

## Features

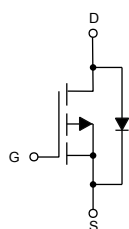
- High Dense Cell Design For Extremely Low  $R_{DS(ON)}$
- Rugged and reliable
- High Speed Switching
- Epoxy Meets UL 94 V-0 Flammability Rating
- Moisture Sensitivity Level 1
- Halogen Free Available Upon Request By Adding Suffix "-HF"
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Maximum Thermal Resistance: 100°C/W Junction to Ambient<sup>(Note1)</sup>

| Parameter                               | Symbol   | Rating | Unit |
|---|----------|--------|------|
| Drain -source Voltage                   | $V_{DS}$ | -20V   | V    |
| Gate -Source Voltage                    | $V_{GS}$ | ±8     | V    |
| Drain Current-Continuous                | $I_D$    | -2.8   | A    |
| Drain Current-Pulse <sup>(Note 2)</sup> | $I_{DM}$ | -10    | A    |
| Power Dissipation                       | $P_D$    | 1.25   | W    |

## Internal Structure

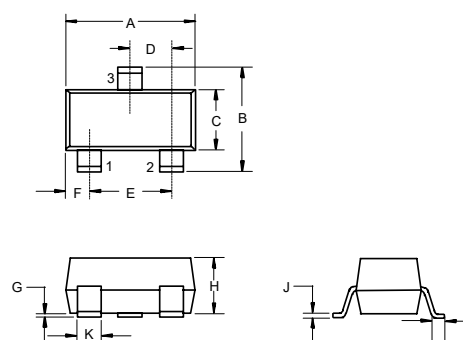


1. GATE
2. SOURCE
3. DRAIN

Marking:S1

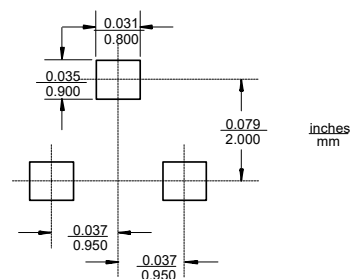
## P-Channel MOSFET

## 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 | 0.006 | 0.01 | 0.15 |      |
| H   | 0.035  | 0.043 | 0.90 | 1.10 |      |
| 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 (Ta=25°C unless otherwise specified)**

| Parameter                                      | Symbol               | Test conditions  | Min   | Typ  | Max   | Unit |
|--|----------------------|--|-------|------|-------|------|
| Static Characteristics                         |                      |  |       |      |       |      |
| Drain-Source Breakdown Voltage                 | V <sub>(BR)DSS</sub> | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA  | -20   |      |       | V    |
| Gate-Threshold Voltage <sup>(Note 3)</sup>     | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                | -0.45 | -0.7 | -1.0  | V    |
| Gate-Body Leakage Current                      | I <sub>GSS</sub>     | V <sub>GS</sub> =±8V, V <sub>DS</sub> =0V  |       |      | ±100  | nA   |
| Zero Gate Voltage Drain Current                | I <sub>DSS</sub>     | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V   |       |      | -1    | μA   |
| Drain-Source On-Resistance <sup>(Note 3)</sup> | R <sub>DS(on)</sub>  | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2.8A  |       | 80   | 120   | mΩ   |
|  |                      | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-2.0A  |       | 110  | 150   |      |
| Forward Tranconductance                        | g <sub>FS</sub>      | V <sub>DS</sub> =-5V, I <sub>D</sub> =-2.8A  |       | 8    |       | S    |
| Diode Forward Current <sup>(Note 1)</sup>      | I <sub>S</sub>       |  |       |      | -0.75 | S    |
| Diode Forward Voltage <sup>(Note 3)</sup>      | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =-0.75A  |       |      | -1.2  | V    |
| Dynamic Characteristics <sup>(Note 4)</sup>    |                      |  |       |      |       |      |
| Input Capacitance                              | C <sub>iss</sub>     | V <sub>DS</sub> =-6V,V <sub>GS</sub> =0V, f=1MHz   |       | 880  |       | pF   |
| Output Capacitance                             | C <sub>oss</sub>     |  |       | 270  |       |      |
| Reverse Transfer Capacitance                   | C <sub>rss</sub>     |  |       | 175  |       |      |
| Switching Characteristics <sup>(Note 4)</sup>  |                      |  |       |      |       |      |
| Turn-On Delay Time                             | t <sub>d(on)</sub>   | V <sub>DD</sub> =-6V,V <sub>GS</sub> =-4.5V,<br>I <sub>D</sub> =-1A,R <sub>GEN</sub> =6Ω |       | 11   | 20    | ns   |
| Turn-On Rise Time                              | t <sub>r</sub>       |  |       | 5    | 10    |      |
| Turn-Off Delay Time                            | t <sub>d(off)</sub>  |  |       | 32   | 65    |      |
| Turn-Off Fall Time                             | t <sub>f</sub>       |  |       | 23   | 45    |      |
| Total Gate Charge                              | Qg                   | V <sub>DS</sub> =-6V,V <sub>GS</sub> =-4.5V,I <sub>D</sub> =-2.8A                        |       | 11   | 14.5  | nC   |
| Gate-Source Chage                              | Qgs                  |  |       | 1.5  |       |      |
| Gage-Drain Charge                              | Qgd                  |  |       | 2.1  |       |      |

