

# Box illumination

by *pmd*technologies

## Abstract

This document describes the LED modules used in the calibration boxes.

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## 1. Functional Description

The Tango\_IFM\_Box\_Illumination\_V0100 PCB is designed to build different patterns with wired 5 mm LEDs. The distance between the LEDs is 30 mm. Multiple PCBs are connected with a simple multi-pin connector with a pitch of 2.54 mm. The distance spanned by the multi-pin connector is calculated with ~10 mm. The LEDs are mounted at the bottom-side.

### 1.1. Connection polarity and series resistance

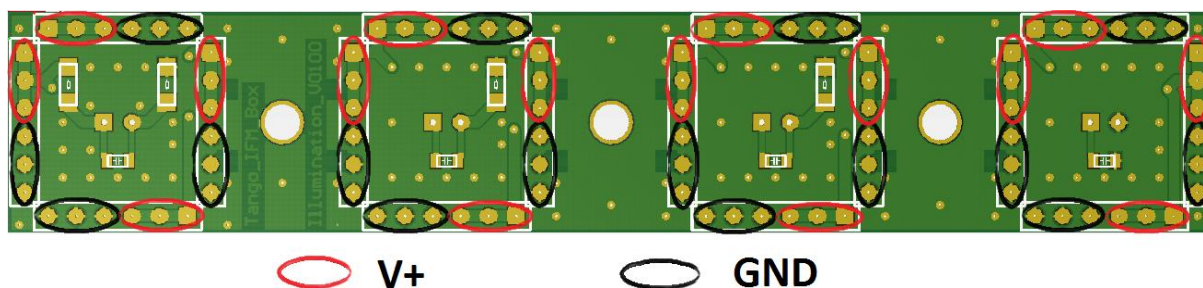


Figure 1: Connection polarity

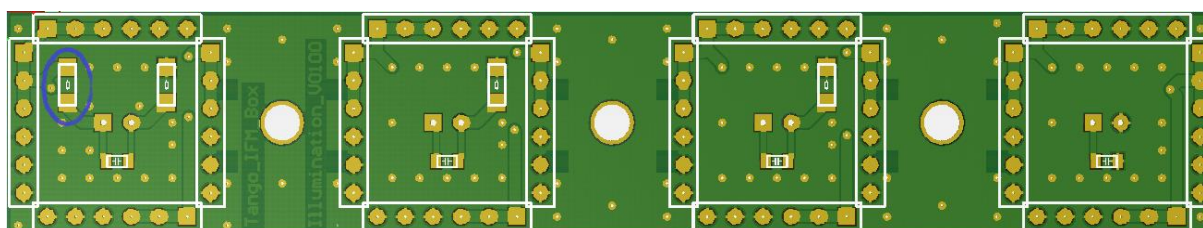


Figure 2: Series resistance

The series resistance is calculated by the number of LEDs on one PCB.

<u>LEDs per PCB</u>	<u>Series resistance</u>	
4	100R	
3	170R	(not used in this case)
2	240R	
1	300R	
→ between 20mA and 22mA per path		

Table 1: Series resistors used for Osram SFH 4550 LEDs and a supply-voltage of 8V

