

NHD-3.5-320240MF-ATXL#-1

TFT (Thin-Film-Transistor) Color Liquid Crystal Display Module

NHD-	Newhaven Display
3.5-	3.5" Diagonal
320240-	320xRGBx240 Pixels
MF-	Model
A-	Built-in Driver / No Controller
T-	White LED Backlight
X-	TFT
L-	12:00 Optimal View, Wide Temperature
#-1	RoHS Compliant

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Document Revision History

Revision	Date	Description	Changed by
0	7/8/2009	Initial Release	CL
1	7/29/2009	MECHANICAL DRAWING UPDATE	CL
2	1/25/2011	Viewing angle updated	AK
3	3/31/2011	Pin description / Note section updated	AK
4	4/8/2011	Contrast removed from electrical characteristics	BE
5	12/10/2012	Timing characteristics updated	AK
6	4/25/2014	Optical characteristics updated	ML
7	5/30/2014	Driver information updated	AK
8	12/03/15	Backlight Lifetime Added, Datasheet Reformat	SB
9	7/5/16	Added Chromaticity	SB
10	12/1/16	V_{DD} , I_{DD} , and Chromaticity Updated	SB

Functions and Features

- 320xRGBx240 resolution
- LED backlight
- 3.3V power supply
- 24-bit Parallel digital RGB interface (6.4MHz)

Pin Description

Pin No.	Symbol	External Connection	Function Description
1	LED_K	Power Supply	Backlight Cathode (Ground)
2	LED_K	Power Supply	Backlight Cathode (Ground)
3	LED_A	Power Supply	Backlight Anode (18mA @ 19.2V)
4	LED_A	Power Supply	Backlight Anode (18mA @ 19.2V)
5	NC	-	No Connect
6	NC	-	No Connect
7	NC	-	No Connect
8	RSTB	MPU	Active LOW Reset signal
9	SPENB	MPU	Active LOW Serial Chip Select signal
10	SPCK	MPU	Serial Clock signal
11	SPDA	MPU	Serial Data signal
12-19	B0-B7	MPU	Blue Data signals
20-27	G0-G7	MPU	Green Data signals
28-35	R0-R7	MPU	Red Data signals
36	HSD	MPU	Horizontal (Line) Sync signal
37	VSD	MPU	Vertical (Frame) Sync signal
38	CLKIN	MPU	Dot Clock signal
39	NC	-	No Connect
40	NC	-	No Connect
41	V _{DD}	Power Supply	Supply Voltage for LCD and logic (3.3V)
42	V _{DD}	Power Supply	Supply Voltage for LCD and logic (3.3V)
43	NC	-	No Connect
44	NC	-	No Connect
45	NC	-	No Connect
46	NC	-	No Connect
47	NC	-	No Connect
48	NC	-	No Connect
49	NC	-	No Connect
50	NC	-	No Connect
51	NC	-	No Connect
52	DEN	-	Data Enable signal (No Connect)
53	GND	Power Supply	Ground
54	GND	Power Supply	Ground

Recommended connector: 54pin, 0.5mm pitch, FFC connector. Molex P/N 51296-5494

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
Digital Supply Voltage	V _{DD}	-	3.0	3.3	3.6	V
Supply Current	I _{DD}	V _{DD} =3.3V	5	10	20	mA
"H" Level input	V _{IH}	-	0.8 * V _{DD}	-	V _{DD}	V
"L" Level input	V _{IL}	-	V _{SS}	-	0.2 * V _{DD}	V
"H" Level output	V _{OH}	-	V _{DD} -0.4	-	V _{DD}	V
"L" Level output	V _{OL}	-	V _{SS}	-	V _{SS} +0.4	V
Backlight Supply Voltage	V _{LED}	-	18.0	19.2	20.4	V
Backlight Supply Current	I _{LED}	V _{LED} = 19.2V	15	18	20	mA
Backlight Lifetime*	-	I _{LED} = 18mA T _{OP} = 25° C	20,000	50,000	-	Hrs.

*Backlight lifetime is rated as Hours until **half-brightness**, under normal operating conditions.

