

# NHD-12864WG-BTMI-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
M-	STN- Blue (-)
I-	Transmissive, Wide Temperature, 6:00 Optimal View
V#N-	Built-in Negative Voltage
	<b>RoHS Compliant</b>

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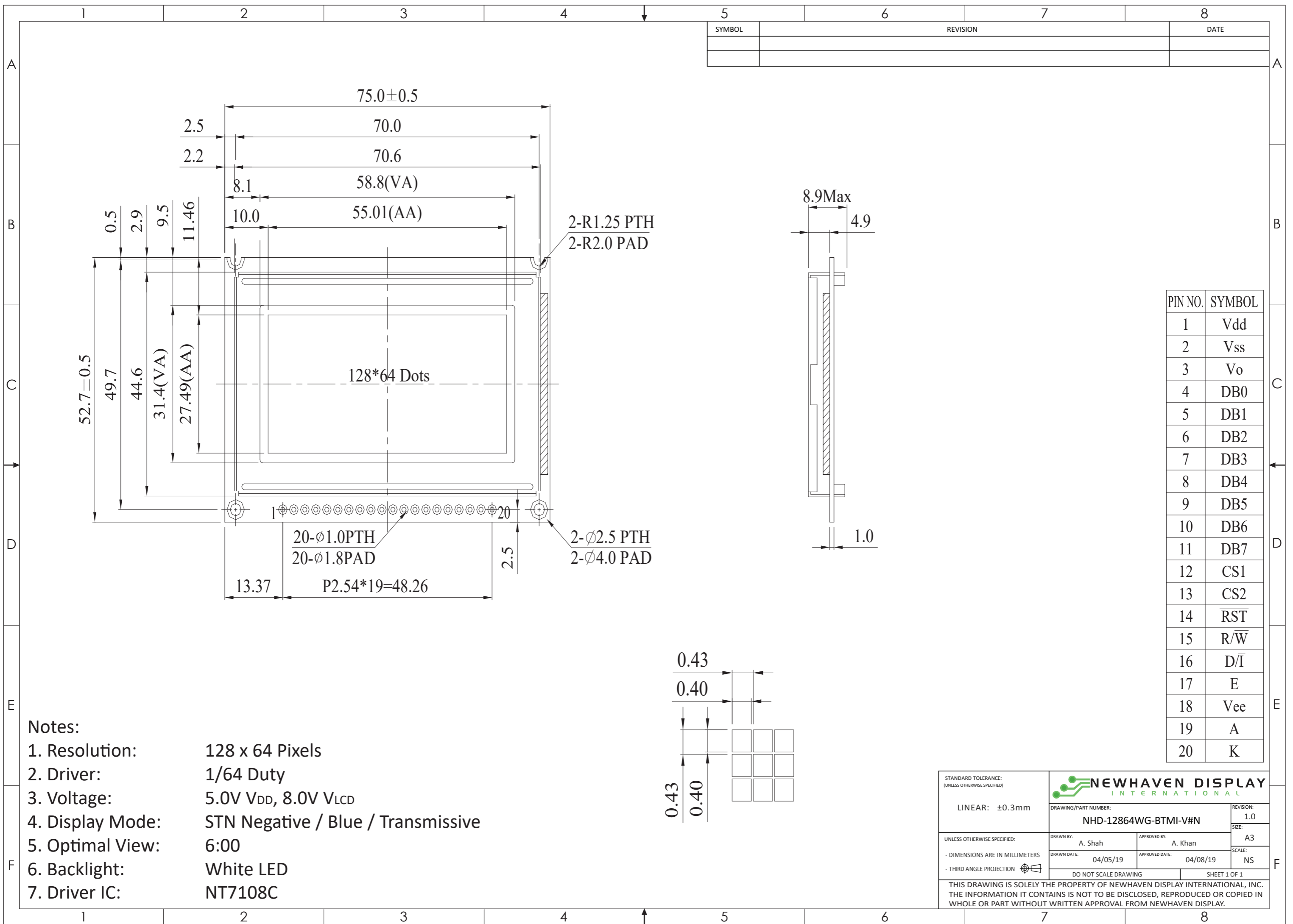
[nhsales@newhavendisplay.com](mailto:nhsales@newhavendisplay.com)

