

Product Specification

NHD-3.9-480128AF-ASXP-T

TFT Liquid Crystal Display

NHD-	Newhaven Display
3.9-	3.9" Diagonal
480128-	480xRGBx128 Pixels
AF-	Model
A-	Built-in Driver / No Controller
S-	High Brightness, White LED Backlight
X-	TFT
P-	IPS, Wide Temperature
T-	Resistive Touch Panel

Table of Contents

Document Revision History.....	2
Mechanical Drawing	3
Pin Description	4
RGB Interface Mode Selection	4
Electrical Characteristics	5
Optical Characteristics	5
Touch Panel Characteristics	5
Driver Information.....	5
Timing Characteristics.....	6
Quality Information.....	13

Additional Resources

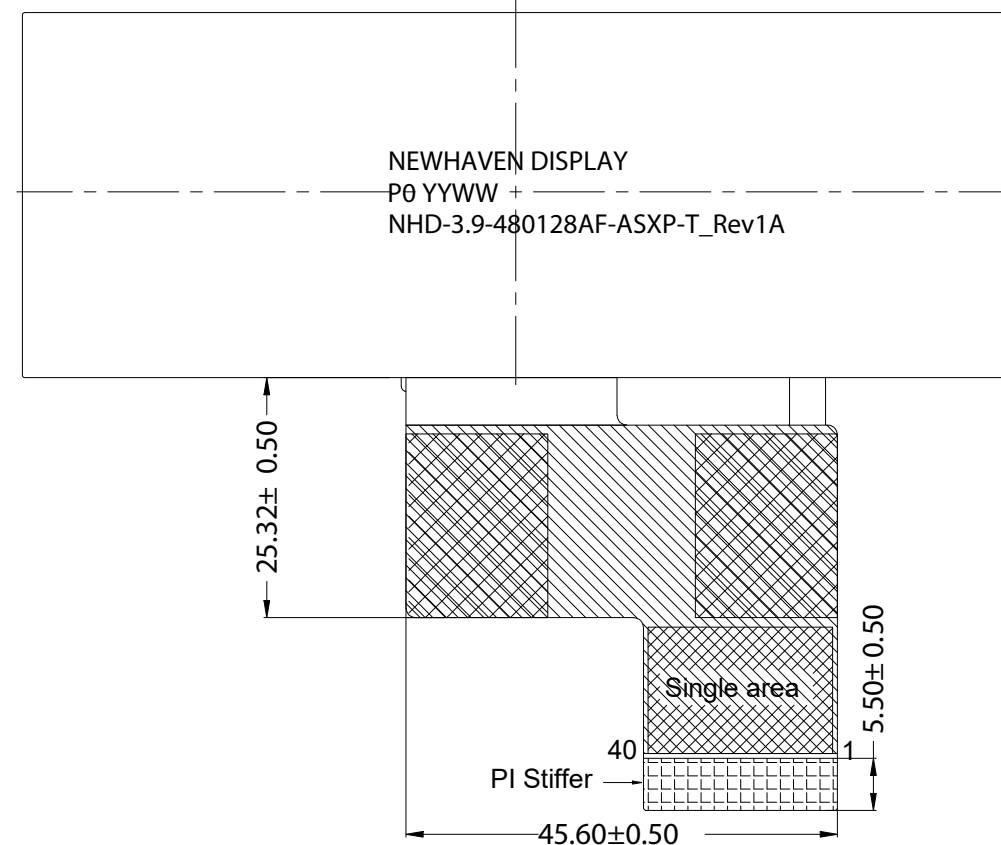
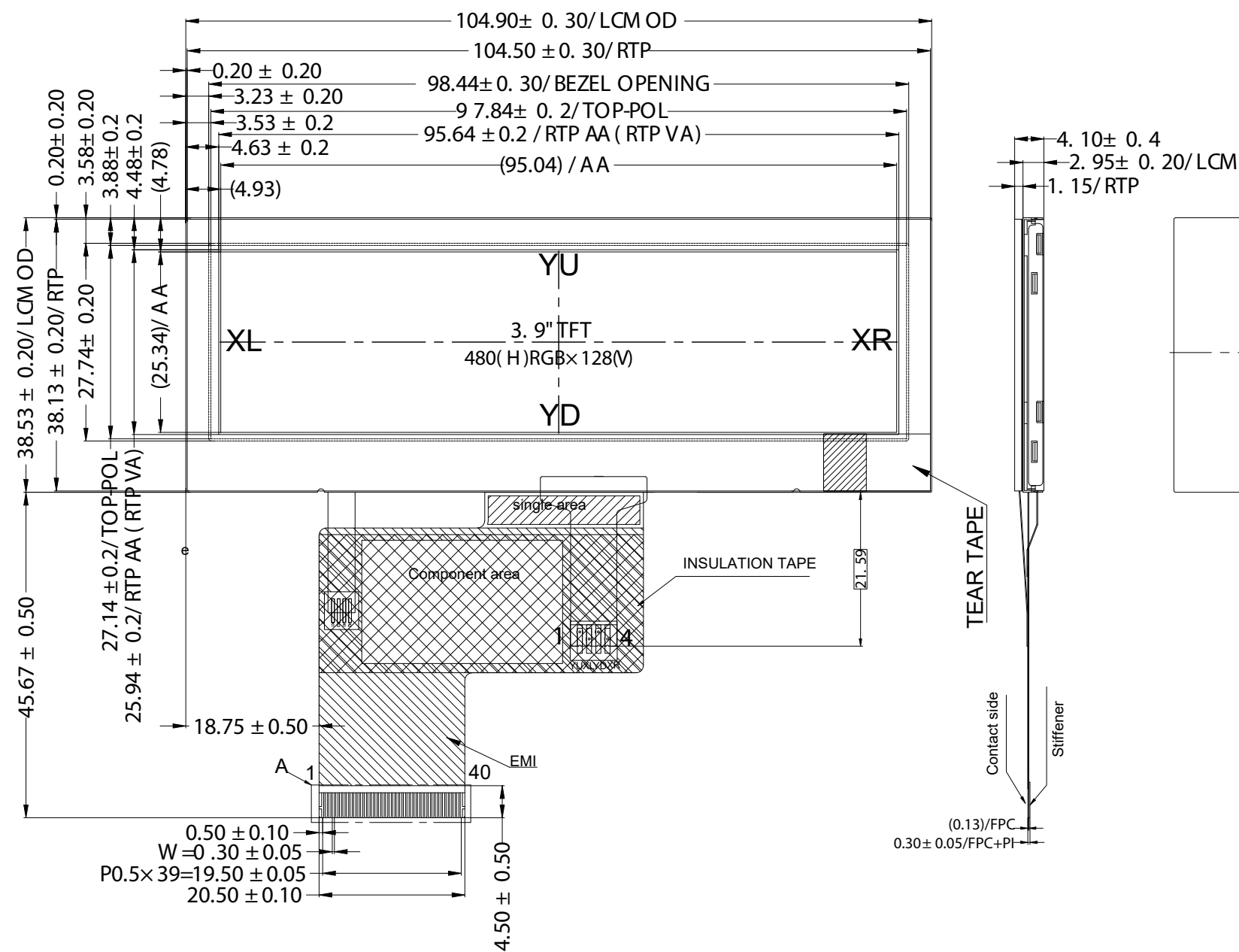
- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html
- **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
-	12/07/2024	Initial Release	KL

