

Overview

The SR-02 high brightness LED lighting module includes seven Rebel LEDs soldered to our 40mm round CoolBase. The LEDs can be connected in series or singly for full control of each LED making this module ideally suited for:

- **Flashlights**
- **Bicycle Lights**
- **Dive Lights**
- **Lightsabers**
- **Spot lighting**
- **Task Lamps**
- **Color tuned lighting**
- **Fiber optic illuminators**
- **Accent lighting**

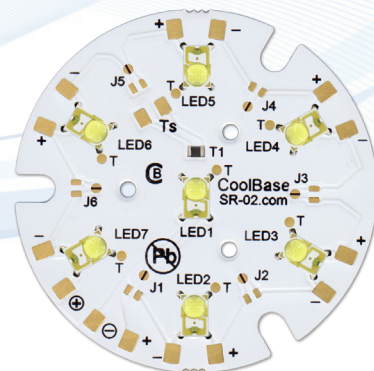
The FR4 CoolBase features a highly efficient thermal design that matches or outperforms* standard aluminium MCPCB bases. This can directly translate into:

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

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

A single Vishay NTC 10K Thermistor ([NTHS0805N02N1002J](#)) is mounted to the board for continuous monitoring and foldback temperature control.

SR-02 modules can be ordered directly from our website at www.luxeonstar.com/sr-02-7up.



Features:

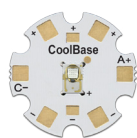
- LEDs can be configured for series or single operation
- Super efficient base design that matches or outperforms aluminium MCPCB bases
- Integrated thermistor for continuous temperature monitoring
- Available with all currently produced Rebel LEDs
- Custom modules can be ordered with any color combination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

Module 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)	40D x 3.6H
Weight	6.7g

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.



Power Drivers

[FlexBlock Wide Range DC Driver](#) - Ideally suited for powering all 7 LEDs connected in series from voltages as low as 10VDC.

[BuckPuck/PowerPuck Drivers](#) - Offers a variety of options for powering the SR-02 LEDs in parallel, series or parallel/series configurations.

Secondary Optics

The SR-02 module is compatible with Khatod and Polymer 7 LED optics available from the Luxeon Star LEDs website at:

www.luxeonstar.com/7-LED-Optics

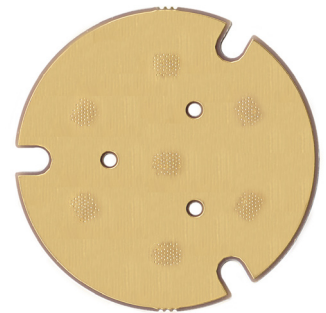
Mounting & Cooling

Use of this module 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.

For optimal cooling, we recommend that the module be mounted to a suitable heat sink (aluminum or copper) that is exposed to open air using a thermal interface material such as our [Bond-Ply® 100 pressure sensitive thermal tape](#) or [Arctic Silver™ thermal adhesive](#). The bottom of the LED module is electrically neutral, so it is not necessary to electrically isolate the LED base from the cooling surface.

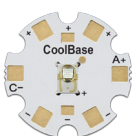
The SR-02 has three mounting points for #4 screws. If you are using adhesive tape as a thermal interface, then we recommend that the module also be fastened to the heat sink using three mechanical fasteners. Before fastening the module to the heat sink, ensure that the two mating surfaces are perfectly flat and clean in order to maximize heat transfer to the sink. Be careful not to warp or distort the base by over tightening the fasteners.

You need to confirm that the module 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 LED junction temperatures are kept below their maximum temperature rating will result in poor color rendering, early degradation of light output, and premature LED failure!



