# SPECIFICATIONS

| | | |
|---|---|---|
| **CUSTOMER** | : | |
| **SAMPLE CODE** | : | SH128800T006-ZFC05 |
| **MASS PRODUCTION CODE** | : | PH128800T006-ZFC05 |
| **SAMPLE VERSION** | : | 01 |
| **SPECIFICATIONS EDITION** | : | 002 |
| **DRAWING NO. (Ver.)** | : | LMD-PH128800T006-ZFC05 (Ver.002) |
| **PACKAGING NO. (Ver.)** | : | PKG-PH128800T006-ZFC05 (Ver.001) |

## Customer Approved

Date:

| Approved | Checked | Designer |
|---|---|---|
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☐ Preliminary specification for design input

■ Specification for sample approval

POWERTIP
2023.10.06
TWRD APR

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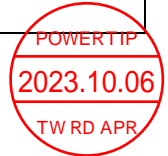
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NO.PT-A-005-8

# History of Version

| Date | Ver. | Edi. | Description | Page | Design by |
|---|---|---|---|---|---|
| 06/09/2023 | 01 | 001 | New Drawing | - | Stephen |
| 10/04/2023 | 01 | 002 | First Sample<br>Modify Drawing | -<br>Appendix | Yuan |
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## Contents

# 1. SPECIFICATIONS

## 1.1 Features

| Item | Standard Value |
|------|----------------|
| Display Resolution | 1280 *3 (RGB) * 800 Dots |
| LCD Type | Full Viewing Angle、Transmissive、Normally Black |
| Screen Size(inch) | 10.1 inch |
| Color Configuration | 16.7M |
| Touch Driver | FT5726 |
| Weight | 520g |
| Interface | HDMI |
| ROHS | THIS PRODUCT CONFORMS THE ROHS OF PTC<br>Detail information please refer website:<br>http://www.powertip.com.tw/news_detail.php?Key=1&cID=1 |

## 1.2  Mechanical Specifications

| Item | Standard Value | Unit |
|------|----------------|------|
| Outline Dimension | 254.96(W) * 173.6 (L) * 26.2 (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 |
|------|--------|-----------|------|------|------|
| Power Supply Voltage | VCC | - | -0.3 | +18.0 | V |
| Logic Voltage | BL_PWM | - | -0.3 | +5.5 | V |
| Operating Temperature | $T_{OP}$ (Ts) | Note 1 | -20 | +70 | ℃ |
| Storage Temperature | $T_{ST}$ (Ta) | Note 2 | -30 | +80 | ℃ |
| Storage Humidity | $H_D$ | Ta＜60 ℃ | - | 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

| Item | Symbol | Status | Condition | Min. | Typ. | Max. | Unit |
|------|--------|--------|-----------|------|------|------|------|
| Power Supply Voltage | VCC | I | VCC-GND | 11.5 | 12.0 | 12.5 | V |
| Power Supply Current | ICC | I | VCC=12.0V | - | 0.65 | 1 | A |
| Logic Voltage | BL_PWM | - | BL_EN=5.0v | 0 | - | 5.0 | V |
| PWM Frequency | $F_{PWM}$ | - | - | 100 | - | 20K | HZ |
| PWM Duty Ratio | PWM | - | - | 5 | - | 100 | % |

Note: Maximum current from RGB full-display

## 1.5 Optical Characteristics

Ta=25°C

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | - |
|---|---|---|---|---|---|---|---|---|
| Response Time | | Tr + Tf | - | - | 25 | 50 | ms | Note2 |
| Viewing Angle | Top | ΘY+ | CR ≥ 10 | - | 85 | - | Deg. | Note4 |
| | Bottom | ΘY- | | - | 85 | - | | |
| | Left | ΘX- | | - | 85 | - | | |
| | Right | ΘX+ | | - | 85 | - | | |
| Contrast Ratio | | CR | | 600 | 800 | - | - | Note3 |
| Color of CIE Coordinate (With B/L ) | White | X | - | 0.25 | 0.30 | 0.35 | - | Note1 |
| | | Y | | 0.28 | 0.33 | 0.38 | | |
| | Red | X | | 0.54 | 0.59 | 0.64 | | |
| | | Y | | 0.30 | 0.35 | 0.40 | | |
| | Green | X | | 0.26 | 0.31 | 0.36 | | |
| | | Y | | 0.53 | 0.58 | 0.63 | | |
| | Blue | X | | 0.09 | 0.14 | 0.19 | | |
| | | Y | | 0.08 | 0.13 | 0.18 | | |
| Average Brightness Pattern=White Display (With LCD&TP)*1 | | IV | VCC=12.0V BL_PWM="High" Duty=100% | 400 | 500 | - | cd/m2 | Note1 |
| Luminance Uniformity (With LCD&TP)*2 | | YU | | 70 | - | - | % | Note1 |

Note1:

1：$\triangle$ B=B(min) / B(max) $\times$ 100%
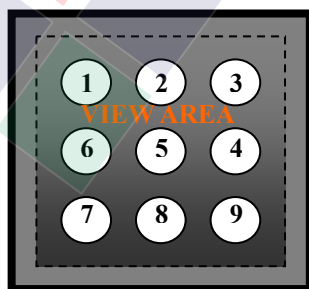
2：Measurement Condition for Optical Characteristics:

  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%
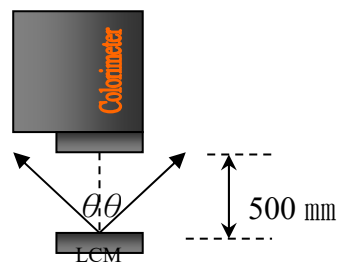


Colorimeter=BM-7 fast

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.
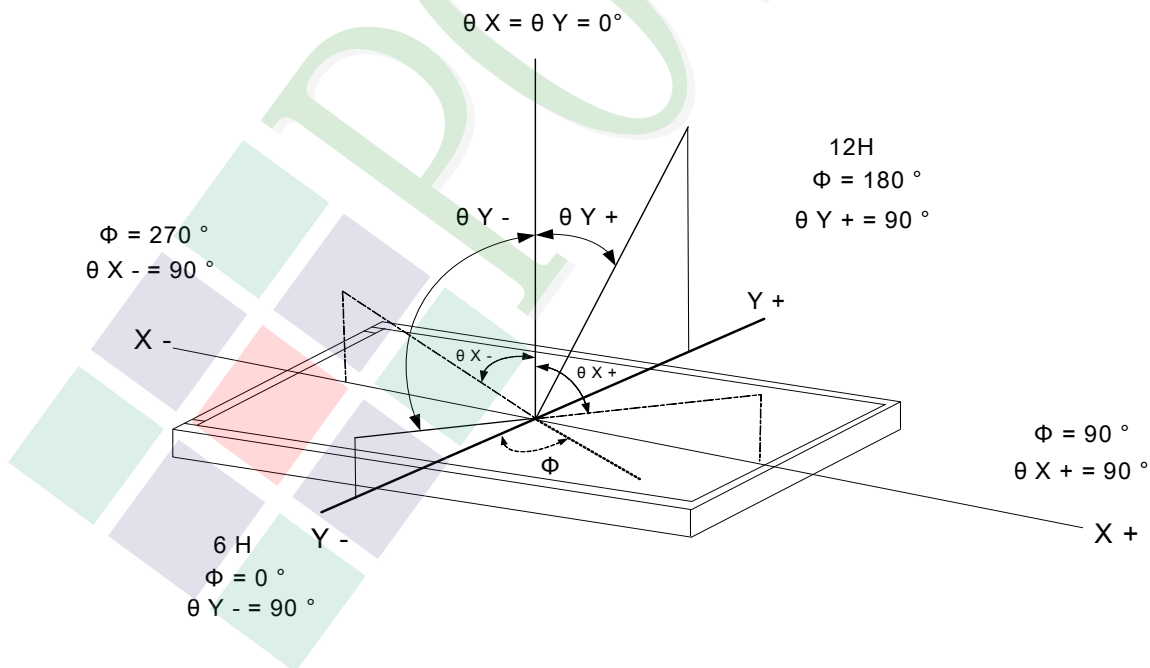   Refer to figure as below:
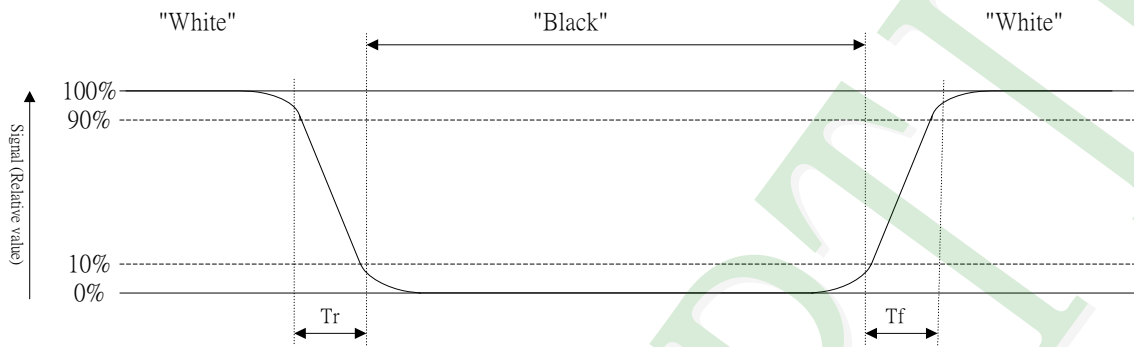


