SPECIFICATIONS   FOR
LIQUID   CRYSTAL   DISPLAY   MODULE

MODEL NO : SC2004CSWB-XA-GB-G

Customer NO:

No Version: REV.0

D.W.G Version:REV.2

CUSTOMER :

APPROVED SIGNATURE

DSGD :

CHKD : Gili Wang

APPD : Chuan-Lin Hsu

DATE : Feb.05.2024

SUNLIKE DISPLAY TECHNOLOGY CO .

11-2 , Chien-kuo Rd . , T . E . P . Z . Taiwan , R . O . C .

TEL   :   886 - 4 – 25342378

FAX   :   886 - 4 – 25327034;2531-2965

Revision Record

No.	Date	Model No.	Version	Remarks
1	Feb.05.2024	SC2004CSWB-XA-GB-G	REV.0	Spec RoHS-Compliant

Contents

Module Classification Information

S	C	2004	C	S	W	B	-	XA	-	G	B	-	G	
1	2	3	4	5	6	7		8		9	10		11	12

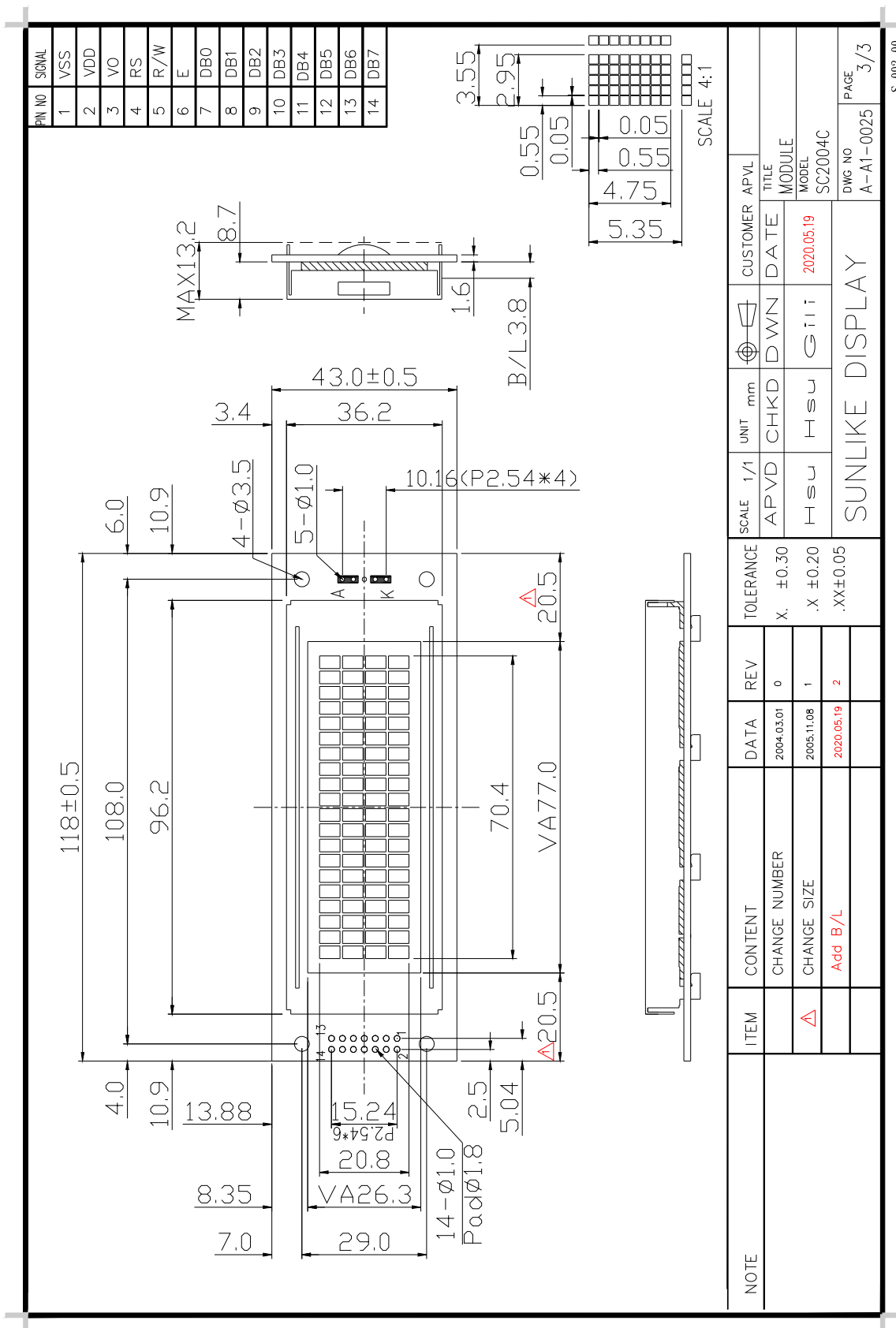|		
1	**SUNLIKE DISPLAY TECHNOLOGY CO.,**	
2	**Product type：LCD COB**	
3	**Display Type：Character 20 words * 4 lines**	
4	**Serials No.**	
5	**LCD Type：**	N → TN/ Positive / Transflective / Reflective M → TN/ Negative / Transmissive H → TN/ Positive/ Transmissive B → STN/ Blue/ Negative / Transmissive S → STN/ Gray/ Positive / Transflective / Reflective Z → STN/ Gray/ Positive/ Transmissive U → STN/ Y-G/ Positive / Transflective / Reflective T → STN/ Y-G/ Positive/ Transmissive F → FSTN/ Positive / Transflective / Reflective W → FSTN/ Negative / Transmissive K → FSTN/ Positive/ Transmissive V → VA TN/ Negative/Transmissive
6	**Backlight Type：**	L → LED / Yellow-Green G → LED / Green / Guide M → LED / Amber W → LED / White / Guide N → LED / Red F → LED / Blue / Guide O → LED / Orange * → No BackLight / Reflective
7	**LCD View direction**	B → 6:00 View T → 12:00 View
8	**LCD Controller**	XA → ENGLISH / JAPAN XB → ENGLISH/EUROPEAN XH → ENGLISH / RUSSIAN
9	**LCD Temp. Range：**	G → General Temp., 5V, Single Supply Voltage H → Wide Temp., 5V , Single Supply Voltage L → General Temp., 3.3V, Single Supply Voltage W → Wide Temp., 3.3V, Single Supply Voltage N → General Temp., Dual Supply Voltage D → Wide Temp., Dual Supply Voltage S → Super Wide Temp., Dual Supply Voltage
10	**Frame Material**	→ NO FRAME B → BLACK S → SILVER
11	**Series Number**	X → A~Z Number
12	**Series Number**	X → --- or 01~99 Number

