## Features

- High Dense Cell Design for Extremely Low $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Halogen Free. “Green” Device (Note 1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

# N-CHANNEL MOSFET

## Maximum Ratings

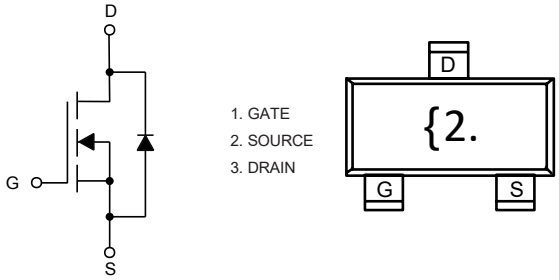
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 100°C/W Junction to Ambient (Note 2)

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 20 | V |
| Gate-Source Volltage | | $V_{GS}$ | ±8 | V |
| Continuous Drain Current | $T_A$=25°C | $I_D$ | 3 | A |
| | $T_A$=100°C | | 1.9 | |
| Pulsed Drain Current (Note 3) | | $I_{DM}$ | 12 | A |
| Total Power Dissipation (Note 4) | | $P_D$ | 1.25 | W |

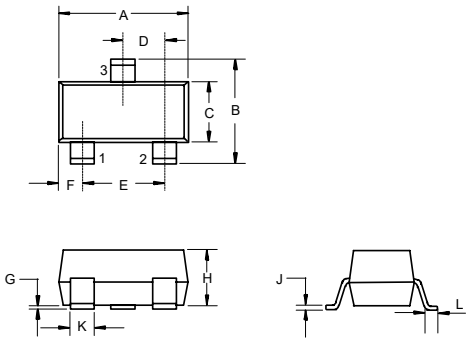
Note:

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$^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25°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

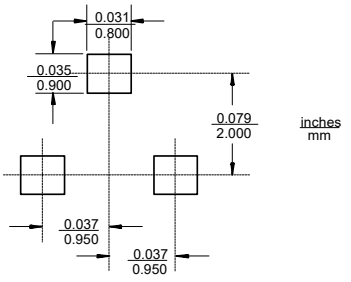



## SOT-23




| 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 | $V_{(BR)DSS}$ | $V_{GS}$=0V, $I_D$=10μA | 20 | | | V |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$ =±8V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=20V, $V_{GS}$=0V | | | 1 | μA |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 0.65 | 0.75 | 1.2 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$=4.5V, $I_D$=3.6A | | 22 | 32 | mΩ |
| | | $V_{GS}$=2.5V, $I_D$=3.1A | | 31 | 47 | |
| Gate Resistance | $R_g$ | f=1 MHz, Open drain | | 4.4 | | Ω |
| Forward Tranconductance | $g_{FS}$ | $V_{DS}$ =5V, $I_D$ =3.6A | | 18 | | S |
| **Diode Characteristics** | | | | | | |
| Continuous Body Diode Current | $I_S$ | | | | 3 | A |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V, $I_S$=4.3A | | | 1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$=3A,di/dt=100A/μs | | 9.6 | | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | | 2.3 | | nC |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=10V,$V_{GS}$=0V,f=1MHz | | 432 | | pF |
| Output Capacitance | $C_{oss}$ | | | 68 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 59 | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=10V,$V_{GS}$=4.5V,$I_D$=3.6A | | 5.5 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 0.7 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 1.5 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$=10V, $V_{GS}$=4.5V, $R_G$=6Ω, $I_D$=3.6A | | 5.3 | | ns |
| Turn-On Rise Time | $t_r$ | | | 14 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 19 | | |
| Turn-Off Fall Time | $t_f$ | | | 7.5 | | |