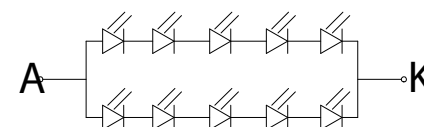
Mechanical Drawing



PIN ASSIGNMENT	
PIN	SYMBOL
1	LEDK
2	LEDA
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	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	GRB
36	GND
37	XR
38	YD
39	XL
40	YU

Product Description: 3.9" 480x128 IPS TFT w/ Resistive Touch

1. Driver IC: ST7282
2. Interface: 24-bit Parallel RGB
3. Power Requirement: 3.3V TFT, 14.8V/40mA Backlight
4. Optical Features: Normally Black, Transmissive, Anti-Glare, 900cd/m²
5. Recommended FFC Connector: 40pin 0.5mm pitch; Ex. Molex 54104-4031
6. EMI Shielded FPC



Backlight LED Circuit

Standard Tolerance: (Unless otherwise specified) Linear: ±0.3mm	 NEWHAVEN DISPLAY INTERNATIONAL	
	Drawing/Part Number: NHD-3.9-480128AF-ASXP-T	Revision: 1A
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection 	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 12/07/2024	Approved Date: 12/07/2024
This drawing is solely the property of Newhaven Display International, Inc. The information it contains is not to be disclosed, reproduced or copied in whole or part without written approval from Newhaven Display.		

