

NHD-12864WG-BTFH-V#N

Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
12864-	128 x 64 pixels
WG-	Display Type: Graphic
B-	Model
T-	White LED Backlight
F-	FSTN (+)
H-	Transflective, Wide Temperature 6:00 view
V#N -	Built-in Negative Voltage
	RoHS Compliant

Newhaven Display International, Inc.

2661 Galvin Ct.

Elgin IL, 60124

Ph: 847-844-8795

Fax: 847-844-8796

www.newhavendisplay.com

nhtech@newhavendisplay.com

nhsales@newhavendisplay.com

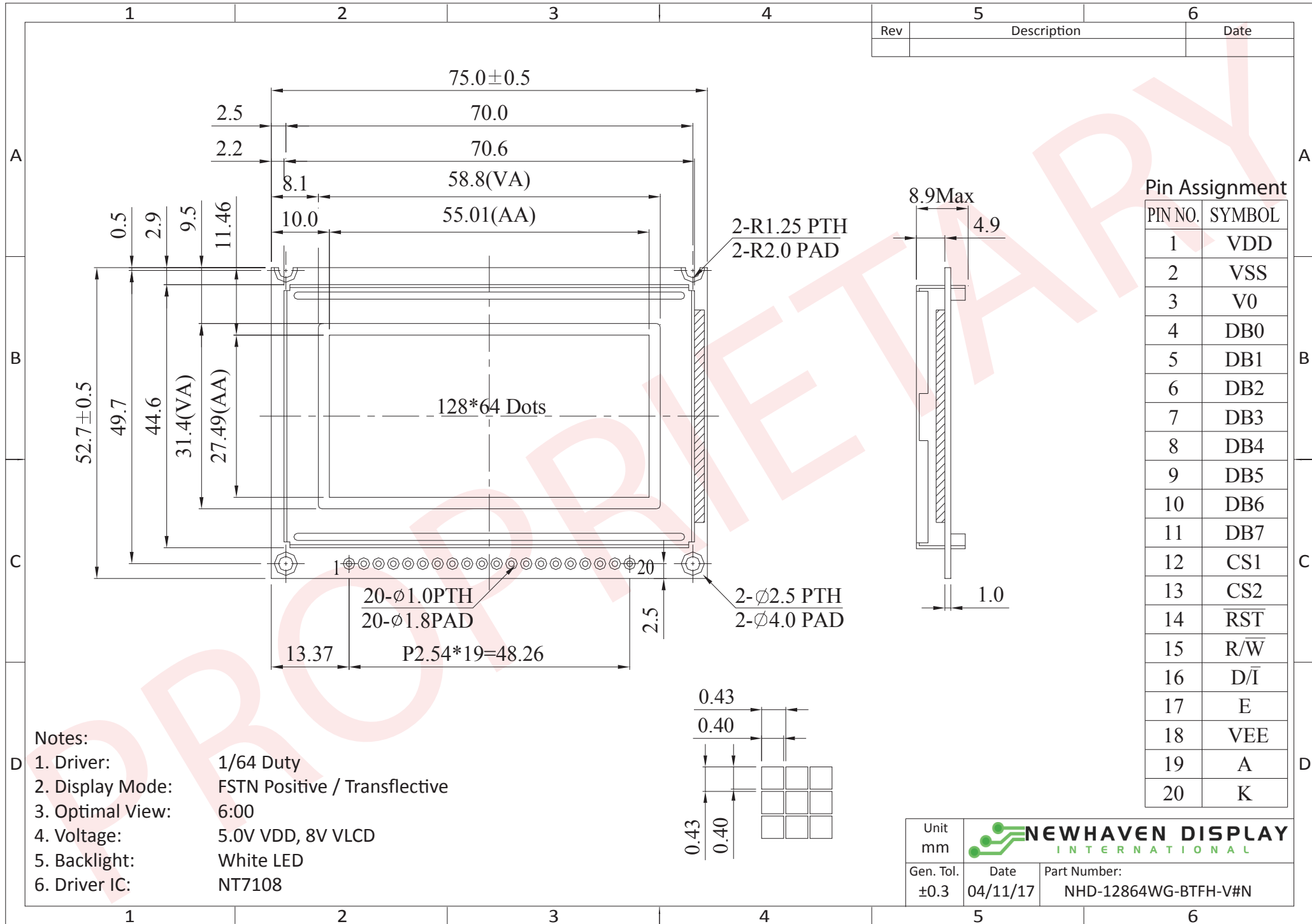
Document Revision History

Revision	Date	Description	Changed by
0	3/7/07	Initial Release	-
1	5/21/08	Backlight info modification	-
2	3/22/10	User guide reformat	BE
3	4/14/10	Block diagram/Initialization updated	BE
