User Guide

NEWHAVEN DISPLAY INTERNATIONAL

5.0” HDMI TFT Modules

Newhaven Display International

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Part Numbering

NHD - x.x - HDMI - N - xxxx - xxx

1 2 3 4 5 6

1	**Manufacturer**	NHD – Newhaven Display
2	**Size** (in inches)	5.0 – 5.0” Diagonal 7.0 – 7.0” Diagonal
3	**Interface**	HDMI – HDMI Interface
4	**Descriptor**	N – 800x480 Resolution, Video Only [HDMI audio not supported]
5	**Type**	RTXL – Premium MVA [Standard model for 7.0” size] RSXV – n/a [Only available in 7.0” size] RSXN – n/a [Only available in 7.0” size]
6	**Touch Panel**	*n/a* – No Touch CTU – Capacitive USB-HID [Pre-calibrated, No external drivers needed] RTU – Resistive USB-HID [Pre-calibrated, No external drivers needed]

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Overview

The HDMI interface has become the most popular video interface standard to date, and HDMI video sources are easier to come by now than ever before. Whether you need an HDMI TFT display for your Raspberry Pi/BeagleBone Black application, a Windows/Windows Embedded PC monitor, or a touch screen HMI for your Linux or other embedded system, the Newhaven Display HDMI TFT product line offers a solution.

Our HDMI TFT Modules unite our existing high-quality TFT display panels with a custom PCB engineered in the USA by Newhaven Display. Assembled to the display, our PCB provides the user an all-in-one, plug-and-play HDMI + USB Touch solution for virtually any application.

Functions and Features

- 5.0” HDMI TFT Module w/ USB-HID Capacitive or Resistive Touch options
- On-board Texas Instruments TFP401A HDMI/DVI Receiver
- HDMI (Type-A) Input
- Compatible with PC (Windows/Linux)
- Compatible with Linux based SBCs such as Raspberry Pi, BeagleBone, etc.
- Plug-and-play USB-HID Touch, no external driver installation required
- 24-bit True Color, 800x480 Resolution (WVGA)
- On-board Texas Instruments TPS61165 High Brightness LED Driver w/ PWM
- 70° Viewing Angles all sides
- 4 x 3.5mm Mounting Holes Enabling Standard M3 or #6-32 Screws
- Open-Source Hardware, Engineered in Elgin, IL (USA)

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Model Information

HDMI Module P/N	TFT Panel Used	Display Type	Luminance Rating	Optimal Viewing Angle	Touch Panel
NHD-5.0-HDMI-N-RTXL	NHD-5.0-800480TF-ATXL#	Premium MVA	620 cd/m²	70° all angles	No Touch
NHD-5.0-HDMI-N-RTXL-CTU	NHD-5.0-800480TF-ATXL#-CTP	Premium MVA	500 cd/m²	70° all angles	Projected Capacitive (USB-HID)
NHD-5.0-HDMI-N-RTXL-RTU	NHD-5.0-800480TF-ATXL#-T	Premium MVA	480 cd/m²	70° all angles	4-Wire Resistive (USB-HID)

For detailed information on the TFT Panel used, please view its Product Specification by accessing the product webpage link above.

Electrical Characteristics

Item	Symbol	Condition	Min.	Typical	Max.	Unit
Operating Temperature Range	T_{OP}	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T_{ST}	Absolute Max	-30	-	+80	°C
Backlight PWM Frequency	f_{PWM}	-	5	-	100	kHz
Module Supply Voltage	V_{DD}	-	5.0	-	9.0	V
Module Supply Current	I_{DD}	V_{DD} = 5V	-	560	590	mA
		V_{DD} = 9V	-	420	450	mA

