

# NHD-12232WG-EYYH-V#A

## Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
12232-	122 x 32 pixels
WG-	Display Type: Graphic
E-	Model
Y-	Yellow/Green LED Backlight
Y-	STN- Yellow/Green
H-	Transflective, Wide Temperature
V#A-	Built-in DC-DC voltage converter

**RoHS Compliant**

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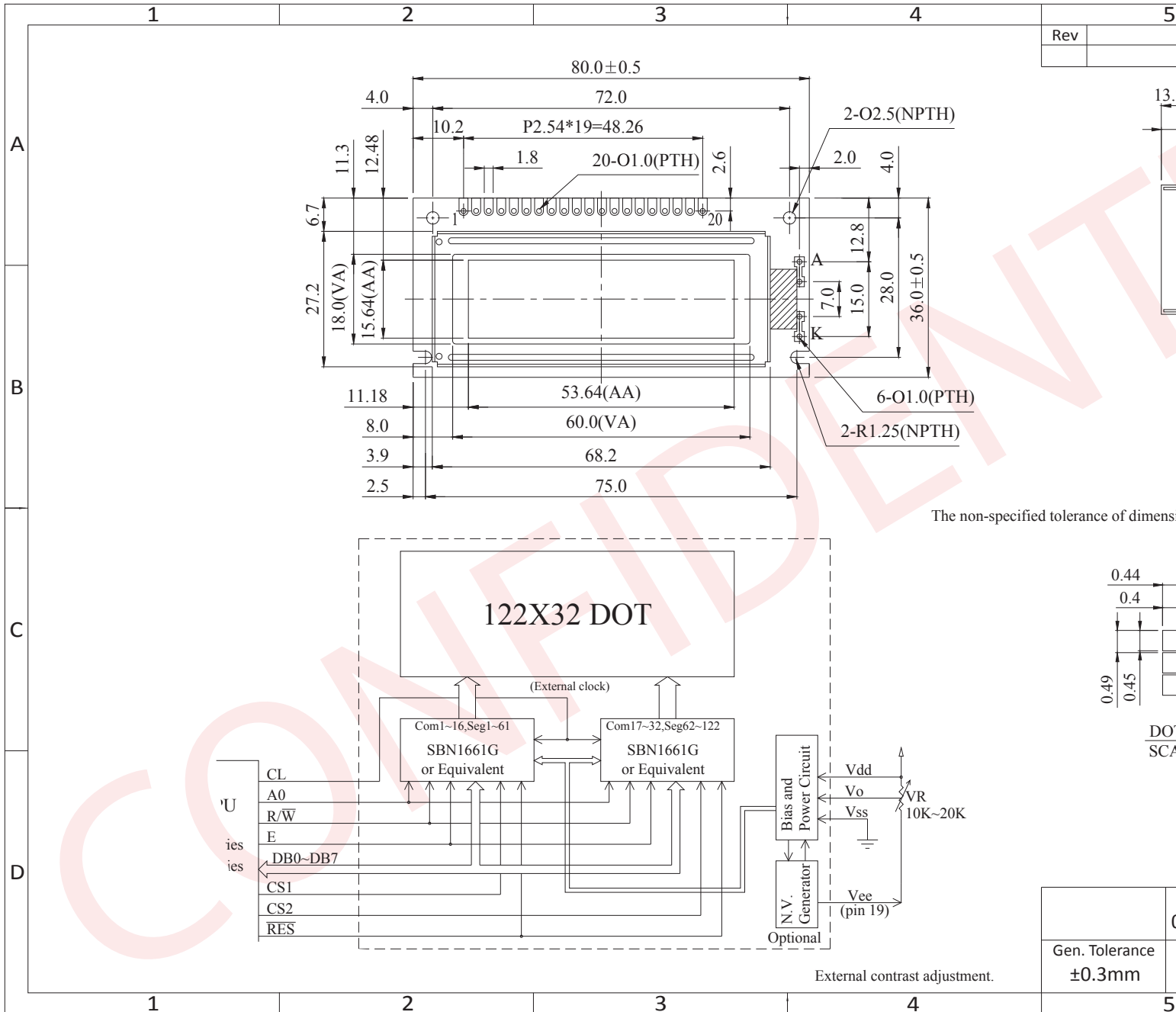
## Document Revision History