4	2/16/11	Mechanical drawing updated	AK
5	12/19/12	Controller information updated	AK
6	3/28/13	Electrical & timing characteristics updated	JN
7	7/22/16	Mechanical Drawing, Electrical & Optical Char. Updated	SB
8	9/7/16	Fixed contrast voltage	SB
9	4/11/17	I _{DD} & I _{LED} Updated	SB
10	5/30/17	Pinout Table & Backlight Characteristics Updated	SB

Functions and Features

- 128 x 64 pixels
- Built-in NT7108C controller
- +5.0V power supply
- 1/64 duty cycle
- RoHS Compliant

Mechanical Drawing



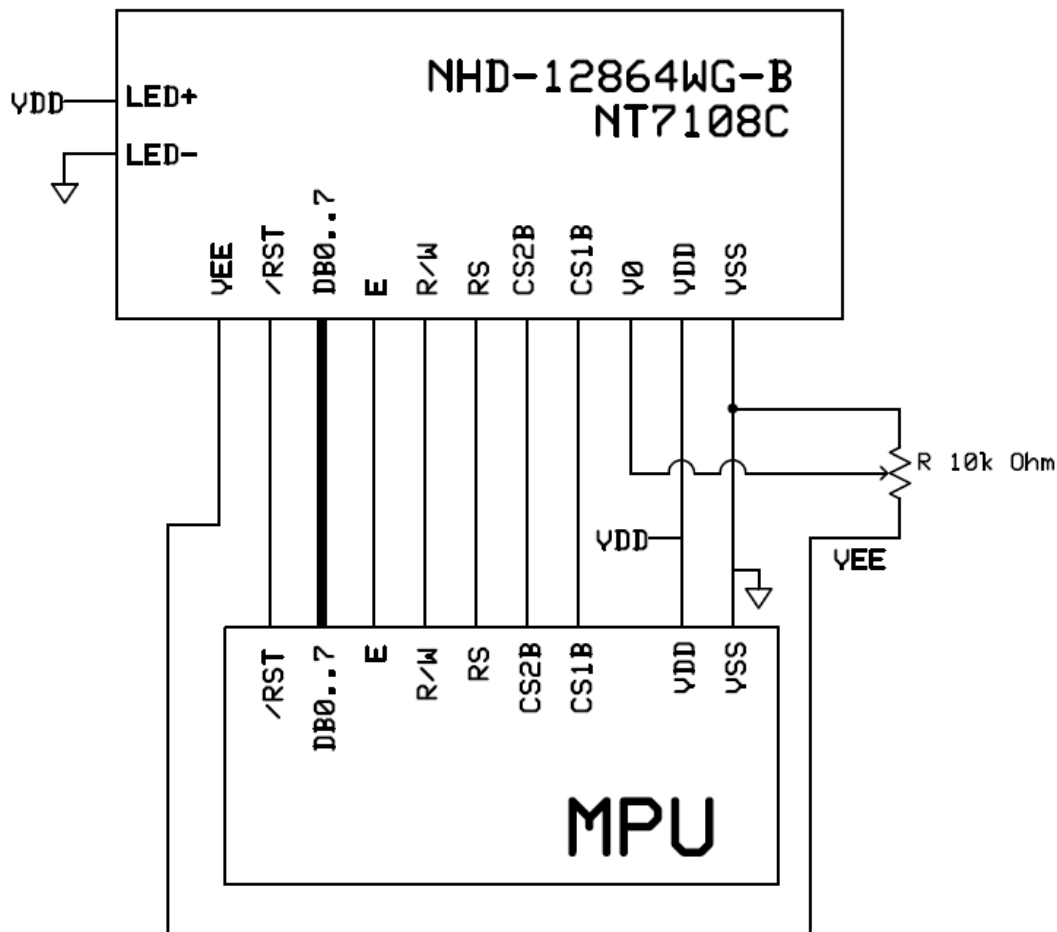
The information contained herein is the exclusive property of Newhaven Display International, Inc. and shall not be copied, reproduced, and/or disclosed in any format without permission.

