NHD-3.5-320240MF-20 Test 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

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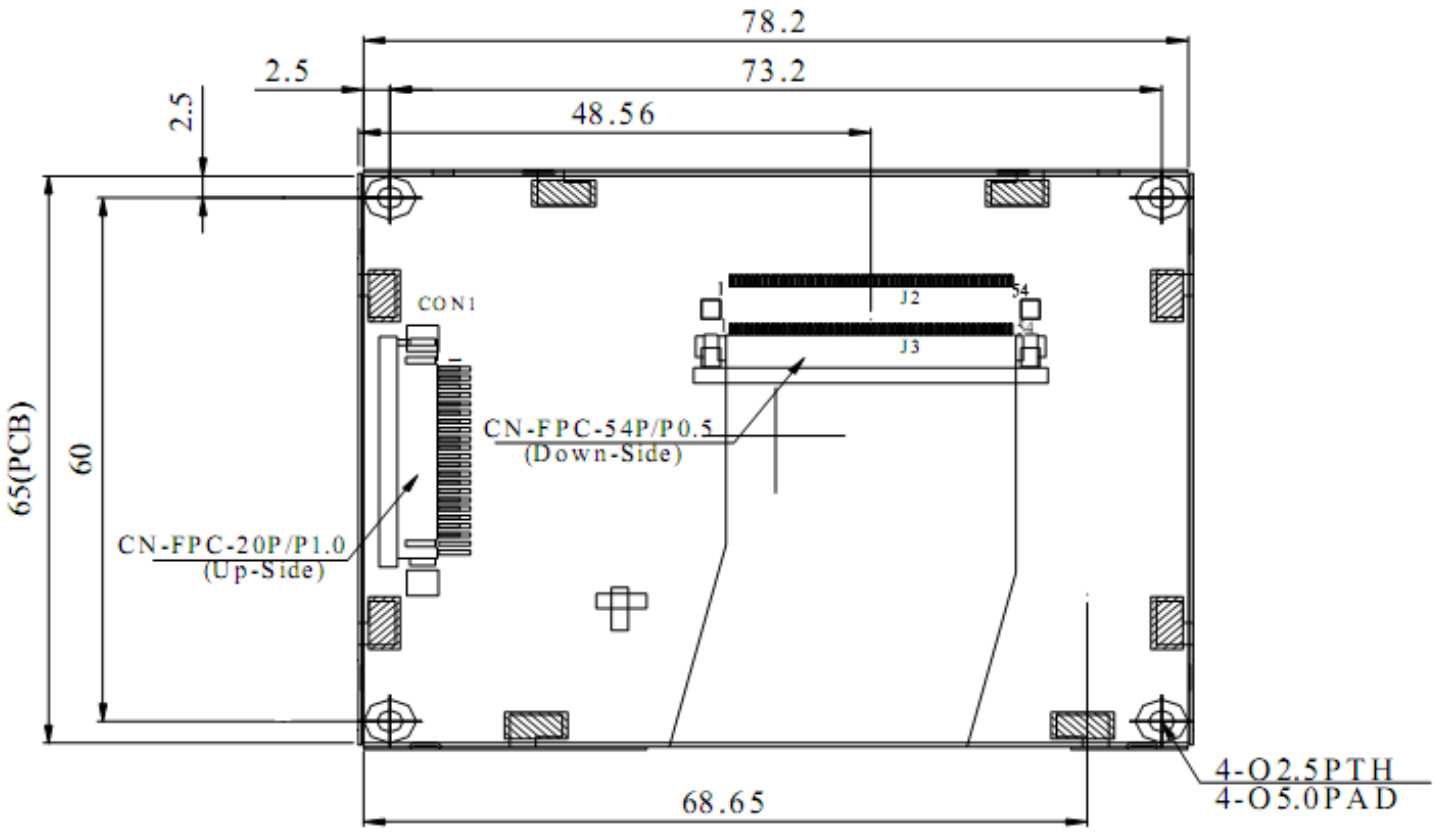
Document Revision History

Revision	Date	Description	Changed by
0	5/14/2007	Initial Release	CL

Functions and Features

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

Mechanical Drawing NHD-3.5-320240MF Test Board



Note: CON1 has a 20-pos FFC connector assembled, pins 21,22 not connected.

Pin Description: CON1 (SSD1963 input from user's MPU)

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

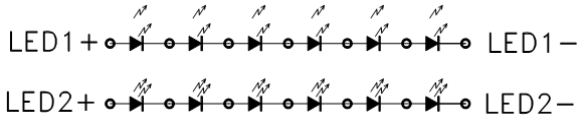
Pin Description: J2,J3 (SSD1963 output to display panel)

Pin No.	Symbol	External Connection	Function Description
1-2	LED-	LED Power Supply	Backlight GND
3-4	LED+	LED Power Supply	Backlight Power (32mA @ 20~22V)
5-6	NC	-	No Connect
7	POL	Output	Polarity signal to monitor VCOM signal
8	RESET	MPU	Active LOW Reset
9	CS	MPU	Active LOW Chip Select
10	SCL	MPU	Serial Clock (No Connect)
11	SDI	MPU	Serial Data In (No Connect)
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	HSYNC	MPU	Line synchronization signal
37	VSYNC	MPU	Frame synchronization signal
38	DCLK	MPU	Dot clock signal
39-40	NC	-	No Connect
41-42	VCC	Power Supply	Power supply for LCD and logic (3.3V)
43-44	NC	-	No Connect
45	ID	-	No Connect
46	SLEEP	MPU	Sleep mode select: 1=Sleep, 0=Normal Operation
47-51	NC	-	No Connect
52	DE	MPU	Data Enable (No Connect)
53-54	GND	Power Supply	GND

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
Digital Operating Current	IDD		-	8.6	-	mA
Input High Voltage	VIH		0.8*VDD	-	VDD	V
Input Low Voltage	VIL		0	-	0.2*VDD	V
Backlight Current	ILED		-	20	25	mA
Power Consumption	PLED		-	400	420	mW
Backlight Voltage	VLED	ILED=20mA	18.6	19.2	21	V
LED Lifetime		ILED=20mA	50,000	-	-	Hr

Backlight diagram:



Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle – Top		Cr ≥ 10	-	40	-	°
Viewing Angle – Bottom		Cr ≥ 10	-	60	-	°
Viewing Angle – Left		Cr ≥ 10	-	60	-	°
Viewing Angle – Right		Cr ≥ 10	-	60	-	°
Contrast Ratio	Cr		-	350	-	
Luminance	Y_L		240	300	-	cd/m^2
Response Time (rise)	Tr	-	-	10	-	ms
Response Time (fall)	Tf	-	-	15	-	ms

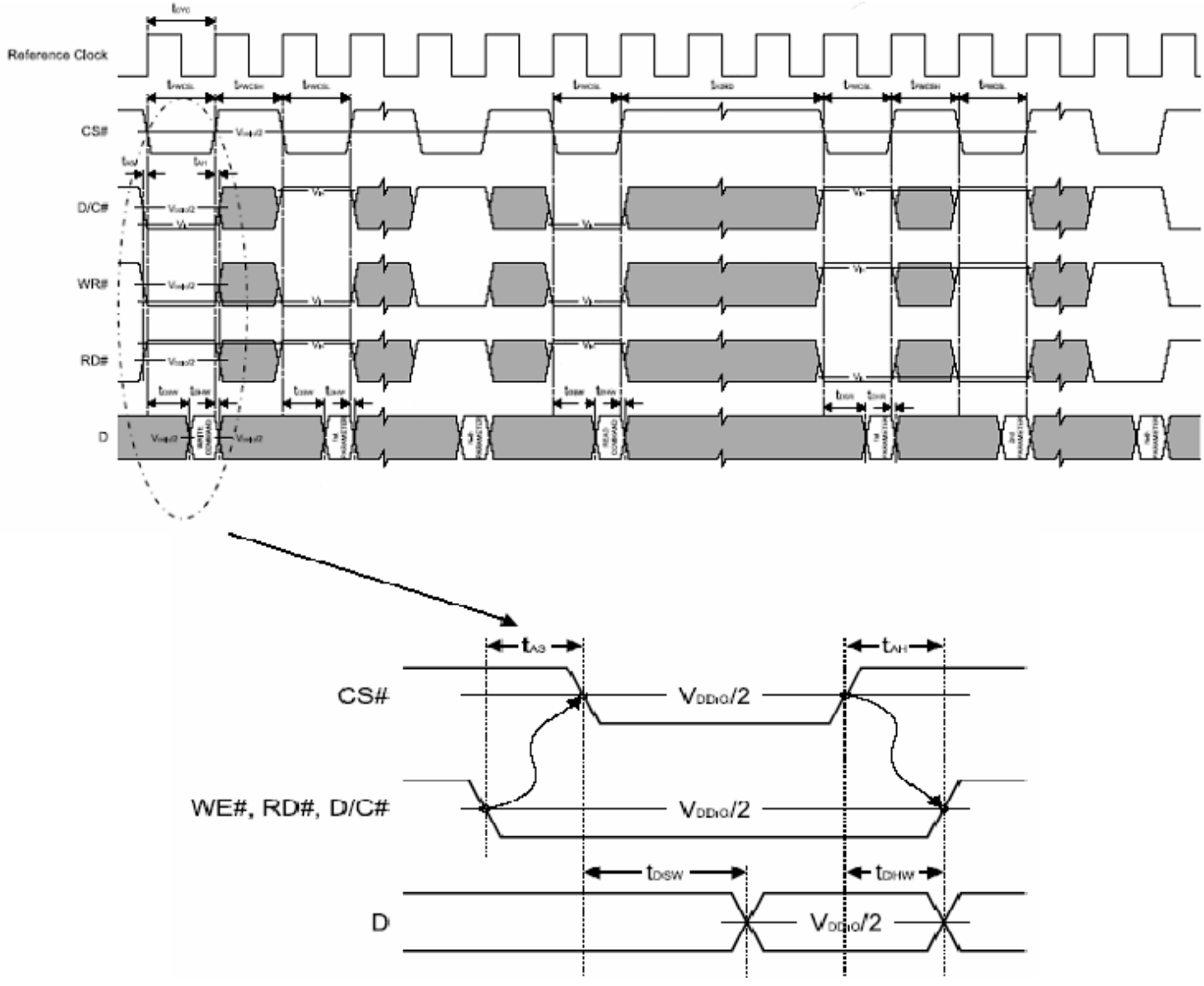
Controller Information

Built-in SSD1963

For specific timing and color information, please download specification at
http://www.newhavendisplay.com/app_notes/SSD1963.pdf

8080 Mode Timing:

Symbol	Parameter	Min	Typ	Max	Unit
tcyc	Reference Clock Cycle Time	9	-	-	ns
tPWCSL	Pulse width CS# low	1	-	-	tCYC
tPWCSH	Pulse width CS# high	1	-	-	tCYC
tFDRD	First Read Data Delay	5	-	-	tCYC
tAS	Address Setup Time	1	-	-	ns
tAH	Address Hold Time	1	-	-	ns
tDSW	Data Setup Time	4	-	-	ns
tDHW	Data Hold Time	1	-	-	ns
tDSR	Data Access Time	-	-	5	ns
tDHR	Output Hold time	1	-	-	ns



Pixel Data Format

Both 6800 and 8080 support 8-bit, 9-bit, 16-bit, 18-bit and 24-bit data bus. Depending on the width of the data bus, the display data are packed into the data bus in different ways.

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									R5	R4	R3	R2	R1	R0	X	X	G5	G4	G3	G2	G1	G0	X	X
	2nd									B5	B4	B3	B2	B1	B0	X	X	R5	R4	R3	R2	R1	R0	X	X
	3rd									G5	G4	G3	G2	G1	G0	X	X	B5	B4	B3	B2	B1	B0	X	X
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																	R5	R4	R3	R2	R1	R0	X	X
	2nd																	G5	G4	G3	G2	G1	G0	X	X
	3rd																	B5	B4	B3	B2	B1	B0	X	X

X: Don't Care

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