

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

The NCE80H11D 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.

### General Features

- $V_{DS} = 80V, I_D = 105A$   
 $R_{DS(ON)} < 7m\Omega @ V_{GS}=10V$  (Typ:6.1m $\Omega$ )
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

### Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

**100% UIS TESTED!**

**100%  $\Delta V_d$ s TESTED!**



Schematic diagram



Marking and pin assignment



TO-263-2L top view

### Package Marking and Ordering Information

| Device Marking | Device    | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| NCE80H11D      | NCE80H11D | TO-263-2L      | -         | -          | -        |

### Absolute Maximum Ratings ( $T_C=25^\circ C$ unless otherwise noted)

| Parameter   | Symbol             | Limit      | Unit          |
|---|--------------------|------------|---------------|
| Drain-Source Voltage                              | $V_{DS}$           | 80         | V             |
| Gate-Source Voltage                               | $V_{GS}$           | $\pm 20$   | V             |
| Drain Current-Continuous                          | $I_D$              | 105        | A             |
| Drain Current-Continuous( $T_C=100^\circ C$ )     | $I_D(100^\circ C)$ | 80         | A             |
| Pulsed Drain Current                              | $I_{DM}$           | 420        | A             |
| Maximum Power Dissipation                         | $P_D$              | 200        | W             |
| Derating factor                                   |                    | 1.33       | W/ $^\circ C$ |
| Single pulse avalanche energy <sup>(Note 5)</sup> | $E_{AS}$           | 800        | mJ            |
| Operating Junction and Storage Temperature Range  | $T_J, T_{STG}$     | -55 To 175 | $^\circ C$    |

## Thermal Characteristic

|  |                 |      |               |
|--|-----------------|------|---------------|
| Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup> | $R_{\theta JC}$ | 0.75 | $^{\circ}C/W$ |
|--|-----------------|------|---------------|

## Electrical Characteristics ( $T_C=25^{\circ}C$ unless otherwise noted)

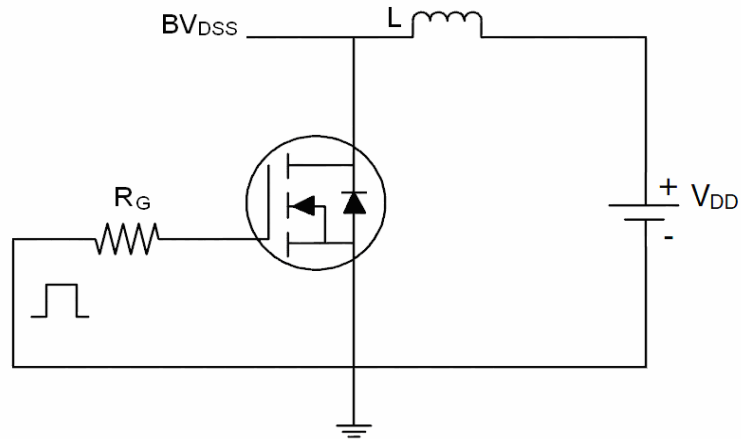
| Parameter  | Symbol       | Condition   | Min | Typ  | Max       | Unit       |
|--|--------------|---|-----|------|-----------|------------|
| <b>Off Characteristics</b>                           |              |   |     |      |           |            |
| Drain-Source Breakdown Voltage                       | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$   | 80  | 86   | -         | V          |
| Zero Gate Voltage Drain Current                      | $I_{DSS}$    | $V_{DS}=80V, V_{GS}=0V$   | -   | -    | 1         | $\mu A$    |
| Gate-Body Leakage Current                            | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$   | -   | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b> <sup>(Note 3)</sup>        |              |   |     |      |           |            |
| Gate Threshold Voltage                               | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$   | 2   | 3    | 4         | V          |
| Drain-Source On-State Resistance                     | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=40A$   | -   | 6.1  | 7         | m $\Omega$ |
| Forward Transconductance                             | $g_{FS}$     | $V_{DS}=25V, I_D=40A$   | 80  | -    | -         | S          |
| <b>Dynamic Characteristics</b> <sup>(Note 4)</sup>   |              |   |     |      |           |            |
| Input Capacitance                                    | $C_{ISS}$    | $V_{DS}=25V, V_{GS}=0V,$<br>$F=1.0MHz$                                | -   | 4900 | -         | PF         |
| Output Capacitance                                   | $C_{OSS}$    |   | -   | 410  | -         | PF         |
| Reverse Transfer Capacitance                         | $C_{RSS}$    |   | -   | 315  | -         | PF         |
| <b>Switching Characteristics</b> <sup>(Note 4)</sup> |              |   |     |      |           |            |
| Turn-on Delay Time                                   | $t_{d(on)}$  | $V_{DD}=30V, I_D=2A, R_L=15\Omega,$<br>$R_G=2.5\Omega, V_{GS}=10V$    | -   | 20   | -         | nS         |
| Turn-on Rise Time                                    | $t_r$        |   | -   | 19   | -         | nS         |
| Turn-Off Delay Time                                  | $t_{d(off)}$ |   | -   | 70   | -         | nS         |
| Turn-Off Fall Time                                   | $t_f$        |   | -   | 30   | -         | nS         |
| Total Gate Charge                                    | $Q_g$        | $I_D=30A, V_{DD}=30V, V_{GS}=10V$                                     | -   | 125  | -         | nC         |
| Gate-Source Charge                                   | $Q_{gs}$     |   | -   | 24   | -         | nC         |
| Gate-Drain Charge                                    | $Q_{gd}$     |   | -   | 49   | -         | nC         |
| <b>Drain-Source Diode Characteristics</b>            |              |   |     |      |           |            |
| Diode Forward Voltage <sup>(Note 3)</sup>            | $V_{SD}$     | $V_{GS}=0V, I_S=40A$  | -   | -    | 1.2       | V          |
| Diode Forward Current <sup>(Note 2)</sup>            | $I_S$        |   | -   | -    | 105       | A          |
| Reverse Recovery Time                                | $t_{rr}$     | $T_j=25^{\circ}C, I_F=75A,$<br>$di/dt=100A/\mu S$ <sup>(Note 3)</sup> | -   | 37   |           | nS         |
| Reverse Recovery Charge                              | $Q_{rr}$     |   | -   | 58   |           | nC         |
| Forward Turn-On Time                                 | $t_{on}$     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)  |     |      |           |            |

### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_j=25^{\circ}C, V_{DD}=40V, V_G=10V, L=0.5mH, R_g=25\Omega$