Revision	Date	Description	Changed by
0	9/14/2006	Initial Release	-
1	3/16/2010	User guide reformat	BE
2	4/15/2010	Pin description update	BE
3	5/6/2010	Electrical, block diagram, initialization updated	BE
4	3/16/2015	Pin description & Example code updated	RM
5	1/6/16	Updated Wiring Diagram, Datasheet Reformat	SB
6	2/8/16	Updated Controller Information	SB
7	5/3/16	Electrical Characteristics, Response Time, Quality information updated	SB

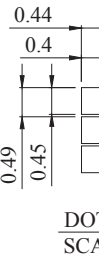
## Functions and Features

- 122 x 32 pixels
- Built-in SBN1661G\_M02 Controller
- +3.0V power supply
- 1/32 duty cycle
- RoHS Compliant

# Mechanical Drawing



The non-specified tolerance of dimensions is  $\pm 0.3$  mm.



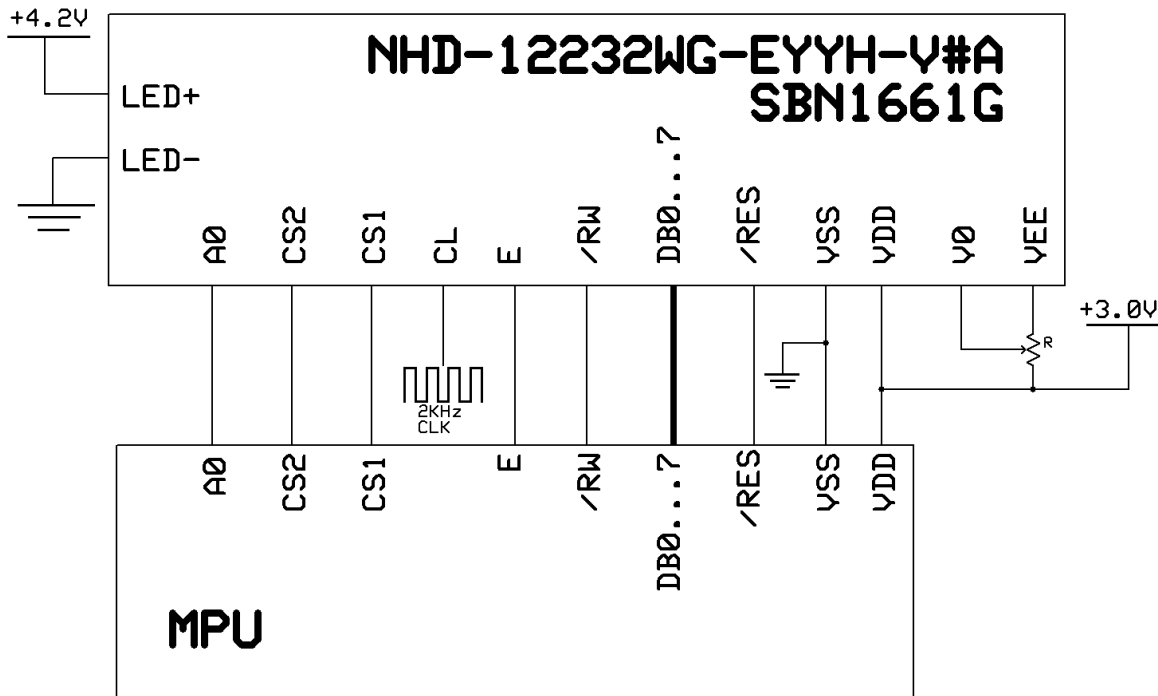
Gen. Tolerance	$\pm 0.3$ mm
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## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	VSS	Power Supply	Ground
2	VDD	Power Supply	Supply voltage for logic (+3.0V)
3	V0	Adj Power Supply	Supply voltage for contrast (approx.- 1.5V)
4	A0	MPU	Register select signal. A0=0: Command, A0=1: Data
5	CS1	MPU	Active LOW Chip Select Signal for LEFT half of LCD
6	CS2	MPU	Active LOW Chip Select Signal for RIGHT half of LCD
7	CL	-	Clock Signal; Requires 2KHz external clock
8	E /RD	MPU	6800 Mode: Active HIGH Enable Signal 8080 Mode: Active LOW Read Signal
9	R/W /WR	MPU	6800 Mode: Read/Write select signal. R/W=1: Read R/W: =0: Write 8080 Mode: Active LOW Write Signal
10-17	DB0-DB7	MPU	This is an 8-bit Bi-directional data bus
18	RESET/IF	MPU	Hardware RESET (edge-sensitive) and interface type selection: Positive Reset: 8080 mode Negative Reset: 6800 mode
19	VEE	Power Supply	Negative voltage output (-3.0V)
20	NC	-	No Connect
A	LED+	Power Supply	Backlight Anode (+4.2V)
K	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	Top	Absolute Max	-20	-	+70	°C
Storage Temperature Range	Tst	Absolute Max	-30	-	+80	°C
Supply Voltage	VDD	-	2.7	3.0	3.3	V
Supply Current	IDD	Ta=25°C, VDD=3.0V	-	5.0	-	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	4.2	-	4.5	V
"H" Level input	VIH	-	2.0	-	VDD	V
"L" Level input	VIL	-	0	-	0.7	V
"H" Level output	VOH	-	VDD -0.3	-	VDD	V
"L" Level output	VOL	-	0	-	0.3	V
Backlight Supply Voltage	VLED	-	4.0	4.2	4.5	V
Backlight Supply Current	ILED	VLED=4.2V	96	120	144	mA
Backlight Lifetime	-	ILED ≤ 120mA	-	100,000	-	Hrs.

