1. Features:

The features of LCD are as follows:

- Display mode   : STN /BLUE, POSITIVE, TRANSMISSIVE
- Colour   : Display dot : WHITE
                  Background: BLUE
- Display Format   : 240x64 Dots
- * IC   : RA6963
- Interface Input Data   :   8 Bits
- Driving Method   : 1/64 Duty, 1/9 Bias
- Viewing Direction: 6 O'clock
- Backlight : LED (WHITE)

2. Mechanical Specifications:

Item	Specification	Unit
Module Size	180.00(W) X65.00(H) X13.30(T)	mm
Viewing Area	132.00(W) X 39.00(H)	mm
Effective Display Area	127.16(W) X33.88(H)	mm
Number of Dots	240x64	-

Dot Size	0.49(W) X 0.49(H)	mm
Dot Pitch	0.54(W) X 0.54(H)	mm

3. Electrical Specifications:

1. Absolute Maximum Ratings (Vss = 0V)

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	V_{DD}	-0.3	-	7.0	V
Supply Voltage For LCD Drive	V_0, V_{OUT}	12	12.2	12.4	V
Operating Temp.	T_{OP}	-20	-	+70	°C
Storage Temp.	T_{ST}	-30	-	+80	°C
Static Electricity		Be sure that you are ground when handing LCM			

2. Electrical Characteristics:

Item		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic		$V_{DD} - V_{SS}$	Ta=25℃	4.8	5.0	5.2	V
Supply Voltage For LCD		$V_{DD} - V_0$	Ta=25℃	12	12.2	12.4	V
Input Voltage	"H" Level	V_{IH}	Ta=25℃	$0.8V_{DD}$	-	V_{DD}	V
	"L" Level	V_{IL}		V_{SS}	-	$0.2V_{DD}$	V
Output Voltage	"H" Level	V_{OH}	I_{OUT}= -0.5mA	$0.8V_{DD}$	-	V_{DD}	V
	"L" Level	V_{OL}	I_{OUT}= 0.5mA	V_{SS}	-	$0.2V_{DD}$	V
Current Consumption		I_{DD}	$V_{IN} = V_{DD}$	-	-	1.0	mA

NOTE: 1) Duty ratio=1/65, Bias=1/9
2) Measured in Dots ON-state

3. BACKLIGHT:

3.1 Absolute Maximum Ratings:

Item	Symbol	Condition	Min.	Typ.	Max	Unit
Forward Current	IF	Ta= 25℃	-	-	20	mA
Reverse Voltage	VR		-	-	5	V
Power Dissipation	PD	Ta= 25℃	-	-	100	mW

3.2 Opto-electronic Characteristics:

Item	Symbol	Condition	Min.	Typ.	Max	Unit
Forward Voltage	VF	Ta= 25℃ IF= 130mA	4.8	5.0	5.2	V
Luminous	-		100	150	-	cd/m²

* The brightness is measured without LCD panel

4. Schematic Design:
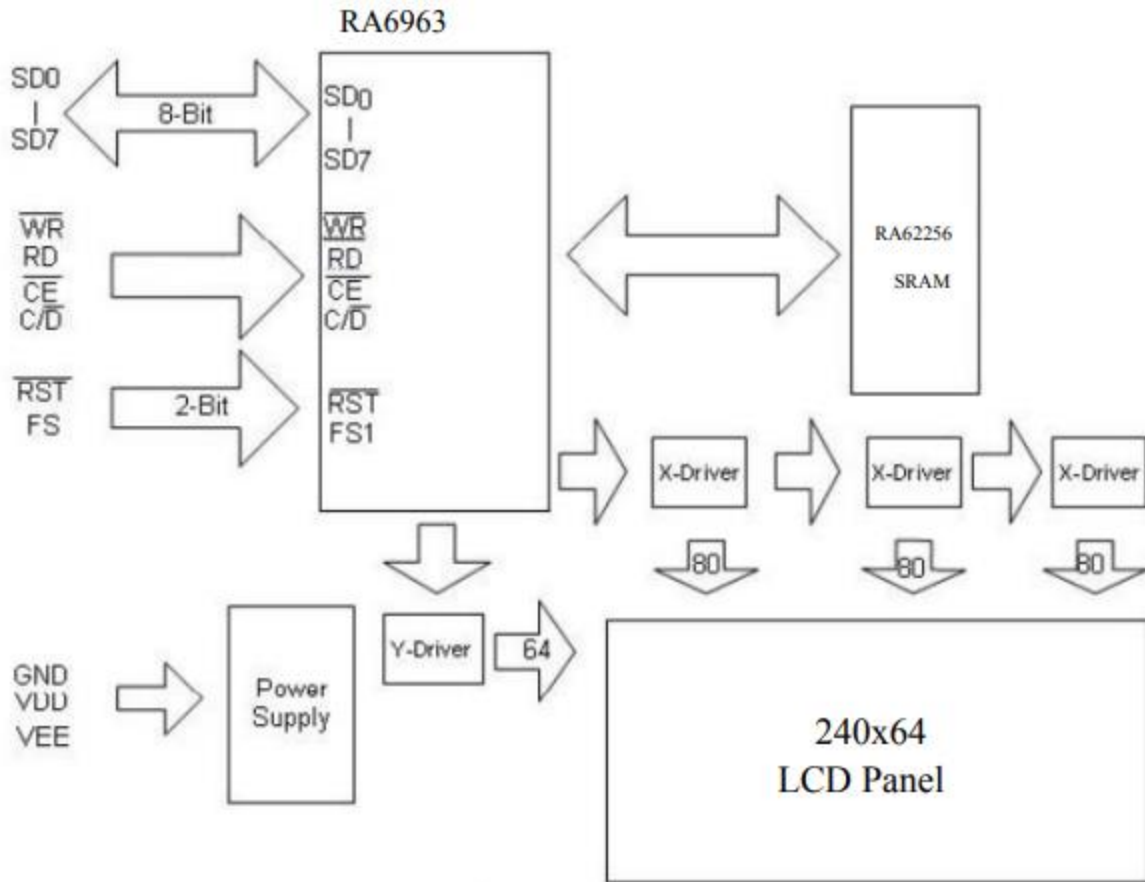
5. Interface Pin Function:

Pin No.	Symbol	Level	Description
1	FG	—	Mounting holes grounding
2	Vss	0V	Ground
3	Vdd	5.0V	Supply voltage for logic (option +3.3V)
4	Vo	—	Operating voltage for LCD
5	WR	H/L	White signal, active "L".
6	RD	H/L	Read signal, active "L".
7	CE	H/L	Chip enable signal, active "L".
8	C\D	H/L	H: Instruction code; L: Data.
9	NC	—	No connection
10	/RST	L	Reset signal
11	DB0	H/L	Data bus line 0
12	DB1	H/L	Data bus line 1
13	DB2	H/L	Data bus line 2
14	DB3	H/L	Data bus line 3
15	DB4	H/L	Data bus line 4
16	DB5	H/L	Data bus line 5
17	DB6	H/L	Data bus line 6
18	DB7	H/L	Data bus line 7
19	FS	H/L	Selection of font H:6 X 8, L=8 X 8
20	VOUT	—	Negative Voltage output −18.5V
21	LEDA	—	Power supply for B/L (+)
22	LEDK	—	Power supply for B/L (GND)

