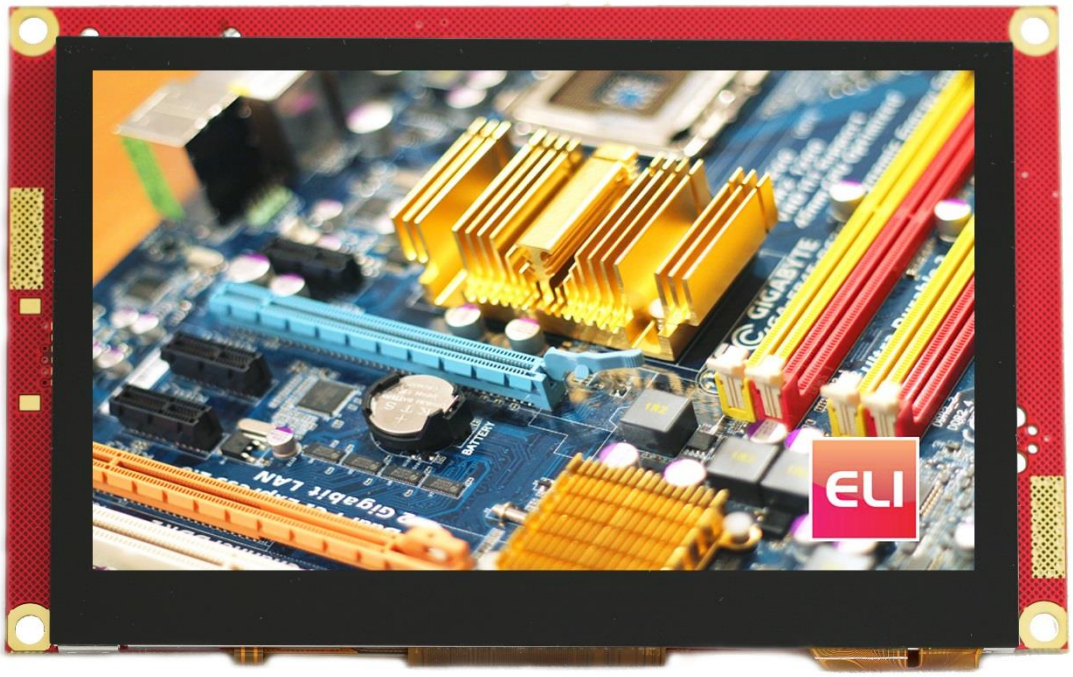
User's Manual
ELI43-CR



Revision 1.05

Future Designs, Inc.
Your Development Partner
996 A Cleaner Way, Huntsville, AL 35805

Copyright ©2018, Future Designs, Inc., All Rights Reserved

Important Legal Information

Information in this document is provided solely to enable the use of Future Designs, Inc. (FDI) products. FDI assumes no liability whatsoever, including infringement of any patent or copyright. FDI reserves the right to make changes to these specifications at any time, without notice. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without the express written permission of Future Designs, Inc. 996 A Cleaner Way, Huntsville, AL 35805.

Microsoft, MS-DOS, Windows, Windows XP, Microsoft Word are registered trademarks of Microsoft Corporation. Other brand names are trademarks or registered trademarks of their respective owners.

Printed in the United States of America.

For more information on FDI or our products please visit https://www.teamfdi.com.
©2024 Future Designs, Inc. All rights reserved.

FDI Document PN: MA00066
Revision: 1.05, 03/18/2024

Important Legal Information 2
1.0 Introduction 4
2.0 ELI43-CR Box Contents 4
3.0 Optional Accessories Recommended for Use (Purchased Separately) 4
4.0 ESD Warning 5
5.0 Determining the Revision of your ELI 5
6.0 Technical Specifications 6
7.0 Connectors 7
8.0 Power Details 7
9.0 Extended Display Information Data (EDID) 8
10.0 PWM Control of Backlight 9
11.0 Mechanical View 14
12.0 Support 16
12.1 Where to Get Help 16
12.2 Useful Links 16

Copyright ©2024, Future Designs, Inc.

1.0 Introduction

About ELI (the Easy LCD Interface)

ELI® is Future Designs, Inc.'s family of long-life, plug-and-play embedded displays. ELI products are true modular embedded display solutions that require no engineering or lead-time. All ELI products are compatible with a wide range of single board computers including Raspberry Pi, BeagleBone Black and Windows-based units. FDI designed ELI as an embedded display option that requires minimal development time to help customers reach production quickly. Once a product is in production, FDI's 10-15 year ELI product availability guarantee helps ensure production schedules without the risk of expensive or time consuming redesigns. Learn more about ELI at TeamFDI.com/ELI.

