NEWHAVEN DISPLAY INTERNATIONAL

Product Specification

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
#-	RoHS Compliant
T-	4-wire Resistive Touch Panel

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REACH Compliant

RoHS Compliant

NEWHAVEN DISPLAY INTERNATIONAL

Table of Contents

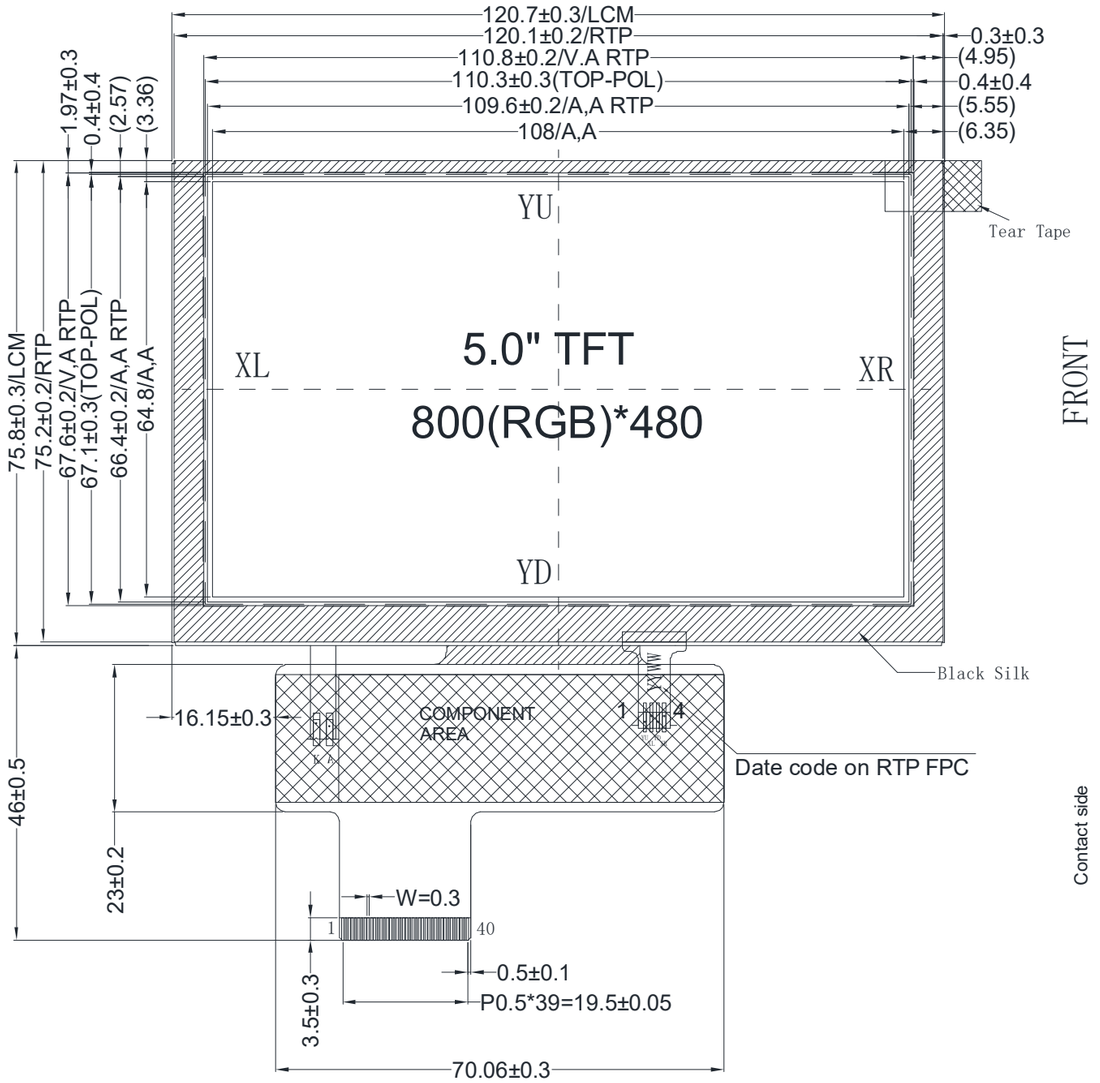
Additional Resources

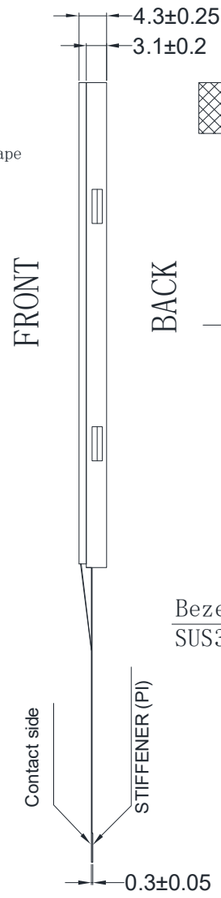
- **Support Forum:** https://support.newhavendisplay.com/hc/en-us/community/topics
- **GitHub:** https://github.com/newhavendisplay
- **Example Code:** https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html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

