NEWHAVEN DISPLAY INTERNATIONAL

Product Specification

NHD-7.0-800480EF-ASXN#-CTP

TFT Liquid Crystal Display

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
#-	RoHS Compliant
CTP-	Capacitive Touch Panel w/Controller

Newhaven Display International, Inc.
2661 Galvin Court, Elgin, IL 60124 USA

Ph: 847.844.8795 | Fx: 847.844.8796
www.newhavendisplay.com

REACH Compliant

RoHS Compliant

Table of Contents

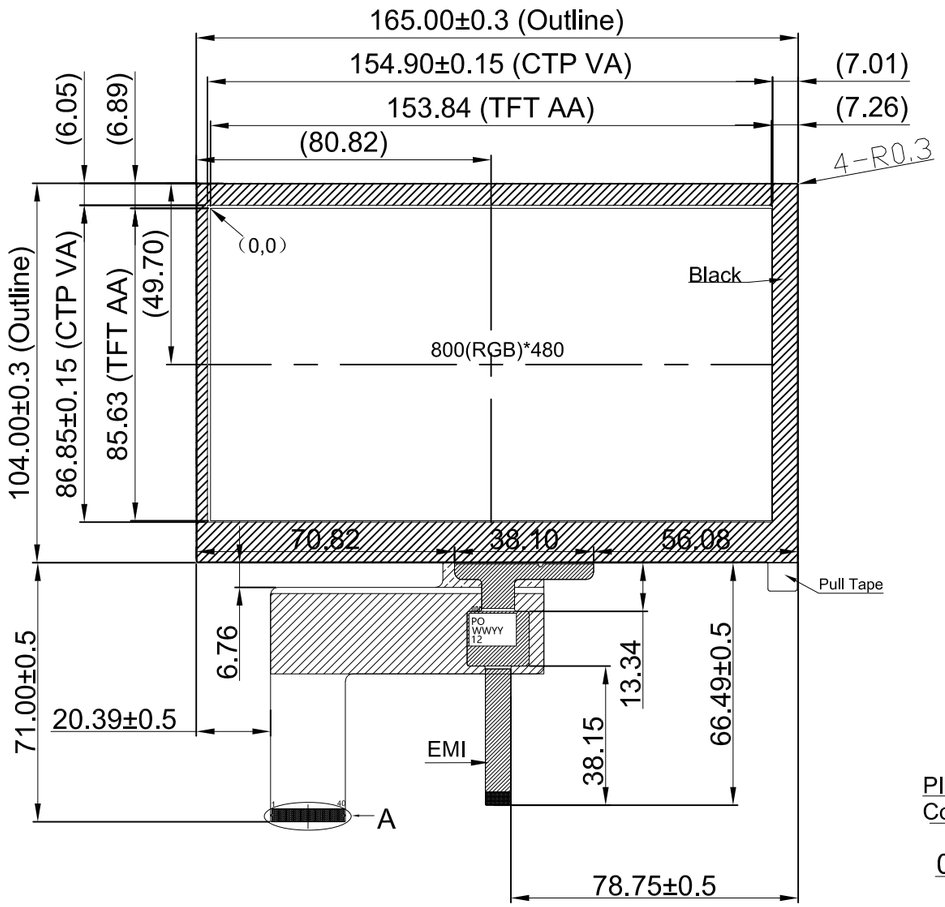
Additional Resources

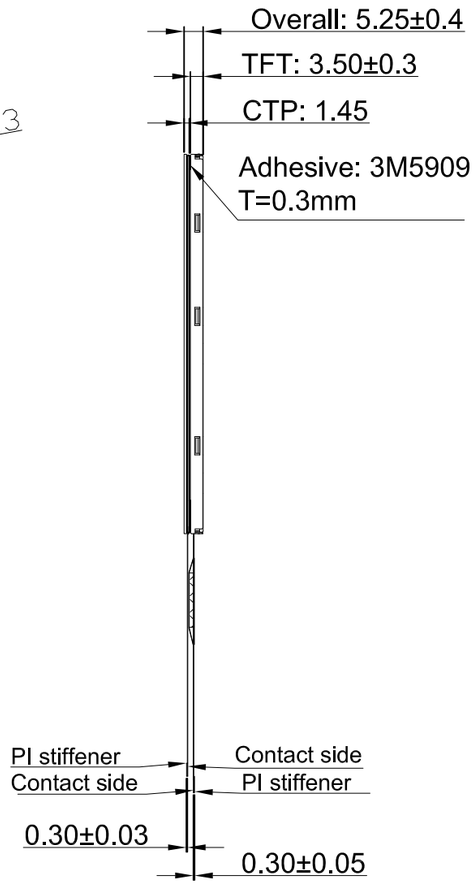
- **Support Forum:** https://support.newhavendisplay.com/hc/en-us/community/topics
- **GitHub:** https://github.com/newhavendisplay
- **Example Code:** https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html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

