

## Features

- Split Gate Trench MOSFET Technology
- Moisture Sensitivity Level 1
- Halogen Free. "Green" Device (Note 1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant (Note 2) ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

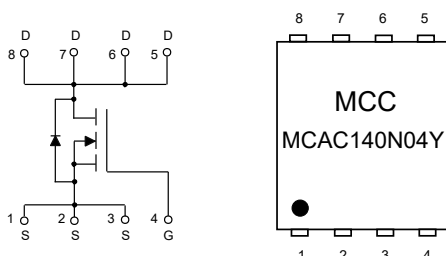
- Operating Junction Temperature Range : -55°C to +175°C
- Storage Temperature Range: -55°C to +175°C
- Thermal Resistance: 50°C/W Junction to Ambient (Note 3)
- Thermal Resistance: 1°C/W Junction to Case

| Parameter                              | Symbol   | Rating | Unit |
|----------------------------------------|----------|--------|------|
| Drain-Source Voltage                   | $V_{DS}$ | 40     | V    |
| Gate-Source Voltage                    | $V_{GS}$ | ±20    | V    |
| Continuous Drain Current               | $I_D$    | 140    | A    |
|                                        |          | 99     |      |
| Pulsed Drain Current (Note 4)          | $I_{DM}$ | 560    | A    |
| Total Power Dissipation (Note 5)       | $P_D$    | 150    | W    |
| Single Pulse Avalanche Energy (Note 6) | $E_{AS}$ | 169    | mJ   |

Note:

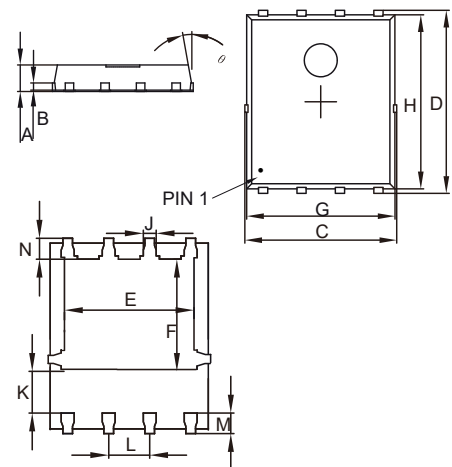
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. High Temperature Solder Exemption Applied, see EU Directive Annex 7a.
3. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in2 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.  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = 30\text{V}$ ,  $R_G = 25\Omega$ ,  $V_{GS} = 10\text{V}$ ,  $L = 0.5\text{mH}$ .

## Internal Structure and Marking Code



## N-CHANNEL MOSFET

### DFN5060



| DIMENSIONS |        |       |       |      |      |
|------------|--------|-------|-------|------|------|
| 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> =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> =32V, 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 | 1.7  | 3.0  | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =50A                                               |     | 1.6  | 2.0  | mΩ   |
|                                 |                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                              |     | 2.7  | 3.9  |      |
| Gate Resistance                 | R <sub>g</sub>       | V <sub>GS</sub> =0V, f=1MHz                                                             |     | 1.8  |      | Ω    |
| Diode Characteristics           |                      |                                                                                         |     |      |      |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                         |     |      | 140  | 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 <sub>F</sub> /dt=220A/μs                                        |     | 24.6 |      | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                         |     | 12   |      | nC   |
| Dynamic Characteristics         |                      |                                                                                         |     |      |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =20V,V <sub>GS</sub> =0V,f=1MHz                                         |     | 2354 |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                         |     | 1073 |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                         |     | 69   |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =20V,V <sub>GS</sub> =10V,I <sub>D</sub> =50A                           |     | 45.7 |      | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                         |     | 9.7  |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                         |     | 10.4 |      |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DD</sub> =20V, V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =40A,R <sub>g</sub> = 3Ω |     | 12.3 |      | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                         |     | 110  |      |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                         |     | 36.8 |      |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                         |     | 22   |      |      |