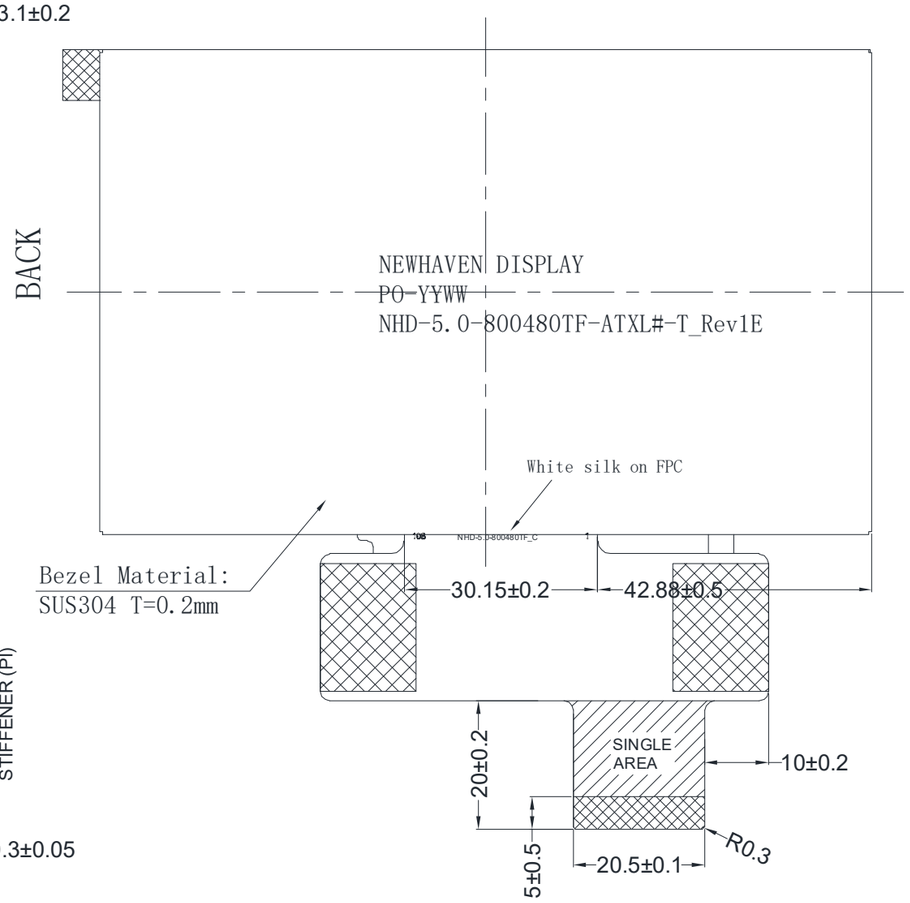
Document Revision History

Revision	Date	Description	Changed By
0	08/28/2013	Initial Release	AK
1	09/16/2014	Electrical Characteristics updated	ML
2	09/02/2015	Driver, Electrical, Optical characteristics updated	AK
3	11/02/2015	Backlight Lifetime Rating Added, Datasheet Reformat	SB
4	02/23/2016	Corrected Notes on Drawing	SB
5	07/22/2016	Updated Mechanical Drawing, Electrical Characteristics	TM
6	04/14/2017	Supply Current Updated	SB
7	10/05/2018	Driver IC Update & Chromaticity Added	SB
8	07/11/2019	Timing Characteristics Updated	SB
9	01/14/2020	Driver Change to ILI6122, Optical Characteristics Updated	SB
10	05/07/2020	Updated Chromaticity Values, Added Information for DE Mode Operation	AS
11	01/15/2021	Updated 2D Mechanical Drawing	AS
12	01/29/2021	Production Line Changed: Part Revision Updated from Rev1C to Rev1D	AS
13	05/05/2021	Updated the Mechanical Drawing	JT
14	06/15/2023	TFT Panel and Driver IC Updated Part Changed to Rev1E	KL

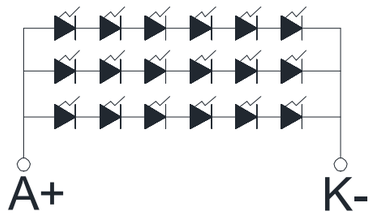
Mechanical Drawing







NO.	PIN NAME
1	VLED−
2	VLED+
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	CLKIN
31	STBYB
32	HSD
33	VSD
34	DEN
35	NC
36	GND
37	XR
38	YD
39	XL
40	YU



Product Description: 5.0” 800x480 IPS TFT w/ Resistive Touch

1. Driver IC: ILI6137A
2. Interface: 24-bit Parallel RGB
