

DISPLAY Elektronik GmbH

DATA SHEET

TFT MODULE

DEM 320240A1 TMH-PW-N

3,5" TFT

Product Specification

Version: 2

16-Dec-16

GENERAL SPECIFICATION

MODULE NO. :

DEM 320240A1 TMH-PW-N

CUSTOMER

| VERSION NO. | CHANGE DESCRIPTION | DATE |
|-------------|--|------------|
| 0 | ORIGINAL VERSION | 19.10.2016 |
| 1 | CHANGE VIEWING DIRECTION FROM 6:00 O'CLOCK TO 12:00 O'CLOCK | 01.12.2016 |
| 2 | CHANGE EXTERNAL DIMENSIONS | 16.12.2016 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

PREPARED BY: ZX

DATE: 16.12.2016

APPROVEDBY: MHO

DATE: 16.12.2016

CONTENTS

1. GENERAL SPECIFICATIONS 2

2. EXTERNAL DIMENSIONS..... 3

3. BLOCK DIAGRAM 4

4. PIN ASSIGNMENT 5

5. OPTICAL CHARACTERISTICS..... 6

6. ABSOLUTE MAXIMUM RATINGS..... 9

7. ELECTRICAL CHARACTERISTICS..... 9

8. TIMING CHARACTERISTICS 10

