

SPECIFICATION



YMFP-G240128YDPSWSD

March 7, 2008
Version 1.02



RECORDS OF REVISION

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November 14, 2007	1.00	FIRST ISSUE	YNN		
December 6, 2007	1.01	Amend pin definition	Ynn		
March 7, 2008	1.02	Amend outline dimensions and other contents	Ynn		



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1. FEATURES:

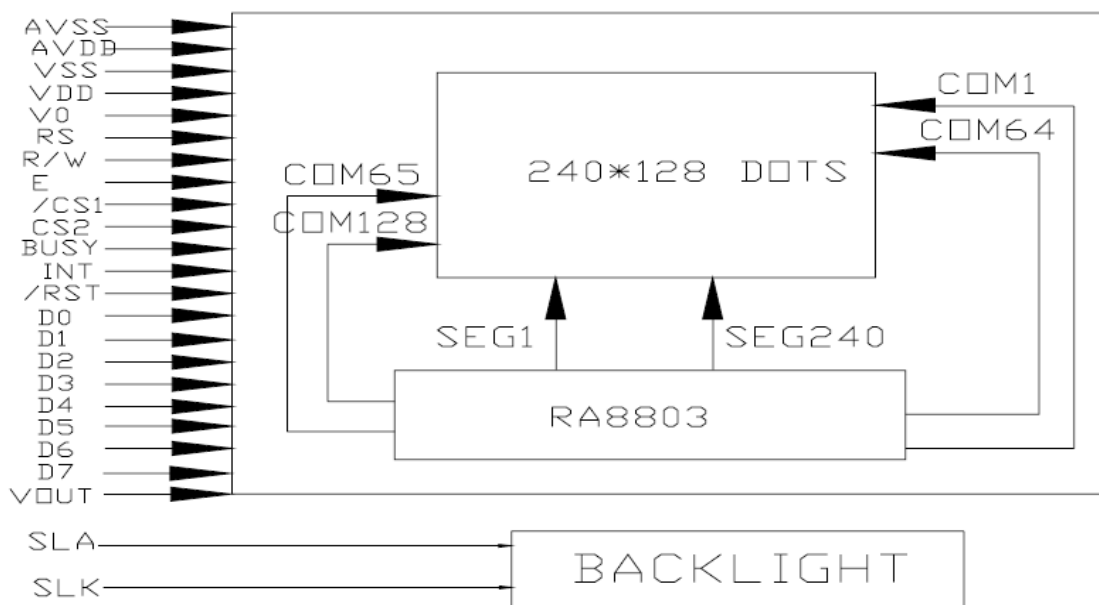
Item	Standard Value
Display Type	240*128 dots
LCD Type	<input checked="" type="checkbox"/> FSTN, Transflective,Positive,Extened TEMP <input type="checkbox"/> STN, BLUE,Transmissive,Negative,Extened TEMP <input type="checkbox"/> STN, GREY,Transflective,Positive,Extened TEMP <input type="checkbox"/> STN, Yellow-GREEN,Positive,Extended TEMP
Driver Condition	LCD Module: 1/128 Duty, 1/12Bias
Viewing Direction	6 O'clock
Backlight Type	<input type="checkbox"/> YELLOW-GREEN LED BL <input checked="" type="checkbox"/> WHITE EDGE LED BL <input type="checkbox"/> CCFL WHITE BL
Weight	TBD
Interface	8-bit 6800/8080 MPU interface
Driver IC	Driver IC: RA8803

2. MACHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
OUTLINE DIMEMSIONS	144(L) X104(W) X 13max(H)	mm
VIEWING AREA	114(L)X64(W)	mm
ACTIVE AREA	107.95(l)X57.55(w)	mm
DISP.CONSTRUCTION	240*128 dots	--
DOT SIZE	0.40(L)X0.40(W)	mm
DOT PITCH	0.45(L)X0.45(W)	mm
ASSY.TYPE	COB	--
WEIGHT	TBD	g

Note : For detailed information please refer to LCM drawing

3. BLOCK DIAGRAM



4. ABSOLUTE MAXIMUM RATING

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY FOR LOGIC	VDD	Ta=25°C	-0.3	--	6.5	V
INPUT VOLTAGE	VIN	Ta=25°C	-0.3	--	VDD+0.3	V
OPERATION TEMPERATURE	TOPR	---	-20	--	+70	°C
STORAGE TEMPERATURE	TSTG	---	-30	--	+80	°C
Storage Humidity	Hd	Ta < 40 °C	-	--	90	%RH

NOTES:

- (1) LCM should be grounded during handling LCM.

