

NHD-C0220AU-FSW-FTS

COG (Chip-on-Glass) Liquid Crystal Display Module

NHD- Newhaven Display
C0220- COG, 2 lines x 20 characters
AU- Model
F- Transflective
SW- Side White LED backlight
F- FSTN+
T- 12:00 View Angle
S- Standard Temp (0C ~ +50C)
RoHS Compliant

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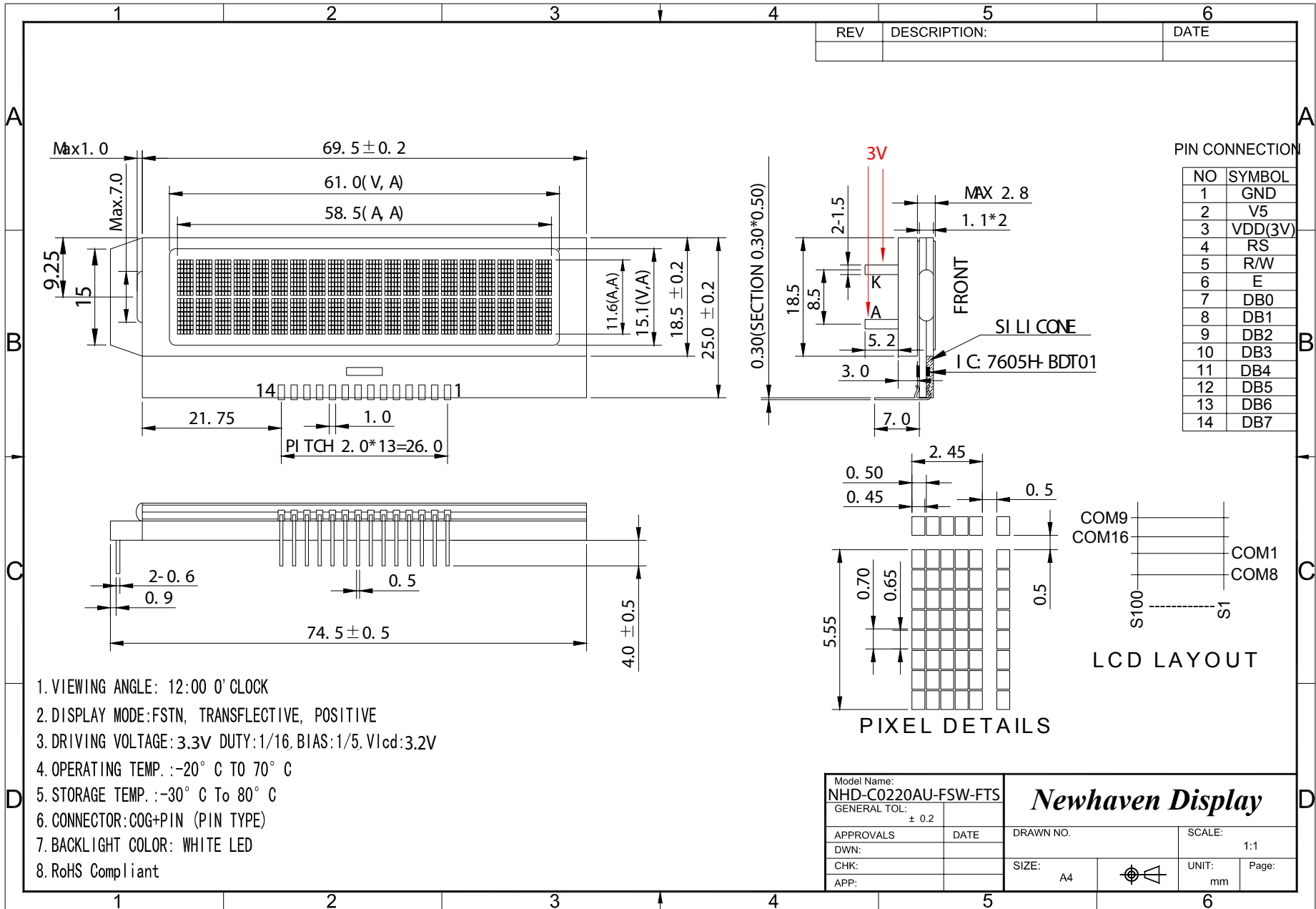
Document Revision History

Revision	Date	Description	Changed by
0	5/17/2007	Initial Release	
1	6/25/2009	User guide reformat	CL
2	6/29/2009	Change typical backlight voltage	CL
3	6/30/2009	User guide reformat	BE
4	10/9/2009	Updated Electrical Characteristic	MC
5	5/14/2010	Controller Note	MP
6	8/27/2010	Drawing /Vlcd updated	BE
7	5/27/2011	Display character address code updated	AK
8	6/2/2011	Timing characteristics updated	AK

Functions and Features

- 2 lines x 20 characters
- Built-in NT7605 controller
- 3.3V power supply
- 1/16 duty, 1/5 bias

Mechanical Drawing



REV	DESCRIPTION:	DATE

PIN CONNECTION

NO	SYMBOL
1	GND
2	V5
3	VDD(3V)
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7

- VIEWING ANGLE: 12:00 O' CLOCK
- DISPLAY MODE:FSTN, TRANSFLECTIVE, POSITIVE
- DRIVING VOLTAGE: 3.3V DUTY:1/16, BIAS:1/5, V_{lcd}:3.2V
- OPERATING TEMP. :-20° C TO 70° C
- STORAGE TEMP. :-30° C TO 80° C
- CONNECTOR: COG+PIN (PIN TYPE)
- BACKLIGHT COLOR: WHITE LED
- RoHS Compliant

Model Name: NHD-C0220AU-FSW-FTS	
GENERAL TOL: ± 0.2	
APPROVALS	DATE
DWN:	
CHK:	
APP:	

Newhaven Display

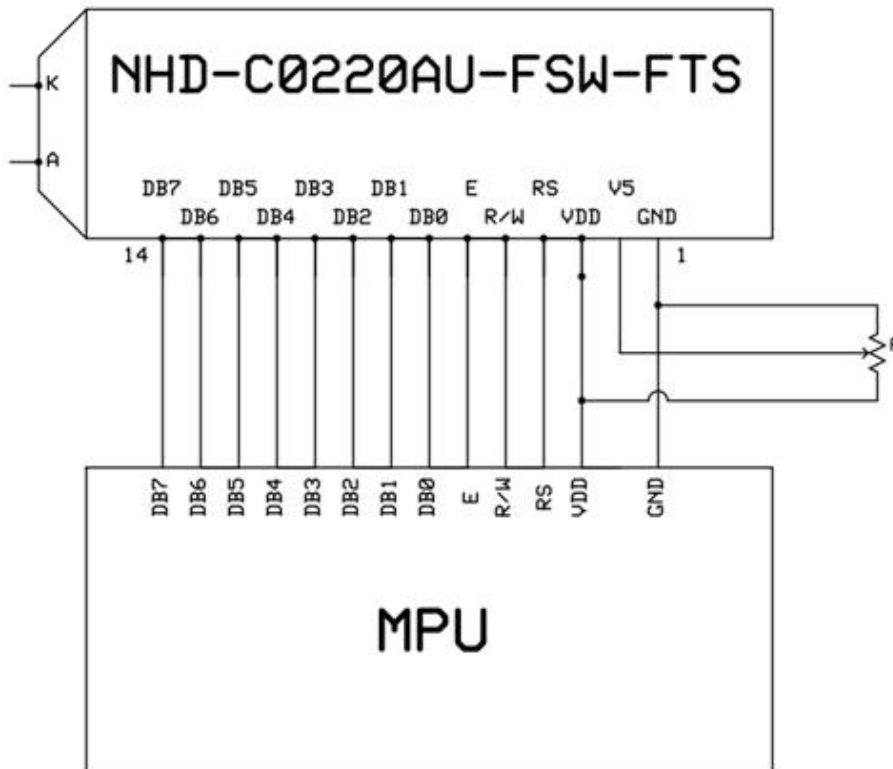
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Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	GND	Power Supply	Ground
2	V5	Adj Power Supply	Contrast voltage adjustment (~0.1V)
3	VDD	Power Supply	VDD=3.3V
4	RS	MPU	Register Select: 0=Instruction, 1=Data
5	R/W	MPU	Read / Write select: 0=Write, 1=Read
6	E	MPU	Read/Write start signal (Schmitt trigger input)
7-10	DB0 – DB3	MPU	Low 4 tri-state bi-directional data bus lines. Not used in 4-bit mode.
11-14	DB4 – DB7	MPU	High 4 tri-state bi-directional data bus lines.

Recommended LCD connector: 2.0mm pitch, 14pins Soldered to PCB, or JST p/n: PHR-14

Backlight connector: A and K pins **Mates with:** Solder to wires or PCB



Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	Top	Absolute Max	0	25	+50	°C
Storage Temperature Range	Tst	Absolute Max	-30	25	+80	°C
Supply Voltage	VDD		3.2	3.3	3.4	V
Supply Current	IDD	VDD=3.3V			1.0	mA
Supply for LCD (contrast)	Vlcd	VLCD=VDD-V5	3.1	3.2	3.3	V
"H" Level input	Vih		0.8VDD		VDD	V
"L" Level input	Vil		0		0.2VDD	V
"H" Level output	Voh		VDD-0.6			V
"L" Level output	Vol				GND+0.6	V
Backlight Supply Voltage	VLED		3.0	3.1	3.2	V
Backlight Supply Current	Iled	VLED=3.1V	30	40	60	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical	AV	Cr ≥ 2	-20		+60	°
Viewing Angle - Horizontal	AH	Cr ≥ 2	-50		+50	°
Contrast Ratio	Cr	25°C	9	15		
Response Time (rise)	Tr			150	200	ms
Response Time (fall)	Tr			250	400	ms

Controller Information

Built-in NT7605N-BDT01. Download specification at http://www.newhavendisplay.com/app_notes/NT7605.pdf

NOTE: The Busy Flag of the NT7605 controller may not always be responsive. Add sufficient delays and/or a time-out check routine to continue operation if busy flag is not cleared.

Timing Characteristics

Read Operation

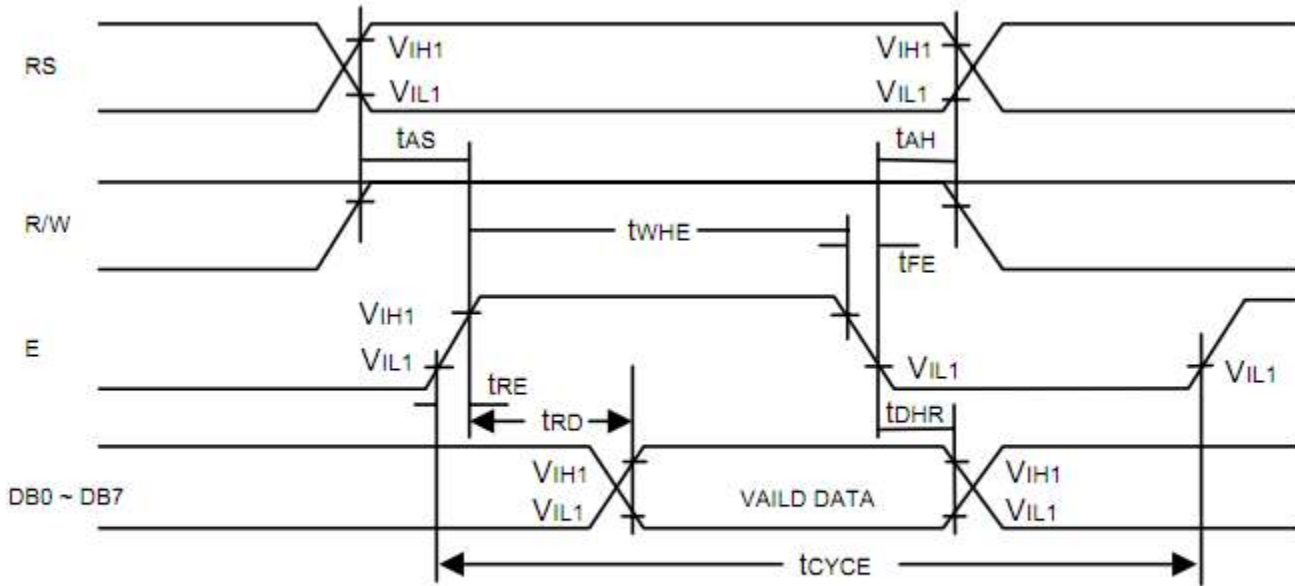


Figure 1. Bus Read Operation Sequence
(Reading out data from NT7605 to MPU)

Read Cycle ($V_{DD} = 5.0V$, $GND = 0V$, $T_A = 25^\circ C$)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
t_{CYCE}	Enable Cycle Time	500	-	-	ns	Figure 1
t_{WHE}	Enable "H" Level Pulse Width	300	-	-	ns	Figure 1
t_{RE}, t_{FE}	Enable Rise/Fall Time	-	-	25	ns	Figure 1
t_{AS}	RS, R/W Setup Time	60^1	-	-	ns	Figure 1
		100^2				
t_{AH}	RS, R/W Address Hold Time	10	-	-	ns	Figure 1
t_{RD}	Read Data Output Delay	-	-	190	ns	Figure 1
t_{DHR}	Read Data Hold Time	20	-	-	ns	Figure 1

Notes: 1: 8-bit operation mode
2: 4-bit operation mode

Write Operation

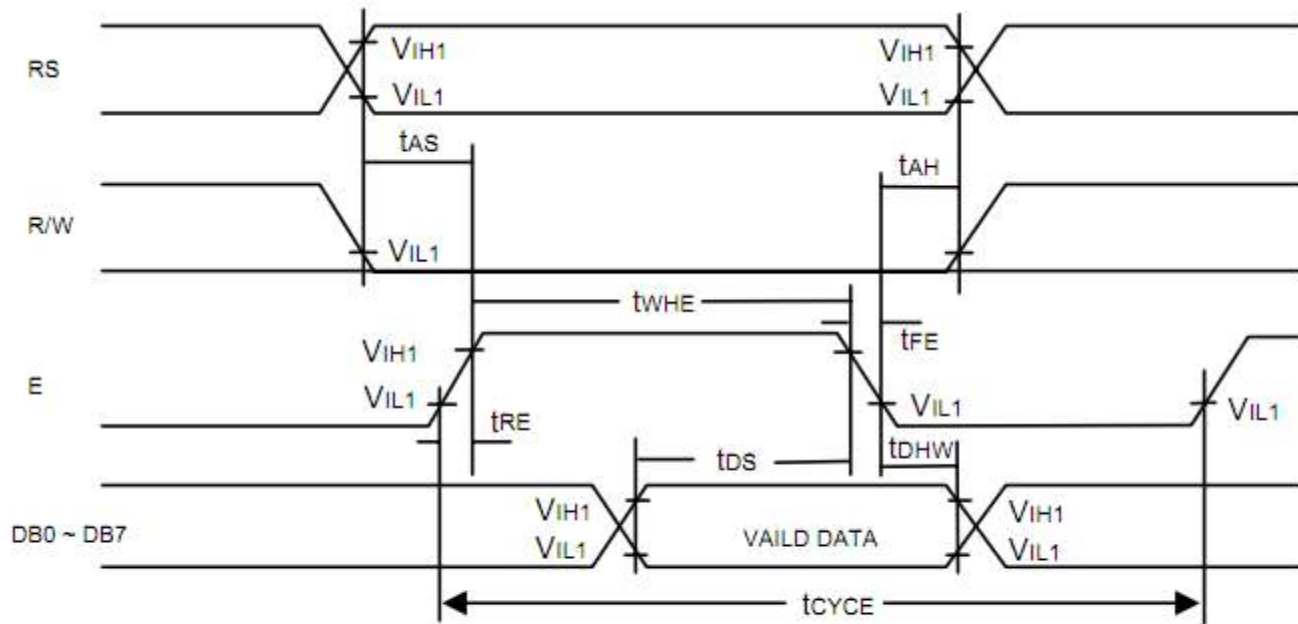


Figure 2. Bus Write Operation Sequence
(Writing data from MPU to NT7605)

Write Cycle ($V_{DD} = 5.0V$, $GND = 0V$, $T_A = 25^\circ C$)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
t_{CYCE}	Enable Cycle Time	500	-	-	ns	Figure 2
t_{WHE}	Enable "H" Level Pulse Width	300	-	-	ns	Figure 2
t_{RE} , t_{FE}	Enable Rise/Fall Time	-	-	25	ns	Figure 2
t_{AS}	RS, R/W Setup Time	60^1	-	-	ns	Figure 2
		100^2				
t_{AH}	RS, R/W Address Hold Time	10	-	-	ns	Figure 2
t_{DS}	Data Output Delay	100	-	-	ns	Figure 2
t_{DHW}	Data Hold Time	10	-	-	ns	Figure 2

Notes: 1: 8-bit operation mode

2: 4-bit operation mode

Built-in Font Table

		Higher 4-bit (D4 to D7) of Character Code (Hexadecimal)																			
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F				
Lower 4-bit (D0 to D3) of Character Code (Hexadecimal)	0	CG RAM (1)			0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
	1	CG RAM (2)		!	"	#	\$	%	&	'	()	*	+	,	-	.	:	;	<	=
	2	CG RAM (3)		"	2	3	4	5	6	7	8	9	A	B	C	D	E	F			
	3	CG RAM (4)		*	3	4	5	6	7	8	9	A	B	C	D	E	F				
	4	CG RAM (5)		#	4	5	6	7	8	9	A	B	C	D	E	F					
	5	CG RAM (6)		%	5	6	7	8	9	A	B	C	D	E	F						
	6	CG RAM (7)		0	6	7	8	9	A	B	C	D	E	F							
	7	CG RAM (8)		'	7	8	9	A	B	C	D	E	F								
	8	CG RAM (1)		C	8	9	A	B	C	D	E	F									
	9	CG RAM (2))	9	A	B	C	D	E	F										
	A	CG RAM (3)		*	A	B	C	D	E	F											
	B	CG RAM (4)		+	B	C	D	E	F												
	C	CG RAM (5)		.	C	D	E	F													
	D	CG RAM (6)		-	D	E	F														
	E	CG RAM (7)		:	E	F															
	F	CG RAM (8)		<	F																

Example Initialization Program

```
'INIT-----  
A = &H30  
Call Writecom                                     'wake up  
Waitms 100  
Call Writecom                                     'wake up  
Waitms 10  
Call Writecom                                     'wake up  
Waitms 10  
A = &H38  
'function set  
Call Writecom  
A = &H10  
'shift display=no  
Call Writecom  
A = &H0C  
'display on  
Call Writecom  
A = &H06  
'entry mode set  
Call Writecom  
'-----  
Sub Writecom  
P1 = A  
Reset P3.0  
'instruction  
Reset P3.7  
'RW  
Waitms 1  
Set P3.4  
'E  
Waitms 1  
Reset P3.4                                     'E  
End Sub  
'-----  
Sub Writedata  
P1 = A  
Set P3.0  
'data  
Reset P3.7  
'RW  
Waitms 1  
Set P3.4  
'E  
Waitms 1  
Reset P3.4                                     'E  
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 , 48hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 48hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+50°C , 48hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	0°C , 48hrs	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.	+40°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.	0°C,30min -> 25°C,5min -> 50°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 and Terms & Conditions

http://www.newhavendisplay.com/index.php?main_page=terms