

# NHD-C24064WO-ATFH-3V3

## COG (Chip-On-Glass) Liquid Crystal Display Module

NHD-	Newhaven Display
C24064-	240 x 64 pixels
WO-	Model
A-	Transflective
T-	White LED backlight
F-	FSTN (+)
H-	6:00 view, Wide Temp (-20°C ~ +70°C)
3V3-	3.0Vdd, 3.5 Volt backlight

**RoHS Compliant**

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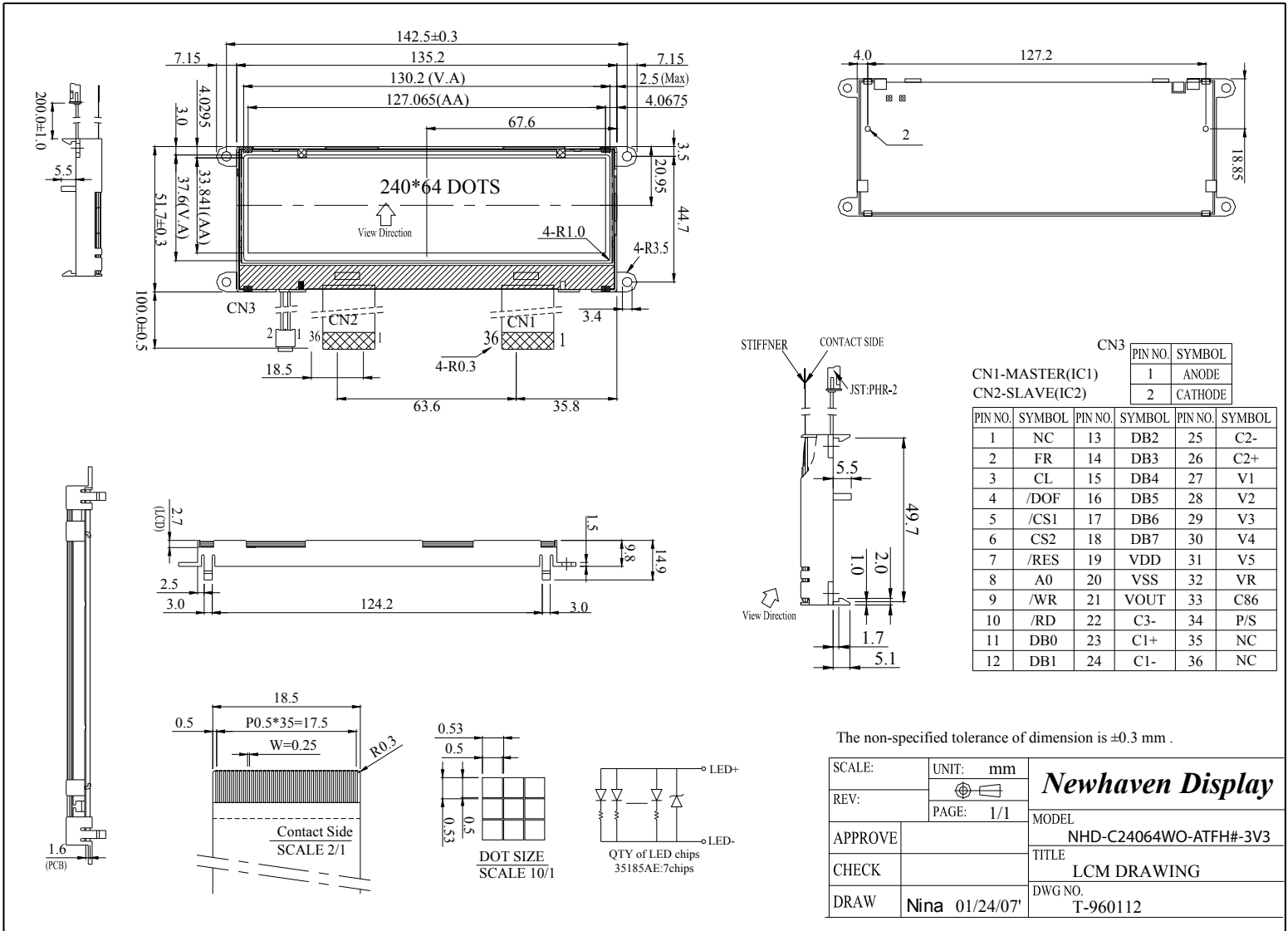
## Document Revision History

Revision	Date	Description	Changed by
0	5/10/2007	Initial Release	-
1	9/23/2009	User guide reformat	BE
2	10/08/2009	Updated Backlight Information	MC
3	11/20/2009	Updated backlight supply current typ.	MC

## Functions and Features

- 240 x 64 pixels
- Built-in DUAL ST7565S controllers
- +3.0V power supply
- Parallel/Serial Interface
- RoHS Compliant

# Mechanical Drawing

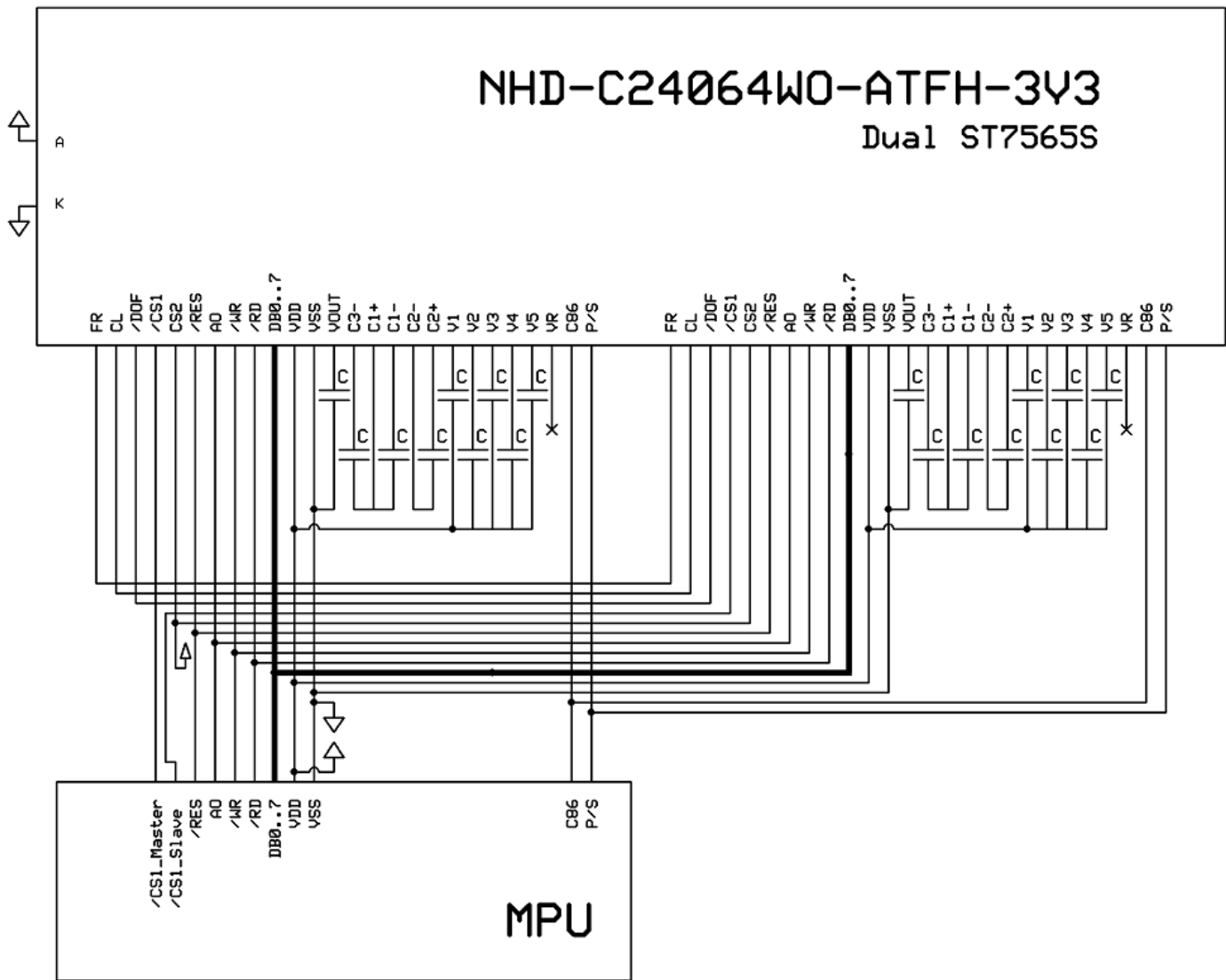


## Pin Description and Wiring Diagram

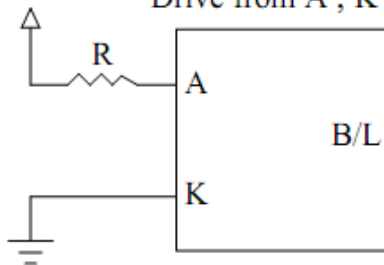
Pin No.	Symbol	External Connection	Function Description
1	NC	-	No Connect
2	FR	-	Alternating current signal (tie both FR pins together)
3	CL	-	Clock input terminal (tie both CL pins together)
4	/DOF	-	Blanking control output (tie both /DOF pins together)
5	/CS1	MPU	Active LOW Chip Select Signal
6	CS2	MPU	Active HIGH Chip Select Signal (can tie HIGH)
7	/RES	MPU	Active low Reset signal
8	A0	MPU	Register Select. 0: instruction; 1: data
9	/WR	MPU	Active low Write signal
10	/RD	MPU	Active low Read signal
11	DB0	MPU	Parallel Interface DB0-DB7: Bi-directional 8-bit data bus  Serial Interface: DB0-DB5: No connect in serial mode  DB6= Serial clock (CLK) DB7= Serial data input (SDA)
12	DB1		
