

## Features

- High Density Cell Design For Ultra Low  $R_{DS(on)}$
- High Speed Switching
- ESD Protected Up to 2.5KV (HBM)
- Trench Power LV MOSFET Technology
- Epoxy Meets UL 94 V-0 Flammability Rating
- Moisture Sensitivity Level 1
- Halogen Free. "Green" Device (Note 1)
- 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: 96°C/W Junction to Ambient<sup>(Note 2)</sup>

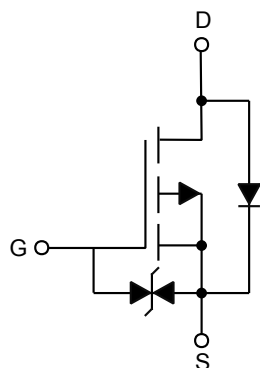
| Parameter                                         | Symbol   | Rating | Unit |
|---------------------------------------------------|----------|--------|------|
| Drain-Source Voltage                              | $V_{DS}$ | -20    | V    |
| Gate-Source Voltage                               | $V_{GS}$ | ±12    | V    |
| Drain Current $T_A=25^\circ\text{C}$ Steady State | $I_D$    | -5.6   | A    |
| $T_A=70^\circ\text{C}$ Steady State               |          | -4.5   |      |
| Pulsed Drain Current <sup>(Note 3)</sup>          | $I_{DM}$ | -30    | A    |
| Total Power Dissipation                           | $P_D$    | 1.3    | 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. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch.

3. Pulse Test: Pulse Width ≤ 300us, Duty cycle ≤ 2%.

## Internal Structure:

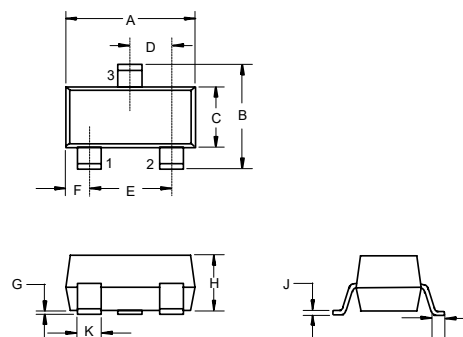


1. GATE
2. SOURCE
3. DRAIN

Marking: 3415.

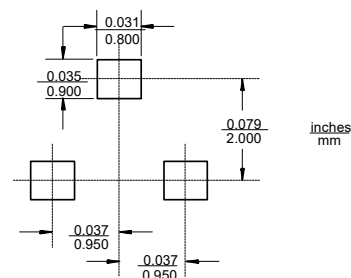
# P-Channel Enhancement Mode Field Effect Transistor

## SOT-23



| DIMENSIONS |        |       |      |      |      |
|------------|--------|-------|------|------|------|
| 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 @ 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-Source Leakage Current           | I <sub>GSS</sub>     | V <sub>DS</sub> =0V, V <sub>GS</sub> =± 10V                                             |       | ±2.5  | ±10  | μA   |
|                                       |                      | V <sub>DS</sub> =0V, V <sub>GS</sub> =± 8V                                              |       | ±0.9  | ±2   | μA   |
| Zero Gate Voltage Drain Current       | I <sub>DSS</sub>     | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                                              |       |       | -1   | μA   |
| Gate-Threshold Voltage                | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                               | -0.40 | -0.62 | -1.0 | V    |
| Drain-Source On-Resistance            | R <sub>DS(on)</sub>  | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5.6A                                           |       | 29    | 42   | mΩ   |
|                                       |                      | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-4.3A                                           |       | 36    | 55   |      |
|                                       |                      | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2A                                             |       | 55    | 100  |      |
| Diode Forward Voltage                 | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =-5.6A                                              |       | -0.8  | -1.2 | V    |
| Maximum Body-Diode Continuous Current | I <sub>S</sub>       |                                                                                         |       |       | -5.6 | A    |
| Dynamic Characteristics               |                      |                                                                                         |       |       |      |      |
| Input Capacitance                     | C <sub>iss</sub>     | V <sub>DS</sub> =-10V,V <sub>GS</sub> =0V,f =1MHz                                       |       | 940   |      | pF   |
| Output Capacitance                    | C <sub>oss</sub>     |                                                                                         |       | 219   |      |      |
| Reverse Transfer Capacitance          | C <sub>rss</sub>     |                                                                                         |       | 116   |      |      |
| Switching Characteristics             |                      |                                                                                         |       |       |      |      |
| Total Gate Charge                     | Q <sub>g</sub>       | V <sub>DS</sub> =-10V,V <sub>GS</sub> =-4.5V,I <sub>D</sub> =-4A                        |       | 7.2   |      | nC   |
| Gate-Source Charge                    | Q <sub>gs</sub>      |                                                                                         |       | 1.2   |      |      |
| Gate-Drain Charge                     | Q <sub>gd</sub>      |                                                                                         |       | 1.6   |      |      |
| Turn-On Delay Time                    | t <sub>d(on)</sub>   | V <sub>GS</sub> =-4.5V,V <sub>DS</sub> =-10V,R <sub>L</sub> =2.5Ω, R <sub>GEN</sub> =3Ω |       | 15    |      | ns   |
| Turn-On Rise Time                     | t <sub>r</sub>       |                                                                                         |       | 63    |      |      |
| Turn-Off Delay Time                   | t <sub>d(off)</sub>  |                                                                                         |       | 21    |      |      |
| Turn-Off Fall Time                    | t <sub>f</sub>       |                                                                                         |       | 12    |      |      |

## Curve Characteristics

Fig. 1 - Typical Output Characteristics

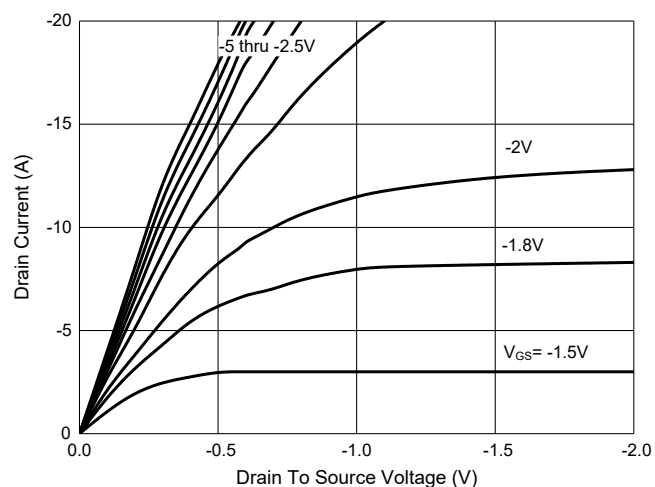


Fig. 2 - Transfer Characteristics

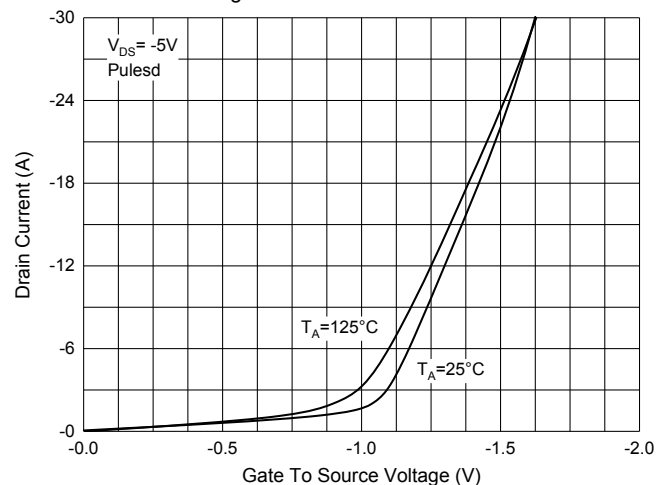


Fig. 3 -  $R_{DS(ON)} - I_D$

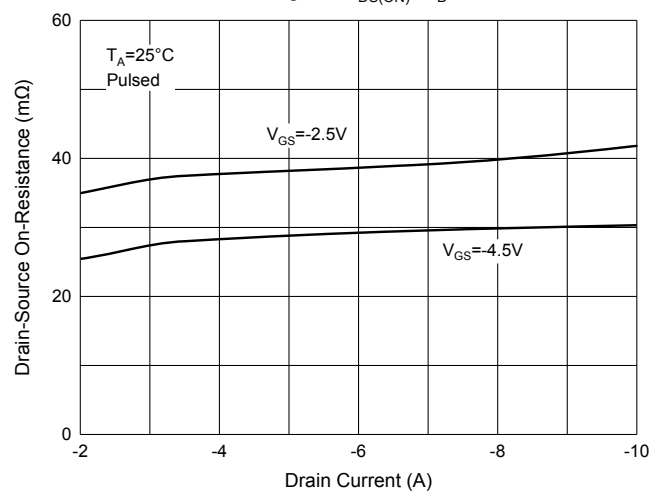


Fig. 4 - Gate Charge

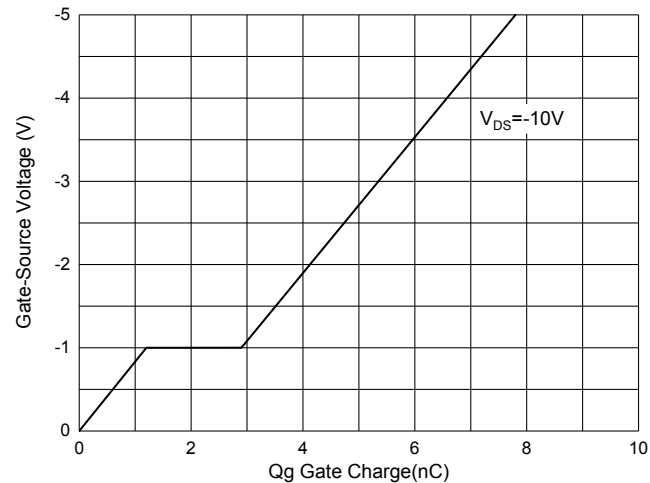


Fig. 5 -  $I_S - V_{SD}$

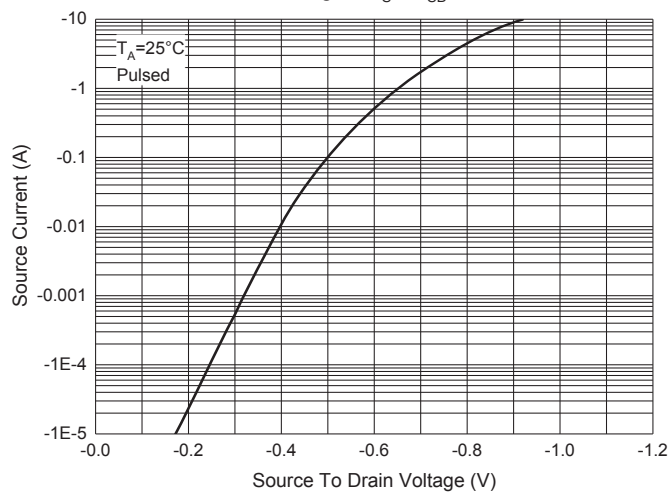
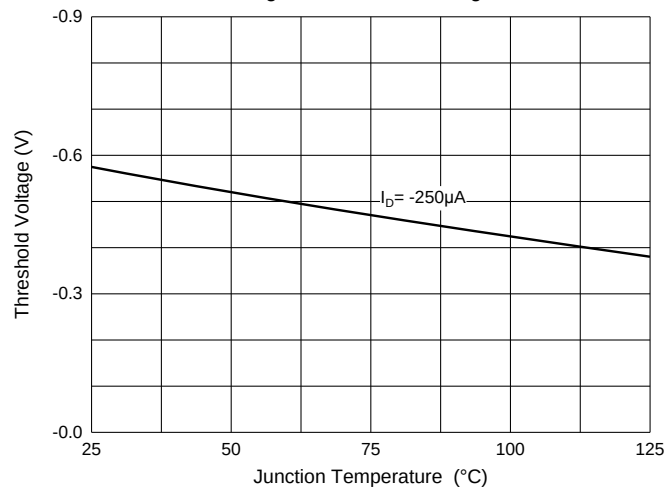


Fig. 6 - Threshold Voltage



## Curve Characteristics

Fig. 7 - Safe Operation Area

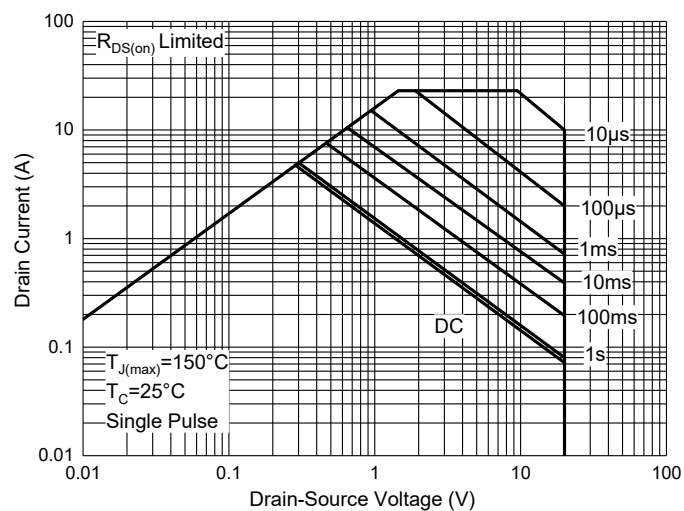
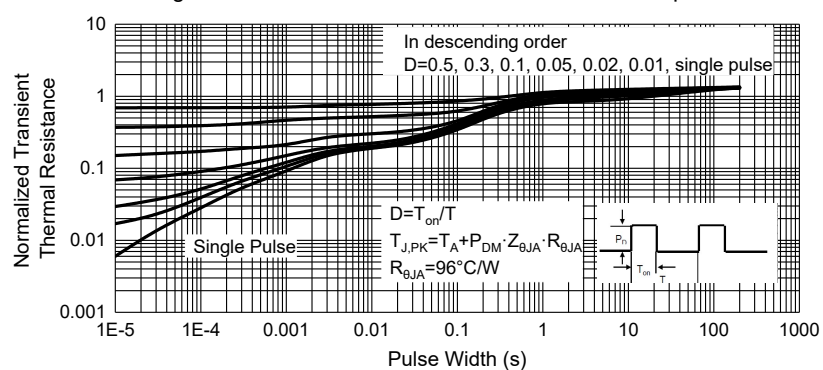


Fig. 8 - Normalized Maximum Transient Thermal Impedance



## Ordering Information

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

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