Note3: Definition of contrast ratio:
   Contrast ratio is calculated with the following formula

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note4: Definition of viewing angle:
   Refer to figure as below:

## 1.6 Backlight Unit Characteristics

Maximum Ratings

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Power Dissipation | Pd | - | - | - | 100 | mW |
| LED Forward Current | IF | 1 LED | - | - | 30 | mA |
| LED Reverse Voltage | VR | 1 LED | - | - | 1.0 | V |

Electrical / Optical Characteristics

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Voltage for LED Backlight | VF | If=80mA | 28 | 30 | 32 | V |
| Current for LED Backlight | IF | | - | 80 | - | mA |
| Color | | White | | | | |

Other Description

| Item | Conditions | Description |
|---|---|---|
| Life Time | Ta =25℃ If= 80 mA | 50000 hrs |



LED=10S4P
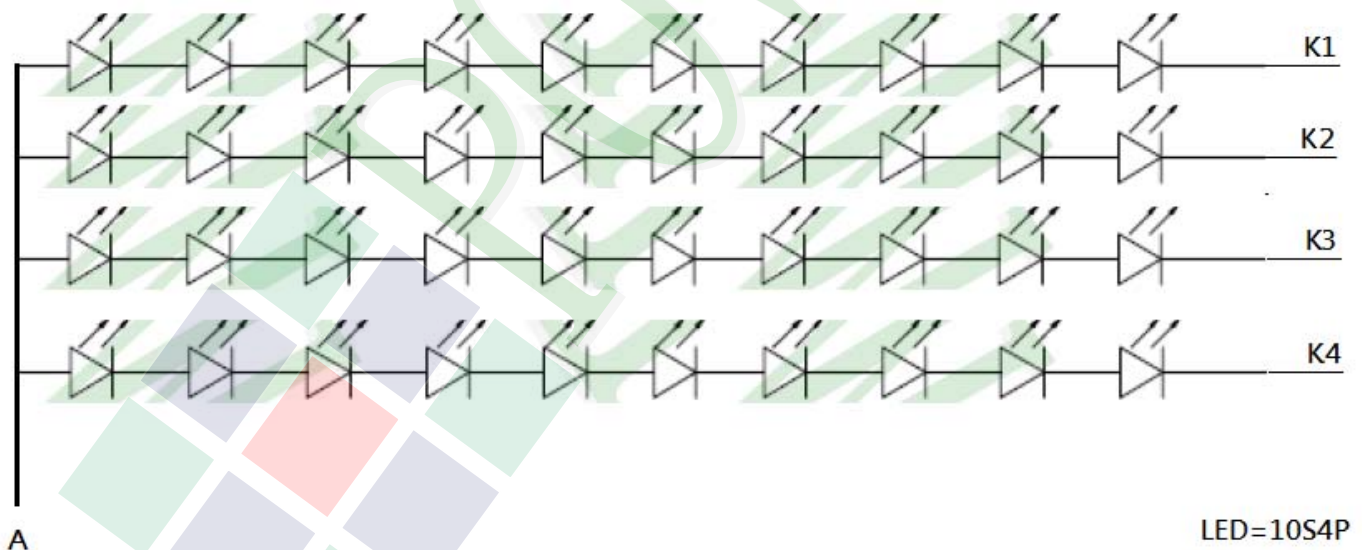
## 1.7 Touch Panel Characteristics

### Features

| Item | Standard Value |
|---|---|
| Touch Panel Size | 10.1" |
| Touch Type | Projective Capacitive Touch Panel |
| Input Method | Finger |
| Support Operation | 5 Points touch |
| Output Interface | USB |
| IC | FT5726 |

### Mechanical Specifications

| Item | Standard Value | Unit |
|---|---|---|
| Viewing Area | 217.96 (W) * 136.60 (L) | mm |

### Absolute Maximum Ratings

| Item | Symbol | Condition | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | VDD_5.0 | - | -0.3 | +6.0 | V |
| Operating Temperature | $T_{OP}$ | - | -20 | +70 | °C |
| Storage Temperature | $T_{ST}$ | - | -30 | +80 | °C |

### DC Electrical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Power Supply Voltage | VDD_5.0 | - | - | 5.0 | - | V |

### Optical Characteristics

| Item | Standard Value | unit |
|---|---|---|
| Total Light Transmittance | >85% | - |

