

New Vision Display

PRODUCT SPECIFICATION

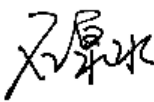
12.3" CTP & 1920RGB x 720 TFT

RFQ NUMBER:-

MODEL NUMBER: 1P.NVDA-TM2118SA123L-03

Rev: 01

CUSTOMER P/N:-

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Revision History

| Revision | Date | Originator | Detail | Remarks |
|----------|------------|------------|-------------|---------|
| 01 | 2020/07/20 | Long Huang | First Issue | |
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Note: All parameters and dimensions in this specification are subject to change and will be confirmed once the program is awarded and kicked-off at New Vision Display.

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1. General Description

This display module consists of a 12.3 inch 1920 RGB x 720, TFT a-Si Active Matrix Color LCD that is electronically and mechanically integrated. The TFT display is capable of displaying 16.7M colors. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes.

The product consists with a full x-y mutual capacitance touch panel with associated controller, true multi-touch function is supported. The touch panel is one glass structure with an optical bonded hardened glass lens. The complete LCD and touch sensor assembly shall be RoHS compliant.

The projected capacitive touch technology applied to this product is an ITO-based touch technology. It consists of a glass substrate layer with ITO coating patterned. During a touch, the capacitance of the finger changes the capacitive coupling between the grid elements on the location of the touch. This location is calculated from the change in electrical characteristics of the sensor grid. Mathematical processing, programmed in the Touch Controller chip, is used to recognize this distortion. Capacitive sensors can be touched with a bare finger, thin glove or a conductive device being held by a bare hand. They are not affected by outside elements and have high clarity.

2. General Parameters

2.1. Module Parameter

| Features | Details | Unit |
|-------------------------------|--------------------------------|----------|
| Display Size(Diagonal) | 12.3" | Inch |
| LCD type | α-Si TFT | |
| Display Mode | Normally Black | |
| Resolution | 1920 RGB(H) x 720(V) | Portrait |
| View Direction | Viewing angle free | |
| Grayscale Inversion Direction | N/A | |
| Module Outline | 330.40(H) x 146.20(V) (Note1) | mm |
| Active Area | 292.03(H) x 109.51(V) | mm |
| Pixel Size | 0.1521(H) x0.1521(V) | mm |
| Pixel Arrangement | RGB Vertical Stripe | |
| Polarizer Surface Treatment | Anti-Glare | |
| Display Colors | 16.7M | |
| Driver IC | - | |
| Interface | Two Port LVDS | |
| Operating Temperature | -30 ~ 85 | °C |
| Storage Temperature | -40 ~ 90 | °C |
| Weight | TBD | g |

Note 1: Excluding hooks, posts, FPC/FPC tail etc.

2.2. Touch Panel Parameter

| Features | Details | Notes |
|--------------------------------|---------------------------------------|-----------------------------|
| Display Size(Diagonal) | 12.3 | Unit: Inch |
| Operation Technology | Projected capacitive | -- |
| Input Method | Bare or gloved finger | -- |
| Number of simultaneous touches | 10 | Points |
| Touch controller | mXT1189T-AT | Atmel |
| Interface to Host | I2C | Maximum bus speed 400KHz |
| I2C address | 0X4A | -- |
| Surface Treatment | AG, AF | -- |
| Optical Transmittance | >85% | -- |
| Haze | 7±2% | -- |
| Life of touches | >10million over lifetime | With correct input method |
| Connection Type | ZIF connector | -- |
| FG Weight | TBD | g |
| Config/Firmware Version | TBD | -- |
| RoHS Compliance | Yes | SJ/T 11363-2006 (China) |
| Resolution | 1920*720 | Origin (0,0) is on left-top |
| Response Time/Speed | <15ms | -- |
| Min. spacing between 2 touches | 18 | Unit: mm |
| Positional Accuracy | ± 2.0mm at edge and ± 1.5mm at centre | Unit: mm |
| Minimum Touch Area | 30 | Unit: mm ² |
| Minimum Touch Pressure | 0 | Unit: N |
| Linearity | ≤3% | -- |