1. Precautions in use of LCD Modules

(1) Avoid applying excessive shocks to the module or making any alterations or modifications to it.
(2) Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.
(3) Don't disassemble the LCM.
(4) Don't operate it above the absolute maximum rating.
(5) Don't drop, bend or twist LCM.
(6) Soldering: only to the I/O terminals.
(7) Storage: please storage in anti-static electricity container and clean environment.
Don't touch the elastomers connecter, especially insert a backlight panel (EL or CCFL)
(8) LCM technological conditions RoHS

2. General Specification

Item	Dimension	Unit
Dot arrangement	20 x 4 (5*7 Dots + Cursor)	Dots
Module dimension	118.0 x 43.0 x 13.2 Max	mm
View area	77.0 x 26.3	mm
Active area	70.4 x 20.8	mm
Dot size	0.55 x 0.55	mm
Dot pitch	0.60 x 0.60	mm
LCD type	STN/ Gray/ Positive / Transflective	
Duty Ratio	1/16 Duty	
View direction	6 o'clock	
Backlight Type	LED White	
Used IC	ST7066U / 8bit 6800 Parallel	

3. Mechanical Drawing & Interface

PIN NO	SIGNAL
1	VSS
2	VDD
3	VO
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7

SCALE 4:1

SUNLIKE DISPLAY

SCALE 1/1	UNIT mm		CUSTOMER	APVL
TOLERANCE	APVD	CHKD	DWN	DATE
X. ±0.30	Hsu	Hsu	Gili	2020.05.19
.X ±0.20				
.XX±0.05				

TITLE MODULE
MODEL SC2004C
DWG NO A-A1-0025
PAGE 3/3

S-092-00

ITEM	CONTENT	DATA	REV
	CHANGE NUMBER	2004.03.01	0
⚠	CHANGE SIZE	2005.11.08	1
	Add B/L	2020.05.19	2

NOTE

3.1 Interface Pin Description

Pin No.	Pin Out	Level	Description
1	V_{SS}	0V	Power Supply Ground
2	V_{DD}	5.0V	Power Supply Voltage
3	Vo	---	Contrast Adj
4	RS	H/L	Register Select
5	R/W	H/L	Read / Write
6	E	H,H→L	Enable Signal
7	DB0	H/L	Data Bit 0
8	DB1	H/L	Data Bit 1
9	DB2	H/L	Data Bit 2
10	DB3	H/L	Data Bit 3
11	DB4	H/L	Data Bit 4
12	DB5	H/L	Data Bit 5
13	DB6	H/L	Data Bit 6
14	DB7	H/L	Data Bit 7

4. Absolute Maximum Ratings

4.1 Electrical Absolute Ratings

Item	Symbol	Min.	Max.	Unit	Note
Supply Voltage for Logic	V_{DD}-V_{SS}	-0.3	7.0	Volt	
Supply Voltage for LCD	V_{DD}-V_O	-0.3	10.0	Volt	
Input Voltage	V_I	-0.3	V_{DD}	Volt	
B/L Power Dissipation	P_{AD}	-	170	mW	
B/L Forward current	I_{AF}	-	50	mA	
B/L Reverse Voltage	V_R	-	5	V	

4.2 Environmental Absolute Maximum Ratings

Item	Normal Temperature			
	Operating		Storage	
	Min,	Max.	Min,	Max.
Ambient Temperature	0℃	+50℃	-20℃	+70℃
Humidity (without condensation)	Note 4,5		Note 4,6	

Note 2: Ta≦50℃: 80% RH max

   Ta>50℃: Absolute humidity must be lower than the humidity of 85%RH at 50℃

Note 3: Ta at -20℃ will be<48hrs at 70℃ will be <120hrs when humidity is higher than 70%.

Note 4: Background color changes slightly depending on ambient temperature. This phenomenon is
   reversible.

Note 5: Ta≦70℃: 75RH max

   Ta>70℃: absolute humidity must be lower than the humidity of 75%RH at 70℃

Note 6: Ta at -30℃ will be <48hrs, at 80 ℃ will be <120hrs when humidity is higher than 70%.

5. Electrical Characteristics

5.1 DC Characteristics for logic and LCD   Ta=25℃,VSS=0V

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage for Logic	V_{DD}-V_{SS}	-	4.5	5.0	5.5	Volt
Input High Voltage	V_{IH}	H level	$0.7V_{DD}$	-	V_{DD}	Volt
Input Low Voltage	V_{IL}	L level	-0.3	-	0.6	Volt
Output High Voltage	V_{OH}	H level	$0.7V_{DD}$	-	V_{DD}	Volt
Output Low Voltage	V_{OL}	L level	-	-	$0.2V_{DD}$	Volt
LCM Recommend LCD Module Driving Voltage	$V_{DD}-V_O$	Ta＝0℃	4.2	4.3	4.7	Volt
		Ta＝25℃	3.8	4.1	4.5	
		Ta＝50℃	3.7	4.0	4.4	
Power Supply Current for LCM	I_{DD}	V_{DD} = 5.0V V_O = 4.1V	-	2.0	4.0	mA

5.2 DC Characteristics for Backlight (B/L)   Ta=25℃

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
LED Forward Voltage	V_F	I_F = 40 mA	3.0	3.2	3.4	Volt
LED Forward Current	I_F	-	-	40	-	mA
The Brightness Of Backlight	L	I_F = 40 mA	300	350	-	cd/m^2
Chromaticity Coordinate	X / Y	-	X=0.29 Y=0.30	X=0.31 Y=0.32	X=0.33 Y=0.34	

6. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	note
Viewing Angle Range	$\Theta 2 - \Theta 1$	CR$\geqq$2.0 Ta=25℃	25	80	-	deg.	1,2
	ϕ		25	60	-	deg.	
Contrast Ratio	CR	Ta=25℃	2.0	3.0	-	-	3
Response Time(rise)	Tr	Ta=25℃	-	90	250	ms	4
Response Time(fall)	Tf	Ta=25℃	-	120	250	ms	4
Brightness for LCM	B	Ta=25℃	-	TBD	-	cd/m^2	5

Note 1: Definition of angle θ and Φ **Note 2:** Definition of viewing angle θ
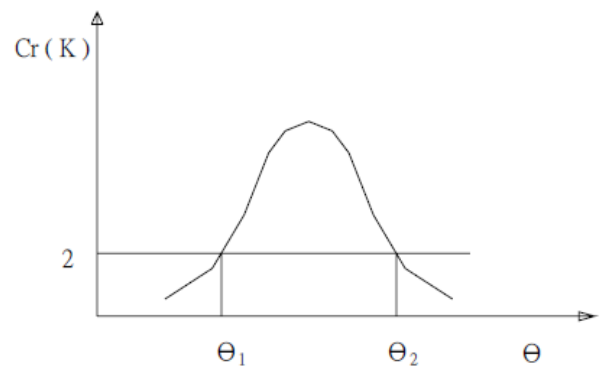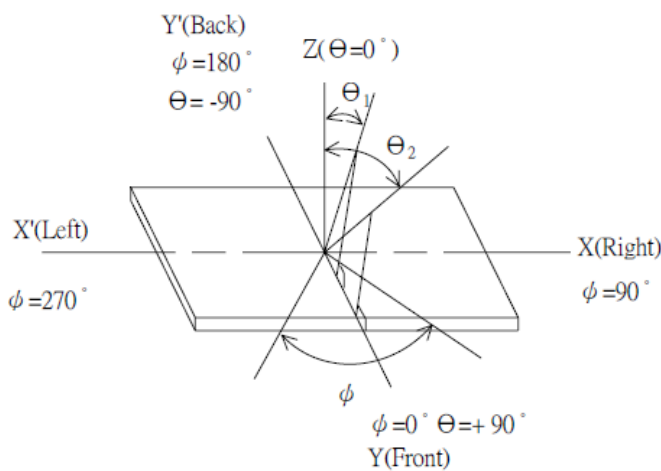
Note 3: Definition of contrast CR

[positive type]   [Negative type]

10
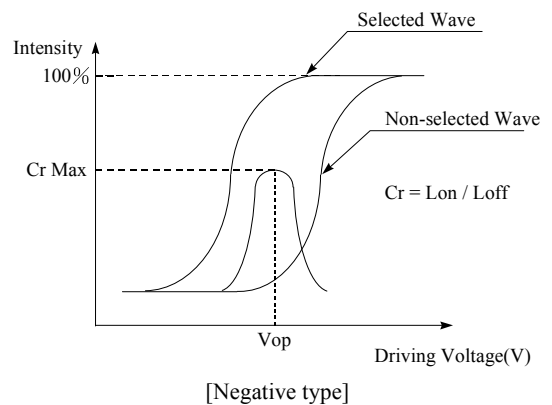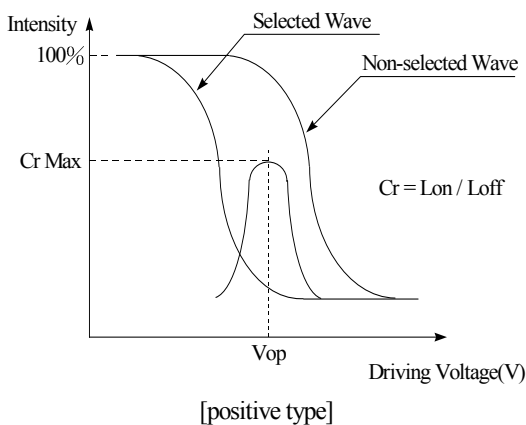
Note 4: Definition of Response Time (Tr, Tf)

[positive type]

[Negative type]
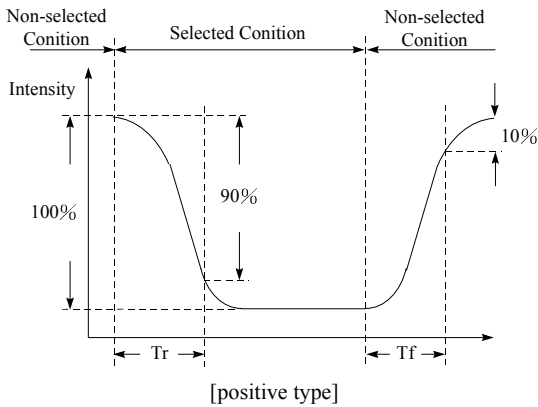
Conditions: Operating Voltage : Vop
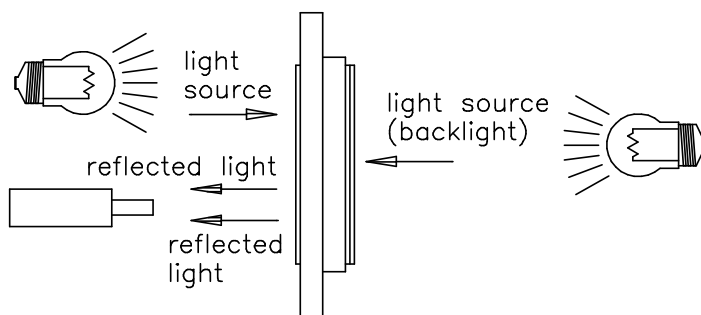**Frequency : 64 Hz**
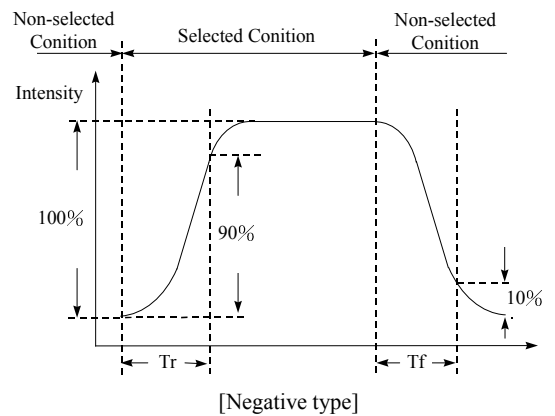
Viewing Angle(θ, φ): 0° , 0°Frame
Driving Wave form : 1/N duty, 1/a bias

