# NCE N-Channel Super Trench Power MOSFET

## Description

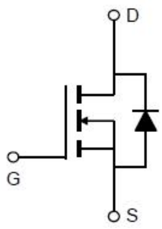
The NCEP15T14D uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and $Q_g$. This device is ideal for high-frequency switching and synchronous rectification.

## General Features

- $V_{DS}$ =150V,$I_D$ =140A
  $R_{DS(ON)}$=5.6mΩ , typical @ $V_{GS}$=10V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

## Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification




**Schematic diagram**

**TO-263-2L top view**

***100% UIS TESTED!***

***100% ΔVds TESTED!***

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| NCEP15T14D | NCEP15T14D | TO-263-2L | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 150 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 140 | A |
| Drain Current-Continuous($T_C$=100℃) | $I_D$ (100℃) | 100 | A |
| Pulsed Drain Current | $I_{DM}$ | 560 | A |
| Maximum Power Dissipation | $P_D$ | 320 | W |
| Derating factor | | 2.1 | W/℃ |
| Single pulse avalanche energy (Note 1) | $E_{AS}$ | 1296 | mJ |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 175 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Case | $R_{θJC}$ | 0.47 | ℃/W |

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

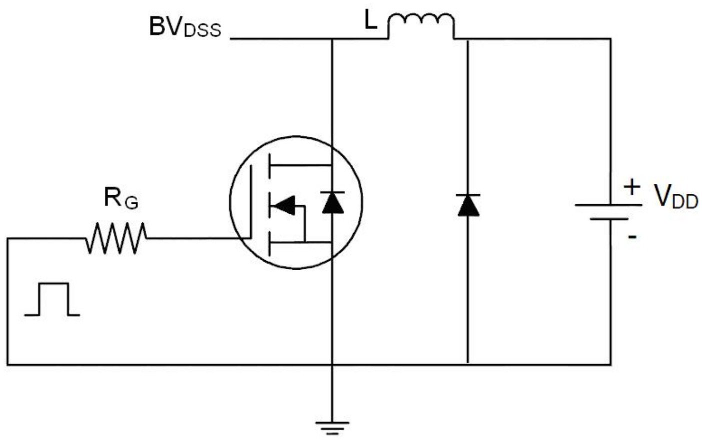
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 150 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=150V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 2.0 | 3.0 | 4.0 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=70A | - | 5.6 | 6.4 | mΩ |
| Gate resistance | $R_G$ | | - | 4.5 | - | Ω |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=10V,$I_D$=70A | 70 | - | - | S |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=75V,$V_{GS}$=0V, F=1.0MHz | - | 6000 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 690 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 24 | - | PF |
| **Switching Characteristics** (Note 2) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=75V,$I_D$=70A $V_{GS}$=10V,$R_G$=4.7Ω | - | 26 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 36 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 47 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 15 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=75V,$I_D$=70A, $V_{GS}$=10V | - | 80 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 32 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 22 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V,$I_F$= $I_S$ | - | | 1.2 | V |
| Diode Forward Current | $I_S$ | | - | - | 140 | A |
| Reverse Recovery Time | $t_{rr}$ | $T_J$ = 25°C, $I_F$ = $I_S$ di/dt = 100A/μs | - | 146 | - | nS |
| Reverse Recovery Charge | Qrr | | - | 485 | - | nC |

## Notes:

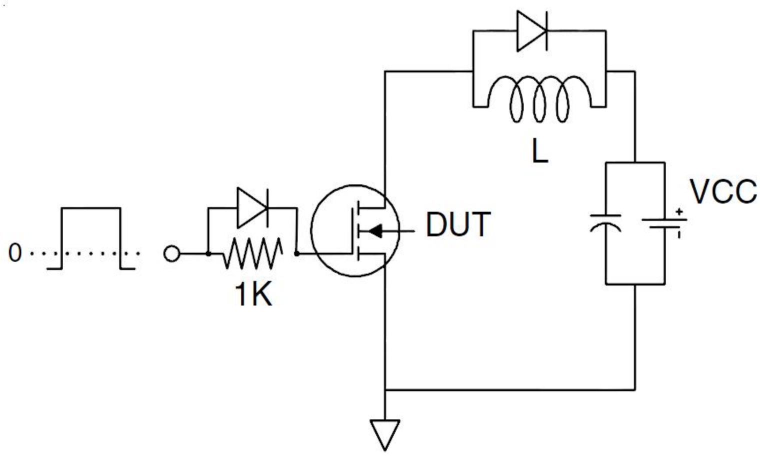
1. EAS condition : Tj=25℃,$V_{DD}$=50V,$V_G$=10V,L=0.5mH,Rg=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsin k, assuming a maximum junction temperature of TJ(MAX)=175° C. The SOA curve provides a single pulse rating.

## Test Circuit

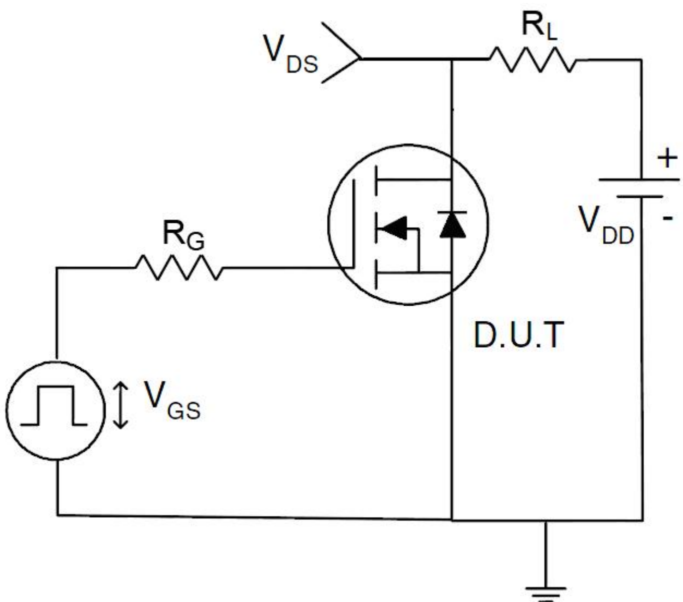
**1) $E_{AS}$ test Circuit**




**2) Gate charge test Circuit**




**3) Switch Time Test Circuit**



## Typical Electrical and Thermal Characteristics

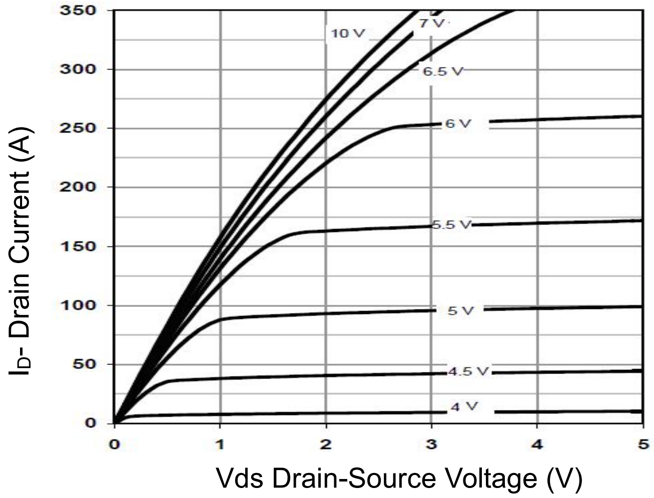



**Figure 1 Output Characteristics**

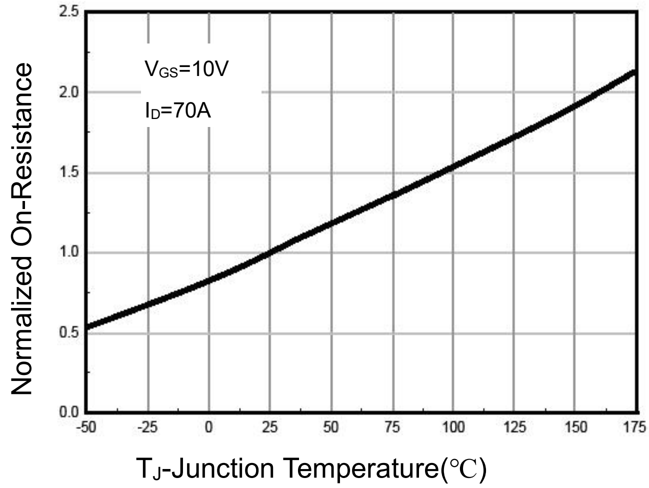



**Figure 4 Rdson-JunctionTemperature**

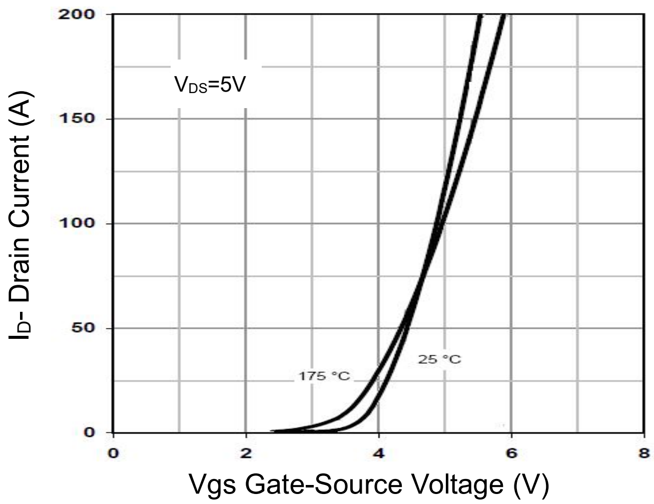



**Figure 2 Transfer Characteristics**

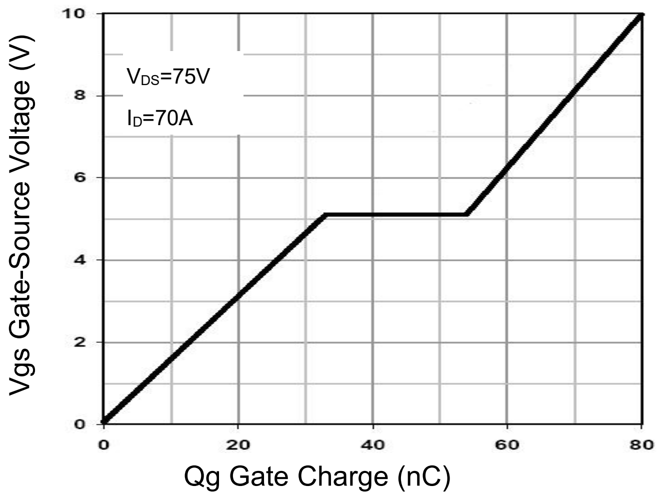



**Figure 5 Gate Charge**

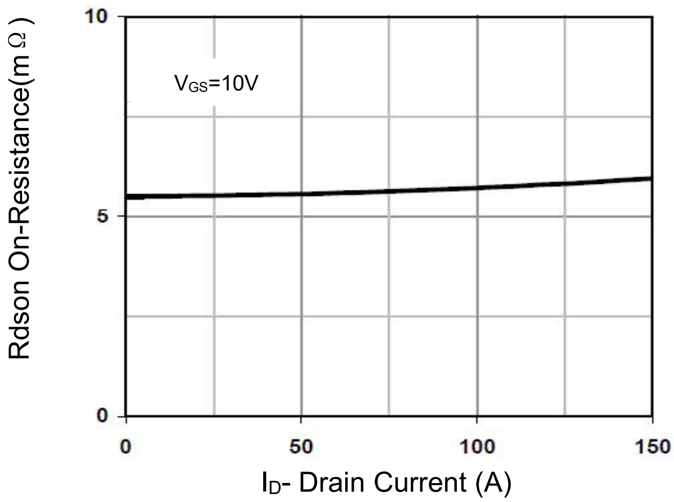



**Figure 3 Rdson- Drain Current**

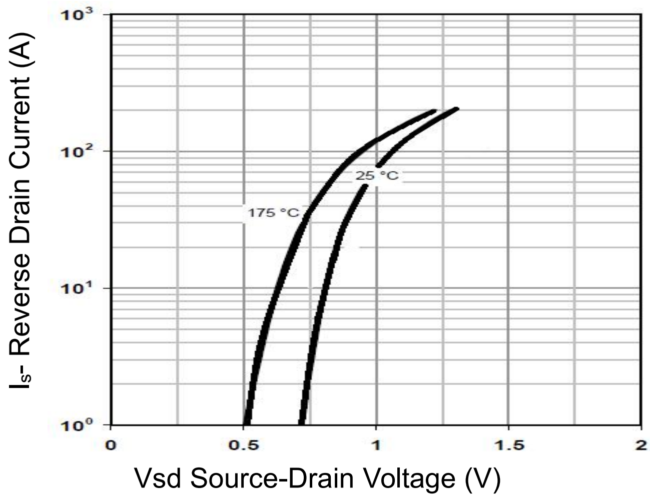



**Figure 6 Source- Drain Diode Forward**

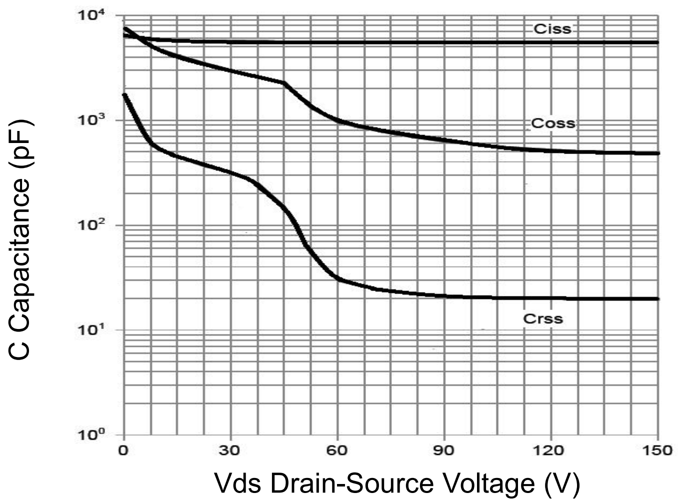



Figure 7 Capacitance vs Vds

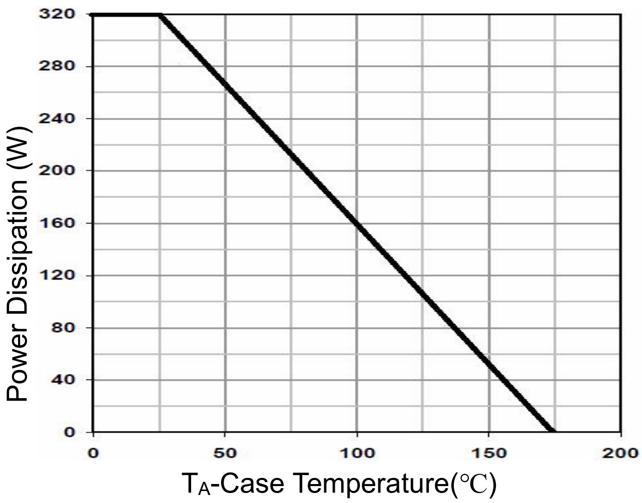



Figure 9 Power De-rating

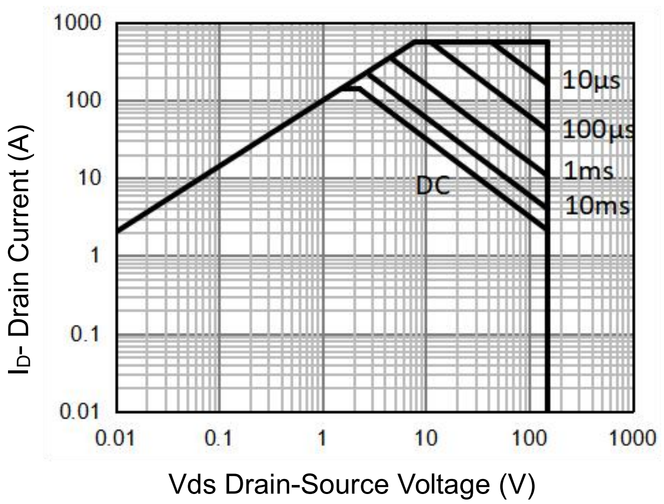



Figure 8 Safe Operation Area(Note3)

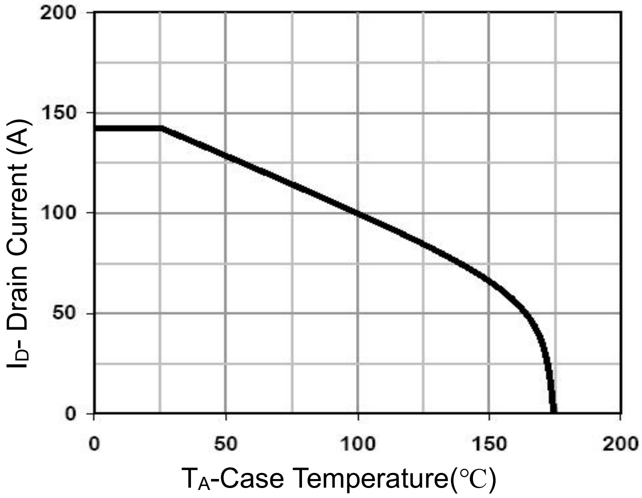



Figure 10 Current De-rating

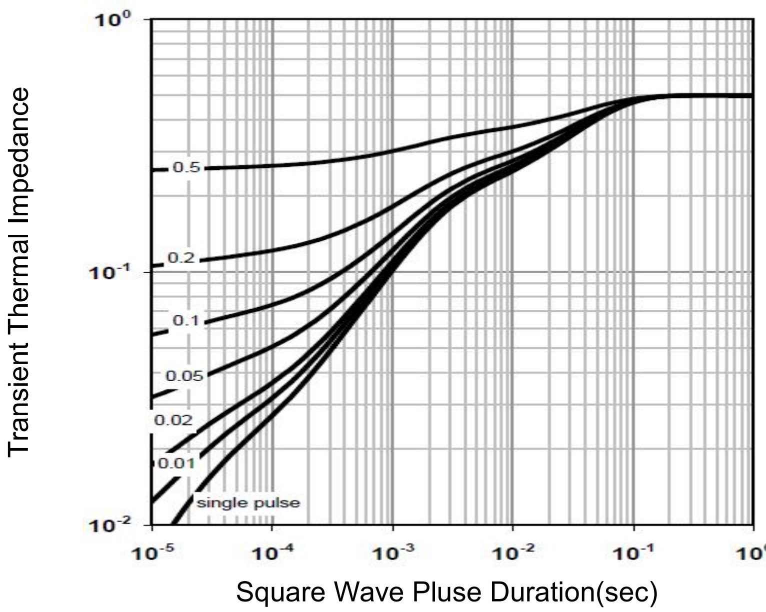
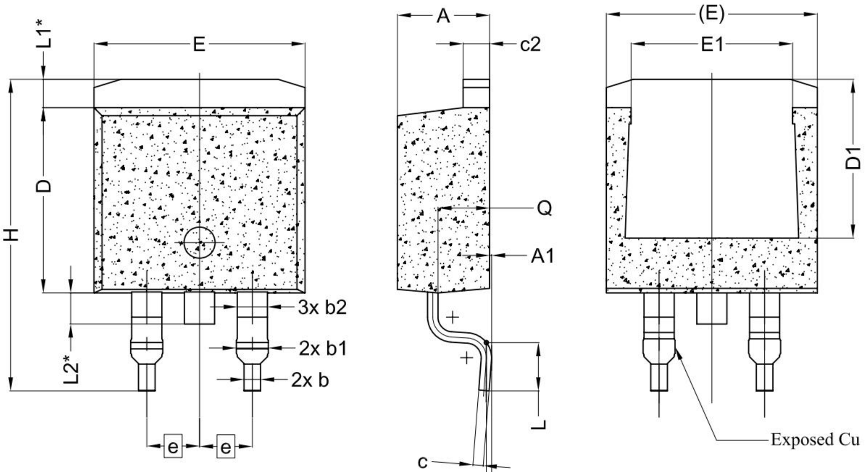
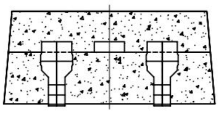


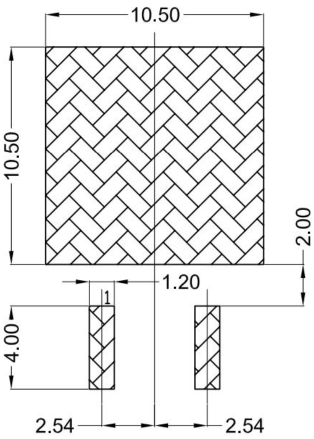

Figure 11 Normalized Maximum Transient Thermal Impedance

## TO-263-2L(G) Package Information



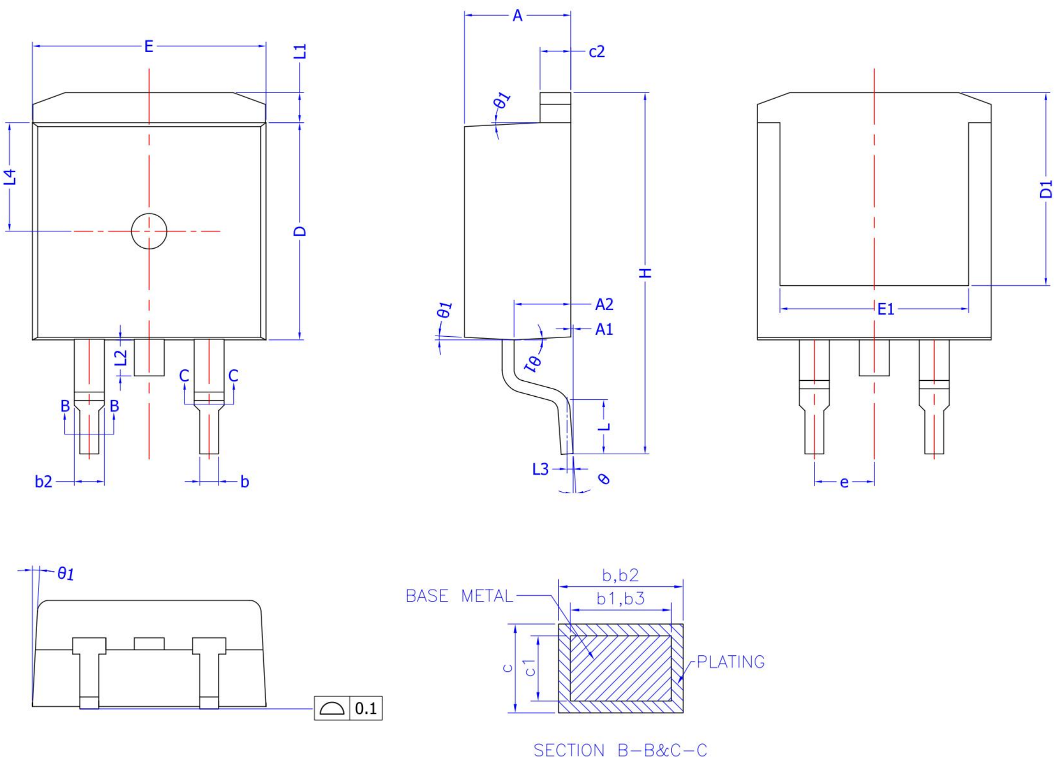
Land Pattern
(Only for Reference)




Note:
1. All Dimensions Are In mm.
2. Dimension D & E Do Not Include Mold Flash.
   Mold Flash Shall Not Exceed 0.127mm Pre Side.
   These Dimensions Are Measured At The Outermost
   Extreme Of The Plastic Body.
3. Thermal Pad Contour Optional Within Dimensions E, L1, D1 & E1.
4. Dimension D1 & E1 Establish A Minmum Mounting Surface for
   The Thermal Pad.
5. "*" is reference .

| SYMBOL | DIMENSIONS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 4.24 | 4.44 | 4.64 |
| A1 | 0.00 | 0.10 | 0.25 |
| b | 0.70 | 0.80 | 0.90 |
| b1 | 1.20 | 1.55 | 1.75 |
| b2 | 1.20 | 1.45 | 1.70 |
| c | 0.40 | 0.50 | 0.60 |
| c2 | 1.15 | 1.27 | 1.40 |
| D | 8.82 | 8.92 | 9.02 |
| D1 | 6.86 | 7.65 | — |
| E | 9.96 | 10.16 | 10.36 |
| E1 | 6.89 | 7.77 | 7.89 |
| e | 2.54 BSC | | |
| H | 14.61 | 15.00 | 15.88 |
| L | 1.78 | 2.32 | 2.79 |
| L1 | 1.36 REF. | | |
| L2 | 1.50 REF. | | |
| L3 | 0.25 BSC | | |
| Q | 2.30 | 2.48 | 2.70 |

## TO-263-2L(P) Package Information




COMMON DIMENSIONS
(UNITS OF MEASURE =MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 4.40 | 4.50 | 4.60 |
| A1 | 0 | 0.10 | 0.25 |
| A2 | 2.20 | 2.40 | 2.60 |
| b | 0.76 | --- | 0.89 |
| b1 | 0.75 | 0.80 | 0.85 |
| b2 | 1.23 | --- | 1.37 |
| b3 | 1.22 | 1.27 | 1.32 |
| c | 0.47 | --- | 0.60 |
| c1 | 0.46 | 0.51 | 0.56 |
| c2 | 1.25 | 1.30 | 1.35 |
| D | 9.10 | 9.20 | 9.30 |
| D1 | 8.00 | --- | --- |
| E | 9.80 | 9.90 | 10.00 |
| E1 | 7.80 | --- | --- |
| e | 2.54 BSC | | |
| H | 14.90 | 15.30 | 15.70 |
| L | 2.00 | 2.30 | 2.60 |
| L1 | 1.17 | 1.27 | 1.40 |
| L2 | --- | --- | 1.75 |
| L3 | 0.25BSC | | |
| L4 | 4.60 REF | | |
| θ | 0° | --- | 8° |
| θ1 | 1° | 3° | 5° |

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