SPECIFICATIONS

CUSTOMER : _____

MODEL NO. : GFT024FC240320YL

VERSION : B

DATE : 2023.03.03

CERTIFICATION : ROHS

Customer Sign	Approved By	Prepared By	Prepared By
	GIFAR 2023.03.03 Sidney	GIFAR 2023.03.03 Roger	GIFAR 2023.03.03 Hazel

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Revision Record

Data(y/m/d)	Ver.	Description	page
2019.11.13	A	Specification released	
2023.03.03	B	更新公司抬頭認證圖示	

Table Of Contents

1. Specifications

1.1 Features

Main LCD Panel

Item	Standard Value
Display Type	240 * (R、G、B) * 320 Dots
LCD Type	a-Si TFT , Normally white TN mode , Transmissive
Screen size(inch)	2.4 (Diagonal)
Viewing Direction	12 O'clock
Color configuration	R.G.B. vertical stripe
Interface	3-wire 9-bit data serial interface,16-bit RGB interface
Other(controller / driver IC)	ILI9341

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	42.72 (W) * 60.26 (L) * 3.5(H)	mm

LCD Panel

Item	Standard Value	Unit
Active Area	36.72 (W) * 48.96 (L)	mm

TP Panel

Item	Standard Value	Unit
Viewing Area	38.32 (W)* 50.26 (L)	mm
Active Area	37.52 (W) * 49.76 (L)	mm

Note : For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Module

Item	Symbol	Condition	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-	-0.3	+4.6	V
Analog Supply Voltage	VCC	-	-0.3	+4.6	V
Input Voltage	VIN	-	-0.3	IOVCC +0.3	V
Operating Temperature	T_{OP}	-	-20	+70	℃
Storage Temperature	T_{ST}	-	-30	+80	℃
Storage Humidity	H_D	Ta ≦ 60 ℃	20	90	%RH

1.4 DC Electrical Characteristics

Module VSS= 0V, Ta = 25℃

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	IOVCC	-	3.0	3.3	3.6	V
Analog Supply Voltage	VCC	-	3.0	3.3	3.6	V
Input High Voltage	V_{IH}	-	0.7* IOVCC	-	IOVCC	V
Input Low Voltage	V_{IL}	-	GND	-	0.3* IOVCC	V
Output High Voltage	V_{OH}	IOH=-1.0 mA	0.8* IOVCC	-	IOVCC	V
Output Low Voltage	V_{OL}	IOL=+1.0mA	GND	-	0.2* IOVCC	V
Supply Current	IDD	VDDI= 3.3V,*1	-	9	14	mA

Note1 : Maximum current display

1.5 Optical Characteristics

TFT LCD Panel VCC = 2.8V, Ta=25℃

Item		Symbol	Condition	Min.	Typ.	Max.	unit	
Response time		Tr + Tf	-	-	25	38	ms	Note2
Viewing angle	Top	θY+	CR ≥ 10	-	60	-	Deg.	Note4
	Bottom	θY-		-	60	-		
	Left	θX-		-	60	-		
	Right	θX+		-	60	-		
Contrast ratio		CR	IF=80mA	500	600	-	-	Note3
Color of CIE Coordinate (With B/L & TP)	White	X		0.24	0.29	0.34	-	Note1
		Y		0.26	0.31	0.36		
	Red	X		0.54	0.59	0.64		
		Y		0.29	0.34	0.39		
	Green	X		0.29	0.34	0.39		
		Y		0.55	0.60	0.65		
	Blue	X		0.10	0.15	0.20		
		Y		0.01	0.06	0.11		
Average Brightness Pattern=white display (With B/L & TP)		IV	IF=80mA	200	260	-	cd/m^2	Note1
Uniformity (With B/L & TP)		△B	-	80	-	-	%	Note1

Note1:

1：△B=B(min) / B(max) × 100%

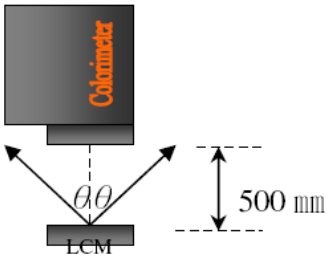
2：Measurement Condition for Optical Characteristics:

a：Environment: 25℃±5℃ / 60±20%R.H，no wind，dark room below 10 Lux at typical lamp current and typical operating frequency.

b：Measurement Distance: 500 ± 50 ㎜ ，(θ= 0°)

c：Equipment: TOPCON BM-7 fast，(field 1°)，after 10 minutes operation.

d：The uncertainty of the C.I.E coordinate measurement ±0.01，Average Brightness ± 4%

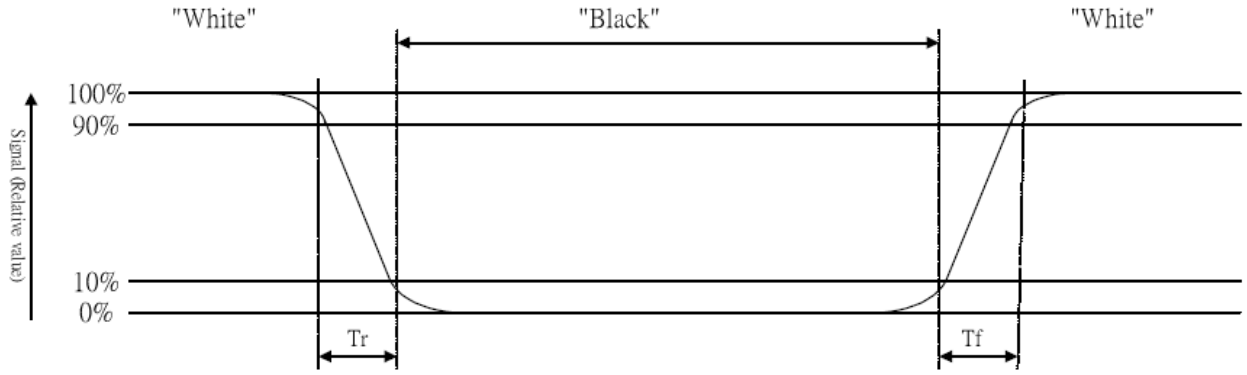


Colorimeter=BM-7 fast

Note2: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes.