HDMI 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

Interface Description

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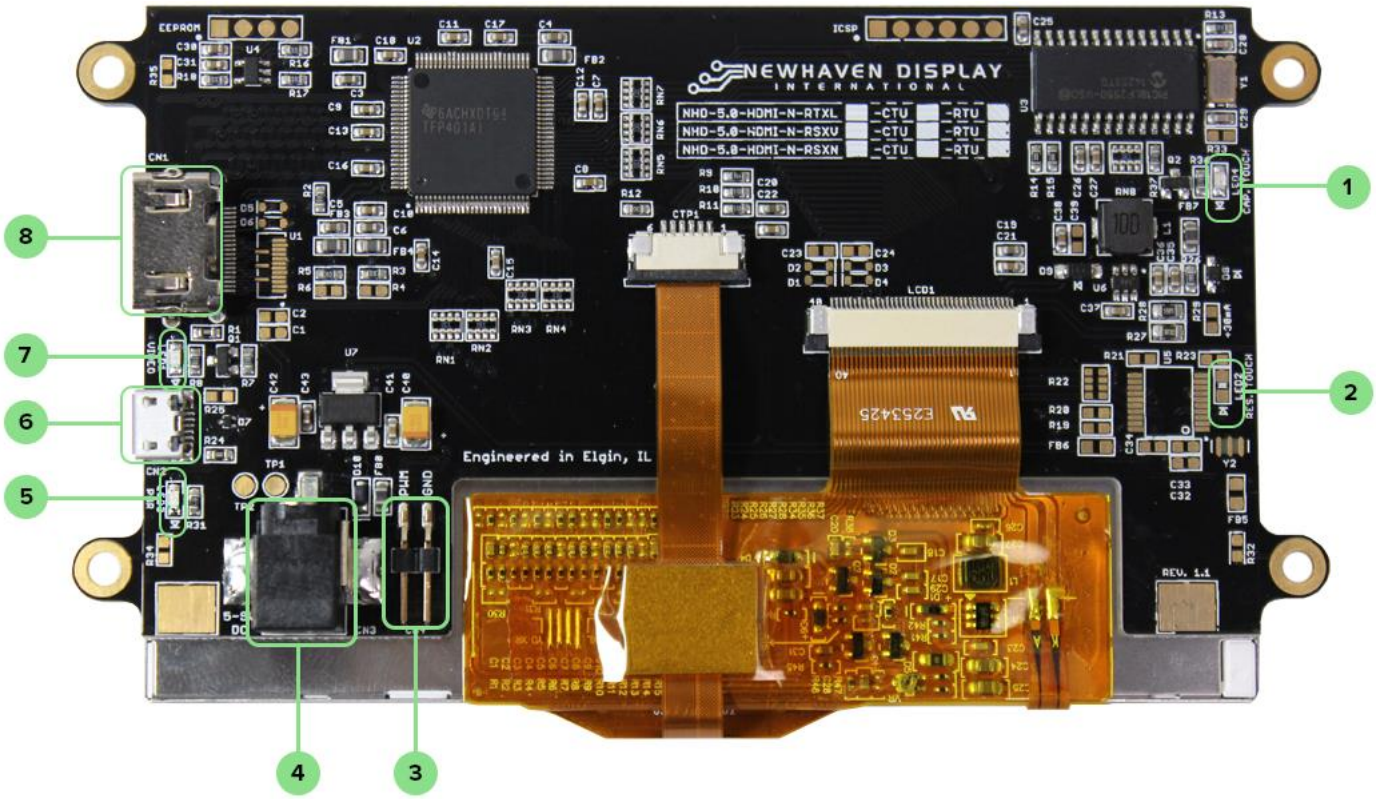

(Capacitive Touch model shown above as reference)

Num.	Description
1)	(LED4) LED Indicator for Touch – *Capacitive Touch models only* This is a Red LED that will illuminate when there is a touch sensed on the CTP.
2)	(LED2) LED Indicator for Touch – *Resistive Touch models only* 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)	(CN4) Surface Mount Pin Header, 2.54mm pitch, for Backlight PWM 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. A PWM frequency in the range of 5kHz – 100kHz must be used.
4)	(CN3) DC Jack (Center-Positive), 2.1mm ID, 5.5mm OD This is used to supply power to the display module. A DC power supply in the range of 5V – 9V must be used. The output current rating of the DC power supply should be at least the maximum Supply Current (I_{DD}) listed in the Electrical Characteristics section on the previous page.
5)	(LED3) LED Indicator for Power This is a Green LED that will illuminate when DC power is supplied to the module.
6)	(CN2) Micro-USB (Type-B) Connector for Touch – *Touch Panel models only* This is to connect the Touch Panel of this module to a USB input to act as a USB-HID device.
7)	(LED1) LED Indicator for Video This is a Blue LED that will illuminate when there is an active video signal detected.
8)	(CN1) HDMI (Type-A) Connector 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). In most applications, this is automatically detected by the HDMI source.

