# Thermal Design Of NVSU233x (U405) LEDs

## 1. Objective

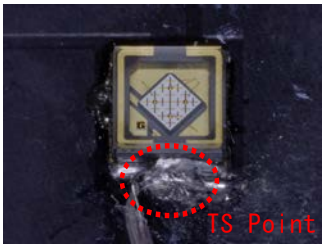
The LEDs' light output can be affected by the heat generated from the LEDs/LED-assembled products.
Also, the reliability performance can be seriously degraded, if the LEDs are operated over the absolute maximum rated junction temperature (Tj).
It is critical to design the heat dissipation performance not to exceed the $T_{jmax}$ for NVSU233x, to deliver high reliability/performance.
This document shows the Tj evaluation results by demonstrating two heat dissipation conditions. Please use the data for reference to your thermal design.

## 2. Tj Calculation

Tj can be calculated by the following formula:

$$Tj = Ts + Rthj\text{-}s \times P_D$$

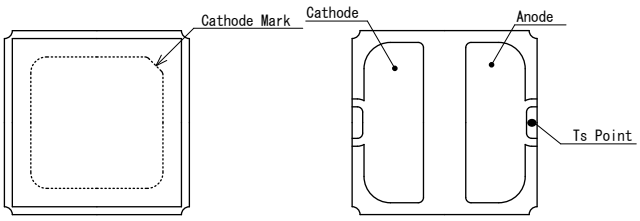
Tj: Junction Temperature
Ts: Soldering Temperature (°C)
Rthj-s: Thermal resistance (°C/W) from the die to the Ts measuring point
* Rthj-s (NVSU233x): 5.7°C/W
PD: Input Power (W)




Picture 1 Ts Measuring Point

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

## 3. Ts Measuring Point



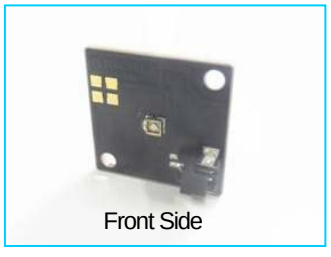

## 4. Tj Evaluation Result

Example 1. Copper Board + Heat Sink B

| $I_F$(A) | $T_S$ (°C) | $V_F$(V) | $T_j$ (°C) |
|---|---|---|---|
| 1.0 | 48.2 | 3.4 | 68 |
| 1.4 | 58.6 | 3.5 | 87 |

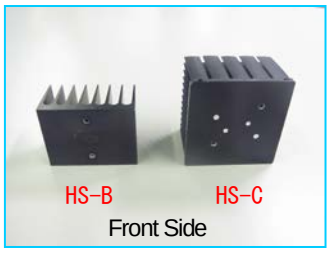
Example 2. Copper Board + Heat Sink C

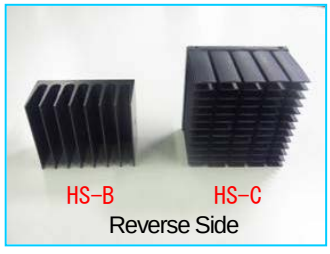
| $I_F$(A) | $T_S$ (°C) | $V_F$(V) | $T_j$ (°C) |
|---|---|---|---|
| 1.0 | 43.6 | 3.4 | 63 |
| 1.4 | 51.9 | 3.5 | 80 |





Picture 2 Copper Board




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; IF= 1.4A and $T_{jmax}$ = 130°C.

We cannot guarantee the usage over these ratings.

We appreciate your understanding and cooperation.