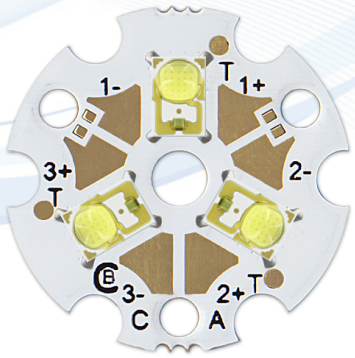
SR-03 Rebel Tri-Star LED Assembly

lead-free RoHS compliant

Overview

The SR-03 high brightness LED lighting assembly includes three Rebel LEDs soldered to our 20mm Star CoolBase. The LEDs can be connected in series or singly for full control of each LED making this assembly ideally suited for:



- **Microscopes**
- **Inspection Lighting**
- **Spot lighting**
- **Task Lamps**
- **Dive Lights**
- **Lightsabers**
- **Flashlights**
- **Bicycle Lights**
- **Accent lighting**

The FR4 CoolBase features a highly efficient thermal design that matches or outperforms* standard aluminium MCPCB bases. This can directly translate into:

- **Longer LED life**
- **Better color stability**
- **Reduced cooling requirements**

The CoolBase makes it easy to mount the LED assembly a suitable heat sink and to work with the assembly using standard bench top soldering and hand tools.

SR-03 Tri-Star LED assemblies can be ordered directly from our website at www.luxeonstar.com/sr-03-tristar.

Features:

- LEDs can be configured for series or single operation
- Super efficient base design that matches or outperforms aluminium MCPCB bases
- Available with all currently produced Rebel LEDs
- Custom assemblies can be ordered with any color combination of LEDs
- RoHS compliant
- Pb free reflow soldered
- Extremely low thermal resistance

Assembly Specifications

Parameter	Value
Base Type	1.6mm FR4 PCB
Base Thermal Performance (Not including LEDs)	1.5°C/W
Finishing	Immersion Gold
Solder Mask Color	White
Solder Paste	AIM NC-258 No-Clean, Lead-Free
Max Operating Temperature (FR4 Base)[1]	95°C
Overall Dimensions (mm)	20D x 3.6H
Weight	1.4g

1. For maximum life, the FR4 board temperature must be kept below this value.
* Results will vary depending on the quality of the dielectric material used in the MCPCB base.

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Power Drivers

The choice of power driver will depend on the LEDs that are mounted to the base, the number of LEDs being powered and how they are connected, the input voltage source and the drive current. We offer a complete selection of compatible low and high voltage current regulating drivers on our website at www.luxeonstar.com/drivers.

Secondary Optics

The SR-03 assembly has been specifically designed to accommodate the Carclo 105 series of optics, including:

- Carclo 10507 - 18° Optic
- Carclo 10511 - 22° Optic
- Carclo 10508 - 27° Optic
- Carclo 10509 - 44° Optic
- Carclo 10510 - 45° x 19° Elliptical Optic

Complete details about the Carclo 105 series of optics can be found on our website at: www.luxeonstar.com/sr-03-optics.

Mounting & Cooling

Use of this assembly requires careful attention to mounting and cooling to ensure that the junction temperature of the LEDs is kept well below the maximum rating as specified in the LED documentation published by Philips Lumileds.

While Bond-Ply© 100 pressure sensitive thermal tape is suitable for mounting this assembly to a finned heat sink, for optimal cooling we recommend that the assembly be fastened to the heat sink using Arctic Silver™ Thermal Adhesive. The bottom of the LED assembly is electrically neutral, so it is not necessary to electrically isolate the LED base from the cooling surface.

The SR-03 has six mounting points for #4 screws. If you are using thermal adhesive tape, we recommend that the assembly also be fastened with 3 fasteners.

You need to confirm that the assembly is being adequately cooled by testing the temperature of each LED as described in the Measuring LED Junction Temperature section of this document.

Bottom View

Failure to ensure that the LED junction temperature is kept below it's maximum temperature rating will result in poor color rendering, early degradation of light output, and premature LED failure!

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Custom Colors

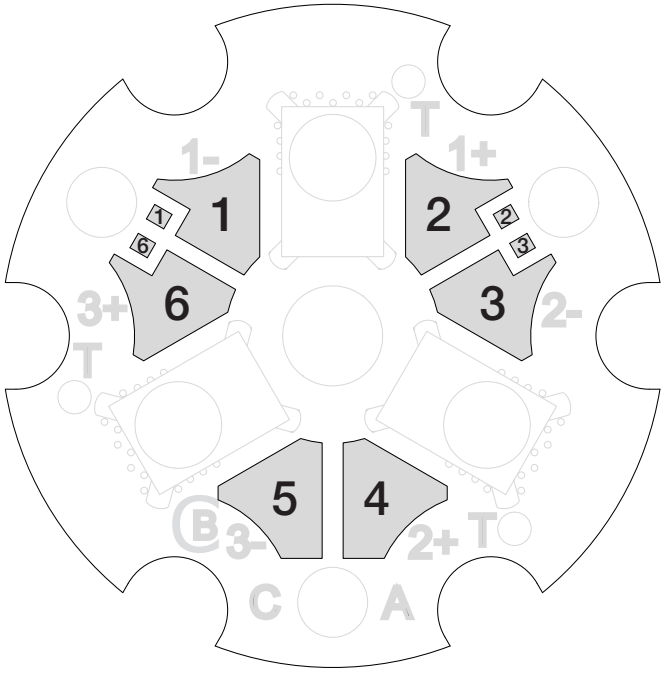
For a small customization fee, the SR-03 assembly can be supplied with any color combination of Rebel LEDs mounted to the base. Visit our website at www.luxeonstar.com/sr-03-custom for more information and to order.

Predefined Assemblies

Once a custom LED assembly has been ordered, the assembly will be assigned a permanent part number and will be available for re-order from our website as a predefined assembly with no customization fees, no minimum order requirements and with quantity discounts. Visit our website at www.luxeonstar.com/sr-03-predefined for a full list of currently available Predefined Assemblies.

Pad Connections

PAD No's	Connection
1	D1 - Cathode (-)
2	D1 - Anode (+)
3	D2 - Cathode
4	D2 - Anode
5	D3 - Cathode
6	D3 - Anode



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Series Operation

To power all of the LEDs simultaneously (series operation), apply solder dots or 0R resistors between the series configuration pads and connect a suitable current regulating driver and the A and C pads as shown in Image 1.

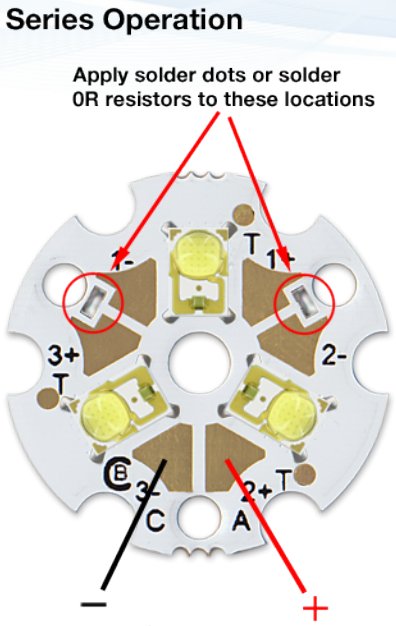

Image 1

Single Operation

To power and control each LED separately, simply connect a suitable current regulating driver to each pad as shown in Image 2.

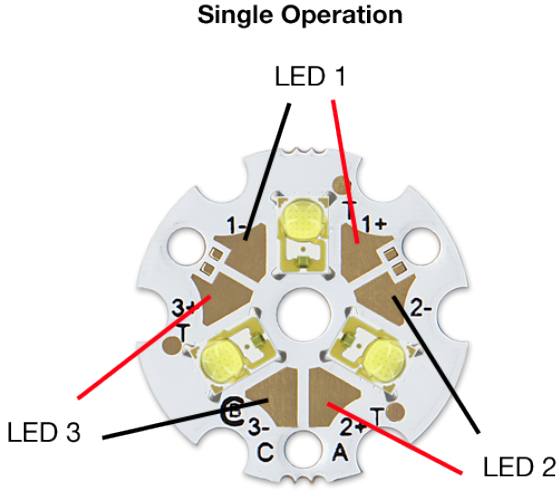

Image 2

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Measuring LED Junction Temperature

The junction temperature of each LED on the assembly must be tested to be sure it is being adequately cooled.

To make testing easy, each LED mounted on the SR-03 assembly includes a temperature test point that can be used to determine the LED junction temperature using the following procedure.

Required Tools

- Digital Multimeter
- Temperature measurement meter
- Thermocouple or thermistor with kapton tape and/or thermal adhesive epoxy

  - or -
- Hand held temperature measurement probe with a tip that is smaller than the temperature test pad on the LED assembly.

Test Procedure

1. Enter the LED Typical Thermal Resistance Junction to Thermal Pad (°C/W) $R\theta_{J\text{-}C}$ value from the Rebel LED datasheet into box **B** in the formula on page 7 of this document.
2. Ideally the temperature should be tested with the LED assembly mounted in the location where it will be operated.

   If the assembly will be in a difficult to reach location, then you will need to attach a thermocouple or thermistor to the assembly using kapton tape or Arctic Silver™ Thermal Adhesive epoxy so that the tip of the sensor is in direct contact with the temperature measurement point as shown in image 3. Be sure to allow the adhesive to fully cure and cool before testing. If the assembly is easily accessible, then you can use a hand held temperature probe to measure the test point temperature.

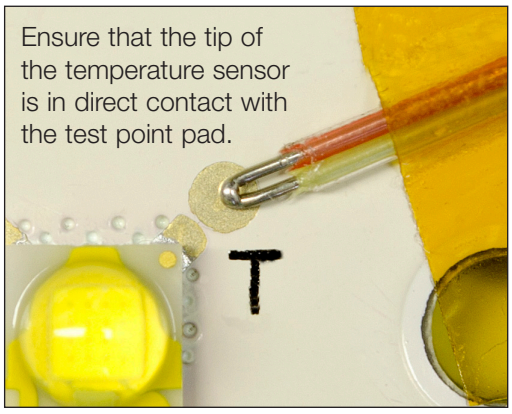

Image 3

Image 4

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3. If you are measuring the temperature with a hand held probe, hold the probe onto the temperature test point for at least 1 minute after the LED assembly has reached its stable operating temperature. (Image 5) Applying a small amount of OMEGATHERM© 201 High Thermal Conductivity Paste, or heat sink thermal grease to the pad and probe tip will help to ensure you get an accurate reading. (Image 6)

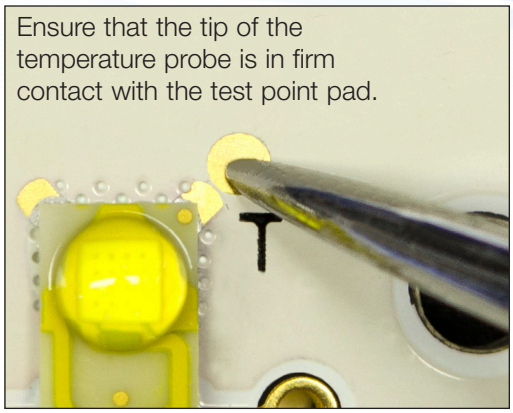


Image 5

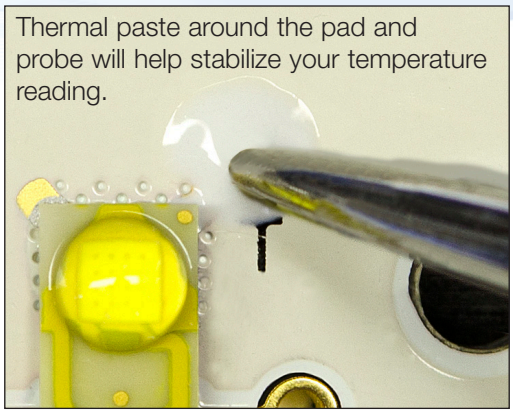
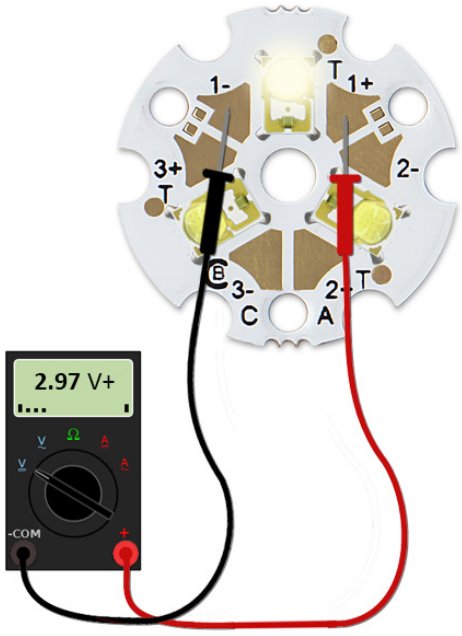


Image 6

4. Power up the LED assembly and allow the temperature to stabilize for at least 5 minutes.
5. After the temperature measurement has stabilized, note the test point temperature and enter it in box **A** on page 7.
6. Measure the voltage across the LED you are testing (image 7) and note it in box **C**.



Only measure the voltage across the LED you are testing.