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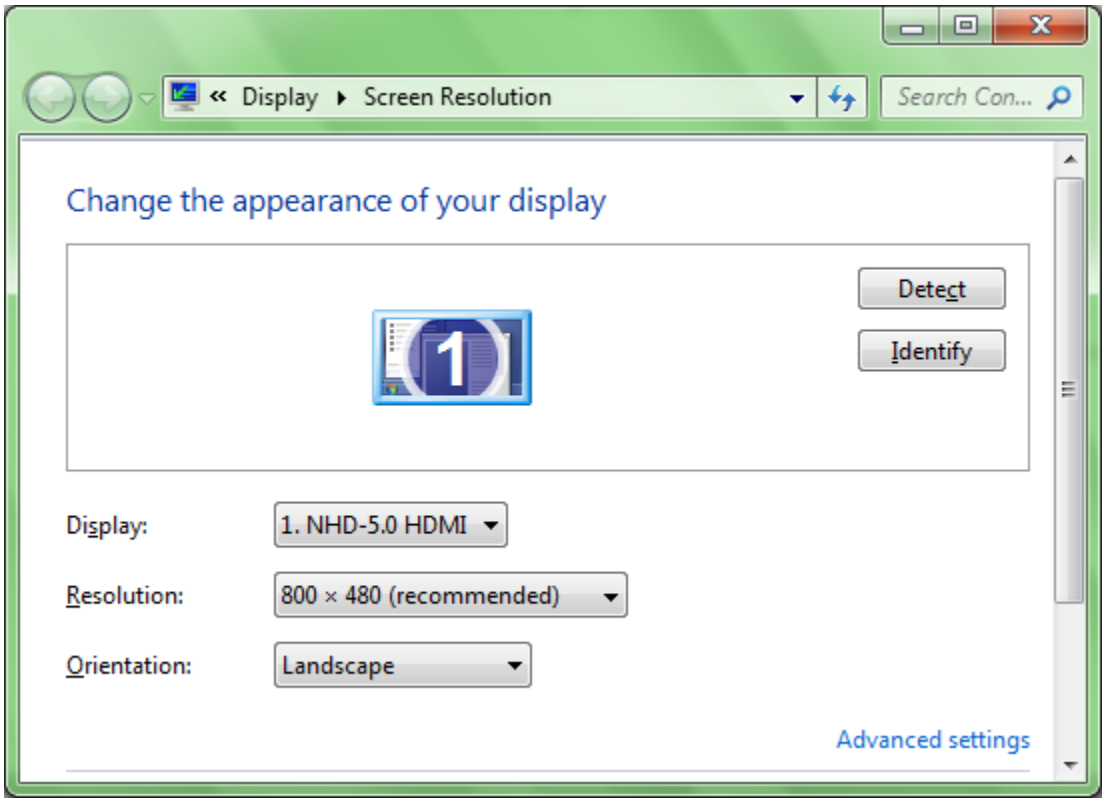
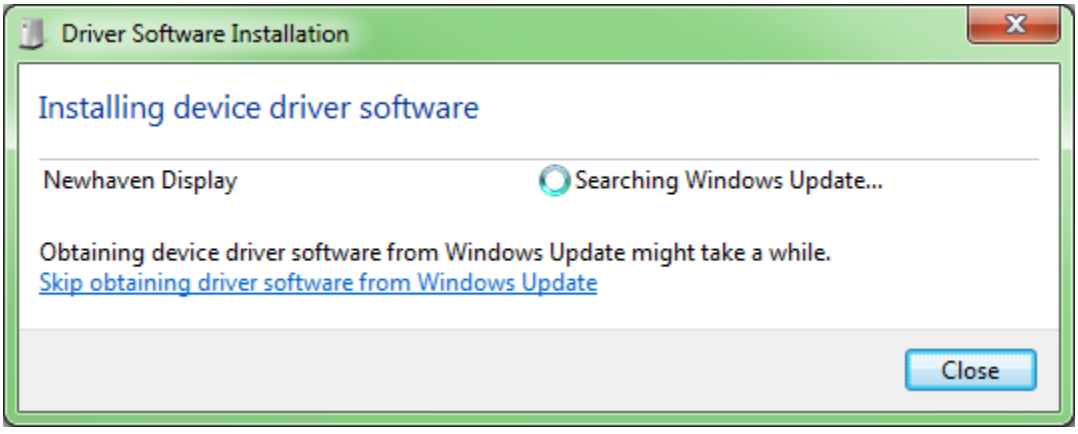
Connecting with Windows/Windows Embedded

Connecting our HDMI TFT Modules to a Windows system is fully plug-and-play. Start by plugging in a DC power supply in the range of 5 - 9V, with at least 1A of output current. The green LED near the DC jack will illuminate when the board has power supplied to it. Next, connect the display to your system via HDMI cable. Due to the on-board EDID, the display will be detected automatically and the system's output resolution will set itself to 800x480.



For Touch Panel models, once the display is connected to the system via USB, Windows will automatically detect and install the necessary drivers.



