NHD-4.3-480272EF-ASXV#-CTP

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

NHD-	Newhaven Display
4.3-	4.3” Diagonal
480272-	480xRGBx272 Pixels
EF-	Model
A-	Built-in Driver / No Controller
S-	High Brightness
X-	TFT
V-	MVA Type, Wide Temperature
#-	**RoHS Compliant**
CTP-	Capacitive Touch Panel with Controller

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Document Revision History

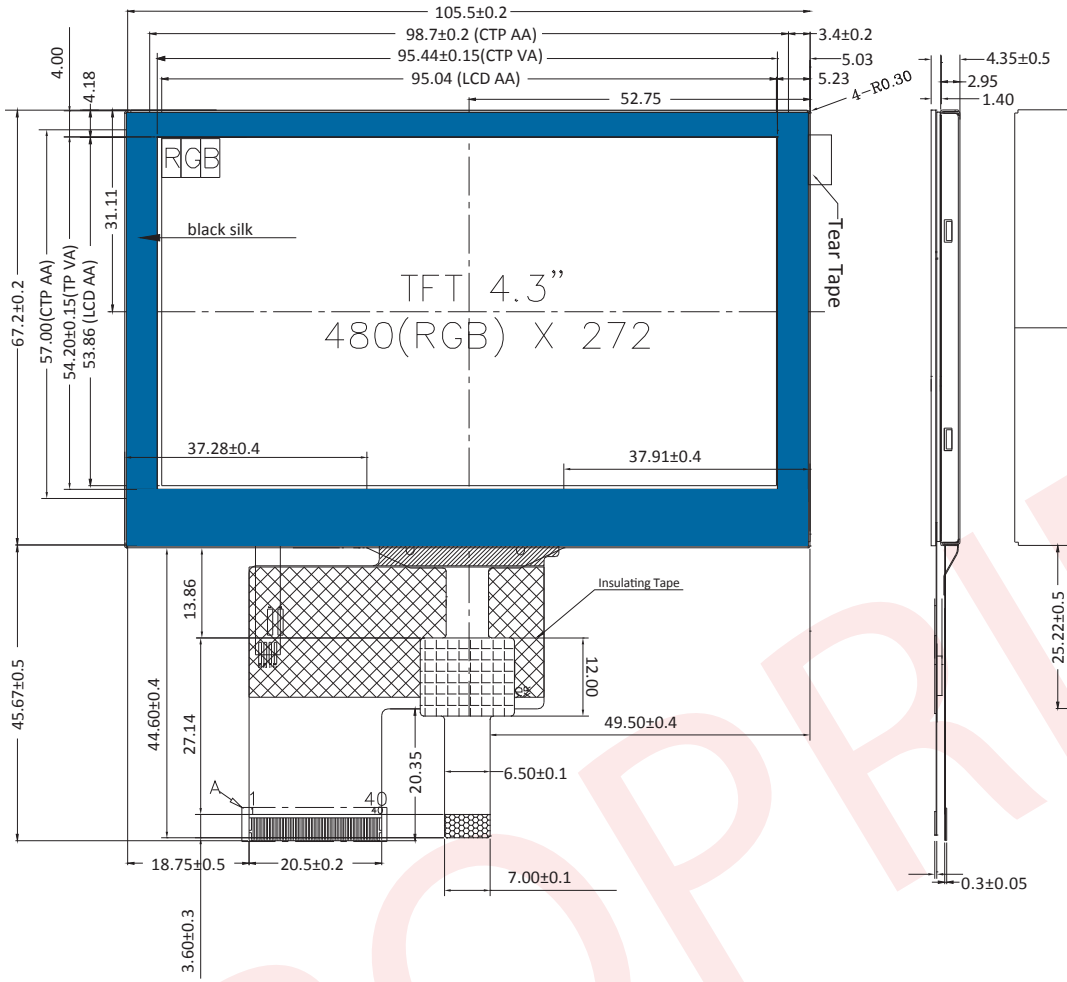
Revision	Date	Description	Changed by
0	10/31/2014	Initial Release	ML
1	1/8/2015	Mechanical drawing updated	AK
2	3/5/2015	Part number revised	AK
3	3/16/2015	CTP mechanical dimensions updated	ML
4	8/11/15	Part number changed from ATXV#-3CTP to ASXV#-CTP	AK
5	10/27/15	Backlight lifetime rating added	AK
6	12/21/15	Datasheet Reformat, Brightness rating updated	SB
7	11/28/16	Contrast Ratio & Supply Current Updated	SB
8	1/9/17	V_{LED} Updated	SB
9	6/21/17	Driver IC Updated	SB
10	10/25/17	CTP Cable Location Fixed	SB

Functions and Features

- 480xRGBx272 resolution, up to 16.7M colors
- 16-LED backlight
- 24 bit RGB interface
- Wide Viewing Angles
- Premium High Brightness
- Capacitive touch panel with controller
    - 5 point multi-touch input
    - Gesture input
        - Zoom In/Out
        - Swipe Up/Down/Left/Right

Mechanical Drawing

Rev	Description	Date

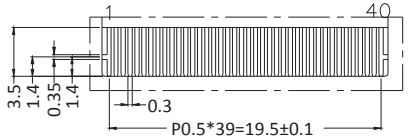


Pin Assignment

Pin No.	Symbol
1	LEDK
2	LEDA
3	GND
4	V_{DD}
5-12	[R0-R7]
13-20	[G0-G7]
21-28	[B0-B7]
29	GND
30	CLK
31	DISP
32	HSYNC
33	VSYNC
34	DEN
35	NC
36	GND
37	NC
38	NC
39	NC
40	NC

Notes:

1. Display Size: 4.3" TFT
2. Optimal View: Full View
3. Display Mode: Transmissive / Normally White / Anti-Glare
4. Driver IC: ST7282T2
5. Supply Voltage: 3.3V
6. Backlight: White LED / 25.6V / 40 mA (Typ)
7. Luminance: 700 cd/m² (Typ)
8. 3M Brightness Enhancement Film
9. Touch Panel: PCAP



Detail A

Pin No.	Symbol
1	VDD
2	GND
3	SCL
4	SDA
5	/INT
6	/RESET

Unit		
mm	NEWHAVEN DISPLAY INTERNATIONAL	
Gen. Tol.	Date	Part Number:
±0.3	06/21/17	NHD-4.3-480272EF-ASXV#-CTP

Pin Description

TFT:

Pin No.	Symbol	External Connection	Function Description
1	LED-	Power Supply	Backlight Cathode (Ground)
2	LED+	Power Supply	Backlight Anode (40mA @ 25.6V)
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	CLK	MPU	Data sample Clock signal
31	DISP	MPU	Display ON/OFF signal; H: Display ON, L: Display OFF
32	HSYNC	MPU	Line synchronization signal
33	VSYNC	MPU	Frame synchronization signal
34	DE	MPU	Data Enable signal
35	NC	-	No Connect
36	GND	Power Supply	Ground
37	NC	-	No Connect
38	NC	-	No Connect
39	NC	-	No Connect
40	NC	-	No Connect

