

## Features

- Trench Power LV MOSFET Technology
- Excellent Package For Heat Dissipation
- High Density Cell Design For Low  $R_{DS(on)}$
- Moisture Sensitivity Level 1
- Halogen Free "Green" Device<sup>(Note1)</sup>
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant<sup>(Note2)</sup> ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

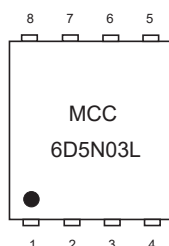
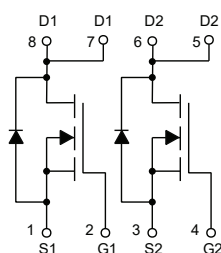
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 50°C/W Junction to Ambient<sup>(Note3)</sup>
- Thermal Resistance: 2.8°C/W Junction to Case

| Parameter                             |                       | Symbol          | Rating | Unit |
|---------------------------------------|-----------------------|-----------------|--------|------|
| Drain-Source Voltage                  |                       | V <sub>DS</sub> | 30     | V    |
| Gate-Source Voltage                   |                       | V <sub>GS</sub> | ±20    | V    |
| Continuous Drain Current              | T <sub>C</sub> =25°C  | I <sub>D</sub>  | 45     | A    |
|                                       | T <sub>C</sub> =100°C |                 | 28     |      |
| Pulsed Drain Current (Note4)          |                       | I <sub>DM</sub> | 180    | A    |
| Total Power Dissipation(Note5)        |                       | P <sub>D</sub>  | 44     | W    |
| Single Pulse Avalanche Energy (Note6) |                       | E <sub>AS</sub> | 144    | mJ   |

Note:

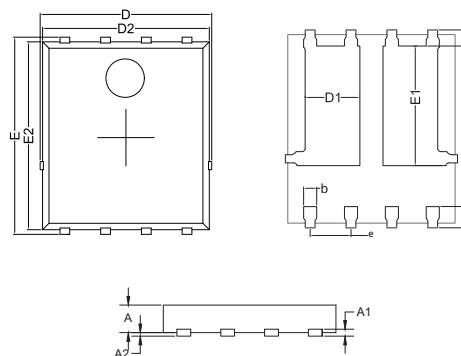
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. High Temperature Solder Exemption Applied, see EU Directive Annex 7a.
3. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$ .
4. Repetitive rating; pulse width limited by max. junction temperature.
5.  $P_D$  is based on max. junction temperature, using junction-case thermal resistance.
6.  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = 25\text{V}$ ,  $V_{GS} = 10\text{V}$ ,  $R_G = 25\Omega$ ,  $L = 1\text{mH}$ .

## Internal Structure and Marking Code



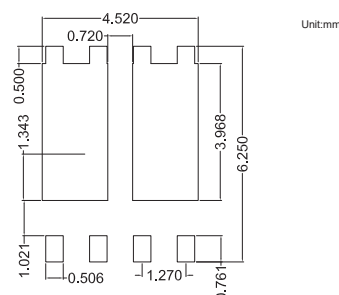
# Dual N-CHANNEL MOSFET

## PDFN5060-8D



| DIM | INCHES |       | MM    |      | NOTE |
|-----|--------|-------|-------|------|------|
|     | MIN    | MAX   | MIN   | MAX  |      |
| D   | 0.203  | 0.218 | 5.15  | 5.55 |      |
| D2  | 0.197  | 0.213 | 5.00  | 5.40 |      |
| E   | 0.234  | 0.250 | 5.95  | 6.35 |      |
| E2  | 0.223  | 0.238 | 5.66  | 6.06 |      |
| A   | 0.039  | 0.047 | 1.00  | 1.20 |      |
| A1  | 0.010  |       | 0.254 |      | BSC  |
| A2  | 0.000  | 0.004 | 0.00  | 0.10 |      |
| D1  | 0.059  | 0.075 | 1.50  | 1.90 |      |
| E1  | 0.139  | 0.154 | 3.52  | 3.92 |      |
| L1  | 0.022  | 0.030 | 0.56  | 0.76 |      |
| L2  | 0.019  |       | 0.50  |      | BSC  |
| b   | 0.012  | 0.020 | 0.31  | 0.51 |      |
| e   | 0.050  |       | 1.27  |      | BSC  |

