

# NHD-7.0-800480EF-ASXN#

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

NHD-	Newhaven Display
7.0-	7.0" Diagonal
800480-	800xRGBx480 Pixels
EF-	Model
A-	Built-in Driver / No Controller
S-	Sunlight Readable
X-	TFT
N-	TN, Wide Temperature
#-	<b>RoHS Compliant</b>

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## Document Revision History

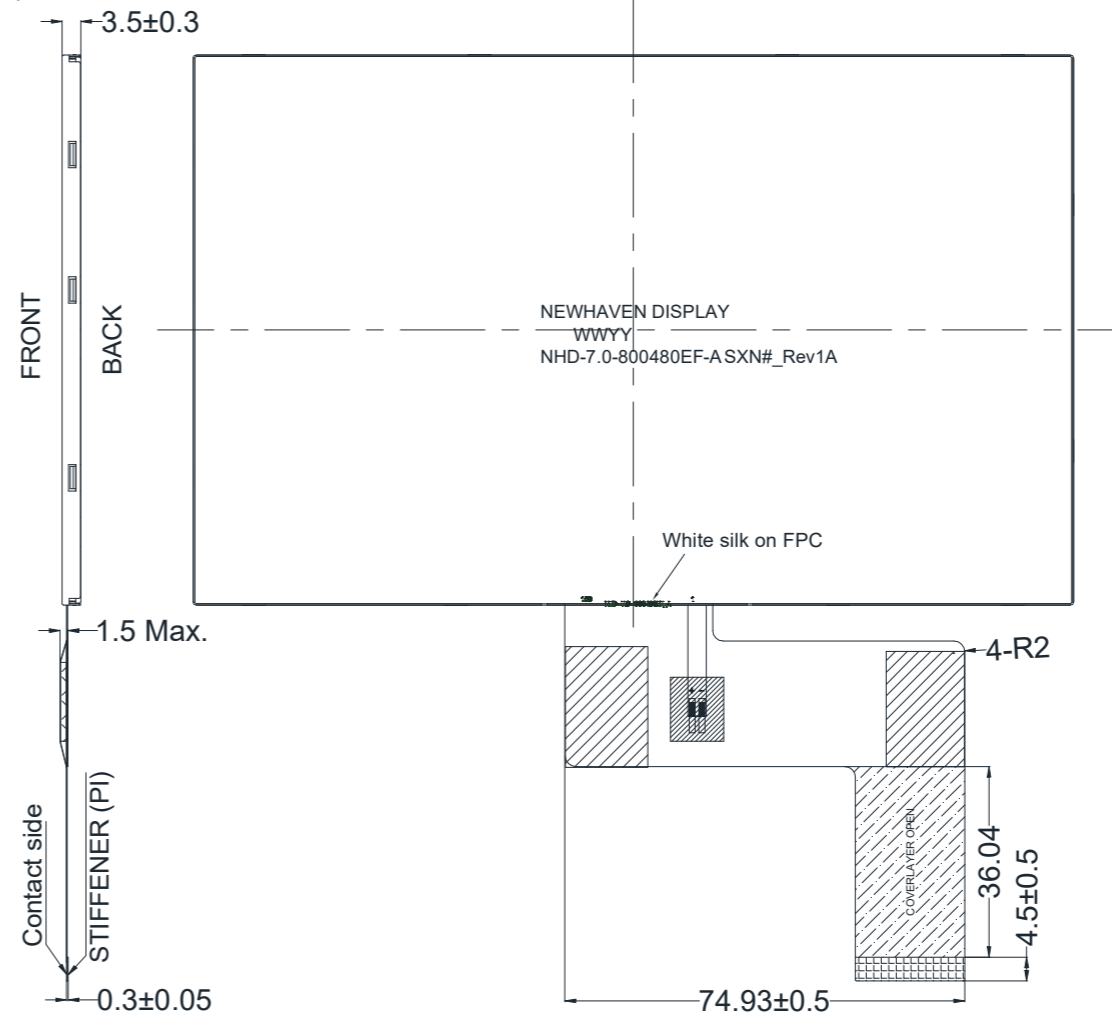
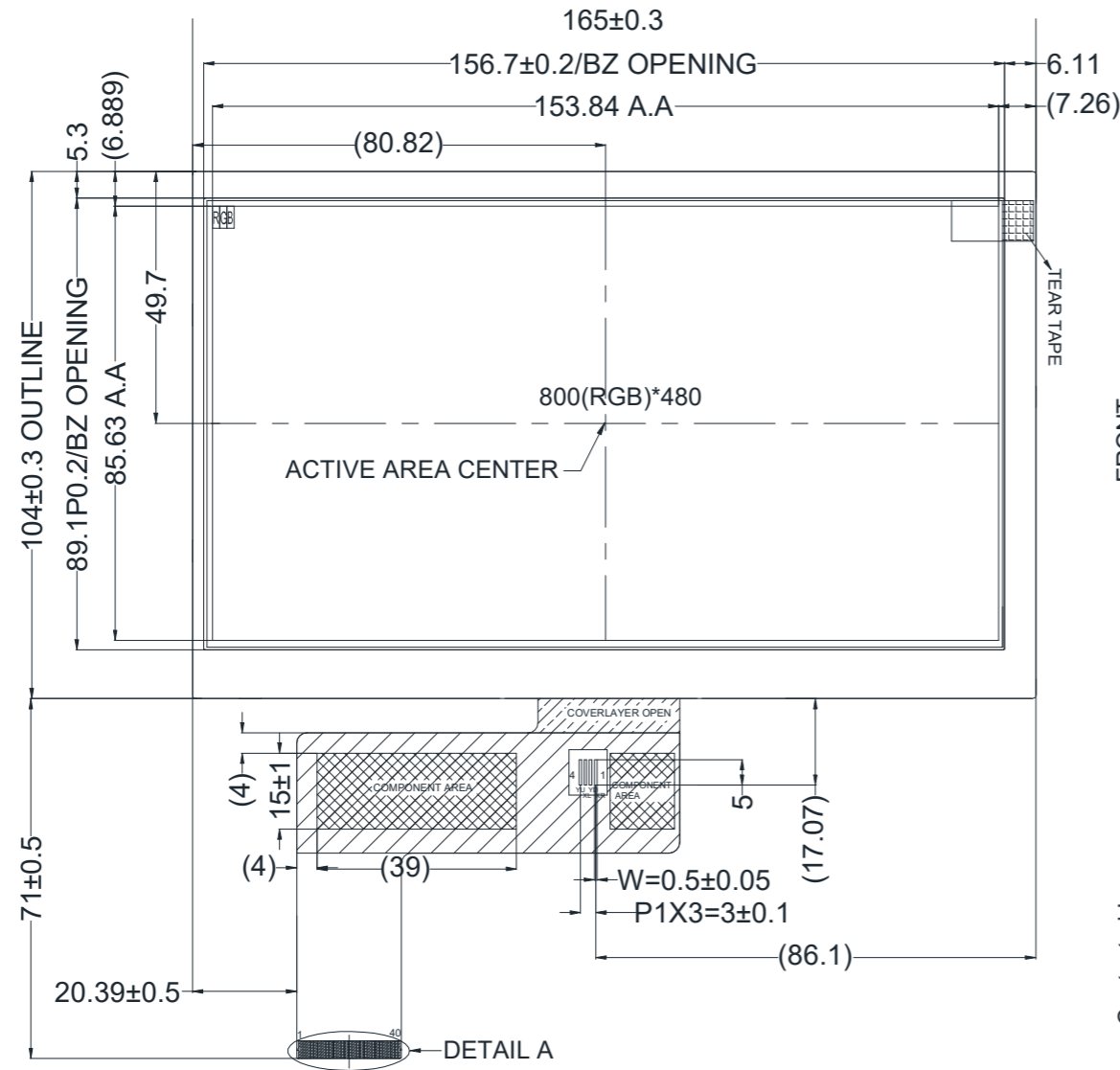
Revision	Date	Description	Changed by
0	3/10/16	Initial Release	SB
1	6/30/16	Added Chromaticity	SB
2	9/15/17	Backlight Characteristics Updated	SB
3	3/9/20	LCD Driver Changed to EK9716	SB
4	6/4/20	Updated 2D Mechanical Drawing, Viewing Angles, Quality Information	AS
5	3/2/21	Updated Silkscreen on FPC	AS
6	5/24/21	Updated Mechanical Drawing	JT

## Functions and Features

- 800xRGBx480 resolution
- LED backlight
- 24-bit digital RGB interface
- 16.7M colors
- Sunlight Readable

