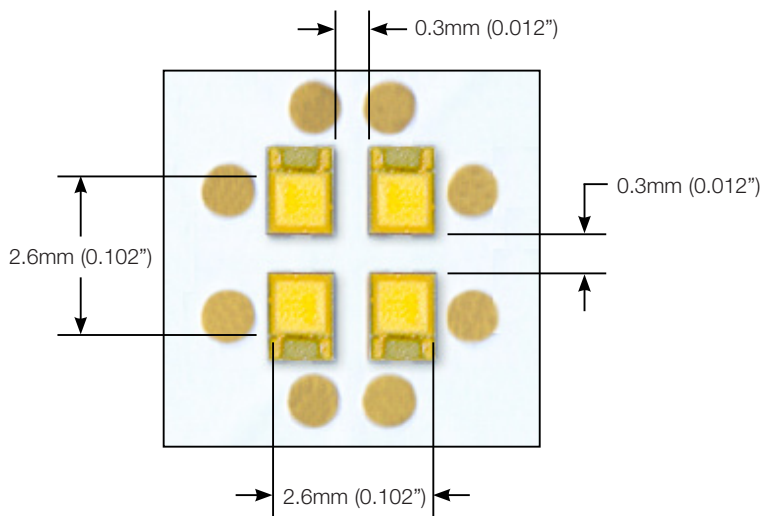
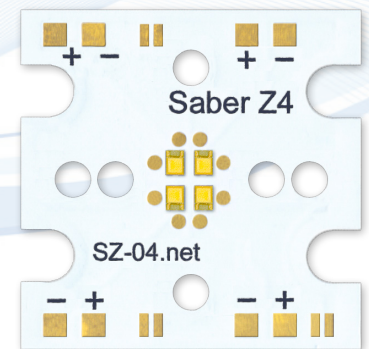


The Saber Z4 Color Mixing Array features four tightly spaced LUXEON™ Z LEDs reflow soldered to a **20mm (0.8") square aluminum board**.

This ready-to-use color mixing LED module can be ordered with **any color combination of LUXEON™ Z LEDs, including a selection of UV LEDs**.

The LEDs can be powered separately or in series with the creation of solder bridges between three series connection pads. The Saber Z4 Color Mixer can be worked with using standard bench top tools and hand soldering techniques. This opens up new opportunities for Makers, R&D, MRO and low & medium volume OEM manufacturers to use the super small series of LUXEON™ Z LEDs in color mixing applications without the need for specialized pick and place equipment or reflow soldering.



The four LUXEON™ Z LEDs are tightly positioned into a **2.6mm square emitting array**, providing the designer with ultimate flexibility in creating a fully customized, highly efficient color mixing array with a small optical light source.

The Saber Z4 color mixer has been designed to precisely position a wide variety of LUXEON™ Z compatible secondary optics over the LEDs.

Features

- **Small emitting array** is fully customizable with any color combination of LEDs, including a selection of UV wavelengths.
- Can be worked with using **standard benchtop tools**.
- Designed to accurately position the secondary optic over the LED array.
- Small size accommodates tight locations.
- Can be mounted with thermal tape or thermally conductive epoxy
- **No minimum** order requirement.
- **RoHS compliant**
- **Pb free** reflow soldered

Benefits

- Create densely packed LED designs
- Create color mixing LEDs in any quantity
- Opens up new design possibilities
- Provides precise positioning of secondary optics

Module Specifications

Parameter	Value
Base Type	1.6mm MCPCB Aluminum
Thermal Performance $R\theta_{C-B}$ <small>From the LED thermal pad to the bottom of the aluminium base</small>	2 °C/W
Pad Finish	Immersion Gold
Solder Mask Color	White
Solder Paste	AIM NC-258 No-Clean, Lead-Free
Max Operating Temperature (Aluminum Base) ¹	120°C
Overall Dimensions (mm)	20L x 20W x 2.56H (The height is dependent on LED type. See drawing for details.)
Weight	1.5g (Not including the carrier tab)

1. For maximum life, the aluminum board temperature must be kept below this value.
For LED specifications, please refer to the Philips Lumileds Rebel LED datasheet.

Power Drivers

The choice of power driver will depend on the Rebel LED that is mounted to the base, desired lumens output, the number of LEDs being powered, the input voltage source, and the drive current. For help with selecting and using LED power drivers, visit our online support center at www.luxeonstar.com/support.