3. Absolute Maximum Ratings

3.1. TFT IC parameter

| Item | Symbol | Min. | Max. | Unit |
|----------------|--------|------|------|------|
| supply voltage | VCC | -0.3 | 3.6 | V |

Note: GND=0V, Ta=25°C

3.2. Touch panel controller Parameter

| Item | Symbol | Rating | Unit |
|------------------------|--------|--------------|------|
| Digital supply voltage | VDD | -0.3 to +3.6 | V |
| Analog supply voltage | AVDD | -0.3 to +3.6 | V |
| I/O supply voltage | VDDIO | -0.3 to +3.6 | V |

Note: GND=0V, Ta=25°C

4. DC Characteristics

4.1. TFT display DC characteristics

Ta=25 °C

| Item | Symbol | Min. | Typ. | Max. | Unit |
|--------------------------|---------------------|------|------|------|------|
| supply voltage | VCC | 3.0 | 3.3 | 3.6 | V |
| Logic Low input voltage | V _{IL} | -100 | - | | mV |
| Logic High input voltage | V _{IH} | | - | 100 | mV |
| Operating current | I _{VCC} | - | | TBD | mA |
| Sleep in current | I _{VCCSLP} | - | | TBD | uA |
| Frame Frequency | f _{FR} | - | 60 | - | HZ |

Note1: test condition is all on the still pattern and Ta is 25°C, Vcc=3.3V.

4.2. CAP TP control IC characteristics

| Parameter | Description | Min. | Typ. | Max. | Units | Notes |
|-----------|-------------------------|----------|------|----------|-------|-------|
| VDD | supply voltage | 3.14 | 3.3 | 3.47 | V | - |
| VDDIO | I/O supply voltage | 1.81 | 3.3 | 3.47 | V | - |
| Vil | Low input logic level | -0.3 | - | 0.3VDDIO | V | - |
| Vih | High input logic level | 0.7VDDIO | - | VDDIO | V | - |
| Vol | Low output logic level | 0 | - | 0.2VDDIO | V | - |
| Voh | High output logic level | 0.8VDD | - | VDDIO | V | - |

4.3. Backlight Characteristic

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|-------------------------------------|--|-----------------------------------|-------|-----|-------|------|
| Forward Voltage | V _f | Ta=25 °C, IF=320mA/LED | - | - | 37.4 | V |
| Forward Current | I _f | Ta=25 °C | - | 320 | -- | mA |
| Reverse Voltage | V _R | - | - | - | - | V |
| Power dissipation | P _d | Ta=25 °C | - | - | 11968 | mW |
| LED Life Time (50% Degradation) | LT | Ta=25 °C , IF=320mA 50+/-20%RH | 30000 | - | - | hr |
| Drive method | Constant current 320mA | | | | | |
| LED Configuration | 44 White LED ,11 in series ,4 string in Parallel | | | | | |

Note: (1) Test condition Ta=25°C.

(2)LED temperature current curve, The temperature at 70 degrees before the output Duty 100%,70 degrees to 85 degrees when the linear drop to Duty40%.

5. Optical Characteristics

The optical specification is valid for optimized LCD drive voltage, room temperature and the recommended initialization setting unless otherwise stated under the respective section.

