ARC3C0845
Evaluation System

Contents

1- Overview

ARC3C0845 Evaluation System is a hardware platform which allows easy customer testing of the Peregrine ARC3C0845 LED Backlight Driver. It can work stand-alone, or in conjunction with Peregrine Studio, a Windows-based application that facilitates evaluation.

1.1- Box Contents & Hardware Requirements

The ARC3C0845 Evaluation System consists of 4 elements: an ARC3C0845 Demo Board, an eight String LED Board, an USB-to-I2C cable, a bench power supply (provided by the user) and an optional waveform generator for non-I2C/PWM operation (provided by the user). The evaluation kit is shipped to customers with the items listed in Table 1, and shown in *Figure 1* below.

Peregrine "ARC3C0845 Demo Board".
Peregrine "Eight String LED Board".
USB-to-I2C interface cable.
USB Thumb Drive with software and documentation.

Table 1. Evaluation Kit Box Contents

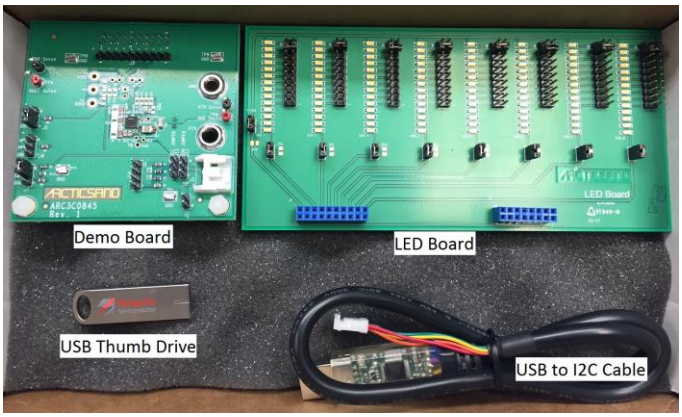


Figure 1. Box Contents

1.2- Hardware Requirements

Hardware requirements in addition to the evaluation kit are listed in Table 2.

Bench supply capable of providing 5.5V – 13.2V at 3A.
2 banana leads to connect the demo board to the bench power supply.
Windows based Computer /w USB port.

Table 2. Additional Hardware Requirements

2- Quick Start Guide in non-I2C Operation Mode:

For a quick test of the evaluation kit without I2C connection and downloading any software, please follow these steps:

1. Attach the Demo Board to the LED Board by press-fitting the two boards together, one on top of the other, as shown in *Figure 2*. The top edge of the Demo Board attaches to the bottom edge of the LED Board as shown in *Figure 3*.
2. Install the jumpers on Eval Board for non-I2C operation, see *Appendix A* for details.
3. Install the jumpers on the LED Board as shown in *Figure 5* for eight Strings, twelve LED/String, 8P12S configuration, see *Appendix A* for further details.
4. The banana connectors for VIN and GND are located on the right side of the Demo Board. GND is the connector at the top and VIN is the connector at the bottom; both are labeled.
5. With the bench power supply off, program its output to 5.5 – 8.7V at 3A for 2Cell applications or 8.25 – 13.05V at 2A for 3Cell applications, and connect it to the Demo Board.
6. To control Intensity, you can remove the jumper on J6 and connect pulse generator to PWM J6-pin2 and GND J6-pin3. Adjust the pulse generator signal to 0-1.8V, 0.2-40KHz. Change the duty cycle.
7. Turn ON the bench power supply and verify all LEDs are at proper brightness.

(Note: You may need to use protective eye wear or cover the LED Board to avoid eye irritation.)

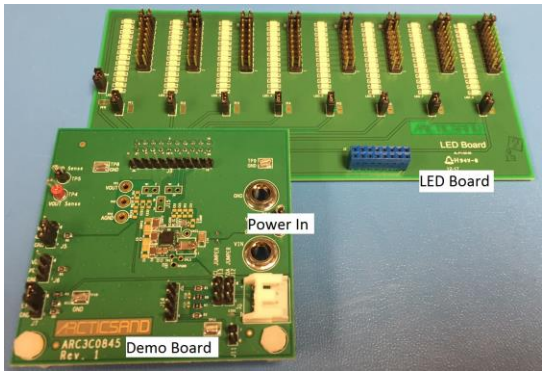


Figure 2: Assembled ARC3C0845 Evaluation System

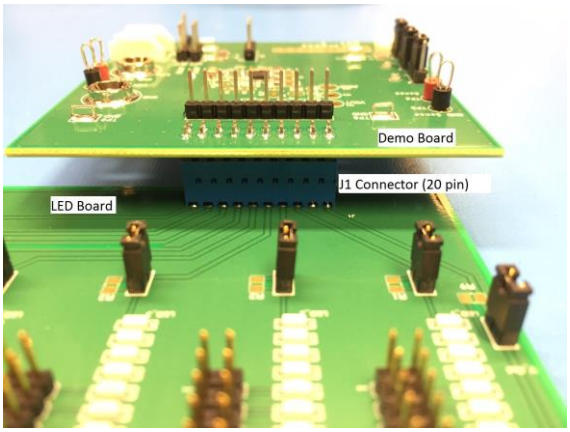


Figure 2: Connection of Boards - Side View

3- I2C Mode Software Setup

3.1- System Requirements

- Microsoft® Windows™ Vista SP2, Win7 SP1 or later
- Microsoft® .NET Framework Version 4.5

