

NHD-12864AZ-FSW-FBW

Graphic Liquid Crystal Display Module

NHD- Newhaven Display
12864- 128 x 64 Pixels
AZ- Model
F- Transflective
SW- Side White LED backlight
F- FSTN Positive
B- 6:00 Optimal View
W- Wide Temperature
RoHS Compliant

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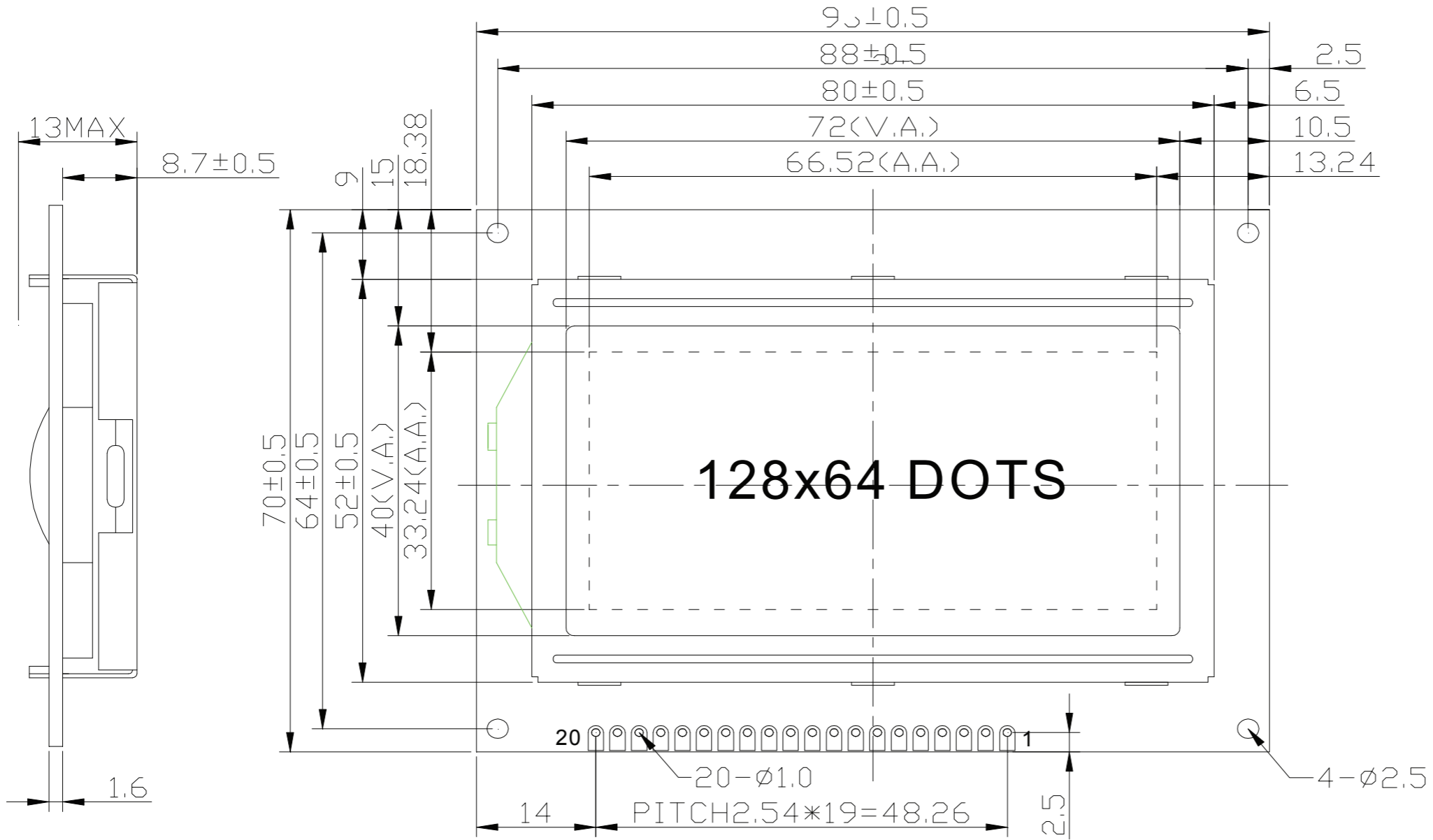
Document Revision History

