POWERTIP TECH. CORP.

SPECIFICATIONS

CUSTOMER	:	PTC
SAMPLE CODE (Ver.)	:	PS320240T-001-I-01 (Ver.A)
MASS PRODUCTION CODE (Ver.)	:	PH320240T-001-I (Ver.0)
DRAWING NO. (Ver.)	:	PH-05034-001 (Ver.0)

Customer Approved

Date:

Approved	QC Confirmed	Designer
	Q.A. DEPT. JUL 12 2005 POWERTIP TECH CORP. 陳佳利	生技 2005-7-11. 鄭祐丞

■ Approval For Specifications Only.

* This specification is subject to change without notice.

Please contact Powertip or it's representative before designing your product based on this specification.

☐ Approval For Specifications and Sample.

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History of Version

Date	Ver.	Description	Page	Design by
2005/07/11	0	Mass Production	-	Yuan

Total : 25 Page

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Appendix A: LCM Drawing

Appendix B: Package

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

Primacy(TFT LCD) : HX8218 + HX8615

1. SPECIFICATIONS

1.1 Features

LCM

Item	Standard Value
Display Type	320(R、G、B) * 240 Dots
LCD Type	Normally white , Transmissive type
Screen size(inch)	3.5 inch
Viewing Direction	6 O'clock
Color configuration	RGB-Strip
Backlight Type	LED
Interface	Digital 24-bits RGB
Driver IC	HX8218 + HX8615
Item	Standard Value

LCM Weight : TBD g

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	76.9(W) * 63.9 (L) * 3.2 (H)(Max)	mm

LCM

Item	Standard Value	Unit
Active Area	70.08 (W) * 52.56 (L)	mm
Dot Pitch	0.219 (W) * 0.219 (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	AVSS=0	-0.3	7.0	V
	VCC	GND=0	-0.3	7.0	
	VGH	GND=0	-0.3	32.0	
	VGL	GND=0	-22.0	0.3	
	VGH-VGL	GND=0	-0.3	45.0	
Input Voltage	Vi	-	-0.3	VDD+0.3	V
	VI	-	-0.3	VCC+0.3	V
LED Reverse Voltage	Vr	One LED	-	3.2	V
LED Forward Current	If	One LED	-	20	mA
LED Power Dissipation	Pd	One LED	-	64	mW
Operating Temperature	T_{OP}	Excluded B/L	-20	60	°C
Storage Temperature	T_{ST}	Excluded B/L	-30	70	°C

1.4 DC Electrical Characteristics

Module Gnd = 0V , Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Digital Supply Voltage	VCC	-	3	3.3	3.6	V
Digital Operation Current	ICC	-		0.02		mA
Analog Supply Voltage	VDD	-	3.8	5	5.5	V
Analog Operation Current	IDD			3.0		mA
Gate On Power	V_{GH}		14	16	18	V
Gate Off Power	V_{GL}		-11	-10	8	V
Gate On Current	I_{GH}			0.04		mA
Gate Off Current	I_{GL}			0.03		mA
V_{COM} Current	I_{com}			8		mA
V_{COM} High Voltage	V_{COMH}			4		V
V_{COM} Low Voltage	V_{COML}			-1		V
Frame frequency	fFrame		-	60	90	Hz
Dot Data Clock	DCLK		-	-	6.4	Hz
Power consumption	P_{LCD}		-	28	32	mW

1.5 Optical Characteristics

TFT LCD panel

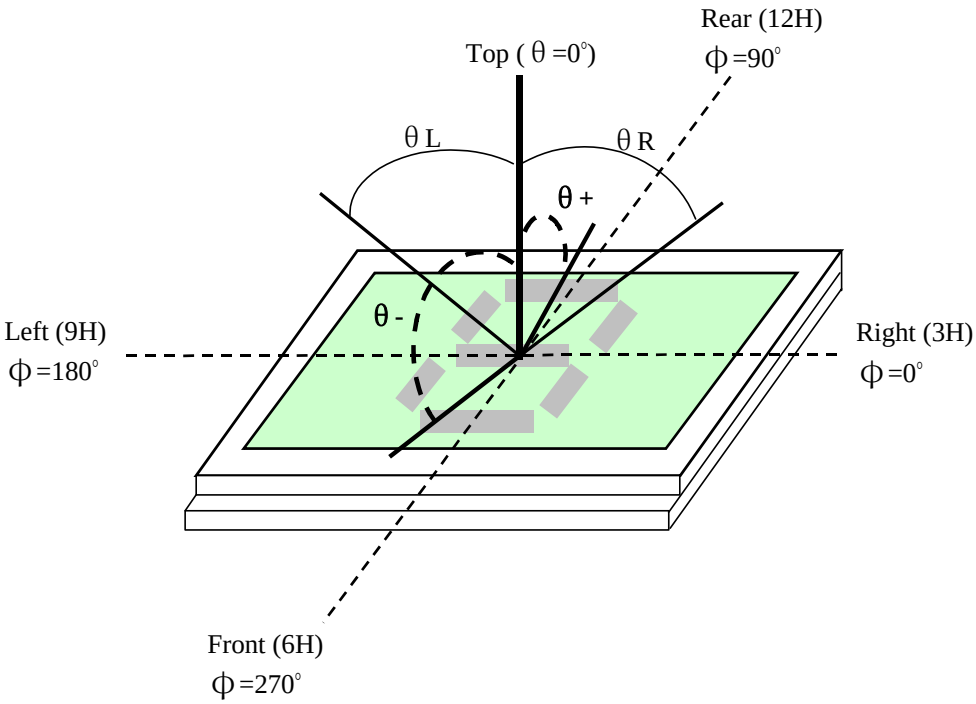
Item		Symbol	Condition	Min.	Typ.	Max.	unit	
Response time	Rise	Tr	Ta = 25°C θX, θY = 0°	-	10	TBD	ms	Note2
	Fall	Tf		-	15	TBD		
Color of CIE Coordinate*1	White	X		0.29	0.32	0.35	-	-
		Y		0.31	0.34	0.37		
	Red	X		0.55	0.58	0.61		
		Y		0.33	0.36	0.39		
	Green	X		0.31	0.34	0.37		
		Y		0.55	0.58	0.61		
	Blue	X		0.11	0.14	0.17		
		Y		0.07	0.10	0.13		
Viewing angle	Top	θY+	CR ≥ 10	35	50	-	deg.	Note1
	Bottm	θY-		40	55	-		
	Left	θ_{X-}		45	60	-		
	Right	θ_{X+}		45	60	-		
Contrast ratio		CR	Ta = 25°C	200	300	-		Note3

*1 This vaule will be changed while mass production. (Color of CIE Coordinate)

Note 1.

