

**DISPLAY Elektronik GmbH**

# DATA SHEET

**TFT MODULE**

**DEM 320240A1 TMH-PW-N  
(A-TOUCH)**

**3,5" TFT + TP**

*Product Specification*

*Version: 4*

**05-Jan-17**

# GENERAL SPECIFICATION

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MODULE NO. :

**DEM 320240A1 TMH-PW-N  
(A-TOUCH)**

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	13.12.2016
3	CHANGE PART NUMBER	16.12.2016
4	CHANGE MODUEL THICKNESS AND ADD TOUCH PANEL SPECIFICATION	05.01.2017

PREPARED BY: ZX

DATE: 05.01.2017

APPROVEDBY: MHO

DATE: 05.01.2017

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**1. GENERAL SPECIFICATIONS**

<b>Item</b>	<b>Contents</b>	<b>Unit</b>
LCD TYPE	TFT / TRANSMISSIVE	-
MODULE SIZE	76.90 x 63.90 x 4.30	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	RTP	-

**Touch Panel Features:**

Type:	4-Wire Analog Resistive Touch Panel
Input Mode:	Stylus or Finger
ITO Film:	0.175 mm (T)
ITO Glass:	0.7 mm (T)
Connector:	FPC

**Touch Panel Mechanical Characteristics**

Surface Hardness: 3H or more (according to JIS-K5400).

**Touch Panel Optical Characteristics**

Transmittance: 80% Typical.