Revision	Date	Description	Changed by
0	11/15/08	Initial Release	-
1	4/2/10	User guide reformat	BE
2	5/6/10	Block diagram/initialization update	BE
3	5/20/10	Updated Pin Out and Electrical Characteristics	MC
4	12/17/12	Controller information updated	AK
5	1/11/18	Mechanical, Electrical & Optical Characteristics Updated	SB

Functions and Features

- 128x64 pixels
- Built-in NT7108C controller
- +5.0V power supply
- 1/64 duty, 1/9 bias
- RoHS Compliant

SYMBOL	REVISION	DATE

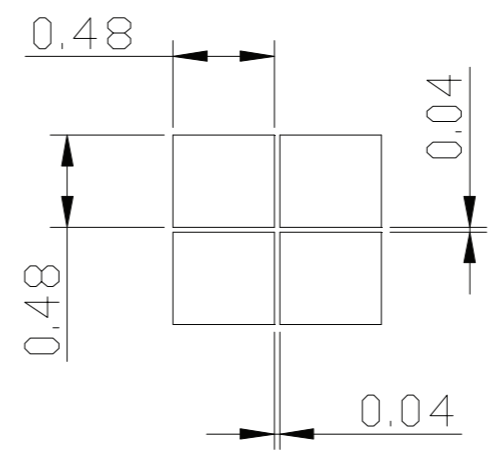


128x64 DOTS

PIN ASSIGNMENT

1	VSS
2	VDD
3	V0
4	RS
5	R/W
6	E
7~14	DB0~DB7
15	CS1
16	CS2
17	RST
18	VEE
19	LED+
20	LED-

- Notes:**
- 1. Driver: 1/64 Duty, 1/9 Bias
 - 2. Display Mode: FSTN Positive / Transflective
 - 3. Optimal View: 6:00
 - 4. Voltage: 5.0V VDD, 9.5V VLCD
 - 5. Backlight: White LED
 - 6. Driver IC: NT7108C



