

# 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**

**Newhaven Display International, Inc.**

2661 Galvin Dr.

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)

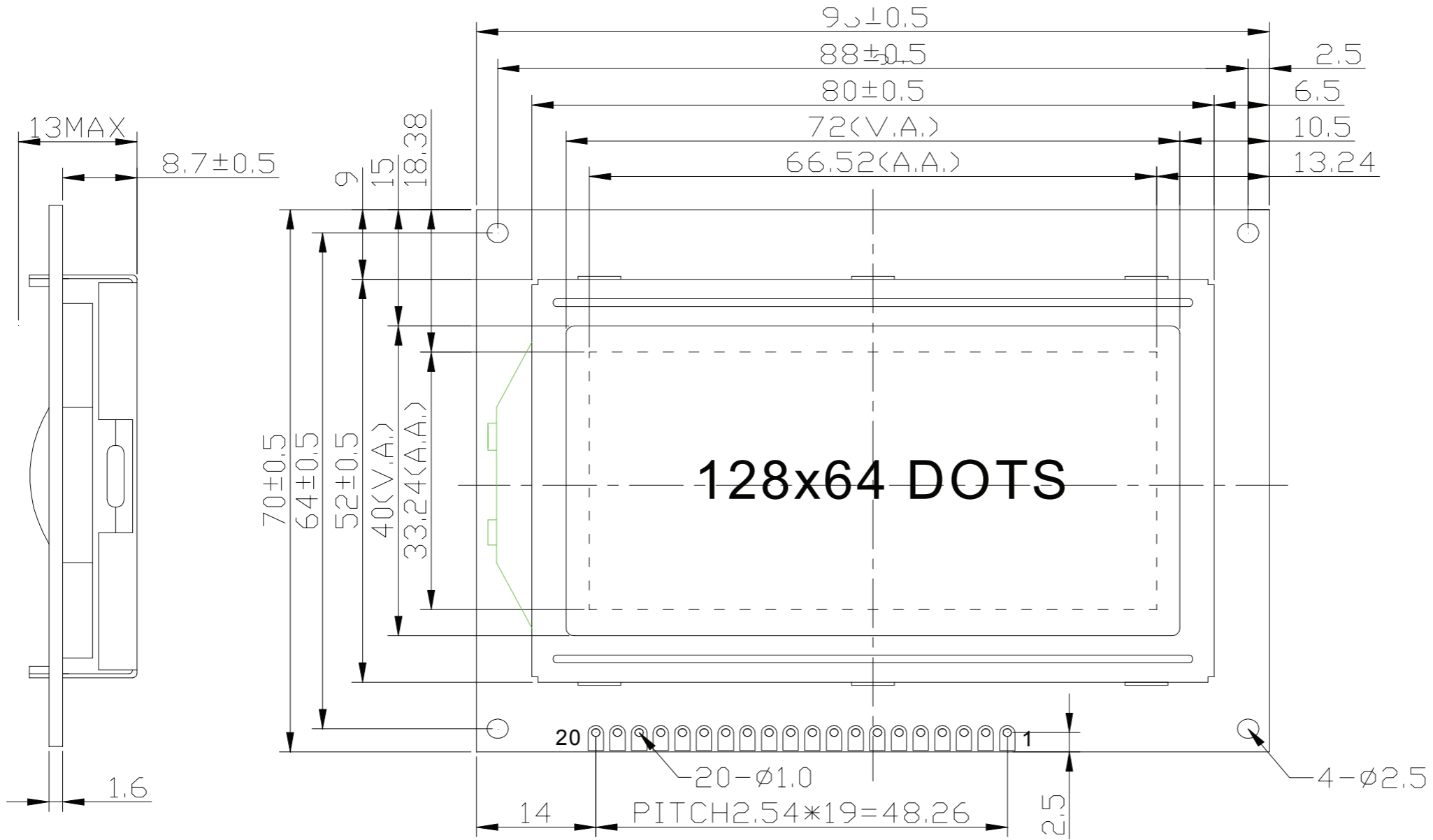
## Document Revision History

Revision	Date	Description	Changed by
0	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

