

## Features

- Trench Power LV MOSFET Technology
- Moisture Sensitivity Level 1
- High Density Cell Design for Low  $R_{DS(on)}$
- 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)

## Maximum Ratings

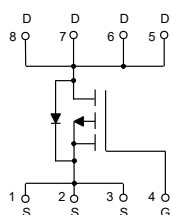
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 60°C/W Junction to Ambient<sup>(Note2)</sup>
- Thermal Resistance: 2.48°C/W Junction to Case

| Parameter                                         | Symbol   | Rating                  | Unit |
|---------------------------------------------------|----------|-------------------------|------|
| Drain-Source Voltage                              | $V_{DS}$ | -30                     | V    |
| Gate-Source Voltage                               | $V_{GS}$ | ±25                     | V    |
| Continuous Drain Current                          | $I_D$    | $T_C=25^\circ\text{C}$  | A    |
|                                                   |          | $T_C=100^\circ\text{C}$ |      |
| Pulsed Drain Current <sup>(Note3)</sup>           | $I_{DM}$ | -300                    | A    |
| Total Power Dissipation <sup>(Note4)</sup>        | $P_D$    | 50                      | W    |
| Single Pulsed Avalanche Energy <sup>(Note5)</sup> | $E_{AS}$ | 566                     | 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  $R_{\theta JA}$  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-case thermal resistance.
5.  $T_J=25^\circ\text{C}$ ,  $V_{DD}=-30\text{V}$ ,  $V_{GS}=-10\text{V}$ ,  $L=2\text{mH}$ .

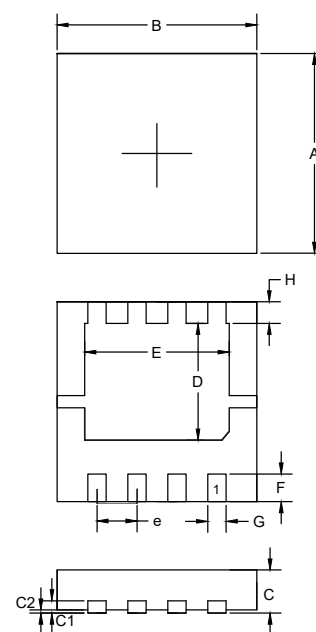
## Internal Structure and Marking Code



4 codes in total  
YY is the year  
WW is the week

## P-CHANNEL MOSFET

### DFN3333



| DIM | INCHES |       | MM   |      | NOTE |
|-----|--------|-------|------|------|------|
|     | MIN    | MAX   | MIN  | MAX  |      |
| A   | 0.126  | 0.130 | 3.20 | 3.30 |      |
| B   | 0.126  | 0.130 | 3.20 | 3.30 |      |
| C   | 0.030  | 0.033 | 0.75 | 0.85 |      |
| C1  | 0.007  | 0.009 | 0.18 | 0.22 |      |
| C2  | ---    | 0.002 | ---  | 0.05 |      |
| D   | 0.071  | 0.079 | 1.80 | 2.00 |      |
| E   | 0.087  | 0.098 | 2.20 | 2.50 |      |
| F   | 0.016  | 0.020 | 0.40 | 0.50 |      |
| G   | 0.010  | 0.014 | 0.25 | 0.35 |      |
| H   | 0.012  | 0.016 | 0.30 | 0.40 |      |
| e   | 0.024  | 0.028 | 0.60 | 0.70 |      |