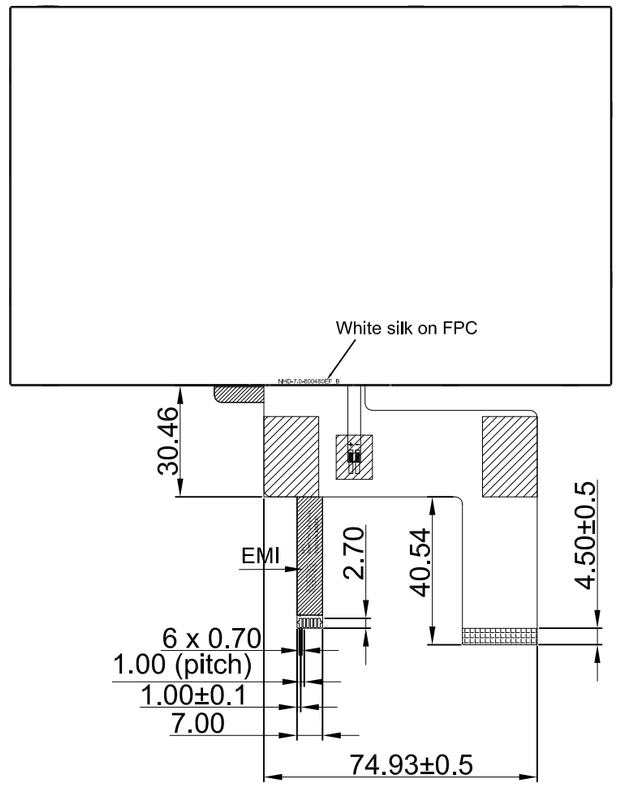
Document Revision History

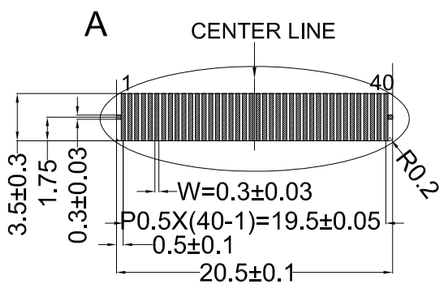
Revision	Date	Description	Changed By
-	03/10/2016	Initial Release	SB
1	06/30/2016	Chromaticity Added	SB
2	08/02/2017	CTP Firmware Updated	SB
3	09/15/2017	Backlight Characteristics Updated	SB
4	08/14/2018	Updated CTP Driver & Panel	SB
5	12/11/2018	Updated Mechanical Drawing	TM
6	05/07/2019	CTP Timing Note Added	SB
7	12/27/2019	CTP Firmware Updated	SB
8	03/09/2020	LCD Driver Changed to EK9716	SB
9	06/04/2020	Updated 2D Mechanical Drawing, Viewing Angles, Quality Information	AS
10	07/02/2020	Corrected 'Gesture ID' Hex Values for CTP	AS
11	09/15/2020	Inclusion of CTP Pin Orientation in 2D Mechanical Drawing	AS
12	03/23/2021	Updated Silkscreen on FPC	AS
13	05/24/2021	Updated Mechanical Drawing	JT
14	11/15/2021	FT5426 CTP IC Version Update	ZP
15	12/13/2021	Included Viewing Angle on Mechanical Drawing	ZP
16	10/06/2022	Updated Mechanical Drawing	TM
17	02/07/2023	Mechanical Drawing Format Updated	KL

Mechanical Drawing









TFT

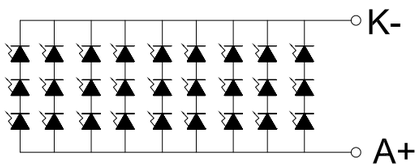
PIN	SYMBOL
1	LED-K
2	LED-A
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DEN
35	NC
36	GND
37	NC(XR)
38	NC(YD)
39	NC(XL)
40	NC(YU)

