



US Micro Products
Electronic Products for the OEM

TFT-LCD PRODUCT SPECIFICATION

| | |
|---------------------|--|
| PART NUMBER: | USMP-TT020TR-01B |
| DESCRIPTION: | 2.0" TFT LCD with 176 x 220 resolution, 8-bit interface for 80 system interface, and LED backlight. |

| ISSUE DATE | APPROVED BY (Customer Use Only) | CHECKED BY | PREPARED BY |
|------------------------------|---|------------|-------------|
| | | | |
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History of Version

| Date | Ver. | Edi. | Description | Page | Design by |
|------------|------|------|-------------------|------|---------------|
| 11/19/2008 | 01 | 001 | New Drawing | - | Binbin |
| 12/24/2008 | 01 | 002 | New sample | - | Binbin |
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1. SPECIFICATIONS

1.1 Features

Main LCD Panel

| Item | Standard Value |
|---------------------|--------------------------------------|
| Display Type | 176(R · G · B) *220 Dots |
| LCD Type | Active matrix TFT, Transmissive type |
| Screen size(inch) | 2.0 inch |
| Viewing Direction | 12 O'clock |
| Color configuration | R. G. B. vertical stripe |
| Backlight | LED B/L |
| Interface | 8-bit interface for 80 system |
| Driver IC | HX8340-B (Support 65K,262K Colors) |

1.2 Mechanical Specifications

| Item | Standard Value | Unit |
|-------------------|---------------------------------|------|
| Outline Dimension | 38.4 (W) * 51.4(L) * 2.4max (H) | mm |

TFT LCD panel

| Item | Standard Value | Unit |
|--------------|---------------------|------|
| Viewing Area | 32.68(W) * 40.6 (L) | mm |
| Active Area | 31.68(W) * 39.6 (L) | mm |

Note : For detailed information please refer to LCM drawing

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1.3 Absolute Maximum Ratings

Module

| Item | Symbol | Condition | Min. | Max. | Unit |
|-----------------------------|----------|------------|-------|---------|------|
| System Power Supply Voltage | VDD | - | -0.3 | 3.6 | V |
| | VGH | VDD=2.8V | 10 | 15.3 | |
| | VGL | VDD=2.8V | -13.5 | -7.5 | |
| | VGH- VGL | VDD=2.8V | 17.5 | 28.8 | |
| Input Voltage | VIN | - | -0.3 | VDD+0.5 | V |
| Operating Temperature | TOP | - | -20 | 70 | °C |
| Storage Temperature | TST | - | -30 | 80 | °C |
| Storage Humidity | HD | Ta < 60 °C | - | 90 | %RH |

1.4 DC Electrical Characteristics

Module

GND = 0V, Ta = 25°C

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------|-----------------|----------------------------------|---------|------|---------|------|
| Power Supply Voltage | VDD | - | 2.6 | 2.8 | 3.0 | V |
| Input High Voltage | V _{IH} | - | 0.7*VDD | - | VDD | V |
| Input Low Voltage | V _{IL} | - | GND | - | 0.3*VDD | V |
| Output High Voltage | V _{OH} | IOH = -1.0 mA | 0.8*VDD | - | VDD | V |
| Output Low Voltage | V _{OL} | IOL = +1.0 mA | GND | - | 0.2*VDD | V |
| Supply Current | IDD | VDD = 2.8 V Pattern= black *1 | - | 4 | 6 | mA |

Note *1: Maximum current display

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1.5 Optical Characteristics

TFT LCD Panel

VDD =2.8V, Ta=25°C

| Item | Symbol | Condition | Min. | Typ. | Max. | unit | | |
|--|---------|--------------------------|---------------------------|------|------|-------------------|-------|-------|
| Response time | Tr + Tf | Ta = 25°C θX, θY = 0° | - | 34 | 51 | ms | Note2 | |
| Viewing angle | Top | θY+ | CR ≥ 10 | - | 50 | - | Deg. | Note4 |
| | Bottom | θY- | | - | 25 | - | | |
| | Left | θX- | | - | 40 | - | | |
| | Right | θX+ | | - | 40 | - | | |
| Contrast ratio | CR | | 150 | 200 | - | - | Note3 | |
| Color of CIE Coordinate (With B/L and TP) | White | X | Ta = 25°C θX , θY = 0° | 0.22 | 0.27 | 0.32 | - | Note1 |
| | | Y | | 0.27 | 0.32 | 0.37 | | |
| | Red | X | | 0.59 | 0.64 | 0.69 | | |
| | | Y | | 0.29 | 0.34 | 0.39 | | |
| | Green | X | | 0.27 | 0.32 | 0.37 | | |
| | | Y | | 0.57 | 0.62 | 0.67 | | |
| | Blue | X | | 0.09 | 0.14 | 0.19 | | |
| | | Y | | 0.04 | 0.09 | 0.14 | | |
| Average Brightness Pattern= white (With B/L) | IV | IF= 60mA | 140 | 160 | - | cd/m ² | Note1 | |
| Uniformity (With B/L) | △B | IF= 60mA | 80 | - | - | % | Note1 | |

Note1:

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

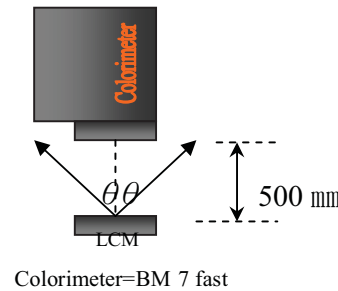
2 : Measurement Condition for Optical Characteristics:

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%

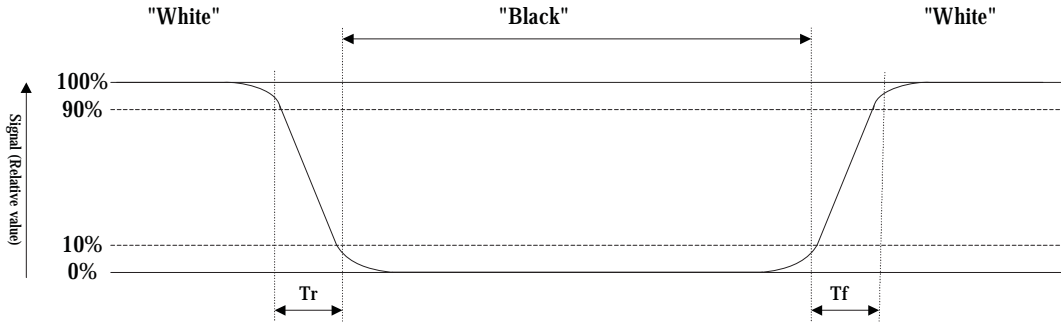


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Note2: Definition of response time:

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:



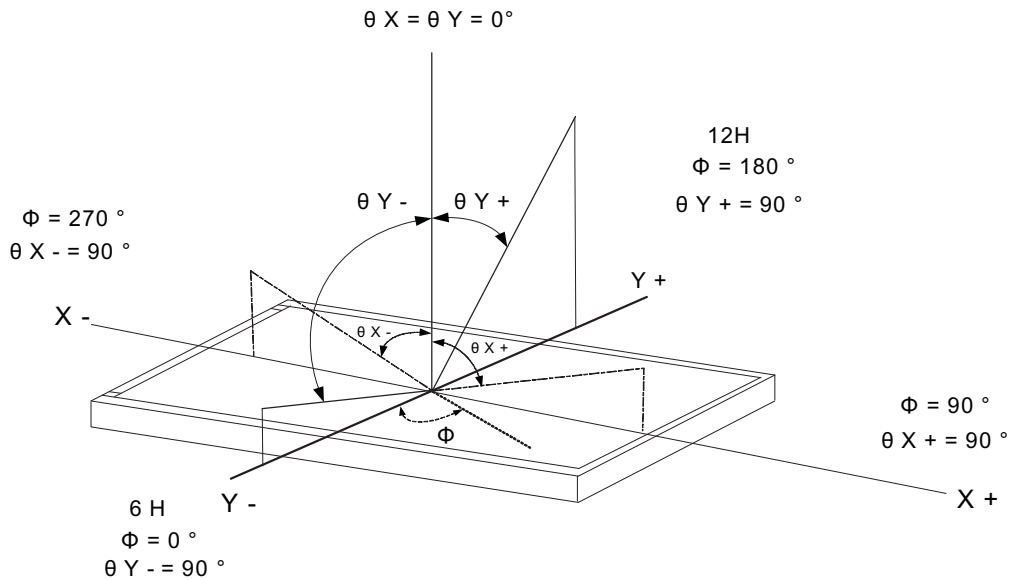
Note3: Definition of contrast ratio:

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:



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1.6 Backlight & LED Characteristics

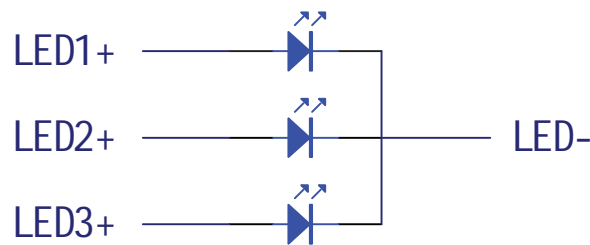
LCD Module with LED Backlight

Maximum Ratings

| Item | Symbol | Conditions | Min. | Max. | Unit |
|-------------------|--------|------------|------|------|------|
| Forward Voltage | VF | Ta =25°C | - | 4 | V |
| Forward Current | IF | Ta =25°C | - | 90 | mA |
| Reverse Voltage | VR | Ta =25°C | - | 5 | V |
| Reverse Current | IR | Ta =25°C | - | 0.15 | mA |
| Power Dissipation | PD | Ta =25°C | - | 360 | mW |

Electrical / Optical Characteristics

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--|--------|------------|------|------|------|-------------------|
| Forward Voltage | VF | IF= 60mA | - | 3.3 | - | V |
| Average Brightness (without LCD) | IV | | 2800 | 3200 | - | cd/m ² |
| Color of CIE Coordinate (without LCD) | X | | - | 0.28 | - | - |
| | Y | | - | 0.28 | - | |
| Color | White | | | | | |