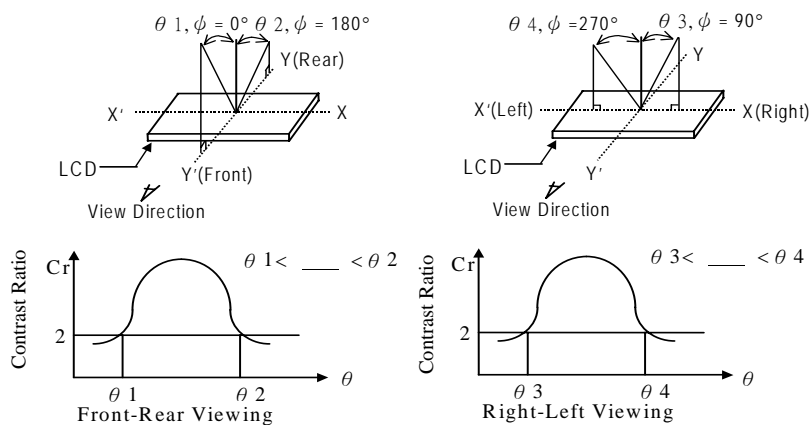
5. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY VOLTAGE	VDD—VSS	Ta= +25°C	4.8	5.0	5.2	V
POWER SUPPLY FOR LCD DRIVING	Vlcd	Ta= +25°C	--	TBD	--	V
INPUT VOLTAGE “H” LEVEL	VIH	--	0.8VDD	--	VDD	V
INPUT VOLTAGE “L” LEVEL	VIL	--	VSS	--	0.2VDD	V
OUTPUT VOLTAGE “H” LEVEL	VOH	IOH=-0.5mA	0.8VDD	--	VDD	V
OUTPUT VOLTAGE “L” LEVEL	VOL	IOL=-0.5mA	VSS	--	0.2VDD	V
Supply Current	IDD	VDD = 5.0 V	--	3	5	mA

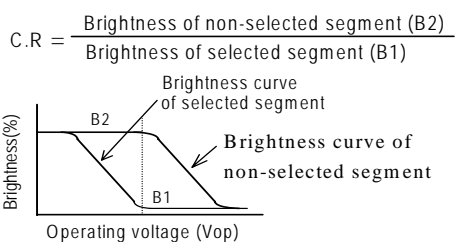
LCM Driver Voltage	Vop	VDD-V0 (-20°C)	-	-	-	V
		VDD-V0 (25°C)	-	18.5	-	V
		VDD-V0 (70°C)	-	-	-	V

