

## DESCRIPTION

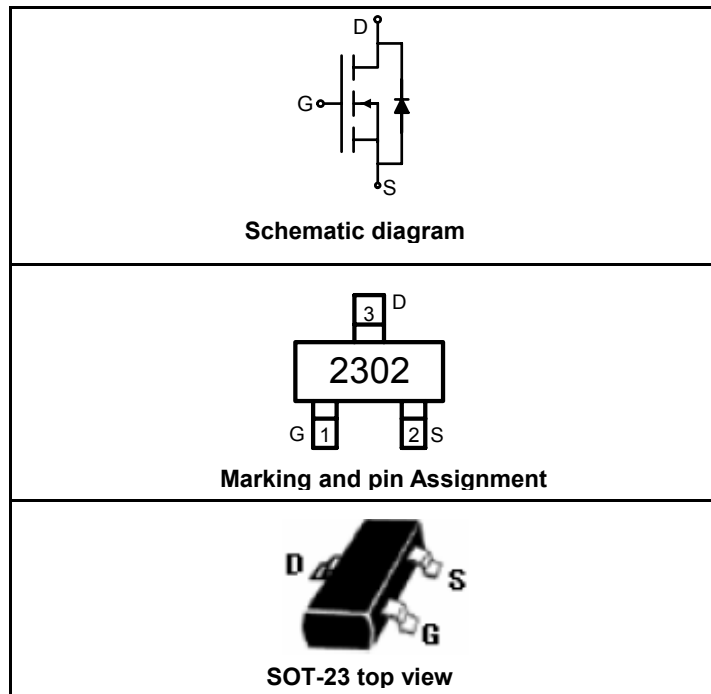
The SSF2302 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

## GENERAL FEATURES

- $V_{DS} = 20V, I_D = 2.4A$   
 $R_{DS(ON)} < 115m\Omega @ V_{GS}=2.5V$   
 $R_{DS(ON)} < 60m\Omega @ V_{GS}=4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

## Application

- Battery protection
- Load switch
- Power management



## PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
2302	SSF2302	SOT-23	Ø180mm	8 mm	3000 units

## ABSOLUTE MAXIMUM RATINGS(TA=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	±8	V
Drain Current-Continuous@ Current-Pulsed (Note 1)	$I_D (25^\circ C)$	2.4	A
	$I_D (70^\circ C)$	1.7	A
	$I_{DM}$	10	A
Maximum Power Dissipation	$P_D$	0.9	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

## THERMAL CHARACTERISTICS

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	140	°C/W
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## ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=20V, V_{GS}=0V$			1	µA
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 8V, V_{DS}=0V$			±100	nA
<b>ON CHARACTERISTICS (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.65	0.95	1.2	V

Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=2.5V, I_D=3.1A$	70	115	m $\Omega$
		$V_{GS}=4.5V, I_D=3.6A$	45	60	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=3.6A$	8		S
<b>DYNAMIC CHARACTERISTICS (Note4)</b>					
Input Capacitance	$C_{ISS}$	$V_{DS}=10V, V_{GS}=0V,$ $F=1.0MHz$	300		PF
Output Capacitance	$C_{OSS}$		120		PF
Reverse Transfer Capacitance	$C_{RSS}$		80		PF
<b>SWITCHING CHARACTERISTICS (Note 4)</b>					
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=10V, R_L = 2.8 \Omega$ $V_{GS}=4.5V, R_{GEN}=6\Omega,$ $I_D=3.6A,$	7	15	nS
Turn-on Rise Time	$t_r$		55	80	nS
Turn-Off Delay Time	$t_{d(off)}$		16	60	nS
Turn-Off Fall Time	$t_f$		10	25	nS
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=3.6A, V_{GS}=4.5V$	4.0	10	nC
Gate-Source Charge	$Q_{gs}$		0.65		nC
Gate-Drain Charge	$Q_{gd}$		1.5		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>					
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=0.94A$	0.76	1.2	V
Diode Forward Current (Note 2)	$I_S$		0.94		A

## NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on 1in<sup>2</sup> FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production testing.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

