

## Features

- Fully Automotive Qualified to AEC-Q101
- Split Gate Trench MOSFET Technology
- High Density Cell Design For Ultra Low  $R_{DS(on)}$
- Moisture Sensitivity Level 1
- Halogen Free "Green" Device<sup>(Note1)</sup>
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant<sup>(Note2)</sup> ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

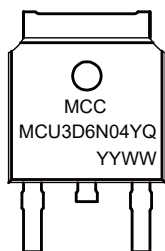
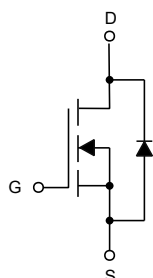
- Operating Junction Temperature Range : -55°C to +175°C
- Storage Temperature Range: -55°C to +175°C
- Thermal Resistance: 50°C/W Junction to Ambient<sup>(Note3)</sup>
- Thermal Resistance: 1.6°C/W Junction to Case

| Parameter                                        | Symbol   | Rating | Unit |
|--------------------------------------------------|----------|--------|------|
| Drain-Source Voltage                             | $V_{DS}$ | 40     | V    |
| Gate-Source Voltage                              | $V_{GS}$ | ±20    | V    |
| Continuous Drain Current                         | $I_D$    | 110    | A    |
|                                                  |          | 77     |      |
| Pulsed Drain Current <sup>(Note4)</sup>          | $I_{DM}$ | 440    | A    |
| Total Power Dissipation <sup>(Note5)</sup>       | $P_D$    | 93     | W    |
| Single Pulse Avalanche Energy <sup>(Note6)</sup> | $E_{AS}$ | 203    | 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 1in<sup>2</sup> 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.  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = 30\text{V}$ ,  $V_{GS} = 10\text{V}$ ,  $R_G = 25\Omega$ ,  $L = 0.5\text{mH}$ .

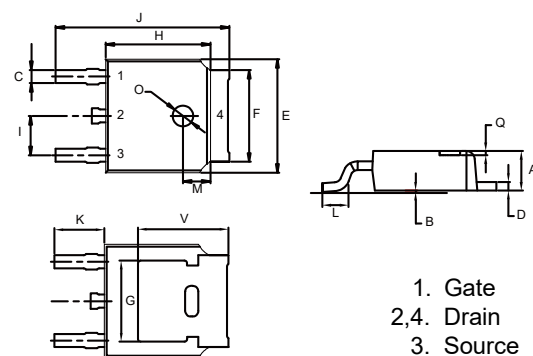
## Internal Structure and Marking Code



4 codes in total  
YY is the year  
WW is the week

## N-CHANNEL MOSFET

### DPAK(TO-252)

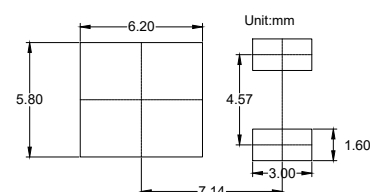


1. Gate
- 2,4. Drain
3. Source

### DIMENSIONS

| 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. |

### Suggested Solder Pad Layout

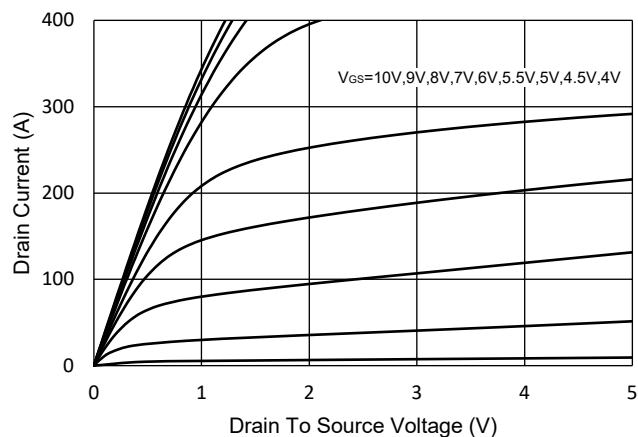


**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

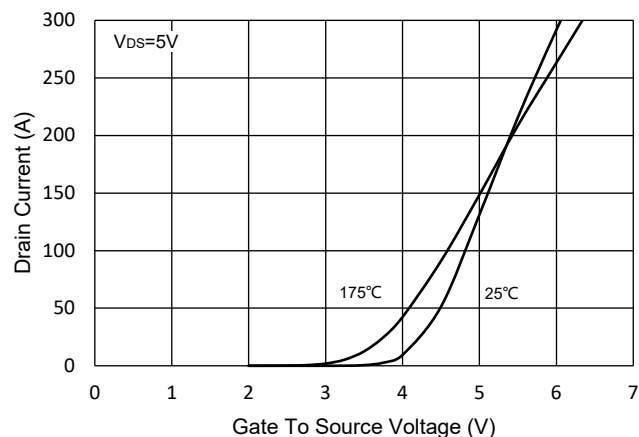
| Parameter                       | Symbol               | Test Conditions                                                                       | Min | Typ  | Max  | Unit |
|---------------------------------|----------------------|---------------------------------------------------------------------------------------|-----|------|------|------|
| 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> =40V, 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                              | 2.0 | 2.8  | 3.6  | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =50A                                             |     | 2.6  | 3.6  | mΩ   |
| Gate Resistance                 | R <sub>g</sub>       | f=1 MHz, Open drain                                                                   |     | 2.8  |      | Ω    |
| Diode Characteristics           |                      |                                                                                       |     |      |      |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                       |     |      | 110  | 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> =80A, dI/dt=100A/μs                                                    |     | 15.3 |      | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                       |     | 8.2  |      | nC   |
| Dynamic Characteristics         |                      |                                                                                       |     |      |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz                                     |     | 2371 |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                       |     | 771  |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                       |     | 25   |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =80A                       |     | 32.7 |      | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                       |     | 10   |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                       |     | 8.4  |      |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DD</sub> =20V, V <sub>GS</sub> =10V, R <sub>G</sub> =2.7Ω, I <sub>D</sub> =80A |     | 13.8 |      | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                       |     | 248  |      |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                       |     | 24.4 |      |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                       |     | 12.6 |      |      |

## Curve Characteristics

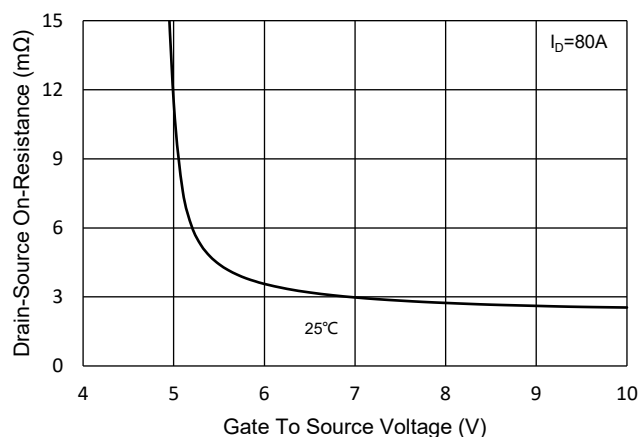
**Fig.1 - Typical Output Characteristics**



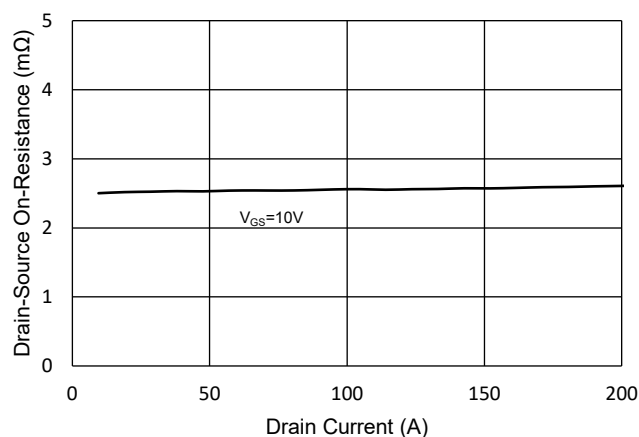
**Fig.2 - Transfer Characteristics**



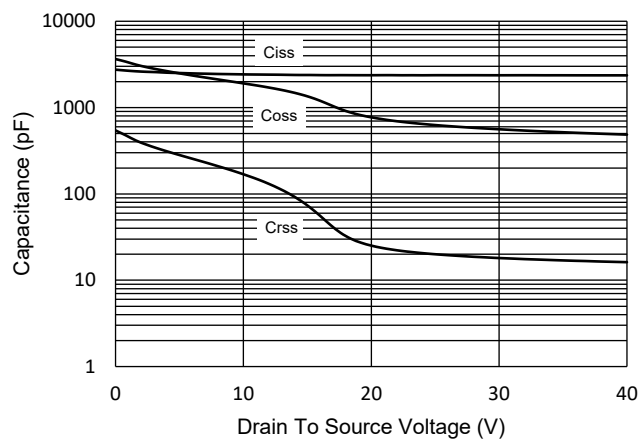
**Fig.3 -  $R_{DS(ON)}$  -  $V_{GS}$**



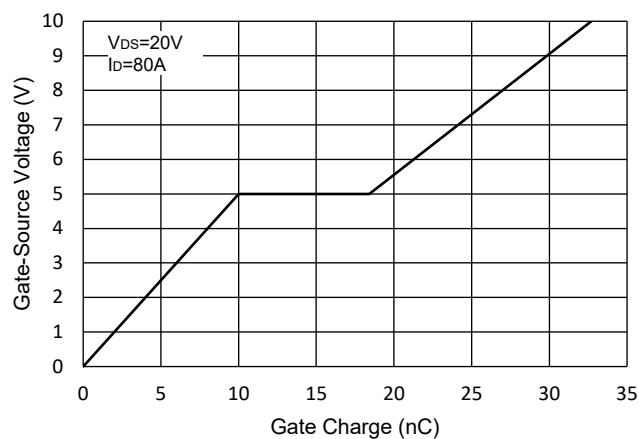
**Fig.4 -  $R_{DS(ON)}$  -  $I_D$**



**Fig.5 - Capacitance Characteristics**

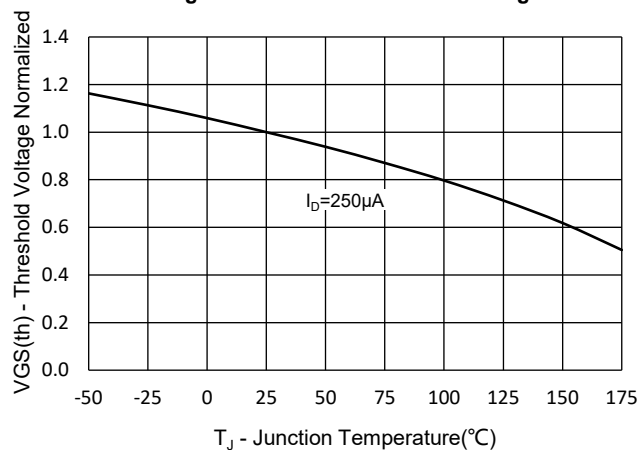


**Fig.6 - Gate Charge**

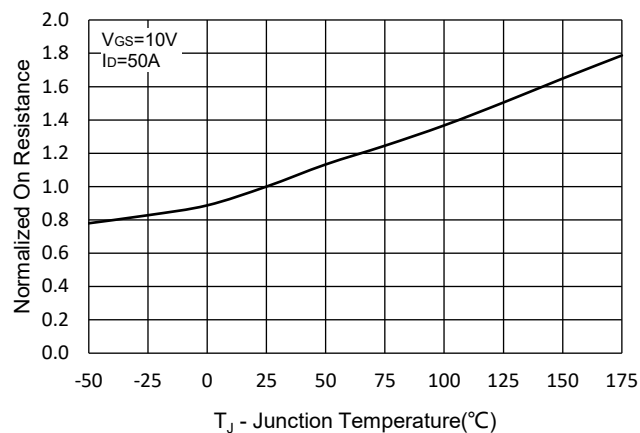


## Curve Characteristics

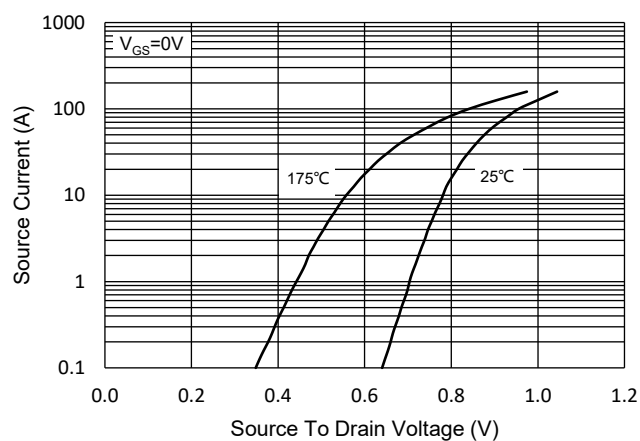
**Fig.7 - Normalized Threshold Voltage**



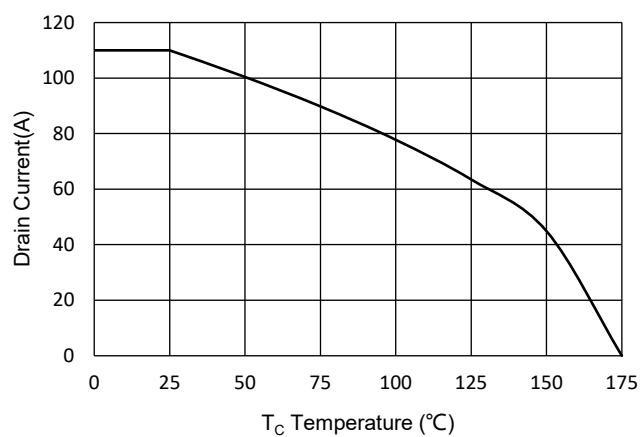
**Fig.8 - Normalized On Resistance Characteristics**



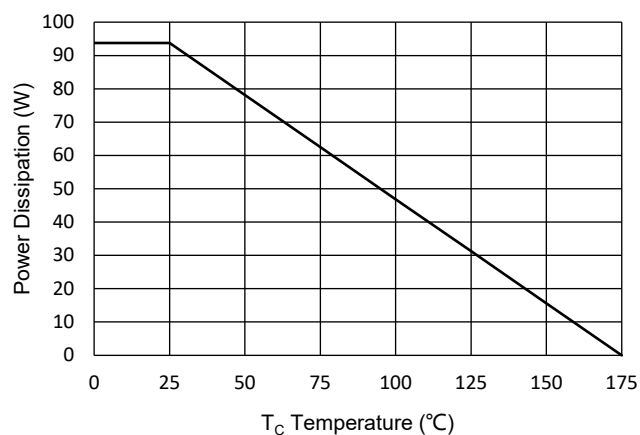
**Fig.9 -  $I_S - V_{SD}$**



**Fig.10 - Drain Current**



**Fig.11 - PD Dissipation**



## Curve Characteristics

Fig. 12 - Safe Operation Area

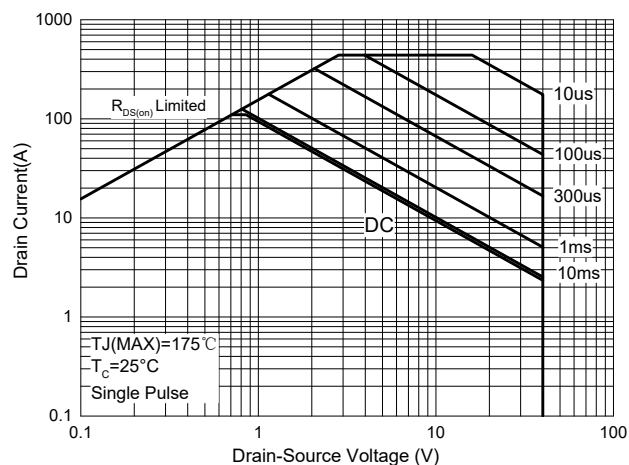
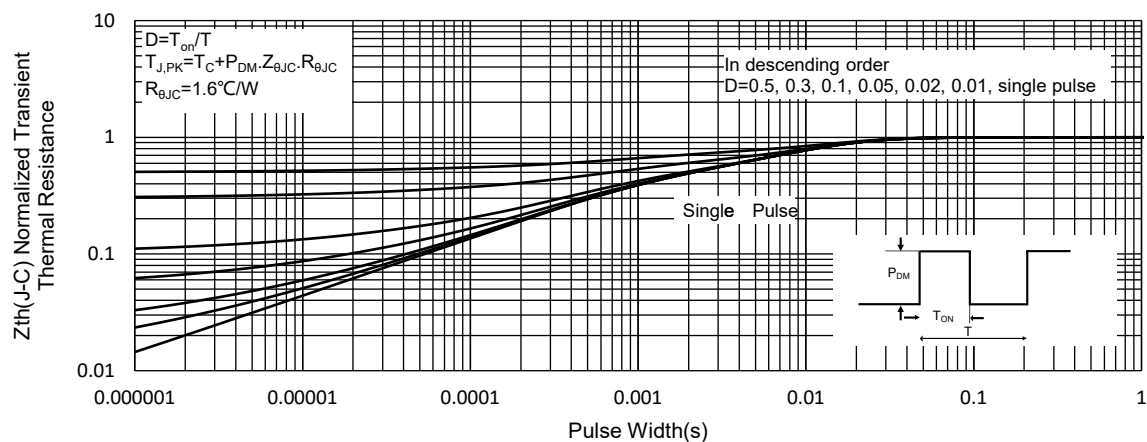


Fig.13 - Normalized Transient Thermal Impedance



## Ordering Information

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

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