

HCC S35 LED

Application Note



This application note is for S35 series products:
S35-x

This application note describes the handling,
measurement, and testing methods for S35 LED
products.

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Recommended Solder Pad Design

There are 3 pads for S35 LED, N & P Pads are on the left-hand and right-hand sides, center is the thermal pad for heat conduction only.

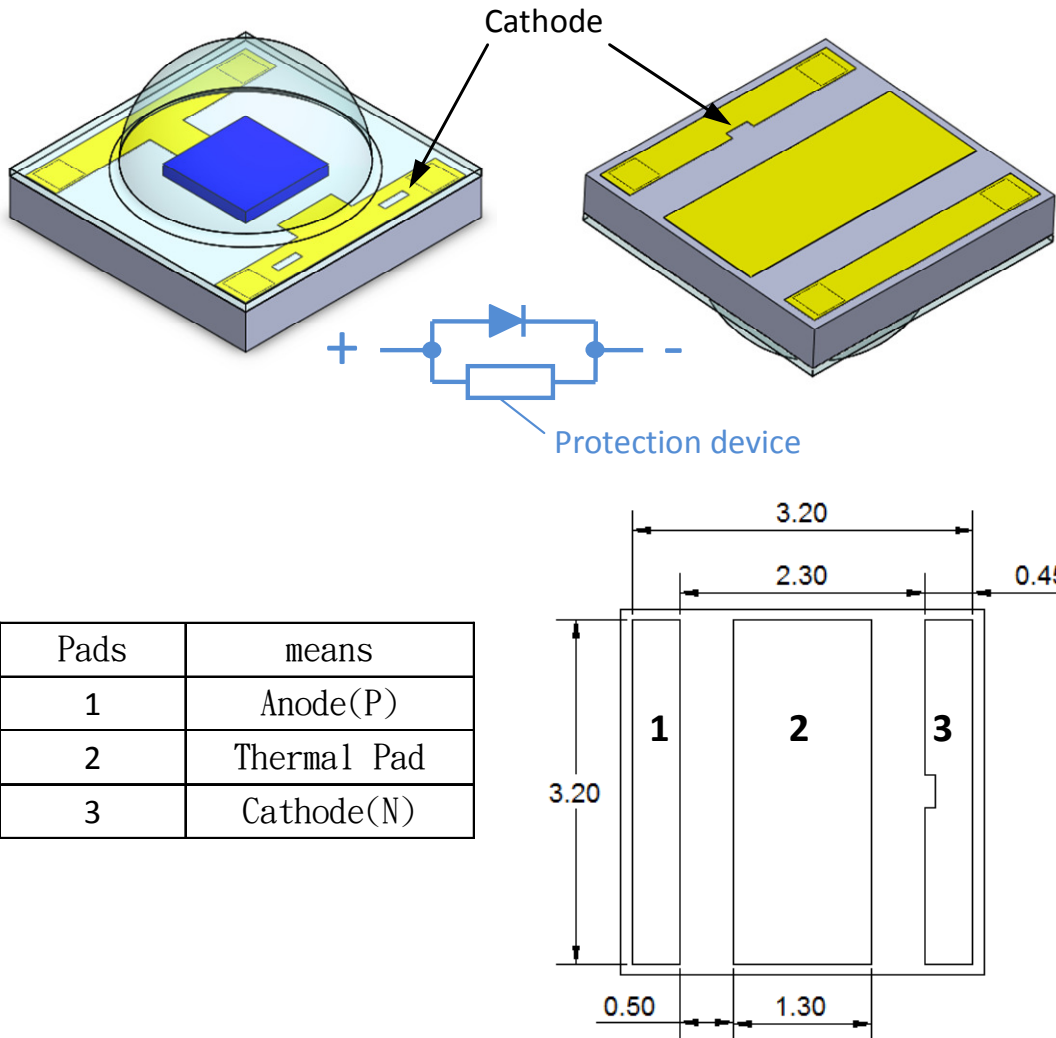
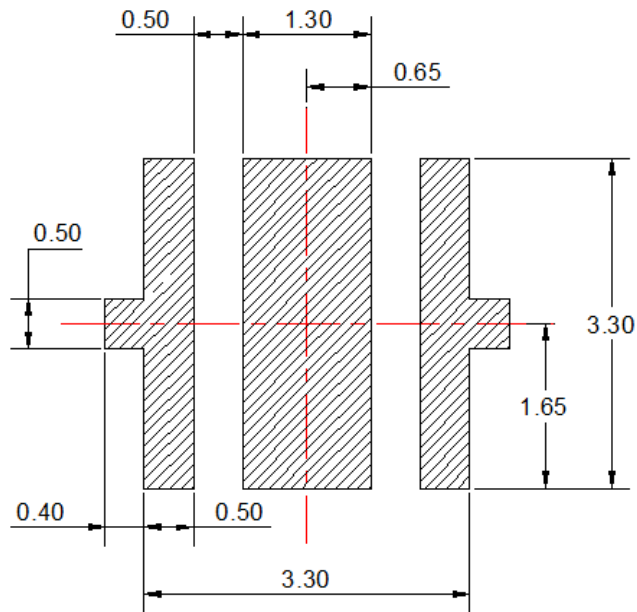


