

## Features

- Split Gate Trench MOSFET Technology
- ESD Protected Up To 2KV (HBM)
- Excellent Package For Heat Dissipation
- 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)

## Maximum Ratings

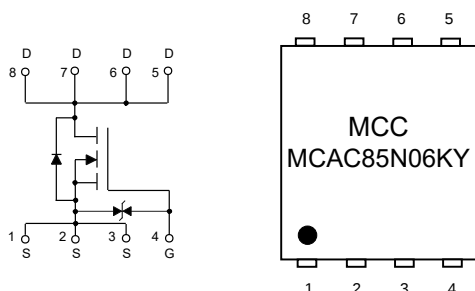
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 55°C/W Junction to Ambient(Steady-State)(Note2)
- Thermal Resistance: 1.1°C/W Junction to Case(Steady-State)

| Parameter                               | Symbol   | Rating | Unit |
|-----------------------------------------|----------|--------|------|
| Drain-Source Voltage                    | $V_{DS}$ | 60     | V    |
| Gate-Source Voltage                     | $V_{GS}$ | ±20    | V    |
| Continuous Drain Current                | $I_D$    | 85     | A    |
|                                         |          | 54     |      |
| Pulsed Drain Current (Note 3)           | $I_{DM}$ | 340    | A    |
| Total Power Dissipation (Note 4)        | $P_D$    | 113    | W    |
| Single Pulsed Avalanche Energy (Note 5) | $E_{AS}$ | 400    | mJ   |

Note:

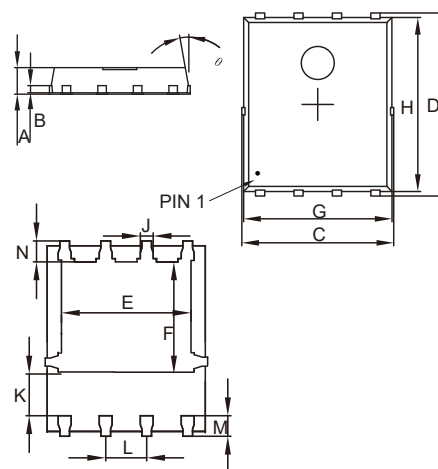
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment 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.  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = 50\text{V}$ ,  $V_G = 10\text{V}$ ,  $L = 2\text{mH}$

## 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   | 0.193  | 0.222 | 4.90  | 5.64 |      |
| 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> =250μA                                            | 60  |      |     | V    |
| Gate-Source Leakage Current     | I <sub>GSS</sub>     | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                            |     |      | ±10 | μA   |
| 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                              | 1.0 | 1.6  | 2.5 | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                             |     | 2.9  | 3.7 | mΩ   |
|                                 |                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                            |     | 3.8  | 5.0 |      |
| Gate Resistance                 | R <sub>G</sub>       | f=1MHz, Open drain                                                                    |     | 2    |     | Ω    |
| Diode Characteristics           |                      |                                                                                       |     |      |     |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                       |     |      | 85  | A    |
| Diode Forward Voltage           | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =20A                                              |     | 0.8  | 1.3 | V    |
| Reverse Recovery Time           | t <sub>rr</sub>      | I <sub>F</sub> =20A, dI <sub>F</sub> /dt=100A/μs                                      |     | 46   |     | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                       |     | 47   |     | nC   |
| Dynamic Characteristics         |                      |                                                                                       |     |      |     |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz                                     |     | 4135 |     | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                       |     | 819  |     |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                       |     | 50   |     |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =25A                       |     | 69   |     | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                       |     | 10   |     |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                       |     | 12   |     |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DS</sub> =30V, V <sub>GEN</sub> =10V, R <sub>G</sub> =2Ω, I <sub>DS</sub> =25A |     | 12   |     | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                       |     | 13   |     |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                       |     | 49   |     |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                       |     | 13   |     |      |

