



## SPECIFICATIONS

CUSTOMER	:	PTC
SAMPLE CODE	:	SH320240T023-IBC
MASS PRODUCTION CODE	:	PH320240T023-IBC
SAMPLE VERSION	:	02
SPECIFICATIONS EDITION	:	006
DRAWING NO. (Ver.)	:	LMD-PH320240T023-IBC_003
PACKAGING NO. (Ver.)	:	JPKG-PH320240T023-IBC_003

**Customer Approved**

Date:



Approved	Checked	Designer
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- Preliminary specification for design input
- Specification for sample approval

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**History of Version**

Date	Ver.	Edi.	Description	Page	Design by
08/23/2013	01	001	New Drawing.	-	Ackey
09/12/2013	01	002	New Sample	-	Ackey
09/24/2013	01	003	Update Data.	-	Ackey
04/03/2014	01	004	Modify TP content. Add CN & Initcode.	8,13, Appendix	Ackey
08/25/2015	01	005	Show Backlight Life Time	8	張斌
09/25/2018	02	006	Second Sample(Change CTP)	-	陳璐

Total: 35 Page

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Note : For detailed information please refer to IC data sheet :

Primacy(TFT LCD): Himax: HX8238-D

## 1. SPECIFICATIONS

### 1.1 Features

#### Main LCD Panel

Item	Standard Value
Display Type	320* (R · G · B) * 240 Dots
LCD Type	Normally white , Transmissive type
Touch panel	Projective capacitive touch panel True Multi-touch with up to 5 Points of Absolution
Screen size(inch)	3.5(Diagonal)
Viewing Direction	6 O'clock
Color configuration	R.G.B. vertical stripe
Interface	Digital 24-bits Parallel RGB HSYNC,VSYNC,3Wires SPI
Other (controller / driver IC)	Himax:HX8238-D
ROHS	THIS PRODUCT CONFORMS THE ROHS OF PTC Detail information please refer website : <a href="http://www.powertip.com.tw/news.php?area_id_view=1085560481/">http://www.powertip.com.tw/news.php?area_id_view=1085560481/</a>

### 1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension(T/P)	84.02(W) x 75.36 (L) x 5.2(H)(MAX)	mm

#### LCD panel

Item	Standard Value	Unit
Active Area	70.08 (W) x 52.56 (L)	mm

#### Touch panel

Item	Standard Value	Unit
Viewing Area	71.68 (W) * 54.16 (L)	mm

Note : For detailed information please refer to LCM drawing

### 1.3 Absolute Maximum Ratings

#### Module

Item	Symbol	Condition	Min.	Max.	Unit
System Power Supply Voltage	VDD	GND=0	-0.3	4.0	V
Booster Reference Supply Voltage	VCI	GND=0	GND-0.3	3.96	V
Operating Temperature	T <sub>OP</sub>	Excluded T/P	-20	70	°C
Storage Temperature	T <sub>ST</sub>	Excluded T/P	-30	80	°C

### 1.4 DC Electrical Characteristics

#### Module

GND = 0V, Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply Voltage	VDD	-	3.0	3.3	3.6	V
Booster Reference Supply Voltage	VCI	-	3.0	3.3	3.6	V
V <sub>COM</sub> High Voltage	V <sub>COMH</sub>	-	-	-	5.54	V
V <sub>COM</sub> Low Voltage	V <sub>COML</sub>	-	-2.8	-	-	V
Input H/L Level Voltage	V <sub>IH</sub>	-	0.8VDD	-	VDD	V
	V <sub>IL</sub>	-	0	-	0.2VDD	V
Output H/L Level Voltage	V <sub>OH</sub>	-	0.9VDD	-	VDD	V
	V <sub>OL</sub>	-	-	-	0.1VDD	V
Supply Current	IDD	VDD=VCI=3.3V*1	-	9	14	mA

Note1: Maximum current display.

## 1.5 Optical Characteristics

### TFT LCD Panel

VDD=VCI=3.3V, Ta=25°C

Item	Symbol	Condition	Min.	Typ.	Max.	unit	-	
Response time	Tr + Tf	-	-	40	60	ms	Note2	
Viewing angle	Top	$\theta Y+$	CR $\geq$ 10	-	60	-	Deg.	Note4
	Bottom	$\theta Y-$		-	60	-		
	Left	$\theta X-$		-	60	-		
	Right	$\theta X+$		-	60	-		
Contrast ratio	CR		500	600	-	-	Note3	
Color of CIE Coordinate (With B/L & T/P )	White	X	IF= 20 mA	0.27	0.32	0.37	-	Note1
		Y		0.29	0.34	0.39		
	Red	X		0.57	0.62	0.67		
		Y		0.31	0.36	0.41		
	Green	X		0.29	0.34	0.39		
		Y		0.56	0.61	0.66		
	Blue	X		0.09	0.14	0.19		
		Y		0.03	0.08	0.13		
Average Brightness Pattern=white display	IV	IF= 20 mA	350	400	-	cd/m <sup>2</sup>	Note1	
Uniformity	$\Delta B$		80	-	-	%	Note1	

Note1:

1 :  $\Delta B = B(\min) / B(\max) \times 100\%$

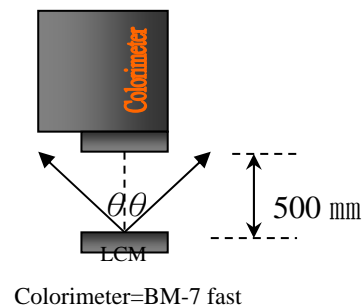
2 : Measurement Condition for Optical Characteristics:

a : Environment: 25°C  $\pm$  5°C / 60  $\pm$  20% R.H , no wind , dark room below 10 Lux at typical lamp current and typical operating frequency.

b : Measurement Distance: 500  $\pm$  50 mm , ( $\theta = 0^\circ$ )

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

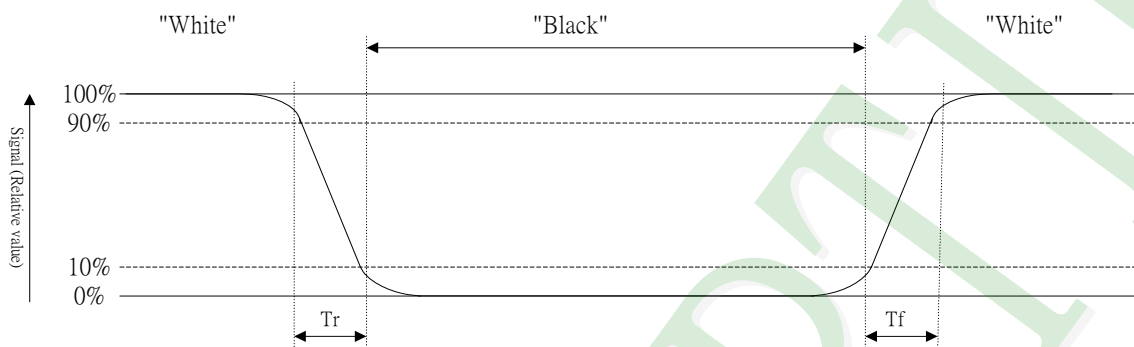
d : The uncertainty of the C.I.E coordinate measurement  $\pm 0.01$  , Average Brightness  $\pm 4\%$



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:



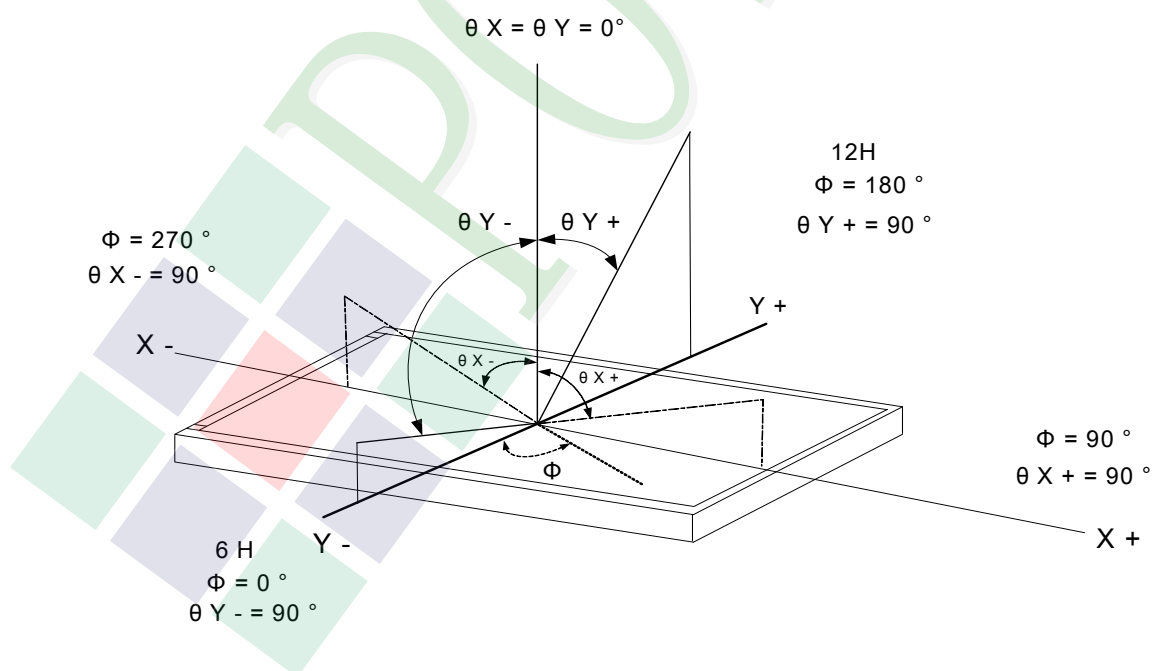
Note3: Definition of contrast ratio:

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°C	-	30	mA
Reverse Voltage	VR	Ta =25°C	-	5	V
Power Dissipation	PD	Ta =25°C	-	30*21	mW

### Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF= 20 mA	16.8	19.2	21.0	V
Luminance	Lv		4500	6000	8500	cd/m <sup>2</sup>
Color of CIE Coordinate (Without LCD & TP)	X		0.28	-	0.32	-
	Y		0.28	-	0.32	
Color		White				

### Internal Circuit Diagram



### Other Description

Item	Conditions	Description
Life Time	Ta =25°C IF= 20mA	20000 hrs



## 1.7 Touch Panel Characteristics

### Features

Item	Standard Value
Touch Panel Size	3.5"
Touch type	Projected Capacitive Touch True Multi-Touch Capacitive Touch Panel
Input Method	True Multi-touch with up to 5 Points of Absolution X and Y Coordinates
Output Interface	I <sup>2</sup> C
IC	FT5346

### I<sup>2</sup>C Address

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	1	1	0	0	0	R/W

Bit 0: 0 for Write / 1 for Read

### Mechanical Specifications

Item	Standard Value	Unit
Viewing Area	71.68 mm (W) x 63.50mm (H)	mm
Number of sensing channel	16 (W) x 10 (H)	mm

### Absolute Maximum Ratings

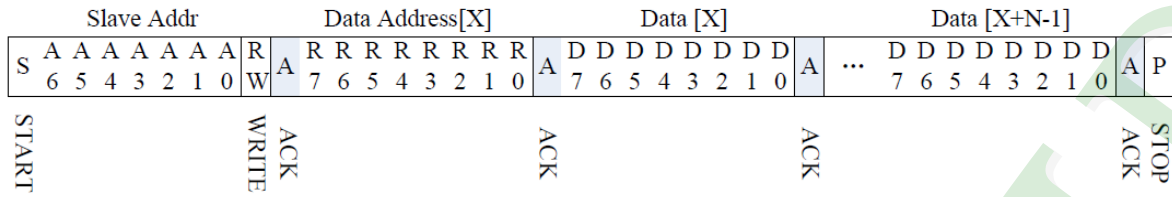
Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	VDD	-	-0.3	3.6V	V
Operating Temperature	T <sub>OP</sub>	-	-20	+70	°C
Storage Temperature	T <sub>ST</sub>	-	-30	+80	°C

### DC Electrical Characteristics

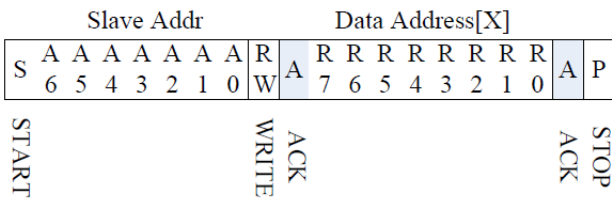
Item	Symbol	Condition	Min	Typ	Max	Unit
Power Supply Voltage	VDD	-	3.0	3.3	3.6	V

## I<sup>2</sup>C Read/Write Interface description

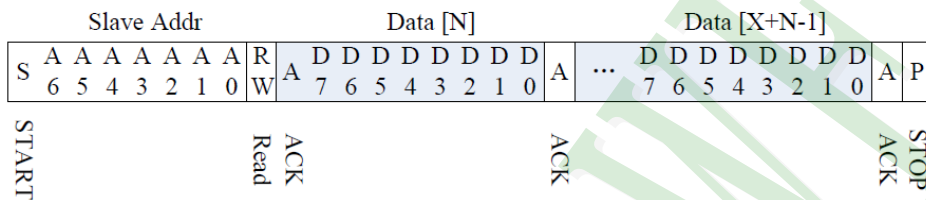
### Write N bytes to I2C slave



### Set Data Address



### Read X bytes from I2C Slave



### Mnemonics Description

Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address A[6:0]:0111000b
R/ W	'1' for read, '0' for write
A(N)	ACK(NACK)
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

### Timing Characteristics

Parameter	Unit	Min	Max
SCL frequency	KHz	0	400
Bus free time between a STOP and START condition	us	4.7	\
Hold time (repeated) START condition	us	4.0	\
Data setup time	ns	250	\
Setup time for a repeated START condition	us	4.7	\
Setup Time for STOP condition	us	4.0	\

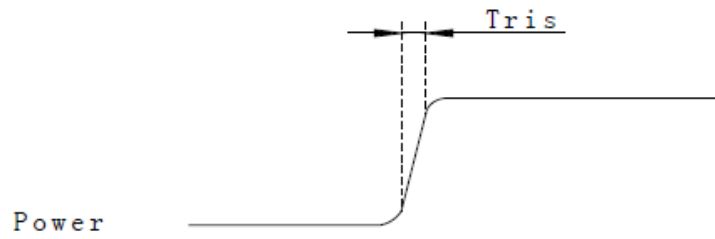


Figure 2-6-1: Power on time

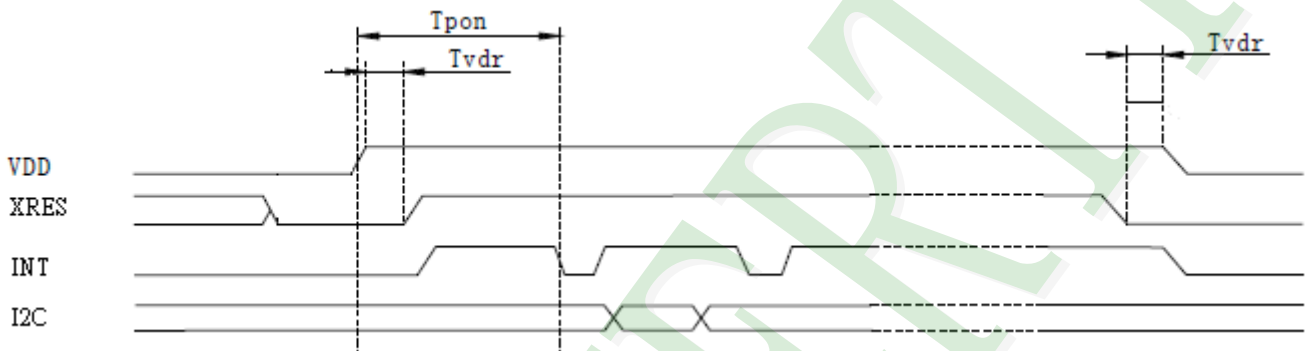


Figure 2-6-2: Power on Sequence

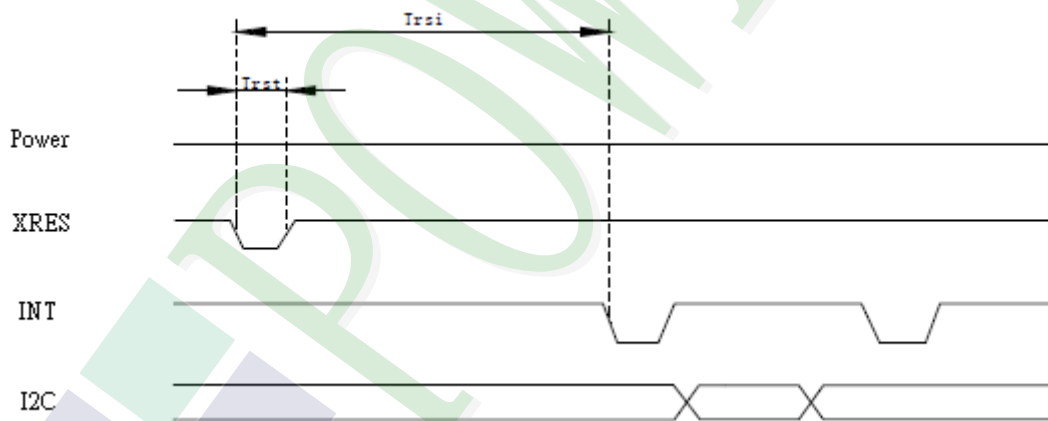


Figure 2-6-3: Reset Sequence

Power on / Reset Sequence Parameters

Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Tpon	Time of starting to report point after powering on	200	--	ms
Tvdr	Reset time after VDD powering on	1	--	ms
Trsi	Time of starting to report point after resetting	200	--	ms
Trst	Reset time	1	--	ms

## Interrupt signal from CTP to Host

As for standard CTP, host need to use both interrupt control signal and serial data interface to get the touch data. There are two kind of method to use interrupt: interrupt trigger and interrupt query.

Here is the timing to get touch data.

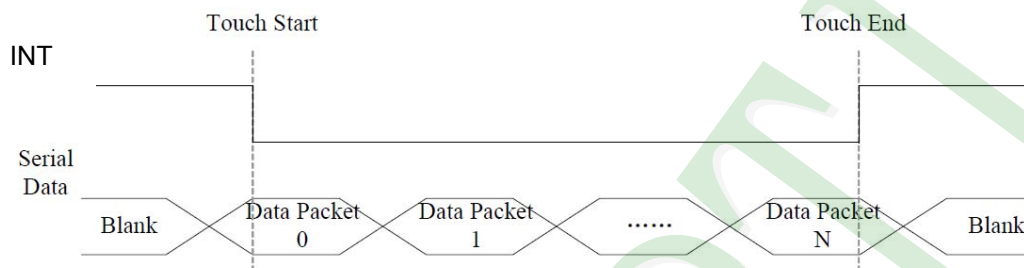


Figure 2-6-4: Interrupt query mode

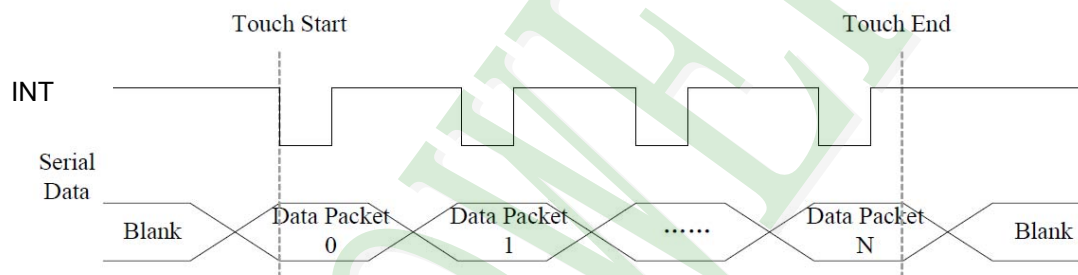


Figure 2-6-5: Interrupt trigger mode

Host use general I2C protocol to read the touch data or the information from CTP . CTP will send host a interrupt signal when there is a valid touch. Then host can use the serial data interface to get the touch data. If there is no valid touch detected, the INT will not be pulled up, the host do not need to read the touch data.

NOTE: “valid touch” may have different definition in various systems. For example, in some systems, the valid touch is defined as there is one more valid touch point. But in some other systems, the valid touch is defined as one more valid touch with valid gestures. In usual, INT will be pulled up when there is a valid touch point, and to be low when a touch finishes.

As for interrupt trigger mode, INT signal will be low if there is a touch detected. But for per update of valid touch data, CTP will produce a valid pulse for INT signal, host can read the touch data periodically according to the frequency of this pulse. In this mode, the pulse frequency is the touch data update frequency.

### 2.6.1.3 CTP Register Mapping

Address	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Host Access
00h	DEVIDE_MODE	-	Device Mode[2:0]			-	-	-	-	WR
01h	TD_STATUS	-	-	-	-	Number of touch points[3:0]				R
02h	TOUCH1_XH	1st Event Flag		-	-	1st Touch X Position[11:8]				R
03h	TOUCH1_XL	1st Touch X Position[7:0]								R
04h	TOUCH1_YH	1st Touch ID[3:0]			1st Touch Y Position[11:8]					R
05h	TOUCH1_YL	1st Touch Y Position[7:0]								R
06h	-	-								R
07h	-	-								R
08h	TOUCH2_XH	2st Event Flag		-	-	2st Touch X Position[11:8]				R
09h	TOUCH2_XL	2st Touch X Position[7:0]								R
0Ah	TOUCH2_YH	2st Touch ID[3:0]			2st Touch Y Position[11:8]					R
0Bh	TOUCH2_YL	2st Touch Y Position[7:0]								R
0Ch	-	-								R
0Dh	-	-								R
0Eh	TOUCH3_XH	3st Event Flag		-	-	3st Touch X Position[11:8]				R
0Fh	TOUCH3_XL	3st Touch X Position[7:0]								R
10h	TOUCH3_YH	3st Touch ID[3:0]			3st Touch Y Position[11:8]					R
11h	TOUCH3_YL	3st Touch Y Position[7:0]								R
12h	-	-								R
13h	-	-								R
14h	TOUCH4_XH	4st Event Flag		-	-	4st Touch X Position[11:8]				R
15h	TOUCH4_XL	4st Touch X Position[7:0]								R
16h	TOUCH4_YH	4st Touch ID[3:0]			4st Touch Y Position[11:8]					R
17h	TOUCH4_YL	4st Touch Y Position[7:0]								R
18h	-	-								R
19h	-	-								R
1Ah	TOUCH5_XH	5st Event Flag		-	-	5st Touch X Position[11:8]				R
1Bh	TOUCH5_XL	5st Touch X Position[7:0]								R
1Ch	TOUCH5_YH	5st Touch ID[3:0]			5st Touch Y Position[11:8]					R
1Dh	TOUCH5_YL	5st Touch Y Position[7:0]								R
1Eh	-	-								R
1Fh	-	-								R

### DEVICE\_MODE

This register is the device mode register, configure it to determine the current mode of the chip.

Address	Bit Address	Register Name	Description
00h	6 : 4	Device Mode [2:0]	000b Work Mode 100b Factory Mode – read raw data

### TD\_STATUS

This register is the Touch Data status register.

Address	Bit Address	Register Name	Description
01h	7 : 4	Reserved	
	3 : 0	Number of touch points[3:0]	How many points detected. 1-5 is valid.

### TOUCHn\_XH

This register describes MSB of the X coordinate of the nth touch point and the corresponding event flag.

Address	Bit Address	Register Name	Description
02h	7 : 6	Event Flag	00b: Put Down 01b: Put Up 10b: Contact 11b: Reserved
	5 : 4		Reserved
	3 : 0	Touch X Position [11:8]	MSB of Touch X Position in pixels

### TOUCHn\_XL

This register describes LSB of the X coordinate of the nth touch point

Address	Bit Address	Register Name	Description
03h	7 : 0	Touch X Position [7:0]	LSB of the Touch X Position in pixels

### TOUCHn\_YH

This register describes MSB of the Y coordinate of the nth touch point and corresponding touch ID.

Address	Bit Address	Register Name	Description
04h	7 : 4	Touch ID[3:0]	Touch ID of Touch Point
	3 : 0	Touch Y Position [11:8]	MSB of Touch Y Position in pixels

### TOUCHn\_YL

This register describes LSB of the Y coordinate of the nth touch point.

Address	Bit Address	Register Name	Description
05h~	7:0	Touch Y Position[7:0]	LSB of The Touch Y Position in pixels

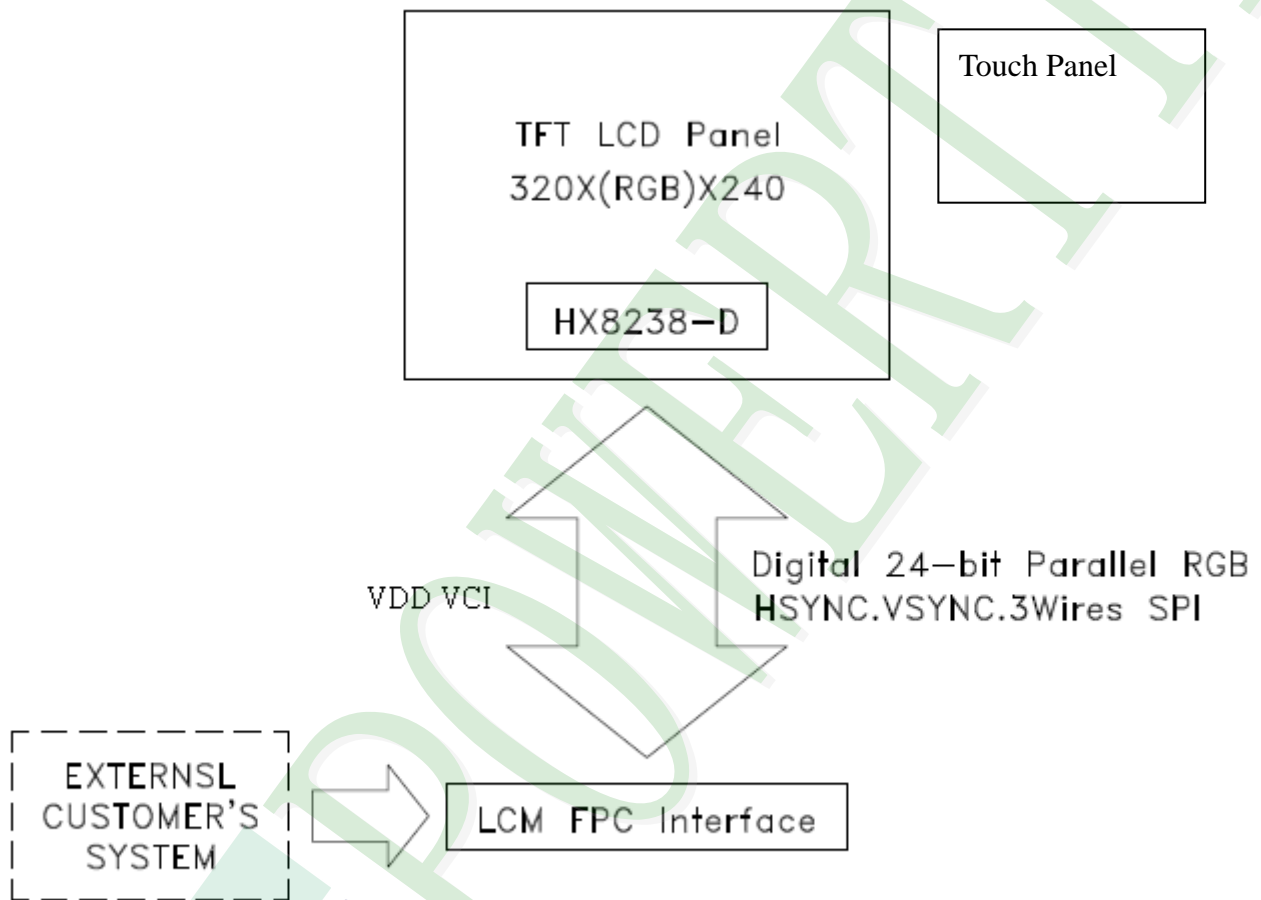
## 2. MODULE STRUCTURE

### 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	A	LED Anode.
2	K	LED Cathode.
3	GND	Ground.
4	VCI	Booster Reference Supply Voltage.
5	ID	Note1.
6	VDD	Power Supply Voltage.
7	GND	Ground.
8	RESB	Reset.
9	CSB	Chip select Input: CSB = L - selected and accessible. CSB = H - is not selected and not accessible.
10	SCK	SPI Clock Input.
11	SDO	SPI Data Output. The data is valid on the falling edge of the SCK signal.
12	SDI	SPI Data Input. The data is latched on the rising edge of the SCK signal.
13	GND	Ground.
14	B0	Graphic display Blue data.
15	B1	
16	B2	
17	B3	
18	B4	
19	B5	
20	B6	



Pin No.	Symbol	Function
21	B7	Graphic display Blue data.
22	G0	Graphic display Green data.
23	G1	
24	G2	
25	G3	
26	G4	
27	G5	
28	G6	
29	G7	
30	R0	Graphic display Red data.
31	R1	
32	R2	
33	R3	
34	R4	
35	R5	
36	R6	
37	R7	
38	GND	Ground.
39	DCLK	Video Clock Input. The data is latched on the rising edge of DCLK.
40	HSYNC	Horizontal Sync Input.
41	VSYNC	Vertical Sync Input.

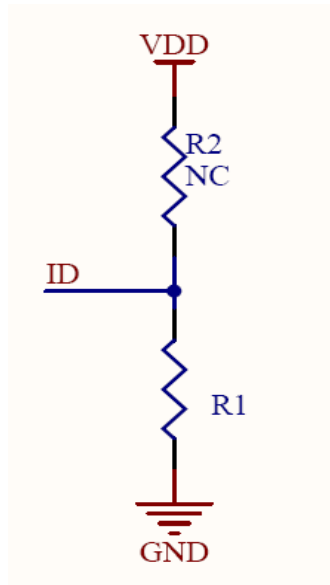
Pin No.	Symbol	Function
42	DEN	Video Data Enable Input. VSYNC+HSYNC mode - This pin is shorted to GND normally and the back/front porch is determined by the control register. VSYNC+HSYNC+DE mode - The valid data is determined by the VSYNC+HSYNC+DEN pin. DE mode - VSYNC and HSYNC are unused and shorted to GND. The valid input. data is determined by DEN pin.
43	GND	Ground.
44	SEL0	Note2.
45	SEL1	
46	SEL2	
47	NC	Not use.
48	NC	Not use.
49	NC	Not use.
50	NC	Not use.

## T/P PIN

Pin No.	Symbol	Function
1	GND	Ground.(T/P)
2	SDA	I <sup>2</sup> C Data.(T/P)
3	SCL	I <sup>2</sup> C Clock. (T/P)
4	VDD	Power.(T/P)
5	INT	The interrupt from the CTP to the Host. H:CTP interrupt not requested. L:CTP request interrupt.
6	XRES	XRES. (T/P)

### Note1: ID code Circuit

Vendor ID (On FPC, ID resistor as specified in vendor table shall be connected to this pin, and other side of the resistor shall be connected to GND)



**R1=44.2KΩ**

### Note2: Define the input interface mode

SEL2	SEL1	SEL0	Format	Operating frequency
0	0	0	Parallel-RGB data format (only support stripe type color filter)	6.5MHz
0	0	1	Serial-RGB data format	19.5MHz
0	1	0	CCIR 656 data format (640RGB)	24.54MHz
0	1	1	CCIR 656 data format (720RGB)	27MHz
1	0	0	YUV mode A data format (Cr-Y-Cb-Y)	24.54MHz
1	0	1	YUV mode A data format (Cr-Y-Cb-Y)	27MHz
1	1	0	YUV mode B data format (Cb-Y-Cr-Y)	27MHz
1	1	1	YUV mode B data format (Cb-Y-Cr-Y)	24.54MHz

Input format	DOTCLK Freq (MHz)	Display data	Active area (DOTCLK)
YUV mode	24.54	640	1280
	27	720	1440

### 2.2.1 Refer Initial code:

```
//Initial-----  
\void Initial_Main(void)  
{  
MOV    DPH,#00H           ;Register 0001  
MOV    DPL,#01H  
CALL   COM_SER  
MOV    DPH,#63H  
MOV    DPL,#00H  
CALL   DATA_SER  
  
MOV    DPH,#00H           ;Register 0002  
MOV    DPL,#02H  
CALL   COM_SER  
MOV    DPH,#02H  
MOV    DPL,#00H  
CALL   DATA_SER  
  
MOV    DPH,#00H           ;Register 0003  
MOV    DPL,#03H  
CALL   COM_SER  
MOV    DPH,#01100100B     ;DB3 ~ DB0  
MOV    DPL,#01100100B  
CALL   DATA_SER
```

MOV DPH,#00H ;Register 0004

MOV DPL,#04H

CALL COM\_SER

MOV DPH,#04H

MOV DPL,#C7H ;Parallel 24 bits

CALL DATA\_SER

MOV DPH,#00H ;Register 0005

MOV DPL,#05H

CALL COM\_SER

MOV DPH,#FCH

MOV DPL,#80H

CALL DATA\_SER

MOV DPH,#00H ;Register 000A

MOV DPL,#0AH

CALL COM\_SER

MOV DPH,#40H

MOV DPL,#08H

CALL DATA\_SER

MOV DPH,#00H ;Register 000D

MOV DPL,#0DH

CALL COM\_SER

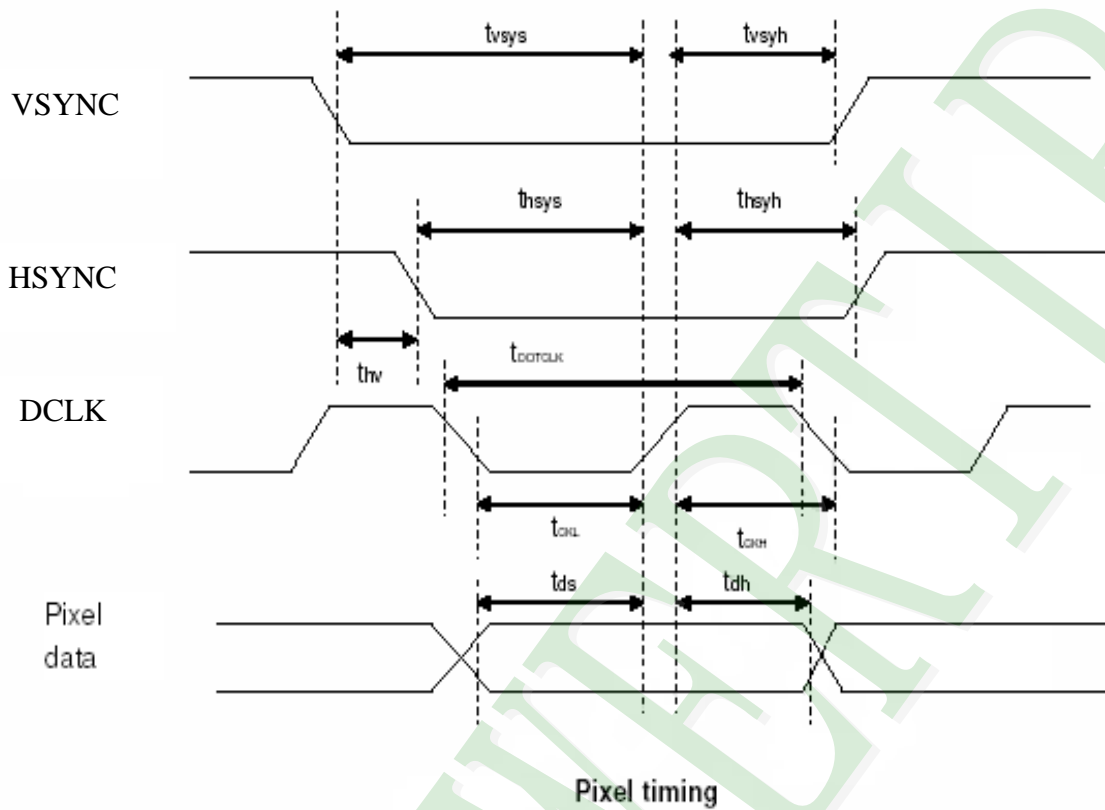
MOV DPH,#00000010B

```
MOV    DPL,#00110001B    ;DB5 ~ DB0  VLCD63
CALL   DATA_SER

MOV    DPH,#00H          ;Register 000E
MOV    DPL,#0EH
CALL   COM_SER
MOV    DPH,#00101110B    ;DB4 ~ DB0 VCOM
MOV    DPL,#10000000B    ;DB7 ~ DB6
CALL   DATA_SER

CALL   DELAY2
}
```

## 2.3 Timing Characteristics

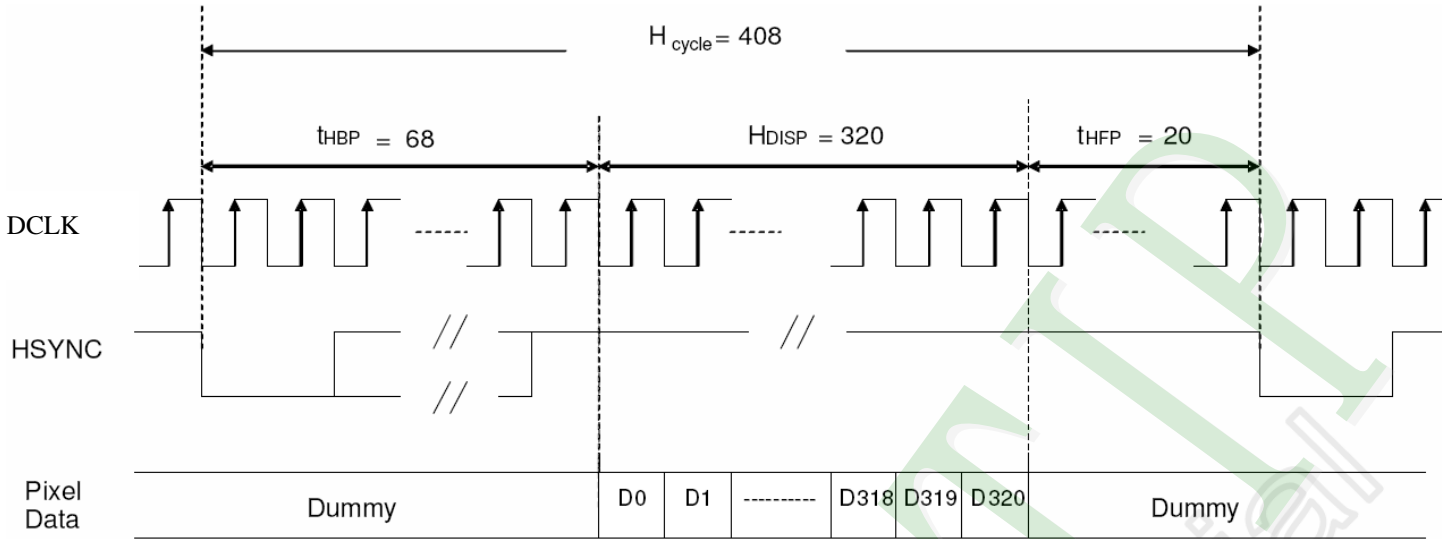


Characteristics	Symbol	Min		Typ		Max		Unit
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Vertical Sync Setup Time	tvsys	20	10	-	-	-	-	ns
Vertical Sync Hold Time	tvsyh	20	10	-	-	-	-	ns
Horizontal Sync Setup Time	thsys	20	10	-	-	-	-	ns
Horizontal Sync Hold Time	thsyh	20	10	-	-	-	-	ns
Phase difference of Sync Signal Falling Edge	thv	1		-		240		tDOTCLK
DOTCLK Low Period	tCKL	50	15	-	-	-	-	ns
DOTCLK High Period	tCKH	50	15	-	-	-	-	ns
Data Setup Time	tds	12	10	-	-	-	-	ns
Data hold Time	tdh	12	10	-	-	-	-	ns
Reset pulse width	tRES	10		-		-		us

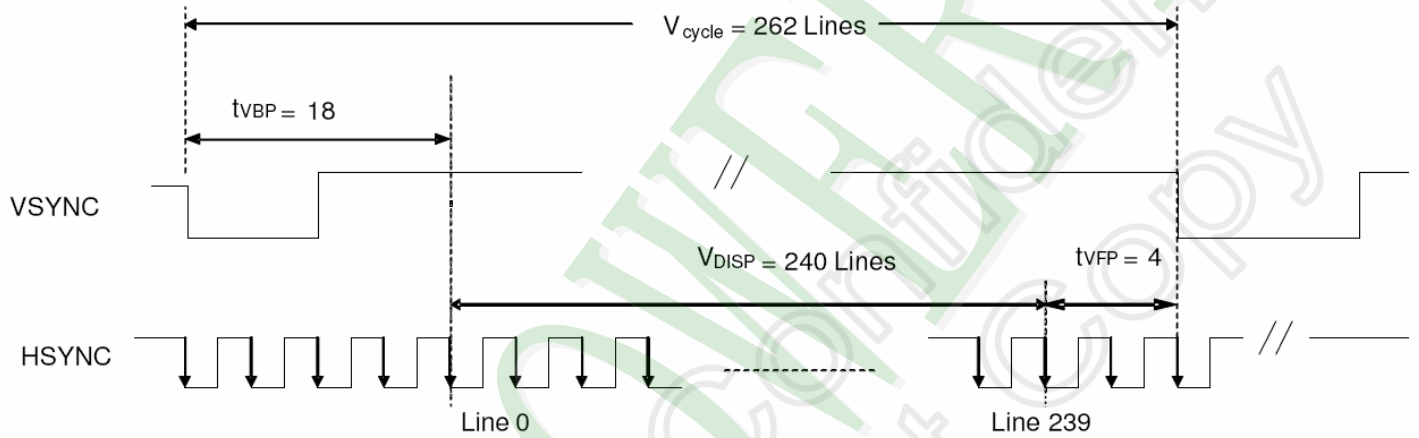
Note: External clock source must be provided to DOTCLK pin of HX8238-A. The driver will not operate if absent of the clocking signal.

Pixel timing

Note : The interface of this module can drive by digital 24-bit data.



a) Horizontal Data Transaction Timing



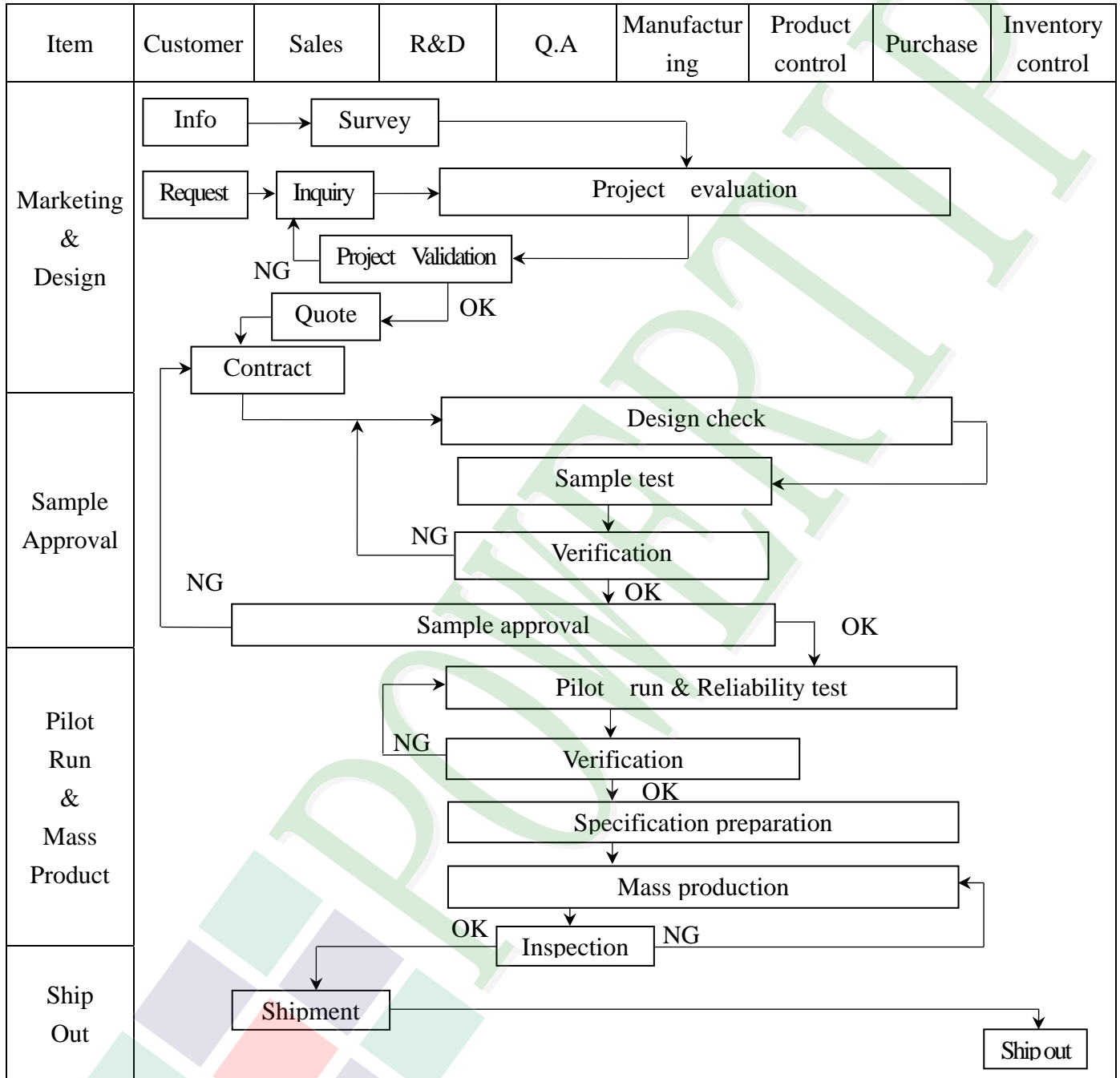
b) Vertical Data Transaction Timing

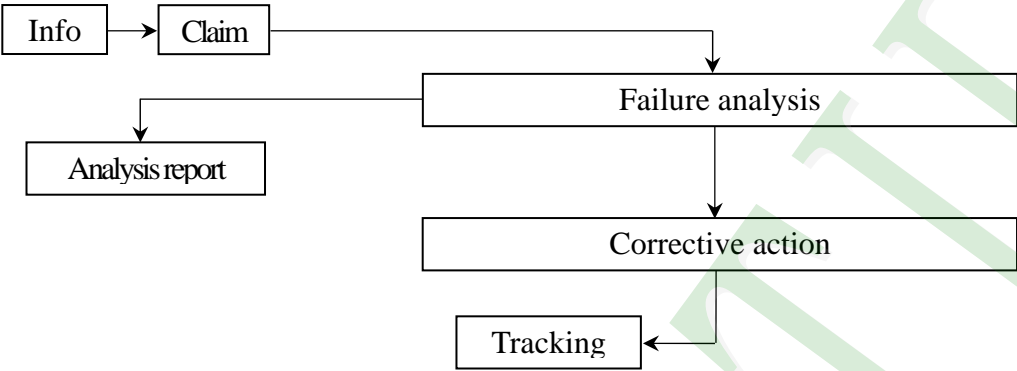
Data transaction timing in parallel RGB(24 bit)interface (SYNC mode)



### 3. QUALITY ASSURANCE SYSTEM

#### 3.1 Quality Assurance Flow Chart



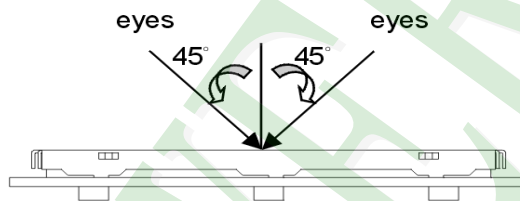
Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service	 <pre> graph TD     Info[Info] --&gt; Claim[Claim]     Claim --&gt; FA[Failure analysis]     Claim --&gt; AR[Analysis report]     FA --&gt; CA[Corrective action]     CA --&gt; Tracking[Tracking]         </pre>							
Q.A Activity	1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management				2. Process improvement proposal 4. Education And Training Activities			

### 3.2. Inspection Specification

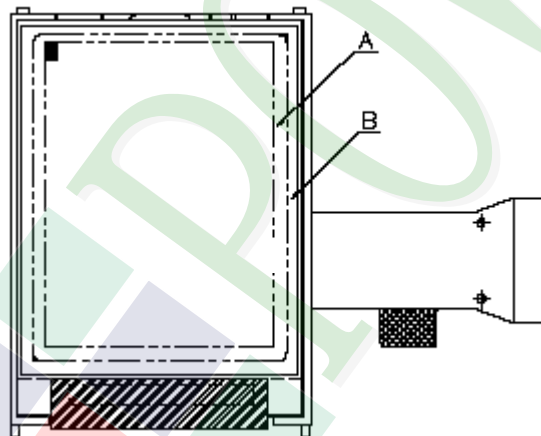
- ◆ Scope : The document shall be applied to TFT-LCD Module for 3.5" ~15" (Ver.B01).
- ◆ Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II.
- ◆ Equipment : Gauge 、 MIL-STD 、 Powertip Tester 、 Sample
- ◆ Defect Level : Major Defect AQL : 0.4 ; Minor Defect AQL : 1.5
- ◆ 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 , and distance of view must be at 30 cm.
- (2). The test direction is base on about around 45° of vertical line.



(3). Definition of area.



**A** area : viewing area

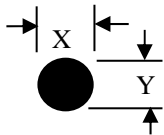
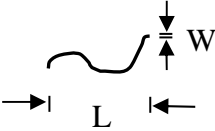
**B** area : Outside of viewing area

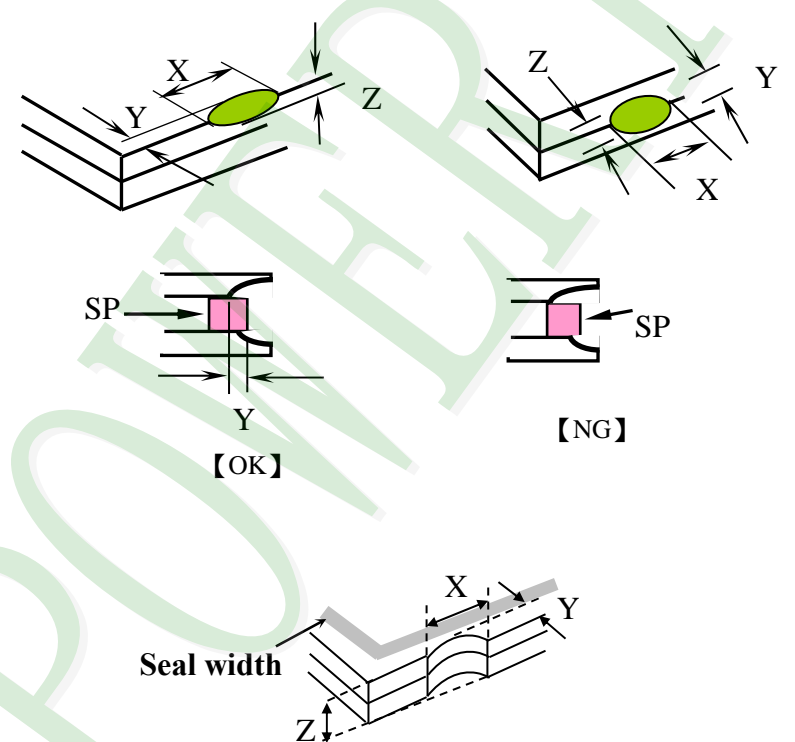
(4). Standard of inspection : (Unit : mm)

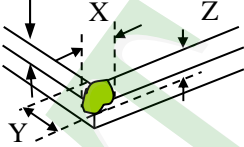
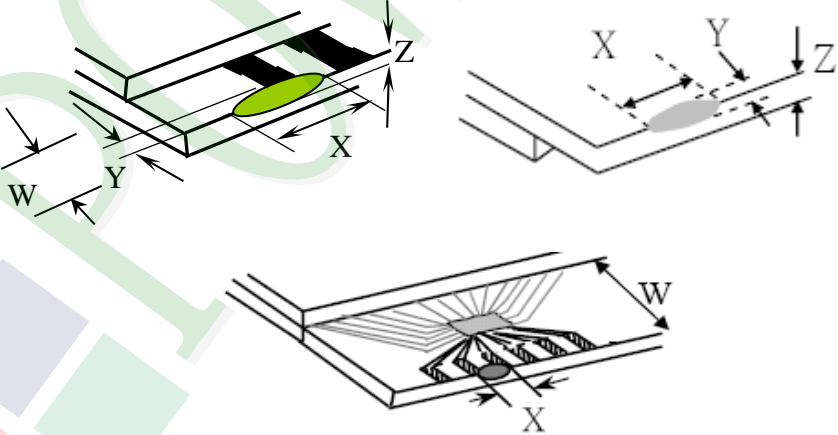
◆Specification For TFT-LCD Module 3.5" ~15" :

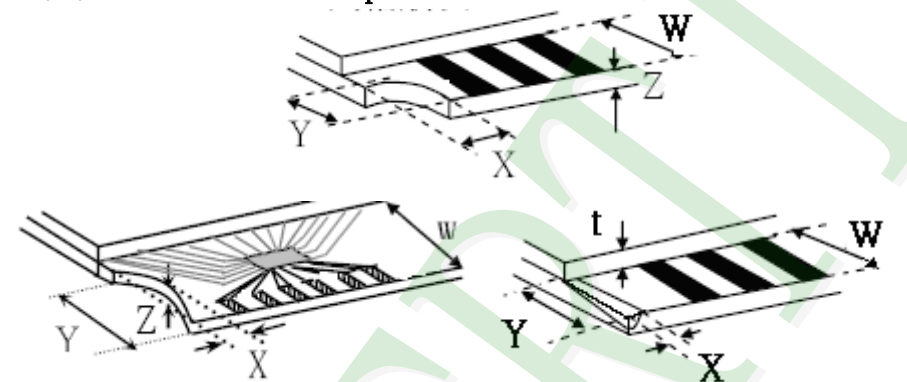
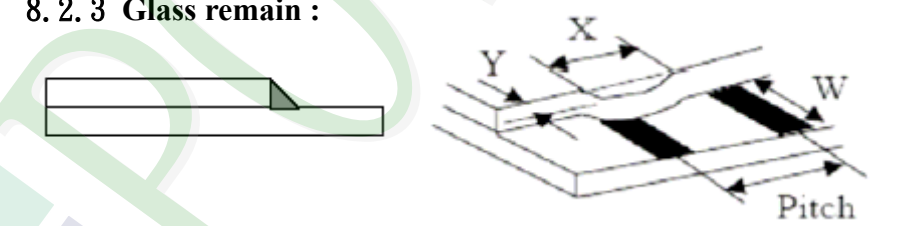
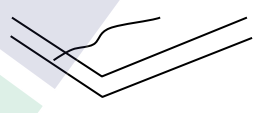
(Ver.B01)

NO	Item	Criterion	Level												
01	Product condition	1. 1 The part number is inconsistent with work order of production.	Major												
		1. 2 Mixed product types.	Major												
		1. 3 Assembled in inverse direction.	Major												
02	Quantity	2. 1 The quantity is inconsistent with work order of production.	Major												
03	Outline dimension	3. 1 Product dimension and structure must conform to structure diagram.	Major												
04	Electrical Testing	4. 1 Missing line character and icon.	Major												
		4. 2 No function or no display.	Major												
		4. 3 Display malfunction.	Major												
		4. 4 LCD viewing angle defect.	Major												
		4. 5 Current consumption exceeds product specifications.	Major												
		4. 6 Mura can not be seen through 5% ND filter. (Mura : Under the normal examination angle of view, the picture has the non-uniform phenomenon.)	Minor												
05	Dot defect (Bright dot 、 Dark dot) On -display	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Item</th> <th>Acceptance (Q'ty)</th> </tr> </thead> <tbody> <tr> <td rowspan="4" style="text-align: center; vertical-align: middle;">Dot Defect</td> <td>Bright Dot</td> <td style="text-align: center;"><math>\leq 4</math></td> </tr> <tr> <td>Dark Dot</td> <td style="text-align: center;"><math>\leq 5</math></td> </tr> <tr> <td>Joint Dot</td> <td style="text-align: center;"><math>\leq 3</math></td> </tr> <tr> <td>Total</td> <td style="text-align: center;"><math>\leq 7</math></td> </tr> </tbody> </table>		Item	Acceptance (Q'ty)	Dot Defect	Bright Dot	$\leq 4$	Dark Dot	$\leq 5$	Joint Dot	$\leq 3$	Total	$\leq 7$	Minor
			Item	Acceptance (Q'ty)											
Dot Defect	Bright Dot	$\leq 4$													
	Dark Dot	$\leq 5$													
	Joint Dot	$\leq 3$													
	Total	$\leq 7$													
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 $\geq 5$ mm. 5. 4 Bright dot that can not be seen through 5% ND filter.															

NO	Item	Criterion	Level																																																													
06	<p>Black or white dot、scratch、contamination</p> <p>Round type</p>  $\Phi = (x + y) / 2$ <p>Line type</p> 	<p>6.1 Round type ( Non-display or display ) :</p> <table border="1" data-bbox="512 434 1289 712"> <thead> <tr> <th rowspan="2">Dimension (diameter : <math>\Phi</math>)</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>A area</th> <th>B area</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.25</math></td> <td colspan="2">Ignore</td> </tr> <tr> <td><math>0.25 &lt; \Phi \leq 0.50</math></td> <td>5</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>\Phi &gt; 0.50</math></td> <td>0</td> </tr> <tr> <td><b>Total</b></td> <td>5</td> </tr> </tbody> </table> <p>6.2 Line type( Non-display or display ) :</p> <table border="1" data-bbox="434 831 1366 1368"> <thead> <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> </thead> <tbody> <tr> <td rowspan="4">3.5" to less 9"</td> <td>---</td> <td><math>W \leq 0.03</math></td> <td colspan="2">Ignore</td> </tr> <tr> <td><math>L \leq 10.0</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> <td>4</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>L \leq 5.0</math></td> <td><math>0.05 &lt; W \leq 0.10</math></td> <td>2</td> </tr> <tr> <td>---</td> <td><math>W &gt; 0.10</math></td> <td colspan="2">As round type</td> </tr> <tr> <td colspan="3"><b>Total</b></td> <td colspan="2">5</td> </tr> <tr> <td rowspan="4">9" to 15"</td> <td>---</td> <td><math>W \leq 0.05</math></td> <td colspan="2">Ignore</td> </tr> <tr> <td><math>L \leq 10.0</math></td> <td><math>0.05 &lt; W \leq 0.10</math></td> <td>5</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>---</td> <td><math>W &gt; 0.10</math></td> <td colspan="2">As round type</td> </tr> <tr> <td colspan="3"><b>Total</b></td> <td colspan="2">5</td> </tr> </tbody> </table>	Dimension (diameter : $\Phi$ )	Acceptance (Q'ty)		A area	B area	$\Phi \leq 0.25$	Ignore		$0.25 < \Phi \leq 0.50$	5	Ignore	$\Phi > 0.50$	0	<b>Total</b>	5	module size	Length (L)	Width (W)	Acceptance (Q'ty)		A area	B area	3.5" to less 9"	---	$W \leq 0.03$	Ignore		$L \leq 10.0$	$0.03 < W \leq 0.05$	4	Ignore	$L \leq 5.0$	$0.05 < W \leq 0.10$	2	---	$W > 0.10$	As round type		<b>Total</b>			5		9" to 15"	---	$W \leq 0.05$	Ignore		$L \leq 10.0$	$0.05 < W \leq 0.10$	5	Ignore	---	$W > 0.10$	As round type		<b>Total</b>			5		Minor
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07	Polarizer Bubble	<table border="1" data-bbox="478 1512 1324 1933"> <thead> <tr> <th rowspan="2">Dimension (diameter : <math>\Phi</math>)</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>A area</th> <th>B area</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.25</math></td> <td colspan="2">Ignore</td> </tr> <tr> <td><math>0.25 &lt; \Phi \leq 0.50</math></td> <td>4</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>0.50 &lt; \Phi \leq 0.80</math></td> <td>1</td> </tr> <tr> <td><math>\Phi &gt; 0.80</math></td> <td>0</td> </tr> <tr> <td><b>Total</b></td> <td colspan="2">5</td> </tr> </tbody> </table>	Dimension (diameter : $\Phi$ )	Acceptance (Q'ty)		A area	B area	$\Phi \leq 0.25$	Ignore		$0.25 < \Phi \leq 0.50$	4	Ignore	$0.50 < \Phi \leq 0.80$	1	$\Phi > 0.80$	0	<b>Total</b>	5		Minor																																											
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NO	Item	Criterion	Level						
08	The crack of glass	<p><b>Symbols :</b></p> <p><b>X :</b> The length of crack  <b>Z :</b> The thickness of crack  <b>t :</b> The thickness of glass</p> <p><b>Y :</b> The width of crack.  <b>W :</b> terminal length  <b>a :</b> LCD side length</p>	Minor						
		<p>8.1 General glass chip :</p> <p>8.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="539 1585 1353 1883"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td><math>\leq a</math></td> <td>Crack can't enter viewing area</td> <td><math>\leq 1/2 t</math></td> </tr> <tr> <td><math>\leq a</math></td> <td>Crack can't exceed the half of SP width.</td> <td><math>1/2 t &lt; Z \leq 2 t</math></td> </tr> </tbody> </table>		X	Y	Z	$\leq a$	Crack can't enter viewing area	$\leq 1/2 t$
X	Y	Z							
$\leq a$	Crack can't enter viewing area	$\leq 1/2 t$							
$\leq a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$							

NO	Item	Criterion	Level										
08	The crack of glass	<p>Symbols :</p> <p>X : The length of crack Z : The thickness of crack t : The thickness of glass</p> <p>Y : The width of crack. W : terminal length a : LCD side length</p> <hr/> <p>8.1.2 Corner crack :</p>  <table border="1" data-bbox="520 779 1337 1070"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td><math>\leq 1/5 a</math></td> <td>Crack can't enter viewing area</td> <td><math>Z \leq 1/2 t</math></td> </tr> <tr> <td><math>\leq 1/5 a</math></td> <td>Crack can't exceed the half of SP width.</td> <td><math>1/2 t &lt; Z \leq 2 t</math></td> </tr> </tbody> </table>	X	Y	Z	$\leq 1/5 a$	Crack can't enter viewing area	$Z \leq 1/2 t$	$\leq 1/5 a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$		
		X	Y	Z									
$\leq 1/5 a$	Crack can't enter viewing area	$Z \leq 1/2 t$											
$\leq 1/5 a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$											
<p>8.2 Protrusion over terminal :</p> <p>8.2.1 Chip on electrode pad :</p>  <table border="1" data-bbox="560 1711 1347 1883"> <thead> <tr> <th></th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>Front</td> <td><math>\leq a</math></td> <td><math>\leq 1/2 W</math></td> <td><math>\leq t</math></td> </tr> <tr> <td>Back</td> <td><math>\leq a</math></td> <td><math>\leq W</math></td> <td><math>\leq 1/2 t</math></td> </tr> </tbody> </table>		X	Y	Z	Front	$\leq a$	$\leq 1/2 W$	$\leq t$	Back	$\leq a$	$\leq W$	$\leq 1/2 t$	Minor
	X	Y	Z										
Front	$\leq a$	$\leq 1/2 W$	$\leq t$										
Back	$\leq a$	$\leq W$	$\leq 1/2 t$										

NO	Item	Criterion	Level												
08	The crack of glass	<p><b>Symbols :</b></p> <p><b>X : The length of crack</b>  <b>Z : The thickness of crack</b>  <b>t : The thickness of glass</b></p> <p><b>Y : The width of crack.</b>  <b>W : terminal length</b>  <b>a : LCD side length</b></p> <hr style="border-top: 1px dashed black;"/> <p><b>8.2.2 Non-conductive portion :</b></p>  <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">X</th> <th style="padding: 5px;">Y</th> <th style="padding: 5px;">Z</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"><math>\leq 1/3 a</math></td> <td style="padding: 5px;"><math>\leq W</math></td> <td style="padding: 5px;"><math>\leq t</math></td> </tr> </tbody> </table> <p>⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.</p> <p><b>8.2.3 Glass remain :</b></p>  <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">X</th> <th style="padding: 5px;">Y</th> <th style="padding: 5px;">Z</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"><math>\leq a</math></td> <td style="padding: 5px;"><math>\leq 1/3 W</math></td> <td style="padding: 5px;"><math>\leq t</math></td> </tr> </tbody> </table> <p><b>8.2.4 Cracking</b></p>  <p style="text-align: center;"><b>Not Allowed</b></p>	X	Y	Z	$\leq 1/3 a$	$\leq W$	$\leq t$	X	Y	Z	$\leq a$	$\leq 1/3 W$	$\leq t$	Minor
X	Y	Z													
$\leq 1/3 a$	$\leq W$	$\leq t$													
X	Y	Z													
$\leq a$	$\leq 1/3 W$	$\leq t$													



◆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 the same as on the production characteristic chart .There should 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 $\leq 1.5$ mm.	Minor

## 4. RELIABILITY TEST

### 4.1 Reliability Test Condition

(Ver.B01)

NO.	TEST ITEM	TEST CONDITION											
1	High Temperature Storage Test	Keep in <b>+80 ±2°C</b> 240hrs Surrounding temperature, then storage at normal condition 4hrs.											
2	Low Temperature Storage Test	Keep in <b>-30 ±2°C</b> 240hrs Surrounding temperature, then storage at normal condition 4hrs.											
3	High Temperature / High Humidity Storage Test	Keep in <b>+60 °C / 90% R.H</b> duration for 240hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer)											
4	Temperature Cycling Storage Test	<p style="text-align: center;"> <math>-30^{\circ}\text{C} \rightarrow +25^{\circ}\text{C} \rightarrow +80^{\circ}\text{C} \rightarrow +25^{\circ}\text{C}</math>            (30mins)    (5mins)    (30mins)    (5mins)  <math>\leftarrow \hspace{10em} \rightarrow</math>            20 Cycle         </p> <p>Surrounding temperature, then storage at normal condition 4hrs.</p>											
5	ESD Test	<b>Air Discharge:</b> Apply <b>2 KV</b> with 5 times Discharge for each polarity +/-	<b>Contact Discharge:</b> Apply <b>250 V</b> with 5 times discharge for each polarity +/-										
		<ol style="list-style-type: none"> <li>1. Temperature ambience : 15°C ~ 35°C</li> <li>2. Humidity relative : 30% ~ 60%</li> <li>3. Energy Storage Capacitance(Cs+Cd) : 150pF±10%</li> <li>4. Discharge Resistance(Rd) : 330Ω±10%</li> <li>5. Discharge, mode of operation :</li> </ol> Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : ±5%)											
6	Vibration Test (Packaged)	<ol style="list-style-type: none"> <li>1. Sine wave <b>10 ~ 55 Hz</b> frequency (1 min/sweep)</li> <li>2. The amplitude of vibration : <b>1.5 mm</b></li> <li>3. Each direction (X、Y、Z) duration for <b>2 Hrs</b></li> </ol>											
7	Drop Test (Packaged)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Packing Weight (Kg)</th> <th>Drop Height (cm)</th> </tr> </thead> <tbody> <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> </tbody> </table>		Packing Weight (Kg)	Drop Height (cm)	0 ~ 45.4	122	45.4 ~ 90.8	76	90.8 ~ 454	61	Over 454	46
		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											

## 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  $320 \pm 10^{\circ}\text{C}$  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.

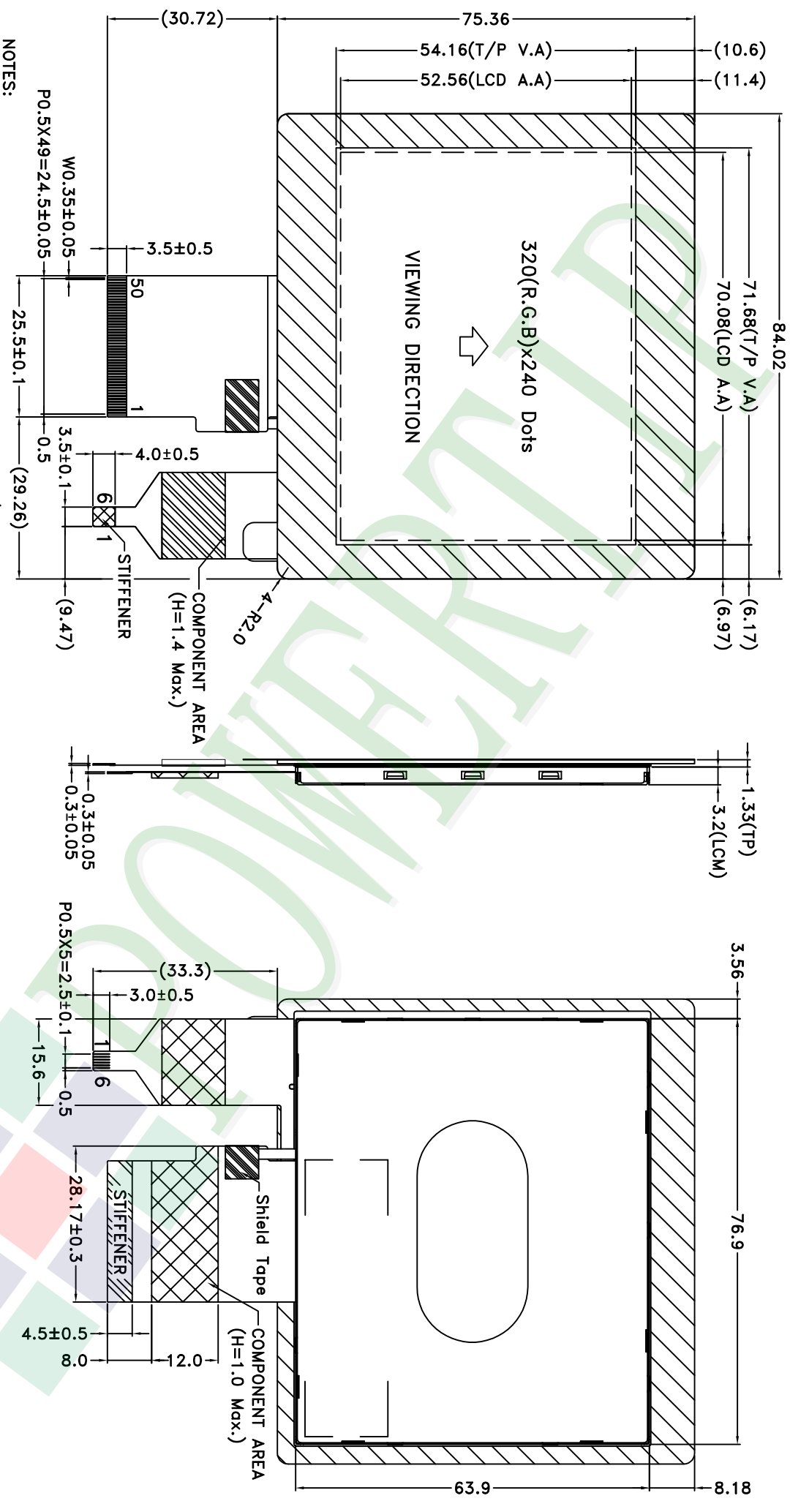
### 5.3 STORAGE

- 5.3.1 Store the panel or module in a dark place where the temperature is  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  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.

A B C D E F G H



- NOTES:
- 1.LCD TYPE: a-Si TFT
  - 2.LCD DISPLAY: POSITIVE / TRANSMISSIVE
  - 3.The tolerance unless classified ±0.2mm

3.4.LCD FPC Matching Connector: Kyocera 08 6282 050 340 829+ or EQUIVALENT  
 3.5.CTP FPC Matching Connector: Kyocera 08 6260 006 340 829+ or EQUIVALENT

PART NO: PH320240T023-IBC  
 DRAWING NAME: LMD-PH320240T023-IBC

久正光電股份有限公司  
 POWER TIP TECHNOLOGY CORPORATION

Design	Stone	Unit	MM	Surface	3	Precision Level
Check	Sarn	Scale	FIT	Material	4	
Approve	Oliver	Page	1/2	Thickness	63 ~ 250	Precision Level
		Quantity			250 ~ 1000	

007					
006					
005					
004					
003	MODIFY NOTE	Stone	2014/03/31		
002	MODIFY DIMENSION	Stone	2013/09/13		
001	NEW DRAWING	Stone	2013/07/15		
REV	REV BY	REVISER	DATE		

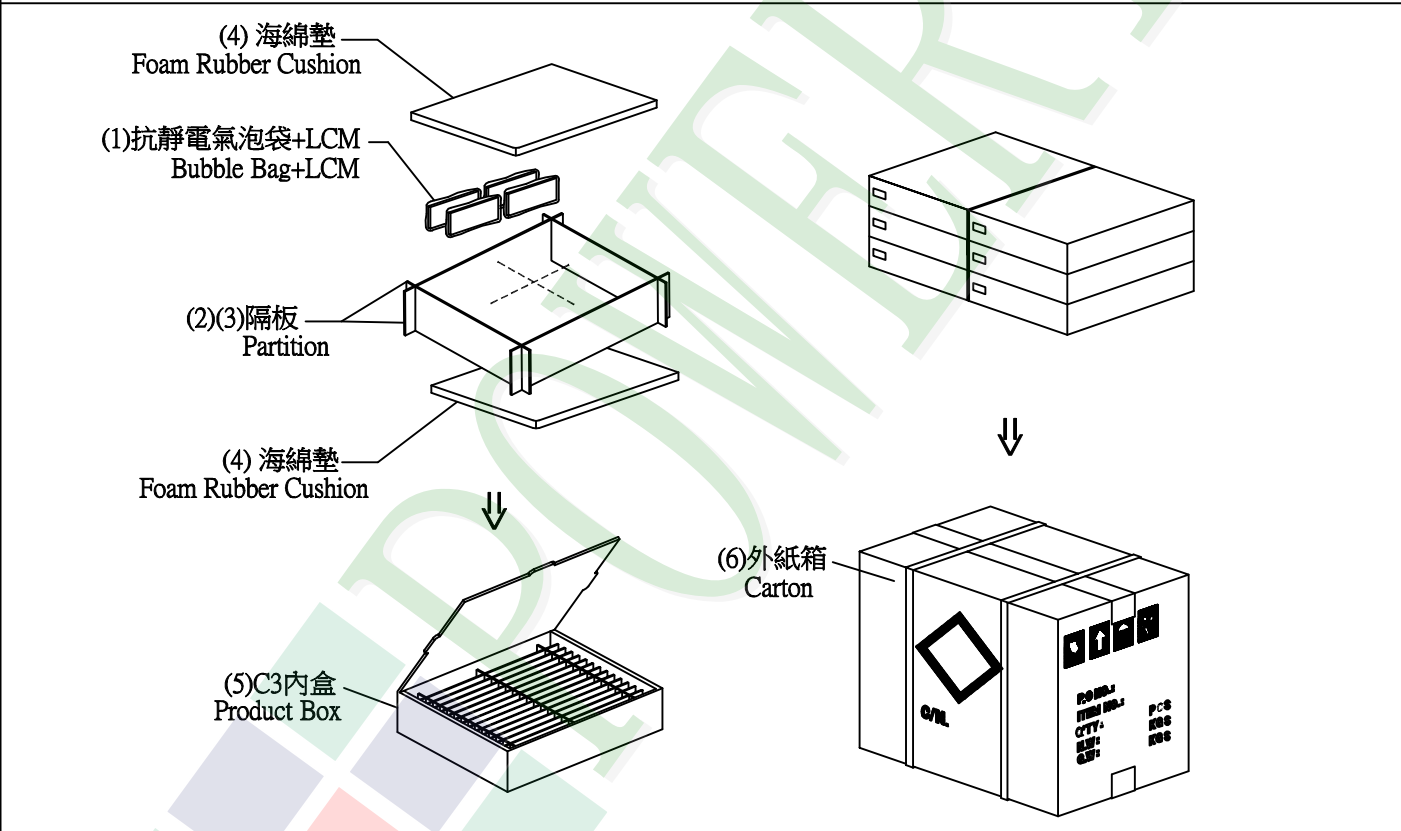
**1. 包裝材料規格表 (Packaging Material) : (per carton)**

No.	Item	Model	Dimensions (mm)	1Pcs Weight	Quantity	Total Weight
1	成品 (LCM)	PH320240T023-IBC	84.02 X 75.36	0.045	120	5.4
2	抗靜電氣泡袋(1)Bubble Bag	BAG0000000005	150 X 120	0.002	120	0.24
3	A2隔板(2)A2 Partition	BX29300070BMBA	293 X 70 X 2.5	0.011	66	0.726
4	B2隔板(3)B2 Partition	BX24500070BLBA	245 X 70 X 2.5	0.01	18	0.18
5	海綿墊(4)Foam Rubber Cushion	OTFOAM00006ABA	290 X 240 X 10	0.02	12	0.24
6	C3內盒(5)Product Box	BX31025510ABBA	310 X 255 X 100	0.263	6	1.578
7	外紙箱(6)Carton	BX52732536CDBA	527 X 325 X 360	0.83	1	0.83
8						
9						

2. 一整箱總重量 (Total LCD Weight in carton) : 8.54 Kg±10%

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

(1)Quantity Of Spacer : A2隔板 X 11 , B2隔板 X 3  
 (2)Total LCM quantity in carton : quantity per box 20 x no of boxes 6 = 120



**特 記 事 項 (REMARK)**

1. LCM排放示意圖(前後間隔不放置):  
 1. LCM placed as figure showing:  
 ( First and last slot should be empty)