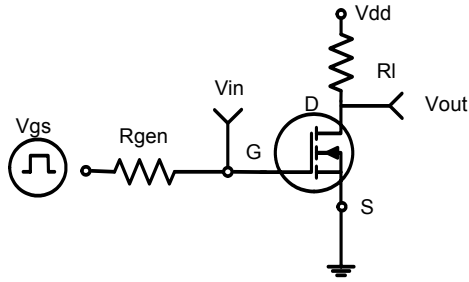


Figure 1: Switching Test Circuit

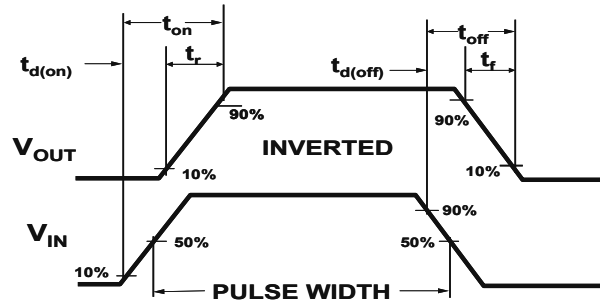


Figure 2: Switching Waveforms

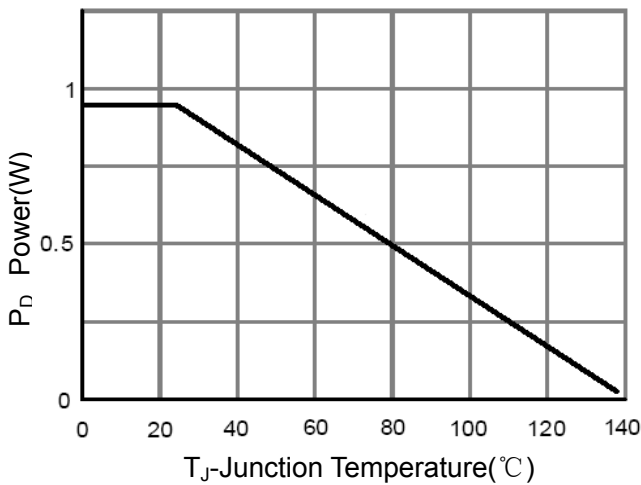


Figure 3 Power Dissipation

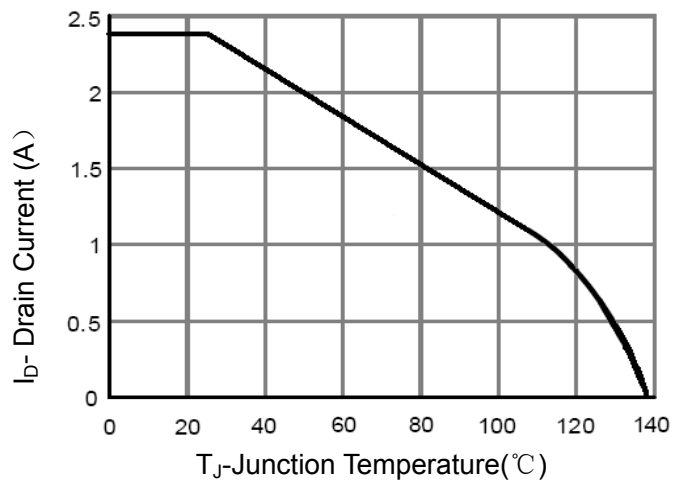