## 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                                              | 30  |      |      | V    |
| Gate-Source Leakage Current     | I <sub>GSS</sub>     | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                              |     |      | ±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                                | 1.0 | 1.5  | 2.5  | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =22.5A                                             |     | 5    | 6.5  | mΩ   |
|                                 |                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                              |     | 7.4  | 10   |      |
| Gate Resistance                 | R <sub>g</sub>       | f=1MHz, Open drain                                                                      |     | 2    |      | Ω    |
| Diode Characteristics           |                      |                                                                                         |     |      |      |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                         |     |      | 45   | A    |
| Diode Forward Voltage           | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =22.5A                                              |     |      | 1.2  | V    |
| Reverse Recovery Time           | t <sub>rr</sub>      | I <sub>F</sub> =22.5A, dI <sub>F</sub> /dt=100A/μs                                      |     | 11   |      | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                         |     | 0.9  |      | nC   |
| Dynamic Characteristics         |                      |                                                                                         |     |      |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =15V,V <sub>GS</sub> =0V,f=1MHz                                         |     | 1770 |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                         |     | 300  |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                         |     | 280  |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =15V,V <sub>GS</sub> =10V,I <sub>D</sub> =22.5A                         |     | 42   |      | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                         |     | 8    |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                         |     | 10   |      |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DD</sub> =15V,V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =22.5A,R <sub>G</sub> =3Ω |     | 12   |      | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                         |     | 64   |      |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                         |     | 38   |      |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                         |     | 92   |      |      |