## Document Revision History

Revision	Date	Description	Changed by
0	2/28/2008	Initial Release	-
1	3/22/2009	User guide reformat	BE
2	4/14/2010	Block diagram/Initialization updated	BE
3	2/16/2011	Mechanical drawing updated	AK
4	7/26/2011	Optical characteristics updated	AK
5	12/19/2012	Controller information updated	AK
6	5/27/16	Mechanical Drawing, Electrical & Optical Char. Updated	SB
7	4/05/19	Supply Current & Quality Information updated	AS

## Functions and Features

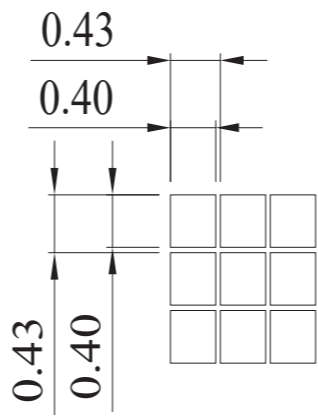
- 128 x 64 pixels
- Built-in NT7108C controller
- +5.0V power supply
- 1/64 duty cycle
- RoHS Compliant



SYMBOL	REVISION	DATE

PIN NO.	SYMBOL
1	Vdd
2	Vss
3	Vo
4	DB0
5	DB1
6	DB2
7	DB3
8	DB4
9	DB5
10	DB6
11	DB7
12	CS1
13	CS2
14	RST
15	R/W
16	D/I
17	E
18	Vee
19	A
20	K

- Notes:**
- 1. Resolution: 128 x 64 Pixels
  - 2. Driver: 1/64 Duty
  - 3. Voltage: 5.0V V<sub>DD</sub>, 8.0V V<sub>LCD</sub>
  - 4. Display Mode: STN Negative / Blue / Transmissive
  - 5. Optimal View: 6:00
  - 6. Backlight: White LED
  - 7. Driver IC: NT7108C