13	DB2		
14	DB3		
15	DB4		
16	DB5		
17	DB6		
18	DB7		
19	VDD	Power Supply	Supply Voltage for Logic (3.0V)
20	Vss	Power Supply	Ground
21	Vout	Power Supply	1.0uF Cap to GND
22	C3-	Power Supply	1.0uF-2.2uF cap to C1+ (Pin-23)
23	C1+	Power Supply	1.0uF-2.2uF cap to C3- (Pin-22) and C1- (Pin-24)
24	C1-	Power Supply	1.0uF-2.2uF cap to C1+ (Pin-23)
25	C2-	Power Supply	1.0uF-2.2uF cap to C2+ (Pin-26)
26	C2+	Power Supply	1.0uF-2.2uF cap to C2-(Pin-25)
27	V1	Power Supply	1.0uF-2.2uF cap to VDD
28	V2	Power Supply	1.0uF-2.2uF cap to VDD
29	V3	Power Supply	1.0uF-2.2uF cap to VDD
30	V4	Power Supply	1.0uF-2.2uF cap to VDD
31	V5	Power Supply	1.0uF-2.2uF cap to VDD
32	VR	-	No connection
33	C86	MPU	Select MPU interface pin. C86 = H: 6800; C86 = L: 8080
34	P/S	MPU	Parallel/Serial select. PS = H: Parallel; PS = L: Serial
35	NC	-	No connection
36	NC	-	No connection

**Recommended LCD connectors:** 0.5mm pitch pins. Molex p/n: 54132-3697

**Backlight connector:** CJT p/n: A2001H-2P      **Mates with:** CJT p/n: A2001WV-2P or A2001WR-S-2P



LED B\L Drive Method  
Drive from A, K



SEG Output ADC	SEG0	SEG 131
(D0) "0"	0 (H) → Column Address	83 (H)
(D0) "1"	83 (H) ← Column Address	0 (H)

## 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=3.3V	281	337	338	µA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	9.3	10	10.7	V
"H" Level input	Vih		0.8VDD	-	VDD	V
"L" Level input	Vil		Vss	-	0.2 VDD	V
"H" Level output	Voh		0.8VDD	-	VDD	V
"L" Level output	Vol		Vss	-	0.2VDD	V
Backlight Supply Voltage	VLED		3.4	3.5	3.6	V
Backlight Supply current	ILED	VLED=3.5V	80	100	150	mA

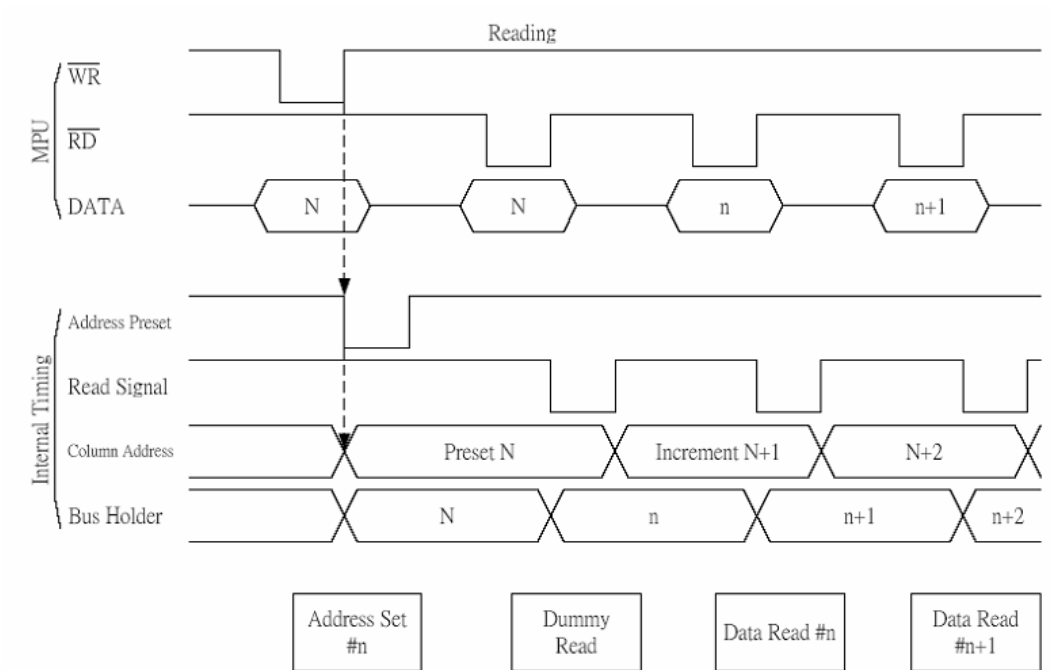
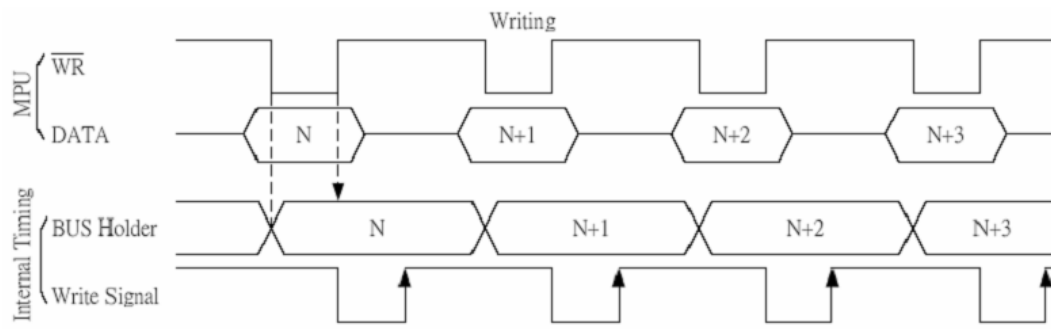
## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical		Cr≥2	-30	-	+60	°
Viewing Angle - Horizontal	Φ		-45	-	+45	°
Contrast Ratio	CR		-	5	-	-
Response Time (rise)	Tr	-	-	200	300	ms
Response Time (fall)	Tf	-	-	200	300	ms

