

## Features

- Low On-resistance and Low Conduction Losses
- ESD Protected up to 2KV(HBM)
- Ultra Low Gate Charge Cause Lower Driving Requirement
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free. "Green" Device (Note 1)
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

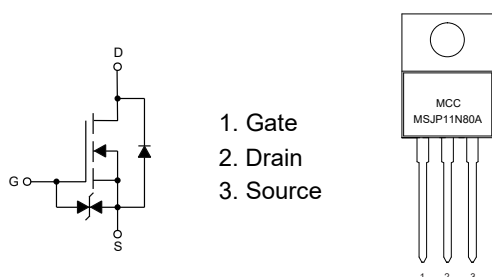
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 62.5°C/W Junction to Ambient<sup>(Note 2)</sup>
- Thermal Resistance: 0.5°C/W Junction to Case

| Parameter                                         | Symbol   | Rating                  | Unit |
|---------------------------------------------------|----------|-------------------------|------|
| Drain-Source Voltage                              | $V_{DS}$ | 800                     | V    |
| Gate-Source Voltage                               | $V_{GS}$ | ±20                     | V    |
| Continuous Drain Current                          | $I_D$    | $T_C=25^\circ\text{C}$  | A    |
|                                                   |          | $T_C=100^\circ\text{C}$ |      |
| Pulsed Drain Current <sup>(Note 3)</sup>          | $I_{DM}$ | 44                      | A    |
| Total Power Dissipation <sup>(Note 4)</sup>       | $P_D$    | 250                     | W    |
| Single Pulse Avalanche Energy <sup>(Note 5)</sup> | $E_{AS}$ | 142                     | mJ   |

Note:

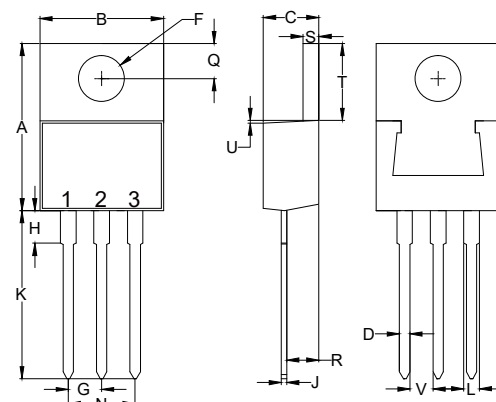
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{\theta JA} t \leq 10\text{s}$  and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.
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.  $T_J=25^\circ\text{C}$ ,  $V_{DD}=50\text{V}$ ,  $V_{GS}=10\text{V}$ ,  $L=79\text{mH}$ .

## Internal Structure and Marking Code



# N-CHANNEL Super-Junction Power MOSFET

## TO-220



| DIMENSIONS |        |       |       |       |      |
|------------|--------|-------|-------|-------|------|
| DIM        | INCHES |       | MM    |       | NOTE |
|            | MIN    | MAX   | MIN   | MAX   |      |
| A          | 0.560  | 0.625 | 14.22 | 15.88 |      |
| B          | 0.380  | 0.420 | 9.65  | 10.67 |      |
| C          | 0.140  | 0.190 | 3.56  | 4.82  |      |
| D          | 0.020  | 0.045 | 0.51  | 1.14  |      |
| F          | 0.139  | 0.161 | 3.53  | 4.09  | Φ    |
| G          | 0.090  | 0.110 | 2.29  | 2.79  |      |
| H          | -----  | 0.250 | ----- | 6.35  |      |
| J          | 0.012  | 0.025 | 0.30  | 0.64  |      |
| K          | 0.500  | 0.580 | 12.70 | 14.73 |      |
| L          | 0.045  | 0.060 | 1.14  | 1.52  |      |
| N          | 0.190  | 0.210 | 4.83  | 5.33  |      |
| Q          | 0.100  | 0.135 | 2.54  | 3.43  |      |
| R          | 0.080  | 0.115 | 2.04  | 2.92  |      |
| S          | 0.045  | 0.055 | 1.14  | 1.39  |      |
| T          | 0.230  | 0.270 | 5.84  | 6.86  |      |
| U          | -----  | 0.050 | ----- | 1.27  |      |
| V          | 0.045  | ----- | 1.15  | ----- |      |