**PCAP Firmware Information**

**File: ATOAC101D0143 TP_v06_20230920.ini**

**SHA256: 1FE1DBF9EE773035D0A78FAE7EB88D949466EB1169D5471D2FB779053EE323B0**

**Remark: None**

# 2. MODULE STRUCTURE

## 2.1 Counter Drawing

### 2.1.1 LCM Mechanical Diagram

* See Appendix

### 2.1.2 Block Diagram
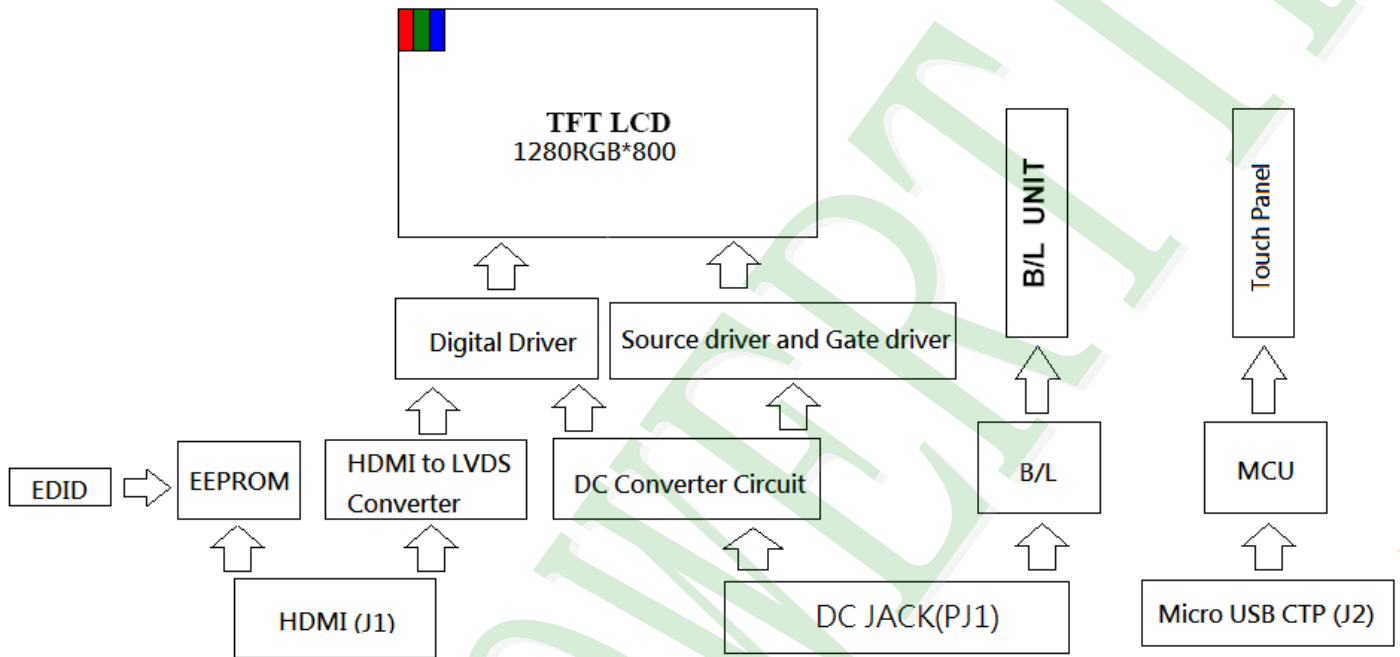
## 2.2 Interface Pin Description(CN1)

### 2.2.1 (J1: HDMI 1.3 A type Interface)

| Pin# | Name | Description |
|------|------|-------------|
| 1 | TX2+ | TMDS Data 2+ |
| 2 | TX2 Shield | TMDS Data 2 Shield |
| 3 | TX2– | TMDS Data 2- |
| 4 | TX1+ | TMDS Data 1+ |
| 5 | TX1 Shield | TMDS Data 1 Shield |
| 6 | TX1– | TMDS Data 1- |
| 7 | TX0+ | TMDS Data 0+ |
| 8 | TX0 Shield | TMDS Data 0 Shield |
| 9 | TX0– | TMDS Data 0- |
| 10 | TXC+ | TMDS Clock+ |
| 11 | TXC Shield | TMDS Clock Shield |
| 12 | TXC– | TMDS Clock- |
| 13 | CEC | CEC |
| 14 | NC | No connection |
| 15 | SCL | Serial Clock for DDC |
| 16 | SDA | Serial Data for DDC |
| 17 | GND | Power Ground |
| 18 | V5V | +5V Power for HDMI |
| 19 | Hot Plug Detect | Hot Plug Detect |

## 2.2.2 (J2: Micro USB Capacitive Touch Panel Interface)

| Pin# | Name | Description |
|------|------|-------------|
| 1 | V$_{Bus}$ | V$_{Bus}$ 4.75V-5.25V |
| 2 | D- | Data- |
| 3 | D+ | Data+ |
| 4 | ID | No connection |
| 5 | GND | Power Ground. |

## 2.2.3 (PJ1: POWER DC JACK Interface)

PJ1

Hold Φ6.4mm / Center Pin Φ 2.0mm
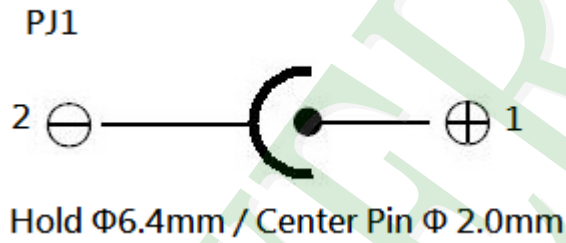
| Pin# | Name | Description |
|------|------|-------------|
| 1 | VCC | +12V Power |
| 2 | GND | Power Ground |

## 2.3 Power Supply Characteristics
### 2.3.1 Power ON/OFF Sequence

1. Interface signals are also shown in the chart. Signals from any system shall be Hi-resistance state or low level when VDD voltage is off.
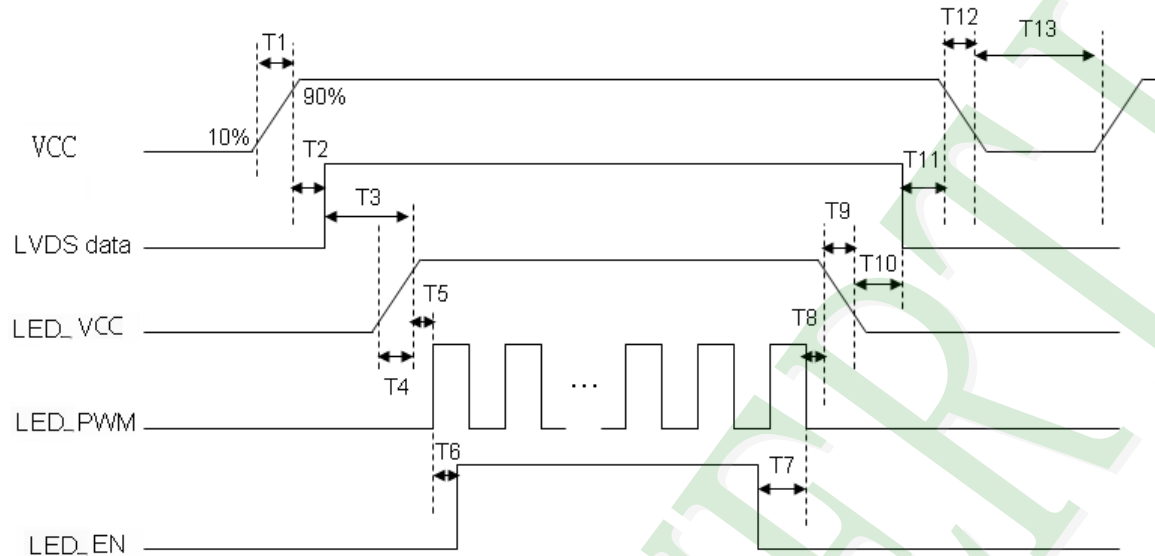


2. Please set timing according to the following figures, otherwise it may cause image sticking

| Parameter | Symbol | Unit | Min | Typ. | Max |
|---|---|---|---|---|---|
| VCC Rise Time (10% to 90%) | T1 | ms | 0.5 | -- | 10 |
| VCC Good to Signal Valid | T2 | ms | 30 | -- | 90 |
| Signal Valid to Backlight On | T3 | ms | 200 | -- | -- |
| Backlight Power On Time | T4 | ms | 0.5 | -- | -- |
| Backlight LED_VCC Good to System PWM On | T5 | ms | 10 | -- | -- |
| System PWM On to Backlight LED_EN On | T6 | ms | 10 | -- | -- |
| Backlight LED_ EN Off to System PWM Off | T7 | ms | 0 | -- | -- |
| System PWM Off to B/L Power Disable | T8 | ms | 10 | -- | -- |
| Backlight Power Off Time | T9 | ms | 0.5 | 10 | 30 |
| Backlight Off to Signal Disable | T10 | ms | 200 | -- | -- |
| Signal Disable to Power Down | T11 | ms | 0 | -- | 50 |
| VDD Fall Time | T12 | ms | 0.5 | 10 | 30 |
| Power Off | T13 | ms | 500 | -- | -- |

## 2.3.2 Input Timing

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| LVDS Clock Frequency | Fclk | 70.0 | 72.4 | 76.6 | MHz |
| H Total Time | HT | 1410 | 1440 | 1470 | Clocks |
| H Active Time | HA | | 1280 | | |
| V Total Time | VT | 828 | 838 | 868 | Lines |
| V Active Time | VA | | 800 | | |
| Frame Rate | FV | - | 60 | - | Hz |

Note1：HT * VT *Frame Frequency ≤ (76.6) MHz

Note2: All reliabilities are specified for timing specification based on refresh rate of 60Hz.
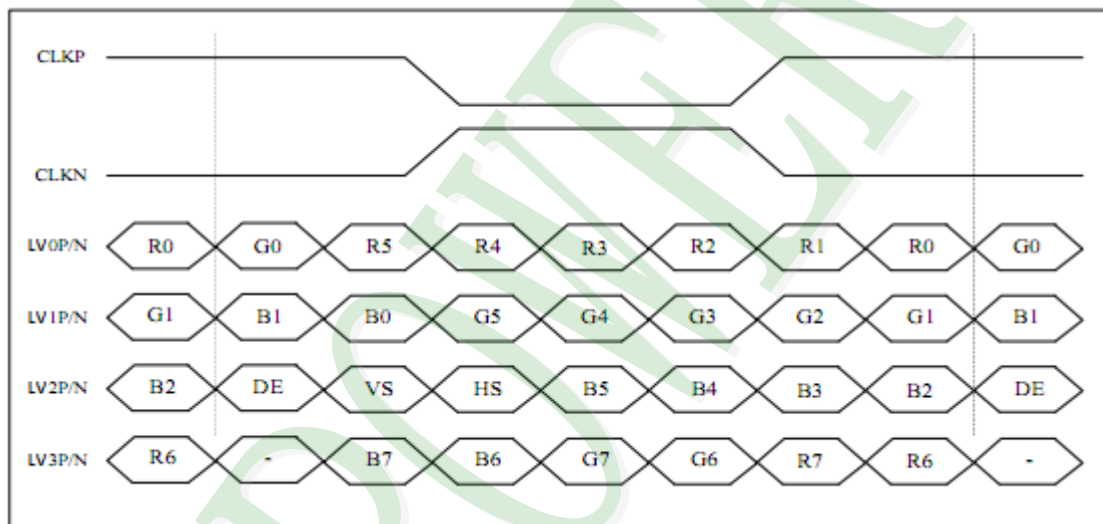
## 2.3 HDMI Characteristics

### 2.3.1 DC Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

| Parameter | TEST CONDITIONS | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| VID Analog input differential voltage(1) | - | 75 | - | 1200 | mV |
| VIC Analog input common-mode voltage(1) | - | AVDD – 300 | - | AVDD – 37 | mV |
| VI(OC) Open-circuit analog input voltage | - | AVDD – 10 | - | AVDD + 10 | mV |
| IDD(2PIX) Normal 2-pix/clock power supply current | ODCK = 82.5 MHz, 2-pix/clock | - | - | 370 | mA |
| IPD Power-down current (3) | PD = low | - | - | 10 | mA |
| IPDO Output drive power-down current(3) | PDO = low | 35 | | | mA |

(1) Specified as dc characteristic with no overshoot or undershoot

(2) Alternating 2-pixel black/2-pixel white pattern. ST = high, STAG = high, QE[23:0] and QO[23:0] CL = 10 pF.

