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**

Newhaven Display International, Inc.

2511 Technology Drive, Suite 101

Elgin IL, 60124

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

www.newhavendisplay.com

nhtech@newhavendisplay.com nhsales@newhavendisplay.com

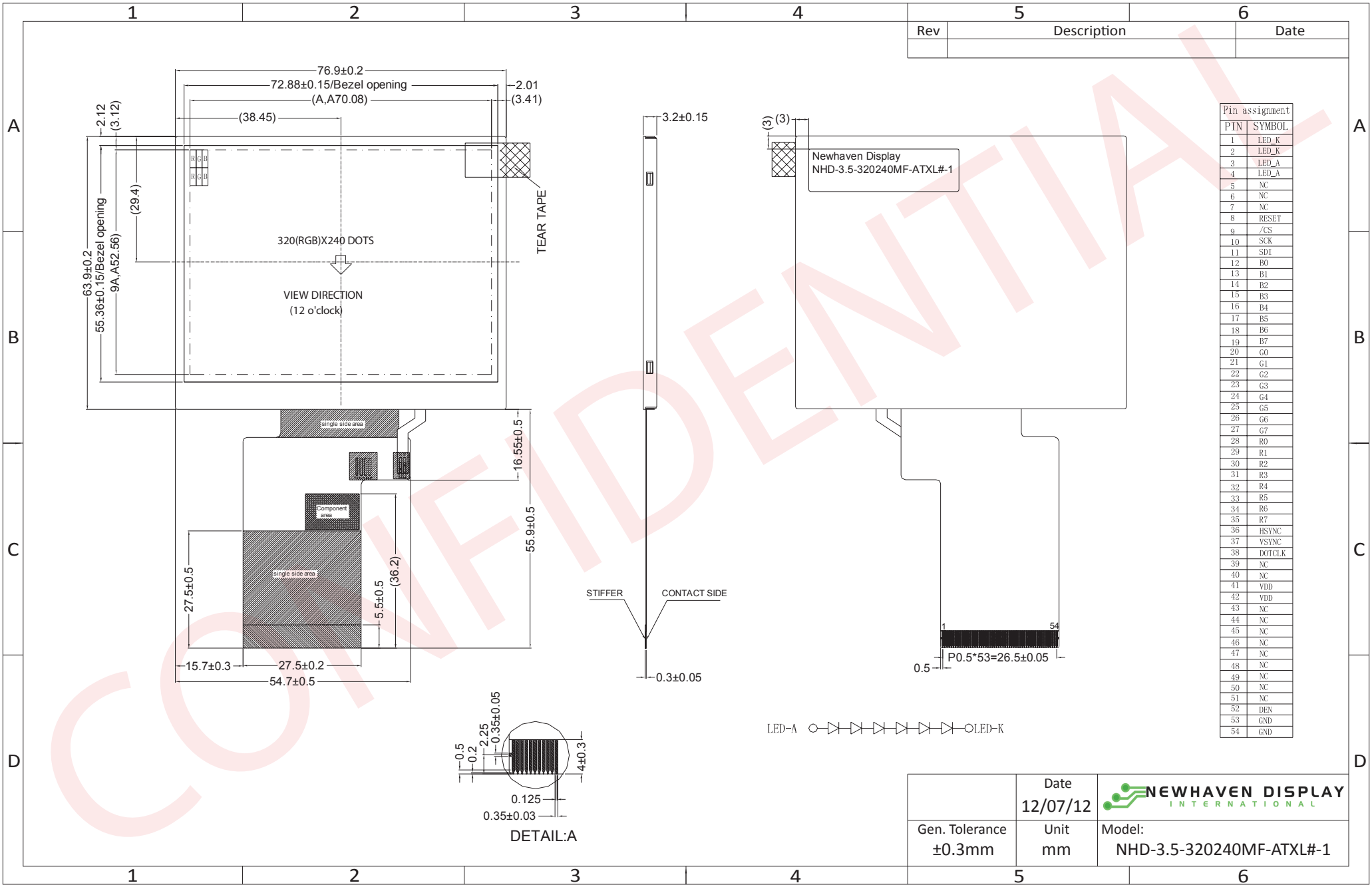
Document Revision History

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

Functions and Features

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

Mechanical Drawing



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	VDD	Power Supply	Supply Voltage for LCD and logic (3.3V)
42	VDD	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	Top	Absolute Max	-20	-	+70	°C
Storage Temperature Range	Tst	Absolute Max	-30	-	+80	°C
Digital Supply Voltage	VDD		3.0	3.3	3.6	V
