RAYSTAR

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RX12864A1-BIW

SPECIFICATION

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

ISSUED DATE:

Contents

1. Revision History

DATE	VERSION	REVISED PAGE NO.	Note
2012/4/12	1		First issue
2012/09/20	2	17	Modify note3

2. General Specification

The Features is described as follow:

- Module dimension: 60.1x 44.5 x5.01 (max.) mm^3

- View area: 54.6 x 32.0 mm^2

- Active area: 49.89 x27.49 mm^2

- Number of dots: 128 x 64

- Dot size: 0.36 x0.4 mm^2

- Dot pitch: 0.39 x 0.43 mm^2

- LCD type: STN Negative, Blue   Transmissive

- Duty: 1/65 , 1/9 Bias

- View direction: 6 o'clock

- Backlight Type: LED, White
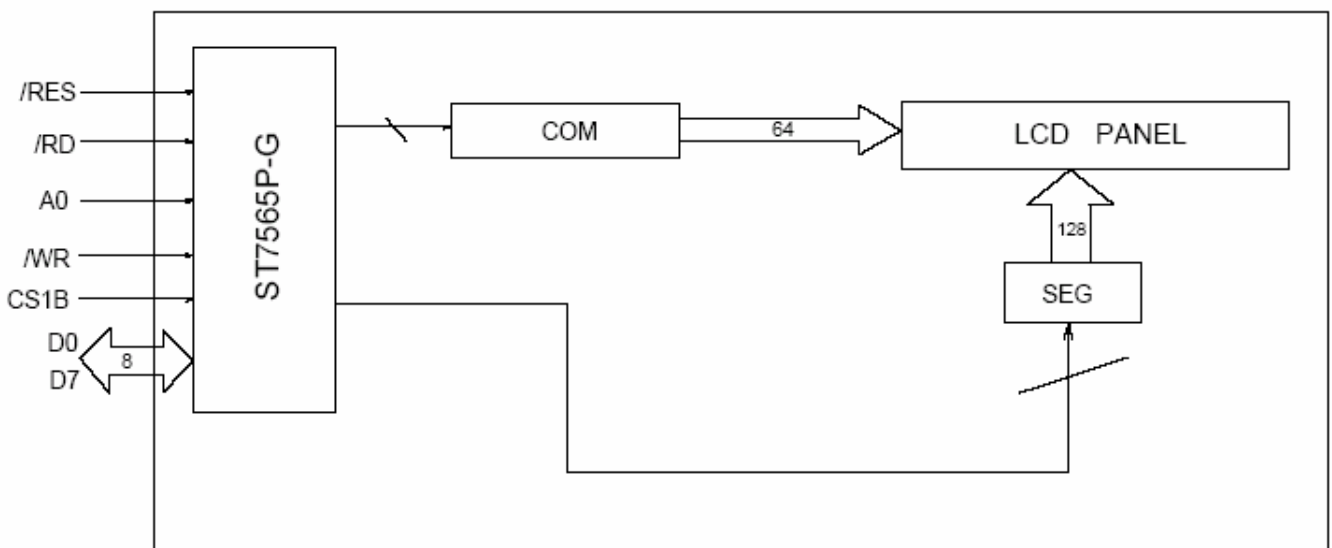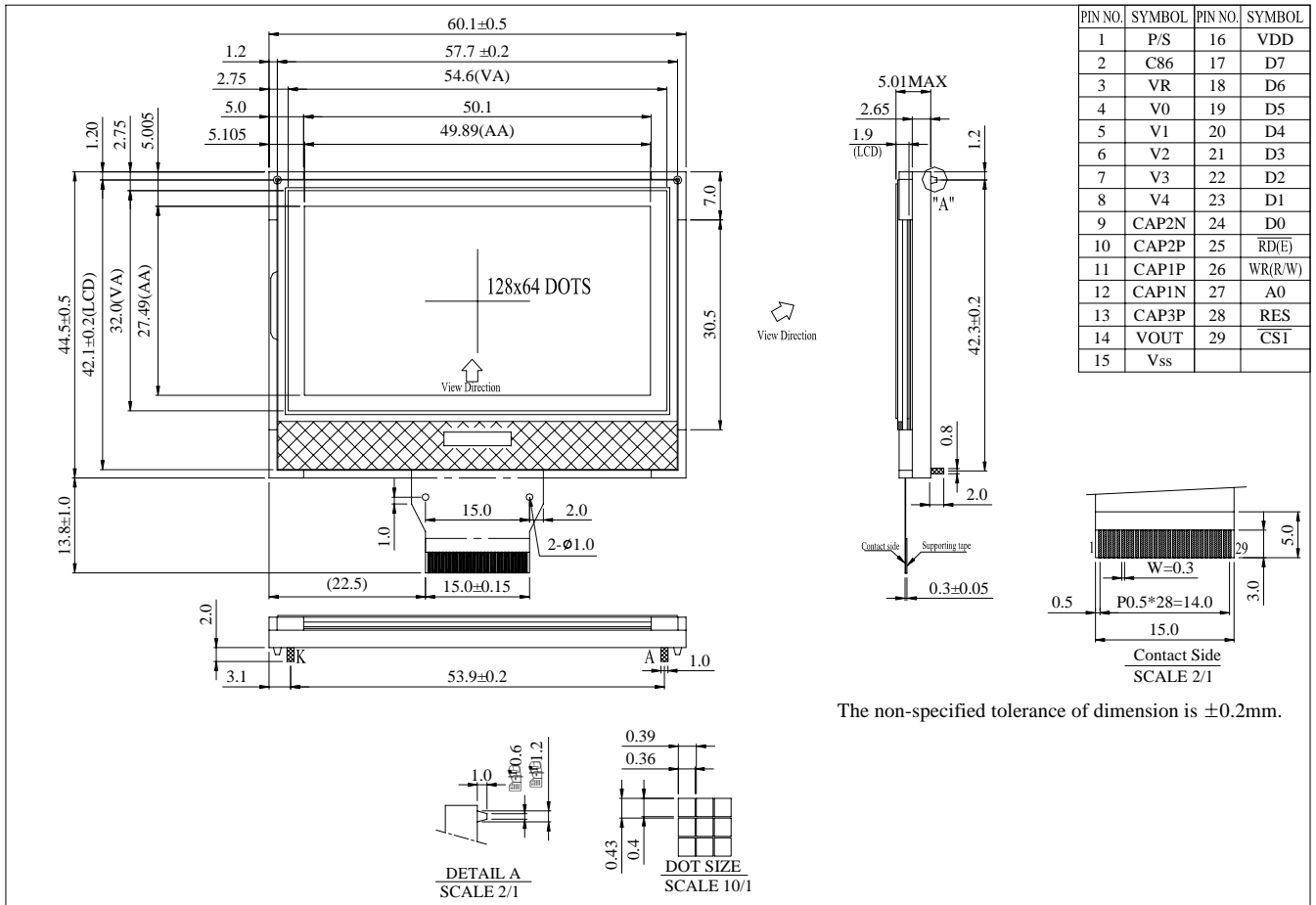
3. Module Coding System