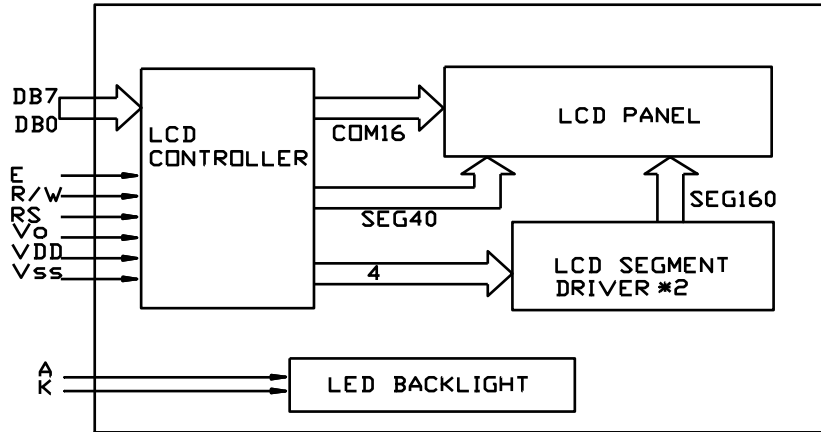**Note 5:** Description of Measuring Equipment
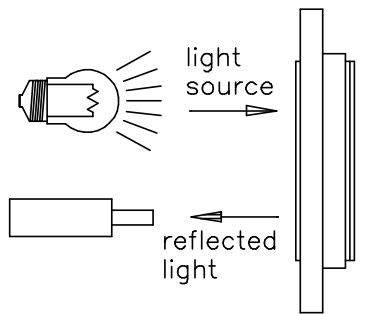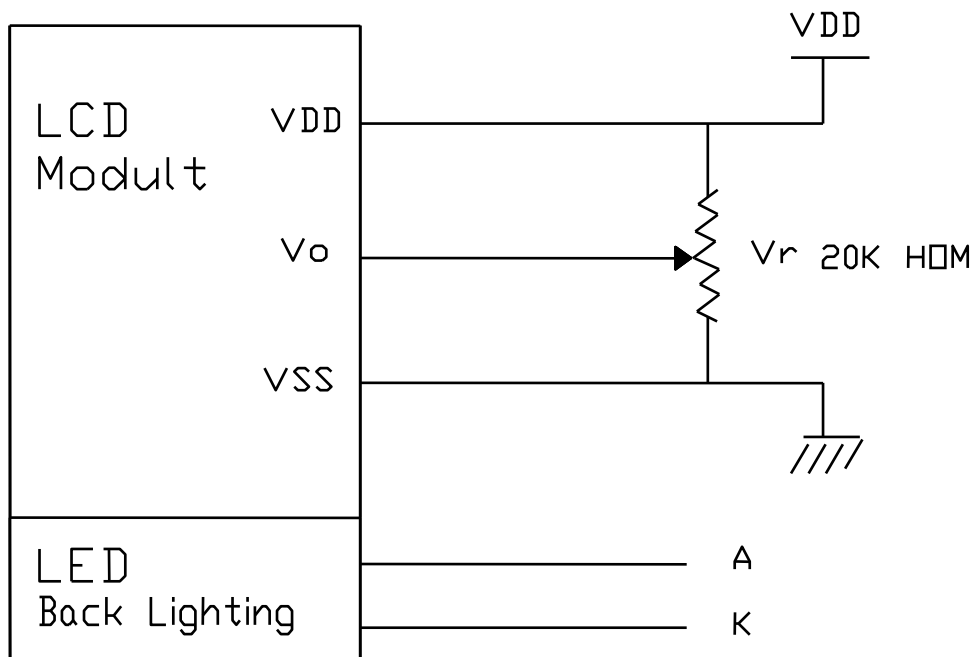

