NEWHAVEN DISPLAY INTERNATIONAL

Product Specification

NHD-4.0-480480AF-ASXP

TFT Liquid Crystal Display

NHD-	Newhaven Display
4.0-	4.0" Diagonal
480480-	480xRGBx480 Pixels
AF-	Model
A-	Built-in Driver / No Controller
S-	High Brightness, White LED Backlight
X-	TFT
P-	IPS, Wide Temperature

Newhaven Display International, Inc.
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REACH Compliant

RoHS Compliant

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Additional Resources

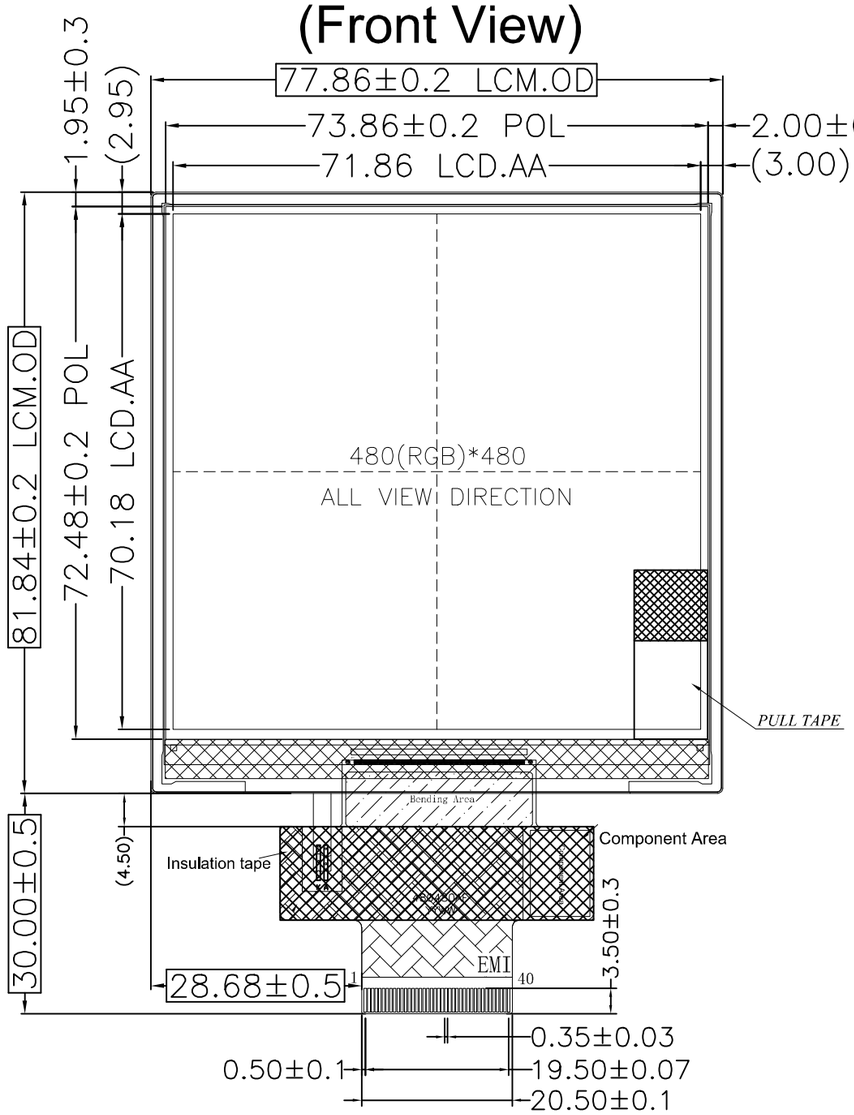
- **Support Forum:** https://support.newhavendisplay.com/hc/en-us/community/topics
- **GitHub:** https://github.com/newhavendisplay
- **Example Code:** https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html
- **Quality Center:** https://www.newhavendisplay.com/quality_center.html
- **Precautions for using LCDs/LCMs:** https://www.newhavendisplay.com/specs/precautions.pdf
- **Warranty / Terms & Conditions:** https://www.newhavendisplay.com/terms.html

Document Revision History

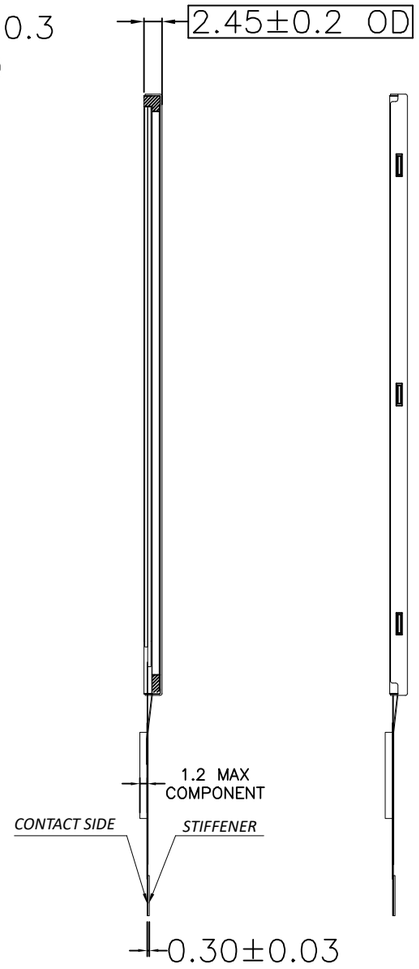
Revision	Date	Description	Changed By
-	09/19/2025	Initial Release	KL

Mechanical Drawing

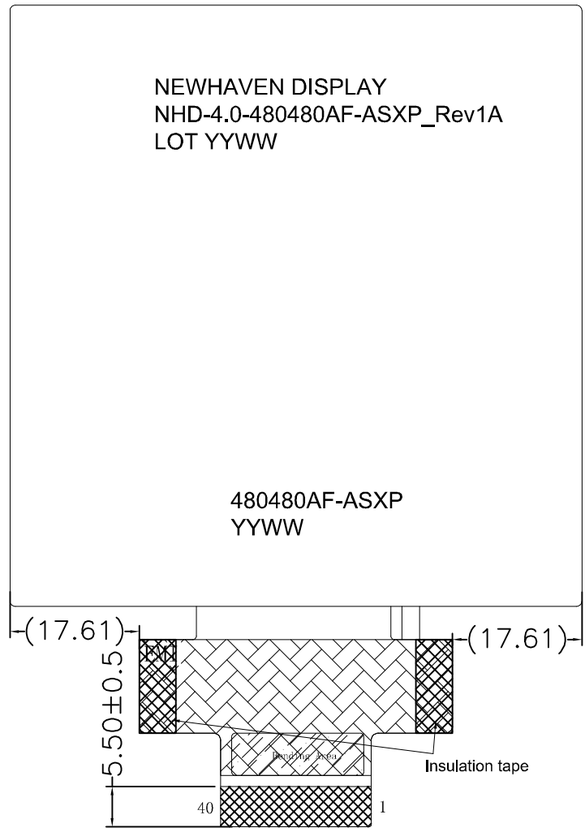
(Front View)



(Side View)



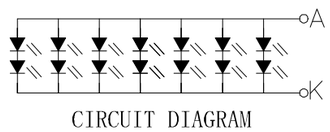
(Back View)



Pin No.	Symbol
1	LED_K
2	LED_A
3	GND
4	VDD
5-12	R0-R7
13-20	G0-G7
21-28	B0-B7
29	GND
30	PCLK
31	RESETX
32	HS
33	VS
34	DE
35	NC
36	GND
37	CSX
38	DCX
39	SCL
40	SDA

Product Description: 4.0” 480x480 IPS TFT

1. Driver IC: ST7701SN
2. Interface: 24-bit Parallel RGB, 4-wire SPI
3. Power Requirement: 3.3V TFT, 6.1V/140mA Backlight
4. Optical Features: Normally Black, Transmissive, Anti-Glare, 1000cd/m²
5. Recommended FFC Connector: 40pin 0.5mm pitch; Ex. Molex 5051104091
6. Built-in EMI Shielding



CIRCUIT DIAGRAM

Standard Tolerance:
(Unless otherwise specified)
Linear: ±0.3mm

NEWHAVEN DISPLAY INTERNATIONAL

Drawing/Part Number: NHD-4.0-480480AF-ASXP
Revision: 1A

Unless otherwise specified:
• Dimensions are in Millimeters
• Third Angle Projection

Drawn By: K. Lewis
Approved By: K. Lewis
Drawn Date: 09/19/2025
Approved Date: 09/19/2025

Pin Description

Pin No.	Symbol	External Connection	Function Description
1	LED_K	Power Supply	Backlight Cathode (Ground)
2	LED_A	Power Supply	Backlight Anode (140mA @ 6.1V)
3	GND	Power Supply	Ground
4	VDD	Power Supply	Supply Voltage for LCD and Logic (3.3V)
5-12	R0-R7	MPU	Red Data signals
13-20	G0-G7	MPU	Green Data signals
21-28	B0-B7	MPU	Blue Data signals
29	GND	Power Supply	Ground
30	PCLK	MPU	Dot Clock signal for RGB interface
31	RESETX	MPU	Active LOW Reset signal
32	HS	MPU	Line Synchronizing signal for RGB interface
33	VS	MPU	Frame Synchronizing signal for RGB interface
34	DE	MPU	Data Enable signal for RGB interface
35	NC	-	No connect
36	GND	Power Supply	Ground
37	CSX	MPU	Active LOW Chip Select signal
38	DCX	MPU	Data/Command selection for SPI: ‘1’ = Data; ‘0’ = Command
39	SCL	MPU	Serial Clock signal for SPI interface (rising edge)
40	SDA	MPU	Serial Data Input signal for SPI interface

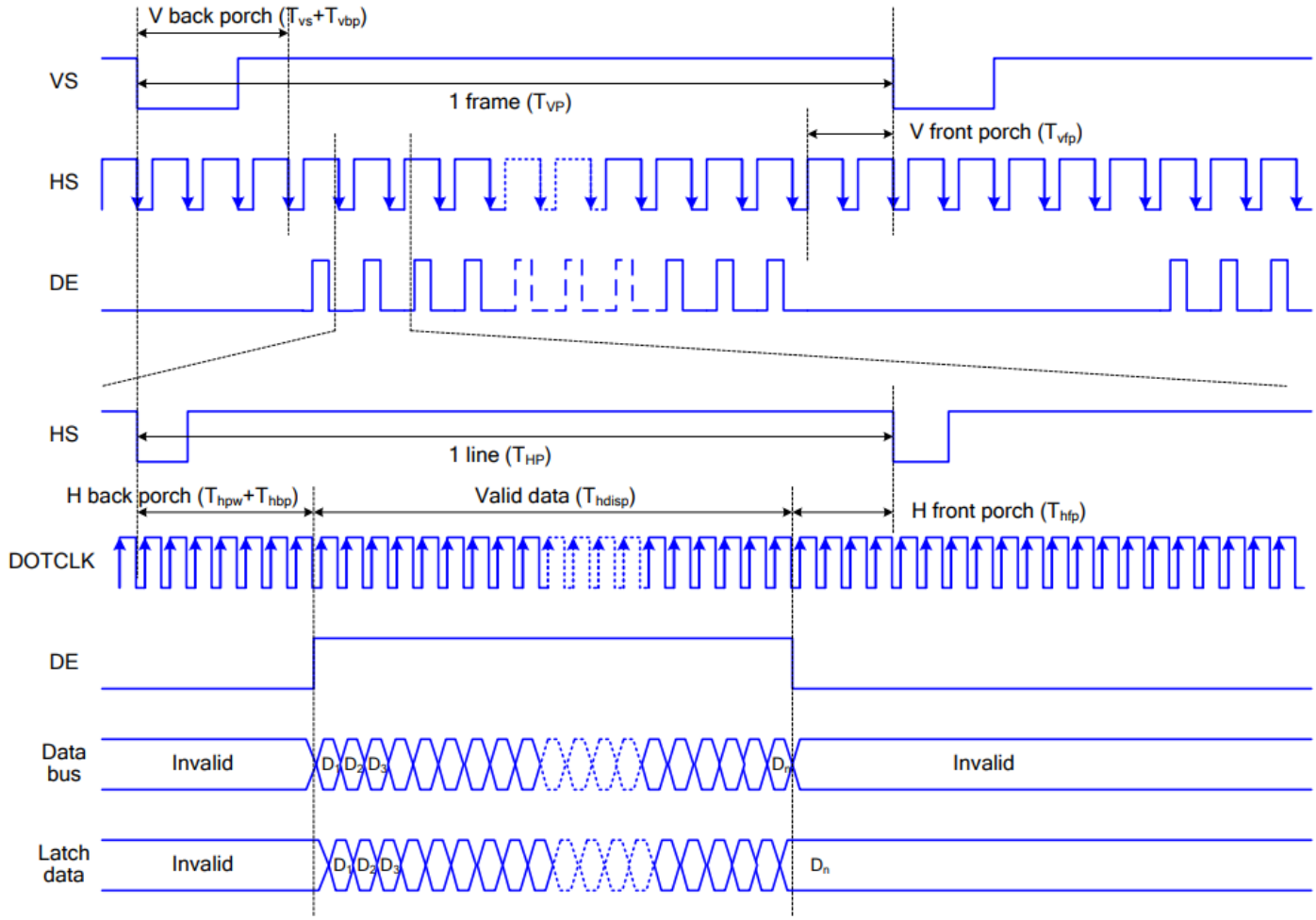
Recommended LCD connector: 40pin 0.5mm pitch FFC; Ex. Molex 5051104091

RGB Interface Mode

The ST7701SN driver IC is user configurable for DE Mode (mode 1) and HV Mode (mode 2) RGB interface.

