## Features

- Split Gate Trench MOSFET Technology
- Lower $R_{DS(ON)}$
- Lower Capacitance
- 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 MOSFET

## Maximum Ratings

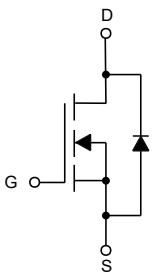
- Operating Junction Temperature Range: -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 40°C/W Junction to Ambient(Note2)
- Thermal Resistance: 0.6°C/W Junction to Case

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 85 | V |
| Gate-Source Volltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $T_C$=25°C | $I_D$ | 118 | A |
| | $T_C$=100°C | | 74 | |
| Pulsed Drain Current(Note3) | | $I_{DM}$ | 472 | A |
| Total Power Dissipation(Note4) | | $P_D$ | 208 | W |
| Single Pulse Avalanche Energy (Note5) | | $E_{AS}$ | 351 | mJ |

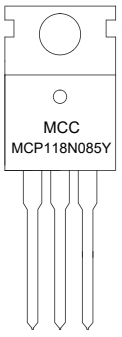
Note:

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$^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25°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°C, $V_{DD}$=50V, $V_{GS}$=10V, L=0.5mH

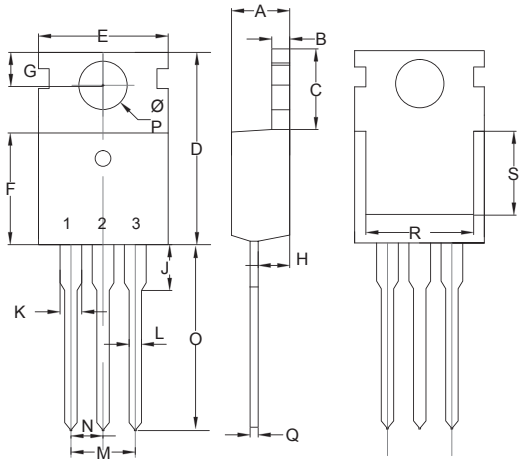
## Internal Structure and Marking Code




1.GATE
2.DRAIN
3.SOURCE




## TO-220AB(H)




| DIMENSIONS | | | | | |
|---|---|---|---|---|---|
| DIM | INCHES | | MM | | NOTE |
| | MIN | MAX | MIN | MAX | |
| A | 0.172 | 0.188 | 4.37 | 4.77 | |
| B | 0.049 | 0.057 | 1.25 | 1.45 | |
| C | 0.246 | 0.270 | 6.25 | 6.85 | |
| D | 0.594 | 0.634 | 15.10 | 16.10 | |
| E | 0.382 | 0.406 | 9.70 | 10.30 | |
| F | 0.346 | 0.370 | 8.80 | 9.40 | |
| G | 0.102 | 0.118 | 2.60 | 3.00 | |
| H | 0.087 | 0.102 | 2.20 | 2.60 | |
| J | ----- | 0.134 | ----- | 3.40 | |
| K | 0.046 | 0.058 | 1.17 | 1.47 | |
| L | 0.028 | 0.037 | 0.70 | 0.95 | |
| M | 0.200 | | 5.08 | | TYP. |
| N | 0.100 | | 2.54 | | TYP. |
| O | 0.502 | 0.543 | 12.75 | 13.80 | |
| P | 0.134 | 0.150 | 3.40 | 3.80 | Φ |
| Q | 0.016 | 0.026 | 0.40 | 0.65 | |
| R | 0.276 | ----- | 7.00 | ----- | |
| S | 0.217 | ----- | 5.50 | ----- | |

## 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, $I_D$=250μA | 85 | | | V |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$ =±20V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=85V, $V_{GS}$=0V | | | 1 | μA |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 2 | 3 | 4 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=20A | | 4.5 | 6.5 | mΩ |
| | | $V_{GS}$=6V, $I_D$=20A | | 7.5 | 10 | |
| Gate Resistance | $R_g$ | f=1MHz, Open drain | | 1.6 | | Ω |
| **Diode Characteristics** | | | | | | |
| Continuous Body Diode Current | $I_S$ | | | | 118 | A |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V, $I_S$=20A | | | 1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_S$=59A, $dI_F/dt$=225A/μs | | 39 | | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | | 60 | | nC |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=40V,$V_{GS}$=0V,f=1MHz | | 4150 | | pF |
| Output Capacitance | $C_{oss}$ | | | 820 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 32 | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=40V,$V_{GS}$=10V,$I_D$=59A | | 62 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 20 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 19.5 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS}$=10V, $V_{DD}$=40V, $I_D$=59A $R_G$=2.2Ω | | 20 | | ns |
| Turn-On Rise Time | $t_r$ | | | 84 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 28 | | |
| Turn-Off Fall Time | $t_f$ | | | 9 | | |

## Curve Characteristics

**Fig. 1 - Typical Output Characteristics**

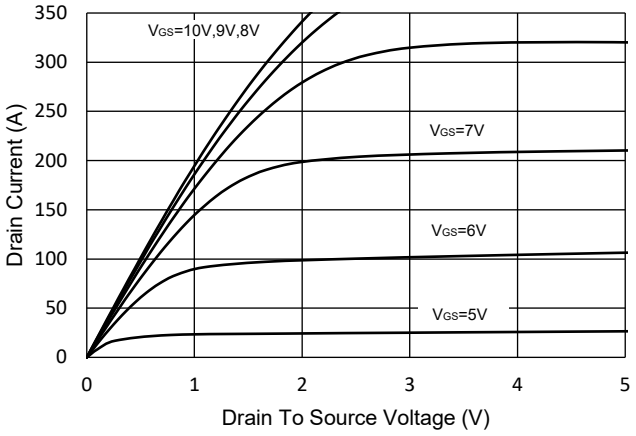



**Fig.2 - Transfer Characteristic**

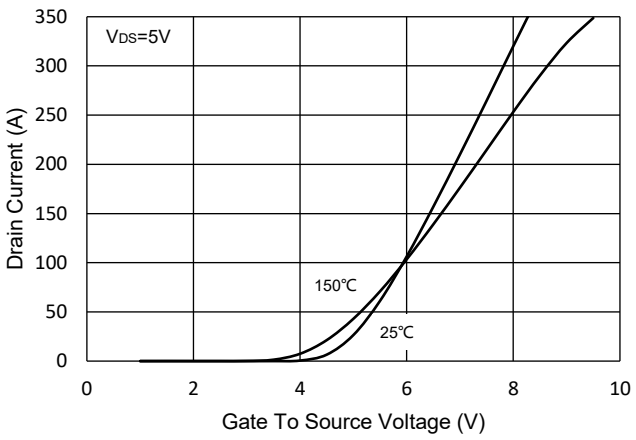



**Fig.3 - $R_{DS(ON)}$ - $V_{GS}$**

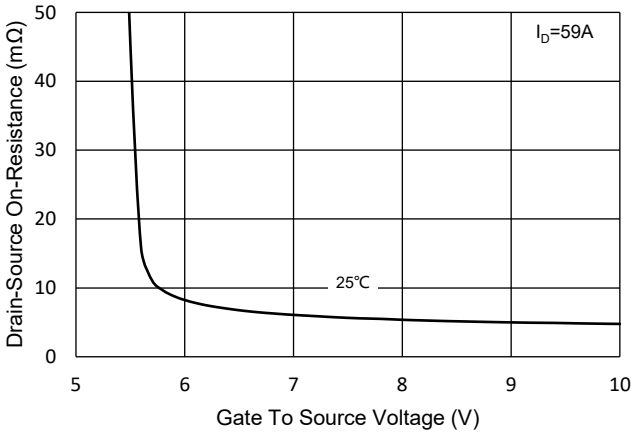



**Fig.4 - $R_{DS(ON)}$ - $I_D$**

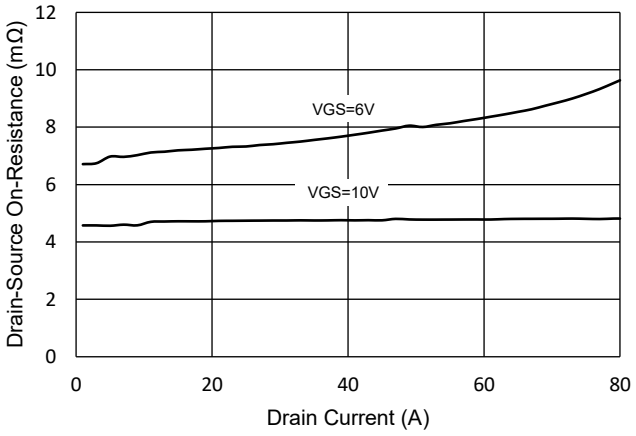



**Fig.5 - Capacitance Characteristics**

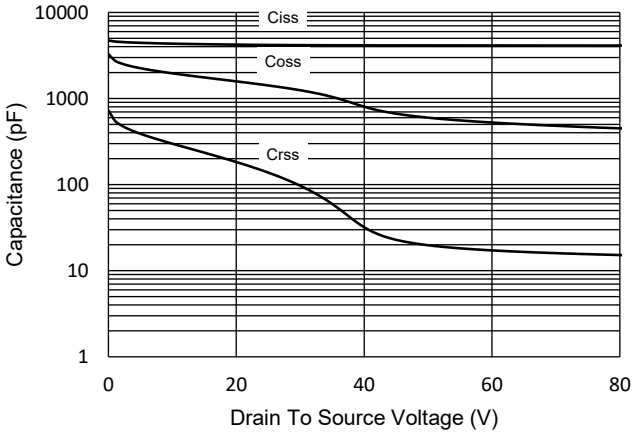
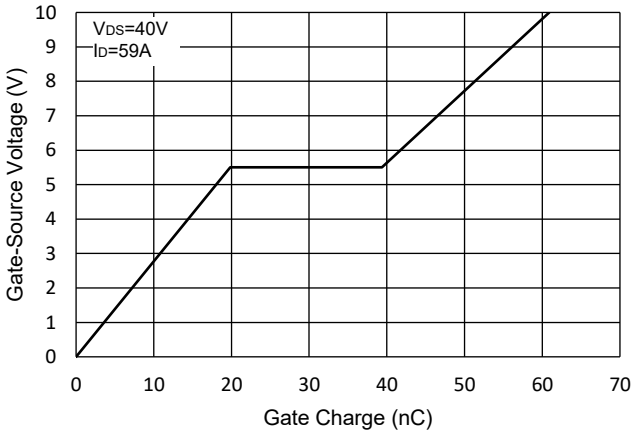



