



RAYSTAR

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RFC570C-SLW-DNN

SPECIFICATION

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

ISSUED DATE:

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1. Revision History

DATE	VERSION	REVISED PAGE NO.	Note
2013/2/5	1		First issue

2. General Specification

- Resolution: 320 x RGBx240
- Module dimension: 143.5x 104.1 x 12.5 mm
- Active Area : 115.2 x 87.6 mm
- Dot pitch: 0.12 x 0.36 mm
- LCD type: TFT LCD Transmissive,
- View direction: 6 o'clock
- Gray Scale Inversion Direction: 12 o'clock
- Backlight Type: LED, Normally White
- Controller/driver IC: HX8218+HX8615(or compatible)

3. Module Coding System

R	F	C	57	0C	-	S	L	W	-	D	N	N
1	2	3	4	5	-	6	7	8	-	9	10	11

Item	Description			
1	R : Raystar Optronics Inc.			
2	Display Type : TFT Type			
3	Solution: A: 128x160 B:320x234 C:320x240 D:480x234 F:800x480			
4	Display Size : 5.7" TFT			
5	Version Code.			
6	Model serials no.			
7	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
		O : 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
8	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
9	Driver Method	D: Digital A: Analog		
10	Interface	N : without control board A : 8Bit B : 16Bit		
11	TS	N : Without TS S : resistive touch panel C : capacitive touch panel		

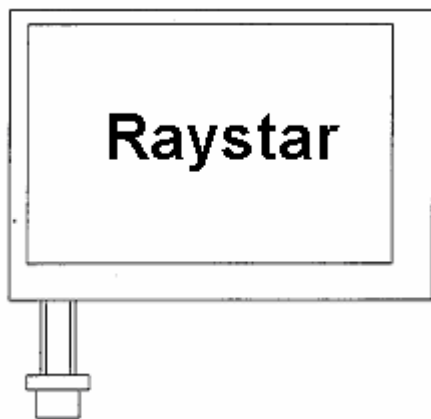
4. Interface Pin Function

4-1 LCM PIN Definition

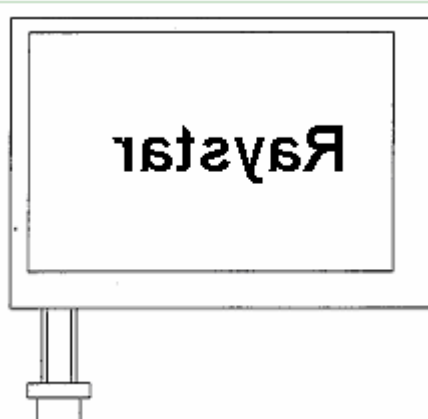
Pin No.	Symbol	I/O	Description	Remark
1	GND	I	Ground	
2	CK	I	Clock signal for sampling each data signal	
3	Hsync	I	Horizontal synchronous signal	
4	Vsync	I	Vertical synchronous signal	
5	GND	I	Ground	
6	R0	I	Red Data bit(LSB)	
7	R1	I	Red Data bit	
8	R2	I	Red Data bit	
9	R3	I	Red Data bit	
10	R4	I	Red Data bit	
11	R5	I	Red Data bit(MSB)	
12	GND	I	Ground	
13	G0	I	Green Data bit(LSB)	
14	G1	I	Green Data bit	
15	G2	I	Green Data bit	
16	G3	I	Green Data bit	
17	G4	I	Green Data bit	
18	G5	I	Green Data bit(MSB)	
19	GND	I	Ground	
20	B0	I	Blue Data bit(LSB)	
21	B1	I	Blue Data bit	
22	B2	I	Blue Data bit	
23	B3	I	Blue Data bit	
24	B4	I	Blue Data bit	
25	B5	I	Blue Data bit(MSB)	
26	GND	I	Ground	
27	ENAB	I	Signal to settle the horizontal display position	Note 1
28	V _{DD}	I	+3.3V power supply	
29	V _{DD}	I	+3.3V power supply	
30	R/L	I	Selection signal for horizontal scanning direction (L: Normally H: Right-and-left reversal)	Note 2
31	U/D	I	Selection signal for vertical scanning direction (H: Normally L: Up-and-Down reversal)	Note 2
32	NC	I	No connection	
33	GND	I	ground	

Note 1: The horizontal display start timing is settled in accordance with a rising timing of ENAB signal. In case ENAB is fixed "Low", the horizontal start timing is determined as described in 6-4 . Don't keep ENAB "High" during operation.