R	X	12864	A1	-	B	I	W
1	2	3	4	-	5	6	7

Item	Description		
1	**R：Raystar Optronics Inc.**		
2	Display Type: COG		
3	Number of dots：**128 x64 Dots**		
4	Serials code		
5	LCD	P：TN Positive, Gray	
		N：TN Negative,	
		G：STN Positive, Gray	
		Y：STN Positive, Yellow Green	
		B：STN Negative, Blue	
		F：FSTN Positive	
		T：FSTN Negative	
6	Polarizer Type, Temperature range, View direction	A：Reflective, N.T, 6:00	K：Transflective, W.T,12:00
		D：Reflective, N.T, 12:00	1：Transflective, U.T,6:00
		G：Reflective, W. T, 6:00	4：Transflective, U.T.12:00
		J：Reflective, W. T, 12:00	C：Transmissive, N.T,6:00
		0：Reflective, U. T, 6:00	F：Transmissive, N.T,12:00
		3：Reflective, U. T, 12:00	**I：Transmissive, W. T, 6:00**
		B：Transflective, N.T,6:00	L：Transmissive, W.T,12:00
		E：Transflective, N.T.12:00	2：Transmissive, U. T, 6:00
		H：Transflective, W.T,6:00	5：Transmissive, U.T,12:00
7	Backlight	N：Without backlight	Y：LED, Yellow Green
		P：EL, Blue green	A：LED, Amber
		T：EL, Green	**W：LED, White**
		D：EL, White	O：LED, Orange
		F：CCFL, White	G：LED, Green

4. Interface Pin Function

Pin No.	Symbol	Level	Description
1	P/S	I	This is the parallel data input/serial data input switch terminal.
2	C86	I	This is the MPU interface switch terminal.
3	VR	I	Output voltage regulator terminal. Provides the voltage between VSS and V0 through a resistive voltage divider.
4~8	V0~V4	Power supply	This is a multi-level power supply for the liquid crystal drive.
9	CAP2N	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2P terminal.
10	CAP2P	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2N terminal.
11	CAP1P	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
12	CAP1N	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1P terminal.
13	CAP3P	O	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
14	VOUT	O	DC/DC voltage converter. Connect a capacitor between this terminal and vss or VDD
15	VSS	Power supply	Ground
16	VDD	Power supply	Power supply
17~24	D7~ D0	I/O	This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus.
25	/RD(E)	I	The data bus is in output status when this signal is "L"
26	/WR(R/W)	I	The data bus are latched at the rising edge of the WR signal
27	A0	I	This is connect to the least significant bit of the Norman MPU address bus, and it determines whether the data bits are data or a command.
28	/RES	I	When RES is set to "L", the setting are initialized.
29	/CS1	I	This is the chip select signal.

5. Outline Dimension & Block Diagram

PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	P/S	16	VDD
2	C86	17	D7
3	VR	18	D6
4	V0	19	D5
5	V1	20	D4
6	V2	21	D3
7	V3	22	D2
8	V4	23	D1
9	CAP2N	24	D0
10	CAP2P	25	RD(E)
11	CAP1P	26	WR(R/W)
12	CAP1N	27	A0
13	CAP3P	28	RES
14	VOUT	29	CS1
15	Vss		

The non-specified tolerance of dimension is ±0.2mm.

