

FH3310B1
N-Channel Enhancement Mode MOSFET
Description

The FH3310B1 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

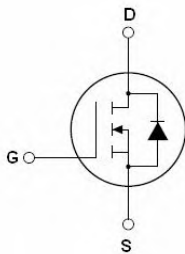
Applications

- 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

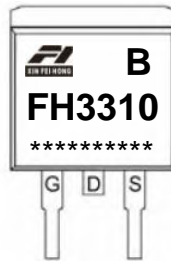
Product Summary

| Parameter | Typ. | Unit |
|----------------------------------|------|-----------------|
| V_{DS} | 100 | V |
| $V_{GS(th)}$ | 3.0 | V |
| I_D (@ $V_{GS} = 10V$) | 130 | A |
| $R_{DS(ON)}$ (@ $V_{GS} = 10V$) | 3.2 | $m\Omega$ (Typ) |

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



Schematic diagram

TO-263


Marking and pin Assignment



TO-263 Top View

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 ⁽¹⁾ | I_D | $T_C = 25^\circ C$ | 130 |
| | | $T_C = 100^\circ C$ | 88 |
| Pulsed Drain Current ⁽²⁾ | I_{DM} | 520 | A |
| Avalanche Energy ⁽³⁾ | E_{AS} | 726 | mJ |
| Power Dissipation ⁽⁴⁾ | P_D | $T_C = 25^\circ C$ | 312 |
| | | $T_C = 100^\circ C$ | 125 |
| Junction & Storage Temperature Range | T_J, T_{STG} | -55 to 150 | $^\circ C$ |

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

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|-----------------|--|---|---------------------------|-----------|------------------|
| STATIC PARAMETERS | | | | | | |
| 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} | $V_{DS} = 80\text{V}, V_{GS} = 0\text{V}$ | | | 1.0 | μA |
| | | | | | 5.0 | |
| Gate-Body Leakage Current | I_{GSS} | $V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$ | | | ± 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 | $R_{DS(on)}$ | $V_{GS} = 10\text{V}, I_D = 20\text{A}$ | | 3.2 | 4.2 | $\text{m}\Omega$ |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{V}, I_D = 20\text{A}$ | | 50 | | 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 | $T_C = 25^\circ\text{C}$ | | | 130 | A |
| DYNAMIC PARAMETERS ⁽⁵⁾ | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$ | | 5497 | | pF |
| Output Capacitance | C_{oss} | | | 900 | | pF |
| Reverse Transfer Capacitance | C_{rss} | | | 24 | | pF |
| Gate Resistance | R_g | $V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$ | | 2.2 | | Ω |
| SWITCHING PARAMETERS ⁽⁵⁾ | | | | | | |
| Total Gate Charge (@ $V_{GS} = 10\text{V}$) | Q_g | $V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 50\text{V}, I_D = 20\text{A}$ | | 84 | | nC |
| Total Gate Charge (@ $V_{GS} = 6.0\text{V}$) | Q_g | | | 57 | | nC |
| Gate Source Charge | Q_{gs} | | | 24 | | nC |
| Gate Drain Charge | Q_{gd} | | | 27 | | nC |
| Turn-On Delay Time | $t_{D(on)}$ | $V_{GS} = 10\text{V}, V_{DS} = 50\text{V}$ $R_L = 2.5\Omega, R_{GEN} = 3\Omega$ | | 21 | | ns |
| Turn-On Rise Time | t_r | | | 35 | | ns |
| Turn-Off Delay Time | $t_{D(off)}$ | | | 49 | | ns |
| Turn-Off Fall Time | t_f | | | 30 | | ns |
| Body Diode Reverse Recovery Time | t_{rr} | | $I_F = 20\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$ | | 71 | |
| Body Diode Reverse Recovery Charge | Q_{rr} | $I_F = 20\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$ | | 127 | | nC |
| Thermal Performance | | | | | | |
| Parameter | Symbol | Typ. | Max. | Unit | | |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 45 | 55 | $^\circ\text{C}/\text{W}$ | | |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.48 | 0.65 | $^\circ\text{C}/\text{W}$ | | |