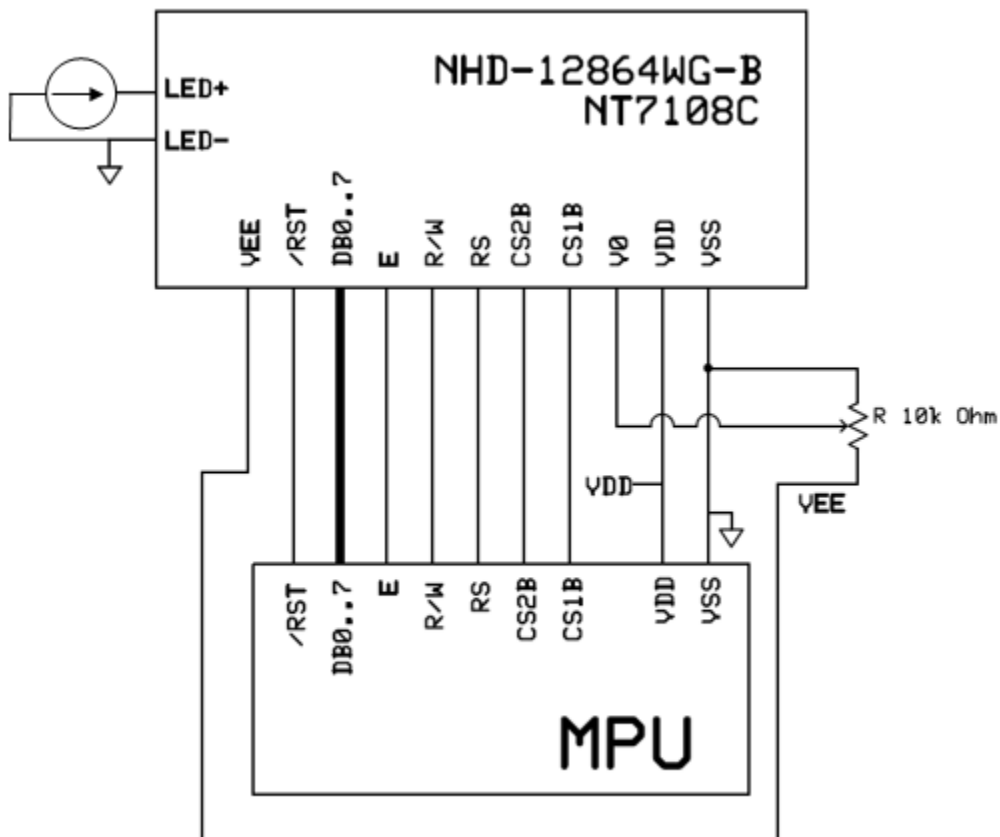
STANDARD TOLERANCE: (UNLESS OTHERWISE SPECIFIED)			REVISION:
			1.0
LINEAR: ±0.3mm	DRAWING/PART NUMBER:		SIZE:
	NHD-12864WG-BTMI-V#N		A3
UNLESS OTHERWISE SPECIFIED: - DIMENSIONS ARE IN MILLIMETERS - THIRD ANGLE PROJECTION	DRAWN BY:	APPROVED BY:	SCALE:
	A. Shah	A. Khan	NS
	DRAWN DATE:	APPROVED DATE:	
	04/05/19	04/08/19	
DO NOT SCALE DRAWING		SHEET 1 OF 1	
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## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	V <sub>DD</sub>	Power Supply	Supply Voltage for Logic (+5.0V)
2	V <sub>SS</sub>	Power Supply	Ground
3	V <sub>0</sub>	Adj. 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 <sub>EE</sub>	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 <sub>OP</sub>	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T <sub>ST</sub>	Absolute Max	-30	-	+80	°C
Supply Voltage	V <sub>DD</sub>	-	4.5	5.0	5.5	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> =5.0V	1.5	3.2	6.0	mA
Supply for LCD (contrast)	V <sub>DD-V<sub>0</sub></sub>	T <sub>OP</sub> =25°	7.8	8.0	8.2	V
"H" Level input	V <sub>IH</sub>	-	0.7*V <sub>DD</sub>	-	V <sub>DD</sub>	V
"L" Level input	V <sub>IL</sub>	-	V <sub>SS</sub>	-	0.3*V <sub>DD</sub>	V
"H" Level output	V <sub>OH</sub>	-	2.4	-	V <sub>DD</sub>	V
"L" Level output	V <sub>OL</sub>	-	V <sub>SS</sub>	-	0.4	V
Backlight Supply Voltage	V <sub>LED</sub>	-	3.4	3.5	3.6	V
Backlight Supply Current	I <sub>LED</sub>	V <sub>LED</sub> = 3.5V	15	45	60	mA

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	Cr ≥ 2	-	20	-	°
	Bottom		-	40	-	°
	Left		-	30	-	°
	Right		-	30	-	°
Contrast Ratio	Cr	-	-	3	-	-
Response Time	Rise	Tr	-	200	300	ms
	Fall	Tf	-	250	350	ms

## Controller Information

Built-in NT7108C controller.

