

Product Specification

NHD-2.8-240320AF-CSXP-FCTP

IPS TFT Liquid Crystal Display Module

NHD-	Newhaven Display
2.8-	2.8" Diagonal
240320-	240 x 320 Pixels (Portrait Mode)
AF-	Model
C-	Built-in Controller
S-	High Brightness, White LED Backlight
X-	TFT
P-	IPS, Wide Temperature
FCTP	FFC ZIF Connection Style, Capacitive Touch Panel with Controller

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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
-	04/09/2019	Initial Release	PK
1	12/09/2019	Interface information updated (8080-II)	SM
2	02/12/2021	Updated FPC Tolerances On 2D Mechanical Drawing	AS
3	05/25/2021	CTP Timing Characteristics Included	ZP
4	03/28/2023	Updated Electrical and Optical Characteristics CTP updated to Rev2A	KL
5	09/05/2023	Mechanical Drawing and V_{DD}/IOV_{DD} Supply Voltage Range Updated	KL
6	12/07/2025	Rev1B TFT FPC Redesigned to add SPI. Backlight Redesigned for 850cd/m^2	KL
7	03/05/2025	Optical Characteristics and Mechanical Drawing Updated	KL

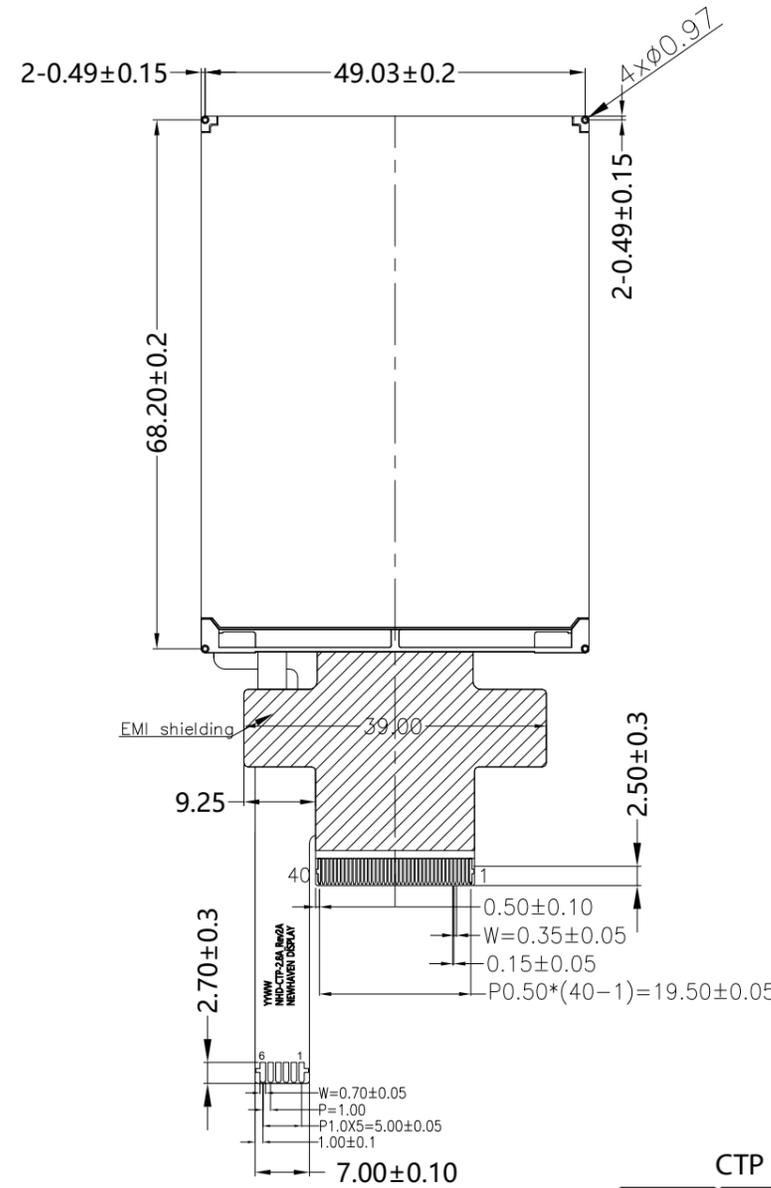
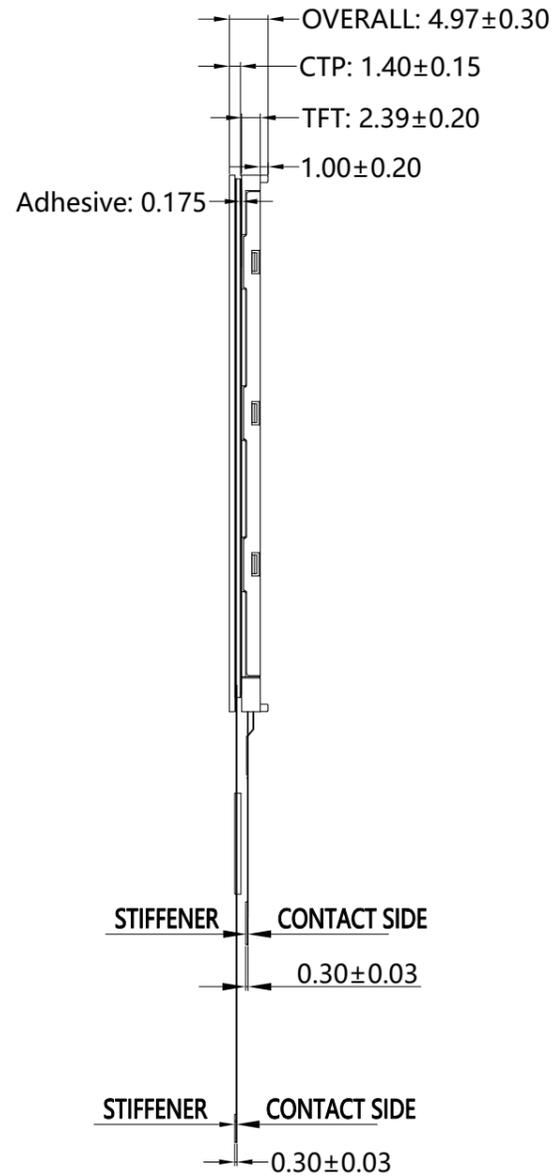
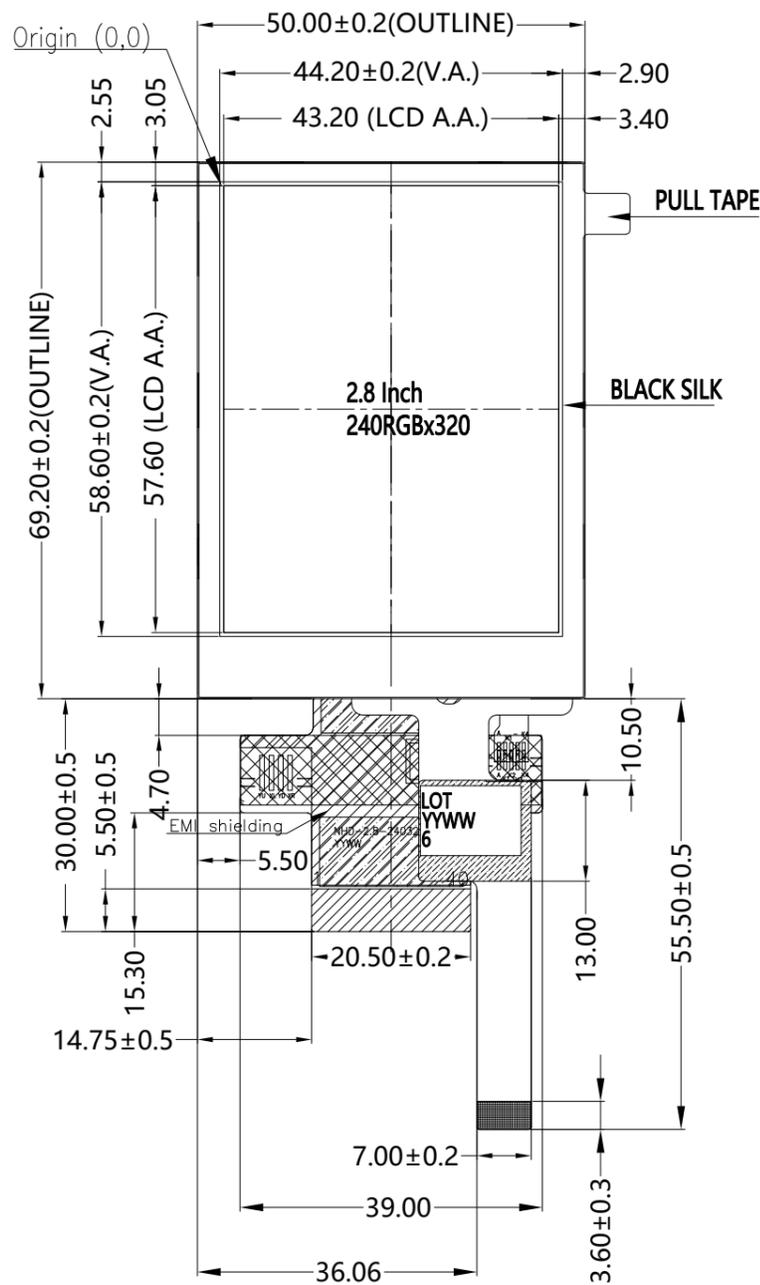
Mechanical Drawing

