NHD-4.3RTP-SHIELD-V

Color TFT Liquid Crystal Display Module + Arduino Shield

NHD-	Newhaven Display
4.3-	4.3” Diagonal
RTP-	4-wire Resistive Touch Panel with Controller
SHIELD-	Arduino Shield
V-	Display: NHD-4.3-480272EF-ASXV#-T, MVA Type, Wide Temperature

Newhaven Display International, Inc.
2661 Galvin Ct.
Elgin IL, 60124
Ph: 847-844-8795 Fax: 847-844-8796

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nhtech@newhavendisplay.com nhsales@newhavendisplay.com

Document Revision History

Revision	Date	Description	Changed by
0	08/17/16	Initial Release	PB

Functions and Features

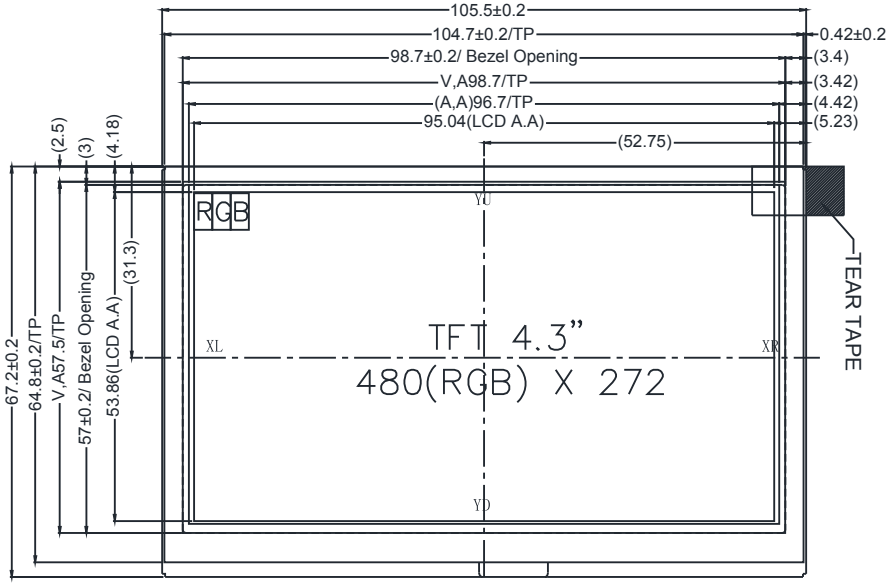
- **480xRGBx272 resolution, up to 262K colors**
- **MVA Type**
- **Utilizes the FTDI FT800 Embedded Video Engine**
- **PWM backlight control**
- **Onboard audio power amplifier**
- **microSD card reader (microSD card not included)**
- **Built-in logic level shifting**
- **Assembled with NHD-4.3-480272EF-ASXV#-T**
- **4-wire resistive Touch Panel**

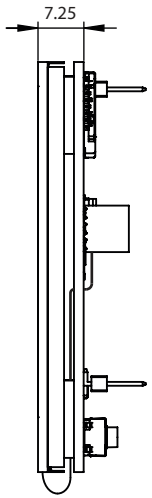
User Guide:

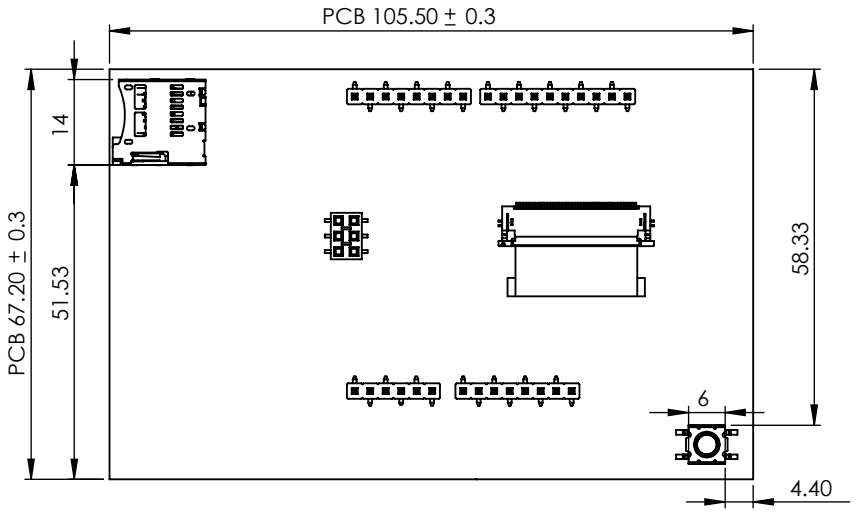
Please download User Guide at http://www.newhavendisplay.com/userguides/NHD-4.3RTP-SHIELD_User_Guide.pdf

