

# NHD-5.0-HDMI-N-RTXL-CTU

## 5.0" HDMI TFT Module w/ USB-HID Capacitive Touch

NHD-	Newhaven Display
5.0-	5.0" Diagonal
HDMI-	HDMI (Type-A) Input
N-	Video Only, Fixed Input Resolution (800x480)
R-	On-board HDMI/DVI Receiver
T-	White LED Backlight
X-	TFT
L-	Full View (MVA), Wide Temperature
CTU-	USB-HID Capacitive Touch Panel

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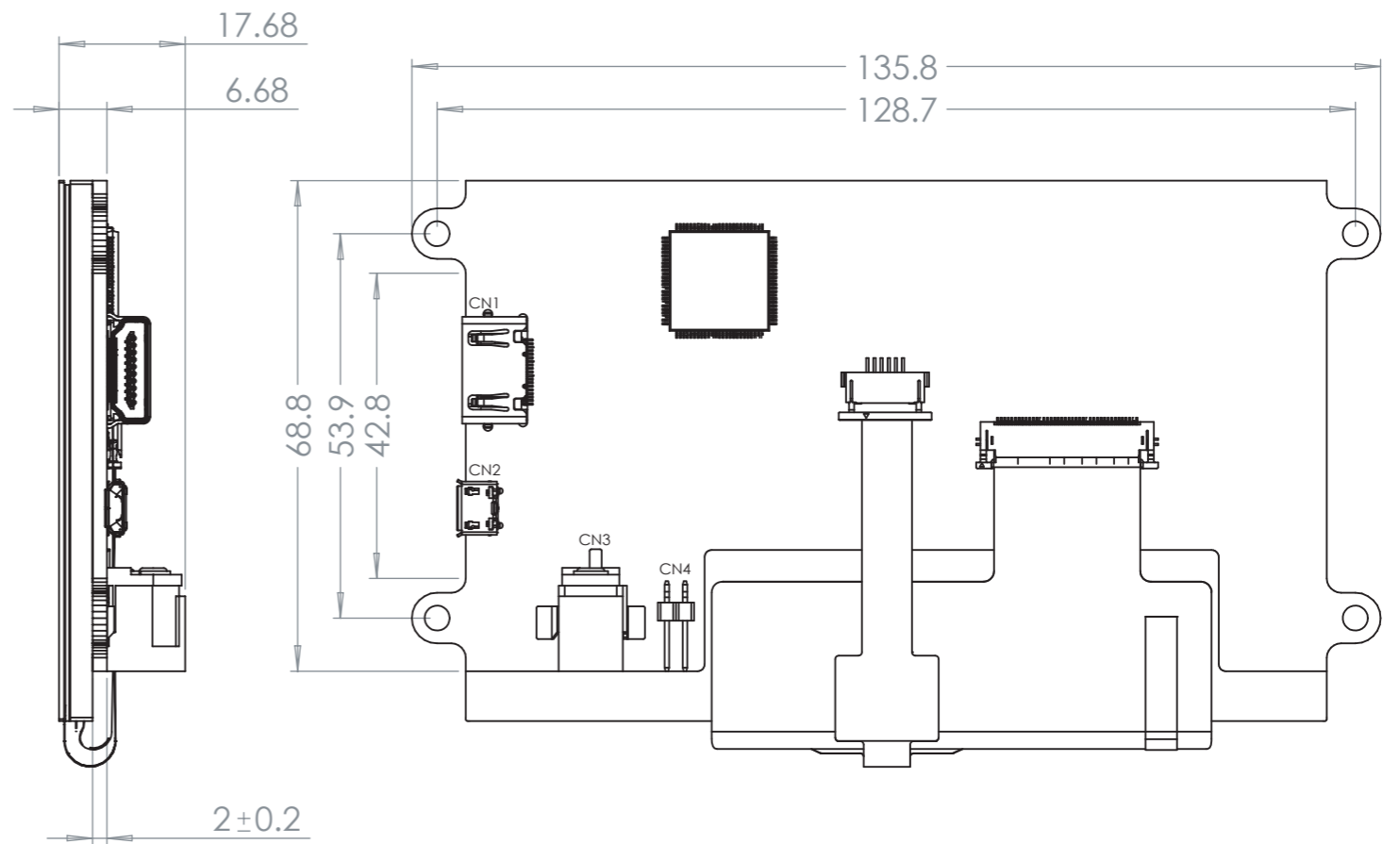
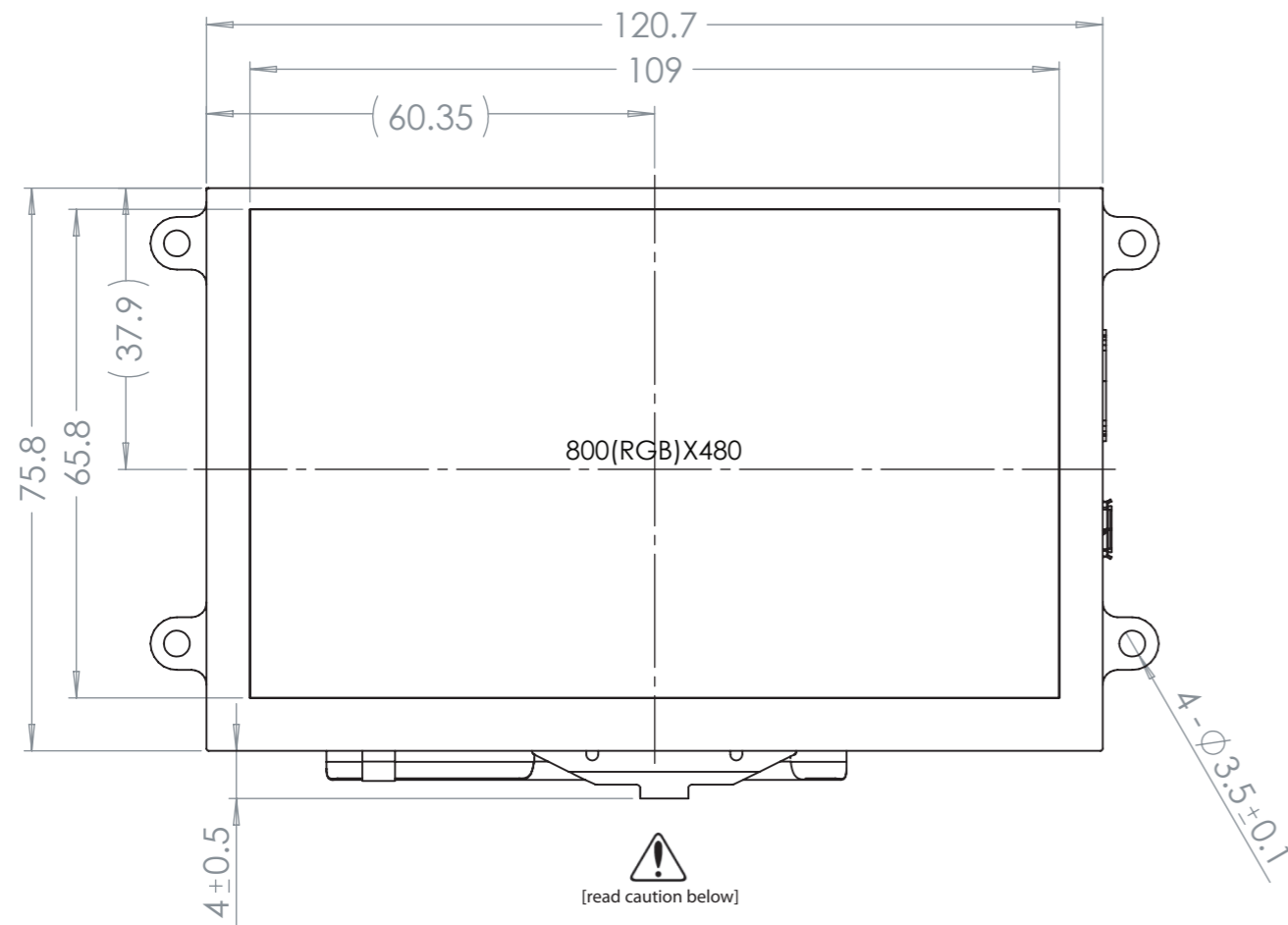
## Document Revision History

