

**FH3510B**
**N-Channel Enhancement Mode MOSFET**
**Features**

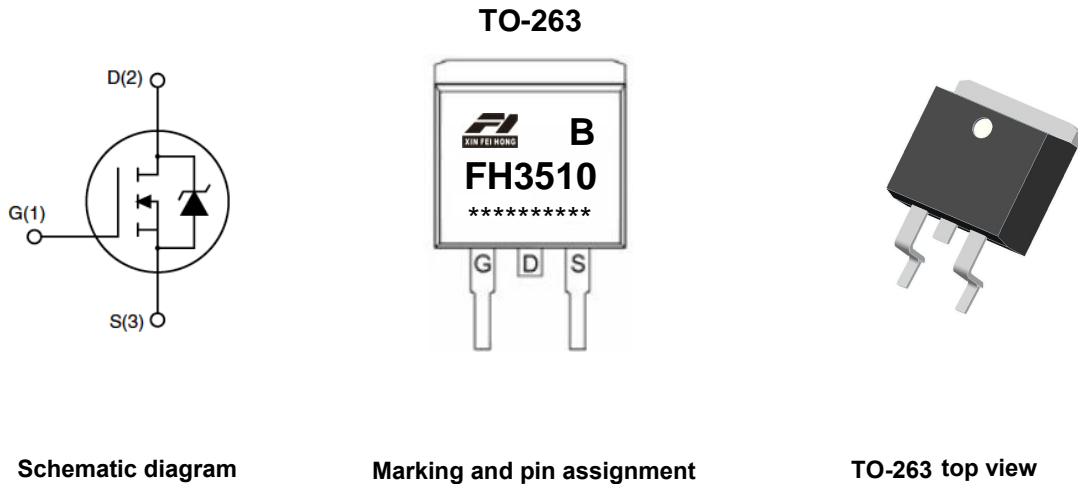
- SGT Trench Technology
- Low  $R_{DS(ON)}$ , Low Gate Charge
- Fast Switching
- Excellent Avalanche Characteristics
- 100% UIS Tested, 100%  $R_g$  Tested
- High Current Capability

**Product Summary**

| Parameter                                | Typ. | Unit       |
|--|------|------------|
| $V_{DS}$                                 | 100  | V          |
| $I_D$ (@ $V_{GS} = 10V$ ) <sup>(1)</sup> | 150  | A          |
| $R_{DS(ON)}$ (@ $V_{GS} = 10V$ ) (Typ)   | 2.8  | m $\Omega$ |
| $R_{DS(ON)}$ (@ $V_{GS} = 4.5V$ ) (Typ)  | 3.4  | m $\Omega$ |

**Application**

- Motor Control and Drive
- Uninterruptible Power Supply (UPS)
- Battery Management


**Absolute Maximum Ratings** ( $T_c=25^\circ\text{C}$  unless otherwise specified)

| Symbol          | Parameter                                     | Max.                      | Units                     |
|-----------------|---|---------------------------|---------------------------|
| $V_{DSS}$       | Drain-Source Voltage                          | 100                       | V                         |
| $V_{GSS}$       | Gate-Source Voltage                           | $\pm 20$                  | V                         |
| $I_D$           | Continuous Drain Current <sup>(1)</sup>       | $T_c = 25^\circ\text{C}$  | 150                       |
|                 |   | $T_c = 100^\circ\text{C}$ | 95                        |
| $I_{DM}$        | Pulsed Drain Current <sup>(2)</sup>           | 465                       | A                         |
| $I_{AS}$        | Avalanche Current <sup>(3)</sup>              | 72                        | A                         |
| $E_{AS}$        | Single Pulsed Avalanche Energy <sup>(3)</sup> | 262                       | mJ                        |
| $P_D$           | Power Dissipation <sup>(4)</sup>              | $T_c = 25^\circ\text{C}$  | 194                       |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case          | 0.61                      | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient       | 57                        | $^\circ\text{C}/\text{W}$ |
| $T_J, T_{STG}$  | Operating and Storage Temperature Range       | -55 to +150               | $^\circ\text{C}$          |

**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   | 105  |            | 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                        | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$  | 1.2   | 1.6  | 2.5        | V                |
| Static Drain-Source ON-Resistance             | $R_{DS(on)}$  | $V_{GS} = 10\text{V}, I_D = 20\text{A}$  |   | 2.8  | 3.4        | $\text{m}\Omega$ |
| Static Drain-Source ON-Resistance             | $R_{DS(on)}$  | $V_{GS} = 4.5\text{V}, I_D = 15\text{A}$   |   | 3.4  | 4.3        | $\text{m}\Omega$ |
| Forward Transconductance                      | $g_{FS}$      | $V_{DS} = 5\text{V}, I_D = 20\text{A}$   |   | 109  |            | S                |
| Diode Forward Voltage                         | $V_{SD}$      | $I_S = 1\text{A}, V_{GS} = 0\text{V}$  |   | 0.7  | 1.0        | V                |
| Diode Continuous Current                      | $I_S$         | $T_C = 25^\circ\text{C}$   |   |      | 114        | A                |
| <b>DYNAMIC PARAMETERS</b> <sup>(5)</sup>      |               |  |   |      |            |                  |
| Input Capacitance                             | $C_{iss}$     | $V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$                         |   | 4646 |            | pF               |
| Output Capacitance                            | $C_{oss}$     |  |   | 1214 |            | pF               |
| Reverse Transfer Capacitance                  | $C_{rss}$     |  |   | 5.8  |            | pF               |
| Gate Resistance                               | $R_g$         | $V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$                          |   | 2.3  |            | $\Omega$         |
| <b>SWITCHING PARAMETERS</b> <sup>(5)</sup>    |               |  |   |      |            |                  |
| Total Gate Charge (@ $V_{GS} = 10\text{V}$ )  | $Q_g$         | $V_{GS} = 0 \text{ to } 10\text{V}$<br>$V_{DS} = 50\text{V}, I_D = 20\text{A}$     |   | 78   |            | nC               |
| Total Gate Charge (@ $V_{GS} = 6.0\text{V}$ ) | $Q_g$         |  |   | 56   |            | nC               |
| Gate Source Charge                            | $Q_{gs}$      |  |   | 11.2 |            | nC               |
| Gate Drain Charge                             | $Q_{gd}$      |  |   | 26   |            | nC               |
| Turn-On Delay Time                            | $t_{D(on)}$   | $V_{GS} = 10\text{V}, V_{DS} = 50\text{V}$<br>$R_L = 2.5\Omega, R_{GEN} = 6\Omega$ |   | 10.0 |            | ns               |
| Turn-On Rise Time                             | $t_r$         |  |   | 22   |            | ns               |
| Turn-Off Delay Time                           | $t_{D(off)}$  |  |   | 84   |            | ns               |
| Turn-Off Fall Time                            | $t_f$         |  |   | 61   |            | ns               |
| Body Diode Reverse Recovery Time              | $t_{rr}$      |  | $I_F = 20\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$ |      | 84         |                  |
| Body Diode Reverse Recovery Charge            | $Q_{rr}$      | $I_F = 20\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$                              |   | 216  |            | nC               |

**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. This single-pulse measurement was taken under the following condition [ $L = 0.1\text{mH}, V_{GS} = 10\text{V}, V_{DS} = 50\text{V}$ ] while its value is limited by  $T_{J\_Max} = 150^\circ\text{C}$ .
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.
6. Continuous current rating is limited by the package used.

## Typical Electrical & Thermal Characteristics

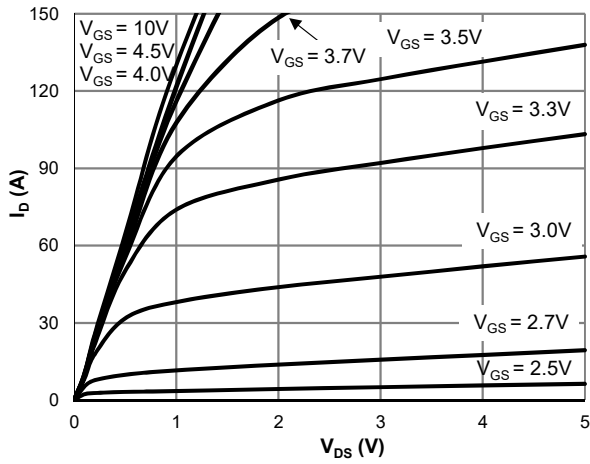


Figure 1: Saturation Characteristics

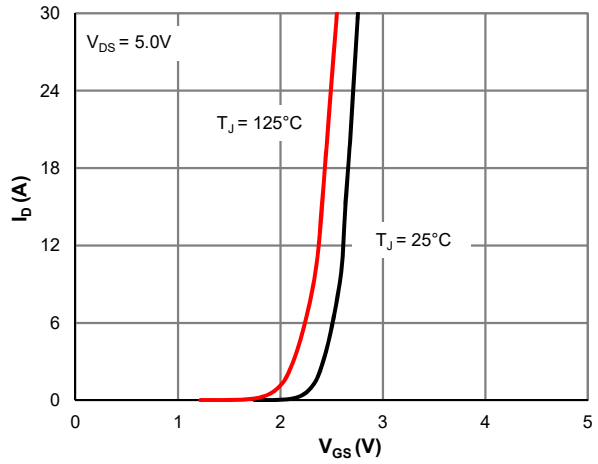


Figure 2: Transfer Characteristics

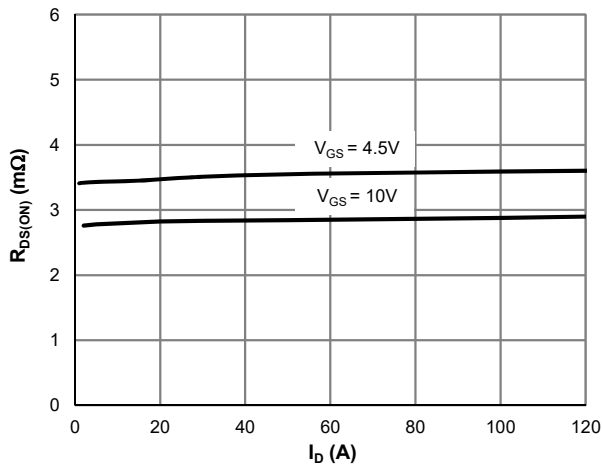


Figure 3:  $R_{DS(ON)}$  vs. Drain Current