## 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                                                | -30  |       |      | V    |
| Gate-Source Leakage Current     | I <sub>GSS</sub>     | V <sub>DS</sub> =0V, V <sub>GS</sub> =±25V                                                 |      |       | ±100 | nA   |
| Zero Gate Voltage Drain Current | I <sub>DSS</sub>     | V <sub>DS</sub> =-30V, 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                                  | -1.3 | -1.8  | -2.3 | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =-10V, I <sub>D</sub> =-15A                                                |      | 4.7   | 6.0  | mΩ   |
|                                 |                      | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-10A                                               |      | 7.3   | 10.2 |      |
| Gate Resistance                 | R <sub>g</sub>       | f=1MHz, Open Drain                                                                         |      | 11.8  |      | Ω    |
| Diode Characteristics           |                      |                                                                                            |      |       |      |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                            |      |       | -75  | A    |
| Diode Forward Voltage           | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =-15A                                                  |      |       | -1.2 | V    |
| Reverse Recovery Time           | t <sub>rr</sub>      | I <sub>F</sub> =-15A, dI <sub>F</sub> /dt=100A/μs                                          |      | 36.4  |      | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                            |      | 30    |      | nC   |
| Dynamic Characteristics         |                      |                                                                                            |      |       |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =-15V,V <sub>GS</sub> =0V,f=1MHz                                           |      | 4312  |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                            |      | 773   |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                            |      | 641   |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =-15V,V <sub>GS</sub> =-10V,I <sub>D</sub> =-15A                           |      | 113   |      | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                            |      | 15.2  |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                            |      | 21.5  |      |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>GS</sub> =-10V,V <sub>DD</sub> =-15V, I <sub>D</sub> =-15A,<br>R <sub>GEN</sub> =3Ω |      | 11.3  |      | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                            |      | 49.9  |      |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                            |      | 288.8 |      |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                            |      | 186.4 |      |      |

