



LCD MODULE

Specyfification

Model:	IE-S-0908CH05P/S-00-1
Version:	V1.0
Date:	25.10.2023

1) GENERAL DATA**1.1. TFT Data**

NO.	ITEM	SPECIFICATIONS	UNIT
1	Display Mode	TFT	-
2	Diagonal Size	3.5	Inch
3	Resolution	320(RGB)x480	Dots
4	Active Area	48.96(H) x 73.44(V)	mm
5	TFT Dimension	54.46(H) x 82.94(V)	mm
6	Thickness	2.32±0.2	mm
7	Pixel Pitch	0.153 x 0.153	mm
8	Pixel Size	0.153 x 0.153	mm
9	Display Driver IC	ST7796U	-
10	Viewing Direction	All View	O'Clock
11	Display Color	16.7M	-
12	Gray Scale	8	Bit
13	Brightness	400 (Typ.)	cd/m2
14	Contrast Ratio	1000:1 (Typ.)	-
15	Interface	8/16 Bit 8080 MCU / SPI	-
16	IC Package Type	COG	-
17	Module Connecting Type	Connector (Pitch:0.5mm)	-
18	Weight	TBD±10%	g
19	Pins	40	Pins
20	Operating Temperature	-20~70	℃
21	Storage Temperature	-30~80	℃

2) ABSOLUTE MAXIMUM RATINGS

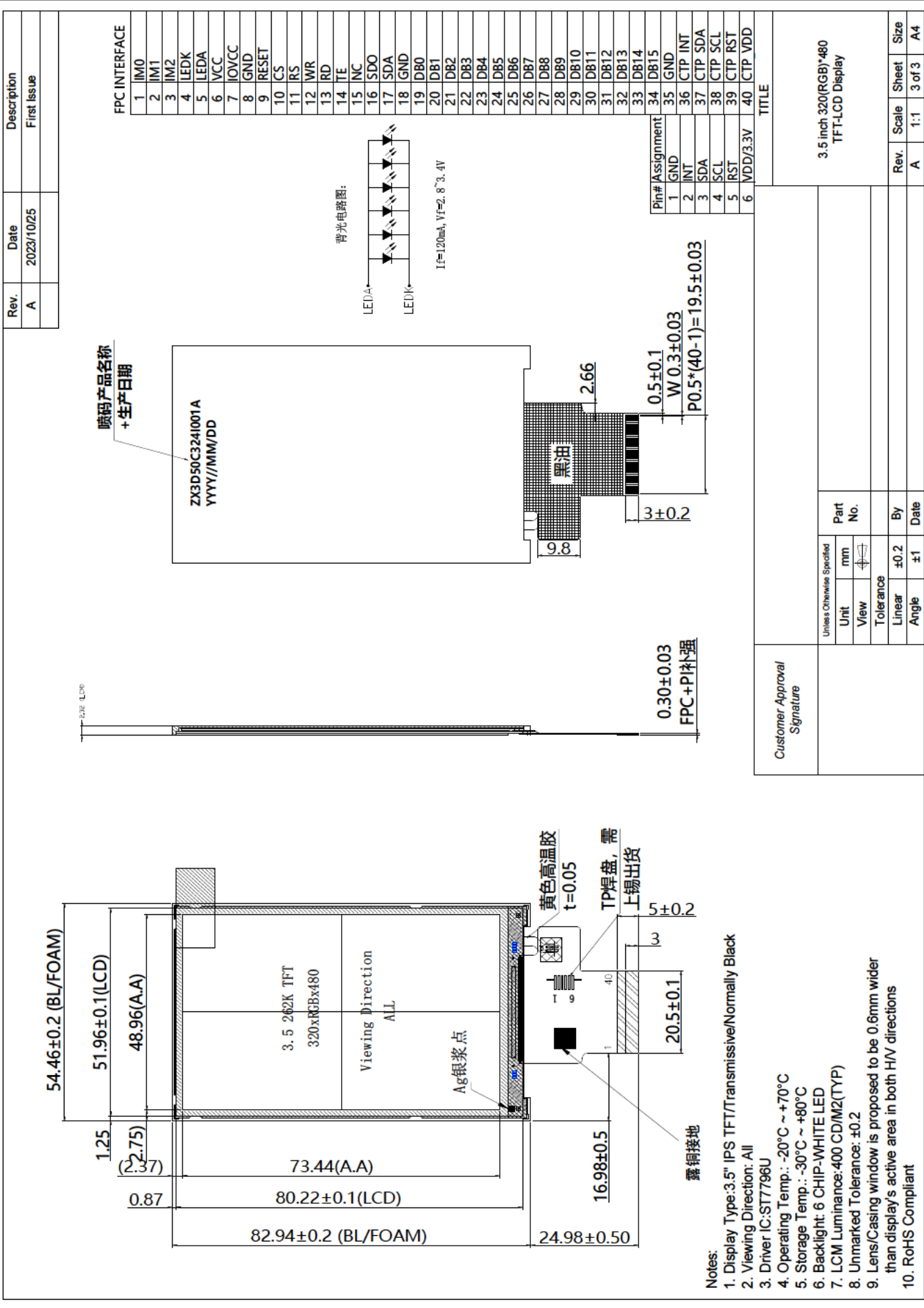
Unless otherwise specified, VSS = 0V

(Ta=25°C)

Items	Min.	Max.	Unit	Remark
Analog Supply Voltage (VCI)	-0.3	+3.3	V	
Digital Supply Voltage (VDD)	-0.3	+3.3	V	
I/O Supply Voltage (IOVCC)	-0.3	+3.3	V	
Operating Temperature (Top)	-20	70	°C	
Storage Temperature (Tst)	-30	80	°C	

NOTE:

Absolute Maximum Ratings means the product can withstand short-term, Not more than 120 hours. If the product is a long time to withstand these conditions, the life time would be shorter.



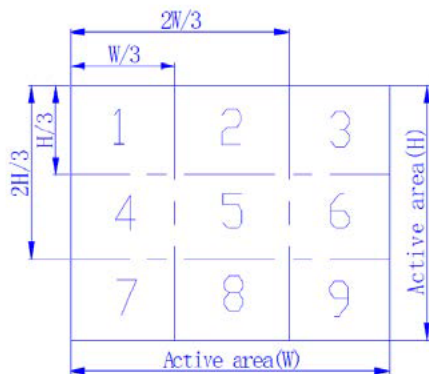
4) ELECTRICAL CHARACTERISTICS

4.1. Backlight Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Voltage for LED backlight	VLED	2.8	3.0	3.2	V	-
Current for LED backlight	ILED	-	120	-	mA	-
Power Consumption	Pbl	-	360	-	mW	1
Brightness	Lbr	-	400	-	cd/m2	2
LED Life time	-	20000	-	-	hr	3
Number of LED	-	6			Pic	-
Connection mode	S/P	P			-	-

Note :