## Curve Characteristics

Fig. 1 - Typical Output Characteristics

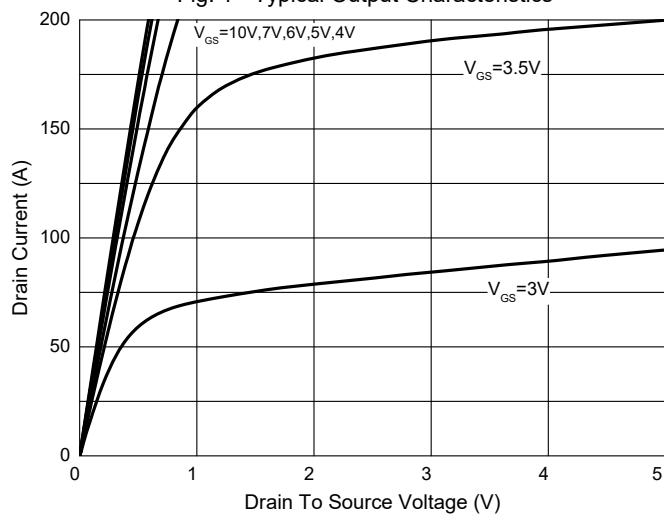


Fig. 2 - Transfer Characteristics

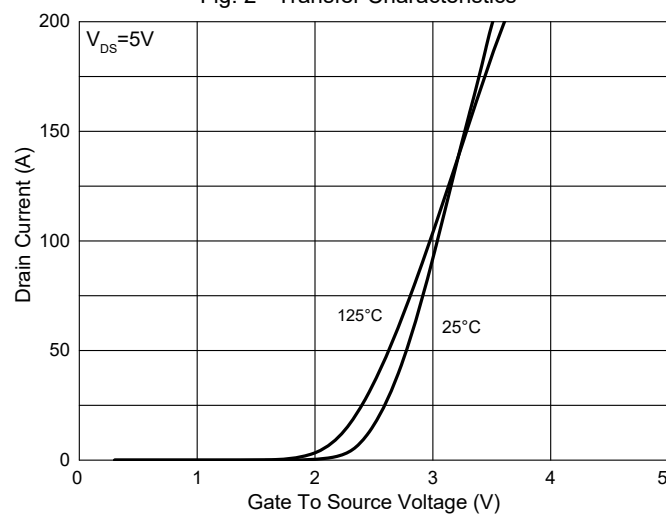


Fig. 3 -  $R_{DS(ON)} - V_{GS}$

