



WINSTAR Display Co.,Ltd.
華凌光電股份有限公司



Winstar Display Co., LTD
華凌光電股份有限公司



WEB: <http://www.winstar.com.tw> E-mail: sales@winstar.com.tw

SPECIFICATION

CUSTOMER : _____

MODULE NO.: **WF35NTVAJDNN0#**

<p>APPROVED BY: (FOR CUSTOMER USE ONLY)</p>	<p>PCB VERSION: _____ DATA: _____</p>
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SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2017/06/14			



RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2015/02/03		First issue
A	2015/03/16		Remove the description of TFT color part
B	2015/04/27		Modify Reliability.
C	2015/11/02		Modify Initial Code.
D	2016/01/21		Modify Static electricity test
E	2016/08/10		Modify Vibration test.
F	2016/10/05		Modify Summary Add Aspect Ratio
G	2017/06/14		Modify Contour Drawing

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1.Module Classification Information

2.Summary

3.General Specification

4.Absolute Maximum Ratings

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9.Interface

10.Block Diagram

11.Reliability

12.Contour Drawing

13.Initial Code For Reference

1.Module Classification Information

W F 35 N T V A J D N N 0 #
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

①	Brand : WINSTAR DISPLAY CORPORATION											
②	Display Type : F→TFT Type, J→Custom TFT											
③	Display Size : 3.5" TFT											
④	Model serials no.											
⑤	Backlight Type :	F→CCFL, White S→LED, High Light White				T→LED, White Z→Nichia LED, White						
⑥	LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction	A→Transmissive, N.T, IPS TFT C→Transmissive, N. T, 6:00 ; F→Transmissive, N.T,12:00 ; I→Transmissive, W. T, 6:00 K→Transflective, W.T,12:00 L→Transmissive, W.T,12:00 N→Transmissive, Super W.T, 6:00				Q→Transmissive, Super W.T, 12:00 R→Transmissive, Super W.T, O-TFT V→Transmissive, Super W.T, VA TFT X→Transmissive, W.T, VA TFT Y→Transmissive, W.T, IPS TFT Z→Transmissive, W.T, O-TFT						
⑦	A : TFT LCD B : TFT+FR+CONTROL BOARD C : TFT+FR+A/D BOARD D : TFT+FR+A/D BOARD+CONTROL BOARD E : TFT+FR+POWER BOARD					F : TFT+CONTROL BOARD G : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD J : TFT+POWER BD						
⑧	Resolution:											
	A	128160	B	320234	C	320240	D	480234	E	480272	F	640480
	G	800480	H	1024600	I	320480	J	240320	K	800600	L	240400
	M	1024768	N	128128	P	1280800	Q	480800	R	640320	S	480128
	T	800320	U	8001280	V	176220	W	1280398	X	1024250	Y	1920720
	Z	800200	2	1024324	3	7201280						
⑨	D: Digital L : LVDS M:MIPI											
⑩	Interface N:without control board A:8Bit B:16Bit H: HDMI I:I2C Interface : R:RS232 S:SPI Interface U:USB											
⑪	TS : N : Without TS T : resistive touch panel C : capacitive touch panel (G-F-F) G : capacitive touch panel(G-G)											
⑫	Version											
⑬	Special Code	#:Fit in with ROHS directive regulations										

2.Summary

The 3.5 " VA Mono TFT that is offers improved contrast ,viewing angle, brightness and response time over traditional passive monochrome products. Increased display brightness display brightness is a key factor for design engineers when selecting a display that must vividly show pictures and alphanumeric data.The TFT cell is manufactured using high aperture panel technology and high transmission polarizer. The result is a clear and extremely bright display.

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3. General Specifications

Item	Dimension	Unit
Size	3.5	inch
Dot Matrix	240 x 320	dots
Module dimension	62.9 x 86.54 x 4.1	mm
Active area	53.28 x 71.04	mm
Dot pitch	0.222 x 0.222	mm
LCD type	TFT, Mono Transmissive	
View Direction	Wide View	
Aspect Ratio	Portrait	
Gray Scale	16 Gray scale (4BPP)/ 4 Gray scale (2BPP)/ 2 Gray scale (1BPP)	
Driver IC	ST7511	
Backlight Type	LED, Normally White	
With /Without TP	Without TP	
Surface	Glare	

* Mono tone slight changed by temperature and driving voltage.

4. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+80	°C
Storage Temperature	TST	-30	—	+80	°C

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

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5. Electrical Characteristics

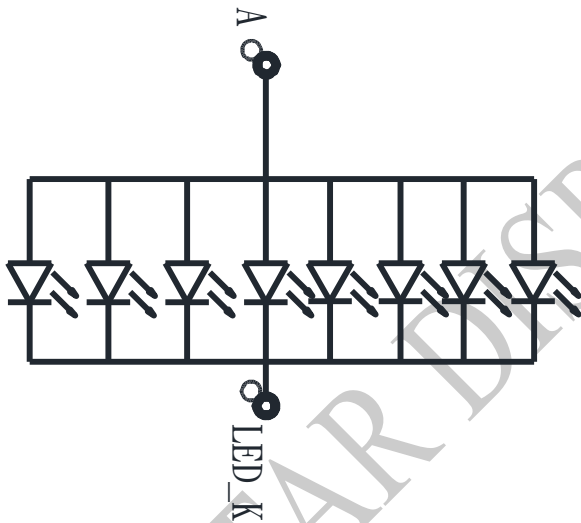
5.1. Operating conditions:

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VDD	—	3.0	3.3	3.6	V	
Supply Current For LCM	IDD	—	—	13	—	mA	Note1
Power Consumption	—	—	—	—	46.8	mW	

Note1: This value is test for VDD=3.3V only

5.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current		—	160	—	mA	
Power Consumption		—	—	—	mW	
LED voltage	A-K	2.8	3.0	3.3	V	Note 1
LED Life Time		—	50,000	—	Hr	Note 2,3,4



Note 1 : Power supply the back light specification

Note 2 : Ta = 25 °C

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

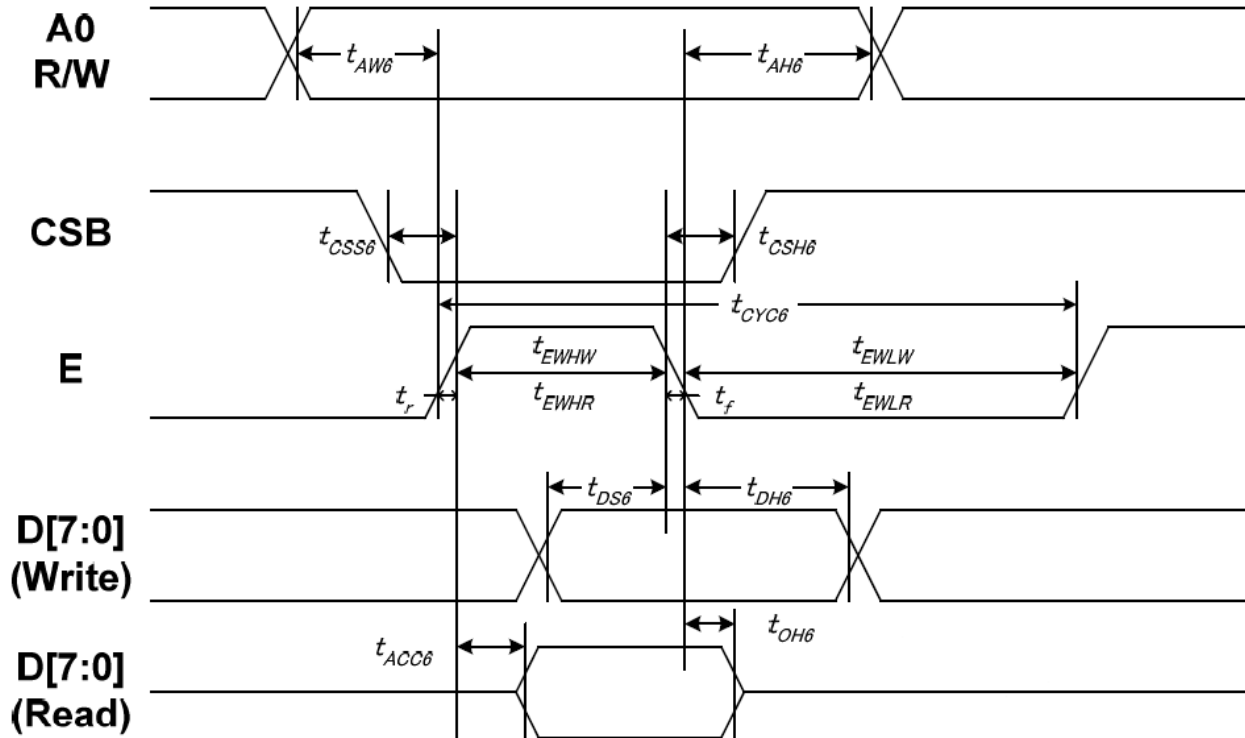
6.DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	V_{IL}	0	-	0.3VDD	V	
High level input voltage	V_{IH}	0.7VDD	-	VDD	V	

