华田信科电子有限公司

HTDISPLAY ELECTRONICS CO.,LTD.

The professional LCD manufacturer

www.htdisplay.com

SPECIFICATIONS

Product Name: LCD Module

Model PartNumber: HG1443201C-GT62L-VAA

Revision: R00 Date: 2015-9-13

Prepared By:	Reviewed By:	Approved By:
韩永全	贺元	王友仁

Customer: _____

Custoer Approved Result: □ OK □ NG

Custoer Confirmed Message: _____

_____

Approved By: _____ Date: _____

Contents

Record of History

The following table tracks the history of the changes made to this document.

Release Date	Rev.	Summary	Design

1. Technology Specifications

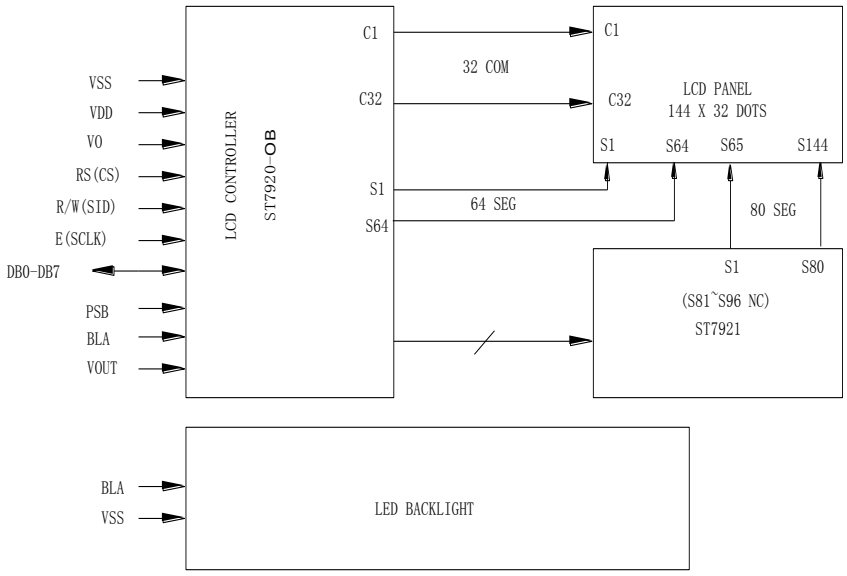
1.1 Features

S/N	ITEM		SPEC
1	Display Format	:	144×32 Dots
2	Display Mode	:	STN,GRAY,POSITIVE
3	Polarizer Mode	:	TRANSMISSIVE
4	Driving Method	:	1/32Duty, 1/5 Bias
5	Viewing Direction	:	6 O'clock
6	Backlight	:	LED WHITE
7	Controller	:	ST7920-0B(COB)
8	Interface	:	——
9	Weight	:	——

1.2 Mechanical Specifications

Item	Description	Unit
Module Dimension	80.8(W) ×35(H) ×12.9(T) Max	mm
Viewing Area	64.6(W) ×16.0(H)	mm
Aactive Area	60.44(W)×13.4(H)	mm
Dot Size	0.38(W) ×0.38(H)	mm
Dot Pitch	0.42(W) ×0.42(H)	mm

