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| MODEL NAME: OSD0240TB1T2 | PAGE: 1 OF 26 | DOC. NO.: T9-OSD0240TB-1T20 | VERSION: A.0 |
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2.4" 262K TFT LCD PANEL WITH TOUCH PANEL SPECIFICATION

MODEL NAME: OSD0240TB1T2



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1 GENERAL DESCRIPTION

1.1 Description

OSD0240TB1T2 is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that used amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit, a back-light unit, and a touch panel. The resolution of 2.4" contains 240 x 320 pixels and can display up to 262K colors. The LCD module is designed and manufactured specifically for use in cellular phone.

1.2 Features

| | | |
|-----------------------|---|---|
| LCD Type | : | Transmissive color active matrix LCD panel TN (Twisted Nematic) mode |
| Drive IC | : | ILITEK ILI9320 or Compatible IC |
| Built-in Drive Power | : | Low power consumption |
| System Interface | : | 80 System Interface (8-/16-bit bus) |
| Internal RAM Capacity | : | 172,800 bytes max. |
| Color Mode | : | 262,144 colors |
| Outline Dimensions | : | 43.4 (W) × 62.0 (H) × 3.9 (D) mm |
| Active Area | : | 36.72 (W) × 48.96 (H) mm |
| Pixel Size | : | 0.153 (W) × 0.153 (H) mm |
| Viewing Direction | : | 12 O' Clock |
| Weight | : | T.B.D. |



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1.3 Touch Panel

| | |
|---------------------|---|
| Type | : Resistance , Analog, 4-Wires Type Touch Panel |
| Input Method | : Polyacetal Pen or Finger |
| Activation Force | : 10gf ~ 80gf |
| Hardness of Surface | : 3H |

1.4 Environmental impact substances controlled for containing in products

The environmental impact substances we control are classified into 2 types as described below.

a. Prohibited substances:

LOI, in principle, does not produce any products containing or contaminated by substances of this type.

- ◆ Cadmium (Cd) < 100 ppm
- ◆ Mercury (Hg) < 1000 ppm
- ◆ Hexavalent-Chromium (Cr ⁺⁶) < 1000 ppm
- ◆ Polybrominated biphenylethers (PBDE) < 1000 ppm
- ◆ Polybrominated biphenyls (PBB) < 1000 ppm

b. Prohibited substances:

Desired not to be contained in or contaminate our products as far as possible and abolished by a targeted date. LOI moderately produces products containing substances of this type.

- ◆ Lead (Pb) < 1000 ppm
-

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2 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical absolute maximum ratings

| Item | Symbol | Value | Unit | Note |
|--------------------------|-------------|----------------|------|---------|
| Power Supply Voltage (1) | Vcc, IOVcc | -0.3 to +4.6 | V | (1),(2) |
| Power Supply Voltage (1) | Vci - AGND | -0.3 to +4.6 | V | (1),(4) |
| Power Supply Voltage (1) | DDVDH-AGND | -0.3 to +6.0 | V | (1),(4) |
| Power Supply Voltage (1) | AGND - VCL | -0.3 to +4.6 | V | (1) |
| Power Supply Voltage (1) | DDVDH - VCL | -0.3 to +9.0 | V | (1),(5) |
| Power Supply Voltage (1) | VGH - AGND | -0.3 to +18.5 | V | (1),(5) |
| Power Supply Voltage (1) | AGND - VGL | 0.0 to -16.5 | V | (1),(6) |
| Input Voltage | Vt | -0.3 ~ Vcc+0.3 | V | (1) |

Note:

- (1) VCC,DGND must be maintained
- (2) (High) (VCC = VCC) \geq DGND (Low), (High) IOVCC \geq DGND (Low).
- (3) Make sure (High) VCI \geq DGND (Low).
- (4) Make sure (High) DDVDH \geq ASSD (Low).
- (5) Make sure (High) DDVDH \geq VCL (Low).
- (6) Make sure (High) VGH \geq ASSD (Low).
- (7) Make sure (High) ASSD \geq VGL (Low).

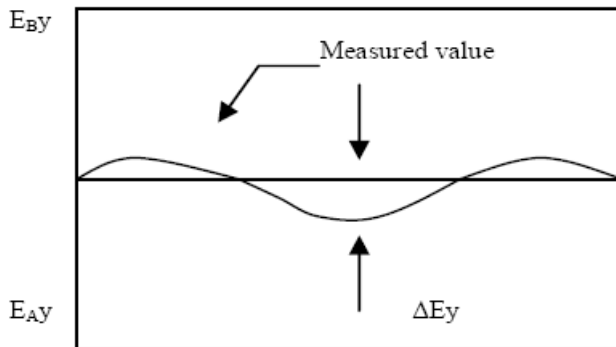
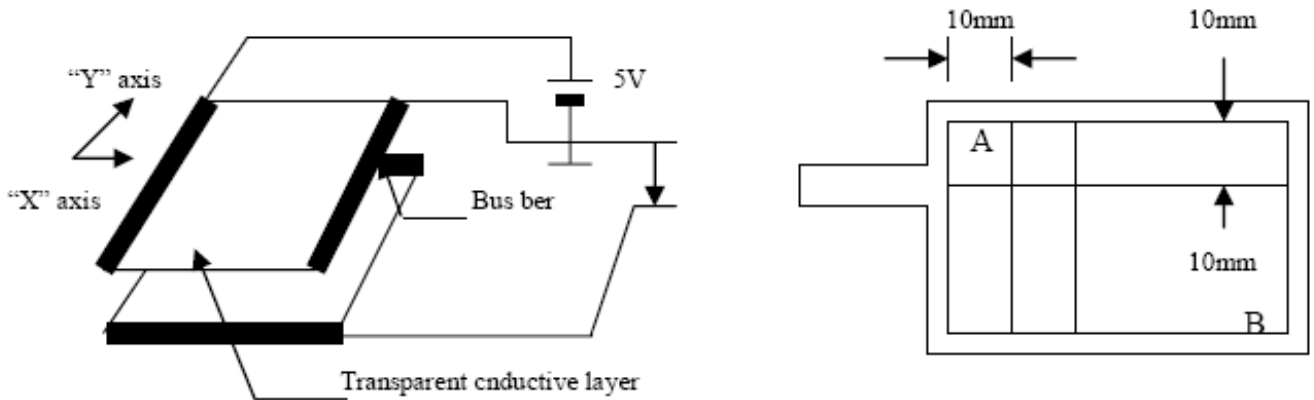
2.2 Electrical characteristics of touch panel

| Description | | Specification | Remark |
|-----------------------|--------|-----------------------------|--|
| Operating Voltage | | DC 5V | |
| Circuit Resistance | X-axis | 200 Ω ~ 900 Ω | At connector |
| | y-axis | 200 Ω ~ 900 Ω | At connector |
| Insulation Resistance | | \geq 20M Ω | At DC 25V |
| Chattering Time | | \leq 10ms | Test Condition: Voltage:3V, Frequency: 5Hz |
| Linearity | | \leq 1.5% | Material of Pen: Poly-acetal resin End shape:R0.8mm Pitch: 10mm Test Forece:180gf (1) |

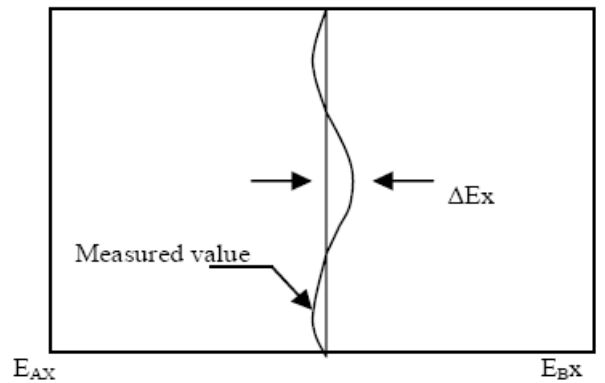
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Note:

(1) Measurement condition of Linearity



Measuring position



Measuring position

$$\text{Linearity of transparent table (X)} = (\Delta E_x / E_{ABx}) \times 100\%$$

$$\text{Linearity of transparent table (Y)} = (\Delta E_y / E_{ABy}) \times 100\%$$

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2.3 Environmental absolute maximum ratings

| Item | Symbol | Min. | Max. | unit | Note |
|--|------------------|-------|------|------|---------|
| Storage Temperature | T _{STG} | (-30) | (70) | °C | (1) |
| Operating Temperature (Ambient Temperature) | T _{OPR} | (-20) | (60) | °C | (1),(2) |

Note:

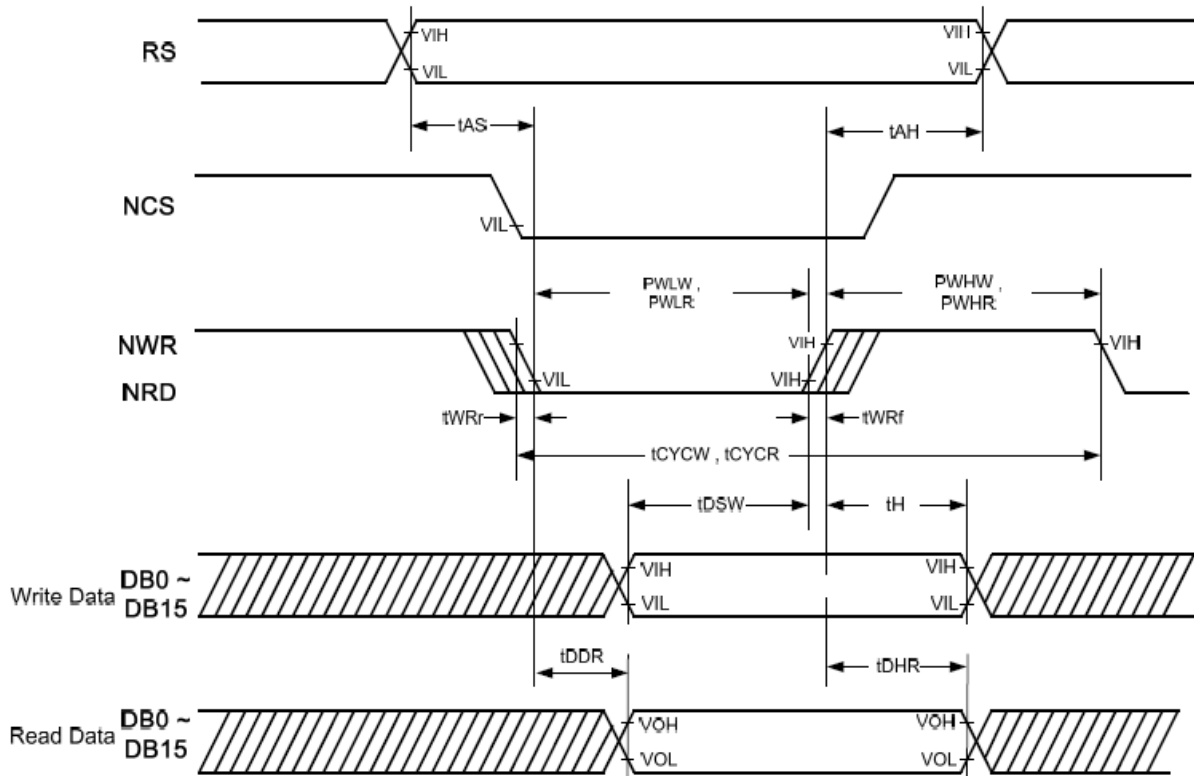
(1) 90 % RH Max. (40 °C ≥ Ta)

(2) In Case of below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one.

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3 AC CHARACTERISTICS

3.1 80-system bus interface timing characteristics



(1) Normal write mode

(IOVCC=1.65~2.4V, VCC=2.4~3.3V)

| Item | Symbol | Unit | Min. | Typ. | Max. | |
|-------------------------------|-----------------------|------------|------|------|------|---|
| Bus cycle time | Write | t_{CYCW} | ns | 200 | - | - |
| | Read | t_{CYCR} | ns | 300 | - | - |
| Write low-level pulse width | PW_{LW} | ns | 40 | - | - | |
| Read low-level pulse width | PW_{LR} | ns | 150 | - | - | |
| Write high-level pulse width | PW_{HW} | ns | 70 | - | - | |
| Read high-level pulse width | PW_{HR} | ns | 150 | - | - | |
| Write / Read rise / fall time | t_{WRr} , t_{WRf} | ns | - | - | 25 | |
| RS Setup time | RS to NCS, NWR | t_{AS} | ns | 5 | - | - |

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| Item | | Symbol | Unit | Min. | Typ. | Max. |
|------------------------|----------------|-----------|------|------|------|------|
| RS Hole time | NCS, NWR to RS | t_{AH} | ns | 5 | - | - |
| Write data set up time | | t_{DSW} | ns | 20 | - | - |
| Write data hold time | | t_H | ns | 15 | - | - |
| Read data delay time | | t_{DDR} | ns | - | - | 100 |
| Read data hold time | | t_{DHR} | ns | 5 | - | - |

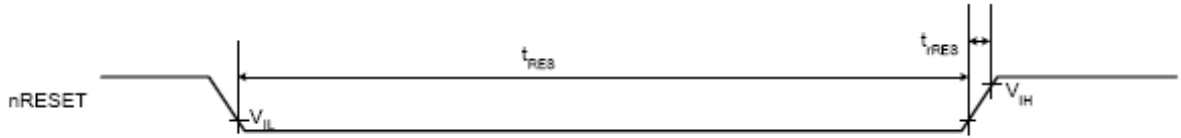
(2) High-speed write mode (HWM=1)

(IOVCC=1.65~2.4V, VCC=2.4~3.3V)

| Item | | Symbol | Unit | Min. | Typ. | Max. |
|-------------------------------|----------------|--------------------|------|------|------|------|
| Bus cycle time | Write | t_{CYCW} | ns | 125 | - | - |
| | Read | t_{CYCR} | ns | 300 | - | - |
| Write low-level pulse width | | PW_{LW} | ns | 40 | - | - |
| Read low-level pulse width | | PW_{LR} | ns | 150 | - | - |
| Write high-level pulse width | | PW_{HW} | ns | 70 | - | - |
| Read high-level pulse width | | PW_{HR} | ns | 150 | - | - |
| Write / Read rise / fall time | | t_{WRr}, t_{WRf} | ns | - | - | 25 |
| RS Setup time | RS to NCS, NWR | t_{AS} | ns | 5 | - | - |
| RS Hole time | NCS, NWR to RS | t_{AH} | ns | 5 | - | - |
| Write data set up time | | t_{DSW} | ns | 20 | - | - |
| Write data hold time | | t_H | ns | 15 | - | - |
| Read data delay time | | t_{DDR} | ns | - | - | 100 |
| Read data hold time | | t_{DHR} | ns | 5 | - | - |

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3.2 Reset timing characteristics



(V_{CC}=1.8~3.3V, IOV_{CC}=1.65~3.3V)

| Item | Symbol | Unit | Min. | Typ. | Max. |
|-----------------------|------------|---------|------|------|------|
| Reset low level width | t_{RES} | ms | 1 | - | - |
| Reset rise time | t_{rRES} | μs | - | - | 10 |

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4 DC CHARACTERISTICS

4.1 DC characteristics

(IOVcc=1.65~3.3V, Vcc=2.4~3.3V, Ta=-40~85°C)

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|--|----------------------|---|-----------|------|-----------|------|
| Input high voltage | V _{IH} | IOVcc=1.8~3.3V | 0.8xIOVcc | - | IOVcc | V |
| Input low voltage | V _{IL} | IOVcc=1.8~3.3V | -0.3 | - | 0.2xIOVcc | V |
| Output high voltage (1) (DB0~17 Pins) | V _{OH1} | I _{OH} = -0.1 mA | 0.8xIOVcc | - | - | V |
| Output low voltage (DB0~17 Pins) | V _{OL1} | IOVcc=1.65~3.3V I _{OL} = 0.1 mA | - | - | 0.2xIOVCC | V |
| I/O leakage current | I _{Li} | V _{in} = 0~Vcc | -0.1 | - | 0.1 | μ A |
| Current consumption during standby mode (Vcc-DGND) | I _{ST(Vcc)} | Vcc=Vci=2.8V Ta=25°C | - | 5 | 10 | μ A |
| Output voltage deviation | - | - | - | 5 | - | mV |
| Dispersion of the Average Output Voltage | V | - | -10 | - | 10 | mV |



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4.2 DC characteristics of the LED back-light

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|-----------------|--------|-----------|------|------|------|------|------|
| LED current | I_L | | - | 15 | 20 | mA | (1) |
| Forward voltage | V_f | | 12.0 | 13.6 | 15.2 | V | |

Note: (1) Four LEDs are in serial type.

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5 OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).

Measuring equipment: BM-5A, BM-7

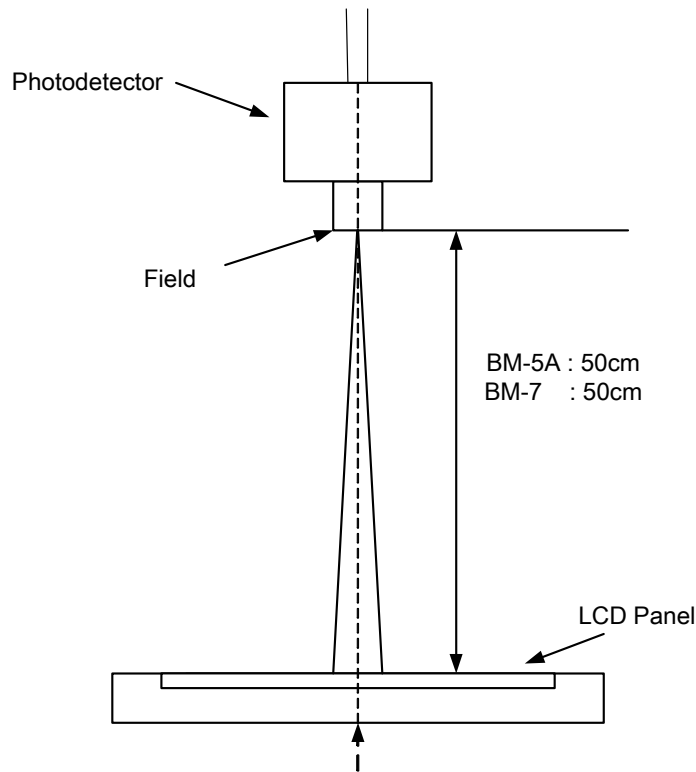
(Ta = 25 +/- 2°C, Vcc = Vci = 2.8V)

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|-------------------------------|-------------|--------|---|---------|---------|---------|-------------------|-----------------|
| Viewing Angle | Hor. | ΘR | C/R ≥ 10 | - | (45) | - | Degree | (1)(6) BM-5A |
| | | ΘL | | - | (45) | - | | |
| | Ver. | ΦH | B/L On | - | (35) | - | | |
| | | ΦL | | - | (15) | - | | |
| Contrast Ratio (Center Point) | | C/R | | (150) | (200) | - | - | (1)(2) BM-5A |
| Brightness | | B | | (170) | (200) | - | cd/m ² | (1)(3) BM-5A |
| Response Time | Rising: Tr | Tr+f | Note (1) Θ = 0 Φ = 0 | (25) | (35) | (50) | msec | (1)(4) BM-7 |
| | Falling: Tf | | | | | | | |
| Chromaticity Coordinate | White | Wx | Viewing Angle B/L On I _L = 20 mA | (0.239) | (0.289) | (0.339) | - | (1)(5) BM-5A |
| | | Wy | | (0.252) | (0.304) | (0.352) | | |
| | Red | Rx | | (0.588) | (0.638) | (0.688) | | |
| | | Ry | | (0.295) | (0.345) | (0.395) | | |
| | Green | Gx | | (0.292) | (0.342) | (0.392) | | |
| | | Gy | | (0.543) | (0.593) | (0.643) | | |
| | Blue | Bx | | (0.092) | (0.142) | (0.192) | | |
| | | By | | (0.039) | (0.089) | (0.139) | | |

Note: (1) Test Equipment Setup

After stabilizing and leaving the module alone at a given temperature for 30 min, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room 30 min after lighting the back-light. This should be measured in the center of screen with a viewing cone of 1° by photodetector.

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(2) Definition of Contrast Ratio (C/R): Ratio of gray max (Gmax) & gray min (Gmin) at the center point:

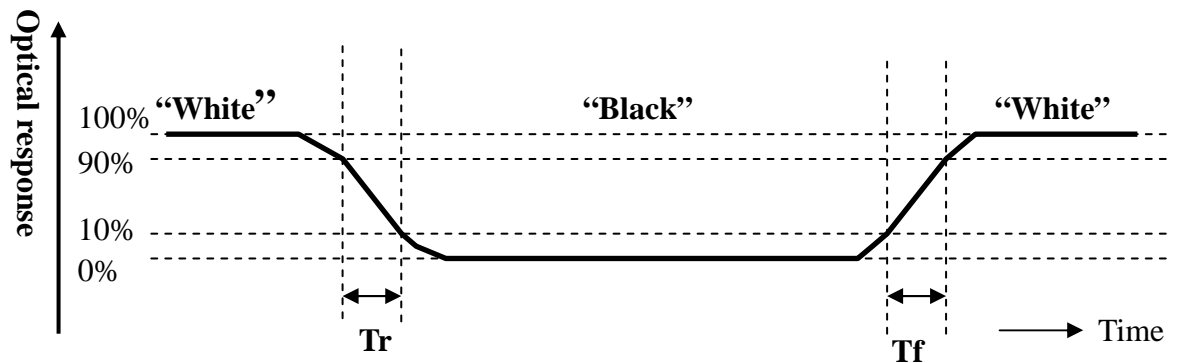
$$CR = \frac{G_{max}}{G_{min}}$$

* Gmax: Luminance with all pixels white

Gmin: Luminance with all pixels black

(3) Definite of Luminance of White: Luminance of white at the center point

(4) Definition of Response time: Sum of Tr, Tf

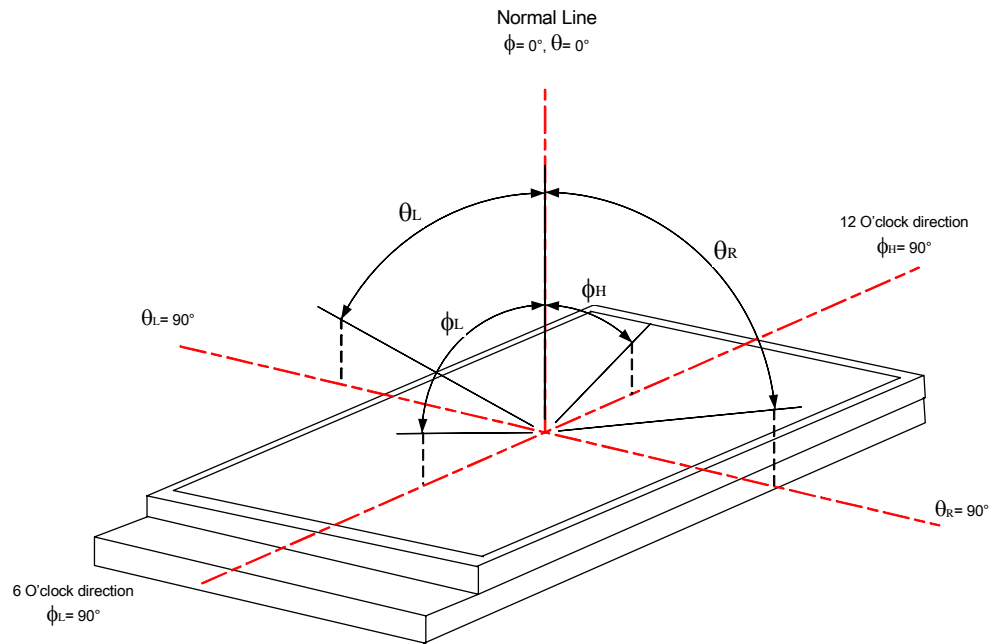


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(5) Definition of Color Chromaticity (CIE 1931)

Color coordinate of white & red, green, blue at center point.

(6) Definition of Viewing Angle: Viewing angle range ($CR \geq 10$)



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7 INTERFACE PIN CONNECTION

7.1 TFT LCD module interface

| Pin No. | Symbol | Pin No. | Symbol |
|---------|-------------------------------|---------|--------|
| 1 | GND | 28 | VCI |
| 2 | NC | 29 | NC |
| 3 | RESET | 30 | XL |
| 4~19 | D15~D0 | 31 | YD |
| 20 | NC | 32 | XR |
| 21 | RD | 33 | YU |
| 22 | WR | 34 | NC |
| 23 | RS | 35 | LED+ |
| 24 | CS | 36 | LED- |
| 25 | BWS1*1 (IM0 For ILI9320) | 37 | NC |
| 26 | DTX1/DTX2 (NC For ILI9320) | 38~39 | GND |
| 27 | VCC | | |

*1 Select the system interface mode as listed below:

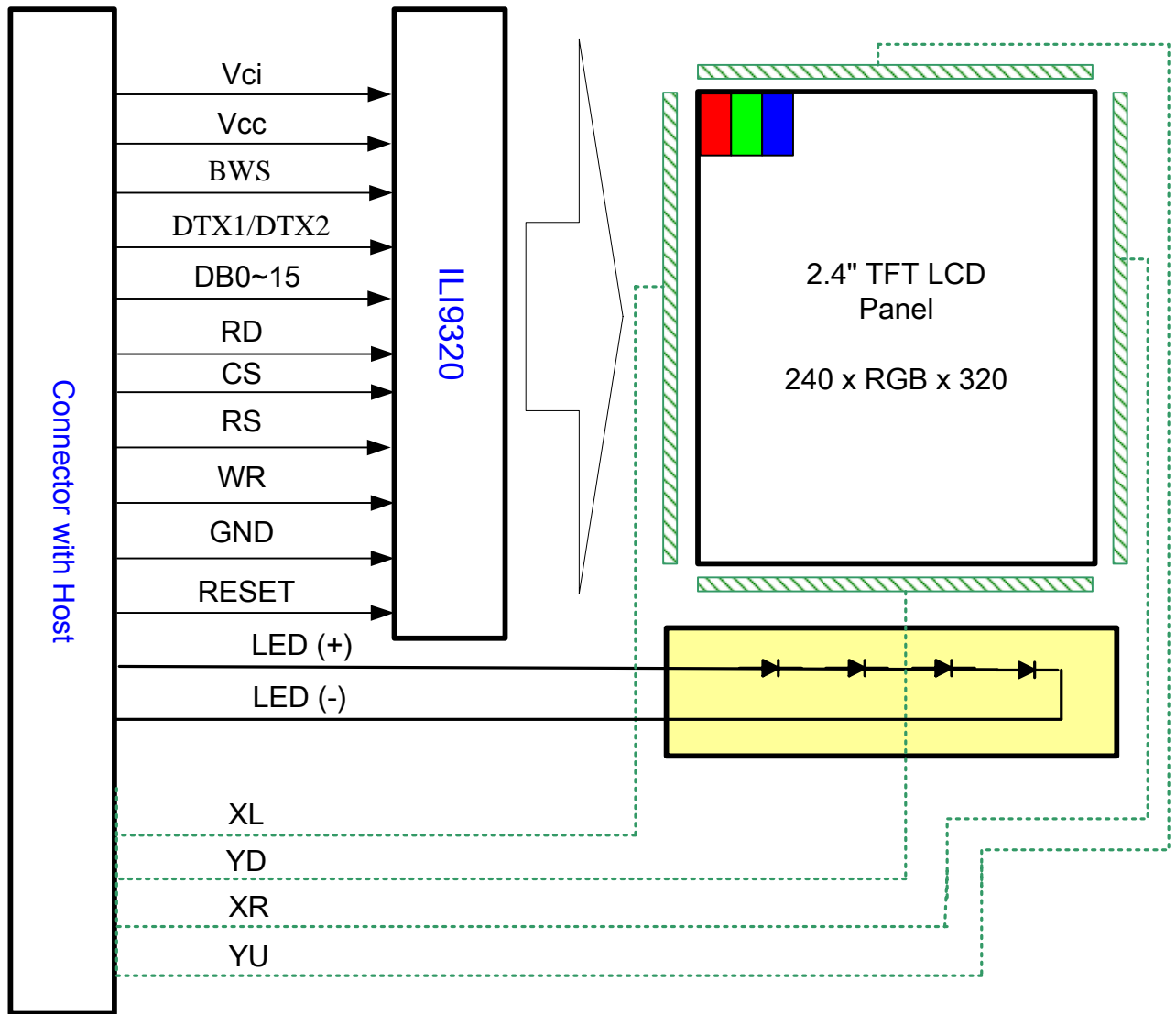
| BWS1 | MPU interface mode | DB pins |
|------|---------------------------------|---------|
| 0 | 80-system, 16 bit bus interface | DB0-15 |
| 1 | 80-system, 8 bit bus interface | DB10-15 |

7.2 Touch panel interface

| Pin No. | Symbol | Pin No. | Symbol |
|---------|--------|---------|--------|
| 1 | XL | 3 | XR |
| 2 | YD | 4 | YU |

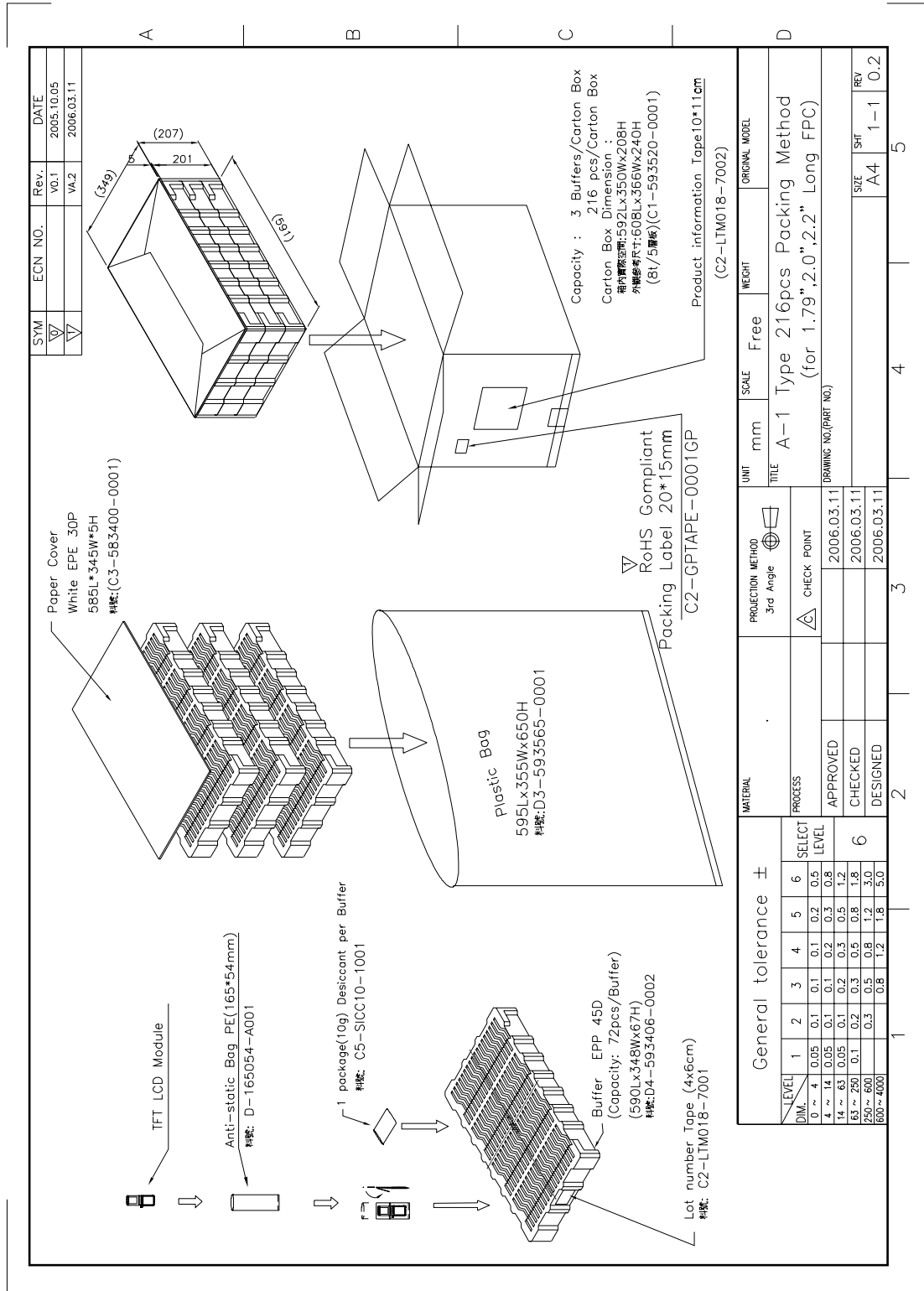
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8. BLOCK DIAGRAM



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9 PACKING FORM



| | | | | |
|-----|---|---------|------|------------|
| SYM | | ECN NO. | Rev. | DATE |
| ▽ | ▽ | | VA.1 | 2005.10.05 |
| ▽ | ▽ | | VA.2 | 2006.03.11 |

| | | | | | |
|-------------------|---|-------------|------------|--------|----------------|
| UNIT | mm | SCALE | Free | WEIGHT | ORIGINAL MODEL |
| TITLE | A-1 Type 216pcs Packing Method (for 1.79", 2.0", 2.2" Long FPC) | | | | |
| PROJECTION METHOD | 3rd Angle | CHECK POINT | 2006.03.11 | | |
| PROCESS | APPROVED | | 2006.03.11 | | |
| | CHECKED | | 2006.03.11 | | |
| | DESIGNED | | 2006.03.11 | | |

| | | | | | | | | |
|---------------------|------------|------|-----|-----|-----|-----|-----|--------------|
| General tolerance ± | | 1 | 2 | 3 | 4 | 5 | 6 | SELECT LEVEL |
| DIM. | 0 ~ 4 | 0.05 | 0.1 | 0.1 | 0.1 | 0.2 | 0.5 | 0.5 |
| | 4 ~ 14 | 0.05 | 0.1 | 0.1 | 0.2 | 0.3 | 0.8 | 0.8 |
| | 14 ~ 63 | 0.05 | 0.1 | 0.2 | 0.3 | 0.5 | 1.2 | 1.2 |
| | 63 ~ 250 | 0.1 | 0.2 | 0.3 | 0.5 | 0.8 | 1.8 | 1.8 |
| | 250 ~ 600 | 0.3 | 0.5 | 0.8 | 1.2 | 1.8 | 3.0 | 3.0 |
| | 600 ~ 4000 | 0.8 | 1.2 | 1.8 | 3.0 | 5.0 | | |

| | | | | |
|----------|----------|--|------------|------------|
| MATERIAL | PROCESS | | APPROVED | 2006.03.11 |
| | CHECKED | | 2006.03.11 | |
| | DESIGNED | | 2006.03.11 | |

| | | | |
|------|----|-----|-----|
| SIZE | A4 | 1-1 | 0.2 |
| REV | | | |

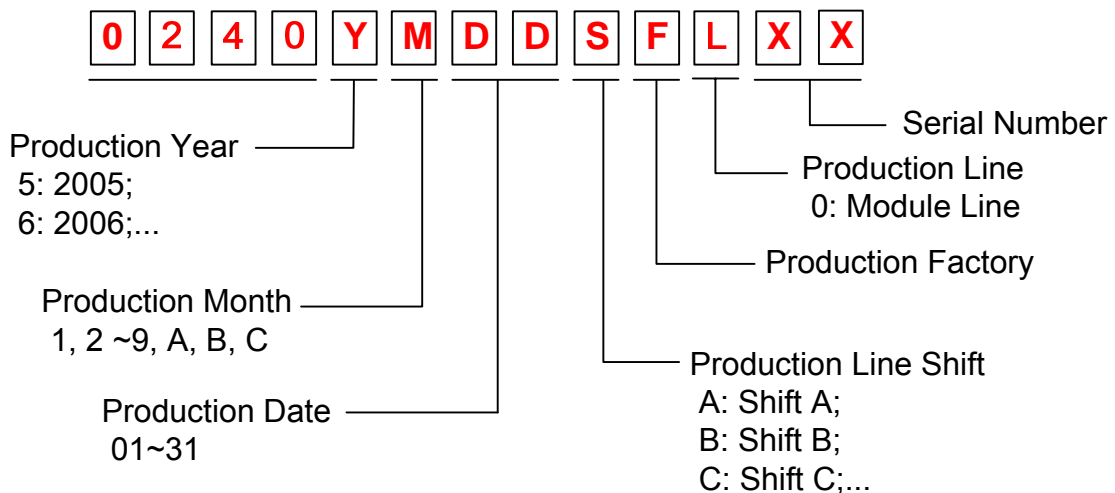
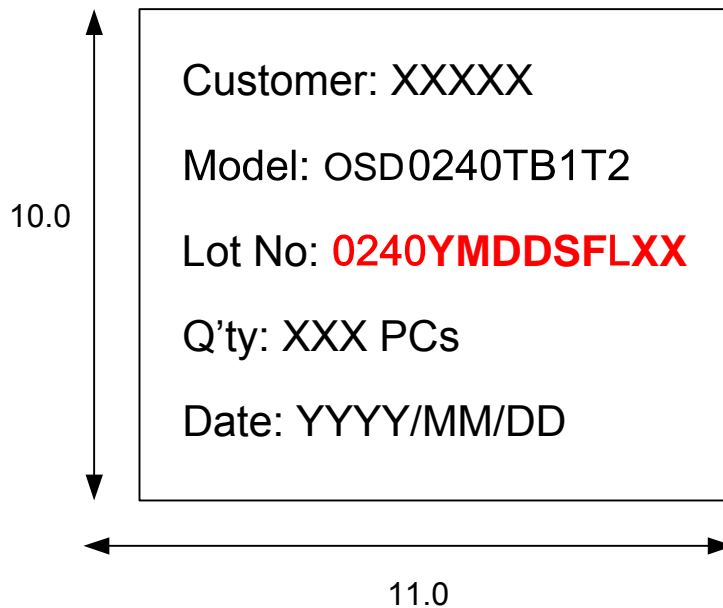


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10 DESIGNATION OF LOT MARK

10.1 Lot Mark on Packing Label

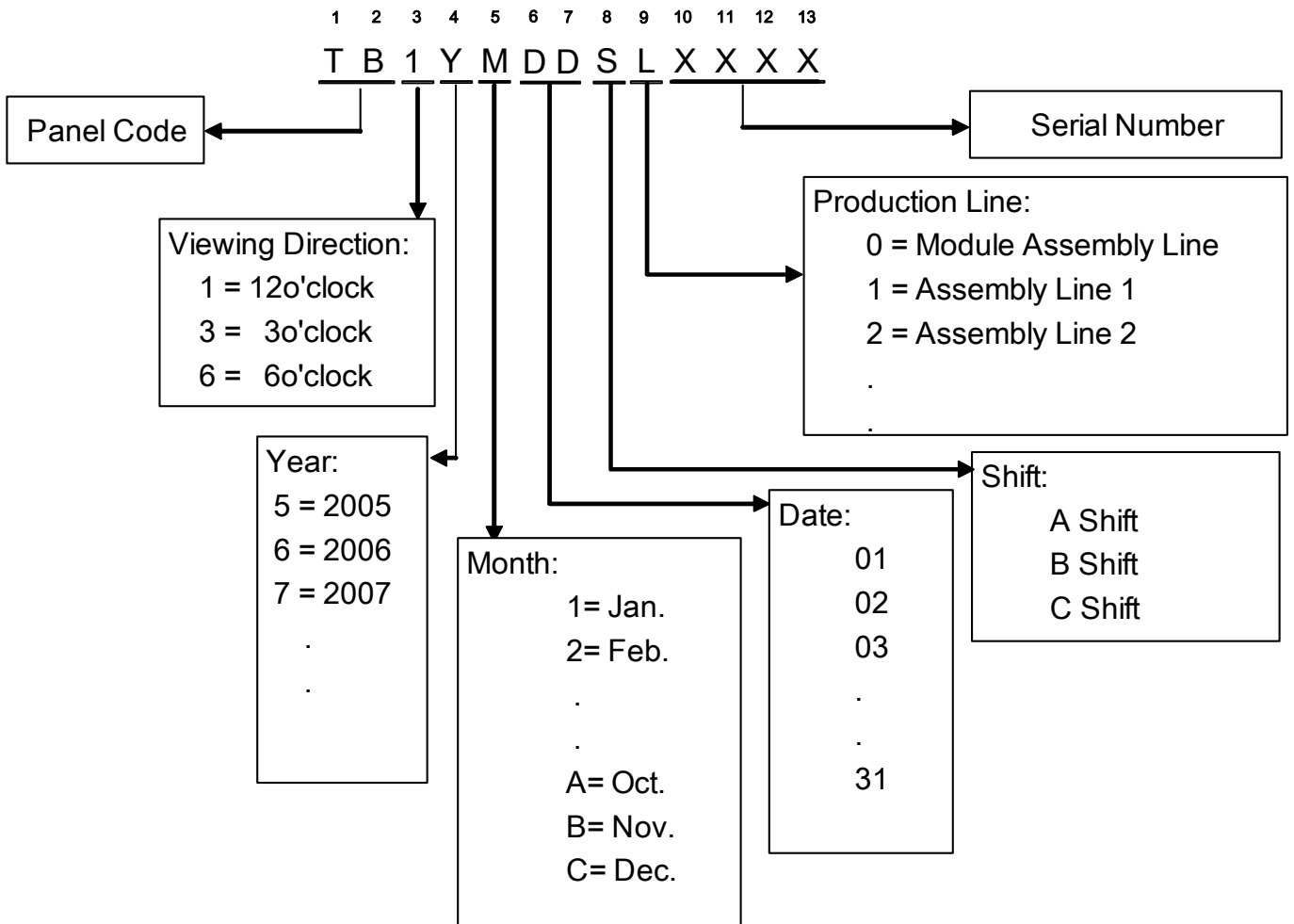
Lot Number on Outer
Carton Box



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10.2 Production Lot Mark of LCD Panel

The production lot of module is specified on the back of panel. The lot mark is consisted of 13-digit number.



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11 RELIABILITY

| No. | Test Items | Test Conditions |
|-----|---|---|
| 1 | High Temperature Storage Test | Ta=80°C , 240 Hrs |
| 2 | Low Temperature Storage Test | Ta=-30°C , 240Hrs |
| 3 | High Temperature and High Humidity Operating Test | Ta=60°C , 90%RH, 240Hrs (No condensation of dew) |
| 4 | High Temperature Operating Test | Ta=70°C , 240Hrs |
| 5 | Low Temperature Operating Test | Ta=-20°C , 240Hrs |
| 6 | Heat Shock Test | Ta=-30°C (0.5H) ~ 80°C (0.5H) / 50 cycles |
| 7 | Electro Static Discharge Test | +200V, 200pF (0Ω), 1 time for each terminal |

- Note: (1) Evaluation should be tested after storage at room temperature for 24 hours.
- (2) There should be no change that might affect the practical display function when the display quality test is conducted under normal operating conditions.
- (3) Judgment:
- a. In the standard condition, there shall be no practical problems that may affect the display function.
 - b. No serious image quality degradation.
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12 PRECAUTIONS

12.1 Handling

- (1) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bend the module.
 - (2) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
 - (3) Note that the polarizer is very fragile and could be easily damaged. Do not press or scratch the surface harder than a B pencil lead.
 - (4) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.
 - (5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
 - (6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Don't use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
 - (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
 - (8) Protect the module from static; it may cause damage to the CMOS Gate Array IC.
 - (9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
 - (10) Do not disassemble the module.
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- (11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (12) Pins of I/F connector shall not be touched directly with bare hands.

12.2 Storage

- (1) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35oC and relative humidity of less than 70%.
- (2) Do not store the TFT-LCD module in direct sunlight.
- (3) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

12.3 Operation

- (1) Do not connect; disconnect the module in the “Power on” condition.
- (2) Power supply should always be turned on/off by the chapter 8 TFT-LCD Driver IC Operation Algorithms.

12.4 Precautions in use of touch panel

- (1) Do not give excessive strain to the product.
 - (2) To prevent giving distortion to the film of the product and peeling off of the film from the product, do not fix the film and a set case or a shock absorbing material adhered to a set case by adhesion.
 - (3) Operate it with a polyacetal pen (tip R0.8 or over) or a belly of a finger without applying excessive load. Never use any mechanical pencils, ball point pens and hard fingertips whose tip is hard for input, otherwise malfunctions may result.
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- (4) The input position may be fluctuated a little through long-time use. It is desirable to provide a zero-adjustment function by using a circuit and software.
- (5) Operation at the out of Active Area is out of our guarantee. It causes a serious damage of a transparent electrode. Do not operate at the out of Active Area.

12.5 Others

- (1) The Liquid crystal is deteriorated by ultra violet, do not leave it in direct sunlight and strong ultraviolet ray for many hours.
 - (2) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
 - (3) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation in part contents and environmental temperature and so on). Otherwise the panel may be damaged.
 - (4) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image" Sticks" to the screen.
 - (5) His panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.
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