

## Product Summary

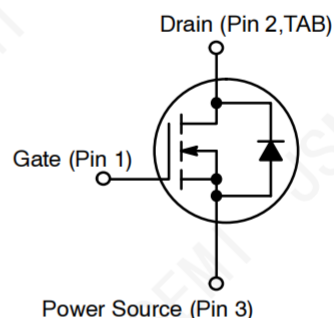
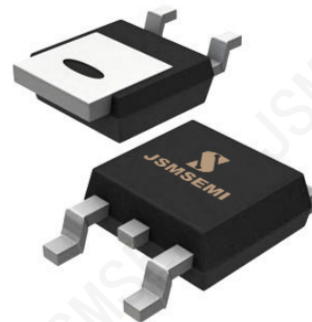
- $V_{DS}$  60V
- $I_D$  100A
- $R_{DS(ON)}$  (at  $V_{GS}=10V$ )  $<3.8m\Omega$
- 100% EAS Tested
- 100%  $\nabla V_{DS}$  Tested

## General Description

- Split gate trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low R
- 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                                               | $V_{DS}$        | 60              | V                  |
| Gate-Source Voltage                                                | $V_{GS}$        | $\pm 20$        | V                  |
| Continuous Drain Current ( $T_c=25^\circ\text{C}$ ) <sup>(1)</sup> | $I_D$           | 100             | A                  |
| Continuous Drain Current ( $T_c=100^\circ\text{C}$ )               | $I_D$           | 75              | A                  |
| Pulsed Drain Current <sup>(1)</sup>                                | $I_{DM}$        | 400             | A                  |
| Drain Power Dissipation                                            | $P_D$           | 104             | W                  |
| Single Pulsed Avalanche Energy <sup>(2)</sup>                      | $E_{AS}$        | 360             | mJ                 |
| Thermal Resistance from Junction to Ambient                        | $R_{\theta JA}$ | 45              | $^\circ\text{C/W}$ |
| Junction Temperature                                               | $T_J$           | $-55 \sim +150$ | $^\circ\text{C}$   |
| Storage Temperature                                                | $T_{STG}$       | $-55 \sim +150$ | $^\circ\text{C}$   |

### Notes:

- 1) Repetitive Rating: pulse width limited by maximum junction temperature
- 2) EAS condition :  $T_J=25^\circ\text{C}$ ,  $V_{DD}=20V$ ,  $V_G=10V$ ,  $L=1.0mH$ ,  $R_g=25\Omega$ ,  $I_{AS}=26.8A$

## Ordering Information

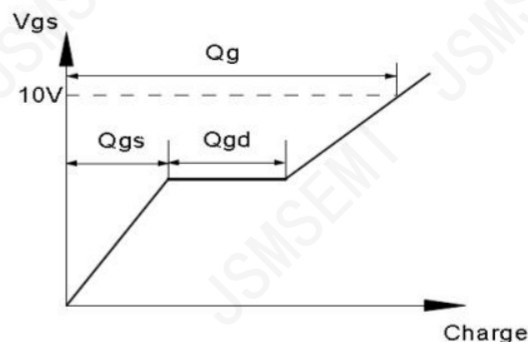
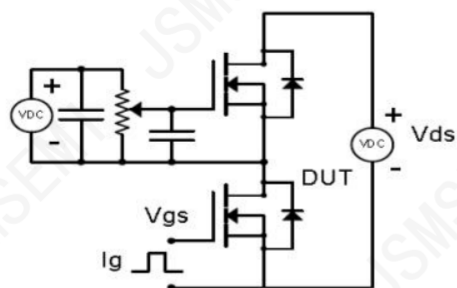
| Order number        | Package | Marking | Operation Temperature Range  | MSL Grade | Ship, Quantity | Green |
|---------------------|---------|---------|------------------------------|-----------|----------------|-------|
| DMTH6004SK3Q-13-JSM | TO-252  | TH6004S | $-55$ to $150^\circ\text{C}$ | 1         | T&R,2500       | Rohs  |

