

## Features

- Split Gate Trench MOSFET Technology
- High Density Cell Design For Ultra 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 ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

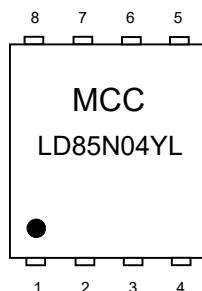
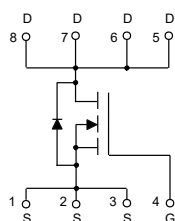
- Operating Junction Temperature Range: -55°C to +175°C
- Storage Temperature Range: -55°C to +175°C
- Thermal Resistance: 50°C/W Junction to Ambient<sup>(1)</sup>
- Thermal Resistance: 1.1°C/W Junction to Case

| Parameter                                          | Symbol                  | Rating | Unit |
|----------------------------------------------------|-------------------------|--------|------|
| Drain-Source Voltage                               | $V_{DS}$                | 40     | V    |
| Gate-Source Voltage                                | $V_{GS}$                | ±20    | V    |
| Continuous Drain Current                           | $T_C=25^\circ\text{C}$  | 300    | A    |
|                                                    | $T_C=100^\circ\text{C}$ | 212    |      |
| Pulsed Drain Current <sup>(Note 3)</sup>           | $I_{DM}$                | 1200   | A    |
| Total Power Dissipation <sup>(Note 4)</sup>        | $P_D$                   | 136    | W    |
| Single Pulsed Avalanche Energy <sup>(Note 5)</sup> | $E_{AS}$                | 1250   | mJ   |

Note:

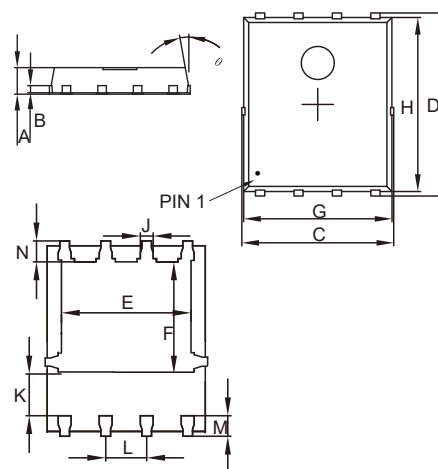
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{\theta JA} \leq 10\text{s}$  and the maximum allowed junction temperature of 175°C. The value in any given application depends on the user's specific board design.
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.  $T_J=25^\circ\text{C}$ ,  $V_{DD}=40\text{V}$ ,  $V_{GS}=10\text{V}$ ,  $R_G=25\Omega$ ,  $L=4\text{mH}$ .

## Internal Structure and Marking Code



## N-Channel MOSFET

### DFN5060



| DIM | INCHES |       | MM    |      | NOTE |
|-----|--------|-------|-------|------|------|
|     | MIN    | MAX   | MIN   | MAX  |      |
| A   | 0.031  | 0.047 | 0.80  | 1.20 |      |
| B   | 0.010  |       | 0.254 |      | TYP. |
| C   | 0.203  | 0.219 | 5.15  | 5.55 |      |
| D   | 0.232  | 0.250 | 5.90  | 6.35 |      |
| E   | 0.148  | 0.167 | 3.75  | 4.25 |      |
| F   | 0.126  | 0.154 | 3.20  | 3.92 |      |
| G   | 0.189  | 0.213 | 4.80  | 5.40 |      |
| H   | 0.222  | 0.239 | 5.65  | 6.06 |      |
| K   | 0.045  | 0.059 | 1.15  | 1.50 |      |
| J   | 0.012  | 0.020 | 0.30  | 0.50 |      |
| L   | 0.046  | 0.054 | 1.17  | 1.37 |      |
| M   | 0.012  | 0.028 | 0.30  | 0.71 |      |
| N   | 0.016  | 0.028 | 0.40  | 0.71 |      |

**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> =1mA                                            | 40  |      |      | 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> =40V, 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   | 1.5  | 2.5  | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                           |     | 0.65 | 0.85 | mΩ   |
|                                 |                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                          |     | 1    | 1.4  |      |
| Gate Resistance                 | R <sub>g</sub>       | f=1 MHz, Open drain                                                                 |     | 2    |      | Ω    |
| Diode Characteristics           |                      |                                                                                     |     |      |      |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                     |     |      | 300  | A    |
| Diode Forward Voltage           | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =50A                                            |     |      | 1.2  | V    |
| Reverse Recovery Time           | t <sub>rr</sub>      | I <sub>F</sub> =50A, dI/dt=100A/μs                                                  |     | 69   |      | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                     |     | 94   |      | nC   |
| Dynamic Characteristics         |                      |                                                                                     |     |      |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz                                   |     | 6125 |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                     |     | 3250 |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                     |     | 150  |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =50A                     |     | 101  |      | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                     |     | 21   |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                     |     | 21   |      |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DD</sub> =20V, V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω, I <sub>D</sub> =50A |     | 16   |      | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                     |     | 44   |      |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                     |     | 71   |      |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                     |     | 45   |      |      |

