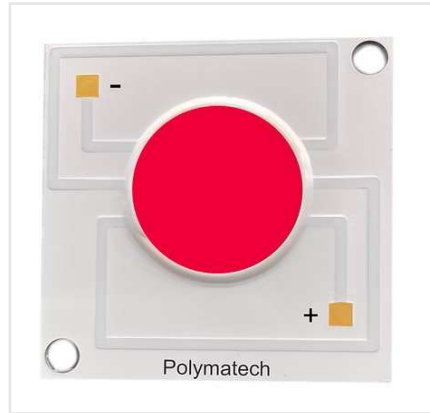


Polymatech®



DATA SHEET

POLYMATECH STANDARD COB Series

Version 2

FL09COB3030 HYPER RED 650nm



POLYMATECH ELECTRONICS LIMITED
www.polymatech.in

HORTICULTURE AND LED LIGHTING



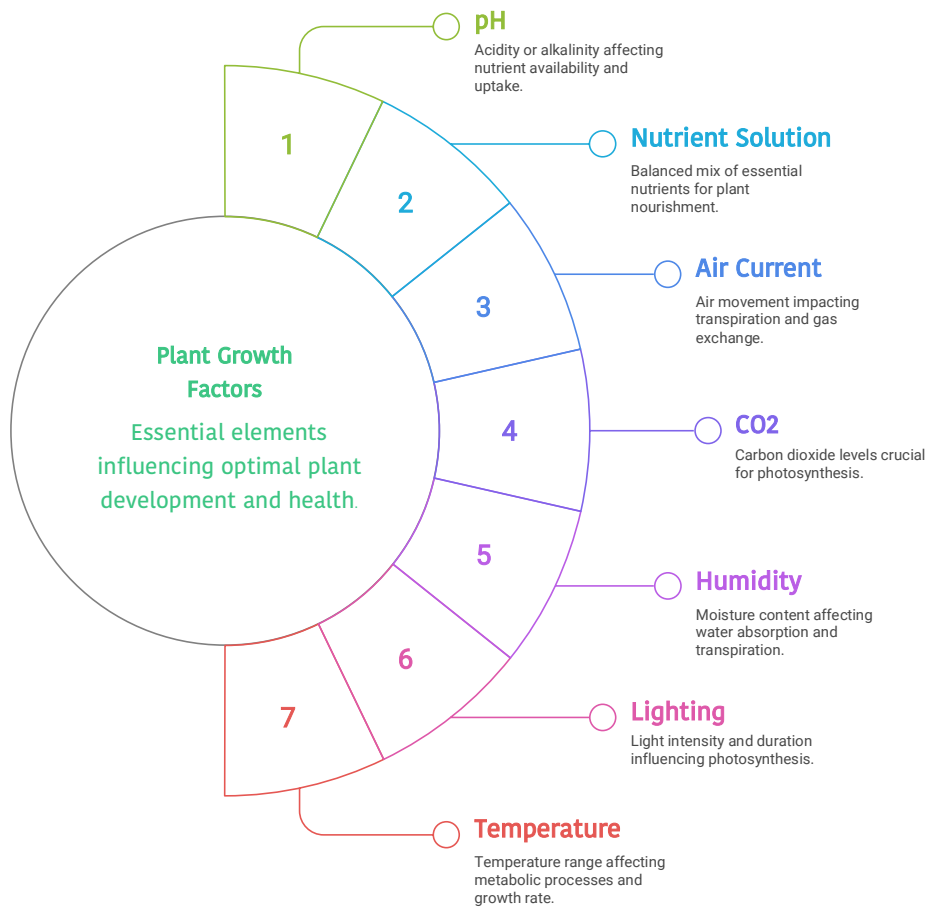
Optimizing Light Strategies for Enhanced Plant Growth



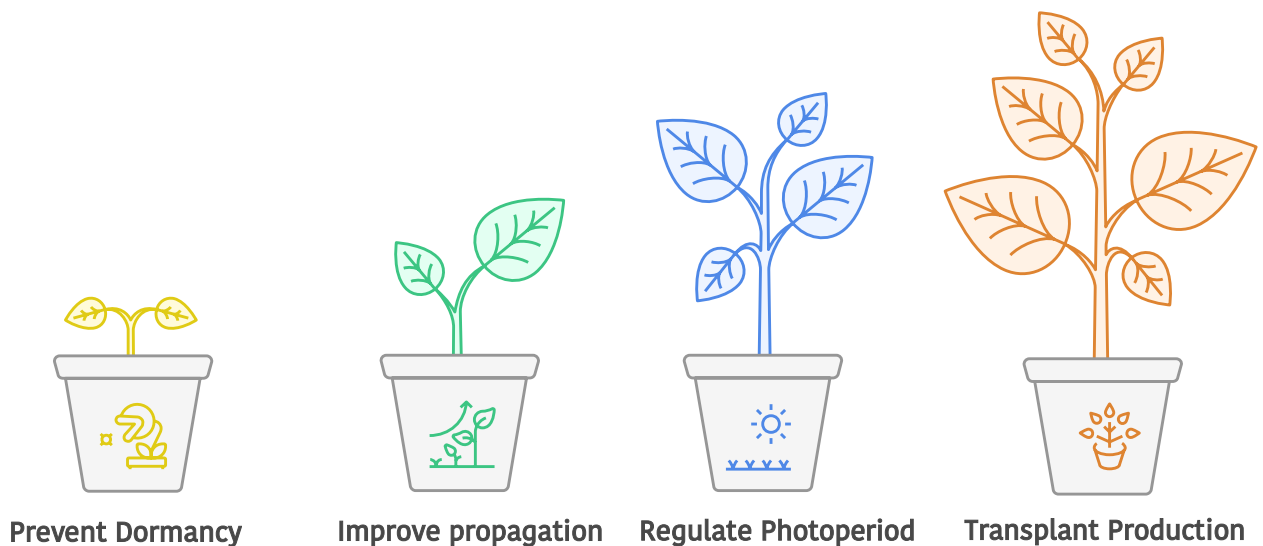
APPLICATIONS

- Horticulture Lighting
- Photobiomodulation Therapy
- Medical & Aesthetic Devices
- Industrial Vision & Sensing Systems
- Optical & Analytical Instruments
- Consumer Electronics Indicators
- Plant growth lighting

