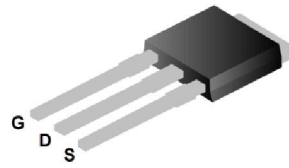
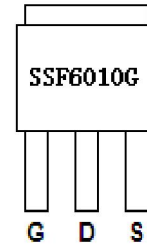


Main Product Characteristics

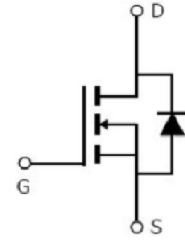
V_{DSS}	60V
$R_{DS(on)}$	8.3m Ω (typ.)
I_D	64A ①



TO-251



Marking and Pin Assignment



Schematic Diagram

Features and Benefits

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 175°C operating temperature
- Lead free product



Description

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

Absolute Max Rating

Symbol	Parameter	Max.	Units
$I_D @ TC = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	64 ①	A
$I_D @ TC = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	45 ①	
I_{DM}	Pulsed Drain Current ②	300	
$P_D @ TC = 25^\circ C$	Power Dissipation ③	91	W
	Linear Derating Factor	0.61	W/°C
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy @ L=0.3mH	160	mJ
I_{AS}	Avalanche Current @ L=0.3mH	32.6	A
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +175	°C

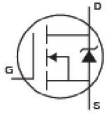
Thermal Resistance

Symbol	Characteristics	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ③	—	1.64	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-ambient ($t \leq 10\text{s}$) ④	—	110	$^{\circ}\text{C}/\text{W}$

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

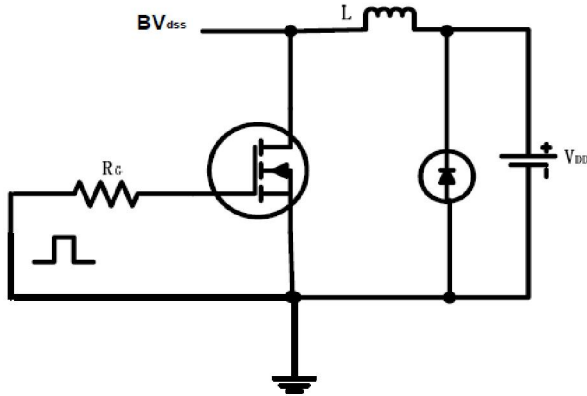
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	60	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	8.3	10	m Ω	$V_{GS}=10\text{V}, I_D = 30\text{A}$
		—	15.6	—		$T_J = 125^{\circ}\text{C}$
$V_{GS(th)}$	Gate threshold voltage	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
		—	2.35	—		$T_J = 125^{\circ}\text{C}$
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$
		—	—	10		$T_J = 125^{\circ}\text{C}$
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 20\text{V}$
		—	—	-100		$V_{GS} = -20\text{V}$
Q_g	Total gate charge	—	49	—	nC	$I_D = 37\text{A},$ $V_{DS}=44\text{V},$ $V_{GS} = 10\text{V}$
Q_{gs}	Gate-to-Source charge	—	11	—		
Q_{gd}	Gate-to-Drain("Miller") charge	—	20	—		
$t_{d(on)}$	Turn-on delay time	—	13	—	ns	$V_{GS}=10\text{V}, V_{DS} = 30\text{V},$ $R_L=15\Omega,$ $R_{GEN}=2.5\Omega$ $I_D = 2\text{A}$
t_r	Rise time	—	12	—		
$t_{d(off)}$	Turn-Off delay time	—	32	—		
t_f	Fall time	—	8.4	—		
C_{iss}	Input capacitance	—	2048	—	pF	$V_{GS} = 0\text{V}$
C_{oss}	Output capacitance	—	218	—		$V_{DS} = 25\text{V}$
C_{rss}	Reverse transfer capacitance	—	162	—		$f = 1\text{MHz}$

