



NHD-3.5-320240MF-ATXL#-1

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

NHD- Newhaven Display 3.5- 3.5" Diagonal 320240- 320x240 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

Newhaven Display International, Inc.

2511 Technology Drive, Suite 101 Elgin IL, 60124

Ph: 847-844-8795 Fax: 847-844-8796

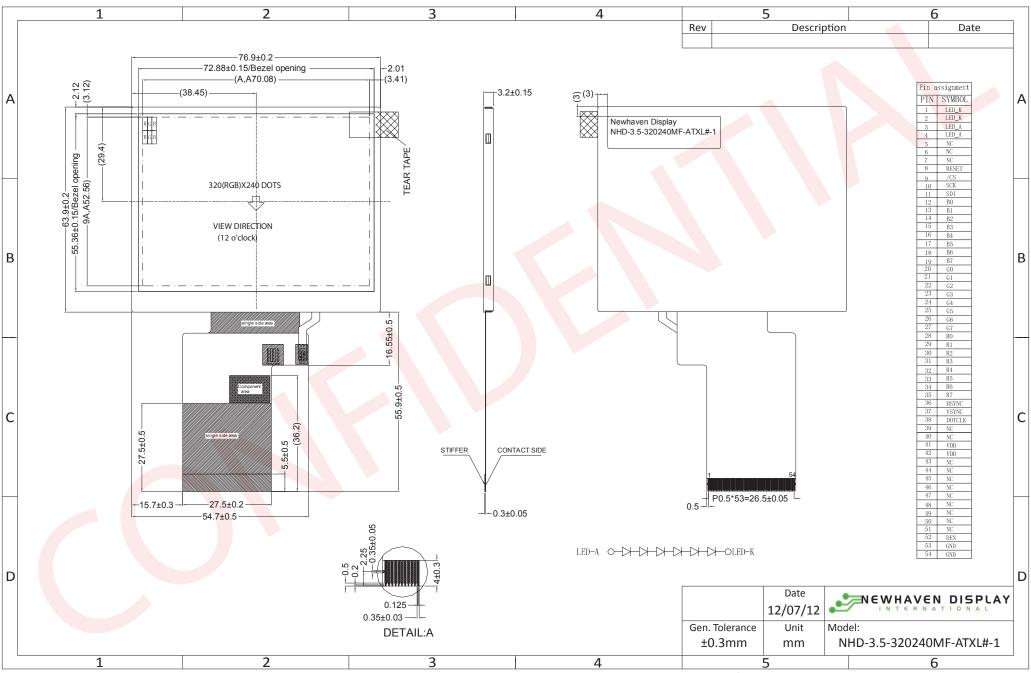
Document Revision History

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

Functions and Features

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

Mechanical Drawing



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Pin Description

Pin No.	Symbol	External Connection	Function Description
1	LED-	Power Supply	Ground for backlight
2	LED-	Power Supply	Ground for backlight
3	LED+	Power Supply	Power for backlight (18mA @ 19.2V)
4	LED+	Power Supply	Power for backlight (18mA @ 19.2V)
5	NC	-	No Connect
6	NC	-	No Connect
7	NC	-	No Connect
8	/RST	MPU	Active LOW Reset
9	/CS	MPU	Active LOW Serial Chip Select
10	SCL	MPU	Serial Clock
11	SDA	MPU	Serial Data
12-19	B0-B7	MPU	Blue Data
20-27	G0-G7	MPU	Green Data
28-35	R0-R7	MPU	Red Data
36	HSYNC	MPU	Horizontal (Line) Sync
37	VSYNC	MPU	Vertical (Frame) Sync
38	DCLK	MPU	Dot Clock
39	NC	-	No Connect
40	NC	-	No Connect
41	VDD	Power Supply	Power for LCD and logic (3.3V)
42	VDD	Power Supply	Power 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	DE	-	Data Enable (No Connect)
53	VSS	Power Supply	Ground
54	VSS	Power Supply	Ground

Recommended LCD connector: 0.5mm pitch, 54 conductor – Molex 51296-5494

Backlight connector: on LCD connector Mates with: ---

Electrical Characteristics

Item	Symbol	Condition	Min.	Тур.	Max.	Unit
Operating Temperature Range	Тор	Absolute Max	-20	•	+70	°C
Storage Temperature Range	Tst	Absolute Max	-30	1	+80	°C
Digital Supply Voltage	VDD		3.0	3.3	3.6	V
Supply Current	IDD	VDD=3.3V	-	25	-	mA
"H" Level input	Vih		0.8*VDD	-	VDD	V
"L" Level input	Vil		VSS	-	0.2*VDD	V
"H" Level output	Voh		VDD-0.4	-	VDD	V
"L" Level output	Vol		VSS	-	VSS+0.4	V
Backlight Supply Voltage	Vled		18.0	19.2	20.4	V
Backlight Supply Current	lled	Vled=19.2V	-	18	20	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Тур.	Max.	Unit
Viewing Angle – Top			-	40	-	0
Viewing Angle – Bottom		Cr ≥ 10	-	60	-	0
Viewing Angle – Left		Ct ≥ 10	-	60	-	0
Viewing Angle – Right			-	60	-	0
Contrast Ratio	Cr		200	350	-	
Luminance	Lv		320	400	-	cd/m ²
Response Time (rise)	Tr		-	10	-	ms
Response Time (fall)	Tf		-	15	-	ms

