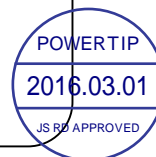


SPECIFICATIONS

CUSTOMER	:	PTC
SAMPLE CODE	:	SH128800T002-ZBA
MASS PRODUCTION CODE	:	PH128800T002-ZBA
SAMPLE VERSION	:	01
SPECIFICATIONS EDITION	:	002
DRAWING NO. (Ver.)	:	JLMD-PH128800T002-ZBA_001
PACKAGING NO. (Ver.)	:	JPKG-PH128800T002-ZBA_001

Customer Approved

Date:



Approved	Checked	Designer
閻偉	張久慧	劉進

- ☐ Preliminary specification for design input
☒ Specification for sample approval

POWERTIP TECH. CORP.

Headquarters: No.8, 6th Road, Taichung Industrial Park,
 Taichung, Taiwan
 台中市 407 工業區六路 8 號

TEL: 886-4-2355-8168

FAX: 886-4-2355-8166

E-mail: sales@powertip.com.tw

[Http://www.powertip.com.tw](http://www.powertip.com.tw)

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**Appendix : LCM Drawing
Packaging**

1. SPECIFICATIONS

1.1 Features

Main LCD Panel

Item	Standard Value
Screen size(inch)	10.1(Diagonal)
Driver element	a-Si TFT active matrix
Resolution	1280* (R 、 G 、 B) * 800 Dots
Display mode	Normally Black, Transmissive
Surface treatment	HC
Color arrangement	RGB-stripe
Weight	292.74(Typ.)
inversion	1+2line
Interface	LVDS
IC	HX8288*4&HX8695*1
ROHS	THIS PRODUCT CONFORMS THE ROHS OF PTC Detail information please refer website : http://www.powertip.com.tw/news.php?area_id_view=1085560481/

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	229.46(W) * 149.10 (L) * 4.80 (H)	mm

LCD panel

Item	Standard Value	Unit
Active Area	216.96 (W) * 135.60 (L)	mm

Note : For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Digital Supply Voltage	VDD	-	-0.3	+3.9	V
TFT Gate on voltage	VGH	-	-0.3	+42	V
TFT Gate off voltage	VGL	-	-19	+0.3	V
TFT Gate voltage	VGH-VGL	-	+12	+40	
Analog power supply voltage	AVDD	-	-0.3	+14	V
Operating Temperature	T _{OP}	-	-20	+70	°C
Storage Temperature	T _{ST}	-	-30	+80	°C
Storage Humidity	H _D	Ta < 60 °C	20	90	%RH

Note 1: 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.

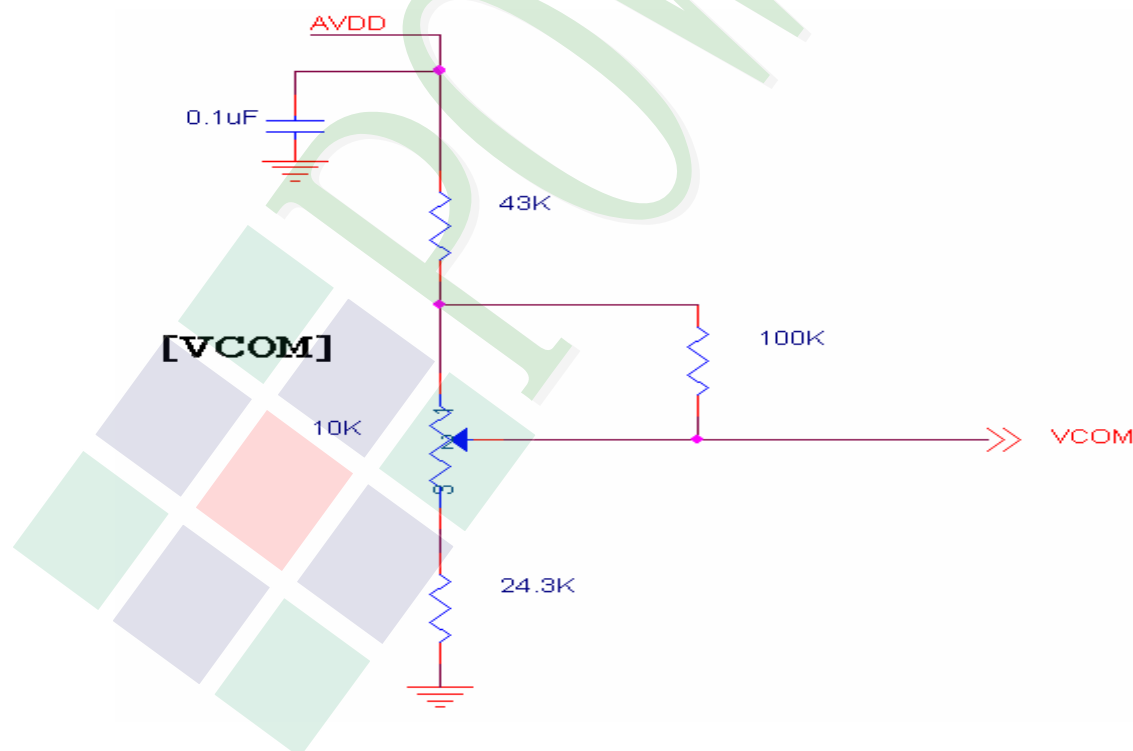
1.4 DC Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Digital Supply Voltage	VDD	-	2.3	2.5	2.7	
Analog power supply voltage	AVDD	-	8.0	8.2	8.4	V
TFT Gate on voltage	VGH	-	21.7	22	22.3	V
TFT Gate off voltage	VGL	-	-7.3	-7	-6.7	V
TFT Common electrode voltage	VCOM	-	2.7	3.0	3.3	V
Input logic high voltage	VIH	-	0.8*VDD	-	VDD	V
Input logic low voltage	VIL	-	0	-	0.2*VDD	V
Gate on Current	IVGH	VGH = 22 V	-	705	1000	uA
Gate off Current	IVGL	VGL = -7V	-	705	1000	uA
Digital Current	IVDD	VDD = 2.5V	-	95	120	mA
Analog Current	IAVDD	AVDD = 8.2V	-	45	70	mA

Note 1: Be sure to apply VDD and V_{GL} to the LCD first, and then apply V_{GH}.

