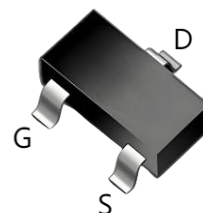
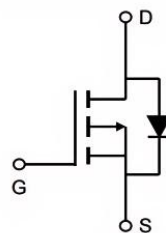


### P-Channel Enhancement Mode MOSFET

| Parameter    | Value | Unit       |
|--------------|-------|------------|
| $V_{DS}$     | -20   | V          |
| $R_{DS(on)}$ | 28    | m $\Omega$ |
| $I_D$        | -5.0  | A          |



SOT-23

### Features

- Super Low Gate Charge
- Excellent  $CdV/dt$  effect decline
- Advanced high cell density Trench technology

### Applications

- Battery protection
- Load switch
- Power management

### Absolute Maximum Ratings ( $T_a=25^\circ\text{C}$ , unless otherwise noted)

| Parameter                            |                        | Symbol    | Value      | Unit             |
|--------------------------------------|------------------------|-----------|------------|------------------|
| Drain-Source Voltage                 |                        | $V_{DS}$  | -20        | V                |
| Gate-Source Voltage                  |                        | $V_{GS}$  | $\pm 12$   | V                |
| Continuous Drain Current             | $T_a=25^\circ\text{C}$ | $I_D$     | -5.0       | A                |
| Continuous Drain Current             | $T_a=70^\circ\text{C}$ | $I_D$     | -3.0       |                  |
| Pulsed Drain Current <sup>2</sup>    |                        | $I_{DM}$  | -16        | A                |
| Total Power Dissipation <sup>3</sup> | $T_a=25^\circ\text{C}$ | $P_D$     | 1.31       | W                |
| Storage Temperature Range            |                        | $T_{STG}$ | -55 to 150 | $^\circ\text{C}$ |
| Operating Junction Temperature Range |                        | $T_J$     | -55 to 150 | $^\circ\text{C}$ |

### Thermal Characteristics

| Parameter                                        | Symbol          | Typ. | Max. | Unit               |
|--------------------------------------------------|-----------------|------|------|--------------------|
| Thermal Resistance Junction-ambient <sup>1</sup> | $R_{\theta JA}$ | --   | 125  | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-Case <sup>1</sup>    | $R_{\theta JC}$ | --   | --   | $^\circ\text{C/W}$ |