Revision	Date	Description	Changed by
-	10/13/17	Initial Release	PB, ML

## Functions and Features

- 5.0" Premium HDMI TFT Module w/ USB-HID Capacitive Touch
- On-board Texas Instruments TFP401A HDMI/DVI Receiver
- 5-9V DC Supply Voltage
- HDMI (Type-A) Input
- Compatible with PC (Windows/Linux)
- Compatible with Linux based SBCs such as Raspberry Pi, BeagleBone, etc.
- Extended Viewing Angles
- High Brightness (415 cd/m<sup>2</sup>)
- 24-bit True Color, 800x480 Resolution (WVGA)
- On-board Texas Instruments TPS61165 High Brightness LED Driver w/ PWM
- 4 x 3.5mm Mounting Holes Enabling Standard M3 or #6-32 Screws
- Open-Source Hardware, Engineered in Elgin, IL (USA)

SYMBOL	REVISION	DATE



**NOTES:**

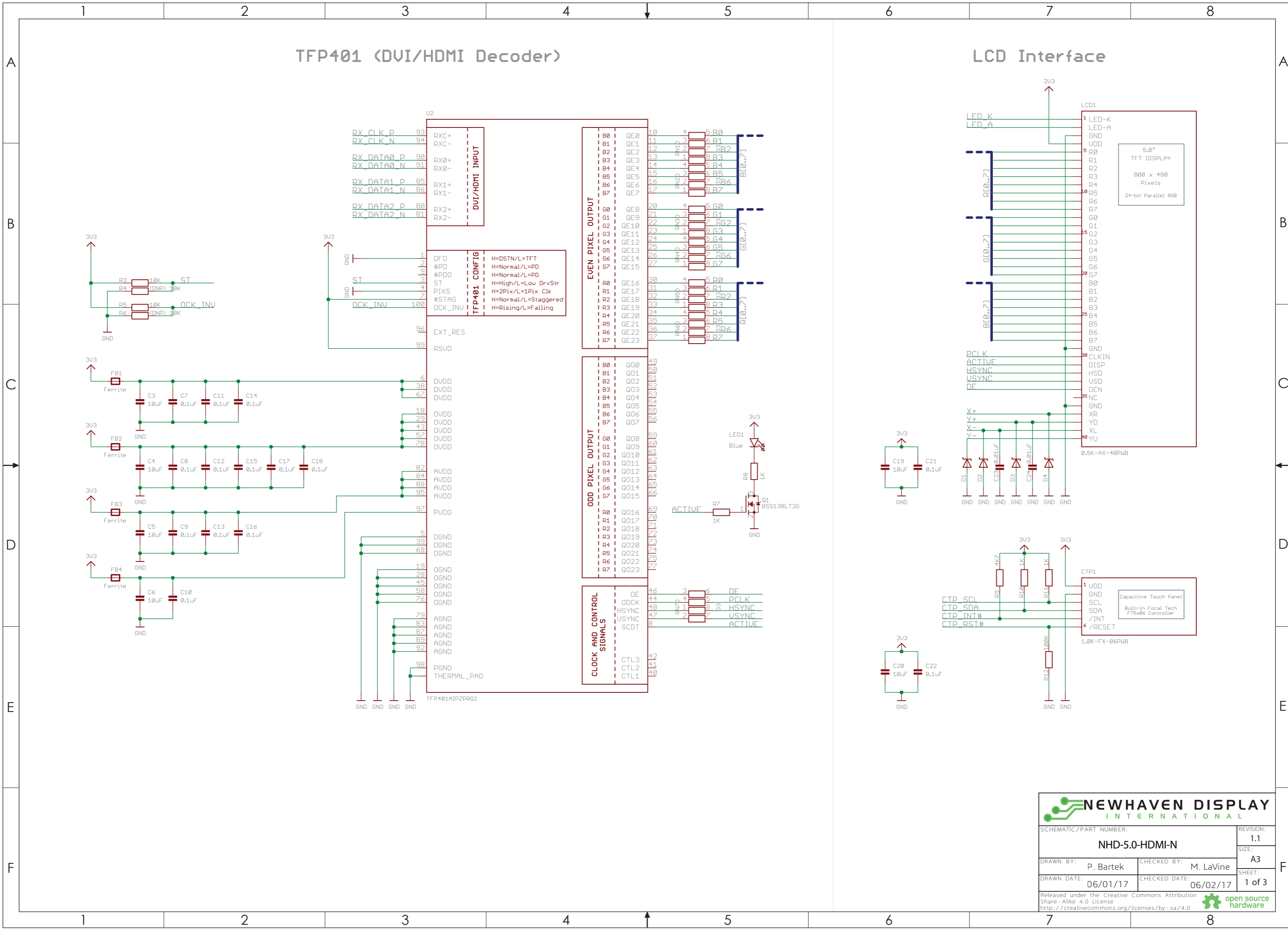
1. 5.0" Premium HDMI TFT Module w/ USB-HID Capacitive Touch
2. On-board Texas Instruments TFP401A HDMI/DVI Receiver
3. Optimal Viewing Direction: Full View
4. Display Mode: Transmissive / Normally White / Anti-Glare
5. Luminance: 415 cd/m<sup>2</sup>
6. 3M Brightness Enhancement Film
7. Touch Panel: Capacitive
8. On-board Texas Instruments TPS61165 High Brightness LED Driver w/ PWM

Improper handling of the FPC connections at the bottom edge of this module may cause damage resulting in display or touch failure. Take special care when handling this area of the display module to make sure these connections are never strained nor creased.

STANDARD TOLERANCES (UNLESS OTHERWISE SPECIFIED)			
LINEAR: ± 0.3mm	DRAWING/PART NUMBER: <b>NHD-5.0-HDMI-N-RTXL-CTU</b>		REVISION: 1.1
UNLESS OTHERWISE SPECIFIED	DRAWN BY: N. Patel	CHECKED BY: P. Bartek	APPROVED BY: M. LaVine
- DIMENSIONS ARE IN MILLIMETERS	DRAWN DATE: 8/25/17	CHECKED DATE: 8/28/17	APPROVED DATE: 8/29/17
- THIRD ANGLE PROJECTION	DO NOT SCALE DRAWING		SCALE: 1:2
THIS DRAWING IS SOLELY THE PROPERTY OF NEWHAVEN DISPLAY INTERNATIONAL, INC. THE INFORMATION IT CONTAINS IS NOT TO BE DISCLOSED, REPRODUCED OR COPIED IN WHOLE OR PART WITHOUT WRITTEN APPROVAL FROM NEWHAVEN DISPLAY.			SHEET 1 OF 1

# TFP401 (DVI/HDMI Decoder)

# LCD Interface



RXC+	93	RXC-	94
RX_DATA0_P	90	RX0+	90
RX_DATA0_N	91	RX0-	91
RX_DATA1_P	85	RX1+	85
RX_DATA1_N	86	RX1-	86
RX_DATA2_P	80	RX2+	80
RX_DATA2_N	81	RX2-	81

