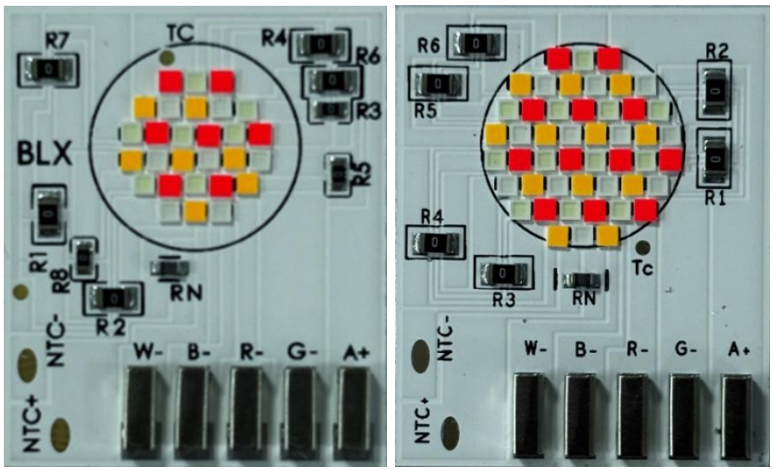
Introduction

The purpose of this document is to provide useful and important guidance to ensure the best outcomes using Bridgelux Vesta Series RGBW Array. The target audience for this Application Note is designers, engineers, and specifiers who contribute to the success of a product's design and launch. This document is principally focused on:

- Bridgelux Vesta Series RGBW Array Product Family
- Bridgelux Vesta Series RGBW Array Product Dimension
- Handling Guide
- Wiring Guideline
- Connector Wiring Guideline
- Selection Guide
- Current Ratio for Tunable White Guide
- Thermal Management Guidelines
- ESD Prevention
- Chemical Compatibility
- Disclaimer
- About Bridgelux



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Bridgelux Vesta Series RGBW Array Product Family

Vesta Series RGBW Array Product family information

For full parameters, refer to datasheets DS591, DS592, DS1800 and DS1801.