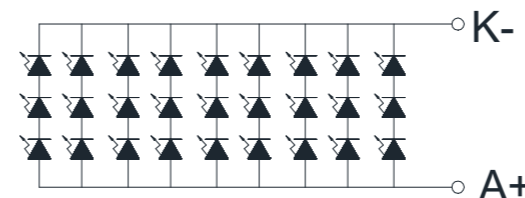
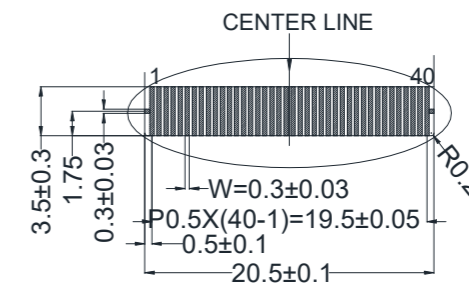
# Mechanical Drawing

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	DISP
32	HSYNC
33	HSYNC
34	DEN
35	NC
36	GND
37	NC(XR)
38	NC(YD)
39	NC(XL)
40	NC(YU)



LED CIRCUIT

## Notes:

1. Display Size: 7.0" TFT
2. Optimal View: 12:00 View
3. Display Mode: Transmissive / Normally White / Anti-Glare
4. Driver IC: EK9716 & EK73002
5. Supply Voltage: 3.3V
6. Backlight: White LED / 9.3 V / 180 mA (Typ)
7. Brightness: 1000cd/m<sup>2</sup> (Typ)
8. 3M Brightness Enhancement Film

STANDARD TOLERANCE: (UNLESS OTHERWISE SPECIFIED)			
LINEAR: ±0.3mm		DRAWING/PART NUMBER: NHD-7.0-800480EF-ASXN	
UNLESS OTHERWISE SPECIFIED: - DIMENSIONS ARE IN MILLIMETERS - THIRD ANGLE PROJECTION		DRAWN BY: J.Thomas	APPROVED BY: J.Thomas
		DRAWN DATE: 5/24/2021	APPROVED DATE: 5/24/2021
		DO NOT SCALE DRAWING	
		SHEET 1 OF 1	
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## Pin Description

Pin No.	Symbol	Connection	Function Description
1	LED-K	Power Supply	Backlight Cathode (Ground)
2	LED-A	Power Supply	Backlight Anode (180mA @ 9.3V)
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	DCLK	MPU	Dot data Clock (Falling Edge Triggered)
31	DISP	MPU	Display ON/OFF signal. DISP=1 : Display ON
32	HSYNC	MPU	Line synchronization signal
33	VSYNC	MPU	Frame synchronization signal
34	DEN	MPU	Data Enable signal
35	NC	-	No Connect
36	GND	Power Supply	Ground
37	NC(XR)	-	No Connect
38	NC(YD)	-	No Connect
39	NC(XL)	-	No Connect
40	NC(YU)	-	No Connect

**Recommended LCD connector:** 40pin 0.5mm pitch FFC. Molex P/N: 54104-4031 (top contact)

## 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, 25°C	45	90	135	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>	-	V <sub>SS</sub>	-	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>	-	V <sub>SS</sub>	-	V <sub>SS</sub> +0.4	V
Backlight Supply Current	I <sub>LED</sub>	-	-	180	225	mA
Backlight Supply Voltage	V <sub>LED</sub>	I <sub>LED</sub> = 180 mA	8.4	9.3	10.2	V
Backlight Lifetime	-	T <sub>OP</sub> = 25° C	20,000	50,000	-	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	-	°	
	Bottom		-	70	-	°	
	Left		-	70	-	°	
	Right		-	70	-	°	
Contrast Ratio	CR	-	-	500	-	-	
Luminance	L <sub>V</sub>	I <sub>LED</sub> = 180 mA	800	1000	-	cd/m <sup>2</sup>	
Response Time	T <sub>R</sub> + T <sub>F</sub>	T <sub>OP</sub> = 25°C	-	25	-	ms	
Chromaticity	Red	X <sub>R</sub>	-	0.532	0.582	0.632	-
		Y <sub>R</sub>	-	0.292	0.342	0.392	-
	Green	X <sub>G</sub>	-	0.285	0.335	0.385	-
		Y <sub>G</sub>	-	0.574	0.624	0.674	-
	Blue	X <sub>B</sub>	-	0.104	0.154	0.204	-
		Y <sub>B</sub>	-	0.092	0.142	0.192	-
White	X <sub>W</sub>	-	0.257	0.307	0.357	-	
	Y <sub>W</sub>	-	0.334	0.384	0.434	-	

