

Product Specification

NHD-10.1-1024600BF-LSXP-CTP

TFT Liquid Crystal Display

NHD-	Newhaven Display
10.1-	10.1" Diagonal
1024600-	1024xRGBx600 Pixels
BF-	Model
L-	LVDS Interface
S-	High Brightness, White LED Backlight
X-	TFT
P-	IPS, Wide Temperature
CTP-	Capacitive Touch Panel

Table of Contents

Document Revision History.....	2
Mechanical Drawing	3
Pin Description	4
Driver Information.....	5
Electrical Characteristics	5
Optical Characteristics	6
Capacitive Touch Panel Registers	7
Timing Characteristics: TFT Display	10
Timing Characteristics: Capacitive Touch Panel	12
Quality Information.....	15

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	07/20/2022	Preliminary Release	CJ
1	09/08/2022	Updated Operating and Storage Temperature Range, LCD Supply Current, Backlight Enable Voltage, Chromaticity Values, and Backlight PWM Frequency Range	JT
2	10/28/2022	Mechanical Drawing page updated	JT
3	09/13/2023	Backlight PWM Frequency Updated from 2000 Hz (Max) to 20,000 Hz (Max)	KL

Mechanical Drawing

Newhaven Display
NHD-10.1-1024600BF-LSXP-CTP
Date Code
Part Label (type/format may vary)

10.1 inch
1024*600 PIXELS

Backlight Circuit

LED-K2
LED-K1
LED-A1
LED-A2

LED_VDD
LED_GND

Product Description: 10.1" IPS TFT w/ Capacitive Touch

1. Driver IC: HX8282-A11 TFT, FT5526-003 CTP, MP3398EGF Backlight
2. Interface: LVDS TFT, I²C CTP
3. Power Requirement: 3.3V TFT, 12.0V/360mA Backlight
4. Optical Features: Normally Black, Transmissive, 700cd/m²
5. Recommended FFC Connector:
TFT: 40pin 0.5mm pitch; Ex. Molex 15020-0435
CTP: 6pin 1.0mm pitch; Ex. Molex 52271-0679
6. Built-in EMI Filter, 10-point Multitouch

TFT Pinout

PIN	Symbol	PIN	Symbol
1	GND	21	Rin3+
2	VDD	22	GND
3	VDD	23	INSEL
4	V_EDID	24	GND
5	GND	25	GND
6	SCL	26	UPDN
7	SDA	27	SHLR
8	Rin0-	28	GND
9	Rin0+	29	RESET
10	GND	30	STBYB
11	Rin1-	31	LED-GND
12	Rin1+	32	LED-GND
13	GND	33	LED-GND
14	Rin2-	34	GND
15	Rin2+	35	LED_PWM
16	GND	36	LED_EN
17	CLKIN-	37	BIST
18	CLKIN+	38	LED_VDD
19	GND	39	LED_VDD
20	Rin3-	40	LED_VDD

CTP Pinout

PIN	SYMBOL
1	VDD
2	GND
3	SCL
4	SDA
5	INT
6	RESET

Standard Tolerance:
(Unless otherwise specified)

Linear: ±0.3mm

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

NEWHAVEN DISPLAY
INTERNATIONAL

Drawing/Part Number:
NHD-10.1-1024600BF-LSXP-CTP

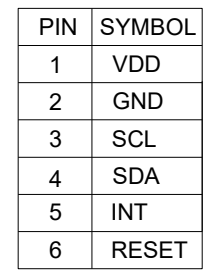
Revision:
-

Drawn By: K. Lewis
Approved By: K. Lewis

Drawn Date: 09/13/2023
Approved Date: 09/13/2023

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Part Label (type/format may vary)



6. Built-in EMI Filter, 10-point Multitouch

Approved Date:	09/13/2023
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Pin Description

TFT:

Pin No.	Symbol	Connection	Function Description
1	GND	Power Supply	Ground
2-3	V _{DD}	Power Supply	Supply voltage for LCD (+3.3V)
4	V _{EDID}	Power Supply	Supply voltage for EDID (+3.3V)
5	GND	Power Supply	Ground
6	SCL	MPU	Serial Clock for EDID
7	SDA	MPU	Serial Data for EDID
8	Rin0-	MPU	-LVDS differential data input CH0
9	Rin0+	MPU	+LVDS differential data input CH0
10	GND	Power Supply	Ground
11	Rin1-	MPU	-LVDS differential data input CH1
12	Rin1+	MPU	+LVDS differential data input CH1
13	GND	Power Supply	Ground
14	Rin2-	MPU	-LVDS differential data input CH2
15	Rin2+	MPU	+LVDS differential data input CH2
16	GND	Power Supply	Ground
17	CLKIN-	MPU	-LVDS differential Clock
18	CLKIN+	MPU	+LVDS differential Clock
19	GND	Power Supply	Ground
20	Rin3-	MPU	-LVDS differential data input CH3
21	Rin3+	MPU	+LVDS differential data input CH3
22	GND	Power Supply	Ground
23	INSEL (HSD)	MPU	Data Input Format: INSEL = L 8-Bit LVDS Input (Default) INSEL = H 6-Bit LVDS Input
24-25	GND	Power Supply	Ground
26	UPDN	MPU	Gate Driver Up/Down Scan Setting: UPDN = H: Reverse Scan UPDN = L: Normal Scan (Default)
27	SHLR	MPU	Gate Driver Left/Right Scan Setting: SHLR = H: Normal Scan (Default) SHLR = L: Reverse Scan
28	GND	Power Supply	Ground
29	RESET	MPU	Active Low Reset Signal
30	STBYB	MPU	Active Low Standby Signal
31-33	LED_GND	Power Supply	Ground for Backlight Driver
34	GND	Power Supply	Ground
35	LED_PWM	MPU	Backlight PWM Signal Input (See Table Below)
36	LED_EN	MPU	Backlight Enable H: Backlight On; L: Backlight Off
37	BIST	MPU	Built in Self-Test BIST = H: Self-Test Enabled BIST = L: Normal Operation (Default)
38-40	LED_V _{DD}	Power Supply	Supply Voltage for Backlight Driver

Recommended TFT connector: 0.5mm pitch 40-Conductor FFC. **Molex P/N:** 15020-0435

Capacitive Touch Panel:

Pin No.	Symbol	External Connection	Function Description
1	V _{DD}	Power Supply	Supply voltage for Logic (3.3V)
2	V _{SS}	Power Supply	Ground
3	SCL	MPU	Serial I2C Clock (Requires 4.7kΩ pull-up resistor)
4	SDA	MPU	Serial I2C Data (Requires 4.7kΩ pull-up resistor)
5	/INT	MPU	Interrupt signal from touch panel module to host
6	/RESET	MPU	Active LOW Reset signal

Recommended CTP Connector: 1.0mm pitch 6-Conductor FFC. **Molex P/N:** 52271-0679



Driver Information

TFT:

Source Driver HX8282-A11: <https://support.newhavendisplay.com/hc/en-us/articles/4414530594583-HX8282-A11>

Gate Driver HX8696-A01: <https://support.newhavendisplay.com/hc/en-us/articles/4414548297367-HX8696-A>

Backlight Driver IC: MP3398EGF

Capacitive Touch Panel:

Built-in FT5526-003 Controller: <https://support.newhavendisplay.com/hc/en-us/articles/4414392845079-FT5x26>

Electrical Characteristics

TFT:

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 for LCD	V _{DD}	-	3.0	3.3	3.6	V
Supply Voltage for EDID	V _{EDID}	-	3.0	3.3	3.6	V
Supply Current for LCD	I _{DD}	V _{DD} = 3.3V	84.5	169	210	mA
LVDS Differential input HIGH Voltage	RxVTH	-	-	-	+100	mV
LVDS Differential input LOW Voltage	RxVTL	-	-100	-	-	mV
LVDS Differential input Common Voltage	RxVCM	-	VID /2	-	VDD-1.2	V
LVDS Differential Voltage	VID	-	200	-	600	mV
Supply Voltage for Backlight Driver	LED_VLED	-	5.0	12.0	22.4	V
Supply Current for Backlight Driver ¹	LED_ILED	-	160	360	1200	mA
Backlight Lifetime ²	-	T _{OP} = 25°C	30,000	-	-	Hrs.
Backlight Enable Voltage	LED_EN	-	1.5	3.3	5.5	V
Backlight PWM Voltage	LED_PWM	-	1.5	3.3	5.5	V
Backlight PWM Frequency	-	LED_PWM = 3.3V	200	-	20,000	Hz

¹Minimum supply current occurs when supply voltage is at max; maximum supply current when supply voltage is at minimum.

²Backlight lifetime is rated as Hours until **half-brightness**, under normal operating conditions.

Capacitive Touch Panel:

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 – Operating	I _{DD}	-	8	15	23	mA
“H” Level input	V _{IH}	-	0.7*V _{DD}	-	V _{DD}	V
“L” Level input	V _{IL}	-	V _{SS}	-	0.3*V _{DD}	V
“H” Level output	V _{OH}	-	0.7*V _{DD}	-	V _{DD}	V
“L” Level output	V _{OL}	-	V _{SS}	-	0.3*V _{DD}	V



Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	$\phi Y+$	$CR \geq 10$	-	80	-	°
	Bottom	$\phi Y-$		-	80	-	°
	Left	$\theta X-$		-	80	-	°
	Right	$\theta X+$		-	80	-	°
Contrast Ratio		CR	-	600	800	-	-
Luminance		L_V	-	510	700	850	cd/m ²
Response Time (Rise + Fall)		$T_R + T_F$	$T_{OP} = 25^\circ C$	-	25	35	ms
Chromaticity	Red	X_R	-	0.57	0.60	0.63	-
		Y_R	-	0.33	0.36	0.39	-
	Green	X_G	-	0.30	0.33	0.36	-
		Y_G	-	0.51	0.54	0.57	-
	Blue	X_B	-	0.10	0.13	0.16	-
		Y_B	-	0.05	0.08	0.11	-
	White	X_W	-	0.28	0.31	0.34	-
		Y_W	-	0.30	0.33	0.36	-

Capacitive Touch Panel Registers

Register No.	Access	Register Name	Bits	Value	Description
01h	RO	Gesture ID	[7:0]	1Ch 14h 10h 18h 48h 49h 00	Swipe Up Swipe Down Swipe Left Swipe Right Zoom In Zoom Out No gesture
02h	RO	Touch Points	[7:0]	0-Ah	0: No touch detected A: 10 touch points detected
03h	RO	TOUCH1_Event_Flag	[7:6]	0 1 2 3	Put Down Put Up Contact Reserved
03h	RO	TOUCH1_XH	[3:0]	0 -1	Upper 4 bits of X touch coordinate
04h	RO	TOUCH1_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
05h	RO	TOUCH1_YH	[3:0]	0 -1	Upper 4 bits of Y touch coordinate
06h	RO	TOUCH1_YL	[7:0]	00 – FFh	Lower 8 bits of Y touch coordinate
07h	RO	TOUCH1_Weight	[7:0]		Touch Weight
08h	RO	TOUCH1_Misc	[3:0]	00-0Fh	Touch Area
09h	RO	TOUCH2_Event_Flag	[7:6]	0 1 2 3	Put Down Put Up Contact Reserved
09h	RO	TOUCH1_XH	[3:0]	0 -1	Upper 4 bits of X touch coordinate
0Ah	RO	TOUCH2_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
0Bh	RO	TOUCH2_YH	[3:0]	0 -1	Upper 4 bits of Y touch coordinate
0Ch	RO	TOUCH2_YL	[7:0]	00 – FFh	Lower 8 bits of Y touch coordinate
0Dh	RO	TOUCH2_Weight	[7:0]		Touch Weight
0Eh	RO	TOUCH2_Misc	[3:0]	00-0Fh	Touch Area
0Fh	RO	TOUCH3_Event_Flag	[7:6]	0 1 2 3	Put Down Put Up Contact Reserved
0Fh	RO	TOUCH3_XH	[3:0]	0 -1	Upper 4 bits of X touch coordinate
10	RO	TOUCH3_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
11h	RO	TOUCH3_YH	[3:0]	0 -1	Upper 4 bits of Y touch coordinate
12h	RO	TOUCH3_YL	[7:0]	00 – FFh	Lower 8 bits of Y touch coordinate
13h	RO	TOUCH3_Weight	[7:0]		Touch Weight
14h	RO	TOUCH3_Misc	[3:0]	00-0Fh	Touch Area
15h	RO	TOUCH4_Event_Flag	[7:6]	0 1 2 3	Put Down Put Up Contact Reserved
15h	RO	TOUCH4_XH	[3:0]	0 -1	Upper 4 bits of X touch coordinate
16h	RO	TOUCH4_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
17h	RO	TOUCH4_YH	[3:0]	0 -1	Upper 4 bits of Y touch coordinate
18h	RO	TOUCH4_YL	[7:0]	00 – FFh	Lower 8 bits of Y touch coordinate
1Ah	RO	TOUCH4_Misc	[3:0]	00-0Fh	Touch Area
1Bh	RO	TOUCH5_Event_Flag	[7:6]	0 1 2 3	Put Down Put Up Contact Reserved



Register No.	Access	Register Name	Bits	Value	Description
1Bh	RO	TOUCH5_XH	[3:0]	0 -1	Upper 4 bits of X touch coordinate
1Ch	RO	TOUCH5_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
1Dh	RO	TOUCH5_YH	[3:0]	0 -1	Upper 4 bits of Y touch coordinate
1Eh	RO	TOUCH5_YL	[7:0]	00 – FFh	Lower 8 bits of Y touch coordinate
1Fh	RO	TOUCH5_Weight	[7:0]		Touch Weight
20	RO	TOUCH5_Misc	[3:0]	00-0Fh	Touch Area
21h	RO	TOUCH6_Event_Flag	[7:6]	0	Put Down
				1	Put Up
				2	Contact
				3	Reserved
21h	RO	TOUCH6_XH	[3:0]	0 -1	Upper 4 bits of X touch coordinate
22h	RO	TOUCH6_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
23h	RO	TOUCH6_YH	[3:0]	0 -1	Upper 4 bits of Y touch coordinate
24h	RO	TOUCH6_YL	[7:0]	00 – FFh	Lower 8 bits of Y touch coordinate
25h	RO	TOUCH6_Weight	[7:0]		Touch Weight
26h	RO	TOUCH6_Misc	[3:0]	00-0Fh	Touch Area
27h	RO	TOUCH7_Event_Flag	[7:6]	0	Put Down
				1	Put Up
				2	Contact
				3	Reserved
27h	RO	TOUCH7_XH	[3:0]	0 -1	Upper 4 bits of X touch coordinate
28h	RO	TOUCH7_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
29h	RO	TOUCH7_YH	[3:0]	0 – 1	Upper 4 bits of Y touch coordinate
2Ah	RO	TOUCH7_YL	[7:0]	00 – FFh	Lower 8 bits of Y touch coordinate
2Bh	RO	TOUCH7_Weight	[7:0]		Touch Weight
2Ch	RO	TOUCH7_Misc	[3:0]	00-0Fh	Touch Area
2Dh	RO	TOUCH8_Event_Flag	[7:6]	0	Put Down
				1	Put Up
				2	Contact
				3	Reserved
2Dh	RO	TOUCH8_XH	[3:0]	0 – 1	Upper 4 bits of X touch coordinate
2Eh	RO	TOUCH8_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
2Fh	RO	TOUCH8_YH	[3:0]	0 – 1	Upper 4 bits of Y touch coordinate
30	RO	TOUCH8_YL	[7:0]	00 – FFh	Lower 8 bits of Y touch coordinate
31h	RO	TOUCH8_Weight	[7:0]		Touch Weight
32h	RO	TOUCH8_Misc	[3:0]	00-0Fh	Touch Area
33h	RO	TOUCH9_Event_Flag	[7:6]	0	Put Down
				1	Put Up
				2	Contact
				3	Reserved
33h	RO	TOUCH9_XH	[3:0]	0 – 1	Upper 4 bits of X touch coordinate
34h	RO	TOUCH9_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
35h	RO	TOUCH9_YH	[3:0]	0 – 1	Upper 4 bits of Y touch coordinate
36h	RO	TOUCH9_YL	[7:0]	00 – FFh	Lower 8 bits of Y touch coordinate
37h	RO	TOUCH9_Weight	[7:0]		Touch Weight
38h	RO	TOUCH9_Misc	[3:0]	00 – 0Fh	Touch Area
39h	RO	TOUCH10_Event_Flag	[7:6]	0	Put Down
				1	Put Up
				2	Contact
				3	Reserved
39h	RO	TOUCH10_XH	[3:0]	0 – 1	Upper 4 bits of X touch coordinate
3Ah	RO	TOUCH10_XL	[7:0]	00 – FFh	Lower 8 bits of X touch coordinate
3Bh	RO	TOUCH10_YH	[3:0]	0 – 1	Upper 4 bits of Y touch coordinate
3Ch	RO	TOUCH10_YL	[7:0]	00 - FFh	Lower 8 bits of Y touch coordinate

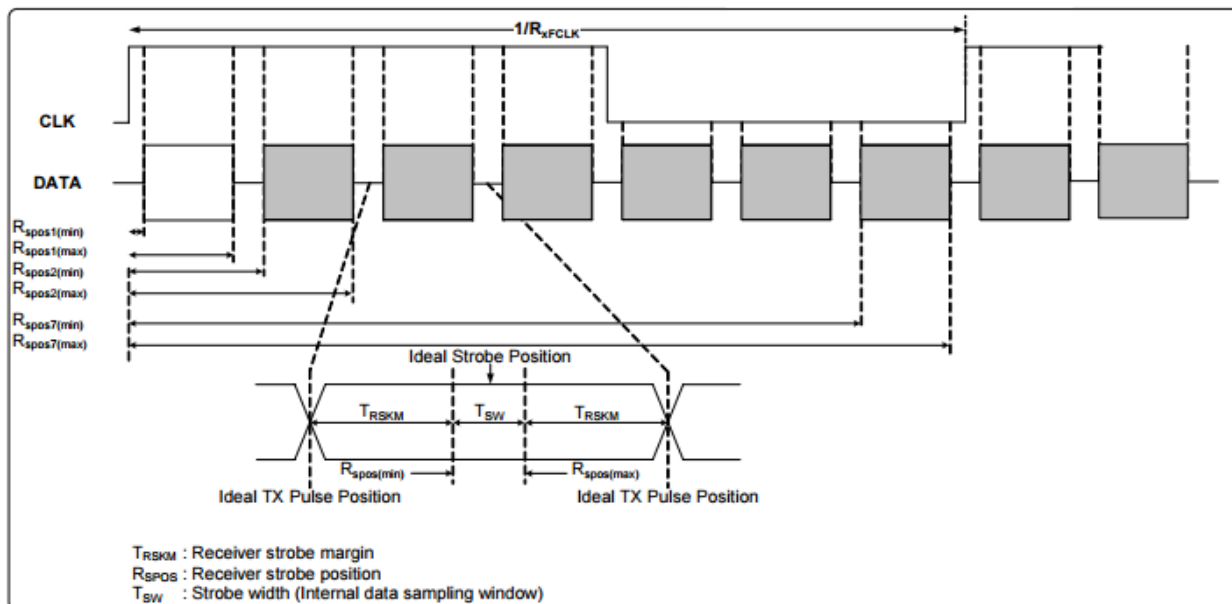
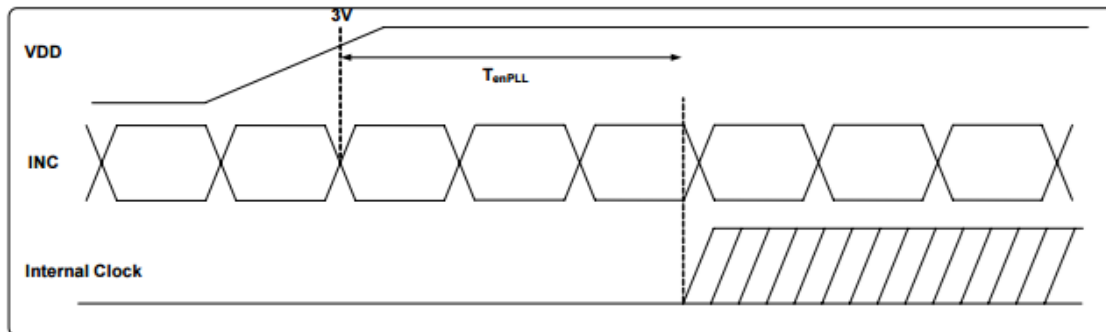
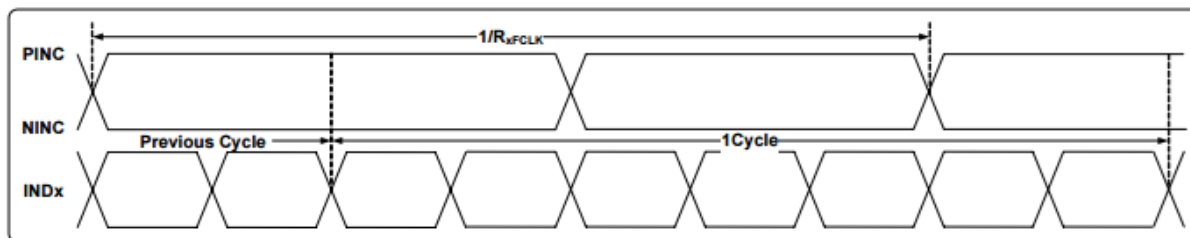


Register No.	Access	Register Name	Bits	Value	Description
3Dh	RO	TOUCH10_Weight	[7:0]	00-FFh	Touch Weight
3Eh	RO	TOUCH10_Misc	[3:0]	00-0Fh	Touch Area
A1h	RO	ID_G_LIB_VERSION_H	[7:0]	00-FFh	App library version high-byte Default: 0
A2h	RO	ID_G_LIB_VERSION_L	[7:0]	00-FFh	App library version low-byte Default: 1h
A3h	RO	ID_G_CHIPER_HIGH	[7:0]	00-FFh	Chip Vendor ID Default: 0x54
A6h	RO	ID_G_FIRMID	[7:0]	00-FFh	Firmware ID Number Default: 18
A8h	RO	ID_G_VENODRID	[7:0]	00-FFh	CTPM Vendor's Chip ID Default: 79h

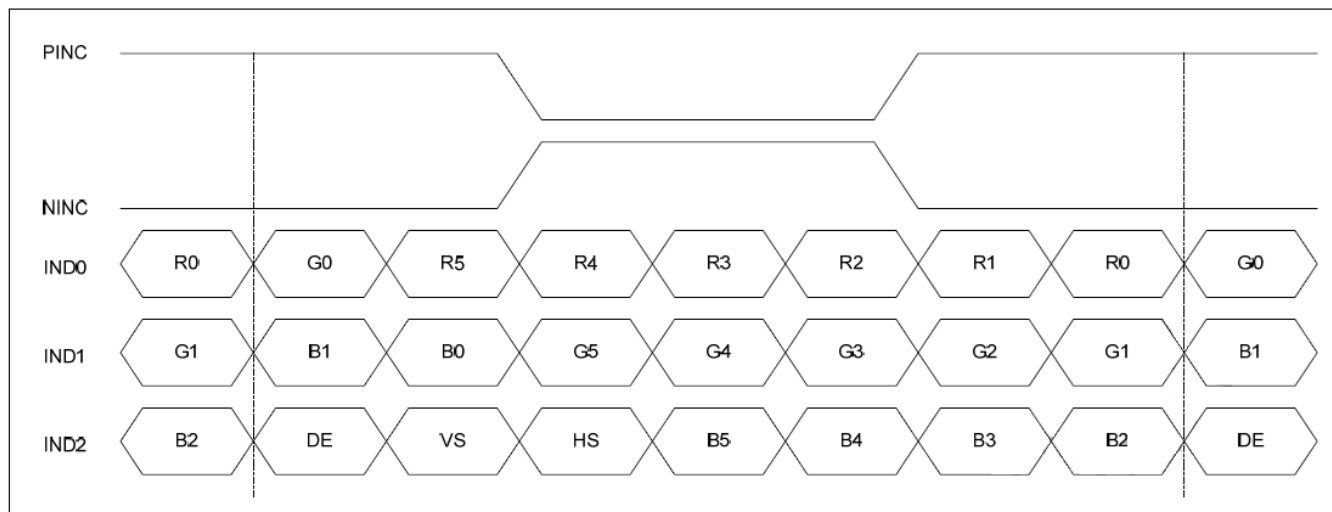
Timing Characteristics: TFT Display

Parameter	Symbol	Spec			Unit	Condition
		Min.	Typ.	Max.		
Clock frequency	R _{XFCLK}	20	-	71	MHz	-
Input data skew margin	T _{RSKM}	500	-	-	pS	VID = 400mV R _{XVCM} = 1.2V R _{XFCLK} = 71MHz
Clock high time	T _{LVCH}	-	4/(7 * R _{XFCLK})	-	nS	-
Clock low time	T _{LVCL}	-	3/(7 * R _{XFCLK})	-	nS	-
PLL wake-up time	T _{emPLL}	-	-	150	μS	-

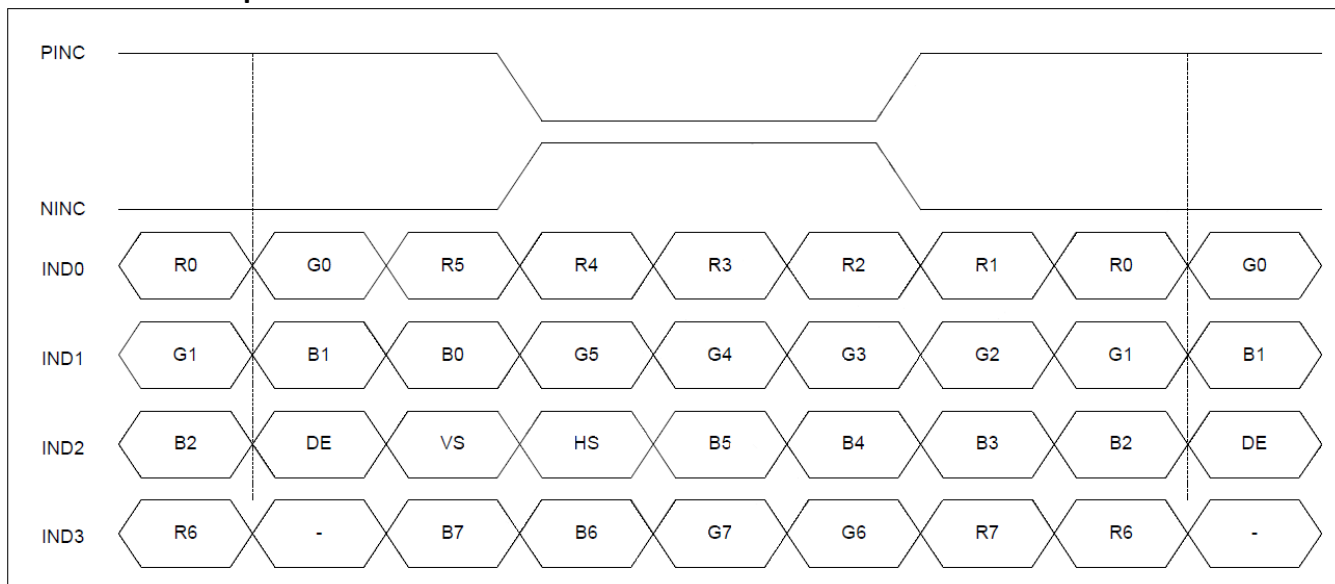
Parameter	Symbol	Spec			Unit	Condition
		Min.	Typ.	Max.		
Modulation Frequency	SSC _{MF}	23	-	93	KHz	-
Modulation Rate	SSC _{MR}	-	-	±3	%	LVDS Clock = 71 MHz



6-Bit LVDS Data Input Format:



8-Bit LVDS Data Input Format:

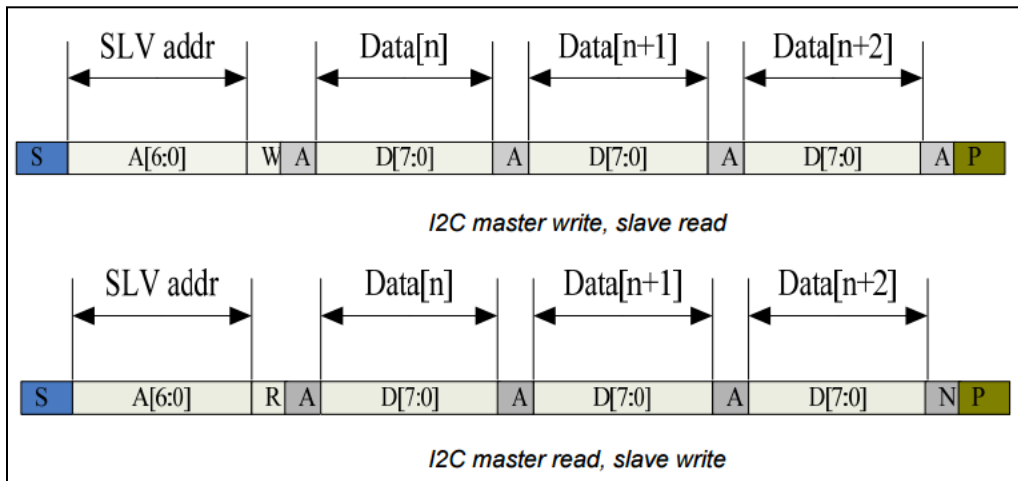
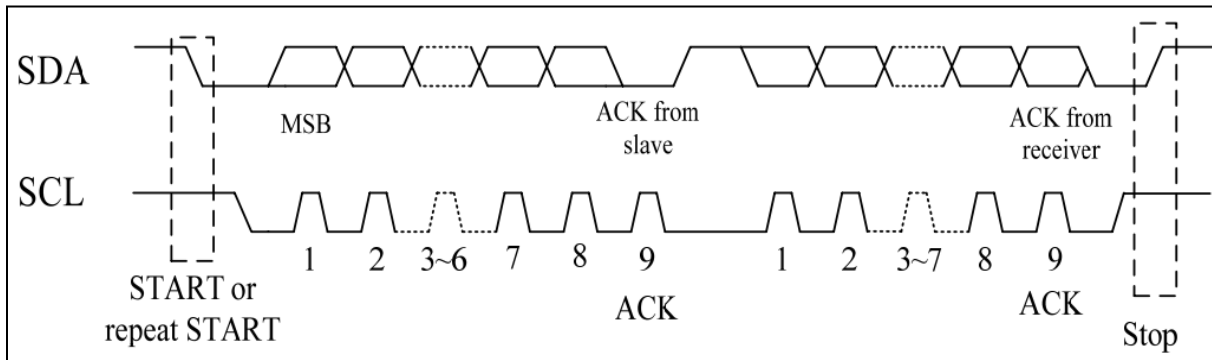


Horizontal & Vertical Timing (1024x600)

Item		Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DCLK Frequency		F _{CLK}	44.9	51.2	63	MHz
HSYNC	Horizontal Display Area	T _{HD}	1024			DCLK
	HSD Period	T _H	1200	1344	1400	DCLK
	HSD Pulse Width	T _{HPW}	1	-	140	DCLK
	HSD Back Porch	T _{HBP}	160			DCLK
	HSD Front Porch	T _{HFP}	16	160	216	DCLK
VSYNC	Vertical Display Area	T _{VD}	600			T _H
	VSD Period	T _V	624	635	750	T _H
	VSD Pulse Width	T _{VPW}	1	-	20	T _H
	VSD Back Porch	T _{VBP}	23			T _H
	VSD Front Porch	T _{VFP}	1	12	127	T _H

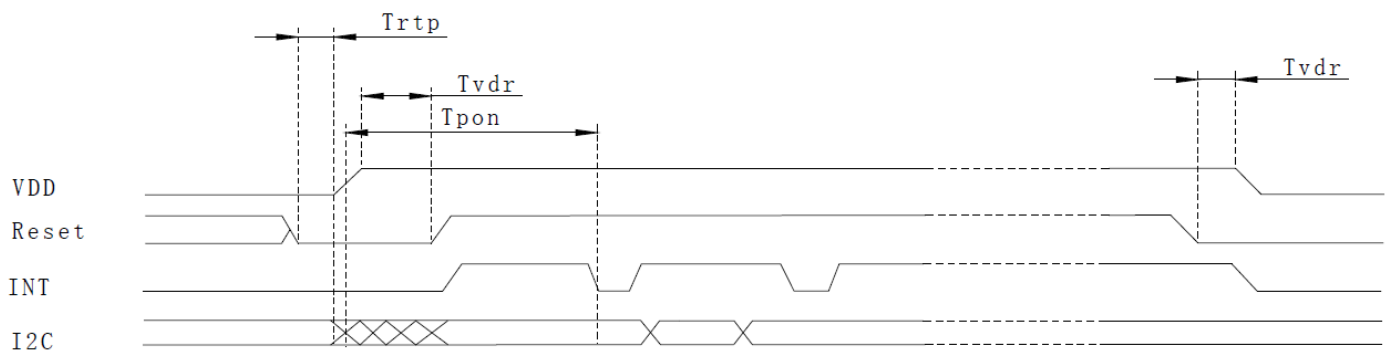
Timing Characteristics: Capacitive Touch Panel

Data Transfer Format

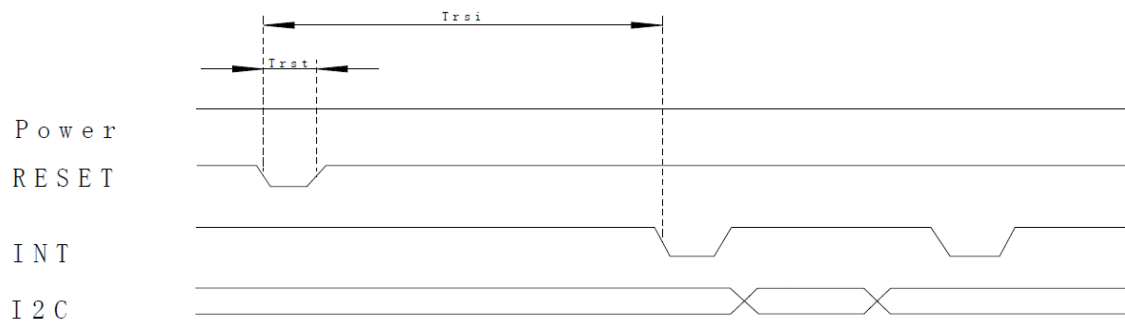


Parameter	Min	Max	Unit
SCL Frequency	0	400	KHz
Bus free time between a STOP and START Condition	1.3	-	μs
Hold Time (repeated) START Condition	0.6	-	μs
Data Setup Time	100	-	ns
Setup Time for a repeated START Condition	0.6	-	μs
Setup Time for STOP Condition	0.6	-	μs

Power ON Sequence



Reset Sequence



Parameter	Description	Min	Max	Unit
T_{ris}	Rise time from $0.1 \cdot V_{DD}$ to $0.9 \cdot V_{DD}$	-	5	ms
T_{pdt}	Time for voltage supply below $0.3 \cdot V_{DD}$	5	-	ms
T_{rtp}	Time to hold reset low Before Applying Power	100	-	μs
T_{pon}	Time of starting to report point after powering on	-	200	ms
T_{vdr}	Reset time after V_{DD} power on	1	-	ms
T_{rsi}	Time of starting to report point after Reset	-	200	ms
T_{rst}	Reset Time	1	-	ms

Sample code to read touch data:

```
i2c_start();  
i2c_tx(0x70);           //Slave Address (Write)  
i2c_tx(0x00);           //Start reading address  
i2c_stop();  
  
i2c_start();  
i2c_tx(0x71);           //Slave Address (Read)  
for(i=0x00;i<0x1F;i++)  
{touchdata_buffer[i] = i2c_rx(1);}  
i2c_stop();
```

Sample code to overwrite default register values:

```
i2c_start();  
i2c_tx(0x70);           //Slave Address (Write)  
i2c_tx(0xA4);           //ID_G_Mode  
i2c_tx(0x01);           //Disable interrupt status to host  
i2c_stop();
```

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, 240 hrs.	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C, 240 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, 120 hrs.	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C, 120 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, 120 hrs.	1,2
Thermal Shock resistance	Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.	-30°C, 30min->25°C, 10min -> 80°C, 30min 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	Frequency: 250r/min Amplitude: 1 inch Time: 45 min	3
Static electricity test	Endurance test applying electric static discharge.	Air: V _s =8KV, Contact: V _s =4KV 10 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.