6. Display Command

Command	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
				Command Code								
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0 / 1	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	\multicolumn{6}{l}{Display start address}					Sets the display RAM display start line address
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address.
(5) Status read	0	0	1	\multicolumn{4}{l}{Status}				0	0	0 0	Reads the status data
(6) Display data write	1	1	0	Write data								Writes to the display RAM
(7) Display data read	1	0	1	Read data								Reads from the display RAM
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0 / 1	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0 / 1	Sets the LCD display normal/reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0 / 1	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0 / 1	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565P)
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0 / 1	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode
(17) V0 voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(Rb/Ra) mode
(18) Electronic volume mode set Electronic volume register set	0	1	0	1 / 0	0 / 0	0	0	0	0	0	1	Set the V0 output voltage electronic volume register
						Electronic volume value						
(20) Booster ratio set	0	1	0	1 / 0	1 / 0	1 / 0	1 / 0	1 / 0	0 / 0	0 0 / step-up value		select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
(21) Power saver												Display OFF and display all points ON compound command
(22) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

7. Timing Characteristics

7-1 System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)
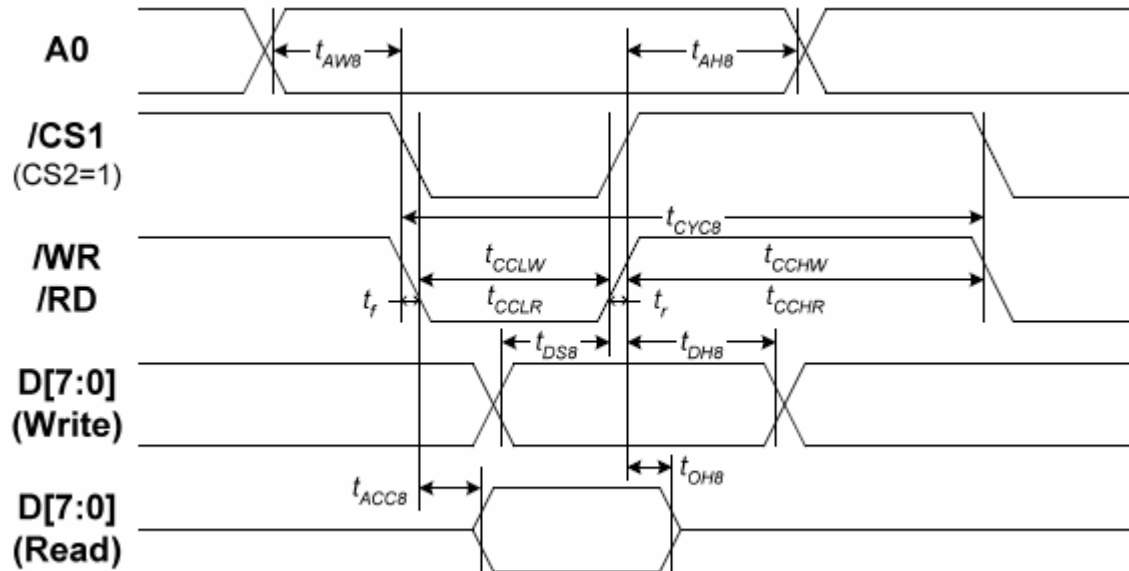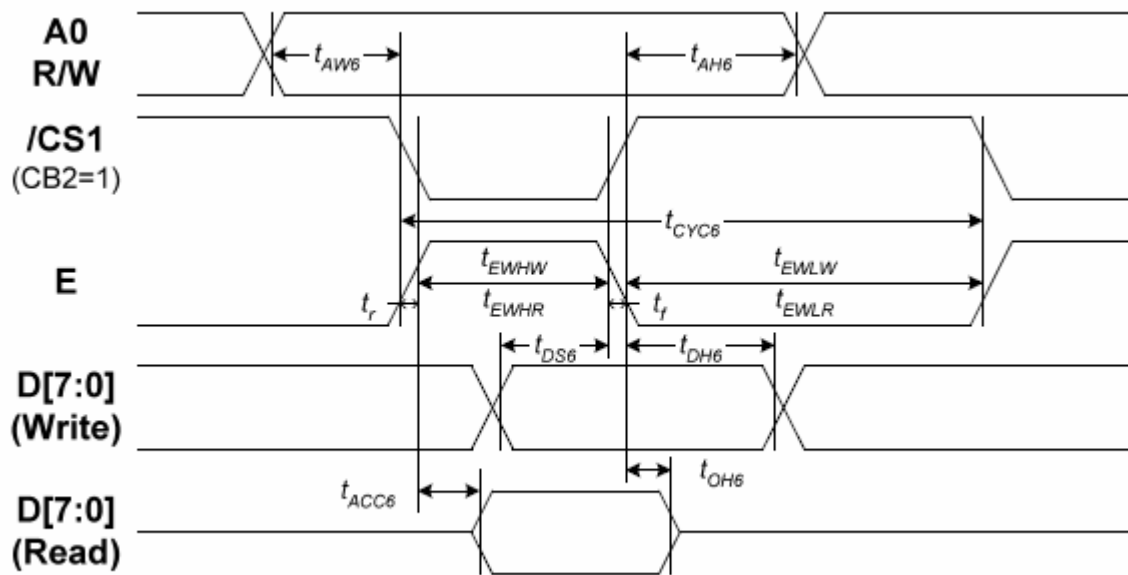