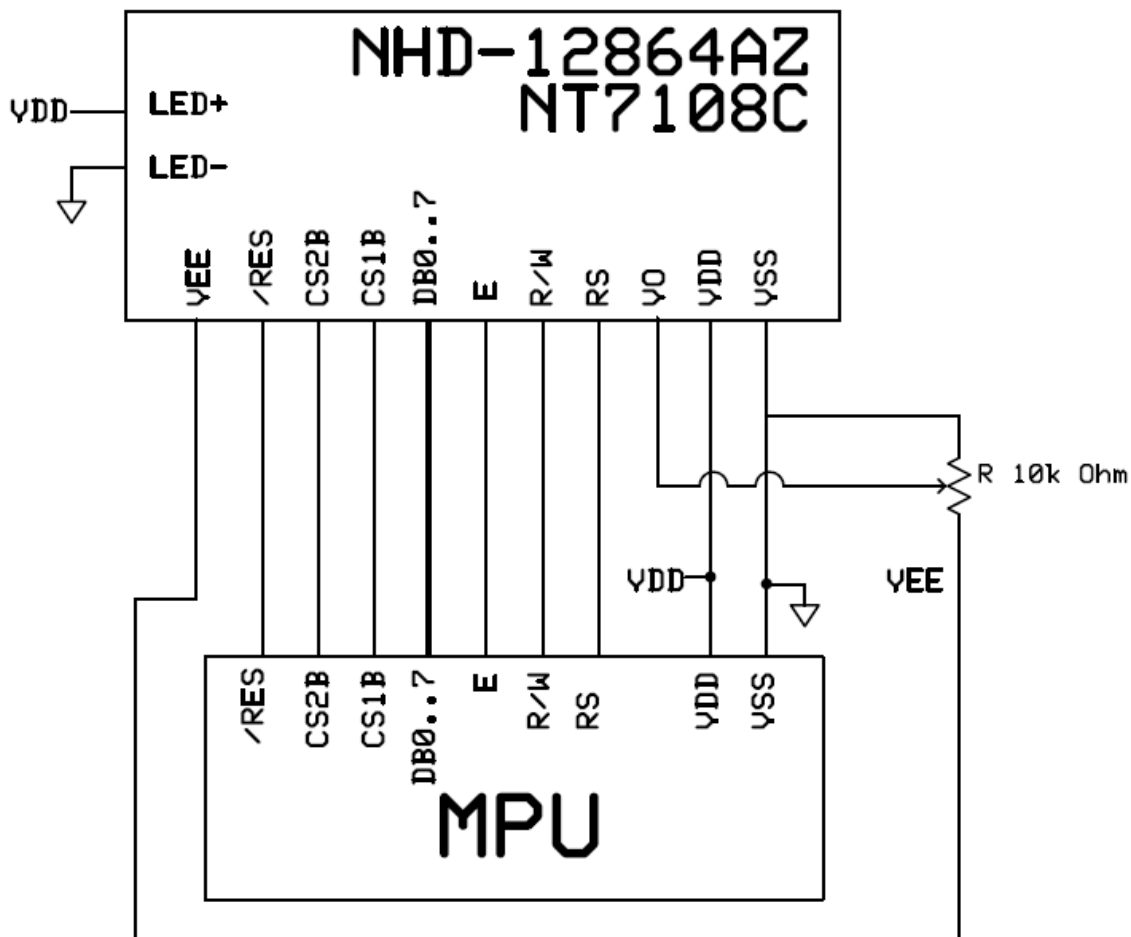
STANDARD TOLERANCES (UNLESS OTHERWISE SPECIFIED) LINEAR: XX. ±0.3 mm XX.X ±0.3 mm XX.XX ±0.3 mm			
	DRAWING/PART NUMBER: NHD-12864AZ-FSW-FBW		
UNLESS OTHERWISE SPECIFIED - DIMENSIONS ARE IN MILLIMETERS - THIRD ANGLE PROJECTION	DRAWN BY: S. Baxi	CHECKED BY: S. Baxi	APPROVED BY: S. Baxi
	DRAWN DATE: 01/11/18	CHECKED DATE: 01/11/18	APPROVED DATE: 01/11/18
DO NOT SCALE DRAWING			REVISION: 1.0 SIZE: A3 SCALE: NS
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Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	V _{SS}	Power Supply	Ground
2	V _{DD}	Power Supply	Supply Voltage for Logic (+5.0V)
3	V ₀	Adj. Power Supply	Supply Voltage for contrast (approx. -4.5)
4	RS	MPU	Register Select: 1=Data, 0=Instruction
5	R/W	MPU	Read/Write Select signal, R/W=1: Read R/W: =0: Write
6	E	MPU	Operation Enable signal. Falling edge triggered.
7-14	DB0-DB7	MPU	This is an 8-bit Bi-directional data bus
15	CS1B	MPU	Chip Selection: CS1=H, CS2=L → select IC1 (left side) CS1=L, CS2=H → select IC2 (right side)
16	CS2B	MPU	
17	/RES	MPU	Active LOW Reset signal
18	VEE	Power Supply	Negative Voltage Output (-5.0V)
19	LED+	Power Supply	Backlight Anode (+5.0V via on-board resistor)
20	LED-	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 2.54mm pitch pins

Backlight connector:



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}	-	4.8	5.0	5.2	V
Supply Current	I_{DD}	$V_{DD} = 5.0V$ $T_{OP} = 25^{\circ}C$	1.0	3.0	5.0	mA
Supply for LCD (contrast)	V_{LCD}		9.3	9.5	9.7	V
"H" Level input	V_{IH}	-	$0.7 * V_{DD}$	-	V_{DD}	V
"L" Level input	V_{IL}	-	V_{SS}	-	$0.3 * V_{DD}$	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}	-	4.8	5.0	5.2	V
Backlight Supply Current	I_{LED}	$V_{LED} = 5.0 V$	20	30	40	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	$CR \geq 2$	-	40	-	°
	Bottom		-	60	-	°
	Left		-	60	-	°
	Right		-	60	-	°
Contrast Ratio	CR	-	2	5	-	-
Response Time	Rise	$T_{OP} = 25^{\circ}C$	-	150	250	ms
	Fall		-	200	300	ms