## Curve Characteristics

Fig.1 - Typical Output Characteristics

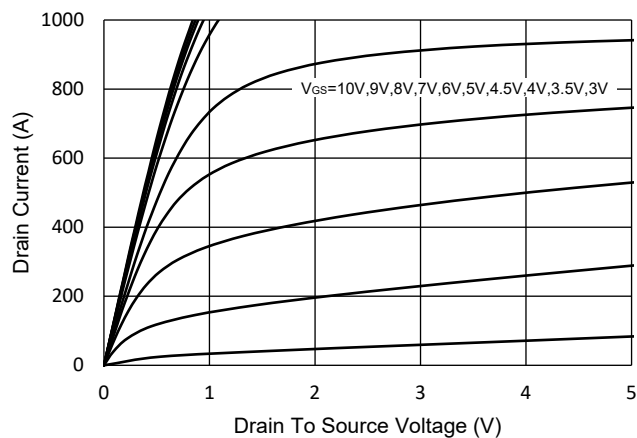


Fig.2 - Transfer Characteristics

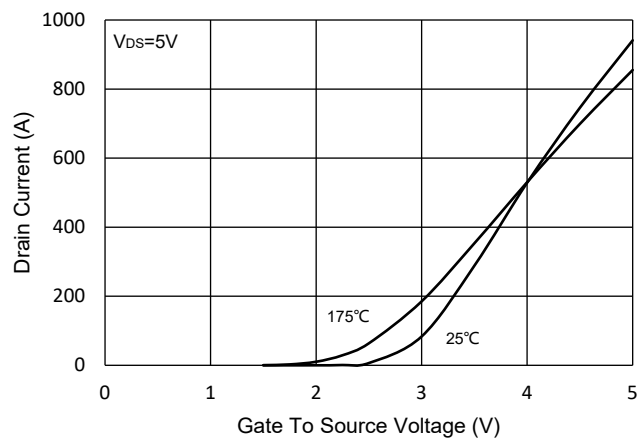


Fig.3 -  $R_{DS(ON)} - V_{GS}$

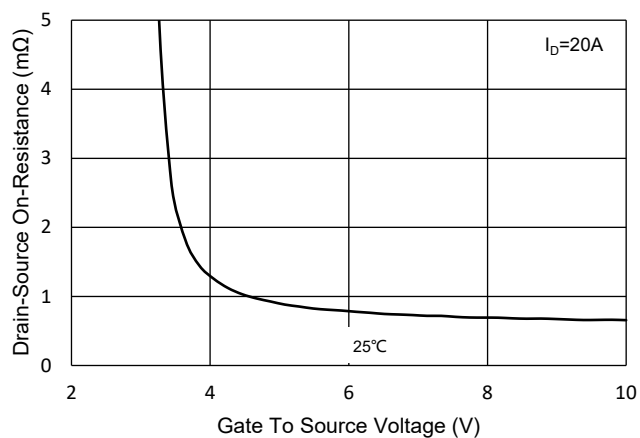


Fig.4 -  $R_{DS(ON)} - I_D$

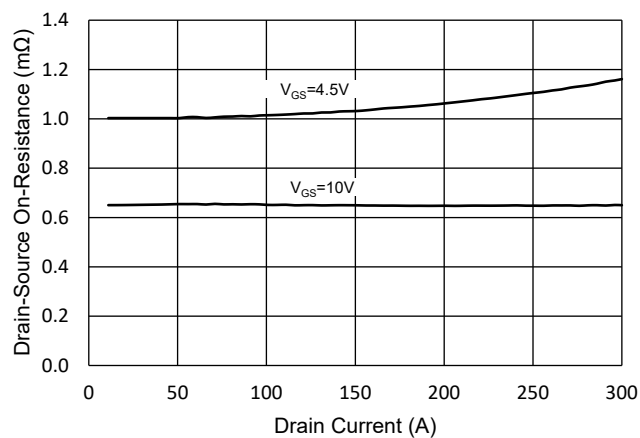


Fig.5 - Capacitance Characteristics

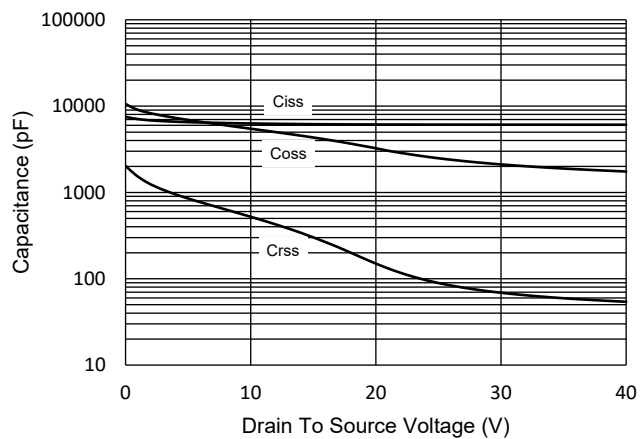
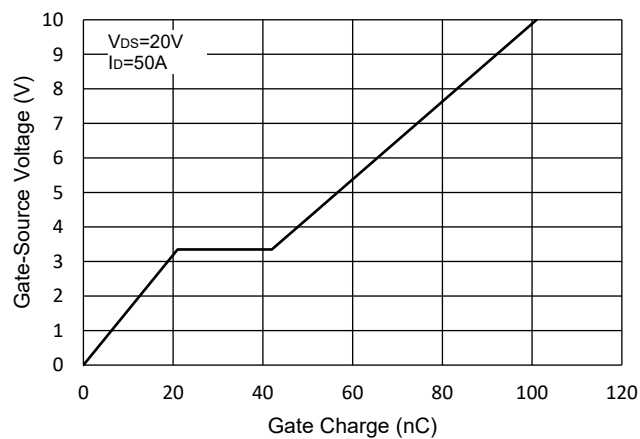