**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                                                  | 800 |      |     | 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> =800V, 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                                    | 2.5 | 3.5  | 4.5 | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =7.1 A                                                 |     | 362  | 470 | mΩ   |
| Gate Resistance                 | R <sub>g</sub>       | f=1 MHz, Open drain                                                                         |     | 25   |     | Ω    |
| Diode Characteristics           |                      |                                                                                             |     |      |     |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                             |     |      | 11  | A    |
| Diode Forward Voltage           | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =11A                                                    |     |      | 1.4 | V    |
| Reverse Recovery Time           | t <sub>rr</sub>      | I <sub>F</sub> =5.5A, dI <sub>F</sub> /dt=100A/μs                                           |     | 200  |     | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                             |     | 1825 |     | nC   |
| Dynamic Characteristics         |                      |                                                                                             |     |      |     |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =400V,V <sub>GS</sub> =0V,f=1MHz                                            |     | 918  |     | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                             |     | 21   |     |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                             |     | 1.5  |     |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =400V,V <sub>GS</sub> = 10V,I <sub>D</sub> =5.5A                            |     | 24   |     | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                             |     | 4.9  |     |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                             |     | 10   |     |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DD</sub> =400V, V <sub>GS</sub> =10V,<br>R <sub>GEN</sub> =6Ω, I <sub>DS</sub> =5.5A |     | 12.4 |     | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                             |     | 16.3 |     |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                             |     | 14   |     |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                             |     | 6    |     |      |