(3) Analog inputs are open circuit (transmitter is disconnected from TFP401/401A).

### 2.3.2 AC Electrical Characteristics

over recommended operating free-air temperature range (unless otherwise noted)

| Parameter | TEST CONDITIONS | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| VID(2) Differential input sensitivity(1) | - | 150 | - | 1560 | mVp-p |
| tps Analog input intra-pair (+ to –) differential skew(2) | - | - | - | 0.4 | Tbit (3) |
| Tccs Analog input inter-pair or channel-to-channel skew (2) | - | - | - | 1 | Tpix (4) |
| tijit Worst-case differential input clock jitter tolerance(2) (5) | - | 50 | - | - | ps |
| tf1 Fall time of data and control signals(6) (7) | ST = low, CL = 5 pF | - | - | 2.4 | ns |
| tf1 Fall time of data and control signals(6) (7) | ST = high, CL = 10 pF | - | - | 1.9 | ns |
| tr1 Rise time of data and control signals(6) (7) | ST = low, CL = 5 pF | - | - | 2.4 | ns |
| tr1 Rise time of data and control signals(6) (7) | ST = high, CL = 10 pF | - | - | 1.9 | ns |
| tr2 Rise time of ODCK clock(6) | ST = low, CL = 5 pF | - | - | 2.4 | ns |
| tr2 Rise time of ODCK clock(6) | ST = high, CL = 10 pF | - | - | 1.9 | ns |
| tf2 Fall time of ODCK clock(6) | ST = low, CL = 5 pF | - | - | 2.4 | ns |
| tf2 Fall time of ODCK clock(6) | ST = high, CL = 10 pF | | | 1.9 | ns |

(1) Specified as ac parameter to include sensitivity to overshoot, undershoot and reflection.

(2) By characterization

(3) tbit is 1/10 the pixel time, tpix

(4) tpix is the pixel time defined as the period of the RxC input clock. The period of ODCK is equal to tpix in 1-pixel/clock mode or 2tpix when

in 2-pixel/clock mode.

(5) Measured differentially at 50% crossing using ODCK output clock as trigger

(6) Rise and fall times measured as time between 20% and 80% of signal amplitude.

(7) Data and control signals are QE[23:0], QO[23:0], DE, HSYNC, VSYNC. and CTL[3:1].

**(continued)** over recommended operating free-air temperature range (unless otherwise noted)

| Parameter | TEST CONDITIONS | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| tsu1 Setup time, data and control signal to falling edge of ODCK | 1.pixel/clock, PIXS = low, OCK_INV =low | 1.8 | - | - | ns |
| | 2 pixel/clock, PIXS = high, ns STAG = high, OCK_INV = low | 3.8 | - | - | |
| | 2 pixel and STAG, PIXS = high, STAG= low, OCK_INV = low | 0.7 | - | - | |
| th1 Hold time, data and control signal to falling edge of ODCK | 1 pixel/clock, PIXS = low, OCK_INV =low | 0.6 | - | - | ns |
| | 2 pixel and STAG, PIXS = high, STAG = low, OCK_INV = low | 2.5 | - | - | |
| | 2 pixel/clock, PIXS = high, STAG = high, OCK_INV = low | 2.9 | - | - | |
| tsu2 Setup time, data and control signal to rising edge of ODCK | 1 pixel/clock, PIXS = low, OCK_INV = high | 2.1 | - | - | ns |
| | 2 pixel/clock, PIXS = high, ns STAG = high, OCK_INV = high | 4 | - | - | |
| | 2 pixel and STAG, PIXS = high, STAG = low, OCK_INV = high | 1.5 | - | - | |
| th2 Hold time, data and control signal to rising edge of ODCK | 1 pixel/clock, PIXS = low, OCK_INV =high | 0.5 | - | - | ns |
| | 2 pixel and STAG, PIXS = high, STAG = low, OCK_INV = high | 2.4 | - | - | |
| | 2 pixel/clock, PIXS = high, STAG = high, OCK_INV = high | 2.1 | - | - | |
| fODCK ODCK frequency | PIX = low (1-PIX/CLK) | 25 | - | 165 | MHz |
| | PIX = high (2-PIX/CLK) | 12.5 | - | 82.5 | |
| tpd(PDL) Propagation delay time from PD low to Hi-Z outputs | - | 40% | 50% | 60% | - |
| tpd(PDL) Propagation delay time from PD low to Hi-Z outputs | - | - | - | 9 | ns |

| tpd(PDOL) Propagation delay time from PDO low to Hi-Z outputs | - | - | - | 9 | ns |
|---|---|---|---|---|---|
| tt(HSC) Transition time between DE transition to SCDT low(8) | - | - | 1e6 | - | tpix |
| tt(FSC) Transition time between DE transition to SCDT high(8) | - | - | 1600 | - | tpix |
| td(st) Delay time, ODCK latching edge to QE[23:0] data output | STAG = low, PIXS = high | - | 0.25 | - | tpix |
| tWL(PDL_MIN) Minimum time PD is asserted low | - | 9 | - | - | Ns |
| tDEL Minimum DE low | - | 128 | - | - | Tpixel |

(8) Link active or inactive is determined by amount of time detected between DE transitions. SCDT indicates link activity.

## 2.3.3 Parameter Measurement Information



QE[23:0], QO[23:0], DE, CTK[3:1], HSYNC, VSYNC

$t_{r1}$  $t_{f1}$  80%  80%  20%  20%
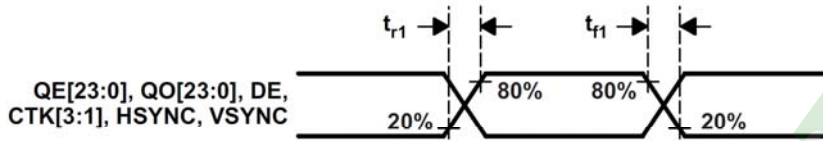
**Figure 2. Rise and Fall Times of Data and Control Signals**



ODCK

$t_{r2}$  $t_{f2}$  80%  80%  20%  20%

**Rise and Fall Times of ODCK**



ODCK

$1/f_{ODCK}$

**ODCK Frequency**



ODCK

$t_{(su1)}$  $t_{(h1)}$  $t_{(su2)}$  $t_{(h2)}$  $V_{OH}$  $V_{OL}$

QE[23:0], QO[23:0] DE, CTL[3:1], HSYNC, VSYNC

$V_{OH}$  $V_{OL}$

OCK_INV
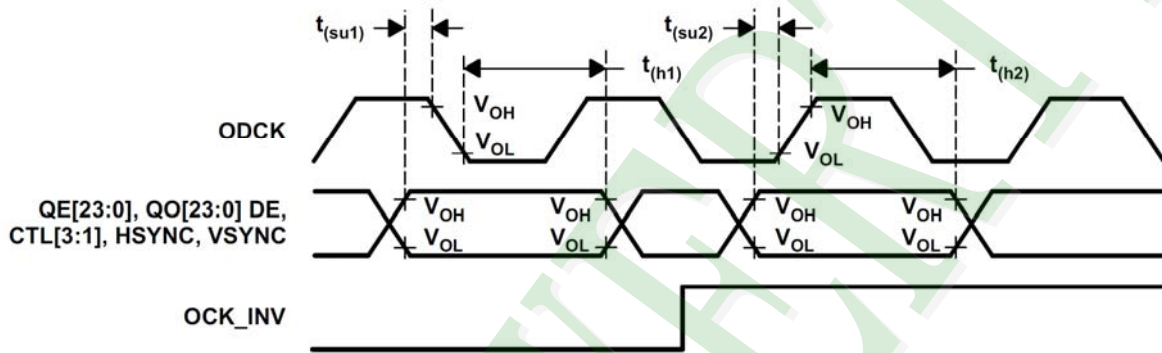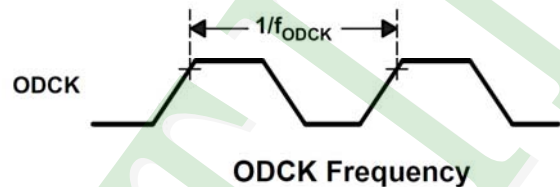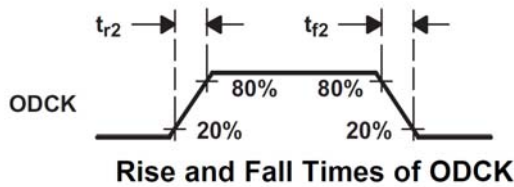
**Data Setup and Hold Times to Rising and Falling Edges of ODCK**