Custom Colors

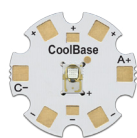
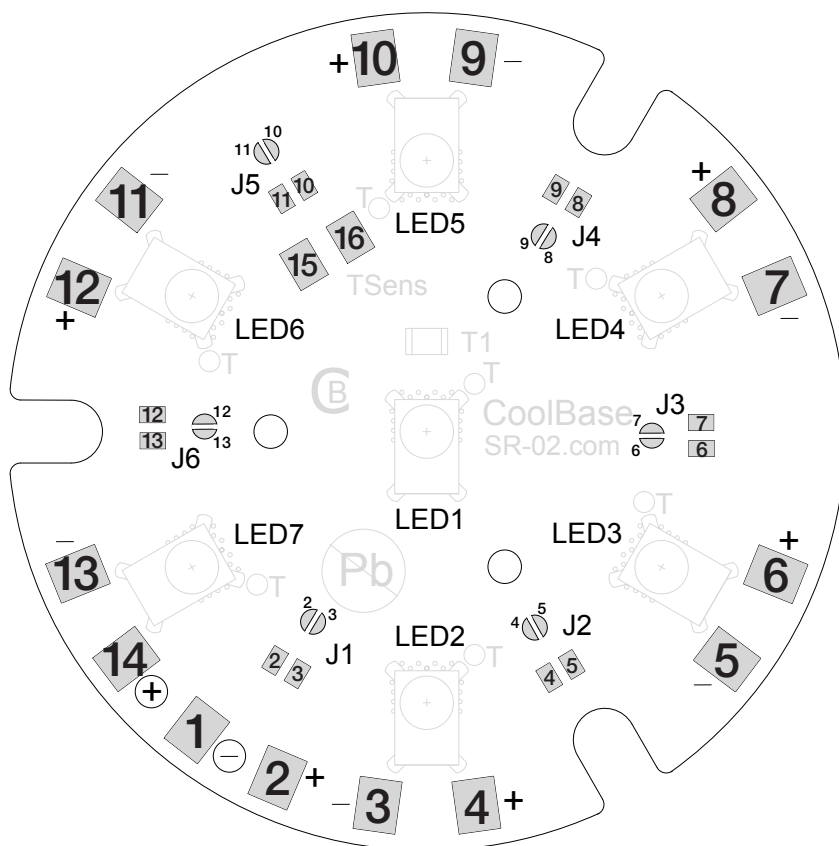
For a small customization fee, the SR-02 module can be supplied with any color combination of Rebel LEDs mounted to the base. Visit our website at www.luxeonstar.com/sr-02-custom for more information and to order.

Predefined Modules

Once a custom LED module has been ordered, the module will be assigned a permanent part number and will be available for re-order from our website as a predefined module with no customization fees, no minimum order requirements and with quantity discounts. Visit our website at www.luxeonstar.com/sr-02-predefined for a full list of currently available Predefined Modules.

Pad Connections

PAD No's	Connection
1	LED1 - Cathode (-)
2	LED1 - Anode (+)
3	LED2 - Cathode
4	LED2 - Anode
5	LED3 - Cathode
6	LED3 - Anode
7	LED4 - Anode
8	LED4 - Cathode
9	LED5 - Cathode
10	LED5 - Anode
11	LED6 - Cathode
12	LED6 - Anode
13	LED7 - Cathode
14	LED7 - Anode
15	TSens
16	TSens



Series Operation

To power all of the LEDs simultaneously (series operation), apply solder dots to the round series configuration pads (J1-J6). Connect a suitable current regulating driver to pad 14 (+) and pad 1 (-) as shown in Image 1.

Apply solder dots to J1-J6

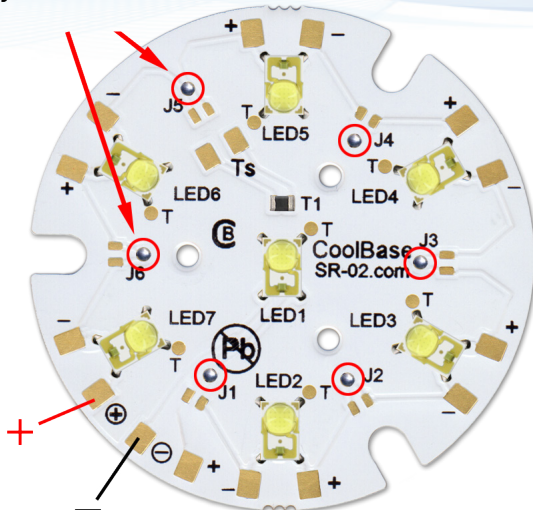


Image 1

Single Operation

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

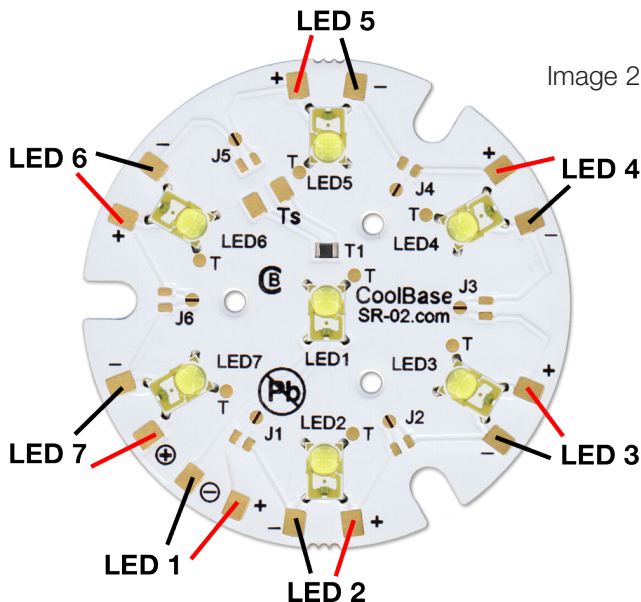
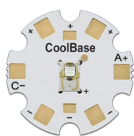


Image 2



Measuring LED Junction Temperature

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

To make testing easy, each LED mounted on the SR-02 module 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 module.

Test Procedure

1. Enter the LED Typical Thermal Resistance Junction to Thermal Pad ($^{\circ}\text{C/W}$) $R\theta_{J-C}$ 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 module mounted in the location where it will be operated.

If the module will be in a difficult to reach location, then you will need to attach a thermocouple or thermistor to the module 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 module is easily accessible, then you can use a hand held temperature measurement probe to measure the test point temperature.

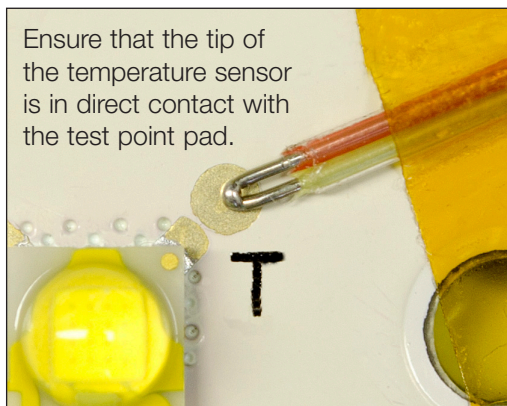
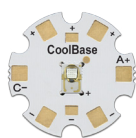


Image 3



Image 4



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 module 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)

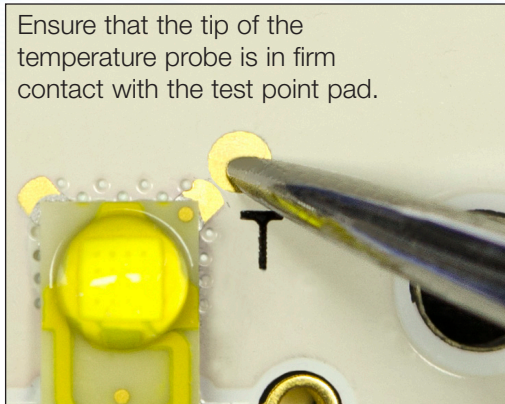


Image 5



Image 6

4. Power up the LED module 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**.

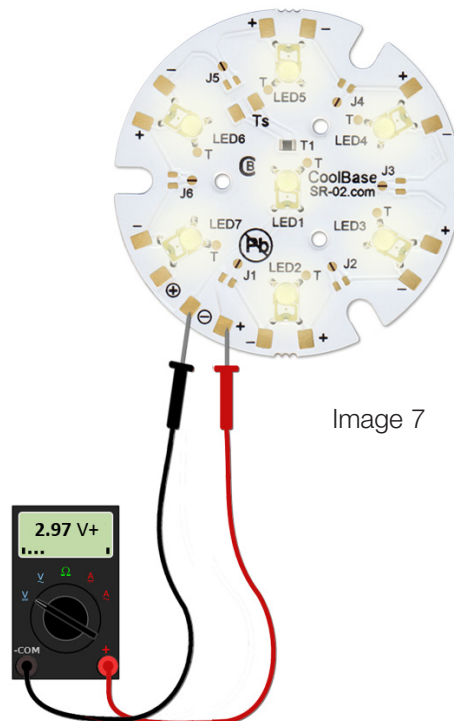
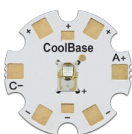


Image 7



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

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

Test Point Temperature °C	Ψ_{J-S} °C/W	$R\theta_{J-C}$	LED Forward Voltage V_f	LED Forward Current I_f	LED Junction Temperature °C
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* 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.

- If you are powering all of the LEDs in series and the module 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.

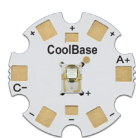
If you are powering the LEDs singly, or if the module is mounted to an unusually shaped heat sink, or will be used in an unusual operating environment, then you will need to test each LED to ensure that the junction temperature is below it's safe operating point.

