

## Features

- ESD protected up to 2KV(HBM)
- Very Low FOM  $R_{DS(on)} \times Q_g$
- 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

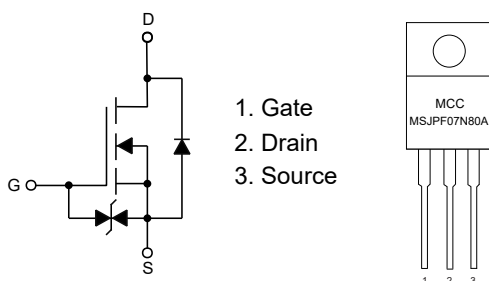
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 40°C/W Junction to Ambient (Note 2)
- Thermal Resistance: 1.6°C/W Junction to Case

| Parameter                                          | Symbol   | Rating | Unit |
|----------------------------------------------------|----------|--------|------|
| Drain-Source Voltage                               | $V_{DS}$ | 800    | V    |
| Gate-Source Voltage                                | $V_{GS}$ | ±20    | V    |
| Continuous Drain Current                           | $I_D$    | 7      | A    |
|                                                    |          | 4.4    |      |
| Pulsed Drain Current <sup>(Note 3)</sup>           | $I_{DM}$ | 28     | A    |
| Total Power Dissipation <sup>(Note 4)</sup>        | $P_D$    | 78     | W    |
| Single Pulsed Avalanche Energy <sup>(Note 5)</sup> | $E_{AS}$ | 32     | mJ   |

Note:

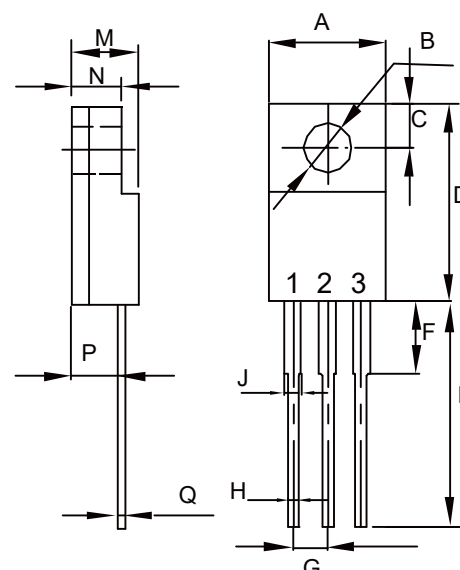
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{\theta JA} \leq 10\text{s}$  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.  $V_{DD}=700\text{V}$ ,  $V_{GS}=10\text{V}$ ,  $L=20\text{mH}$ .

## Internal Structure and Marking Code



## N-CHANNEL MOSFET

### TO-220F



### DIMENSIONS

| DIM | INCHES |       | MM    |       | NOTE |
|-----|--------|-------|-------|-------|------|
|     | MIN    | MAX   | MIN   | MAX   |      |
| A   | 0.392  | 0.421 | 9.96  | 10.70 |      |
| B   | 0.138  |       | 3.50  |       | Φ    |
| C   | 0.106  |       | 2.70  |       | TYP. |
| D   | 0.567  | 0.642 | 14.40 | 16.30 |      |
| E   | 0.520  |       | 13.20 |       | TYP. |
| F   | ---    | 0.177 | ---   | 4.50  |      |
| G   | 0.100  |       | 2.54  |       | TYP. |
| H   | 0.020  | 0.035 | 0.50  | 0.90  |      |
| J   | 0.043  | 0.053 | 1.10  | 1.35  |      |
| M   | 0.169  | 0.201 | 4.30  | 5.10  |      |
| N   | ---    | 0.140 | ---   | 3.56  |      |
| P   | 0.083  | 0.126 | 2.10  | 3.20  |      |
| Q   | 0.020  | 0.032 | 0.50  | 0.80  |      |

**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 | 3.6  | 4.5 | V    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =4A                                                  |     | 750  | 950 | mΩ   |
| Gate Resistance                 | R <sub>G</sub>       | f = 1.0MHz,Open Drain                                                                     |     | 25   |     | Ω    |
| Diode Characteristics           |                      |                                                                                           |     |      |     |      |
| Continuous Body Diode Current   | I <sub>S</sub>       |                                                                                           |     |      | 7   | A    |
| Diode Forward Voltage           | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>S</sub> =7A                                                   |     |      | 1.4 | V    |
| Reverse Recovery Time           | t <sub>rr</sub>      | I <sub>F</sub> =3A, dI <sub>F</sub> /dt=100A/μs                                           |     | 262  |     | ns   |
| Reverse Recovery Charge         | Q <sub>rr</sub>      |                                                                                           |     | 2175 |     | nC   |
| Dynamic Characteristics         |                      |                                                                                           |     |      |     |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =25V,V <sub>GS</sub> =10V,f=1MHz                                          |     | 502  |     | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                           |     | 678  |     |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                           |     | 21   |     |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =400V,V <sub>GS</sub> =10V,I <sub>D</sub> =3A                             |     | 14   |     | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                           |     | 3.7  |     |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                           |     | 5.3  |     |      |
| Turn-On Delay Time              | t <sub>d(on)</sub>   | V <sub>DS</sub> =400V, V <sub>GS</sub> =10V,<br>R <sub>G</sub> =2.5Ω, I <sub>DS</sub> =3A |     | 12   |     | ns   |
| Turn-On Rise Time               | t <sub>r</sub>       |                                                                                           |     | 27   |     |      |
| Turn-Off Delay Time             | t <sub>d(off)</sub>  |                                                                                           |     | 70   |     |      |
| Turn-Off Fall Time              | t <sub>f</sub>       |                                                                                           |     | 28.5 |     |      |

## Curve Characteristics

Fig. 1 - Typical Output Characteristics

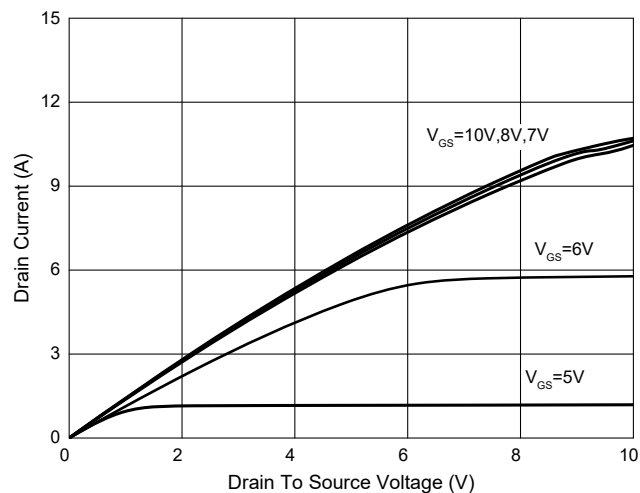


Fig. 2 - Transfer Characteristics

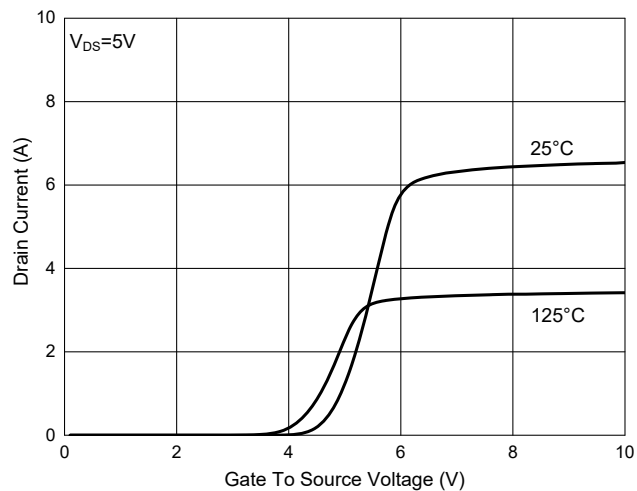


Fig. 3 -  $R_{DS(ON)} - V_{GS}$

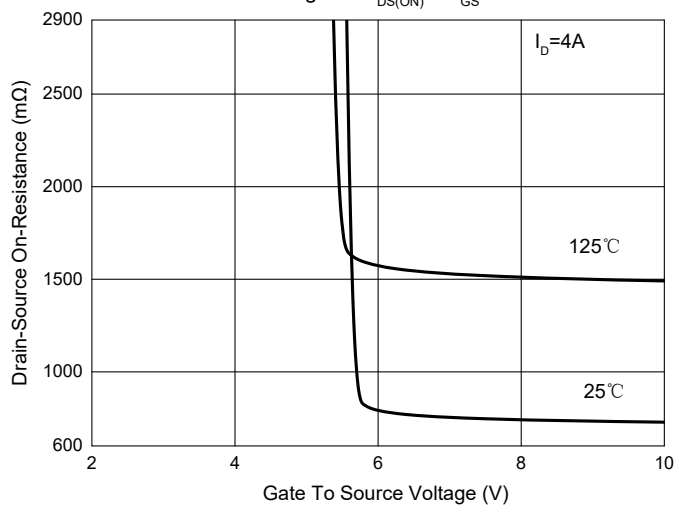


Fig. 4 -  $R_{DS(ON)} - I_D$

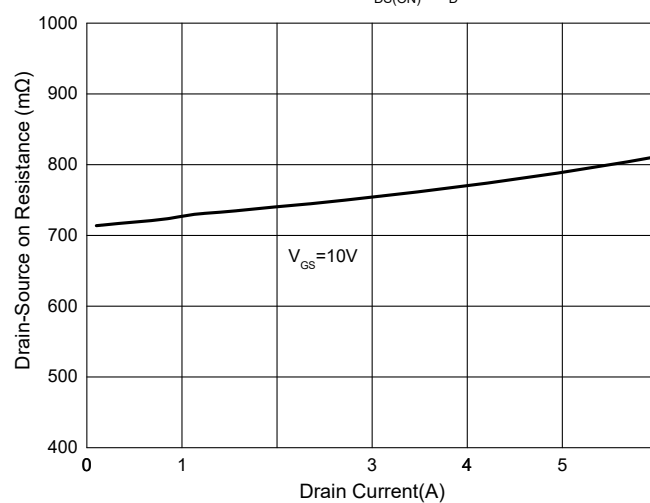


Fig. 5 - Capacitance Characteristics

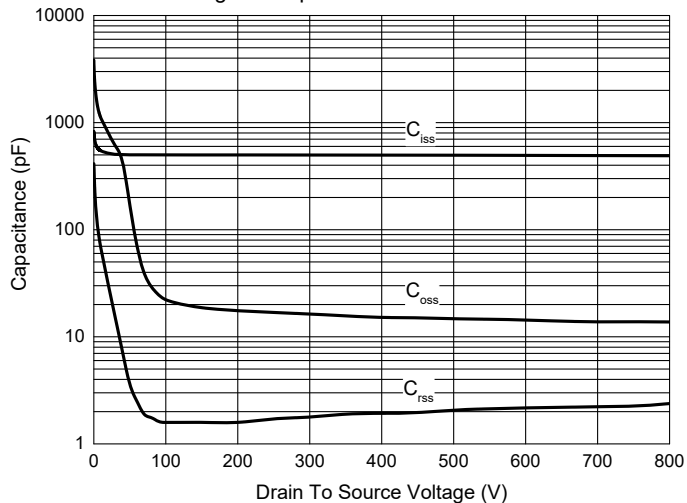
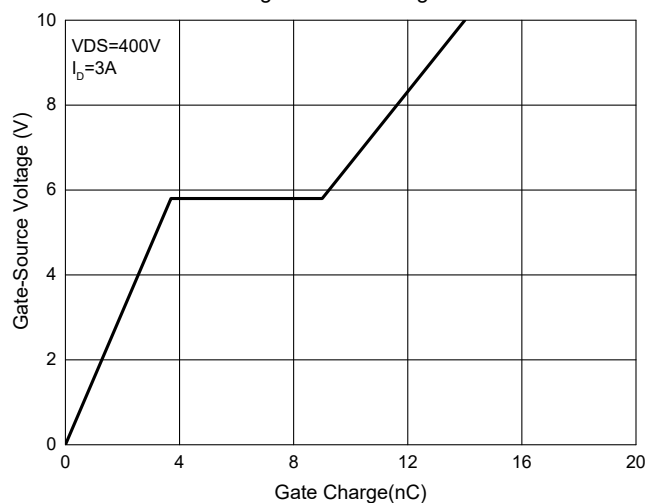


