## Features

- Split Gate Trench Mosfet Technology
- Excellent Stability and Uniformity
- 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: 40°C/W Junction to Ambient(Note 2)
- Thermal Resistance: 0.9°C/W Junction to Case

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain -Source Voltage | | $V_{DS}$ | 120 | V |
| Gate -Source Volltage | | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $T_C$=25°C | $I_D$ | 90 | A |
| | $T_C$=100°C | | 56 | |
| Drain Current-Pulse(Note 3) | | $I_{DM}$ | 360 | A |
| Power Dissipation(Note 4) | | $P_D$ | 139 | W |
| Single Pulsed Avalanche Energy(Note 5) | | $E_{AS}$ | 400 | mJ |

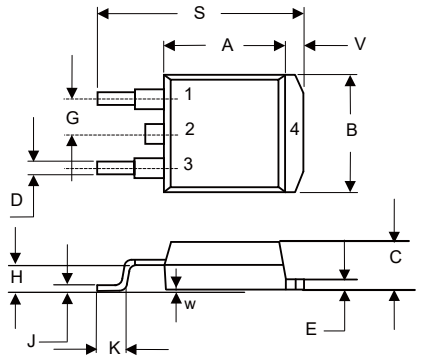
Note:

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 RθJA is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with TA =25°C.
3. Repetitive rating; pulse width limited by max. junction temperature.
4. $P_D$ is based on max. junction temperature, using junction-Case thermal resistance.
5. $T_J$=25℃,$V_{DD}$=50V, $R_G$=25Ω, $V_{GS}$=10V,L=2mH.

## Internal Structure and Marking Code



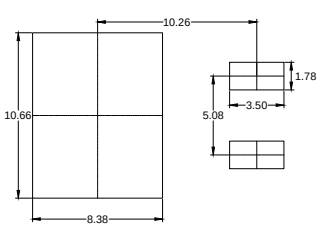

## $D^2$-PAK




| DIMENSIONS | | | | | |
|---|---|---|---|---|---|
| DIM | INCHES | | MM | | NOTE |
| | MIN | MAX | MIN | MAX | |
| A | 0.331 | 0.370 | 8.40 | 9.40 | |
| B | 0.378 | 0.417 | 9.60 | 10.60 | |
| C | 0.165 | 0.189 | 4.20 | 4.80 | |
| D | 0.027 | 0.037 | 0.68 | 0.94 | |
| E | 0.045 | 0.055 | 1.14 | 1.40 | |
| G | 0.10 | | 2.54 | | TYP. |
| H | 0.096 | 0.134 | 2.43 | 3.40 | |
| J | 0.011 | 0.025 | 0.28 | 0.64 | |
| K | 0.071 | 0.131 | 1.80 | 3.32 | |
| S | 0.575 | 0.625 | 14.60 | 15.87 | |
| V | 0.042 | 0.058 | 1.07 | 1.47 | |
| W | 0.000 | 0.010 | 0.00 | 0.25 | |

**Suggested Solder Pad Layout**

Unit:mm



## Electrical Characteristics @ 25°C (Unless Otherwise Noted)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 120 | | | V |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$ =±20V,$V_{DS}$=0V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=120V, $V_{GS}$=0V | | | 1 | uA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 1.0 | 2.0 | 3.0 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=45A | | 7 | 9 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=20A | | 8.5 | 11 | |
| Gate resistance | $R_G$ | $V_{GS}$=0V,f=1MHz | | 0.8 | | Ω |
| **Diode Characteristics** | | | | | | |
| Continuous Body Diode Current | $I_S$ | | | | 90 | A |
| Body Diode Voltage | $V_{SD}$ | $I_{SD}$=20A, $V_{GS}$=0V | | | 1.2 | V |
| Reverse Recovery Charge | $Q_{rr}$ | $I_F$=20A,di/dt=100A/μs | | 176 | | nC |
| Reverse Recovery Time | $t_{rr}$ | | | 85 | | ns |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=60V,$V_{GS}$=0V,f=1MHz | | 4604 | | pF |
| Output Capacitance | $C_{oss}$ | | | 430 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 7.4 | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=60V,$V_{GS}$=10V,$I_D$=20A | | 67.5 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 13.5 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 10 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$=60V,$I_D$=20A, $V_{GS}$=10V,$R_G$=2.2Ω | | 16 | | ns |
| Turn-On Rise Time | $t_r$ | | | 8.7 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 43 | | |
| Turn-Off Fall Time | $t_f$ | | | 11 | | |