## Curve Characteristics

Fig. 1 - Typical Output Characteristics

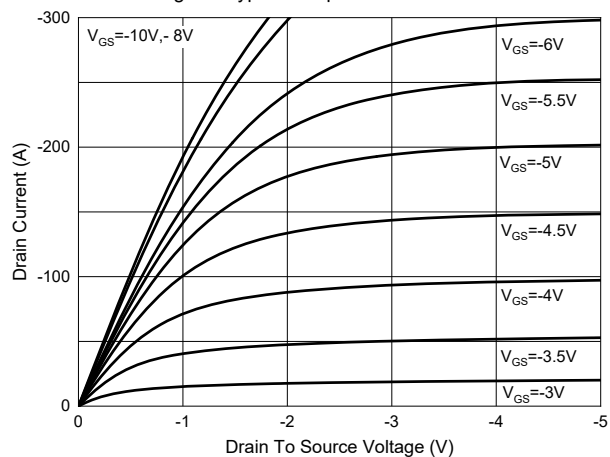


Fig. 2 - Transfer Characteristics

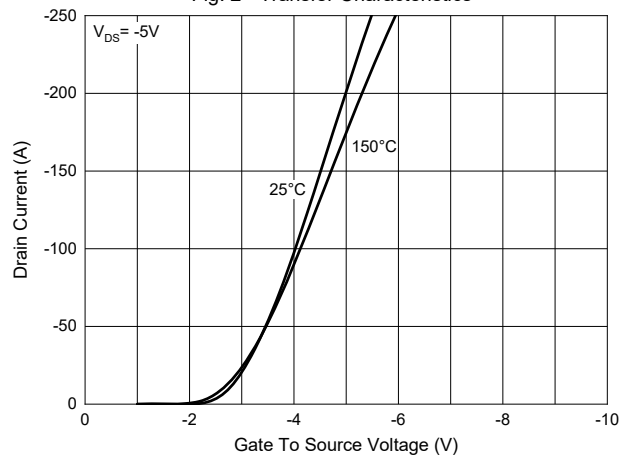


Fig.3- $R_{DS(ON)}-V_{GS}$

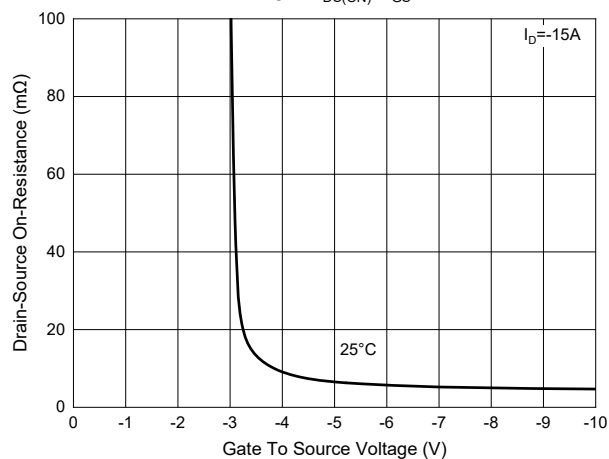


Fig.4- $R_{DS(ON)}-I_D$

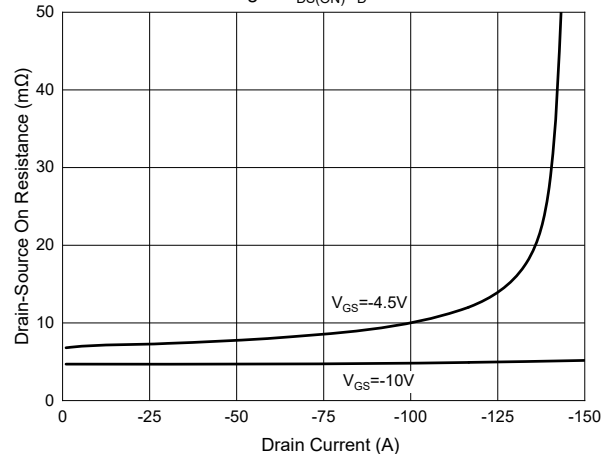


Fig. 5 - Capacitance Characteristics

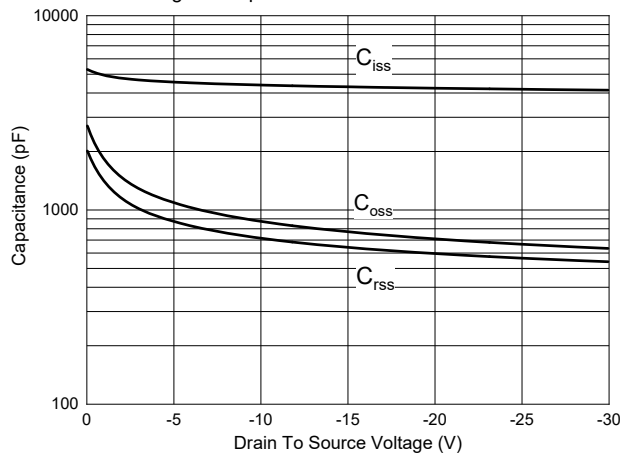
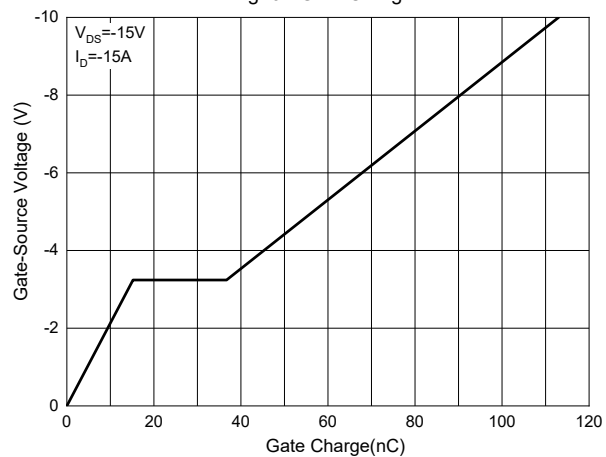