6. OPTICAL CHARACTERISTICS

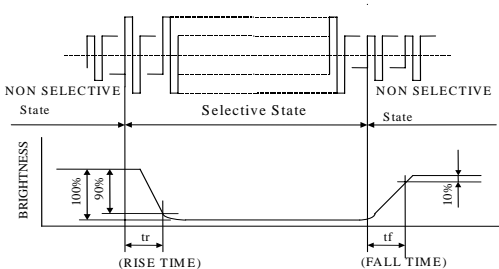
(1) DEFINITION OF VIEWING ANGLE



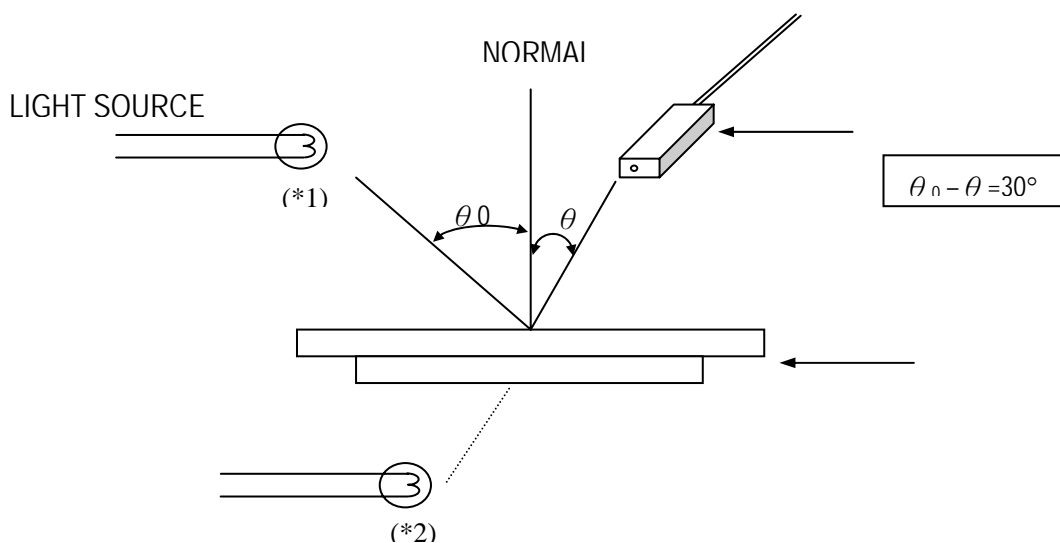
(2) DEFINITION OF CONTRAST



(3) DEFINITION OF RESPONSE



(4) Measuring Instruments For Electro-optical Characteristics



7. TIMING CHARACTERISTICS

The RA8803/8822 support 8080 or 6800 compatible MPU interface. When the pin SYS_MI is pull low then the MPU interface is set to 8080 compatible. If SYS_MI pull high then the MPU interface is defined as 6800 compatible.

And the pin SYS_DB is used to select the 8080 MPU data bus is 4-Bit or 8-Bit. When SYS_DB pull low, then the data bus for data transition is 4-Bit. If pin SYS_DB pull high, the data transition is 8-Bit. The option of 4-Bit or 8-Bit data bus is for 8080 MPU only. Of course, if used 4-Bit interface then the 8080 MPU has to take double time to communicate with RA8803/8822.

7-1 MPU Interface of 8080 Series

Please refer to Figure 2-1 when 8080 MPU series is used. If SYS_MI pull low, the RA8803/8822 only accept the control signal and handshake with 8080 families MPU.

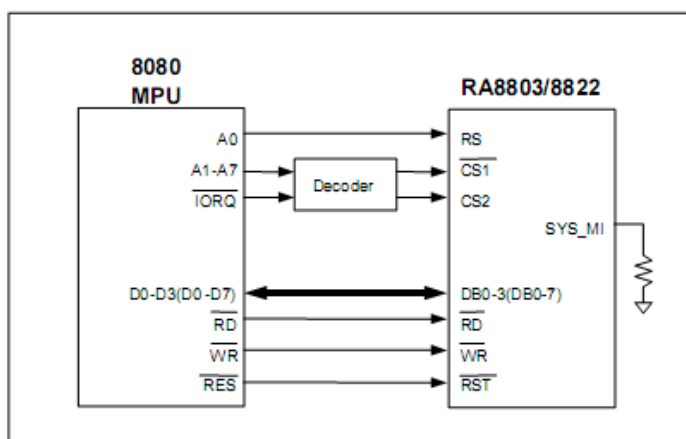


Figure2-1:RA8803/8822 with 8080(4/8-Bit) MPU I/F

Figure 2-2 is the timing diagram of 8080 MPU with RA8803/8822. When RS = "L", means MPU want execute Register Access. When RS = "H" means MPU will execute Data Access for RA8803/8822 Display RAM. Normally the RS pin is connecting to MPU address pin – A0. The major difference of 8080 with 6800 is the Read and Write control signals are separate. RD = Low for read cycle and WR = Low for write cycle. The target of read/write cycle depends on the RS.

In Figure 2-2, If 8080 MPU want to execute Register Read, the MPU has to send Register Address first and then get the register data from data bus. If MPU want to execute Register Write, the MPU has to send the register first and then send the write data through data bus. For RA8803/8822 memory access, The MPU could read from or write data to the Display RAM directly.