Refer to figure as below:



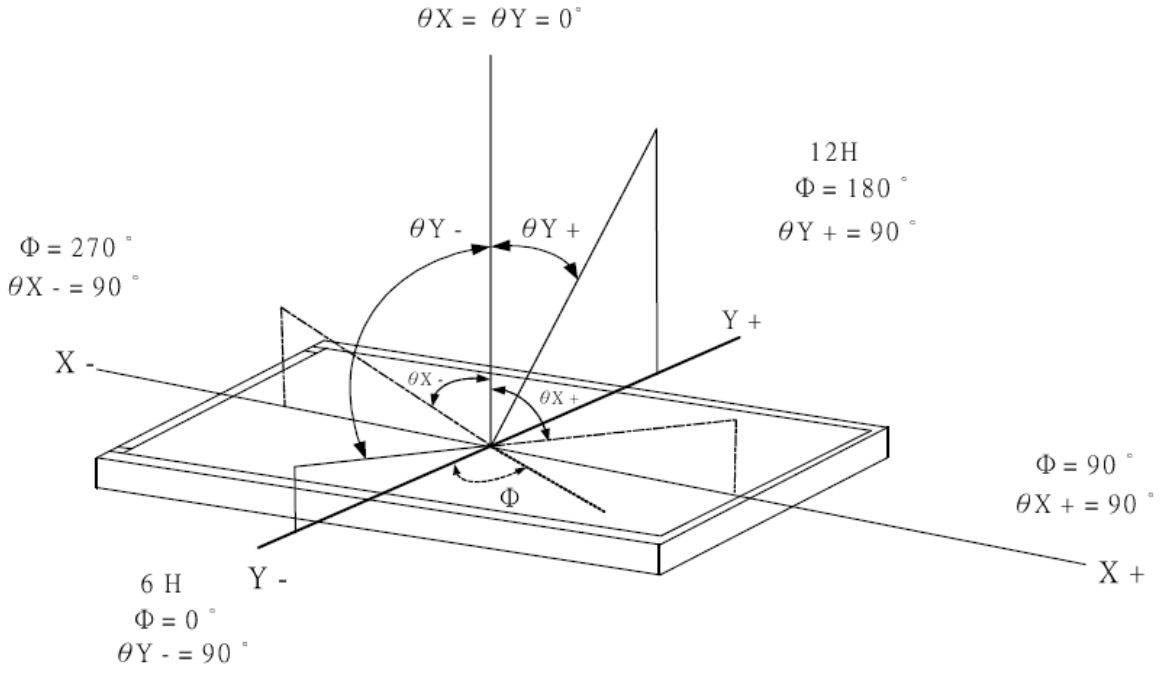
Note3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at “White” state}}{\text{Photo detector output when LCD is at “Black” state}}$$

Note4: Definition of viewing angle:

Refer to figure as below:



1.6 Backlight Characteristics

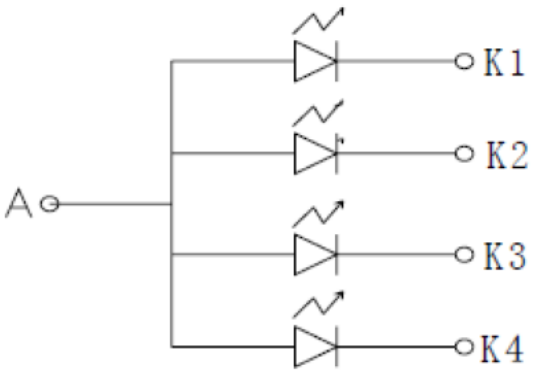
Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25℃	-	120	mA
Reverse Voltage	VR	Ta =25℃	-	5	V
Power dissipation	Pd	Ta =25℃	-	420	mW

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF=80mA	2.9	3.2	3.5	V
Average Brightness (without LCD & T/P)	IV	IF=80mA	5900	6600	-	cd/m^2
Color of CIE Coordinate (without LCD & T/P)	X		0.25	0.28	0.31	-
	Y		0.25	0.28	0.31	
Color	White					

Internal Circuit Diagram



Other Description

Item	Conditions	Description
Life Time	Ta =25℃ IF= 80mA	20000 hrs

1.7 Touch Panel Characteristics

1.7.1 Optical Characteristics

Item	Specification
1.Transparency	80% Min

1.7.2 Mechanical Characteristic

Item	Specification
1.Input Method	Finger or stylus pen.
2.Hardness of surface	3H -pressure 500g of ,45deg.
3.FPC peeling strength	500gf min(Peeling upward by 90°)
4.Activation Force	50gf less individual point with stylus pen(R0.8) Activation force guarantee area:3.0mm inside of Active Area.
5.Linearity Force	140gf less input with stylus pen(R0.8) Activation force guarantee area:3.0mm inside of Active Area.

1.7.3 Electrical Characteristics

Item	Specification
1.Rated Voltage	DC 5V(DC 7V Max)
2.Resistance Between Terminals.	Direction X (Glass side): 200Ω~ 600Ω
	Direction Y (Film side): 250Ω~ 900Ω
3.Insulation Resistance	20 MΩ or more (DC 25V 1min)
4.Linearity	±1.5%. Linearity(%)= ΔV/ (EV-SV) *100. ΔV: The difference between the ideal voltage and measured voltage on the each measuring line. SV: Voltage of starting Points. EV: Voltage of Ending Points. (Test condition refers to 1.7.2 item5)
5.Bouncing	<10ms (Tip R 3.75mm, hardness 10°~20° ,silicon rubber ,500gf operation : 40 mm/sec)

1.7.4 Reliability Characteristic

NO	Test Item	Test Condition	Test Result
1	Hitting Durability	1,000,000times min.(R 8 mm Silicon Rubber Hardness 60° 250gf 2times/sec).	Follow 1.7.3 item2 and item4.
2	Pen Sliding Durability	100,000 times min(Tip R0.8mm).	Follow 1.7.3 item2 and item4.
3	Impact Resistance	ψ9mm steel ball is dropped on the surface from 30 cm height at 1 time.	No Crack
4	Flexible pattern Bending Resistance	Bending 3 times by bending radius R1.0 mm	Follow 1.7.3 item2.
5	Flexible Pattern Insert/Pull Out Resistance	5times at least .	Follow 1.7.3 item2.

