

## Features

- Trench Power LV MOSFET Technology
- 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

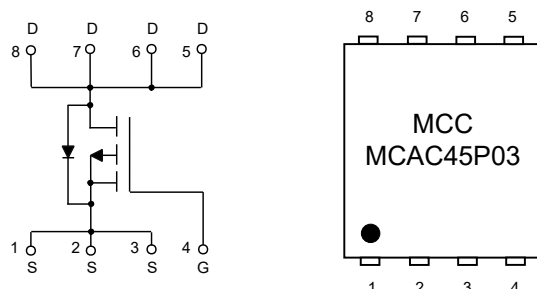
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 40°C/W Junction to Ambient (Note 2)
- Thermal Resistance: 2.5°C/W Junction to Case

| Parameter                              | Symbol   | Rating | Unit |
|----------------------------------------|----------|--------|------|
| Drain-Source Voltage                   | $V_{DS}$ | -30    | V    |
| Gate-Source Voltage                    | $V_{GS}$ | ±20    | V    |
| Continuous Drain Current               | $I_D$    | -45    | A    |
|                                        |          | -28    |      |
| Pulsed Drain Current (Note 3)          | $I_{DM}$ | -180   | A    |
| Total Power Dissipation (Note 4)       | $P_D$    | 50     | W    |
| Single Pulse Avalanche Energy (Note 5) | $E_{AS}$ | 98     | mJ   |

Note:

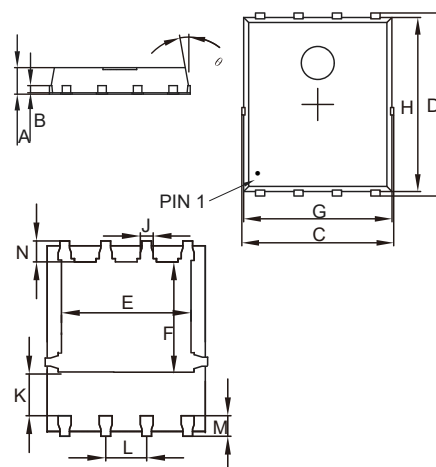
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment 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.  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = -30\text{V}$ ,  $V_{GS} = -10\text{V}$ ,  $L = 1\text{mH}$ .

## 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  | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=-250\mu A$                               | -30  |      |           | V          |
| Gate-Source Leakage Current     | $I_{GSS}$     | $V_{DS}=0V, V_{GS}=\pm 20V$                              |      |      | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current | $I_{DSS}$     | $V_{DS}=-30V, V_{GS}=0V$                                 |      |      | -1        | $\mu A$    |
| Gate-Threshold Voltage          | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=-250\mu A$                           | -1.0 | -1.5 | -2.0      | V          |
| Drain-Source On-Resistance      | $R_{DS(on)}$  | $V_{GS}=-10V, I_D=-20A$                                  |      | 9.7  | 14        | m $\Omega$ |
|                                 |               | $V_{GS}=-4.5V, I_D=-20A$                                 |      | 13.3 | 18        |            |
| Gate Resistance                 | $R_g$         | f=1 MHz, Open drain                                      |      | 4.5  |           | $\Omega$   |
| Diode Characteristics           |               |                                                          |      |      |           |            |
| Continuous Body Diode Current   | $I_S$         |                                                          |      |      | -45       | A          |
| Diode Forward Voltage           | $V_{SD}$      | $V_{GS}=0V, I_S=-20A$                                    |      |      | -1.2      | V          |
| Reverse Recovery Time           | $t_{rr}$      | $I_F=-27.5A, dI_F/dt=100A/\mu s$                         |      | 24.5 |           | ns         |
| Reverse Recovery Charge         | $Q_{rr}$      |                                                          |      | 10.5 |           | nC         |
| Dynamic Characteristics         |               |                                                          |      |      |           |            |
| Input Capacitance               | $C_{iss}$     | $V_{DS}=-25V, V_{GS}=0V, f=1MHz$                         |      | 1719 |           | pF         |
| Output Capacitance              | $C_{oss}$     |                                                          |      | 186  |           |            |
| Reverse Transfer Capacitance    | $C_{rss}$     |                                                          |      | 170  |           |            |
| Total Gate Charge               | $Q_g$         | $V_{DS}=-15V, V_{GS}=-10V, I_D=-22A$                     |      | 35   |           | nC         |
| Gate-Source Charge              | $Q_{gs}$      |                                                          |      | 5    |           |            |
| Gate-Drain Charge               | $Q_{gd}$      |                                                          |      | 7    |           |            |
| Turn-On Delay Time              | $t_{d(on)}$   | $V_{DD}=-10V, V_{GS}=-10V, R_{GEN}=6\Omega, I_{DS}=-22A$ |      | 7.6  |           | ns         |
| Turn-On Rise Time               | $t_r$         |                                                          |      | 11.3 |           |            |
| Turn-Off Delay Time             | $t_{d(off)}$  |                                                          |      | 55   |           |            |
| Turn-Off Fall Time              | $t_f$         |                                                          |      | 31   |           |            |