## Curve Characteristics

**Fig.1 - Typical Output Characteristics**

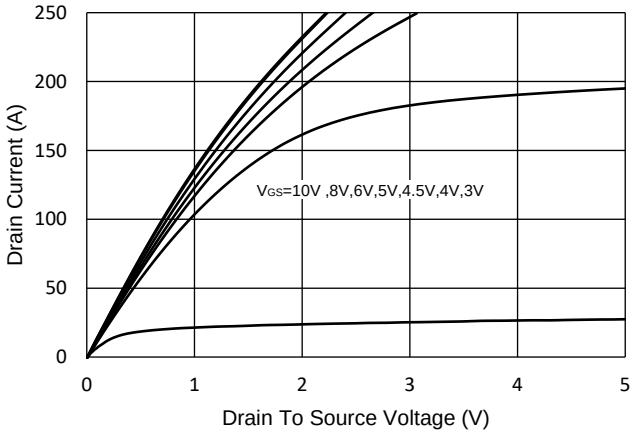



**Fig.2 - Transfer Characteristic**

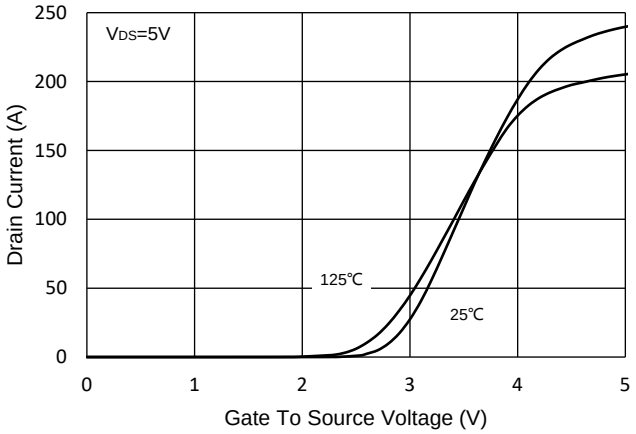



**Fig.3 - $R_{DS(ON)}$ - $V_{GS}$**

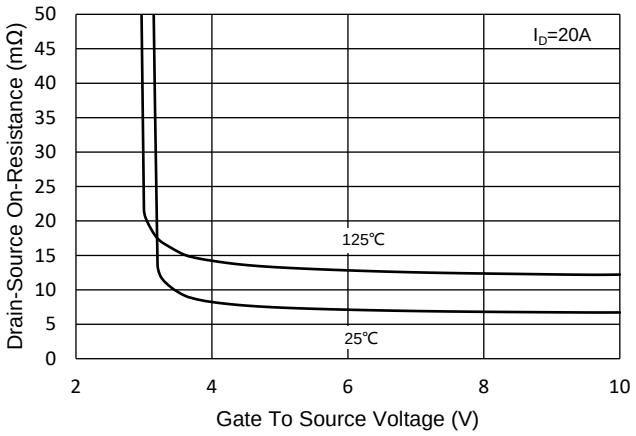



**Fig.4 - $R_{DS(ON)}$ - $I_D$**

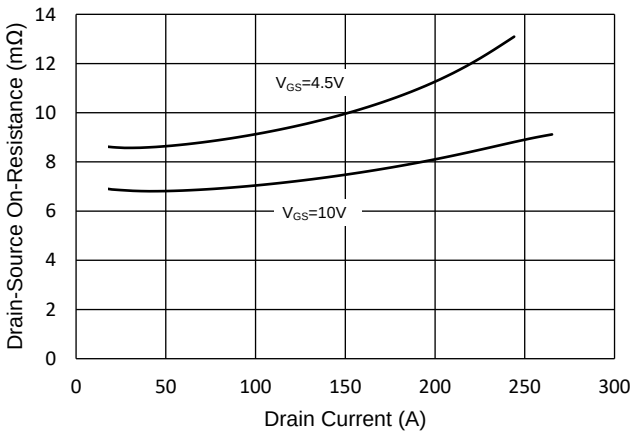



**Fig.5 - Capacitance Characteristics**

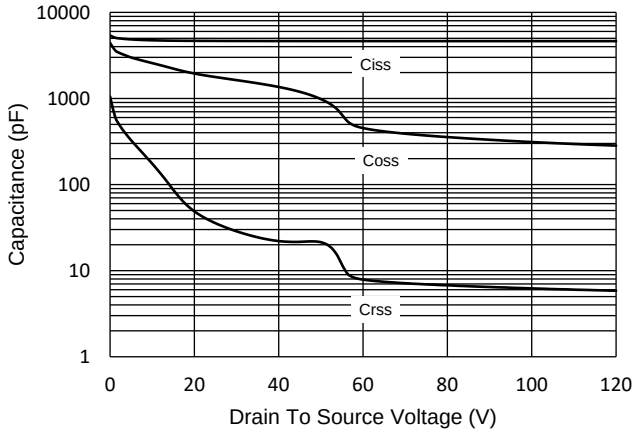
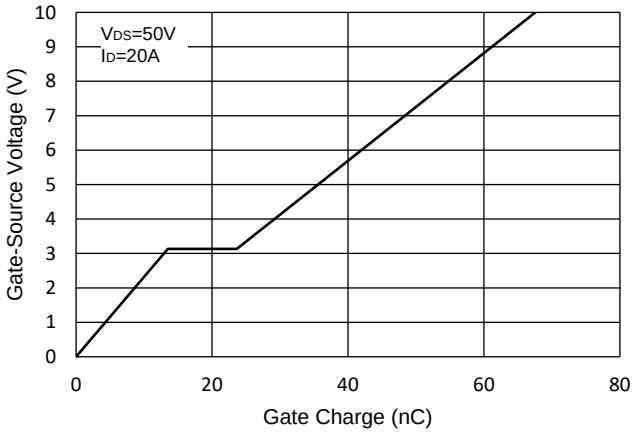