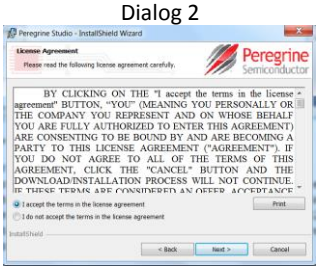
3.2- Application Software / Software Installation

The USB Thumb drive contains the Peregrine Studio setup installer. Running the installer will guide the user in loading the application on the user's computer. Double click the setup file to begin the process. Please note the actual file name will be different from setup.exe depending on the software version. A series of setup dialog windows will be presented as follows:

Dialog 1

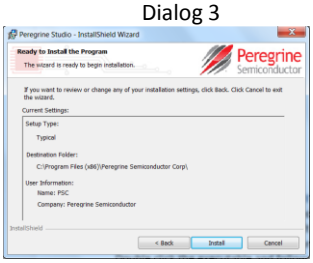
Welcome
Click 'Next' to continue

Dialog 2



License Agreement
Check "I accept" the click 'Next' to continue

Dialog 3



Installer Completed
Click 'Next' to continue

Dialog 4

Installer Completed
Click 'Finish to exit

3.3- USB Interface Adapter Driver

After the application software is loaded, open Windows Explorer and navigate to the FTDI Driver folder in the applications root directory. The default path is C:\Program Files (x86)\Peregrine Semiconductor Corp\Peregrine Studio\Support\FTDI Driver. There is an executable in this folder named, "CDM v2.12.00 WHQL Certified.exe". Double click the executable and follow the dialog instructions. After the one-time installation of the driver has finished, the setup is complete.

4- Evaluation System Hardware Setup for I2C Mode:

To setup the evaluation system, follow the steps outlined below before starting the Peregrine Studio software. The assembled system is shown in *Figure 2*.

1. Attach the Demo Board to the LED Board J1 connector by press-fitting the two boards together, one on top of the other, as shown in *Figure 2*. The top edge of the Demo Board attaches to the bottom edge of the LED Board as shown in *Figure 3*.
2. Install the jumpers on Eval Board for I2C operation, see *Appendix A* for details.
3. Install the jumpers on the LED Board as shown in *Figure 5* for eight Strings, twelve LED/String, 8P12S configuration, see *Appendix A* for further details.
4. The I2C interface is a keyed connector located at the lower right corner of the Demo Board (labeled J2). Attach the provided USB-to-I2C cable to this connector.
5. The connectors for VIN and GND are located on the right side of the Demo Board. GND is the connector at the top and VIN is the connector at the bottom; both are labeled.
6. With the bench power supply off, program its output to 5.5 – 8.7V at 3A for 2Cell applications or 8.25 – 13.05V at 2A for 3Cell applications, and connect it to the Demo Board.
7. If you have not installed the USB Interface Driver and Peregrine Studio software, do that now (as shown on previous page) before proceeding.

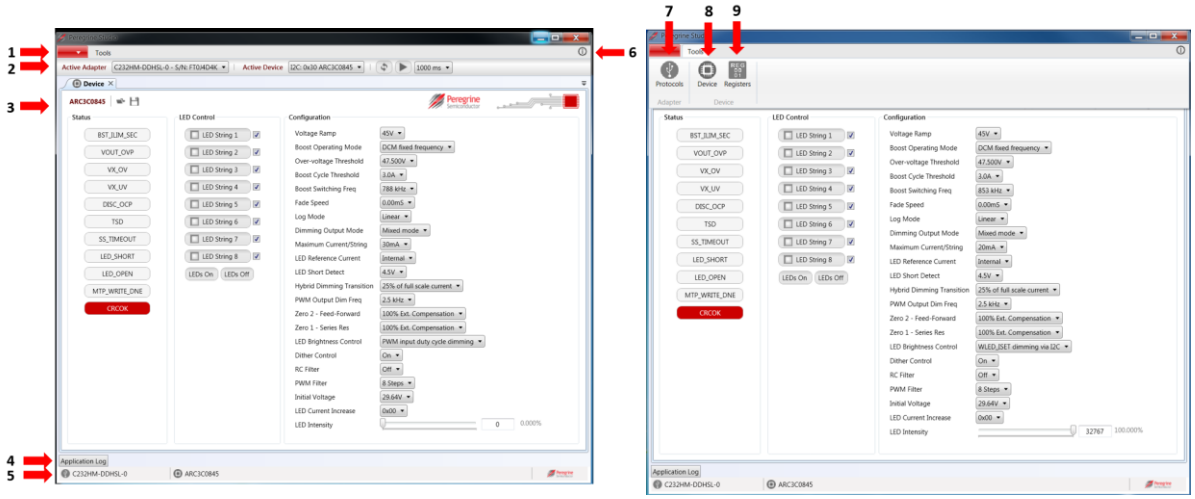
8. Connect the USB-to-I2C cable to your PC, and wait for any necessary device drivers to install.
9. Turn on the Bench Supply.
10. NOTE: At this point, the current drawn from the bench supply should be approximately 2mA. If you see a different current, make sure all the previous steps are properly followed.