## Curve Characteristics

Fig. 1 - Typical Output Characteristics

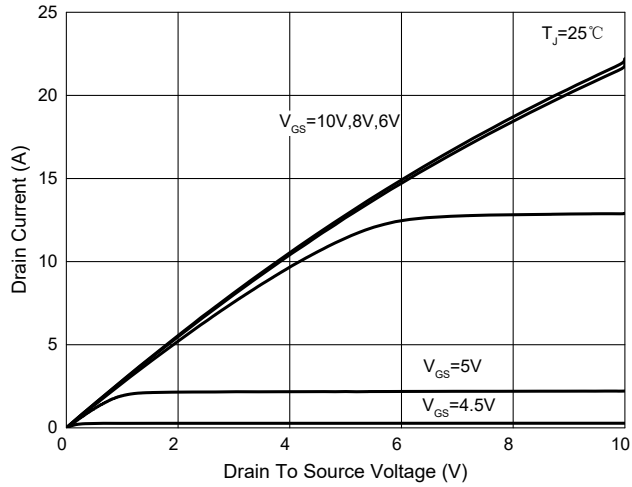


Fig. 2 - Transfer Characteristics

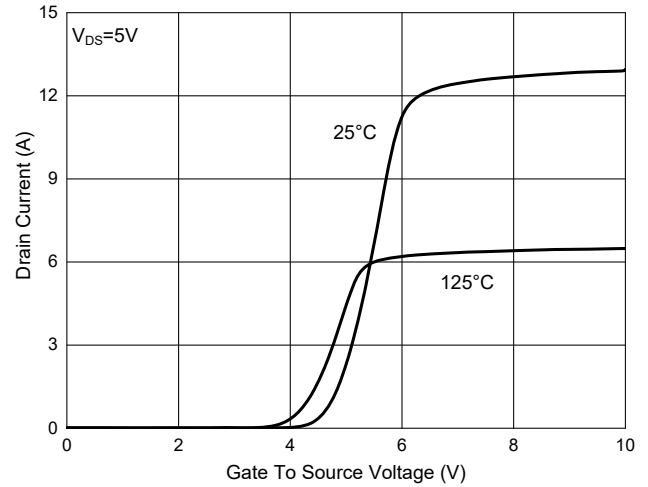


Fig. 3 -  $R_{DS(ON)} - V_{GS}$

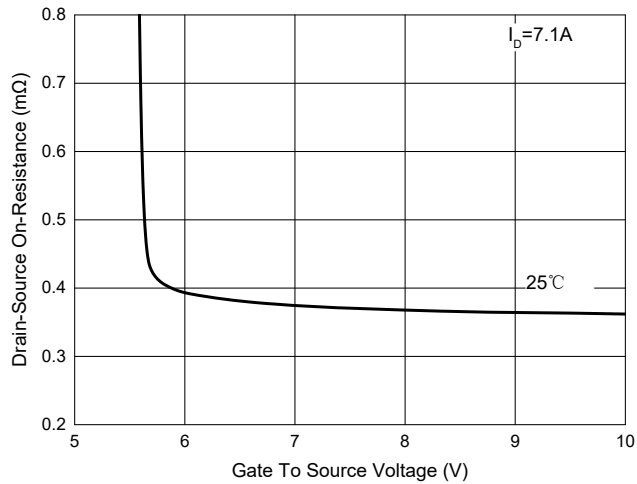


Fig. 4 - Normalized On Resistance Characteristics

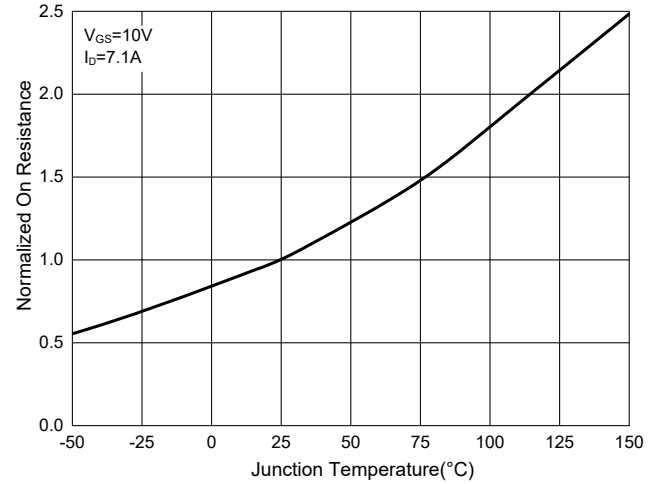


Fig. 5 - Capacitance Characteristics

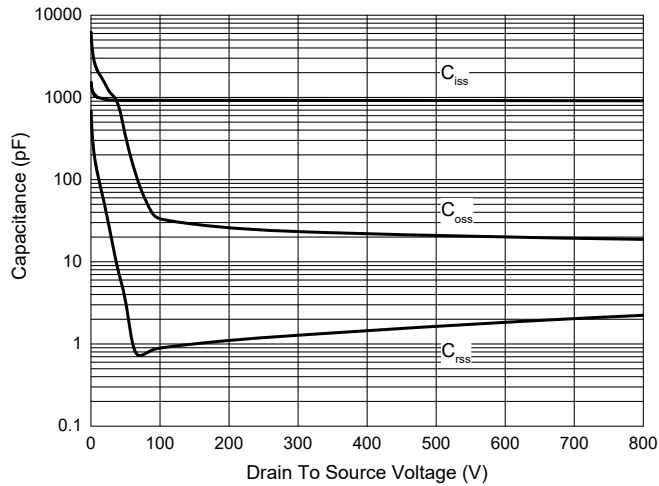
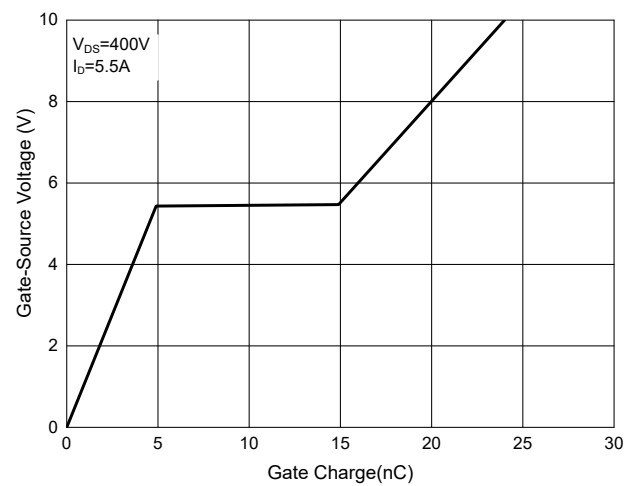


Fig. 6 - Gate Charge



## Curve Characteristics

Fig. 7 -  $R_{DS(ON)} - I_D$

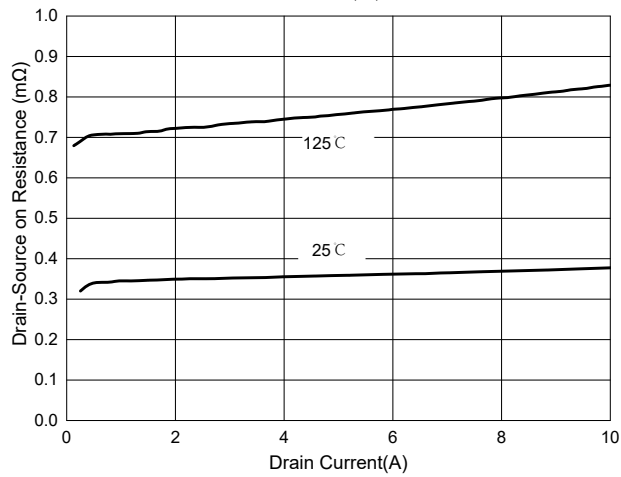


Fig. 8 - Normalized Threshold voltage

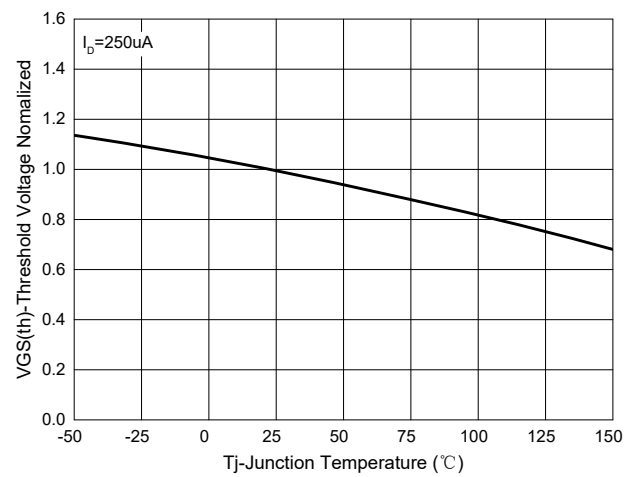


Fig. 9 -  $I_S - V_{SD}$

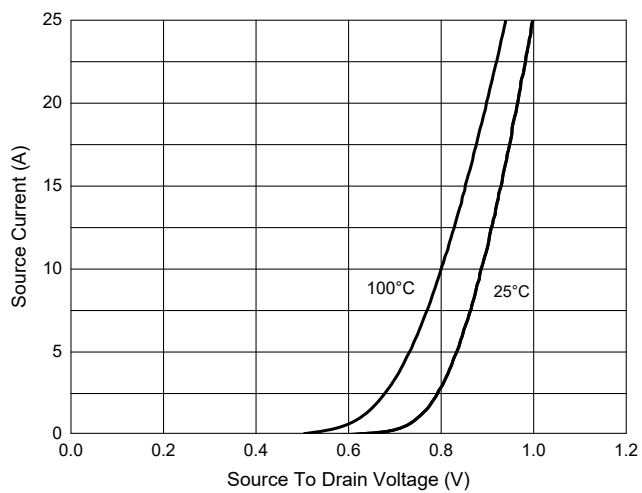


Fig. 10 - Drain Current

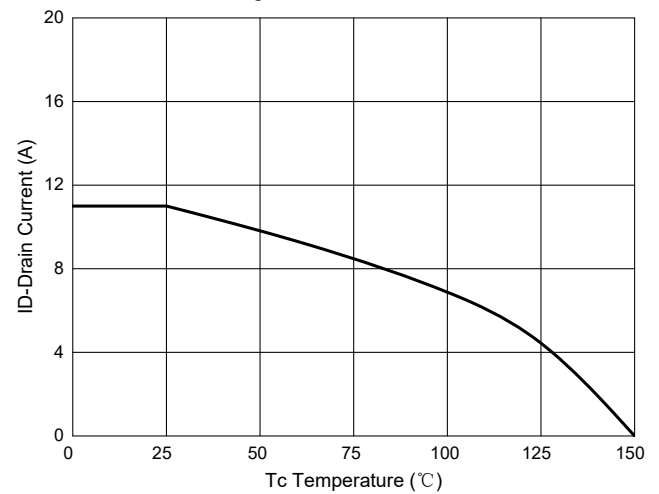
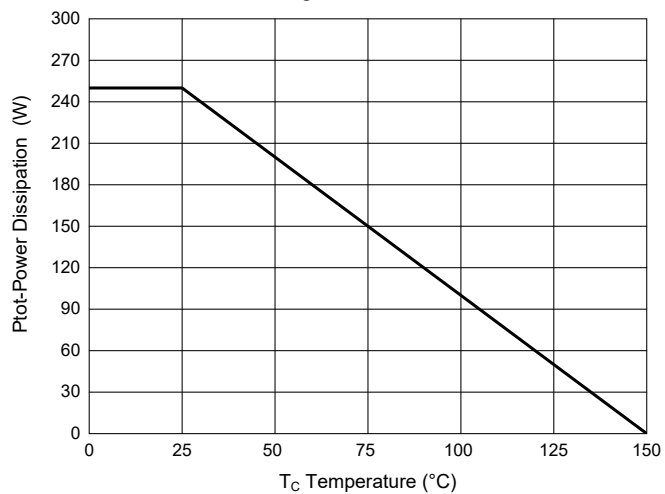