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	Cr ≥ 2	-	20	-	°
	Bottom		-	40	-	°
	Left		-	30	-	°
	Right		-	30	-	°
Contrast Ratio	Cr	-	-	3	-	-
Response Time	Rise	Tr	-	150	200	ms
	Fall	Tf	-	150	200	ms

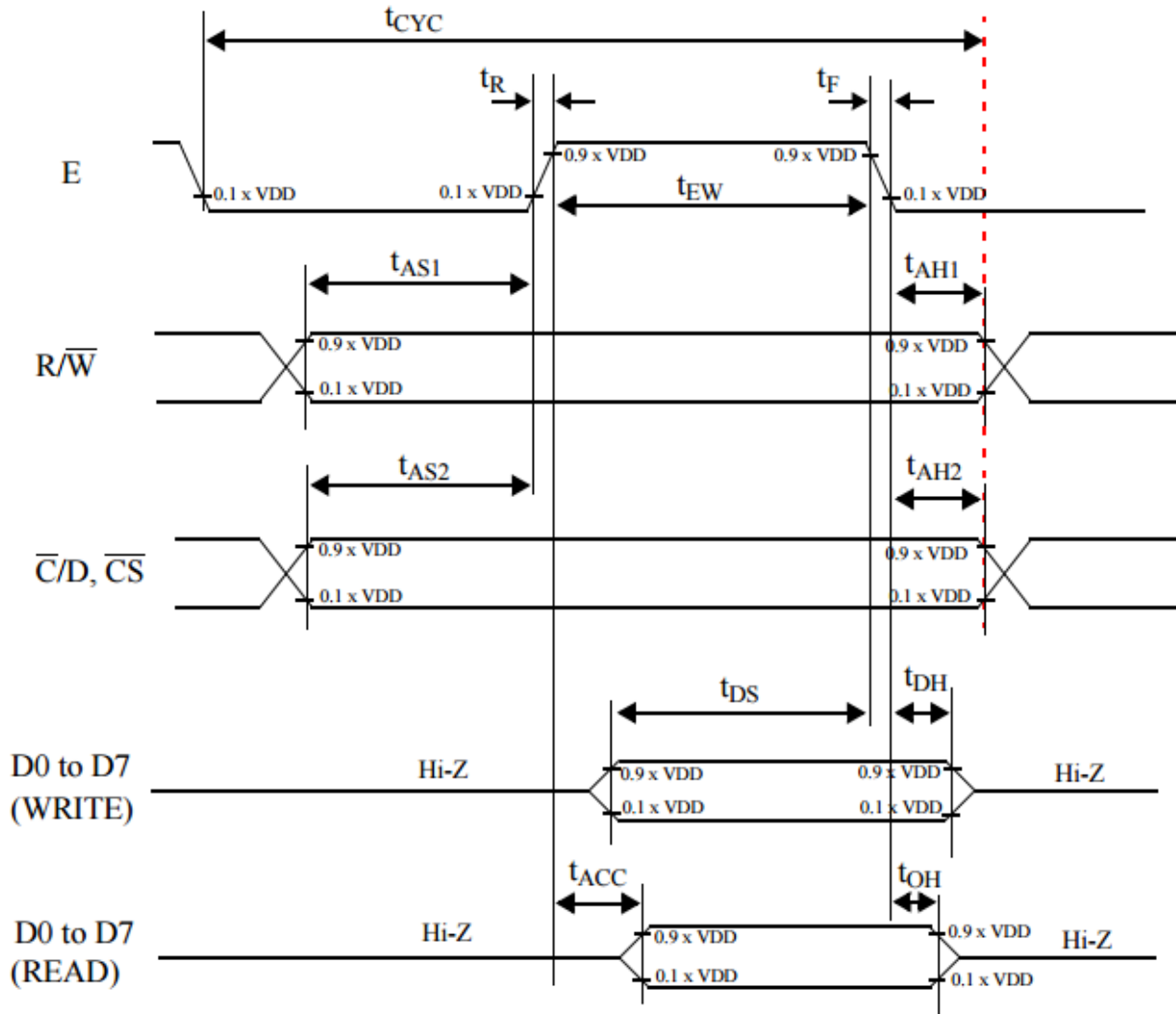
## Controller Information

Built-in SBN1661G\_M02 controller.

Please download specification at [http://www.newhavendisplay.com/app\\_notes/SBN1661G.pdf](http://www.newhavendisplay.com/app_notes/SBN1661G.pdf)