Image 7

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7. Enter the current you are powering the LED at in box **D**.
8. Evaluate the completed formula to determine the junction temperature of the LED.

$$[A] + (1.5 + [B]) \times ([C] \times [D]) = [\ ]^{*}$$

A	B	C	D	
Test Point Temperature °C	$\Psi_{J\text{-}S}$ °C/W	$R\theta_{J\text{-}C}$	LED Forward Voltage V_f	LED Forward Current I_f	LED Junction Temperature °C

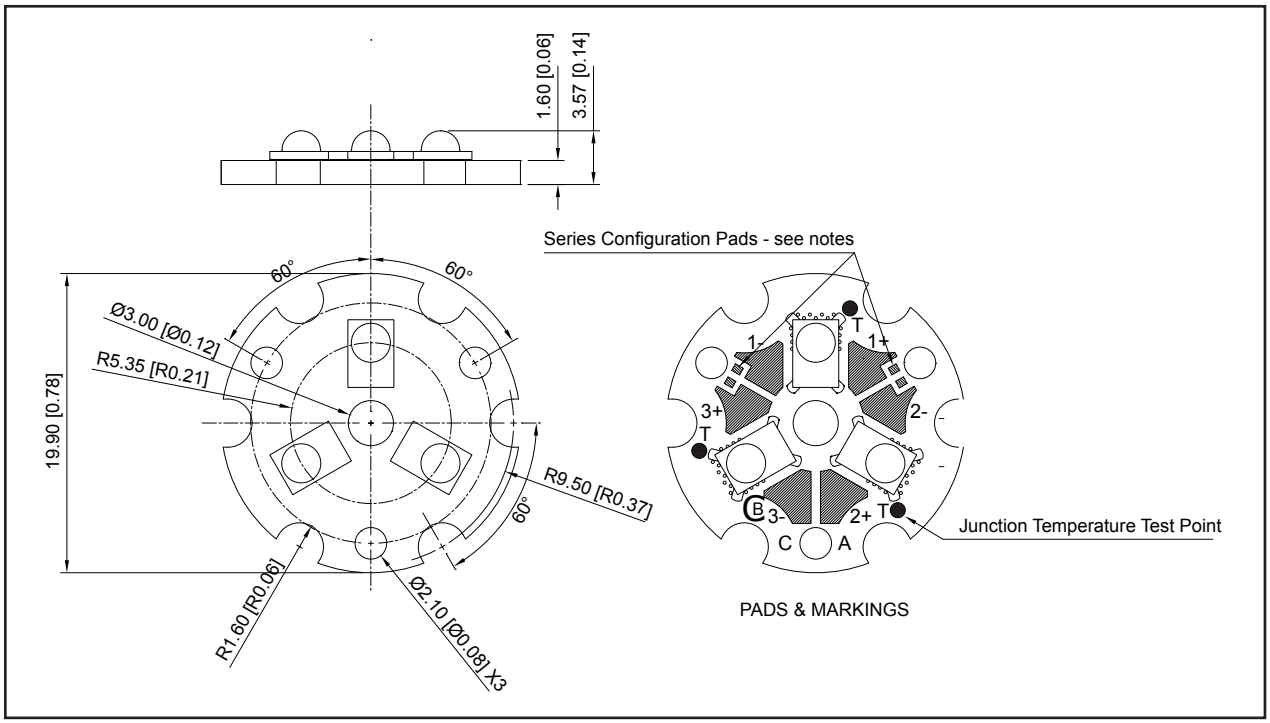
* For maximum LED life, color stability and reliability, the calculated junction temperature must always be at or below the temperature shown in the Max Rec1 Junction Temp °C column of the specification table on page 8 of this document.

More information about this junction measurement technique can be found in the LUXEON LED Thermal Measurement Application Brief (AB33) published by Philips Lumileds.

9. If you are powering all of the LEDs in series and the assembly is mounted to the center of a symmetrically shaped heat sink in open air, then it is typically only necessary to test a single LED to determine the junction temperature of all the LEDs.

   If you are powering the LEDs singly, or if the assembly is mounted to an unusually shaped heat sink, or will be used in an unusual operating environment, then you will need to test each LED to ensure that the junction temperature is below it's safe operating point.

Assembly Drawing



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Safety:

The LEDs mounted onto this assembly produce highly intense points of light. Do not stare directly at the LEDs for any length of time.

Restricted Use:

Products produced or sold by Quadica Developments Inc. are not certified for use as critical components in life support devices, systems, nor in medical operating room or life rescue equipment. A critical component is any component of a life support device, system or medical/rescue equipment whose failure to perform can be reasonably expected to cause failure or malfunction of the life support device, system or medical operating room/life rescue equipment.

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