

SPECIFICATIONS

CUSTOMER : PTC

SAMPLE CODE : SH480272T005-IAC12

MASS PRODUCTION CODE : PH480272T005-IAC12

SAMPLE VERSION : 01

SPECIFICATIONS EDITION : 001

DRAWING NO. (Ver.) : JLMD- PH480272T005-IAC12_001

PACKAGING NO. (Ver.) : _____

Customer Approved

Date: _____

| Approved | Checked | Designer |
|----------|---------|----------|
| 劉進 | 劉進 | 俞承澤 |

- 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 E-mail: sales@powertip.com.tw
 FAX: 886-4-2355-8166 [Http://www.powertip.com.tw](http://www.powertip.com.tw)

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> |
|---------------------------------|-------------|-------------|--------------------|-------------|------------------|
| 06/30/2022 | 01 | 001 | New Drawing | - | 俞承澤 |
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Appendix : 1. LCM Drawing

1.1 Features

| Item | Standard Value |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display Type | 480 * 3 (RGB) * 272 Dots |
| LCD Type | Normally white TN , Transmissive Type |
| Screen size(inch) | 4.3"(Diagonal) |
| Viewing Direction | 6 O'clock |
| Color configuration | R,G, B vertical stripe |
| Backlight | White LED B/L |
| Display Interface | Digital 24-bits RGB |
| Driver IC | ST7257 |
| ROHS | THIS PRODUCT CONFORMS THE ROHS OF PTC Detail information please refer website : http://www.powertip.com.tw/news_detail.php?Key=1&Cid=1 |

1.2 Mechanical Specifications

| Item | Standard Value | Unit |
|-------------------|----------------------------------|------|
| Outline Dimension | 115.1 (W) x 78.94 (L) x 4.95 (H) | mm |
| Ink Opening | 97.1 (W) * 55.9 (L) | mm |

LCD panel

| Item | Standard Value | Unit |
|-------------|-----------------------|------|
| Active Area | 95.04 (W) x 53.86 (L) | mm |
| Pixel Size | 0.198 (W) * 0.198 (H) | 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 | GND=0 | -0.3 | +4.6 | V |
| Operating Temperature | T _{OP} | - | -20 | +70 | °C |
| Storage Temperature | T _{ST} | - | -30 | +80 | °C |
| Storage Humidity | H _b | T _a ≅ 60 °C | - | 90 | %RH |

1.4 DC Electrical Characteristics

Module

GND = 0V, T_a = 25°C

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|--------------------|-----------------|-----------|---------|------|----------|------|
| Power supply | VDD | - | 3.0 | 3.3 | 3.6 | V |
| | VGH | - | 12 | 15 | 16 | V |
| | VGL | - | -12 | -10 | -7 | V |
| “H” Input Voltage | V _{IH} | - | 0.7*VDD | - | VDD | V |
| “L” Input Voltage | V _{IL} | - | GND | - | 0.3* GND | V |
| “H” Output Voltage | V _{OH} | - | VDD-0.4 | - | VDD | V |
| “L” Output Voltage | V _{OL} | - | GND | - | GND +0.4 | V |
| Supply Current | I _{DD} | VDD=3.3V | - | - | (45) | mA |

1.5 Optical Characteristics

TFT LCD Panel

VDD =3.3V, Ta=25°C

| Item | Symbol | Condition | Min. | Typ. | Max. | unit | | |
|-------------------------------------------------------------------|------------|-------------|--------------|-------|--------|------|-------|-------|
| Response time | Tr + Tf | - | - | 26 | 39 | ms | Note2 | |
| Viewing angle | Top | $\theta Y+$ | CR \geq 10 | - | 60 | - | Deg. | Note4 |
| | Bottom | $\theta Y-$ | | - | 60 | - | | |
| | Left | $\theta X-$ | | - | 60 | - | | |
| | Right | $\theta X+$ | | - | 60 | - | | |
| Contrast ratio | CR | - | 500 | 600 | - | - | - | |
| Color of CIE Coordinate (B/L & LCD & TP) | White | X | IF=20mA | - | (0.31) | - | - | Note1 |
| | | Y | | - | (0.33) | - | | |
| | Red | X | | - | (0.60) | - | | |
| | | Y | | - | (0.36) | - | | |
| | Green | X | | - | (0.35) | - | | |
| | | Y | | - | (0.58) | - | | |
| | Blue | X | | - | (0.15) | - | | |
| | | Y | | - | (0.09) | - | | |
| Average Brightness Pattern=white display (B/L & LCD & TP) | IV | IF=20mA | - | (280) | - | - | Note1 | |
| Uniformity | ΔB | IF=20mA | 70 | - | - | % | Note1 | |

Note1:

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

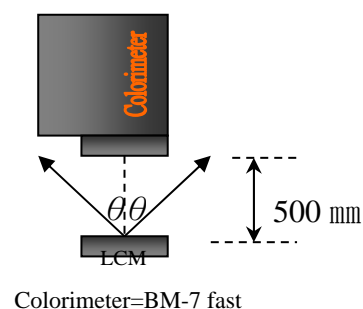
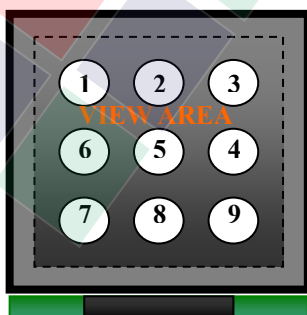
2 : Measurement Condition for Optical Characteristics:

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

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

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

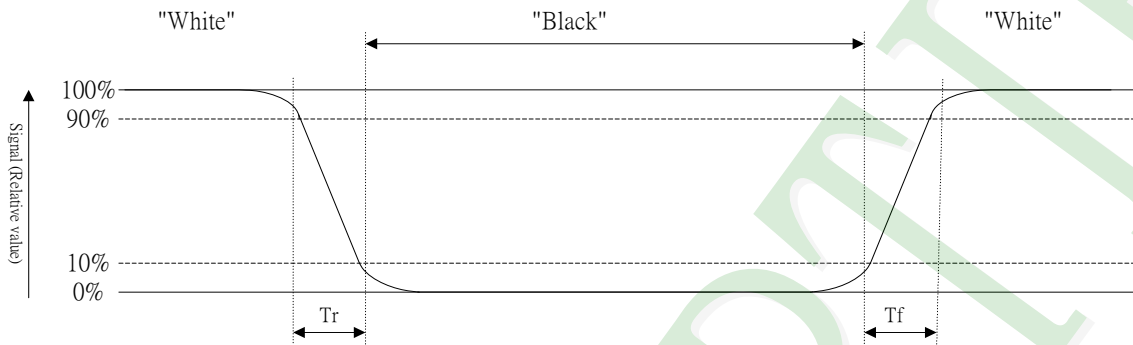
d : The uncertainty of the C.I.E coordinate measurement ± 0.01 , Average Brightness $\pm 4\%$



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:



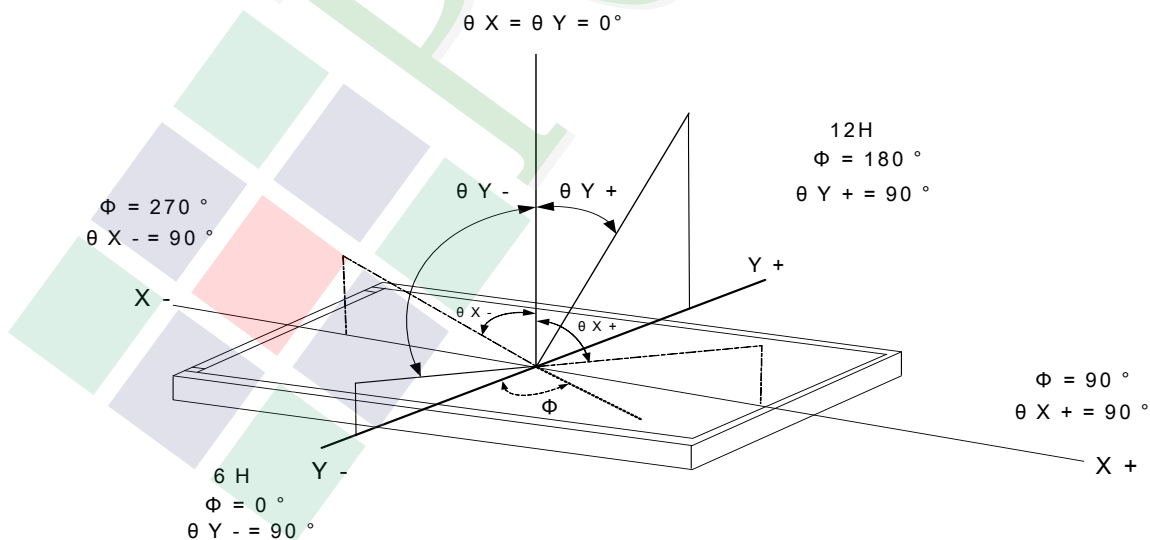
Note3: Definition of contrast ratio:

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. | Max. | Unit |
|-----------------------------------|--------|------------|------|------|------|
| LED Forward Current (Each LED) | IF | Ta =25°C | - | 30 | mA |
| LED Reverse Voltage (Each LED) | VR | Ta =25°C | - | 5 | V |
| Power Dissipation | PD | Ta =25°C | - | 100 | mW |

Electrical / Optical Characteristics

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------------|--------|------------|------|------|------|-------------------|
| Forward Voltage | VF | IF=20mA | 18.2 | 22.8 | 24.5 | V |
| Average Brightness (Without LCD) | IV | | 4500 | 5400 | - | cd/m ² |
| CIE Color Coordinate (Without LCD) | X | | 0.26 | 0.29 | 0.32 | - |
| | Y | | 0.26 | 0.29 | 0.32 | |
| Color | White | | | | | |

Internal Circuit



Other Description

| Item | Conditions | Description |
|-------------|----------------------|-------------|
| Life Time*1 | Ta =25°C IF= 20mA | 20,000 hrs |

*1 : The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=20mA. The LED lifetime could be decreased if operating IL is larger than 20 mA.

1.7 Touch Panel Characteristics

Features

| Item | Standard Value |
|------------------|-----------------------------------------------------------------------------------------|
| Touch Panel Size | 4.3" |
| Touch type | Projective capacitive touch panel True Multi-touch with up to 5 Points of Absolution |
| Output Interface | I ² C |
| IC | ICNT8952 |

I²C Address

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | R/W |

Bit 0: 0 for Write / 1 for Read

Mechanical Specifications

| Item | Standard Value | Unit |
|--------------|-----------------------------|------|
| Viewing Area | 96.10 mm (W) x 54.90 mm (H) | mm |

Absolute Maximum Ratings

| Item | Symbol | Condition | Min. | Max. | Unit |
|-----------------------|-----------------|-----------|------|------|------|
| Operating Temperature | T _{OP} | - | -20 | +70 | °C |
| Storage Temperature | T _{ST} | - | -30 | +80 | °C |

DC Electrical Characteristics

| Item | Description | Unit |
|-------------------|-------------|------|
| Operating Voltage | 2.8~3.3 | V |

T/P PIN

| Pin No. | Symbol | Function |
|---------|--------|-----------------------------------------|
| 1 | TPGND | TP Ground |
| 2 | SDA | I ² C Data |
| 3 | SCL | I ² C Clock |
| 4 | TPVDD | TP VDD |
| 5 | INT | Interrupt Output |
| 6 | XRES | Chip Reset Input, Negative Edge Trigger |

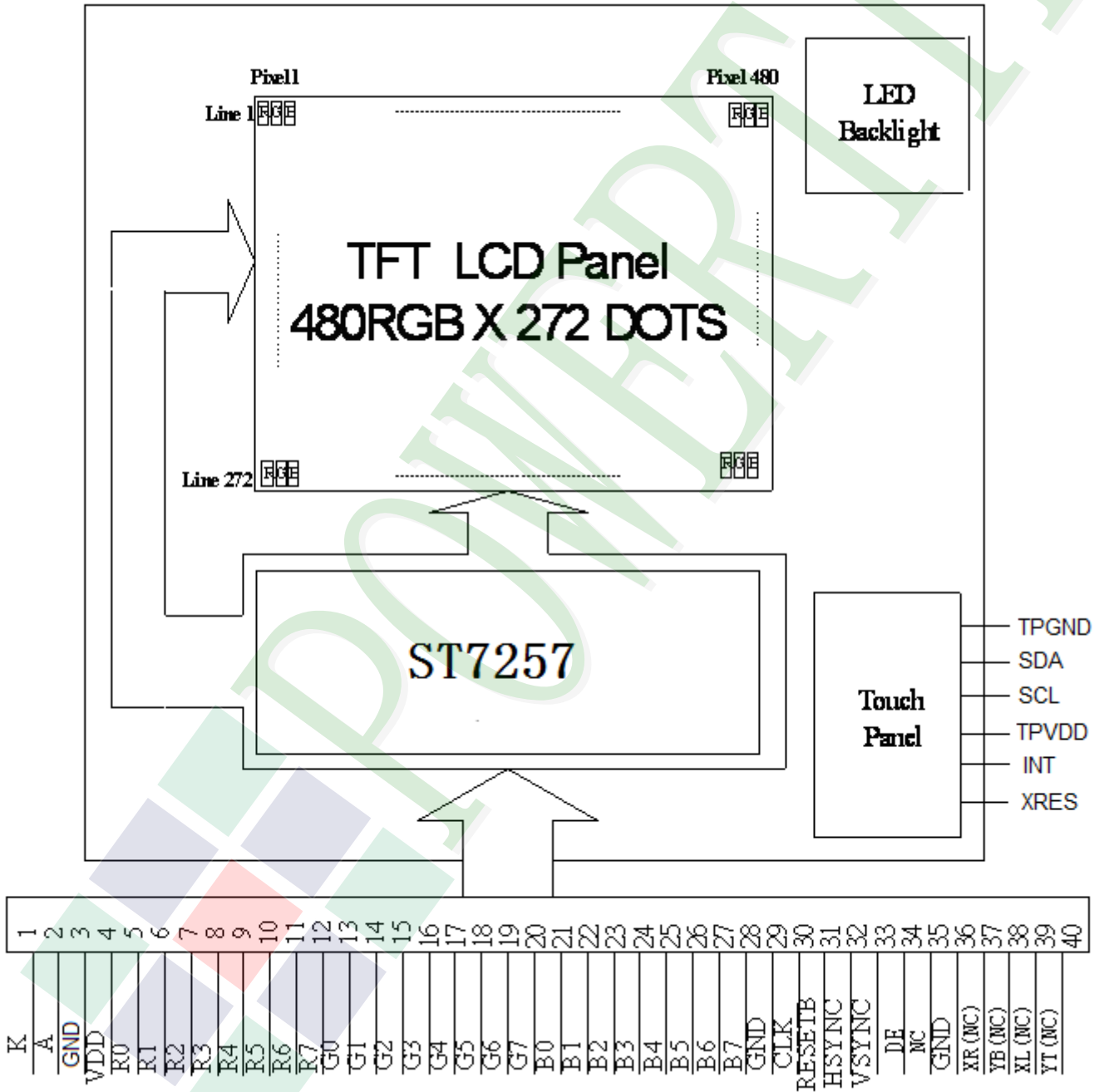
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