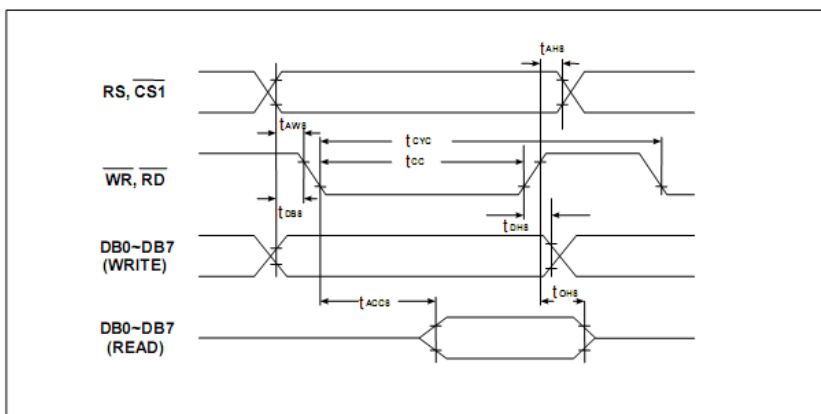


Figure 2-2 : 8-Bit 8080 MPU Access RA8803/8822 Register/Memory

Table 2-1

Signal	Symbol	Parameter	Rating		Unit	Condition
			Min	Max		
RS, CS1#	t_{AHS}	Address hold time	10	--	ns	System Clock: 8MHz Voltage: 3.3V
	t_{AWS}	Address setup time	63	--	ns	
WR#, RD#	t_{CYC}	System cycle time	800	--	ns	
	t_{CC}	Strobe pulse width	400	--	ns	
DB0 to DB7	t_{DSS}	Data setup time	63	--	ns	
	t_{DHS}	Data hold time	10	--	ns	
	t_{ACCS}	RD access time	--	330	ns	
	t_{OHS}	Output disable time	10	--	ns	

7-2 MPU Interface of 6800 Series

Please refer to Figure 2-3 when 6800 MPU series is used. If SYS_MI pull high, the RA8803/8822 only accept the control signal and hand-shake with 8080 families MPU. For 6800 MPU interface, the Read and Write control is use the same pin -R/W#. When R/W# = High, the read cycle is executed. When R/W# is Low, the write cycle is executed. But the Read or Write cycle is available only when EN = High. The target of read/write cycle also depends on the RS.

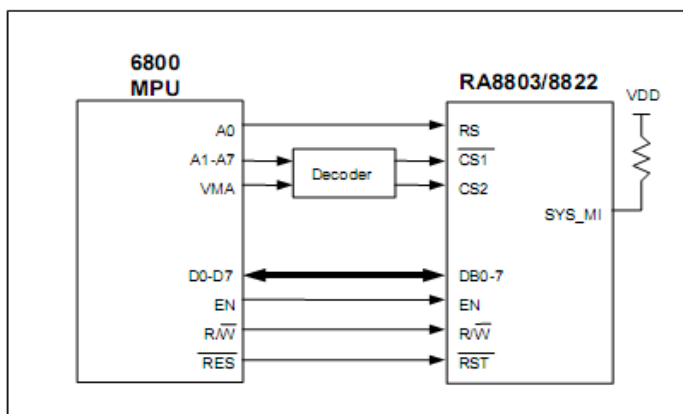


Figure 2-3 : RA8803/8822 With 6800 (8-bit Only) MPU I/F

RA8803/8822 couldn't accept signal from 6800 and 8080 at the same time. Therefore, some pins will have different definition, such as RD#(EN). When users use 8080 MPU, then it is defined as RD#. But when users use 6800 MPU, then it is defined as EN. As for Pin WR#(R/W#), when users use 8080, then it is defined as WR#. However, when users choose 6800 MPU, then it is defined as R/W#. You can refer to RA8803/8822 Datasheet (Chapter 4-1) for more details.

In Figure 2-4, If 6800 MPU want to execute Register Read, the MPU has to send Register Address first and then get the register data from data bus. If MPU want to execute Register Write, the MPU has to send the register first and then send the write data through data bus. For RA8803/8822 memory access, The MPU could read from or write data to the Display RAM directly.

Note: RA8803/8822 support 8Bit data bus only for 6800 series MPU. But for 8080 MPU, RA8803/8822 support both 4Bit and 8Bit interface.