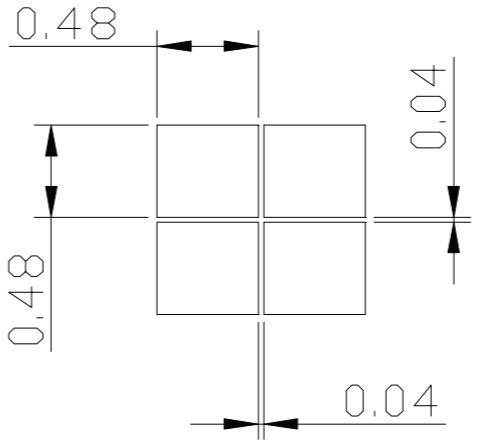


**128x64 DOTS**

**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

UNLESS OTHERWISE SPECIFIED  
 - DIMENSIONS ARE IN MILLIMETERS  
 - THIRD ANGLE PROJECTION

**NEWHAVEN DISPLAY INTERNATIONAL**

DRAWING/PART NUMBER: NHD-12864AZ-FSW-FBW

REVISION: 1.0  
 SIZE: A3  
 SCALE: NS

APPROVED BY: S. Baxi  
 CHECKED BY: S. Baxi  
 DRAWN BY: S. Baxi

DRAWN DATE: 01/11/18  
 CHECKED DATE: 01/11/18  
 APPROVED DATE: 01/11/18

DO NOT SCALE DRAWING SHEET 1 OF 1

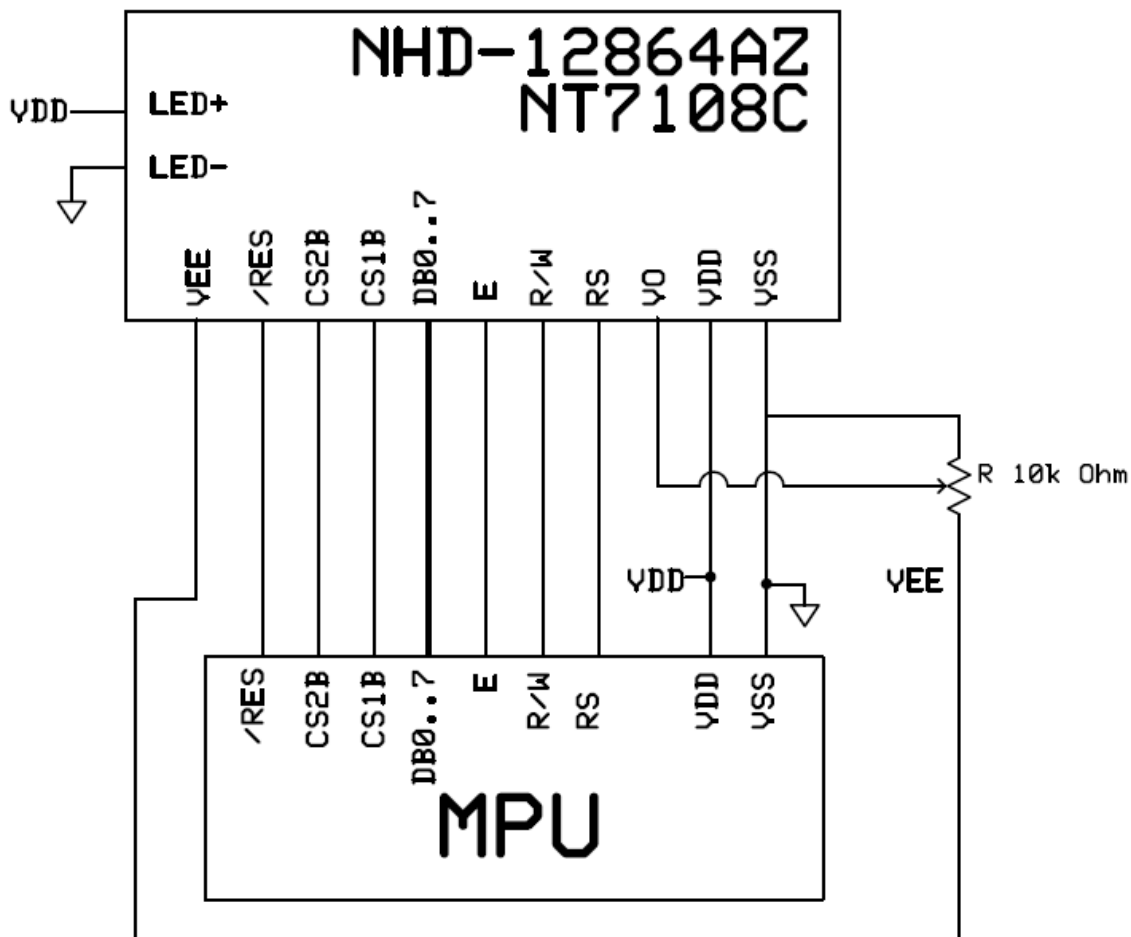
THIS DRAWING IS SOLELY THE PROPERTY OF NEWHAVEN DISPLAY INTERNATIONAL, INC. THE INFORMATION IT CONTAINS IS NOT TO BE DISCLOSED, REPRODUCED OR COPIED IN WHOLE OR PART WITHOUT WRITTEN APPROVAL FROM NEWHAVEN DISPLAY.

## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	V <sub>SS</sub>	Power Supply	Ground
2	V <sub>DD</sub>	Power Supply	Supply Voltage for Logic (+5.0V)
3	V <sub>0</sub>	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

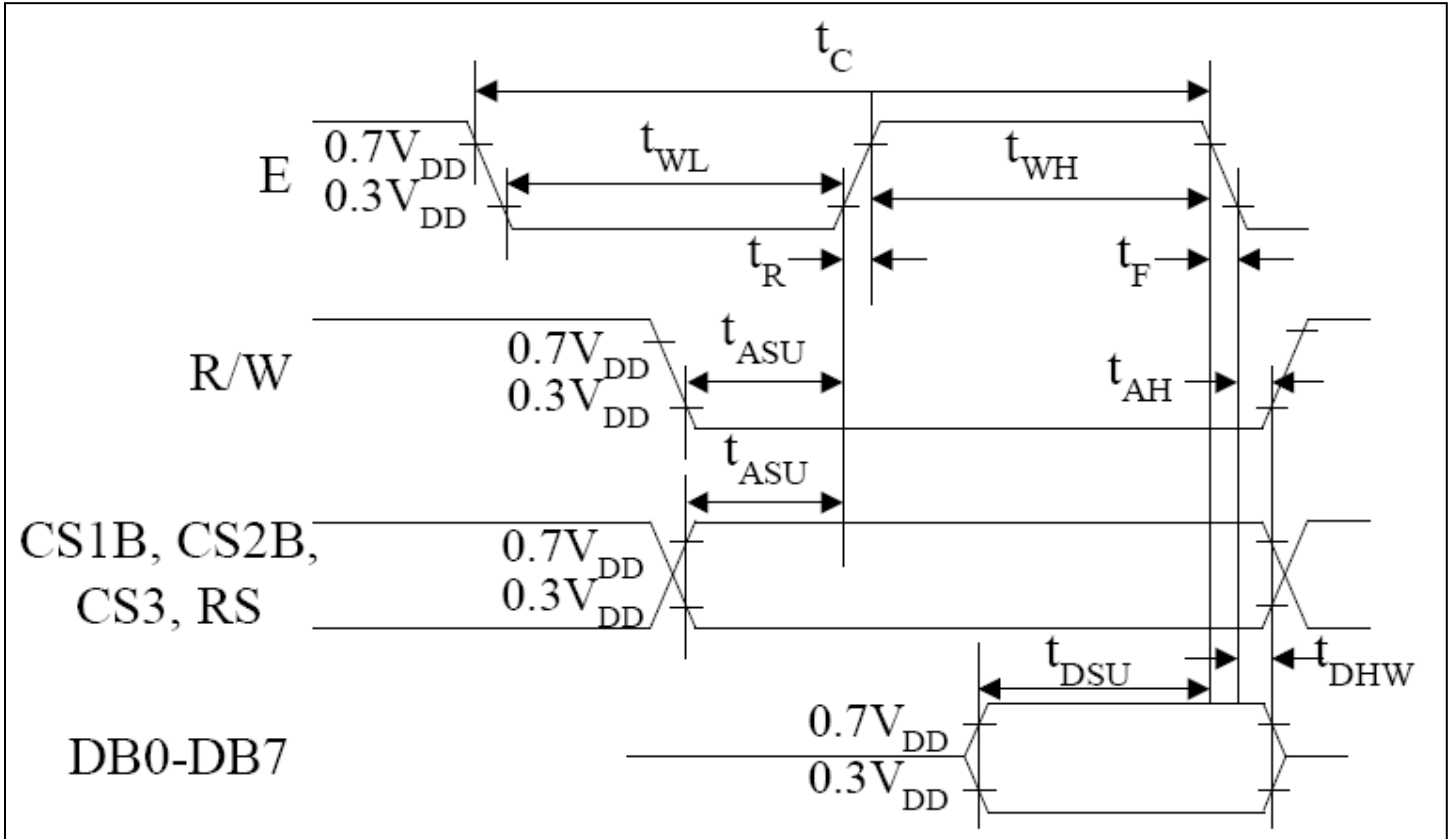
Built-in NT7108C controller.

Please download specification at [http://www.newhavendisplay.com/app\\_notes/NT7108.pdf](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](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)