

# NHD-12864AZ-FL-YBW

## Graphic Liquid Crystal Display Module

NHD- Newhaven Display  
12864- 128 x 64 Pixels  
AZ- Model  
F- Transflective  
L- Yellow/Green LED backlight  
Y- STN Positive, Yellow/Green  
B- 6:00 Optimal View  
W- Wide Temperature  
**RoHS Compliant**

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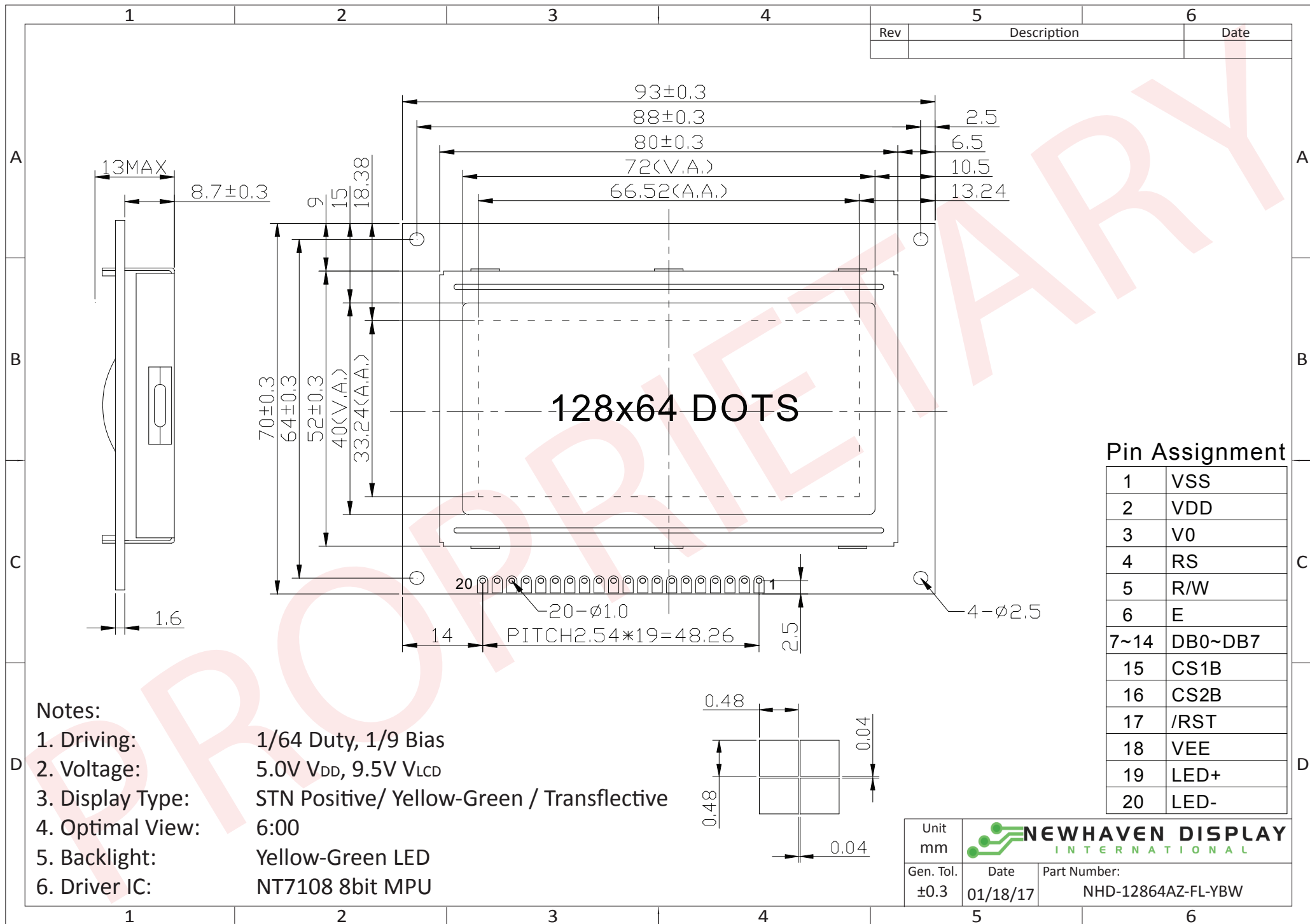
## Document Revision History