## Curve Characteristics

Fig.1 - Typical Output Characteristics

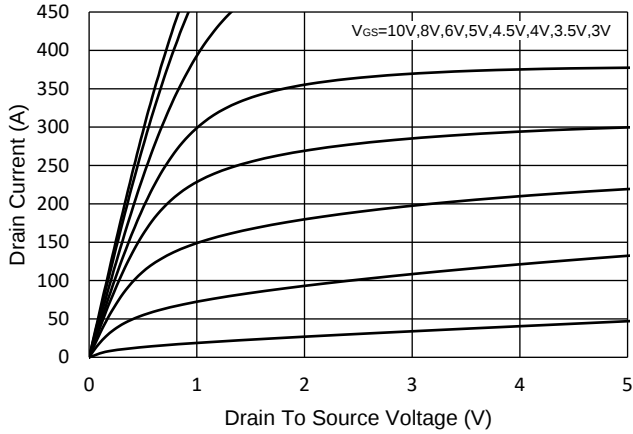


Fig.2 - Transfer Characteristics

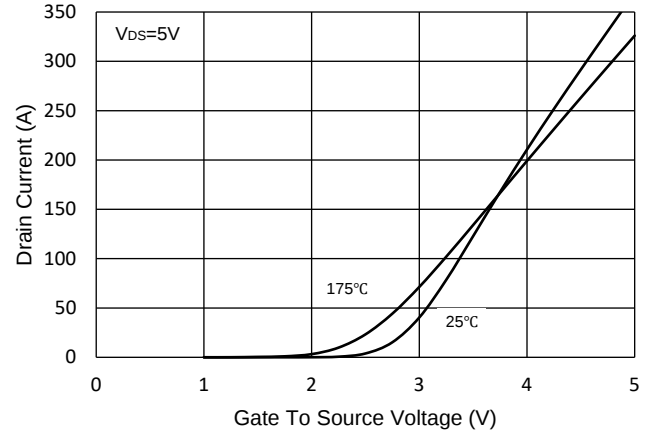


Fig.3 -  $R_{DS(ON)} - V_{GS}$

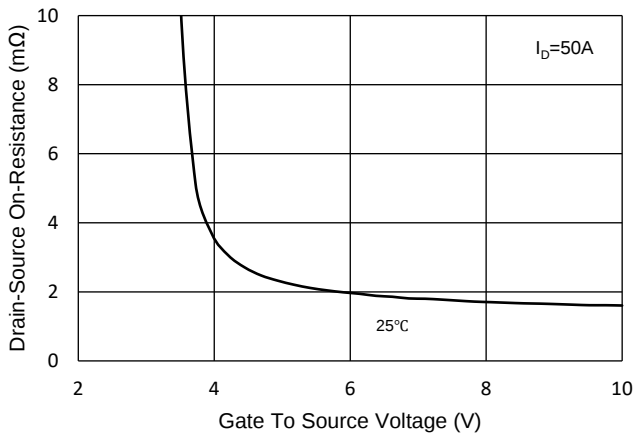


Fig.4 -  $R_{DS(ON)} - I_D$

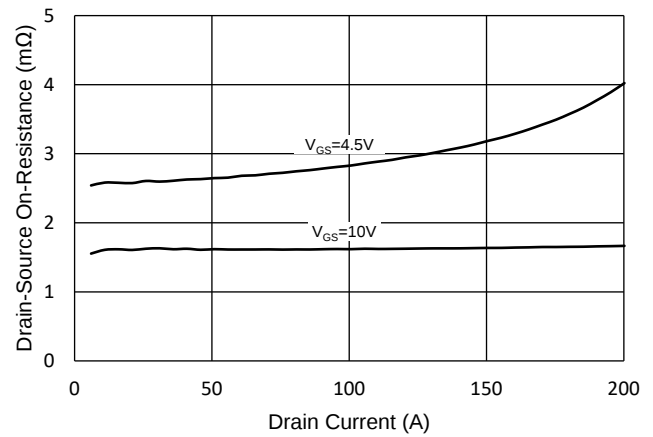


Fig.5 - Capacitance Characteristics

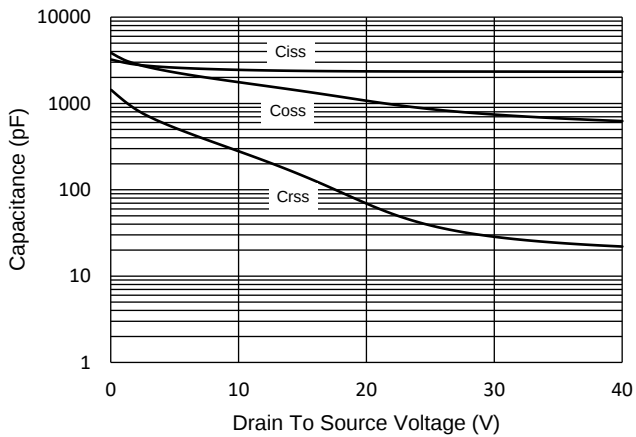
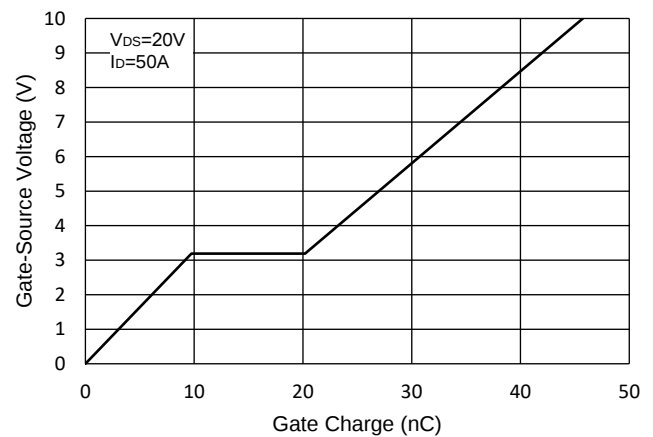


Fig.6 - Gate Charge



## Curve Characteristics

Fig.7 - Normalized Threshold Voltage

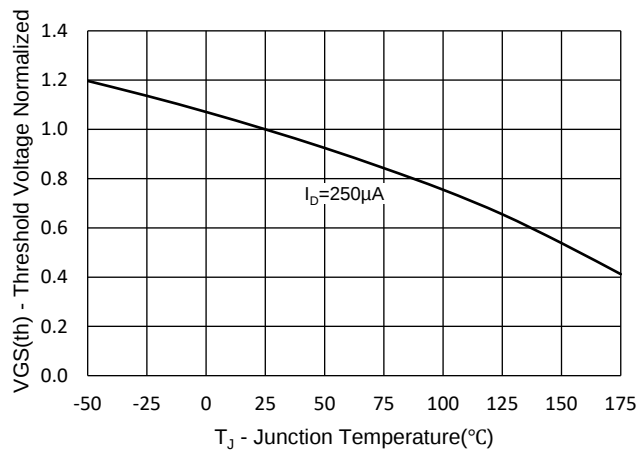


Fig.8 - Normalized On Resistance Characteristics

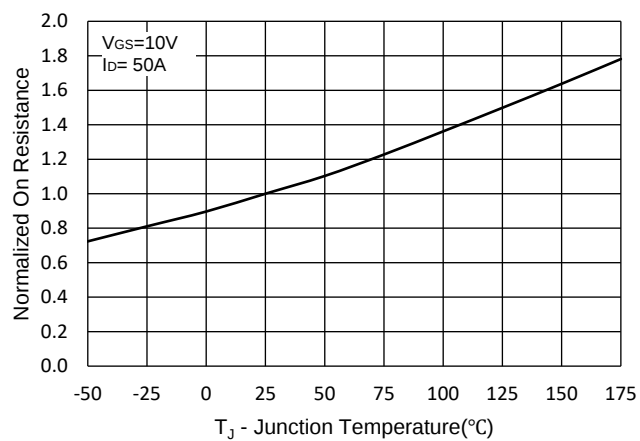


Fig.9 -  $I_S - V_{SD}$

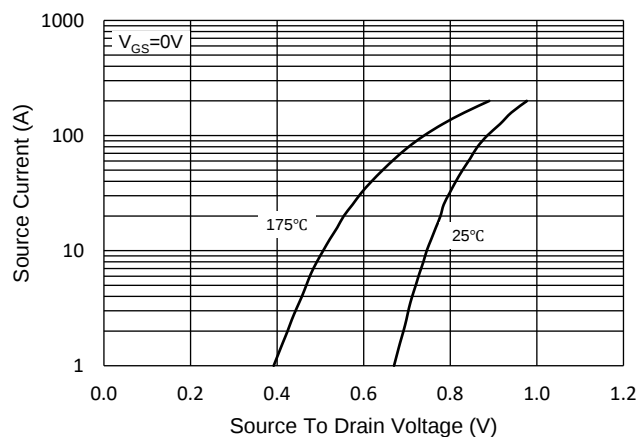


Fig.10 - Drain Current

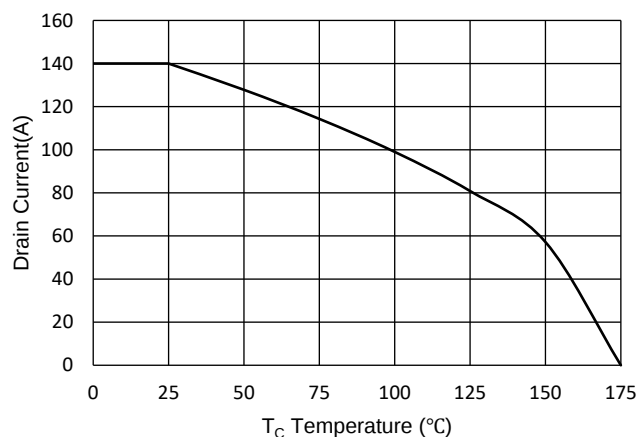