9. RELIABILITY TEST.....11

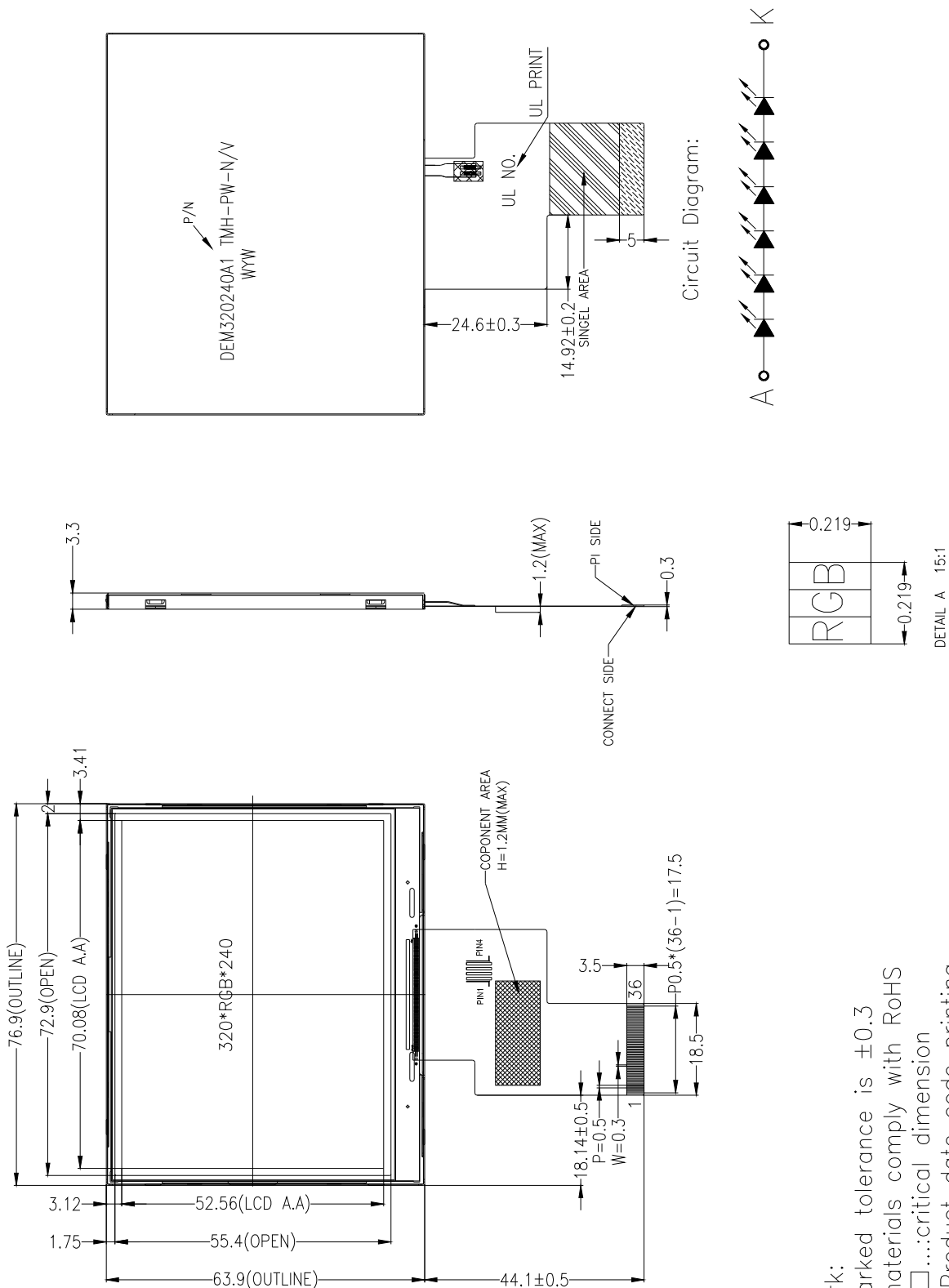
10. LCD MODULES HANDLING PRECAUTIONS 13

11. OTHERS..... 13

1. GENERAL SPECIFICATIONS

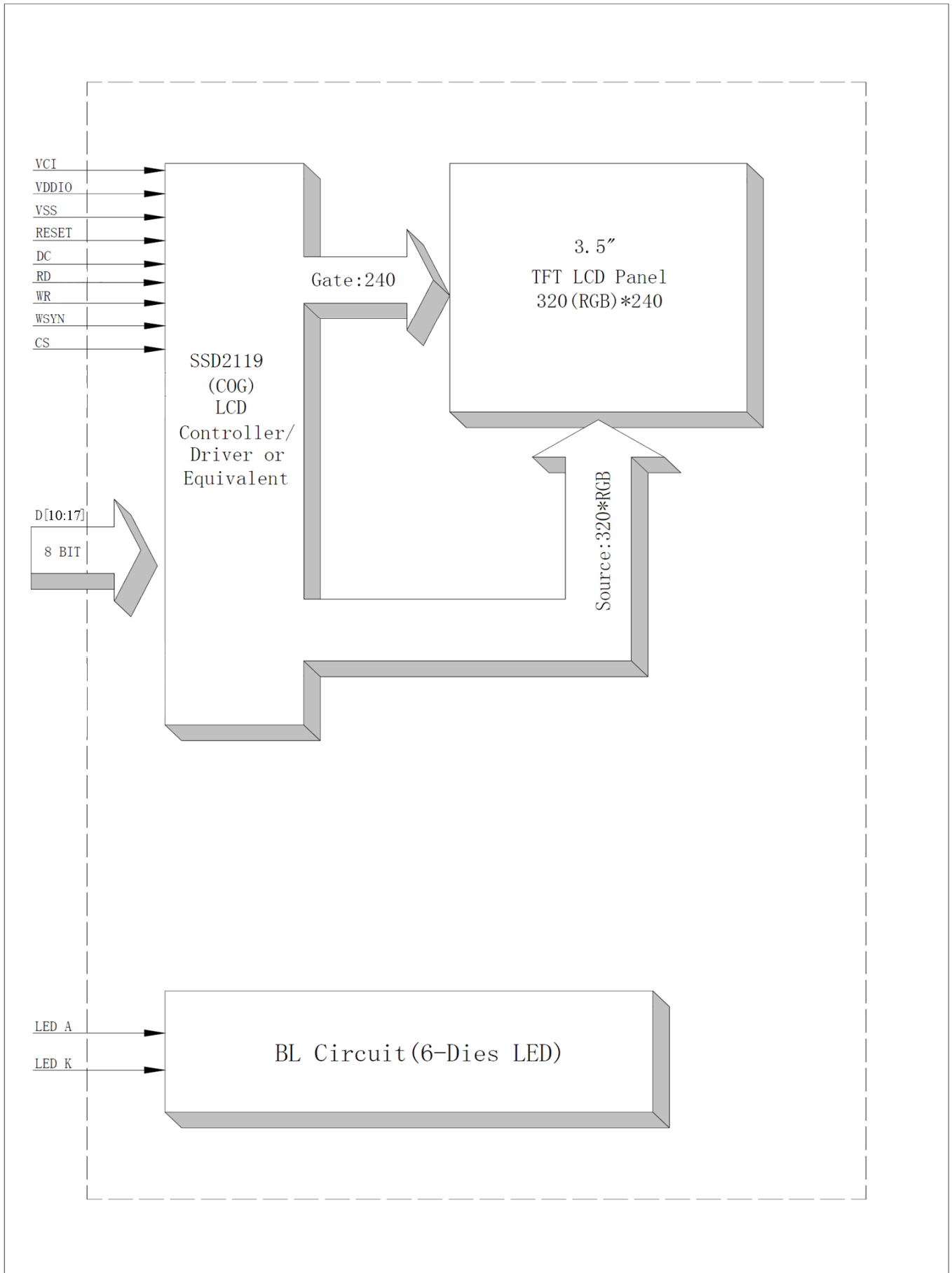
| Item | Contents | Unit |
|--------------------------------|----------------------|-------------|
| LCD TYPE | TFT / TRANSMISSIVE | - |
| MODULE SIZE | 76.90 x 63.90 x 3.30 | mm |
| ACTIVE SIZE | 70.08 x 52.56 | mm |
| PIXEL PITCH | 0.219 x 0.219 | mm |
| NUMBER OF DOTS | 320 x RGB x 240 | - |
| DIVER IC | SSD2119 | - |
| INTERFACE TYPE | 8 Bit MCU | - |
| TOP POLARIZER TYPE | ANTI-GLARE | - |
| RECOMMEND VIEWING DIRECTION | 12:00 | O'CLOCK |
| GRAY SCALE INVERSION DIRECTION | 6:00 | O'CLOCK |
| COLORS | 262K | - |
| BACKLIGHT TYPE | 6-DIES WHITE LED | - |
| TOUCH PANEL TYPE | NO TOUCH | - |

