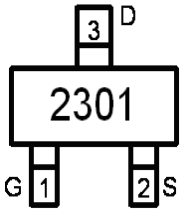
SSF2301

20V P-Channel MOSFET

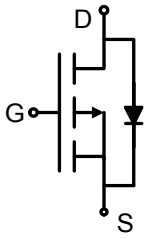
Main Product Characteristics

V_{DSS}	-20V
$R_{DS(on)}$	60mΩ (typ.)
I_D	-3A ①

SOT-23



Marking and Pin Assignment



Schematic Diagram

Features and Benefits

- Advanced MOSFET process technology
- Ideal for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 150°C operating temperature

Description

The SSF2301 utilizes the latest processing techniques to achieve high cell density, low on-resistance and high repetitive avalanche rating. These features make this device extremely efficient and reliable for use in power switching applications and a wide variety of other applications.

Absolute Max Ratings (T_A=25°C unless otherwise specified)

Symbol	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	-3 ①	A
I_D @ T_C = 70°C	Continuous Drain Current, V_{GS} @ 10V	-1.8 ①	
I_{DM}	Pulsed Drain Current ②	-10	
P_D @T_C = 25°C	Power Dissipation ③	1.25	W
V_{DS}	Drain-Source Voltage	-20	V
V_{GS}	Gate-to-Source Voltage	± 12	V
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C

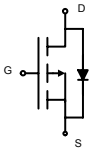
Thermal Resistance

Symbol	Characterizes	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient (t ≤ 10s) ④	—	100	°C/W

Electrical Characteristics (T_A=25°C unless otherwise specified)

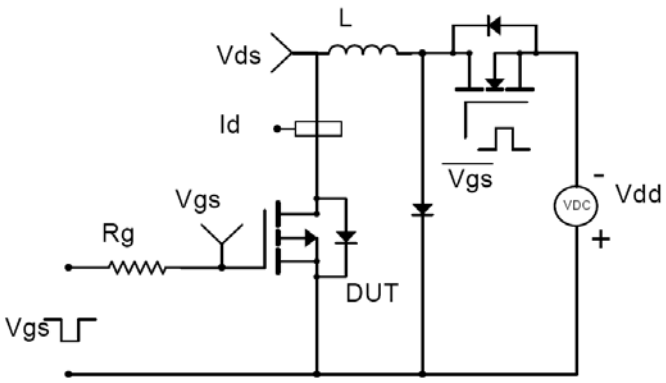
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-20	—	—	V	V_{GS} = 0V, I_D = -250μA
$R_{DS(on)}$	Static Drain-to-Source On-resistance	—	60	90	mΩ	V_{GS}=-4.5V,I_D = -3A
		—	85	115		V_{GS}=-2.5V,I_D = -2A
$V_{GS(th)}$	Gate Threshold Voltage	-0.5	—	-1	V	V_{DS} = V_{GS}, I_D = -250μA
		—	-0.58	—		T_J = 125°C
I_{DSS}	Drain-to-Source Leakage Current	—	—	-1	μA	V_{DS} = -20V,V_{GS} = 0V
		—	—	-50		T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V_{GS} =12V
		—	—	-100		V_{GS} = -12V
Q_g	Total Gate Charge	—	9.6	—	nC	I_D = -3A,
Q_{gs}	Gate-to-Source Charge	—	1.1	—		V_{DS}=-10V,
Q_{gd}	Gate-to-Drain("Miller") Charge	—	2.6	—		V_{GS} = -4.5V
$t_{d(on)}$	Turn-on Delay Time	—	9.7	—	ns	V_{GS}=-4.5V, V_{DS} =-20V, R_{GEN}=3Ω
t_r	Rise Time	—	18	—		
$t_{d(off)}$	Turn-Off Delay Time	—	25	—		
t_f	Fall Time	—	31	—		
C_{iss}	Input Capacitance	—	490	—	pF	V_{GS} = 0V,
C_{oss}	Output Capacitance	—	75	—		V_{DS} =-10V,
C_{rss}	Reverse Transfer Capacitance	—	60	—		f = 1MHz