DF0	1	H=DSTN/L=TFT
#PD	2	H=Normal/L=PD
#PDD	3	H=Normal/L=PD
ST	4	H=High/L=Low DrvStr
PIXS	5	H=2Pix/L=1Pix Clk
#STAG	6	H=Normal/L=Staggered
OCC_INU	7	H=Rising/L=Falling

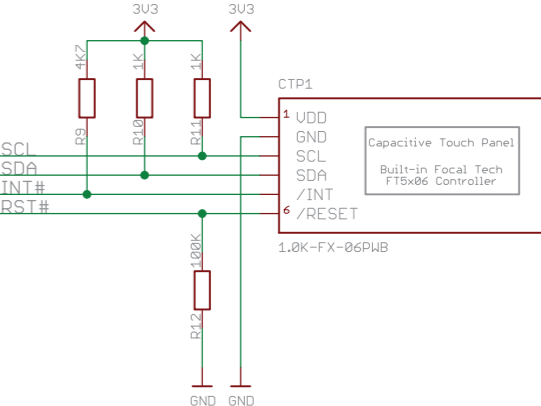
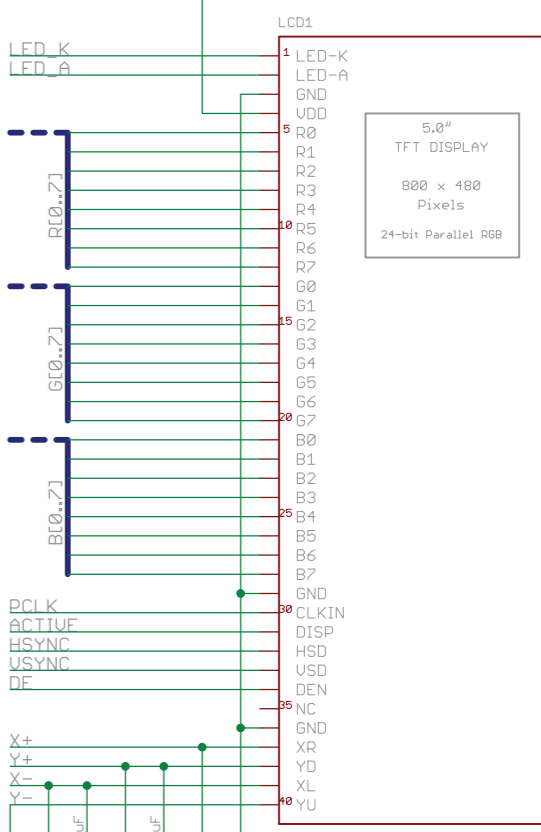
B0	QE0	10	5 B0
B1	QE1	11	6 B1
B2	QE2	12	7 B2
B3	QE3	13	8 B3
B4	QE4	14	9 B4
B5	QE5	15	10 B5
B6	QE6	16	11 B6
B7	QE7	17	12 B7

B0	QE8	20	5 G0
B1	QE9	21	6 G1
B2	QE10	22	7 G2
B3	QE11	23	8 G3
B4	QE12	24	9 G4
B5	QE13	25	10 G5
B6	QE14	26	11 G6
B7	QE15	27	12 G7

B0	Q00	49	5 R0
B1	Q01	50	6 R1
B2	Q02	51	7 R2
B3	Q03	52	8 R3
B4	Q04	53	9 R4
B5	Q05	54	10 R5
B6	Q06	55	11 R6
B7	Q07	56	12 R7

DE	46	DF	46
ODCX	44	CLK	46
HSYNC	48	HSYNC	48
USYNC	47	USYNC	47
SCDT	8	ACTIVE	48

CTL3	42
CTL2	41
CTL1	40

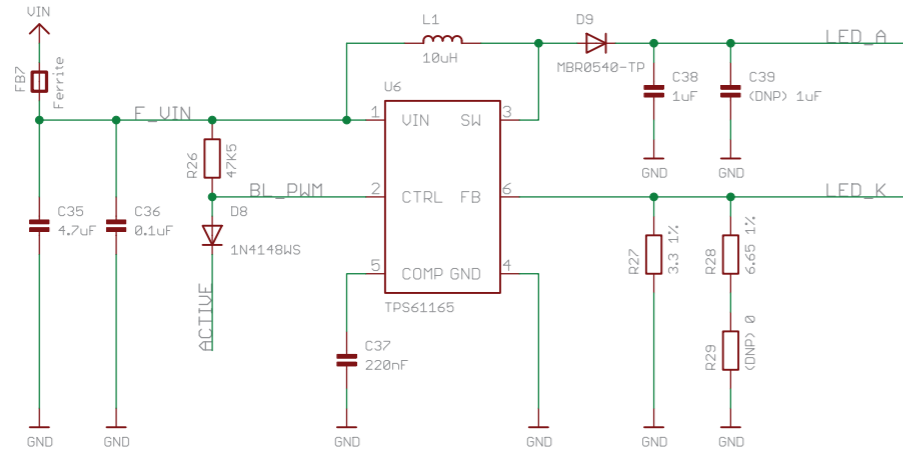


**NEWHAVEN DISPLAY INTERNATIONAL**

SCHEMATIC/PART NUMBER:		REVISION:
<b>NHD-5.0-HDMI-N</b>		<b>1.1</b>
DRAWN BY: P. Bartek		CHECKED BY: M. LaVine
DRAWN DATE: 06/01/17		CHECKED DATE: 06/02/17
SIZE: A3		SHEET: 1 of 3

