

# NHD-5.0-800480TF-ATXL#-T

## TFT (Thin-Film-Transistor) Color Liquid Crystal Display Module

NHD-	Newhaven Display
5.0-	5.0" Diagonal
800480-	800xRGBx480 Pixels
TF-	Model
A-	Built-in Driver / No Controller
T-	White LED Backlight
X-	TFT
L-	MVA, Enhanced Optical Characteristics, Wide Temperature
#-	<b>RoHS Compliant</b>
T-	4-wire Resistive Touch Panel

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## Document Revision History

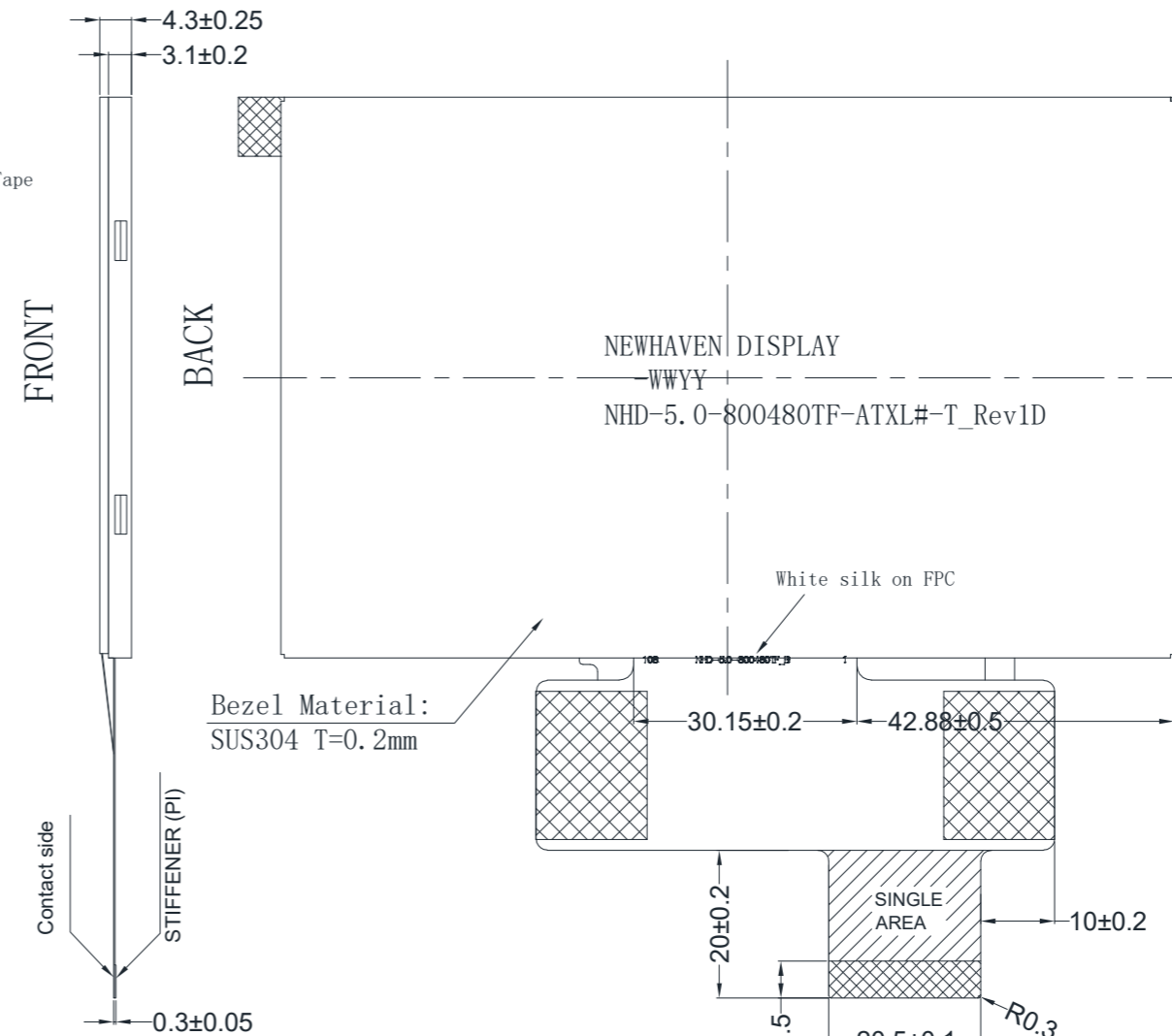
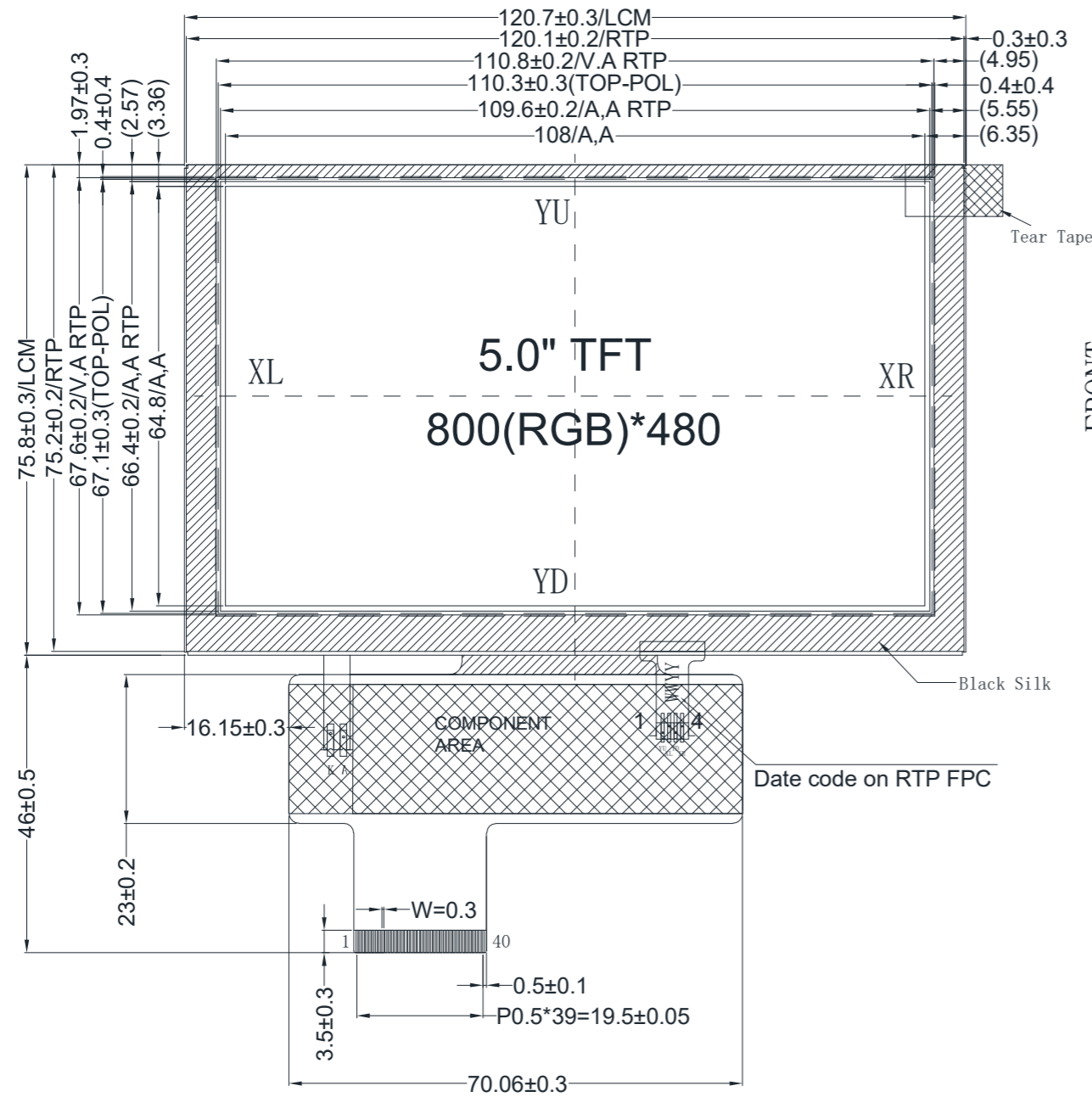
Revision	Date	Description	Changed by
0	8/28/13	Initial Release	AK
1	9/16/14	Electrical Characteristics updated	ML
2	9/2/15	Driver, Electrical, Optical characteristics updated	AK
3	11/2/15	Backlight Lifetime Rating Added, Datasheet Reformat	SB
4	2/23/16	Corrected Notes on Drawing	SB
5	7/22/16	Updated Mechanical Drawing, Electrical Characteristics	TM
6	4/14/17	Supply Current Updated	SB
7	10/5/18	Driver IC Update & Chromaticity Added	SB
8	7/11/19	Timing Characteristics Updated	SB
9	1/14/20	Driver Change to ILI6122, Optical Characteristics Updated	SB
10	5/7/20	Updated Chromaticity Values, Added Information for DE Mode Operation	AS
11	1/15/21	Updated 2D Mechanical Drawing	AS
12	1/29/21	Production Line Changed: Part Revision Updated from Rev1C to Rev1D	AS
13	5/5/21	Updated the Mechanical Drawing	JT

