NHD-FT81x-SHIELD

Arduino Shield User Guide for NHD EVE2 TFT Modules

NHD-	Newhaven Display
FT81x-	Supports Newhaven Display FT81x (EVE2) based TFT Modules
SHIELD-	Arduino Shield

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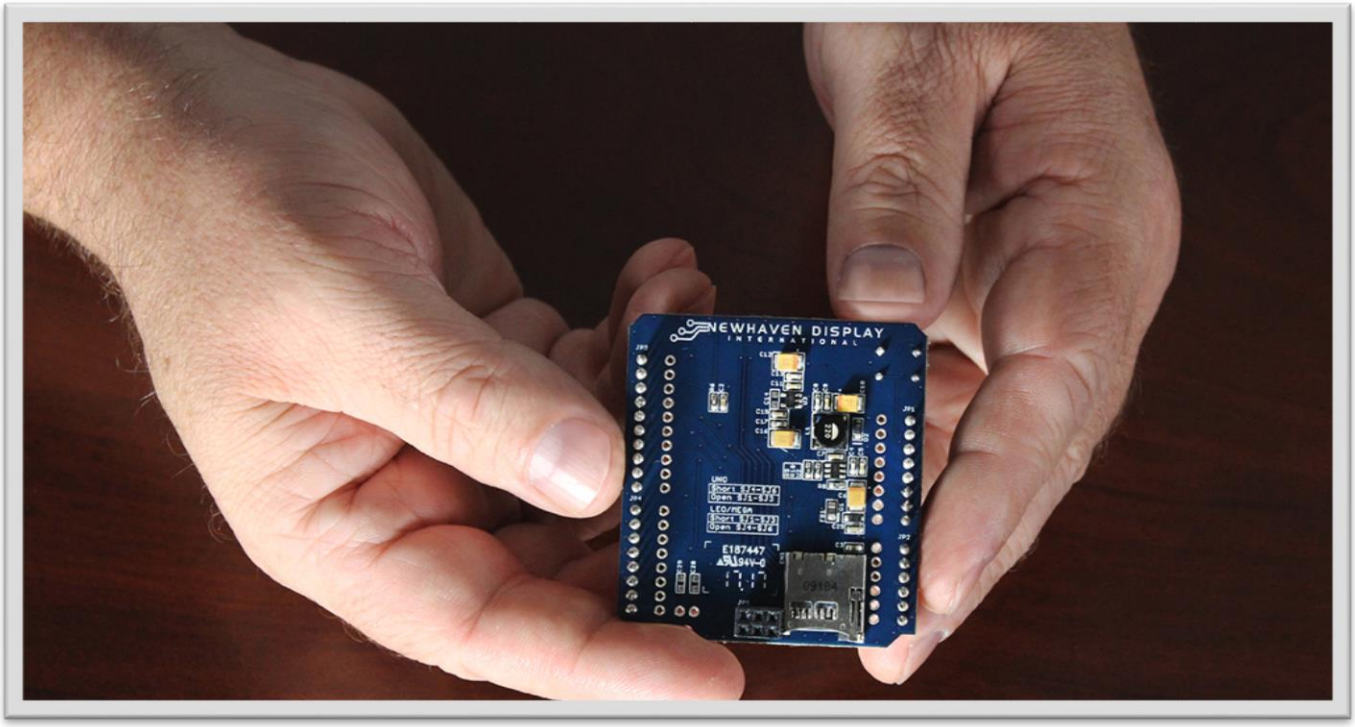
Table of Contents

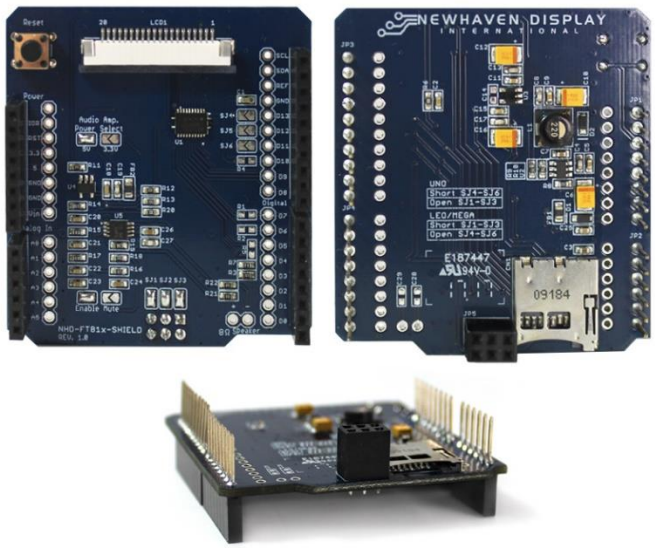
Overview 3
Supported TFT Modules 4
Configuration Options 5
Power Supply Selection 5
Arduino I/O Configuration (SPI) 5
Reset Button 6
Micro-SD Slot 6
Audio Connector 6
Audio Amplifier Power Select 6
Audio Amplifier Mute/Enable Select 6
TFT Connector Pin Description 7
Connecting with an Arduino 7
Arduino Installation Instruction for EVE2 TFT Modules 9
Application Sketch Test 10
Software Support 11
Hardware Support 11
Additional Information/Resources 14
Quality Information 16
Document Revision History 17

Overview



Arduino shields are meant to extend the capabilities of the Arduino, while also making initial development of a new device much easier for the user. In this case, our NHD-FT81x-SHIELD provides seamless connectivity and direct software compatibility for the user when using any of our EVE2 TFT Modules with an Arduino. In addition, the NHD-FT81x-SHIELD offers the following features:

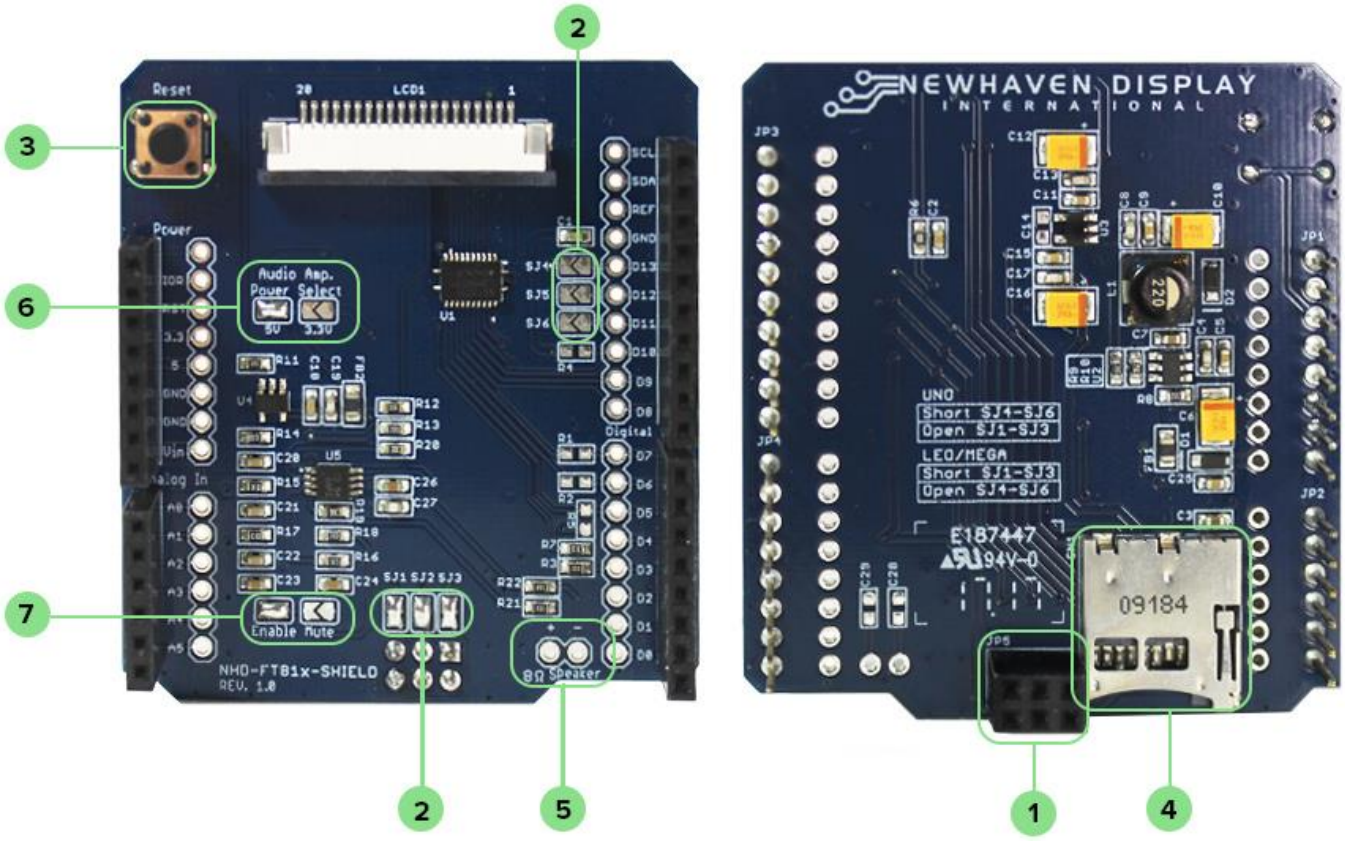
- Logic level shifters to allow the 5V Arduino to communicate with the 3.3V FT81x
- Regulators to allow the Arduino to output more current to the EVE2 TFT Module
- Audio filter/amplifier circuit to utilize the EVE2 TFT Module's audio output signal
- MicroSD card slot, which allows expandable storage for data such as images, video, and audio, etc.



Supported TFT Modules

Part Number	Resolution	Display Type	Luminance Rating	Optimal Viewing Angle	Touch Panel	Controller
NHD-3.5-320240FT-CTXL-T	320xRGBx240 Pixels	Standard	320 cd/m²	12:00	4-Wire Resistive	FT812
NHD-3.5-320240FT-CSXV#-T		Premium	620 cd/m²	75° all angles		
NHD-3.5-320240FT-CSXN#-T		Sunlight Readable	780 cd/m²	12:00		
NHD-3.5-320240FT-CTXL#-CTP		Standard	330 cd/m²	12:00	Projected Capacitive	FT813
NHD-3.5-320240FT-CSXV#-CTP		Premium	660 cd/m²	75° all angles		
NHD-3.5-320240FT-CSXN#-CTP		Sunlight Readable	830 cd/m²	12:00		
NHD-4.3-480272FT-CTXL#-T	480xRGBx272 Pixels	Standard	340 cd/m²	6:00	4-Wire Resistive	FT812
NHD-4.3-480272FT-CSXV#-T		Premium	680 cd/m²	75° all angles		
NHD-4.3-480272FT-CSXN#-T		Sunlight Readable	780 cd/m²	6:00		
NHD-4.3-480272FT-CTXL#-CTP		Standard	350 cd/m²	6:00	Projected Capacitive	FT813
NHD-4.3-480272FT-CSXV#-CTP		Premium	700 cd/m²	75° all angles		
NHD-4.3-480272FT-CSXN#-CTP		Sunlight Readable	830 cd/m²	6:00		
NHD-5.0-800480FT-CTXL#-T	800xRGBx480 Pixels	Premium	400 cd/m²	75° all angles	4-Wire Resistive	FT812
NHD-5.0-800480FT-CTXL#-CTP		Premium	415 cd/m²	75° all angles	Projected Capacitive	FT813
NHD-7.0-800480FT-CTXL#-T		Standard	220 cd/m²	12:00	4-Wire Resistive	FT812
NHD-7.0-800480FT-CSXV#-T		Premium	600 cd/m²	75° all angles		
NHD-7.0-800480FT-CSXN#-T		Sunlight Readable	780 cd/m²	12:00		
NHD-7.0-800480FT-CTXL#-CTP		Standard	230 cd/m²	12:00	Projected Capacitive	FT813
NHD-7.0-800480FT-CSXV#-CTP		Premium	660 cd/m²	75° all angles		
NHD-7.0-800480FT-CSXN#-CTP		Sunlight Readable	830 cd/m²	12:00		

Configuration Options



(1) *Power Supply Selection*

Since you'll probably be connecting other things to the Arduino (LEDs, sensors, servos) we recommend using a DC power supply that can provide at least 1000mA of output current.

