



## Description

The Si2302DS 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.

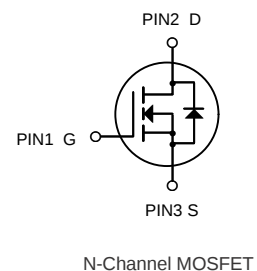
## General Features

$V_{DS} = 20V$   $I_D = 2.3A$

$R_{DS(ON)} < 60m\Omega @ V_{GS}=4.5V$

## Application

Battery protection  
Load switch  
Uninterruptible power supply



## Ordering Information

| Product ID | Pack   | Brand      | Qty(PCS) |
|------------|--------|------------|----------|
| Si2302DS   | SOT-23 | HXY MOSFET | 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             |
| $I_D$           | Drain Current-Continuous                         | 2.3        | A             |
| $I_{DM}$        | Drain Current-Pulsed (Note 1)                    | 16         | A             |
| $P_D$           | Maximum Power Dissipation                        | 0.9        | 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) | 139        | $^{\circ}C/W$ |



**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Parameter                                 | Symbol       | Condition                                                     | Min | Typ  | Max       | Unit       |
|-------------------------------------------|--------------|---------------------------------------------------------------|-----|------|-----------|------------|
| Drain-Source Breakdown Voltage            | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                                     | 20  | 22   | -         | V          |
| Zero Gate Voltage Drain Current           | $I_{DSS}$    | $V_{DS}=20V, V_{GS}=0V$                                       | -   | -    | 1         | $\mu A$    |
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 12V, V_{DS}=0V$                                   | -   | -    | $\pm 100$ | nA         |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                                 | 0.5 | 0.75 | 1.2       | V          |
| Drain-Source On-State Resistance          | $R_{DS(on)}$ | $V_{GS}=2.5V, I_D=2.0A$                                       | -   | 54   | 72        | m $\Omega$ |
|                                           |              | $V_{GS}=4.5V, I_D=2.3A$                                       | -   | 48   | 60        | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=5V, I_D=2.3A$                                         | -   | 8    | -         | S          |
| Input Capacitance                         | $C_{iss}$    | $V_{DS}=10V, V_{GS}=0V,$<br>$F=1.0MHz$                        | -   | 260  | -         | PF         |
| Output Capacitance                        | $C_{oss}$    |                                                               | -   | 48   | -         | PF         |
| Reverse Transfer Capacitance              | $C_{rss}$    |                                                               | -   | 27   | -         | PF         |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=10V, R_L=3.3\Omega$<br>$V_{GS}=4.5V, R_{GEN}=6\Omega$ | -   | 2.5  | -         | nS         |
| Turn-on Rise Time                         | $t_r$        |                                                               | -   | 3.2  | -         | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |                                                               | -   | 21   | -         | nS         |
| Turn-Off Fall Time                        | $t_f$        |                                                               | -   | 3    | -         | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=10V, I_D=2.3A,$<br>$V_{GS}=4.5V$                      | -   | 2.9  | 5         | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |                                                               | -   | 0.4  | -         | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |                                                               | -   | 0.6  | -         | nC         |
| Diode Forward Voltage <sup>(Note 3)</sup> | $V_{SD}$     | $V_{GS}=0V, I_S=2.3A$                                         | -   | 0.75 | 1.2       | V          |
| Diode Forward Current <sup>(Note 2)</sup> | $I_S$        |                                                               | -   | -    | 3.3       | A          |

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on 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



