

## Features

- Trench MOSFET Technology
- High Density Cell Design for Low  $R_{DS(ON)}$
- 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

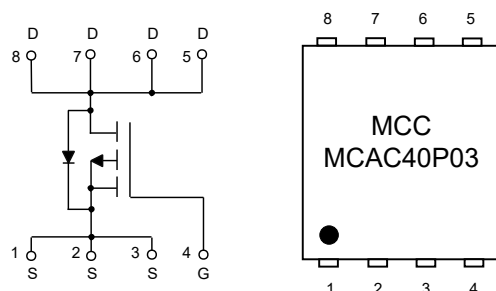
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 50°C/W Junction to Ambient (Note 2)
- Thermal Resistance: 2.3°C/W Junction to Case

| 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>  | -40    | A    |
|                                                    | T <sub>C</sub> =100°C |                 | -25    |      |
| Pulsed Drain Current <sup>(Note 3)</sup>           |                       | I <sub>DM</sub> | -160   | A    |
| Total Power Dissipation <sup>(Note 4)</sup>        |                       | P <sub>D</sub>  | 54     | W    |
| Single Pulsed Avalanche Energy <sup>(Note 5)</sup> |                       | E <sub>AS</sub> | 180    | mJ   |

Note:

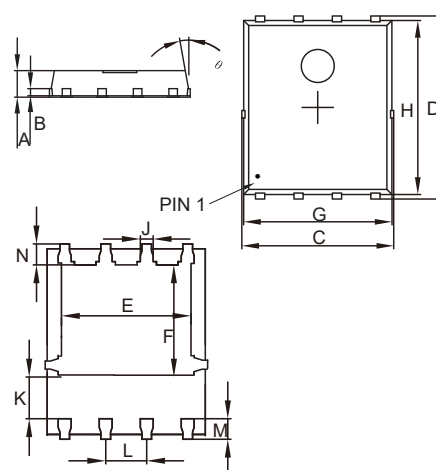
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$ .
2. Repetitive rating; pulse width limited by max. junction temperature.
3.  $P_D$  is based on max. junction temperature, using junction-case thermal resistance.
4.  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = -50\text{V}$ ,  $V_{GS} = -10\text{V}$ ,  $R_G = 25\Omega$ ,  $L = 1\text{mH}$ .

## Internal Structure and Marking Code



## P-CHANNEL MOSFET

### DFN5060



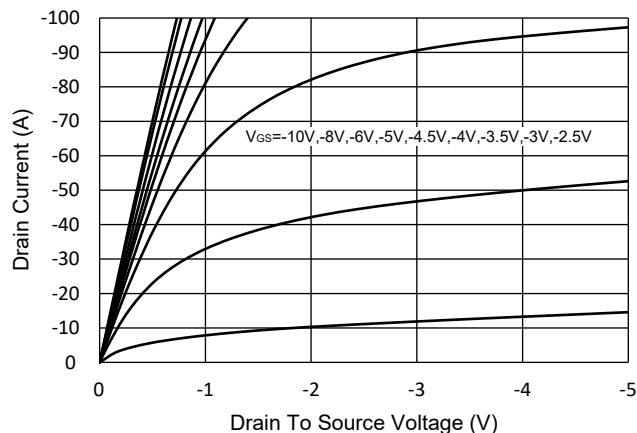
| DIM | INCHES |       | MM    |      | NOTE |
|-----|--------|-------|-------|------|------|
|     | MIN    | MAX   | MIN   | MAX  |      |
| A   | 0.031  | 0.047 | 0.80  | 1.20 |      |
| B   | 0.010  |       | 0.254 |      | TYP. |
| C   | 0.193  | 0.222 | 4.90  | 5.64 |      |
| D   | 0.232  | 0.250 | 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)

