POWERTIP TECH. CORP.

SPECIFICATIONS

CUSTOMER	:	
SAMPLE CODE	:	SH800480T027-ZHA
MASS PRODUCTION CODE	:	PH800480T027-ZHA
SAMPLE VERSION	:	01
SPECIFICATIONS EDITION	:	002
DRAWING NO. (Ver.)	:	LMD-PH800480T027-ZHA (Ver.002)
PACKAGING NO. (Ver.)	:	-

Customer Approved

Date:

Approved	Checked	Designer
林裳中 **Daniel Lin**	廖志豪 **Rex Liao**	張慶源 **Yuan Chang**

POWERTIP
2018.08.14
TWRD APR

■ Preliminary specification for design input
☐ Specification for sample approval
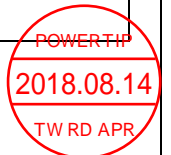
POWERTIP TECH. CORP.

History of Version

Date (mm / dd / yyyy)	Ver.	Edi.	Description	Page	Design by
06/06/2018	01	001	New Drawing.	-	Yuan
08/13/2018	01	002	Modify Mechanical Specifications Modify Optical Characteristics Modify Backlight Characteristics Modify Interface Pin Description Modify LCM Design	4 7 9 12 Appendix	Yuan

Total: 25 Page

Contents

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	800 * (RGB) * 480
LCD Type	IPS , Normally Black , Transmissive type
Screen size(inch)	7.0 inch
Surface treatment	Hard Coating
Color configuration	RGB-stripe
Backlight Type	LED B/L
Weight	-
Interface	24 Bits RGB Interface
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

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	167.7(W) * 109.45 (L) * 19.8 (H)	mm

LCD panel

Item	Standard Value	Unit
Active Area	152.4 (W) * 91.44 (L)	mm

Note : For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Module

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power Supply Voltage	V_{DD}	GND=0	3	3.6	V	-
	AV_{DD}		12.85	13.5	V	
	V_{GH}		-0.3	40	V	
	V_{GL}	AGND=0	-20	0.3	V	
	$V_{GH} - V_{GL}$	-	0	40	V	
Operating Temperature	T_{OP}	-	-30	+85	℃	(1)(2)(3)(4)
Storage Temperature	T_{ST}	-	-40	+90	℃	(1)(2)(3)(4)

Note (1)   (a) 90 %RH Max. (Ta <= 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2)   Ta = Ambient Temperature, Tp = Panel Surface Temperature.

Note (3)   This rating applies to all parts of the module and should not be exceeded.

Note (4)   If the product were used out of the operation and storage range, it will have quality issue.

1.4 DC Electrical Characteristics

Module   GND = 0V, Ta = 25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage	V_{DD}	3.0	3.3	3.6	V	-
	V_{GH}	25	26	27		
	V_{GL}	-7.14	-7.07	-7.0		
	AV_{DD}	12.9	13.2	13.5		
VCOM	V_{COM}	-	-	-	V	
Input signal Voltage	V_{IH}	$0.7V_{DD}$	-	V_{DD}	V	
	V_{IL}	0	-	$0.3V_{DD}$		
Supply Current	IV_{DD}	-	(90)	=	mA	-

1.5 Optical Characteristics

TFT LCD Module V_{DD} = 3.3 V, Ta=25℃

Item		Symbol	Condition	Min.	Typ.	Max.	unit	
Response time		Tr+Tf	Ta = 25℃ θX, θY = 0°	-	30	45	ms	Note 2
Viewing angle	Top	θY+	CR ≥ 10	70	80	-	Deg.	Note 4
	Bottom	θY-		70	80	-		
	Left	θX-		70	80	-		
	Right	θX+		70	80	-		
Contrast ratio		CR		600	800	-		Note 3
Color of CIE Coordinate （With B/L）	White	X	Ta = 25℃ θX , θY = 0°	-	-	-	-	Note1
		Y		-	-	-		
	Red	X		-	-	-		
		Y		-	-	-		
	Green	X		-	-	-		
		Y		-	-	-		
	Blue	X		-	-	-		
		Y		-	-	-		
Average Brightness Pattern=white display （With B/L）*1		IV	IL = (160) mA	-	(1000)	-	cd/m2	Note1
Uniformity （With B/L）*2		△B	IL =(160) mA	70	-	-	%	Note1

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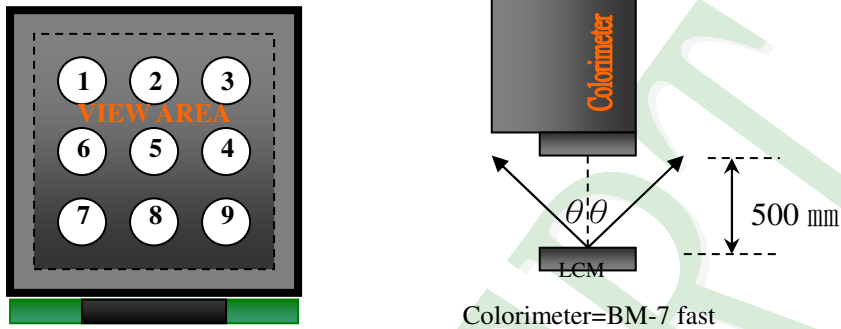
To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation (module)

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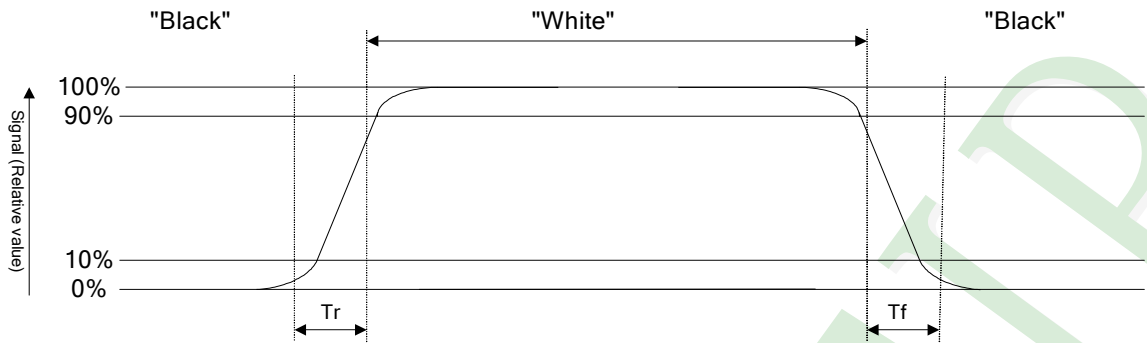 "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes.