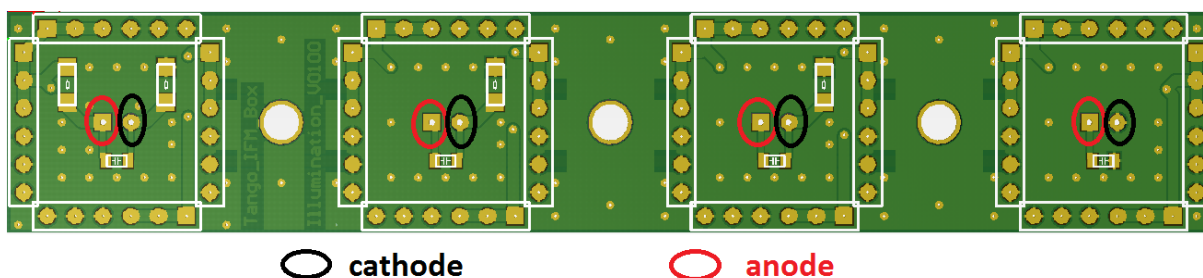
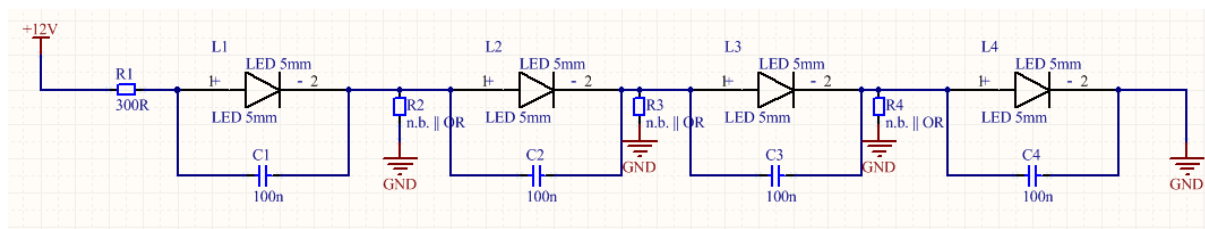


Figure 3: LED polarity

The LEDs are mounted at the bottom-side of the PCB.

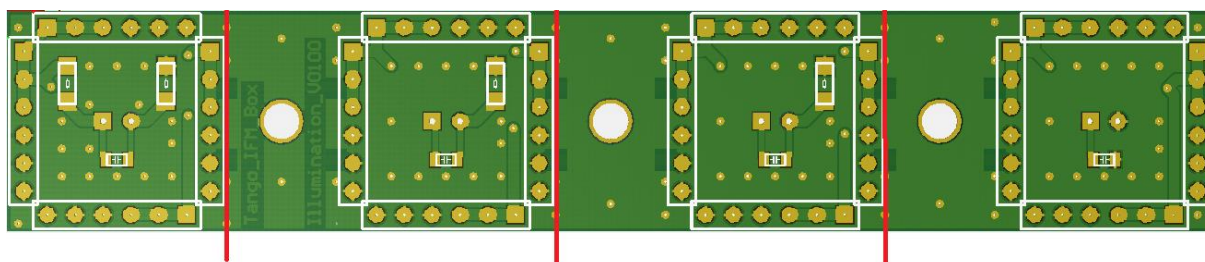


**Figure 4: Schematic of one LED line**

The capacitors parallel to the LEDs are not necessary in this case, values of serial resistance are shown in Table 1.

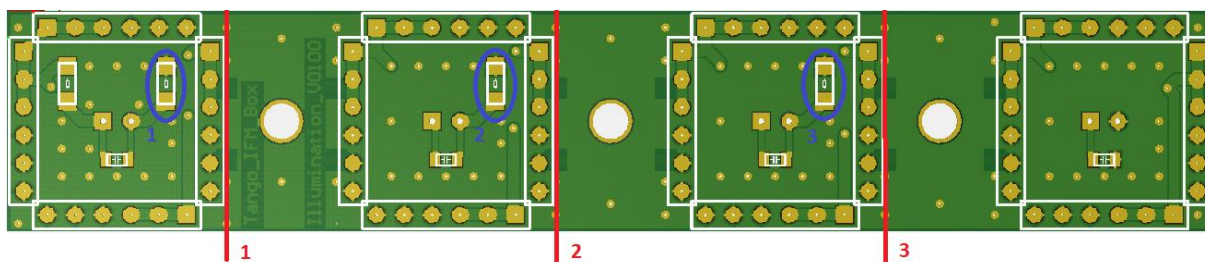
In case of a line with 4 LEDs the 0R resistors are not equipped. If the PCB is cut to 1, 2 or 3 LEDs, Figure 6 shows which resistor must be equipped.