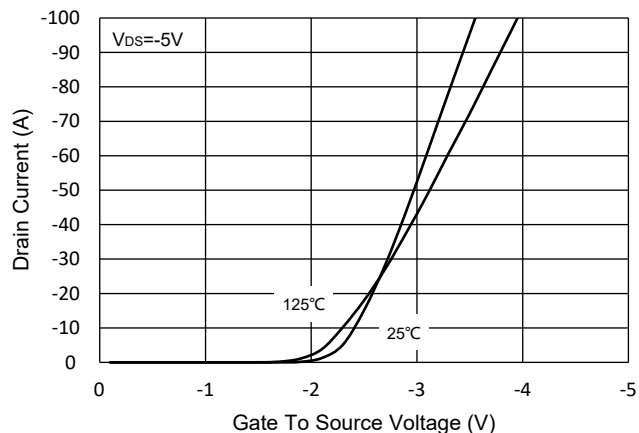
| Parameter                       | Symbol               | Test Conditions                                                                              | Min | Typ  | Max  | Unit |
|---------------------------------|----------------------|----------------------------------------------------------------------------------------------|-----|------|------|------|
| Static Characteristics          |                      |                                                                                              |     |      |      |      |
| Drain-Source Breakdown Voltage  | V <sub>(BR)DSS</sub> | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA                                                  | -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  | -1.5 | -2.5 | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =-10V, I <sub>D</sub> =-20A                                                  |     | 6.8  | 9    | mΩ   |
|                                 |                      | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A                                                 |     | 9.2  | 13   |      |
| Gate Resistance                 | R <sub>g</sub>       | f=1 MHz, Open drain                                                                          |     | 2.5  |      | Ω    |
| Diode Characteristics           |                      |                                                                                              |     |      |      |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                              |     |      | -35  | A    |
| Diode Forward Voltage           | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =-20A                                                    |     |      | -1.2 | V    |
| Reverse Recovery Time           | t <sub>rr</sub>      | I <sub>F</sub> =-17.5A, dI <sub>F</sub> /dt=100A/μs                                          |     | 20   |      | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                              |     | 10   |      | nC   |
| Dynamic Characteristics         |                      |                                                                                              |     |      |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =-15V,V <sub>GS</sub> =0V,f=1MHz                                             |     | 2718 |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                              |     | 323  |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                              |     | 305  |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =-15V,V <sub>GS</sub> =-10V,I <sub>D</sub> =-17.5A                           |     | 54   |      | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                              |     | 6.4  |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                              |     | 11   |      |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DD</sub> =-15V, V <sub>GS</sub> =-10V,<br>R <sub>G</sub> =6Ω, I <sub>DS</sub> =-17.5A |     | 8.7  |      | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                              |     | 10   |      |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                              |     | 69   |      |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                              |     | 32   |      |      |

## Curve Characteristics

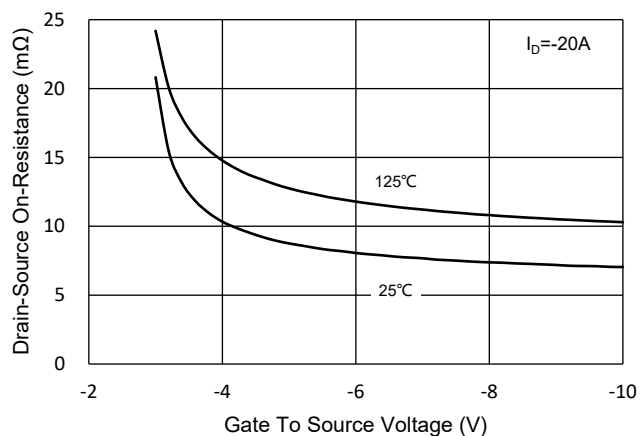
**Fig.1 - Typical Output Characteristics**



