POWERTIP TECH. CORP.

SPECIFICATIONS

CUSTOMER	:	PTC
SAMPLE CODE	:	SH320480T012-ZAA01
MASS PRODUCTION CODE	:	PH320480T012-ZAA01
SAMPLE VERSION	:	01
SPECIFICATIONS EDITION	:	002
DRAWING NO. (Ver.)	:	JLMD-PH320480T012-ZAA01_001
PACKAGING NO. (Ver.)	:	JPKG-PH320480T012-ZAA01_001

Customer Approved

Date:

POWERTIP
2024.04.27
JS RD APPROVED

Approved	Checked	Designer
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☐ Preliminary specification for design input

■ Specification for sample approval

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History of Version

Date (mm / dd / yyyy)	Ver.	Edi.	Description	Page	Design by
03/04/2024	01	001	Preliminary.	-	王琦
04/22/2024	01	002	First Sample	-	王琦

Contents

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Resolution	320(R、G、B) * 480 Dots
LCD Type	IPS TFT , Normally Black , Transmissive type
Screen size(inch)	3.5 inch
Color configuration	R.G.B. Vertical Stripe
Interface	Parallel 8080-series MCU Interface (8-bit, 9-bit, 16-bit, and 18-bit) 16/18 RGB Interface Serial Peripheral Interface (SPI Interface)
Driver IC	Sitronix: ST7796P-G5
ROHS	THIS PRODUCT CONFORMS THE ROHS OF PTC Detail information please refer website: http://www.powertip.com.tw/news_detail.php?Key=1&cID=1

Note : For detailed information please refer to IC data sheet :
Primacy(TFT LCD): Sitronix: ST7796P-G5

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	84.71 (W) * 54.48 (L) * 2.16 (H)	mm

LCD panel

Item	Standard Value	Unit
View Area	74.44 (W) * 49.96 (L)	mm
Active Area	73.44 (W) * 48.96 (L)	mm

Note: For detailed information please refer to LCM drawing.

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
System Power Supply Voltage	VDD	-	-0.3	+4.6	V
System Power Supply Voltage	VDDI	-	-0.3	+4.6	V
Input Voltage	VIN	-	0.5	VDDI +0.5	V
Operating Temperature	T_{OP} (Ts)	Note 1	-20	70	°C
Storage Temperature	T_{ST} (Ta)	Note 2	-30	80	°C
Storage Humidity	H_D	Ta ≦ 60 °C	20	90	%RH

The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 1：Ts is the temperature of panel's surface.
Note 2：Ta is the ambient temperature of samples.

1.4 DC Electrical Characteristics

Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply Voltage	VDD	-	2.7	3.3	3.6	V
Power Supply Voltage	VDDI	-	2.7	3.3	3.6	V
Input High Voltage	V_{IH}	-	0.7 * VDDI	-	VDDI	V
Input Low Voltage	V_{IL}	-	GND	-	0.3* VDDI	V
Output High Voltage	V_{OH}	I_{OH}=-0.1mA	0.8* VDDI	-	VDDI	V
Output Low Voltage	V_{OL}	I_{OL}=0.1mA	GND	-	0.2* VDDI	V
Supply Current	IDD	VDD=VDDI= 3.3V	-	25	35	mA

1.5 Optical Characteristics

VDDI=VDD= 3.3V, Ta=25°C

Item		Symbol	Condition	Min.	Typ.	Max.	unit	-
Response time		Tr+ Tf	Ta = 25°C θX, θY = 0°	-	40	60	ms	Note2
Viewing angle	Top	θY+	CR≥10	-	80	-	Deg.	Note4
	Bottom	θY-		-	80	-		
	Left	θX-		-	80	-		
	Right	θX+		-	80	-		
Contrast ratio		CR	Ta = 25°C θX , θY = 0°	650	800	-	-	Note3
Color of CIE Coordinate	White	X	IF= 20 mA	0.23	0.28	0.33	-	Note1
		Y		0.27	0.32	0.37		
	Red	X		0.59	0.64	0.69		
		Y		0.27	0.32	0.37		
	Green	X		0.25	0.30	0.35		
		Y		0.57	0.62	0.67		
	Blue	X		0.10	0.15	0.20		
		Y		0.00	0.03	0.08		
Average Brightness (With LCD)*1		IV	IF= 20 mA	210	270	-	cd/m^2	
Uniformity (With LCD)*2		△B	IF= 20 mA	70	-	-	%	

Note 1:

*1：△B=B(min) / B(max) * 100%

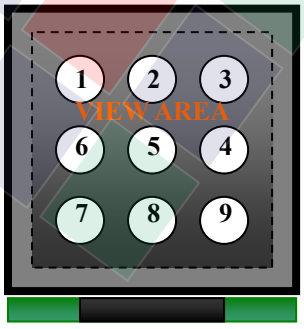
*2：Measurement Condition for Optical Characteristics:

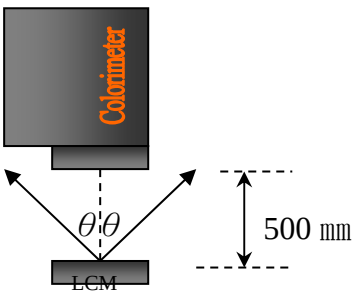
a：Environment: 25℃±5℃ / 60±20%R.H，no wind，dark room below 10 Lux at typical lamp current and typical operating frequency.

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%





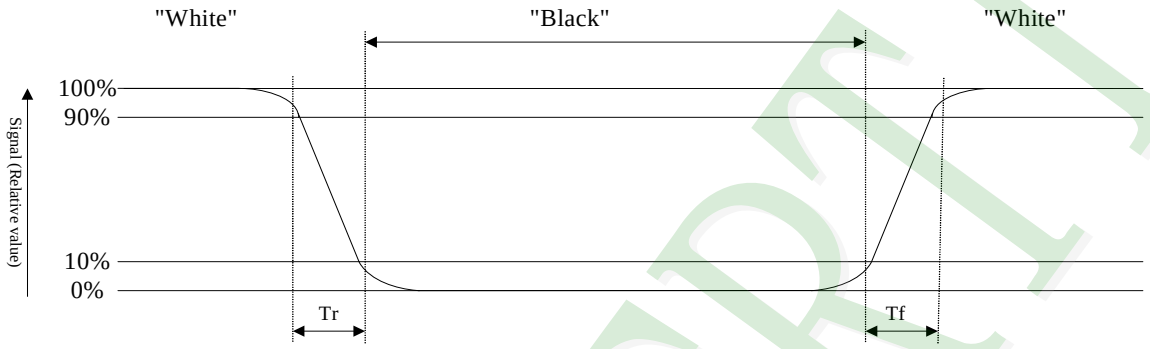
Colorimeter=BM-7 fast

To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation (module)

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:



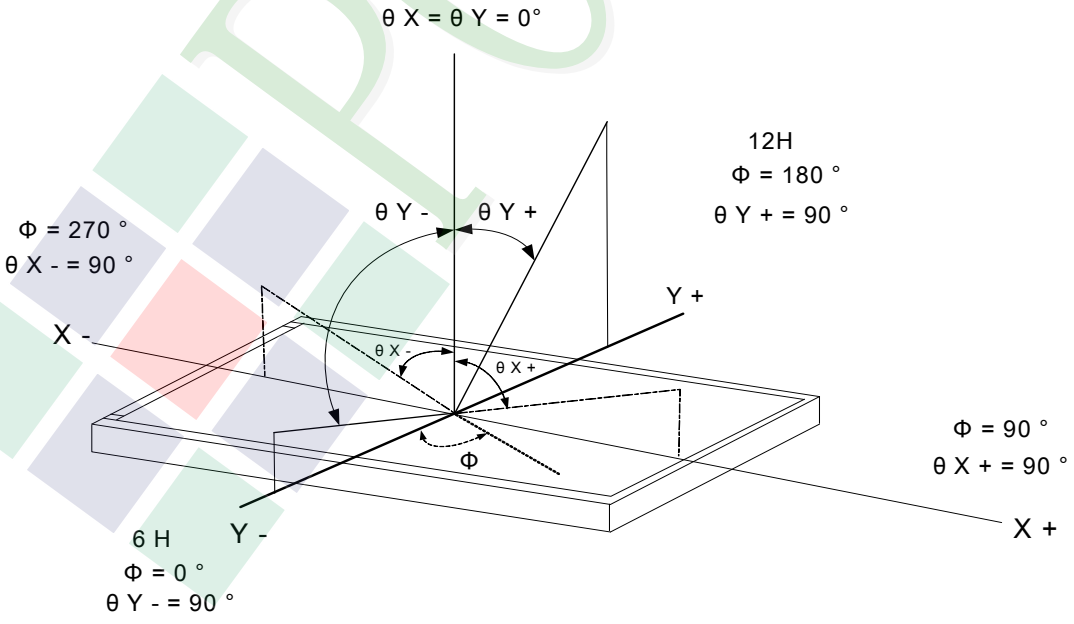
Note3: Definition of contrast ratio:

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 Unit Characteristics

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25℃	-	30	mA
Reverse Voltage	VR	Ta =25℃	-	5	V
Power Dissipation	PD	Ta =25℃	-	576	mW

