Product Transition Guide

TN/MVA: NHD-2.4-240320CF-xxxx | IPS (NEW)**: NHD-2.4-240320AF-CSXP**

The new high brightness 2.4" IPS TFT display has been designed with the same mechanical footprint as the current TN display. This makes the IPS display compatible with existing overlays, enclosures and other assembly components that are presently used with the TN display.

The IPS display also uses the same driver IC as the TN display, and the unused (no connect) pins from the TN display have been repurposed on the IPS display to provide customers with multiple interface options.

The purpose of this document is to highlight and explain the key differences that need to be accounted for when transitioning from our 2.4" TN TFT display to our new high brightness 2.4" IPS TFT display.

Design Improvements

➢ Better EMC with built-in EMI shielding

➢ Better color reproduction throughout the color gamut

➢ Better optical characteristics (higher contrast, higher brightness, wider viewing angles)

➢ Better color and image consistency when viewed from various angles

➢ User selectable Parallel and Serial interface modes

➢ Top bezel frame for added protection and durability

➢ Capacitive touchscreen option with built-in cover glass

Display Models

	NHD-2.4-240320CF-BSXV-F	NHD-2.4-240320CF-CSXV#-F	NHD-2.4-240320CF-CSXN#-F	NHD-2.4-240320AF-CSXP
Display Type	Premium (MVA)	Premium (MVA)	Sunlight Readable TN	Sunlight Readable IPS
Display Mode	Normally White	Normally White	Normally White	Normally Black*
Resolution	240 x 320	240 x 320	240 x 320	240 x 320
Outer Dimensions	42.72 x 60.26 x 2.55 mm	42.8 x 59.91 x 2.55 mm	42.8 x 59.91 x 2.55 mm	42.8 x 59.91 x 2.55 mm
Active Area	36.72 x 48.96 mm	36.72 x 48.96 mm	36.72 x 48.96 mm	36.72 x 48.96 mm
EMI Shielding	No	No	No	Yes
FPC Size & Shape	See datasheet	See datasheet	See datasheet	Identical
Pinout	See datasheet	See datasheet	See datasheet	See below
Driver IC	ST7789VI	ST7789VI	ST7789VI	ST7789VI
Software Timing	See datasheet	See datasheet	See datasheet	Identical
Interface	3/4-wire SPI	8/16-bit Parallel	8/16-bit Parallel	Parallel + SPI
LCD Voltage	3.3V	3.3V	3.3V	3.3V
Backlight	100mA @ 3.1V	100mA @ 3.1V	100mA @ 3.1V	160mA @ 3.0V**
Brightness	850 cd/m^2	850 cd/m^2	1000 cd/m^2	1200 cd/m^2
Contrast	200	200	200	1500

	Optimal View	MVA	MVA	6:00	Full View
	Touchscreen Options	No-touch	No-touch	No-touch	No-touch
		Resistive	Resistive	Resistive	Capacitive
					Resistive

*A normally black display shows a black screen when backlight is ON, but LCD is OFF. Both components must be powered ON to view the screen.

**The new IPS display backlight can be driven with the same 100mA power supply as used with the old display. Brightness may be less than 100%.