5- Getting Started in I2C mode:

If you have not already done so, please follow the hardware setup steps 1 – 10 on the previous page. Double click the application icon located on the desktop. Peregrine Studio will load and auto-detect the connected hardware. At this point, your screen should look like the picture below. Passive components and device configuration may vary – please ensure that you set device registers (using the right hand side drop down menus) to match the appropriate page in the "ARC3C0845 Initial Configuration Setup.pdf" file supplied with the evaluation kit USB thumb drive. You can now adjust the LED intensity using the sliding bar, and click LEDs On.

5.1- Peregrine Studio Interface

Peregrine Studio is a plug-in based architecture which provides flexibility for evaluating multiple devices from within a single application. There is a dedicated plug-in for the ARC3C0845 and additional plug-ins that are universal and work with any I2C device.

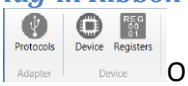


When the application initializes it will auto-detect the connected device and automatically load the device specific plug-in. In this example and throughout this document we will be using the ARC3C0845.

5.2- Getting to know the core environment

1. Plug-in Ribbon Control Menu
2. USB Adapter Selector and Polling Controls
3. Main View-Panel
4. Application Log Fly-Out Panel
5. Adapter and Device Information panel
6. Application Informational and Update Dialog
7. Protocols
8. Device Specific Plug-in
9. Registers

5.2.1- Plug-in Ribbon Control Menu



On the top of the application is the ribbon control that displays the available plug-ins for the connected device. Clicking on any of the plug-in icons will load them into the main view-panel as a new tabbed 'Pane'. Any number of plug-ins can be opened at the same time, even plug-ins that communicate to the device asynchronously.

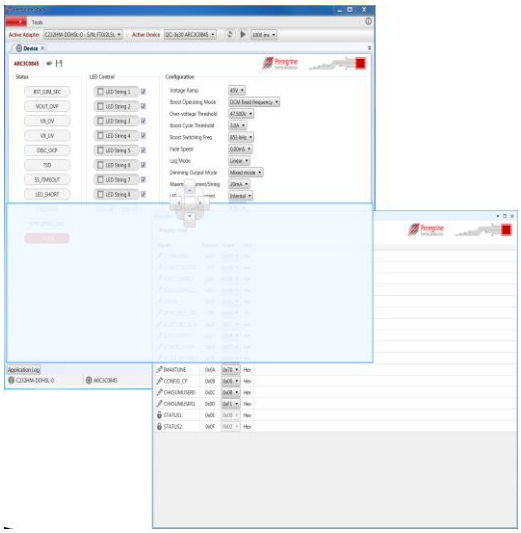
5.2.2- USB Adapter Selector and Polling Controls

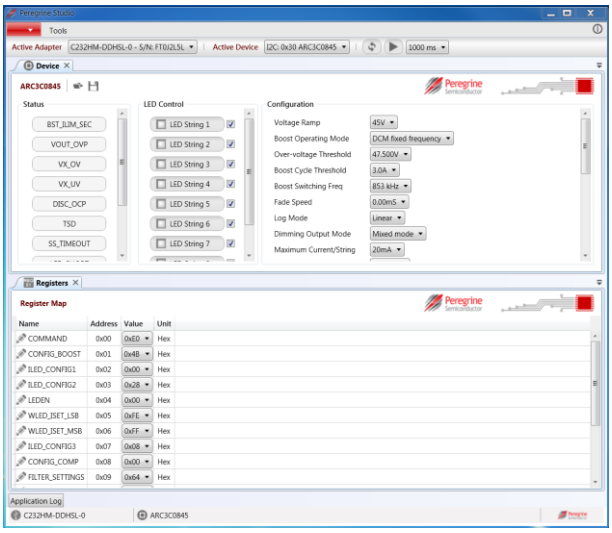
The application is capable of enumerating multiple USB interface adapters each with a connected device. Simply use the drop down selection control C232HM-DDHSL-0 to select an adapter. The newly selected adapter will become active and the user interface will reformat to display the devices available plug-ins. In most cases there will only be a single adapter at any time.

To the right of the Active Adapter selection control are several controls used for polling the registers of a connected device. Polling is mainly used for monitoring the status registers for fault conditions during run-time. Register polling is off by default. This means that the status registers are not automatically updated if there is a fault in the system. To initiate a single polling sequence, click on the Refresh button. To enable continuous polling click the Play button once to start. To change the polling frequency, use the drop down 1000 ms to select an available elapsed time in milliseconds. When continuous polling is no longer needed click the Play button to end.