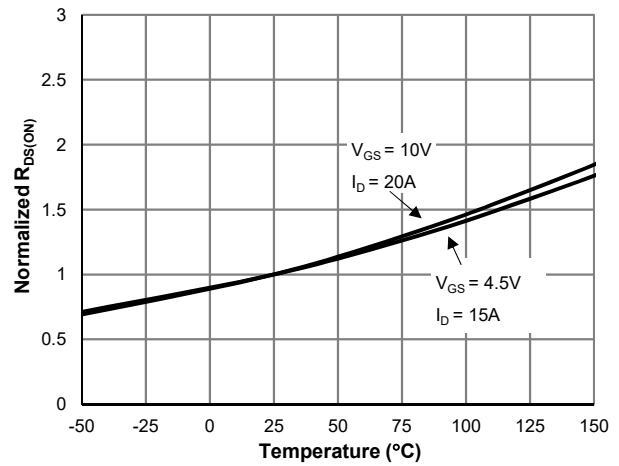


Figure 4:  $R_{DS(ON)}$  vs. Junction Temperature

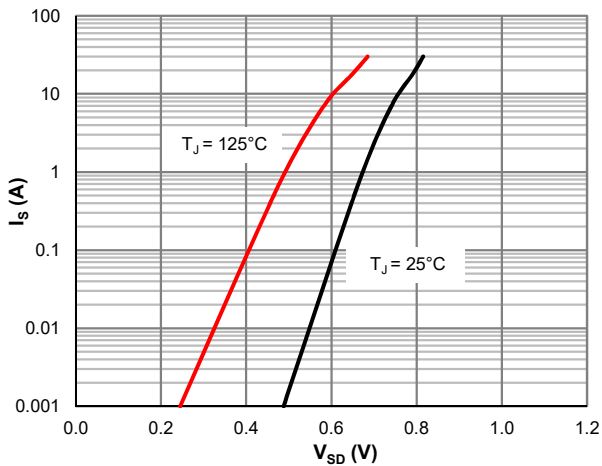


Figure 5: Body-Diode Characteristics

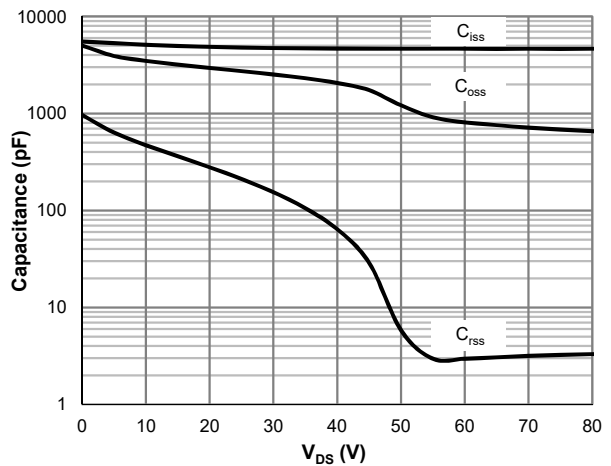


Figure 6: Capacitance Characteristics

## Typical Electrical & Thermal Characteristics

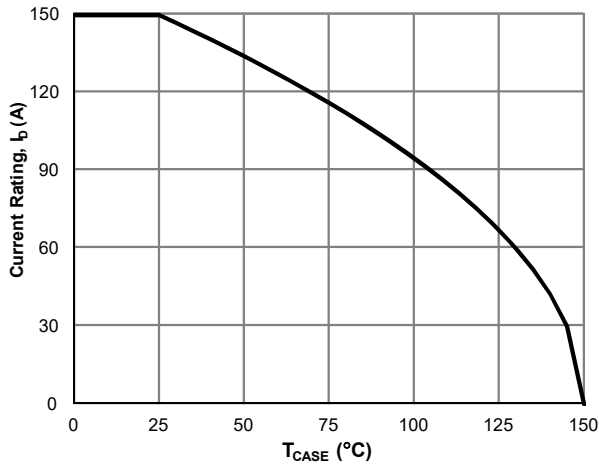