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 726 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 3\text{mH}$, $I_{AS} = 22\text{A}$, $V_{GS} = 10\text{V}$, $V_{DD} = 50\text{V}$; 100% test at $L = 0.3\text{mH}$, $I_{AS} = 45\text{A}$, $T_{J_Max} = 150^\circ\text{C}$.
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

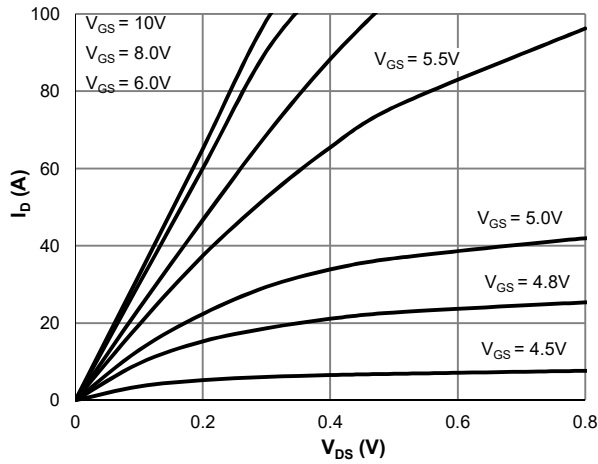


Figure 1: Saturation Characteristics

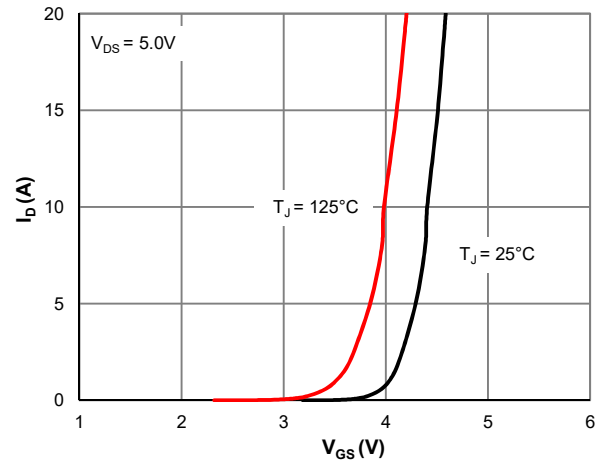


