NEWHAVEN DISPLAY INTERNATIONAL

Product Specification

NHD-2.9-376960AF-ASXP

TFT Liquid Crystal Display

NHD-	Newhaven Display
2.9-	2.9" Diagonal
376960-	376xRGBx960 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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Table of Contents

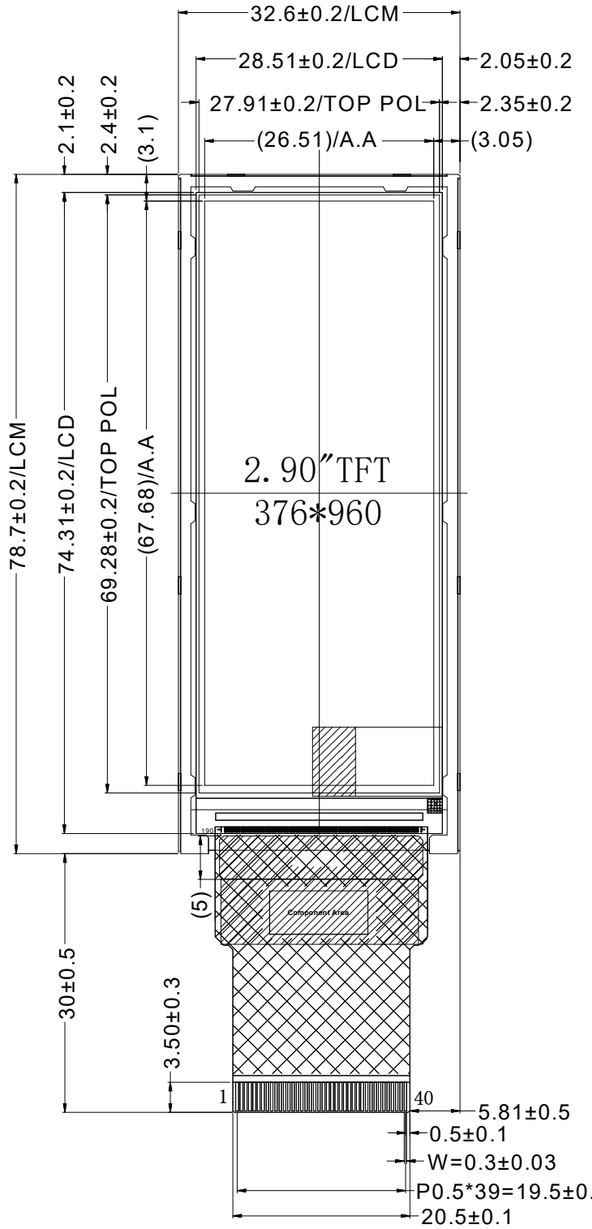
Additional Resources

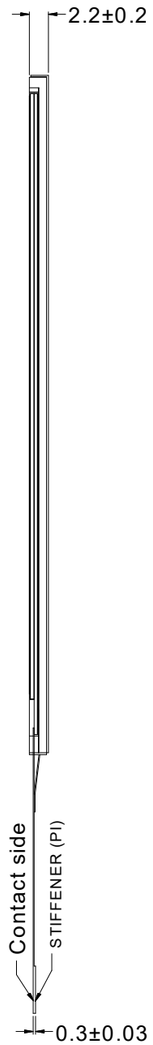
- **Support Forum:** https://support.newhavendisplay.com/hc/en-us/community/topics
- **GitHub:** https://github.com/newhavendisplay
- **Example Code:** https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html
- **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