6. Command List:

COMMAND	CODE	D1	D2	FUNCTION
REGISTERS SETTING	00100001	X address	Y address	Set Cursor Pointer
	00100010	Data	00H	Set Offset Register
	00100100	Low address	High address	Set Address Pointer
SET CONTROL WORD	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00H	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00H	Set Graphic Area
MODE SET	1000X000	—	—	OR mode
	1000X001	—	—	EXOR mode
	1000X011	—	—	AND mode
	1000X100	—	—	Text Attribute mode
	10000XXX	—	—	Internal CG ROM mode
	10001XXX	—	—	External CG RAM mode
DISPLAY MODE	10010000	—	—	Display off
	1001XX10	—	—	Cursor on, blink off
	1001XX11	—	—	Cursor on, blink on
	100101XX	—	—	Text on, graphic off
	100110XX	—	—	Text off, graphic on
	100111XX	—	—	Text on, graphic on
CURSOR PATTERN SELECT	10100000	—	—	1-line cursor
	10100001	—	—	2-line cursor
	10100010	—	—	3-line cursor
	10100011	—	—	4-line cursor
	10100100	—	—	5-line cursor
	10100101	—	—	6-line cursor
	10100110	—	—	7-line cursor
	10100111	—	—	8-line cursor
DATA AUTO READ/ WRITE	10110000	—	—	Set Data Auto Write
	10110001	—	—	Set Data Auto Read
	10110010	—	—	Auto Reset
DATA READ/WRITE	11000000	Data	—	Data Write and Increment ADP
	11000001	—	—	Data Read and Increment ADP
	11000010	Data	—	Data Write and Decrement ADP
	11000011	—	—	Data Read and Decrement ADP
	11000100	Data	—	Data Write and Nonvariable ADP
	11000101	—	—	Data Read and Nonvariable ADP
SCREEN PEEK	11100000	—	—	Screen Peek
SCREEN COPY	11101000			Screen Copy

Command List (Continued)

COMMAND	CODE	D1	D2	FUNCTION
BIT SET / RESET	11110XXX	—	—	Bit Reset
	11111XXX	—	—	Bit Set
	1111X000	—	—	Bit 0 (LSB)
	1111X001	—	—	Bit 1
	1111X010	—	—	Bit 2
	1111X011	—	—	Bit 3
	1111X100	—	—	Bit 4
	1111X101	—	—	Bit 5
	1111X110	—	—	Bit 6
	1111X111	—	—	Bit 7 (MSB)

FONT BALE

7. Timing Characteristics (Continued):
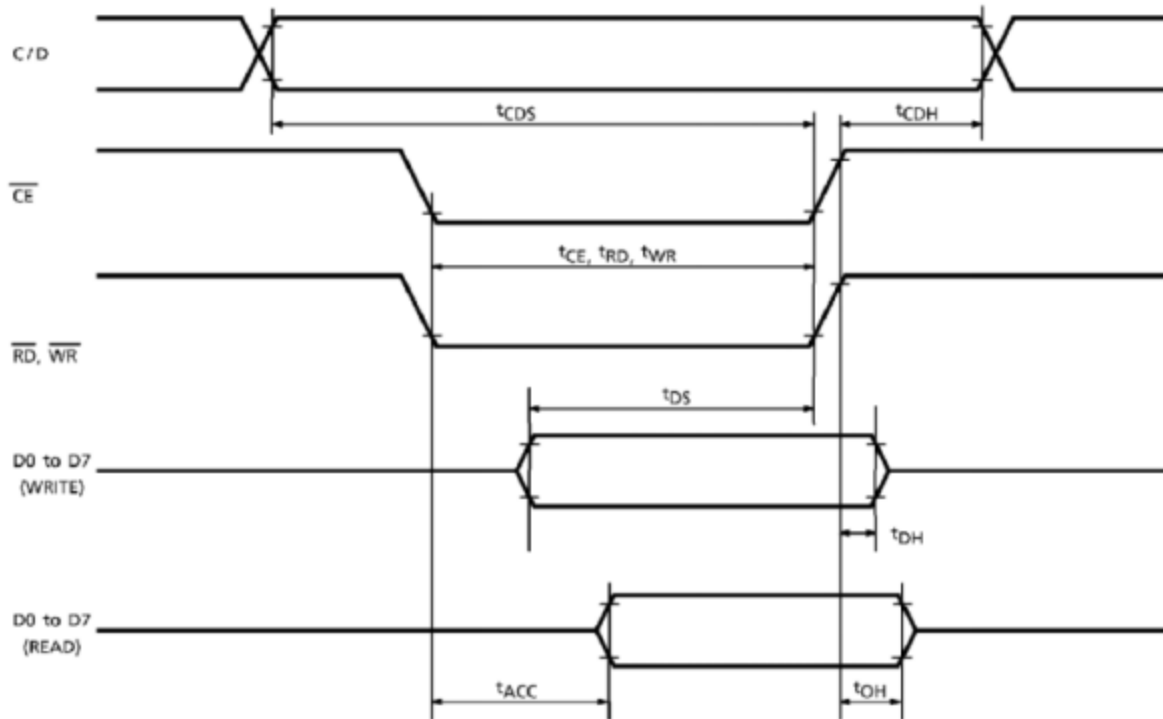
ITEM	SYMBOL	TEST CONDITIONS	MIN	MAX	UNIT
C/D Set-up Time	t_{CDS}	—	100	—	ns
C/D Hold Time	t_{CDH}	—	10	—	ns
CE, RD, WR Pulse Width	t_{CE}, t_{RD}, t_{WR}	—	80	—	ns
Data Set-up Time	t_{DS}	—	80	—	ns
Data Hold Time	t_{DH}	—	40	—	ns
Access Time	t_{ACC}	—	—	150	ns
Output Hold Time	t_{OH}	—	10	50	ns