ODCK  $V_{OH}$  $t_{d(st)}$

QE[23:0]  50%

**ODCK High to QE[23:0] Staggered Data Output**



Rx+  $t_{ps}$  50%  Rx−
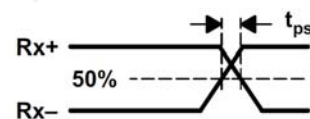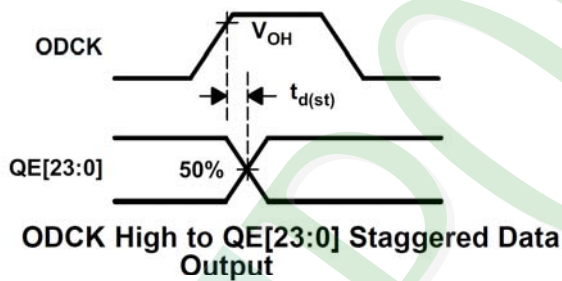
**Analog Input Intra-Pair Differential Skew**



$\overline{PD}$  $V_{IL}$  $t_{pd(PDL)}$

QE[23:0], QO[23:0], ODCK, DE, CTL[3:1], HSYNC, VSYNC, SCDT

**Delay From $\overline{PD}$ Low to Hi-Z Outputs**



$\overline{PDO}$  $V_{IL}$  $t_{pd(PDOL)}$

QE[23:0], QO[23:0], ODCK, DE, CTL[3:2], HSYNC, VSYNC

**Delay From $\overline{PDO}$ Low to Hi-Z Outputs**



$\overline{PD}$  $V_{IH}$  $t_{p(PDH-V)}$

DFO, ST, PIXS, STAG, Rx[2:0]+, Rx[2:0]−, OCK_INV

**Delay From $\overline{PD}$ Low to High Before Inputs Are Active**



$\overline{PD}$  $V_{IL}$  $t_{wL(PDL\_MIN)}$

**Minimum Time $\overline{PD}$ Low**
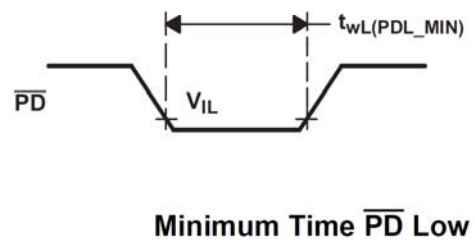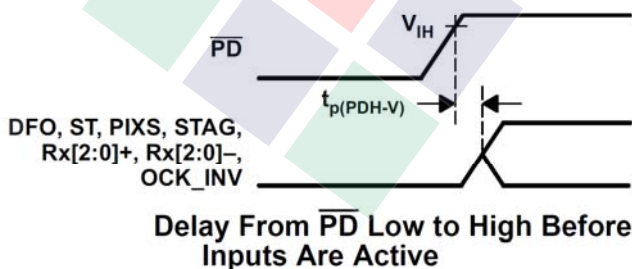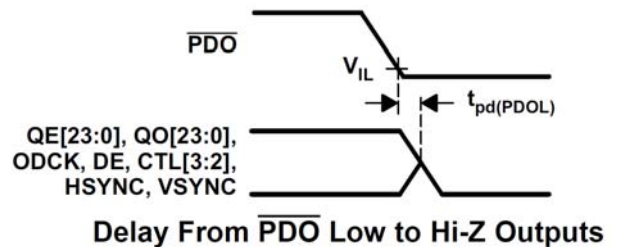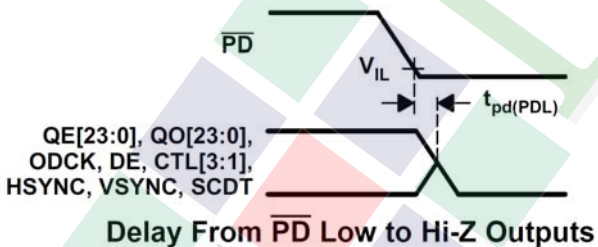
## Parameter Measurement Information (continued)
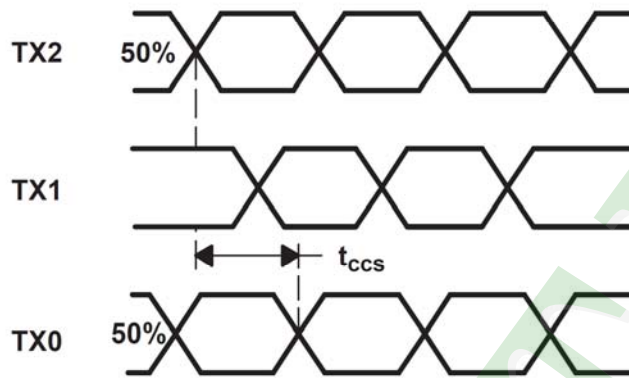


**Analog Input Channel-to-Channel Skew**
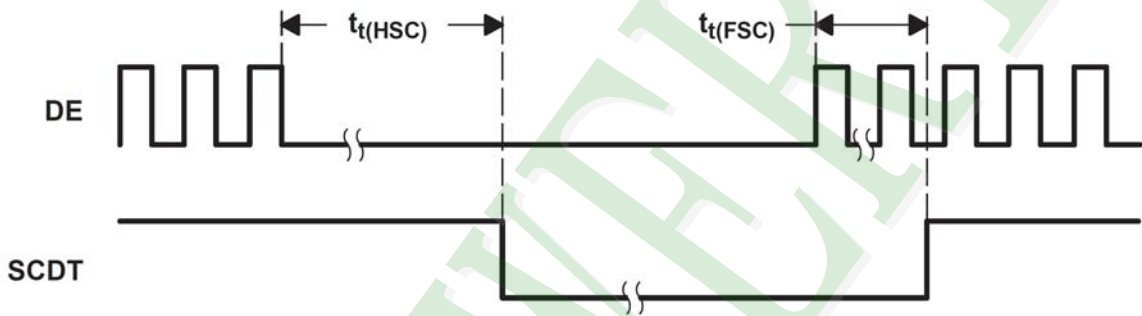


**Time Between DE Transitions to SCDT Low and SCDT High**
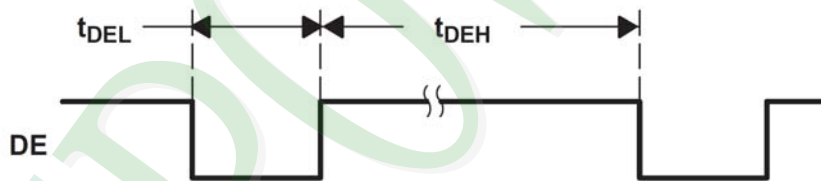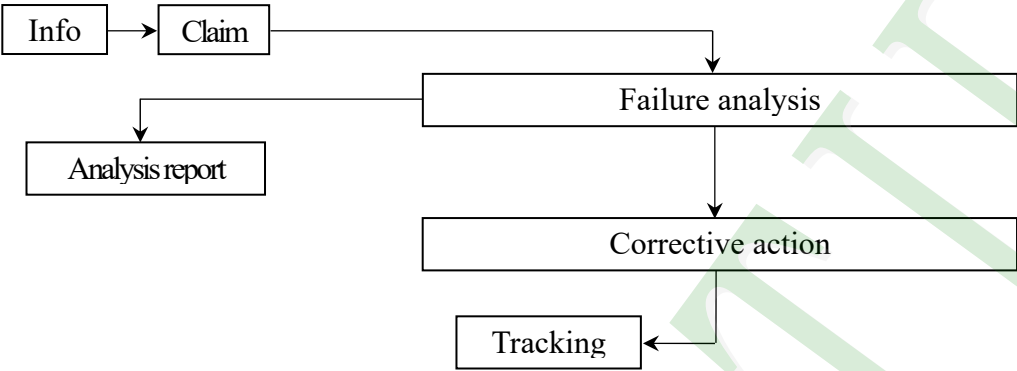