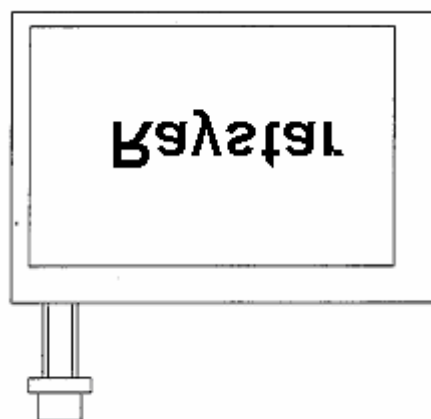
Note2



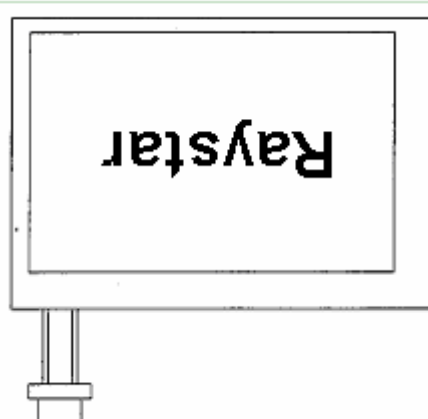
R/L =L ,UD=H



R/L=H,UD=H



R/L =L ,UD=L

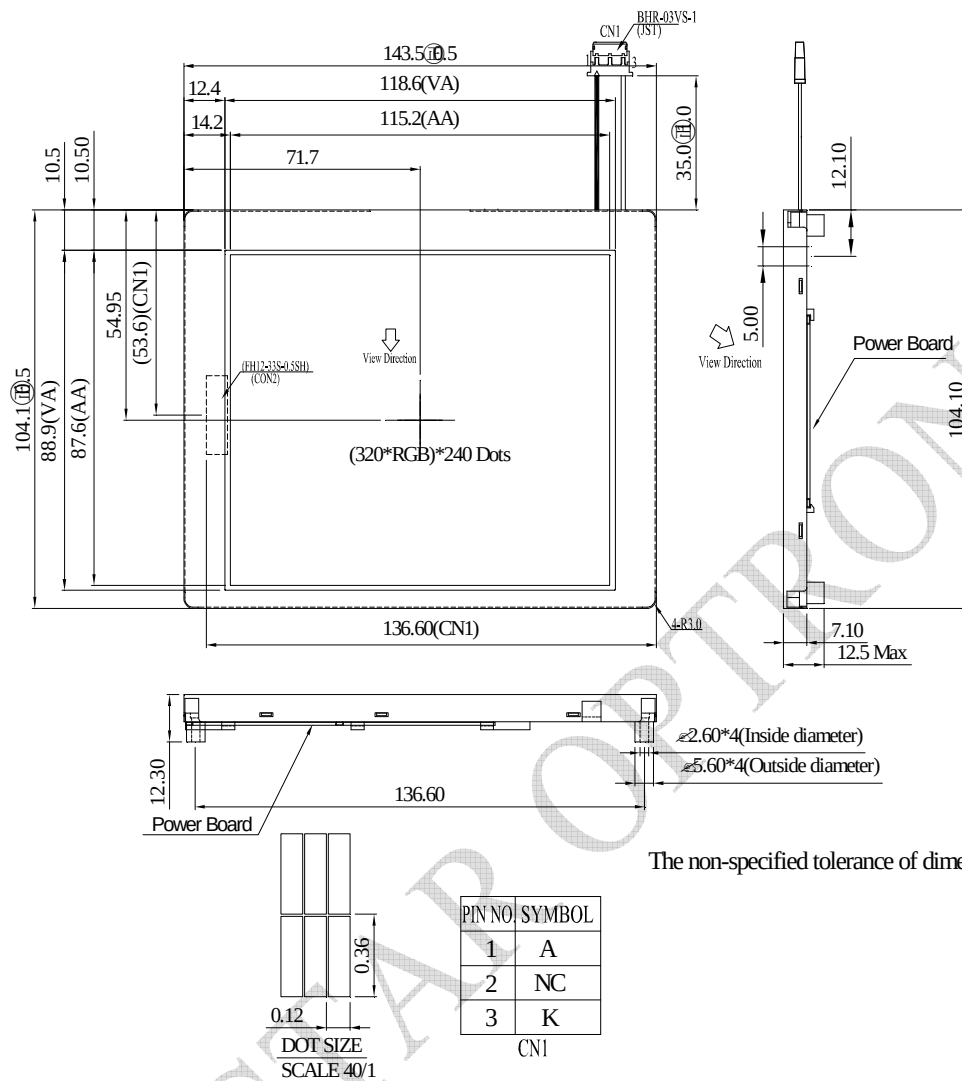


R/L=H,UD=L

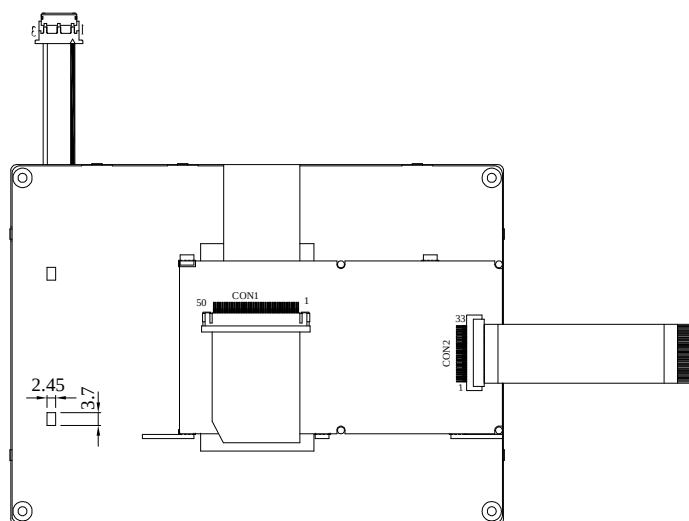
4.2 Backlight PIN Definition

Pin No.	Symbol	I/O	Description
1	VLED-	I	White, LED_Cathode
2	NC		No connection
3	VLED+	I	Red, LED_Anode

5. Contour drawing



The non-specified tolerance of dimension is $\pm 0.3\text{mm}$.

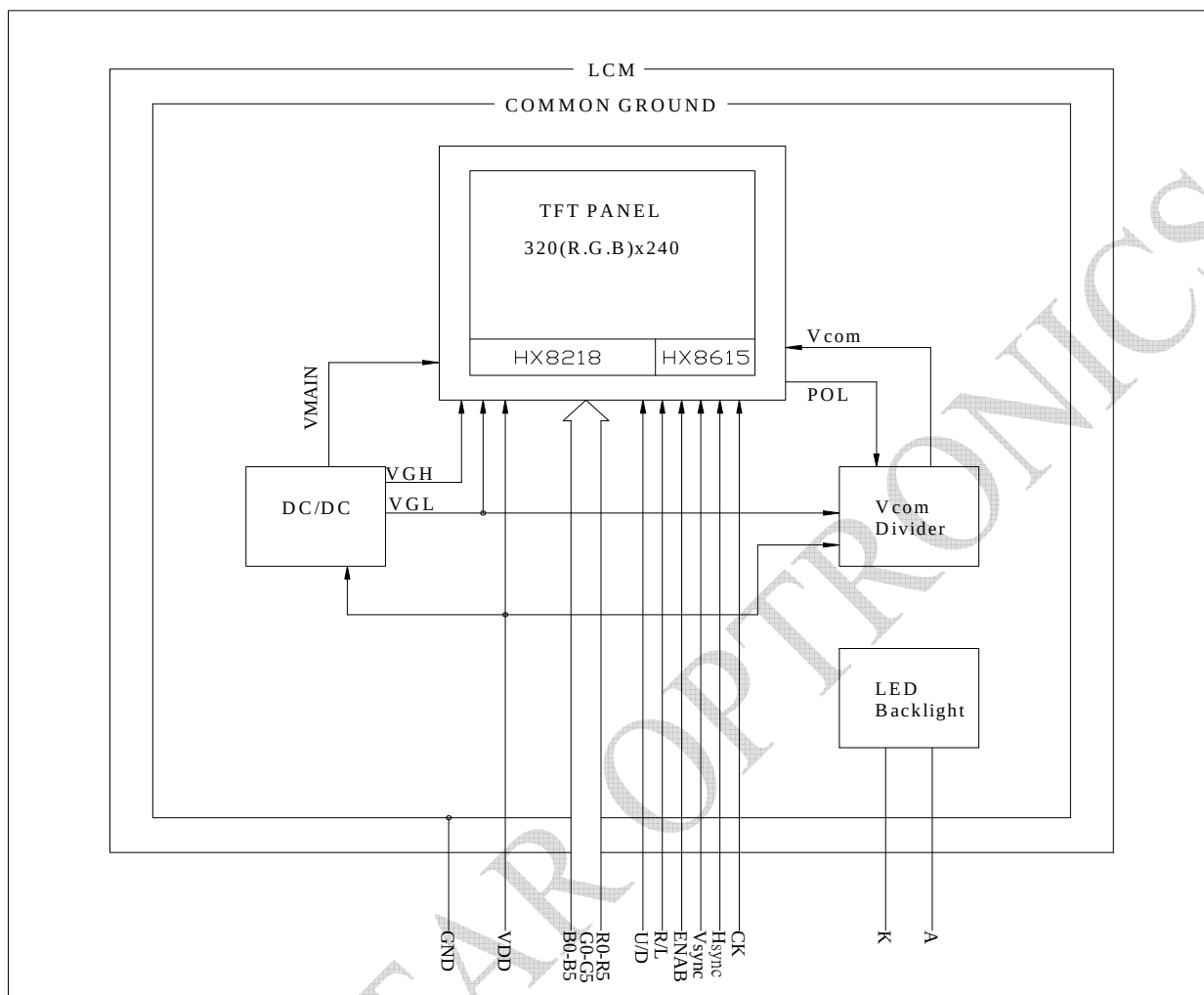


PIN NO	SYMBOL	PIN NO	SYMBOL
1	GND	18	G5
2	CK	19	GND
3	Hsync	20	B0
4	Vsync	21	B1
5	GND	22	B2
6	R0	23	B3
7	R1	24	B4
8	R2	25	B5
9	R3	26	GND
10	R4	27	ENAB
11	R5	28	Vcc
12	GND	29	Vcc
13	G0	30	R/L
14	G1	31	U/D
15	G2	32	NC
16	G3	33	GND
17	G4		

CON2

The non-specified tolerance of dimension is $\pm 0.1\text{mm}$.

6. Block Diagram



7. Electrical Characteristics

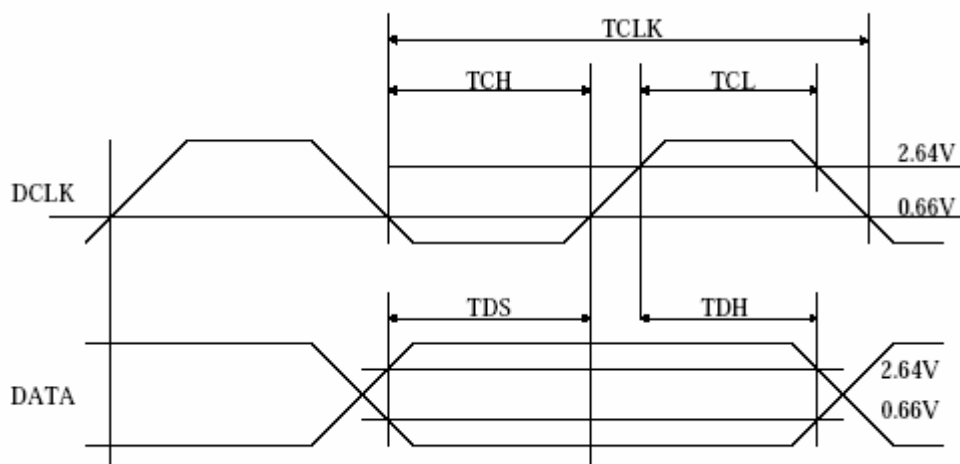
Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	V_{DD}	—	3.0	3.3	3.6	V
Input High Volt.	V_{IH}	—	$0.7 V_{DD}$	—	+5.5	V
Input Low Volt.	V_{IL}	—	0	—	$0.3 V_{DD}$	V
Supply Current	I_{VDD}	$V_{DD}=3.3V$	100	—	—	mA

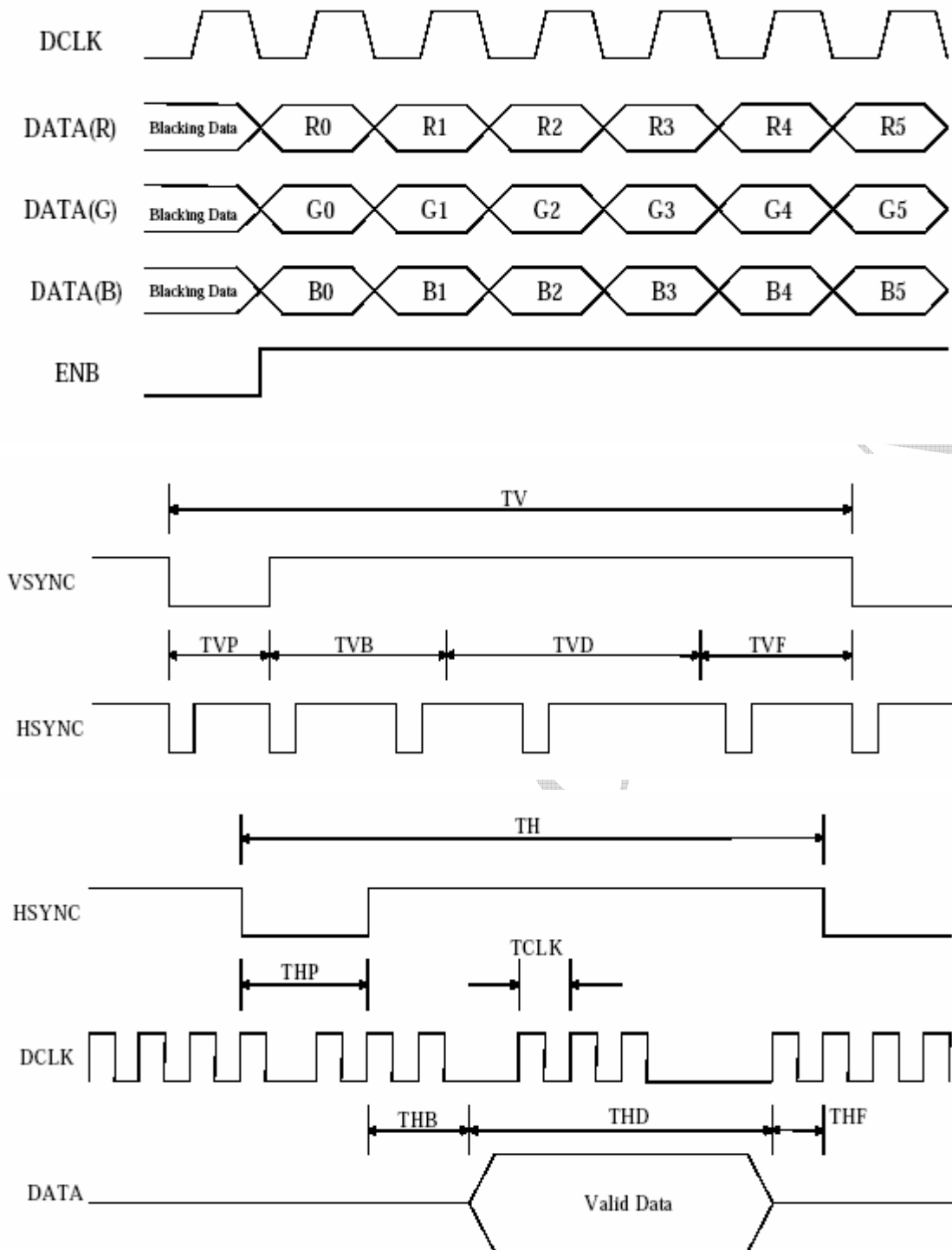
8. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	°C
Storage Temperature	T_{ST}	-30	—	+80	°C

9. Timing Characteristics

Signal	Item		Symbol	Min.	Typ.	Max.	Unit
Dclk	Frequency		Dclk		6.4		MHz
	High Time		Tch		78		ns
	Low Time		Tcl		78		ns
Data	Setup Time		Tds	12			ns
	Hold Time		Tdh	12			ns
Hsync	Period		TH		408		DCLK
	Pulse Width		Thp		30		DCLK
	Back-Porch		Thb		38		DCLK
	Display Period		Thd		320		DCLK
	Front-Porch		Thf		20		DCLK
Vsync	Period	NTSC	Tv		262.5		TH
		PAL			31.25		
	Pulse Width		Tvp	1	3	5	TH
	Back-Porch	NTSC	Tvb		15		TH
		PAL			23		
	Display Period		Tvd		240		TH
	Front-Porch	NTSC	Tvf		4.5		TH
		PAL			46.5		





Color Data Assignment

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	RED(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	GREEN(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	BLUE(255)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	CYAN	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAGENTA	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	YELLOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	WHITE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RED	RED(0)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	RED(1)	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	RED(2)	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	RED(254)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	RED(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GREEN	GREEN(0)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	GREEN(1)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
	GREEN(2)	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
	GREEN(254)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
	GREEN(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
BLUE	BLUE(0)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	BLUE(1)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
	BLUE(2)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
	BLUE(254)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1
	BLUE(255)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0

[Note]

- (1) Definition of gray scale
Color (n) : n means level of gray scale
Larger n means brighter level
- (2) Data: 1-High, 0-Low

10. Optical characteristics

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remarks
Viewing angle range		θ_{21}, θ_{22}	$CR \geq 5$	60	65	—	$^{\circ}(\text{degree})$	[Note 1]
		θ_{11}		60	65	—	$^{\circ}(\text{degree})$	
		θ_{12}		35	40	—	$^{\circ}(\text{degree})$	
Contrast ratio		CRmax	Optimal viewing angle	250	350	—		[Note 2]
Response time	Rise	t_r	$\theta=0^{\circ}$	—	8	20	ms	[Note 3]
	Fall	t_d		—	21	40	ms	

Lamp test in the module is made with the following inverter.

HIU-288[Output condenser :22pF] TOSHIBA HARISON LIGHTING co.Ltd.

The optical specifications are measured 30 minute after tturing lamp on and in a dark room or equivalent condition, according to the method shown in Fig2.

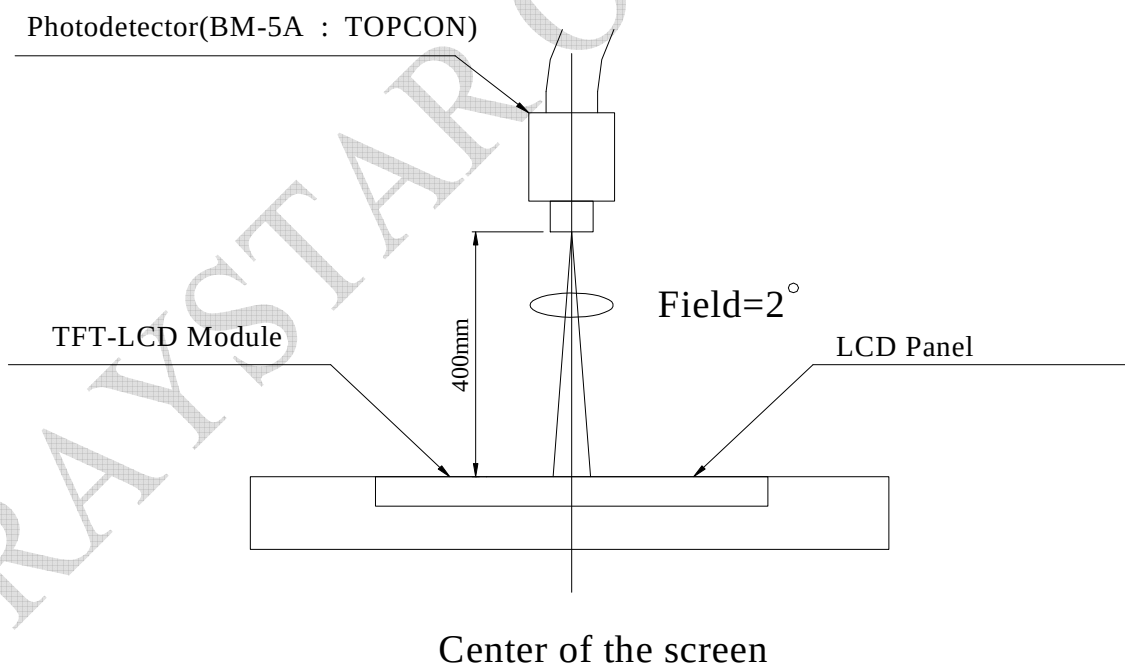
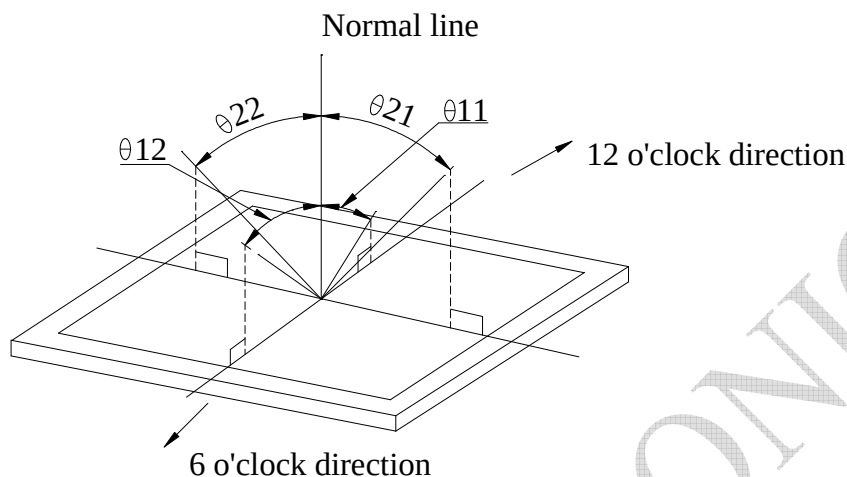


Fig 2 Optical characteristics measurement method

Note 1 Viewing angle range is defined as follows.



The best viewing angle of this slightly leaned to 12 o'clock from normal line.

Where $\theta_{11} > \theta_{max}$, gray scale is reversed partially.

Where $\theta_{11} > \theta_{max}$, or in θ_{12} direction, gray scale isn't reversed.

[Note 2] Contrast ratio is defined as follows:

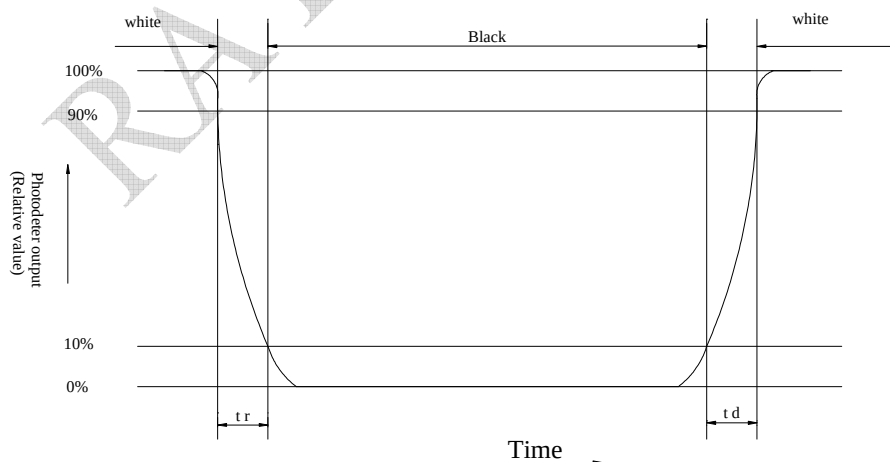
Luminance (brightness) with all pixels white

Contrast ratio (CR) = $\frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$

Luminance (brightness) with all pixels black

※ Measurement point : Center of the active area

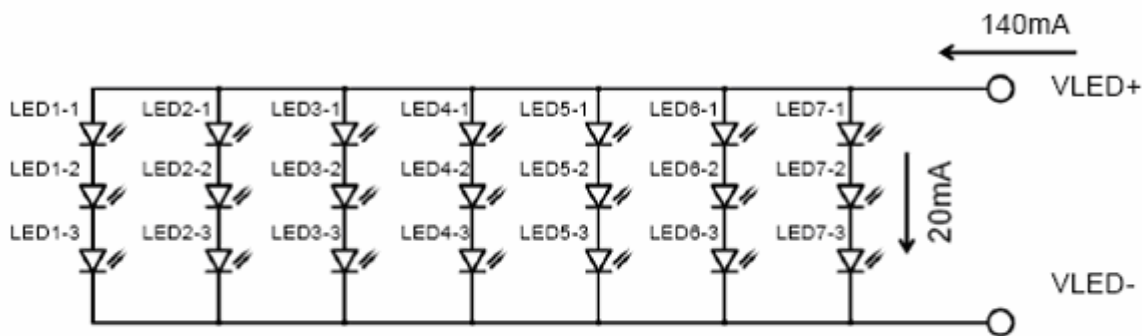
[Note 3] Response time is obtained by measuring the transition time of photo detector output, when input signals are so are to make the area "black" to and from "white".



11. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Current	I_{LED}	----	140	210	mA	Note1
LED voltage	V_{LED}	9.0	----	10.5	V	
LED life Time	-	----	50K	----	-	Note 2,3.5
Luminous Intensity	IV	320	----	----	CD/M ²	Note 4

Note 1: There are 7 Groups LED shown as below, =9.9 V(Min)



Note 2 : $T_a = 25^{\circ}\text{C}$,

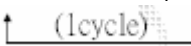
Note 3 : Brightness to be decreased to 50% of the initial value.

Note 4: The luminous is measured through LCD panel.

Note 5:50K hours is only an estimate for reference.

12. Reliability Test

WIDE TEMPERATURE RELIABILITY TEST

N O	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	80℃	240 Hrs		Appearance without defect	
2	Low Temp. Storage	-30℃	240 Hrs		Appearance without defect	
3	High Temp. & High Humi. Storage	60 ℃ 90%RH	240 Hrs		Appearance without defect	
4	High Temp. Operating Display	70℃	240 Hrs		Appearance without defect	
5	Low Temp. Operating Display	-20℃	240 Hrs		Appearance without defect	
6	Thermal Shock	-20 ℃, 30min. → 70℃, 30min. 			Appearance without defect	10 cycles

Inspection Provision

1.Purpose

The RAYSTAR inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of RAYSTAR LCD produces.

2.Applicable Scope

The RAYSTAR inspection provision is applicable to the arrangement in regard to outgoing inspection and quality assurance after outgoing.

3.Technical Terms

3-1 RAYSTAR Technical Terms



4.Outgoing Inspection

4-1 Inspection Method

MIL-STD-105E Level II Regular inspection

4-2 Inspection Standard

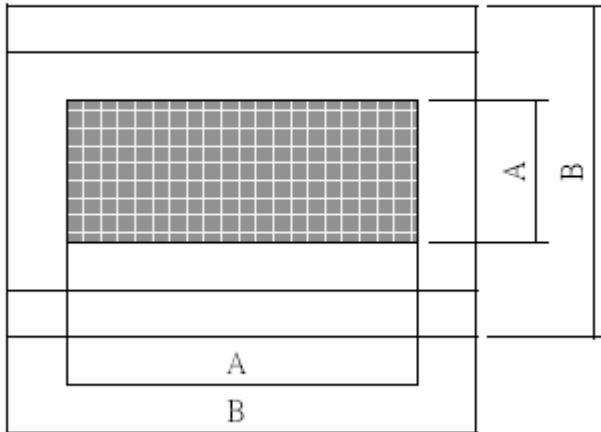
	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	Faults which substantially lower the practicality and the initial purpose difficult to achieve
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		

	Dimensions	External from Dimensions	0.4	
Minor Defect	Inside the glass	Black spots	0.65	Faults which appear to pose almost no obstacle to the practicality, effective use, and operation
	Polarizing plate	Scratches, foreign Matter, air bubbles, and peeling		
	Dots	Pinhole, deformation		
	Color tone	Color unevenness		
	Solder appearance	Cold solder Solder projections		

4-3 Inspection Provisions

*Viewing Area Definition

Fig. 1



A : Zone Viewing Area

B : Zone Glass Plate Outline

*Inspection place to be 500 to 1000 lux illuminance uniformly without glaring.

The distance between luminous source(daylight fluorescent lamp and cool white fluorescent lamp)

and sample to be 30 cm to 50 cm.

*Test and measurement are performed under the following conditions, unless otherwise specified.

Temperature $20 \pm 15^{\circ}\text{C}$

Humidity $65 \pm 20\%\text{R.H.}$

Pressure 860~1060hPa(mmbar)

In case of doubtful judgment, it is performed under the following conditions.

Temperature $20 \pm 2^{\circ}\text{C}$

Humidity $65 \pm 5\%\text{R.H.}$

Pressure 860~1060hPa(mmbar)

5.Specification for quality check

5-1-1 Electrical characteristics :

NO.	Item	Criterion
1	Non operational	Fail
2	Miss operating	Fail
3	Contrast irregular	Fail
4	Response time	Within Specified value

5-1-2 Components soldering :

Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mounting position, etc.

5-2 Inspection Standard for TFT panel

5-2-1 The environmental condition of inspection :

The environmental condition and visual inspection shall be conducted as below.

(1) Ambient temperature : $25 \pm 5^{\circ}\text{C}$

(2) Humidity : 25~75% RH

(3) External appearance inspection shall be conducted by using a single 20W fluorescent lamp or equivalent illumination.

(4) Visual inspection on the operation condition for cosmetic shall be conducted at the distance 30cm or more between the LCD panels and eyes of inspector. The viewing angle shall be 90 degree to the front surface of display panel.

(5) Ambient Illumination : 300~500 Lux for external appearance inspection.

(6) Ambient Illumination : 100~200 Lux for light on inspection.

5-2-2 Inspection Criteria

(1) Definition of dot defect induced from the panel inside

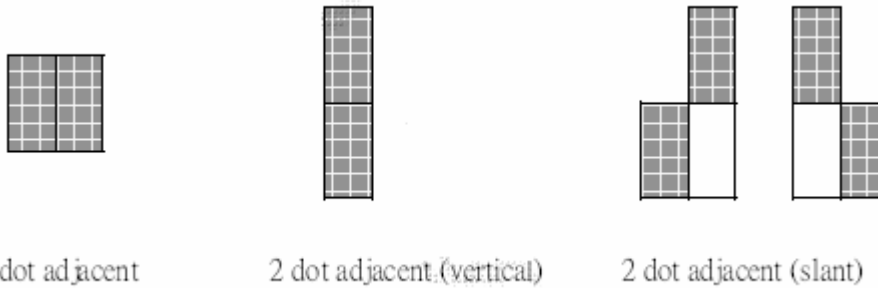
a) The definition of dot : The size of a defective dot over 1/2 of whole dot is regarded as one defective dot

b) Bright dot : Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

c) Dark dot : Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern.

d) 2 dot adjacent = 1 pair = 2 dots

Picture :



(2) Display Inspection

NO.	Item		Acceptable Count
1	Dot defect	Bright Dot	Random $N \leq 2$
		2 dots adjacent	$N \leq 0$
		Dark Dot	Random $N \leq 3$
		2 dots adjacent	$N \leq 1$
	Total bright and dark dot		$N \leq 4$
	Functional failure (V-line/ H-line/Cross line etc.)		Not allowable
	Mura	It's OK if mura is slight visible through 6% ND filter. (Judged by limit sample if it is necessary)	
2	Newton ring (touch panel)	Orbicular of interference fringes is not allowed in the optimum contrast within the active area under viewing angle.	

(3) Appearance inspection

NO.	Item	Standards
1	Panel Crack	Not allow. It is shown in Fig.1.
2	Broken CF Non -lead Side of TFT	The broken in the area of $W > 2\text{mm}$ is ignored, L is ignored. It is shown in Fig.2.
3	Broken Lead Side of TFT	FPC lead, electrical line or alignment mark can't be damaged. It is shown in Fig.3.
4	Broken Corner of TFT at Lead Side	FPC lead. electrical line or alignment mark can't be damaged. It is shown in Fig.4.
5	Burr of TFT / CF Edge	The distance of burr from the edge of TFT / CF, $W \leq 0.3\text{mm}$. It is shown in Fig.5.
6	Foreign Black / White/Bright Spot	(1) $0.15 < D \leq 0.5 \text{ mm}$, $N \leq 4$; (2) $D \leq 0.15\text{mm}$, Ignore. It is shown in Fig.6.
7	Foreign Black / White/Bright Line	(1) $0.05 < W \leq 0.1 \text{ mm}$, $0.3 < L \leq 2 \text{ mm}$, $N \leq 4$.
		(2) $W \leq 0.05\text{mm}$ and $L \leq 0.3\text{mm}$ Ignore. It is shown in Fig.7.
8	Color irregular	Not remarkable color irregular.

Fig 1.

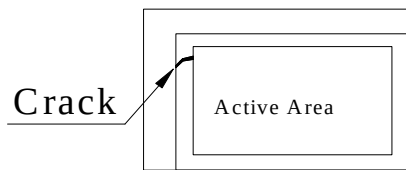


Fig 2.

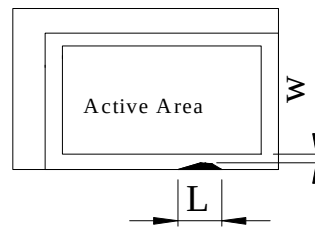


Fig 3.

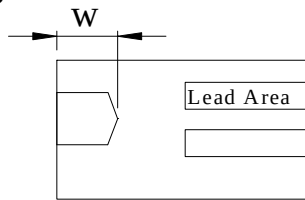


Fig 4.

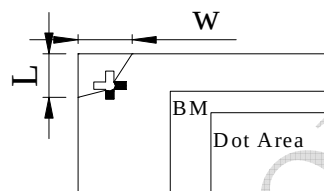


Fig 5.

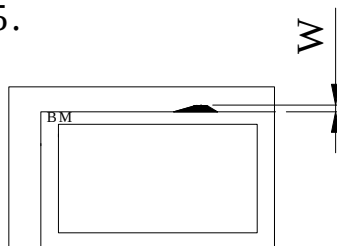
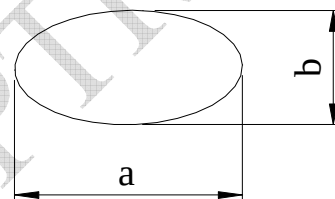


Fig 6.



$$D = (a + b) / 2$$

Fig 7.

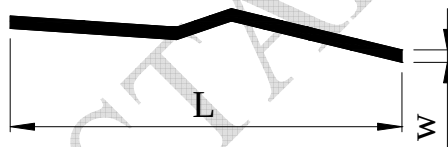
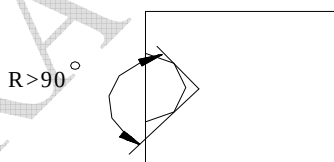


Fig8.



Notes

1.W:Width

2.Length

3.D:Average Diameter

4.N:Count

5.All the anhle of the broken must be larger than 90°.It is shown in Fig.8.(R>90°)

NOTICE:

- SAFETY

1. If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.
2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

- HANDLING

1. Avoid static electricity which can damage the CMOS LSI.
2. Do not remove the panel or frame from the module.
3. The polarizing plate of the display is very fragile. So, please handle it very carefully.
4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
5. Do not use ketonics solvent & Aromatic solvent. Use a soft cloth soaked with a cleaning naphtha solvent.

- STORAGE

1. Store the panel or module in a dark place where the temperature is $25\pm5^{\circ}\text{C}$ and the humidity is below 65% RH.
2. Do not place the module near organics solvents or corrosive gases.
3. Do not crush, shake, or jolt the module.

- TERMS OF WARRANT

1. Acceptance inspection period

The period is within one month after the arrival of contracted commodity at the buyer's factory site.

2. Applicable warrant period

The period is within twelve months since the date of shipping out under normal using and storage conditions.

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. Material 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 : / /