

# NHD-10.1-1024600AF-LSXV#

## TFT (Thin-Film-Transistor) Color Liquid Crystal Display Module

NHD-	Newhaven Display
10.1-	10.1" Diagonal
1024600-	1024xRGBx600 Pixels
AF-	Model
L-	LVDS Interface
S-	High Brightness, White LED Backlight
X-	TFT
V-	MVA, Standard Temperature
#-	<b>RoHS Compliant</b>

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## Document Revision History

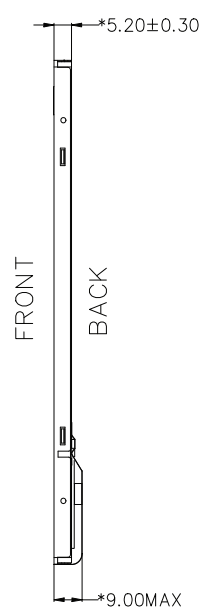
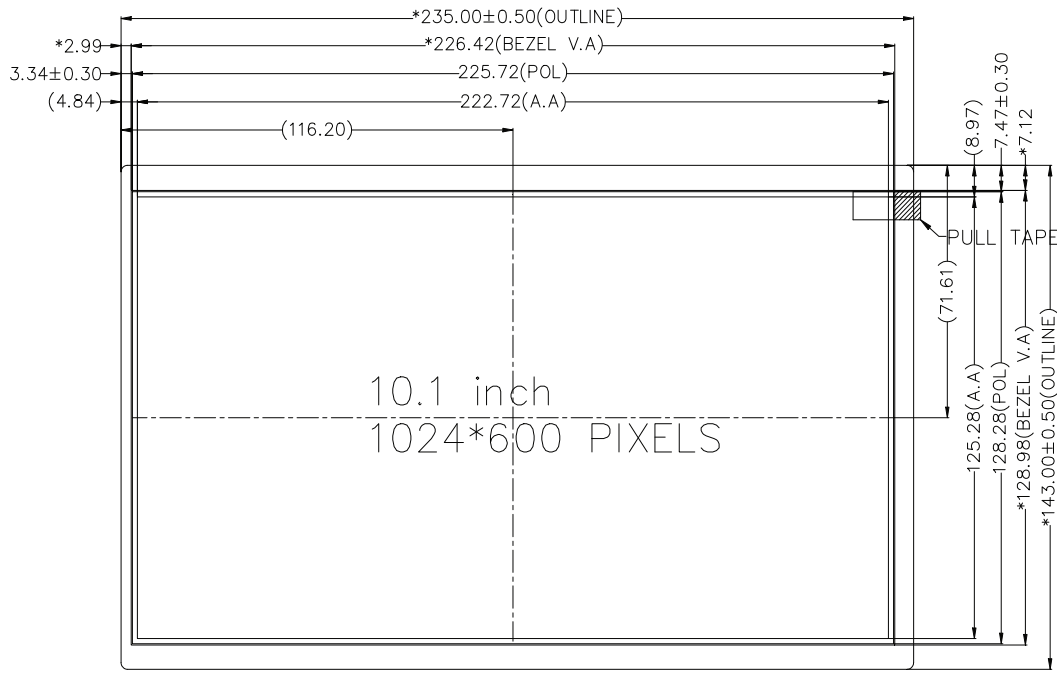
Revision	Date	Description	Changed by
0	5/17/17	Initial Release	SB
1	8/14/17	Backlight Characteristics Added, Pin Descriptions Updated	SB
2	3/6/18	Electrical & Optical Characteristics Updated	SB
3	7/1/18	Backlight Redesign	SB
4	7/10/19	Electrical Characteristics Updated	SB
5	7/21/20	Updated 2D Mechanical Drawing; Kapton Tape on Golden Fingers	AS
6	8/18/20	Revision of SCL & SDA Pin Description; Included Horizontal & Vertical Timing Charts	AS

## Functions and Features

- 1024xRGBx600 Resolution
- LED Backlight
  - Built In-LED Driver
  - PWM Brightness Control
- LVDS Interface
  - 4 LVDS Channels
- 262K Colors
- Wide Viewing Angles