ELI Compatibility

ELI products are compatible with most single board computers, PCs and operating systems. See https://www.teamfdi.com/product-details/eli43-cr#compatibility for the results of FDI's compatibility tests with popular operating systems and platforms. Our results, as indicated in the table, demonstrate ELI's versatility but the table is not exhaustive. ELI products are designed to work with any single board computer that has an HDMI or DVI output. To submit a question about ELI's compatibility with a platform or operating system that is not included in the table, contact a member of the FDI support team at Support@teamfdi.com.

Your ELI Experience

Share your experience connecting ELI devices to various (single board) computers at: https://www.teamfdi.com/edid/#edidform.

2.0 ELI43-CR Box Contents

- ELI43-CR

3.0 Optional Accessories Recommended for Use (Purchased Separately)

- 12V DC (+/- 5%) 2A Power Supply with a center positive barrel plug
  - 2.1mm I.D. x 5.5mm O.D. x 9.5mm
  - All ELI units operate from +12V DC so this is the recommended power supply input voltage for the entire Family. ELI43-CR units from Rev 3.0 and greater are also capable of operation from a range of +5 to 24V DC (+/- 5%)
- USB Type A to Mini Type B Cable (For touch)
- HDMI Cable (Type A Male)

Copyright ©2024, Future Designs, Inc.

4.0 ESD Warning

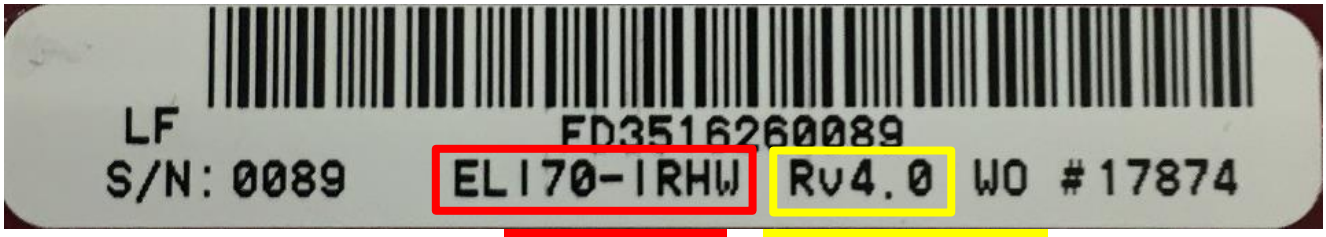


Figure 1. Electrostatic Sensitive Device

Our ELI units are shipped in a protective anti-static package. Do not subject the module to high electrostatic potentials. Exposure to high electrostatic potentials may cause damage to the boards that will not be covered under warranty. General practice for working with static sensitive devices should be followed when working with this device.

5.0 Determining the Revision of your ELI

All ELI units have a label on the board to identify the part number and revision. An example of an ELI label is shown below.



ELI Part Number ELI Revision Number

Copyright ©2024, Future Designs, Inc.

6.0 Technical Specifications

Table 1. Technical Specifications

Screen Size (inches):	4.3
Display Technology:	TFT LCD TN panel anti-glare
Resolution:	480 x 272 (WQVGA)
Brightness (nits typical):	470
Contrast Ratio (typical):	500:1
Aspect Ratio:	16:9
Interface Input Mode:	HDMI/DVI
Colors:	16M (24 bit)
Horizontal Viewing Angle:	70/70°
Vertical Viewing Angle:	70/50°
Surface:	Anti-glare
Touch Screen:	4-wire Resistive
Touch Screen Interface (mA typical/max):	USB Device (24/47)
Touch Panel Hardness:	>7H
Touch Panel Force (gF max):	80
Active Area (in mm W x H):	95.04 x 53.86
Response Time (ms):	24
Backlight:	10 LED (5S x 2P)
Backlight Life (K hours typical):	20
Backlight Power Consumption (mW Typical):	600
Operating Temperature:	-20° to 70° C
Storage Temperature:	-30° to 80° C
Input Voltage (Rev. 3.0 and above):	+5 to 24VDC ± 5%
Input Voltage (Rev. 2.x and below):	+12VDC ± 5%
Power Consumption (ma typical/max)	106/250
RoHS Compliant:	Yes
Dimensions (in mm W x H x D)	116.84 x 72.26 x 19.10
Mounting:	#4 screw mounts in 4 corners
Weight:	106 grams

Copyright ©2024, Future Designs, Inc.

