



NHD-2.4-240320SF-CTXI#-FT1

TFT (Thin-Film Transistor) Liquid Crystal Display Module

NHD- Newhaven Display 2.4- 2.4" Diagonal

240320- 240 x 320 Pixels (Portrait Mode)

SF- Model

C- Built-in Controller
T- White LED Backlight

X- TFT

I- 12:00 Optimal View, Wide Temperature

#- RoHS Compliant

F- FFC ZIF Connection Style

T- Touch Panel 1- ILI9341 Controller

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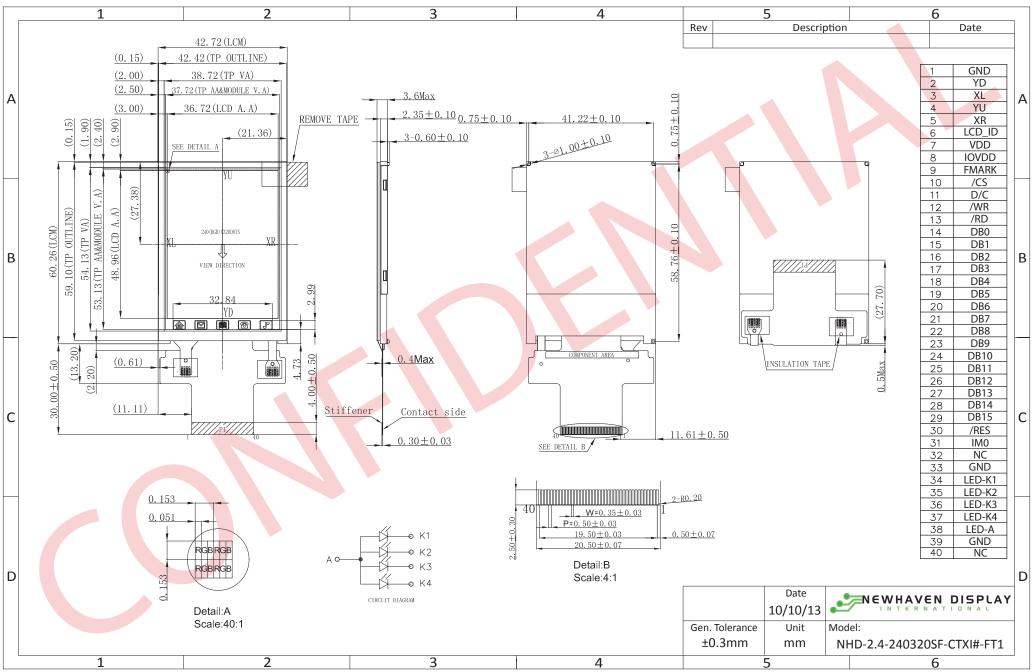
Document Revision History

Revision	Date	Description	Changed by
0	9/20/2010	Initial Release	BE
1	5/9/2012	Timing characteristics updated	AK
2	6/28/2012	Electrical & Optical characteristics updated	TJ
3	12/10/2012	Added wiring diagram. Updated mechanical drawing &	JN
		electrical characteristics.	
		Mechanical Drawing, Pin Description, Wiring Diagram,	
4	10/10/2013	Electrical/Optical Characteristics, Example Code updated.	ML
		Controller changed to ILI9341	
5	4/21/2014	Changed optimal viewing direction in datasheet	ML

Functions and Features

- 240 x 320 pixels
- LED backlight
- 2.8V power supply
- 8-bit or 16-bit Parallel MPU interface
- FFC ZIF I/O connection
- Built-in ILI9341 controller
- 262K colors
- 4-wire Resistive Touch Panel

Mechanical Drawing



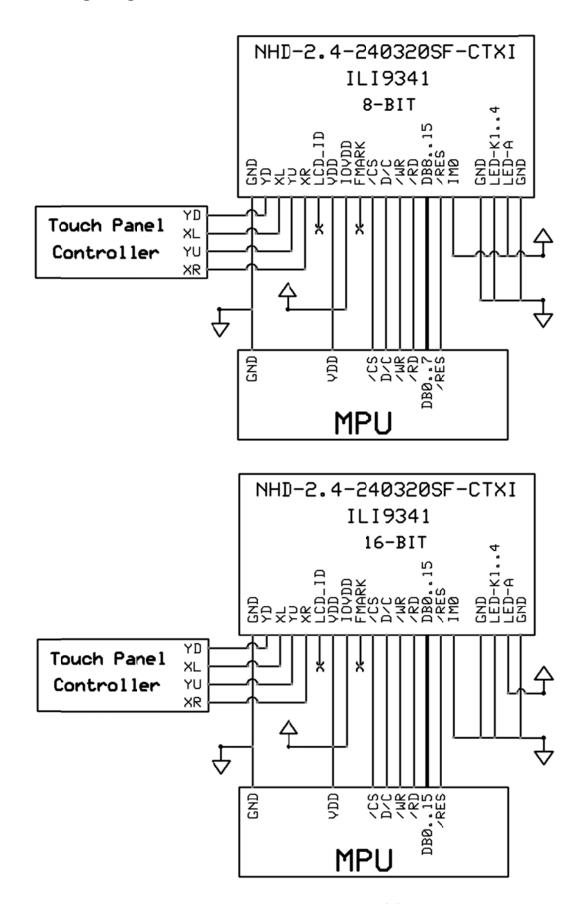
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Pin Description

Pin No.	Symbol	External	Function Description
1 111 140.	Symbol	Connection	Tunction Bescription
1	GND	Power Supply	Ground
2	YD	Touch Controller	Touch Panel - DOWN
3	XL	Touch Controller	Touch Panel - LEFT
4	YU	Touch Controller	Touch Panel - UP
5	XR	Touch Controller	Touch Panel - RIGHT
6	LCD ID	MPU/NC	LCD ID pin (No Connect)
7	VDD	Power Supply	Supply Voltage for LCD (2.8V)
8	IOVDD	Power Supply	Supply Voltage for Logic (2.8V)
9	FMARK	MPU/NC	Used when writing RAM data in sync with frame (No Connect)
10	/CS	MPU	Active LOW Chip Select signal (can tie to GND)
11	D/C	MPU	Data / Command selection: '1' = Data ; '0' = Command
12	/WR	MPU	Active LOW Write signal
13	/RD	MPU	Active LOW Read signal
14	DB0	MPU	Bi-directional data bus
15	DB1	MPU	Di directional data sus
16	DB2	MPU	8-bit: use DB8-DB15
17	DB3	MPU	16-bit: use DB0-DB15
18	DB4	MPU	
19	DB5	MPU	
20	DB6	MPU	
21	DB7	MPU	
22	DB8	MPU	
23	DB9	MPU	
24	DB10	MPU	
25	DB11	MPU	
26	DB12	MPU	
27	DB13	MPU	
28	DB14	MPU	
29	DB15	MPU	
30	/RES	MPU	Active LOW Reset signal
31	IM0	MPU	IM0=0: 16-bit i80 IM0=1: 8-bit i80
32	NC	-	No Connect
33	GND	Power Supply	Ground
34	LED-K1	Power Supply	Backlight Cathode (Ground)
35	LED-K2	Power Supply	Backlight Cathode (Ground)
36	LED-K3	Power Supply	Backlight Cathode (Ground)
37	LED-K4	Power Supply	Backlight Cathode (Ground)
38	LED-A	Power Supply	Backlight Anode (3.2V)
39	GND	Power Supply	Ground
40	NC	-	No Connect

Recommended LCD connector: 40-pin, 0.5mm pitch FFC connector **Molex P/N:** 54132-4062 or similar

Wiring Diagram



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	-	+80	°C
Supply Voltage for LCD	VDD	-	2.5	2.8	3.3	V
Supply Voltage for Logic	IOVDD	-	1.65	2.8	3.3	V
Supply Current	IDD	VDD=2.8V	-	7	9	mA
"H" Level input	Vih	-	0.8*VDD	-	VDD	V
"L" Level input	Vil	-	GND	-	0.2*VDD	V
"H" Level output	Voh	-	0.8*VDD	-	VDD	V
"L" Level output	Vol	-	GND	-	0.2*VDD	V
Backlight Supply Voltage	Vled	-	2.9	3.2	3.4	V
Backlight Supply Current	lled	Vled=3.2V	-	60	-	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Тур.	Max.	Unit
Viewing Angle – Top	-		-	60	-	0
Viewing Angle – Bottom	-	Cr ≥ 10	-	70	-	0
Viewing Angle – Left	-	Ct 2 10	-	70	-	0
Viewing Angle – Right	-		-	70	-	0
Contrast Ratio	Cr	-	400	500	-	-
Luminance	Lv	-	-	250	-	cd/m ²
Response Time (rise + fall)	Tr+Tf	-	-	20	30	ms

Viewing angles based on 6:00 gray scale inversion

Touch Panel Characteristics

Item	Min.	Tym	Max.	Unit
Item	IVIIII.	Тур.	IVIAX.	Unit
Linearity	-	ı	1.5	%
Insulation Resistance	10	ı	-	МΩ
Operation Voltage	-	5	-	V
Response Time	-	ı	10	ms
Transmittance	80	-	-	%
Operating Force	50	-	200	G
Touch Durability	1,000,000	ı	-	Touches
Handwriting Durability	100,000	-	-	Characters
Hardness	3	-	-	Н

Controller Information

Built-in ILI9341 controller.

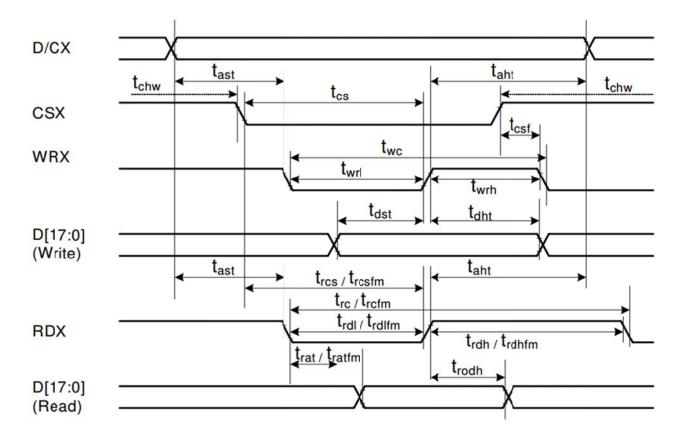
Please download specification at http://www.newhavendisplay.com/app notes/ILI9341.pdf

Table of Commands

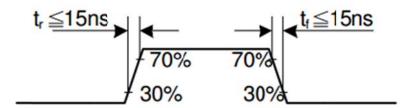
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Timing Characteristics

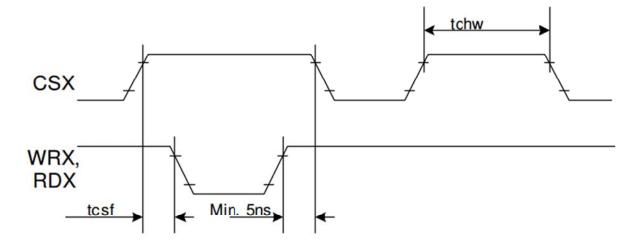
Parallel 18/16/9/8-bit Interface Timing Characteristics (8080-II system)



Signal	Symbo	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
DCX	taht	Address hold time (Write/Read)	0		ns	
	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15		ns	
CSX	trcs	Chip Select setup time (Read ID)	45		ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
	twc	Write cycle	66	-	ns	
WRX	twrh	Write Control pulse H duration	15	• 1	ns	
W0000000000000000000000000000000000000	twrl	Write Control pulse L duration	15	-	ns	
	trcfm	Read Cycle (FM)	450		ns	
RDX (FM)	trdhfm	Read Control H duration (FM)	90	-	ns	
222 222 0	trdlfm	Read Control L duration (FM)	355		ns	
	trc	Read cycle (ID)	160		ns	
RDX (ID)	trdh	Read Control pulse H duration	90	- 1	ns	
	trdl	Read Control pulse L duration	45		ns	
D(47.0)	tdst	Write data setup time	10	-	ns	
D[17:0], D[17:10]&D[8:1], D[17:10], D[17:9]	tdht	Write data hold time	10	-	ns	
	trat	Read access time	2.51	40	ns	For maximum CL=30pF
	tratfm	Read access time	-	340	ns	For minimum CL=8pF
	trod	Read output disable time	20	80	ns	1

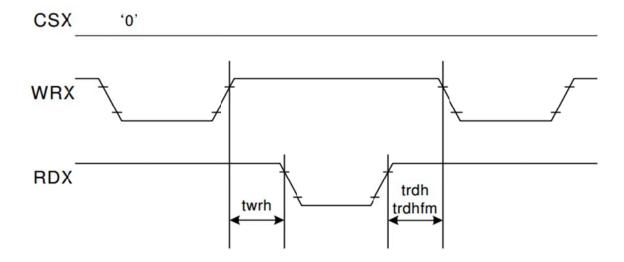


CSX timings:



Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Write to read or read to write timings:



Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Example Recommended Initialization Code

```
void TFT_24S_Write_Command(int command)
       GPIO ResetBits(GPIOC, DC);
       GPIO_Write(GPIOB, command);
       GPIO ResetBits(GPIOC, nWR);
       GPIO SetBits(GPIOC, nWR);
}
void TFT_24S_Write_Data(int data)
{
       GPIO SetBits(GPIOC, DC);
       GPIO Write(GPIOB, data);
       GPIO ResetBits(GPIOC, nWR);
       GPIO SetBits(GPIOC, nWR);
void init()
       GPIO ResetBits(GPIOC, CS);
       GPIO_SetBits(GPIOC, nRD);
       GPIO_ResetBits(GPIOC, nWR);
       GPIO WriteBit(GPIOC, RES, Bit RESET);
       delay(120);
       GPIO_WriteBit(GPIOC, RES, Bit_SET);
       delay(120);
       TFT 24S Write Command(0x0028);
                                            //display OFF
       TFT_24S_Write_Command(0x0011);
                                            //exit SLEEP mode
       TFT 24S Write Data(0x0000);
       TFT 24S Write Command(0x00CB);
                                            //Power Control A
       TFT 24S Write Data(0x0039);
                                            //always 0x39
       TFT_24S_Write_Data(0x002C);
                                            //always 0x2C
       TFT 24S Write Data(0x0000);
                                            //always 0x00
       TFT 24S Write Data(0x0034);
                                            //Vcore = 1.6V
       TFT_24S_Write_Data(0x0002);
                                            //DDVDH = 5.6V
       TFT_24S_Write_Command(0x00CF);
                                            //Power Control B
       TFT 24S Write Data(0x0000);
                                            //always 0x00
       TFT 24S Write Data(0x0081);
                                            //PCEQ off
       TFT_24S_Write_Data(0x0030);
                                            //ESD protection
       TFT 24S Write Command(0x00E8);
                                            //Driver timing control A
       TFT 24S Write Data(0x0085);
                                            //non-overlap
       TFT 24S Write Data(0x0001);
                                            //EQ timing
       TFT_24S_Write_Data(0x0079);
                                            //Pre-charge timing
       TFT 24S Write Command(0x00EA);
                                            //Driver timing control B
       TFT_24S_Write_Data(0x0000);
                                            //Gate driver timing
       TFT_24S_Write_Data(0x0000);
                                            //always 0x00
```

```
TFT 24S Write Command(0x00ED);
                                       //Power-On sequence control
TFT_24S_Write_Data(0x0064);
                                       //soft start
TFT_24S_Write_Data(0x0003);
                                       //power on sequence
TFT 24S Write Data(0x0012);
                                       //power on sequence
                                       //DDVDH enhance on
TFT_24S_Write_Data(0x0081);
TFT 24S Write Command(0x00F7);
                                       //Pump ratio control
TFT 24S Write Data(0x0020);
                                       //DDVDH=2xVCI
                                       //power control 1
TFT_24S_Write_Command(0x00C0);
TFT_24S_Write_Data(0x0026);
TFT_24S_Write_Data(0x0004);
                                       //second parameter for ILI9340 (ignored by ILI9341)
TFT 24S Write Command(0x00C1);
                                       //power control 2
TFT 24S Write Data(0x0011);
TFT 24S Write Command(0x00C5);
                                       //VCOM control 1
TFT 24S Write Data(0x0035);
TFT_24S_Write_Data(0x003E);
TFT_24S_Write_Command(0x00C7);
                                       //VCOM control 2
TFT 24S Write Data(0x00BE);
TFT_24S_Write_Command(0x0036);
                                       //memory access control = BGR
TFT_24S_Write_Data(0x0088);
TFT 24S Write Command(0x00B1);
                                       //frame rate control
TFT 24S Write Data(0x0000);
TFT_24S_Write_Data(0x0010);
TFT 24S Write Command(0x00B6);
                                       //display function control
TFT_24S_Write_Data(0x000A);
TFT_24S_Write_Data(0x00A2);
TFT_24S_Write_Command(0x003A);
                                       //pixel format = 16 bit per pixel
TFT 24S Write Data(0x0055);
TFT_24S_Write_Command(0x00F2);
                                       //3G Gamma control
TFT_24S_Write_Data(0x0002);
                                       //off
TFT 24S Write Command(0x0026);
                                       //Gamma curve 3
TFT_24S_Write_Data(0x0001);
TFT 24S Write Command(0x002A);
                                       //column address set
TFT 24S Write Data(0x0000);
TFT_24S_Write_Data(0x0000);
                                       //start 0x0000
TFT 24S Write Data(0x0000);
TFT_24S_Write_Data(0x00EF);
                                       //end 0x00EF
TFT_24S_Write_Command(0x002B);
                                       //page address set
TFT_24S_Write_Data(0x0000);
TFT 24S Write Data(0x0000);
                                       //start 0x0000
TFT_24S_Write_Data(0x0001);
TFT_24S_Write_Data(0x003F);
                                       //end 0x013F
```

}

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.	-10°C,30min -> 25°C,5min -> 60°C,30min = 1 cycle 100 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10Hz-55Hz-10Hz , 1.5mm amplitude. 60 mins in each of 3 directions X,Y,Z	3
Static electricity test	Endurance test applying electric static discharge.	VS=8KV, RS=330k Ω , CS=150pF Ten 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

See Terms & Conditions at http://www.newhavendisplay.com/index.php?main_page=terms