Source-Drain Ratings and Characteristics

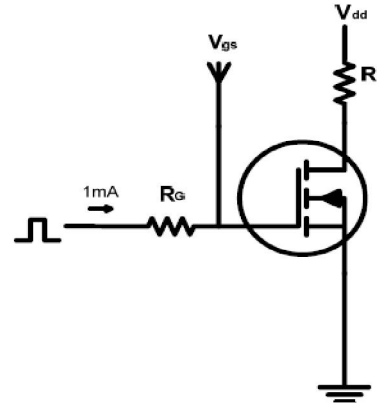
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	64①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	300	A	
V_{SD}	Diode Forward Voltage	—	—	1.2	V	$I_S=30\text{A}, V_{GS}=0\text{V}$
t_{rr}	Reverse Recovery Time	—	25	—	nS	$T_J = 25^{\circ}\text{C}, I_F = 37\text{A},$
Q_{rr}	Reverse Recovery Charge	—	24	—	nC	$di/dt = 100\text{A}/\mu\text{s}$

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

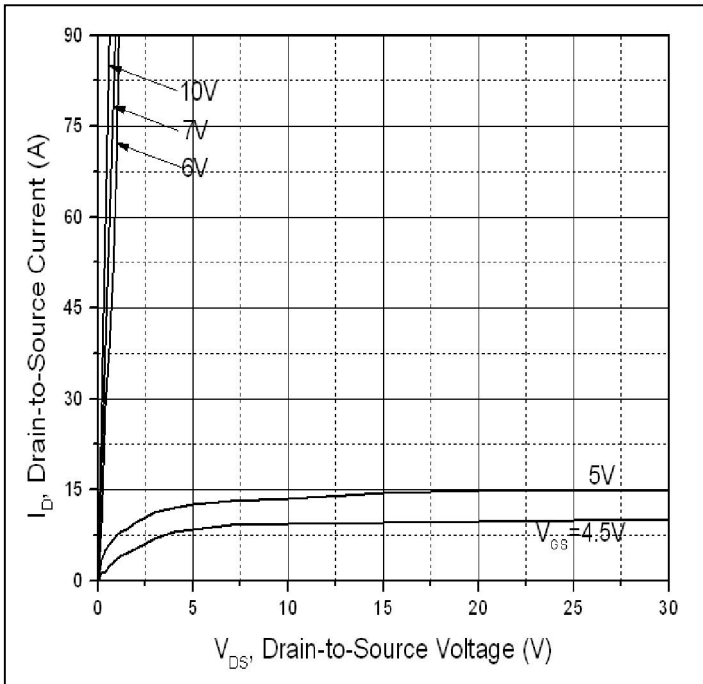


Figure 1: Typical Output Characteristics

