



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



# NHD-12232DZ-FSPG-YBW

## Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
12232-	122 x 32 pixels
DZ-	Model
F-	Transflective
SPG-	Side Pure Green LED Backlight
Y-	STN- Yellow/Green
B-	6:00 view
W-	Wide Temperature (-20°C ~+70°C)
	<b>RoHS Compliant</b>

**Newhaven Display International, Inc.**

2511 Technology Drive, Suite 101

Elgin IL, 60124

Ph: 847-844-8795

Fax: 847-844-8796

[www.newhavendisplay.com](http://www.newhavendisplay.com)

[nhtech@newhavendisplay.com](mailto:nhtech@newhavendisplay.com)

[nhsales@newhavendisplay.com](mailto:nhsales@newhavendisplay.com)

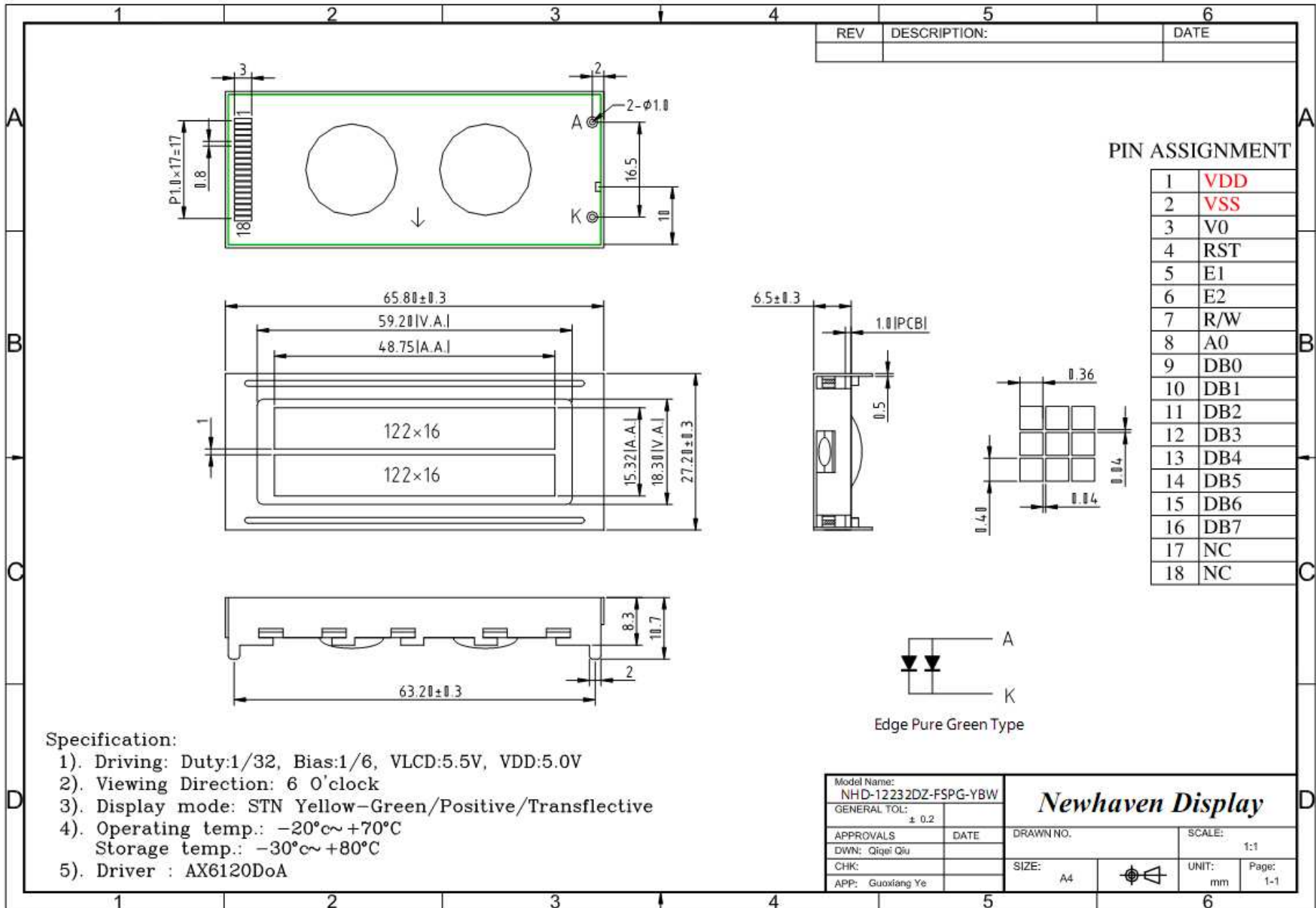
## Document Revision History

Revision	Date	Description	Changed by
0	5/19/2008	Initial Release	-