IMPORTANT NOTE: When using the Arduino + NHD-FT81x-SHIELD connected to an EVE2 TFT Module, a DC power supply should always be connected to the Arduino's DC input. This is due to the current limitations of the USB input on the Arduino.

(2) *Arduino I/O Configuration (SPI)*

On the NHD-FT81x-SHIELD, six solder jumpers (SJ1, SJ2, SJ3, SJ4, SJ5, and SJ6) have been added to provide flexibility to the Users' Arduino selection.

Solder Jumpers **SJ1**, **SJ2**, and **SJ3** enable the SPI lines on the ICSP header. The MISO, MOSI, and SCK lines are available in a consistent physical location on the ICSP header (Solder connections fitted by default).

Solder Jumpers **SJ4**, **SJ5**, and **SJ6** enable the SPI lines on the Arduino Uno's Digital header. A number of clones do not include the ICSP header, and therefore this configuration is required to be compatible.

(3) *Reset Button*

S1 is a reset button for the Arduino, not for the display. This allows access to the Arduino's reset button which is covered up when a shield in placed on top of the Arduino for a number of the Arduino models.

(4) *Micro-SD Slot*

The micro-SD socket CN1 on the NHD-FT81x-SHIELD enables the Arduino to access files for use with the FT81x Graphics Controller, along with being a storage media for general storage used by the Arduino. The Arduino communicates to both the Display and micro-SD card over SPI, and some of the communication from the display may request the Arduino for information which is stored on a file on the card. The Arduino will then access the information on the micro-SD card and send the information to the Display. The micro-SD card chip select signal is available on the Arduino's Digital pin 5, while the card detection signal is available on the Arduino's Digital pin 3.

(5) *Audio Connector*

The audio connector JP6 is used for connecting an external 8 Ohm 1 Watt speaker.

SP+ Audio speaker +ve from the onboard amplifier.
SP- Audio speaker -ve from the onboard amplifier.

(6) *Audio Amplifier Power Select*

This jumper provides the option to select the power supply voltage for the onboard power amplifier.

SJ9 (5V) Audio Amplifier Power Select 5 Volts. (Solder connection fitted by default).
SJ10 (3.3V) Audio Amplifier Power Select 3.3 Volts.

(7) *Audio Amplifier Mute/Enable Select*

This jumper provides the option to Enable or Mute the onboard amplifier.

SJ7 (Enable) Audio Amplifier Enable (Solder connection fitted by default).
SJ8 (Mute) Audio Amplifier Mute.

The onboard amplifier circuit can also be muted by the AUDIO_SHDN# signal connected to GPIO2 on the TFT-LCD Controller board.

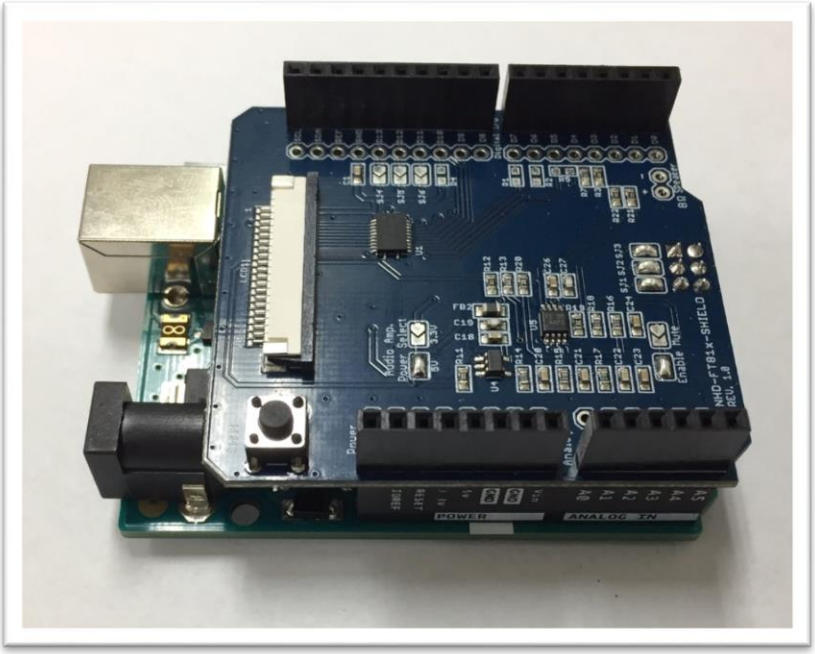
TFT Connector Pin Description

The EVE2 TFT Module is connected to the NHD-FT81x-SHIELD via the FFC connector labeled “LCD1” (20-Pin 1.0mm FFC Bottom-Contact). The table below describes the pins of the TFT connector and shows their connection to the Arduino.