## Functions and Features

- 800xRGBx480 resolution, up to 16.7M colors
- 18-LED backlight
- 24-bit RGB interface
- Enhanced Optical Characteristics
- 4-wire Resistive Touch Panel
- Wide Viewing Angles

# Mechanical Drawing

SYMBOL	REVISION	DATE

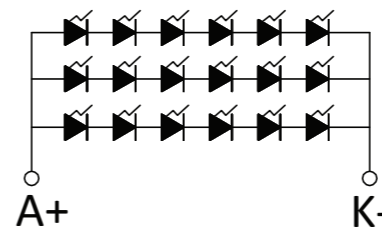


## TFT Pinout:

Pin No.	Symbol
1	LEDK
2	LEDA
3	GND
4	VDD
5-12	[R0-R7]
13-20	[G0-G7]
21-28	[B0-B7]
29	GND
30	CLK
31	STBYB
32	HSD
33	VSD
34	DEN
35	NC
36	GND
37	XR
38	YD
39	XL
40	YU

## Notes:

1. Display size: 5.0" TFT
2. Display mode: MVA/Transmissive/Normally White/Anti-glare
3. Supply Voltage: 3.3V
4. Driver IC: ILI6122
5. Backlight: White LED / 19.2V (Typ) / 60mA (Typ)
6. Brightness: 480 cd/m<sup>2</sup> (Typ)
7. 3M Brightness Enhancement Film
8. Touch Panel: 4-wire Resistive Touch



STANDARD TOLERANCE: (UNLESS OTHERWISE SPECIFIED)	NEWHAVEN DISPLAY INTERNATIONAL	
LINEAR: ±0.3mm	DRAWING/PART NUMBER: NHD-5.0-800480TF-ATXL#-T	REVISION: 1D
UNLESS OTHERWISE SPECIFIED: - DIMENSIONS ARE IN MILLIMETERS - THIRD ANGLE PROJECTION	DRAWN BY: J.Thomas	APPROVED BY: J.Thomas
	DRAWN DATE: 5/5/21	APPROVED DATE: 5/5/21
	DO NOT SCALE DRAWING	
	SHEET 1 OF 1	
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## Pin Description

Pin No.	Symbol	External Connection	Function Description
1	LED-	LED Power Supply	Ground for Backlight
2	LED+	LED Power Supply	Backlight Power Supply (60mA @ 19.2V)
3	GND	Power Supply	Ground
4	V <sub>DD</sub>	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	CLKIN	MPU	Clock for input data (Rising Edge)
31	STBYB	MPU	1: Normal Operation; 0: Standby Mode
32	HSD	MPU	Line synchronization signal
33	VSD	MPU	Frame synchronization signal
34	DEN	MPU	Data Enable signal
35	NC	-	No Connect
36	GND	Power Supply	Ground
37	XR	Touch Controller	Touch Panel Right
38	YD	Touch Controller	Touch Panel Down
39	XL	Touch Controller	Touch Panel Left
40	YU	Touch Controller	Touch Panel Up

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

**Backlight connector:** on LCD connector

**Mates with:** ---

The ILI6122 driver IC is configured for DE Mode by default which eliminates the need to depend on HSD and VSD timing signals. Using DE mode in place of Sync mode, the display will no longer be affected by changes to the sync timing or porch settings in the event of a driver IC change. This will maintain a consistent display performance for any driver IC changes that may occur in the future.

The ILI6122 driver will treat the data on the Dx[7:0] RGB data bus as active display data while DEN is at “H” level and ignore the data on the Dx[7:0] RGB data bus while DEN is at “L” level.

Sync Mode can still be provided as the default setting but will need to be ordered as a custom option.

## Driver Information

Built-in ILI6122 Source Driver: <http://www.newhavendisplay.com/appnotes/datasheets/LCDs/ILI6122.pdf>

Built-in ILI5960D Gate Driver: <http://www.newhavendisplay.com/appnotes/datasheets/LCDs/ILI5960D.pdf>

## Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T <sub>OP</sub>	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T <sub>ST</sub>	Absolute Max	-30	-	+80	°C
Supply Voltage	V <sub>DD</sub>	-	3.0	3.3	3.6	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> = 3.3V	39	78	117	mA
"H" Level input	V <sub>IH</sub>	-	0.7 * V <sub>DD</sub>	-	V <sub>DD</sub>	V
"L" Level input	V <sub>IL</sub>	-	GND	-	0.3 * V <sub>DD</sub>	V
"H" Level output	V <sub>OH</sub>	-	V <sub>DD</sub> - 0.4	-	V <sub>DD</sub>	V
"L" Level output	V <sub>OL</sub>	-	GND	-	GND + 0.4	V
Backlight Supply Current	I <sub>LED</sub>	-	-	60	75	mA
Backlight Supply Voltage	V <sub>LED</sub>	I <sub>LED</sub> = 60mA	16.8	19.2	20.4	V
Backlight Lifetime*	-	T <sub>OP</sub> = 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	CR ≥ 10	60	70	-	°	
	Bottom		60	70	-	°	
	Left		60	70	-	°	
	Right		60	70	-	°	
Contrast Ratio	CR	-	400	500	-	-	
Luminance	L <sub>V</sub>	I <sub>LED</sub> = 60 mA	380	480	-	cd/m <sup>2</sup>	
Response Time	T <sub>R</sub> + T <sub>F</sub>	T <sub>OP</sub> = 25°C	-	25	50	ms	
Chromaticity	Red	X <sub>R</sub>	-	0.506	0.556	0.606	-
		Y <sub>R</sub>	-	0.298	0.348	0.398	-
	Green	X <sub>G</sub>	-	0.296	0.346	0.396	-
		Y <sub>G</sub>	-	0.540	0.590	0.640	-
	Blue	X <sub>B</sub>	-	0.086	0.136	0.186	-
		Y <sub>B</sub>	-	0.058	0.107	0.157	-
White	X <sub>W</sub>	-	0.261	0.311	0.361	-	
	Y <sub>W</sub>	-	0.305	0.355	0.405	-	

## Touch Panel Characteristics

Item	Min.	Typ.	Max.	Unit
Linearity	-1.5	-	1.5	%
Circuit Resistance – X-Axis	350	-	1000	Ω
Circuit Resistance – Y-Axis	100	-	450	Ω
Insulation Resistance	20	-	-	MΩ
Operating Voltage	-	-	10	V
Chattering	-	-	10	ms
Transmittance	80	-	-	%
Activation Force	20	-	100	g
Pen Writing Durability	20,000	-	-	Characters
Pitting Durability	1,000,000	-	-	Touches
Surface Hardness	3	-	-	H
Haze	4	7	10	%

# Timing Characteristics

## Horizontal Input Timing

Parameter	Symbol	Value			Unit
Horizontal Display Area	thd	800			MHz
DCLK Frequency	fclk	Min	Typ	Max	MHz
		-	33.3	50	
1 Horizontal Line	th	862	1056	1200	DCLK
HSD Pulse Width	thpw	1	-	40	
HSD Back Porch (Blanking)	thb	46	46	46	
HSD Front Porch	thfp	16	210	354	

## Vertical Input Timing

Parameter	Symbol	Min	Typ	Max	Unit
Vertical Display Area	tvd	480			HSD
VSD Period Tim	tv	510	525	650	
VSD Pulse Width	tvpw	1	-	20	
VSD Back Porch (Blanking)	tvb	23	23	23	
VSD Front Porch	tvfp	7	22	147	