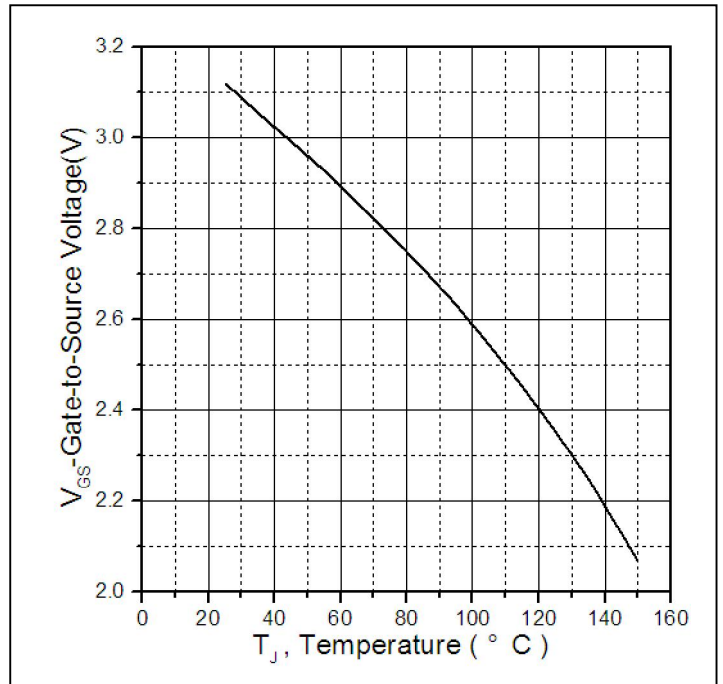


Figure 2: Gate to source cut-off voltage

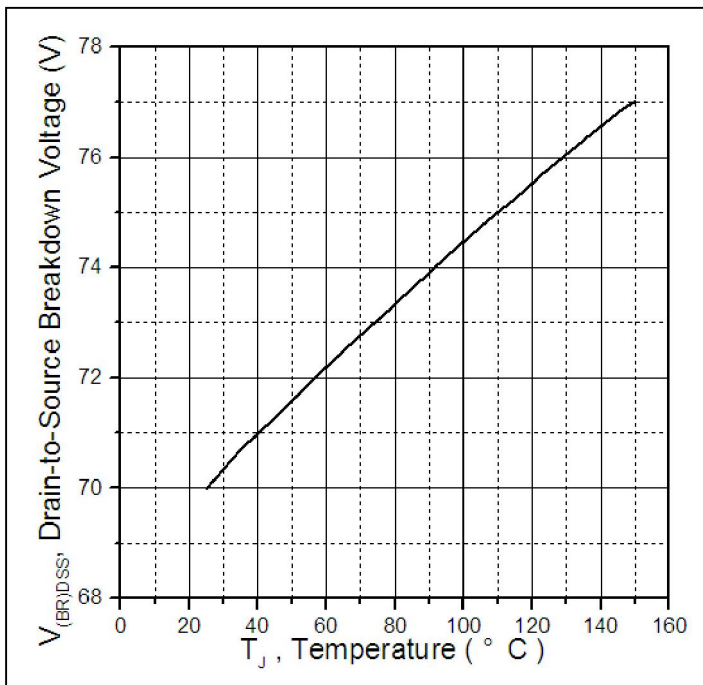


Figure 3: Drain-to-Source Breakdown Voltage Vs. Case Temperature

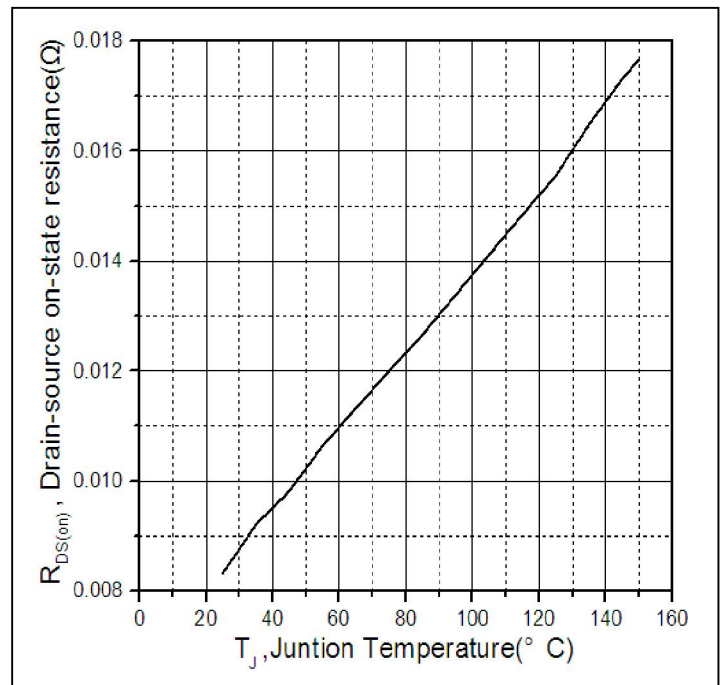


Figure 4: Normalized On-Resistance Vs. Case Temperature

Typical Electrical and Thermal Characteristics

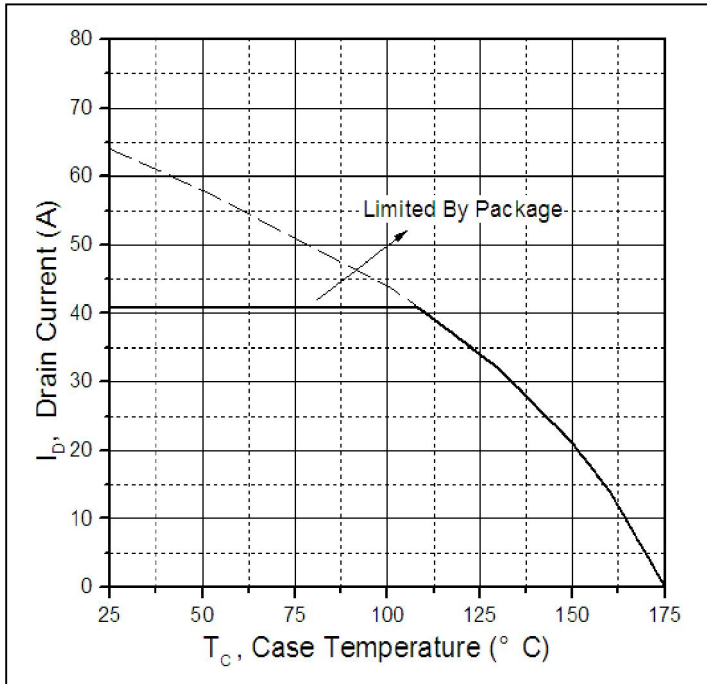


Figure 5. Maximum Drain Current Vs. Case Temperature

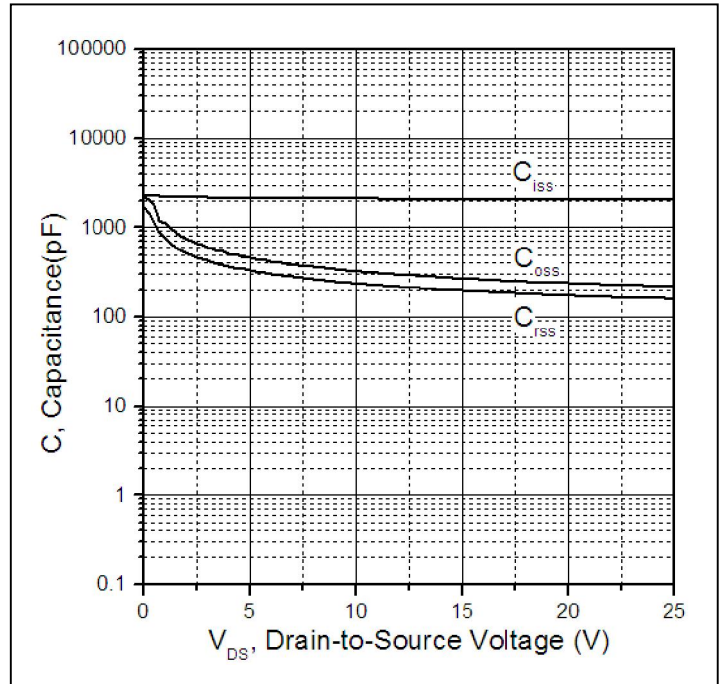


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