3. Power Requirement: 3.3V TFT, 19.2V/60mA Backlight
4. Optical Features: Normally White, Transmissive, Anti-Glare, 480cd/m²
5. Recommended FFC Connector: 40pin 0.5mm pitch; Ex. Molex 54104-4031

Standard Tolerance: (Unless otherwise specified) Linear: ±0.3mm	NEWHAVEN DISPLAY INTERNATIONAL	
	Drawing/Part Number: NHD-5.0-800480TF-ATXL#-T	Revision: 1E
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 06/15/2023	Approved Date: 06/15/2023

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 (19.2V/60mA)
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	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 ILI6137A 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 ILI6137A 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 ILI6137A Source Driver: https://support.newhavendisplay.com/hc/en-us/articles/14969253572119-ILI6137

Built-in ILI5960D Gate Driver: https://support.newhavendisplay.com/hc/en-us/articles/4414531730583--ILI5960D

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	39	78	117	mA
"H" Level input	V_{IH}	-	0.7 * V_{DD}	-	V_{DD}	V
"L" Level input	V_{IL}	-	GND	-	0.3 * V_{DD}	V
"H" Level output	V_{OH}	-	V_{DD} - 0.4	-	GND	V
"L" Level output	V_{OL}	-	GND	-	Vss + 0.4	V
Backlight Supply Current	I_{LED}	-	30	60	75	mA
Backlight Supply Voltage	V_{LED}	I_{LED} = 60mA	16.8	19.2	20.4	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.