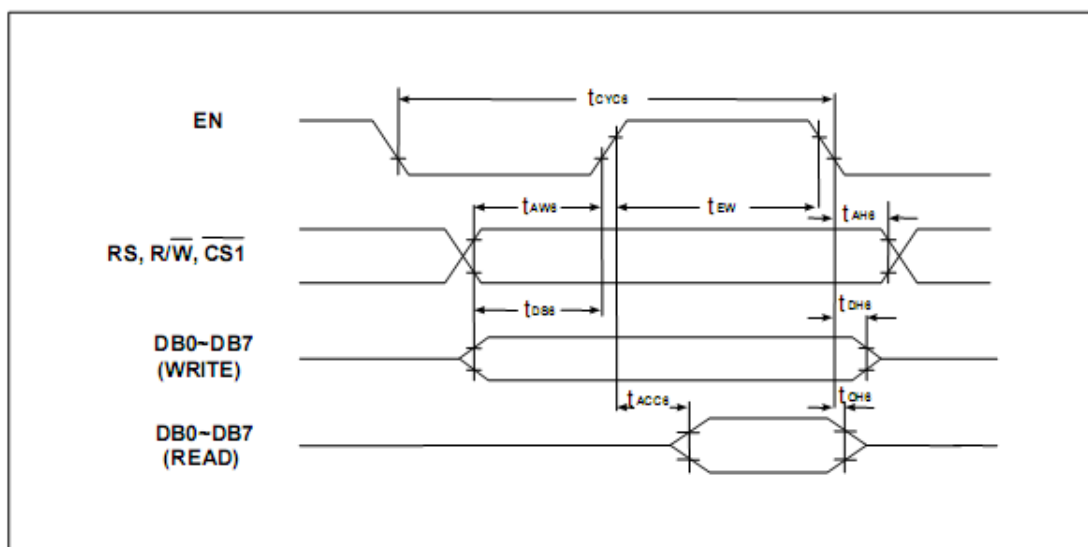


Figure 2-4 : 8-bit 6800 MPU Access A8803/8822 Register/Memory

Table 2-2

Signal	Symbol	Parameter	Rating		Unit	Condition
			Min	Max		
A0, R/W#, CS1#	t_{AHS}	Address hold time	10	--	ns	System Clock: 8MHz Voltage: 3.3V
	t_{AWS}	Address setup time	63	--	ns	
	t_{CVCS}	System cycle time	800	--	ns	
DB0 to DB7	t_{DSS}	Data setup time	63	--	ns	
	t_{DHS}	Data hold time	10	--	ns	
	t_{ACCS}	Access time	--	330	ns	
	t_{OHS}	Output disable time	10	--	ns	
EN	t_{EW}	Enable pulse width	400	--	ns	

8. PIN ASSIGNMENT

CN1:

Pin NO.	Symbol	I/O	Description
1	AVSS	I	Analog Ground of ADC Touch Panel Controller
2	AVDD	I	Analog Power of ADC Touch Panel Controller
3	VSS	I	Ground
4	VDD	I	Power Supply Voltage
5	V0	I	LCD Drive Voltage Input Terminal
6	RS	I	Register/Memory Select The MPU will access Register when RS is Low and access Data Memory when RS is High. Usually connect to MPU address bus A0.
7	R/W	I	Write/Read-Write When MPU I/F is 8080 series, this pin (WR#) is used as data write, active low. When MPU I/F is 6800 series, this pin(R/W#) is used as data read/write control. Active high for read and active low for write.
8	E	I	Enable/Read Enable When MPU I/F is 8080 series, this pin (RD#) is used as data read, active low. When MPU I/F is 6800 series, this pin (EN) is used as Enable, active high.
9	CS1 CS2	I	Chip Select The RA8803/8822 is active when CS1# is low and CS2 is high
10	BUSY	I	Busy Signal This is a busy output to indicate the RA8803/8822 is in busy state. It could be setup active high or low. If setup active high, the RA8803/8822 can't be access when BUSY pin is high. It's should be connected to MPU I/O input. The MPU have to poll this pin before accessing RA8803/8822.
11	INT	I	Interrupt Signal This is an interrupt output to indicate the status of RA8803/8822. It could be setup active high or low.
12	RST	I	Reset Signal This is a reset signal used to reset RA8803/8822. Active low.
13	DB0~ DB7	I/O	Data Bus These are data bus for data transfer between MPU and RA8803/8822. The high nibble DB[7..4] should be floating when 4-bit data bus mode is used.
14	VOUT	O	Booster Output
15	LEDK	I	Backlight- Terminal
16	LEDA	I	Backlight+ Terminal

CN2:

Pin No.	Symbol	I/O	Description
1.	KO0	O	Keypad output pins
2.	KO1	O	
3.	KO2	O	
4.	KO3	O	
5.	KO4	O	
6.	KO5	O	
7.	KO6	O	
8.	KO7	O	
9.	KI0	I	Keypad input pins
10.	KI1	I	
11.	KI2	I	
12.	KI3	I	
13.	KI4	I	
14.	KI5	I	
15.	KI6	I	
16.	KI7		

CN3:

Pin No.	Symbol	I/O	Description
1.	X1	I	This is connecting to the left pin(XL) of 4-wire touch panel.
2.	Y1	I	This is connecting to the top pin(YU) of 4-wire touch panel.
3.	X2	I	This is connecting to the right pin(XR) of 4-wire touch panel.
4.	Y2	I	This is connecting to the bottom pin(YD) of 4-wire touch panel.

