



# 100V 1.9mΩ N-Ch Power MOSFET

### Features

- Ultra-low  $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested, 100%  $R_g$  Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant

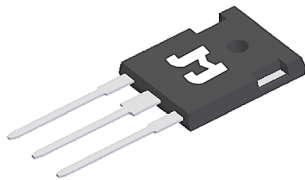
### Product Summary

| Parameter                                | Value | Unit |
|--|-------|------|
| $V_{DS}$                                 | 100   | V    |
| $V_{GS(th\_Typ)}$                        | 3.0   | V    |
| $I_D$ (@ $V_{GS} = 10V$ ) <sup>(1)</sup> | 308   | A    |
| $R_{DS(ON\_Typ)}$ (@ $V_{GS} = 10V$ )    | 1.9   | mΩ   |

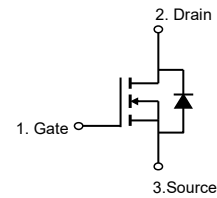
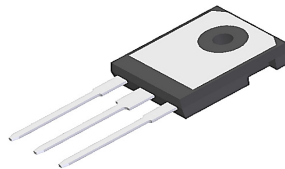
### Applications

- Motor Driving in Power Tool, E-vehicle, Robotics
- Current Switching in DC/DC & AC/DC (SR) Sub-systems
- Power Management in Telecom., Industrial Automation, CE

TO-247-3L Top View



TO-247-3L Bottom View

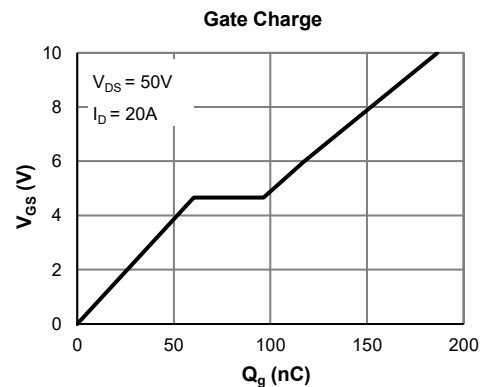
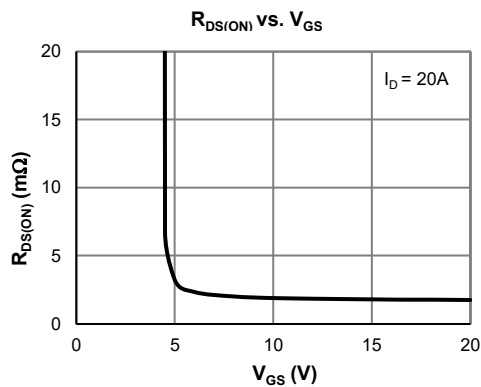


### Ordering Information

| Device       | Package   | # of Pins | Marking | MSL | $T_J$ (°C) | Media | Quantity (pcs) |
|--------------|-----------|-----------|---------|-----|------------|-------|----------------|
| JMSH1001NS-U | TO-247-3L | 3         | SH1001N | NA  | -55 to 150 | Tube  | 30             |

### Absolute Maximum Ratings (@ $T_A = 25^\circ C$ unless otherwise specified)

| Parameter                               | Symbol         | Value               | Unit |
|---|----------------|---------------------|------|
| Drain-to-Source Voltage                 | $V_{DS}$       | 100                 | V    |
| Gate-to-Source Voltage                  | $V_{GS}$       | ±20                 | V    |
| Continuous Drain Current <sup>(1)</sup> | $I_D$          | $T_C = 25^\circ C$  | 308  |
|   |                | $T_C = 100^\circ C$ | 195  |
| Pulsed Drain Current <sup>(2)</sup>     | $I_{DM}$       | 537                 | A    |
| Avalanche Energy <sup>(3)</sup>         | $E_{AS}$       | 1838                | mJ   |
| Power Dissipation <sup>(4)</sup>        | $P_D$          | $T_C = 25^\circ C$  | 367  |
|   |                | $T_C = 100^\circ C$ | 147  |
| Junction & Storage Temperature Range    | $T_J, T_{STG}$ | -55 to 150          | °C   |





**Electrical Characteristics** (@  $T_J = 25^\circ\text{C}$  unless otherwise specified)

| Parameter                         | Symbol        | Conditions  | Min. | Typ. | Max.       | Unit          |
|-----------------------------------|---------------|---|------|------|------------|---------------|
| <b>STATIC PARAMETERS</b>          |               |   |      |      |            |               |
| Drain-Source Breakdown Voltage    | $V_{(BR)DSS}$ | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$                            | 100  |      |            | V             |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{DS} = 80\text{V}, V_{GS} = 0\text{V}$<br>$T_J = 55^\circ\text{C}$ |      |      | 1.0<br>5.0 | $\mu\text{A}$ |
| Gate-Body Leakage Current         | $I_{GSS}$     | $V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$                         |      |      | $\pm 100$  | nA            |
| Gate Threshold Voltage            | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$                               | 2.0  | 3.0  | 4.0        | V             |
| Static Drain-Source ON-Resistance | $R_{DS(ON)}$  | $V_{GS} = 10\text{V}, I_D = 20\text{A}$                               |      | 1.9  | 2.2        | m $\Omega$    |
| Forward Transconductance          | $g_{FS}$      | $V_{DS} = 5\text{V}, I_D = 20\text{A}$                                |      | 66   |            | S             |
| Diode Forward Voltage             | $V_{SD}$      | $I_S = 1\text{A}, V_{GS} = 0\text{V}$                                 |      | 0.66 | 1.0        | V             |
| Diode Continuous Current          | $I_S$         | $T_C = 25^\circ\text{C}$  |      |      | 308        | A             |

**DYNAMIC PARAMETERS** <sup>(5)</sup>

|                              |           |  |  |       |  |          |
|------------------------------|-----------|--|--|-------|--|----------|
| Input Capacitance            | $C_{iss}$ | $V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$ |  | 13489 |  | pF       |
| Output Capacitance           | $C_{oss}$ |  |  | 2166  |  | pF       |
| Reverse Transfer Capacitance | $C_{rss}$ |  |  | 37    |  | pF       |
| Gate Resistance              | $R_g$     | $V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$  |  | 3.4   |  | $\Omega$ |

