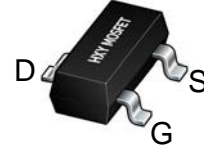




## Description

The Si2301ADS uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.



**SOT-23**

## General Features

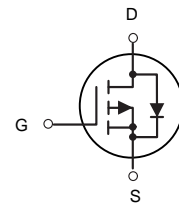
$V_{DS} = -20V, I_D = -2.3A$

$R_{DS(ON)} < 140m\Omega @ V_{GS} = -4.5V$

$R_{DS(ON)} < 170m\Omega @ V_{GS} = -2.5V$

## Application

PWM applications  
Load switch



P-Channel MOSFET

## Package Marking and Ordering Information

| Product ID | Pack   | Brand      | Qty(PCS) |
|------------|--------|------------|----------|
| Si2301ADS  | SOT-23 | HXY MOSFET | 3000     |

## Absolute Maximum Ratings (TA=25°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)                    | -9         | A    |
| $P_D$           | Maximum Power Dissipation                        | 0.65       | W    |
| $T_J, T_{STG}$  | Operating Junction and Storage Temperature Range | -55 To 150 | °C   |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 2) | 178        | °C/W |



**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  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        | $\mu A$    |
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 12V, V_{DS}=0V$                                   | -    | -    | $\pm 100$ | nA         |
| <b>On Characteristics (Note 3)</b>        |              |   |      |      |           |            |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$                                | -0.4 | -0.7 | -1        | V          |
| Drain-Source On-State Resistance          | $R_{DS(on)}$ | $V_{GS}=-4.5V, I_D=-2A$                                       |      | 130  | 140       | m $\Omega$ |
|   |              | $V_{GS}=-2.5V, I_D=-1.8A$                                     |      | 152  | 170       | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=-5V, I_D=-2A$   | 4    | -    | -         | S          |
| <b>Dynamic Characteristics (Note4)</b>    |              |   |      |      |           |            |
| Input Capacitance                         | $C_{iss}$    | $V_{DS}=-10V, V_{GS}=0V,$<br>$F=1.0\text{MHz}$                | -    | 285  | -         | PF         |
| Output Capacitance                        | $C_{oss}$    |   | -    | 58   | -         | PF         |
| Reverse Transfer Capacitance              | $C_{rss}$    |   | -    | 32   | -         | PF         |
| <b>Switching Characteristics (Note 4)</b> |              |   |      |      |           |            |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=-10V, R_L=5\Omega$<br>$V_{GS}=-4.5V, R_{GEN}=3\Omega$ | -    | 9.8  | -         | nS         |
| Turn-on Rise Time                         | $t_r$        |   | -    | 4.9  | -         | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |   | -    | 20.5 | -         | nS         |
| Turn-Off Fall Time                        | $t_f$        |   | -    | 7    | -         | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=-10V, I_D=-2A,$<br>$V_{GS}=-4.5V$                     | -    | 2.9  | -         | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |   | -    | 0.45 | -         | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |   | -    | 0.75 | -         | nC         |
| <b>Drain-Source Diode Characteristics</b> |              |   |      |      |           |            |
| Diode Forward Voltage (Note 3)            | $V_{SD}$     | $V_{GS}=0V, I_S=-2A$  | -    | -    | -1.2      | V          |
| Diode Forward Current (Note 2)            | $I_S$        |   | -    | -    | -2.0      | 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