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 Saber Z4 has been specifically designed to precisely position the following optics over the LUXEON™ Z LED:

- [Carclo - 20mm Pegged Feet Optic Holders](#)
- [Ledil - Lisa2 Round Pin Leg Optics](#)
- [Khatod - Color Mixing Optics for LUXEON Z LEDs](#)

For more information about all of optics currently available on our website, please go to: www.luxeonstar.com/optics.

Mounting & Cooling

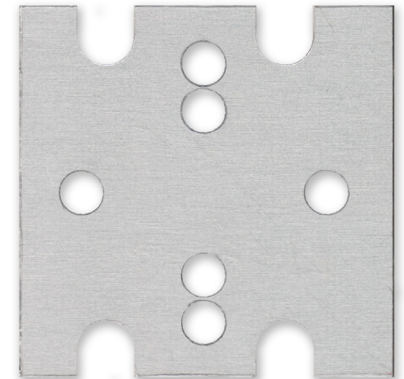
Use of this module requires careful attention to mounting and cooling to ensure that the junction temperature of the LED is kept well below the maximum rating as specified in the LED documentation published by Philips Lumileds.

For optimal cooling, we recommend that the module be mounted to a suitable finned heat sink (aluminum or copper) that is exposed to open air. The module can be mounted to the heat sink in one of two ways:

- [pressure sensitive, thermally conductive tape](#)
- [thermally conductive adhesive](#)

The bottom of the LED module is electrically neutral, so it is not necessary to electrically isolate the base from the cooling surface.

Once mounted, you need to confirm that the module is being adequately cooled by testing the temperature of the LED as described in the Measuring LED Junction Temperature section of this document.



Bottom View

LED Mounting Using Pressure Sensitive Thermal Tape

Pressure sensitive thermal tape such as our [pre-cut Bond-Ply® 100 tape](#) makes it easy to fasten the base directly to a heat sink without the need for screws, clip mounts, or fasteners. However in order to ensure a sound thermal bond, it is very important that the tape be used correctly. This includes:

- Ensuring that all mating surfaces are clean, totally flat and free of voids
- Sizing and positioning the tape so that all mating surfaces are covered
- Applying a minimum of 10 PSI of even pressure between the LED and heat sink for at least 30 seconds

Applying even pressure to bond the LED module to the heat sink can be difficult due to the small size of the module and the need to avoid touching or applying any pressure to the LED optic. To overcome this problem, we include a thermal press with our pre-cut thermal tape. This press has been specifically designed to allow you to apply even, constant pressure to the module and heat sink, without touching the LED itself. A video that demonstrates how to properly apply pressure sensitive thermal tape and use a thermal press is available at www.luxeonstar.com/using-thermal-tape.

If pressure sensitive thermal tape is used correctly, there is no need to use any additional mechanical fasteners.

LED Mounting Using Thermally Conductive Adhesive

Thermally conductive adhesive such as [Arctic Silver™ Thermal Adhesive](#) requires a bit more effort to use than thermal tape, but offers a permanent bond, wider operating temperature range, and higher reliability, especially in environments where the module will be subjected to mechanical shock and vibration.

To create a thermally efficient and reliable bond:

- Ensure that all mating surfaces are clean and free of any grease or oil
- Use just enough epoxy to create as thin a bond line as possible
- Apply as much pressure as possible between the LED and heat sink for at least 30 seconds, and then maintain pressure using a clamp or weight until the epoxy has set

Like our thermal tape, we include a thermal press with every order of the Arctic Silver Thermal Adhesive to make it easier to create a sound bond. A video that demonstrates how to properly use the Arctic Silver Thermal Adhesive and a thermal press is available at www.luxeonstar.com/using-arctic-silver.

Mechanical Fasteners Cannot Be Used

The Saber Z4 is not designed to be fastened to the heat sink using mechanical fasteners.