## Curve Characteristics

**Fig. 1 - Typical Output Characteristics**

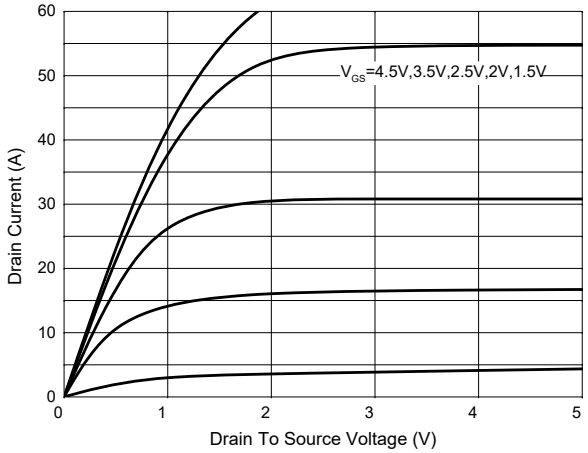



**Fig. 2 - Transfer Characteristics**

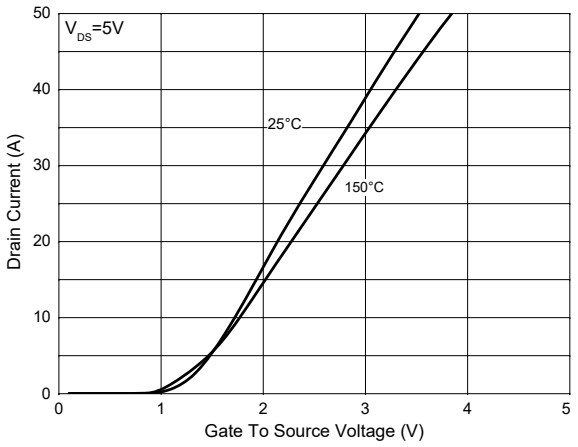



**Fig.3 - $R_{DS(ON)}$ - $V_{GS}$**

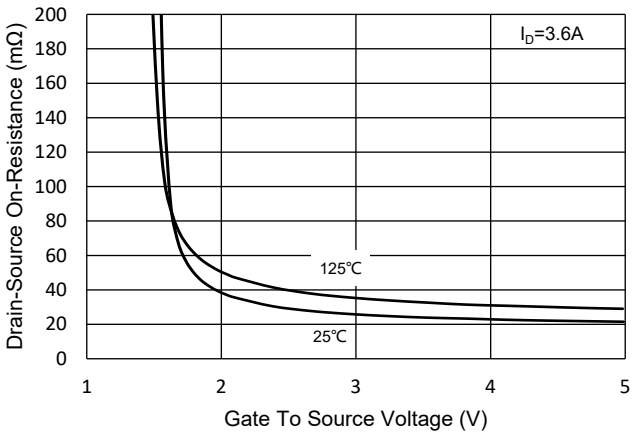



**Fig. 4 - $R_{DS(ON)}$—$I_D$**

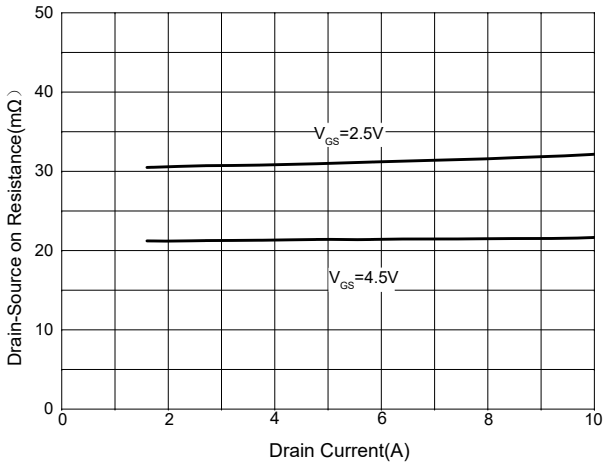



**Fig.5 - Capacitance Characteristics**

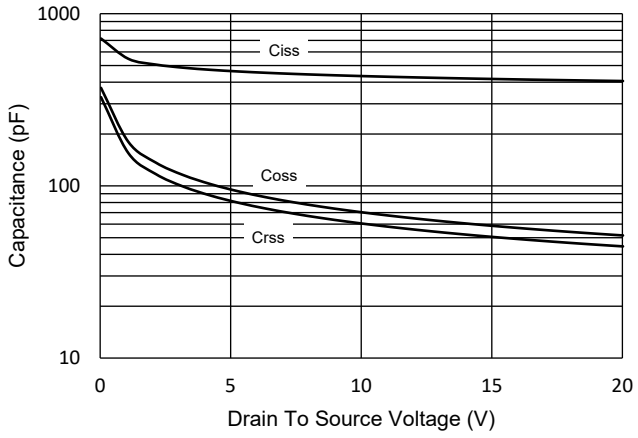
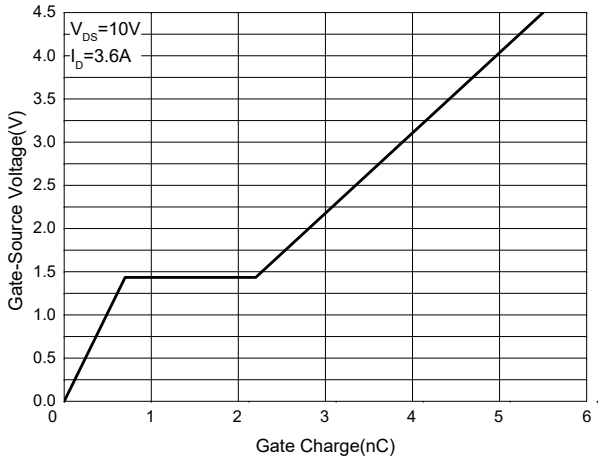



**Fig. 6 - Gate Charge**



## Curve Characteristics

**Fig.7 - Normalized Threshold Voltage**

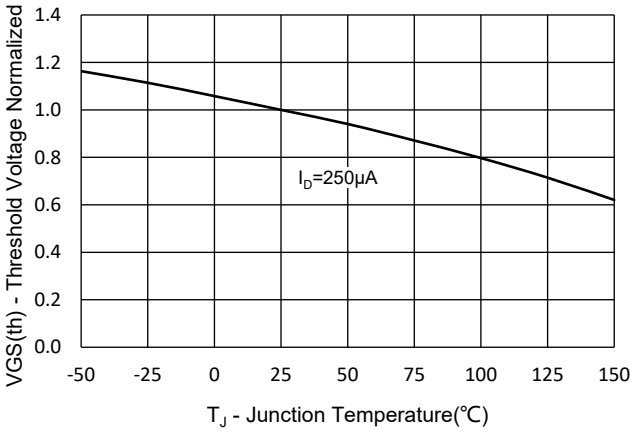



**Fig.8 - Normalized On Resistance Characteristics**

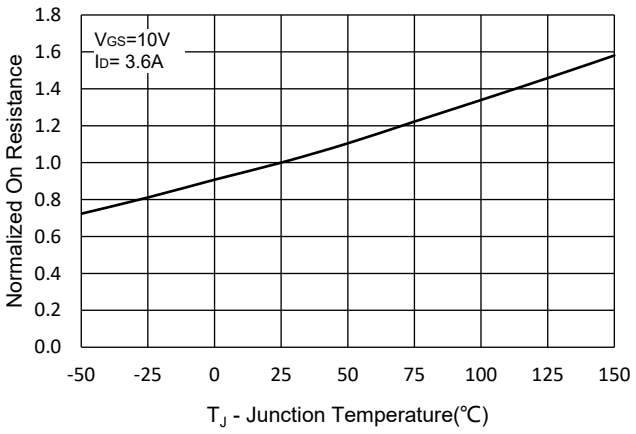



**Fig.9 - $I_S$—$V_{SD}$**

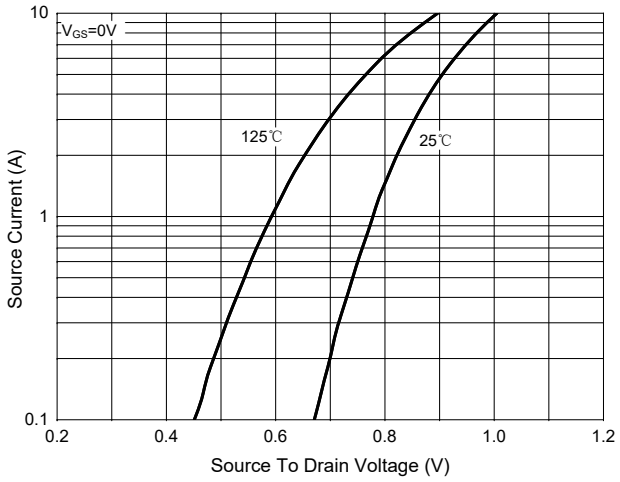



**Fig. 10 - Drain Current**

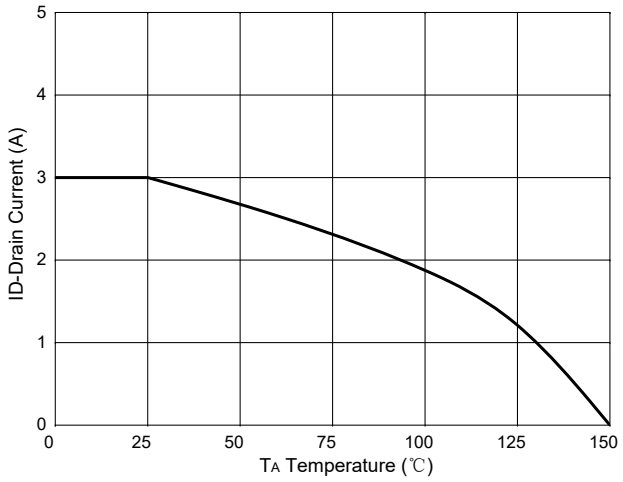
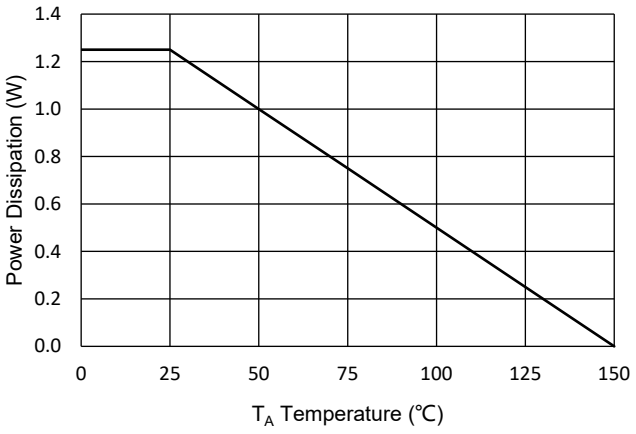



**Fig.11 - PD Dissipation**



## Curve Characteristics

**Fig.12 - Safe Operation Area**

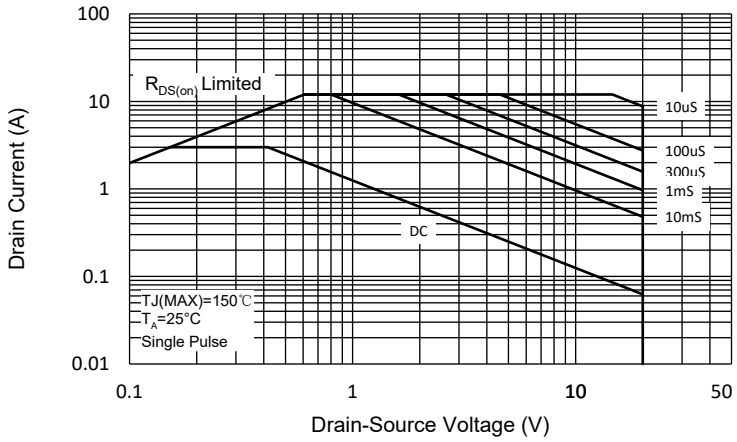
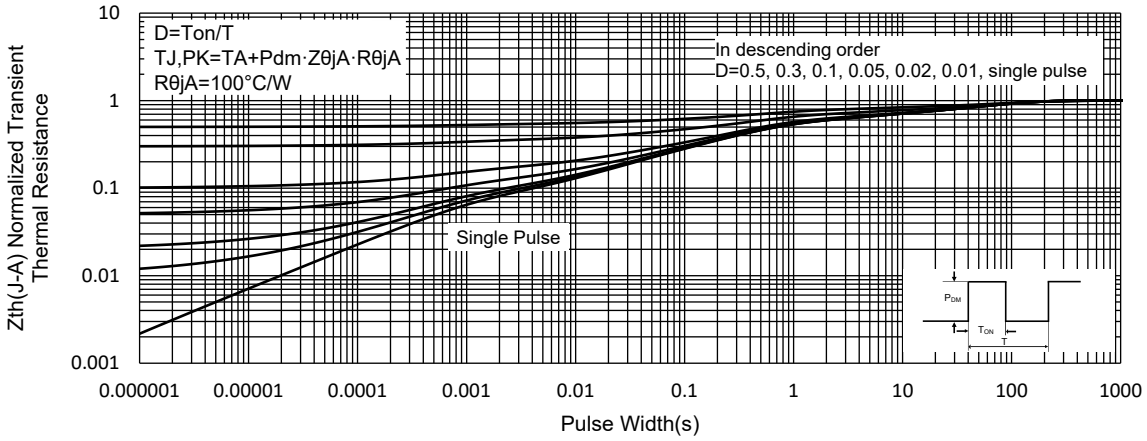



**Fig.13 - Normalized Transient Thermal Impedance**



## Ordering Information

| Device | Packing |
|---|---|
| Part Number-TP | Tape&Reel: 3Kpcs/Reel |
| Part Number-13P | Tape&Reel: 10Kpcs/Reel |

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