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## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



# NHD-320240WG-DTMI-VZ#

## Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
320240-	320 x 240 pixels
WG-	Display Type: Graphic
D-	Model
T-	White LED Backlight
M-	STN- negative Blue
I-	Transmissive, 6:00 view, Wide Temperature (-20°C ~+70°C)
VZ#-	Built-in Negative Voltage
	<b>RoHS Compliant</b>

**Newhaven Display International, Inc.**

2511 Technology Drive, Suite 101

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)

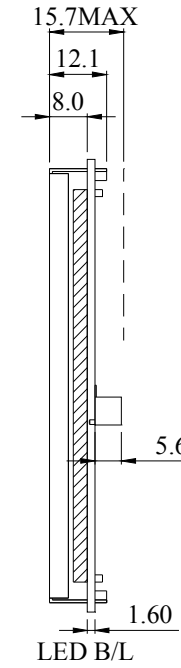
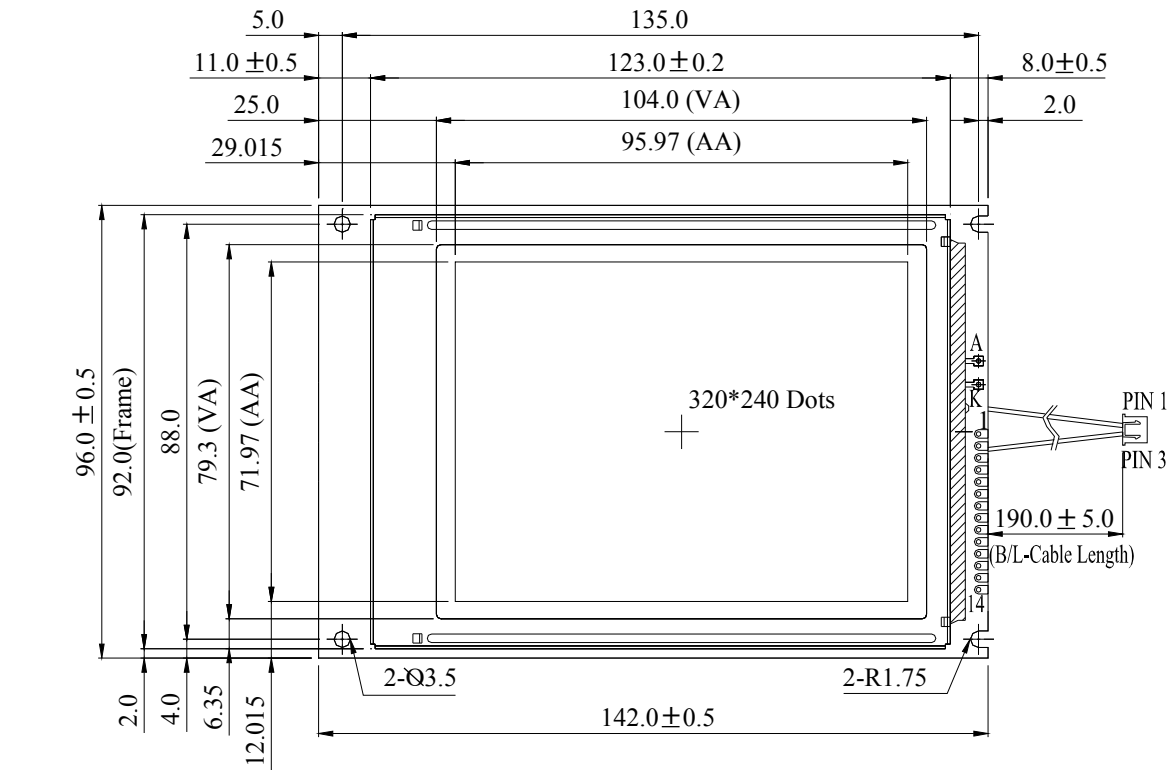
## Document Revision History

Revision	Date	Description	Changed by
0	-	Initial Release	-
1	4/20/2010	User guide reformat	MC

