# NCE N-Channel Enhancement Mode Power MOSFET

## Description

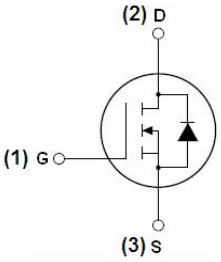
The NCE0270T uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

## General Features

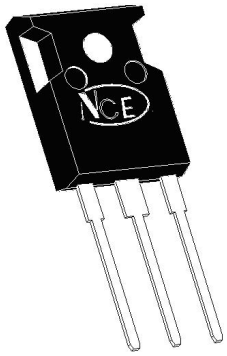
- $V_{DS}$ =200V,$I_D$ =70A
  $R_{DS(ON)}$ <19mΩ @ $V_{GS}$=10V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

## Application

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




**Schematic diagram**




**TO-247-3L top view**

***100% UIS TESTED!***
***100% ΔVds TESTED!***

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| NCE0270T | NCE0270T | TO-247-3L | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 200 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 70 | A |
| Drain Current-Continuous($T_C$=100℃) | $I_D$ (100℃) | 49.5 | A |
| Pulsed Drain Current | $I_{DM}$ | 280 | A |
| Maximum Power Dissipation | $P_D$ | 320 | W |
| Derating factor | | 2.13 | W/℃ |
| Single pulse avalanche energy (Note 5) | $E_{AS}$ | 200 | mJ |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 175 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Case(Note 2) | $R_{\theta JC}$ | 0.47 | ℃/W |

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

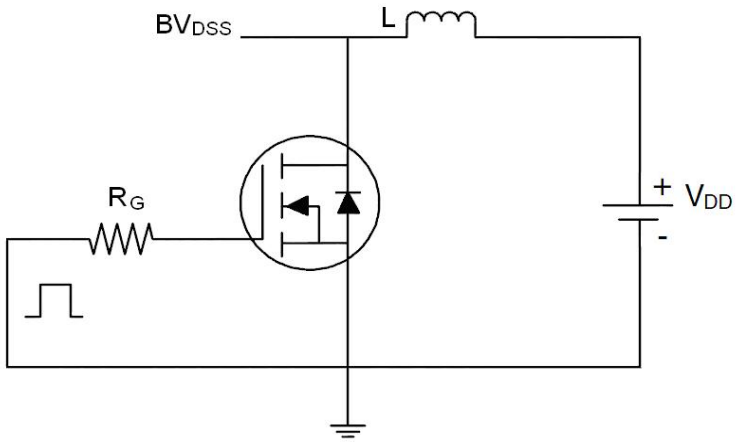
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 200 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=200V,$V_{GS}$=0V | - | - | 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 | 2 | 3 | 4 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=20A | - | 15.5 | 19 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V,$I_D$=20A | 40 | - | - | S |
| **Dynamic Characteristics** (Note4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=100V,$V_{GS}$=0V, F=1.0MHz | - | 12400 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 262 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 209 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=100V, $R_L$=5Ω $V_{GS}$=10V,$R_G$=2.5Ω | - | 41 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 105 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 64 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 74 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=100V,$I_D$=20A, $V_{GS}$=10V | - | 290 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 50 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 97 | | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=20A | - | | 1.2 | V |
| Diode Forward Current (Note 2) | $I_S$ | | - | - | 70 | A |
| Reverse Recovery Time | $t_{rr}$ | TJ = 25°C, IF = 20A di/dt = 100A/μs(Note3) | - | 90 | | nS |
| Reverse Recovery Charge | Qrr | | - | 260 | | nC |
| Forward Turn-On Time | $t_{on}$ | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

## Notes:

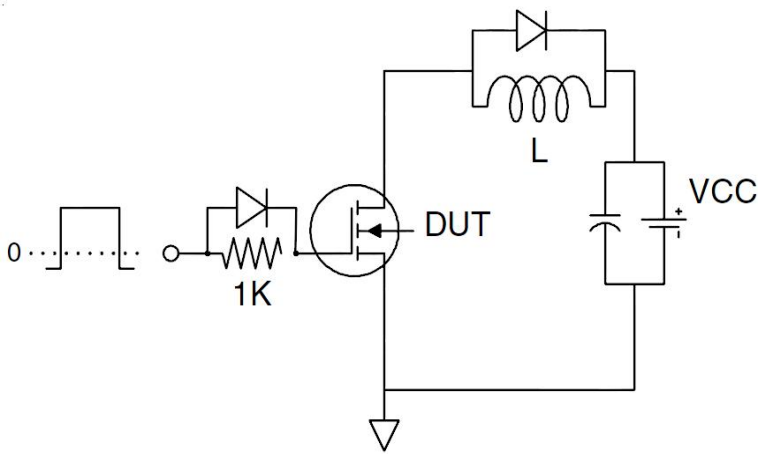
**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** Surface Mounted on FR4 Board, t ≤ 10 sec.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production
5. $E_{AS}$ condition:Tj=25℃,$V_{DD}$=50V,$V_G$=10V,L=0.5mH,Rg=25Ω

## Test Circuit

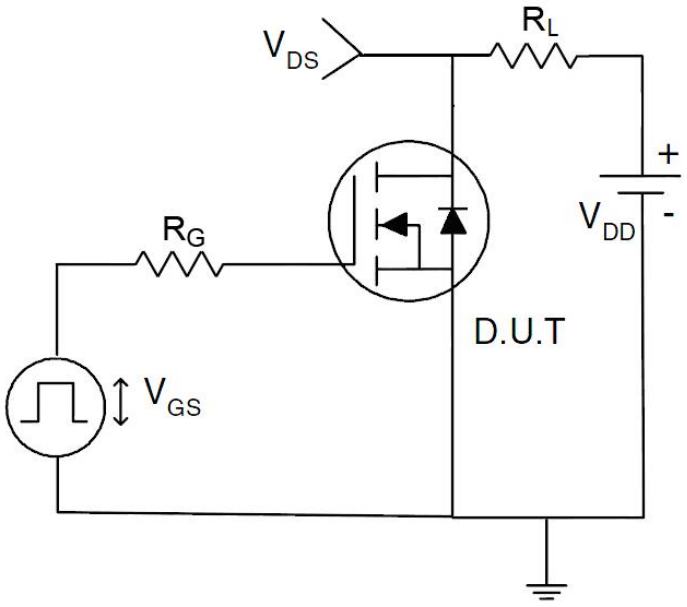
### 1) $E_{AS}$ test Circuits




### 2) Gate charge test Circuit




### 3) Switch Time Test Circuit



## Typical Electrical and Thermal Characteristics (Curves)

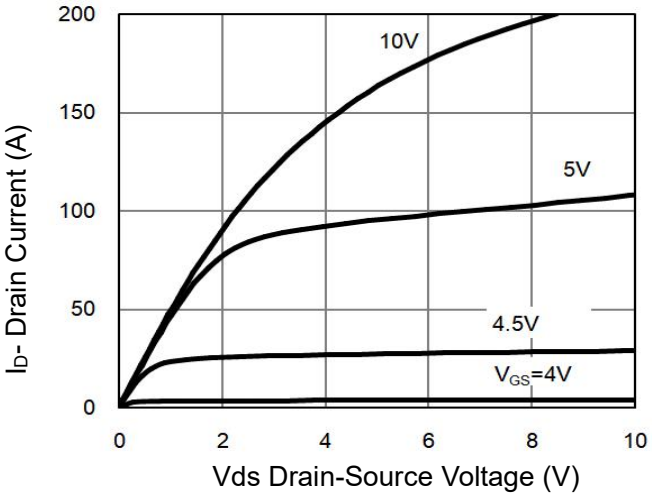



**Figure 1 Output Characteristics**

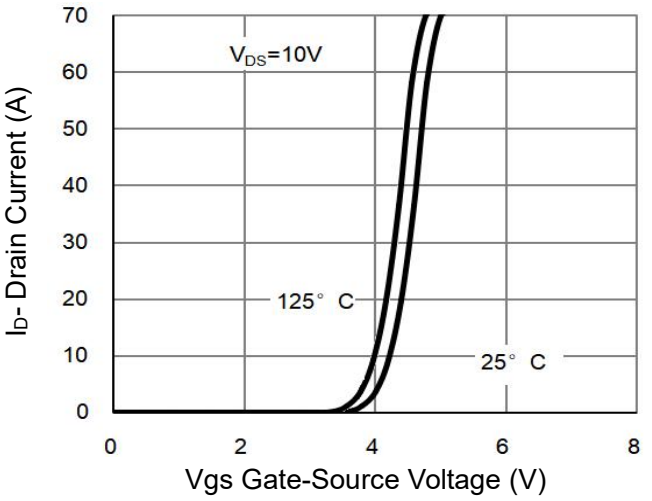



**Figure 2 Transfer Characteristics**

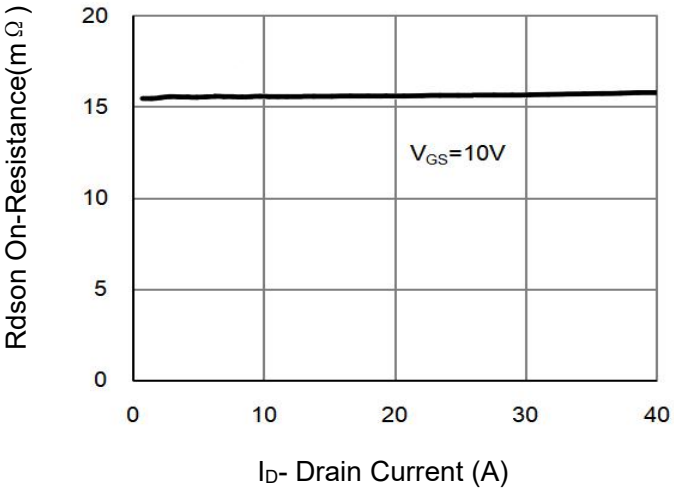



**Figure 3 Rdson- Drain Current**

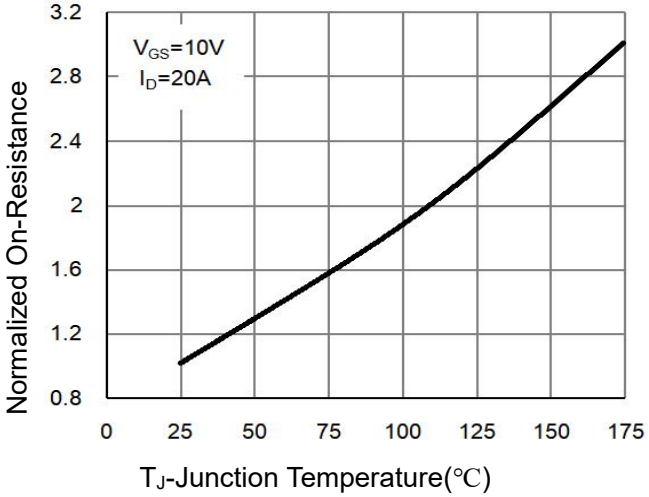



**Figure 4 Rdson-Junction Temperature**

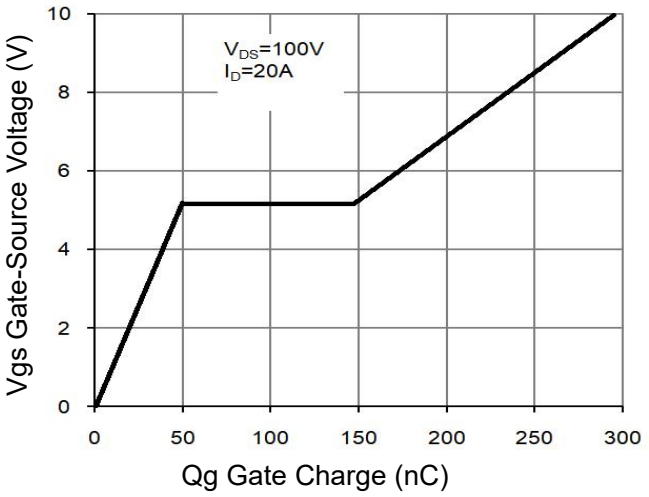



**Figure 5 Gate Charge**

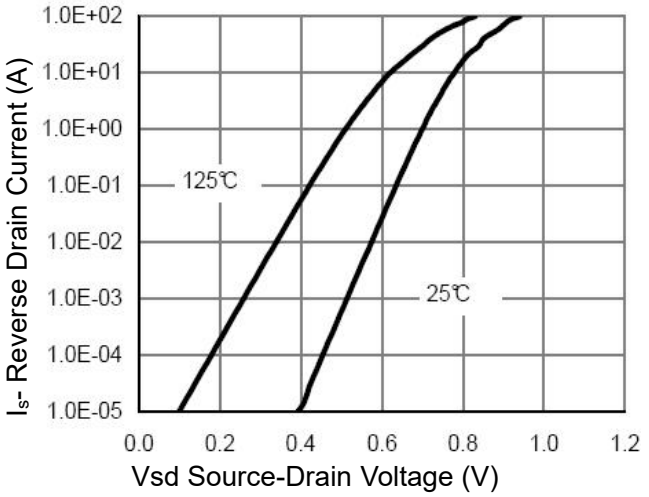



**Figure 6 Source- Drain Diode Forward**

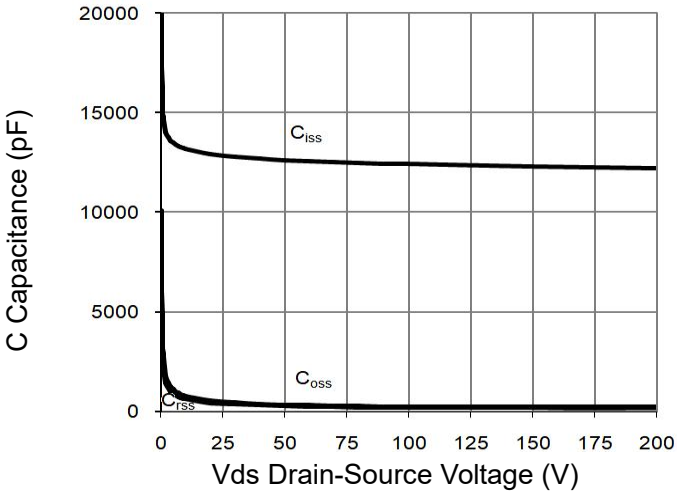



**Figure 7 Capacitance vs Vds**

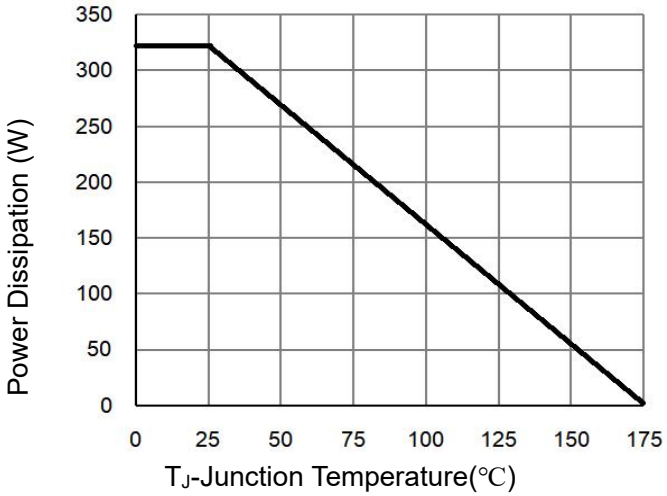



**Figure 9 Power De-rating**

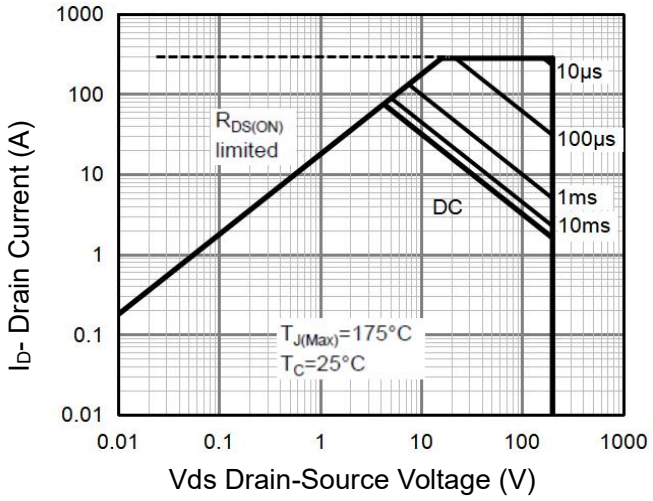



**Figure 8 Safe Operation Area**

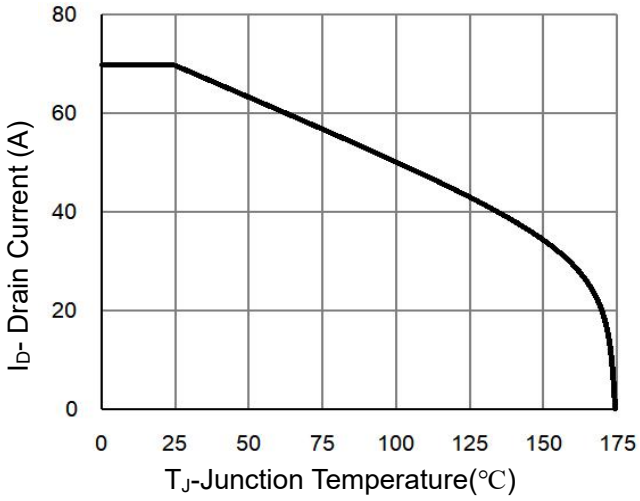



**Figure 10 Current De-rating**

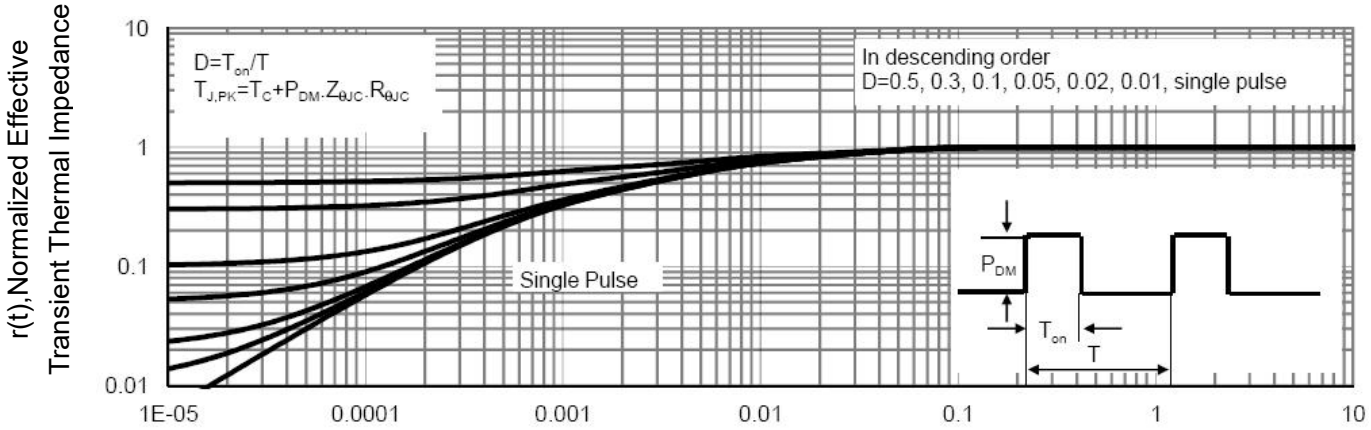
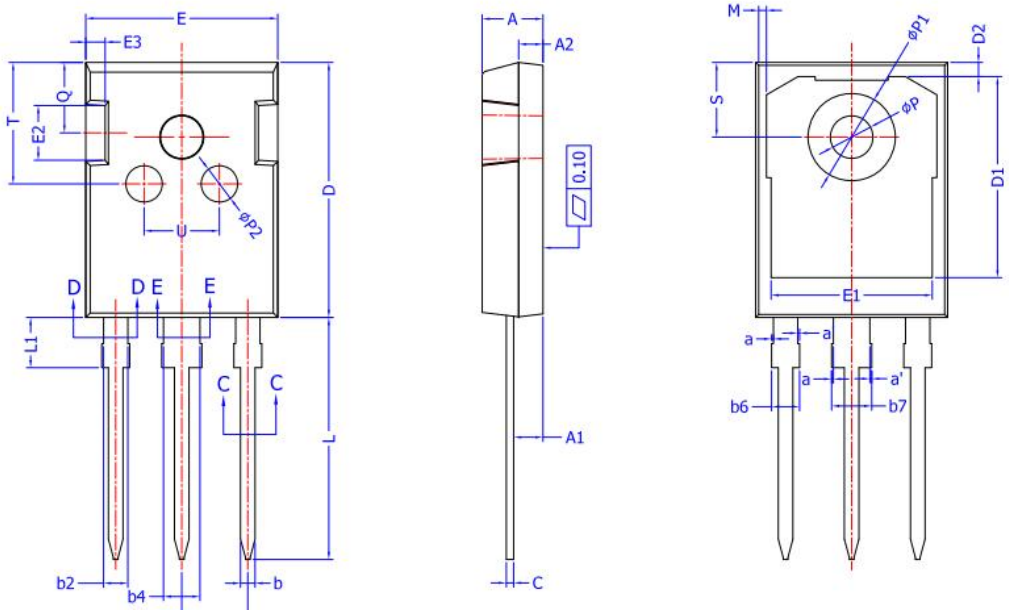
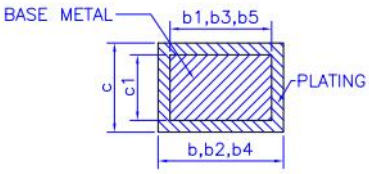



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## TO-247-3L Package Information




SECTION C-C,D-D & E-E

COMMON DIMENSIONS
(UNITS OF MEASURE =MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 4.90 | 5.00 | 5.10 |
| A1 | 2.31 | 2.41 | 2.51 |
| A2 | 1.90 | 2.00 | 2.10 |
| a | 0 | --- | 0.15 |
| a' | 0 | --- | 0.15 |
| b | 1.16 | --- | 1.26 |
| b1 | 1.15 | 1.2 | 1.22 |
| b2 | 1.96 | --- | 2.06 |
| b3 | 1.95 | 2.00 | 2.02 |
| b4 | 2.96 | --- | 3.06 |
| b5 | 2.96 | 3.00 | 3.02 |
| b6 | --- | --- | 2.25 |
| b7 | --- | --- | 3.25 |
| c | 0.59 | --- | 0.66 |
| c1 | 0.58 | 0.60 | 0.62 |
| D | 20.90 | 21.00 | 21.10 |
| D1 | 16.25 | 16.55 | 16.85 |
| D2 | 1.05 | 1.17 | 1.35 |
| E | 15.70 | 15.80 | 15.90 |
| E1 | 13.10 | 13.30 | 13.50 |
| E2 | 4.40 | 4.50 | 4.60 |
| E3 | 2.40 | 2.50 | 2.60 |
| e | 5.436 BSC | | |
| L | 19.80 | 19.92 | 20.10 |
| L1 | --- | --- | 4.30 |
| M | 0.35 | --- | 0.95 |
| P | 3.40 | 3.50 | 3.60 |
| P1 | 7.00 | --- | 7.40 |
| P2 | 2.40 | 2.50 | 2.60 |
| Q | 5.60 | --- | 6.00 |
| S | 6.05 | 6.15 | 6.25 |
| T | 9.80 | --- | 10.20 |
| U | 6.00 | --- | 6.40 |

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