

## Features

- AEC-Q101 Qualified
- 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

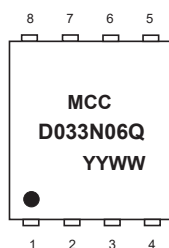
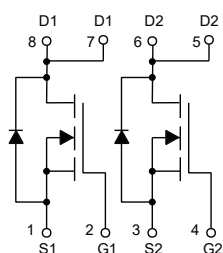
- Operating Junction Temperature Range : -55°C to +175°C
- Storage Temperature Range: -55°C to +175°C
- Thermal Resistance: 60°C/W Junction to Ambient<sup>(Note3)</sup>
- Thermal Resistance: 2.4°C/W Junction to Case

| Parameter                                        |                         | Symbol   | Rating | Unit |
|--------------------------------------------------|-------------------------|----------|--------|------|
| Drain-Source Voltage                             |                         | $V_{DS}$ | 60     | V    |
| Gate-Source Voltage                              |                         | $V_{GS}$ | ±20    | V    |
| Continuous Drain Current                         | $T_C=25^\circ\text{C}$  | $I_D$    | 22     | A    |
|                                                  | $T_C=100^\circ\text{C}$ |          | 15     |      |
| Pulsed Drain Current <sup>(Note4)</sup>          |                         | $I_{DM}$ | 88     | A    |
| Total Power Dissipation <sup>(Note5)</sup>       |                         | $P_D$    | 62     | W    |
| Single Pulse Avalanche Energy <sup>(Note6)</sup> |                         | $E_{AS}$ | 30     | 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.  $T_J=25^\circ\text{C}$ ,  $V_{DD}=30\text{V}$ ,  $V_{GS}=10\text{V}$ ,  $R_G=25\Omega$ ,  $L=0.5\text{mH}$ .

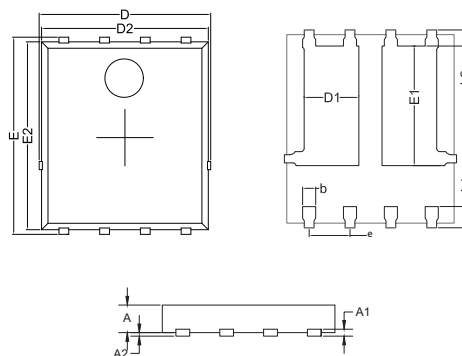
## Internal Structure and Marking Code



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

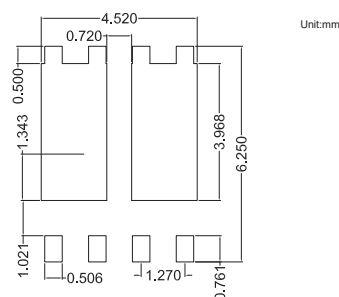
# Dual N-CHANNEL MOSFET

## 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                                               | 60  |      |      | 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> =60V, 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                                 | 1.5 | 2.0  | 2.5  | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                                |     | 25   | 33   | mΩ   |
|                                 |                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A                                               |     | 38   | 55   |      |
| Gate Resistance                 | R <sub>g</sub>       | f=1MHz, Open drain                                                                       |     | 1.7  |      | Ω    |
| Diode Characteristics           |                      |                                                                                          |     |      |      |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                          |     |      | 22   | 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> =10A, dI <sub>F</sub> /dt=360A/μs                                         |     | 19.4 |      | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                          |     | 50   |      | nC   |
| Dynamic Characteristics         |                      |                                                                                          |     |      |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz                                        |     | 940  |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                          |     | 100  |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                          |     | 73   |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =10A                          |     | 17.2 |      | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                          |     | 3.3  |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                          |     | 4.5  |      |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, I <sub>DS</sub> =10A, R <sub>GEN</sub> =2.2Ω |     | 7.4  |      | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                          |     | 38.5 |      |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                          |     | 19.3 |      |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                          |     | 3    |      |      |