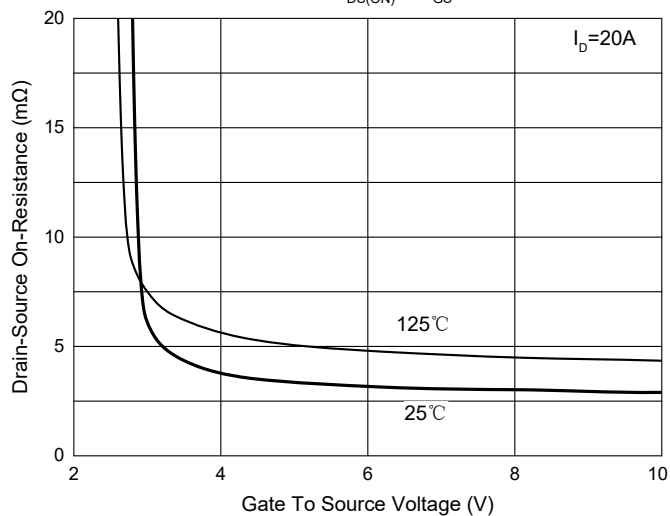


Fig. 4 -  $R_{DS(ON)} - I_D$

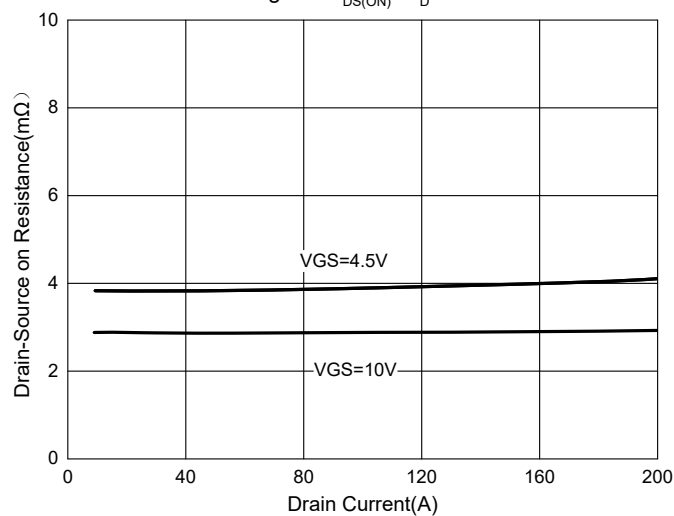


Fig. 5 - Capacitance Characteristics

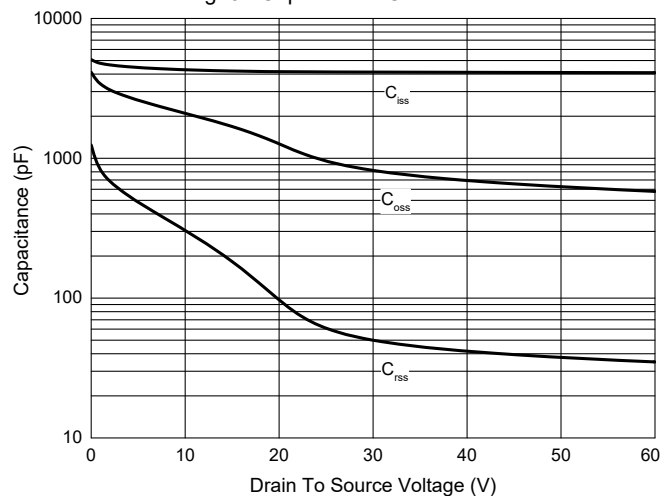
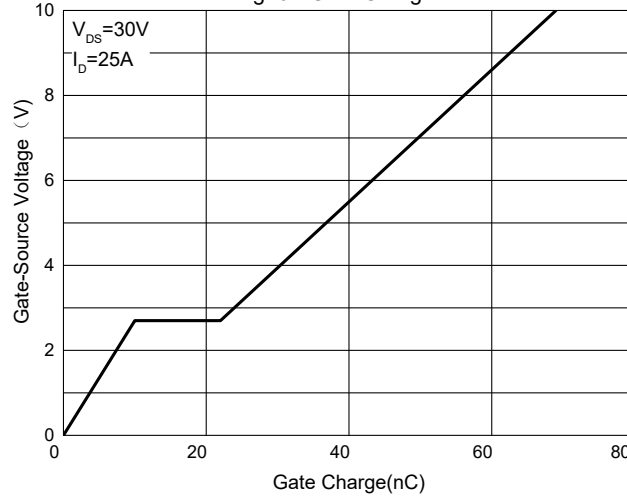