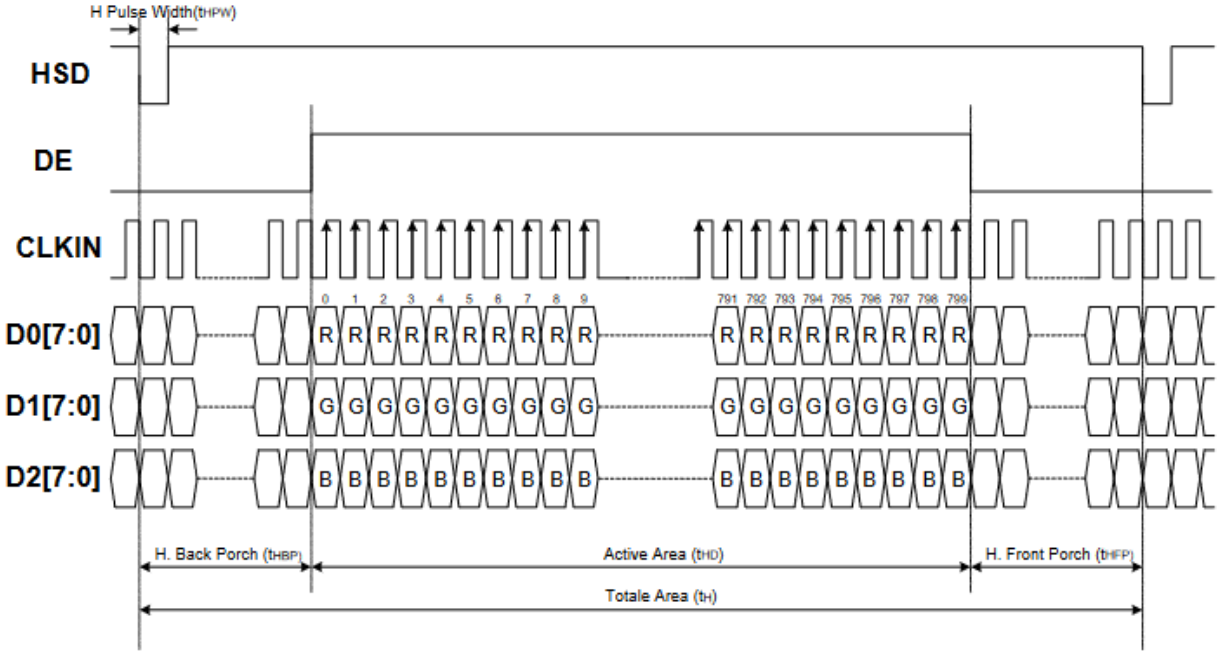
Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 10	60	70	-	°
	Bottom	φY-		60	70	-	°
	Left	θX-		60	70	-	°
	Right	θX+		60	70	-	°
Contrast Ratio		CR	-	400	500	-	-
Luminance		L_V	I_{LED} = 60 mA	380	480	-	cd/m²
Response Time		$T_R + T_F$	T_{OP} = 25°C	-	25	50	ms
Chromaticity	Red	X_R	-	0.506	0.556	0.606	-
		Y_R	-	0.298	0.348	0.398	-
	Green	X_G	-	0.296	0.346	0.396	-
		Y_G	-	0.540	0.590	0.640	-
	Blue	X_B	-	0.086	0.136	0.186	-
		Y_B	-	0.058	0.107	0.157	-
	White	X_W	-	0..261	0.311	0.361	-
		Y_W	-	0.305	0.355	0.405	-