1	3/10/2010	User guide reformat	BE
2	4/14/2010	Pin description updated	BE

## Functions and Features

- 122 x 32 pixels
- Built-in AX6120 Controller
- +5.0V power supply
- 1/32 duty cycle; 1/6 bias
- RoHS Compliant

# Mechanical Drawing



## Specification:

- Driving: Duty:1/32, Bias:1/6, VLCD:5.5V, VDD:5.0V
- Viewing Direction: 6 O'clock
- Display mode: STN Yellow-Green/Positive/Transflective
- Operating temp.:  $-20^{\circ}\text{C} \sim +70^{\circ}\text{C}$   
Storage temp.:  $-30^{\circ}\text{C} \sim +80^{\circ}\text{C}$
- Driver : AX6120DoA

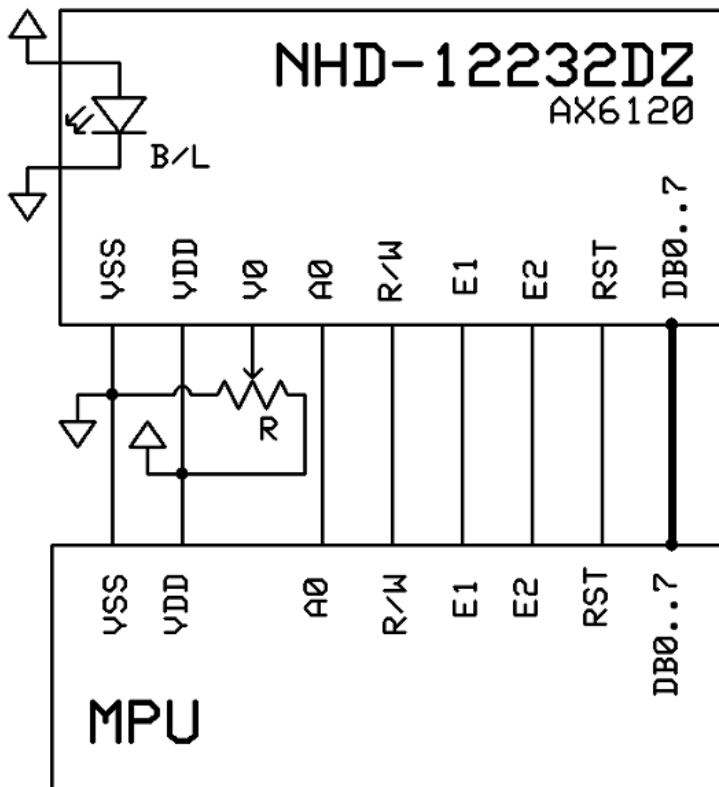
Model Name: NHD-12232DZ-FSPG-YBW		<b>Newhaven Display</b>	
GENERAL TOL: $\pm 0.2$			
APPROVALS	DATE	DRAWN NO.	SCALE:
DWN: Qiwei Qiu			1:1
CHK:		SIZE:	UNIT:
APP: Guoxiang Ye		A4	mm
			Page:
			1-1

## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	VDD	Power Supply	Power supply for logic (+5.0V)
2	VSS	Power Supply	Ground
3	V0	Adj Power Supply	Power supply for contrast (approx.- 0.5V)
4	RST	MPU	Active low Reset
5	E1	MPU	Operation enable signal. Falling edge triggered, SEG (1~60)
6	E2	MPU	Operation enable signal. Falling edge triggered, SEG (61~120)
7	R/W	MPU	Read/Write select signal, R/W=1: Read R/W: =0: Write
8	A0	MPU	Register select signal. A0=0: Command, A0=1: Data
9-16	DB0-DB7	MPU	This is an 8-bit bi-directional data bus
17	NC	-	No Connect
18	NC	-	No Connect
A	LED+	Power Supply	Power supply for LED Backlight (+3.0V)
K	LED-	Power Supply	Ground for Backlight

Recommended LCD connector: 1.0mm pitch pins

Backlight connector: - Mates with: -





## Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	Top	Absolute Max	-20	-	+70	°C
Storage Temperature Range	Tst	Absolute Max	-30	-	+80	°C
Supply Voltage	VDD		4.7	5.0	5.5	V
Supply Current	IDD	Ta=25°C, VDD=5.0V	-	1.2	1.5	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	-	5.5	-	V
"H" Level input	VIH		2.2	-	VDD	V
"L" Level input	VIL	-	0	-	0.6	V
"H" Level output	VOH	-	2.4	-	-	V
"L" Level output	VOL	-	-	-	0.4	V
Backlight Supply Voltage	VLED		-	3.0	-	V
Backlight Supply Current	ILED	VLED=3.0V	-	36	-	mA

## Optical Characteristics

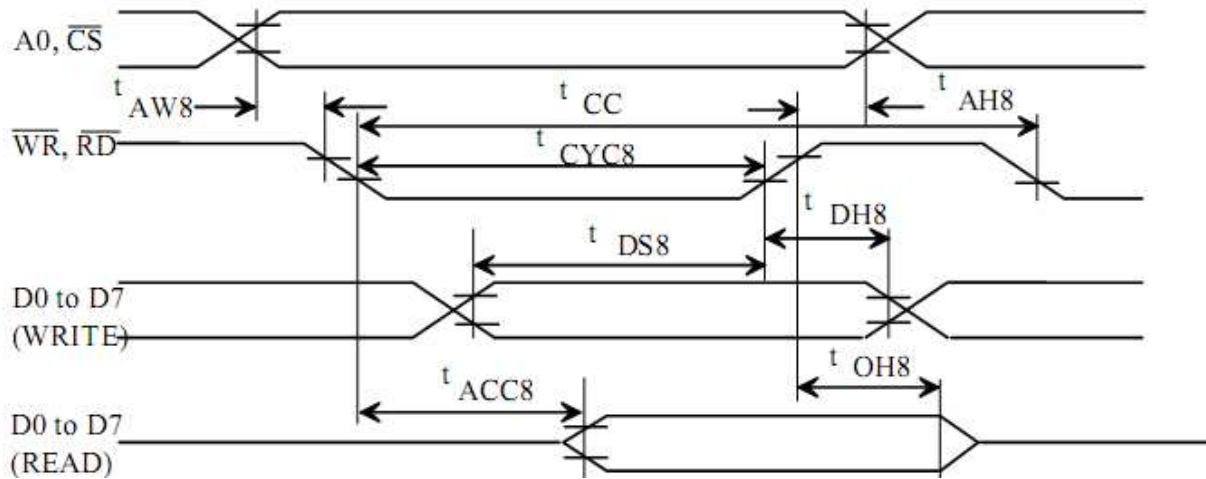
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical (top)	AV	Cr ≥ 3	-	10	-	
Viewing Angle – Vertical (bottom)	AV	Cr ≥ 3	-	60	-	°
Viewing Angle – Horizontal (left)	AH	Cr ≥ 3	-	45	-	
Viewing Angle - Horizontal (right)	AH	Cr ≥ 3	-	45	-	°
Contrast Ratio	Cr		-	5	-	-
Response Time (rise)	Tr	-	-	100	150	ms
Response Time (fall)	Tf	-	-	150	200	ms