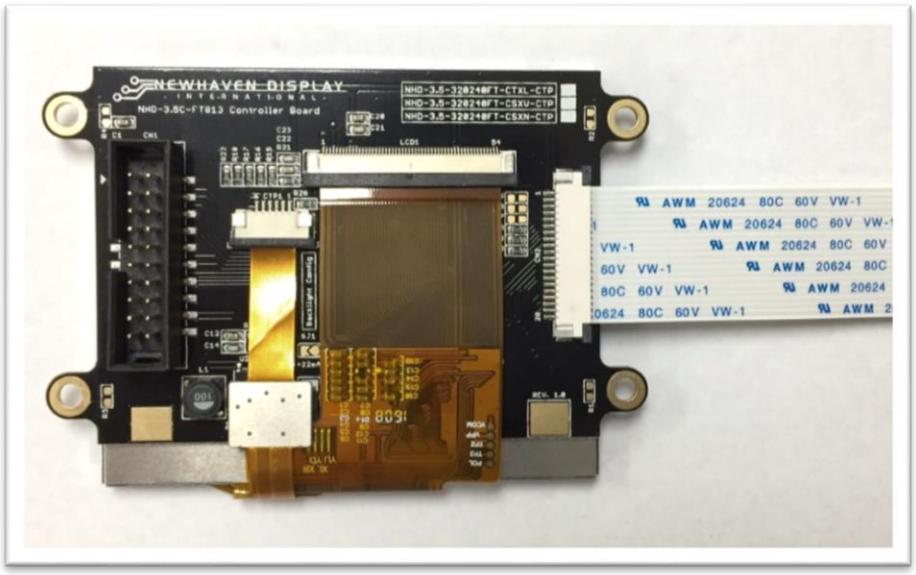
Pin No.	Symbol	Arduino Pin	Function Description
1	VDD	-	Power supply for TFT and FT813 Video Engine (3.3V)
2	GND	GND	Ground
3	SCK	D13	SPI Clock (Input)
4	MISO/IO1	D12	SPI MISO (Output) / Quad-SPI mode: SPI data line 1
5	MOSI/IO0	D11	SPI MOSI (Input) / Quad-SPI mode: SPI data line 0
6	/CS	D10	SPI Chip Select (Input), Active LOW
7	/INT	D9	Interrupt to host (Output), Active LOW
8	/PD	D8	Power Down control (Input), Active LOW
9	AUDIO_L	-	Audio PWM out (Output)
10	N.C.	-	No Connect
11	GPIO0/IO2	-	General Purpose IO0 / SPI Quad mode: SPI data line 2
12	GPIO1/IO3	-	General Purpose IO1 / SPI Quad mode: SPI data line 3
13	GPIO2	-	General Purpose IO2
14	GPIO3	-	General Purpose IO3
15 - 16	N.C.	-	No Connect
17 - 18	VBL	-	Power supply for LED Backlight Circuit (3.3V/5V)
19 - 20	GND	GND	Ground

Connecting with an Arduino

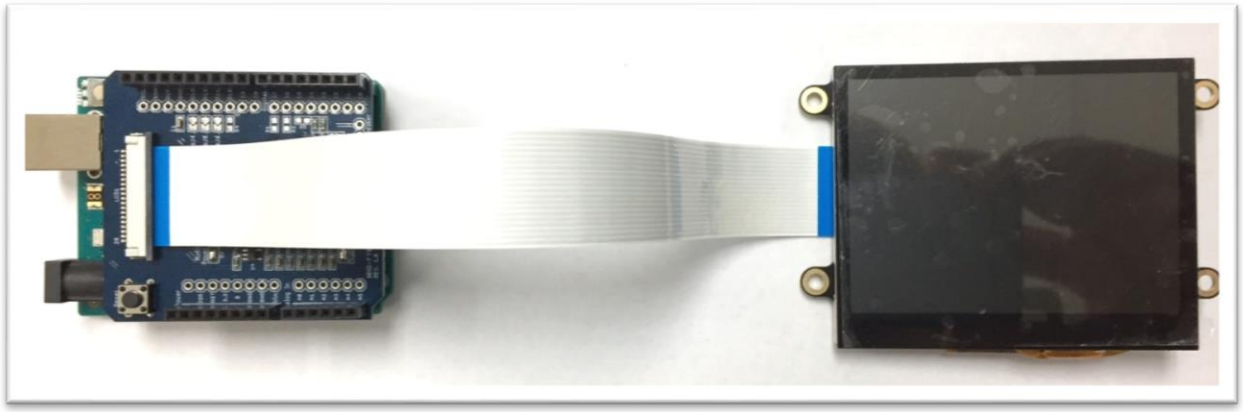
To use the NHD-FT81x-SHIELD, simply place it onto your Arduino as shown below:



Using one of the EVE2 TFT Modules, connect the shield to the display through the 20-pin, 1.0mm pitch FFC connectors using an FFC cable as shown below:

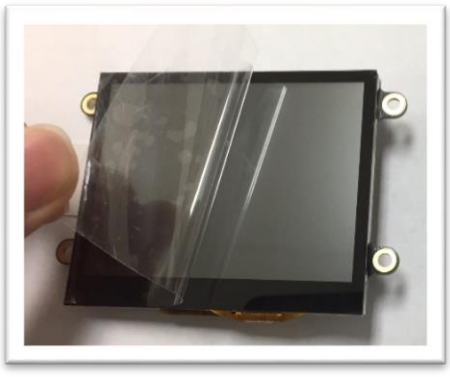


(FFC connector on the EVE2 TFT Module is Top-Contact)



(FFC connector on the NHD-FT81x-SHIELD is Bottom-Contact)

Don't forget to remove the protective film from the display!