Note:

1. Surface Mounted on FR4 Board,  $t < 5$  sec.
2. Repetitive Rating : Pulse width limited by maximum junction temperature.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by Design, Not Subject to Production Testing.

## Curve Characteristics

Fig. 1 - Output Characteristics

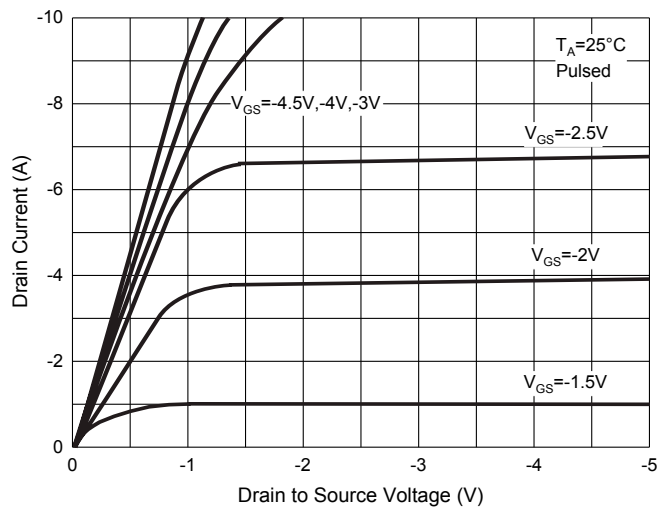


Fig. 2 - Transfer Characteristics

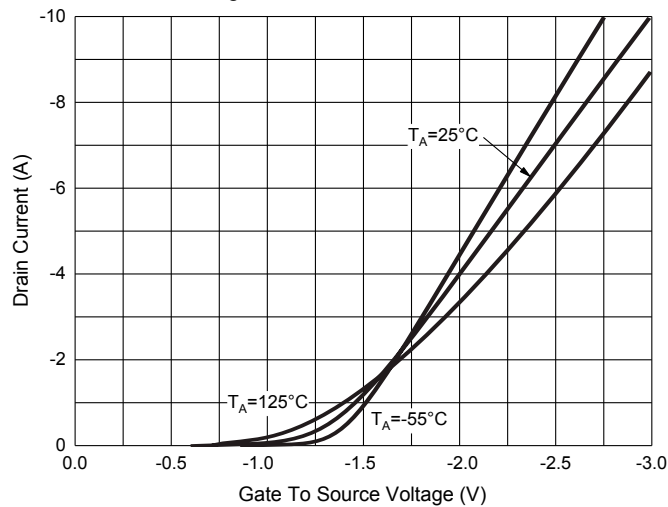


Fig. 3 - Capacitance Characteristics