1.7.5 Touch Panel Design/Handing Guide

(1) Keep the gap, for example 0.2 to 0.3mm, between bezel edge and T/P edge.
The reason is to avoid the bezel edge from contacting T/P surface that may cause “short” with bottom layer

(2) Insertion a cushion material is recommended.

(3) The cushion material should be limited on the busbar insulation paste area. If it is over the transparent insulation paste area, a “short” may be occurred.

(4) Do not to use an adhesive tape to bond it on the front of T/P and hang it to the housing bezel.

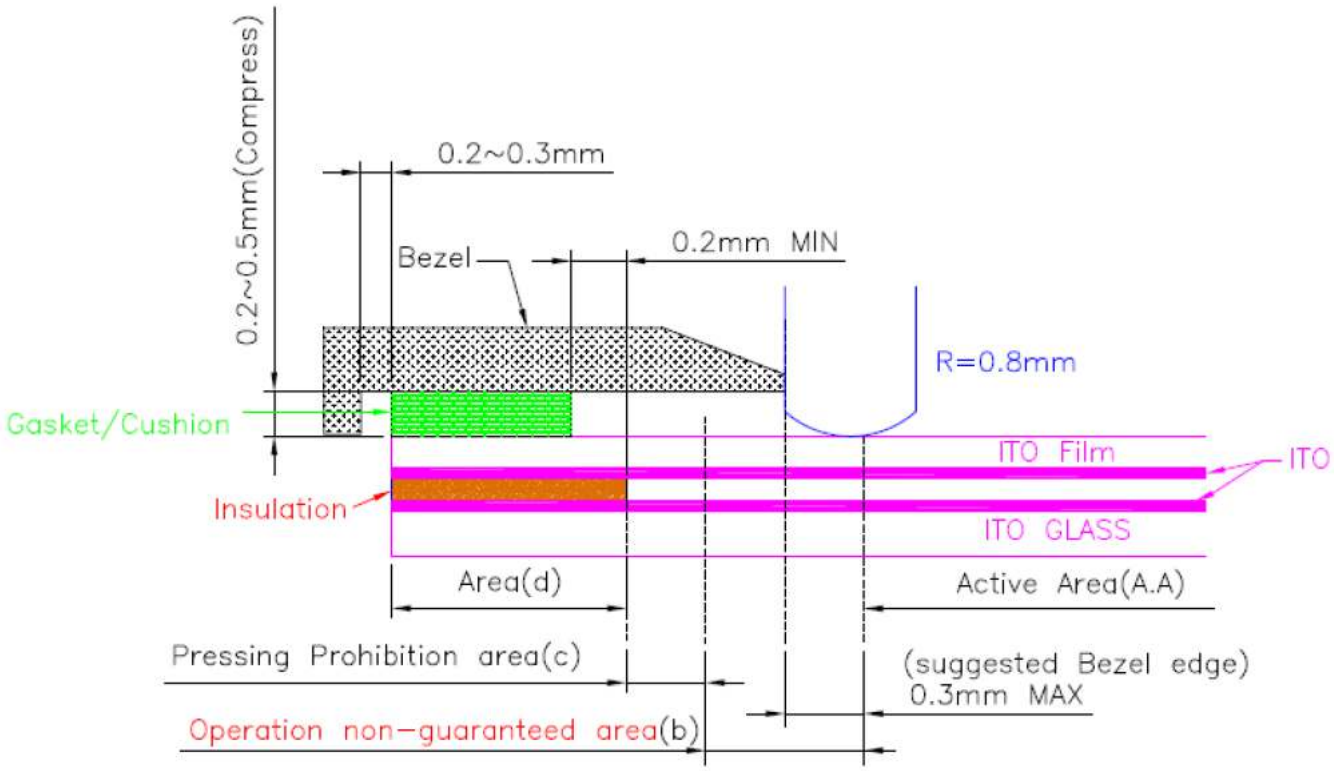
(5) Never expand the T/P top layer (PET Film) like a balloon by internal air pressure. The life of the T/P will extremely decreasing.

(6) Top layer, PET, dimension is changing base on environment temperature and humidity. Please avoid a stress from housing bezel to top layer, because it may cause “waving”.

(7) The input to the Touch Panel sometimes distorts touch panel itself.

(8)To use the stylus pen or fingernail sliding at the edge of the housing is prohibited. It would cause the cracking of the ITO coating and damage the touch panel. It also request not to press this area while assembling

(9) Purpose: In order to prevent accidental use and performance deterioration, please keep the following precautions.



In order to prevent unusual performance degradation and malfunction of a touch panel, please carry out the set case designing and a touch panel assembling method after surely considering the definition of each area illustrated in above figure.

Area(a)：Active area
The active area is guaranteed the position data detectable precision, operation force and other operations. it is strongly recommended to place the operation button or menu keys within the active area. Due to structure, the active area is less durable at the edge or close to the edge.

Area(b)：Operation non-guaranteed area
This area does not guarantee a touch panel operation and its function. When this area is pressed, touch panel shows degradation of its performance and durability such as a pen sliding durability becomes about one-tenth compared with the active area (area-(a) as guaranteed area) and its operation force requires about double. About 0.5 mm outside from a boundary of the active area corresponds to this area.

Area(c)：Pressing prohibition area
The area which forbids pressing, because an excessive load is applied to a transparent electrode (ITO) and a serious damage is given to a touch panel function by pressing. About 0.5 mm outside from Operation non-guaranteed area .

Area(d)：Non-Active area
The area does not activate even if pressed.