Recommended LCD connector: 0.5mm pitch 40-Conductor FFC. Molex p/n: 54104-4033
Backlight connector: on LCD connector **Mates with**: ---

Capacitive Touch Panel:

Pin No.	Symbol	External Connection	Function Description
1	VDD	Power Supply	Power supply for logic (3.3V)
2	GND	Power Supply	Ground
3	SCL	MPU	Serial I2C Clock (Requires pull-up resistor)
4	SDA	MPU	Serial I2C Data (Requires pull-up resistor)
5	/INT	MPU	Interrupt signal from T.P. module to host (Requires pull-up resistor)
6	/RESET	MPU	Active LOW Reset signal

Recommended connector: 1.0mm pitch 6-Conductor FFC. Molex p/n: 52271-0679

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	V_{DD}	-	3.0	3.3	3.6	V
Supply Current	I_{DD}	V_{DD} = 3.3V	12	25	50	mA
"H" level input	V_{IH}	-	0.8 * V_{DD}	-	V_{DD}	V
"L" level input	V_{IL}	-	GND	-	0.3 * V_{DD}	V
"H" level output	V_{OH}	-	0.9 * V_{DD}	-	V_{DD}	V
"L" level output	V_{OL}	-	GND	-	0.1 * V_{DD}	V
Backlight Supply Current	I_{LED}	-	-	40	50	mA
Backlight Supply Voltage	V_{LED}	I_{LED} = 40 mA	22.4	25.6	27.2	V
Backlight Lifetime*	-	I_{LED} = 40mA T_{OP} = 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.

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}	V_{DD} = 3.3V	-	6.0	-	mA
Supply Current (Hibernate)	I_{DD}	T_{OP} = 25°C	-	1.0	-	µA
"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}	-	0.7 * V_{DD}	-	V_{DD}	V
"L" level output	V_{OL}	-	GND	-	0.3 * V_{DD}	V

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	Cr ≥ 10	-	75	-	º
	Bottom	φY-		-	75	-	º
	Left	θX-		-	75	-	º
	Right	θX+		-	75	-	º
Contrast Ratio		CR	-	400	500	-	-
Luminance		L_V	-	550	700	-	cd/m^2
Response Time	Rise + Fall	$T_R + T_F$	T_{OP} = 25°C	-	25	30	ms
Chromaticity	Red	X_R	-	0.531	0.581	0.631	-
		Y_R	-	0.300	0.350	0.400	-
	Green	X_G	-	0.263	0.313	0.363	-
		Y_G	-	0.568	0.618	0.668	-
	Blue	X_B	-	0.093	0.143	0.193	-
		Y_G	-	0.050	0.100	0.150	-
	White	X_W	-	0.233	0.283	0.333	-
		Y_W	-	0.286	0.336	0.386	-

Capacitive Touch Panel Material Characteristics

Property	Requirement	Unit
IC	FT5306DE4	-
ITO Glass Thickness	0.55	mm
Surface Hardness	≥6	H
Transparency	83% ± 5%	-
Operating Humidity	20~90	RH
Storage Humidity	20~90	RH

Driver/Controller Information

TFT:

Built-in Sitronix ST7282T2 Driver.
Please download specification at http://www.newhavendisplay.com/appnotes/datasheets/LCDs/ST7282T2.pdf

Capacitive Touch Panel:

Built-in FocalTech FT5306
Please download specification at http://www.newhavendisplay.com/app_notes/FT5x06.pdf

Capacitive Touch Panel Registers

Address	Name	B7	B6	B5	B4	B3	B2	B1	B0	Access
00h	DEVICE_MODE		Device Mode [2..0]							R/W
01h	GEST_ID	Gesture ID [7..0]								R
02h	TD_STATUS						Touch Points [3..0]			R
03h	TOUCH1_XH	Event Flag				1st Touch X Position MSB [11..8]				R
04h	TOUCH1_XL	1st Touch X Position LSB [7..0]								R
05h	TOUCH1_YH	Touch ID [3..0]				1st Touch Y Position MSB [11..8]				R
06h	TOUCH1_YL	1st Touch Y Position LSB [7..0]								R
07h										R
08h										R
09h	TOUCH2_XH	Event Flag				2nd Touch X Position MSB [11..8]				R
0Ah	TOUCH2_XL	2nd Touch X Position LSB [7..0]								R
0Bh	TOUCH2_YH	Touch ID [3..0]				2nd Touch Y Position MSB [11..8]				R
0Ch	TOUCH2_YL	2nd Touch Y Position LSB [7..0]								R
0Dh										R
0Eh										R
0Fh	TOUCH3_XH	Event Flag				3rd Touch X Position MSB [11..8]				R
10h	TOUCH3_XL	3rd Touch X Position LSB [7..0]								R
11h	TOUCH3_YH	Touch ID [3..0]				3rd Touch Y Position MSB [11..8]				R
12h	TOUCH3_YL	3rd Touch Y Position LSB [7..0]								R
13h										R
14h										R
15h	TOUCH4_XH	Event Flag				4th Touch X Position MSB [11..8]				R
16h	TOUCH4_XL	4th Touch X Position LSB [7..0]								R
17h	TOUCH4_YH	Touch ID [3..0]				4th Touch Y Position MSB [11..8]				R
18h	TOUCH4_YL	4th Touch Y Position LSB [7..0]								R
19h										R
1Ah										R
1Bh	TOUCH5_XH	Event Flag				5th Touch X Position MSB [11..8]				R
1Ch	TOUCH5_XL	5th Touch X Position LSB [7..0]								R
1Dh	TOUCH5_YH	Touch ID [3..0]				5th Touch Y Position MSB [11..8]				R
1Eh	TOUCH5_YL	5th Touch Y Position LSB [7..0]								R
1Fh										R

Address	Name	B7	B6	B5	B4	B3	B2	B1	B0	Access
80h	ID_G_THGROUP	valid touching detect threshold								R/W
81h	ID_G_THPEAK	valid touching peak detect threshold								R/W
82h	ID_G_THCAL	the threshold when calculating the focus of touching								R/W
83h	ID_G_THWATER	the threshold when there is surface water								R/W
84h	ID_G_TEMP	the threshold of temperature compensation								R/W
85h	ID_G_THDIFF	the threshold whether the coordinate is different from original								R/W
86h	ID_G_CTRL					Power Control Mode [1..0]				R/W
87h	ID_G_TIME_ENTER_MONITOR	the timer for entering monitor status								R/W
88h	ID_G_PERIODACTIVE					Period Active [3..0]				R/W
89h	ID_G_PERIODMONITOR	the timer of entering idle when in monitor status								R/W
A0h	ID_G_AUTO_CLB_MODE	auto calibration mode								R/W
A1h	ID_G_LIB_VERSION_H	Firmware Library Version H byte								R
A2h	ID_G_LIB_VERSION_L	Firmware Library Version L byte								R
A3h	ID_G_CIPHER	Chip vendor ID								R
A4h	ID_G_MODE	the interrupt status to host								R
A5h	ID_G_PMODE	Power Consume Mode								
A6h	ID_G_FIRMID	Firmware ID								R
A7h	ID_G_STATE	Running State								
A8h	ID_G_FT5201ID	CTPM Vendor ID								R
A9h	ID_G_ERR	Error Code								R
AAh	ID_G_CLB	Configure TP module during calibration in Test Mode								R/W
FEh	LOG_MSG_CNT	The log MSG count								R
FFh	LOG_CUR_CHA	Current character of log message								R

NOTE: Registers 80h – AFh have been configured for optimum settings and do not need to be modified.

