

Thermal Design of NCSU275 (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 NCSU275, 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} (NCSU275): $10.5^{\circ}C/W$

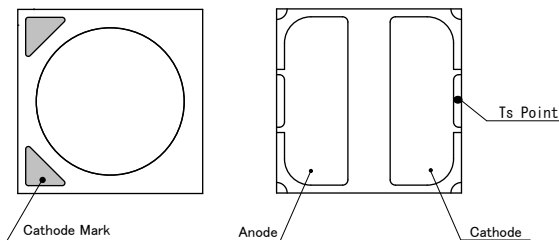
P_D : Input Power (W)



Picture 1 T_s Measuring Point

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

3. T_s Measuring Point



4. T_j Evaluation Result

Example 1. Copper Board + Heat Sink B

$I_F(A)$	$T_S(^{\circ}C)$	$V_F(V)$	$T_j(^{\circ}C)$
0.5	40.3	3.6	59
0.7	46.2	3.8	74
1.0	58.0	4.1	101

Example 2. Copper Board + Heat Sink C

$I_F(A)$	$T_S(^{\circ}C)$	$V_F(V)$	$T_j(^{\circ}C)$
0.5	37.6	3.6	57
0.7	43.1	3.8	71
1.0	52.3	4.1	95

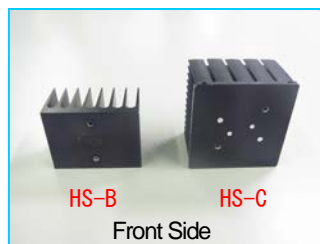


Front Side

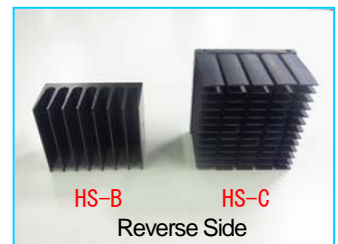


Reverse Side

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 NCSU275; $I_F = 0.7A$ and $T_{jmax} = 130^{\circ}C$.

We cannot guarantee the usage over these ratings.

We appreciate your understanding and cooperation.