Unveiling the Spectrum of Plant Growth Factors



Achieving Enhanced Plant Growth



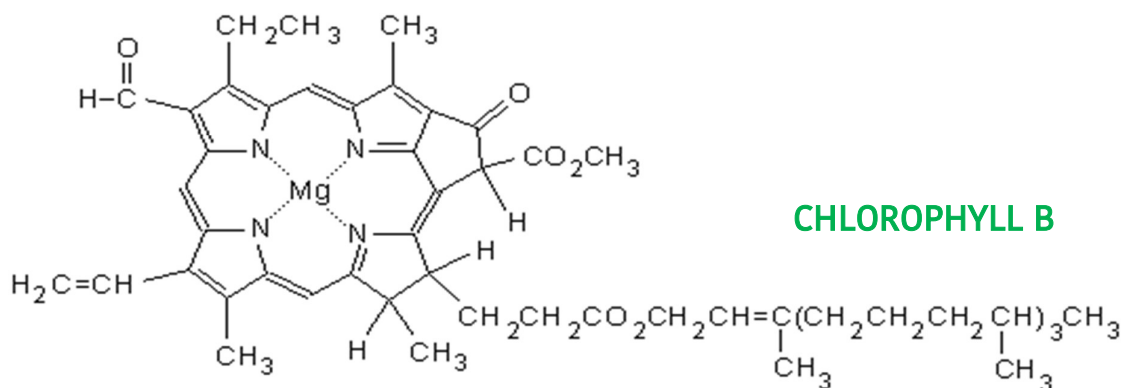
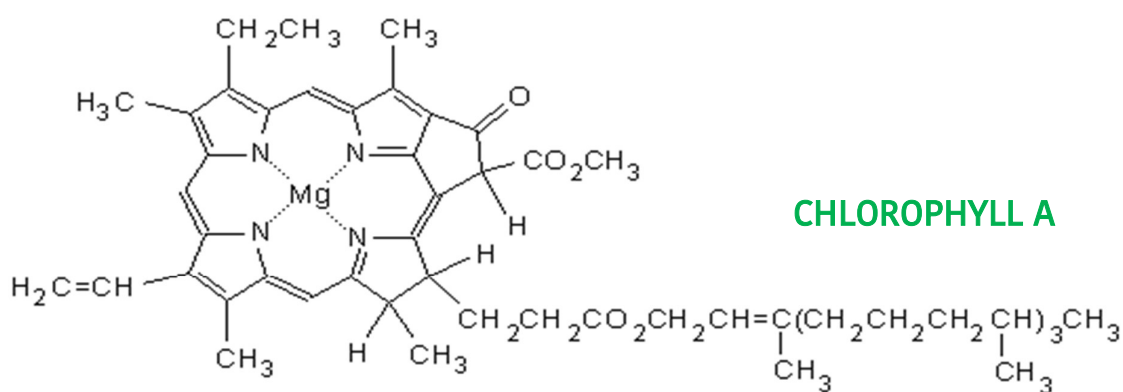
Field of Use

Polymatech Horticulture LED: Boost Your Plant Growth

Polymatech's Horticulture LED solutions, including the full-spectrum packages and monochromatic LEDs, are engineered to enhance plant growth by delivering light optimized for photosynthesis, with a focus on chlorophyll a and b absorption. In Polymatech's lab, these LEDs have achieved up to 30% faster plant growth compared to competing LEDs, offering growers a powerful tool for higher yields. Here's how Polymatech's technology delivers and why it stands out.

Tailored Light for Maximum Chlorophyll Absorption

- **Chlorophyll a and b Efficiency:** Chlorophyll a absorbs light most effectively at ~430 nm (blue) and ~660 nm (red), while chlorophyll b peaks at ~450 nm (blue) and ~640 nm (red). Polymatech's Ravaye™ full-spectrum LEDs provide a balanced mix of yellow, green, blue, and red wavelengths, emphasizing blue and red to maximize chlorophyll absorption.



- **Monochromatic Precision:** Polymatech's monochromatic LEDs can target 660 nm (red), aligning with chlorophyll a's peak absorption, boosting photosynthetic efficiency during vegetative growth and flowering stages.

Revolutionary Red and Blue Integrated Module

- **Innovative Design:** Polymatech combines red and blue light into a single, specially designed module to optimize yield. This ensures plants receive the ideal red:blue ratio (e.g., 5:1, a proven horticultural standard) for enhanced growth efficiency.
- **Yield Advantage:** Unlike competitors who use separate red and blue fixtures or less precise spectra, Polymatech's integrated module delivers uniform, yield-enhancing light, improving chlorophyll absorption and increasing crop productivity.



Full-Spectrum Power

- Beyond typical red-blue LEDs (which produce a purple glow), Polymatech's full-spectrum LEDs incorporate yellow and green wavelengths, mimicking natural sunlight. Green light penetrates deeper into the plant canopy, supporting photosynthesis in lower leaves and boosting overall chlorophyll activity.
- Far-red light (730 nm) influences phytochrome activity, promoting flowering and optimizing plant structure for better yields.

Up to 30% Faster Growth Achieved in Polymatech Lab



- Polymatech's LEDs have demonstrated up to 30% faster plant growth in controlled lab conditions compared to standard LEDs. This result, achieved through optimized photosynthesis driven by the integrated red-blue module and full-spectrum design, highlights the potential for significant growth improvements.

- **Note:** The 30% faster growth was observed in Polymatech's lab and may vary based on plant species, environmental conditions, and LED setup. Growers can expect enhanced performance tailored to their specific needs.