**Electrical Characteristics**(Ta=25°C, unless otherwise noted)

| Electrical Characteristics (Ta = 25°C, unless otherwise noted) |                      |                                                                                             |      |      |      |      |
|----------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------|------|------|------|------|
| Parameter                                                      | Symbol               | Conditions                                                                                  | Min. | Typ. | Max. | Unit |
| Off Characteristics                                            |                      |                                                                                             |      |      |      |      |
| Drain-Source Breakdown Voltage                                 | V <sub>(BR)DSS</sub> | I <sub>D</sub> =-250μA, V <sub>GS</sub> =0V                                                 | -20  | -    | -    | V    |
| Zero Gate Voltage Drain Current                                | I <sub>DSS</sub>     | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                                                  | -    | -    | -1.0 | μA   |
| Gate-Body Leakage Current                                      | I <sub>GSS</sub>     | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V                                                  | -    | -    | ±100 | nA   |
| On Characteristics                                             |                      |                                                                                             |      |      |      |      |
| Gate Threshold Voltage                                         | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                   | -0.5 | -0.7 | -1.0 | V    |
| Static Drain-Source ON-Resistance<br>note <sup>2</sup>         | R <sub>DS(ON)</sub>  | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.1A                                               | -    | 28   | 35   | mΩ   |
|                                                                |                      | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3A                                                 | -    | 38   | 53   | mΩ   |
| Dynamic Characteristics                                        |                      |                                                                                             |      |      |      |      |
| Input Capacitance                                              | C <sub>iss</sub>     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-10V,<br>f= 1MHz                                      | -    | 830  | -    | pF   |
| Output Capacitance                                             | C <sub>oss</sub>     |                                                                                             | -    | 132  | -    | pF   |
| Reverse Transfer Capacitance                                   | C <sub>rss</sub>     |                                                                                             | -    | 85   | -    | pF   |
| Total Gate Charge                                              | Q <sub>g</sub>       | V <sub>GS</sub> =-4.5V<br>V <sub>DS</sub> =-10V, I <sub>D</sub> =-2A                        | -    | 8.8  | -    | nC   |
| Gate Source Charge                                             | Q <sub>gs</sub>      |                                                                                             | -    | 1.4  | -    | nC   |
| Gate Drain("Miller") Charge                                    | Q <sub>gd</sub>      |                                                                                             | -    | 1.9  | -    | nC   |
| Switching Characteristics                                      |                      |                                                                                             |      |      |      |      |
| Turn-On DelayTime                                              | t <sub>d(on)</sub>   | V <sub>DD</sub> =-10V, I <sub>D</sub> =-3.3A<br>R <sub>G</sub> =1Ω, V <sub>GEN</sub> =-4.5V | -    | 10   | -    | ns   |
| Turn-On Rise Time                                              | t <sub>r</sub>       |                                                                                             | -    | 32   | -    | ns   |
| Turn-Off DelayTime                                             | t <sub>d(off)</sub>  |                                                                                             | -    | 50   | -    | ns   |
| Turn-Off Fall Time                                             | t <sub>f</sub>       |                                                                                             | -    | 51   | -    | ns   |
| Drain-Source Diode Characteristics and Max Ratings             |                      |                                                                                             |      |      |      |      |
| Maximum Continuous Drain to Source Diode Forward Current       | I <sub>S</sub>       |                                                                                             | -    | -    | -5.0 | A    |
| Maximum Pulsed Drain to Source Diode Forward Current           | I <sub>SM</sub>      |                                                                                             | -    | -    | -16  | A    |
| Drain to Source Diode Forward Voltage                          | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =-4.1A                                                  | -    | -    | -1.2 | V    |

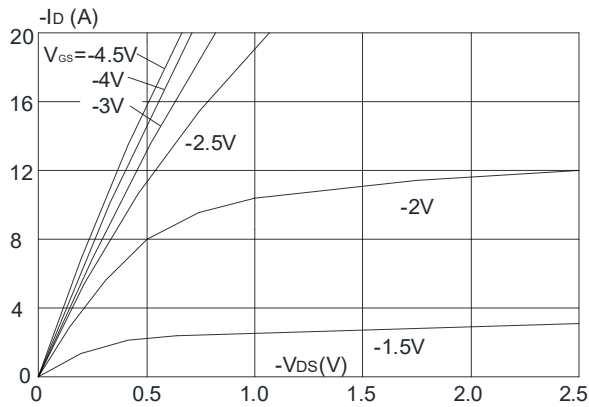
Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

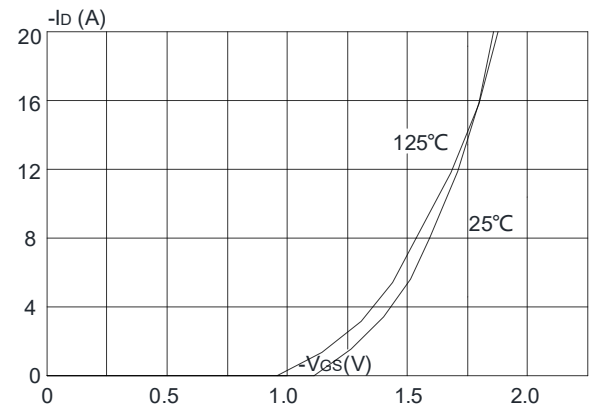
2. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$