CTP

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

Product Description: 7” 800x480 Sunlight Readable TFT w/ Capacitive Touch

1. Driver IC: EK9716B TFT, FT5426-003 CTP
2. Interface: 24-Bit Parallel RGB TFT, I²C CTP
3. Power Requirement: 3.3V TFT, 9.3V/180mA Backlight, 3.3V CTP
4. Optical Features: Normally White, Transmissive, 820cd/m²
5. Recommended FFC Connector:
   - TFT: 40pin 0.5mm pitch; Ex. Molex 54104-4031
   - CTP: 6pin 1.0mm pitch; Ex. Molex 52271-0679
6. EMI Shielded FPC



LED CIRCUIT

Newhaven Display
NHD-7.0-800480EF-ASXN#-CTP
Date Code
Part Label (type/format may vary)

Standard Tolerance:
(Unless otherwise specified)
Linear: ±0.3mm

NEWHAVEN DISPLAY INTERNATIONAL

Drawing/Part Number: NHD-7.0-800480EF-ASXN#-CTP
Revision: -

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

Drawn By: K. Lewis
Approved By: K. Lewis
Drawn Date: 02/07/2023
Approved Date: 02/07/2023

Pin Description

TFT:

Pin No.	Symbol	External Connection	Function Description
1	LED-K	Power Supply	Ground for Backlight
2	LED-A	Power Supply	Backlight Power Supply (180mA @ 9.3V)
3	GND	Power Supply	Ground
4	V_{DD}	Power Supply	Power Supply (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 DISP=1: Display on; DISP=0: Display off
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

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

Capacitive Touch Panel:

Pin No.	Symbol	External Connection	Function Description
1	V_{DD}	Power Supply	Power Supply (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 touch panel module to host
6	/RESET	MPU	Active LOW Reset signal. (Do not tie to V_{DD})

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

Driver/Controller Information

TFT:

Built-in EK9716B Source Driver: https://support.newhavendisplay.com/hc/en-us/article_attachments/6066352840215/EK79716BD4.pdf

Built-in EK73002AB2 Gate Driver: https://support.newhavendisplay.com/hc/en-us/article_attachments/4414487925399/EK73002AB2.pdf

Capacitive Touch Panel:

Built-in FT5426-003 Controller: https://support.newhavendisplay.com/hc/en-us/article_attachments/4414386815639/FT5x26.pdf

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, 25°C	45	90	135	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}	-	V_{DD}-0.4	-	-	V
"L" Level Output	V_{OL}	-	V_{SS}	-	V_{SS}+0.4	V
Backlight Supply Current	I_{LED}	-	-	180	225	mA
Backlight Supply Voltage	V_{LED}	I_{LED} = 180mA	8.7	9.3	10.2	V
Backlight Lifetime*	-	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}	-	2.8	3.3	3.6	V
Supply Current – Operating	I_{DD}	V_{DD} = 3.3V	-	15.0	-	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}	-	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	φY+	CR ≥ 10	-	60	-	°
	Bottom	φY-		-	70	-	°
	Left	θX-		-	70	-	°
	Right	θX+		-	70	-	°
Contrast Ratio		CR	-	-	500	-	-
Luminance		L_V	I_{LED} = 180 mA	660	820	-	cd/m²
Response Time		$T_R + T_F$	T_{OP} = 25°C	-	25	-	ms
Chromaticity	Red	X_R	-	0.532	0.582	0.632	-
		Y_R	-	0.292	0.342	0.392	-
	Green	X_G	-	0.285	0.335	0.385	-
		Y_G	-	0.574	0.624	0.674	-
	Blue	X_B	-	0.104	0.154	0.204	-
		Y_B	-	0.092	0.142	0.192	-
	White	X_W	-	0.257	0.307	0.357	-
		Y_W	-	0.334	0.384	0.434	-

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 1 2 3	Put Down Put Up Contact 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 1 2 3	Put Down Put Up Contact 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 1 2 3	Put Down Put Up Contact 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 1 2 3	Put Down Put Up Contact 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 1 2 3	Put Down Put Up Contact 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: 2h
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: 11
A8h	RO	ID_G_VENODRID	[7:0]	00-FFh	CTPM Vendor's Chip ID Default: 79h

Capacitive Touch Panel Characteristics:

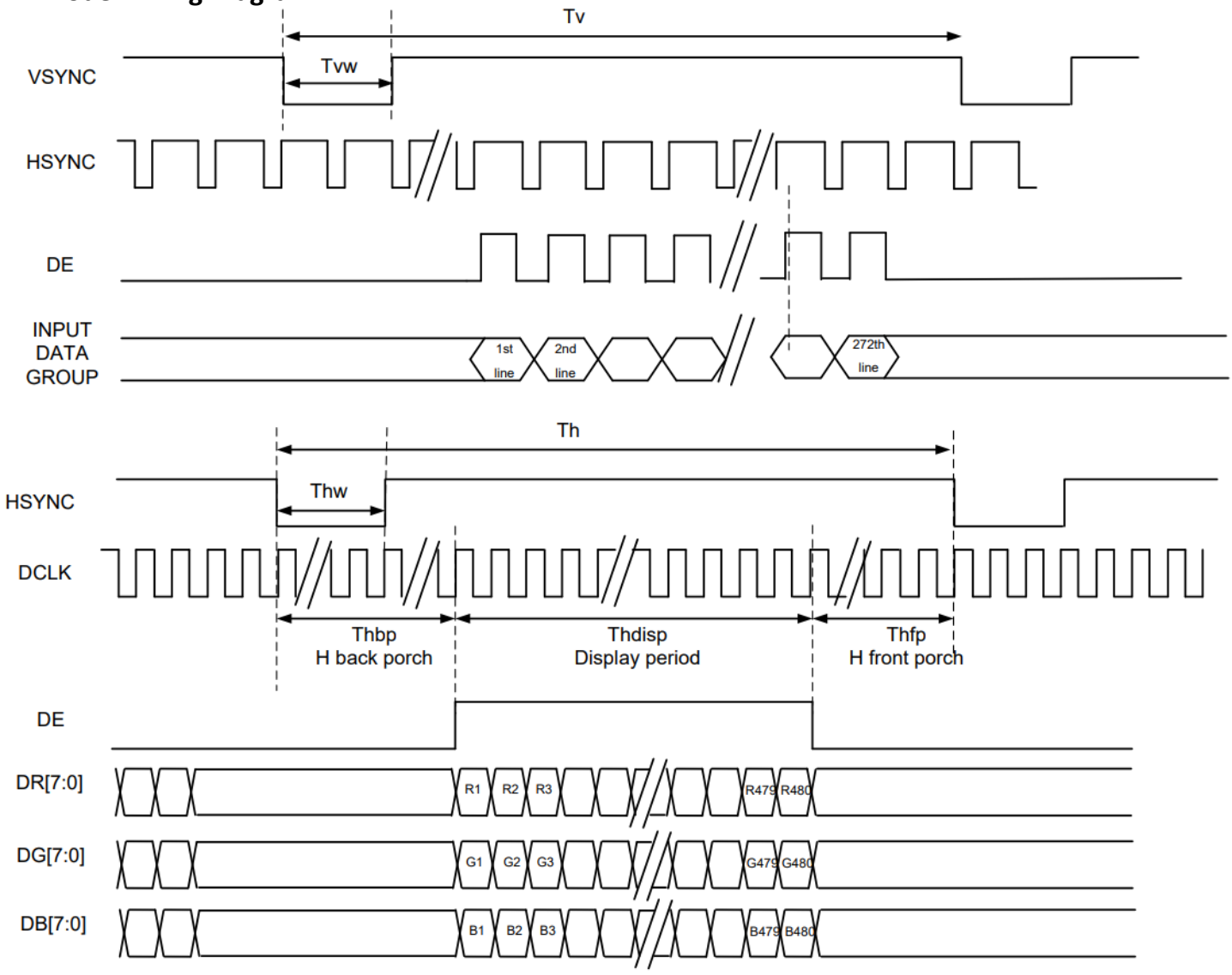
Property	Requirement
Surface Hardness	≥6H
Transmittance	82%
Multitouch Points	10

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 DLCK is fixed
	Display Period	T_{hdisp}		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	Tvw + 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	-

