

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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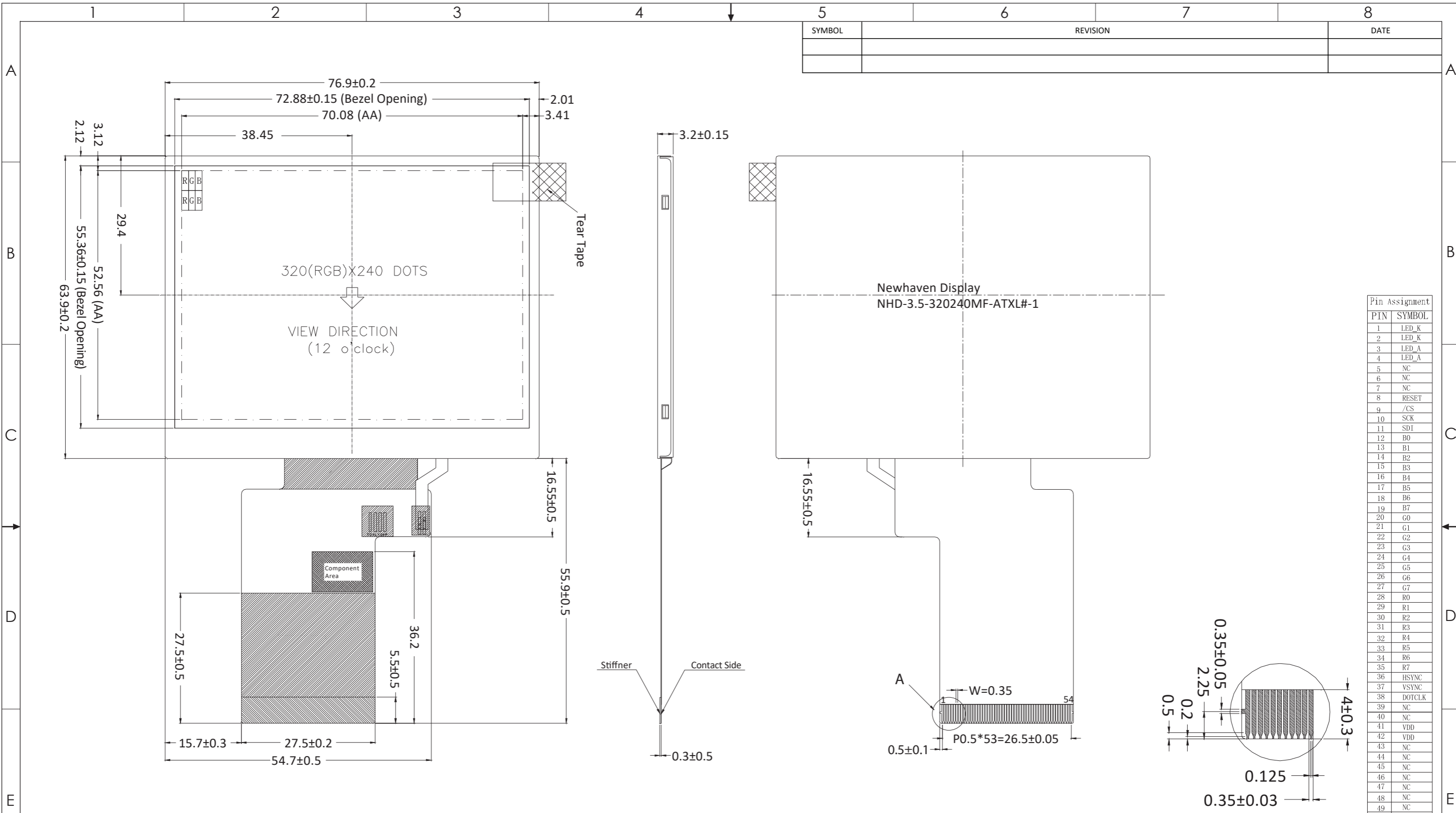
Document Revision History