## Typical Characteristics

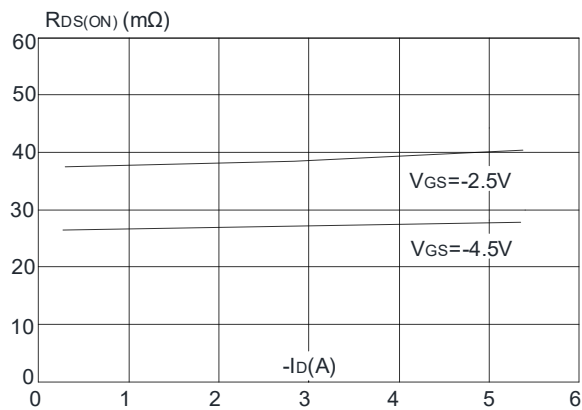
**Figure 1: Output Characteristics**



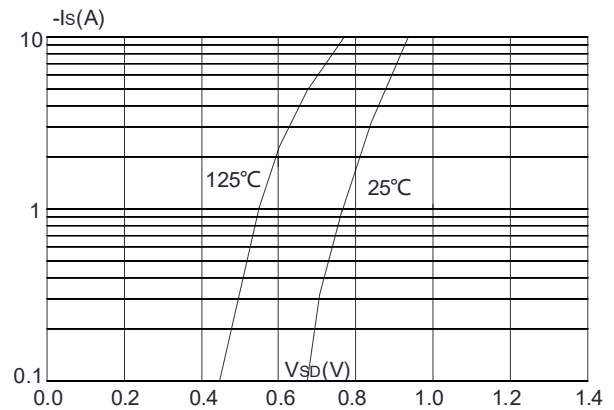
**Figure 2: Typical Transfer Characteristics**



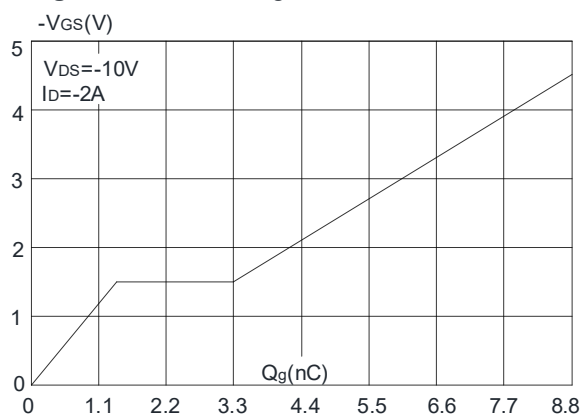
**Figure 3: On-resistance vs. Drain Current**



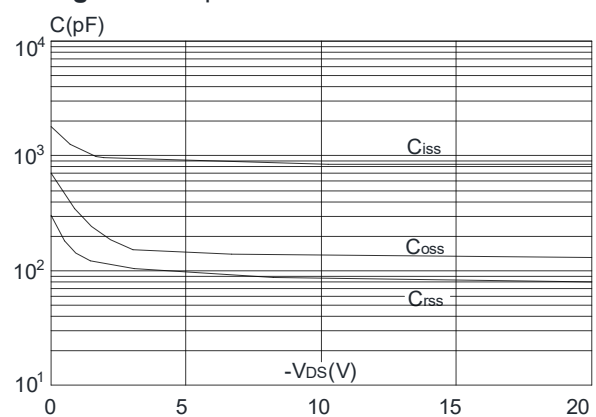
**Figure 4: Body Diode Characteristics**



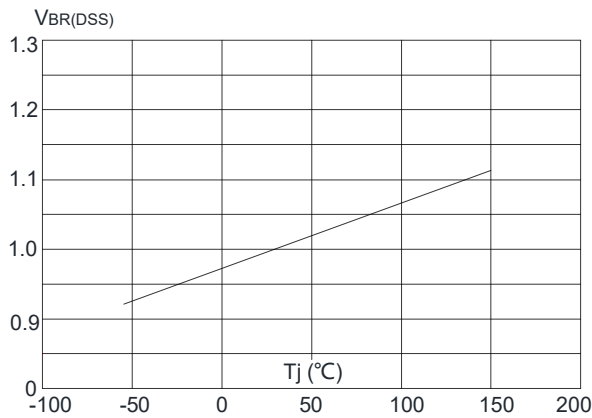
**Figure 5: Gate Charge Characteristics**



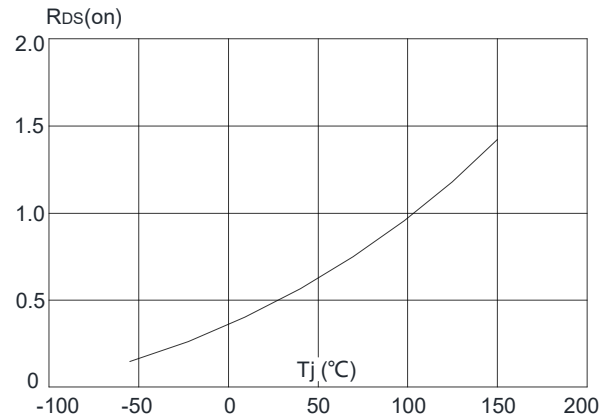
**Figure 6: Capacitance Characteristics**