Why Polymatech Outshines Competitors

- **Spectral Superiority:** Many horticulture LEDs focus solely on red and blue but lack Polymatech's integrated red-blue module or full-spectrum capabilities. Competitors' separate fixtures can result in uneven light distribution, reducing chlorophyll absorption efficiency.
- **Energy Efficiency:** With high-efficacy LEDs (potentially up to 80% wall-plug efficiency for red and blue), Polymatech delivers more usable light to plants compared to less efficient LEDs or traditional HPS lamps.
- **Yield Optimization:** The single-module red-blue design ensures consistent, yield-focused light delivery, giving Polymatech an edge over peers with broader, less targeted spectra or multi-fixture setups.

Conclusion

Polymatech's Horticulture LEDs enhance plant growth by optimizing chlorophyll a and b absorption through full-spectrum light and a unique red-blue integrated module. With up to 30% faster growth achieved in Polymatech's lab, these LEDs deliver precise wavelengths (430–450 nm blue, 640–660 nm red) to maximize photosynthesis and yield, surpassing standard LEDs with less targeted spectra or separate fixtures. Explore the future of horticulture at Polymatech's website.

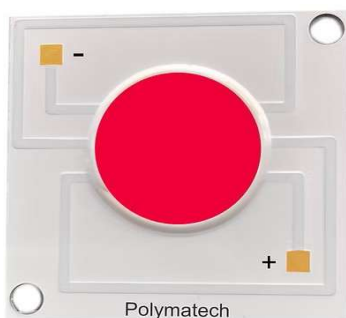
Important consideration:

The 30% faster growth achieved in Polymatech's lab is a testament to the technology's potential, but real-world results may vary depending on factors like plant type and growing conditions. Independent studies or Polymatech-provided data can offer further insights into performance across diverse applications.



Product Nomenclature

FL09COB3030 HYPER RED 650nm



[1]	Product shape	: FL09COB3030
[2]	Die count in series	: 12
[3]	Die count in parallel	: 01

Contents

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INTRODUCTION

Product Description

The FL09COB3030 series of high-flux, multi-die arrays in a smaller, easy-to-use platform. With FL09COB3030 LED lighting-class reliability, the FL09COB3030's small, uniform emitting surface enables both directional and non-directional lighting applications including lamp retrofit and luminaire designs. featuring a 17-mm optical source, the FL09COB3030 brings new levels of flux and efficacy to this form factor.

The FL09COB3030 series is designed with flip chip technology which has high heat emission property thus increasing product life.

Features

- Mechanical Dimensions : 30×30×1(mm)
- Packaging Structure : Aluminium Base Chip on Board
- Reference Assembly : M4 screw, Connector
- Thermal Resistance : 2C/W
- Maximum Drive Current : 700mA
- RoHS Complaint.
- Better die arrangement for optics.
- Wide range of luminous flux and high efficacy.
- Improved lumen density compared with precious version.
- High Thermal conductivity package.
- Large, monolithic chips with uniform emitting area.
- Encapsulated die with low profile protective window for higher lumen output.
- Electricity isolated thermal path.
- Environmentally friendly: RoHS and REACH complaint.

Performance Characteristics

Tj=85C

Product code	Luminous flux (lm)		Efficacy (lm/W)	Balanced Output (V)	Red overdrive (V)	Forward current (mA)	Forward Voltage(V)			
	Tj85C						Tc25C*	Min.	Typ.	Max.
	Min.	Typ.	Typ.	Typ.						
FL09COB3030 HYPER RED 650nm	396	450	489	148	24.20V	21V	700mA	20.7V	23.85V	27V

1. Polymatech Electronics maintains a tolerance of $\pm 10\%$ on luminous flux measurements.
 2. Polymatech Electronics maintains a tolerance of $\pm 3\%$ on forward voltage measurements.
- *: Values of Luminous flux at Tc=25C are provided as reference only.

Absolute Maximum Ratings

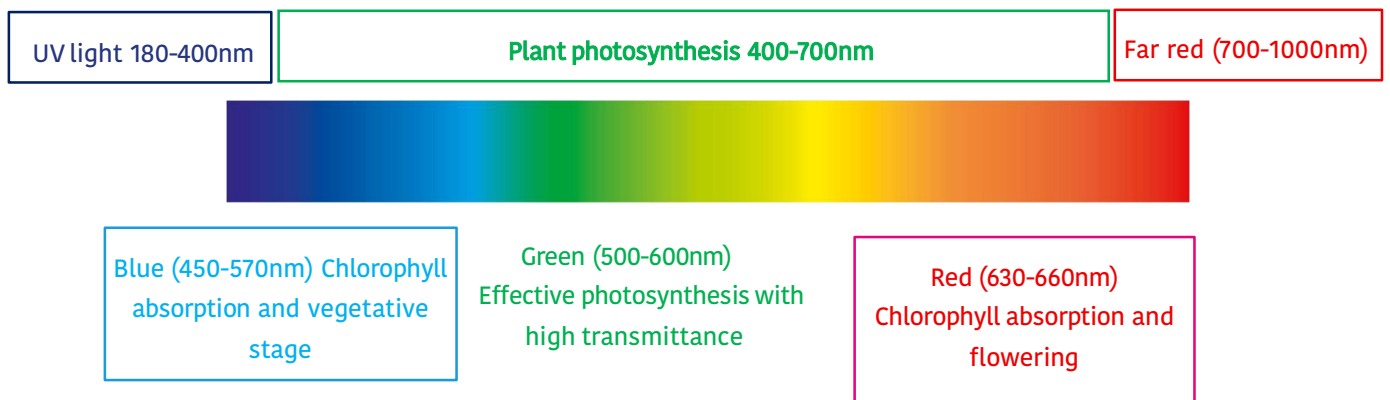
Parameter	Symbol	Rating	
Input Power	Pi	6.4	*1
Forward Current(mA)	If	700	*1
Reverse current(mA)	Ir	1	
Operating Temperature(C)	Top	-40 ~ +100	
Storage Temperature(C)	Tst	-40 ~ + 100	*2
Case Temperature(C)	Tc	105	
Junction Temperature(C)	Tj	125	*3