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## Backlight

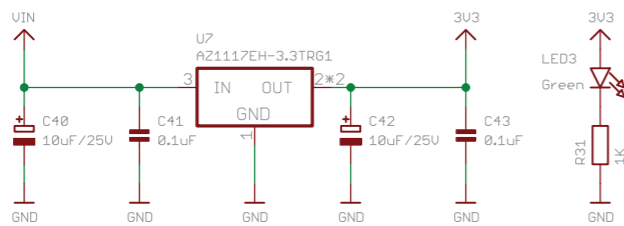


Backlight Configuration		
Current	R29	Display
(Default) ~60mA	Open	ATXL#
~90mA	Close	ASXU#, ASXN#

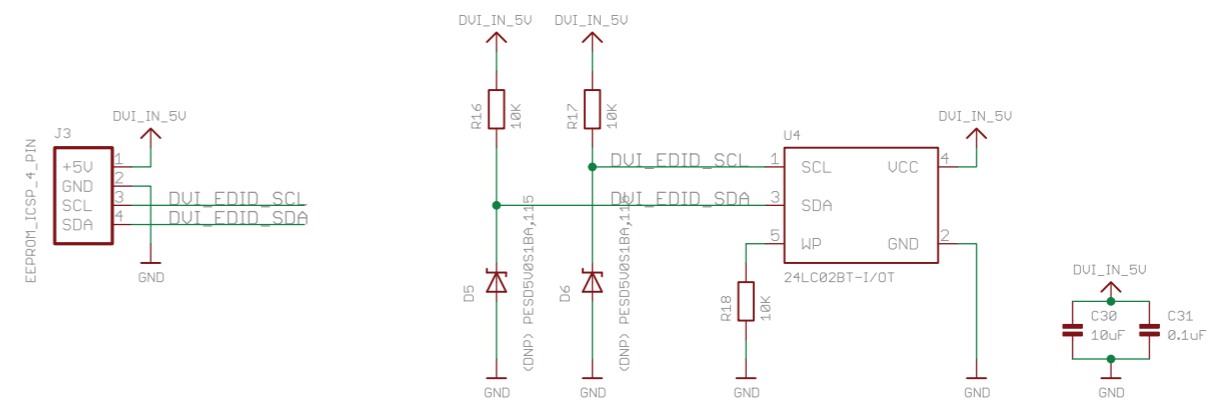
## HDMI-A



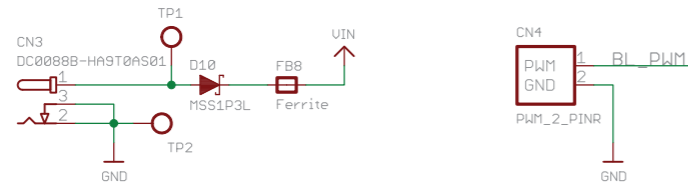
## 3.3V Regulator 800mA



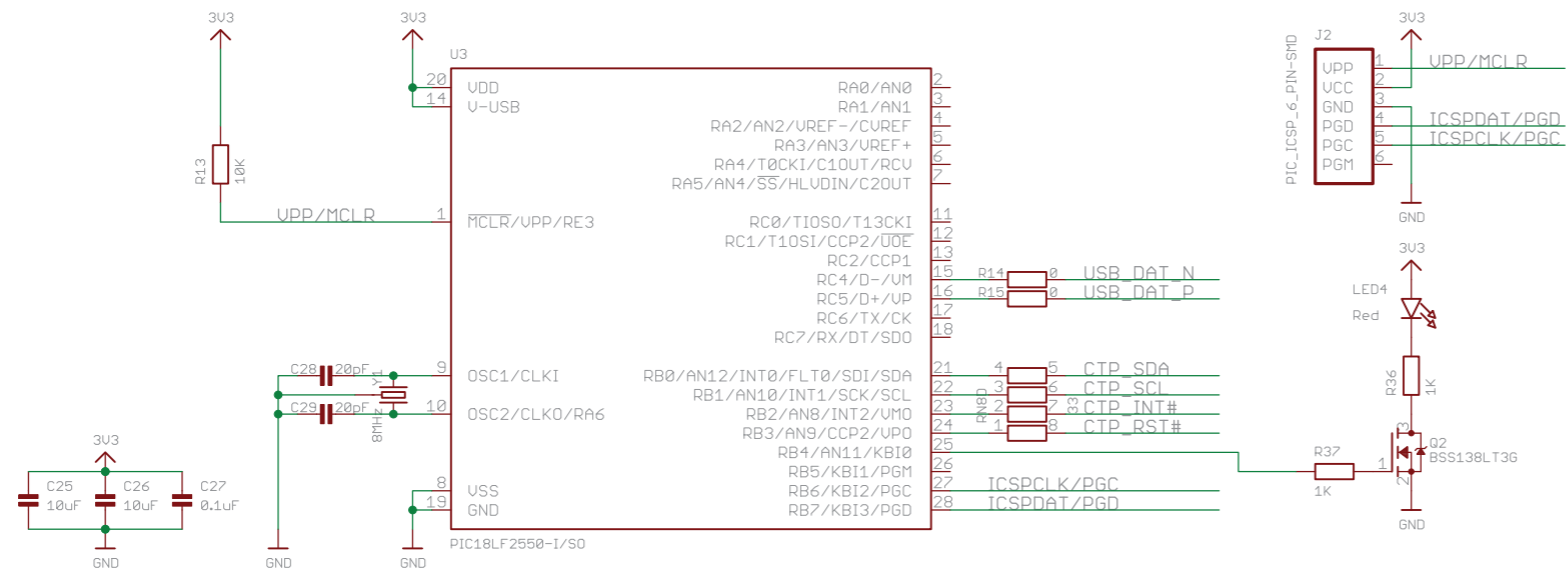
## EEPROM



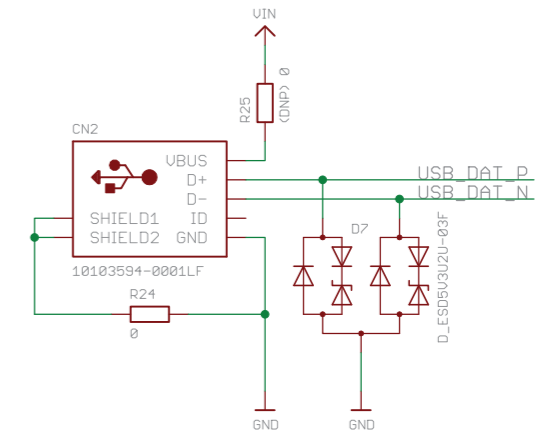
## UIN / PWM



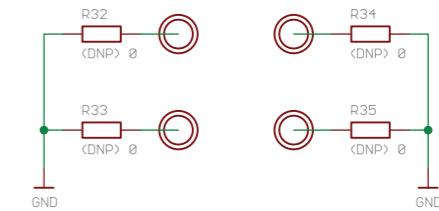
## PIC18LF2550 / Capacitive Touch Screen Controller



