Heat Dissipation from NCSU03xx depending on Tj

1. Objective

The light output of LEDs is reduced under the influence of heat generation. When LEDs are operated over the absolute maximum junction temperature (T_{jmax}), the performance is severely degraded. It is critical to design the heat dissipation not to exceed the T_{jmax} for NCSU03xx to achieve a high reliability and a high performance. This document provides the Tj evaluation results under two conditions by using different heat sinks. Please use the data as reference for NCSU03xx's thermal design at your site.

2. Tj Calculation

Tj can be obtained by the following formula:

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

where, Tj: Junction Temperature [°C]
Ts: Soldering Temperature [°C]
Rthj-s: Thermal resistance between the LED die and the Ts measuring point [°C/W]
* The Rthj-s of NCSU03xx is 7.3 [°C/W]
P_D: Input Power [W]

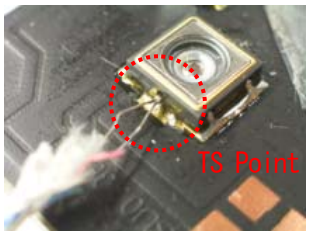

Figure 1
Ts Measuring Point

3. Tj Measurement Result

Ex.1 Aluminum Board

I_F(A)	T_S (°C)	V_F(V)	T_j (°C)
0.5	75	3.57	89
0.7	95	3.63	114

Ex.2 Aluminum Board + Heat Sink

I_F(A)	T_S (°C)	V_F(V)	T_j (°C)
0.5	54	3.62	68
0.7	66	3.70	85

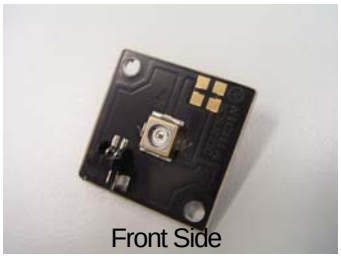

Figure 2 Aluminum Board

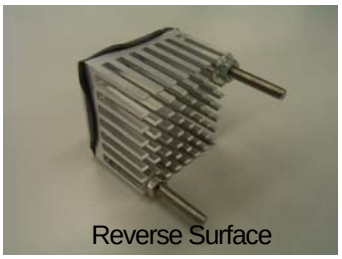

Figure 3 Aluminum Board & Heat Sink

4. Heat Dissipation Materials

- Metal-based board; Aluminum, Dimension; 30mm × 30mm × 1.6mm
- Heat Sink : 30mm × 30mm × h=20mm, Depth: 4mm, Fin; 64 pcs. (Dimension of Fin; 1.4mm × 2mm, Structure; 8 × 8)

Note: Absolute Maximum Ratings

Nichia specifies the absolute maximum ratings for NCSU03xx as IF=0.7A and T_{jmax} =130°C. We cannot assure the performance of the LEDs if they are used above the specified temperature and IF. Thank you very much for your cooperation.