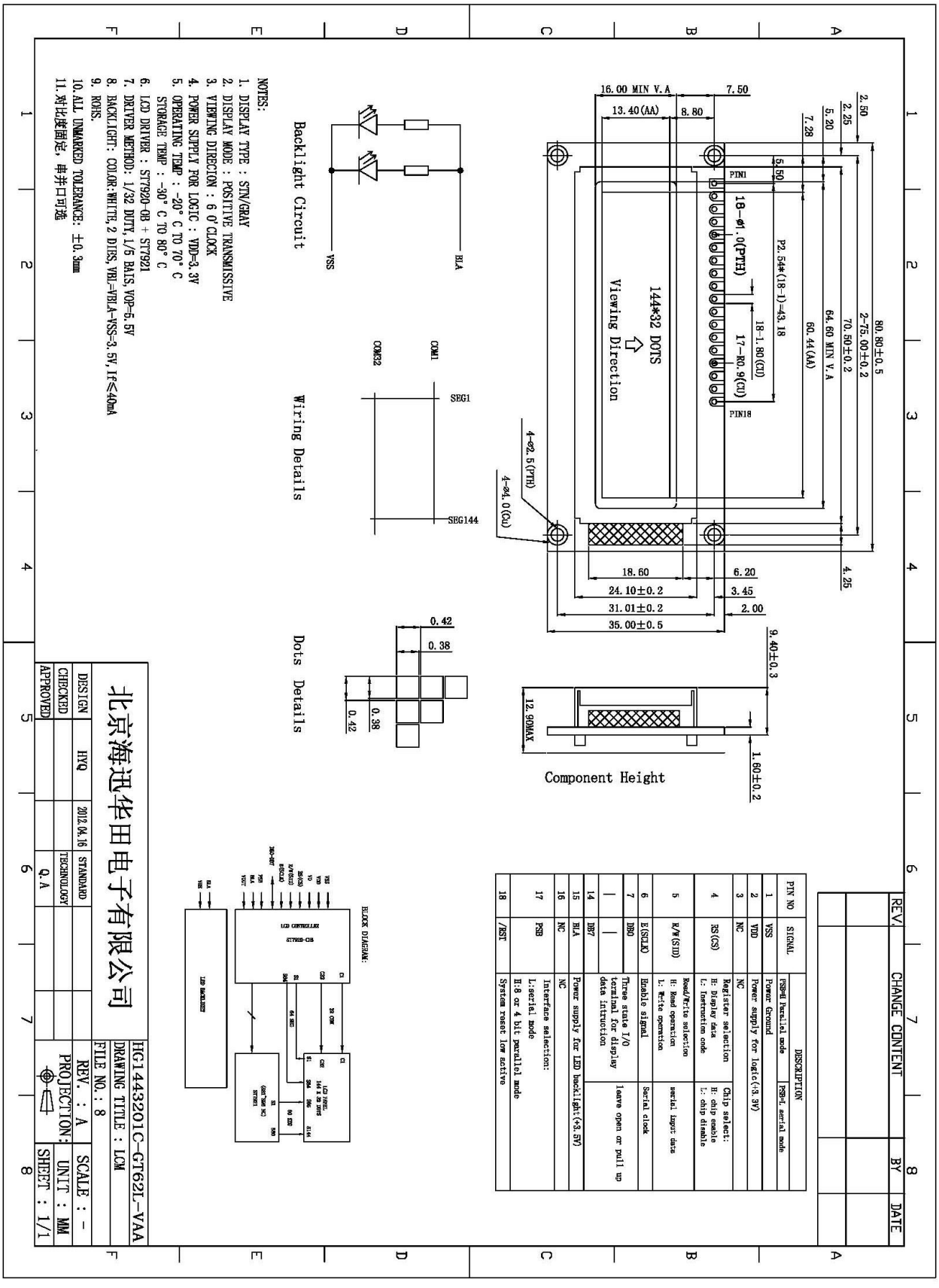
1.3 System Block Diagram



1.4 INTERFACE FUNCTIONS

PIN NO	SIGNAL	DESCRIPTION	
		PSB=H Parallel mode	PSB=L serial mode
1	VSS	Power Ground	
2	VDD	Power supply for logic(+3.3V)	
3	NC	NC	
4	RS(CS)	Register selection H: Display data L: Instruction code	Chip select: H: chip enable L: chip disable
5	R/W(SID)	Read/Write selection H: Read operation L: Write operation	serial input data
6	E(SCLK)	Enable signal	Serial clock
7	DB0	Three state I/O terminal for display data intruction	leave open or pull up
|	|		
14	DB7		
15	BLA	Power supply for LED backlight(+3.5V)	
16	NC	NC	
17	PSB	Interface selection: L:serial mode H:8 or 4 bit parallel mode	
18	/RST	System reset low active	

1.5 Dimensional Outline



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2、Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Supply Voltage (Logic)	VDD-VSS	-0.3	6.0	V
Supply Voltage (LCD)	VDD-V0	-0.3	7.0	V
Input Voltage	VI	-0.3	7.0	V
Operating Temperature	Topr	-20	70	℃
Storage Temperature	Tstg	-30	80	℃

3、Electrical Characteristics

3.1 DC Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage (Logic)	VDD		3.1	3.3	3.5	V
Supply Voltage (LCD Drive)	VLCD	Ta = 25℃		5.5		V
Input High Voltage	VIH		0.7VDD	——	VDD	V
Input Low Voltage	VIL		-0.3	——	0.6	V
Output High Voltage	VOH	IOH= -0.1 mA	0.8 VDD	——	VDD	V
Output Low Voltage	VOL	IOH= 0.5 mA	Vss	——	0.1VDD	V
Operating Current	IDD	Ta = 25℃			6	mA

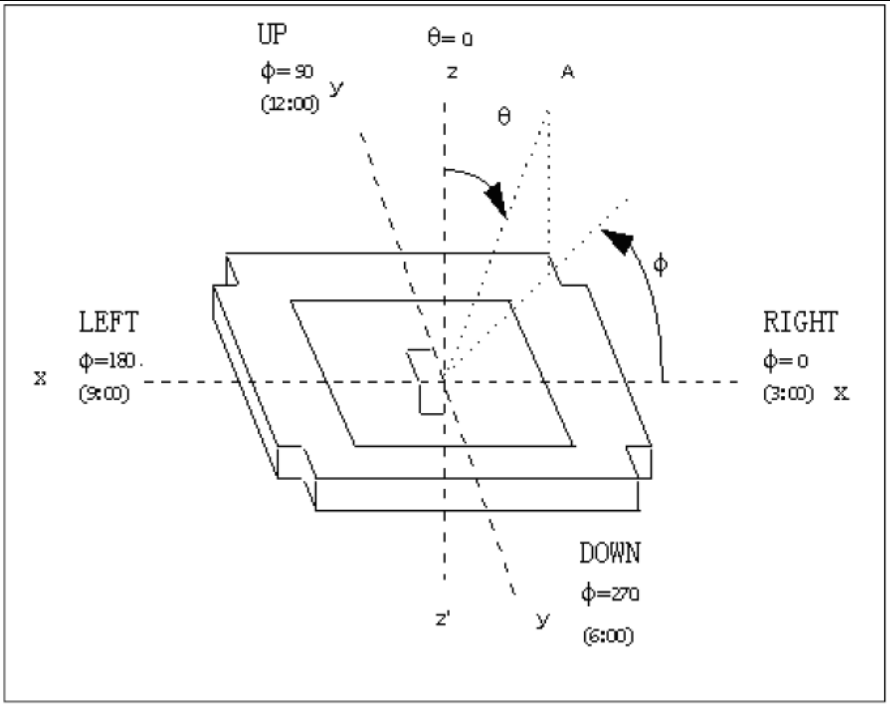
3.2 OpticalCharacteristics(Ta=25 ℃)

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	
Response time	Ton	25℃		350		ms	
	Toff	25℃		350		ms	
Contrast ration	CR	25℃	2	5		-	
Viewing Angle	φ	25 °		35		Deg θ=90 °	CR≥2.0
				45		Deg θ=270 °	
				35		Deg θ=0 °	
				35		Deg θ=180 °	

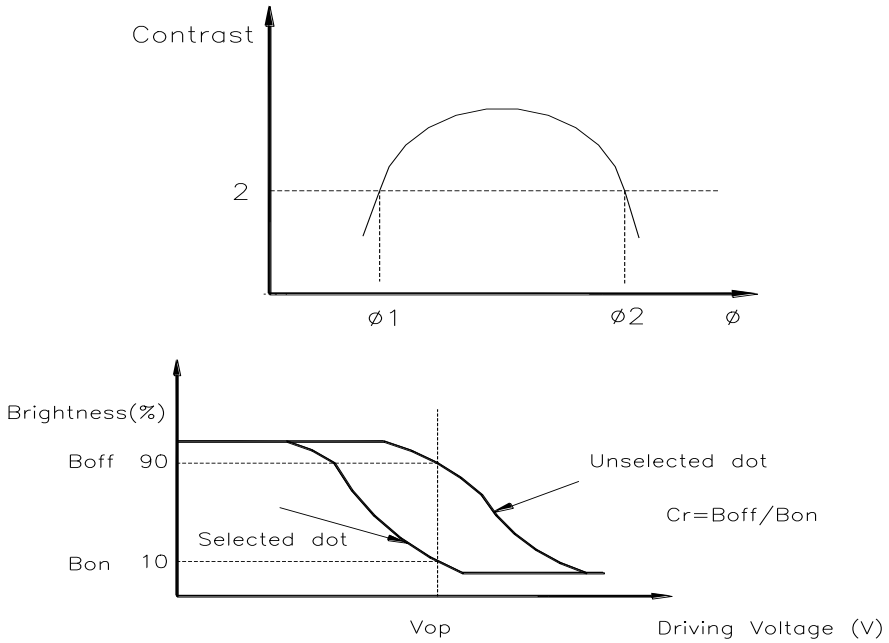
Panel only characteristics

NOTE1: Definition of Viewing Angle θ,ϕ

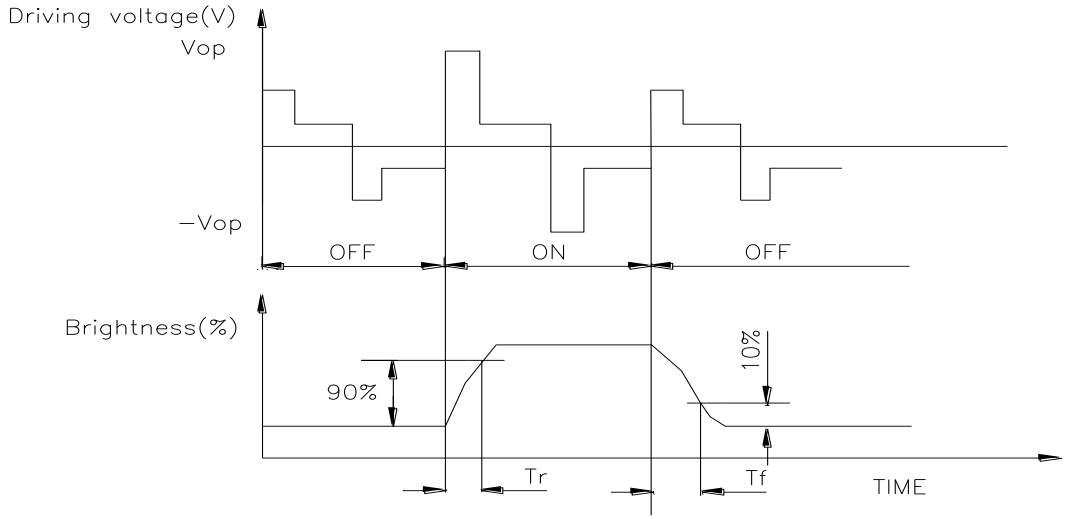
NOTE2: Definition of viewing Angle Range: Δϕ=\|ϕ2-ϕ1\|



NOTE3: Definition of Contrast

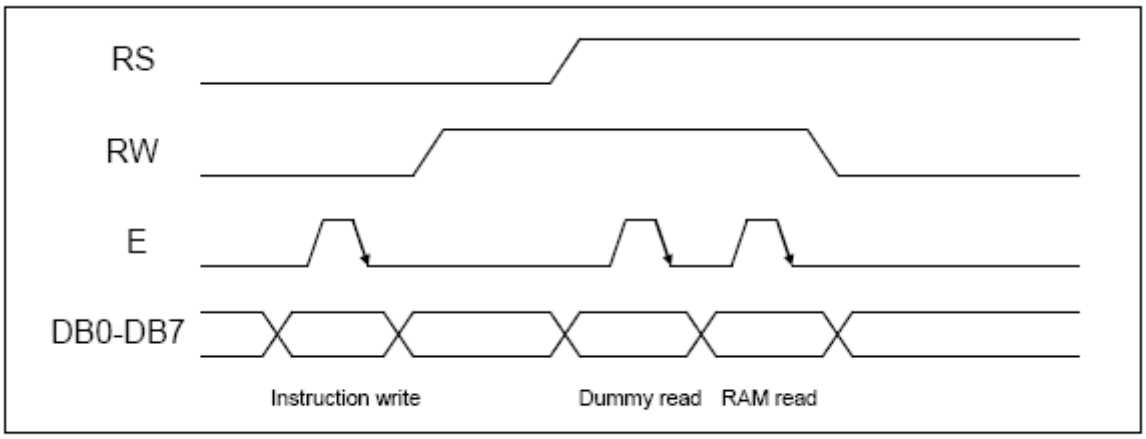


NOTE4: Definition of Response Time



4. Timing Characteristics

4-1. PARALLEL Interface Timing



Timing Diagram of 8-bit Parallel Bus Mode Data Transfer

5、LED Backlight Characteristics(Ta = 25℃)

Item	Symbol	Min.	Typ.	Max.	Condition	Unit
Forward Current	If	20	30	40	IF=3.5V	MA
Reverse Current	Ir			20	IF=3.5V	uA
色坐标	X	0.27	0.30	0.33	IF=3.5V	nm
	Y	0.27	0.30	0.33	IF=3.5V	nm
Luminance	Lv	200	250	350	IF=3.5V	cd/m^2

6、Display Control Instruction

6.1 Summary

Instruction Set 1: (RE=0: Basic Instruction)

Inst.	Code										Description	Exec time (540KHZ)
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Display Clear	0	0	0	0	0	0	0	0	0	1	Fill DDRAM with "20H" and set DDRAM address counter (AC) to "00H".	1.6 ms
Return Home	0	0	0	0	0	0	0	0	1	X	Set DDRAM address counter (AC) to "00H", and put cursor to origin ：the content of DDRAM are not changed	72 us
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Set cursor position and display shift when doing write or read operation	72 us
Display Control	0	0	0	0	0	0	1	D	C	B	D=1: Display ON C=1: Cursor ON B=1: Character Blink ON	72 us
Cursor Display Control	0	0	0	0	0	1	S/C	R/L	X	X	Cursor position and display shift control; the content of DDRAM are not changed	72 us
Function Set	0	0	0	0	1	DL	X	0 RE	X	X	DL=1 8-bit interface DL=0 4-bit interface **RE=1: extended instruction** **RE=0: basic instruction**	72 us
Set CGRAM Address.	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address to address counter (AC) **Make sure that in extended instruction SR=0 (scroll or RAM address select)**	72 us
Set DDRAM Address.	0	0	1	0 AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address to address counter (AC) AC6 is fixed to 0	72 us
Read Busy Flag (BF) & AC.	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Read busy flag (BF) for completion of internal operation, also Read out the value of address counter (AC)	0 us
Write RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data to internal RAM (DDRAM/CGRAM/GDRAM)	72 us
Read RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM/GDRAM)	72 us

Instruction set 2: (RE=1: extended instruction)

Inst.	Code										Description	Exec time (540KHZ)
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Standby	0	0	0	0	0	0	0	0	0	1	Enter standby mode, any other instruction can terminate. COM1…32 are halted.	72 us
Scroll or RAM Address. Select	0	0	0	0	0	0	0	0	1	SR	SR=1: enable vertical scroll position SR=0: enable CGRAM address **(basic instruction)**	72 us
Reverse (by line)	0	0	0	0	0	0	0	1	R1	R0	Select 1 out of 4 line (in DDRAM) and decide whether to reverse the display by toggling this instruction **R1,R0 initial value is 0,0**	72 us
Extended Function Set	0	0	0	0	1	DL	X	1 RE	G	0	DL=1 :8-bit interface DL=0 :4-bit interface **RE=1: extended instruction set** **RE=0: basic instruction set** G=1 :graphic display ON G=0 :graphic display OFF	72 us
Set Scroll Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	SR=1: AC5~AC0 the address of vertical scroll	72 us
Set Graphic Display RAM Address	0	0	1	0 0	0 AC5	0 AC4	AC3 AC3	AC2 AC2	AC1 AC1	AC0 AC0	Set GDRAM address to address counter (AC) Set the vertical address first and followed the horizontal address by consecutive writings Vertical address range: AC5…AC0 Horizontal address range: AC3…AC0	72 us

Note:

1. Make sure that ST7920 is not in busy state by reading the busy flag before sending instruction or data. If using delay loop instead, please make sure the delay time is enough. Please refer to the instruction execution time.
2. "RE" is the selection bit of basic and extended instruction set. After setting the RE bit, the value will be kept. So that the software doesn't have to set RE every time when using the same instruction set.

更详细指令描述请参阅 ST7920 数据手册

7、Precautions For use of LCD Module

7.1 Handling Precautions

LCD modules are assembled and adjusted with a high degree of precision, do not applying excessive shocks to it or making any alterations or modifications to it, the following precautions should be taken when handing.

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth. If the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- Do not apply excessive force on the surface of display or the adjoining areas of LCD module since this may cause the color tone to VAy.
- If the display surface of LCD module becomes contaminated, blow 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

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic Solvents

— The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

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

- Terminal electrode sections.
- Part of pattern wiring on TAB, etc.

7.2 Electro-Static Discharge Control

— The IC mounted on the LCD is very susceptible to static electricity. To protect them from static electricity which your body and clothing collect, connect your body to the ground via a resistor of some 1MΩ so that electricity should discharge connect the resistor close to your body in the grounding line and protect yourself from electric shock hazard.

— Module should be store in antistatic bag or other containers resistant to static after remove from its original package.

— The LCD modules use CMOS LSI drivers, so customers are recommend that any unused input terminal would be connected to VDD or VSS, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

— In order to reduce the generation of static electricity, a relative humidity of 50-60% is recommended.

— The LCD module is coated with a film to protect the display surface. Take care when peeling off this protective film since static electricity may be charged.

— Tools required for assembly, such as soldering irons, must be properly grounded.

7.3 Design Precautions

— The absolute maximum ratings represent the rated value beyond which LCD module can not exceed. When the LCD modules are used in excess of this rated value, their operating characteristics may be adversely affected.

— To prevent the occurrence of erroneous operation caused by noise, attention must be paid to satisfy VIL, VIH specification values, including taking the precaution of using signal cables that are short.

— The liquid crystal display exhibits temperature dependency characteristics. Since recognition of the display becomes difficult when the LCD is used outside its designated operating temperature range, be sure to use the LCD within this range. Also, keep in mind that the

LCD driving voltage levels necessary for clear displays will VAy according to temperature.

— Sufficiently notice the mutual noise interference occurred by peripheral devices.

— To cope with EMI, take measures basically on outputting side.

— If DC is impressed on the liquid crystal display panel, display definition is rapidly deteriorated by the electrochemical reaction that occurs inside the liquid crystal display panel. To eliminate the opportunity of DC impressing, be sure to maintain the AC characteristics of the input signals sent to the LCD Module.

7.4 Soldering Precautions

Soldering should apply to I/O terminals only.

— Soldering temperature is 280℃+(-)10℃.

— Soldering time 3-4 seconds.

— Eutectic solder (rosin flux filled) should be used.

— Only properly grounded soldering iron should be used.

— If soldering flux is used, be sure to remove any remaining flux after finishing the soldering operation and LCD surface should be covered during soldering to prevent any damage to flux spatters.

— When remove the lead wires from the I/O terminals, use proper de-soldering methods, e.g. suction type de-soldering irons. Do not repeat wiring by soldering more than three times at the pads and plated though holes may be damaged.

7.5 Operational Precautions

— Do not remove the panel or frame from the liquid crystal display module.

— Power supplies should always be turned on before the independent input signal sources turned on, and input signals should be turned off before power supplies turned off.

— The IC would break down if the driving voltage exceeds the limit. Make sure of electrical specifications, particularly the supply voltage.

— It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life. The use of direct current drive should be avoided because an electrochemical reaction due to direct current causes LCD's undesirable deterioration.

— Some font will be abnormally displayed when the display area is pushed hard during operation. But It resumes normal condition after turning off once.

— The response of the display is slow when the ambient temperature is below the lower limit, and the display surface appears dark everywhere when the ambient temperature is above the upper limit, in any case, id does not mean failure. It operates properly in the normal operating temperature range.

— The contrast of the liquid crystal display VAies with the viewing angle, ambient temperature, and driving voltage. Adjust the driving voltage for the best contrast by installing external VAiable switch.

— 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.

— Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions. Therefore it must be used under the relative condition of 50% RH.

7.6 Storage Precautions

— Take care to minimize corrosion of the electrodes. Water droplets or a current flow in a high humidity environment accelerates corrosion of the electrodes.

— When storing the LCD module, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the LCD module in sealed polyethylene bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperature below 0). The temperature range of 0℃~ -30℃ and at low humidity is recommended.

Whenever possible, the LCD module should be stored in the same conditions in which they were shipped from our company.

8. Quality Specification

8.1 Acceptable Quality Level

Inspection items	Sampling procedures	AQL
Function Display Function Photoelectric property	GB/T2828.1-2003 Inspection level Ⅱ Normal inspection Single sample inspection	0.1
Structure size	GB/T2828.1-2003 Inspection level Ⅱ Normal inspection Single sample inspection	0.1
Appearance	GB/T2828.1-2003 Inspection level Ⅱ Normal inspection Single sample inspection	0.65

8.2 Inspection Conditions

8.2.1 The Environmental

-Room temperature: 25±3 oC

-Humidity: 65±20%RH

8.3 Inspection Standards

8.3.1 VISUAL WHILE OPERATING

Items to be inspected	Inspection standard
No display	If any pattern is not active at all, they can be rejected.

Irregular operating	No irregular operating are allowed Appeared different display, which they should be chosen in the pattern, or appeared in different position where they should be chosen.
Irregular display	Any segment doesn't active, they can be rejected.
Over current	The total current required to activate the module should not be exceed the MAX current in specification.
View angles	Valves that don't meet the minimum value noted in the specification. they can be rejected.
Contrast	Valves that don't meet the minimum value noted in the specification, they can be reject.
.LCD operate voltage	Meet the specification.

8.3.2 Visual while not operating

Module dimension	**Meet the module outline drawing, not exceed the tolerance.**
LCD panel scratch	Following scratches inside the effective viewing area considered as the defects when their width & length are larger than the following combinations. Number: one or more Width: 0.1 length: 3.0 three or more Width: 0.05 length: 2.0 three or more Width: 0.03 length: 3.0 When the defects exceed this, it can be rejected.

9. Reliability

9.1 Standard Specification for Reliability of General-purpose LCM

Test Item	Test Condition	Note
High Temperature Store	80 °C,12hr.	2
Low Temperature Store	-30 °C,4hr	2
Humidity Store	40 °C,90~95%RH,96hr	1,2
High Temperature Operation	70°C,typical operating conditions,48hr	2
Low Temperature Operation	-20°C,typical operating conditions,48hr	2
Shock	Acceleration: 100m/s^2 , Pulse time: 11ms, 6 times in each direction of XYZ	
Mechanical Vibration	10~55Hz sweep, 3G, ampl.=0.75mm(max) XYZ for 20 min, each.	

Note 1: Condensation of water is not permitted on the module.
Note 2: The module should be inspected after 4 hour storage in normal conditions (15~35 °C,45~65%RH)

9.2MTTF （Mean-Time-To-Fail）

The LCD is designed to meet the MTTF by 50,000 hours under normal room conditions (25℃,65%RH,without sun-shine)