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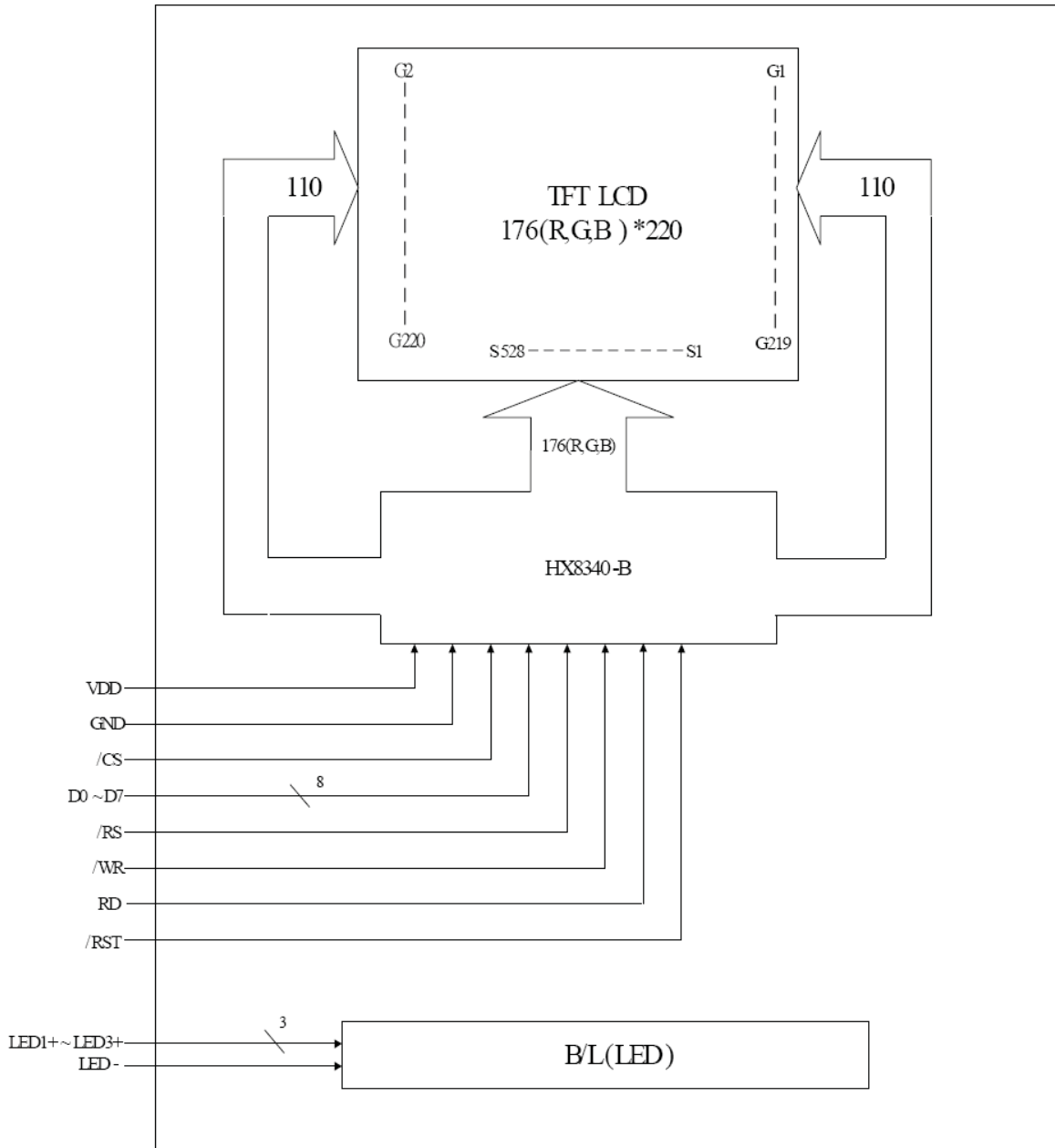
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



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2.2 Interface Pin Description

| Pin NO | Symbol | Function |
|--------|--------|---|
| 1 | GND | Signal ground. |
| 2 | X+ | NC. |
| 3 | Y+ | NC. |
| 4 | X- | NC. |
| 5 | Y- | NC. |
| 6 | GND | Signal ground. |
| 7 | VDD | Power supply 2.8V. |
| 8 | /CS | Chip select signal. Low: chip can be accessed. High: chip cannot be accessed. |
| 9 | /RS | The signal for register index or register command select. Low: Register index or internal status (in read operation); High: Register command. |
| 10 | /WR | Serves as a write signal and writes data at the rising edge in i80 system interface. |
| 11 | RD | Low: Write ; High: Read Serves as a read signal and reads data at the low level in i80 system interface |
| 12 | D0 | Data bus bit 0 |
| 13 | D1 | Data bus bit 1 |
| 14 | D2 | Data bus bit 2 |
| 15 | D3 | Data bus bit 3 |
| 16 | D4 | Data bus bit 4 |
| 17 | D5 | Data bus bit 5 |
| 18 | D6 | Data bus bit 6 |
| 19 | D7 | Data bus bit 7 |
| 20 | /RST | Reset pin. Setting either pin low initializes the LSI. Must be reset after power is supplied. |
| 21 | GND | Signal ground |

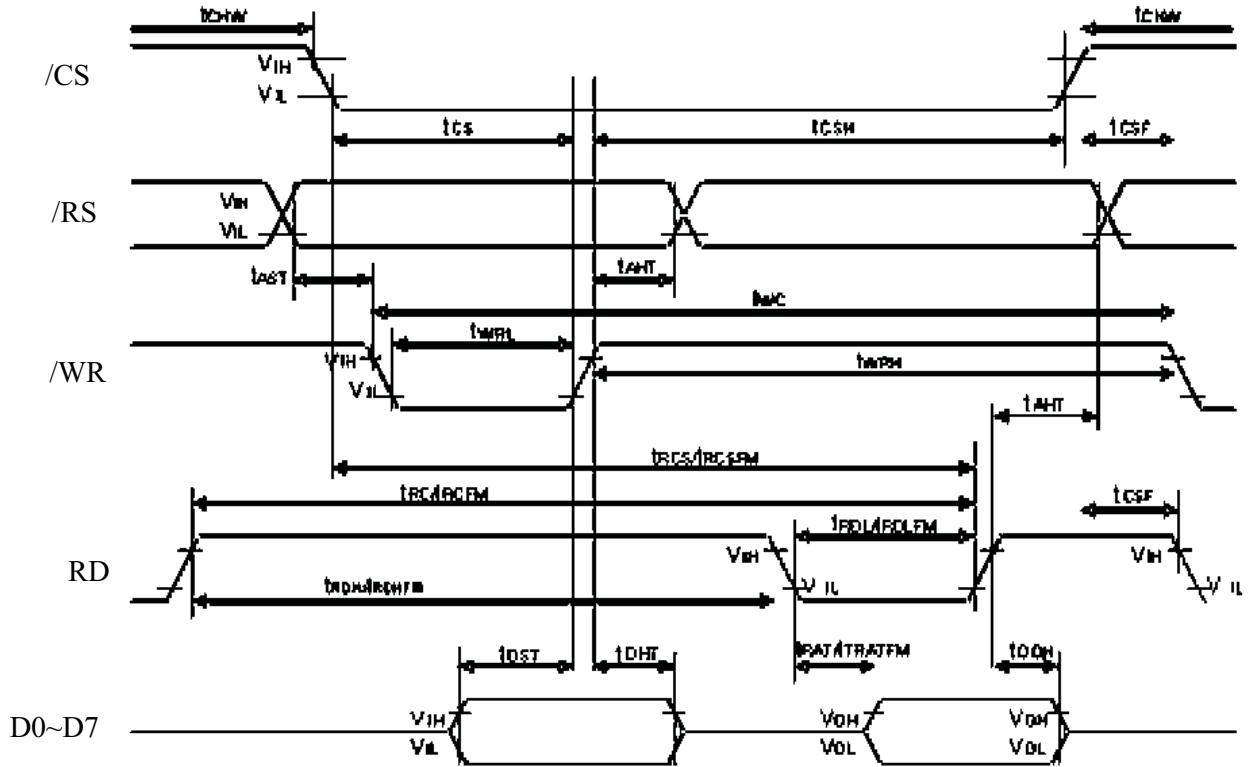
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| Pin NO | Symbol | Function |
|--------|--------|----------------------------------|
| 22 | LED1+ | Backlight LED1 anode input pin. |
| 23 | LED2+ | Backlight LED2 anode input pin. |
| 24 | LED3+ | Backlight LED3 anode input pin. |
| 25 | LED- | Backlight LED cathode input pin. |