Optical characteristics-2

Viewing angle

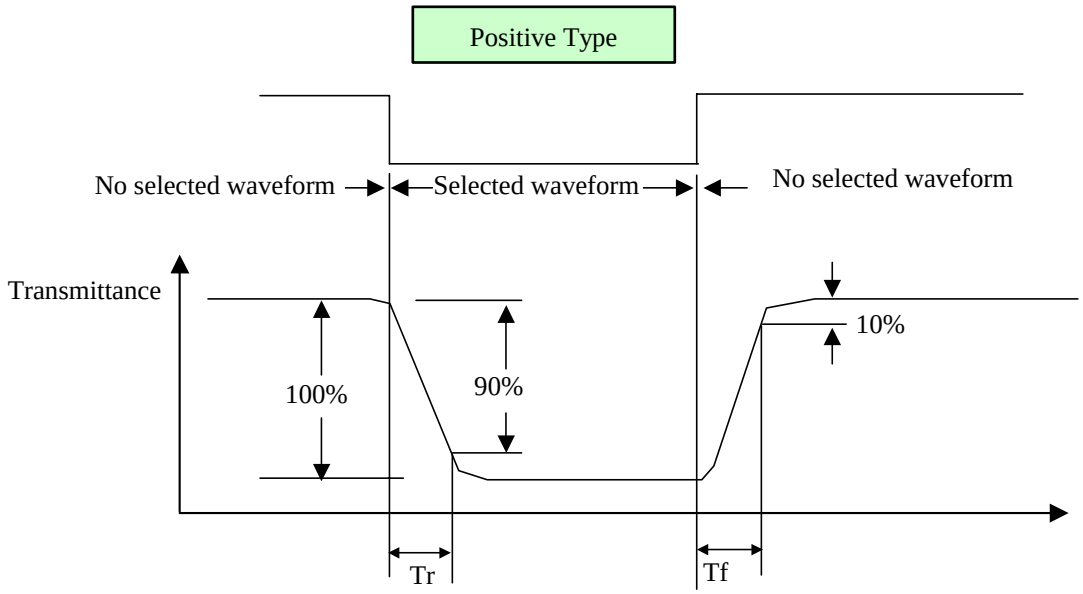


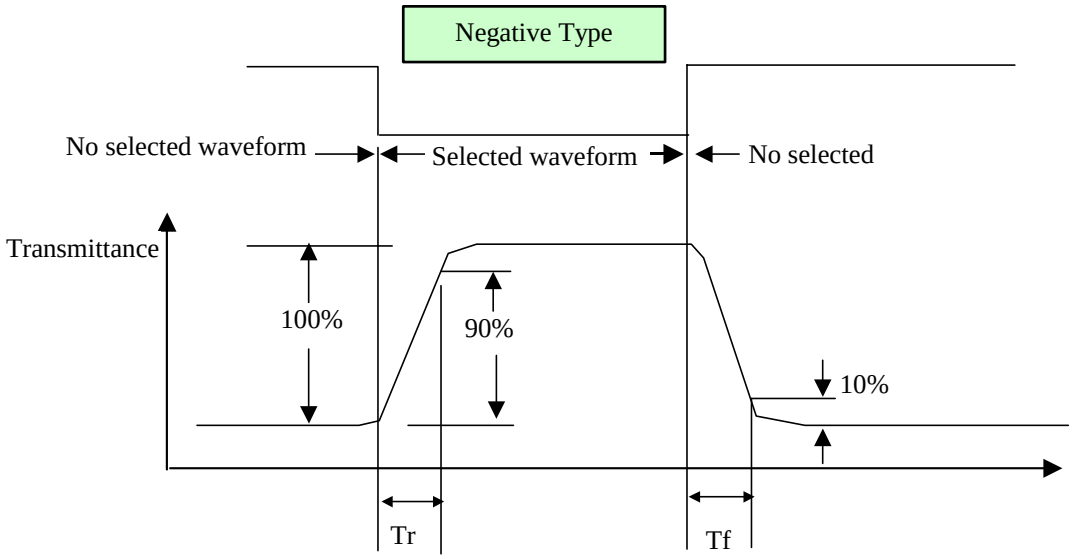
Viewing angle

Note 2.

