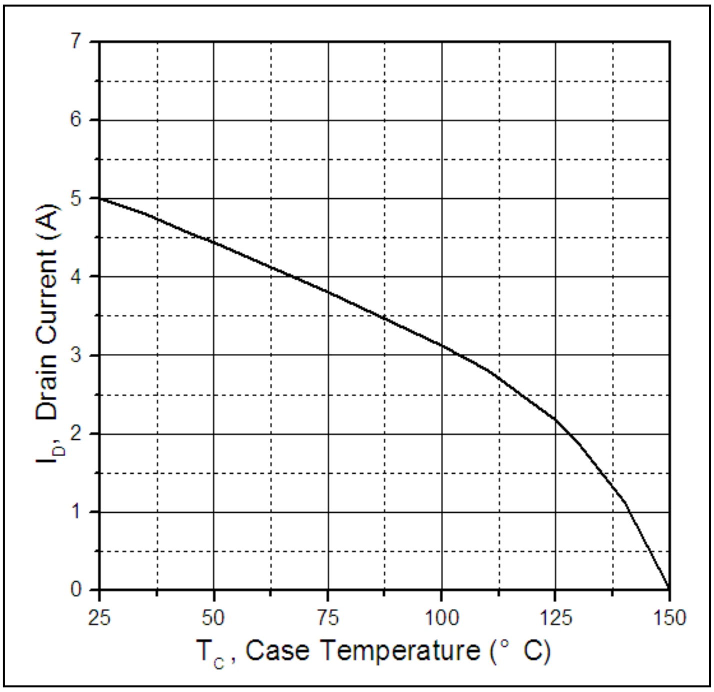


Figure 5. Maximum Drain Current Vs. Case Temperature

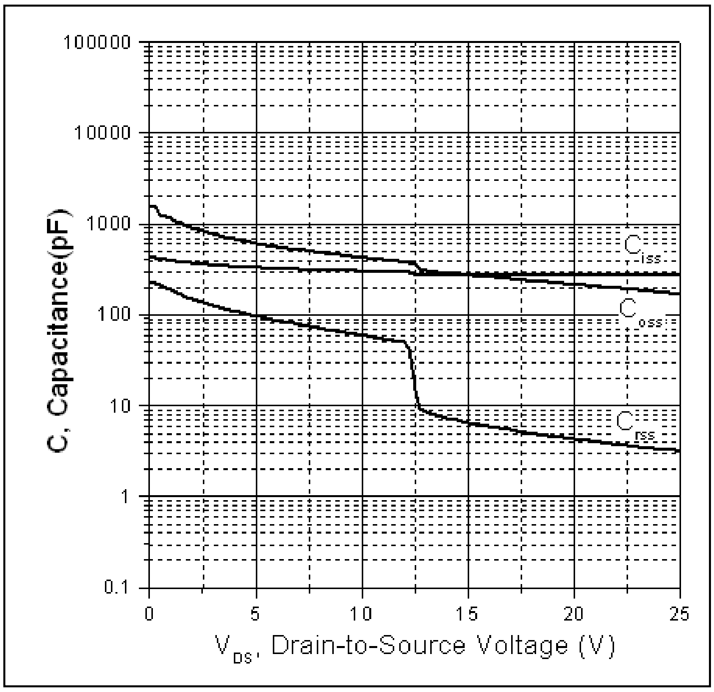
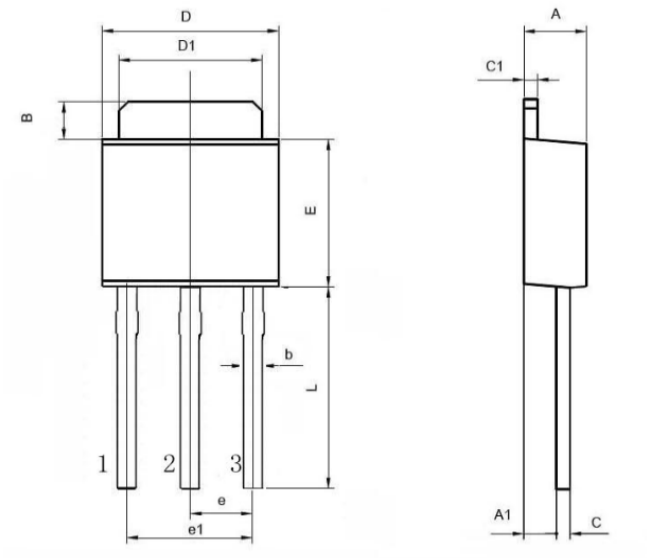