**Test circuit**

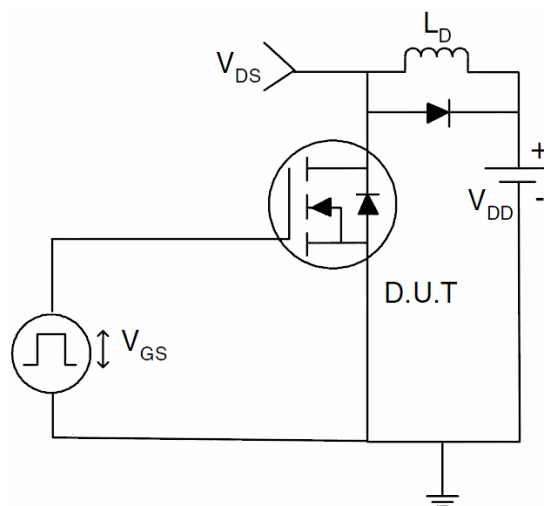
**1) E<sub>AS</sub> test Circuit**



**2) Gate charge test Circuit**



**3) Switch Time Test Circuit**



## Typical Electrical and Thermal Characteristics (Curves)

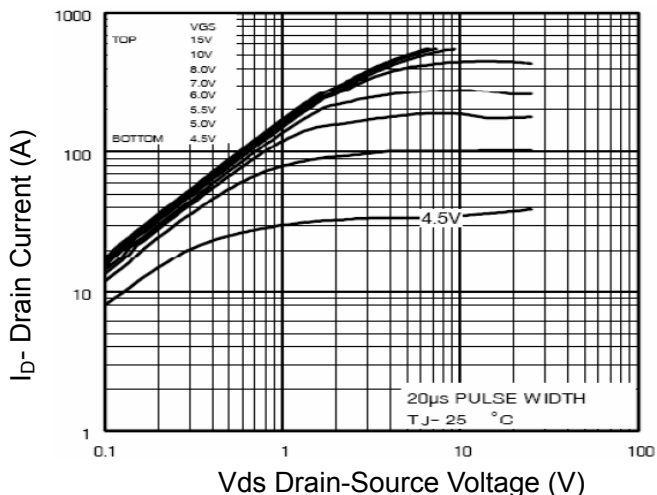


Figure 1 Output Characteristics

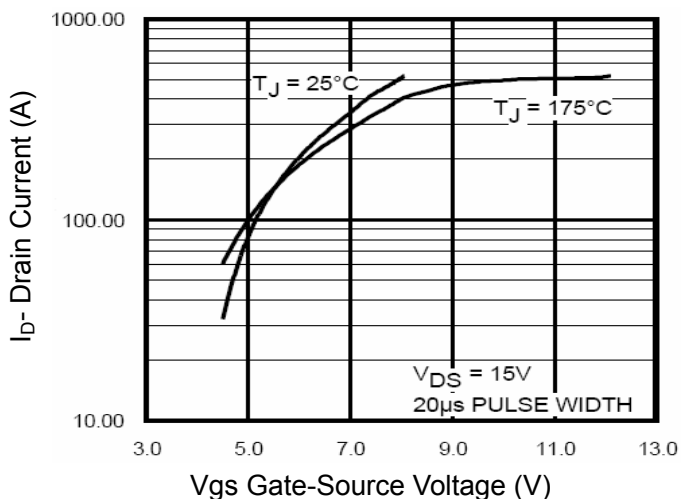


Figure 2 Transfer Characteristics

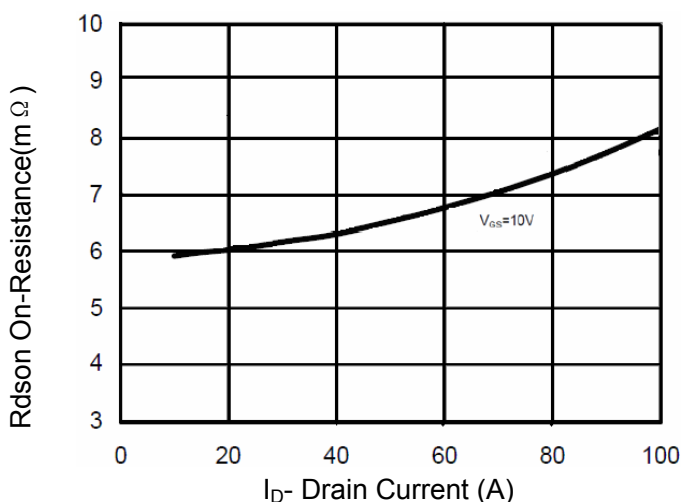


Figure 3  $R_{DS(on)}$ - Drain Current

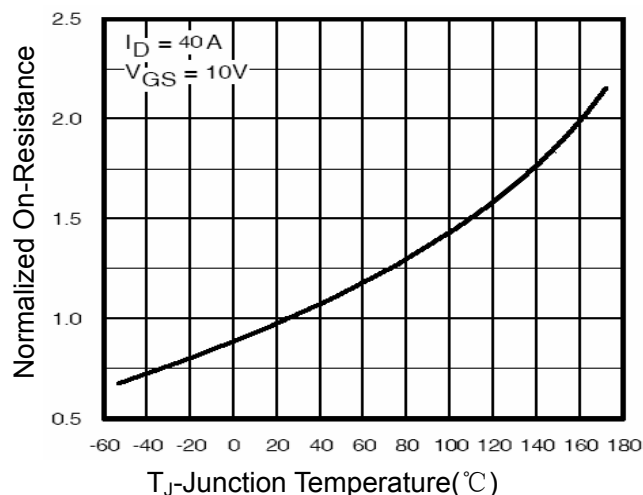


Figure 4  $R_{DS(on)}$ -Junction Temperature

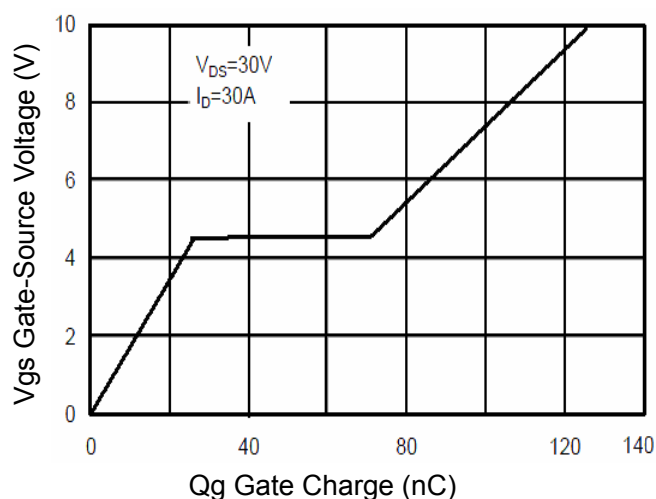


Figure 5 Gate Charge

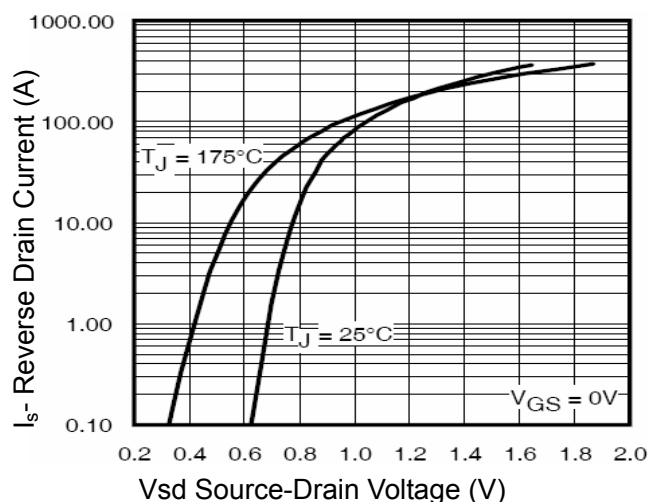


Figure 6 Source- Drain Diode Forward

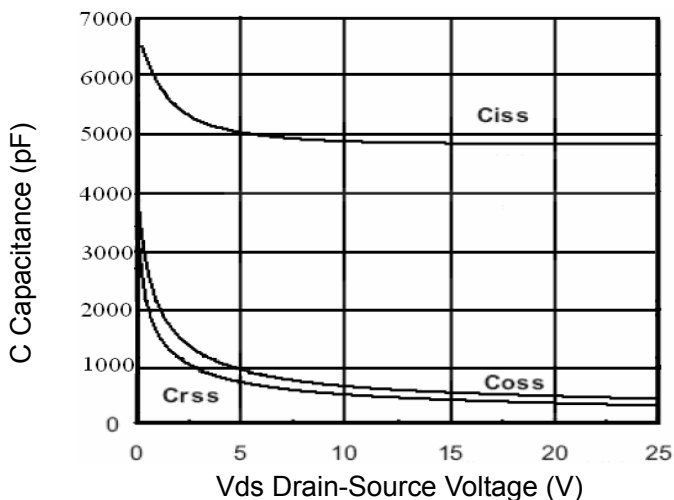


Figure 7 Capacitance vs Vds

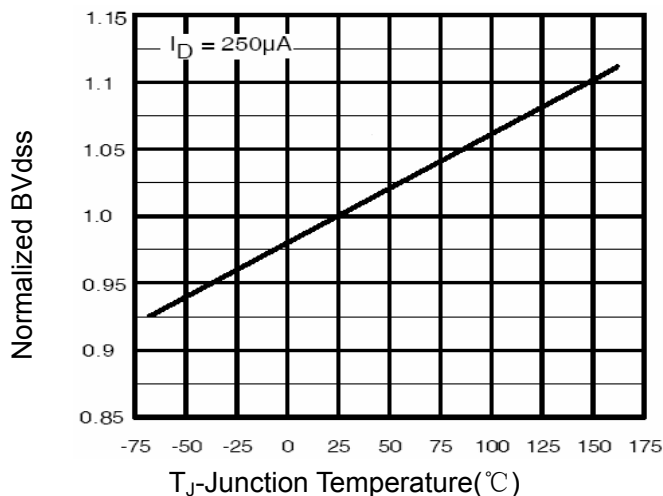


Figure 9  $BV_{DSS}$  vs Junction Temperature

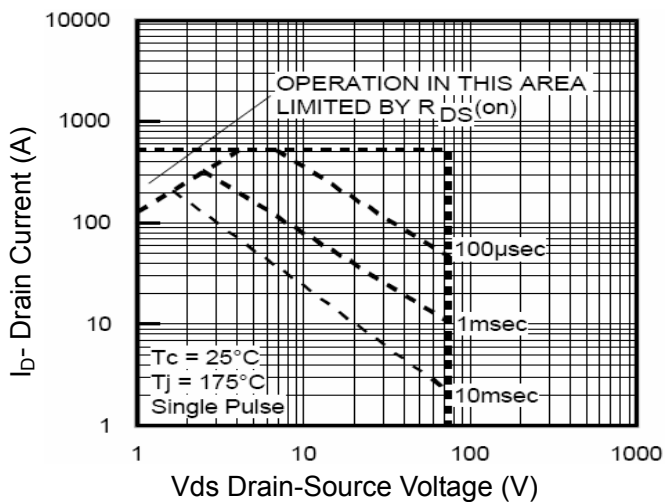


Figure 8 Safe Operation Area

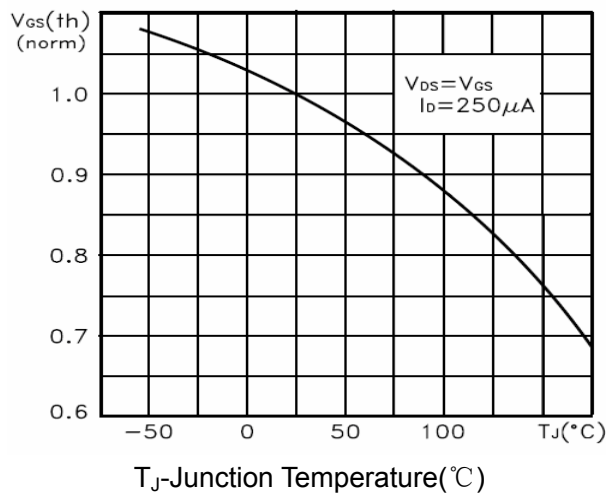


Figure 10  $V_{GS(th)}$  vs Junction Temperature

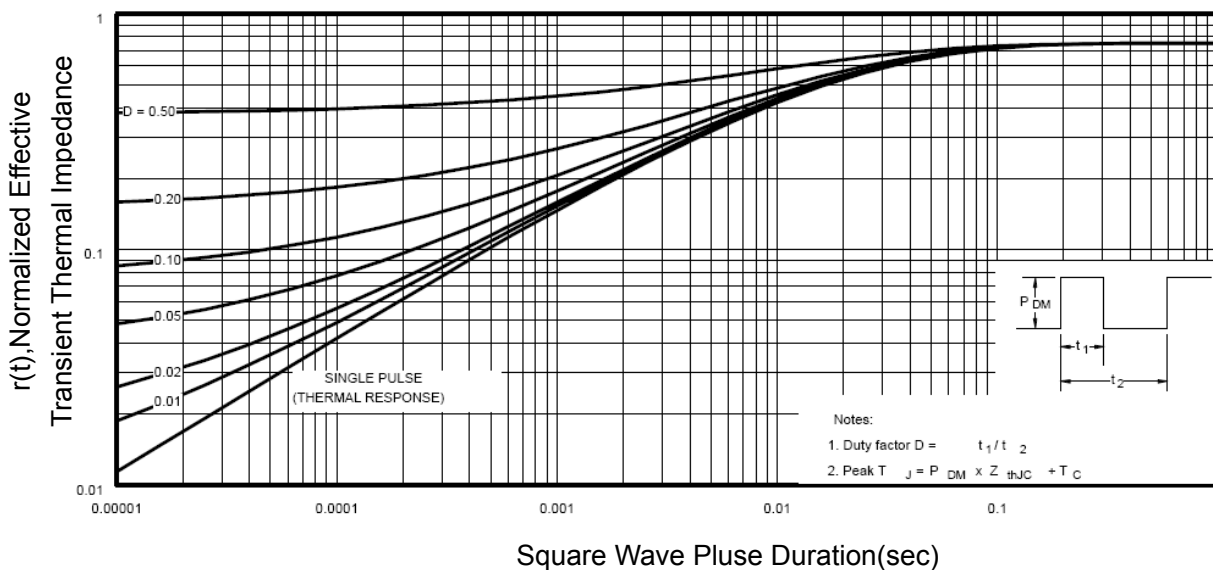
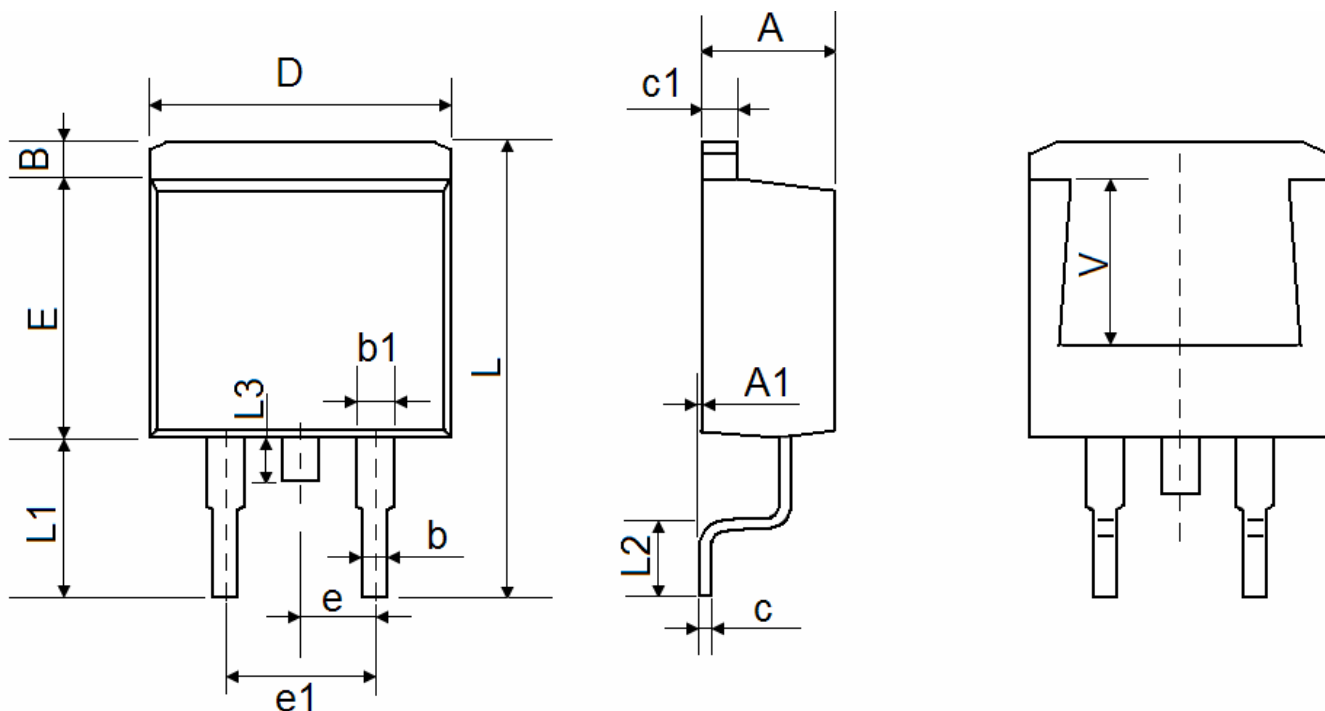


Figure 11 Normalized Maximum Transient Thermal Impedance

## TO-263-2L Package Information



| 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            |       |

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