Refer to figure as below:
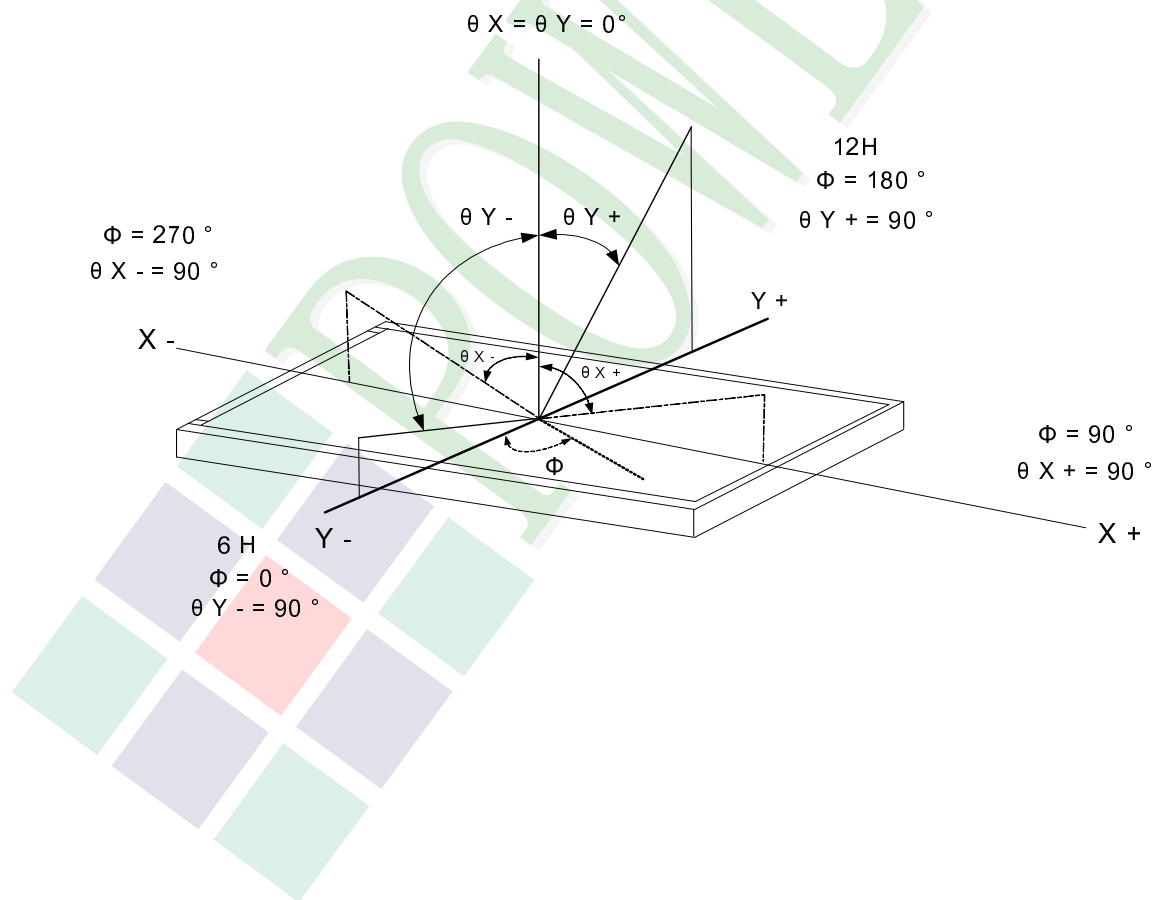
Normally White

Normally Black

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
LED Forward Current	IF	Ta =25℃	-	-	mA
LED Reverse Voltage	VR	Ta =25℃	-	(5)	V
Power Dissipation	PD	Ta =25℃	-	-	W

Backlight Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF		-	(15.0)	-	V
Average Brightness (Without LCD)	IV	IF= (160) mA	-	(8500)	-	cd/m²
CIE Color Coordinate (Without LCD)	X		-	(0.295)	-	-
	Y		-	(0.264)	-	
Uniformity *1	△B		75	-	-	*2
Color	White					

*1：This value will be changed while mass production.

*2：△B=B(min) / B(max)%
B/L Internal Circuit Diagram
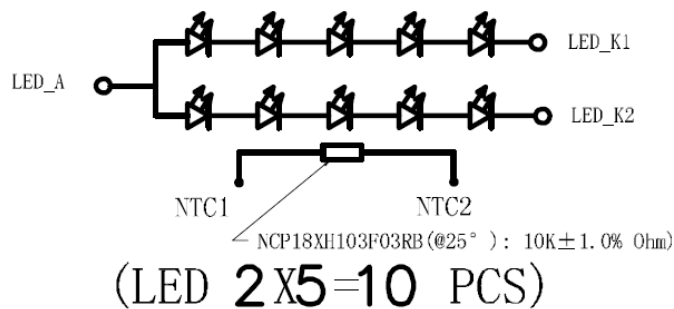
Other Description