10 RELIABILITY
Content of Reliability Test

Environmental Test				
No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	80 °C 200 hrs	
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-30 °C 200 hrs	
3	High temperature operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70 °C 200 hrs	
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	-20 °C 200 hrs	
5	High temperature Humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	50 °C , 90% RH 96 hrs	MIL-202E-103B JIS-C5023
6	High temperature Humidity operation	Endurance test applying the electric stress (Voltage & Current) and temperature humidity stress to the element for a long time.	50 °C , 90% RH 96 hrs	MIL-202E-103B JIS-C5023
7	Temperature cycle	Endurance test applying the low and high temperature cycle. <div style="text-align: center;"> $-20^{\circ}\text{C} \quad 25^{\circ}\text{C} \quad 70^{\circ}\text{C}$ $\begin{array}{c} \leftarrow 30\text{min.} \rightleftharpoons 5\text{min.} \rightleftharpoons 30\text{min.} \rightarrow \\ \text{1 cycle} \end{array}$ </div>	-20°C – 70°C 10 cycles	
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10-22Hz → 1.5mmp-p 22-500Hz → 1.5G Total 0.5hrs	MIL-202E-201A JIS-C5025 JIS-C7022-A-10

9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G half sign wave 1l msedc 3 times of each direction	MIL-202E-213B
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115 mbar 40 hrs	MIL-202E-105C
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V, RS=1.5 k CS=100 pF 1 time	MIL-883B-3015.1

Supply voltage for logic system = 3V. Supply voltage for LCD system = Operating voltage at 25°C.

11 QUALITY GUARANTEE

Acceptable Quality Level

Each lot should satisfy the quality level defined as follows.

- Inspection method : MIL-STD-105E LEVEL II Normal one time sampling
- AQL

Partition	AQL	Definition
A: Major	0.4%	Functional defective as product
B: Minor	1.5%	Satisfy all functions as product but not satisfy cosmetic standard

Definition of 'LOT'

One lot means the delivery quantity to customer at one time.

Conditions of Cosmetic Inspection

Environmental condition

The inspection should be performed at the 1cm of height from the LCD module under 2 pieces of 40W white fluorescent lamps (Normal temperature 20~25°C and normal humidity 60 ± 15%RH).

Inspection method

The visual check should be performed vertically at more than 30cm distance from the LCD panel.

Driving voltage

The VO value which the most optimal contrast can be obtained near the specified VO in the specification. (Within $\pm 0.5V$ of typical value at 25°C.).

12 INSPECTION CRITERIA

12.1 Module Cosmetic Criteria

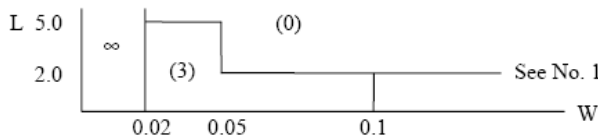
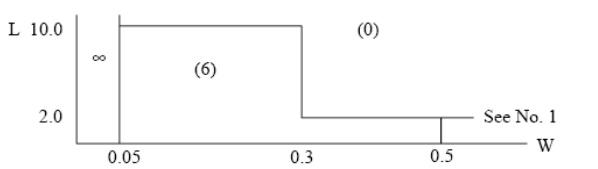
No.	Item	Judgement Criterion	Partition
1	Difference in Spec.	None allowed	Major
2	Pattern peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing No soldering bridge No cold soldering	Major Major Major
4	Resist flaw on substrate	Invisible copper foil ('0.5mm or more) on substrate pattern	Minor
5	Accretion of metallic Foreign matter	No soldering dust No accretion of metallic foreign matters (Not exceed '0.2mm)	Minor Minor
6	Stain	No stain to spoil cosmetic badly	Minor
7	Plate discoloring	No plate fading, rusting and discoloring	Minor
8	1. Lead parts	a. Soldering side of PCB Solder to form a 'Filet' all around the lead. Solder should not hide the lead form perfectly. (too much)	Minor
	2. Flat packages	b. Components side (In case of 'Through Hole PCB') Solder to reach the Components side of PCB. Either 'Toe' (A) or 'Seal' (B) of the lead to be covered by 'Filet'.	
	3. Chips	$(3/2) H \geq h \geq (1/2) H$	Minor

12.2 Screen Cosmetic Criteria (Non-Operating)

No.	Defect	Judgement Criterion	Partition										
1	Spots	In accordance with <i>Screen Cosmetic Criteria (Operating) No.1.</i>	Minor										
2	Lines	In accordance with <i>Screen Cosmetic Criteria (Operating) No.2.</i>	Minor										
3	Bubbles in polarizer	<table border="1"> <thead> <tr> <th>Size : d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>d ≤ 0.3</td> <td>Disregard</td> </tr> <tr> <td>0.3 < d ≤ 1.0</td> <td>3</td> </tr> <tr> <td>1.0 < d ≤ 1.5</td> <td>1</td> </tr> <tr> <td>1.5 < d</td> <td>0</td> </tr> </tbody> </table>	Size : d mm	Acceptable Qty in active area	d ≤ 0.3	Disregard	0.3 < d ≤ 1.0	3	1.0 < d ≤ 1.5	1	1.5 < d	0	Minor
Size : d mm	Acceptable Qty in active area												
d ≤ 0.3	Disregard												
0.3 < d ≤ 1.0	3												
1.0 < d ≤ 1.5	1												
1.5 < d	0												
4	Scratch	In accordance with spots and lines operating cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor										
5	Allowable density	Above defects should be separated more than 30mm each other.	Minor										
6	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-lit type should be judged with back-lit on state only.	Minor										
7	Contamination	Not to be noticeable.	Minor										

12.3 Screen Cosmetic Criteria (Operating)

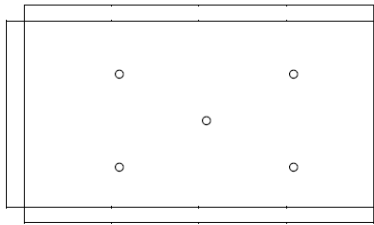
No.	Defect	Judgement Criterion	Partition																				
1	Spots	<p>A) Clear Note :</p> <table border="1"> <thead> <tr> <th>Size : d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>d ≤ 0.1</td> <td>Disregard</td> </tr> <tr> <td>0.1 < d ≤ 0.2</td> <td>3</td> </tr> <tr> <td>0.2 < d ≤ 0.3</td> <td>2</td> </tr> <tr> <td>0.3 < d</td> <td>0</td> </tr> </tbody> </table> <p>Including pin holes and defective dots which must be within one pixel size.</p> <p>B) Unclear Size :</p> <table border="1"> <thead> <tr> <th>Size : d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>d ≤ 0.2</td> <td>Disregard</td> </tr> <tr> <td>0.2 < d ≤ 0.5</td> <td>6</td> </tr> <tr> <td>0.5 < d ≤ 0.7</td> <td>2</td> </tr> <tr> <td>0.7 < d</td> <td>0</td> </tr> </tbody> </table>	Size : d mm	Acceptable Qty in active area	d ≤ 0.1	Disregard	0.1 < d ≤ 0.2	3	0.2 < d ≤ 0.3	2	0.3 < d	0	Size : d mm	Acceptable Qty in active area	d ≤ 0.2	Disregard	0.2 < d ≤ 0.5	6	0.5 < d ≤ 0.7	2	0.7 < d	0	Minor
Size : d mm	Acceptable Qty in active area																						
d ≤ 0.1	Disregard																						
0.1 < d ≤ 0.2	3																						
0.2 < d ≤ 0.3	2																						
0.3 < d	0																						
Size : d mm	Acceptable Qty in active area																						
d ≤ 0.2	Disregard																						
0.2 < d ≤ 0.5	6																						
0.5 < d ≤ 0.7	2																						
0.7 < d	0																						

2	Lines	<p>A) Clear</p>  <p>Note : () - Acceptable Qty in active area L -Length (mm) W - Width (mm) ∞ - Disregard</p> <p>B) Unclear</p> 	Minor
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'Clear' = The shade and size are not changed by VO.

'Unclear' = The shade and size are changed by VO.

12.4 Screen Cosmetic Criteria (Operating) (Continued)

No.	Defect	Judgement Criterion	Partition
3	Rubbing line	Not to be noticeable.	
4	Allowable density	Above defects should be separated more than 10mm each other.	Minor
5	Rainbow	Not to be noticeable.	Minor
6	Dot size	To be 95% ~ 105% of the dot size (Typ.) in drawing. Partial defects of each dot (ex. pin-hole) should be treated as 'Spot'. (see <i>Screen Cosmetic Criteria (Operating) No.1</i>)	Minor
7	Uneven brightness (only back-lit type module)	<p>Uneven brightness must be $B_{MAX} / B_{MIN} \leq 2$</p> <ul style="list-style-type: none"> - BMAX : Max. value by measure in 5 points - BMIN : Min. value by measure in 5 points <p>Divide active area into 4 vertically and horizontally. Measure 5 points shown in the following figure.</p>  <p style="text-align: center;">○ : Measuring points</p>	Minor

Note :

- (1) Size : $d = (\text{long length} + \text{short length}) / 2$
- (2) The limit samples for each item have priority.
- (3) Complexed defects are defined item by item, but if the number of defects are defined in above table, the total number should not exceed 10.
- (4) In case of 'concentration', even the spots or the lines of 'disregarded' size should be not allowed. Following three situations should be treated as 'concentration'.
 - 7 or over defects in circle of '5mm.
 - 10 or over defects in circle of '10mm.
 - 20 or over defects in circle of '20mm.

13. PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

- (1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it or impact.
- (2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- (5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents :
 - Isopropyl alcohol
 - Ethyl alcohol
- (6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solvents
- (7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- (8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the IO cable or the backlight cable.
- (9) Do not attempt to disassemble or process the LCD module.
- (10) NC terminal should be open. Do not connect anything.
- (11) If the logic circuit power is off, do not apply the input signals.
- (12) To prevent destruction of the elements by static electricity, be careful to maintain

an optimum work environment.

- Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

Storage Precautions

When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags (avoid high temperature, high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.

14 USING LCD MODULES

Liquid Crystal Display Modules

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

- (1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- (2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).
- (3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.
- (4) When the display surface becomes dusty, wipe gently with absorbent cotton or

other soft material like chamois soaked in petroleum benzin. Do not scrub hard to avoid damaging the display surface.

(5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

(6) Avoid contacting oil and fats.

(7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(8) Do not put or attach anything on the display area to avoid leaving marks on.

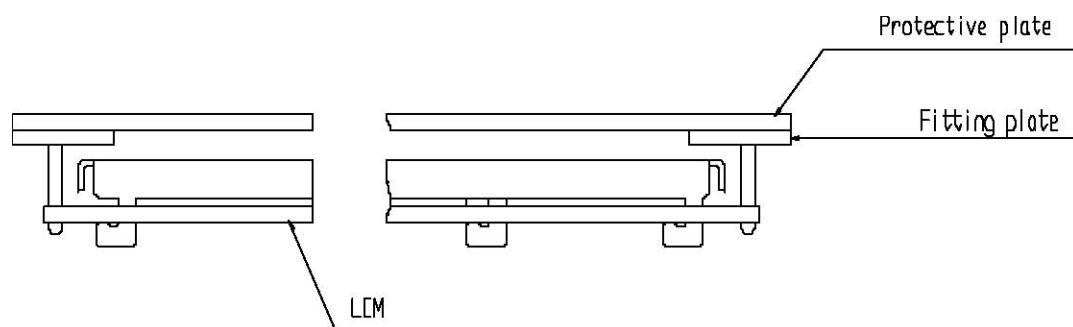
(9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).

(10) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



(2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be 0.1mm.

Precaution for Handling LCD Modules

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

(1) Do not alter, modify or change the the shape of the tab on the metal frame.

(2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

(3) Do not damage or modify the pattern writing on the printed circuit board.

(4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

(5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

(6) Do not drop, bend or twist LCM.

Electro-Static Discharge Control

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

(1) Make certain that you are grounded when handling LCM.

(2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.

(3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.

(4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

(5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

(6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%60% is recommended.

Precaution for soldering to the LCM

(1) Observe the following when soldering lead wire, connector cable and etc. to the LCM.

- Soldering iron temperature : 280°C 10°C.
- Soldering time : 3-4 sec.
- Solder : eutectic solder.

If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

(2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

(3) When remove the electoluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

Precautions for Operation

(1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.

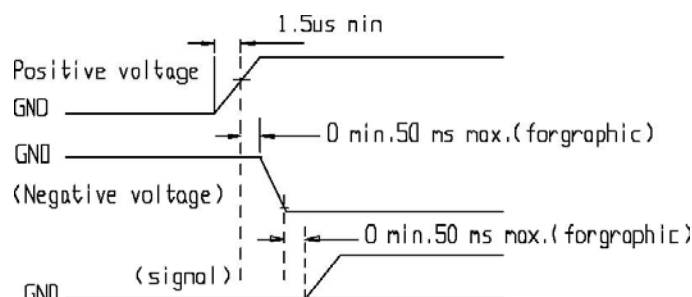
(2) Driving the LCD in the voltage above the limit shortens its life.

(3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.

(4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

(5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.

(6) When turning the power on, input each signal after the positive/negative voltage becomes stable.



Storage

When storing LCDs as spares for some years, the following precaution are necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- (3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)

Safety

- (1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- (2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

Limited Warranty

Unless agreed between YAOYU and customer, YAOYU will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with YAOYU LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to YAOYU within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of YAOYU limited to repair and/or replacement on the terms set forth above. YAOYU will not be responsible for any subsequent or consequential events.

Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded.

The typical examples of violations are :

- Broken LCD glass.
- PCB eyelet's damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.



- PCB tampered with by grinding, engraving or painting varnish.
- soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet's, conductors and terminals.