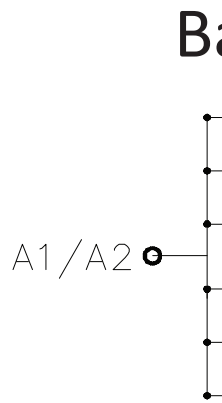
# Mechanical Drawing

A  
B  
C  
D  
E  
F



## Notes:

1. Display Size: 10.1" TFT
2. Display Resolution: 1024 x 600 Pixels
3. Display Mode: Transmissive / Normally White / Anti-Glare
4. Optimal View: Full View
5. Driver IC: HX8282 - LVDS Interface
6. Power Supply Voltage: 3.3V
7. Backlight: White LED
8. Luminance: 800cd/m<sup>2</sup> (Typ)



1 2 3 4

## Pin Description

Pin No.	Symbol	Connection	Function Description
1	GND	Power Supply	Ground
2-3	V <sub>DD</sub>	Power Supply	Supply voltage for LCD (+3.3V)
4	V <sub>EDID</sub>	Power Supply	Supply voltage for EDID (+3.3V)
5	GND	Power Supply	Ground
6	SCL	MPU	Serial Clock for EDID
7	SDA	MPU	Serial Data for EDID
8	Rin0-	MPU	-LVDS differential data input CH0
9	Rin0+	MPU	+LVDS differential data input CH0
10	GND	Power Supply	Ground
11	Rin1-	MPU	-LVDS differential data input CH1
12	Rin1+	MPU	+LVDS differential data input CH1
13	GND	Power Supply	Ground
14	Rin2-	MPU	-LVDS differential data input CH2
15	Rin2+	MPU	+LVDS differential data input CH2
16	GND	Power Supply	Ground
17	CLKIN-	MPU	-LVDS differential Clock
18	CLKIN+	MPU	+LVDS differential Clock
19	GND	Power Supply	Ground
20	Rin3-	MPU	-LVDS differential data input CH3
21	Rin3+	MPU	+LVDS differential data input CH3
22	GND	Power Supply	Ground
23	INSEL (HSD)	MPU	Data Input Format: INSEL = L 8-Bit LVDS Input (Default) INSEL = H 6-Bit LVDS Input
24-25	GND	Power Supply	Ground
26	UPDN	MPU	Gate Driver Up/Down Scan Setting: UPDN = H: Reverse Scan UPDN = L: Normal Scan (Default)
27	SHLR	MPU	Gate Driver Left/Right Scan Setting: SHLR = H: Normal Scan (Default) SHLR = L: Reverse Scan
28	GND	Power Supply	Ground
29	RESET	MPU	Active Low Reset Signal
30	STBYB	MPU	Active Low Standby Signal
31-33	LED_GND	Power Supply	Ground for Backlight Driver
34	GND	Power Supply	Ground
35	LED_PWM	MPU	Backlight PWM Signal Input (See Table Below)
36	LED_EN	MPU	Backlight Enable H: Backlight On; L: Backlight Off
37	BIST	MPU	Built in Self-Test BIST = H: Self-Test Enabled BIST = L: Normal Operation (Default)
38-40	LED_V <sub>DD</sub>	Power Supply	Supply Voltage for Backlight Driver

**LCD connector:** 0.5mm pitch 40-Conductor FFC.

**Recommended cable:** 40 POS FFC      **Molex P/N:** 15020-0435

### LED\_PWM Signal Operating Frequency:

PWM Frequency (F)	Duty Cycle (Min.)	Duty Cycle (Max.)
100Hz < F < 500Hz	5%	100%
500Hz < F < 20KHz	10%	100%

