



# THE DATASHEET OF MCU45P03A-TP



## Features

- Trench Power LV MOSFET Technology
- High Density Cell Design for Low  $R_{DS(ON)}$
- High Speed Switching
- 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

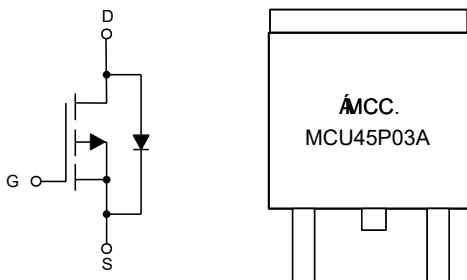
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 50°C/W Junction to Ambient<sup>(Note 2)</sup>
- Thermal Resistance: 2°C/W Junction to Case

| Parameter  | Symbol   | Rating                 | Unit |
|--|----------|------------------------|------|
| Drain-Source Voltage                               | $V_{DS}$ | -30                    | V    |
| Gate-Source Voltage                                | $V_{GS}$ | ±25                    | V    |
| Continuous Drain Current                           | $I_D$    | $T_C=25^\circ\text{C}$ | -45  |
|  |          | $T_C=85^\circ\text{C}$ | -32  |
| Pulsed Drain Current <sup>(Note 3)</sup>           | $I_{DM}$ | -175                   | A    |
| Total Power Dissipation <sup>(Note 4)</sup>        | $P_D$    | 62.5                   | W    |
| Single Pulsed Avalanche Energy <sup>(Note 5)</sup> | $E_{AS}$ | 256                    | mJ   |

Note:

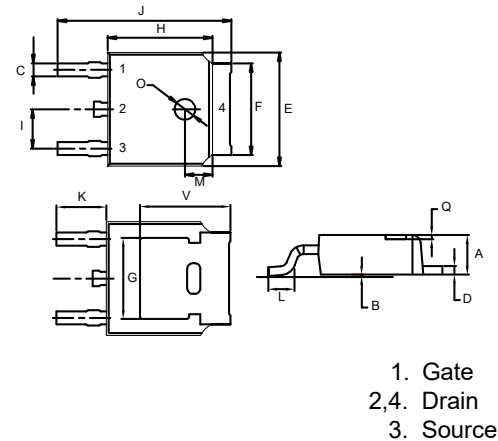
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment 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.  $T_J=25^\circ\text{C}$ ,  $V_{DD}=-25\text{V}$ ,  $R_G=25\Omega$ ,  $L=0.5\text{mH}$ .

## Internal Structure and Marking Code



## P-CHANNEL MOSFET

### DPAK(TO-252)



| DIM | INCHES |       | MM   |       | NOTE |
|-----|--------|-------|------|-------|------|
|     | MIN    | MAX   | MIN  | MAX   |      |
| A   | 0.087  | 0.094 | 2.20 | 2.40  |      |
| B   | 0.000  | 0.005 | 0.00 | 0.13  |      |
| C   | 0.026  | 0.034 | 0.66 | 0.86  |      |
| D   | 0.018  | 0.023 | 0.46 | 0.58  |      |
| E   | 0.256  | 0.264 | 6.50 | 6.70  |      |
| F   | 0.201  | 0.215 | 5.10 | 5.46  |      |
| G   | 0.190  |       | 4.83 |       | TYP. |
| H   | 0.236  | 0.244 | 6.00 | 6.20  |      |
| I   | 0.086  | 0.094 | 2.18 | 2.39  |      |
| J   | 0.386  | 0.409 | 9.80 | 10.40 |      |
| K   | 0.114  |       | 2.90 |       | TYP. |
| L   | 0.055  | 0.067 | 1.40 | 1.70  |      |
| M   | 0.063  |       | 1.60 |       | TYP. |
| O   | 0.043  | 0.051 | 1.10 | 1.30  |      |
| Q   | 0.000  | 0.012 | 0.00 | 0.30  |      |
| V   | 0.211  |       | 5.35 |       | TYP. |