## Typical Electrical and Thermal Characteristics

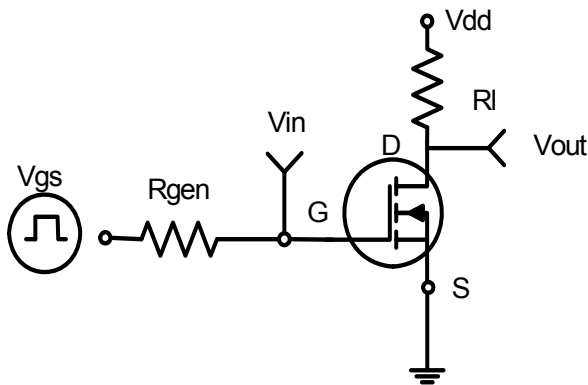


Figure 1: Switching Test Circuit

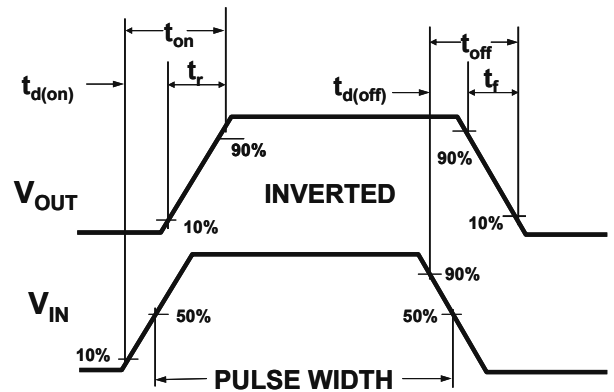


Figure 2: Switching Waveforms

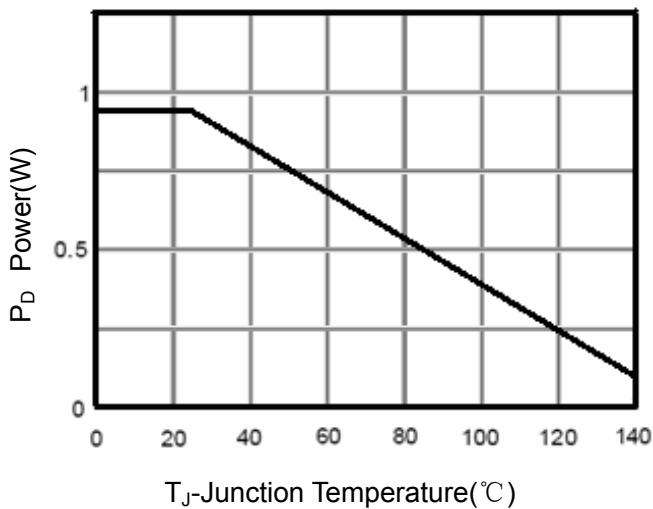


Figure 3 Power Dissipation

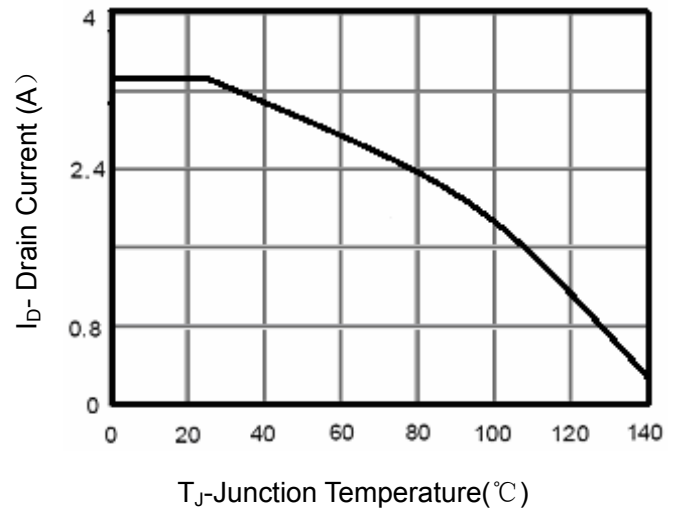


Figure 4 Drain Current

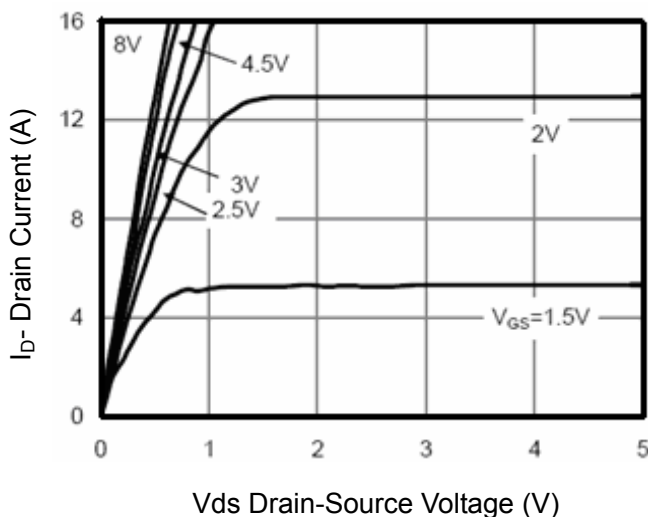