## Curve Characteristics

Fig.1 - Typical Output Characteristics

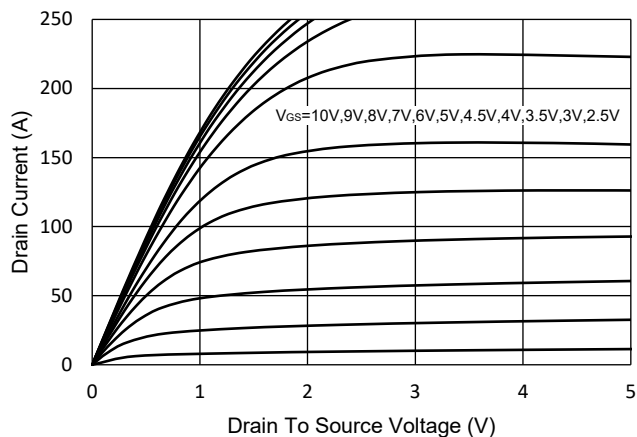


Fig.2 - Transfer Characteristics

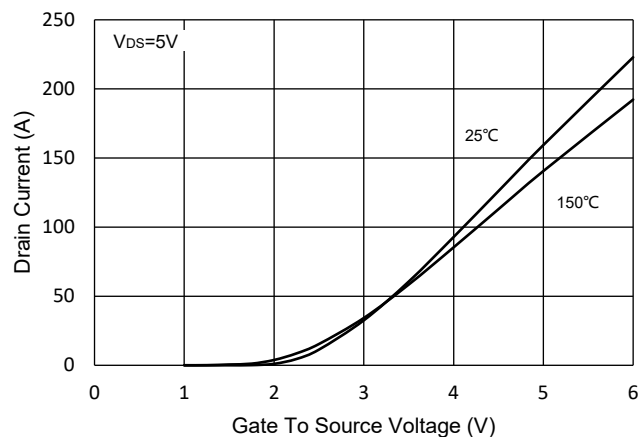


Fig.3 -  $R_{DS(ON)}$  -  $V_{GS}$

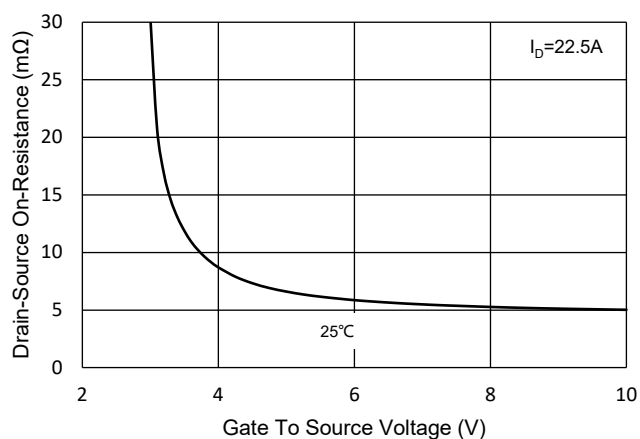


Fig.4 -  $R_{DS(ON)}$  -  $I_D$

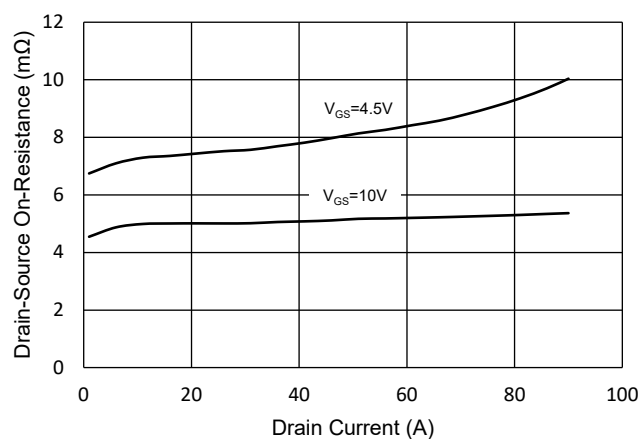


Fig.5 - Capacitance Characteristics

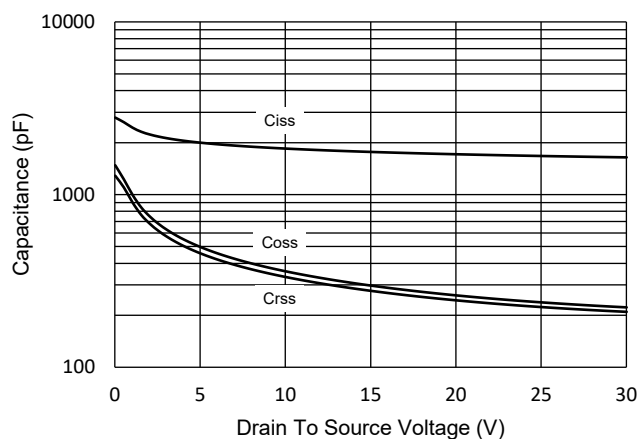
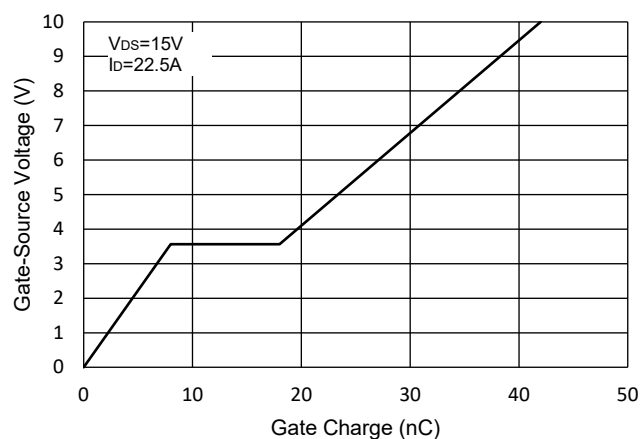
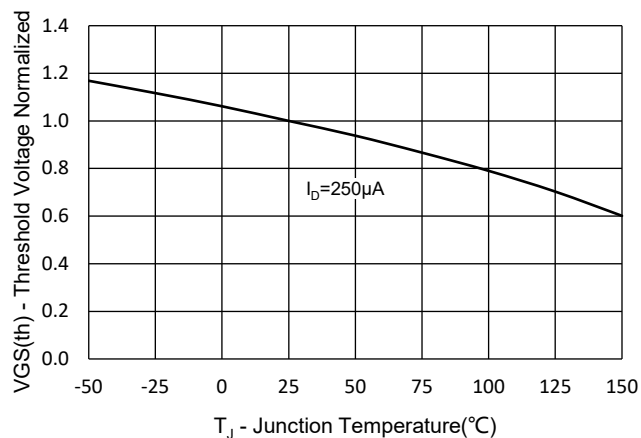