**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

| Parameter                       | Symbol        | Test Conditions   | Min  | Typ  | Max       | Unit       |
|---------------------------------|---------------|---|------|------|-----------|------------|
| <b>Static Characteristics</b>   |               |   |      |      |           |            |
| Drain-Source Breakdown Voltage  | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=-250\mu A$                              | -30  |      |           | V          |
| Gate-Source Leakage Current     | $I_{GSS}$     | $V_{DS}=0V, V_{GS}=\pm 25V$                             |      |      | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current | $I_{DSS}$     | $V_{DS}=-30V, V_{GS}=0V$                                |      |      | -1        | $\mu A$    |
| Gate-Threshold Voltage          | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=-250\mu A$                          | -1.2 | -1.8 | -2.8      | V          |
| Drain-Source On-Resistance      | $R_{DS(on)}$  | $V_{GS}=-20V, I_D=-20A$                                 |      | 4.8  | 7         | m $\Omega$ |
|                                 |               | $V_{GS}=-10V, I_D=-15A$                                 |      | 5.5  | 8         |            |
|                                 |               | $V_{GS}=-6V, I_D=-12A$                                  |      | 6.5  | 12        |            |
|                                 |               | $V_{GS}=-4.5V, I_D=-12A$                                |      | 8    | 13        |            |
| Gate Resisitance                | $R_g$         | f=1MHz, Open drain                                      |      | 3    |           | $\Omega$   |
| <b>Diode Characteristics</b>    |               |   |      |      |           |            |
| 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           | $t_{rr}$      | $I_S=-15A, di_F/dt=100A/\mu s$                          |      | 32.5 |           | ns         |
| Reverse Recovery Charge         | $Q_{rr}$      |   |      | 23   |           | nC         |
| <b>Dynamic Characteristics</b>  |               |   |      |      |           |            |
| Input Capacitance               | $C_{iss}$     | $V_{DS}=-15V, V_{GS}=0V, f=1MHz$                        |      | 5091 |           | pF         |
| Output Capacitance              | $C_{oss}$     |   |      | 645  |           |            |
| Reverse Transfer Capacitance    | $C_{rss}$     |   |      | 582  |           |            |
| Total Gate Charge               | $Q_g$         | $V_{DS}=-15V, V_{GS}=10V, I_D=-15A$                     |      | 90   |           | nC         |
| Gate-Source Charge              | $Q_{gs}$      |   |      | 12   |           |            |
| Gate-Drain Charge               | $Q_{gd}$      |   |      | 19   |           |            |
| Turn-On Delay Time              | $t_{d(on)}$   | $V_{DD}=-15V, V_{GS}=-10V, R_{GEN}=2.5\Omega, I_D=-15A$ |      | 13.7 |           | ns         |
| Turn-On Rise Time               | $t_r$         |   |      | 28   |           |            |
| Turn-Off Delay Time             | $t_{d(off)}$  |   |      | 108  |           |            |
| Turn-Off Fall Time              | $t_f$         |   |      | 56.6 |           |            |