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

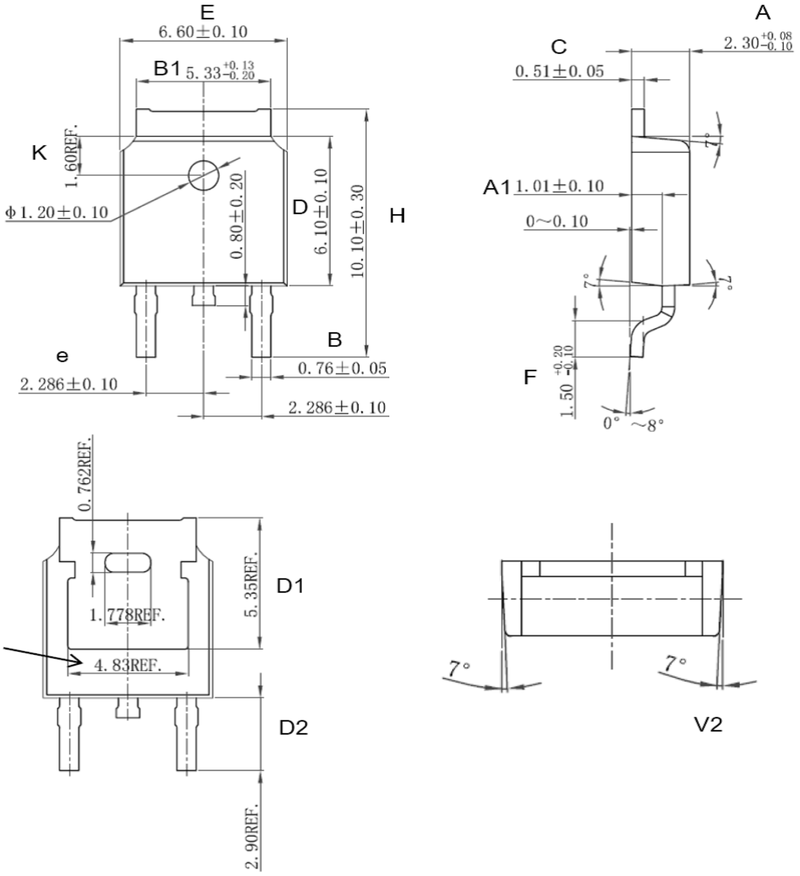
Mechanical Data：

TO-251 PACKAGE OUTLINE DIMENSION



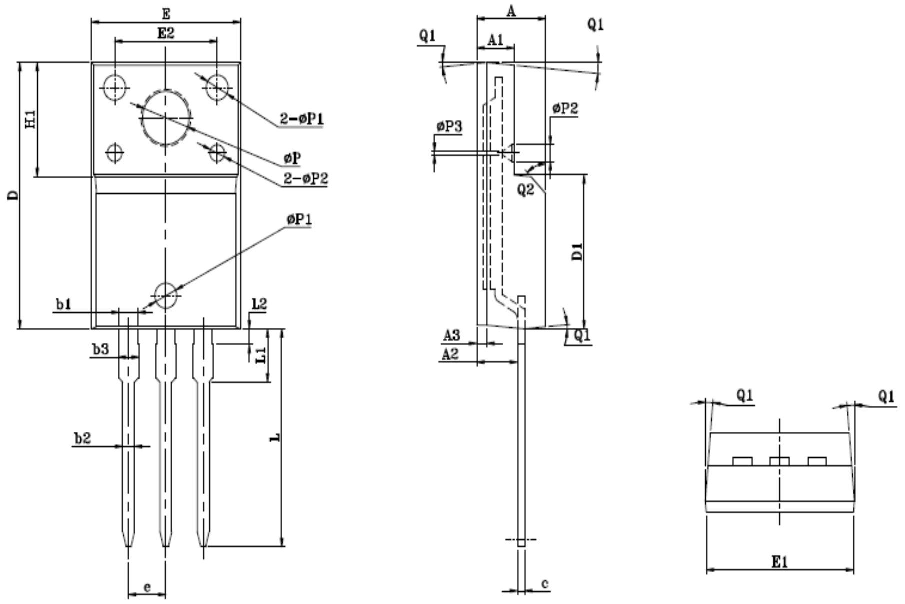
Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
A	2.200	-	2.400	0.087	-	0.094
A1	0.950	-	1.150	0.037	-	0.045
B	0.950	-	1.250	0.037	-	0.049
b	0.500	-	0.700	0.020	-	0.028
c	0.450	-	0.550	0.018	-	0.022
c1	0.450	-	0.550	0.018	-	0.022
D	6.450	-	6.750	0.254	-	0.266
D1	5.200	-	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	8^0 (REF)			8^0 (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
Q1	3^{o}	5^{o}	7^{o}	3^{o}	5^{o}	7^{o}
Q2	43^{o}	45^{o}	47^{o}	43^{o}	45^{o}	47^{o}
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

Ordering and Marking Information

Device Marking: SSF5NS70G/D/F

Package (Available)
TO-251(IPAK)/TO-252(DPAK)/TO-220F
Operating Temperature Range
C : -55 to 150 ºC

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℃ to 150℃ @ 80% of Max V_{DSS}/V_{CES}/VR	168 hours 500 hours 1000 hours	3 lots x 77 devices
High Temperature Gate Bias(HTGB)	T_j=150℃ @ 100% of Max V_{GSS}	168 hours 500 hours 1000 hours	3 lots x 77 devices

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