**Fig.6 - Gate Charge**



## Curve Characteristics

**Fig.7 - Normalized Threshold Voltage**

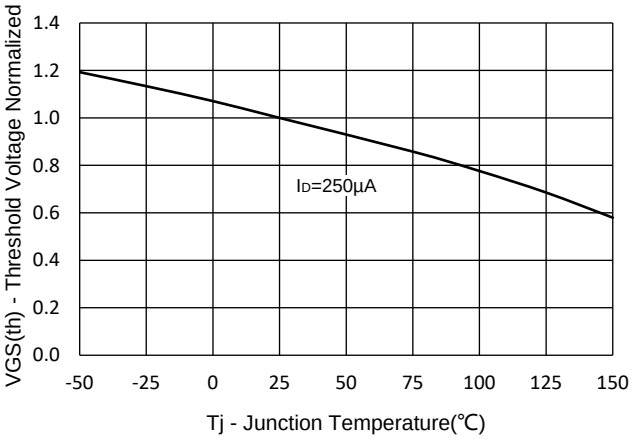



**Fig.8 - Normalized On Resistance Characteristics**

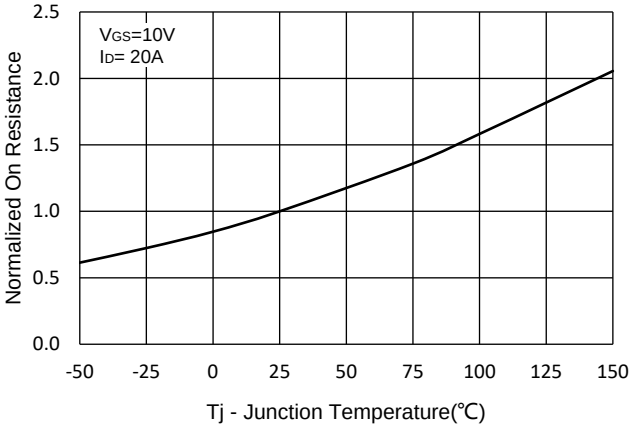



**Fig.9 - $I_S$ - $V_{SD}$**

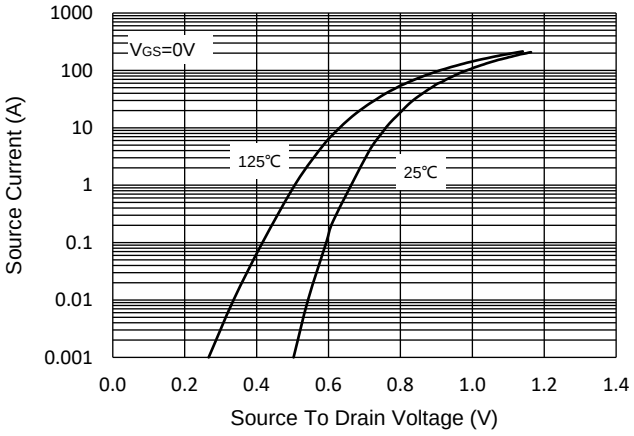



**Fig.10 - Drain Current**

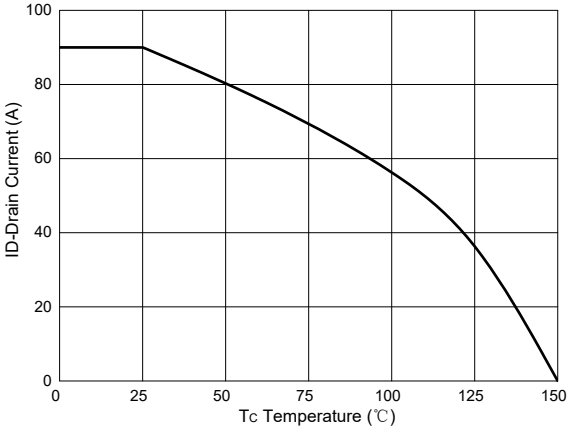
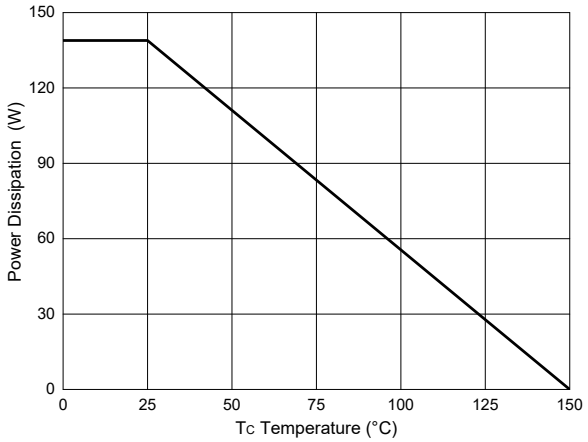