Fig. 6 - Gate Charge



## Curve Characteristics

Fig. 7 - Normalized Threshold Voltage

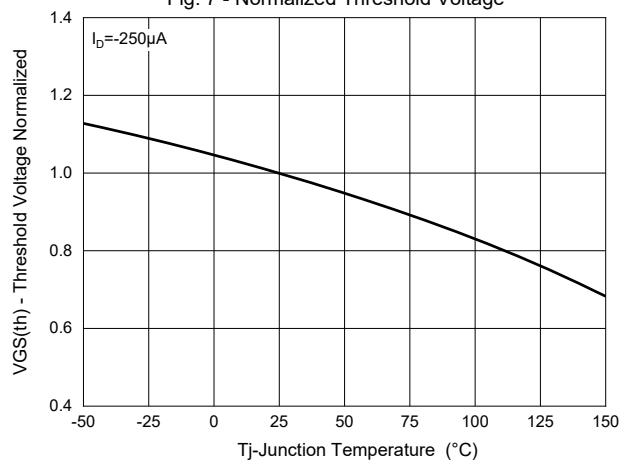


Fig. 8 - Normalized On Resistance Characteristics

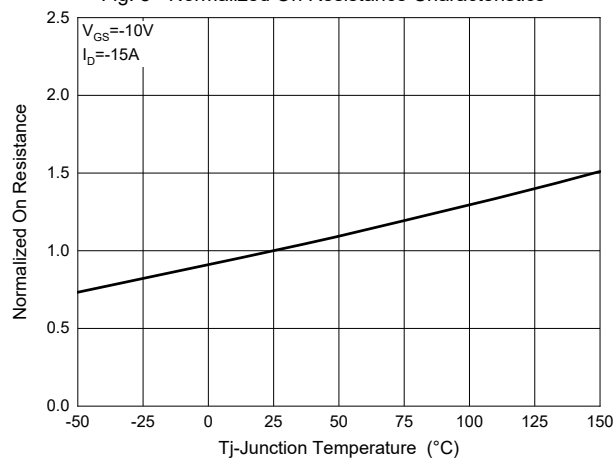


Fig.9- $I_S$ - $V_{SD}$

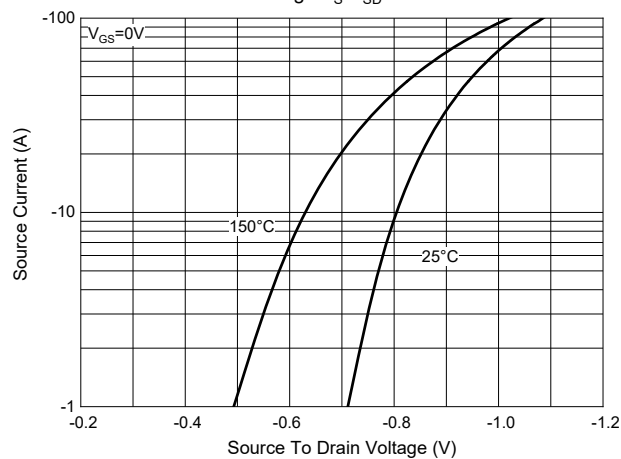


Fig. 10 - Drain Current

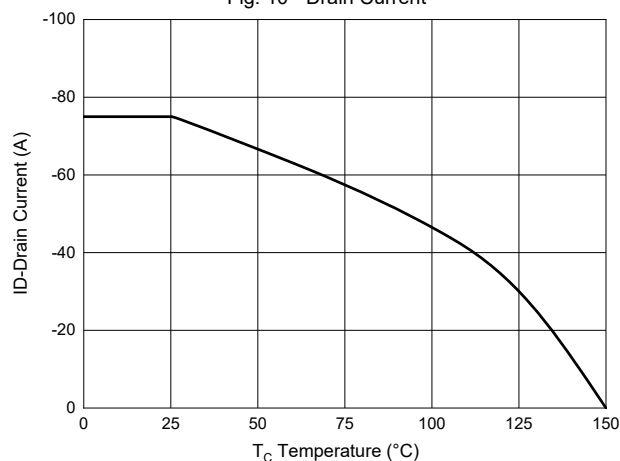
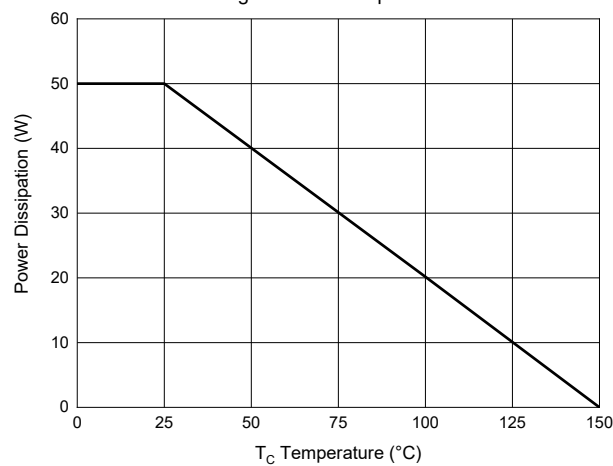


