

Thermal Design of NVSU233x-Dx (U395) LEDs

1. Objective

The LEDs' light output can be affected by the heat generated from the LEDs/LED-assembled products. Also, the reliability performance can be seriously degraded, if the LEDs are operated over the absolute maximum rated junction temperature (T_j).

It is critical to design the heat dissipation performance not to exceed the T_{jmax} for NVSU233Ax-Dx, to deliver high reliability/performance.

This document shows the T_j evaluation results by demonstrating two heat dissipation conditions. Please use the data for reference to your thermal design.

2. T_j Calculation

T_j can be calculated by the following formula:

$$T_j = T_s + R_{thj-s} \times P_D$$

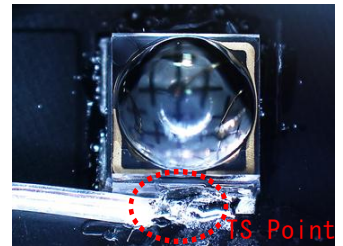
T_j : Junction Temperature

T_s : Soldering Temperature ($^{\circ}C$)

R_{thj-s} : Thermal resistance ($^{\circ}C/W$) from the die to the T_s measuring point

* R_{thj-s} (NVSU233x-Dx): $5.7^{\circ}C/W$

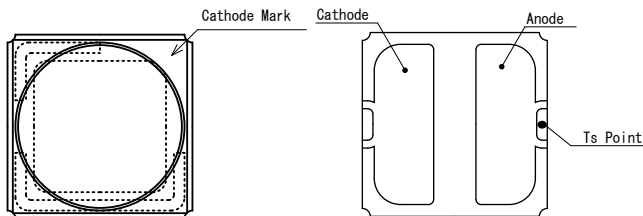
P_D : Input Power (W)



Picture 1 T_s Measuring Point

The thermocouple was solder-attached to the T_s measuring point for the evaluation.

3. T_s Measuring Point



4. T_j Evaluation Result

Example 1. Copper Board + Heat Sink B

| I_F (A) | T_s ($^{\circ}C$) | V_F (V) | T_j ($^{\circ}C$) |
|-----------|-----------------------|-----------|-----------------------|
| 1.0 | 49.5 | 3.5 | 69 |
| 1.4 | 61.1 | 3.6 | 90 |

Example 2. Copper Board + Heat Sink C

| I_F (A) | T_s ($^{\circ}C$) | V_F (V) | T_j ($^{\circ}C$) |
|-----------|-----------------------|-----------|-----------------------|
| 1.0 | 47.3 | 3.5 | 67 |
| 1.4 | 56.6 | 3.6 | 85 |

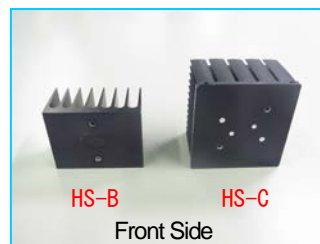


Front Side

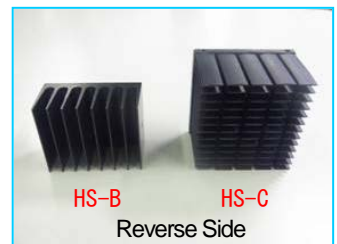


Reverse Side

Picture 2 Copper Board



HS-B HS-C
Front Side



HS-B HS-C
Reverse Side

Picture 3 Copper Board + Heat Sink

5. Heat Dissipating Materials

Metal-based Board: Copper, 30mm × 30mm × 1.7mm

Heat Sink B: 50mm × 38mm × 25mm (H), Base Thickness: 5 mm, Fin: 8 pcs.(1mm × 38mm, Array: 1 × 8)

Heat Sink C: 54mm × 54mm × 35mm (H), Base Thickness: 4mm, Fin=64 pcs.(0.8mm × 9mm, Array: 5 × 13)

Note

We specified the absolute maximum ratings for NVSU233x-Dx; $I_F = 1.4A$ and $T_{jmax} = 130^{\circ}C$.

We cannot guarantee the usage over these ratings.

We appreciate your understanding and cooperation.