

SPECIFICATIONS

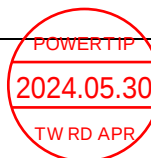
CUSTOMER	:	-
SAMPLE CODE	:	SH480128T002-ZCA
MASS PRODUCTION CODE	:	PH480128T002-ZCA
SAMPLE VERSION	:	01
SPECIFICATIONS EDITION	:	003
DRAWING NO. (Ver.)	:	LMD-PH480128T002-ZCA (Ver.002)
PACKAGING NO. (Ver.)	:	PKG-PH480128T002-ZCA (Ver.002)

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

<u>Date</u> (mm / dd / yyyy)	<u>Ver.</u>	<u>Edi.</u>	<u>Description</u>	<u>Page</u>	<u>Design by</u>
02/20/2024	01	001	Preliminary.	-	Grace
04/19/2024	01	002	First Sample. Update Drawing.	Appendix	Grace
05/30/2024	01	003	Modify PACKAGING.	Appendix	Grace

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1. SPECIFICATIONS

1.1 Features

<u>Item</u>	<u>Standard Value</u>
Display Type	480*3(R、G、B) * 128 Dots
LCD Type	Full Viewing Angle , Normally Black , Transmissive type
Screen size(inch)	3.9 inch
Color configuration	RGB-Strip
Backlight Type	LED B/L
Weight	13.6g
Control IC	ST7282A (Or Compatible IC)
Interface	Digital 24-bits RGB
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

<u>Item</u>	<u>Standard Value</u>	<u>Unit</u>
Outline Dimension	103.2(W) x 34.85(L) x 2.66(H)	mm

LCD panel

<u>Item</u>	<u>Standard Value</u>	<u>Unit</u>
Active Area	95.04 (W) x 25.344 (L)	mm

Note : For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Supply Voltage	V _{DD}	GND=0	-0.3	4.0	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	-	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

GND = 0V, Ta = 25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage	V _{DD}	3.0	3.3	3.6	V	-
Input H/L Level Voltage	V _{IH}	0.7*V _{DD}	-	V _{DD}		
	V _{IL}	0	-	0.3*V _{DD}		
Supply Current	I _{DD}	-	14.5	22	mA	Note1

Note1: Maximum current display.

1.5 Optical Characteristics

VDD= 3.3 V, Ta=25°C

Item		Symbol	Condition	Min	Typ	Max	Unit	
Response time		Tr +Tf	Ta = 25°C θX, θY = 0°	-	40	60	ms	Note 2
Viewing angle	Top	θY+	CR ≥ 10	-	80	-	Deg.	Note 4
	Bottom	θY-		-	80	-		
	Left	θX-		-	80	-		
	Right	θX+		-	80	-		
Contrast ratio		CR	IF=40mA	650	800	-	-	Note 3
Color of CIE Coordinate (With B/L)	White	X		0.26	0.31	0.36	-	Note1
		Y		0.29	0.34	0.39		
	Red	X		0.55	0.60	0.65		
		Y		0.31	0.36	0.41		
	Green	X		0.27	0.32	0.37		
		Y		0.54	0.59	0.64		
	Blue	X		0.08	0.13	0.18		
		Y		0.07	0.12	0.17		
Average Brightness Pattern=white display (With LCD) *2		IV	IF=40mA	550	650	-	cd/m²	Note1
Uniformity (With B/L) *1		△B		70	-	-	%	Note1

Note 1:

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

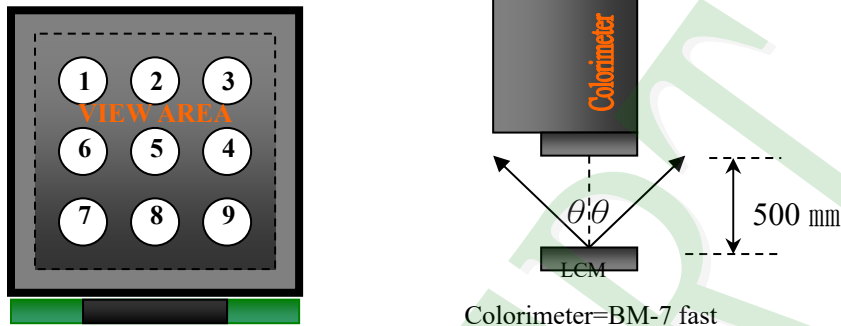
*2 : Measurement Condition for Optical Characteristics:

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

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

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

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



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:

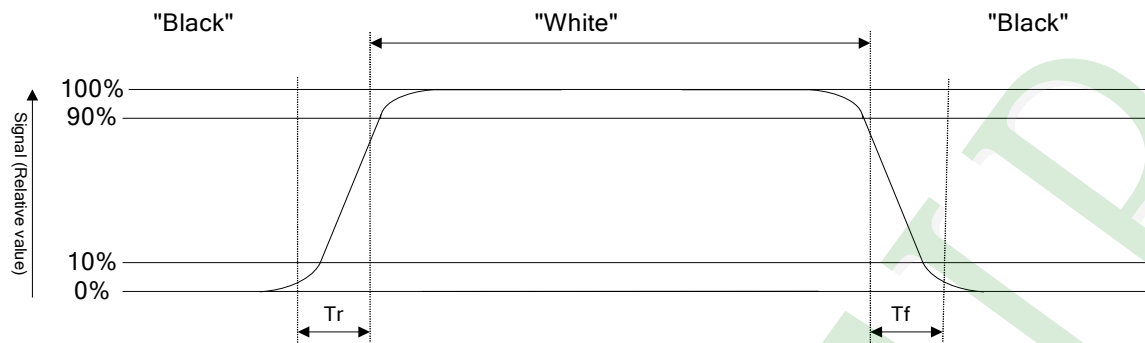
The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes.

Refer to figure as below:

Normally White



Normally Black



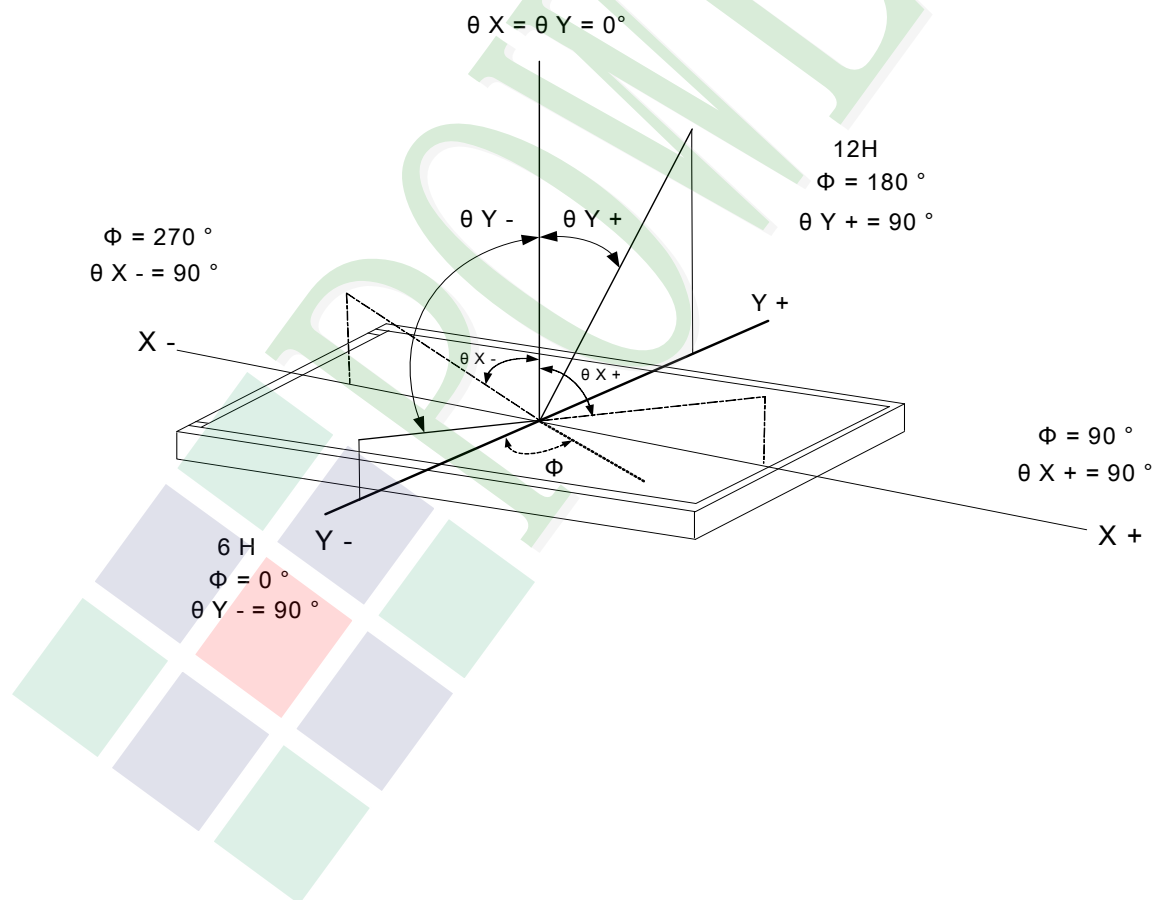
Note3: Definition of contrast ratio:

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 Power Dissipation	PD _{LED}	Ta =25℃ / 40mA	-	0.12	W
Power Dissipation	PD	Ta =25℃	-	0.99	W

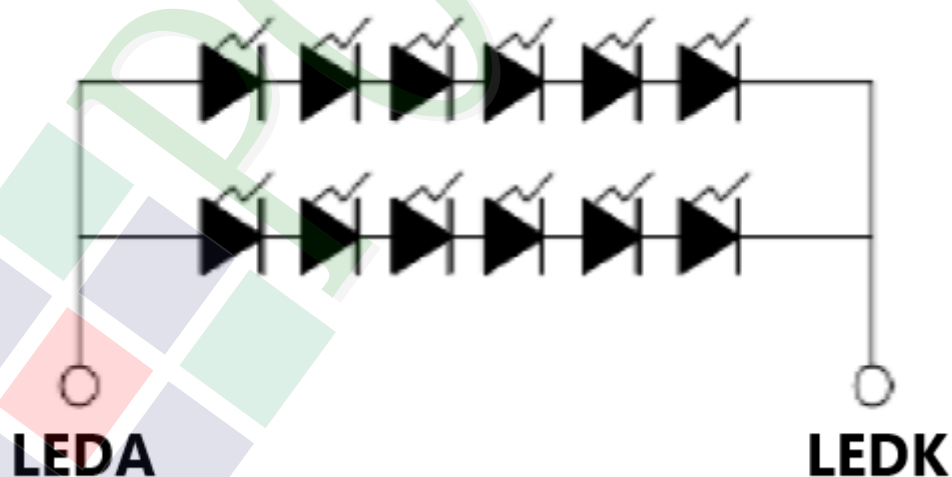
Backlight Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF= 40 mA	16.2	18	19.8	V
Average Brightness (Without LCD)	IV		9000	10500	15000	cd/m ²
CIE Color Coordinate (Without LCD)	X		0.26	0.29	0.32	-
	Y		0.26	0.29	0.32	
Uniformity *1	△B		80	-	-	*2
Color	White					

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

*2 : $\Delta B = B(\min) / B(\max)\%$

B/L Internal Circuit Diagram



Other Description

Item	Conditions	Description
Life Time	Ta =25℃	50000 hrs

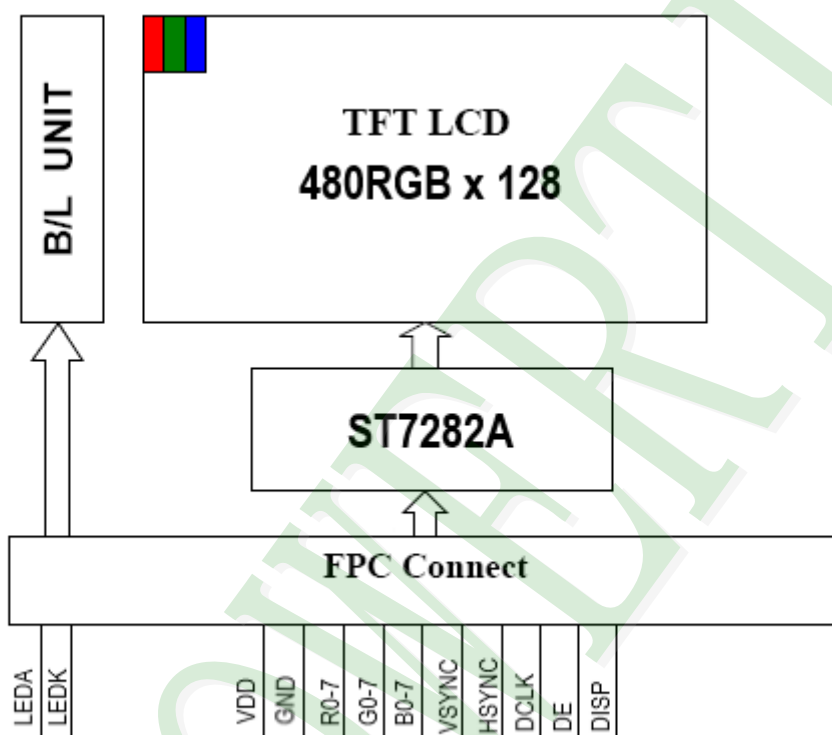
2. MODULE STRUCTURE

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#	Name	Description
1	LEDK	Backlight LED Cathode.
2	LED A	Backlight LED Anode.
3	GND	Power Ground.
4	VDD	Power supply for logic operation.
5	R0	data bit R0.
6	R1	data bit R1.
7	R2	data bit R2.
8	R3	data bit R3.
9	R4	data bit R4.
10	R5	data bit R5.
11	R6	data bit R6.
12	R7	data bit R7.
13	G0	data bit G0.
14	G1	data bit G1.
15	G2	data bit G2.
16	G3	data bit G3.
17	G4	data bit G4.
18	G5	data bit G5.
19	G6	data bit G6.
20	G7	data bit G7.
21	B0	data bit B0.
22	B1	data bit B1.
23	B2	data bit B2.
24	B3	data bit B3.
25	B4	data bit B4.
26	B5	data bit B5.
27	B6	data bit B6.
28	B7	data bit B7.
29	GND	Power Ground.

<u>Pin#</u>	<u>Name</u>	<u>Description</u>
30	DCLK	Dot data clock.
31	DISP	Display on/off control.
32	HSYNC	Horizontal sync input.
33	VSYNC	Vertical sync input.
34	DE	Data enable.
35	NC	No Connection.
36	GND	Power Ground.
37	NC	No Connection.
38	NC	No Connection.
39	NC	No Connection.
40	NC	No Connection.