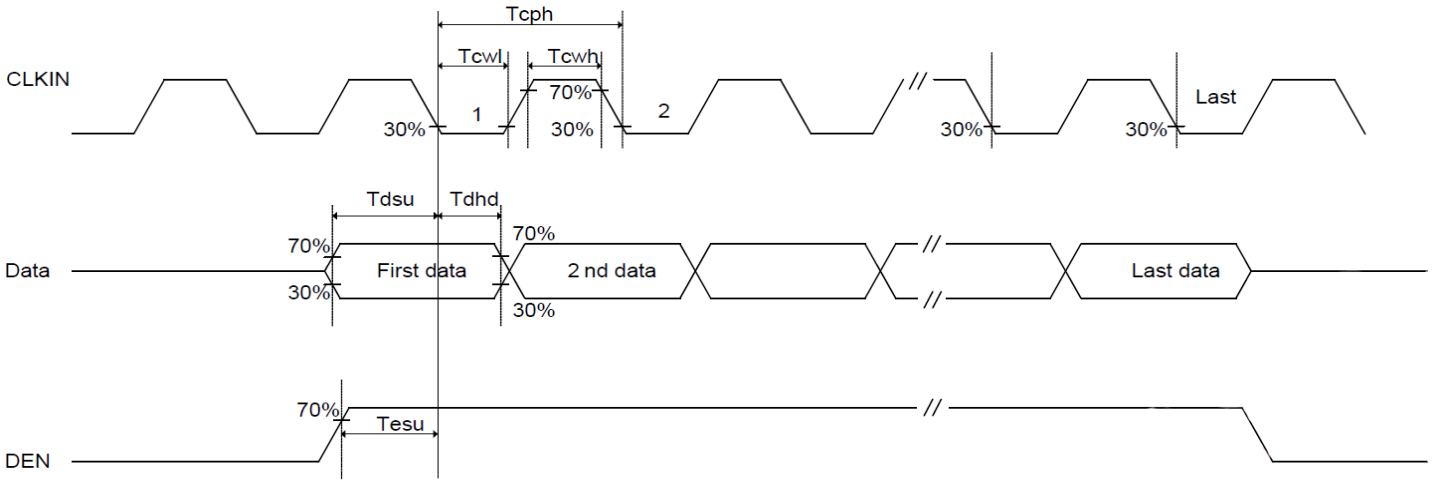
DE Mode Timing Diagram



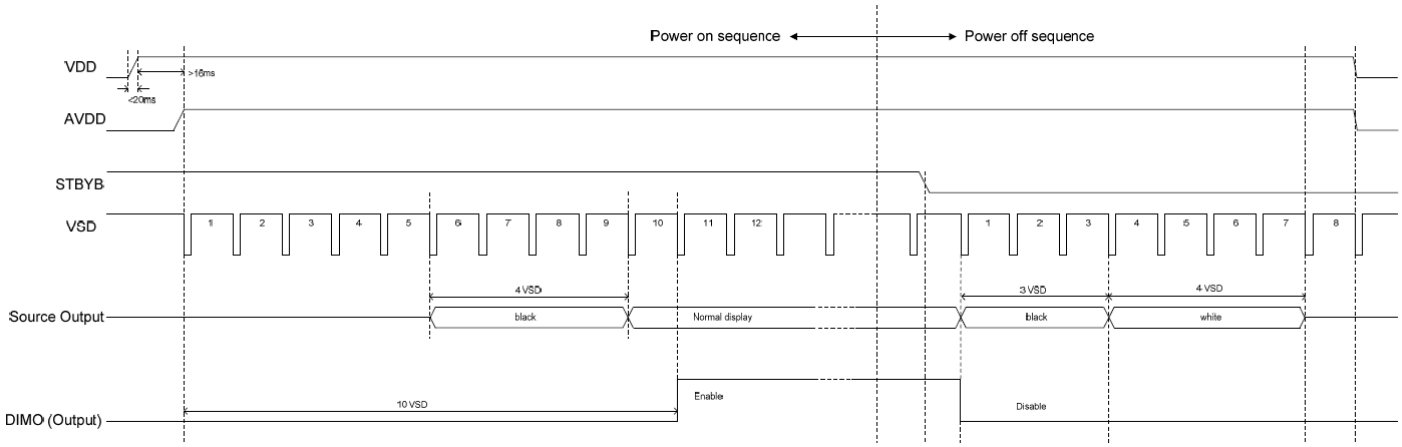
Input Setup Timing Requirements

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

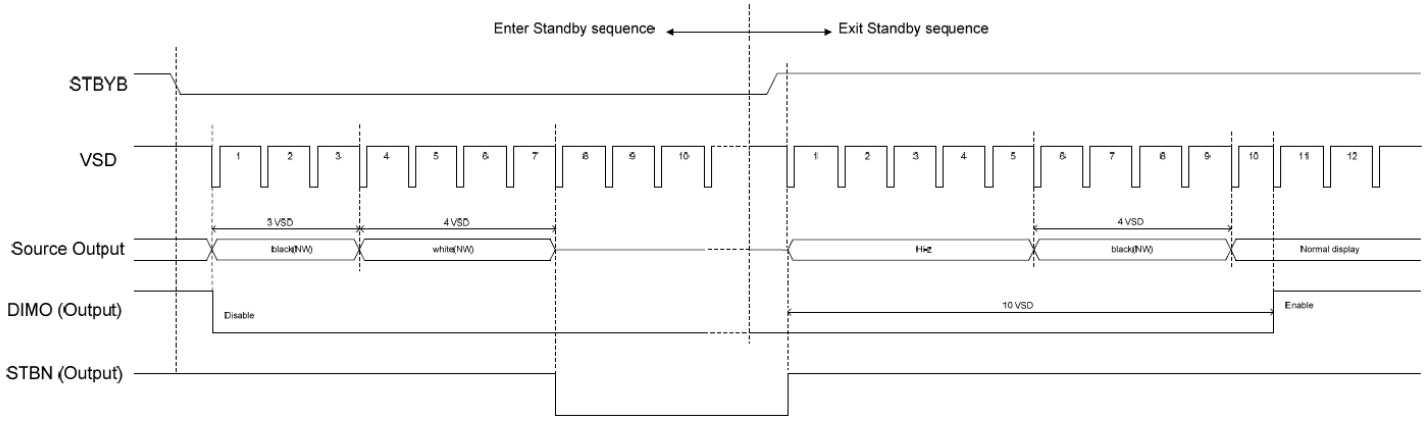
Input Setup Timing Diagram



Power ON/OFF Sequence

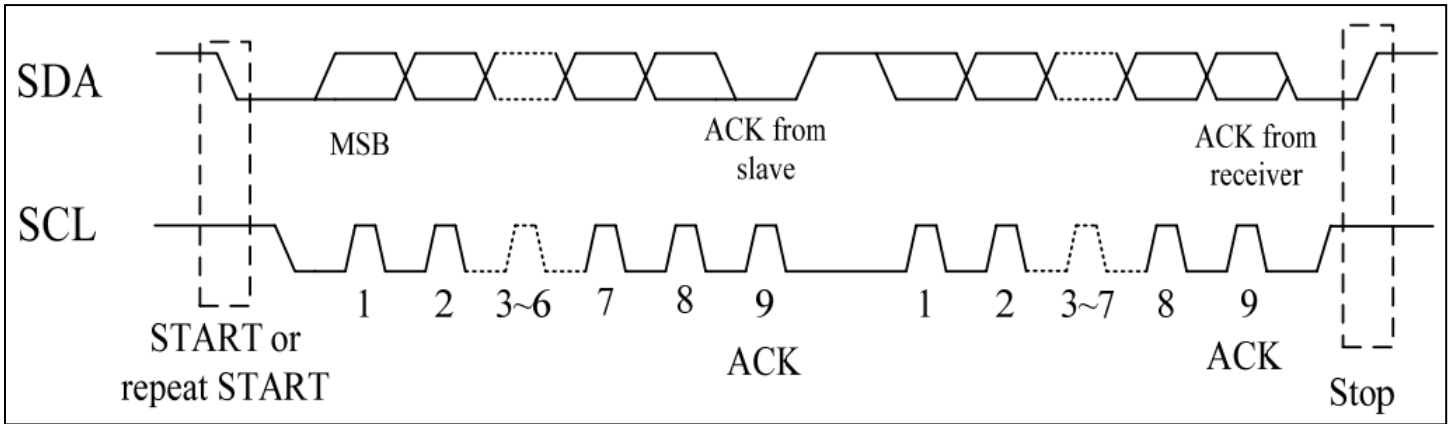


Enter/Exit Standby Mode Sequence

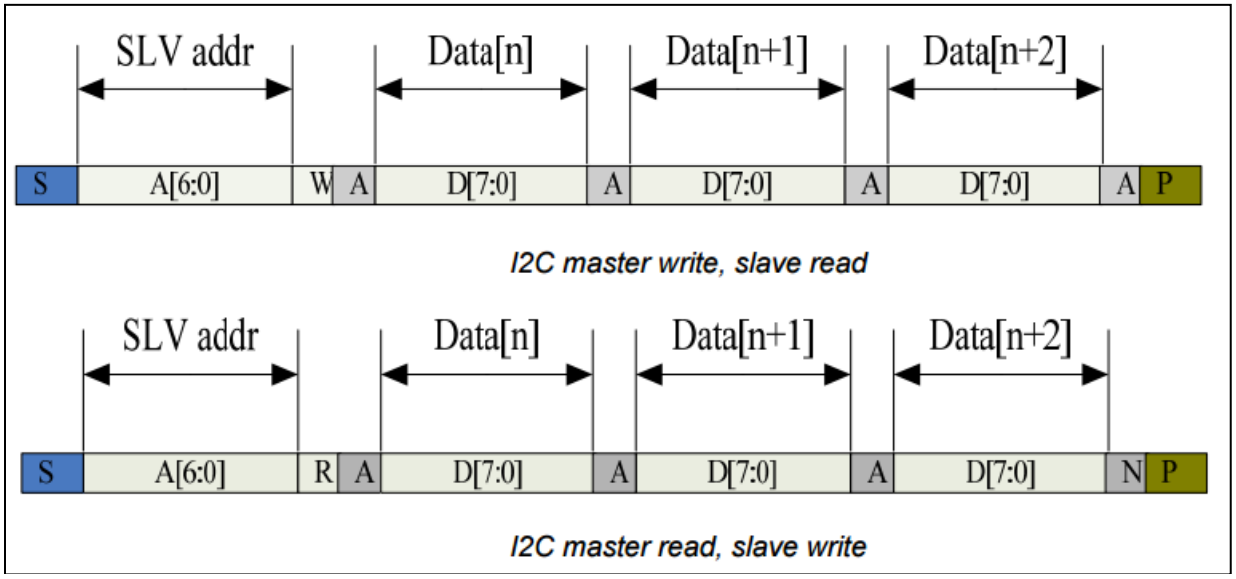


Timing Characteristics – Capacitive Touch Panel

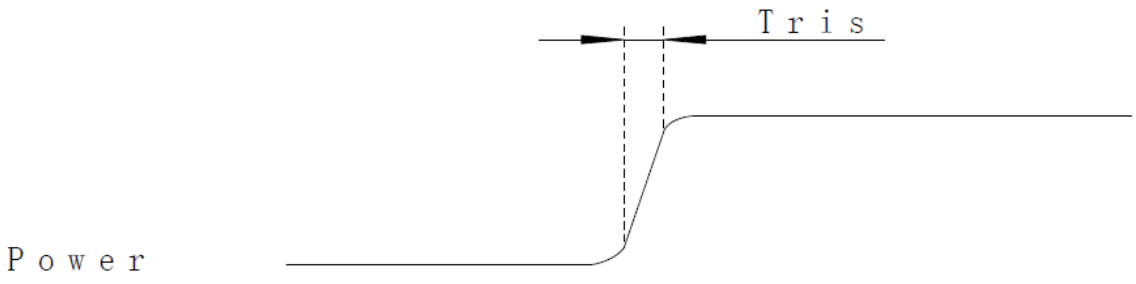
Data Transfer Format



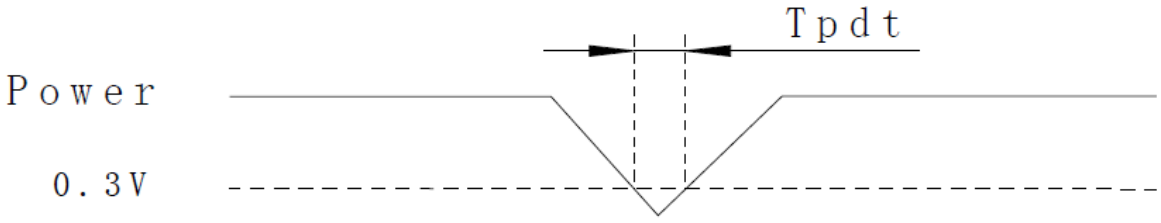
Parameter	Min	Max	Unit
SCL Frequency	0	400	KHz
Bus free time between a STOP & START condition	1.3	-	µs
Hold time Repeated START condition	0.6	-	µs
Data Setup Time	100	-	ns
Setup time for a repeated START condition	0.6	-	µs
Setup time for a STOP condition	0.6	-	µs



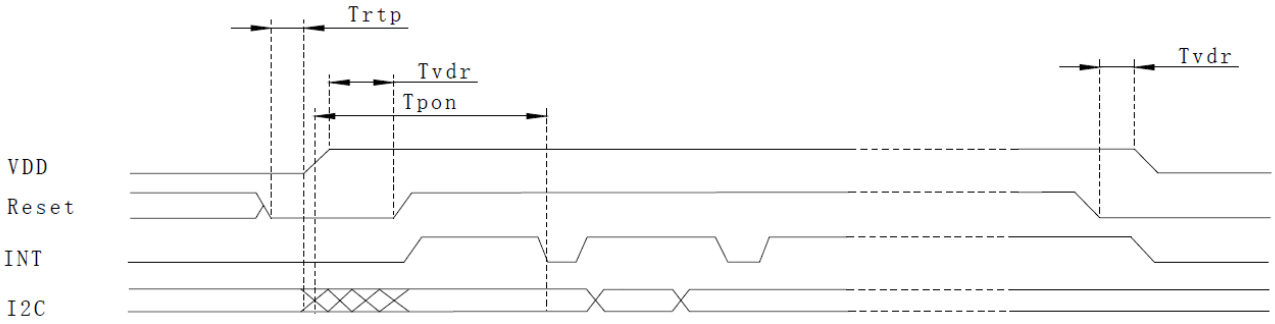
Power ON/Reset Sequence



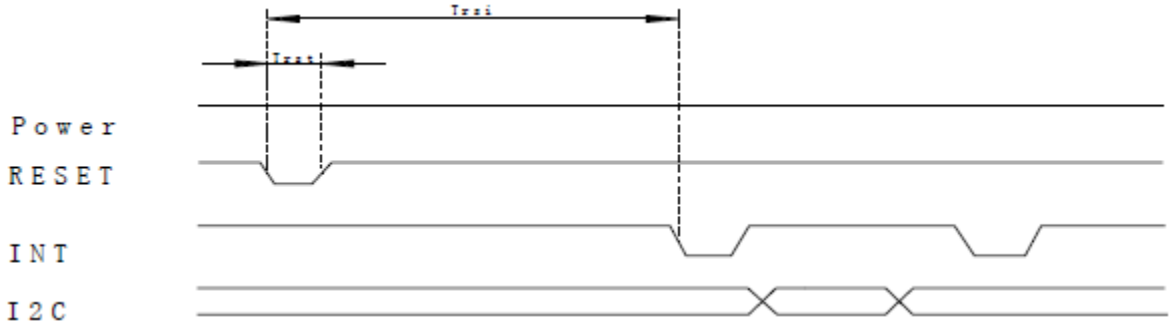
Power On Time



Power Cycle Requirement



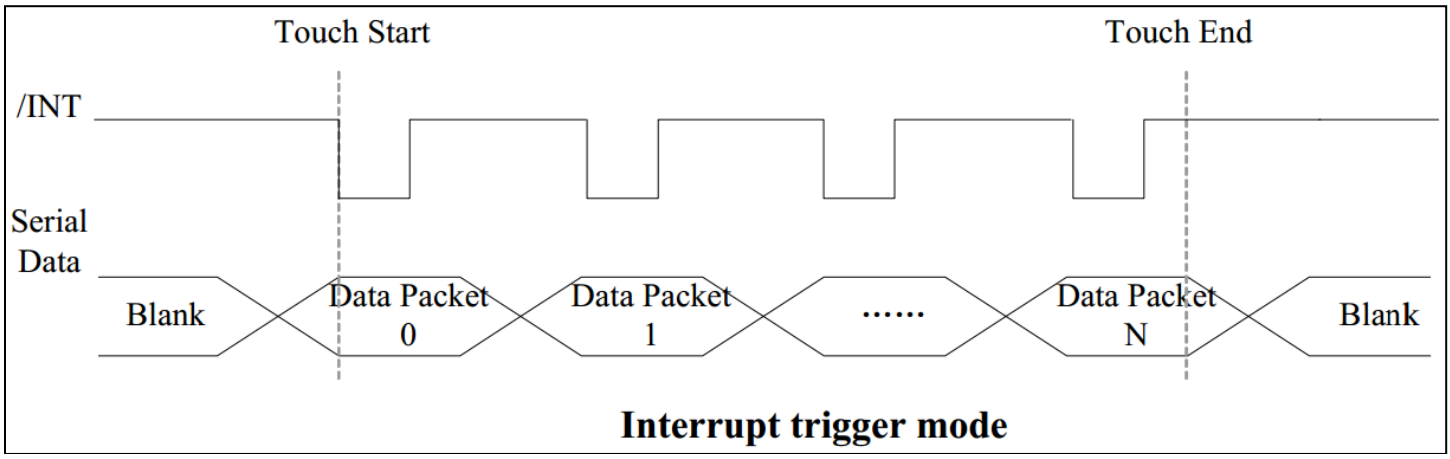
Power ON Sequence



Reset sequence

Parameter	Description	Min	Max	Unit
Tris	Rise time from 0.1V_{DD} to 0.9V_{DD}	-	5	ms
Tpdt	Time of the voltage of supply being below 0.3V	5	-	ms
Trtp	Time of resetting to be low before powering on	100	-	µs
Tpon	Time to start reporting after power on	-	200	ms
Tvdr*	Reset time after applying V_{DD}	1	-	ms
Trsi	Time to start reporting after reset	-	200	ms
Trst*	Reset Time	1	-	ms

*Note: If Reset is tied to V_{DD} data corruption can occur



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, 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 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, 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. 30min 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.