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2.3 Timing Characteristics

i80-System Interface Timing Characteristics

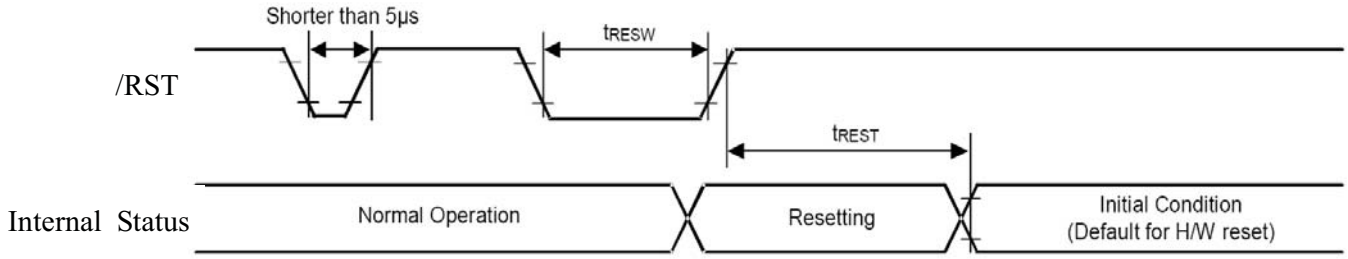


VDD=2.8V, Ta=25°C

| Signal | Symbol | Parameter | Min. | Max. | Unit | Description |
|--------|--------|------------------------------------|------|------|------|-----------------------------|
| /RS | tAST | Address setup time | 0 | - | ns | - |
| | tAHT | Address hold time (Write/Read) | 10 | - | ns | - |
| /CS | tCHW | Chip select "H" pulse width | 0 | - | - | - |
| | tCS | Chip select setup time (Write) | 15 | - | - | - |
| | tRCS | Chip select setup time (Read ID) | 45 | - | ns | - |
| | tRCSFM | Chip select setup time (Read FM) | 355 | - | - | - |
| | tCSF | Chip select wait time (Write/Read) | 10 | - | - | - |
| | tCSH | Chip select hold time | 10 | - | - | - |
| /WR | tWC | Write cycle | 66 | - | - | - |
| | tWRH | Control pulse "H" duration | 15 | - | ns | - |
| | tWRL | Control pulse "L" duration | 15 | - | - | - |
| RD(ID) | tRC | Read cycle (ID) | 160 | - | - | - |
| | tRCH | Control pulse "H" duration (ID) | 90 | - | ns | When read ID data |
| | tRDL | Control pulse "L" duration (ID) | 45 | - | - | - |
| RD(FM) | tRCFM | Read cycle (FM) | 450 | - | - | - |
| | tRDHFM | Control pulse "H" duration (FM) | 90 | - | ns | When read from frame memory |
| | tRDLFM | Control pulse "L" duration (FM) | 355 | - | - | - |
| D0~D7 | tDST | Data setup time | 10 | - | - | - |
| | tDHT | Data hold time | 10 | - | - | - |
| | tRAT | Read access time (ID) | - | 40 | ns | For maximum CL=30pF |
| | tRATFM | Read access time (FM) | - | 340 | - | For minimum CL=8pF |
| | tODH | Output disable time | 20 | 80 | - | - |

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Reset Timing Characteristics



VDD=2.8V, Ta=25°C

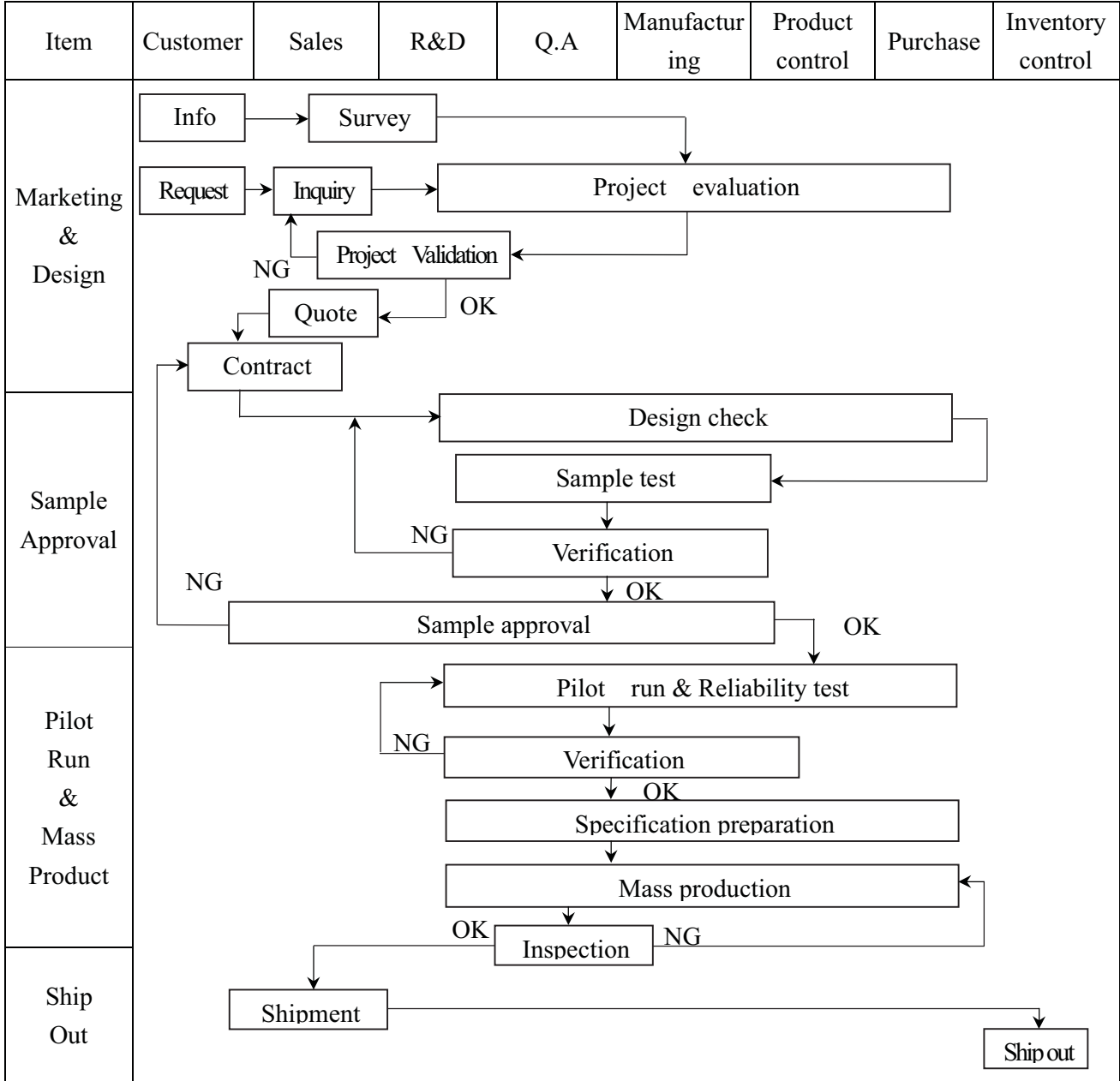
| Symbol | Parameter | Related Pins | Min. | Typ. | Max. | Note | Units |
|-------------------|-----------------------|-------------------------|------|------|------|--|---------------|
| t_{RESW} | Reset low pulse width | $\overline{\text{RST}}$ | 10 | - | - | - | μs |
| t_{REST} | Reset complete time | - | - | - | 5 | When reset applied during Sleep In mode | ms |
| | | - | - | - | 120 | When reset applied during Sleep Out mode | ms |

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3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart

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| Item | Customer | Sales | R&D | Q.A | Manufacturing | Product control | Purchase | Inventory control |
|---------------|--|-------|-----|-----|---|-----------------|----------|-------------------|
| Sales Service | <pre> graph TD Info[Info] --> Claim[Claim] Claim --> FA[Failure analysis] Claim --> AR[Analysis report] FA --> CA[Corrective action] CA --> 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 | | | |

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3.2. Inspection Specification

◆ Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II .

◆ Equipment : Gauge 、 MIL-STD 、 Sample

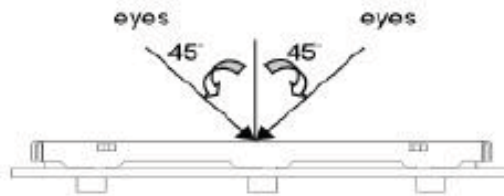
◆ Defect Level : Major Defect AQL : 0.65 ; Minor Defect AQL : 1.5

◆ OUT Going Defect Level : Sampling.

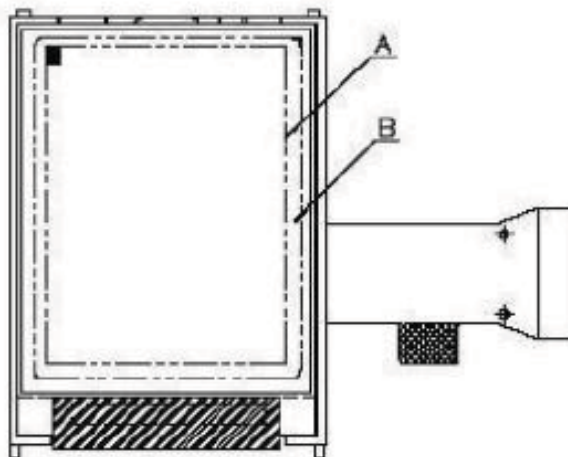
◆ Standard of the product appearance test :

a. Manner of appearance test :

- (1). The test best be under 20W×2 fluorescent light , and distance of view must be at 30 cm.
- (2). The test direction is base on about around 45° of vertical line.



(3). Definition of area.