Newhaven Display

NHD-2.8-240320AF-CSXP-FCTP

Date Code

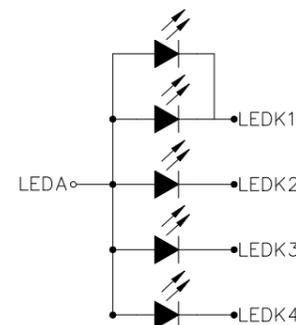
Part Label (type/format may vary)



TFT	
Pin No.	Symbol
1	GND
2	NC
3	NC
4	NC
5	NC
6	SDO
7	VDD
8	VDDI
9	SDA
10	CSX
11	DCX
12	WRX
13	RDX
14-29	DB0-DB15
30	/RES
31	IM0
32	IM1
33	IM2
34	LED-K1
35	LED-K2
36	LED-K3
37	LED-K4
38	LED-A
39	GND
40	TE

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

- E Product Description: 2.8" 240x320 IPS TFT w/ Capacitive Touch**
1. Driver IC: ST7789VI TFT, FT5426 CTP
 2. Interface: 8/16-bit Parallel, 3/4-wire SPI TFT, I²C CTP
 3. Power Requirement: 3.3V TFT, 3.1V/160mA Backlight, 3.3V CTP
 4. Optical Features: Normally Black, Transmissive, 850cd/m²
 5. Recommended FFC Connector:
TFT: 40pin 0.5mm; Molex 54132-4062
CTP: 6pin 1.0mm; Molex 52271-0679
 6. Key Features: 5-point Multitouch, Built-in EMI Shielding



Standard Tolerance: (Unless otherwise specified) Linear: ±0.3mm			
	Drawing/Part Number: NHD-2.8-240320AF-CSXP-FCTP	Revision: -	
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection	Drawn By: K. Lewis	Approved By: K. Lewis	
	Drawn Date: 07/17/2025	Approved Date: 07/17/2025	
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Pin Description

TFT:

Pin No.	Symbol	External Connection	Function Description
1	GND	Power Supply	Ground
2	NC	-	No Connect
3	NC	-	No Connect
4	NC	-	No Connect
5	NC	-	No Connect
6	SDO	MPU	Serial Data Output
7	VDD	Power Supply	Supply Voltage for LCD (3.3V)
8	VDDI	Power Supply	Supply Voltage for Logic
9	SDA	MPU	Serial Data Input
10	CSX	MPU	Active LOW Chip Select signal
11	DCX	MPU	Parallel Interface: Data / Command selection: '1' = Data ; '0' = Command Serial Interface: Serial Clock Signal
12	WRX	MPU	Active LOW Write signal
13	RDX	MPU	Active LOW Read signal
14-29	DB0-DB15	MPU	Bi-directional data bus 8-bit: use DB8-DB15 16-bit: use DB0-DB15
30	/RES	MPU	Active LOW Reset signal
31	IM0	MPU	Interface Mode Select
32	IM1	MPU	Interface Mode Select
33	IM2	MPU	Interface Mode Select
34	LED-K1	Power Supply	Backlight Cathode (Ground)
35	LED-K2	Power Supply	Backlight Cathode (Ground)
36	LED-K3	Power Supply	Backlight Cathode (Ground)
37	LED-K4	Power Supply	Backlight Cathode (Ground)
38	LED-A	Power Supply	Backlight Anode (160mA @ 3.1V)
39	GND	Power Supply	Ground
40	TE	MPU	Tearing Effect Output

Recommended LCD connector: 40-pin, 0.5mm pitch FFC connector **Molex P/N:** 54132-4062 or similar