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7.AC CHARACTERISTICS

7.1. System Bus Timing for 6800 Series MPU

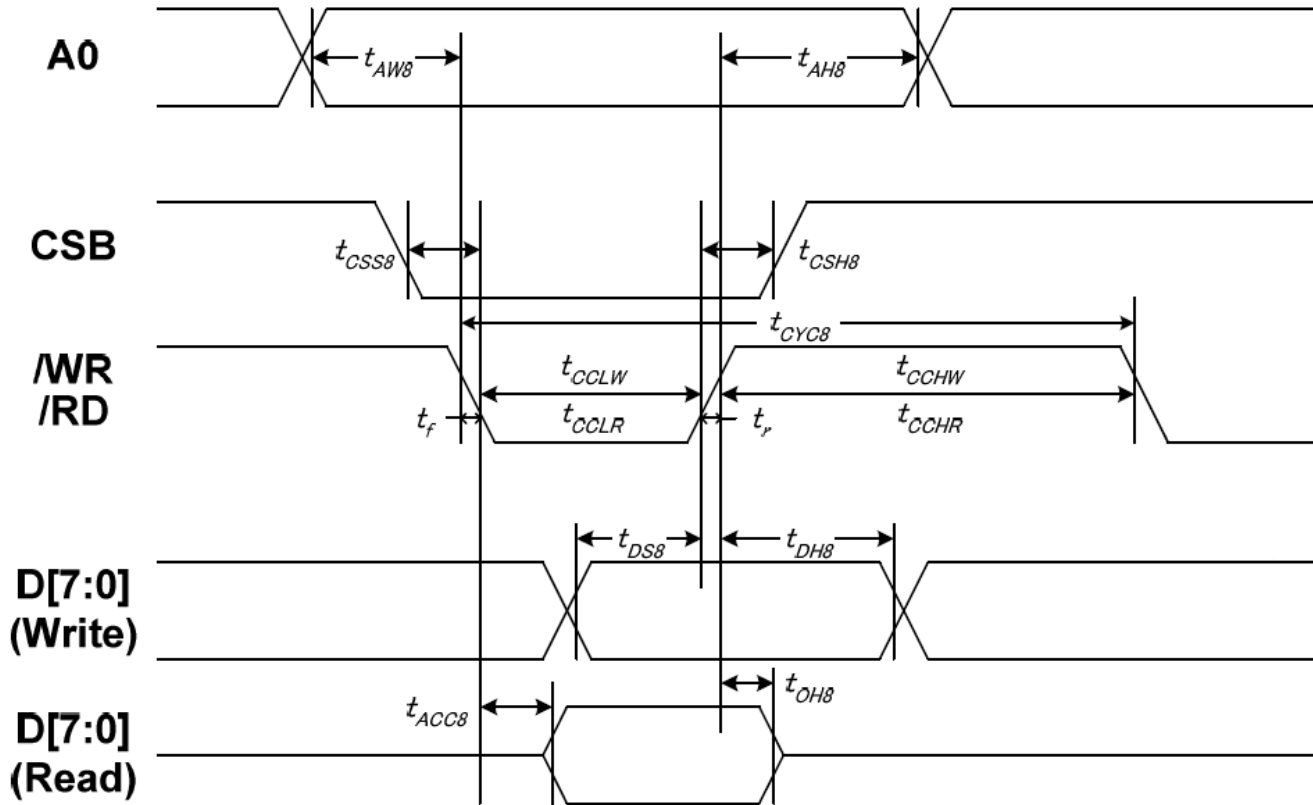


Item	Signal	Symbol	Condition	Min	Max	Unit
Address setup time	A0	tAW6	-	10	-	ns
Address hold time		tAH6	-	0	-	
System cycle time		tCYC6	-	200	-	
Enable L pulse width (WRITE)	E	tEHLW	-	100	-	
Enable H pulse width (WRITE)		tEHLR	-	100	-	
Enable L pulse width (READ)		tEHLR	-	130	-	
Enable H pulse width (READ)		tEHLR	-	130	-	
CSB setup time	CSB	tCSS6	-	100	-	
CSB hold time		tCSH6	-	100	-	
Write data setup time	D[7:0]	tDS6	-	70	-	
Write data hold time		tDH6	-	20	-	
Read data access time		tACC6	CL = 100 pF	-	80	
Read data output disable time		tOH6	CL = 100 pF	15	80	

Note:

- The input signal rise time and fall time (t_r , t_f) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leq (t_{CYC8} - t_{CCLW} - t_{CCHW})$ for $(t_r + t_f) \leq (t_{CYC8} - t_{CCLR} - t_{CCHR})$ are specified.
- All timing is specified using 20% and 80% of VDDI as the reference.
- t_{CCLW} and t_{CCLR} are specified as the overlap between CSB being "L" and /WR and /RD being at the "L" level. CSB and /WR (or /RD) cannot act at the same time and CSB should be 100ns wider than /WR (or /RD).

