

SPECIFICATION OF LCD MODULE

CUSTOMER 客户名称	
PART NO. 产品型号	JHD529(12864F)Y/YG 1.0
PRODUCTS TYPE 产品内容	
REMARKS 备注	
SIGNATURE BY CUSTOMER 客户签署:	

		
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深圳市晶汉达电子有限公司

LCM System

1 LCD Type STN FSTN DFSTN**2 Viewing Angle** Lower 6:00 Upper 12:00 Others**3 Display Mode** Yellow Green positive Blue Negative Grey positive FSTN positive FSTN negative**4 Polarizer Mode** Reflective Transflective Transmissive**5 Connector** Pin Heat sealed Zebra**6 Thickness of Glass** 1.1mm 0.4mm 0.55mm 0.7mm**7 Backlight Mode:** LED CCFL**8 Backlight Color** Blue Brilliant Green Yellow Green Red White Without backlight**9 Temperature Grade** Normal temperature Wide temperature Super wide temperature

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1. FEATURES

•Display construction.....	128*64 DOTS
•Display mode.....	STN(Y/G)
•Display type.....	Positive Transflective
•Backlight.....	LED(YG)/5.0V
•Viewing direction.....	6 o'clock
•Operating temperature.....	-20 to 60 °C
•Storage temperature	-30 to 80°C
•Driving voltage.....	Single power
•Driving method.....	1/64 duty, 1/9 bias
•Type.....	COB (Chip On Board)
•Controller/Drive IC.....	ST7920/ST7921
•Number of data line.....	8-bit parallel
•Connector.....	Pin

2. MECHANICAL DATA

ITEM		WIDTH	HEIGHT	THICKNESS	UNIT
Module size		93.0	70.0	14.0(MAX)	mm
Active area		66.52	33.24	-	mm
Viewing area		72.0	40.0	-	mm
Dot	Size	0.48	0.48	-	mm
	Pitch	0.52	0.52	-	mm
Diameter of mounting hole		Φ 2.5			mm
Weight		About 180			g

3. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Value	Unit
Power Supply voltage	VDD	-0.3 to +6.0	V
LCD Driver Voltage	V _{LCD} or V ₀	-0.3 to +7.0	V
Voltage Douber Output	V _{OUT}	-0.3 to +7.0	V
Input Voltage	V _{IN}	-0.3 to V _{DD} +0.3	V
Operating temperature	T _{OPR}	-20 to 70	°C
Storage temperature	T _{sto}	-30 to 80	°C

4. ELECTRICAL CHARACTERISTICS

DC Characteristics (TA = -30°C ~ 85°C, VDD = 4.5 V - 5.5 V)

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
V _{DD}	Operating Voltage	-	4.5	-	5.5	V
V _{LCD}	LCD Voltage	V ₀ -V _{SS}	3.0	-	7	V
I _{CC}	Power Supply Current	f _{OSC} = 540KHz, V _{DD} =5V Rf=33KΩ	-	0.45	0.75	mA
V _{IH1}	Input High Voltage (Except OSC1)	-	0.7V _{DD}	-	V _{DD}	V
V _{IL1}	Input Low Voltage (Except OSC1)	-	-0.3	-	0.6	V
V _{IH2}	Input High Voltage (OSC1)	-	V _{DD} -1	-	V _{DD}	V
V _{IL2}	Input Low Voltage (OSC1)	-	-	-	1.0	V
V _{OH1}	Output High Voltage (DB0 - DB7)	I _{OH} = -0.1mA	0.8V _{DD}	-	V _{DD}	V
V _{OL1}	Output Low Voltage (DB0 - DB7)	I _{OL} = 0.1mA	-	-	0.4	V
V _{OH2}	Output High Voltage (Except DB0 - DB7)	I _{OH} = -0.04mA	0.8V _{DD}	-	V _{DD}	V
V _{OL2}	Output Low Voltage (Except DB0 - DB7)	I _{OL} = 0.04mA	-	-	0.1V _{DD}	V
I _{LEAK}	Input Leakage Current	V _{IN} = 0V to V _{DD}	-1	-	1	μA
I _{PUP}	Pull Up MOS Current	V _{DD} = 5V	75	80	85	μA

4.1 LED ELECTRICAL/OPTICAL CHARACTERISTICS

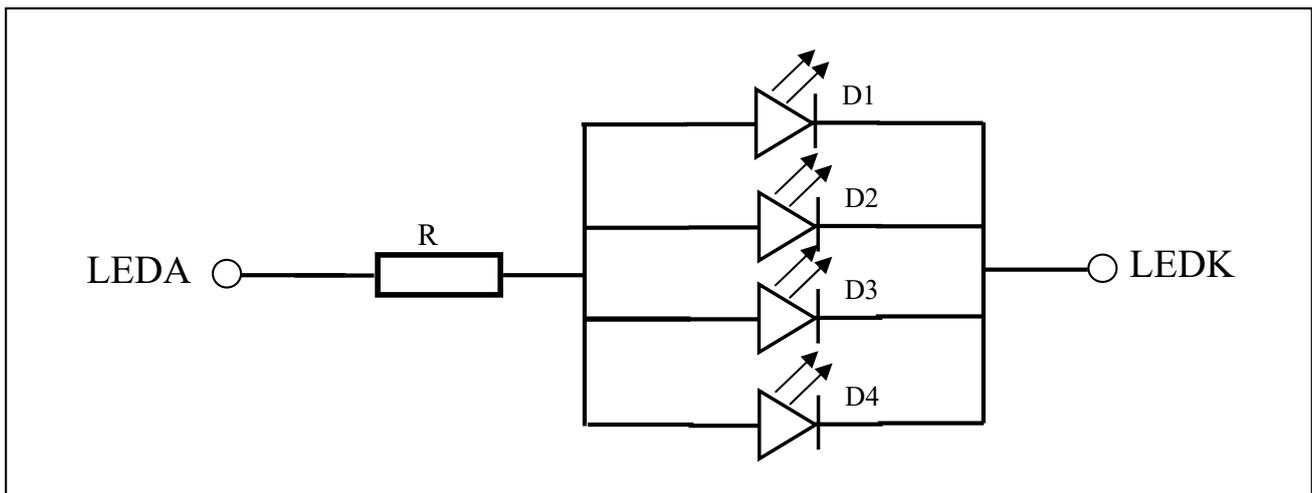
Item	Symbol	min	typ	max	Unit	Condition
Forward Voltage	V _f	-	5.0	5.2	V	I _f = 80 mA
Reverse Current	I _r	-	60	-	uA	V _r = 5 V
Dominant wave length	λ _d	568	572	575	nm	I _f = 80 mA
Spectral Line Half width	Δλ	-	30	-	nm	I _f = 80 mA
Luminance	L _v	-	110	-	cd/m ²	I _f = 80 mA