Item	Conditions	Description
Life Time	Ta =25℃ IF= (160)mA	50000 hrs

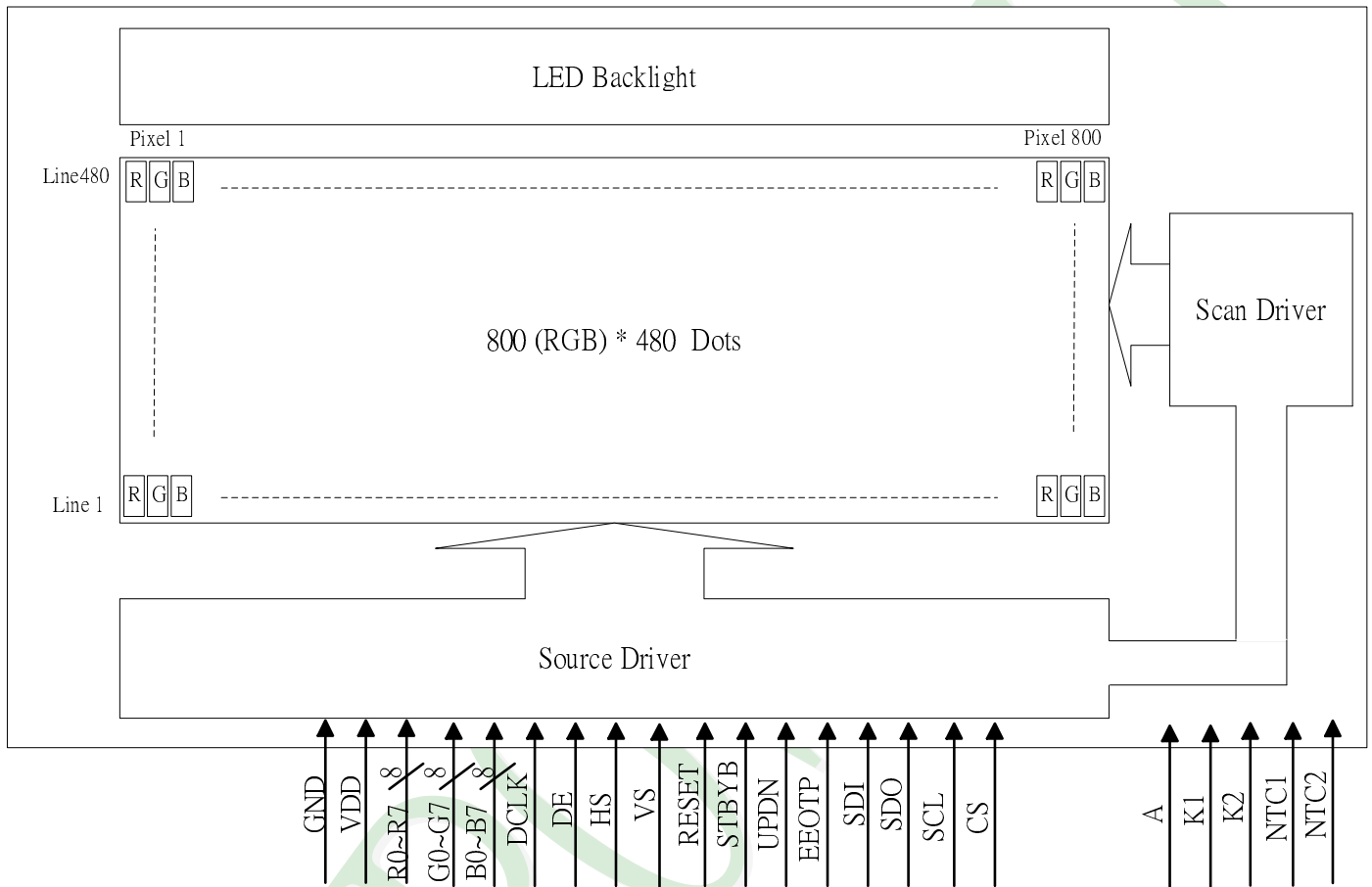# 2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram

2.2   Interface Pin Description

TFT LCM Interface

Pin NO.	SYMBOL	DESCRIPTION
1	GND	Power ground.
2	NC	No Connection
3	V_{DD}	Power for Digital Circuit.
4	R0	Red Data(LSB).
5	R1	Red Data.
6	R2	Red Data.
7	R3	Red Data.
8	R4	Red Data.
9	R5	Red Data.
10	R6	Red Data.
11	R7	Red Data(MSB).
12	G0	Green Data(LSB).
13	G1	Green Data.
14	G2	Green Data.
15	G3	Green Data.
16	G4	Green Data.
17	G5	Green Data.
18	G6	Green Data.
19	G7	Green Data(MSB).
20	B0	Blue Data(LSB).
21	B1	Blue Data.
22	B2	Blue Data.
23	B3	Blue Data.
24	B4	Blue Data.
25	B5	Blue Data.
26	B6	Blue Data.
27	B7	Blue Data(MSB).
28	DCLK	Clock signal
29	DE	Data Input Enable.
30	HS	Horizontal Sync Input.
31	VS	Vertical Sync Input.
32	NC	No Connection
33	RESET	Global reset pin.
34	STBYB	Standby mode
35	SHLR	Horizontal scan direction

Pin NO.	SYMBOL	DESCRIPTION
36	V$_{DD}$	Power for Digital Circuit.
37	UPDN	Vertical scan direction
38	GND	Power Ground
39	GND	Power Ground.
40	NC	No connection.
41	NC	No connection.
42	NC	No connection.
43	NC	No connection.
44	NC	No connection.
45	NC	No connection.
46	NC	No connection.
47	NC	No connection.
48	NC	No connection.
49	EEOTP	Apply 6.65V to OTP
50	NC	No connection.
51	SDI	Serial data input of SPI
52	SDO	Serial data output of SPI
53	SCL	Clock signal of SPI
54	CS	Slaver select
55	NC	No connection.
56	NC	No connection.
57	V$_{DD}$	Power for Digital Circuit.
58	NC	No connection.
59	GND	Power Ground.
60	NC	No connection.

FPC1 interface (LED Backlight)

Pin No.	Symbol	Function
1	A	LED Backlight anode input
2	K1	LED Backlight for cathode input
3	K2	LED Backlight for cathode input
4	NC	No Connection
5	NTC1	Thermistor
6	NTC2	Thermistor

