Crystalfontz America, Inc.
12412 East Saltese Avenue
Spokane Valley, WA 99216

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(888) 206-9720

PRELIMINARY

Crystalfontz America, Inc.

SPECIFICATION

CUSTOMER   :

MODULE NO.:   **CFAX12864T-NFH**

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

ISSUED DATE:

Crystalfontz America, Inc.

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PRELIMINARY

1.Module Classification Information

CFA X   1 2 8 6 4 T－N F H
① ② ③ ④ ⑤⑥⑦

①	Brand：CRYSTALFONTZ AMERICA, INCORPORATED		
②	Display Type：H→Character Type, G→Graphic Type, **X→TAB Type**		
③	Display's logical dimensions: **128** pixels by **64** pixels		
④	Model variant: **T**		
⑤	Backlight Type：	**N→Without backlight**	P→LED, Bule
		B→EL, Blue green	A→LED, Amber
		D→EL, Green	R→LED, Red
		W→EL, White	O→LED, Orange
		F→CCFL, White	G→LED, Green
		Y→LED, Yellow Green	T→LED, White
⑥	LCD Mode：	B→TN Positive, Gray	T→FSTN Negative
		N→TN Negative,	
		G→STN Positive, Gray	
		Y→STN Positive, Yellow Green	
		M→STN Negative, Blue	
		F→FSTN Positive	
⑦	LCD Polarizer Type/ Temperature range/ View direction	A→Reflective, N.T, 6:00	**H→Transflective, W.T,6:00**
		D→Reflective, N.T, 12:00	K→Transflective, W.T,12:00
		G→Reflective, W. T, 6:00	C→Transmissive, N.T,6:00
		J→Reflective, W. T, 12:00	F→Transmissive, N.T,12:00
		B→Transflective, N.T,6:00	I→Transmissive, W. T, 6:00
		E→Transflective, N.T.12:00	L→Transmissive, W.T,12:00
⑧	Special Code	CB:	

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2.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.

3.General Specification

Item	Dimension	Unit
Number of Characters	128 x 64	—
Module dimension	34.0 x43.72 x1.6(MAX)	mm
View area	29.58x 17.98	mm
Active area	25.58x 15.98	mm
Dot size	0.23x 0.18	mm
Dot pitch	0.25 x 0.2	mm
LCD type	FSTN Positive Transflective (In LCD production, It will occur slightly color difference. We can only guarantee the same color in the same batch.)	
Duty	1/64	
View direction	6 o'clock	
Backlight Type	Without backlight	

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4.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	℃
Storage Temperature	T_{ST}	-30	—	+80	℃
Input Voltage	V_I	V_{SS}	—	V_{DD}	V
Supply Voltage For Logic	$V_{DD}-V_{SS}$	1.8	—	3.6	V
Supply Voltage For LCD	$V_{OUT}-V_{SS}$	6.0	—	14.2	V

5.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 LCD	$V_{DD}-V_{0UT}$	Ta=-20℃	—	—	—	V
		Ta=25℃	—	8.5	—	V
		Ta=70℃	—	—	—	V
Input High Volt.	V_{IH}	—	0.8 V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	V_{SS}	—	0.2 V_{DD}	V
Output High Volt.	V_{OH}	—	0.8 V_{DD}	—	V_{DD}	V
Output Low Volt.	V_{OL}	—	V_{SS}	—	0.2 V_{DD}	V
Supply Current	I_{DD}	V_{DD}=3.3V	0.18	0.18	0.18	mA

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6.<u>Optical Characteristics</u>

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	$(V)\,\theta$	CR≧2	30	—	60	deg
	$(H)\,\varphi$	CR≧2	-45	—	45	deg
Contrast Ratio	CR	—	—	5	—	—
Response Time	T rise	—	—	110	220	ms
	T fall	—	—	260	520	ms

6.1 Definitions

■**View Angles**

Z (Visual angle direction)

X

Y

■**Contrast Ratio**

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

Selected state

Non-selected state

Brightness (%)

Bs

Bns

Operating voltage for LCD driving

■**Response Time**

Nonselected Condition   Selected Condition   Nonselected Condition

Brightness

100 %

10 %

90 %

tr
Rise Time

td
Decay Time (fall time tf)
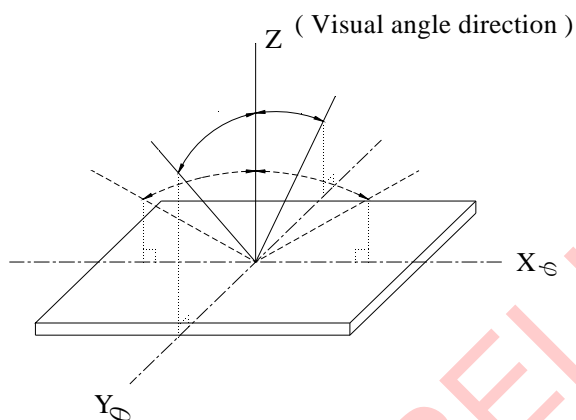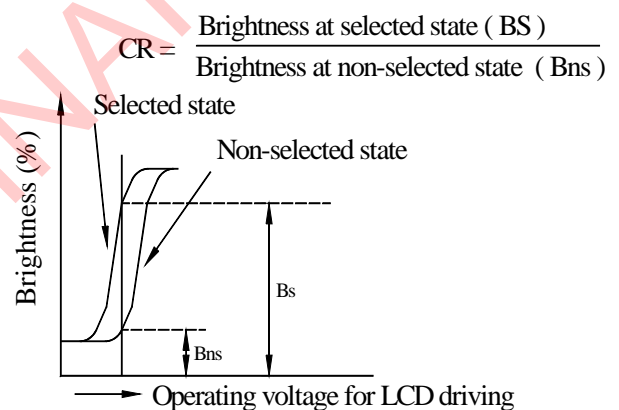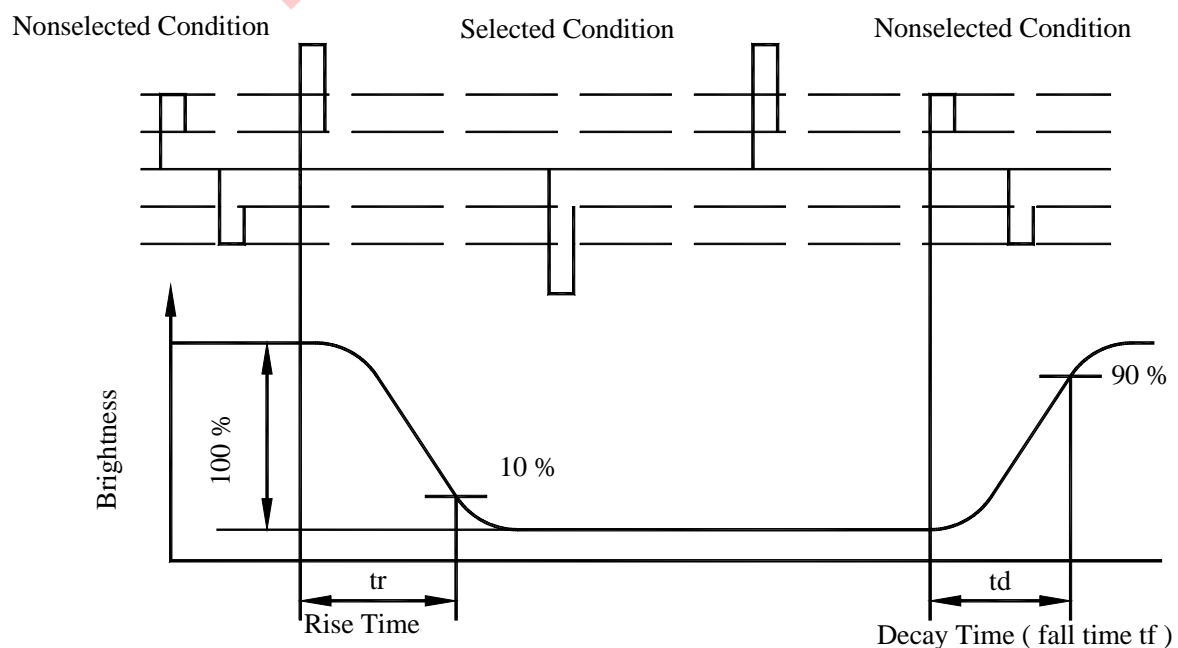
PRELIMINARY

7.Interface Description

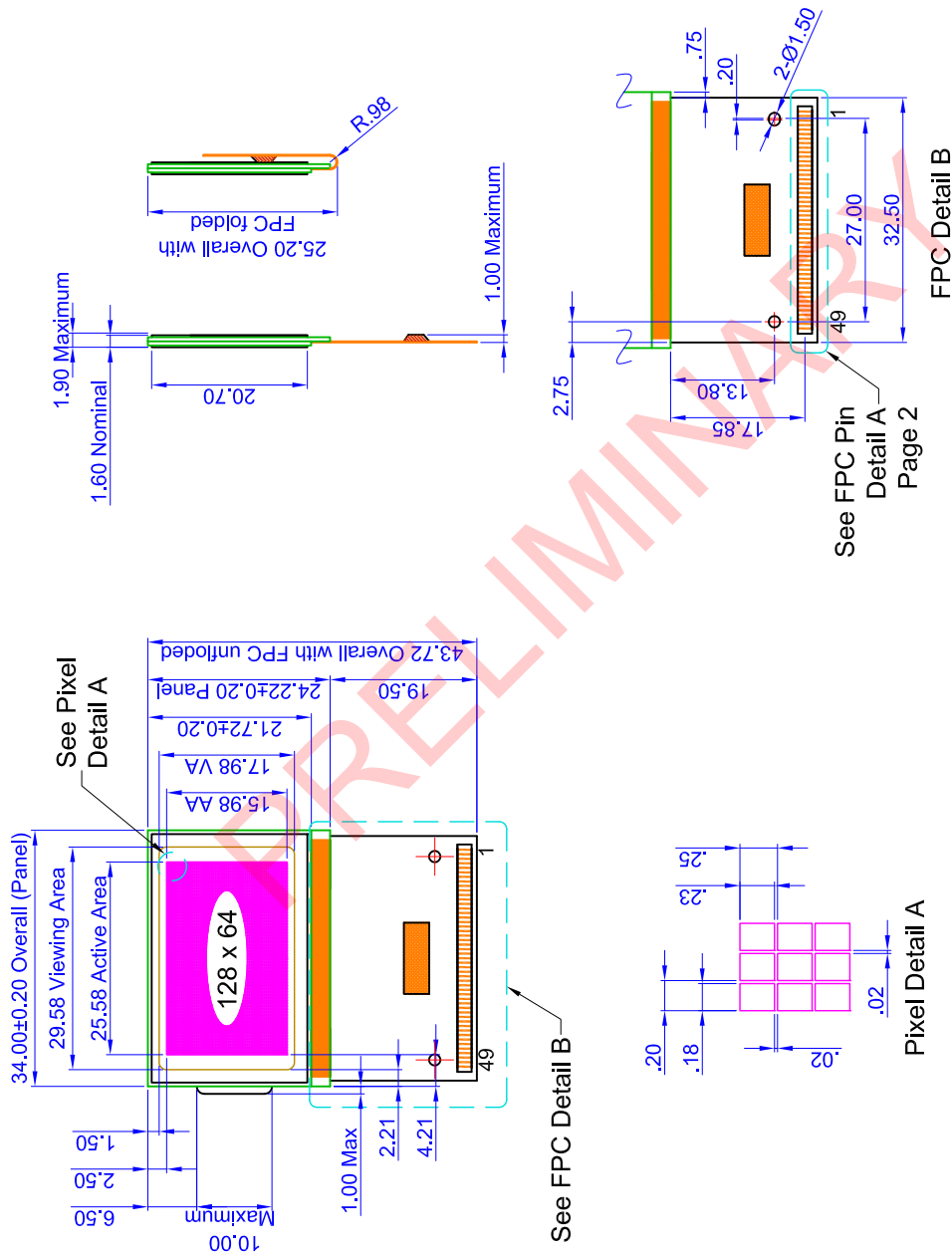| Pin No.	Symbol	I/O	Description
1	NC		No connection
2	IRS	I	This terminal selects the resistors for the V0 voltage level adjustment IRS = "H", Use the internal resistors IRS = "L", Do not use the internal resistors The V0 voltage level is regulated by an external resistive voltage divider attached to the VR terminal. This pad is enabled only when the master operation mode is selected. It is fixed to either "H" or "L" when the slave operation mode is selected
3	/HPM	I	This is the power control terminal for the power supply circuit for liquid crystal drive. /HPM = "H", Normal power mode /HPM = "L" ,High power mode This pad is enabled only when the master operation mode is selected and it is fixed to either "H" or "L" when the slave operation mode is selected.
4	P/S	I	This is the parallel data input/serial data input switch terminal P/S = "H": Parallel data input P/S = "L": Serial data input The following applies depending on the P/S status: | P/S	Data/Command	Data	Read/Write	Serial Clock
-----	--------------	------	------------	--------------
"H"	A0	D0 to D7	/RD, /WR	-
"L"	A0	SI (D7)	Write only	SCL (D6)	 When P/S = "L", fix D0~D5 pads to VDD or VSS level. /RD(E) and /WR (R/W) are fixed to either "H" or "L". With serial data input ,RAM display data reading is not supported.
5	C86	I	This is the MPU interface switch terminal C86 = "H":6800 Series MPU interface C86 = "L":8080 Series MPU interface
6	CLS	I	Terminal to select whether enable or disable the display clock internal oscillator circuit. CLS = "H": Internal oscillator circuit for display is enabled CLS = "L": Internal oscillator circuit for display is enabled (requires external input) When CLS = "L", input the display clock through the CL pad.
7	M/S	I	This terminal selects the master/slave operation for the NT7534 chips. Master operation outputs the timing signals that required for LCD display, while slave operation inputs the timing signals required for the liquid crystal display, synchronizing the liquid crystal display system.
8	VR	I	Voltage adjustment pad. Applies voltage between V0 and VSS using a resistive divider.
9	V0	I/O	LCD driver supplies voltages. The voltage determined by the LCD cell is impedance-converted by a resistive driver or an operation amplifier for application. Voltages should be according to the following
10	V4		
11	V3		

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12	V2		relationship:
			$V0 \geq V1 \geq V2 \geq V3 \geq V4 \geq VSS2$
13	V1		When the on-chip operating power circuit is on ,the following voltages are supplied to V1 to V4 by the on-chip power circuit. Voltages selection is performed by the LCD Bias Set command.
14	NC		No connection
15	NC		No connection
16	C2-	O	Capacitor 2-pad for internal DC/DC voltage converter.
17	C2+	O	Capacitor 2+pad for internal DC/DC voltage converter.
18	C1+		Capacitor 1+pad for internal DC/DC voltage converter.
19	C1-		Capacitor 1-pad for internal DC/DC voltage converter.
20	C3+		Capacitor 3+pad for internal DC/DC voltage converter.
21	NC		No connection
22	VOUT	I/O	DC/DC voltage converter output
23	VSS	O	Ground output for pad option.
24	VDD2	Supply	These are the power supply pads for the step-up voltage circuit for the LCD. These pads must be connected to each other.
25	VDD	O	Power supply output for pad option
26	DUTY1	I	Select the maximum LCD driver duty
27	DUTY0		
28	D7	I/O	This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus. When the serial interface is selected (P/S= "L"), then D7 serves as the serial data input terminal (SI) and D6 serves as the serial clock input terminal (SCL). When the serial interface is selected , fix D0~D5 pads to VDD or VSS level. When the chip select is inactive, D0 to D7 are set to high impedance.
29	D6		
30	D5		
31	D4		
32	D3		
33	D2		
34	D1		

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35	D0		
36	/RD	I	When connected to an 8080 MPU ,it is active LOW. This pad is connected to the /RD signal of the 8080 MPU ,and the NT7534 data bus is in an output status when this signal is "L". When connected to a 6800 Series MPU, this is active HIGH. This is used as an enable clock input of the 6800 series MPU
37	/WR	I	When connected to an 8080 MPU, this is active LOW . This terminal connects to the 8080 MPU, and the NT7534 data bus are latched at rising edge of the /WR signal. When connected to an 8080 MPU, this is the read/write control signal input terminal. When R/W= "H": Read When R/W= "L": Write
38	A0	I	This is connected to the least significant bit of the normal MPU address bus, and it determines whether the data bits are data or a command . A0="H": Indicate that D0 to D7 are display data A0="L": Indicate that D0 to D7 are control data
39	/RES	I	When /RES is set to "L" the settings are initialized. The reset operation is performed by the /RES signal level.
40	CS2	I	This is the chip select signal
41	/CS1		This is the chip select signal
42	NC		No connection
43	/DOF	I/O	This is the liquid crystal display blanking control terminal. M/S="H":output M/S= "L":Inptu When the NT7534chip is used in master/slave mode, the various DOF terminals must be connected.
44	CL		This is the display clock input terminal .When the NT7534 chips are used in master/slave mode ,the various CL terminals must be connected.
45	FR	I/O	This is the liquid crystal alternating current signal I/O terminal M/S="H":output M/S= "L":Inptut When the NT7534chip is used in master/slave mode, the various FR terminals must be connected.
46	NC		No connection
47	NC		No connection
48	NC		No connection
49	NC		No connection

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8.Contour Drawing

8. Contour Drawing ˙7cbH"

Pin Detail A

P0.60 X (49-1) = 28.80

W0.30

49

1.90

2.60

Ⓐ FPC Pin Detail

Pin Detail A

#	Signal
1	NC
2	IRS
3	HPM
4	PS
5	C86
6	CLS
7	MS
8	VR
9	V0
10	V4
11	V3
12	V2
13	V1
14	NC
15	NC
16	C2-
17	C2+
18	C1+
19	C1-
20	C3+
21	NC
22	V_{out}
23	GND
24	V_{DD2}
25	V_{DD}
26	DUTY1
27	DUTY0
28	D7
29	D6
30	D5
31	D4
32	D3
33	D2
34	D1
35	D0
36	$\overline{RD}_{8080}$ (E_{6800})
37	$\overline{WR}_{8080}$ (R/W_{6800})
38	D/C
39	$\overline{RST}$
40	CS2
41	$\overline{CS1}$
42	NC
43	$\overline{DOF}$
44	CL
45	FR
46	NC
47	NC
48	NC
49	NC

Note: 1. Tolerance is ±0.3 mm unless specified.
2. FPC = Flexible Printed Circuit.
3. Diagonal = 1.19".

Part No.(s): CFAX12864T-NFH

Scale:	Not to scale
Units:	Millimeters

Drawing Number: CFAX12864T_master
Date: 2010/03/11

Hardware Rev.: vA
Sheet: 2 of 2

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9. Fuction Description

Refer to <u>IC NT7534</u> data sheet

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10.RELIABILITY

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

Environmental Test			
Test Item	**Content of Test**	**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.	Total 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	____
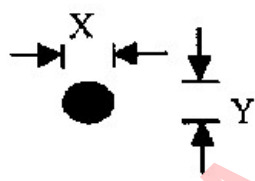
Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal

  Temperature and humidity after remove from the test chamber.
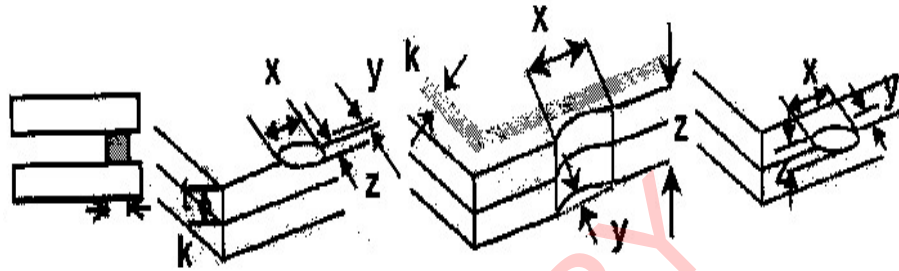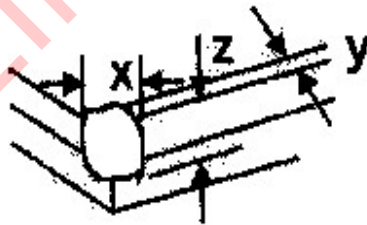
Note3: Vibration test will be conducted to the product itself without putting it in a container.
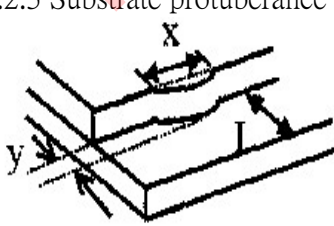
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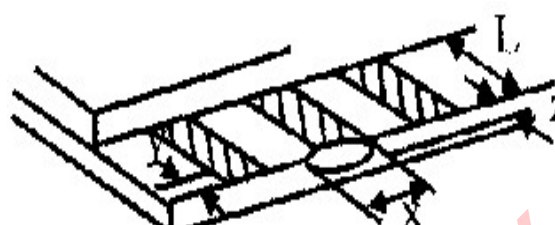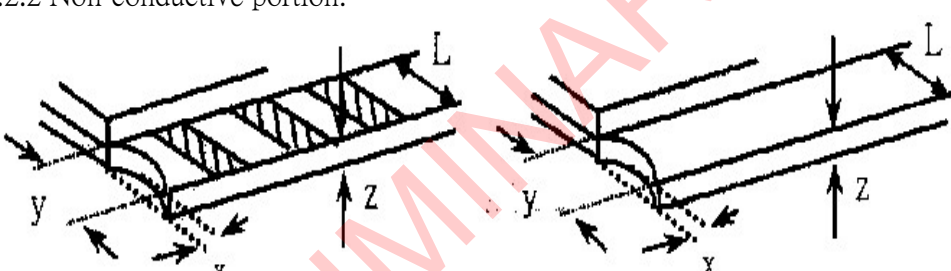
11. Inspection specification

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$0.25mm, no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5

3.1 Round type : As following drawing

$\Phi = (x + y) / 2$

SIZE	Acceptable Q TY
$\Phi \leq 0.10$	Accept no dense
$0.10 < \Phi \leq 0.20$	2
$0.20 < \Phi \leq 0.25$	1
$0.25 < \Phi$	0

Item 03: LCD black spots, white spots, contamination (non-display) — AQL 2.5

3.2 Line type : (As following drawing)

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

Item 04: Polarizer bubbles — AQL 2.5

If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.

Size Φ	Acceptable Q TY
$\Phi \leq 0.20$	Accept no dense
$0.20 < \Phi \leq 0.50$	3
$0.50 < \Phi \leq 1.00$	2
$1.00 < \Phi$	0
Total Q TY	3

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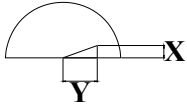| NO	Item	Criterion	AQL
05	Scratches	Follow NO.3 LCD black spots, white spots, contamination	
06	Chipped glass	Symbols Define: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length: 6.1 General glass chip : 6.1.1 Chip on panel surface and crack between panels: 6.1.2 Corner crack: 	2.5

6.1.1 table:

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

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

6.1.2 table:

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

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

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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 : See table below 6.2.2 Non-conductive portion: See table below ⊙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.	2.5

6.2.1 table:

y: Chip width	x: Chip length	z: Chip thickness
$y \leqq 0.5mm$	$x \leqq 1/8a$	$0 < z \leqq t$

6.2.2 table:

y: Chip width	x: Chip length	z: Chip thickness
$y \leqq L$	$x \leqq 1/8a$	$0 < z \leqq t$

6.2.3 table:

y: width	x: length
$y \leqq 1/3L$	$x \leqq a$

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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

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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

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12. Material List of Components for RoHS

1. Crystalfontz America, Inc. 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.