## Electrical Characteristics (T<sub>OP</sub> = 25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T <sub>OP</sub>	Absolute Max	0	-	+50	°C
Storage Temperature Range	T <sub>ST</sub>	Absolute Max	-20	-	+60	°C
Supply Voltage for LCD	V <sub>DD</sub>	-	3.0	3.3	3.6	V
Supply Voltage for EDID	V <sub>EDID</sub>	-	3.0	3.3	3.6	V
Supply Current for LCD	I <sub>DD</sub>	V <sub>DD</sub> = 3.3V	50	120	180	mA
LVDS Differential input HIGH Voltage	RxVTH	-	-	-	+100	mV
LVDS Differential input LOW Voltage	RxVTL	-	-100	-	-	mV
LVDS Differential input Common Voltage	RxVCM	-	0.7	-	1.6	V
LVDS Differential Voltage	VID	-	200	-	600	mV
Supply Voltage for Backlight Driver	LED_V <sub>DD</sub>	-	5.0	12.0	22.4	V
Supply Current for Backlight Driver <sup>1</sup>	LED_I <sub>DD</sub>	-	160	360	1200	mA
Backlight Enable Voltage	LED_EN	-	2.5	3.3	5.5	V
Backlight PWM Voltage	LED_PWM	I <sub>PWM</sub> ≤ 5 mA	2.5	3.3	5.5	V
Backlight Lifetime <sub>2</sub>	-	T <sub>OP</sub> = 25° C	20,000	50,000	-	Hrs.

<sup>1</sup>Minimum supply current occurs when supply voltage is at max; maximum supply current when supply voltage is at minimum.

<sup>2</sup>Backlight lifetime is rated as Hours until **half-brightness**, under normal operating conditions.

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Optimal Viewing Angles	Top	Cr ≥ 10	-	80	-	°	
	Bottom		-	80	-	°	
	Left		-	80	-	°	
	Right		-	80	-	°	
Contrast Ratio	CR	-	450	750	-	-	
Luminance	L <sub>V</sub>	-	600	800	1000	cd/m <sup>2</sup>	
Response Time	Rise + Fall	T <sub>R</sub> + T <sub>F</sub>	T <sub>OP</sub> = 25°C		-	8	ms
Chromaticity	Red	X <sub>R</sub>	-	0.565	0.605	0.635	-
		Y <sub>R</sub>	-	0.309	0.349	0.379	-
	Green	X <sub>G</sub>	-	0.286	0.326	0.356	-
		Y <sub>G</sub>	-	0.565	0.605	0.635	-
	Blue	X <sub>B</sub>	-	0.112	0.152	0.182	-
		Y <sub>B</sub>	-	0.075	0.115	0.145	-
White	X <sub>W</sub>	-	0.257	0.297	0.327	-	
	Y <sub>W</sub>	-	0.283	0.323	0.353	-	

