AZ DISPLAYS, INC.

COMPLETE LCD SOLUTIONS

SPECIFICATIONS FOR
AGM3224Q-NC-CBW-T

DATE: **Jan 29, 2013**

1.MECHANICAL DATA

NO	ITEM	CONTENTS	UNIT
1	Product No.	AGM3224Q-NC-CBW-T	—
2	Module Size	168 (W) x 111 (H) x 9.5 Max (D)	mm
3	Dot Size	0.10 (W) x 0.34 (H)	mm
4	Dot Pitch	0.12 (W) x 0.36 (H)	mm
5	Number of Dots	320 RGB (W) x 240 (H)	Dot
6	Duty	1/240	—
7	LCD Display Mode	FSTN, Color STN Module	—
8	Rear Polarizer	Color Transmissive Type	—
9	Viewing Direction	6	O'clock
10	Backlight	CCFL	—
11	Controller	Excluded	—
12	DC/DC Converter	Included	—
13	Touch Panel	Excluded	—
14	Weight	250 (Approx.)	g

NOTE: AZ Displays guarantees that this project doesn't include RoHS Compliance. any materials (6 materials) or includes less than specified quantities which are regulated by RoHS Compliance.

2.ABSOLUTE MAXIMUM RATINGS

2-1.ELECTRICAL ABSOLUTE RATINGS VSS=0V

ITEM	SYMBOL	MIN.	MAX.	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Power Supply for LCD Drive	VEE-VSS	0	30	V	
Input Voltage	VI	-0.3	VDD+0.3	V	
Static Electricity	—	—	—	—	Note 1

Note 1 LCM should be grounded during handling LCM.

2-2.ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature(℃)	0	50	-20	70
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 2 Ta ≦ 50℃ : 80%RH MAX.

Note 3 Please refer to item of reliability test.

Note 4 Background color will change slightly depending on ambient temperature.
That phenomenon is reversible.

3.ELECTRICAL CHARACTERISTICS

3-1.ELECTRICAL CHARACTERISTICS OF LCM

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic	VDD-VSS	—		4.5	5.0	5.5	V
				3	3.3	3.6	
Input Voltage	VIH	H Level		0.8VDD	—	VDD	V
	VIL	L Level		0	—	0.2VDD	
Contrast Adjustment Voltage	Vcon-VSS	VDD=3.3/5V Duty = 1/240	0℃ ~ 50℃	1.5	2.0	2.5	V
Power Supply Current (Ta=25℃)	IDD (VDD=3.3V)	Vcon-VSS=2.0V Pattern: 		—	55	80	mA
	IDD (VDD=5V)			—	30	50	
LCM Surface Luminance (Ta=25℃)	L	IL=5mA	Dots All On (White)	45	60	—	cd/㎡
			Dots All Off (Black)	—	3	—	
Recommended Frame Frequency for Optimum Contrast	FLM	—		115	120	125	Hz

3-2.ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used Lamp Rating

Ta=25℃

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	VL	—	350	—	Vrms	—
Lamp Current	IL	4.5	5	5.5	mArms	—
Lamp Power Consumption	PL	—	1.75	—	W	(*1)
Starting Voltage	VS	—	—	490	Vrms	Ta=25℃
		—	—	650	Vrms	Ta=0℃
Lamp life time	LL	—	30,000	—	Hrs	at IL=5 mArms Ta=25℃(*2)

(*1) Power consumption excluded inverter loss.

(*2) Lamp life time is defined as follows : The final brightness is at 50% of original brightness.

(*3) a. Please follow the table of lamp characteristics shown above if not to use the inverter tested by AZ Displays.

b. If customers want to design inverter by themselves, please inform Nan Ya to offer the detail lamp specification.

3-3 ELECTRICAL CHARACTERISTICS OF TESTED INVERTER

TDK CXA-L10L

(If the inverter output "CN2" couldn't mating CCFL connector, please refer to specification "INTERNAL PIN CONNECTION" page to fit it.)

3-3-1 GENERAL SPECIFICATIONS

OPERATION TEMPERATURE : -10℃~60℃

STORAGE TEMPERATURE : -20℃~85℃

DIMENSION : 44.0(L)mm x 21(W)mm x MAX. 18(H)mm

3-3-2 PIN ASSIGNMENTS

INPUT(CN1) CONNECTOR :

NO.	FUNCTION
1	VIN
2	GND

OUTPUT(CN2) CONNECTOR :

NO.	FUNCTION
3	OUT1
4	OUT2
5	OUT GND

3-3-3 RELATIONSHIP BETWEEN VIN & TUBE CURRENT

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Input Voltage	VIN	—	10.1	—	V	
No Load Output Voltage	Vs	800	900	—	Vrms	
Tube Current	IL	—	5	—	mA	
Working Frequency	F	30	35	40	KHz	

3-4.CHARACTERISTICS OF TOUCH PANEL

Used Touch Panel Rating Ta=25℃

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Applied Rating Voltage	VR	—	—	—	7	V
Operating Temperature	TOPR	20%~85% R.H. Max. Avoid Dew Condensation	-5	—	60	℃
Storage Temperature	TSTO		-30	—	70	
Resistance of Terminal Electrodes	RETD	X Electrode	300	—	900	Ω
		Y Electrode	200	—	600	
Linearity	L	—	—	—	1.5	%
Insulation Resistance	ROFF	VDC =25V	10	—	—	MΩ
Transparency	T		—	80	—	%
Surface Hardness	SH		3	—	—	H

Test condition : Touch screen is placed horizontally in a vessel and no power is supplied to T/P.
Normal state is temperature : 25 ±10℃, relative humidity : 60 ±25%RH.

