

## Features

- Low On-Resistance
- 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)

# N-CHANNEL Super-Junction Power MOSFET

## Maximum Ratings

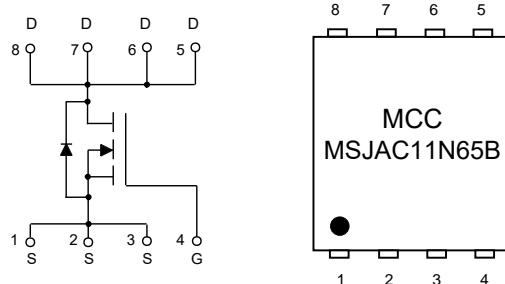
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 55°C/W Junction to Ambient (Note2)
- Thermal Resistance: 1.4°C/W Junction to Case

| Parameter                       | Symbol          | Rating | Unit |
|---------------------------------|-----------------|--------|------|
| Drain-Source Voltage            | V <sub>DS</sub> | 650    | V    |
| Gate-Source Voltage             | V <sub>GS</sub> | ±30    | V    |
| Continuous Drain Current        | I <sub>D</sub>  | 11     | A    |
| T <sub>C</sub> =100°C           | 7               |        |      |
| Pulsed Drain Current (Note 3)   | I <sub>DM</sub> | 44     | A    |
| Total Power Dissipation (Note4) | P <sub>D</sub>  | 89     | W    |
| Avalanche Energy (Note 5)       | E <sub>AS</sub> | 30     | 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<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C.
3. Repetitive rating; pulse width limited by max. junction temperature.
4. P<sub>D</sub> is based on max. junction temperature, using junction-case thermal resistance.
5. T<sub>J</sub>=25°C, V<sub>DD</sub>=50V, V<sub>GS</sub>=10V, R<sub>G</sub>=25Ω, L=30mH.

## Internal Structure and Marking Code



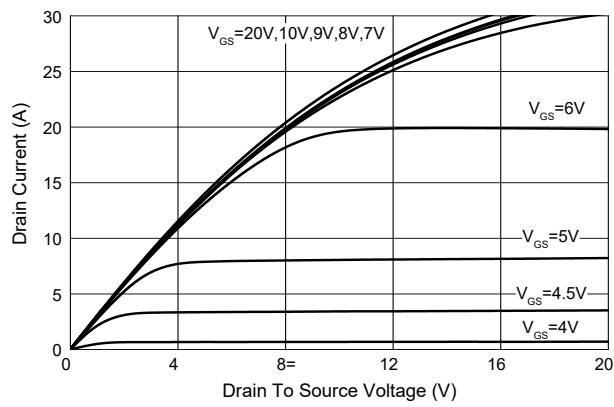
| DFN5060 |       |        |     |       |      | NOTE |
|---------|-------|--------|-----|-------|------|------|
| DIM     |       | INCHES |     | MM    |      |      |
|         |       | MIN    | MAX | MIN   | MAX  |      |
| A       | 0.031 | 0.047  |     | 0.80  | 1.20 |      |
| B       | 0.010 |        |     | 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)**