2. EXTERNAL DIMENSIONS



Remark:
 1. Unmarked tolerance is ±0.3
 2. All materials comply with RoHS
 3. [] ...:critical dimension
 4. WYW:Product date code printing
 Format: Y:year ,WW:week

3. BLOCK DIAGRAM



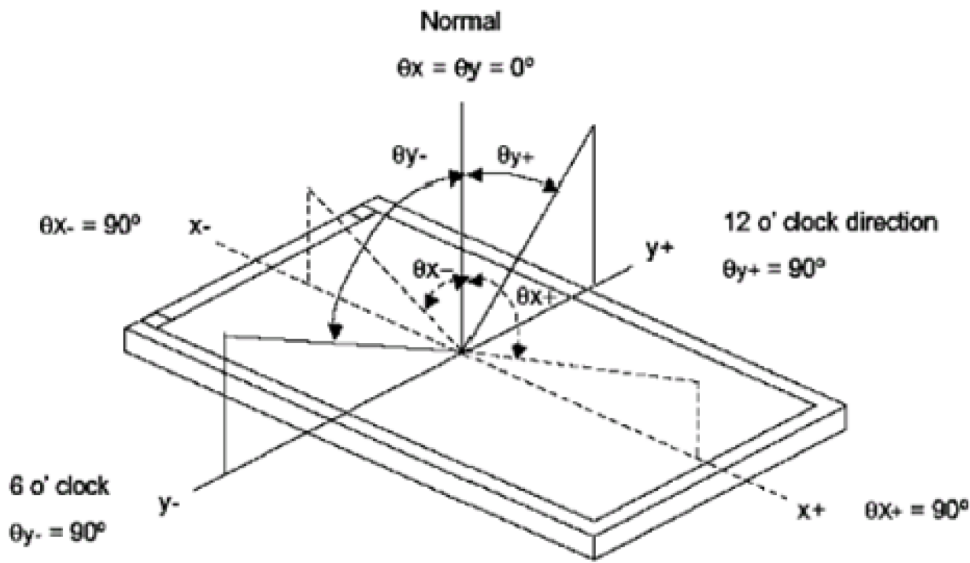
4. PIN ASSIGNMENT

| NO. | SYMBOL | DESCRIPTION | I/O |
|-------|-----------|--|-----|
| 1 | LED_A | Anode of LED Backlight | P |
| 2 | LED_K | Cathode of LED Backlight | P |
| 3 | VDDIO | Voltage input pin for logic I/O | P |
| 4 | NC | No Connect | I |
| 5 | NC | No Connect | I |
| 6 | NC | No Connect | I |
| 7 | NC | No Connect | I |
| 8 | NC | No Connect | I |
| 9 | NC | No Connect | I |
| 10 | NC | No Connect | I |
| 11 | NC | No Connect | I |
| 12 | NC | No Connect | I |
| 13 | NC | No Connect | I |
| 14~21 | DB10~DB17 | Data Bus | I |
| 22 | WSYN | Ram Write Synchronization output-Leave it OPEN when not used | I |
| 23 | GND | Ground | P |
| 24 | /CS | Chip select pin | I |
| 25 | /WR | Write strobe signal | I |
| 26 | /RD | Read strobe signal | I |
| 27 | DC | A register select signal | I |
| 28 | /RESET | System reset pin | I |
| 29 | VDDIO | Voltage input pin for logic I/O | P |
| 30 | VCI | Power supply for analog | P |
| 31 | NC(XL) | No connect(Touch panel XL) | I |
| 32 | NC(YD) | No connect(Touch panel YD) | I |
| 33 | NC(XR) | No connect(Touch panel XR) | I |
| 34 | NC(YU) | No connect(Touch panel YU) | I |
| 35 | GND | Ground | P |
| 36 | GND | Ground | P |

5. OPTICAL CHARACTERISTICS

| Item | Symbol | Conditions | Specifications | | | Unit | Note | |
|-----------------------|--------|------------------|----------------------|------|-------|-------------------|--------|---|
| | | | Min | Typ. | Max | | | |
| Luminance | L | $I=20\text{mA}$ | - | 450 | - | Cd/m ² | - | |
| Contrast Ratio | CR | $\theta=0^\circ$ | 150 | 300 | - | - | - | |
| Response Time | Ton | 25°C | - | 35 | 50 | ms | - | |
| | Toff | | | | | | | |
| CIE Colour Coordinate | RED | XR | Viewing normal angle | - | - | - | - | - |
| | | YR | | - | - | - | - | - |
| | GREEN | XG | | - | - | - | - | - |
| | | YG | | - | - | - | - | - |
| | BLUE | XB | | - | - | - | - | - |
| | | YB | | - | - | - | - | - |
| | WHITE | XW | | - | 0.330 | - | - | - |
| | | YW | | - | 0.350 | - | - | - |
| Viewing Angle | Hor. | θ_{x+} | $CR \geq 10$ | - | 60 | - | Degree | - |
| | | θ_{x-} | | - | 60 | - | | - |
| | Ver. | θ_{y+} | | - | 50 | - | | - |
| | | θ_{y-} | | - | 60 | - | | - |
| Uniformity | Un | - | - | 80 | 85 | - | % | - |

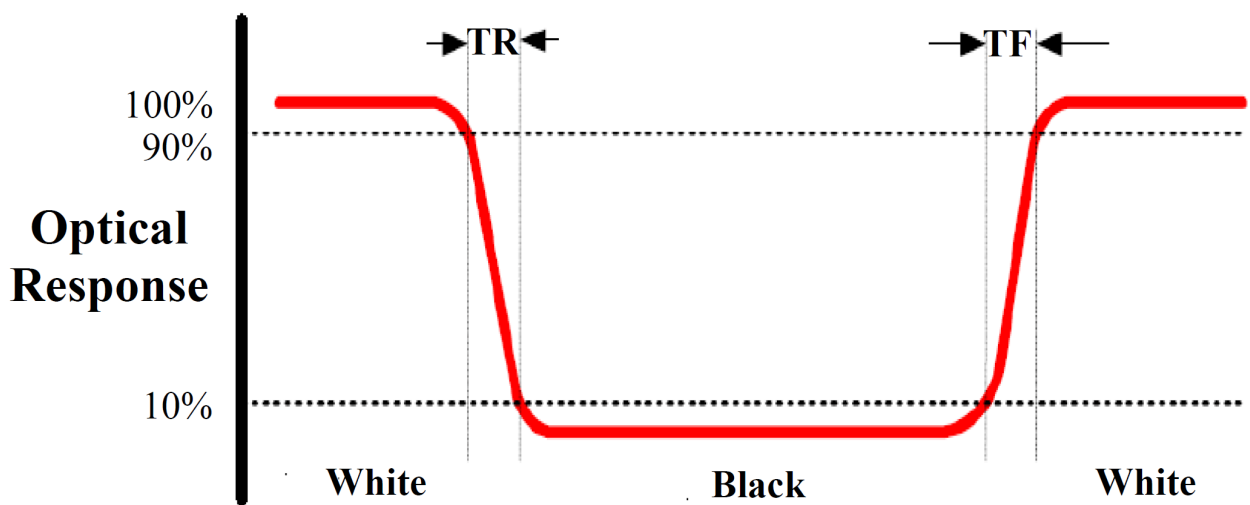
Note 1: Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

