JEWEL HILL ELECTRONIC CO..LTD.

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SPECIFICATIONS FOR
LCD MODULE

Module No. JHG1202A

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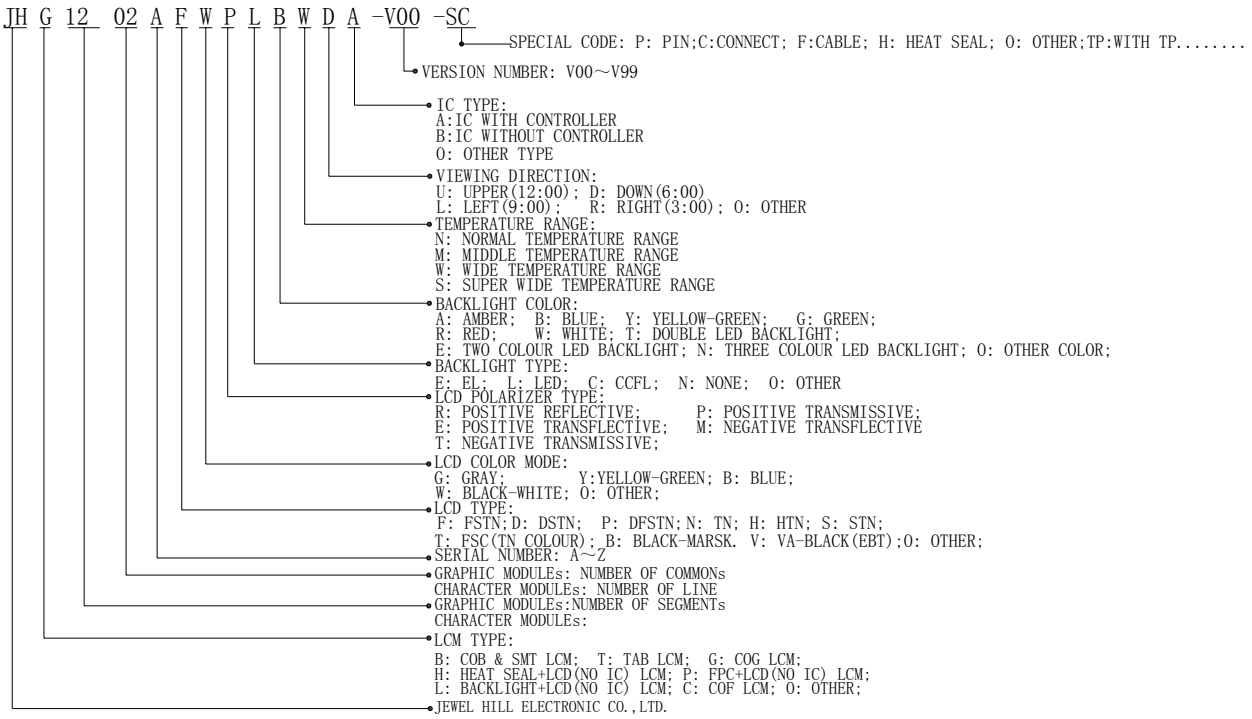
LCM Number System



1. GENERAL DESCRIPTION

The JHG1202A is a 12Char. x 2Line Character LCD module. It has a FSTN panel composed of 60 segments and 16commons. The LCM can be easily accessed by microcontroller via Serial interface.