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Optimal Viewing Angles	Top	CR ≥ 10	-	60	-	°	
	Bottom		-	40	-	°	
	Left		-	60	-	°	
	Right		-	60	-	°	
Contrast Ratio	CR	-	200	350	-	-	
Luminance	L _V	I _{LED} = 18 mA	320	400	-	cd/m ²	
Response Time	Rise	T _{OP} =25°C	-	25	40	ms	
	Fall		-	25	40	ms	
Chromaticity	Red	X _R	-	0.556	0.606	0.656	-
		Y _R	-	0.302	0.352	0.402	-
	Green	X _G	-	0.268	0.318	0.368	-
		Y _G	-	0.541	0.591	0.641	-
	Blue	X _B	-	0.093	0.143	0.193	-
		Y _B	-	0.052	0.102	0.152	-
White	X _W	-	0.230	0.280	0.330	-	
	Y _W	-	0.256	0.306	0.356	-	

Driver Information

Built-in NV3035C driver. No controller.

Please download specification at http://www.newhavendisplay.com/app_notes/NV3035C.pdf

Note: To achieve optimum VCOM and VGL settings, the SPI interface may be used to set the following registers:

ROEh = 6Bh

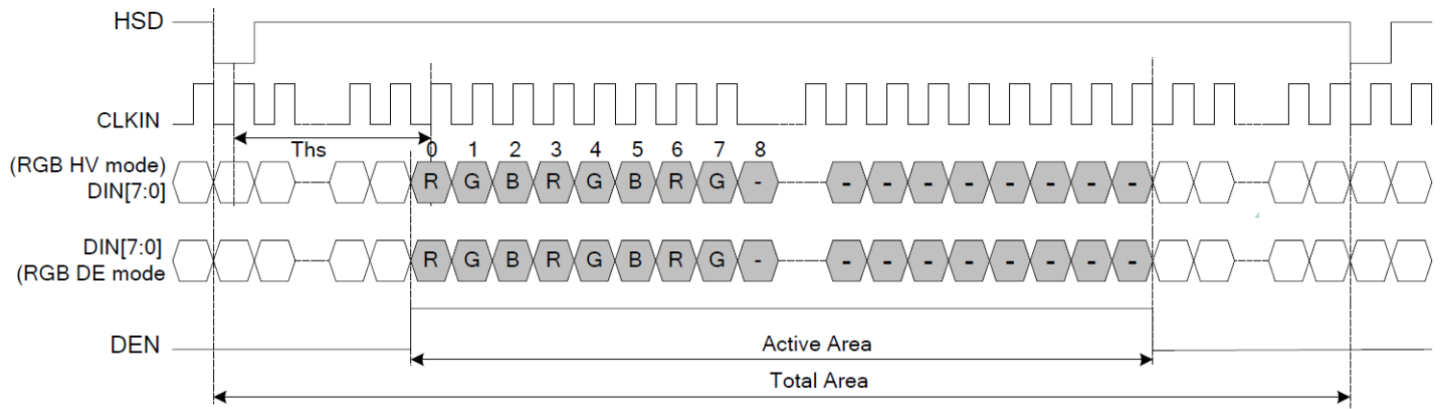
ROFh = 24h

Timing Characteristics

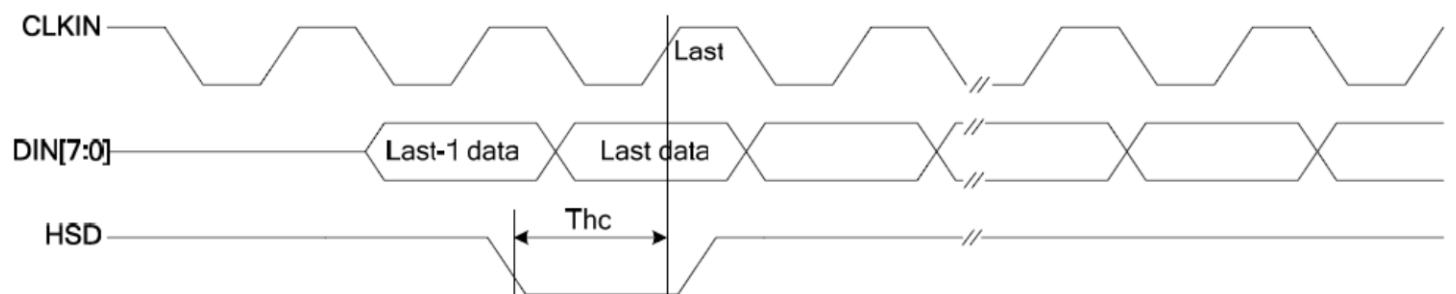
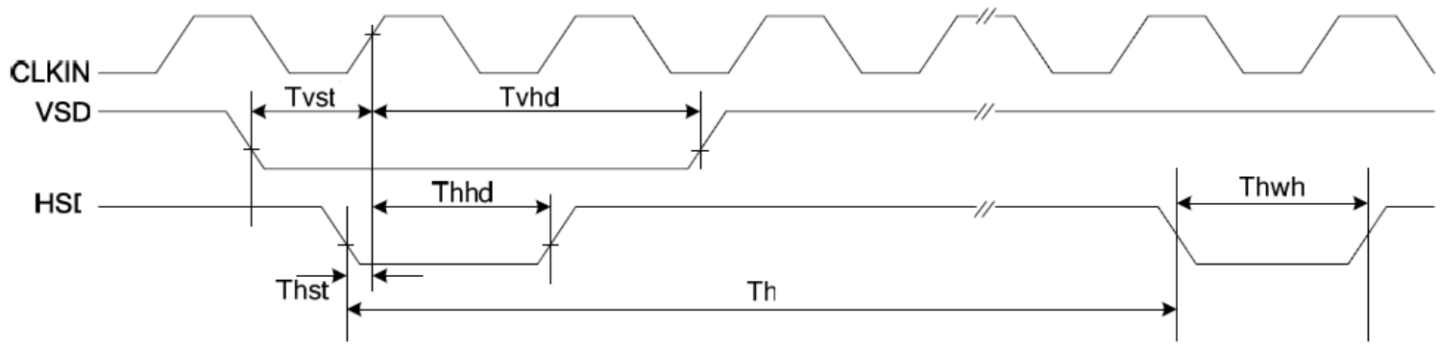
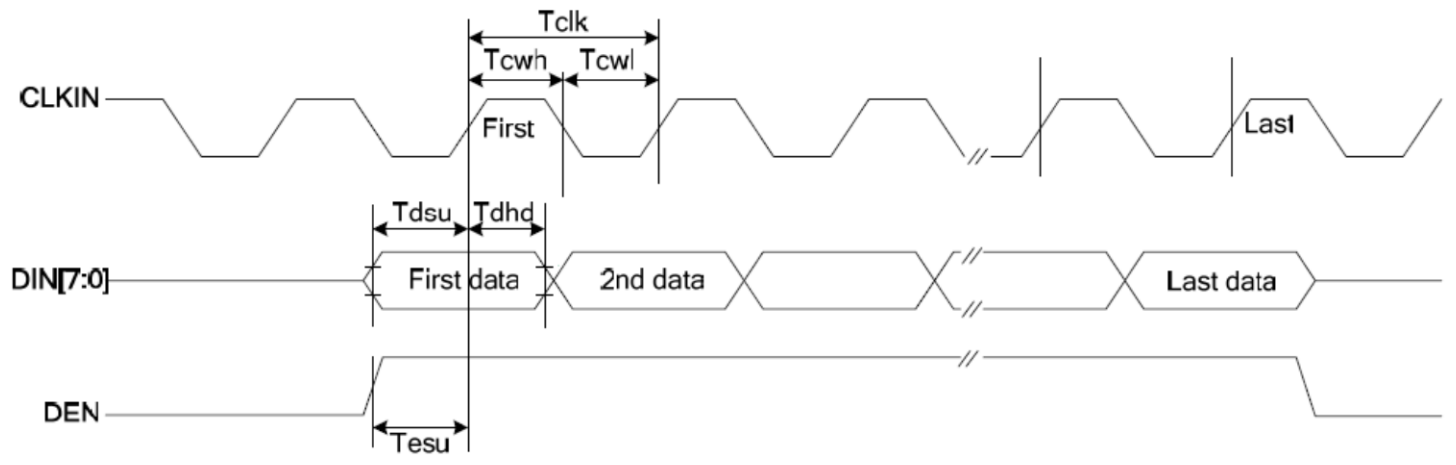
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