## Driver Information

Built-in EK9716B Source Driver: [https://www.newhavendisplay.com/appnotes/datasheets/LCDs/EK9716B\\_v1-1.pdf](https://www.newhavendisplay.com/appnotes/datasheets/LCDs/EK9716B_v1-1.pdf)

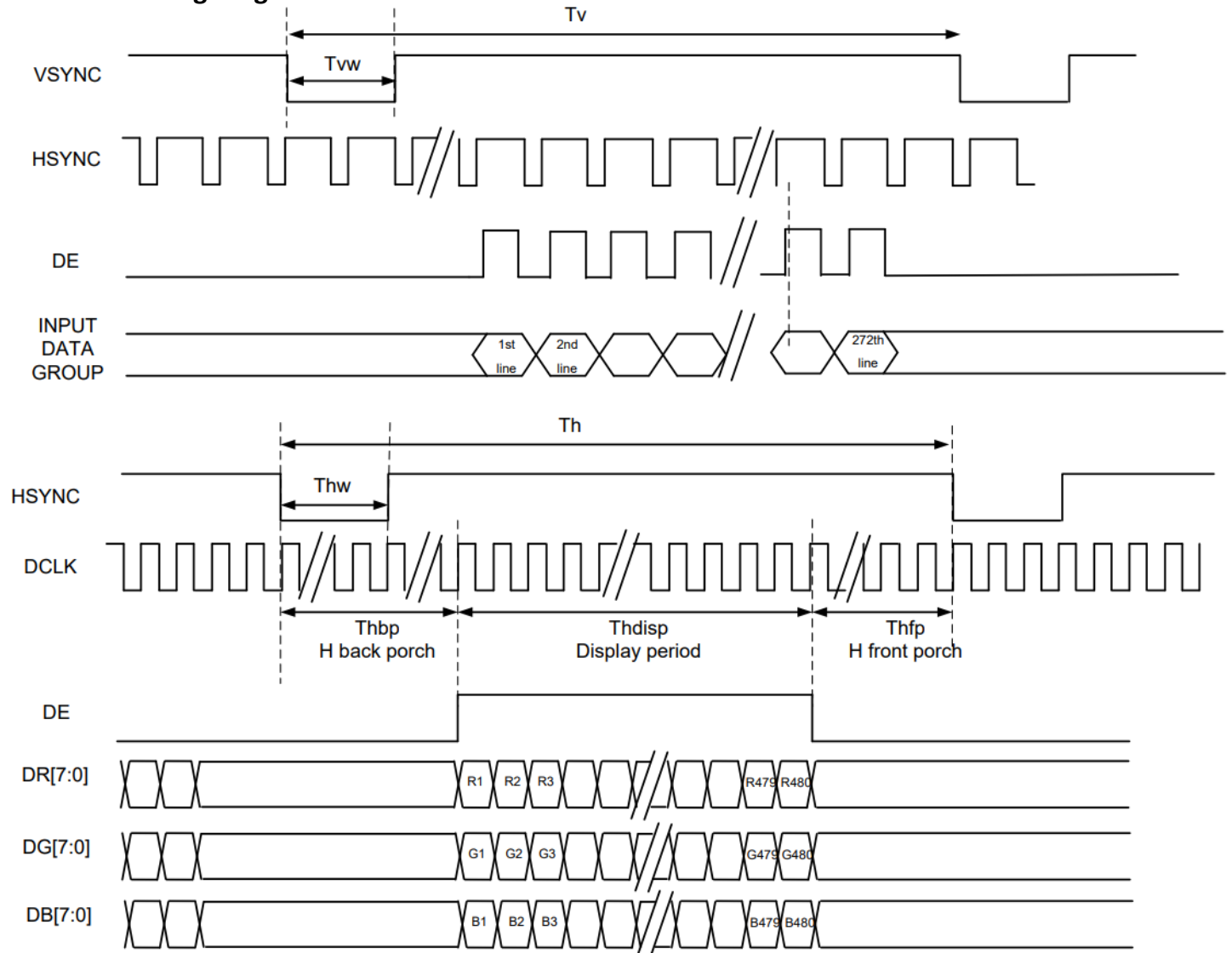
Built-in EK73002AB2 Gate Driver: <https://www.newhavendisplay.com/appnotes/datasheets/LCDs/EK73002AB2.pdf>