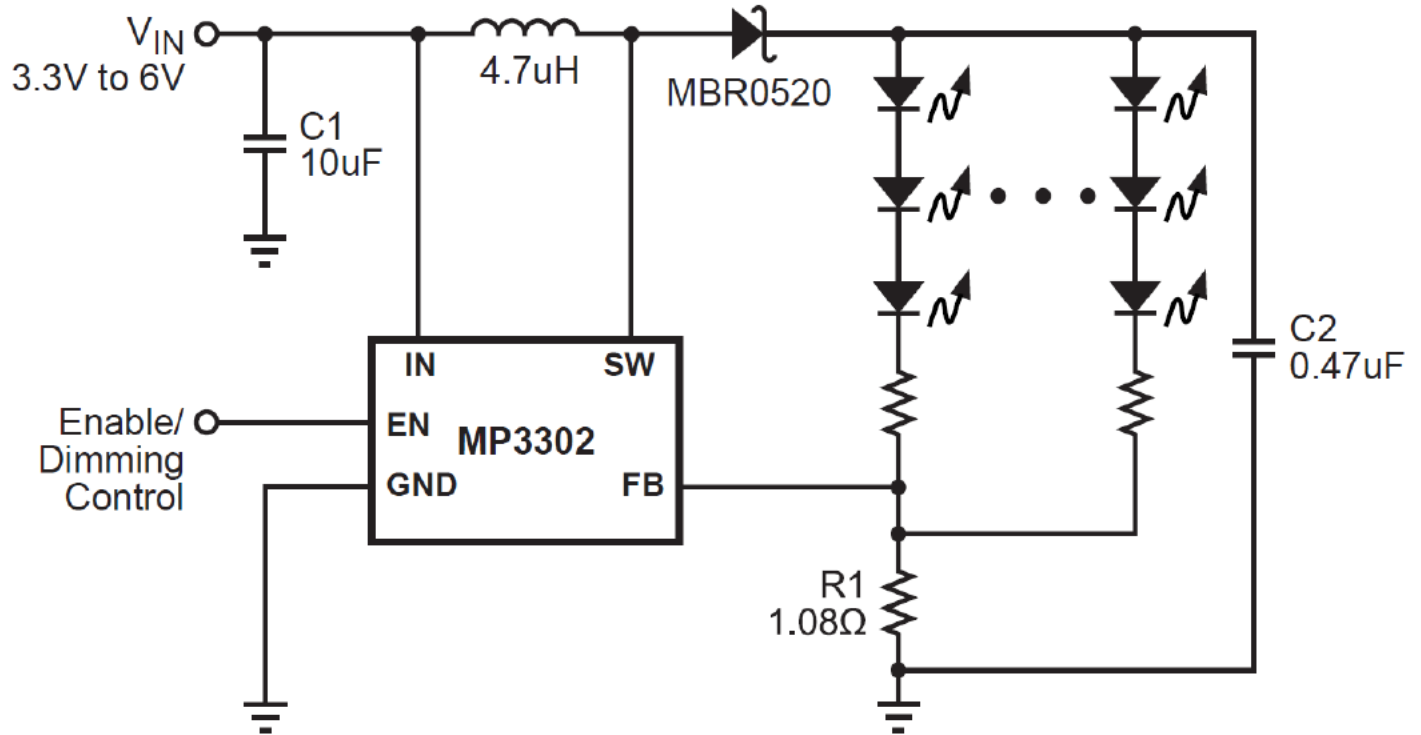
1. Where $I_{LED} = 120\text{mA}$, $V_{LED} = 3.0\text{V}$, $P_{bl} = I_{LED} \times V_{LED}$
2. Uniform measure condition :
 - a. Measure 9 point, Measure location is show below
 - b. $\text{Uniform} = (\text{Min brightness} / \text{Max brightness}) \times 100\%$
 - c. Best Contrast.



3. The environmental conducted under ambient air flow, at $T_a = 25 \pm 2^\circ\text{C}$, $60\%RH \pm 5\%$

4.2. Backlight Recommended Circuit

Motherboard driver backlight is need constant current circuit, if threatened voltage screen after light brightness difference. Current and power consumption of the machine are inconsistent, so recommend a backlight driving circuit is best rated current. It is recommended to use IC (MP3302). The reference circuit is as follows:

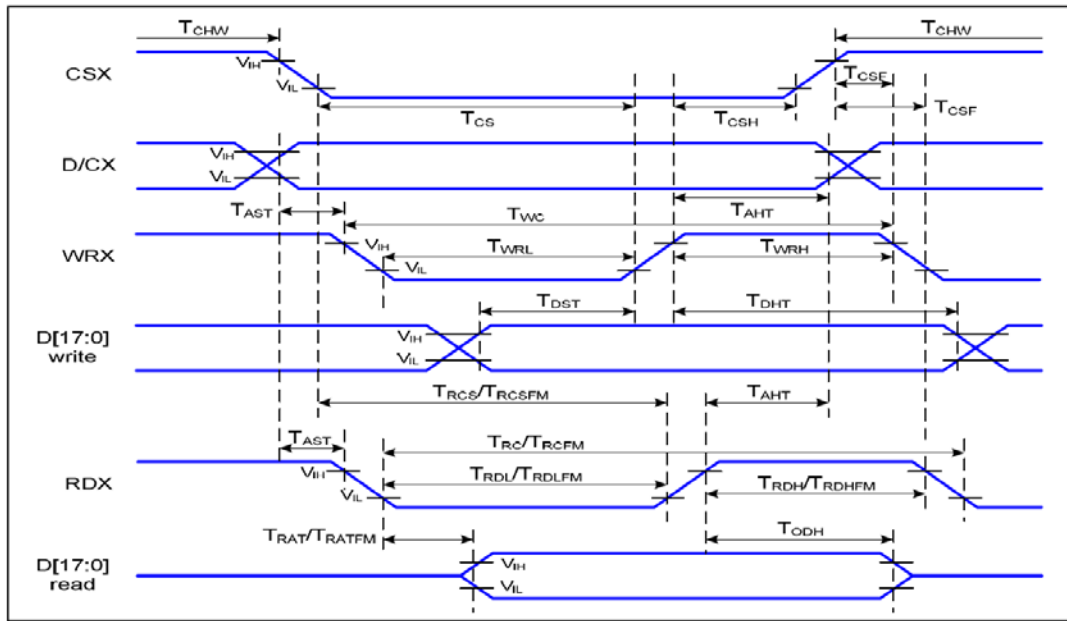


4.3. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply Voltage	VCI	2.7	2.8	3.3	V	
Digital Supply Voltage	VDD	2.7	2.8	3.3	V	
Interface Operation Voltage	IOVCC	1.65	1.8/2.8	3.3	V	
Input High Voltage	VIH	0.8*IOVCC	-	IOVCC	V	
Input Low Voltage	VIL	0	-	0.2*IOVCC	V	
Output High Voltage	VOH	0.8*IOVCC	-	IOVCC	V	
Output Low Voltage	VOL	0	-	0.2*IOVCC	V	

4.4. AC Characteristics

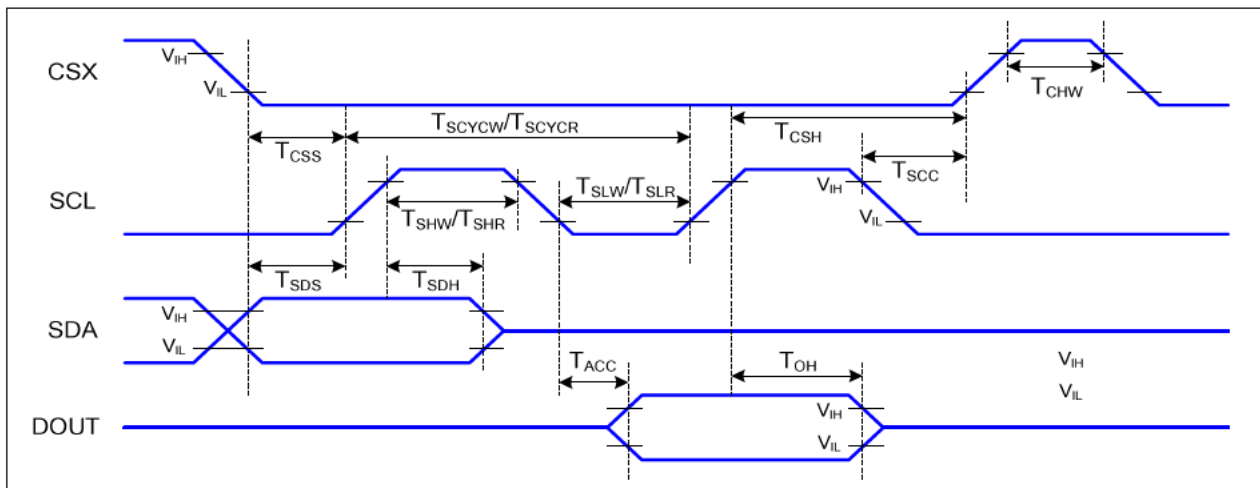
4.4.1. 8080 Series MCU Parallel Interface Characteristics:



VDDI=1.8V, VDDA=2.8V, AGND=DGND=0V, Ta=25°C

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	

4.4.2. 3-SPI interface Characteristics



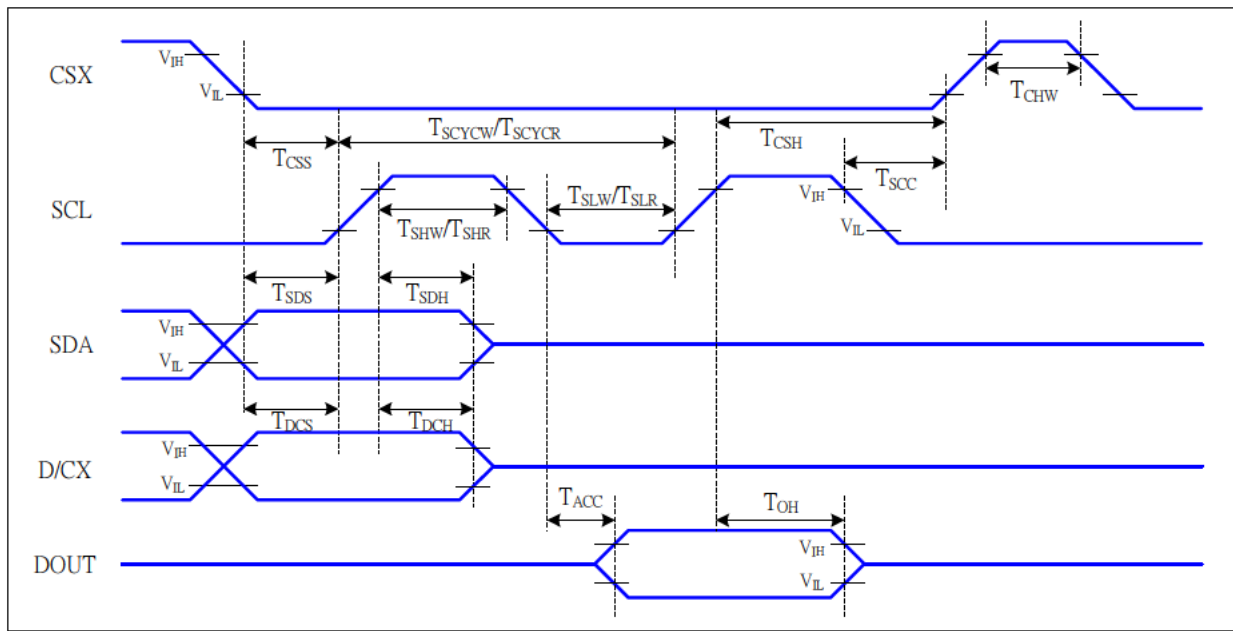
3-SPI Interface Timing Characteristics

$V_{DDI}=1.8V, V_{DDA}=2.8V, AGND=DGND=0V, T_a=25\text{ }^{\circ}\text{C}$

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)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		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	10		ns	
	T_{SDH}	Data hold time	10		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

