

**SuperMOS – SOT-23 -20V BV<sub>DSS</sub>, 58mΩ R<sub>DS(on)</sub>, -3.0A I<sub>D</sub> P-channel MOSFET**

**1. Description**

The SI2301DS-ES is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent R<sub>DS(ON)</sub> with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product SI2301DS-ES is Pb-free.

**2. Features**

- -20V, R<sub>DS(ON)</sub>=58mΩ(Typ), V<sub>GS</sub>=-4.5V
- R<sub>DS(ON)</sub>=80mΩ(Typ), V<sub>GS</sub>=-2.5V
- Fast Switching
- High density cell design for low R<sub>DS(on)</sub>
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

**3. Applications**

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

**4. Ordering Information**

| Part Number | Package | Material     | Quantity per reel | Flammability Rating |
|-------------|---------|--------------|-------------------|---------------------|
| SI2301DS-ES | SOT-23  | Halogen free | 3,000 PCS         | UL 94V-0            |

Table-1 Ordering information

**5. Pin Configuration and Functions**


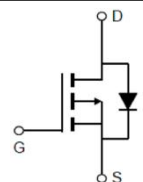
| Pin | Function | Outline   | Circuit Diagram   |
|-----|----------|---|---|
| 1   | Gate     |  |  |
| 2   | Source   |   |   |
| 3   | Drain    |   |   |

Table-2 Pin configuration

## 6. Specification

### Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

| Parameter                      | Symbol     | Limit             | Unit |   |
|--------------------------------|------------|-------------------|------|---|
| Drain-Source Voltage           | $BV_{DSS}$ | -20               | V    |   |
| Gate-Source Voltage            | $V_{GS}$   | ±8                | V    |   |
| Continuous Drain Current       | $I_D$      | $T_A=25^{\circ}C$ | 3.0  | A |
|                                |            | $T_A=75^{\circ}C$ | 1.7  |   |
| Maximum Power Dissipation      | $P_D$      | $T_A=25^{\circ}C$ | 1.4  | W |
|                                |            | $T_A=75^{\circ}C$ | 0.84 |   |
| Pulsed Drain Current           | $I_{DM}$   | 9.2               | A    |   |
| Operating Junction Temperature | $T_J$      | 150               | °C   |   |
| Storage Temperature Range      | $T_{stg}$  | -55 to +150       | °C   |   |