Curve Characteristics

Fig. 1 Typical Output Characteristics

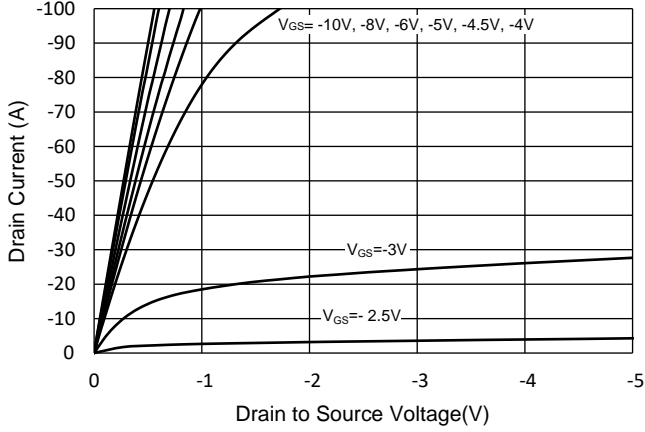


Fig.2 Transfer Characteristic

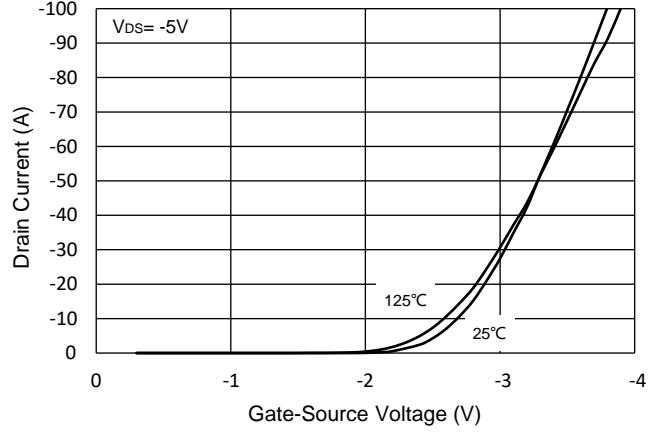


Fig.3  $R_{DS(on)}$ - $V_{GS}$

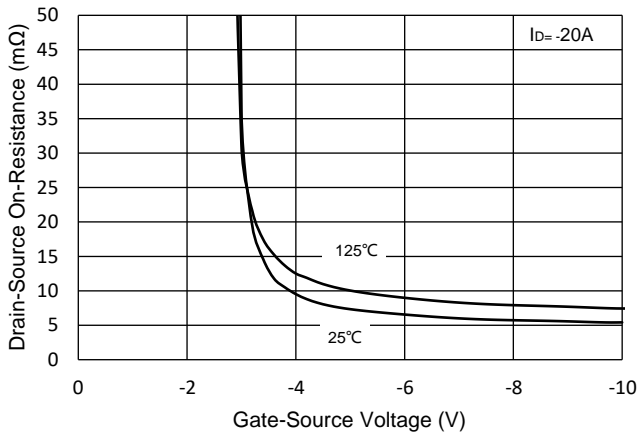


Fig.4  $R_{DS(on)}$ - $I_D$

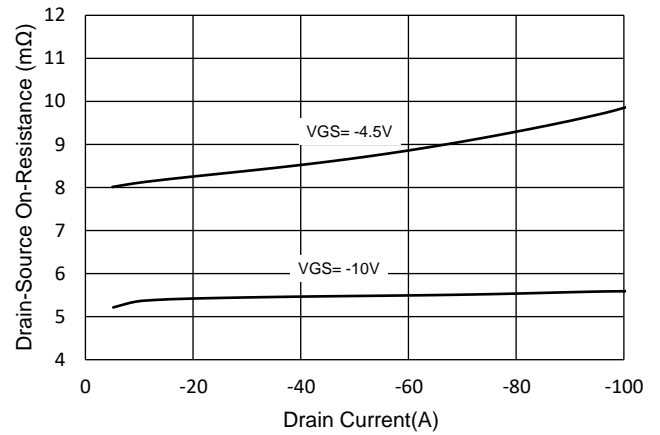


Fig.5 Capacitance Characteristics

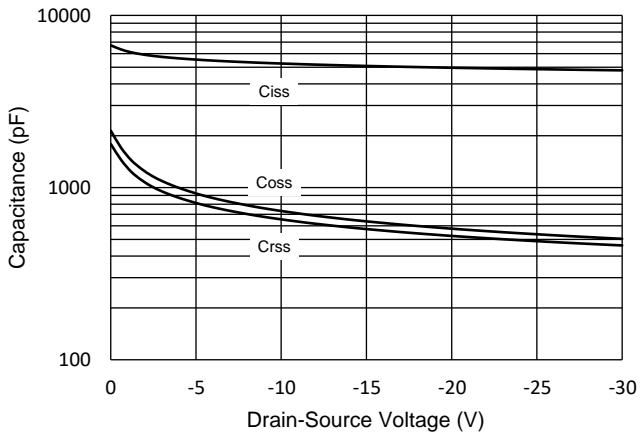
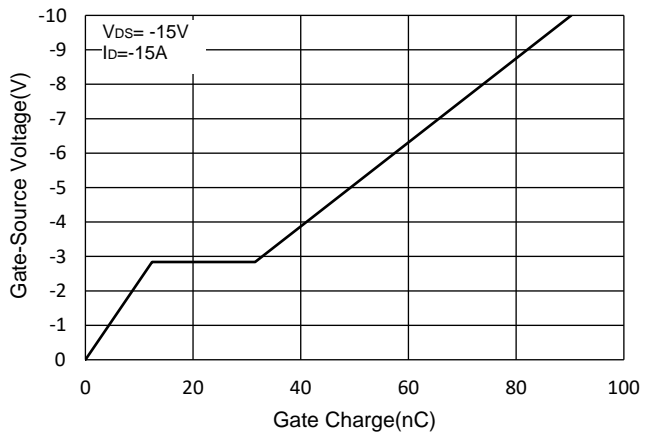
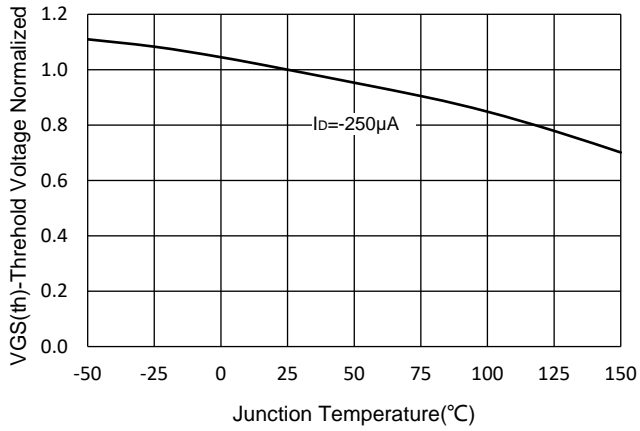