Supply Current	IDD	VDD=3.3V	-	25	40	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	Iled	Vled=19.2V	-	18	20	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle – Top		Cr ≥ 10	-	40	-	°
Viewing Angle – Bottom			-	60	-	°
Viewing Angle – Left			-	60	-	°
Viewing Angle – Right			-	60	-	°
Contrast Ratio	Cr		200	350	-	
Luminance	Lv		320	400	-	cd/m^2
Response Time (rise)	Tr		-	25	40	ms
Response Time (fall)	Tf		-	25	40	ms

Viewing angles based on 6:00 gray-scale inversion

Driver Information

Built-in NV3035C driver. No controller.
Please download specification at http://www.newhavendisplay.com/app_notes/NV3035C.pdf

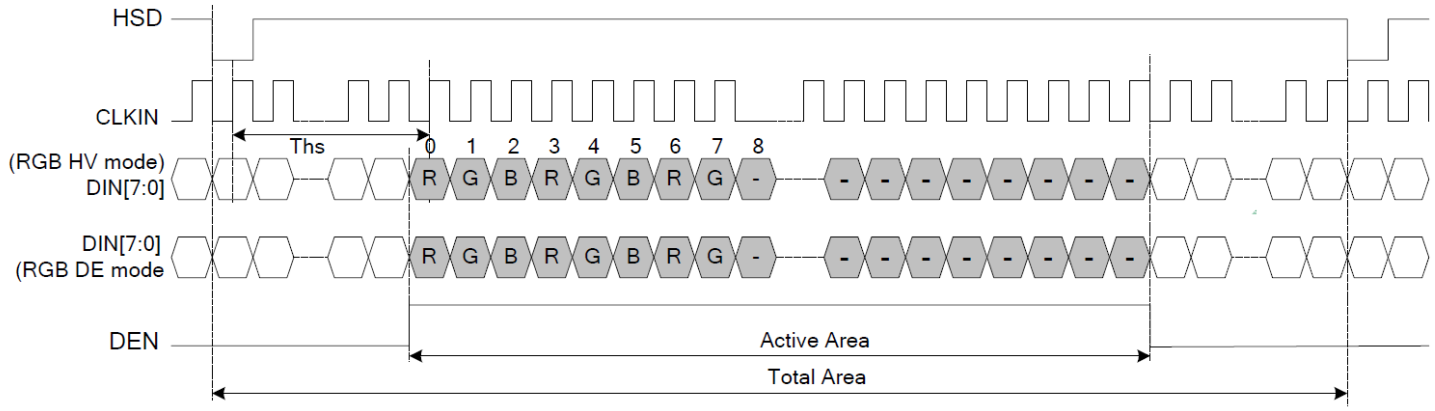
Note: To achieve optimum VCOM and VGL settings, the SPI interface may be used to set the following registers:
R0Eh = 6Bh
R0Fh = 24h

Timing Characteristics

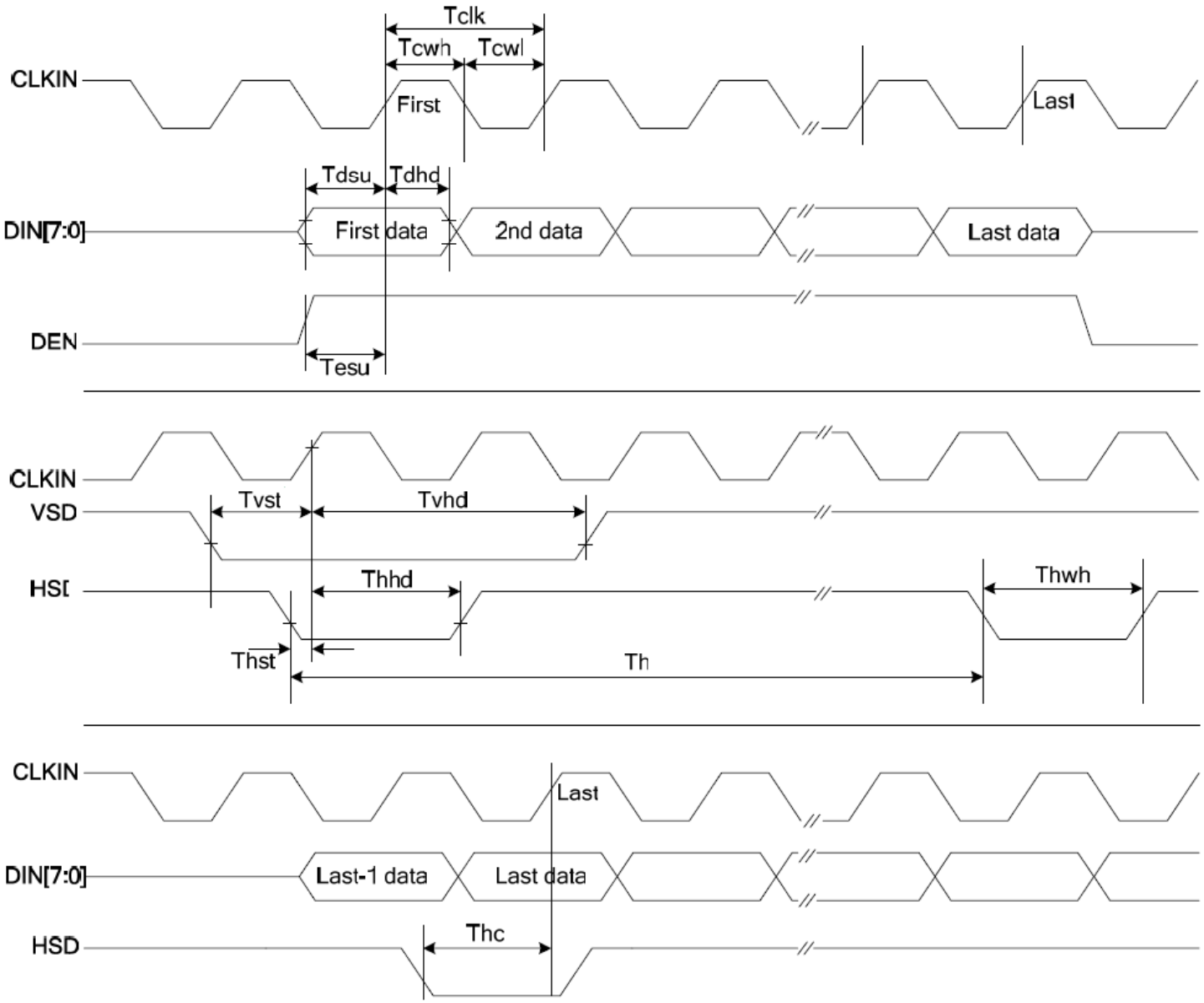
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
System Operation Timing						
VDD power source slew time	T_{POR}			1000	us	From 0V to 90% VDD
RSTB active pulse width	T_{RSTB}	40			us	VDD=3.3V
Input Output Timing						
CLKIN clock time	Tclk	-		35.7	ns	Please refer to timing table(P25)
HSD to CLKIN	Thc	-	-	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	12	-	-	ns	
VSD hold time	Tvhd	12	-	-	ns	
HSD setup time	Thst	12	-	-	ns	
HSD hold time	Thhd	12	-	-	ns	
Data set-up time	Tdsu	12	-	-	ns	DIN[23:0] to CLKIN
Data hold time	Tdhd	12	-	-	ns	DIN[23:0] to CLKIN
DEN setup time	Tesd	12	-		ns	DEN to CLKIN
Time that VSD to 1st line data input	Tvs	2	13	127	Th	@CIR601/8bit RGB HV mode Control by HDLY[6:0] setting Tvs=HDLY[6:0]
Time that CCIR_V to 1st line data input	Tvs	12	20	28	Th	@CCIR656 NTSC mode Control by HDLY[6:0] setting Tvs=HDLY[6:0]
Time that CCIR_V to 1st 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 data input	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	Tcst	-	4	8	us	96% final, CL=33nF, RL=100ohm
3-wire serial communication AC timing						
Serial clock	Tspck	320	-	-	ns	
SPCK pulse duty	Tscdut	40	50	60	%	Tckh/Tspck
Serial data setup time	Tisu	120	-	-	ns	
Serial data hold time	Tihd	120	-	-	ns	
Serial clock high/low	Tssw	120	-	-	ns	
Chip select distinguish	Tcd	1	-	-	us	
SPENA to VSD	Tcv	1	-	-	us	
SPENB input setup time	Teck	150	-	-	Ns	
SPENB input hold time	Tcke	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	Tcwh	40	50	60	%	Tclk
Time that HSD to 1st data input(NTSC)	Ths	40	70	255	CLKIN	DDLY=70,Offset=0(fixed)

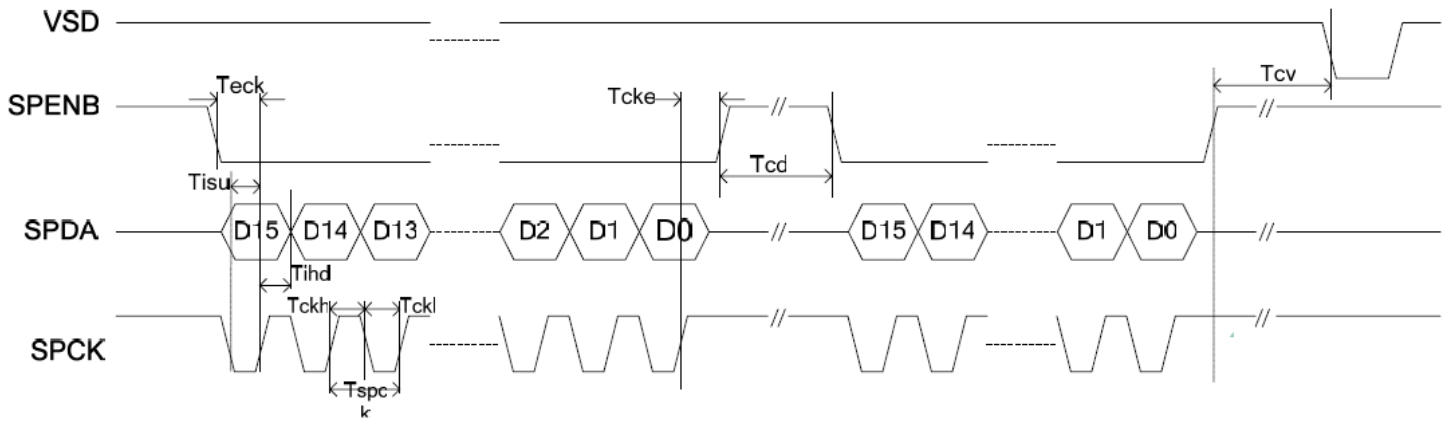
Input Data Format



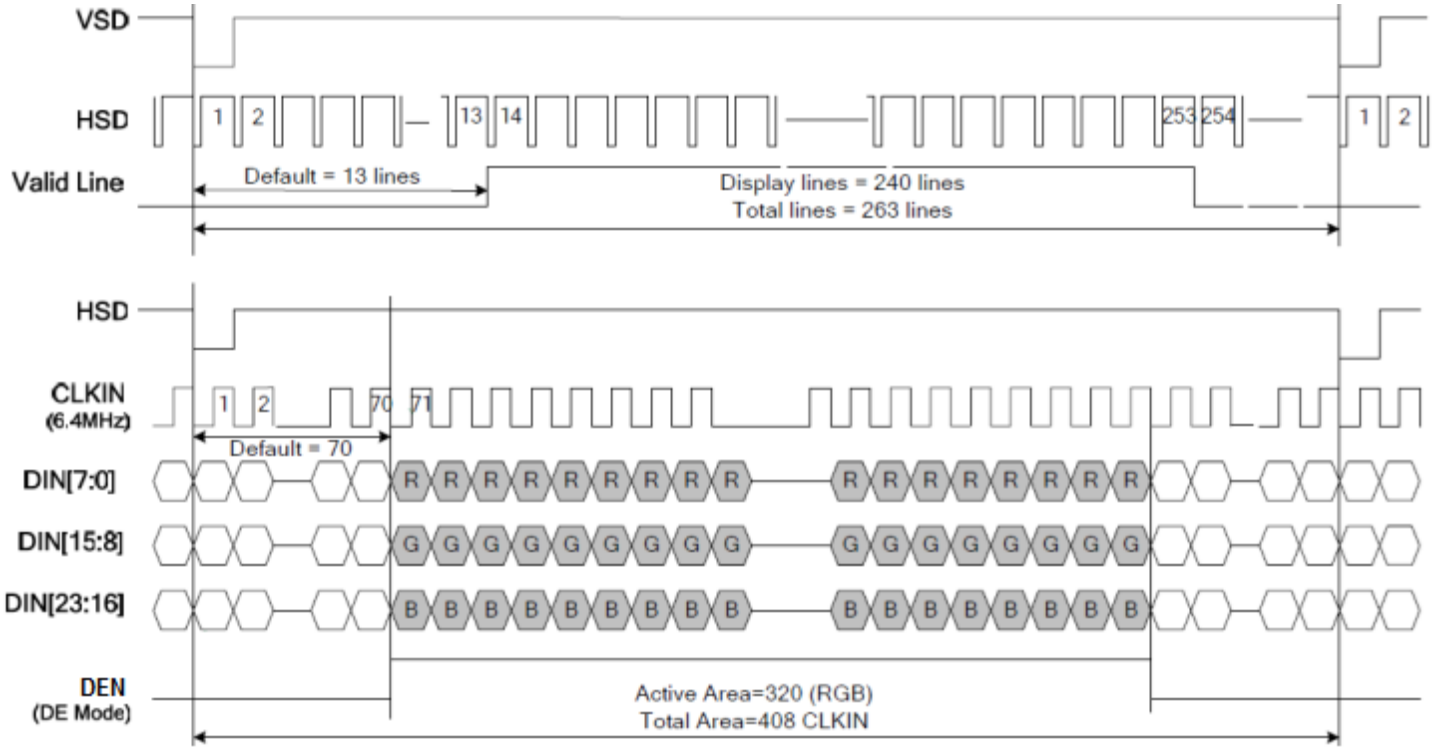
Clock and Data Input Timing Diagram



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.	+70°C , 240hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 240hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+60°C , 240hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 240hrs	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 , 160hrs	1,2
Thermal Shock resistance	Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.	-30°C,30min -> 25°C,5min -> 80°C,30min = 1 cycle 100 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=4KV, RS=330kΩ, CS=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