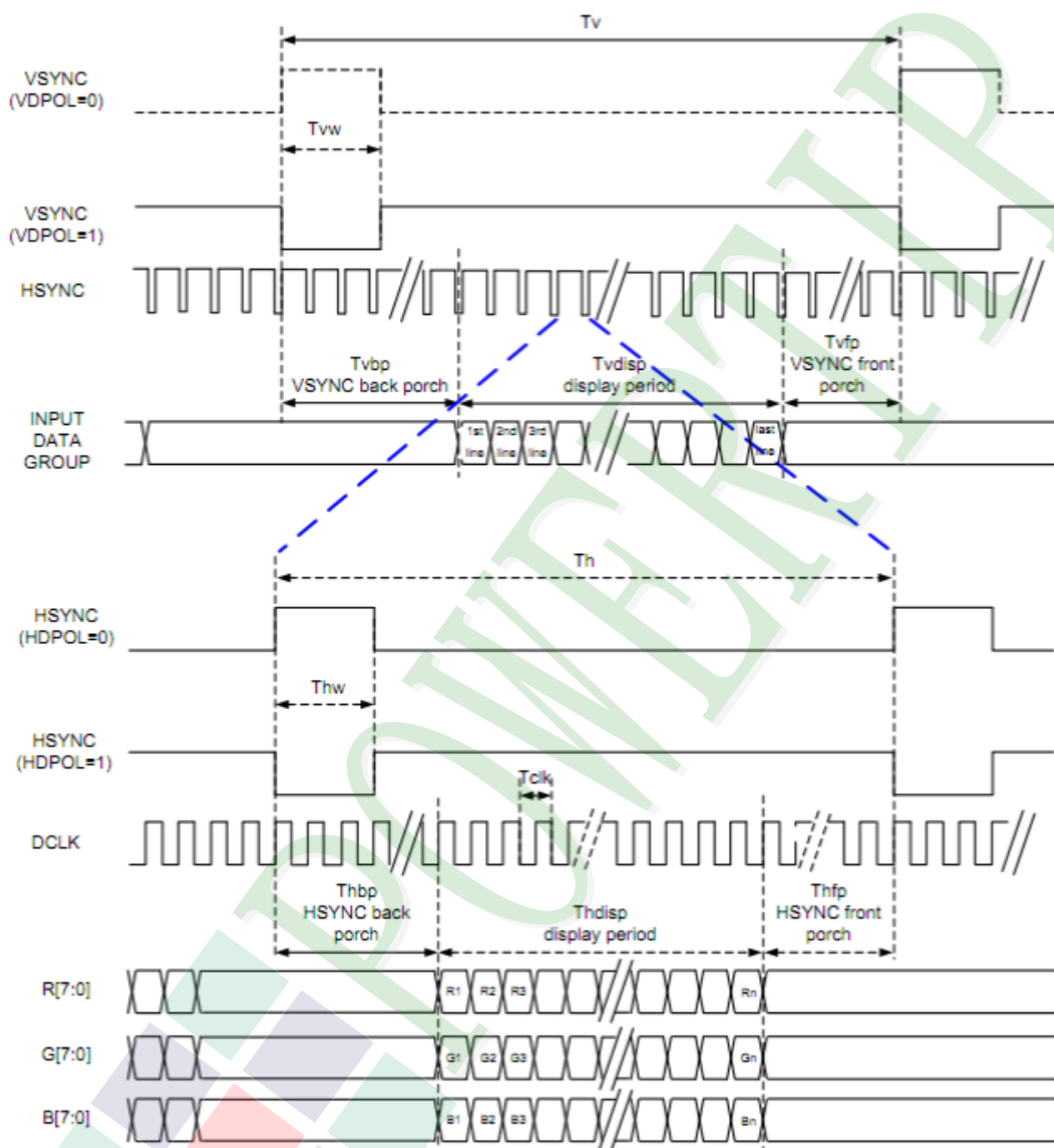
2.3 Timing Characteristics

2.3.1 RGB Mode Selection Table

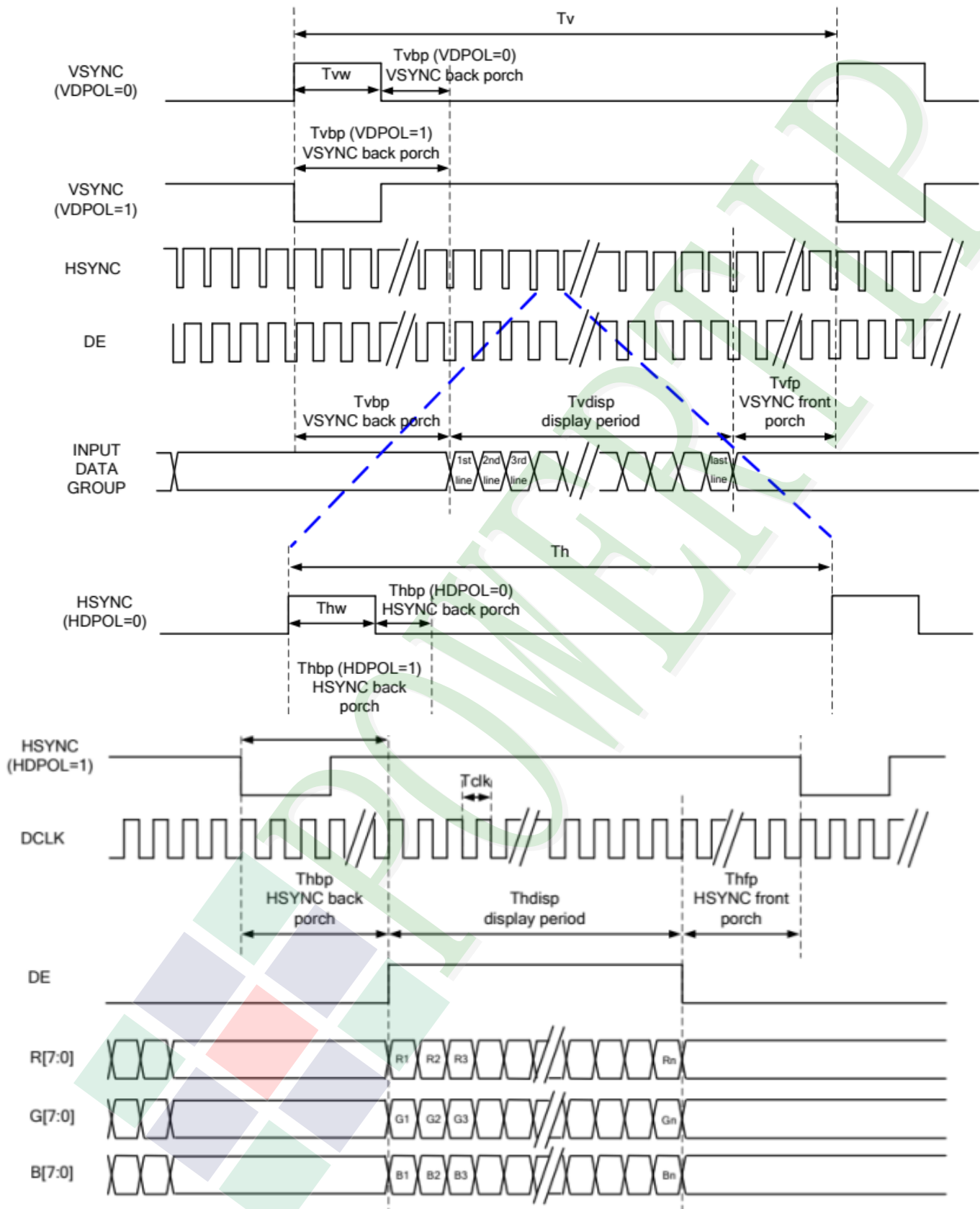
RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC-DE Mode	INPUT	INPUT	INPUT	GND
SYNC Mode	INPUT	INPUT	INPUT	INPUT
DE Mode	INPUT	GND	GND	INPUT

Note: "INPUT" means these signals are driven by host side.

