XIAMEN OCULAR

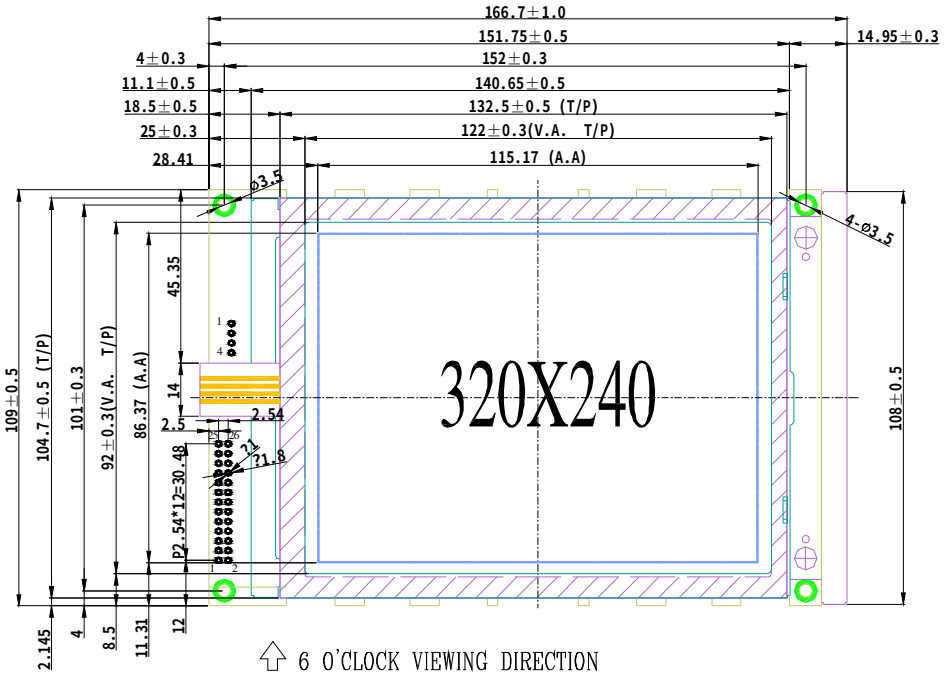
GDM320240C-NSW-BBW-T

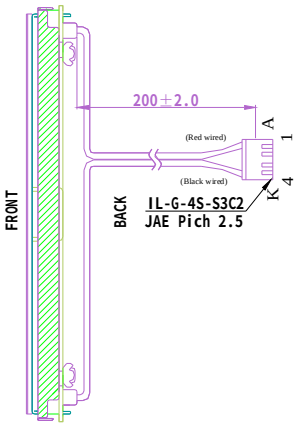
SPECIFICATIONS OF LCD MODULE

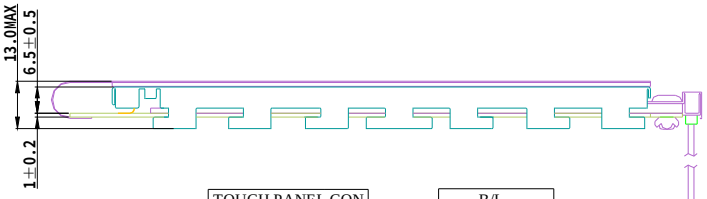
1.Features

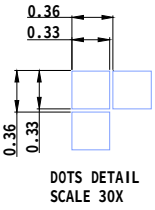
a) 320*240 dots graphic LCD module
b) Built-in controller (RA8835P3N or Equivalent)
c) STN Blue mode, Transmissive, Negative
d) View angle: 6:00 o'clock
e) +5V power supply
f) 1/240 duty cycle
g) WHITE LED sidelight
h) 4 Lines touch screen

2.Outline dimension









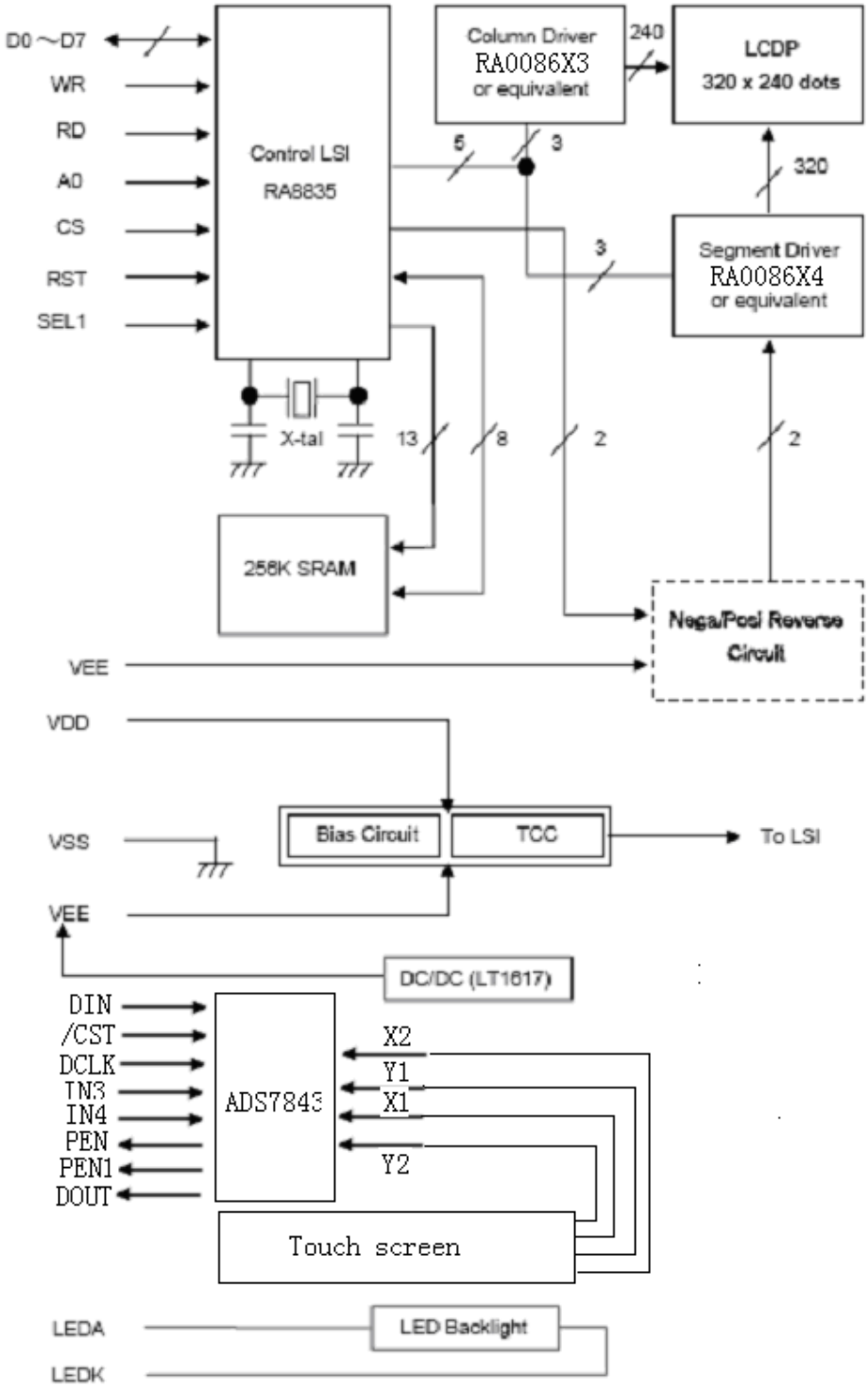
TOUCH PANEL CON	
1	XR
2	YU
3	XL
4	YD

B/L	
1	Anode
2	NC
3	NC
4	Cathode

3.Absolute maximum ratings

Item	Symbol	Standard			Unit
Power voltage	V_{DD}-V_{SS}	0	-	7.0	V
Input voltage	VIN	VSS	-	VDD	
Operating temperature range	VOP	-20	-	+70	℃
Storage temperature range	VST	-30	-	+80	

4.Block diagram

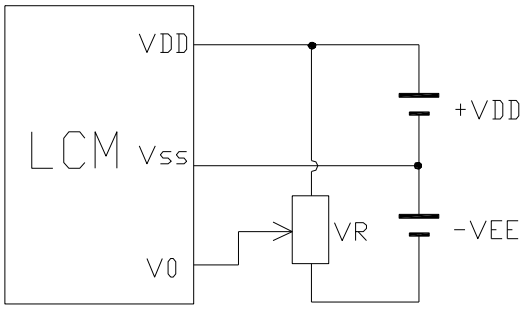


5.Interface pin description

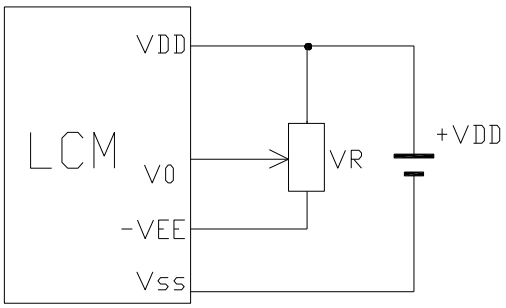
Pin No.	Symbol	External connection	Function
1	V_{SS}	Power supply	Signal ground for LCM (GND)
2	V_{DD}		Power supply for logic (+5V) for LCM
3	V_0		Operating voltage for LCD
4	A0	MCU	H: Instruction L: Data
5	/WR	MCU	Read enable signal
6	/RD	MCU	Write enable signal
7~14	DB0~DB7	MCU	Data bus line
15	/CS	MCU	Chip enable signal
16	/RST	MCU	Reset signal
17	VEE	Power supply	Negative voltage output
18	SEL1	MCU	Selection of 8080 family processors or 6800 family processors (H=6800,L=8080)
19	DCLK	MCU (Touch screen control)	External Clock Input. This clock runs the SAR conversion process and synchronizes serial data I/O.
20	/CST		Chip Select Input. Controls conversion timing and enables the serial input/output register.
21	DIN		Serial Data Input. If CS is LOW, data is latched on rising edge of DCLK.
22	DOUT		Serial Data Output. Data is shifted on the falling edge of DCLK. This output is high impedance when CS is HIGH.
23	PEN		Pen Interrupt.
24	PEN1		Pen Interrupt. Open anode output (with 100kΩ pull-up resistor externally).
25	IN3		Auxiliary Input 1. ADC input Channel 3.
26	IN4		Auxiliary Input 2. ADC input Channel 4.

Contrast adjust

A） DC/DC not build in



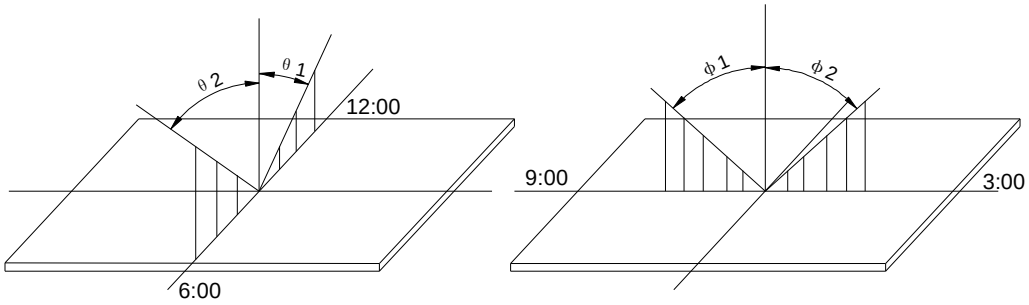
B) DC/DC build in



V_{DD}~V_0: LCD Driving voltage

VR: 10k~20k

6.Optical characteristics



STN type display module (Ta=25℃, VDD=5.0V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing angle	θ 1	$C_r \geqslant 2$	-	45	-	deg
	θ 2		-	60	-	
	Φ1			40		
	Φ2			40		
Contrast ratio	C_r		-	6	-	-
Response time (rise)	T_r	-	-	300	-	ms
Response time (fall)	T_r	-	-	300	-	

7.Electrical characteristics

LED back-light

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Current	IF	-	70	105	140	mA
Reverse Voltage	VR	-	3.1	3.3	-	V
LED Power Dissipation	PD	-	-	0.35	-	W
AVG. x of 1931 C.I.E.	X		0.28	0.30	0.32	
	Y	-	0.29	0.30	0.33	

DC characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage for LCD	V_{DD}-V_0	Ta =25℃	—	23.0	—	V
Input voltage	V_{DD}		4.5	5.0	5.5	
Supply current	I_{DD}	Ta=25℃, V_{DD}=5.0V	—	20	30	mA
Input leakage current	I_{LKG}		—	—	1.0	uA
“H” level input voltage	V_{IH}		0.8xVDD	—	V_{DD}	V
“L” level input voltage	V_{IL}	Twice initial value or less	VSS	—	0.2xVDD	
“H” level output voltage	V_{OH}	LOH=-0.5mA	2.4	—	—	
“L” level output voltage	V_{OL}	LOH=0.5mA	—	—-	0.4	
Backlight supply voltage	V_F		—	—	3.3	

Backlight supply current	I_F	V_{led}=3.3v		105		mA

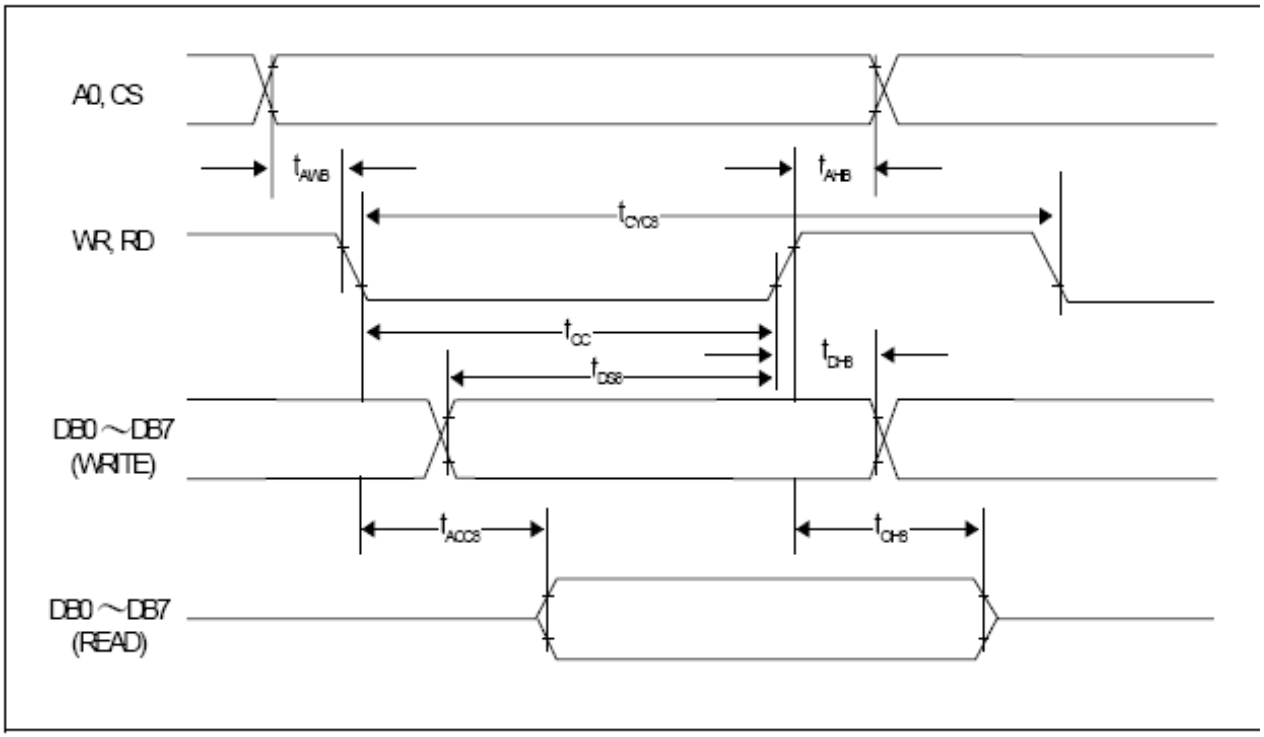
8.Switching characteristics

(Ta=25℃, VDD=5.0V)

8080 family interface timing

Signal	Symbol	Parameter	V_{DD} = 4.5 to 5.5		V_{DD} = 2.7 to 4.5		Units	Condition
			Min.	Max.	Min.	Max.		
A0, CS	t_{AH8}	Address hold time	10	--	10	--	ns	CL=100pF
	t_{AW8}	Address setup time	0	--	0	--	ns	
WR, RD	t_{CYC8}	System cycle time	See note	--	See note	--	ns	
	t_{CC}	Strobe pulse width	120	--	150	--	ns	
DB0 to DB7	t_{DS8}	Data setup time	120	--	120	--	ns	
	t_{DH8}	Data hold time	5	--	5	--	ns	
	t_{ACC8}	RD access time	--	50	--	80	ns	
	t_{OH8}	Output disable time	10	50	10	55	ns	

Bus timing diagram

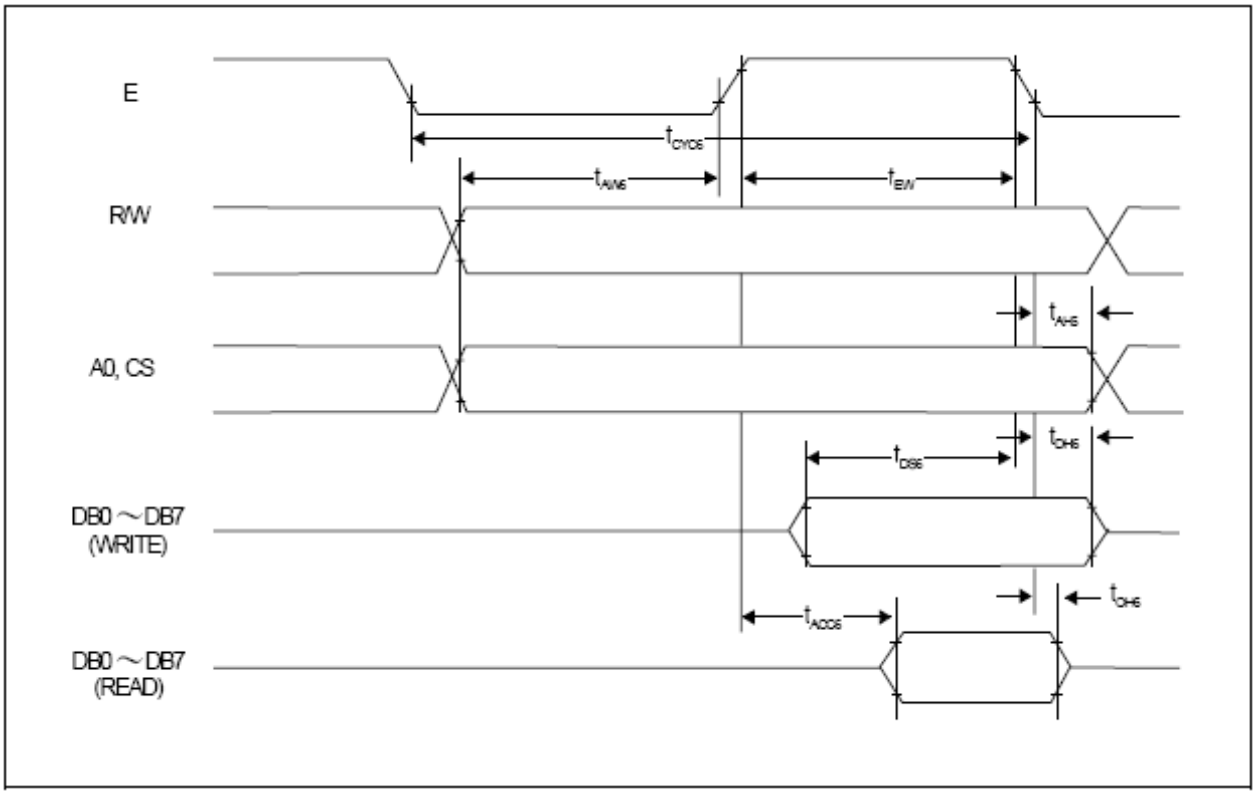


Note:For memory control and system control commands:
tCYC8 = 2tC + tCC + tCEA + 75 > tACV + 245
For all other commands:
tCYC8 = 2tC + tCC + 30

6800 family interface timing

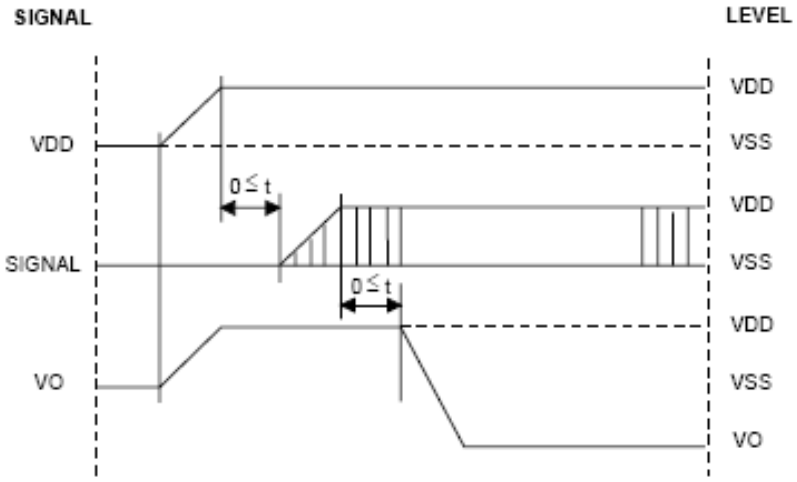
Signal	Symbol	Parameter	V_{DD} = 4.5 to 5.5		V_{DD} = 2.7 to 4.5		Units	Condition
			Min.	Max.	Min.	Max.		
A0, CS, R/W	t_{CYC6}	System cycle time	See note	--	See note	--	ns	CL=100pF
	t_{AW6}	Address setup time	0	--	10	--	ns	
	t_{AH6}	Address hold time	0	--	0	--	ns	
DB0 to DB7	t_{DS6}	Data setup time	100	--	120	--	ns	
	t_{DH6}	Data hold time	0	--	0	--	ns	
	t_{OH6}	Output disable time	10	50	10	75	ns	
	t_{ACC6}	Access time	--	85	--	130	ns	
WR, RD	t_{EW}	Enable pulse width	120	--	150	--	ns	

Note:For memory control and system control commands:
tCYC6 = 2tC + tEW + tCEA + 75 > tACV + 245
For all other commands:
tCYC6 = 4tC + tEW + 30

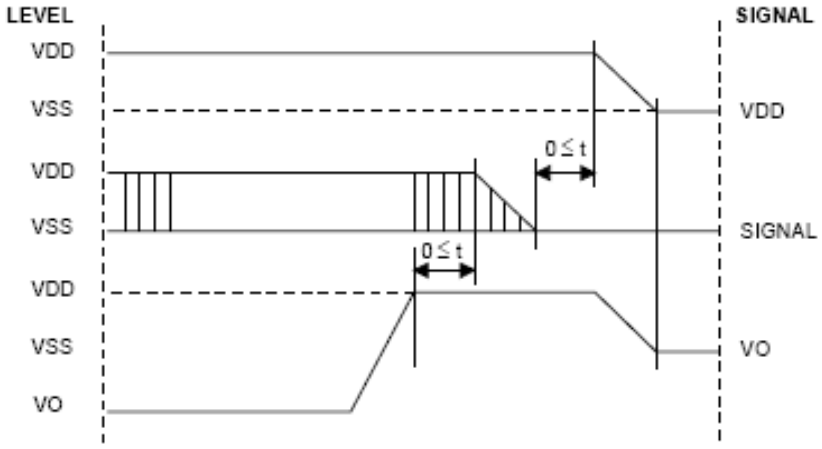


9.Power Supply ON/OFF Sequence

ON Sequence



OFF Sequence



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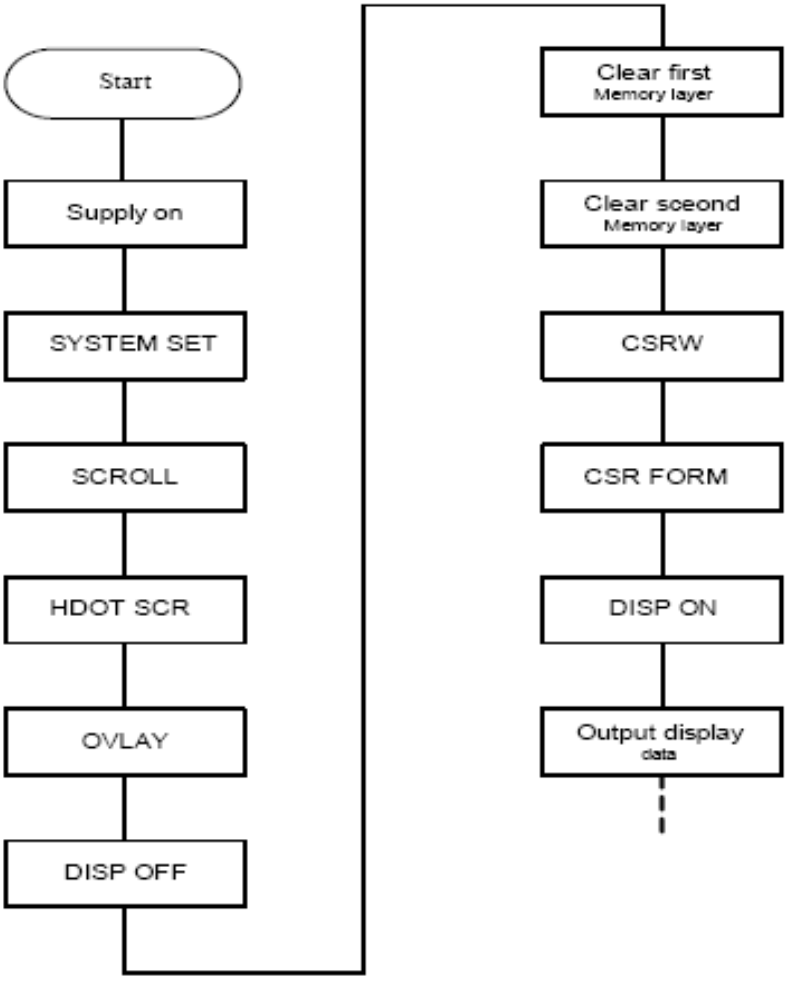
`Please maintain the above sequence when turning on and off the power supply of the module. If VEE is supplied to the module while internal alternate signal for LCD driving (M) is unstable or RESET is active, DC component will be supplied to the LCD panel. This may cause damage to the LCD module.

10.Flowchart of communications with MPU

Setting data

When using the RA8835P3N, first set the data, and then set the command. Procedure for sending a command:



Note: Set the cursor address to the start of each screen's layer memory, and use MWRITE to fill the memory with space characters, 20H

11.Command definitions

The Command Set

Table-1: Command Set

Class	Command	Code											Hex	Command Description	Command Read Parameters	
		RD	WR	A0	D7	D6	D5	D4	D3	D2	D1	D0			No. of Bytes	Section
System Control	SYSTEM SET	1	0	1	0	1	0	0	0	0	0	0	40	Initialize device and display	8	9-2-1
	SLEEP IN	1	0	1	0	1	0	1	0	0	1	1	53	Enter standby mode	0	9-2-2
Display Control	DISPLAY ON/OFF	1	0	1	0	1	0	1	1	0	0	D	58, 59	Enable and disable display and display flashing	1	9-3-1
	SCROLL	1	0	1	0	1	0	0	0	1	0	0	44	Set display start address and display regions	10	9-3-2
	CSRFORM	1	0	1	0	1	0	1	1	1	0	1	5D	Set cursor type	2	9-3-3
	CGRAM ADR	1	0	1	0	1	0	1	1	1	0	0	5C	Set start address of character generator RAM	2	9-3-6
	CSRDIR	1	0	1	0	1	0	0	1	1	CD 1	CD 0	4C to 4F	Set direction of cursor movement	0	9-3-4
	HDOT SCR	1	0	1	0	1	0	1	1	0	1	0	5A	Set horizontal scroll position	1	9-3-7
	OVLAY	1	0	1	0	1	0	1	1	0	1	1	5B	Set display overlay format	1	9-3-5
Drawing Control	CSRW	1	0	1	0	1	0	0	0	1	1	0	46	Set cursor address	2	9-r1
	CSRR	1	0	1	0	1	0	0	0	1	1	1	47	Read cursor address	2	9-4-2
Memory Control	MWRITE	1	0	1	0	1	0	0	0	0	1	0	42	Write to display memory	—	9-5-1
	MREAD	1	0	1	0	1	0	0	0	0	1	1	43	Read from display memory	—	9-5-2

Notes:

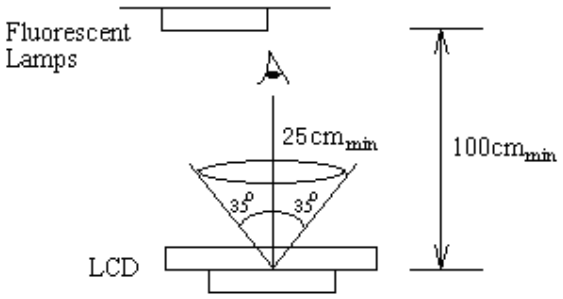
1. In general, the internal registers of the RA8835 series are modified as each command parameter is input. However, the microprocessor does not have to set all the parameters of a command and may send a new command before all parameters have been input. The internal registers for the parameters that have been input will have been changed but the remaining parameter registers are unchanged. 2-byte parameters (where two bytes are treated as 1 data item) are handled as follows:
   a. CSRW, CSRR: Each byte is processed individually. The microprocessor may read or write just the low byte of the cursor address.
   b. SYSTEM SET, SCROLL, CGRAM ADR: Both parameter bytes are processed together. If the command is changed after half of the parameter has been input, the single byte is ignored.
2. APL and APH are 2-byte parameters, but are treated as two 1-byte parameters.

12. Specification of Quality Assurance

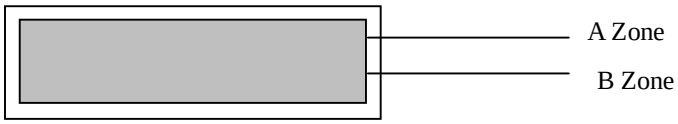
12.1 STANDARD OF THE PRODUCT APPEARANCE TEST

Manner of appearance test: The inspection should be performed in using 20W x 2 fluorescent lamps. Distance between LCM and fluorescent lamps should be 100 cm or more. Distance between LCM and inspector eyes should be 25 cm or more.

Viewing direction for inspection is 35° from vertical against LCM.



Definition of zone:



A Zone: Active display area (minimum viewing area).

B Zone: Non-active display area (outside viewing area).

12.2 SPECIFICATION OF QUALITY ASSURANCE

AQL inspection standard

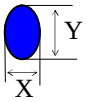
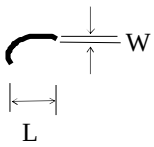
Sampling method: GB2828-87, Level II, single sampling

Defect classification **(Note: * is not including)**

Classify		Item	Note	AQL
Major	Display state	Short or open circuit	1	0.65
		LC leakage		
		Flickering		
		No display		
		Wrong viewing direction		
		Contrast defect (dim, ghost)	2	
		Backlight	1,8	
	Non-display	Flat cable or pin reverse	10	
		Wrong or missing component	11	
Minor	Display state	Background color deviation	2	1.0
		Black spot and dust	3	
		Line defect, Scratch	4	
		Rainbow	5	
		Chip	6	
		Pin hole	7	

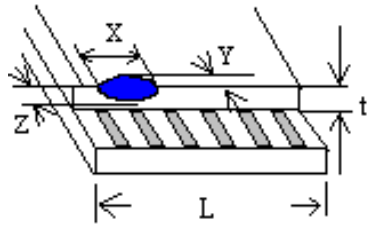
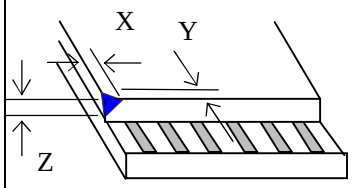
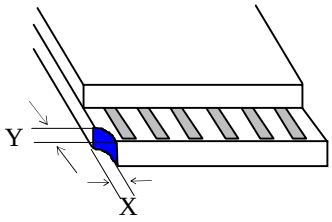
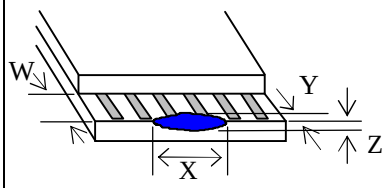
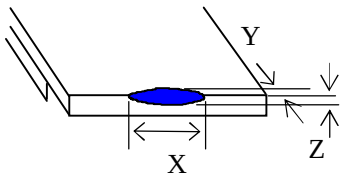
		Protruded	12
	Polarizer	Bubble and foreign material	3
	Soldering	Poor connection	9
	Wire	Poor connection	10
	TAB	Position, Bonding strength	13

Note on defect classification

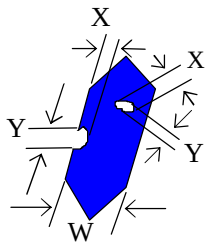
No.	Item	Criterion
1	Short or open circuit	Not allow
	LC leakage	
	Flickering	
	No display	
	Wrong viewing direction	
	Wrong Back-light	
2	Contrast defect	Refer to approval sample
	Background color deviation	
3	Point defect, Black spot, dust (including Polarizer) $\phi = (X+Y)/2$	 Point Size / Acceptable Qty. $\phi \leq 0.10$: Disregard $0.10 < \phi \leq 0.15$: 2 $0.15 < \phi \leq 0.25$: 1 $\phi > 0.25$: 0 Unit: $Inch^2$
4	Line defect, Scratch	 Line: L / W; Acceptable Qty. ---: $0.05 > W$: Disregard $3.0 > L$: $0.1 > W > 0.05$: Disregard $2.0 > L$: $0.15 \geq W > 0.1$: Disregard

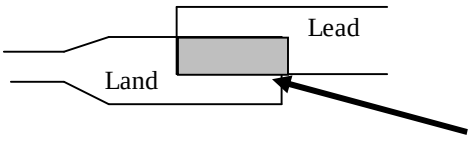
		Unit: mm
5	Rainbow	Not more than two color changes across the viewing area.

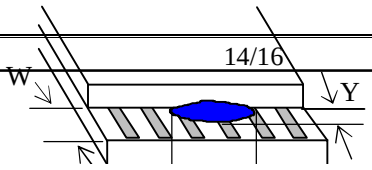
No	Item	Criterion

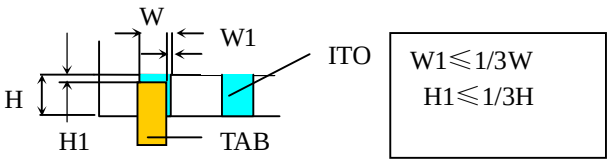
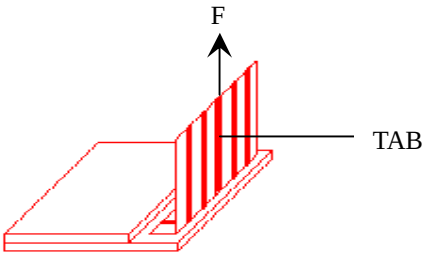
6	Chip Remark: X: Length direction Y: Short direction Z: Thickness direction t: Glass thickness W: Terminal width L: Glass length	 Acceptable criterion X: < L /8; Y: 0.5mm; Z: ⩽t/2  Acceptable criterion X: ⩽2; Y: 0.5mm; Z: ⩽t  Acceptable criterion X: ⩽3; Y: ⩽2; Z: ⩽t shall not reach to ITO  Acceptable criterion X: Disregard; Y: ⩽0.2; Z: ⩽t  Acceptable criterion X: ⩽5; Y: ⩽2; Z: ⩽t/3

No.	Item	Criterion

<table>
<tr><td>7</td><td>Segment
pattern
W = Segment width
ϕ = (X+Y)/2</td><td>(1) Pin hole
ϕ < 0.10mm is acceptable.
 

<table>
<tr><th>Point Size</th><th>Acceptable Qty</th></tr>
<tr><td>ϕ≤1/4W</td><td>Disregard</td></tr>
<tr><td>1/4W< ϕ≤1/2W</td><td>1</td></tr>
<tr><td>ϕ>1/2W</td><td>0</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>8</td><td>Back-light</td><td>(1) The color of backlight should be in match with the specification.
(2) Not allow flickering</td></tr>
<tr><td>9</td><td>Soldering</td><td>(1) Not allow heavy dirty and solder ball on PCB.
(The size of dirty refer to point and dust defect)
(2) Over 50% of lead should be soldered on Land.
 
</td></tr>
<tr><td>10</td><td>Wire</td><td>(1) Copper wire should not be rusted
(2) Not allow crack on copper wire connection.
(3) Not allow reversing the position of the flat cable.
(4) Not allow exposed copper wire inside the flat cable.</td></tr>
<tr><td>11*</td><td>PCB</td><td>(1) Not allow screw rust or damage.
(2) Not allow missing or wrong putting of component.</td></tr>
</table>

No	Item	Criterion
12	Protruded	 Y ≤ 0.4

	W: Terminal Width	
13	TAB	1. Position  2 TAB bonding strength test  P (=F/TAB bonding width) ≥650gf/cm ,(speed rate: 1mm/min) 5pcs per SOA (shipment)
14	Total no. of acceptable Defect	A. Zone Maximum 2 minor non-conformities per one unit. Defect distance: each point to be separated over 10mm B. Zone It is acceptable when it is no trouble for quality and assembly in customer's end product.

12.3 RELIABILITY OF LCM

Reliability test condition:

Item	Condition	Time (hrs)	Assessment
High temp. Storage	80°C	48	

High temp. Operating	70°C	48	
Low temp. Storage	-30°C	48	
Low temp. Operating	-20°C	48	
Humidity	40°C/ 90%RH	48	
Temp. Cycle	0°C ← 25°C →50°C (30 min ← 5 min → 30min)	10cycles	

Recovery time should be 24 hours minimum. Moreover, functions, performance and appearance shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (20±8°C), normal humidity (below 65% RH), and in the area not exposed to direct sun light.

121.4 PRECAUTION FOR USING LCD/LCM

LCD/LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification. The followings should be noted.

GENERAL PRECAUTIONS:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isoproply alcohol, ethyl alcohol or trichlorotriflorothane, do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting XIAMEM OCULAR
5. When mounting a LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal spreads to skin or clothes, wash it off immediately with soap and water.

STATIC ELECTRICITY PRECAUTIONS:

1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.
5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.

7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

SOLDERING PRECAUTIONS:

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature: 280°C±10°C
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

OPERATION PRECAUTIONS:

1. The viewing angle can be adjusted by varying the LCD driving voltage Vo.
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over 40°C is required, the relative humidity should be kept below 60%, and avoid direct sunlight.