Figure 2: Transfer Characteristics

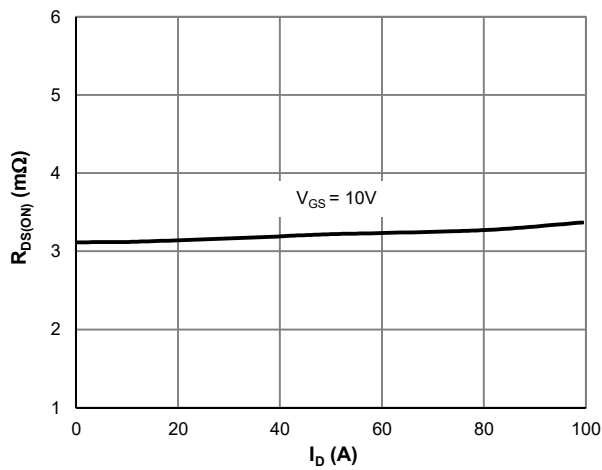


Figure 3: $R_{DS(ON)}$ vs. Drain Current

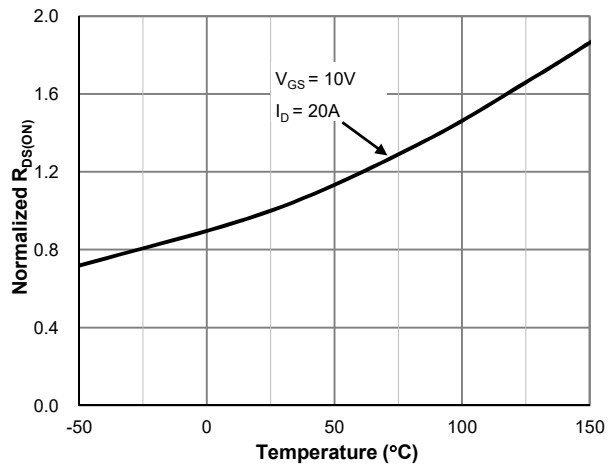


Figure 4: $R_{DS(ON)}$ vs. Junction Temperature

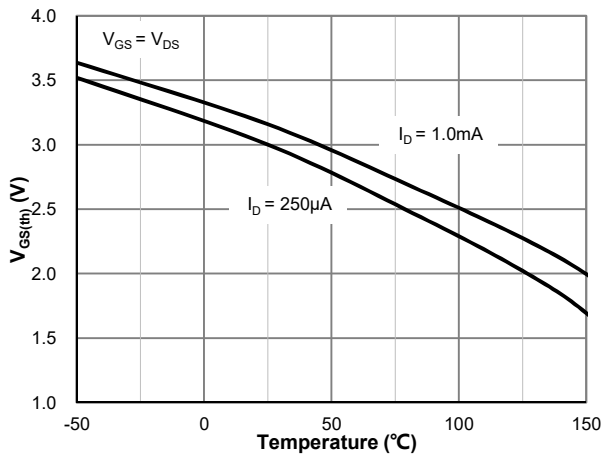


Figure 5: $V_{GS(th)}$ vs. Junction Temperature

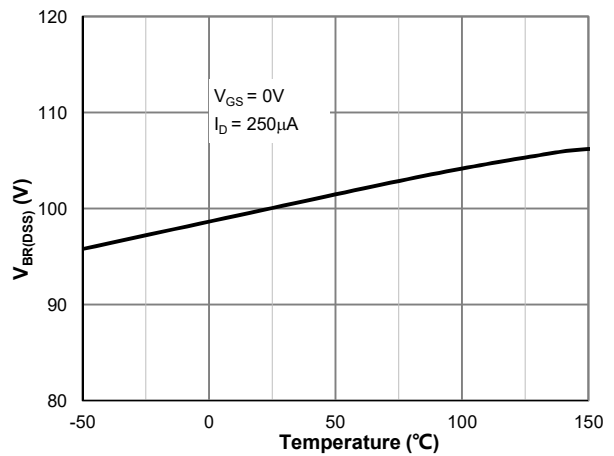


Figure 6: $V_{BR(DSS)}$ vs. Junction Temperature

Typical Electrical & Thermal Characteristics

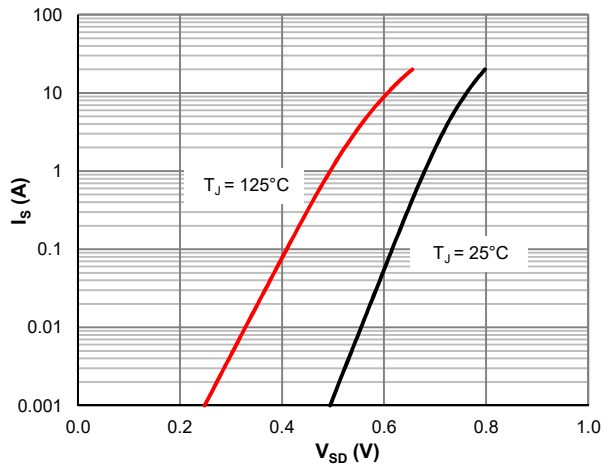