Figure 7: Current De-rating

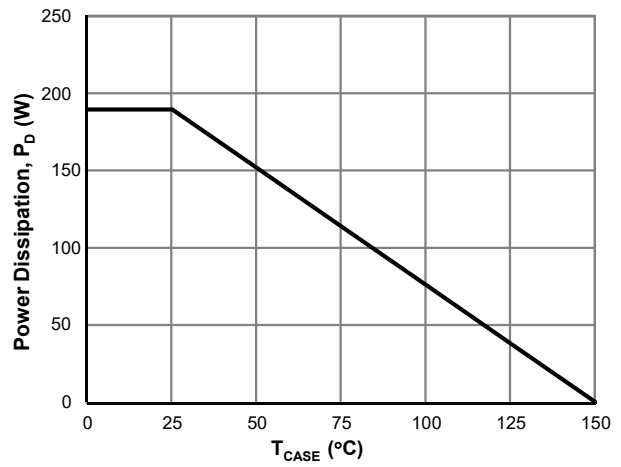


Figure 8: Power De-rating

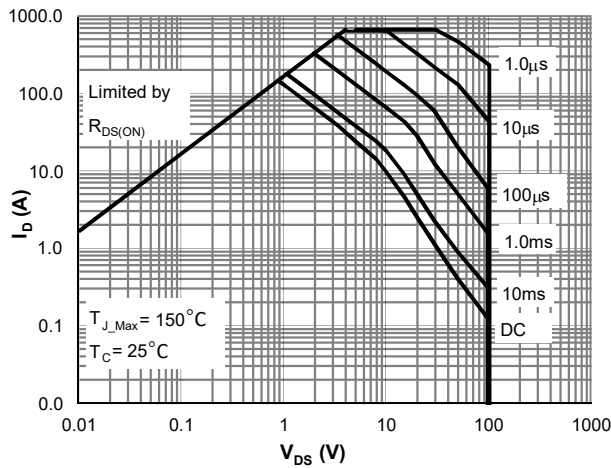


Figure 9: Maximum Safe Operating

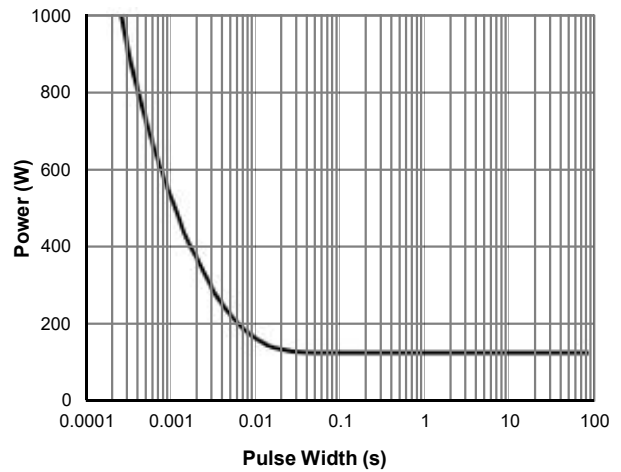
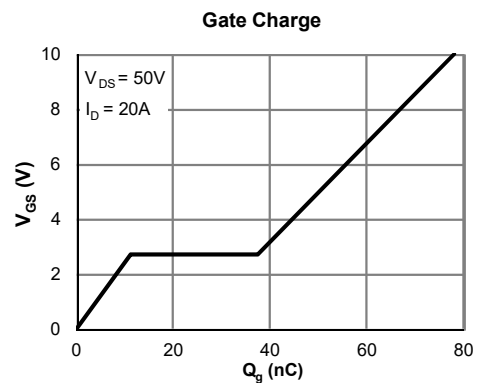
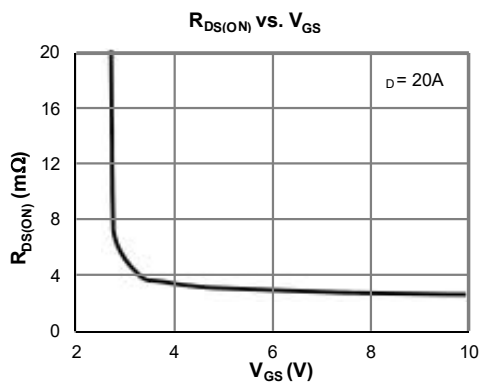