System Operation Timing						
VDD power source slew time	T _{POR}			1000	us	From 0V to 90% VDD
RSTB active pulse width	T _{RSTB}	40			us	VDD=3.3V
Input Output Timing						
CLKIN clock time	T _{clk}	-		35.7	ns	Please refer to timing table(P25)
HSD to CLKIN	T _{hc}	-	-	1	CLKIN	
HSD width	T _{hwh}	1	-	-	CLKIN	
VSD width	T _{vwh}	1	-	-	Th	
HSD period time	T _h	60	63.56	67	us	
VSD setup time	T _{vst}	12	-	-	ns	
VSD hold time	T _{vhd}	12	-	-	ns	
HSD setup time	T _{hst}	12	-	-	ns	
HSD hold time	T _{hhd}	12	-	-	ns	
Data set-up time	T _{dsu}	12	-	-	ns	DIN[23:0] to CLKIN
Data hold time	T _{dhd}	12	-	-	ns	DIN[23:0] to CLKIN
DEN setup time	T _{esd}	12	-	-	ns	DEN to CLKIN
Time that VSD to 1 st line data input	T _{vs}	2	13	127	Th	@CIR601/8bit RGB HV mode Control by HDLY[6:0] setting T _{vs} =HDLY[6:0]
Time that CCIR_V to 1 st line data input	T _{vs}	12	20	28	Th	@CCIR656 NTSC mode Control by HDLY[6:0] setting T _{vs} =HDLY[6:0]
Time that CCIR_V to 1 st line data input	T _{vs}	17	25	33	Th	@CCIR656 PAL mode Control by HDLY[6:0] setting T _{vs} =HDLY[6:0]