Source-Drain Ratings and Characteristics

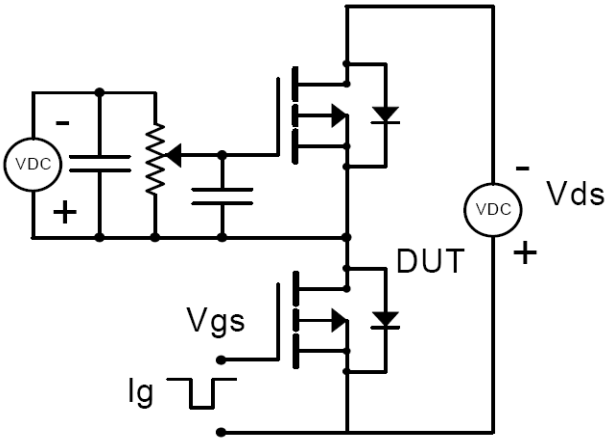
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-3 ①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	-10	A	
V_{SD}	Diode Forward Voltage	—	-0.83	-1.2	V	I_S=-0.75A, V_{GS}=0V

Test Circuits and Waveforms

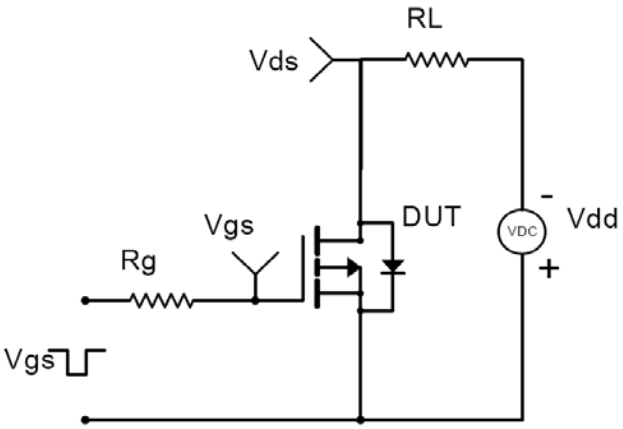
EAS Test Circuit:



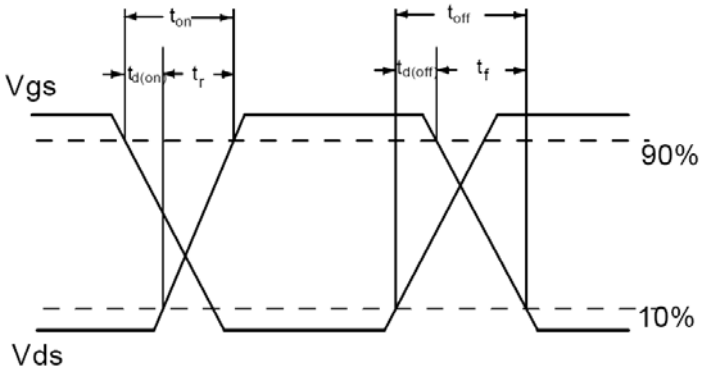
Gate Charge Test Circuit:



Switching Time Test Circuit:



Switching Waveforms:



Notes:

①Calculated continuous current based on maximum allowable junction temperature.
②Repetitive rating; pulse width limited by max. junction temperature.
③The power dissipation P_D 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 T_A =25°C.