Fig.6 Gate Charge

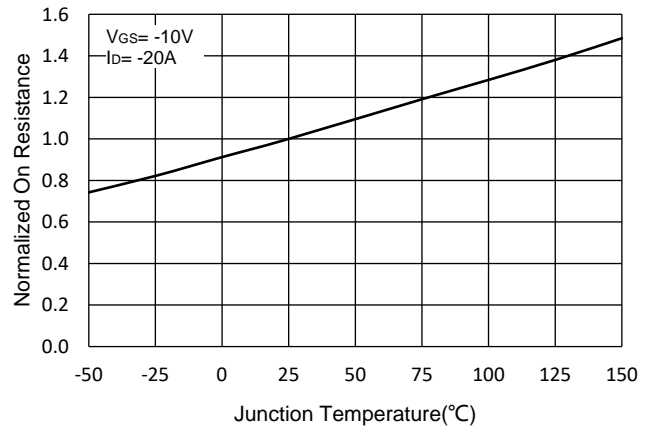


## Curve Characteristics

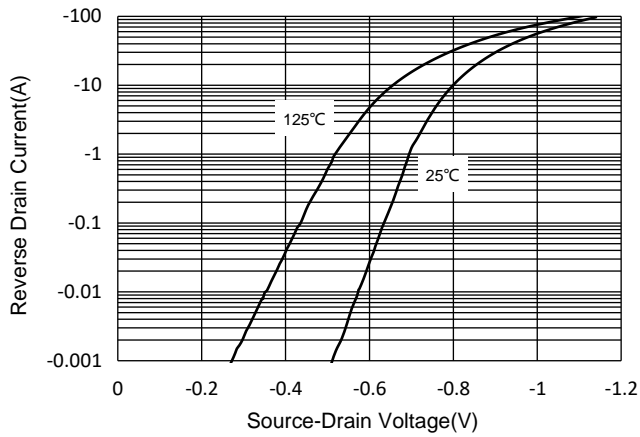
**Fig.7 Normalized Threshold Voltage**



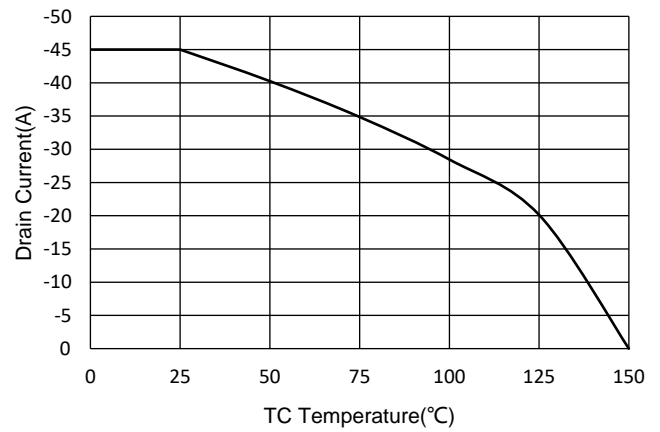
**Fig.8 Normalized On Resistance Characteristics**