## Driver Information

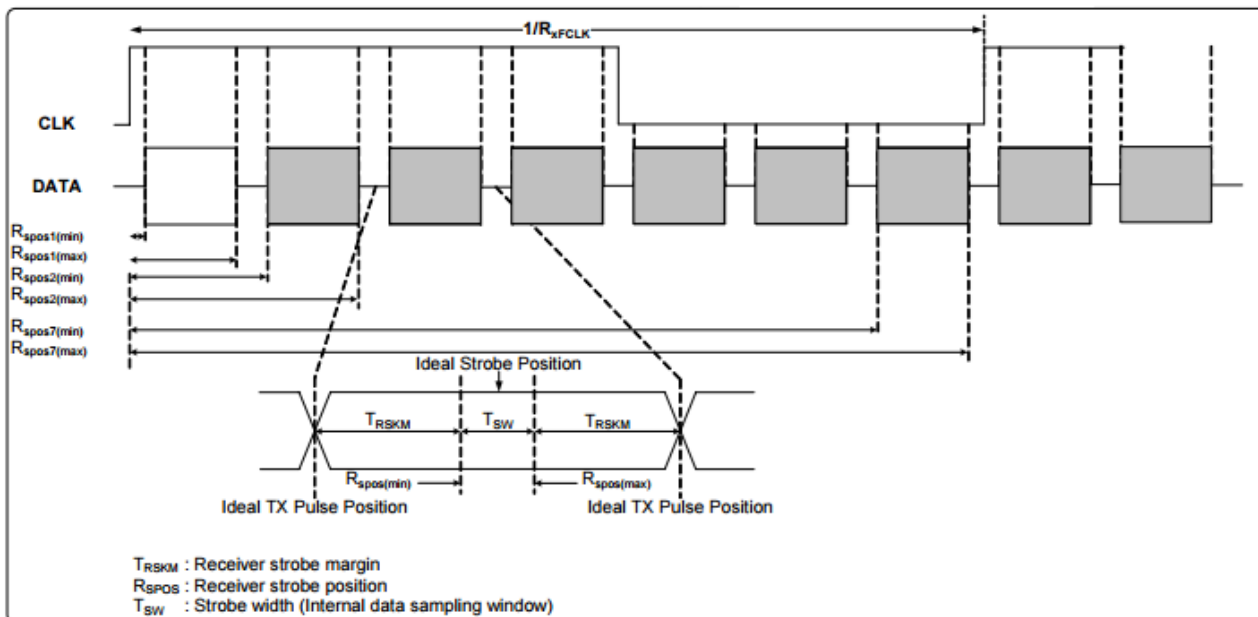
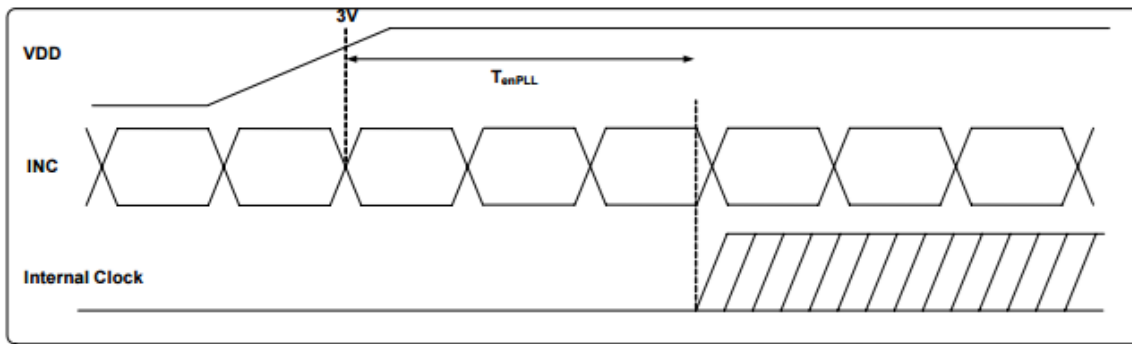
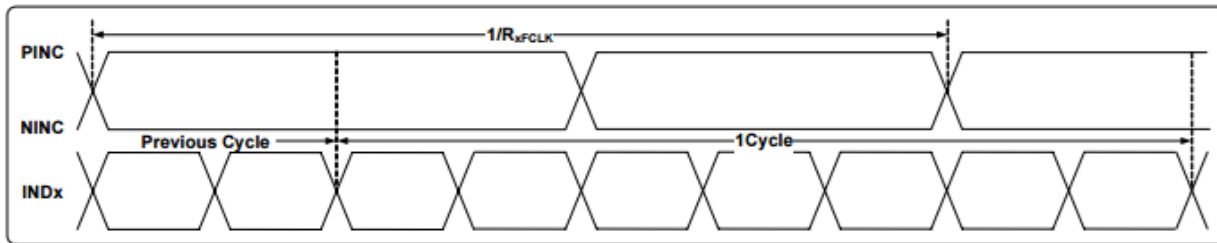
Built-in HX8282 Source Driver: <http://www.newhavendisplay.com/appnotes/datasheets/LCDs/HX8282-A01.pdf>

Built-in HX8696 Gate Driver: <http://www.newhavendisplay.com/appnotes/datasheets/LCDs/HX8696-A.pdf>