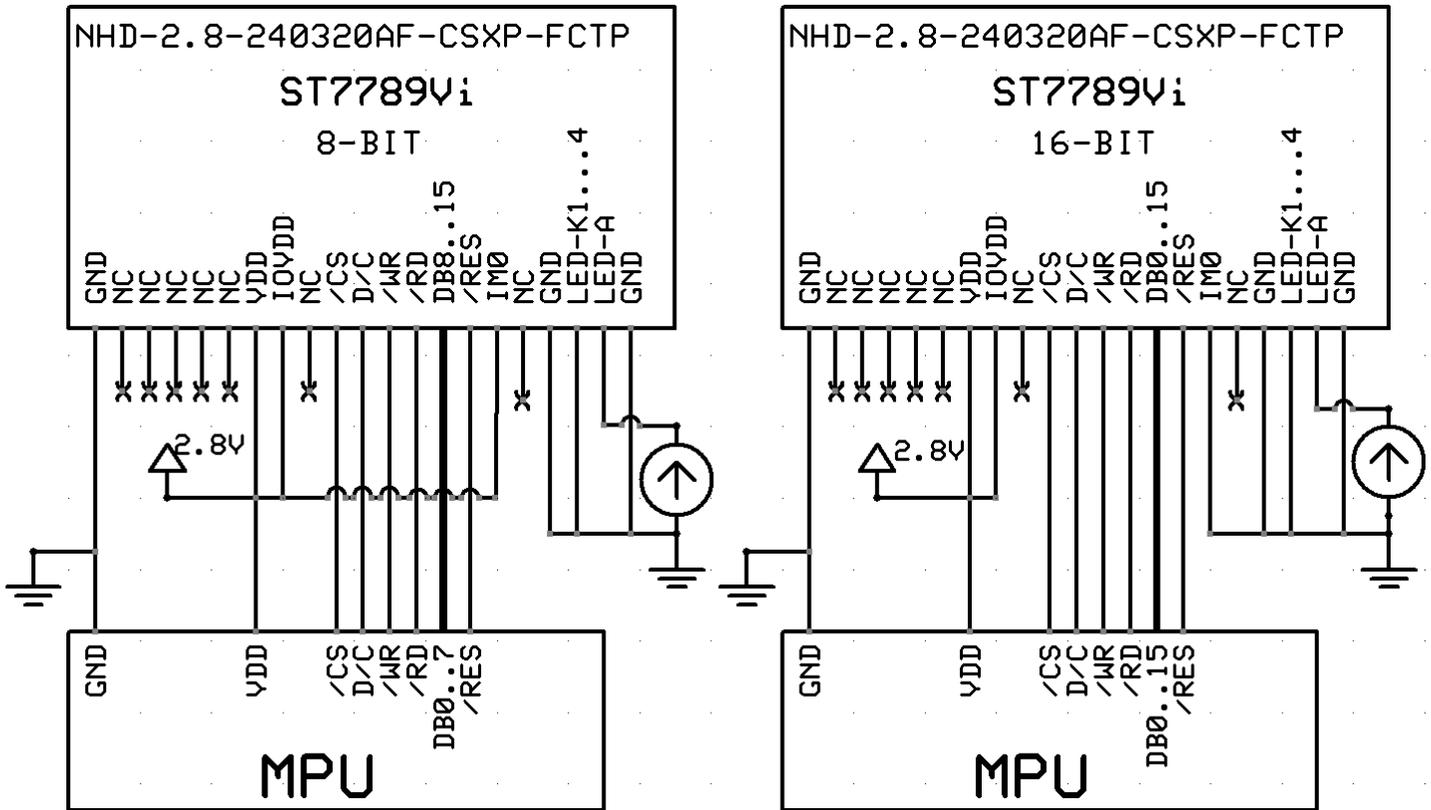
Capacitive Touch Panel:

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 connector: 6pin, 1.0mm pitch, FFC connector. Molex P/N 52271-0679



Wiring Diagram



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}	-	2.4	3.3	3.6	V
Supply Voltage for Logic	IOV _{DD}	-	1.65	1.8	3.3	V
Supply Current	I _{DD}	V _{DD} = 3.3V	3	8	15	mA
"H" Level input	V _{IH}	-	0.7 * V _{DDI}	-	V _{DDI}	V
"L" Level input	V _{IL}	-	GND	-	0.3 * V _{DDI}	V
"H" Level output	V _{OH}	-	0.8 * V _{DDI}	-	V _{DD}	V
"L" Level output	V _{OL}	-	GND	-	0.2 * V _{DDI}	V
Backlight Supply Current	I _{LED}	-	-	160	-	mA
Backlight Supply Voltage	V _{LED}	I _{LED} = 160 mA	2.8	3.1	3.4	V
Backlight Lifetime*	-	I _{LED} = 160mA T _{OP} = 25°C	20,000	-	-	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}	-	2.7	3.3	3.6	V
Supply Current – Operating	I _{DD}	-	-	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	-	$^{\circ}$
	Bottom	$\phi Y-$		-	80	-	$^{\circ}$
	Left	$\theta X-$		-	80	-	$^{\circ}$
	Right	$\theta X-$		-	80	-	$^{\circ}$
Contrast Ratio		CR	-	600	800	-	-
Luminance		L _V	I _{LED} = 160 mA	680	850	-	cd/m ²
Response Time		T _R + T _F	T _{OP} = 25°C	-	30	40	Ms
Chromaticity	Red	X _R	-	0.58	0.62	0.66	-
		Y _R	-	0.29	0.33	0.37	-
	Green	X _G	-	0.26	0.30	0.34	-
		Y _G	-	0.56	0.60	0.64	-
	Blue	X _B	-	0.11	0.15	0.19	-
		Y _B	-	0.01	0.05	0.09	-
	White	X _W	-	0.23	0.27	0.31	-
		Y _W	-	0.24	0.28	0.32	-

Driver/Controller Information

TFT Display:

Built-in ST7789VI Controller: <https://support.newhavendisplay.com/hc/en-us/articles/10814990300823-ST7789VI>

Capacitive Touch Panel:

Built-in FT5426 Controller: <https://support.newhavendisplay.com/hc/en-us/articles/4414392845079-FT5x26>

TFT Table of Commands

Please download specification at: <http://www.newhavendisplay.com/appnotes/datasheets/LCDs/ST7789V.pdf>