**Fig.6 - Gate Charge**



## Curve Characteristics

**Fig.7 - Normalized Threshold Voltage**

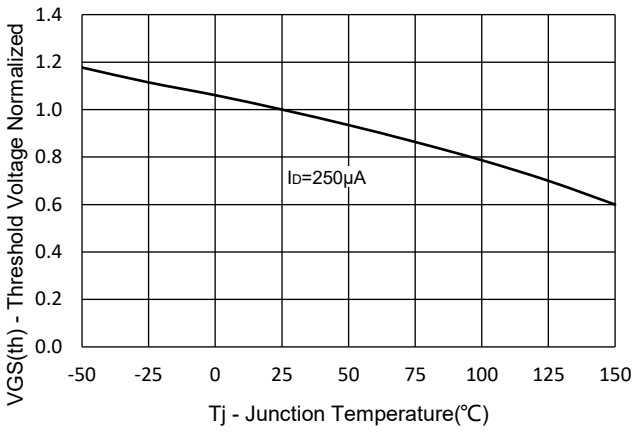



**Fig.8 - Normalized On Resistance Characteristics**

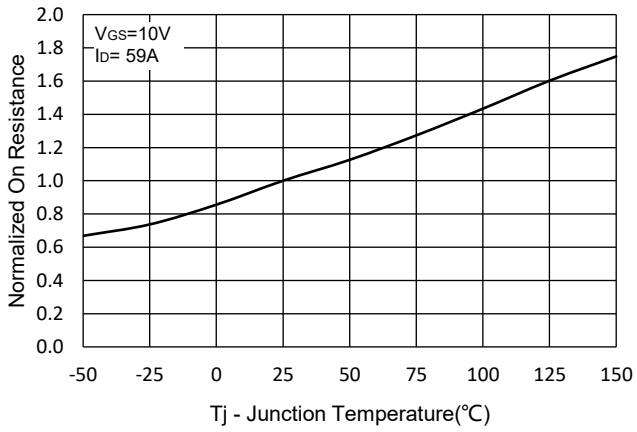



**Fig.9 - $I_S$ - $V_{SD}$**

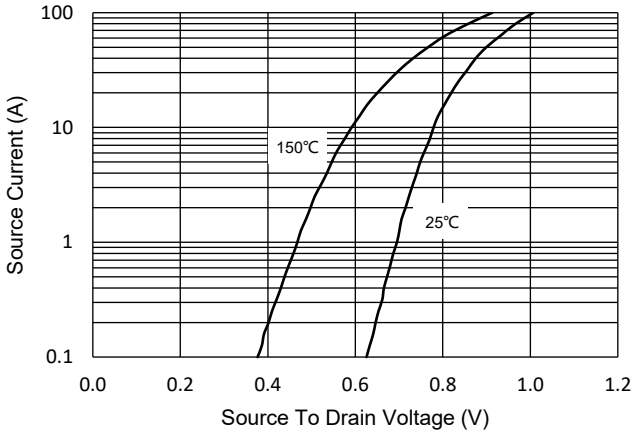



**Fig.10 - Drain Current**

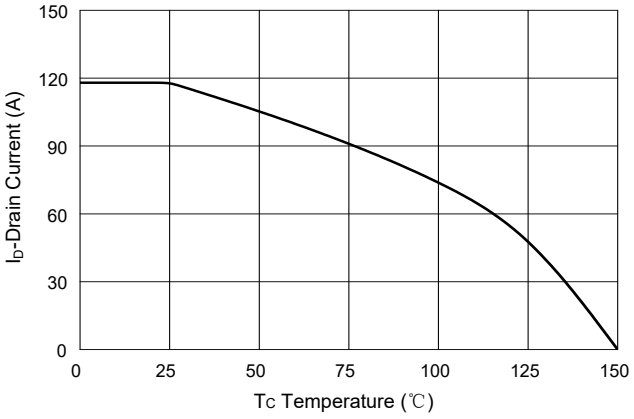