2.3 Timing Characteristics

2.3.1 POWER ON/OFF TIMING SEQUENCE

The recommended sequence should be:Digital power(VDD, GND) → Logic signals→Analog power(VDD, GND) & Gamma correction reference voltage(GMAH, GMAL).To shut down, reverse this sequence, or turn off all signals and power simultaneously.
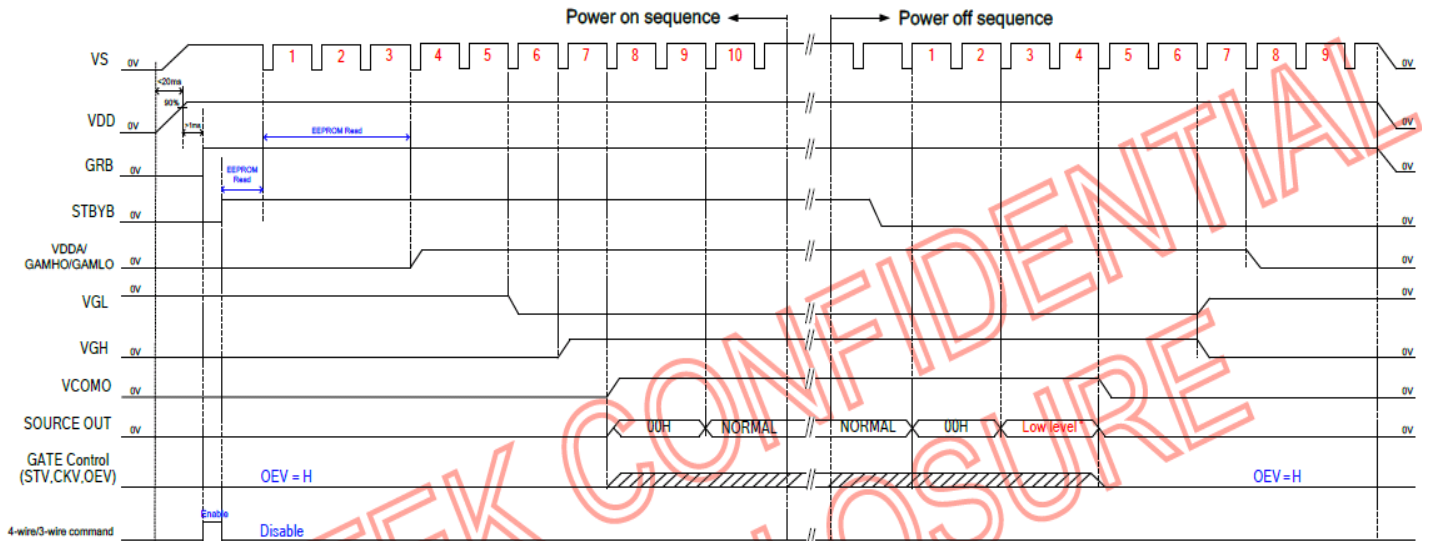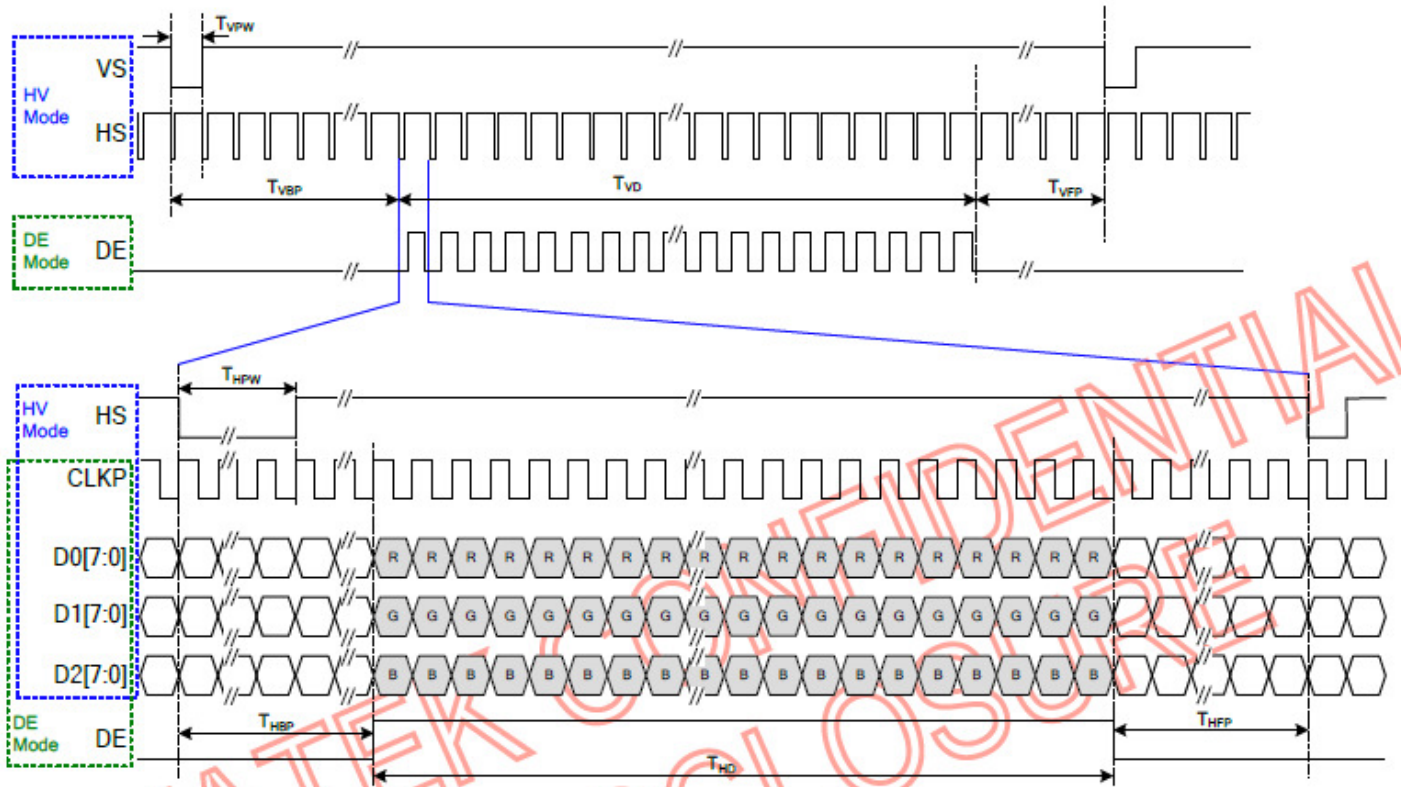