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	V _{DD}	Power Supply	Supply Voltage for logic (+5.0V)
2	V _{SS}	Power Supply	Ground
3	V ₀	Power Supply	Supply Voltage for contrast (approx.. -3.0V)
4-11	DB0-DB7	MPU	Bi-directional 8-bit data bus
12	CS1B	MPU	Chip Selection: CS1=H, CS2=L : select IC1 (left side) CS1=L, CS2=H : select IC2 (right side)
13	CS2B	MPU	
14	/RST	MPU	Active LOW Reset signal
15	R/W	MPU	Read/Write select signal. R/W=1: Read R/W: =0: Write
16	RS	MPU	Register Select: 1=Data, 0= Instruction
17	E	MPU	Operation Enable signal. Falling edge triggered.
18	V _{EE}	Power Supply	Negative voltage output (- 5V)
19	LED+	Power Supply	Backlight Anode(+3.5V)
20	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	T_{OP}	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T_{ST}	Absolute Max	-30	-	+80	°C
Supply Voltage	V_{DD}	-	4.5	5.0	5.5	V
Supply Current	I_{DD}	$V_{DD} = 5.0V$ $T_{OP} = 25^{\circ}$	1.0	3.0	6.0	mA
Supply for LCD (contrast)	$V_{DD}-V_0$		7.8	8.0	8.2	V
"H" Level input	V_{IH}	-	$0.7 * V_{DD}$	-	V_{DD}	V
"L" Level input	V_{IL}	-	V_{SS}	-	0.8	V
"H" Level output	V_{OH}	-	2.4	-	V_{DD}	V
"L" Level output	V_{OL}	-	V_{SS}	-	0.4	V
Backlight Supply Current	I_{LED}	-	-	50	60	mA
Backlight Supply Voltage	V_{LED}	$I_{LED} = 50mA$	3.3	3.5	3.8	V

*The LED of the backlight is driven by current drain; drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated.

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	$CR \geq 2$	-	30	-	°
	Bottom		-	60	-	°
	Left		-	45	-	°
	Right		-	45	-	°
Contrast Ratio	CR	-	2	5	-	-
Response Time	Rise	$T_{OP} = 25^{\circ}C$	-	200	300	ms
	Fall		-	250	350	ms

Controller Information

Built-in NT7108C controller.