Fig.6 - Gate Charge

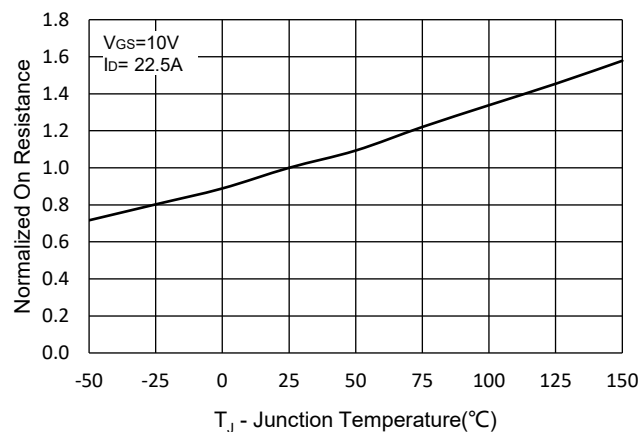


## Curve Characteristics

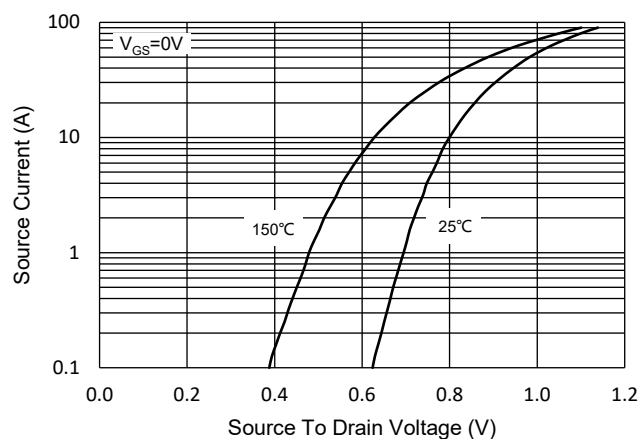
**Fig.7 - Normalized Threshold Voltage**



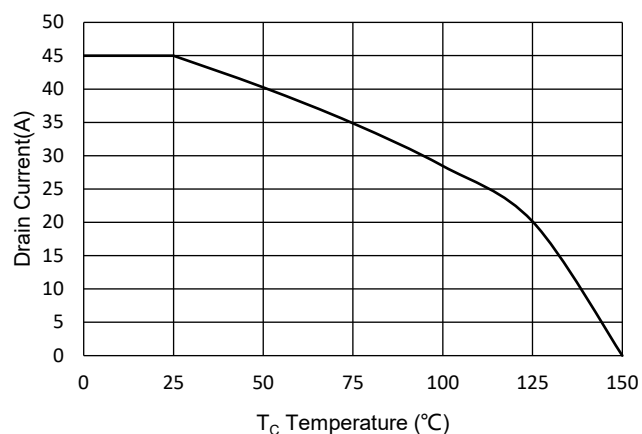
**Fig.8 - Normalized On Resistance Characteristics**



