SPECIFICATION

CUSTOMER　:

MODULE NO.:　　**WF22ATLAJD0#**

APPROVED BY: (FOR CUSTOMER USE ONLY)	
	PCB VERSION:　　　　DATA:

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2011.07.15		First issue

Winstar Display Co., LTD
華凌光電股份有限公司

MODLE NO：

RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2011.07.15		First issue

1.Module Classification Information

<u>WF</u> <u>22</u><u>A</u> <u>T</u> <u>L</u> <u>A</u> <u>J</u> <u>D 0 #</u>
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨⑩ ⑪

① Brand：WINSTAR DISPLAY CORPORATION
② Display Type：H→Character Type, G→Graphic Type F→TFT Type
③ Display Size：2.2" TFT
④ Model serials no.
⑤ Backlight Type：   F→CCFL, White   T→LED, White

⑥ LCD Polarize   A→Reflective, N.T, 6:00   H→Transflective, W.T,6:00
  Type/ Temperature D→Reflective, N.T, 12:00   K→Transflective, W.T,12:00
  range/ View   G→Reflective, W. T, 6:00   C→Transmissive, N.T,6:00
  direction   J→Reflective, W. T, 12:00   F→Transmissive, N.T,12:00
                      B→Transflective, N.T,6:00   I→Transmissive, W. T, 6:00
                      E→Transflective, N.T.12:00   L→Transmissive, W.T,12:00

⑦ A: TFT LCD
  B: TFT+FR+CONTROL BOARD
  C: TFT+FR+A/D BOARD
  D:TFT+FR+A/D BOARD+CONTROL BOARD

⑧ Solution: A : 128 * 160 Dots   B : 320 * 234 Dots   C : 320 * 240 Dots
                   D : 480 * 234 Dots   E : 480 * 272 Dots   F : 640 * 480 Dots
                   G: 800 * 480 Dots   H: 1024 * 600 Dots   I: 320 * 480 Dots
                   J: 240 * 320 Dots

⑨ D: Digital   A: Analog

⑩ Version

⑪ Special Code   #:Fit in with ROHS directive regulations
                     00:Sales code   0:Version(Add TS)

General Specifications

Feature		Spec
Display Spec	Size	2.2 inch
	Resolution	240(RGB) x 320
	Interface	CPU 8/16 bit
	Color Depth	262K
	Technology Type	a-Si
	Pixel Pitch (mm)	0.141 x 0.141
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment	Clear type (3H)
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	40.10×55.20×2.35
	Active Area(mm)	33.84×45.12
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	4 LEDs
Electronic	Driver IC	ILI9340

Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2: Requirements on Environmental Protection: RoHS.

Note 3: LCM weight tolerance: +/- 5%.

2 Input/Output Terminals

2.1 TFT LCD Panel

No	Symbol	I/O	Description	Remark
1	DB0	I	Data bus	
2	DB1	I	Data bus	
3	DB2	I	Data bus	
4	DB3	I	Data bus	
5	GND	P	Power Ground	
6	VCC	P	Power Supply	
7	/CS	I	Chip select	
8	RS	I	Register select	
9	/WR	I	Write strobe	
10	/RD	I	Read strobe	
11	IM0	I	Mode select	
12	NC(XR)	-	No connection	
13	NC(YU)	-	No connection	
14	NC(XL)	-	No connection	
15	NC(YD)	-	No connection	
16	LED-A	P	LED anode	
17	LED-K1	P	LED cathode	
18	LED-K2	P	LED cathode	
19	LED-K3	P	LED cathode	
20	LED-K4	P	LED cathode	
21	NC	-	No connection	
22	DB4	I	Data bus	
23	DB8	I	Data bus	
24	DB9	I	Data bus	
25	DB10	I	Data bus	
26	DB11	I	Data bus	
27	DB12	I	Data bus	
28	DB13	I	Data bus	
29	DB14	I	Data bus	
30	DB15	I	Data bus	
31	/RESET	I	Reset	
32	VCI	P	Power Supply	
33	VCC	P	Power Supply	
34	GND	P	Power Ground	
35	DB5	I	Data bus	
36	DB6	I	Data bus	
37	DB7	I	Data bus	

Note1: I/O definition: I-----Input; O---Output; P----Power/Ground.

IM0	Interface	DB pin	Remark
0	i80-parallel 16bit interface	DB[15~0]	
1	i80-parallel 8bit interface	DB[15~8]	D0~D7 If not use, fix to GND

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

Ta = 25oC

Item	Symbol	Min	Max	Unit	Remark
Analog Supply Voltage	VCI	-0.3	4.6	V	
Logic Supply Voltage	VCC	-0.3	4.6	V	
Input Signal Voltage	/CS,/WR,/RD,RS,/RESET IM0,DB[0:15]	-0.3	VCC+0.3	V	
Back Light Forward Current	I_{LED}	--	25.0	mA	For each LED
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
Analog Supply Voltage		VCI	2.5	2.8	3.3	V	
Logic Supply Voltage		VCC	1.65	1.8/2.8	3.3	V	
Input Signal Voltage	Low Level	V_{IL}	0	--	0.2xVCC	V	/CS,/WR,/RD,RS,/RESET IM0,DB[0:15]
	High Level	V_{IH}	0.8xVCC	--	VCC	V	
Output Signal Voltage	Low Level	V_{OL}	0	--	0.2xVCC	V	
	High Level	V_{OH}	0.8xVCC	--	VCC	V	
(Panel+ LSI) Power Consumption	Black Mode	--	TBD	--	mW	Frame Rate:60Hz	
	8 color Mode	--	TBD	--	µW		
	Sleeping Mode	--	TBD	--	µW		

4.2 Driving Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	18	--	mA	For each LED
Forward Voltage	V_F	--	3.2	--	V	
Power Consumption	W_{BL}	--	230.4	--	mW	
Operating Life Time	--	10000	(20000)	--	Hrs	

Note 1: The figure below shows the connection of backlight LED.
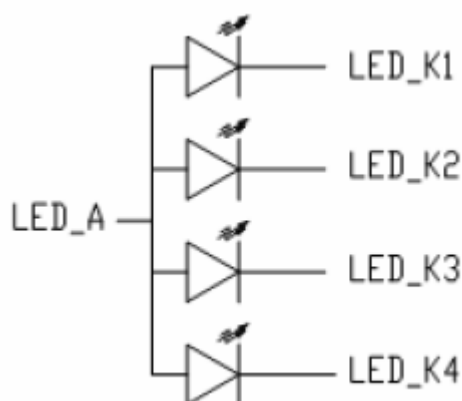
Note 2: One LED: I_F =18mA, V_F =3.2V.

Note 3:

I_F is defined for one channel LED.

Optical performance should be evaluated at Ta=25℃ only.

If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.

Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

4.3 Block Diagram
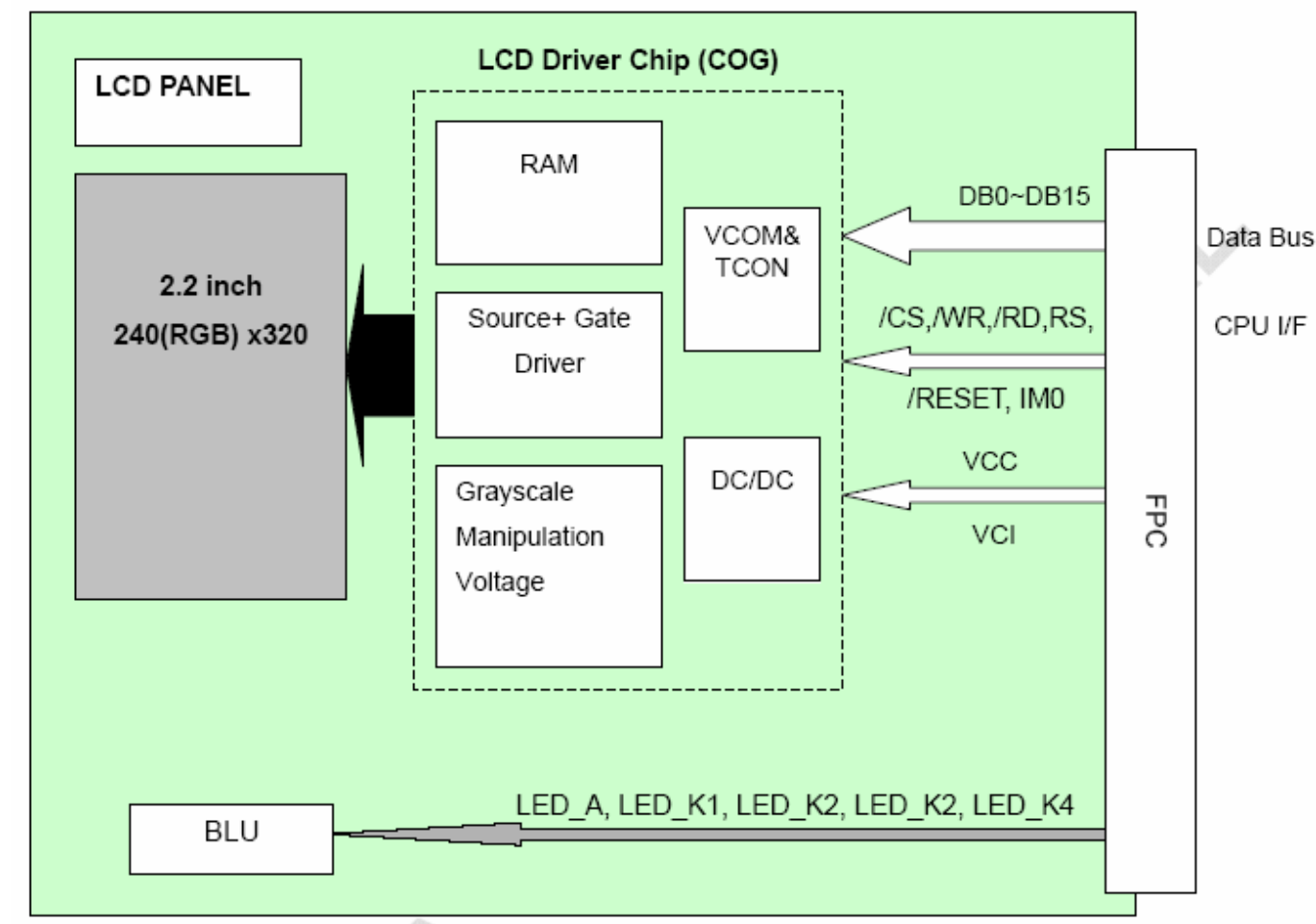
5 Timing Chart

## 5.1 Timing Parameter

Normal Write Mode

Signal	Symbol	Parameter	min	max	Unit	Description
RS	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	10	-	ns	
/CS	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
/WR	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
	twrl	Write Control pulse L duration	15	-	ns	
/RD(FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
/RD(ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
DB[17:0] DB[15:0] DB[8:0] DB[7:0]	tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

Table 5.1 Timing Parameter

I80-parallel 16bit register write/read timing
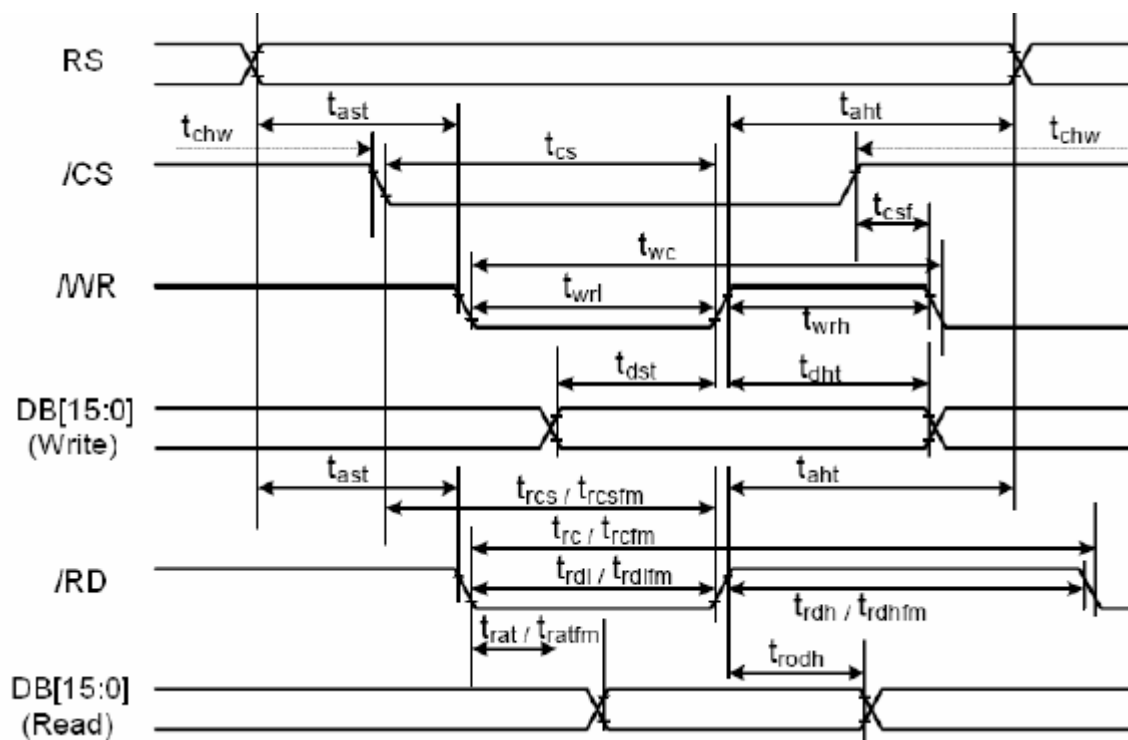
I80-parallel 8bit register write/read timing
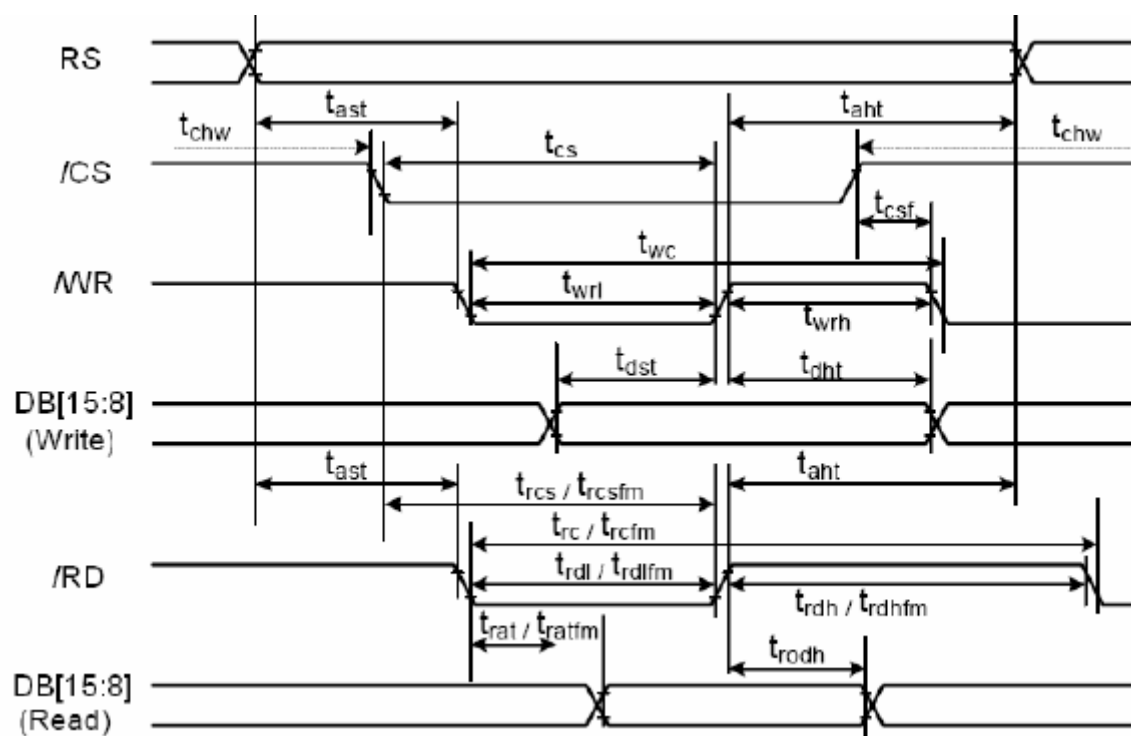
5.2 Register write/read timing

5.2.1 Register Write Timing

5.2.1.1 16-bit System Bus Interface Register Write Timing
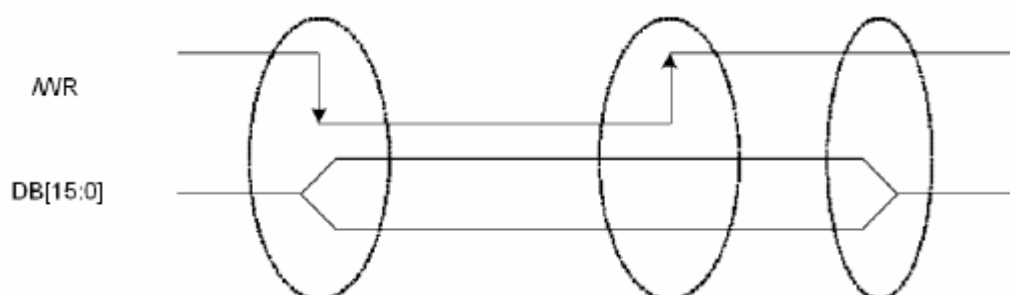
Note: /WR is an unsynchronized signal (It can be stopped)

Figure 5.2.1.1 16-bit System Bus Interface Timing(Register Write Timing)

5.2.1.2 8-bit System Bus Interface Register Write Timing

Note: /WR is an unsynchronized signal (It can be stopped)

Figure 5.2.1.2 8-bit System Bus Interface Timing(Register Write Timing)

5.2.2 Register read Timing

5.2.2.1 16-bit System Bus Interface Register read Timing

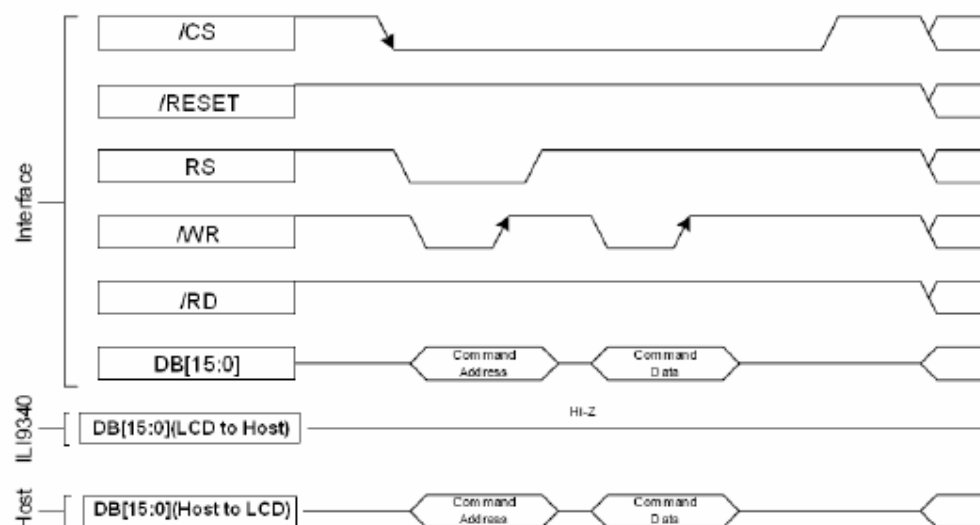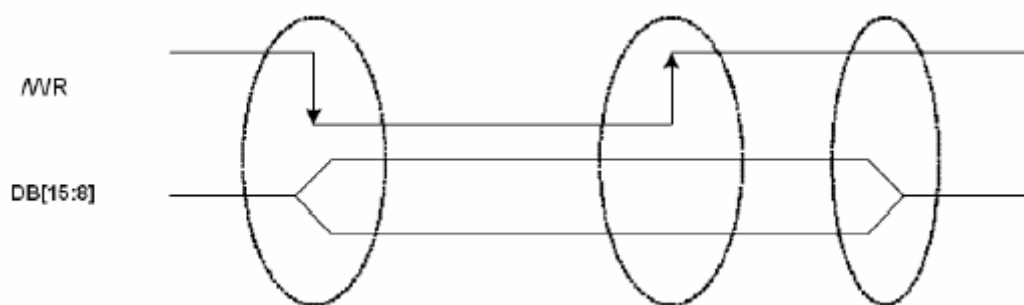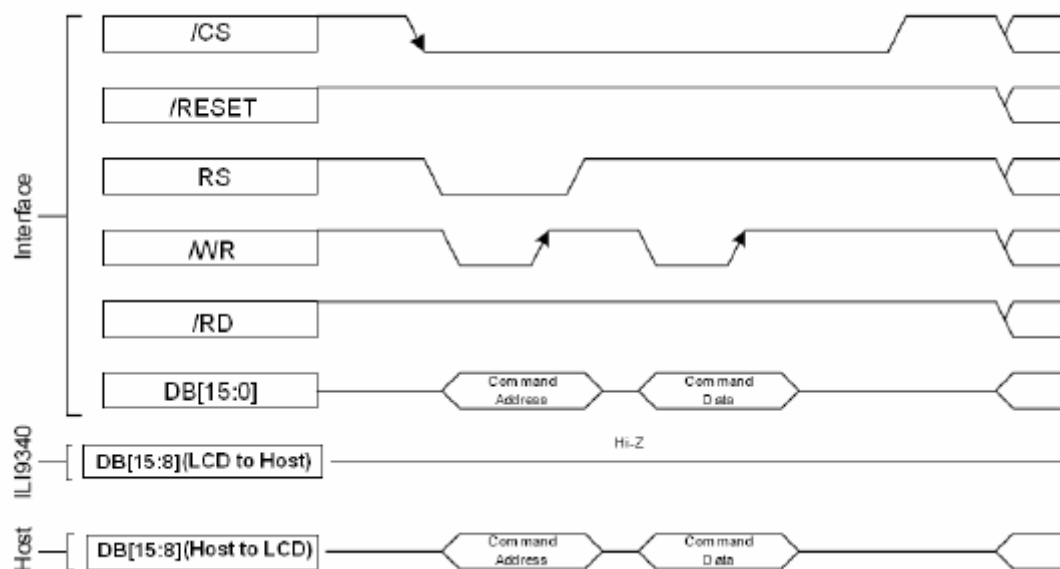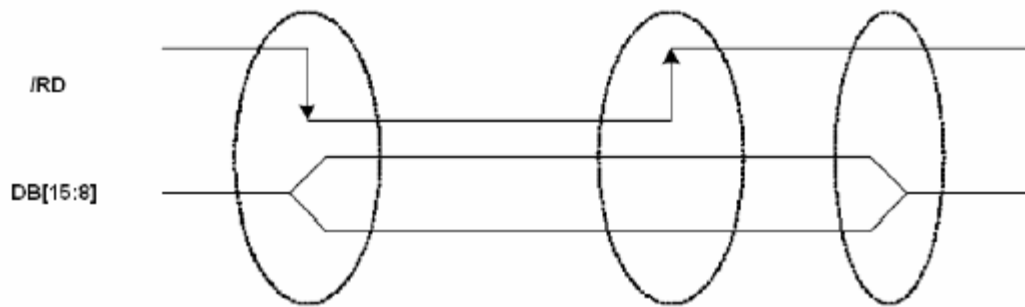Note: /WR is an unsynchronized signal (It can be stopped).

Figure 5.2.2.1 16-bit System Bus Interface Timing(Register Read Timing)

5.2.2.2 8-bit System Bus Interface Register read Timing
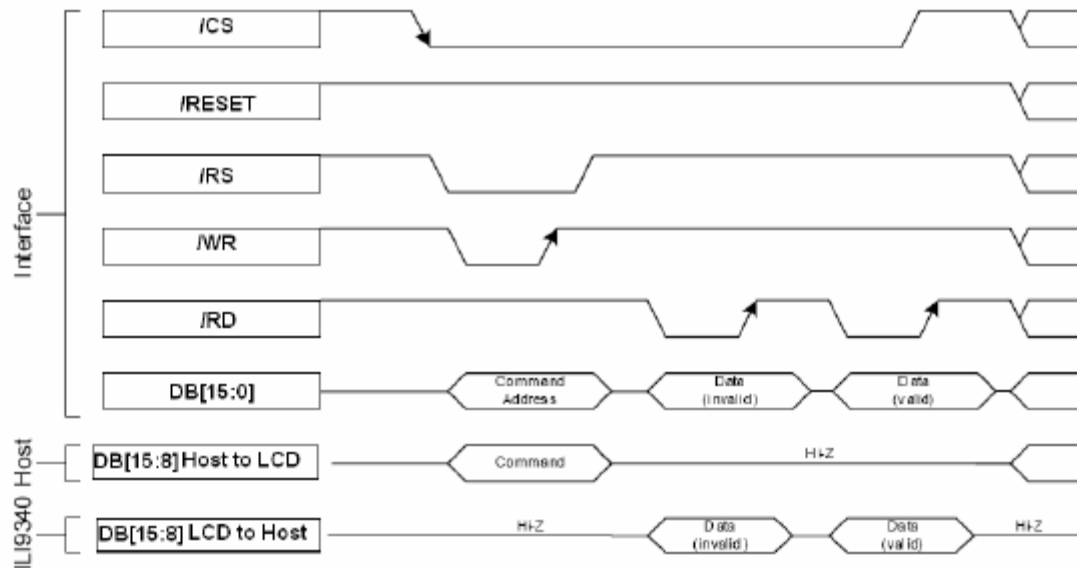

Figure 5.2.2.2 8-bit System Bus Interface Timing(Register Read Timing)

5.3 GRAM write/read timing

5.3.1 16-bit Read/Write GRAM Data format

Count	0	1	2	3	...	238	239	240
RS	0	1	1	1	...	1	1	1
D15		0R4	1R4	2R4	...	237R4	238R4	239R4
D14		0R3	1R3	2R3	...	237R3	238R3	239R3
D13		0R2	1R2	2R2	...	237R2	238R2	239R2
D12		0R1	1R1	2R1	...	237R1	238R1	239R1
D11		0R0	1R0	2R0	...	237R0	238R0	239R0
D10		0G5	1G5	2G5	...	237G5	238G5	239G5
D9		0G4	1G4	2G4	...	237G4	238G4	239G4
D8		0G3	1G3	2G3	...	237G3	238G3	239G3
D7	C7	0G2	1G2	2G2	...	237G2	238G2	239G2
D6	C6	0G1	1G1	2G1	...	237G1	238G1	239G1
D5	C5	0G0	1G0	2G0	...	237G0	238G0	239G0
D4	C4	0B4	1B4	2B4	...	237B4	238B4	239B4
D3	C3	0B3	1B3	2B3	...	237B3	238B3	239B3
D2	C2	0B2	1B2	2B2	...	237B2	238B2	239B2
D1	C1	0B1	1B1	2B1	...	237B1	238B1	239B1
D0	C0	0B0	1B0	2B0	...	237B0	238B0	239B0

Figure 5.3.1.1 16-bit Read/Write GRAM Data format(65K)

Count	0	1	2	3	...	358	359	360
RS	0	1	1	1	...	1	1	1
D15		0R5	0B5	1G5	...	238R5	238B5	239G5
D14		0R4	0B4	1G4	...	238R4	238B4	239G4
D13		0R3	0B3	1G3	...	238R3	238B3	239G3
D12		0R2	0B2	1G2	...	238R2	238B2	239G2
D11		0R1	0B1	1G1	...	238R1	238B1	239G1
D10		0R0	0B0	1G0	...	238R0	238B0	239G0
D9					...			
D8					...			
D7	C7	0G5	1R5	1B5	...	238G5	239R5	239B5
D6	C6	0G4	1R4	1B4	...	238G4	239R4	239B4
D5	C5	0G3	1R3	1B3	...	238G3	239R3	239B3
D4	C4	0G2	1R2	1B2	...	238G2	239R2	239B2
D3	C3	0G1	1R1	1B1	...	238G1	239R1	239B1
D2	C2	0G0	1R0	1B0	...	238G0	239R0	239B0
D1	C1				...			
D0	C0				...			

Figure 5.3.1.2 16-bit Read/Write GRAM Data format(262K)

5.3.2 8-bit Read/Write GRAM Data format

COUNT	0	1	2	3	4	...	477	478	479	480
RS	0	1	1	1	1	...	1	1	1	1
DB15	C7	0R4	0G2	1R4	1G2	...	238R4	238G2	239R4	239G2
DB14	C6	0R3	0G1	1R3	1G1	...	238R3	238G1	239R3	239G1
DB13	C5	0R2	0G0	1R2	1G0	...	238R2	238G0	239R2	239G0
DB12	C4	0R1	0B4	1R1	1B4	...	238R1	238B4	239R1	239B4
DB11	C3	0R0	0B3	1R0	1B3	...	238R0	238B3	239R0	239B3
DB10	C2	0G5	0B2	1G5	1B2	...	238G5	238B2	239G5	239B2
DB9	C1	0G4	0B1	1G4	1B1	...	238G4	238B1	239G4	239B1
DB8	C0	0G3	0B0	1G3	1B0	...	238G3	238B0	239G3	239B0

Figure 5.3.1.2 8-bit Read/Write GRAM Data format(65K)

Count	0	1	2	3	...	718	719	720
D/CX	0	1	1	1	...	1	1	1
DB15	C7	0R5	0G5	0B5	...	239R5	239G5	239B5
DB14	C6	0R4	0G4	0B4	...	239R4	239G4	239B4
DB13	C5	0R3	0G3	0B3	...	239R3	239G3	239B3
DB12	C4	0R2	0G2	0B2	...	239R2	239G2	239B2
DB11	C3	0R1	0G1	0B1	...	239R1	239G1	239B1
DB10	C2	0R0	0G0	0B0	...	239R0	239G0	239B0
DB9	C1				...			
DB8	C0				...			

Figure 5.3.1.2 8-bit Read/Write GRAM Data format(262K)

5.4 Reset Timing Characteristics

Signal	Symbol	Parameter	Min	Max	Unit
/RESET	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS
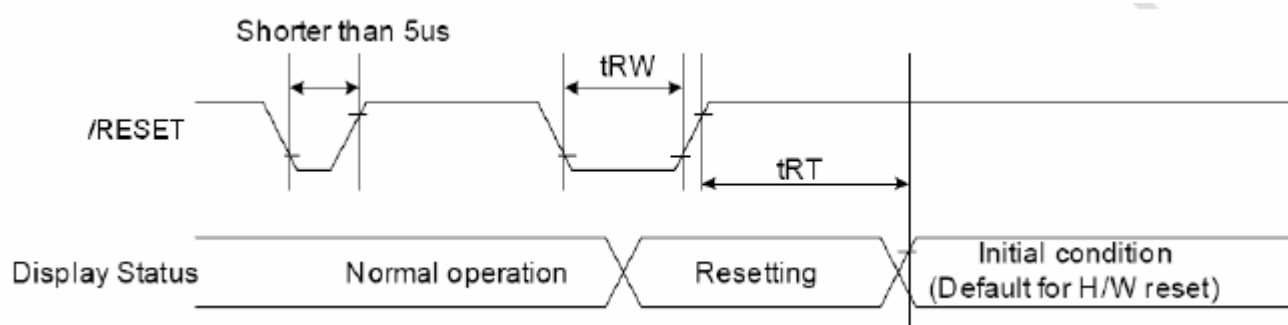
5.5 Power ON/OFF Sequence

5.5.1 Power ON Sequence

```
                    ┌─────────────────────────┐
                    │  Power Supply ON  (VCI.VCC)  │
                    └─────────────────────────┘
                                │
                    ┌─────────────────────────┐
                    │  Power On Reset and Display  │
                    │           OFF              │
                    └─────────────────────────┘
                                │
                    ┌─────────────────────────┐
                    │ Registers setting before power │
                    │      supply startup         │
                    └─────────────────────────┘
                                │
  50ms or more                  │
  Stabilizing time              │
                    ┌─────────────────────────┐
                    │  Registers setting for power │
                    │      supply startup         │
                    └─────────────────────────┘
  80ms or more Step-up          │
  circuit stabilizing time      │
                                │
  Operational Amplifier ┌─────────────────────────┐
  stabilizing time      │   Set the other registers   │
                        └─────────────────────────┘
                                │
                    ┌─────────────────────────┐
                    │   Display ON  sequence     │
                    └─────────────────────────┘
                                │
                    ┌─────────────────────────┐
                    │       Display ON          │
                    └─────────────────────────┘
                                │
                    ┌─────────────────────────┐
                    │        BLU ON             │
                    └─────────────────────────┘
```

5.5.2 Power OFF Sequence

```
           ┌─────────────────────┐
           │   Normal Display    │
           └─────────────────────┘
                      │
                      ▼
           ┌─────────────────────┐
           │      BLU OFF        │
           └─────────────────────┘
                      │
                      ▼
           ┌─────────────────────┐
           │    Display OFF      │
           └─────────────────────┘
                      │
                      ▼
           ┌─────────────────────┐
           │  Power Supply Halt  │
           │      Setting        │
           └─────────────────────┘
                      │
                      ▼
         ┌─────────────────────────┐
         │ Power Supply OFF (VCI,VCC)│
         └─────────────────────────┘
```

6.Optical Characteristics

Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angle		θT	CR≥10	60	70	--	Degree	Note 2
		θB		50	60	--		
		θL		60	70	--		
		θR		60	70	--		
Contrast Ratio		CR	θ=0°	400	500	--		Note1 Note3
Response Time		T_{ON}	25℃		20	30	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.245	0.295	0.345		Note1 Note5
		y		0.274	0.324	0.374		
	Red	x		0.556	0.606	0.656		
		y		0.277	0.327	0.377		
	Green	x		0.294	0.344	0.394		
		y		0.484	0.534	0.584		
	Blue	x		0.096	0.146	0.196		
		y		0.056	0.106	0.156		
Uniformity (%)		U		--	80	--		Note1 Note6
NTSC (%)				--	50	--		Note5
Luminance		L		170	220	--		Note1 Note7

Test Conditions:

1. V_F =3.2V ,I_F =18mA(LED current), the ambient temperature is 25℃.

2. The test systems refer to Note1 and Note2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°
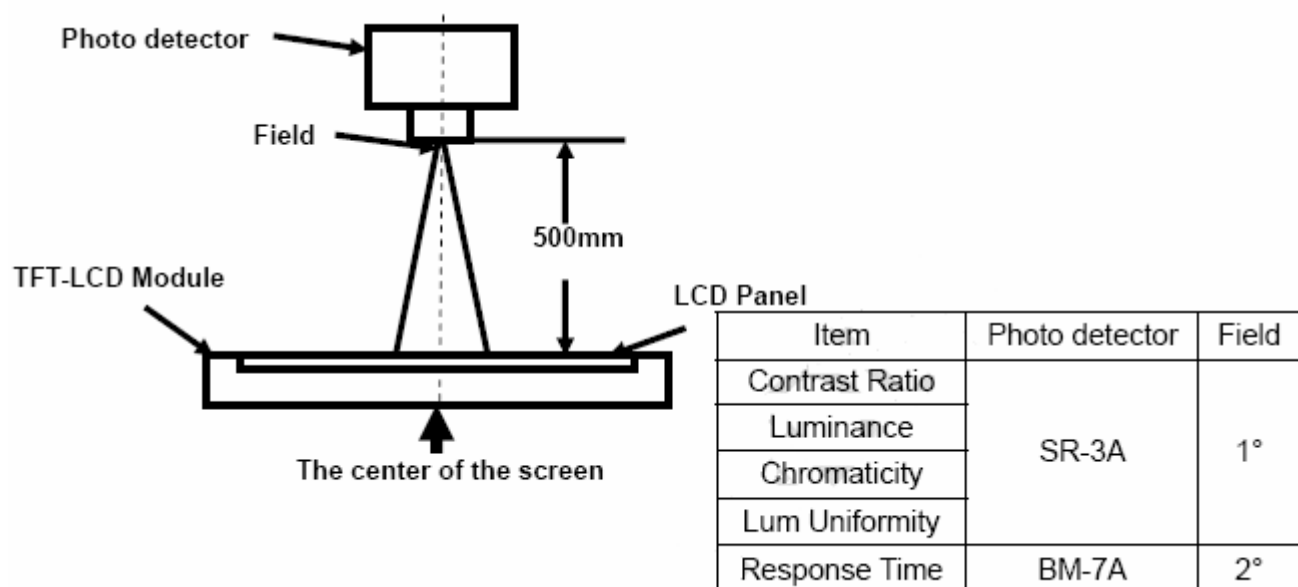
Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。
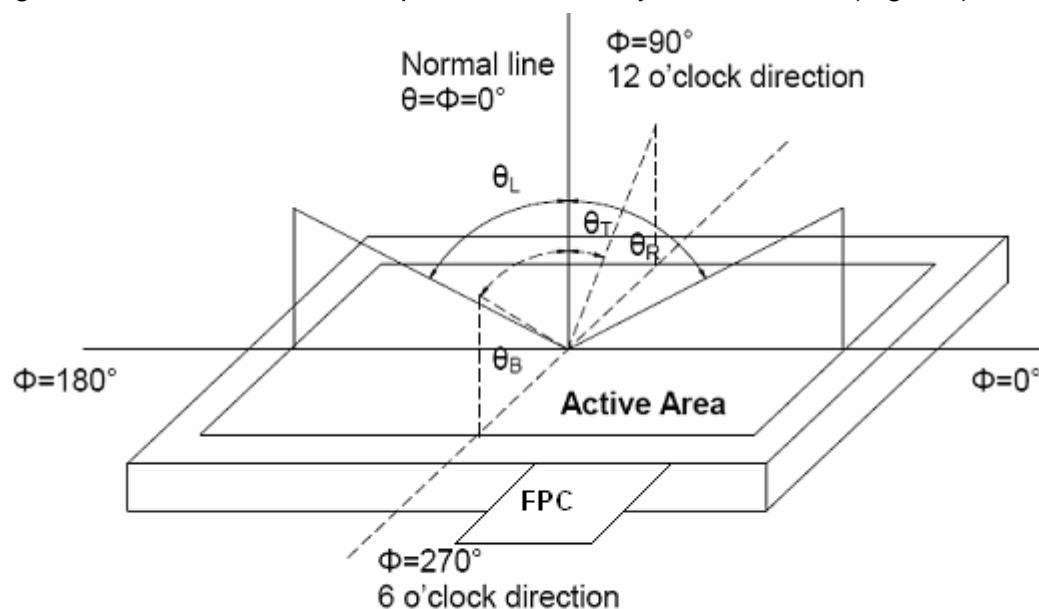
Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

"White state ":The state is that the LCD should driven by Vwhite.

"Black state": The state is that the LCD should driven by Vblack.

V_{white}: To be determined V_{black}: To be determined.

Note 4: 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_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.
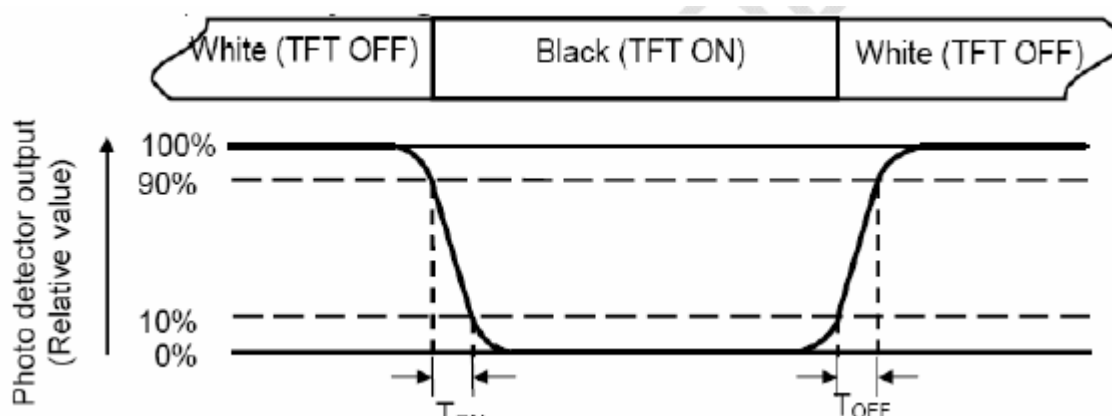
Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of luminance uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) = Lmin/ Lmax

L-------Active area length W----- Active area width
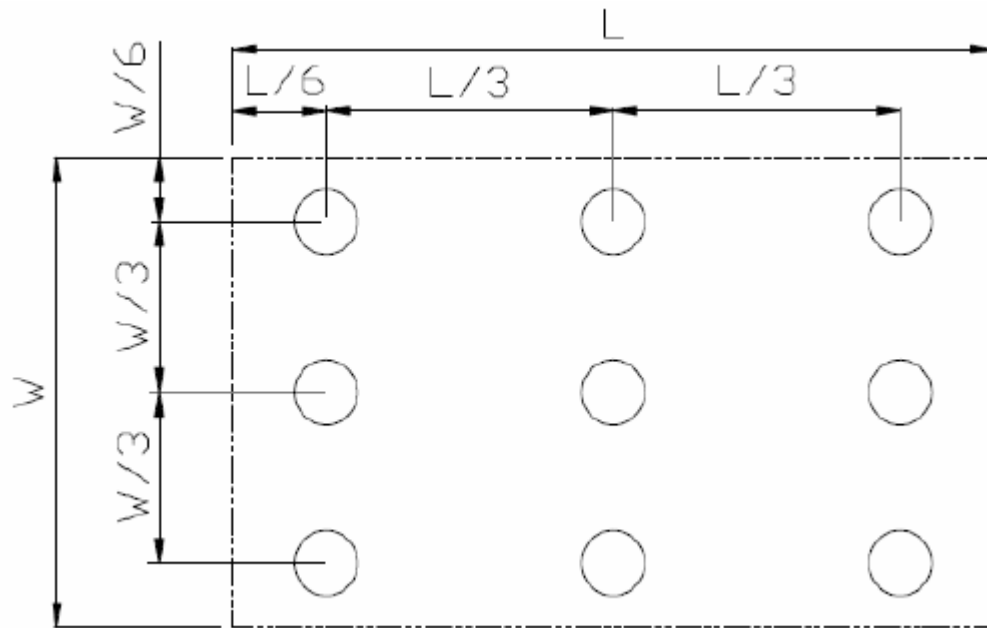
Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of luminance:

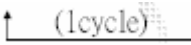Measure the luminance of white state at center point.

7 Mechanical Drawing
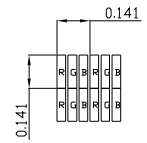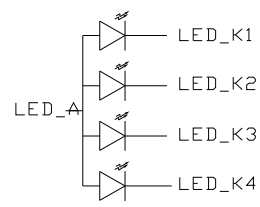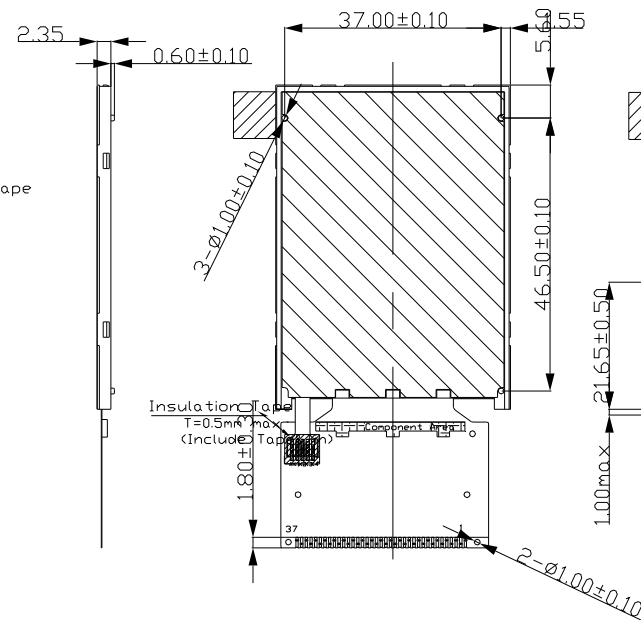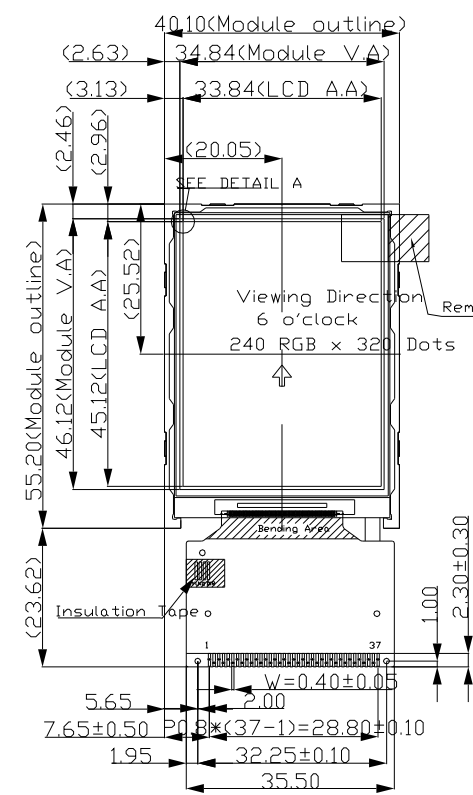
NO.	PIN NAME
1	DB0
2	DB1
3	DB2
4	DB3
5	GND
6	VCC
7	/CS
8	RS
9	/WR
10	/RD
11	IM0
12	NC(XR)
13	NC(YU)
14	NC(XL)
15	NC(YD)
16	LED-A
17	LED-K1
18	LED-K2
19	LED-K3
20	LED-K4
21	NC
22	DB4
23	DB8
24	DB9
25	DB10
26	DB11
27	DB12
28	DB13
29	DB14
30	DB15
31	/RESET
32	VCI
33	VCC
34	GND
35	DB5
36	DB6
37	DB7

The non-specified tolerance of dimension is ± 0.2mm.

LED CIRCUIT DIAGRAM

DETAIL A
SCALE 40:1

8.Reliability Test

WIDE TEMPERATURE RELIABILITY TEST

NO.	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	80℃	240 Hrs		Appearance without defect	
2	Low Temp. Storage	-30℃	240 Hrs		Appearance without defect	
3	High Temp. & High Humi. Storage	60 ℃ 90%RH	240 Hrs		Appearance without defect	
4	High Temp. Operating Display	70℃	240 Hrs		Appearance without defect	
5	Low Temp. Operating Display	-20℃	240 Hrs		Appearance without defect	
6	Thermal Shock	-20 ℃, 30min. → 70℃, 30min. (1cycle)			Appearance without defect	10 cycles

Inspection Provision

1.Purpose

The WINSTAR inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of WINSTAR LCD produces.

2.Applicable Scope

The WINSTAR inspection provision is applicable to the arrangement in regard to outgoing inspection and quality assurance after outgoing.

3.Technical Terms

3-1 WINSTAR Technical Terms

4.Outgoing Inspection

4-1 Inspection Method

MIL-STD-105E Level Ⅱ Regular inspection

4-2 Inspection Standard

		Item	AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	Faults which substantially lower the practicality and the initial purpose difficult to achieve
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		
	Dimensions	External from Dimensions	0.4	
Minor Defect	Inside the glass	Black spots	0.65	Faults which appear to pose almost no obstacle to the practicality, effective use, and operation
	Polarizing plate	Scratches, foreign Matter, air bubbles, and peeling		
	Dots	Pinhole, deformation		
	Color tone	Color unevenness		
	Solder appearance	Cold solder Solder projections		

4-3 Inspection Provisions

*Viewing Area Definition

Fig. 1
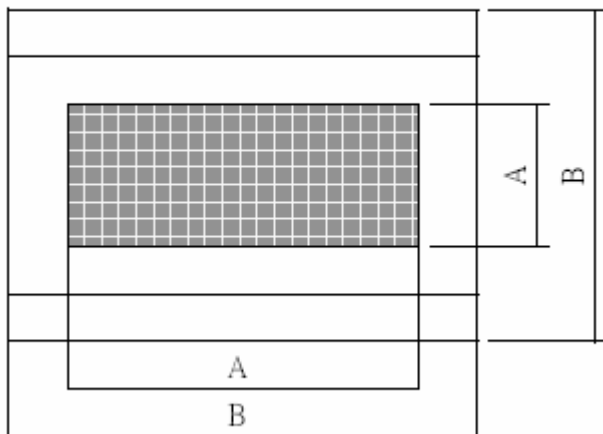
A : Zone Viewing Area

B : Zone Glass Plate Outline

*Inspection place to be 500 to 1000 lux illuminance uniformly without glaring.

The distance between luminous source(daylight fluorescent lamp and cool white fluorescent lamp) and sample to be 30 cm to 50 cm.

*Test and measurement are performed under the following conditions, unless otherwise specified.

Temperature $20 \pm 15℃$

Humidity $65 \pm 20\%$R.H.

Pressure   860~1060hPa(mmbar)

In case of doubtful judgment, it is performed under the following conditions.

Temperature $20 \pm 2℃$

Humidity $65 \pm 5\%$R.H.

Pressure   860~1060hPa(mmbar)

5.Specification for quality check

5-1-1 Electrical characteristics :

NO.	Item	Criterion
1	Non operational	Fail
2	Miss operating	Fail
3	Contrast irregular	Fail
4	Response time	Within Specified value

5-1-2 Components soldering :

Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mounting position, etc.

5-2 Inspection Standard for TFT panel

5-2-1 The environmental condition of inspection :

The environmental condition and visual inspection shall be conducted as below.

(1) Ambient temperature : 25±5℃

(2) Humidity : 25~75% RH

(3) External appearance inspection shall be conducted by using a single 20W fluorescent lamp or equivalent illumination.

(4) Visual inspection on the operation condition for cosmetic shall be conducted at the distance 30cm or more between the LCD panels and eyes of inspector. The viewing angle shall be 90 degreeto the front surface of display panel.

(5) Ambient Illumination : 300~500 Lux for external appearance inspection.

(6) Ambient Illumination : 100~200 Lux for light on inspection.

5-2-2 Inspection Criteria

(1) Definition of dot defect induced from the panel inside

a) The definition of dot : The size of a defective dot over 1/2 of whole dot is regarded as one defective dot

b) Bright dot : Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

c) Dark dot : Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern.
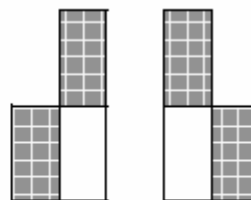
d) 2 dot adjacent = 1 pair = 2 dots

Picture :
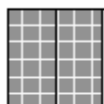
2 dot adjacent   2 dot adjacent (vertical)   2 dot adjacent (slant)

(2) Display Inspection

NO.	Item			Acceptable Count
1	Dot defect	Bright Dot	Random	N ≦ 2
			2 dots adjacent	N ≦ 0
		Dark Dot	Random	N ≦ 3
			2 dots adjacent	N ≦ 1
		Total bright and dark dot		N ≦ 4
	Functional failure (V-line/ H-line/Cross line etc.)			Not allowable
	Mura	It's OK if mura is slight visible through 6% ND filter. (Judged by limit sample if it is necessary)		
2	Newton ring (touch panel)	Orbicular of interference fringes is not allowed in the optimum contrast within the active area under viewing angle.		

(3) Appearance inspection

NO.	Item	Standards
1	Panel Crack	Not allow. It is shown in Fig.1.
2	Broken CF Non -lead Side of TFT	The broken in the area of W > 2mm is ignored, L is ignored. It is shown in Fig.2.
3	Broken Lead Side of TFT	FPC lead, electrical line or alignment mark can't be damaged. It is shown in Fig.3.
4	Broken Corner of TFT at Lead Side	FPC lead. electrical line or alignment mark can't be damaged. It is shown in Fig.4.
5	Burr of TFT / CF Edge	The distance of burr from the edge of TFT / CF, W ≦ 0.3mm. It is shown in Fig.5.
6	Foreign Black / White/Bright Spot	(1) 0.15 < D ≦ 0.5 mm, N≦ 4 ; (2) D ≦ 0.15mm, Ignore. It is shown in Fig.6.
7	Foreign Black / White/Bright Line	(1) 0.05<W≦ 0.1 mm, 0.3<L≦2 mm, N≦ 4.
		(2) W ≦ 0.05mm and L≦ 0.3mm Ignore.
		It is shown in Fig.7.
8	Color irregular	Not remarkable color irregular.

Fig 1.

Crack

Active Area

Fig 2.

Active Area

W

L

Fig 3.

w

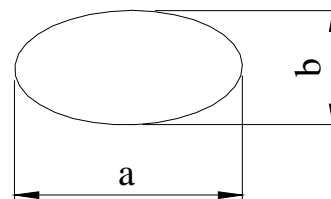Lead Area

Fig 4.

L

w

BM

Dot Area
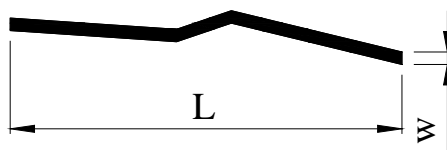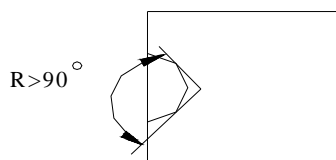
Fig 5.

W

BM

Fig 6.

b

a

D=(a+b)/2

Fig 7.

L

w

Fig8.

R>90°
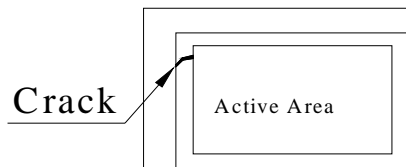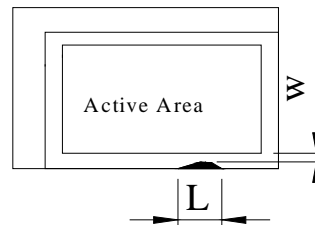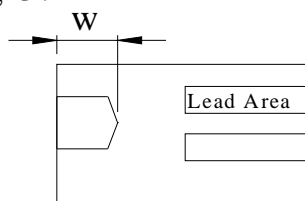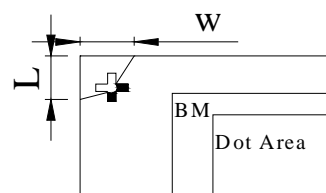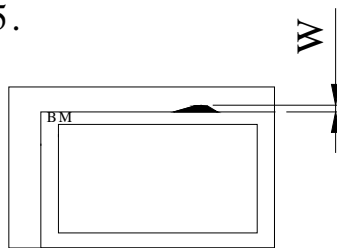
Notes
1.W:Widh
2.Lengh
3.D:Average Diameter
4.N:Count
5.All the anhle of the broken must be larger than 90～.It is shown in Fig.8.(R>90～)

NOTICE:
- SAFETY

1. If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.

2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

- HANDLING

1. Avoid static electricity which can damage the CMOS LSI.

2. Do not remove the panel or frame from the module.

3. The polarizing plate of the display is very fragile. So, please handle it very carefully.

4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

5. Do not use ketonics solvent & Aromatic solvent. Use a soft cloth soaked with a cleaning naphtha solvent.

- STORAGE

1. Store the panel or module in a dark place where the temperature is 25±5℃ and the humidity is below 65% RH.

2. Do not place the module near organics solvents or corrosive gases.

3. Do not crush, shake, or jolt the module.

- TERMS OF WARRANT

1. Acceptance inspection period

The period is within one month after the arrival of contracted commodity at the buyer's factory site.

2. Applicable warrant period

The period is within twelve months since the date of shipping out under normal using and storage conditions.