Optical characteristics-3

Fig.2 Definition of response time





Electrical characteristics-2

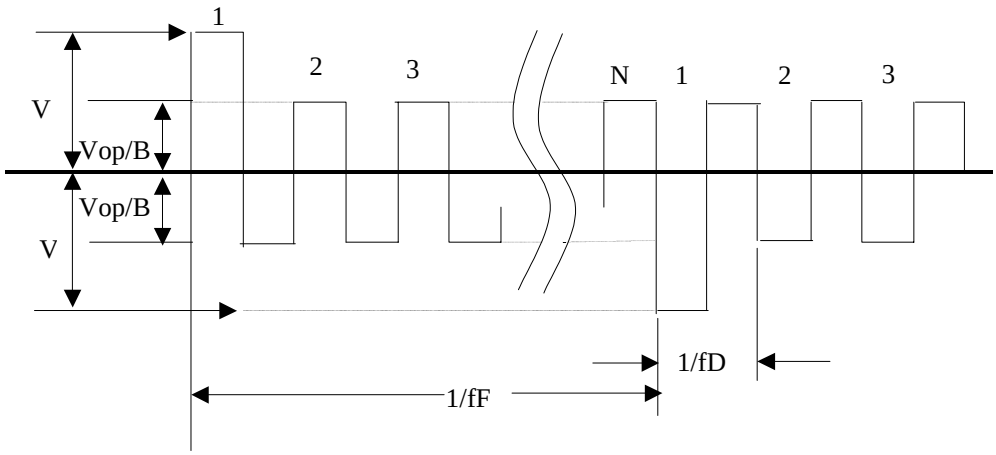
※2 Drive waveform

Vop: Drive voltage fF: Frame frequency

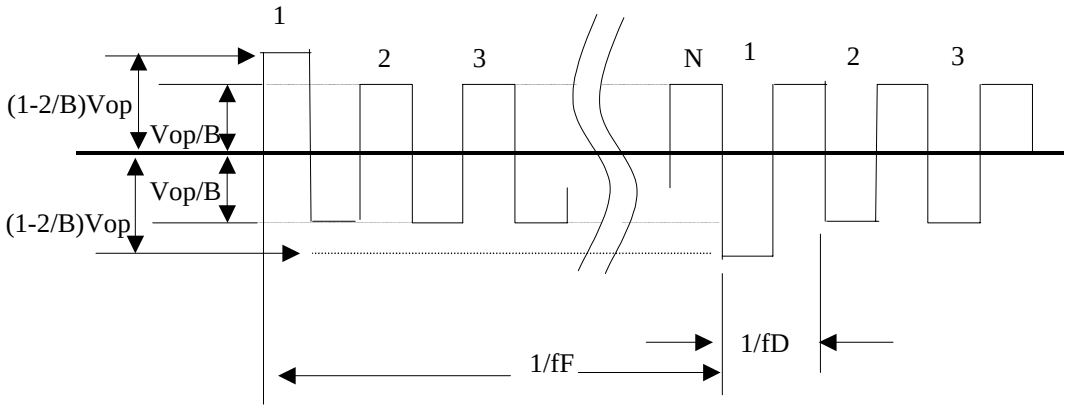
1/B: Bias fD: Drive frequency

N: Duty

(1) Selected waveform



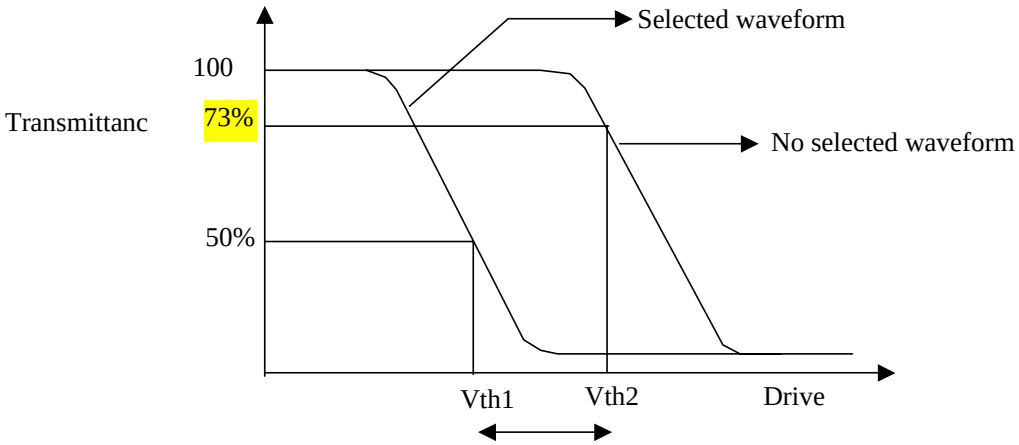
(2) Non- Selected waveform



Note:

Frame frequency is defined as follows: Common side supply voltage peak - to - peak /2 = 1 period

Note 3. : Definition of Vth

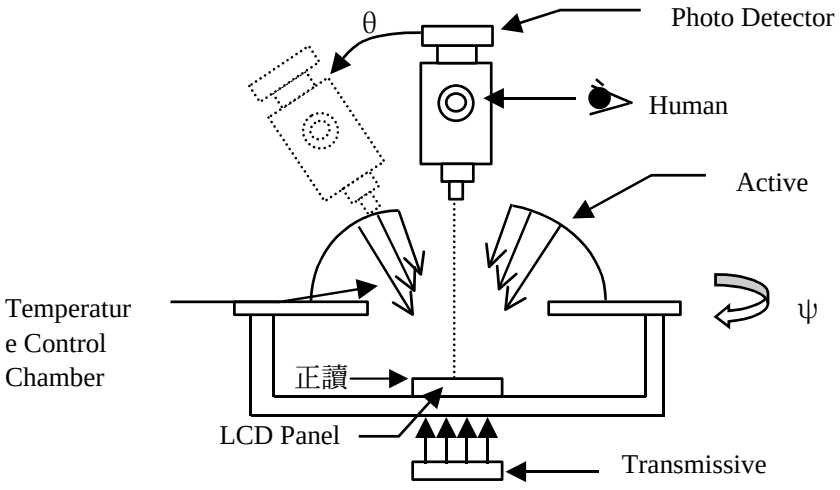


Active voltage range

	Vth1	Vth2
View direction	10°	40°
Drive waveform	(Selected waveform)	(No selected waveform)
Transmittance	50%	73%

※1 Contrast ratio
= (Brightness in OFF state) / (Brightness in ON state)

Outline of Electro-Optical Characteristics Measuring System



Measuring System: Autronic DMS-803

1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Typ	Max.	Unit
Forward Current	I_F	Ta =25°C	-	20	-	mA
Reverse Voltage	V_R	Ta =25°C	-	-	-	V
Power Dissipation	P_D	Ta =25°C	-	420	-	mW

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Average Brightness (with LCD)	I_V	IF=20 mA	200	290	-	cd/m^2
CIE Color Coordinate (With LCD)	X	IF= 20 mA	0.29	0.32	0.35	-
	Y		0.31	0.34	0.37	
Backlight Uniformity (with LCD)	△B	IF= 20mA	70	-	-	%
Control ratio(With LCD)	CR	Ta =25°C	150	200	-	
Color	White					

Note: △B=(Min/Max)100%

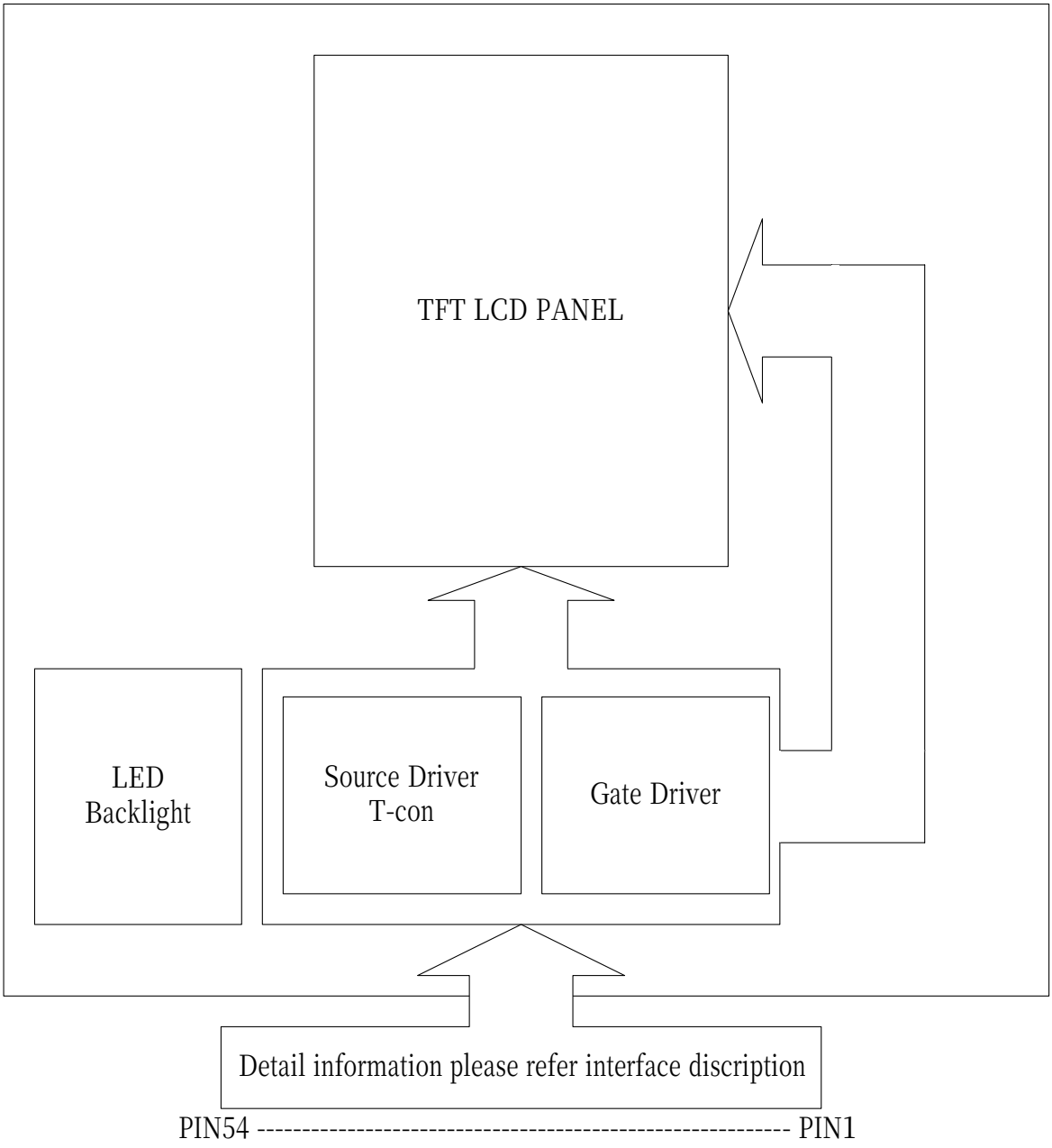
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



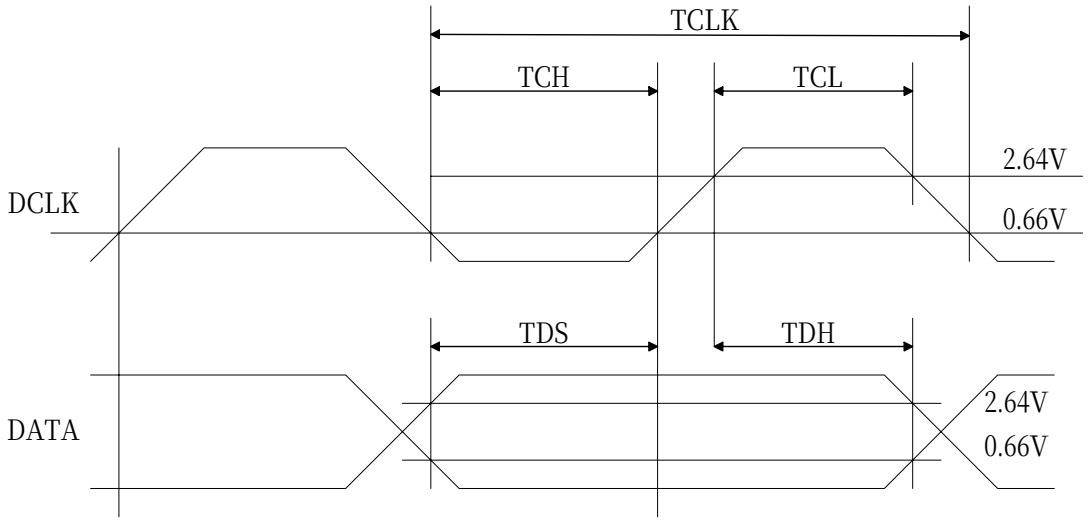
2.2 Interface Pin Description

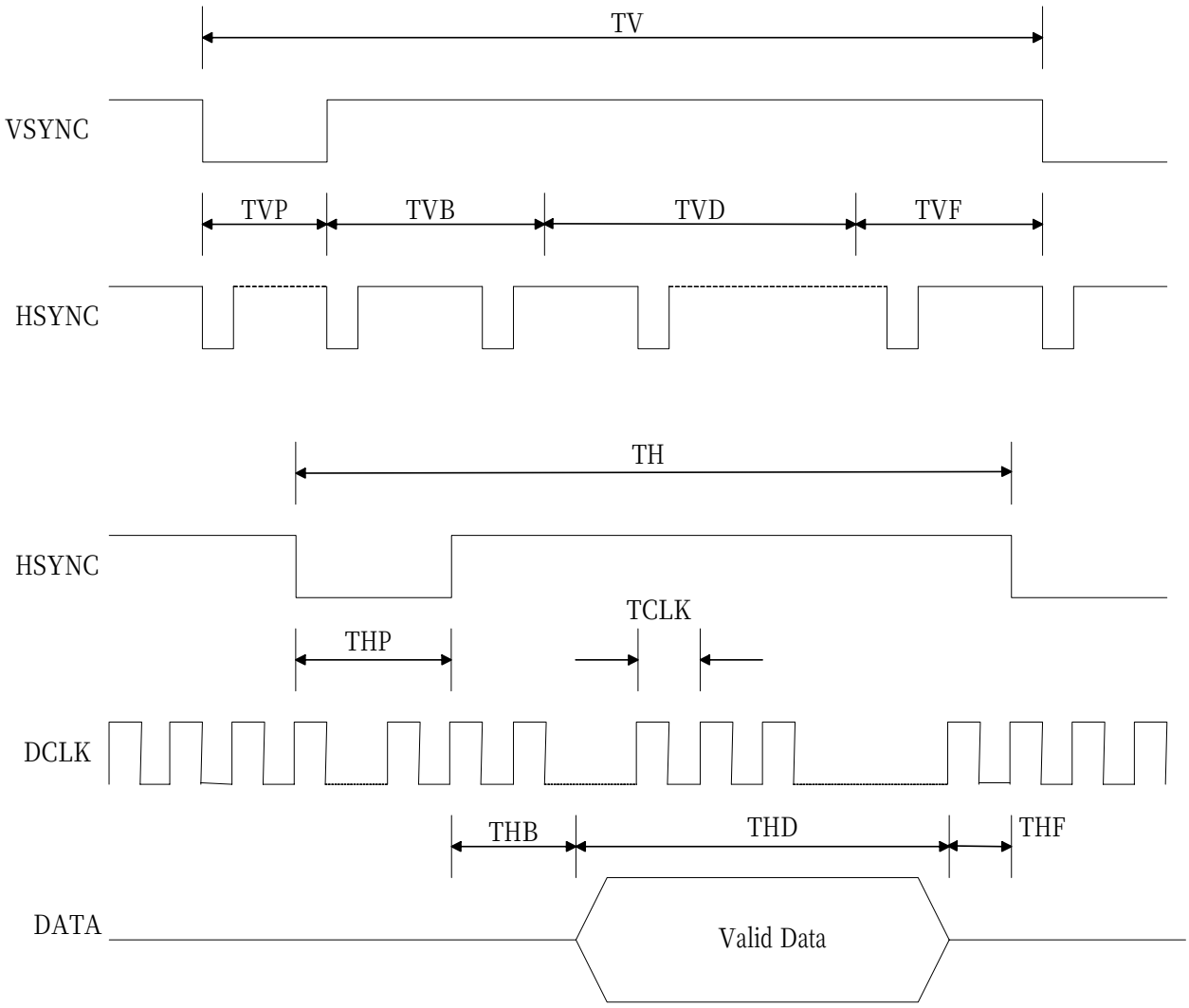
Pin No.	Symbol	Function
1	VBL-	Power supply for LED Backlight cathode input
2	VBL-	Power supply for LED Backlight cathode input
3	VBL+	Power supply for LED Backlight anode input
4	VBL+	Power supply for LED Backlight anode input
5	NC	Not used , Must be open
6	NC	Not used , Must be open
7	POL	Connect to Vcom circuit
8	/RESET	Hardware reset
9	SPENA	Serial port data enable signal
10	SPCLK	Serial data clock
11	SPDAT	Serial data
12	B0	Blue data bit 0
13	B1	Blue data bit 1
14	B2	Blue data bit 2
15	B3	Blue data bit 3
16	B4	Blue data bit 4
17	B5	Blue data bit 5
18	B6	Blue data bit 6
19	B7	Blue data bit 7
20	G0	Green data bit 0
21	G1	Green data bit 1
22	G2	Green data bit 2
23	G3	Green data bit 3
24	G4	Green data bit 4
25	G5	Green data bit 5
26	G6	Green data bit 6
27	G7	Green data bit 7
28	R0	Red data bit 0
29	R1	Red data bit 1
30	R2	Red data bit 2
31	R3	Red data bit 3