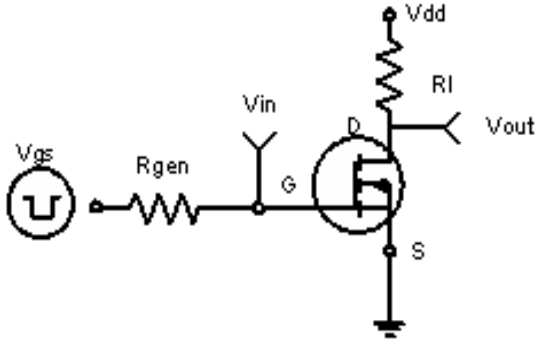


Figure 1: Switching Test Circuit

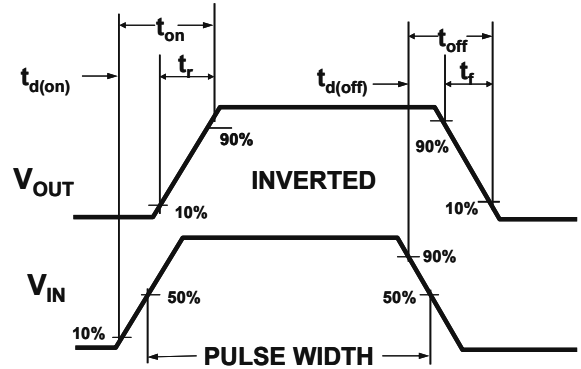
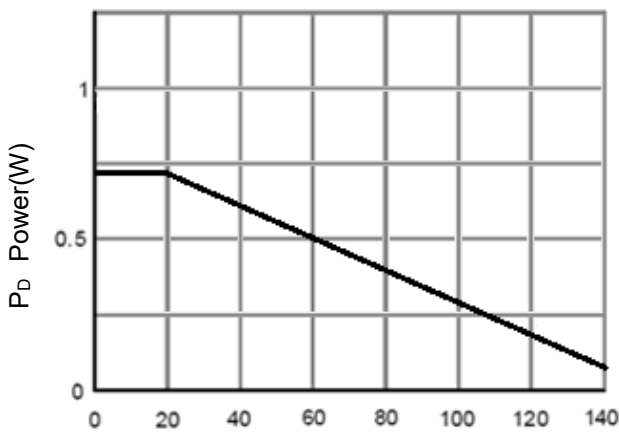
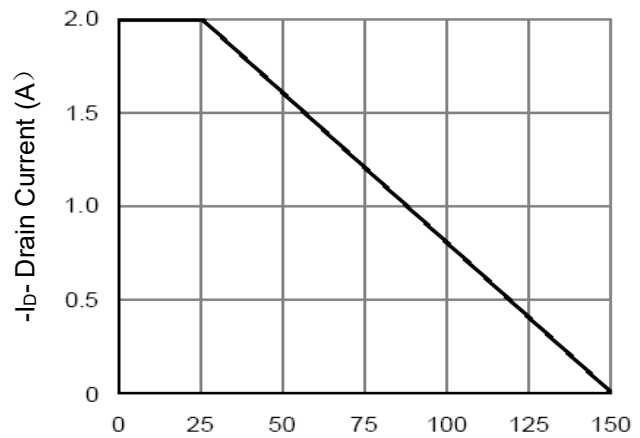


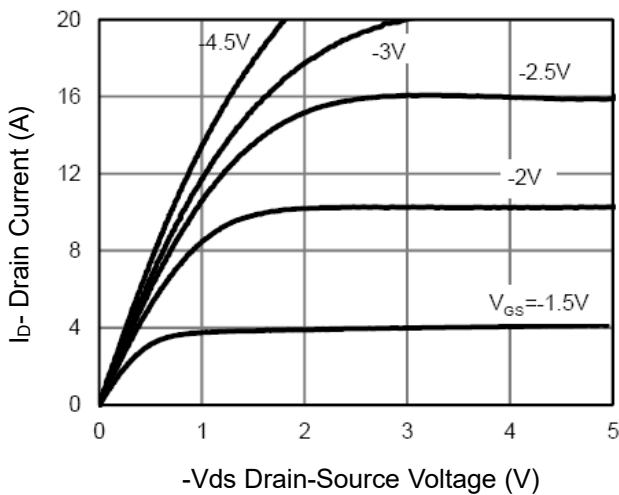
Figure 2: Switching Waveforms



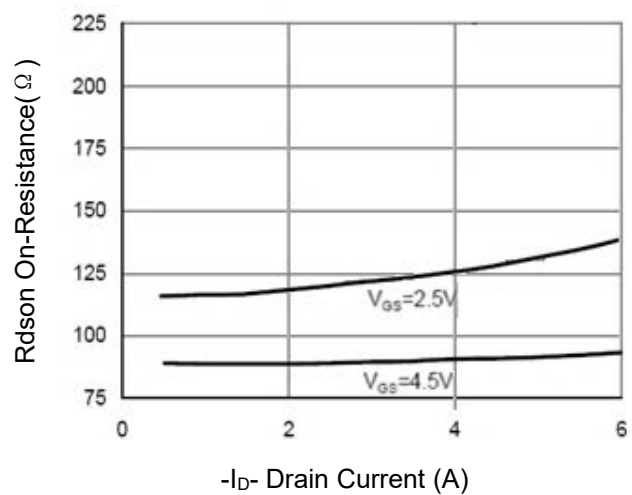
T<sub>J</sub>-Junction Temperature(°C)  
Figure 3 Power Dissipation