Capacitive Touch Panel Registers

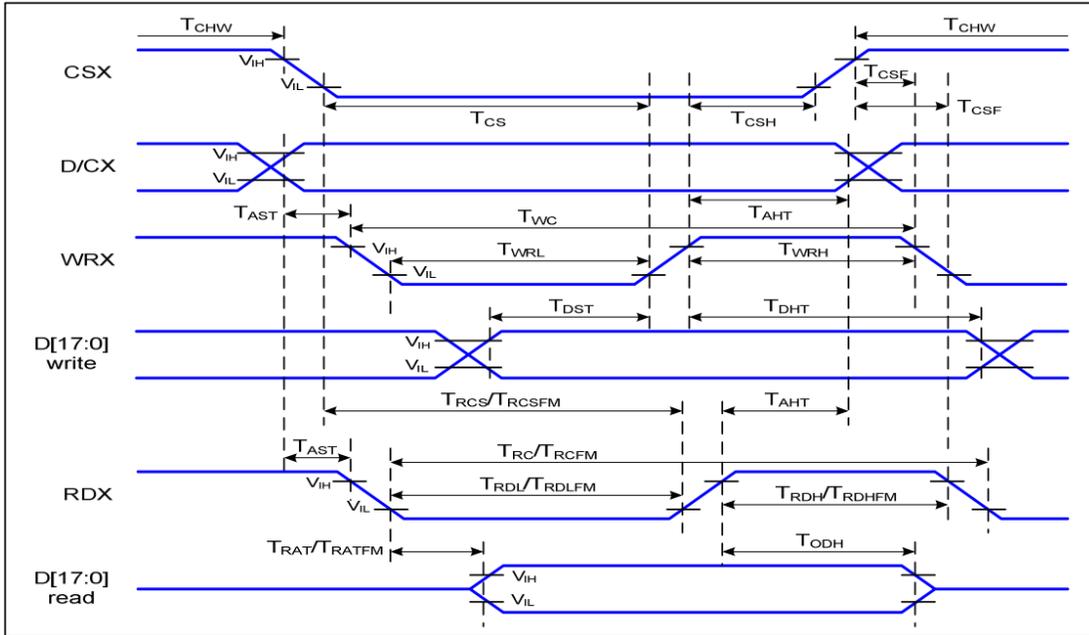
Register No.	Access	Register Name	Bits	Value	Description
01h	RO	Gesture ID	[7:0]	10	Swipe Up
				18h	Swipe Down
				1C	Swipe Left
				14	Swipe Right
				48	Zoom Out
				49	Zoom In
				00	No gesture
02h	RO	Touch Points	[7:0]	0-5h	0: No touch detected A: 5 touch points detected
03h	RO	TOUCH1_Event_Flag	[7:6]	0	Put Down
				1	Put Up
				2	Contact
				3	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	Put Down
				1	Put Up
				2	Contact
				3	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	Put Down
				1	Put Up
				2	Contact
				3	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	Put Down
				1	Put Up
				2	Contact
				3	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	Put Down
				1	Put Up
				2	Contact
				3	Reserved
1Bh	RO	TOUCH5_XH	[3:0]	0 - 1	Upper 4 bits of X touch coordinate

Register No.	Access	Register Name	Bits	Value	Description
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
20h	RO	TOUCH5_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: 54h

Register No.	Access	Register Name	Bits	Value	Description
A6h	RO	ID_G_FIRMID	[7:0]	00-FFh	Firmware ID Number Default: 6
A8h	RO	ID_G_VENODRID	[7:0]	00-FFh	CTPM Vendor's Chip ID Default: 79h

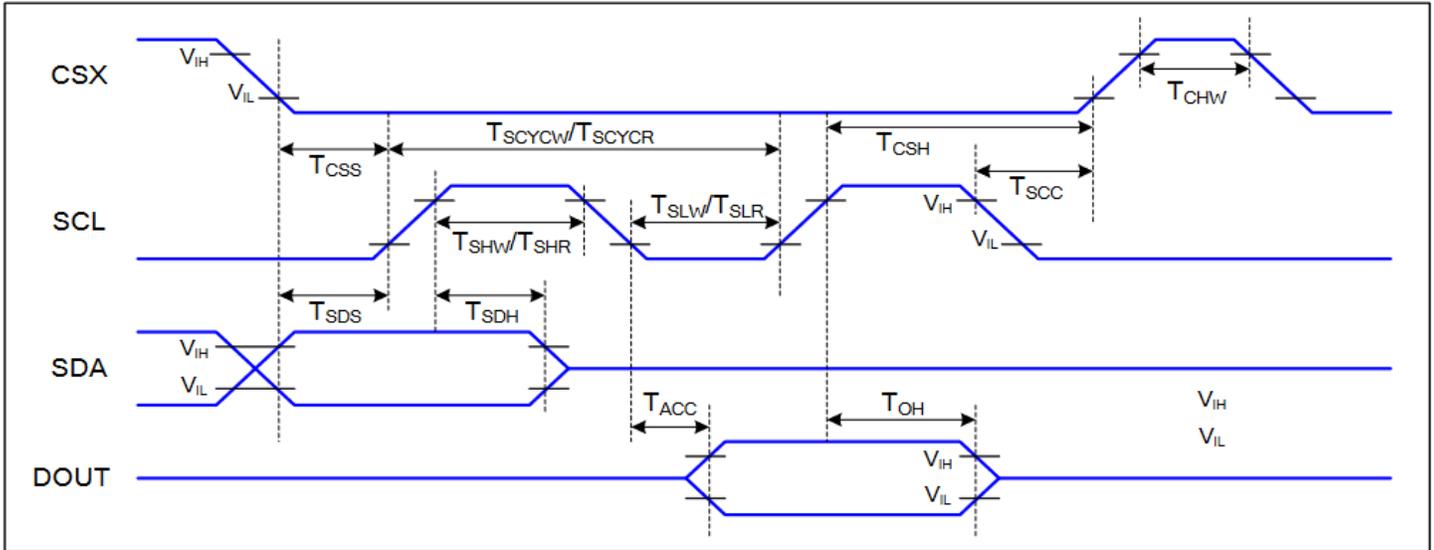
Timing Characteristics – TFT Display

Parallel 18/16/9/8-bit Interface Timing Characteristics (8080-II system)

