



CY3268 PowerPSoC™ Lighting Starter Kit Quick Start

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WARNING: HIGH BRIGHTNESS LEDs CAN CAUSE PERMANENT EYE DAMAGE!

Do not look at the LEDs directly 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.

WARNING: Generally all lab work in power electronics must be done with extreme care. Caution must be exercised when using power supplies and/or power related equipment.

Getting Started

1. [Review Kit Contents](#)
2. [CY3268 PowerPSoC Board Features](#)
3. [Use the Board as Factory Programmed](#)
4. [Create a PSoC Designer Project](#)
5. [Safety precautions](#)
6. [Additional Cypress Resources](#)

The CY3268 PowerPSoC™ Lighting Starter Kit demonstrates the ability of PowerPSoC to create scalable LED management solutions and enables designers to evaluate PowerPSoC. PowerPSoC family of devices features high performance power electronics including 1A, 2 MHz rated power FETs, hysteretic controllers, current sense amplifiers, and PrISM™ technology to create a complete solution for LED power management.

This kit also enables designers to test and evaluate preliminary prototype designs using PowerPSoC and understand the design flow using PSoC Designer™ software for the PowerPSoC device family.

1. Review Kit Contents

Each CY3268 PowerPSoC Lighting Starter Kit contains:

- CY3268 PowerPSoC Board
- 12V, 1A Power Supply
- 2 Jumper Shunts
- Software CD, which includes:
 - PSoC Designer
 - PSoC Programmer
- Kit CD, which includes:
 - Demo Firmware,
 - Design Files, and
 - Related Documents

2. CY3268 PowerPSoC Board Features

Use the CY3268 PowerPSoC Lighting Starter Kit to understand and evaluate the PowerPSoC device.

- 4 High Brightness LEDs (300mA rating)
- 5 CapSense™ Buttons
- 1 Power On Indicator LED (Green)
- 1 Reset Switch
- ISSP/I2C Header
- Debug Port

3. Use the Board as Factory Programmed

- a. Connect the power supply to a wall outlet and to the board.
- b. The LEDs turn on with 0% brightness level.
- c. Touch the CapSense buttons CSB1..CSB4 to turn on the LEDs initially.
- d. Touch the CapSense buttons CSB1..CSB4 to select/deselect corresponding LEDs.
- e. Touch the CapSense button CSB5 to increase/decrease the brightness of the selected LED.
- f. Turn off the board by removing the power supply from the wall outlet.

4. Create a PSoC Designer Project

4.1 Install Software

To setup the software environment for developing firmware for PowerPSoC

- Install PSoC Designer from the CD (or download the latest version from <http://www.cypress.com/design/SD1099>).
- Install PSoC Programmer from the CD (or download the latest version from <http://www.cypress.com/design/SD1062>).

For Installation instructions do refer to the instruction in respective web page.

4.2 Hardware Setup

- Attach the supplied power supply to a wall receptacle. Connect the other end of the power supply to the main board.
- Use miniprogram (sold separately) or the ICE (sold separately) to download the firmware to flash and to execute it.

To use the ICE, use blue colored cable (supplied with CY3215 Kit) to connect with the board or a standard RJ-45 CAT5 cable.

4.3 Example PSoC Designer Project

The first example project demonstrates the ability of the PowerPSoC device to integrate CapSense, LED driving capabilities in one chip. This project sets up the CapSense buttons, initializes the power peripherals blocks, and enables them. It then goes into an infinite loop scanning the buttons and performing the required functions.

The CapSense buttons are setup in the following way:

- Button 1: selects HBLED1
- Button 2: selects HBLED2
- Button 3: selects HBLED3
- Button 4: selects HBLED4
- Button 5: Each tap on the button increases the brightness of the selected LED and when the maximum brightness is reached, starts decreasing. When the brightness is completely low, further taps start increasing the brightness again.

Steps to write the firmware for example project 1

- 4.1. Start PSoC Designer 5.0
- 4.2. Click **File > New Project**
- 4.3. Select chip level project as the project type

- 4.4. Give a name to the project (**CY3268_Example1**). Choose a folder to save the project.
- 4.5. A new dialog opens to select the device. Select **CY8CLEDD04D01-56LTXI** from the catalog. Use **C** to generate the main file
- 4.6. After creating the project, PSoC Designer presents the chip interconnect view of the project.
- 4.7. Configure the global parameters by changing the following global parameters to the values given and leave the rest at their default values.
 - a. CPU_Clock: SysClk/2
 - b. VC3 Divider: 255
 - c. AINX_Mode: IREF
 - d. MOD Clock: SysClk

Global Resources	
Power Setting [Vcc / Sys: 5.0V / 24MHz	
CPU_Clock	SysClk/2
Sleep_Timer	512_Hz
VC1= SysClk/N	1
VC2= VC1/N	1
VC3 Source	SysClk/1
VC3 Divider	255
SysClk Source	Internal
SysClk*2 Disable	No
Analog Power	SC On/Ref Low
Ref Mux	(Vdd/2)+/-BandGap
AGndBypass	Disable
Op-Amp Bias	Low
A_Buff_Power	Low
Trip Voltage [LVD]	4.81V
LVDThrottleBack	Disable
AINX Connection	CSA0
AINX Mode	IREF
MOD Clock	SysClk
Bias Generator	Enable

- 4.8. Begin placing the user modules.
 - a. Browse through User Modules (UM), and search for CURSENSEHW UM in Power category. Double click on the UM and it automatically gets placed in the first available position, here CSA0. From the workspace explorer, select the UM just placed by clicking it. In the UM Properties window, rename the

UM to CSA0. Change the gain to 20. Leave other parameters at their default values. Repeat this step and create CSA1, CSA2, and CSA3.

Generated	false
Name	CSA0
User Module	CURSENSEHW
Version	1.0
Gain	20
Bandwidth	Highest

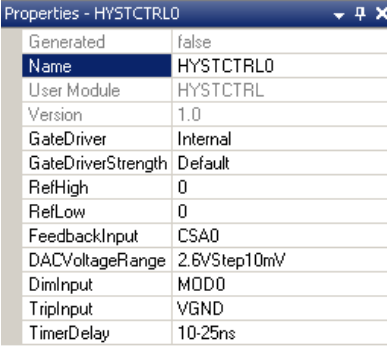
- b. Search for PRISM16HW UM in the Power category. Double click on the UM to place it. Select the UM and change its properties to the following:
- Name: PRISM0
 - ColorScaler: 255
 - DimmingResolution: 8
 - SignalDensity: 0
 - CompareType: LessThanEqual
 - Leave all other parameters at their default values. Repeat step b to create PRISM1, PRISM2, PRISM3.

Generated	false
Name	PRISM0
User Module	PRISM16HW
Version	1.0
ClockScaler	255
DimmingResolution	8
SignalDensity	0
FrequencyCompens	Disable
CompareType	LessThanEqual

- c. Search and place the HYSTCTRL UM from the Power category. Change its parameters to the following:
- Name: HYSTCTRL0
 - GateDriver: Internal
 - GateDriverStrength: Default
 - FeedbackInput: CSA0
 - DACVoltageRange: 2.6VStep10mV
 - DIMInput: MOD0
 - TriplInput: VGND

- ❑ TimerDelay:10-25ns
- ❑ Repeat step c and place three more UMS. All the parameters remain the same except as in the following table.

Name	HYSTCTRL1	HYSTCTRL2	HYSTCTRL3
Feedback Input	CSA1	CSA2	CSA3
Dim Input	MOD1	MOD2	MOD3



Properties - HYSTCTRL0	
Generated	false
Name	HYSTCTRL0
User Module	HYSTCTRL
Version	1.0
GateDriver	Internal
GateDriverStrength	Default
RefHigh	0
RefLow	0
FeedbackInput	CSA0
DACVoltageRange	2.6VStep10mV
DimInput	MOD0
TriplInput	VGND
TimerDelay	10-25ns

- d. Now browse through **Cap Sensors > CSD UM** category and place CSD with PRS16 as clock source. Select the UM from the workspace explorer. Change its name to CSD0. Change the following parameters:
- ❑ Finger Threshold: 200
 - ❑ Modulator Capacitor Pin: P0_5
 - ❑ Feedback Resistor Pin: P1_5

Properties - CSD0	
Generated	false
Name	CSD0
User Module	CSD
Version	1.3
FingerThreshold	200
NoiseThreshold	20
BaselineUpdateThre	200
Sensors Autoreset	Enabled
Hysteresis	10
Debounce	3
NegativeNoiseThre	20
LowBaselineReset	50
Scanning Speed	Normal
Resolution	12
Modulator Capacito	P0[5]
Feedback Resistor	P1[5]
Ref Value	2
ShieldElectrodeOut	None

- Now right click on the UM and select the CSD wizard. Change the value in N Sensors field to 5 and double click to apply. Drag the pins on the right to the switch positions to correlate to the hardware settings as follows

Connections

CapSense button 1: Port 1.4

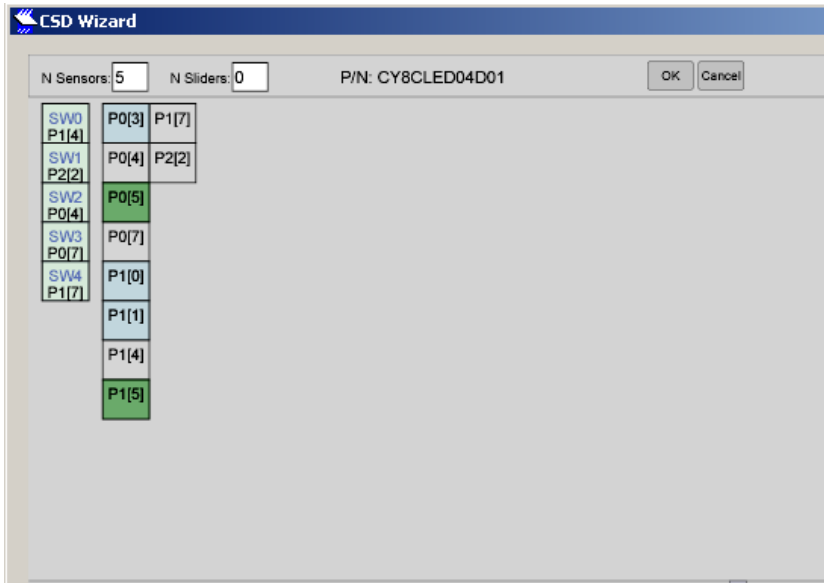
CapSense button 2: Port 2.2

CapSense button 3: Port 0.4

CapSense button 4: Port 0.7

CapSense button 5: Port 1.7

- e. Click **OK** to exit the wizard



- 4.9. To save the project, click **File > Save Workspace**. To generate the application, click **Build > Generate/Build 'CY3268_Example1' Project**.
- 4.10. Open *main.c* file from the workspace explorer under the source files category and replace the content in the *main.c* file with the content of *main.c* on CD included with the kit. The *main.c* is available in the folder `\Demo Firmware\CY3268_Example1\CY3268_Example1`.
- 4.11. To rebuild the project, save the project and click **Build > Build 'CY3268_Example1' Project**.
- 4.12. Program the device and check the functionality.

Additional example project is available in the folder `\Demo Firmware\CY3268_Heartbeat`. This example cycles through preset colors indefinitely when the CapSense button CSB5 is tapped. CSB1..CSB4, when tapped turn on/off the LEDs.

5. Safety precautions

Precautions to be taken when preparing a circuit

Use only isolated power sources (either isolated power supplies or AC power through isolation power transformers). This helps you to use a grounded oscilloscope and reduces the possibility of risk of completing a circuit through your body or destroying the test equipment.

Precautions to be taken before powering the circuit

- Check for all the connections of the circuit and scope connections before powering the circuit, to avoid shorting or any ground looping that may lead to electrical shocks or damage of test equipment.
- Know your board well - It is recommended to have your board schematic printed out. Double check your wiring and circuit connections.

Precautions while switching ON the circuit

- Apply only lower current settings (preferably 50mA) while using the hysteretic controller. The demo firmware will be configured for driving 300mA through LEDs.
- After functionality is proven, increase LED current by varying the Hysteretic DAC thresholds, stopping at frequent levels to check for proper functioning of circuit or for any components is hot or for any electrical noise that can affect the circuit's operation. Do not cross the limits for each of the thresholds mentioned in the sample code.
- Follow the FET turn ON sequence suggested in the demo firmware.


Precautions while switching OFF or shutting down the circuit

Switch off all the power supplies and remove the power supply connections.

6. Additional Cypress Resources

PowerPSoC Data Sheets, Application Notes and Technical Articles

Cypress provides a wealth of information about PowerPSoC, and more is frequently added. Many sample documents, schematics, layouts, guidelines, and other documents are available on the CD and at www.cypress.com (except where indicated). To find documentation online:

- a. Go to www.cypress.com.
- 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.
- e. Click the **Search** button .

PowerPSoC Data Sheet

For all PowerPSoC device data sheets visit www.cypress.com/go/lighting.

PowerPSoC Technical Reference Manual

For PowerPSoC device TRM visit www.cypress.com/go/lighting.

PowerPSoC Application Notes

AN47372-PrISM(TM) Technology for LED Dimming

<http://www.cypress.com/design/AN47372>

Design Support

PowerPSoC Development Software Online

All PowerPSoC development software tools are available for download online. For PSoC Designer visit www.cypress.com/psocdesigner. For PSoC Programmer visit www.cypress.com/psocprogrammer.

PowerPSoC On Demand Training

Visit www.cypress.com/psoctraining to engage in on demand self paced PowerPSoC product and development software training. Learn to design PowerPSoC like the pros, at the introductory, intermediate, and advanced knowledge levels!

PowerPSoC On Site Training

Email training@cypress.com to enquire about PowerPSoC in person training seminars at a location near you. Learn design basics, tips, and tricks from the pros to become a PowerPSoC design expert!

Online Technical Support

For knowledge base articles, customer forums, and online application support, visit www.cypress.com/go/support.

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