32	R4	Red data bit 4
33	R5	Red data bit 5
34	R6	Red data bit 6
35	R7	Red data bit 7
36	HSYNC	Horizontal sync input
37	VSYNC	Vertical sync input
38	DCLK	Dot data clock
39	V_{DD}	Analog power
40	V_{DD}	Analog power
41	V_{CC}	Digital power
42	V_{CC}	Digital power
43	NC	Not used , Must be open
44	NC	Not used , Must be open
45	V_{GL}	Gate off power
46	NC	Not used , Must be open
47	V_{GH}	Gate on power
48	NC	Not used , Must be open
49	NC	Not used , Must be open
50	NC	Not used , Must be open
51	VCOM	Driving input
52	ENB	Data enable control
53	GND	Ground
54	VSS	Ground

2.3 Timing Characteristics

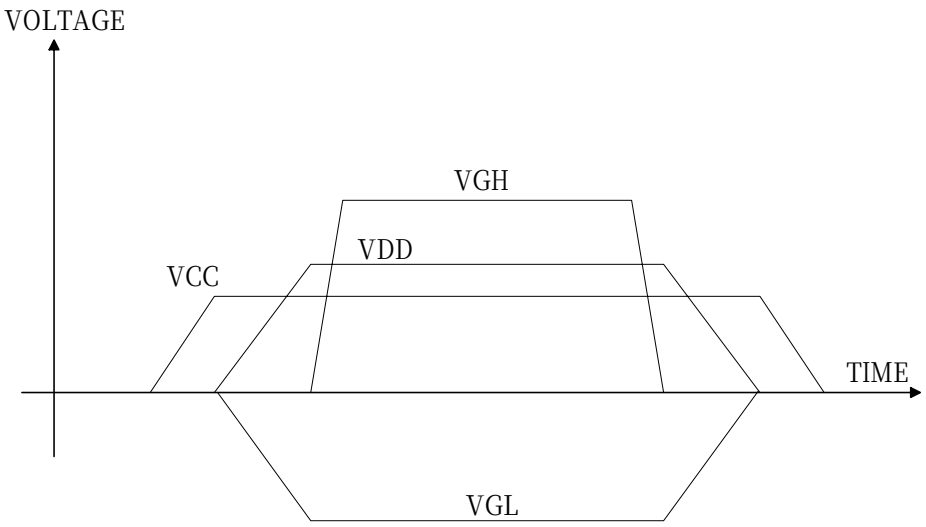
Signal	Item		Symbol	Min.	Typ.	Max.	Unit
Dclk	Frequency		Dclk		6.4		MHz
	High Time		Tch		78		ns
	Low Time		Tcl		78		ns
Data	Setup Time		Tds	12			ns
	Hold Time		Thd	12			ns
Hsync	Period		TH		408		DCLK
	Pulse Width		Thp		30		DCLK
	Back-Porch		Thb		38		DCLK
	Display Period		Thd		320		DCLK
	Front-Porch		Thf		20		DCLK
Vsync	Period	NTSC	Tv		262.5		TH
		PAL			312.5		
	Pulse Width		Tvp	1	3	5	TH
	Back-Porch	NTSC	Tvb		15		TH
		PAL			23		
	Display Period		Tvd		240		TH
	Front-Porch	NTSC	Tvf		4.5		TH
		PAL			46.5		