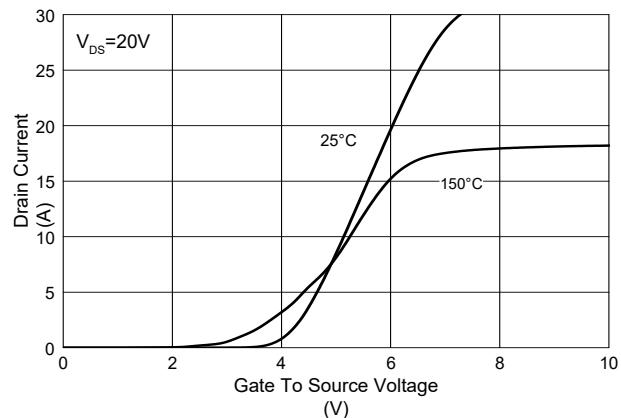
| Parameter                       | Symbol        | Test Conditions                                  | Min | Typ  | Max       | Unit     |
|---------------------------------|---------------|--|-----|------|-----------|----------|
| <b>Static Characteristics</b>   |               |  |     |      |           |          |
| Drain-Source Breakdown Voltage  | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=250\mu A$                        | 650 |      |           | V        |
| Gate-Source Leakage Current     | $I_{GSS}$     | $V_{DS}=0V, V_{GS}=\pm 30V$                      |     |      | $\pm 100$ | nA       |
| Zero Gate Voltage Drain Current | $I_{DSS}$     | $V_{DS}=650V, V_{GS}=0V$                         |     |      | 1         | $\mu A$  |
| Gate-Threshold Voltage          | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=250\mu A$                    | 2   | 3    | 4         | V        |
| Drain-Source On-Resistance      | $R_{DS(on)}$  | $V_{GS}=10V, I_D=3.2A$                           |     | 0.32 | 0.38      | $\Omega$ |
| Gate Resistance                 | $R_g$         | f=1MHz, Open drain                               |     | 23   |           | $\Omega$ |
| <b>Diode Characteristics</b>    |               |  |     |      |           |          |
| Continuous Body Diode Current   | $I_S$         |  |     |      | 11        | A        |
| Diode Forward Voltage           | $V_{SD}$      | $V_{GS}=0V, I_S=11A$                             |     |      | 1.4       | V        |
| Reverse Recovery Time           | $t_{rr}$      | $I_F=11A, dI_F/dt=100A/\mu s$                    |     | 290  |           | ns       |
| Reverse Recovery Charge         | $Q_{rr}$      |  |     | 3.3  |           | $\mu C$  |
| <b>Dynamic Characteristics</b>  |               |  |     |      |           |          |
| Input Capacitance               | $C_{iss}$     | $V_{DS}=25V, V_{GS}=0V, f=1MHz$                  |     | 768  |           | pF       |
| Output Capacitance              | $C_{oss}$     |  |     | 898  |           |          |
| Reverse Transfer Capacitance    | $C_{rss}$     |  |     | 29   |           |          |
| Total Gate Charge               | $Q_g$         | $V_{DS}=520V, V_{GS}=10V, I_D=11A$               |     | 22   |           | nC       |
| Gate-Source Charge              | $Q_{gs}$      |  |     | 5    |           |          |
| Gate-Drain Charge               | $Q_{gd}$      |  |     | 10   |           |          |
| Turn-On Delay Time              | $t_{d(on)}$   | $V_{DD}=325V, V_{GS}=10V, I_D=11A, R_G=25\Omega$ |     | 16   |           | ns       |
| Turn-On Rise Time               | $t_r$         |  |     | 50   |           |          |
| Turn-Off Delay Time             | $t_{d(off)}$  |  |     | 126  |           |          |
| Turn-Off Fall Time              | $t_f$         |  |     | 46   |           |          |

## Curve Characteristics

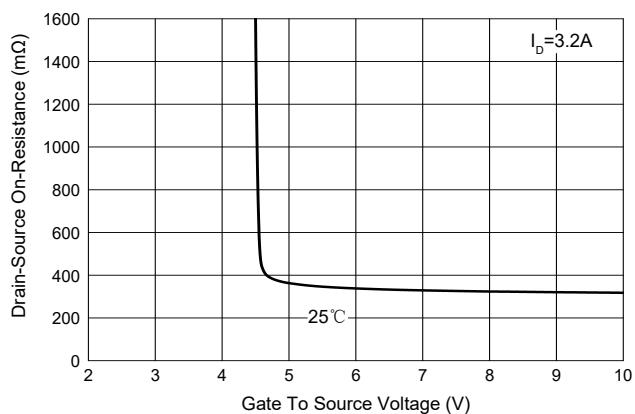
**Fig.1 - Typical Output Characteristics**



