

## Product Summary

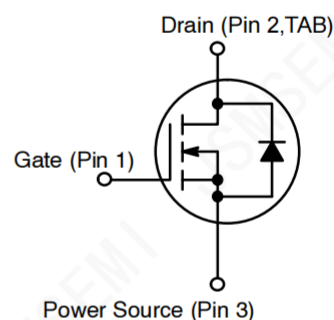
- $V_{DS}$  80V
- $I_D$  120A
- $R_{DS(ON)}$  ( at  $V_{GS}=10V$ )  $<4.0m\Omega$
- 100% EAS Tested
- 100%  $\nabla V_{DS}$  Tested

## General Description

- Split gate trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low  $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

## Applications

- Power switching application
- Uninterruptible power supply
- DC-DC convertor
- Motor drivers



## ABSOLUTE MAXIMUM RATINGS ( $T_J=25^\circ\text{C}$ unless otherwise noted)

| Parameter                                                          | Symbol          | Value     | Unit               |
|--------------------------------------------------------------------|-----------------|-----------|--------------------|
| Drain-Source Voltage                                               | $V_{DS}$        | 80        | V                  |
| Gate-Source Voltage                                                | $V_{GS}$        | $\pm 20$  | V                  |
| Continuous Drain Current ( $T_c=25^\circ\text{C}$ ) <sup>(1)</sup> | $I_D$           | 120       | A                  |
| Continuous Drain Current ( $T_c=100^\circ\text{C}$ )               | $I_D$           | 90        | A                  |
| Pulsed Drain Current <sup>(1)</sup>                                | $I_{DM}$        | 480       | A                  |
| Drain Power Dissipation                                            | $P_D$           | 180       | W                  |
| Single Pulsed Avalanche Energy <sup>(2)</sup>                      | $E_{AS}$        | 340       | mJ                 |
| Thermal Resistance from Junction to Ambient <sup>(3)</sup>         | $R_{\theta JA}$ | 43        | $^\circ\text{C/W}$ |
| Thermal Resistance from Junction to Case                           | $R_{\theta JC}$ | 1.0       | $^\circ\text{C/W}$ |
| Junction Temperature                                               | $T_J$           | -55~ +150 | $^\circ\text{C}$   |
| Storage Temperature                                                | $T_{STG}$       | -55~ +150 | $^\circ\text{C}$   |

### Notes:

- 1) Repetitive Rating: pulse width limited by maximum junction temperature
- 2) EAS condition :  $T_J=25^\circ\text{C}$ ,  $V_{DD}=50V$ ,  $V_G=10V$ ,  $L=1.0mH$ ,  $R_g=25\Omega$ ,  $I_{AS}=44.7A$
- 3) The value of  $R_{\theta JA}$  Mounted on FR4 Board (25.4mm\*25.4mm\*t1.6mm) With 2oz Copper  $T_A=25^\circ\text{C}$

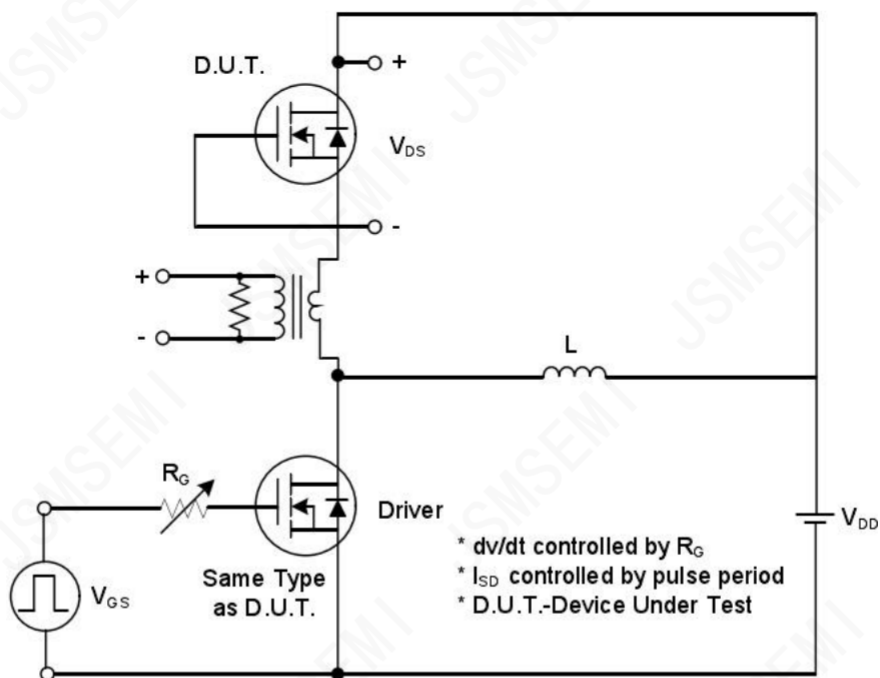
**MOSFET ELECTRICAL CHARACTERISTICS(T<sub>J</sub>=25°C unless otherwise noted)**