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
11	3/12/19	I_{LED} Updated and Drawing Repaired	SB
12	6/19/19	Backlight Characteristics Updated	SB
13	1/16/20	V_{LED} Updated	SB

Functions and Features

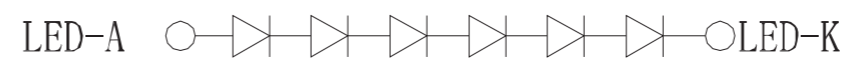
- 320xRGBx240 resolution
- LED backlight
- 3.3V power supply
- 24-bit Parallel digital RGB interface (6.4MHz)

SYMBOL	REVISION	DATE



PIN	SYMBOL
1	LED_K
2	LED_K
3	LED_A
4	LED_A
5	NC
6	NC
7	NC
8	RESET
9	/CS
10	SCK
11	SDI
12	B0
13	B1
14	B2
15	B3
16	B4
17	B5
18	B6
19	B7
20	G0
21	G1
22	G2
23	G3
24	G4
25	G5
26	G6
27	G7
28	R0
29	R1
30	R2
31	R3
32	R4
33	R5
34	R6
35	R7
36	HSYNC
37	VSYNC
38	DOTCLK
39	NC
40	NC
41	VDD
42	VDD
43	NC
44	NC
45	NC
46	NC
47	NC
48	NC
49	NC
50	NC
51	NC
52	DEN
53	GND
54	GND

- NOTES:**
- 1. Display Size: 3.5" TFT
 - 2. Optimal View: 12:00
 - 3. Display Mode: Transmissive / Normally White / Anti-Glare
 - 4. Driver IC: NV3035C
 - 5. Supply Voltage: 3.3V
 - 6. Backlight: White LED / 19.2 V / 18 mA (Typ)
 - 7. Luminance: 400 cd/m² (Typ)



STANDARD TOLERANCE: (UNLESS OTHERWISE SPECIFIED)		NEWHAVEN DISPLAY INTERNATIONAL	
LINEAR: ±0.3mm		DRAWING/PART NUMBER: NHD-3.5-320240MF-ATXL#-1	REVISION: 1.0
UNLESS OTHERWISE SPECIFIED: - DIMENSIONS ARE IN MILLIMETERS - THIRD ANGLE PROJECTION		DRAWN BY: S. Baxi	APPROVED BY: S. Baxi
		DRAWN DATE: 06/19/19	APPROVED DATE: 06/19/19
DO NOT SCALE DRAWING			SHEET 1 OF 1
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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 Current	I _{LED}	-	15	18	21	mA
Backlight Supply Voltage	V _{LED}	I _{LED} = 18mA	16.8	19.2	20.4	V
Backlight Lifetime*	-	T _{OP} = 25° C	20,000	50,000	-	Hrs.

*Backlight lifetime is rated as Hours until **half-brightness**, under normal operating conditions. The LED of the backlight is driven by current drain; drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 10	-	60	-	°
	Bottom	φY-		-	40	-	°
	Left	θX-		-	60	-	°
	Right	θX+		-	60	-	°
Contrast Ratio		CR	-	200	350	-	-
Luminance		L _V	I _{LED} = 18 mA	320	400	-	cd/m ²
Response Time	Rise	T _r	T _{OP} =25°C	-	25	40	ms
	Fall	T _f		-	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

