

## Features

- ESD Protected Up To 2KV (HBM)
- High Density Cell Design For Low  $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Halogen Free. "Green" Device (Note1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

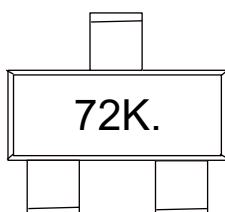
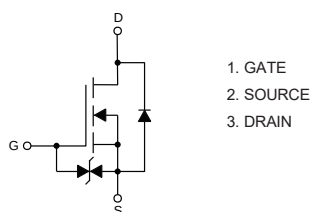
- Operating Junction Temperature Range: -55°C to +150°C
- Storage Temperature: -55°C to +150°C
- Thermal Resistance: 379°C/W Junction to Ambient (Note2)

| Parameter                       | Symbol   | Rating | Unit |
|---------------------------------|----------|--------|------|
| Drain-Source Voltage            | $V_{DS}$ | 60     | V    |
| Gate-Source Voltage             | $V_{GS}$ | ±20    | V    |
| Continuous Drain Current        | $I_D$    | 0.34   | A    |
|                                 |          | 0.22   |      |
| Pulsed Drain Current (Note3)    | $I_{DM}$ | 1.4    | A    |
| Total Power Dissipation (Note4) | $P_D$    | 0.33   | W    |

Note:

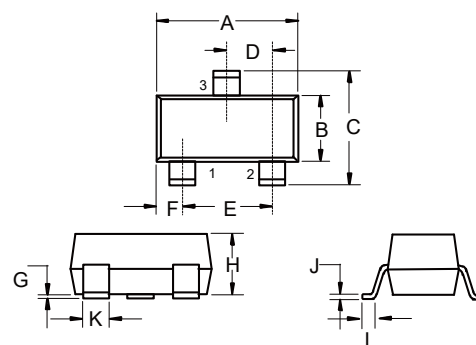
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$ .
3. Repetitive rating; pulse width limited by max. junction temperature.
4.  $P_D$  is based on max. junction temperature, using junction-ambient thermal resistance.

## Internal Structure and Marking Code



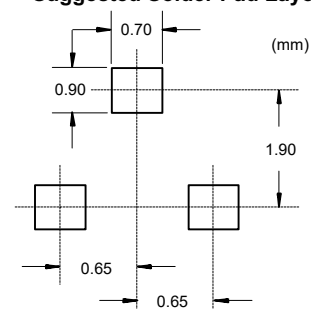
## N-Channel MOSFET

### SOT-323



| DIM | INCHES |       | MM   |      | NOTE |
|-----|--------|-------|------|------|------|
|     | MIN    | MAX   | MIN  | MAX  |      |
| A   | 0.071  | 0.087 | 1.80 | 2.20 |      |
| B   | 0.045  | 0.053 | 1.15 | 1.35 |      |
| C   | 0.083  | 0.096 | 2.10 | 2.45 |      |
| D   | 0.026  |       | 0.65 |      | TYP. |
| E   | 0.047  | 0.055 | 1.20 | 1.40 |      |
| F   | 0.012  | 0.016 | 0.30 | 0.40 |      |
| G   | 0.000  | 0.004 | 0.00 | 0.10 |      |
| H   | 0.035  | 0.044 | 0.90 | 1.10 |      |
| J   | 0.002  | 0.010 | 0.05 | 0.25 |      |
| K   | 0.006  | 0.016 | 0.15 | 0.40 |      |
| L   | 0.010  | 0.018 | 0.26 | 0.46 |      |