Fig. 6 - Gate Charge



## Curve Characteristics

Fig. 7 - Normalized Threshold voltage

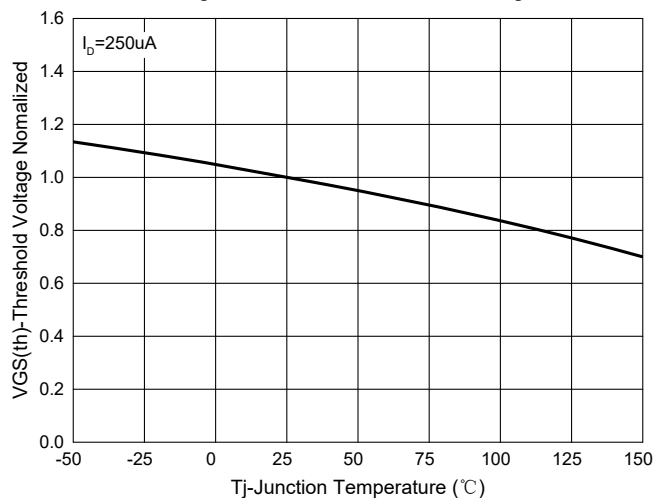


Fig. 8 - Normalized On Resistance Characteristics

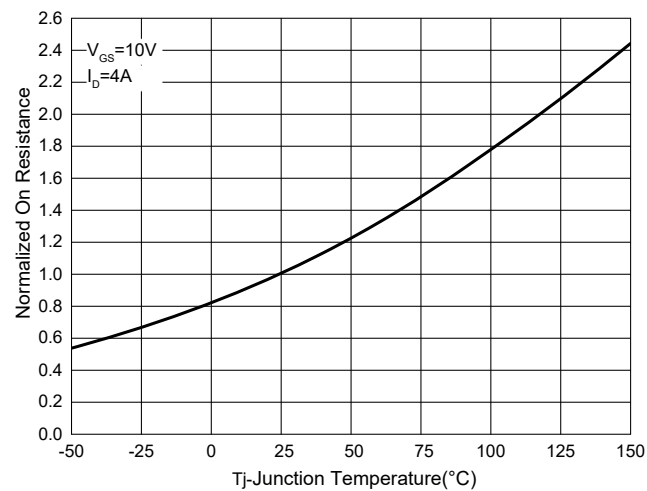


Fig. 9 -  $I_S - V_{SD}$

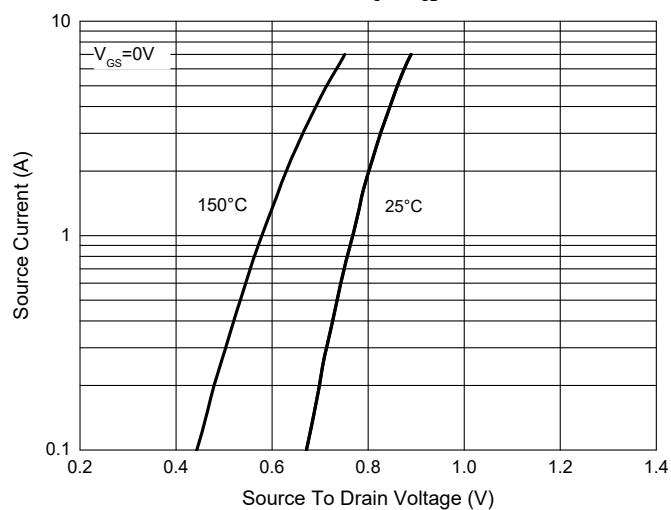


Fig. 10 - Drain Current

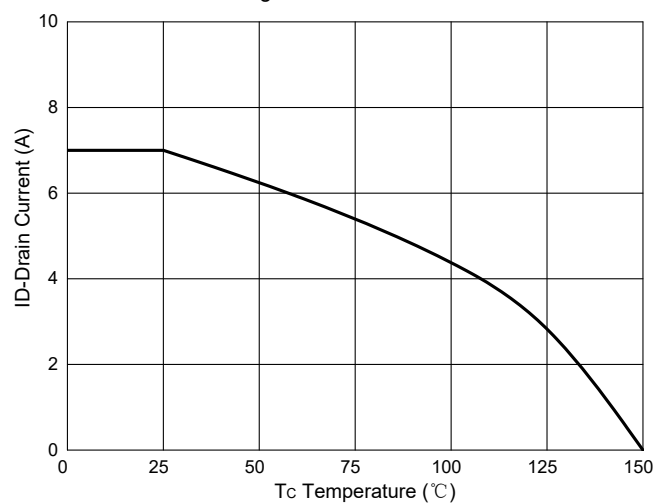
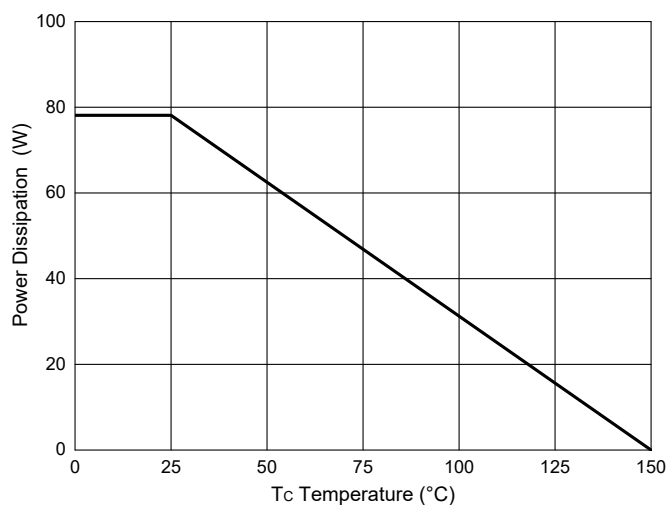


Fig. 11-PD Dissipation



## Curve Characteristics

Fig. 12 - Safe Operation Area

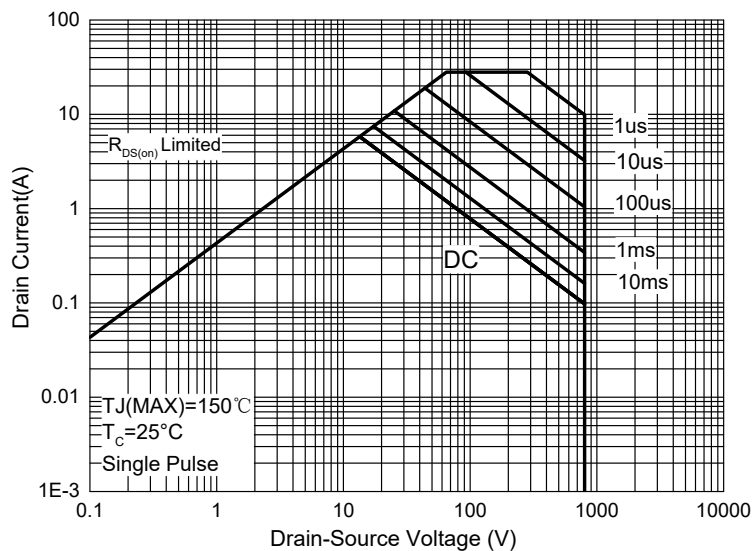
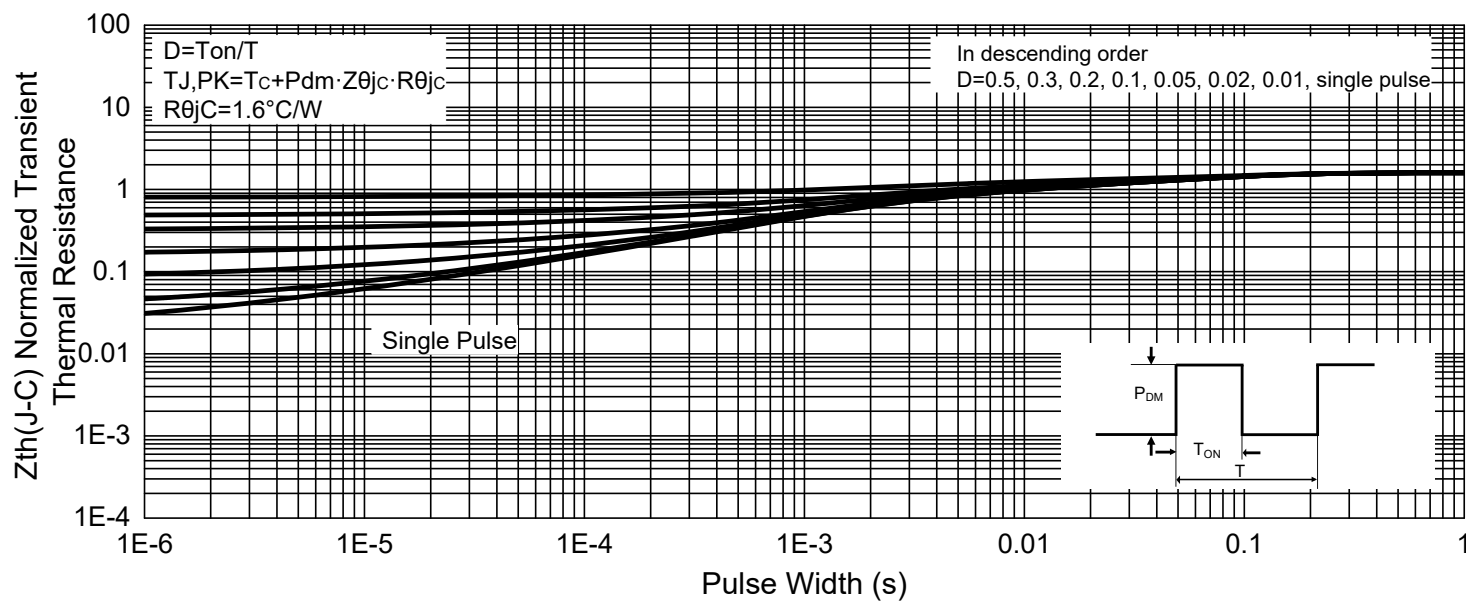


Fig. 13 -Normalized Transient Thermal Impedance



## Ordering Information

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

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