Reflective type

Transflective type
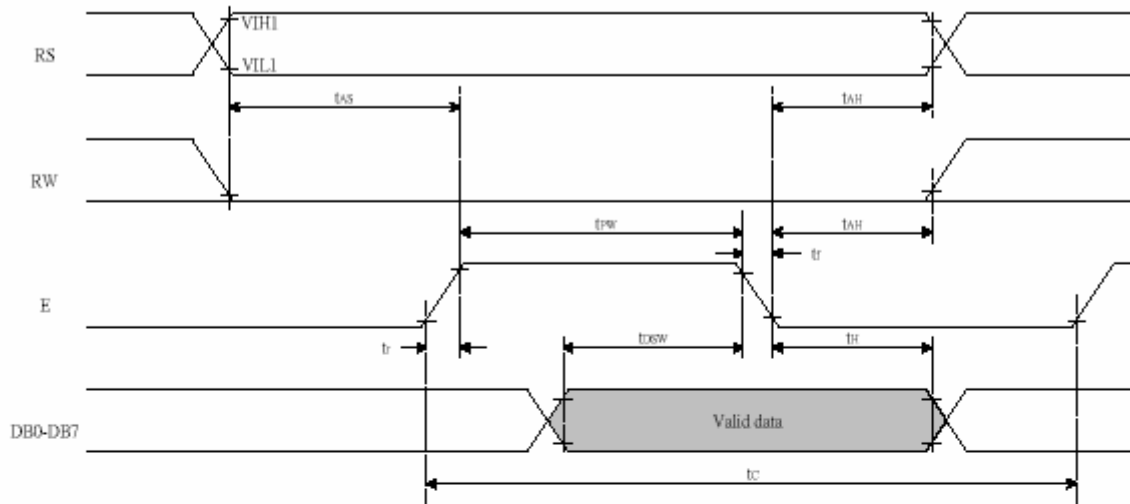
7. Block Diagram

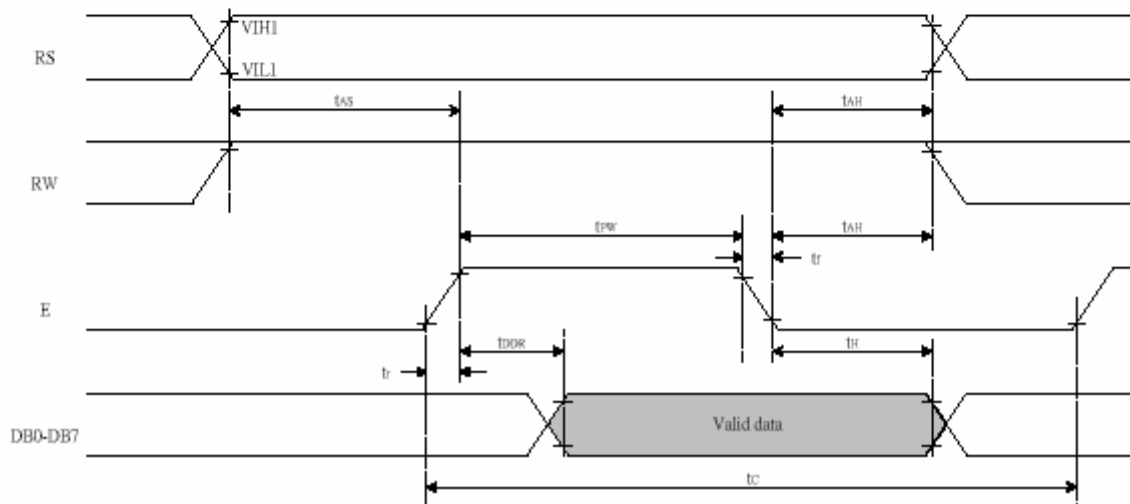## 8. Power Supply for LCM

9. Read/Write Timing Chart

● Writing data from MPU to ST7066U

● Reading data from ST7066U to MPU

10. AC Characteristics

(TA = 25℃, VCC = 5V)

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
Internal Clock Operation						
f_{OSC}	OSC Frequency	R = 91KΩ	190	270	350	KHz
External Clock Operation						
f_{EX}	External Frequency	-	125	270	410	KHz
	Duty Cycle	-	45	50	55	%
T_R, T_F	Rise/Fall Time	-	-	-	0.2	μs
Write Mode (Writing data from MPU to ST7066U)						
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	0	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
T_{DSW}	Data Setup Time	Pins: DB0 - DB7	40	-	-	ns
T_H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns
Read Mode (Reading Data from ST7066U to MPU)						
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	0	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
T_{DDR}	Data Setup Time	Pins: DB0 - DB7	-	-	100	ns
T_H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns

11. Instructions

Instruction Table:

Instruction	Instruction Code										Description	Description Time (270KHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.52 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.	1.52 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.	37 us
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	37 us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	37 us
Function Set	0	0	0	0	1	DL	N	F	x	x	DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	37 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	37 us
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 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM)	37 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	37 us

Note:
Be sure the ST7066U is not in the busy state (BF = 0) before sending an instruction from the MPU to the ST7066U. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to Instruction Table for the list of each instruction execution time.

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12. DD RAM Addressing

For 20*4 Display

	1	2	3	4	5	6	7	8	9	10	---	---	17	18	19	20
Character DD RAM Address	00	01	02	03	04	05	06	07	08	09	---	---	10	11	12	13
	40	41	42	43	44	45	46	47	48	49	---	---	50	51	52	53
	14	15	16	17	18	19	1A	1B	1C	1D	---	---	24	25	26	27
	54	55	56	57	58	59	5A	5B	5C	5D	---	---	64	65	66	67

13. Reset Function

Initializing by Internal Reset Circuit

An internal reset circuit automatically initializes the ST7066U when the power is turned on. The following instructions are executed during the initialization. The busy flag (BF) is kept in the busy state until the initialization ends (BF = 1). The busy state lasts for 40 ms after VCC rises to 4.5 V.
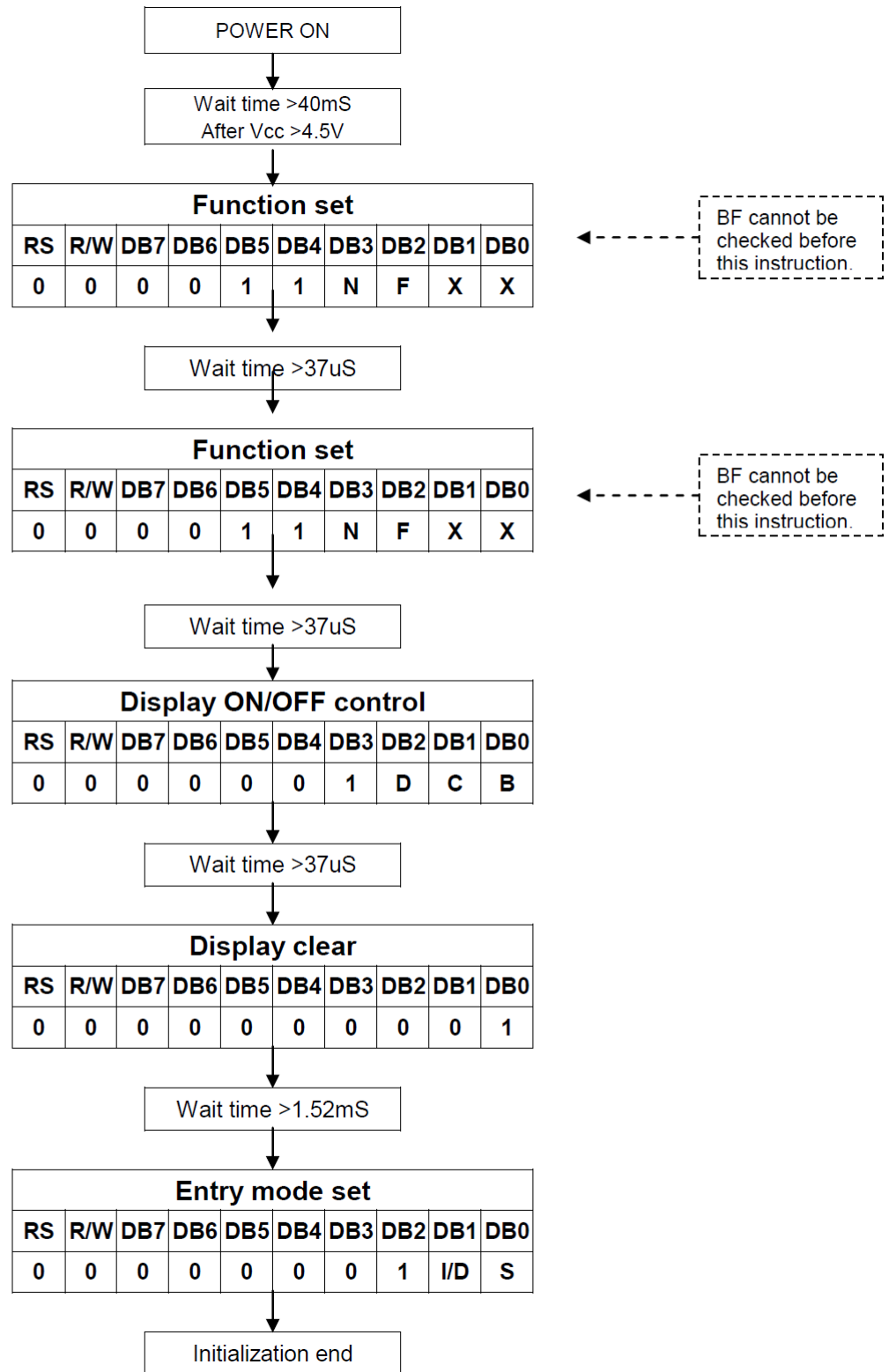
1. Display clear
2. Function set:

   DL = 1; 8-bit interface data

   N = 0; 1-line display

   F = 0; 5x8 dot character font
3. Display on/off control:

   D = 0; Display off

   C = 0; Cursor off

   B = 0; Blinking off
4. Entry mode set:

   I/D = 1; Increment by 1

   S = 0; No shift

Note:
If the electrical characteristics conditions listed in the table Power Supply Conditions (Page 31) are not met, the internal reset circuit will not operate normally and will fail to initialize the ST7066U. For such a case, initialization must be performed by the MPU as explain by the following figures.

14. Initializing by Instruction

- **8-bit Interface (fosc=270KHz)**

POWER ON

↓

Wait time >40mS
After Vcc >4.5V

↓

Function set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	N	F	X	X

← BF cannot be checked before this instruction.

↓

Wait time >37uS

↓

Function set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	N	F	X	X

← BF cannot be checked before this instruction.

↓

Wait time >37uS

↓

Display ON/OFF control

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	1	D	C	B

↓

Wait time >37uS

↓

Display clear

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	0	1

↓

Wait time >1.52mS

↓

Entry mode set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	1	I/D	S

↓

Initialization end

15. CG RAM Mapping

Character Code (DDRAM Data)								CGRAM Address						Character Patterns (CGRAM Data)							
b7	b6	b5	b4	b3	b2	b1	b0	b5	b4	b3	b2	b1	b0	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	-	0	0	0	0	0	0	0	0	0	-	-	-	1	1	1	1	1
					0	0	0				0	0	1				0	0	1	0	0
					0	0	0				0	1	0				0	0	1	0	0
					0	0	0				0	1	1				0	0	1	0	0
					0	0	0				1	0	0				0	0	1	0	0
					0	0	0				1	0	1				0	0	1	0	0
					0	0	0				1	1	0				0	0	1	0	0
					0	0	0				1	1	1				0	0	0	0	0
0	0	0	0	-	0	0	1	0	0	1	0	0	0	-	-	-	1	1	1	1	0
					0	0	1				0	0	1				1	0	0	0	1
					0	0	1				0	1	0				1	0	0	0	1
					0	0	1				0	1	1				1	1	1	1	0
					0	0	1				1	0	0				1	0	1	0	0
					0	0	1				1	0	1				1	0	0	1	0
					0	0	1				1	1	0				1	0	0	0	1
					0	0	1				1	1	1				0	0	0	0	0

Table 5 Relationship between CGRAM Addresses, Character Codes (DDRAM) and Character patterns (CGRAM Data)

Notes:
1. Character code bits 0 to 2 correspond to CGRAM address bits 3 to 5 (3 bits: 8 types).
2. CGRAM address bits 0 to 2 designate the character pattern line position. The 8th line is the cursor position and its display is formed by a logical OR with the cursor. Maintain the 8th line data, corresponding to the cursor display position, at 0 as the cursor display. If the 8th line data is 1, 1 bits will light up the 8th line regardless of the cursor presence.
3. Character pattern row positions correspond to CGRAM data bits 0 to 4 (bit 4 being at the left).
4. As shown Table 5, CGRAM character patterns are selected when character code bits 4 to 7 are all 0. However, since character code bit 3 has no effect, the R display example above can be selected by either character code 00H or 08H.
5. 1 for CGRAM data corresponds to display selection and 0 to non-selection.
"-": Indicates no effect.

SUNLIKE DISPLAY   Model No : SC2004C

16. Character Font Table

NO.7066-0A

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17. Reliability

The LCD module shall have no failure in the following reliability test. However the following
Test of a different item doesn't do by means of the same LCD module.

Test Item	Test Conditions	Note
High temperature operation	50±3℃，t =120hrs	2
Low temperature operation	0±3℃，t =120hrs	2
High Temperature storage	70±3℃，t =120hrs	1 , 2
Low Temperature storage	-20±3℃，t =120hrs	1 , 2
Temperature Cycle	-20℃ ～ 25℃ ～ 70℃ 30min. 5min. 30min. (1 cycle) Total 10 cycle	1 , 2
Humidity Test	40℃, Humidity 90% , 96 hrs	1 , 2
Vibration Test	Sweep frequency ： 10～55 , 1.5mmp-p Test direction ： X.Y.Z/3 axis Duration ： 60min/each axis	2
ESD Testing	Contract Discharge Voltage: +1～5kV and −1～−5kV	3
	Air Discharge Voltage: +1～8kV and −1～-8kV	

Note l. The module should not have condensation of water on it.
Note 2. The module should be inspected after 4-hour storage under normal
　　　　Conditions (15℃ to 35℃ , 45% to 65% RH)
Note 3. There will be discharged ten times at every discharging voltage cycle.
　　　Energy Storage Capacitance(Cs+Cd) : 150pF±10%
　　　Discharge Resistance(Rd) : 330Ω±10%
　　　The voltage gap is 1kV.

Definitions of life end point
(1) Current consumption is more than specified value.
(2) Function of the module is not maintained.
(3) There is visible degradation of appearance and display quality.
(4) Contrast ratio is less than 50% of specified minimum value.
(5) Brightness is less than 50% of specified minimum value.
Life Time:　LCD Module　50,000hr (type)
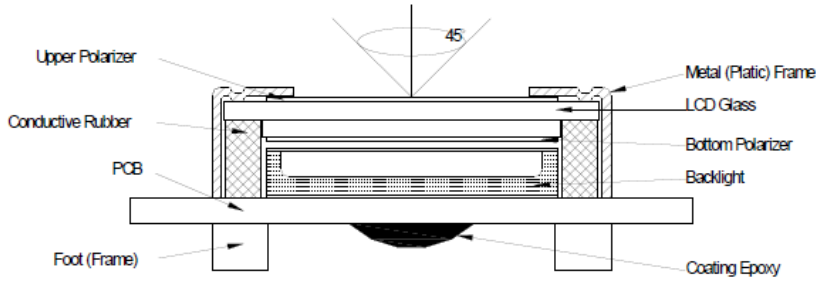　　　　　　　LED Backlight 20,000hr (type)
　　　　　　　Conditions : Ta=25℃ , Humidity=65±20% RH

18. Quality

TEST CONDITIONS

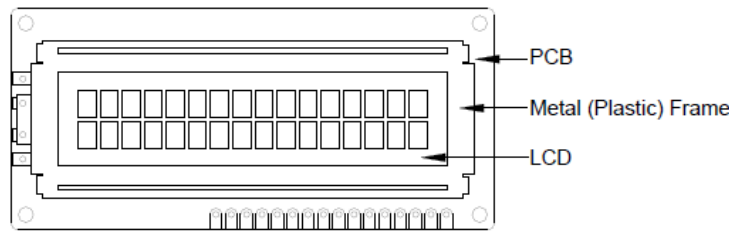8 - 1. LCM Appearance and Electric inspection Condition

1. Inspection will be done by placing LCM 30cm away from inspector's eyeballs under normal illumination.
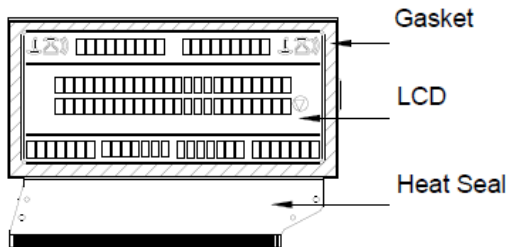

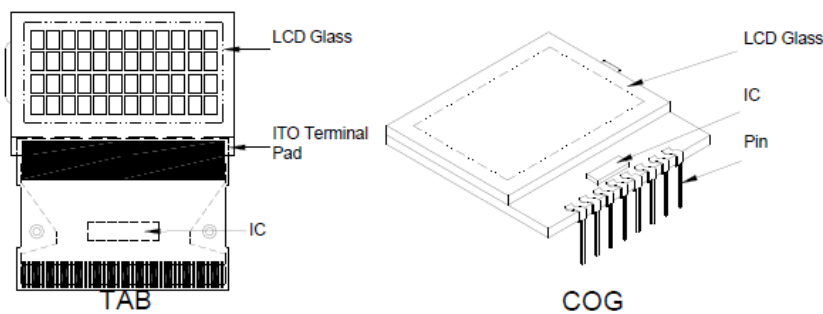2. View Angle: with in 45° around perpendicular line.

8 - 2. Definition

1. COB

2. Heat Seal

3. TAB and COG

QUALITY SPECIFICATIONS (Continued)

8-3. Sampling Plan and Acceptance

1. Sampling Plan

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

2. Acceptance

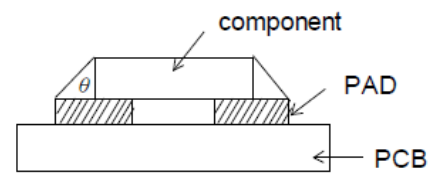|	
Major defect:	AQL = 0.25
Minor defect:	AQL = 0.65
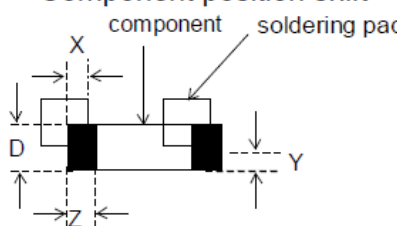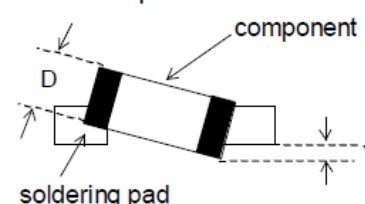
8-4. Criteria

1. 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

2. SMT

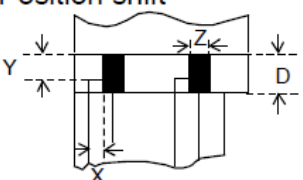| Defect	Inspection Item	Inspection Standards	
Minor	Component marking not readable		Reject
Minor	Component height	Exceed the dimension Of drawing	Reject
Major	Component solder defect (missing, extra, wrong component or wrong orientation		Reject
Minor	Component position shift	$X < 3/4Z$ $Y > 1/3D$	Reject Reject
Minor	Component tilt	$Y > 1/3D$	Reject
Minor	Insufficient solder	$\theta \leq 20°$	Reject

QUALITY SECIFICATIONS (Continued)

8-4. Criteria (Continued)

3. 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≤w<0.25mm	L≤5.0mm	5
		0.25mm≤w<0.4mm	L≤5.0mm	3
		w≥0.4mm	Any	0
		Note: 1. Above criteria applicable to scratch lines with distance greater than 5mm. 2. Scratch on the side face of frame (not visible) can be ignored.		
Minor	Frame Dent, Prick $\Phi = \dfrac{L + W}{2}$			Acceptable of Dents / Pricks
		$\Phi \leq 1.0mm$		5
		$1.0 < \Phi \leq 1.5mm$		3
		$1.5mm > \Phi$		0
		Note: 1. Above criteria applicable to any two dents / pricks with distance greater than 5mm 2. Dent / prick on the side face of frame (not visible) can be ignored		
Minor	Frame Deformation	Exceed the dimension of drawing		
Minor	Metal Frame Oxidation	Any rust		