### Suggested Solder Pad Layout

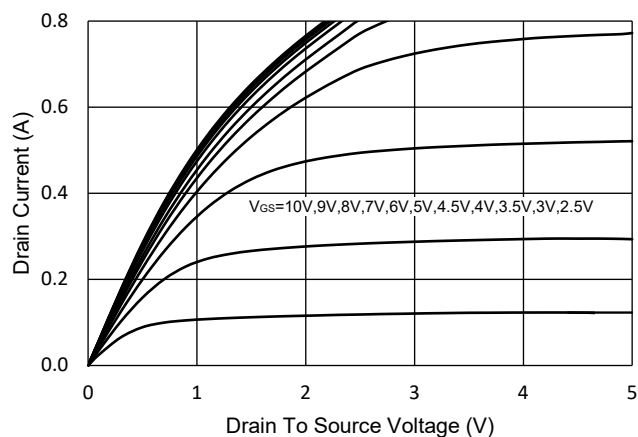


**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

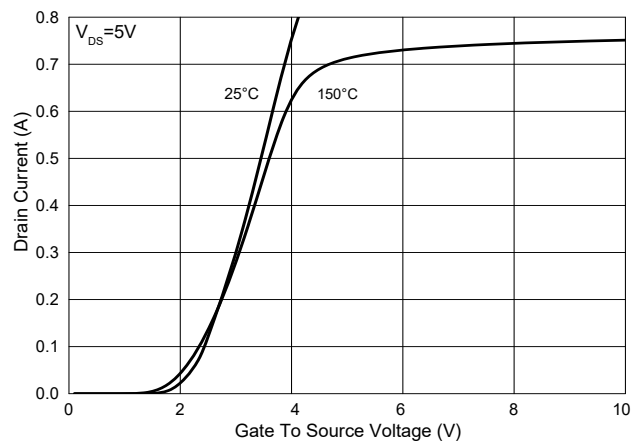
| Parameter                       | Symbol               | Test Conditions                                                                           | Min | Typ  | Max  | Unit |
|---------------------------------|----------------------|-------------------------------------------------------------------------------------------|-----|------|------|------|
| Static Characteristics          |                      |                                                                                           |     |      |      |      |
| Drain-Source Breakdown Voltage  | V <sub>(BR)DSS</sub> | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                | 60  |      |      | V    |
| Gate-Source Leakage Current     | I <sub>GSS</sub>     | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                                |     |      | ±10  | μA   |
| Zero Gate Voltage Drain Current | I <sub>DSS</sub>     | V <sub>DS</sub> =48V, 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> =250uA                                  | 1.0 | 1.5  | 2.0  | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =500mA                                               |     | 1.8  | 2.5  | Ω    |
|                                 |                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =200mA                                              |     | 2.0  | 3.0  |      |
| Forward Transconductance        | g <sub>FS</sub>      | V <sub>DS</sub> =10V, I <sub>D</sub> =200mA                                               |     | 300  |      | mS   |
| Gate Resistance                 | R <sub>g</sub>       | f=1 MHz, Open drain                                                                       |     | 100  |      | Ω    |
| Diode Characteristics           |                      |                                                                                           |     |      |      |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                           |     |      | 0.34 | A    |
| Diode Forward Voltage           | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =300mA                                                |     |      | 1.2  | V    |
| Reverse Recovery Time           | t <sub>rr</sub>      | I <sub>F</sub> =0.3A, dI <sub>F</sub> /dt=100A/μs                                         |     | 10   |      | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                           |     | 2.6  |      | nC   |
| Dynamic Characteristics         |                      |                                                                                           |     |      |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =25V,V <sub>GS</sub> =0V,f=1MHz                                           |     | 15   |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                           |     | 3    |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                           |     | 2    |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =30V,V <sub>GS</sub> =10V,I <sub>D</sub> =0.3A                            |     | 0.9  |      | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                           |     | 0.15 |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                           |     | 0.25 |      |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DD</sub> =50V, V <sub>GS</sub> =10V<br>, R <sub>G</sub> =50Ω, I <sub>D</sub> =0.3A |     | 3    |      | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                           |     | 3.8  |      |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                           |     | 10   |      |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                           |     | 30   |      |      |