Fig. 11 - PD Dissipation



## Curve Characteristics

Fig. 12 - Safe Operation Area

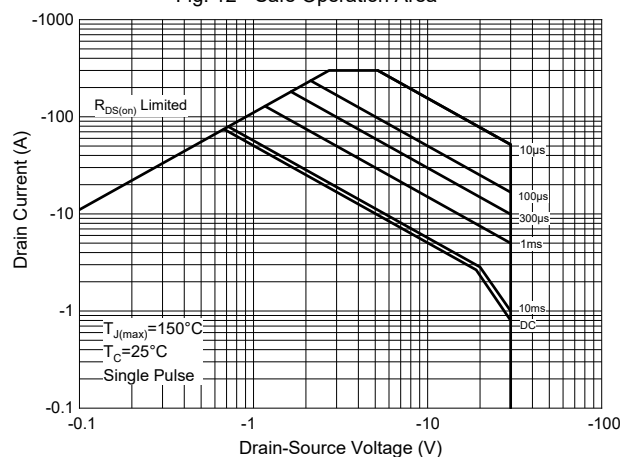
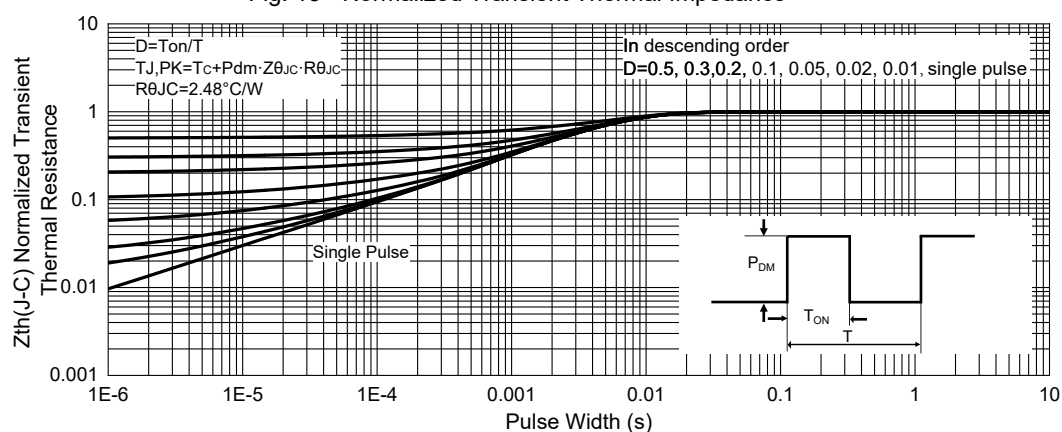


Fig. 13 - Normalized Transient Thermal Impedance



## Ordering Information

| Device         | Packing               |
|----------------|-----------------------|
| Part Number-TP | Tape&Reel: 5Kpcs/Reel |

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