Controller Information

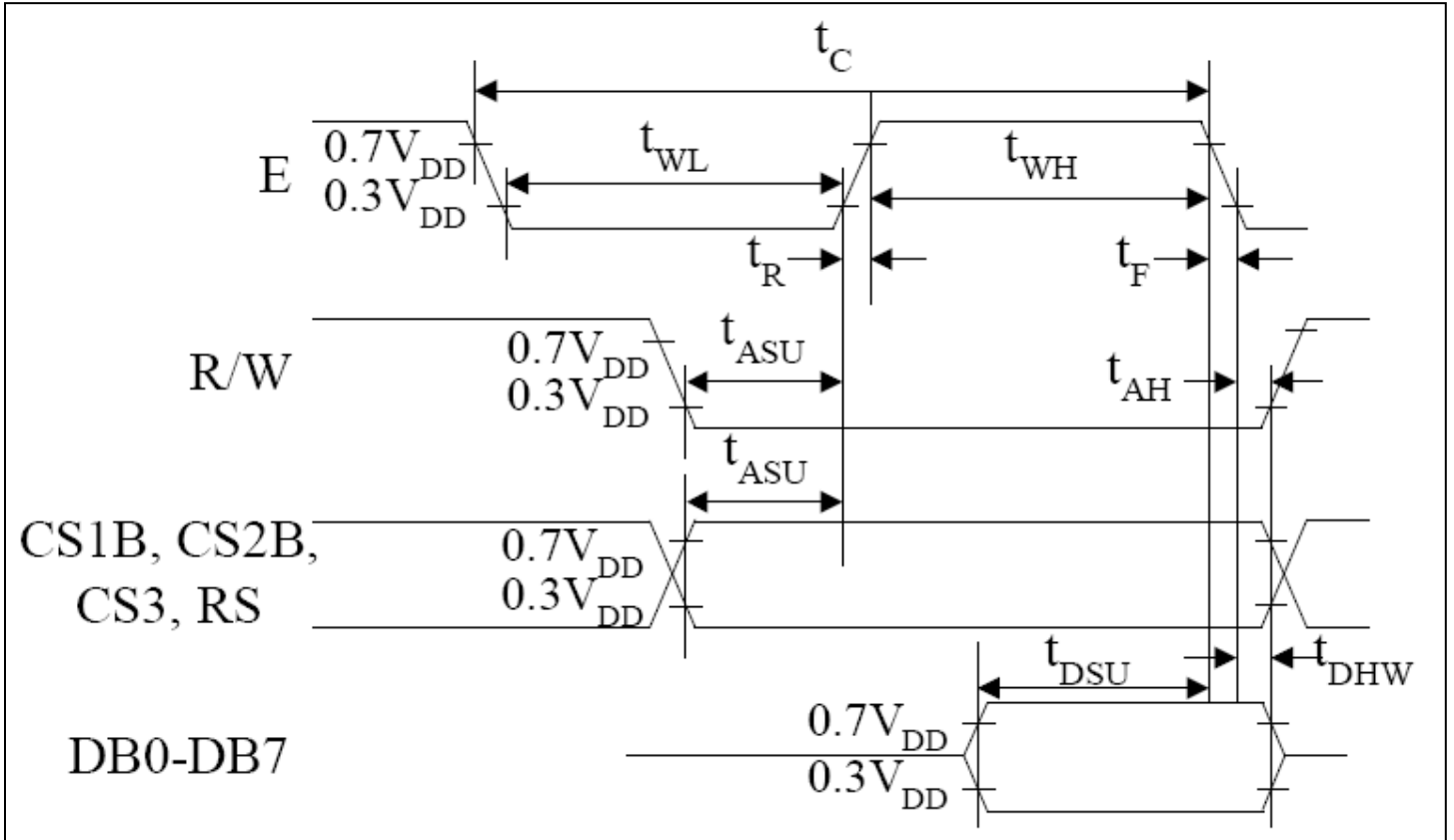
Built-in NT7108C controller.

Please download specification at 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}	200	-	-	
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  
'CS2      16           P3.6  
'CS1      15           P3.1  
'RST      17           P3.2  
'R/W      5            P3.7  
'D/I      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 , 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

Warranty Information and Terms & Conditions

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



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