Fig.6 - Gate Charge



## Curve Characteristics

Fig.7 - Normalized Threshold Voltage

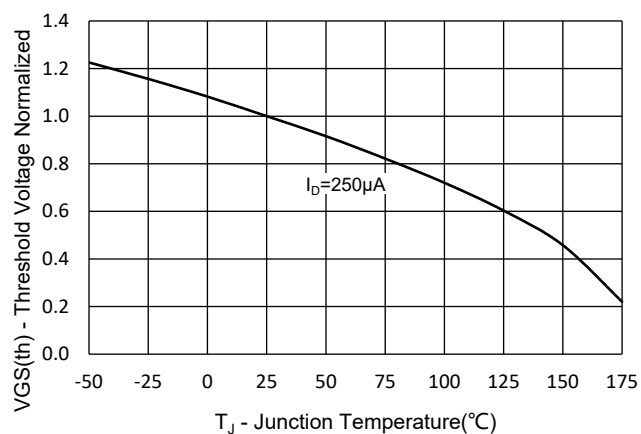


Fig.8 - Normalized On Resistance Characteristics

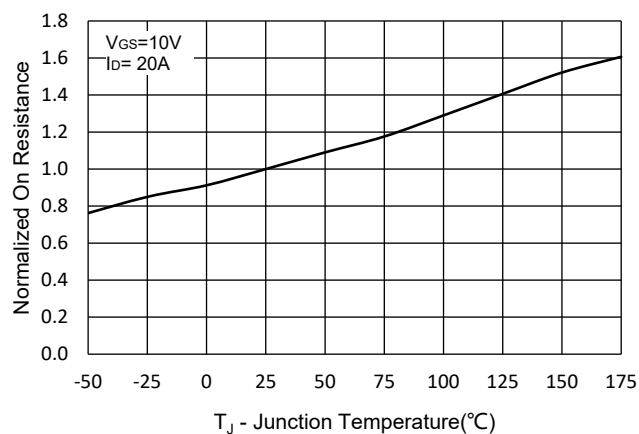


Fig.9 -  $I_S - V_{SD}$

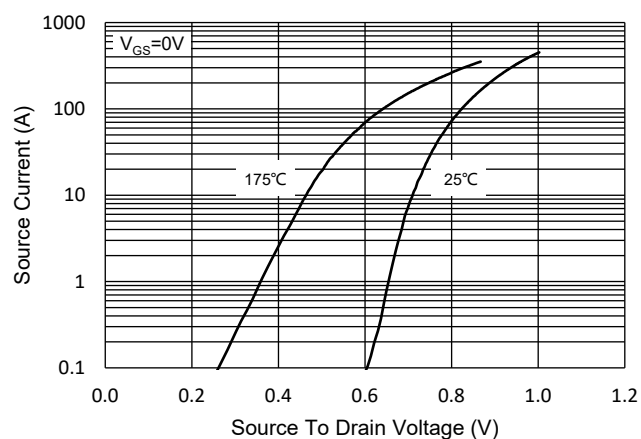


Fig.10 - Drain Current

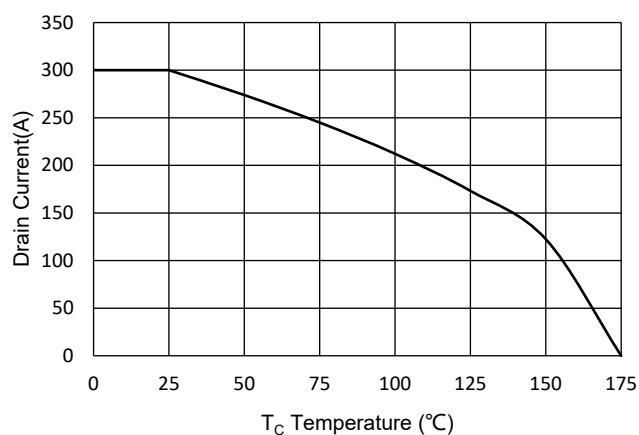