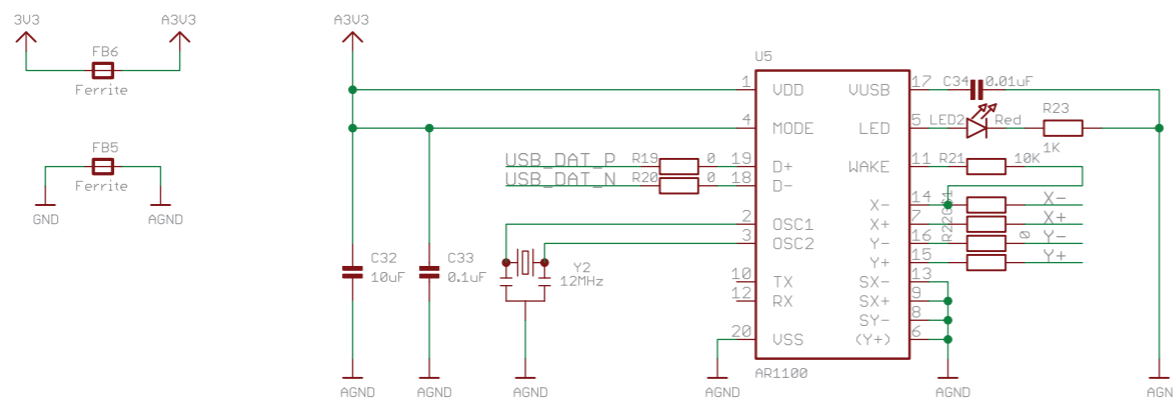
## Micro-B USB



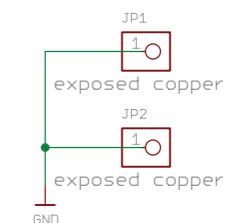
## Mounting Holes 3.5mm Plated



## Resistive Touch Screen Controller



## Exposed Pads to Ground TFT Bezel



## BOARD VERSIONS

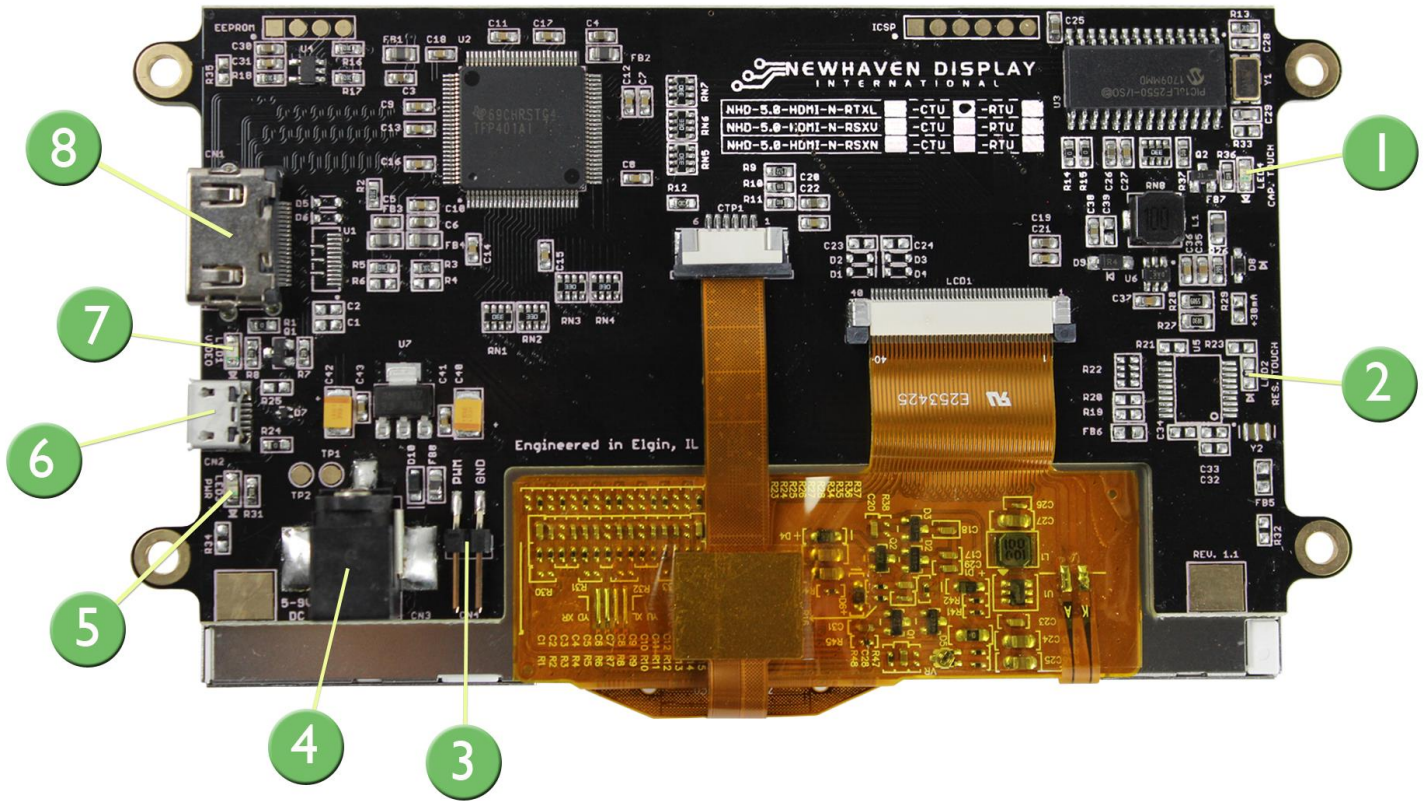
**RTU Version:** (DNP) - C1, C20, C25, C26, C2, C22, C27, C28, C29, C39, CTP1, D1, D2, D3, D4, D5, D6, LED4, Q2, R4, R6, R13, R9, R10, R11, R36, R37, R12, R14, R15, R25, R29, R32, R33, R34, R35, RN8, U1, U3, Y1

**CTU Version:** (DNP) - C1, C32, C2, C33, C23, C24, C34, C39, D1, D2, D3, D4, D5, D6, FB5, FB6, LED2, R4, R6, R21, R19, R20, R25, R29, R22, R23, R32, R33, R34, R35, U1, U5, Y2

**Non-Touch Version:** (DNP) - C1, C20, C25, C26, C32, C2, C22, C27, C33, C23, C24, C34, C28, C29, C39, CN2, CTP1, D1, D2, D3, D4, D5, D6, D7, FB5, FB6, LED2, LED4, Q2, R4, R6, R13, R21, R9, R10, R11, R23, R36, R37, R12, R14, R15, R19, R20, R24, R25, R29, R22, R32, R33, R34, R35, RN8, U1, U3, U5, Y1, Y2

SCHEMATIC/PART NUMBER: <b>NHD-5.0-HDMI-N</b>	
REVISION: <b>1.1</b>	SIZE: <b>A3</b>
DRAWN BY: <b>P. Bartek</b>	CHECKED BY: <b>M. LaVine</b>
DRAWN DATE: <b>06/01/17</b>	CHECKED DATE: <b>06/02/17</b>
SHEET: <b>3 of 3</b>	
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# Interface Description



(Capacitive Touch model shown above as reference)