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF= 20 mA	16.8	18.0	19.2	V
Average Brightness (without LCD)	IV		8050	8855	-	cd/m^2
CIE Color Coordinate (Without LCD)	X		0.25	0.28	0.31	-
	Y		0.25	0.28	0.31	
Color	White					

Circuit Diagram

Other Description

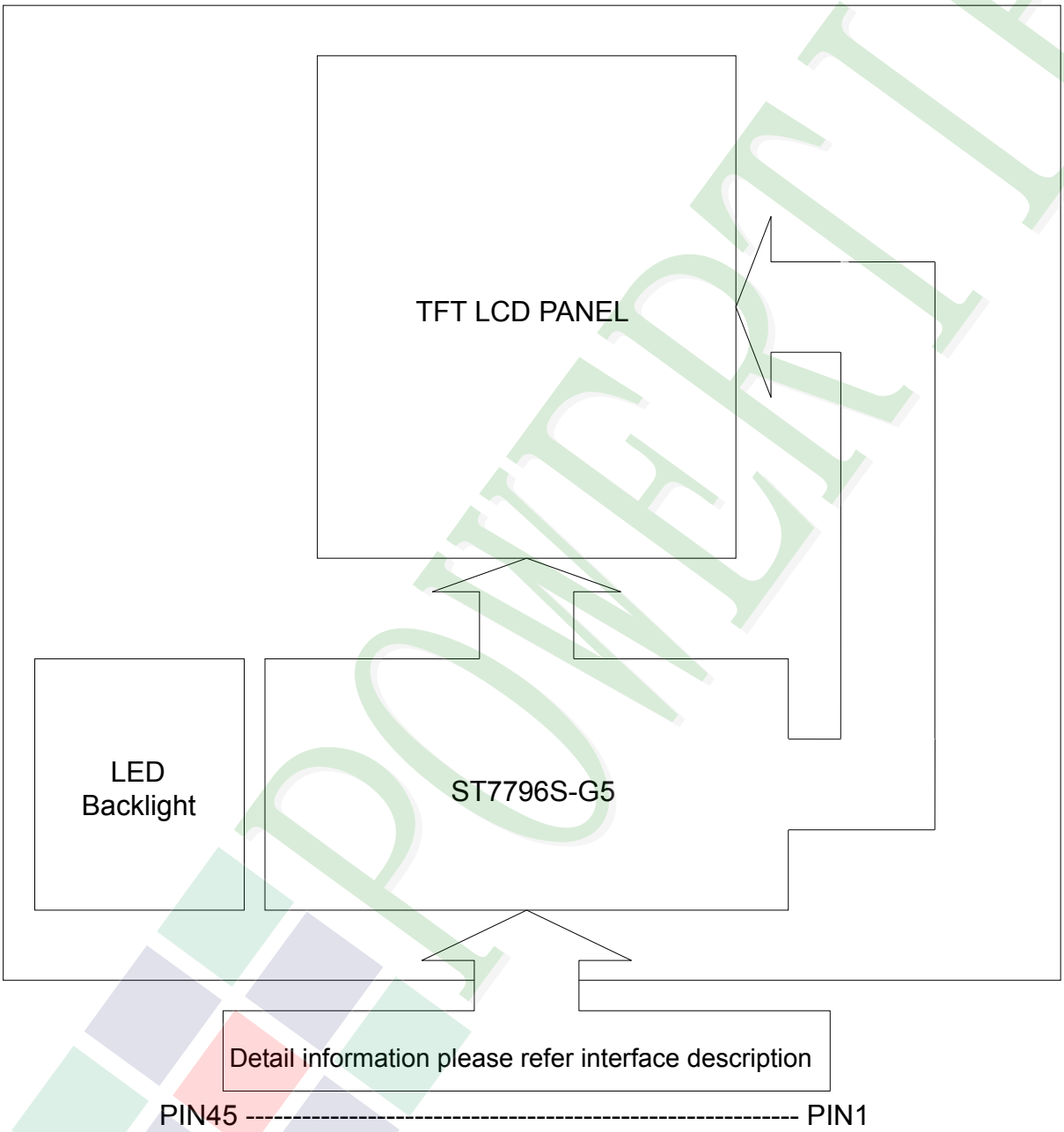
Item	Conditions	Description
MTBF (Life Time)	Ta =25℃ IF= 20 mA	20000 hrs

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	LEDK	Power supply for LED Backlight cathode input
2		
3		
4		
5		
6		
7	LEDA	Power supply for LED Backlight anode input
8	GND	Ground
9	VDD	Power supply for analog and booster circuits
10	VDDI	Power supply for I/O system. VDDI must be lower than or equal to VDD.
11	TE	Tearing Effect output signal. Leave the pin open when not in use.
12	CSX	Chip selection pin. Low-active. If not used, please fix this pin at VDDI or DGND level.
13	DCX	Display data/command selection (RS) pin in MCU interface. DCX='1': display data or parameter. DCX='0': register index / command. If not used, please fix this pin at VDDI or DGND level.
14	WRX/SCL	Write enable in MCU parallel interface. In SPI mode, this pin is used as SCL. If not used, please fix this pin at VDDI or DGND level.
15	RDX	Read enable in 8080 MCU parallel interface. Low-active. If not used, please fix this pin at VDDI or DGND level.
16	SDA	SPI interface input/output pin. The data is latched on the rising edge of the SCL signal. If not used, please fix this pin at VDDI or DGND level.
17	SDO	SPI interface output pin. The data is outputted on the falling edge of the SCL signal. If not used, please fix this pin at floating.
18	DB0	Data bus Fix to GND level when not in use.
19	DB1	
20	DB2	
21	DB3	

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Function</th></tr>
<tr><td>22</td><td>DB4</td><td rowspan="14">Data bus
Fix to GND level when not in use.
<table><tr><th>IM2</th><th>IM1</th><th>IM0</th><th>MPU Interface Mode</th><th>Data pin</th></tr><tr><td>0</td><td>0</td><td>0</td><td>8080 18-bit Interface</td><td>DB[17:0]</td></tr><tr><td>0</td><td>0</td><td>1</td><td>8080 9-bit Interface</td><td>DB[8:0]</td></tr><tr><td>0</td><td>1</td><td>0</td><td>8080 16-bit Interface</td><td>DB[15:0]</td></tr><tr><td>0</td><td>1</td><td>1</td><td>8080 8-bit Interface</td><td>DB[7:0],</td></tr><tr><td>1</td><td>0</td><td>1</td><td>3SPI</td><td>SDA, SDO</td></tr><tr><td>1</td><td>1</td><td>1</td><td>4Line SPI</td><td>SDA, SDO</td></tr></table></td></tr>
<tr><td>23</td><td>DB5</td></tr>
<tr><td>24</td><td>DB6</td></tr>
<tr><td>25</td><td>DB7</td></tr>
<tr><td>26</td><td>DB8</td></tr>
<tr><td>27</td><td>DB9</td></tr>
<tr><td>28</td><td>DB10</td></tr>
<tr><td>29</td><td>DB11</td></tr>
<tr><td>30</td><td>DB12</td></tr>
<tr><td>31</td><td>DB13</td></tr>
<tr><td>32</td><td>DB14</td></tr>
<tr><td>33</td><td>DB15</td></tr>
<tr><td>34</td><td>DB16</td></tr>
<tr><td>35</td><td>DB17</td></tr>
<tr><td>36</td><td>ENABLE</td><td>Data enable signal for RGB interface operation.
If not used, please fix this pin at VDDI or DGND.</td></tr>
<tr><td>37</td><td>DOTCLK</td><td>Dot clock signal for RGB interface operation.
If not used, please fix this pin at VDDI or DGND.</td></tr>
<tr><td>38</td><td>HSYNC</td><td>Horizontal synchronizing input signal for RGB interface operation.
If not used, please fix to VDDI or DGND.</td></tr>
<tr><td>39</td><td>GND</td><td>Ground</td></tr>
<tr><td>40</td><td>VSYNC</td><td>Vertical synchronizing input signal for RGB interface operation.
If not used, please fix to the VDDI or DGND.</td></tr>
<tr><td>41</td><td>RESET</td><td>This signal will reset the device and it must be applied to
properly initialize the chip.
Signal is active low.</td></tr>
<tr><td>42</td><td>IM2</td><td rowspan="3">The MCU interface mode select.</td></tr>
<tr><td>43</td><td>IM1</td></tr>
<tr><td>44</td><td>IM0</td></tr>
<tr><td>45</td><td>GND</td><td>Ground</td></tr>
</table>