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 (40mA @ 14.8V)
3	GND	Power Supply	Ground
4	V _{DD}	Power Supply	Power supply 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	DCLK	MPU	Pixel Clock signal for input data (Falling Edge)
31	DISP	MPU	H: Normal Operation; L: Standby Mode
32	HSYNC	MPU	Horizontal (Line) synchronization signal
33	VSNC	MPU	Vertical (Frame) synchronization signal
34	DE	MPU	Data Enable signal
35	GRB	MPU	Active LOW Reset signal
36	GND	Power Supply	Ground
37	XR	Touch Controller	Right
38	YD	Touch Controller	Down
39	XL	Touch Controller	Left
40	YU	Touch Controller	Up

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

RGB Interface Mode Selection

The Sitronix ST7282 driver IC is user configurable for DE Mode, SYNC mode, or SYNC-DE mode RGB interface.

DE Mode is enabled when HSYNC and VSYNC signals are set to logic-low state, and DE signal is toggled high for valid pixel data. Data is clocked in using DCLK signal. DE mode is recommended to enable the ST7282 driver IC to synchronize the display image on TFT panel without depending on specific horizontal and vertical sync timing from host controller.

SYNC mode is enabled when the DE signal is set to logic-low state, and HSYNC and VSYNC 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 DCLK signal. Any change to the HSYNC or VSYNC values may prevent the image from correctly appearing on the display.

SYNC-DE Mode is enabled when HSYNC and VSYNC signals are used to explicitly define the horizontal and vertical sync timing to synchronize the display image on TFT panel. DE signal is used as an additional indicator for transmission of valid pixel data. Data is clocked in using DCLK signal. Any change to the HSYNC or VSYNC values may prevent the image from correctly appearing on the display.

RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC-DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

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}	-	3.0	3.3	3.6	V
Supply Current	I _{DD}	V _{DD} = 3.3V	8	16	24	mA
"H" Level input	V _{IH}	-	0.7 * V _{DD}	-	V _{DD}	V
"L" Level input	V _{IL}	-	GND	-	0.3V _{DD}	V
"H" Level output	V _{OH}	-	V _{DD} - 0.4	-	V _{DD}	V
"L" Level output	V _{OL}	-	GND	-	GND + 0.4	V
Backlight Supply Current	I _{LED}	-	30	40	50	mA
Backlight Supply Voltage	V _{LED}	I _{LED} = 40mA	13.5	14.8	16.0	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	-	°
	Bottom	φY-		-	85	-	°
	Left	θX-		-	85	-	°
	Right	θX+		-	85	-	°
Contrast Ratio		CR	-	1000	1200	-	-
Luminance		L _V	I _{LED} = 40mA	720	900	-	cd/m ²
Response Time (Rise + Fall)		T _R + T _F	T _{OP} = 25°C	-	30	35	ms
Chromaticity	Red	X _R	-	0.550	0.600	0.650	-
		Y _R	-	0.286	0.336	0.386	-
	Green	X _G	-	0.257	0.307	0.357	-
		Y _G	-	0.536	0.586	0.636	-
	Blue	X _B	-	0.076	0.126	0.176	-
		Y _B	-	0.075	0.125	0.175	-
	White	X _W	-	0.220	0.270	0.320	-
		Y _W	-	0.264	0.314	0.364	-

Touch Panel Characteristics

Item	Min.	Typ.	Max.	Unit
Linearity	-1.5	-	1.5	%
Circuit Resistance – X-Axis	800	-	1600	Ω
Circuit Resistance – Y-Axis	50	-	200	Ω
Insulation Resistance	20	-	-	MΩ
Operating Voltage	-	-	5	V
Chattering	-	-	10	ms
Activation Force	30	-	100	g
Pen Writing Durability	100,000	-	-	Characters
Pitting Durability	1,000,000	-	-	Touches
Surface Hardness	3	-	-	H

Driver Information

Built-in ST7282 Source Driver: <https://support.newhavendisplay.com/hc/en-us/articles/4414848420119-ST7282>



Timing Characteristics

Horizontal Input Timing

Parameter	Symbol	Min	Typ	Max	Unit	Note
HSYNC Display period	T_{HDISP}	480			DCLK	
DCLK Frequency	F_{CLK}	8	9	12	MHz	
HSYNC Period Time	T_H	485	531	598	DCLK	
HSYNC Pulse Width	T_{HW}	2	4	75		
HSYNC Back Porch (Blanking)	T_{HBP}	3	43	43		
HSYNC Front Porch	T_{HFP}	2	8	75		

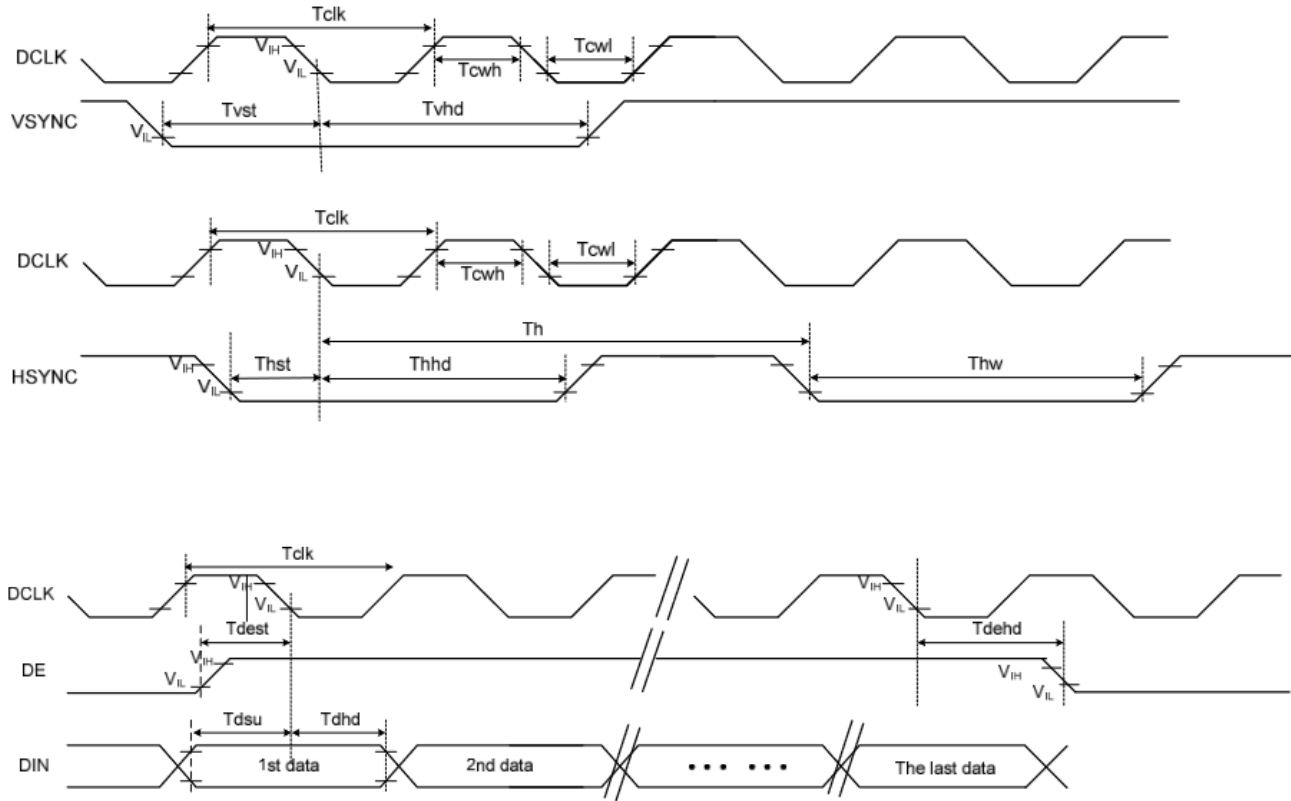
Vertical Input Timing

Parameter	Symbol	Min	Typ	Max	Unit	Note
VSYNC Display period	T_{VDISP}	272			HSYNC	
VSYNC Period Time	T_V	276	292	321		
VSYNC Pulse Width	T_{VW}	2	4	37		
VSYNC Back Porch (Blanking)	T_{VBP}	2	12	12		
VSYNC Front Porch	T_{VFP}	2	8	37		