Viewing angles based on 6:00 gray-scale inversion

Driver Information

Built-in NT39016D driver. No controller.

Please download specification at http://www.newhavendisplay.com/app_notes/NT39016D.pdf

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

ROEh = 6Bh

R0Fh = 24h

Timing Characteristics

Parameter	Symbol	Min.	Тур.	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	Tclk	33.3/125	-	-	ns	Please refer to timing table(p.32)
HSD to CLKIN	Thc	-	-	1	CLKIN	
HSD width	Thwh	1	-	-	CLKIN	
VSD width	Tvwh	1	-	-	Th	
HSD period time	Th	60	63.56	67	us	
VSD setup time	Tvst	8	-	-	ns	
VSD hold time	Tvhd	10	-	-	ns	
HSD setup time	Thst	8	-	-	ns	
HSD hold time	Thhd	10	-	-	ns	
Data set-up time	Tdsu	8	-	-	ns	DIN[23:0] to CLKIN
Data hold time	Tdhd	10	-	-	ns	DIN[23:0] to CLKIN
DEN setup time	Tesd	12	-		ns	DEN to CLKIN
Time that VSD to 1 st line data input	Tvs	2	13	127	Th	<pre>@CCIR601 / 8bit RGB HV mode Control by HDLY[6:0] setting Tvs = HDLY[6:0]</pre>
Time that CCIR_V to 1 st line data input	Tvs	12	20	28	Th	<pre>@CCIR656 NTSC mode Control by HDLY[6:0] setting Tvs = HDLY[6:0]</pre>
Time that CCIR_V to 1 st line data input	Tvs	17	25	33	Th	@CCIR656 PAL mode Control by HDLY[6:0] setting Tvs = HDLY[6:0]
Time that VSD to 1st line	Tvs	2	13	127	Th	@24bit RGB HV mode Control by HDLY[6:0] setting Tvs = HDLY[6:0]
Source output stable time 1	Tst	-	25	30	us	96% final, CL=30pF, RL=2K
Gate output stable time	Tgst	-	500	1000	ns	96% final, CL=40pF
VCOMOUT output stable time	Tost	-	4	8	us	96% final, CL=33nF, RL=100ohm

3-wire serial communication AC timing								
Serial clock	Tspck	320	-	-	ns			
SPCK pulse duty		40	50	60	%	Tckh / Tspck		
Serial data setup time	Tisu	120	-	-	ns			
Serial data hold time	Tihd	120	-	-	ns			
Serial clock high/low	Tckh/I	120	-	-	ns			
Chip select distinguish	Tcd	1	-	-	us			
SPENB to VSD	Tcv	1	-	-	us			
SPENB input setup time	Teck	150	-	-	ns			
SPENB input hold time	Tcke	150	-	-	ns			

CCIR601 Mode A/B *

Parameter	Symbol	Min.	Тур.	Max.	Unit	Conditions
CLKIN frequency	Fclk	-	24.54 /27	30	MHz	VDD = 3.0 ~3.6V
CLKIN cycle time	Tclk	-	40/37		ns	
CLKIN pulse duty	Tcwh	40	50	60	%	Tclk
Time from HSD to 1'st data input (PAL)	Ths	128	264	-	CLKIN	DDLY = 136, Offset = 128 (fixed)
Time from HSD to 1'st data input (NTSC)	Ths	128	244	-	CLKIN	DDLY = 116, Offset = 128 (fixed)

CCIR656 Mode A/B *

Parameter	Symbol	Min.	Тур.	Max.	Unit	Conditions
CLKIN frequency	Fclk	-	27	30	MHz	VDD = 3.0 ~3.6V
CLKIN cycle time	Tclk	-	37		ns	
CLKIN pulse duty	Tcwh	40	50	60	%	Tclk
Time from EAV to 1'st data input (PAL)	Ths	128	288		CLKIN	DDLY = 152, Offset = 128 (fixed)
Time from EAV to 1'st data input (NTSC)	Ths	128	276		CLKIN	DDLY = 140, Offset = 128 (fixed)