Register No	Register Name	Bits	Value	Description
00h	Device Mode	[2:0]	000b	Normal Operating Mode
			100b	Test Mode - read raw data (reserved)
			001b	System Information Mode (reserved)
01h	Gesture ID	[7:0]	48h	Zoom In
			49h	Zoom Out
			00h	No Gesture
02h	Touch Points	[3:0]	000b	0 touch points detected
			001b	1 touch point detected
			010b	2 touch points detected
			011b	3 touch points detected
			100b	4 touch points detected
			101b	5 touch points detected
03h	Touch 1 Event Flag	[7:6]	00b	Put Down
			01b	Put Up
			10b	Contact
			11b	Reserved
03h	TOUCH1_XH	[3:0]	0h - 1h	Upper 4 bits of X touch coordinate
04h	TOUCH1_XL	[7:0]	00h - FFh	Lower 8 bits of X touch coordinate
05h	TOUCH1_YH	[3:0]	0h - 1h	Upper 4 bits of Y touch coordinate
06h	TOUCH1_YL	[7:0]	00h - FFh	Lower 8 bits of Y touch coordinate
09h	Touch 2 Event Flag	[7:6]	00b	Put Down
			01b	Put Up
			10b	Contact
			11b	Reserved
09h	TOUCH2_XH	[3:0]	0h - 1h	Upper 4 bits of X touch coordinate
0Ah	TOUCH2_XL	[7:0]	00h - FFh	Lower 8 bits of X touch coordinate
0Bh	TOUCH2_YH	[3:0]	0h - 1h	Upper 4 bits of Y touch coordinate
0Ch	TOUCH2_YL	[7:0]	00h - FFh	Lower 8 bits of Y touch coordinate
0Fh	Touch 3 Event Flag	[7:6]	00b	Put Down
			01b	Put Up
			10b	Contact
			11b	Reserved
0Fh	TOUCH3_XH	[3:0]	0h - 1h	Upper 4 bits of X touch coordinate
10h	TOUCH3_XL	[7:0]	00h - FFh	Lower 8 bits of X touch coordinate
11h	TOUCH3_YH	[3:0]	0h - 1h	Upper 4 bits of Y touch coordinate
12h	TOUCH3_YL	[7:0]	00h - FFh	Lower 8 bits of Y touch coordinate
15h	Touch 4 Event Flag	[7:6]	00b	Put Down
			01b	Put Up
			10b	Contact
			11b	Reserved
15h	TOUCH4_XH	[3:0]	0h - 1h	Upper 4 bits of X touch coordinate
16h	TOUCH4_XL	[7:0]	00h - FFh	Lower 8 bits of X touch coordinate
17h	TOUCH4_YH	[3:0]	0h - 1h	Upper 4 bits of Y touch coordinate
18h	TOUCH4_YL	[7:0]	00h - FFh	Lower 8 bits of Y touch coordinate

Register No	Register Name	Bits	Value	Description
1Bh	Touch 5 Event Flag	[7:6]	00b	Put Down
			01b	Put Up
			10b	Contact
			11b	Reserved
1Bh	TOUCH5_XH	[3:0]	0h - 1h	Upper 4 bits of X touch coordinate
1Ch	TOUCH5_XL	[7:0]	00h - FFh	Lower 8 bits of X touch coordinate
1Dh	TOUCH5_YH	[3:0]	0h - 1h	Upper 4 bits of Y touch coordinate
1Eh	TOUCH5_YL	[7:0]	00h - FFh	Lower 8 bits of Y touch coordinate
80h	ID_G_THGROUP	[7:0]	00h - FFh	Valid touching detect threshold Recommended: 46h
				Actual value will be 4 times register's value
81h	ID_G_THPEAK	[7:0]	00h - FFh	valid touching peak detect threshold Recommended: 3Ch
82h	ID_G_THCAL	[7:0]	00h - FFh	Touch focus threshold Recommended: 1Dh
83h	ID_G_THWATER	[7:0]	00h - FFh	threshold when there is surface water Recommended: D3h
84h	ID_G_THTEMP	[7:0]	00h- FFh	threshold of temperature compensation Recommended: EBh
85h	ID_G_THDIFF	[7:0]	00h- FFh	Touch difference threshold Recommended: A0h
				Actual value is 32 times the register's value
86h	ID_G_CTRL	[1:0]	00h	Power Control Mode: Not Auto Jump
			01h	Power Control Mode: Auto Jump
87h	ID_G_TIME_ENTER_MONITOR	[7:0]	00h-FFh	Delay to enter 'Monitor' status (s) Recommended: C8h
88h	ID_G_PERIODACTIVE	[3:0]	3h-Eh	Period of 'Active' status (ms) Recommended: 6h
89h	ID_G_PERIODMONITOR	[7:0]	1Eh-FFh	Timer to enter 'idle' when in 'Monitor' (ms) Recommended: 28h
A0h	ID_G_AUTO_CLB_MODE	[7:0]	00h	Auto calibration mode: Enable auto calibration
			FFh	Auto calibration mode: Disable auto calibration
A1h	ID_G_LIB_VERSION_H	[7:0]	30h	Firmware Library Version H byte
A2h	ID_G_LIB_VERSION_L	[7:0]	01h	Firmware Library Version L byte
A3h	ID_G_CIPHER	[7:0]	55h	Chip vendor ID
A4h	ID_G_MODE	[0:0]	00h	Interrupt status: Enable interrupt to host
			01h	Interrupt status: Disable interrupt to host
A5h	ID_G_PMODE	[1:0]	00h	'Active' Mode
			01h	'Monitor' Mode
			03h	'Hibernate' Mode
A6h	ID_G_FIRMID	[7:0]	08h	Firmware ID
A7h	ID_G_STATE	[7:0]	00h	Running State: Configure
			01h	Running State: Work
			02h	Running State: Calibration
			03h	Running State: Factory
			04h	Running State: Auto-calibration
A8h	ID_G_FT5201ID	[7:0]	79h	CTPM Vendor's Chip ID
A9h	ID_G_ERR	[7:0]	00h	Error Code: OK
			03h	Error Code: Chip register writing inconsistent with reading
			05h	Error Code: Chip start fail
			1Ah	Error Code: Calibration match fail

