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:　__HG12864C1G-VF__

Revision:　__R00__　　　Date:　__2018-08-18__

Prepared By:	Reviewed By:	Approved By:
WS	HYQ	WYR

Customer: _____
Customer Approved Result: _____ □ OK _____ □ NG _____
Customer Confirmed Message: _____

_____

Approved By: _____ Date: _____

Contents

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Record of History

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

Release Date	Rev.	Summary	Design
2018.8.18	R00	Orign Released	WS

1. Technology Specifications

1.1 Features

S/N	ITEM		SPEC
1	Display Format	:	128×64 Dots
2	Display Mode	:	FSTN, Positive
3	Polarizer Mode	:	TRANSFLECTIVE
4	Driving Method	:	1/65Duty, 1/9 Bias, Vop 11.0V
5	Viewing Direction	:	6 O'clock
6	Backlight	:	LED White
7	Controller	:	ST7567A
8	Interface	:	IIC Interface
9	Weight	:	——

1.2 Mechanical Specifications

Item	Description	Unit
Module Dimension Without FPC	32.5(W) ×22.5(H) ×3.0 (T)	mm
Viewing Area	29.0(W) ×16.35(H)	mm
Active Area	25.58(W)×14.06(H)	mm
Dot Size	0.18 (W) ×0.2(H)	mm
Dot Pitch	0.2(W) ×0.22(H)	mm

1.3INTERFACE FUNCTIONS

Pin no.	SYMBOL	I/O	FUNCTION
1	A	P	Power for Backlight（+3.3V）
2	K	P	Power for Backlight（0V）
3	RST	I/O	Hardware reset input pin. When RSTB is "L", internal initialization is executed and the internal registers will be initialized.
4	SCL	I/O	Serial clock input
5	SDA	I/O	Serial data input
6	VDD	P	Power for LCD（+3.3V）
7	VSS-	P	Power for LCD（0V）
8	V0	--	V0 is the LCD driving voltage for common circuits at negative frame
9	XV0	--	XV0 is the LCD driving voltage for common circuits at positive frame
10	VG	--	VG is the LCD driving voltage for segment circuits

1.4 Dimensional Outline

REV.	CHANGE CONTENT	BY	DATE
Ⓐ	Change BL with LED,FPC TO SOCKET CONNECT.	WS	2018.5.17
Ⓑ	Correct errors about FPC thickness.	WS	2018.6.8
Ⓒ	change solder/tape to the end of FPC.	WS	2018.6.22
Ⓓ	decrease BL's current(brightness) to increase lifetime.	WS	2018.7.10
Ⓔ	change FPC length and remove cross shaped column on the BL. change solder point from front to back to protect solder point.	WS	2018.8.7

DOTS:128X64

REAR

FRONT

solder

SOLDER/TAPE

MAX 0.7

STIFFENER

CONTACT SIDE

Ⓔ Ⓐ

Ⓔ

0.25±0.05 Ⓑ

3.00 MAX

2.70

2.70

BACKLIGHT

K

VBL=3.3V

A

R

NO	NAME
1	A
2	K
3	RST
4	SCL
5	SDA
6	VDD
7	VSS
8	V0
9	XV0
10	VG

Ⓐ

NOTES:
1. DISPLAY TYPE: FSTN,POSITIVE,TRANSFLECTIVE
2. DRIVE METHOD: DUTY=1/65,BIAS=1/9,VDD=3.3V,VOP=TBD.
3. VIEWING DIR.: 6:00.
4. CONTROLLER: ST7567A; INTERFACE: IIC
5. OPERATING TEMP: -30℃~80℃.
6. STORAGE TEMP: -40℃~85℃. Ⓓ
7. BACKLIGHT: 1 WHITE LED, VBL=3.3V,IBL=13mA(TYP) Ⓐ
8. ROHS
9. UNMARK TOLERANCE IS :±0.2mm Ⓓ
10. Display life>=100,000H, Backlight life>=50,000H

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DRAWING No. :	HG12864C1G-VF		
DRAWING TITLE:	LCM MODULE		
FILE NO. :	1		
DESIGN	WS	2018.5.17	STANDARD		REV. : A	SCALE : -
CHECKED	HY	2018.5.17	TECHNOLOGY		PROJECTION:	UNIT : MM
APPROVED	JYQ	2018.5.17	Q.A			SHEET : 1/1

2、Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Supply Voltage (Logic)	VDD-VSS	-0.3	4.0	V
Supply Voltage (LCD)	VLCD	-0.3	13.0	V
Operating Temperature	Topr	-30	80	℃
Storage Temperature	Tstg	-40	85	℃

3、Electrical Characteristics

3.1 DC Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage (Logic)	VDD		2.4	3.3	3.6	V
Supply Voltage (LCD Drive)	VLCD	Ta = 25℃	10.8	11.0	11.2	V
Input High Voltage	VIH		0.8VDD	——	VDD	V
Input Low Voltage	VIL		Vss	——	0.2VDD	V
Output High Voltage	VOH		0.8 VDD	——	VDD	V
Output Low Voltage	VOL		Vss	——	0.2VDD	V
Operating Current	IDD	Ta = 25℃		0.3	0.6	mA

3.2 OpticalCharacteristics(Ta=25 ℃)

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	
Response time	Ton	25℃		200	300	ms	
	Toff	25℃		250	350	ms	
Contrast ration	CR	Θ=10 °，φ=270 °	4	5		--	
Viewing Angle	θ	25 °		35		Deg φ=90 °	CR≥2.0
				50		Deg φ=270 °	
				35		Deg φ=0 °	
				35		Deg φ=180 °	

Panel only characteristics
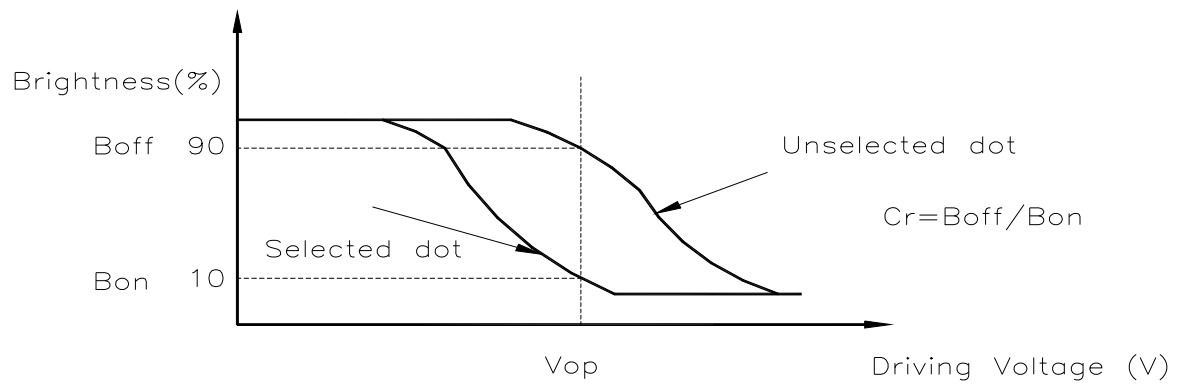**NOTE1: Definition of Viewing Angle θ,φ**
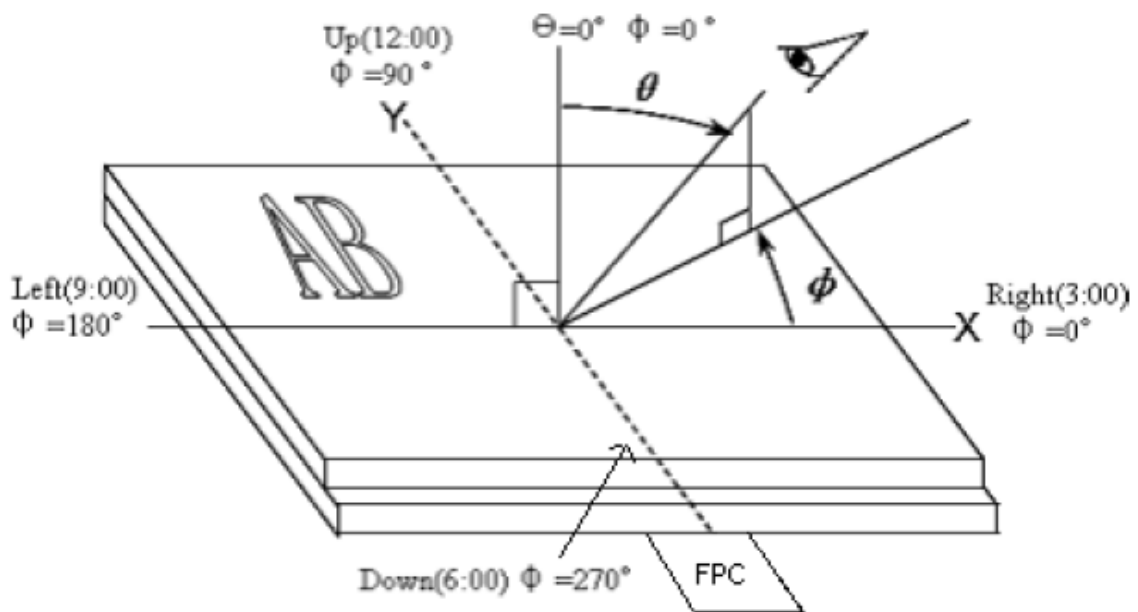
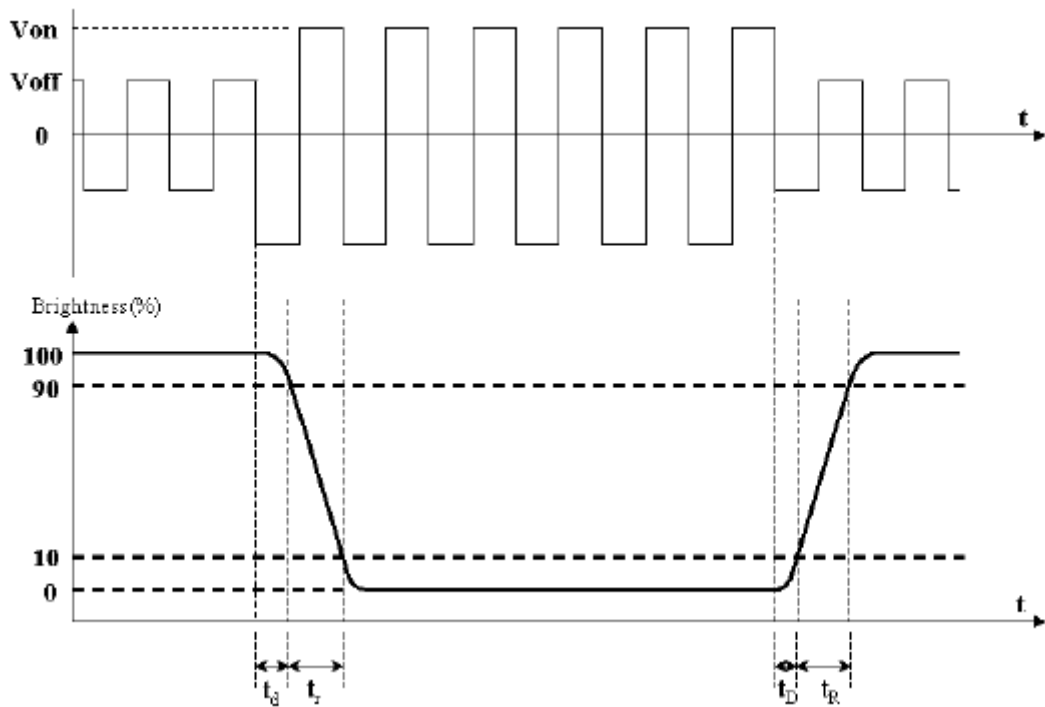**NOTE2: Definition of viewing Angle Range**
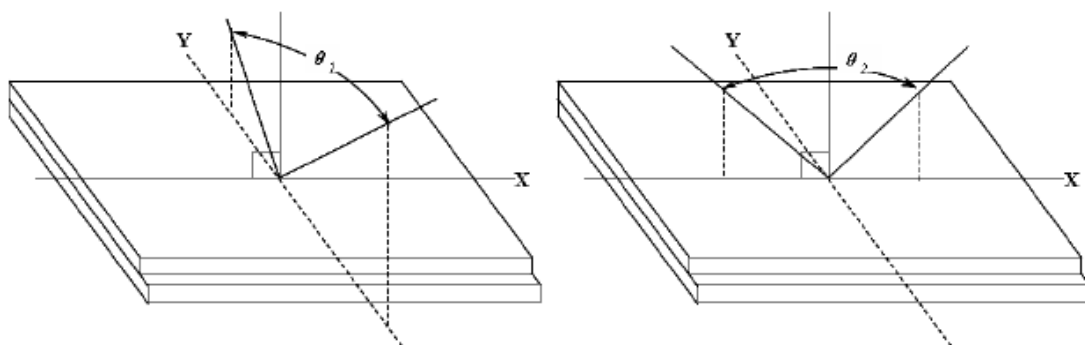
θ1 ——range of viewing angle from up to down

θ2 ——range of viewing angle from left to right.

NOTE3: Definition of Contrast

$$Cr(\theta, \phi) = \frac{L_2}{L_1} = \frac{Luminance(\theta, \phi)\ (Dark\ state)}{Luminance(\theta, \phi)\ (Bright\ state)}$$
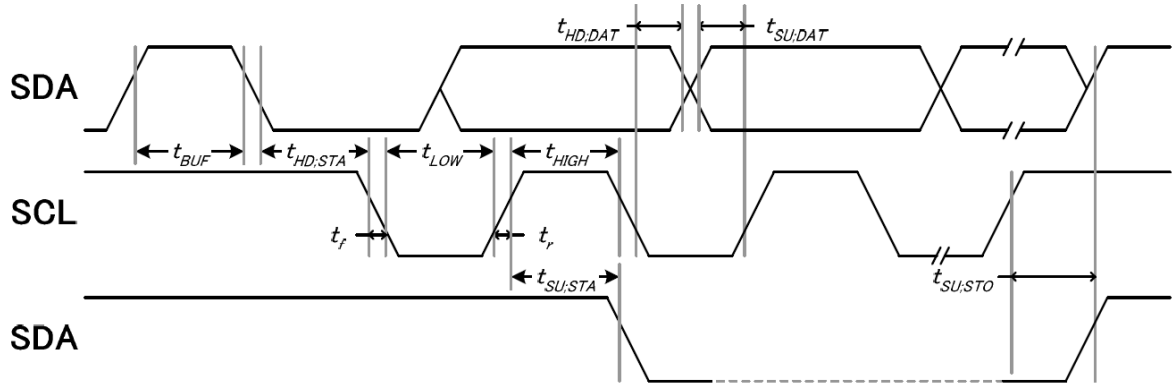
Brightness(%)

Boff   90

Bon   10

Unselected dot

Cr=Boff/Bon

Selected dot

Vop

Driving Voltage (V)

NOTE4: Definition of Response Time

Von

Voff

0

t

Brightness(%)

100

90

10

0

t

t_d t_r t_D t_R

4. Timing Characteristics

4-1. Interface Timing chart

IIC Timing Characteristics

(VDD1 = 3.3V , Ta =25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
SCL clock frequency	SCL	fSCL		-	400	
SCL clock low period		tLOW		160	-	
SCL clock high period		tHIGH		60	-	
Data set-up time	SDA	tSU;Data		80	-	
Data hold time		tHD;Data		40	-	ns
Setup time for a repeated START condition	SDA	tSU;STA		90	-	
Start condition hold time		tHD;STA		220	-	
Setup time for STOP condition		tSU;STO		110	-	
Bus free time between a STOP and START		tBUF		150	-	

*1 The rise and fall time (tr, tf) of the input signal are specified at 15 ns or less.

*2 All timings take 20% and 80% of VDD1 as standard.

4.2 RESET Timing
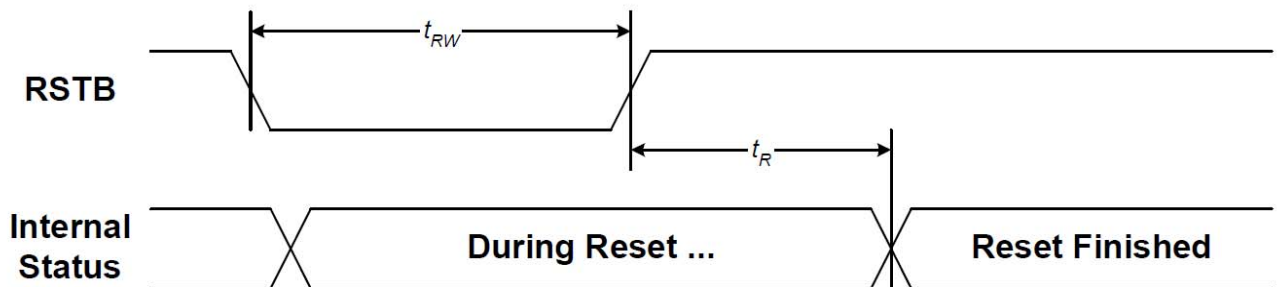
(VDD1 = 3.3V , Ta =25°C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1.0	us
Reset "L" pulse width	tRW		1.0	—	

5、LED Backlight Characteristics(Ta = 25℃)

Item	Symbol	Min.	Typ.	Max.	Condition	Unit
Forward Current	If	10	13	15	Vf =3.3V	mA
Reverse Current	Ir		10/LED		5.0V	uA
Peak Wave Length	λp	--	--	--	Vf =3.3V	nm
Spectral Line Half Width	Δλ	--	--	--	Vf =3.3V	nm
Spectral Line Half Width	X	0.235	0.255	0.275	Vf =3.3V	—
	Y	0.245	0.265	0.285	Vf =3.3V	—
Luminance	Lv	--	--	--	Vf =3.3V	cd/m2

6、Display Control Instruction

6.1 LCM Initial

```
void initial()
{
        RST = 0;
        mDelay(50);
        RST = 1;
        mDelay(50);


        write_com(0xE2);        //software reset
        mDelay(50);
        write_com(0xae);        //DISPLAY OFF

        write_com(0xa2);        //1/9 Bias
        write_com(0xa0);        //ADC
        write_com(0xc8);        //COM
        write_com(0x40);        //

        write_com(0x26);        //V0 Voltage Resistor Ratio Set
        write_com(0x81);        //Electronic Volume Mode Set
        write_com(0x2A);        //Electronic Volume Register Set()

        write_com(0xf8);        //The Booster set
        write_com(0x00);        //The Booster set
```

```
write_com(0x2c);          //The Power Control Set
write_com(0x2e);          //
write_com(0x2f);          //
write_com(0xaf);          //Lcd Disply ON
}
```

6.2 Code Summary

INSTRUCTION	A0	R/W (RWR)	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	0	1	0	1	0	1	1	1	D	D=1, display ON D=0, display OFF
(2) Set Start Line	0	0	0	1	S5	S4	S3	S2	S1	S0	Set display start line
(3) Set Page Address	0	0	1	0	1	1	Y3	Y2	Y1	Y0	Set page address
(4)Set Column Address	0	0	0	0	0	1	X7	X6	X5	X4	Set column address (MSB)
	0	0	0	0	0	0	X3	X2	X1	X0	Set column address (LSB)
(5) Read Status	0	1	0	MX	D	RST	0	0	0	0	Read IC Status
(6) Write Data	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write display data to RAM
(7) Read Data	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read display data from RAM
(8) SEG Direction	0	0	1	0	1	0	0	0	0	MX	Set scan direction of SEG MX=1, reverse direction MX=0, normal direction
(9) Inverse Display	0	0	1	0	1	0	0	1	1	INV	INV =1, inverse display INV =0, normal display
(10) All Pixel ON	0	0	1	0	1	0	0	1	0	AP	AP=1, set all pixel ON AP=0, normal display
(11) Bias Select	0	0	1	0	1	0	0	0	1	BS	Select bias setting 0=1/9; 1=1/7 (at 1/65 duty)
(12) Read-modify-Write	0	0	1	1	1	0	0	0	0	0	Column address increment: Read:+0 , Write:+1
(13) END	0	0	1	1	1	0	1	1	1	0	Exit Read-modify-Write mode
(14) RESET	0	0	1	1	1	0	0	0	1	0	Software reset
(15) COM Direction	0	0	1	1	0	0	MY	-	-	-	Set output direction of COM MY=1, reverse direction MY=0, normal direction
(16) Power Control	0	0	0	0	1	0	1	VB	VR	VF	Control built-in power circuit ON/OFF
(17) Regulation Ratio	0	0	0	0	1	0	0	RR2	RR1	RR0	Select regulation resistor ratio
(18) Set EV	0	0	1	0	0	0	0	0	0	1	Double command!! Set electronic volume (EV) level
	0	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	
(19) Set Booster	0	0	1	1	1	1	1	0	0	0	Double command!! Set booster level: BL=0: 4X BL=1: 5X
	0	0	0	0	0	0	0	0	0	BL	
(20) Power Save	0	0	Compound Command								Display OFF + All Pixel ON
(21) NOP	0	0	1	1	1	0	0	0	1	1	No operation
(22) Set N-Line	0	0	1	0	0	0	0	1	0	1	Set N-Line inversion
	0	0	0	0	0	NL4	NL3	NL2	NL1	NL0	
(23) Release N-Line	0	0	1	0	0	0	0	1	0	0	Exit N-Line inversion
(24) SPI Read Status	0	1	1	1	1	1	1	1	0	0	SPI read status command
	0	1	0	MX	D	RST	ID3	ID2	ID1	ID0	
(25) SPI Read DDRAM	0	1	1	1	1	1	1	1	0	1	SPI read DDRAM command
	1	1	D7	D6	D5	D4	D3	D2	D1	D0	

Command											Description
Extension Command Set	0	0	1	1	1	1	1	1	1	Mode	Mode=1: Enter extension command table Mode=0: Exit extension command table
(1) High Power Mode ON	0	0	0	1	1	0	1	0	1	1	Enter high power mode
(2) High Power Mode OFF	0	0	0	1	1	0	0	1	0	0	Exit high power mode
(3) Display Setting Mode	0	0	0	1	1	1	-	-	DSM	0	Complex command DSM=1: Enter display setting DSM=0: Exit display setting When DSM=1, Set duty(DT[3:0]), bias(BA[2:0]), frame rate(FR[2:0])
	0	0	1	1	0	1	DT3	DT2	DT1	DT0	
	0	0	1	0	0	1	0	BA2	BA1	BA0	
	0	0	1	0	0	1	1	FR2	FR1	FR0	

Note: 1. Symbol "-" means this bit can be "H" or "L".

2. Do not use instructions not listed in these tables.

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°C~ -30°C 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: 50±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	85 $^{\circ}$C,96hr.	2
Low Temperature Store	-40 $^{\circ}$C,96hr	2
Humidity Store	60 $^{\circ}$C,70%RH,96hr	1,2
High Temperature Operation	80°C,typical operating conditions,96hr	2
Low Temperature Operation	-30°C,typical operating conditions,96hr	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 $^{\circ}$C,45~65%RH)

9.2MTTF （Mean-Time-To-Fail）

The LCD is designed to meet the MTTF by 100,000 hours under normal room conditions

The Backlight is designed to meet the MTTF by 50,000 hours under normal room conditions

(25℃,65%RH,without sun-shine)