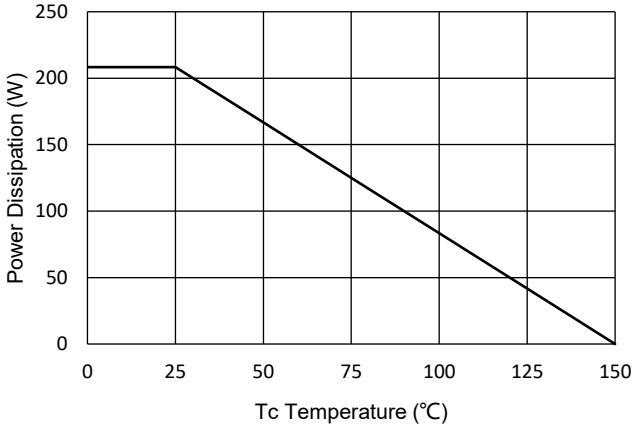



**Fig.11 - PD Dissipation**



## Curve Characteristics

**Fig.12 - Safe Operation Area**

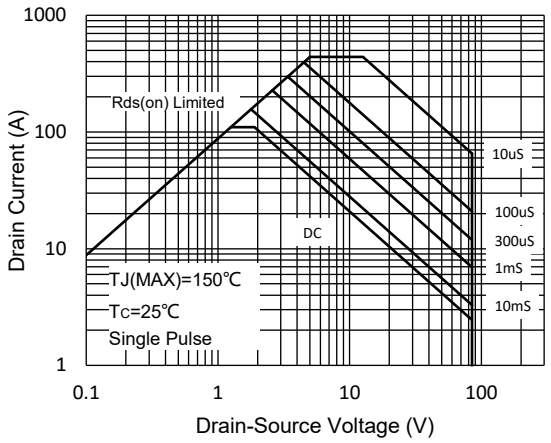
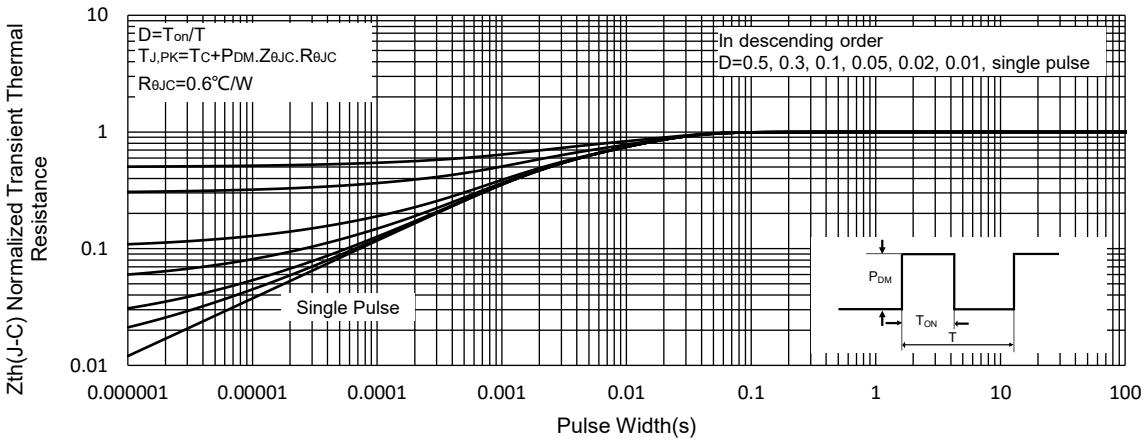



**Fig.13 - Normalized Transient Thermal Impedance**



## Ordering Information

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


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