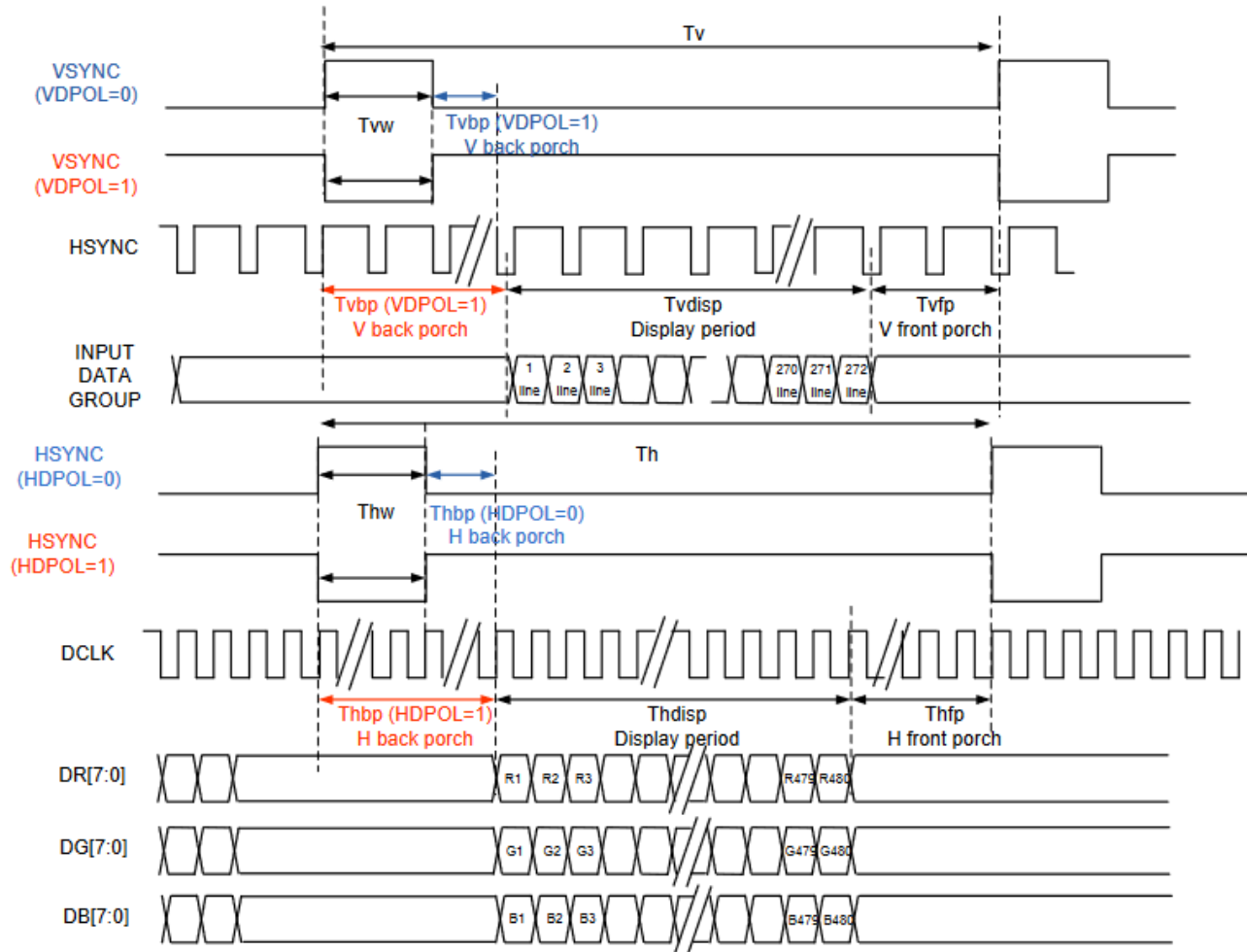
AC Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
CLK pulse duty	T_{CW}	40	50	60	%	
VSYNC setup time	T_{VST}	12	-	-	ns	
VSYNC hold time	T_{VHD}	12	-	-	ns	
HSYNC setup time	T_{HST}	12	-	-	ns	
HSYNC hold time	T_{HHD}	12	-	-	ns	
Data set-up time	T_{DSU}	12	-	-	ns	
Data hold time	T_{DHD}	12	-	-	ns	
DE setup time	T_{DEST}	10	-	-	ns	
DE hold time	T_{DHD}	10	-	-	ns	
Output stable time	T_{SST}	-	-	12	μs	