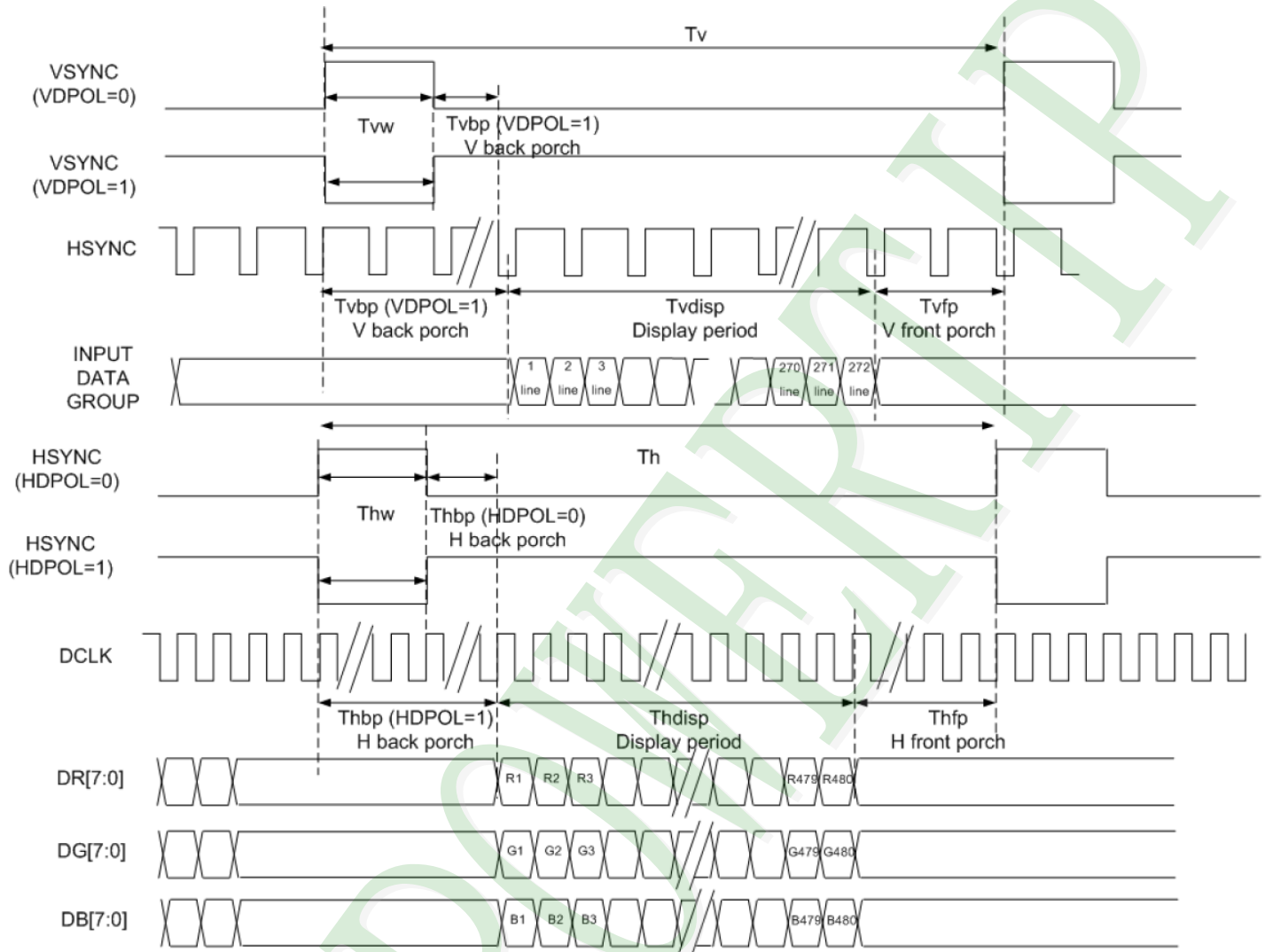
2.2 Interface Pin Description

| <u>Pin No.</u> | <u>Symbol</u> | <u>Function</u> |
|----------------|---------------|----------------------------------------------|
| 1 | K | Power supply for LED Backlight cathode input |
| 2 | A | Power supply for LED Backlight anode input |
| 3 | GND | Ground |
| 4 | VDD | Digital power |
| 5 | R0 | Red data bit 0 |
| 6 | R1 | Red data bit 1 |
| 7 | R2 | Red data bit 2 |
| 8 | R3 | Red data bit 3 |
| 9 | R4 | Red data bit 4 |
| 10 | R5 | Red data bit 5 |
| 11 | R6 | Red data bit 6 |
| 12 | R7 | Red data bit 7 |
| 13 | G0 | Green data bit 0 |
| 14 | G1 | Green data bit 1 |
| 15 | G2 | Green data bit 2 |
| 16 | G3 | Green data bit 3 |
| 17 | G4 | Green data bit 4 |
| 18 | G5 | Green data bit 5 |
| 19 | G6 | Green data bit 6 |
| 20 | G7 | Green data bit 7 |

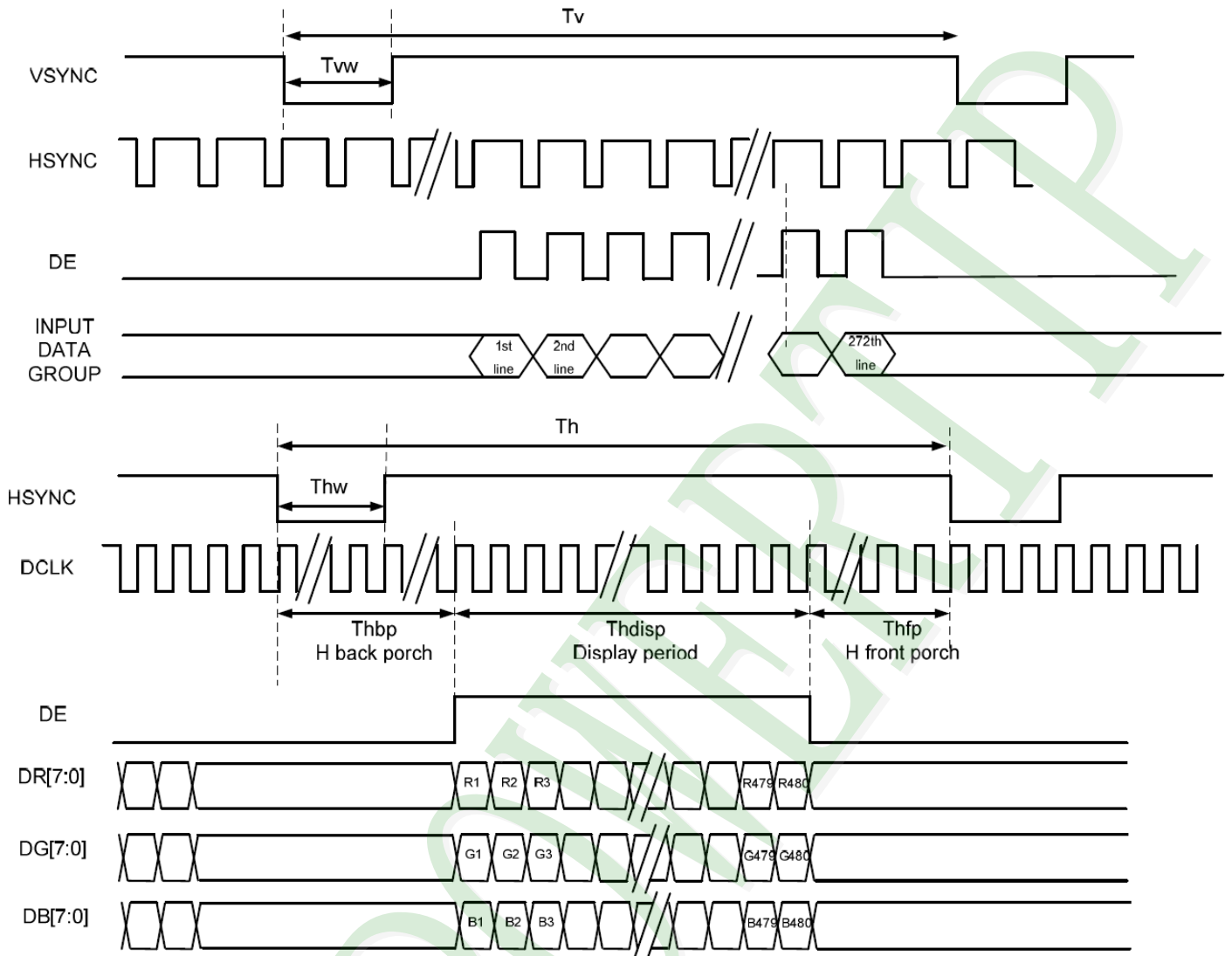
| <u>Pin No.</u> | <u>Symbol</u> | <u>Function</u> |
|----------------|---------------|---------------------------------------------------------------------|
| 21 | B0 | Blue data bit 0 |
| 22 | B1 | Blue data bit 1 |
| 23 | B2 | Blue data bit 2 |
| 24 | B3 | Blue data bit 3 |
| 25 | B4 | Blue data bit 4 |
| 26 | B5 | Blue data bit 5 |
| 27 | B6 | Blue data bit 6 |
| 28 | B7 | Blue data bit 7 |
| 29 | GND | Ground |
| 30 | CLK | Dot data clock |
| 31 | DISP | Display control / standby mode selection "High" : Normal display |
| 32 | HSYNC | Horizontal sync input |
| 33 | VSYNC | Vertical sync input |
| 34 | DE | Data input enable. Active High to enable the data input |
| 35 | N.C | Not Connect. |
| 36 | GND | Ground |
| 37 | XR | Not Connect. |
| 38 | YB | Not Connect. |
| 39 | XL | Not Connect. |
| 40 | YT | Not Connect. |