## Curve Characteristics

Fig. 1 - Typical Output Characteristics

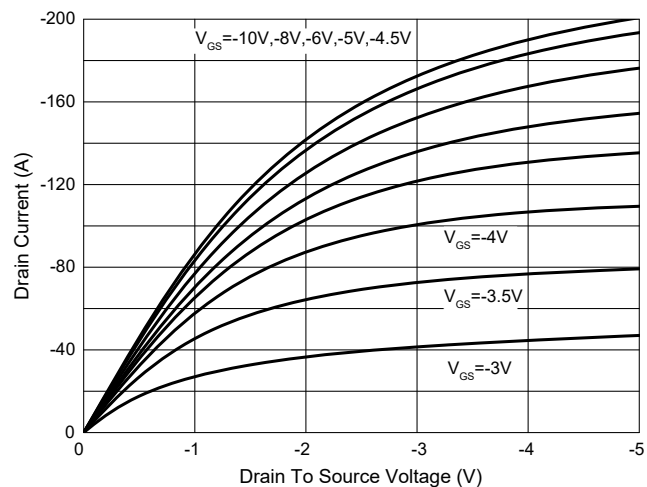


Fig. 2 - Transfer Characteristics

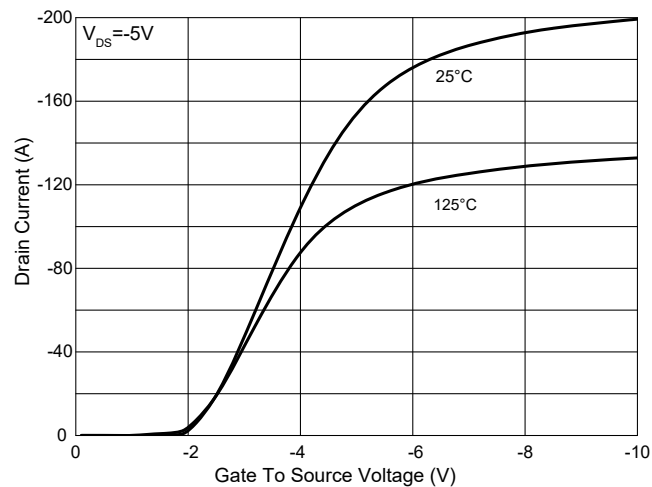


Fig. 3 -  $R_{DS(ON)} - V_{GS}$