4.OPTICAL CHARACTERISTICS

4-1.Optical Char. of Normal Temp. Mode

at Vop

ITEM / MODE		Cr(Contrast Ratio)						θ (Viewing Angle)		φ(Viewing Angle)	
		0 ℃		25 ℃		50 ℃		25 ℃		25 ℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	Viewing Direction	TYP.	Viewing Direction	TYP.
T	M	14	20	17	25	5.5	8	6 O'Clock	55	9 O'Clock	45
								12 O'Clock	30	3 O'Clock	45
NOTE		NOTE 3,6						NOTE 3,5			

NOTE :

T : Transmissive

M : Color STN Module, 6 O'clock

at $\varphi = 0°, \theta = 0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0 ℃	640	800	1200	ms	NOTE 2,3
		25 ℃	304	380	570		
		50 ℃	176	220	330		
Response Time (fall)	Tf	0 ℃	360	450	675	ms	NOTE 2,3
		25 ℃	96	120	180		
		50 ℃	56	70	105		

NOTE :

1. The above optical characteristics are based on DMS-501 measured data.
2. Applied waveform : 1/240 duty, 1/13 bias

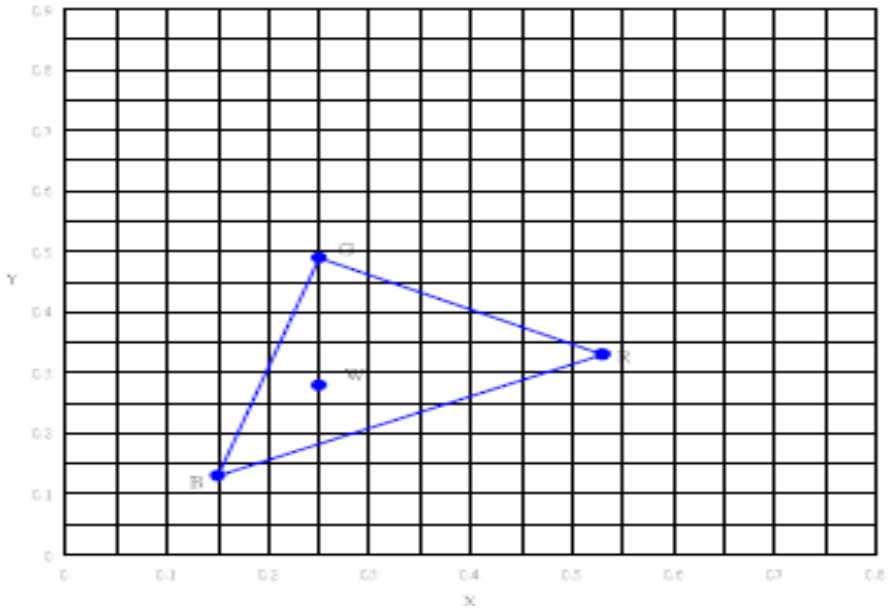
4-2.Color of CIE Coordinate

Ta=25℃

ITEM		SYMBOL	CONDITION	VALUE			NOTE
				MIN.	TYP.	MAX.	
Color of CIE Coordinate	Red	x	φ=0°, θ=0°	0.48	0.53	0.58	Note※
		y		0.28	0.33	0.38	
	Green	x	φ=0°, θ=0°	0.2	0.25	0.3	
		y		0.44	0.49	0.54	
	Blue	x	φ=0°, θ=0°	0.1	0.15	0.2	
		y		0.08	0.13	0.18	
	White	x	φ=0°, θ=0°	0.2	0.25	0.3	
		y		0.23	0.28	0.33	

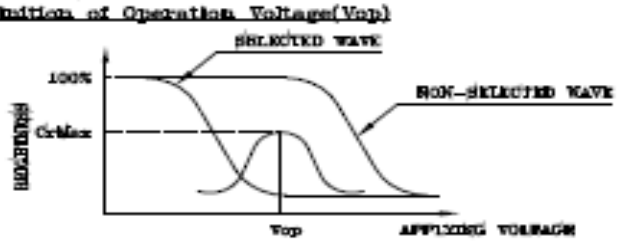
Note※ Measuring at position 3 on Fig.1 CIE chromaticity diagram

Fig.1

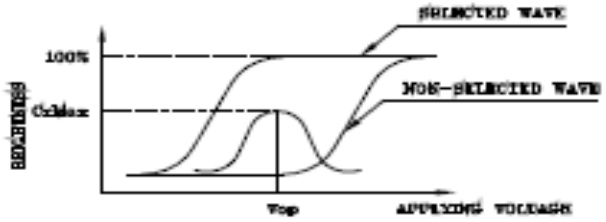


(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



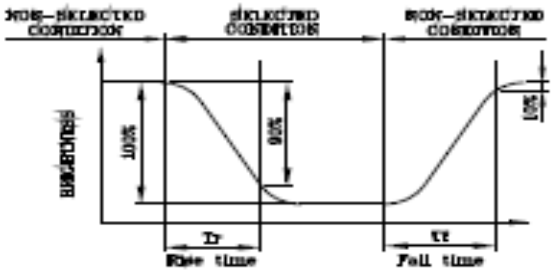
(negative type)

*Conditions

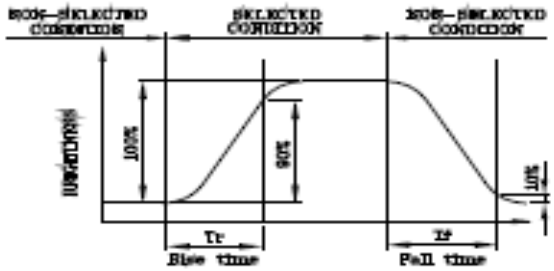
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