7.0 Connectors

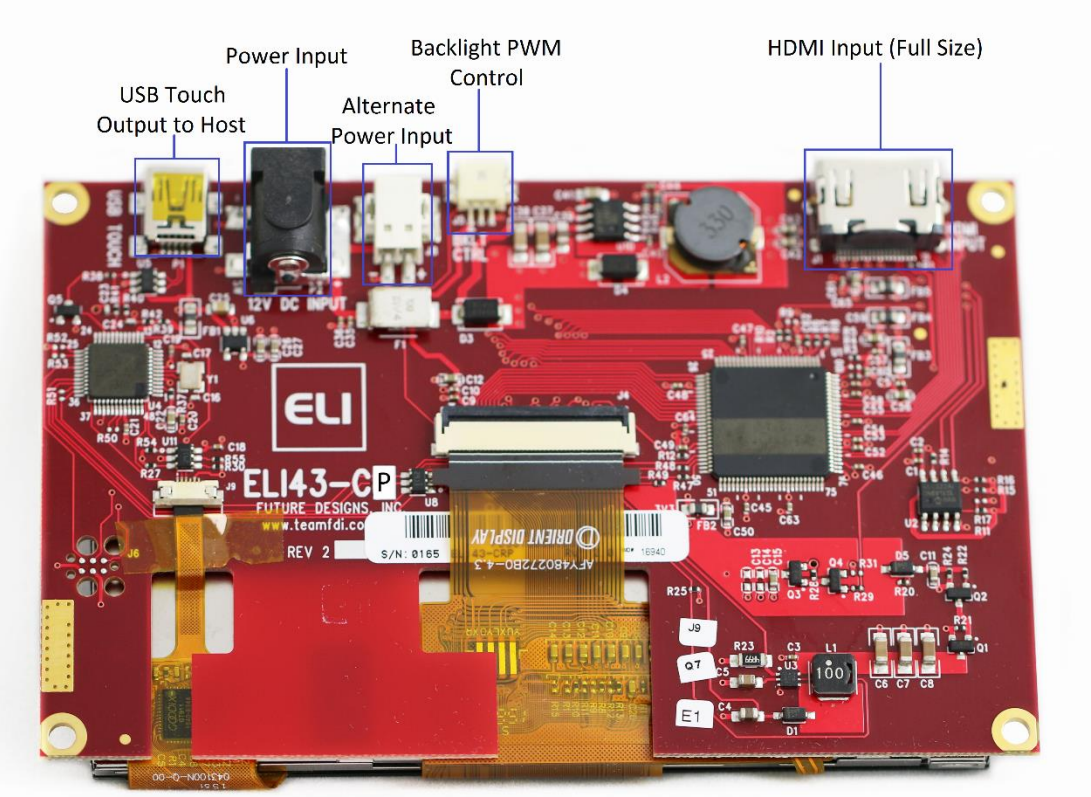


Figure 2. ELI43-CR Connectors

8.0 Power Details

A 12VDC (+/- 5%) power supply with a 2.0A output will power any board from the ELI Family. This allows a common, off-the-shelf power supply such as the **T1071-P5P-ND** to be used for quick demos or prototyping across the entire ELI Family. In general, any 12VDC power supply with a 2.1mm center positive plug will be acceptable if it can provide enough current to power the particular ELI unit being used.

For volume production applications, the input power can be optimized for your particular ELI unit and lower capacity power supplies can be used.

On the ELI43-CR, plug power into the (P2) connector. In cases where the barrel connector is not desired, you can use the alternate power input connector (J8) with supports directly plugging in 20-26 AWG wire with maximum 5A current per contact. The datasheet for this J8 connector (PCB terminal block - PTSM 0,5/ 2-2,5-H SMD WH R24 – 1814634) can be found at https://tinyurl.com/1814634.

On ELI43-CR units of Revision ≥3.0 and above, the input power range is expanded from +5 to 24V DC ± 5% (2.0A) for greater design flexibility.

Copyright ©2024, Future Designs, Inc.

To verify that the ELI43-CR unit is correctly powered you may check the 12VDC input with a Fluke meter or scope by probing the +12V and GND contacts, shown below. Please verify that the +12VDC is present, is within the +/- 5% tolerance and is free from excessive noise or AC ripple.

Note: If using an input that is within the acceptable range of Rev 3.0 ELI43-CR boards, +5VDC to +24VDC (+/- 5%), please keep in mind that the 12V Test points should be at the voltage of your chosen power supply (5-24VDC).