Thermistor Temperature Measurement

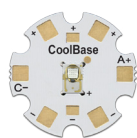
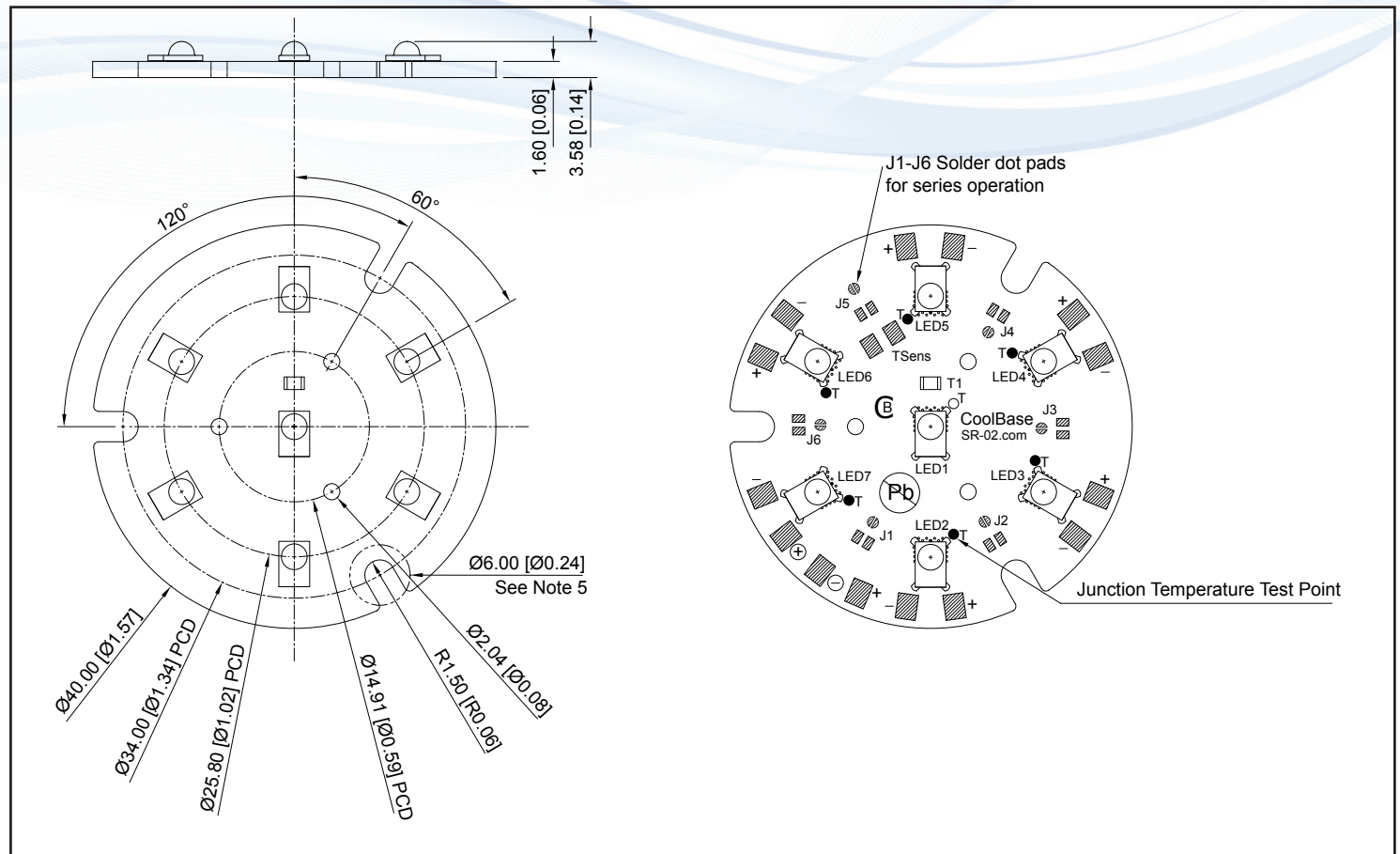
Every SR-02 module includes a single Vishay NTC 10K Thermistor ([NTHS0805N02N1002J](#)) mounted near the center of the board. This thermistor is intended for continuous monitoring of the module during operation and can be used as part of a foldback temperature control circuit to ensure that the module does not overheat.

The thermistor does not replace the need to ensure that each LED is being adequately cooled by using the previously described test procedure. It is only intended to be used for in situ monitoring of the entire LED module.

For details on how to measure the board temperature using the thermistor, please refer to our [Onboard Thermistor Temperature Measurement Application Note](#).



Module Drawing



Safety:

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

Restricted Use:

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