Typical Electrical and Thermal Characteristics

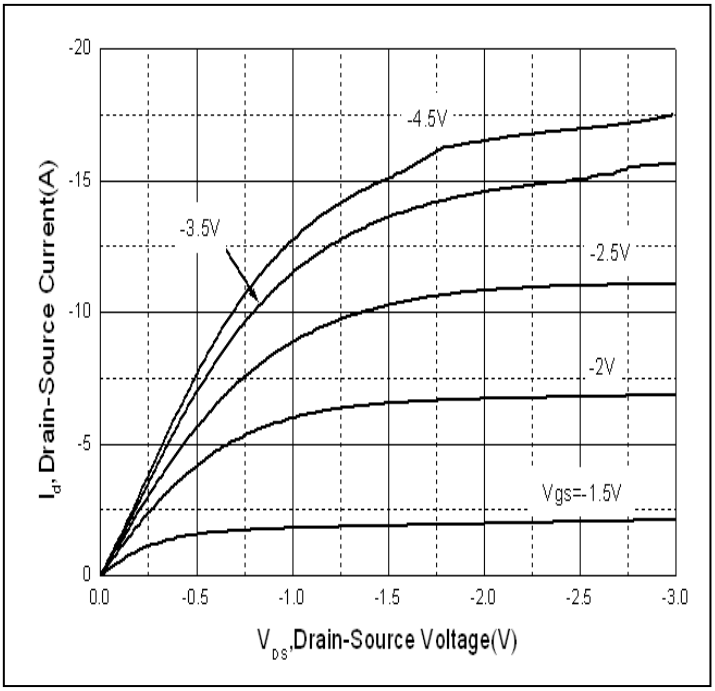


Figure 1. Typical Output Characteristics

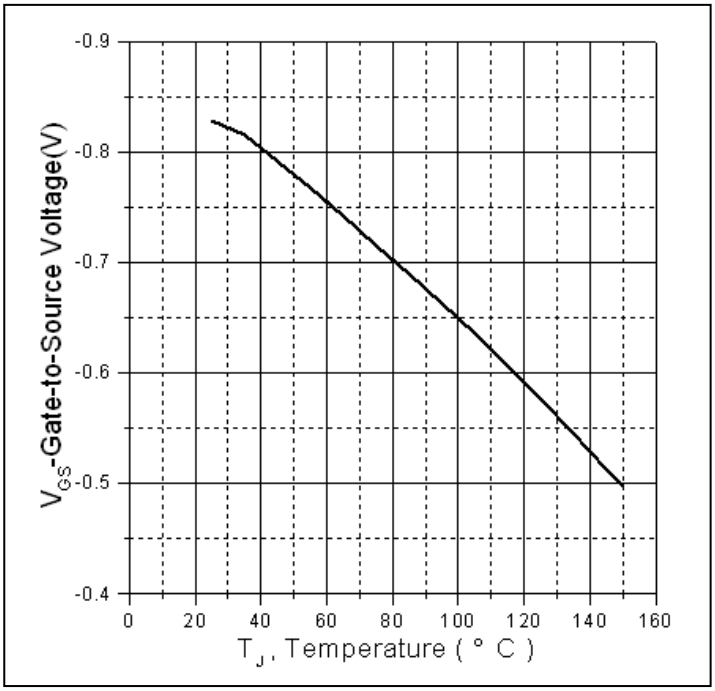


Figure 2. Gate to Source Cut-off Voltage

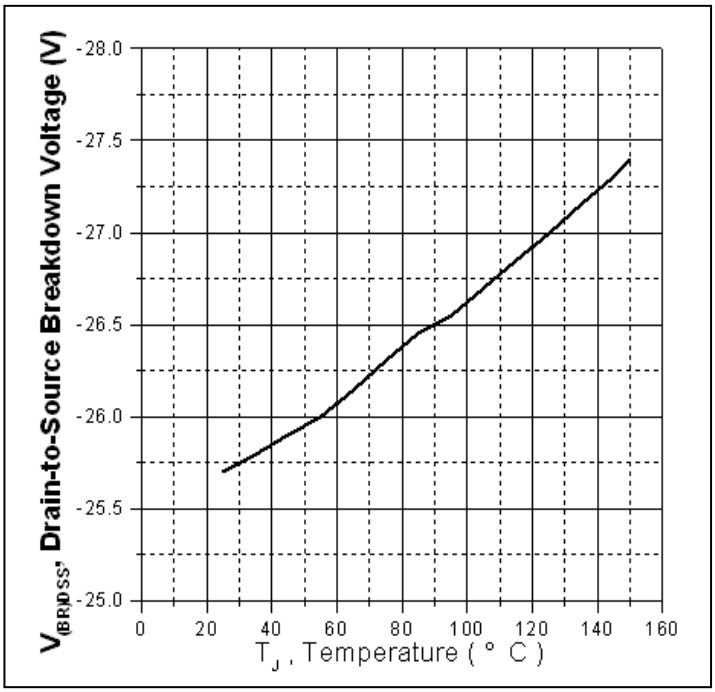


Figure 3. Drain-to-Source Breakdown Voltage Vs. Case Temperature

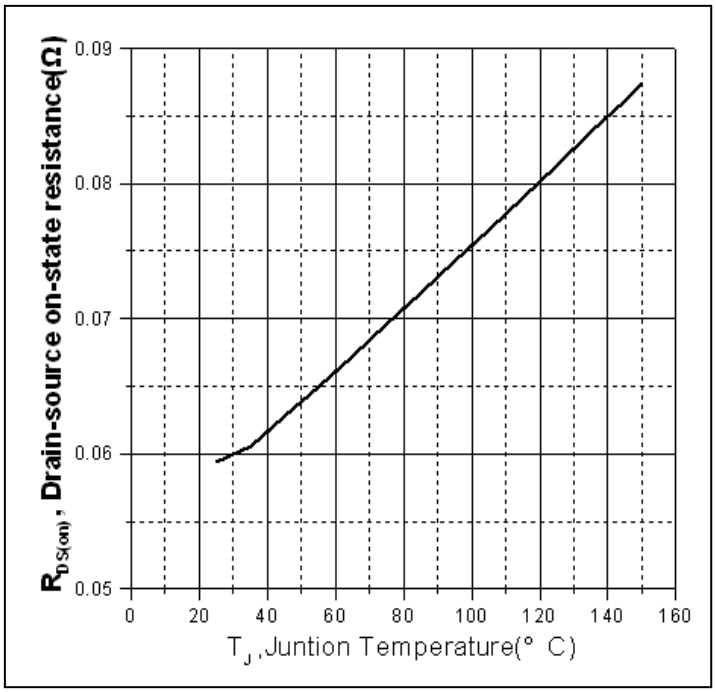