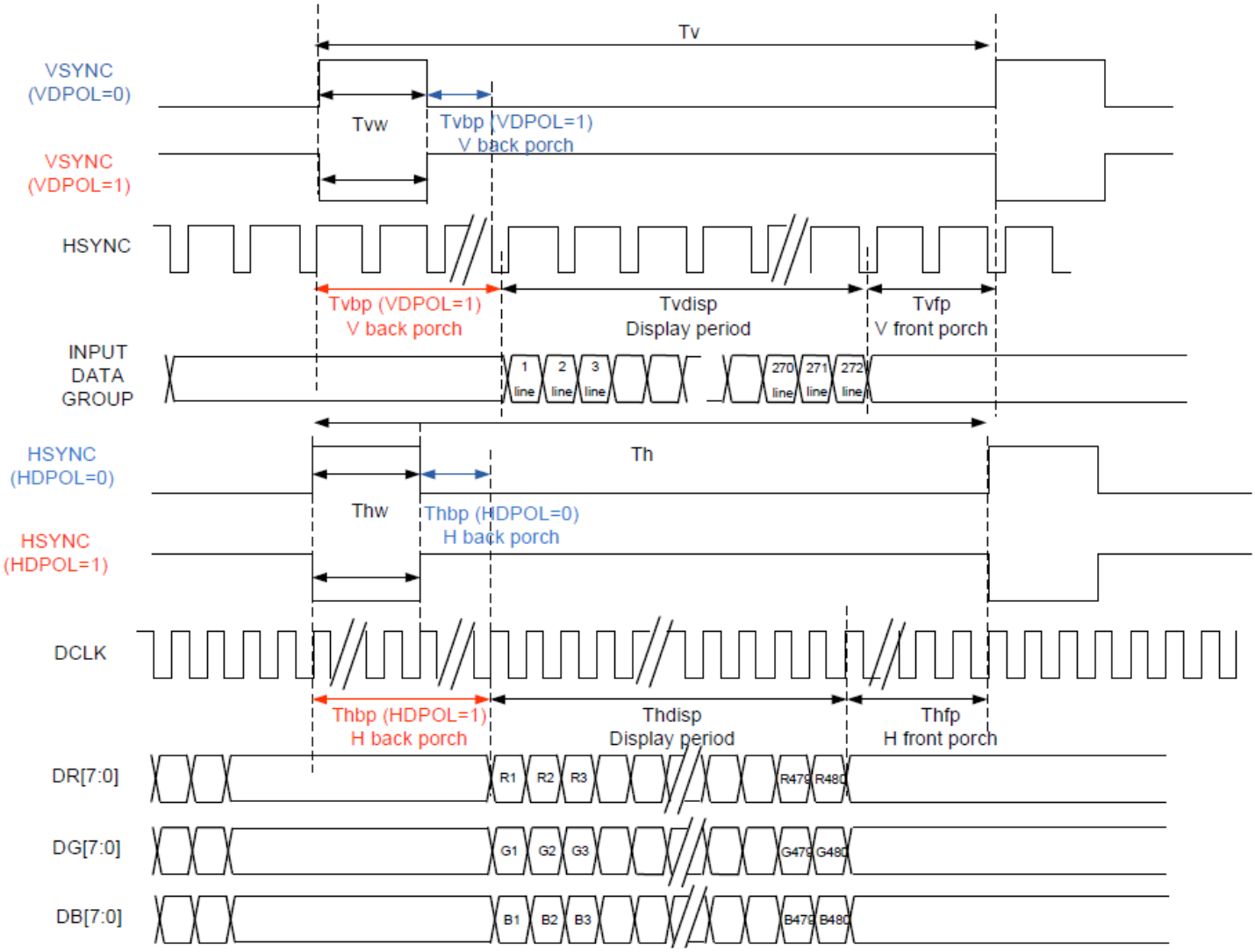
Timing Characteristics – TFT Display

Timing Characteristics

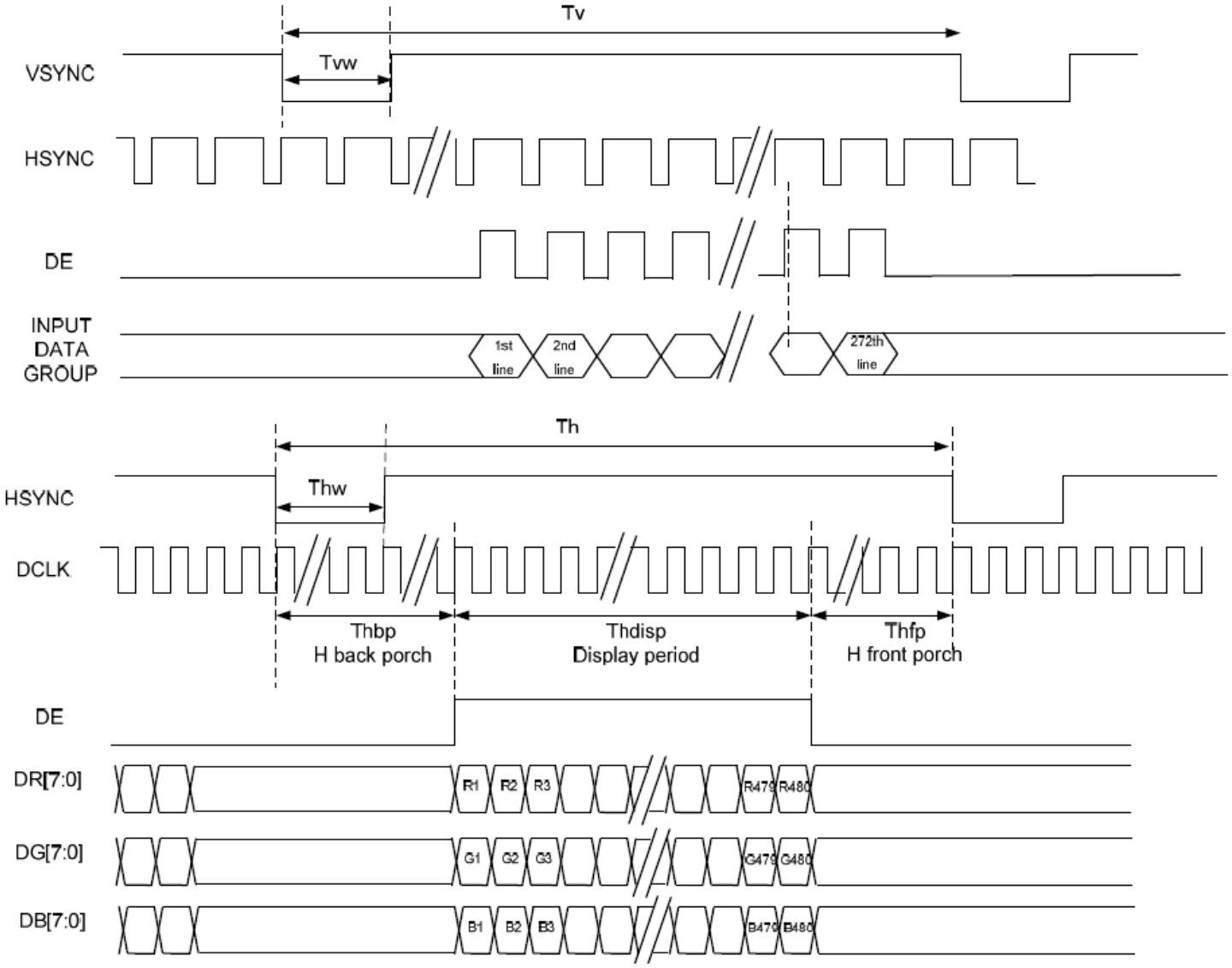
Parallel RGB input timing requirement

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		FCLK	9	12	15	MHz	
DCLK Period		TCLK	10	50	-	µS	R=10KΩ, 1µF
HSYNC	Period Time	Th	485	525	532	DCLK	
	Display Period	Thdisp	-	480	-	DCLK	
	Back Porch	Thbp	3	43	50	DCLK	By H_Blanking Setting
	Front Porch	Thfp	2	2	2	DCLK	
	Pulse Width	Thw	1	1	1	DCLK	
VSYNC	Period Time	Tv	275	285	303	H	
	Display Period	Tvdisp	-	272	-	H	
	Back Porch	Tvbp	2	12	30	H	By V_Blanking Setting
	Front Porch	Tvfp	1	1	1	H	
	Pulse Width	Tvw	1	1	1	H	