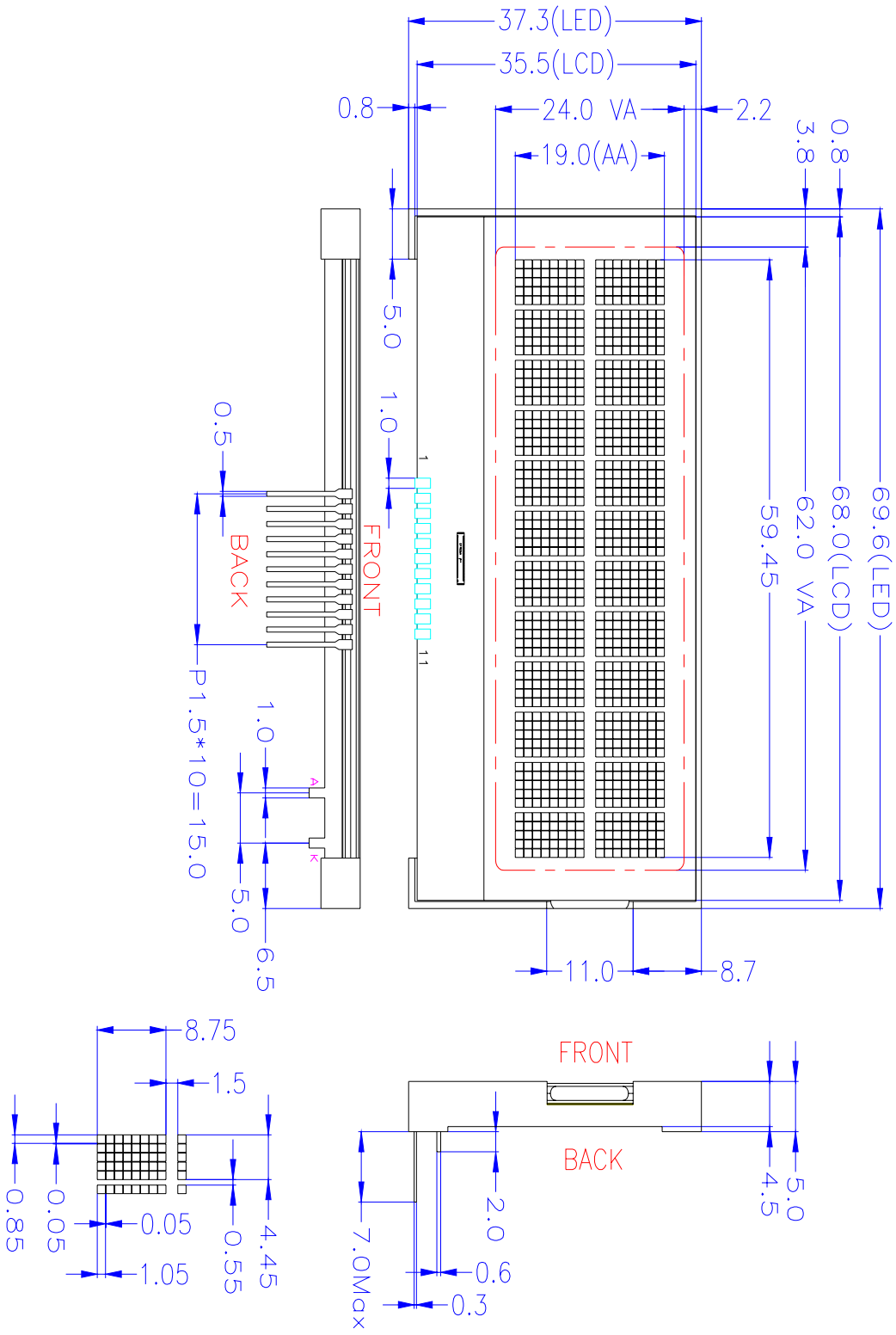
2. FEATURES

Display Mode	Transmissive and positive
	FSTN module
Display Format	12Char.x2Line(5x8Dots) Character
Input Data	4-line Serial data input from MPU
Driving Method	1/16Duty, 1/5Bias
Viewing Direction	6 O'clock
Backlight	LED / Blue

3. MECHANICAL SPECIFICATION

Item	Specifications	Unit
Dimensional outline	69.6 x 37.3 x (5.0+7.0)Max	mm
Resolution	12Char.x2Line	Character
Viewing area	62.0(W) x 24.0(H)	mm
Area area	59.45(W) x 19.0(H)	mm
Char. pitch	5.0(W) x 10.25(H)	mm
Char. Size	4.45(W) x 8.75(H)	mm
Dot pitch	0.9(W) x 1.1 (H)	mm
Dot size	0.85(W) x 1.05(H)	mm

4. MECHANICAL DIMENSION



5. MAXIMUM RATINGS

Item	Symbol	Min	Max	Unit	Note
Supply voltage	V_{DD}	-0.3	7.0	V	
LCD Driver Volage	V0-VSS	-0.3	7.0	V	
Input Voltage	V_{IN}	-0.3	V_{DD}+0.3	V	
Operating temperature	T_{OPR}	-20	+70	℃	
Storage temperature	T_{STR}	-30	+80	℃	
Humidity	---	---	90	%RH	

6. ELECTRICAL CHARACTERISTICS

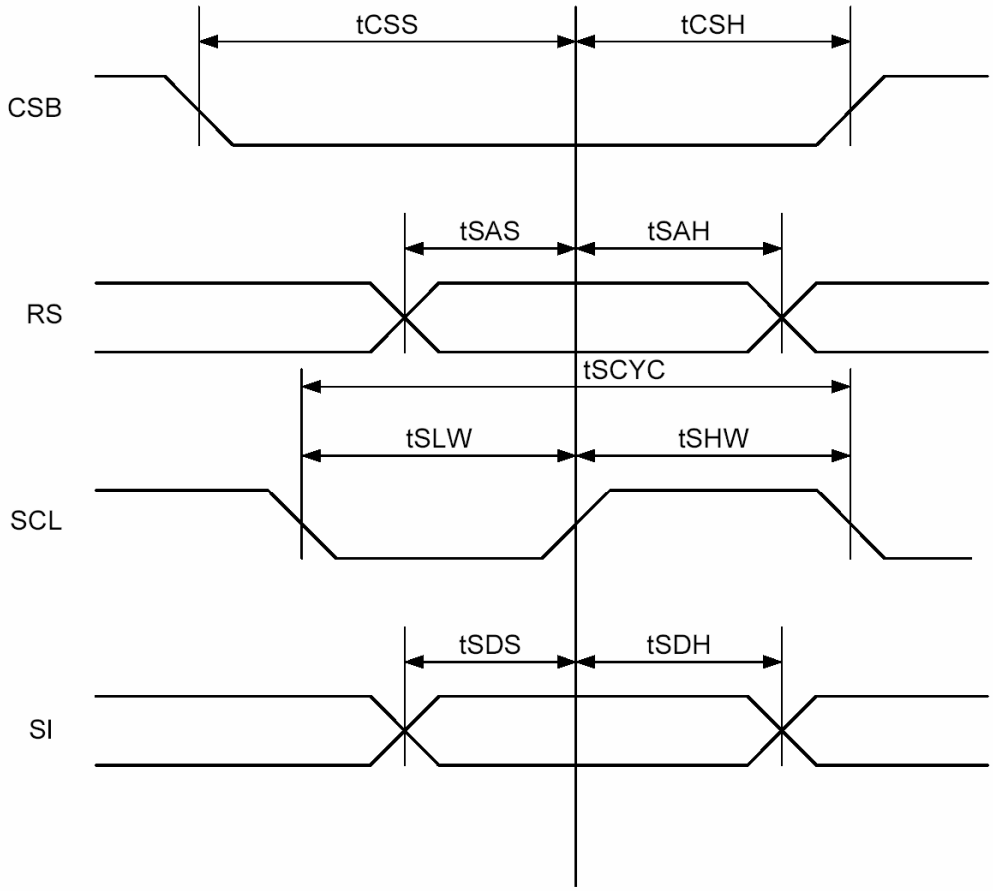
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	Logic	V_{DD}	---	-	3.0	3.3	V
Input Voltage	H level	V_{IH}	---	$0.7V_{DD}$	---	V_{DD}	V
	L level	V_{IL}		-0.3	---	$0.2V_{DD}$	
Current Consumption (Without Backlight)		I_{DD}	V_{DD}=3.0V; V_{LCD}=4.5V,T_{amb}=25℃;	---	---	1.2	mA
LCD Driving Voltage		V_{LCD}	VLCD=V0-Vss	4.2	4.5	4.8	V
Power Supply for LED		V_f	If=100mA	2.8	3.1	3.3	V
Current Consumption (With LED BackLight)		If	V_{DD}=3.0V; V_f =3.1V,T_{amb}=25℃;	---	100	120	mA

7. MODULE FUNCTION DESCRIPTION

7.1. PIN DESCRIPTION

Pin No.	Symbol	Description
1	CAP1N	For voltage booster circuit External capacitor about 0.1uF to 4.7uF
2	CAP1P	
3	VOUT	LCD driving voltage output
4	VIN	Logic low level of power supply
5	VDD	Power supply for Positive
6	VSS	Power supply for Ground
7	SDA	Serial data input/output pin
8	SCL	Serial colok input/output pin
9	CSB	Chip selection input pin
10	RS	Registers selection
11	RES	Reset pin

7.2 AC CHARACTERISTICS OF THE SERIAL BUS



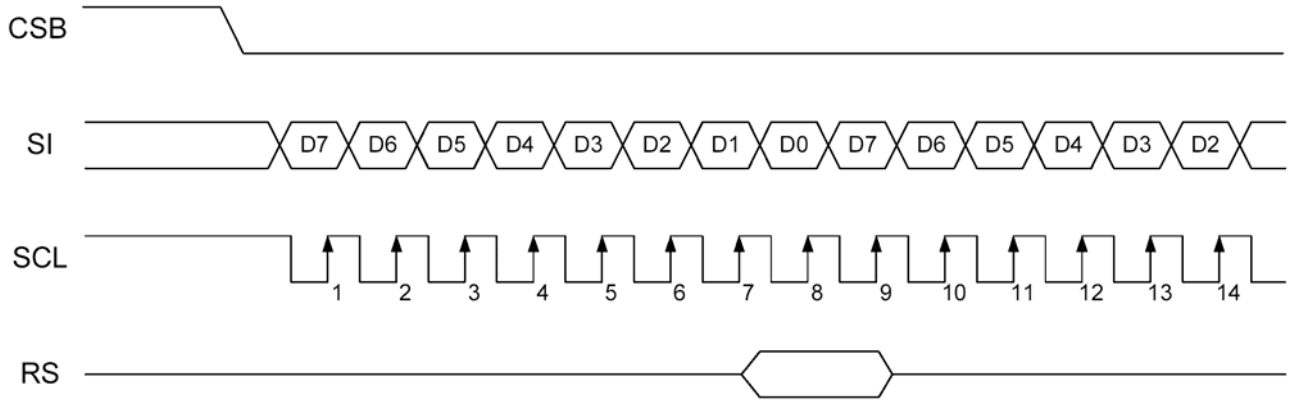
(Ta = 25°C)

Item	Signal	Symbol	Condition	VDD=2.7 to 4.5V Rating		VDD=4.5 to 5.5V Rating		Units
				Min.	Max.	Min.	Max.	
Serial Clock Period	SCL	t_{SCYC}	—	200	-	100	-	ns
SCL “H” pulse width		t_{SHW}		20	-	20	-	
SCL “L” pulse width		t_{SLW}		160	-	120	-	
Address setup time	RS	t_{SAS}	—	10	-	10	-	ns
Address hold time		t_{SAH}		250	-	150	-	
Data setup time	SI	t_{SDS}	—	10	-	10	-	ns
Data hold time		t_{SDH}		10	-	20	-	
CS-SCL time	CS	t_{CSS}	—	20	-	20	-	ns
		t_{CSH}		350	-	200	-	

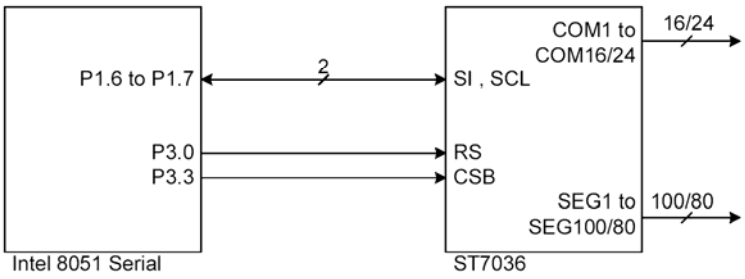
*1 All timing is specified using 20% and 80% of V_{DD} as the standard.

7.3 INTERFACING to the MPU

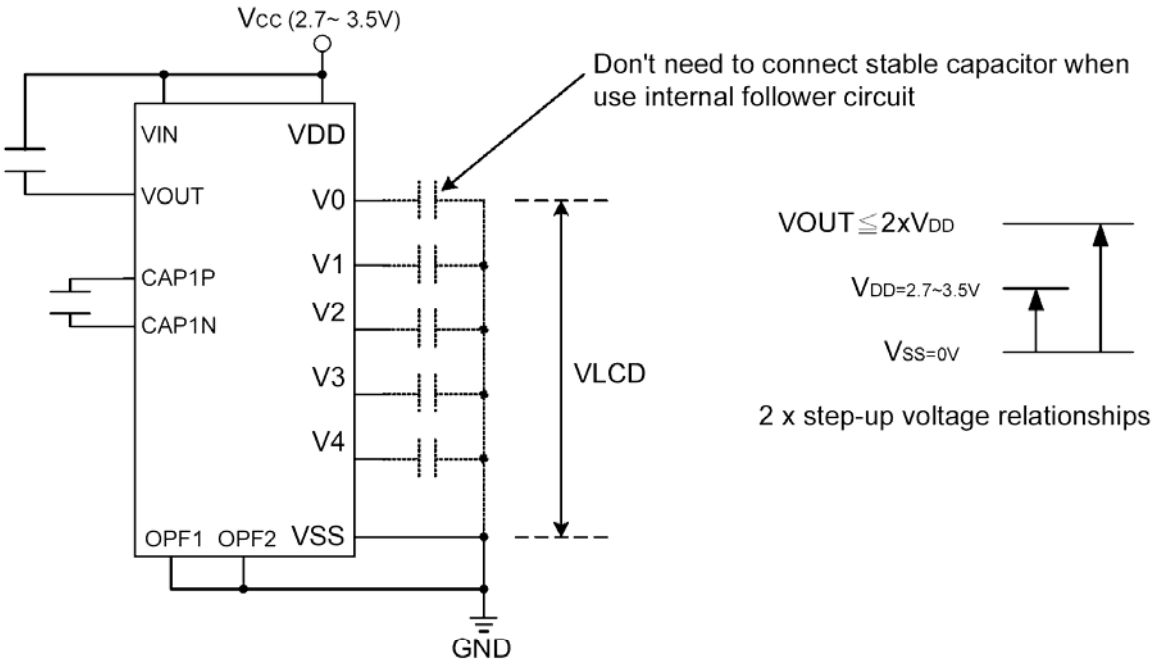
- **Example of timing sequence**



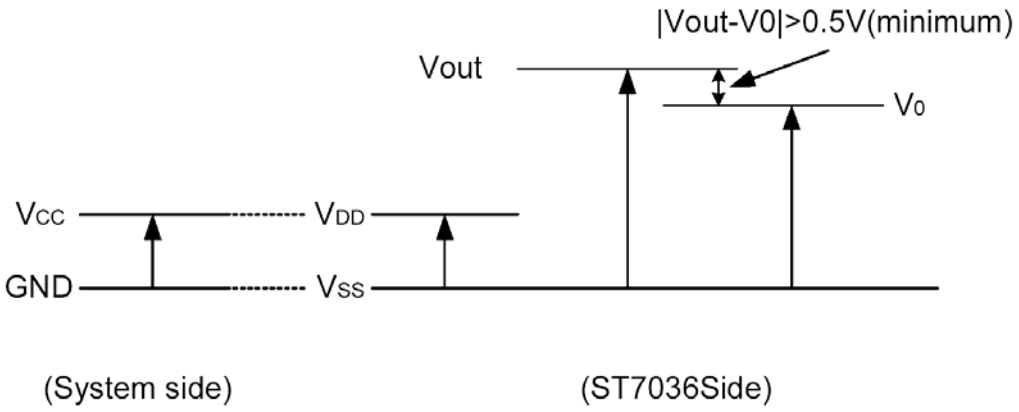
- **Intel 8051 interface (Serial 4-line)**



7.4 TABLE OF COMMAND



Note:
Ensure V0 level stable, that must let |Vout-V0| over 0.5V(if panel size over 4.5",the |Vout-V0| propose over 0.8V)



7.5 TABLE OF COMMAND

(when "EXT" option pin connect to Vss, the instruction set follow below table)

Instruction	Instruction Code										Description	Instruction Execution Time		
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		OSC= 380kHz	OSC= 540kHz	OSC= 700kHz
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.08 ms	0.76 ms	0.59 ms
Return Home	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.08 ms	0.76 ms	0.59 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	26.3 µs	18.5 µs	14.3 µs
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	26.3 µs	18.5 µs	14.3 µs
Function Set	0	0	0	0	1	DL	N	DH	IS2	IS1	DL: interface data is 8/4 bits N: number of line is 2/1 DH: double height font IS[2:1]: instruction table select	26.3 µs	18.5 µs	14.3 µs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	26.3 µs	18.5 µs	14.3 µs
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0	0	0
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM/ICONRAM)	26.3 µs	18.5 µs	14.3 µs
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM/ICONRAM)	26.3 µs	18.5 µs	14.3 µs
Instruction table 0(IS[2:1]=[0,0])														
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	X	X	S/C and R/L: Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	26.3 µs	18.5 µs	14.3 µs
Set CGRAM	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	26.3 µs	18.5 µs	14.3 µs
Instruction table 1(IS[2:1]=[0,1])														
Bias Set	0	0	0	0	0	1	BS	1	0	FX	BS=1:1/4 bias BS=0:1/5 bias FX: fixed on high in 3-line application and fixed on low in other applications.	26.3 µs	18.5 µs	14.3 µs
Set ICON Address	0	0	0	1	0	0	AC3	AC2	AC1	AC0	Set ICON address in address counter.	26.3 µs	18.5 µs	14.3 µs
Power/ICON Control/ Contrast Set	0	0	0	1	0	1	Ion	Bon	C5	C4	Ion: ICON display on/off Bon: set booster circuit on/off C5,C4: Contrast set for internal follower mode.	26.3 µs	18.5 µs	14.3 µs
Follower Control	0	0	0	1	1	0	Fon	Rab 2	Rab 1	Rab 0	Fon: set follower circuit on/off Rab2~0: select follower amplified ratio.	26.3 µs	18.5 µs	14.3 µs
Contrast Set	0	0	0	1	1	1	C3	C2	C1	C0	Contrast set for internal follower mode.	26.3 µs	18.5 µs	14.3 µs

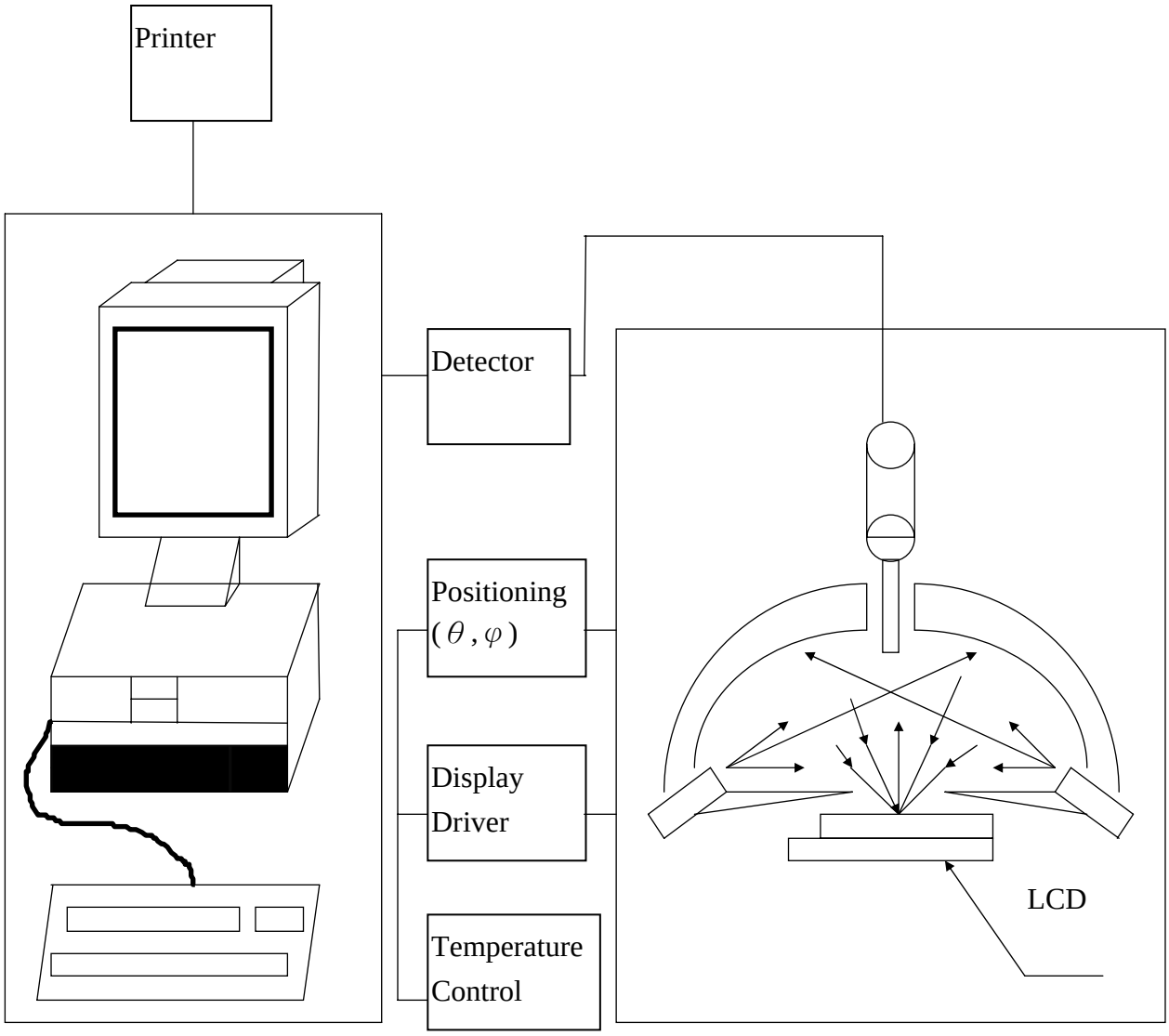
8. ELECTRO-OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Temp	Min	Typ.	Max	Units	Note
LCD driving voltage	V_{LCD}	$\theta = \phi = 0$	0℃	---	4.7	---	V	NOTE1
			25℃	4.2	4.5	4.8		
			50℃	---	4.3	---		
Response Time	Rise Time (Tr)	$\theta = \phi = 0$	0℃	---	---	--	msec	NOTE2
	Decay Time (Td)			---	----	---		
	Rise Time (Tr)		25℃	---	225	340		
	Decay Time (Td)			---	240	360		
	Rise Time (Tr)		50℃	---	---	--		
	Decay Time (Td)			---	---	--		
Contrast Ratio	Cr	$\theta = \phi = 0$	25℃	5	10	---	---	NOTE4

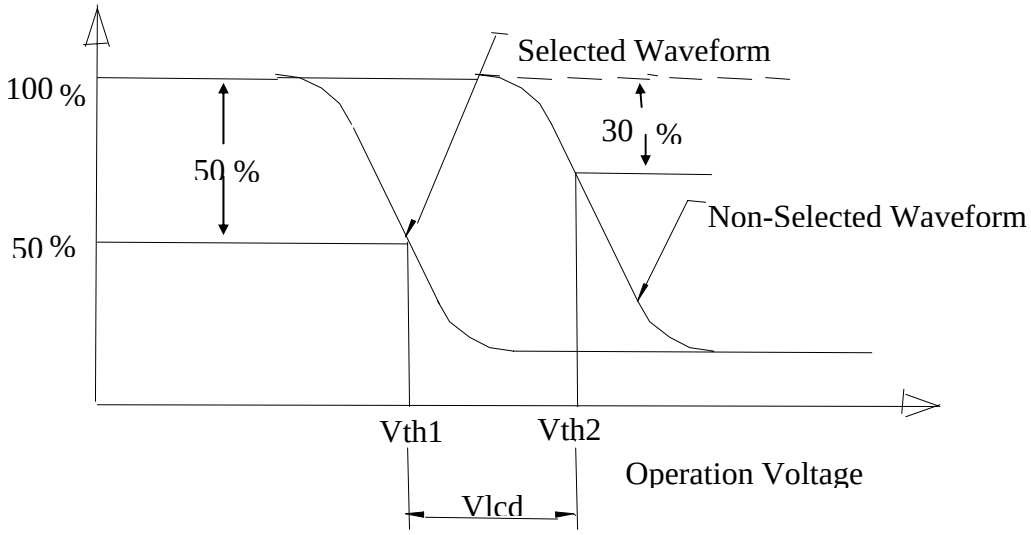
Viewing Angle Range	θ (ϕ = 0°) (6”)	ϕ = 90° (3”)	ϕ =180° (12”)	ϕ =270° (9”)	備註
θ (25℃) CR≥2	35	15	5	17	Deg NOTE3

● For panel only

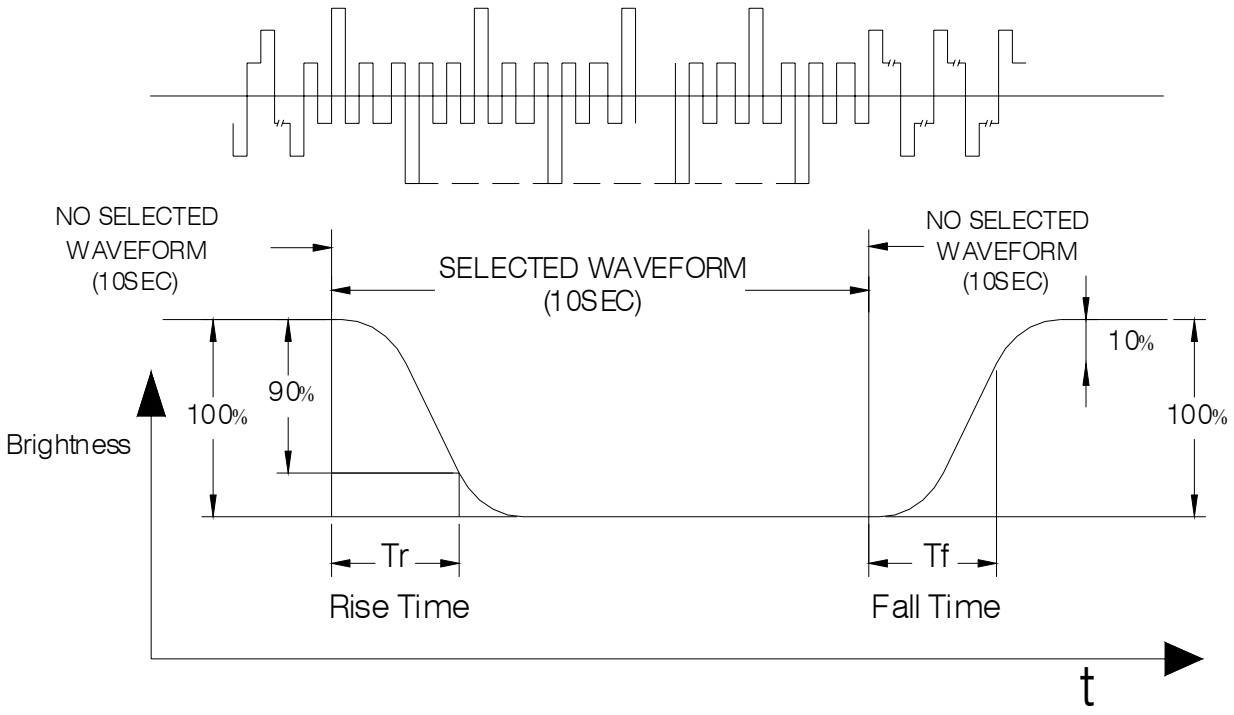
- **Electro-Optical Characteristics Measuring Equipment(DMS501)**



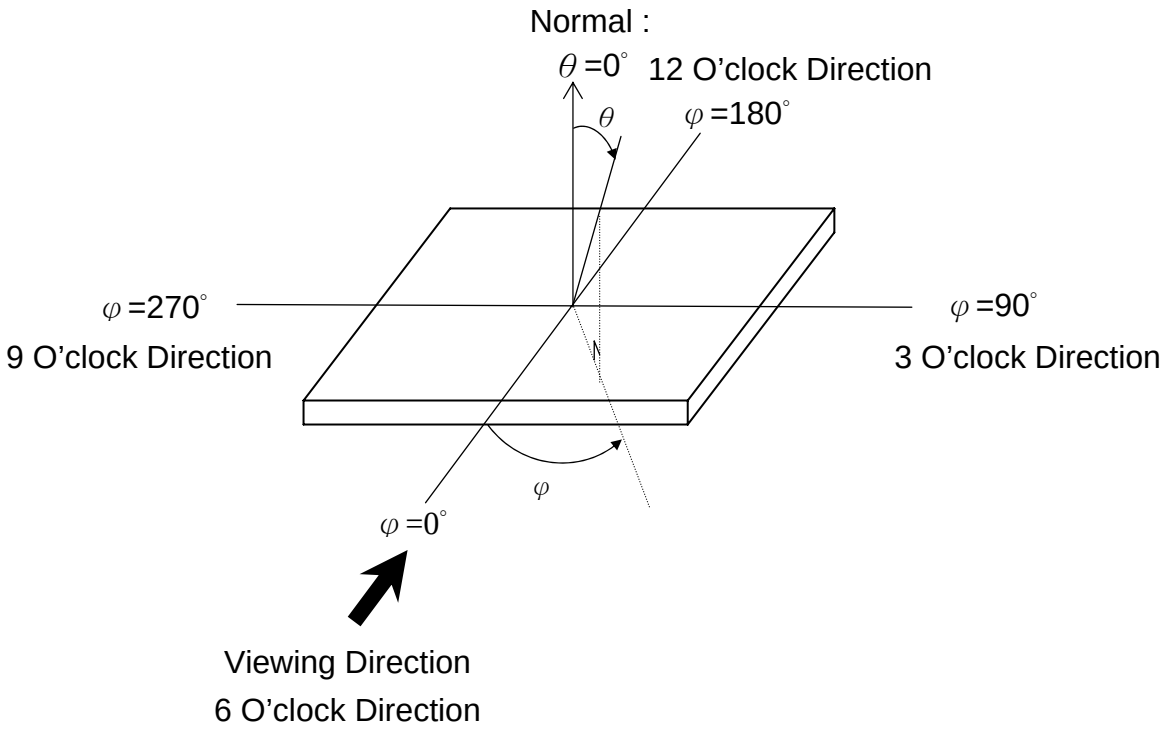
- **Note 1. Definition of Driving Voltage(Vlcd) :**



- **Note 2. Definition of Optical Response Time :**

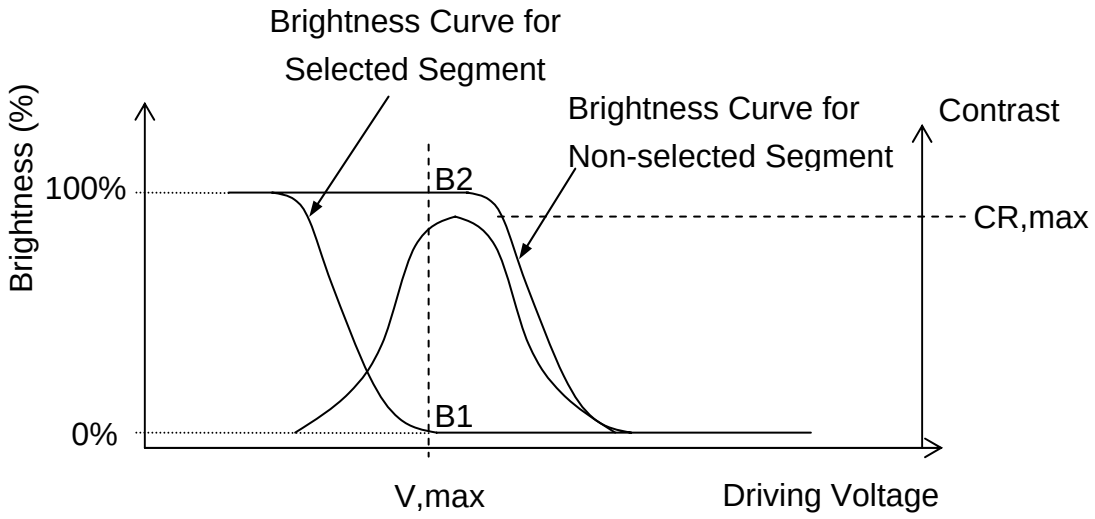


• Note 3. Definition of Viewing Angle θ and ϕ :



• Note 4. Definition of Contrast ratio(CR) :

$$CR = \frac{\text{Brightness of Non-selected Segment (B2)}}{\text{Brightness of Selected Segment (B1)}}$$



9. RELIABILITY

9.1. MTBF

The LCD module shall be designed to meet a minimum MTBF value of 30000 hours with normal. (25°C in the room without sunlight)

9.2. TESTS

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Operating	70℃ 120Hrs	◦ No Defect Of Operational Function In Room Temperature Are Allowable. ◦ IDD of LCM in Pre-and post-test should follow specification
2	Low Temperature Operating	-20℃ 120Hrs	
3	High Temperature/ Humidity Non-Operating	60℃ ,90%RH ,120 Hrs	
4	High Temperature Non-Operating	80℃ 120Hrs	
5	Low Temperature Non-Operating	-30℃ 120Hrs	
6	Temperature Cycling Non-Operating	-20℃(30Min)↔ 60℃(30Min) 10 CYCLES	

Notes: Judgments should be mode after exposure in room temperature for two hours.

10. PRECAUTIONS FOR USING LCD MODULES

10.1. HANDLING PRECAUTIONS

(1) The display panel is made of glass. Do not subject it to a mechanical shock or impact by dropping it.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

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

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten a cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

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

- Water
- Ketone
- Aromatic solvents

(7) Extra care to minimize corrosion of the electrode. Water droplets, moisture condensation or a current flow in a high-humidity environment accelerates corrosion of the electrode.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD Module, make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD Module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Be sure to ground the body when handling he LCD Module.
- Tools required for assembling, such as soldering irons, must be properly grounded.
-To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.

-The LCD Module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

10.2. STORAGE CONDITIONS

When storing, avoid the LCD module to be exposed to direct sunlight of fluorescent lamps. For stability, to keep it away form high temperature and high humidity environment (The best condition is : 23±5°C, 45±20%RH). ESD protection is necessary for long-term storage also.

10.3. OTHERS

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD Module 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 recovered by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD Module resulting from destruction caused by static electricity etc. exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.

11. Using LCD modules

11.1 LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

(1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

(2) Do not touch, push or rub the exposed polarizers with anything harder than a HB pencil lead (glass, tweezers, etc).

(3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances, which will be damaged by chemicals such as acetone, toluene, toluene, ethanol and isopropyl alcohol.

(4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum ether. Do not scrub hard to avoid damaging the display surface.

(5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

(6) Avoid contacting oil and fats.

(7) Condensation on the surface and contact with terminals due to cold will damage, stain or polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(8) Do not put or attach anything on the display area to avoid leaving marks on.

(9) Do not touch the display with bare hands. This will stain the display area and degrade insulation between terminals (some cosmetics are determinate to the polarizers).

(10)As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

11.2 INSTALLING LCD MODULE

Attend to the following items when installing the LCM.

(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.

(2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.

11.3 ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid for electrostatic discharge as for an ordinary CMOS IC.

(1) Make certain that you are grounded when handing LCM.
(2) Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
(3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
(4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
(5) As far as possible, make the electric potential of your work clothes and that of the workbenches to the ground potential.
(6) To reduce the generation of electro-static discharge, be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

11.4 PRECAUTIONS FOR OPERATION

(1) Viewing angle varies with the change of liquid crystal driving voltage (Vo). Adjust Vo to show the best contrast.
(2) Driving the LCD in the voltage above the limit will shorten its lifetime.
(3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
(4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then on.
(5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, this product must be used and stored within the specified condition of 23±5°C, 45±20%RH.
(6) When turning the power on, input each signal after the positive/negative voltage becomes stable.

11.5 SAFETY

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

12. REVISION HISTORY

Version	Revise record	Date
1.0	Original version	05-10-18
2.0	Change “LCM Number System”	09-12-09
2.01	Perfect the VER2.0spec，Commany internal modify.	13-08-01

SAMPLE APPROVED REPORT
(样品确认单)

SAMPLE MODEL NO. (样品型号)	JHG1202A
SAMPLE SERIES NUMBER NO. (样品序号)	
SAMPLE QUANTITY (样品数量)	
COLOR/TYPE (底色/类型)	FSTN/POSITIVE
VIEWING DIRECTION (视角)	6 :00
DRIVING METHOD (驱动参数)	1/16Duty, 1/5Bias
LOGIC VOLTAGE (IC 工作电压)	3.0V
LCD VOP (LCD 操作电压)	4.5 V
OPERATING TEMP. (操作温度) ℃	-20℃ TO 70℃
STORAGE TEMP. (储存温度) ℃	-30℃ TO 80℃
POLARIZER MODE (偏光片类型)	TRANSMISSIVE
CONTROLLER/DRIVER IC(控制/驱动 IC)	ST7036-0A
BACKLIGHT COLOR/TYPE (背光源类型/颜色)	LED/BLUE
DRAWING REV/NO./QUANTITY (图纸版本/数量)	
SPECIFICATION (规格书 份数)	

REMARKS:
(备注)
WRIT BY: _____ DATE: _____ APROV BY: _____ DATE: _____

CUSTOMER'S APPROVAL (客户确认):

1） FUNCTION （功能）: ☐ OK ☐ N.G.
2） DRIVER CONDITION （驱动条件）: ☐ OK ☐ N.G.
3） DISPLAY MODE （显示模式）: ☐ OK ☐ N.G.
4） VIEWING ANGLE （视角）: ☐ OK ☐ N.G.
5） BACKLIGHT （背光源）: ☐ OK ☐ N.G.
6） DISPLAYING PATTERN （显示效果）: ☐ OK ☐ N.G.

CUSTOMER'S CONCLUSIONS (客户意见): _____

_____

_____

CUSTOMER'S SIGNATURE（客户签名）: _____ DATE (日期): _____