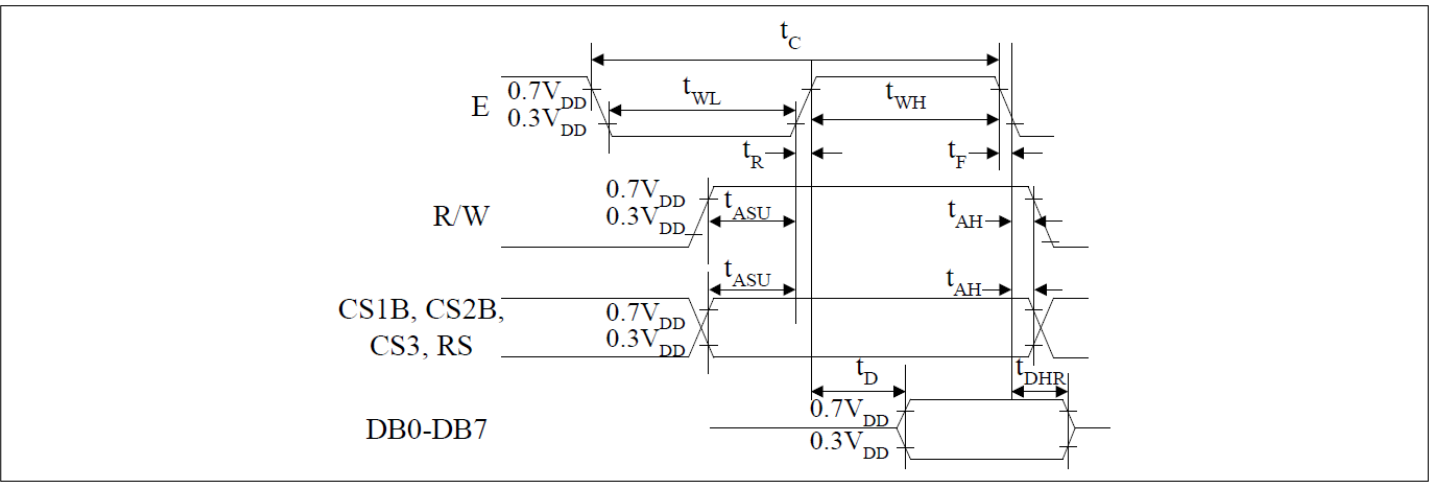
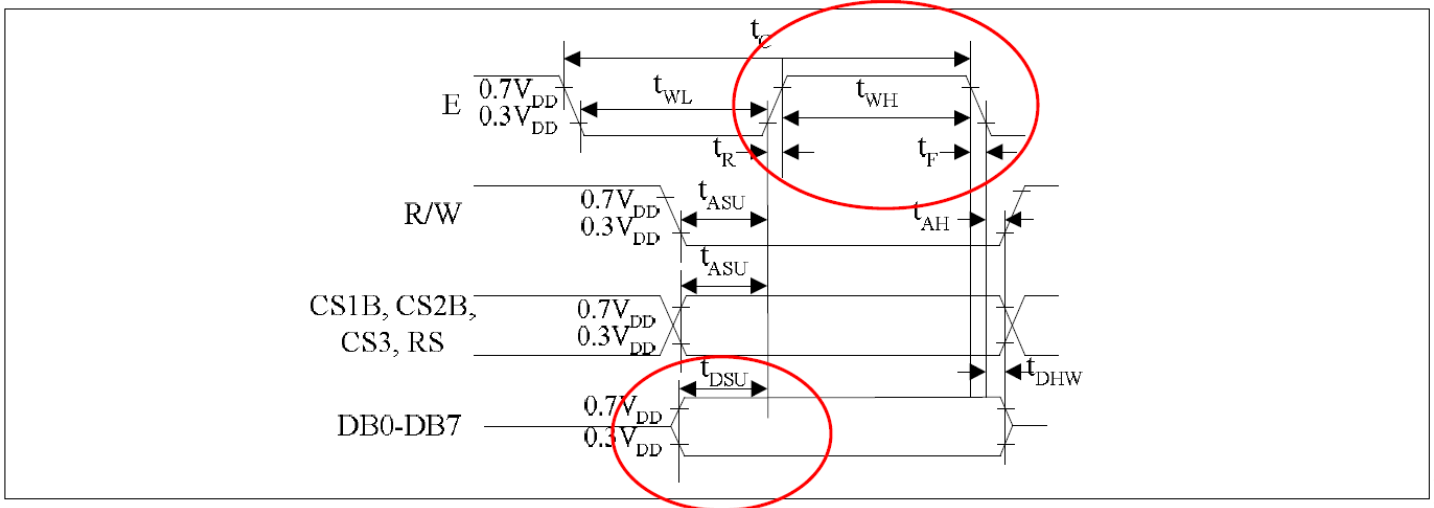
Please download specification at http://www.newhavendisplay.com/app_notes/NT7108.pdf

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}	140	-	-	
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  
'CS2B     16           P3.6  
'CS1B     15           P3.1  
'/RST     17           P3.2  
'R/W      5            P3.7  
'RS       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 , 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

Warranty Information and Terms & Conditions

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