2.3 Timing Characteristics

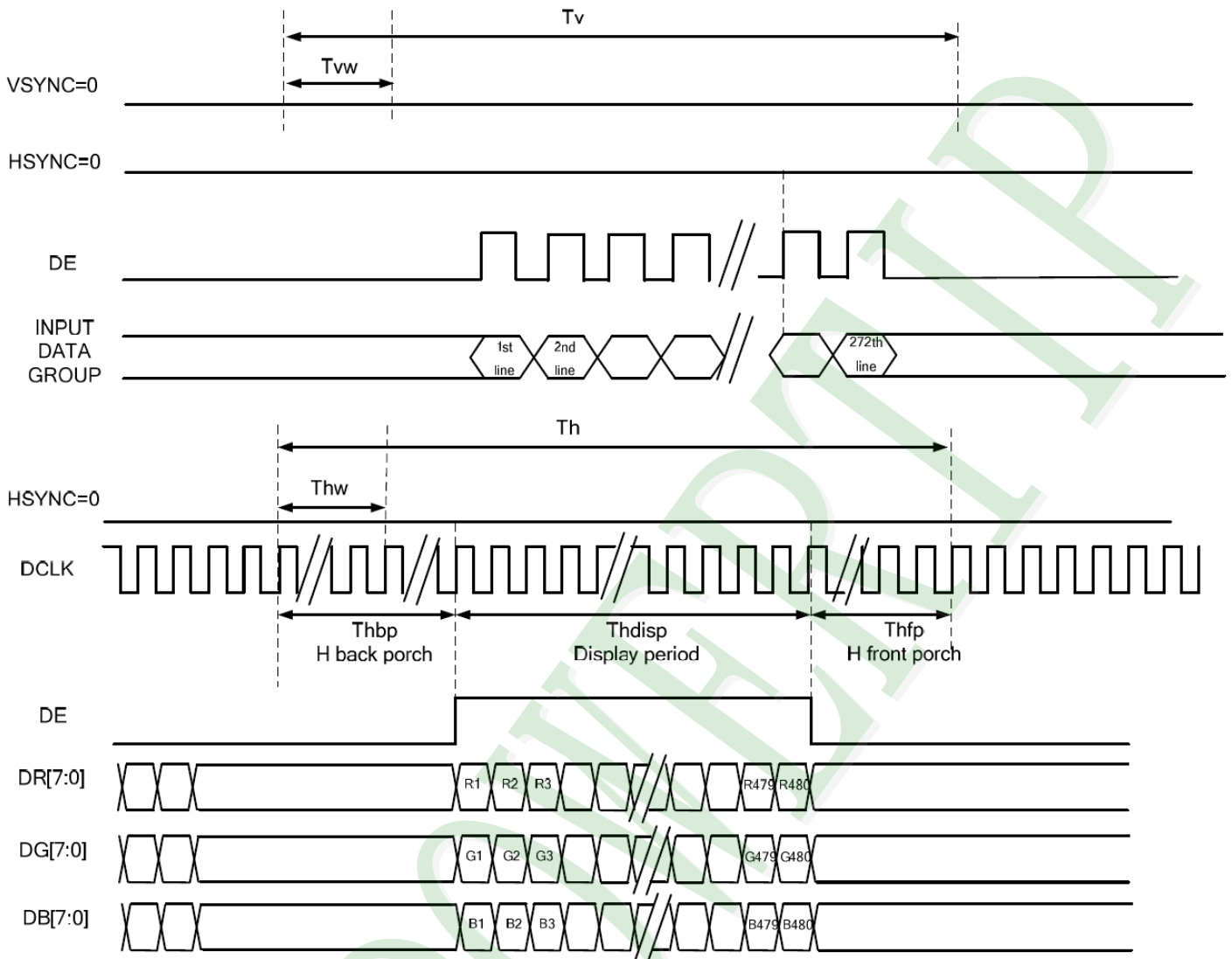
2.3.1 SYNC Mode



2.3.2 SYNC-DE Mode



2.3.3 DE Mode



2.3.4 Parallel 24-bit RGB Input Timing Table

| 480RGB*272 Resolution Timing Table | | | | | | | |
|------------------------------------|----------------|--------|------|------|------|--------|-----------------------|
| Item | Symbol | Min. | Typ. | Max. | Unit | Remark | |
| DCLK Frequency | Fclk | 8 | 9 | 12 | MHz | | |
| DCLK Period | Tclk | 83 | 111 | 125 | ns | | |
| HSYNC | Period Time | Th | 485 | 531 | 598 | DCLK | |
| | Display Period | Thdisp | | 480 | | DCLK | |
| | Back Porch | Thbp | 3 | 43 | 43 | DCLK | By H_Blanking setting |
| | Front Porch | Thfp | 2 | 8 | 75 | DCLK | |
| | Pulse Width | Thw | 2 | 4 | 75 | DCLK | |
| VSYNC | Period Time | Tv | 276 | 292 | 321 | H | |
| | Display Period | Tvdisp | | 272 | | H | |
| | Back Porch | Tvbp | 2 | 12 | 12 | H | By V_Blanking setting |
| | Front Porch | Tvfp | 2 | 8 | 37 | H | |
| | Pulse Width | Tvw | 2 | 4 | 37 | H | |

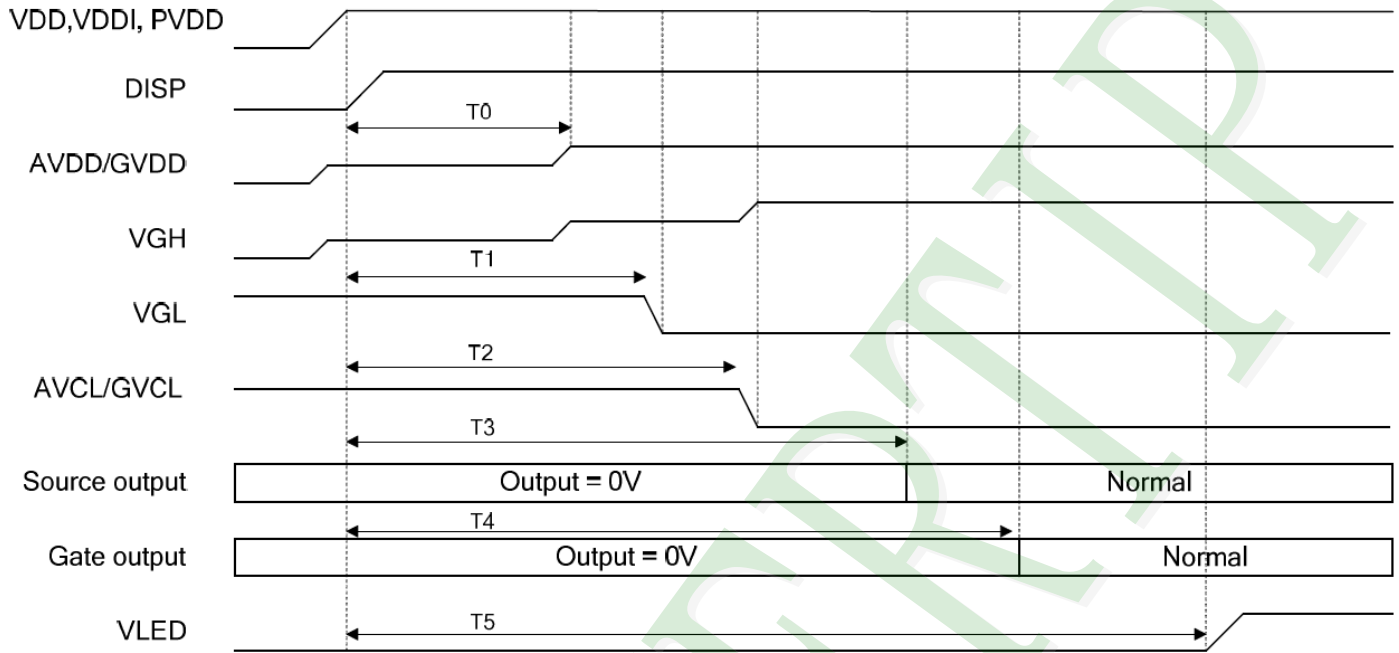
Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