Bridgelux Vesta Series RGBW Array Product Dimension

RGBW D10 Series

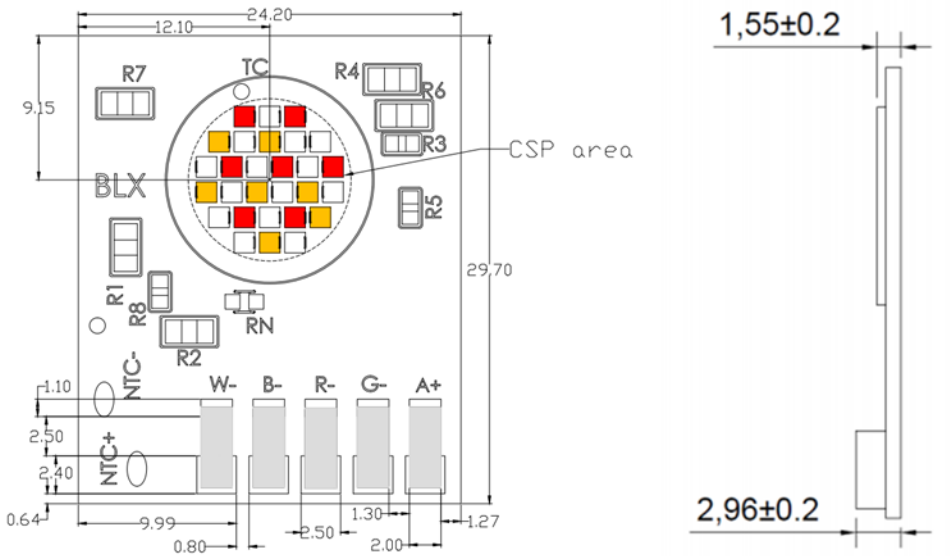

Figure 1: RGBW D10 Series Dimension in millimeter

RGBW D13 Series

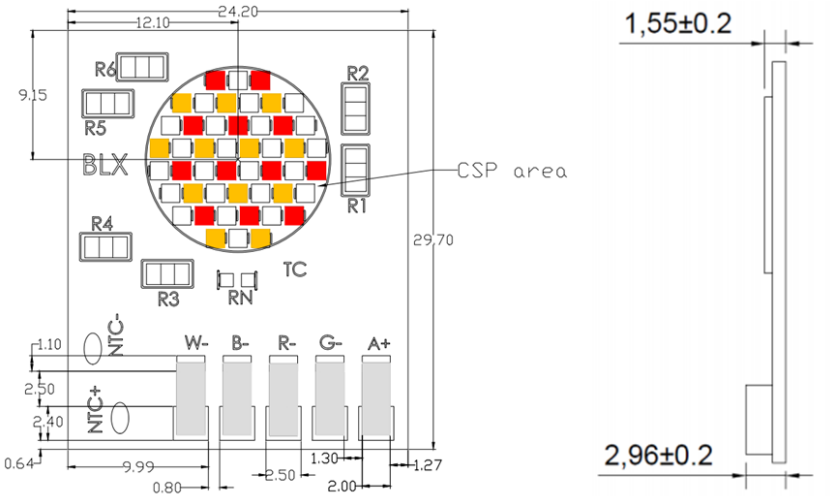

Figure 2: RGBW D13 Series Dimension in millimeter

Handling Guide

CAUTION: CONTACT WITH OPTICAL AREA

Avoid any contact with the optical area. Do not touch the optical area of the LED array or apply stress to the CSP area. Contact may cause damage to the LED array.

Optics and reflectors must not be mounted in contact with the CSP area. Optical devices may be mounted on the top surface of the plastic housing of the LED array. Use the mechanical features of the LED array housing, edges and/or mounting holes to locate and secure optical devices as needed.

Bridgelux LED Arrays are packaged for volume shipment in trays of various sizes. Low volume sample shipments may be packaged using other methods. To manually remove the LED Arrays simply lift the LED Arrays from the tray by gripping the white plastic portion of the LED Arrays module. The trays come with notched areas around the array that accommodate fingers for grabbing the arrays from the sides. Figure 3 illustrates a suitable method of removing the Bridgelux LED Arrays modules from the shipping tray.

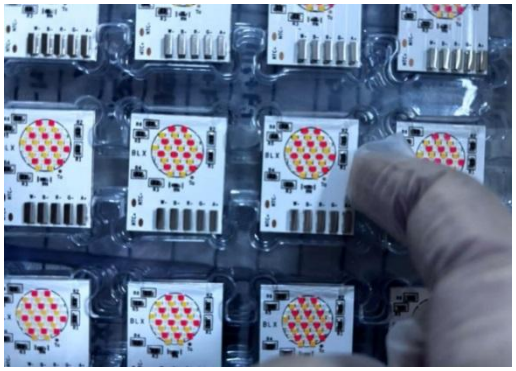

Figure 3: Removal of an LED Array from the tray

If debris contacts the resin, gently remove it by rinsing it with isopropyl alcohol (commonly called rubbing alcohol).

If pick-and-place equipment is used for automated assembly, the vacuum collet should be designed so as to avoid contact on the CSP area. Contact with the outer plastic is acceptable

Pick up Tools

Sharp tools are strictly prohibited from being used on the CSP in the light-emitting area, and strong external force must not be applied to it.

Handling

Handle the parts with care. It is recommended to wear finger cots or gloves to prevent dirt or other contaminants from adhering to the LED array (see Figure 4 and 5). Bridgelux LED Arrays modules are optical devices. Please ensure that nothing comes into contact with the Light Source Area, as this may adversely affect performance.

Although use of a clean room is not required, the environment in which the LED array are assembled should be clean, avoiding dust and particles which may adhere to the resin area of the Vesta Series RGBW Array With CSP.

LED array have passed ESD testing to levels which do not require special handling for most assembly processes. However, to prevent inadvertent damage, Bridgelux recommends using appropriate ESD grounding procedures while handling the Vesta Series RGBW Array With CSP.

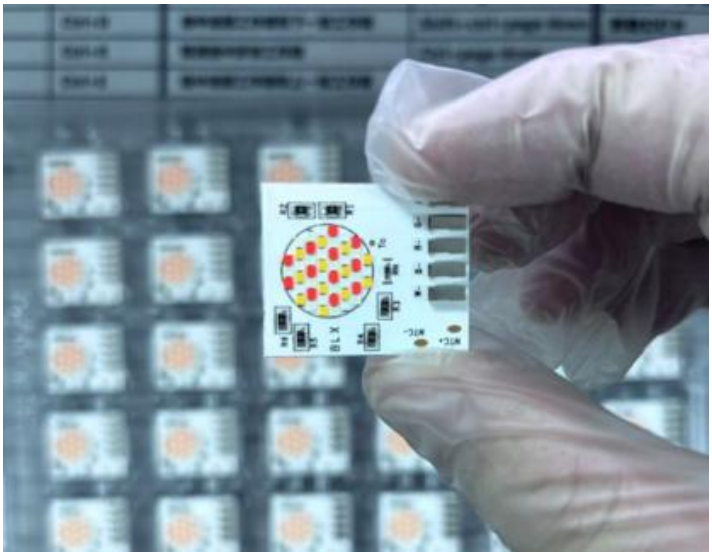

Figure 4: Wear gloves or finger cots when handling LED Arrays modules from the plastic portion of the module

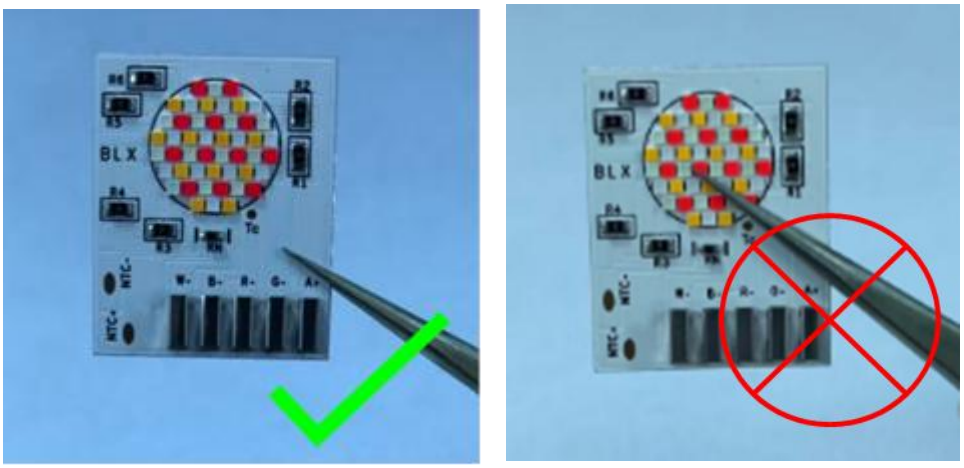

Figure 5: Proper handling of the LED array using fingers and tweezers

Wiring Guideline

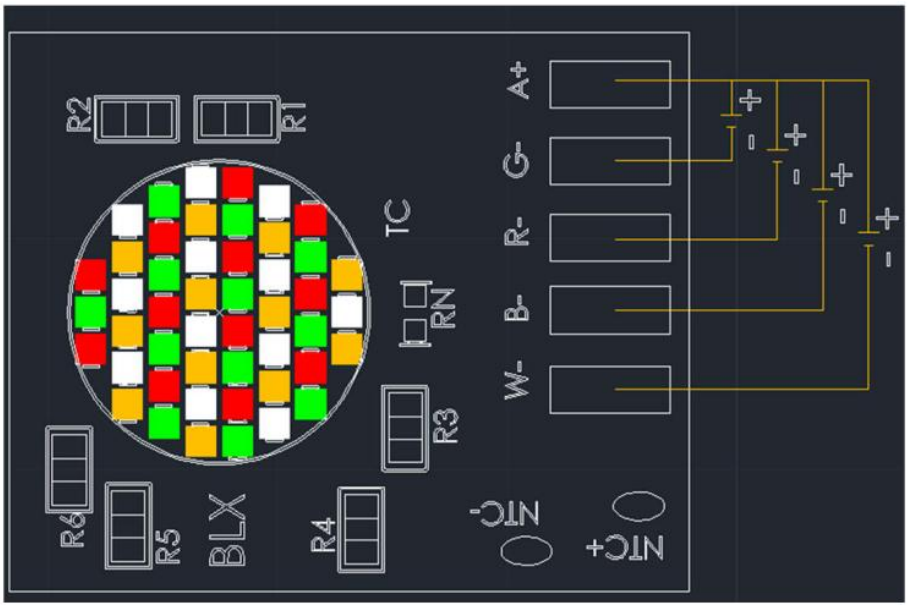

Figure 6: Wiring Diagram

Connector Wiring Guideline

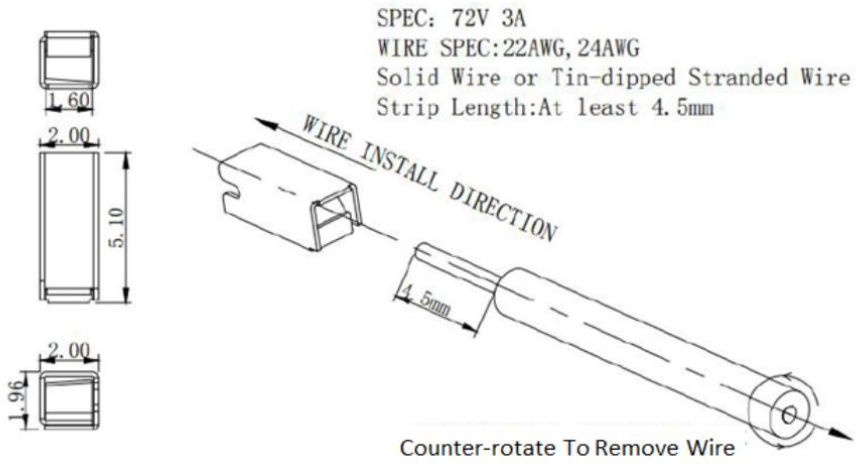

Figure 7: Connector Wiring Guideline

Selection Guide

Vesta Series RGBW Array Product family Tunable White information

For full parameters, refer to datasheets DS591, DS592, DS1800 and DS1801.

Current Ratio for Tunable White Guide

Reference Current Ratio for Tunable White with BBL

For full parameters, refer to datasheets DS591, DS592, DS1800 and DS1801.

Bridgelux provides reference current ratio, and customer needs to fine tune & finally fix it based on actual fixture operation condition.

Thermal Management Guidelines

This part provides general guidelines for how to characterize the junction temperature of Bridgelux Vesta Series RGBW Array With CSP in order to verify that the junction temperature in the actual application during regular operation does not exceed the maximum allowable temperature specified in the datasheet. The typical thermal resistance $R_{th\ j\text{-}sp}$ between the junction and the solder point for Vesta Series RGBW Array With CSP is specified in Bridgelux Vesta Series RGBW Array With CSP product datasheets. The junction temperature Tj can be characterized according to the following equation:

$$T_j = T_{sp} + R_{thj\text{-}sp} \bullet P_e$$

In the equation, Pe is the electrical power operating in product component and Tsp is the temperature at the bottom of the product solder point.

In actual applications it is hard to measure the solder point temperature Tsp directly. Therefore, a practical way to characterize the product LED junction temperature is by measuring the temperature Tc of a monitor pad on the PCB close to the product with a thermocouple. The junction temperature can then be calculated as follows:

$$T_j = T_c + R_{thj\text{-}sp} \bullet P_e$$

To ensure accurate readings of Tc, the Tc monitor pad should be set as close as possible to the product component. See Figure 8.

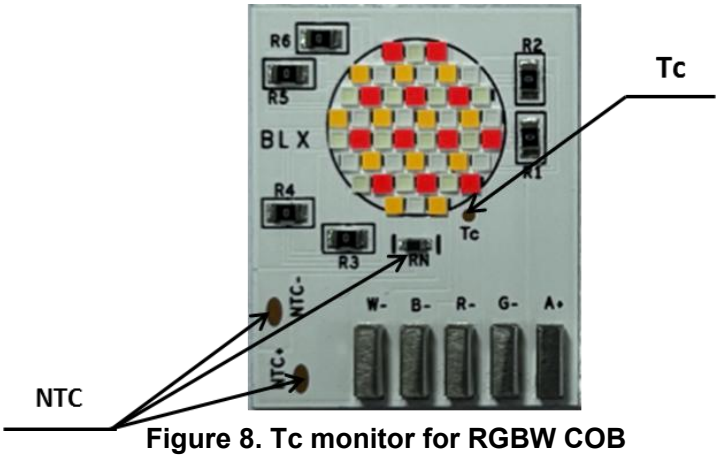

Figure 8. Tc monitor for RGBW COB

To ensure timely monitoring and get accurate readings of Tc, Bridgelux suggests integrating NTC thermal resistance for high density module application. The temperature in the emitter center area is much higher than that of emitter outer area, thus there should be reserve buffer to up-limiting Tj of Vesta Series RGBW Array With CSP for high density module design.

ESD Prevention

Bridgelux Vesta Series RGBW Array With CSP have passed ESD testing to levels which do not require special handling for most assembly processes. However, to prevent inadvertent damage, Bridgelux recommends using appropriate ESD grounding procedures while handling the modules.

According to the ESD Association out of Rome, New York, there are six basic principles in the development and implementation of effective ESD control programs:

1. Design in protection by designing products and assemblies to be as robust as reasonable from the effects of ESD.
2. Define the level of control needed in your environment.
3. Identify and define the electrostatic protected areas (EPAs), the areas in which you will be handling ESD sensitive parts (ESDS).
4. Reduce Electrostatic charge generation by reducing and eliminating static generating processes, keeping processes and materials at the same electrostatic potential, and by providing appropriate ground paths to reduce charge generation and accumulation.

5. Dissipate and neutralize by grounding, ionization, and the use of conductive and dissipative static control materials.
6. Protect products from ESD with proper grounding or shunting and the use of static control packaging and material handling products.

Chemical Compatibility

To optimize performance and reliability of a lighting system using Vesta Series RGBW Array With CSP Array, standardized operating procedures shall be followed, and suitable manufacturing processes as well as materials shall be selected during the assembly of COB into the lighting systems. Careful consideration must be given to the compatibility between the involved materials and chemicals both in the processing stage and during the selection of all materials incorporated into the finished luminaires. This section provides a list of commonly used chemicals that should be avoided or strictly controlled during the processing and subsequent application of all Bridgelux COB components.

Silicone encapsulation is commonly used by most LED manufacturers, including Bridgelux. The silicone encapsulation is permeable to gas molecules. The gas molecules, including volatile organic compounds (VOC's), halogen and sulfur compounds, can interact with silicone and other components that compromise the Bridgelux Vesta Series RGBW Array With CSP and cause degradation in performance. The possibility and extent of degradation is dependent on the type of chemical, the concentration of the chemical, the temperature during exposure, and the length of time the COB is exposed to the chemical. Additional considerations should be given to IP rated or "sealed" luminaires that create "air tight environments" around the module. Luminaires sealed in this fashion can trap potentially damaging gas molecules from manufacturing processes or subsequent out-gassing of materials used in the luminaire which can result in long term exposure of the COB to the contaminant.

The source of the gas molecules can be out-gassing from polymeric materials such as glues, gaskets, paints and/or under-cured materials. Materials used inside a luminaire with a potential to outgas should be characterized as part of the luminaire design to understand the environment that will be surrounding any Bridgelux COB during the luminaire lifetime. The silicone encapsulation is also vulnerable to nonpolar fluids and solvents commonly used during the manufacturing process of the luminaire such as cleaning, oil assisted drilling, and any processes that would allow the COB to come into contact with the fluids or solvents. Care should be taken such that the Vesta Series RGBW Array With CSP are protected from such chemicals to avoid ingress of small non-polar molecules into the encapsulation silicone.

Common chemicals that are known to be harmful to Bridgelux Vesta Series RGBW Array With COB are listed in Table 4. Note that the chemicals listed in Table 4 may be found in various states – liquid, gas, and/or solid. All physical states of these chemicals can be harmful to the COB, but those that are in a gaseous state, such as volatile organic compounds (VOCs), can readily permeate the lens material of the module and damage the COB internally and/or externally. Because it is impossible to determine all of the chemicals that may be detrimental to the performance of the Bridgelux Vesta Series RGBW Array With CSP, the list of chemicals may not be exhaustive. It is the responsibility of the luminaire manufacturer to ensure that any and all materials used in the luminaire design or manufacturing process does not cause damage to the subsystems.

Table 4: List of known chemical contaminants and likely sources

Classification	Chemical Name	Found In Some
Acids	Hydrochloric Acid Sulfuric Acid Nitric Acid Phosphoric acid	Cleaners, cutting fluids
Organic acids	Acetic acid	RTV silicones, cutting fluids, degreasers, adhesives
Bases	Sodium Hydroxide Potassium hydroxide Amines	Detergents, cleaners
Organic Solvents	Ethers such as glycol ether Ketones such as MEK, MIBK Aldehydes such as formaldehyde	Cleaners, mineral spirits, petroleum, paint, gasoline
Aromatic solvents	Xylene Toluene Benzene	Cleaners
Low Molecular Weight Organics Volatile Organic Compounds (VOC's)	Acetates Acrylates Aldehydes Dienes	Superglue, Loctite adhesives, threadlockers and activators, common glues, conformal coatings
Petroleum Oils	Liquid hydrocarbons	Machine oil, lubricants
Non-petroleum Oils	Siloxanes, fatty acids	Silicone oil, lard, linseed oil, castor oil
Oxidizers/Reducers	Sulfur compounds	Gaskets, paints, sealants, petroleum byproducts
Halogen compounds	Cl, F,or Br containing organic and inorganic compounds	Solder fluxes/pastes, flame retardants

Disclaimer

This application note has been prepared to provide guidance on the application of Bridgelux Vesta Series RGBW Array With CSP in customer products. Bridgelux provides this information in good faith, but does not assume any responsibility or liability for design deficiencies that might exist in the design based on the information contained in this document.
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It is the responsibility of the customer to ensure that their design meets all necessary requirements and safety certifications for its intended use.

About Bridgelux

At Bridgelux, we help companies, industries and people experience the power and possibility of light. Since 2002, we’ve designed LED solutions that are high performing, energy efficient, cost effective and easy to integrate. Our focus is on light’s impact on human behavior, delivering products that create better environments, experiences and returns—both experiential and financial. And our patented technology drives new platforms for commercial and industrial luminaires.

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WeChat ID: BridgeluxInChina

46410 Fremont Boulevard
Fremont, CA 94538
Tel (925) 583-8400
www.bridgelux.com