TV
VSYNC
TVP
TVB
TVD
TVF
HSYNC
TH
HSYNC
TCLK
THP
DCLK
THB
THD
THF
DATA
Valid Data

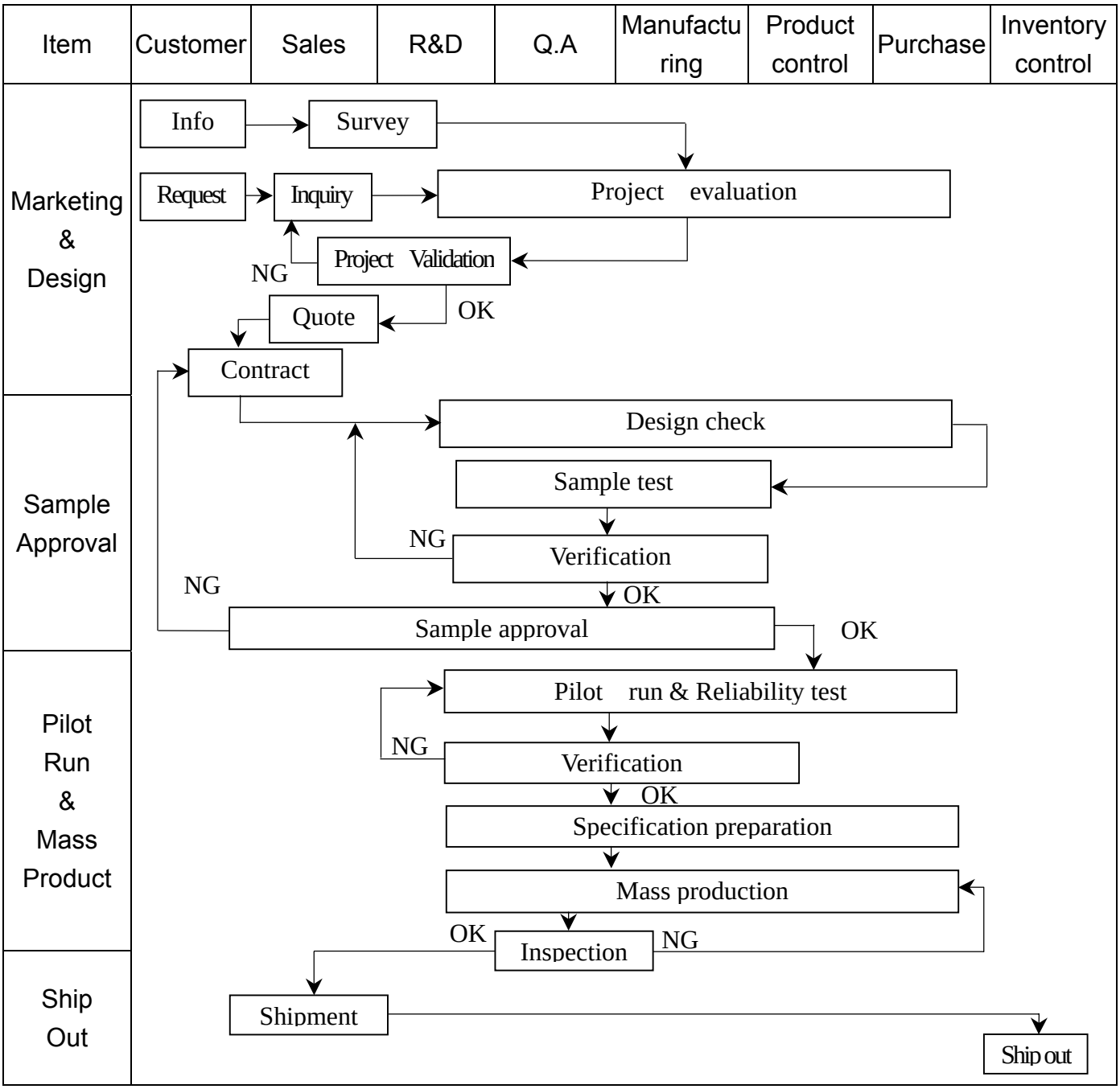
2.4 Power Sequence

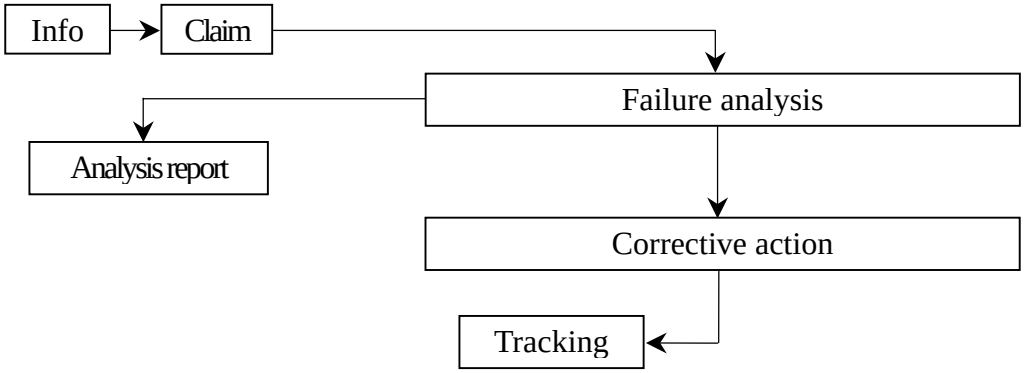
The LCD panel adopts high voltage driver ICs , so it could be permanently damaged if a wrong power on/off sequence is used, When powering on the LCD , VCC should go up firstly, and then turn on VGL and VDD , and finally VGH ,Turn off the LCD panel with reversed order or shut off all the power supplies simultaneously.



3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

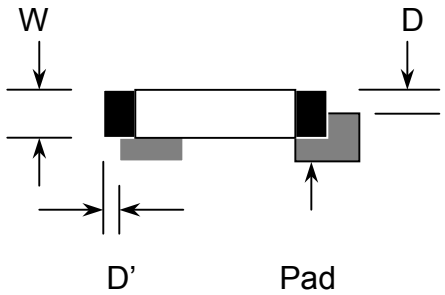


Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service								
Q.A Activity	1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management				2. Process improvement proposal 4. Education And Training Activities			

3.2 Inspection Specification

Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II
Equipment : Gauge , MIL-STD , Powertip Tester , Sample
IQC Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5
FQC Defect Level : 100% Inspection
OUT Going Defect Level : Sampling
Specification :

NO	Item	Specification	Judge	Level
1	Part Number	The part number is inconsistent with work order of production	N.G.	Major
2	Quantity	The quantity is inconsistent with work order of production	N.G.	Major
3	Electronic characteristics of LCM A=(L + W)／2	The display lacks of some patterns.	N.G.	Major
		Missing line.	N.G.	Major
		The size of missing dot, A is > 1/2 Dot size	N.G.	Major
		There is no function.	N.G.	Major
		Output data is error	N.G.	Major
4	Appearance of LCD A=(L + W)／2 Dirty particle (Including scratch、bubble)	Material is different with work order of production	N.G.	Major
		LCD is assembled in inverse direction	N.G.	Major
		Bezel is assembled in inverse direction	N.G.	Major
		Shadow is within LCD viewing area + 0.5 mm	N.G.	Major
		The diameter of dirty particle, A is > 0.4 mm	N.G.	Minor
		Dirty particle length is > 3.0mm, and 0.01mm < width ≤ 0.05mm	N.G.	Minor
		Display is without protective film	N.G.	Minor
		Conductive rubber is over bezel 1mm	N.G.	Minor
		Polarizer exceeds over viewing area of LCD	N.G.	Minor
		Area of bubble in polarizer, A > 1.0mm, the number of bubble is > 1 piece.	N.G.	Minor
		0.4mm < Area of bubble in polarizer, A < 1.0mm, the number of bubble is > 4 pieces.	N.G.	Minor
5	Appearance of PCB A=(L + W)／2	Burned area or wrong part number is on PCB	N.G.	Major
		The symbol, character, and mark of PCB are unidentifiable.	N.G	Minor
		The stripped solder mask , A is > 1.0mm	N.G.	Minor
		0.3mm < stripped solder mask or visible circuit, A < 1.0mm, and the number is ≥ 4 pieces	N.G.	Minor
		There is particle between the circuits in solder mask	N.G	Minor
		The circuit is peeled off or cracked	N.G	Minor
		There is any circuits risen or exposed.	N.G	Minor
		0.2mm < Area of solder ball, A is ≤ 0.4mm The number of solder ball is ≥ 3 pieces	N.G	Minor
		The magnitude of solder ball, A is > 0.4mm.	N.G	Minor

NO	Item	Specification	Judge	Level
6	Appearance of molding A=(L + W)／2	The shape of modeling is deformed by touching.	N.G.	Major
		Insufficient epoxy: Circuit or pad of IC is visible	N.G.	Minor
		Excessive epoxy: Diameter of modeling is > 20mm or height is > 2.5mm	N.G.	Minor
		The diameter of pinhole in modeling, A is > 0.2mm.	N.G.	Minor
7	Appearance of frame A=(L + W)／2	The folding angle of frame must be > 45°+ 10°	N.G.	Minor
		The area of stripped electroplate in top-view of frame, A is > 1.0mm.	N.G.	Minor
		Rust or crack is (Top view only)	N.G.	Minor
		The scratched width of frame is > 0.06mm. (Top view only)	N.G.	Minor
8	Electrical characteristic of backlight A=(L + W)／2	The color of backlight is nonconforming	N.G.	Major
		Backlight can't work normally.	N.G.	Major
		The LED lamp can't work normally	N.G.	Major
		The unsoldering area of pin for backlight, A is > 1/2 solder joint area.	N.G.	Minor
		The height of solder pin for backlight is > 2.0mm	N.G.	Minor
10	Assembly parts A=(L + W)／2	The mark or polarity of component is unidentifiable.	N.G.	Minor
		The height between bottom of component and surface of the PCB is floating > 0.7mm	N.G.	Minor
		D > 1/4W  	N.G.	Minor
		End solder joint width, D' is > 50% width of component termination or width of pad	N.G.	Minor
		Side overhang, D is > 25% width of component termination.	N.G.	Minor
		Component is cracked, deformed, and burned, etc.	N.G.	Minor
		The polarity of component is placed in inverse direction.	N.G.	Minor
		Maximum fillet height of solder extends onto the component body or minimum fillet height is < 0.5mm.	N.G.	Minor

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO	Item	Test Condition	
1	High Temperature Storage	Storage at 70 ± 2°C 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
2	Low Temperature Storage	Storage at -20 ± 2°C 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
3	High Temperature /Humidity Storage	1.Storage 96~100 hrs 60 ± 2°C, 90~95%RH surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer). or 2.Storage 96~100 hrs 40 ± 2°C, 90~95%RH surrounding temperature, then storage at normal condition 4 hrs.	
4	Temperature Cycling	0°C → 25°C → 60°C → 25°C (30mins) (5mins) (30mins) (5mins) 10 Cycle	
5	Vibration	10~55Hz (1 minute) 1.5mm X,Y and Z direction * (each 2hrs)	
6	ESD Test	Air Discharge: Apply 6 KV with 5 times discharge for each polarity +/-	Contact Discharge: Apply 250V with 5 times discharge for each polarity +/-
		Testing location: Around the face of LCD	Testing location: 1.Apply to bezel. 2.Apply to Vcc, Gnd.
7	Drop Test	Packing Weight (Kg)	Drop Height (cm)
		0 ~ 45.4	122
		45.4 ~ 90.8	76
		90.8 ~ 454	61
		Over 454	46

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 280 ± 10°C 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°C ± 5°C and the humidity is below 65% RH.

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

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

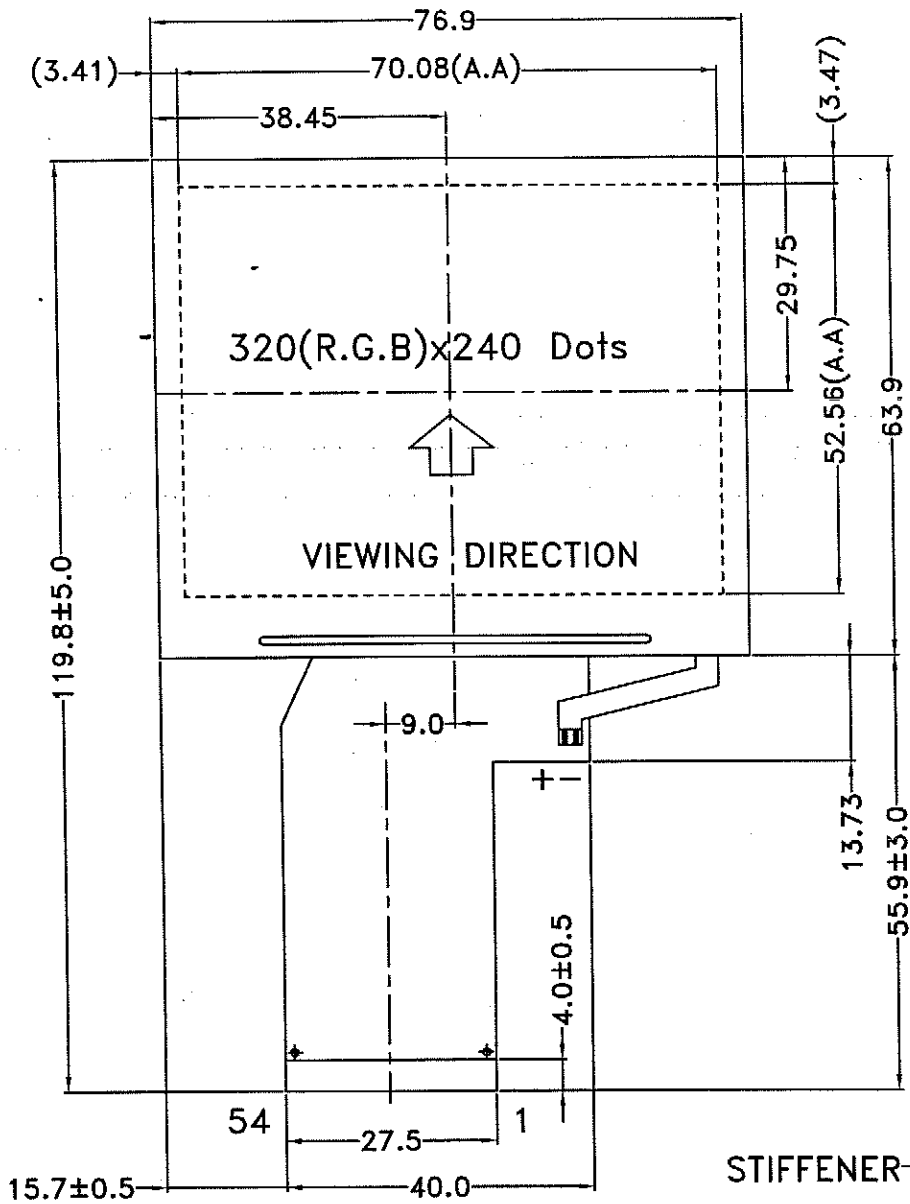
5.4 TERMS OF WARRANTY

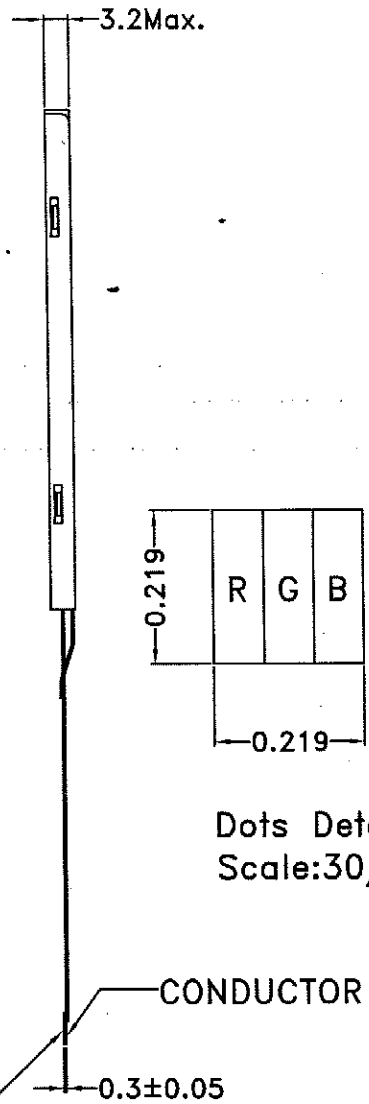
5.4.1 Applicable warrant period

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

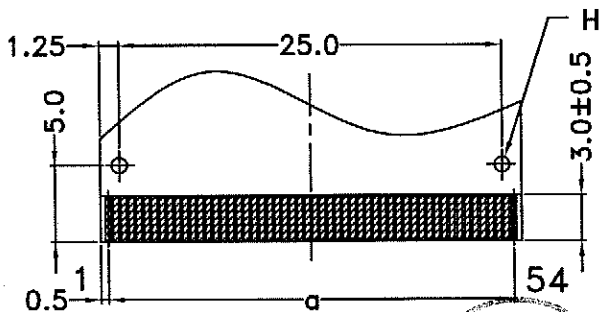
5.4.2 Unaccepted responsibility

This product has been manufactured to your company’s specification as a part for use in your company’s general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in nuclear power control equipment, aerospace equipment , fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.





Dots Detail
Scale:30/1



FPC Detail
Scale:2/1

NOTES:
1.LCD TYPE: a-Si TFT
2.LCD DISPLAY:POSITIVE/TRANSMISSIVE
3.VIEW DIRECTION: 6 O'CLOCK
4.Top: -20~60°C Tst:-30~70°C
5.The tolerance unless classified ±0.3mm
6.IC NO.:HX8218+HX8615
7.R for not assigned 0.5
8.a=P0.5x53=26.5±0.1,W=0.35±0.05

圖面發行 94.7.11-4

REV	DESCRIPTION	DATE

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

SCALE:1/1	UNIT:mm	PAGE:1/1	APPROVED	CHECKER	DRAWN
圖面名稱	PH320240T-001-I				
圖面編號	PH-05034-001	EDI	0			

APPROVED: 研發 2005-7-11 [illegible]
CHECKER: 研發 2005-7-11 李美倫
DRAWN: 研發 2005-7-11 張雅惠

NO.PT-R-251-1

LCM Model	PH320240T-001-I

LCM包裝規格書
LCM Packaging Specifications (For Tray)

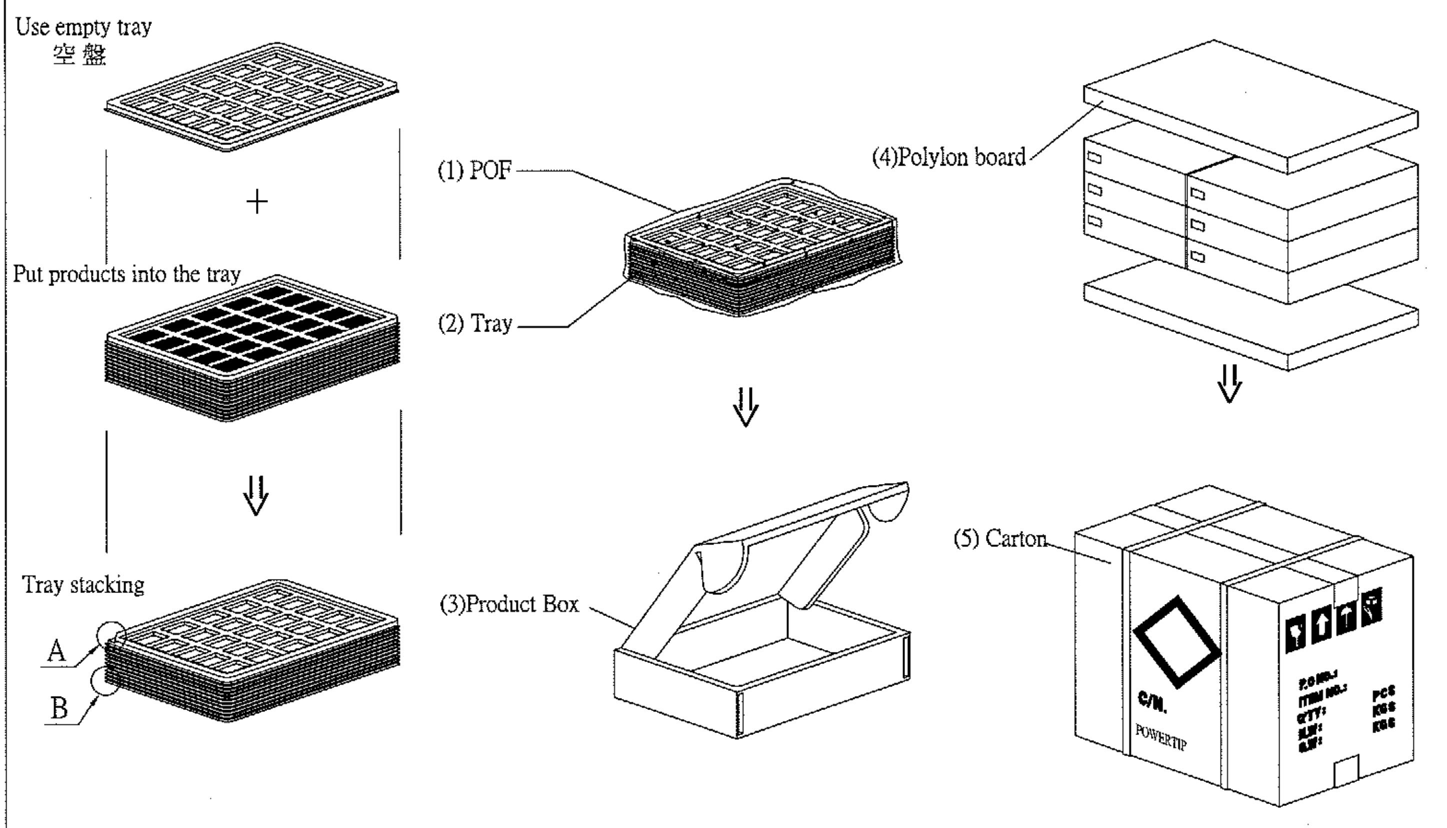
Approve	Check	Contact
DATE	初版	版次Ver
05'07.11	05'07.11	0

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

No.	Item	Model	Dimensions (mm)	Quantity
1	成品 (LCM)	PH320240T-001-I	76.9 X 63.9	288
2	多層薄膜(1)POF	BA03	19"X350X0.015	6
3	TRAY 盤 (2)	TY32024001TZBA	352 X 260 X 10.8	54
4	內盒(3)Product Box	BP01	393 X 274 X 68	6
5	保力龍板(4)Polylon board	PL08	550 X 393 X 20	2
6	外紙箱(5)Carton	BC10	570 X 410 X 265	1
7				
8				
9				

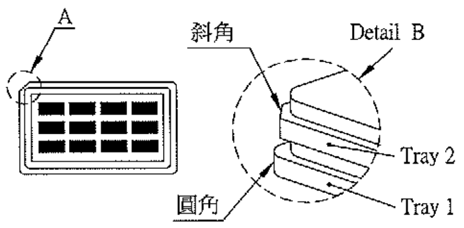
2.單箱數量規格表 (Packaging Specifications and Quantity) :

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



特 記 事 項 (REMARK)

MODEL:
LOT NO:
QUANTITY:
CHECK:



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

3.It's also suitable to Panel
(可適用於單品包裝)

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