4.2 LED ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Rating	Unit
Reverse Voltage	V _r	T _a =25°C	5	V
Absolute maximum forward current	I _{fm}	T _a =25°C	100	mA
Power description	pd	T _a =25°C	500	mW

4.2.1 LED ARRAY BLOCK DIAGRAM

(LED DICE 4 dices)



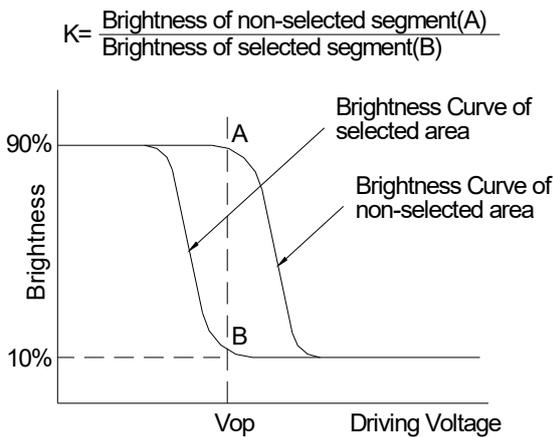
4.2.2 LED POWER SOURCE

LED	Option	Power source	Jumper setting
	A	19A/20K	J6、J7、R9、R17
	B	19K/20A	J5、J8、R9、R17

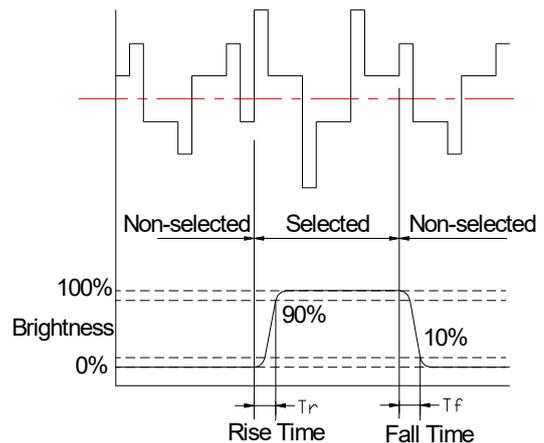
5. ELECTRO-OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast ratio	K	$\varphi=0$	1.4	4	-	-	1
Response time (rise)	Tr	$\varphi=0$	-	250	300	ms	2
Response time (fall)	Tf	$\varphi=0$		250	350	ms	2
Viewing angle	φ	K ≥ 2.0	-40 -- +40			deg.	3
	θ		-40 -- +15				

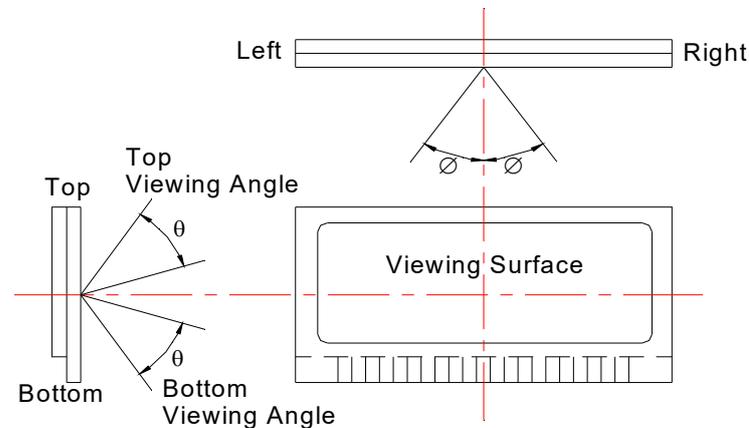
Note 1: Definition of Contrast Ratio "K"