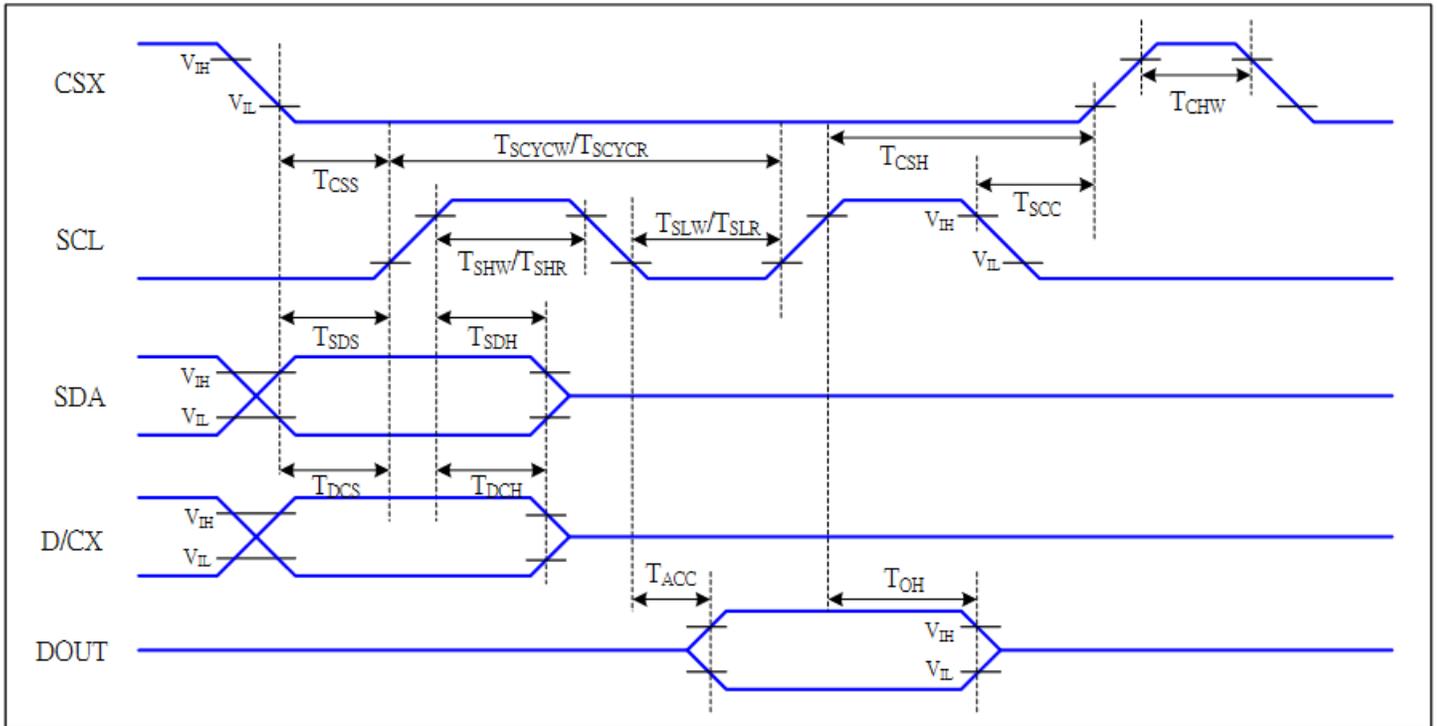


Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	T_{AST}	Address setup time	0		ns	-
	T_{AHT}	Address hold time (Write/Read)	10		ns	
CSX	T_{CHW}	Chip select "H" pulse width	0		ns	-
	T_{CS}	Chip select setup time (Write)	15		ns	
	T_{RCS}	Chip select setup time (Read ID)	45		ns	
	T_{RCSFM}	Chip select setup time (Read FM)	355		ns	
	T_{CSF}	Chip select wait time (Write/Read)	10		ns	
	T_{CSH}	Chip select hold time	10		ns	
WRX	T_{WC}	Write cycle	66		ns	-
	T_{WRH}	Control pulse "H" duration	15		ns	
	T_{WRL}	Control pulse "L" duration	15		ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160		ns	When read ID data
	T_{RDH}	Control pulse "H" duration (ID)	90		ns	
	T_{RDL}	Control pulse "L" duration (ID)	45		ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450		ns	When read from frame memory
	T_{RDHFM}	Control pulse "H" duration (FM)	90		ns	
	T_{RDLFM}	Control pulse "L" duration (FM)	355		ns	
D[17:0]	T_{DST}	Data setup time	10		ns	For CL=30pF
	T_{DHT}	Data hold time	10		ns	
	T_{RAT}	Read access time (ID)		40	ns	
	T_{RATFM}	Read access time (FM)		340	ns	
	T_{ODH}	Output disable time	20	80	ns	

3-wire SPI

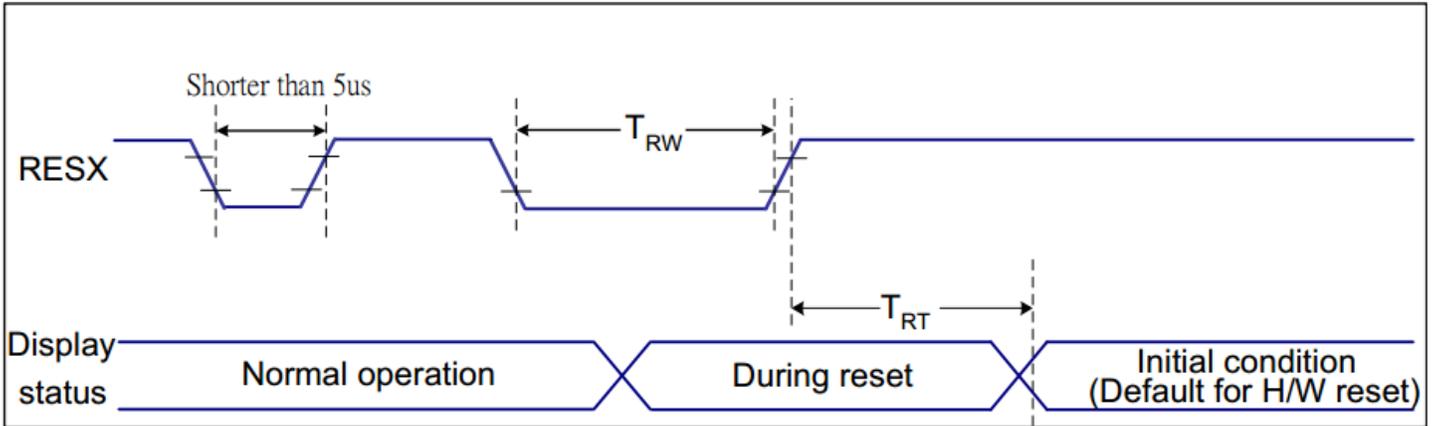


Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	16		ns	
	T_{SHW}	SCL "H" pulse width (Write)	7		ns	
	T_{SLW}	SCL "L" pulse width (Write)	7		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	7		ns	
	T_{SDH}	Data hold time	7		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum $CL=30pF$
	T_{OH}	Output disable time	15	50	ns	For minimum $CL=8pF$

