SPECIFICATION

CUSTOMER　:

MODULE NO.:　　WF43FTIFEDBN0#

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

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2012/11/27		First issue

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2012/11/27		First issue

Contents

1.Module Classification Information

W	F	43	F	T	I	F	E	D	B	N	0	#
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬

① Brand：WINSTAR DISPLAY CORPORATION
② Display Type：H→Character Type, G→Graphic Type F→TFT Type
③ Display Size：4.3" TFT
④ Model serials no.
⑤ Backlight Type： F→CCFL, White T→LED, White

⑥ LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction
   I→Transmissive, W. T, 6:00
   L→Transmissive, W.T,12:00

⑦ A：TFT LCD   G：TFT+FR
   B：TFT+FR+CONTROL BOARD   H：TFT+D/V　BOARD
   C：TFT+FR+A/D BOARD   I：TFT+FR+D/V　BOARD
   D：TFT+FR+A/D BOARD+CONTROL BOARD   J：TFT+POWER BD
   E：TFT+FR+POWER　BOARD
   F：TFT+CONTROL　BOARD

⑧ Solution:
   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

⑨
⑩ D: Digital   L：LVDS
   Interface：   N：without control board   A：8Bit   B：16Bit

⑪ TS：   N：Without TS   T：resistive touch panel   C：capacitive touch panel
⑫ Version
⑬ Special Code   #:Fit in with ROHS directive regulations

2. General Specifications

No.	Item	Specification	Remark
1	LCD size	4.3 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	480 × 3 (RGB) × 272	
4	Display mode	Normally White, Transmissive	
5	Dot pitch	0.066(W) × 0.198(H) mm	
6	Active area	95.04(W) × 53.85(H) mm	
7	Module size	105.5(W) × 67.2(H) ×6.85(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Interface	Digital	
11	Backlight Power consumption	TBD W(Typ.)	
12	Panel Power consumption	TBD W (Typ.)	
13	Weight	TBD (Typ.)	
14	View Direction	12 o'clock	
15	Gray Scale Inversion Direction	6 o'clock	
16	Controller IC	RA8875	
17	Control Board Interface	16Bit 8080	

Note 1: Refer to Mechanical Drawing.

3.Block Diagram

```
                        ┌──────────────────────────┐
                        │                          │
                        │   4.3" TFT LCD Panel      │
                        │                          │
                        └──────────────────────────┘
                                    ▲
                                    │
┌──────────────────────┐  RGB 565  ┌──────────────┐      ┌──────────────┐
│                      │  POWER    │              │      │              │
│  RA8875 BD+LED       │ ◄──────►  │  LCD Panel   │      │  Back Light  │
│  BackLight Driver    │           │  Interface FPC│     │              │
│                      │           │              │      │              │
└──────────────────────┘           └──────────────┘      └──────────────┘
   Power
   8Bit                    VBL+
   16Bit                   VBL-
   I/O
┌──────────────────────┐
│                      │
│   EXTERNAL            │
│   CUSTOMER's          │
│   SYSTEM             │
│                      │
└──────────────────────┘
```
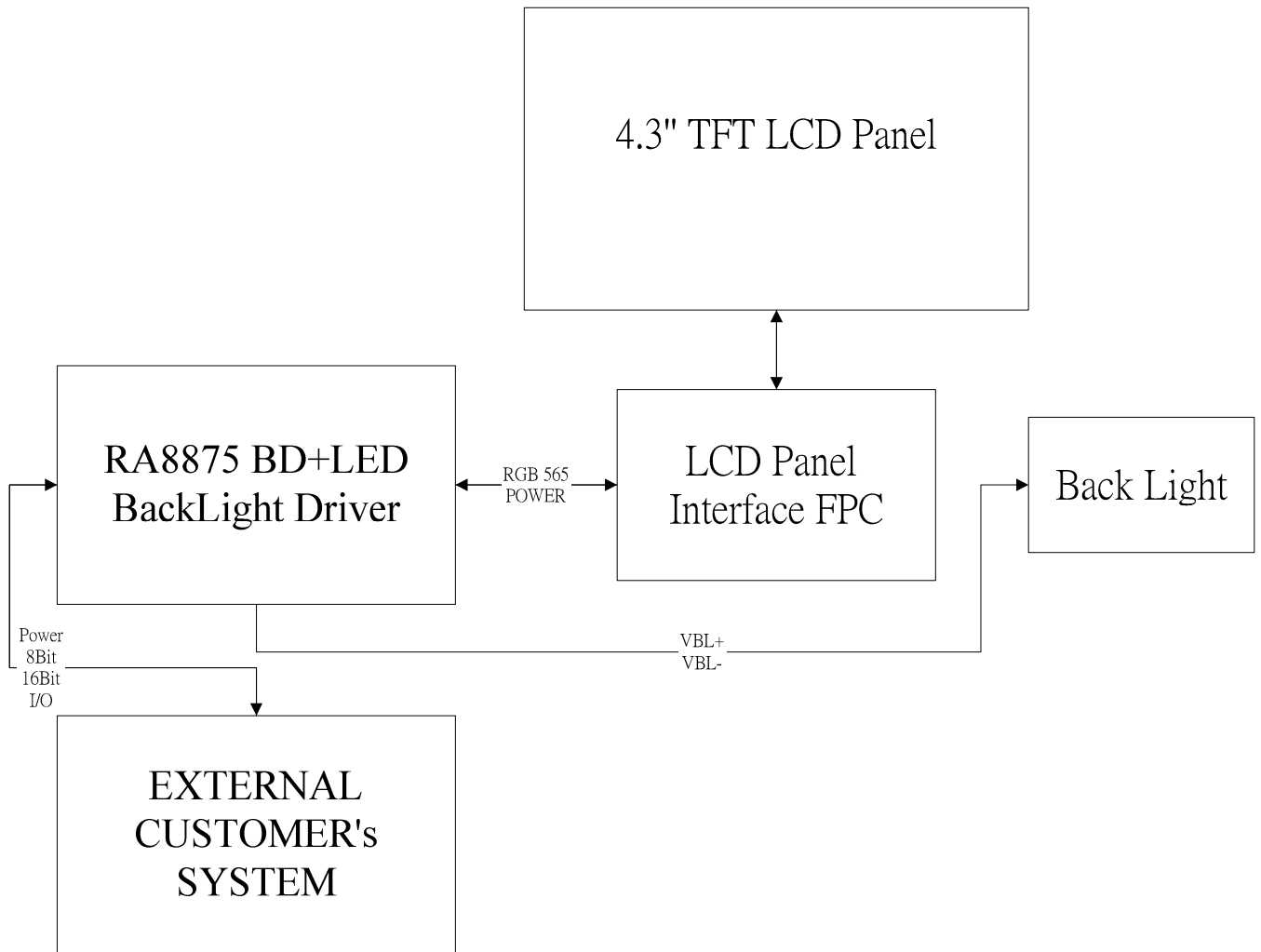
Note: Please refer to "Pin Define" for more detail interface information.

4.Contour Drawing

105.5±0.3 (TFT_Outline)
98.1(TFT_VA)
95.04(TFT_AA)
4.0
5.23
2.41
4.225
52.75

67.2±0.3 (TFT_Outline)
57.5(TFT_VA)
53.85(TFT_AA)
31.15

480(RGB)x272

36.07

71.32

6.85±0.3

3.9±0.3

40.0
21.81

66.9
17.81
P0.5*39=19.5
19.5
28.8

CON3
32
CON1
42.45

ZN-FPC-32P/P0.5
(Up-Side)

P0.5*31=15.50
0.20
0.50
CON3
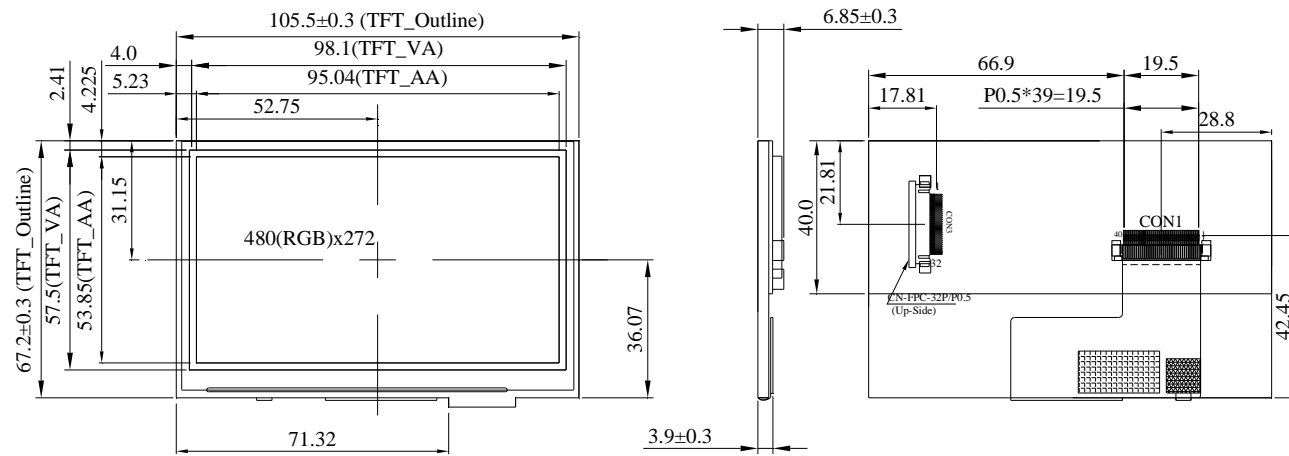
16bit mode

PIN NO	SYMBOL	PIN NO	SYMBOL
1	GND	17	DB10
2	VDD(3.3V)	18	DB11
3	BL_E	19	DB12
4	RS	20	DB13
5	WR	21	DB14
6	RD	22	DB15
7	DB0	23	WAIT
8	DB1	24	INT
9	DB2	25	CS
10	DB3	26	RST
11	DB4	27	NC
12	DB5	28	NC
13	DB6	29	NC
14	DB7	30	NC
15	DB8	31	GND
16	DB9	32	VCC(5V)
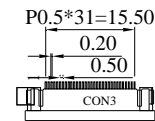
The non-specified tolerance of dimension is ±0.3mm.

5.Pin Function

5.1. TFT LCD Panel Driving Section

FPC Connector is used for the module electronics interface.

P/N	Symbol	16 B IT Function
1	GND	Ground
2	VDD	Power supply for Logic
3	BL_E	Backlight enable, support PWM control
4	RS	Command / Data Select Input
5	WR	8080 family MPU interface : Write signal
6	RD	8080 family MPU interface: Read signal
7	DB0	Data bus
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	DB8	
16	DB9	
17	DB10	
18	DB11	
19	DB12	
20	DB13	
21	DB14	
22	DB15	
23	WAIT	Wait Signal Output(RA8875)
24	INT	Interrupt
25	CS	Chip select
26	RST	RESET
27	NC	No connection
28	NC	No connection
29	NC	No connection
30	NC	No connection
31	GND	Ground
32	VCC	Power supply for Backlight driver

WAIT: This is a WAIT# output to indicate the RA8875 is in busy state. The RA8875 can't access MCU cycle when WAIT# pin is active. It is active low and could be used for MCU to poll busy status by connecting it to I/O port.

6. Operation Specifications

6.1 Absolute Maximum Ratings.

Item	Symbol	Values		Unit	Remark
		Min	max		
Power Supply Voltages	VDD	-0.5	3.5	V	
Input signal voltage	Logic input	-0.5	3.5	V	
Operating Temperature	Topa	-20	70	° C	Note3,4
Storage Temperature	Tst	-30	80	° C	Note3,4
LED Reverse Voltage	Vr	-	1.2	V	Each LED Note2
LED Forward Current	IF	-	25	mA	Each LED

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed.

Note 2: VR Conditions: Zener Diode 20mA

Note 3: 90% RH Max. (Max wet temp. is 60℃)

Maximum wet-bulb temperature is at 60℃ or less. And No condensation (no drops of dew)
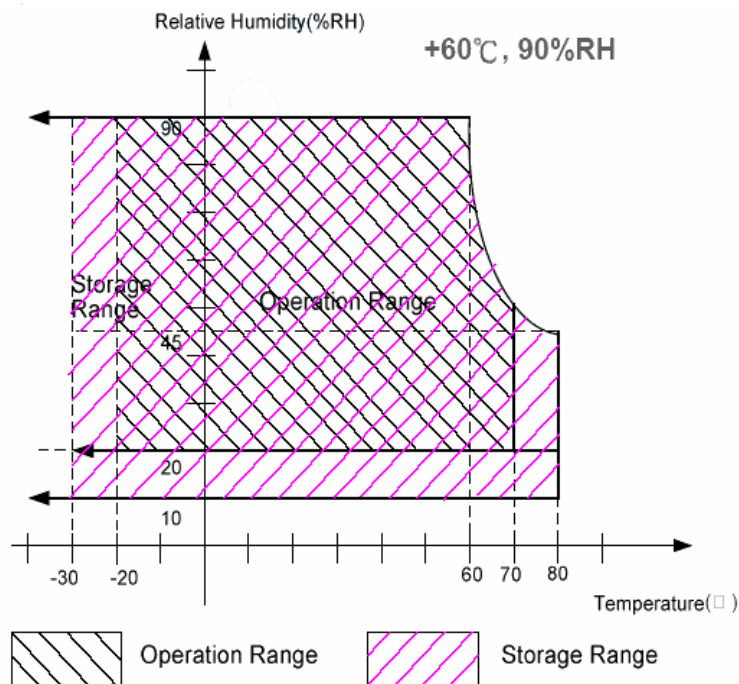
Note 4: In case of temperature below 0℃, the response time of liquid crystal (LC) becomes slower and the color of panel darker than normal one.

6.2 Typical operation conditions

Item	Symbol	Values			Unit	Remark
		Min	TYP	max		
Power voltage	V_{DD}	3.1	3.3	3.5	V	
Current of driver	IV_{DD}	-	40		mA	V_{DD} =3.3V
Supply voltage for backlight driver	Vcc	3.3	5	5.5	V	
Supply current for backlight driver	Icc		110		mA	
Input logic high voltage	VIH	0.8* V_{DD}	-	V_{DD}	V	Note1
Input logic low voltage	VIL	GND	-	0.2 V_{DD}	V	

Note1: CLK, DE, R0~ R7, G0~ G7, B0~ B7.

6.3 Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min	TYP	max		
Voltage for LED Backlight	V_L	25.2	27.9	31.5	V	Note 2
Current for LED Backlight	I_L	18	20	22	mA	
LED life time	-	20,000	-	-	Hr	Note1

Note 1: The "LED life time" is defined as the module brightness decrease to 50% original
brightness that the ambient temperature is 25℃ and IL =20mA. The LED lifetime could
be decreased if operating IL is lager than 20 mA.

Note 2: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and
IL =20mA.

6.4 Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.
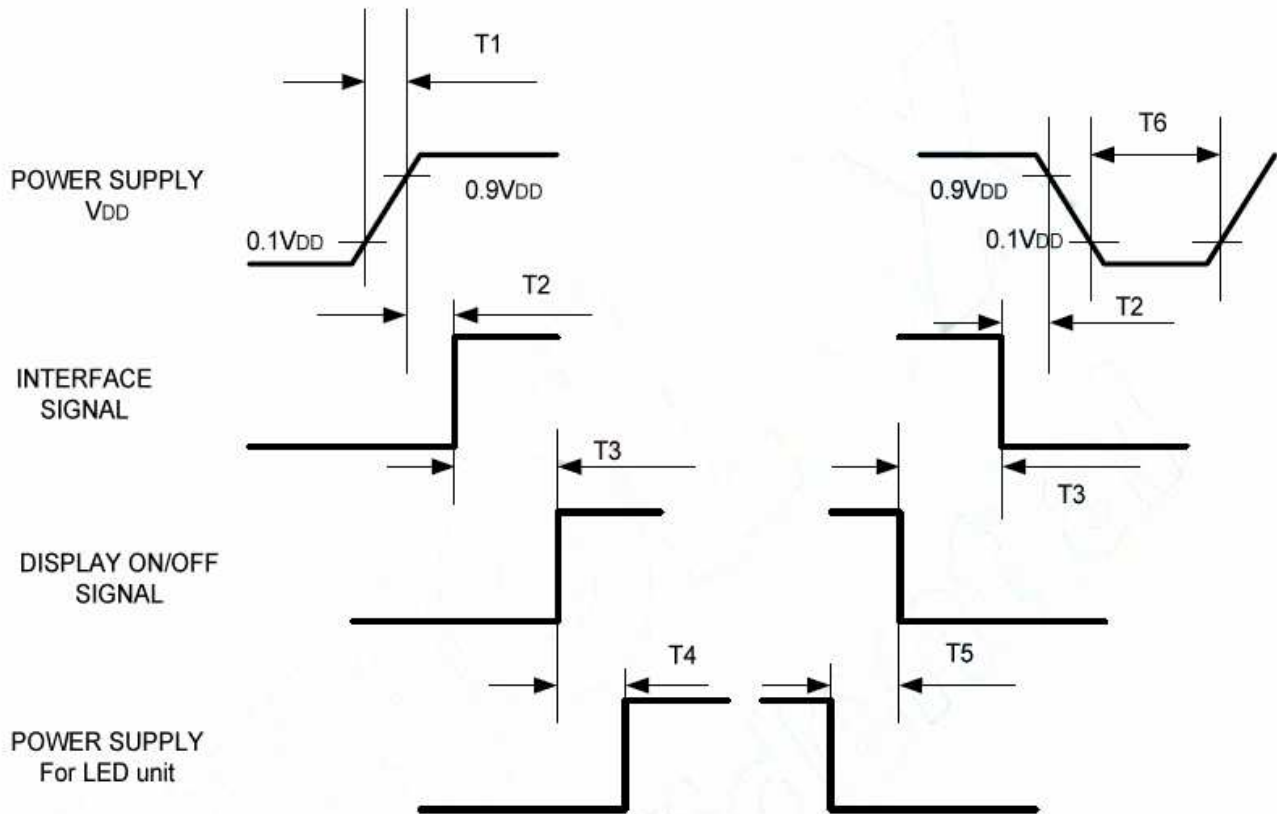
Symbol	Specification	Symbol	Specification
T1	$0 \leq T1 \leq 10$ msec	T4	160 msec $\leq T4$
T2	$0 \leq T2 \leq 100$ msec	T5	160 msec $\leq T5$
T3	$0 \leq T3 \leq 200$ msec	T6	1 msec $\leq T6$

7. AC Characteristics

7.1 Parallel I/F Protocol

The following timing charts are used to describe the timing specification of the standard 8080 and 6800 interfaces.

6800 – 8/16-bit Interface
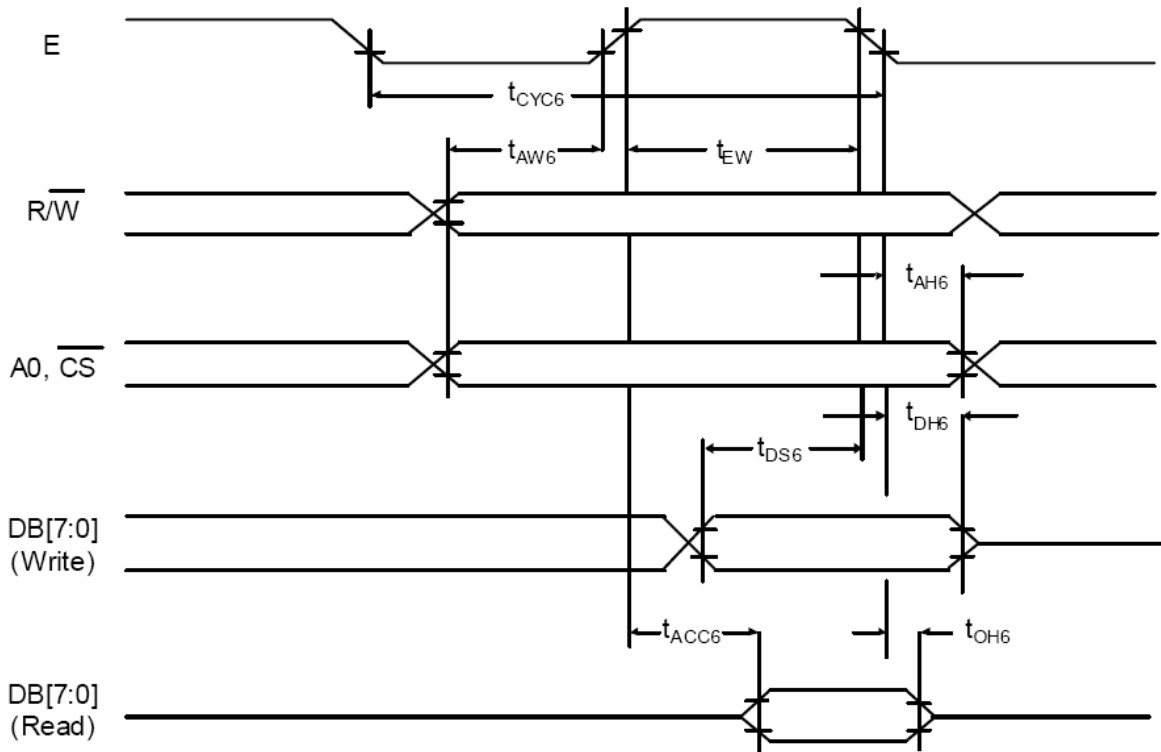
Figure 7-1: 6800 MCU Waveform

Table 7-1: 6800 MCU I/F Timing

Symbol	Parameter	Rating		Unit	Symbol
		Min.	Max		
tCYC6	Cycle time	50	--	ns	tc is one system clock period: tc = 1/SYS_CLK
tEW	Strobe Pulse width	20	--	ns	
tAW6	Address setup time	0	--	ns	
tAH6	Address hold time	10	--	ns	
tDS6	Data setup time	20	--	ns	
tDH6	Data hold time	10	--	ns	
tACC6	Data output access time	0	20	ns	
tOH6	Data output hold time	0	20	ns	

8080 – 8/16-bit Interface
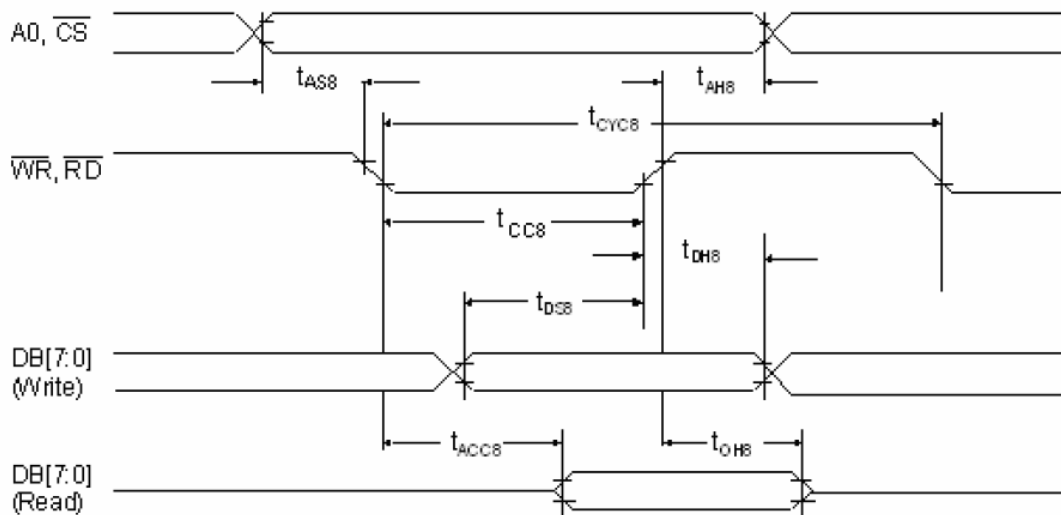
Figure 7-2: 8080 Waveform
Table 7-2: 8080 MCU I/F Timing

Symbol	Parameter	Rating		Unit	Symbol
		Min.	Max.		
tCYC8	Cycle time	50	--	ns	tc is one system clock period: tc = 1/SYS_CLK
tCC8	Strobe Pulse width	20	--	ns	
tAS8	Address setup time	0	--	ns	
tAH8	Address hold time	10	--	ns	
tDS8	Data setup time	20	--	ns	
tDH8	Data hold time	10	--	ns	
tACC8	Data output access time	0	20	ns	
tOH8	Data output hold time	0	20	ns	

The data bus width of RA8875 can be selected to 8-bit/16-bit by setting the Bit [1:0] of SYSR. When Bit [1:0] of SYSR is cleared to "00", then the data bus is 8-bit. If Bit [1:0] of SYSR is set to "11", then the data transition is set as16-bit. No matter what type of MCU I/F is selected (6800/8080), both of them can be changed the bus width when need. But if the 8-bit is used, it needs double transmission time than 16-bit bus and all of the registers must be accessed by 8-bit data.

The continuous data write speed determines the display update speed. The cycle-to-cycle interval must be larger than 4 times of system clock period. Over the specification may cause the data lose or function fail. Please refer to Figure 6-5 and Figure 6-6 for waveform detail.

In order to reduce the transmission interference between MCU interface and RA8875, It is

suggested that a small capacitor to the GND should be added at the signal of CS#, RD#, and WR #. If using cable to connect MCU and RA8875, please keep the cable length less than 20cm. Otherwise it's suggested to add 1~10Kohm pull-up resistors on pins CS#, RD#, WR# and RS.
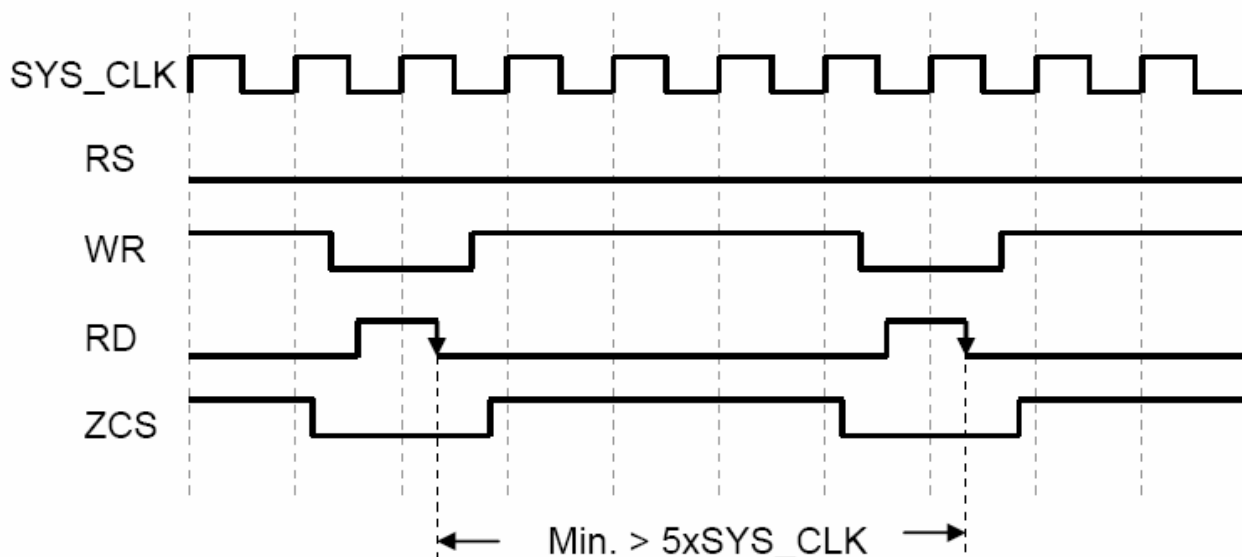
Figure 7-3: 6800 I/F Continuous Data Write Cycle Waveform
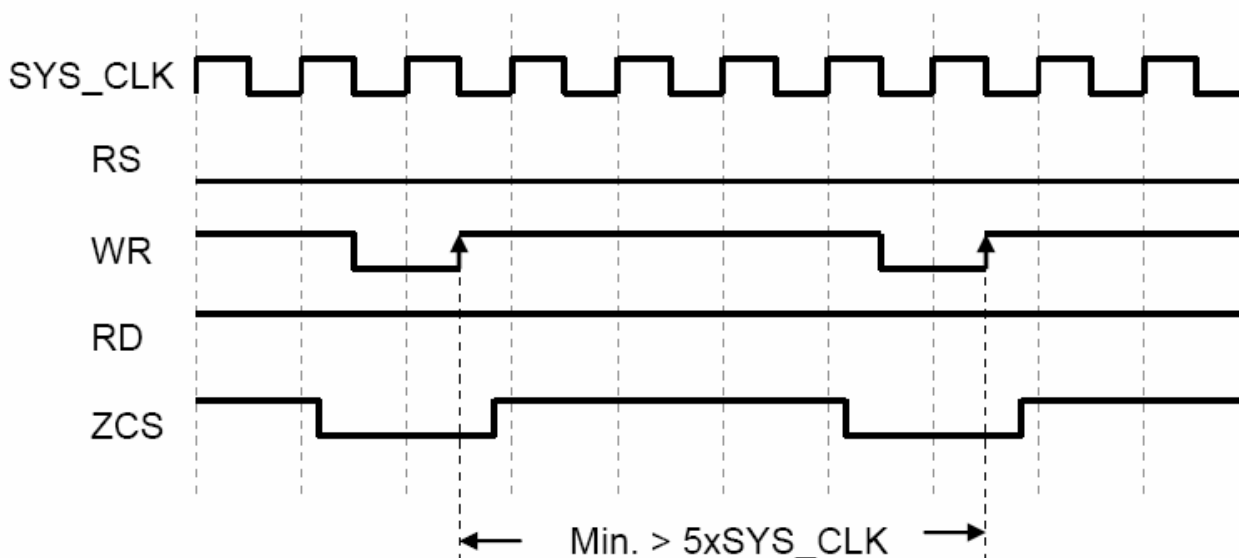
Figure7-4: 8080 I/F Continuous Data Write Cycle Waveform

8. Data transfer order Setting
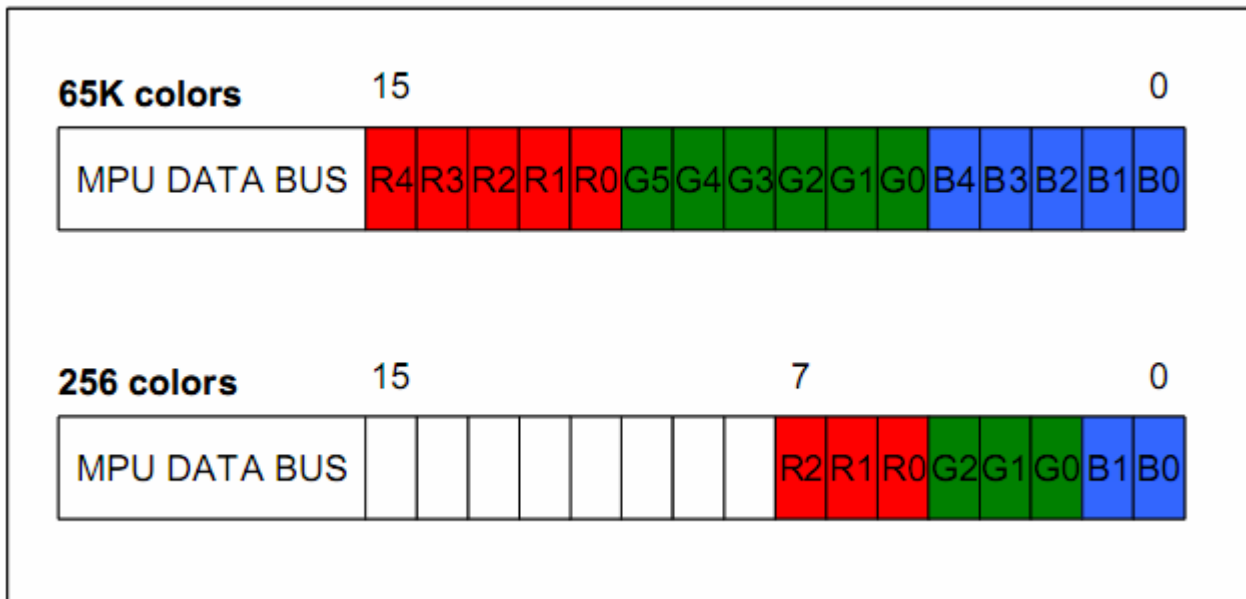
 MCU Data Bus 8-Bit

The following illustration is used for 16-bit MCU.

Figure 10-1: Color illustrations for 16-Bit Data Bus MCU

9. Register Depiction

Please consult the spec of RA8875

10. OPTICAL Specifications

TFT LCD characteristic

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	60	70	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	60	70	-		
	θ_T	Φ=90°(12 o'clock)	40	50	-		
	θ_B	Φ=270°(6 o'clock)	60	70	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		400	500	-	cd/m²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:

1. V_{DD}=3.3V, I_L=20mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note2.

Note 1: Definition of viewing angle range
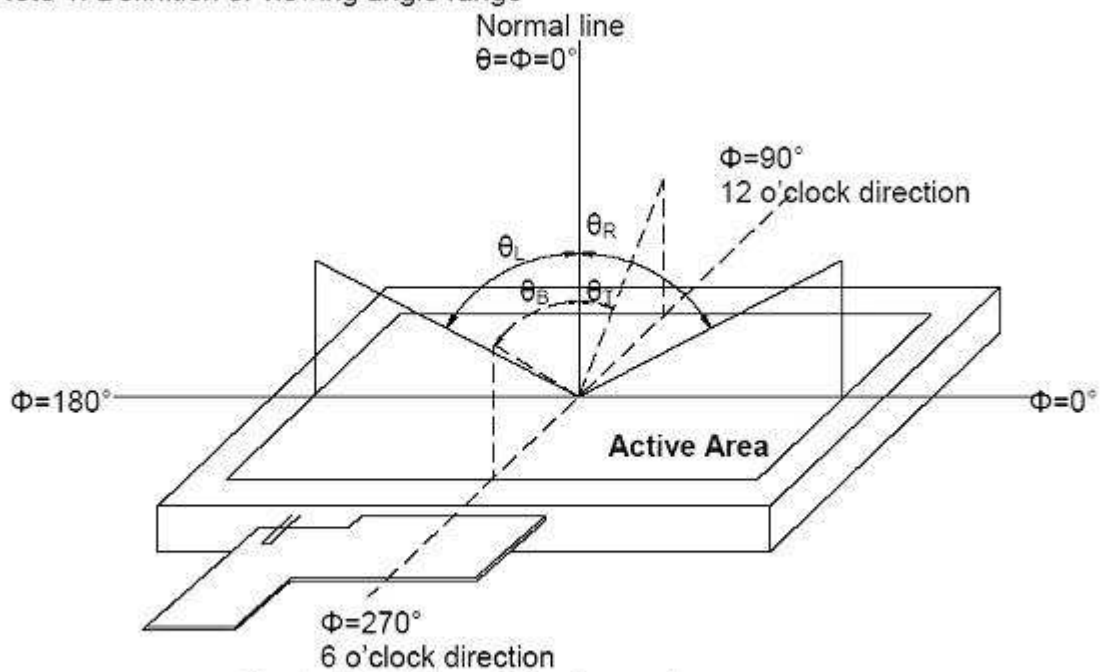
Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.
The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)
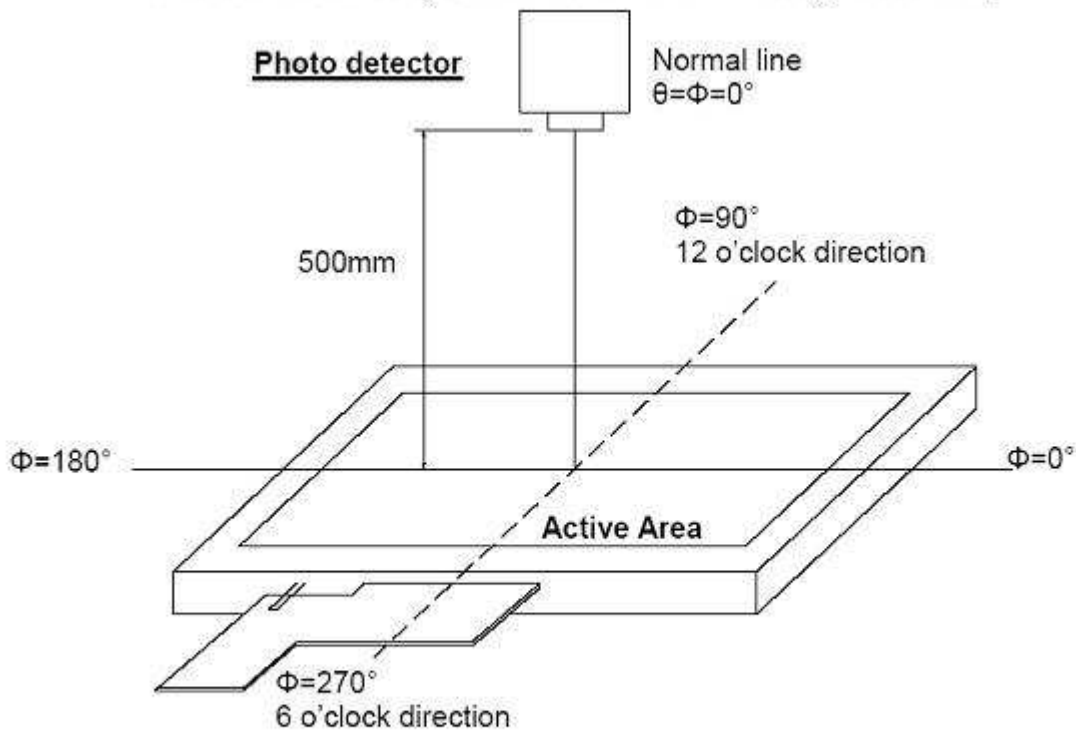
Fig. 4-2 Optical measurement system setup

Note3: 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%~10%. And fall time (T_{OFF}) is the time between photo detector output intensity change from 10%~90%.
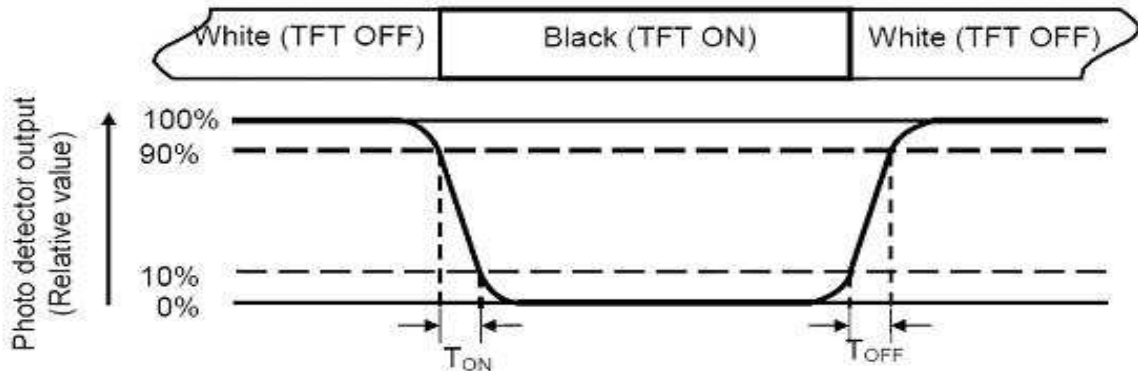
Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

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

Note 5: Definition of color chromaticity (CIE1931) Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is I_L=20mA.

Note 7: Definition of Luminance Uniformity Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

$$Luminance\ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$

L-------Active area length   W----- Active area width
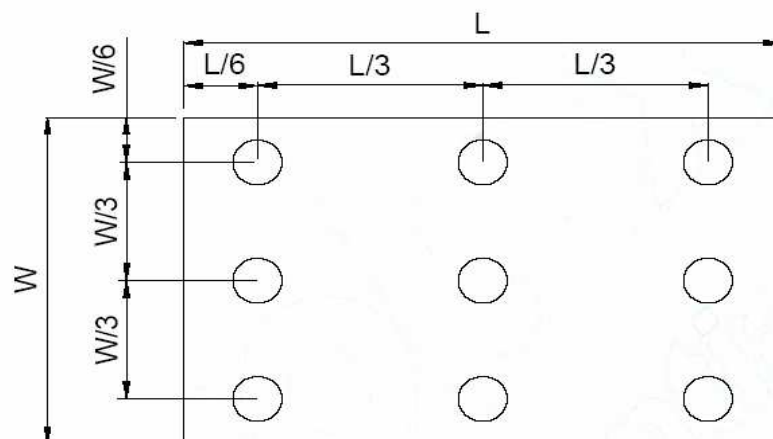
Fig. 4-4 Definition of measuring points

Bmax: The measured maximum luminance of all measurement position.

Bmin: The measured minimum luminance of all measurement position.

11.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
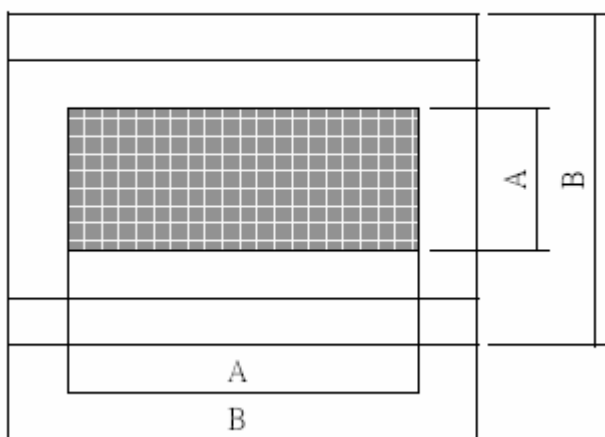
A: Zone Viewing Area

B: Zone Glass Plate Outline

*Inspection place to be 500 to 1000 lux luminance 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 ± 15℃

Humidity   65 ± 20%R.H.

Pressure   860~1060hPa(mmbar)

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

Temperature   20 ± 2℃

Humidity   65 ±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 degree to 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

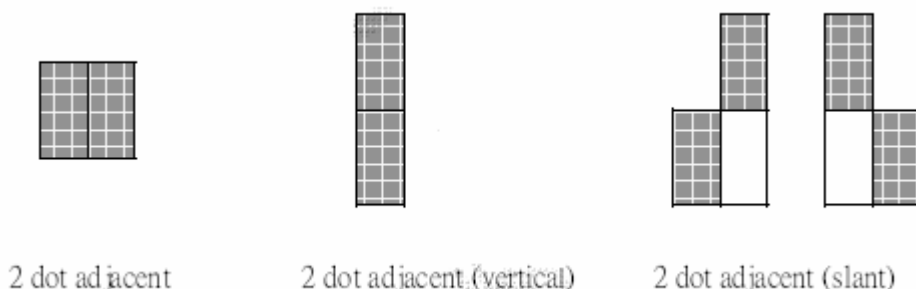(1) Definition of dot defect induced from the panel inside

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.

w

L

BM

Dot Area

Fig 5.

W

BM
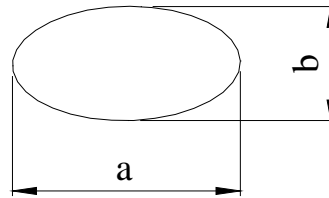
Fig 6.

b

a

D=(a+b)/2

Fig 7.

L

w

Fig8.

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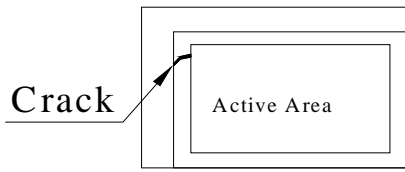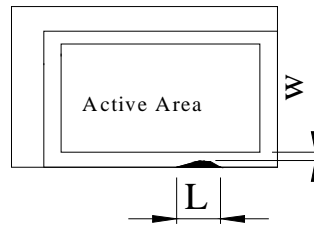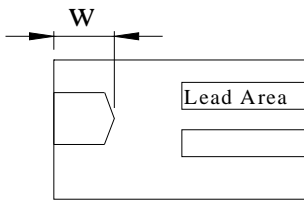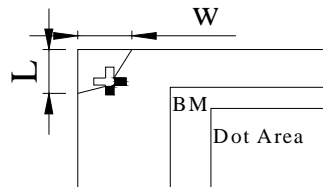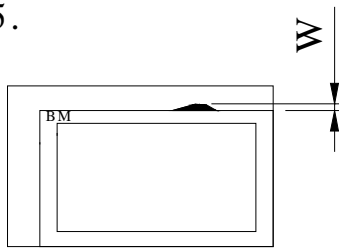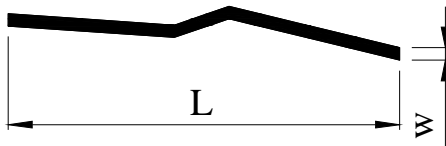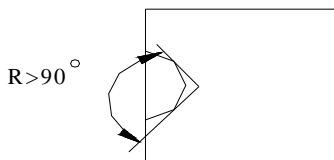
Notes
1.W:Widh
2.Lengh
3.D:Average Diameter
4.N:Count
5.All the anhle of the broken must be larger than 90〜.It is shown in Fig.8.(R>90〜)

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 tectonics 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.