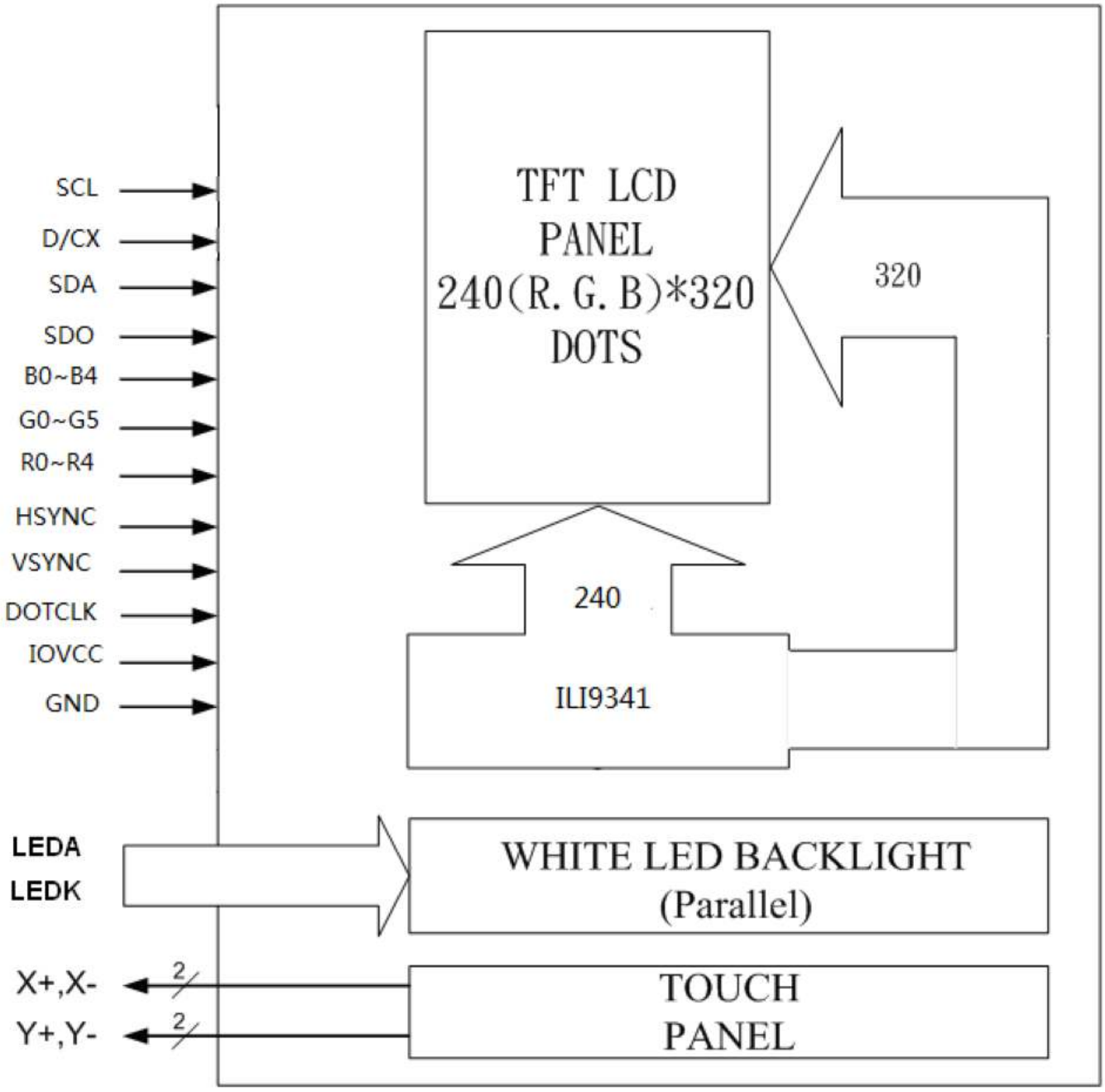
2. Module Structure

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



2.2 Interface Pin Description

Pin No.	Symbol	Function
1	K1	LED backlight cathode.
2	K2	LED backlight cathode.
3	VBL+	LED backlight anode.
4	VBL+	LED backlight anode.
5	K3	LED backlight cathode.
6	K4	LED backlight cathode.
7	SDO	Serial input signal in SPI I/F. If not used, open this pin.
8	RESET	Reset signal input terminal, active at “L”.
9	SPENB	Chip select input pin (“Low” enable) in SPI I/F.
10	SPCK	This pin is used serial interface clock in SPI.
11	SPDA	Serial input signal in SPI I/F.
12	NC	NC
13	NC	NC
14	D0	16-bit/pixel: D[17:13]=R[4:0], D[11:6]=G[5:0] and D[5:1]=B[4:0]; Connect D0 and D12 pins to GND.
15	D1(B0)	
16	D2(B1)	
17	D3(B2)	
18	D4(B3)	
19	D5(B4)	
20	NC	NC
21	NC	NC
22	D6(G0)	16-bit/pixel: D[17:13]=R[4:0], D[11:6]=G[5:0] and D[5:1]=B[4:0]; Connect D0 and D12 pins to GND.
23	D7(G1)	
24	D8(G2)	
25	D9(G3)	
26	D10(G4)	
27	D11(G5)	

Pin No.	Symbol	Function
28	NC	NC
29	NC	NC
30	D12	16-bit/pixel: D[17:13]=R[4:0], D[11:6]=G[5:0] and D[5:1]=B[4:0]; Connect D0 and D12 pins to GND.
31	D13(R0)	
32	D14(R1)	
33	D15(R2)	
34	D16(R3)	
35	D17(R4)	
36	HSYNC	Horizontal sync signal in RGB I/F.
37	VSYNC	Vertical sync signal in RGB I/F.
38	DOTCLK	Pixel clock signal in RGB I/F.
39	NC	NC
40	NC	NC
41	IOVCC	I/O power supply.
42	IOVCC	I/O power supply.
43	VCC	System power supply.
44	VCC	System power supply.
45	NC	NC
46	NC	NC
47	NC	NC
48	XR	TOUCH PANEL PIN.
49	YD	
50	XL	
51	YU	
52	DEN	Data enable signal in RGB I/F mode.
53	GND	Power ground.
54	GND	Power ground.
55	NC	NC

