Light Emitting Diode

Heat Dissipation from NC4U13xx 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 NC4U13xx to achieve a high reliability and a high performance. This document provides the Tj evaluation results under three conditions by using different heat sinks. Please use the data as reference for NC4U13xx'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 NC4U13xx is Typ:1.7 [°C/W] (Max:2.2 [°C/W])
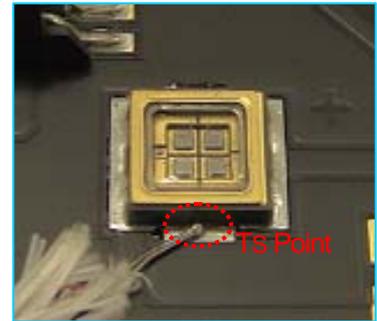　　　　P_D: Input Power [W]

Figure 1
Ts Measuring Point

3. Tj Measurement Result

Ex.1 Copper Board + Heat Sink A

I_F(A)	T_S(°C)	V_F(V)	T_j(°C)
0.3	70	13.3	77
0.5	93	13.5	104
0.7	117	13.7	133

Ex.2 Copper Board + Heat Sink B

I_F(A)	T_S(°C)	V_F(V)	T_j(°C)
0.3	53	13.4	60
0.5	67	13.7	79
0.7	79	14.0	96

Ex.3 Copper Board + Heat Sink C

I_F(A)	T_S(°C)	V_F(V)	T_j(°C)
0.3	51	13.4	58
0.5	64	13.7	76
0.7	77	14.0	94

Front Side　Reverse Surface

Figure 2 Copper Board
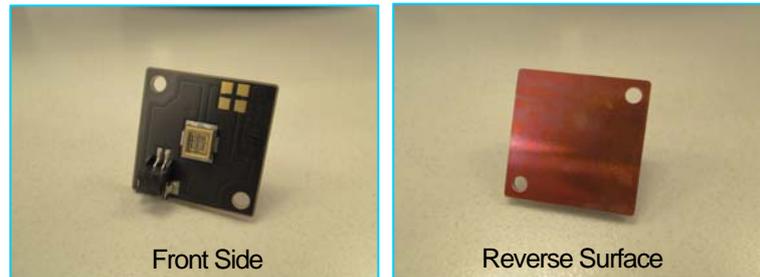

HS-A　HS-B　HS-C　　HS-A　HS-B　HS-C
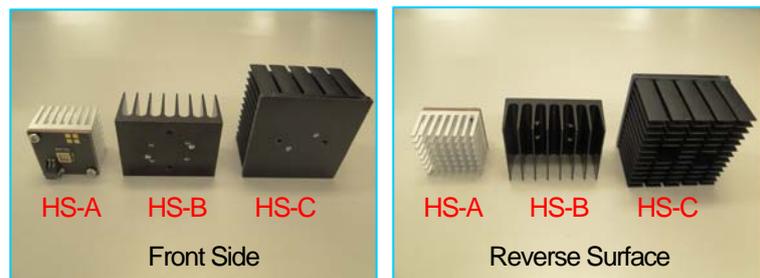Front Side　　Reverse Surface

Figure 3 Copper Board & Heat Sink

4. Heat Dissipation Materials

 - Metal-based board; Copper, Dimension; 30mm × 30mm × 1.7mm

 - Heat Sink A: 30mm × 30mm × h=20mm, Depth: 4mm, Fin; 64 pcs. (Dimension of Fin; 1mm × 2mm, Structure; 8 × 8)

 - Heat Sink B: 50mm × 38mm × h=25mm, Depth; 5mm, Fin; 8 pcs. (Dimension of Fin; 1mm × 38mm, Structure; 1 × 8)

 - Heat Sink C: 54mm × 54mm × h=35mm, Depth; 4mm, Fin; 64pcs. (Dimension of Fin: 0.8mm × 9mm　and Structure; 5 × 13)

Note: Absolute Maximum Ratings

Nichia specifies the absolute maximum ratings for NC4U13xx 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.

This sheet contains tentative information, we may change contents without notice.