5.1. Optical Characteristics

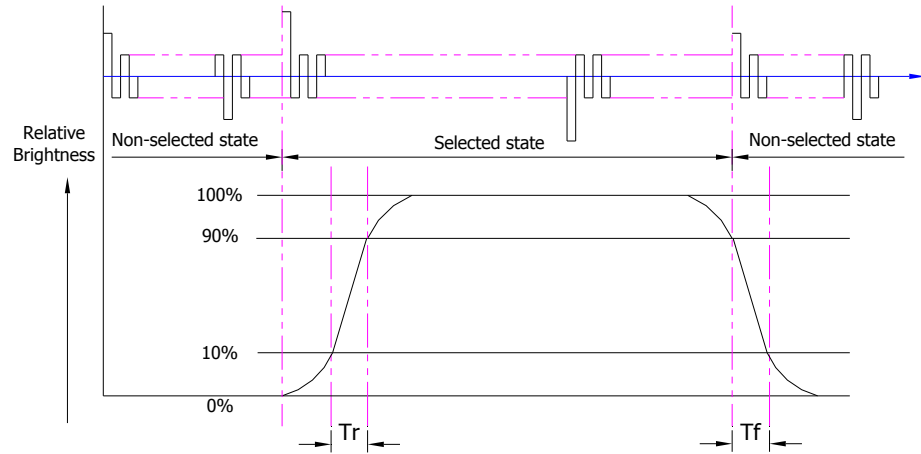
Ta=25°C, Vcc=3.30V

| | Item | Symbol | Condition | Specification | | | Unit | |
|----------------------------------|--|---------------|--|---------------|------|------|-------------------|------|
| | | | | Min. | Typ. | Max. | | |
| Backlight On (Transmissive Mode) | Surface Luminance (On TP Lens Surface, $I_f=320\text{mA}$) (See 5.6) | L_v | $\theta=0^\circ$ Normal viewing angle | 550 | 700 | | cd/m ² | |
| | Contrast ratio(See 5.3) | CR | | 1100 | 1400 | - | | |
| | Response time (See 5.2) | T_{R+TF} | 25 °C | | 25 | 30 | ms | |
| | | T_{R+TF} | -20 °C | | 170 | 250 | ms | |
| | | T_{R+TF} | -30 °C | | 400 | 450 | ms | |
| | Chromaticity Transmissive (See 5.5) | Red | X_R | Center CR≥10 | TBD | TBD | TBD | |
| | | | Y_R | | TBD | TBD | TBD | |
| | | Green | X_G | | TBD | TBD | TBD | |
| | | | Y_G | | TBD | TBD | TBD | |
| | | Blue | X_B | | TBD | TBD | TBD | |
| | | | Y_B | | TBD | TBD | TBD | |
| | White | X_W | TBD | TBD | TBD | | | |
| | | Y_W | TBD | TBD | TBD | | | |
| | Viewing Angle (See 5.4) | Horizontal | θ_{x+} | Center CR≥10 | 80 | 85 | - | Deg. |
| | | | θ_{x-} | | 80 | 85 | - | |
| Vertical | | θ_{y+} | 80 | | 85 | - | | |
| | | θ_{y-} | 80 | | 85 | - | | |
| | NTSC Ratio(Gamut) | - | | - | TBD | - | % | |
| | Uniformity | - | | 70 | 80 | - | % | |

Note: All the optical characteristics are just for reference which should be updated after first sample build.

5.2. Definition of Response Time

5.2.1. Normally Black Type (Negative)

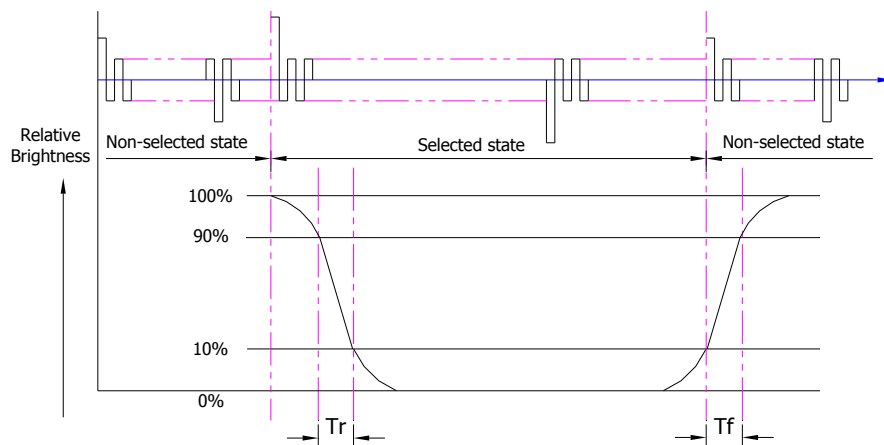


T_r is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

T_f is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note : Measuring machine: LCD-5100 or EQUI