Figure 7: Body-Diode Characteristics

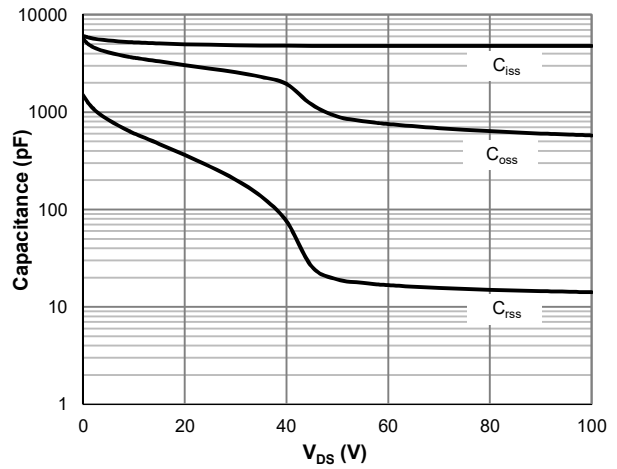


Figure 8: Capacitance Characteristics

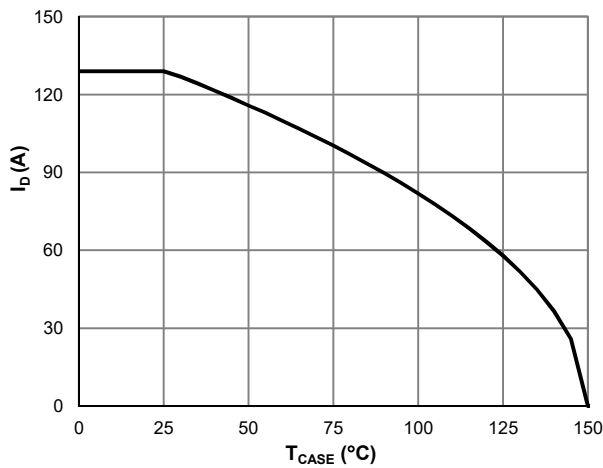


Figure 9: Current De-rating

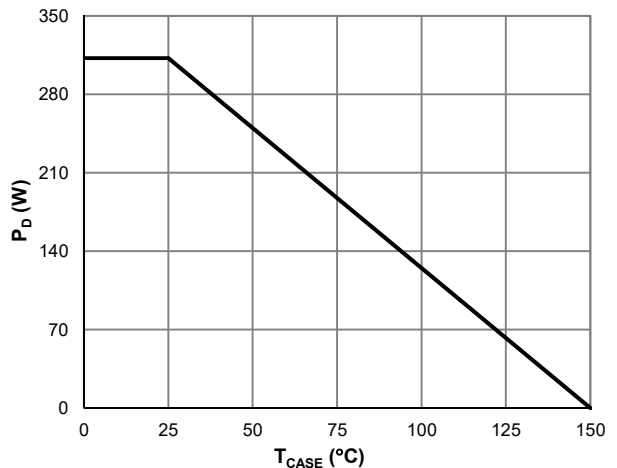


Figure 10: Power De-rating

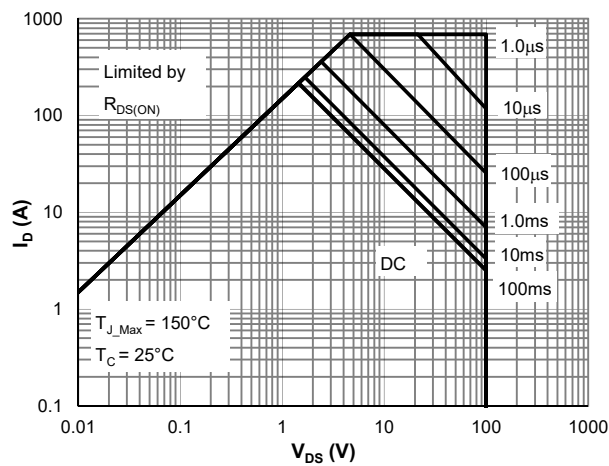


Figure 11: Maximum Safe Operating Area

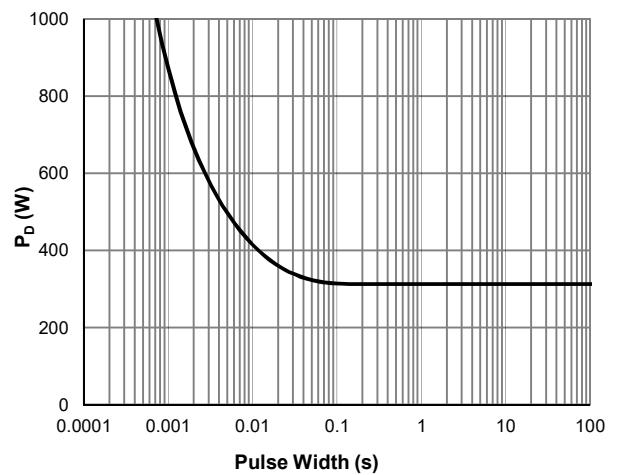
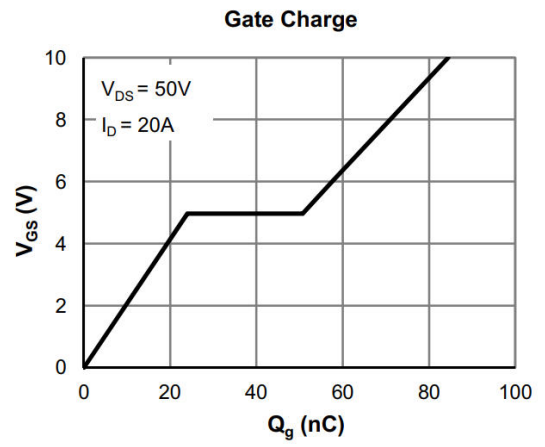
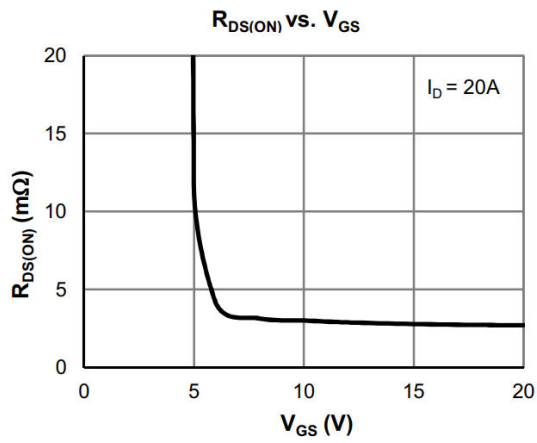