- **SYNC Mode Timing**



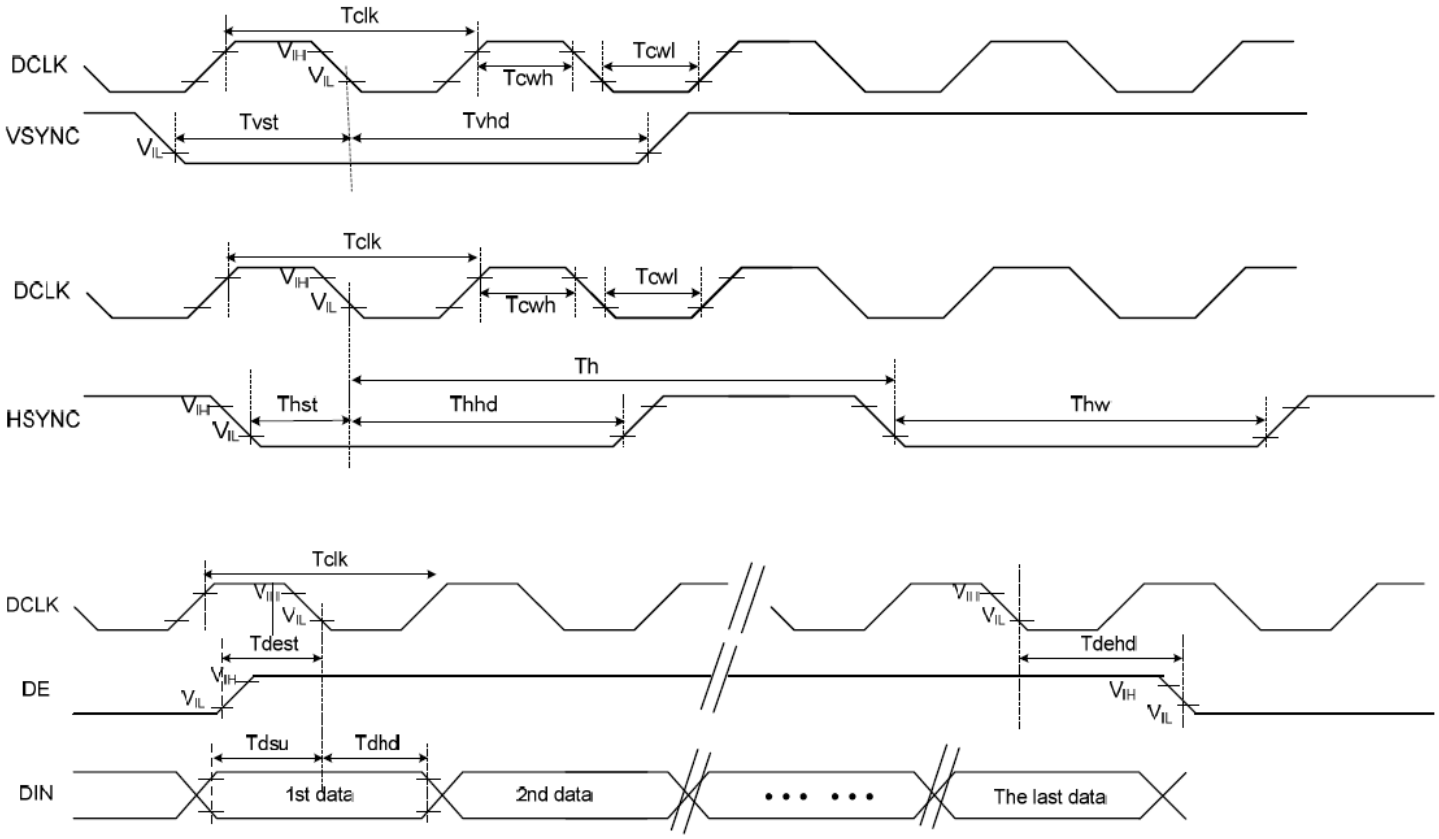
- **SYNC-DE Mode Timing**



Input setup timing requirement

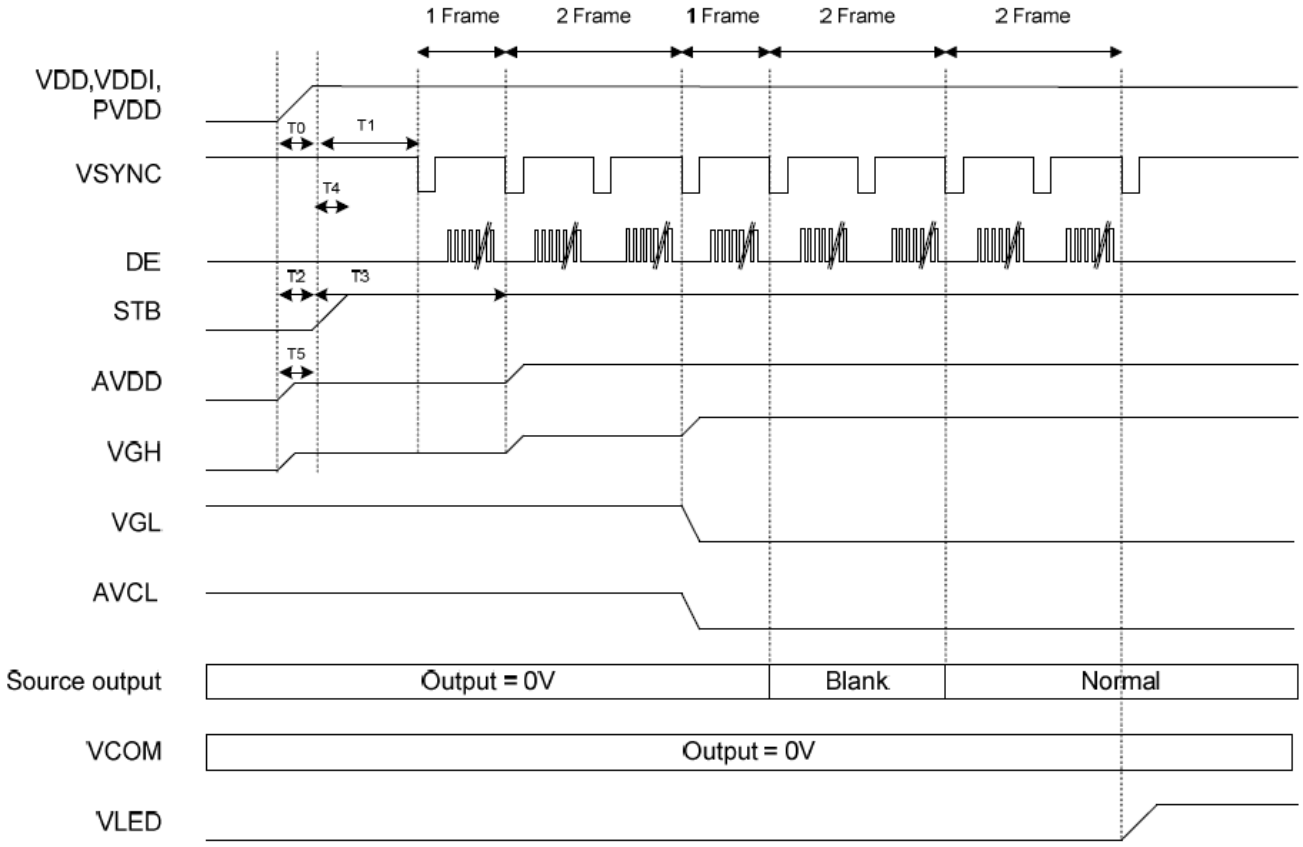
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
System Operation Timing						
V_{DD} Power Source Slew Time	TPOR	-	-	20	ms	From 0V to 99% V_{DD}
GRB Pulse Width	tRSTW	10	50	-	µS	R=10KΩ, 1µF
Input / Output Timing						
CLK pulse Duty	TCW	40	50	60	%	
Hsync Width	Thw	1	-	-	DCLK	
Hsync Period	Th	50	60	65	µS	
Vsync setup time	Tvst	12	-	-	ns	
Vsync hold time	Tvhd	12	-	-	ns	
Hsync setup time	Thst	12	-	-	ns	
Hsync hold time	Thhd	12	-	-	ns	
Data setup time	Tdsu	12	-	-	ns	
Data hold time	Tdhd	12	-	-	ns	
SD output stable time	Tst	-	-	12	µS	Output settled within +20mV Loading = 6.8k+28.2pF
GD output rise and fall time	Tgst	-	-	6	µS	Output settled (5%~95%) Loading = 4.7k+29.8pF