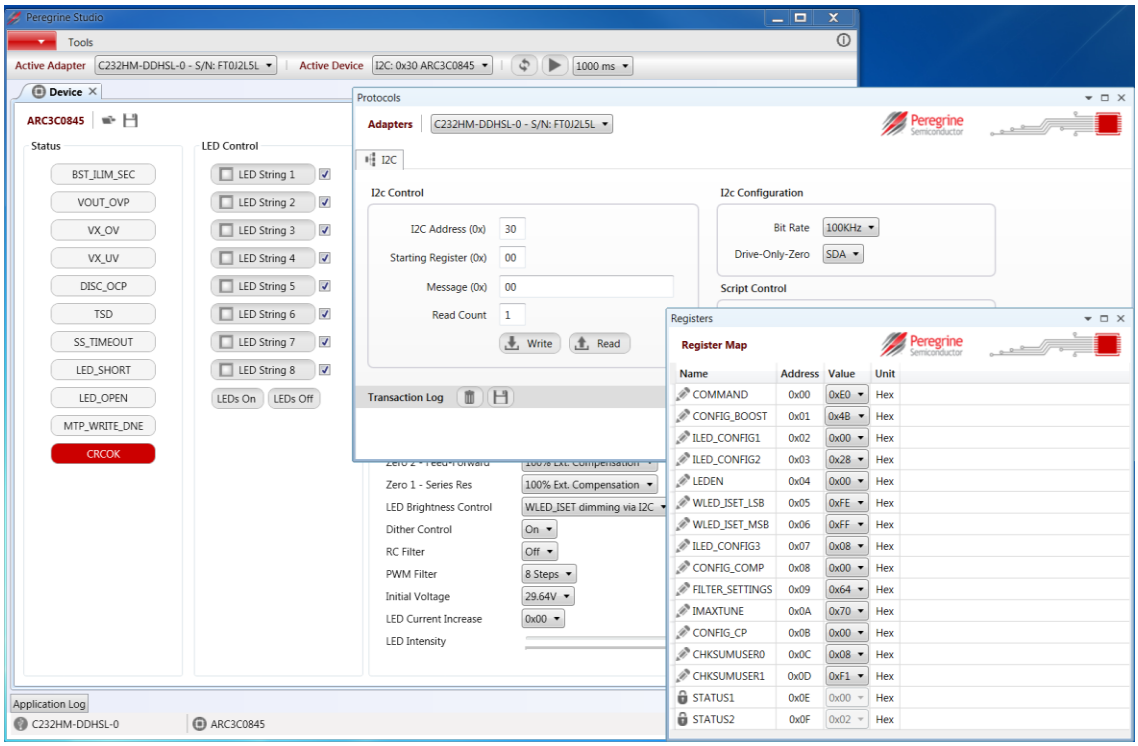
5.2.3- Main View-Panel

The main view-panel is a docking control where all of the plug-ins load by default. This control is highly flexible and allows the user to place the plug-ins in many different locations within the view-panel by docking the plug-in to the Top, Right, Bottom or Left. When there are at least two plug-ins loaded, left click and hold the 'Tab' of the plug-in and start to drag it. Once the plug-in starts to move you will see a docking image appear in the center of the view-panel. Continue to the drag the plug-in to the image with the four arrows and drop it in the side you want the plug-in to appear. The Example below shows dragging and dropping the Registers plug-in to the Bottom dock of the view-panel.

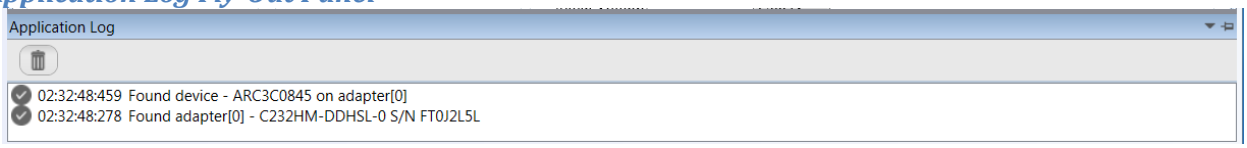




Plug-ins can be docked in any position limited only by the available screen area of the PC. Plug-ins can also become undocked and run in their own space, even another monitor.



5.2.4- Application Log Fly-Out Panel



During the course of an evaluation session, various application information may be logged for the user to view at any time by simply hovering the mouse over the Application Log button. This action will trigger the panel to 'Fly-Out' displaying a list of information. The panel itself can also be docked or pinned to stay open at all times by clicking the 'Pin' icon on the top right corner.