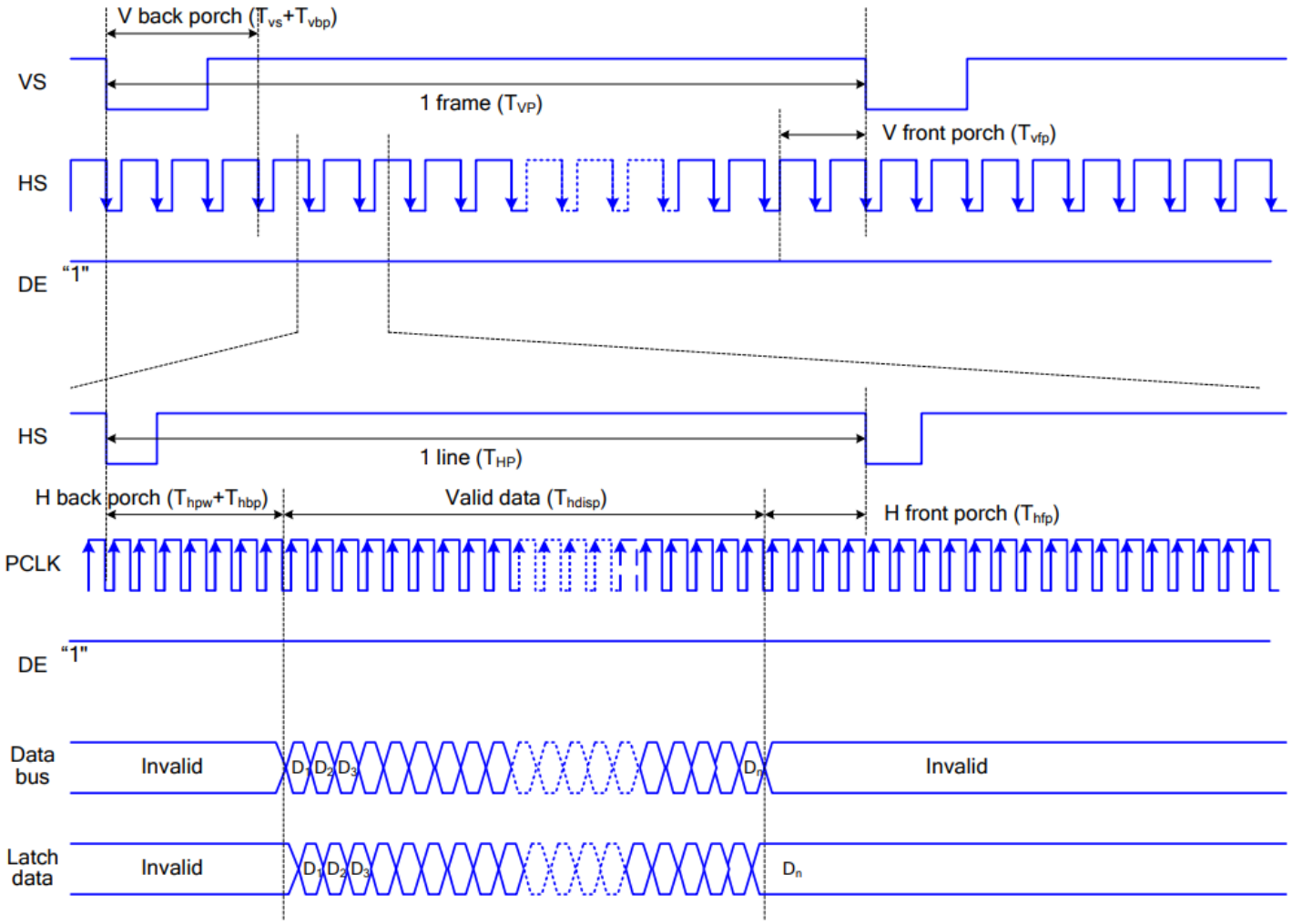
RGB Interface Mode	PCLK	DE	VS	HS	Blanking Porch Setting
DE Mode (mode 1)	Used	Used	Used	Used	Not used
HV Mode (mode 2)	Used	Not used	Used	Used	Used

DE Mode is enabled when the DE/HV bit of RGBCTR (0xC3) command is set to "0", and DE signal is high for valid pixel data. The PCLK, HS, and VS signals are used for clocking the display data and must always be used by host controller.



Note: The setting of front porch and back porch in host must match that in IC as this mode.

HV Mode is enabled when the DE/HV bit of RGBCTR (0xC3) command is set to "1", DE signal is ignored. VS back porch is defined by VBP_HVRGB [7:0] of RGBCTR command, and HS back porch is defined by HBP_HVRGB [7:0] of RGBCTR command. VS front porch is not used in this mode.



RGB Input Timing:

Parameter	Symbol	Min.	Typ.	Max.	Unit
Horizontal Sync. Width	hpw	2	-	255	Clock
Horizontal Sync. Back Porch	hbp	2	-	255	Clock
Horizontal Sync. Front Porch	hfp	2	-	-	Clock
Vertical Sync. Width	vs	2	-	255	Line
Vertical Sync. Back Porch	vbp	2	-	255	Line
Vertical Sync. Front Porch	vfp	2	-	-	Line

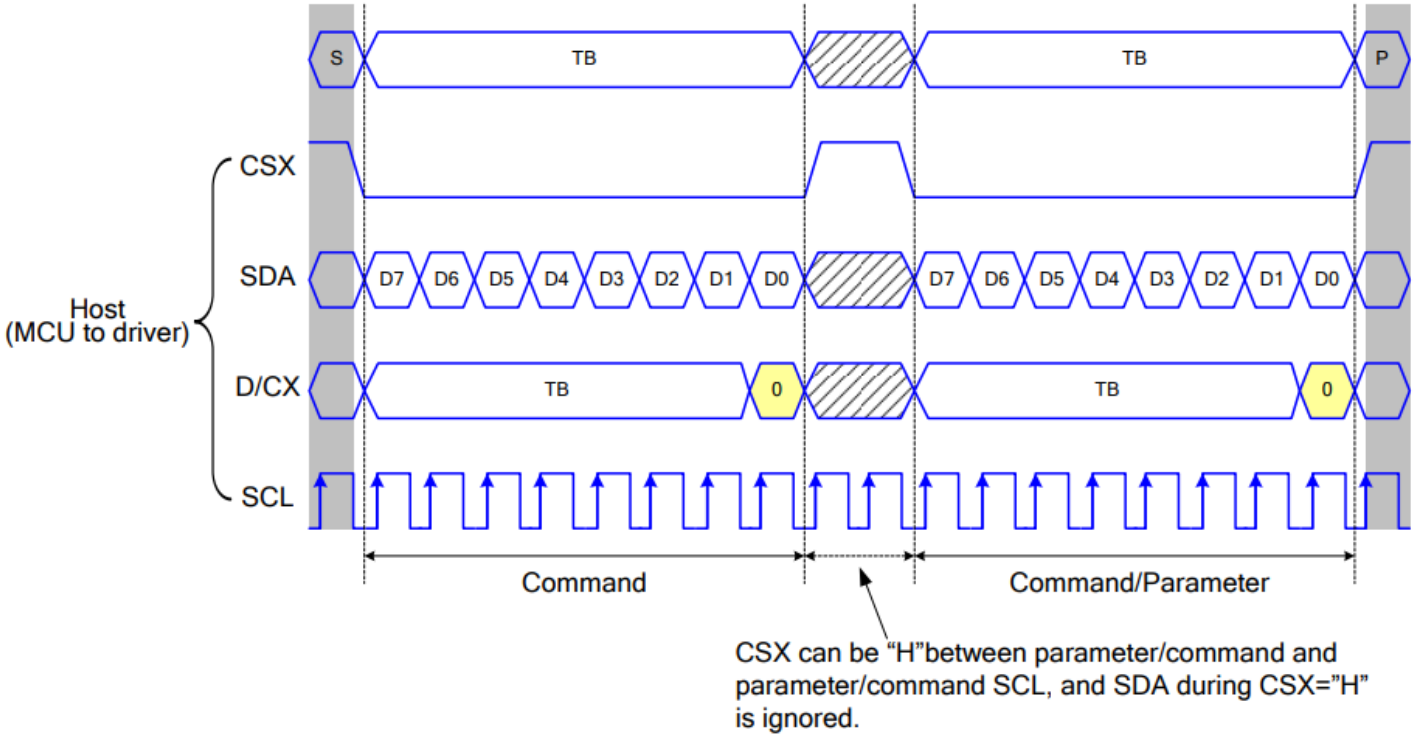
VIPF[2:0] bits of Interface Pixel Format (0x3A) command can be used to select the pixel format.