Figure 37

Table 24

(V$_{DD}$ = 3.3V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	t$_{AH8}$		0	—	Ns
Address setup time		t$_{AW8}$		0	—	
System cycle time		t$_{CYC8}$		240	—	
Write L pulse width	/WR	t$_{CCLW}$		80	—	
Write H pulse width		t$_{CCHW}$		80	—	
Read L pulse width	/RD	t$_{CCLR}$		140	—	
Read H pulse width		t$_{CCHR}$		80	—	
Write Data setup time	D0 to D7	t$_{DS8}$		40	—	
Write Address hold time		t$_{DH8}$		0	—	
Read access time		t$_{ACC8}$	C$_L$ = 100 pF	—	70	
Read Output disable time		t$_{OH8}$	C$_L$ = 100 pF	5	50	

Table 25

(VDD = 2.7V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
Address hold time	A0	tAH8		0	—	ns
Address setup time	A0	tAW8		0	—	
System cycle time	A0	tCYC8		400	—	
Write L pulse width	WR	tCCLW		220	—	
Write H pulse width	WR	tCCHW		180	—	
Read L pulse width	RD	tCCLR		220	—	
Read H pulse width	RD	tCCHR		180	—	
Write Data setup time	D0 to D7	tDS8		40	—	
Write Address hold time	D0 to D7	tDH8		0	—	
Read access time	D0 to D7	tACC8	CL = 100 pF	—	140	
Read Output disable time	D0 to D7	tOH8	CL = 100 pF	10	100	

Table 26

(VDD = 1.8V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
Address hold time	A0	tAH8		0	—	ns
Address setup time	A0	tAW8		0	—	
System cycle time	A0	tCYC8		640	—	
Write L pulse width	WR	tCCLW		360	—	
Write H pulse width	WR	tCCHW		280	—	
Read L pulse width	RD	tCCLR		360	—	
Read H pulse width	RD	tCCHR		280		
Write Data setup time	D0 to D7	tDS8		80	—	
Write Address hold time	D0 to D7	tDH8		0	—	
Read access time	D0 to D7	tACC8	CL = 100 pF	—	240	
Read Output disable time	D0 to D7	tOH8	CL = 100 pF	10	200	

*1 The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cycle time is extremely fast,
(tr +tf) ≦ (tCYC8 – tCCLW – tCCHW) for (tr + tf) ≦ (tCYC8 – tCCLR – tCCHR) are specified.
*2 All timing is specified using 20% and 80% of VDD as the reference.
*3 tCCLW and tCCLR are specified as the overlap between /CS1 being "L" (CS2 = "H") and /WR and /RD being at the "L" level.

7-2 System Bus Read/Write Characteristics 2 (For the 6800 Series MPU)

Figure 38

Table 27

(V$_{DD}$ = 3.3V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
Address hold time	A0	tAH6		0	—	ns
Address setup time	A0	tAW6		0	—	ns
System cycle time		tCYC6		240	—	ns
Enable L pulse width (WRITE)	E	tEWLW		80	—	ns
Enable H pulse width (WRITE)	E	tEWHW		80	—	ns
Enable L pulse width (READ)	E	tEWLR		80	—	ns
Enable H pulse width (READ)	E	tEWHR		140		ns
WRITE Data setup time	D0 to D7	tDS6		40	—	ns
WRITE Address hold time	D0 to D7	tDH6		0	—	ns
READ access time	D0 to D7	tACC6	CL = 100 pF	—	70	ns
READ Output disable time	D0 to D7	tOH6	CL = 100 pF	5	50	ns

Table 28

(VDD = 2.7V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
Address hold time	A0	tAH6		0	—	ns
Address setup time		tAW6		0	—	
System cycle time		tCYC6		400	—	
Enable L pulse width (WRITE)	E	tEWLW		220	—	
Enable H pulse width (WRITE)		tEWHW		180	—	
Enable L pulse width (READ)		tEWLR		220	—	
Enable H pulse width (READ)		tEWHR		180	—	
WRITE Data setup time	D0 to D7	tDS6		40	—	
WRITE Address hold time		tDH6		0	—	
READ access time		tACC6	CL = 100 pF	—	140	
READ Output disable time		tOH6	CL = 100 pF	10	100	

Table 29

(VDD = 1.8V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
Address hold time	A0	tAH6		0	—	ns
Address setup time		tAW6		0	—	
System cycle time		tCYC6		640	—	
Enable L pulse width (WRITE)	E	tEWLW		360	—	
Enable H pulse width (WRITE)		tEWHW		280	—	
Enable L pulse width (READ)		tEWLR		360	—	
Enable H pulse width (READ)		tEWHR		280	—	
WRITE Data setup time	D0 to D7	tDS6		80	—	
WRITE Address hold time		tDH6		0	—	
READ access time		tACC6	CL = 100 pF	—	240	
READ Output disable time		tOH6	CL = 100 pF	10	200	

*1 The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cycle time is extremely fast,

(tr +tf) ≦ (tCYC6 – tEWLW – tEWHW) for (tr + tf) ≦ (tCYC6 – tEWLR – tEWHR) are specified.

*2 All timing is specified using 20% and 80% of VDD as the reference.

*3 tEWLW and tEWLR are specified as the overlap between CS1 being "L" (CS2 = "H") and E.

7-3. The Serial Interface
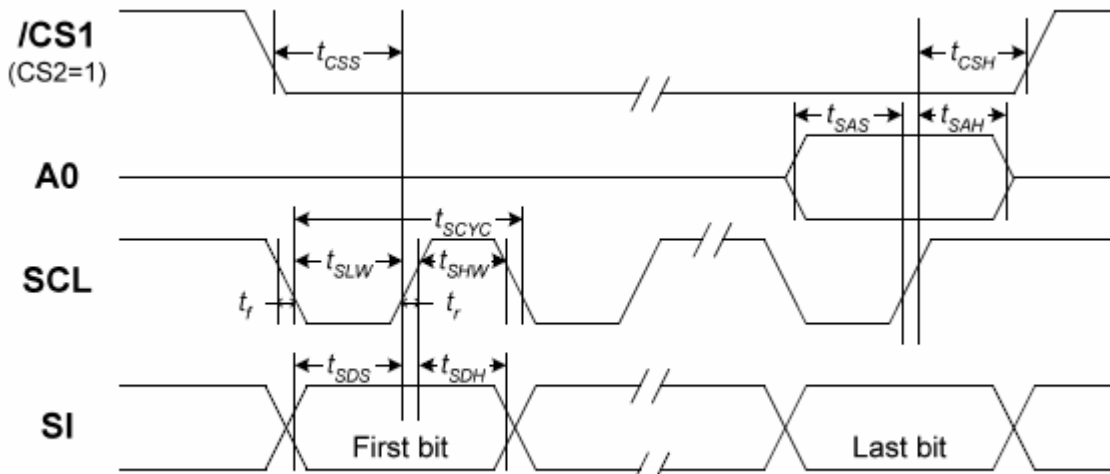
Figure 39

Table 30

(VDD = 3.3V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
Serial Clock Period	SCL	t_{SCYC}		50	—	ns
SCL "H" pulse width		t_{SHW}		25	—	
SCL "L" pulse width		t_{SLW}		25	—	
Address setup time	A0	t_{SAS}		20	—	
Address hold time		t_{SAH}		10	—	
Data setup time	SI	t_{SDS}		20	—	
Data hold time		t_{SDH}		10	—	
CS-SCL time	CS	t_{CSS}		20	—	
CS-SCL time		t_{CSH}		40	—	

Table 31

(VDD = 2.7V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
Serial Clock Period	SCL	t_{SCYC}		100	—	ns
SCL "H" pulse width		t_{SHW}		50	—	
SCL "L" pulse width		t_{SLW}		50	—	
Address setup time	A0	t_{SAS}		30	—	
Address hold time		t_{SAH}		20	—	
Data setup time	SI	t_{SDS}		30	—	
Data hold time		t_{SDH}		20	—	
CS-SCL time	CS	t_{CSS}		30	—	
CS-SCL time		t_{CSH}		60	—	

Table 32

(V_{DD} = 1.8V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
Serial Clock Period	SCL	t_{SCYC}		200	—	ns
SCL "H" pulse width	SCL	t_{SHW}		80	—	ns
SCL "L" pulse width	SCL	t_{SLW}		80	—	ns
Address setup time	A0	t_{SAS}		60	—	ns
Address hold time	A0	t_{SAH}		30	—	ns
Data setup time	SI	t_{SDS}		60	—	ns
Data hold time	SI	t_{SDH}		30	—	ns
CS-SCL time	CS	t_{CSS}		40	—	ns
CS-SCL time	CS	t_{CSH}		100	—	ns

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

*2 All timing is specified using 20% and 80% of VDD as the standard.

Reset Timing
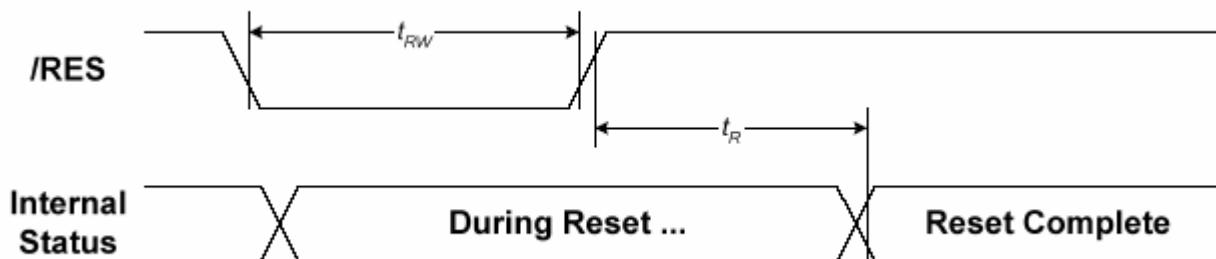
Figure 41

Table 36

(V_{DD} = 3.3V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Typ.	Rating Max.	Units
Reset time	/RES	t_R		—	—	1.0	µs
Reset "L" pulse width	/RES	t_{RW}		1.0	—	—	µs

Table 37

(V_{DD} = 2.7V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Typ.	Rating Max.	Units
Reset time	/RES	t_R		—	—	2.0	µs
Reset "L" pulse width	/RES	t_{RW}		2.0	—	—	µs

Table 38

(V_{DD} = 1.8V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Typ.	Rating Max.	Units
Reset time	/RES	t_R		—	—	3.0	µs
Reset "L" pulse width	/RES	t_{RW}		3.0	—	—	µs

*1 All timing is specified with 20% and 80% of VDD as the standard.

8. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ	CR≧2	20	—	40	deg
	(H)φ	CR≧2	-30	—	30	deg
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	100	280	ms
	T fall	—	—	150	330	ms

Definition of Operation Voltage, Vop.   **Definition of Response Time, Tr and Tf.**
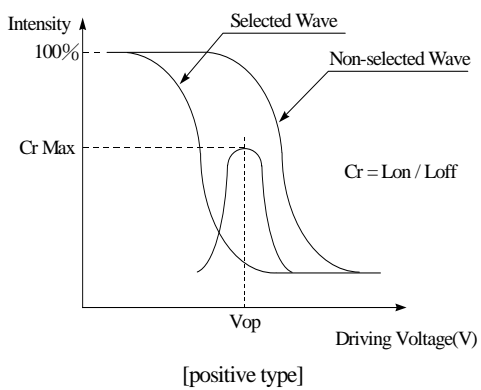
Intensity
100%
Selected Wave
Non-selected Wave
Cr Max
$Cr = Lon / Loff$
Vop
Driving Voltage(V)
[positive type]

Non-selected Conition
Selected Conition
Non-selected Conition
Intensity
100%
90%
10%
Tr
Tf
[positive type]
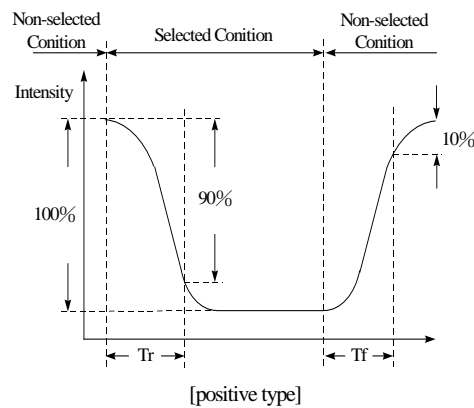
Conditions:

Operating Voltage : Vop   Viewing Angle(θ，φ) : 0°， 0°

Frame Frequency: 64 HZ   Driving Waveform: 1/N duty, 1/a bias

Definition of viewing angle (CR≧2)

θb
θf
$\varphi = 180°$
$\theta 1$
θr
$\varphi = 270°$
$\varphi = 90°$
$\varphi = 0°$
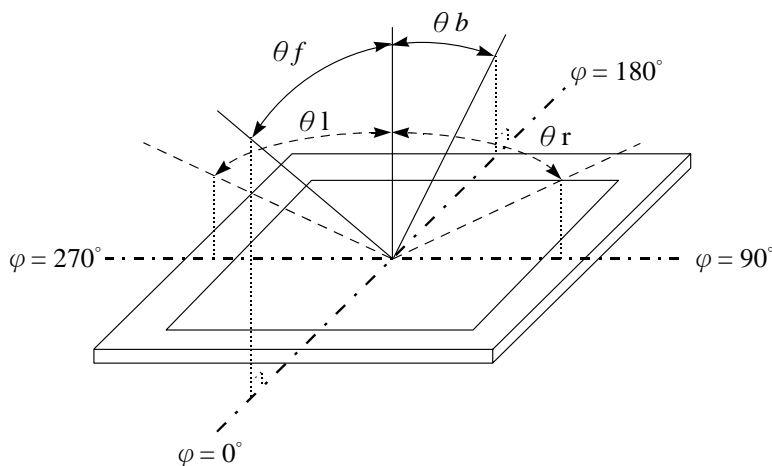
9. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	℃
Storage Temperature	T_{ST}	-30	—	+80	℃
Supply voltage for Logic	V_{DD}	-0.3	—	5.0	V
LCD Driver Supply Voltage	V_{OUT} ,V0	0		18.0	V

10. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	—	3.0	3.3	3.6	V
Supply Voltage For LCM *Note	V_O - V_{SS}	Ta=-20℃	9.43	9.73	10.03	V
		Ta=25℃	9.20	9.45	9.7	V
		Ta=70℃	8.87	9.17	9.47	V
Input High Volt.	V_{IH}	—	0.8 V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	Vss	—	0.2 V_{DD}	V
Output High Volt.	V_{OH}	I_{OUT}=-0.5mA	0.8 V_{DD}	—	V_{DD}	V
Output Low Volt.	V_{OL}	I_{OUT}=0.5mA	Vss	—	0.2V_{DD}	V
Supply Current(No include LED Backlight)	I_{DD}	V_{DD}=3.3V		0.10	2.0	mA

11.Backlight Information

Specification

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	ILED	43.2	48	75	mA	V=3.5V
Supply Voltage	V	3.4	3.5	3.6	V	
Reverse Voltage	VR	—	—	5	V	—
Luminous Intensity (Without LCD)	IV	568	710	—	CD/M^2	ILED=48mA
LED Life Time (For Reference only)	—	—	50K	—	Hr.	$I_{LED} \leqq 48mA$ 25℃,50-60%RH, (Note 1)
Color	White					

Note: The LED of B/L is drive by current only；driving voltage is only for reference

To make driving current in safety area (waste current between minimum and maximum).