Mechanical Drawing

Rev	Description	Date
1.0	Initial Release	08/17/16



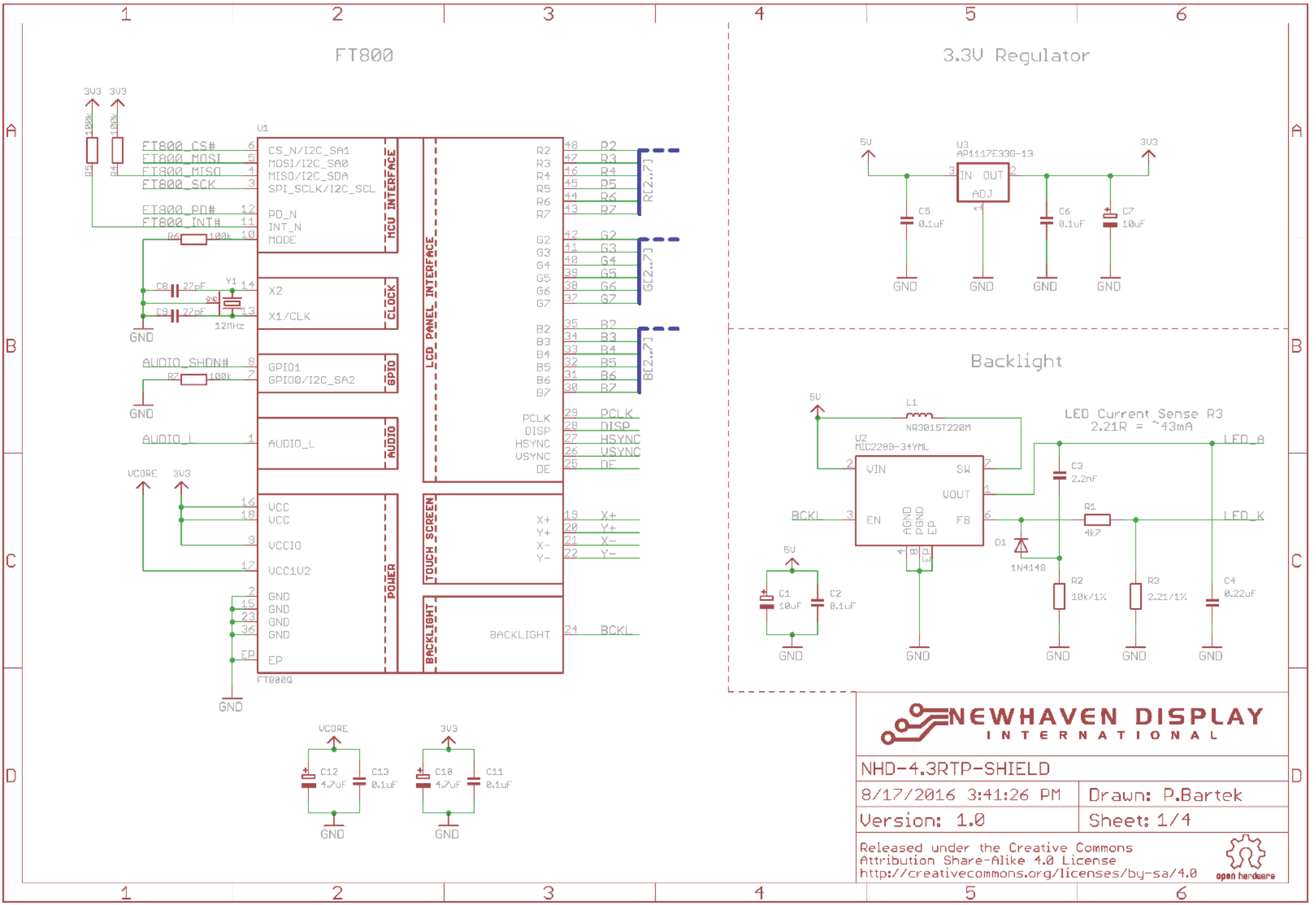




NOTES:
1. Display Size: 4.3" TFT
2. Optimal Viewing Direction: Full View
3. Display Mode: Transmissive / Normally White / Anti-Glare
4. Luminance: 680 cd/m²
5. 3M Brightness Enhancement Film
6. Touch Panel: 4-Wire Resistive