4-wire SPI


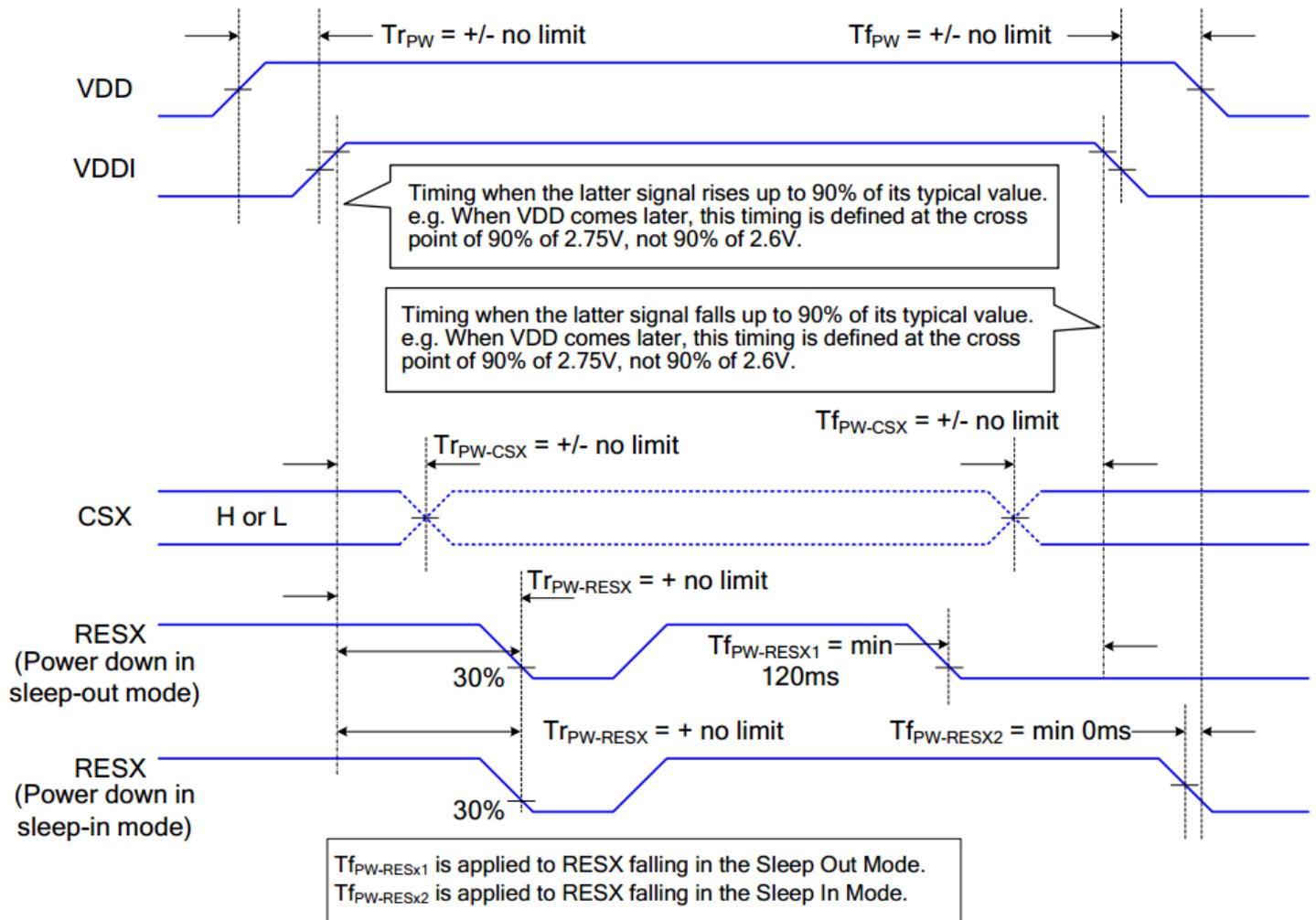
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T _{CSS}	Chip select setup time (write)	15		ns	
	T _{CSH}	Chip select hold time (write)	15		ns	
	T _{CSS}	Chip select setup time (read)	60		ns	
	T _{SCC}	Chip select hold time (read)	65		ns	
	T _{CHW}	Chip select "H" pulse width	40		ns	
SCL	T _{SCYCW}	Serial clock cycle (Write)	16		ns	-write command & data ram
	T _{SHW}	SCL "H" pulse width (Write)	7		ns	
	T _{SLW}	SCL "L" pulse width (Write)	7		ns	
	T _{SCYCR}	Serial clock cycle (Read)	150		ns	-read command & data ram
	T _{SHR}	SCL "H" pulse width (Read)	60		ns	
	T _{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T _{DCS}	D/CX setup time	10		ns	
	T _{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T _{SDS}	Data setup time	7		ns	
	T _{SDH}	Data hold time	7		ns	
DOUT	T _{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T _{OH}	Output disable time	15	50	ns	For minimum CL=8pF

Reset Timing



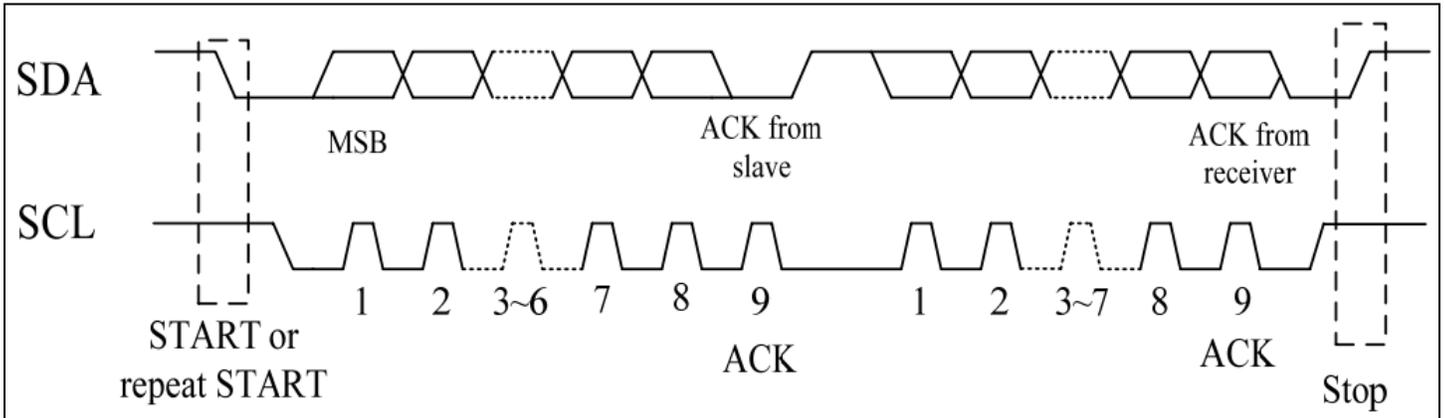
Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120 (Note 1, 6, 7)	ms