- *1. Input power and forward current are the values when the LED is used within the range of the derating curve in this data sheet.
- *2. Refer to 3. Outline drawing for Tc MEASUREMENT POINT.
- *3. Junction temperature **calculation** formula: $T_j = T_c + R_{j-c} \times P_i$

Spectral Absorption Properties of Chlorophyll and Their Role in Photosynthesis

Chlorophyll pigments, primarily chlorophyll a and b, are central to the photosynthetic process, exhibiting peak absorption in the blue (400–500 nm) and red (600–700 nm) regions of the light spectrum. These spectral zones correspond closely with the photosynthetically active radiation (PAR) range, making them critical targets for horticultural lighting design. Polymatech’s advanced LED solutions leverage precise spectral tuning to deliver optimized light output that aligns with the absorption characteristics of chlorophyll. This paper examines the relationship between light wavelength and photosynthetic activity, demonstrating how Polymatech LED technology enhances plant growth, accelerates development, and improves crop yield in controlled environment agriculture. By aligning LED emission with plant photoreceptor needs, Polymatech provides energy-efficient, crop-specific lighting tailored to modern horticultural practices.

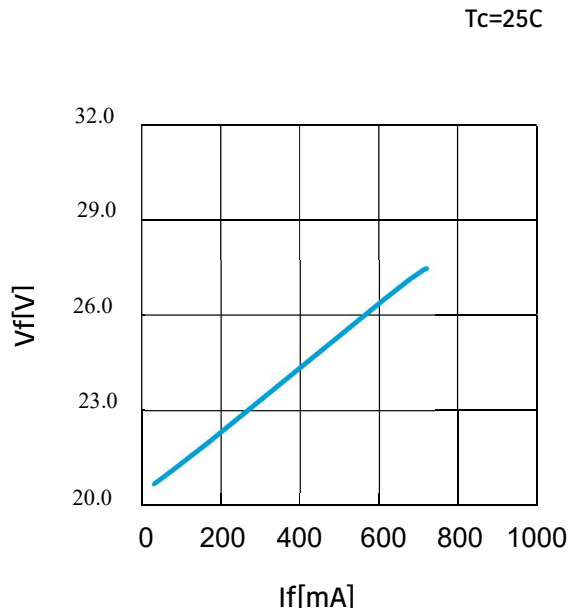
Figure: Influence of Light Wavelength on Plant Growth and Development



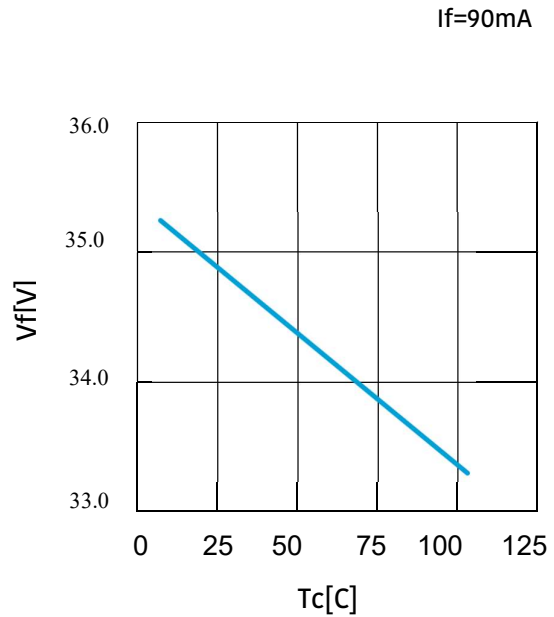
Characteristics Curves

Forward Current Characteristic/Temperature Characteristics

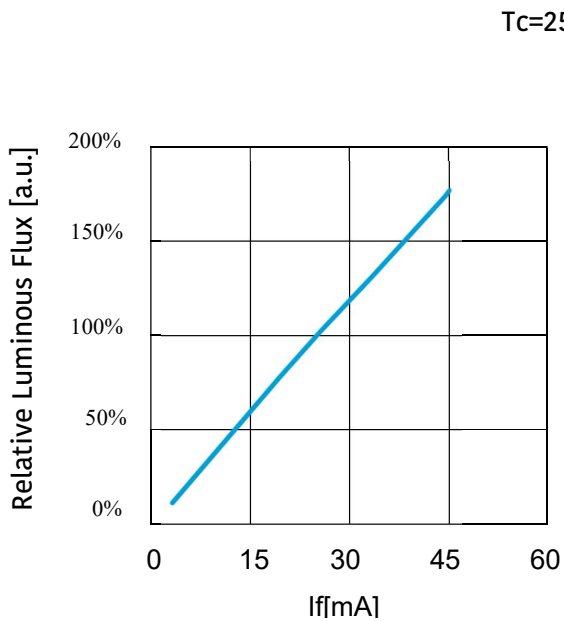
Forward Current VS. Forward Voltage



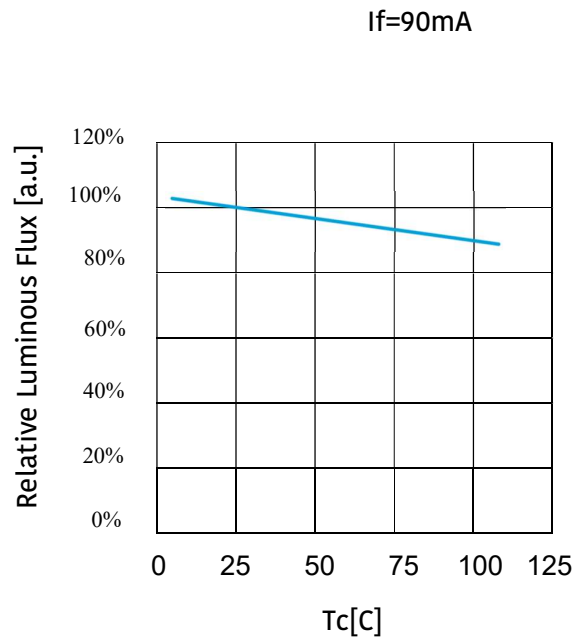
Case Temperature vs. Forward Voltage



Forward Current VS. Relative Luminous Flux



Case Temperature vs. Relative luminous flux

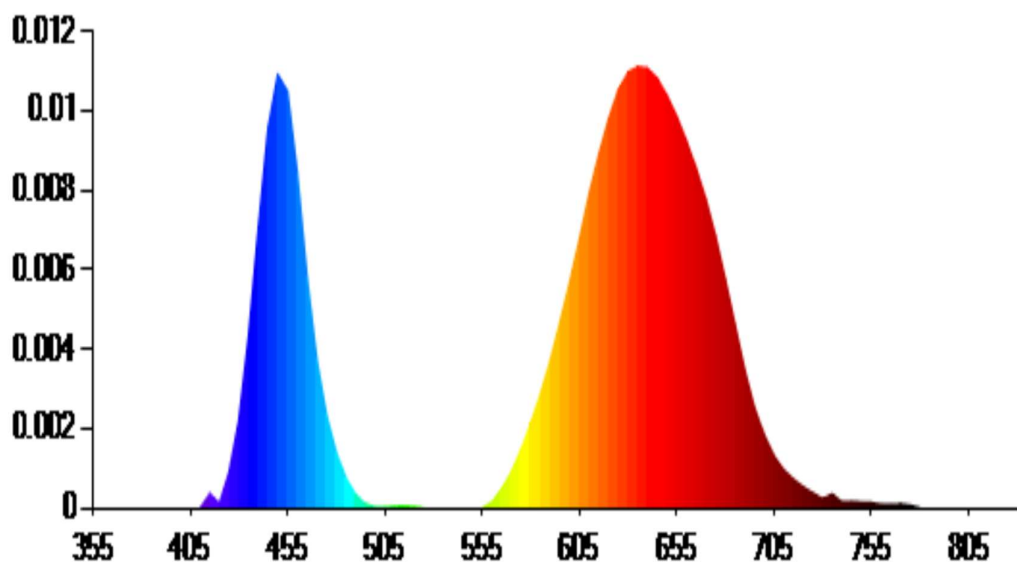


Optical Characteristics

Balanced output:

Balanced spectrum lighting is essential for supporting healthy plant development from the seed stage through to full growth. Our lighting system is designed to closely replicate the natural sunlight by combining blue, red, and far-red wavelengths in a carefully calibrated ratio. This balanced spectrum promotes strong root formation during germination, encourages compact and healthy seedling development, and supports vigorous leaf and stem growth during the vegetative stage. Unlike traditional lighting solutions that require spectrum changes at different growth stages, our balanced spectrum lighting offers a seamless and efficient solution throughout the entire plant life cycle. By maintaining consistent light quality and intensity, it minimizes plant stress, improves uniformity, and enhances overall yield. This makes it an ideal choice for indoor farming, greenhouses, and vertical growing systems where both energy efficiency and crop quality are top priorities.

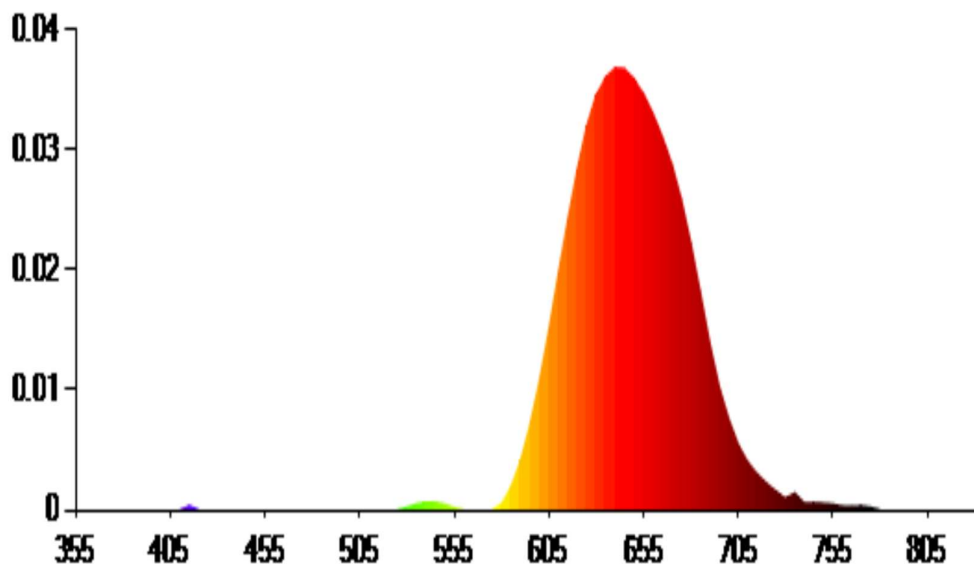
Spectral Power Distribution



Red Overdrive:

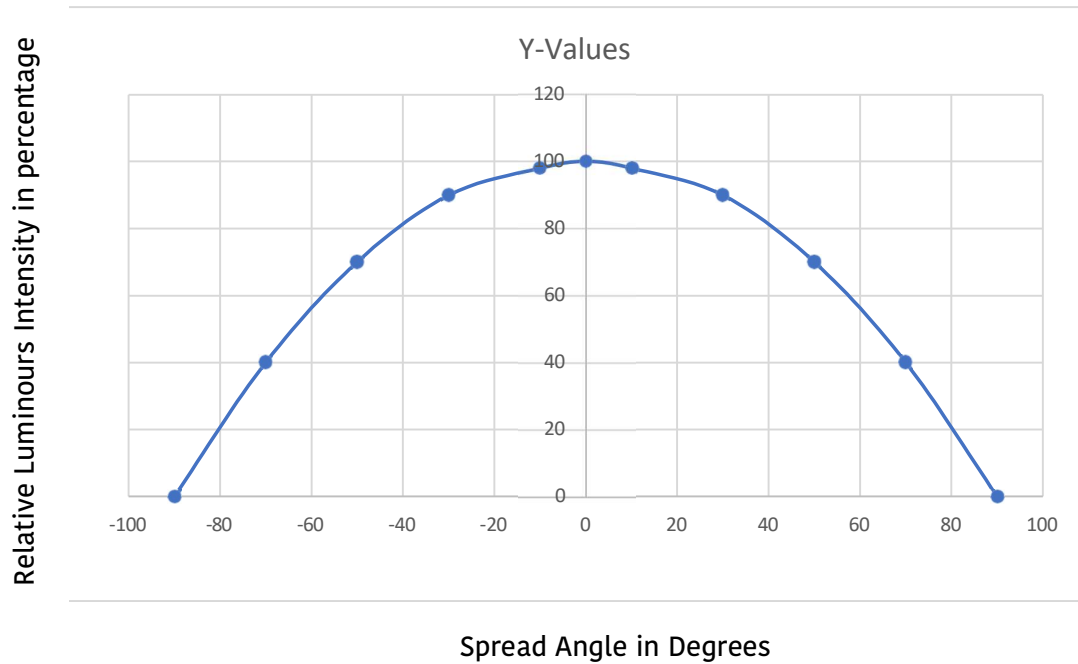
Red overdrive is a vital lighting enhancement applied during the flowering to fruiting stages of plant growth to maximize productivity and quality. During this critical phase, plants require an increased intensity of red light to stimulate flowering hormones and accelerate the reproductive process. By applying red overdrive, growers can effectively signal plants to initiate and sustain robust flower formation, leading to better pollination and enhanced fruit set. This intensified red spectrum boosts photosynthetic activity, encouraging plants to allocate more energy toward developing larger, more vibrant flowers and ultimately producing high-quality fruits. Red overdrive not only supports earlier blooming and faster fruit ripening but also contributes to increased yield, improved taste, and richer coloration in fruits. In controlled environments such as greenhouses, indoor farms, and vertical cultivation systems, red overdrive ensures optimal lighting conditions precisely when plants need it most, making it an essential tool for modern horticultural success.

Spectral Power Distribution



Optical characteristics (continued)

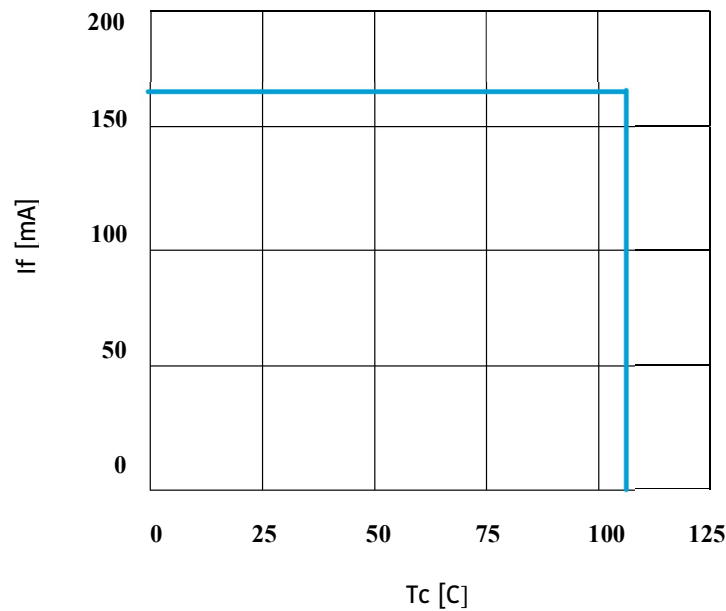
Radiation Characteristics



Derating Characteristics

Case Temperature

vs. Allowable Forward Current



Reliability

Reliability Test

Test Item	Test Condition
Continuous Operation Test	If=90mA, Ta=25C (with A1-fin) × 1000 hours
	If=90mA, Tj=120C (with A1-fin) × 1000 hours
Low Temperature Storage Test	-40 C × 1000 hours
High Temperature Storage Test	100 C × 1000 hours
Moisture-proof Test	60C, 95%RH for 500 hours
Thermal Shock Test	-40 C × 30 minutes - 100 C × 30 minutes, 100 cycle

Failure Criteria

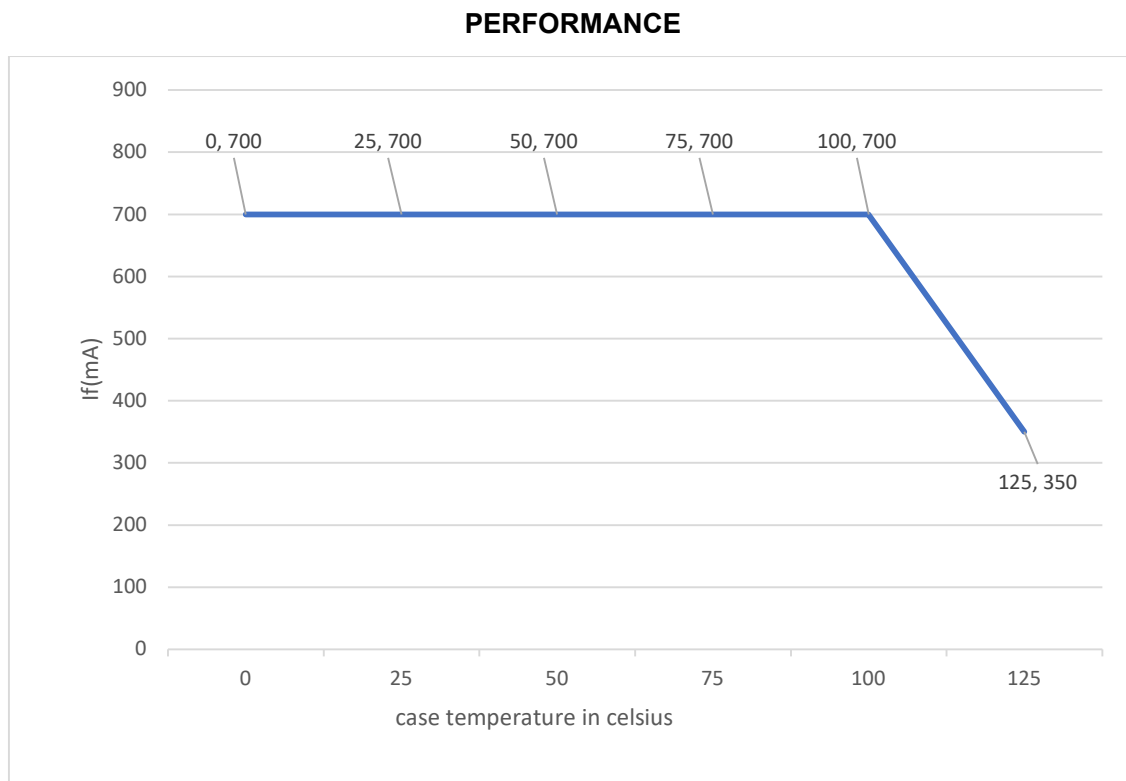
(Tc=25C)			
Measuring Item	Symbol	Measuring Condition	Failure Criteria
Forward Voltage	Vf	If=90mA	>U × 1.1
Total Luminous Flux	ΦV	If=90mA	<S × 0.85

U defines the upper limit of the specified characteristics. S defines the initial value.

Note: Measurement shall be taken between 2 hours and 24 hours, and the test pieces should be return to the normal ambient conditions after the completion of each test.

Operating limits

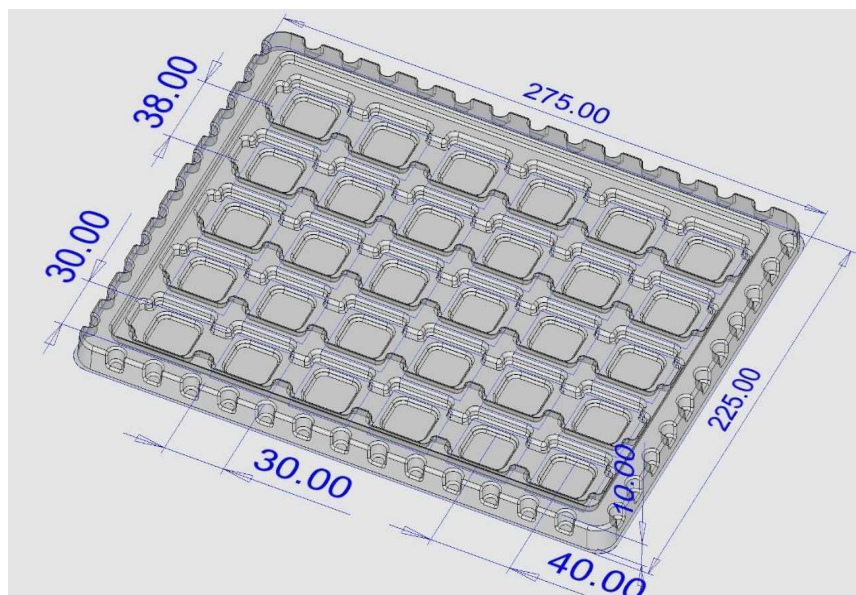
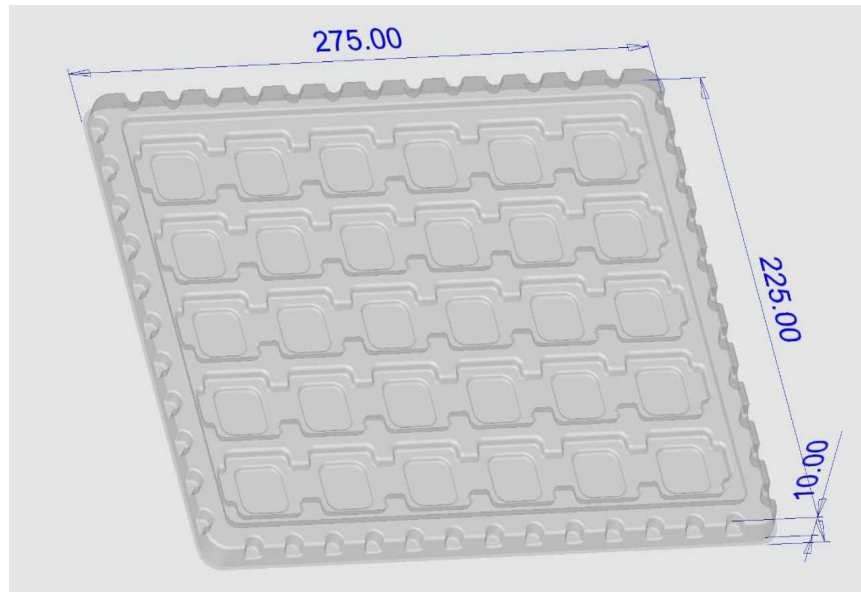
The maximum current rating of the FL09COB3030 depends on the case temperature (T_c) when the LED has reached thermal equilibrium under steady-state operation. The graphs shown below assume that the system design employs good thermal management (thermal interface material and heat sink) and may vary when poor thermal management is employed. Polymatech Electronics LED recommends a maximum Junction temperature of 135 °C to ensure optimal LED lifetime.



Packaging Specification

Packing

The package each tray contains 30 pieces of COBs and each box contains 12 trays of COBs (Vacuum Sealed).



Precaution

Handling with care for this product

- Both the light emitting area and white rim around the light emitting area is composed of resin materials. Please avoid the resin area from being pressed, stressed, rubbed, come into contact with sharp metal nail (e.g. edge of reflector part) because the function, performance and reliability of this product are negatively impacted.
- Please be aware that this product should not come into contact with any other parts while incorporating in your lighting apparatus or your other products.
- Please be aware that careful handling is required after the attachment of lead wires to prevent the application of any load to the connections.
- For more information, please refer to application note "Instruction Manual (COB LED Package)".

Countermeasure against static electricity

- Handling of this product needs countermeasures against static electricity because this is a semiconductor product.
- Please take adequate measures to prevent any static electricity being produced such as the wearing of a wristband or anti-static gloves when handling this product.
- Every manufacturing facility in regard to the product (plant, equipment, machine, carrier machine and conveyance unit) should be connected to ground and please avoid the product to be electric-charged.
- ESD sensitivity of this product is over 1000V (HBM, based on JEITA ED-4701/304). After assembling the LEDs into your final product(s), it is recommended to check whether the assembled LEDs are damaged by static electricity (electrical leak phenomenon) or not.
- It is easy to find static damaged LED dies by a light-on test with the minimum current value.

Caution of product assembly

- Regarding this product assembling on the heat sink, it is recommended to use M4 screw. It might be good for screw tightening on the heat sink to do temporary tightening and final tightening. In addition, please don't press with excess stress on the product.
- The condition of the product assembling on the heat sink and the control of screw tightening torque needs to be optimized according to the specification of the heat sink.
- Roughness, unevenness and burr of surface negatively impact thermal bonding between the product and heat sink and increase heat thermal resistance between them. Confidence of thermally and mechanical coupling between the product and heat sink are confirmed by checking the mounting surface and measuring the case temperature of the product.
- In order to reduce the thermal resistance at assembly, it might be good to use TIM (Thermal Interface Material) on whole contact surface of the product. In case of using thermal grease for the TIM, it might be good to apply uniformly on the contact surface of the product.
- In case of using thermal sheet for the TIM, it might be good to make sure that the product is NOT strained by stress when the screws are tightened for assembly.
- For more information, please refer to application note "Instruction Manual (COB LED Package)".

Thermal Design

- The thermal design to draw heat away from the LED junction is most critical parameter for an LED illumination system. High operating temperatures at the LED junction adversely affect the performance of LED's light output and lifetime. Therefore, the LED junction temperature should not exceed the absolute maximum rating in LED illumination system.
- The LED junction temperature while operation of LED illumination system depends upon thermal resistance of internal LED package (R_{j-c}), outer thermal resistances of LED package, power loss and ambient temperature. Please take both of the thermal design specifications and ambient temperature conditions into consideration for the setting of driving conditions.
- For more information, please refer to application note "Thermal Management", "Instruction Manual (COB LED Package)".

Driving Current

- A constant current is recommended as an applying driving current to this product.
In the case of constant voltage driving, please connect current-limiting resistor to each product in series and control the driving current to keep under the absolute maximum rating forward current value.
- Electrical transient might apply excess voltage, excess current and reverse voltage to the product(s). They also affect negative impact on the product(s) therefore please make sure that no excess voltage, no excess current and no reverse voltage are applied to the product(s) when the LED driver is turn-on and/or turn-off.
- For more information, please refer to application note "Driving", "Instruction Manual (COB LED Package)".

Lighting at a minimum current value

- A minimum current value of lighting of all dice is 5 mA.
- When a minimum current is applied, LED dice may look different in their brightness due to the individual difference of the LED element, and it is not a failed product.

Electrical Safety

- This product is designed and produced according to IEC 62031:2008 IEC 62031:2008 LED modules for general lighting. Safety specification)
- Dielectric voltage withstand test has been conducted on this product to see any failure after applying voltage between active pads and aluminum section of the product, and to pass at least 500V.
- Considering conformity assessment for IEC62031:2008, almost all items of the specification depend upon your final product of LED illumination system. Therefore, please confirm with your final product for electrical safety of your product. As well, the products comply with the criteria of IEC62031:2008 as single LED package.

Recommended soldering Condition (This product is not adaptable to reflow process).

-For manual soldering Please use lead-free soldering. Soldering shall be implemented using a soldering bit at a temperature lower than 350C, and shall be finished within 3.5 seconds for one land. No external force shall be applied to resin part while soldering is implemented. Next process of soldering should be carried out after the product has return to ambient temperature. Contacts number of soldering bit should be within twice for each terminal.

* Polymatech Electronics cannot guarantee if usage exceeds these recommended conditions.
Please use it after sufficient verification is carried out on your own risk if absolutely necessary.

- For more information, please refer to application note "Instruction Manual (COB LED Package)".

Eye Safety

-The International Electrical Commission (IEC) published in 2006 IEC 62471 "2006 Photobiological safety of lamps and lamp systems" which includes LEDs within its scope. When sorting single LEDs according to IEC 62471, almost all white LEDs can be classified as belonging to either Exempt Group (no hazard) or Risk Group 1 (low risk). However, Optical characteristics of LEDs such as radiant flux, spectrum and light distribution are factors that affect the risk group determination of the LED, and especially a high-power LED, that emits light containing blue wavelengths, might have properties equivalent to those of Risk Group 2 (moderate risk).

-Great care should be taken when directly viewing an LED that is driven at high current, has multiple uses as a module or when focusing the light with optical instruments, as these actions might greatly increase the hazard to your eyes. It is recommended to regard the evaluation of stand-alone LED packages as a reference and to evaluate your final product.

This product is not designed for usage under the following conditions.

If the product might be used under the following conditions, you shall evaluate its effect and appropriate them. In places where the product might:

- directly and indirectly get wet due to rain and/or at place with the fear.
- be damage by seawater and/or at place with the fear
- be exposed to corrosive gas (such as Cl₂, H₂S, NH₃, SO_x, NO_x and so on) and/or at place with the fear.
- be exposed to dust, fluid or oil and/or at place with the fear.

The LEDs may not be able to maintain their specified performance if they used in a high temperature and high humidity environment.

Precaution with regard to product use

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The LEDs described in this brochure are intended to be used for ordinary

electronic equipment (such as office equipment, communications equipment, measurement instruments and household appliances). Consult POLYMATECH Electronics' sales staff in advance for information on the applications in which exceptional quality and reliability are required, particularly when the failure or malfunction of the LEDs may directly jeopardize life or health (such as for airplane, aerospace, submersible repeaters, nuclear reactor control system, automobiles, traffic control equipment, life support system and safety devices). This LED does not comply with ISO/TS 16949 (IATF16949) and is not intended for automotive applications.

The customer shall not reserve engineer by disassembling or analysis of the LEDs without having prior written consent from POLYMATECH Electronics. When defective LEDs are found, the customer shall inform POLYMATECH Electronics before disassembling or analysis.

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