Pinout Comparison

Pin #	NHD-2.4-240320CF-Bxxx	NHD-2.4-240320CF-Cxxx	NHD-2.4-240320AF-CSXP
	Signal	Signal	Signal
1	GND	GND	GND
2	NC	NC	NC
3	NC	NC	NC
4	NC	NC	NC
5	NC	NC	NC
6	VDD	NC	SDO
7	IOVDD	VDD	VDD
8	MOSI	IOVDD	VDDI*
9	MISO	NC	SDA
10	SCLK	/CS	CSX*
11	D/C	D/C	DCX*
12	/CS	/WR	WRX*
13	/RES	/RD	RDX*
14	IM0	DB0	DB0
15	IM1	DB1	DB1
16	LED-K1	DB2	DB2
17	LED-K2	DB3	DB3
18	LED-K3	DB4	DB4
19	LED-K4	DB5	DB5
20	LED-A	DB6	DB6
21	-	DB7	DB7
22	-	DB8	DB8
23	-	DB9	DB9
24	-	DB10	DB10
25	-	DB11	DB11
26	-	DB12	DB12
27	-	DB13	DB13
28	-	DB14	DB14
29	-	DB15	DB15
30	-	/RES	RESX*
31	-	IM0	IM0
32	-	NC	IM2
33	-	GND	GND
34	-	LED-K1	LED-K1
35	-	LED-K2	LED-K2
36	-	LED-K3	LED-K3
37	-	LED-K4	LED-K4
38	-	LED-A	LED-A
39	-	GND	GND
40	-	NC	TE

*Symbols have been updated for the new IPS model; however, the same electrical function can be expected.

