

### T<sub>j</sub> Control for Good Heat Dissipation in NVSU233A-D1 (U395)

#### 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<sub>j</sub>).

It is critical to design the heat dissipation performance not to exceed the T<sub>jmax</sub> for NVSU233A-D1, to deliver high reliability/performance.

This document shows the T<sub>j</sub> evaluation results by demonstrating two heat dissipation conditions. Please use the data for reference to your thermal design.

#### 2. T<sub>j</sub> Calculation

T<sub>j</sub> can be calculated by the following formula:

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

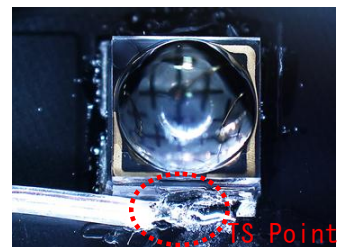
T<sub>j</sub>: Junction Temperature

T<sub>s</sub>: Soldering Temperature (°C)

R<sub>thj-s</sub>: Thermal resistance (°C/W) from the die to the T<sub>s</sub> measuring point

\* R<sub>thj-s</sub> (NVSU233A-D1): 5.7°C/W

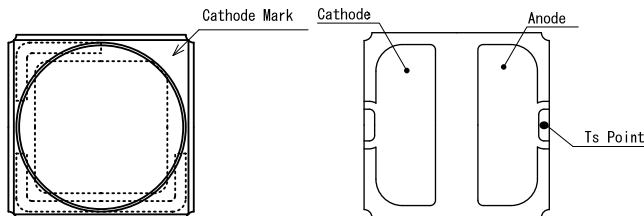
P<sub>D</sub>: Input Power (W)



Picture 1 T<sub>s</sub> Measuring Point

The thermocouple was solder-attached to the T<sub>s</sub> measuring point for the evaluation.

#### 3. T<sub>s</sub> Measuring Point



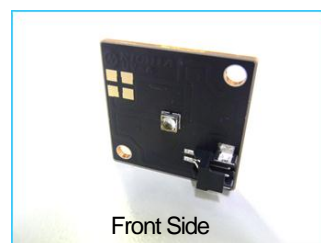
#### 4. T<sub>j</sub> Evaluation Result

Example 1. Copper Board + Heat Sink B

I <sub>F</sub> (A)	T <sub>S</sub> (°C)	V <sub>F</sub> (V)	T <sub>j</sub> (°C)
1.0	49.5	3.5	69
1.4	61.1	3.6	90

Example 2. Copper Board + Heat Sink C

I <sub>F</sub> (A)	T <sub>S</sub> (°C)	V <sub>F</sub> (V)	T <sub>j</sub> (°C)
1.0	47.3	3.5	67
1.4	56.6	3.6	85

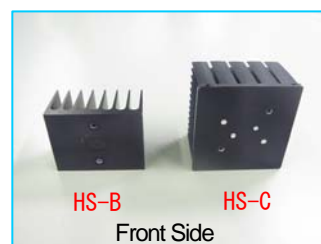


Front Side

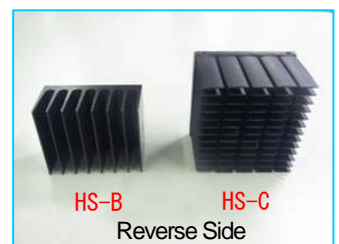


Reverse Side

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 NVSU233A-D1;  $I_F = 1.4A$  and  $T_{jmax} = 130^{\circ}C$ .

We cannot guarantee the usage over these ratings.

We appreciate your understanding and cooperation.