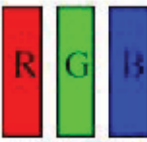

A area : Active Area

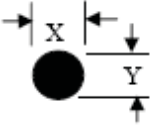
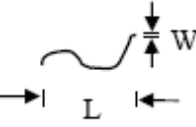
B area : Outside of Active Area

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

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| 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 | The quantity is inconsistent with work order of production. | Major | | | | | | | | | | | |
| 03 | Outline dimension | 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 | | | | | | | | | | | |
| 05 | Dot defect (Bright dot , Dark dot) On -display | <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Item</th> <th>Acceptance (Q'ty)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Dot Defect (Sub Pixel)</td> <td>Bright Dot</td> <td>≤ 3</td> </tr> <tr> <td>Joint Dot</td> <td>≤ 2</td> </tr> <tr> <td>Pixel Defect</td> <td>Bright Dot</td> <td>≤ 1</td> </tr> </tbody> </table> | Item | | Acceptance (Q'ty) | Dot Defect (Sub Pixel) | Bright Dot | ≤ 3 | Joint Dot | ≤ 2 | Pixel Defect | Bright Dot | ≤ 1 | Minor |
| | | Item | | Acceptance (Q'ty) | | | | | | | | | | |
| Dot Defect (Sub Pixel) | Bright Dot | ≤ 3 | | | | | | | | | | | | |
| | Joint Dot | ≤ 2 | | | | | | | | | | | | |
| Pixel Defect | Bright Dot | ≤ 1 | | | | | | | | | | | | |
| 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. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Sub Pixel (alone R orG orB)</p> </div> <div style="text-align: center;">  <p>Pixel (R+G+B)</p> </div> </div> | | | | | | | | | | | | | | |

| NO | Item | Criterion | Level | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|---|--|-----------------------------------|-------------------|-------------------|--------|------------|------------------|---------------|--------|-------------------------|---------------|---------------|-------------------------|------------|----------------------|---------------|---|------------|-----------------------------------|-------------------|--|--------|-----------|----------------------|---------------|-----------|-----------------------|-------------------|--|-----------------------|-----------|--------|--------------|-----|---------------|---------------|--|------------|----------------------|---|--|------------|---------------------|---|--|--|-----------|----------------------|--|-------|
| 06 | <p>Round type</p>  <p>$\Phi = (x+y) / 2$</p> | <p>6.1 Clear Spots :</p> <table border="1"> <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">3</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.30$</td> <td colspan="2">3</td> </tr> <tr> <td>$\Phi > 0.30$</td> <td colspan="2">0</td> </tr> </tbody> </table> <p>6.2 Dim Spots :</p> <table border="1"> <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>$\Phi \leq 0.2$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.4$</td> <td colspan="2">3</td> </tr> <tr> <td>$0.4 < \Phi \leq 0.6$</td> <td colspan="2">1</td> </tr> <tr> <td>$\Phi > 0.6$</td> <td colspan="2">0</td> </tr> </tbody> </table> <p>※Ignore 6.2 that can be removed.</p> | Dimension (diameter : Φ) | Acceptance (Q'ty) | | A area | B area | $\Phi \leq 0.15$ | Ignore | | $0.15 < \Phi \leq 0.20$ | 3 | | $0.20 < \Phi \leq 0.30$ | 3 | | $\Phi > 0.30$ | 0 | | Dimension (diameter : Φ) | Acceptance (Q'ty) | | A area | B area | $\Phi \leq 0.2$ | Ignore | | $0.2 < \Phi \leq 0.4$ | 3 | | $0.4 < \Phi \leq 0.6$ | 1 | | $\Phi > 0.6$ | 0 | | Minor | | | | | | | | | | | | | | |
| Dimension (diameter : Φ) | Acceptance (Q'ty) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | A area | B area | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\Phi \leq 0.15$ | Ignore | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.15 < \Phi \leq 0.20$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.20 < \Phi \leq 0.30$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\Phi > 0.30$ | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dimension (diameter : Φ) | Acceptance (Q'ty) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | A area | B area | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\Phi \leq 0.2$ | Ignore | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.2 < \Phi \leq 0.4$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.4 < \Phi \leq 0.6$ | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\Phi > 0.6$ | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07 | <p>Line type</p>  <p>$\Phi = (x+y) / 2$</p> | <p>7.1 Line :</p> <table border="1"> <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>$L \leq 5$</td> <td>$0.03 < W \leq 0.05$</td> <td colspan="2">4</td> </tr> <tr> <td>$L \leq 5$</td> <td>$0.05 < W \leq 0.1$</td> <td colspan="2">3</td> </tr> <tr> <td></td> <td>$W > 0.1$</td> <td colspan="2">As round type</td> </tr> </tbody> </table> <p>7.2 Scratch :</p> <table border="1"> <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>$L \leq 5$</td> <td>$0.03 < W \leq 0.05$</td> <td colspan="2">4</td> </tr> <tr> <td>$L \leq 5$</td> <td>$0.05 < W \leq 0.1$</td> <td colspan="2">3</td> </tr> <tr> <td></td> <td>$W > 0.1$</td> <td colspan="2">As round type</td> </tr> </tbody> </table> <p>※Ignore 7.1 that can be removed.</p> | Dimension | | Acceptance (Q'ty) | | Length (L) | Width (W) | A area | B area | --- | $W \leq 0.03$ | Ignore | | $L \leq 5$ | $0.03 < W \leq 0.05$ | 4 | | $L \leq 5$ | $0.05 < W \leq 0.1$ | 3 | | | $W > 0.1$ | As round type | | Dimension | | Acceptance (Q'ty) | | Length (L) | Width (W) | A area | B area | --- | $W \leq 0.03$ | Ignore | | $L \leq 5$ | $0.03 < W \leq 0.05$ | 4 | | $L \leq 5$ | $0.05 < W \leq 0.1$ | 3 | | | $W > 0.1$ | As round type | | Minor |
| Dimension | | Acceptance (Q'ty) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Length (L) | Width (W) | A area | B area | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | $W \leq 0.03$ | Ignore | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 5$ | $0.03 < W \leq 0.05$ | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 5$ | $0.05 < W \leq 0.1$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | $W > 0.1$ | As round type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dimension | | Acceptance (Q'ty) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Length (L) | Width (W) | A area | B area | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | $W \leq 0.03$ | Ignore | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 5$ | $0.03 < W \leq 0.05$ | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 5$ | $0.05 < W \leq 0.1$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | $W > 0.1$ | As round type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| NO | Item | Criterion | Level | | | | | | | | | | | | | | | | | |
|---|--------------------|---|-----------------------------------|-------------------|--|--------|--------|-----------------|--------|--|-----------------------|---|--|-----------------------|---|--|--------------|---|--|-------|
| 08 | Bubble / Dent | <table border="1"> <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>$\Phi \leq 0.2$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.4$</td> <td colspan="2">3</td> </tr> <tr> <td>$0.4 < \Phi \leq 0.5$</td> <td colspan="2">1</td> </tr> <tr> <td>$\Phi > 0.5$</td> <td colspan="2">0</td> </tr> </tbody> </table> | Dimension (diameter : Φ) | Acceptance (Q'ty) | | A area | B area | $\Phi \leq 0.2$ | Ignore | | $0.2 < \Phi \leq 0.4$ | 3 | | $0.4 < \Phi \leq 0.5$ | 1 | | $\Phi > 0.5$ | 0 | | Minor |
| | | Dimension (diameter : Φ) | | Acceptance (Q'ty) | | | | | | | | | | | | | | | | |
| | | | A area | B area | | | | | | | | | | | | | | | | |
| | | $\Phi \leq 0.2$ | Ignore | | | | | | | | | | | | | | | | | |
| | | $0.2 < \Phi \leq 0.4$ | 3 | | | | | | | | | | | | | | | | | |
| $0.4 < \Phi \leq 0.5$ | 1 | | | | | | | | | | | | | | | | | | | |
| $\Phi > 0.5$ | 0 | | | | | | | | | | | | | | | | | | | |
| 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 | Newton's ring | N: Area of Newton's ring VA: LCM View Area $N \leq 1/2 * VA$ | Minor | | | | | | | | | | | | | | | | | |
| 11 | General appearance | 11. 1 Pin type 、 quantity 、 dimension must match type in structure diagram. | Major | | | | | | | | | | | | | | | | | |
| | | 11. 2 No short circuits in components on PCB or FPC . | Major | | | | | | | | | | | | | | | | | |
| | | 11. 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 | | | | | | | | | | | | | | | | | |
| | | 11. 4 Product packaging must the same as specified on packaging specification sheet. | Minor | | | | | | | | | | | | | | | | | |
| | | 11. 5 The folding and peeled off in polarizer are not acceptable. | Minor | | | | | | | | | | | | | | | | | |
| | | 11. 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

| NO. | TEST ITEM | TEST CONDITION | | Judgment Standard | | | | | | | |
|---------------------------------------|---|--|---|-------------------|--------------------|------------------|-----------------------|-----|---------------------------------------|----|---------------------|
| 1 | High Temperature Storage Test | Keep in $+80 \pm 2^\circ\text{C}$ 96 hrs, Humidity: Except , Surrounding temperature, then storage at normal condition 4hrs. | | Note1 | | | | | | | |
| 2 | Low Temperature Storage Test | Keep in $-30 \pm 2^\circ\text{C}$ 96 hrs, Humidity: Except , 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 96 hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer) | | | | | | | | | |
| 4 | Temperature Cycling Storage Test | $ \begin{array}{ccccccc} & -20^\circ\text{C} & \rightarrow & +25^\circ\text{C} & \rightarrow & +70^\circ\text{C} & \rightarrow & +25^\circ\text{C} \\ & (30\text{mins}) & & (5\text{mins}) & & (30\text{mins}) & & (5\text{mins}) \\ & \leftarrow & & \xrightarrow{\hspace{4em}} & & \leftarrow & & \xrightarrow{\hspace{4em}} \\ & & & \text{10 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 250V with 5 times discharge for each polarity +/- | Note2 | | | | | | | |
| | | 1. Temperature ambience: $15^\circ\text{C} \sim 35^\circ\text{C}$ 2. Humidity relative: $30\% \sim 60\%$ 3. Energy Storage Capacitance(Cs+Cd): $150\text{pF} \pm 10\%$ 4. Discharge Resistance(Rd): $330\Omega \pm 10\%$ 5. Discharge, mode of operation: Single Discharge (time between successive discharges at least 1 s) (Tolerance if the output voltage indication: $\pm 5\%$) | | | | | | | | | |
| 6 | Vibration Test (Packaged) | 1. Sine wave 10~55 Hz frequency (1 min) 2. The amplitude of vibration : 1.5 mm 3. Each direction (X、Y、Z) duration for 2 Hrs | | Note3 | | | | | | | |
| 7 | Drop Test (Packaged) | <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Package Weight (W)</th> <th>Drop Height (cm)</th> </tr> </thead> <tbody> <tr> <td>$W \leq 9 \text{ Kg}$</td> <td>100</td> </tr> <tr> <td>$9 \text{ Kg} < W \leq 18 \text{ Kg}$</td> <td>80</td> </tr> <tr> <td>$W > 18 \text{ Kg}$</td> <td>60</td> </tr> </tbody> </table> Drop direction :※ 1 corner / 3 edges / 6 sides each 1times | | | Package Weight (W) | Drop Height (cm) | $W \leq 9 \text{ Kg}$ | 100 | $9 \text{ Kg} < W \leq 18 \text{ Kg}$ | 80 | $W > 18 \text{ Kg}$ |
| Package Weight (W) | Drop Height (cm) | | | | | | | | | | |
| $W \leq 9 \text{ Kg}$ | 100 | | | | | | | | | | |
| $9 \text{ Kg} < W \leq 18 \text{ Kg}$ | 80 | | | | | | | | | | |
| $W > 18 \text{ Kg}$ | 60 | | | | | | | | | | |

※Note1 : a.No LC air bubble & leakage.

b.No display function related objection contrast before test.

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※Note2 : No error of operational function after rebooting.

※Note3 : The inspection of appearance、 the whole structure no error.

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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

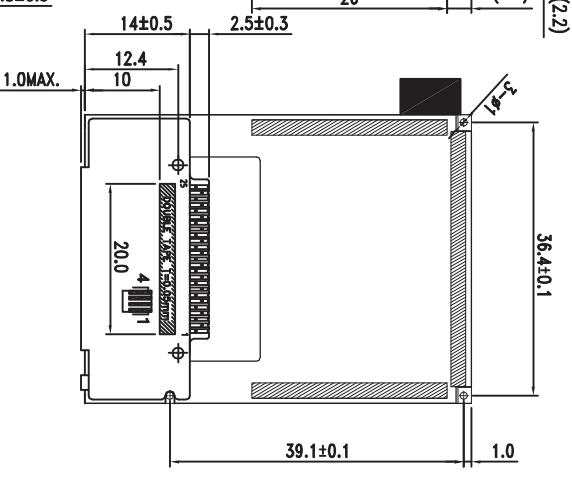
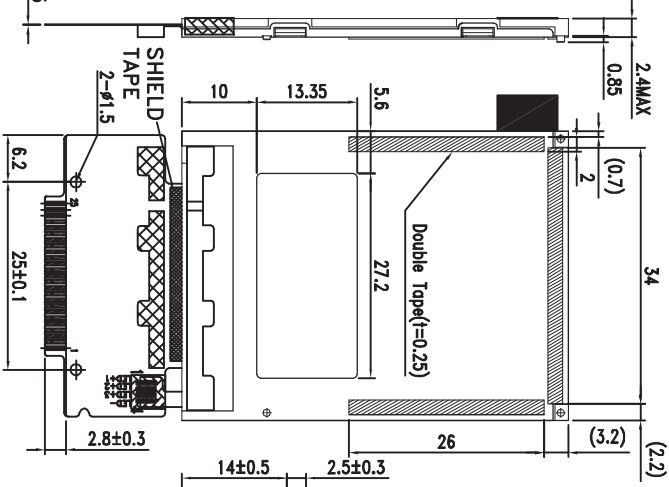
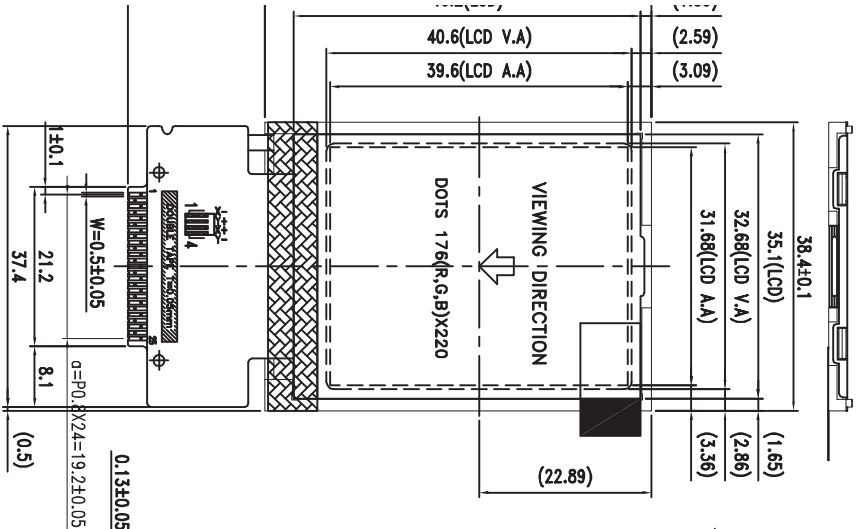
5.3 STORAGE

- 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.

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- NOTES:
- 1.DISPLAY TYPE: 65K COLOR TFT-LCD TRANSMISSIVE,NORMAL WHITE
 - 2.DRIVER IC: HX8340B
 - 3.THE TOLERANCE UNLESS CLASSIFIED ±0.2mm
 - 4.OPERATING TEMP: -20°c~70°c
 - 5.BACKLIGHT: LUMINANCE>=2800cd/m2 UNIFORMITY>=80%

| | | | |
|----|-----|----|----|
| NO | PIN | 1 | G |
| 2 | G | 3 | G |
| 4 | G | 5 | G |
| 6 | G | 7 | V |
| 8 | G | 9 | L |
| 10 | L | 11 | L |
| 12 | L | 13 | L |
| 14 | L | 15 | L |
| 16 | L | 17 | L |
| 18 | L | 19 | L |
| 20 | L | 21 | L |
| 22 | LE | 23 | LE |
| 24 | LE | 25 | LE |

| | |
|---------------|--------------------|
| PART NO. | USMP-TT020TR-01B |
| DRAWING NAME: | LCD MODULE DRAWING |
| REV BY | King |
| REVISER | King |
| DATE | 2008/11/19 |

| | | | |
|---------|-------|--|-----|
| DESIGN | King | UNIT | MM |
| CHECK | Eddy | SCALE | 1:1 |
| APPROVE | Jimmy | PAGE | 1/1 |
| | | Surface Material Thickness Quantity | |

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Open Frame Monitors



Passive LCDs



Multitouch



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Trackballs



Aerospace Trackballs



Joysticks



Printers

