

Thermal Design of NVSU119C (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 (T_j).

It is critical to design the heat dissipation performance not to exceed the T_{jmax} for NVSU119C, 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

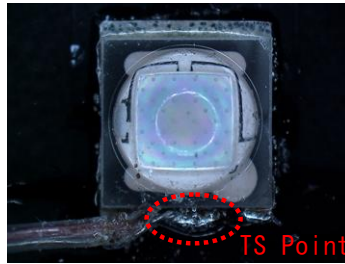
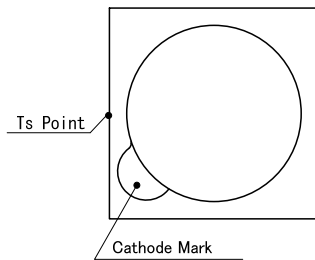
T_s : Soldering Temperature ($^{\circ}C$)

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

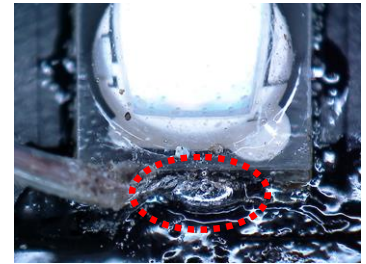
* R_{thj-s} (NVSU119C_U405): $3.1^{\circ}C/W$

P_D : Input Power (W)

3. T_s Measuring Point



Picture 1 T_s Measuring Point



Picture 2 T_s Measuring Point(Close-up)

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

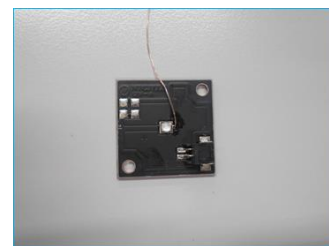
4. T_j Evaluation Result

Example 1. Copper Board + Heat Sink A

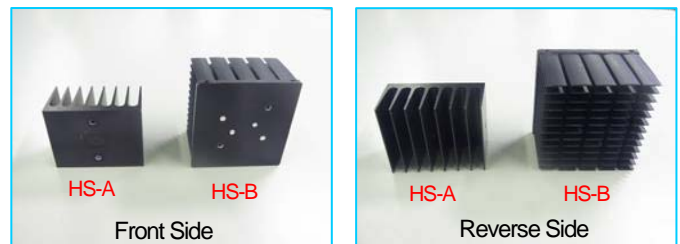
I_F (A)	T_s ($^{\circ}C$)	V_F (V)	T_j ($^{\circ}C$)
0.7	36.9	3.1	44
1.4	49.4	3.2	63

Example 2. Copper Board + Heat Sink B

I_F (A)	T_s ($^{\circ}C$)	V_F (V)	T_j ($^{\circ}C$)
0.7	34.1	3.1	41
1.4	44.5	3.2	59



Picture 3 Copper Board



Picture 4 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 NVSU119C(U405); IF= 1.4A and $T_{jmax} = 130^{\circ}\text{C}$.

We cannot guarantee the usage over these ratings.

We appreciate your understanding and cooperation.