Bit	NAME	DESCRIPTION
VIPF[2:0]	Pixel Format for RGB Interface	"101"=16-bit/pixel "110"=18-bit/pixel "111"=24-bit/pixel The others=not defined

SPI Interface Mode

ST7701SN requires SPI to initialize the display before sending pixel data over RGB data lines. SPI cannot be used for sending pixel data.

4-line serial interface write protocol (write to register with control bit in transmission)



Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T_{OP}	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T_{ST}	Absolute Max	-30	-	+80	°C
Supply Voltage	V_{DD}	-	2.5	3.3	3.6	V
Supply Current	I_{DD}	V_{DD} = 3.3V	-	39	59	mA
"H" Level input	V_{IH}	-	0.7*V_{DD}	-	V_{DD}	V
"L" Level input	V_{IL}	-	V_{SS}	-	0.3*V_{DD}	V
"H" Level output	V_{OH}	-	0.8*V_{DD}	-	V_{DD}	V
"L" Level output	V_{OL}	-	V_{SS}	-	0.2*V_{DD}	V
Backlight Supply Current	I_{LED}	-	117	140	168	mA
Backlight Supply Voltage	V_{LED}	I_{LED} = 140mA T_{OP} = 25°C	5.4	6.1	6.8	V
Backlight Lifetime*	-		30,000	-	-	Hrs.

*Backlight lifetime is rated as Hours until **half-brightness**, under normal operating conditions. The LED of the backlight is driven by current drain; drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated.

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 10	-	80	-	°
	Bottom	φY-		-	80	-	°
	Left	θX-		-	80	-	°
	Right	θX+		-	80	-	°
Contrast Ratio		CR	-	640	800	-	-
Luminance		L_V	I_{LED} =140mA	700	1000	1500	cd/m²
Response Time (Rise + Fall)		$T_R + T_F$	T_{OP} = 25°C	-	25	35	ms
Chromaticity	Red	X_R	-	0.58	0.61	0.64	-
		Y_R	-	0.32	0.35	0.38	-
	Green	X_G	-	0.27	0.30	0.33	-
		Y_G	-	0.57	0.60	0.63	-
	Blue	X_B	-	0.11	0.14	0.17	-
		Y_B	-	0.05	0.08	0.11	-
	White	X_W	-	0.25	0.28	0.31	-
		Y_W	-	0.28	0.31	0.34	-

Driver Information

Built-in ST7701SN Driver: https://support.newhavendisplay.com/hc/en-us/articles/14147699906711-ST7701SN

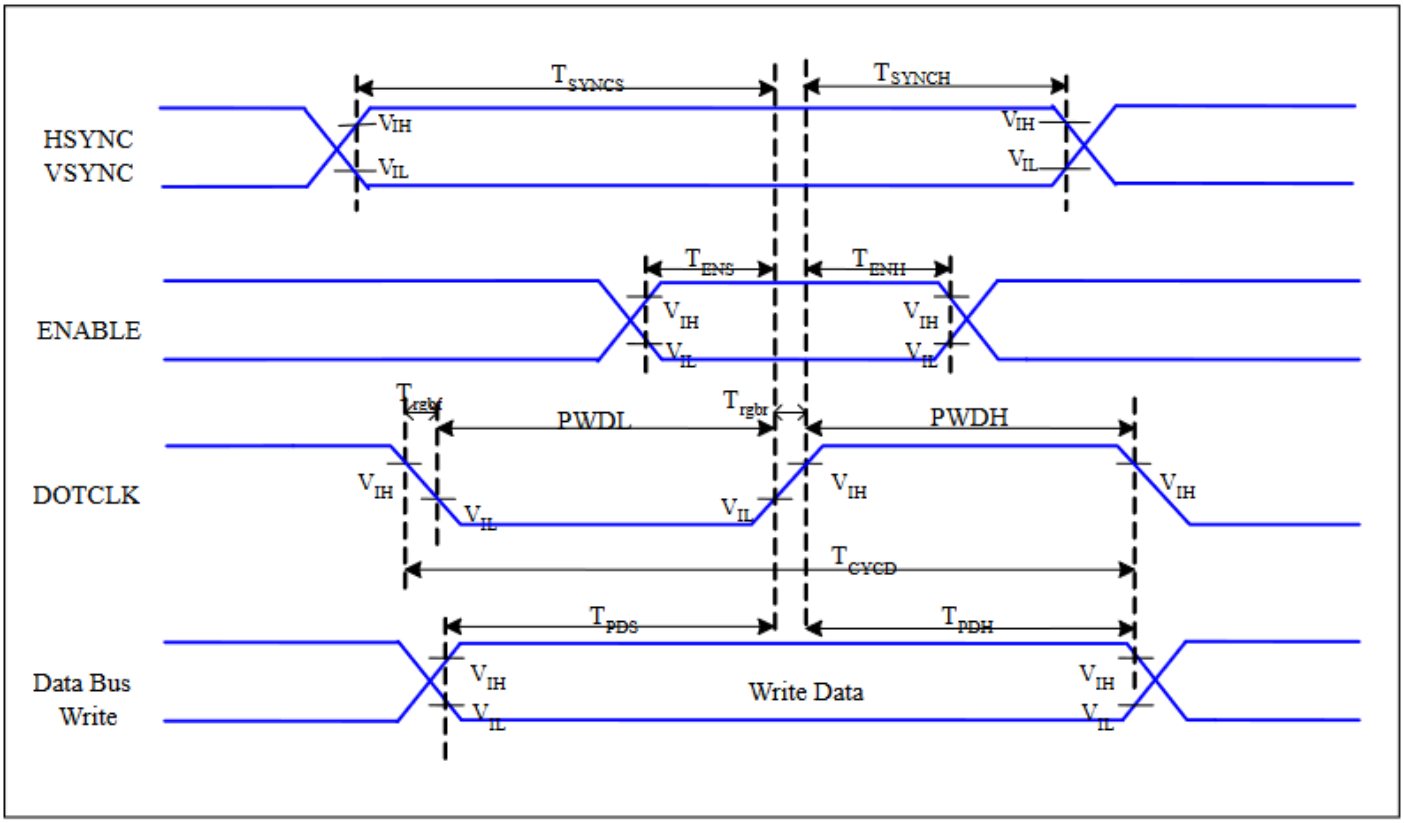
Recommended Timing Values

Recommended RGB Timing Values:

HS Total	HFP	HBP	HS Pulse	VS Total	VFP	VBP	VS Pulse	PCLK Freq
790	150	150	10	530	20	20	10	25 MHz