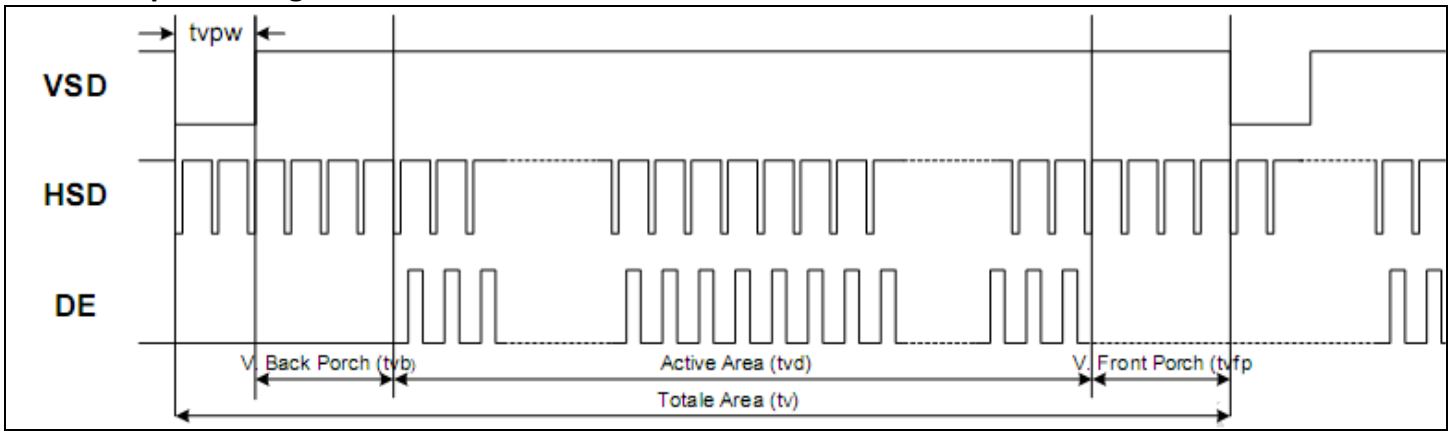
## AC Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
V <sub>DD</sub> Power ON Slew Rate	T <sub>POR</sub>	-	-	20	ms	From 0V to 90% V <sub>DD</sub>
RSTB Pulse Width	T <sub>RST</sub>	10	-	-	μs	CLKIN = 45MHz
CLKIN cycle time	T <sub>cph</sub>	20	-	-	ns	
CLKIN pulse duty	T <sub>cwh</sub>	40	50	60	%	
VSD setup time	T <sub>vst</sub>	8	-	-	ns	
VSD hold time	T <sub>vhd</sub>	8	-	-	ns	
HSD setup time	T <sub>hst</sub>	8	-	-	ns	
HSD hold time	T <sub>hhd</sub>	8	-	-	ns	
Data set-up time	T <sub>dsu</sub>	8	-	-	ns	DOR[7:0], D1G[7:0], D2B[7:0] to CLKIN
Data hold time	T <sub>dhd</sub>	8	-	-	ns	DOR[7:0], D1G[7:0], D2B[7:0] to CLKIN
DE setup time	T <sub>esu</sub>	8	-	-	ns	
DE hold time	T <sub>ehd</sub>	8	-	-	ns	
Output stable time	T <sub>sst</sub>	-	-	6	μs	10%-90% target voltage C <sub>L</sub> = 120pf, R = 10kΩ