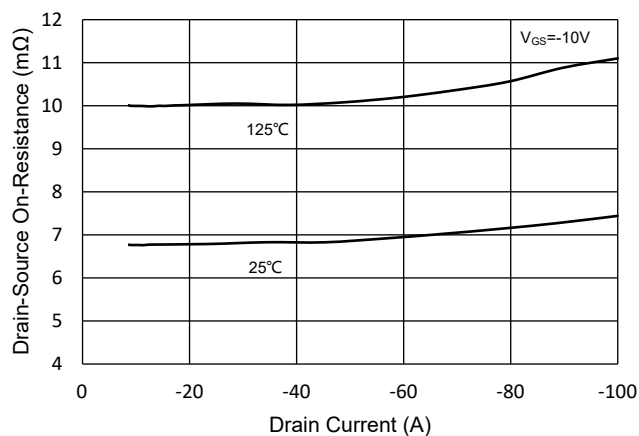
**Fig.2 - Transfer Characteristic**



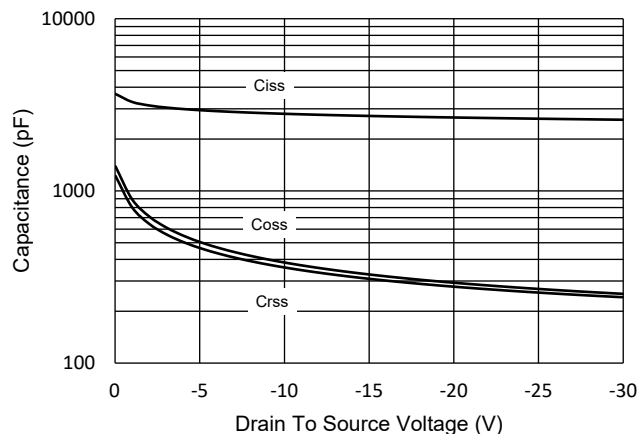
**Fig.3 -  $R_{DS(ON)}$  -  $V_{GS}$**



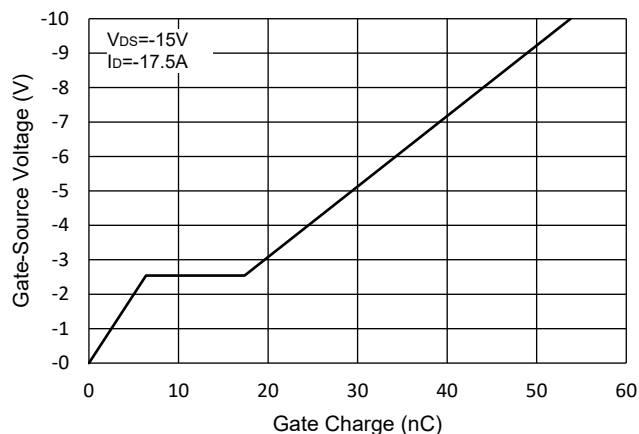
**Fig.4 -  $R_{DS(ON)}$  -  $I_D$**



**Fig.5 - Capacitance Characteristics**



**Fig.6 - Gate Charge**



## Curve Characteristics

Fig.7 - Normalized Threshold Voltage