Note 1:50K hours is only an estimate for reference.
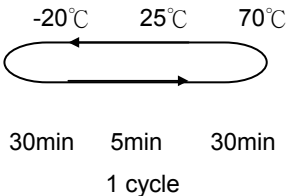
LED B\L Drive Method
1.Drive from A , K
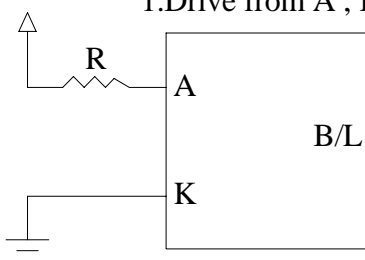
12. Reliability

Content of Reliability Test (wide temperature, -20℃~70℃)
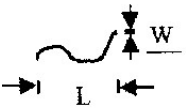
Environmental Test			
Test Item	**Content of Test**	**Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 200hrs	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20℃ 25℃ 70℃ 30min 5min 30min 1 cycle	-20℃/70℃ 10 cycles	-
Vibration test	Endurance test applying the vibration during transportation and using.	fixed amplitude: 15mm Vibration. Frequency: 10~55Hz. One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS= 1.5kΩ CS=100pF 1 time	———
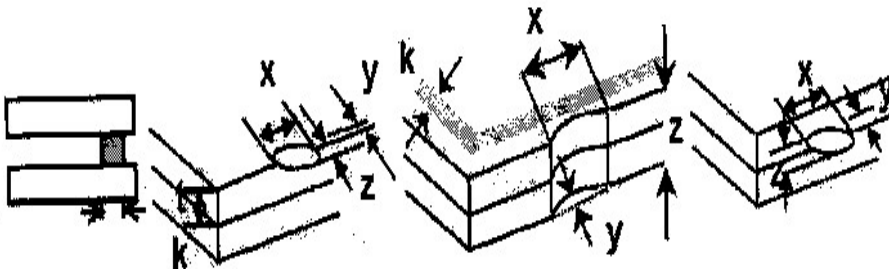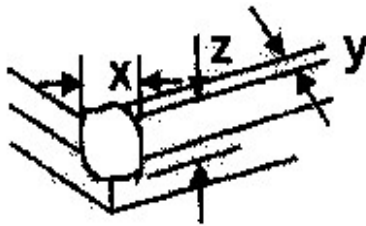
Note1: No dew condensation to be observed.
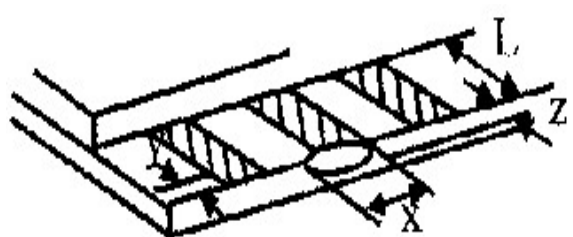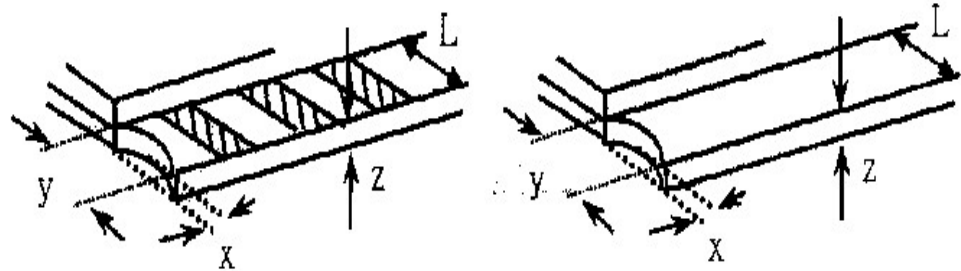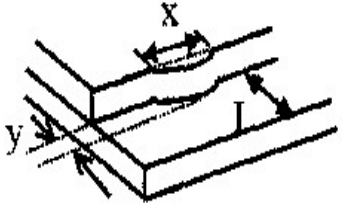
Note2: The function test shall be conducted after 4 hours storage at the normal temperature and humidity after remove from the test chamber.
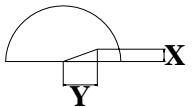
Note3: The packing have to including into the vibration testing.

13. Inspection specification

NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Contrast defect.	0.65
02	Black or white spots on LCD (display only)	2.1 White and black spots on display ≦0.25mm, no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5
03	LCD black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing Φ=(x + y) / 2	2.5

3.2 Line type : (As following drawing)

Length	Width	Acceptable Q TY
---	W≦0.02	Accept no dense
L≦3.0	0.02＜W≦0.03	2
L≦2.5	0.03＜W≦0.05	
---	0.05＜W	As round type

AQL 2.5

NO	Item	Criterion	AQL
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.	2.5

Size Φ	Acceptable Q TY
Φ≦0.20	Accept no dense
0.20＜Φ≦0.50	3
0.50＜Φ≦1.00	2
1.00＜Φ	0
Total Q TY	3

NO	Item	Criterion	AQL
05	Scratches	Follow NO.3 LCD black spots, white spots, contamination	
06	Chipped glass	Symbols Define: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length: 6.1 General glass chip : 6.1.1 Chip on panel surface and crack between panels: (table below) ⊙If there are 2 or more chips, x is total length of each chip. 6.1.2 Corner crack: (table below) ⊙If there are 2 or more chips, x is the total length of each chip.	2.5

6.1.1:

z: Chip thickness	y: Chip width	x: Chip length
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$
$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$

⊙If there are 2 or more chips, x is total length of each chip.

6.1.2:

z: Chip thickness	y: Chip width	x: Chip length
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$
$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$

⊙If there are 2 or more chips, x is the total length of each chip.

NO	Item	Criterion	AQL
06	Glass crack	Symbols : x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 6.2 Protrusion over terminal : 6.2.1 Chip on electrode pad : <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>y≦0.5mm</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr></table>6.2.2 Non-conductive portion: <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>y≦ L</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr></table>⊙If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. ⊙If the product will be heat sealed by the customer, the alignment mark not be damaged. 6.2.3 Substrate protuberance and internal crack. <table><tr><td>y: width</td><td>x: length</td></tr><tr><td>y≦1/3L</td><td>x ≦ a</td></tr></table>	2.5

NO	Item	Criterion	AQL
07	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using LCD spot, lines and contamination standards. 8.3 Backlight doesn't light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down. 10.9 The Scraping testing standard for Copper Coating of PCB X * Y<=2mm^2	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP. 12.2 No cracks on interface pin (OLB) of TCP. 12.3 No contamination, solder residue or solder balls on product. 12.4 The IC on the TCP may not be damaged, circuits. 12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it causes the interface pin to sever. 12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. 12.7 Sealant on top of the ITO circuit has not hardened. 12.8 Pin type must match type in specification sheet. 12.9 LCD pin loose or missing pins. 12.10 Product packaging must the same as specified on packaging specification sheet. 12.11 Product dimension and structure must conform to product specification sheet.	2.5 0.65 2.5 2.5 2.5 2.5 2.5 0.65 0.65 0.65 0.65

14. 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.
8. Raystar have the right to change the passive components
   (Resistors,capacitors and other passive components will have different appearance and color caused by the different supplier.)
9. Raystar have the right to change the PCB Rev.

15. Material List of Components for RoHs

1. RAYSTAR Optronics Co., Ltd. hereby declares that all of or part of products, including, but not limited to, the LCM, accessories or packages, manufactured and/or delivered to your company (including your subsidiaries and affiliated company) directly or indirectly by our company (including our subsidiaries or affiliated companies) do not intentionally contain any of the substances listed in all applicable EU directives and regulations, including the following substances.

   Exhibit A：The Harmful Material List

Material	(Cd)	(Pb)	(Hg)	(Cr6+)	PBBs	PBDEs
Limited Value	100 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm
Above limited value is set up according to RoHS.						

2. Process for RoHS requirement：
   (1) Use the Sn/Ag/Cu soldering surface；the surface of Pb-free solder is rougher than we used before.
   (2) Heat-resistance temp.：
   Reflow：250℃, 30 seconds Max.；
   Connector soldering wave or hand soldering：320℃, 10 seconds max.
   (3) Temp. curve of reflow, max. Temp.：235±5℃；
   Recommended customer's soldering temp. of connector：280℃, 3 seconds.

16. Recommendable storage

1. Place the panel or module in the temperature 25°C±5°C and the humidity below 65% RH

2. Do not place the module near organics solvents or corrosive gases.

3. Do not crush, shake, or jolt the module

LCM Sample Estimate Feedback Sheet

Module Number：_____

1、Panel Specification：

1. Panel Type：	□ Pass	□ NG ,_____
2. View Direction：	□ Pass	□ NG ,_____
3. Numbers of Dots：	□ Pass	□ NG ,_____
4. View Area：	□ Pass	□ NG ,_____
5. Active Area：	□ Pass	□ NG ,_____
6.Operating Temperature：	□ Pass	□ NG ,_____
7.Storage Temperature：	□ Pass	□ NG ,_____
8.Others：_____		

2、Mechanical Specification：

1. PCB Size：	□ Pass	□ NG ,_____
2.Frame Size：	□ Pass	□ NG ,_____
3.Materal of Frame：	□ Pass	□ NG ,_____
4.Connector Position：	□ Pass	□ NG ,_____
5.Fix Hole Position：	□ Pass	□ NG ,_____
6.Backlight Position：	□ Pass	□ NG ,_____
7. Thickness of PCB：	□ Pass	□ NG ,_____
8. Height of Frame to PCB：	□ Pass	□ NG ,_____
9.Height of Module：	□ Pass	□ NG ,_____
10.Others：	□ Pass	□ NG ,_____

3、Relative Hole Size：

1.Pitch of Connector：	□ Pass	□ NG ,_____
2.Hole size of Connector：	□ Pass	□ NG ,_____
3.Mounting Hole size：	□ Pass	□ NG ,_____
4.Mounting Hole Type：	□ Pass	□ NG ,_____
5.Others：	□ Pass	□ NG ,_____

4、Backlight Specification：

1.B/L Type：	□ Pass	□ NG ,_____
2.B/L Color：	□ Pass	□ NG ,_____
3.B/L Driving Voltage (Reference for LED Type)：□ Pass □ NG ,_____		
4.B/L Driving Current：	□ Pass	□ NG ,_____
5.Brightness of B/L：	□ Pass	□ NG ,_____
6.B/L Solder Method：	□ Pass	□ NG ,_____
7.Others：	□ Pass	□ NG ,_____

＞＞ **Go to page 2** ＜＜

Module Number：		

5、Electronic Characteristics of Module：

1.Input Voltage：	□ Pass	□ NG ,
2.Supply Current：	□ Pass	□ NG ,
3.Driving Voltage for LCD：	□ Pass	□ NG ,
4.Contrast for LCD：	□ Pass	□ NG ,
5.B/L Driving Method：	□ Pass	□ NG ,
6.Negative Voltage Output：	□ Pass	□ NG ,
7.Interface Function：	□ Pass	□ NG ,
8.LCD Uniformity：	□ Pass	□ NG ,
9.ESD test：	□ Pass	□ NG ,
10.Others：	□ Pass	□ NG ,

6、Summary：

Sales signature： _____

Customer Signature： _____ **Date：** __/__/__