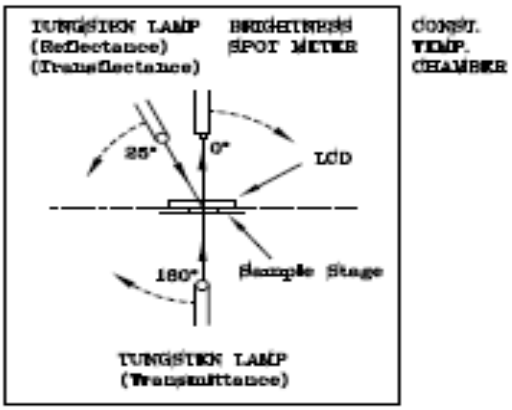
(negative type)

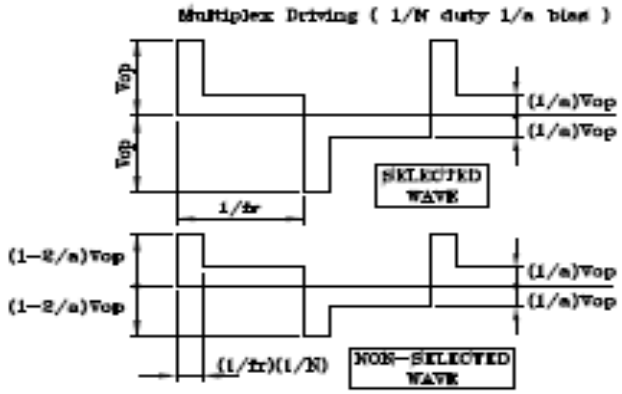
*Conditions

Operating Voltage : Vop
Viewing Angle (ϕ,θ) : (0,0)
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

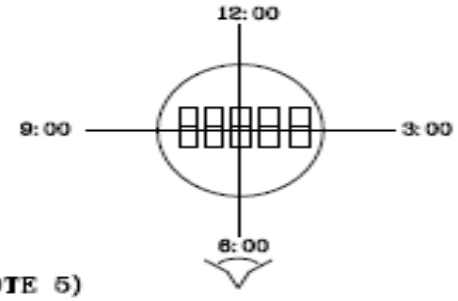
Description of Measuring Equipment and Driving Waveforms





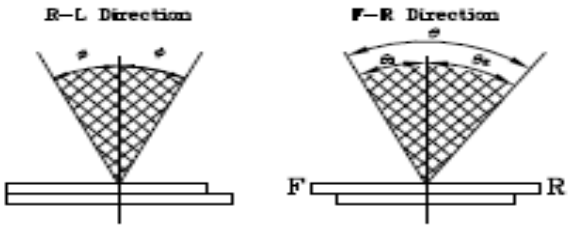
(NOTE 4)

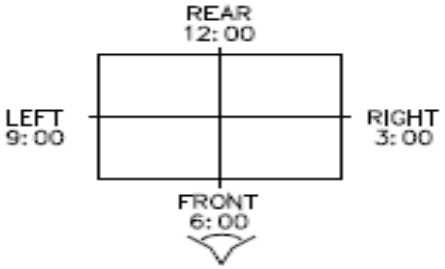
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





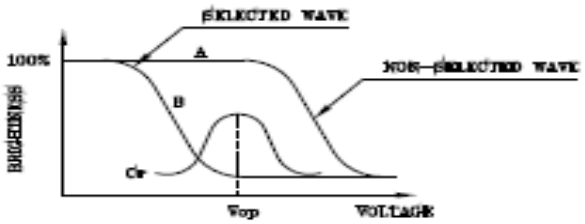
$\theta = \theta_1 + \theta_2$

*Conditions

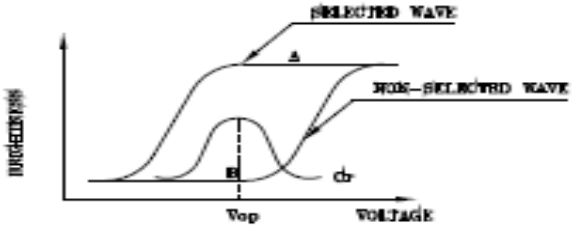
Operating Voltage : Vop
Frame Frequency : 120Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



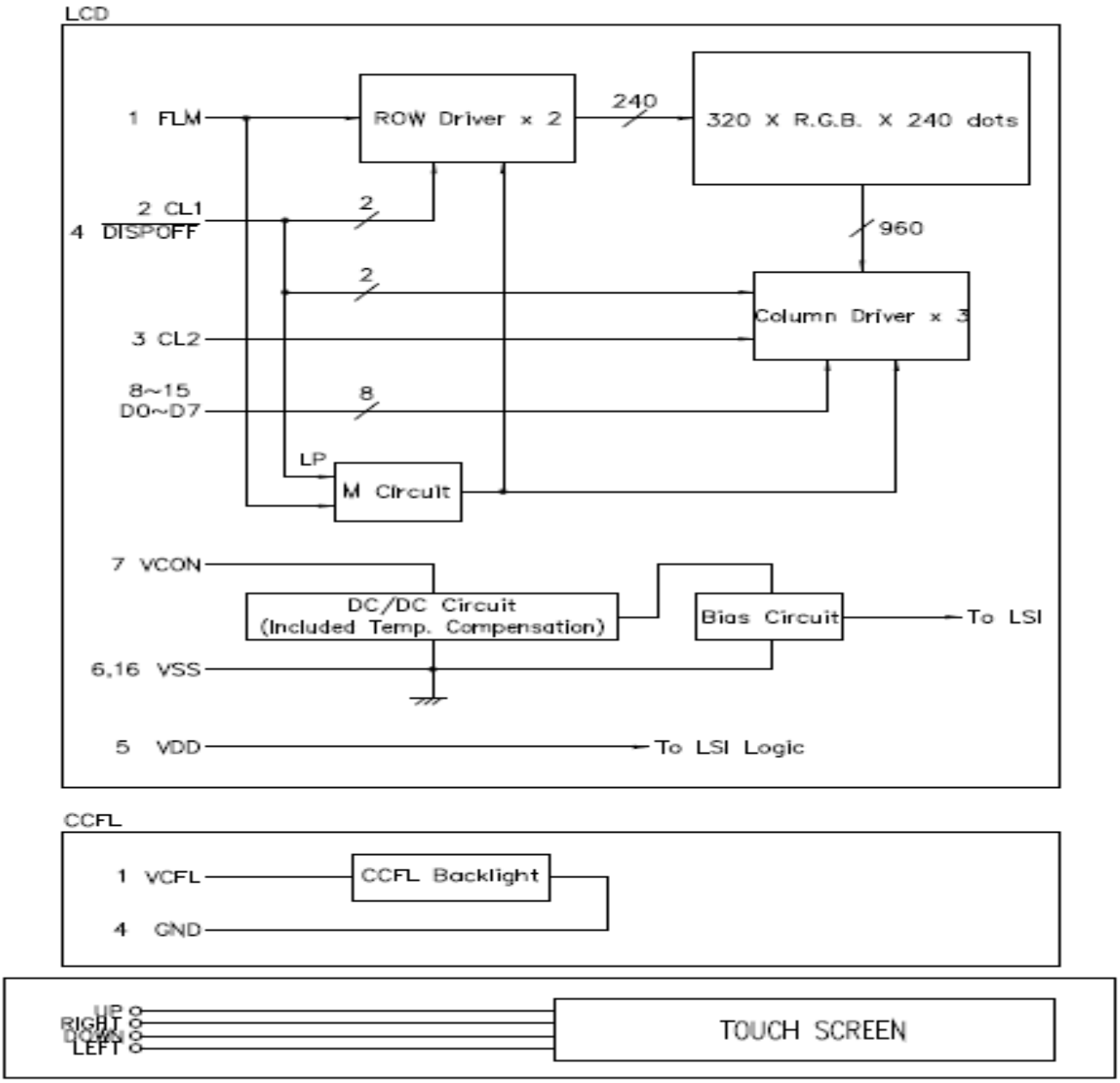
(negative type)

Contrast Ratio : Cr=A/B

*Conditions

Viewing Angle : 0
Frame Frequency : 120Hz
Applying Waveform : 1/N duty 1/a bias

5. BLOCK DIAGRAM



6.INTERNAL PIN CONNECTION

LCD

Pin No.	Symbol	Level	Function
1	FLM	H	First Line Marker
2	CL1	H→L	Data Latch Signal
3	CL2	H→L	Clock Signal for Shifting Data
4	/DISPOFF	H/L	Display Control Signal, H :Display on L :Display off
5	VDD	—	Power Supply for Logic
6	VSS	—	Power Supply (0V,GND)
7	VCON	—	Contrast Adjust
8	D0	H/L	Display data
9	D1		
10	D2		
11	D3		
12	D4		
13	D5		
14	D6		
15	D7		
16	VSS	—	Power Supply (0V,GND)

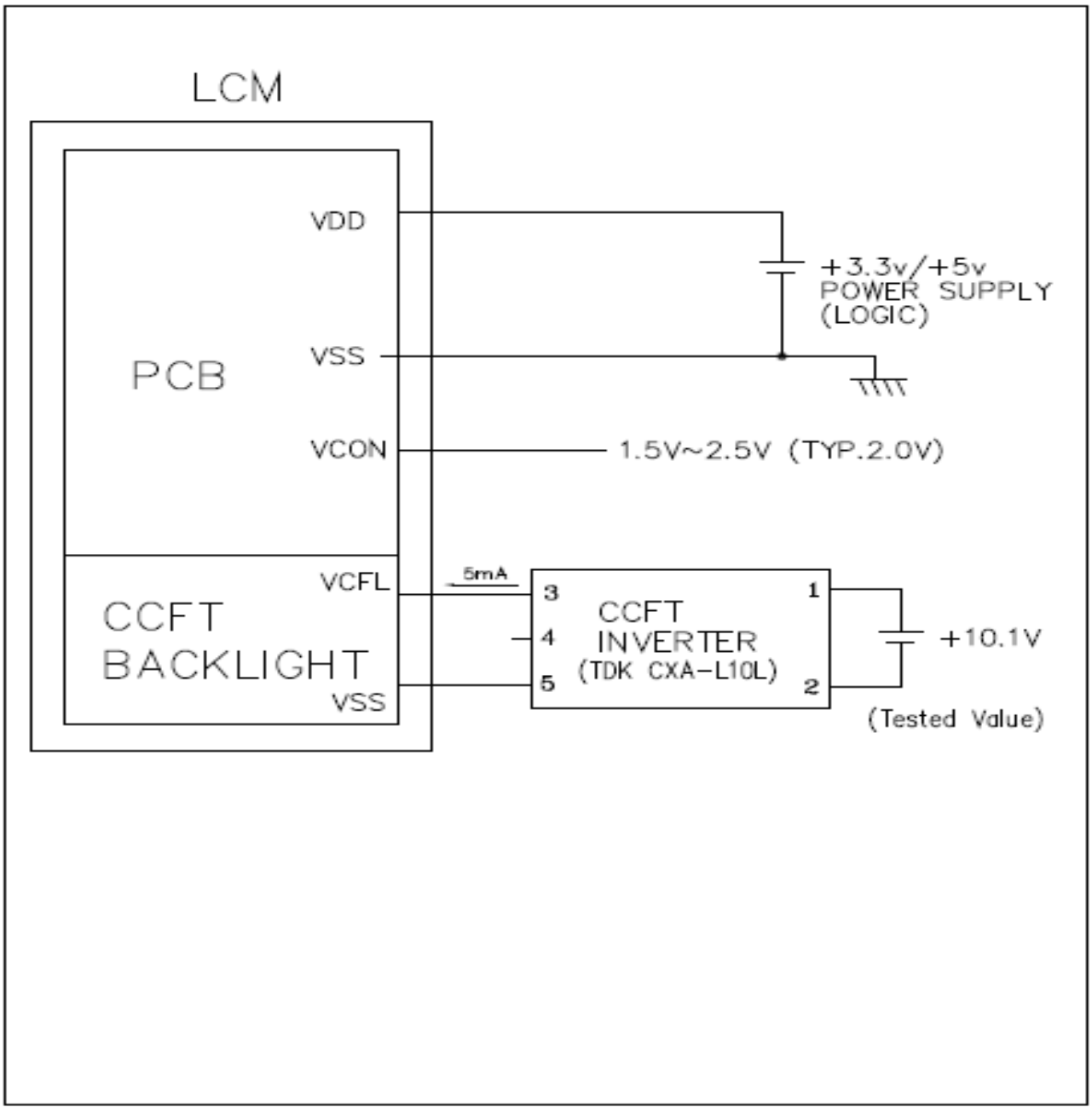
LCD INTERFACE CABLE : FFC,N16,Pitch 1.0mm (Thickness=0.3mm)
MATING CONNECTOR : MOLEX 52207-1685 or COMPATIBLE