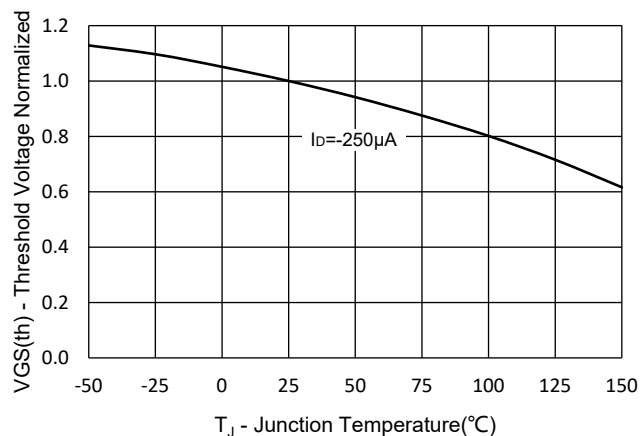


Fig.8 - Normalized On Resistance Characteristics

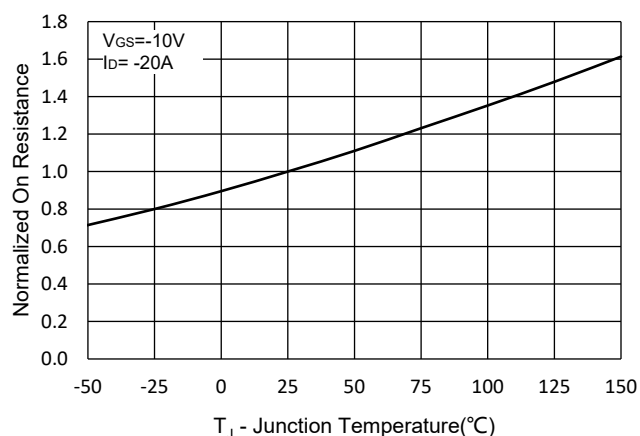


Fig.9 -  $I_S$  -  $V_{SD}$

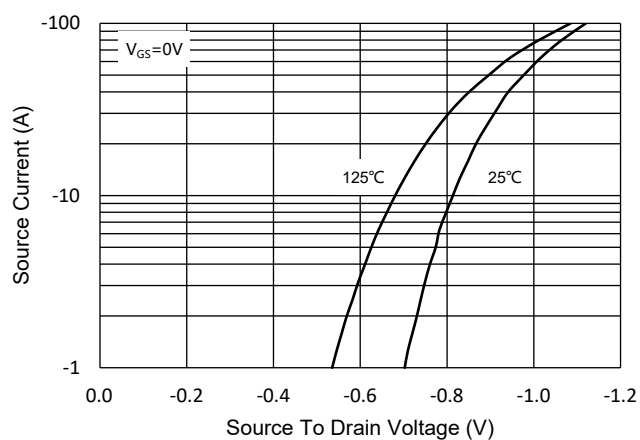


Fig.10 - Drain Current

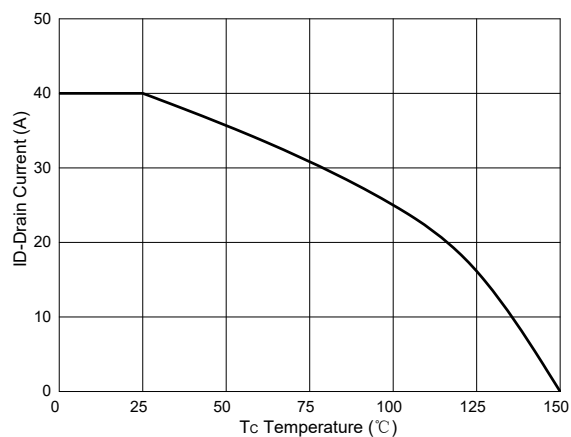
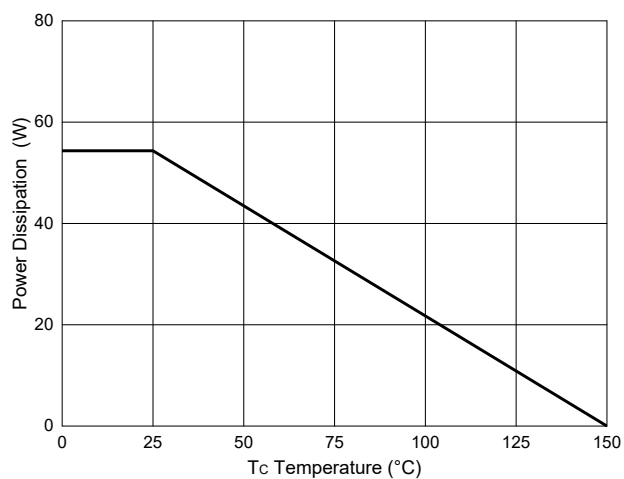