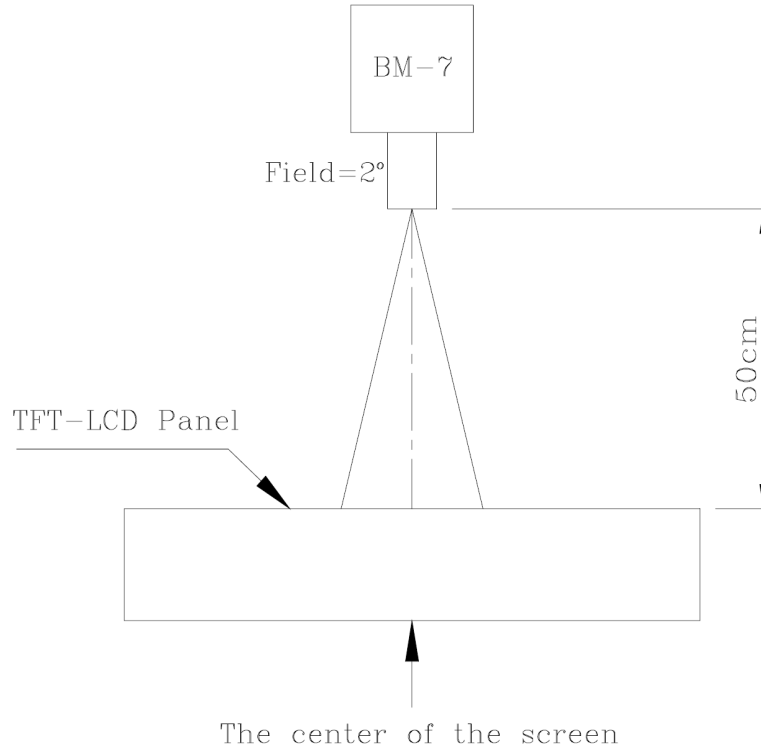
Note 3: Definition of Response Time (T_r, T_f)



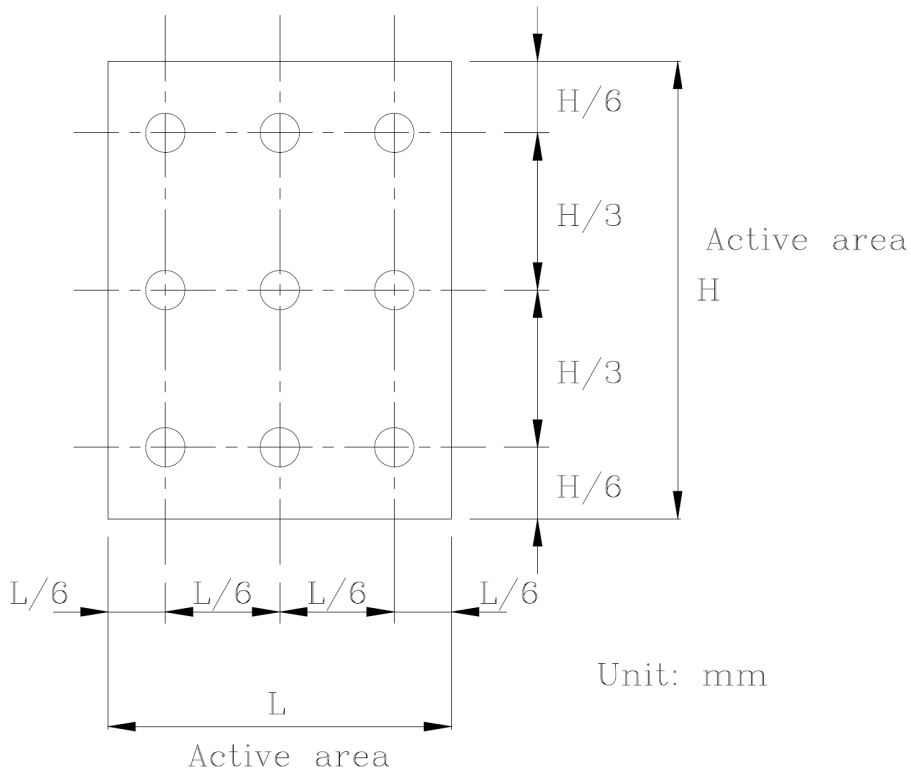
Note 4: Definition of Luminance

① The Brightness Test Equipment Setup

Field=2° (As measuring “black” image, field=2° is the best testing condition)



② The Brightness Test Point Setup



6. ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | MIN | Max | Unit |
|---------------------------|------------------|------|-----|------|
| Supply Voltage for Analog | VCI | -0.3 | 4.5 | V |
| Supply Voltage for Logic | VDDIO | -0.3 | 4.5 | V |
| Supply Current (one LED) | I _{LED} | - | 30 | mA |
| Operating Temperature | T _{OP} | -20 | +70 | °C |
| Storage Temperature | T _{ST} | -30 | +80 | °C |

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

7. ELECTRICAL CHARACTERISTICS

7.1 Electrical Characteristics

| Item | Symbol | Min | Typ. | Max | Unit |
|---------------------------|------------------|--------|------|--------|------|
| Supply Voltage for Analog | VCI | 3.0 | 3.3 | 3.6 | V |
| Supply Voltage for Logic | VDDIO | 3.0 | 3.3 | 3.6 | V |
| Input Voltage | V _{IL} | GND | - | 0.3VCI | V |
| | V _{IH} | 0.7VCI | - | VCI | V |
| Input Leakage Current | I _{IKG} | -1 | - | 1 | μA |

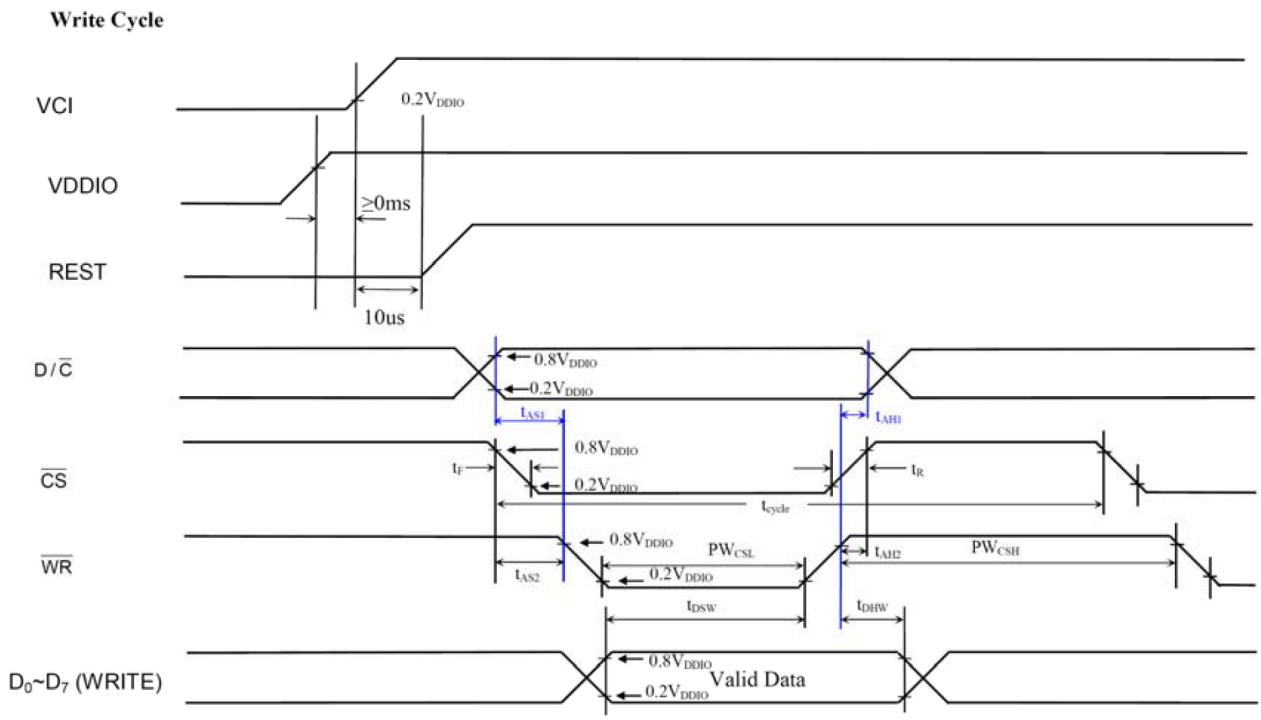
7.2 Backlight Driving Conditions

| Item | Symbol | Specifications | | | Unit | Remark |
|---------------------------|----------------|----------------|--------|-----|------|----------------------|
| | | Min | Typ. | Max | | |
| Voltage for LED Backlight | V _F | - | 19.2 | - | V | I _L =20mA |
| Current for LED Backlight | I _L | - | 20 | 30 | mA | - |
| Power Consumption | P | - | 0.384 | - | W | - |
| Led Lifetime | - | 30,000 | 50,000 | - | Hr | Note |

Note: brightness to be decreased to 50% of the initial value at ambient temperature T_A=25°C

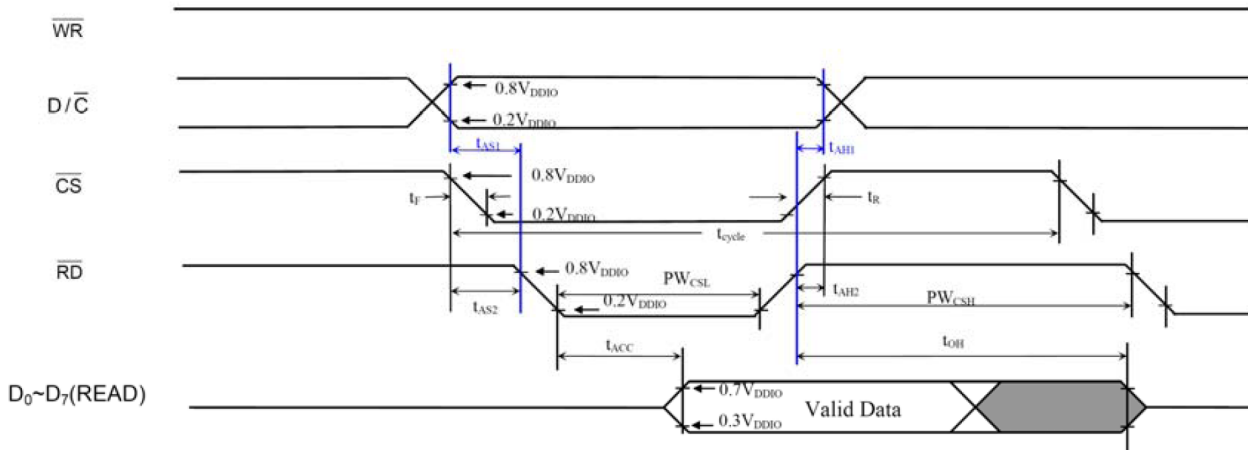
8. TIMING CHARACTERISTICS

MCU mode Timing Diagram



Remark: It's highly recommended that \overline{RD} remains high for the whole write cycle