Figure 4 Drain Current

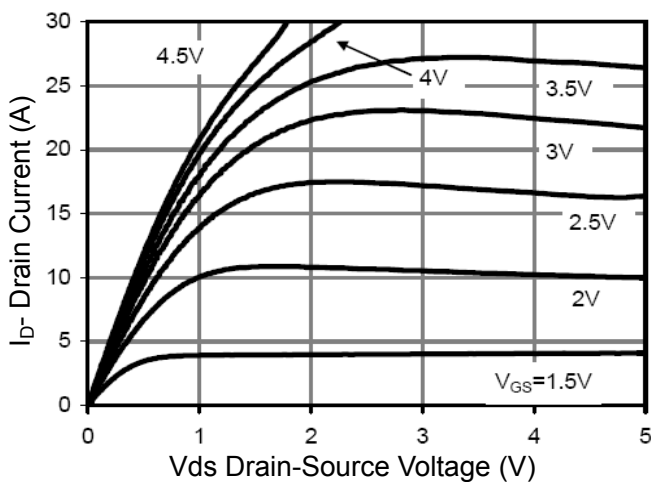


Figure 5 Output CHARACTERISTICS

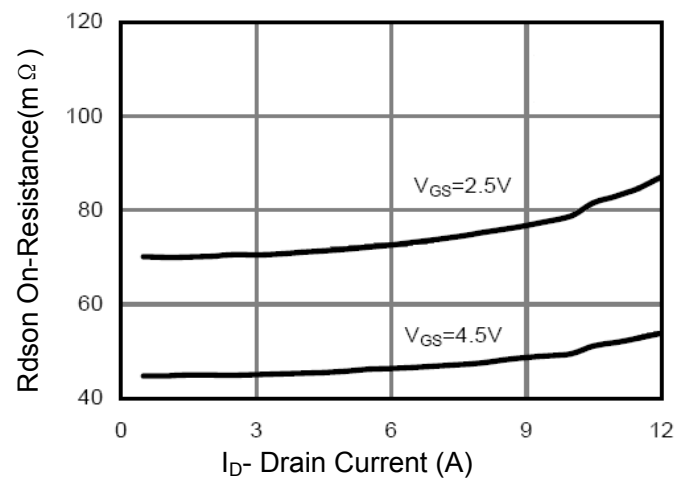
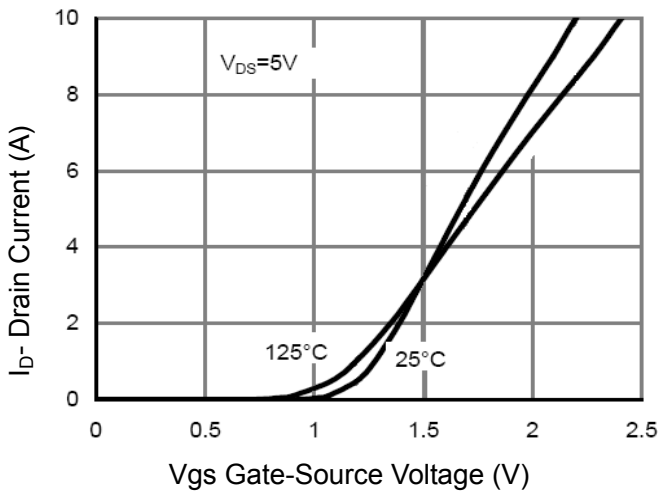
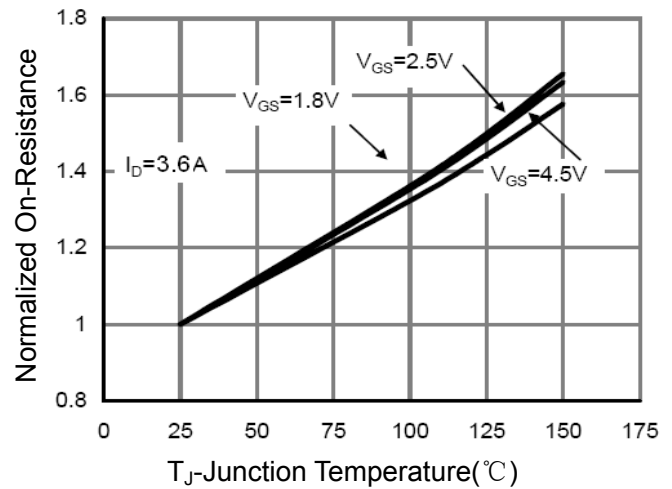


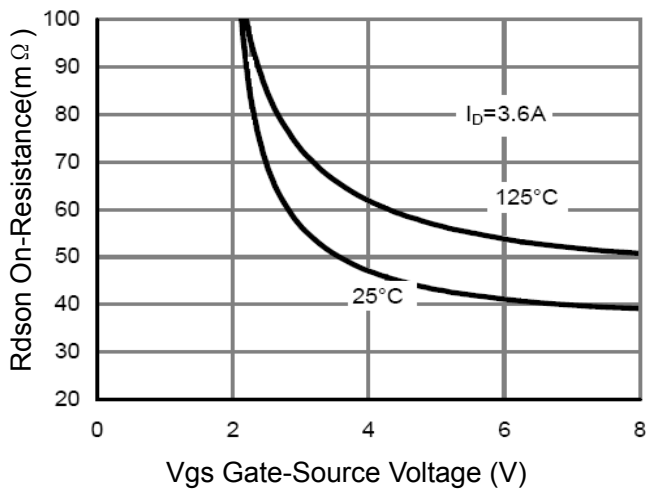
Figure 6 Drain-Source On-Resistance



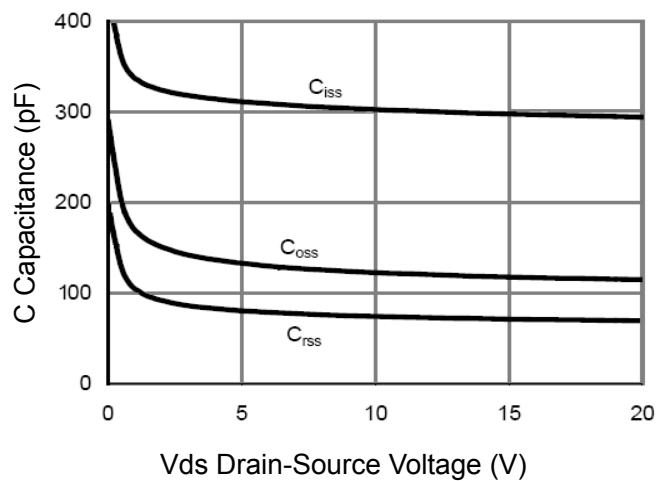
**Figure 7 Transfer Characteristics**



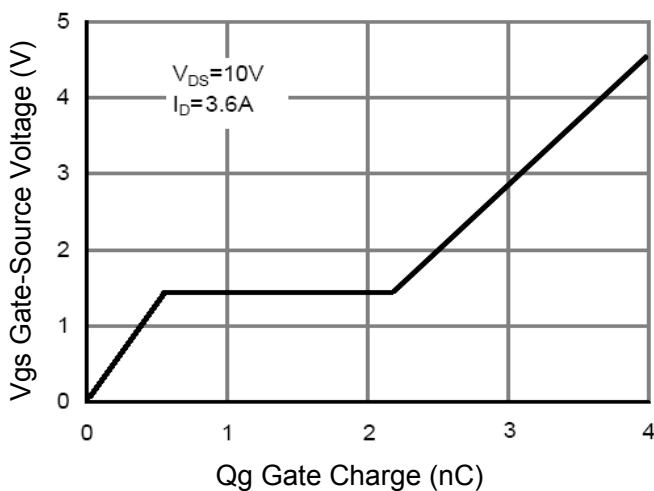
**Figure 8 Drain-Source On-Resistance**



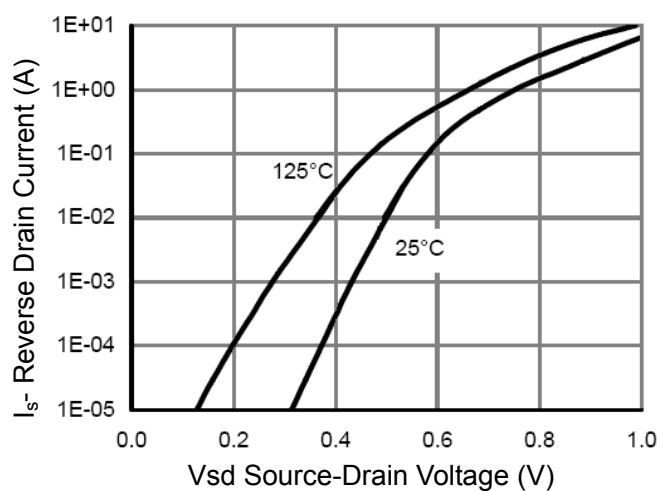
**Figure 9 Rdson vs Vgs**



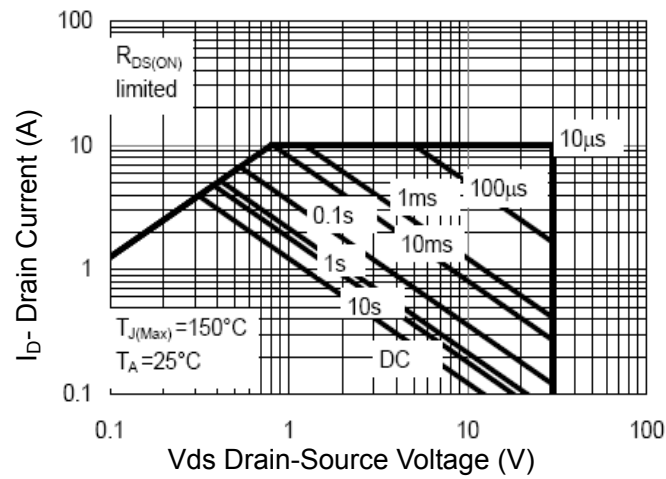
**Figure 10 Capacitance vs Vds**



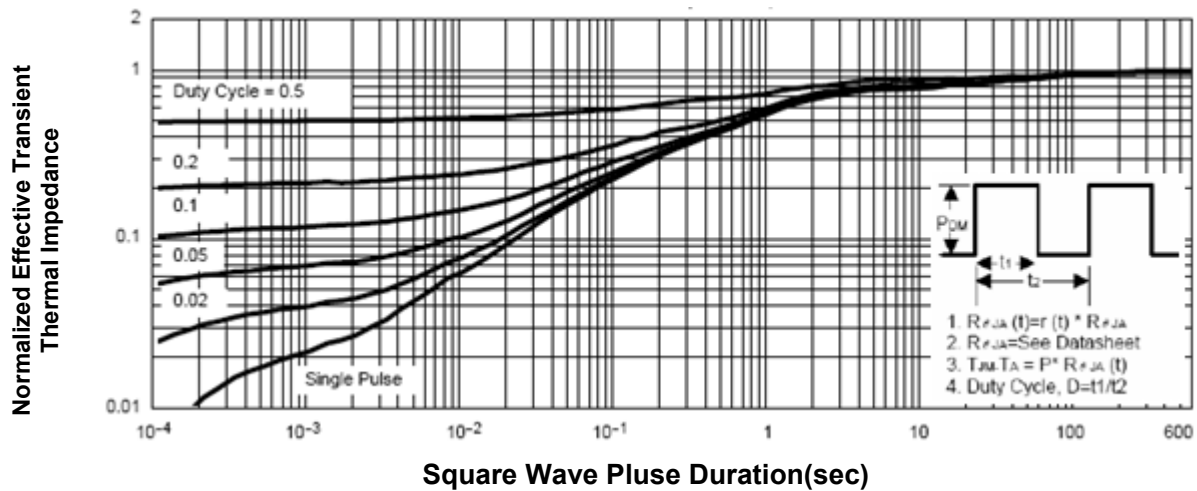
**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**



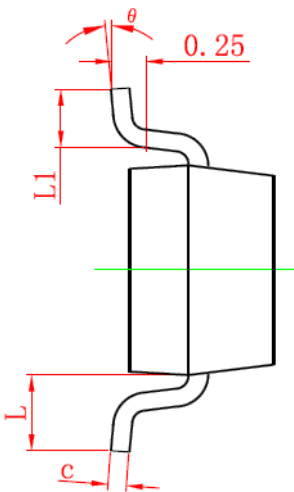
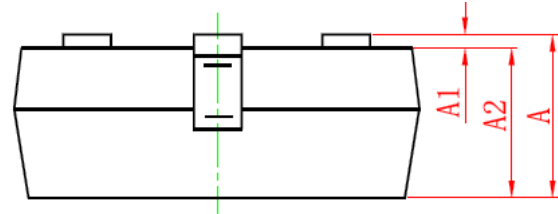
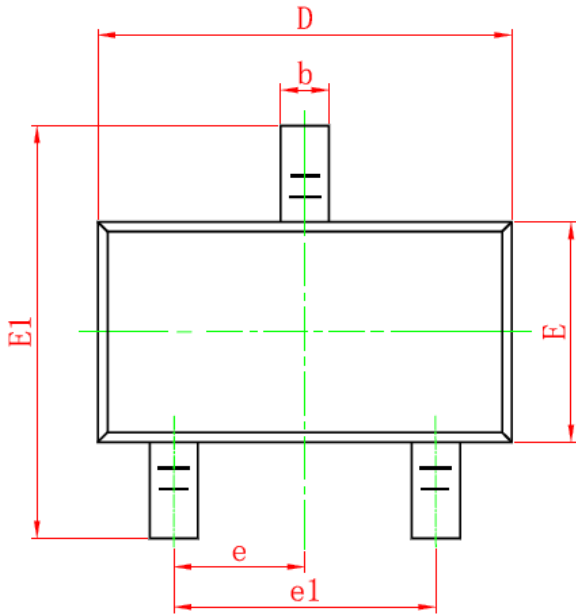
**Figure 13 Safe Operation Area**



**Figure 14 Normalized Maximum Transient Thermal Impedance**

## SOT-23 PACKAGE INFORMATION

Dimensions in Millimeters (UNIT:mm)



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
$\theta$	0°	8°

### NOTES

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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