Figure 12: Single Pulse Power Rating, Junction-to-Case



Typical Electrical & Thermal Characteristics

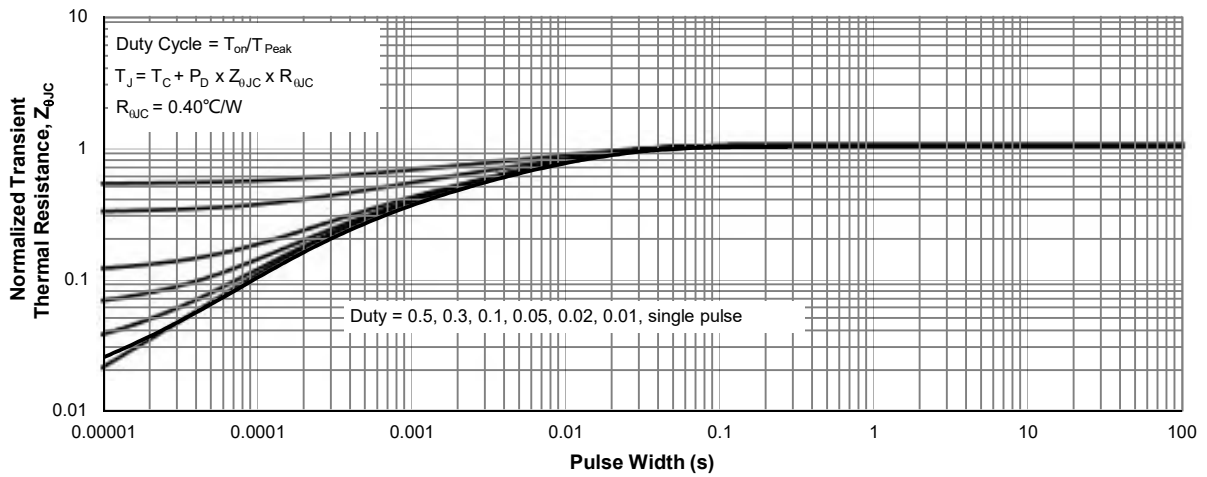
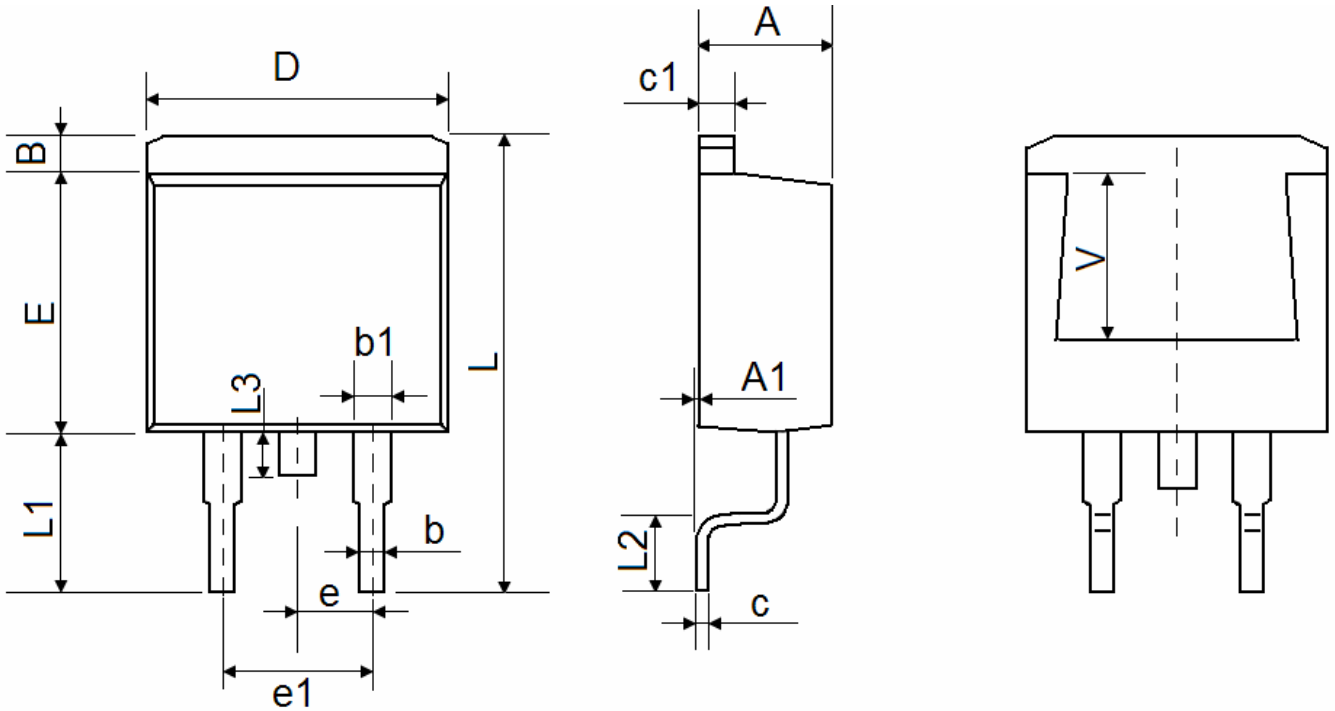


Figure 13: Normalized Maximum Transient Thermal Impedance

Package Information : TO-263



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.470 | 4.670 | 0.176 | 0.184 |
| A1 | 0.000 | 0.150 | 0.000 | 0.006 |
| B | 1.170 | 1.370 | 0.046 | 0.054 |
| b | 0.710 | 0.910 | 0.028 | 0.036 |
| b1 | 1.170 | 1.370 | 0.046 | 0.054 |
| c | 0.310 | 0.530 | 0.012 | 0.021 |
| c1 | 1.170 | 1.370 | 0.046 | 0.054 |
| D | 10.010 | 10.310 | 0.394 | 0.406 |
| E | 8.500 | 8.900 | 0.335 | 0.350 |
| e | 2.540 TYP. | | 0.100 TYP. | |
| e1 | 4.980 | 5.180 | 0.196 | 0.204 |
| L | 15.050 | 15.450 | 0.593 | 0.608 |
| L1 | 5.080 | 5.480 | 0.200 | 0.216 |
| L2 | 2.340 | 2.740 | 0.092 | 0.108 |
| L3 | 1.300 | 1.700 | 0.051 | 0.067 |
| V | 5.600 REF | | 0.220 REF | |