Arduino Installation Instruction for EVE2 TFT Modules

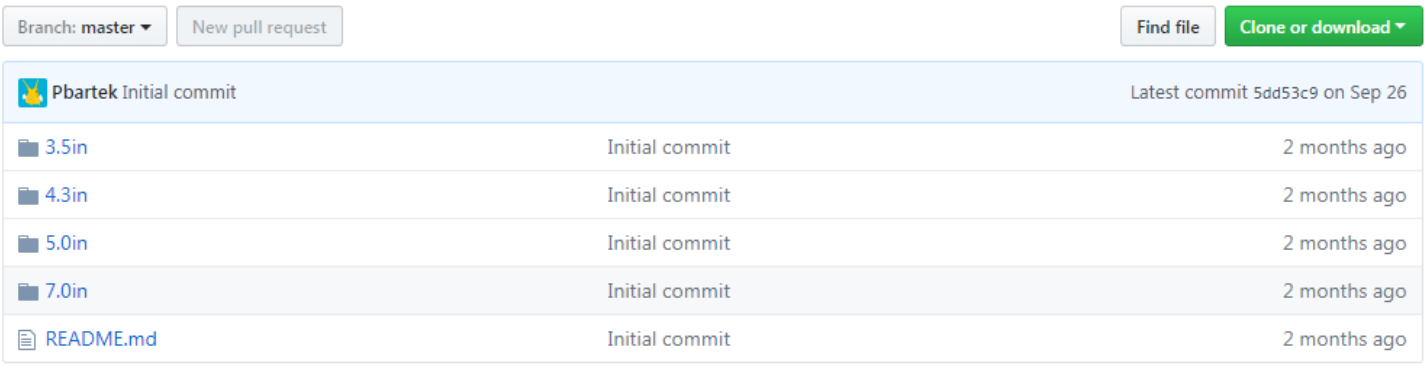
Before you jump to installing the Arduino project files, make sure you've got the correct Arduino IDE version installed.

Tested Platform Version: Arduino 1.8.1

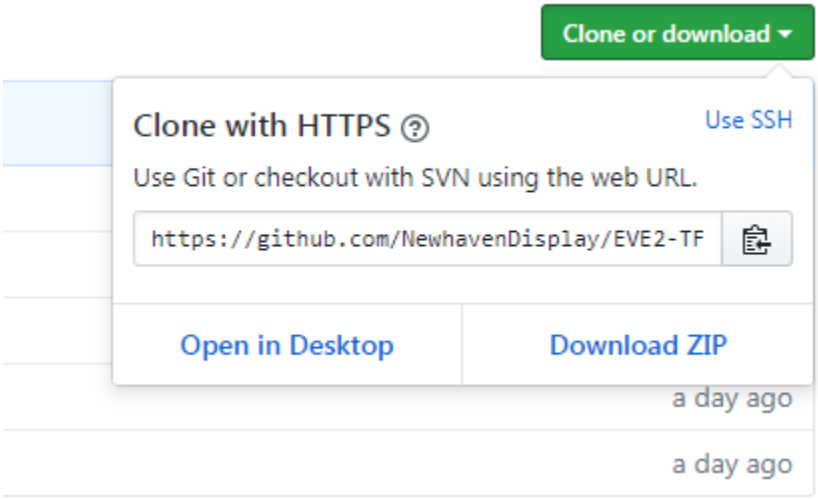
FTDI/Bridgetek has Arduino example code ready to go for use with the NHD-FT81x-SHIELD. You will need to download the project files and unzip the package onto a respective project folder and open the solution/sketch file in the project folder and execute it.

Visit Newhaven Display's GitHub page and download the Arduino specific project files.

https://github.com/NewhavenDisplay/EVE2-TFT-Modules



Click the 'Clone or download' drop-down, then click 'Download ZIP' and the browser will download the EVE2 TFT Module library to your computer.



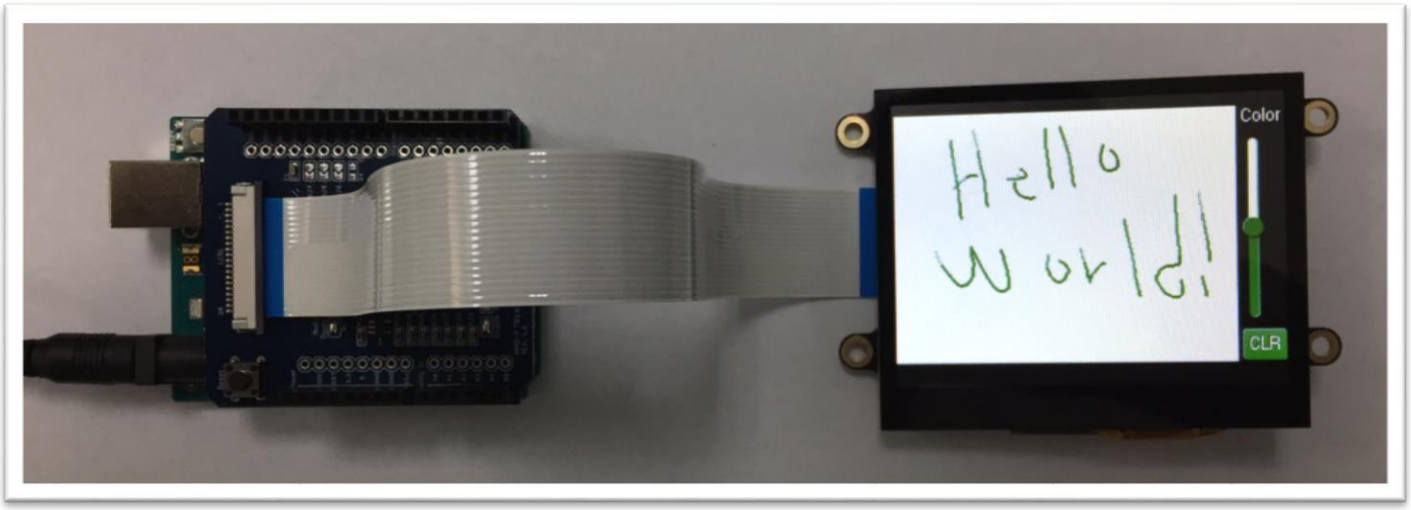
Un-zip the folder and rename it "EVE2-TFT-Modules" make sure to place the package into a desired project folder and open the sketch file in the project folder to use one of the examples.