#### Thermal resistance ratings

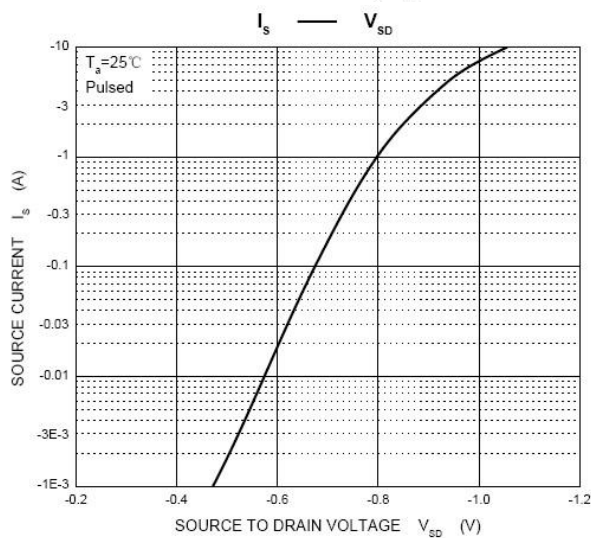
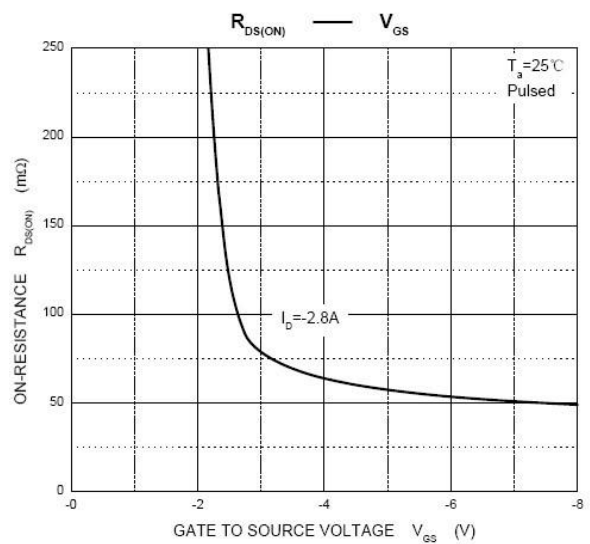
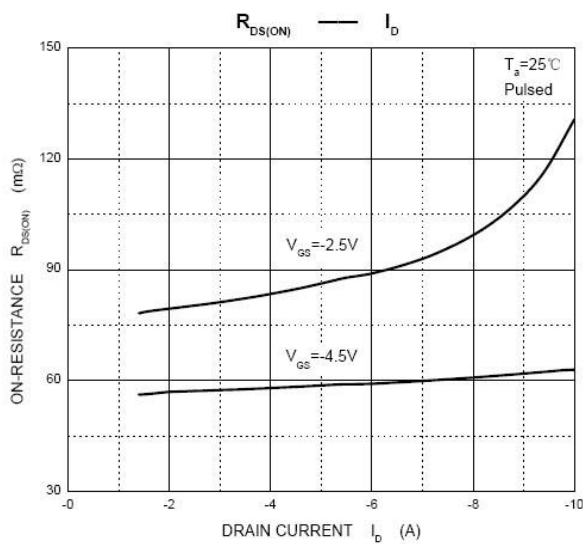
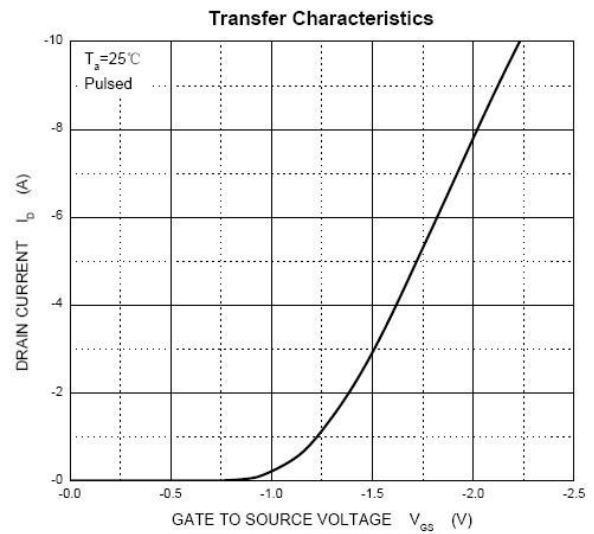
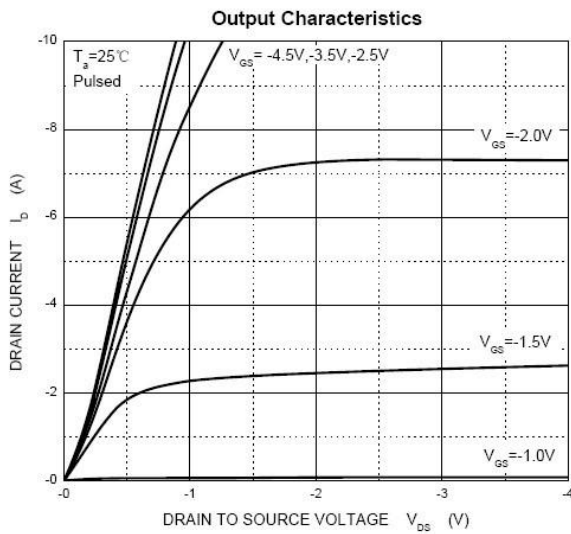
| Single Operation                       |                 |         |      |
|--|-----------------|---------|------|
| Parameter                              | Symbol          | Typical | Unit |
| Junction-to-Ambient Thermal Resistance | $R_{\theta JA}$ | 90      | °C/W |

## Electrical Characteristics

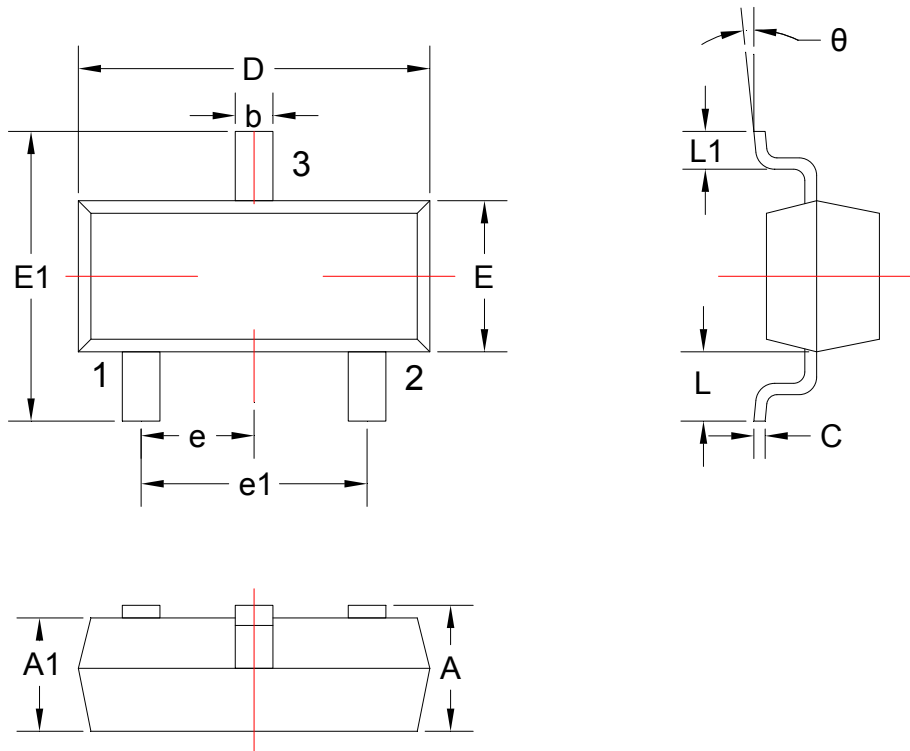
At TA = 25°C unless otherwise specified

| Parameter  | Symbol       | Test Conditions  | Min. | Typ. | Max.      | Unit       |
|--|--------------|--|------|------|-----------|------------|
| <b>OFF CHARACTERISTICS</b>                       |              |  |      |      |           |            |
| Drain-to-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-to-source Leakage Current                   | $I_{GSS}$    | $V_{DS}=0V, V_{GS}=\pm 8V$   |      |      | $\pm 100$ | nA         |
| <b>ON CHARACTERISTICS</b>                        |              |  |      |      |           |            |
| Gate Threshold Voltage                           | $V_{GS(TH)}$ | $V_{GS}=V_{DS}, I_D=-250\mu A$   | -0.4 | -0.7 | -1.0      | V          |
| Drain-to-source On-resistance                    | $R_{DS(on)}$ | $V_{GS}=-4.5V, I_D=-3.0A$  |      | 58   | 75        | m $\Omega$ |
|  |              | $V_{GS}=-2.5V, I_D=-2.0A$  |      | 80   | 90        |            |
| Forward trans conductance(a)                     | gfs          | $V_{DS}=-5V, I_D=-2.3A$  |      | 6.5  |           | S          |
| <b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b> |              |  |      |      |           |            |
| Input Capacitance                                | $C_{ISS}$    | $V_{GS}=0V, V_{DS}=-10V,$<br>$f=1MHz$                                    |      |      | 405       | pF         |
| Output Capacitance                               | $C_{OSS}$    |  |      |      | 75        |            |
| Reverse Transfer Capacitance                     | $C_{RSS}$    |  |      |      | 55        |            |
| Gate Resistance                                  | $R_g$        | $f=1MHz$   |      | 6    |           | $\Omega$   |
| Total Gate Charge                                | $Q_{G(TOT)}$ | $V_{GS}=-2.5V, V_{DS}=-10V,$<br>$I_D=-2.3A$                              |      | 3.3  | 6         | nC         |
| Gate-to-Source Charge                            | $Q_{GS}$     |  |      | 0.7  |           |            |
| Gate-to-Drain Charge                             | $Q_{GD}$     |  |      | 1.3  |           |            |
| <b>SWITCHING CHARACTERISTICS</b>                 |              |  |      |      |           |            |
| Turn-On Delay Time                               | $t_{d(ON)}$  | $V_{GS}=-4.5V, V_{DS}=10V,$<br>$R_L=10\Omega, I_D=-1A,$<br>$R_G=1\Omega$ |      | 11   | 20        | ns         |
| Rise Time  | $t_r$        |  |      | 35   | 60        |            |
| Turn-Off Delay Time                              | $t_{d(OFF)}$ |  |      | 30   | 50        |            |
| Fall Time  | $t_f$        |  |      | 10   | 20        |            |
| <b>BODY DIODE CHARACTERISTICS</b>                |              |  |      |      |           |            |
| Forward Voltage                                  | $V_{SD}$     | $V_{GS}=0V, I_S=-1.0A$   |      | -0.8 | -1.2      | V          |

## 7. Typical Characteristic



8. Dimension (SOT-23)



COMMON DIMENSIONS: UNITS OF MEASURE=MILLIMETER

| Symbol | Dimensions |       | Symbol   | Dimensions |       |
|--------|------------|-------|----------|------------|-------|
|        | Min.       | Max.  |          | Min.       | Max.  |
| A      | 0.900      | 1.150 | E1       | 2.250      | 2.550 |
| A1     | 0.900      | 1.050 | e        | 0.950TYP   |       |
| b      | 0.300      | 0.500 | e1       | 1.800      | 2.000 |
| c      | 0.080      | 0.150 | L        | 0.550REF   |       |
| D      | 2.800      | 3.00  | L1       | 0.300      | 0.500 |
| E      | 1.200      | 1.400 | $\theta$ | 0°         | 8°    |

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