Fig.11 - PD Dissipation



## Curve Characteristics

Fig. 12 - Safe Operation Area

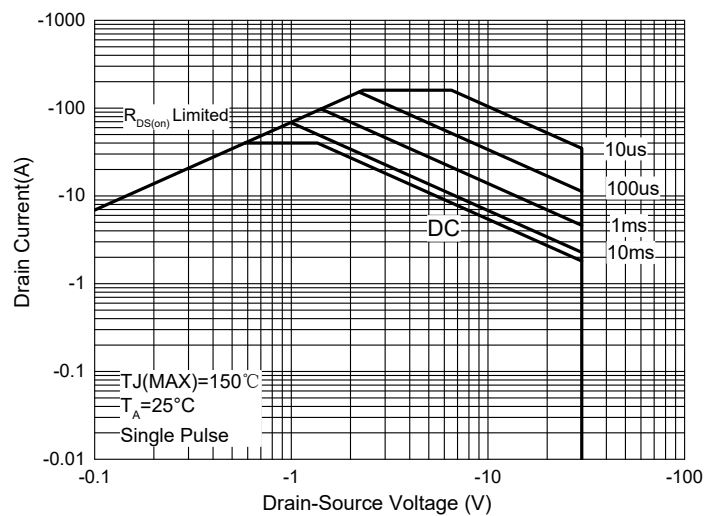
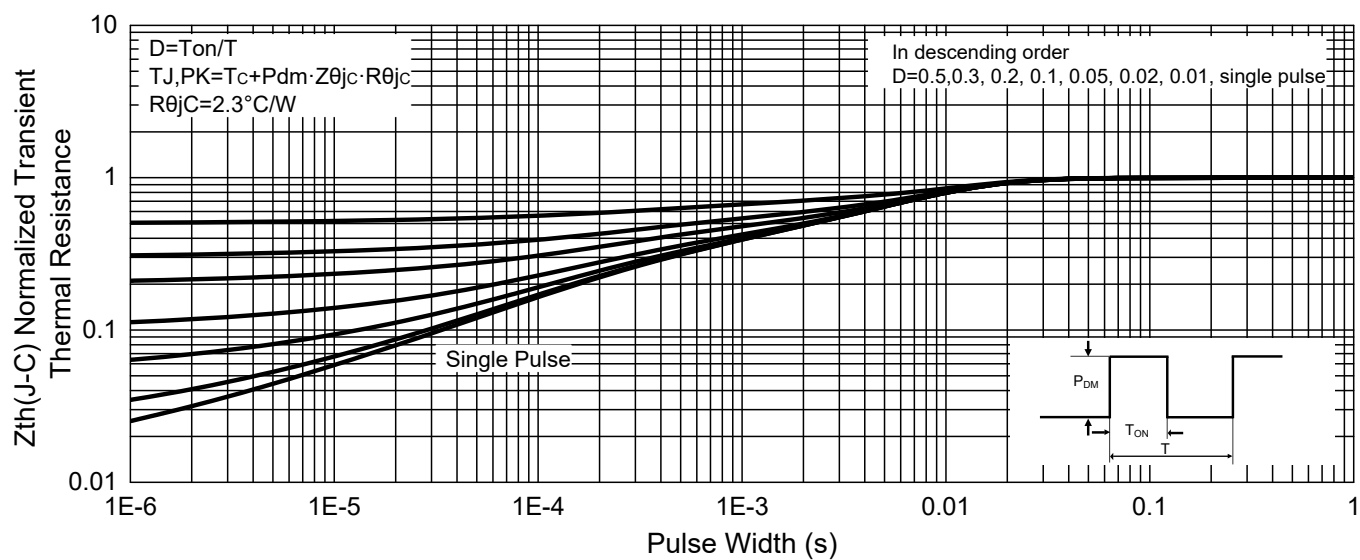


Fig. 13 -Normalized Transient Thermal Impedance



## Ordering Information

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

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