**Minimum DE Low and Maximum DE High**

# 3. QUALITY ASSURANCE SYSTEM

## 3.1 Quality Assurance Flow Chart

| Item | Customer | Sales | R&D | Q.A | Manufacturing | Product control | Purchase | Inventory control |
|------|----------|-------|-----|-----|---------------|-----------------|----------|-------------------|
| Marketing & Design | Info → Survey<br>Request → Inquiry<br>Project Validation (NG → Inquiry)<br>Quote → Contract | | Project evaluation<br>OK | | | | | |
| Sample Approval | Contract | Design check<br>Sample test<br>NG → Verification → OK<br>Sample approval (NG)<br>OK | | | | | | |
| Pilot Run & Mass Product | | Pilot run & Reliability test<br>NG → Verification → OK<br>Specification preparation<br>Mass production<br>Inspection (OK / NG) | | | | | | |
| Ship Out | Shipment | | | | | | | Ship out |

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

Sales Service flow:

Info → Claim → Failure analysis → Analysis report

Failure analysis → Corrective action → Tracking

## 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.**
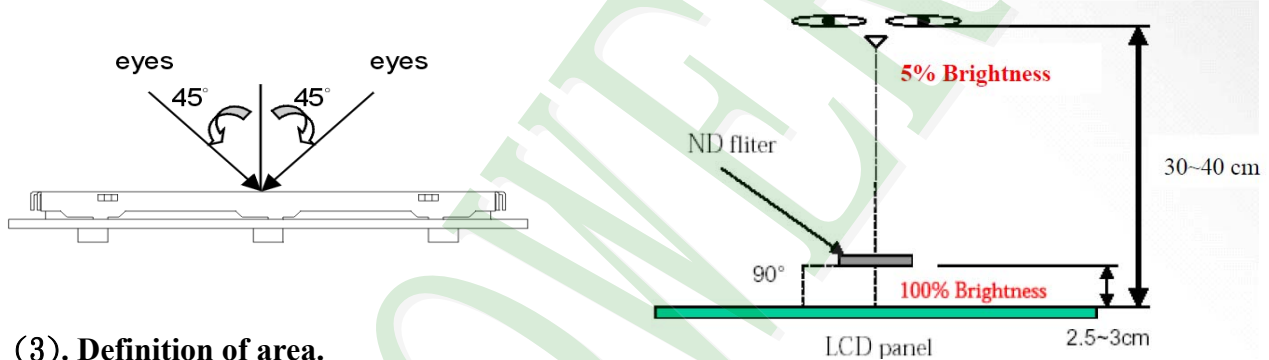


    **(3). Definition of area.**
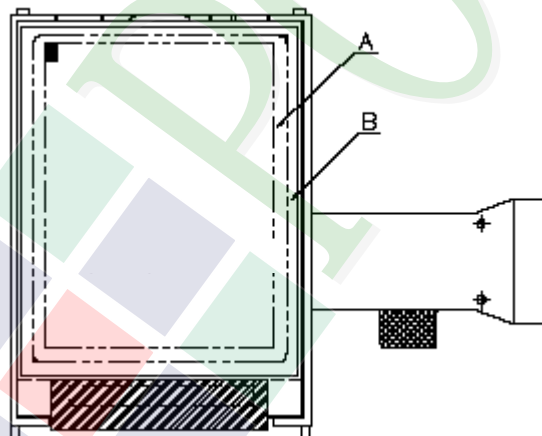


**A area: viewing area**

**B area: Outside of viewing area**

    **(4). Standard of inspection： (Unit：mm)**
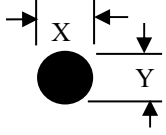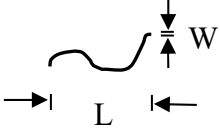
◆**Specification For TFT-LCD Module 3.5" ~15" :**                                    **(Ver.B01)**
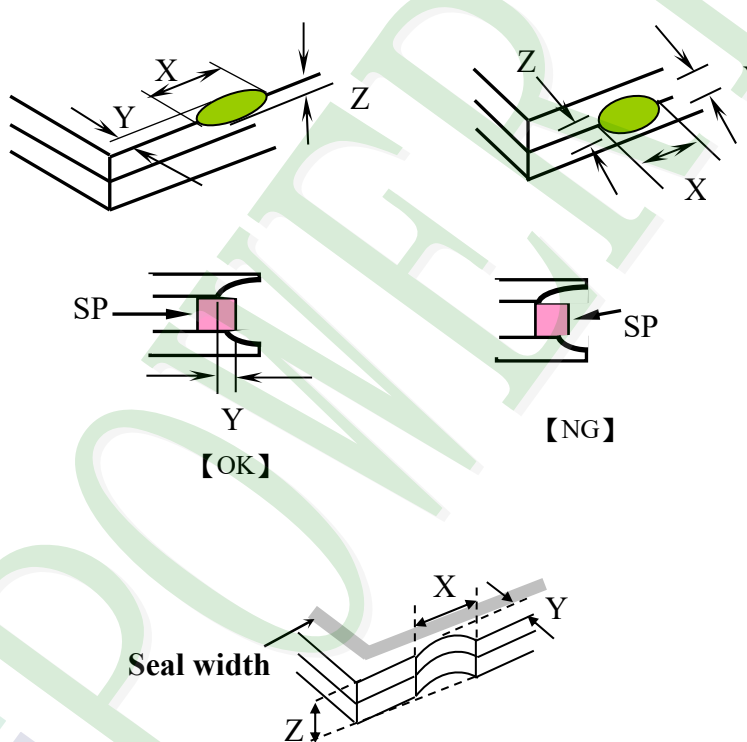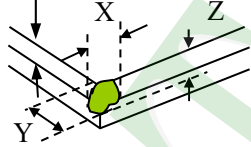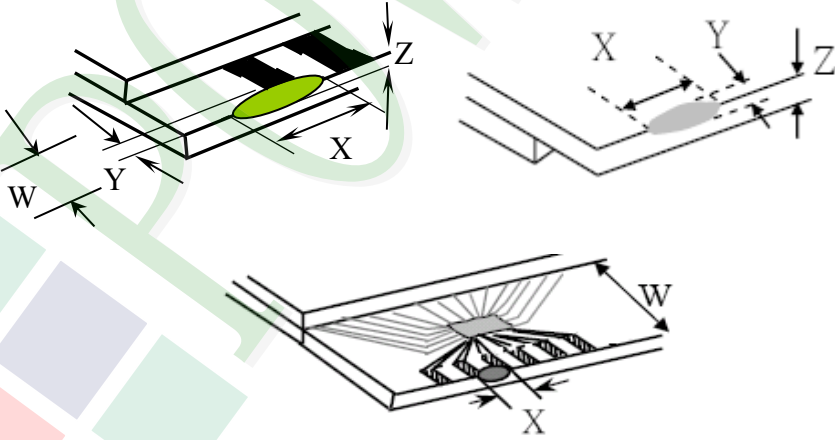
| NO | Item | Criterion | Level |
|----|------|-----------|-------|
| 01 | Product condition | 1.1 The part number is inconsistent with work order of production. | Major |
|    |                   | 1.2 Mixed product types. | Major |
|    |                   | 1.3 Assembled in inverse direction. | Major |
| 02 | Quantity | 2.1 The quantity is inconsistent with work order of production. | Major |
| 03 | Outline dimension | 3.1 Product dimension and structure must conform to structure diagram. | Major |
| 04 | Electrical Testing | 4.1 Missing line character and icon. | Major |
|    |                    | 4.2 No function or no display. | Major |
|    |                    | 4.3 Display malfunction. | Major |
|    |                    | 4.4 LCD viewing angle defect. | Major |
|    |                    | 4.5 Current consumption exceeds product specifications. | Major |
|    |                    | 4.6 Mura cannot be seen through 5% ND filter at 50% Gray , should be judged by the viewing angle of 90 degree. | Minor |
| 05 | Dot defect<br><br>(Bright dot,<br>Dark dot)<br><br>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><br>5.1 Inspection pattern: full white, full black, Red, Green and blue screens.<br>5.2 It is defined as dot defect if defect area ＞1/2 dot.<br>5.3 The distance between two dot defect ≧5 mm.<br>5.4 Bright dot : Dots appear bright and unchanged in visible with 5% ND filter is defined.<br>5.5 Tiny bright dot: bright dot area ≦1/2 dot.<br>  a. Dots appear bright and unchanged in visible with 5% ND filter is defined defect and is judged in accordance with 6.1<br>  b. Dots invisible with 5% ND Filter is Ignored. | Minor |