Fig. 11 -  $P_D - T_J$



## Curve Characteristics

Fig. 12 - Safe Operation Area

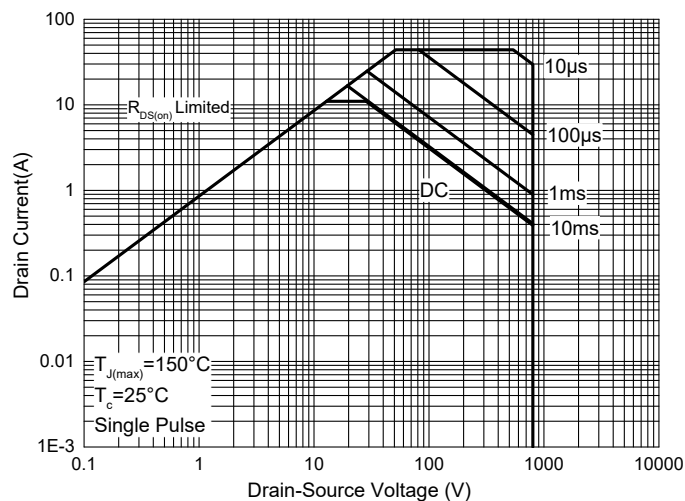
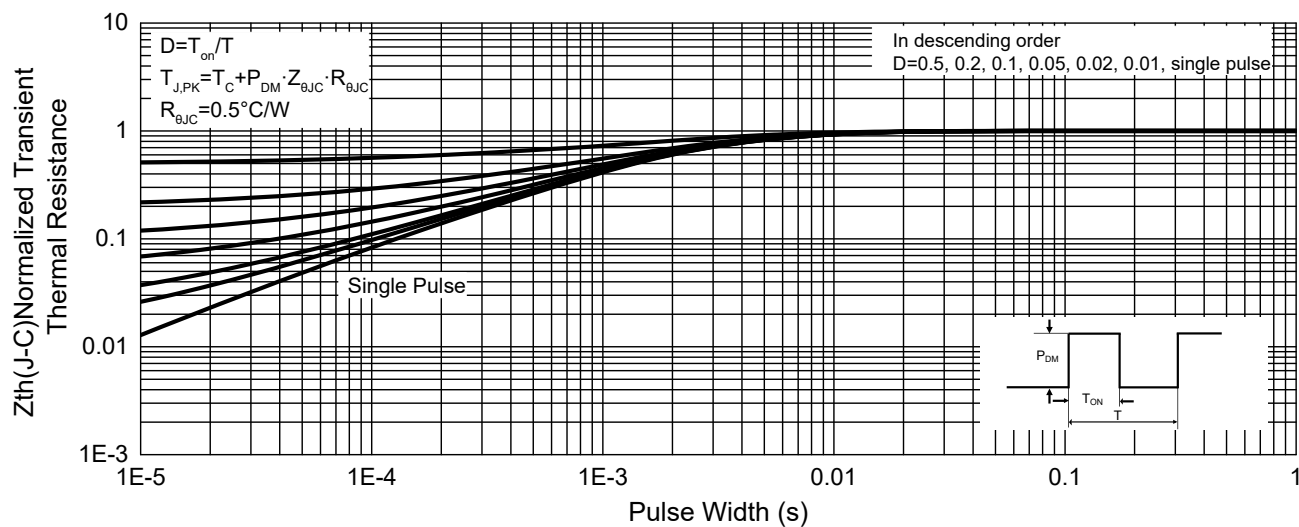


Fig. 13 - Normalized Transient Thermal Impedance



## Ordering Information

| Device         | Packing                                  |
|----------------|------------------------------------------|
| Part Number-BP | Bulk:50pcs/Tube, 1Kpcs/Box, 5Kpcs/Carton |

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