Num.	Description
1)	<b>(LED4) LED Indicator for Touch – Capacitive Touch model only.</b> This is a Red LED that will illuminate when there is a touch sensed on the CTP.
2)	<b>(LED2) LED Indicator for Touch – Resistive Touch model only.</b> This is a Red LED that will blink slowly (once per second) if the RTP controller is powered ON, awake, and no touch is detected. This LED will blink rapidly (5 times per second) if the RTP controller detects a touch.
3)	<b>(CN4) Surface Mount Pin Header, 2.54mm pitch, for Backlight PWM.</b> The pin labelled 'PWM' is connected directly to the LED driver's CTRL pin (T.I. TPS61165). This is a multifunctional pin which can be used for enable control, PWM, and digital dimming. The PWM signal's frequency and duty cycle should operate within the specified ranges listed in the Electrical Characteristics section on page 8.
4)	<b>(CN3) DC Jack (Center-Positive).</b> This is used to supply power to the display module. A DC power supply in the range of 5-9V should be used. The output current rating of the DC power supply should be at least the maximum Supply Current (I <sub>DD</sub> ) listed in the Electrical Characteristics section on page 8.
5)	<b>(LED3) LED Indicator for Power.</b> This is a Green LED that will illuminate when DC power is supplied to the module.
6)	<b>(CN2) Micro-USB (Type-B) Connector for Touch – Touch Panel models only.</b> This is to connect the Touch Panel of this module to a USB input to act as a USB-HID device.
7)	<b>(LED1) LED Indicator for Video.</b> This is a Blue LED that will illuminate when there is an active video signal detected.
8)	<b>(CN1) HDMI (Type-A) Connector for Video.</b> This is a full-size HDMI connector meant to connect the HDMI source signal (Video only) to this module. The on-board T.I. TFP401A HDMI/DVI Receiver does not scale video resolutions. Therefore, the output resolution of the source must be 800x480 (WVGA).

## Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T <sub>OP</sub>	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T <sub>ST</sub>	Absolute Max	-30	-	+80	°C
Supply Voltage	V <sub>DD</sub>	-	5.0	-	9.0	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> = 5V	-	560	590	mA
		V <sub>DD</sub> = 9V	-	420	450	mA
PWM Frequency	f <sub>PWM</sub>	-	5	-	100	kHz

## Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 10	-	75	-	°
	Bottom	φY-		-	75	-	°
	Left	θX-		-	75	-	°
	Right	θX+		-	75	-	°
Contrast Ratio		CR	-	-	350	-	-
Luminance		L <sub>V</sub>	-	330	415	-	cd/m <sup>2</sup>
Response Time	Rise + Fall	T <sub>R</sub> + T <sub>F</sub>	T <sub>OP</sub> = 25°C	-	20	30	ms

## Capacitive Touch Panel Material Characteristics

Property	Requirement	Unit
IC	FT5306	-
ITO Glass Thickness	0.55	mm
Cover Lens Thickness	0.70	mm
Surface Hardness	≥6	H
Transparency	≥83%	-
Operating Humidity	20~90	RH
Storage Humidity	20~90	RH

## Digital Receiver Information

On-board Texas Instruments TFP401A Receiver.

To view the full TFP401A specification, please download it by accessing the link below:

<http://www.ti.com/lit/ds/slds190a/slds190a.pdf>

## Display Information

Part Number	Display Type	Luminance Rating	Viewing Angle	Interface
NHD-5.0-800480TF-ATXL#-CTP	Premium MVA	415 cd/m <sup>2</sup>	75° all angles	24-Bit RGB

This product consists of the above TFT display assembled with a PCB which supports all the features of this module.

For more details on the TFT display itself, please download the specification at:

<http://www.newhavendisplay.com/specs/NHD-5.0-800480TF-ATXL-CTP.pdf>

## Raspberry Pi Application

On the Raspberry Pi, we recommend forcing the HDMI resolution by using the following config.txt file (in /boot/config.txt) - you can edit it by inserting the Pi's SD card into your computer.

```
# uncomment if you get no picture on HDMI for a default "safe" mode
#hdmi_safe=1

# uncomment this if your display has a black border of unused pixels visible
# and your display can output without overscan
#disable_overscan=1

# uncomment the following to adjust overscan. Use positive numbers if console
# goes off screen, and negative if there is too much border
#overscan_left=16
#overscan_right=16
#overscan_top=16
#overscan_bottom=16

# uncomment to force a console size. By default it will be display's size minus
# overscan.
#framebuffer_width=1280
#framebuffer_height=720

# uncomment if hdmi display is not detected and composite is being output
hdmi_force_hotplug=1

# uncomment to force a specific HDMI mode
hdmi_group=2
hdmi_mode=1
hdmi_mode=87
hdmi_timings=800 0 40 48 44 480 0 13 3 30 0 0 0 60 0 32000000 6

# uncomment to force a HDMI mode rather than DVI. This can make audio work in
# DMT (computer monitor) modes
#hdmi_drive=2

# uncomment to increase signal to HDMI, if you have interference, blanking, or
# no display
#config_hdmi_boost=4

# uncomment for composite PAL
#sdtv_mode=2

#uncomment to overclock the arm. 700 MHz is the default.
#arm_freq=800
```

## 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](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information

See Terms & Conditions at [http://www.newhavendisplay.com/index.php?main\\_page=terms](http://www.newhavendisplay.com/index.php?main_page=terms)