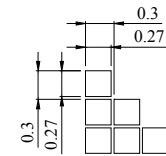
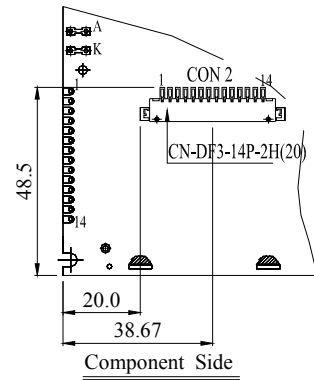
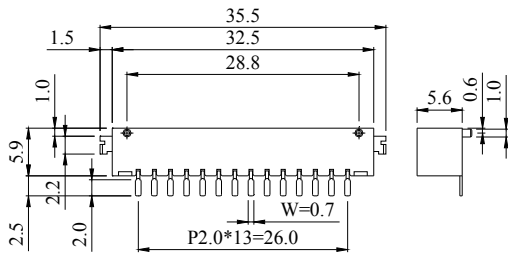
## Functions and Features

- 320 x 240 pixels
- No Controller
- Driver NT7086
- +5.0V power supply
- RoHS Compliant

# Mechanical Drawing



PIN NO.	SYMBOL
1	FRAME
2	DF
3	LOAD
4	CP
5	DISPOFF
6	D0
7	D1
8	D2
9	D3
10	VDD
11	VSS
12	VEE
13	V0
14	FG



DOT SIZE  
SCALE 20/1

The non-specified tolerance of dimension is ±0.3mm.

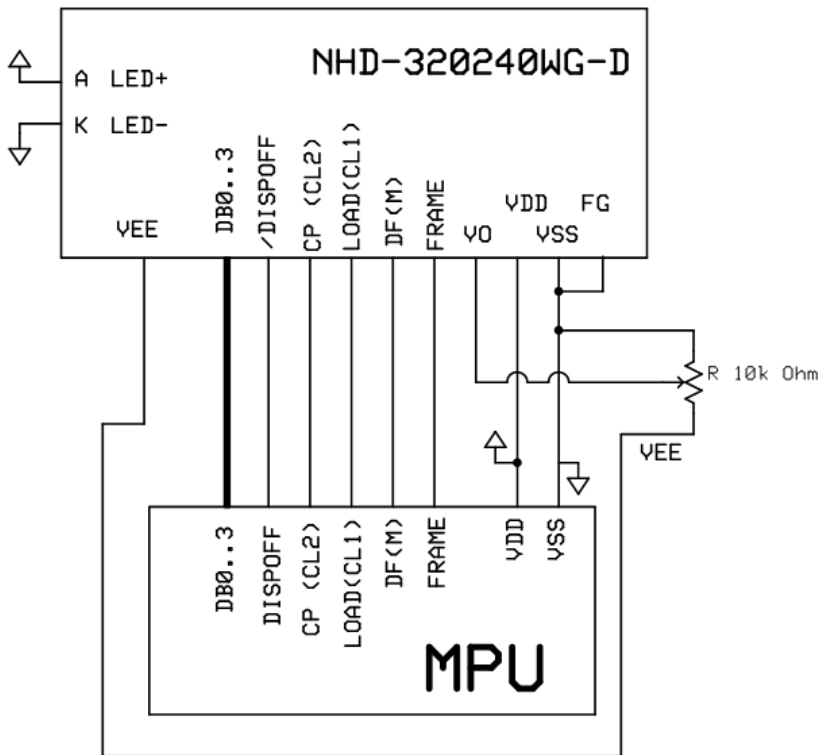
Newhaven Display  
NHD-320240WG-DTMI-VZ#

## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	FRAME	MPU	Scan start-up signal
2	DF	MPU	Frame reverse signal (alternate signal)
3	LOAD	MPU	Data latch pulse
4	CP	MPU	Data shift pulse
5	DISPOFF	MPU	Active LOW display off signal
6-9	D0~D03	MPU	Bi-directional data bus lines
10	VDD	Power Supply	Power supply for logic (+5.0V)
11	VSS	Power Supply	Ground
12	VEE	Power Supply	Negative voltage output (-25V)
13	VO	Adj Power Supply	Power supply for contrast (approx. -16.6V)
14	FG	Power Supply	Frame Ground