Figure 4. Normalized On-Resistance Vs. Case Temperature

Typical Electrical and Thermal Characteristics

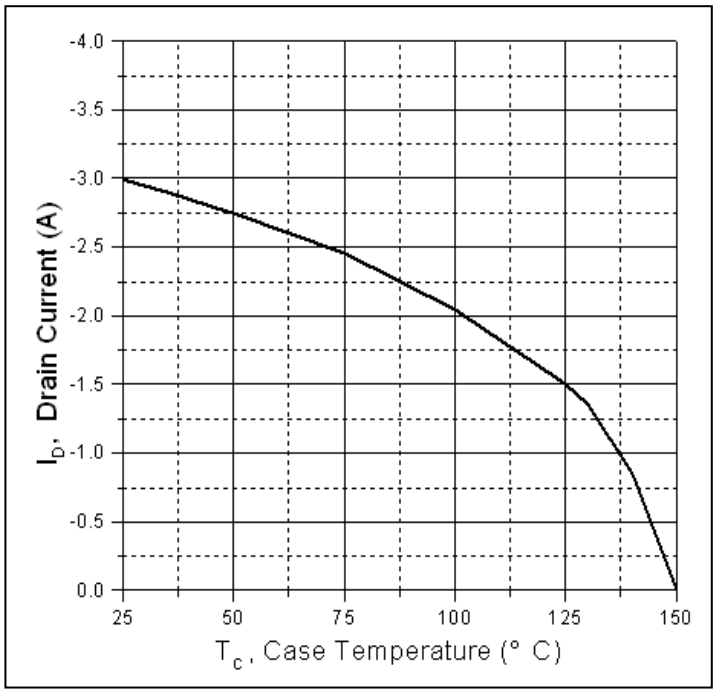


Figure 5. Maximum Drain Current Vs. Case Temperature

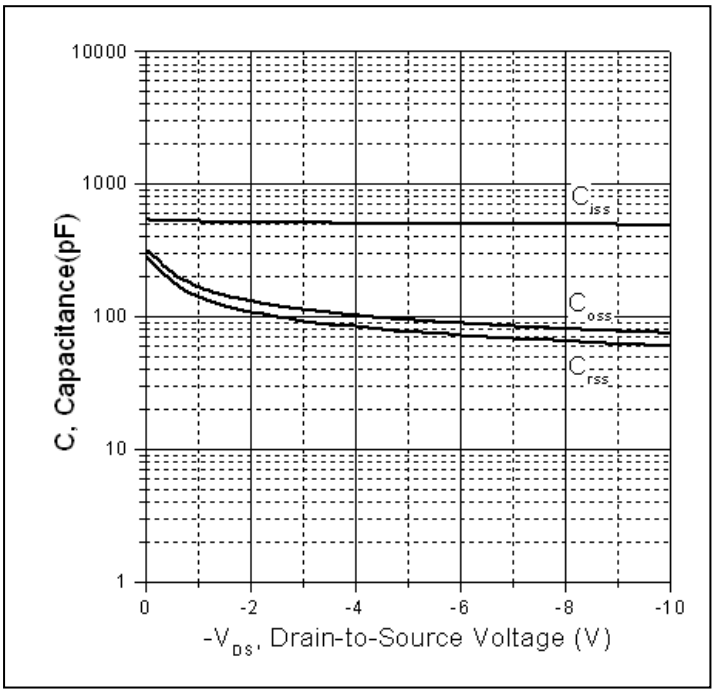


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

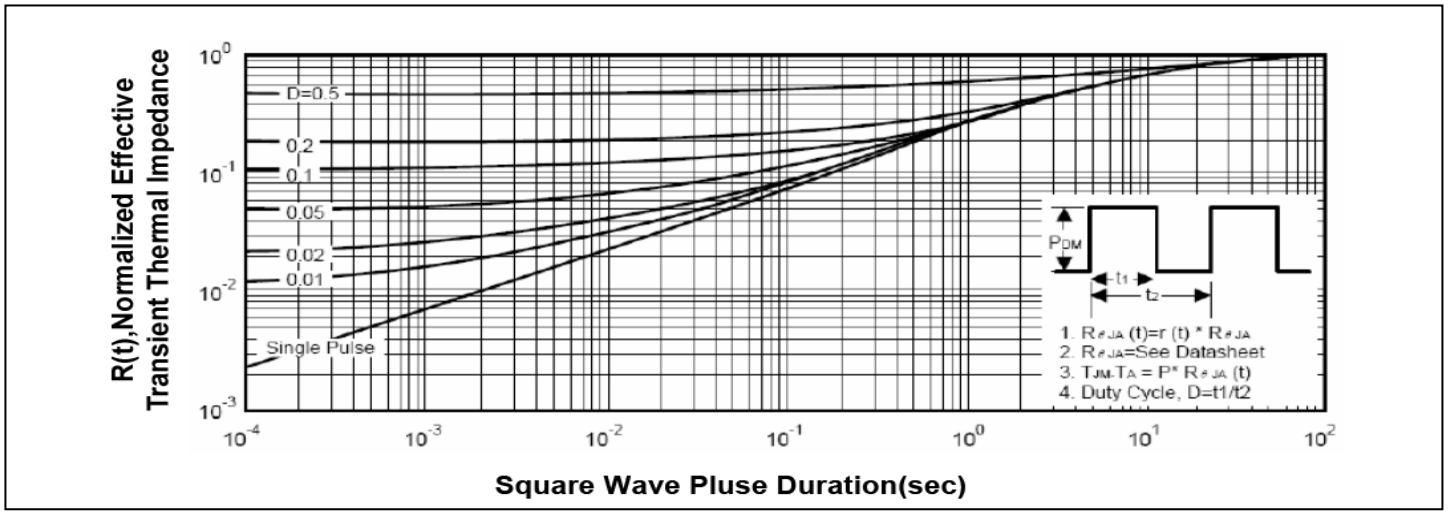
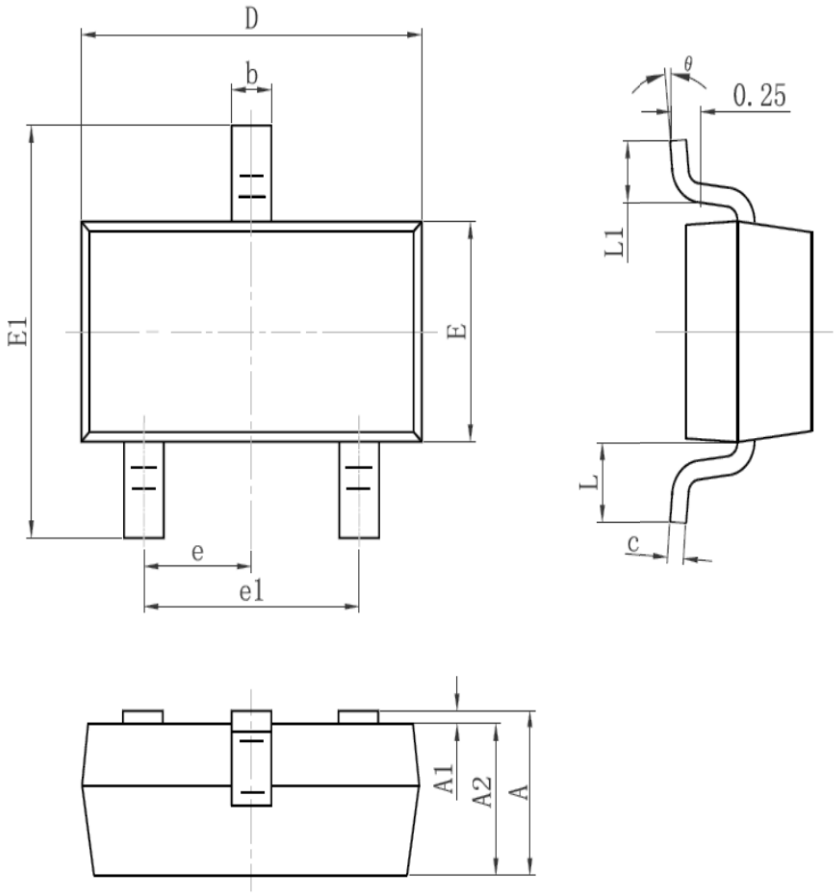


Figure 7. Maximum Effective Transient Thermal Impedance Junction-to-Case

Mechanical Data

SOT-23 PACKAGE OUTLINE DIMENSION



Symbol	Dimension In Millimeters		Dimension In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.95TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.55REF		0.022REF	
L1	0.300	0.500	0.012	0.020
θ	0^0	8^0	0^0	8^0

Ordering and Marking Information

Device Marking: 2301

Package (Available)
SOT-23
Operating Temperature Range
C : -55 to 150 ºC

Devices per Unit

Package Type	Units/ Tape	Tapes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
SOT-23	3000	10	30000	4	120000

Reliability Test Program

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	T_J=125°C to 150°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°C@ 100% of Max V_{GSS}	168 hours 500 hours 1000 hours	3 lots x 77 devices