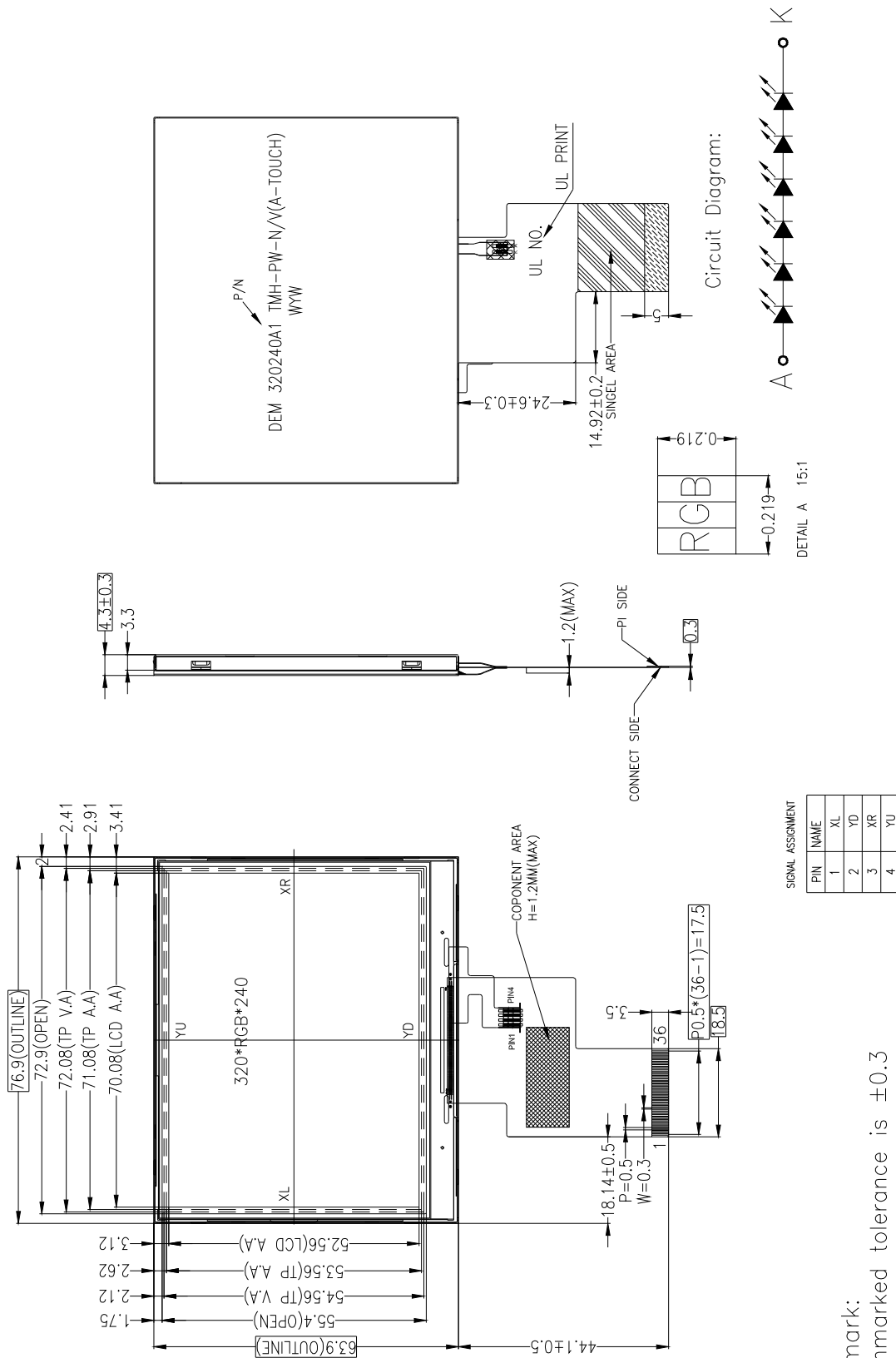
**Touch Panel Rating**

1. Maximum Voltage  
Less than DC 7 volts.
2. Operating Temperature Range  
- 20°C to 60°C (Humidity: 20% RH to 70% RH, No condensation of dew).
3. Storage Temperature Range  
- 30°C to 70°C (Humidity: 20% RH to 80% RH, No condensation of dew).

**Electrical Characteristics**

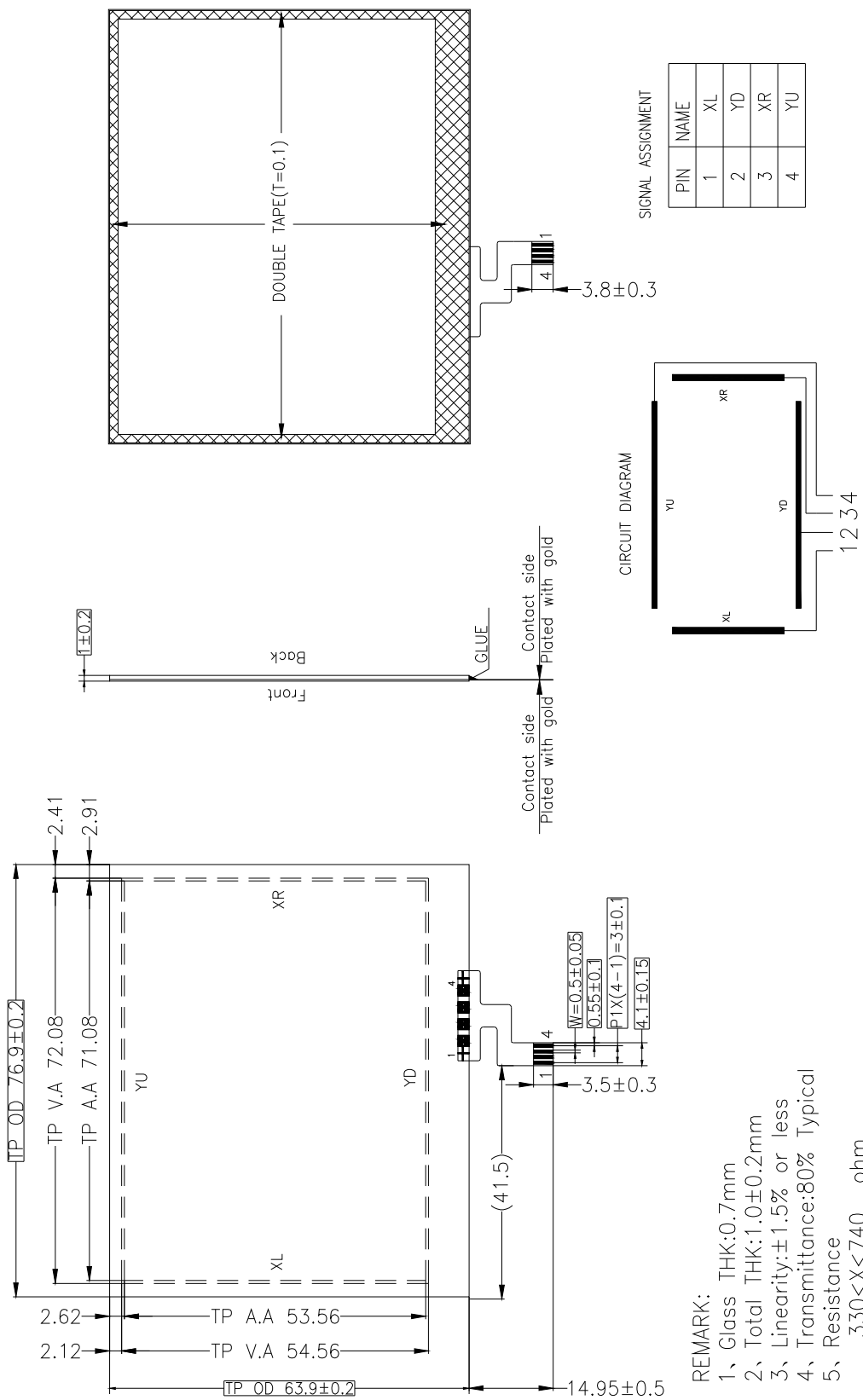
1. Resistance between Terminals  
Direction "X": 330~740Ω  
Direction "Y": 180~420Ω
2. Linearity  
X axis:  $\leq \pm 1.5\%$   
Y axis:  $\leq \pm 1.5\%$
3. Insulation Resistance: 20MΩ or more at DC 25 V.
4. Chattering Time: 10 msec or less at 100kΩ Pull-up.