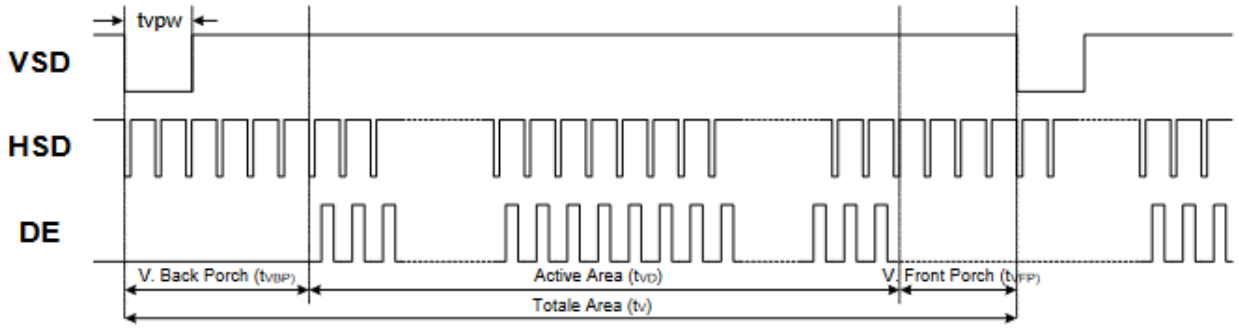
Touch Panel Characteristics

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



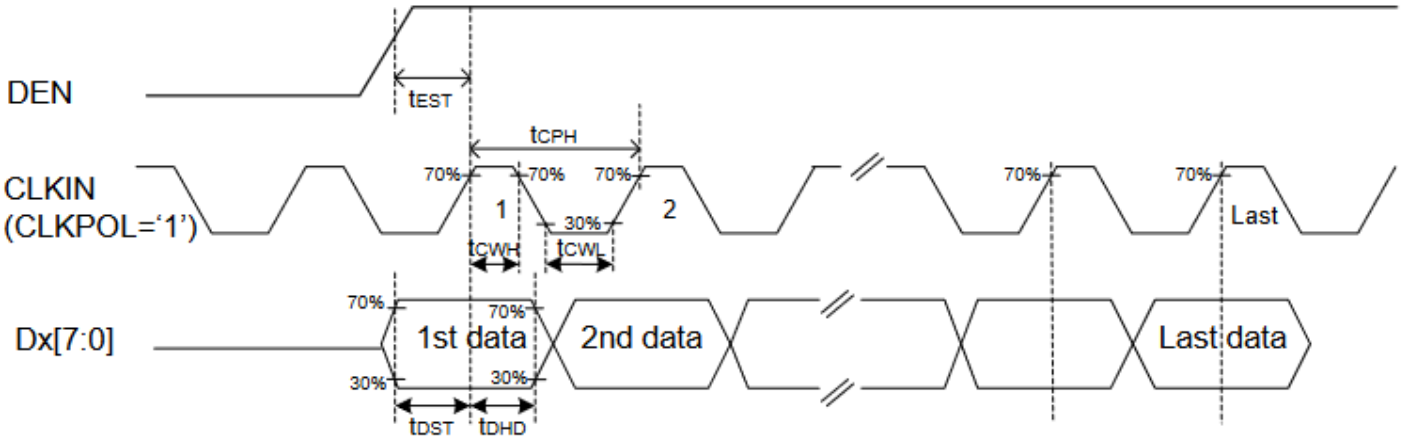
Horizontal Input Timing						
Parameter		Symbol	Value			Unit
			Min.	Typ.	Max.	
Horizontal display area		t_{HD}	--	800	--	CLKIN
CLKIN frequency		f_{CLK}	--	33.3	50	MHz
1 Horizontal line period		t_H	862	1056	1200	CLKIN
HSD pulse width	Min.	t_{HPW}	--	1	--	CLKIN
	Typ.		--	--	--	CLKIN
	Max.		--	40	--	CLKIN
HSD back porch	SYNC	t_{HBP}	46	46	46	CLKIN
HSD front porch	SYNC	t_{HFP}	16	210	354	CLKIN