**Fig.11 - PD Dissipation**



## Curve Characteristics

**Fig.12 - Safe Operation Area**

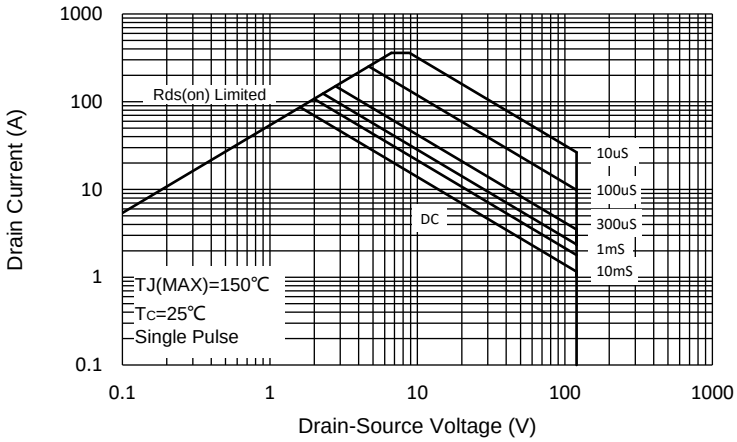
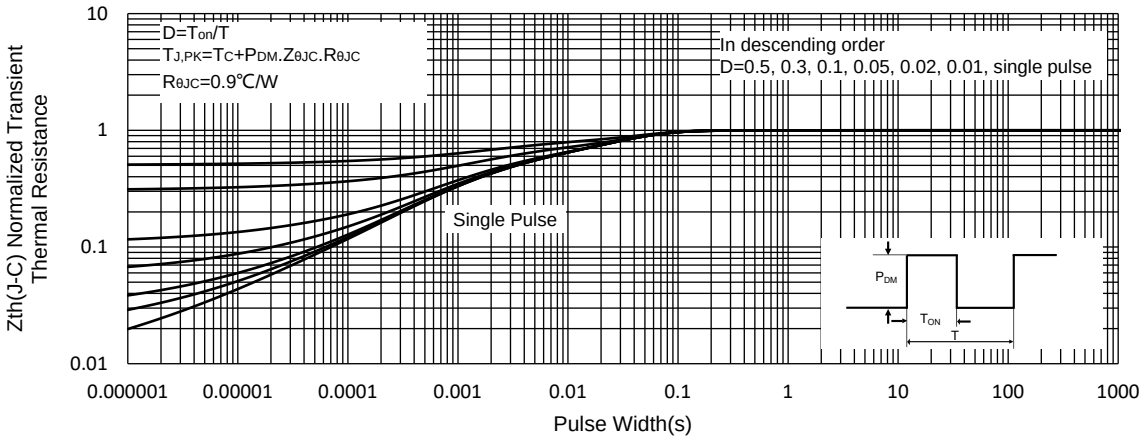



**Fig.13 - Normalized Transient Thermal Impedance**



## Ordering Information

| Device | Packing |
|---|---|
| Part Number-TP | Tape&Reel: 800pcs/Reel |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