## Curve Characteristics

Fig.1 - Typical Output Characteristics

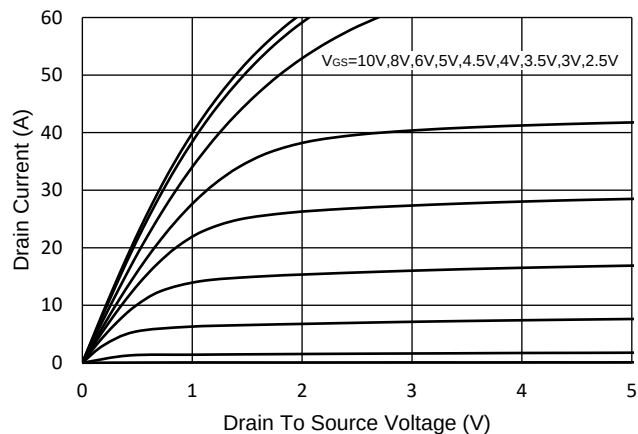


Fig.2 - Transfer Characteristics

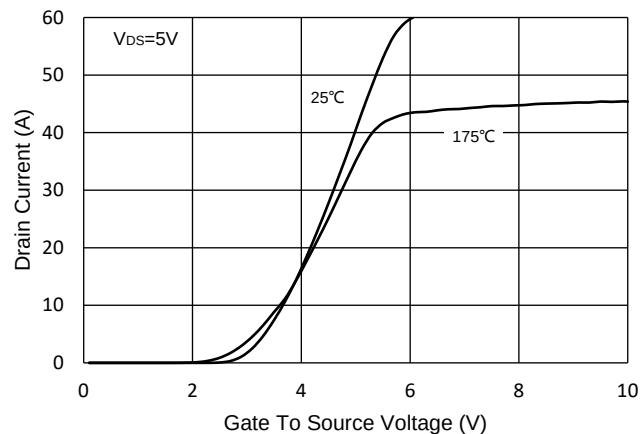


Fig.3 -  $R_{DS(ON)}$  -  $V_{GS}$

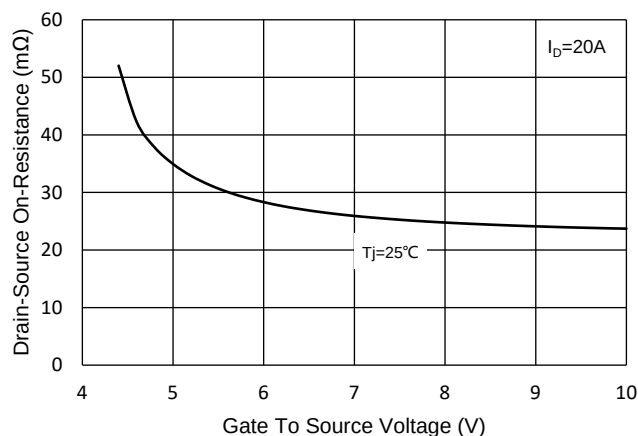


Fig.4 -  $R_{DS(ON)}$  -  $I_D$

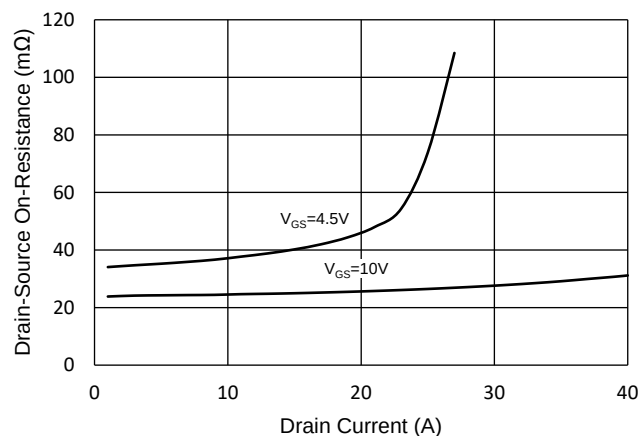


Fig. 5 - Capacitance Characteristics

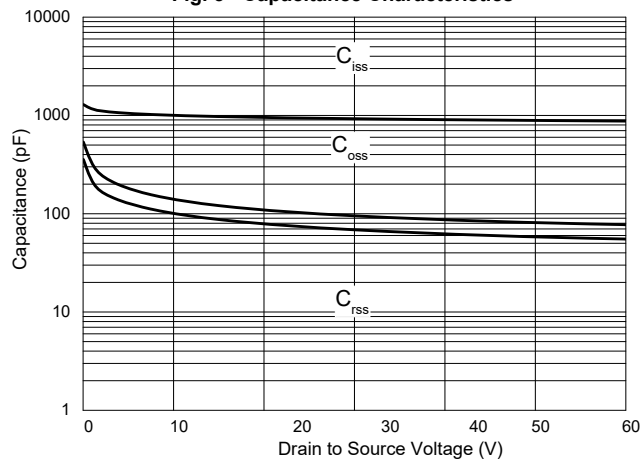
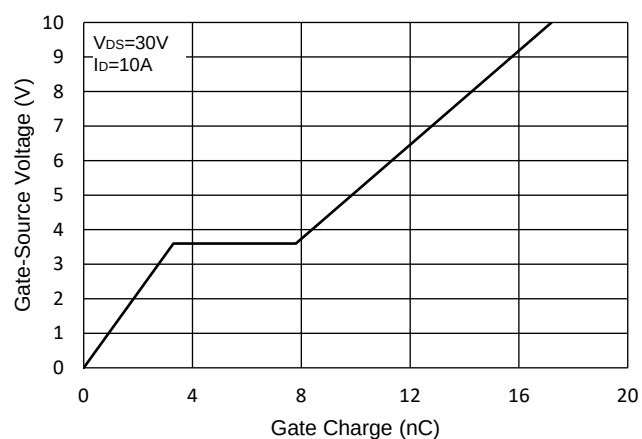