## Controller Information

Built-in AX6120. Download specification at [http://www.newhavendisplay.com/app\\_notes/AX6120.pdf](http://www.newhavendisplay.com/app_notes/AX6120.pdf)

## Timing Characteristics

- MPU Bus Read/Write i (80-family MPU)



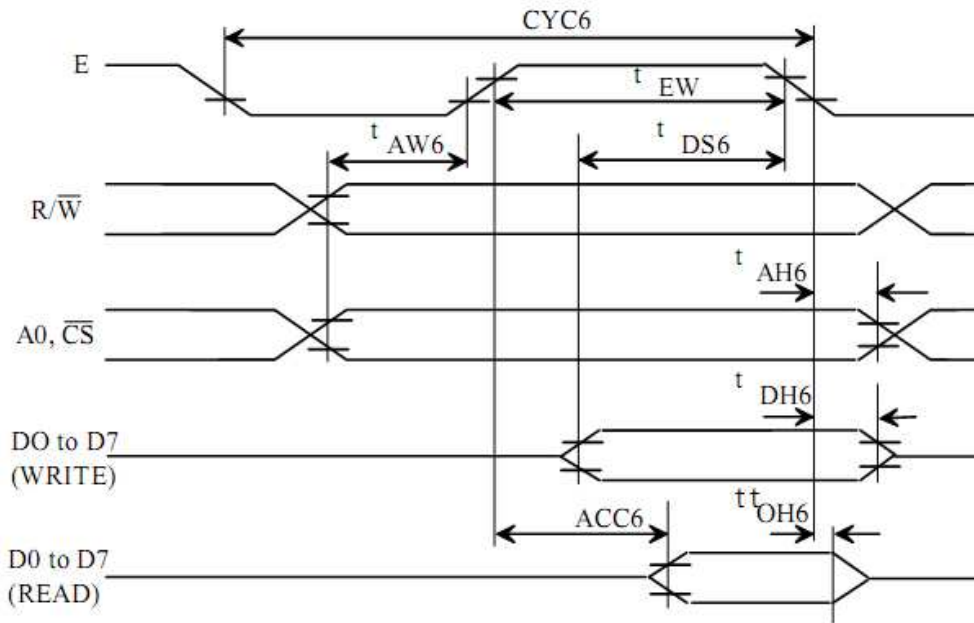
$T_a = -20$  to  $75$  deg. C,  $V_{ss} = -1.0 \pm 10\%$  unless stated otherwise

Parameter	Symbol	Condition	Rating		Unit	Signal
			min	max		
Address hold time	$t_{AH8}$		10	--	ns	A0, CS
Address setup time	$t_{AW8}$		20	--	ns	
System cycle time	$t_{CYC8}$		1,000	--	ns	WR, RD
Control pulsewidth	$t_{CC}$		200	--	ns	
Data setup time	$t_{DS8}$		80	--	ns	D0 to D7
Data hold time	$t_{DH8}$		10	--	ns	
RD access time	$t_{ACC8}$	CL = 100pF	--	90	ns	
Output disable time	$t_{CH8}$		10	60	ns	

Notes : 1. Increase parameter values by 200% when  $V_{ss} = -3.0V$ .