The above window is shown for the Capacitive Touch model. The Resistive Touch model will also install automatically, however it will be labelled 'AR1100 HID-MOUSE' instead of 'Newhaven Display'.

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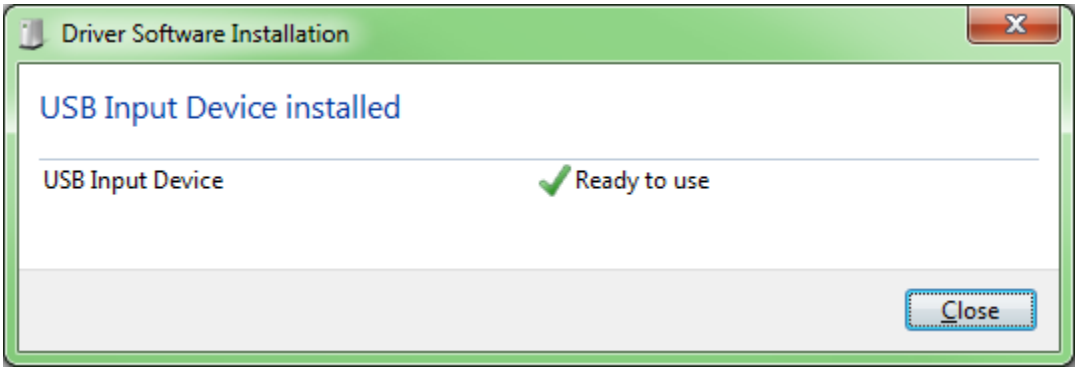
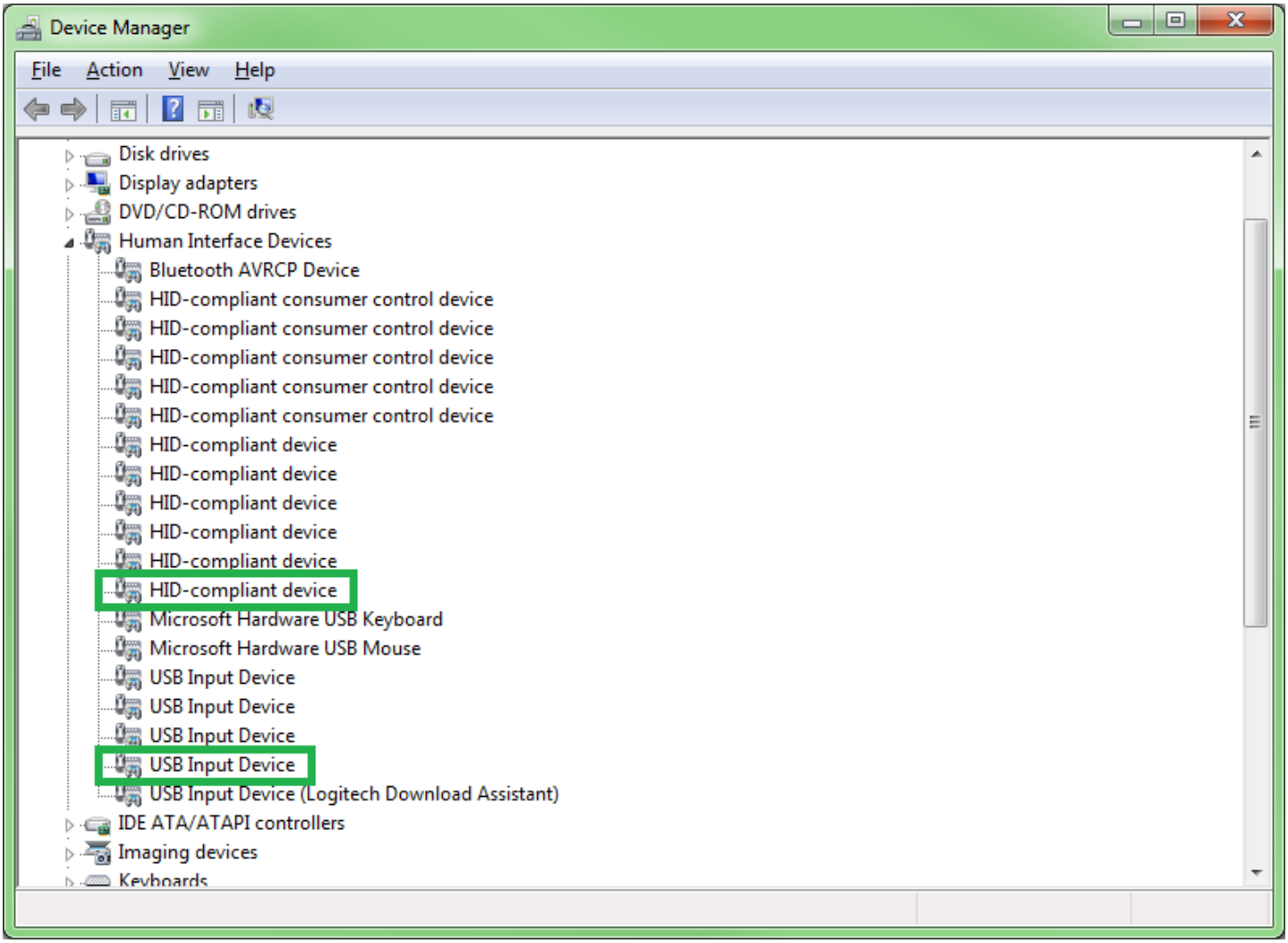
Once Windows has finished installing the drivers, the device will show as 'Ready to use'.