4. Flexible Film Connector (FFC)

Defect	Inspection Item		Inspection Standards	
Minor	Tilted soldering		Within the angle ±3°	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
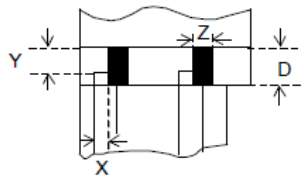
QUALITY SPECIFICATIONS (Continued)

8-4. Criteria (Continued)

5. 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

6. 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

7. LED Backing Protective Film and Others

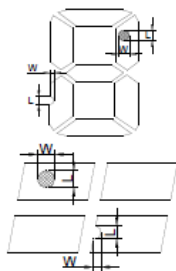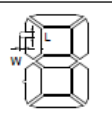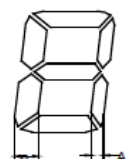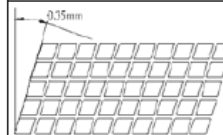| Defect	Inspection Item	Inspection Standards	
Minor	LED dirty, prick	Acceptable number of units	
		$\Phi \leq 0.10mm$	Ignore
		$0.10 < \Phi \leq 0.15mm$	2
		$0.15 < \Phi \leq 0.25mm$	1
		$\Phi > 0.25mm$	0
		The distance between any two spots should be $\geq 10mm$ Any spot/dot/void outside of viewing area is acceptable	
Minor	Protective film tilt	Not fully cover LCD	Reject
Major	COG coating	Not fully cover ITO circuit	Reject

8. Electric Inspection

Defect	Inspection Item	Inspection Standards	
Major	Short		Reject
Major	Open		Reject

QUALITY SPECIFICATIONS (Continued)

8-4. Criteria (Continued)

  8. 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≤0.07	W>0.07
			L	L<5	L<5	Any
			ACC. NO.	3	1	Reject
			Note	L is the length and W is the width of the defect		

Defect	Inspect Item		Inspection Standards				
Minor	Black Spot and Polarizer Pricked	* Foreign material between glass and polarizer or glass and glass * Polarizer hole or protuberance by external force	Φ	Φ≤0.1	0.1<Φ≤0.20	0.20<Φ≤0.25	Φ>0.25
			ACC. NO.	3EA /1PC	2	1	0
			Note	Φ is the average diameter of the defect. Distance between two defects > 10mm.			

Defect	Inspect Item		Inspection Standards				
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	Φ≤0.1	0.1<Φ≤0.25	0.25<Φ≤0.5	Φ>0.5
			ACC. NO.	3EA / 1PC	2	1	0
			Note	Φ is the average diameter of the defect. Distance between two defects > 10mm.			

Defect	Inspect Item		Inspection Standards		
Minor	Segment Defect		Φ	Φ≤0.10	0.10<Φ≤0.25 Φ>0.25
			ACC. NO.	3EA /1PC	2 0
			Note	W is more than 1/2 segment width Reject	
				$\Phi = \dfrac{L + W}{2}$ Distance between two defect is 10mm	

Defect	Inspect Item		Inspection Standards		
Minor	Protuberant Segment	 Φ = (L + W) / 2	Φ	Φ≤0.10	0.10<Φ≤0.25 Φ>0.25
			W	Glue	W≤1/2 Seg , W≤0.2 Ignore
			ACC. NO.	3EA /1PC	2 0

Defect	Inspect Item		Inspection Standards			
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

Defect	Inspect Item		Inspection Standards
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 above items: "Black spot" and "White Spot"

19. Handling Precaution

1. Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizes which 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 (recommended below) and Wipe lightly.

-Isopropyl alcohol

-Ethyl alcohol

-Trichlorotriflorothane

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

Do not use the following solvent：

-Water

-Kettle

-Aromatics

3. Caution against static charge

The LCD Module use C-MOSLSI drivers, so we recommend end that you connect any unused input terminal to VDD or VSS, do not input any signals before power is 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 in tense shock and falls from a height.

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

5. Caution for operation

It is indispensable to drive LCD's with in 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.

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 dark color 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 40 ℃, 50%RH or less is required.

6. Storage

In the case of storing for a long period of time (for instance. For years) for the purpose 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 recommended to store them as they have been contained in the inner container at the time of delivery)
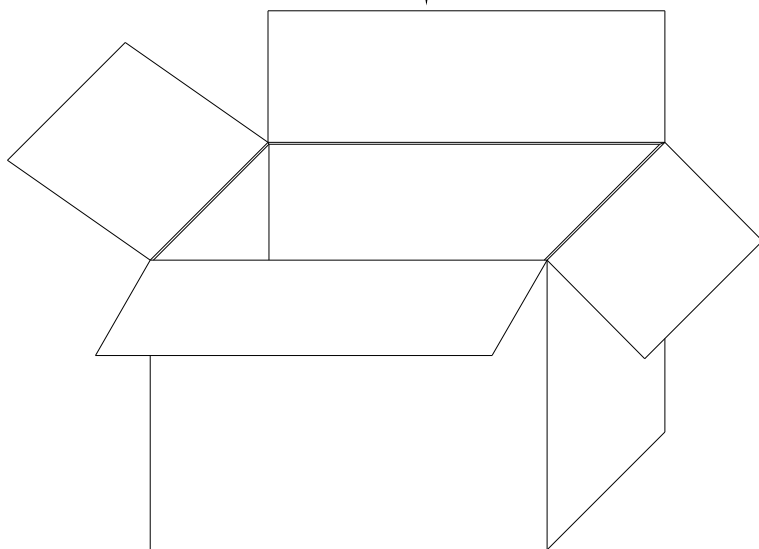

7. Safety

It is recommendable to crash damaged or unnecessary LCD into pieces and wash off 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 with your hands, please wash it off well with soap and water.

20. Packing Method
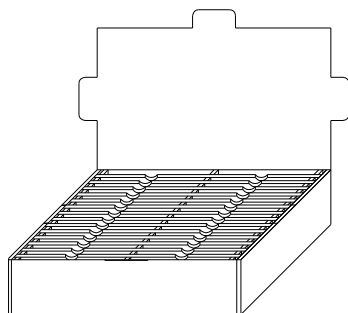
30 pcs/box

8 box/ctn

240 pcs/ctn

Ctn size :54.5*35.0*24.5(cm)