## Controller Information

Built-in ST7565. Download specification at [http://www.newhavendisplay.com/app\\_notes/ST7565.pdf](http://www.newhavendisplay.com/app_notes/ST7565.pdf)

# Timing Characteristics



## Table of Commands

**Table 16: Table of ST7565S Commands**

(Note) \*: disabled data

Command	Command Code										Function	
	A0	$\overline{RD}$	$\overline{WR}$	D7	D6	D5	D4	D3	D2	D1		D0
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address					Sets the display RAM display start line address	
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address.
(5) Status read	0	0	1	Status				0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data							Writes to the display RAM	
(7) Display data read	1	0	1	Read data							Reads from the display RAM	
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	Sets the LCD display normal/reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565S)
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode		Select internal power supply operating mode	
(17) Vs voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio		Select internal resistor ratio(Rb/Ra) mode	
(18) Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set the Vs output voltage electronic volume register
Electronic volume register set				0	0	Electronic volume value						
(19) Static indicator ON/OFF	0	1	0	1	0	1	0	1	1	0	0	0: OFF, 1: ON Set the flashing mode
Static indicator register set				0	0	0	0	0	0	0	0	
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
(21) Power saver												Display OFF and display all points ON compound command
(22) NOP	0	1	0	1	1	1	0	0	0	0	1	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command



## Example Initialization Program

```
/******NHD-C24064WO*****/
void init()
{
    command_master(0xA2);           //1/9 bias
    command_master(0xA0);           //ADC segment driver direction (A0=Normal)
    command_master(0xC8);           //Com output reverse
    command_master(0xA4);           //Display all points normal
    command_master(0x40);           //Display Start line set
    command_master(0x25);           //Internal resistor ratio
    command_master(0x81);           //Electronic volume mode set
    command_master(0x10);           //Electronic Volume
    command_master(0x2F);           //Power controller set
    command_master(0xAF);           //Display on

    command_slave(0xA2);            //1/9 bias
    command_slave(0xA0);            //ADC segment driver direction (A0=Normal)
    command_slave(0xC8);            //Com output reverse
    command_slave(0xA4);            //Display all points normal
    command_slave(0x40);            //Display Start line set
    command_slave(0x25);            //Internal resistor ratio
    command_slave(0x81);            //Electronic volume mode set
    command_slave(0x10);            //Electronic Volume
    command_slave(0x2F);            //Power controller set
    command_slave(0xAF);            //Display on
}
/******/
void command_master(unsigned int c)
{
    CS_Master = reset;
    AO = reset;                      //Command   LOW
    WRT = reset;
    P1 = c;
    delay(1);
    WRT = set;
    CS_Master = set;
}
/******/
void data_master(unsigned int d)
{
    CS_Master = reset;
    AO = set;                          //Data     High
    delay(1);
    WRT = reset;
    P1 = d;
    delay(1);
    WRT = set;
    CS_Master = set;
}
/******/
void commmand_slave(unsigned int c)
{
    CS_Slave = reset;
    AO = reset;                      //Command   LOW
    WRT = reset;
    P1 = c;
    delay(1);
    WRT = set;
    CS_Slave = set;
}
/******/
```

```

void data_slave(unsigned int d)
{
    CS_Slave = reset;
    AO = set; //Data High
    delay(1);
    WRT = reset;
    P1 = d;
    delay(1);
    WRT = set;
    CS_Slave = set;
}
/*****/

```

## 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.	+70°C 48hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°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 , 48hrs	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](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)