Figure 5 Output Characteristics

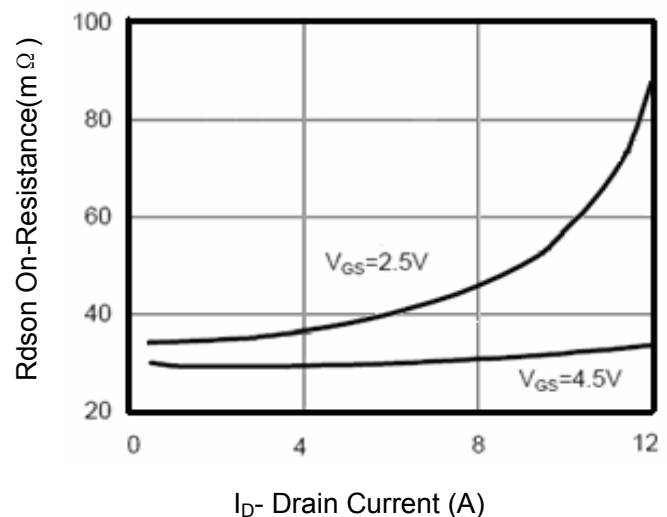


Figure 6 Drain-Source On-Resistance

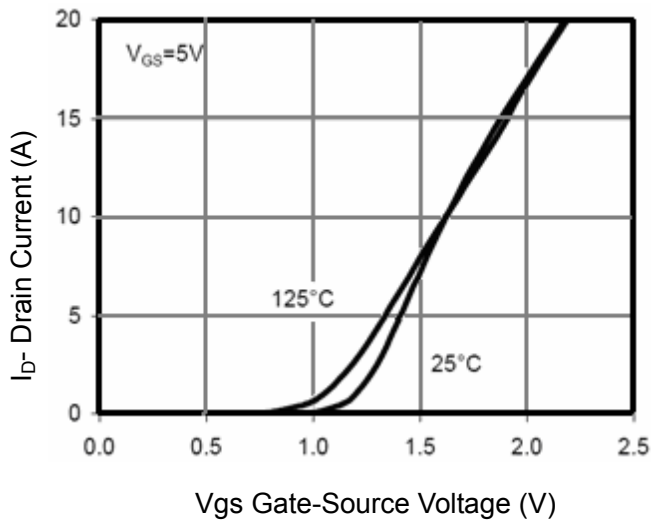


Figure 7 Transfer Characteristics

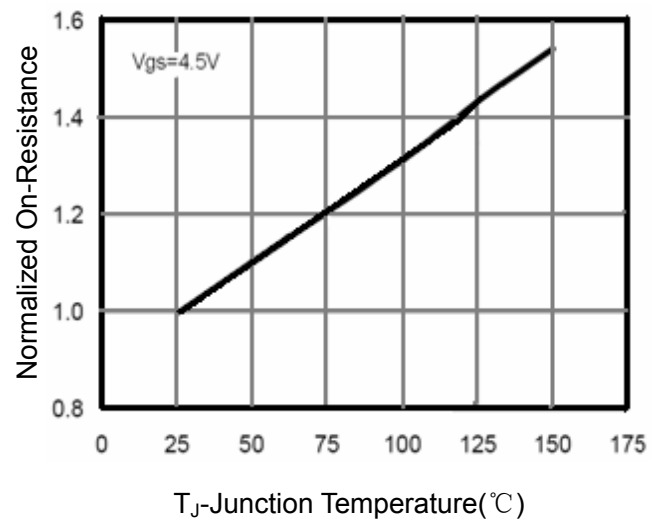


Figure 8 Drain-Source On-Resistance

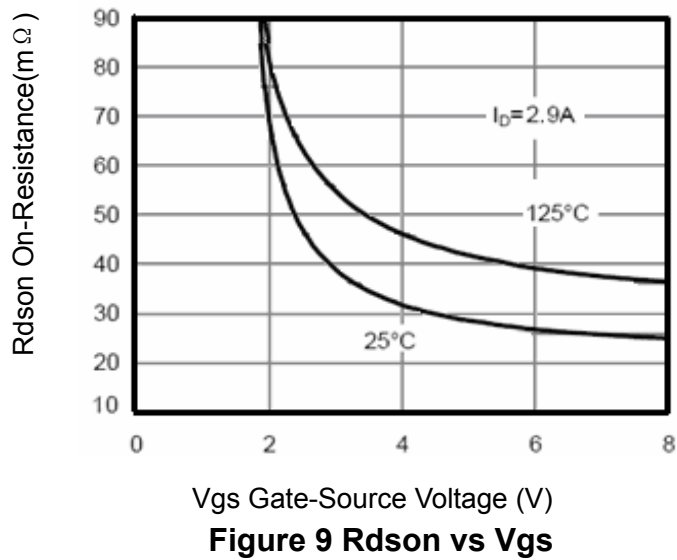


Figure 9  $R_{DS(on)}$  vs  $V_{GS}$

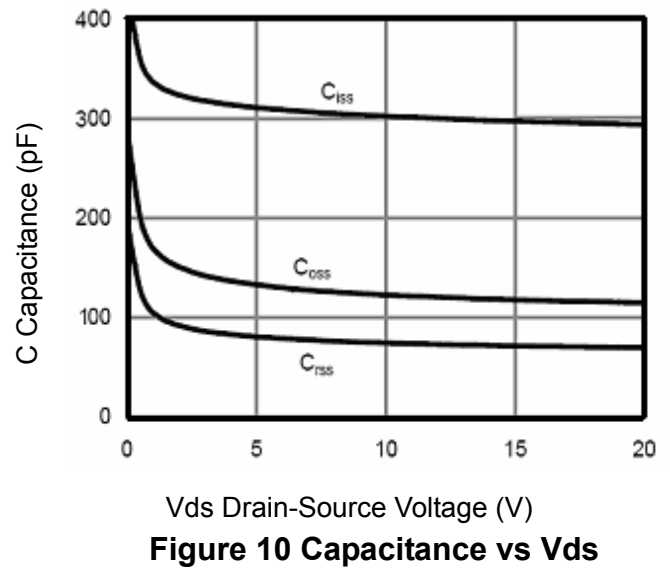


