

# NHD-12864WG-BTFH-V#N

## Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
12864-	128 x 64 pixels
WG-	Display Type: Graphic
B-	Model
T-	White LED Backlight
F-	FSTN (+)
H-	Transflective, Wide Temperature 6:00 view
V#N -	Built-in Negative Voltage
	<b>RoHS Compliant</b>

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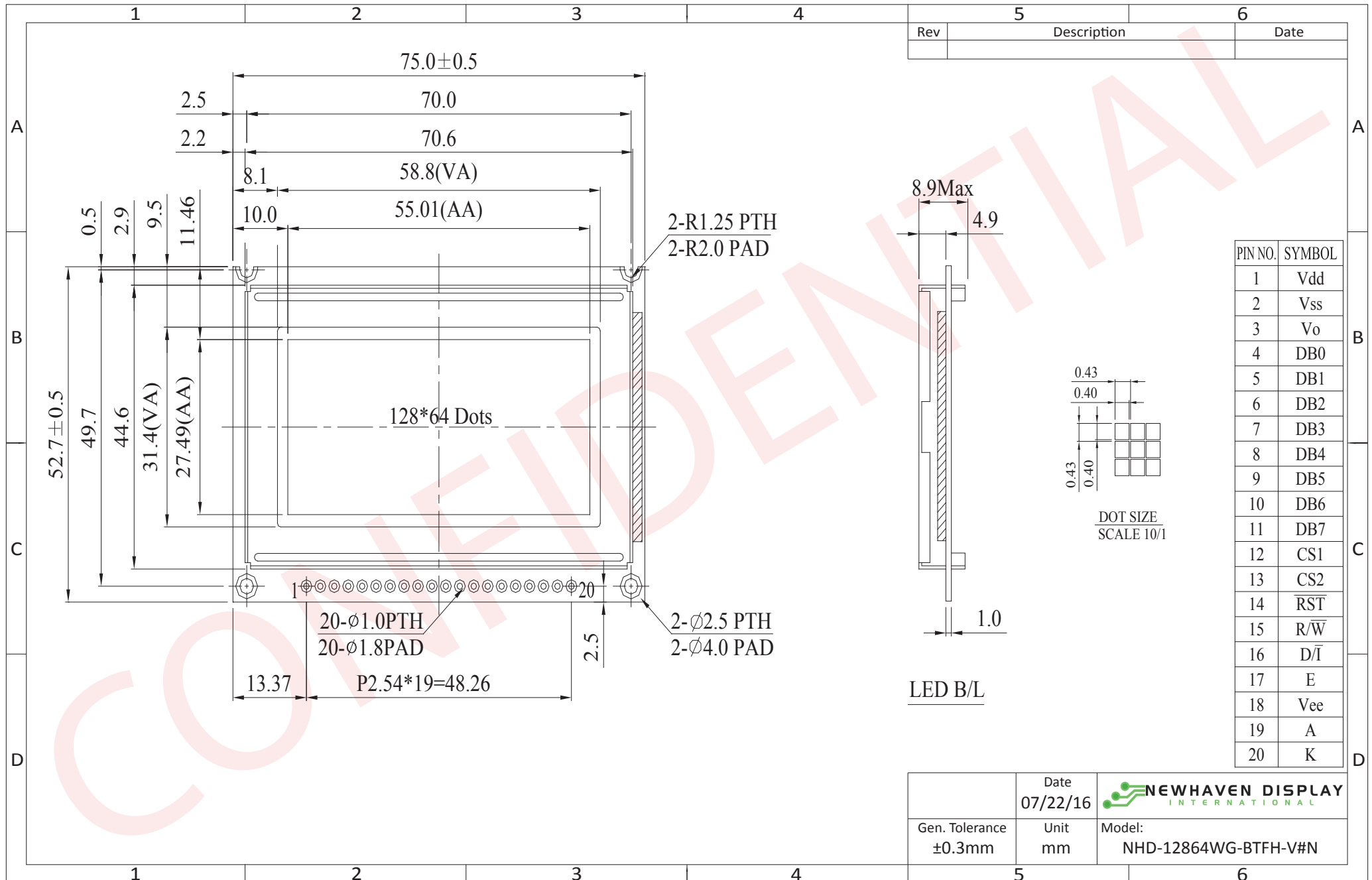
## Document Revision History