2. EXTERNAL DIMENSIONS



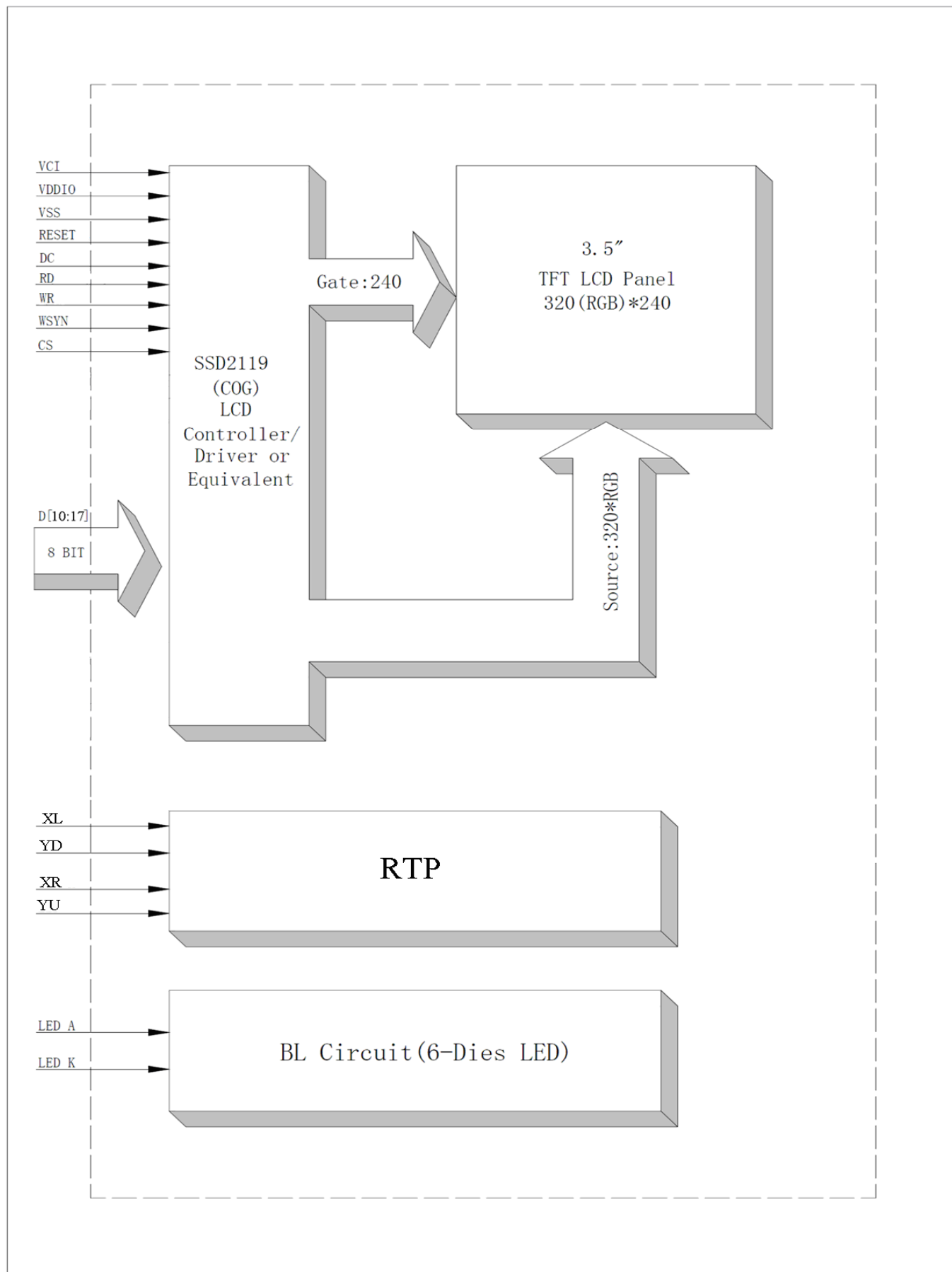
Remark:  
 1. Unmarked tolerance is ±0.3  
 2. All materials comply with RoHS  
 3. [ ] ...:critical dimension  
 4. WW:Product date code printing  
 Format: Y:year ,WW:week

TOUCH PANEL DRAWING:



- REMARK:
1. Glass THK:0.7mm
  2. Total THK:1.0±0.2mm
  3. Linearity:±1.5% or less
  4. Transmittance:80% Typical
  5. Resistance
    - 330<X<740 ohm
    - 180<Y<420 ohm
  6. Connector:FPC
  7. For prevention of detach of FPC from Glass,add taping and gluing(Like LCD module)
  8. Operating Force:20~100g
  9. Silicon Rubber Measuring Head Contact Area: φ0.3mm~φ0.8mm
  9. General Tolerance:±0.3mm.
  10. All materials comply with RoHS
  11.  ...critical dimension.

3. BLOCK DIAGRAM





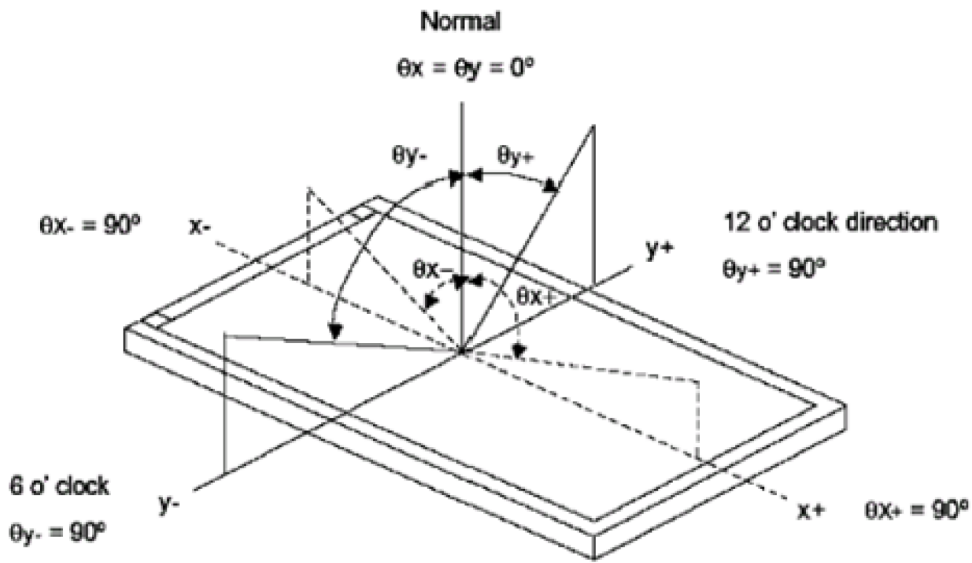
**4. PIN ASSIGNMENT**

<b>NO.</b>	<b>SYMBOL</b>	<b>DESCRIPTION</b>	<b>I/O</b>
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	XL	Touch panel XL	I
32	YD	Touch panel YD	I
33	XR	Touch panel XR	I
34	YU	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	$I=20\text{mA}$	-	360	-	Cd/m <sup>2</sup>	-	
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.	$\theta_{x+}$	$CR \geq 10$	-	60	-	Degree	-
		$\theta_{x-}$		-	60	-		-
	Ver.	$\theta_{y+}$		-	50	-		-
		$\theta_{y-}$		-	60	-		-
Uniformity	Un	-	-	80	85	-	%	-