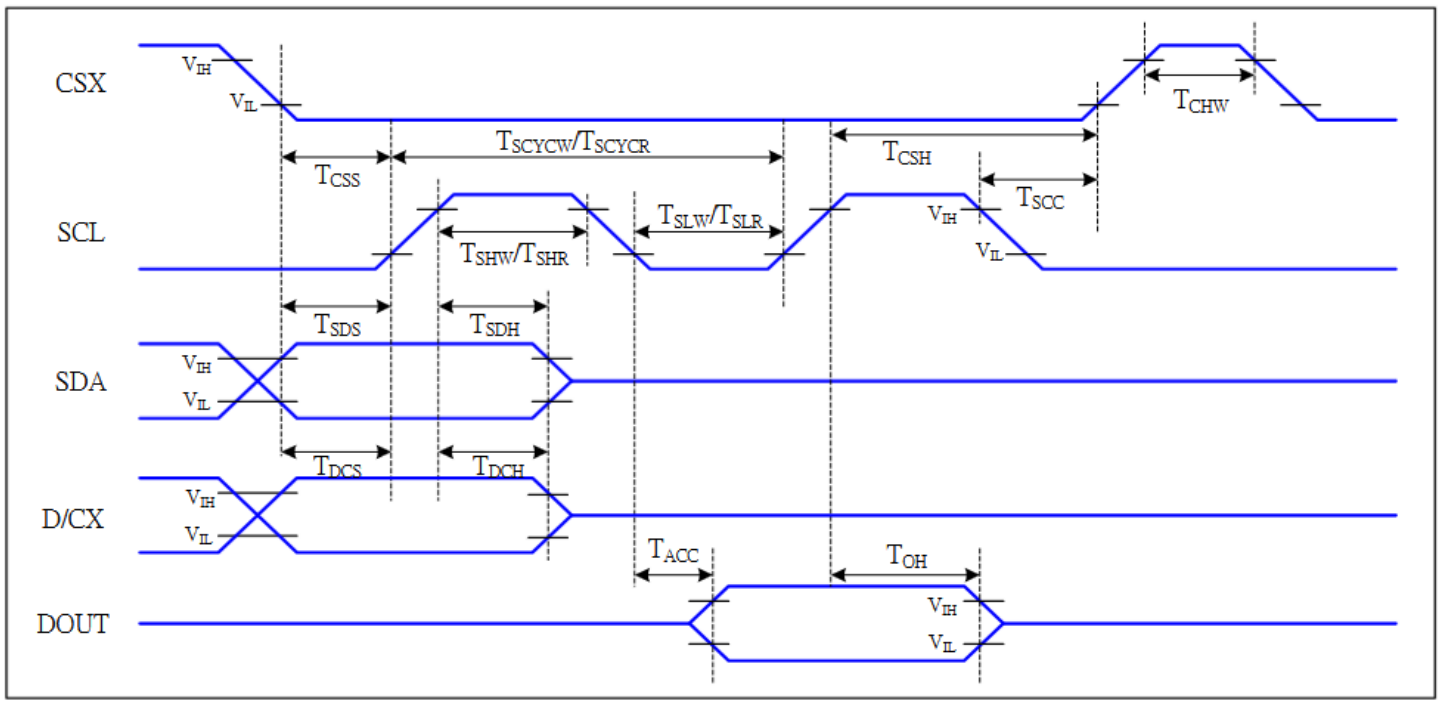
Timing Characteristics

24-bit RGB Interface Characteristics



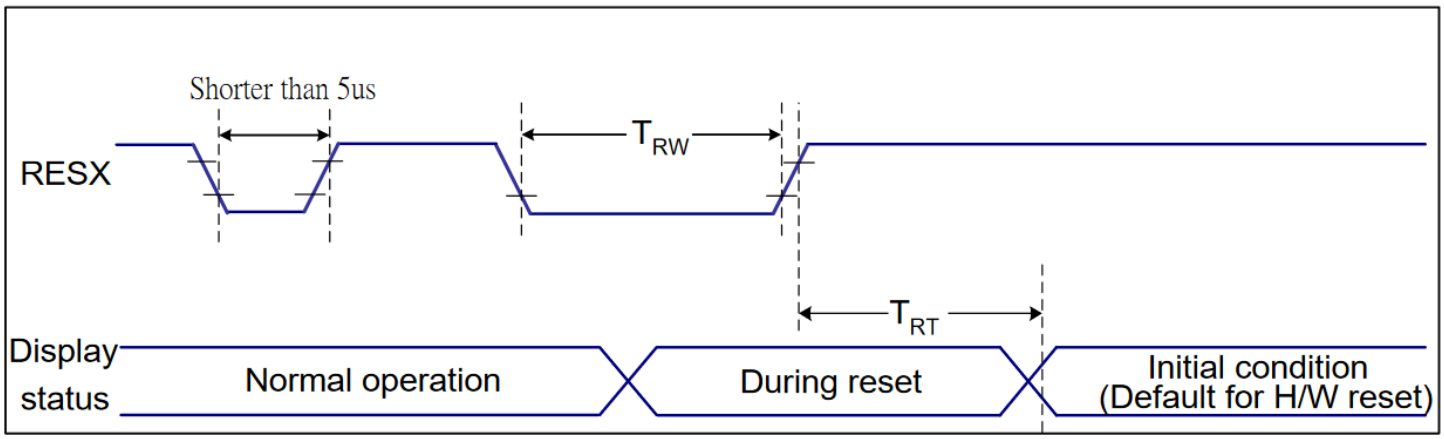
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYNC, HSYNC Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	

Serial Interface Characteristics (4-wire serial)



Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	-write command
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	-read command
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	
SDO (DOUT)	T_{ACC}	Access time	20	50	ns	Max: CL=30pF
	T_{OH}	Output disable time	50	50	ns	Min: CL=8pF

Reset Input Timing



Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120(Note 1, 6, 7)	ms

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 , 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.	+70°C , 120hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 120hrs	1,2
High Temperature / Humidity Storage	Endurance test applying the electric stress (voltage & current) and the high thermal with high humidity stress for a long time.	+50°C , 90% RH , 120hrs	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,10min -> 80°C,30min 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	Frequency range:250r/min Amplitude: 1 inch Time: 45min	3
Static electricity test	Endurance test applying electric static discharge.	Air: Vs=±8kV 10 Times	
		Contact: Vs= ±4kV 10 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.