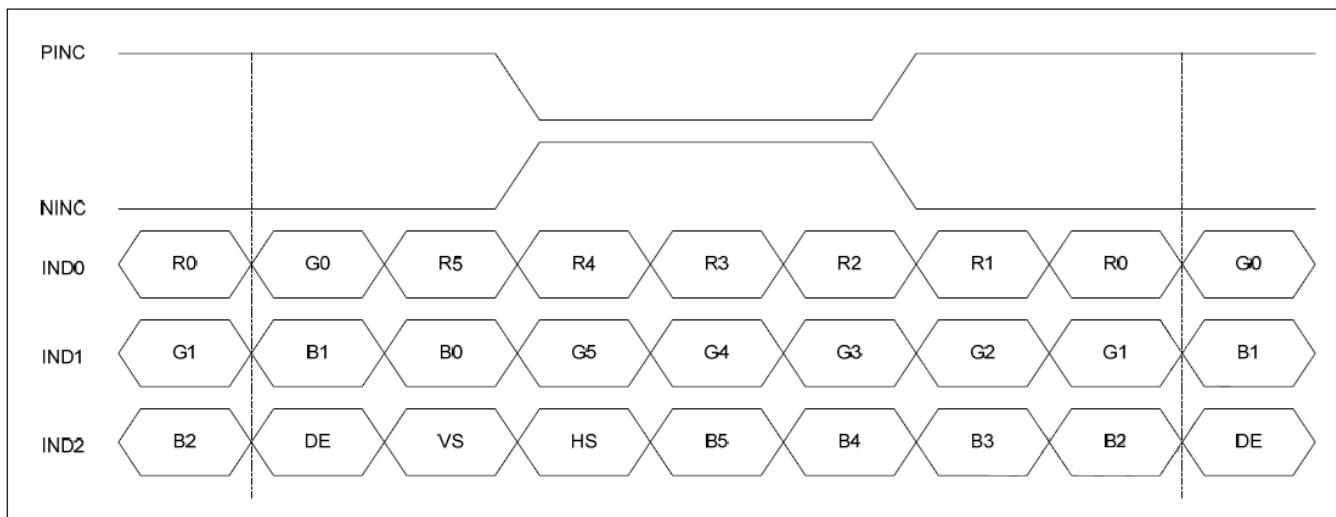
# Timing Characteristics

Parameter	Symbol	Spec			Unit	Condition
		Min.	Typ.	Max.		
Clock frequency	R <sub>XFCLK</sub>	20	-	71	MHz	-
Input data skew margin	T <sub>RSKM</sub>	500	-	-	pS	VID  = 400mV R <sub>XVCM</sub> = 1.2V R <sub>XFCLK</sub> = 71MHz
Clock high time	T <sub>LVCH</sub>	-	4/(7 * R <sub>XFCLK</sub> )	-	nS	-
Clock low time	T <sub>LVCL</sub>	-	3/(7 * R <sub>XFCLK</sub> )	-	nS	-
PLL wake-up time	T <sub>emPLL</sub>	-	-	150	μS	-

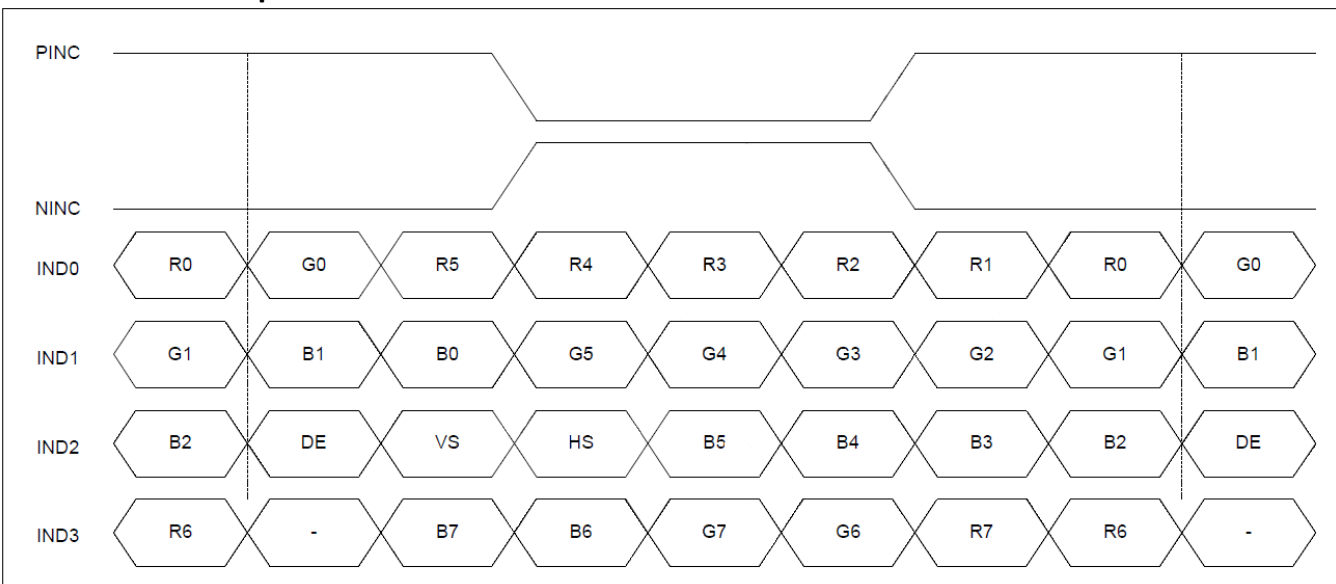
Parameter	Symbol	Spec			Unit	Condition
		Min.	Typ.	Max.		
Modulation Frequency	SSC <sub>MF</sub>	23	-	93	KHz	-
Modulation Rate	SSC <sub>MR</sub>	-	-	±3	%	LVDS Clock = 71 MHz