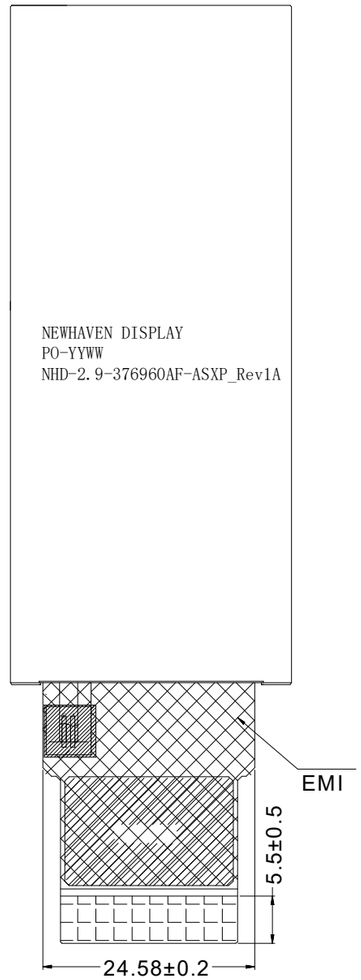
Document Revision History

Revision	Date	Description	Changed By
-	07/30/2025	Initial Release	KL

Mechanical Drawing



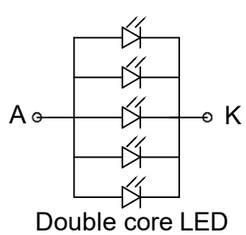




PIN	SYMBOL
1	LED_K
2	LED_A
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	PCLK
31	RESETX
32	HS
33	VS
34	DE
35	NC
36	GND
37	CSX
38	DCX
39	SCL
40	SDA

Product Description: 2.9” 376x960 IPS TFT

1. Driver IC: ST7701SN
2. Interface: 24-bit Parallel RGB, 4-wire SPI
3. Power Requirement: 3.0V TFT, 6.0V/100mA Backlight
4. Optical Features: Normally Black, Transmissive, Anti-Glare, 1050cd/m²
5. Recommended FFC Connector: 40pin 0.5mm pitch; Ex. Molex 54104-4031
6. Built-in EMI Shielding



Double core LED

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

NEWHAVEN DISPLAY INTERNATIONAL

Drawing/Part Number: NHD-2.9-376960AF-ASXP
Revision: 1A

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

Drawn By: K. Lewis
Approved By: K. Lewis
Drawn Date: 07/30/2025
Approved Date: 07/30/2025

Pin Description

Pin No.	Symbol	External Connection	Function Description
1	LED-K	LED Power Supply	Ground for Backlight
2	LED-A	LED Power Supply	Backlight Power Supply (100mA @ 6.0V)
3	GND	Power Supply	Ground
4	V_{DD}	Power Supply	Power supply for LCD and logic (3.0V)
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	Pixel Clock signal for input data (Rising edge)
31	RESETX	MPU	Active LOW Reset signal
32	HS	MPU	Horizontal (Line) synchronization signal
33	VS	MPU	Vertical (Frame) synchronization signal
34	DE	MPU	Data Enable signal
35	NC	-	No Connect
36	GND	Power Supply	Ground
37	CSX	MPU	Active LOW Chip Select signal
38	DCX	MPU	Data/Command selection: '1' = Data; '0' = Command
39	SCL	MPU	Serial Clock Input signal
40	SDA	MPU	Serial Data Input signal

Recommended LCD connector: 0.5mm pitch 40-Conductor FFC. Molex p/n: 54104-4031 (top contact)

RGB Interface Mode Selection

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

DE Mode is enabled by using Command C3h to set the DE/HV select bit to '0'.
In this mode, DE signal is toggled high for valid pixel data. Data is clocked in using PCLK signal. HS and VS are used for internal display clock. DE mode is recommended to enable ST7701SN driver IC to synchronize the display image on TFT panel without depending on specific horizontal and vertical sync timing from host controller.

HV Mode is enabled by using Command C3h to set the DE/HV select bit to '1'.
In this mode, DE signal is set to logic-high state, and HS and VS signals are used to explicitly define the horizontal and vertical sync timing to synchronize the display image on TFT panel. Data is clocked in using PCLK signal. Any change to the HS or VS values may prevent the image from correctly appearing on the display.
Back porch of HS is defined by HBP_HVRGB [7:0] of RGBCTR command.
Back porch of VS is defined by VBP_HVRGB [7:0] of RGBCTR command. Front porch of VS is not set in this mode.

RGB Mode Selection Table	PCLK	DE	VS	HS
DE Mode (mode 1)	Used	Used	Used	Used
HV Mode (mode 2)	Used	Not used	Used	Used

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	3.0	3.3	V
Supply Current	I_{DD}	V_{DD} = 3.0V	13	26	39	mA
"H" Level input	V_{IH}	-	0.7 * V_{DD}	-	V_{DD}	V
"L" Level input	V_{IL}	-	V_{SS}	-	0.3V_{DD}	V
"H" Level output	V_{OH}	-	0.8V_{DD}	-	V_{DD}	V
"L" Level output	V_{OL}	-	V_{SS}	-	0.2V_{DD}	V
Backlight Supply Current	I_{LED}	-	75	100	125	mA
Backlight Supply Voltage	V_{LED}	I_{LED} = 100mA	5.5	6.0	6.5	V
Backlight Lifetime*	-	T_{OP} = 25°C	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+	-	-	85	-	º
	Bottom	φY-		-	85	-	º
	Left	θX-		-	85	-	º
	Right	θX+		-	85	-	º
Contrast Ratio		CR	-	1000	1500	-	-
Luminance		L_V	I_{LED} = 100 mA	840	1050	-	cd/m^2
Response Time (Rise + Fall)		$T_R + T_F$	T_{OP} = 25°C	-	30	35	ms
Chromaticity	Red	X_R	-	0.561	0.611	0.661	-
		Y_R	-	0.276	0.326	0.376	-
	Green	X_G	-	0.291	0.341	0.391	-
		Y_G	-	0.552	0.602	0.652	-
	Blue	X_B	-	0.070	0.120	0.170	-
		Y_B	-	0.023	0.073	0.123	-
	White	X_W	-	0.242	0.292	0.342	-
		Y_W	-	0.260	0.310	0.360	-

Driver Information

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

Timing Characteristics

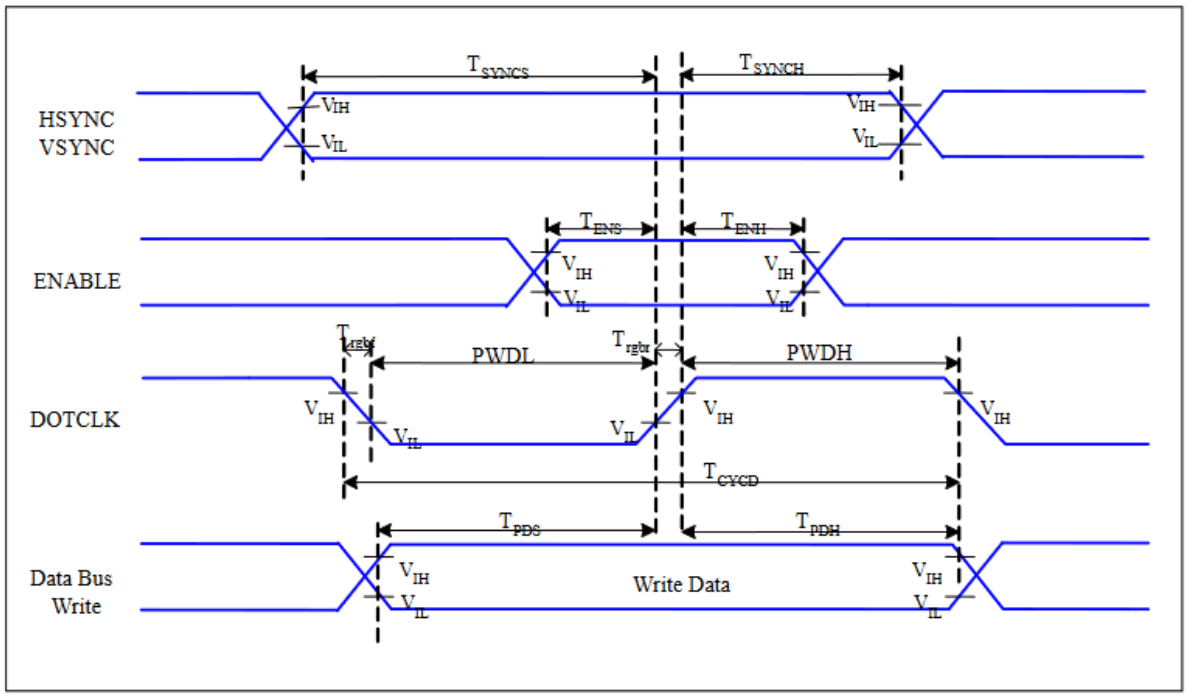
Horizontal Input Timing

Parameter	Symbol	Min	Typ	Max	Unit	Note
Horizontal Sync Width	hpw	2	-	255	Clock	VS + VBP <= 254, HPW + HBP <= 255
Horizontal Sync Back Porch	hbp	2	-	255		
Horizontal Sync Front Porch	hfp	2	-	-		

Vertical Input Timing

Parameter	Symbol	Min	Typ	Max	Unit	Note
Vertical Sync. Width	vs	2	-	254	Line	VS + VBP <= 254, HPW + HBP <= 255
Vertical Sync. Back Porch	vbp	2	-	254		
Vertical Sync. Front Porch	vfp	2	-	-		

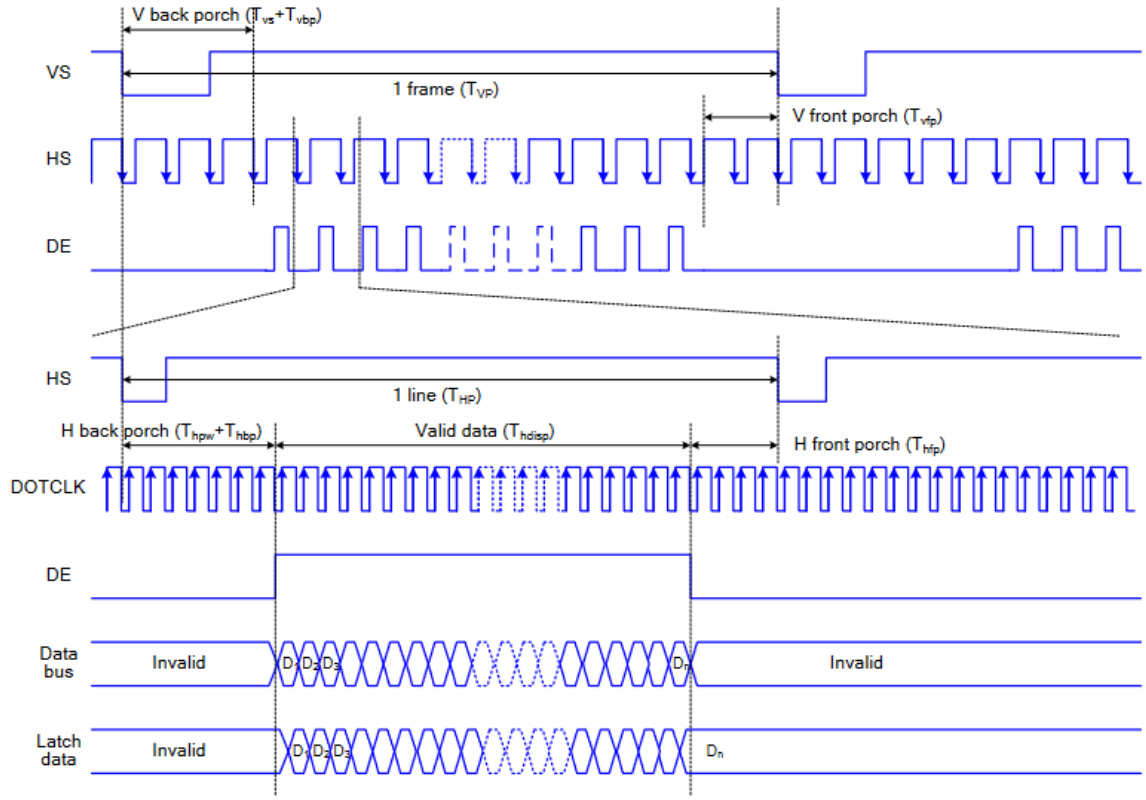
RGB Interface Characteristics