2.2.1 Refer Initial code

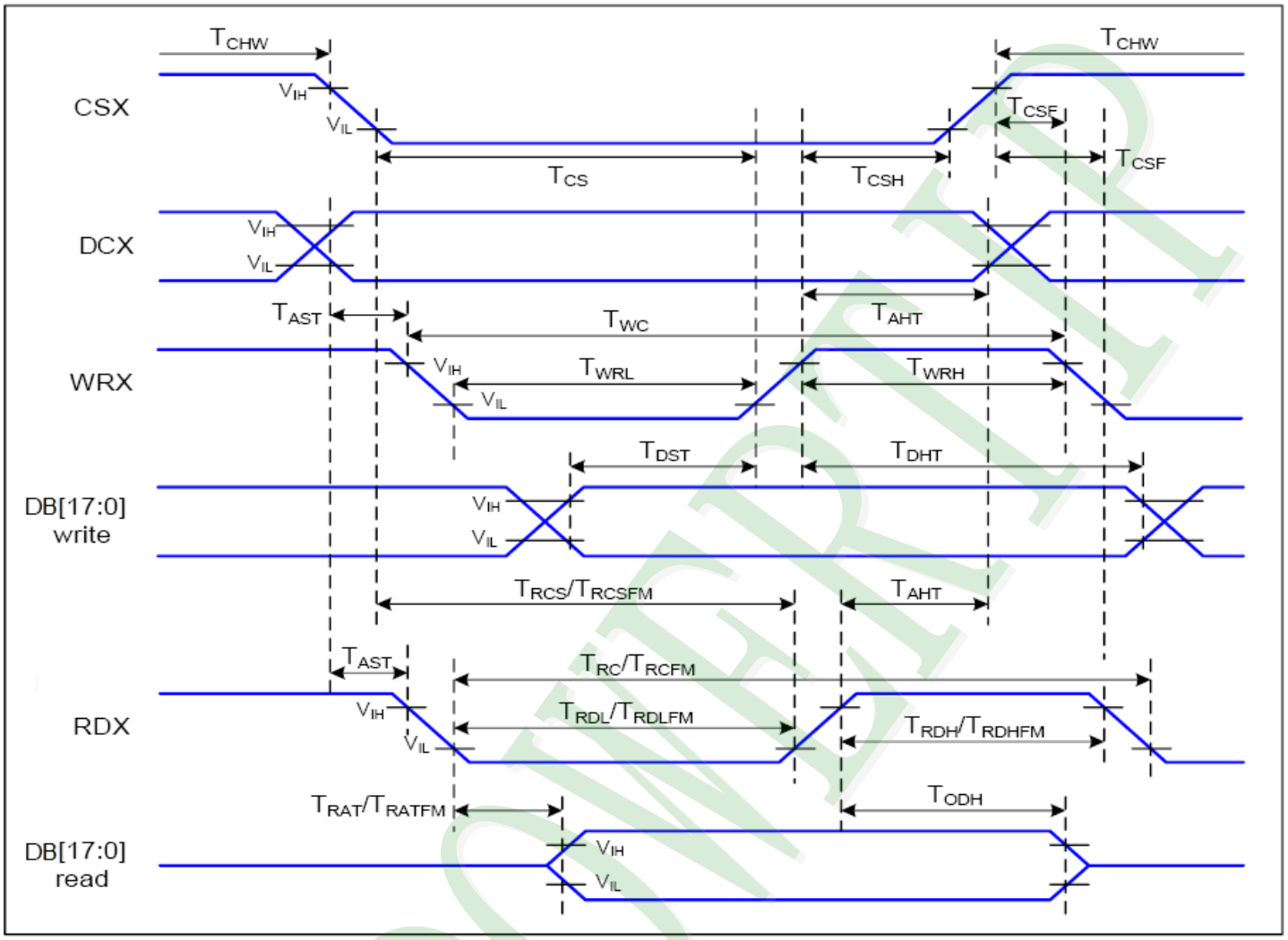
```
void LCD_SPI_Init()
{
//*************LCD Driver Initial **********//
      delay_ms(120);                    // Delay 120ms

      LCD_SPI_REG(0x01);

      delay_ms(120);                    // Delay 120ms

      LCD_SPI_REG(0x11);                 // Sleep Out

      delay_ms(120);                    // Delay 120ms


      LCD_SPI_REG(0xf0);                //Enable command 2
      LCD_SPI_DATA(0xc3);

      LCD_SPI_REG(0xf0);
      LCD_SPI_DATA(0x96);

      LCD_SPI_REG(0x36);
      LCD_SPI_DATA(0x40);

      LCD_SPI_REG(0x21);                 // Display Inversion On

      LCD_SPI_REG(0x3a);
      LCD_SPI_DATA(0x66);               //18BIT

      LCD_SPI_REG(0xb0);
      LCD_SPI_DATA(0x00);

      LCD_SPI_REG(0xB4);                 //1-dot inversion
      LCD_SPI_DATA(0x01);

      LCD_SPI_REG(0xb6);
      LCD_SPI_DATA(0x20);
      LCD_SPI_DATA(0x02);
      LCD_SPI_DATA(0x3b);
```

```
LCD_SPI_REG(0xe8);
LCD_SPI_DATA(0x40);
LCD_SPI_DATA(0x8a);
LCD_SPI_DATA(0x00);
LCD_SPI_DATA(0x00);
LCD_SPI_DATA(0x29);
LCD_SPI_DATA(0x19);
LCD_SPI_DATA(0xa5);
LCD_SPI_DATA(0x33);

LCD_SPI_REG(0xc1);
LCD_SPI_DATA(0x06);

LCD_SPI_REG(0xc2);
LCD_SPI_DATA(0xa7);

LCD_SPI_REG(0xc5);
LCD_SPI_DATA(0x18);

LCD_SPI_REG(0xe0);          //Positive Voltage Gamma Control
LCD_SPI_DATA(0xf0);
LCD_SPI_DATA(0x09);
LCD_SPI_DATA(0x0b);
LCD_SPI_DATA(0x06);
LCD_SPI_DATA(0x04);
LCD_SPI_DATA(0x15);
LCD_SPI_DATA(0x2f);
LCD_SPI_DATA(0x54);
LCD_SPI_DATA(0x42);
LCD_SPI_DATA(0x3c);
LCD_SPI_DATA(0x17);
LCD_SPI_DATA(0x14);
LCD_SPI_DATA(0x18);
LCD_SPI_DATA(0x1b);

LCD_SPI_REG(0xe1);          //Negative Voltage Gamma Control
LCD_SPI_DATA(0xf0);
LCD_SPI_DATA(0x09);
```

```
    LCD_SPI_DATA(0x0b);
    LCD_SPI_DATA(0x06);
    LCD_SPI_DATA(0x04);
    LCD_SPI_DATA(0x03);
    LCD_SPI_DATA(0x2d);
    LCD_SPI_DATA(0x43);
    LCD_SPI_DATA(0x42);
    LCD_SPI_DATA(0x3b);
    LCD_SPI_DATA(0x16);
    LCD_SPI_DATA(0x14);
    LCD_SPI_DATA(0x17);
    LCD_SPI_DATA(0x1b);

    LCD_SPI_REG(0xf0);              //Disable command 2
    LCD_SPI_DATA(0x3c);

    LCD_SPI_REG(0xf0);
    LCD_SPI_DATA(0x69);

    delay_ms(120);                  //Delay 120ms

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

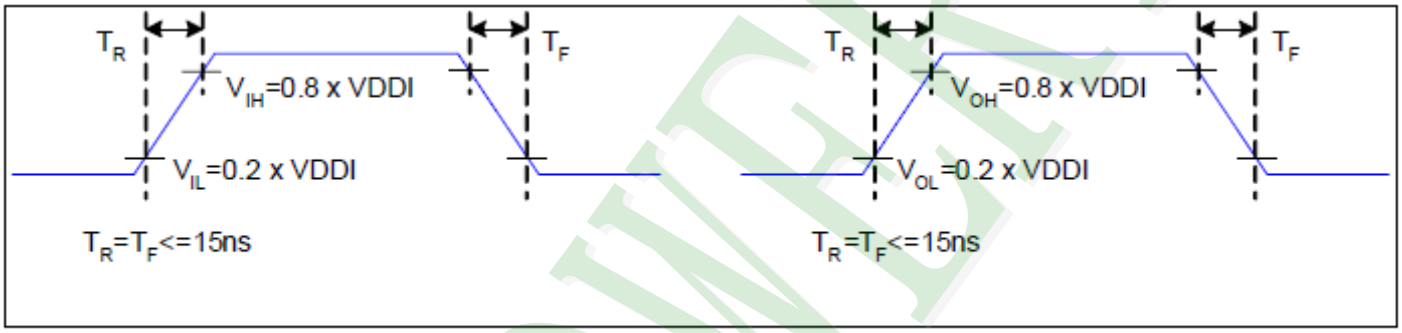
2.3 Timing Characteristics

8080 Series MCU Parallel Interface Characteristics: 18/16/9/8-bit Bus



Signal	Symbol	Parameter	Min	Max	Unit	Description
DCX	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	

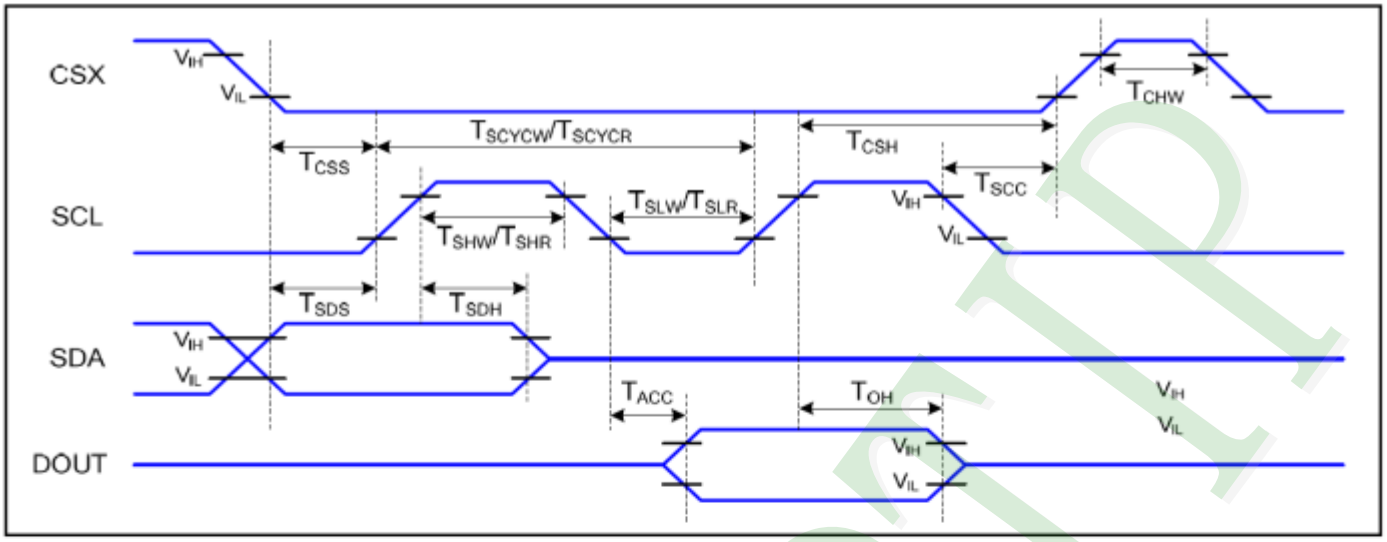
	T_{WRL}	Control pulse "L" duration	15		ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160		ns	When read ID data
	T_{RDH}	Control pulse "H" duration (ID)	90		ns	
	T_{RDL}	Control pulse "L" duration (ID)	45		ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450		ns	When read from frame memory
	T_{RDHFM}	Control pulse "H" duration (FM)	90		ns	
	T_{RDLFM}	Control pulse "L" duration (FM)	355		ns	
DB[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	