Note 2: Definition of Optical Response Time

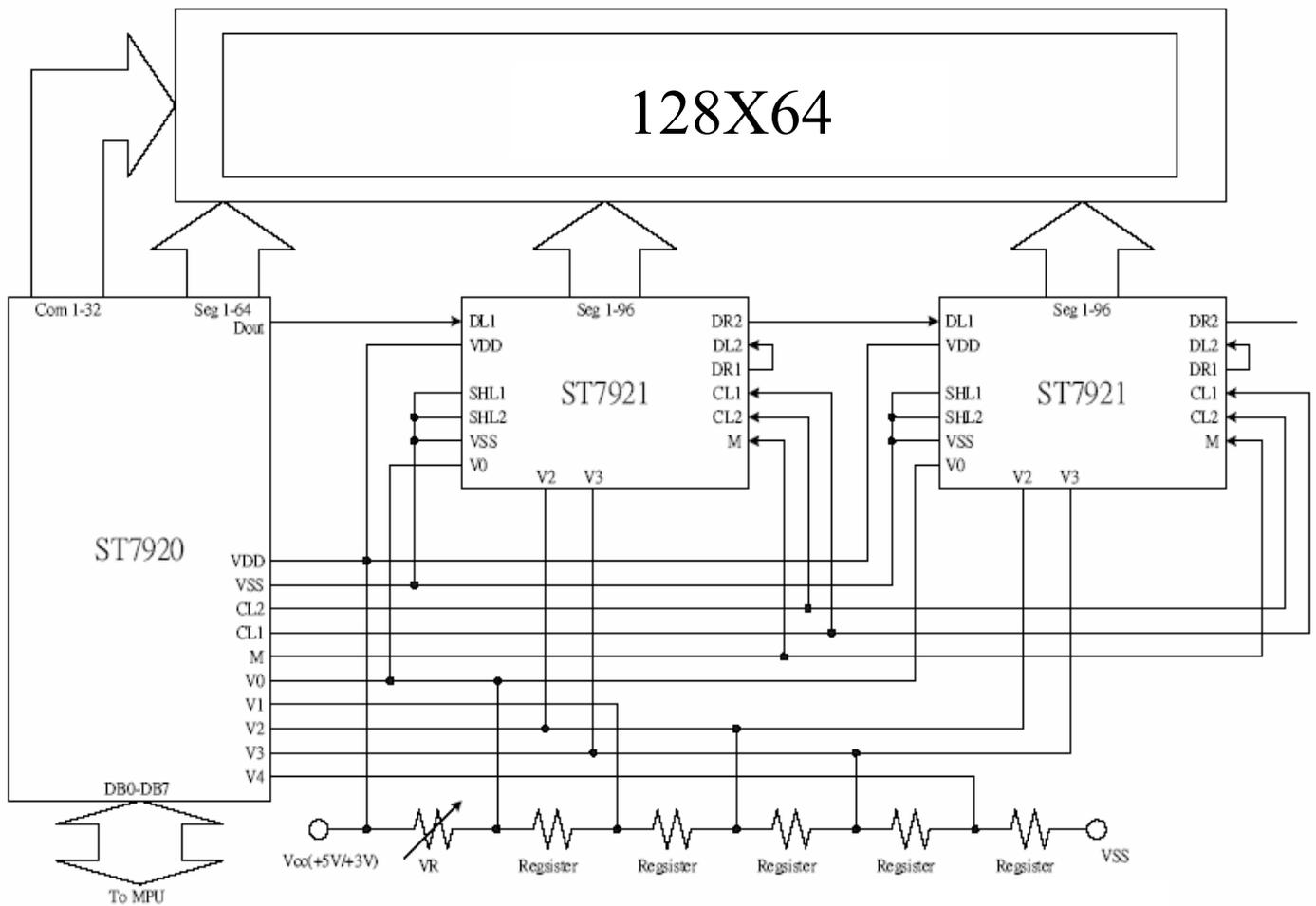


Note 3: Definition of Viewing Angle

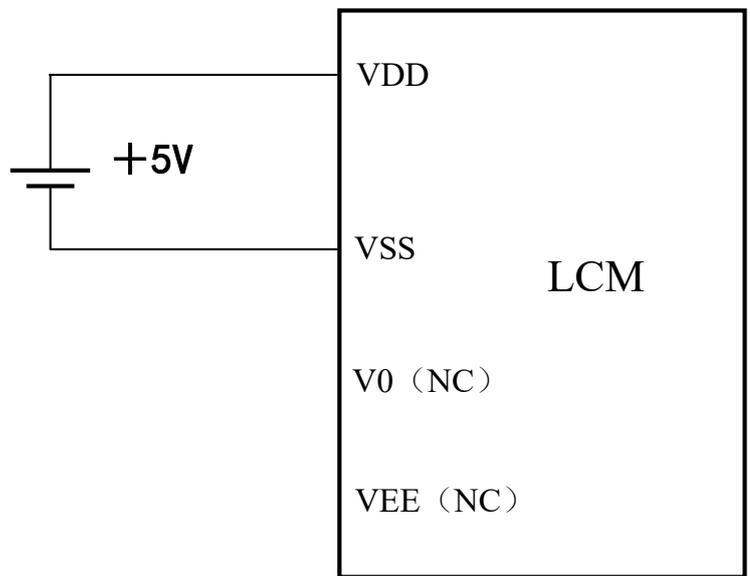


Please select either top or bottom viewing angle

6. BLOCK DIAGRAM

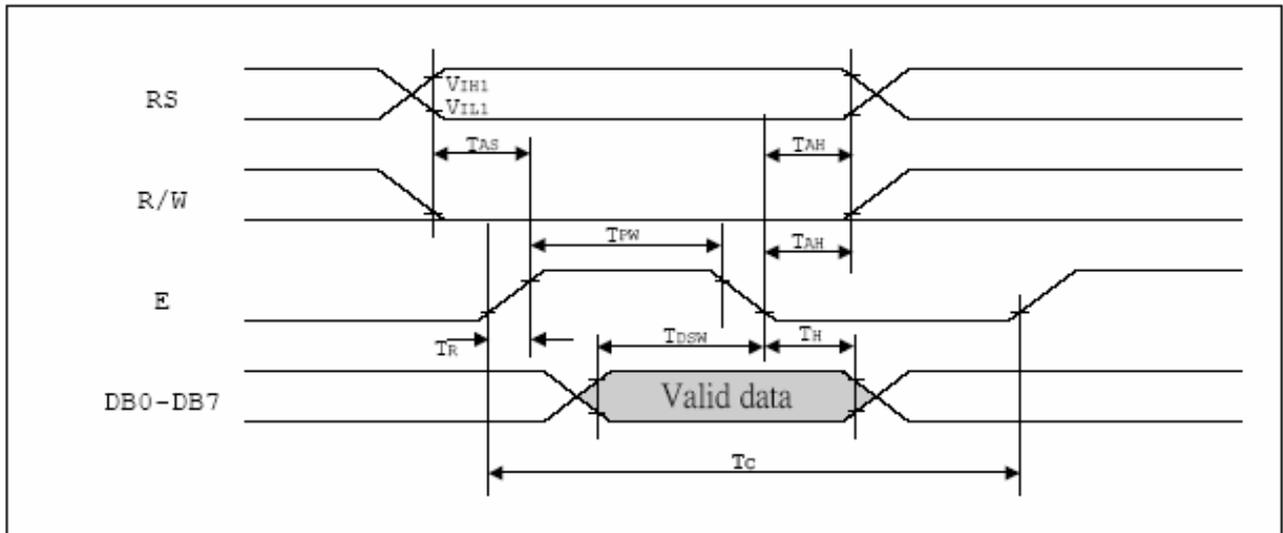


7. VOLTAGE REGULATOR CIRCUITS

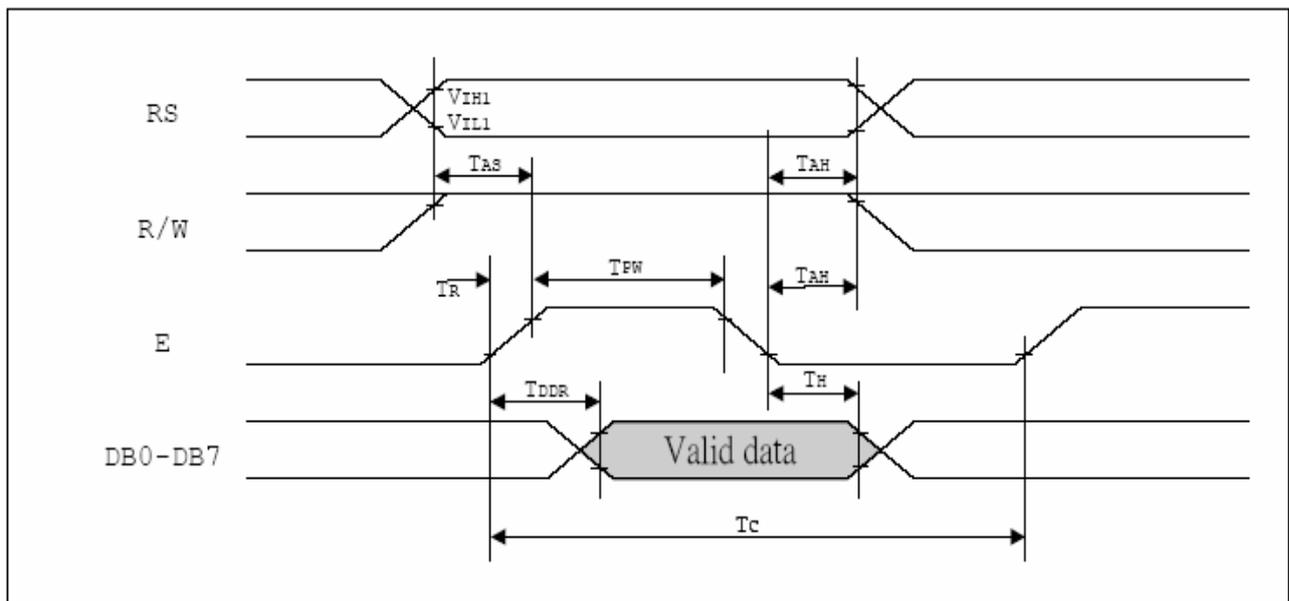


8. TIMING DIAGRAM

- MPU write data to ST7920



- MPU read data from ST7920



AC Characteristics (TA = -30°C ~ 85°C, VDD = 4.5V) Parallel Mode Interface

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
<i>Internal Clock Operation</i>						
f _{OSC}	OSC Frequency	R = 33KΩ	480	540	600	KHz
<i>External Clock Operation</i>						
f _{EX}	External Frequency	-	480	540	600	KHz
	Duty Cycle	-	45	50	55	%
T _R , T _F	Rise/Fall Time	-	-	-	0.2	μs
<i>Write Mode (Writing data from MPU to ST7920)</i>						
T _C	Enable Cycle Time	Pin E	1200	-	-	ns
T _{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T _R , T _F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T _{AS}	Address Setup Time	Pins: RS,RW,E	10	-	-	ns
T _{AH}	Address Hold Time	Pins: RS,RW,E	20	-	-	ns
T _{DSW}	Data Setup Time	Pins: DB0 - DB7	40	-	-	ns
T _H	Data Hold Time	Pins: DB0 - DB7	20	-	-	ns
<i>Read Mode (Reading Data from ST7920 to MPU)</i>						
T _C	Enable Cycle Time	Pin E	1200	-	-	ns
T _{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T _R , T _F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T _{AS}	Address Setup Time	Pins: RS,RW,E	10	-	-	ns
T _{AH}	Address Hold Time	Pins: RS,RW,E	20	-	-	ns
T _{DDR}	Data Delay Time	Pins: DB0 - DB7	-	-	100	ns
T _H	Data Hold Time	Pins: DB0 - DB7	20	-	-	ns
<i>Interface Mode with LCD Driver(ST7921)</i>						
T _{CWH}	Clock Pulse with High	Pins: CL1, CL2	800	-	-	ns
T _{CWL}	Clock Pulse with Low	Pins: CL1, CL2	800	-	-	ns
T _{CST}	Clock Setup Time	Pins: CL1, CL2	500	-	-	ns
T _{SU}	Data Setup Time	Pin: D	300	-	-	ns
T _{DH}	Data Hold Time	Pin: D	300	-	-	ns
T _{DM}	M Delay Time	Pin: M	-1000	-	1000	ns

9. INSTRUCTION SET

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	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	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	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	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	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)