**Recommended LCD connector:** 14-pin, 2.0mm pitch pins Hirose (DF3-14P-2H)

**Backlight connector:** JST p/n: XHP-3      **Mates with:** JST p/n: S3B-XH-SM3-TB



## Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	Top	Absolute Max	-20	-	+70	°C
Storage Temperature Range	Tst	Absolute Max	-30	-	+80	°C
Supply Voltage	VDD		-	5.0	5.5	V
Supply Current	IDD	Ta=25°C, VDD=5.0V	-	45.0	50.0	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	19.8	21.6	23.5	V
"H" Level input	VIH		0.8VDD	-	VDD	V
"L" Level input	VIL	-	-0.3	-	0.2VDD	V
"H" Level output	VOH	-	VDD-0.4	-	-	V
"L" Level output	VOL	-	-	-	0.4	V
Backlight Supply Voltage	VLED		3.4	3.5	3.6	V
Backlight Supply Current	ILED	VLED=3.5V	115.2	128	200	mA
Backlight Lifetime		ILED=128mA	-	50,000	-	Hrs

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical	AV	Cr ≥ 3	-20	-	40	°
Viewing Angle - Horizontal	AH	Cr ≥ 3	-30	-	30	°
Contrast Ratio	Cr		-	3	-	-
Response Time (rise)	Tr	-	-	200	300	ms
Response Time (fall)	Tf	-	-	150	200	ms

## Driver Information

Built-in NT7086. Download specification at [http://www.newhavendisplay.com/app\\_notes/NT7086.pdf](http://www.newhavendisplay.com/app_notes/NT7086.pdf)



## Timing Characteristics

### AC CHARACTERISTICS

#### (1) Segment Driver Application

(V<sub>SS</sub> = 0V, Ta = -30 ~ +85°C)

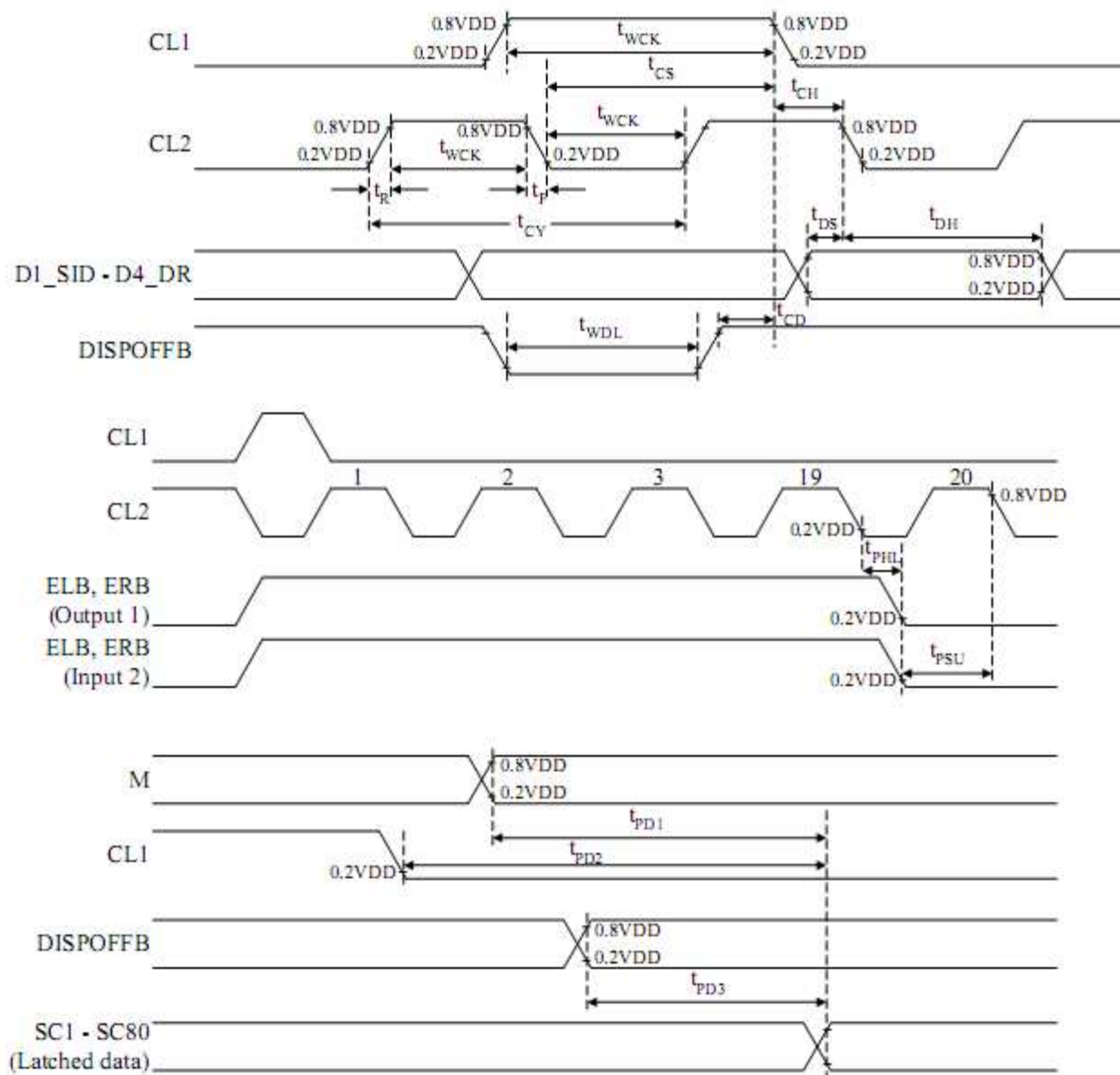
Characteristic	Symbol	Test condition	(1) VDD=5V±10%			(2) VDD=3V±10%			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Clock cycle time	t <sub>CY</sub>	Duty=50%	125	-	-	250	-	-	ns
Clock pulse width	t <sub>WCK</sub>	-	45	-	-	95	-	-	
Clock rise/ fall time	t <sub>R</sub> / t <sub>F</sub>	-	-	-	-	-	-	30	
Data set-up time	t <sub>DS</sub>	-	30	-	-	65	-	-	
Data hold time	t <sub>DH</sub>	-	30	-	-	65	-	-	
Clock set-up time	t <sub>CS</sub>	-	80	-	-	120	-	-	
Clock hold time	t <sub>CH</sub>	-	80	-	-	120	-	-	
Propagation delay time	t <sub>PHL</sub>	ELB output	-	-	60	-	-	125	
		ERB output	-	-	60	-	-	125	
ELB,ERB set-up time	t <sub>PSU</sub>	ELB input	30	-	-	65	-	-	
		ERB input	30	-	-	65	-	-	
DISPOFFB low pulse width	t <sub>WDL</sub>	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t <sub>CD</sub>	-	100	-	-	100	-	-	ns
M – OUT propagation delay time	t <sub>PD1</sub>	C <sub>L</sub> =15pF	-	-	1.0	-	-	1.2	μs
CL1 – OUT propagation delay time	t <sub>PD2</sub>		-	-	1.0	-	-	1.2	
DISPOFFB – OUT propagation delay time	t <sub>PD3</sub>		-	-	1.0	-	-	-	

#### (2) Common Driver Application

(V<sub>SS</sub> = 0V, Ta = -30 ~ +85°C)

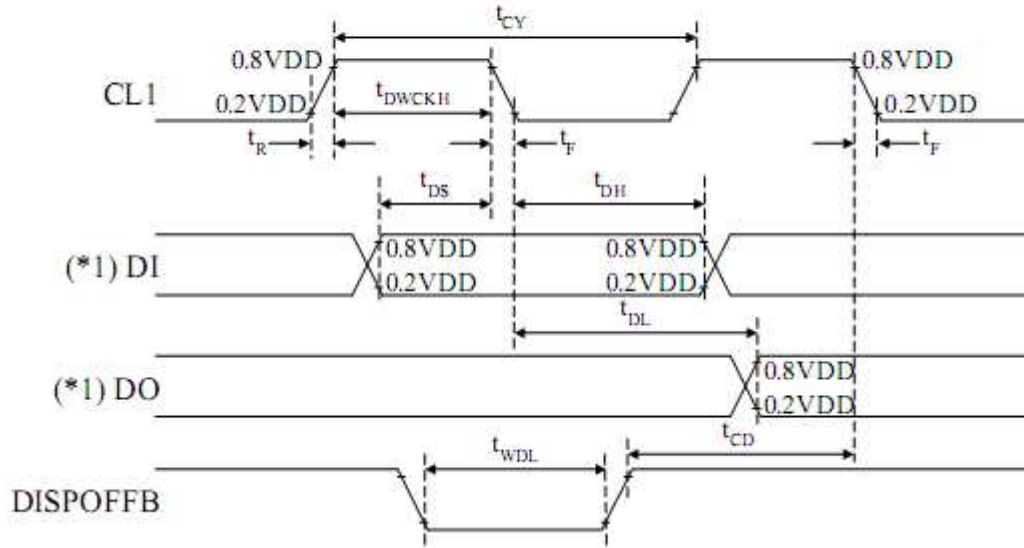
Characteristic	Symbol	Test condition	(1) VDD=5V±10%			(2) VDD=3V±10%			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Clock cycle time	t <sub>CY</sub>	Duty=50%	250	-	-	500	-	-	ns
Clock pulse width	t <sub>WCK</sub>	-	45	-	-	95	-	-	
Clock rise/ fall time	t <sub>R</sub> / t <sub>F</sub>	-	-	-	50	-	-	50	
Data set-up time	t <sub>DS</sub>	-	30	-	-	65	-	-	
Data hold time	T <sub>DH</sub>	-	30	-	-	65	-	-	
DISPOFFB low pulse width	t <sub>WDL</sub>	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t <sub>CD</sub>	-	100	-	-	100	-	-	ns
Output delay time	t <sub>DL</sub>	C <sub>L</sub> =15pF	-	-	200	-	-	250	μs
M – OUT propagation delay time	t <sub>PD1</sub>		-	-	1.0	-	-	1.2	
CL1 – OUT propagation delay time	t <sub>PD2</sub>		-	-	1.0	-	-	1.2	
DISPOFFB – OUT propagation delay time	t <sub>PD3</sub>		-	-	1.0	-	-	1.2	

### (3) Segment Driver Application Timing

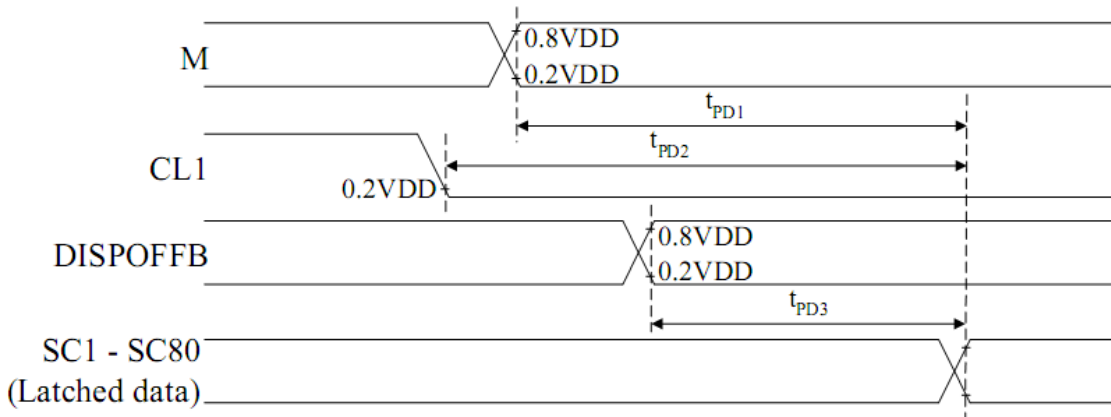




#### (4) Common Driver Application Timing



(\*1) When in single-type interface mode  
 DI=>DDL(SHL=L), D4\_DR(SHL=H)  
 DO=>D4\_DR(SHL=L), D2\_DL(SHL=H)  
 When in dual-type interface mode  
 DI=>D2\_DL and D3\_DM(SHL=L), D4\_DR and D3\_DM(SHL=H)  
 DO=>D4\_DR(SHL=L), D2\_DL(SHL=H)



## 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](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)