Fig. 6 - Gate Charge



Curve Characteristics

Fig. 7 - Normalized Threshold Voltage

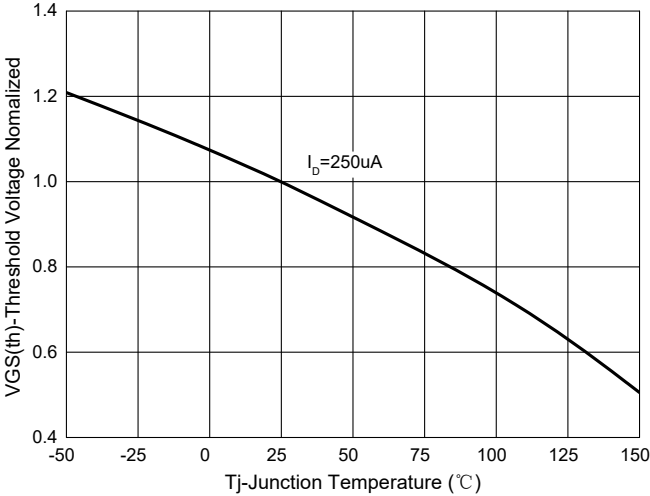


Fig.8-Normalized On Resistance Characteristics

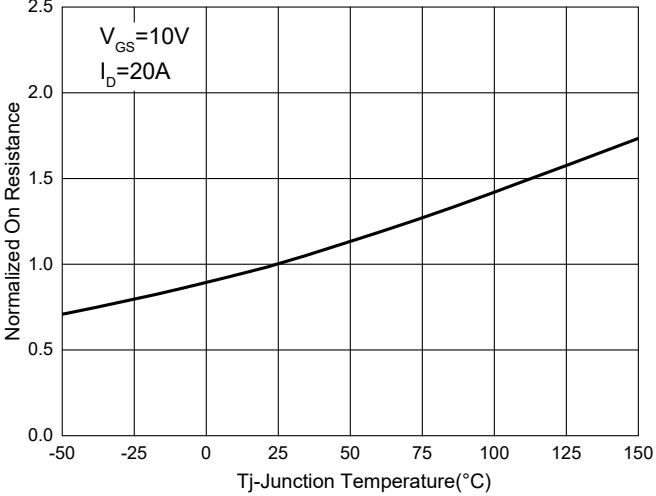


Fig.9 -  $I_s - V_{SD}$

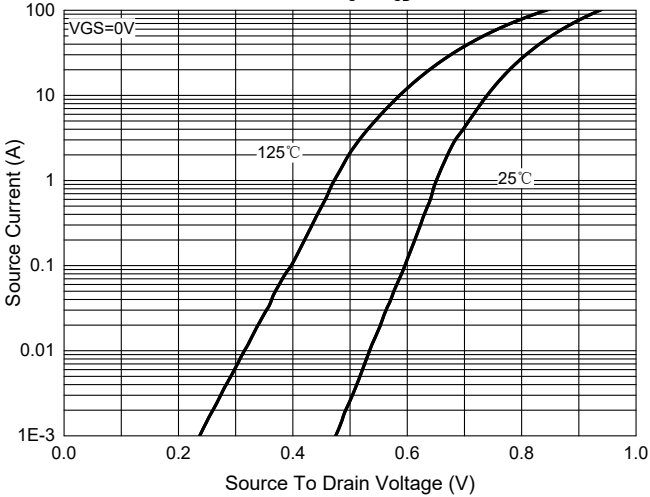


Fig. 10 - Drain Current

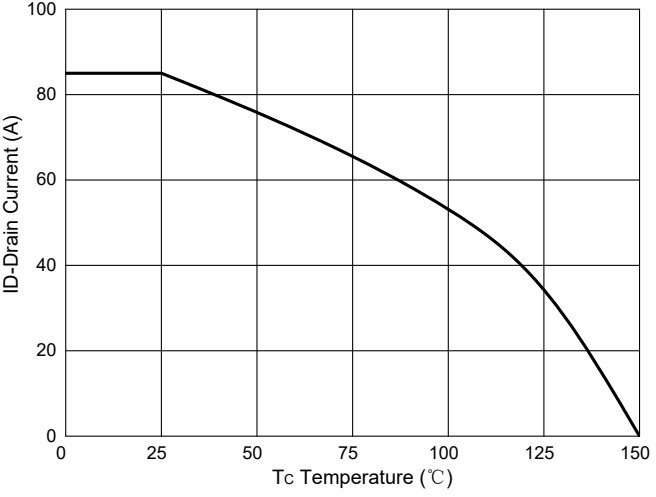
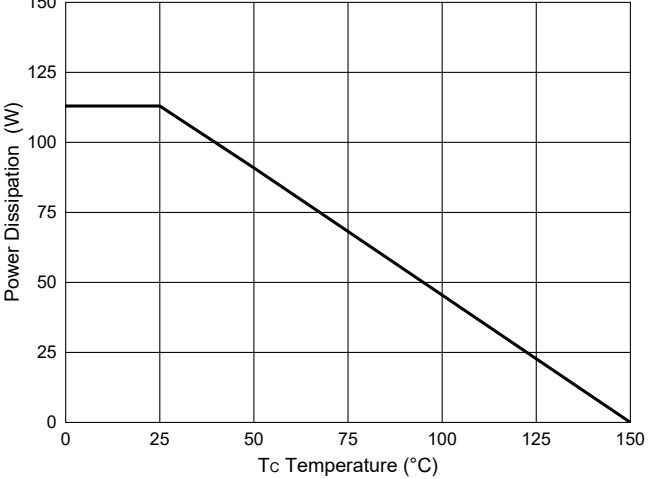