8. Quality Specification (Continued):

8-3. Sampling Plan and Acceptance

1. Sampling Plan

MIL - STD - 105E (II) ordinary single inspection is used.

2. Acceptance
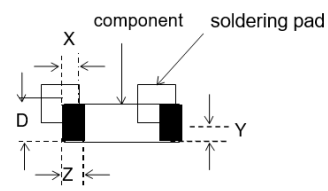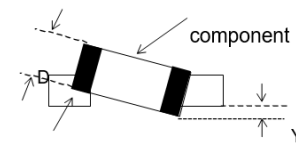
Major defect:	AQL = 0.25%
Minor defect:	AQL = 0.65%
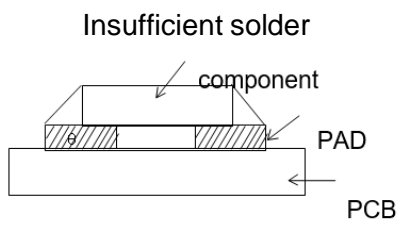
8-4. Criteria

a)   COB

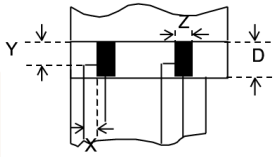| Defect	Inspection Item	Inspection Standards	
Major	PCB copper flakes peeling off	Any copper flake in viewing Area should be greater than 1.0mm^2	Reject
Major	Height of coating epoxy	Exceed the dimension of drawing	Reject
Major	Void or hole of coating epoxy	Expose bonding wire or IC	Reject
Major	PCB cutting defect	Exceed the dimension of drawing	Reject

b)   SMT

Defect	Inspection Item	Inspection Standards	
Minor	Component marking not readable		Reject
Minor	Component height	Exceed the dimension Of drawing	Reject
Major	Component solder defect (missing , extra, wrong component or wrong orientation)		Reject
Minor	 Component position shift	$X < 3/4Z$ $Y > 1/3D$	Reject Reject
Minor	 Component tilt	$Y > 1/3D$	Reject

Minor	Insufficient solder — component — PAD — PCB	$\theta \leq 20^{'}$	Reject

c)   **Metal (Plastic) Frame**

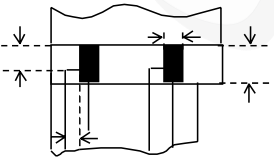| Defect	Inspection Item	Inspection Standards		
Major	Crack / breakage	Anywhere		Reject
Minor	Frame Scratch	W	L	Acceptable of Scratch
		w<0.03mm	Any	Ignore
		0.03mm$\leq$w<0.05mm	L$\leq$5.0mm	2
		0.05mm<w<0.1mm	L<3.0mm	1
		w>0.1mm	Any	0
		Note: 1. Above criteria applicable to scratch lines with distance greater than 5mm. 2. Scratch on the back side of frame (not visible) can be ignored.		
Minor	Frame Dent, Prick $\Phi = \dfrac{L + W}{2}$			Acceptable of Dents / Pricks
		$\Phi \leq 1.0$mm		2
		1.0<$\Phi \leq 1.5$mm		1
		1.5mm>Φ		0
		Note: 1. Above criteria applicable to any two dents / pricks with distance greater than 5mm 2. Dent / prick on the back side of frame (not visible) can be ignored		
Minor	Frame Deformation	Exceed the dimension of drawing		
Minor	Metal Frame Oxidation	Any rust		

d) Flexible Film Connector (FFC)

Defect	Inspection Item		Inspection Standards	
Minor	Tilted soldering		Within the angle $\pm3°$	Acceptable
Minor	Uneven solder joint /bump			Reject
Minor	Hole	$\Phi = \dfrac{L + W}{2}$	Expose the conductive line	Reject
			$\Phi > 1.0mm$	Reject
Minor	Position shift		$Y > 1/3D$	Reject
			$X > 1/2Z$	Reject

e) Screw

Defect	Inspection Item	Inspection Standards	
Major	Screw missing/loosen		Reject
Minor	Screw oxidation	Any rust	Reject
Minor	Screw deformation	Difficult to accept screw driver	Reject

f) Heat seal 、TCP 、FPC

Defect	Inspection Item		Inspection Standards	
Major	Scratch expose conductive layer			Reject
Minor	HS Hole	$\Phi = \dfrac{L + W}{2}$	$\Phi > 0.2mm$	Reject
Major	Adhesion strength		Less than the specification	Reject
Minor	Position shift		$Y > 1/3D$	Reject
			$X > 1/2Z$	Reject
Major	Conductive line break			Reject

g)   **LED Backing Protective Film and Others**

Defect	Inspection Item	Inspection Standards	
Minor	LED dirty, prick	Acceptable number of units	
		$\Phi \leq 0.10$mm	Ignore
		$0.10 < \Phi \leq 0.15$mm	2
		$0.15 < \Phi \leq 0.2$mm	1
		$\Phi > 0.2$mm	0
		The distance between any two spots should be ≥ 10mm Any spot/dot/void outside of viewing area is acceptable	
Minor	Protective film tilt	Not fully cover LCD	Reject
Major	COG coating	Not fully cover ITO circuit	Reject

h)   **Electric Inspection**

Defect	Inspection Item	Inspection Standards	
Major	Short		Reject
Major	Open		Reject

i) Inspection Specification of LCD

Defect	Inspect Item		Inspection Standards			
Minor	Linear Defect	* Glass Scratch * Polarizer Scratch * Fiber and Linear material	W	W<0.03	0.03<W<0.05	W>0.05
			L	L<5	L<3	Any
			ACC. NO.	1	1	Reject
			Note	L is the length and W is the width of the defect		
Minor	Black Spot and Polarizer Pricked	* Foreign material between glass and polarizer or glass and glass * Polarizer hole or protuberance by external force	Φ	$\Phi \leq 0.1$	$0.1 < \Phi \leq 0.15$ $0.15 < \Phi \leq 0.2$	$\Phi > 0.2$
			ACC. NO.	3EA /1PC	2 1	0
			Note	Φ is the average diameter of the defect. Distance between two defects > 10mm.		
Minor	White Spot and Bubble in polarizer	* Unobvious transparent foreign material between glass and glass or glass and polarizer * Air protuberance between polarizer and glass	Φ	$\Phi \leq 0.1$	$0.1 < \Phi \leq 0.15$ $0.15 < \Phi \leq 0.2$	$\Phi > 0.2$
			ACC. NO.	3EA / 1PC	2 1	0
			Note	Φ is the average diameter of the defect. Distance between two defects > 10mm.		
Minor	Segment Defect		Φ	$\Phi \leq 0.10$	$0.10 < \Phi \leq 0.20$	$\Phi > 0.2$
			ACC. NO.	3EA /1PC	2	0
				W is more than 1/2 segment width		Reject
			Note	$\Phi = \dfrac{L + W}{2}$ Distance between two defect is 10mm		
Minor	Protuberant Segment	 $\Phi = (L+W)/2$	Φ	$\Phi \leq 0.10$	$0.10 < \Phi \leq 0.20$	$\Phi > 0.2$
			W	Glue	$W \leq 1/2$ Seg , $W \leq 0.2$	Ignore
			ACC. NO.	3EA /1PC	2	0
Minor	Assembly Mis-alignment		1. Segment			
			B	B≤0.4mm	0.4<B≤1.0mm	B>1.0mm
			B-A	B-A<1/2B	B-A<0.2	B-A<0.25
			Judge	Acceptable	Acceptable	Acceptable
			2. Dot Matrix			
			Deformation>0.35mm			Reject

Minor	Stain on LCD Panel Surface		Accept when stains can be wiped lightly with a soft cloth or a similar one. Otherwise, judged according to the aboveitems: "Black spot" and "White Spot"

9. Reliability:

NO.	Item	Condition	Criterion
1	High Temperature Operating	70℃, 96Hrs	No defect in cosmeticand operational function allowable. Total current Consumption shouldbe below double of initial value.
2	Low Temperature Operating	-20℃, 96Hrs	
3	High Humidity	40℃, 90%RH, 96Hrs	
4	High Temperature Storage	80℃, 96Hrs	
5	Low Temperature Storage	-30℃, 96Hrs	
6	Vibration	Random wave 10 ~ 100Hz Acceleration: 2g 2 Hrs per direction(X,Y,Z)	
7	Thermal Shock	-10℃ to 25℃ to 60℃ (60Min) (5Min) (60Min) 16Cycles	
8	ESD Testing	Contract Discharge Voltage: +1 ~ 5kV and –1 ~ –5kV	There will be discharged ten times at every discharging voltage cycle. The voltage gap is 1kV.
		Air Discharge Voltage: +1 ~ 8kV and –1 ~ -8kV	

Note: 1) Above conditions are suitable for xinnuoya standard products.

2) For restrict products, the test conditions listed as above must be revised.

10.   Handling Precaution:

(1)   Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizerswhich easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling

the LCD Modules.

(2)   Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommendedbelow) and wipe lightly.

-      Isopropyl alcohol

-      Ethyl alcohol

-      Trichlorotrifloroethane

Do not wipe the display surface with dry or hard materials that will damage thepolarizer surface.

Do not use the following solvent:

-      Water

-      Ketone

-      Aromatics

(3)   Caution against static charge

The LCD Module use C-MOS LSI drivers, so we recommend that you connect any unused input terminal to VDD or VSS, do not input any signals before poweris turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

(4)   Packaging

-      Modules use LCD elements, and must be treated as such. Avoid intense shockand falls from a height.

- To prevent modules from degradation. Do not operate or store them exposeddirectly to sunshine or high temperature/humidity.

(5)   Caution for operation

-      It is indispensable to drive LCD's within the specified voltage limit since the higher voltage than the limit shorten LCD life. An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.

Handling Precaution (Continued):

-        Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show darkcolor in them. However those phenomena do not mean malfunction or out of order with LCD's.Which will come back in the specified operating temperature range.

-        If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.

-        A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 60℃, 90%RH or less is required.

(6)   Storage

In the case of storing for a long period of time (for instance, for years) for thepurpose or replacement use, The following ways are recommended.

-        Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it,And with no desiccant.

-        Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping temperature in the specified storage temperature range.

-        Storing with no touch on polarizer surface by the anything else. (It is recommendedto store them as they have been contained in the inner container at the time of delivery)

(7)   Safety

-        It is recommendable to crash damaged or unnecessary LCD into pieces and washoff liquid crystal by using solvents such as acetone and ethanol.

Which should be burned up later.

When any liquid crystal leaked out of a damaged glass cell comes in contact withyour hands, please wash it off well with soap and water.

11. Outline Dimensions: