

TFT-Display Datenblatt

Modell LB035Q03-TD02

Kurzdaten

| | |
|-------------|----------------------------|
| Hersteller | LG Display |
| Diagonale | 3,5" / 8,9cm |
| Format | 4:3 |
| Auflösung | 320x240 |
| Backlight | LED / 500cd/m ² |
| Interface | RGB |
| Touchscreen | nein |
| Temperatur | -30...+85°C (Betrieb) |

Product Specifications

**SPECIFICATION
FOR
APPROVAL**


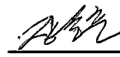

- () Preliminary Specification
(●) Final Specification

| | |
|--------------|--|
| Title | 3.5" qVGA (320 X RGB X 240) TFT - LCD |
|--------------|--|

| | |
|-------|--|
| BUYER | |
| MODEL | |

| | |
|----------|----------------------|
| SUPPLIER | LG Display Co., Ltd. |
| MODEL | LB035Q03 |
| SUFFIX | TD02 |

| SIGNATURE | DATE |
|-----------|-------|
| / | _____ |
| / | _____ |
| / | _____ |

| APPROVED BY | DATE |
|---|----------|
| J.D. KIM / G.Manager  | _____ |
| REVIEWED BY | 11.01.18 |
| D.H. JANG / S.Manager  | _____ |
| PREPARED BY | 11.01.18 |
| E.S. LEE / Engineer  | _____ |
| | 11.01.18 |

**Product Engineering Dept.
LG Display Co., Ltd**

Product Specifications**CONTENTS**

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Product Specifications

RECORD OF REVISIONS

| Revision No. | Revision Date | Page | Summary |
|--------------|---------------|---------|--|
| 0.0 | Sep. 2. 2010 | - | First Draft (Preliminary) |
| 0.1 | Nov. 3. 2010 | 5 | Delete the temperature condition row |
| | | 4, 7, 9 | Change the LED symbol - V _{LED} → Anode, FB → Cathode |
| | | 9 | Delete the temperature condition. (Ta=25 °C) Add LED derating curve |
| | | 14 | Correct the Notes 3 for explaining of optical measurement condition |
| | | 24 | Delete the phrase of corresponding to CCFL backlight (11-2. OPERATING PRECAUTIONS (2)) |
| 1.0 | Jan. 18. 2011 | 5 | Update the Absolute Maximum Rating - I _{RUSH} value |
| | | 8 | Update the Electrical Characteristics - I _{CC} Typ. & Max. value |
| | | 9 | Update the LED Electrical Characteristics - Change V _{LED} , P _{LED} Min. & Typ. & Max. Value - Change contents about Notes 1 & Notes 2 - Add Notes 3 & Notes 4 |
| | | 21 | Delete the phrase of 9-1. Safety |
| | | 23 | Change the Packing From - Packing Q'ty in one box: 54 pcs → 48 pcs |
| | | - | Final Specification |

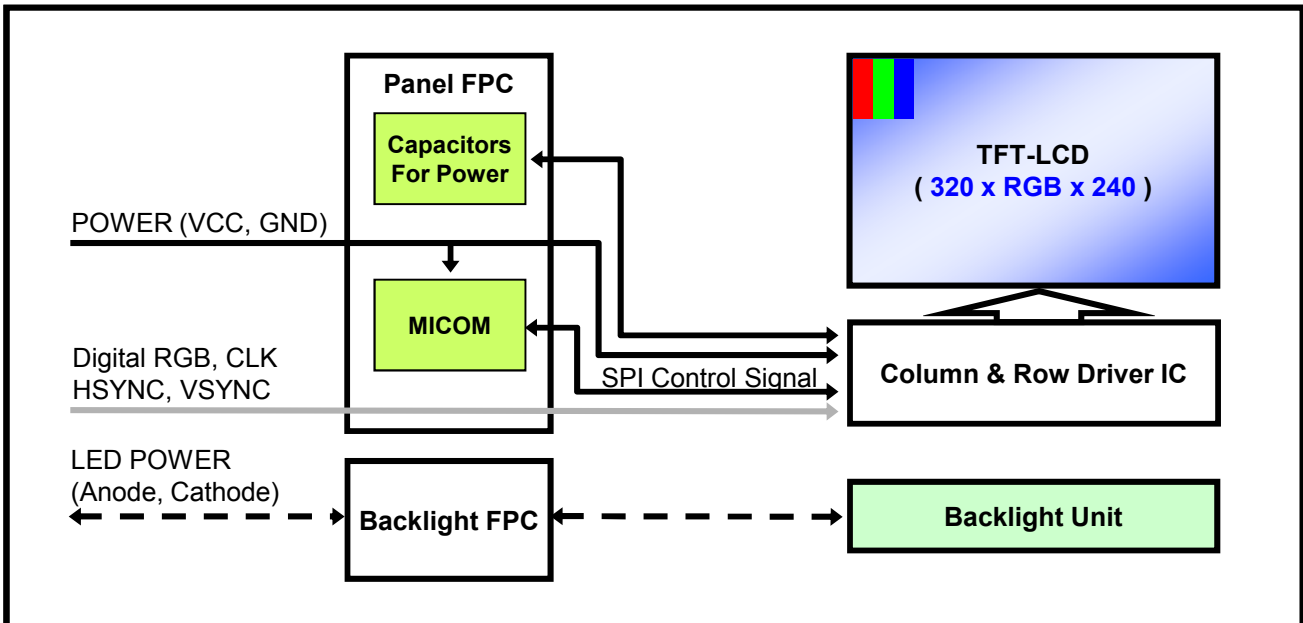
Product Specifications

1. Summary

This module utilizes amorphous silicon thin film transistors and a aspect ratio of 4:3. The 3.5" active matrix liquid crystal display allows 262,144 colors to be displayed by Digital RGB signal(18bit TTL level) input interface is available. The applications are display for cluster display for vehicle.

2. Features

- The 3.5" screen produces a high resolution image that is composed of 76,800 RGB pixel elements in a stripe arrangement.
- Technology of wide viewing angle is employed.
- By adopting an active matrix drive, high contrast picture or image is realized.
- By using of COG mounting technology, the module became thin, light and compact.



3. General Features

@T_a=25°C, Aging time: Over 10 minutes

| | |
|------------------------|--|
| Active Screen Size | 3.5 Inches Diagonal |
| Outline Dimension | 84mm (H) X 67mm (V) X 6.7mm (T) (Typ.) |
| Pixel Pitch | 0.219mm × 0.219mm |
| Pixel Format | 320(H) X 3(R,G,B) X 240(V), RGB Vertical Stripes |
| Color Depth | 6-bit, 262,144 Colors |
| Luminance, White | 500 cd/m ² (Min.) |
| Weight | 65g(Max.) |
| Display Operating Mode | TN mode, Normally White |
| Surface Treatment | Anti-Glare |
| Main Viewing Direction | 12 o'clock |

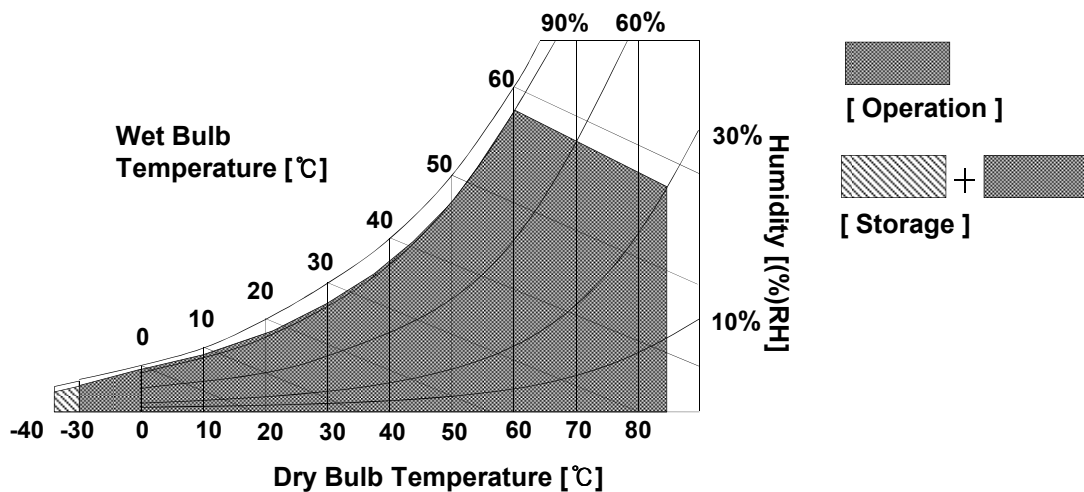
Product Specifications
4. Absolute Maximum Rating

The followings are maximum values which, if exceeded, may cause malfunction or damage to the Module.

| Parameter | Symbol | Min. | Max. | Unit | Notes |
|-----------------------|---|------|------|-------|-------|
| Logic Voltage | VCC | -0.3 | 3.6 | Vdc | |
| Inrush Current | I_{RUSH} | - | 1.5 | Apeak | 1 |
| Digital Input Signals | R0-R5 G0-G5 B0-B5 HSYNC VSYNC DCLK, DE | -0.3 | 3.6 | Vdc | |
| Storage Temperature | T_{ST} | -40 | 85 | °C | 2 |
| Operating Temperature | T_{OP} | -30 | 85 | °C | 2,3,4 |

Notes:

1. Measure condition: VCC=3.3V, VCC rising rate=150mV/μs
2. Maximum wet-bulb temperature is 58°C. Condensation of dew must be avoided, because it may cause electrical current leakage, and deterioration of performance and quality.
3. The operating temperature means that LCD Module guarantees operation of the circuit.
All the contents of Electro-optical specifications are guaranteed under the room temperature condition.
4. This temperature is ambient temperature with regard to the heat which is generated under operation of circuit and backlight on. (reference value)



Product Specifications

5. Electrical Specifications

5-1. FPC pin assignment

This LCD employs two interface connections, one FPC is used for the module electronics interface and the other FPC is used for the integral backlight system.

5-1-1. Panel FPC Pin Configuration

The matching connector model name is FH28-40S-0.5SH manufactured by HIROSE or equivalent.

| Pin | Symbol | I/O | Description | Notes |
|-----|--------|-----|-------------------------|-------|
| 1 | GND | I | Ground | |
| 2 | GND | I | Ground | |
| 3 | VCC | I | Power Supply For Logic | |
| 4 | VCC | I | Power Supply For Logic | |
| 5 | GND | I | Ground | |
| 6 | R0 | I | Red Data 0 [LSB] | |
| 7 | R1 | I | Red Data 1 | |
| 8 | R2 | I | Red Data 2 | |
| 9 | R3 | I | Red Data 3 | |
| 10 | R4 | I | Red Data 4 | |
| 11 | R5 | I | Red Data 5 [MSB] | |
| 12 | GND | I | Ground | |
| 13 | G0 | I | Green Data 0 [LSB] | |
| 14 | G1 | I | Green Data 1 | |
| 15 | G2 | I | Green Data 2 | |
| 16 | G3 | I | Green Data 3 | |
| 17 | G4 | I | Green Data 4 | |
| 18 | G5 | I | Green Data 5 [MSB] | |
| 19 | GND | I | Ground | |
| 20 | B0 | I | Blue Data 0 [LSB] | |
| 21 | B1 | I | Blue Data 1 | |
| 22 | B2 | I | Blue Data 2 | |
| 23 | B3 | I | Blue Data 3 | |
| 24 | B4 | I | Blue Data 4 | |
| 25 | B5 | I | Blue Data 5 [MSB] | |
| 26 | GND | I | Ground | |
| 27 | CLK | I | Digital RGB Pixel Clock | |
| 28 | GND | I | Ground | |
| 29 | N.C. | - | No Connection | |
| 30 | HSYNC | I | Horizontal Sync Signal | |
| 31 | VSYNC | I | Vertical Sync Signal | |
| 32 | DE | I | Digital RGB Data Enable | |
| 33 | GND | I | Ground | |
| 34 | N.C. | - | No Connection | |
| 35 | N.C. | - | No Connection | |
| 36 | GND | I | Ground | |
| 37 | N.C. | - | No Connection | |
| 38 | N.C. | - | No Connection | |
| 39 | GND | I | Ground | |
| 40 | GND | I | Ground | |

Product Specifications**5-1-2. Backlight FPC Pin Configuration**

The matching connector model name is FH12-5S-1SH manufactured by HIROSE or equivalent.

| Pin | Symbol | Description | Notes |
|------------|---------------|----------------------|--------------|
| 1 | Anode | Anode of LED chain | |
| 2 | Anode | Anode of LED chain | |
| 3 | N.C. | No Connection | |
| 4 | Cathode | Cathode of LED chain | |
| 5 | Cathode | Cathode of LED chain | |

Product Specifications
5-2. Electrical Characteristics

 @T_a=25°C, Aging time: Over 10 minutes

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|--------------------------|-----------------------------------|-----------|------|-----------|------|-------|
| Logic Supply Voltage | VCC | 3.15 | 3.3 | 3.45 | Vdc | |
| | I _{CC} | - | 20 | 30 | mA | 1 |
| Logic High Input Voltage | V _{IH} | 0.8 x VCC | - | VCC | V | 2 |
| Logic Low Input Voltage | V _{IL} | 0 | - | 0.2 x VCC | V | |
| Logic Input Current | I _{IH} / I _{IL} | -1 | - | 1 | uA | |

Notes:

1. Measure condition: VCC=3.3V, Black Patten
2. The recommended operating conditions show the ranges in which the device can operate normally. Operation beyond the limit of the recommended operation conditions is not assured, even though operating conditions are within the limit of the maximum ratings.

Product Specifications

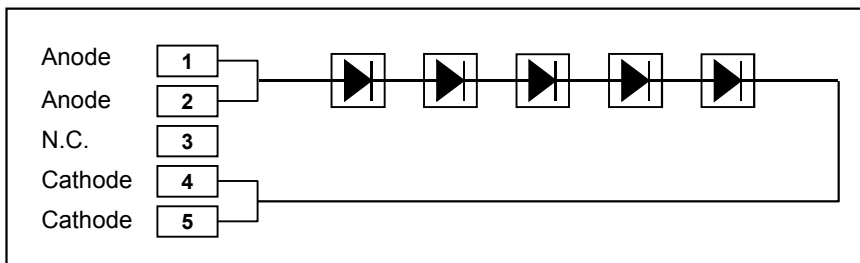
5-3. LED Electrical Characteristics

Ta: 25°C, Aging time: 10 minutes

| Parameter | Symbol | Values | | | Unit | Notes |
|-----------------------|-----------|--------|------|------|------|-------|
| | | Min. | Typ. | Max. | | |
| LED current per chain | I_{LED} | - | 40 | 45 | mA | 1, 3 |
| LED voltage | V_{LED} | 12.0 | 14.0 | 16.5 | V | 1, 4 |
| LED power | P_{LED} | - | 0.56 | 0.75 | W | |
| LED string | - | - | 1 | - | - | 2 |

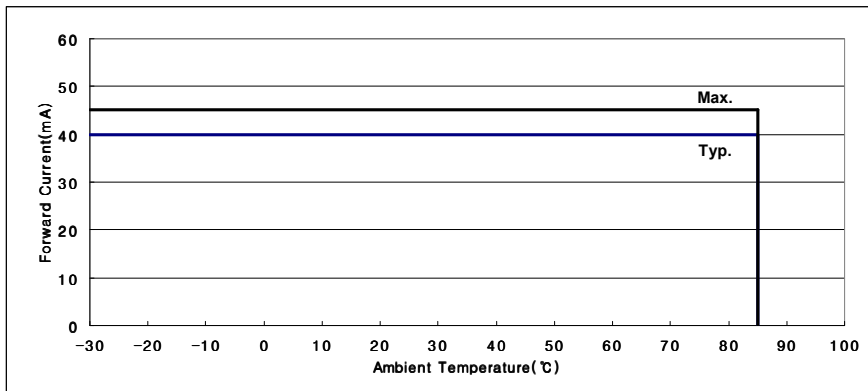
Notes 1. The value applies to one string.

Notes 2. LED string diagram.



Notes 3. LED derating curve.

LED should be turned off when Ambient temperature is over 85°C



Notes 4. LED forward voltage characteristics depend on temperature at typical LED current.

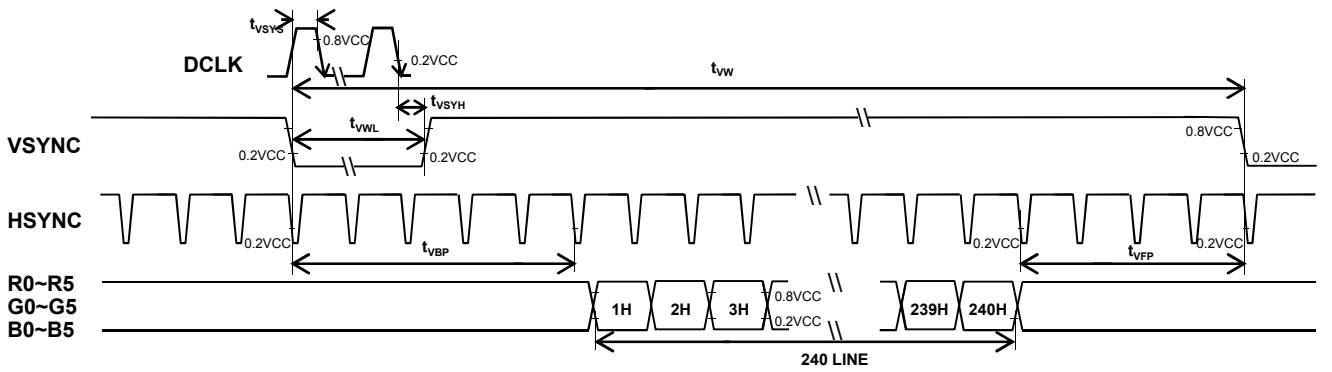
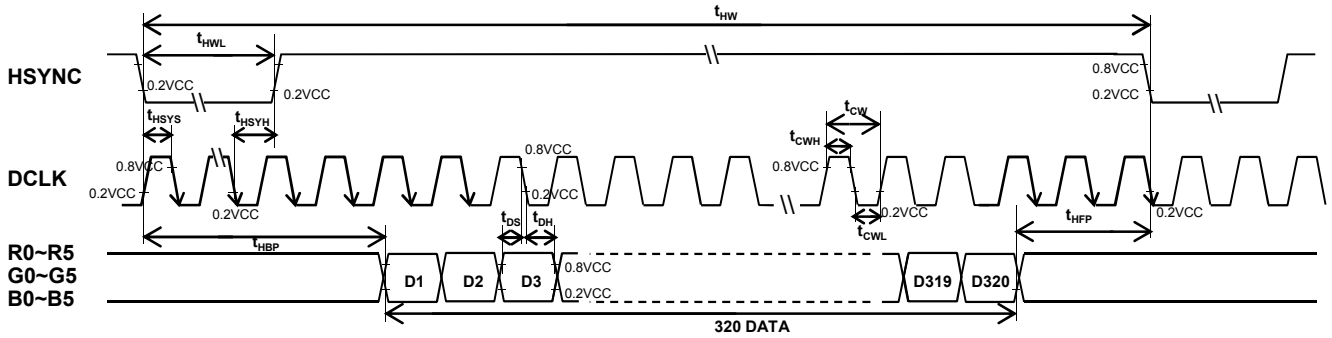
| Temp. | Min. | Typ. | Max. | Unit |
|-------|------|------|------|------|
| -30°C | 13.9 | 15.5 | 17.1 | V |
| +85°C | 11.7 | 13.0 | 14.3 | |

Product Specifications
5-4. Interface Timing Specification
5-4-1. Timing Characteristics of Driver IC input signals

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|------------------------|------------|------|------|------|----------|-----------------|
| DCLK Frequency | f_{DCLK} | 6.0 | 6.5 | 7.0 | MHz | Refer to 5-4-2. |
| DCLK Period | t_{CW} | 143 | 154 | 167 | ns | |
| DCLK High Period | t_{CWH} | 50 | - | - | ns | |
| DCLK Low Period | t_{CWL} | 50 | - | - | ns | |
| HSYNC Total Period | t_{HW} | 378 | 390 | 406 | t_{CW} | |
| Horizontal Back Porch | t_{HBP} | 46 | 46 | 46 | t_{CW} | |
| Horizontal Front Porch | t_{HFP} | 8 | - | - | t_{CW} | |
| HSYNC Low Period | t_{HWL} | 4 | - | - | t_{CW} | |
| VSYNC Frequency | f_{VS} | 60 | 60 | 60 | Hz | |
| VSYNC Total Period | t_{VW} | 268 | 278 | 286 | t_{HW} | |
| Vertical Back Porch | t_{VBP} | 16 | 16 | 16 | t_{HW} | |
| Vertical Front Porch | t_{VFP} | 10 | - | - | t_{HW} | |
| VSYNC Low Period | t_{VWL} | 2 | - | - | t_{HW} | |
| Data Setup Time | t_{DS} | 12 | - | - | ns | |
| Data Hold Time | t_{DH} | 20 | - | - | ns | |
| HSYNC Setup Time | t_{HSYS} | 20 | - | - | ns | |
| HSYNC Hold Time | t_{HSYH} | 20 | - | - | ns | |
| VSYNC Setup Time | t_{VSYH} | 20 | - | - | ns | |
| VSYNC Hold Time | t_{VSYH} | 20 | - | - | ns | |

Product Specifications

5-4-2. Digital RGB Timing Diagram



Product Specifications
5-4-3. Color Input Data Reference(Digital RGB)

The brightness of each primary color(red,green and blue) is based on the 6-bit gray scale data input for the color ; the higher the binary input, the brighter the color.

The following table provides a reference for color versus data input.

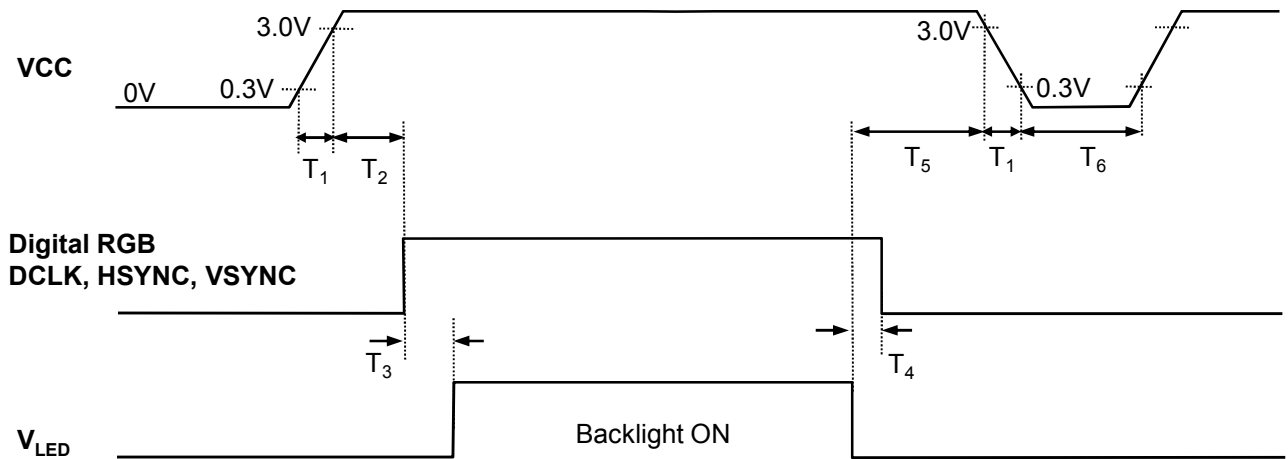
COLOR DATA REFERENCE

| Color | | Input Color Data | | | | | | | | | | | | | | | | | |
|--------------|-----------------|------------------|----|-----|----|-----|----|-------|----|-------|----|-----|----|------|----|------|----|-----|----|
| | | Red | | | | | | Green | | | | | | Blue | | | | | |
| | | MSB | | Red | | LSB | | MSB | | Green | | LSB | | MSB | | Blue | | LSB | |
| | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Red | Red(00) Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(01) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(02) | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(61) | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(62) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(63) Bright | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green | Green(00)Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(01) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(02) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(61) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(62) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(63)Bright | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Blue | Blue(00) Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(01) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(02) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(61) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(63) Bright | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

Product Specifications

5-5. Power Supply Sequence

For LCD's normal operation, it is recommended to keep below power supply sequence.



| Parameter | Value | | | Units | Note |
|----------------|-------|------|------|-------|------|
| | Min. | Typ. | Max. | | |
| T ₁ | 0 | - | 10 | ms | |
| T ₂ | 1 | - | 50 | ms | |
| T ₃ | 800 | - | - | ms | |
| T ₄ | 0 | - | - | ms | |
| T ₅ | 0 | - | - | ms | |
| T ₆ | 800 | - | - | ms | |

Notes: If it is difficult to perform as our recommendation, customer should ask to LG Display.

Product Specifications

6. Electro-optical Characteristics

@T_a=25°C, Aging time: Over 10 minutes

| Parameter | | Symbol | Values | | | Units | Notes |
|--------------------------|-------------------------|--------------------|--------|-------|-------|-------------------|------------------------|
| | | | Min. | Typ. | Max. | | |
| Contrast Ratio | | CR | 350 | 500 | - | - | 1 |
| Surface Luminance, white | | L _{WH} | 500 | 625 | - | cd/m ² | 2 |
| Luminance Variation | | δ _{WHITE} | 80 | 85 | - | % | 3 |
| Response Time | Rise Time | T _{rR} | - | 7 | 15 | ms | 4 |
| | Decay Time | T _{rD} | - | 18 | 30 | ms | |
| Color Coordinates | Red | R _X | 0.535 | 0.585 | 0.635 | - | 2 (Reference Value) |
| | | R _Y | 0.313 | 0.363 | 0.413 | | |
| | Green | G _X | 0.312 | 0.362 | 0.412 | | |
| | | G _Y | 0.513 | 0.563 | 0.613 | | |
| | Blue | B _X | 0.110 | 0.160 | 0.210 | | |
| | | B _Y | 0.092 | 0.142 | 0.192 | | |
| White | W _X | 0.265 | 0.315 | 0.365 | | | |
| | W _Y | 0.290 | 0.340 | 0.390 | | | |
| Viewing Angle | x axis, right (φ = 0°) | Θ _r | 65 | 70 | - | degree | 5 |
| | x axis, left (φ = 180°) | Θ _l | 65 | 70 | - | | |
| | y axis, up (φ = 90°) | Θ _u | 55 | 60 | - | | |
| | y axis, down (φ = 270°) | Θ _d | 45 | 50 | - | | |
| Life Time | | - | 10,000 | - | - | Hours | 6 |

Notes:

- Contrast Ratio (CR) is defined mathematically as

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

- Surface luminance is measured at the center point(L1) of the LCD with all pixels displaying white at the distance of 500mm by PR-880. Color Coordinates are measured at the center point(L1) of the LCD with all pixels displaying red, green, blue and white at the distance of 500mm by PR-650. For more information, refer to the Fig. 1 and Fig. 2.
- The variation in surface luminance. The panel total variation (δ_{WHITE}) is determined by measuring LN at each test position 1 through 9, and then dividing the maximum LN of 9 points luminance by minimum LN of 9 points luminance. For more information see the Fig. 1 and Fig. 2.

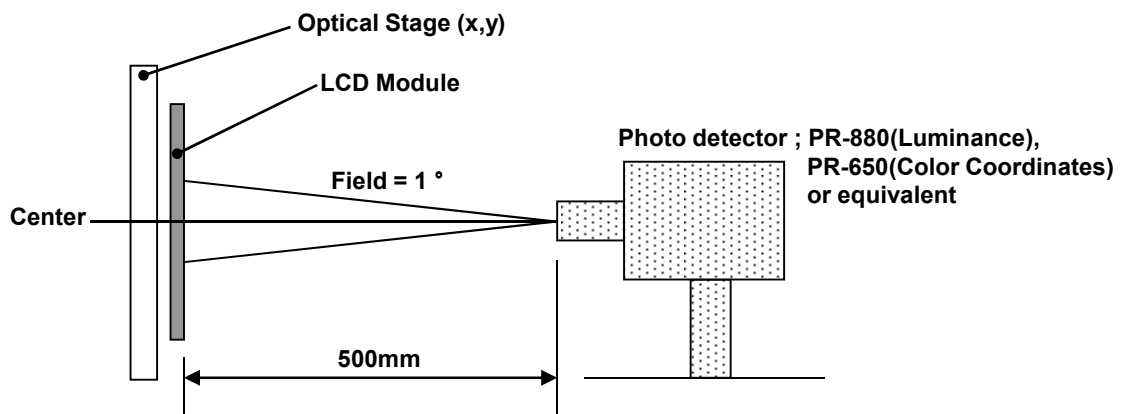
$$\delta_{\text{WHITE}} = \text{Minimum}(L1, L2, \dots L9) / \text{Maximum}(L1, L2, \dots L9) \times 100$$

Product Specifications

Notes:

4. Response time is the time required for the display to transition from white to black (Rise Time, T_{rR}) and from black to white (Decay Time, T_{rD}). For additional information see Fig. 3.
5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Fig. 4.
6. "Life Time" is defined as the time the brightness decreases to 50% from initial brightness which is stabilized under continuous lighting condition, at ambient temperature 25 °C.

Fig. 1 Optical Characteristic Measurement Equipment and Method



Measuring Conditions ;

- Surroundings: Dark Room
- Temperature: $T_a=25^\circ\text{C}$
- Input Video Signal: Digital RGB (18bits)
- Electrical parameters set typical values.
- Measured value at the center point of LCD panel after more than 10 minutes while backlight turning on.

Product Specifications

Fig. 2 Luminance

<measuring point for surface luminance & measuring point for luminance variation >

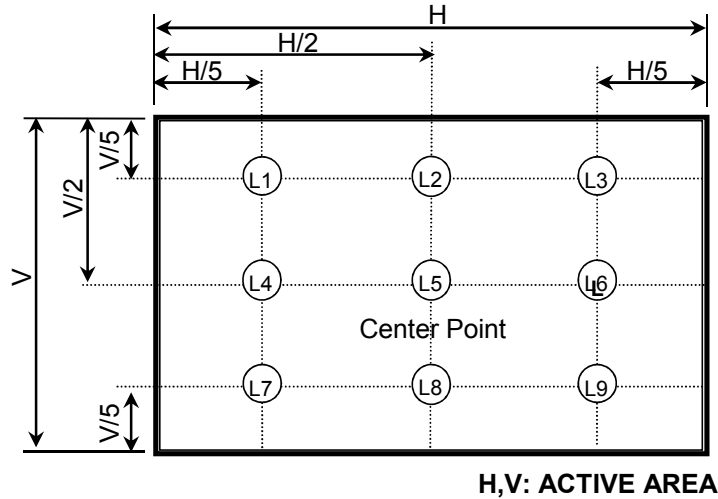


Fig. 3 Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

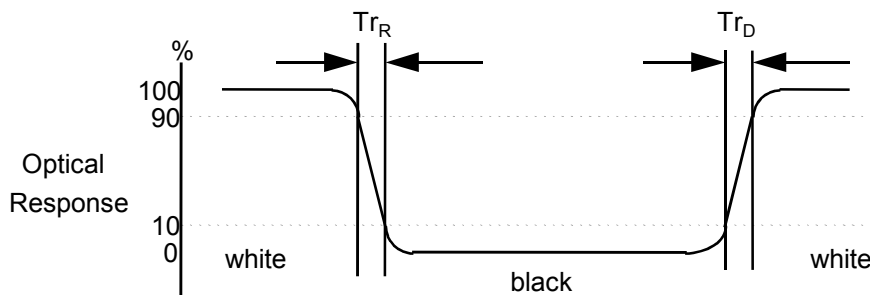
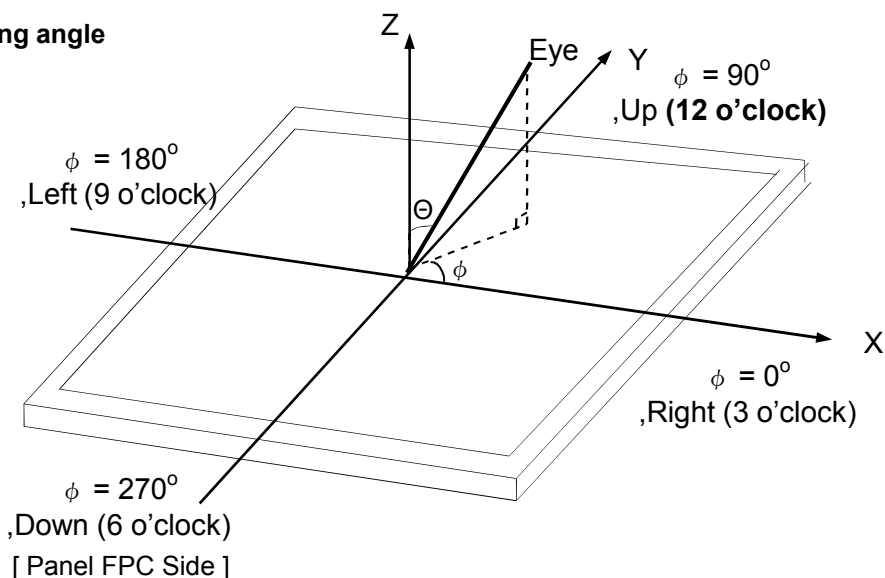


Fig. 4 Viewing angle



Product Specifications

7. Mechanical Characteristics

The contents provide general mechanical characteristics for this module.
In addition the figures in the next page are detailed mechanical drawing of the LCD.

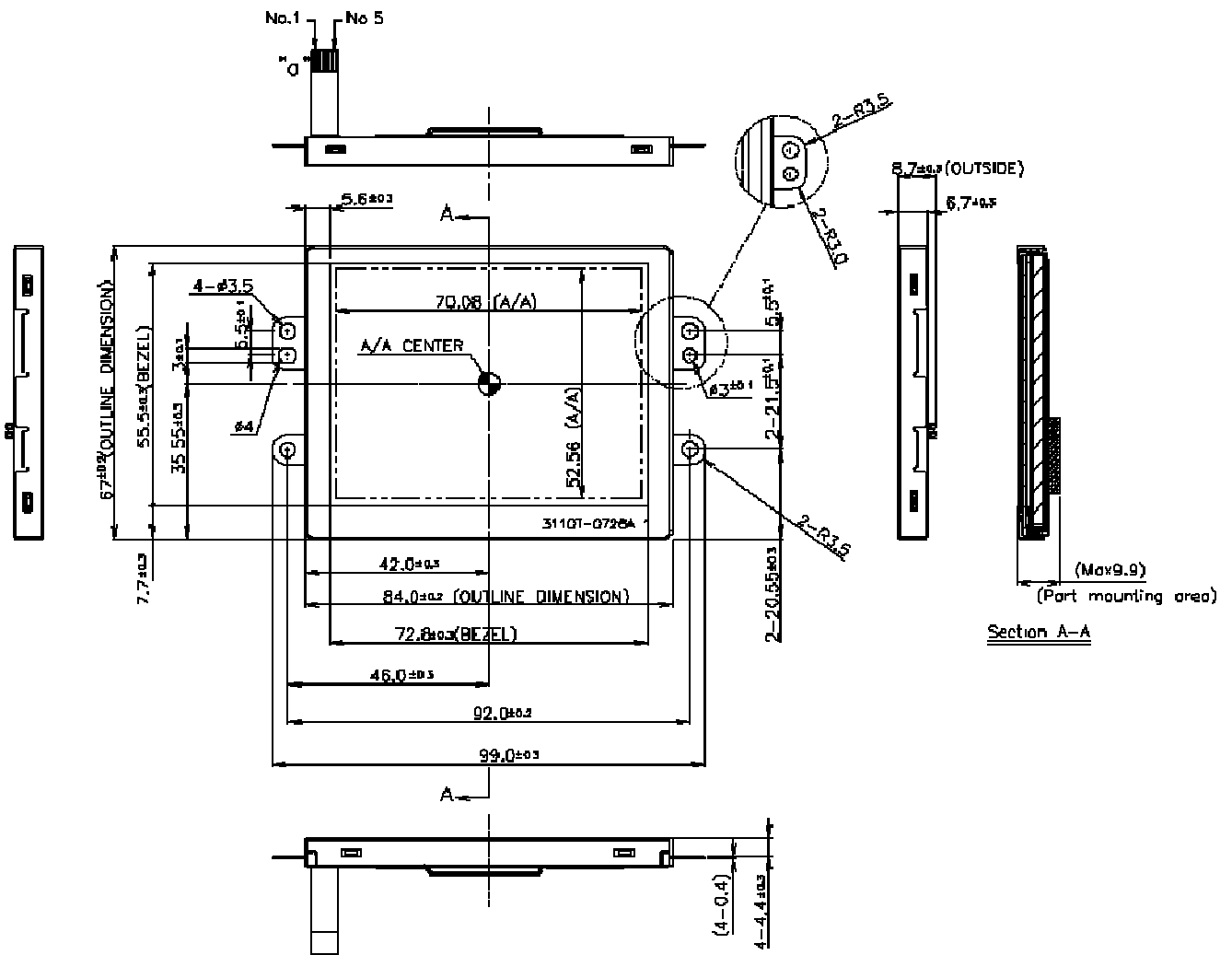
| | | |
|---------------------|------------|---|
| Outline Dimension | Horizontal | 84.0 ± 0.2mm |
| | Vertical | 67.0 ± 0.2mm |
| | Thickness | 6.7 ± 0.3mm 9.9mm (Max., Part mounting area) |
| Bezel Area | Horizontal | 72.8 ± 0.3mm |
| | Vertical | 56.3 ± 0.3mm |
| Active Display Area | Horizontal | 70.08mm |
| | Vertical | 52.56mm |
| Weight | 65g (Max.) | |

Product Specifications

<FRONT VIEW>

Note) Unit:[mm], General tolerance: $\pm 0.3\text{mm}$

(12 o'clock direction)

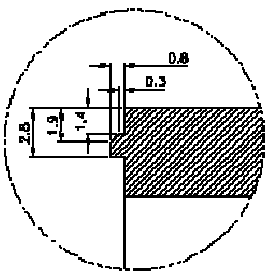
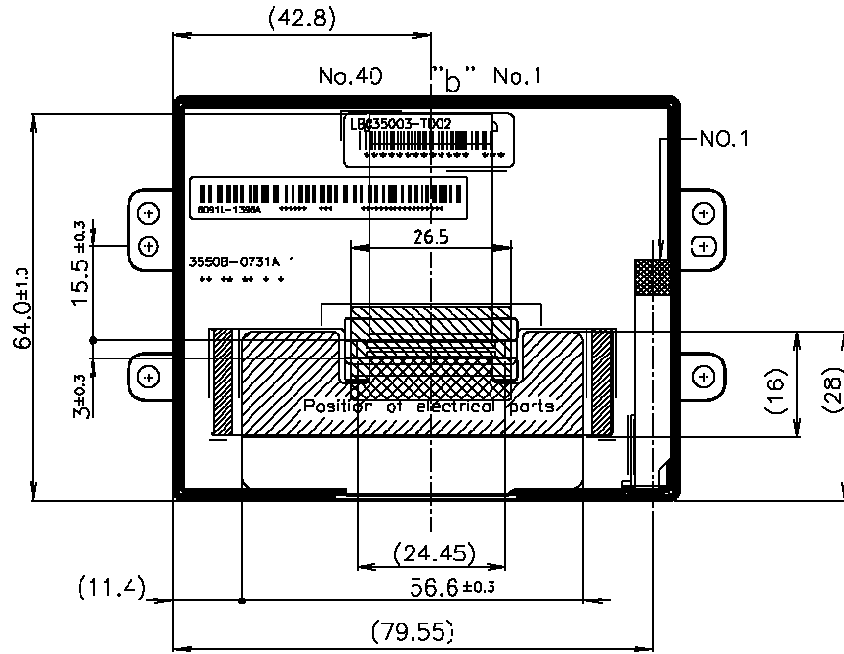


Product Specifications

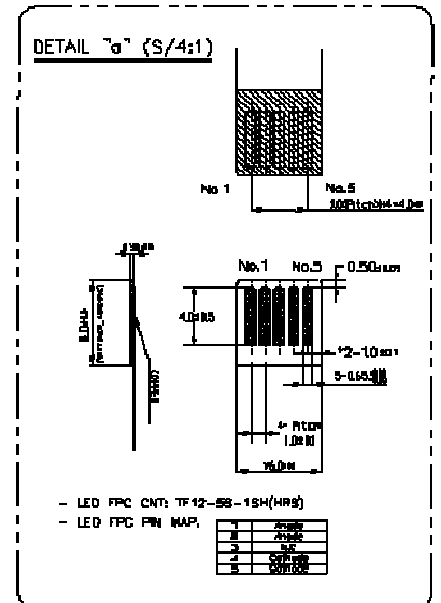
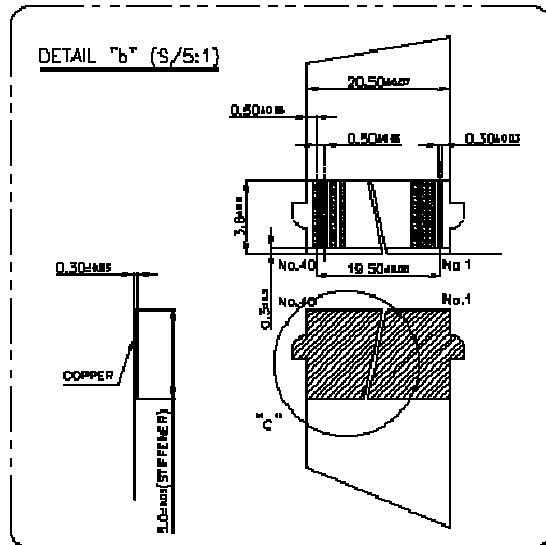
<REAR VIEW>

Note) Unit:[mm], General tolerance: ± 0.3mm

(12 o'clock direction)



DETAIL "c" (S/5:1)
ALL TOLERANCE IN CIRCLE ARE ±0.05.



Product Specifications
8. Reliability Test

| No. | Test Items | Test Condition | Notes |
|-----|-----------------------------------|--|-------|
| 1 | High Temperature Storage Test | Ta=85℃ 240h | |
| 2 | Low Temperature Storage Test | Ta=-40℃ 240h | |
| 3 | High Temperature Operation Test | Ta=85℃ 240h | |
| 4 | Low Temperature Operation Test | Ta=-30℃ 240h | |
| 5 | High Humidity Operation Test | Ta=65℃/90%RH 240h | |
| 6 | Humid Heat Cyclic Test | Ta=-10℃~65℃/80~96%RH 240h | |
| 7 | Thermal Shock Test | - 1cycle: Ta=-40℃(0.5h) ~ 85℃(0.5h) - 240Cycles | |
| 8 | Shock Test (non-operating) | - Half sine wave, 50G, 11ms, three times - One in each opposite direction of each perpendicular axis | |
| 9 | Vibration Test (non-operating) | - 5Hz to 200Hz logarithm sweep for 20min/cycle. - 5Hz to 12.2Hz:The amplitude is 10mm p-p. - 12.2Hz to 100Hz:The acceleration is 3.0G 0-pk. - 101Hz to 200Hz:The acceleration is 1.5G 0-pk. - 3 axes, 18 sweeps per axis | |
| 10 | Vibration Test Temperature Cycle | -10Hz to 50Hz, 1G, -20℃~60℃ - 8H×6Cycle | |

• Ta: Ambient Temperature

Notes:

1. In the Reliability Test, Confirm performance after leaving in room temp(25℃)
2. In the standard condition, there shall be no practical problems that may affect the display function 24 hours later after reliability test.

Product Specifications**9. International Standards****9-1. Environment**

- a) RoHS, Directive 2002/95/EC of the European Parliament and of the council of 27 January 2003

Product Specifications

10. Packing

10-1. Designation of Lot Mark

a) Lot Mark



A,B,C: SIZE(INCH)
E: MONTH

D: YEAR
F ~ M: SERIAL NO.

Note

1. YEAR

| | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Mark | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |

2. MONTH

| | | | | | | | | | | | | |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Mark | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C |

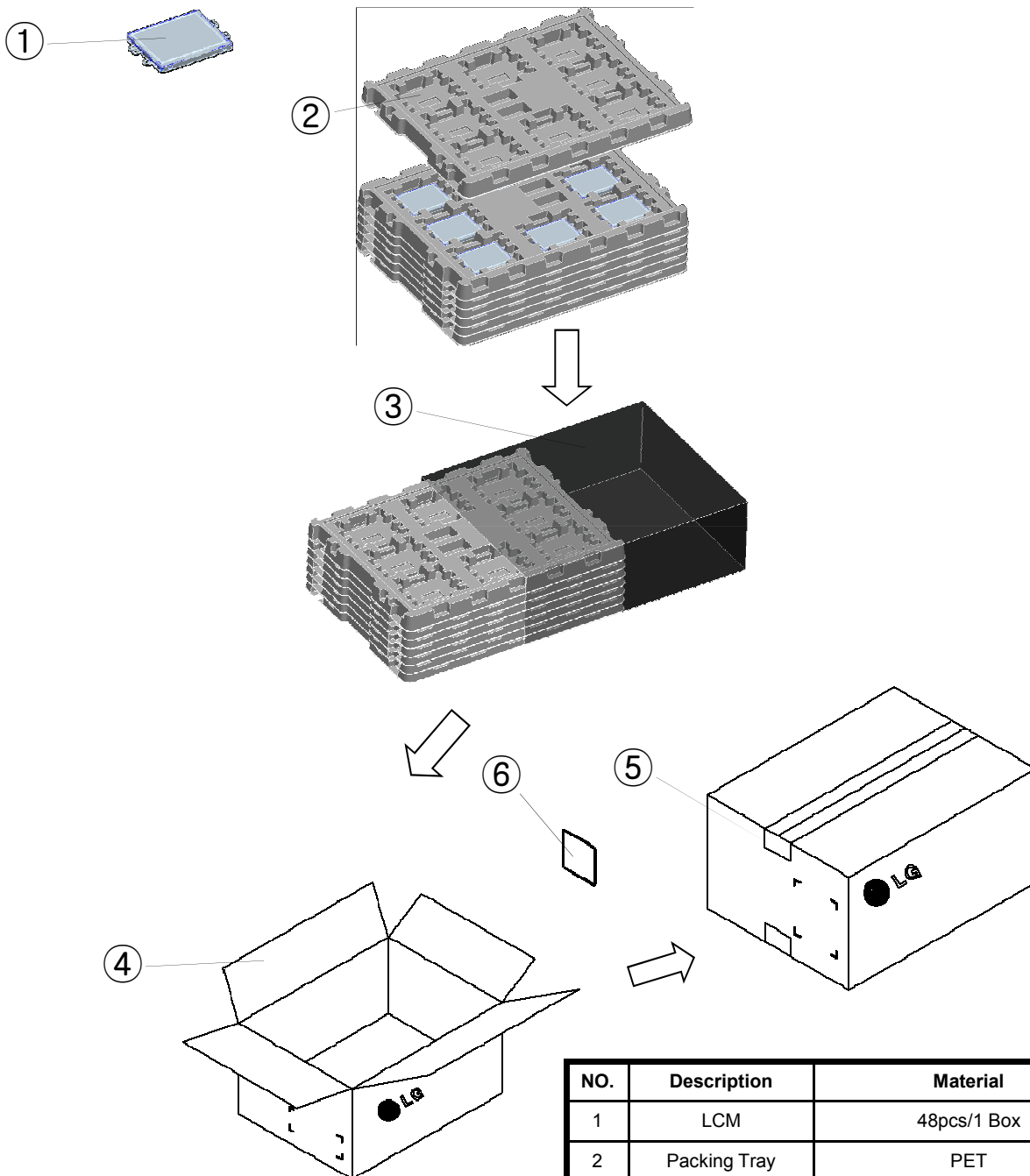
b) Location of Lot Mark

Serial No. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

Product Specifications

10-2. Packing Form

- a) Package quantity in one box: 48 pcs
- b) Box Size: 478 x 365 x 162 (mm)



| NO. | Description | Material |
|-----|--------------|-------------------|
| 1 | LCM | 48pcs/1 Box |
| 2 | Packing Tray | PET |
| 3 | Bag | PE |
| 4 | Carton Box | SWR4 |
| 5 | Tape | OPP 70MMx300m |
| 6 | Label | YUPO Paper 100x70 |

Product Specifications

11. PRECAUTIONS

Please pay attention to the following when you use this TFT LCD module.

11-1. MOUNTING PRECAUTIONS

- (1) You must mount a module using holes arranged in four corners or four sides.
- (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external forces are not transmitted directly to the module.
- (3) Please attach a transparent protective plate to the surface in order to protect the polarizer.
Transparent protective plate should have sufficient strength in order to resist external forces.
- (4) You should adopt radiation structure to satisfy the temperature specification.
- (5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- (6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics deteriorate the polarizer.)
- (7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with a small amount of Ethanol.
- (8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (9) Do not open the case because inside circuits do not have sufficient strength.
- (10) The metal case of a module should be contacted to electrical ground of your system.

11-2. OPERATING PRECAUTIONS

- (1) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- (2) Brightness depends on the temperature. (In higher temperature, it becomes lower.)
- (3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrically contacted parts. And after fading condensation, smear or spot will occur.
- (4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (5) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

Product Specifications

11-3. ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that handling persons are connected to ground through wrist band etc. And don't touch interface pin directly.

11-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

11-5. STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

- (1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- (2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

11-6. HANDLING PRECAUTIONS FOR PROTECTION FILM

- (1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly (more than 3 seconds) and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- (2) The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer.
Please carefully peel off the protection film without rubbing it against the polarizer.
- (3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- (4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with a small amount of Ethanol.