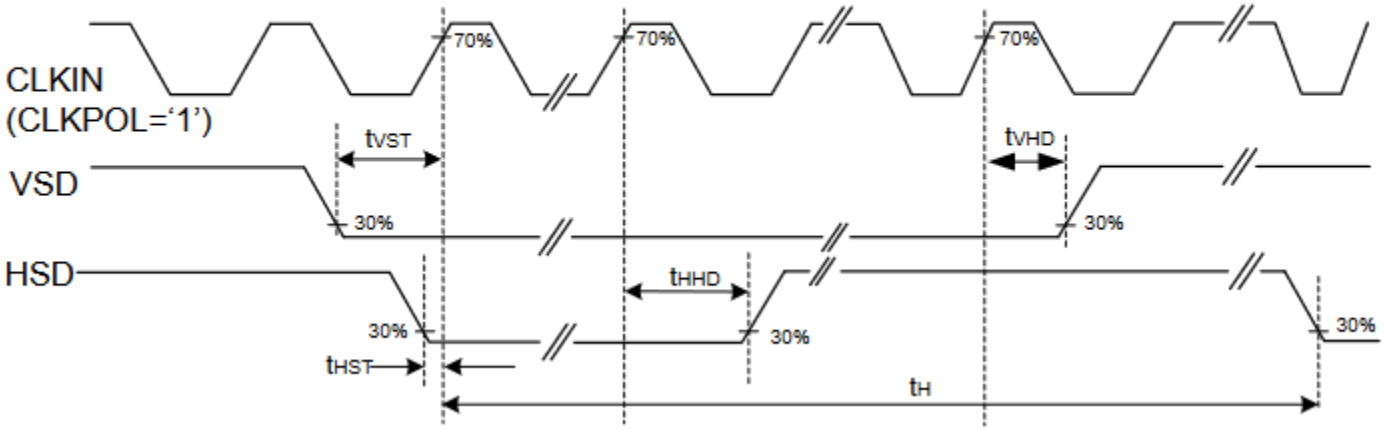
Vertical Input Timing						
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	t_{VD}	--	480	--	HSD
VSD period time	t_V	510	525	650	HSD
VSD pulse width	t_{VPW}	1	--	20	HSD
VSD back porch	t_{VBP}	23	23	23	HSD
VSD front porch	t_{VFP}	7	22	147	HSD

Parameter	Symbol	Spec			Unit	Conditions
		Min.	Typ.	Max.		
VDD Power ON slew rate	t_{POR}	--	--	20	ms	0V ~ 0.9*VDD
RSTB pulse width	t_{RST}	10	--	--	us	CLKIN=50MHz
CLKIN cycle time	t_{CPH}	20	--	--	ns	
CLKIN pulse duty	t_{CWH}	40	50	60	%	
VSD setup time	t_{VST}	8	--	--	ns	
VSD hold time	t_{VHD}	8	--	--	ns	
HSD setup time	t_{HST}	8	--	--	ns	
HSD hold time	t_{HHD}	8	--	--	ns	
Data setup time	t_{DST}	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
Data hold time	t_{DHD}	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
DE setup time	t_{EST}	8	--	--	ns	
DE hold time	t_{EHD}	8	--	--	ns	
Output stable time	t_{SST}	--	--	6	us	10% to 90% target voltage. CL=120pF, R=10KΩ
CLKIN frequency	f_{CLK}	--	40	50	MHz	VDD=3.0 ~ 3.6V
CLKIN cycle time	t_{CLK}	20	25	--	ns	
CLKIN pulse duty	t_{CWH}	40	50	60	%	T_{CLK}
Time from HSD to Source output	t_{HSO}	--	20	--	CLKIN	
Time from HSD to LD	t_{HLD}	--	20	--	CLKIN	Note (2)
Time from HSD to STV	t_{HSTV}	--	2	--	CLKIN	
Time from HSD to CKV	t_{HCKV}	--	20	--	CLKIN	
LD pulse width	t_{WLD}	--	10	--	CLKIN	Note (2)
CKV pulse width	t_{WCKV}	--	66	--	CLKIN	
OEV pulse width	t_{WOEV}	--	74	--	CLKIN	

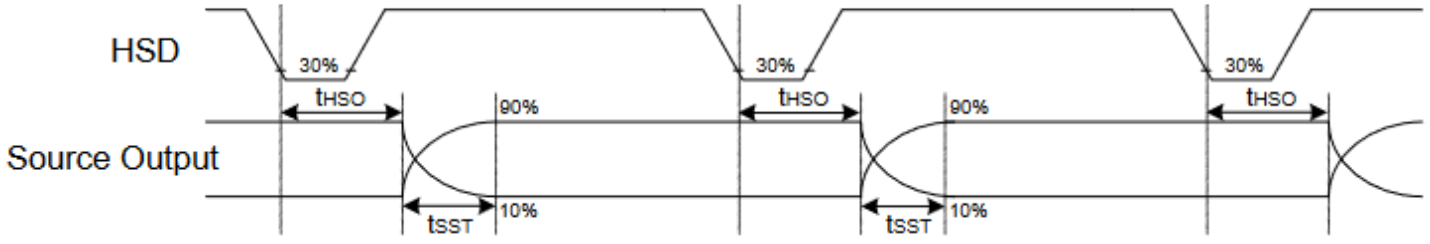
DE Mode (MODE= H)



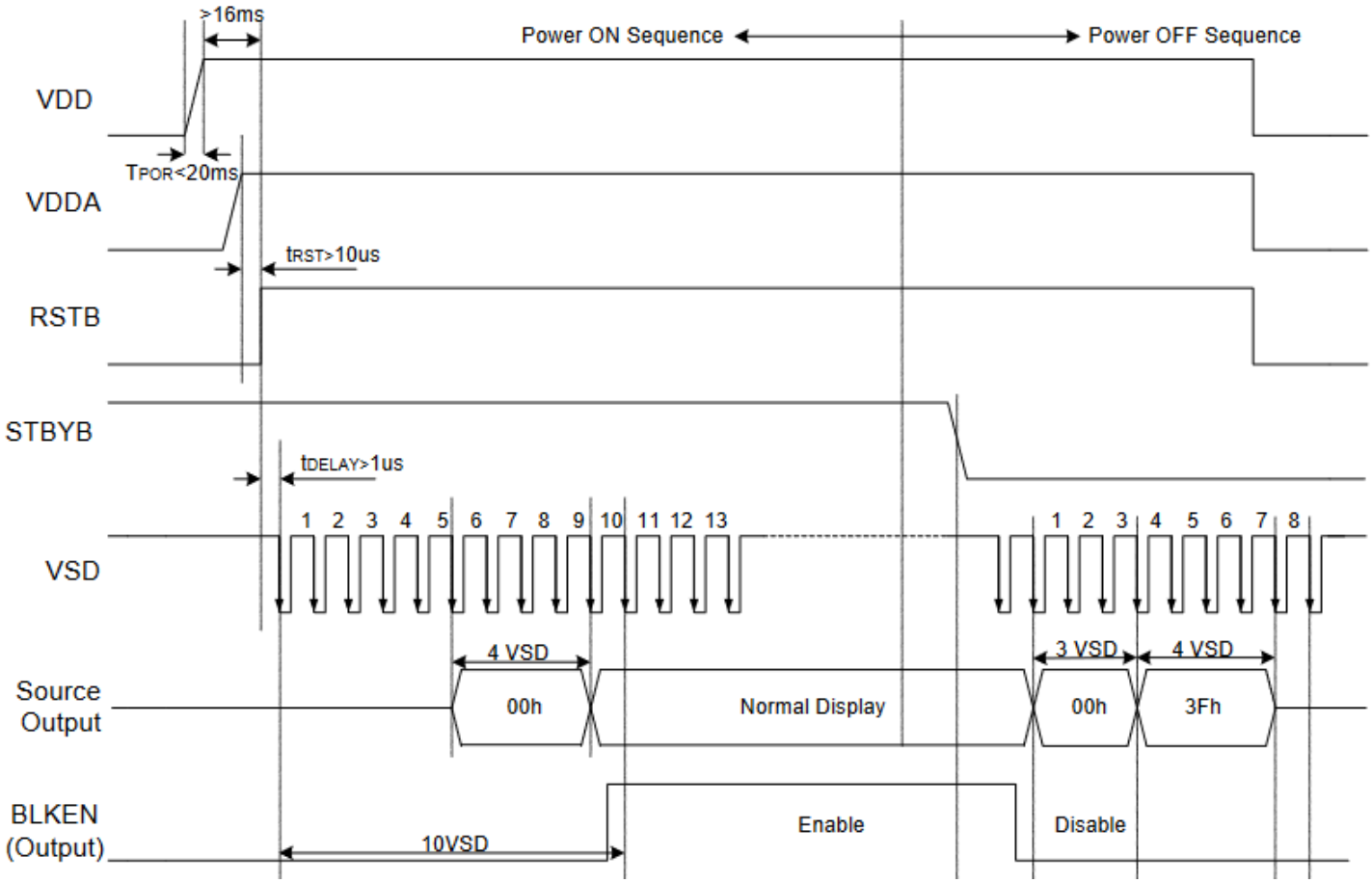
SYNC Mode (MODE= L)