2.2.1 Reference Initial code

```
void LCD_Init(void)
{
    LCD_SPI_REG(0xCB);
    LCD_SPI_DATA(0x39);
    LCD_SPI_DATA(0x2C);
    LCD_SPI_DATA(0x00);
    LCD_SPI_DATA(0x34);
    LCD_SPI_DATA(0x02);

    LCD_SPI_REG(0xCF);
    LCD_SPI_DATA(0x00);
    LCD_SPI_DATA(0xD9);
    LCD_SPI_DATA(0x30);

    LCD_SPI_REG(0xE8);
    LCD_SPI_DATA(0x85);
    LCD_SPI_DATA(0x00);
    LCD_SPI_DATA(0x78);

    LCD_SPI_REG(0xEA);
    LCD_SPI_DATA(0x00);
    LCD_SPI_DATA(0x00);

    LCD_SPI_REG(0xED);
    LCD_SPI_DATA(0x64);
    LCD_SPI_DATA(0x03);
    LCD_SPI_DATA(0x12);
    LCD_SPI_DATA(0x81);
```

```
LCD_SPI_REG(0xF6);
LCD_SPI_DATA(0x01);
LCD_SPI_DATA(0x00);
LCD_SPI_DATA(0x06);

LCD_SPI_REG(0x3A); //Memory access Control
LCD_SPI_DATA(0x66);//18 bits / pixel

LCD_SPI_REG(0xF7);
LCD_SPI_DATA(0x20);

LCD_SPI_REG(0xC0);//Power control
LCD_SPI_DATA(0x21);//VRH[5:0] //0x1B

LCD_SPI_REG(0xC1);//Power control
LCD_SPI_DATA(0x12);//SAP[2:0];BT[3:0]

LCD_SPI_REG(0xC5); //VCOM Control
LCD_SPI_DATA(0x37);
LCD_SPI_DATA(0x34);

LCD_SPI_REG(0xC7); //VCOM Control2
LCD_SPI_DATA(0x00);

LCD_SPI_REG(0x36); //Memory access Control
LCD_SPI_DATA(0x00);
LCD_SPI_REG(0xB0);
```

```
LCD_SPI_DATA(0x40);

LCD_SPI_REG(0xB1);//Frame Rate control (In Normal Mode/Full Colors)
LCD_SPI_DATA(0x00);
LCD_SPI_DATA(0x10);//119Hz

LCD_SPI_REG(0xB3);//Frame Rate control (In Partial Mode/Full Colors)
LCD_SPI_DATA(0x00);
LCD_SPI_DATA(0x10); //119Hz

LCD_SPI_REG(0xB4);
LCD_SPI_DATA(0x02);     //Line inversion in full colors normal mode

LCD_SPI_REG(0xB6); //Display Function
LCD_SPI_DATA(0x0A);
LCD_SPI_DATA(0xA2);
LCD_SPI_DATA(0x27);
LCD_SPI_DATA(0x00);

LCD_SPI_REG(0xF2); //3Gamma Function Disable
LCD_SPI_DATA(0x00);

LCD_SPI_REG(0x26); //Gamma Curve select
LCD_SPI_DATA(0x01);
//----------set gamma----------------
LCD_SPI_REG(0xE0); //set gamma
LCD_SPI_DATA(0x0F);
LCD_SPI_DATA(0x3A);
```

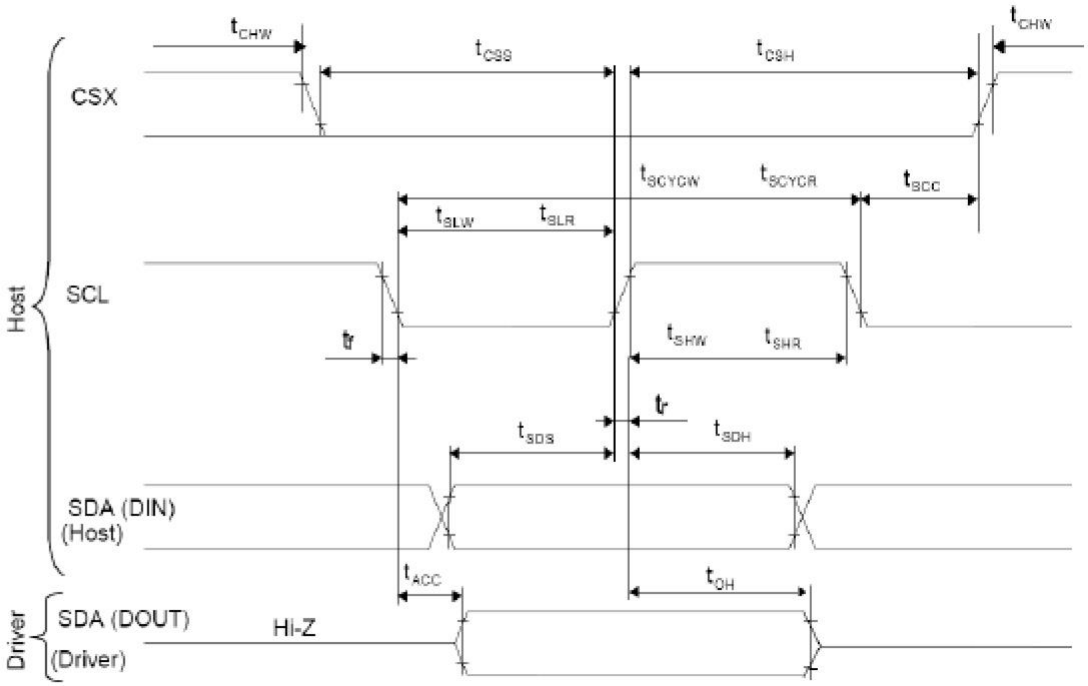
```
LCD_SPI_DATA(0x36);
LCD_SPI_DATA(0x0B);
LCD_SPI_DATA(0x0D);
LCD_SPI_DATA(0x06);
LCD_SPI_DATA(0x4C);
LCD_SPI_DATA(0x91);
LCD_SPI_DATA(0x31);
LCD_SPI_DATA(0x08);
LCD_SPI_DATA(0x10);
LCD_SPI_DATA(0x04);
LCD_SPI_DATA(0x11);
LCD_SPI_DATA(0x0C);
LCD_SPI_DATA(0x00);

LCD_SPI_REG(0xE1); //set gamma
LCD_SPI_DATA(0x00);
LCD_SPI_DATA(0x06);
LCD_SPI_DATA(0x0A);
LCD_SPI_DATA(0x05);
LCD_SPI_DATA(0x12);
LCD_SPI_DATA(0x09);
LCD_SPI_DATA(0x2C);
LCD_SPI_DATA(0x92);
LCD_SPI_DATA(0x3F);
LCD_SPI_DATA(0x08);
LCD_SPI_DATA(0x0E);
LCD_SPI_DATA(0x0B);
LCD_SPI_DATA(0x2E);
```

```
    LCD_SPI_DATA(0x33);
    LCD_SPI_DATA(0x0F);

    LCD_SPI_REG(0x11); //exit sleep

    delay_ms(120);

    LCD_SPI_REG(0x29);//Display on
}
```