## Curve Characteristics

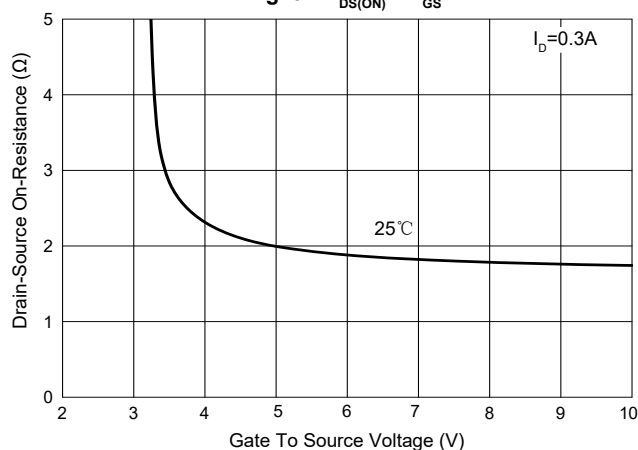
**Fig.1 - Typical Output Characteristics**



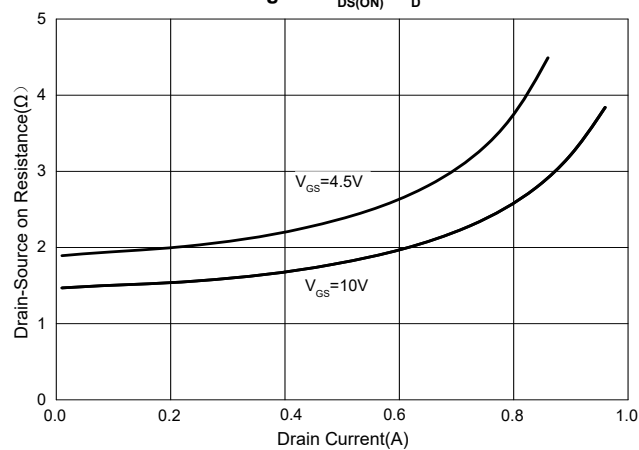
**Fig. 2 - Transfer Characteristics**



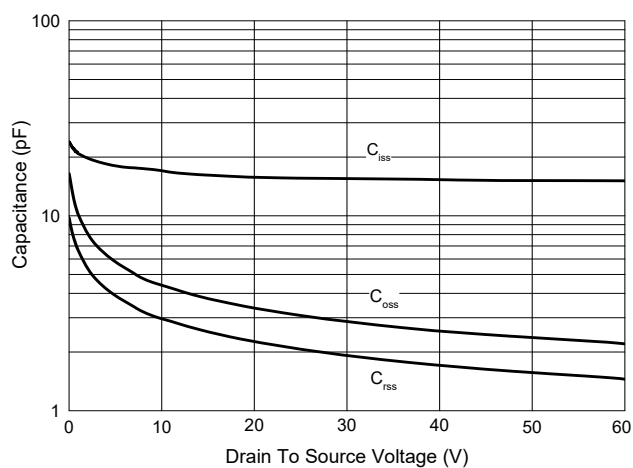
**Fig. 3 -  $R_{DS(ON)}$  —  $V_{GS}$**



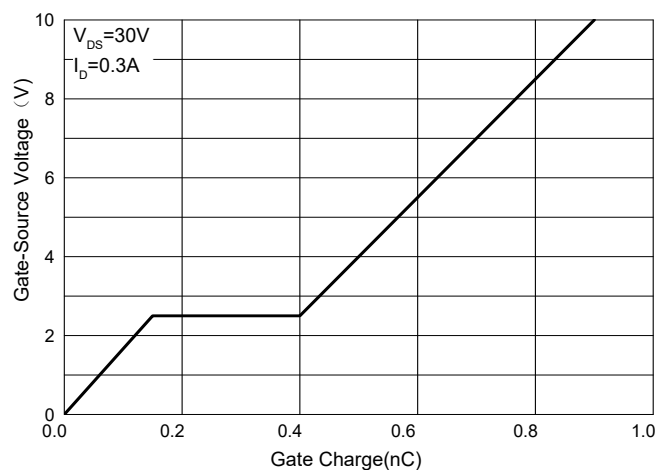
**Fig. 4 -  $R_{DS(ON)}$  —  $I_D$**



**Fig. 5 - Capacitance Characteristics**

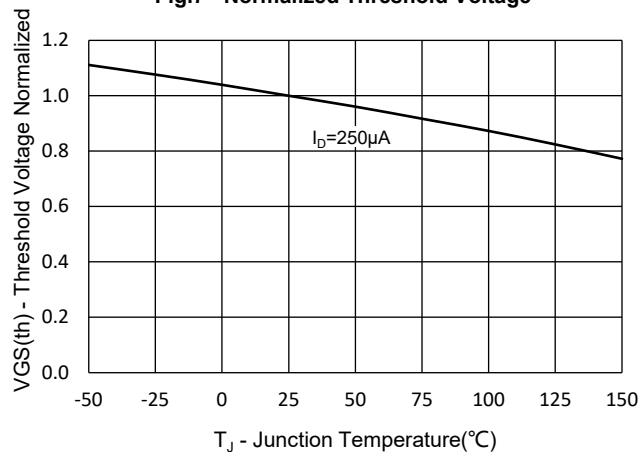


**Fig. 6 - Gate Charge**

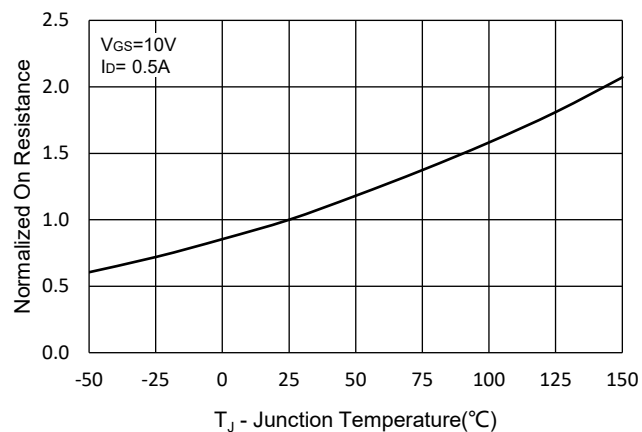


## Curve Characteristics

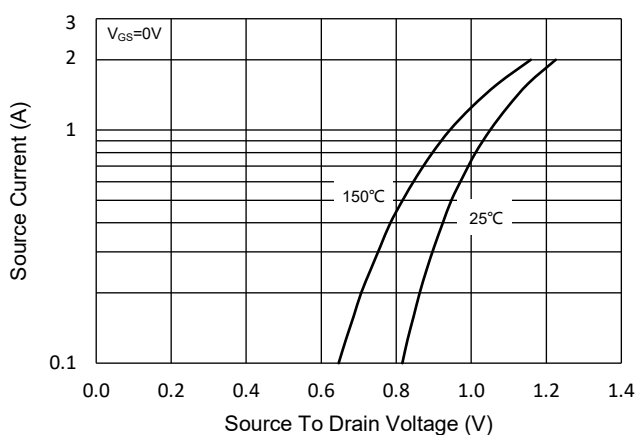
**Fig.7 - Normalized Threshold Voltage**



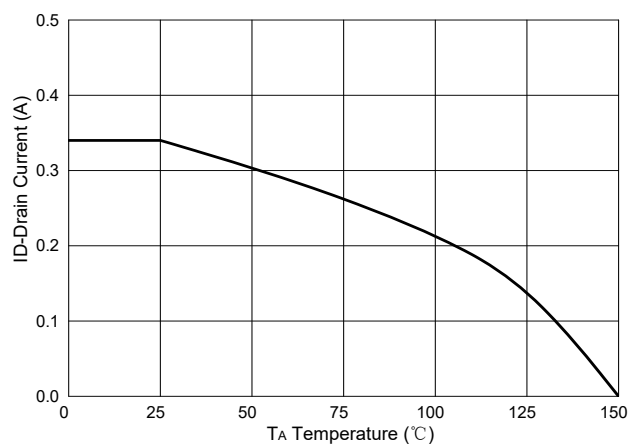
**Fig.8 - Normalized On Resistance Characteristics**