Fig.6 - Gate Charge



## Curve Characteristics

Fig.7 - Normalized Threshold Voltage

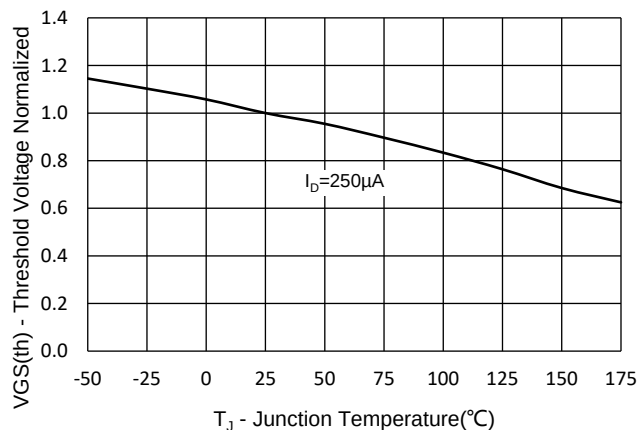


Fig.8 - Normalized On Resistance Characteristics

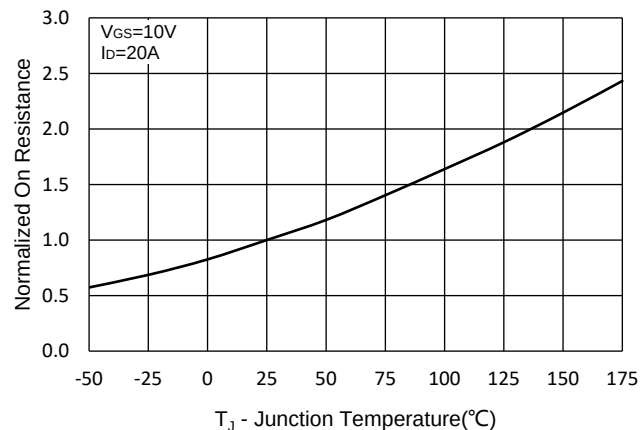


Fig.9 -  $I_S - V_{SD}$

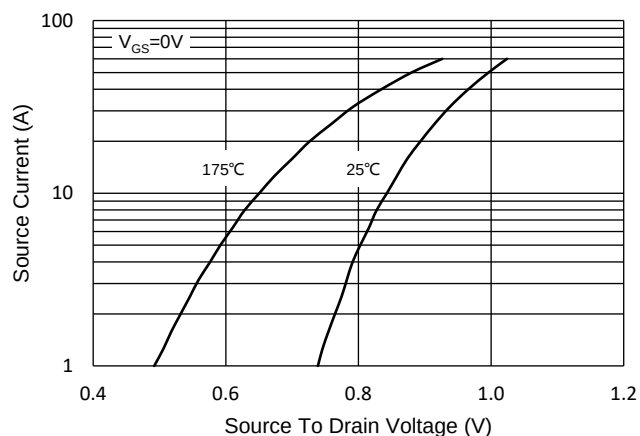


Fig.10 - Drain Current

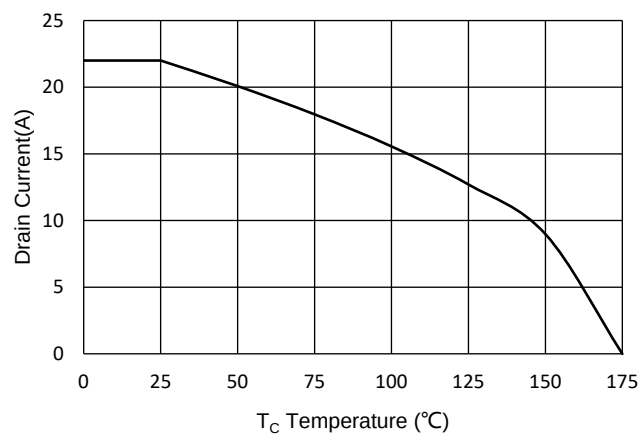