Revision	Date	Description	Changed by
0	3/7/2007	Initial Release	-
1	5/21/2008	Backlight info modification	-
2	3/22/2010	User guide reformat	BE
3	4/14/2010	Block diagram/Initialization updated	BE
4	2/16/2011	Mechanical drawing updated	AK
5	12/19/2012	Controller information updated	AK
6	3/28/2013	Electrical & timing characteristics updated	JN
7	7/22/16	Mechanical Drawing, Electrical & Optical Char. Updated	SB
8	9/7/16	Fixed contrast voltage	SB

## Functions and Features

- 128 x 64 pixels
- Built-in NT7108C controller
- +5.0V power supply
- 1/64 duty cycle
- RoHS Compliant

# Mechanical Drawing



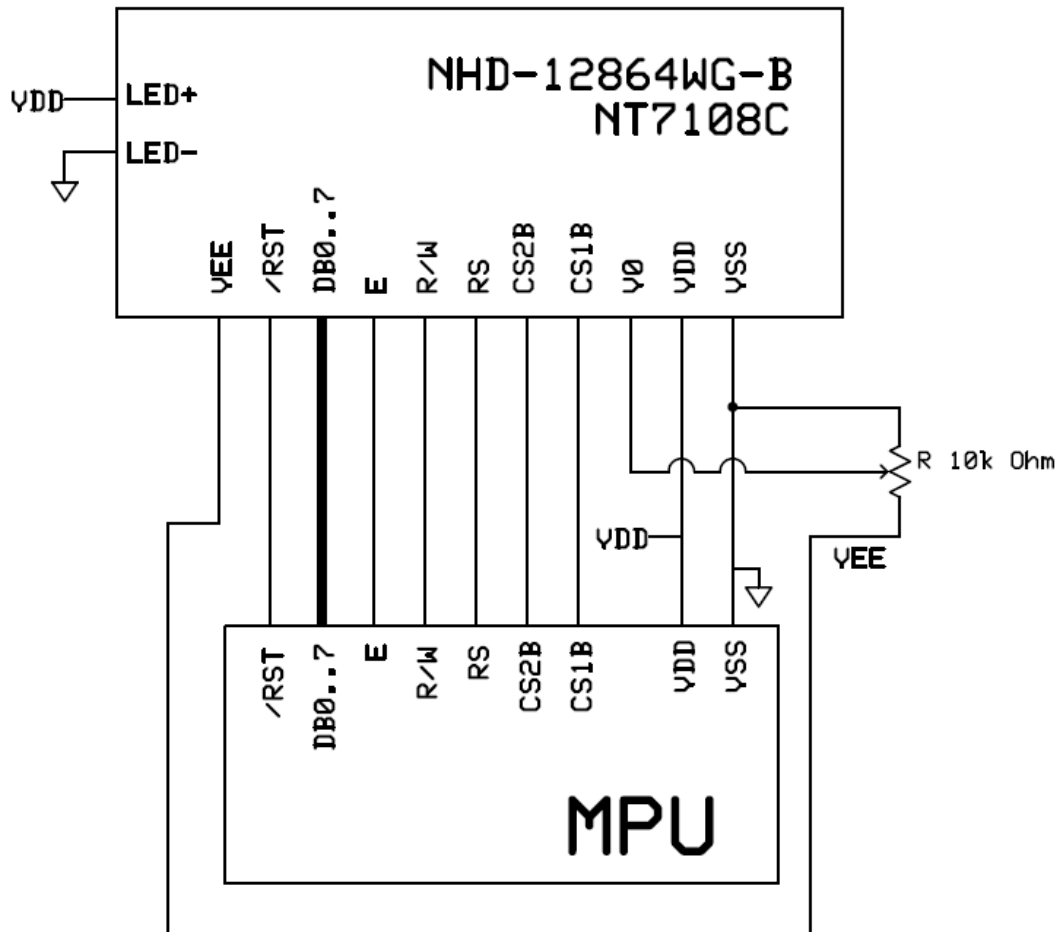
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## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	V <sub>DD</sub>	Power Supply	Supply Voltage for logic (+5.0V)
2	V <sub>SS</sub>	Power Supply	Ground
3	V <sub>0</sub>	Power Supply	Supply Voltage for contrast (approx.. -3.5V)
4-11	DB0-DB7	MPU	Bi-directional 8-bit data bus
12	CS1B	MPU	Chip Selection: CS1=H, CS2=L : select IC1 (left side) CS1=L, CS2=H : select IC2 (right side)
13	CS2B	MPU	
14	/RST	MPU	Active LOW Reset signal
15	R/W	MPU	Read/Write select signal. R/W=1: Read R/W: =0: Write
16	RS	MPU	Register Select: 1=Data, 0= Instruction
17	E	MPU	Operation Enable signal. Falling edge triggered.
18	V <sub>EE</sub>	Power Supply	Negative voltage output (- 10V)
19	LED+	Power Supply	Backlight Anode(+3.5V)
20	LED-	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 2.54mm pitch pins