Time that VSD to 1 st line data input	T _{vs}	2	13	127	Th	@24bit RGB HV mode Control by HDLY[6:0] setting T _{vs} =HDLY[6:0]
Source output stable time 1	T _{st}	-	25	30	us	96% final, CL=30pF, RL=2K
Gate output stable time	T _{gst}	-	500	1000	ns	96% final, CL=40pF
VCOMOUT output stable time	T _{est}	-	4	8	us	96% final, CL=33nF, RL=100ohm
3-wire serial communication AC timing						
Serial clock	T _{spck}	320	-	-	ns	
SPCK pulse duty	T _{scdut}	40	50	60	%	T _{ckh} /T _{spck}
Serial data setup time	T _{isu}	120	-	-	ns	
Serial data hold time	T _{ihd}	120	-	-	ns	
Serial clock high/low	T _{ssw}	120	-	-	ns	
Chip select distinguish	T _{cd}	1	-	-	us	
SPENA to VSD	T _{cv}	1	-	-	us	
SPENB input setup time	T _{eck}	150	-	-	Ns	
SPENB input hold time	T _{cke}	150	-	-	ns	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLKIN frequency	F _{clk}	6.1	6.4	8.0	MHz	VDD=3.0~3.6V
CLKIN cycle time	T _{clk}	125	156	164	ns	
CLKIN pulse duty	T _{cwh}	40	50	60	%	T _{clk}
Time that HSD to 1 st data input(NTSC)	T _{hs}	40	70	255	CLKIN	DDLY=70,Offset=0(fixed)