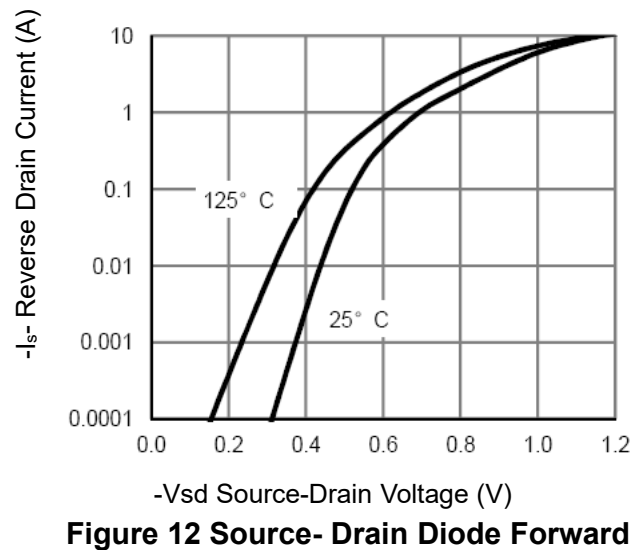
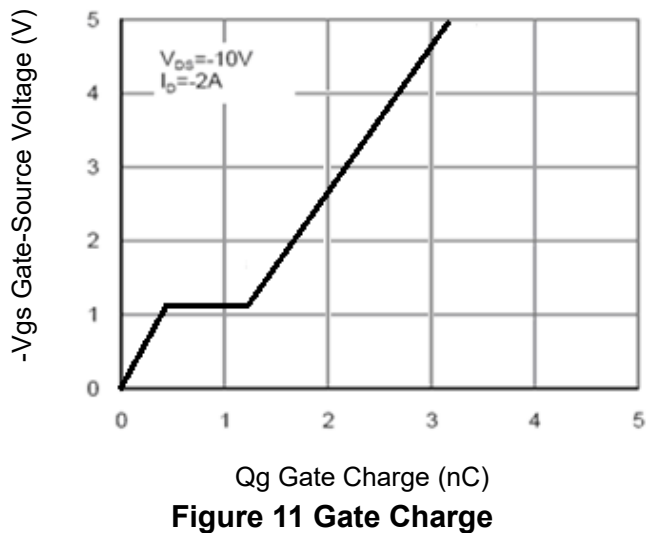
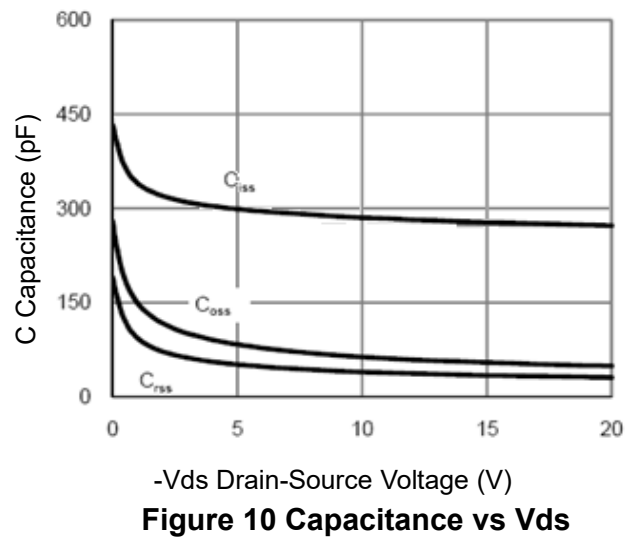
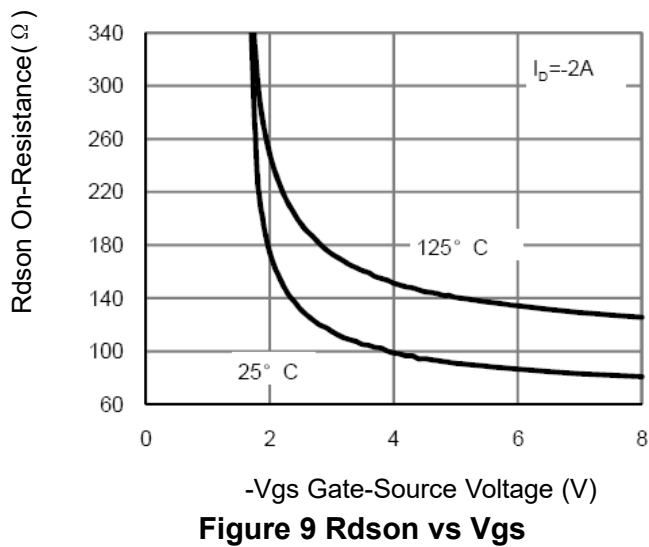