Fig.11-PD Dissipation



## Curve Characteristics

Fig. 12 - Safe Operation Area

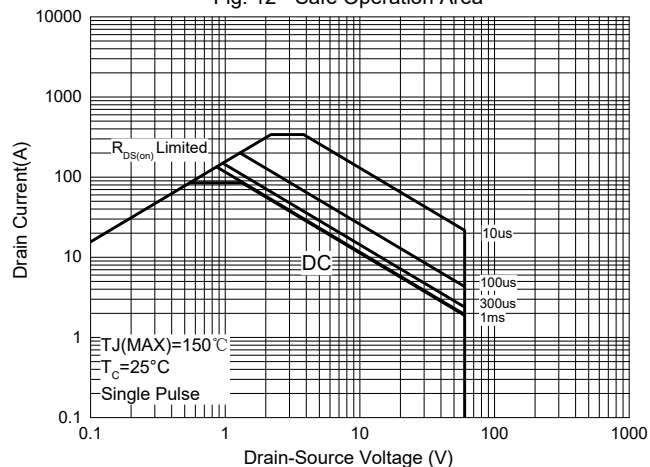
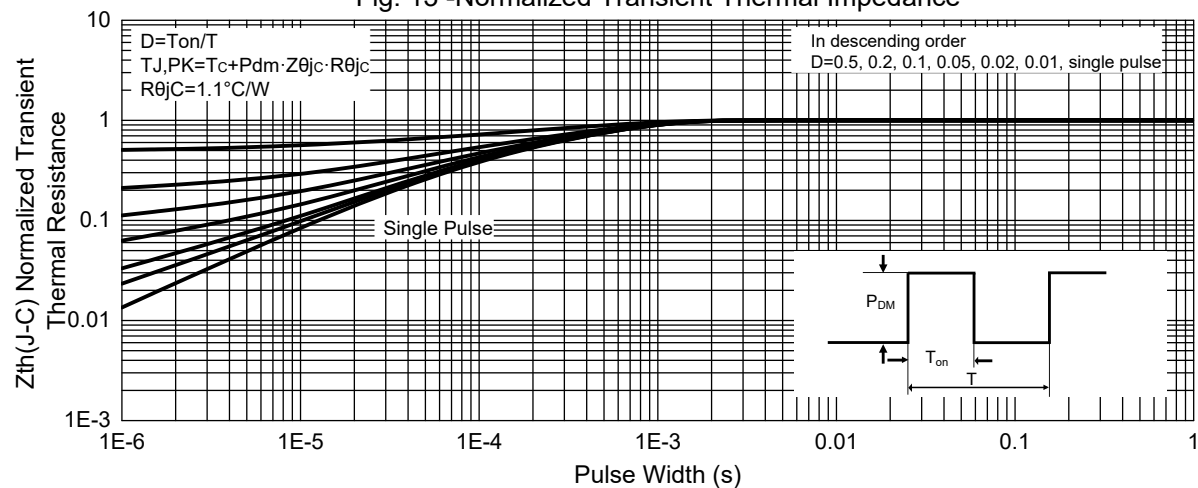


Fig. 13 - Normalized Transient Thermal Impedance



## Ordering Information

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

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