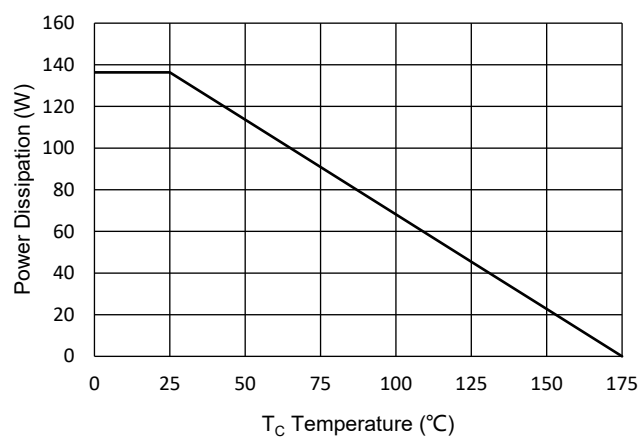


Fig.11 - PD Dissipation



## Curve Characteristics

Fig.12 - Safe Operation Area

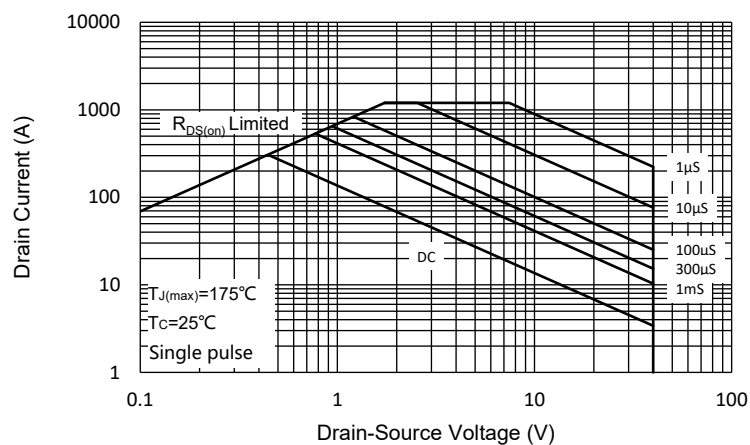
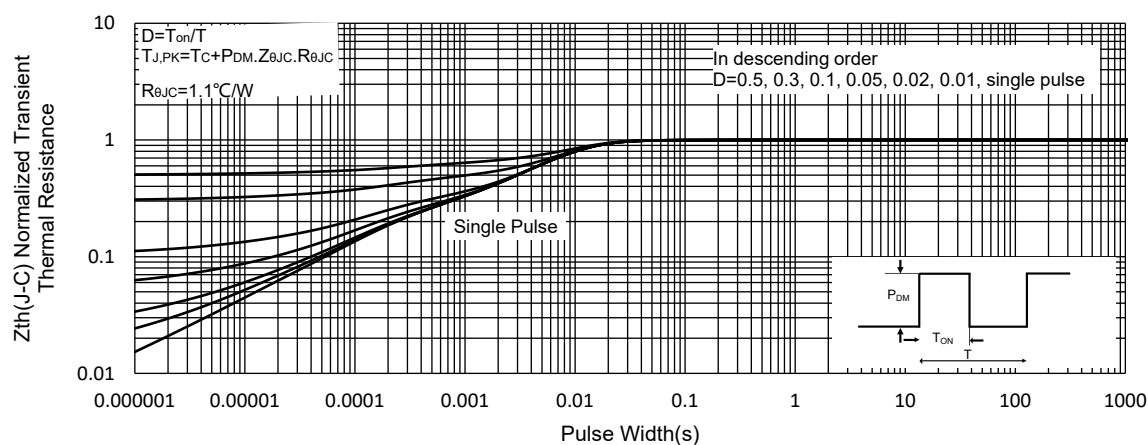


Fig.13 - Normalized Transient Thermal Impedance



## Ordering Information

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

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