2. All inputs must have a rise and fall time of less than 15 ns.

● MPU Bus Read/Write II (68-family MPU)



Ta= -20 to 75 deg. C. Vss= -5V ± 10 unless stated otherwise

Parameter	Symbol	Condition	Rating		Unit	Signal
			min	max		
System cycle time	tCYC6		1,000	--	ns	A0, $\overline{CS}$ , R/ $\overline{W}$
Address setup time	tAW6		20	--	ns	
Address hold time	tAH6		10	--	ns	
Data setup time	tDS6		80	--	ns	D0 to D7
Data hold time	tDH6		10	--	ns	
Output disable time	tOH6		10	60	ns	
Access time	tACC6	CL= 100pF	--	90	ns	
Enable pulsewidth	Read	tEW	100	--	ns	E
	Write		8	--	ns	

- Notes :
1. tCYC6 is the cycle time of  $\overline{CS}$ . E=H. not the cycle time of E.
  2. Increase parameter values by 200% when Vss= -3.0V.
  3. all inputs must have a rise and fall time of less than 15 ns.



## Table of Commands

Command	Code											Function
	A0	$\overline{RD}$	$\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	
Display On/Off	0	1	0	1	0	1	0	1	1	1	0/1	Turns display on or off. 1 : ON, 0 : OFF
Display start line	0	1	0	1	1	0	Display start address (0 to 31)				Specifies RAM line corresponding to top line of display.	
Set page address	0	1	0	1	0	1	1	1	0	Page (0 to 3)		Sets display RAM page in page address register.
Set column (segment) address	0	1	0	0	Column address (0 to 79)						Sets display RAM column address in column address register.	
Read status	0	0	1	Busy	ADC	ON/OFF	Reset	0	0	0	0	Reads the following status : BUSY 1 : Busy 0 : Ready ADC 1 : CW output 0 : CCW output ON/OFF 1 : Display off 0 : Display on RESET 1 : Being reset 0 : Normal
Write display data	1	1	0	Write data							Writes data from data bus into display RAM.	
Read display data	1	0	1	Read data							Reads data from display RAM onto data bus.	
Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	0 : CW output, 1 : CCW output
Static drive ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	Selects static driving operation. 1 : Static drive, 0 : Normal driving
Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Selects LCD duty cycle 1 : 1/32, 0 : 1/16
Read-Modify-Write	0	1	0	1	1	1	0	0	0	0	0	Read-modify-write ON
End	0	1	0	1	1	1	0	1	1	1	0	Read-modify-write OFF
Reset	0	1	0	1	1	1	0	0	0	1	0	Software reset

## Example Initialization Program:

```
/******  
void Comleft(char i)  
{  
  P1 = i;  
  R_W = 0;  
  D_I = 0;  
  E1 = 1;  
  delay(2);  
  E1 = 0;  
}  
  
void Comright(char i)  
{  
  P1 = i;  
  R_W = 0;  
  D_I = 0;  
  E2 = 1;  
  delay(2);  
  E2 = 0;  
}  
  
void Writeleft(char i)  
{  
  P1 = i;  
  R_W = 0;  
  D_I = 1;  
  E1 = 1;  
  delay(2);  
  E1 = 0;  
}  
  
void Writerright(char i)  
{  
  P1 = i;  
  R_W = 0;  
  D_I = 1;  
  E2 = 1;  
  delay(2);  
  E2 = 0;  
}  
/******  
void bothSides(char i)  
{  
  Comleft(i);  
  Comright(i);  
}  
/******  
  
void init()  
{  
  P1 = 0;  
  P3 = 0;  
  RST = 0; //      Reset RST  
  delay(1);  
  RST = 1; //      Reset RST= M68 Interface  
  delay(10);  
  D_I = 0;  
  E1 = 1;  
  E2 = 1;  
  R_W = 1;  
  
  bothSides(0xE2);  
  delay(10);  
  bothSides(0xA4);  
  bothSides(0xA9);  
  bothSides(0xA0);  
  bothSides(0xEE);  
  bothSides(0xC0);  
  bothSides(0xAF);  
}  
/******
```

## 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)