

Tj Control for Good Heat Dissipation in NVSU333A (U365) with Water Cooling System

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 NVSU333A, to deliver high reliability/performance.

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

2. Tj Calculation

T_j can be calculated by the following formula:

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

T_j : Junction Temperature

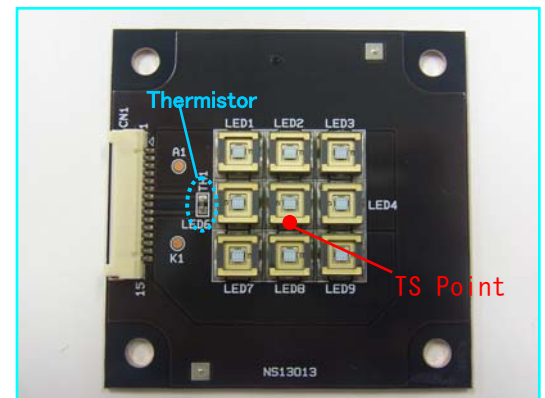
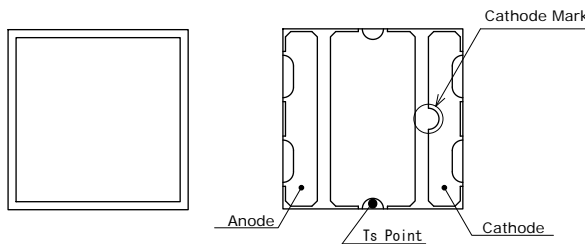
T_s : Soldering Temperature ($^{\circ}C$)

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

* R_{thj-s} (NVSU333A): $2.08^{\circ}C/W$

P_D : Input Power (W)

3. Ts Measuring Point



Picture 1 Ts Measuring Point

The thermocouple was solder-attached to the T_s measuring point for the evaluation. (Board Size: $60mm \times 60mm \times 1mm$)

4. Tj Evaluation Result

Board	I_F (A)	Thermistor($^{\circ}C$)	T_s ($^{\circ}C$)	V_F (V)	T_j ($^{\circ}C$)
Al	3.5	26	49	3.85	77
Cu	3.5	25	34	3.85	62

5. Heat Dissipating Conditions

Input Current [A]	Temperature [$^{\circ}C$]	Water Flow [L/min.]	Cooling Heat Sink	LED Pitch [mm]	Internal Circuit	Interface between Heat Sink and Board	
						Thermal Conductivity [W/(m·K)]	Material
3.5	18	2.5	Oxygen-free copper 60mm×60mm×10mm	8.2	9 LEDs connected in series	0.9	Grease

Note

We specified the absolute maximum ratings for NVSU333A; $I_F=4.5A$ and $T_{jmax} = 100^{\circ}C$.

We cannot guarantee the usage over these ratings.

We appreciate your understanding and cooperation.