# AU OPTRONICS CORPORATION

## Specification for Approval
## INCOMING INSPECTION STANDARD FOR 24.0" TFT-LCD MODULES (A grade)

## Model Name: G240UAN Series

| Approved By | Prepared By |
|---|---|
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**General Display Business Unit/AU Optronics**

| Customer | Checked and Approved by |
|---|---|
| | |



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| Revision History | | | | |
|---|---|---|---|---|
| **Rev.** | **Date** | **Page** | **Old Inspection Spec** | **New Inspection Spec** |
| 0 | 2016.Oct. 3rd | All | | Preliminary Specification |
| 1 | 2017.Oct. 2nd | All | | Specification for Approval |
| 2 | 2018.Feb. 21st | 4 | Bright dot ≦1 | Bright dot ≦0 |
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(Note 1) The revised inspection criteria is effective before the expiration of the IIS as specified



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**1. Scope:**

1.1 The incoming inspection standards shall be applied to TFT-LCD Modules (hereinafter called ""Modules"") that supplied by AU Optronics Corporation (hereinafter called ""seller"").

1.2 Specifications contains

- Electrical inspection specification
- Appearance specification
- Outside dimension specification

**2. Incoming inspection:**

The buyer (customer) shall inspect the modules within twenty calendar days since the delivery date (the ""inspection period"" ) at its own cost. The results of the inspection (acceptance or rejection) shall be recorded in writing, and a copy of this writing will be promptly sent to the seller.

The buyer may, under commercially reasonable reject procedures, reject an entire lot in the delivery involved. Within the inspection period,if the samples of modules within a lot show a number of unacceptable defects in accordance with this incoming inspection standards, the buyer must notify the seller in writing of any such rejection promptly, and not later than within three business days in the end of the inspection period.

Should the buyer fail to notify the seller within the inspection period, the buyer''s right to reject the modules shall be lapsed and the modules shall be deemed to have been accepted by the buyer.

**3. Inspection sampling method:**

Unless otherwise agree in writing, the method of incoming inspection shall be based on MIL-STD-105E.

3.1 Lot size: Quantity per shipment lot per model.

3.2 Sampling type: Normal inspection, single sampling.

3.3 Sampling level: Level II.

3.4 Acceptable quality level (AQL):

Major defect: AQL=1.0%.

Minor defect: AQL=2.5%.

**4. Inspection instruments:**

4.1 Pattern generator: LD-2000 or equivalent model.

4.2 Video board: AU video board or equivalent. The output of the signal should comply with the specification provided by AU.

4.3 Luminance colorimeter: Topcon BM-7 or equivalent model

**5. Inspection environment conditions:**

5.1 Room temperature : **20 ~ 25** C.

5.2 Humidity: **65±5**% RH.

5.3 Illumination: Fluorescent light (Day-Light Type) display surface illumination to be **300 ~ 700** lux. (standard **500** lux.)

5.4 To be a distance about **35 ± 5** cm in front of LCD unit and view angle should be **± 40°.**

5.5 White luminance set as 600cd/m2 when operating inspection.



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5.5 Take off the protector of polarizer while judging the display area

5.6 If there is any question while judging, check the panel again while operating

**6. Classification of defects:**

Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

**Major defects:**

A major defect is a defect that is likely to result in failure, or to reduce materially the usability of the product for its intended purpose.

**Minor defects:**

A minor defect is either a defect that is not likely to reduce materially the usability of the product for its intended purpose, or a departure from an intended purpose with little bearing on the effective use or operation of the product.