| 480RGB*272 Resolution Timing Table | | | | | | | |
|------------------------------------|----------------|--------|------|------|------|--------|-----------------------|
| Item | Symbol | Min. | Typ. | Max. | Unit | Remark | |
| DCLK Frequency | Fclk | 8 | 9 | 12 | MHz | | |
| DCLK Period | Tclk | 83 | 111 | 125 | ns | | |
| HSYNC | Period Time | Th | 485 | 531 | 598 | DCLK | |
| | Display Period | Thdisp | | 480 | | DCLK | |
| | Back Porch | Thbp | 3 | 43 | 43 | DCLK | By H_Blanking setting |
| | Front Porch | Thfp | 2 | 8 | 75 | DCLK | |
| | Pulse Width | Thw | 2 | 4 | 75 | DCLK | |
| VSYNC | Period Time | Tv | 244 | 260 | 321 | H | |
| | Display Period | Tvdisp | | 240 | | H | |
| | Back Porch | Tvbp | 2 | 12 | 12 | H | By V_Blanking setting |
| | Front Porch | Tvfp | 2 | 8 | 37 | H | |
| | Pulse Width | Tvw | 2 | 4 | 37 | H | |

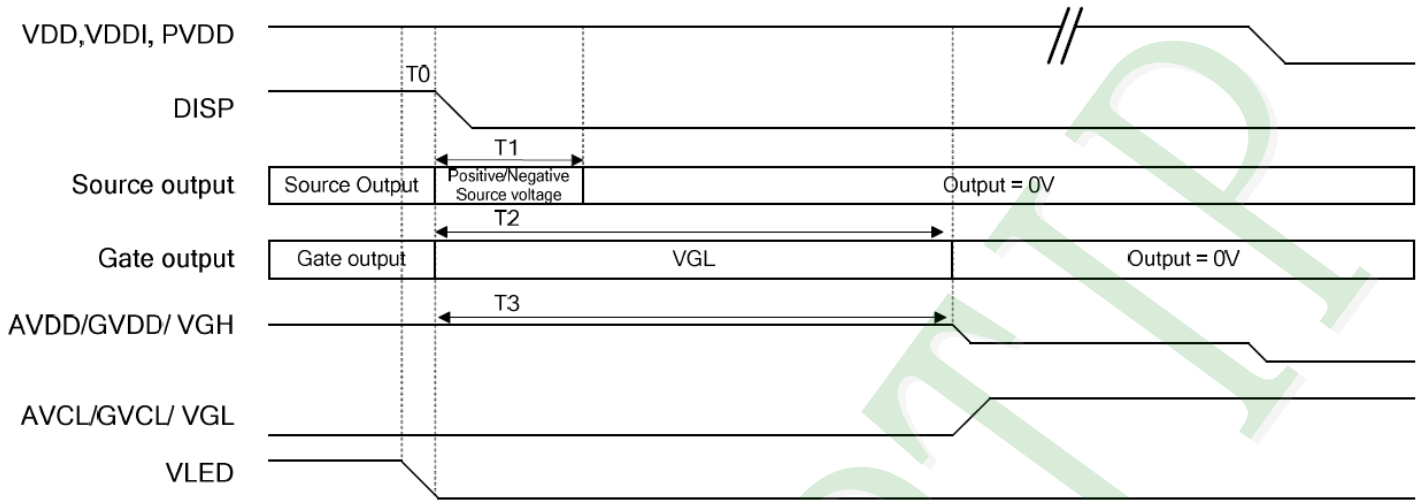
Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

2.3.5 Power Sequence

POWER ON



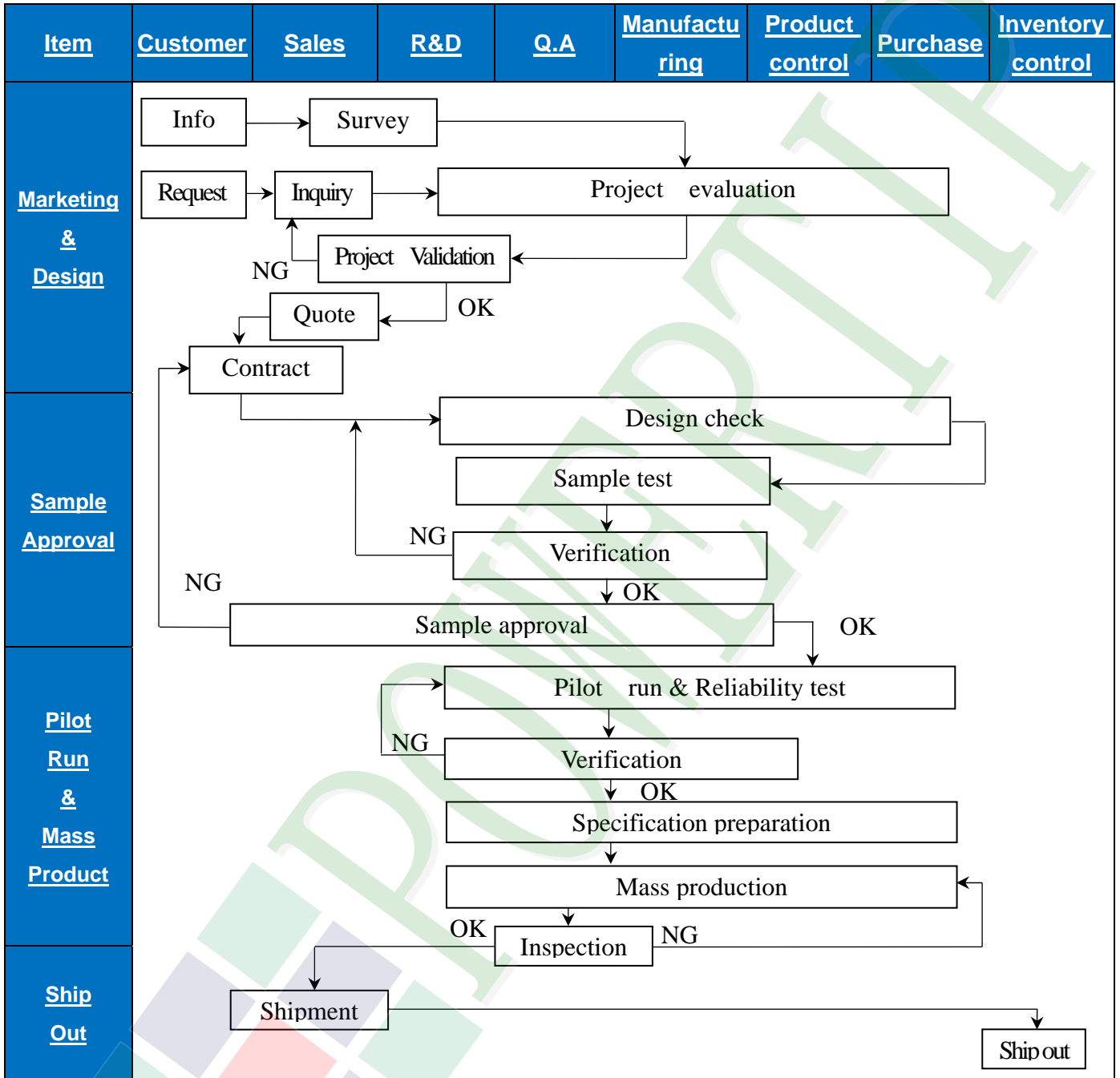
| Symbol | Description | Min. Time | Unit |
|--------|--------------------------------------------|-----------|------|
| T0 | DISP="High" to AVDD/GVDD voltage stability | 40 | ms |
| T1 | DISP="High" to VGL voltage stability | 50 | ms |
| T2 | DISP="High" to AVCL/GVCL stability | 70 | ms |
| T3 | DISP="High" to Source output | 100 | ms |
| T4 | DISP="High" to Gate output | 110 | ms |
| T5 | Black Turn on | 130 | ms |