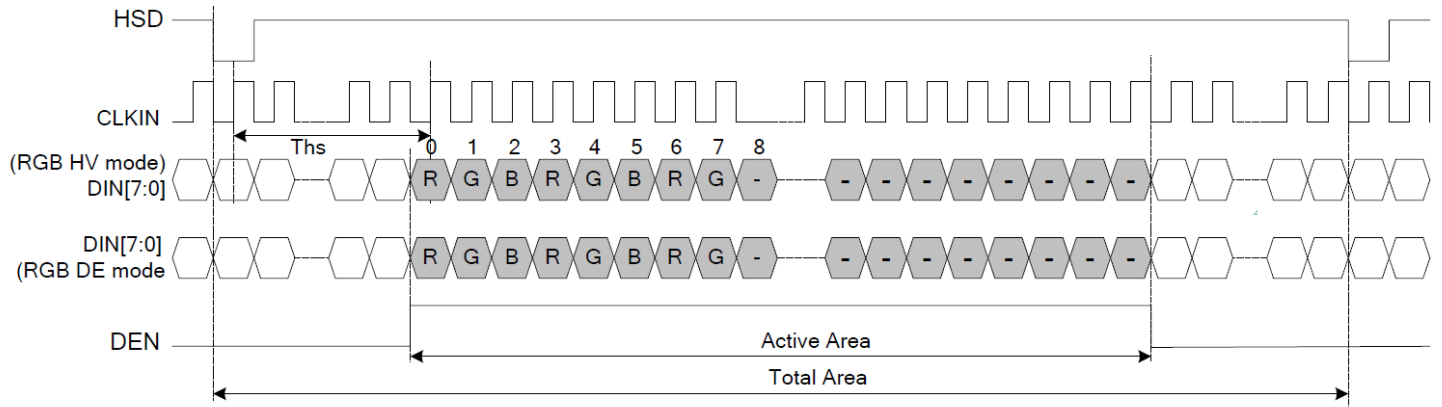
ROFh = 24h

Timing Characteristics

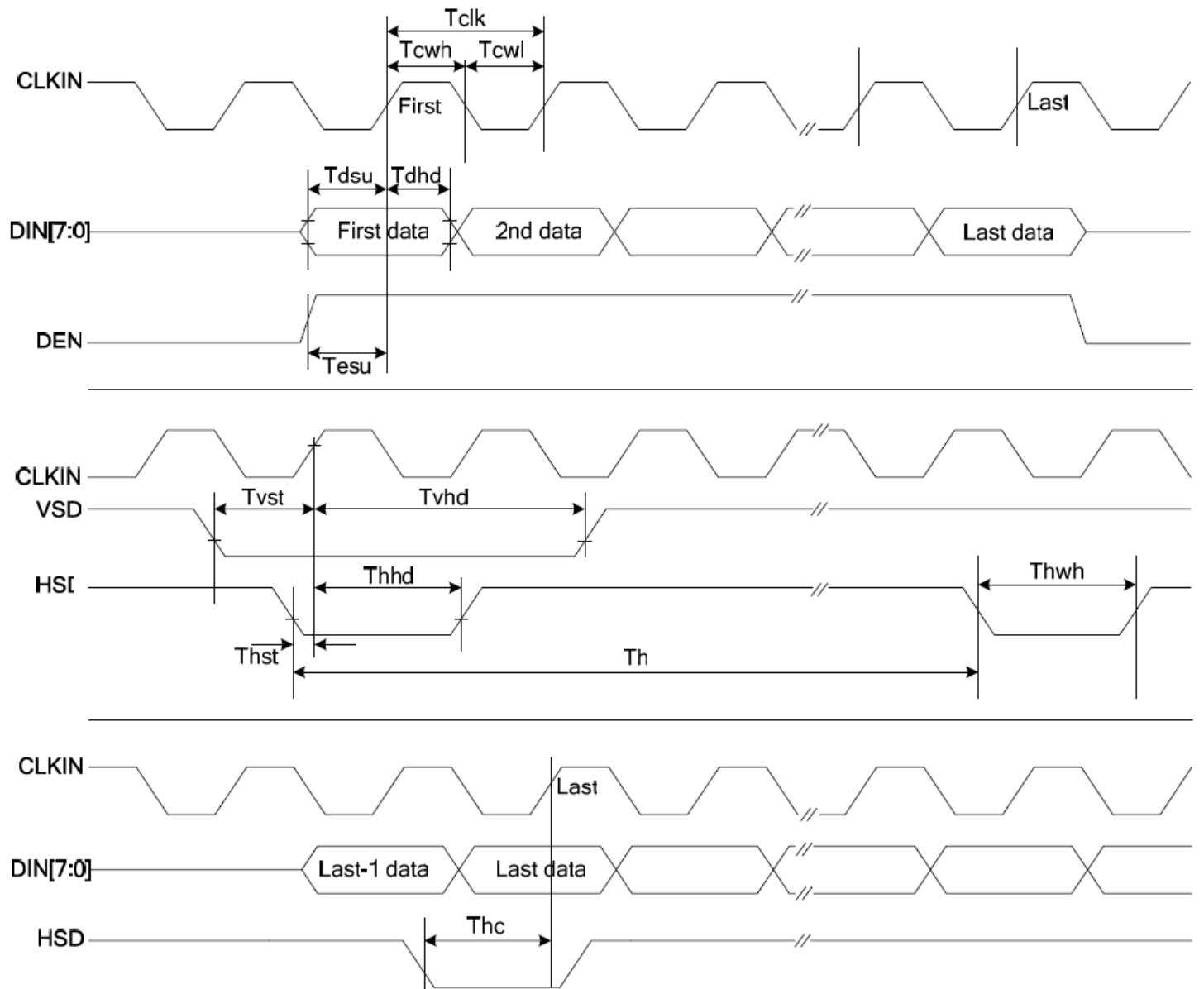
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
System Operation Timing						
VDD power source slew time	T _{POR}			1000	us	From 0V to 90% VDD
RSTB active pulse width	T _{RSTB}	40			us	VDD=3.3V
Input Output Timing						
CLKIN clock time	Tclk	-		35.7	ns	Please refer to timing table(P25)
HSD to CLKIN	T _{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 _{ev}	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	Fclk	6.1	6.4	8.0	MHz	VDD=3.0~3.6V
CLKIN cycle time	Tclk	125	156	164	ns	
CLKIN pulse duty	T _{cwh}	40	50	60	%	Tclk
Time that HSD to 1 st data input(NTSC)	T _{hs}	40	70	255	CLKIN	DDLY=70,Offset=0(fixed)

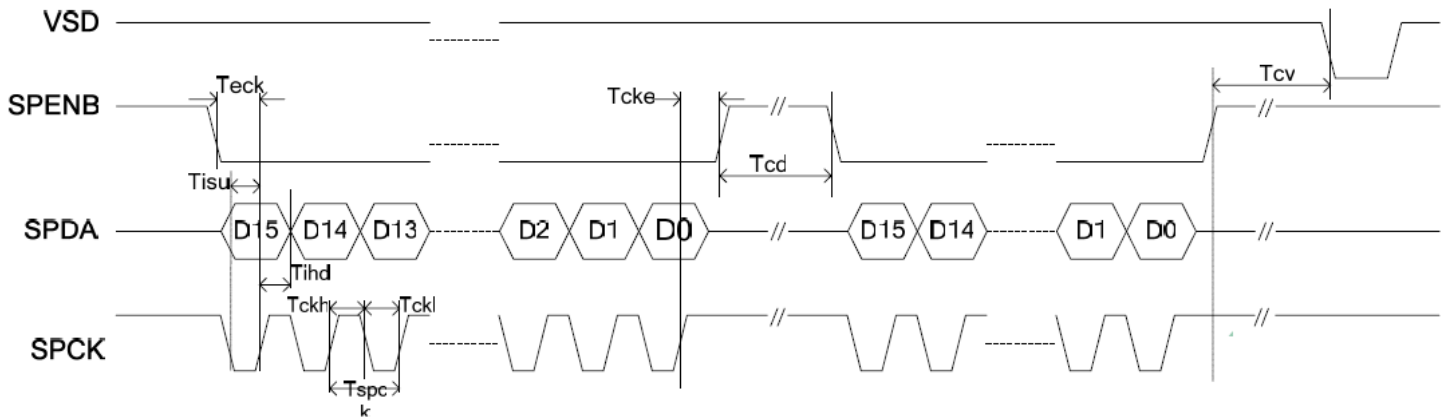
Input Data Format



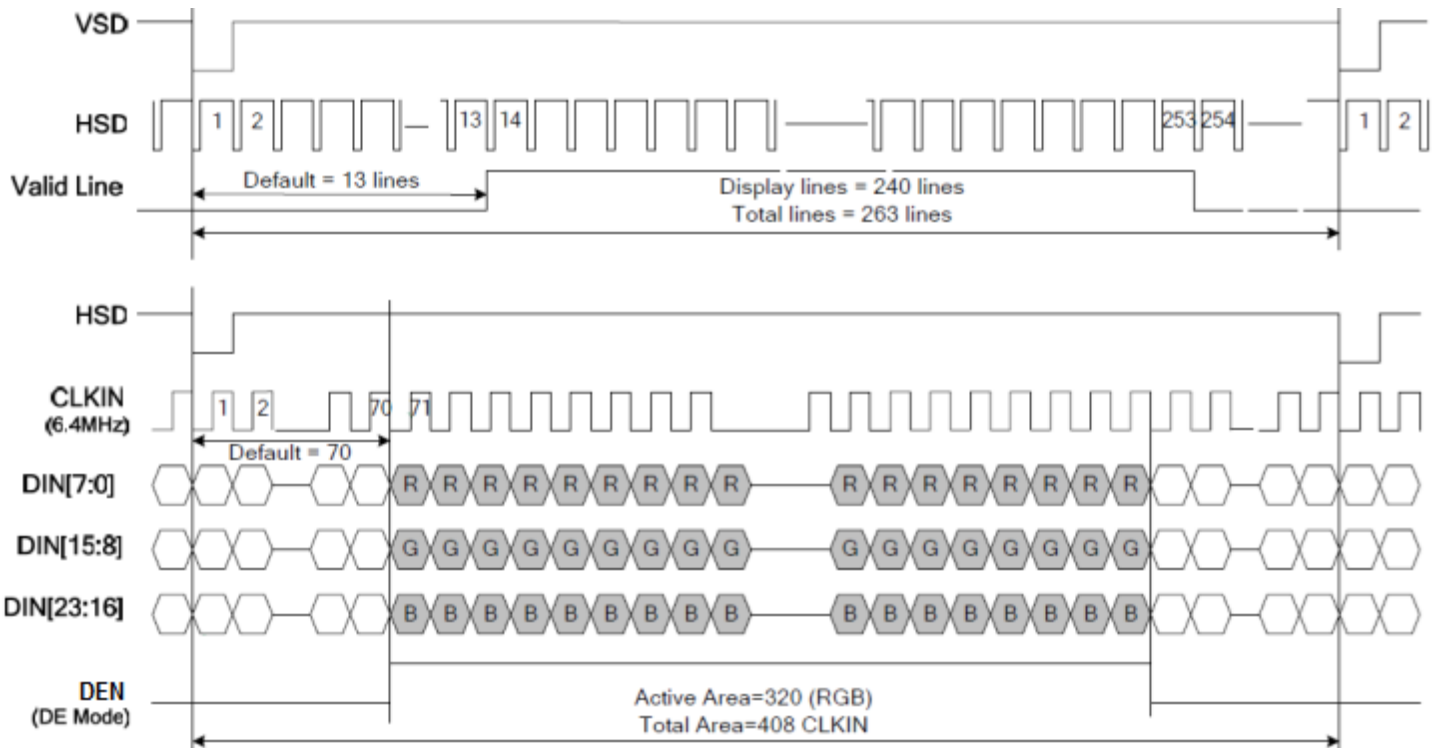
Clock and Data Input Timing Diagram



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