Backlight connector: - Mates with: -



## 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	$V_{DD}$	-	4.5	5.0	5.5	V
Supply Current	$I_{DD}$	$V_{DD} = 5.0V$	3.0	4.0	5.0	mA
Supply for LCD (contrast)	$V_{DD}-V_0$	$T_{OP} = 25^\circ$	7.8	8.0	8.2	V
"H" Level input	$V_{IH}$	-	$0.7 * V_{DD}$	-	$V_{DD}$	V
"L" Level input	$V_{IL}$	-	$V_{SS}$	-	0.8	V
"H" Level output	$V_{OH}$	-	2.4	-	$V_{DD}$	V
"L" Level output	$V_{OL}$	-	$V_{SS}$	-	0.4	V
Backlight Supply Voltage	$V_{LED}$	-	3.4	3.5	3.6	V
Backlight Supply Current	$I_{LED}$	$V_{LED} = 3.5V$	43	48	60	mA

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	$CR \geq 2$	-	30	-	°
	Bottom		-	60	-	°
	Left		-	45	-	°
	Right		-	45	-	°
Contrast Ratio	CR	-	2	5	-	-
Response Time	Rise	$T_{OP} = 25^\circ C$	-	200	300	ms
	Fall		-	250	350	ms

## Controller Information

Built-in NT7108C controller.

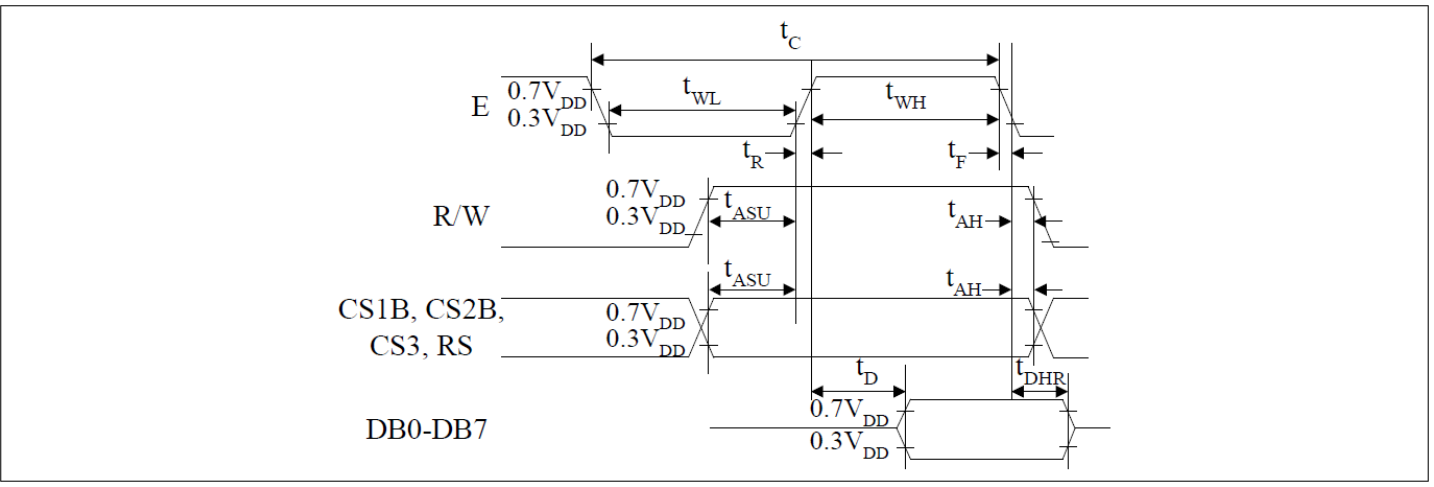
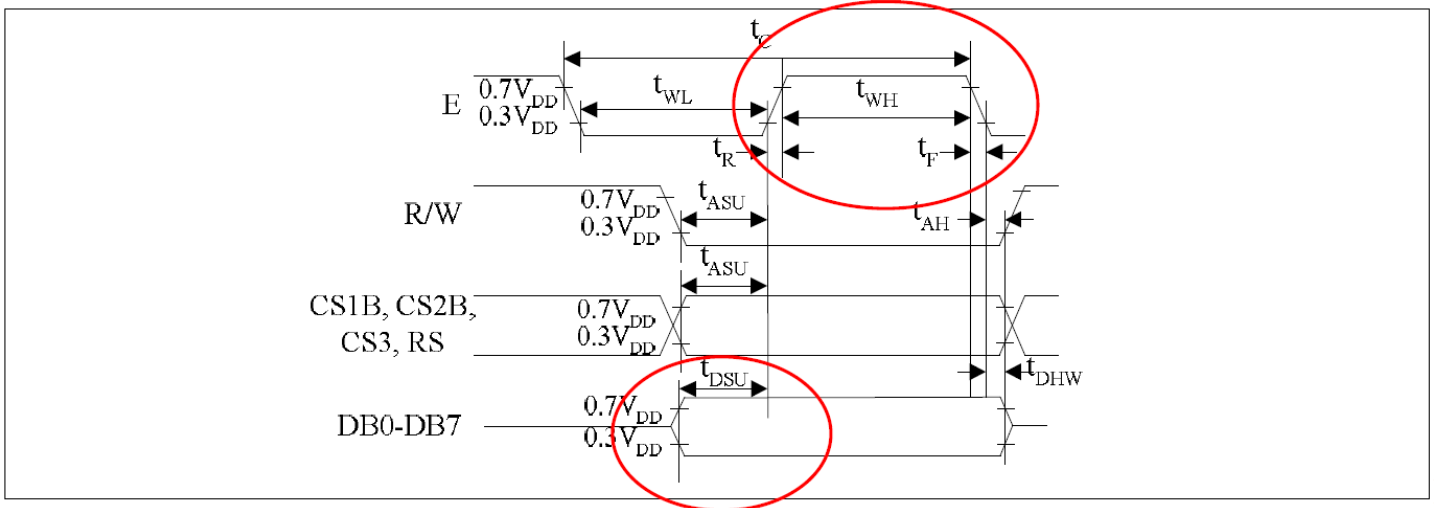
Please download specification at [http://www.newhavendisplay.com/app\\_notes/NT7108.pdf](http://www.newhavendisplay.com/app_notes/NT7108.pdf)

## Table of Commands

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L:OFF, H:ON	
Set address (Y address)	L	L	L	H	Y address (0-63)						Sets the Y address in the Y address counter.	
Set page (X address)	L	L	H	L	H	H	H	Page (0-7)			Sets the X address at the X address register.	
Display Start line (Z address)	L	L	H	H	Display start line (0-63)						Indicates the display data RAM displayed at the top of the screen.	
Status read	L	H	Busy	L	On/Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset	
Write display data	H	L	Write data									Writes data (DB0: 7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data									Reads data (DB0: 7) from display data RAM to the data bus.

# Timing Characteristics

Characteristic	Symbol	Min	Type	Max	Unit
E cycle	$t_c$	1000	-	-	ns
E high level width	$t_{WH}$	450	-	-	
E low level width	$t_{WL}$	450	-	-	
E rise time	$t_R$	-	-	25	
E fall time	$t_F$	-	-	25	
Address set-up time	$t_{ASU}$	140	-	-	
Address hold time	$t_{AH}$	10	-	-	
Data set-up time	$t_{DSU}$	140	-	-	
Data delay time	$t_D$	-	-	320	
Data hold time (write)	$t_{DHW}$	10	-	-	
Data hold time (read)	$t_{DHR}$	20	-	-	



## Example Initialization Program

```
'-----  
'DB0-DB7  7-14          P1  
'CS2B      16           P3.6  
'CS1B      15           P3.1  
'/RST      17           P3.2  
'R/W       5            P3.7  
'RS        4            P3.0  
'E         6            P3.4  
'-----
```

Sub Init

Reset P3.2

Set P3.2

Reset P3.4

Reset P3.0

Reset P3.7

Reset P3.6

Reset P3.1

A = &H3F

Call Comleft

'display on

Call Comright

'display on

End Sub

'-----  
Sub Comleft

P1 = A

Set P3.6

Reset P3.0

Set P3.4

Reset P3.4

Reset P3.6

End Sub

Sub Comright

P1 = A

Set P3.1

Reset P3.0

Set P3.4

Reset P3.4

Reset P3.1

End Sub

Sub Writeleft

P1 = A

Set P3.6

Set P3.0

Set P3.4

Reset P3.4

Reset P3.6

End Sub

Sub Writeright

P1 = A

Set P3.1

Set P3.0

Set P3.4

Reset P3.4

Reset P3.1

End Sub



## 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 , 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C 200hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 200hrs	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 and Terms & Conditions

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