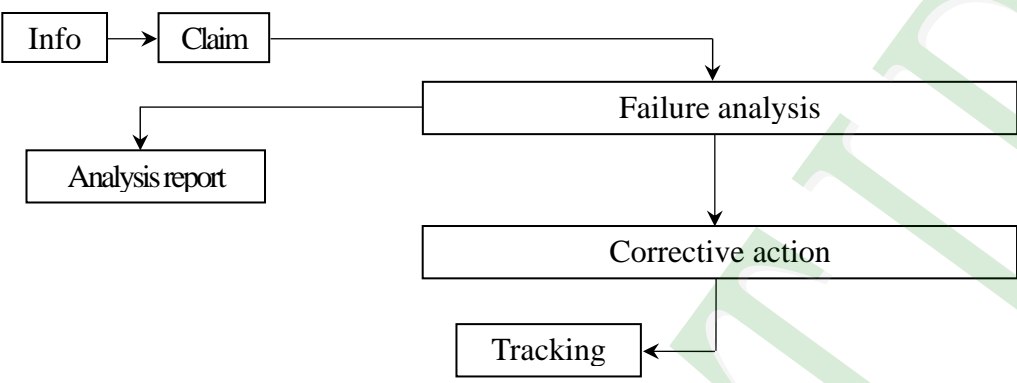
POWER OFF


| Symbol | Description | Min. Time | Unit |
|--------|-------------------------------------|-----------|------|
| T0 | Backlight turn off to DISP="Low" | 5 | ms |
| T1 | DISP="Low" to Source output disable | 20 | ms |
| T2 | DISP="Low" to Gate output disable | 50 | ms |
| T3 | DISP="Low" to Gate output disable | 50 | ms |

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



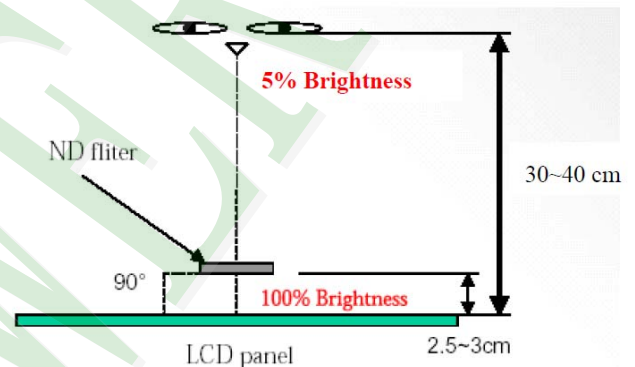
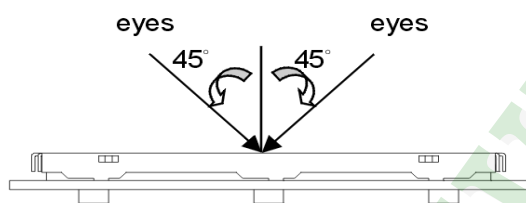
| <u>Item</u> | <u>Customer</u> | <u>Sales</u> | <u>R&D</u> | <u>Q.A</u> | <u>Manufacturing</u> | <u>Product control</u> | <u>Purchase</u> | <u>Inventory control</u> |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------|------------|-------------------------------------------------------------------------|------------------------|-----------------|--------------------------|
| Sales Service |  <pre> graph TD Info[Info] --> Claim[Claim] Claim --> Failure[Failure analysis] Failure --> 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

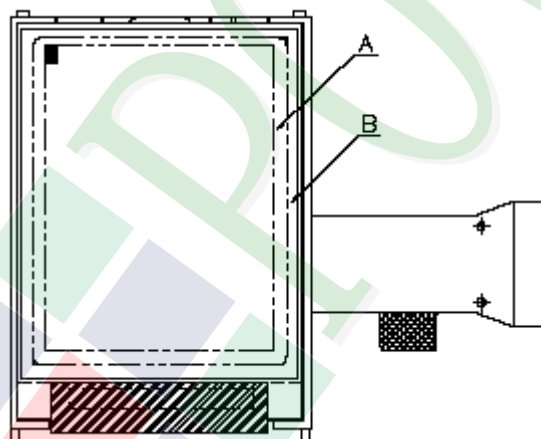
- ◆Scope : The document shall be applied to TFT-LCD Module for less than 3.5" (Ver.B01).
- ◆Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II.
- ◆Equipment : Gauge 、MIL-STD 、Powertip Tester 、Sample
- ◆Defect Level : Major Defect AQL : 0.4 ; Minor Defect AQL : 1.5
- ◆OUT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

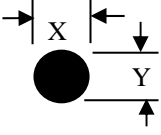
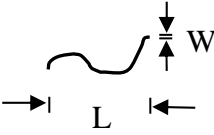
◆Specification For TFT-LCD Module Less Than 3.5" :

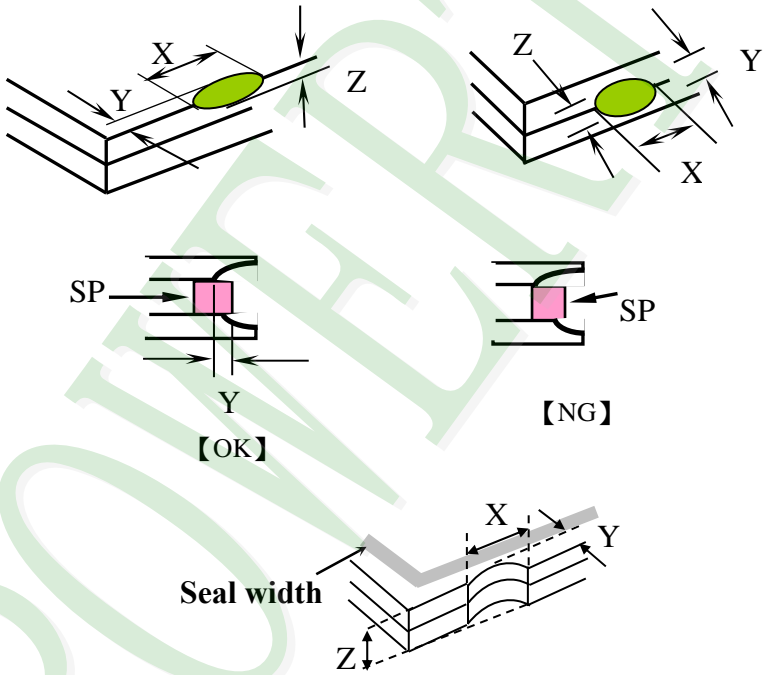
(Ver.B01)

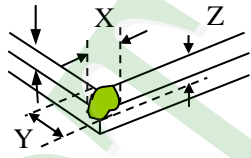
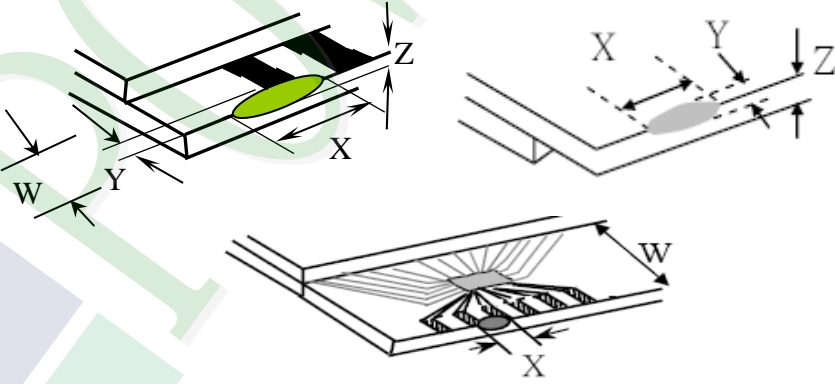
| NO | Item | Criterion | Level | | | | | | | | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------|-------------------|------------|------------|----------|----------|----------|-----------|----------|-------|----------|-------|
| 01 | Product condition | 1. 1The 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. 1The 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 can not be seen through 5% ND filter at 50% Gray screen , should be judged by the viewing angle of 90 degree. | Minor | | | | | | | | | | | | |
| 05 | Dot defect (Bright dot 、 Dark dot) On -display | <table border="1"> <thead> <tr> <th></th> <th>Item</th> <th>Acceptance (Q'ty)</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Dot Defect</td> <td>Bright Dot</td> <td>≤ 2</td> </tr> <tr> <td>Dark Dot</td> <td>≤ 3</td> </tr> <tr> <td>Joint Dot</td> <td>≤ 2</td> </tr> <tr> <td>Total</td> <td>≤ 3</td> </tr> </tbody> </table> | | Item | Acceptance (Q'ty) | Dot Defect | Bright Dot | ≤ 2 | Dark Dot | ≤ 3 | Joint Dot | ≤ 2 | Total | ≤ 3 | Minor |
| | | | Item | Acceptance (Q'ty) | | | | | | | | | | | |
| Dot Defect | Bright Dot | ≤ 2 | | | | | | | | | | | | | |
| | Dark Dot | ≤ 3 | | | | | | | | | | | | | |
| | Joint Dot | ≤ 2 | | | | | | | | | | | | | |
| | Total | ≤ 3 | | | | | | | | | | | | | |
| 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 that can not be seen through 5% ND filter. | | | | | | | | | | | | | | | |