For reference, in Device Manager the USB-HID Touch device will show as below:



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Connecting with Linux

Most Linux applications with an HDMI source will also be fully plug-and-play, however when using our HDMI TFT Modules with the Raspberry Pi, the config.txt file on the Pi's microSD card will need to be slightly modified by the user.

The following highlighted lines need to be added in config.txt for proper display output:

```
# For more options and information see
# http://rpf.io/configtxt
# Some settings may impact device functionality. See link above for details

# 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 (this will force VGA)
#hdmi_group=1
#hdmi_mode=1

hdmi_group=2
hdmi_mode=87

hdmi_cvt=800 480 60 6 0 0 0

# 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

# Uncomment some or all of these to enable the optional hardware interfaces
#dtparam=i2c_arm=on
#dtparam=i2s=on
#dtparam=spi=on

# Uncomment this to enable the lirc-rpi module
#dtoverlay=lirc-rpi

# Additional overlays and parameters are documented /boot/overlays/README

# Enable audio (loads snd_bcm2835)
dtparam=audio=on
```

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Technical Resources

2D Drawings

NHD-5.0-HDMI-N-RTXL

NHD-5.0-HDMI-N-RTXL-CTU

NHD-5.0-HDMI-N-RTXL-RTU

3D Models

NHD-5.0-HDMI-N-xxxx

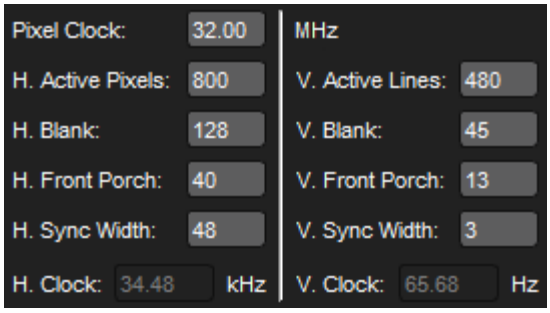
NHD-5.0-HDMI-N-xxxx-CTU

NHD-5.0-HDMI-N-xxxx-RTU

Schematic

NHD-5.0-HDMI-N

EDID Timing



EDID Array

```
const unsigned char NHD_HDMI5[] = {
0x00, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0x00, 0x39, 0x04, 0x3B, 0x07, 0x00, 0x00, 0x00, 0x00,
0x01, 0x11, 0x01, 0x03, 0x80, 0x0B, 0x07, 0x00, 0x0A, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0x01,
0x01, 0x01, 0x01, 0x01, 0x01, 0x01, 0x80, 0x0C, 0x20, 0x80, 0x30, 0xE0, 0x2D, 0x10, 0x28, 0x30,
0xD3, 0x00, 0x6C, 0x41, 0x00, 0x00, 0x00, 0x18, 0x00, 0x00, 0x00, 0xFC, 0x00, 0x4E, 0x48, 0x44,
0x2D, 0x35, 0x2E, 0x30, 0x20, 0x48, 0x44, 0x4D, 0x49, 0x0A, 0x00, 0x00, 0x00, 0x10, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x10,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x5A,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
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0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00
};
```

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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.	Air: 8kV, 150pF, 330Ω, 5 times Contact: 4kV, 150pF, 330Ω, 5 times	

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

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Document Revision History

Revision	Date	Comments
1.0	1/4/2017	Initial Release
1.1	2/8/2018	Add DC Jack size; Update Schematic link
1.2	5/8/2020	Updated Luminance, Viewing Angles, & Static Electricity Test

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