Revision	Date	Description	Changed by
0	12/23/08	Initial Release	-
1	4/2/10	User guide reformat	BE
2	5/21/10	Updated Pin Out and Electrical Characteristics	MC
3	12/17/12	Controller information updated	AK
4	1/18/17	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

# Mechanical Drawing



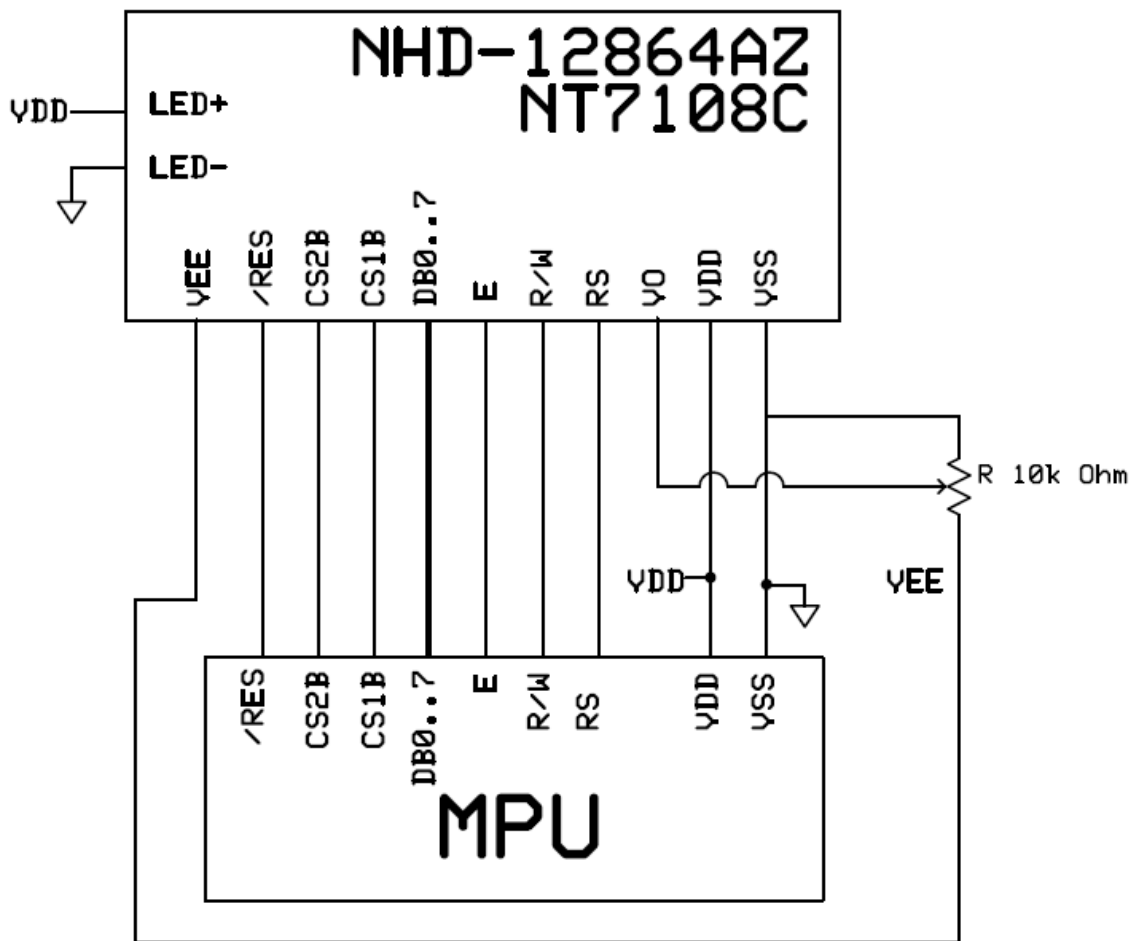
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## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	VSS	Power Supply	Ground
2	VDD	Power Supply	Supply Voltage for Logic (+5.0V)
3	V0	Adj Power Supply	Supply Voltage for Contrast (approx. -4.5V)
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	8-Bit Bi-Directional Data Bus
15	CS1B	MPU	Chip Select: 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

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	5.2	V
Supply Current	$I_{DD}$	$V_{DD} = 5.0V$ $T_{OP} = 25^{\circ}C$	1	2	3	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	$I_{LED}$	$V_{LED} = 5.0V$	130	150	170	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