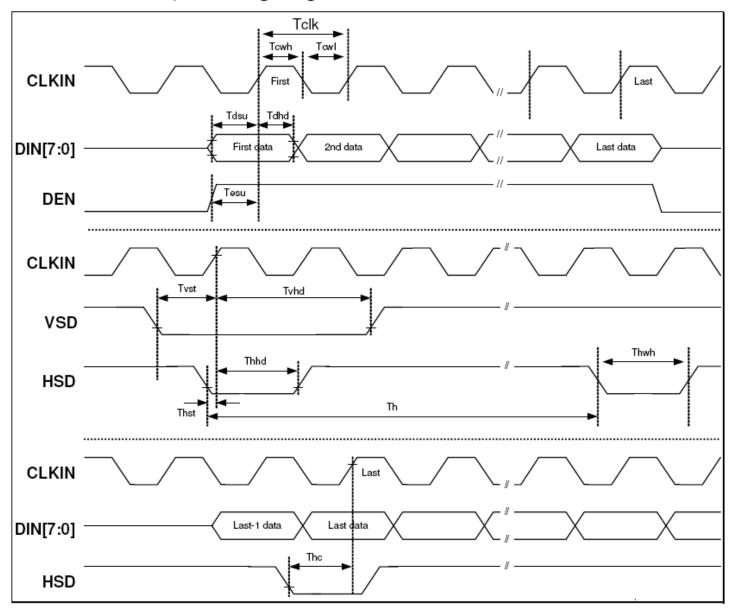
8 Bit RGB 960 CH Mode

Parameter	Symbol	Min.	Тур.	Max.	Unit	Conditions
CLKIN frequency	Fclk	-	27	30	MHz	VDD = 3.0 ~3.6V
CLKIN cycle time	Tclk	-	37		ns	
CLKIN pulse duty	Tcwh	40	50	60	%	Tclk
Time that HSD to 1'st data input(NTSC)	Ths	35	70	255	CLKIN	DDLY = 70, Offset = 0 (fixed)

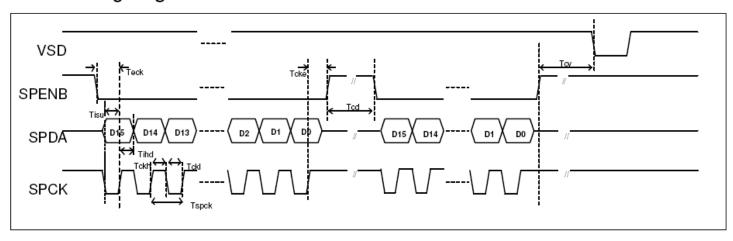
24 Bit RGB Mode (@ SEL[3:0] = 1100 or 1101)

Parameter	Symbol	Min.	Тур.	Max.	Unit	Conditions
CLKIN frequency	Fclk	6.1	6.4	8.0	MHz	VDD = 3.0 ~3.6V
CLKIN cycle time	Tclk	125	156	164	ns	
CLKIN pulse duty	Tcwh	40	50	60	%	Tclk
Time that HSD to 1'st data input(NTSC)	Ths	40	70	255	CLKIN	DDLY =70, Offset = 0 (fixed)