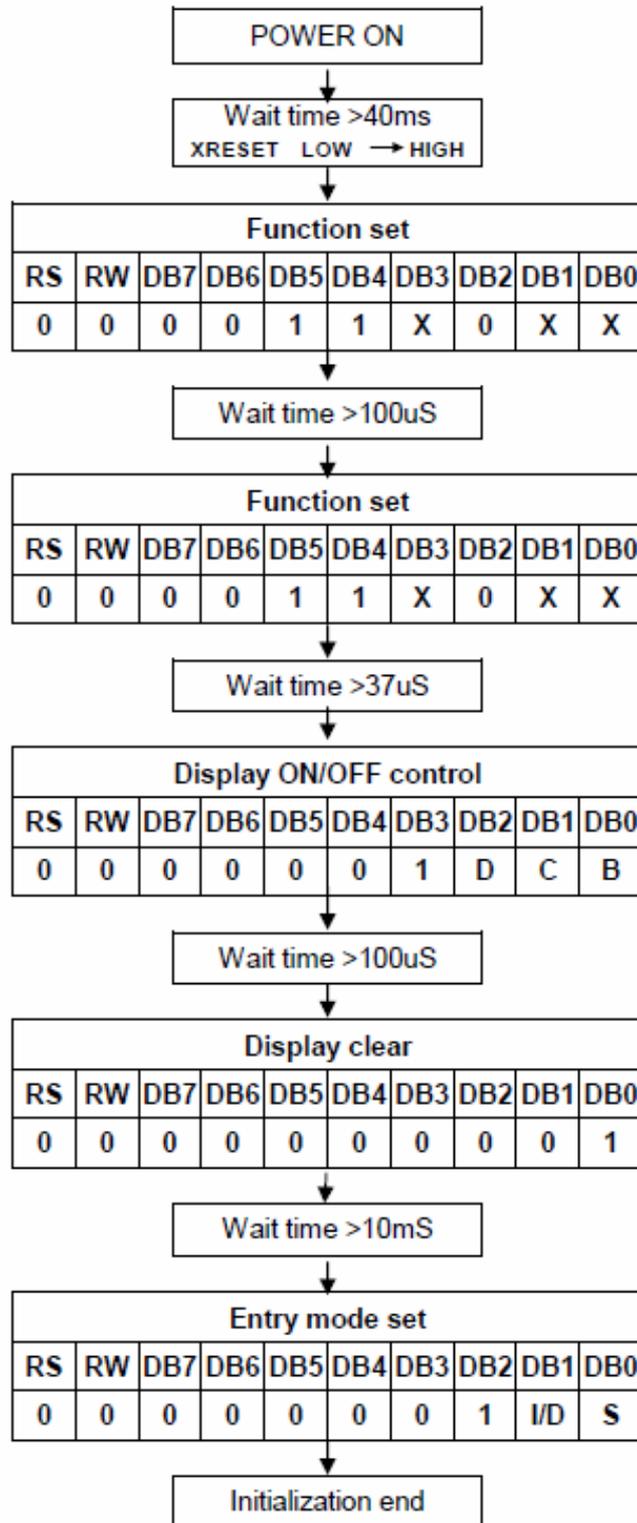
Inst.	Code										Description	Exec time (540KHZ)	
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0			
Standby	0	0	0	0	0	0	0	0	0	1	Enter standby mode, any other instruction can terminate. COM1...32 are halted.	72 us	
Scroll or RAM Address. Select	0	0	0	0	0	0	0	0	1	SR	SR=1: enable vertical scroll position SR=0: enable CGRAM address (<u>basic instruction</u>)	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 <u>R1,R0 initial value is 0,0</u>	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 <u>RE=1: extended instruction set</u> <u>RE=0: basic instruction set</u> 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	AC3	AC2	AC1	AC0	0	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:

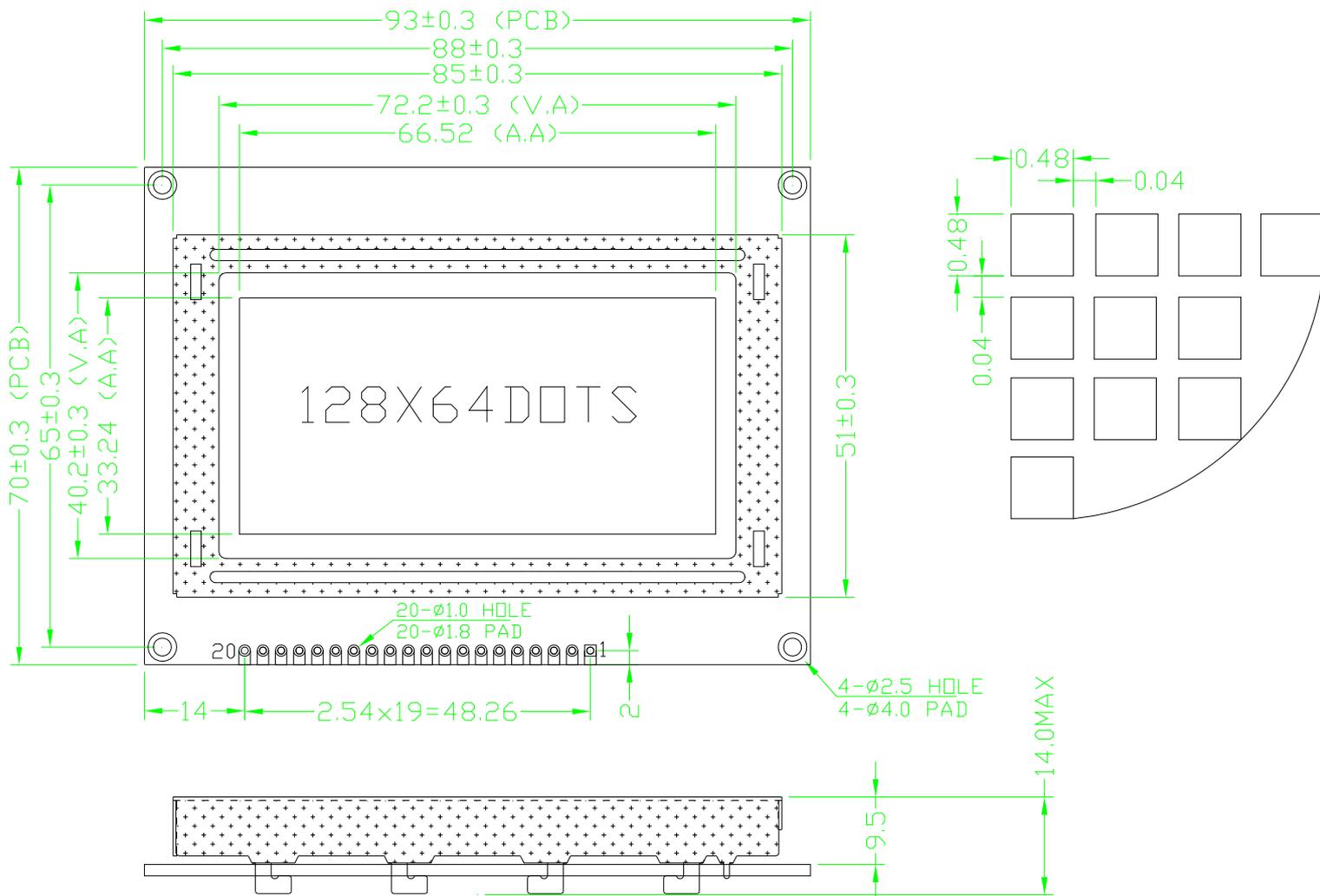
1. Make sure that ST7920 is not in busy state by reading the busy flag before sending instruction or data. If using delay loop instead, please make sure the delay time is enough. Please refer to the instruction execution time.
2. "RE" is the selection bit of basic and extended instruction set. After 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.

10. INSTRUCTION SEQUENCE

8-bit interface:



11. EXTERNAL DIMENSION



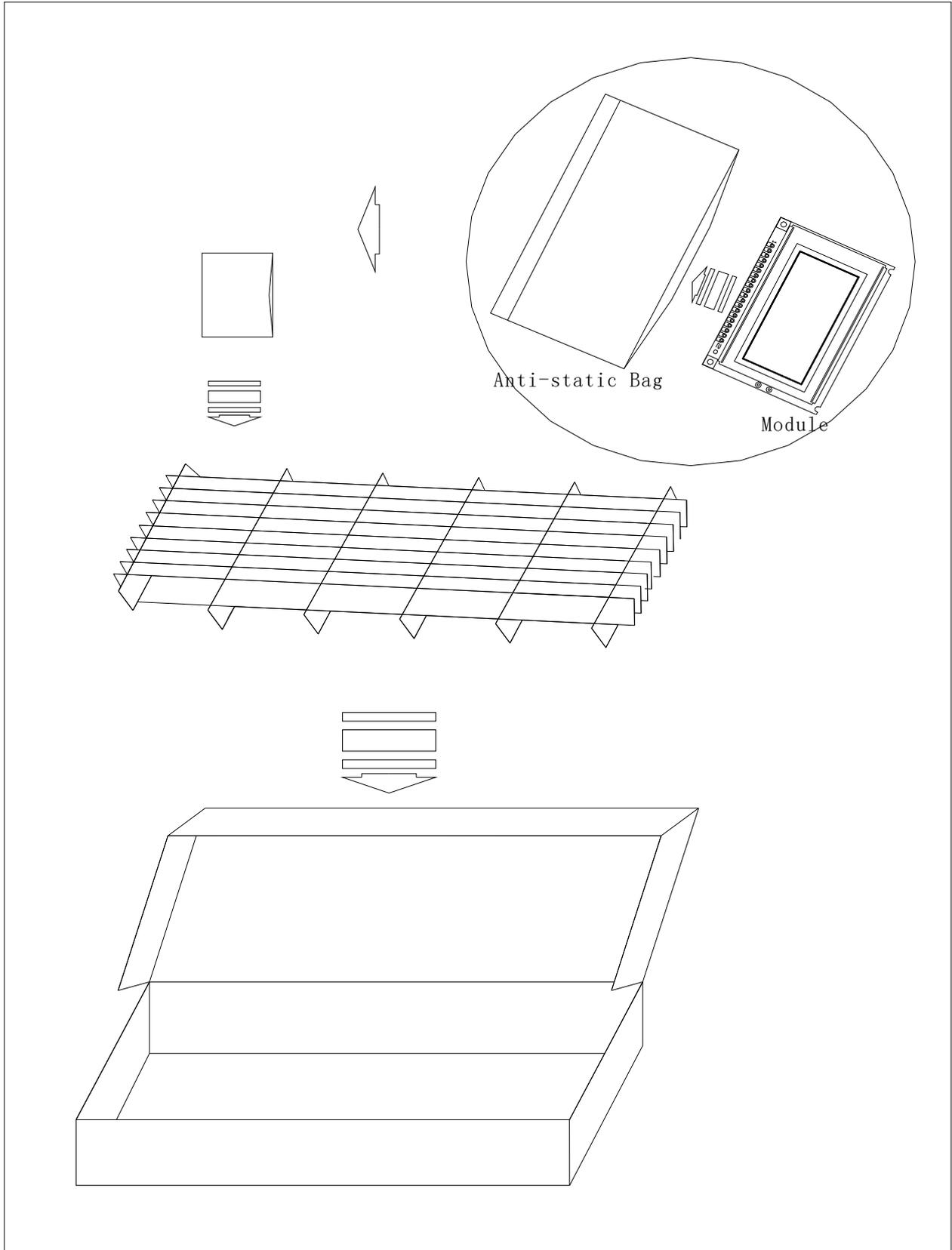
1	2	3	4	5	6	7	8	9	10
VSS	VDD	NC	D/I(CS)	R/W(SDI)	E(SCLK)	DB0	DB1	DB2	DB3
11	12	13	14	15	16	17	18	19	20
DB4	DB5	DB6	DB7	PSB	NC	RST	NC	LEDA	LEDK

12.INTERFACE

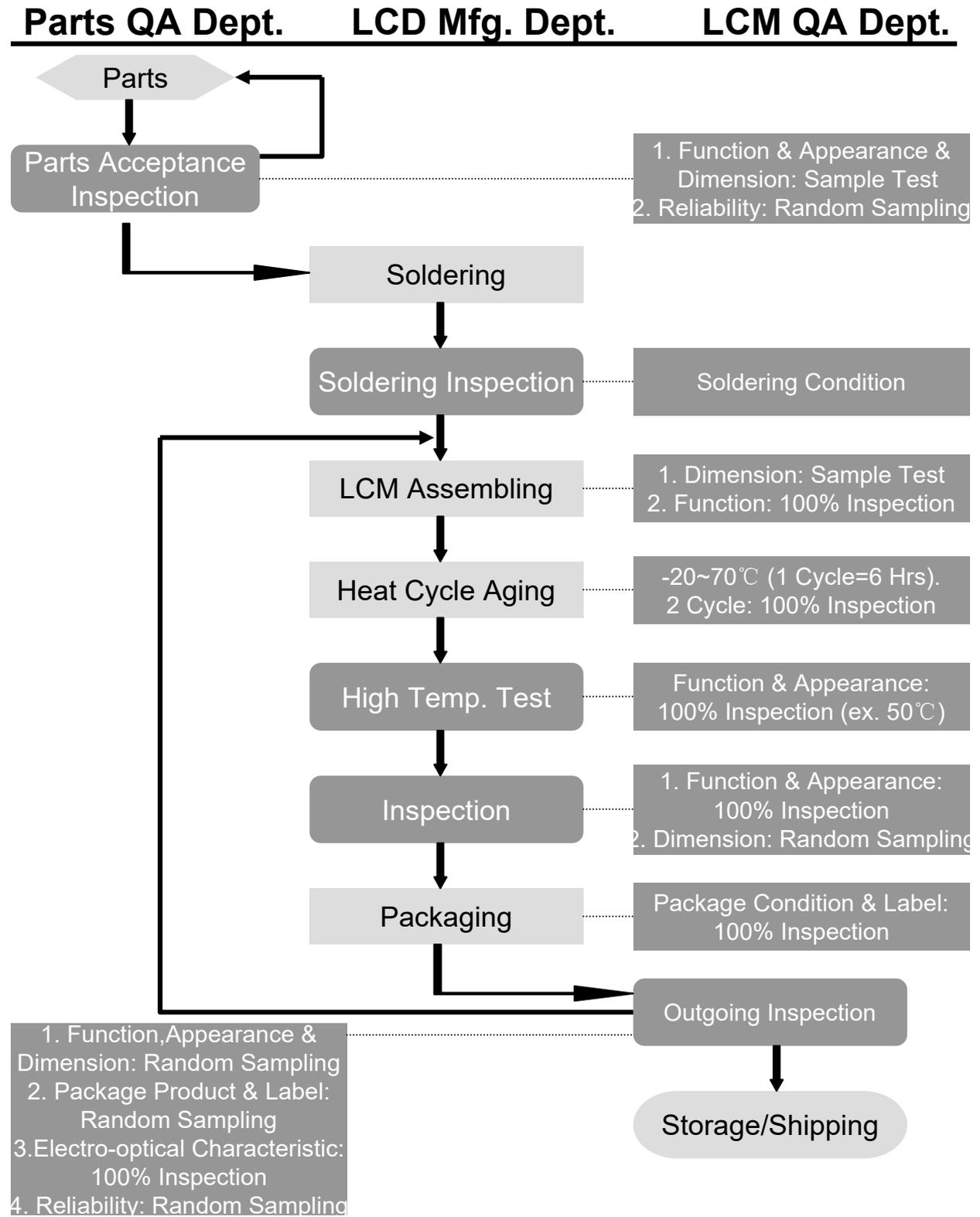
PIN NO.	SYMBOL	DESCRIPTION	FUNCTION
1	VSS	GROUND	0V (GND)
2	VDD	POWER SUPPLY FOR LOGIC CIRCUIT	+5V
3	V0/VDD/NC	LCD CONTRAST ADJUSTMENT OR LCD VOLTAGE OR NC	
4	D/I(CS)	INSTRUCTION/DATA REGISTER SELECTION	D/I = 0 : INSTRUCTION REGISTER D/I = 1 : DATA REGISTER
5	R/W(SDI)	READ/WRITE SELECTION	R/W = 0 : REGISTER WRITE R/W = 1 : REGISTER READ
6	E(SCLK)	ENABLE SIGNAL	
7	DB0	DATA INPUT/OUTPUT LINES	8 BIT: DB0-DB7
8	DB1		
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		
15	PSB	SERIAL/PARALLEL SELECTION	PSB=0:SERIAL MODE PSB=1:8/4BIT PARALLEL BUS MODE
16	NC		
17	RST	RESET SIGNAL	RSTB=0,DISPLAY OFF,DISPLAY FROM LINE 0.
18	VEE/NC	LCD DRIVE VOLTAGE/NC	
19	LEDK	SUPPLY VOLTAGE FOR LED-	0V
20	LEDA	SUPPLY VOLTAGE FOR LED+	+5V

13. PACKAGE INFORMATION

A Box include 30pcs



14. QC/QA PROCEDURE



15. RELIABILITY

•Operating life time:

Longer than 50000 hours (at room temperature without direct irradiation of sunlight)

•Reliability Characteristics:

Item	Test	Criterion
High temp	70°C / 200 Hrs	■Total current consumption should be below double of initial value ■Contrast ratio should be within initial value±50% ■No defect in cosmetic and operational function is allowable
Low temp.	-20°C / 200 Hrs	
High humidity	40°C * 90%RH / 200 Hrs	
Thermal shock	-20°C→25°C→70°C→25°C /5 Cycles (30min) (5min) (30min) (5min)	
Vibration	1.Operating time: Thirty minutes exposure in each direction (x, y, z) 2.Sweep Frequency (1min):10Hz→ 55Hz→10Hz 3.Amplitude: 0.75mm double amplitude	

16. Handling Precaution

1. Limitation of Application:

Jing HanDa products are designed for use in ordinary electronic devices such as business machines, telecommunications equipment, measurement devices and etc. Please handle the products with care. (see below)

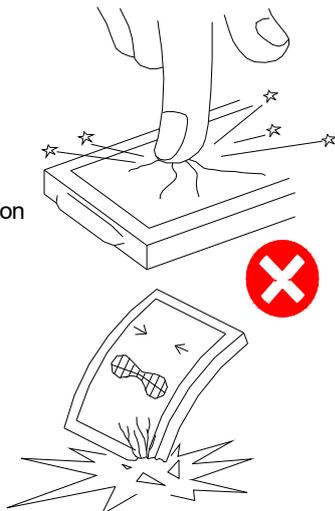
Jing HanDa products are not designed, intended, or authorized for use in any application which the failure of the product could result in a situation where personal injury or death may occur. these applications include, but are not limited to. life-sustaining equipment, nuclear control devices, aerospace equipment, devices related to hazardous or flammable materials, etc. [If Buyer intends to purchase or use the Jing HanDa Products for such unintended or unauthorized applications, Buyer must secure prior written consent to such use by a responsible officer of Jing HanDa Corporation.] Should Buyer purchase or use Jing HanDa Products for any such unintended or unauthorized application [without such consent]. Buyer shall indemnify and hold Jing HanDa and its officers, employees, subsidiaries, affiliates and distributors harmless against all claims, costs, damages and expenses, and reasonable attorney's fees, arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Jing HanDa was negligent regarding the design or manufacture of the part.

2. Industrial Rights and Patents

Jing HanDa shall not be responsible for any infringement of industrial property rights of third parties in any country arising out of the application or use of Jing HanDa products, except which directly concern the structure or production of such products.

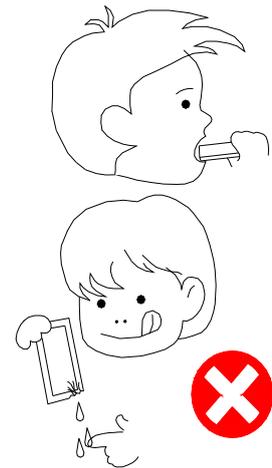
No Press and Shock!

If pressure to LCD, orientation may be disturbed.
LCD will broken by shock!



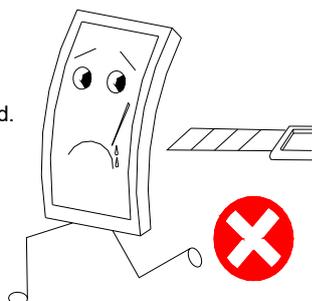
Don't Swallow or Touch Liquid Crystal!

Liquid Crystal may be leaked when display is broked.
If it accidentally gets your hands, wash then with water!



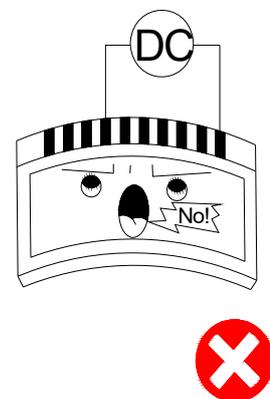
Don't not Scratch!

Polarizer is a soft material and can easily be scratched.



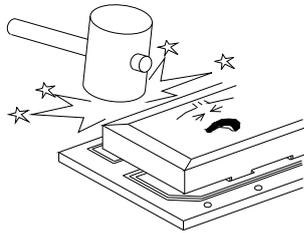
No DC Voltage to LCD!

DC volrage or driveing higher than the specified voltage will reduce the lifetime of the LCD.

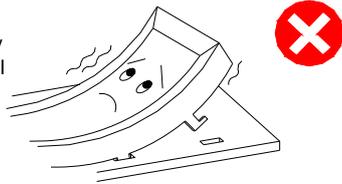


Don't Press the Metallic Frame and Disassemble the LCM

Pressure on the metallic frame and PCB may deform the conductive rubber or break the liquid crystal cell and back light, which will cause defects.



LCD may be shifted or conductive rubber may be reshaped, which will cause defects.



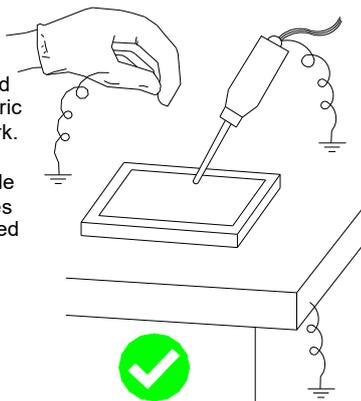
Slowly Peel Off Protective Film!

Avoid static electricity.



Avoid Static Electricity!

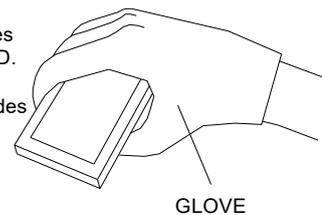
Please be sure to ground human body and electric appliances during work. It is preferable to use conductive mat on table and wear cotton clothes or conduction processed fiber. Synthetic fiber is not recommended.



Wear Gloves While Handling!

It is preferable to wear gloves to avoid damaging the LCD.

Please do not touch electrodes with bare hands or make them dirty.



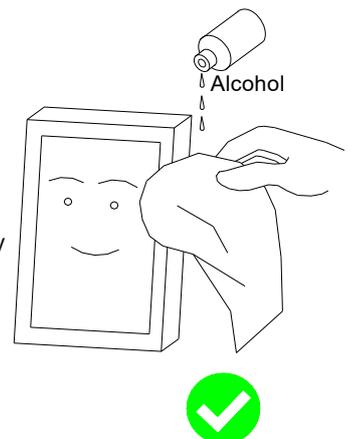
Keep Away From Extreme Heat and Humidity!

LCD deteriorates.



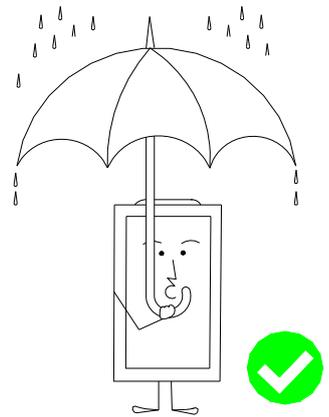
Use Alcohol to Clean Terminals!

When attaching with the heat seal or anisotropically conductive film, wipe off with alcohol before use.



Don't Drop Water on LCD!

Note that the presence of waterdrops or dew in the LCD panel may deteriorate the polarizer or corrode electrode.

**Precaution in Soldering LCD Module**

Basic instructions: Solder I/O terminals only.
Use soldering iron without leakage.

(1) Soldering condition to I/O terminals

Temperature at tip of the iron: $280 \pm 10^{\circ}\text{C}$

Soldering time: 3~4 sec.

Type of solder: Eutectic solder (containing colophony-flux)

*Please do not use flux because it may soak into LCD Module or contaminate it.

*It is preferable to peel off protective film on display surface after soldering I/O terminals is finished.

(2) Remove connector or cable

*When you remove connector or cable soldered to I/O terminals, please confirm that solder is fully melted. If you remove by force, electrodes at I/O terminals may be damaged (or stripped off).

*It is recommended to use solder suction machine.

Long-term Storage

If it is necessary to store LCD modules for a long time, please comply with the following procedures.

If storage condition is not satisfactory, display (especially polarizer) may be deteriorated or soldering I/O terminals may become difficult (some oxide is generated at I/O terminals plating).

1. Store as delivered by Optrex

2. If you store as unpacked, put in anti-static bag, seal its opening and store where it is not subjected to direct sunshine nor fluorescent lamp.

3. Store at temperature 0 to $+35^{\circ}\text{C}$ and at low humidity. Please refer to our specification sheets for storage temperature range and humidity condition.

Long-term Storage

Please use power supply with built-in surge protection circuit.