Connections

PAD No	Connection
1	D1 - Anode (+)
2	D1 - Cathode (-)
3	D1 - Cathode
4	D2 - Anode
5	D2 - Anode
6	D2 - Cathode
7	D2 - Cathode
8	D3 - Anode
9	D3 - Anode
10	D3 - Cathode
11	D3 - Cathode
12	D4 - Anode
13	D4 - Anode
14	D4 - Anode

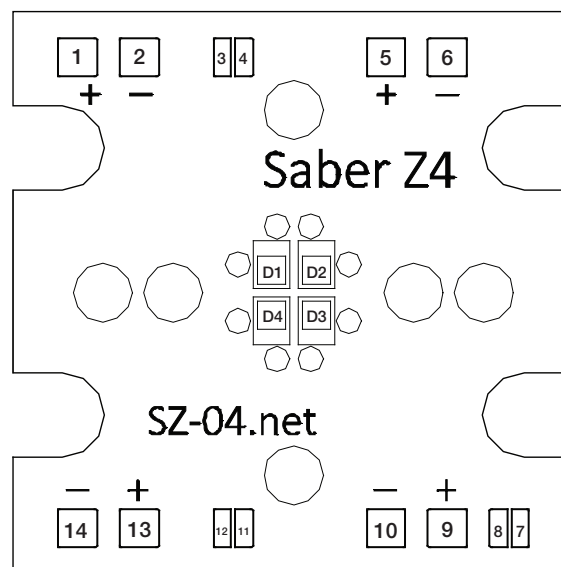
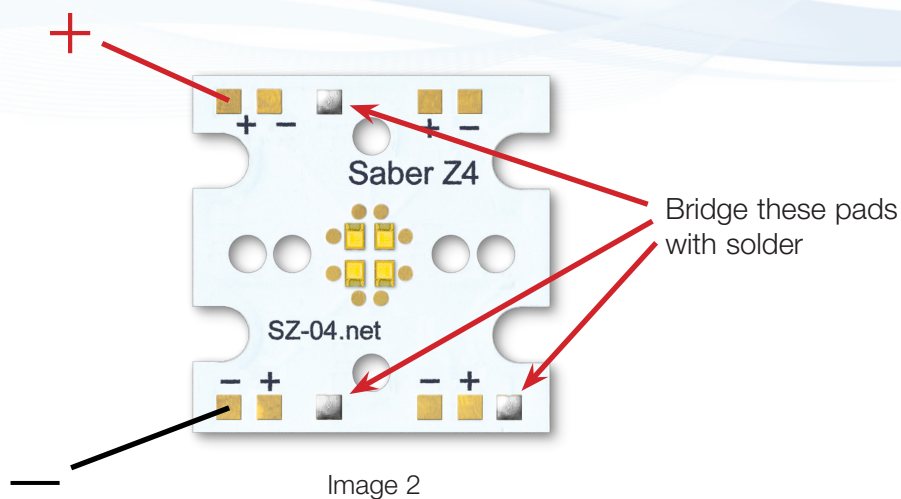


Image 1

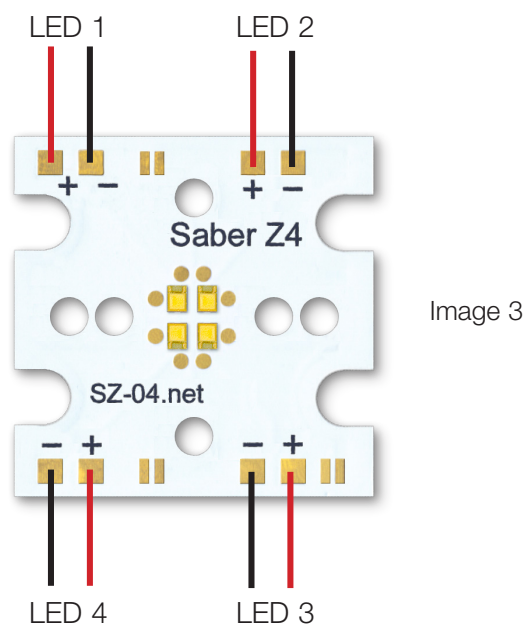
Series Operation

To power all of the LEDs simultaneously (series operation), bridge the series configuration pads with solder and connect a suitable current regulating driver to the + and - pads as shown in Image 2.



Parallel (Single) Operation

To power and control each LED separately, simply connect a suitable current regulating driver to each pad as shown in Image 3.



Custom Colors

The Saber Z4 can be ordered with any color combination of Rebel LEDs. There is no minimum order requirement or additional fees. To order a custom Saber Z4, visit our website at:

www.luxeonstar.com/sz-04

Measuring LED Junction Temperature

The junction temperature of the LED must be tested to ensure it is being adequately cooled.

To make testing easy, the Saber Z4 includes a temperature test points that can be used to determine the LED junction temperature using the following procedure.

For more details, refer to the Thermal Model on page 8 of this document.

Required Tools

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

Test Procedure

1. Enter the LED Typical Thermal Resistance Junction to Thermal Pad ($^{\circ}\text{C}/\text{W}$) $R\theta_{J-C}$ 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's location will be difficult to reach, 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 Images 4 & 5. Be sure to allow the adhesive to fully cure before testing.

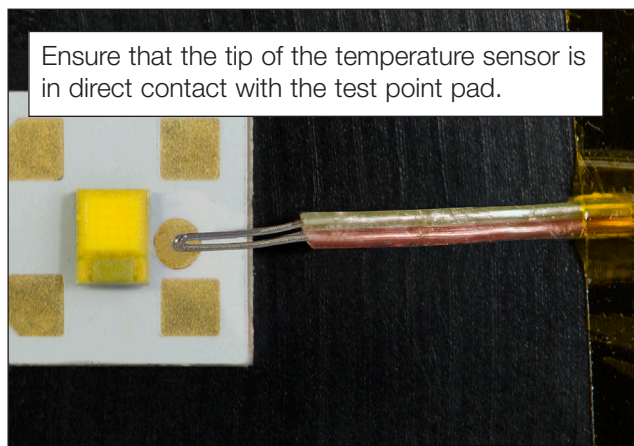


Image 4

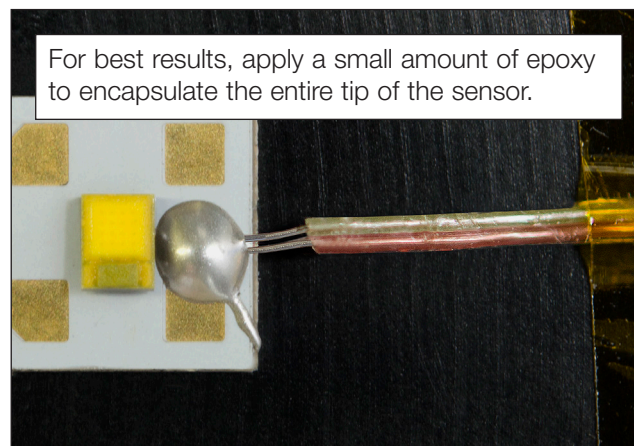


Image 5

- After the temperature measurement has stabilized, note the test point temperature and enter it in box **A** below.
- Measure the forward voltage of the LED while at the stabilized temperature (Image 6) and note it in box **C**.
- Enter the current, which you are using to power the LED, in box **D**.
Evaluate the completed formula to determine the junction temperature of the LED.

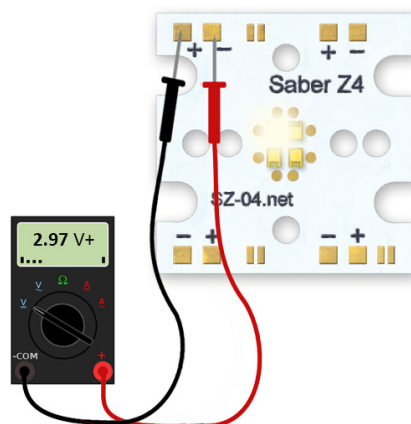


Image 6

$$\boxed{A} + \left(5 + \boxed{B} \right) \times \left(\boxed{C} \times \boxed{D} \right) = \boxed{}^*$$

Test Point T_s
 $R\theta_{C-S}$
 $R\theta_{J-C}$
LED Forward
LED Forward
LED Junction
Temperature °C
Voltage V_f
Current I_f
Temperature °C

* For maximum LED life, color stability and reliability, the calculated junction temperature must always be below the maximum LED junction temperature published in the Philips Lumileds datasheet for LUXEON™ Z LEDs.

- 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.
More information about how to determine the junction temperature for single and multiple LED arrays can be found in the [Assembly and handling information Application Brief \(AB105\)](#) published by Lumileds.

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!

Thermal Model

Image 7 is a cross section of a typical LUXEON™ Z LED module that illustrates how the LED is attached to the aluminium base and shows the thermal paths between the LED junction, temperature test point and bottom of the LED module.

- $R\theta_{J-C}$ is the thermal resistance from the LED junction (T_j) to the LED thermal pad
- $R\theta_{C-S}$ is the thermal resistance from the LED thermal pad to the temperature test point (T_s)
- $R\theta_{C-B}$ is the thermal resistance from the LED thermal pad to the bottom of the module

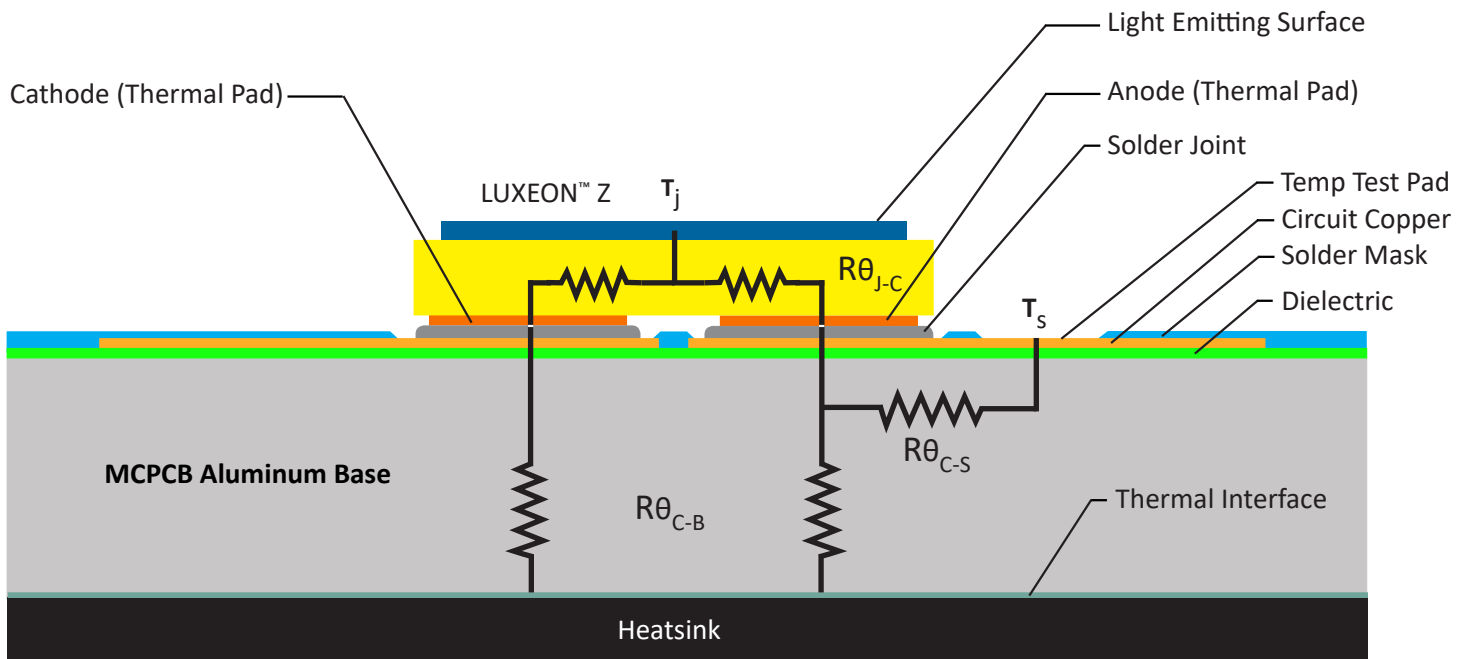
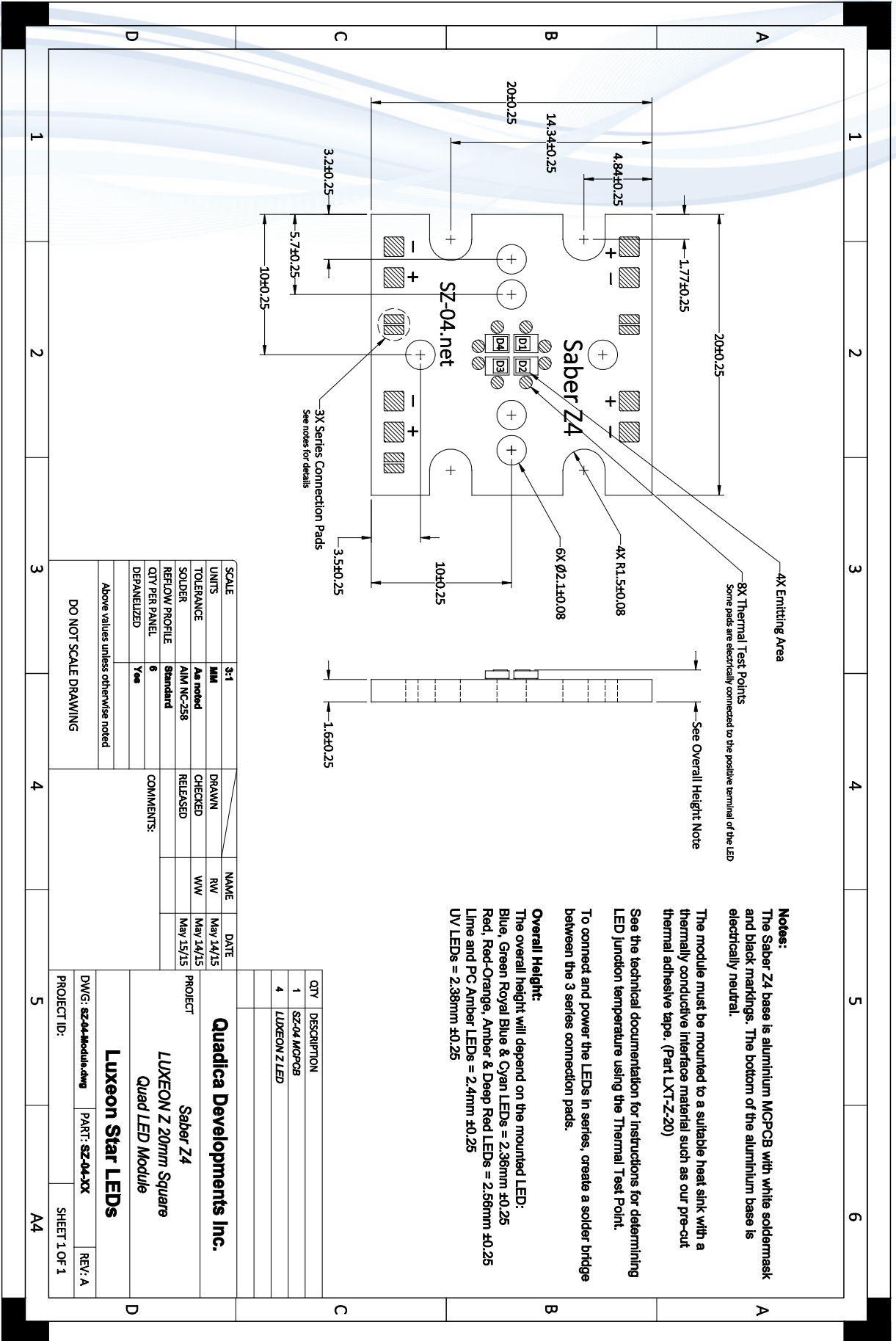