3-SPI Interface Characteristics

4.4.3. 4-SPI interface Characteristics

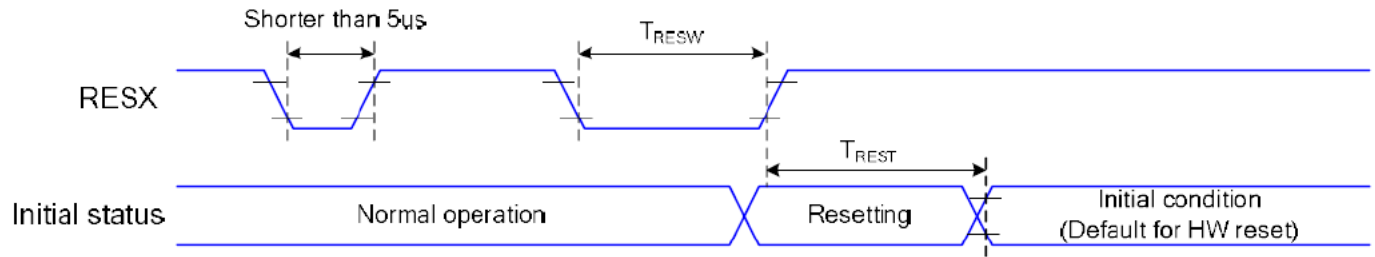


4-SPI Interface Timing Characteristics

VDDI=1.8V, VDDA=2.8V, AGND=DGND=0V, $T_a=25\text{ }^{\circ}\text{C}$

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)	66		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		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	10		ns	
	T_{SDH}	Data hold time	10		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

4.4.4. Reset Timing:



Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	tRESW	Reset Pulse Duration	10	-	us
	tREST	Reset Cancel	-	5	ms
				120	ms

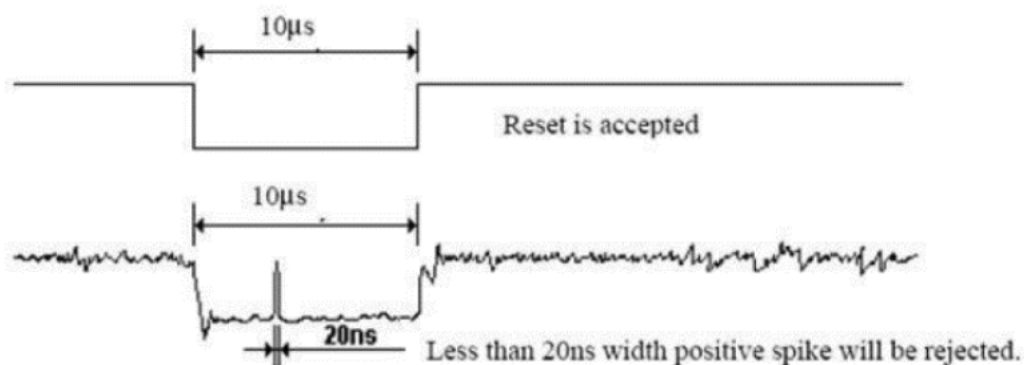
Notes:

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.
2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below :

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts at Sleep-Out status. The display remains the blank state in Sleep-In mode). Then return to Default condition for Hardware Reset

4. Spike Rejection also applies during a valid reset pulse as shown below :

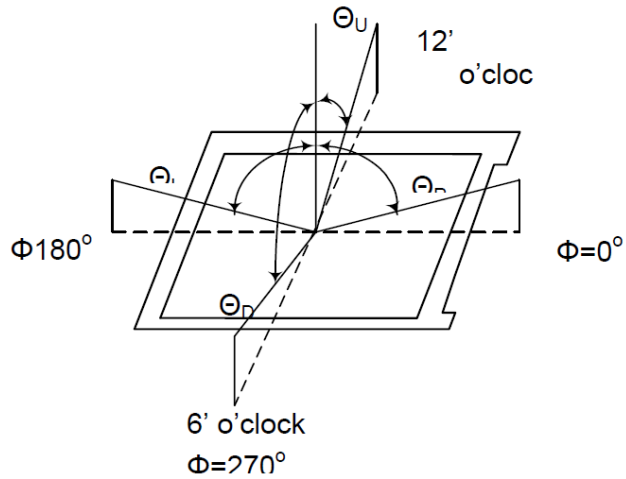


5. When Reset applied during Sleep-In Mode.
6. When Reset applied during Sleep-Out Mode.
7. It is necessary to wait 10ms after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120 ms.

