# NCE N-Channel Enhancement Mode Power MOSFET

## Description

The NCE30H29D 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

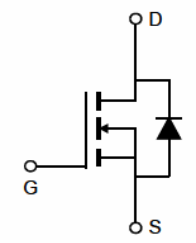
- $V_{DS}$ =30V ,$I_D$ =290A
  $R_{DS(ON)}$ < 1.8mΩ @ $V_{GS}$=10V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

## Application

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

***100% UIS TESTED!***

***100% ΔVds 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 |
|---|---|---|---|---|---|
| NCE30H29D | NCE30H29D | TO-263-2L | - | - | - |

## Absolute Maximum Ratings ($T_A$=25℃unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous (Silicon Limited) | $I_D$ | 290 | A |
| Drain Current-Continuous($T_C$=100℃) (Silicon Limited) | $I_D$ (100℃) | 205 | A |
| Pulsed Drain Current | $I_{DM}$ | 1160 | A |
| Maximum Power Dissipation | $P_D$ | 270 | W |
| Derating factor | | 1.8 | W/℃ |
| Single pulse avalanche energy (Note 5) | $E_{AS}$ | 1600 | mJ |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 175 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Case (Note 2) | $R_{\theta JC}$ | 0.56 | ℃/W |

## Electrical Characteristics ($T_A$=25℃unless otherwise noted)

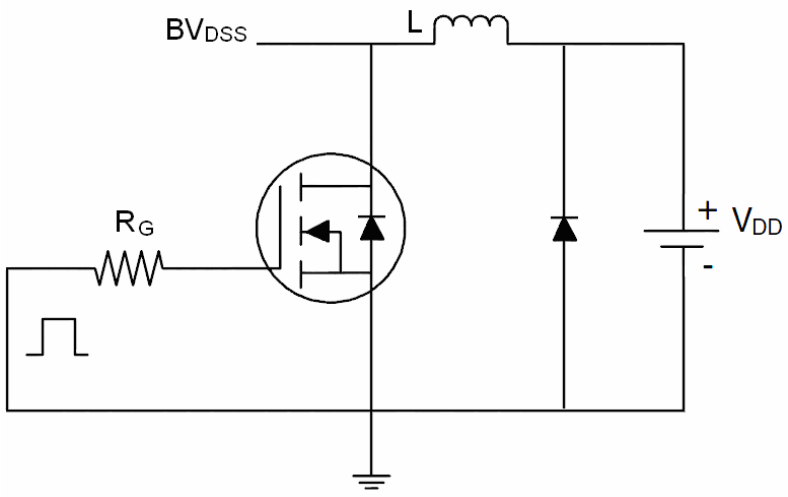
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 30 | | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=30V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 1.0 | 1.6 | 2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=160A | - | 1.4 | 1.8 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V,$I_D$=160A | 50 | - | - | S |
| **Dynamic Characteristics** (Note4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=15V,$V_{GS}$=0V, F=1.0MHz | - | 13873 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 1672 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 1508 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=15V,$R_L$=15Ω, $R_G$=2.5Ω,$V_{GS}$=10V | - | 18 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 200 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 85 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 125 | - | nS |
| Total Gate Charge | $Q_g$ | $I_D$=160A,$V_{DD}$=15V,$V_{GS}$=10V | - | 231 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 27.5 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 55 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=160A | - | 0.85 | 1.2 | V |
| Diode Forward Current (Note 2) | $I_S$ | | - | - | 320 | A |
| Reverse Recovery Time | $t_{rr}$ | TJ = 25°C, $I_F$ = 160A di/dt = 100A/μs (Note3) | - | 70 | | nS |
| Reverse Recovery Charge | Qrr | | - | 180 | | nC |
| Forward Turn-On Time | $t_{on}$ | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

## Notes:

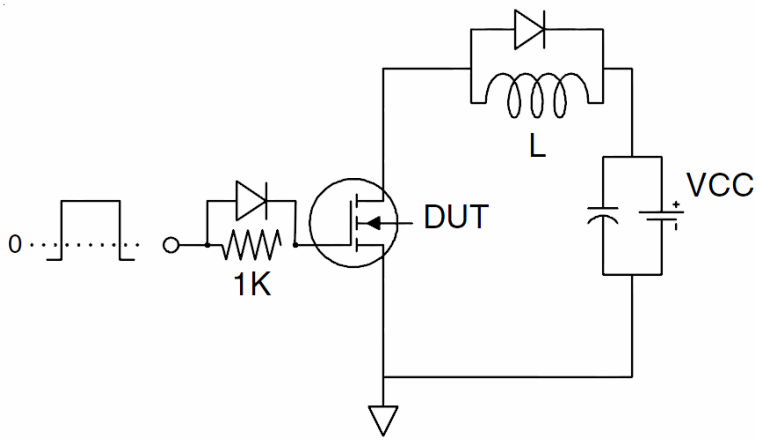
**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** Surface Mounted on FR4 Board, t ≤ 10 sec.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production
**5.** EAS condition：Tj=25℃,$V_{DD}$=15V,$V_G$=10V,L=0.5mH,Rg=25Ω

## Test circuit

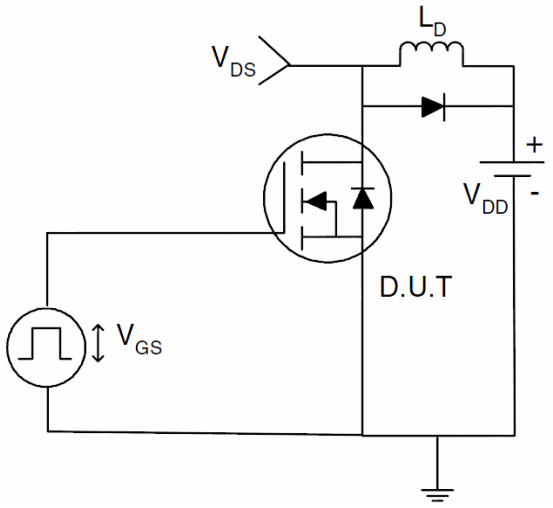
### 1）$E_{AS}$ test Circuits




### 2）Gate charge test Circuit:




### 3）Switch Time Test Circuit：



## Typical Electrical and Thermal Characteristics (Curves)

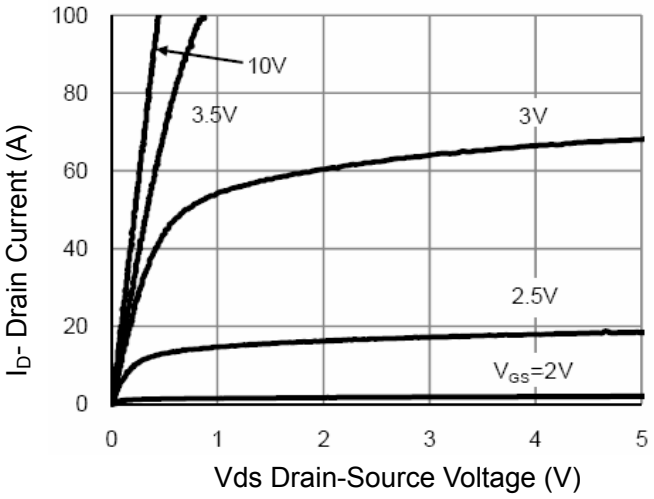



**Figure 1 Output Characteristics**

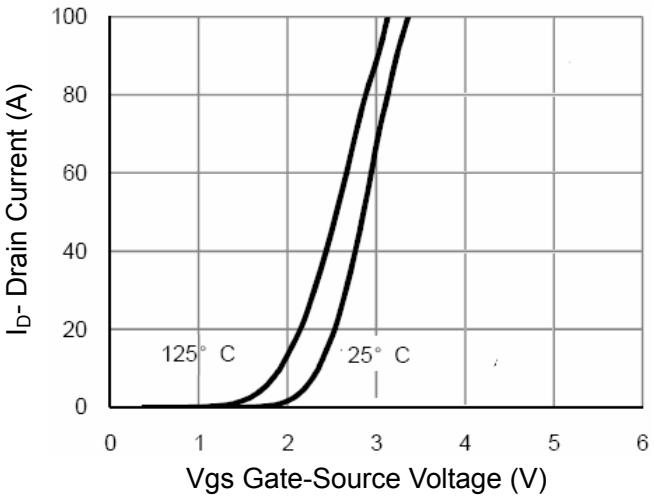



**Figure 2 Transfer Characteristics**

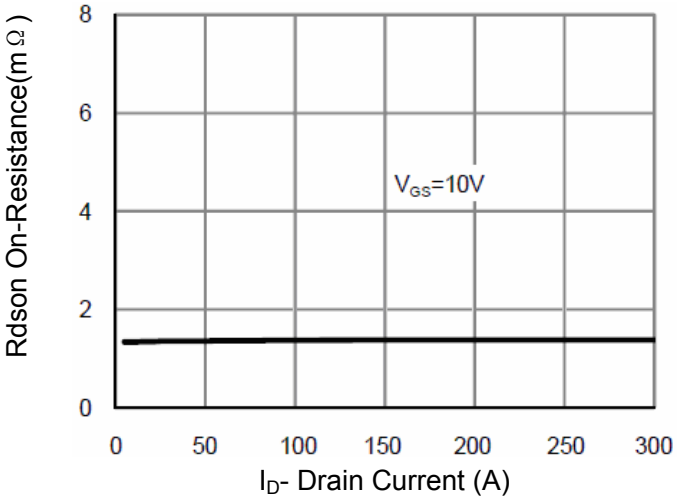



**Figure 3 Rdson- Drain Current**

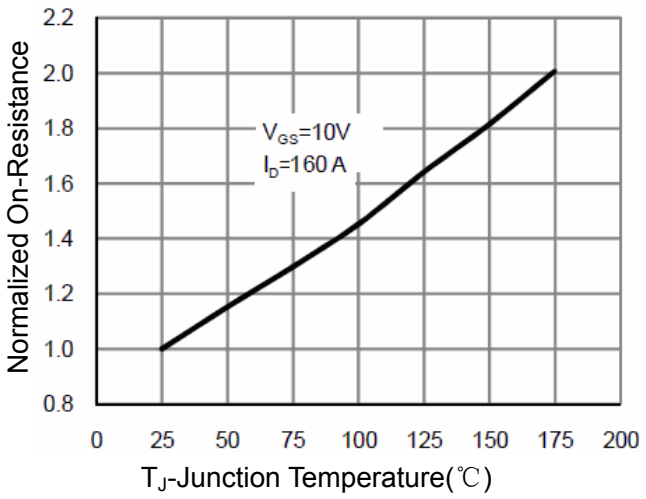



**Figure 4 Rdson-JunctionTemperature**

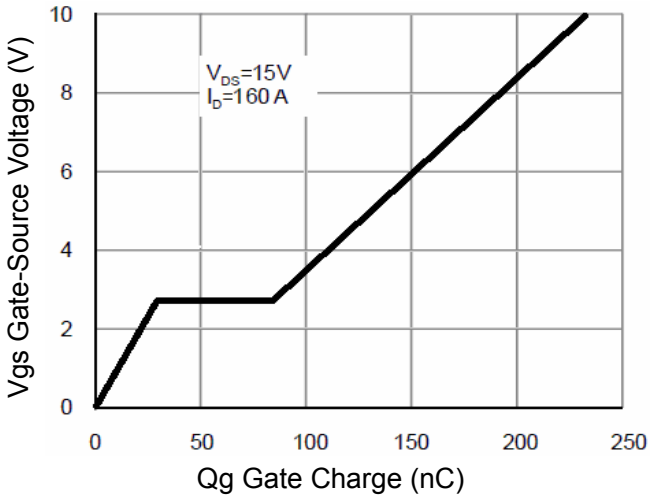



**Figure 5 Gate Charge**

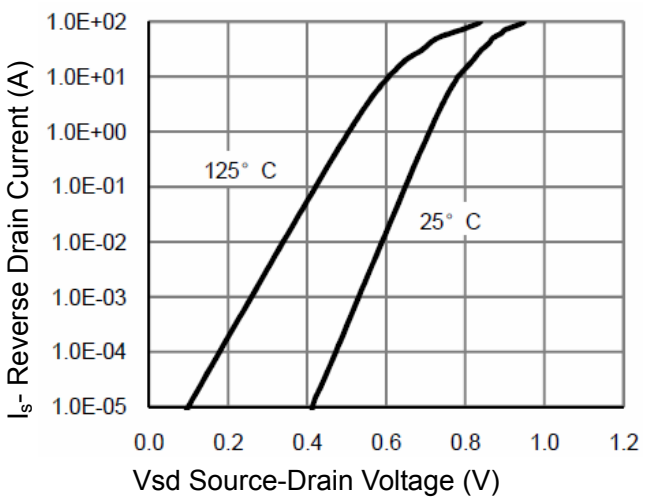



**Figure 6 Source- Drain Diode Forward**

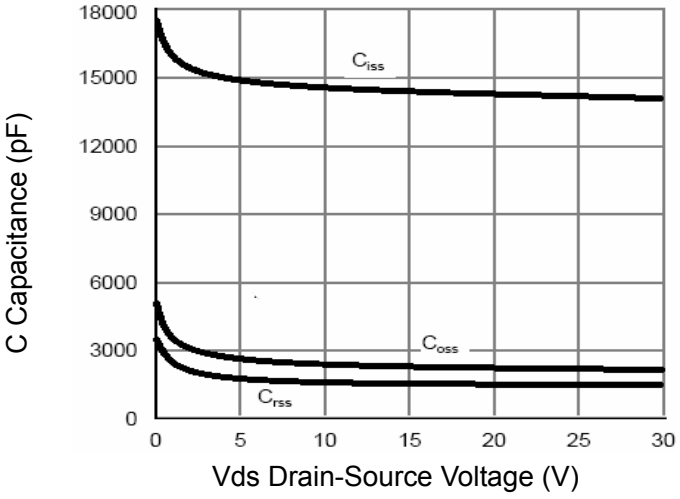



**Figure 7 Capacitance vs Vds**

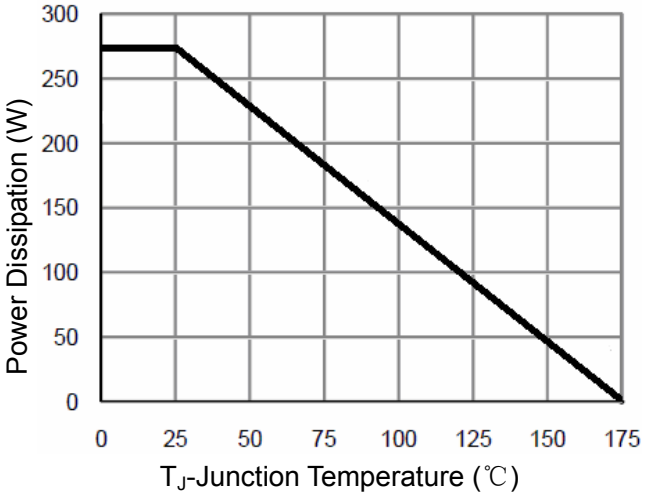



**Figure 9 Power De-rating**

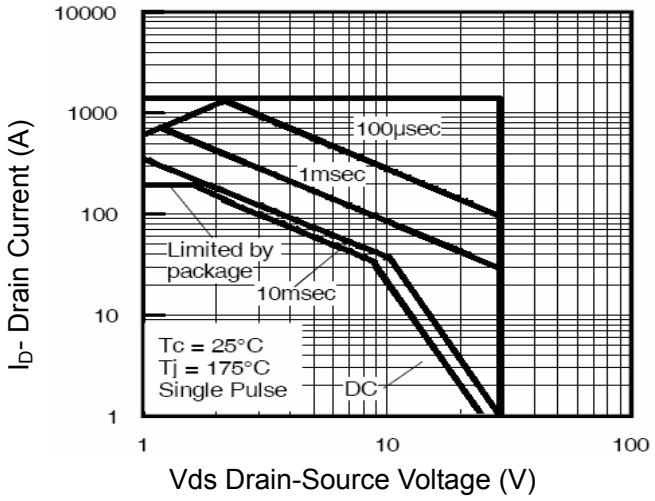



**Figure 8 Safe Operation Area**

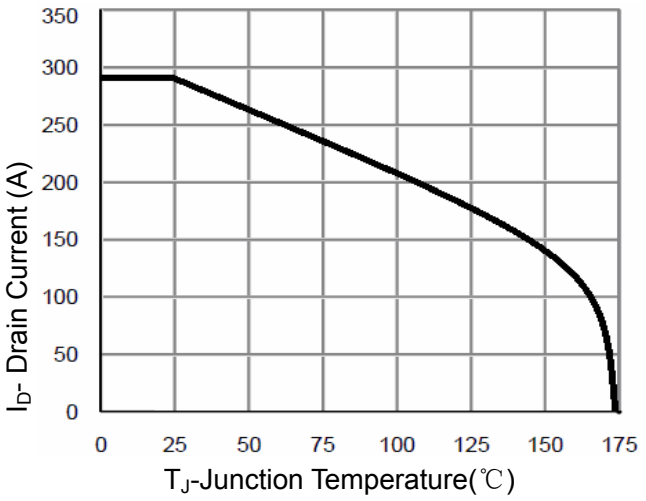



**Figure 10 Current vs Junction Temperature**

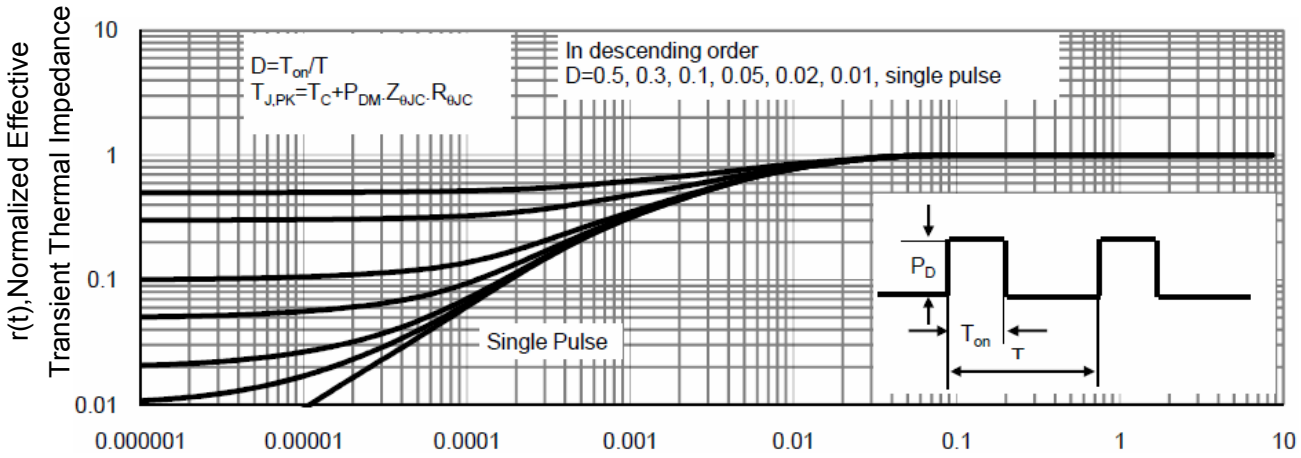
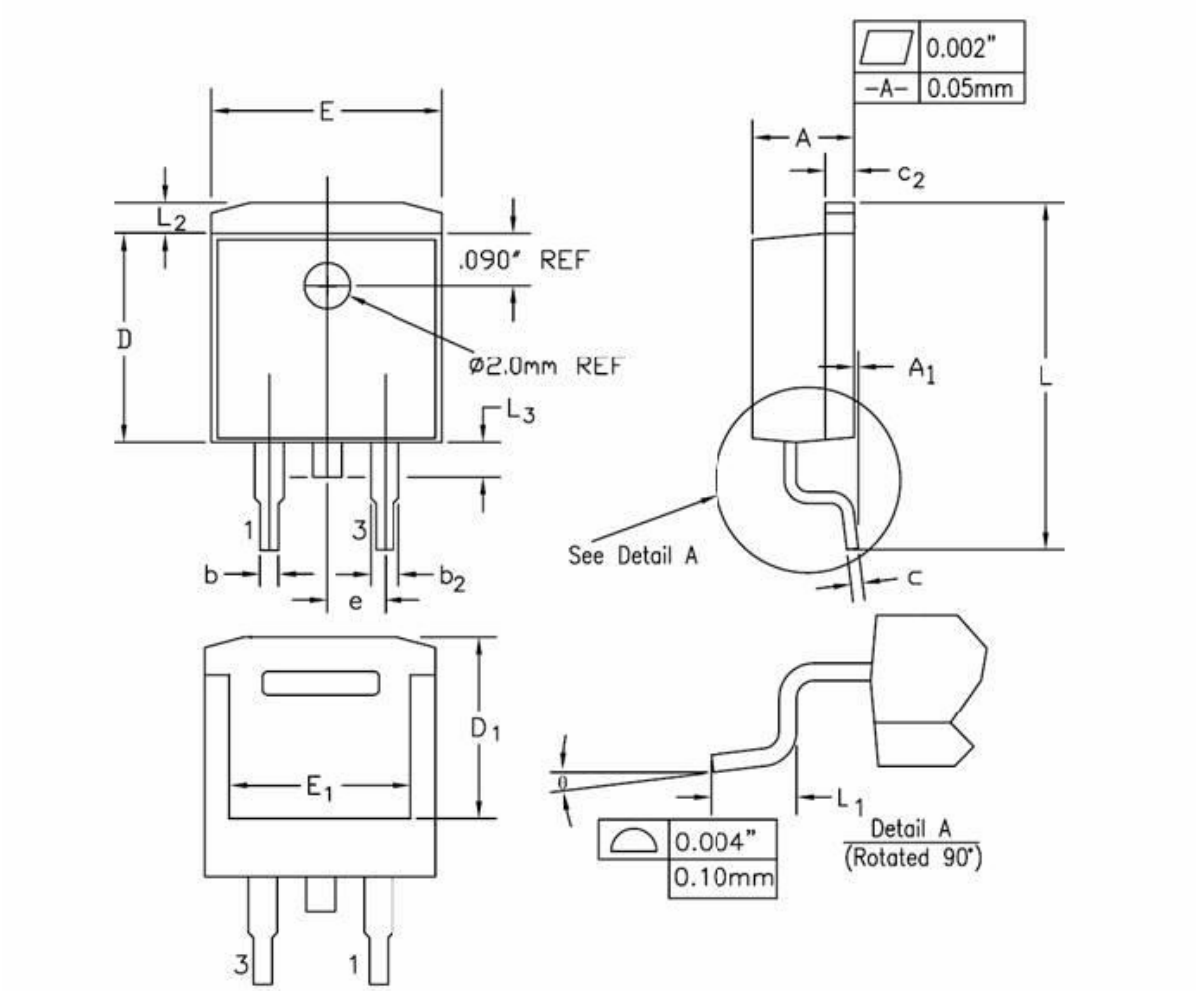



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## TO-263-2L Package Information




| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | |
| A | 0.170 | 0.180 | 4.32 | 4.57 | |
| A1 | - | 0.010 | - | 0.25 | |
| b | 0.028 | 0.037 | 0.71 | 0.94 | |
| b2 | 0.045 | 0.055 | 1.15 | 1.40 | |
| c | 0.018 | 0.024 | 0.46 | 0.61 | |
| c2 | 0.048 | 0.055 | 1.22 | 1.40 | |
| D | 0.350 | 0.370 | 8.89 | 9.40 | |
| D1 | 0.315 | 0.324 | 8.01 | 8.23 | |
| E | 0.395 | 0.405 | 10.04 | 10.28 | |
| E1 | 0.310 | 0.318 | 7.88 | 8.08 | |
| e | 0.100 BSC. | | 2.54 BSC. | | |
| L | 0.580 | 0.620 | 14.73 | 15.75 | |
| L1 | 0.090 | 0.110 | 2.29 | 2.79 | |
| L2 | 0.045 | 0.055 | 1.15 | 1.39 | |
| L3 | 0.050 | 0.070 | 1.27 | 1.77 | |
| θ | 0° | 8° | 0° | 8° | |

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