**◆Specification For TFT-LCD Module 3.5″ ~15″ :** (Ver.B01)

| NO | Item | Criterion | Level |
|---|---|---|---|
| 06 | **Black or white Dot, scratch, contamination**<br><br>**Round type**<br><br>$\Phi = (x+y)/2$<br><br>**Line type**<br> | *See criterion tables below* | **Minor** |

**6.1 Round type (Non-display or display):**

| Dimension (diameter: Φ) | Acceptance (Q'ty) | |
|---|---|---|
| | **A area** | **B area** |
| Φ ≦ 0.25 | **Ignore** | |
| 0.25 < Φ ≦ 0.50 | **5** | **Ignore** |
| Φ > 0.50 | **0** | |
| **Total** | **5** | |

**6.2 Line type(Non-display or display):**

| module size | Length (L) | Width (W) | Acceptance (Q'ty) | |
|---|---|---|---|---|
| | | | **A area** | **B area** |
| **3.5" to less 9"** | --- | W ≦ 0.03 | Ignore | |
| | L ≦10.0 | 0.03 <W ≦ 0.05 | 4 | |
| | L ≦5.0 | 0.05 <W ≦ 0.10 | 2 | **Ignore** |
| | --- | W >0.10 | As round type | |
| | **Total** | | 5 | |
| **9" to 15"** | --- | W ≦ 0.05 | Ignore | |
| | L ≦10.0 | 0.05 <W ≦ 0.10 | 5 | **Ignore** |
| | --- | W >0.10 | As round type | |
| | **Total** | | 5 | |

| NO | Item | Criterion | Level |
|---|---|---|---|
| 07 | **Polarizer Bubble** | *See table below* | **Minor** |

| Dimension (diameter: Φ) | Acceptance (Q'ty) | |
|---|---|---|
| | **A area** | **B area** |
| Φ ≦ 0.25 | Ignore | |
| 0.25 < Φ ≦ 0.50 | 4 | |
| 0.50 < Φ ≦ 0.80 | 1 | **Ignore** |
| Φ >0.80 | 0 | |
| **Total** | **5** | |

| NO | Item | Criterion | Level |
|----|------|-----------|-------|
| 08 | **The crack of glass** | Symbols：<br><br>X: The length of crack    Y: The width of crack.<br>Z: The thickness of crack    W: terminal length<br>T: The thickness of glass    a : LCD side length<br><br>8.1 General glass chip:<br><br>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**： <br><br> **X: The length of crack**　　　**Y: The width of crack.** <br> **Z: The thickness of crack**　　**W: terminal length** <br> **t: The thickness of glass**　　　**a: LCD side length** <br><br> 8.1.2 Corner crack: <br><br>  <br><br> 8.2 Protrusion over terminal: <br> 8.2.1 Chip on electrode pad: <br><br>  | Minor |

Corner crack table:

| X | Y | Z |
|---|---|---|
| ≦1/5 a | **Crack can't enter viewing area** | **Z** ≦ 1/2 t |
| ≦1/5 a | **Crack can't exceed the half of SP width.** | 1/2 t < **Z** ≦ 2 t |

Chip on electrode pad table:

|  | X | Y | Z |
|---|---|---|---|
| **Front** | ≦ a | ≦ 1/2 W | ≦ t |
| **Back** | ≦ a | ≦ W | ≦ 1/2 t |

| NO | Item | Criterion | Level |
|----|------|-----------|-------|
| 08 | The crack of glass | **Symbols:**<br><br>X: The length of crack　　　Y: The width of crack.<br>Z: The thickness of crack　　W: terminal length<br>t: The thickness of glass　　a: LCD side length<br><br>8.2.2 Non-conductive portion:<br><br><br><br>| X | Y | Z |<br>\| ≦ 1/3 a \| ≦ W \| ≦t \|<br><br>⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications<br><br>8.2.3 Glass remain:<br><br><br><br>| X | Y | Z |<br>\| ≦ a \| ≦ 1/3 W \| ≦t \|<br><br>**8.2.4 Cracking:**<br><br> 　**Not Allowed** | Minor |

| 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℃<br>(30mins)  (5mins)  (30mins)  (5mins)<br>←————————————————————→<br>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 +/-<br>1.Temperature ambiance : 15℃～35℃<br>2.Humidity relative : 30%～60%<br>3.Energy Storage Capacitance(Cs+Cd) : 150pF±10%<br>4.Discharge Resistance(Rd) : 330Ω±10%<br>5.Discharge, mode of operation :<br>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)<br>2.The amplitude of vibration :1.5 mm<br>3.Each direction (X、Y、Z) duration for 2 Hrs |
| 7 | Drop Test (Packaged) | Packing Weight (Kg) / Drop Height (cm) table below; Drop Direction :※1 corner / 3 edges / 6 sides each 1time |

For item 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 |

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°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 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°C and 3-5 sec.

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

5.2.10    Caution!( LCM products with Capacitive Touch Panel)

Strong EMI-sources such as switch-mode power supplies (SMPS) can lead to touch malfunction (e.g. ghost-touches).

Therefore, the touch needs to be thoroughly tested inside the target application.

5.2.11    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 attach with the customer's mechanical device, please follow up the rules and regulations published by the original manufacturer of double-sided 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°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.
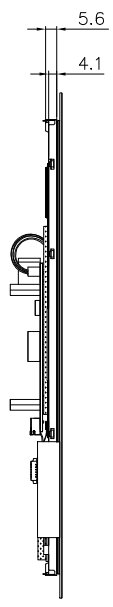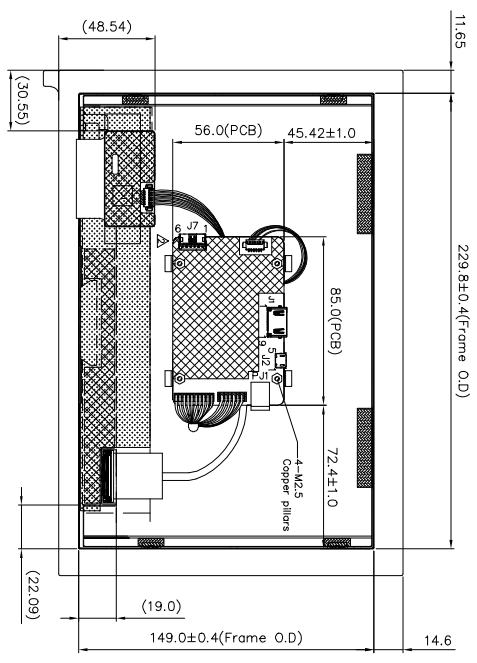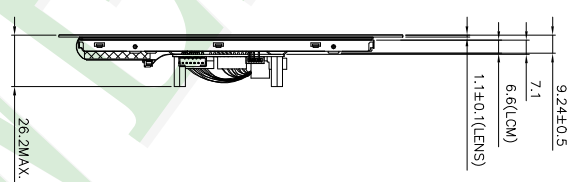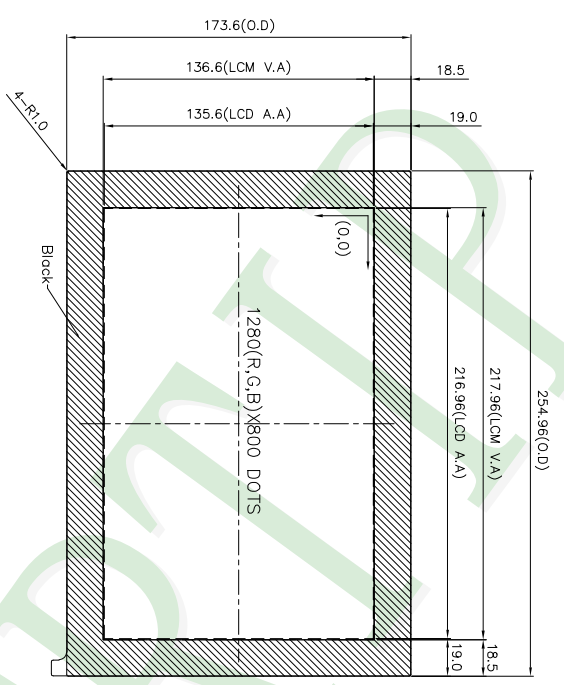
NOTES:
1.LCD TYPE: TFT
2.LCD DISPLAY: Normally Black/Transmissive
3.The tolerance unless classified ±0.3mm
4.▨Component Area;▩Insulating Tape;▦Shading tape;
  ■Insulating Tape;▨Shading tape;
5.PJ1:KD-014-L(DC JACK2.0mm ROHS) OR EQUIVALENT.
6.J1 : ETC-HMAR51610U019S-3440N-7RM4-GP OR EQUIVALENT.
7.J2 : OUPIIN-8971-B05G000DPT OR EQUIVALENT.
8.J7 : JST S6B-PH-KL OR EQUIVALENT.