Image 7



Notes:
 The Saber Z4 base is aluminum MCPCB with white soldermask and black markings. The bottom of the aluminum base is electrically neutral.
 The module must be mounted to a suitable heat sink with a thermally conductive interface material such as our pre-cut thermal adhesive tape. (Part LXT-Z-20)

See the technical documentation for instructions for determining LED Junction Temperature using the Thermal Test Point.
 To connect and power the LEDs in series, create a solder bridge between the 3 series connection pads.

Overall Height:
 The overall height will depend on the mounted LED:
 Blue, Green Royal Blue & Cyan LEDs = 2.36mm ±0.25
 Red, Red-Orange, Amber & Deep Red LEDs = 2.56mm ±0.25
 Lime and PC Amber LEDs = 2.4mm ±0.25
 UV LEDs = 2.38mm ±0.25

SCALE	3:1	NAME		DATE	
UNITS	MM	DRAWN	RW	MAY 14/15	
TOLERANCE	As noted	CHECKED	WW	MAY 14/15	
SOLDER	AIM NC-258	RELEASED		MAY 15/15	
REFLOW PROFILE	Standard	COMMENTS:			
QTY PER PANEL	6				
DEPANELIZED	Yes				
Above values unless otherwise noted					
DO NOT SCALE DRAWING					

QTY	DESCRIPTION
1	SZ-04 MCPCB
4	LUXEON Z LED

Quadica Developments Inc.			
PROJECT		Saber Z4	
LUXEON Z 20mm Square		Quad LED Module	
Luxeon Star LEDs			
DWG: SZ-04-Module.dwg	PART: SZ-04-XX	REV: A	
PROJECT ID:		SHEET 1 OF 1	A4

You can download the full sized drawing from www.luxeonstar.com/SZ-01-drawing.pdf

Safety:

The LED mounted onto this module will produce a highly intense point of light. Do not stare directly at the LED for any length of time.

Restricted Use:

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