Unit		
mm	NEWHAVEN DISPLAY INTERNATIONAL	
Gen. Tol.	Date	Model:
±0.3	08/17/16	NHD-4.3RTP-SHIELD-V

Schematic


FT800
3.3V Regulator
Backlight
U1
FT800_CS#
FT800_MOSI
FT800_MISO
FT800_SCK
FT800_PD#
FT800_INT#
AUDIO_SHDN#
AUDIO_L
CS_N/I2C_SA1
MOSI/I2C_SA0
MISO/I2C_SDA
SPI_SCLK/I2C_SCL
PD_N
INT_N
MODE
X2
X1/CLK
GPIO1
GPIO0/I2C_SA2
AUDIO_L
VCC
VCC
VCCIO
VCC1V2
GND
EP
FT800Q
MCU INTERFACE
CLOCK
GPIO
AUDIO
POWER
LCD PANEL INTERFACE
TOUCH SCREEN
BACKLIGHT
R2
R3
R4
R5
R6
R7
G2
G3
G4
G5
G6
G7
B2
B3
B4
B5
B6
B7
PCLK
DISP
HSYNC
VSYNC
DE
X+
Y+
X-
Y-
BACKLIGHT
BCKL
12MHz
U3
AP1117E33G-13
IN
OUT
ADJ
U2
MIC2289-34YML
VIN
SW
VOUT
EN
FB
AGND
PGND
EP
L1
NR3015T220M
D1
1N4148
LED Current Sense R3
2.21R = ~43mA
LED_A
LED_K
NEWHAVEN DISPLAY
INTERNATIONAL
NHD-4.3RTP-SHIELD
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Version: 1.0
Sheet: 1/4
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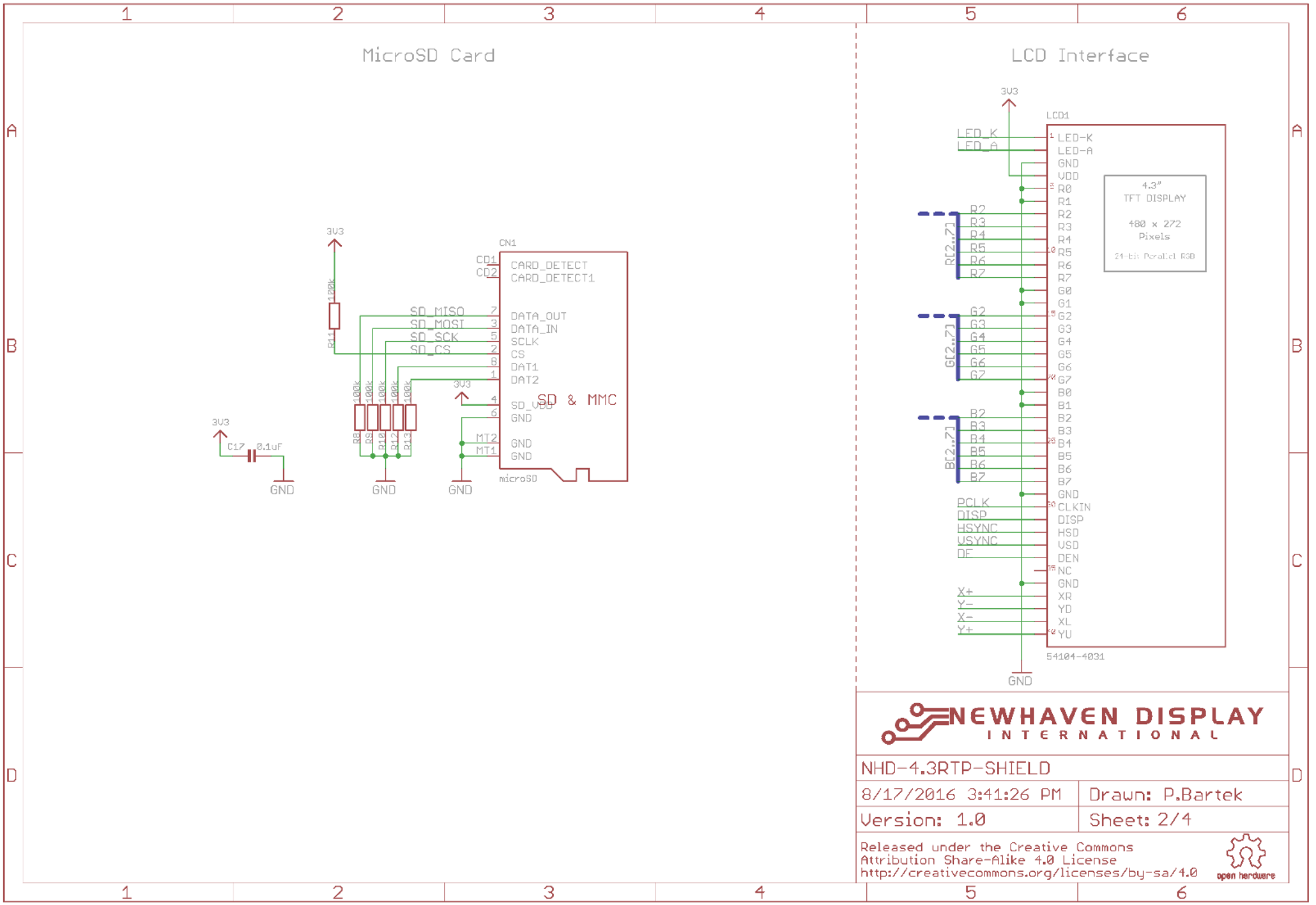
Schematic


MicroSD Card
LCD Interface
3V3
C17
0.1uF
GND
CN1
CD1
CD2
CARD_DETECT
CARD_DETECT1
SD_MISO
SD_MOSI
SD_SCK
SD_CS
DATA_OUT
DATA_IN
SCLK
CS
DAT1
DAT2
SD_VDD
GND
MT2
MT1
microSD
SD & MMC
LCD1
LED_K
LED_A
VDD
R0
R1
R2
R3
R4
R5
R6
R7
G0
G1
G2
G3
G4
G5
G6
G7
B0
B1
B2
B3
B4
B5
B6
B7
PCLK
DISP
HSYNC
VSYNC
DE
NC
CLKIN
HSD
VSD
DEN
XR
YD
XL
YU
X+
Y-
X-
Y+
4.3"
TFT DISPLAY
480 x 272
Pixels
54104-4031
NEWHAVEN DISPLAY
INTERNATIONAL
NHD-4.3RTP-SHIELD
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Version: 1.0
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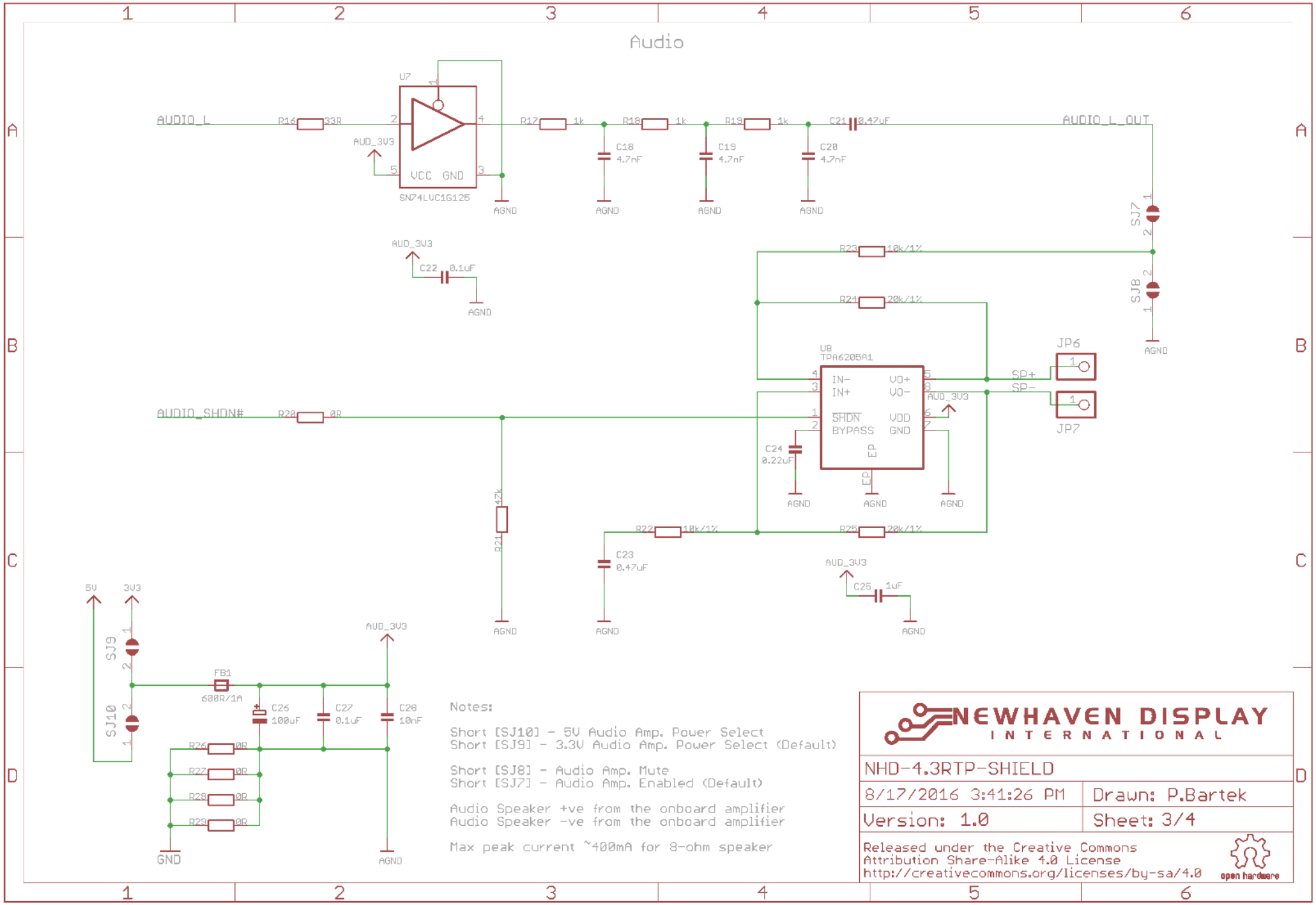
Schematic


Audio
AUDIO_L
R16 33R
U7
SN74LVC1G125
VCC GND
AUD_3V3
R17 1k
R18 1k
R19 1k
C21 0.47uF
AUDIO_L_OUT
C18 4.7nF
C19 4.7nF
C20 4.7nF
AGND
SJ7
SJ8
C22 0.1uF
R23 10k/1%
R24 20k/1%
U8
TPA6205A1
IN-
IN+
SHDN
BYPASS
VO+
VO-
VDD
GND
EP
JP6
JP7
SP+
SP-
AUDIO_SHDN#
R20 0R
R21 47k
C24 0.22uF
R22 10k/1%
R25 20k/1%
C23 0.47uF
C25 1uF
5V
3V3
SJ9
SJ10
FB1
600R/1A
C26 100uF
C27 0.1uF
C28 10nF
R26 0R
R27 0R
R28 0R
R29 0R
GND
Notes:
Short [SJ10] - 5V Audio Amp. Power Select
Short [SJ9] - 3.3V Audio Amp. Power Select (Default)
Short [SJ8] - Audio Amp. Mute
Short [SJ7] - Audio Amp. Enabled (Default)
Audio Speaker +ve from the onboard amplifier
Audio Speaker -ve from the onboard amplifier
Max peak current ~400mA for 8-ohm speaker
NEWHAVEN DISPLAY INTERNATIONAL
NHD-4.3RTP-SHIELD
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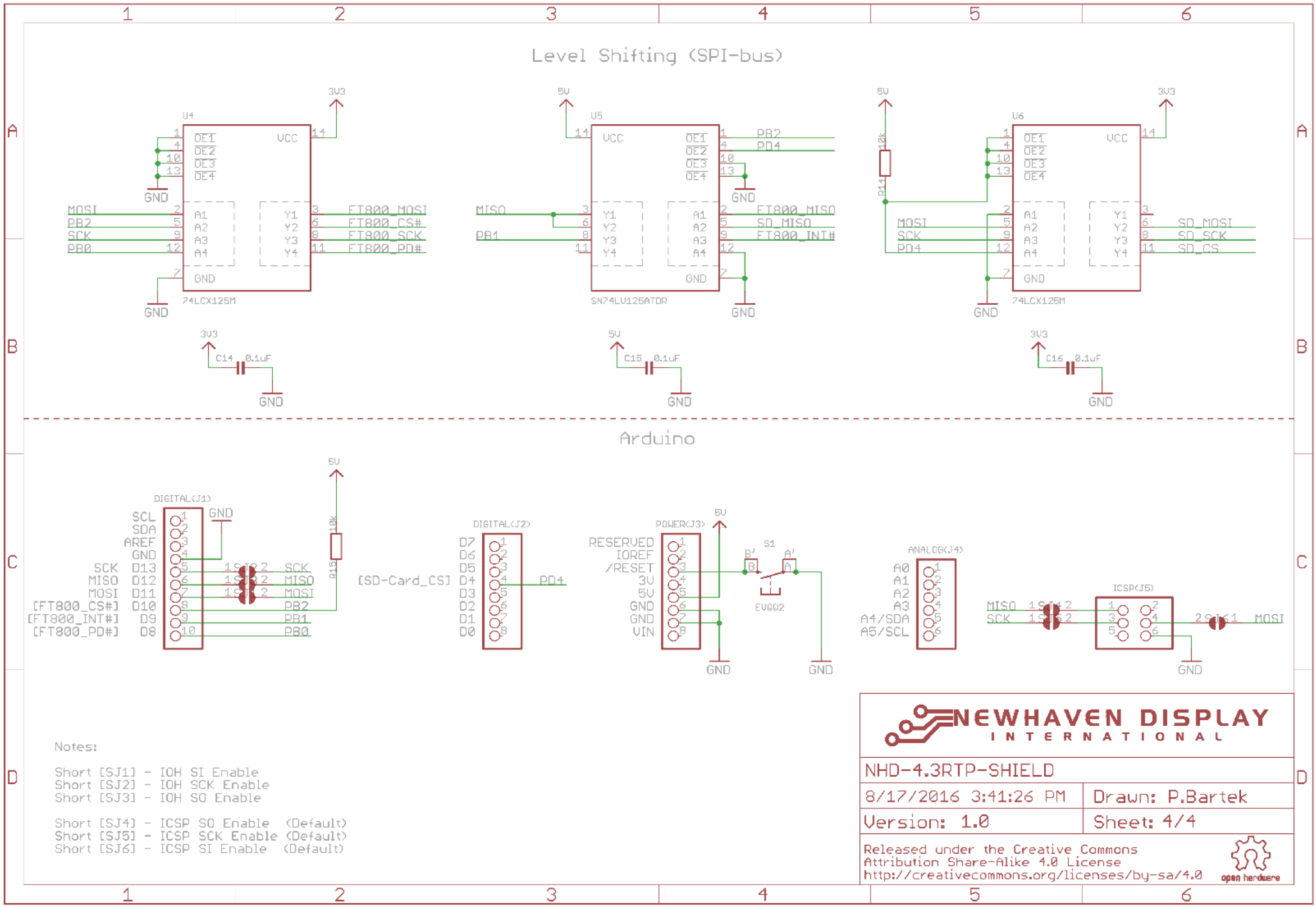
Schematic