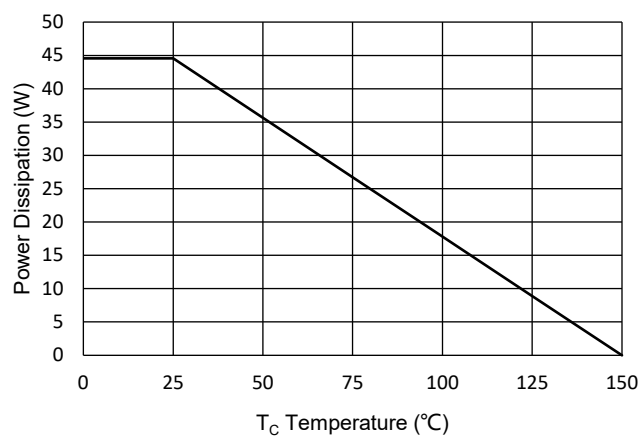
**Fig.9 -  $I_S$  -  $V_{SD}$**



**Fig.10 - Drain Current**



**Fig.11 - PD Dissipation**



## Curve Characteristics

Fig. 12 - Safe Operation Area

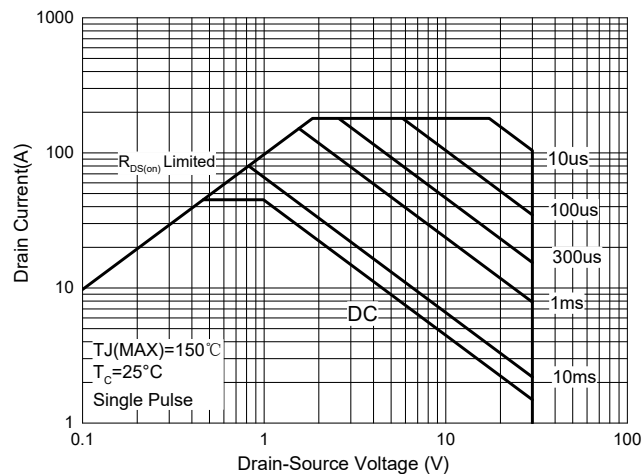
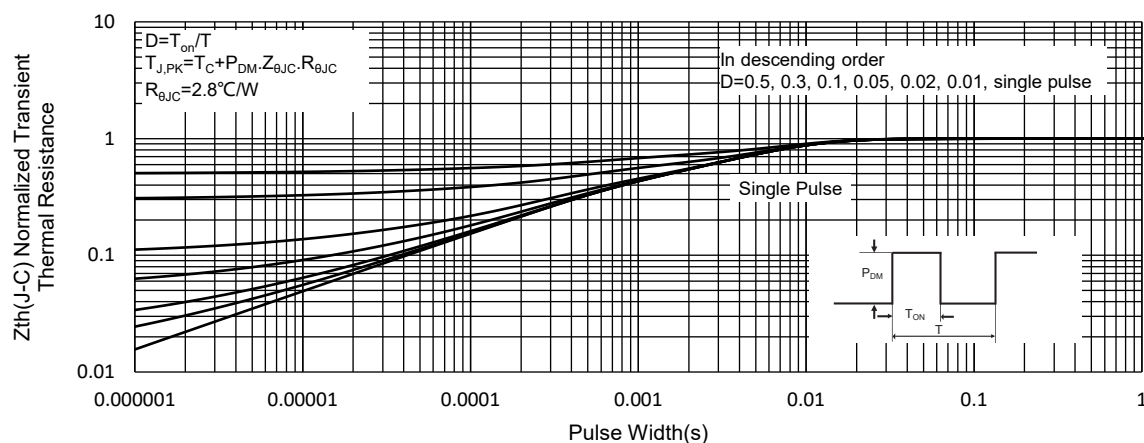


Fig.13 - Normalized Transient Thermal Impedance



## Ordering Information

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

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