Application Sketch Test

IMPORTANT NOTE: Due to the current limitations of the USB input on the Arduino, whenever connecting the Arduino to your computer and/or uploading code with an EVE2 TFT Module connected to it, a DC power supply should always be connected to the Arduino's DC input in addition to the USB input connection.

The example named 'FT_App_Sketch' demonstrates interactive sketching by utilizing the FT81x's built-in sketch, slider & button commands.

Select this example and upload it to your Arduino. When the Arduino restarts, you should see the following:



Software Support

All software relating to the NHD-FT81x-SHIELD and the Arduino are supplied from FTDI Directly, and are not created nor maintained by Newhaven Display International, Inc.

Newhaven Display has created the NHD-FT81x-SHIELD hardware, however all software relating to these products are provided by FTDI/Bridgetek. For additional software support relating to these products, please contact the FTDI/Bridgetek Support Team:

http://www.ftdichip.com/FTContact.htm

Hardware Support

The NHD-FT81x-SHIELD hardware is supported by Newhaven Display. Any issues regarding the hardware itself, please contact the Newhaven Display Support Team via the Newhaven Display website, or on the Newhaven Display Forum (also accessible from the Newhaven Display website):

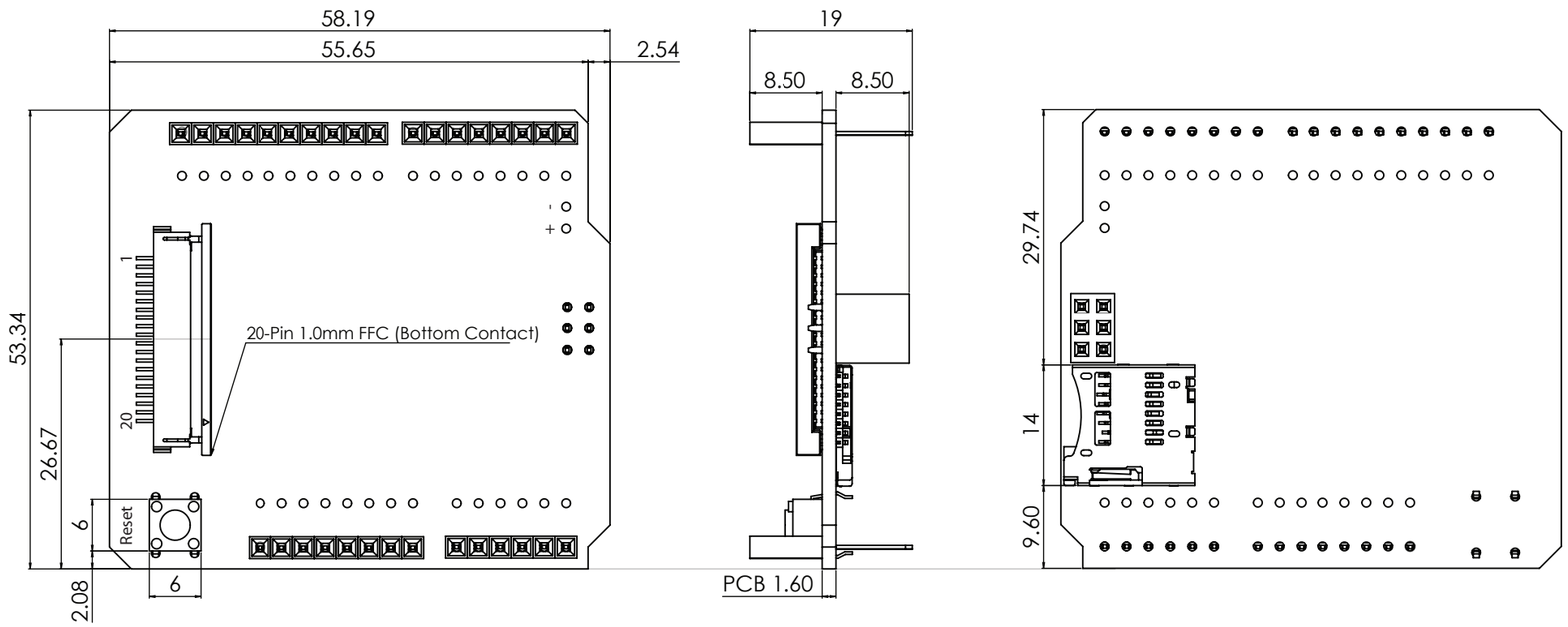
http://www.newhavendisplay.com/

Compatible Arduinos

The NHD-FT81x-SHIELD is compatible with a wide range of Arduino and Arduino clones, however there are some which are not compatible. The NHD-FT81x-SHIELD requires 5V to be supplied from the Arduino itself, and some Arduino clones, specifically 3.3V versions such as the Arduino Pro 3.3V, feature 3.3V on the pin typically specified as being 5V. These 3.3V varieties are not compatible as 5V is required for the NHD-FT81x-SHIELD.

