

**Features**

- Excellent Stability and Uniformity
- High Dense Cell Design For Extremely Low  $R_{DS(ON)}$
- Epoxy Meets UL 94 V-0 Flammability Rating
- Moisture Sensitivity Level 1
- Halogen Free. "Green" Device <sup>(1)</sup>
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

**Maximum Ratings**

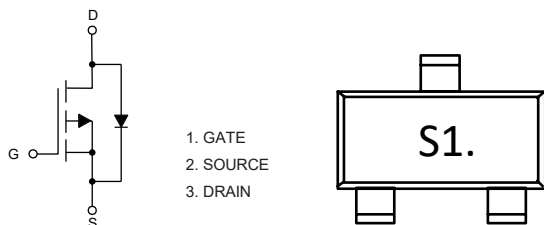
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 125°C/W Junction to Ambient(Steady-State)<sup>(2)</sup>

| Parameter                              | Symbol   | Rating                  | Unit |
|--|----------|-------------------------|------|
| Drain-Source Voltage                   | $V_{DS}$ | -20                     | V    |
| Gate-Source Voltage                    | $V_{GS}$ | ±8                      | V    |
| Continuous Drain Current               | $I_D$    | $T_A=25^\circ\text{C}$  | -2.8 |
|  |          | $T_A=100^\circ\text{C}$ | -1.8 |
| Pulsed Drain Current <sup>(3)</sup>    | $I_{DM}$ | -10                     | A    |
| Total Power Dissipation <sup>(4)</sup> | $P_D$    | 1                       | W    |

Note:

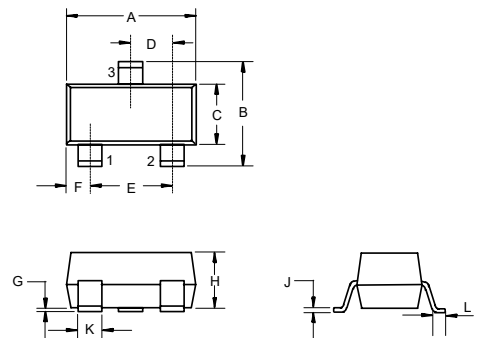
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{\theta JA} t \leq 10\text{s}$  and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.
3. Repetitive rating; pulse width limited by max. junction temperature.
4.  $P_D$  is based on max. junction temperature, using junction to ambient thermal resistance.

**Internal Structure and Marking Code**



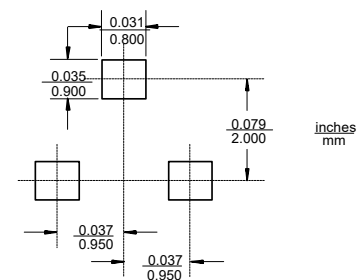
**P-CHANNEL MOSFET**

**SOT-23**



| DIM | INCHES |       | MM   |       | NOTE |
|-----|--------|-------|------|-------|------|
|     | MIN    | MAX   | MIN  | MAX   |      |
| A   | 0.110  | 0.120 | 2.80 | 3.04  |      |
| B   | 0.083  | 0.104 | 2.10 | 2.64  |      |
| C   | 0.047  | 0.055 | 1.20 | 1.40  |      |
| D   | 0.034  | 0.041 | 0.85 | 1.05  |      |
| E   | 0.067  | 0.083 | 1.70 | 2.10  |      |
| F   | 0.018  | 0.024 | 0.45 | 0.60  |      |
| G   | 0.0004 | 0.004 | 0.01 | 0.10  |      |
| H   | 0.035  | 0.041 | 0.90 | 1.025 |      |
| J   | 0.003  | 0.007 | 0.08 | 0.18  |      |
| K   | 0.012  | 0.020 | 0.30 | 0.51  |      |
| L   | 0.007  | 0.020 | 0.20 | 0.50  |      |