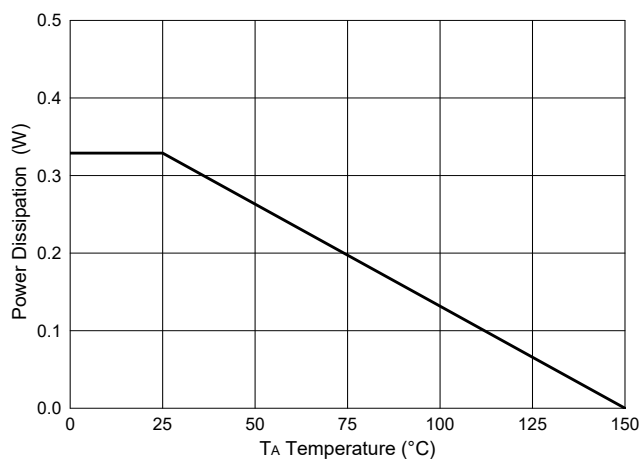
**Fig.9 -  $I_S$  -  $V_{SD}$**



**Fig. 10 - Drain Current**

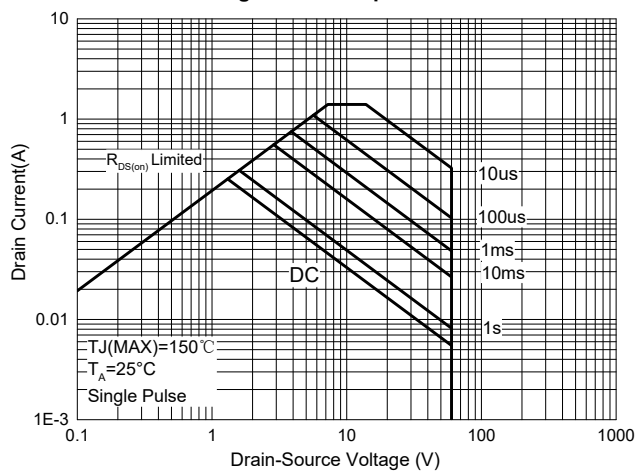


**Fig.11-PD Dissipation**

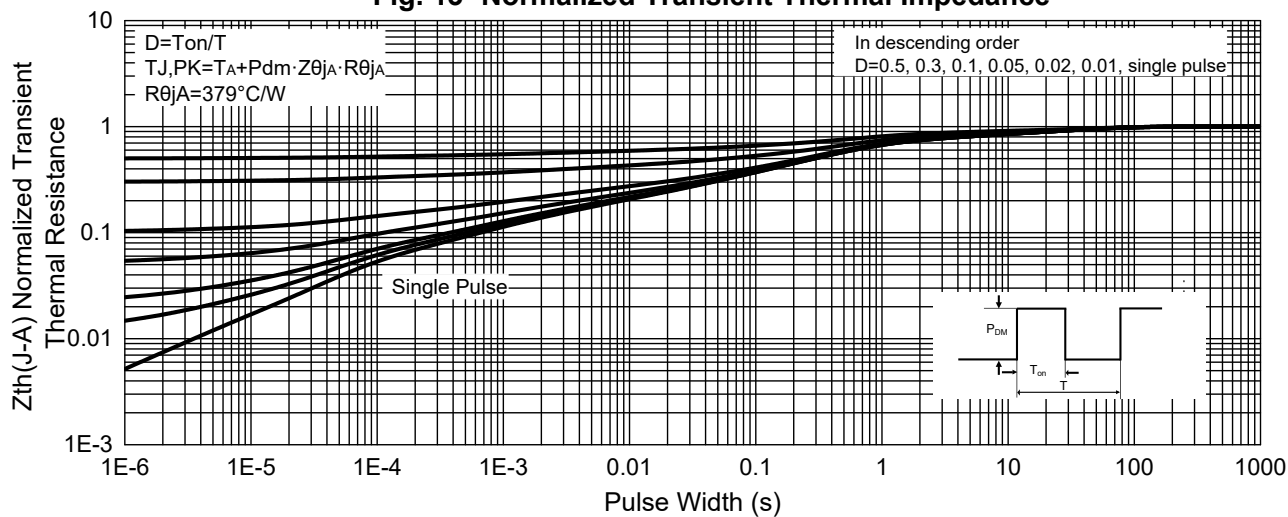


## Curve Characteristics

**Fig. 12 - Safe Operation Area**



**Fig. 13 -Normalized Transient Thermal Impedance**



## Ordering Information

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

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