6.1 Electrical inspection specification:

| Inspection Item | Specification | |
|---|---|---|
| Line defect | Not allowed | |
| Bright dots | ≦0 dot (note 1~3) | |
| Dark dots | ≦4 dots | |
| Total dots defect | ≦4 dots | |
| Continuous defect | Two continuous bright dots : | Not allowed |
| | Over three continuous bright dots (vertical, horizontal, oblique) : | Not allowed |
| | Two continuous dark dots (vertical, horizontal, oblique) : | ≦2 pairs |
| | Over three continuous dark dots (vertical, horizontal, oblique) : | Not allowed |
| | Two continuous dark dots and bright dots (vertical, horizontal, oblique) : | Not allowed |
| | Over three continuous dots (vertical, horizontal, oblique) : | Not allowed |
| | Distance between 2 Bright dots : | NA |
| | Distance between 2 Dark dots : | ≥ 15 mm |
| | Distance between Dark dot and Bright Dot : | ≥ 15 mm |
| Mura | Use 5% ND filter or judged by equivalent limit sample (note 6) | |

Note 1) A dot defect is defined as the defective size larger than 1/2 area of a sub-pixel. A small dot defect, defined as the defective size equal or smaller than 1/2 area of a sub-pixel, should be ignored. (Fig.1).



Fig.1

Note 2) Bright dot judgment criteria : visible through 10% ND filter → refer to 6.1 table
invisible through 10% ND filter → N≦10.

Press dot should be ignored if it will disappear after releasing external pressure.



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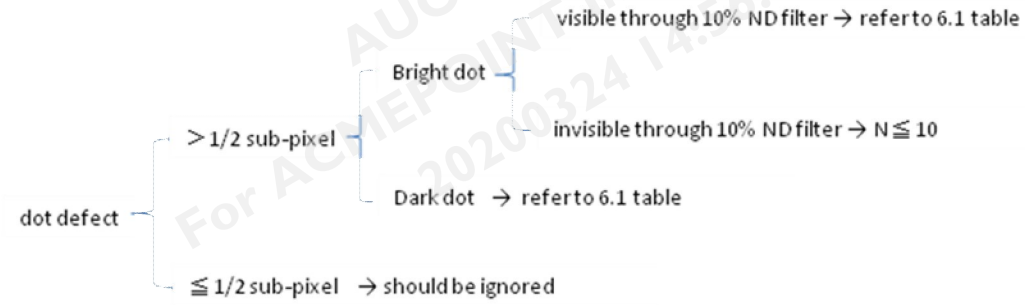



Note 3) Adjacent-dot defect should be observed under the same display pattern in any one of Black/Green/Blue/Red pattern. (Please refer to Note 5).

*Inspection pattern: Standard inspection patterns of dot defect are listed below. AU uses these patterns as standard criteria for judging dot defect. Please inform AU if any other pattern is to be used to examine dot defect.

| **Test Pattern** | **Defect** |
|---|---|
| Full Black | For bright dot(s) |
| Full White | For dark dot(s) |
| Monotone Red /Green /Blue | For bright and dark dot(s) |
| L92 Gray | non-uniformity display or Mura |

Note 4) In three (or more) adjacent dot defect, for any 3rd dot that adjacent to 2 continuous defective dots (can be of any combination of bright dots and dark dots), the 3rd dot, no matter how large it may be, should be viewed as a dot.

Note 5) Defect criteria diagram

5-1) Adjacent Dot defect diagram:

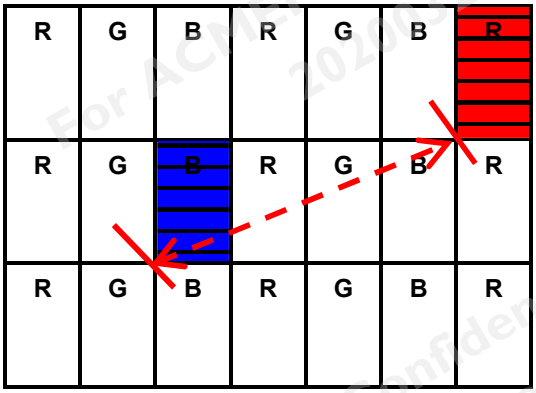
Adjacent-dot defect : refer to Figure 2, dot 1,2,..,8 around A are all A's adjacent dots




Fig.2

5-2) Definition of distance between defect dots as following:

Fig.3




A: Distance between defect dots

Defect Dot

Note 6) Unless otherwise specified by written document or limit samples, Mura (display un-uniformity) should



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inspected under the ND filter and shall be accepted when it is invisible 5% ND filter is applied.

ND filter use method: The inspection method of ND Filter - holding ND filter in front of the panel around 5 cm and examine the panel from **35±5** cm in the front view for **3** seconds. (Fig.4)

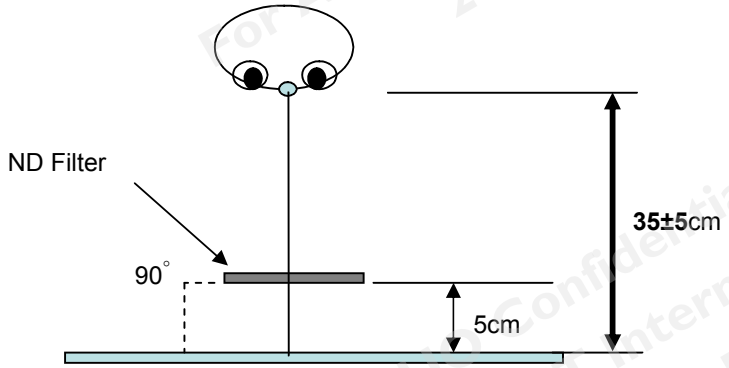


Fig.4

6.2 Scratches, dent, extraneous substances and Appearance inspection specification.

| Judge area | Judge item | | Inspection specification | | Judge criterion | |
|---|---|---|---|---|---|---|
| | | | | | Major | Minor |
| Active area | Particles on the polarizer | Circular | **Average diameter: D (mm)** | **Numbers** | | ○ |
| | | | D≦0.20 | Disregarded | | |
| | | | 0.20＜D≦0.50 | n≦3 | | |
| | | | 0.50＜D | n＝0 | | |
| | | Linear | **Width: W (mm)**<br>**Length: L (mm)** | **Numbers** | | ○ |
| | | | W≦0.07 or L≦ 0.3 | Disregarded | | |
| | | | 0.07＜W≦0.10mm, 0.3＜L≦2.0 | n≦3 | | |
| | | | 0.10＜W or 2.0＜L | n＝0 | | |
| | Scratch/Dent on the polarizer | Circular | **Average diameter: D (mm)** | **Numbers** | | ○ |
| | | | D≦0.15 | Disregarded | | |
| | | | 0.15＜D≦0.30 | n≦4 | | |
| | | | 0.30＜D | n＝0 | | |
| | | Linear | **Width: W (mm)**<br>**Length: L (mm)** | **Numbers** | | ○ |
| | | | W≦0.05 and L≦ 2.0 | Disregarded | | |
| | | | 0.05＜W or 2.0＜L | n＝0 | | |
| | Bubble on the polarizer | Circular | **Average diameter: D (mm)** | **Numbers** | | ○ |
| | | | D≦0.50 | n≦4 | | |
| | | | 0.50＜D | n＝0 | | |
| | Extraneous substances | Circular | **Average diameter: D (mm)** | **Numbers** | | ○ |
| | | | D≦0.20 | Disregarded | | |
| | | | 0.20＜D≦0.50 | n≦3 | | |
| | | | 0.50＜D | n＝0 | | |



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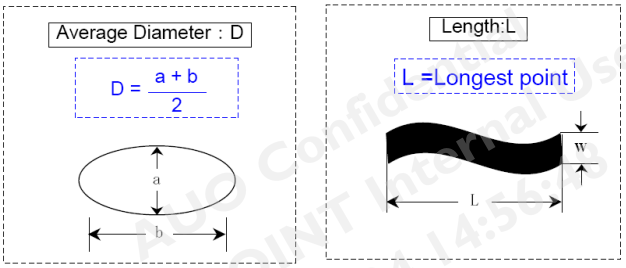
| | | | | | | |
|---|---|---|---|---|---|---|
| | | Linear | **Width: W (mm)**<br>**Length: L (mm)** | **Numbers** | | ○ |
| | | | W≦0.07 or L≦ 0.3 | Disregarded | | |
| | | | 0.07＜W≦0.10mm, 0.3＜L≦2.0 | n≦3 | | |
| | | | 0.10＜W or 2.0＜L | n＝0 | | |
| From Active area outside 0.3mm | The end of polarizer | | The defect can't be seen ,from active area outside 0.3mm | | | ○ |
| Bezel | Gap between front bezel and Polarizer on all sides | | W ≦ 1.50mm | | | ○ |
| | Scratches, Wrap and Sunken | | No harm, dangerous | | | ○ |
| | Assembly Fail | | Not allowed | | ○ | |
| | Color Difference | | Allowed (No harm, dangerous) | | | ○ |
| Label (S/N, B/L, WEEK) | No label | | Not allowed | | ○ | |
| | Invert label | | | | ○ | |
| | Content Error | | | | ○ | |
| | Dirt | | Word can be read. Barcode can be scanned. | | | ○ |
| | Not clear | | | | | ○ |
| | Word out of shape | | | | | ○ |
| | Broken | | | | | ○ |
| | Crease | | | | | ○ |
| | Label overlapping | | | | | ○ |
| | Position | | Be attached on right position | | | ○ |
| Screw | Not enough (Q'ty) | | Not allowed | | ○ | |
| | Loose | | Not allowed | | ○ | |
| Connector | Appearance | | No broken, rising, deformation | | ○ | |

Note 1 : Extraneous substances which can be wiped out, such as fingerprint and particles are not considered as a defect.

Note 2 : Defects on the Black Matrix (outside Active Area 0.3mm) are not considered as a defect.

Note 3 : Defect size definition: (Unit:mm). When L≧2W, defect count as liner defect.

**D: Average Diameter; L: Length W: Width**



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**7. Inspection judgement:**

7.1 The judgement of the shipped lot (acceptance or rejection) should follow the sampling plan of ANSI/ASQL Z1.4-2003, single sampling, normal inspection, level II.

7.2 If the number of defects is equal to or less than the applicable acceptance level, the lot shall be accepted.

7.3 If the number of defects is more than the applicable acceptance level, the lot shall be rejected and the buyer should inform the seller of the result of incoming inspection in writing.

**8. Precaution:**

Please pay attention to the following items when you use the LCD Module with back-light unit.

1. Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.
2. Adopt measures in adequately ventilated environment. Be sure to use the module in the specified temperature range.
3. Avoid dust or oil mist during assembly.
4. Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.
5. Try to avoid the electrical magnetic interference, and it will be more safety and less noise.
6. Please operate module in suitable temperature. The response time & brightness will drift by different temperature.
7. Avoid displaying the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image sticking.
8. Be sure to turn off the power when connecting or disconnecting the circuit.
9. Display surface Polarizer scratches easily, please avoid dirt and stains carefully.
10. A dewdrop may lead to destruction. Please wipe off any moisture before using module.
11. Sudden temperature changes cause condensation, and it will cause polarizer damaged.
12. High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.
13. Avoid any acid or chlorine compounds, which are harmful to the LCD module.
14. Static electricity will damage the modules; please do not touch the module without any grounded device connected.
15. Do not disassemble and reassemble the module by self.
16. Do not touch the rear side directly to avoid the electrical shock by the backlight high voltage.
17. Avoid strong vibration or shock. or it will cause the module broken.
18. Store the modules in suitable environment with regular packing.
19. Be careful of injury from a broken display module. Please avoid the pressure adding to the surface (front or rear side) of modules, because it will cause the non-uniformity or other function issue to display.
20. Please softly tear the sticking tape of protective film to prevent bezel out of shape and un-uniformity display.

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