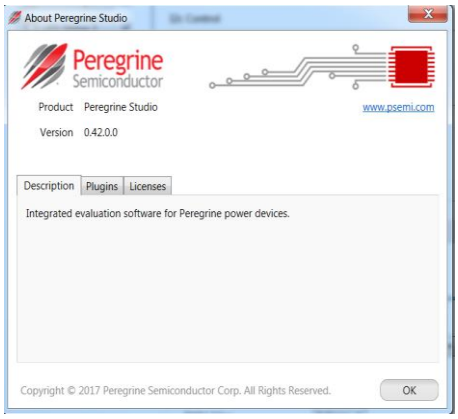
During normal operation, the application log will stay closed and silently log information. However, if the log is closed and an error occurs then the panel will automatically open so the user can immediately inspect the error that has occurred.

5.2.5- Adapter and Device Information Panel

This panel displays the current active adapter and device. In most cases, there will only be a single adapter and single device connected at any given time.

5.2.6- Application Informational

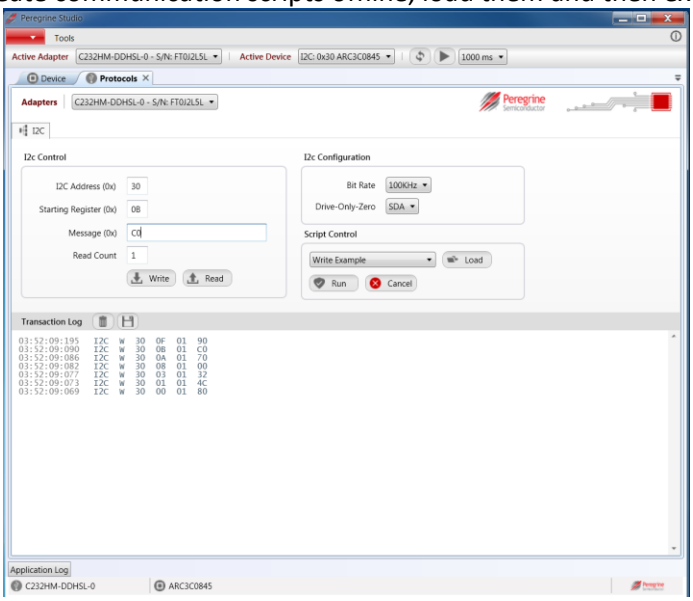
Various information about the application can be viewed in the 'About' dialog. Click the icon on the top right corner to open the dialog.



5.2.7- Protocols

The Protocols plug-in is unique in the fact that it will load with or without a connected device as long as there is an available USB interface adapter connected. This powerful plug-in allows the user to directly control the low level data communications without the safeguards of the application manager. Caution should be used when using this tool since the user is unrestricted when reading and writing to the device. This is more of an advanced user's tool where the user is comfortable with the device and knows the register space well. In normal evaluation of a device the user will not need to use this plug-in since the device can easily be evaluated with its default device specific plug-in.

All communication data is captured in the Transaction Log for viewing and troubleshooting. Various protocol bit-rates can be selected for testing. There is also a communication script engine that allows the user to create communication scripts offline, load them and then execute them at will.



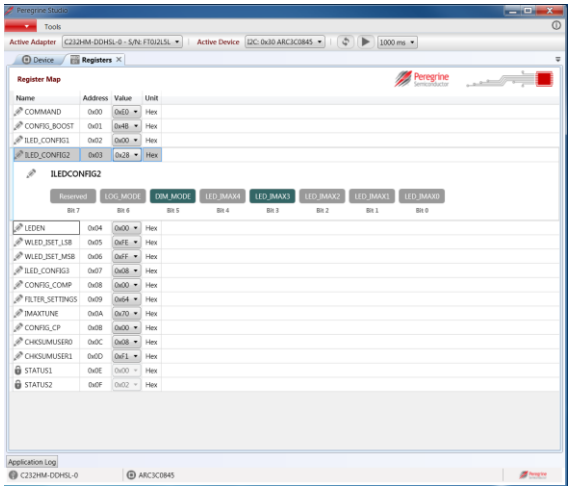
The scripts are standard XML format and can contain any number of scripts in a single document. The individual scripts can be selected using the drop down selector.
A sample script is included with the installed application and can be located in the 'Scripts' folder of the applications root directory.

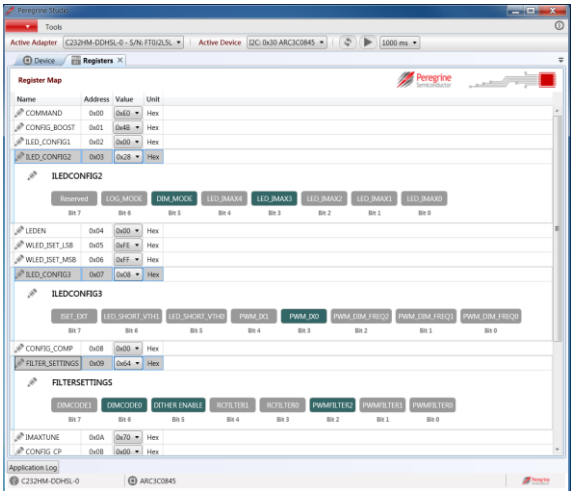
Basic Script Example:

```
<I2cScript>
    <!--
        All values are in hex with the exception of the
        optional attributes RepeatCount and InnerDelay.
    -->
    <Script Name="WriteExample1" SlaveAddress="34">
        <I2c Type="W" RegisterAddress="01" RepeatCount="10" InnerDelayMs="100">01 02 03 AB CD EF</I2c>
        <I2c Type="W" RegisterAddress="02">FE DC BA 30 20 10</I2c>
    </Script>

    <Script Name="ReadExample2" SlaveAddress="34">
        <I2c Type="R" RegisterAddress="01" Length="10" RepeatCount="10" InnerDelayMs="100" />
        <I2c Type="R" RegisterAddress="02" Length="10" />
    </Script>

    <Script Name="WriteReadExample3" SlaveAddress="34">
        <I2c Type="W" RegisterAddress="00" InnerDelayMs="250">01 02</I2c>
        <I2c Type="R" RegisterAddress="00" Length="2" RepeatCount="3" />
    </Script>
</I2cScript>
```

5.2.8- Registers

The Registers plug-in loads with any device and provides a detailed look at the register space at a bit level. Each writable register can be directly manipulated. Simply click on the register name in the list to expand the bit-field view. Hover over the bits for a brief description of the bit and click to set or clear the bit. Register values can also be changed by using the drop down selector in the 'Value' column. Holding the Ctrl-Key while expanding the registers allows a view of multiple registers at once. *Note: During editing, only one row can be expanded at a time.*





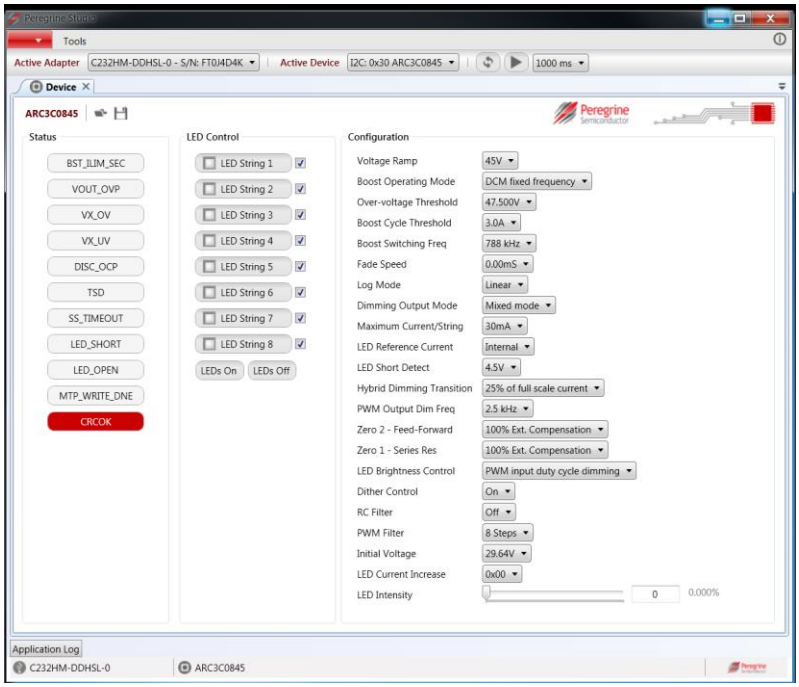
5.2.9- Device Specific Plug-ins

All device specific plug-ins are designed to simplify the evaluation process by providing intuitive UI controls that contain pop-up tool-tip information, clear text description of configuration selections, simple ON/OFF control and easy to see Status monitoring.

The ARC3C0845 plug-in consists of three basic sections.

1. **Status Monitoring** – This section displays all of the status bits of the device in one panel. Gray indicates that the bit is Clear/OFF and Green indicates that the bit is Set/ON. Note: Polling must be active for real-time monitoring.
2. **LED Control** – This section allows turning the LEDs ON or OFF. LEDs can be toggled ON/OFF simply by clicking the LED String (x) button. To turn on multiple LEDs at once, use the checkboxes next to the desired LEDs to indicate that these LEDs are marked to be turned on together. Then use the LEDs On and LEDs Off buttons to turn them ON/OFF at the same time.
3. **Configuration** – This section is used to configure the device. Each selection contains clear text descriptions of the setting to be configured. For a detailed description of each setting please refer to the device datasheet.

When the device is configured to the preferred settings, the user can save this configuration by clicking the Save icon. At any time later the device can be reverted back to this configuration by clicking the Load icon.
The picture below shows the ARC3C0845 plug-in panel with three sections described above for a specific operating condition.



6- Appendix A – Hardware and Jumper Options

Each board in the evaluation kit has test points, optional components, jumper configurations and various connectors. They are described in detail below.

6.1- ARC3C0845 Demo Board

The Demo Board has the connectors, jumpers and options, summarized in *Table3* and indicated in *Figure 4*. Demo Board Connectors and Options.

•VDDIO, SDA, SCL JUMPERS for I2C and non-I2C Modes
VDDIO: J11 Connect pin1 to pin2 in non-I2C mode*. Remove the jumper in I2C mode
SDA: J12, Connect pin2 to pin3 for boost switching frequency in non-I2C mode*. Remove the jumper in I2C mode
SCL: J13, Connect pin2 to pin3 for dimming mode in non-I2C mode*. Remove the jumper in I2C mode
*Refer to below table for setting options.
I2C Pull-Up (J14): connect pin 1 to 2 and pin 3 to 4 to provide pull up voltage to SDA, SCL if needed in I2C mode. Remove both jumpers in non-I2C mode.

•CONNECTORS
VIN / GND – Banana connectors
Header Interface to LED Board (J1)
I2C Input (J2)

•TEST / SENSE POINTS
GND Sense:TP5, TP7, TP8, TP9, TP10, TP11
VIN Sense: TP6
VOUT sense: TP4
J3-pin10: LED8 sense
J3-pin9: LED7sense
J3-pin8: LED6 sense
J3-pin7: LED1sense
J3-pin6: LED1 sense
J3-pin5: LED1 sense
J3-pin4: LED1 sense
J3-pin3: LED1 sense
J3-pin2: N/C
J3-pin1: Vout sense

•JUMPERS	
SDA (J12): in non-I2C mode connect pin2 to	VDD (pin1) - 1.138 MHz
	Float- 731 KHz
	GND (pin3)- 512 KHz
SCL (J13): in non-I2C mode connect pin2 to	VDD - DPWM dimming
	Float- Analog dimming
	GND - Mixed dimming
ADDR (J5): for I2C mode connect pin2 to	VDD - 7-bit slave address=35h
	Float - 7-bit slave address=32h
	GND - 7-bit slave address=30h
PWM (J6): in non-I2C mode connect pin2 to	VDD - 100% brightness
	GND - 1% brightness
	Or pulse generator
EN (J7): for I2C mode and non-I2C mode connect pin 2 to	VDD - Turn ON
	GND - Turn OFF