### 1.2. Cutting PCBs



**Figure 5: Possible cuts**

It's possible to cut the PCB in the red-marked lines. The cut-line is defined by 4 vias to keep the 30 mm pattern.



**Figure 6: 0R resistance to connect to GND**

When cutting a PCB, a 0R resistor must be added to connect the last LED pin in line to GND. If the PCB is cut at 1<sup>st</sup> mark, 1<sup>st</sup> resistor must be added. If it's cut in 2<sup>nd</sup> mark, 2<sup>nd</sup> resistor and so on.

### 1.3. Connecting PCBs

Each PCB has to be supplied from the slim side of the 1<sup>st</sup> LED.

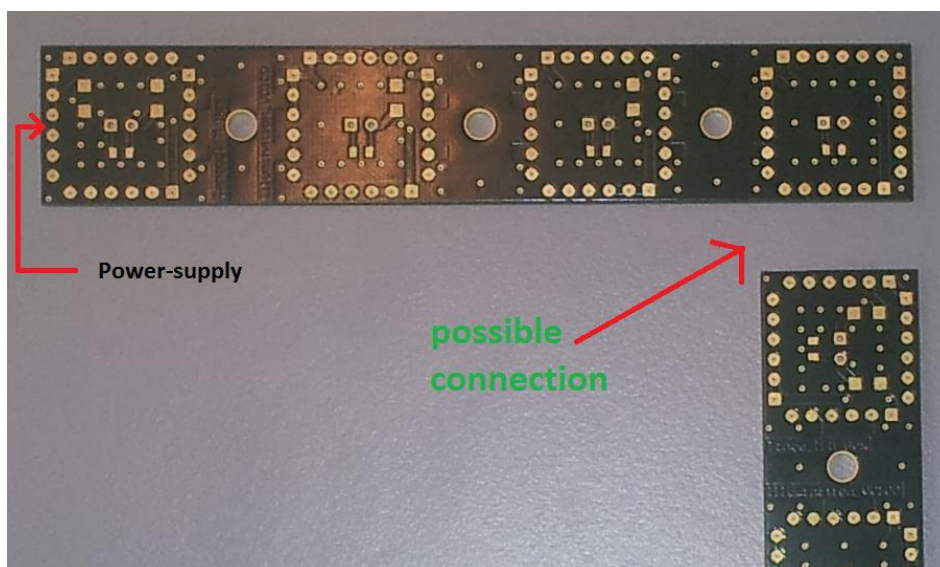


Figure 7: Possible connection 1

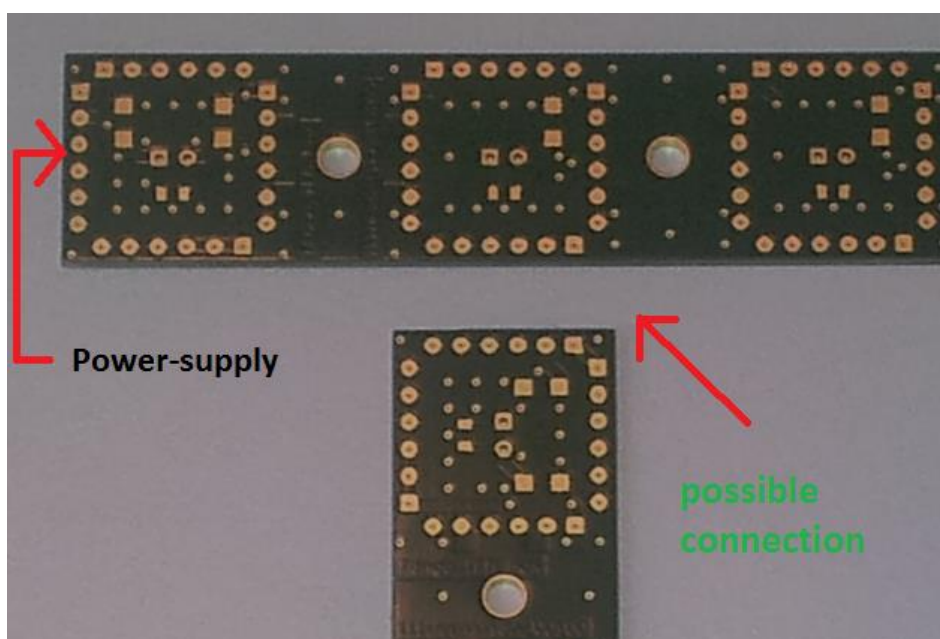


Figure 8: Possible connection 2



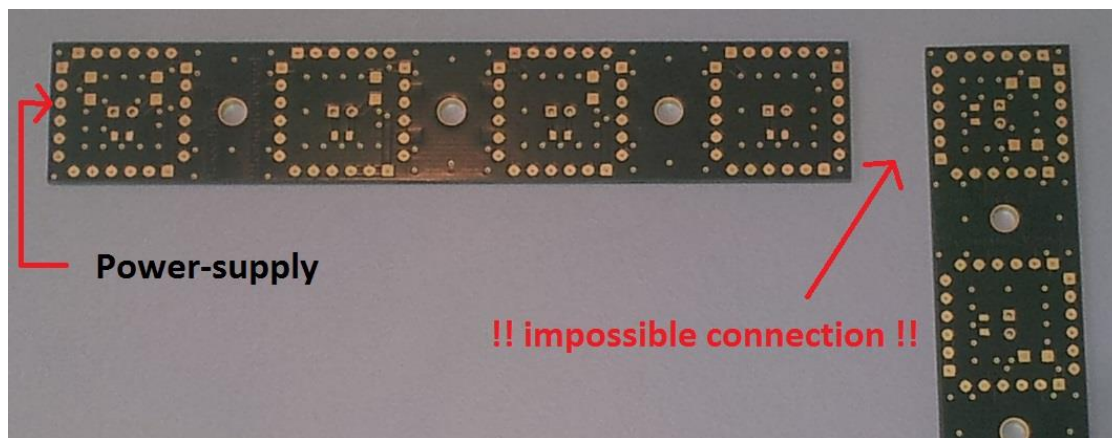


Figure 9: Impossible connection

## 2. Controlling with $\mu\text{C}$

To switch LEDs on and off with a  $\mu\text{C}$  or another 5 V signal a setup with a transistor or mosfet is needed.

In the example case the following setup to switch the illumination with an Arduino is used:

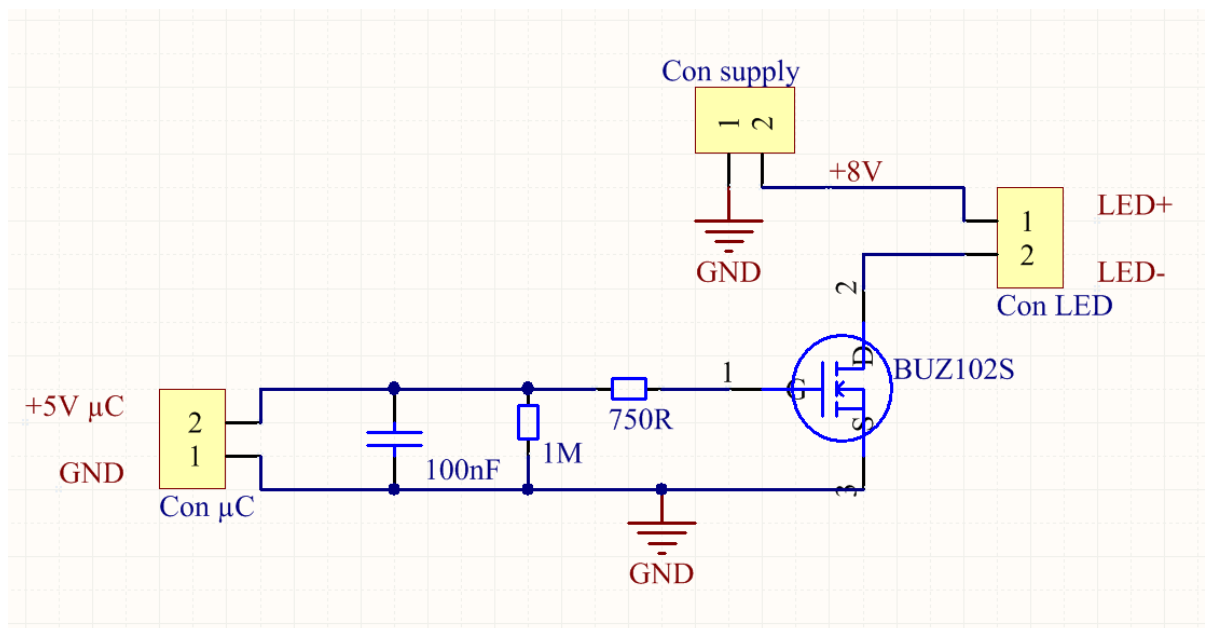


Figure 10: Transistor schematic for controlling with  $\mu\text{C}$

### 3. Soldered PCB and calibration setup



Figure 11: Bottom-side of PCB

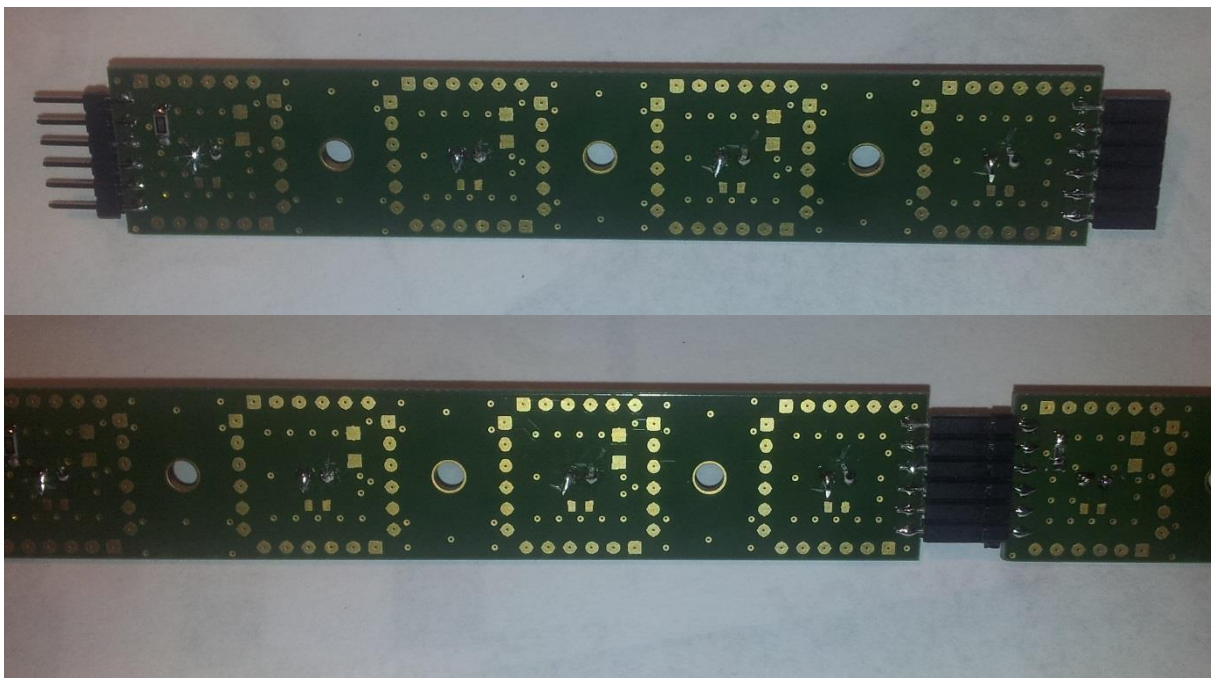


Figure 12: Top-side of PCB

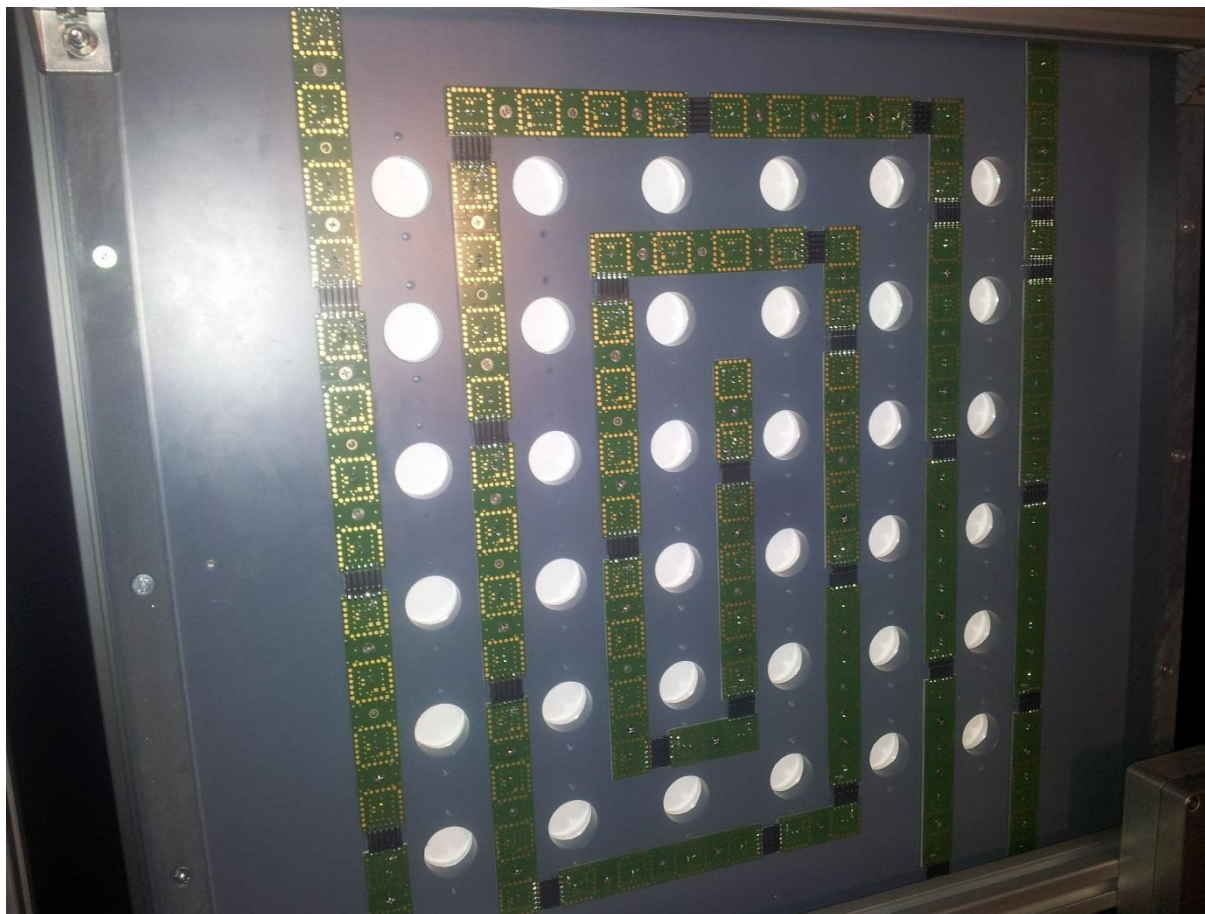


Figure 13: Connected PCBs in calibration setup

## Document History

Document title: Box illumination – Cal-1-6-AN

Revision	Origin of Change	Submission Date	Description of Change
0	TLe	2016-05-10	New Application Note

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