Rising and Falling Timing for I/O Signal

Note: The rising time and falling time (Tr, Tf) of input signal and fall time are specified at 15 ns or less. Logic high and low levels are specified as 20% and 80% of VDDI for Input signals.

3-SPI Serial Data Transfer Interface Characteristics:



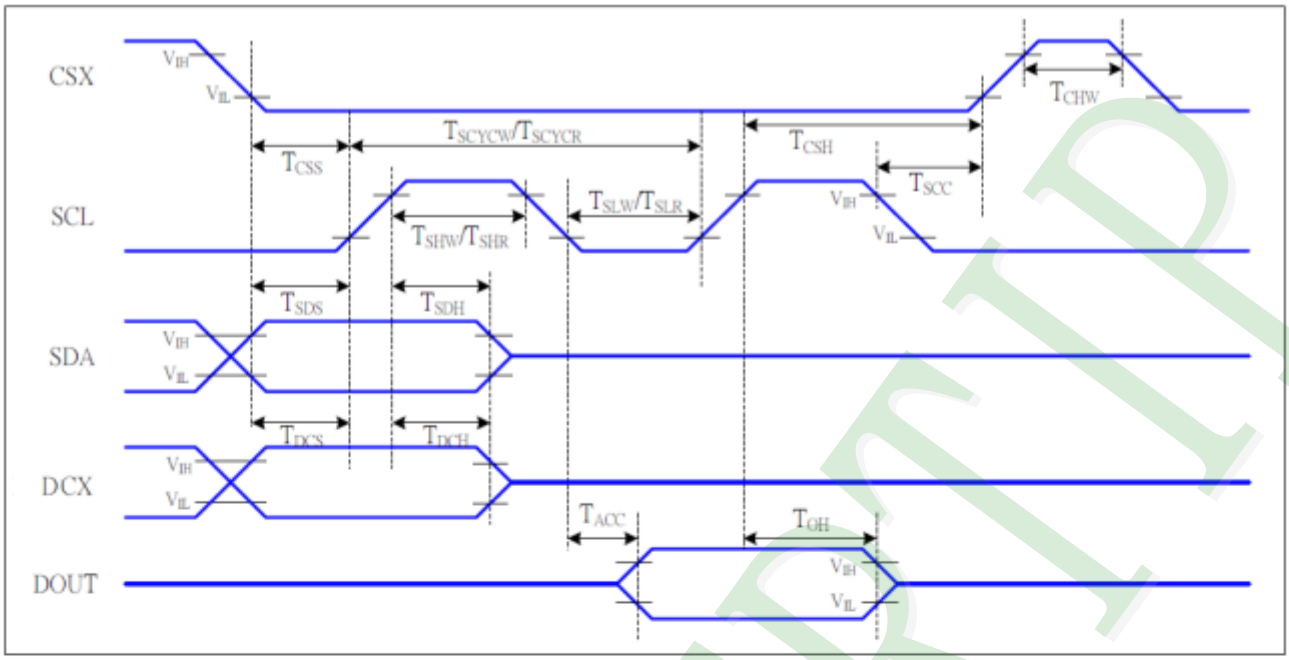
3-SPI Interface Timing Characteristics

Ta=25 ℃

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-SPI Serial Data Transfer Interface Characteristics:

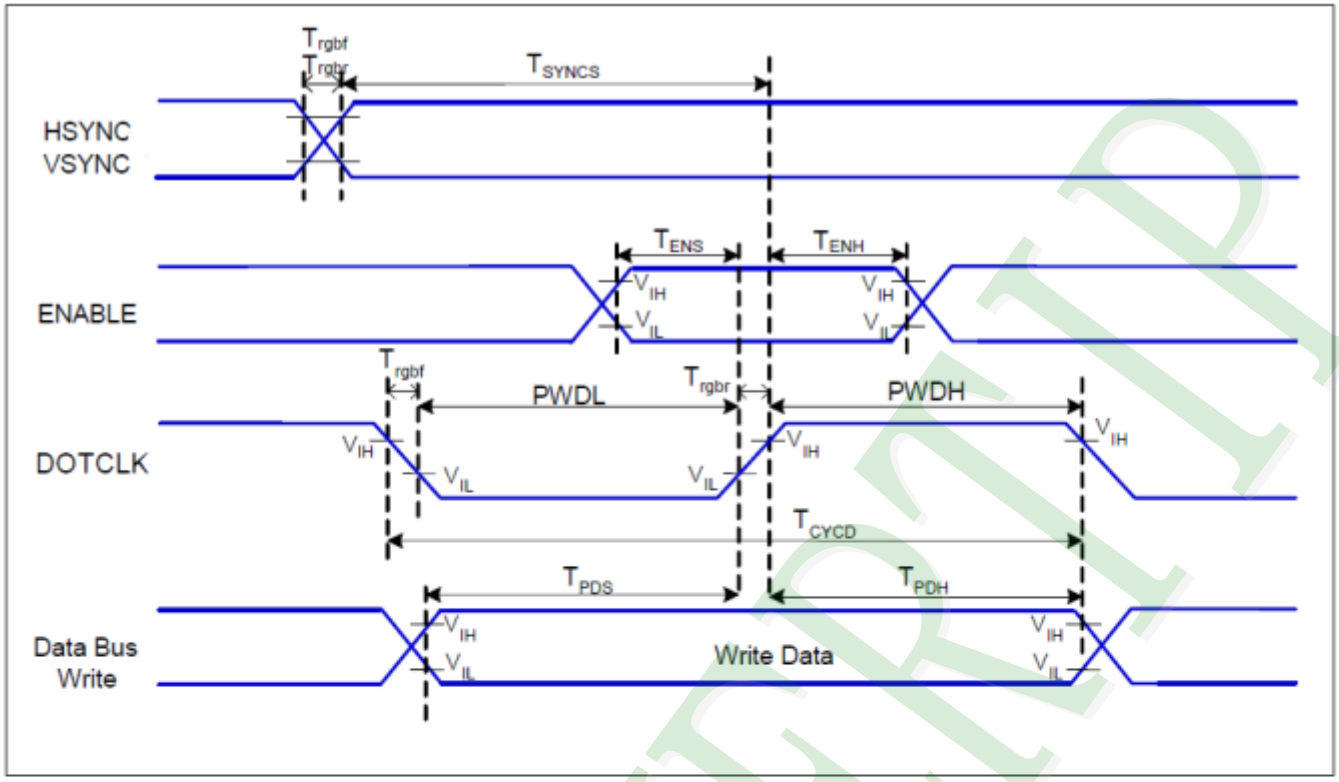


4-SPI Interface Timing Characteristics

Ta=25 ℃

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	
DCX	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

RGB Interface Characteristics:



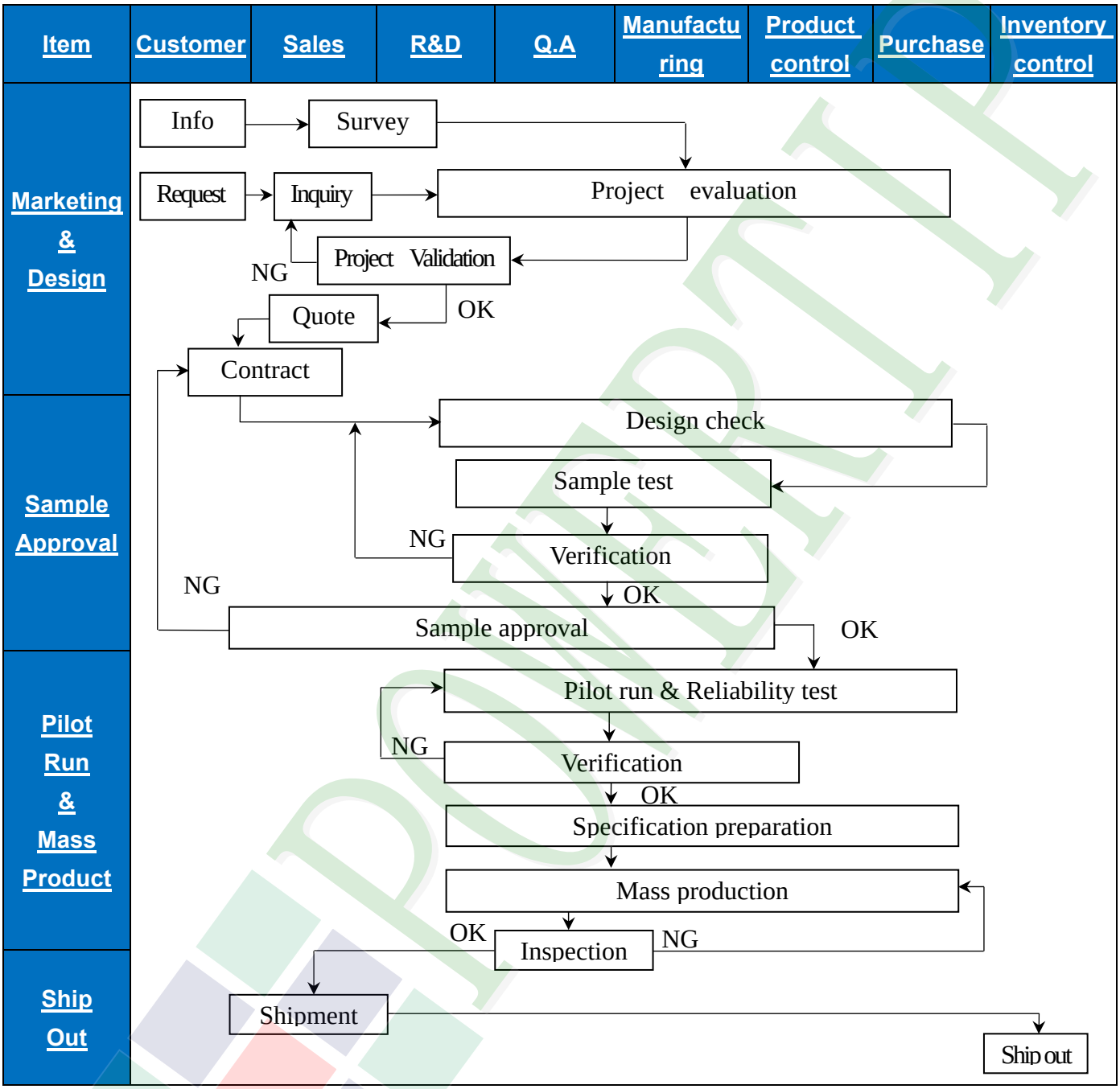
Ta=25℃

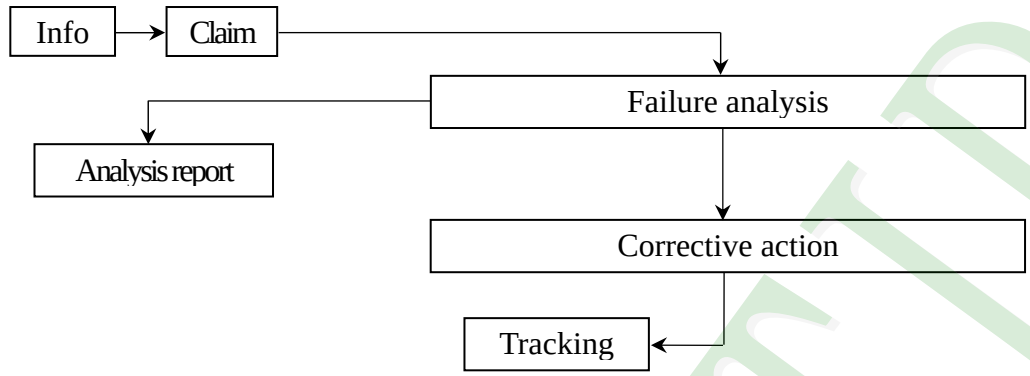
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYNC, HSYNC Setup Time	15	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	15	-	ns	
	T_{ENH}	Enable Hold Time	15	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	30	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	30	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	66	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	15	-	ns	
	T_{PDH}	PD Data Hold Time	15	-	ns	

RGB Interface Timing Characteristics

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service								
Q.A Activity	1. ISO 9001 Maintenance Activities 2. Process improvement proposal 3. Equipment calibration 4. Education And Training Activities 5. Standardization Management							

3.2. Inspection Specification

◆Scope: The document shall be applied to TFT-LCD Module for 3.5" -15" (Ver.B01).

◆Inspection Standard: MIL-STD-105E Table Normal Inspection Single Sampling Level Ⅱ.

◆Equipment: Gauge, MIL-STD, Powertip Tester, Sample

◆Defect Level: Major Defect AQL: 0.4; Minor Defect AQL: 1.5

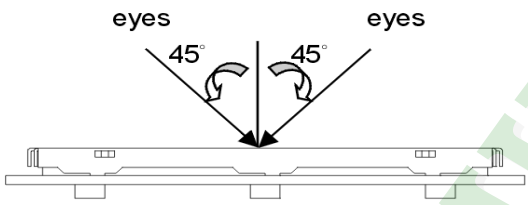
◆OUT Going Defect Level: Sampling.

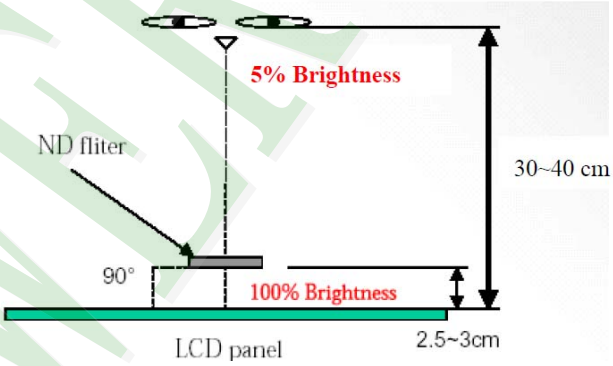
◆Standard of the product appearance test:

a. Manner of appearance test:

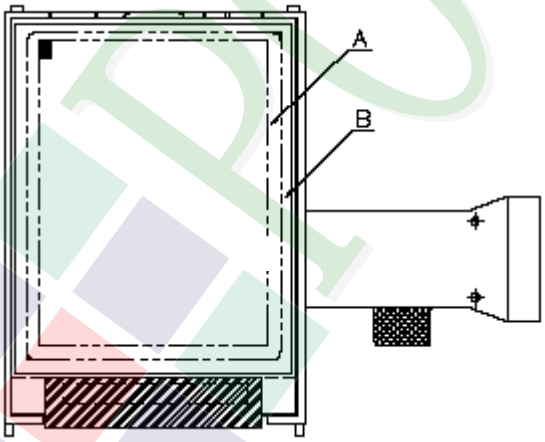
(1). The test best be under 20W×2 fluorescent light(about 300lux ～500lux) , and distance of view must be at 30~40 cm.

(2). The test direction is base on about around 45° of vertical line.





(3). Definition of area.



A area: viewing area

B area: Outside of viewing area

(4). Standard of inspection： (Unit：mm)

◆Specification For TFT-LCD Module 3.5” ~15” : (Ver.B01)

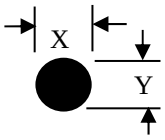
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td rowspan="3">01</td><td rowspan="3">Product condition</td><td>1.1The part number is inconsistent with work order of production.</td><td>Major</td></tr>
<tr><td>1.2 Mixed product types.</td><td>Major</td></tr>
<tr><td>1.3 Assembled in inverse direction.</td><td>Major</td></tr>
<tr><td>02</td><td>Quantity</td><td>2.1The quantity is inconsistent with work order of production.</td><td>Major</td></tr>
<tr><td>03</td><td>Outline dimension</td><td>3.1Product dimension and structure must conform to structure diagram.</td><td>Major</td></tr>
<tr><td rowspan="6">04</td><td rowspan="6">Electrical Testing</td><td>4.1 Missing line character and icon.</td><td>Major</td></tr>
<tr><td>4.2 No function or no display.</td><td>Major</td></tr>
<tr><td>4.3 Display malfunction.</td><td>Major</td></tr>
<tr><td>4.4 LCD viewing angle defect.</td><td>Major</td></tr>
<tr><td>4.5 Current consumption exceeds product specifications.</td><td>Major</td></tr>
<tr><td>4.6Mura cannot be seen through 5% ND filter at 50% Gray , should be judged by the viewing angle of 90 degree.</td><td>Minor</td></tr>
<tr><td>05</td><td>Dot defect

(Bright dot, Dark dot)

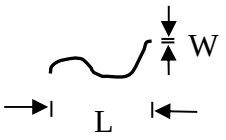
On -display</td><td>
<table>
<tr><th colspan="2">Item</th><th>Acceptance (Q’ty)</th></tr>
<tr><td rowspan="4">Dot Defect</td><td>Bright Dot</td><td>≦ 4</td></tr>
<tr><td>Dark Dot</td><td>≦ 5</td></tr>
<tr><td>Joint Dot</td><td>≦ 3</td></tr>
<tr><td>Total</td><td>≦ 7</td></tr>
</table>
5.1 Inspection pattern: full white, full black, Red, Green and blue screens.
5.2 It is defined as dot defect if defect area ＞1/2 dot.
5.3 The distance between two dot defect ≧5 mm.
5.4 Bright dot : Dots appear bright and unchanged in visible with 5% ND filter is defined.
5.5 Tiny bright dot: bright dot area ≦1/2 dot.
a. Dots appear bright and unchanged in visible with 5% ND filter is defined defect and is judged in accordance with 6.1
b. Dots invisible with 5% ND Filter is Ignored.
</td><td>Minor</td></tr>
</table>

◆Specification For TFT-LCD Module 3.5″ ~15″ : (Ver.B01)

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td>06</td><td>Black or white Dot, scratch, contamination

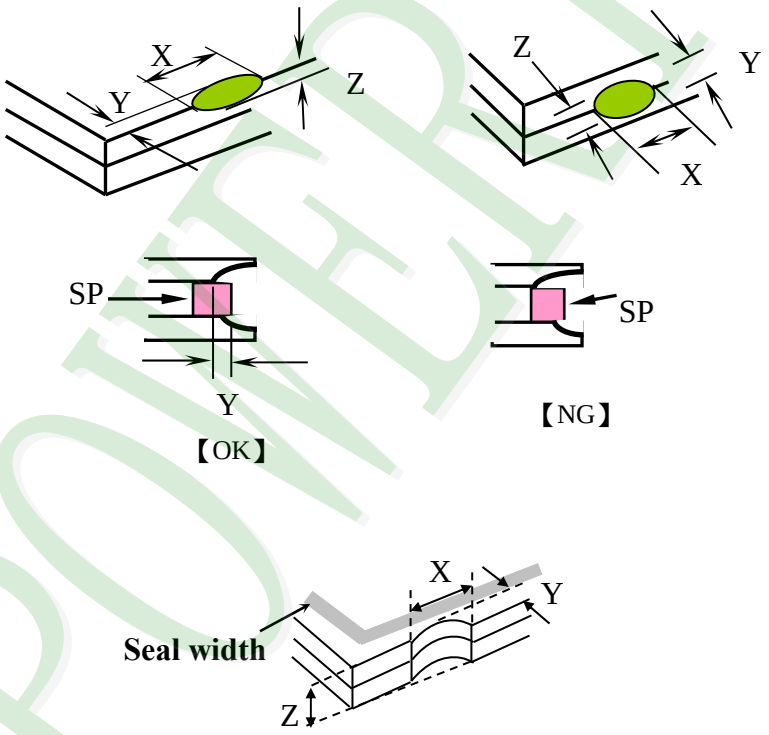
Round type
 

Φ=(x+y) / 2

Line type
 
</td><td>6.1 Round type (Non-display or display):
<table><tr><th rowspan="2">Dimension (diameter：Φ)</th><th colspan="2">Acceptance (Q’ty)</th></tr><tr><th>A area</th><th>B area</th></tr><tr><td>Φ ≦ 0.25</td><td>Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>0.25 ＜ Φ ≦ 0.50</td><td>5</td></tr><tr><td>Φ ＞ 0.50</td><td>0</td></tr><tr><td>Total</td><td>5</td></tr></table>6.2 Line type(Non-display or display):
<table><tr><th rowspan="2">module size</th><th rowspan="2">Length (L)</th><th rowspan="2">Width (W)</th><th colspan="2">Acceptance (Q’ty)</th></tr><tr><th>A area</th><th>B area</th></tr><tr><td rowspan="5">3.5” to less 9”</td><td>---</td><td>W ≦ 0.03</td><td>Ignore</td><td rowspan="5">Ignore</td></tr><tr><td>L ≦10.0</td><td>0.03 ＜W ≦ 0.05</td><td>4</td></tr><tr><td>L ≦5.0</td><td>0.05 ＜W ≦ 0.10</td><td>2</td></tr><tr><td>---</td><td>W ＞0.10</td><td>As round type</td></tr><tr><td colspan="2">Total</td><td>5</td></tr><tr><td rowspan="4">9” to 15”</td><td>---</td><td>W ≦ 0.05</td><td>Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>L ≦10.0</td><td>0.05 ＜W ≦ 0.10</td><td>5</td></tr><tr><td>---</td><td>W ＞0.10</td><td>As round type</td></tr><tr><td colspan="2">Total</td><td>5</td></tr></table></td><td>Minor</td></tr>
<tr><td>07</td><td>Polarizer Bubble</td><td><table><tr><th rowspan="2">Dimension (diameter: Φ)</th><th colspan="2">Acceptance (Q’ty)</th></tr><tr><th>A area</th><th>B area</th></tr><tr><td>Φ ≦ 0.25</td><td>Ignore</td><td rowspan="5">Ignore</td></tr><tr><td>0.25 ＜ Φ ≦ 0.50</td><td>4</td></tr><tr><td>0.50 ＜ Φ ≦ 0.80</td><td>1</td></tr><tr><td>Φ ＞0.80</td><td>0</td></tr><tr><td>Total</td><td>5</td></tr></table></td><td>Minor</td></tr>
</table>

◆Specification For TFT-LCD Module 3.5″ ~15″：

(Ver.B01)

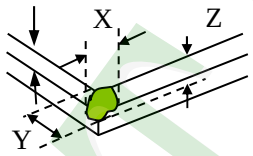
NO	Item	Criterion	Level
08	The crack of glass	Symbols： X: The length of crack　Y: The width of crack. Z: The thickness of crack　W: terminal length t: The thickness of glass　a: LCD side length 8.1 General glass chip: 8.1.1 Chip on panel surface and crack between panels:  	Minor

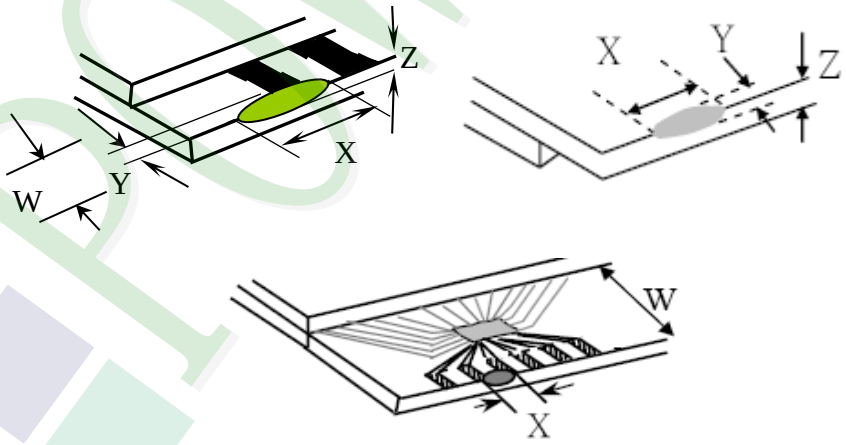
X	Y	Z
≦ a	Crack can't enter viewing area	≦1/2 t
≦ a	Crack can't exceed the half of SP width.	1/2 t < Z ≦2 t

◆Specification For TFT-LCD Module 3.5″ ~15″ : (Ver.B01)

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td rowspan="2">08</td><td rowspan="2">The crack of glass</td><td>
Symbols :

X: The length of crack Y: The width of crack.
Z: The thickness of crack W: terminal length
t: The thickness of glass a: LCD side length

8.1.2 Corner crack:


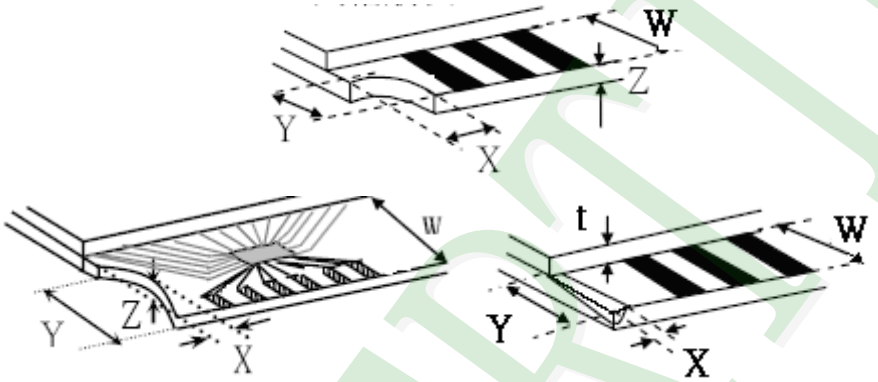
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦1/5 a</td><td>Crack can’t enter viewing area</td><td>Z ≦ 1/2 t</td></tr>
<tr><td>≦1/5 a</td><td>Crack can’t exceed the half of SP width.</td><td>1/2 t < Z ≦ 2 t</td></tr>
</table>
</td><td rowspan="2">Minor</td></tr>
<tr><td>
8.2 Protrusion over terminal:
8.2.1 Chip on electrode pad:


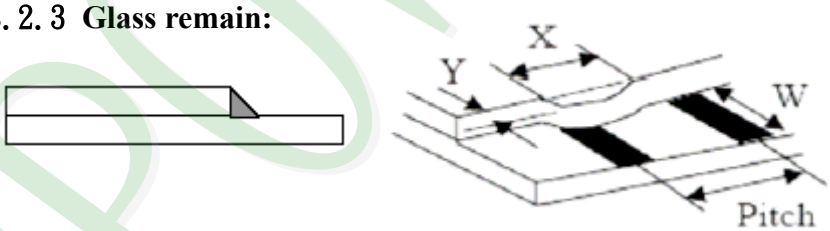
<table>
<tr><th></th><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>Front</td><td>≦ a</td><td>≦ 1/2 W</td><td>≦ t</td></tr>
<tr><td>Back</td><td>≦ a</td><td>≦ W</td><td>≦ 1/2 t</td></tr>
</table>
</td></tr>
</table>

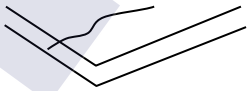
◆Specification For TFT-LCD Module 3.5″ ~15″ : (Ver.B01)

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>Level</th></tr>
<tr><td>08</td><td>The crack of glass</td><td>
Symbols:

X: The length of crack Y: The width of crack.
Z: The thickness of crack W: terminal length
t: The thickness of glass a: LCD side length

8.2.2 Non-conductive portion:


<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦ 1/3 a</td><td>≦ W</td><td>≦t</td></tr>
</table>
⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.
8.2.3 Glass remain:


<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≦ a</td><td>≦ 1/3 W</td><td>≦t</td></tr>
</table>
8.2.4 Cracking:

Not Allowed
</td><td>Minor</td></tr>
</table>

◆Specification For TFT-LCD Module 3.5″ ~15″：

(Ver.B01)

NO	Item	Criterion	Level
09	Backlight elements	9.1 Backlight can't work normally.	Major
		9.2 Backlight doesn't light or color is wrong.	Major
		9.3 Illumination source flickers when lit.	Major
10	General appearance	10.1 Pin type、quantity、dimension must match type in structure diagram.	Major
		10.2 No short circuits in components on PCB or FPC.	Major
		10.3 Parts on PCB or FPC must be: no wrong parts, missing parts or excess parts.	Major
		10.4 Product packaging must the same as specified on packaging specification sheet.	Minor
		10.5 The folding and peeled off in polarizer are not acceptable.	Minor
		10.6 The PCB or FPC between B/L assembled distance(PCB or FPC) is ≦1.5 mm.	Minor

4. RELIABILITY TEST

4.1 Reliability Test Condition (Ver.B01)

<table>
<tr><th>NO.</th><th>TEST ITEM</th><th>TEST CONDITION</th></tr>
<tr><td>1</td><td>High Temperature Storage Test</td><td>Keep in +80 ±5℃ 240 hrs</td></tr>
<tr><td>2</td><td>Low Temperature Storage Test</td><td>Keep in -30 ±5℃ 240 hrs</td></tr>
<tr><td>3</td><td>High Temperature / High Humidity Storage Test</td><td>Keep in +60 ℃ / 90% R.H duration for 240 hrs
(Excluding the polarizer)</td></tr>
<tr><td>4</td><td>Temperature Cycling Storage Test</td><td>-30℃ → +25℃ →+80℃ → +25℃
(30mins) (5mins) (30mins) (5mins)
20 Cycle</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">ESD Test</td><td>Air Discharge:
Apply 2 KV with 5 times Discharge for each polarity +/-
Contact Discharge:
Apply 250 V with 5 times discharge for each polarity +/-</td></tr>
<tr><td>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%)</td></tr>
<tr><td>6</td><td>Vibration Test (Packaged)</td><td>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</td></tr>
<tr><td>7</td><td>Drop Test (Packaged)</td><td><table><tr><th>Packing Weight (Kg)</th><th>Drop Height (cm)</th></tr><tr><td>0 ~ 45.4</td><td>122</td></tr><tr><td>45.4 ~ 90.8</td><td>76</td></tr><tr><td>90.8 ~ 454</td><td>61</td></tr><tr><td>Over 454</td><td>46</td></tr></table>Drop Direction :※1 corner / 3 edges / 6 sides each 1time</td></tr>
</table>

Result Evaluation Criteria :

Under the display quality test conditions with normal operations with normal operation state.
Do not change these conditions as such changes may affect practical display function.
(Normal operation state)
Temperature：+20~30°C, Humidity：50~70%, Atmospheric pressure：86~106Kpa

NOTE:

In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

5. PRECAUTION RELATING PRODUCT HANDLING

5.1 SAFETY

5.1.1 If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.

5.1.2 If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

5.2 HANDLING

5.2.1 Avoid any strong mechanical shock which can break the glass.

5.2.2 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.

5.2.3 Do not remove the panel or frame from the module.

5.2.4 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.)

5.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

5.2.6 Do not touch the display area with bare hands, this will stain the display area.

5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

5.2.8 To control temperature and time of soldering is 320 ± 10°C and 3-5 sec.

5.2.9 To avoid liquid (include organic solvent) stained on LCM

5.2.10 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.

5.2.11 CAUTION: Continuously displaying same static image will result in high possibility of image sticking/image burn-in effect due to TFT panel characteristic.

5.2.12 Double-sided tape designed to be attach with the customer's mechanical device, please follow up the rules and regulations published by the original manufacturer of double-sided tape for the attachment operation.

5.3 STORAGE

5.3.1 Store the panel or module in a dark place where the temperature is 25°C ± 5°C and the humidity is below 65% RH.

5.3.2 Do not place the module near organics solvents or corrosive gases.

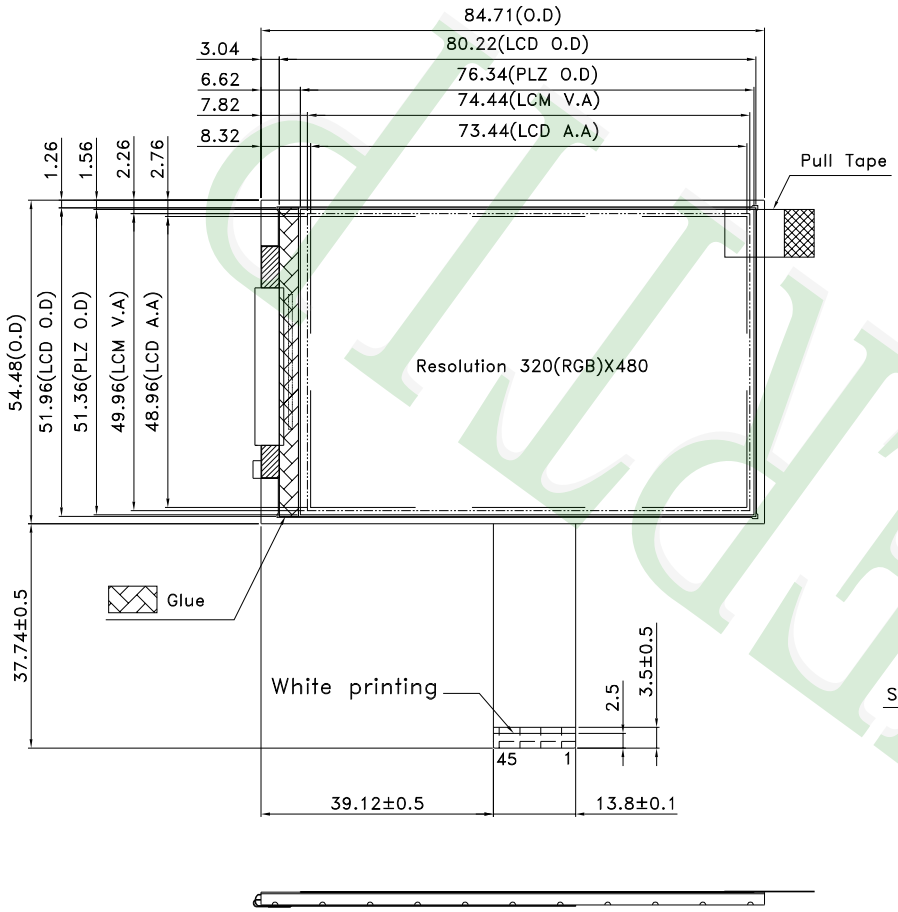
5.3.3 Do not crush, shake, or jolt the module.

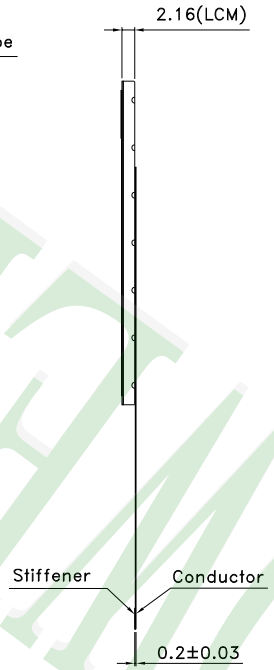
5.4 TERMS OF WARRANTY

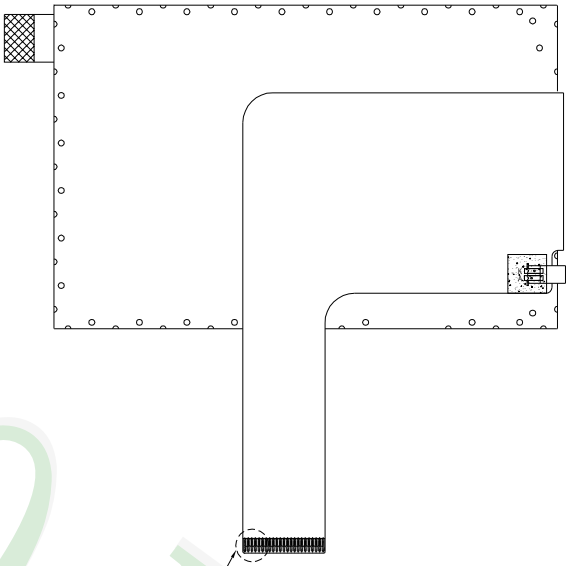
5.4.1 Applicable warrant period The period is within thirteen months since the date of shipping out under normal using and storage conditions.

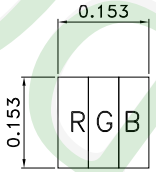
5.4.2 Unaccepted responsibility

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.

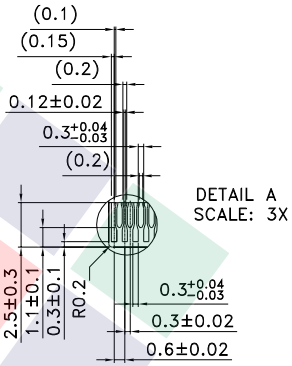








DOTS DETAIL
SCALE: 100X



DETAIL A
SCALE: 3X

NOTES:
1. LCD TYPE: IPS
2. LCD DISPLAY:Negative/Normally Black,Transmissive
3. The tolerance unless classified ±0.3mm
4. FPC suggested connector : "Hirose"FH26-45S-0.3SHW or compatible

REV	REV BY	REVISER	DATE
007			
006			
005			
004			
003			
002			
001	NEW DRAWING	Sally	2024/03/01

PART NO: PH320480T012-ZAA01

DRAWING NAME : JLMD-PH320480T012-ZAA01

TITLE: LCD MODULE DRAWING

久正光電股份有限公司
POWERTIP TECHNOLOGY CORPORATION

Design	Sally	(3)	Surface		
Check	Air	Unit	MM	Material	
Approve	LiuJin	Scale	FIT	Thickness	
		Page	1/1	Quantity	

Length(Min) (mm) \ Tolerance \ Precision	Precision Level
1 ~ 4	-
4 ~ 16	-
16 ~ 63	-
63 ~ 250	-
250 ~ 1000	-

PT-A-054-01

Ver.001

Documents NO.	JPKG-PH320480T012-ZAA01

包裝規格書
Packaging Specifications
(For Tray)

Approve	Check	Contact
Liujin	Air	Sally

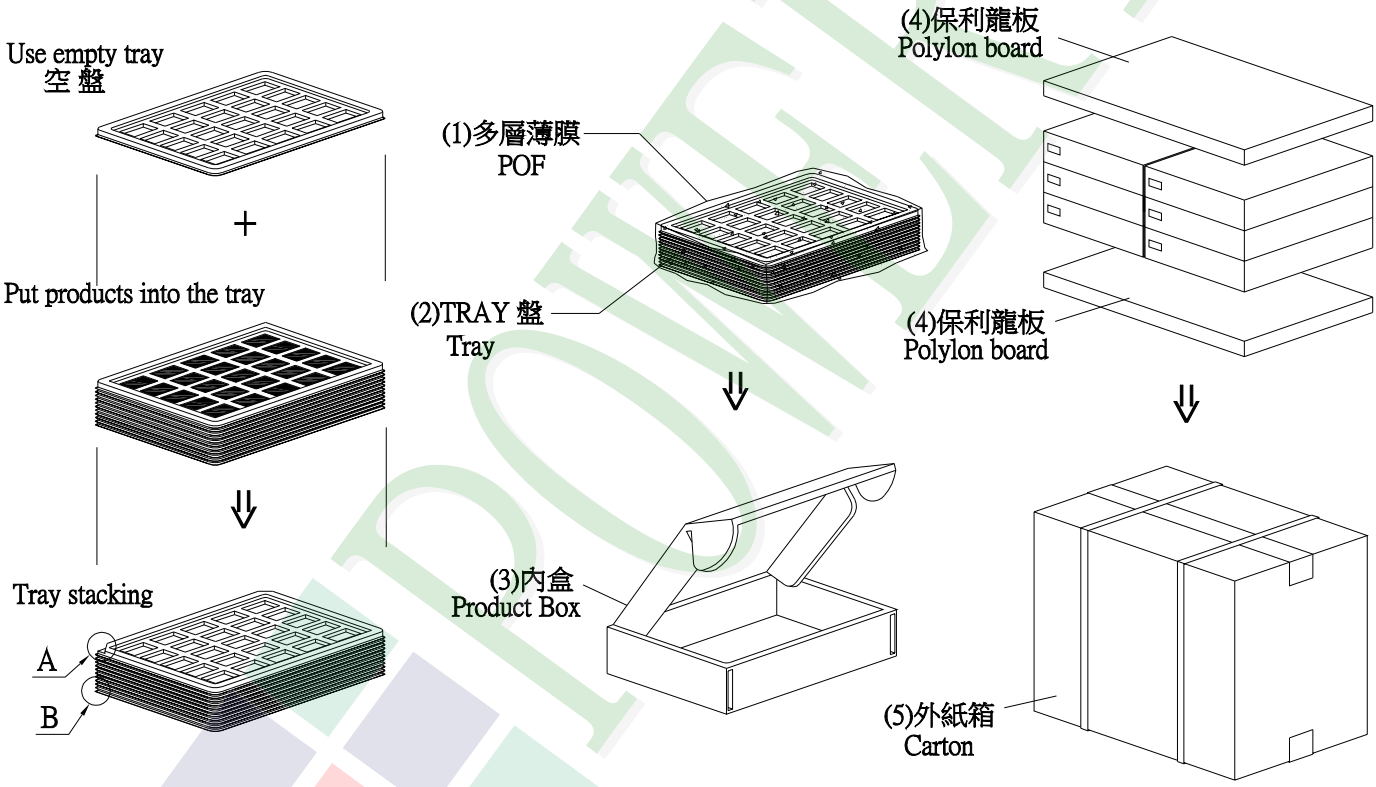
1.包裝材料規格表 (Packaging Material) : (per carton)

No.	Item	Model	Dimensions (mm)	1Pcs Weight	Quantity	Total Weight
1	成品 (LCM)	PH320480T012-ZAA01	84.71 X 54.48 X 2.16	0.0202	288	5.8176
2	多層薄膜(1)POF	OTFILM0BA03ABA	19"X350X0.015	——	6	——
3	TRAY 盤 (2)Tray	TYSG000000733	352 X 260 X 11.02	0.09	54	4.86
4	內盒(3)Product Box	BX36627063ABBA	383 X 270 X 66	0.182	6	1.092
5	保利龍板(4)Polylon board	OTPLB00PL08ABA	550 X 393 X 20	0.0284	2	0.0568
6	外紙箱(5)Carton	BX57041027CCBA	570 X 410 X 265	1.0	1	1.0
7						
8						
9						

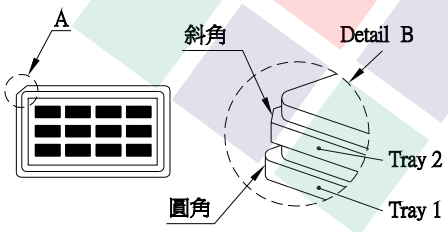
2.一 整箱總重量 (Total LCD Weight in carton) : 12.83 Kg±10%

3.單箱數量規格表 (Packaging Specifications and Quantity) :

(1)LCM quantity per box : no per tray	6	x no of tray	8	=	48
(2)Total LCM quantity in carton : quantity per box	48	x no of boxes	6	=	288



特 記 事 項 (REMARK)



4.TRAY盤相疊時,需旋轉180度,請詳見B視圖
Rotate tray 180 degrees and place on top of stack.
Check the tray stack using Fig. B.