Figure 10 Capacitance vs  $V_{DS}$

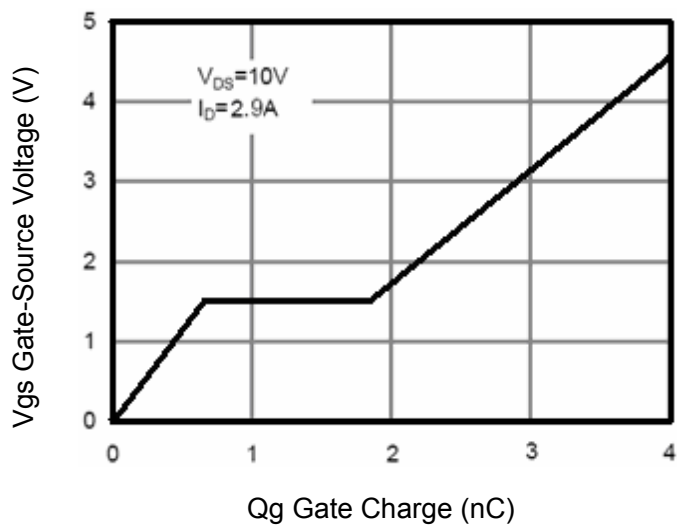


Figure 11 Gate Charge

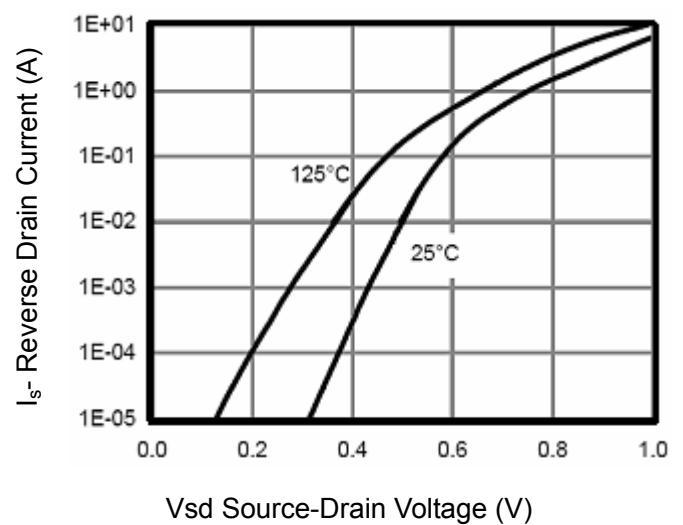
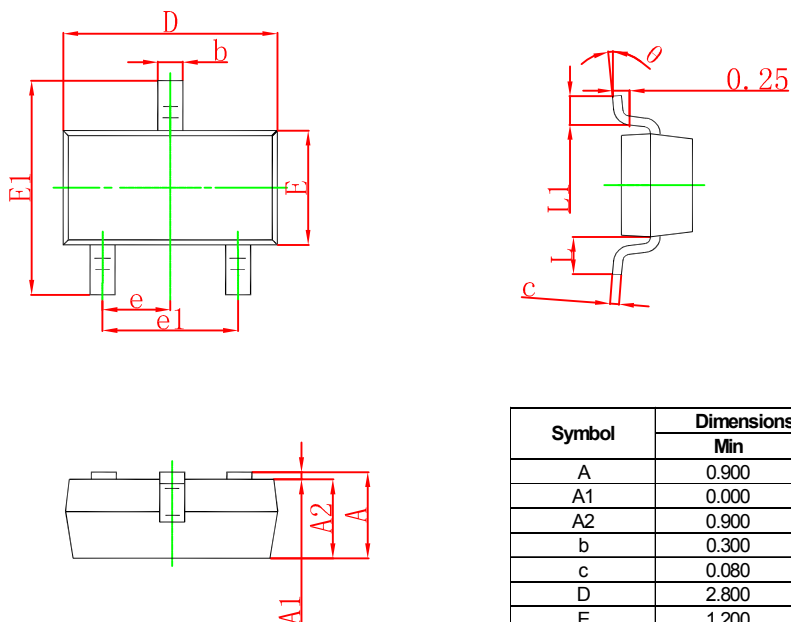


Figure 12 Source- Drain Diode Forward



## 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:  $\pm 0.05$  mm.  
3. The pad layout is for reference purposes only.



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