



## Description

The SI2312A 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

$V_{DS} = 20V$   $I_D = 6A$

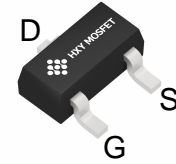
$R_{DS(ON)} < 27m\Omega @ V_{GS}=4.5V$

## Application

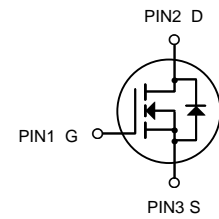
Battery protection

Load switch

Uninterruptible power supply



SOT-23



N-Channel MOSFET

## Ordering Information

Product ID	Pack	Marking	Qty(PCS)
SI2312A	SOT-23	AE9T	3000

## Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Limit	Unit	
$V_{DS}$	Drain-Source Voltage	20	V	
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V	
$I_D$	Continuous Drain Current	$T_A = 25^\circ C$	6	A
		$T_A = 70^\circ C$	3.6	
$I_{DM}$	Drain Current-Pulsed (Note 1)	15	A	
$P_D$	Maximum Power Dissipation	1.25	W	
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 150	$^\circ C$	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2)	100	$^\circ C/W$	



**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	20	22.5	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	-	-	±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.5	0.65	1.0	V
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =4.0 A	-	22	27	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =4.5A	-	28	40	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =4A	-	10	-	S
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =8V, V <sub>GS</sub> =0V, F=1.0MHz	-	500	-	PF
Output Capacitance	C <sub>oss</sub>		-	295	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	96	-	PF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =10V, I <sub>D</sub> =1A V <sub>GS</sub> =4.5V, R <sub>GEN</sub> =6Ω	-	11	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	30	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	35	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	10	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =3A, V <sub>GS</sub> =4.5V	-	10	15	nC
Gate-Source Charge	Q <sub>gs</sub>		-	2.3	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	2.9	-	nC
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A	-	-	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	4.5	A

**Notes:**

1. Repetitive rating: pulse width limited by maximum junction temperature.
2. Surface mounted on FR4 Board, t ≤ 10 sec.
3. Pulse test: pulse width ≤ 300μs, duty cycle ≤ 2%.
4. Guaranteed by design, not subject to production



### Typical Electrical and Thermal Characteristics

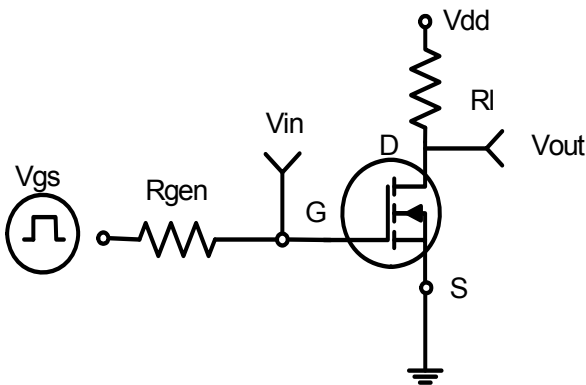


Figure 1: Switching Test Circuit

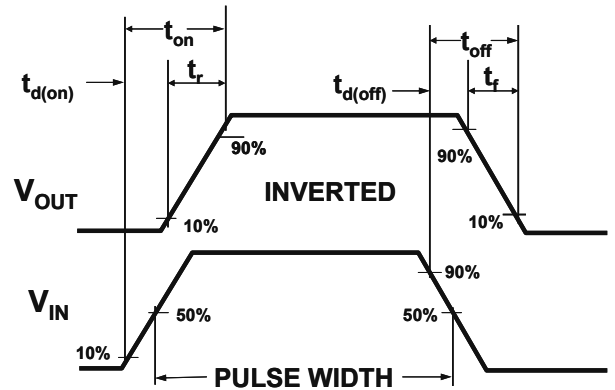


Figure 2: Switching Waveforms

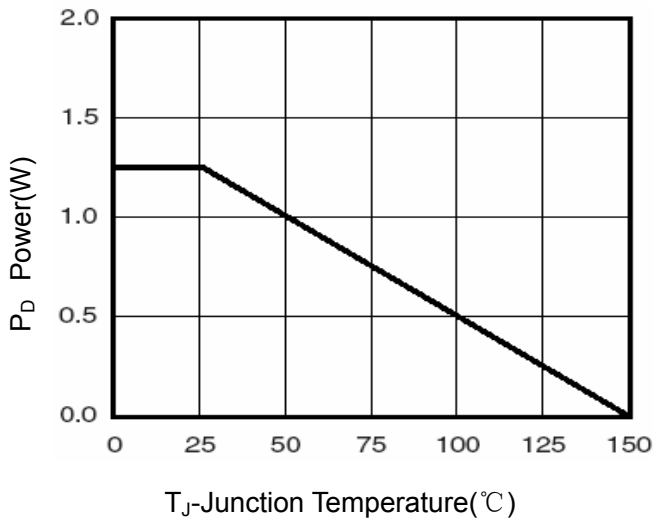


Figure 3 Power Dissipation

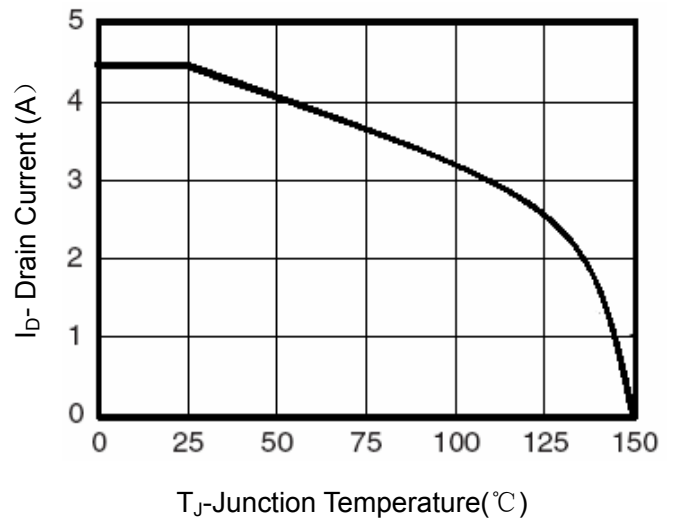


Figure 4 Drain Current

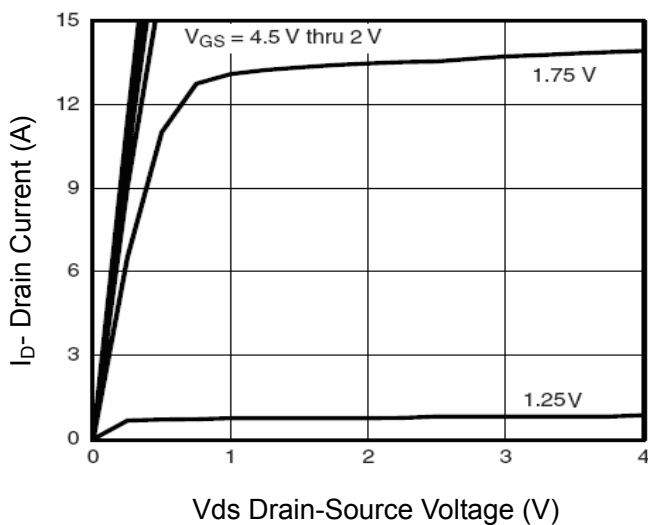


Figure 5 Output Characteristics

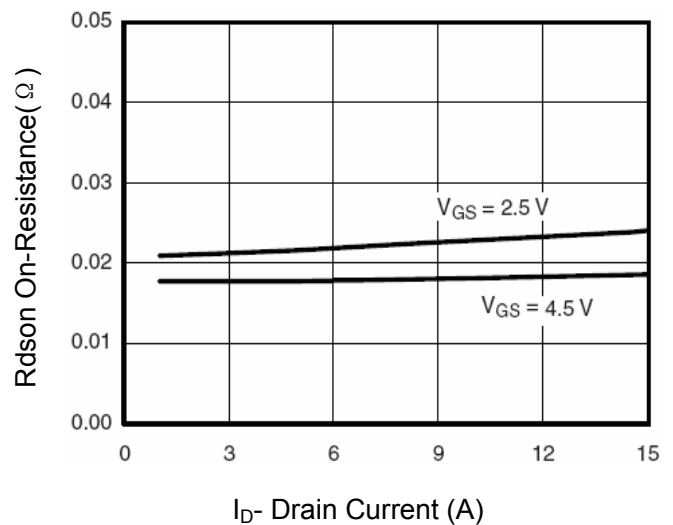


Figure 6 Drain-Source On-Resistance

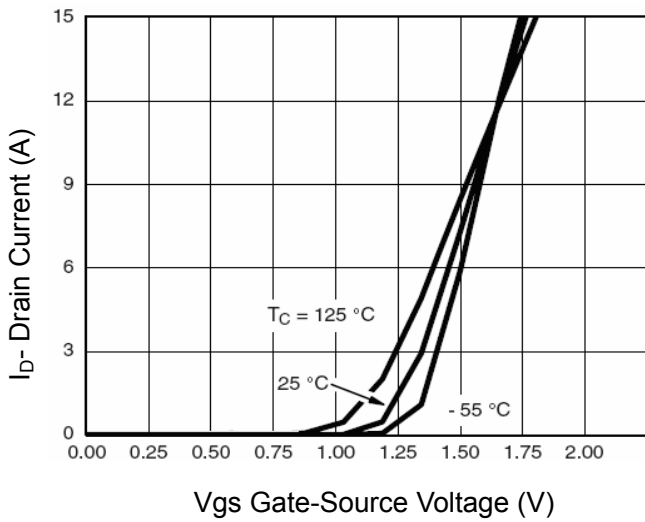


Figure 7 Transfer Characteristics

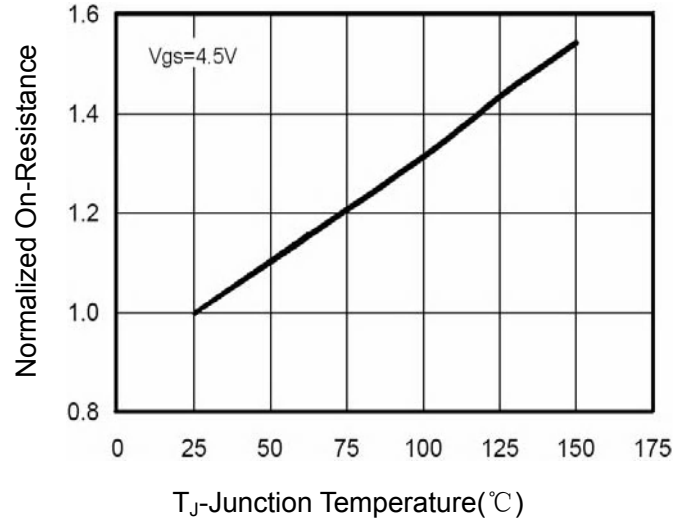


Figure 8 Drain-Source On-Resistance

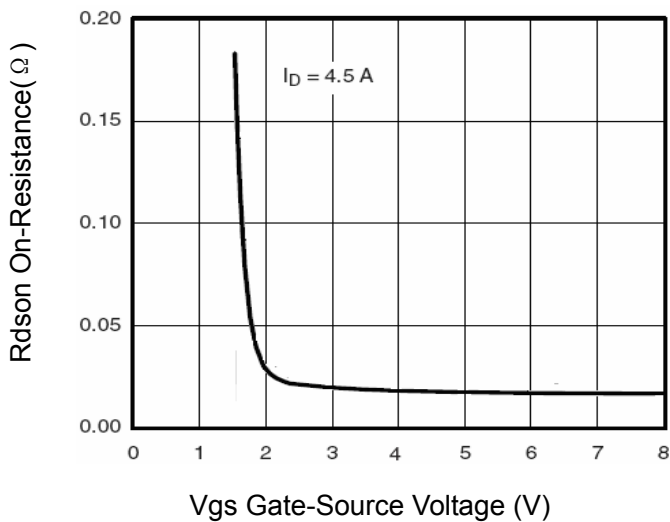


Figure 9  $R_{dson}$  vs.  $V_{gs}$

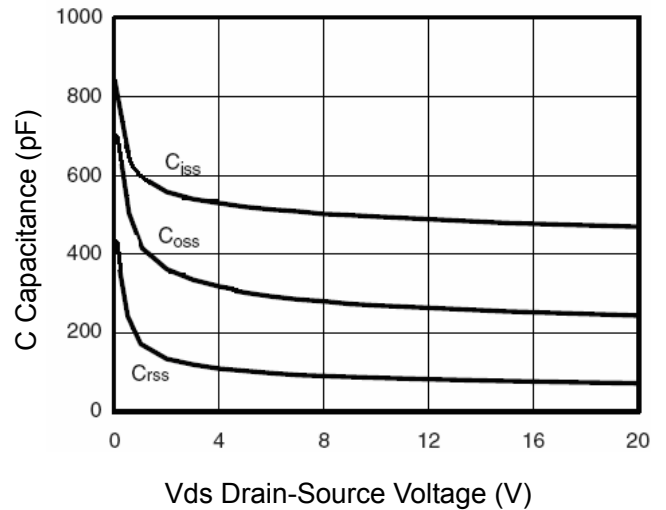


Figure 10 Capacitance vs  $V_{ds}$

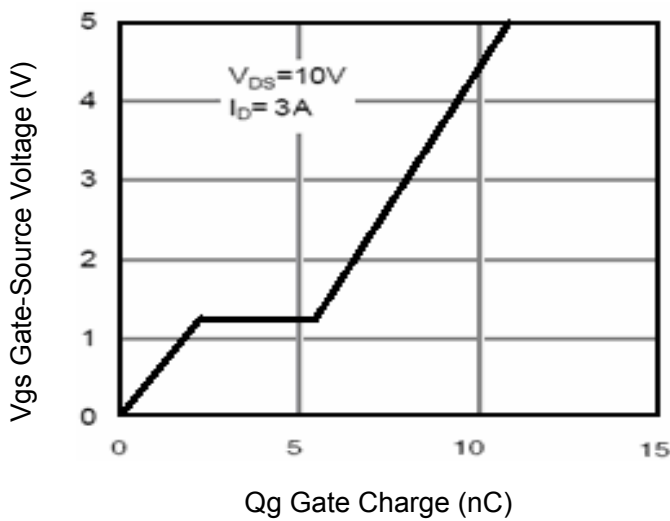


Figure 11 Gate Charge

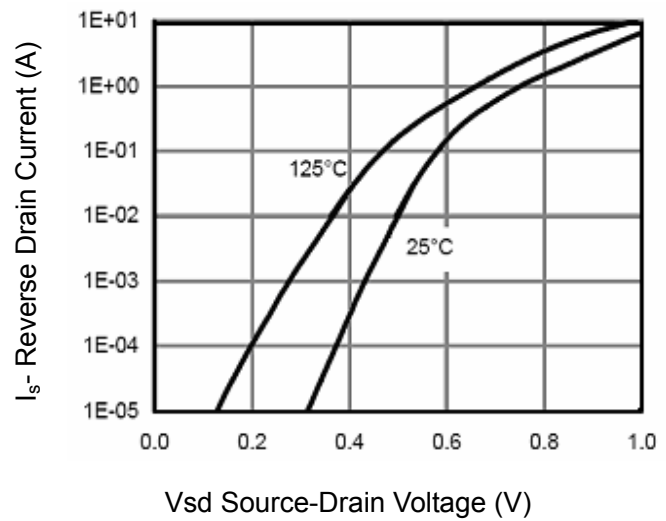


Figure 12 Source- Drain Diode Forward

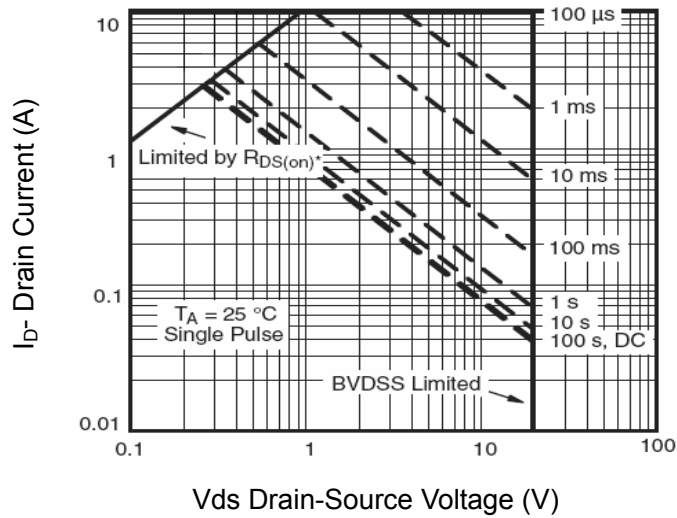


Figure 13 Safe Operation Area

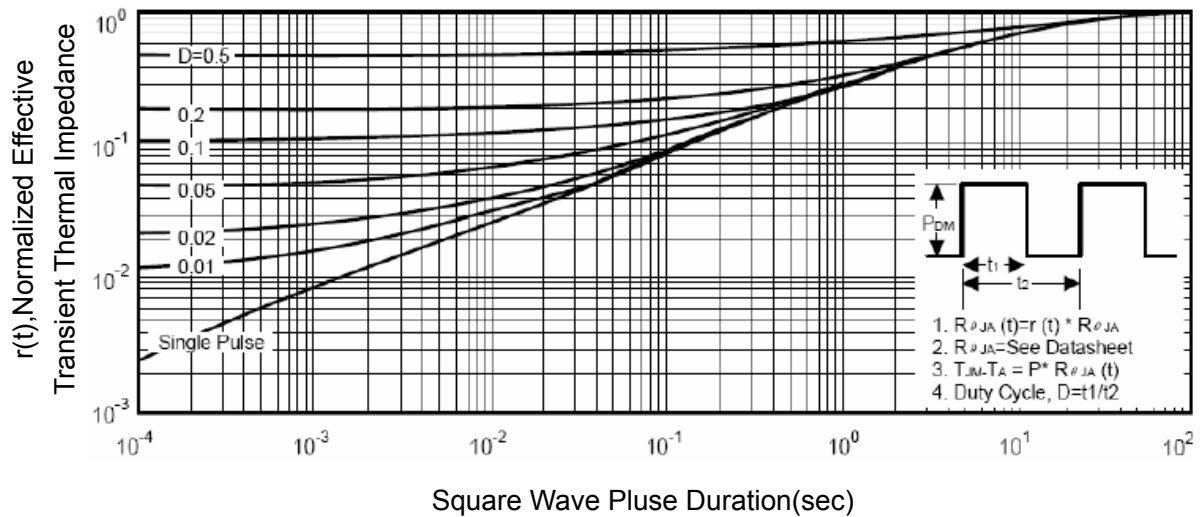
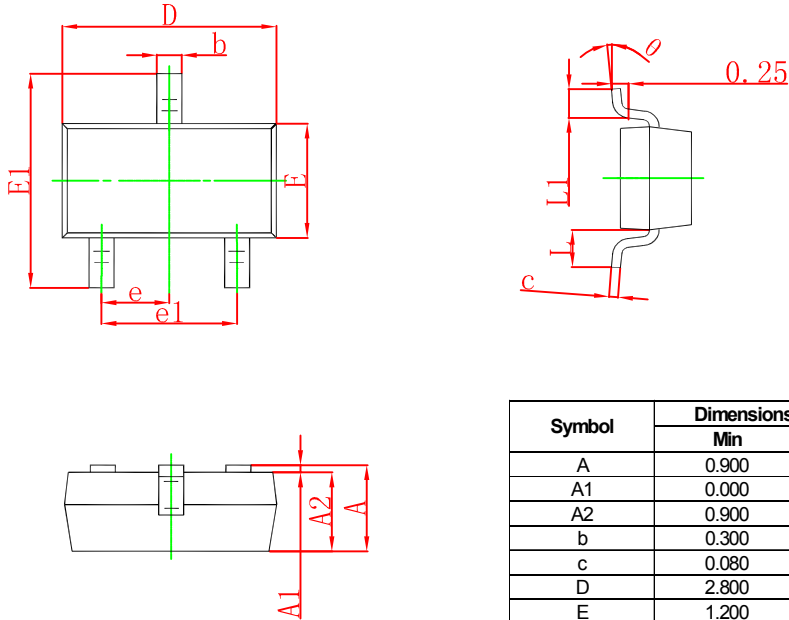


Figure 14 Normalized Maximum Transient Thermal Impedance

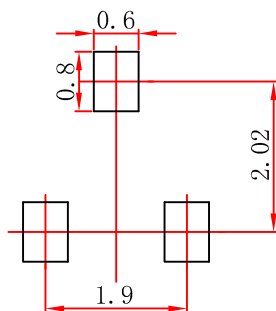


### SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions 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	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

### SOT-23 Suggested Pad Layout



- Note:
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.05\text{mm}$ .
  3. The pad layout is for reference purposes only.



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