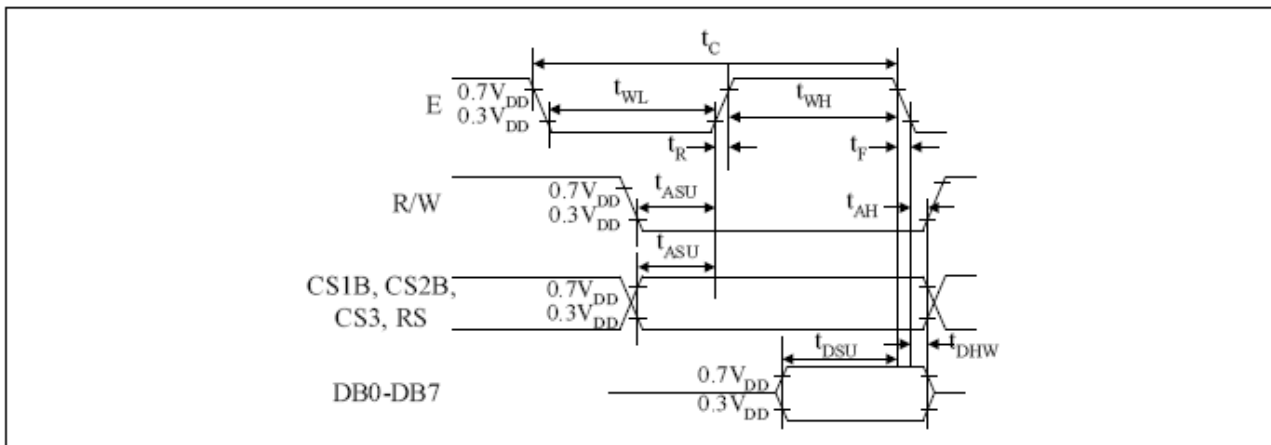
Please download specification at [http://www.newhavendisplay.com/app\\_notes/NT7108.pdf](http://www.newhavendisplay.com/app_notes/NT7108.pdf)

## Table of Commands

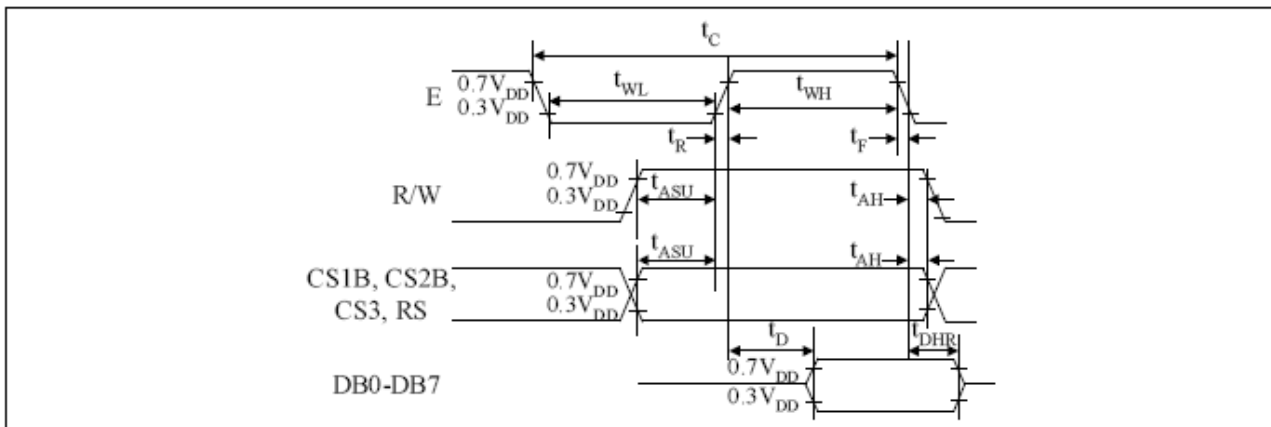
Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L:OFF, H:ON	
Set address (Y address)	L	L	L	H	Y address (0-63)						Sets the Y address in the Y address counter.	
Set 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	-	-	



**MPU Write Timing**



**MPU Read Timing**

## 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, 1.5mm 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=330Ω, CS=150pF 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.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)