2.3 Timing Characteristics

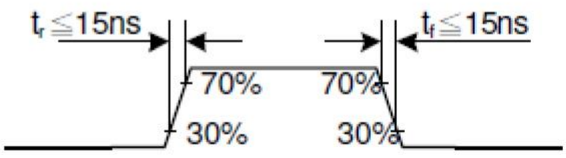
2.3.1 3-line SPI system

Display Serial Interface Timing Characteristics (3-line SPI system)



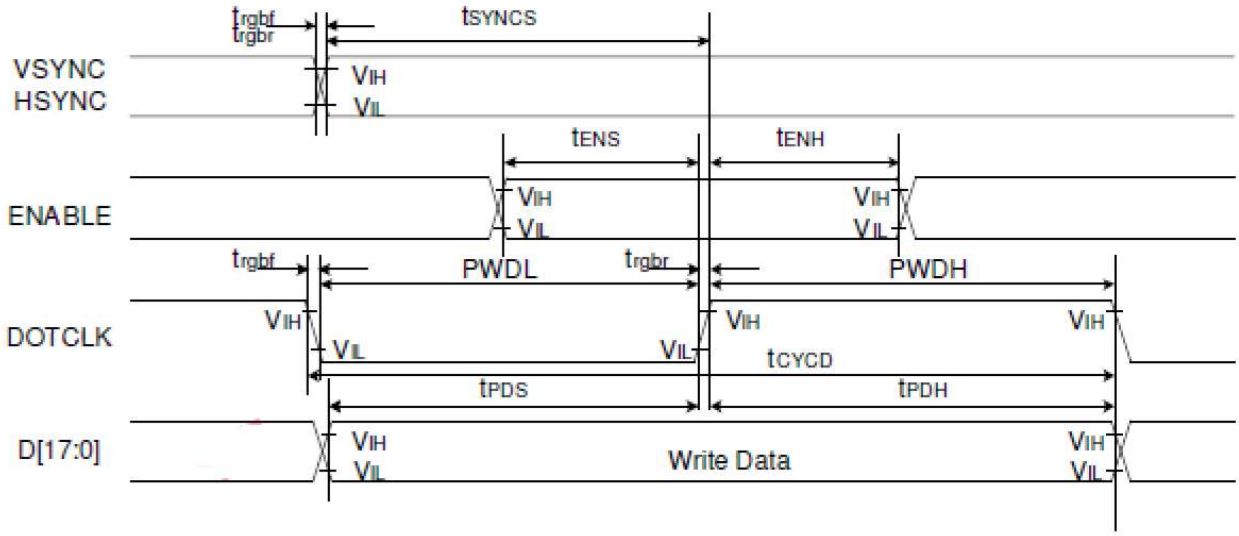
Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA / SDI (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	10	50	ns	
CSX	tscc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcsh		65	-	ns	

Note: Ta = 25 ℃, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V



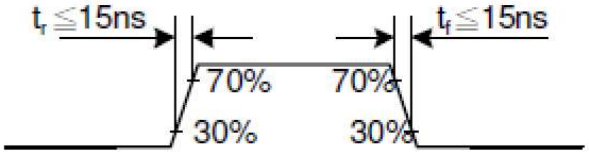
2.3.2 16-bit RGB Interface

Parallel 18/16/6-bit RGB Interface Timing Characteristics

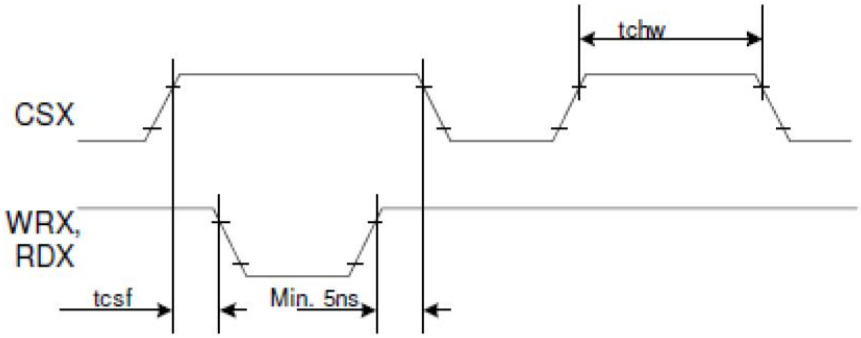


Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{PDS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	15	-	ns	
	PWDL	DOTCLK low-level period	15	-	ns	
	t_{CYCD}	DOTCLK cycle time	100	-	ns	
	t_{rgbr} , t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	6-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{PDS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level pulse period	15	-	ns	
	PWDL	DOTCLK low-level pulse period	15	-	ns	
	t_{CYCD}	DOTCLK cycle time	100	-	ns	
	t_{rgbr} , t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

Note: Ta = -30 to 70 ℃, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V

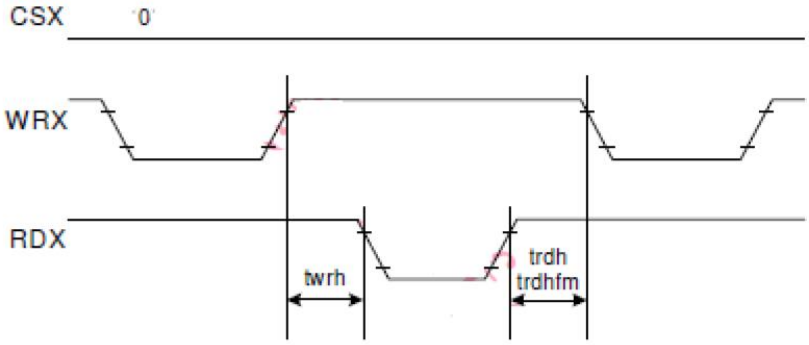


CSX timings :



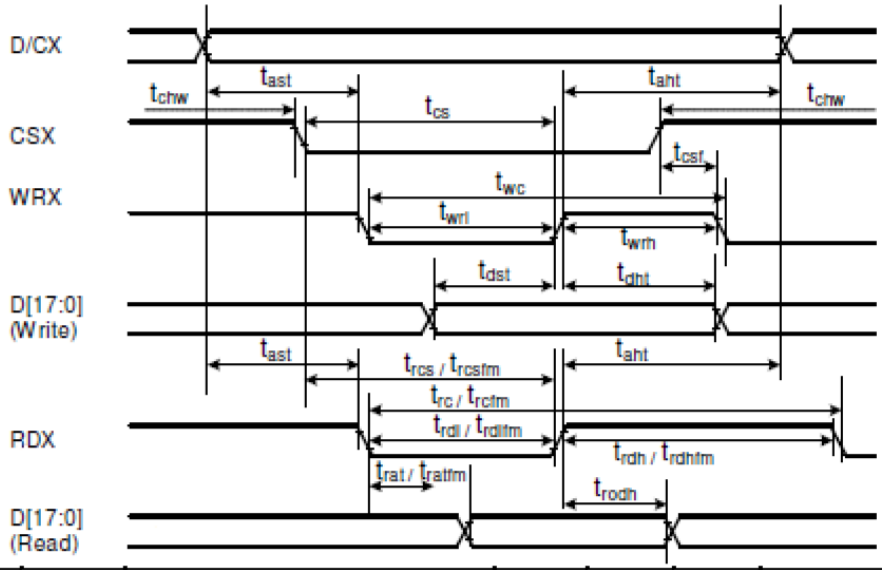
Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Write to read or read to write timings:



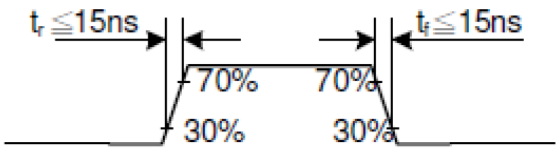
Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

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

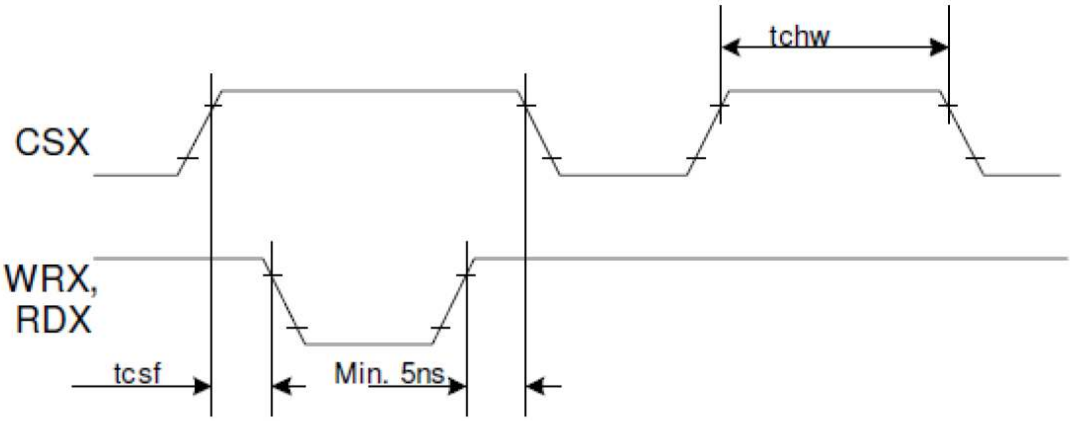


Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
	twrl	Write Control pulse L duration	15	-	ns	
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
D[17:0], D[17:10]&D[8:1], D[17:10], D[17:9]	tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

Note: Ta = -30 to 70 ℃, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, VSS=0V.

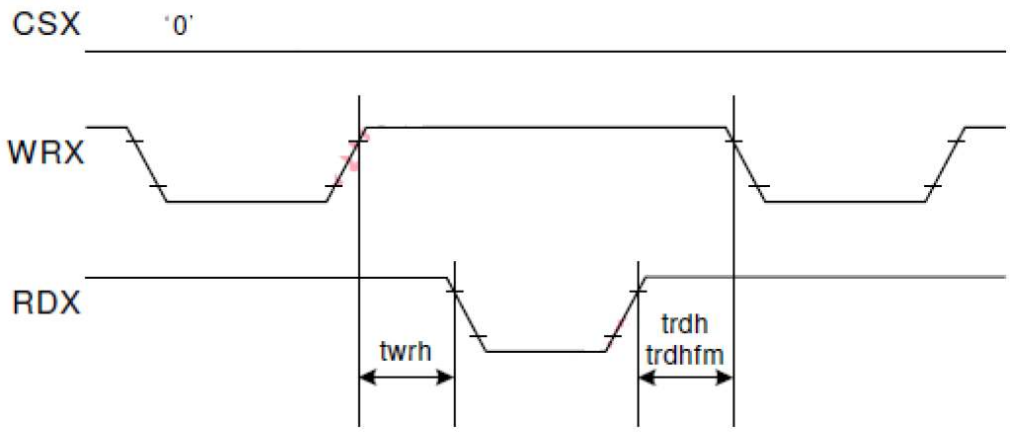


CSX timings :



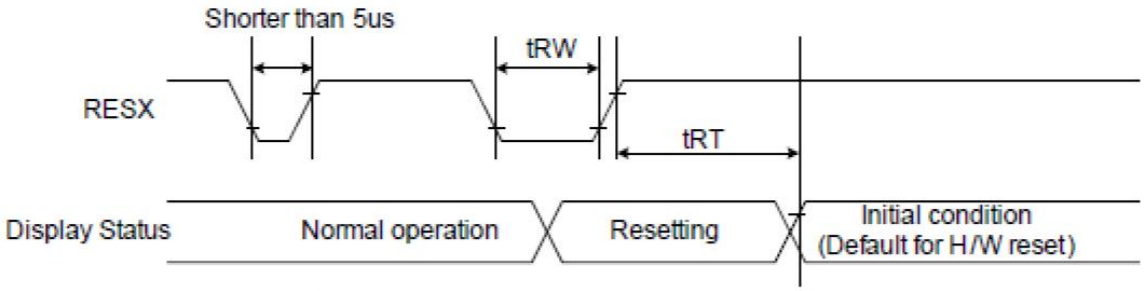
Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Write to read or read to write timings:



Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

2.3.3 Reset Timing



Signal	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

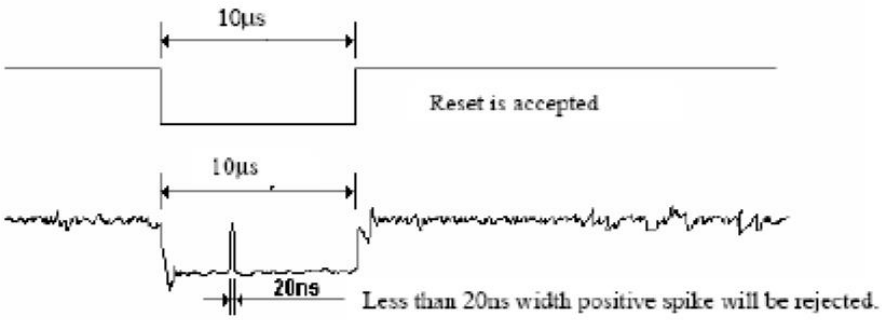
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note 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 10us	Reset
Between 5us and 10us	Reset starts

Note 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 in Sleep Out –mode. The display remains the blank state in Sleep In –mode.) And then return to Default condition for Hardware Reset.

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



Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

3. Reliability Test

3.1 Reliability Test Cond

NO.	TEST ITEM	TEST CONDITION
1	High Temperature Storage Test	Keep in +80℃ ±2℃ 240hrs Surrounding temperature, then storage at normal condition 4hrs.
2	Low Temperature Storage Test	Keep in -30℃ ±2℃ 240hrs Surrounding temperature, then storage at normal condition 4hrs.
3	High Temperature / High Humidity Storage Test	Keep in +60 ℃ / 90% R.H duration for 240hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer)
4	Temperature Cycling Storage Test	-30℃ → +25℃ → +80℃ → +25℃ (30mins) (5mins) (30mins) (5mins) 20 Cycle Surrounding temperature, then storage at normal condition 4hrs.
5	ESD Test	Air Discharge: Apply 2 KV with 5 times Discharge for each polarity +/- Contact Discharge: Apply 250 V with 5 times discharge for each polarity +/- 1. Temperature ambiance : 15℃～35℃ 2. Humidity relative : 30%～60% 3. Energy Storage Capacitance(Cs+Cd) : 150pF±10% 4. Discharge Resistance(Rd) : 330Ω±10% 5. Discharge, mode of operation : Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : ±5%)
6	Vibration Test (Packaged)	1. Sine wave 10～55 Hz frequency (1 min/sweep) 2. The amplitude of vibration :1.5 mm 3. Each direction (X、Y、Z) duration for 2 Hrs
7	Drop Test (Packaged)	Packing Weight (Kg) / Drop Height (cm): 0 ~ 45.4 / 122; 45.4 ~ 90.8 / 76; 90.8 ~ 454 / 61; Over 454 / 46 Drop Direction :※1 corner / 3 edges / 6 sides each 1time

4. Precaution Relating Product Handling

4.1 SAFETY

4.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.
4.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

4.2 HANDLING

4.2.1 Avoid any strong mechanical shock which can break the glass.
4.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module , be sure to ground your body and any electrical equipment you may be using.
4.2.3 Do not remove the panel or frame from the module.
4.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully, do not touch , push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)
4.2.5 Do not wipe the polarizing plate with a dry cloth , as it may easily scratch the surface of plate.
4.2.6 Do not touch the display area with bare hands , this will stain the display area.
4.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.
4.2.8 To control temperature and time of soldering is 320 ± 10°C and 3-5 sec.
4.2.9 To avoid liquid (include organic solvent) stained on LCM
4.2.10 Caution!(LCM products with Capacitive Touch Panel) Strong EMI-sources such as switch-mode power supplies (SMPS) can lead to touch malfunction (e.g. ghost-touches). Therefore, the touch needs to be thoroughly tested inside the target application.

4.3 STORAGE

4.3.1 Store the panel or module in a dark place where the temperature is 25°C ± 5°C and the humidity is below 65% RH.
4.3.2 Do not place the module near organics solvents or corrosive gases.
4.3.3 Do not crush , shake , or jolt the module.

4.4 TERMS OF WARRANTY

4.4.1 Applicable warrant period
The period is within thirteen months since the date of shipping out under normal using and storage conditions.
4.4.2 Unaccepted responsibility
This product has been manufactured to your company's specification as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in nuclear power control equipment, aerospace equipment , fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.

Quality warranty period: Within one year after shipment date (excluding abnormal usage way and abnormal environments.)

5. LCM Drawing