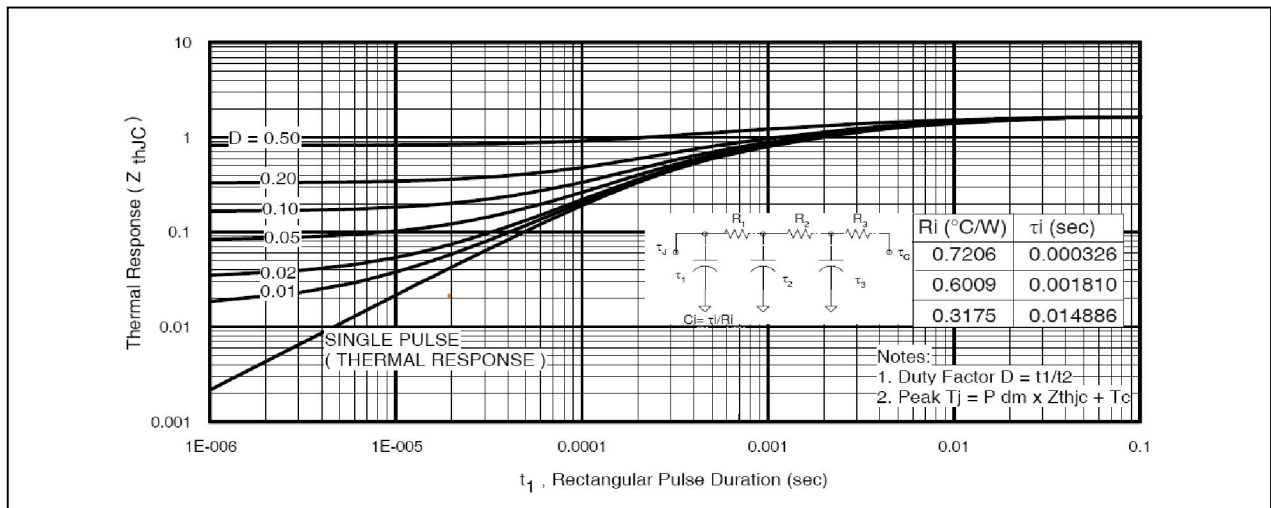
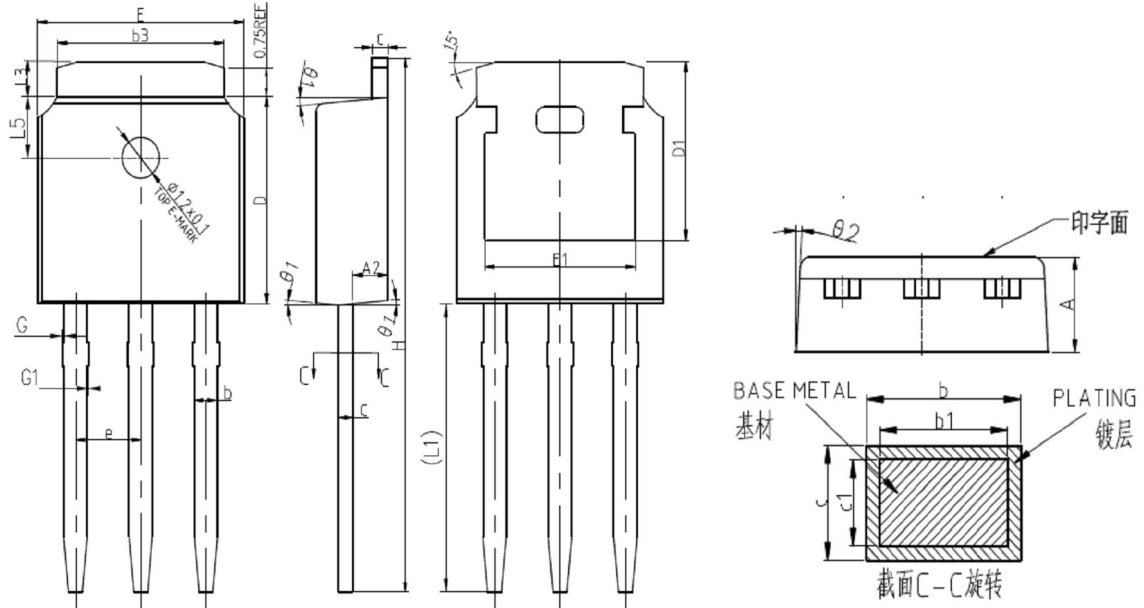


Figure7. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Mechanical Data

TO-251 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
A2	0.970	1.070	1.170	0.038	0.042	0.046
b	0.720	0.780	0.850	0.028	0.031	0.033
b1	0.710	0.760	0.810	0.028	0.030	0.032
b3	5.230	5.330	5.460	0.206	0.210	0.215
c	0.470	0.530	0.580	0.019	0.021	0.023
c1	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	5.300REF			0.209REF		
E	6.500	6.600	6.700	0.256	0.260	0.264
E1	4.700	4.830	4.920	0.185	0.190	0.194
e	2.286BSC			0.090BSC		
H	16.100	16.400	16.600	0.634	0.646	0.654
L1	9.200	9.400	9.600	0.362	0.370	0.378
L3	0.900	1.020	1.250	0.035	0.040	0.049
L5	1.700	1.800	1.900	0.067	0.071	0.075
θ1	5°	7°	9°	5°	7°	9°
θ2	5°	7°	9°	5°	7°	9°
G	0.000		0.076	0.000	0.000	0.003
G1	0.000		0.076	0.000	0.000	0.003



Ordering and Marking Information

Device Marking: SSF6010G

Package (Available)
TO-251(IPAK)
Operating Temperature Range
C : -55 to 175 °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

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