Known compatible Arduinos for the NHD-FT81x-SHIELD:
Uno
NerO
Leonardo
Mega 2560

SYMBOL	REVISION	DATE



STANDARD TOLERANCES
(UNLESS OTHERWISE SPECIFIED)

LINEAR: ±0.3mm

UNLESS OTHERWISE SPECIFIED
- DIMENSIONS ARE IN MILLIMETERS
- THIRD ANGLE PROJECTION

NEWHAVEN DISPLAY INTERNATIONAL

DRAWING/PART NUMBER:			REVISION:
NHD-FT81x-SHIELD			1.0
DRAWN BY: N. Patel	CHECKED BY: P. Bartek	APPROVED BY: M. LaVine	SIZE: A3
DRAWN DATE: 01/17/17	CHECKED DATE: 01/17/17	APPROVED DATE: 01/18/17	SCALE: NS
DO NOT SCALE DRAWING		SHEET 1 OF 1	

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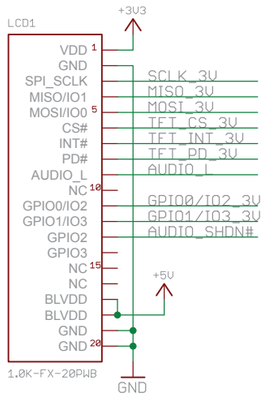
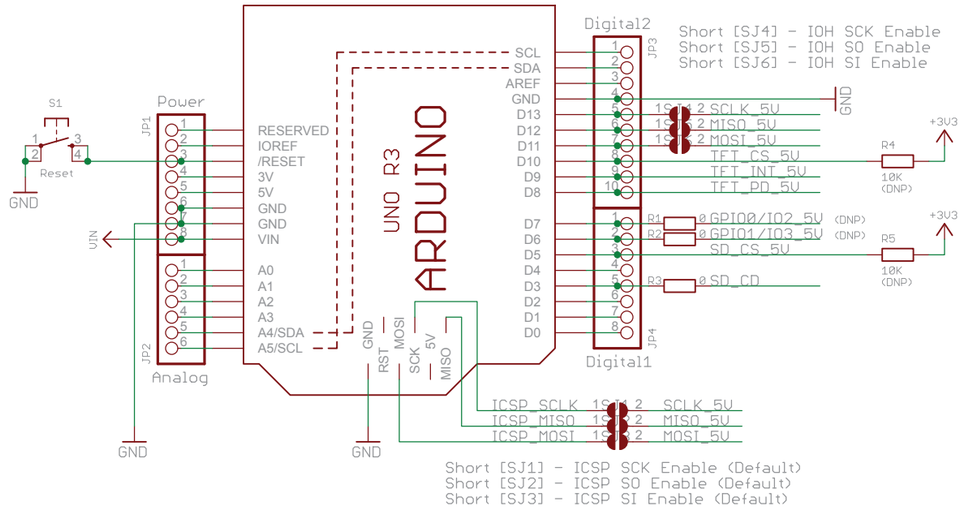
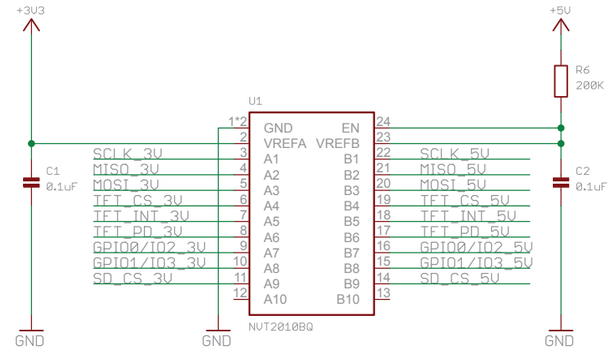
Controller Board Interface



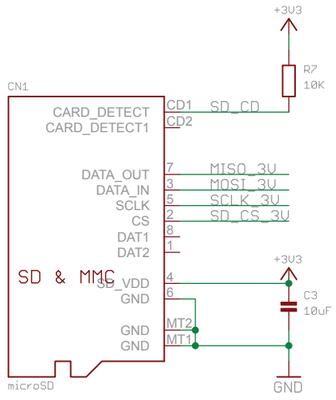
Arduino Interface



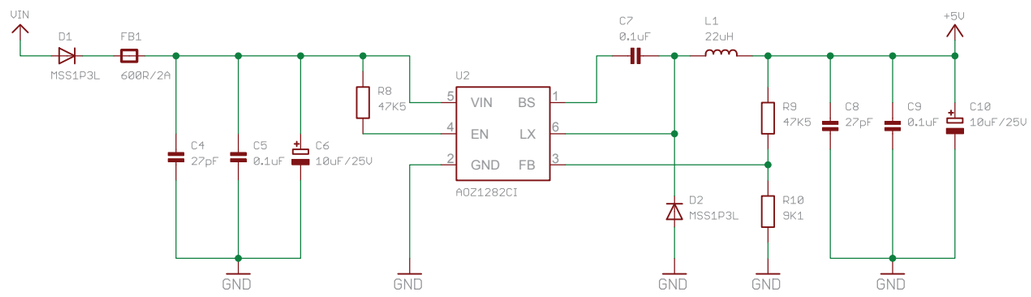
Level Shifting (SPI-bus)



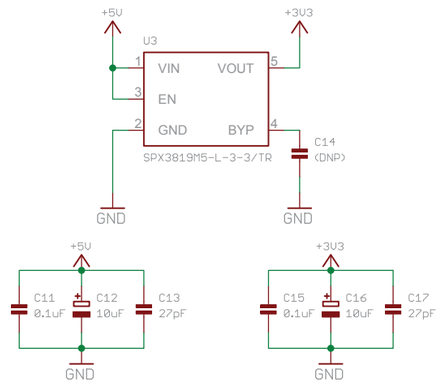
MicroSD Card



5V Buck Regulator



3.3V Regulator



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SCHEMATIC/PART NUMBER: NHD-FT81x-SHIELD	REVISION: 1.0
DRAWN BY: P. Bartek	CHECKED BY: M. LaVine; SIZE: A3
DRAWN DATE: 01/17/17	CHECKED DATE: 01/18/17; SHEET: 1 of 2