| Parameter                          | Symbol               | Test Condition                                                                         | Min | Type | Max  | Unit |
|------------------------------------|----------------------|----------------------------------------------------------------------------------------|-----|------|------|------|
| Static Characteristics             |                      |                                                                                        |     |      |      |      |
| Drain-source breakdown voltage     | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> =250μA                                            | 100 | -    | -    | V    |
| Zero gate voltage drain current    | I <sub>DSS</sub>     | V <sub>DS</sub> =100V, V <sub>GS</sub> = 0V                                            | -   | -    | 1    | μA   |
| Gate-body leakage current          | I <sub>GSS</sub>     | V <sub>GS</sub> =±20V, V <sub>DS</sub> = 0V                                            | -   | -    | ±100 | nA   |
| Gate threshold voltage             | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                               | 2.0 | 3.0  | 4.0  | V    |
| Drain-source on-resistance         | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                              | -   | 3.5  | 4.0  | mΩ   |
| Forward transconductance           | R <sub>g</sub>       | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V, f=1.0MHz                                   | -   | 2.0  | -    | Ω    |
| Dynamic characteristics            |                      |                                                                                        |     |      |      |      |
| Input Capacitance                  | C <sub>iss</sub>     | V <sub>DS</sub> =50V, VGS=0V, f=1MHz                                                   | -   | 4628 | -    | pF   |
| Output Capacitance                 | C <sub>oss</sub>     |                                                                                        | -   | 1624 | -    |      |
| Reverse Transfer Capacitance       | C <sub>rss</sub>     |                                                                                        | -   | 19   | -    |      |
| Switching characteristics          |                      |                                                                                        |     |      |      |      |
| Turn-on delay time                 | t <sub>d(on)</sub>   | V <sub>DD</sub> =50V, I <sub>D</sub> =20A, R <sub>G</sub> =3Ω,<br>V <sub>GS</sub> =10V | -   | 12   | -    | nS   |
| Turn-on rise time                  | t <sub>r</sub>       |                                                                                        | -   | 26   | -    |      |
| Turn-off delay time                | t <sub>d(off)</sub>  |                                                                                        | -   | 38   | -    |      |
| Turn-off fall time                 | t <sub>f</sub>       |                                                                                        | -   | 31   | -    |      |
| Total Gate Charge                  | Q <sub>g</sub>       | V <sub>DS</sub> =50V, I <sub>D</sub> =20A,<br>V <sub>GS</sub> =10V                     | -   | 61   | -    | nC   |
| Gate-Source Charge                 | Q <sub>gs</sub>      |                                                                                        | -   | 19.5 | -    |      |
| Gate-Drain Charge                  | Q <sub>gd</sub>      |                                                                                        | -   | 8.7  | -    |      |
| Source-Drain Diode characteristics |                      |                                                                                        |     |      |      |      |
| Diode Forward voltage              | V <sub>SD</sub>      | T <sub>J</sub> =25℃, V <sub>GS</sub> =0V, I <sub>S</sub> =20A                          | -   | 0.8  | 1.2  | V    |
| Diode Forward current              | I <sub>S</sub>       | T <sub>C</sub> =25℃                                                                    | -   | -    | 120  | A    |
| Body Diode Reverse Recovery Time   | t <sub>rr</sub>      | T <sub>J</sub> =25℃, I <sub>F</sub> =20A, di/dt=100A/us                                | -   | 77   | -    | nS   |
| Body Diode Reverse Recovery Charge | Q <sub>rr</sub>      |                                                                                        | -   | 189  | -    | nC   |

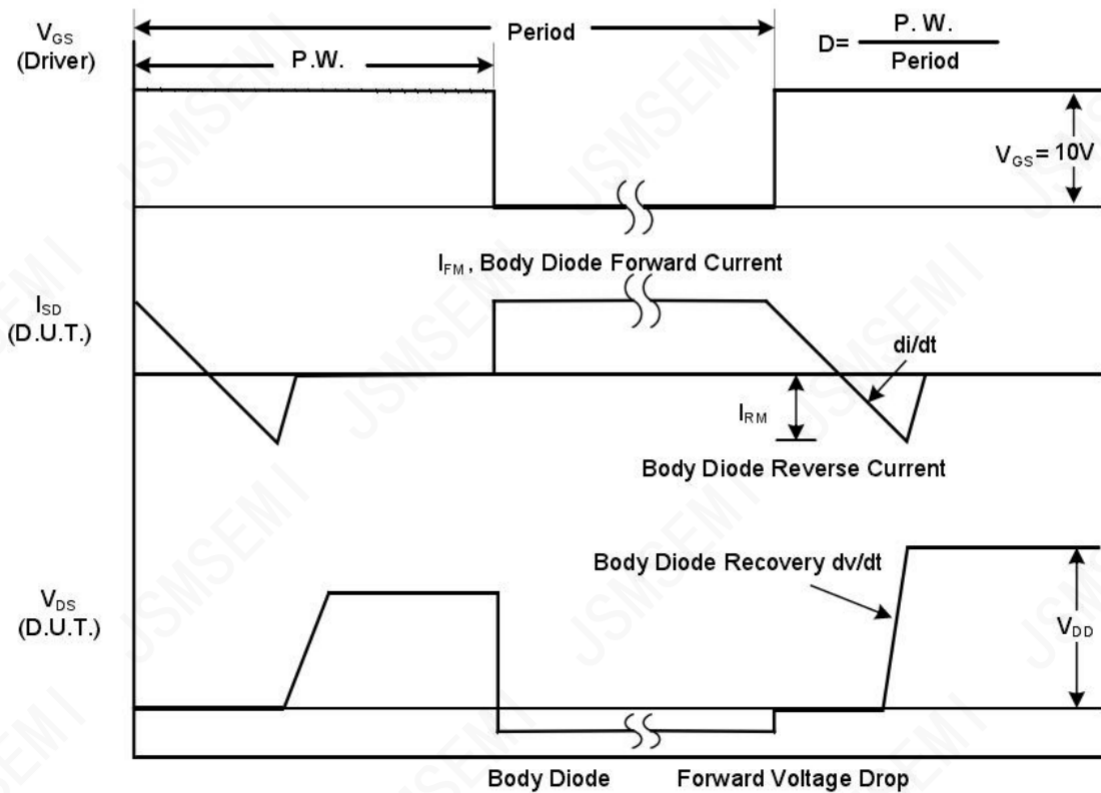
**Ordering Information**

| Order number           | Package  | Marking  | Operation Temperature Range | MSL Grade | Ship, Quantity | Green |
|------------------------|----------|----------|-----------------------------|-----------|----------------|-------|
| IPP040N08NF2SAKMA1-JSM | TO-220-3 | 040N08NS | -55 to 150°C                | 1         | T&R, 800       | RoHS  |

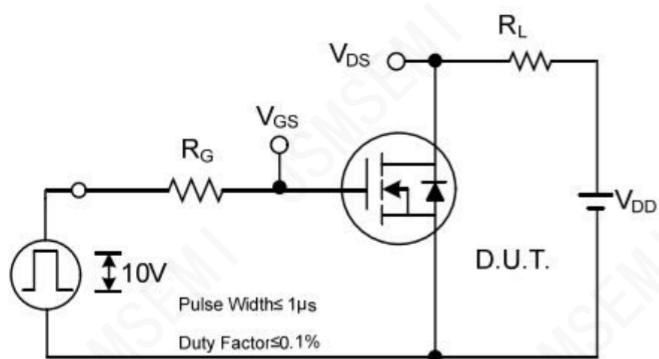
■ RATING AND CHARACTERISTIC CURVES



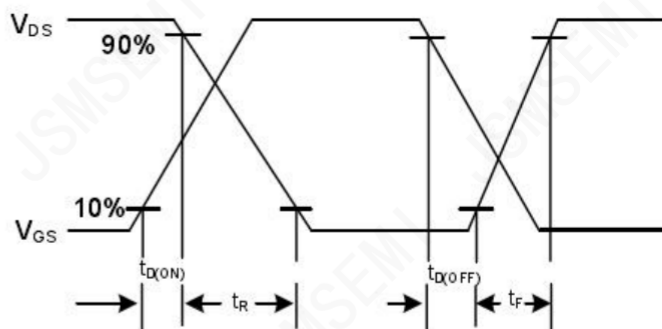
Peak Diode Recovery  $dv/dt$  Test Circuit



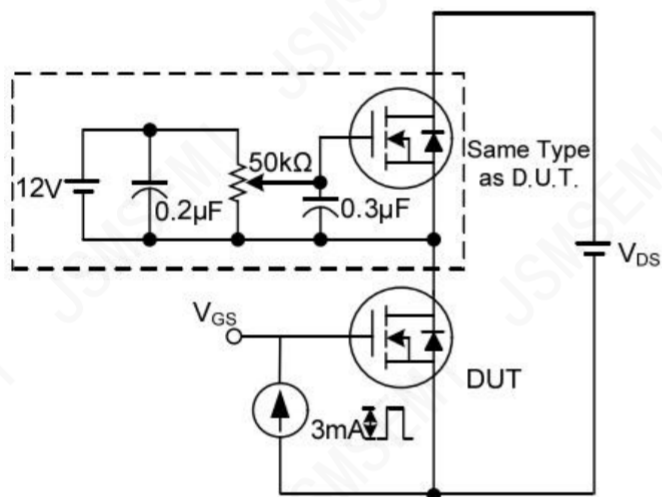
Peak Diode Recovery  $dv/dt$  Waveforms



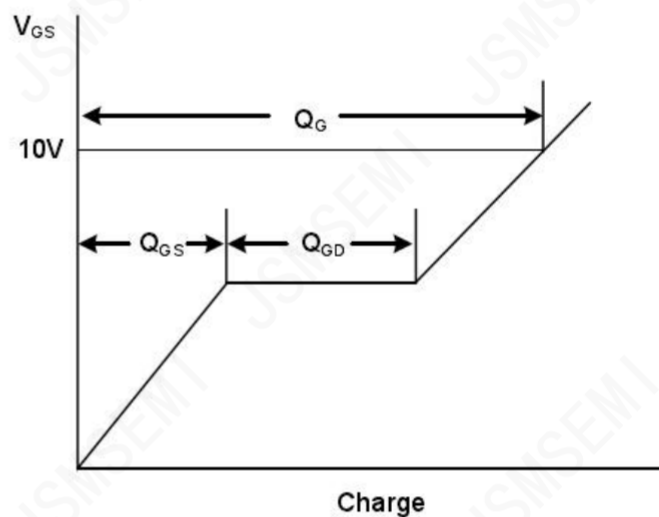
Switching Test Circuit



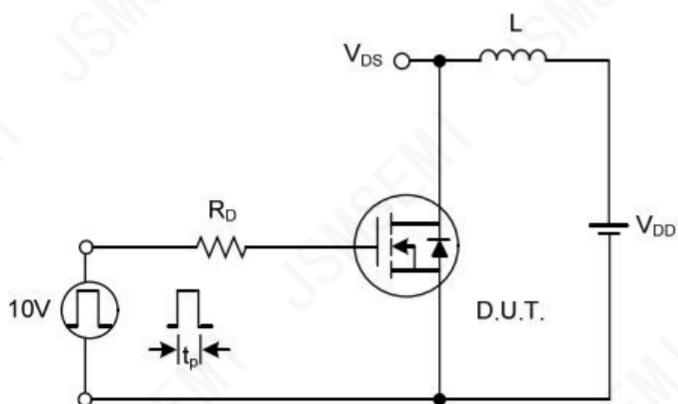
Switching Waveforms



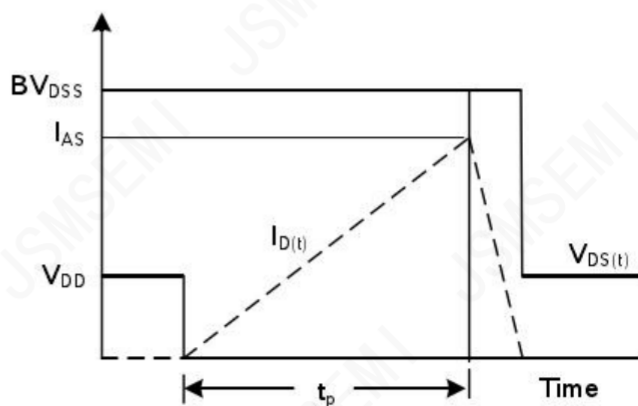
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