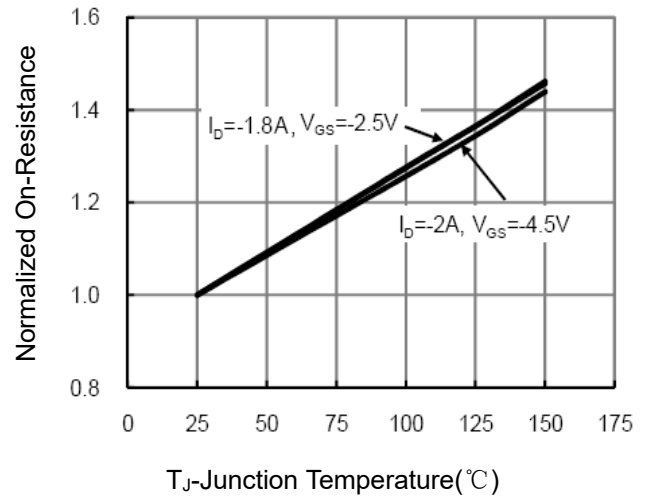
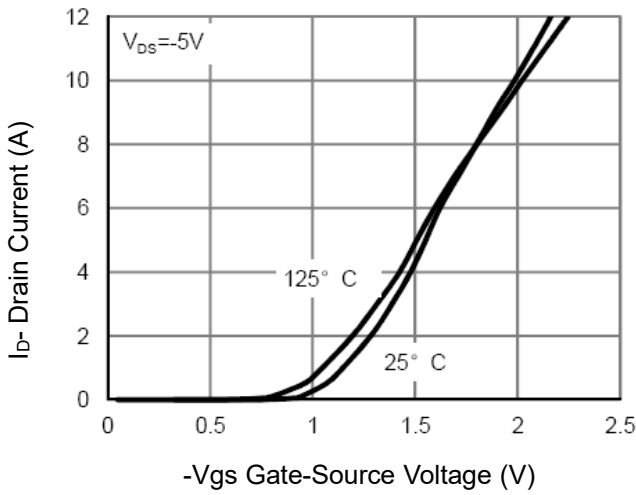
T<sub>J</sub>-Junction Temperature(°C)  
Figure 4 Drain Current