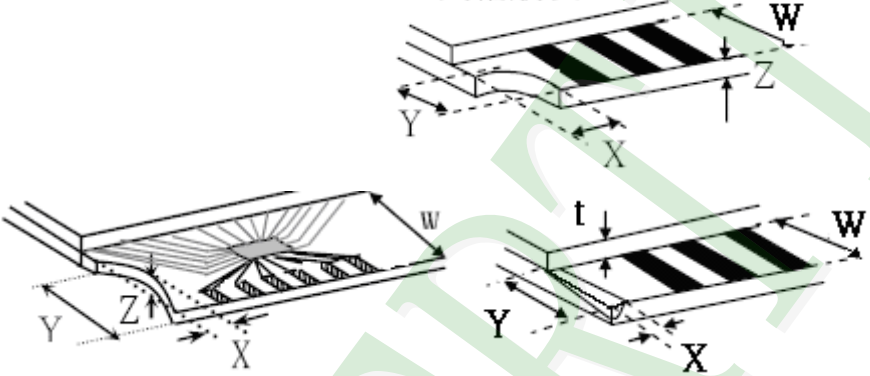
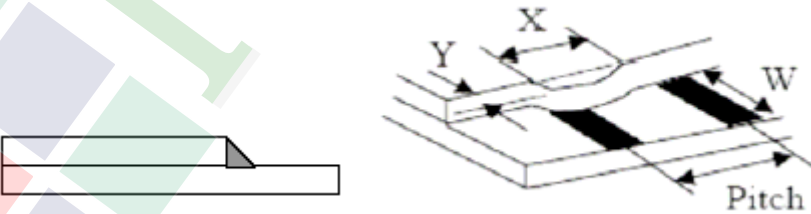
◆Specification For TFT-LCD Module Less Than 3.5" :

(Ver.B01)

| NO | Item | Criterion | Level | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------|--|--------|--------|------------------|--------|--|-------------------------|---|--|-------------------------|---|--|---------------|----------|--|--------------|----------|--|-----------|--|-------------------|--|------------|-----------|--------|--------|-----|---------------|--------|--|--------------|----------------------|---|--|-----|------------|---------------|--|--------------|--|----------|--|-------|
| 06 | <p>Black or white dot、scratch、contamination</p> <p>Round type</p>  <p>$\Phi = (x + y) / 2$</p> <p>Line type</p>  | <p>6. 1 Round type (Non-display or display) :</p> <table border="1" data-bbox="550 425 1324 884"> <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>$\Phi \leq 0.15$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.20$</td> <td colspan="2">2</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.30$</td> <td colspan="2">2</td> </tr> <tr> <td>$\Phi > 0.30$</td> <td colspan="2">0</td> </tr> <tr> <td>Total</td> <td colspan="2">3</td> </tr> </tbody> </table> <p>6. 2 Line type(Non-display or display) :</p> <table border="1" data-bbox="526 996 1340 1411"> <thead> <tr> <th colspan="2">Dimension</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>Length (L)</th> <th>Width (W)</th> <th>A area</th> <th>B area</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.03$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.03 < W \leq 0.05$</td> <td colspan="2">3</td> </tr> <tr> <td>---</td> <td>$W > 0.05$</td> <td colspan="2">As round type</td> </tr> <tr> <td colspan="2">Total</td> <td colspan="2">3</td> </tr> </tbody> </table> | Dimension (diameter : Φ) | Acceptance (Q'ty) | | A area | B area | $\Phi \leq 0.15$ | Ignore | | $0.15 < \Phi \leq 0.20$ | 2 | | $0.20 < \Phi \leq 0.30$ | 2 | | $\Phi > 0.30$ | 0 | | Total | 3 | | Dimension | | Acceptance (Q'ty) | | Length (L) | Width (W) | A area | B area | --- | $W \leq 0.03$ | Ignore | | $L \leq 5.0$ | $0.03 < W \leq 0.05$ | 3 | | --- | $W > 0.05$ | As round type | | Total | | 3 | | Minor |
| Dimension (diameter : Φ) | Acceptance (Q'ty) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | A area | B area | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\Phi \leq 0.15$ | Ignore | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.15 < \Phi \leq 0.20$ | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.20 < \Phi \leq 0.30$ | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\Phi > 0.30$ | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dimension | | Acceptance (Q'ty) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Length (L) | Width (W) | A area | B area | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | $W \leq 0.03$ | Ignore | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 5.0$ | $0.03 < W \leq 0.05$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | $W > 0.05$ | As round type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07 | Polarizer Bubble | <table border="1" data-bbox="534 1467 1332 1870"> <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>$\Phi \leq 0.20$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.50$</td> <td colspan="2">3</td> </tr> <tr> <td>$\Phi > 0.50$</td> <td colspan="2">0</td> </tr> <tr> <td>Total</td> <td colspan="2">3</td> </tr> </tbody> </table> | Dimension (diameter : Φ) | Acceptance (Q'ty) | | A area | B area | $\Phi \leq 0.20$ | Ignore | | $0.20 < \Phi \leq 0.50$ | 3 | | $\Phi > 0.50$ | 0 | | Total | 3 | | Minor | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dimension (diameter : Φ) | Acceptance (Q'ty) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | A area | B area | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\Phi \leq 0.20$ | Ignore | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.20 < \Phi \leq 0.50$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\Phi > 0.50$ | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| NO | Item | Criterion | Level | | | | | | | | | |
|----------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---|---|----------|--------------------------------|--------------|----------|------------------------------------------|----------------------|-------|
| 08 | The crack of glass | <p>Symbols :</p> <p>X : The length of crack Z : The thickness of crack t : The thickness of glass</p> <p>Y : The width of crack. W : terminal length a : LCD side length</p> <hr/> <p>8.1 General glass chip :</p> <p>8.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="539 1462 1353 1756"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <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> </tbody> </table> | X | Y | Z | $\leq a$ | 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 |
| X | Y | Z | | | | | | | | | | |
| $\leq a$ | 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 | <p>Symbols :</p> <p>X : The length of crack Z : The thickness of crack t : The thickness of glass</p> <p>Y : The width of crack. W : terminal length a : LCD side length</p> <hr/> <p>8.1.2 Corner crack :</p>  <table border="1" data-bbox="523 784 1340 1075"> <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. | $1/2 t < Z \leq 2 t$ | | | | | | | | | | |
| <p>8.2 Protrusion over terminal :</p> <p>8.2.1 Chip on electrode pad :</p>  <table border="1" data-bbox="561 1680 1348 1859"> <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>$\leq a$</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 | $\leq a$ | $\leq W$ | $\leq 1/2 t$ |
| | X | Y | Z | | | | | | | | | |
| Front | $\leq a$ | $\leq 1/2 W$ | $\leq t$ | | | | | | | | | |
| Back | $\leq a$ | $\leq W$ | $\leq 1/2 t$ | | | | | | | | | |

| NO | Item | Criterion | Level | | | | | | | | | | | | |
|--------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---|---|--------------|----------|----------|---|---|---|----------|--------------|----------|-------|
| 08 | The crack of glass | <p>Symbols :</p> <p>X : The length of crack Y : The width of crack. Z : The thickness of crack W : terminal length t : The thickness of glass a : LCD side length</p> <hr/> <p>8.2.2 Non-conductive portion :</p>  <table border="1" data-bbox="619 963 1252 1120"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 1/3 a$</td> <td>$\leq W$</td> <td>$\leq t$</td> </tr> </tbody> </table> <p>⊙ If the chipped area touches the ITO terminal, over 2/3 of</p> <ul style="list-style-type: none"> the ITO must remain and be inspected according to electrode terminal specifications. <p>8.2.3 Glass remain :</p>  <table border="1" data-bbox="542 1765 1236 1892"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq a$</td> <td>$\leq 1/3 W$</td> <td>$\leq t$</td> </tr> </tbody> </table> | 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 Less Than 3.5" :