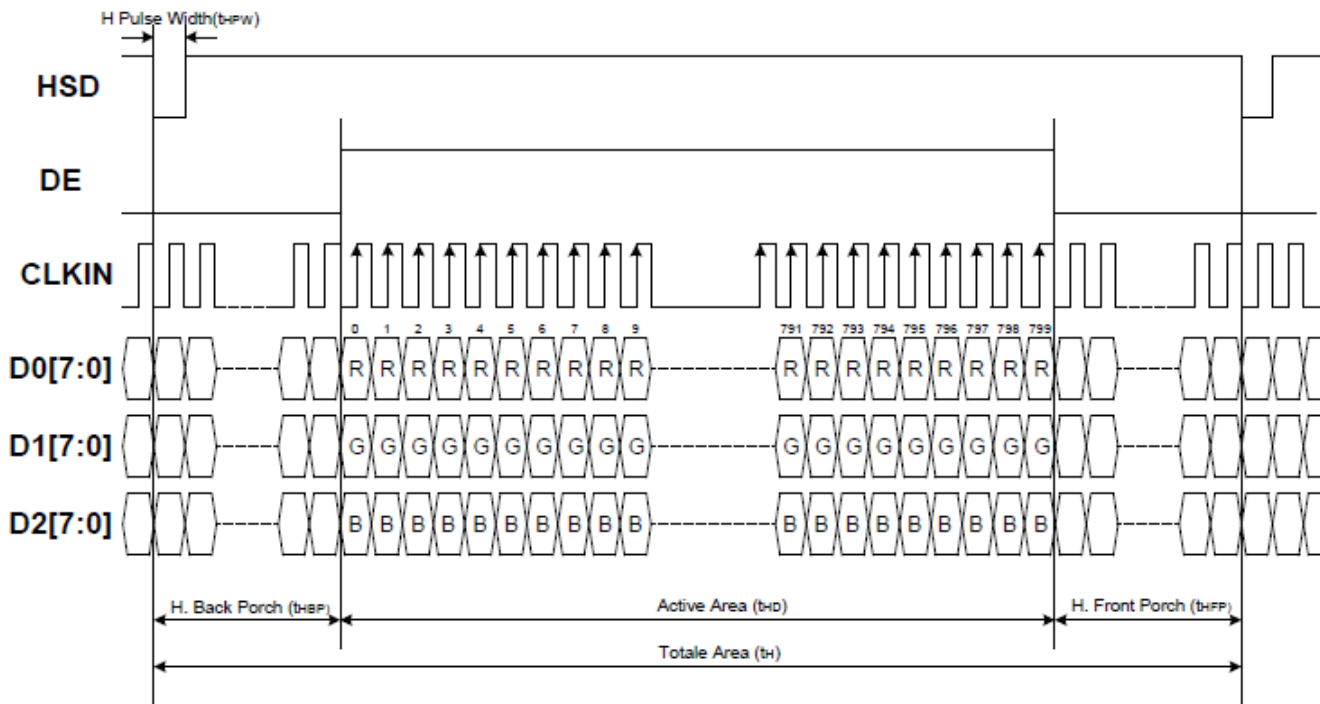
## Parallel 24-Bit RGB Mode Timing

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
CLKIN Frequency	F <sub>clk</sub>	-	40	50	MHz	V <sub>DD</sub> = 2.7V ~ 3.6V
CLKIN time	T <sub>clk</sub>	20	25	-	Ns	
CLKIN Pulse Duty	T <sub>cwh</sub>	40	50	60	%	T <sub>clk</sub>
Time from HSD to Source Output	T <sub>hso</sub>	-	20	-	CLKIN	
Time from HSD to LD	T <sub>hld</sub>	-	20	-	CLKIN	
Time from HSD to STV	T <sub>hstv</sub>	-	2	-	CLKIN	
Time from HSD to CKV	T <sub>hckv</sub>	-	20	-	CLKIN	
Time from HSD to OEV	T <sub>hoev</sub>	-	4	-	CLKIN	
LD Pulse Width	T <sub>wld</sub>	-	10	-	CLKIN	
CKV Pulse Width	T <sub>wckv</sub>	-	66	-	CLKIN	
OEV Pulse Width	T <sub>woev</sub>	-	74	-	CLKIN	