7.2. System Bus Timing for 8080 Series MPU

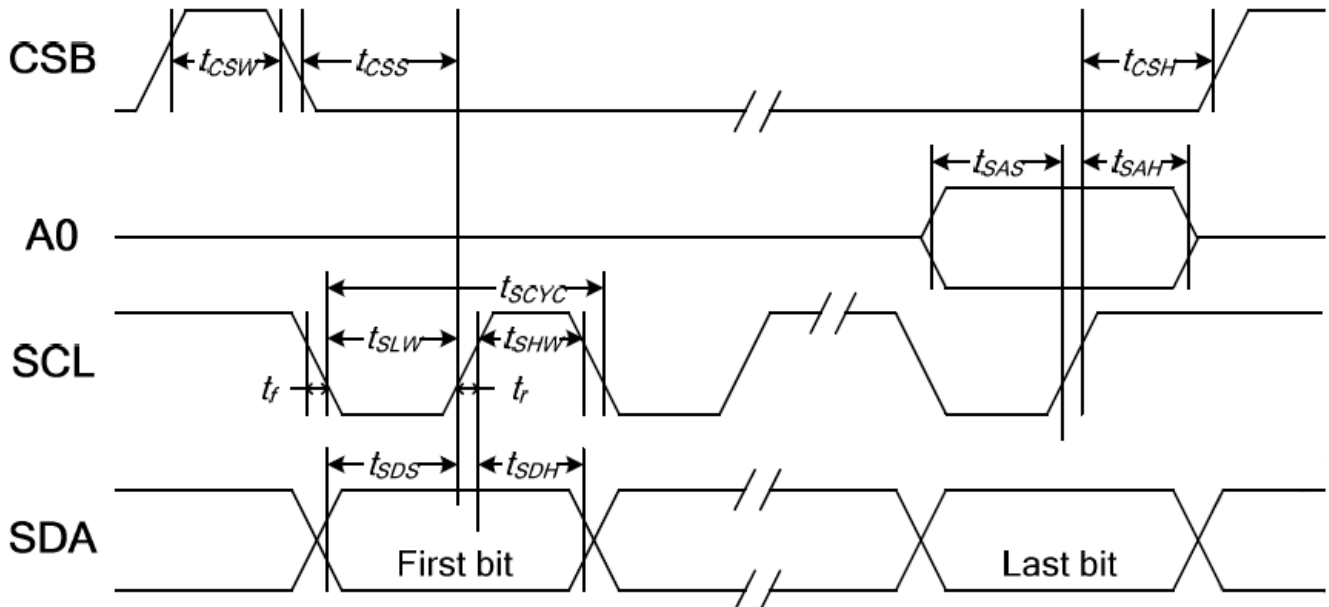


Item	Signal	Symbol	Condition	Min	Max	Unit
Address setup time	A0	tAW8	-	10	-	ns
Address hold time		tAH8	-	0	-	
System cycle time		tCYC8	-	200	-	
/WR L pulse width (WRITE)	/WR	tCCLW	-	100	-	
/WR H pulse width (WRITE)		tCCHW	-	100	-	
/RD L pulse width (READ)	/RD	tCCLR	-	120	-	
/RD H pulse width (READ)		tCCHR	-	120	-	
CSB setup time	CSB	tCSS8	-	100	-	
CSB hold time		tCSH8	-	100	-	
Write data setup time	D[7:0]	tDS8	-	70	-	
Write data hold time		tDH8	-	20	-	
Read data access time		tACC8	CL = 100 pF	-	80	
Read data output disable time		tOH8	CL = 100 pF	15	80	

Note:

- The input signal rise time and fall time (t_r , t_f) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leq (t_{CYC8} - t_{CCLW} - t_{CCHW})$ for $(t_r + t_f) \leq (t_{CYC8} - t_{CCLR} - t_{CCHR})$ are specified.
- All timing is specified using 20% and 80% of VDDI as the reference.
- t_{CCLW} and t_{CCLR} are specified as the overlap between CSB being "L" and /WR and /RD being at the "L" level. CSB and /WR (or /RD) cannot act at the same time and CSB should be 100ns wider than /WR (or /RD).

7.3. System Bus Timing for 4-Line Serial Interface

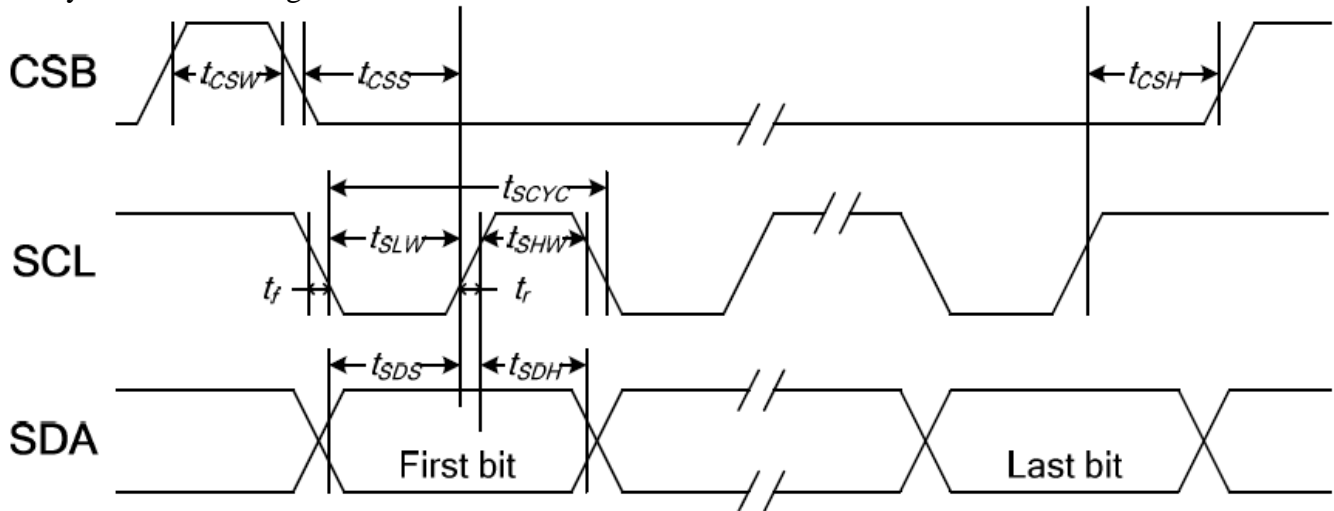


Item	Signal	Symbol	Condition	Min	Max	Unit
Serial clock period	SCL	tSCYC	-	80	-	ns
SCL "H" pulse width		tSHW	-	40	-	
SCL "L" pulse width		tSLW	-	40	-	
Address setup time	A0	tSAS	-	40	-	
Address hold time		tSAH	-	40	-	
Data setup time	SDA	tSDS	-	15	-	
Data hold time		tSDH	-	20	-	
CSB-SCL time	CSB	tCSS	-	40	-	
CSB-SCL time		tCSH	-	40	-	
CSB "H" pulse width		tCSW	-	15	-	

Note:

1. The input signal rise and fall time (t_r , t_f) are specified at 15 ns or less.
2. All timing is specified using 20% and 80% of VDDI as the standard.

7.4. System Bus Timing for 3-Line Serial Interface



Item	Signal	Symbol	Condition	Min	Max	Unit
Serial clock period		tSCYC	-	80	-	ns
SCL "H" pulse width	SCL	tSHW	-	40	-	
SCL "L" pulse width	SCL	tSLW	-	40	-	
Data setup time	SDA	tSDS	-	15	-	
Data hold time	SDA	tSDH	-	20	-	
CSB-SCL time		tCSS	-	40	-	
CSB-SCL time	CSB	tCSH	-	40	-	
CSB "H" pulse width	CSB	tCSW	-	15	-	

Note:

1. The input signal rise and fall time (t_r , t_f) are specified at 15 ns or less.
2. All timing is specified using 20% and 80% of VDDI as the standard.

8. Optical Characteristics

Item	Symbol	Temp	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr	25°C	$\theta=0^\circ, \Phi=0^\circ$	-	35	-	.ms	Note 3
	Tf	25°C		-		-		
Contrast ratio	CR	25°C	At optimized viewing angle	-	900	-	-	Note 4
Viewing angle (Gray Scale Inversion Direction)	Hor.	Θ_R	25°C	$CR \geq 10$	80		Deg.	Note 1 Note 2
		Θ_L	25°C		80			
	Ver.	Φ_B	25°C		80			
		Φ_T	25°C		80			
Brightness	-	25°C	-	400	500	-	cd/m ²	Center of display

Ta=25±2°C, IL=160mA

Note 1: Definition of viewing angle range

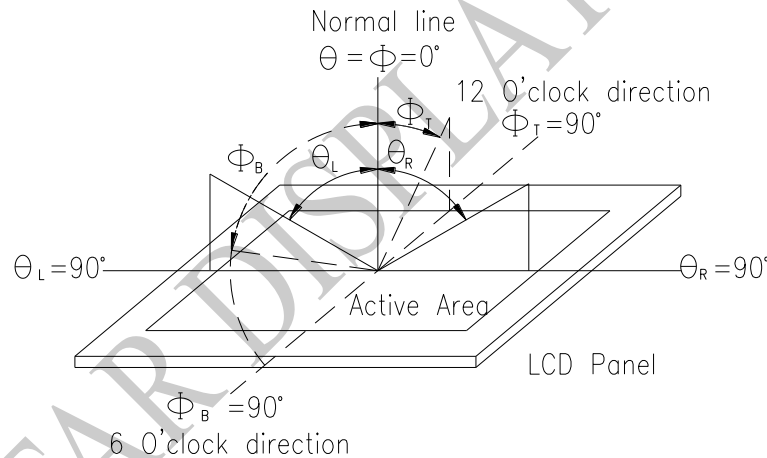


Fig. 8.1. Definition of viewing angle

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(BM-5) luminance meter 1.0° field of view at a distance of 50cm and normal direction.

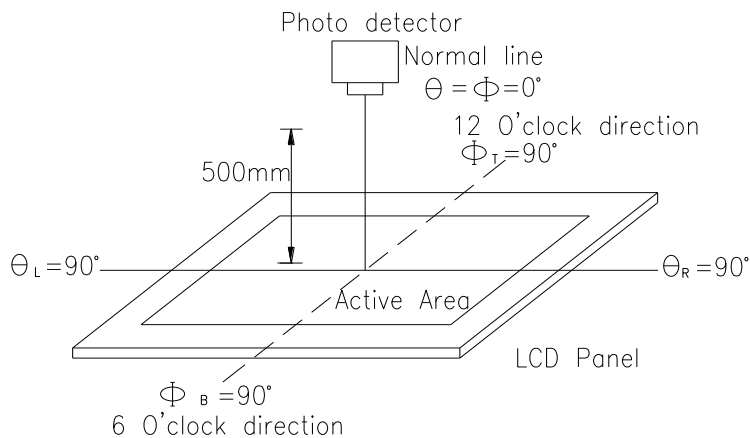
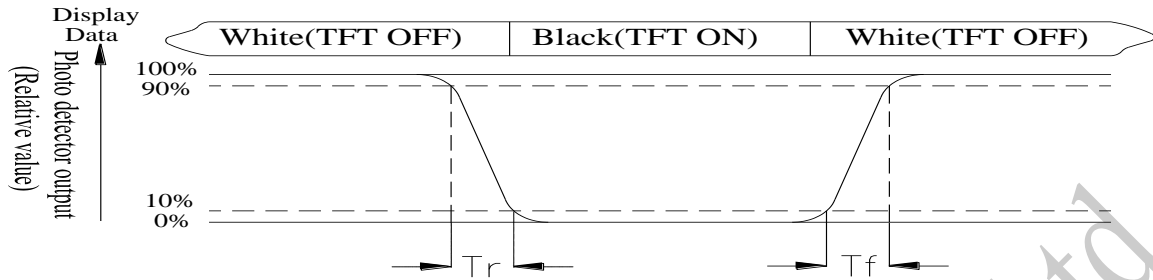