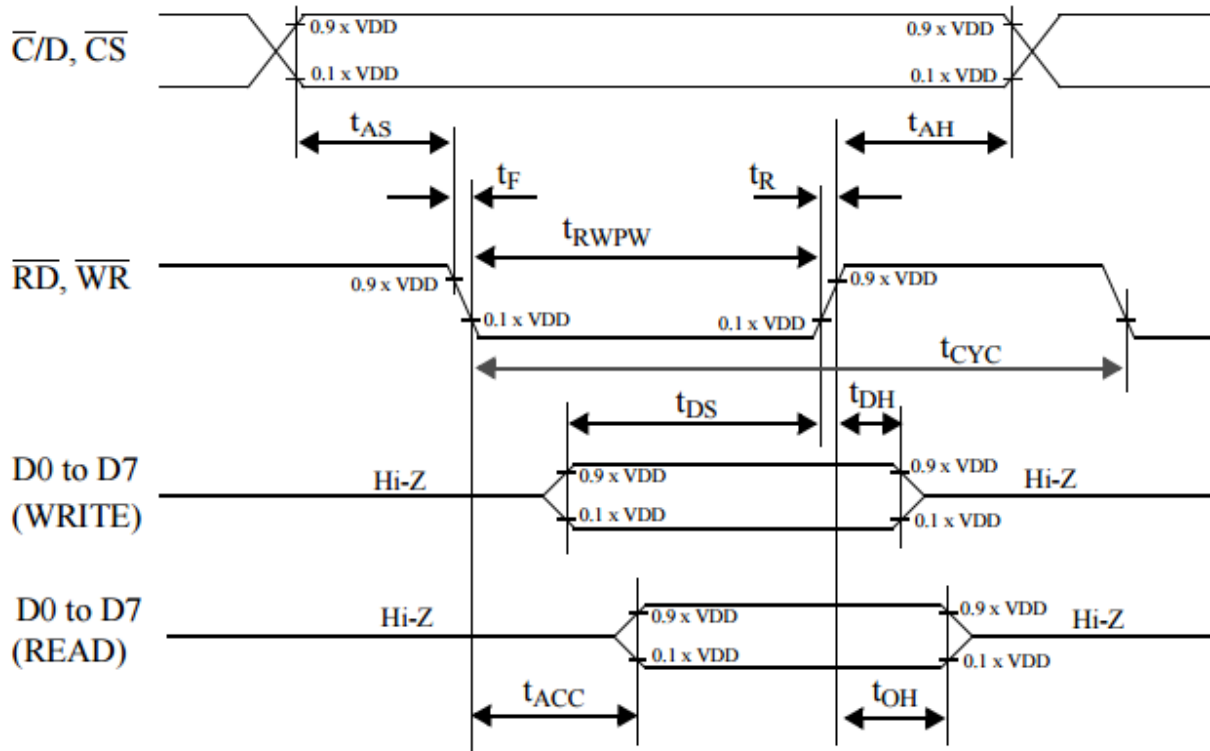
# Timing Characteristics

## AC timing for interface with a 68-type microcontroller



symbol	parameter	min.	max.	test conditons	unit
$t_{AS1}$	Address set-up time with respect to $R/\bar{W}$	20			ns
$t_{AS2}$	Address set-up time with respect to $\bar{C}/D, \bar{CS}$	20			ns
$t_{AH1}$	Address hold time with respect to $R/\bar{W}$	10			ns
$t_{AH2}$	Address hold time respect with to $\bar{C}/D, \bar{CS}$	10			ns
$t_F, t_R$	Enable (E) pulse falling/rising time		15		ns
$t_{CYC}$	System cycle time	1000		Note 1	ns
$t_{EWR}$	Enable pulse width for READ	100			ns
$t_{EWW}$	Enable pulse width for WRITE	80			ns
$t_{DS}$	Data setup time	80			ns
$t_{DH}$	Data hold time	10			ns
$t_{ACC}$	Data access time		90	CL= 100 pF.	ns
$t_{OH}$	Data output hold time	10	60	Refer to Fig. 23.	ns

## AC timing for interface with an 80-type microcontroller



symbol	parameter	min.	max.	test conditons	unit
$t_{AS}$	Address set-up time	20			ns
$t_{AH}$	Address hold time	10			ns
$t_F, t_R$	Read/Write pulse falling/rising time		15		ns
$t_{RWPW}$	Read/Write pulse width	200			ns
$t_{CYC}$	System cycle time	1000			ns
$t_{DS}$	Data setup time	80			ns
$t_{DH}$	Data hold time	10			ns
$t_{ACC}$	Data READ access time		90	CL= 100 pF.	ns
$t_{OH}$	Data READ output hold time	10	60	Refer to Fig. 23.	ns

## Table of Commands

COMMAND	COMMAND CODE								FUNCTION
	D7	D6	D5	D4	D3	D2	D1	D0	