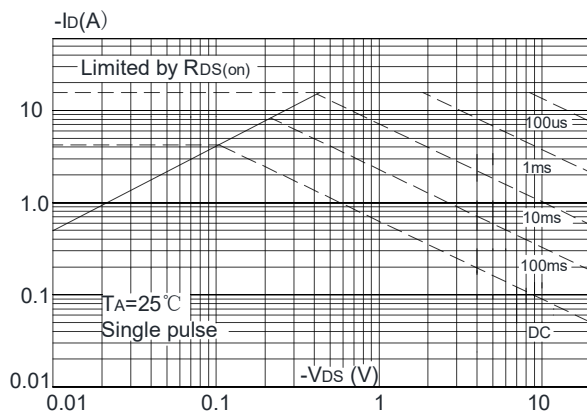
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



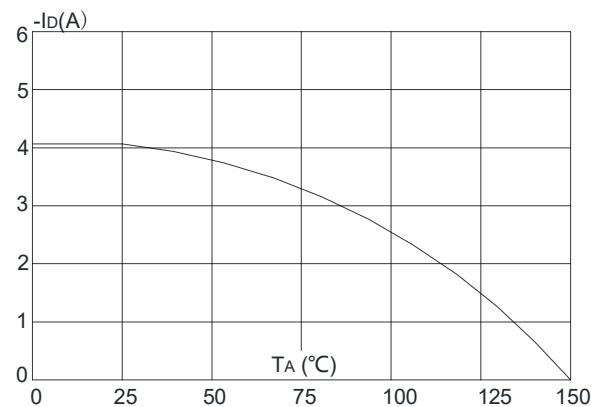
**Figure 8:** Normalized on Resistance vs. Junction Temperature



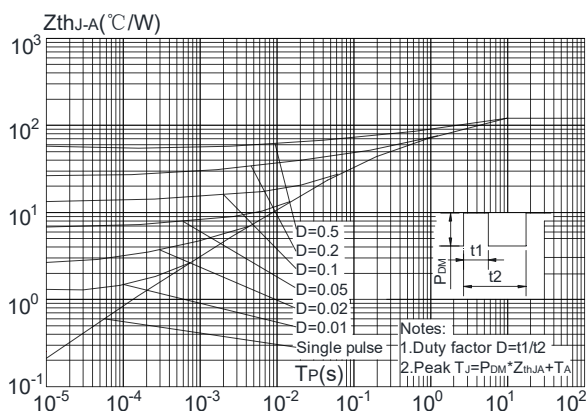
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature

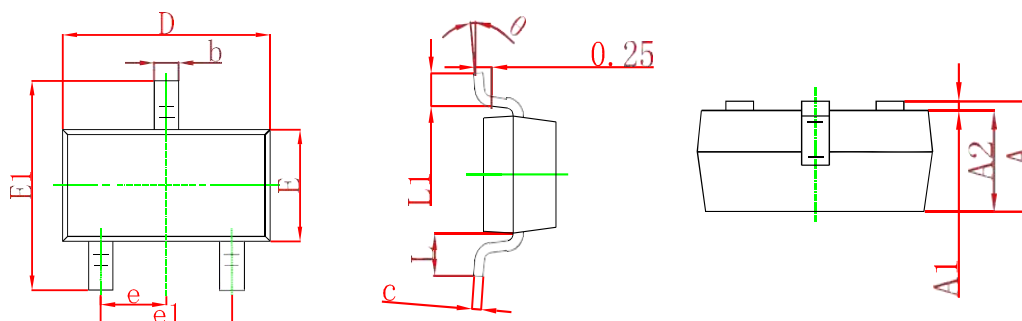


**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



**Package Outline Dimensions (Units: mm)**

**SOT-23**



| 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 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |

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