Design Support and Resources

**PSoC and EZ-Color Development Software Online**
All PSoC development software tools are available for download online. For PSoC Express, visit www.cypress.com/psocexpress. For PSoC Designer visit www.cypress.com/psocdesigner. For PSoC Programmer visit www.cypress.com/psocprogrammer.

**EZ-Color Data Sheets and Application Notes**
For all EZ-Color device data sheets and detailed application notes, many with complete starter projects, visit www.cypress.com/ez-color. For datasheets, select **Products**, and then select an EZ-Color part. For application notes, select **Support → Application Notes**.

**EZ-Color Device Selector Guide**
For a list of all EZ-Color devices, visit www.cypress.com/ez-color and select **Products**.

**EZ-Color Development Tools Selector Guide**
For a description of EZ-Color development tools visit www.cypress.com/ez-color, select **Support → Software Development Tools**.

**EZ-Color On-Demand Training**
Visit www.cypress.com/training to engage in on-demand self-paced EZ-Color product and development software training. Learn to design EZ-Color like the pros, at the introductory, intermediate, and advanced knowledge levels!

**EZ-Color On-Site Training**
Email training@cypress.com to enquire about EZ-Color in-person training seminars at a location near you. Learn design basics, tips, and tricks from the pros to become an EZ-Color design expert!

**Online Technical Support**
For knowledge base articles, customer forums, and online application support, visit www.cypress.com/support.

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ColorLock EZ-Color Technical Articles
- Using Optical Feedback to Design a More Robust High-Brightness-LED System
- How to Design a Three-Channel LED Driver
- EZ-Color and PSoC Express: Bridging the Knowledge Gap for Intelligent Lighting and the Semiconductor Market
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WARNING: HIGH BRIGHTNESS LEDs CAN CAUSE PERMANENT EYE DAMAGE!
Do not look at the LEDs if they are not covered by the protective enclosure. The LEDs illuminate at a very high intensity and can cause permanent eye damage if they are viewed without the protective enclosure.

Getting Started
1. Review Kit Contents
2. Install Software
3. Board Layout
4. Use the Board as Factory Programmed
5. Explore the CY3263 Hands-On Example Projects
6. Review Additional ColorLock EZ-Color Resources

The CY3263-ColorLock EZ-Color evaluation board demonstrates the ability of a PSoC® controller to use real-time optical feedback to control three primary, high brightness LEDs and create accurate, mixed-color output. The three LEDs on the CY3263 evaluation board use the primary colors red, green, and blue, although any three primary color LEDs can be used in a design, depending upon the application and the desired color gamut.

Right out of the box, CY3263-ColorLock EZ-Color can be used to evaluate and demonstrate EZ-Color functionality, including color mixing and optical feedback. Part of evaluating ColorLock requires using a PC GUI to monitor and control ColorLock functionality (see Section 4. Use the Board as Factory Programmed).

The next step is to develop a ColorLock application using this kit as a platform. Use PSoC Express, Cypress’s revolutionary visual embedded design tool, to quickly design powerful lighting applications. See Section 5. Explore the CY3263 Hands-On Example Projects.

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6. Review Additional ColorLock EZ-Color Resources

Cypress provides a wealth of information about ColorLock EZ-Color and PSoC Express, and more is frequently added. Many sample documents, schematics, layouts, guidelines, and other ColorLock EZ-Color documents are available on the CD and at www.cypress.com.

Note This quick start guide is available on the CD (\documents) as a PDF and has working links to all the following resources.

To find documentation online (without using the CD):
   b. Click on the Documentation link.
   c. Select the type of documentation you are looking for from the Resource Types list.
   d. Type the part number or document number into the Search in Design Resources field.
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ColorLock EZ-Color DataSheets
- CY8CLED04, 4 LED Dimming Channels, PrISM Dimming, DMX512, CapSense, 68-pin QFN
- CY8CLED08, 8 LED Dimming Channels, PrISM Dimming, DMX512, 48-pin QFN or SSOP
- CY8CLED16, 16 LED Dimming Channels, PrISM Dimming, DMX512, 48-pin QFN or SSOP and 28-pin SSOP

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1. Review Kit Contents

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  - .NET Framework 2.0 (for Windows 2000 and Windows XP)
  - PSoC Express 3
  - ColorLock Express Pack
- CY3263-ColorLock EZ-Color Kit CD
- ColorLock Monitor Application
  - Firmware
- Retractable USB Cable (A to Mini-B)
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2. Install Software

Install the PSoC Express Development Software

Insert the Tools CD, wait for the installer to start, and install the following software in the order listed:
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   b. Install .NET Framework 2.0
   c. Install PSoC Express 3
   d. Install ColorLock Express Pack

Install the CY3263-ColorLock EZ-Color Kit Software

2.1. Insert the CY3263-ColorLock EZ-Color Kit CD.
2.2. Open CY3263-ColorLock Setup.msi.
2.3. Follow the Setup Wizard instructions.
5. Explore the CY3263 Hands-On Example Projects

The CY3263-ColorLock EZ-Color Evaluation Kit Guide (available on the CD in \documents) contains three PSoC Express example projects. These examples take you step-by-step from creating a new project and adding drivers and valuators, through programming and tuning the evaluation board. Discover how designing with PSoC Express is quick, easy, and powerful by experiencing the step-by-step example projects in the kit guide.

Chapter 3: Tuner Project

This project creates firmware that color mixes three primary high-brightness LEDs to a specific color and introduces optical feedback into the system using a color sensor. The user can then choose the Tuner to select other desired colors mapped along the 1931 CIE XYZ Color Space.

Chapter 4: Traffic Light Project

This project creates firmware that color mixes three primary high-brightness LEDs to the three cycled colors found in a traffic light and introduces optical feedback into the system using a color sensor. The user can then choose the Tuner to select other desired colors mapped along the 1931 CIE XYZ Color Space.

Chapter 5: Modulated Dimmer Project

This project creates firmware that color mixes three primary high-brightness LEDs to a single color, modulates the brightness and introduces optical feedback into the system using a color sensor. The user can then choose the Tuner to select other desired colors mapped along the 1931 CIE XYZ Color Space.

3. Board Layout

The On/Off Button
For a demonstration without using a PC, push this button to turn the LEDs on and off.

The Color Selection Button
For a demonstration without using a PC, push this button to cycle through seven preset colors (white, red, green, blue, yellow, magenta, and cyan).

The Liquid Crystal Display
The top line of the display shows the current target 1931 CIE color coordinates. The bottom line of the display shows the coordinates sensed by the color sensor.

Figure 1-1 ColorLock Selection Button

[Image of ColorLock circuit board with On/Off and Color Selection buttons, LCD, and color mixing components]
4. Use the Board as Factory Programmed

The board can be controlled using the Windows ColorLock Monitor application provided on the kit's CD. This application can be installed on a personal computer running either the Windows XP or Windows Vista operating system. (Note The application might run on earlier versions of Windows, but it has not been tested for those versions.) See the CY3263-ColorLock EZ-Color Evaluation Kit Guide for detailed instructions on the CY3263-Color Monitor application.

When using the board with the ColorLock Monitor application, the board must be attached to the computer using a USB cable (included). The board can be attached to the computer before or after the application is started. Once the hardware is attached, the status field located on the bottom edge of the display on the right-hand side indicates that the hardware is present. This status field is displayed as green when the hardware is present and red otherwise.

Note The ColorLock Monitor application is completely separate from the Tuner in PSoC Express and will not function while PSoC Express is open.

Setup the CY3263-ColorLock EZ-Color Kit

4.1. Power the CY3263-ColorLock EZ-Color device using the provided AC power adapter.
4.2. Press the On/Off button and notice the viewing window light up then dim to indicate it is on.
4.3. Press the Color button to cycle through the preset colors.
4.4. Plug the USB cable into the side of the case and also into the USB port on the PC.
4.5. If a popup window appears asking to install a driver follow the steps labeled Recommended.
4.6. Open the ColorLock.exe application (Figure 1-2). This stand alone GUI enables you to adjust various settings on the CY3263-ColorLock EZ-Color Evaluation board.
4.7. Ensure the USB Link Status field in the bottom right corner of the window is green and displays Connected to ColorLock Demonstration. If it does not, recheck all connections to the board.
Use the ColorLock Monitor Application

4.8. Click the Green Arrow in the toolbar to run the GUI. You can now see the optical feedback algorithm in action.

4.9. Select different colors on the CIE color chart and watch the ColorLock kit lock on that color.

4.10. Observe the Current CIE Sensor Coordinates chart in the upper left. This is a plot over time of the x and y values measured by the color sensor in the system.

4.11. Observe the ColorLock Accuracy chart in the upper right. This is a plot over time of the delta between the measured x and y values and target x, y displayed beneath the CIE color chart. Each time a different color is selected you will see a dramatic change in these values, and as the ColorLock feedback algorithm works, it will pull this delta close to zero (within some margin of error).

4.12. Observe the PrISM Values chart in the lower right. This is a plot over time of PrISM dimmer values of the red, green and blue LEDs.

4.13. Adjust the brightness using the Brightness slider to the right of the CIE chart.

4.14. Evaluate ColorLock by exposing the hole in the bottom of the ColorLock case to an external light source and notice the adjustment of PrISM dimming levels to maintain the target color.

4.15. Check Disable Feedback to manually adjust the PrISM dimming values of the individual red green and blue LEDs using the associated slider.

4.16. Uncheck Disable Feedback to re-enable the ColorLock feedback algorithm.

4.17. Click the u’v’ button in the toolbar and notice that the color chart changes to the CIE 1976 u’ v’ color chart and all associated x and y labels are now changed to u’ and v’.

4.18. If you have an external color meter, and would like to calibrate the system:
   a. Click the Calibrate button in the toolbar.
   b. Press the On/Off button on the top of the ColorLock case. The red LED will be fully illuminated.
   c. A popup window will appear prompting you to enter the XYZ tri-stimulus values measured from your external color meter. Enter these values and click Next.
   d. Repeat these steps with the green and blue LEDs to complete the calibration.

Note: These steps should only be done if you own an external color meter. If you enter incorrect values, the system may not operate properly, and you should follow the directions the Reset the Board to the Original Factory Programming section.
Use the ColorLock Monitor Application

4.8. Click the Green Arrow in the toolbar to run the GUI. You can now see the optical feedback algorithm in action.

4.9. Select different colors on the CIE color chart and watch the ColorLock kit lock on that color.

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Figure 1-2  CY3263-ColorLock Monitor Application
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4.7. Ensure the USB Link Status field in the bottom right corner of the window is green and displays Connected to ColorLock Demonstration. If it does not, recheck all connections to the board.

---

Reset the Board to the Original Factory Programming

Follow these steps if you wish to reset the board to the original factory installed programming:

4.19. Locate the CY3263-ColorLock CY8CLED16.hex file on the ColorLock CD included with this kit, it is in the following directory:

D:\Firmware\Hex Files\CY3263-ColorLock CY8CLED16.hex

4.20. To reset the board to the factory conditions, connect your computer to the ColorLock main board ISSP Connector (J4) using the PSoC MiniProg and a USB cable.

4.21. Open PSoC Programmer by going to the Windows Start menu → All Programs → Cypress MicroSystems → PSoC Programming → PSoC Programmer

4.22. Click File Load, navigate to, and open the CY3263-ColorLock CY8CLED16.hex file.

4.23. From the Device Family menu, select CY8CLED16.

4.24. From the Device menu, select CY8CLED16-48LFXI.

4.25. Click Program. “Programming Succeeded...” appears in the Actions pane when programming is complete.
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**EZ-Color On-Demand Training**
Visit www.cypress.com/training to engage in on-demand self-paced EZ-Color product and development software training. Learn to design EZ-Color like the pros, at the introductory, intermediate, and advanced knowledge levels!

**EZ-Color On-Site Training**
Email training@cypress.com to enquire about EZ-Color in-person training seminars at a location near you. Learn design basics, tips, and tricks from the pros to become an EZ-Color design expert!

**Online Technical Support**
For knowledge base articles, customer forums, and online application support, visit www.cypress.com/support.