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	

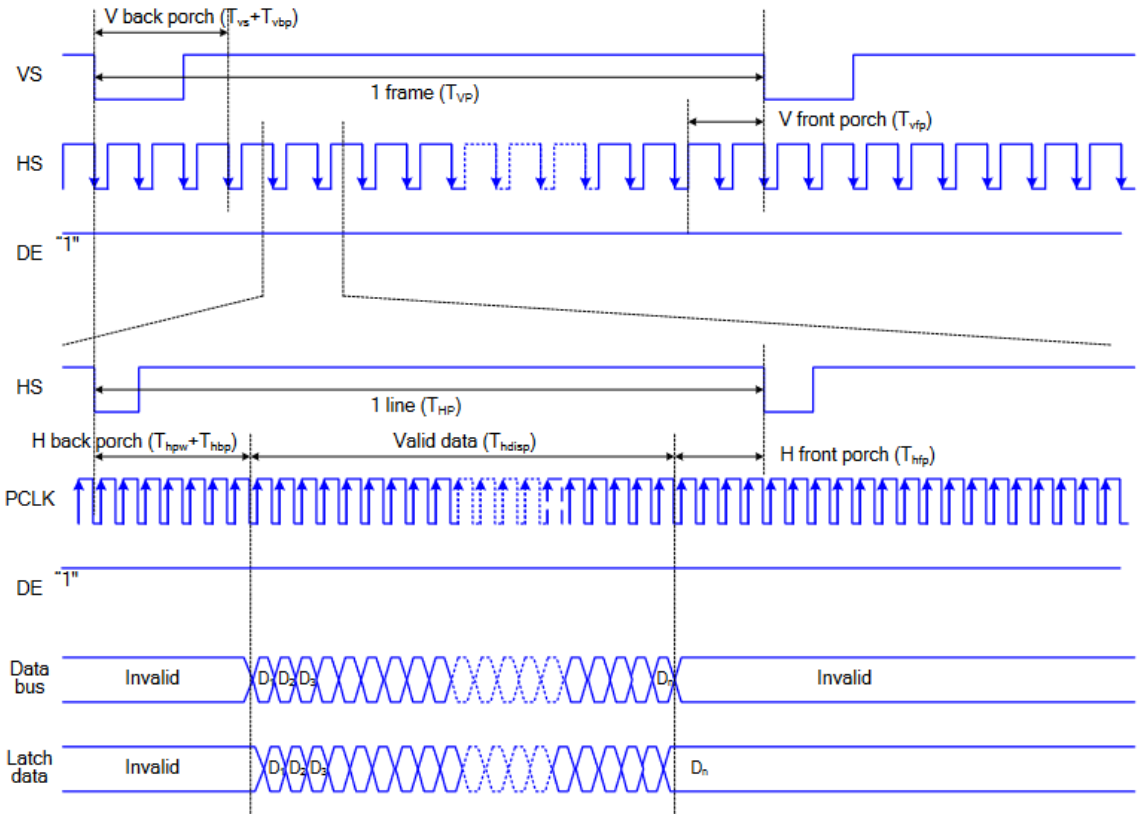
RGB Interface Timing

RGB Interface DE mode

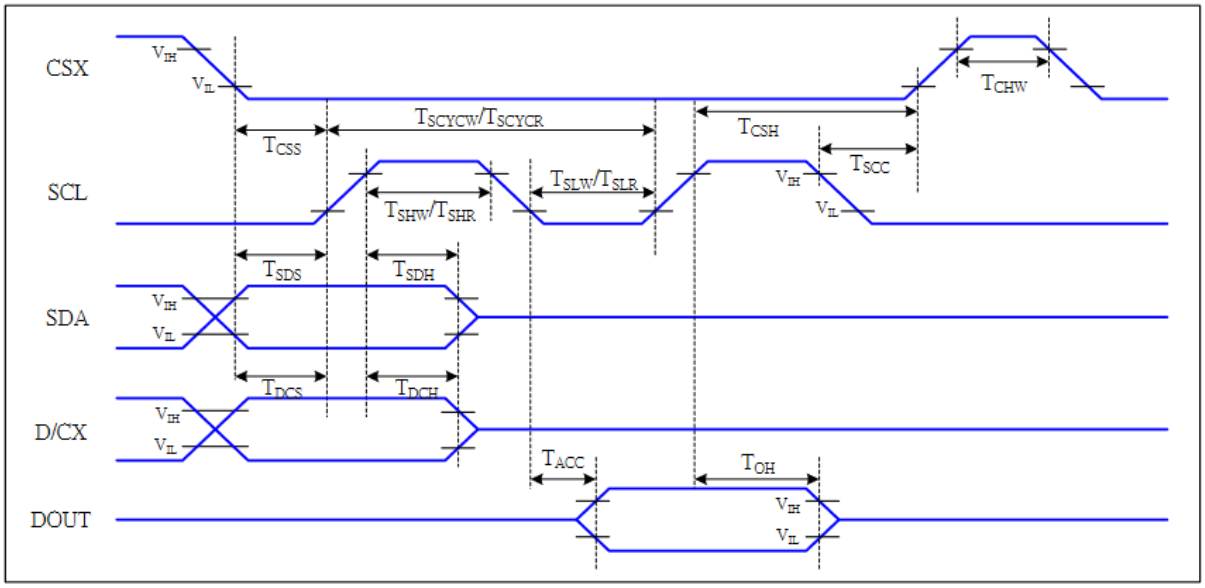


Note: The setting of front porch and back porch in host must match that in IC as this mode.