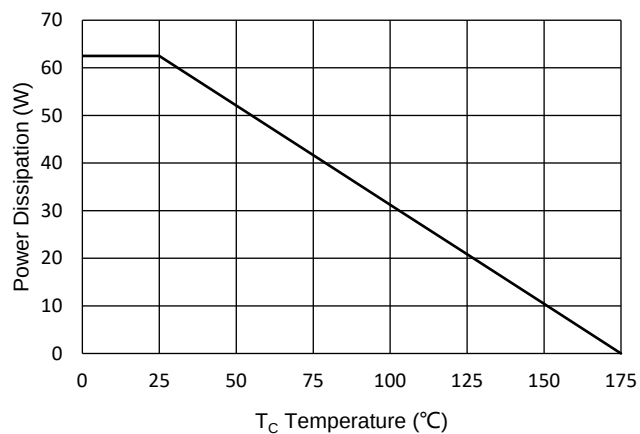


Fig.11 - PD Dissipation



## Curve Characteristics

Fig.12 - Safe Operation Area

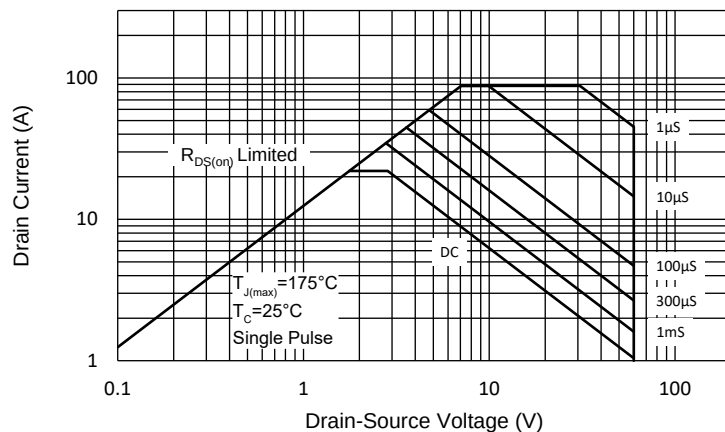
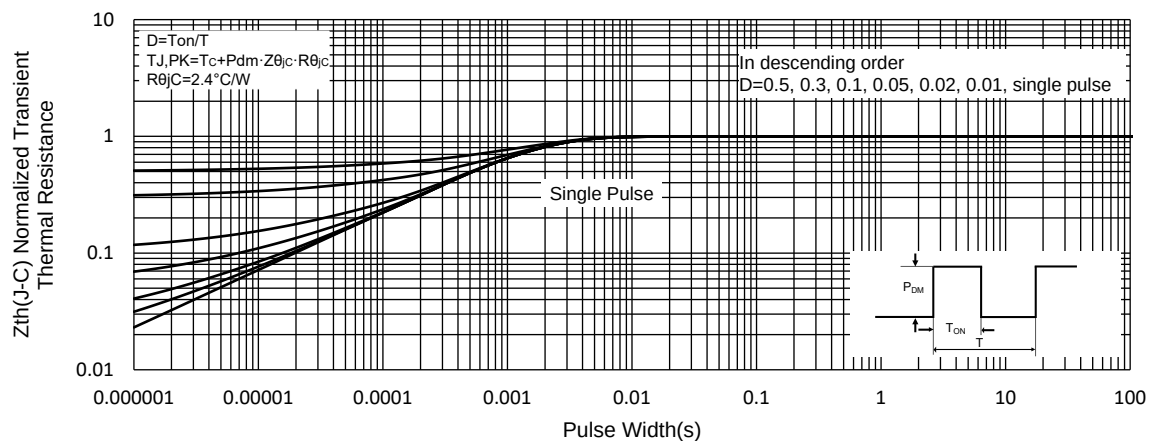


Fig.13 - Normalized Transient Thermal Impedance



# Ordering Information

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

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