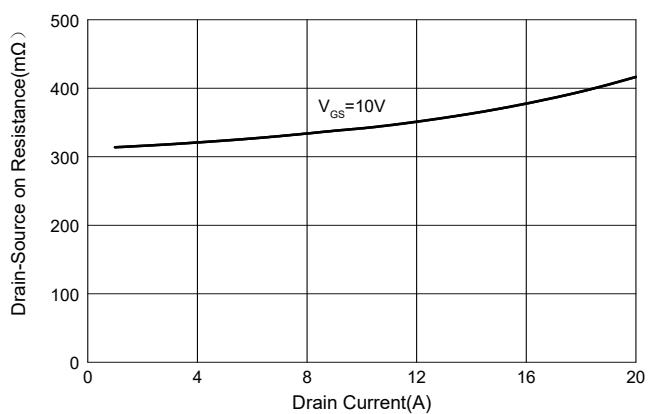
**Fig.2 - Transfer Characteristic**



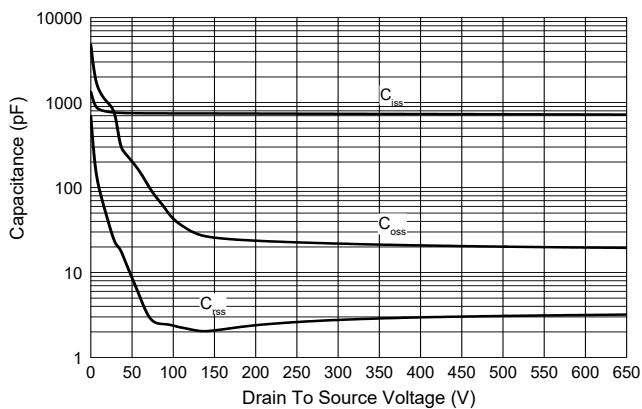
**Fig.3 -  $R_{DS(ON)}$  -  $V_{GS}$**



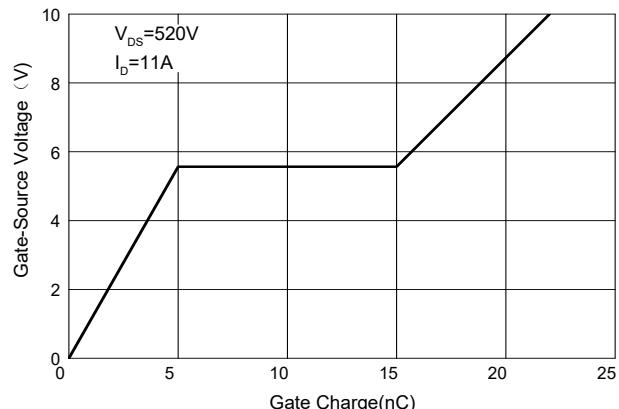
**Fig.4 -  $R_{DS(ON)}$  -  $I_D$**



**Fig.5 - Capacitance Characteristics**

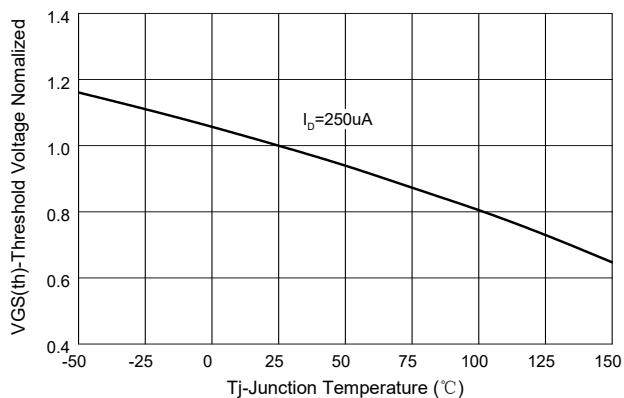


**Fig.6 - Gate Charge**

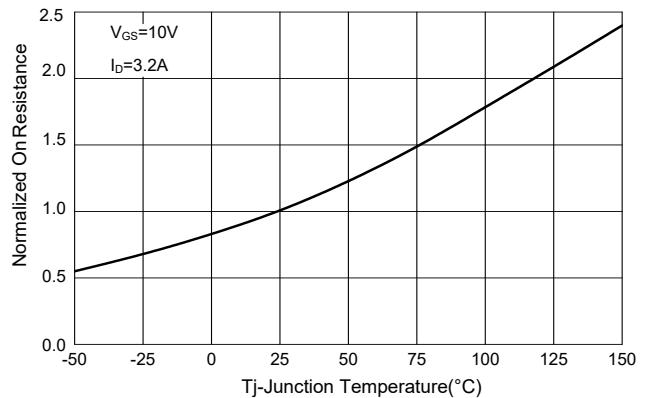


## Curve Characteristics

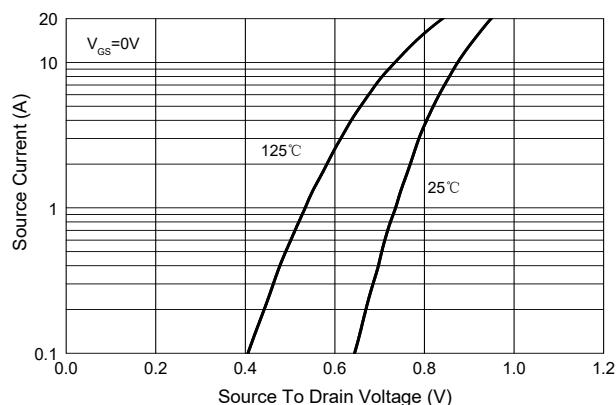
**Fig.7 - Normalized Threshold Voltage**