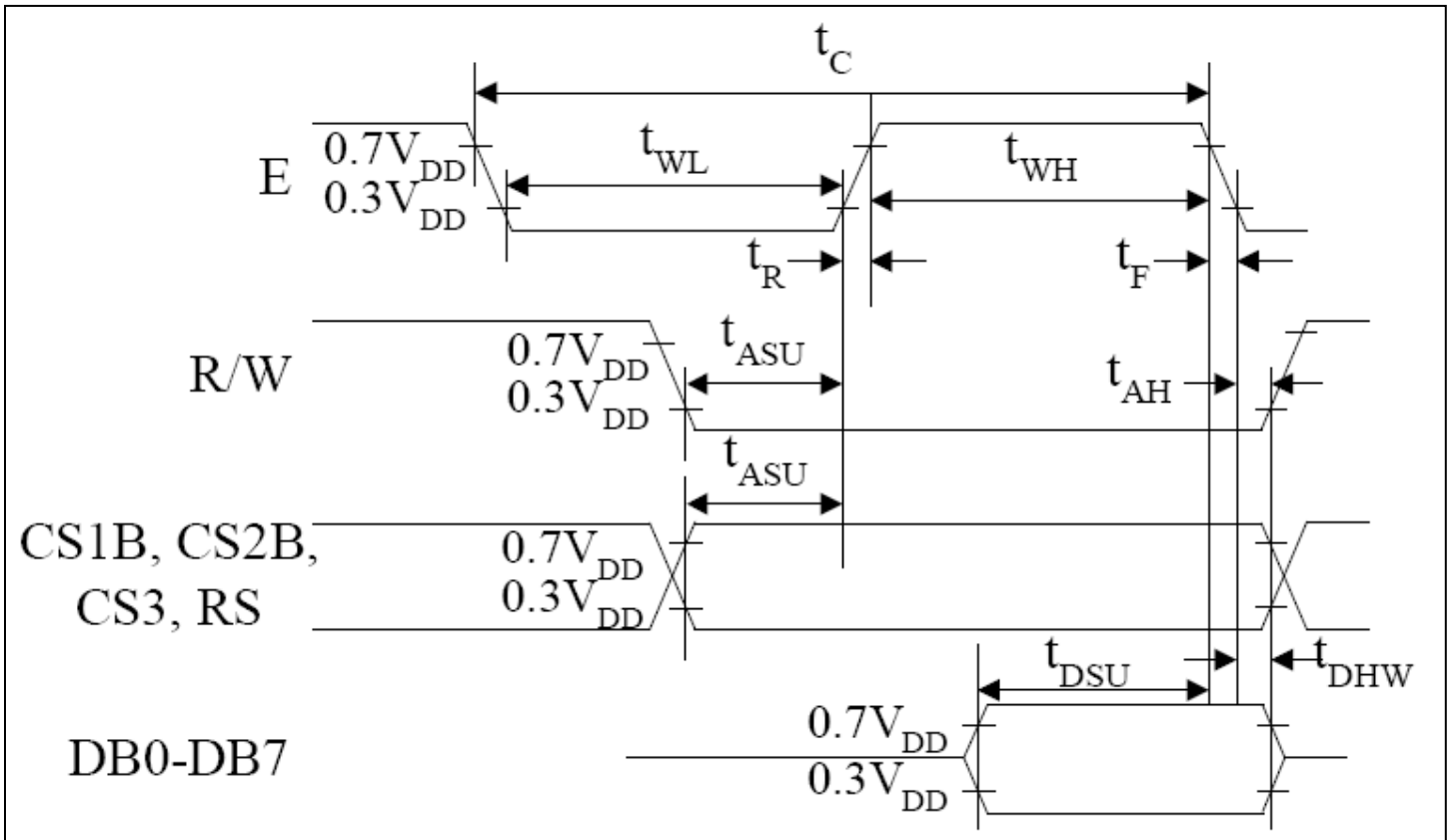
Built-in NT7108C controller.

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.	V <sub>s</sub> =800V, R <sub>s</sub> =1.5kΩ, C <sub>s</sub> =100pF 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.newhavendisply.com/specs/precautions.pdf](http://www.newhavendisply.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

[http://www.newhavendisply.com/index.php?main\\_page=terms](http://www.newhavendisply.com/index.php?main_page=terms)