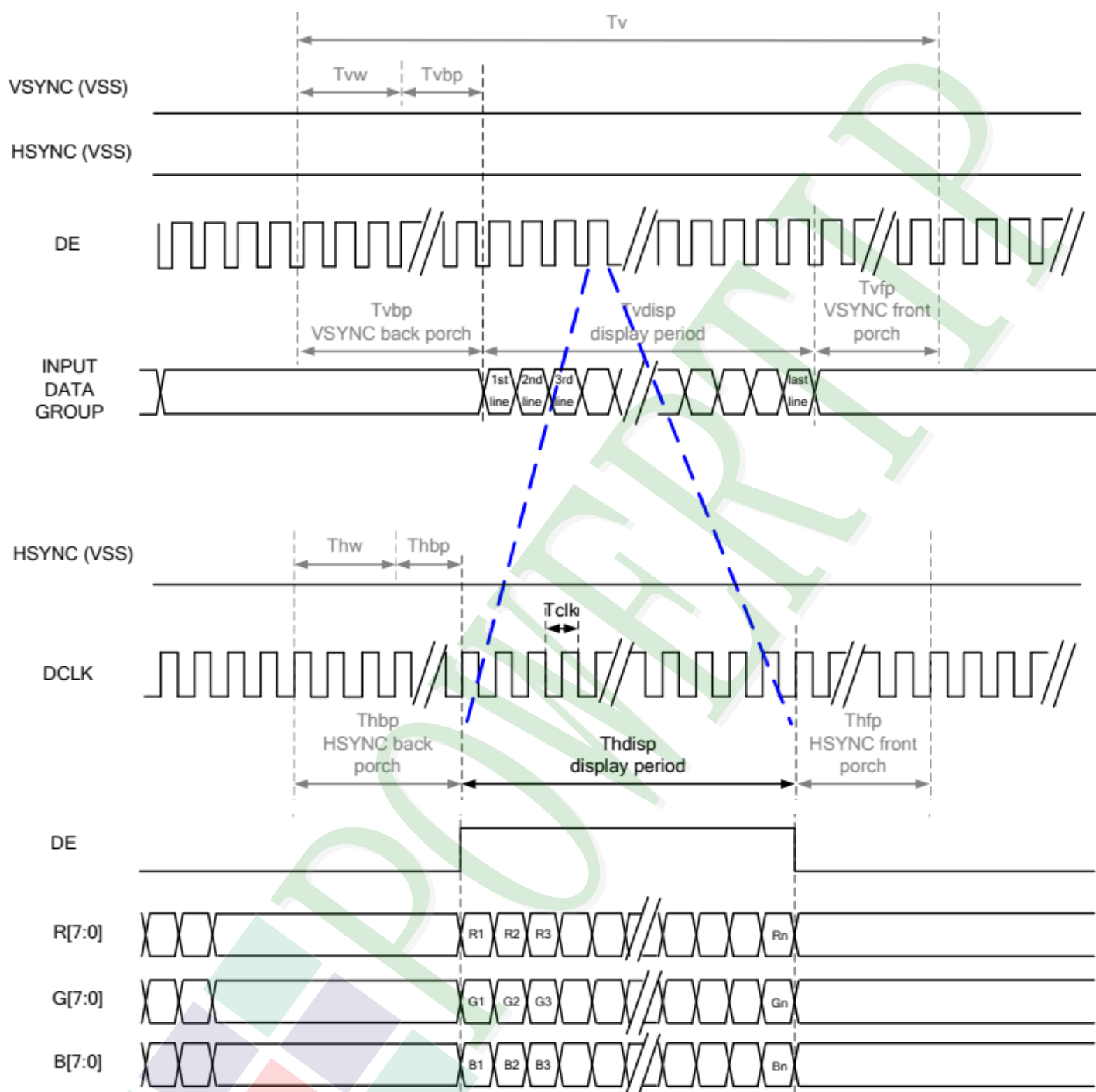
2.3.2 SYNC-Mode Timing Diagram



2.3.3 SYNC-DE Mode Timing Diagram



2.3.4 DE Mode Timing Diagram

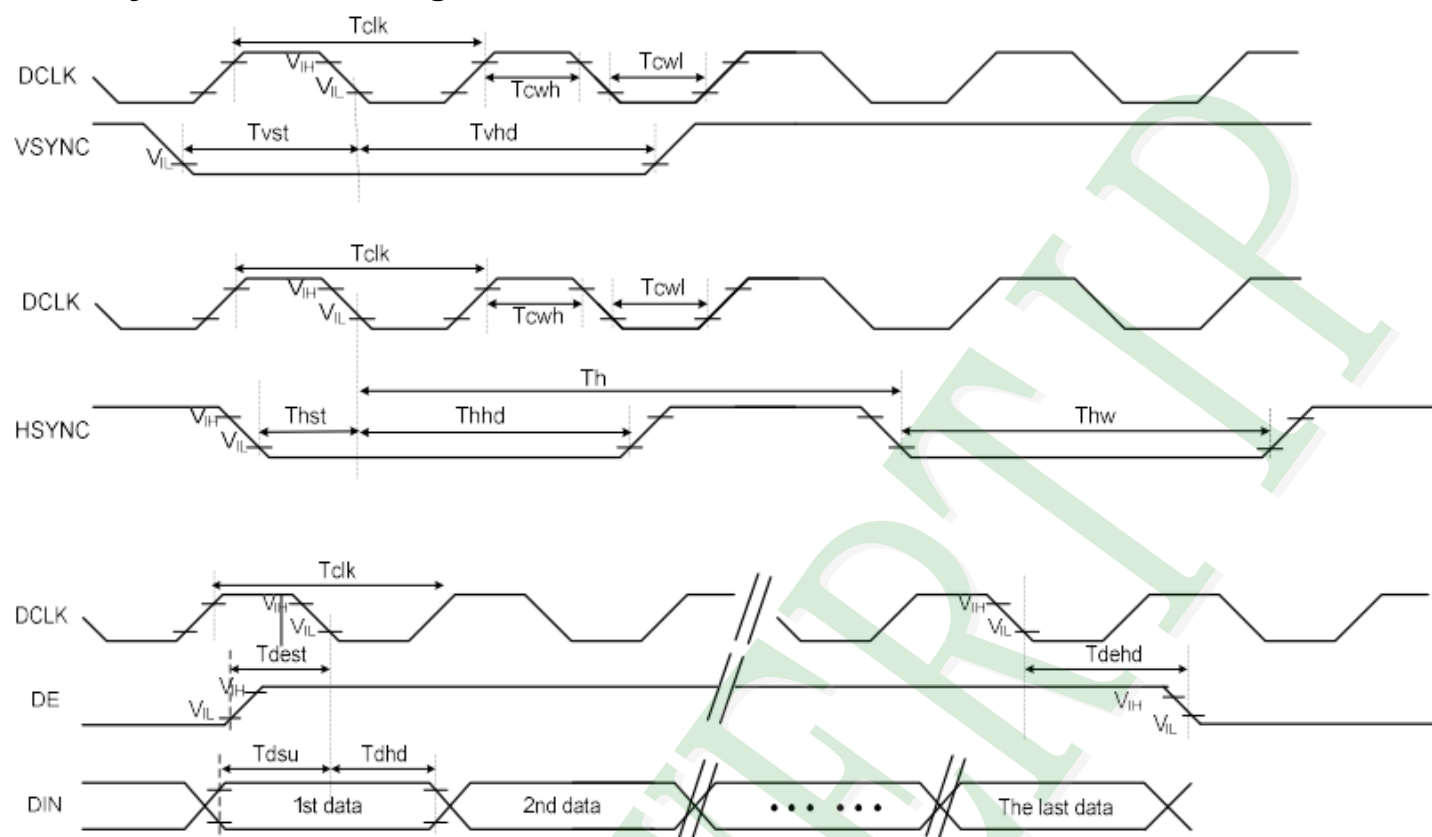


2.3.5 Parallel 24-bit RGB Input Timing Table

VDD =3.3V,GND=0V,TA=25°C

<u>Signal</u>	<u>Item</u>	<u>Symbol</u>	<u>Min.</u>	<u>Typ.</u>	<u>Max.</u>	<u>Unit</u>
DCLK	Frequency	Fclk	-	9	-	MHz
	Period	Tclk	-	111	-	ns
HSYNC	Period	Th	-	531	-	DCLK
	Pulse Width	Thp	-	4	-	DCLK
	Back-Porch	Thb	-	43	-	DCLK
	Display Period	Thd	-	480	-	DCLK
	Front-Porch	Thf	-	8	-	DCLK
VSYNC	Period	Tv	-	148	-	HSYNC
	Pulse Width	Tvp	-	4	-	HSYNC
	Back-Porch	Tvb	-	12	-	HSYNC
	Display Period	Tvd	-	128	-	HSYNC
	Front-Porch	Tvf	-	8	-	HSYNC

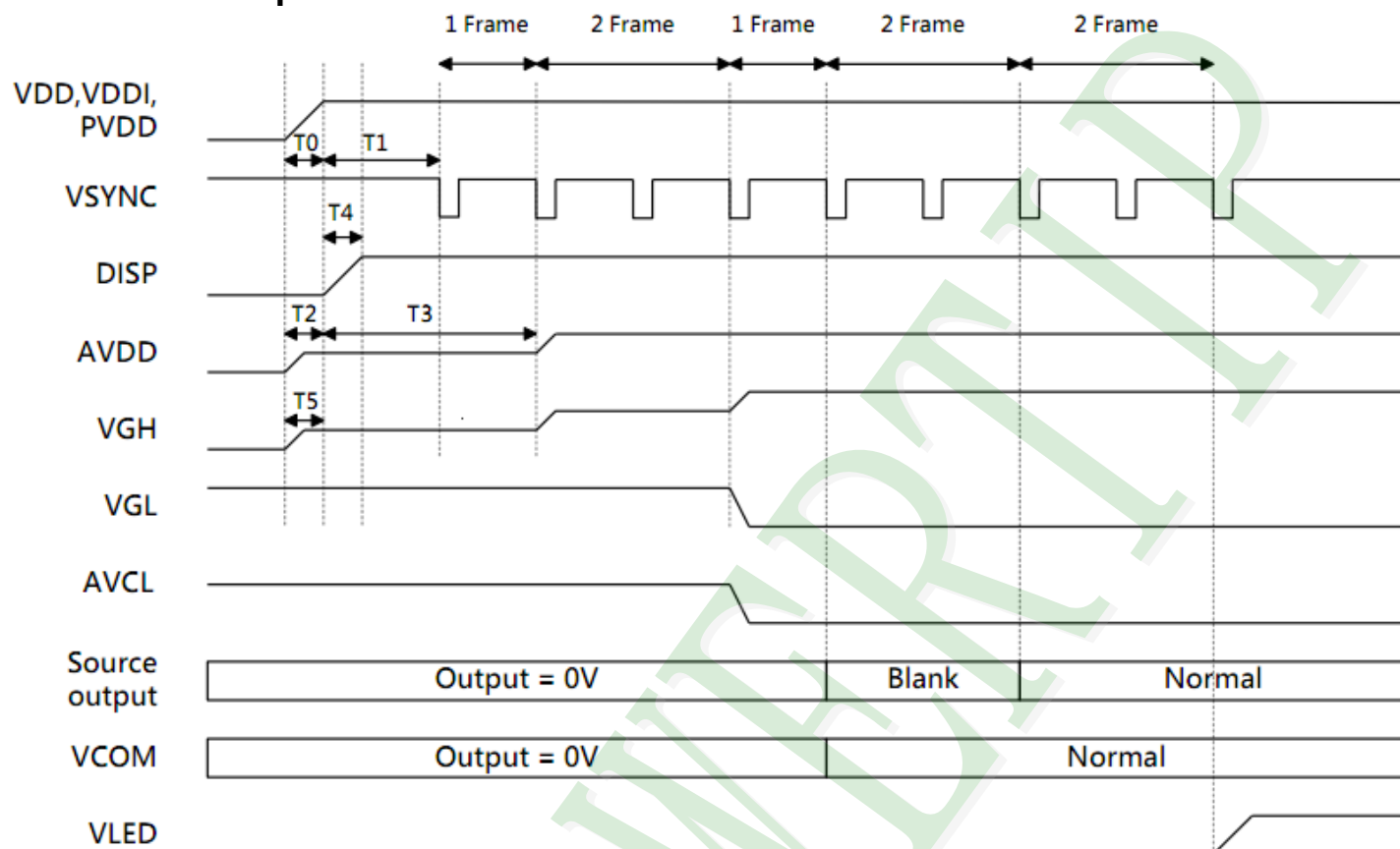
2.3.6 System Bus Timing for RGB Interface



Parmeter	Symbol	Min	Tpy	Max	Unit
CLK Pulse Duty	T_{cw}	-	50	-	%
HSYNC Width	T_{hw}	2	-	-	DCLK
HSYNC Period	T_h	-	60	-	us
VSYNC Setup Time	T_{vst}	12	-	-	ns
VSYNC Hold Time	T_{vhd}	12	-	-	ns
HSYNC Setup Time	T_{hst}	12	-	-	ns
HSYNC Hold Time	T_{hhd}	12	-	-	ns
Data Setup Time	T_{dsu}	12	-	-	ns
Data Hold Time	T_{dhd}	12	-	-	ns
DE Setup Time	T_{dest}	12	-	-	ns
DE Hold Time	T_{dehd}	12	-	-	ns

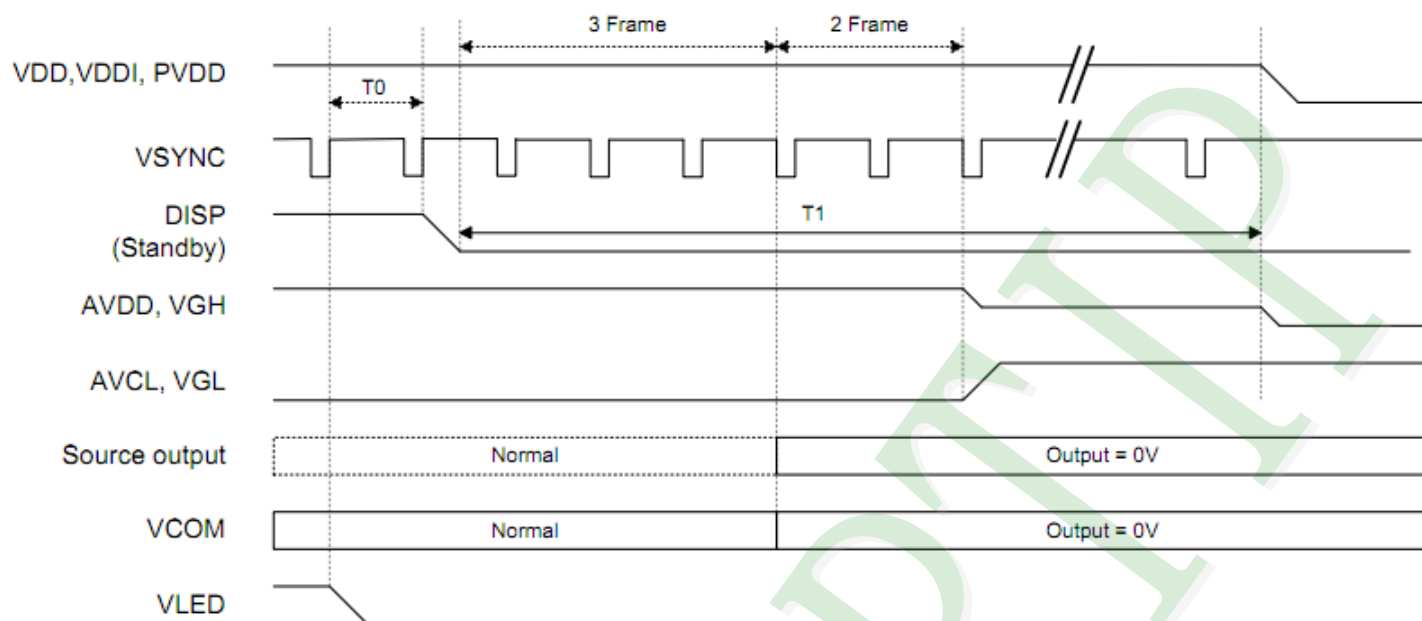
2.4 Electrical Characteristics

POWER ON Sequence



	Description	Min. Time
T0	Determined by the external power	
T1	Time from stable VDD, VDDI, PVDD set-up to the first VSYNC	T1 = 0
T2	Time from AVDD = 0V to AVDD = 3.3V	T2 = T0
T3	Time from AVDD = 3.3V to AVDD = 6.0V	T3 = T1+(1*Frame)
T4	Time from stable VDD, VDDI, PVDD set-up to DISP asserted	T4 = 0
T5	Time from VGH=0V to VGH=3.3V	T5 = T0

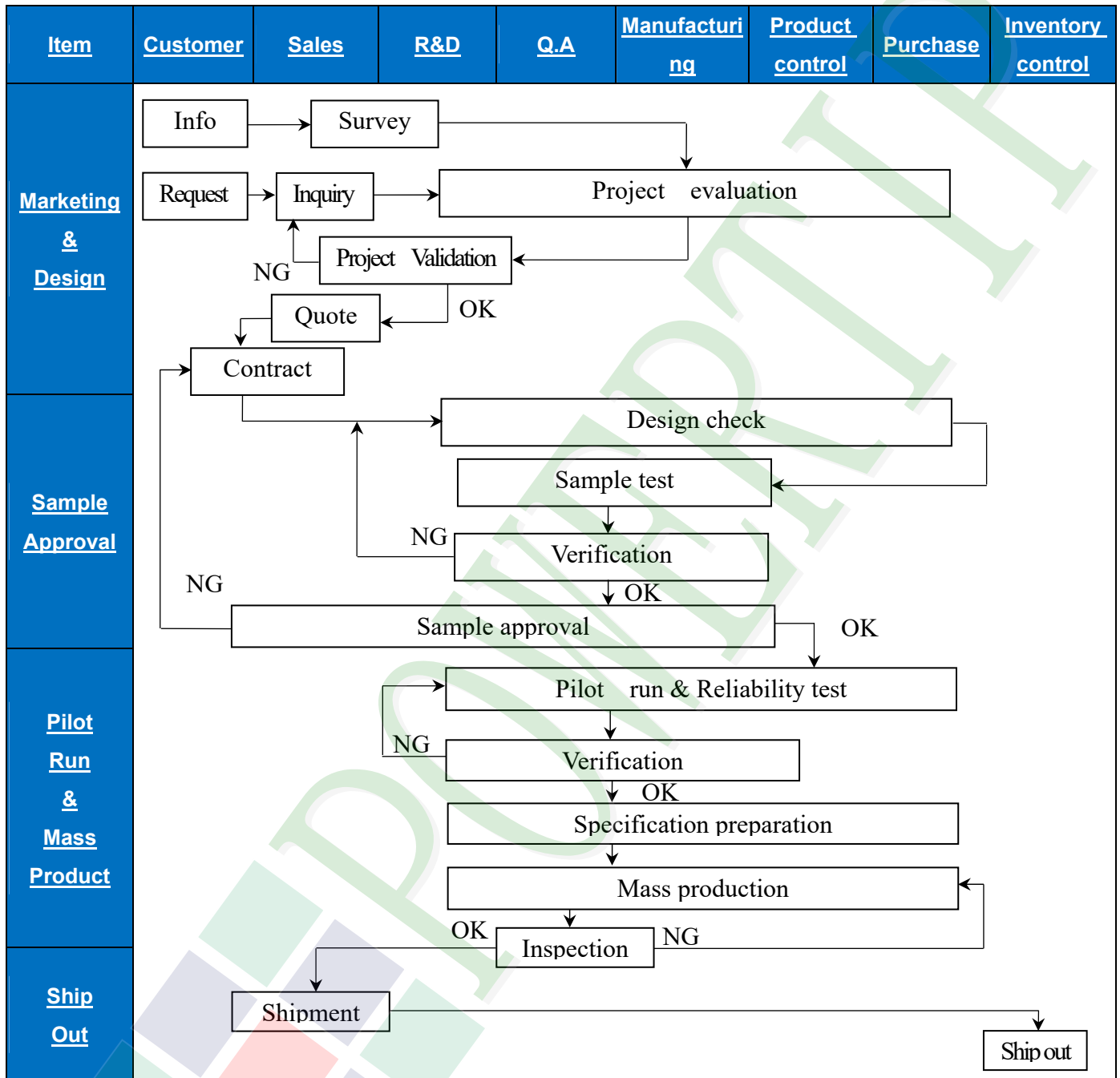
POWER OFF Sequence

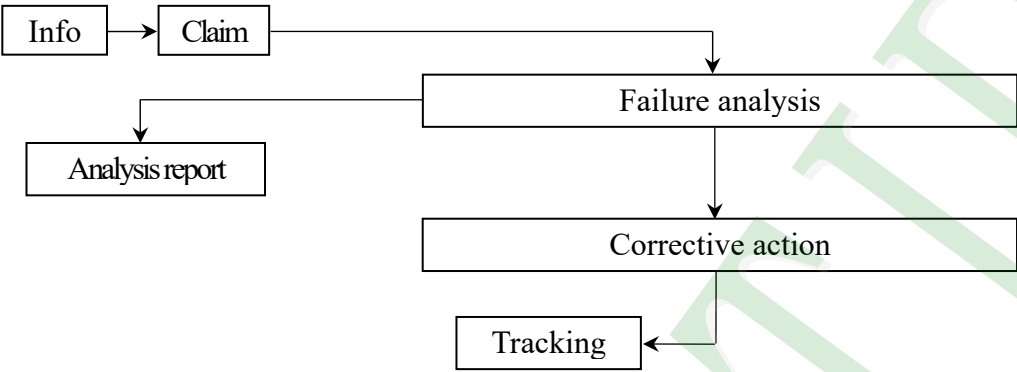


Item	Description	Min. Time
T0	Time from backlight power off to DISP = "L"	1*Frame
T1	Time from DISP = "L" to LCM Power off	5*Frame

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



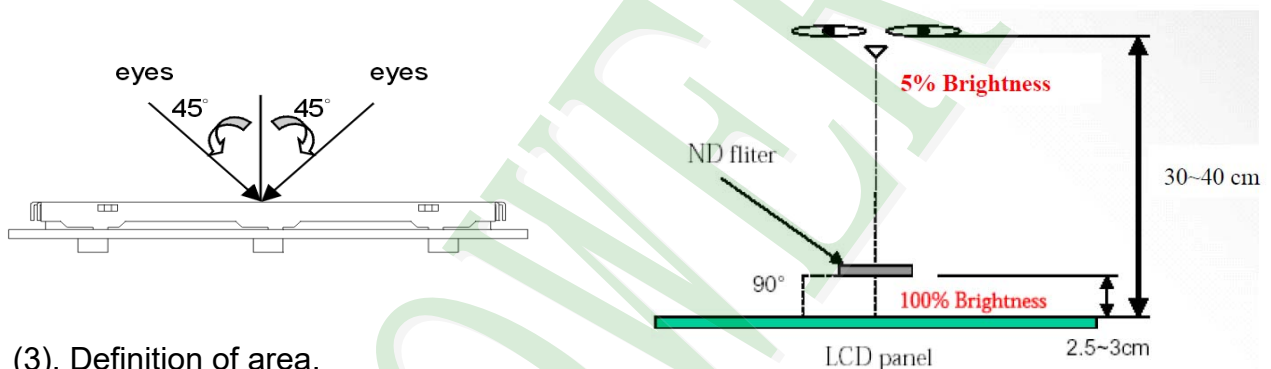
Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
<u>Sales Service</u>	 <pre> graph TD Info[Info] --> Claim[Claim] Claim --> Failure[Failure analysis] Claim --> Report[Analysis report] Failure --> Action[Corrective action] Action --> Tracking[Tracking] </pre>						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

3.2. Inspection Specification

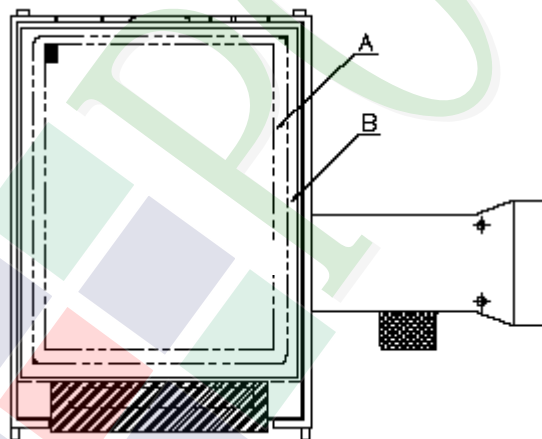
- ◆Scope: The document shall be applied to TFT-LCD Module for 3.5"-15" (Ver.B01).
- ◆Inspection Standard: MIL-STD-105E Table Normal Inspection Single Sampling Level II.
- ◆Equipment: Gauge, MIL-STD, Powertip Tester, Sample
- ◆Defect Level: Major Defect AQL: 0.4; Minor Defect AQL: 1.5
- ◆OUT Going Defect Level: Sampling.
- ◆Standard of the product appearance test:

a. Manner of appearance test:

- (1). The test best be under 20W×2 fluorescent light(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

B area: Outside of viewing area

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

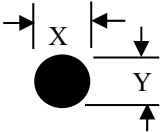
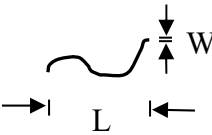
◆Specification For TFT-LCD Module 3.5"~15":

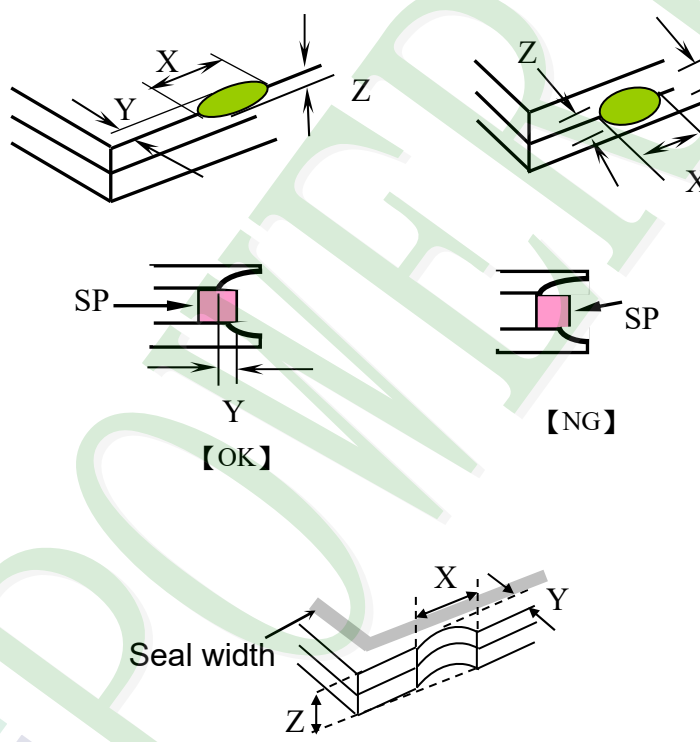
(Ver.B01)

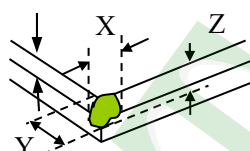
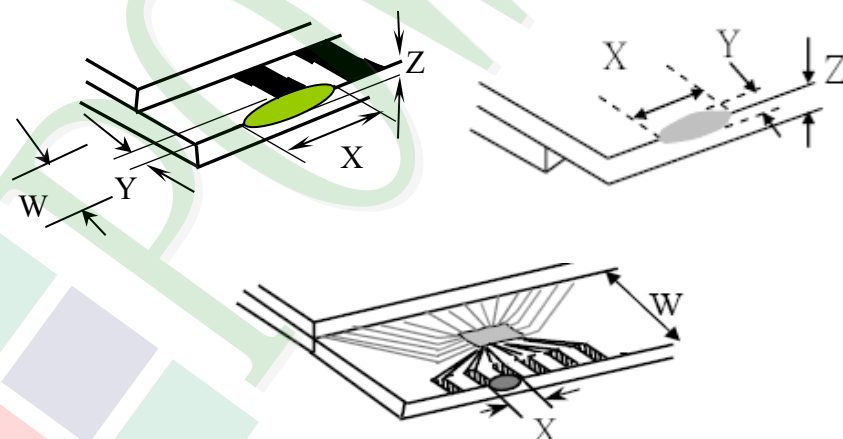
NO	Item	Criterion	Level												
01	Product condition	1.1 The part number is inconsistent with work order of production.	Major												
		1.2 Mixed product types.	Major												
		1.3 Assembled in inverse direction.	Major												
02	Quantity	2.1 The quantity is inconsistent with work order 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 cannot be seen through 5% ND filter at 50% Gray , should be judged by the viewing angle of 90 degree.	Minor												
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>	Item		Acceptance (Q'ty)	Dot Defect	Bright Dot	≤ 4	Dark Dot	≤ 5	Joint Dot	≤ 3	Total	≤ 7	Minor
		Item		Acceptance (Q'ty)											
Dot Defect	Bright Dot	≤ 4													
	Dark Dot	≤ 5													
	Joint Dot	≤ 3													
	Total	≤ 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 ≥ 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.															

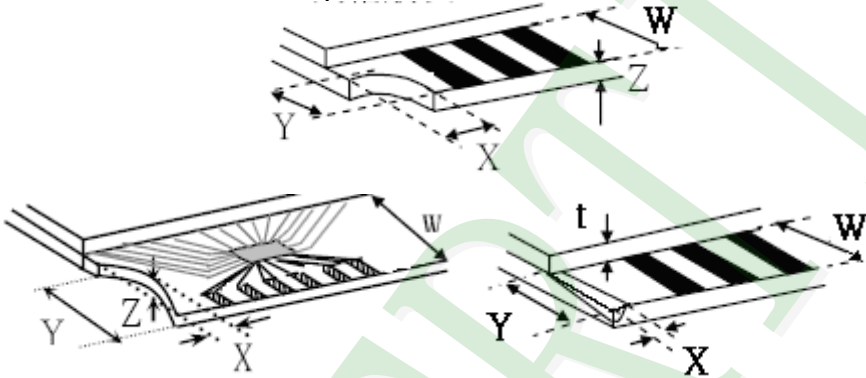
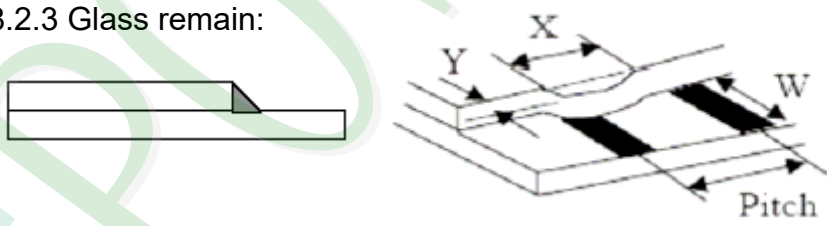
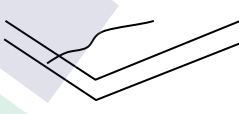
◆Specification For TFT-LCD Module 3.5" ~15" :

(Ver.B01)

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): <table><thead><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></thead><tbody><tr><td>$\Phi \leq 0.25$</td><td>Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.25 < \Phi \leq 0.50$</td><td>5</td></tr><tr><td>$\Phi > 0.50$</td><td>0</td></tr><tr><td>Total</td><td>5</td></tr></tbody></table> 6.2 Line type(Non-display or display): <table><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="5">3.5" to less 9"</td><td>---</td><td>$W \leq 0.03$</td><td>Ignore</td><td rowspan="5">Ignore</td></tr><tr><td>$L \leq 10.0$</td><td>$0.03 < W \leq 0.05$</td><td>4</td></tr><tr><td>$L \leq 5.0$</td><td>$0.05 < W \leq 0.10$</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="5">9" to 15"</td><td>---</td><td>$W \leq 0.05$</td><td>Ignore</td><td rowspan="5">Ignore</td></tr><tr><td>$L \leq 10.0$</td><td>$0.05 < W \leq 0.10$</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></tbody></table>	Dimension (diameter: Φ)	Acceptance (Q'ty)		A area	B area	$\Phi \leq 0.25$	Ignore	Ignore	$0.25 < \Phi \leq 0.50$	5	$\Phi > 0.50$	0	Total	5	module size	Length (L)	Width (W)	Acceptance (Q'ty)		A area	B area	3.5" to less 9"	---	$W \leq 0.03$	Ignore	Ignore	$L \leq 10.0$	$0.03 < W \leq 0.05$	4	$L \leq 5.0$	$0.05 < W \leq 0.10$	2	---	$W > 0.10$	As round type	Total		5	9" to 15"	---	$W \leq 0.05$	Ignore	Ignore	$L \leq 10.0$	$0.05 < W \leq 0.10$	5	---	$W > 0.10$	As round type	Total		5	Minor
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			A area	B area																																																			
3.5" to less 9"	---	$W \leq 0.03$	Ignore	Ignore																																																			
	$L \leq 10.0$	$0.03 < W \leq 0.05$	4																																																				
	$L \leq 5.0$	$0.05 < W \leq 0.10$	2																																																				
	---	$W > 0.10$	As round type																																																				
	Total		5																																																				
9" to 15"	---	$W \leq 0.05$	Ignore	Ignore																																																			
	$L \leq 10.0$	$0.05 < W \leq 0.10$	5																																																				
	---	$W > 0.10$	As round type																																																				
	Total		5																																																				
	07	Polarizer Bubble	<table><thead><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></thead><tbody><tr><td>$\Phi \leq 0.25$</td><td>Ignore</td><td rowspan="5">Ignore</td></tr><tr><td>$0.25 < \Phi \leq 0.50$</td><td>4</td></tr><tr><td>$0.50 < \Phi \leq 0.80$</td><td>1</td></tr><tr><td>$\Phi > 0.80$</td><td>0</td></tr><tr><td>Total</td><td>5</td></tr></tbody></table>		Dimension (diameter: Φ)	Acceptance (Q'ty)		A area	B area	$\Phi \leq 0.25$	Ignore	Ignore	$0.25 < \Phi \leq 0.50$	4	$0.50 < \Phi \leq 0.80$	1	$\Phi > 0.80$	0	Total	5	Minor																																		
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NO	Item	Criterion	Level									
08	The crack of glass	Symbols : X: The length of crack Z: The thickness of crack T: The thickness of glass Y: The width of crack. W: terminal length a : LCD side length 8.1 General glass chip: 8.1.1 Chip on panel surface and crack between panels:  <table> <tr> <th><u>X</u></th> <th><u>Y</u></th> <th><u>Z</u></th> </tr> <tr> <td>$\leq a$</td> <td>Crack can't enter viewing area</td> <td>$\leq 1/2 t$</td> </tr> <tr> <td>$\leq a$</td> <td>Crack can't exceed the half of SP width.</td> <td>$1/2 t < Z \leq 2 t$</td> </tr> </table>	<u>X</u>	<u>Y</u>	<u>Z</u>	$\leq a$	Crack can't enter viewing area	$\leq 1/2 t$	$\leq a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$	Minor
<u>X</u>	<u>Y</u>	<u>Z</u>										
$\leq a$	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	Symbols : X: The length of crack Z: The thickness of crack t: The thickness of glass Y: The width of crack. W: terminal length a: LCD side length 8.1.2 Corner crack:  <table><thead><tr><th>X</th><th>Y</th><th>Z</th></tr></thead><tbody><tr><td>$\leq 1/5 a$</td><td>Crack can't enter viewing area</td><td>$Z \leq 1/2 t$</td></tr><tr><td>$\leq 1/5 a$</td><td>Crack can't exceed the half of SP width.</td><td>$1/2 t < Z \leq 2 t$</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.	$1/2 t < Z \leq 2 t$	Minor
		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.	$1/2 t < Z \leq 2 t$										
8.2 Protrusion over terminal: 8.2.1 Chip on electrode pad:  <table><thead><tr><th></th><th>X</th><th>Y</th><th>Z</th></tr></thead><tbody><tr><td>Front</td><td>$\leq a$</td><td>$\leq 1/2 W$</td><td>$\leq t$</td></tr><tr><td>Back</td><td>a</td><td>$\leq W$</td><td>$\leq 1/2 t$</td></tr></tbody></table>		X	Y	Z	Front	$\leq a$	$\leq 1/2 W$	$\leq t$	Back	a	$\leq W$	$\leq 1/2 t$
	X	Y	Z									
Front	$\leq a$	$\leq 1/2 W$	$\leq t$									
Back	a	$\leq W$	$\leq 1/2 t$									

NO	Item	Criterion	Level												
08	The crack of glass	Symbols: X: The length of crack Z: The thickness of crack t: The thickness of glass Y: The width of crack. W: terminal length a: LCD side length 8.2.2 Non-conductive portion:  <table> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td>$\leq 1/3 a$</td> <td>$\leq W$</td> <td>$\leq t$</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>$\leq a$</td> <td>$\leq 1/3 W$</td> <td>$\leq t$</td> </tr> </table> 8.2.4 Cracking:  Not Allowed	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: 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)

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

◎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 : $+20 \sim 30^{\circ}\text{C}$

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 ketonic 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 (SPS) 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 attached with the customer's mechanical device, please follow up the rules and regulations published by the original manufacturer of double-side tape for the attachment operation.

5.3 STORAGE

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

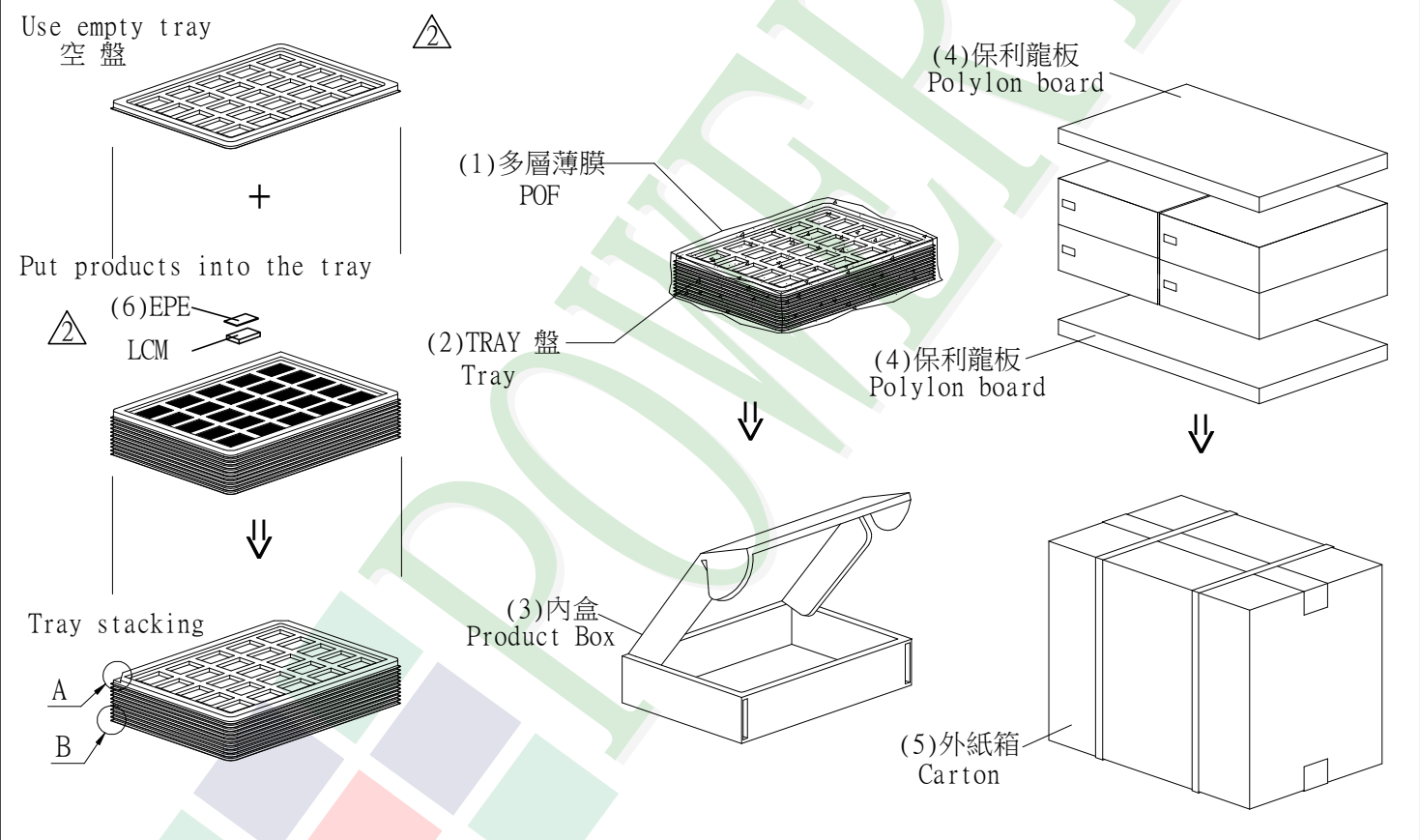
- 5.4.1 Applicable **warrant** period
The period is **within** thirteen months since the date of shipping out under normal using and storage **conditions**.
- 5.4.2 Unaccepted **responsibility**
This product has been manufactured to your company's specification as a part for use in your company's general 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.

[illegible]

Ver.002			Approve	Check	Contact
Documents NO.	PKG-PH480128T002-ZCA	Packaging Specifications	Bright	Tina	Clare

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)	PH480128T002-ZCA	103.2 X 34.85	0.0136	216	2.9376
2	多層薄膜(1)POF	OTFILM0BA03ABA	19"X350X0.015	——	4	——
3	TRAY盤 (2)Tray	TYSG000000734	352 X 260 X 14	0.1	40	4.0
4	內盒(3)Product Box	BX00000000022	393 X 274 X 107	0.25	4	1.0
5	保利龍板(4)Polylon board	OTPLB000000008	550 X 393 X 15	0.022	2	0.044
6	外紙箱(5)Carton	BX57041027CCBA	570 X 410 X 265	1.0	1	1.0
7	EPE(6)EPE	FOAM000000062	150m X 1.1m X2mm	——	0.003056	——
8						
9						

2.一整箱總重量 (Total LCD Weight in carton)： 8.98 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 9 = 54						
(2)Total LCM quantity in carton：quantity per box 54 x no of boxes 4 = 216						



特 記 事 項 (REMARK) △		
A 斜角 Detail B Tray 2 Tray 1 圓角 1. 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.	5. 每個LCM上方皆放緩衝材質EPE(6) Cut size = 100 X 30 X 2.0mm (6)EPE LCM	