•Optional Components
RISET: external current set resistor

Table 3. Summary of Demo Board Connectors and Option

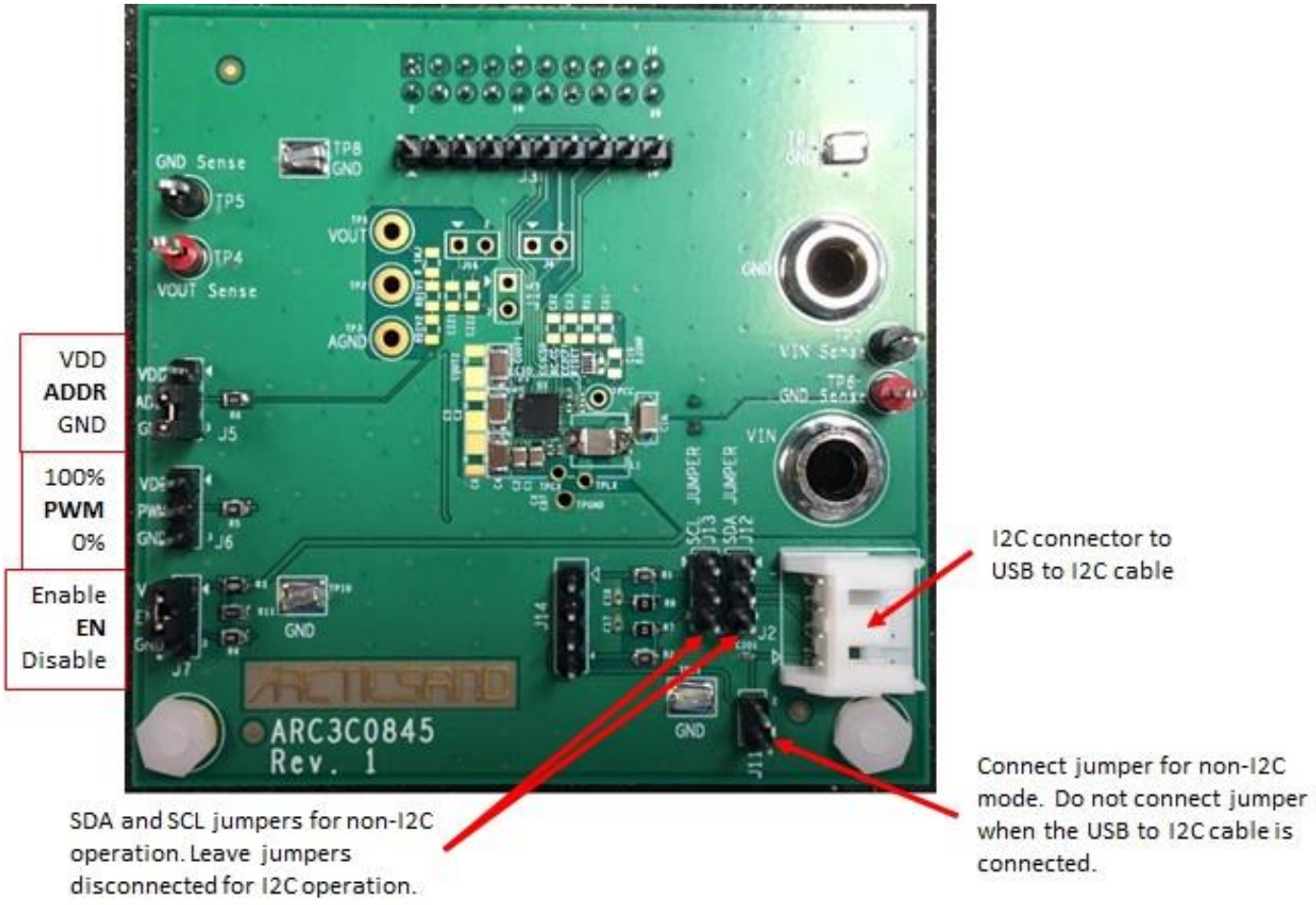


Figure 4. Demo Board Connectors and Options

6.2- Eight String LED Board

The Eight String LED Board has the connectors, jumpers and options, summarized in Table 4 and indicted In Figure 5.

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•CONNECTORS
J1 – 8 String Interface to Demo Board J2 – 6 String Interface to Demo Board

•Jumpers / Optional Components
LED Count Select: Each String of LEDs has a jumper-selectable Count. 4 to 14 LEDs per string may be selected.

•TEST / SENSE POINTS
LED Current Sense Resistor: Each LED string may have a series resistor installed for current sensing. A shunt block is installed across the measurement points by default.
VOUT Current Sense Resistor: VOUT may have a series resistor installed for current sensing. A shunt block is installed across the measurement points by default.

Table 4. Summary of LED Board Connectors and Options

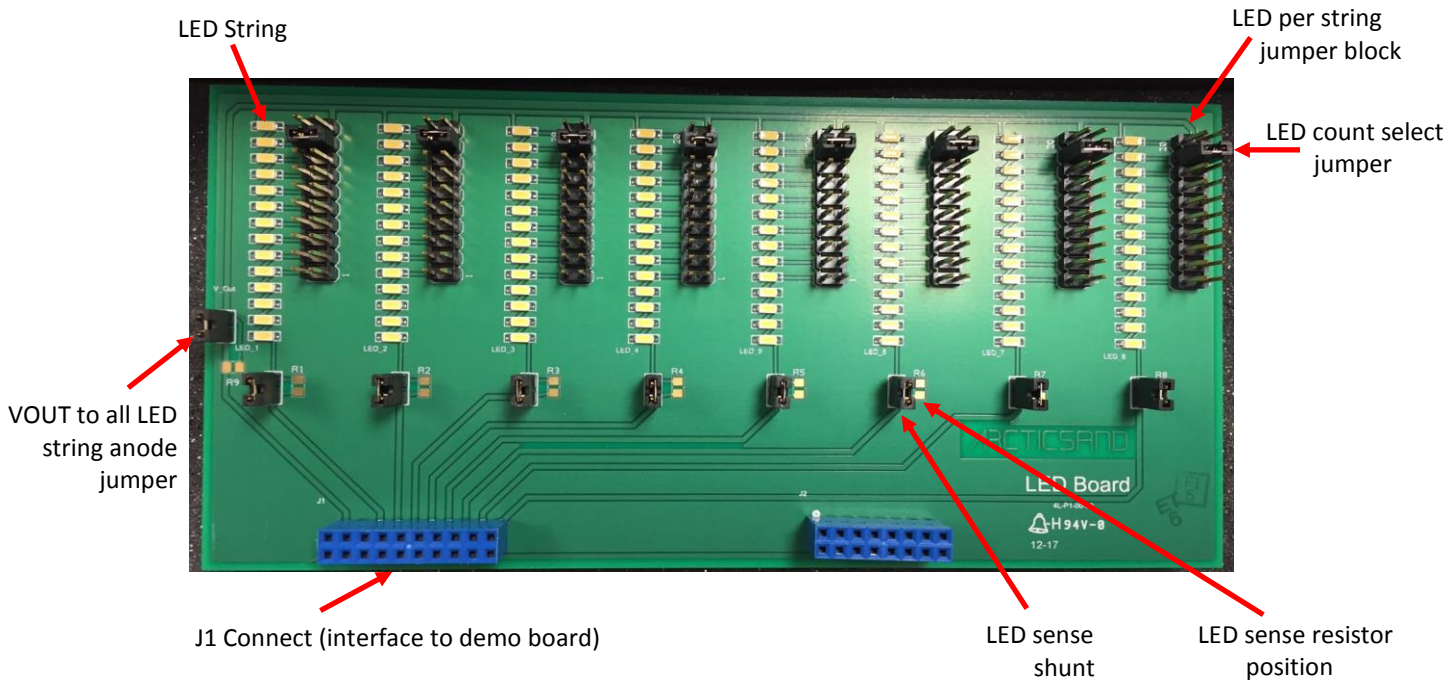

Figure 5. LED Board Connectors and Options