5) ELECTRO-OPTICAL CHARACTERISTICS

Items	Symbol	Condition		Min.	Typ.	Max.	Unit	Note
Viewing angle	θ	$\Phi=0^{\circ}$	25°C	-	85	-	Deg	Note1
		$\Phi=180^{\circ}$	25°C	-	85	-		
	θ	$\Phi=90^{\circ}$	25°C	-	85	-		
		$\Phi=270^{\circ}$	25°C	-	85	-		
Brightness	Lbr	-	-	-	400	-	Cd/m2	
Luminance Uniformity	ΔL	-	-	80	-	-	-	
Contrast Ratio	CR	-	25°C	800	1000	-	-	Note2
Response Time	Tr+Tf	$\theta=0^{\circ}$ $\Phi=0^{\circ}$	25°C	-	35	-	ms	Note3
CIE(x,y) chromaticity	White	X	25°C	-	0.292	-	-	BM-7A
		Y	25°C	-	0.333	-		
	Red	X	25°C	-	0.655	-		
		Y	25°C	-	0.317	-		
	Green	X	25°C	-	0.262	-		
		Y	25°C	-	0.568	-		
	Blue	X	25°C	-	0.137	-		
		Y	25°C	-	0.085	-		
Transmittance (with polarizer)	-	-		-	TBD	-	%	

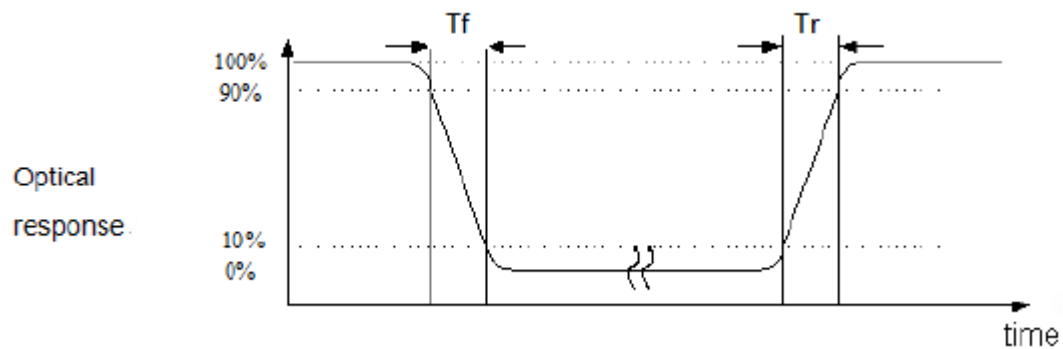
Note1. Definition of Viewing Angle:



Note 2. Definition of Contrast Ratio:

$$\text{Contrast Ratio} = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note3. Definition of Response Time : Sum of T_r and T_f :



6) INTERFACE PIN CONNECTIONS

6.1. TFT Pin Interface

No.	Symbol	Description
1~3	IM0~IM2	The MCU interface mode select
4	LEDK	LED Cathode
5	LEDA	LED Anode
6	VCC	Analog power supply LCM
7	IOVCC	Digit power supply LCM
8	GND	Ground
9	RESET	This signal will reset the device. Signal is active low
10	CS	Chip selection pin; Low enable, high disable.
11	RS	Register select signal. 0:index register; 1:data register
12	WR	Write enable in MCU parallel interface
13	RD	Read MCU parallel interface
14	TE	Synchronize MCU to frame memory
15	NC	NC
16	SDO	Serial interface output pin
17	SDA	Serial data input pin
18	GND	Ground
19~34	DB0~DB15	Data bus
35	GND	Ground
36	CTP_INT	Touch Interrupt
37	CTP_SDA	Touch IIC Data signal
38	CTP_SCL	Touch IIC Clock signal
39	CTP_RST	Touch Reset Signal
40	CTP_VDD	Touch Power Supply