Note 2: VDD setting should match the signals output voltage (VIH / VIL) of customer's system board.

Note 3: Typical VCOM is only a reference value, it must be optimized according to each LCM. Be sure to use VR.



1.5 Optical Characteristics

TFT LCD Panel

Ta=25°C

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	-
Response time		Tr	-	-	10	20	ms	Note2
		Tf		-	15	30		
Viewing angle	Top	ΘY+	CR ≥ 10	75	85	-	Deg.	Note4
	Bottom	ΘY-		75	85	-		
	Left	ΘX-		75	85	-		
	Right	ΘX+		75	85	-		
Contrast ratio		CR	IF=200mA	600	800	-	-	Note3
Color of CIE Coordinate (With B/L)	White	X		0.26	0.31	0.36	-	Note1
		Y		0.27	0.32	0.37		
Average Brightness Pattern=white display		IV	IF=200mA	400	500	-	cd/m2	Note1
Luminance uniformity		YU	IF=200mA	75	80	-	%	Note1

Note1:

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

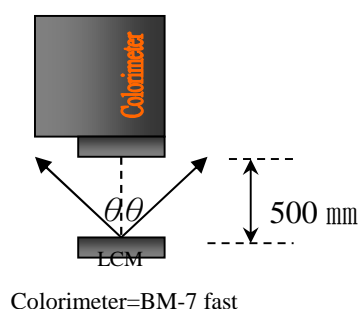
2 : Measurement Condition for Optical Characteristics:

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

b : Measurement Distance: 500 ± 50 mm , (θ= 0°)

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

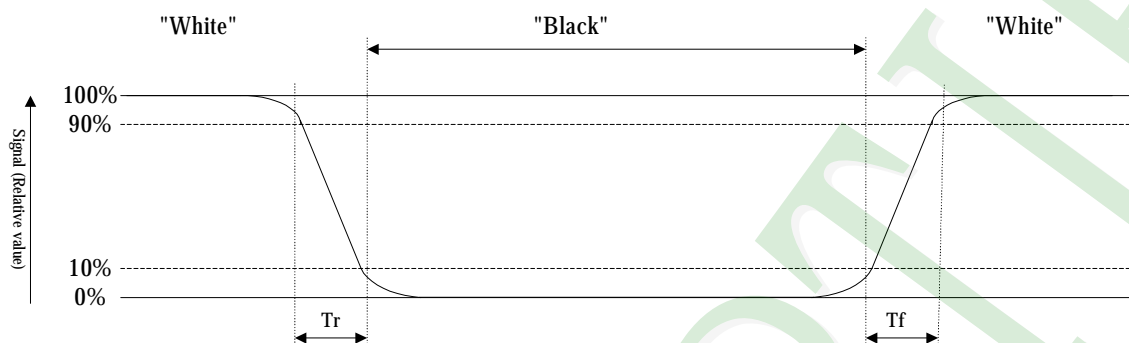
d : The uncertainty of the C.I.E coordinate measurement ±0.01 , Average Brightness ± 4%



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:



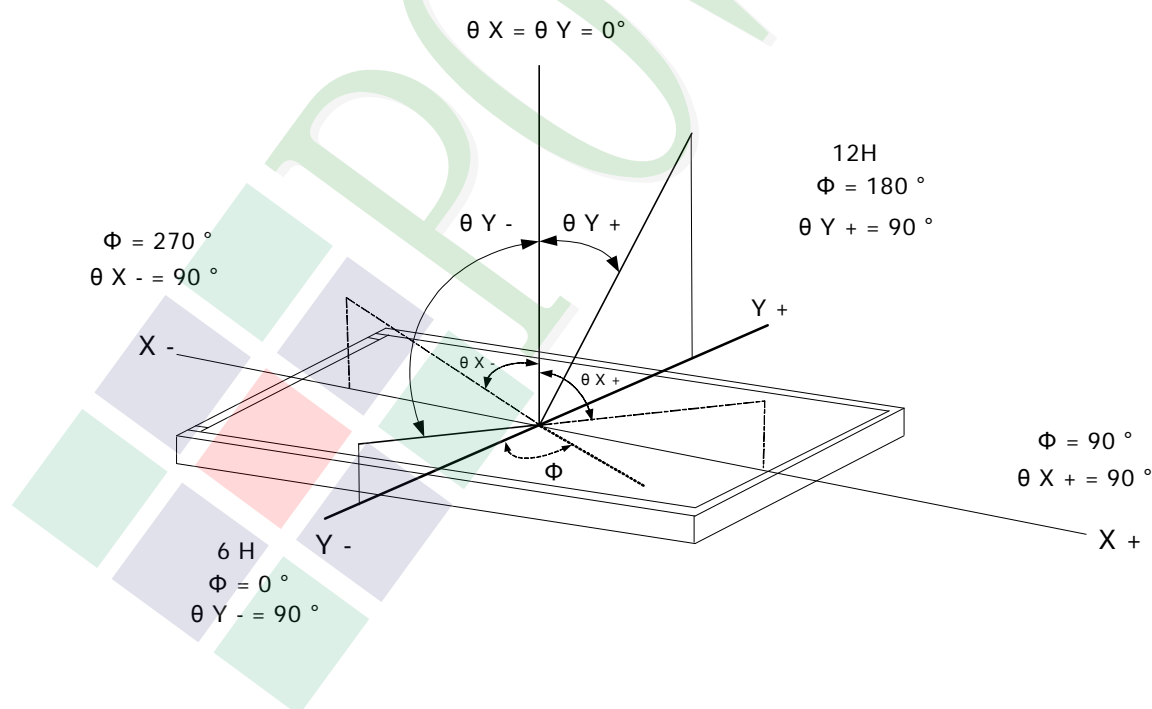
Note3: Definition of contrast ratio:

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.	Typ.	Max.	Unit
Power Dissipation	Pd	-	-	4680	-	mW
LED Forward Current	IF	1 LED	-	-	70	mA
LED Reverse Voltage	VR	1 LED	-	-	5	V

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Voltage for LED backlight	VF	IF=200mA Ta=25°C	16.8	(19.5)	21	V
Current for LED backlight	IF	-	200	240	280	mA
Color	White					

Other Description

Item	Conditions	Description
Life Time	Ta =25°C IF= 200mA	20000 hrs

Note: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IF =200mA. The LED lifetime could be decreased if operating IF is larger than 200mA.

2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.2 Interface Pin Description

A 40pin connector is used for the module electronics interface. The recommended model is FH52-40S-0.5SH manufactured by Vigorconn.

Pin No.	Symbol	Description
1	VCOM	Common voltage
2	VDD	Digital power
3	VDD	Digital power
4	NC	Not connect
5	NC	Not connect
6	NC	Not connect
7	GND	Ground
8	RXIN0-	Negative LVDS differential data inputs
9	RXIN0+	Positive LVDS differential data inputs
10	GND	Ground
11	RXIN1-	Negative LVDS differential data inputs
12	RXIN1+	Positive LVDS differential data inputs
13	GND	Ground
14	RXIN2-	Negative LVDS differential data inputs
15	RXIN2+	Positive LVDS differential data inputs
16	GND	Ground
17	RXCLKIN-	Negative LVDS differential clock inputs
18	RXCLKIN+	Positive LVDS differential clock inputs
19	GND	Ground
20	RXIN3-	Negative LVDS differential data inputs
21	RXIN3+	Positive LVDS differential data inputs
22	GND	Ground
23	NC	Not connect
24	NC	Not connect
25	GND	Ground

Pin No.	Symbol	Description
26	NC	Not connect
27	LED_PWM	CABC controller signal output for backlight
28	NC	Not connect
29	AVDD	Power for Analog Circuit
30	GND	Ground
31	LED-	LED Cathode
32	LED-	LED Cathode
33	NC	Not connect
34	NC	Not connect
35	VGL	Gate OFF Voltage
36	GND	Ground
37	CABC_EN	CABC Enable Input. High Voltage: Enable; Low Voltage or open: Disable
38	VGH	Gate ON Voltage
39	LED+	LED Anode
40	LED+	LED Anode

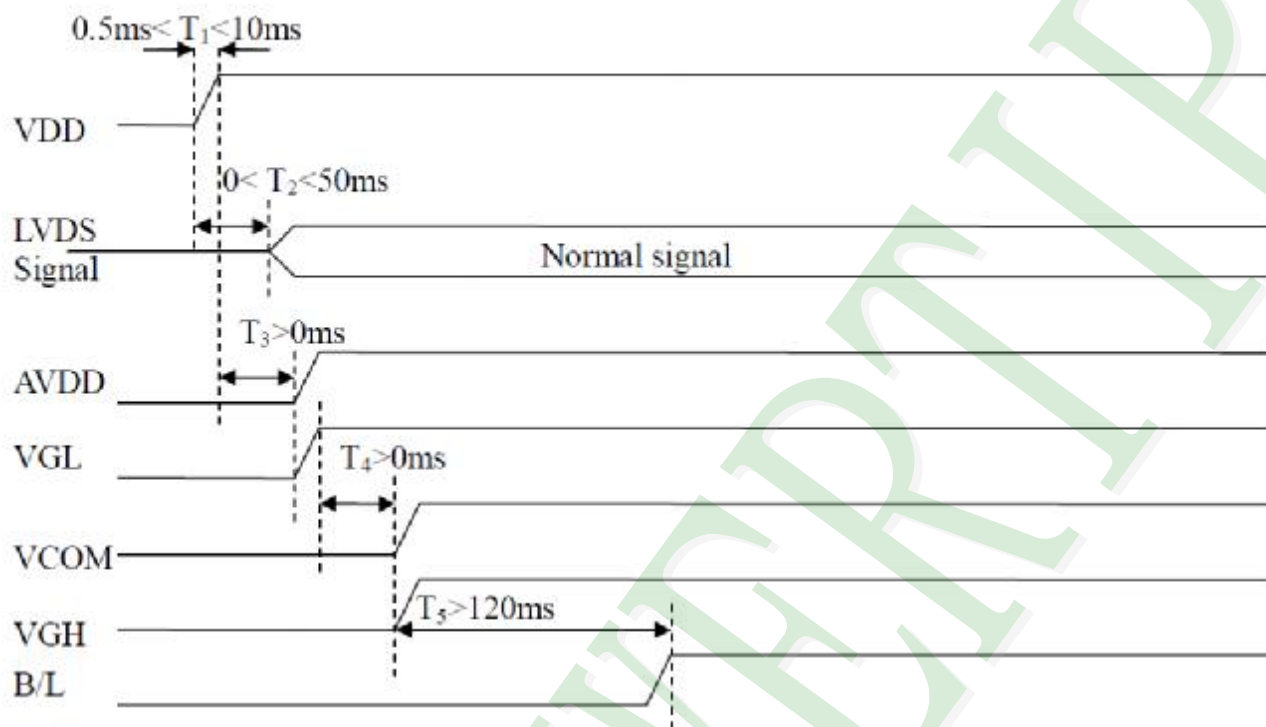
Note: LED_PWM is used to adjust backlight brightness



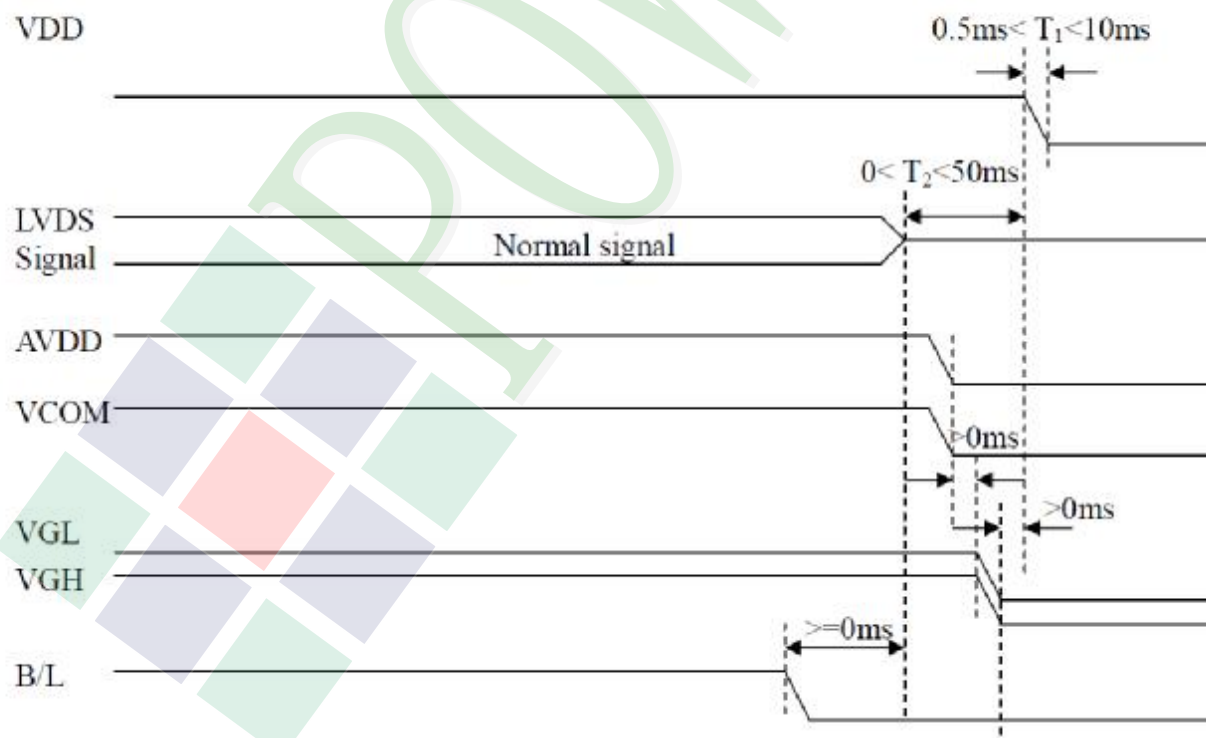
2.3 Timing Characteristics

2.3.1 POWER ON/OFF SEQUENCE

a. Power on:



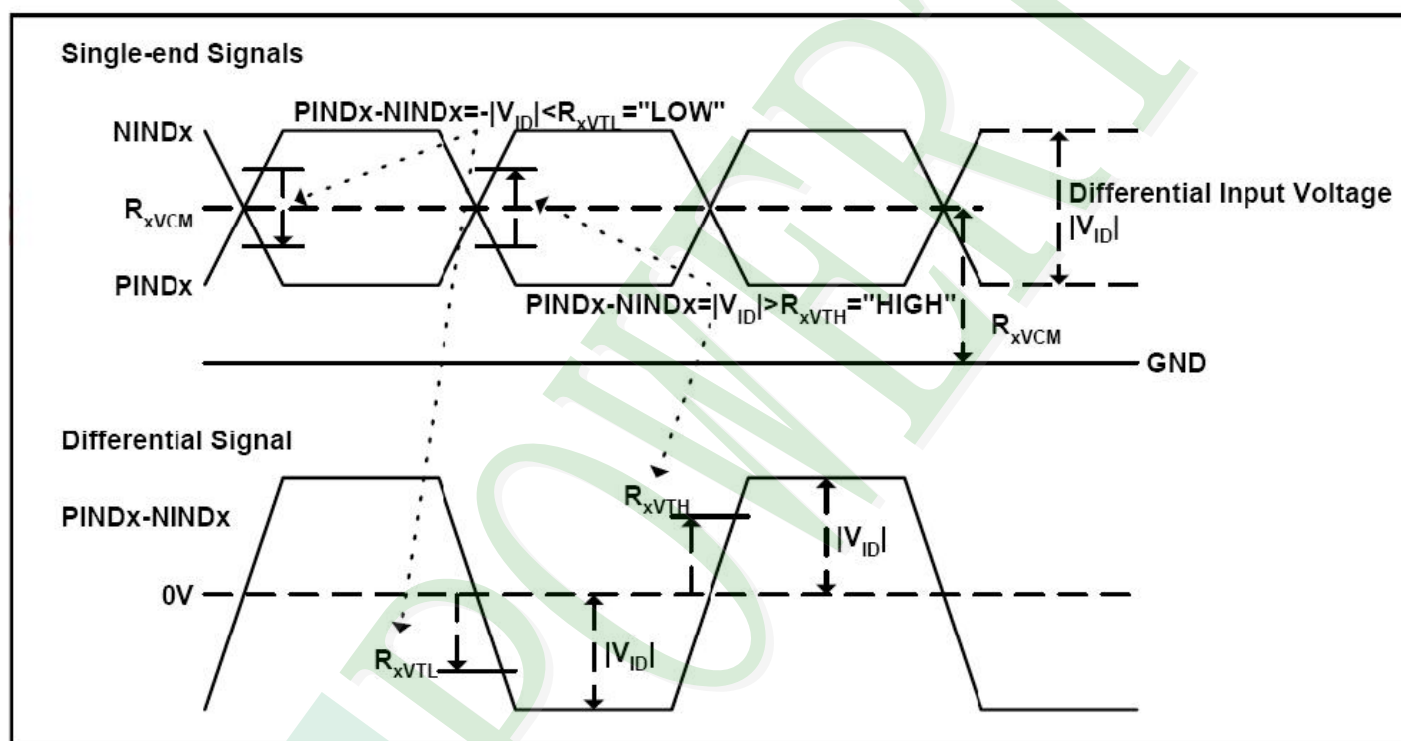
b. Power off:



2.3.2 LVDS Signal Timing Characteristics

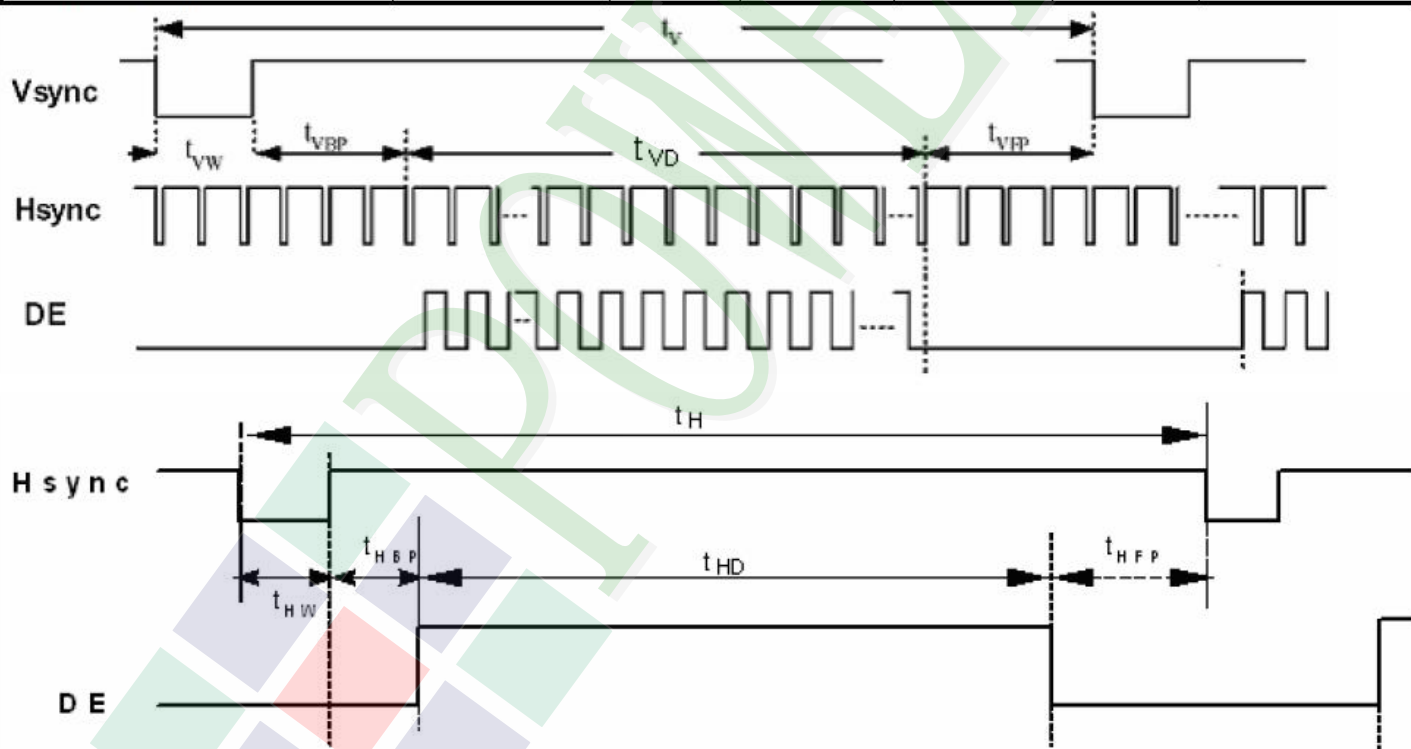
AC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	R_{xVTH}	-	-	+100	mV	$R_{xVCM}=1.2$ V
LVDS Differential input low Threshold voltage	R_{xVTL}	-100	-	-	mV	
LVDS Differential input common mode voltage	R_{xVCM}	0.7	-	1.6	V	
LVDS Differential voltage	$ V_{ID} $	200	-	600	mV	

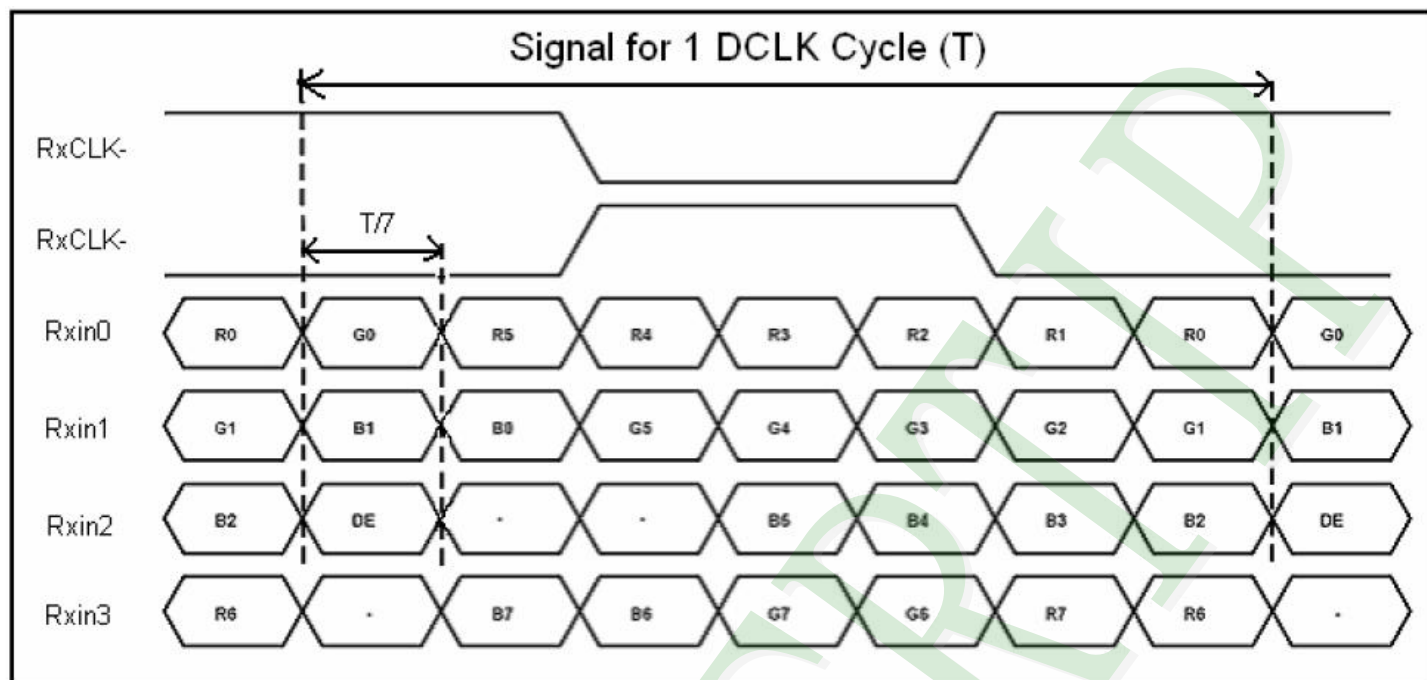


Timing Table

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	$1/T_c$	68.9	71.1	73.4	MHz	Frame rate =60Hz
Horizontal display area	t_{HD}	1280			T_c	
HS period time	t_H	1410	1440	1470	T_c	
HS Width +Back Porch +Front Porch	$t_{HW} + t_{HBP} + t_{HFP}$	130	160	190	T_c	
Vertical display area	t_{VD}	800			t_H	
VS period time	t_V	815	823	833	t_H	
VS Width +Back Porch +Front Porch	$t_{VW} + t_{VBP} + t_{VFP}$	15	23	33	t_H	

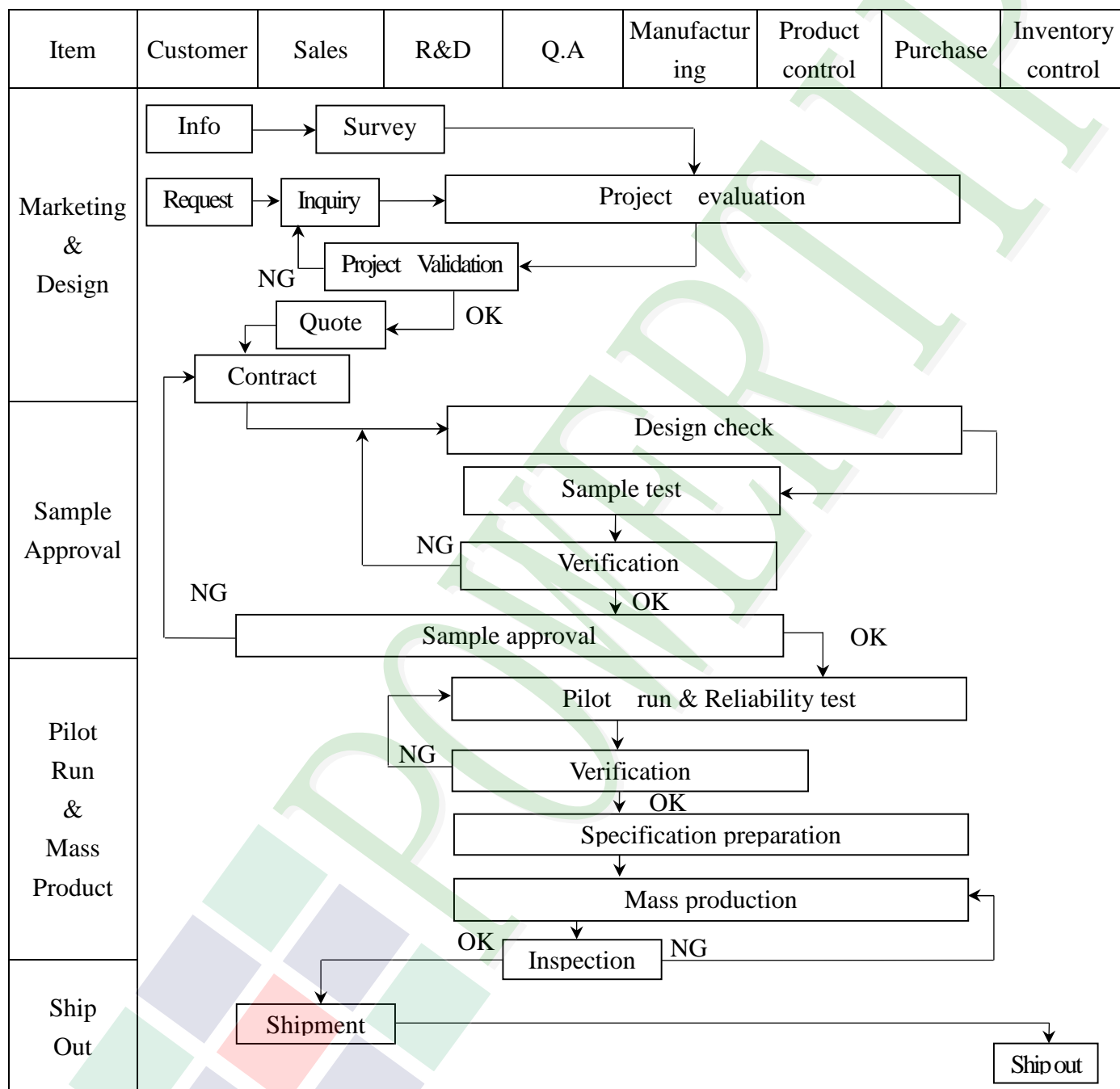


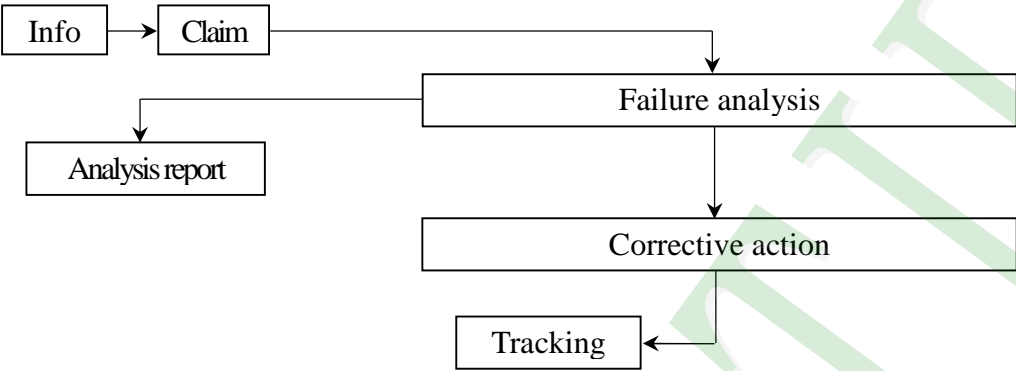
LVDS Data Input Format



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] --> Claim[Claim] Claim --> Failure[Failure analysis] Claim --> Report[Analysis report] Failure --> Action[Corrective action] Action --> 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

1. Description

This model is only used in Automotive product, if it is used in other product applications; it still adopts this copy of specification. If there are any other product applications such as handwriting recognition, Industrial use, Medical use, Aerospace usage and so on, the specifications should be negotiated separately.

2. Acceptable Criteria

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E.

- (1) Lot size: Quantity per shipment as one lot (different model as different lot).
- (2) Sampling type: Normal inspection, single sampling.
- (3) Sampling level: Level II.
- (4) AQL: Acceptable Quality Level
 - Major defect: AQL=0.65
 - Minor defect: AQL=1.0

3. Classification of defects

Defects are classified two types, major defect and minor defect according to the defect. And, the definition of defects is classified as below.

- (1) Major defect
 - Any defect may result in functional failure, or reduce the usability of product for its purpose. For Example, electrical failure, deformation and etc..
- (2) Minor defect
 - A defect that is not to reduce the usability of product for its intended purpose and un-uniformity, dot defect and etc..
 - The criteria on major or minor judgment will be according with the classification of defects.

4. The environmental condition of inspection

The environmental condition and visual inspection shall be conducted as below.

- (1) Ambient temperature : 25 ± 5 °C
- (2) Humidity : 25~75 % RH
- (3) Panel visual inspection on the operation condition for cosmetic shall be conducted at the distance 30~40cm or more between the LCD module and eyes of inspector.
 - Ambient Illumination : 800~1200Lux for external appearance inspection
 - Ambient Illumination : 200~500 Lux for light on inspection
- (4) The viewing angle :
 - a) ± 15 degree to the front surface of display panel in vertical direction.

b) ± 15 degree to the front surface of display panel in horizontal direction.

(5) Display panel shall be conducted at the distance 30~40cm between the LCD module and eyes of inspector (Fig. 1)

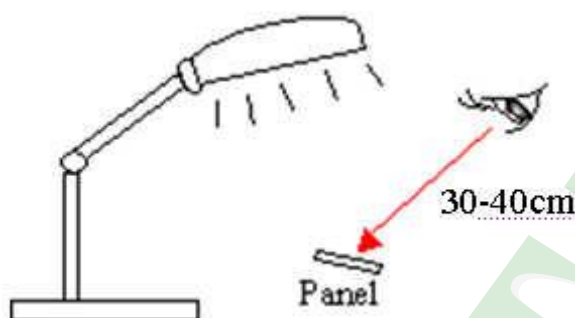


Fig. 1

5. Inspection Criteria

(1) Definition of dot defect induced from the panel inside

a) Bright dot : Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

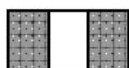
b) Dark dot : Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.

c) 2 dot adjacent = 1 pair = 2 dots

Picture:



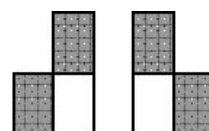
2 dot adjacent



2 dot adjacent



2 dot adjacent (vertical)



2 dot adjacent (slant)

(2) Display Inspection

Items		Acceptable count
Bright dot	Random	$N \leq 0$
Dark dot	Random	$N \leq 4$
Total bright and dark dot		$N \leq 4$
Distance	Minimum Distance Between dark dots	5mm
Display failure (V-line/H-line/Cross line etc.)		Not allowable
Mura/Waving/ Hot spot	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary	
COG Mura	Not visible through 1% ND filter in 50% gray or judge by limit sample if necessary	

Note:

1. Defect which is on the Black Matrix (outside of Active Area) are not considered as a defect.
2. The definition of dot: the size of a defective dot over 1/2 of whole dot is regarded as one defective dot.

Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern.

(3) Appearance & Display inspection

Item	Standards
Foreign Black/White/Bright Spot (Display & Appearance)	$D \leq 0.15\text{mm}$, Ignore $0.15\text{mm} < D \leq 0.3\text{mm}$, $N \leq 4$ Distance $\geq 5\text{mm}$ It is shown in Fig. 2.
Foreign Black/White/Bright Line (Display & Appearance)	$W \leq 0.01\text{ mm}$, Ignore $0.01 < W \leq 0.05\text{ mm}$ $L \leq 3.0\text{ mm}$, $N \leq 4$ It is shown in Fig. 3.
Polarizer Dent/Air Bubble	$D \leq 0.15\text{mm}$, Ignore $0.15\text{mm} < D \leq 0.3\text{mm}$, $N \leq 4$ Distance $\geq 5\text{mm}$
Polarizer Scratches	$W \leq 0.01\text{ mm}$, Ignore $0.01 < W \leq 0.05\text{ mm}$ $L \leq 3.0\text{ mm}$, $N \leq 4$

Note:

1. W : Width
2. L : Length
3. D : Average Diameter
4. N : Count

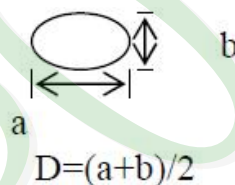


Fig. 2



W: width, L : length

Fig. 3

6. External Appearance Inspection Criteria

Item	Contents	
FPC cable	Cable not continuous ・ Break-off ・ Connector Burn-off /Break-off	
Metal frame (Bezel)	Scratch	*Noticeable scratch and exfoliation coating are not permitted. *The oxidized metal is not permitted.
	Incomplete assembly is not permitted.	
Backlight	Scratch	The scratch which may causes a problem in practical use is not permitted.
	Break-off	Breaking off is not permitted.
	Crack	The crack is not permitted.
Stain on Polarizer	The stain, which can't be wiped off, is not permitted.	
Tape/Label	Incorrect position, missed label is not permitted.	
Connector	Assembly NG or Function fail caused by deformation is not permitted	
Outline size	Spec. out is not permitted.	

4. RELIABILITY TEST

4.1 Reliability Test Condition

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80°C 240hrs	Note 1, Note 4
Low Temperature Storage	Ta = -30°C 240hrs	Note 1, Note 4
High Temperature Operation	Ts = 70°C 240hrs	Note 2, Note 4
Low Temperature Operation	Ta = -20°C 240hrs	Note 1, Note 4
Operate at High Temperature and Humidity	+60°C, 90%RH 240hrs	Note 4
Thermal Shock	-30°C/30 min ~ +80°C/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : ISTA-3A 1Hz~200Hz,Grms=0.53 Half hours for direction of Z.	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

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

5.3 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.

Approve	Check	Contact
Ryan	Eddy	Terry

Ver.001

LCM包裝規格書

Documents NO.	JPKG-PH128800T002-ZBA
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LCM Packaging Specifications

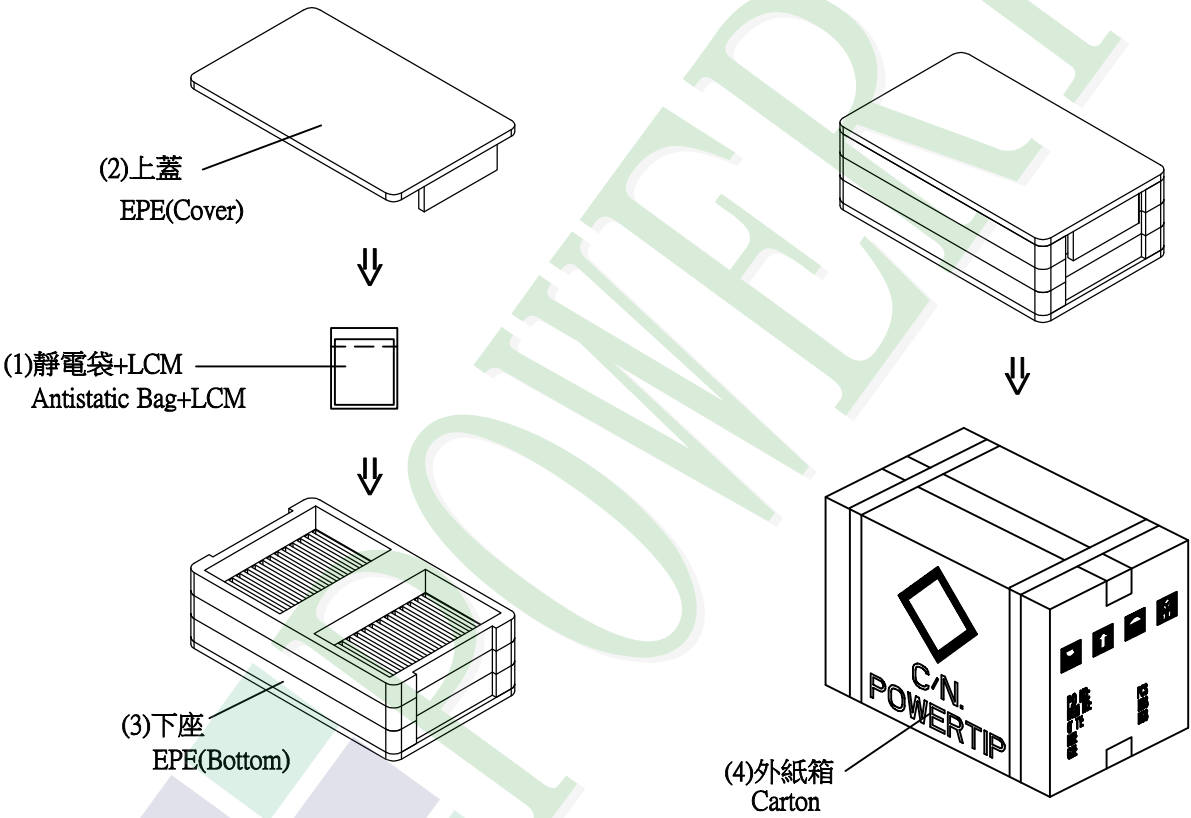
1.包裝材料規格表 (Packaging Material) : (per carton)

No.	Item	Model	Dimensions (mm)	1Pcs Weight	Quantity	Total Weight
1	成品 (LCM)	PH128800T002-ZBA	229.46X149.1X4.8	0.2745	20	5.49
2	靜電袋(1)Antistatic Bag	BAG0000000021	240 X 300	0.008	20	0.16
3	上蓋(2)EPE(Cover)	FOAM0000000132	520 X 315 X 65	0.108	1	0.108
4	下座(3)EPE(Bottom)	FOAM0000000133	520 X 315 X 330	0.85	1	0.85
5	外紙箱(4)Carton	BX52732536CCBA	527 X 325 X 360	1.092	1	1.092
6						

2.一整箱總重量 (Total LCD Weight in carton) : 7.7 Kg±10%

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

Total LCM quantity in carton : quantity per EPE 20 x no of EPE 1 = 20



特 記 事 項 (REMARK)