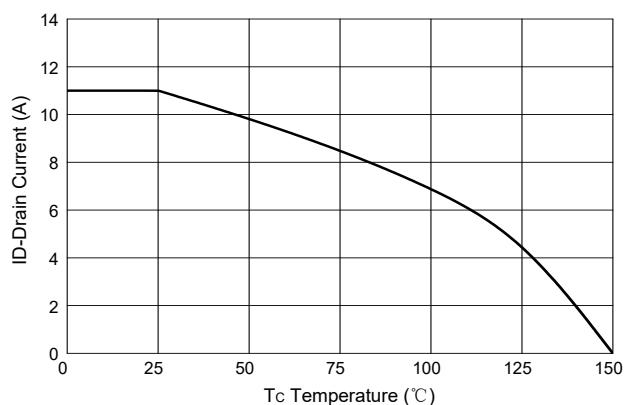
**Fig.8 - Normalized On Resistance Characteristics**



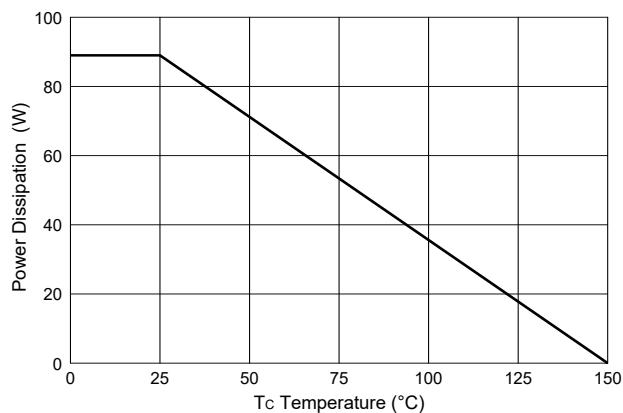
**Fig.9 -  $I_S - V_{SD}$**



**Fig.10 - Drain Current**



**Fig.11 - PD Dissipation**



## Curve Characteristics

Fig. 12 - Safe Operation Area

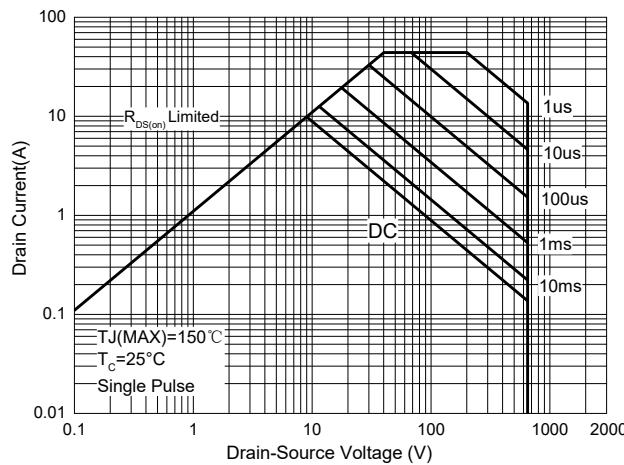
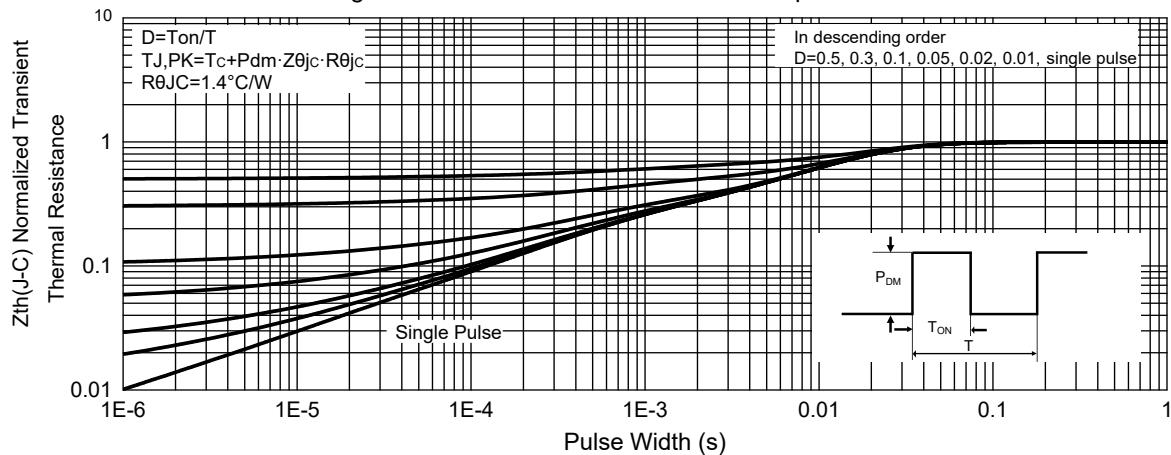


Fig. 13 -Normalized Transient Thermal Impedance



## Ordering Information

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

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