Power ON/OFF Sequence

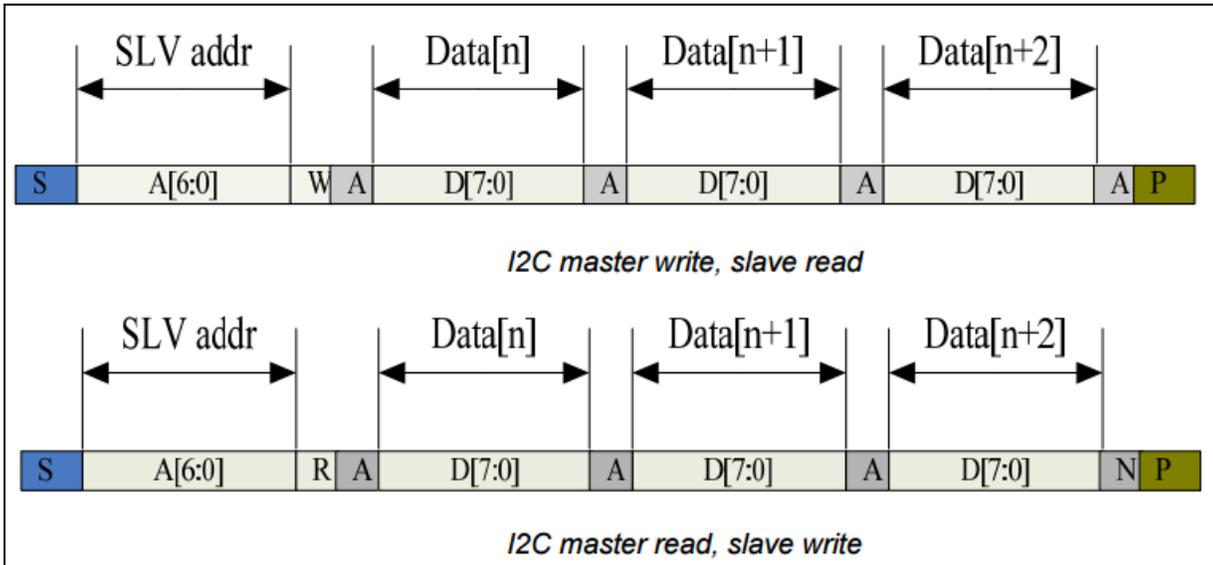


Timing Characteristics – Capacitive Touch Panel

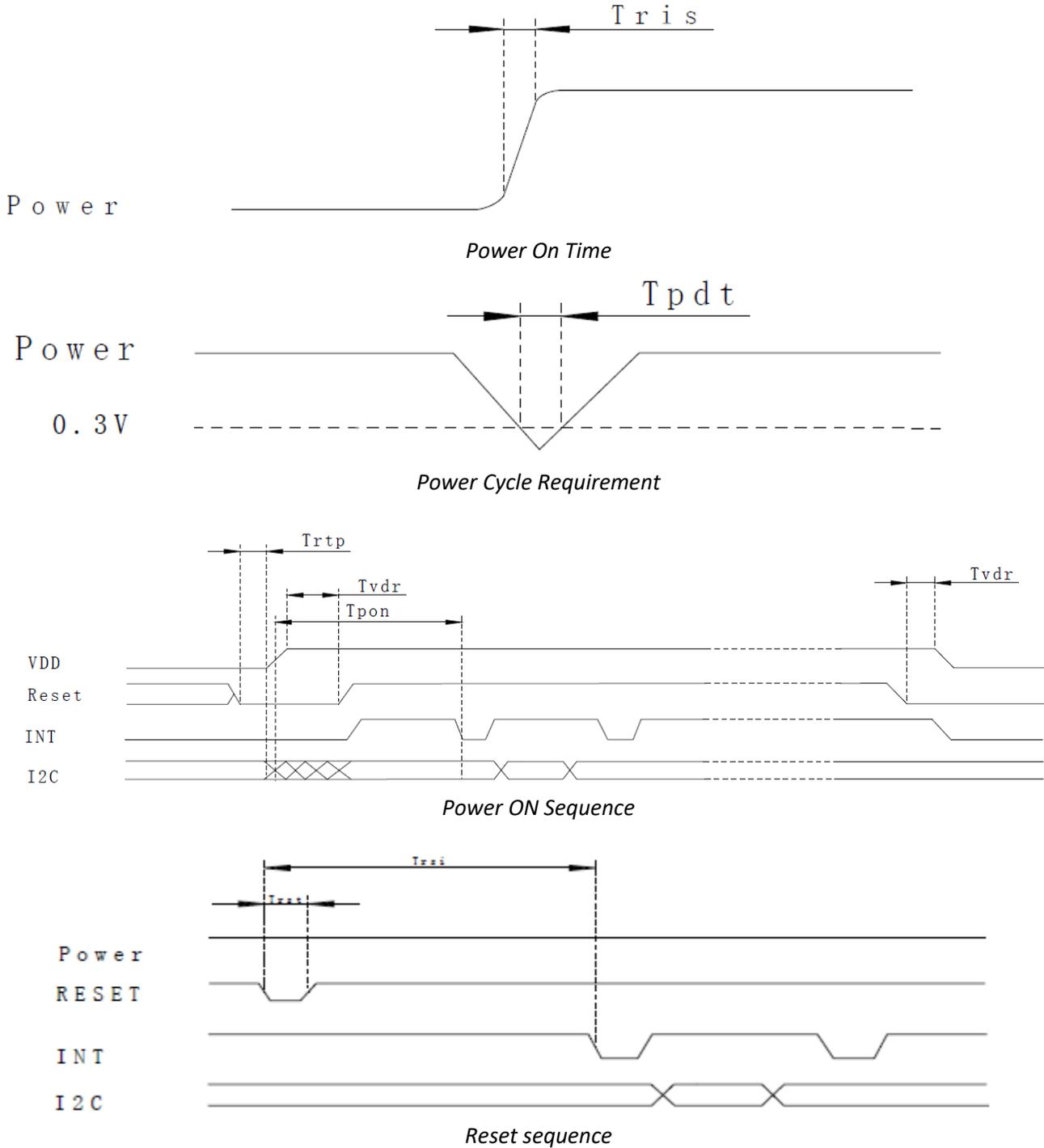
Data Transfer Format



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

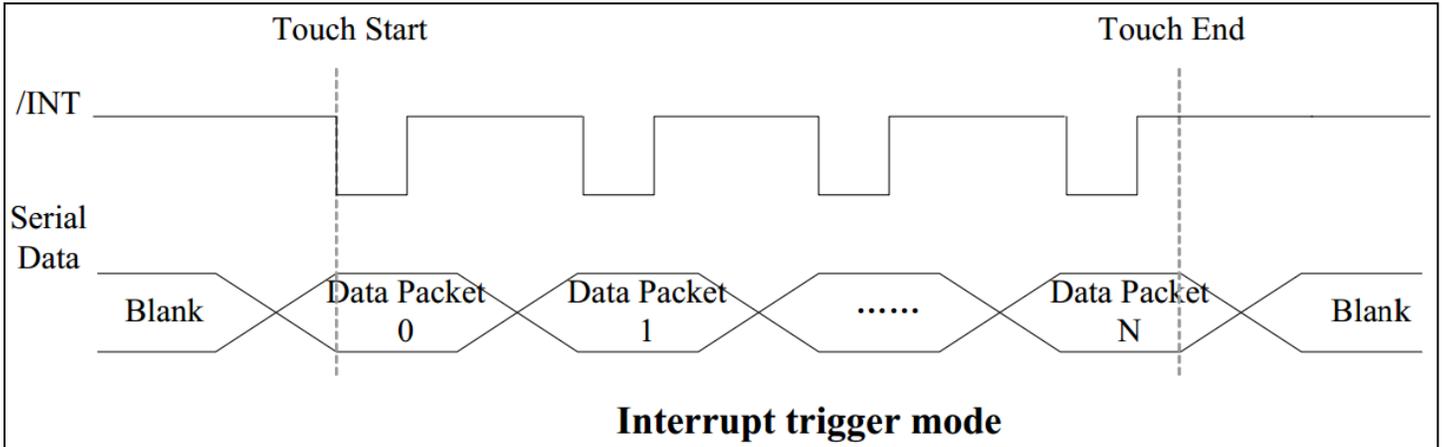


Power ON/Reset Sequence



Parameter	Description	Min	Max	Unit
T_{ris}	Rise time from $0.1V_{DD}$ to $0.9V_{DD}$	-	5	ms
T_{pdt}	Time of the voltage of supply being below 0.3V	5	-	ms
T_{rtp}	Time of resetting to be low before powering on	100	-	μs
T_{pon}	Time to start reporting after power on	-	200	ms
T_{vdr}^*	Reset time after applying V_{DD}	1	-	ms
T_{rsi}	Time to start reporting after reset	-	200	ms
T_{rst}^*	Reset Time	1	-	ms

*If Reset is tied to V_{CC} data corruption can occur.