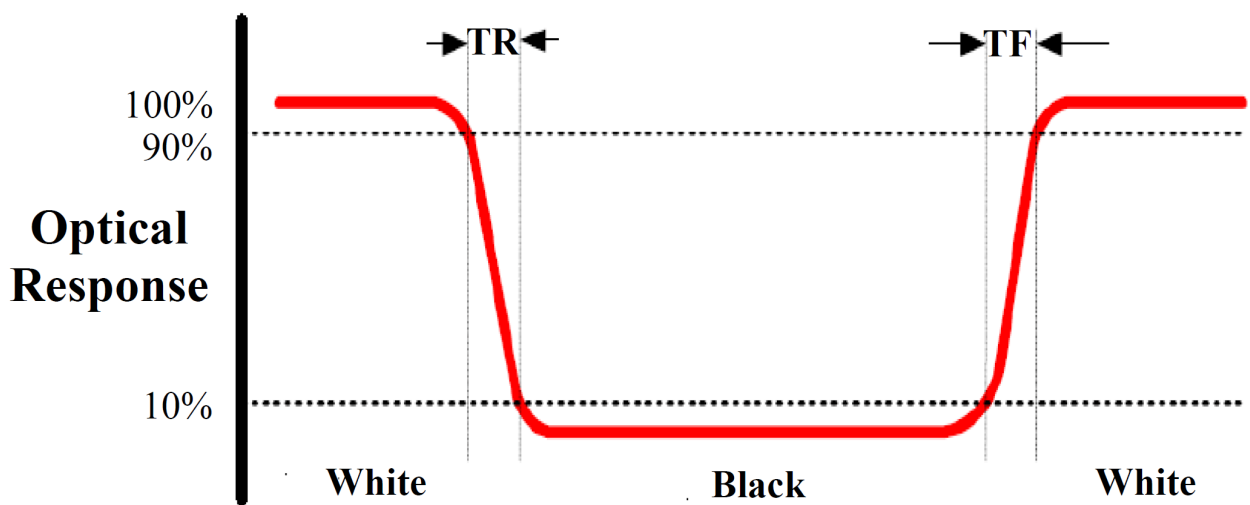
**Note 1: Definition of Viewing Angle  $\theta_x$  and  $\theta_y$ :**



**Note 2: Definition of contrast ratio CR:**

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

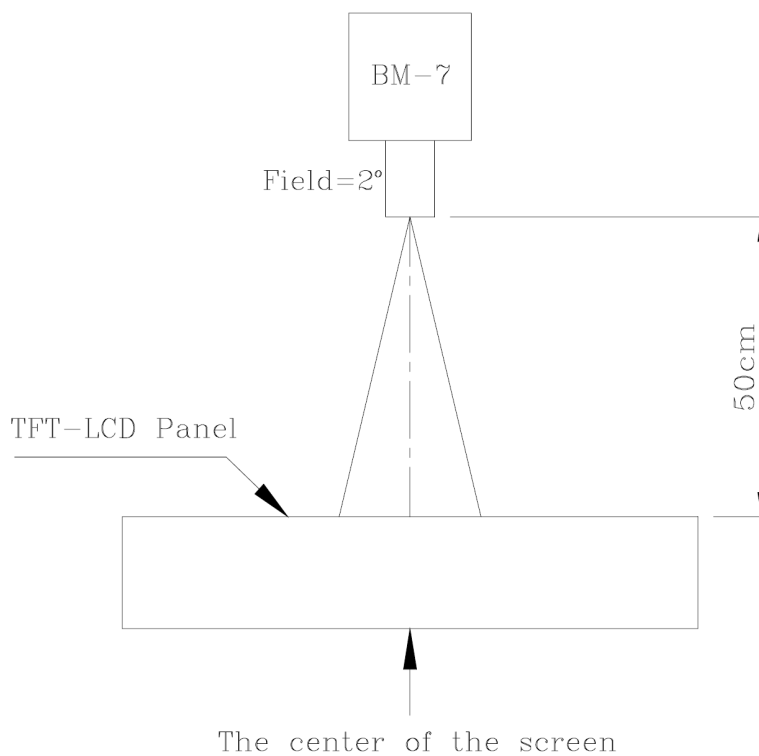
**Note 3: Definition of Response Time ( $T_r, T_f$ )**



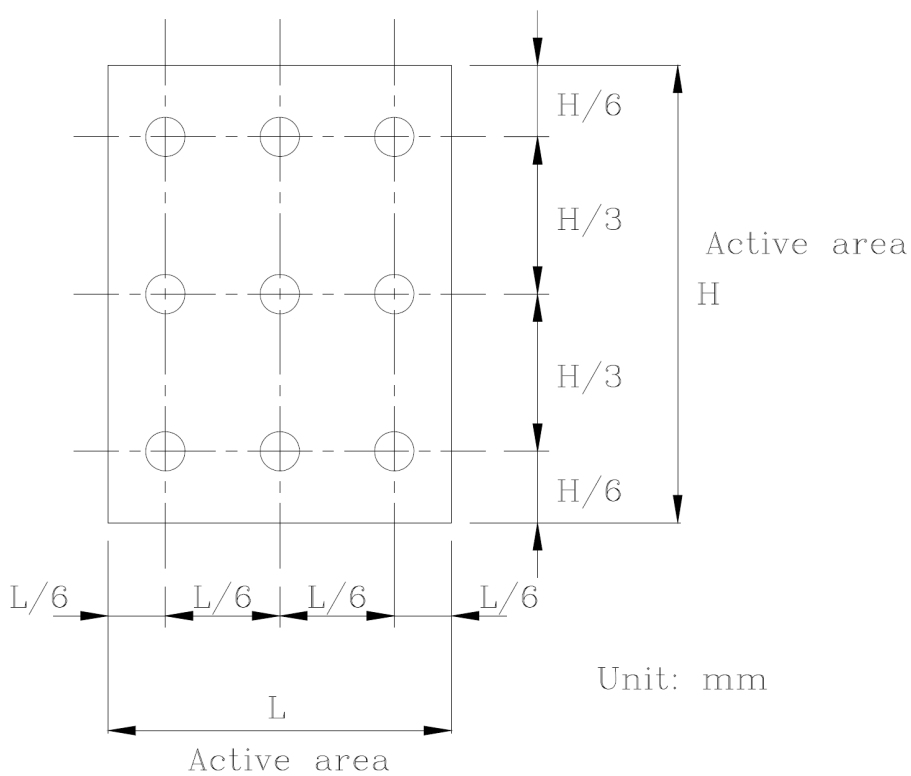
**Note 4: Definition of Luminance**

**①The Brightness Test Equipment Setup**

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



**②The 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)	ILED	-	30	mA
Operating Temperature	TOP	-20	+70	°C
Storage Temperature	TST	-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	VIL	GND	-	0.3VCI	V
	VIH	0.7VCI	-	VCI	V
Input Leakage Current	I <sub>IKG</sub>	-1	-	1	μA

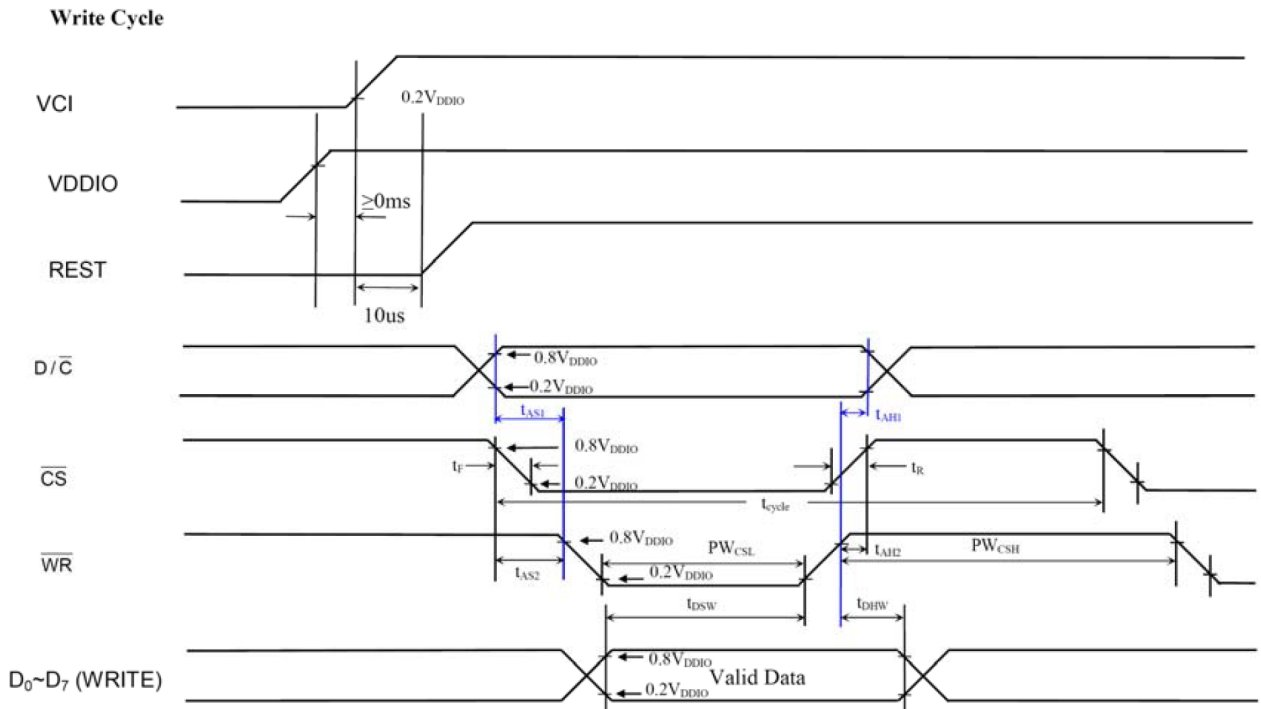
**7.2 Backlight Driving Conditions**

Item	Symbol	Specifications			Unit	Remark
		Min	Typ.	Max		
Voltage for LED Backlight	V <sub>F</sub>	-	19.2	-	V	I <sub>L</sub> =20mA
Current for LED Backlight	I <sub>L</sub>	-	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 TA=25°C

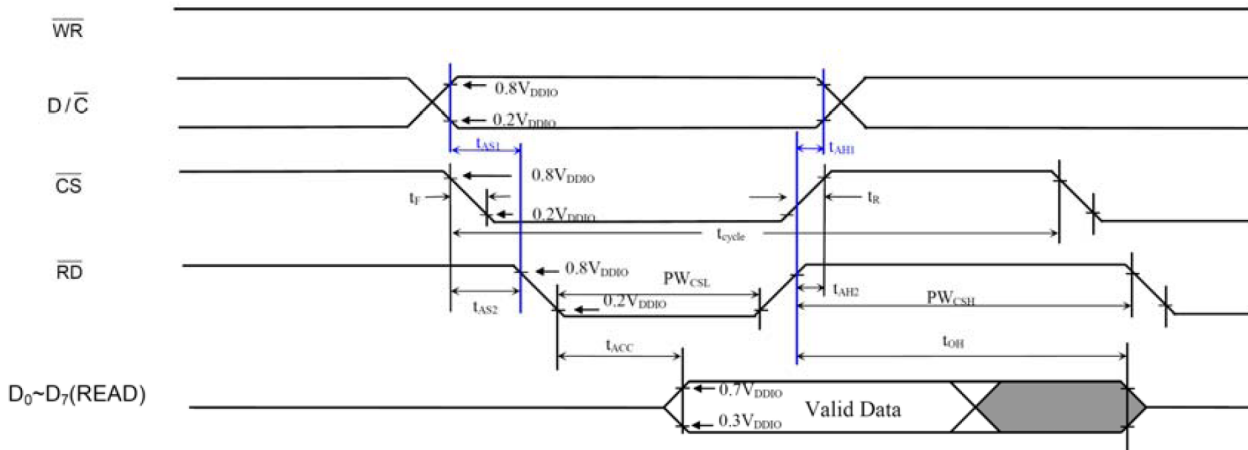
8. TIMING CHARACTERISTICS

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.
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**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.