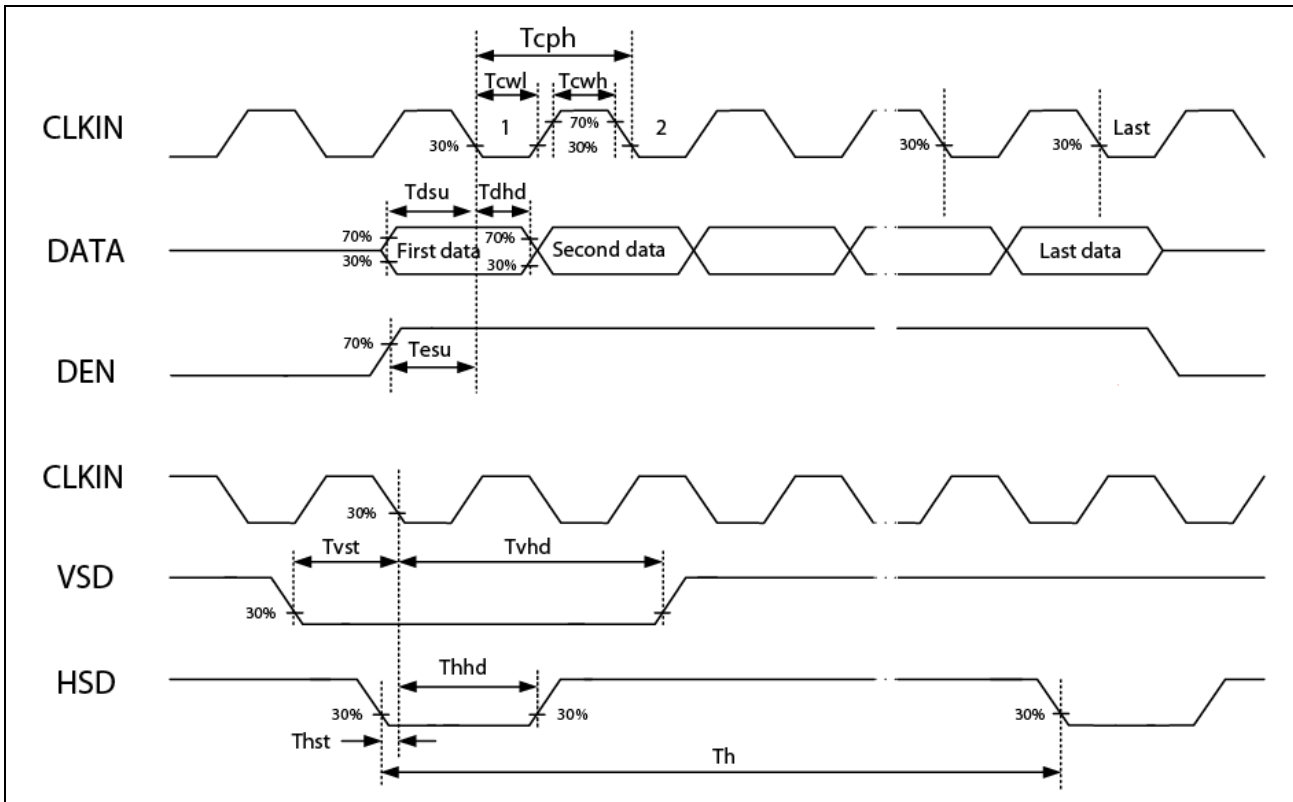
## Vertical Input Timing



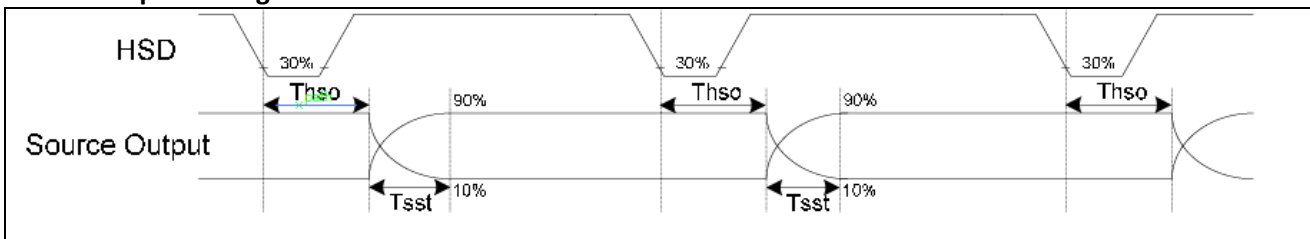
## Horizontal Input Timing



## Input Clock and Data Timing

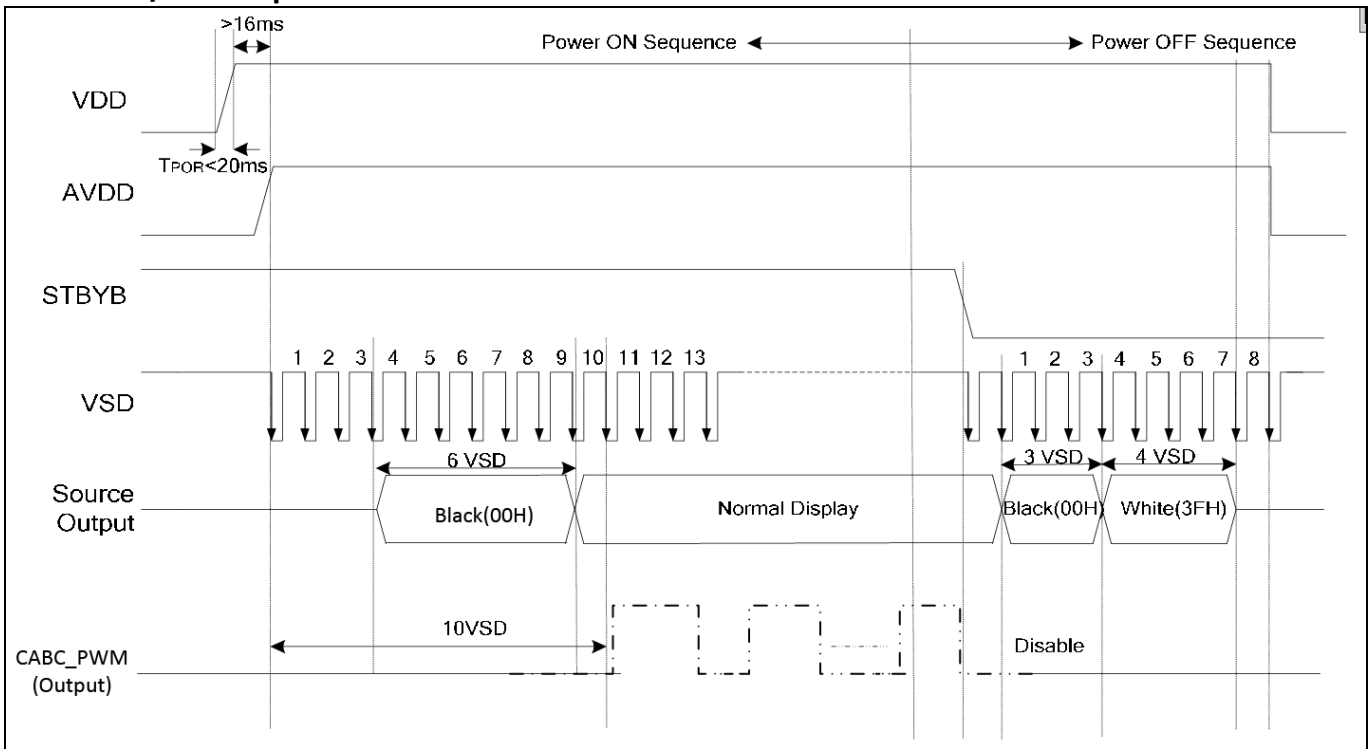


## Source Output Timing

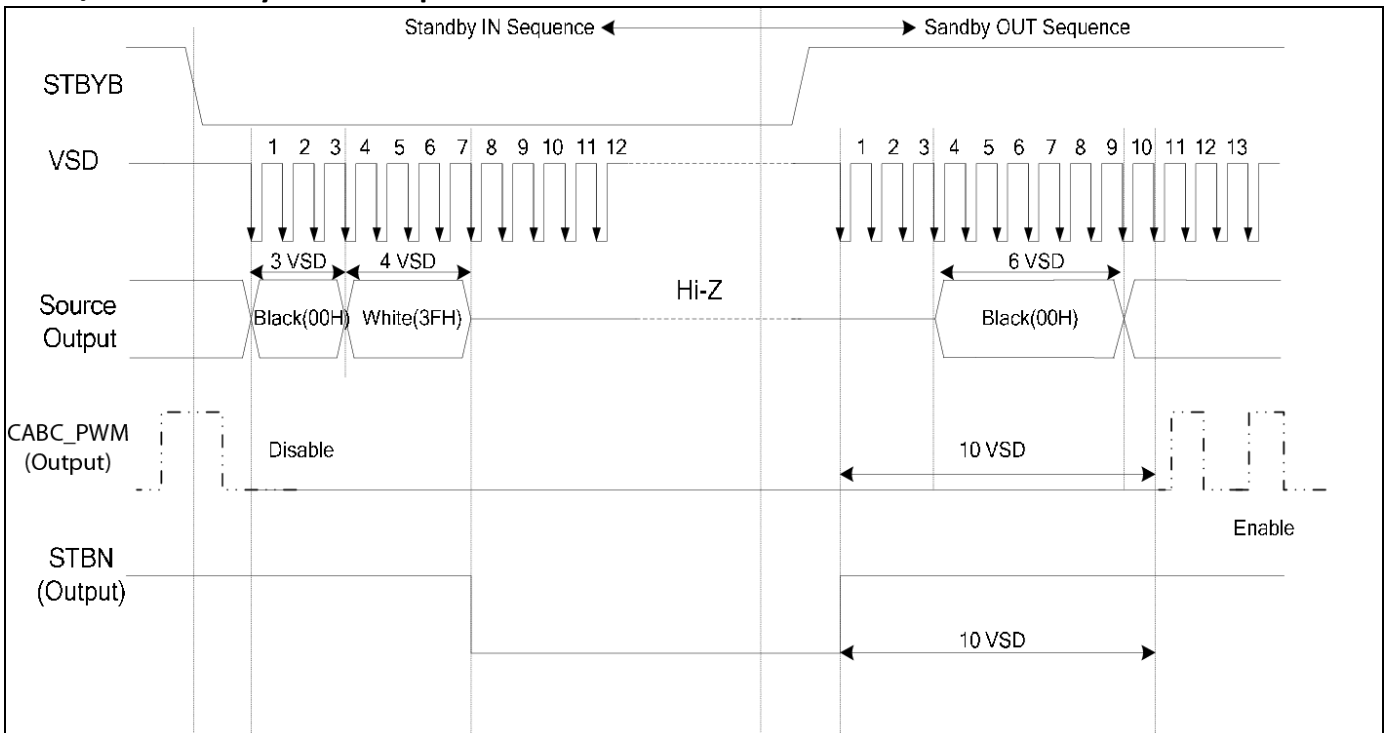




## Power ON/OFF Sequence



## Enter/Exit Standby Mode Sequence



## 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, 96 Hrs.	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C, 96 Hrs.	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C, 96 Hrs.	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C, 96 Hrs.	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, 96 Hrs.	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, 60min = 1 Cycle for 20 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz , 5G Acceleration 60 sec in each of 3 directions (X,Y,Z) For 30 minutes	3
Static electricity test	Endurance test applying electric static discharge.	Air: ±8kV 150pF/330Ω, 5 Times	
		Contact: ±4kV 150pF/330Ω, 5 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](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

[http://www.newhavendisplay.com/index.php?main\\_page=terms](http://www.newhavendisplay.com/index.php?main_page=terms)