RGB Interface HV Mode

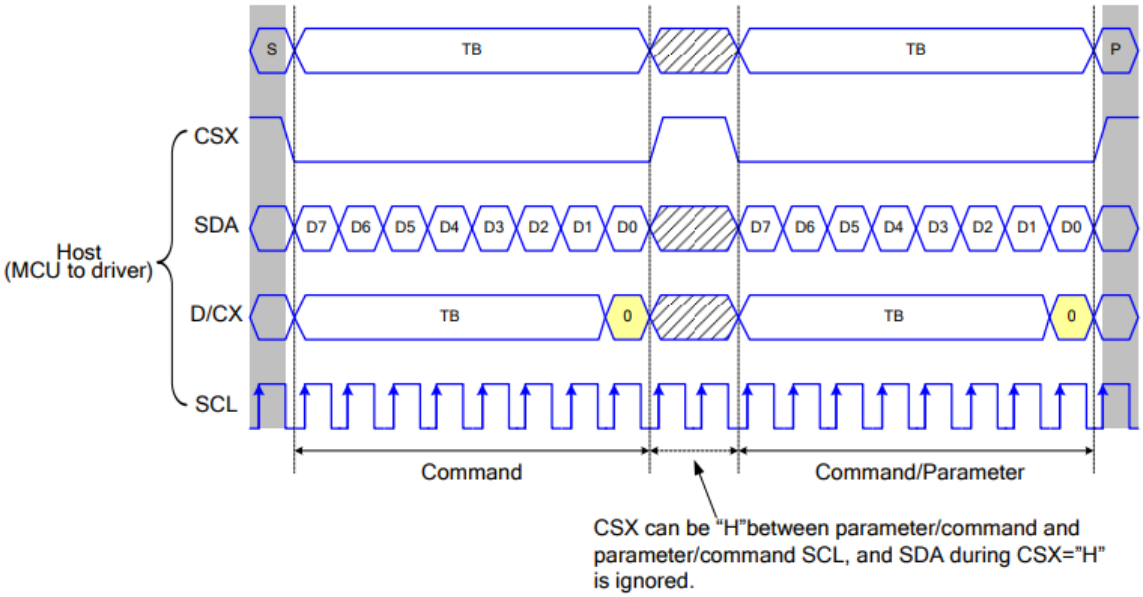


4-wire Serial Interface Timing Characteristics

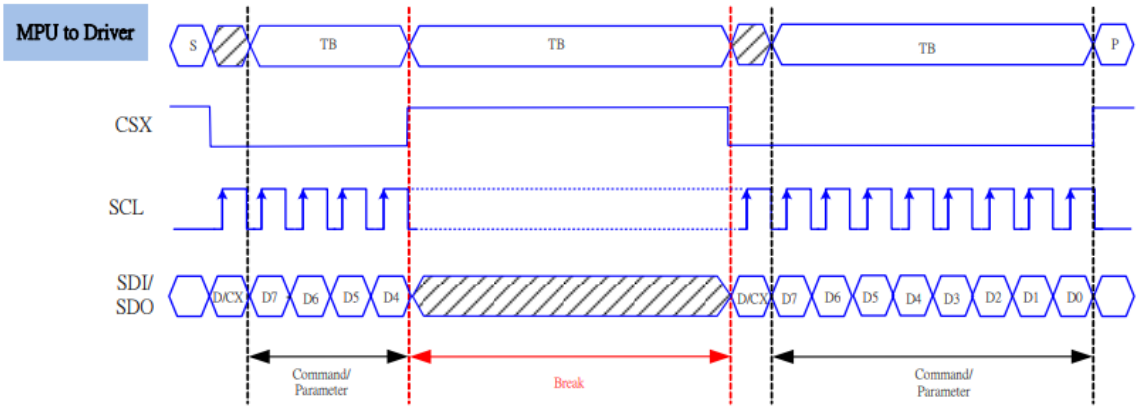


Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	-write command
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	-read command
	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

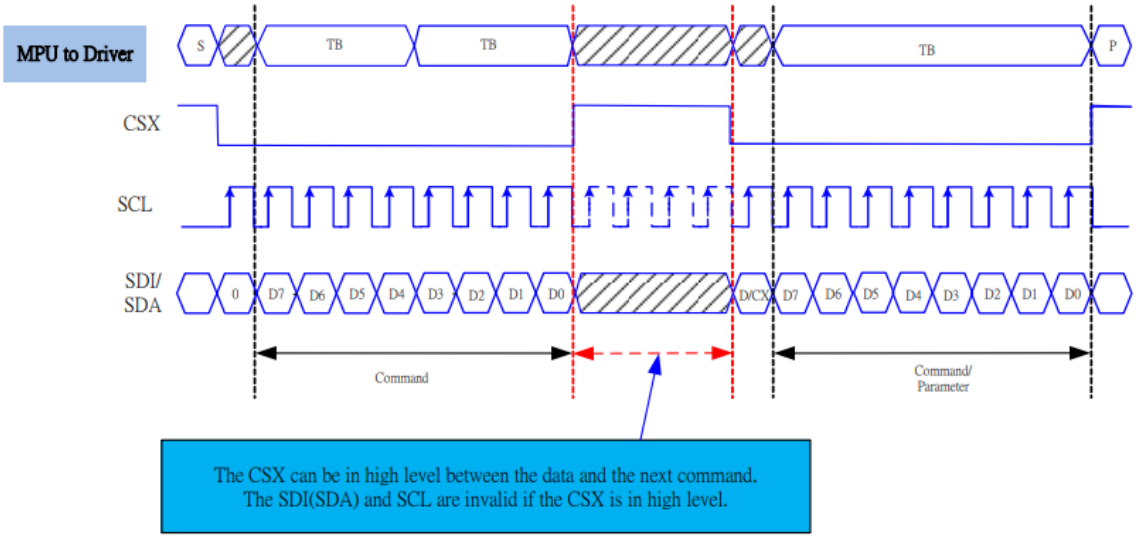
4-line Serial Interface Write Protocol (write to register with control bit in transmission)



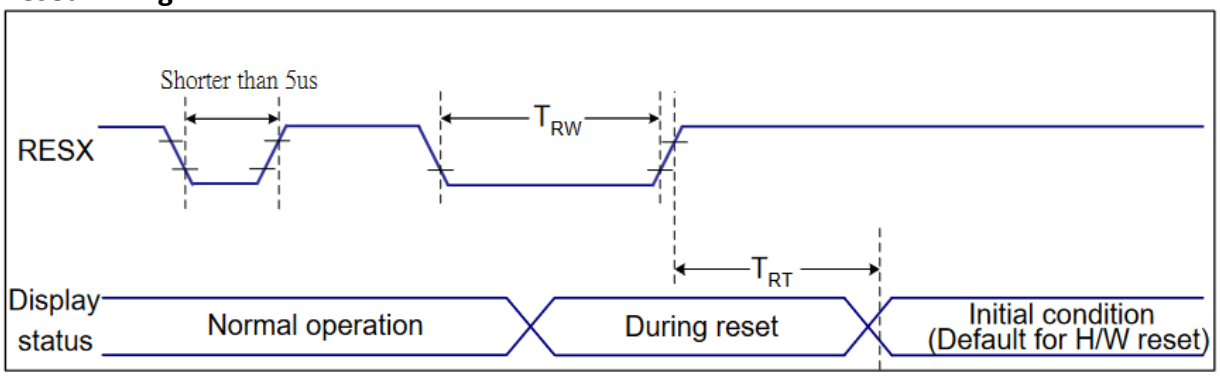
4-line Serial Interface Data Transfer Break and Recovery – please refer to ST7701SN driver IC spec for detailed information.



4-line Serial Interface Data Transfer Pause – please refer to ST7701SN driver IC spec for detailed information.



Reset 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 , 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 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 , 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,60min -> 70°C,60 min =20 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	Frequency range:10Hz~50Hz Acceleration of gravity:5G X, Y, Z 30 min for each direction	3
Static electricity test	Endurance test applying electric static discharge.	Air: ±4kV 150pF/330Ω ; Contact: ±2kV 150pF/330Ω For 5 times each.	

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.