| 007 | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|
| 006 | | | | | | |
| 005 | | | | | | |
| 004 | | | | | | |
| 003 | | | | | | |
| 002 | MODIFY DRAWING | Kevin | Kevin | 2023/8/17 | | |
| 001 | NEW DRAWING | Kevin | Kevin | 2023/6/8 | | |
| REV | REV BY | REVISER | DATE | | | |
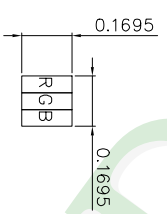
PART NO.:
PH128800T006-ZFC05

DRAWING NAME :
LMD-PH128800T006-ZFC05

TITLE:
LCD MODULE DRAWING

大 正 光 電 股 份 有 限 公 司
POWERTIP TECHNOLOGY CORPORATION

Detail Dots
Scale 150X
0.1695
R G B
0.1695

| | Design | Check | Approve |
|---|--------|-------|---------|
| | Kevin | Stone | Rex |
| | Surface | Material | Quantity |
| | | Thickness | |

| | | Unit | Scale | Page |
|---|---|------|-------|------|
| | | MM | 1:1 | 1/1 |

| Length(mm) | Tolerance Precision (mm) | Precision Level |
|------------|--------------------------|-----------------|
| 1 ~ 4 | 4 ~ 16 | - |
| 4 ~ 16 | 16 ~ 63 | - |
| 16 ~ 63 | 63 ~ 250 | - |
| 63 ~ 250 | 250 ~ 1000 | - |

173.6(O.D)
136.6(LCM V.A)
135.6(LCD A.A)
18.5
19.0
4-R1.0
Black
(0.0)
1280(R,G,B)X800 DOTS
217.96(LCM V.A)
216.96(LCD A.A)
254.96(O.D)
18.5
19.0

5.6
4.1
26.2MAX.

9.24±0.5
7.1
6.6(LCM)
1.1±0.1(LENS)

(48.54)
(30.55)
11.65
56.0(PCB)
45.42±1.0
6 J7
85.0(PCB)
J1
5
J2
229.8±0.4(Frame O.D)
72.4±1.0
4-M2.5
Copper pillars
(22.09)
(19.0)
149.0±0.4(Frame O.D)
14.6

PT-A-054-01

1. (Packaging Material) : (per carton)

| No. | Item | Model | Dimensions (mm) | 1Pcs Weight | Quantity | Total Weight |
|---|---|---|---|---|---|---|
| 1 | 成品 (LCM) | PH128800T006-ZFC05 | 254.96 X 173.6 | 0.516 | 11 | 4.12 |
| 2 | 氣泡袋(1)Bubble Bag | BAG0000000048 | 330X 260 | 0.01 | 11 | 0.08 |
| 3 | A10隔板(2)A10 Partition | BX00000000119 | 340 X 174 X 7 | 0.031 | 10 | 0.31 |
| 4 | B10隔板(3)B10 Partition | BX00000000118 | 500 X 174 X 7 | 0.037 | 2 | 0.074 |
| 5 | 舒美墊(4)EPE | FOAM000000244 | 500 X 340 X 20 | 0.036 | 2 | 0.072 |
| 6 | 外箱C6 (5)Carton | BX00000000120 | 514 X 354 X 228 | 0.75 | 1 | 0.75 |
| 7 | 舒美墊(6)EPE | FOAM000000245 | 170 X 130 X 15 | 0.01 | 4 | 0.04 |
| 8 | 舒美墊(7)EPE | FOAM000000246 | 170 X 23 X 15 | 0.001 | 49 | 0.049 |
| 9 | | | | | | |

2.一 整箱總重量 (Total LCD Weight in carton ) :     5.50    Kg±10%
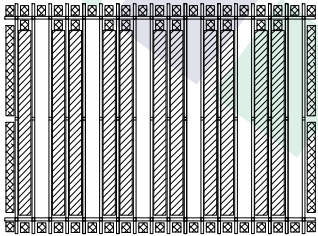
3.單箱數量規格表 (Packaging Specifications and Quantity) :

   (1)Quantity Of Spacer : A9隔板  X  10     , B9隔板  X  2

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

(4) 舒美墊 EPE

(8)EPE+(1)氣泡袋+LCM EPE+Bubble Bag+LCM

(5)外紙箱 Carton

(2)(3)隔板 Partition

(6)(7)舒美墊EPE (註 Remark 1 )

(5) 舒美墊 EPE
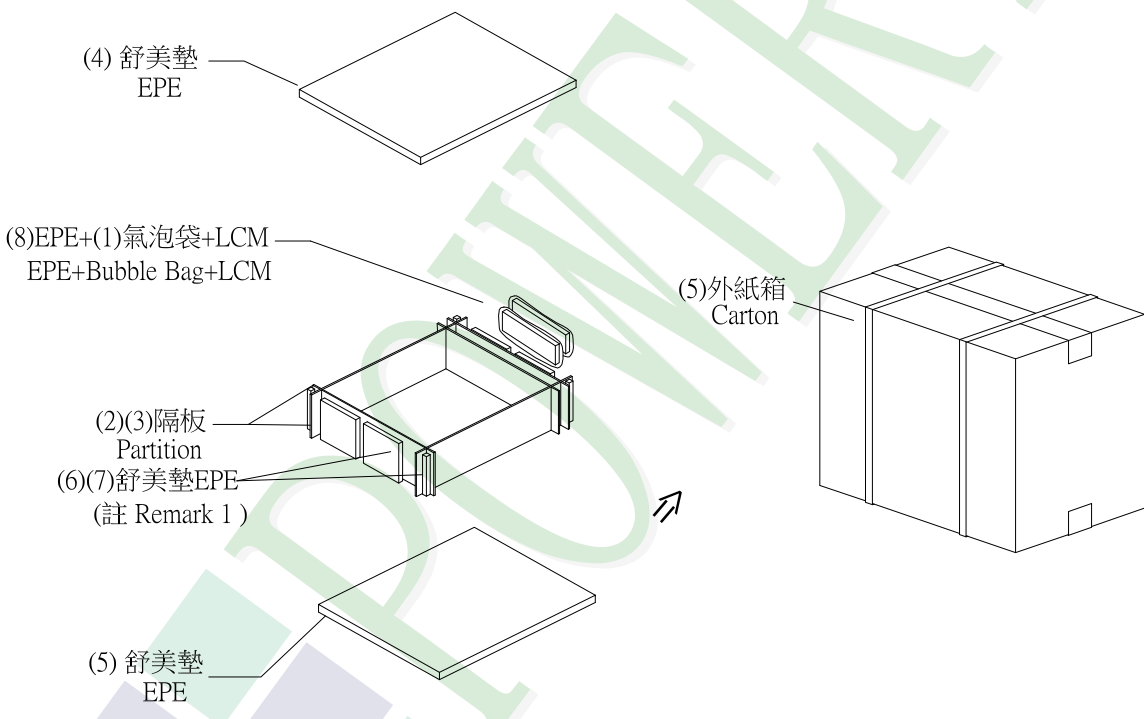
特　記　事　項 (REMARK)

4.LCM排放示意圖(前後間隔不放置):

4.LCM placed as figure showing:

 ( First and last slot should be empty)

模組(LCM) X 1pcs.

5.模組銅柱面，朝空的間隔方向擺放，如下示意: