NHD-3.5-320240MF-20 Controller Board

TFT Controller Evaluation Board

NHD-	Newhaven Display
3.5-	3.5” Diagonal
320240-	320xRGBx240 pixels
MF-	Model
20-	20-POS FFC interface (8-bit data) SSD1963 Controller

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

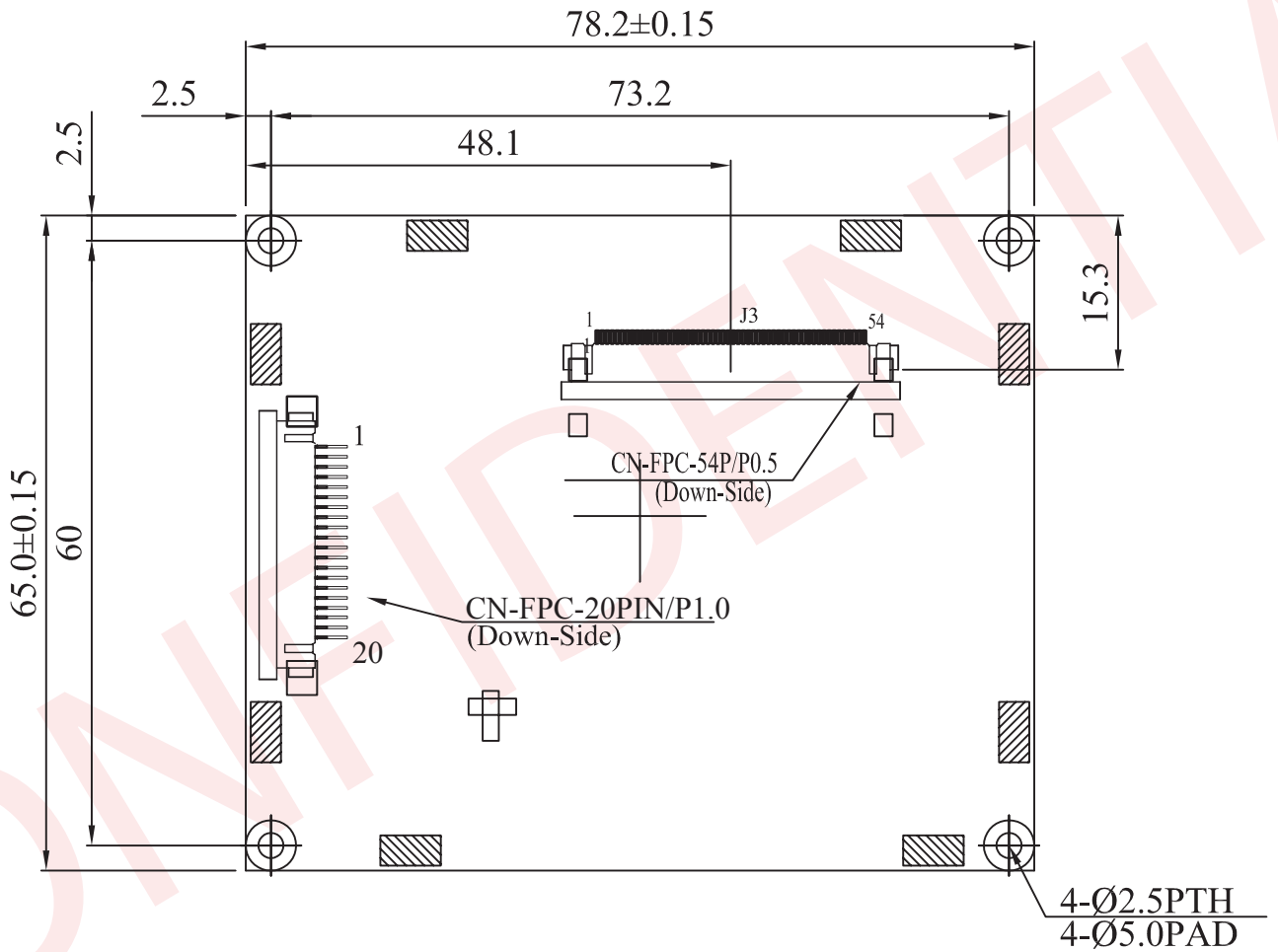
Revision	Date	Description	Changed by
0	5/14/2007	Initial Release	CL
1	4/17/2012	Mechanical drawing updated	AK
2	4/27/2012	J2 Pin description updated	AK
3	1/25/2013	J2 Pin description updated	AK

Functions and Features

- **To use for testing, evaluating, or in final production with NHD-3.5-320240MF-A displays.**

Mechanical Drawing

Rev	Description	Date



	Date	
	01/24/13	NEWHAVEN DISPLAY INTERNATIONAL
Gen. Tolerance	Unit	Model:
±0.3mm	mm	NHD-3.5-320240MF-20

Pin Description

J2 (SSD1963 input from user's MPU):

Pin No.	Symbol	External Connection	Function Description
1	VSS	Power Supply	Ground
2	VDD	Power Supply	Power supply for LCD and logic (3.3V)
3	B/L Enable	Power Supply	Backlight Enable
4	RS	MPU	Register Select. RS=0: Command, RS=1: Data
5	/WR	MPU	8080 mode: Active LOW Write
6	/RD	MPU	8080 mode: Active LOW Read
7-14	DB0-DB7	MPU	8-bit bidirectional data bus
15	/CS	MPU	Active LOW Chip Select
16	/RST	MPU	Active LOW Reset
17	NC	-	No Connect
18	NC	-	No Connect
19	NC	-	No Connect
20	NC	-	No Connect

J3, J4 (SSD1963 output to display panel):

Pin No.	Symbol	External Connection	Function Description
1	LED-	LED Power Supply	Ground for backlight
2	LED-	LED Power Supply	Ground for backlight
3	LED+	LED Power Supply	Power for backlight
4	LED+	LED Power Supply	Power for backlight
5-7	NC	-	No Connect
8	/RST	MPU	Active LOW Reset
9	/CS	-	Active LOW Serial Chip Select (No Connect)
10	SCL	-	Serial Clock (No Connect)
11	SDA	-	Serial Data (No Connect)
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
39-40	NC	-	No Connect
41	VDD	Power Supply	Power supply for LCD and logic (3.3V)
42	VDD	Power Supply	Power supply for LCD and logic (3.3V)
43-51	NC	-	No Connect
52	DE	-	Data Enable (No Connect)
53	VSS	Power Supply	Ground
54	VSS	Power Supply	Ground

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		3.0	3.3	3.6	V
Supply Current	IDD		-	25	-	mA
Input High Voltage	VIH		0.8*VDD	-	VDD	V
Input Low Voltage	VIL		VSS	-	0.2*VDD	V
Backlight Voltage	VLED	ILED=20mA	18	19.2	20.4	V
Backlight Current	ILED		-	18	20	mA

Controller Information

Built-in SSD1963 controller

Please download specification at http://www.newhavendisplay.com/app_notes/SSD1963.pdf

MCU Interface

The controller board operates in 8080 mode. This interface uses /WR to define a write cycle and /RD for read cycle. If /WR goes low when the /CS signal is low, the data or command will be latched into the system at the rising edge of /WR. Similarly, the read cycle will start when /RD goes low and end at the rising edge of /RD.

Pixel Data Format

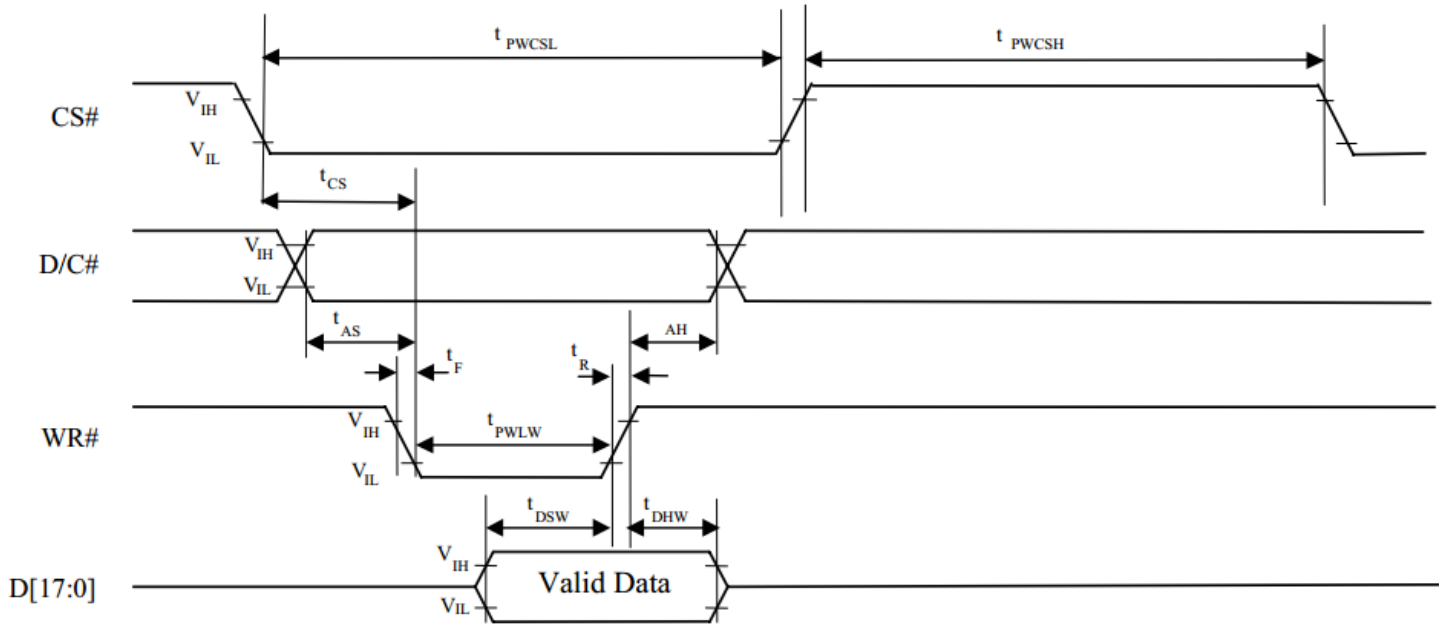
Interface	Cycle	D[23]	D[22]	D[21]	D[20]	D[19]	D[18]	D[17]	D[16]	D[15]	D[14]	D[13]	D[12]	D[11]	D[10]	D[9]	D[8]	D[7]	D[6]	D[5]	D[4]	D[3]	D[2]	D[1]	D[0]
24 bits	1st	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
18 bits	1st							R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
16 bits (565 format)	1st									R5	R4	R3	R2	R1	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1
16 bits	1st									R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0
	2nd									B7	B6	B5	B4	B3	B2	B1	B0	R7	R6	R5	R4	R3	R2	R1	R0
	3rd									G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
12 bits	1st													R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4
	2nd													G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
9 bits	1st																R5	R4	R3	R2	R1	R0	G5	G4	G3
	2nd																G2	G1	G0	B5	B4	B3	B2	B1	B0
8 bits	1st																	R7	R6	R5	R4	R3	R2	R1	R0
	2nd																	G7	G6	G5	G4	G3	G2	G1	G0
	3rd																	B7	B6	B5	B4	B3	B2	B1	B0

Timing Characteristics

Parallel 8080-series Interface Timing

Symbol	Parameter		Min	Typ	Max	Unit
f_{MCLK}	System Clock Frequency*		1	-	110	MHz
t_{MCLK}	System Clock Period*		$1/f_{MCLK}$	-	-	ns
t_{PWCSL}	Control Pulse High Width	Write	13	1.5* t_{MCLK}	-	ns
		Read	30	3.5* t_{MCLK}		
t_{PWCSH}	Control Pulse Low Width	Write (next write cycle)	13	1.5* t_{MCLK}	-	ns
		Write (next read cycle)	80	9* t_{MCLK}		
		Read	80	9* t_{MCLK}		
t_{AS}	Address Setup Time		1	-	-	ns
t_{AH}	Address Hold Time		2	-	-	ns
t_{DSW}	Write Data Setup Time		4	-	-	ns
t_{DHW}	Write Data Hold Time		1	-	-	ns
t_{PWLW}	Write Low Time		12	-	-	ns
t_{DHR}	Read Data Hold Time		1	-	-	ns
t_{ACC}	Access Time		32	-	-	ns
t_{PWLR}	Read Low Time		36	-	-	ns
t_R	Rise Time		-	-	0.5	ns
t_F	Fall Time		-	-	0.5	ns
t_{CS}	Chip select setup time		2	-	-	ns
t_{CSH}	Chip select hold time to read signal		3	-	-	ns

* System Clock denotes external input clock (PLL-bypass) or internal generated clock (PLL-enabled)



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

Warranty Information and Terms & Conditions

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