Write Display Data	Data to be written into the Display Data Memory.								Write a byte of data to the Display Data Memory.
Read Display Data	Data read from the Display Data Memory.								Read a byte of data from the Display Data Memory.
Read-Modify-Write	1	1	1	0	0	0	0	0	Start Read-Modify-Write operation.
END	1	1	1	0	1	1	1	0	Stop Read-Modify-Write operation.
Software Reset	1	1	1	0	0	0	1	0	Software Reset.

## Example Initialization Program:

```
/******  
void Comleft(char i)  
{  
  CS1 = 0;  
  P1 = i;  
  R_W = 0;  
  D_I = 0;  
  E1 = 1;  
  delay(2);  
  E1 = 0;  
  CS1 = 1;  
}
```

```
void Comright(char i)  
{  
  CS2 = 0;  
  P1 = i;  
  R_W = 0;  
  D_I = 0;  
  E2 = 1;  
  delay(2);  
  E2 = 0;  
  CS2 = 1;  
}
```

```
void Writeleft(char i)  
{  
  CS1 = 0;  
  P1 = i;  
  R_W = 0;  
  D_I = 1;  
  E1 = 1;  
  delay(2);  
  E1 = 0;  
  CS1 = 1;  
}
```

```
void Writeright(char i)  
{  
  CS2 = 0;  
  P1 = i;  
  R_W = 0;  
  D_I = 1;  
  E2 = 1;  
  delay(2);  
  E2 = 0;  
  CS2 = 1;  
}
```



```

/*****/
void bothSides(char i)
{
  Comleft(i);
  Comright(i);
}
/*****/

void init()
{
  P1 = 0;
  P3 = 0;
  CS1 = 0;
  CS2 = 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, 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.	VS=600V, RS=330Ω, CS=150pF 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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