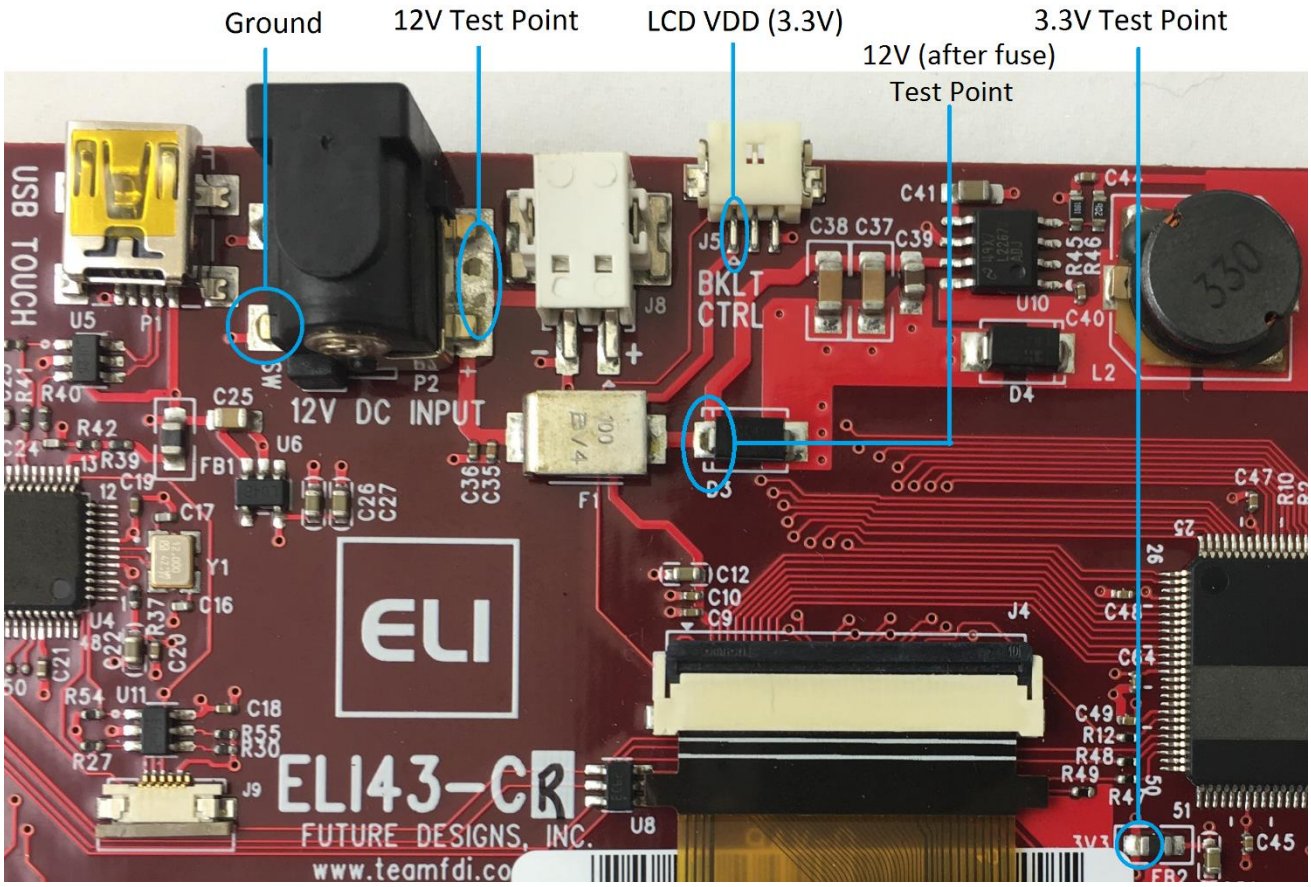


Figure 3. ELI43-CR Power Test Points

9.0 Extended Display Information Data (EDID)

ELI uses Extended Display Identification Data (EDID) for automatic configuration with many operating systems. You can find out more on our website at https://www.teamfdi.com/edid/.

Copyright ©2024, Future Designs, Inc.

10.0 PWM Control of Backlight

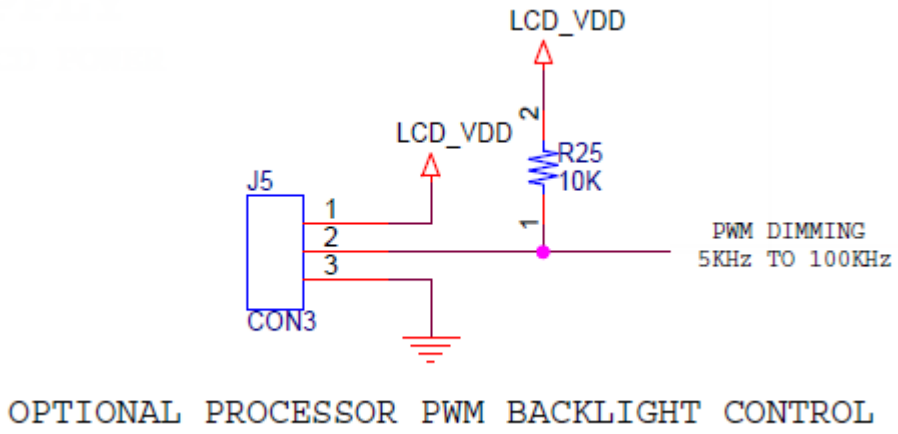


Figure 4. PWM Backlight Control

J5 mating connector housing information:

- Manufacturer: Hirose
- Part Number: DF12-3S-1.25C
- Digi-Key Link: https://www.digikey.com/products/en?keywords=H2180-ND
- Pre-terminated wires https://www.digikey.com/products/en?PPV=1811-9-566967

ELI provides an input so an external processor can control the display backlight to vary the display brightness or to reduce power consumption (the display backlight is typically one of the larger sources of power consumption in the system). PWM dimming is an input with a 0 to 3.3 VDC range and the user should drive this with a push-pull type output or a suitable open collector output.