Mechanical Comparison

NHD-2.4-240320CF-Cxxx
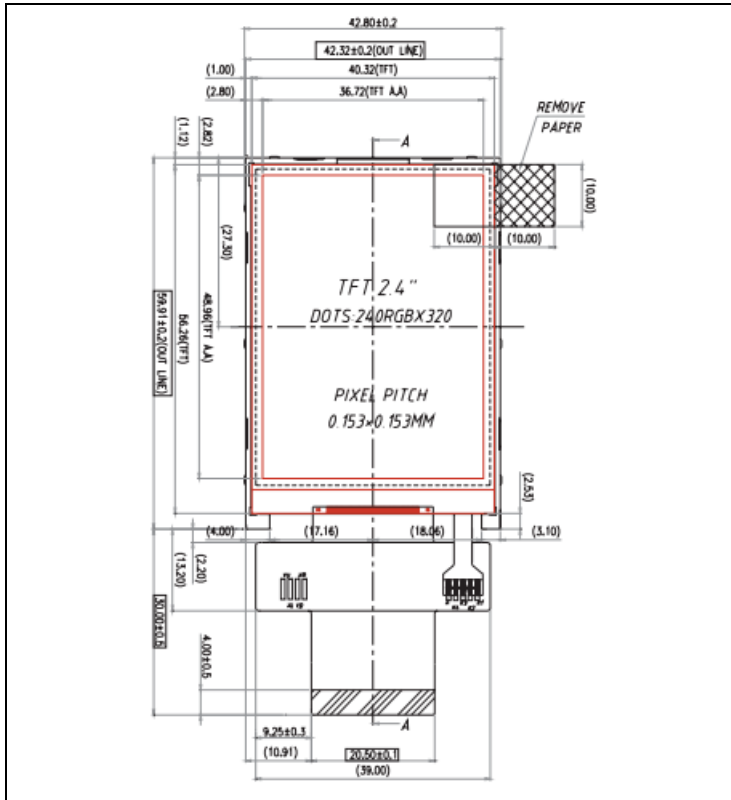
NHD-2.4-240320AF-CSXP
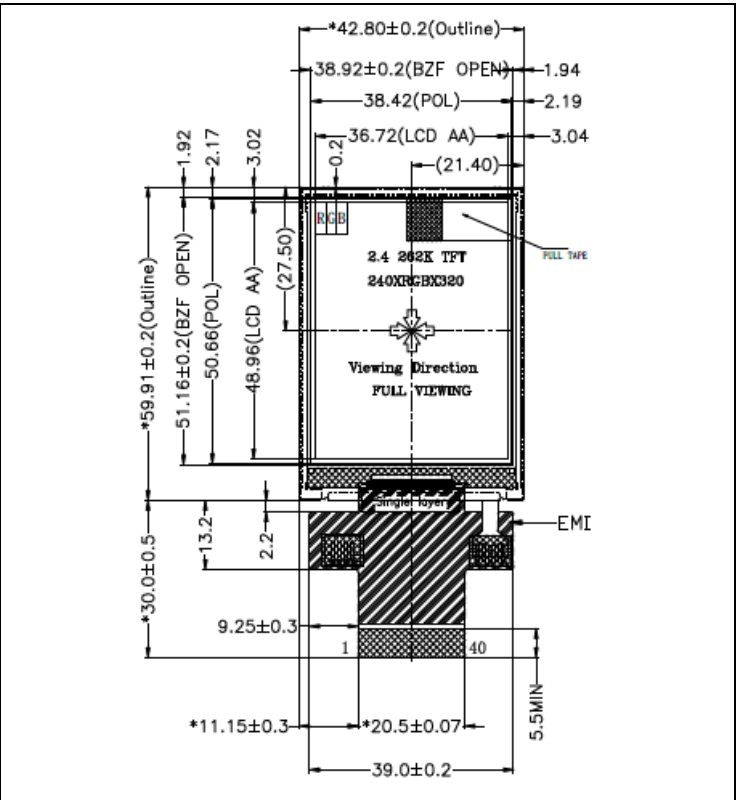
NHD-2.4-240320CF-Bxxx
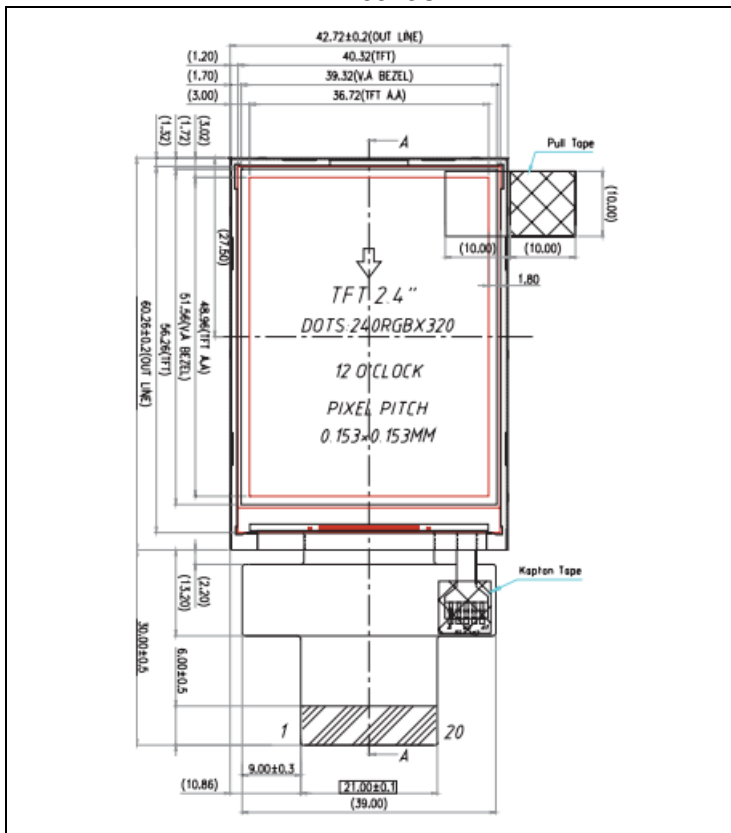
NHD-2.4-240320AF-CSXP
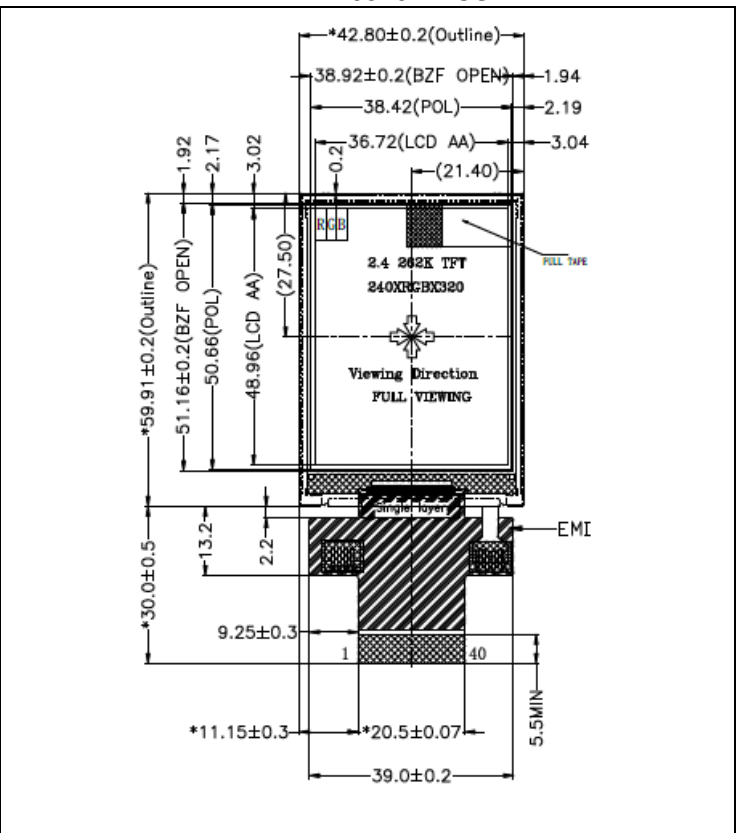
Hardware

- ➢ Wiring
    - ○ Parallel interface (NHD-2.4-240320CF-Cxxx → NHD-2.4-240320AF-Cxxx)

        - ▪ Pin 32 is No Connect on the TN display, whereas it is IM2 signal on the IPS display. This pin must be pulled low (logic '0') for 8/16-bit interface on the IPS display. Leaving IM2 pin floating (no connect) on the IPS display may result in unexpected behavior.

        - ▪ Pin 40 is No Connect on the TN display, whereas it is TE signal on the IPS display. This pin can be treated as a no connect if not used.

    - ○ Serial interface (NHD-2.4-240320CF-Bxxx → NHD-2.4-240320AF-Cxxx)

        - ▪ The TN display supports 3-wire and 4-wire SPI, whereas the IPS display is designed for 3-wire SPI only. If you require 4-wire SPI on the IPS display, please contact our Engineering team to discuss design options.

        - ▪ When using 3-wire SPI:
            - • DCX = Serial clock signal; this is same as SCLK on the TN display.
            - • SDA = Serial data input signal; this is same as MOSI on the TN display.
            - • SDO = Serial data output signal; this is same as MISO on the TN display.

- ➢ Backlight
    - ○ The new IPS display backlight requires 160mA to achieve a nominal brightness of 1200 cd/m^2, whereas the TN display backlights require 100mA for 1000 cd/m^2 nominal brightness. The same 100mA supply can be used to drive the new IPS display backlight, but the brightness may be less than 100%.

Software

- ➢ Initialization
    - ○ The new IPS display can be driven using the same 8/16-bit Parallel and 3-wire SPI input timing as the TN display.

    - ○ The IPS display mode is Normally Black, whereas the TN display mode is Normally White. The IPS display requires Display Inversion On (command 0x21) to achieve the same appearance as the TN display.

    - ○ The photos below illustrate an image on the IPS display before (left) and after (right) adding the Display Inversion On command to the initialization.

NHD-2.4-240320AF-CSXP **With Old Initialization**	**NHD-2.4-240320AF-CSXP** **With New Initialization**
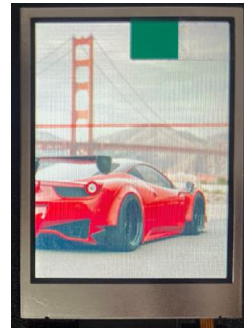
For additional support on transitioning to our new 2.4" IPS TFT display, or questions about other products, please contact us through any of our technical support channels listed below:

Email: nhtech@newhavendisplay.com

Online Support Center: Contact an Engineer

Forum: Community Forum

Phone: (847) 844-8795