**SWITCHING PARAMETERS** <sup>(5)</sup>

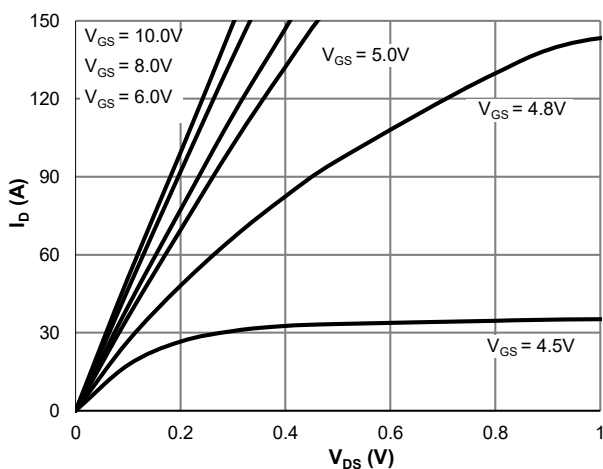
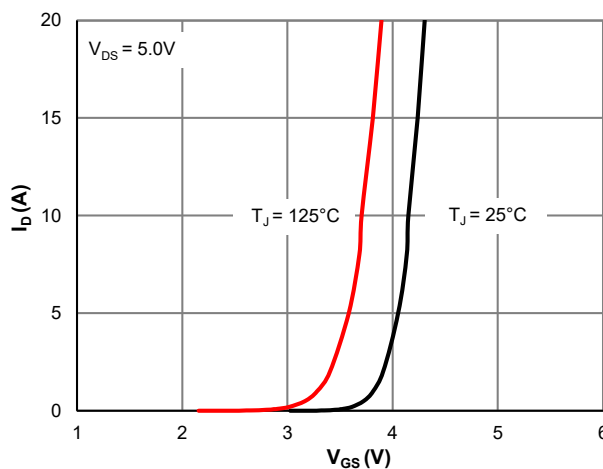
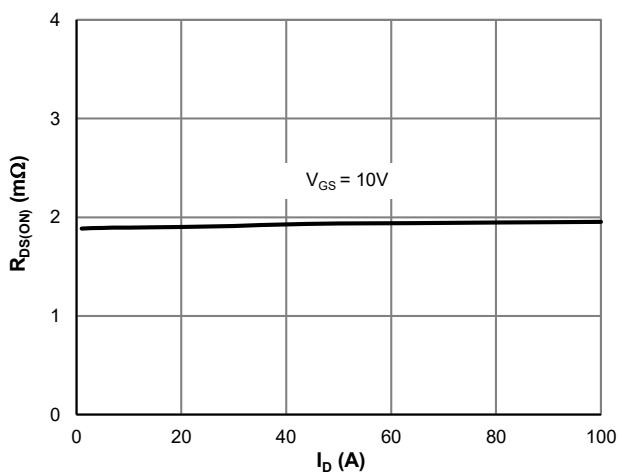
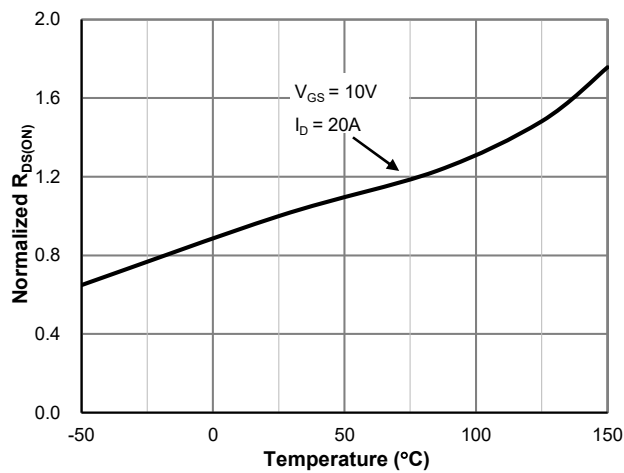
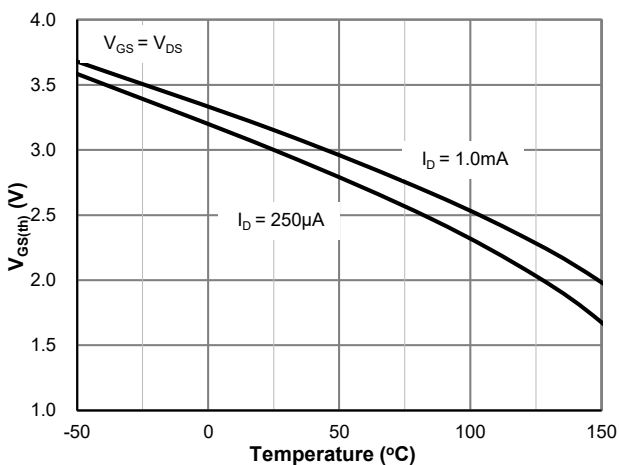
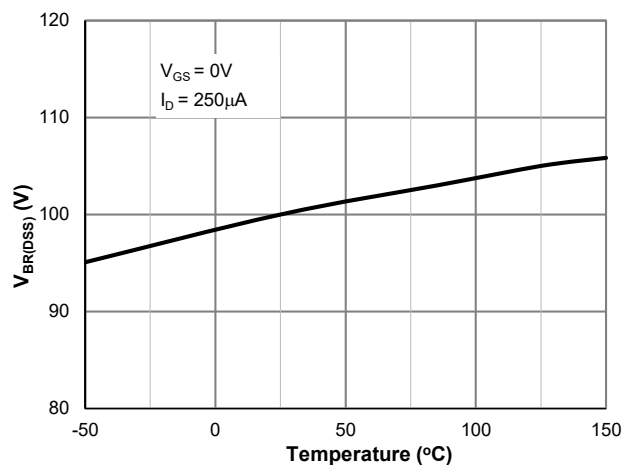
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|---|--------------|--|--|-----|--|----|
| Total Gate Charge (@ $V_{GS} = 10\text{V}$ )  | $Q_g$        | $V_{GS} = 0 \text{ to } 10\text{V}$<br>$V_{DS} = 50\text{V}, I_D = 20\text{A}$     |  | 186 |  | nC |
| Total Gate Charge (@ $V_{GS} = 6.0\text{V}$ ) | $Q_g$        |  |  | 118 |  | nC |
| Gate Source Charge                            | $Q_{gs}$     |  |  | 60  |  | nC |
| Gate Drain Charge                             | $Q_{gd}$     |  |  | 36  |  | nC |
| Turn-On DelayTime                             | $t_{D(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 50\text{V}$<br>$R_L = 2.5\Omega, R_{GEN} = 3\Omega$ |  | 41  |  | ns |
| Turn-On Rise Time                             | $t_r$        |  |  | 62  |  | ns |
| Turn-Off DelayTime                            | $t_{D(off)}$ |  |  | 133 |  | ns |
| Turn-Off Fall Time                            | $t_f$        |  |  | 75  |  | ns |
| Body Diode Reverse Recovery Time              | $t_{rr}$     | $I_F = 20\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$                              |  | 115 |  | ns |
| Body Diode Reverse Recovery Charge            | $Q_{rr}$     | $I_F = 20\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$                              |  | 333 |  | nC |

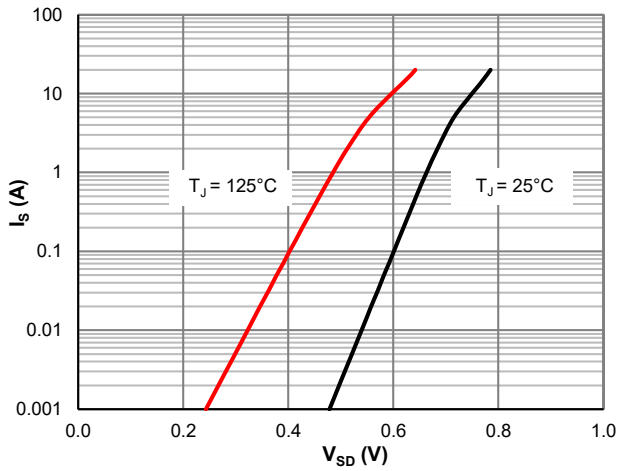
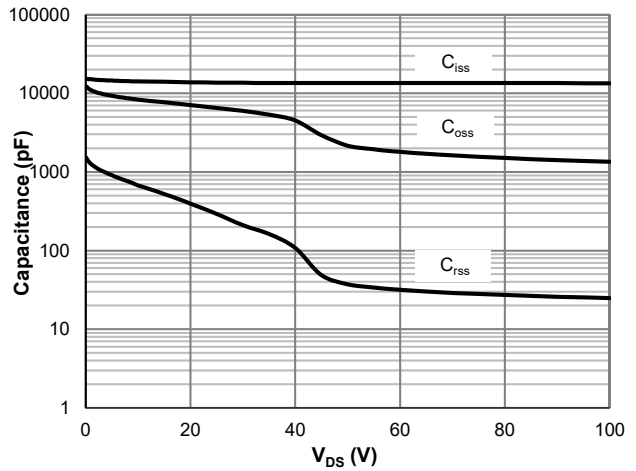
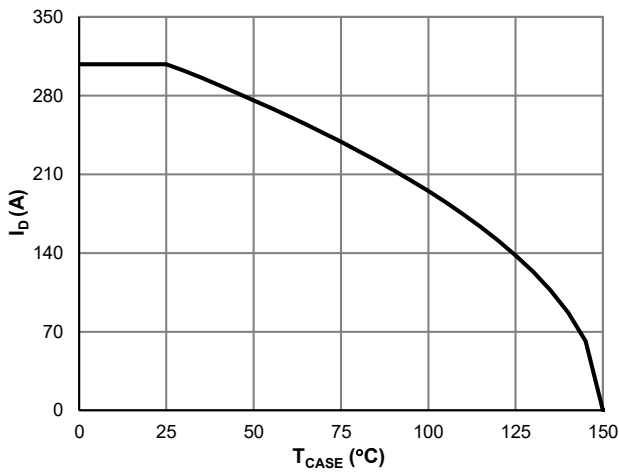
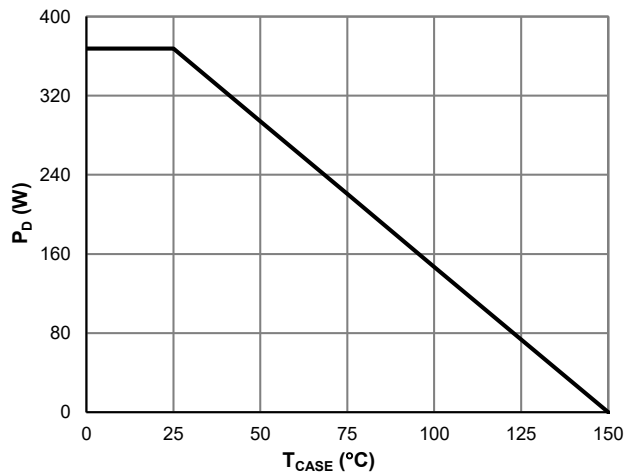
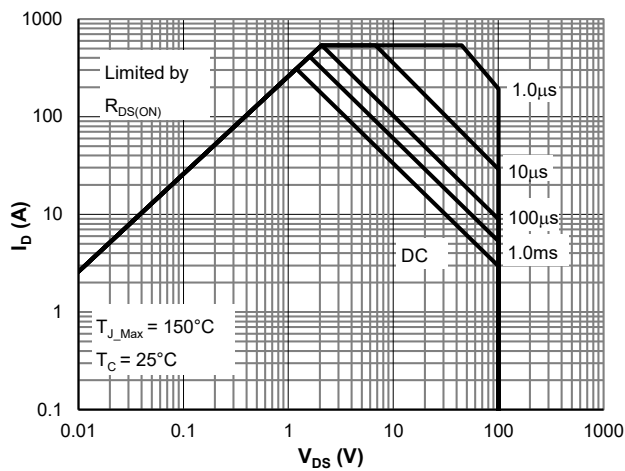
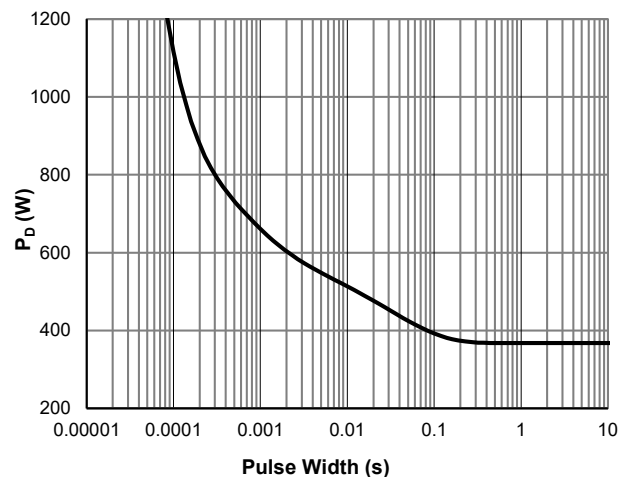
**Thermal Performance**

| Parameter                               | Symbol          | Typ. | Max. | Unit                      |
|---|-----------------|------|------|---------------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 48   | 58   | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 0.34 | 0.41 | $^\circ\text{C}/\text{W}$ |

**Notes:**

1. Computed continuous current assumes the condition of  $T_{J\_Max}$  while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under  $T_{J\_Max} = 150^\circ\text{C}$ .
3.  $E_{AS}$  of 1838 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 20\text{A}$ ,  $V_{GS} = 10\text{V}$ ,  $V_{DD} = 50\text{V}$ ; 100% test at  $L = 0.3\text{mH}$ ,  $I_{AS} = 84\text{A}$ .
4. The power dissipation  $P_D$  is based on  $T_{J\_Max} = 150^\circ\text{C}$ .
5. This value is guaranteed by design hence it is not included in the production test.

**Typical Electrical & Thermal Characteristics**

**Figure 1: Saturation Characteristics**

**Figure 2: Transfer Characteristics**

**Figure 3:  $R_{DS(ON)}$  vs. Drain Current**

**Figure 4:  $R_{DS(ON)}$  vs. Junction Temperature**

**Figure 5:  $V_{GS(th)}$  vs. Junction Temperature**

**Figure 6:  $V_{BR(DSS)}$  vs. Junction Temperature**

**Typical Electrical & Thermal Characteristics**

**Figure 7: Body-Diode Characteristics**

**Figure 8: Capacitance Characteristics**

**Figure 9: Current De-rating**

**Figure 10: Power De-rating**

**Figure 11: Maximum Safe Operating Area**

**Figure 12: Single Pulse Power Rating, Junction-to-Case**



### Typical Electrical & Thermal Characteristics

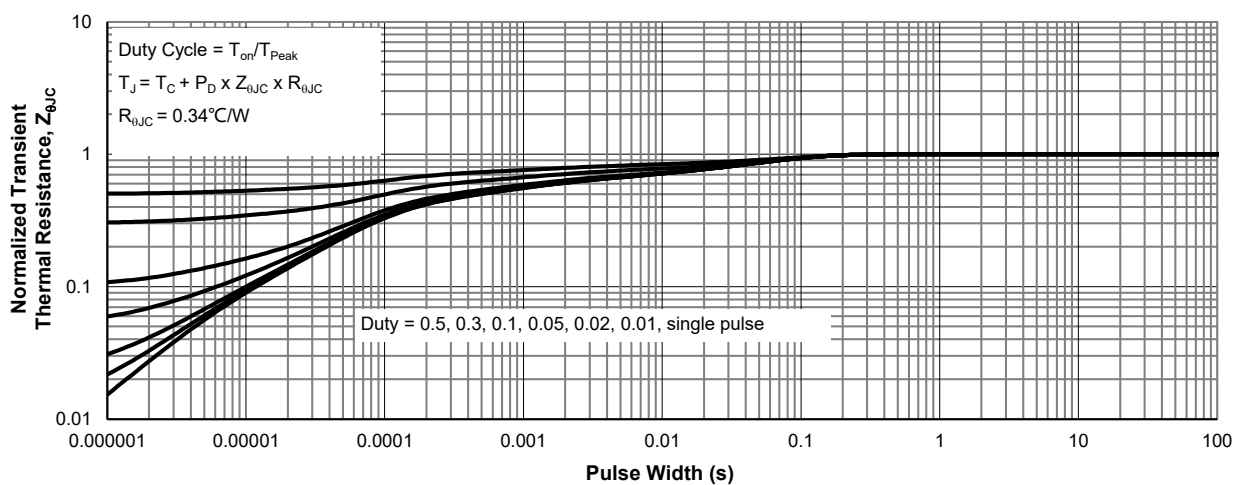
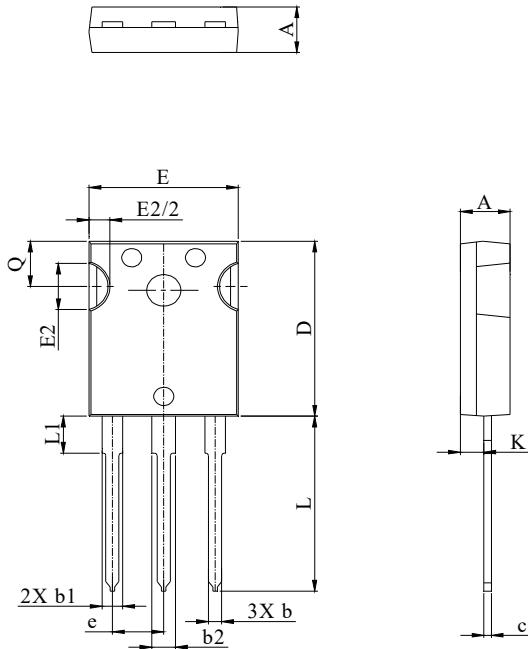
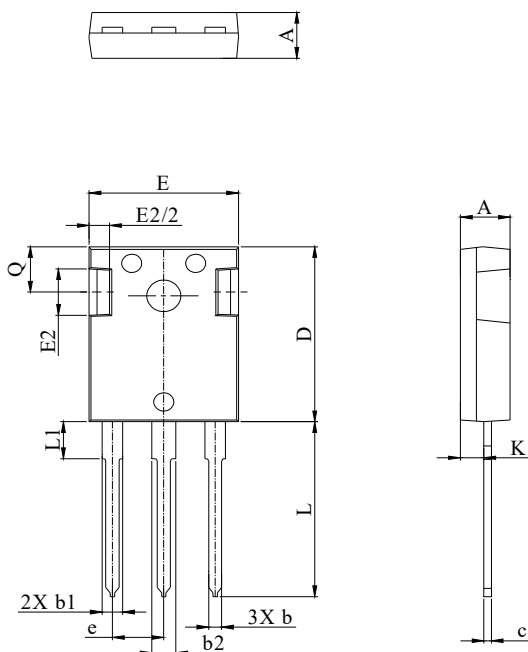


Figure 13: Normalized Maximum Transient Thermal Impedance

**TO-247-3L Package Information**
**Type\_A Package Outline**


| DIM. | MILLIMETER |       |       |
|------|------------|-------|-------|
|      | MIN.       | NOM.  | MAX.  |
| A    | 4.80       | 5.02  | 5.21  |
| b    | 1.00       | 1.20  | 1.40  |
| b1   | 1.90       | 2.00  | 2.39  |
| b2   | 2.87       | 3.00  | 3.22  |
| c    | 0.41       | 0.60  | 0.79  |
| D    | 20.80      | 21.00 | 21.20 |
| E    | 15.50      | 15.94 | 16.13 |
| E2   | 4.32       |       | 5.49  |
| L    | 19.70      | 20.07 | 20.32 |
| L1   | 4.00       |       | 4.40  |
| K    | 2.20       |       | 2.50  |
| e    | 5.44 BSC   |       |       |

**Type\_B Package Outline**


| DIM. | MILLIMETER |       |       |
|------|------------|-------|-------|
|      | MIN.       | NOM.  | MAX.  |
| A    | 4.80       | 5.02  | 5.21  |
| b    | 1.00       | 1.20  | 1.40  |
| b1   | 1.90       | 2.00  | 2.39  |
| b2   | 2.87       | 3.00  | 3.22  |
| c    | 0.41       | 0.60  | 0.79  |
| D    | 20.80      | 21.00 | 21.20 |
| E    | 15.50      | 15.94 | 16.13 |
| E2   | 4.32       |       | 5.49  |
| L    | 19.70      | 20.07 | 20.32 |
| L1   | 4.00       |       | 4.40  |
| K    | 2.20       |       | 2.50  |
| e    | 5.44 BSC   |       |       |