Figure 1. S35 LED Pads

Due to the S35 is a small package, please identify the proper P/N pads position carefully before SMT.

Recommended Soldering Pad Design (Unit:mm) :



Recommended Stencil Pattern Design (Mark Area is Opening) ,(Unit: mm) :

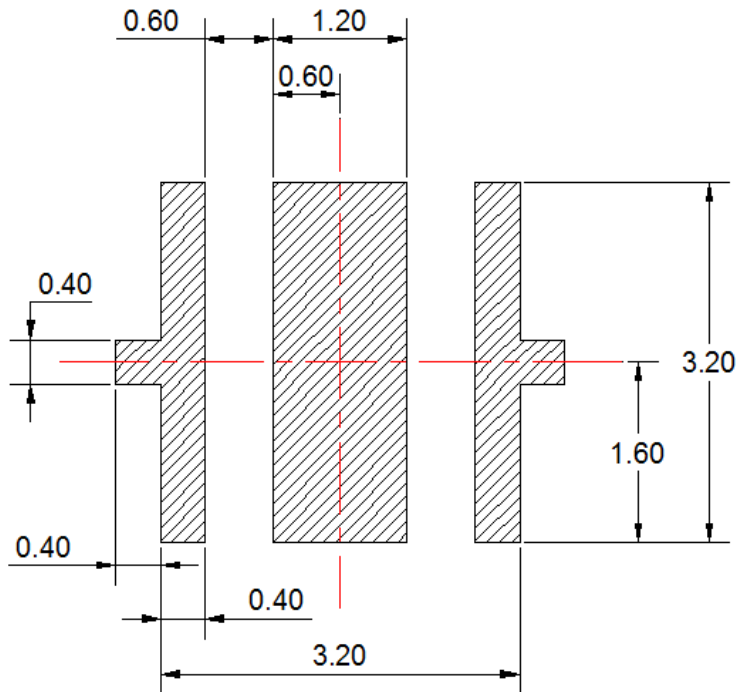


Figure 2. S35 recommended solder pad and stencil pad layouts

Cleaning and Storage

S35 LED Cleaning

S35 was 100% cleaned before shipping. So in normal case it is no need to be cleaned again before SMT. In the case where a minimal level of dirt and dust particles cannot be guaranteed during shipping & using, suitable cleaning solution can be applied to the lens surface.

1. During handling, keeps the environment cleaning.
2. Try a gentle swabbing using a lint-free swab.
3. If needed, the use of lint-free swab and IPA(isopropyl alcohol) or Alcohol used gently removes dirt from the lens surface. Do not use other solvents as they may directly react with the LED lens.
4. Do not use ultrasonic cleaning that the LED will be damaged.
5. Do not press on the lens.