Level Shifting (SPI-bus)
U4
74LCX125M
U5
SN74LV125ATDR
U6
74LCX125M
MOSI
PB2
SCK
PB0
MISO
PB1
FT800_MOSI
FT800_CS#
FT800_SCK
FT800_PD#
FT800_MISO
FT800_INT#
SD_MOSI
SD_SCK
SD_CS
PD4
C14 0.1uF
C15 0.1uF
C16 0.1uF
Arduino
DIGITAL(J1)
DIGITAL(J2)
POWER(J3)
ANALOG(J4)
ICSP(J5)
S1
EVQQ2
R15 10k
R14 10k
[SD-Card_CS]
Notes:
Short [SJ1] - IOH SI Enable
Short [SJ2] - IOH SCK Enable
Short [SJ3] - IOH SO Enable
Short [SJ4] - ICSP SO Enable (Default)
Short [SJ5] - ICSP SCK Enable (Default)
Short [SJ6] - ICSP SI Enable (Default)
NEWHAVEN DISPLAY INTERNATIONAL
NHD-4.3RTP-SHIELD
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Sheet: 4/4
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Pin Description

Arduino UNO Pin Symbol	Function Description
J1 Interface	
SCL	No Connect
SDA	No Connect
AREF	No Connect
GND	Ground
13	No Connect (Short SJ2 for SPI SCK signal)
12	No Connect (Short SJ3 for SPI MISO signal)
11	No Connect (Short SJ1 for SPI MOSI signal)
10	FT801 Active LOW Chip Select signal
9	FT801 Active LOW Host Interrupt signal
8	FT801 Active LOW Power Down signal
J2 Interface	
7	No Connect
6	No Connect
5	No Connect
4	microSD Active LOW Chip Select signal
3	No Connect
2	No Connect
1	No Connect
0	No Connect
J3 Interface	
RESERVED	No Connect
IOREF	No Connect
RESET	No Connect
3.3V	No Connect
5V	Supply Voltage for Module (+5V)
GND	Ground
GND	Ground
Vin	No Connect
J4 Interface	
A0	No Connect
A1	No Connect
A2	No Connect
A3	No Connect
A4	No Connect
A5	No Connect
J5 Interface	
MISO	SPI MISO signal (Default)
5V	No Connect
SCK	SPI SCK signal (Default)
MOSI	SPI MOSI signal (Default)
RESET	No Connect
GND	Ground

Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T_{OP}	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T_{ST}	Absolute Max	-30	-	+80	°C
Supply Voltage	V_{DD}	-	4.8	5.0	5.5	V
Supply Current	I_{DD}	V_{DD} = 5V	-	330	420	mA
"H" level input	V_{IH}	-	2.2	-	V_{DD}	V
"L" level input	V_{IL}	-	GND	-	0.8	V

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 10	60	75	-	°
	Bottom	φY-		60	75	-	°
	Left	θX-		60	75	-	°
	Right	θX+		60	75	-	°
Contrast Ratio		Cr	-	400	500	-	-
Luminance		Lv	I_{LED} = 40 mA	-	680	-	cd/m^2
Response Time	Rise	Tr	T_{OP} = 25°C	-	25	30	ms
	Fall	Tf		-	25	30	ms

Touch Panel Characteristics

Item	Min.	Typ.	Max.	Unit
Linearity	-1.5	-	1.5	%
Circuit Resistance – X-Axis	350	-	1050	Ω
Circuit Resistance – Y-Axis	100	-	450	Ω
Insulation Resistance	20	-	-	MΩ
Operating Voltage	-	-	10	V
Chattering	-	-	15	ms
Transmittance	80	-	-	%
Activation Force	20	-	80	g
Pen Writing Durability	100,000	-	-	Characters
Pitting Durability	1,000,000	-	-	Touches
Surface Hardness	3	-	-	H
Haze	4	7	10	%

Controller Information

TFT Controller:

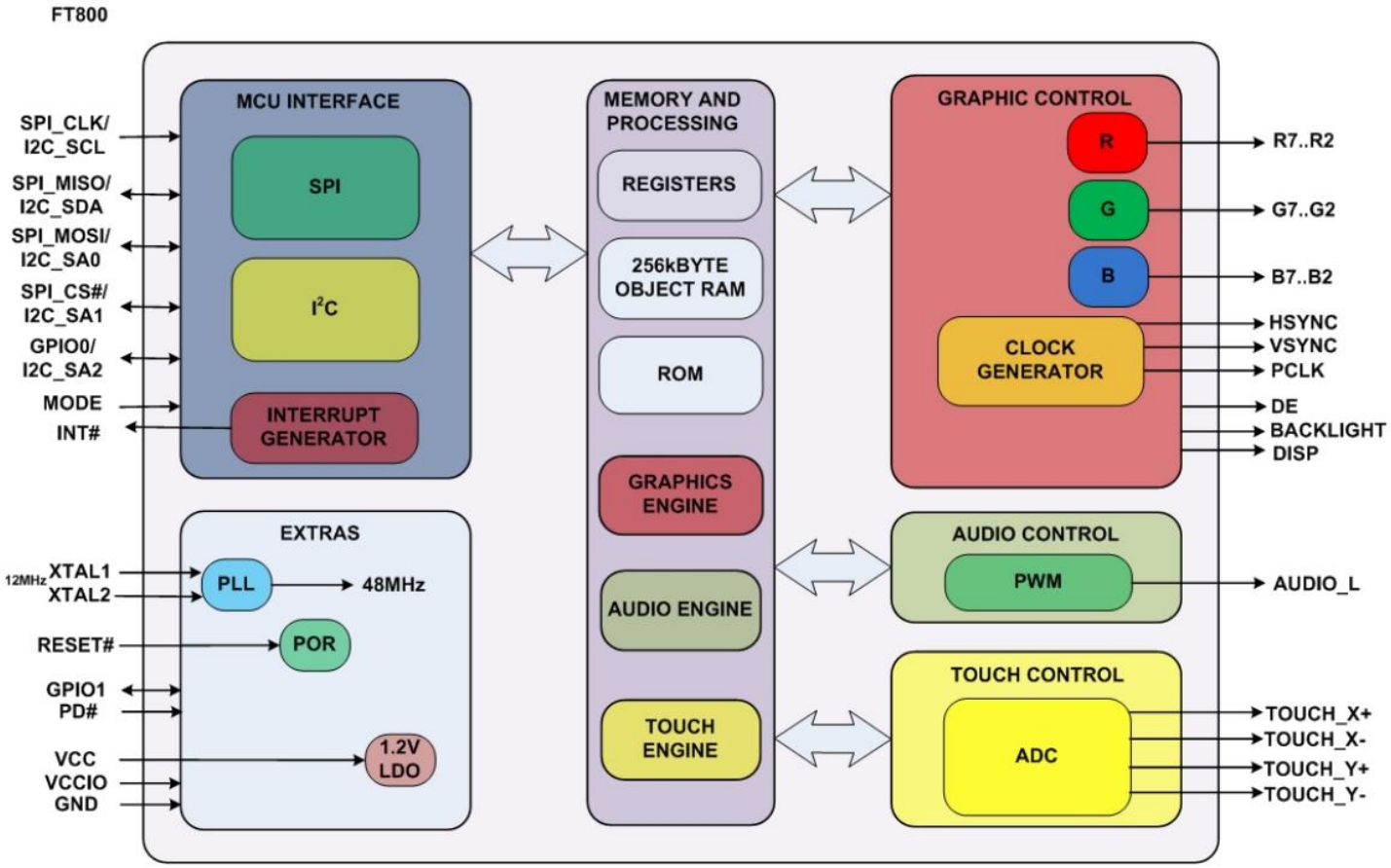
Built-in FTDI FT800 Embedded Video Engine.
Please download specification at http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT800.pdf

Display Information

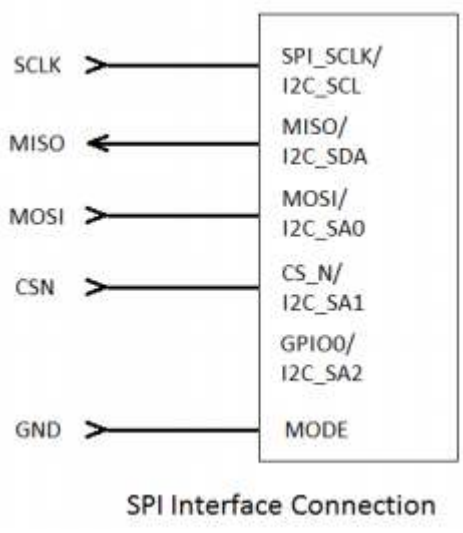
TFT:

NHD-4.3-480272EF-ASXV-T – Premium 4.3" TFT, 480x272 Pixels, 24-bit Parallel RGB Interface, w/ 4-wire Resistive Touch Panel.
Please download specification at http://www.newhavendisplay.com/specs/NHD-4.3-480272EF-ASXV-T.pdf

Block Diagram



Host Interface

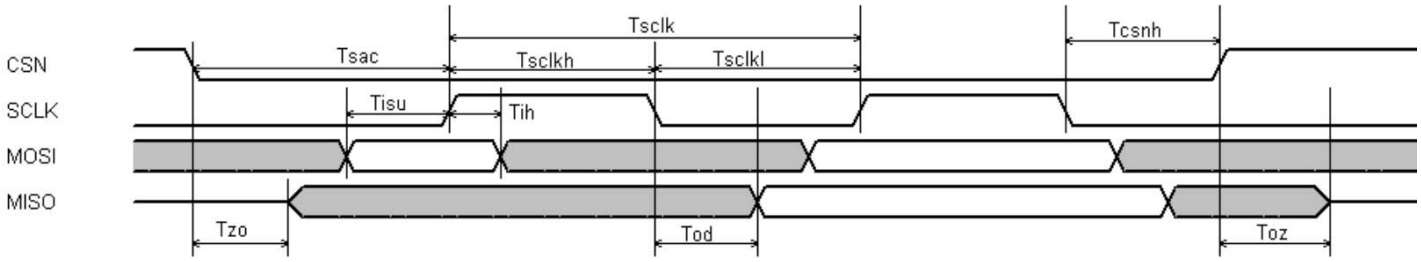


SPI Interface Connection

SPI Interface – The SPI slave interface operates up to 30MHz. Only SPI mode 0 is supported. The SPI interface is selected by default (MODE pin is internally pulled low by a 100k resistor).

Timing Characteristics

SPI Interface:



Parameter	Description	VCC(I/O)=1.8V		VCC(I/O)=2.5V		VCC(I/O)=3.3V		Units
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	
Tsclk	SPI clock period	60	-	40	-	33	-	ns
Tsclkl	SPI clock low duration	25	-	16	-	13	-	ns
Tsclkh	SPI clock high duration	25	-	16	-	13	-	ns
Tsac	SPI access time	16	-	16	-	16	-	ns
Tisu	Input Setup	12	-	11	-	11	-	ns
Tih	Input Hold	3	-	3	-	3	-	ns
Tzo	Output enable delay	0	30	0	20	0	16	ns
Toz	Output disable delay	0	30	0	20	0	16	ns
Tod	Output data delay	0	24	0	15	0	12	ns
Tcsnh	CSN hold time	0	-	0	-	0	-	ns

For more information about FT801 controller please go to official FT800 Datasheet.
http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT800.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