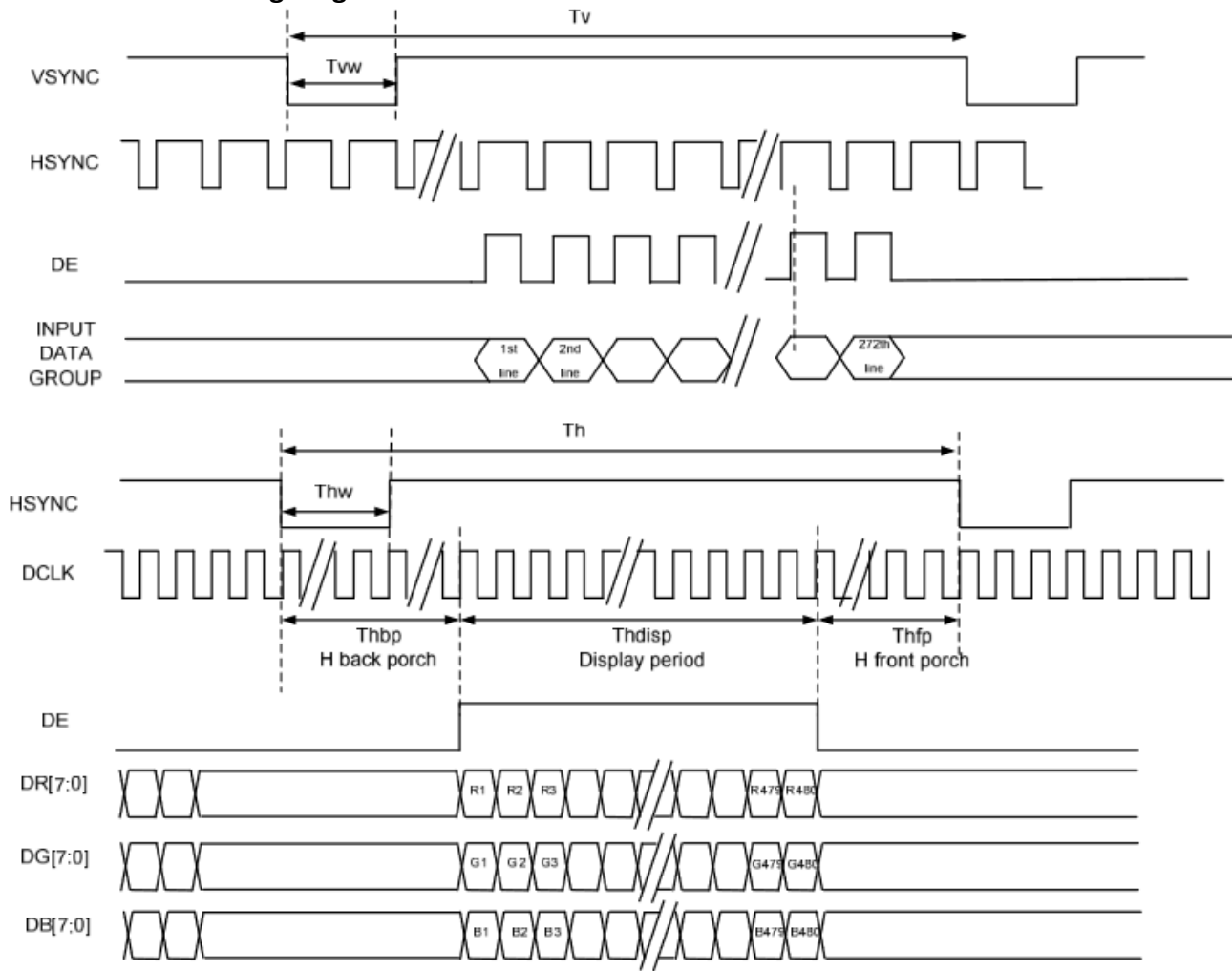
Clock and Data Input Timing Diagram



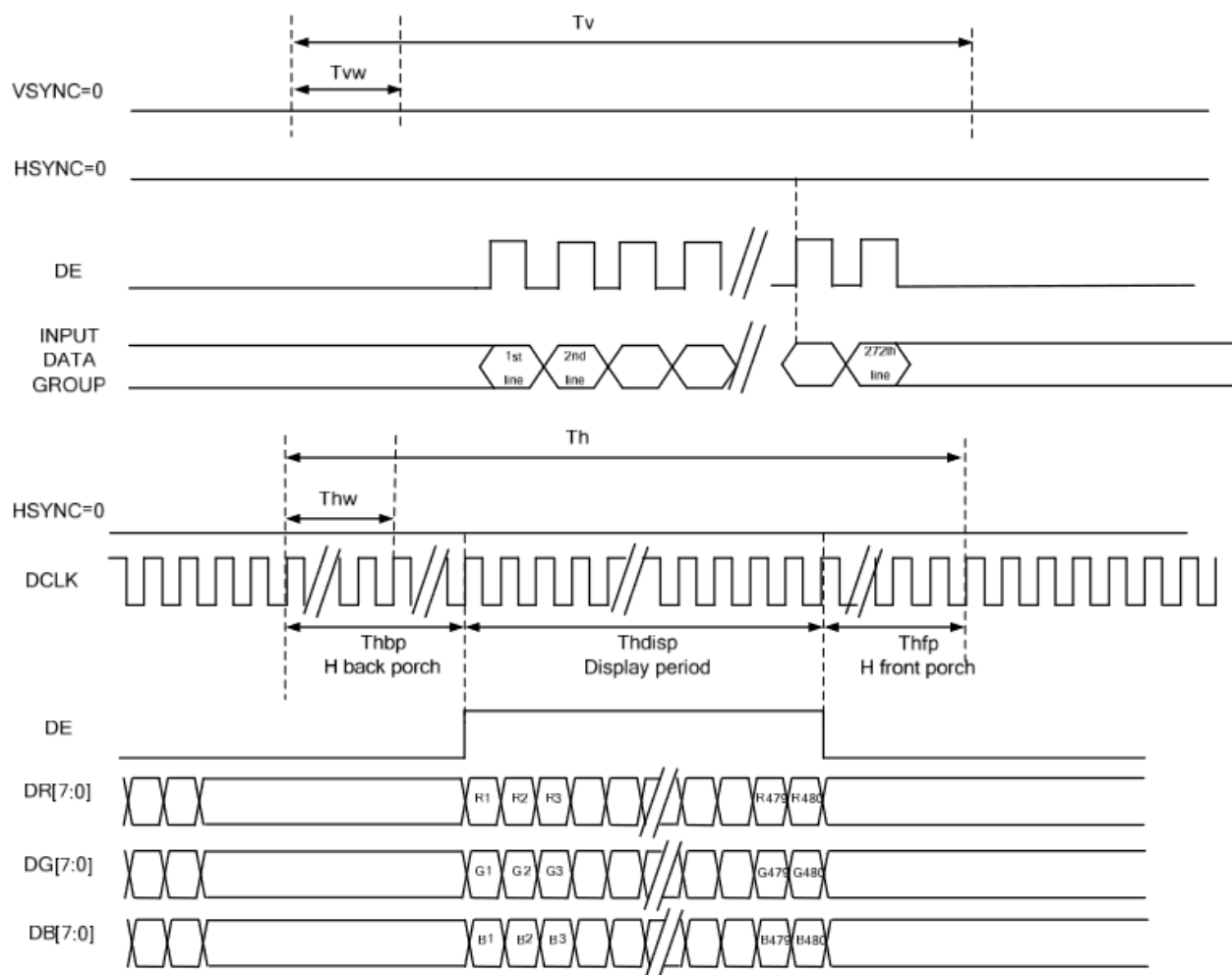
SYNC-Mode Timing Diagram



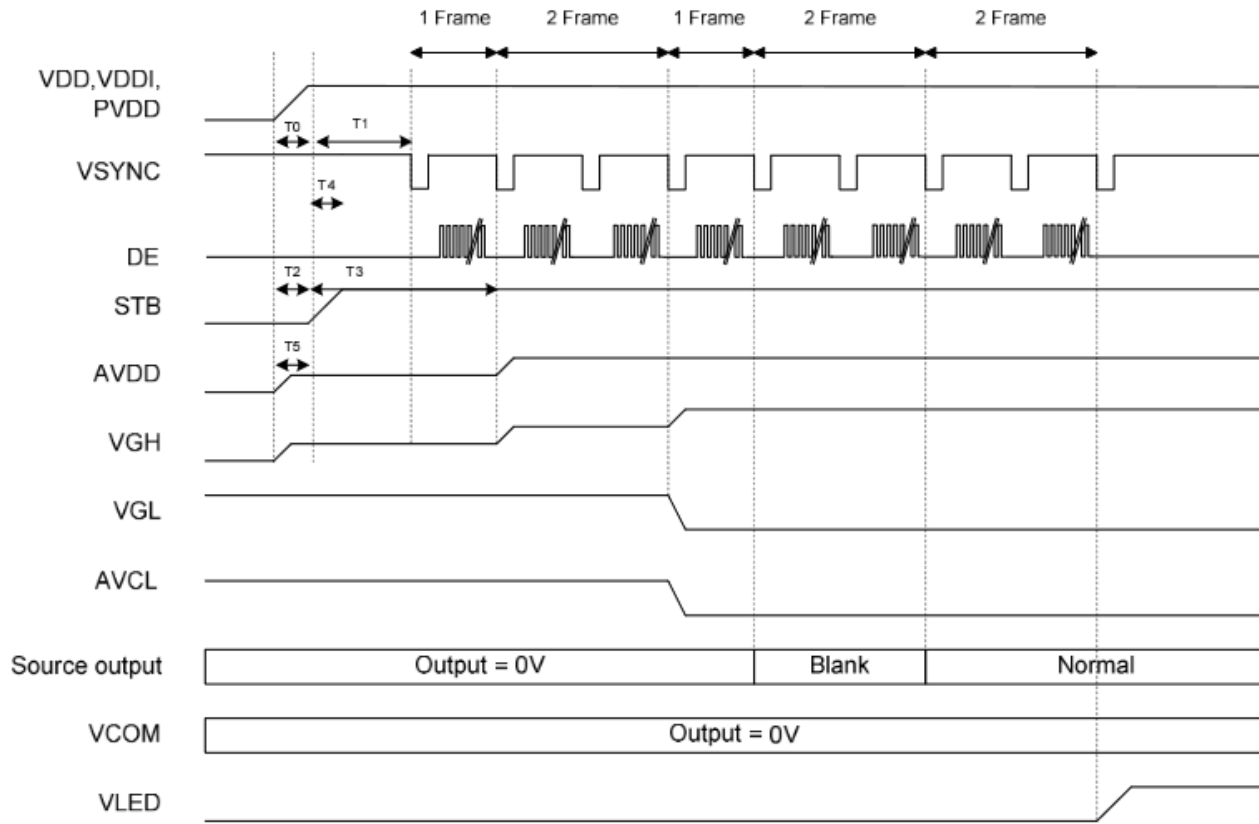
SYNC-DE Mode Timing Diagram



DE Mode Timing Diagram

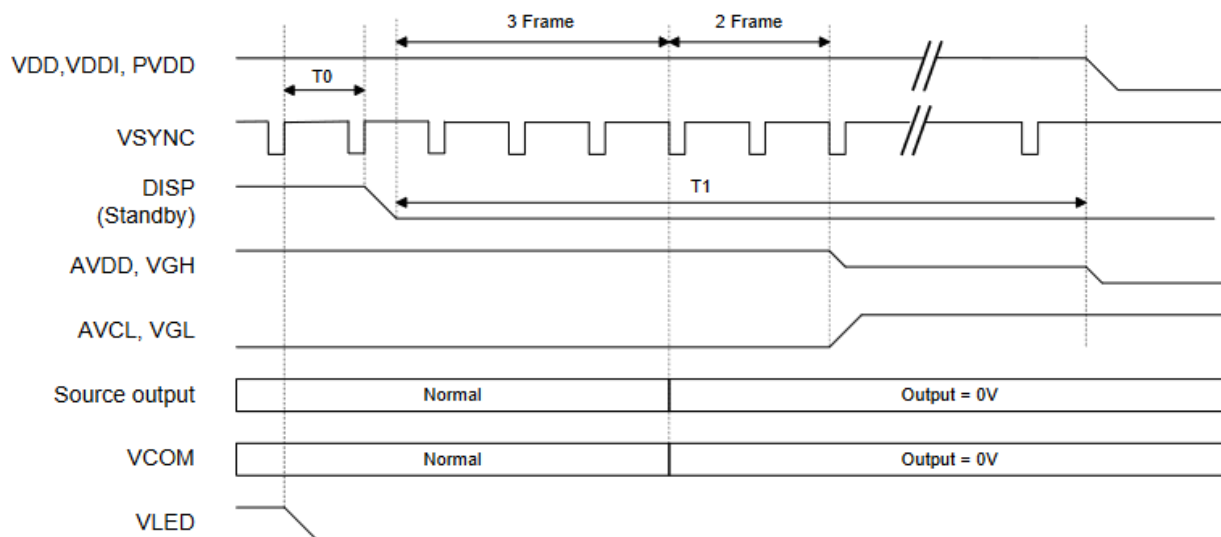


Power On Sequence



	Description	Min. Time
T0	Determined by the external power	
T1	Time from stable VDD, VDDI, PVDD set-up to the first VSYNC	$T_1=0$
T2	Time from AVDD=0V to AVDD=3.3V	$T_2=T_0$
T3	Time from AVDD=3.3V to AVDD=6.0V	$T_3=T_1 + (1 \times \text{Frame})$
T4	Time from stable VDD, VDDI, PVDD set-up to DISP asserted	$T_4=0$
T5	Time from VGH=0V to VGH=3.3V	$T_5=T_0$

Power Off Sequence



	Description	Min. Time
T0	Time from backlight power off to DISP="L"	1*Frame
T1	Time from DISP="L" to LCM Power off	5*Frame

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/330 Ω ; 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.