# Timing Characteristics

## Parallel RGB Input Timing Requirements

Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
DCLK Frequency	$F_{clk}$	28.2	29.2	40	MHz	-	
DLCK Period	$T_{clk}$	25	34	-	ns	-	
HSYNC	Period Time	$T_h$	908	928	1088	DCLK	Thw + Thbp = 88 DCLK is fixed
	Display Period	$T_{ndisp}$	800			DCLK	
	Pulse Width	$T_{hw}$	1	48	87	DCLK	
	Back Porch	$T_{hbp}$	87	40	1	DCLK	
	Front Porch	$T_{hfp}$	20	40	200	DCLK	
VSYNC	Display Period	$T_{vdisp}$	480			H	Tv + Tvbp = 32 H is fixed
	Period Time	$T_v$	517	525	613	H	
	Pulse Width	$T_{vw}$	1	1	3	H	
	Back Porch	$T_{vbp}$	31	31	29	H	
	Front Porch	$T_{vfp}$	5	13	101	H	

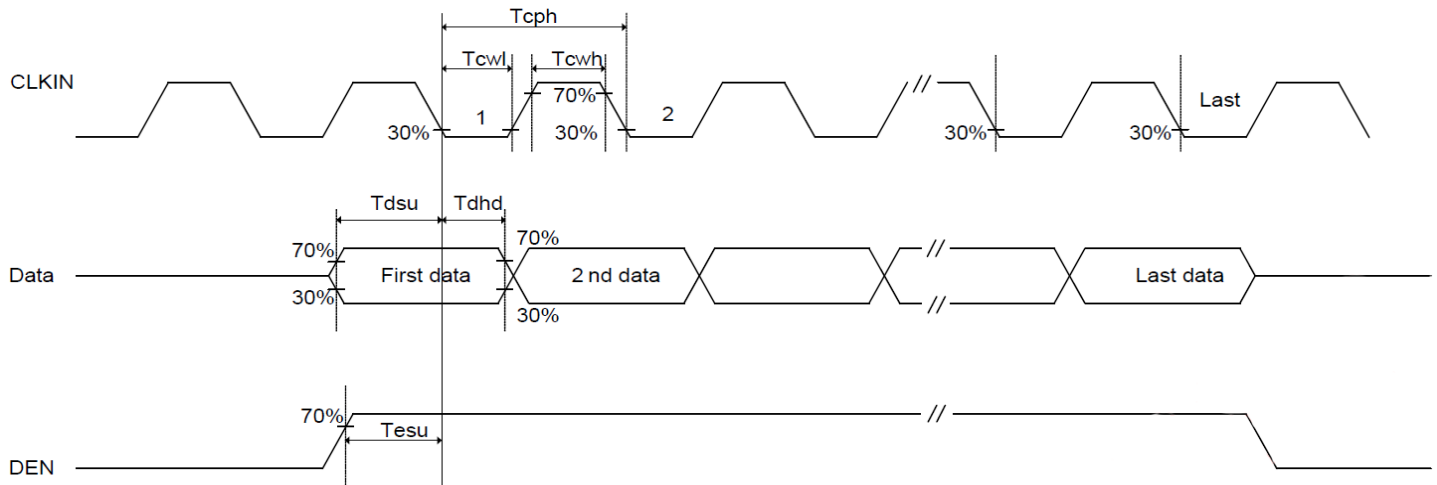
## DE Mode Timing Diagram



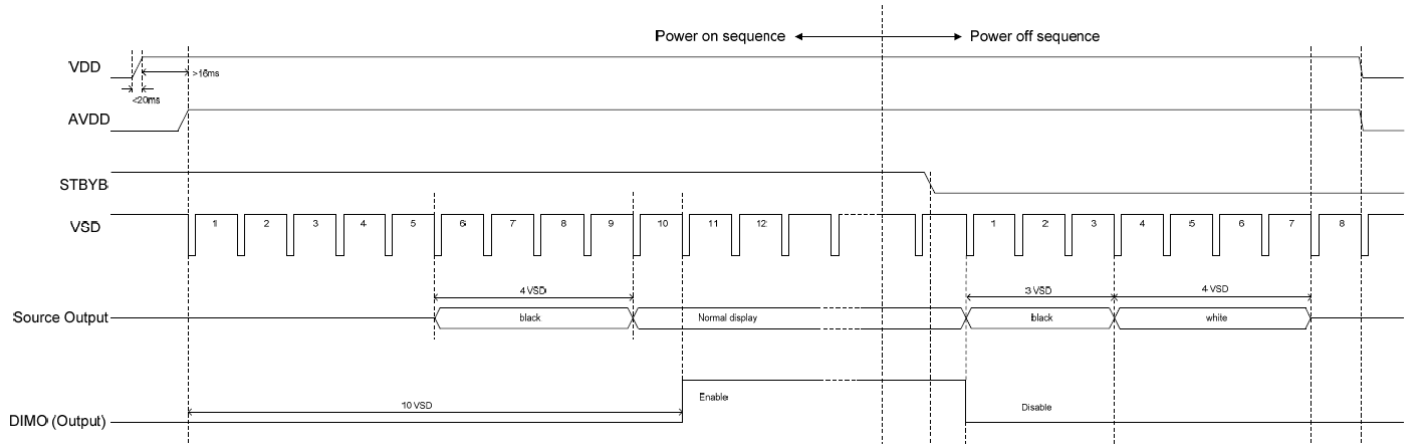
## Input Setup Timing Requirements

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