**Suggested Solder Pad Layout**



**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

| Parameter                       | Symbol        | Test Conditions   | Min  | Typ   | Max       | Unit       |
|---------------------------------|---------------|---|------|-------|-----------|------------|
| <b>Static Characteristics</b>   |               |   |      |       |           |            |
| Drain-Source Breakdown Voltage  | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=-250\mu A$                                | -20  |       |           | V          |
| Gate-Source Leakage Current     | $I_{GSS}$     | $V_{DS}=0V, V_{GS}=\pm 8V$                                |      |       | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current | $I_{DSS}$     | $V_{DS}=-20V, V_{GS}=0V$                                  |      |       | -1        | $\mu A$    |
| Gate-Threshold Voltage          | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=-250\mu A$                            | -0.5 | -0.7  | -0.9      | V          |
| Drain-Source On-Resistance      | $R_{DS(on)}$  | $V_{GS}=-4.5V, I_D=-2.8A$                                 |      | 80    | 120       | m $\Omega$ |
|                                 |               | $V_{GS}=-2.5V, I_D=-2.0A$                                 |      | 110   | 150       |            |
| Gate Resistance                 | $R_g$         | F=1 MHz, Open drain                                       |      | 15    |           | $\Omega$   |
| <b>Diode Characteristics</b>    |               |   |      |       |           |            |
| Continuous Body Diode Current   | $I_S$         |   |      |       | -2.8      | A          |
| Diode Forward Voltage           | $V_{SD}$      | $V_{GS}=0V, I_S=-2.8A$                                    |      |       | -1.2      | V          |
| Reverse Recovery Time           | $t_{rr}$      | $I_F=-1.4A, dI_F/dt=100A/\mu s$                           |      | 28    |           | ns         |
| Reverse Recovery Charge         | $Q_{rr}$      |   |      | 13    |           | nC         |
| <b>Dynamic Characteristics</b>  |               |   |      |       |           |            |
| Input Capacitance               | $C_{iss}$     | $V_{DS}=-6V, V_{GS}=0V, f=1MHz$                           |      | 482   |           | pF         |
| Output Capacitance              | $C_{oss}$     |   |      | 79    |           |            |
| Reverse Transfer Capacitance    | $C_{rss}$     |   |      | 64    |           |            |
| Total Gate Charge               | $Q_g$         | $V_{DS}=-6V, V_{GS}=-4.5V, I_D=-2.8A$                     |      | 5.4   |           | nC         |
| Gate-Source Charge              | $Q_{gs}$      |   |      | 0.77  |           |            |
| Gate-Drain Charge               | $Q_{gd}$      |   |      | 1.07  |           |            |
| Turn-On Delay Time              | $t_{d(on)}$   | $V_{DD}=-6V, V_{GS}=-4.5V,$<br>$R_{GEN}=6\Omega, I_D=-1A$ |      | 7.26  |           | ns         |
| Turn-On Rise Time               | $t_r$         |   |      | 8.18  |           |            |
| Turn-Off Delay Time             | $t_{d(off)}$  |   |      | 46.72 |           |            |
| Turn-Off Fall Time              | $t_f$         |   |      | 19.46 |           |            |

**Curve Characteristics**

Fig. 1 - Typical Output Characteristics

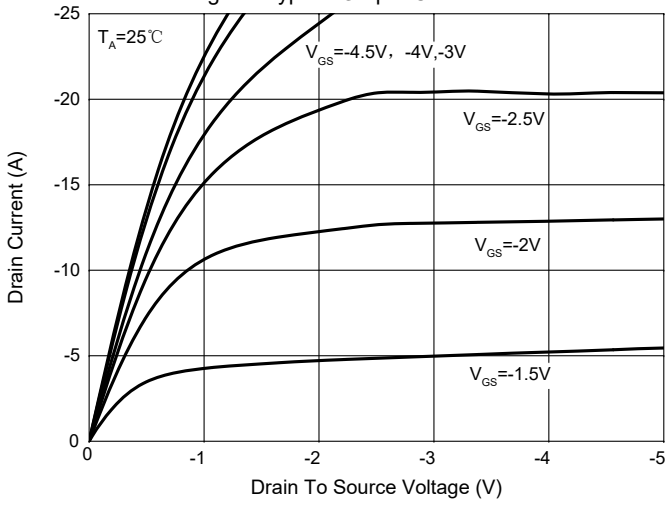


Fig. 2 - Transfer Characteristics

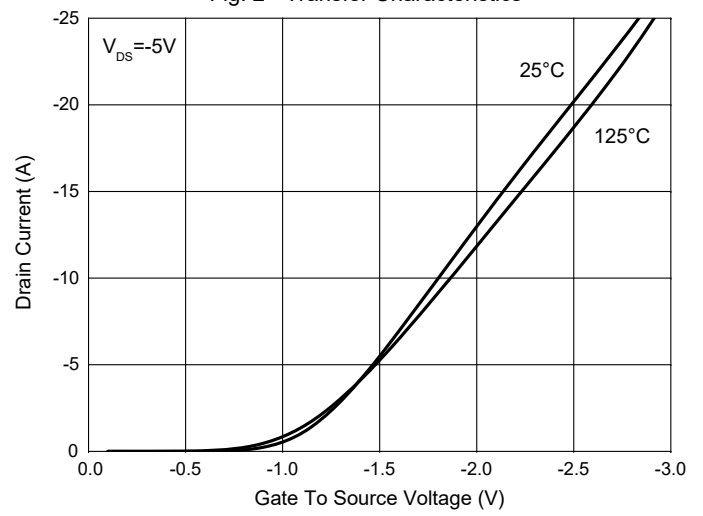


Fig. 3 - Capacitance Characteristics

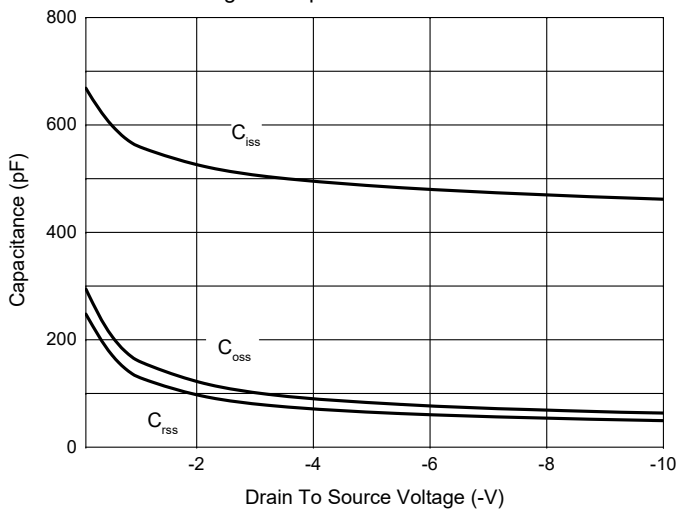


Fig.4-NormalizedOnResistanceCharacteristics

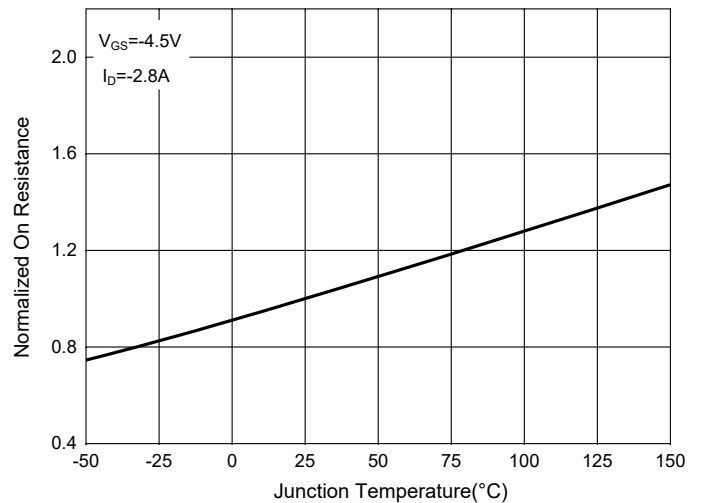


Fig. 5 - GateCharge

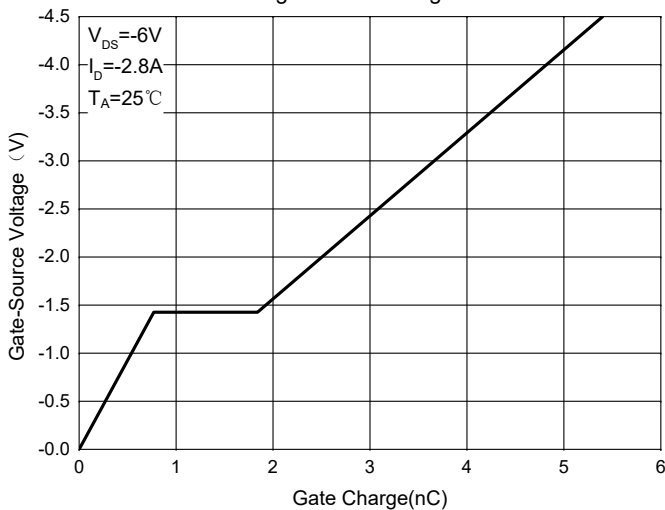
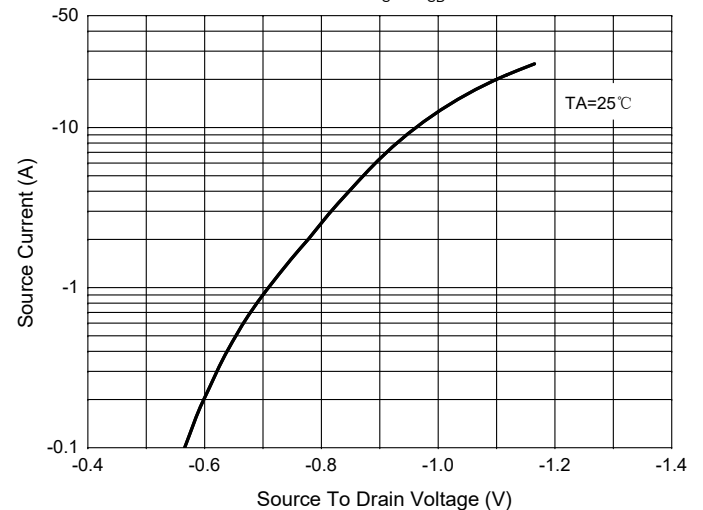


Fig. 6 -  $I_S - V_{SD}$



Curve Characteristics

Fig. 7 -  $R_{DS(ON)} - I_D$

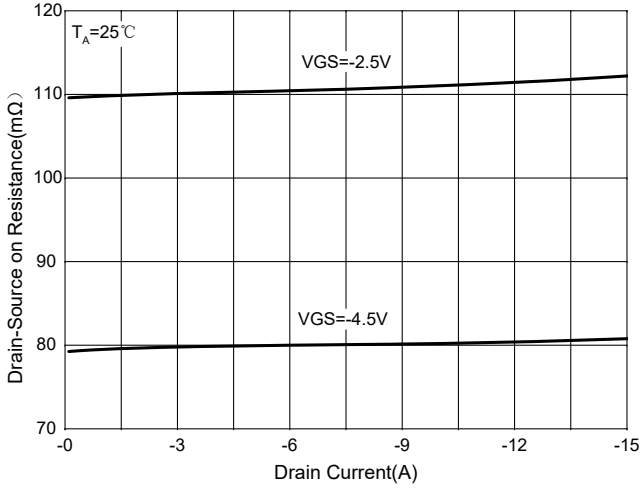


Fig. 8 -  $V_{TH} - T_J$

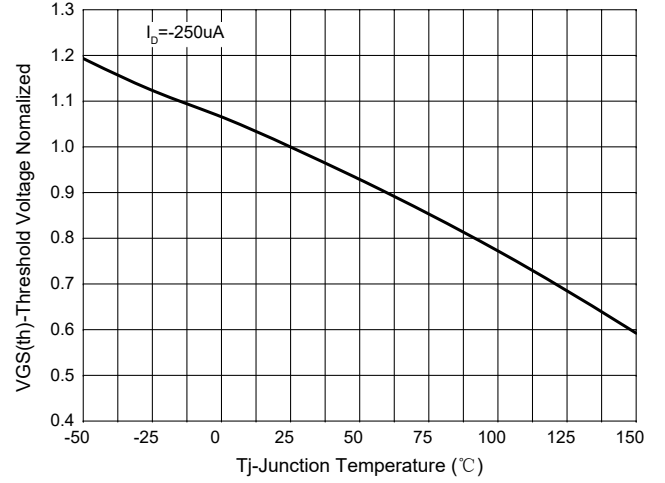


Fig. 9 -  $R_{DS(ON)} - V_{GS}$

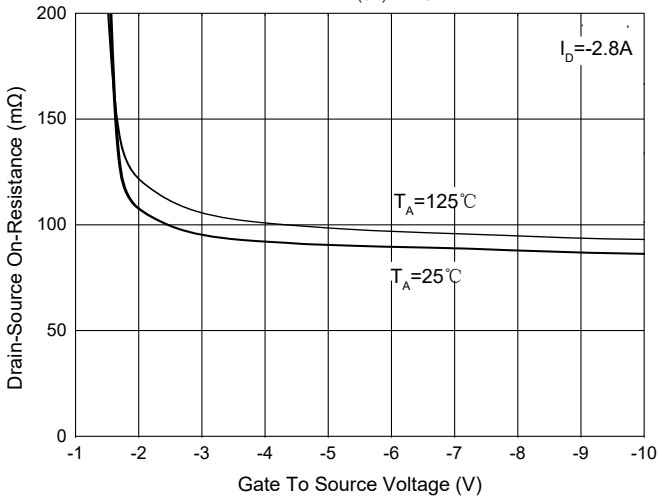


Fig. 10- Current dissipation

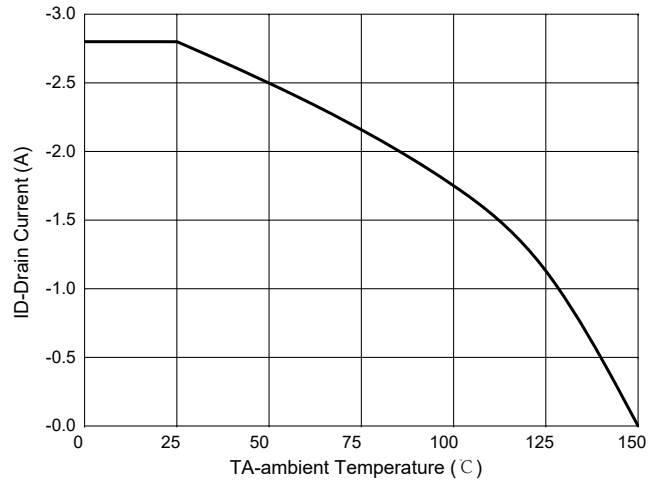
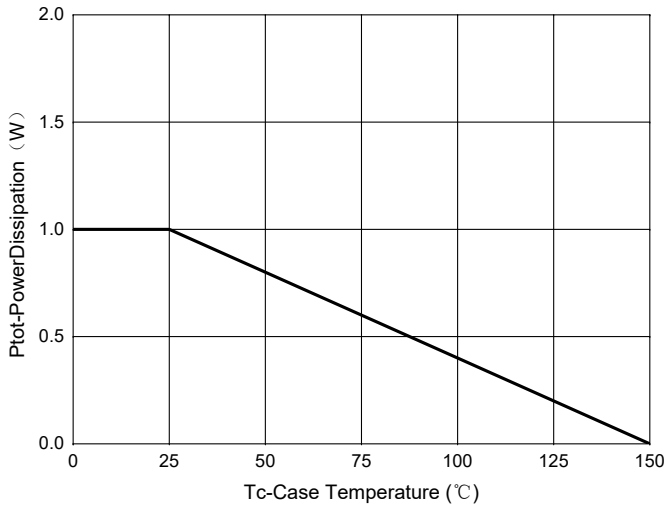


Fig. 11- Power Dissipation



Curve Characteristics

Fig. 12 - Safe Operation Area

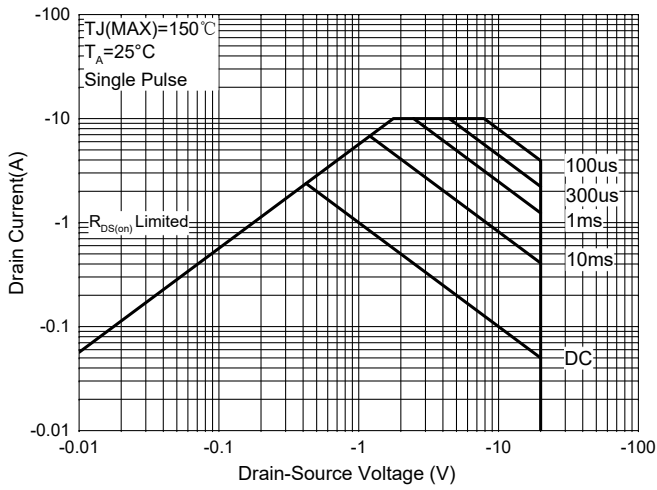
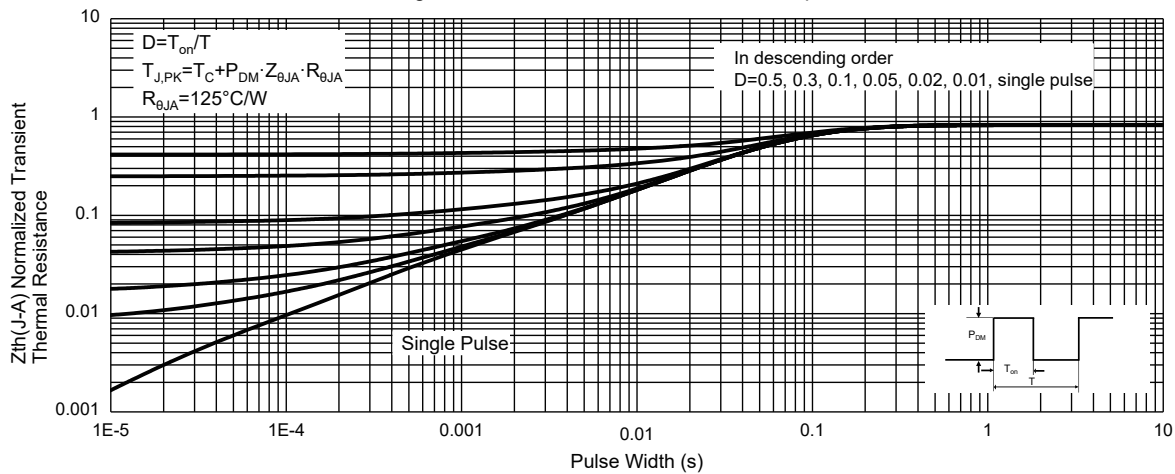


Fig. 13 - Normalized Transient Thermal Impedance



## Ordering Information

| Device     | Packing               |
|------------|-----------------------|
| SI2301A-TP | Tape&Reel: 3Kpcs/Reel |

## Revision History

| Datasheet status      | Version No | Release date | Update content |
|-----------------------|------------|--------------|----------------|
| New product datasheet | Rev4-1     | 20221215     |                |

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