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();

```

Example Initialization Code

```

/*****/
void TFT_28_7789_Write_Command(unsigned int command)
{
  GPIO_ResetBits(GPIOC, CS1);
  GPIO_ResetBits(GPIOC, RS);
  GPIO_SetBits(GPIOC, nRD);
  GPIO_ResetBits(GPIOC, nWR);
  GPIO_Write(GPIOB, command);
  TFT_delay(10);
  GPIO_SetBits(GPIOC, nWR);
  TFT_delay(1);
}
/*****/
void TFT_28_7789_Write_Data(unsigned int data1)
{
  GPIO_Write(GPIOB, data1);
  GPIO_SetBits(GPIOC, RS);
  GPIO_ResetBits(GPIOC, nWR);
  TFT_delay(1);
  GPIO_SetBits(GPIOC, nWR);
}
/*****/
void TFT_28_7789_Init(void)
{
  int n;
  GPIO_ResetBits(GPIOC, CS1);
  GPIO_SetBits(GPIOC, nRD);
  GPIO_ResetBits(GPIOC, nWR);
  GPIO_WriteBit(GPIOC, RES, Bit_RESET);
  TFT_delay(100);
  GPIO_WriteBit(GPIOC, RES, Bit_SET);
  TFT_delay(100);
  TFT_28_7789_Write_Command(0x0011); //exit SLEEP mode
  TFT_delay(100);

  TFT_28_7789_Write_Command(0x0036);
  TFT_28_7789_Write_Data(0x0080); //MADCTL: memory data access control
  TFT_28_7789_Write_Command(0x003A);
  TFT_28_7789_Write_Data(0x0066); //COLMOD: Interface Pixel format
  TFT_28_7789_Write_Command(0x0021); //INVON: Display Inversion ON (setting for IPS)
  TFT_28_7789_Write_Command(0x00B2);
  TFT_28_7789_Write_Data(0x000C);
  TFT_28_7789_Write_Data(0x0C);
  TFT_28_7789_Write_Data(0x00);
  TFT_28_7789_Write_Data(0x33);
  TFT_28_7789_Write_Data(0x33); //PORCTRK: Porch setting
  TFT_28_7789_Write_Command(0x00B7);
  TFT_28_7789_Write_Data(0x0035); //GCTRL: Gate Control
  TFT_28_7789_Write_Command(0x00BB);
  TFT_28_7789_Write_Data(0x002B); //VCOMS: VCOM setting
  TFT_28_7789_Write_Command(0x00C0);
  TFT_28_7789_Write_Data(0x002C); //LCMCTRL: LCM Control
  TFT_28_7789_Write_Command(0x00C2);
  TFT_28_7789_Write_Data(0x0001);
  TFT_28_7789_Write_Data(0xFF); //VDVVRHEN: VDV and VRH Command Enable
  TFT_28_7789_Write_Command(0x00C3);
  TFT_28_7789_Write_Data(0x0011); //VRHS: VRH Set
  TFT_28_7789_Write_Command(0x00C4);

```



```
TFT_28_7789_Write_Data(0x0020);//VDVS: VDV Set
TFT_28_7789_Write_Command(0x00C6);
TFT_28_7789_Write_Data(0x000F);//FRCTRL2: Frame Rate control in normal mode
TFT_28_7789_Write_Command(0x00D0);
TFT_28_7789_Write_Data(0x00A4);
TFT_28_7789_Write_Data(0xA1);//PWCTRL1: Power Control 1
TFT_28_7789_Write_Command(0x00E0);
TFT_28_7789_Write_Data(0x00D0);
TFT_28_7789_Write_Data(0x0000);
TFT_28_7789_Write_Data(0x0005);
TFT_28_7789_Write_Data(0x000E);
TFT_28_7789_Write_Data(0x0015);
TFT_28_7789_Write_Data(0x000D);
TFT_28_7789_Write_Data(0x0037);
TFT_28_7789_Write_Data(0x0043);
TFT_28_7789_Write_Data(0x0047);
TFT_28_7789_Write_Data(0x0009);
TFT_28_7789_Write_Data(0x0015);
TFT_28_7789_Write_Data(0x0012);
TFT_28_7789_Write_Data(0x0016);
TFT_28_7789_Write_Data(0x0019);//PVGAMCTRL: Positive Voltage Gamma control
TFT_28_7789_Write_Command(0x00E1);
TFT_28_7789_Write_Data(0x00D0);
TFT_28_7789_Write_Data(0x0000);
TFT_28_7789_Write_Data(0x0005);
TFT_28_7789_Write_Data(0x000D);
TFT_28_7789_Write_Data(0x000C);
TFT_28_7789_Write_Data(0x0006);
TFT_28_7789_Write_Data(0x002D);
TFT_28_7789_Write_Data(0x0044);
TFT_28_7789_Write_Data(0x0040);
TFT_28_7789_Write_Data(0x000E);
TFT_28_7789_Write_Data(0x001C);
TFT_28_7789_Write_Data(0x0018);
TFT_28_7789_Write_Data(0x0016);
TFT_28_7789_Write_Data(0x0019);//NVGAMCTRL: Negative Voltage Gamma control
TFT_28_7789_Write_Command(0x002A);
TFT_28_7789_Write_Data(0x0000);
TFT_28_7789_Write_Data(0x0000);
TFT_28_7789_Write_Data(0x0000);
TFT_28_7789_Write_Data(0x00EF);//X address set
TFT_28_7789_Write_Command(0x002B);
TFT_28_7789_Write_Data(0x0000);
TFT_28_7789_Write_Data(0x0000);
TFT_28_7789_Write_Data(0x0001);
TFT_28_7789_Write_Data(0x003F);//Y address set

TFT_delay(10);
}
/*****/
```

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, 240hrs	2
Low Temperature Storage	Endurance test applying the low storage temperature for a long time.	-30°C, 240hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C, 120hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C, 120hrs	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, 90-95% RH, 120hrs	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 = 1 cycle. For 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	Frequency: 250 r/min Amplitude: 1 inch Time: 45min	3
Static electricity test	Endurance test applying electric static discharge.	Air discharge: ±8KV 10 Times Contact discharge: ±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.