V <sub>DD</sub> Power Source Slew Time	T <sub>por</sub>	-	-	20	ms	From 0V to 90% V <sub>DD</sub>
CLK cycle time	T <sub>cph</sub>	20	-	-	ns	-
CLK pulse duty	T <sub>cwh</sub>	40	50	60	%	-
Data setup time	T <sub>dsu</sub>	8	-	-	ns	-
Data hold time	T <sub>dhd</sub>	8	-	-	ns	-
DEN setup time	T <sub>esu</sub>	8	-	-	ns	-
DEN hold time	T <sub>ehd</sub>	8	-	-	ns	-

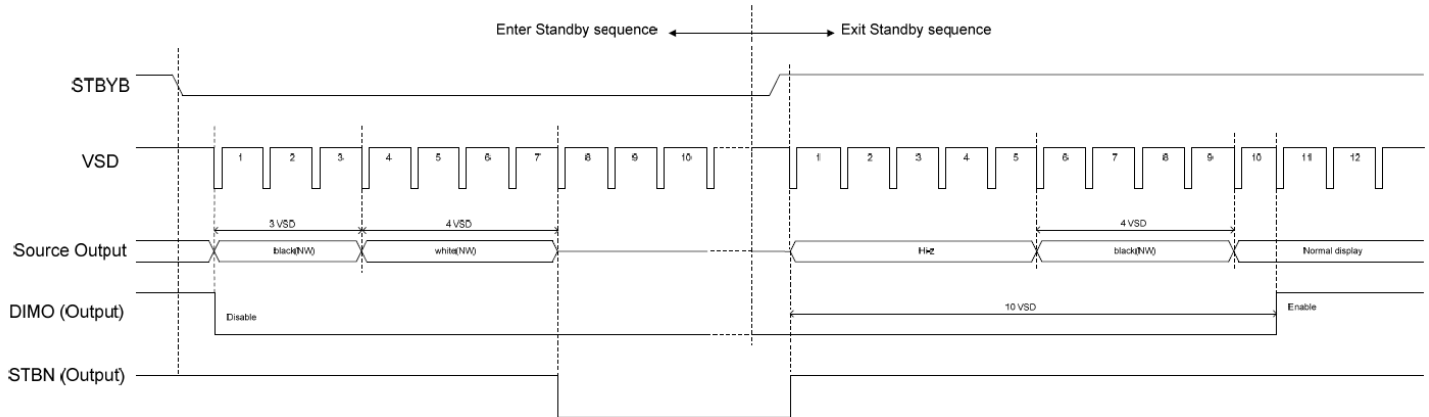
## Input Setup Timing Diagram



## 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, 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 Operation	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, 60min = 1 cycle For 20 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz, 5G amplitude. 30 min in each of 3 directions: X, Y, Z	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)