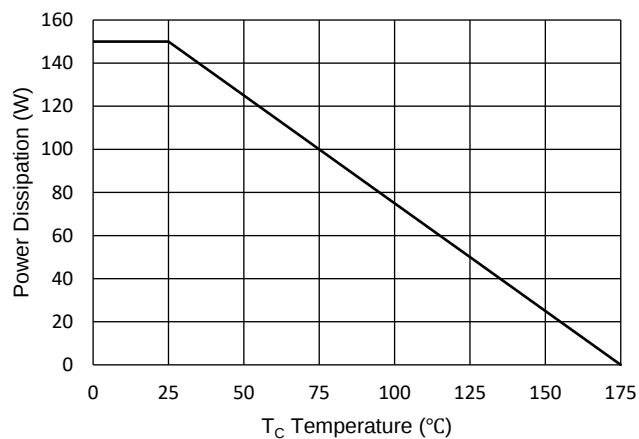


Fig.11 - PD Dissipation



## Curve Characteristics

Fig.12 - Safe Operation Area

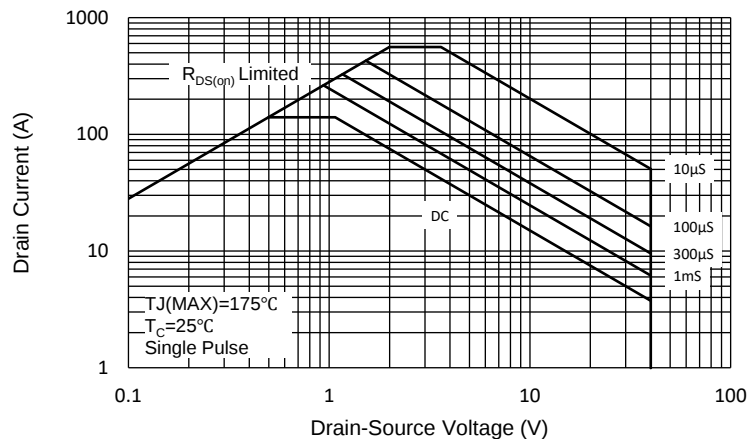
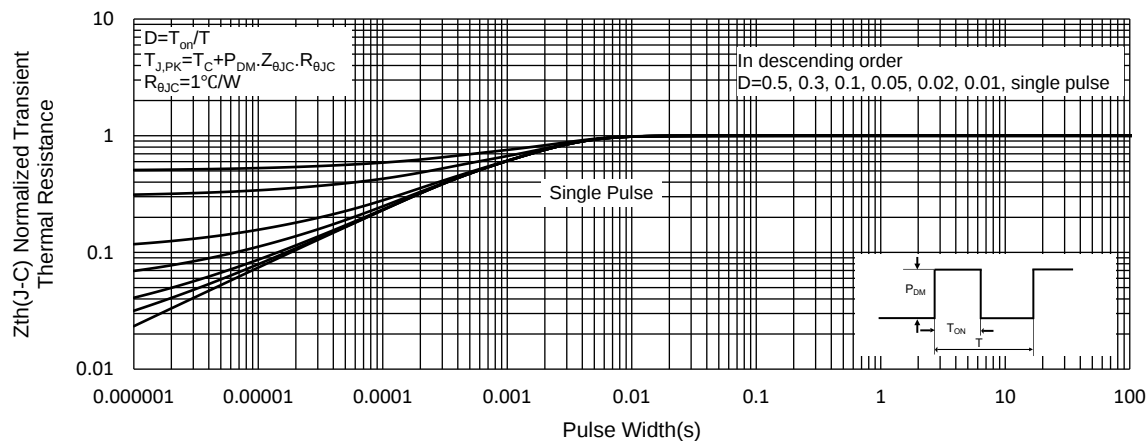


Fig.13 - Normalized Transient Thermal Impedance



## Ordering Information

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

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