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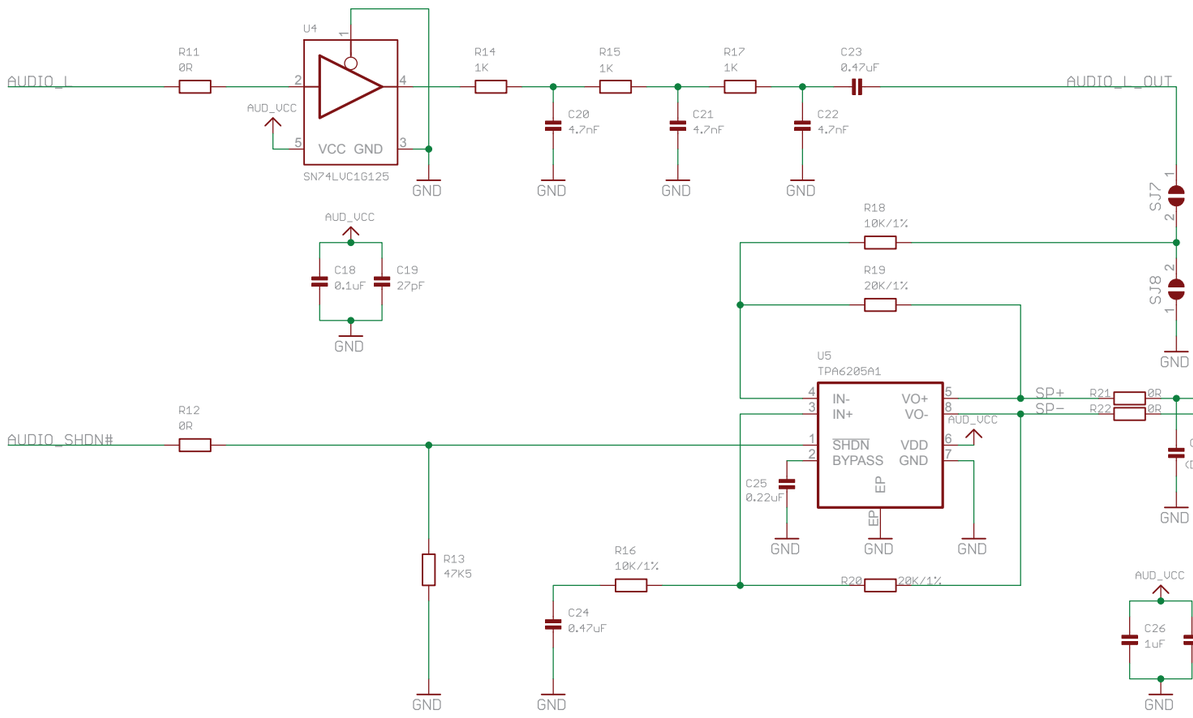
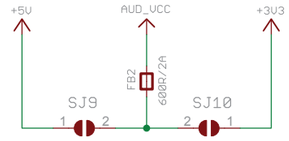
open source hardware

Audio



Short [SJ7] - Audio Amp. Enabled (Default)

Short [SJ8] - Audio Amp. Mute



Max peak current ~400mA for 8-ohm speaker

Short [SJ10] - 3.3V Audio Amp. Power Select

Short [SJ9] - 5V Audio Amp. Power Select (Default)

Audio Speaker +ve from the onboard amplifier

Audio Speaker -ve from the onboard amplifier

NEWHAVEN DISPLAY INTERNATIONAL

SCHEMATIC/PART NUMBER: NHD-FT81x-SHIELD	REVISION: 1.0
DRAWN BY: P. Bartek	CHECKED BY: M. LaVine
DRAWN DATE: 01/17/17	CHECKED DATE: 01/18/17
	SIZE: A3
	SHEET: 2 of 2

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open source hardware

FT81x Datasheet:

FTDI/Bridgetek FT81x Embedded Video Engine (EVE2)
http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT81x.pdf

Programmers Guide:

FT81x Series Programmers Guide
http://www.ftdichip.com/Support/Documents/ProgramGuides/FT81X_Series_Programmer_Guide.pdf

NHD GitHub Page:

NHD EVE2 TFT Module Example Projects
https://github.com/NewhavenDisplay/EVE2-TFT-Modules

EVE2 Software Examples:

FT81x Example Projects
http://www.ftdichip.com/Support/SoftwareExamples/FT800_Projects.htm

FTDI/Bridgetek Utilities:

Screen Designer
http://www.ftdichip.com/Support/Utilities.htm#ESD3

Image Converters
http://www.ftdichip.com/Support/Utilities.htm#EVEImageConverters

Audio Converter
http://www.ftdichip.com/Support/Utilities.htm#EVEAudioConverter

Font Converter
http://www.ftdichip.com/Support/Utilities.htm#EVEFontConverter

FT80x to FT81x Migration Guide:

FT80x to FT81x Migration Guide
http://www.ftdichip.com/Support/Documents/AppNotes/AN_390%20FT80x%20To%20FT81x%20Migration%20Guide.pdf

Quality Information

Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	+80°C , 96hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 96hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C , 96hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 96hrs	1,2
High Temperature / Humidity Operation	Endurance test applying the electric stress (voltage & current) and the high thermal with high humidity stress for a long time.	+60°C , 90% RH , 96hrs	1,2
Thermal Shock resistance	Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.	-20°C,30min -> 25°C,5min - >70°C,30min = 1 cycle 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-55Hz , 15mm amplitude. 60 sec in each of 3 directions X,Y,Z For 15 minutes	3
Static electricity test	Endurance test applying electric static discharge.	VS=800V, RS=1.5kΩ, CS=100pF One time	

Note 1: No condensation to be observed.
Note 2: Conducted after 4 hours of storage at 25°C, 0%RH.
Note 3: Test performed on product itself, not inside a container.

Precautions for using LCDs/LCMs

See Precautions at www.newhavendisplay.com/specs/precautions.pdf

Warranty Information

See Terms & Conditions at http://www.newhavendisplay.com/index.php?main_page=terms

Document Revision History

Revision	Date	Comments
1.0	11/29/2017	Initial Release

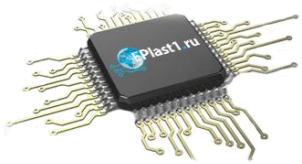
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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