To control the display backlight the user should connect an externally generated Pulse Width Modulated (PWM) signal to J5 pin 2 with a common ground to J5 pin 3. The frequency range for this signal is from 5KHz to 100KHz. Each ELI unit's unique sized display backlight properties will vary, so the user should test their version for an acceptable range of brightness control. For example, the actual display 0 to 100% brightness range may be 40% to 90% of the PWM range. In certain installations, a series resistor may be required to ensure a clean PWM signal is provided to the ELI. The suggested value for the resistor is 100ohms. See Figure *6* below, for example of connectivity. Actual testing in your installation may require this resistor to be changed, or possibly not required at all.

On the ELI unit, the PWM dimming signal is pulled up to LCD_VDD providing 100% backlight power when no PWM signal is applied at pin 2 of J5. If nothing is connected to J5 the ELI will drive the display at 100% brightness (default).

Copyright ©2024, Future Designs, Inc.

The LCD_VDD output at pin 1 of J5 is a 3.3VDC ± 5%. ELI provides the 3.3 VDC signal, called LCD_VDD, for the external system in case this voltage is needed to generate the correct levels on the PWM Dimming Input. If the external system is capable of directly driving the PWM dimming signal at 3.3VDC, there is no need to connect pin 1 to the cable.

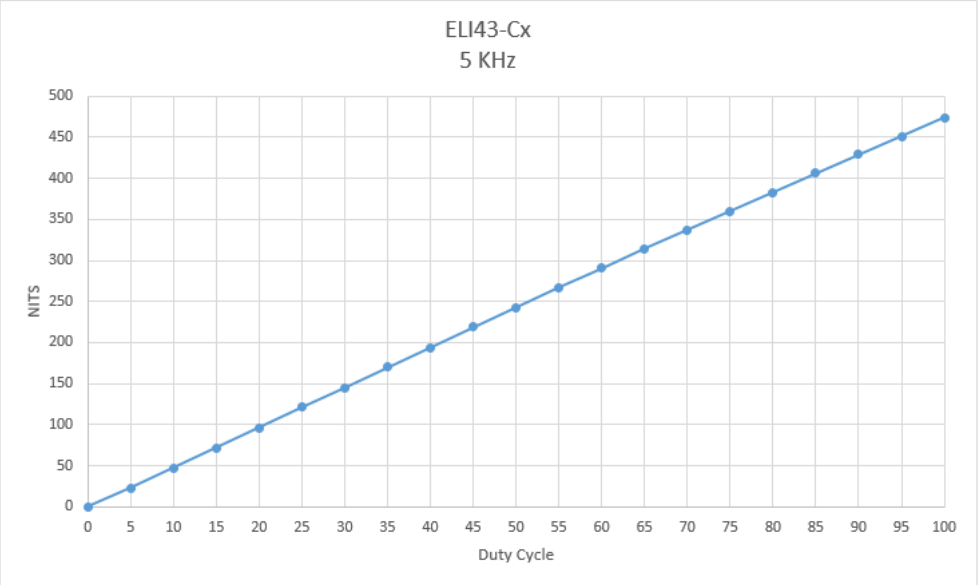


Figure 5. ELI43-CR Backlight Curve in Nits

Copyright ©2024, Future Designs, Inc.

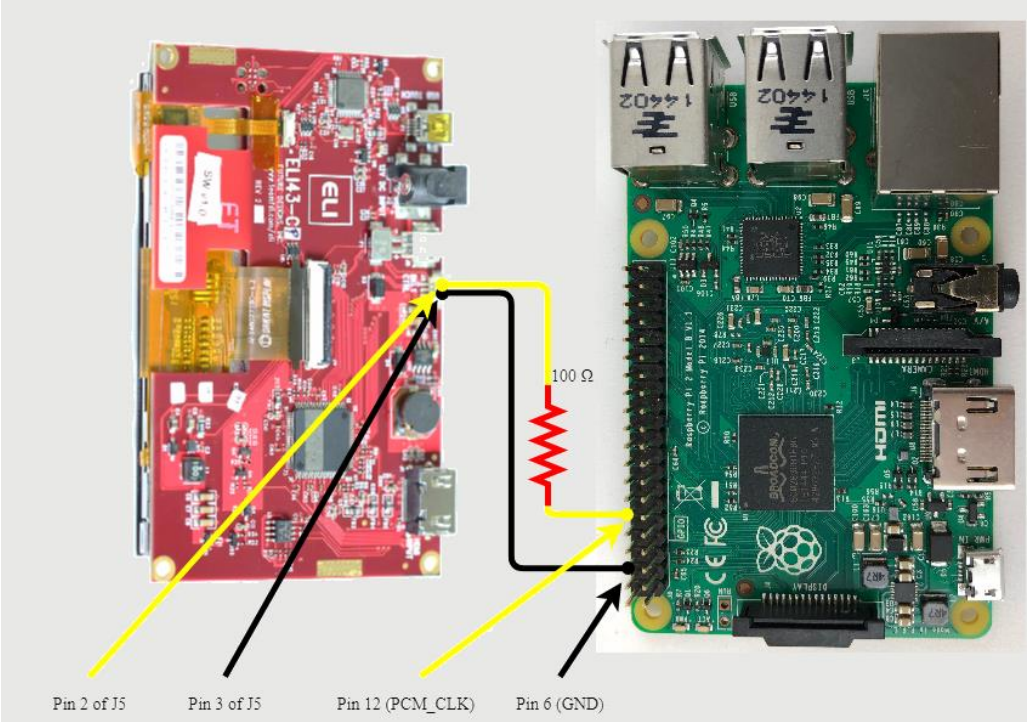


Figure 6. Raspberry Pi Signal and Ground

The ELI backlight can be controlled from a Raspberry Pi. See Figure *6* for a wiring diagram. Our software is available on the FDI website at https://www.teamfdi.com/product-details/eli43-cr#software or you may copy the code from here:

```
/* Changes brightness of ELI backlight given a
command line argument between 0 and the set
range. Uses bcm2835 header file provided by
Broadcom at
https://www.airspayce.com/mikem/bcm2835/bcm2835-
1.52.tar.gz This source code must be compiled using
"g++ brightness.cpp -o brightness -l bcm2835"in
order to properly link the header file. Must be
run using sudo, accessing GPIO pins requires root
permissions. After compiling, you may add
executable to "/usr/bin" which allows you to type
"sudo brightness <value>" to change brightness
anywhere in terminal. The "/boot/config.txt" file
must also be changed by adding a "#" before the
line "dtparam=audio=on". This disables audio
output from the Raspberry Pi. If this is not
disabled then anytime sound is output the screen
will return to 100% brightness.
*/
```

Copyright ©2024, Future Designs, Inc.

```
#include<iostream>
#include<bcm2835.h>
#include<string>

using namespace std;

#define LED RPI_GPIO_P1_12 // PWM pin number for
backlight control
#define RANGE 20 // Range for PWM steps
#define CLOCK 192 // Clock rate

int main(int argc, char *argv[]){

    int data = 0; // Brightness level

    if(argc != 2){ // Give user correct usage if
ran incorrectly
                cout << "Error: correct usage,
brightness <value>" << endl;
                return 1;
        }

    data = stoi(argv[1]);

    if(data > RANGE || data < 0){
        cout << "Error: brightness value must be
between 0 and " << RANGE << endl;
        return 1;
    }

    if(!bcm2835_init())
        return 1;


bcm2835_gpio_set_pad(BCM2835_PAD_GROUP_GPIO_0_27,
BCM2835_PAD_DRIVE_2mA); // Sets the drive current
to 2mA
    bcm2835_gpio_fsel(LED,
BCM2835_GPIO_FSEL_ALT5); // Sets up pin 18 for
alt5 pwm mode

    bcm2835_pwm_set_clock(CLOCK); // Sets pwm
clock to 19.2 MHz / CLOCK
    bcm2835_pwm_set_mode(0,1,1); // Sets mode to
markspace
    bcm2835_pwm_set_range(0,RANGE); // Sets range
    bcm2835_pwm_set_data(0,data); // Sets data
rate to argument value

    bcm2835_close();
    return 0;
}
```

Copyright ©2024, Future Designs, Inc.

Figure 7. Backlight Control for Raspberry Pi

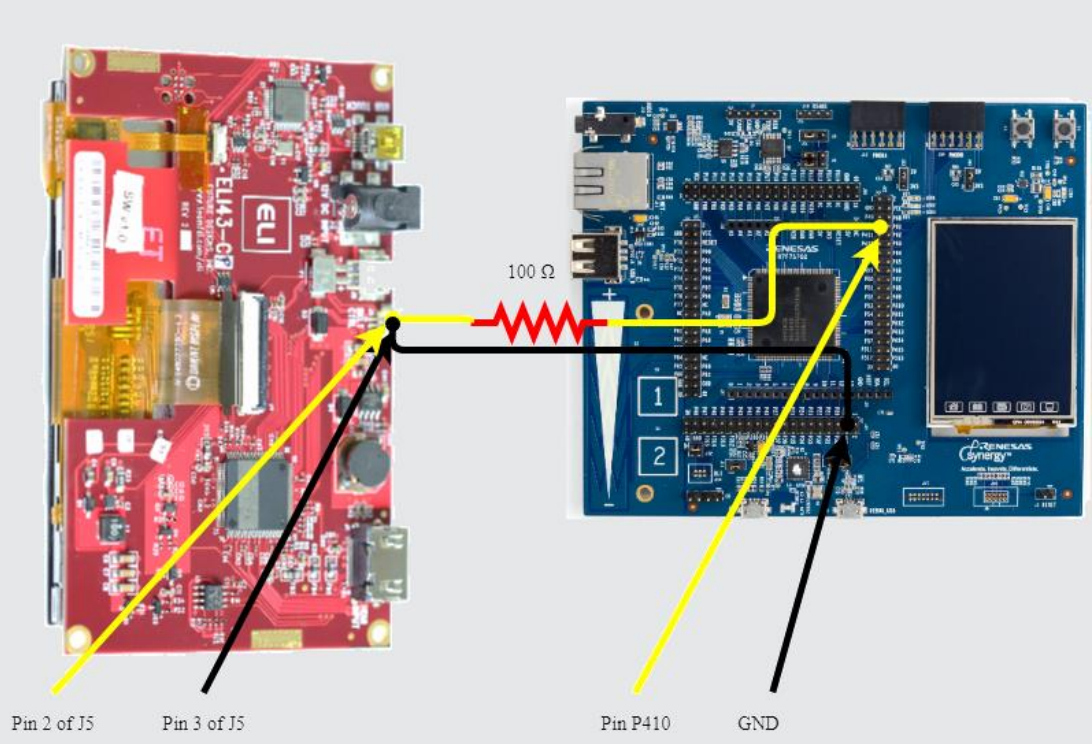


Figure 8. Renesas Synergy S7G2 Signal and Ground

The ELI backlight can also be controlled from a Renesas Synergy S7G2 wired as shown in Figure *8***Error! Reference source not found.**. The software for Synergy can be found on our website at https://www.teamfdi.com/product-details/eli43-cr#software.

Copyright ©2024, Future Designs, Inc.

11.0 Mechanical View

- Tape used to secure the LCD to the PCB is: 3M VHB 4956 ½" width
- 4 screw holes on the ELI43-CR accept up to #4 size screws to mount ELI43-CR into an enclosure and to connect to the system ground.
- The exposed ground pads may be used to connect the ELI43-CR PCB directly to the LCD using copper or aluminum foil tape. This practice meets ESD requirements.

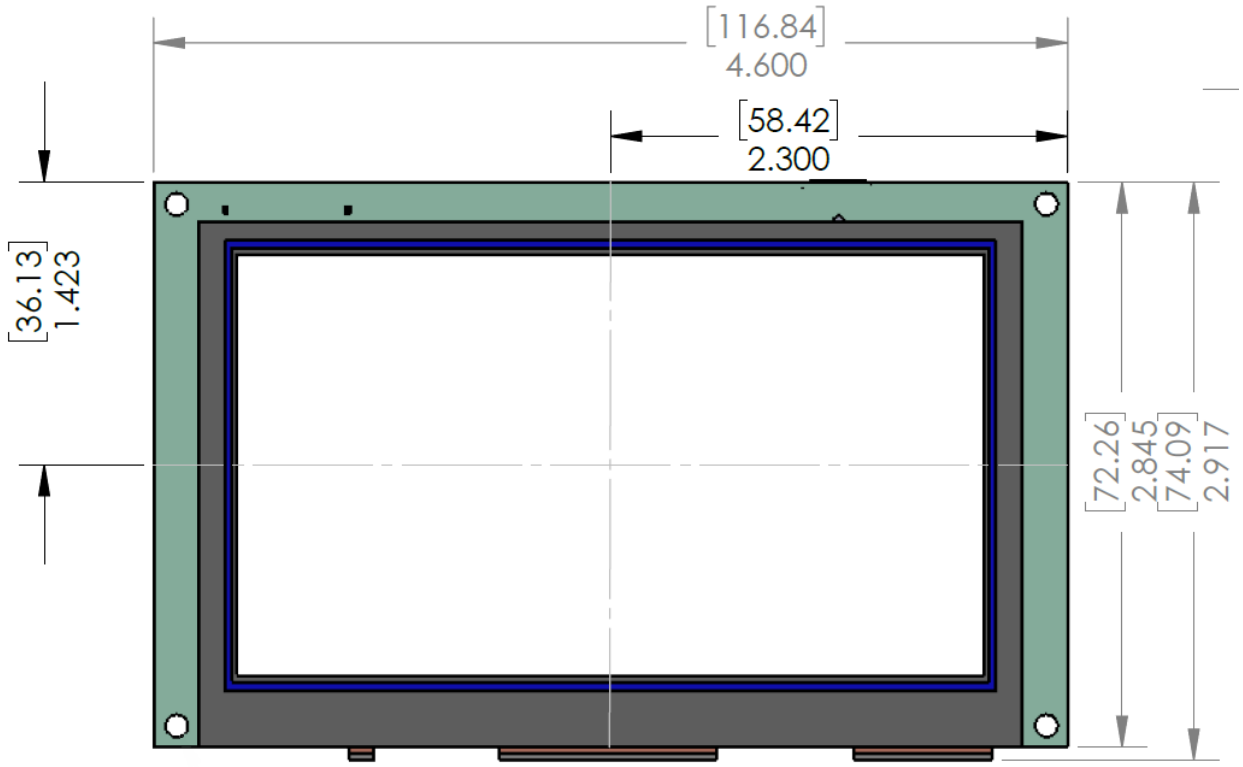


Figure 9. Front View with Measurements

Copyright ©2024, Future Designs, Inc.

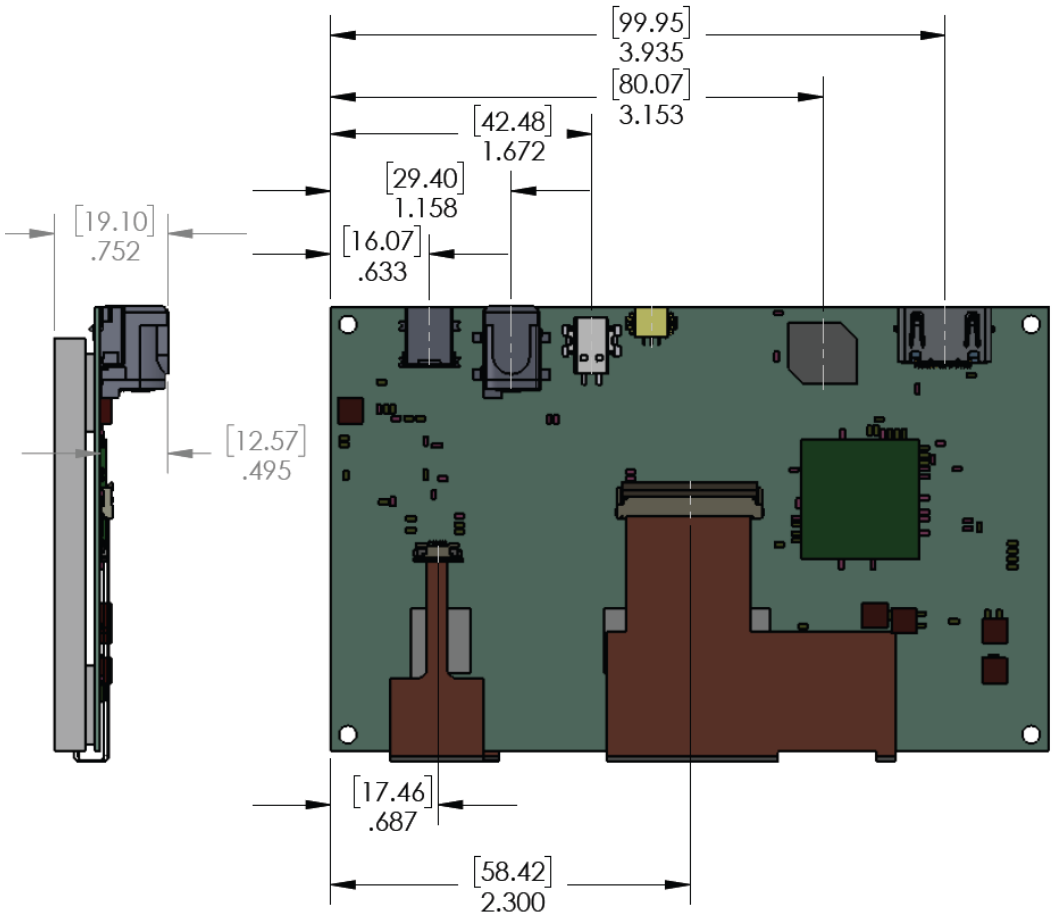


Figure 10. Side and Back Views with Measurements

Copyright ©2024, Future Designs, Inc.

12.0 Support

12.1 Where to Get Help

Online technical support is available at https://www.teamfdi.com/support/

12.2 Useful Links

- Future Designs, Inc. Forums: https://www.teamfdi.com/forum
- ELI43-CR Product Page: https://www.teamfdi.com/product-details/eli43-cr
- ELI Software User's Manual: https://www.teamfdi.com/wp-content/uploads/ELI-Software-Users-Manual.pdf
- Tell us about your ELI experience: https://www.teamfdi.com/edid/#edidform
- EDID Information Page: https://www.teamfdi.com/edid/

Copyright ©2024, Future Designs, Inc.