CCFL

Pin No.	Symbol	Level	Function
1	HOT	—	Power Supply for CCFL(HOT)
2,3	NC	—	Non-Connection
4	GND	—	Power Supply for CCFL(GND)

CCFL CONNECTOR : JAE/IL-G-4S-S3C2-SA
MATING CONNECTOR : JAE/IL-G-4P-S3T2-SA

7.POWER SUPPLY

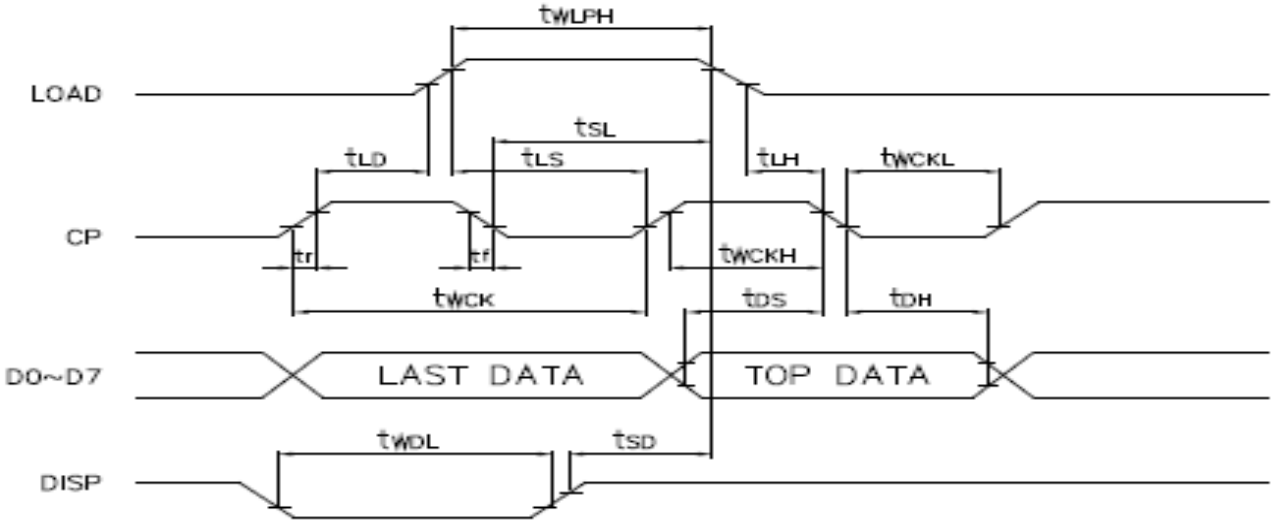


8.TIMING CHARACTERISTICS

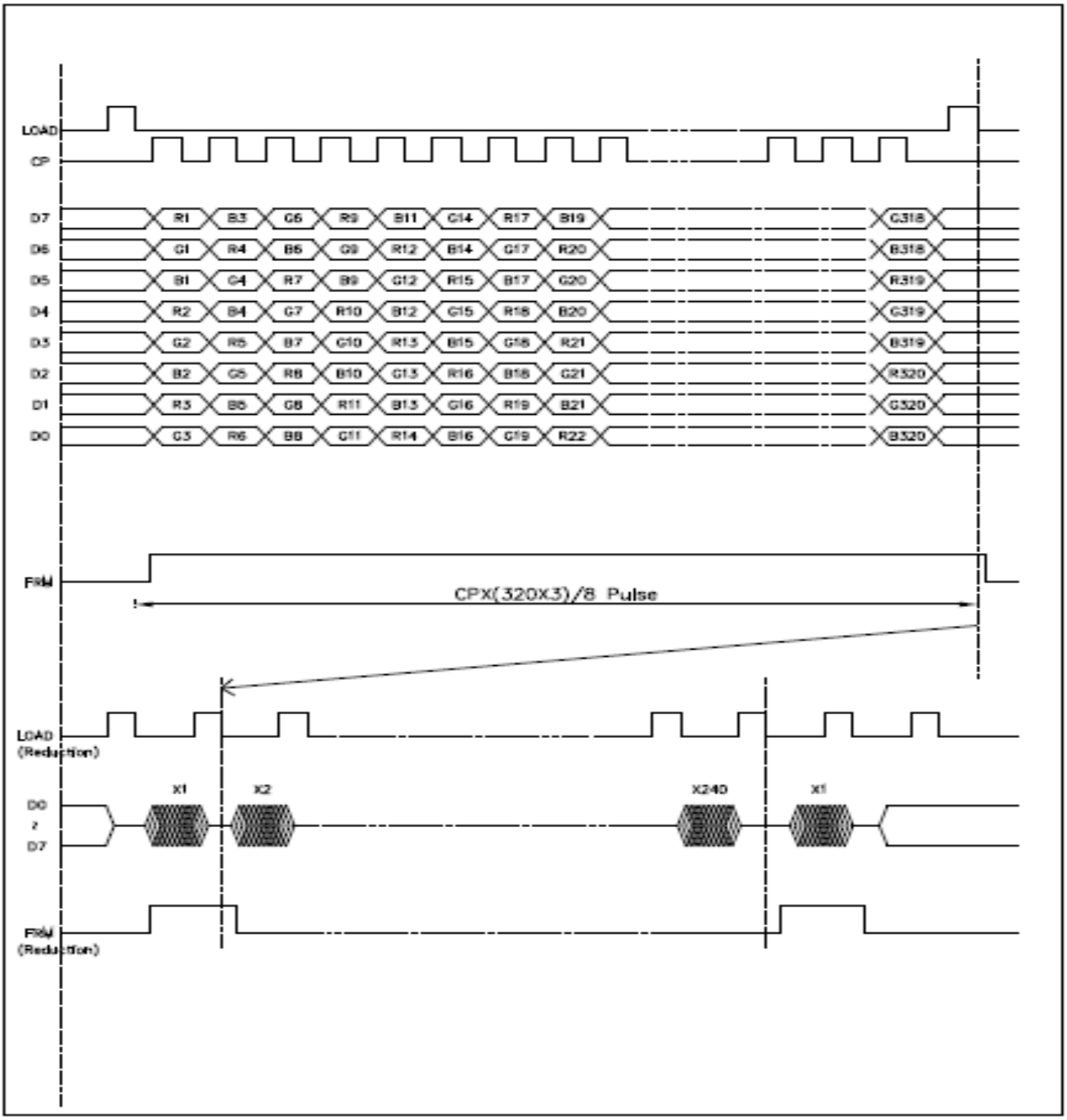
8-1.INTERFACE TIMING

VDD=3.3V ± 10%

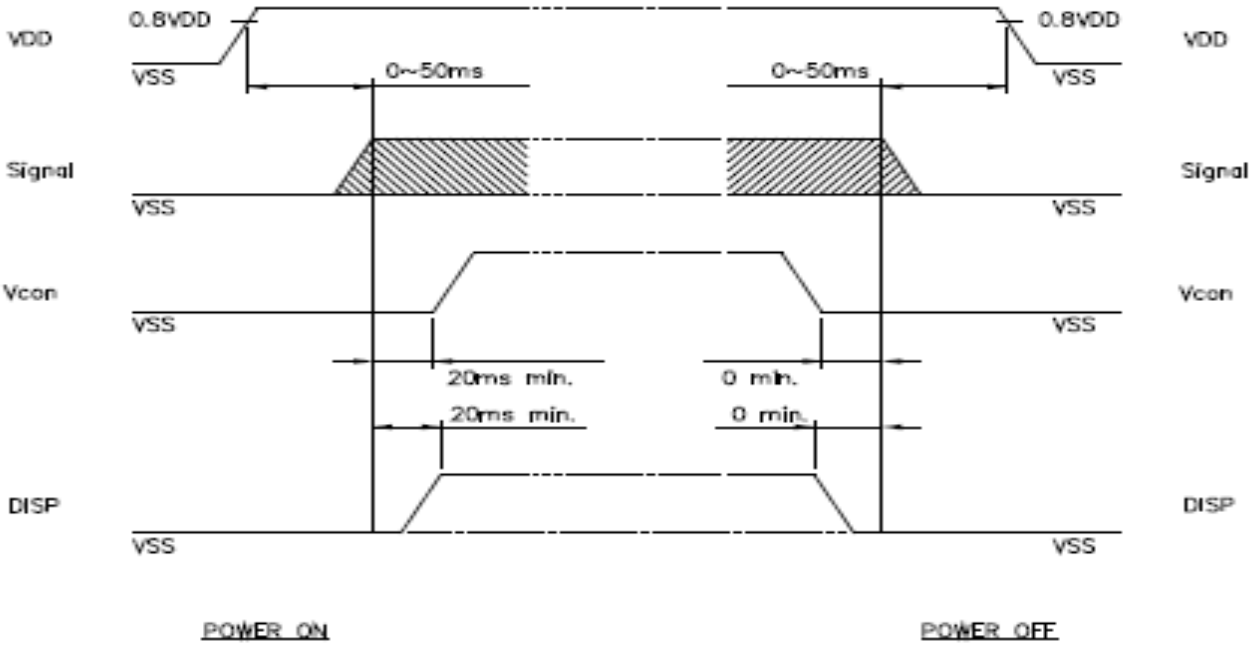
Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK PULSE CYCLE TIME	t_{WCK}	66	—	ns
CLOCK PULSE HIGH LEVEL WIDTH	t_{WCKH}	23	—	ns
CLOCK PULSE LOW LEVEL WIDTH	t_{WCKL}	23	—	ns
LATCH PULSE HIGH LEVEL WIDTH	t_{WLPH}	30	—	ns
CP→LOAD RISE TIME	t_{LD}	10	—	ns
CP→LOAD FALL TIME	t_{SL}	30	—	ns
LOAD→CP RISE TIME	t_{LS}	30	—	ns
LOAD→CP FALL TIME	t_{LH}	30	—	ns
CLOCK PULSE RISE/FALL TIME	t_r , t_f	—	30	ns
DATA SETUP TIME	t_{DS}	10	—	ns
DATA HOLD TIME	t_{DH}	25	—	ns
DISP LOW LEVEL WIDTH	t_{WDL}	1.2	—	μs
DISP CANCELLATION TIME	t_{SD}	100	—	ns



8-2.TIMING CHART OF INPUT SIGNAL

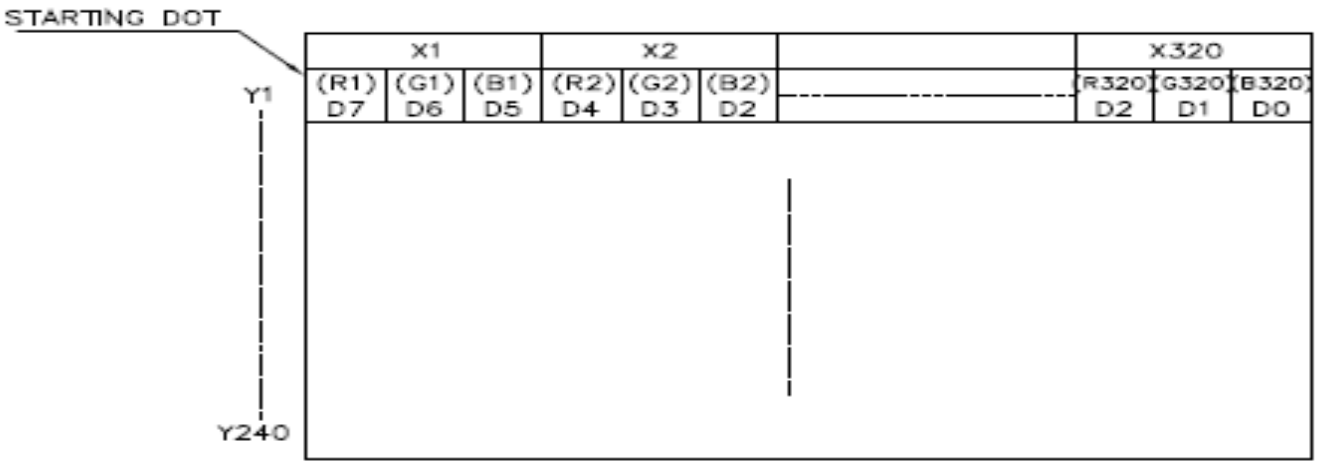


8-3.POWER ON/OFF TIMING



The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

8-4.DISPLAY PATTERN



D0~D7 are 8 bits transmitted data, where D0 is LSB and D7 is MSB.

9.RELIABILITY TEST

NORMAL TEMPERATURE RELIABILITY TEST

NO.	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70 ℃	120 Hrs		Appearance without defect	
2	Low Temp. Storage	-20 ℃	120 Hrs		Appearance without defect	
3	High Temp. & High Humi. Storage	40 ℃ 90%RH	120 Hrs		Appearance without defect	
4	High Temp. Operating Display	50 ℃	120 Hrs		Appearance without defect	
5	Low Temp. Operating Display	0 ℃	120 Hrs		Appearance without defect	
6	Thermal Shock	-20 ℃, 30min. → 70℃, 30min. (1cycle)			Appearance without defect	10 cycles

*There is no guarantee surround the boundary of polarizer within 0.5mm after reliability test.

Inspection Provision

1.Purpose

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

2.Applicable Scope

The AZ Displays inspection provision is applicable to the arrangement in regard to outgoing inspection and
Quality assurance after outgoing.

3.Technical Terms

3-1 AZ Displays Technical Terms

4.Outgoing Inspection

4-1 Inspection Method

MIL-STD-105E Level II Regular inspection

4-2 Inspection Standard

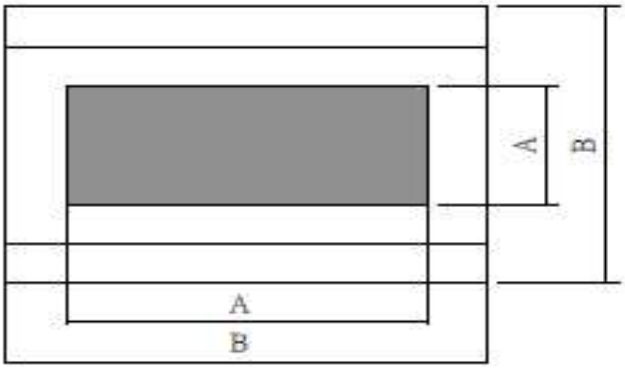
	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	faults which substantially lower the practicality and the initial purpose difficult to achieve.
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		

	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.

*AC power of Luminous source(daylight fluorescent lamp and cool white fluorescent lamp) is 60HZ.