Fig. 8.2. Optical measurement system setup

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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%



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

9. Interface

9.1. LCM PIN Definition

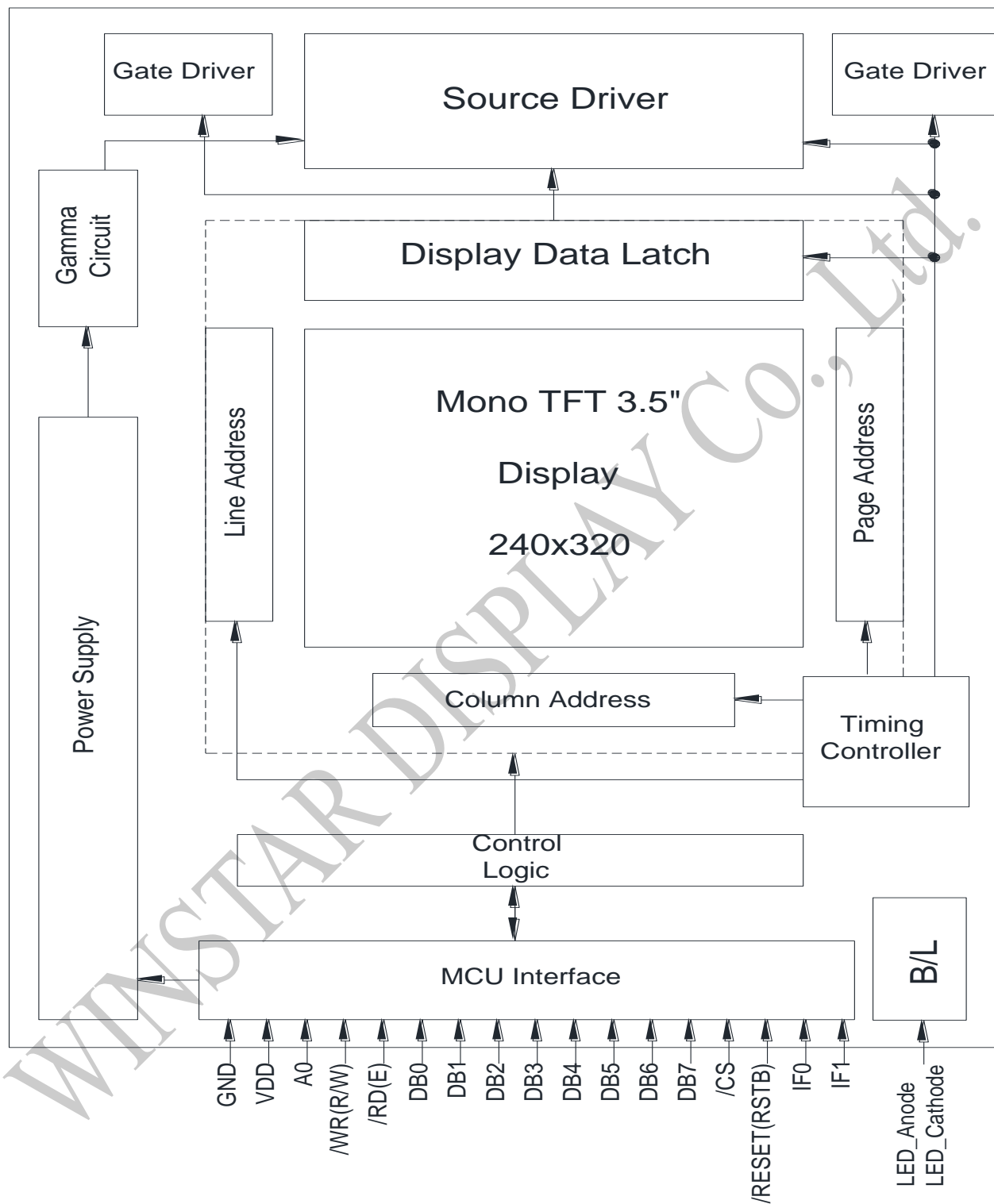
Pin	Symbol	Function	Remark
1	GND	System ground	
2	VDD	Power Supply : +3.3V	
3	NC	No connect	
4	A0	Data/Command select	
5	/WR(R/W)	Write strobe signal	
6	/RD(E)	Read strobe signal	
7	DB0	Data bus	
8	DB1	Data bus	
9	DB2	Data bus	
10	DB3	Data bus	
11	DB4	Data bus	
12	DB5	Data bus	
13	DB6	Data bus	
14	DB7	Data bus	
15	/CS	Chip select	
16	/RESET(RSTB)	Hardware reset	
17	IF0	Mode select	Note1
18	IF1		
19	A	LED +	
20	K	LED -	
21	NC	No connect	
22	NC	No connect	

Note1:

Setting		MCU Type	Interface Pin Function				
IF1	IF0		CSB	A0	RWR	ERD	D[7:0]
L	L	Parallel 8080 series MCU	CSB	A0	/WR	/RD	D[7:0]
L	H	Parallel 6800 series MCU			R/W	E	
H	H	Serial 4-Line series MCU		-	-	D7=SCL, D0=SDA, D[6:1] are not used	
H	L	Serial 3-Line series MCU		-	-		

The un-used pins are marked as “-” and should be connected to “H” by VDDI.

10. Block Diagram



11. Reliability

Content of Reliability Test (Super Wide temperature, -30°C~80°C)

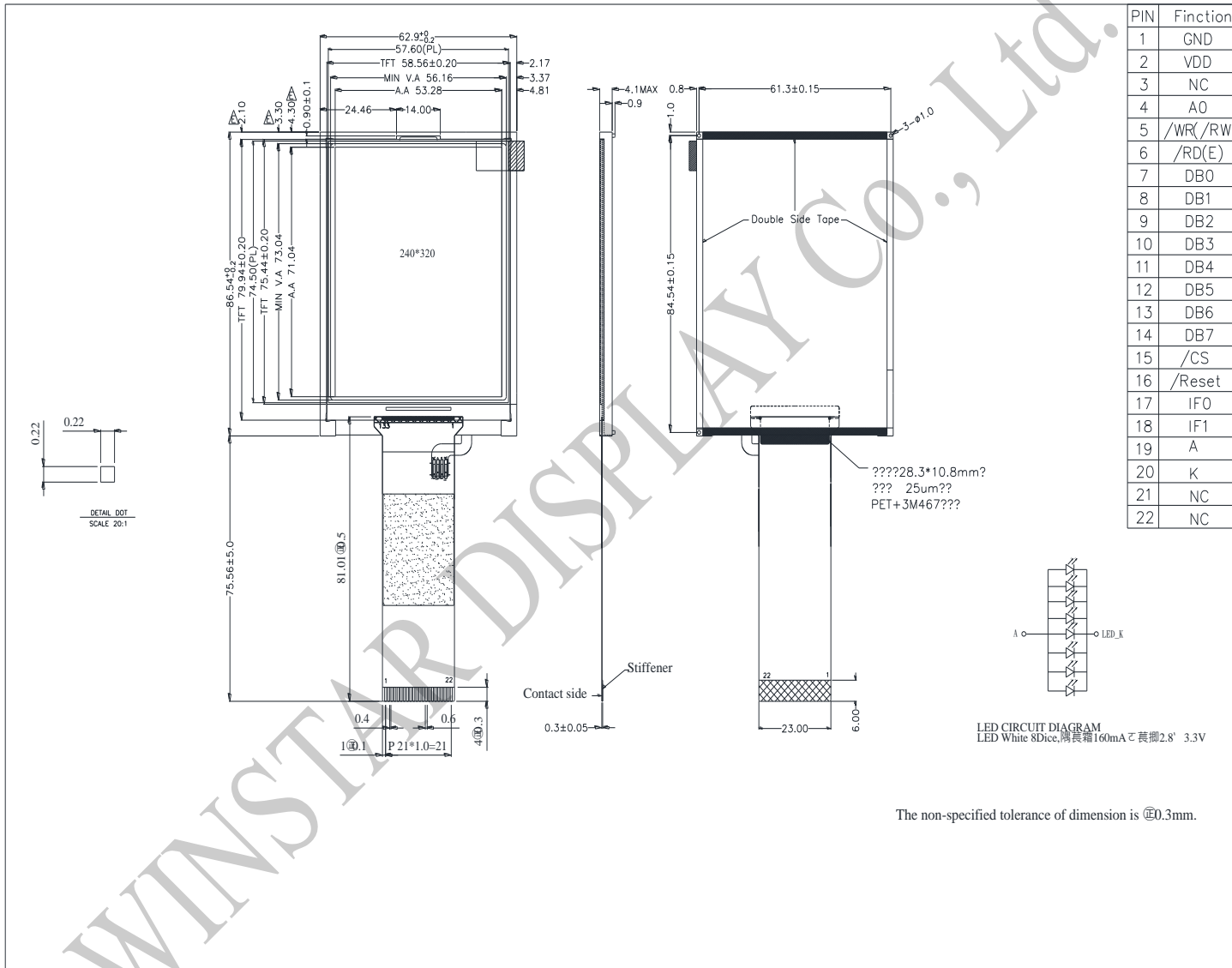
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30°C 200hrs	1
High Temperature/Humidity storage	The module should be allowed to stand at 60°C, 90%RH max	60°C, 90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;"> <p style="margin: 0;">-30°C 25°C 80°C</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">1 cycle</p> </div>	-30°C/80°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X, Y, Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact), ±800v(air), RS=330Ω CS=150pF 10 times	—

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

12. Contour Drawing



13.Initial Code For Reference

```
void Initial_code()
{
    Write_Command(0xae);
    Write_Data(0xa5);

    Write_Command(0x61);
    Write_Data(0x8f);
    Write_Data(0x04);
    Write_Data(0xa5);
    Write_Data(0xa5);

    Write_Command(0x62);
    Write_Data(0x42);
    Write_Data(0x0b);
    Write_Data(0x0c);
    Write_Data(0xa5);

    Write_Command(0x33);
    Write_Data(0x07);
    Write_Data(0x2c);
    Write_Data(0x09);
    Write_Data(0x2a);

    Write_Command(0x63);
    Write_Data(0x09);
    Write_Data(0x17);
    Write_Data(0xa5);
    Write_Data(0xa5);

    Write_Command(0x24);
    Write_Data(0x01);
    Write_Data(0xa5);
    Write_Data(0xa5);
    Write_Data(0xa5);

    Write_Command(0x22);
    Write_Data(0x00);
    Write_Data(0xa5);
    Write_Data(0xa5);
    Write_Data(0xa5);

    Write_Command(0x91);
    Write_Data(0x00);
    Write_Data(0x17);
    Write_Data(0x1b);
```

Write_Data(0x1d);

Write_Command(0x92);

Write_Data(0x1f);

Write_Data(0x21);

Write_Data(0x23);

Write_Data(0x25);

Write_Command(0x93);

Write_Data(0x27);

Write_Data(0x29);

Write_Data(0x2a);

Write_Data(0x2c);

Write_Command(0x94);

Write_Data(0x2e);

Write_Data(0x31);

Write_Data(0x34);

Write_Data(0x3f);

Write_Command(0x99);

Write_Data(0x00);

Write_Data(0x17);

Write_Data(0x1b);

Write_Data(0x1d);

Write_Command(0x9a);

Write_Data(0x1f);

Write_Data(0x21);

Write_Data(0x23);

Write_Data(0x25);

Write_Command(0x9b);

Write_Data(0x27);

Write_Data(0x29);

Write_Data(0x2a);

Write_Data(0x2c);

Write_Command(0x9c);

Write_Data(0x2e);

Write_Data(0x31);

Write_Data(0x34);

Write_Data(0x3f);

Write_Command(0x12);

Write_Data(0xa5);

Write_Command(0x15);

Write_Data(0xa5);

}

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LCM Sample Estimate Feedback Sheet

Module Number : _____

Page: 1

1、Panel Specification :

- 1. Panel Type : Pass NG , _____
- 2. View Direction : Pass NG , _____
- 3. Numbers of Dots : Pass NG , _____
- 4. View Area : Pass NG , _____
- 5. Active Area : Pass NG , _____
- 6. Operating Temperature : Pass NG , _____
- 7. Storage Temperature : Pass NG , _____
- 8. Others : _____

2、Mechanical Specification :

- 1. PCB Size : Pass NG , _____
- 2. Frame Size : Pass NG , _____
- 3. Material of Frame : Pass NG , _____
- 4. Connector Position : Pass NG , _____
- 5. Fix Hole Position : Pass NG , _____
- 6. Backlight Position : Pass NG , _____
- 7. Thickness of PCB : Pass NG , _____
- 8. Height of Frame to PCB : Pass NG , _____
- 9. Height of Module : Pass NG , _____
- 10. Others : Pass NG , _____

3、Relative Hole Size :

- 1. Pitch of Connector : Pass NG , _____
- 2. Hole size of Connector : Pass NG , _____
- 3. Mounting Hole size : Pass NG , _____
- 4. Mounting Hole Type : Pass NG , _____
- 5. Others : Pass NG , _____

4、Backlight Specification :

- 1. B/L Type : Pass NG , _____
- 2. B/L Color : Pass NG , _____
- 3. B/L Driving Voltage (Reference for LED Type) : Pass NG , _____
- 4. B/L Driving Current : Pass NG , _____
- 5. Brightness of B/L : Pass NG , _____
- 6. B/L Solder Method : Pass NG , _____
- 7. Others : Pass NG , _____

>> Go to page 2 <<



winstar

Module Number : _____

Page: 2

5、Electronic Characteristics of Module :

- | | | |
|------------------------------|-------------------------------|-------------------------------------|
| 1. Input Voltage : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. Supply Current : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Driving Voltage for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. Contrast for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. B/L Driving Method : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. Negative Voltage Output : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Interface Function : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8. LCD Uniformity : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 9. ESD test : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 10. Others : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

6、Summary :

Sales signature : _____

Customer Signature : _____

Date : / /