Figure 10: Single Pulse Power Rating, Junction-to-Case



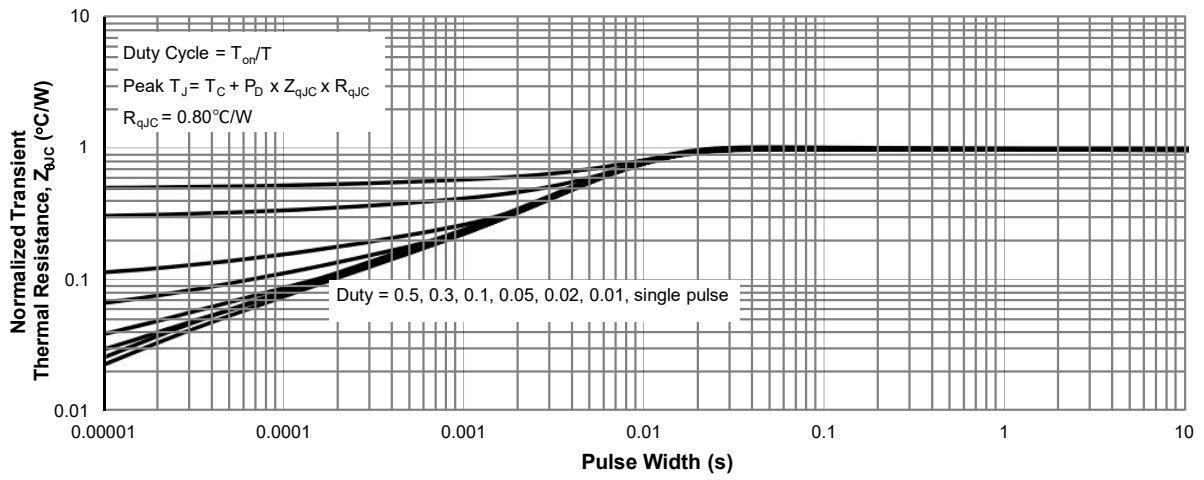
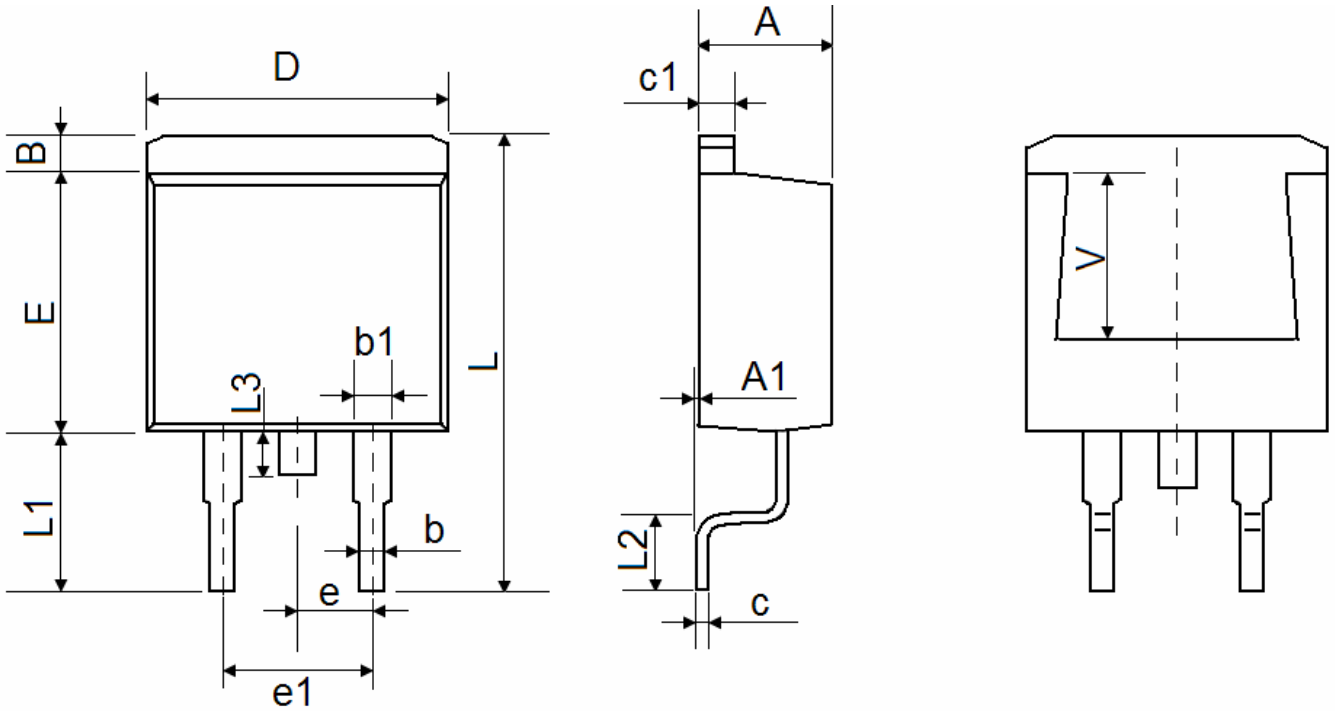


Figure 11: Normalized Maximum Transient Thermal Impedance

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            |       |