



RAYSTAR

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RG320240A-FHW-X

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
2012/08/13	1		First issue

RAYSTAR OPTRONICS

2. General Specification

The Features is described as follow:

- Module dimension: 160.0×109.0×13.0 (max.) mm³
- View area: 122.0×92.0 mm²
- Active area: 115.18×86.38 mm²
- Number of dots: 320 x 240
- Dot size: 0.34 x0.34 mm²
- Dot pitch: 0.36 x 0.36 mm²
- LCD type: FSTN Positive Transflective
- Duty: 1/240
- View direction: 6 o'clock
- Backlight Type: LED , White

3. Module Coding System

R	G	320240	A	-	F	H	W	-	X
1	2	3	4	-	5	6	7	-	8

Item	Description		
1	R : Raystar Optronics Inc.		
2	Display	C : Character Type, G : Graphic Type	
3	Number of dots : 320 x240 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
8	Special code	X: Without Negative Voltage	

4. Interface Pin Function

Pin No.	Symbol	Level	Description
1	DB0	H/L	Data bus line
2	DB1	H/L	Data bus line
3	DB2	H/L	Data bus line
4	DB3	H/L	Data bus line
5	DISPOFF	H/L	H: Display ON, L: Display OFF
6	FLM	H/L	Scan start-up signal
7	M	H/L	Frame reverse signal(alternate signal)
8	LP	H to L	Data latch pulse
9	CP	H to L	Data shift pulse
10	V _{DD}	-	Power supply for Logic
11	V _{SS}	0V	Ground
12	V _{EE}		NC
13	V _O	(Variable)	Driving voltage for LCD
14	FGND		Frame Ground

6. Timing Characteristics

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

(1) Segment Driver Application

 ($V_{SS} = 0V$, $T_a = -30 \sim +85^\circ C$)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Operating Voltage 1	V_{DD}	-	2.7	-	5.5	V	
	V_{LCD}	$V_{IN} = V_{DD} - V_{EE}$	6	-	28		
Input voltage (1)	V_{IH}	-	$0.8V_{DD}$	-	V_{DD}	V	
	V_{IL}	-	0	-	$0.2V_{DD}$		
Input voltage (2)	V_{OH}	$I_{CH} = -0.4mA$	$V_{DD} - 0.4$	-	-	V	
	V_{OL}	$I_{OH} = -0.4mA$	-	-	0.4		
Input leakage current 1 (1)	I_{IL1}	$V_{IN} = V_{DD}$ to V_{SS}	-10	-	10	μA	
Input leakage current 2 (3)	I_{IL2}	$V_{IN} = V_{DD}$ to V_{EE}	-25	-	25		
On resistance(4)	R_{ON}	$I_{ON} = 100 \mu A$	-	2	4	$k\Omega$	
Supply current(5)	I_{STBY}	$f_{CL1} = 32kHz$, $M = V_{SS}$	V_{SS} PIN	-	-	100	μA
	I_{DD}	$f_{CL1} = 32kHz$, $F_M = 80HZ$	$V_{DD} = 5V$	-	-	5	mA
			$V_{DD} = 3V$	-	-	2	
I_{EE}		$V_{DD} = 5V$	-	-	500	μA	

NOTES:

1. Applied to CL1, CL2, ELB, ERB, D1_SID - D4_DR, SHL, DISPOFFB, M, CS, AMS pin

2. ELB, ERB pin

3. V0, V12, V43, V5 pin

 4. $V_{LCD} = V_{DD} - V_{EE}$, $V0 = V_{DD} = 5V$, $V5 = V_{EE} = -23V$
 $V12 = V_{DD} - 2/n(V_{LCD})$, $V43 = V_{EE} + 2/n(V_{LCD})$, $n = 17$ (1/256 duty, 1/17 bias)

 5. $V0 = V_{DD}$, $V12 = 1.71V$ ($V_{DD} = 5V$) or $-0.06V$ ($V_{DD} = 3V$),

 $V43 = -19.71V$ ($V_{DD} = 5V$) or $-19.94V$ ($V_{DD} = 3V$), $V5 = V_{EE} = -23V$, no-load condition (1/256 duty, 1/17 bias)

4-bit parallel interface mode

 I_{STBY} : $V_{DD} = 5V$, $f_{CL2} = 5.12MHz$, $SHL = V_{SS}$, $DISPOFFB = V_{DD}$, $M = V_{EE}$, display data pattern = 0000

 I_{DD} : $V_{DD} = 3V$, $f_{CL2} = 4MHz$, display data pattern = 0101

 $V_{DD} = 5V$, $f_{CL2} = 5.12MHz$, display data pattern = 0101

 I_{EE} : $V_{DD} = 5V$, $f_{CL2} = 5.12MHz$, display data pattern = 0101, V_{EE} pin



DC CHARACTERISTICS (CONTINUED)
(2) Common Driver Application
 $(V_{SS} = 0V, T_a = -30 \sim +85^{\circ}C)$

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Operating Voltage 1	V_{DD}	-	2.7	-	5.5	V	
	V_{LCD}	$V_{IN} = V_{DD} - V_{EE}$	6	-	28		
Input voltage (1)	V_{IH}	-	$0.8V_{DD}$	-	V_{DD}	V	
	V_{IL}	-	0	-	$0.2V_{DD}$		
Input voltage (3)	V_{OH}	$I_{CH} = -0.4mA$	$V_{DD} - 0.4$	-	-	V	
	V_{OL}	$I_{OH} = -0.4mA$	-	-	0.4		
Input leakage current 1 (1)	I_{IL1}	$V_{IN} = V_{DD}$ to V_{SS}	-10	-	10	μA	
Input leakage current 2 (2)	I_{IL2}	$V_{IN} = 0V, V_{DD} = 5V$ (Pull up)	-50	-125	-250		
Input leakage current 3 (4)	I_{IL3}	$V_{IN} = V_{DD}$ to V_{EE}	-25	-	25		
On resistance(5)	R_{ON}	$I_{ON} = 100 \mu A$	-	2	4	$k\Omega$	
Supply current(6)	I_{STBY}	$f_{CL1} = 32kHz, M = V_{SS}$	V_{SS} PIN	-	-	100	μA
	I_{DD}	$f_{CL1} = 32kHz, F_M = 80Hz$	$V_{DD} = 5V$	-	-	200	
			$V_{DD} = 3V$	-	-	120	
			$V_{DD} = 5V$	-	-	150	

NOTES:

- Applied to CL1, D2_DL (SHL = LOW), D4_DR (SHL = HIGH), SHL, DISPOFFB, M, CS, AMS pin
- Pull-up input pins : CL2, D1_SID, D3_DM (AMS = HIGH), ELB (SHL = LOW), ERB (SHL = HIGH)
- D2_DL (SHL = HIGH), D4_DR (SHL = LOW) pin
- V0, V12, V43, V5 pin
- $V_{LCD} = V_{DD} - V_{EE}$, $V0 = V_{DD} = 5V$, $V5 = V_{EE} = -23V$
 $V12 = V_{DD} - 1/n(V_{LCD})$, $V43 = V_{EE} + 1/n(V_{LCD})$, $n = 17$ (1/256 duty, 1/17 bias)
- $V0 = V_{DD}$, $V12 = 3.35V$ ($V_{DD} = 5V$) or $1.47V$ ($V_{DD} = 3V$),
 $V43 = -21.35V$ ($V_{DD} = 5V$) or $-21.47V$ ($V_{DD} = 3V$), $V5 = V_{EE} = -23V$, no-load condition (1/256 duty, 1/17 bias)
single-type mode operation : AMS = V_{SS} , SHL = V_{EE} , DISPOFFB = V_{DD}
D1_SID = D3_DM = VDD, D4_DR = OPEN, ELB = ERB = OPEN,
 I_{STBY} : $V_{DD} = 5V, M = V_{SS}, D2_DL = V_{SS}$
 I_{DD} : $f_M = 80Hz, D2_DL = V_{DD}$
 $V_{DD} = 3V$, display data pattern = 10000000..., 01000000..., 00100000..., 00010000..., ..
 $V_{DD} = 5V$, display data pattern = 10000000..., 01000000..., 00100000..., 00010000..., ..
 I_{EE} : $f_M = 80Hz, D2_DL = V_{DD}$
 $V_{DD} = 5V$, current through V_{EE} Pin, display data pattern = 10000000..., 01000000..., 00100000..., 00010000...

RA

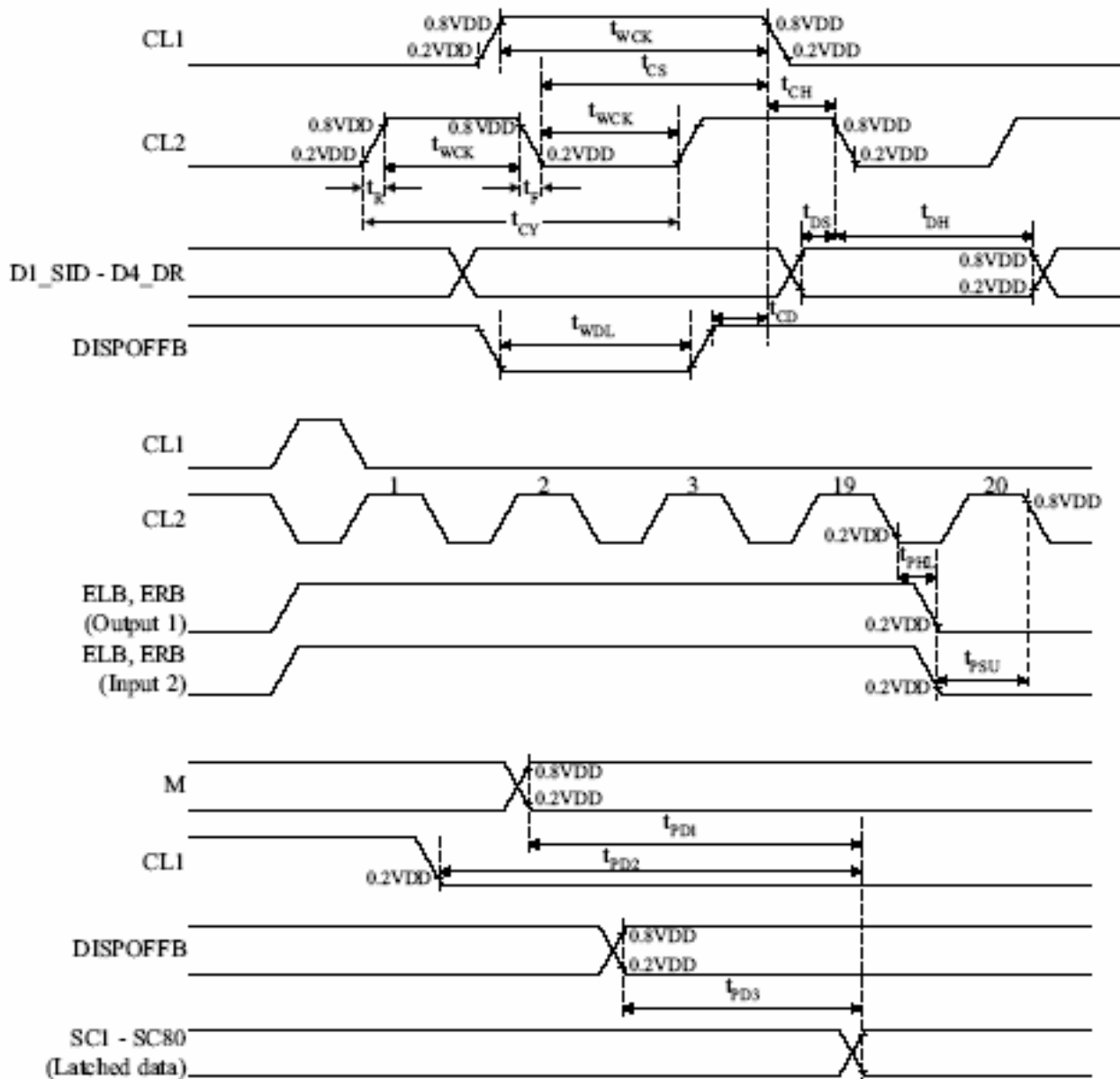
AC CHARACTERISTICS
(1) Segment Driver Application
 $(V_{SS} = 0V, T_a = -30 \sim +85^\circ C)$

Characteristic	Symbol	Test condition	(1) VDD=5V±10%			(2) VDD=3V±10%			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Clock cycle time	t_{CY}	Duty=50%	125	-	-	250	-	-	ns
Clock pulse width	t_{WCK}	-	45	-	-	95	-	-	
Clock rise/ fall time	t_R / t_F	-	-	-	-	-	-	30	
Data set-up time	t_{DS}	-	30	-	-	65	-	-	
Data hold time	t_{DH}	-	30	-	-	65	-	-	
Clock set-up time	t_{CS}	-	80	-	-	120	-	-	
Clock hold time	t_{CH}	-	80	-	-	120	-	-	
Propagation delay time	t_{PHL}	ELB output	-	-	60	-	-	125	
		ERB output	-	-	60	-	-	125	
ELB,ERB set-up time	t_{FSU}	ELB input	30	-	-	65	-	-	
		ERB input	30	-	-	65	-	-	
DISPOFFB low pulse width	t_{WDL}	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t_{CD}	-	100	-	-	100	-	-	ns
M – OUT propagation delay time	t_{PD1}	$C_L=15pF$	-	-	1.0	-	-	1.2	μs
CL1 – OUT propagation delay time	t_{PD2}		-	-	1.0	-	-	1.2	
DISPOFFB – OUT propagation delay time	t_{PD3}		-	-	1.0	-	-	-	

(2) Common Driver Application
 $(V_{SS} = 0V, T_a = -30 \sim +85^\circ C)$

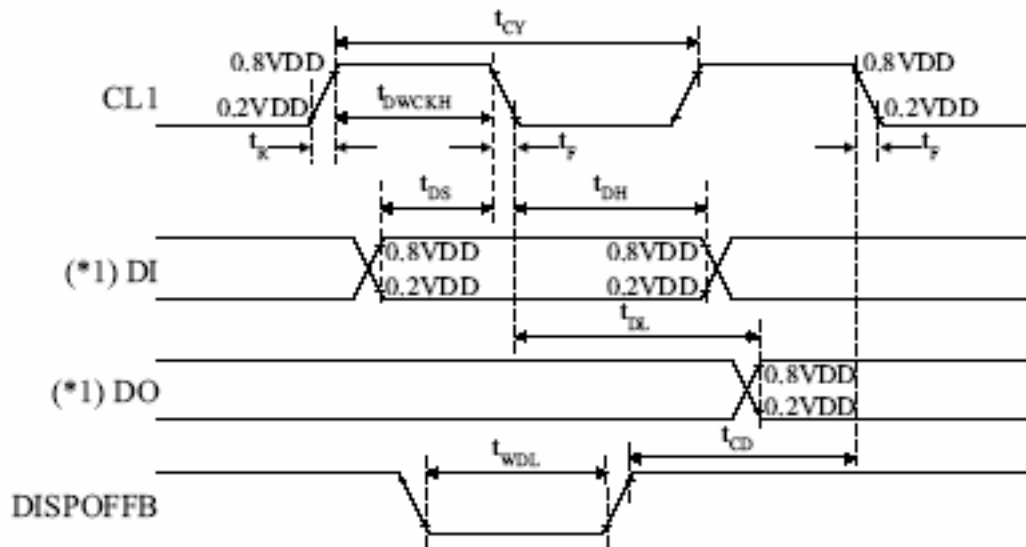
Characteristic	Symbol	Test condition	(1) VDD=5V±10%			(2) VDD=3V±10%			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Clock cycle time	t_{CY}	Duty=50%	250	-	-	500	-	-	ns
Clock pulse width	t_{WCK}	-	45	-	-	95	-	-	
Clock rise/ fall time	t_R / t_F	-	-	-	50	-	-	50	
Data set-up time	t_{DS}	-	30	-	-	65	-	-	
Data hold time	T_{DH}	-	30	-	-	65	-	-	
DISPOFFB low pulse width	t_{WDL}	-	1.2	-	-	1.2	-	-	μs
DISPOFFB clear time	t_{CD}	-	100	-	-	100	-	-	ns
Output delay time	t_{DL}	$C_L=15pF$	-	-	200	-	-	250	μs
M – OUT propagation delay time	t_{PD1}		-	-	1.0	-	-	1.2	
CL1 – OUT propagation delay time	t_{PD2}		-	-	1.0	-	-	1.2	
DISPOFFB – OUT propagation delay time	t_{PD3}		-	-	1.0	-	-	1.2	

(3) Segment Driver Application Timing



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(4) Common Driver Application Timing



(*1) When in single-type interface mode

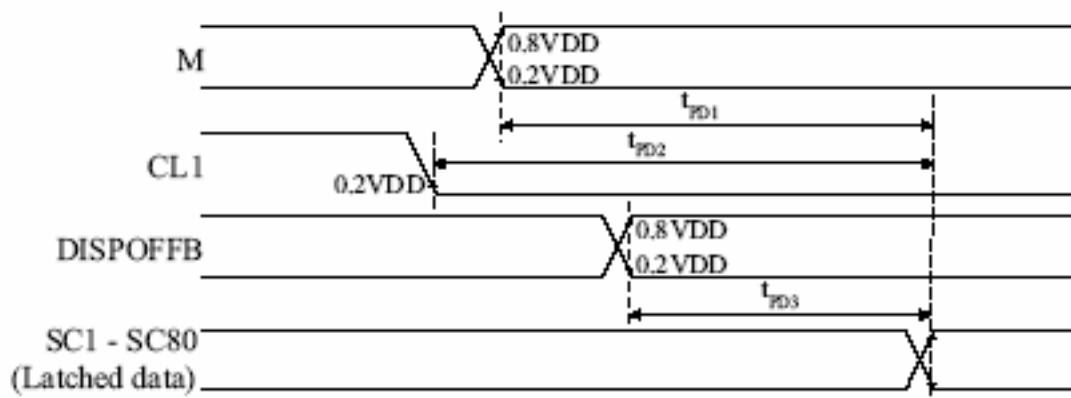
DI=>DDL(SHL=L), D4_DR(SHL=H)

DO=>D4_DR(SHL=L), D2_DL(SHL=H)

When in dual-type interface mode

DI=>D2_DL and D3_DM(SHL=L), D4_DR and D3_DM(SHL=H)

DO=>D4_DR(SHL=L), D2_DL(SHL=H)

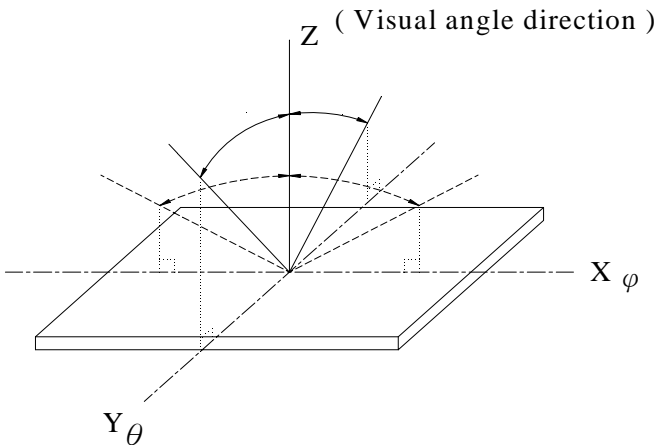


7. Optical Characteristics

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V) θ	$CR \geq 2$	30	—	60	deg.
	(H) ϕ	$CR \geq 2$	-45	—	45	deg.
Contrast Ratio	CR	—	—	5	—	—
Response Time	T rise	—	—	150	200	ms
	T fall	—	—	150	200	ms

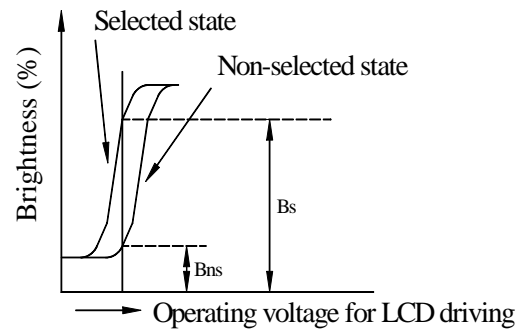
Definitions

■ View Angles

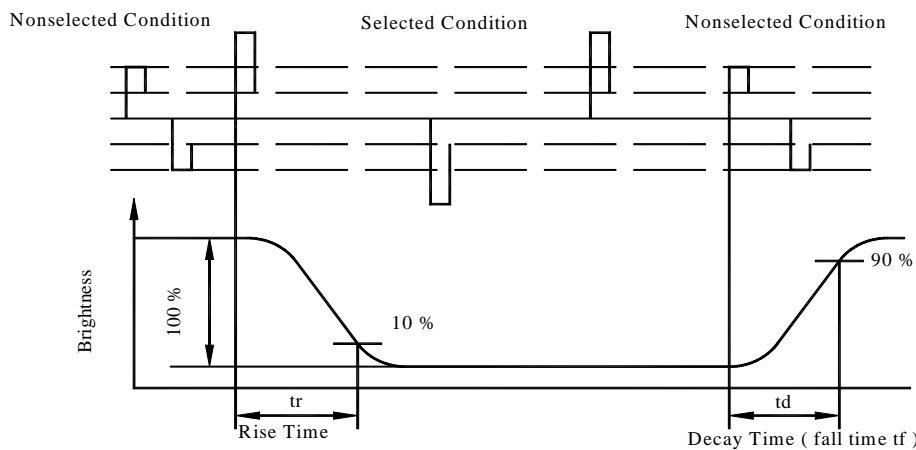


■ Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$



■ Response Time



8. Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Temperature	T_{OP}	-20	—	+70	°C
Storage Temperature	T_{ST}	-30	—	+80	°C
Input Voltage	V_I	0	—	V_{DD}	V
Supply Voltage For Logic	V_{DD}	0	—	6.5	V
Supply Voltage For LCD	$V_{DD}-V_{EE}$	0	—	32	V

9. Electrical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Voltage	$V_{DD}-V_{SS}$	—	2.7	—	5.5	V
Supply Voltage For LCD	$V_{DD}-V_O$	$T_a=-20^{\circ}\text{C}$	—	—	26.2	V
		$T_a=25^{\circ}\text{C}$	23.0	23.6	24.2	V
		$T_a=+70^{\circ}\text{C}$	22.1	—	—	V
Input High Volt.	V_{IH}	—	$0.8V_{DD}$	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	-0.3	—	$0.2V_{DD}$	V
Output High Volt.	V_{OH}	—	$V_{DD}-0.4$	—	V_{DD}	V
Output Low Volt.	V_{OL}	—	0	—	0.4	V
Supply Current	I_{DD}	—	60.0	75.0	80.0	mA

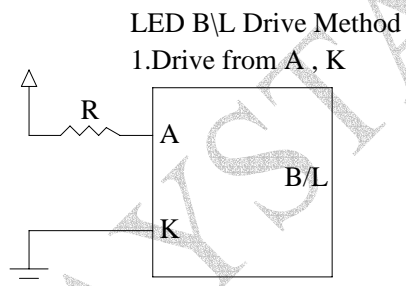
10. Backlight Information

Specification

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	I _{LED}	—	128	160	mA	V=3.5V
Supply Voltage	V	3.4	3.5	3.6	V	—
Reverse Voltage	V _R	—	—	5	V	—
Luminous Intensity	I _V	380	420	—	CD/M ²	I _{LED} =128mA
LED Life Time	—	—	50K	—	Hr.	I _{LED} =128mA 25°C,50-60%RH, Note 1
Color	White					

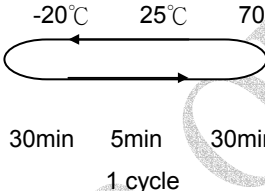
Note: The LED of B/L is drive by current only, drive voltage is for reference only. drive voltage can make driving current under safety area (current between minimum and maximum).

Note1 :50K hours is only an estimate for reference.



11. Reliability

Content of Reliability Test (wide temperature, -20°C~70°C)

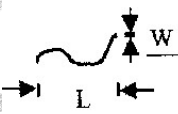
Environmental Test			
Test Item	Content of Test	Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60°C,90%RH 96hrs	1,2
Thermal shock resistance	<p>The sample should be allowed stand the following 10 cycles of operation</p>  <p style="text-align: center;">-20°C 25°C 70°C</p> <p style="text-align: center;">30min 5min 30min</p> <p style="text-align: center;">1 cycle</p>	-20°C/70°C 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	—

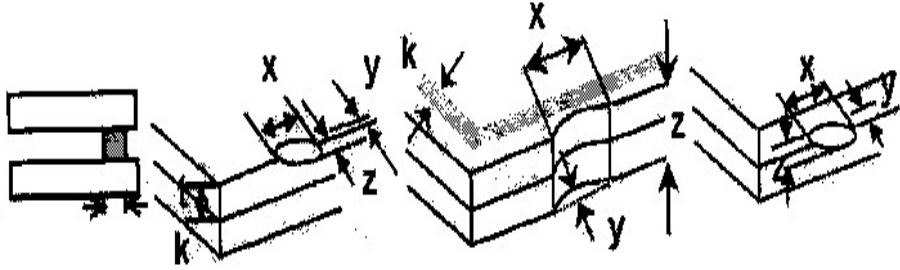
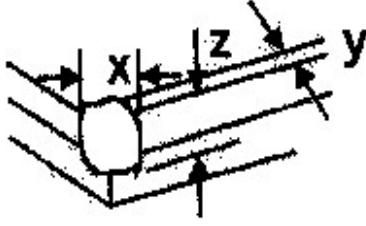
Note1: No dew condensation to be observed.

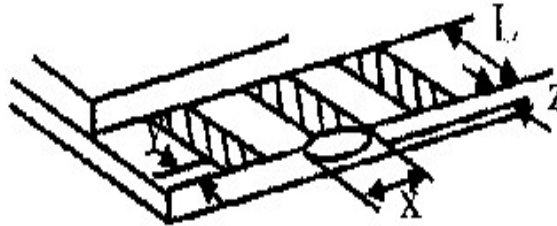
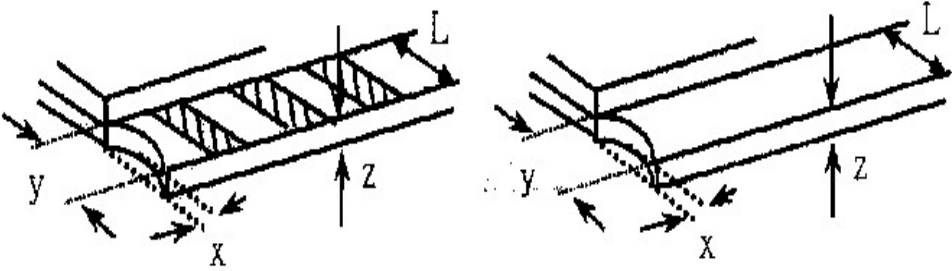
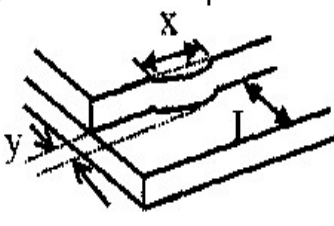
Note2: The function test shall be conducted after 4 hours storage at the normal temperature and humidity after remove from the test chamber.

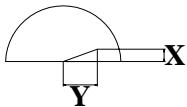
Note3: Vibration test will be conducted to the product itself without putting it in a container.

12. 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 $\leq 0.25\text{mm}$, 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 $\Phi = (x + y) / 2$	2.5												
		3.2 Line type : (As following drawing)  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.02$</td> <td>Accept no dense</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.02 < W \leq 0.03$</td> <td rowspan="2">2</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> </tr> <tr> <td>---</td> <td>$0.05 < W$</td> <td>As round type</td> </tr> </tbody> </table>		Length	Width	Acceptable QTY	---	$W \leq 0.02$	Accept no dense	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	$L \leq 2.5$	$0.03 < W \leq 0.05$	---
Length	Width	Acceptable QTY													
---	$W \leq 0.02$	Accept no dense													
$L \leq 3.0$	$0.02 < W \leq 0.03$	2													
$L \leq 2.5$	$0.03 < W \leq 0.05$														
---	$0.05 < W$	As round type													
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Size Φ</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.20$</td> <td>Accept no dense</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.50$</td> <td>3</td> </tr> <tr> <td>$0.50 < \Phi \leq 1.00$</td> <td>2</td> </tr> <tr> <td>$1.00 < \Phi$</td> <td>0</td> </tr> <tr> <td>Total QTY</td> <td>3</td> </tr> </tbody> </table>	Size Φ	Acceptable QTY	$\Phi \leq 0.20$	Accept no dense	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total QTY	3	2.5
Size Φ	Acceptable QTY														
$\Phi \leq 0.20$	Accept no dense														
$0.20 < \Phi \leq 0.50$	3														
$0.50 < \Phi \leq 1.00$	2														
$1.00 < \Phi$	0														
Total QTY	3														

NO	Item	Criterion	AQL																		
05	Scratches	Follow NO.3 LCD black spots, white spots, contamination																			
06	Chipped glass	<p>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:</p> <p>6.1 General glass chip : 6.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="443 1077 1353 1234"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</td> </tr> </tbody> </table> <p>⊙ If there are 2 or more chips, x is total length of each chip.</p> <p>6.1.2 Corner crack:</p>  <table border="1" data-bbox="443 1615 1353 1771"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</td> </tr> </tbody> </table> <p>⊙ If there are 2 or more chips, x is the total length of each chip.</p>	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	$x \leq 1/8a$	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	$x \leq 1/8a$	2.5
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
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z: Chip thickness	y: Chip width	x: Chip length																			
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$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$																			

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

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  $X * Y \leq 2\text{mm}^2$	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.	2.5
		12.2 No cracks on interface pin (OLB) of TCP.	0.65
		12.3 No contamination, solder residue or solder balls on product.	2.5
		12.4 The IC on the TCP may not be damaged, circuits.	2.5
		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.	2.5
		12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5
		12.7 Sealant on top of the ITO circuit has not hardened.	0.65
		12.8 Pin type must match type in specification sheet.	0.65
		12.9 LCD pin loose or missing pins.	0.65
		12.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		12.11 Product dimension and structure must conform to product specification sheet.	0.65

13. 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.

14. 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°C , 30 seconds Max. ;
 Connector soldering wave or hand soldering : 320°C , 10 seconds max.
- (3) Temp. curve of reflow, max. Temp. : 235±5°C ;
 Recommended customer's soldering temp. of connector : 280°C , 3 seconds.

15. 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 :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. View Direction :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Numbers of Dots :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. View Area :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Active Area :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. Operating Temperature :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Storage Temperature :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8. Others :	_____	

2 、 Mechanical Specification :

1. PCB Size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. Frame Size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Material of Frame :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. Connector Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Fix Hole Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. Backlight Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Thickness of PCB :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8. Height of Frame to PCB :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
9. Height of Module :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
10. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

3 、 Relative Hole Size :

1. Pitch of Connector :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. Hole size of Connector :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Mounting Hole size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. Mounting Hole Type :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

4 、 Backlight Specification :

1. B/L Type :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. B/L Color :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. B/L Driving Voltage (Reference for LED Type) :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. B/L Driving Current :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Brightness of B/L :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. B/L Solder Method :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

>> Go to page 2 <<

Module Number : _____

5 、 Electronic Characteristics of Module :

1.Input Voltage :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2.Supply Current :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3.Driving Voltage for LCD :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4.Contrast for LCD :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5.B/L Driving Method :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6.Negative Voltage Output :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7.Interface Function :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8.LCD Uniformity :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
9.ESD test :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
10.Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

6 、 Summary :

Sales signature : _____

Customer Signature : _____

Date : / /