-V<sub>ds</sub> Drain-Source Voltage (V)  
Figure 5 Output Characteristics



-I<sub>D</sub>- Drain Current (A)  
Figure 6 Drain-Source On-Resistance



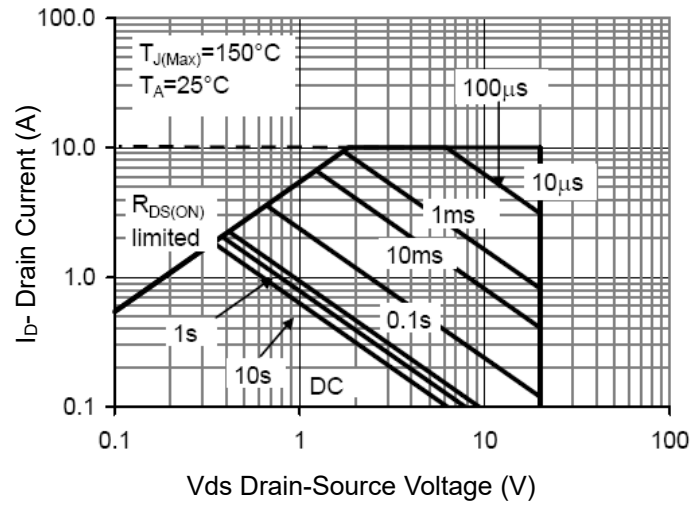


Figure 13 Safe Operation Area

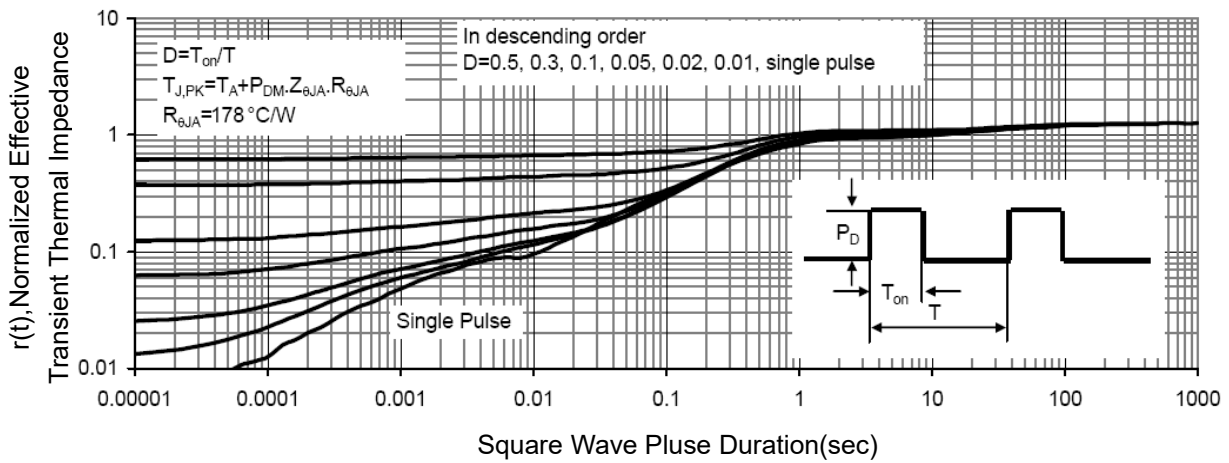
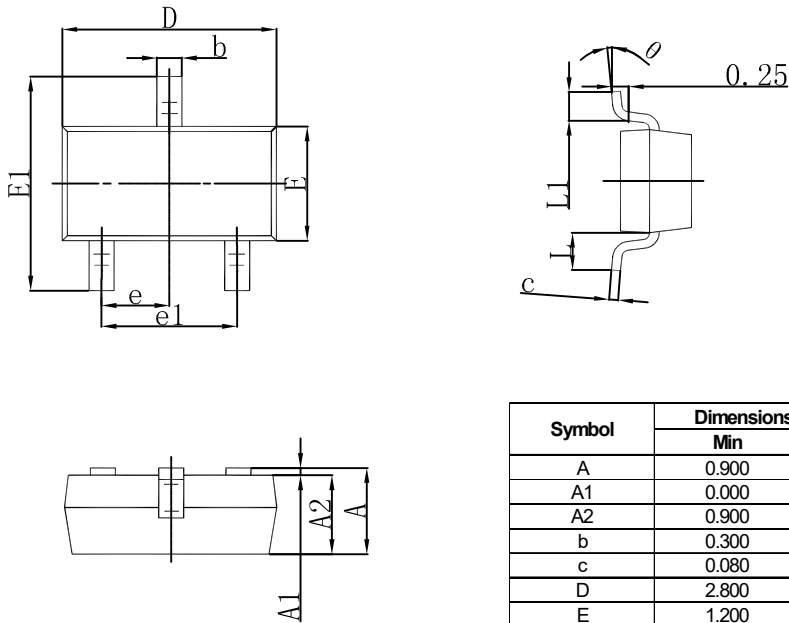


Figure 14 Normalized Maximum Transient Thermal Impedance

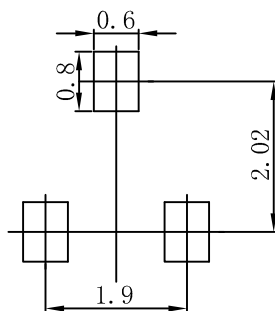


### SOT-23 Package Outline Dimensions



| 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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