**MOSFET ELECTRICAL CHARACTERISTICS**( $T_J=25^{\circ}\text{C}$  unless otherwise noted)

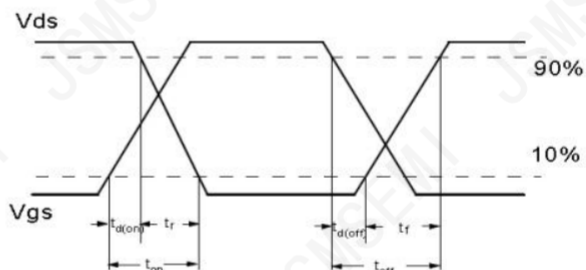
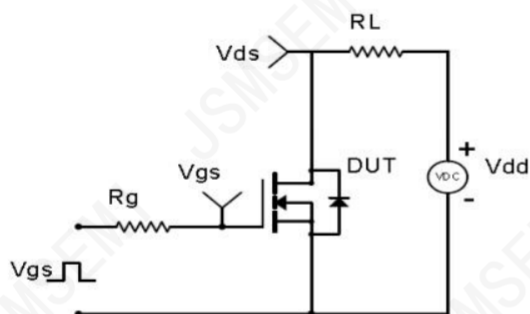
| Parameter                          | Symbol        | Test Condition                                         | Min | Type | Max       | Unit       |
|------------------------------------|---------------|--------------------------------------------------------|-----|------|-----------|------------|
| Static Characteristics             |               |                                                        |     |      |           |            |
| Drain-source breakdown voltage     | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$                          | 60  | -    | -         | V          |
| Zero gate voltage drain current    | $I_{DSS}$     | $V_{DS} = 60V, V_{GS} = 0V$                            | -   | -    | 1         | $\mu A$    |
| Gate-body leakage current          | $I_{GSS}$     | $V_{GS} = \pm 20V, V_{DS} = 0V$                        | -   | -    | $\pm 100$ | nA         |
| Gate threshold voltage             | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu A$                      | 2.0 | 3.0  | 4.0       | V          |
| Drain-source on-resistance         | $R_{DS(on)}$  | $V_{GS} = 10V, I_D = 20A$                              | -   | 3.0  | 3.8       | m $\Omega$ |
| Forward transconductance           | $R_g$         | $V_{GS} = 0V, V_{DS} = 0V, f = 1.0MHz$                 | -   | 1.2  | -         | $\Omega$   |
| Dynamic characteristics            |               |                                                        |     |      |           |            |
| Input Capacitance                  | $C_{iss}$     | $V_{DS} = 30V, V_{GS} = 0V, f = 1MHz$                  | -   | 2717 | -         | pF         |
| Output Capacitance                 | $C_{oss}$     |                                                        | -   | 1089 | -         |            |
| Reverse Transfer Capacitance       | $C_{rss}$     |                                                        | -   | 48   | -         |            |
| Switching characteristics          |               |                                                        |     |      |           |            |
| Turn-on delay time                 | $t_{d(on)}$   | $V_{DD} = 30V, I_D = 20A, R_G = 3\Omega, V_{GS} = 10V$ | -   | 7.2  | -         | nS         |
| Turn-on rise time                  | $t_r$         |                                                        | -   | 11   | -         |            |
| Turn-off delay time                | $t_{d(off)}$  |                                                        | -   | 24   | -         |            |
| Turn-off fall time                 | $t_f$         |                                                        | -   | 11   | -         |            |
| Total Gate Charge                  | $Q_g$         | $V_{DS} = 30V, I_D = 20A, V_{GS} = 10V$                | -   | 45   | -         | nC         |
| Gate-Source Charge                 | $Q_{gs}$      |                                                        | -   | 11.6 | -         |            |
| Gate-Drain Charge                  | $Q_{gd}$      |                                                        | -   | 11.5 | -         |            |
| Source-Drain Diode characteristics |               |                                                        |     |      |           |            |
| Diode Forward voltage              | $V_{SD}$      | $T_J = 25^{\circ}C, V_{GS} = 0V, I_S = 20A$            | -   | 0.8  | 1.2       | V          |
| Diode Forward current              | $I_S$         | $T_C = 25^{\circ}C$                                    | -   | -    | 185       | A          |
| Body Diode Reverse Recovery Time   | $t_{rr}$      | $T_J = 25^{\circ}C, I_F = 20A, di/dt = 100A/us$        | -   | 43   | -         | nS         |
| Body Diode Reverse Recovery Charge | $Q_{rr}$      |                                                        | -   | 59   | -         | nC         |

## Test Circuit & Waveform

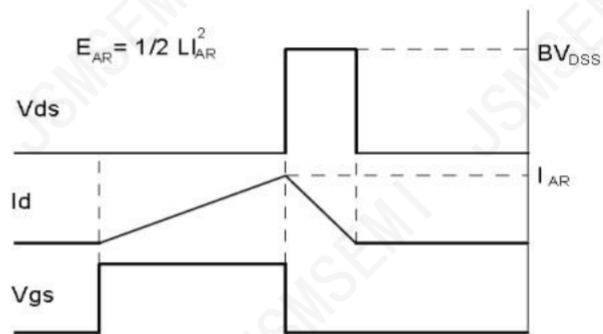
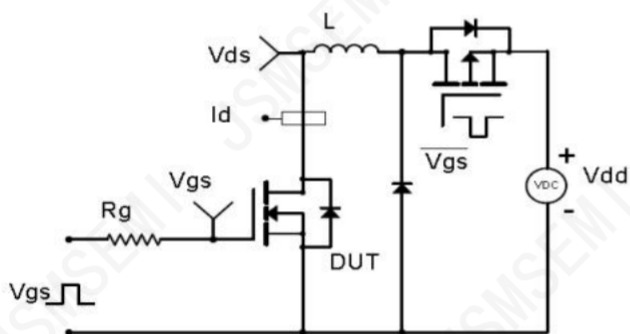
Gate Charge Test Circuit & Waveform



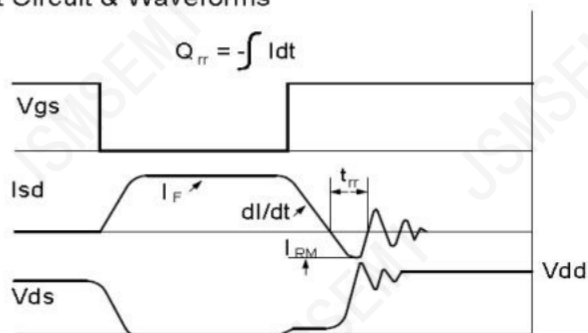
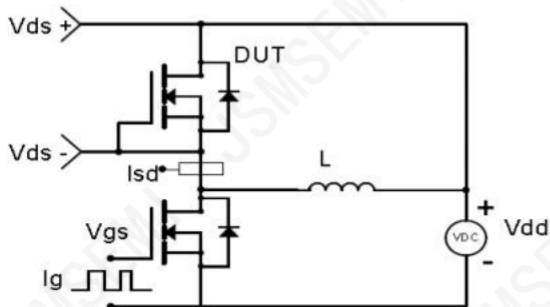
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Typical Characteristics

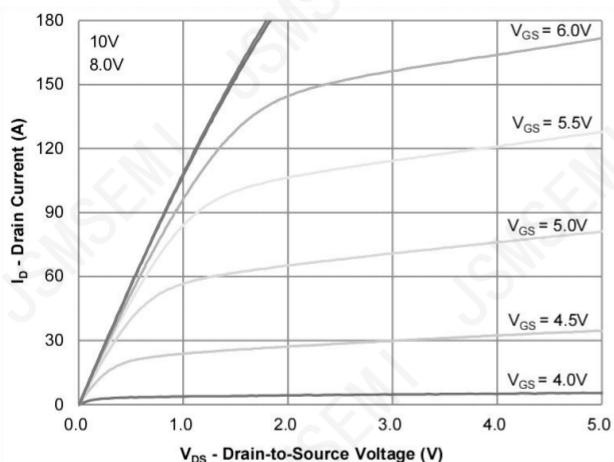


Figure 1: Output Characteristics

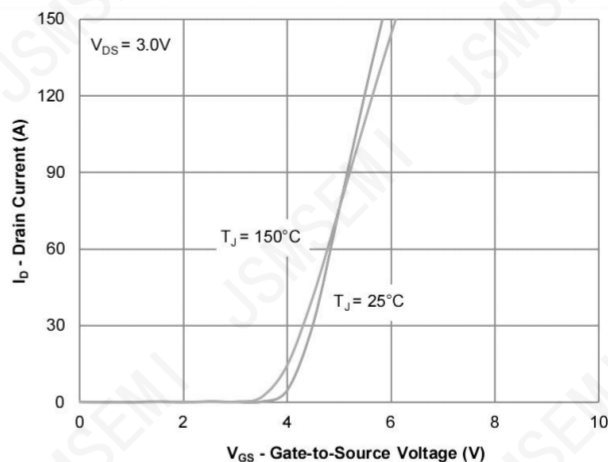


Figure 2: Transfer Characteristics

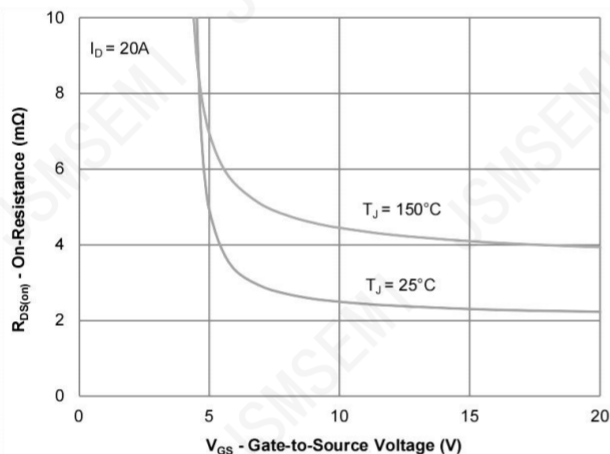


Figure 3: On-Resistance vs. Gate-Source Voltage

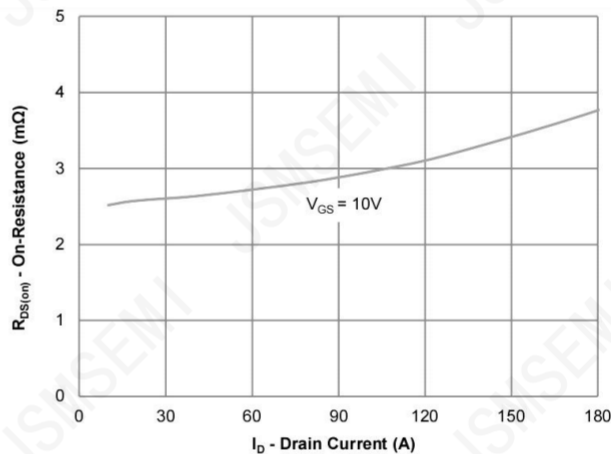


Figure 4: On-Resistance vs. Drain Current

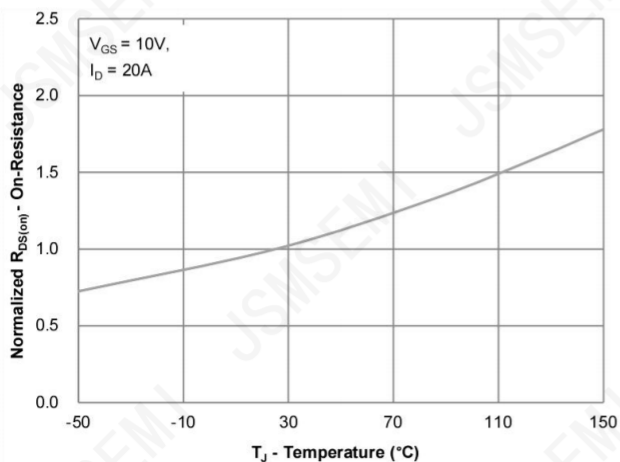


Figure 5: On-Resistance vs. Junction Temperature

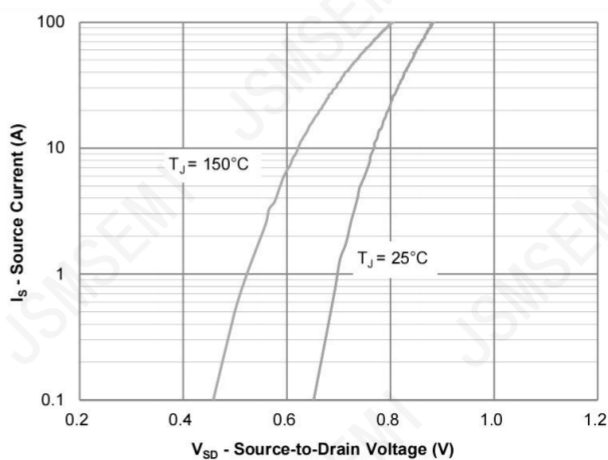


Figure 6: Source-Drain Diode Forward Voltage

## Typical Characteristics

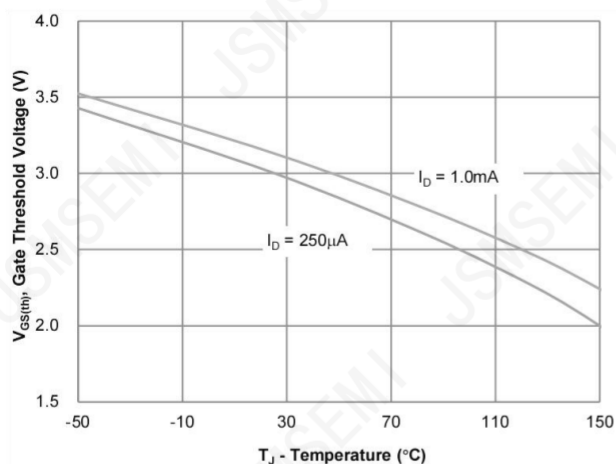


Figure 7: Gate Threshold Variation vs. Junction Temperature

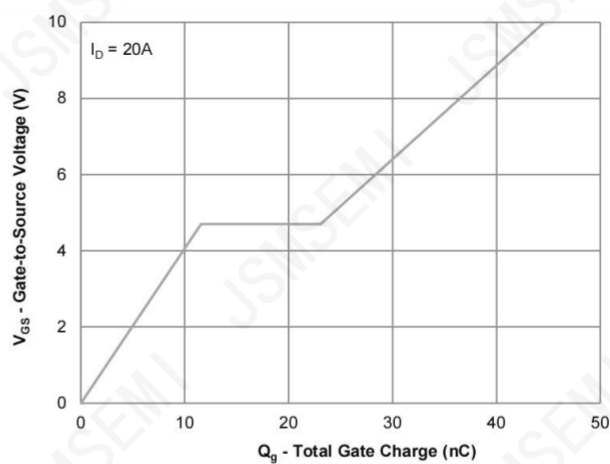


Figure 8: Gate Charge Characteristics

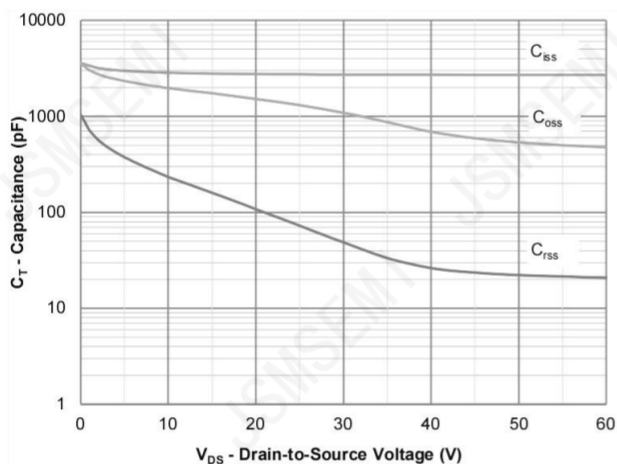


Figure 9: Capacitance Characteristics

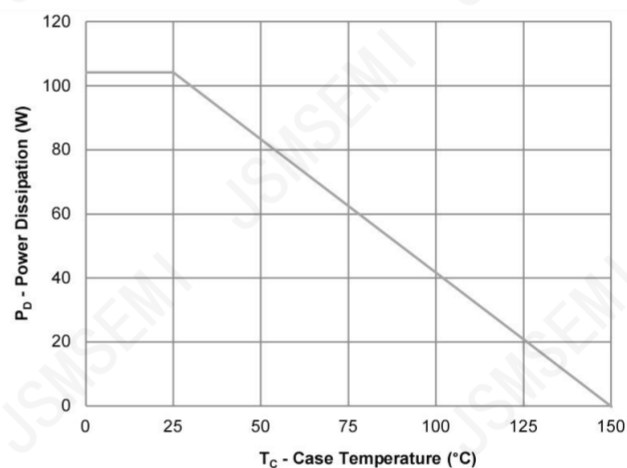


Figure 10: Power Derating

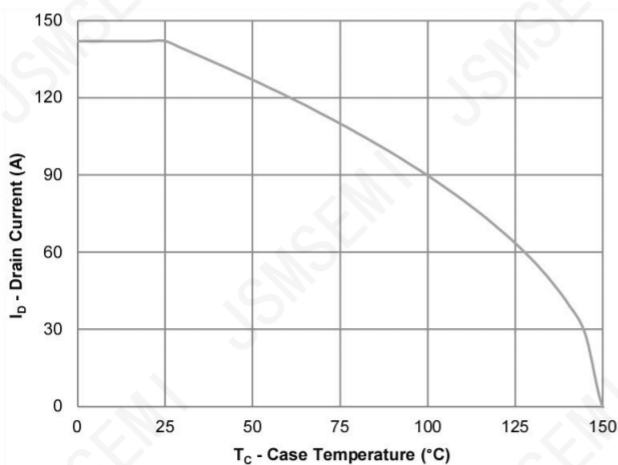


Figure 11: Current Derating

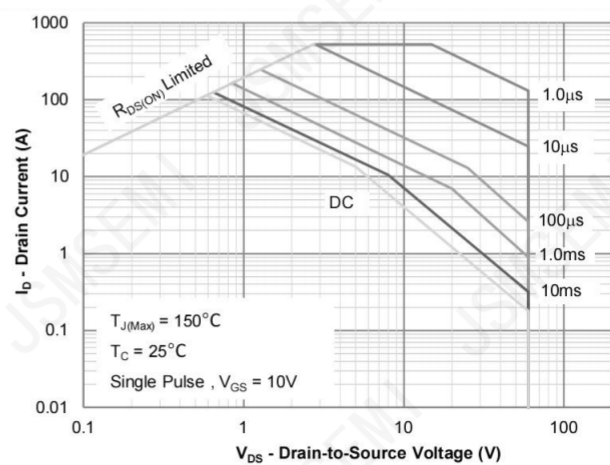


Figure 12: Safe Operating Area



## Typical Characteristics

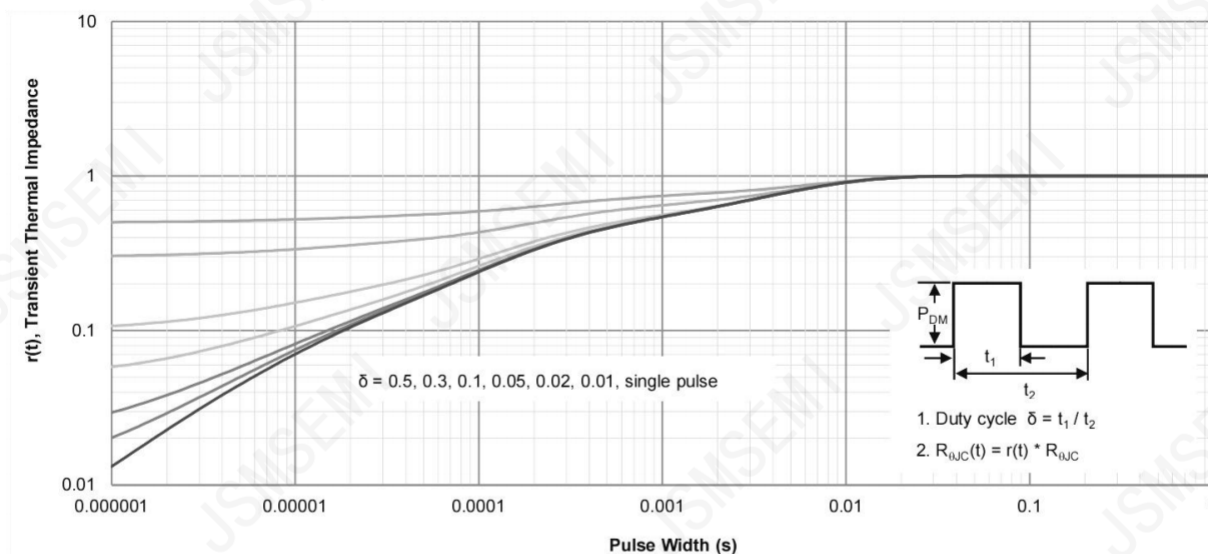
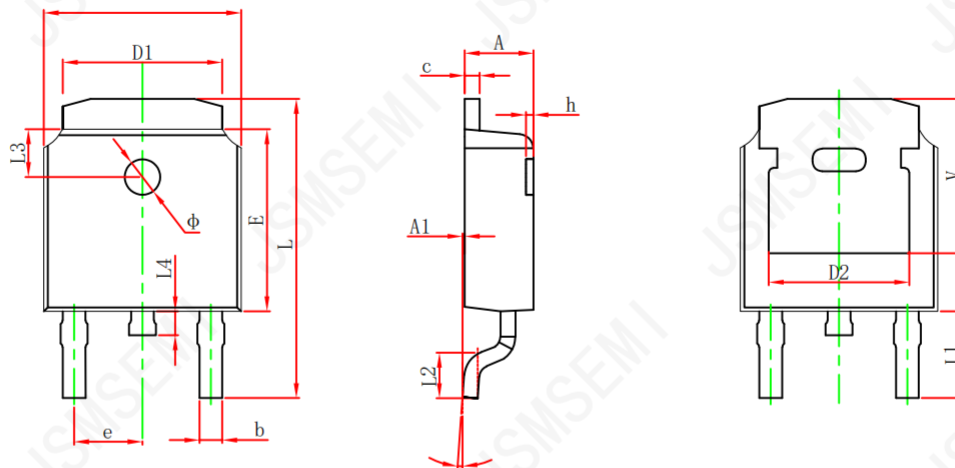


Figure 13: Normalized Maximum Transient Thermal Impedance

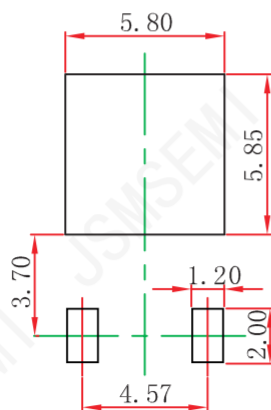
## Package Information

### TO-252-2



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.400  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127  | 0.000                | 0.005 |
| b      | 0.635                     | 0.770  | 0.025                | 0.030 |
| c      | 0.460                     | 0.580  | 0.018                | 0.023 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.100                     | 5.460  | 0.201                | 0.215 |
| D2     | 4.830 REF.                |        | 0.190 REF.           |       |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.186                     | 2.386  | 0.086                | 0.094 |
| L      | 9.712                     | 10.312 | 0.382                | 0.406 |
| L1     | 2.900 REF.                |        | 0.114 REF.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| L3     | 1.600 REF.                |        | 0.063 REF.           |       |
| L4     | 0.600                     | 1.000  | 0.024                | 0.039 |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |
| θ      | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.250 REF.                |        | 0.207 REF.           |       |

### TO-252-2L Suggested Pad Layout



**Note:**

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.

## Revision History

| Rev. | Change          | Date      |
|------|-----------------|-----------|
| V1.0 | Initial version | 8/21/2021 |
|      |                 |           |

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