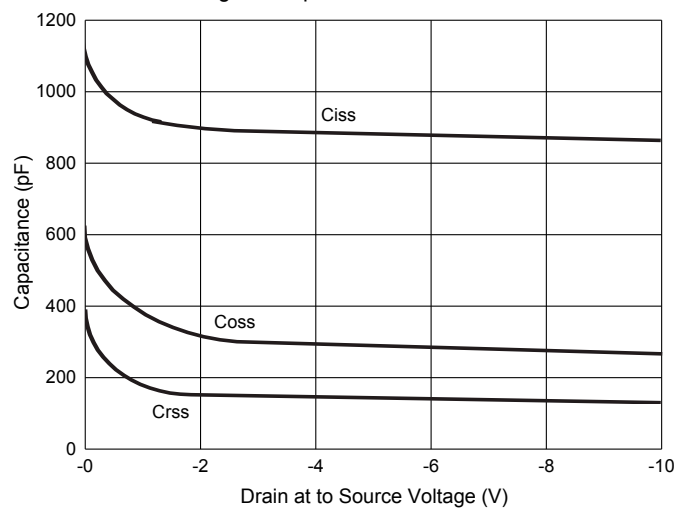


Fig. 4 -  $R_{DS(ON)}$ —Temperature

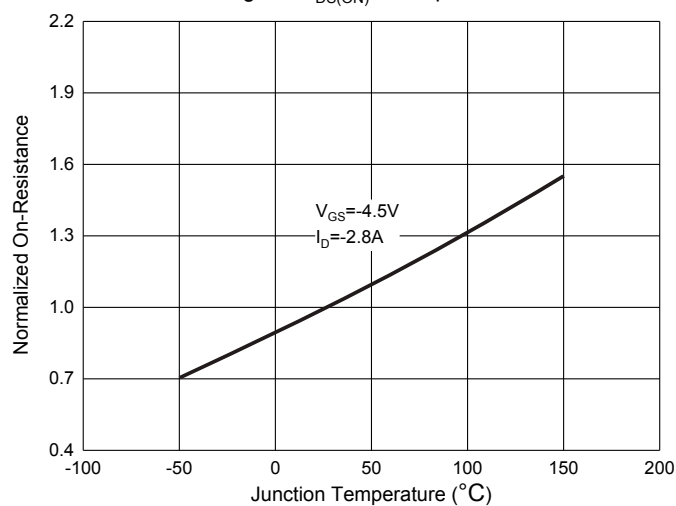


Fig. 5 - Threshold Voltage

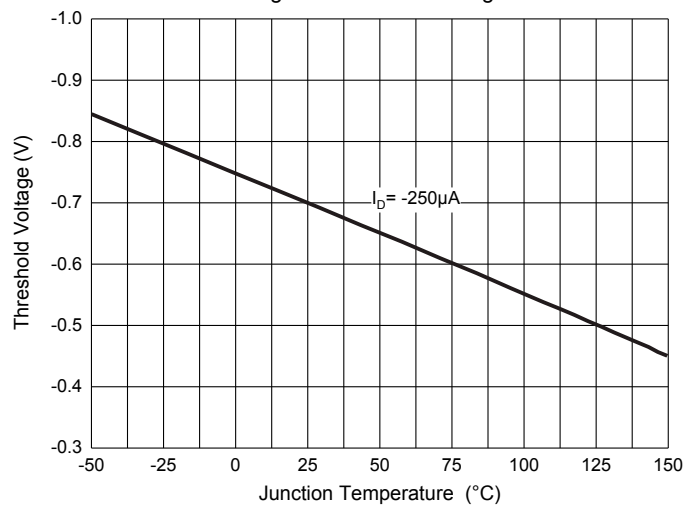
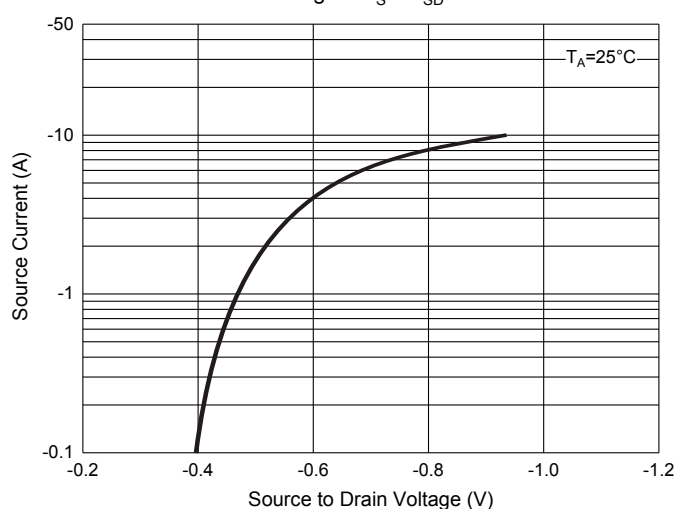


Fig. 6 -  $I_S$ — $V_{SD}$



## Ordering Information

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

Note : Adding "-HF" Suffix For Halogen Free, eg. Part Number-TP-HF

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