

LCD Open Cell Inspection Specification

Model No.: M215HJJ-P30

Customer :	EDOM
Approved by	

Approved By

Revision History

Version	Date	Page	Section	Description

Inspection Standards for LCD Modules

1. Description

These inspection standards shall be applied to LCD open cell supplied by INNOLUX Corporation.

This model is only used in ordinary monitor product, if it is used in other product applications, it still adopts this copy of specification. If there are any other product applications such as touch function, handwriting recognition, Industrial use, Medical use, Aerospace usage and so on, the specifications should be negotiated separately.

2. Open cell quality judgment

Open cell customer should set up 100% inspection (appearance and light-on) process before input production line. Quality responsibility would be divided by 100% inspection process (RA items could be excepted). Panel removed polarizer protective film regard as a WIP in customer production line and inspection process is finished.

- After 100% inspection process, Panel, Drive IC, Polarizer and PCBA material issue could be INX responsibility (customer analyzed first); appearance, functional, and handling issues should be customer's responsibility.
- Customer should be responsible to provide on-site verification environment, which include clean room and backlight modules.
- INX can reject to verify open cell issues from production line or field return, if it doesn't pack and protect properly. A proper package means INX original package or a package passed transportation reliability tests.
- If the defect responsibility is customer, Customer should take responsible for this, INX don't need RMA.

Notes:

(1) About appearance defect:

- a) For TFT polarizer scratch: If the upper protective film (TFT side) was not removed at all =>INX responsibility.
If the upper protective film (TFT side) was removed any area =>Customer responsibility.
- b) For CF polarizer scratch: If the upper protective film (CF side) was not removed (Judge by a palm area) =>INX responsibility.
If the upper protective film (CF side) was removed (Judge by a palm area) =>Customer responsibility.
- c) COG broken:
If COG broken is found at 100% inspection process =>INX responsibility.
If COG broken is found at assembly or final inspection station =>Customer responsibility.

d) TAB blemish:

If TAB blemish is found at 100% inspection process =>INX responsibility.

If TAB blemish is found at assembly or final inspection station =>Customer responsibility.

3.The environmental condition of inspection

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

- (1) Ambient temperature : 15~25°C
- (2) Humidity: 25~75 %RH
- (3) External appearance inspection shall be conducted by using a single 20W fluorescent lamp or equivalent illumination.
- (4) Panel visual inspection on the operation condition for cosmetic shall be conducted at the distance 35cm or more between the LCD module and eyes of inspector. And, the viewing angle shall be 90 degree to the front surface of display panel.

Ambient Illumination: 400 ~ 600 Lux for external appearance inspection

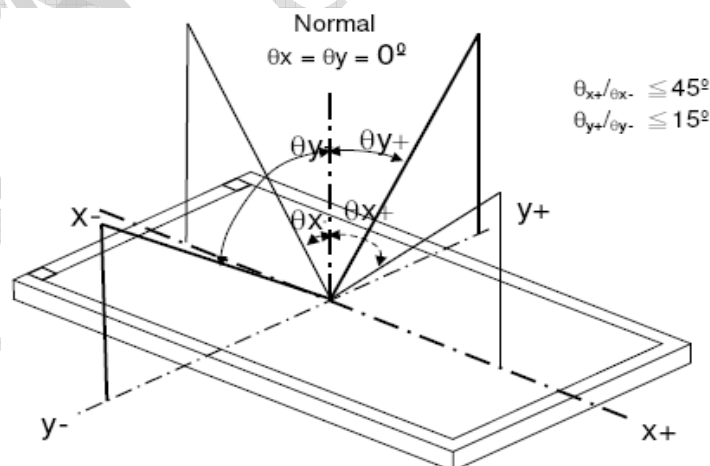
Ambient Illumination: 100 ~ 200 Lux for light on inspection

(5) Using method for ND Filter

When using ND Filter for judging Mura, placing ND Filter near Mura defect and get close to the surface of LCD Panel (its distance shall be 3~5cm between the surface of panel and ND Filter.) for 2~3sec. Don't touch the surface of polarizer to avoid scratching polarizer, and then move to the Defect position to judge mura by view angle 90 degree (The viewing angle shall be 90 degree to the right top of Mura defect with panel.)

(6) The viewing angle:

- a) ± 15 degree to the front surface of display panel in vertical direction.
- b) ± 45 degree to the front surface of display panel in horizontal direction.



(7) MNT Open Cell lighted on with BackLight, its luminance value should be between the following:

(The brightness of panel central point under white pattern)

Size < 28" : 200~250 nits

Size \geq 28" : 250~300 nits

4. Classification of defects

Defects are classified two types, major defect and minor defect according to the defect. And, the definition of defects is classified as below.

(1) Major defect

Any defect may result in functional failure, or reduce the usability of product for its purpose. For example, electrical failure, deformation and etc.

(2) Minor defect

A defect that is not to reduce the usability of product for its intended purpose and un-uniformity, dot defect and etc.

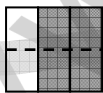
The criteria on major and/or minor judgement will be according with the classification of defects.

5. Inspection Criteria

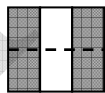
(1) Definition of dot defect induced from the panel inside

- The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
- Bright dot: Dots appear bright and unchanged in size in which module is displaying under black pattern.
- Dark dot: Dots appear dark and unchanged in size in which module is displaying under pure red, green, blue picture.
- 2 dot adjacent = 1 pair = 2 dots

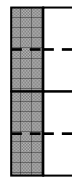
Picture:



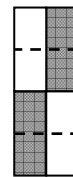
2 dot adjacent



2 dot adjacent



2 dot adjacent (vertical)



2 dot adjacent (slant)

(2) Display Inspection

Items		Acceptable count
Bright dot	Random	$N \leq 0$
	2 dots adjacent	$N \leq 0$

	3 dots adjacent or more	$N \leq 0$
Dark dot	Random	$N \leq 3$
	2 dots adjacent	$N \leq 1$
	3 dots adjacent or more	$N \leq 0$
Distance	Minimum Distance Between Bright dots	$L \geq 10\text{mm}$
	Minimum Distance Between Dark dots	$L \geq 10\text{mm}$
Total bright and dark dot		$N \leq 3$
Slight Bright dot ($\leq 1/2$ dot)		$N \leq 15$ (visual at 30~35cm from eyes to display)
Display failure (V-line/H-line/Cross line etc.)		Not allowable
Mura	Not visible through 8% ND filter in 50% gray pattern or judge by limit sample if necessary	
CF Peel Off	Follow Bright dot (Slight Bright dot) specifications.	
Half-moon gap	Follow MURA Item specifications.	

Notes:

(1) When the defect was spot by visual ,it should used the spec of spot.

(3) Appearance inspection

Item	Standards
Panel Crack	Not allowable. It is shown in Fig. 1.
Broken CF/Non-Lead Side of TFT	Min. distance between the broken and dot area, $d_1 \geq 2.0\text{mm}$, is ignored; $d_1 < 2.0\text{mm}$, $N \leq 0$; L is ignored It is shown in Fig. 2.
Broken of TFT Lead Side	$W \leq 0.8 \text{ mm}$, It is shown in Fig.3.
Corner Broken of TFT Lead Side	The second cross mark can't been damaged. It is shown in Fig. 4.
Burr of TFT/CF Edge	The distance of burr from the edge of TFT /CF, $d_2 \leq 0.2\text{mm}$. It is shown in Fig. 5.
Foreign Spot(Black/White/Bright)	$0.15 < D \leq 0.5 \text{ mm}$, $N \leq 4$, It is shown in Fig. 6.
Foreign Lint(Black/White/Bright)	$0.05 < W \leq 0.1 \text{ mm}$, $0.5 < L \leq 5.0 \text{ mm}$, $N \leq 4$, It is shown in Fig. 7.

Polarizer Scratches	$0.05 < W \leq 0.1 \text{ mm}$, $0.5 < L \leq 10.0 \text{ mm}$, $N \leq 4$
Dent/Air Bubble	Avg. $0.15 < D \leq 0.5 \text{ mm}$, $N \leq 6$
Corner Broken	$L \leq 3 \text{ mm}$, $W \leq 2 \text{ mm}$ It is shown in Fig. 8.
PCBA Components	External appearance is ignored
COF	External appearance is ignored
Silicone spread	External appearance is ignored
Polarizer Protective Film	Neglect any defect on the Polarizer Protective Film, such as protective film scratches, protective film bubbles, and particles on protective film.

Notes:

- (1) d_1 : Minimum distance between the broken and dot area
- (2) d_2 : The distance of burr from the edge of TFT/CF
- (3) W: Width
- (4) L: Length
- (5) D: Average Diameter
- (6) N: Count
- (7) All the angle of the broken must be larger than 90° . It is shown in Fig. 9 ($R > 90^\circ$).
- (8) When the defect was spot by visual, it should used the spec of spot.

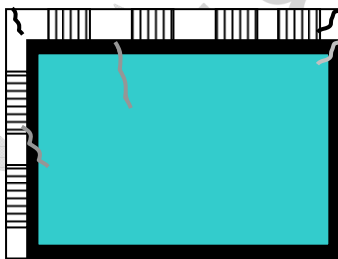


Fig 1

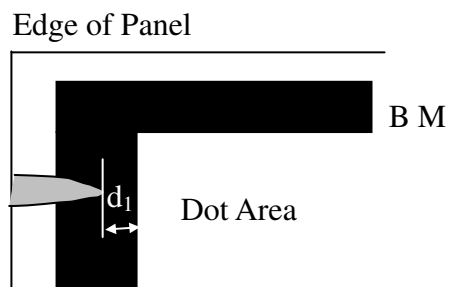


Fig 2

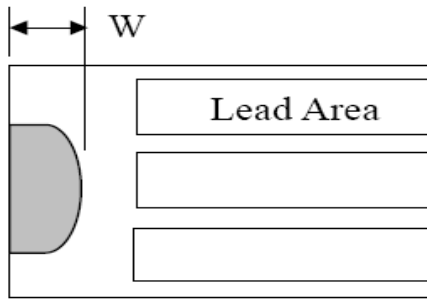


Fig 3

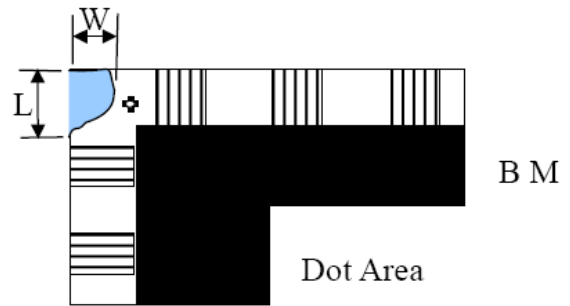


Fig 4

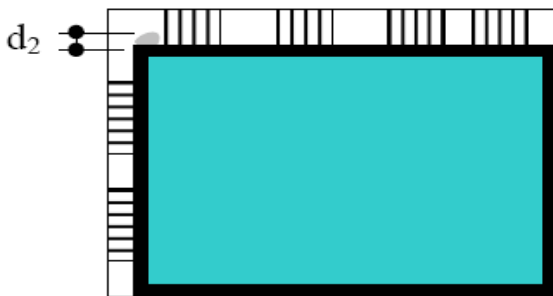
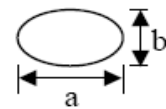
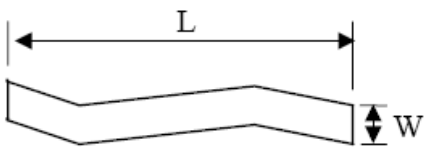


Fig 5



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

Fig 6



W: width, L: length

Fig 7

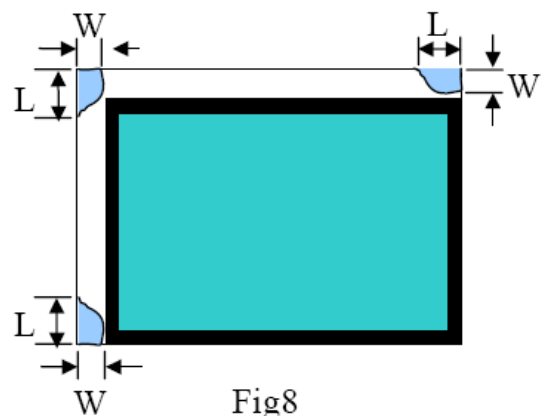


Fig 8

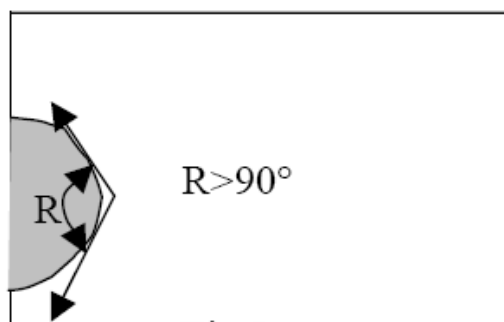


Fig 9

5. Classification of defects

Inspection Item	Criteria and Description	Defect type
Vertical line	Signal input, vertical line off or abnormal V-line appears	Major
Horizontal line	Signal input, horizontal line off or abnormal H-line appears	Major
Cross line	Pattern signal input, a correct display is not obtained	Major
No display	Signal input, display is dead	Major
Abnormal display	Pattern signal input, a correct display is not obtained	Major
Dots defect	Exceed specified standards	Minor
Foreign material	Exceed specified standards	Minor
Mura	Not visible through 8% ND filter in 50% gray pattern or judge by limit sample if necessary	Minor
External Appearance	A appearance defect that do not affect function or performance	Minor
Polarizer bubble	Exceed specified standards	Minor