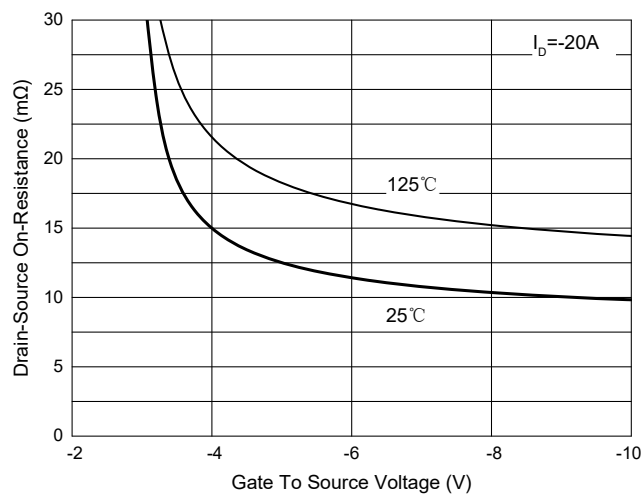


Fig. 4 -  $R_{DS(ON)} - I_D$

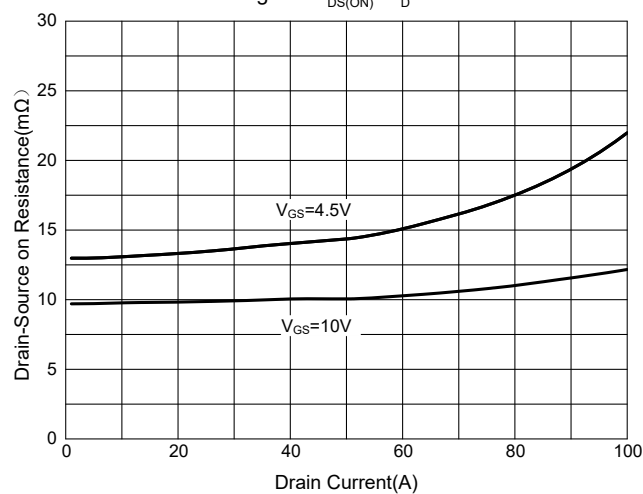


Fig. 5 - Capacitance Characteristics

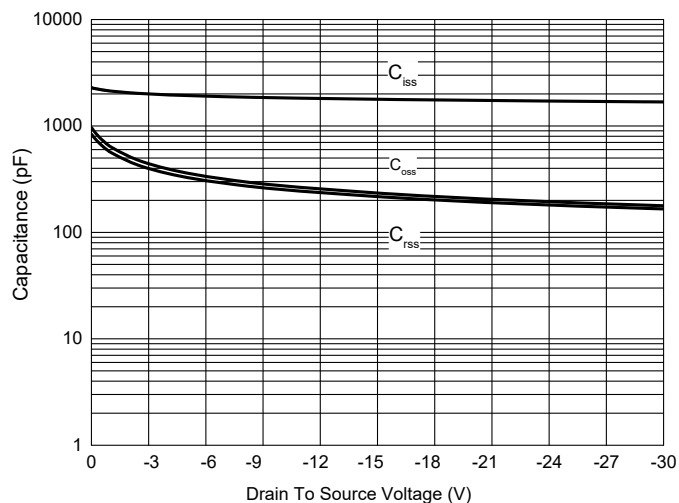
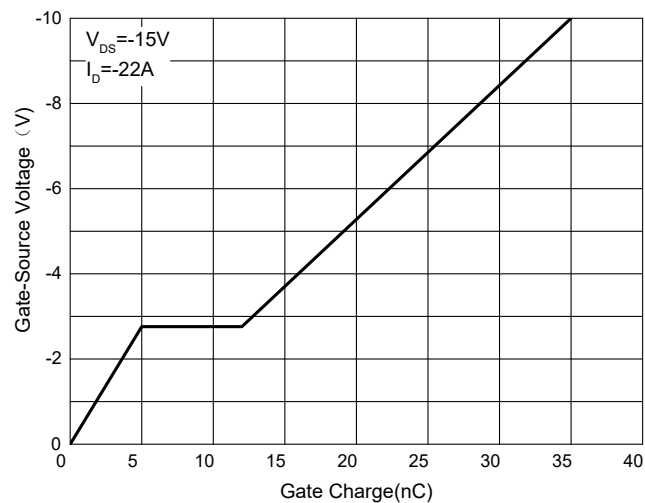