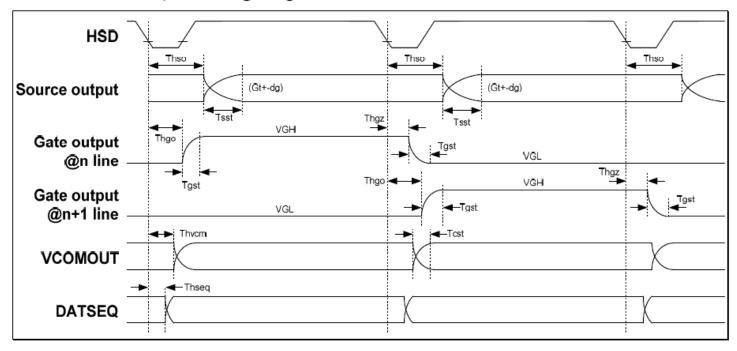
Clock and Data Input Timing Diagram



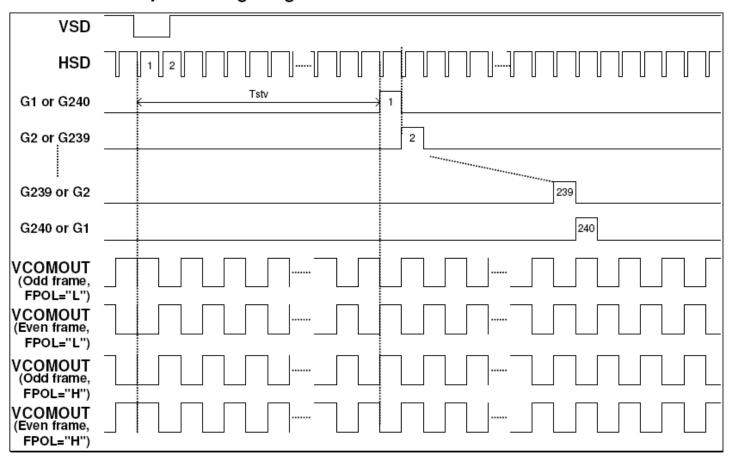
3-Wire Timing Diagram



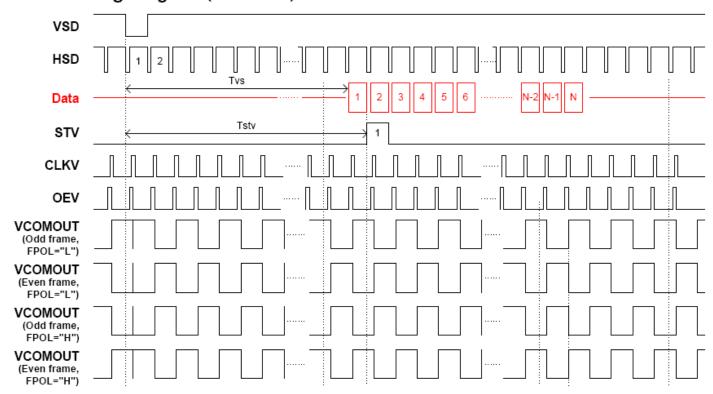
Source Driver Output Timing Diagram



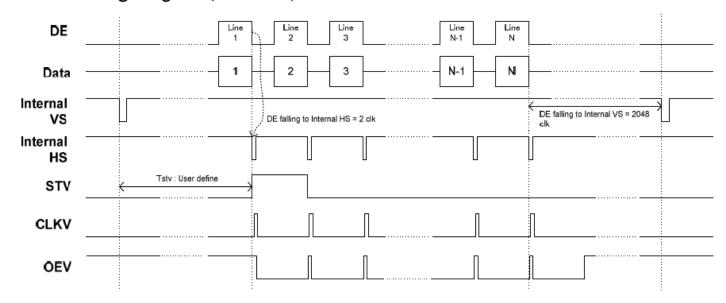
Gate Driver Output Timing Diagram



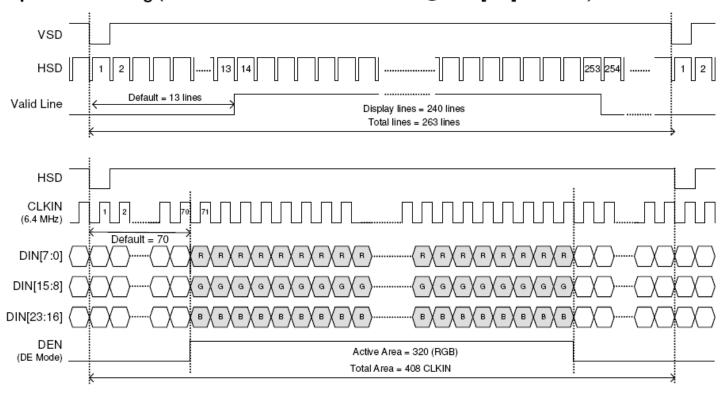
Vertical Timing Diagram (HV Mode)



Vertical Timing Diagram (DE Mode)



Input Data Timing (24 bit RGB mode for 960 x 240 @ SEL[3:0] = 1100b)



Quality Information

Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high	+70°C , 240hrs	2
	storage temperature for a long time.		
Low Temperature storage	Endurance test applying the low storage	-30°C , 240hrs	1,2
	temperature for a long time.		
High Temperature	Endurance test applying the electric stress	+60°C, 240hrs	2
Operation	(voltage & current) and the high thermal		
	stress for a long time.		
Low Temperature	Endurance test applying the electric stress	-20°C , 240hrs	1,2
Operation	(voltage & current) and the low thermal		
	stress for a long time.		
High Temperature /	Endurance test applying the electric stress	+60°C, 90% RH, 160hrs	1,2
Humidity Operation	(voltage & current) and the high thermal		
	with high humidity stress for a long time.		
Thermal Shock resistance	Endurance test applying the electric stress	-30°C,30min -> 25°C,5min ->	
	(voltage & current) during a cycle of low	80°C,30min = 1 cycle	
	and high thermal stress.	100 cycles	
Vibration test	Endurance test applying vibration to	10-55Hz , 15mm amplitude.	3
	simulate transportation and use.	60 sec in each of 3 directions	
		X,Y,Z	
		For 15 minutes	
Static electricity test	Endurance test applying electric static	VS=4KV, RS=330kΩ, CS=150pF	
	discharge.	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