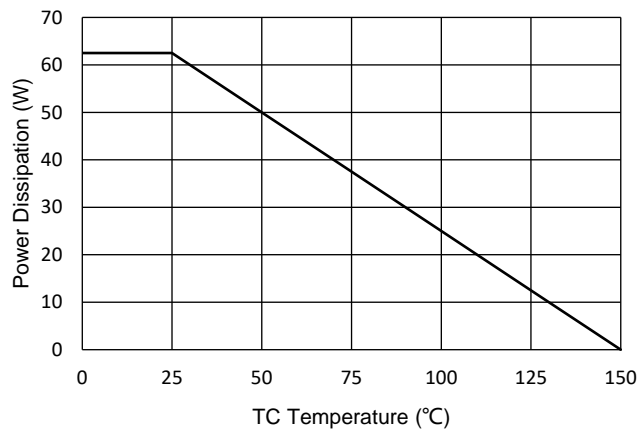
**Fig.9 IS-VSD**



**Fig.10 Drain Current**

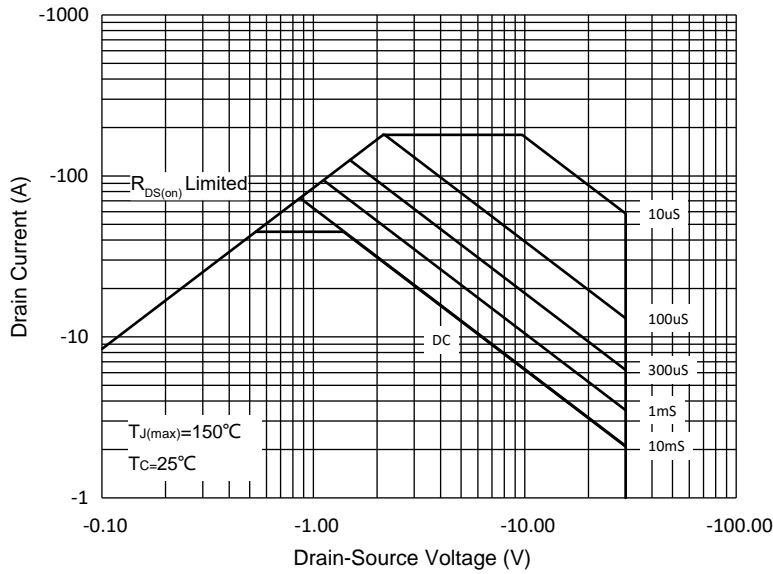


**Fig.11 PD Dissipation**

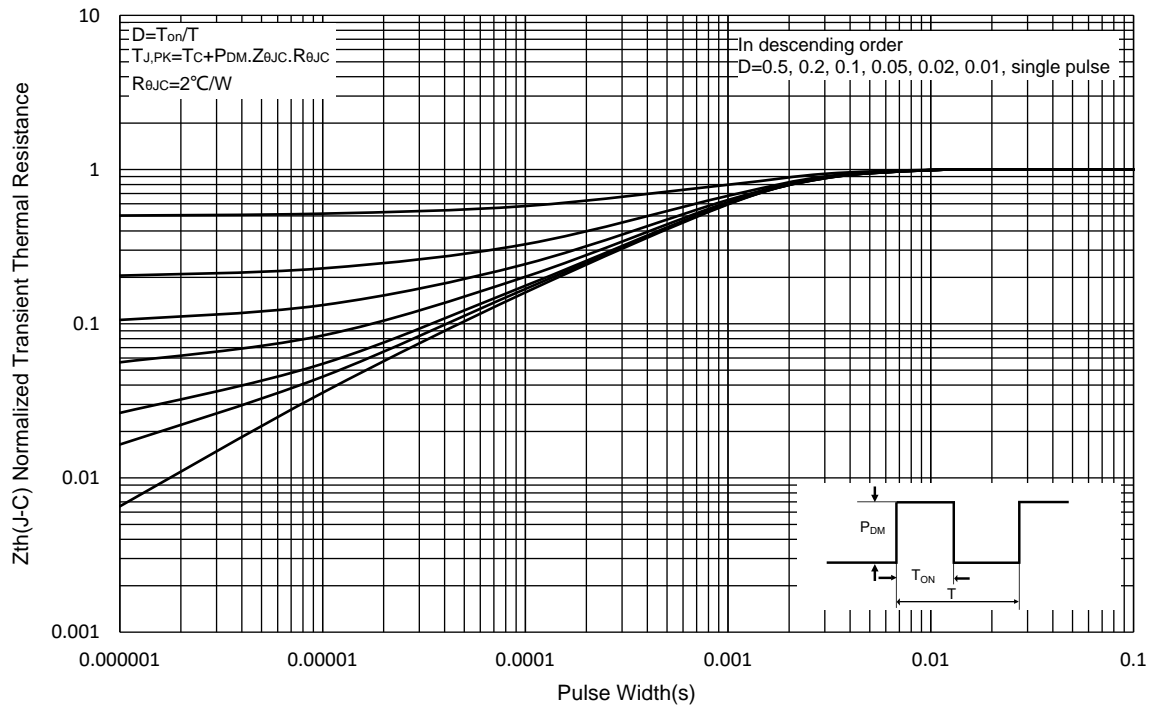


## Curve Characteristics

**Fig.12 Safe Operation Area**



**Fig.13 Normalized Transient Thermal Impedance**



## Ordering Information

| Device         | Packing                 |
|----------------|-------------------------|
| Part Number-TP | Tape&Reel: 2.5Kpcs/Reel |

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