*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 Electrical characteristics

NO.	Item	Criterion
1	Non operational	Fail
2	Miss operating	Fail
3	Missing dot	Fail
4	Contrast irregular	Fail
5	Response time	Within Specified value
6	Backlight turn on/off	Within Specified value

5-2 External Appearance Defect

<table>
<tr><th>NO.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>1</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>(1)-1-Spots

<table><tr><th>Average Diameter (mm):D</th><th>Number of pieces permitted</th><th>Minimum Space</th></tr><tr><td>D≦0.2</td><td>Ignore</td><td>—</td></tr><tr><td>0.2<D≦0.3</td><td>5</td><td>10mm</td></tr><tr><td>0.3<D≦0.4</td><td>2</td><td>30mm</td></tr><tr><td>0.4<D</td><td>0</td><td>—</td></tr></table>Number of total pieces is set to within 5 pieces.

Note that when there are 2 pieces or more, they are not to be concentrated. Set as: Average diameter = (Long diameter + Short diameter)/2

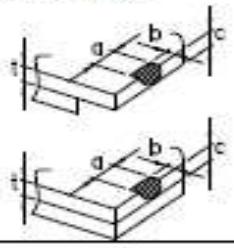
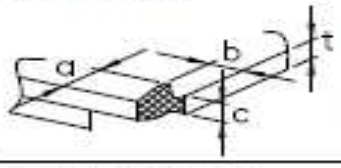
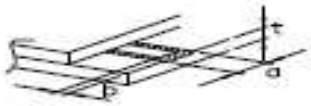
(1)-2-Blurred Spots(At lighting condition)

<table><tr><th>Average Diameter (mm):D</th><th>Number of pieces permitted</th></tr><tr><td>D≦0.3</td><td>Ignore</td></tr><tr><td>0.3<D≦0.75</td><td>5</td></tr><tr><td>0.75<D</td><td>0</td></tr></table>Number of total pieces is set to within 5 pieces.

Note that when there are 2 pieces or more, they are not to be concentrated. Set as: Average diameter = (Long diameter + Short diameter)/2</td></tr>
</table>

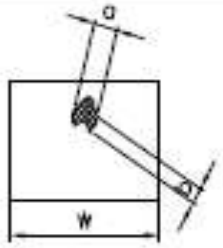
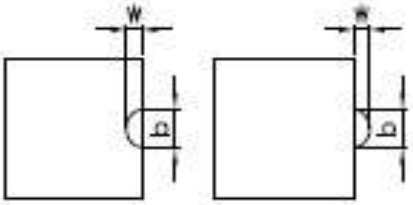
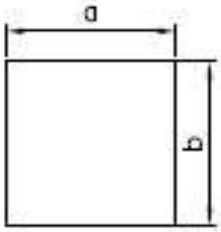
<table>
<tr><td>1</td><td>Line</td><td>(1)-1-Lines
<table><tr><th>Width(mm):W</th><th>Length(mm): L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td>0.03<W≦0.08</td><td>L≦4</td><td>2</td></tr><tr><td>0.08<W≦0.1</td><td>L≦1</td><td>1</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form. Note that when there are 2 pieces or more, they are not to be concentrated.

(1)-2-Blurred Lines(At lighting condition)
<table><tr><th>Width(mm):W</th><th>Length(mm): L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td>0.03<W≦0.08</td><td>L≦3</td><td>6</td></tr><tr><td>0.08<W</td><td>3<L</td><td>None</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form. Note that when there are 2 pieces or more, they are not to be concentrated.</td></tr>
<tr><td>2</td><td>Scratches(Glass, reflection plates, and polarizing plates)</td><td>In accordance with black spots.
(At non lighting condition)</td></tr>
<tr><td>3</td><td>Color irregular</td><td>Not remarkable color irregular.</td></tr>
</table>

<table>
<tr><td>4</td><td>Air bubbles polarizing plates, and reflection plates</td><td colspan="2">
<table>
<tr><th>Average Diameter (mm):D</th><th>Number of pieces permitted</th></tr>
<tr><td>D≦0.3</td><td>Ignore</td></tr>
<tr><td>0.3<D</td><td>0</td></tr>
</table>
Average diameter = (Long diameter + Short diameter)/2
Note that when there are 4 pieces or more, they are not to be concentrated.
</td></tr>
<tr><td rowspan="5">5</td><td rowspan="5">Cracks</td><td>(1)General crack
  </td><td>a≦5
b≦2
c≦t
Where, a and b are ignored when less than or equal to 0.5 . The numbers of pieces are set at up to 5 pieces.</td></tr>
<tr><td>(2)Corner crack
  </td><td>a≦2.5
b≦2.5
c≦t
a+b≦4</td></tr>
<tr><td>(3)Seal portion crack
  </td><td>a≦The seal width x 1/3
b≦t x 2/3
c≦5
The numbers of pieces are set at up to 5 pieces.</td></tr>
<tr><td>(4)ITO Pin crack
  </td><td>a≦5
b≦1/3 pin length
c≦t</td></tr>
<tr><td>(5)Progressive cracks</td><td>All taken to be unacceptable.</td></tr>
</table>

6	Outer dimensions	Should be within the tolerance.
7	Soldering	Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mounting position, etc.

5-3 Dot Appearance Defect

NO.	Item	Criteria	
1	Pinhole		Dot display a and b are each ≦0.2mm. The overall total is taken be with in 10 units. Note that they are not to be concentrated.
2	Missing		Dot display a and b are each ≦0.2mm. The overall total is taken to be with in 10 units.
3	Thick and thin display		Taken to be within ±15% of display character width(a) and height(b).

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 WARRANTY

1. Acceptance inspection period

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

2. Applicable warranty period

The period is within twelve months since the date of shipping out under normal using , and the storage environment should be kept on 25±5℃ and 50~60%RH.

10.OUTLINE DRAWING