

Product Specifications

| | |
|-------------|-------------------|
| Customer | |
| Description | 7" TFT LCD Module |
| Model Name | EK070TN83 V.1 |
| Date | 2010/02/01 |
| Revision | 01 |

| | |
|-------------------|--|
| Customer Approval | |
| | |
| Date | |

| Engineering | | | |
|-------------|------|----------|------|
| Check | Date | Prepared | Date |
| | | | |

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RECORD OF REVISIONS

| Revision | Date | Page | Description |
|----------|------------|------|--------------|
| 01 | 2009/09/12 | all | New Creation |
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1. SUMMARY

This technical specification applies to 7" TFT-LCD module with a LED Backlight unit and a 40-pin TTL interface. This module supports 800*R.G.B x 480 WVGA mode and can display 262,144 colors.

2. FEATURES

- Thin and Light Weight.
- WVGA(800x480 pixels) resolution.
- 3.3 V TTL interface

3. GENERAL SPECIFICATIONS

| Parameter | | Specifications | Unit |
|---------------------------------------|-----------|------------------------------|------|
| Screen size | | 7"(Diagonal) | inch |
| Display Format | | 800 RGB x 480 | dot |
| Active area | | 152.4x91.44 | mm |
| Pixel size | | 190.5 x 190.5 | um |
| Surface treatment | | Anti-glare | |
| Color Saturation (NTSC) | | 45 | % |
| Pixel Configuration | | RGB Vertical Stripe | |
| Outline dimension | | 165(W) x 104.44(H) x 5.2 (D) | mm |
| Weight | | TBD | g |
| View Angle direction (Gray inversion) | | 6 o'clock | |
| Temperature Range | Operation | -20~70 | °C |
| | Storage | -30~80 | °C |

4. ABSOLUTE MAXIMUM RATINGS (GND=0V)

| Item | Symbol | Condition | Min. | Max. | Unit | Remark |
|---------------------|--------|-----------|------|---------|------|--------|
| Power Voltage | Vcc | GND=0 | -0.3 | 6 | V | - |
| Input logic voltage | Vi | GND=0 | -0.3 | Vcc+0.3 | V | Note 1 |

Note 1: DCLK, DE, R0~ R5, G0~ G5, B0~ B5.

5. ELECTRICAL CHARACTERISTICS

5.1 Recommended Operation condition (GND=0V , Ta=25°C)

| Parameter | Symbol | Rating | | | Unit | Condition | |
|----------------------|-----------------|-----------------|--------------------|------|--------------------|-----------|--------|
| | | Min. | Typ. | Max. | | | |
| Power Supply Voltage | V _{cc} | 3.0 | 3.3 | 3.6 | V | | |
| Input logic voltage | High Level | V _{IH} | 0.7V _{cc} | - | V _{cc} | V | Note 1 |
| | Low Level | V _{IL} | 0 | - | 0.3V _{cc} | V | Note 1 |

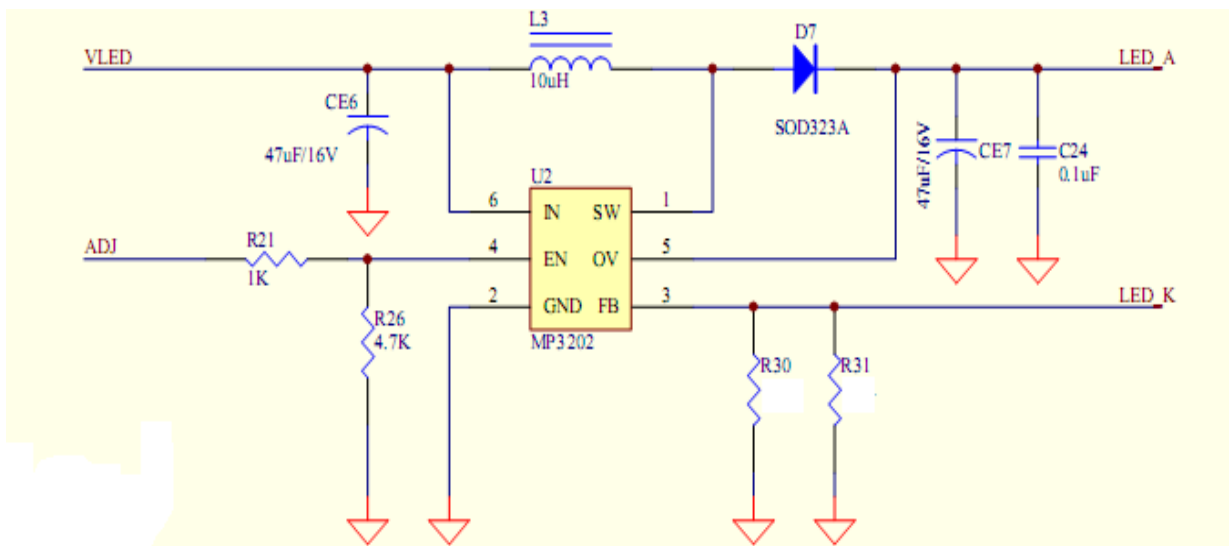
Note 1: DCLK, DE, R0~ R5, G0~ G5, B0~ B5.

5.2 LED Driving Conditions

Ta = 25°C

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---------------|------------------|--------|--------|------|------|--------|
| LED current | I _{LED} | - | 500 | 550 | mA | Note 1 |
| LED voltage | V _{LED} | 4.8 | 5.0 | 5.2 | V | |
| LED Life Time | - | 10,000 | 20,000 | - | Hr | |

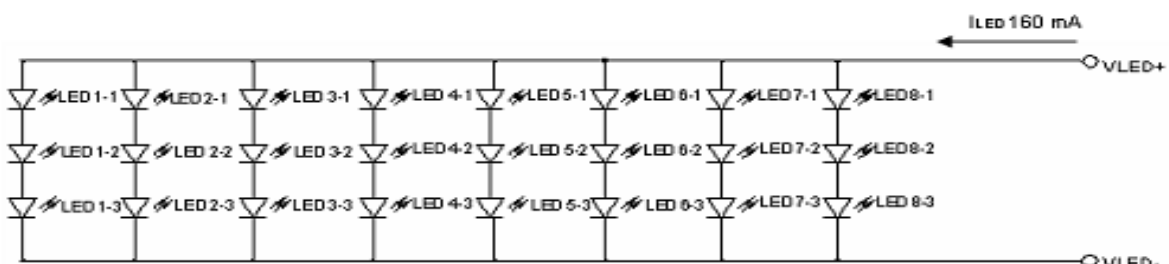
Note 1: Comes With Backlight Driver



5.3 TFT-LCD current consumption

| Parameter | Symbol | Rating | | | Unit | Condition |
|-------------------|------------------|--------|------|------|------|---------------|
| | | Min. | Typ. | Max. | | |
| LCD power current | I _{cc} | -- | 200 | 260 | mA | black pattern |
| LED power current | I _{LED} | -- | 160 | 200 | mA | Note 1 |

Note 1: Backlight Current



6. AC CHARACTERISTICS

6.1 AC Electrical CHARACTERISTICS

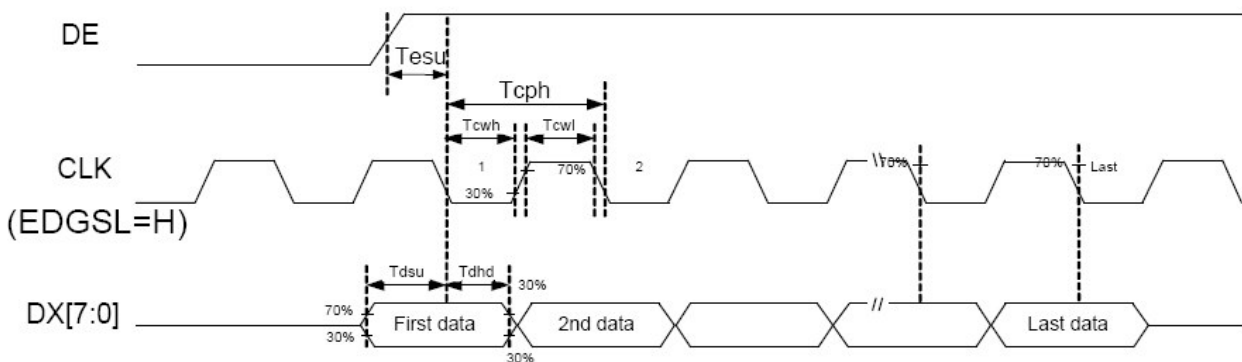
Frame rate range : 60Hz~65Hz

| Parameter | Symbol | Rating | | | Unit |
|-------------------|------------------------------------|--------|-------|-------|------------------------------------|
| | | Min. | Typ. | Max. | |
| Data setup time | Tdsu | 6 | - | - | ns |
| Data hold time | Tdhd | 6 | - | - | ns |
| DE setup time | Tesu | 6 | - | - | ns |
| CLK frequency | F _{CPH} | 29.40 | 33.26 | 42.48 | MHz |
| CLK period | T _{CPH} | 23.54 | 30.06 | 34.01 | ns |
| CLK pulse duty | T _{CWH} | 40 | 50 | 60 | % |
| CLK pulse duty | T _{CWL} | 40 | 50 | 60 | % |
| DE period | T _{DEH} +T _{DEL} | 1000 | 1056 | 1200 | T _{CPH} |
| DE pulse width | T _{DEH} | - | 800 | - | T _{CPH} |
| DE frame blanking | T _{DEB} | 10 | 45 | 110 | T _{DEH} +T _{DEL} |
| DE frame width | T _{DE} | - | 480 | - | T _{DEH} +T _{DEL} |

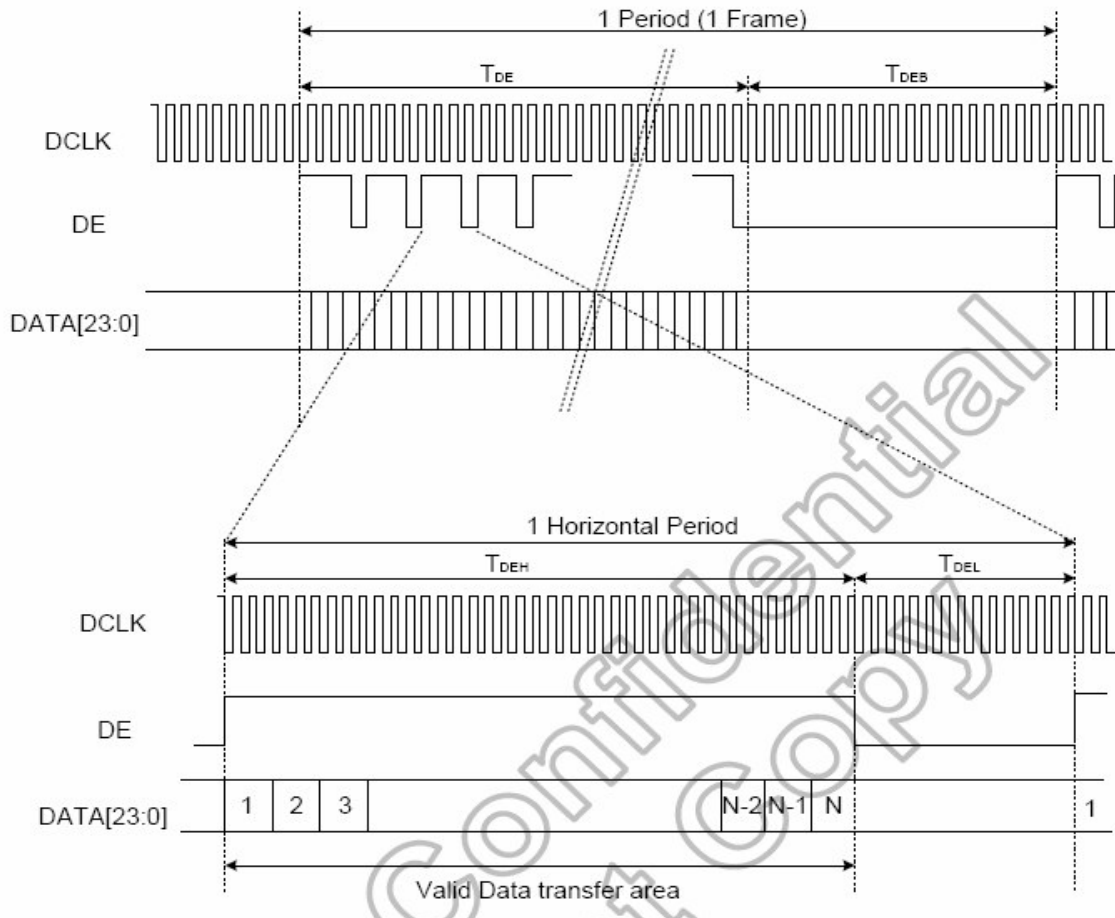
Note : We suggest using the typical value, so it can have better performance.

6.2 Timing Controller Timing Chart

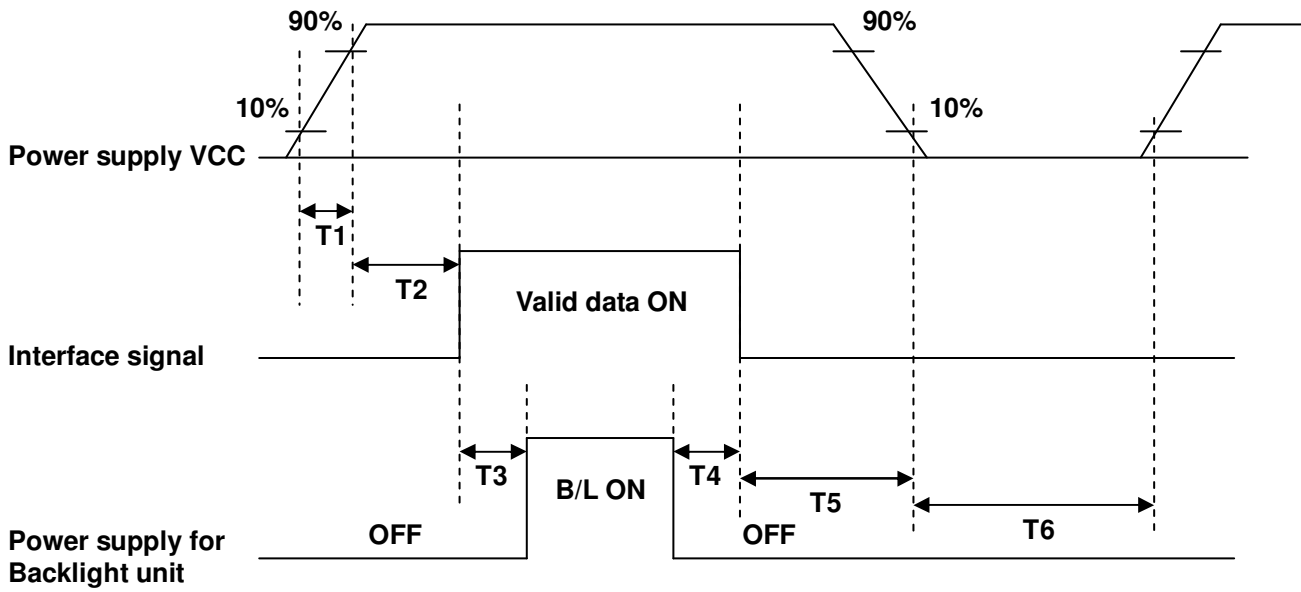
Clock and Data input waveforms



6.3 Data input format



6.4 Power ON/OFF sequence



| Parameter | SPEC. | | | Unit |
|-----------|-------|------|------|------|
| | Min. | Typ. | Max. | |
| T1 | 1 | | 2 | ms |
| T2 | 0 | 60 | | ms |
| T3 | 200 | | | ms |
| T4 | 200 | | | ms |
| T5 | 1 | | | ms |
| T6 | 1000 | | | ms |

7. OPTICAL CHARACTERISTIC

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|--------------------|--------|--|-------|-------|-------|-------------------|-------------------|
| Brightness | - | Viewing normal angle $\theta = \phi = 0$ | 300 | 350 | - | cd/m ² | Center of display |
| Response time | Tr | | - | 5 | 10 | .ms | Note 3,5 |
| | Tf | | - | 11 | 16 | .ms | |
| Contrast ratio | CR | | 250 | 400 | - | - | Note 4,5 |
| Color Chromaticity | White | Wx | 0.249 | 0.299 | 0.349 | - | Note 2,6,7 |
| | | Wy | 0.278 | 0.328 | 0.378 | | |
| Viewing angle | Hor. | θR | 60 | 70 | - | Deg. | Note 1 |
| | | θL | 60 | 70 | - | | |
| | Ver. | ϕT | 50 | 60 | - | | |
| | | ϕB | 60 | 70 | - | | |

Note 1: Definition of viewing angle range

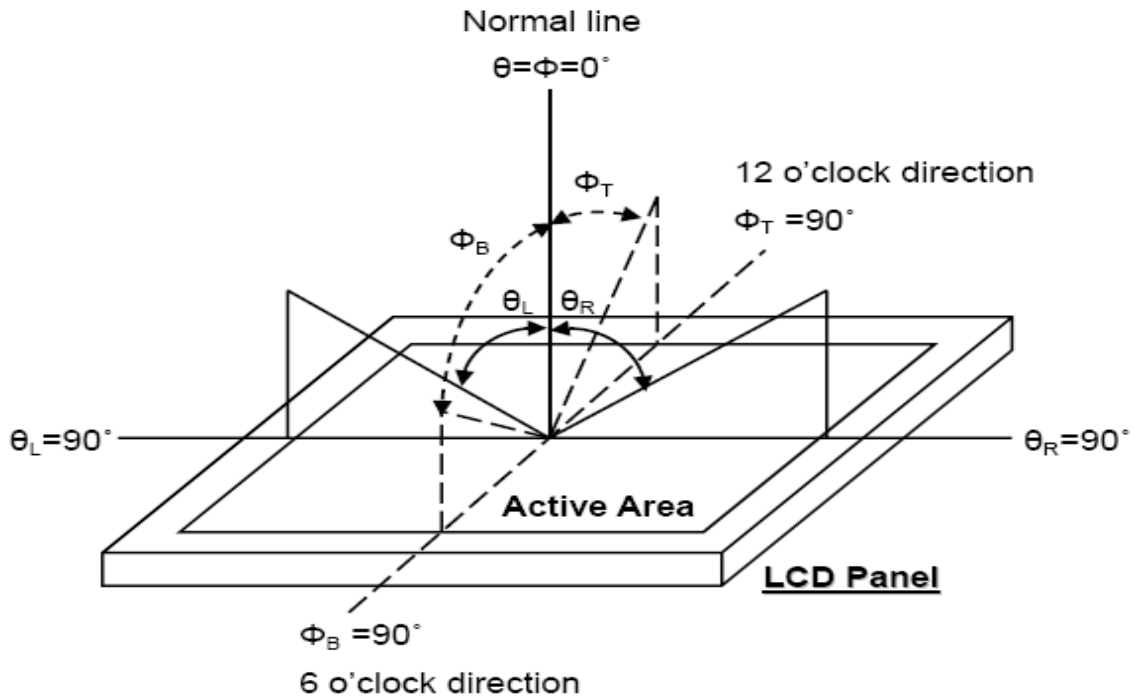


Fig. 7-1 Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

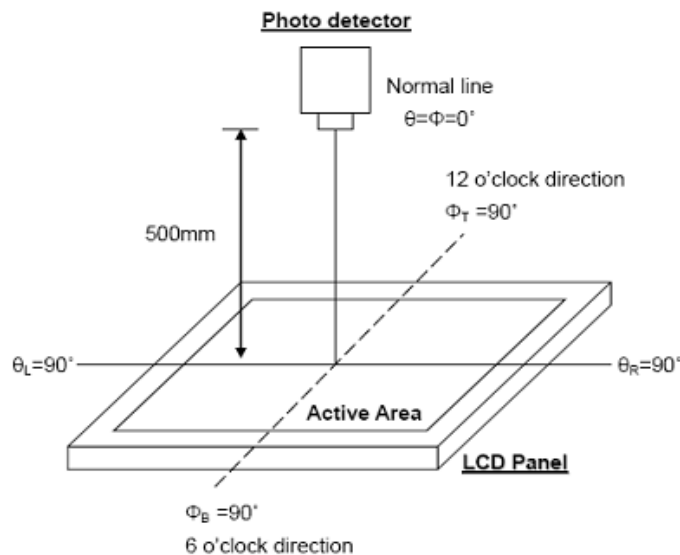


Fig.7-2 Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White state and “Black” state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10% . And fall time, T_f , is the time between photo detector output Intensity changed from 10% to 90% .

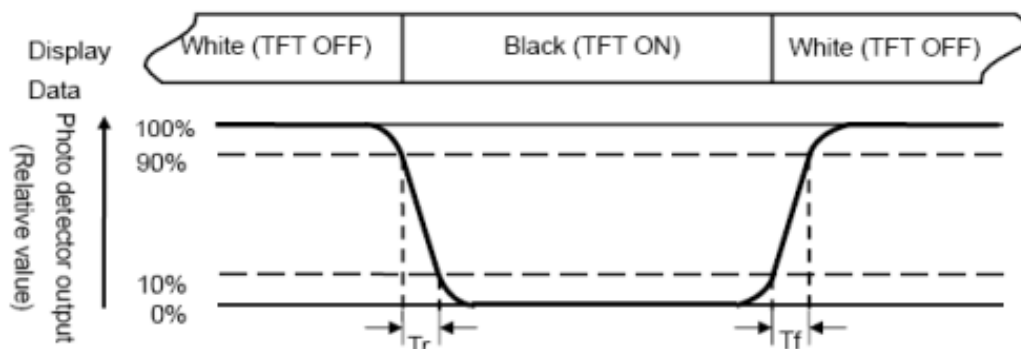


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

"±" means that the analog input signal swings in phase with VCOM signal.

"±" means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

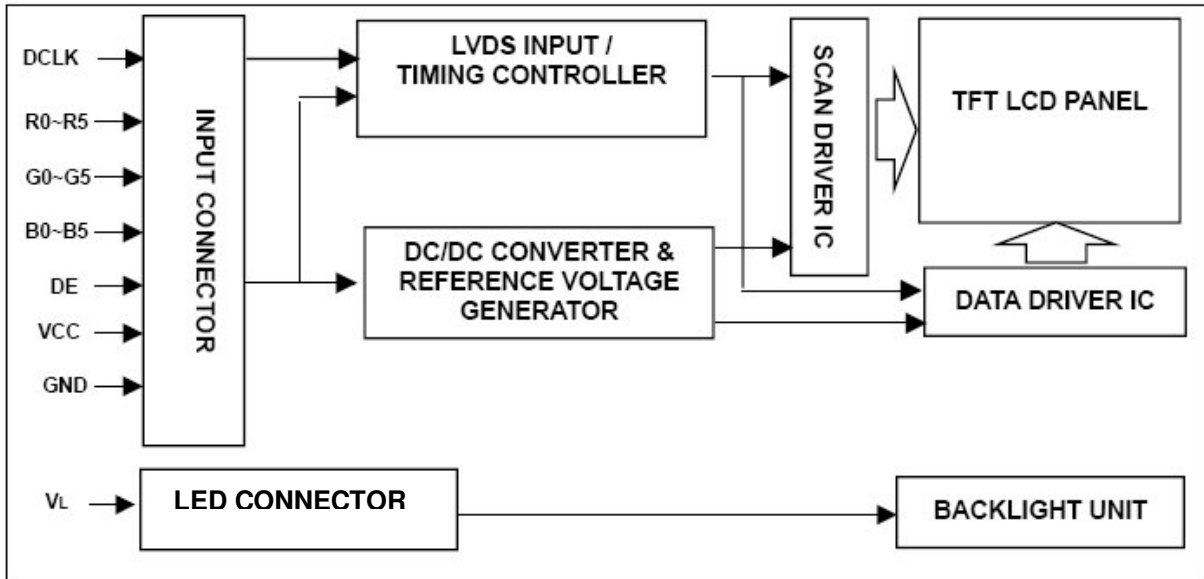
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

$$\text{Note 8 : Uniformity (U)} = \frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$$

8. INTERFACE

| Pin No. | Symbol | Description | Remark |
|---------|--------|--|--------|
| 1 | VLED | Power Voltage For LED Driver | |
| 2 | VLED | Power Voltage For LED Driver | |
| 3 | ADJ | Adjust The LED Brightness With PWM Pulse | |
| 4 | GLED | Ground For Circuit | |
| 5 | GLED | Ground For Circuit | |
| 6 | VDD | Power Supply for Digital Circuit | |
| 7 | VDD | Power Supply for Digital Circuit | |
| 8 | MODE | NC | |
| 9 | DE | Data Enable | |
| 10 | VS | NC | |
| 11 | HS | NC | |
| 12 | GND | Power Ground | |
| 13 | B5 | Blue Data 5 (MSB) | |
| 14 | B4 | Blue Data 4 | |
| 15 | B3 | Blue Data 3 | |
| 16 | GND | Power Ground | |
| 17 | B2 | Blue Data 2 | |
| 18 | B1 | Blue Data 1 | |
| 19 | B0 | Blue Data 0 (LSB) | |
| 20 | GND | Power Ground | |
| 21 | G5 | Green Data 5 (MSB) | |
| 22 | G4 | Green Data 4 | |
| 23 | G3 | Green Data 3 | |
| 24 | GND | Power Ground | |
| 25 | G2 | Green Data 2 | |
| 26 | G1 | Green Data 1 | |
| 27 | G0 | Green Data 0 (LSB) | |
| 28 | GND | Power Ground | |
| 29 | R5 | Red Data 5 (MSB) | |
| 30 | R4 | Red Data 4 | |
| 31 | R3 | Red Data 3 | |
| 32 | GND | Power Ground | |
| 33 | R2 | Red Data 2 | |
| 34 | R1 | Red Data 1 | |
| 35 | R0 | Red Data 0 (LSB) | |
| 36 | GND | Power Ground | |
| 37 | DCLK | Clock Signals | |
| 38 | GND | Power Ground | |
| 39 | L/R | NC | |
| 40 | U/D | NC | |

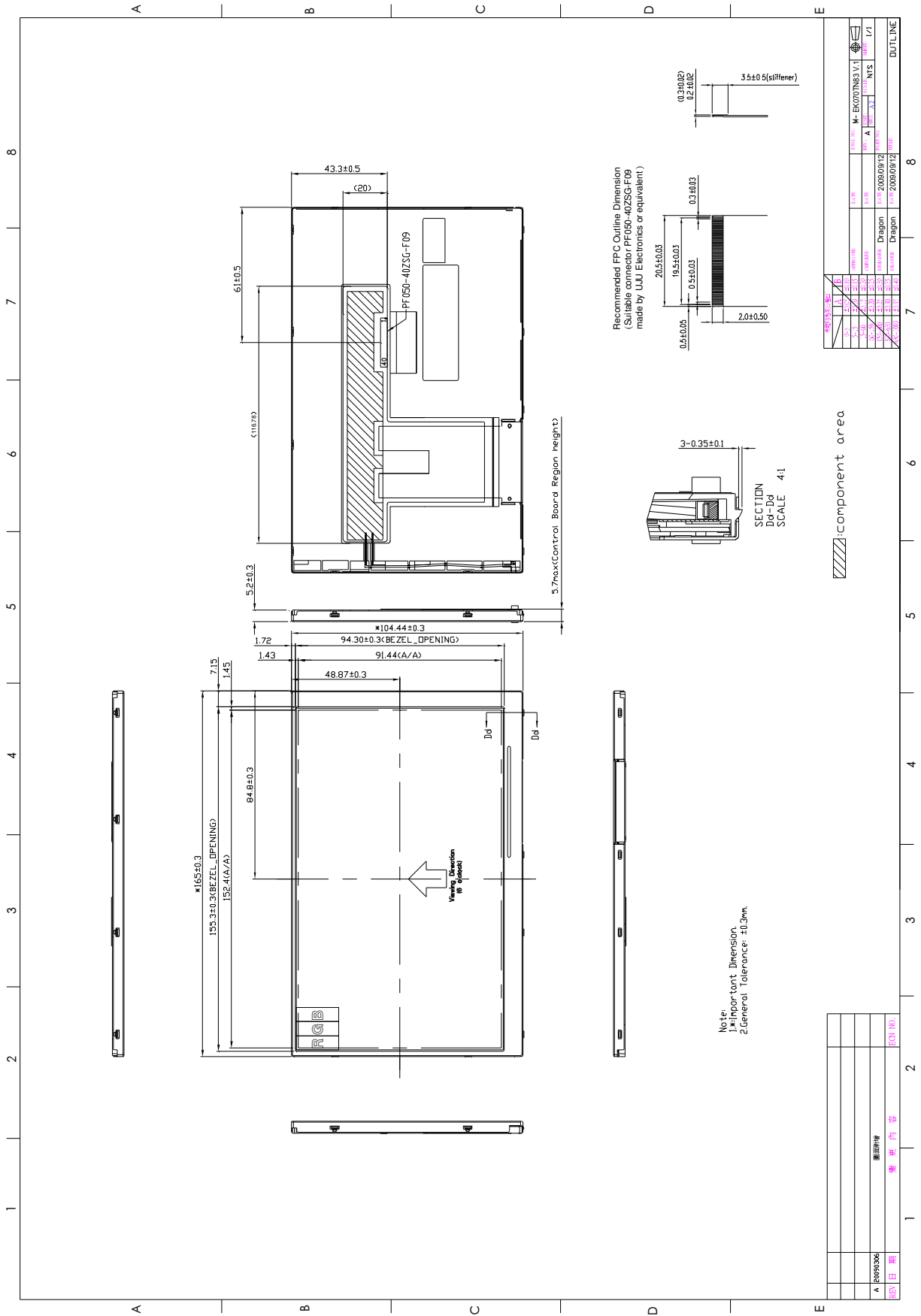
9. BLOCK DIAGRAM



10. QUALITY ASSURANCE

| No. | Test Items | Test Condition | REMARK |
|-----|---|---|--------|
| 1 | High Temperature Storage Test | Ta=80°C Dry 240h | |
| 2 | Low Temperature Storage Test | Ta=-30°C Dry 240h | |
| 3 | High Temperature Operation Test | Ta=70°C Dry 240h | |
| 4 | Low Temperature Operation Test | Ta=-20°C Dry 240h | |
| 5 | High Temperature and High Humidity Operation Test | Ta=60°C 90%RH 240h | |
| 6 | Electro Static Discharge Test | 150pF, 330Ω , ±8KV(Contact)/±15KV(Air), 5 points/panel, 5 times/point | |
| 7 | Shock Test (non-operating) | Half sine wave, 180G, 2ms one shock of each six faces (I.e. run 180G 2ms for all six faces) | |
| 8 | Vibration Test (non-operating) | Sine wave, 10 ~ 500 ~ 10Hz, 1.5G, 0.37oct/min 3 axis, 1hour/axis | |
| 9 | Thermal Shock Test | -20°C(0.5h) ~ 70°C(0.5h) / 100 cycles(Dry) | |

***** Ta= Ambient Temperature



| | | | | | |
|-----|----------|--------|-----|-----|-------------|
| REV | DATE | BY | CHK | APP | DESCRIPTION |
| 1 | 20080912 | Dragon | | | Outline |
| 2 | 20080912 | Dragon | | | Outline |

| | | | | | |
|-----|----------|--------|-----|-----|-------------|
| REV | DATE | BY | CHK | APP | DESCRIPTION |
| 1 | 20080912 | Dragon | | | Outline |
| 2 | 20080912 | Dragon | | | Outline |

| | | | | | |
|-----|----------|--------|-----|-----|-------------|
| REV | DATE | BY | CHK | APP | DESCRIPTION |
| 1 | 20080912 | Dragon | | | Outline |
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|-----|----------|--------|-----|-----|-------------|
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| 1 | 20080912 | Dragon | | | Outline |
| 2 | 20080912 | Dragon | | | Outline |

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|-----|----------|--------|-----|-----|-------------|
| REV | DATE | BY | CHK | APP | DESCRIPTION |
| 1 | 20080912 | Dragon | | | Outline |
| 2 | 20080912 | Dragon | | | Outline |

| | | | | | |
|-----|----------|--------|-----|-----|-------------|
| REV | DATE | BY | CHK | APP | DESCRIPTION |
| 1 | 20080912 | Dragon | | | Outline |
| 2 | 20080912 | Dragon | | | Outline |

12. PRECAUTIONS

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

12.1 MOUNTING PRECAUTIONS

- (1) You must mount a module using 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 force is 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 the resist external force.
- (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 describe 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 are determined to the polarizer)
- (7) When the surface becomes dusty, please wipe gently with adsorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
- (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.

12.2 OPERATING PRECAUTIONS

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage : $V = \pm 200\text{mV}$ (Over and under shoot voltage)
- (2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- (3) Brightness depends on the temperature. (In lower temperature, it becomes lower)
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
- (4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (6) 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.

12.3 ELECTROSTATIC DISCHARGE CONTROL

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

12.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

12.5 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.

12.6 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 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. 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 normal-hexane.