## Typical Characteristics

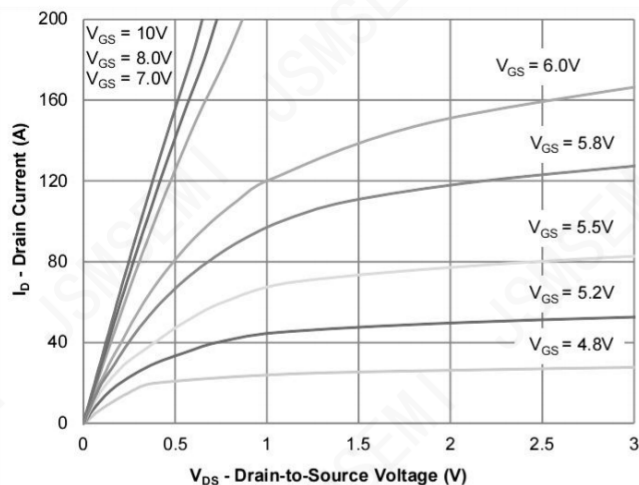


Figure 1: Output Characteristics

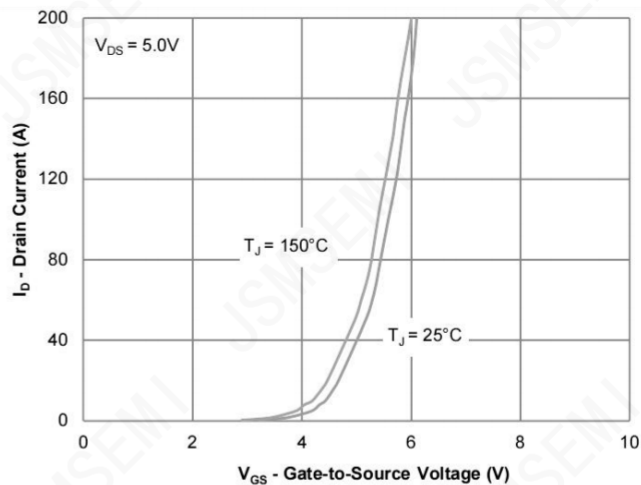


Figure 2: Transfer Characteristics

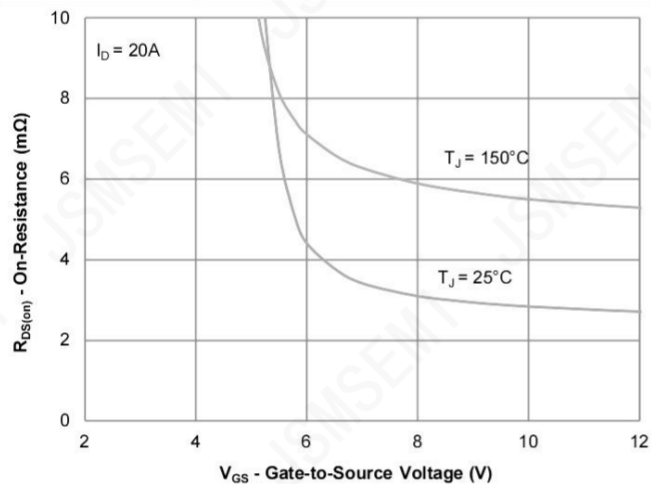


Figure 3: On-Resistance vs. Gate-Source Voltage

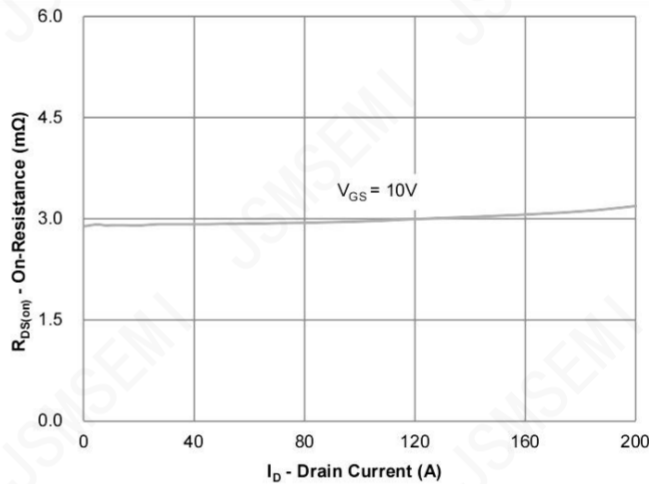


Figure 4: On-Resistance vs. Gate-Source Voltage

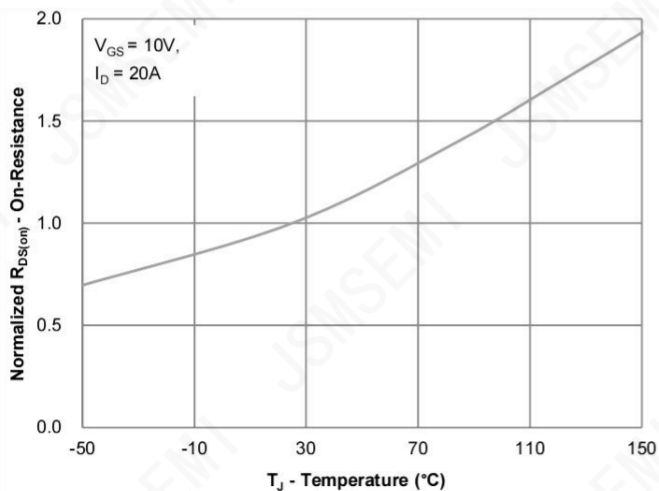


Figure 5: On-Resistance vs. Junction Temperature

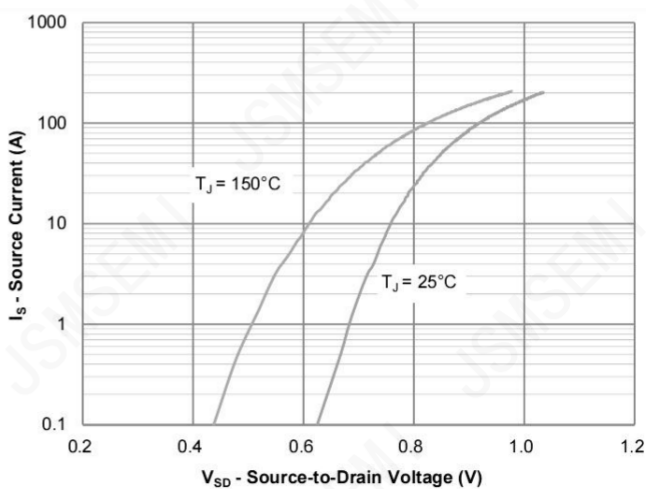


Figure 6: Source-Drain Diode Forward Voltage

## Typical Characteristics

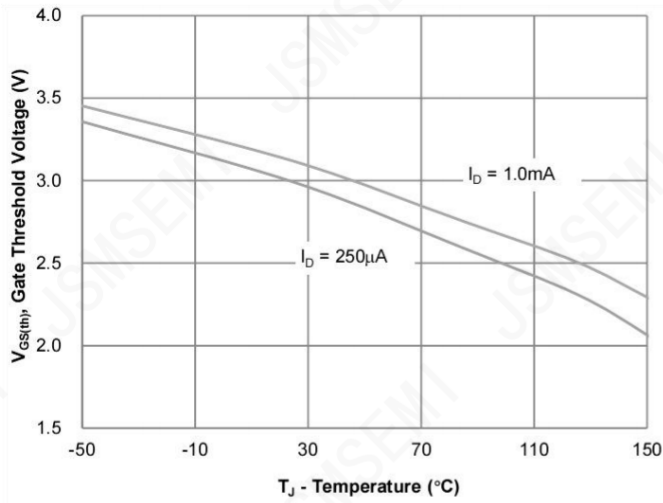


Figure 7: Gate Threshold Variation vs. Junction Temperature

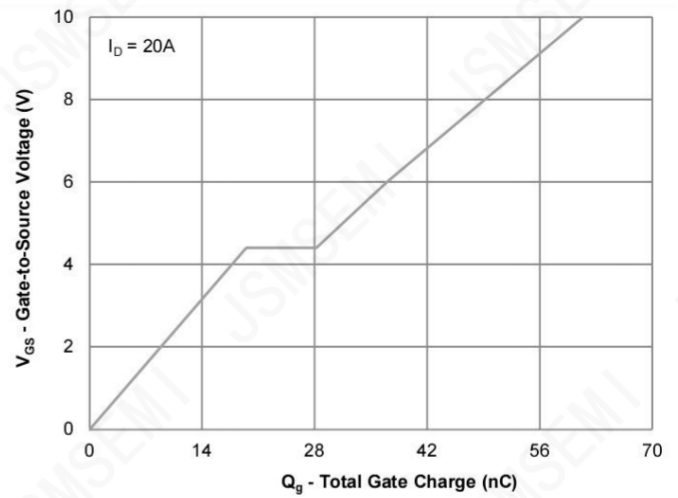


Figure 8: Gate Charge Characteristics

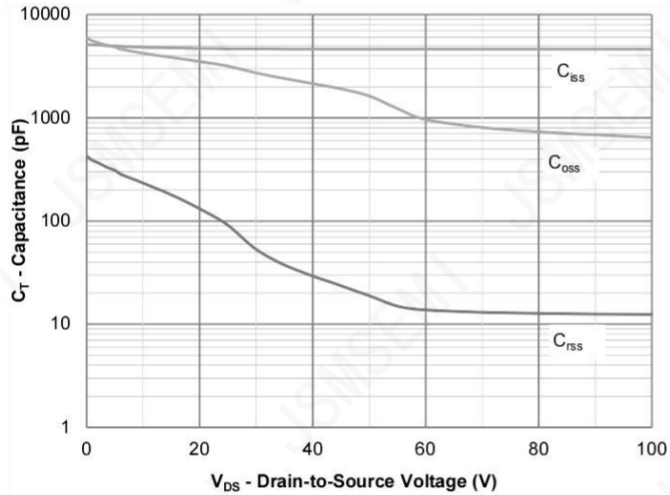


Figure 9: Capacitance Characteristics

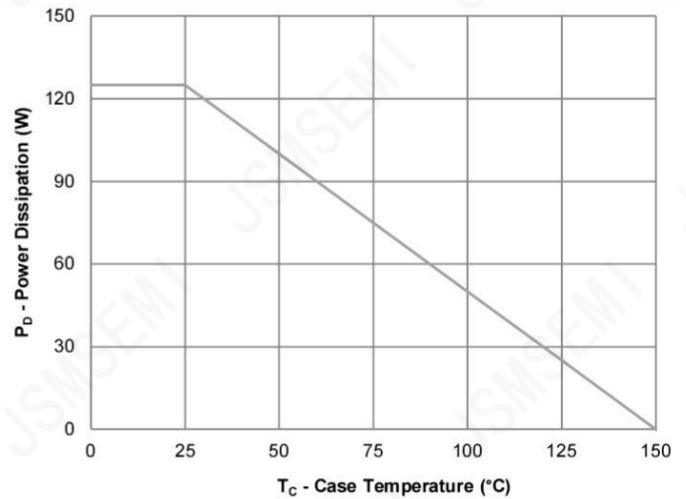


Figure 10: Power Derating

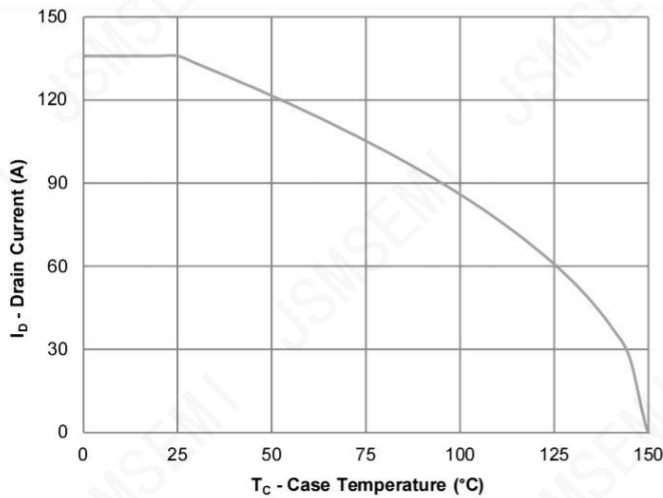


Figure 11: Current Derating

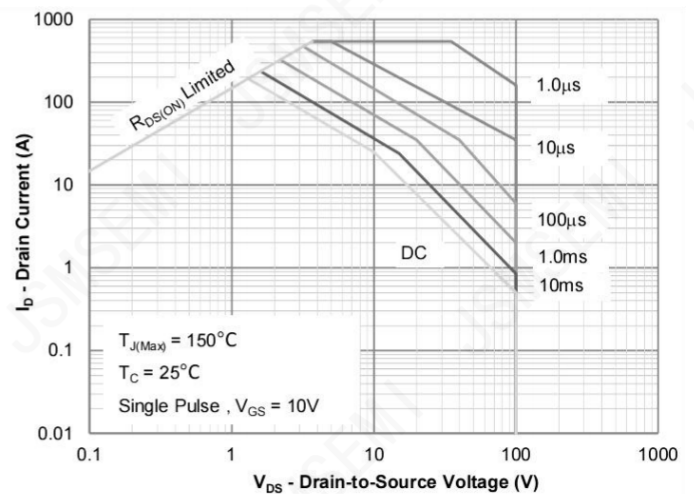


Figure 12: Safe Operating Area

## Typical Characteristics

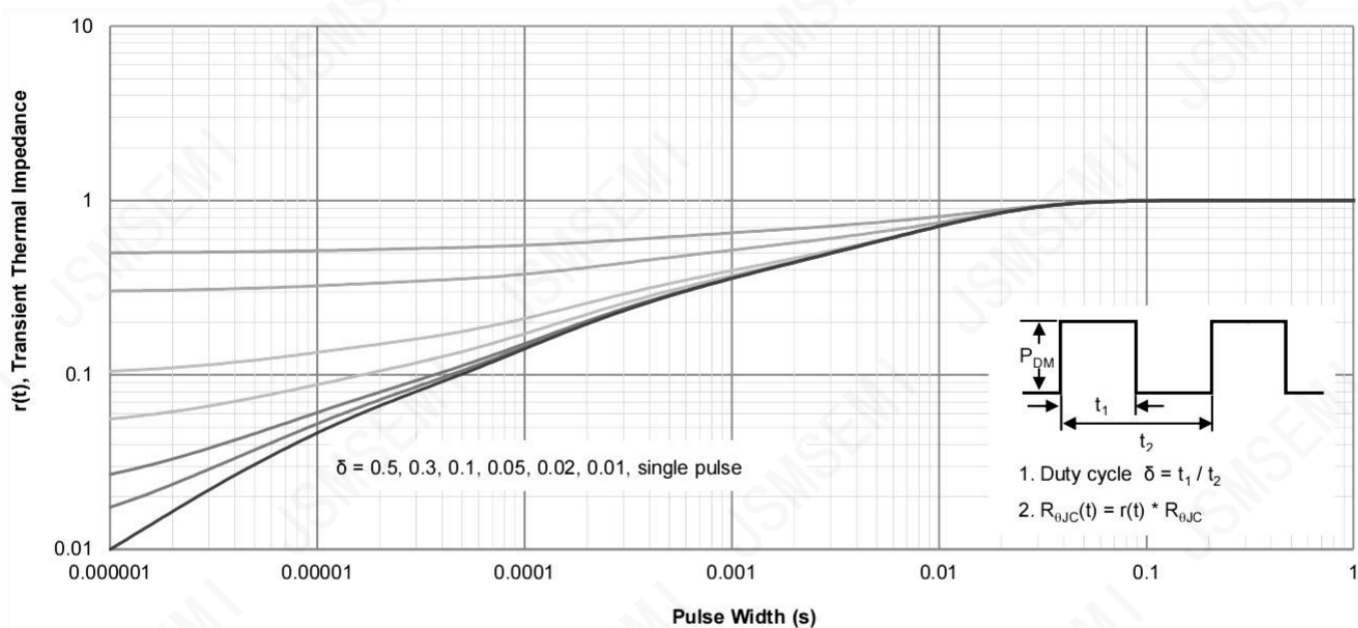
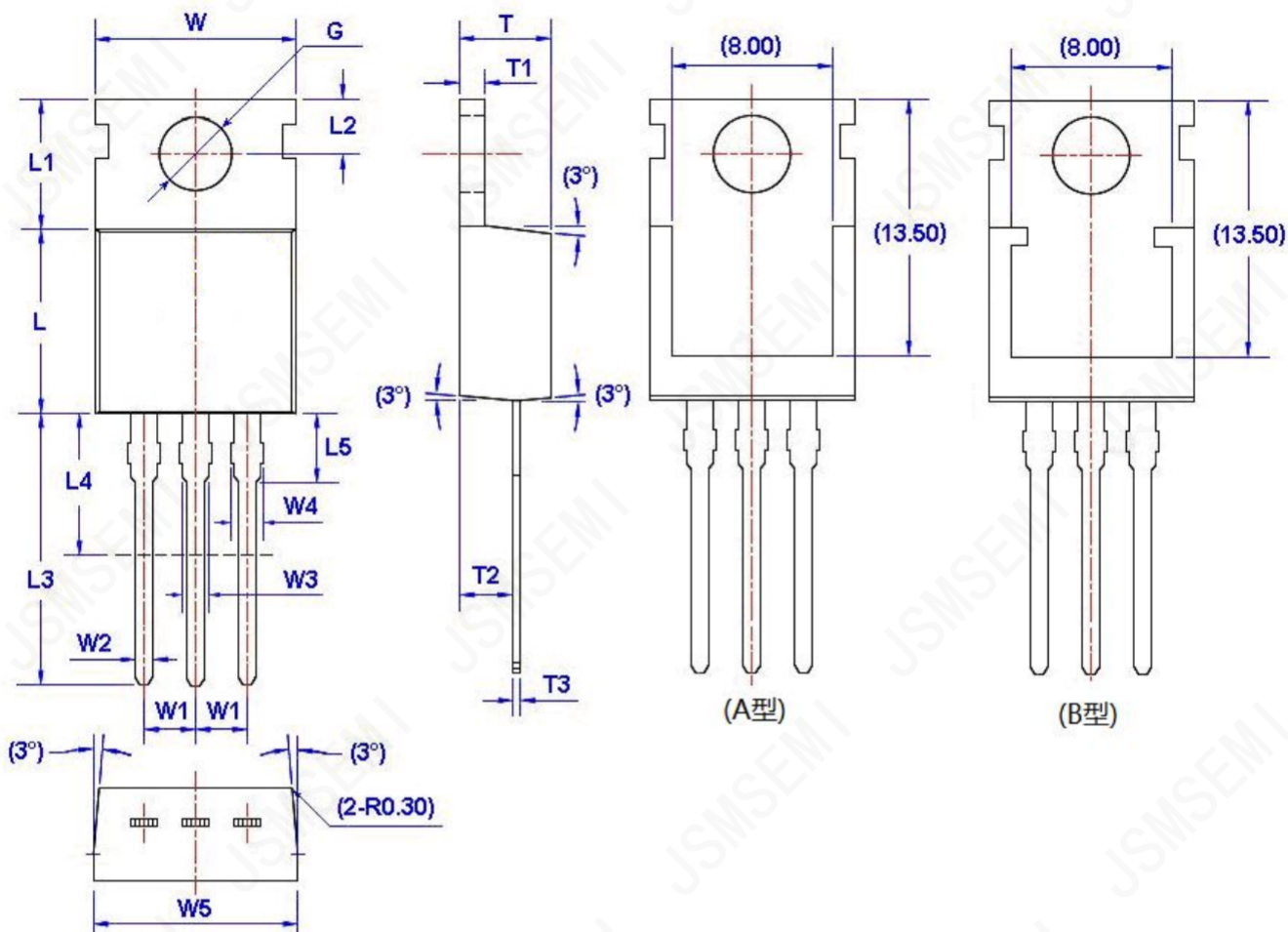


Figure 13: Normalized Maximum Transient Thermal Impedance

Package Information

TO-220-3



Unit: mm

| Symbol | Size       |       | Symbol | Size  |       | Symbol | Size |      | Symbol | Size |      |
|--------|------------|-------|--------|-------|-------|--------|------|------|--------|------|------|
|        | Min        | Max   |        | Min   | Max   |        | Min  | Max  |        | Min  | Max  |
| W      | 9.66       | 10.28 | W5     | 9.80  | 10.20 | L4**   | 6.20 | 6.60 | T3     | 0.45 | 0.60 |
| W1     | 2.54 (TYP) |       | L      | 9.00  | 9.40  | L5     | 2.79 | 3.30 | G(Φ)   | 3.50 | 3.70 |
| W2     | 0.70       | 0.95  | L1     | 6.40  | 6.80  | T      | 4.30 | 4.70 |        |      |      |
| W3     | 1.17       | 1.37  | L2     | 2.70  | 2.90  | T1     | 1.15 | 1.40 |        |      |      |
| W4*    | 1.32       | 1.72  | L3     | 12.70 | 14.27 | T2     | 2.20 | 2.60 |        |      |      |

## Revision History

| Rev. | Change          | Date      |
|------|-----------------|-----------|
| V1.0 | Initial version | 9/17/2020 |
|      |                 |           |

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