Fig. 6 - Gate Charge



## Curve Characteristics

Fig. 7 - Normalized Threshold Voltage

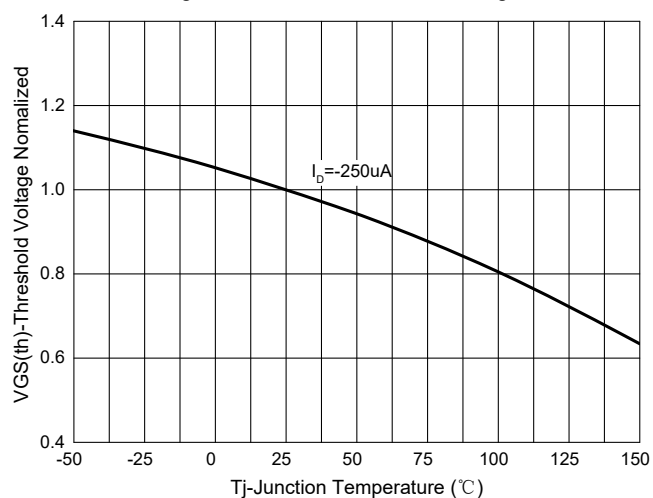


Fig.8-Normalized On Resistance Characteristics

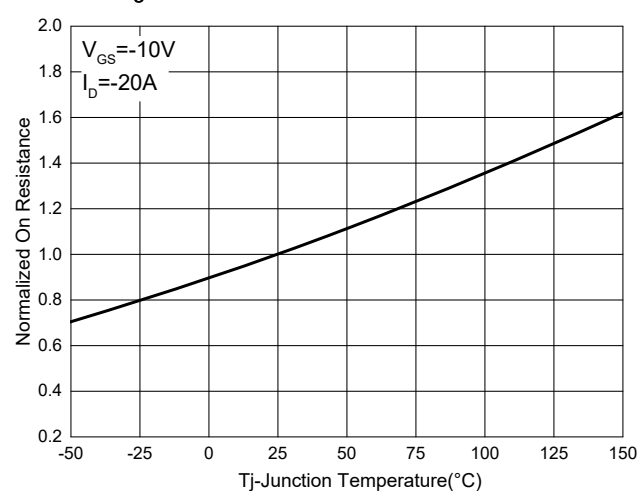


Fig.9 -  $I_S - V_{SD}$

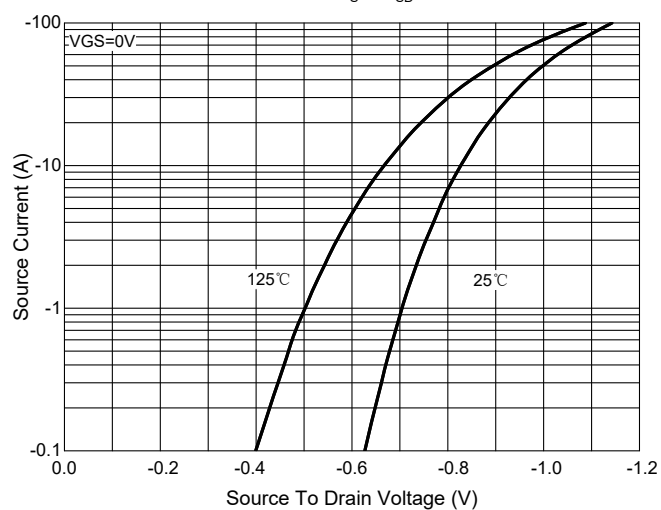


Fig. 10 - Drain Current

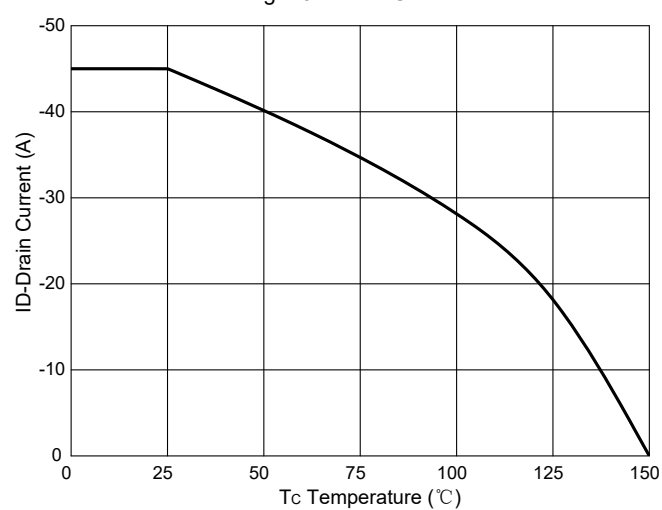
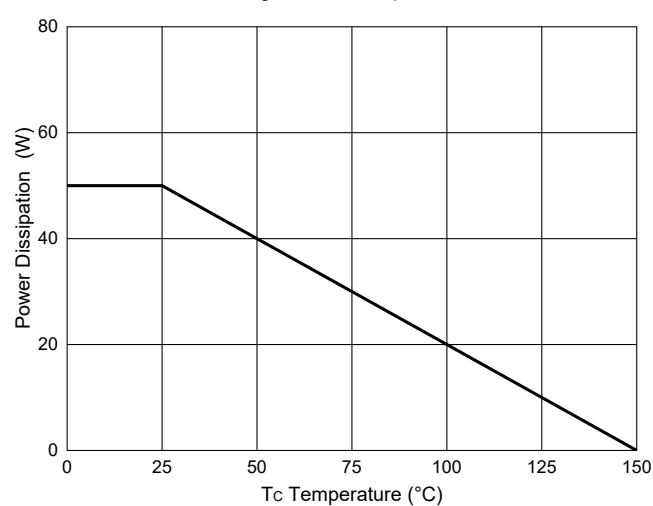