Read Cycle



| Symbol | Parameter | Min | Typ | Max | Unit |
|--------------------|---|-----|-----|-----|------|
| t _{cycle} | Clock Cycle Time (write cycle) | 75 | - | - | ns |
| t _{cycle} | Clock Cycle Time (read cycle) (Based on VOL/VOH = 0.3*VDDIO/0.7*VDDIO) | 450 | - | - | ns |
| t _{AS1} | Address Setup Time between (R/ \overline{W}) and D/ \overline{C} | 0 | - | - | ns |
| t _{AH1} | Address Hold Time between (R/ \overline{W}) and D/ \overline{C} | 0 | - | - | ns |
| t _{AS2} | Address Setup Time between (R/ \overline{W}) and \overline{CS} | 0 | - | - | ns |
| t _{AH2} | Address Hold Time between (R/ \overline{W}) and \overline{CS} | 0 | - | - | ns |
| t _{DSW} | Data Setup Time (D0~D7, WRITE) | 5 | - | - | ns |
| t _{DHW} | Data Hold Time (D0~D7, WRITE) | 5 | - | - | ns |
| t _{ACC} | Data Access Time (D0~D7, READ) | 250 | - | - | ns |
| t _{OH} | Output Hold time (D0~D7, READ) | 100 | - | - | ns |
| PW _{CSL} | Pulse width /CS low (write cycle) | 40 | - | - | ns |
| PW _{CSH} | Pulse width /CS high (write cycle) | 25 | - | - | ns |
| PW _{CSL} | Pulse width /CS low (read cycle) | 500 | - | - | ns |
| PW _{CSH} | Pulse width /CS high (read cycle) | 500 | - | - | ns |
| t _R | Rise time | - | - | 4 | ns |
| t _F | Fall time | - | - | 4 | ns |

9. RELIABILITY TEST

9.1 Standard Specification for Reliability of LCD Module

| No. | Test Item | Description |
|-----|-----------------------------|---|
| 1 | High Temperature Operation | The sample should be allowed to stand at 70°C for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 2 | Low Temperature Operation | The sample should be allowed to stand at -20°C for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 3 | High Temperature Storage | The sample should be allowed to stand at 80°C for 120 hours under no-load condition and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 4 | Low Temperature Storage | The sample should be allowed to stand at -30°C for 120 hours under no-load condition and then returning it to normal temperature condition, and allowing it stand for 2 hours. |
| 5 | Moisture Storage | The sample should be allowed to stand at 60°C, 90%RH MAX for 240 hours under no-load condition, then taking it out and drying it at normal temperature for 2 hours. |
| 6 | Thermal Shock Storage | The sample should be allowed to stand the following 10 cycles: -30°C for 30 minutes → normal temperature for 5 minutes → +80°C for 30 minutes → normal temperature for 5 minutes, as one cycle. |
| 7 | Packing Vibration | Frequency range:10HZ~55HZ Amplitude of vibration:1.5mm Sweep time:12min X, Y, Z 2 hours for each direction. |
| 8 | Packing Drop | According to ASTM-D-5327 |
| 9 | Electrical static Discharge | Air: ±4KV 150Pf/330Ω 5 times Contact: ±2KV 150Pf/330Ω 5 times |

*sample size for each test item is 3-5pcs

9.2 Testing Conditions and Inspection Criteria

For the final test, the testing sample must be stored at room temperature for 24 hours. After the tests listed in table 9.2, standard specifications for reliability will be executed in order to ensure stability.

| No. | Item | Test model | In section Criteria |
|-----|---------------------|------------------------|--|
| 1 | current consumption | Refer to specification | The current consumption should conform to the product specification |
| 2 | Contrast | Refer to specification | After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests. |
| 3 | Appearance | Visual inspection | Defect free |

9.3 MTBF

| | |
|------|---|
| MTBF | Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature ($25\pm 5^{\circ}\text{C}$), normal humidity ($50\pm 10\%$ RH), and in area not exposed to direct sun light. |
|------|---|

10. LCD MODULES HANDLING PRECAUTIONS

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If
- The substance come into contact with your skin or clothes promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD module.
 - Tools required for assembly, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
- Storage precautions
When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

11. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
 - Exposed area of the printed circuit board
 - Terminal electrode sections.