- **Clock And Data Input Timing Diagram**



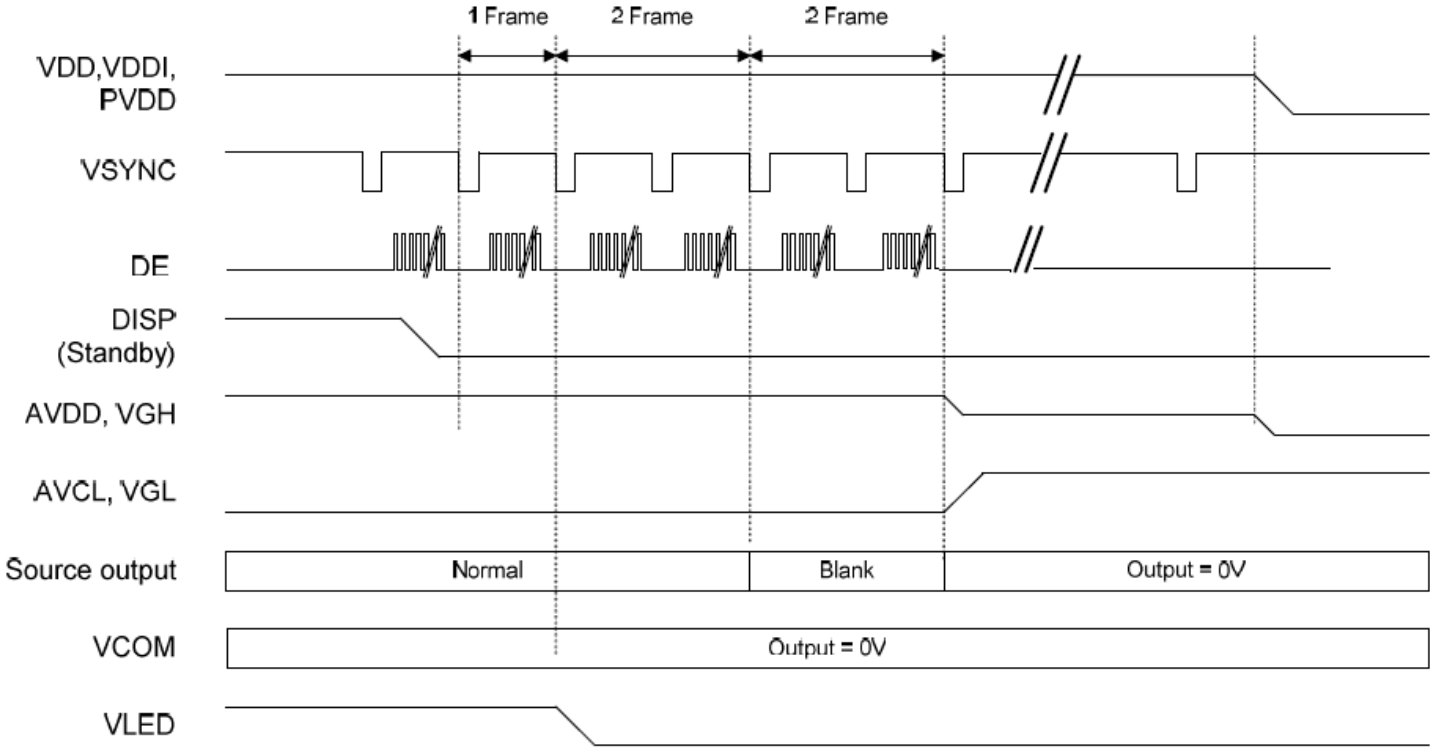
Power On/Off Sequence

- **Power On Sequence**



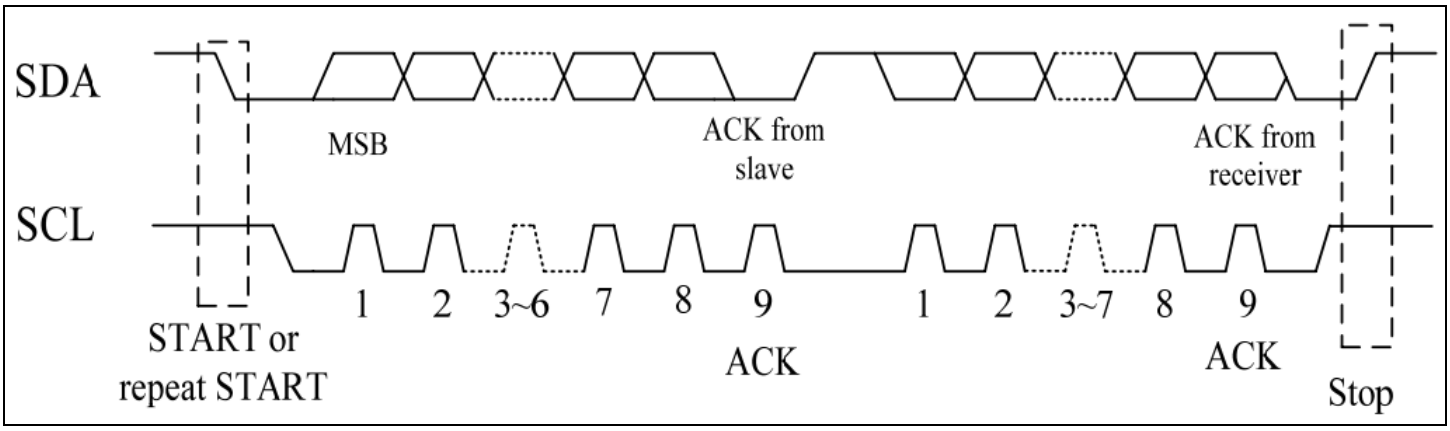
	Description	Min. Time
T0	Determined by the external power	
T1	Time from stable VDD, VDDI, PVDD set-up to the first VSYNC	T1=0
T2	Time from AVDD=0V to AVDD=3.3V	T2=T0
T3	Time from AVDD=3.3V to AVDD=6.0V	T3=T1+ (1*Frame)
T4	Time from stable VDD, VDDI, PVDD set-up to DISP asserted	T4=0
T5	Time from VGH=0V to VGH=3.3V	T5=T0

- **Power Off Sequence**

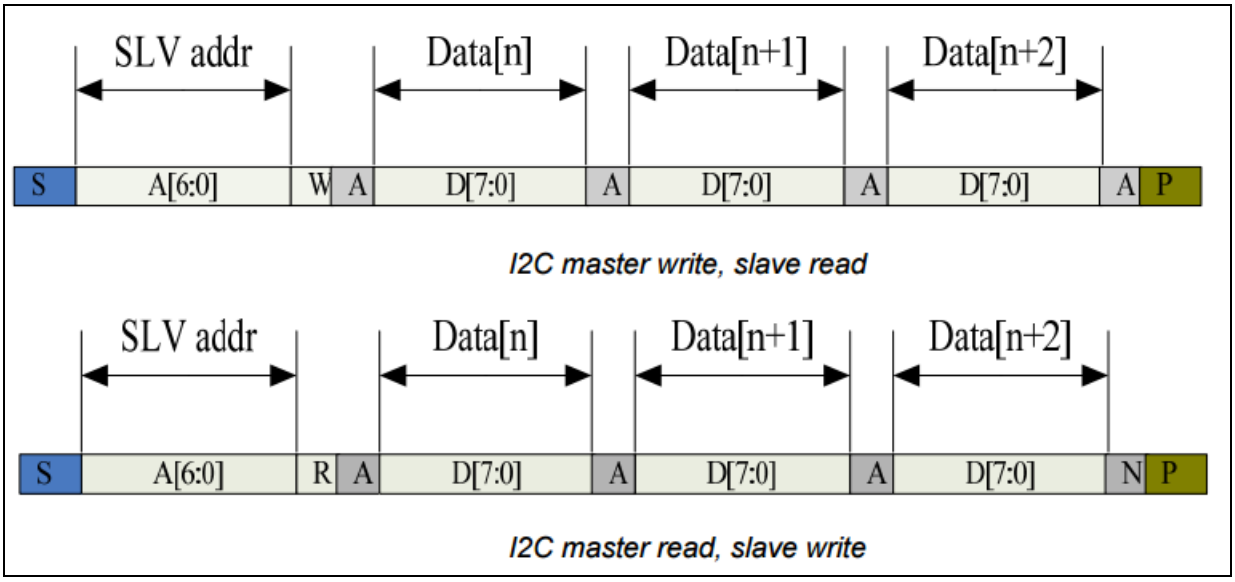


Timing Characteristics – Capacitive Touch Panel

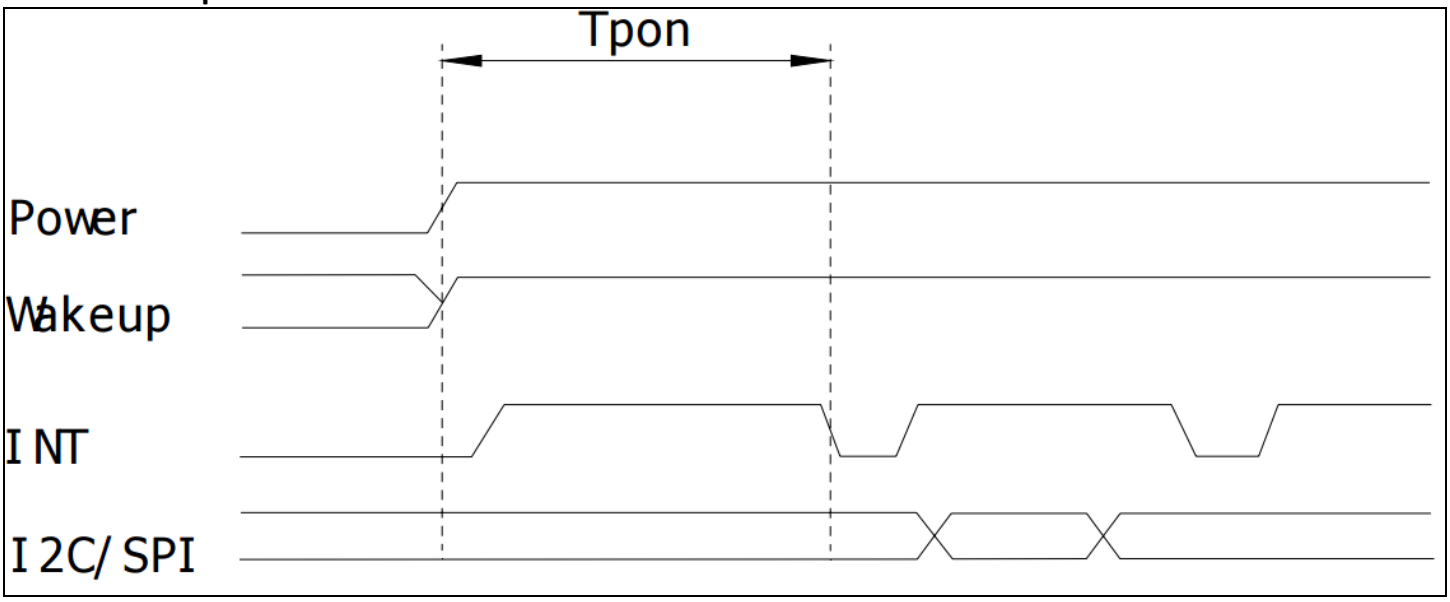
Data Transfer Format



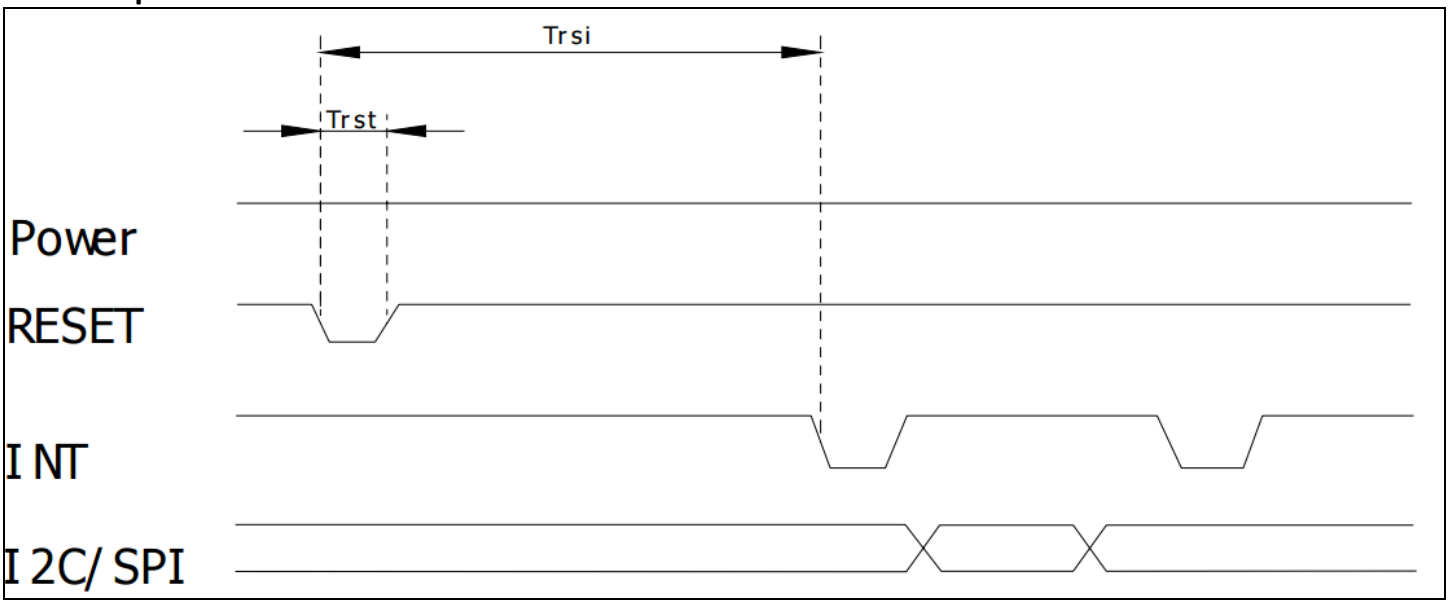
Parameter	Unit	Min	Max
SCL frequency	KHz	0	400
Bus free time between a STOP and START condition	us	4.7	\
Hold time (repeated) START condition	us	4.0	\
Data setup time	ns	250	\
Setup time for a repeated START condition	us	4.7	\
Setup Time for STOP condition	us	4.0	\



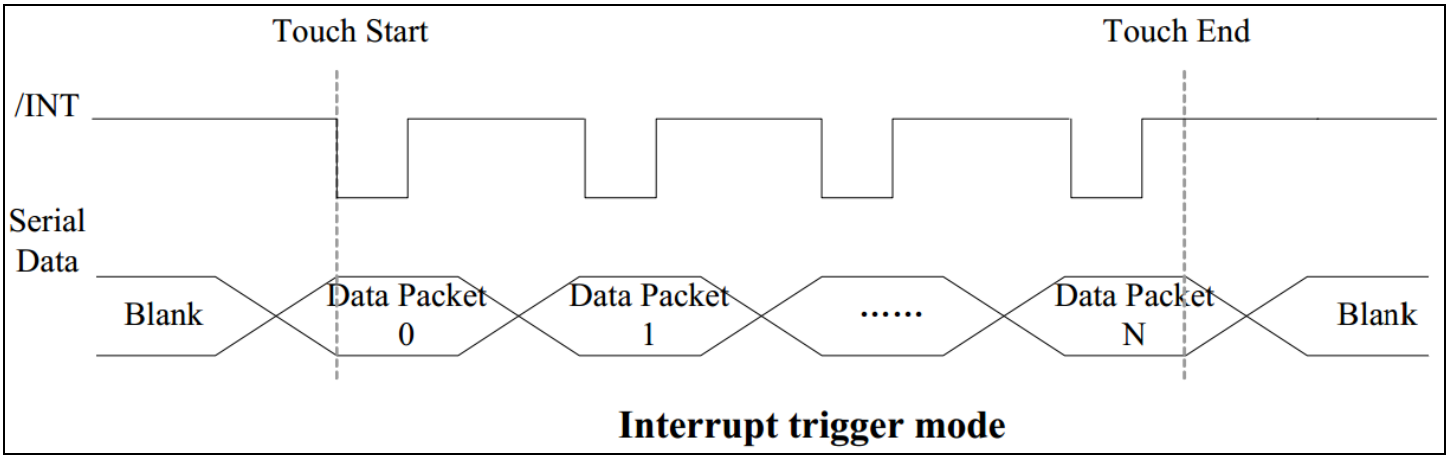
Power ON Sequence



Reset Sequence



Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	10	ms
Tpon	Time of starting to report point after powering on	300	--	ms
Trsi	Time of starting to report point after resetting	300	--	ms
Trst	Reset time	5	--	ms
Twai	Time of starting to report point after waking	300	--	ms
Twak	Wake up time	5	--	ms



Interrupt trigger mode

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 , 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 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 , 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 -> 25°C,5min - >70°C,60min = 1 cycle 20 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz , 15mm amplitude. 30 Min. Each Direction X,Y,Z	3
Static electricity test	Endurance test applying electric static discharge.	Air: V_S=±8KV, Contact: V_S=±4KV R_S=330Ω C_S=150pF 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

Warranty Information

See Terms & Conditions at http://www.newhavendisplay.com/index.php?main_page=terms