S35 LED Storage

Please store S35 LEDs in a dry box. The recommended storage conditions are: 5~30°C; RH<50%.

After opening the package:

1. The LEDs should be soldered within one day.
2. If unused LEDs remain, they should be stored in moisture proof packages or in a dry box. The storage conditions are: 5~40°C; RH<30%.
3. If unused LEDs are stored for more than one week, baking treatment should be performed with the following conditions:
Baking condition: more than 4 hours at 60±5°C.

S35 Handling

Recommended Handling

1. S35 Emitter is a SMT type device and is strongly recommended to do the pick and place onto the PCB by auto-machines. The material of pickup head is better to be plastic or silicone to avoid damage the emitters during pick and place.

- Recommended pickup head dimensions

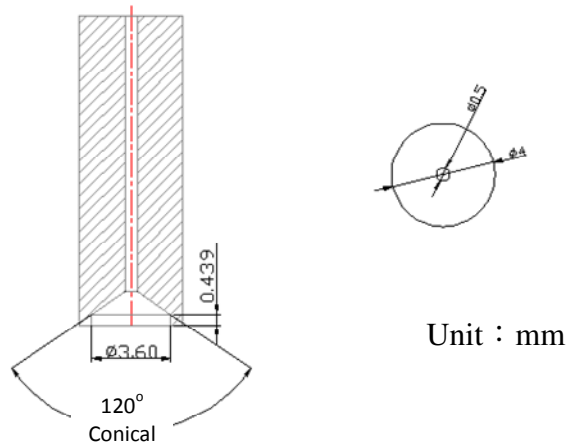


Figure 3. Recommended pickup tooling dimensions

2. If need to do the pick and place by manual, only plastic tweezers is allowed. Do not touch the lens with the tweezers or fingers. Use tweezers to grab the S35 Emitters at the base gently and put onto the PCB with solder paste carefully as Figure 4.

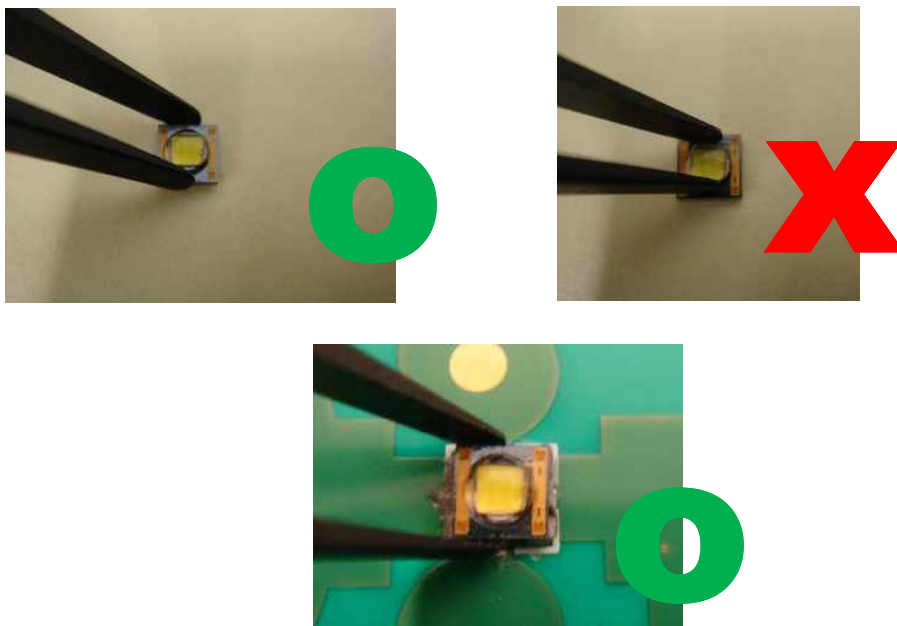


Figure 4. Proper to use the tweezers

If metal tweezers need be used, do not choose the one list as Figure 5.

● Tweezers

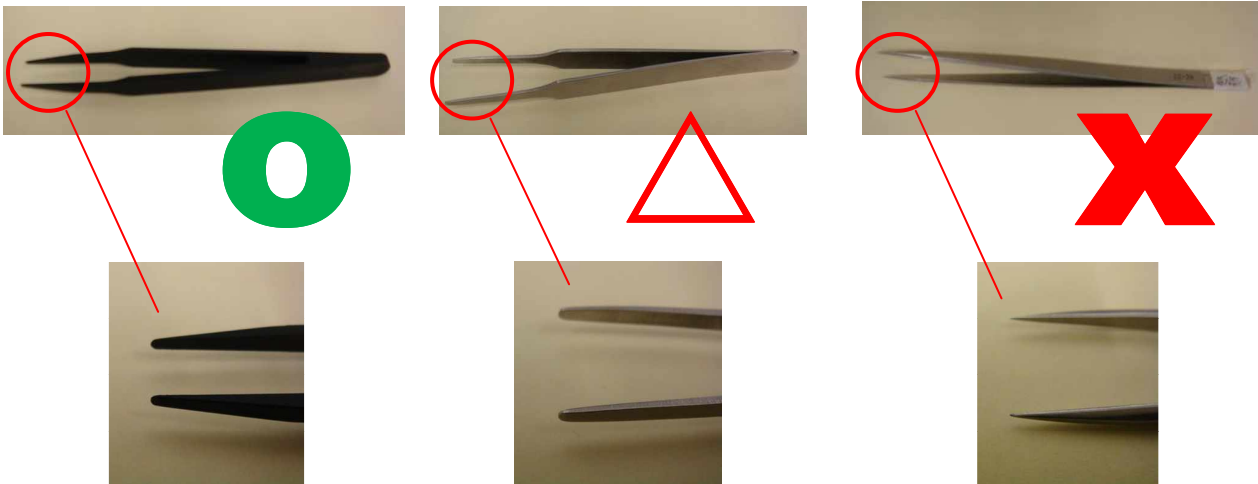
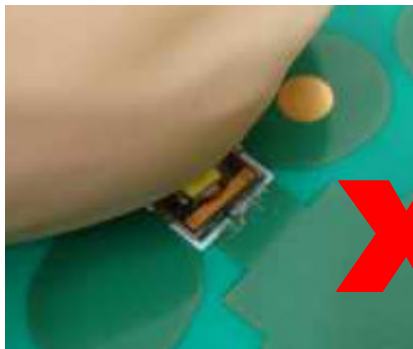


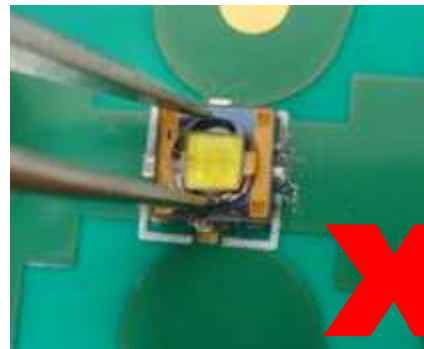
Figure 5. Proper to select the tweezers

3. S35 LEDs are designed to be reflowed soldered to a board. Reflow soldering should be done by a reflow oven. Normally, hotplate is not recommended. The reflow soldering profile listed on the following page. (If hot plate is used, Temperature<250°C; and Time<15 seconds for each one.)
4. Do not use wave soldering or iron.

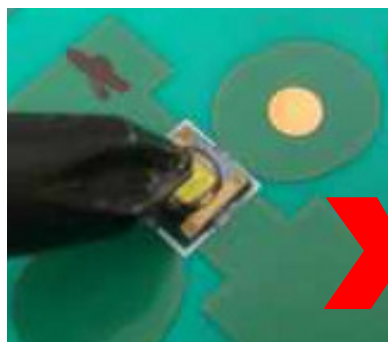
Incorrect handling during assembly



Press on the lens



Pick up on the lens



The screw drivers trike the LED

Figure 6.Incorrect handling during assembly

Recommended Manual Rework Procedure

Step 1: Set up the hot plate temperature properly. Do not put the PCB on the hot plate before the temperature is stable at the setting value.

Step 2: Using tweezers to take the S35 from the PCB carefully while the solder paste is melting.

Step 3: Check the solder pads condition. Make sure the solder pads are covered by the solder paste.

Step 4: Put the LED back to the PCB properly. The time from step 2 to step 4 should be completed within 30 secs.

Step 5: Take the PCB out the hot plate and put on a heat sink to cool down the PCB temperature.

Notes:

1. Do not have solder balls which may short anode, cathode or thermal pad
2. To avoid external mechanical force applied on the LED lens or substrate.
3. Do not touch the lens surface with sharp objects or fingers.
4. Leakage path maybe existed when sub-mount crack or chipping that damaged from un-suitable Handling.
5. Final inspection and test is suggested after SMT process for each emitter.

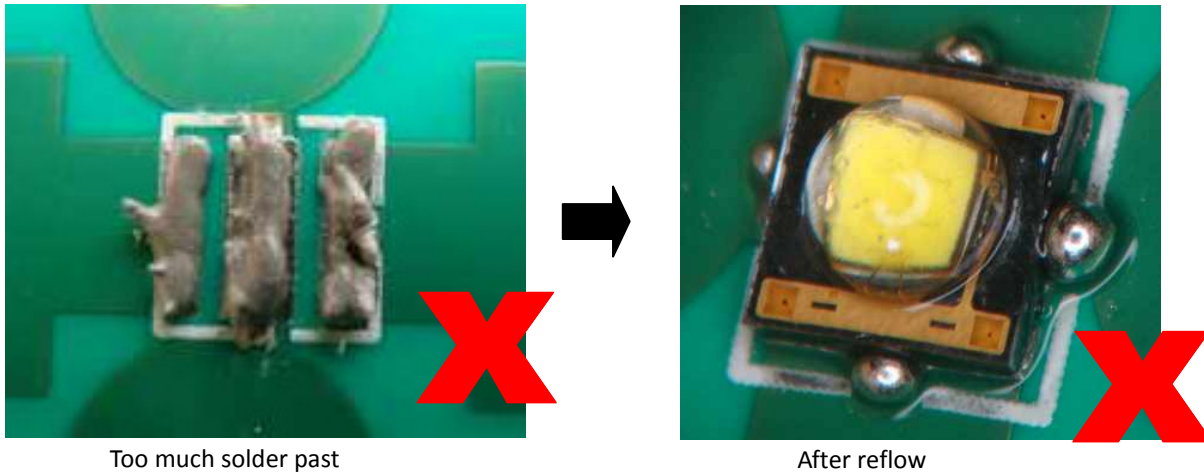
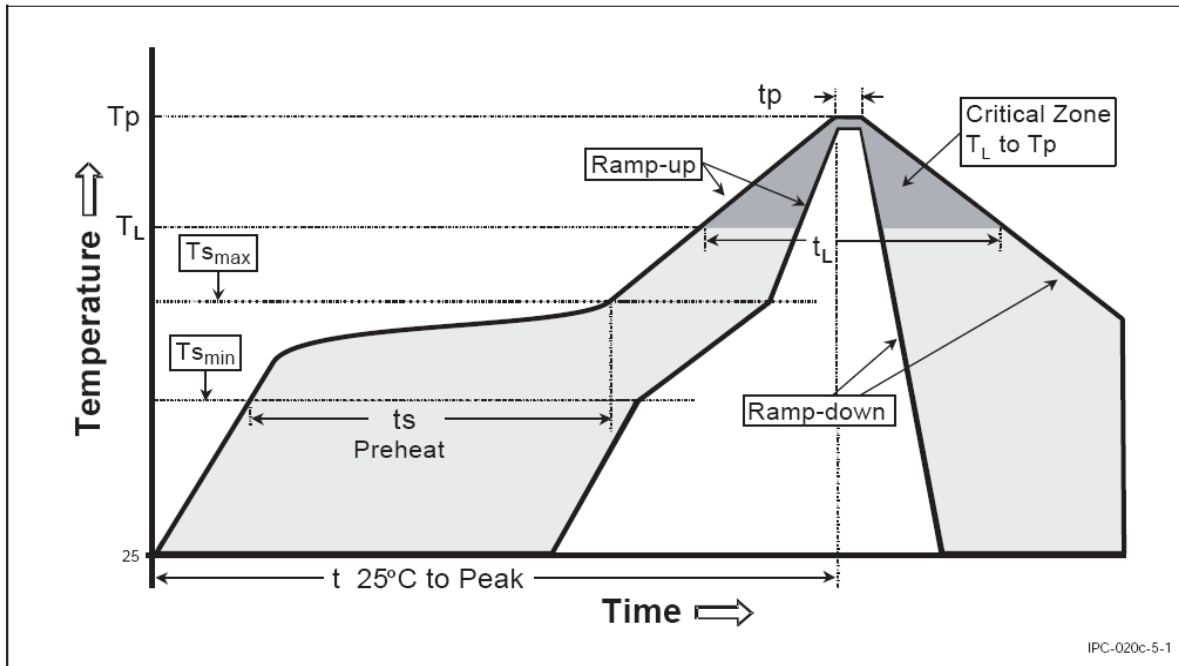


Figure 7.Soldering Problems

Reflow Information

The LEDs can be soldered using the parameter listed below. As a general guideline, the users are suggested to follow the recommended soldering profile provided by the manufacturer of the solder paste. Although the recommended soldering conditions are specified in the list, reflow soldering at the lowest possible temperature is preferred for the LEDs.



Profile Feature	For solder with Pb	For Lead free solder
Temp ramp up rate ($T_{s_{max}}$ to T_p)	3°C/second max.	3°C/second max.
Pre-heat		
- Min. Temp($T_{s_{min}}$)	100°C	150°C
- Max. Temp($T_{s_{max}}$)	150°C	200°C
- Time($t_{s_{min}}$ to $t_{s_{max}}$)	60-120 seconds	60-180 seconds
Stable Condition:		
- Temp. (T_L)	183°C	217°C
- Time (t_L)	60-150 seconds	60-150 seconds
Peak Temp. (T_p)	215°C	240°C
Time in Peak Temp. (t_p)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time from 25°C to Peak temp.	6 minutes max.	8 minutes max.

Notes: After reflow process, the LED lens surface may be polluted by flux or contamination which will impact the LED optical performance. Suggest to clean the lens surface by alcohol or IPA. Please refer to P3: "S35 LED Cleaning".

Assembly Storage and Handling

Recommendations

Do not stack PCBs or assemblies containing S35 emitters. The S35 emitter may be damaged during this stacking. The PCB should be stacked in a way to allow an enough spacing above the LED lens.



Figure 8. Correct Storage Method

Incorrect Method

Stacking the PCBs with S35 Emitter.

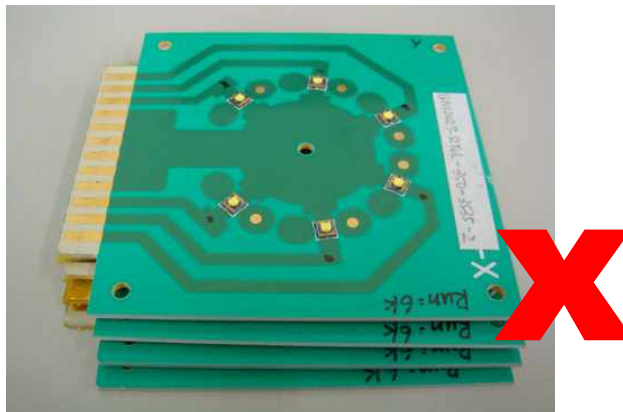


Figure 9. Stacking the PCBs with S35 Emitter

Light up Test

- When using a power supply to light up the LEDs after SMT, the voltage should be limited. The voltage can't exceed 4V for each LED. When the voltage is 4V, the current will be in excess of 1500mA. This will damage the emitter.
 ea. : If there is a module with 3 LEDs in series, the maximum voltage of the power supply should be lower than 12V.

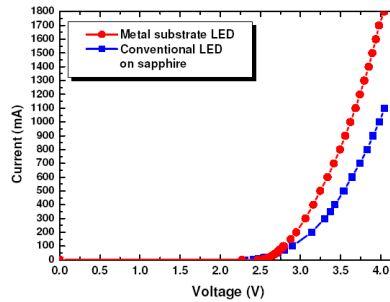


Figure 10. The I-V Curve Comparing Metal Substrate LEDs and Conventional LEDs

- Check the polarity of the emitter. Applied reverse voltage and current may damage the Zener diode.

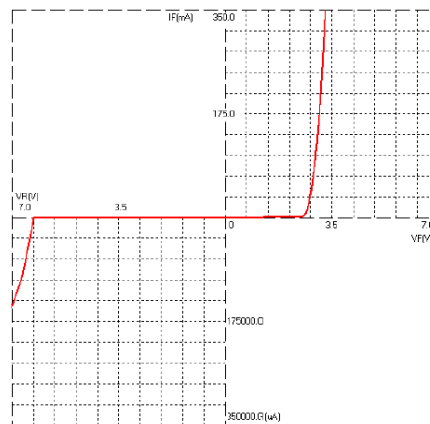


Figure 11. S35 LED I-V curve

- If using a constant current limited voltage driver to light up the LED module, please connect the power supply and the LED module before plugging the power supply into the AC power cord. This can reduce the probability of surge current damaging the LED modules.

Measurement and Calibration

There are two causes which can result in LED measurement errors. Describes these as below:

Type of Integrated Sphere

In non-standard LED measurements, the emitter is measured at the bottom and not the inside of the integrated sphere. Part of the light emitting from the LED transmits into the integrated sphere from the bottom glass window. The light pattern of the emitter affects the measurement results. There is a huge measurement error when the tester is not calibrated with the correct golden samples.

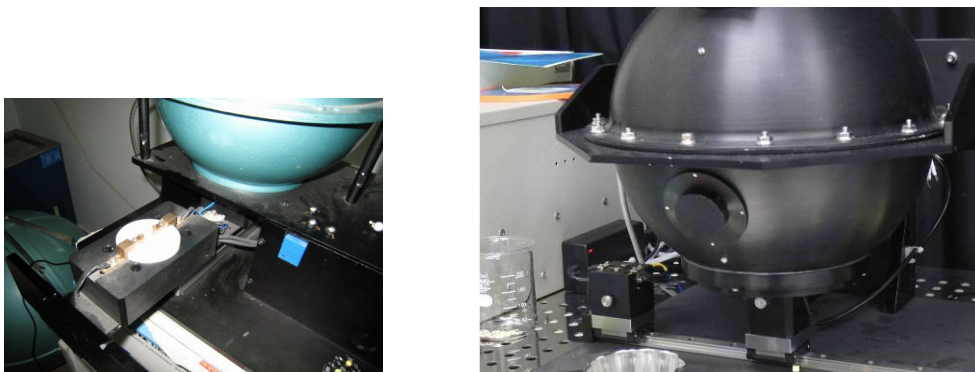


Figure 12. Non-standard LED Measurement

Integration Time

A long integration time will induce thermal issues in LED measurements. If the integration time is 1 sec, the LED junction temperature (T_j) may reach over 50°C , which results in the light output dropping more than 5%. It is recommended that the integration time is shorter than 25ms in high power LED measurements.

Recommended Method

1. Use measurement instruments which follow CIE 137 standards. The integration time should be shorter than 25ms.
2. If the operator uses non-standard testers, calibrate the tester with the golden sample before measurement. The golden sample should be measured by the instrument following CIE 137 standards (ea. IS CAS 140B).