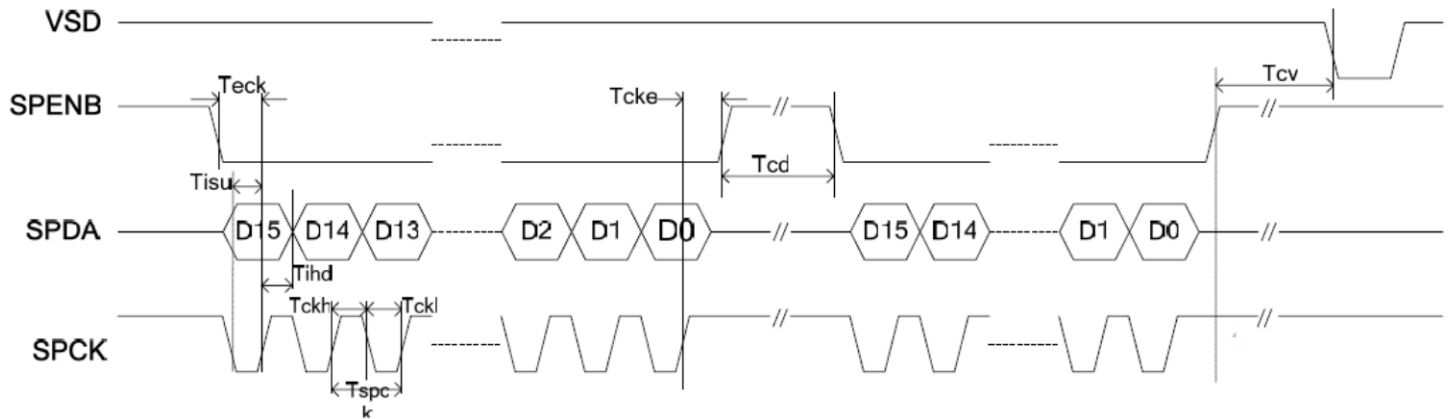
Input Data Format



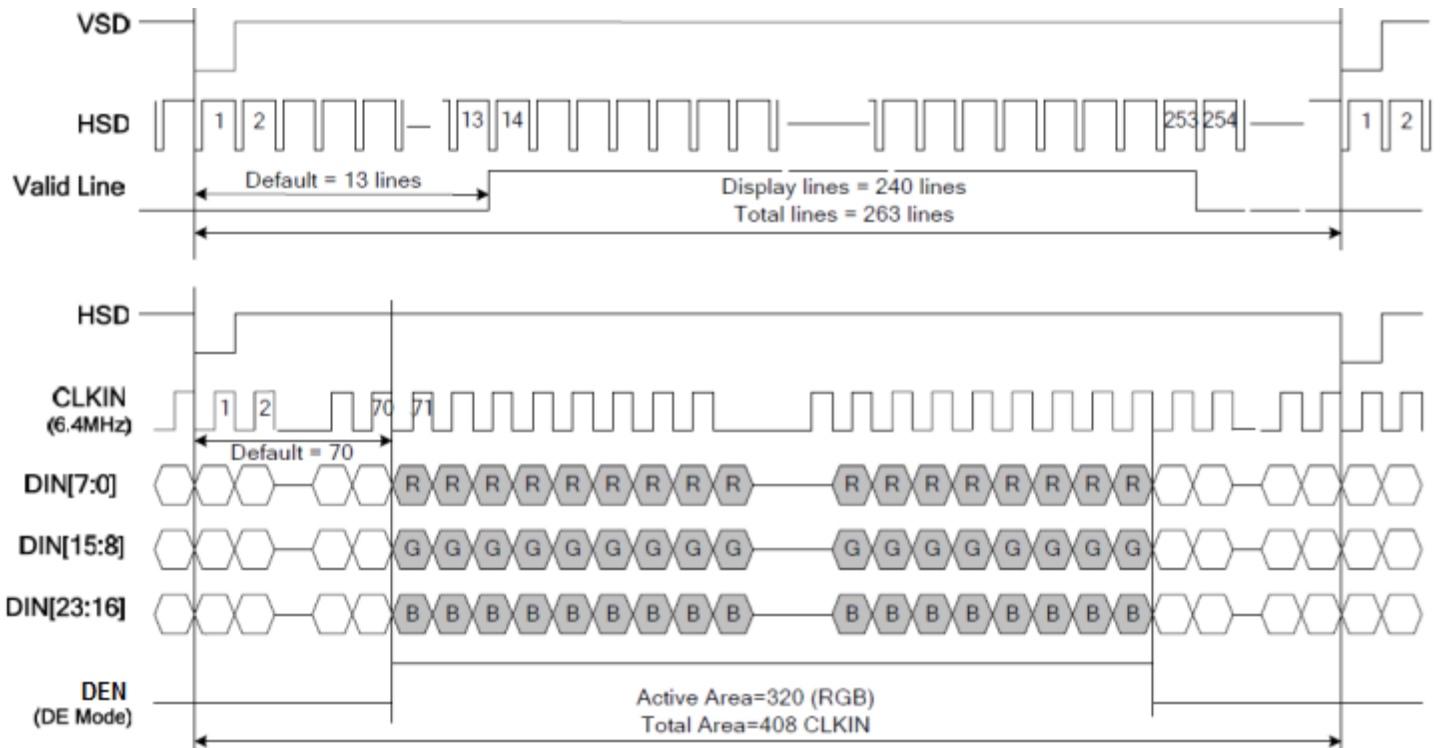
Clock and Data Input Timing Diagram



3-wire Timing Diagram



Input Data Timing



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 , 96hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 96hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C , 96hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 96hrs	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.	+50°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,60min -> 25°C,5min -> 70°C,60min = 1 cycle 20 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz , 1.5mm amplitude. 60 sec in each of 3 directions (X,Y,Z) For 30 minutes	3
Static electricity test	Endurance test applying electric static discharge.	V _s =4KV, R _s =330kΩ, C _s =150pF Five 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

Warranty Information and Terms & Conditions

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

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