(Ver.B01)

| <u>NO</u> | <u>Item</u> | <u>Criterion</u> | <u>Level</u> |
|-----------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 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 the same as on the production characteristic chart .There should 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 $+80 \pm 2^{\circ}\text{C}$ 240 hrs Surrounding temperature, then storage at normal condition 4hrs. | | | | | | | | | | | |
| 2 | Low Temperature Storage Test | Keep in $-30 \pm 2^{\circ}\text{C}$ 240 hrs Surrounding temperature, then storage at normal condition 4hrs. | | | | | | | | | | | |
| 3 | High Temperature / High Humidity Storage Test | Keep in $+60^{\circ}\text{C}$ / 90% R.H duration for 240 hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer) | | | | | | | | | | | |
| 4 | Temperature Cycling Storage Test | $ \begin{array}{ccccccc} & -30^{\circ}\text{C} & \rightarrow & +25^{\circ}\text{C} & \rightarrow & +80^{\circ}\text{C} & \rightarrow & +25^{\circ}\text{C} \\ & (30\text{mins}) & & (5\text{mins}) & & (30\text{mins}) & & (5\text{mins}) \\ & \longleftarrow & & & & & & \longrightarrow \\ & & & & & & & 20 \text{ Cycle} \end{array} $ Surrounding temperature, then storage at normal condition 4hrs. | | | | | | | | | | | |
| 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 +/- | | | | | | | | | | |
| | | <ol style="list-style-type: none"> Temperature ambience : $15^{\circ}\text{C} \sim 35^{\circ}\text{C}$ Humidity relative : 30%~60% Energy Storage Capacitance(C_s+C_d) : $150\text{pF} \pm 10\%$ Discharge Resistance(R_d) : $330\Omega \pm 10\%$ Discharge, mode of operation : Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : $\pm 5\%$) | | | | | | | | | | | |
| 6 | Vibration Test (Packaged) | <ol style="list-style-type: none"> Sine wave 10 ~ 55 Hz frequency (1 min/sweep) The amplitude of vibration : 1.5 mm Each direction (X、Y、Z) duration for 2 Hrs | | | | | | | | | | | |
| 7 | Drop Test (Packaged) | <table border="1"> <thead> <tr> <th>Packing Weight (Kg)</th> <th>Drop Height (cm)</th> </tr> </thead> <tbody> <tr> <td>0 ~ 45.4</td> <td>122</td> </tr> <tr> <td>45.4 ~ 90.8</td> <td>76</td> </tr> <tr> <td>90.8 ~ 454</td> <td>61</td> </tr> <tr> <td>Over 454</td> <td>46</td> </tr> </tbody> </table> | | Packing Weight (Kg) | Drop Height (cm) | 0 ~ 45.4 | 122 | 45.4 ~ 90.8 | 76 | 90.8 ~ 454 | 61 | Over 454 | 46 |
| | | 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 | | | | | | | | | | | |

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
- 5.2.10 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.

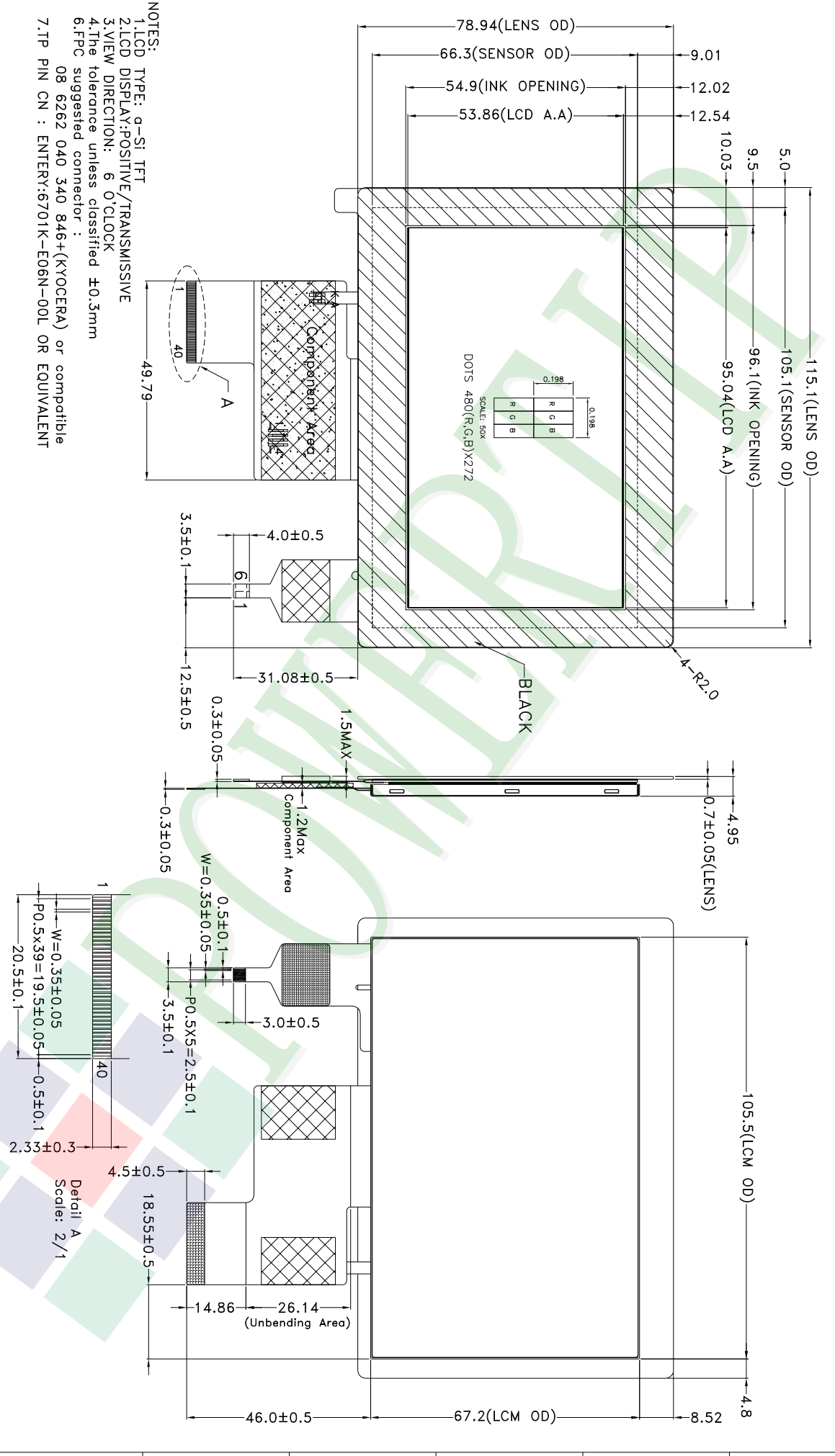
5.3 STORAGE

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

A B C D E F G H



NOTES:

- LCD TYPE: a-Si TFT
- LCD DISPLAY: POSITIVE / TRANSMISSIVE
- VIEW DIRECTION: 6 O'CLOCK
- The tolerance unless classified ±0.3mm
- FPC suggested connector:
- 08 6262 040 340 846+ (KYOCERA) or compatible
- 7.TP PIN CN: ENTERY: 6701K-E06N-00L OR EQUIVALENT

| | | | | | | | | | | | | |
|-----|-------------|---------|--------------------|--------------------|---------|---------|------------------------------------------------|-----------|----------|--|--|--|
| 007 | | | PH4802721005-IAC12 | PH4802721005-IAC12 | Design | Sally | 久正光電股份有限公司 POWER TIP TECHNOLOGY CORPORATION | | | | | |
| 006 | | | | | Check | Air | | | | | | |
| 005 | | | | | Approve | Liu jin | | | | | | |
| 004 | | | | | | | | | | | | |
| 003 | | | | | | | | | | | | |
| 002 | | | | | | | | | | | | |
| 001 | NEW DRAWING | Sally | 2017/1/1/27 | LCD Module Drawing | Approve | | | | | | | |
| REV | REV BY | REVISER | DATE | TITLE | Check | Surface | Material | Thickness | Quantity | | | |

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

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