Power On/Off Timing
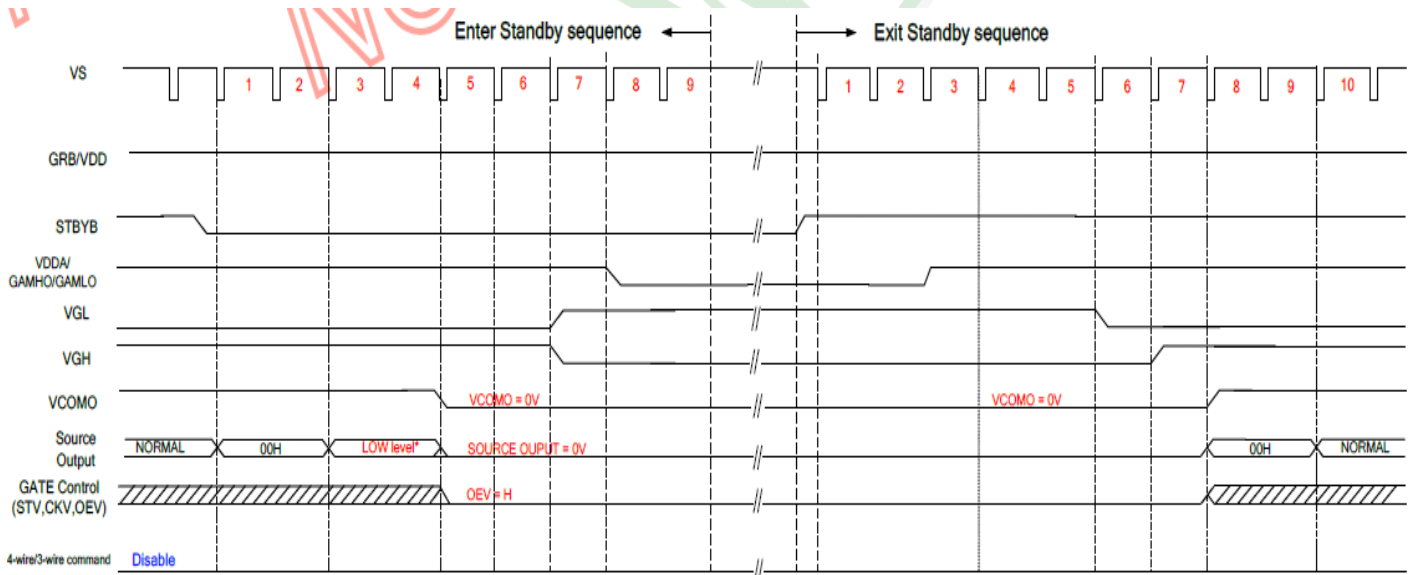
Enter/Exit Standby Mode

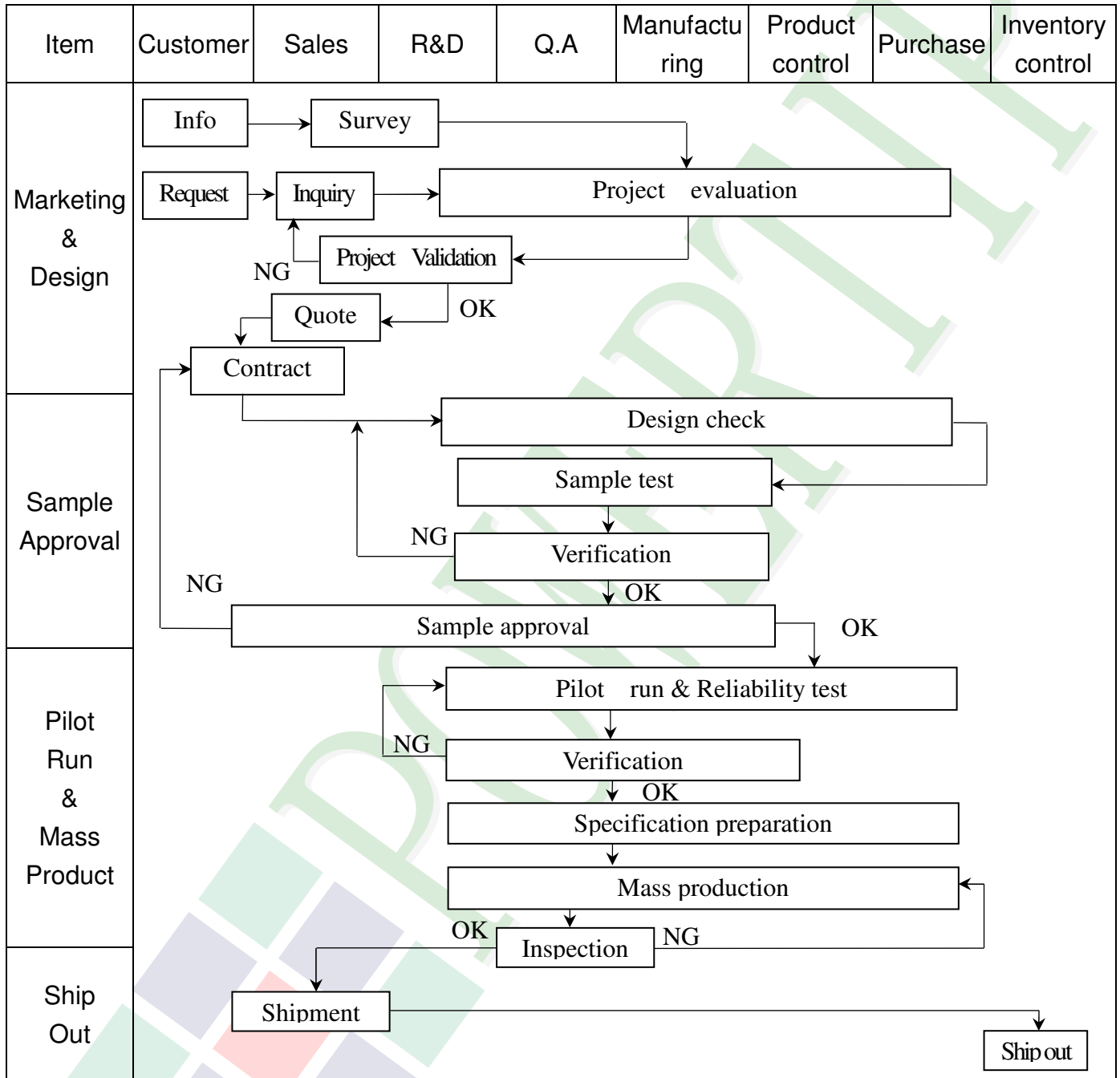## 2.3.2 INPUT CHARACTERISTICS FOR TTL MODE SIGNALS

HV mode for 800x480

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK frequency	F_{CLK}	25.2	25.4	35.7	MHz
Horizontal display area	T_{HD}		800		CLK
HS period time	T_H	860	864	974	CLK
HS pulse width	T_{HPW}	1	2	40	CLK
HS back porch	T_{HBP}		32		CLK
HS front porch	T_{HFP}	28	32	142	CLK
Vertical display area	T_{VD}		480		H
VS period time	T_V	488	490	611	H
VS pulse width	T_{VPW}	1	2	20	H
VS back porch	T_{VBP}		5		H
VS front porch	T_{VFP}	3	5	126	H
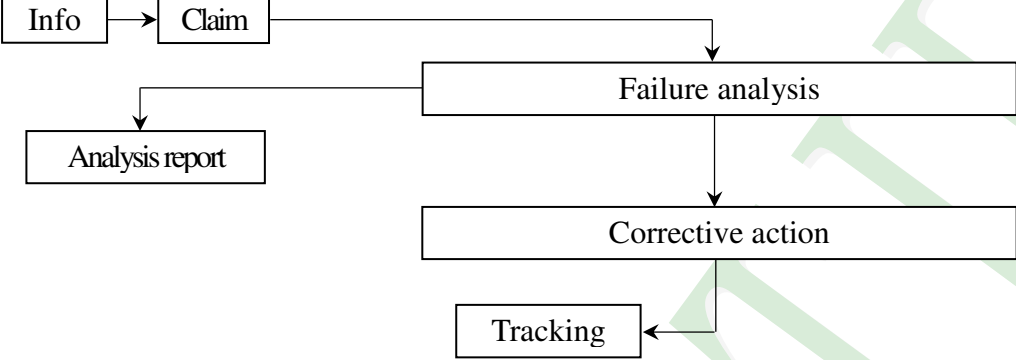
DE mode for 800x480

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK frequency	F_{CLK}	25.2	25.4	35.7	MHz
Horizontal display area	T_{HD}		800		CLK
HS period time	T_H	860	864	974	CLK
HS blanking	$T_{HFP} + T_{HBP}$	60	64	174	CLK
Vertical display area	T_{VD}		480		H
VS period time	T_V	488	490	611	H
VS blanking	$T_{VBP} + T_{VFP}$	8	10	131	H

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

Item	Customer	Sales	R&D	Q.A	Manufactu ring	Product control	Purchase	Inventory control
Marketing & Design								
Sample Approval								
Pilot Run & Mass Product								
Ship Out								

Info → Survey

Request → Inquiry → Project evaluation

Project Validation ← NG / OK

Quote

Contract

Design check

Sample test

Verification — NG

OK — Sample approval — NG / OK

Pilot run & Reliability test

Verification — NG

OK — Specification preparation

Mass production

Inspection — OK / NG

Shipment

Ship out

Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service	Info → Claim → Failure analysis → Corrective action → Tracking; Failure analysis → Analysis report							
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″~10″ (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.
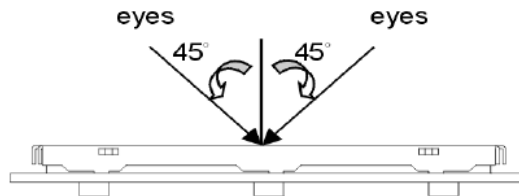
　（3）.Definition of area.
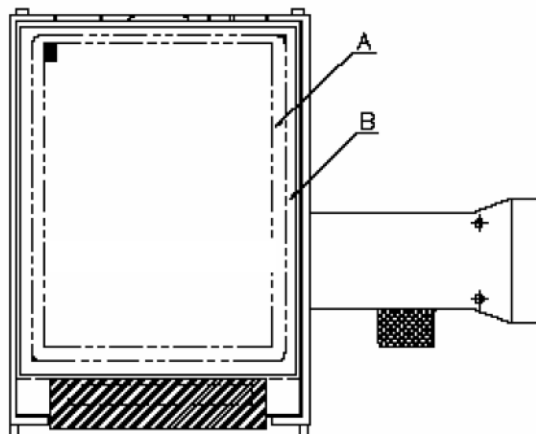
A area : viewing area

B area : Outside of viewing area

　（4）.Standard of inspection：　(Unit：mm)
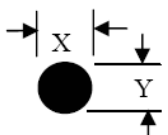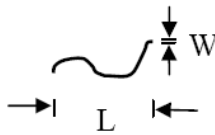
◆**Specification For TFT-LCD Module 3.5″ ~10″ :**　　　　　　　　　　　　　　(Ver.B01)
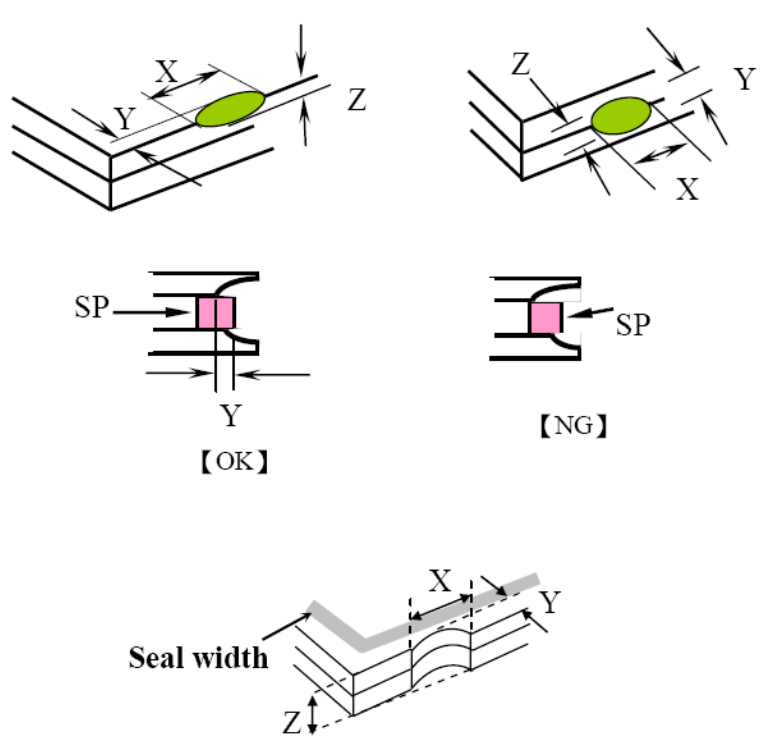
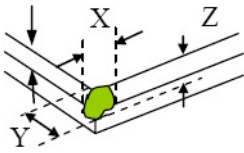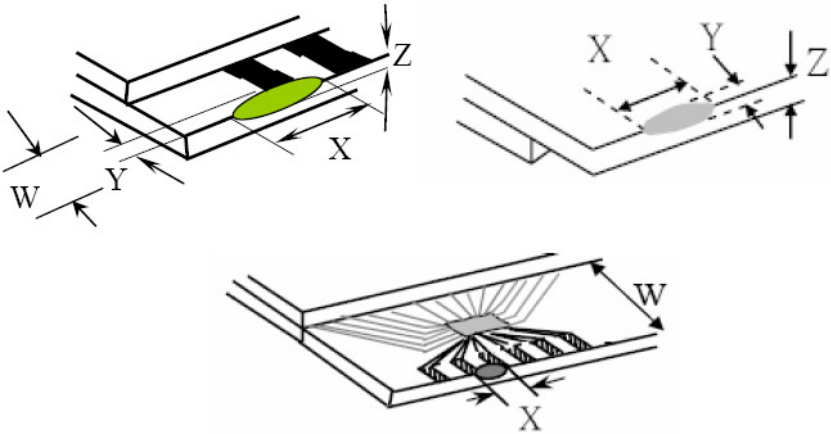| NO	Item	Criterion	Level
01	Product condition	1.1 The part number is inconsistent with work order of production.	Major
		1.2 Mixed product types.	Major
		1.3 Assembled in inverse direction.	Major
02	Quantity	2.1 The quantity is inconsistent with work order of production.	Major
03	Outline dimension	3.1 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
05	Dot defect (Bright dot、Dark dot) On -display	<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.	Minor

NO	Item	Criterion	Level
06	**Black or white dot、scratch、contamination** **Round type** $\Phi=(x+y)/2$ **Line type**	**6.1 Round type (Non-display or display):** 	Dimension (diameter:Φ)	Acceptance (Q'ty)	
	A area	B area
$\Phi \leqq 0.25$	Ignore	Ignore
$0.25 < \Phi \leqq 0.50$	5	
$\Phi > 0.50$	0	
Total	5	| **6.2 Line type(Non-display or display):** | Length (L)	Width (W)	Acceptance (Q'ty)	
		A area	B area
---	$W \leqq 0.03$	Ignore	Ignore
$L \leqq 10.0$	$0.03 < W \leqq 0.05$	4	
$L \leqq 5.0$	$0.05 < W \leqq 0.10$	2	
---	$W > 0.10$	As round type	
Total		5			Minor
07	**Polarizer Bubble**		Dimension (diameter:Φ)	Acceptance (Q'ty)	
	A area	B area
$\Phi \leqq 0.25$	Ignore	Ignore
$0.25 < \Phi \leqq 0.50$	4	
$0.50 < \Phi \leqq 0.80$	1	
$\Phi > 0.80$	0	
Total	5			Minor

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
$\leqq a$	Crack can't enter viewing area	$\leqq 1/2\ t$
$\leqq a$	Crack can't exceed the half of SP width.	$1/2\ t < Z \leqq 2\ t$
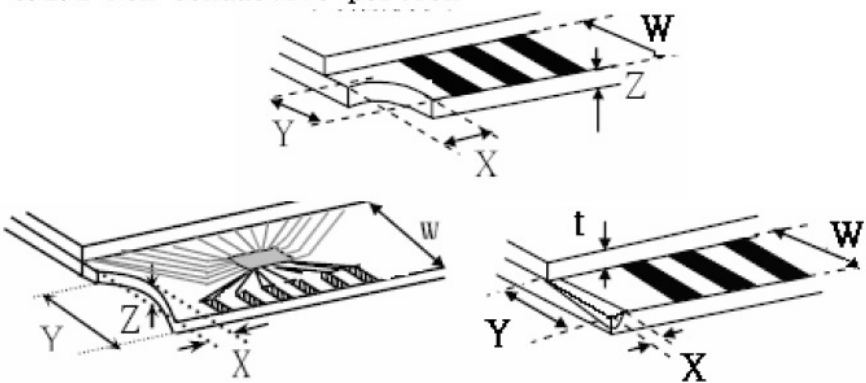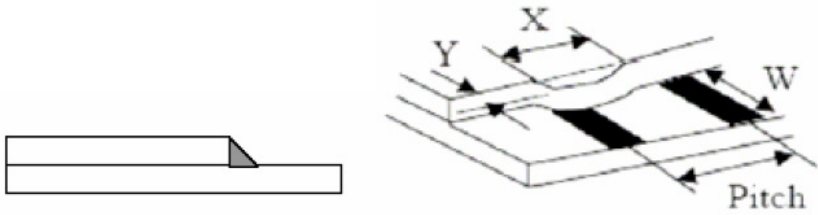
NO	Item	Criterion	Level
08	The crack of glass	Symbols：	Minor

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：

X	Y	Z
$\leqq 1/5$ a	Crack can't enter viewing area	$Z \leqq 1/2$ t
$\leqq 1/5$ a	Crack can't exceed the half of SP width.	$1/2$ t $< Z \leqq 2$ t

8.2 Protrusion over terminal：

8.2.1 Chip on electrode pad：

	X	Y	Z
Front	$\leqq$ a	$\leqq 1/2$ W	$\leqq$ t
Back	$\leqq$ a	$\leqq$ W	$\leqq 1/2$ t

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 8.2.2 Non-conductive portion： 	X	Y	Z	 	---	---	---	 	≦ 1/3 a	≦ W	≦t	 ⊙ 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： 	X	Y	Z	 	---	---	---	 	≦ a	≦ 1/3 W	≦t		Minor

4. RELIABILITY TEST

4.1   Reliability Test Condition   (Ver.A01)

NO.	TEST ITEM	TEST CONDITION	
1	**High Temperature Storage Test**	**Keep in 90 ±5℃ 500 hrs** **Surrounding temperature, then storage at normal condition 4hrs.**	
2	**High Temperature Operating Test**	**Keep in 85 ±5℃ 500 hrs** **Surrounding temperature, then storage at normal condition 4hrs.**	
3	**Low Temperature Storage Test**	**Keep in−40 ±5℃ 500 hrs** **Surrounding temperature, then storage at normal condition 4hrs.**	
4	**Low Temperature Operating Test**	**Keep in −30 ±5℃ 500 hrs** **Surrounding temperature, then storage at normal condition 4hrs.**	
5	**High Temperature / High Humidity Storage Test**	**Keep in +60℃ ╱ 90％ R.H duration for 500 hrs** **Surrounding temperature, then storage at normal condition 4hrs.** **(Excluding the polarizer)**	
6	**High Temperature / High Humidity Operating Test**	**Keep in +60℃ ╱ 90％ R.H duration for 500 hrs** **Surrounding temperature, then storage at normal condition 4hrs.** **(Excluding the polarizer)**	
7	**Temperature Cycling Storage Test**	**−40℃ → +25℃ →90℃ → +25℃** **(30mins) (5mins) (30mins) (5mins)** **25 Cycle** **Surrounding temperature, then storage at normal condition 4hrs.**	
8	**Temperature Cycling Operating Test**	**−30℃ → +25℃ → 85℃ → +25℃** **(30mins) (5mins) (30mins) (5mins)** **25 Cycle** **Surrounding temperature, then storage at normal condition 4hrs.**	
9	**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％)**	
10	**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**	

		Packing Weight (Kg)	Drop Height (cm)
11	**Drop Test (Packaged)**	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	

◎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℃

Humidity：50~70%

Atmospheric pressure：86~106Kpa

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℃ and 3-5 sec.

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

5.3 STORAGE

5.3.1   Store the panel or module in a dark place where the temperature is 25℃ ±5℃ 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.
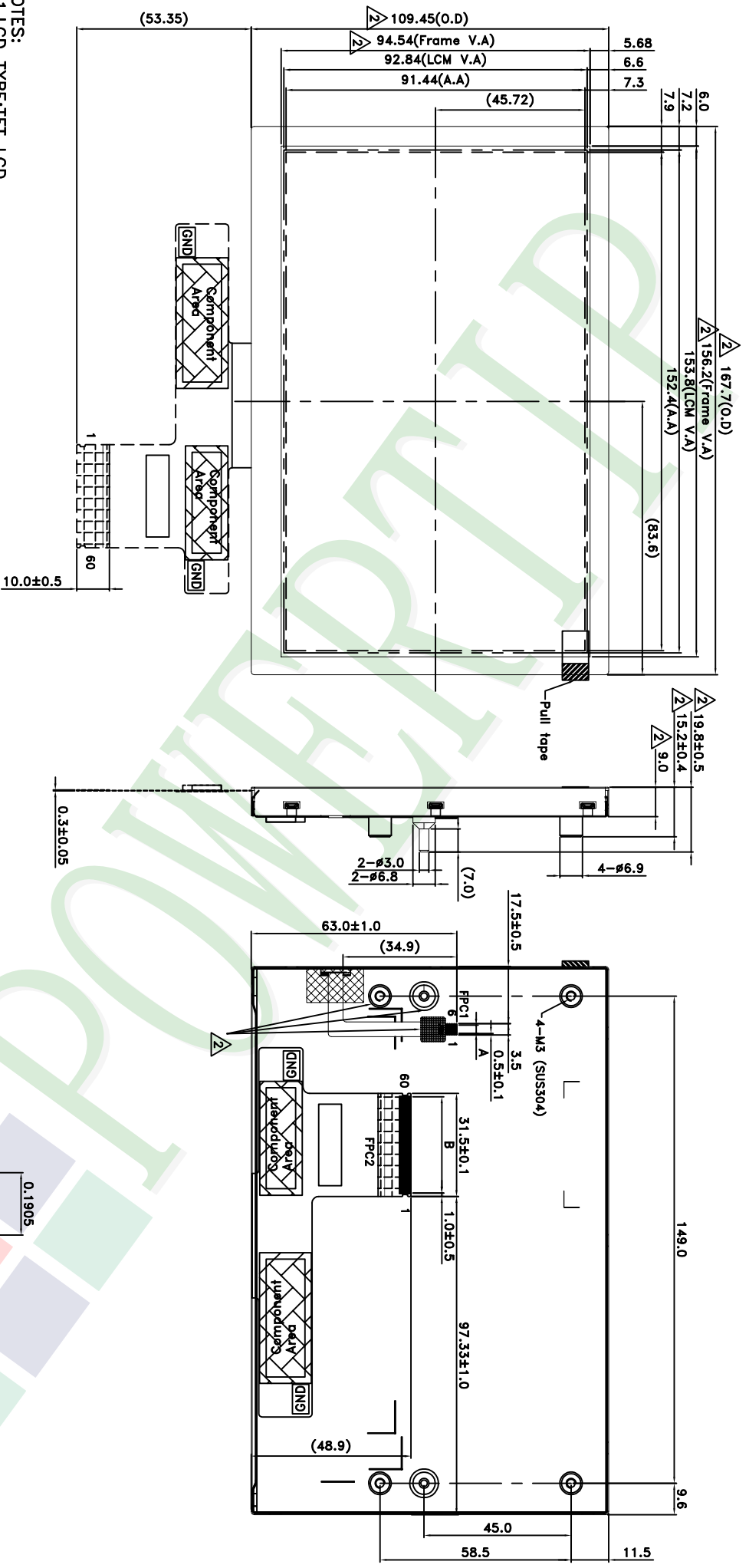
NOTES:
1.LCD TYPE:TFT LCD
2.LCD DISPLAY:Normally Black
3.The tolerance unless classified ±0.3mm
4.A :P0.5*5=2.5±0.05 ; W=0.3±0.05
  B :P0.5*59=29.5±0.05 ; W=0.3±0.05
5. ▨▨ :Shielding tape; ▨▨ :Black tape
6.BL FPC1 suggested connector : "Hirose" FH19SC-6S-0.5SH, 6 PIN or compatible
7.LCD FPC2 suggested connector : "IRISO" IMSA-12001S-60Y903, 60 PIN or compatible

(53.35)
109.45(O.D)
94.54(Frame V.A)
92.84(LCM V.A)
91.44(A.A)
(45.72)
5.68
6.6
7.3
6.0
7.2
7.9

167.7(O.D)
156.2(Frame V.A)
153.8(LCM V.A)
152.4(A.A)
(83.6)

GND
Component Area
Component Area
GND
1
60
10.0±0.5

Pull tape

19.8±0.5
15.2±0.4
9.0

0.3±0.05
2-ø3.0
2-ø6.8
(7.0)
4-ø6.9

63.0±1.0
(34.9)
17.5±0.5
FPC1
6
1
A
3.5
0.5±0.1
4-M3 (SUS304)
149.0
9.6

GND
Component Area
60
FPC2
31.5±0.1
B
1.0±0.5
1
97.33±1.0
GND
Component Area

(48.9)
45.0
58.5
11.5

Detail Dots
Scale 100X
0.1905
R G B
0.1905

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

					Length(Min) (mm)	Tolerance Precision Level	Precision Level
Design	Check	Approve			1 ~ 4	4	-
Clare	Tina	Jimmy			4 ~ 16	-	-
			Unit	Surface	16 ~ 63	-	-
			Scale	Material	63 ~ 250	-	-
			Page	Thickness	250 ~ 1000	-	-
				Quantity			

Unit: MM
Scale: FIT
Page: 1/1

DRAWING NAME：LMD-PH800480T027-ZHA
PART NO：PH800480T027-ZHA
TITLE: LCD MODULE DRAWING

007				
006				
005				
004				
003				
002	Modify LCM design	Clare	2018/08/13	
001	NEW DRAWING	Clare	2018/06/01	
REV	REV BY	REVISER	DATE	

PT-A-054-01