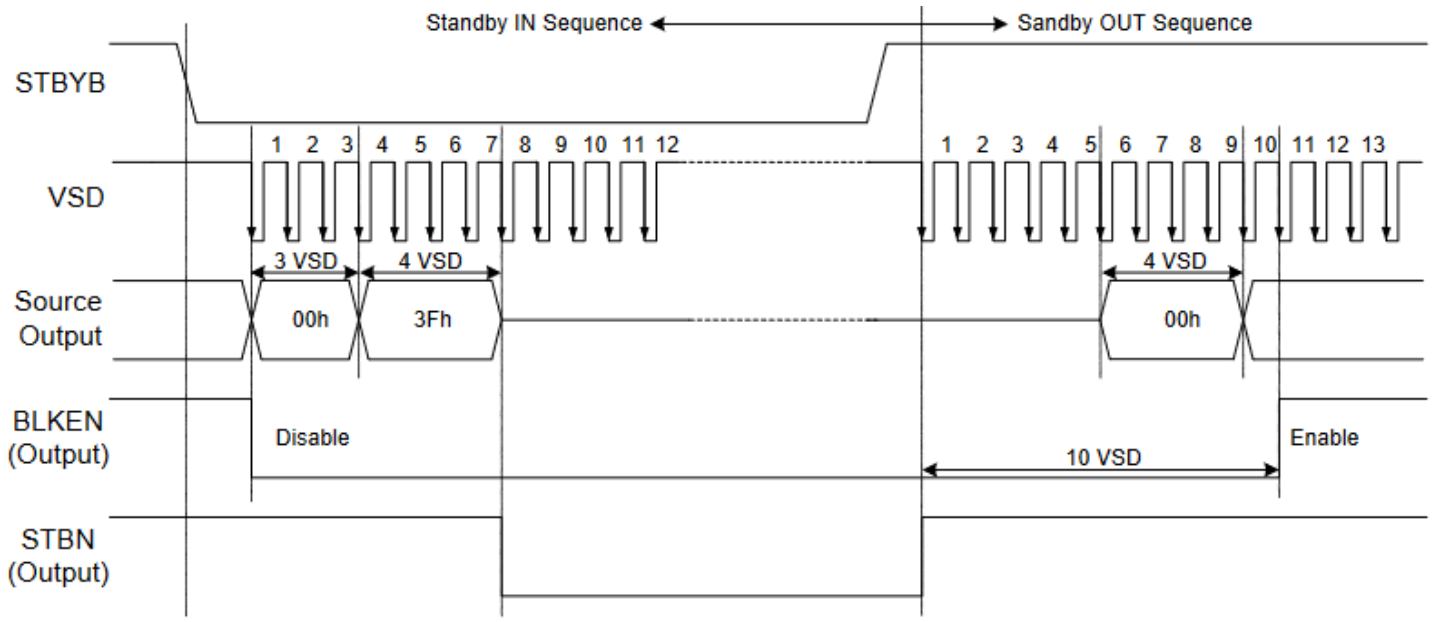
Source Output timing Diagram (Cascade)



Power ON/OFF Sequence



Standby ON/OFF Control



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.