Fig.11-PD Dissipation



## Curve Characteristics

Fig. 12 - Safe Operation Area

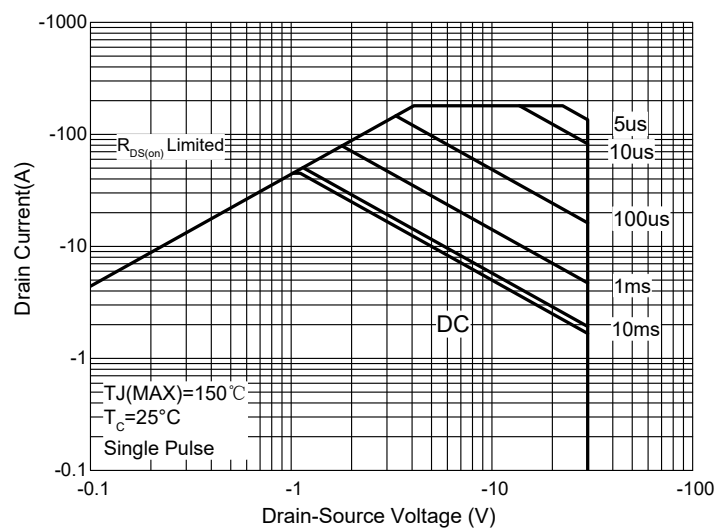
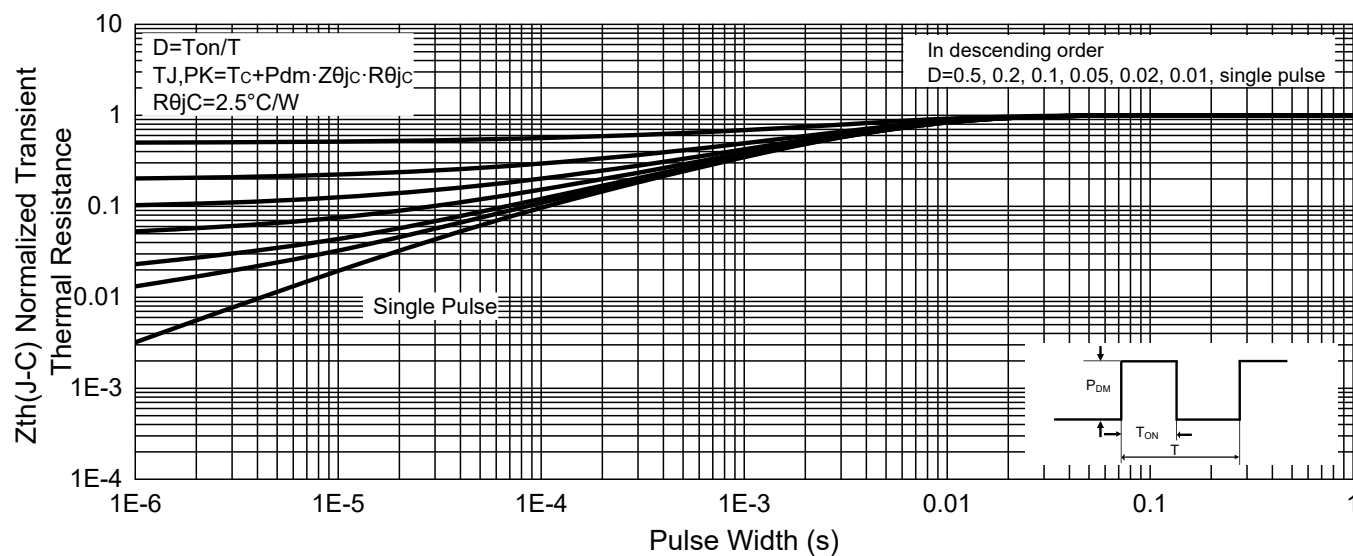


Fig. 13 - Normalized Transient Thermal Impedance



## Ordering Information

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

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