### 6-bit LVDS data input format:



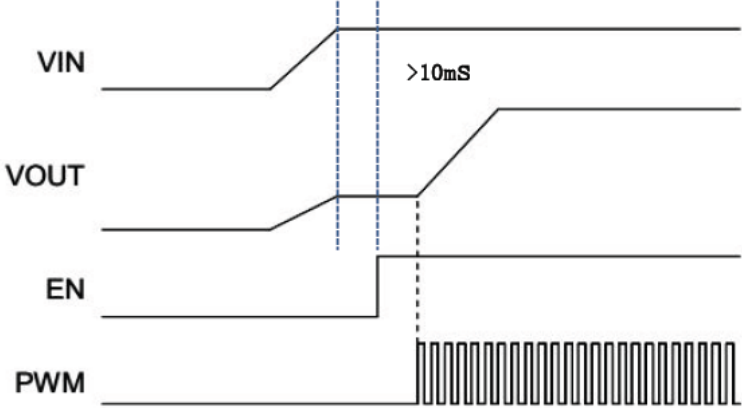
### 8-Bit LVDS Data Input Format:



### Horizontal & Vertical Timing (1024x600)

Item		Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DCLK Frequency		F <sub>CLK</sub>	44.9	51.2	63	MHz
HSYNC	Horizontal Display Area	T <sub>HD</sub>	1024			DCLK
	HSD Period	T <sub>H</sub>	1200	1344	1400	DCLK
	HSD Pulse Width	T <sub>HPW</sub>	1	-	140	DCLK
	HSD Back Porch	T <sub>HBP</sub>	160			DCLK
	HSD Front Porch	T <sub>HFP</sub>	16	160	216	DCLK
VSYNC	Vertical Display Area	T <sub>VD</sub>	600			T <sub>H</sub>
	VSD Period	T <sub>V</sub>	624	635	750	T <sub>H</sub>
	VSD Pulse Width	T <sub>VPW</sub>	1	-	20	T <sub>H</sub>
	VSD Back Porch	T <sub>VBP</sub>	23			T <sub>H</sub>
	VSD Front Porch	T <sub>VFP</sub>	1	12	127	T <sub>H</sub>

# Backlight Power ON Timing Sequence





## Quality Information

Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	+60°C, 240 hrs.	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-20°C, 240 hrs.	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+50°C, 120 hrs.	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	0°C, 120 hrs.	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.	+50°C, 90% RH, 120 hrs.	1,2
Thermal Shock resistance	Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.	0°C, 30min->25°C, 5min -> 50°C, 30min 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-55Hz, 1.5mm 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: V <sub>s</sub> =8KV, Contact: V <sub>s</sub> =4KV 10 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](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

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

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