5.2.2. Normally White Type (Positive)



T_r is the time it takes to change from non-selected state with relative luminance 90% to selected state with relative luminance 10%;

T_f is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note : Measuring machine: LCD-5100 or EQUI

5.3. Definition of Contrast Ratio

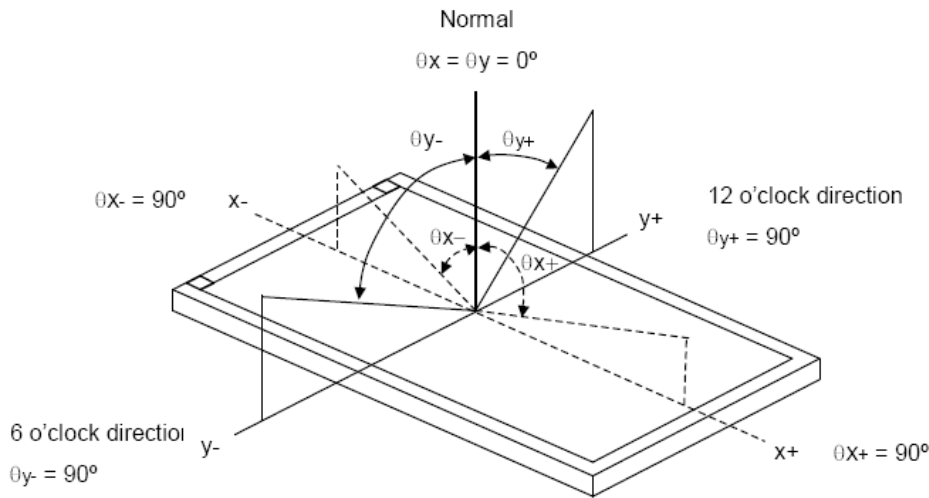
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

| | |
|--------------------------|--------------------------|
| Measuring Equipment | BM-7 or Equivalent |
| Measuring Point Diameter | 3mm//1mm |
| Measuring Point Location | Active Area centre point |
| Test pattern | A: All Pixels white |
| | B: All Pixel black |
| Contrast setting | Maximum |

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

5.4. Definition of Viewing Angles



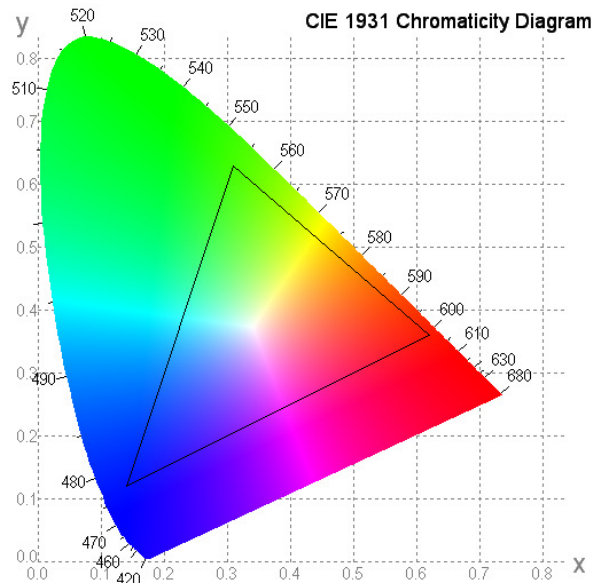
Measuring machine: LCD-5100 or EQUI

5.5. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7 OR EQUIVALENT)

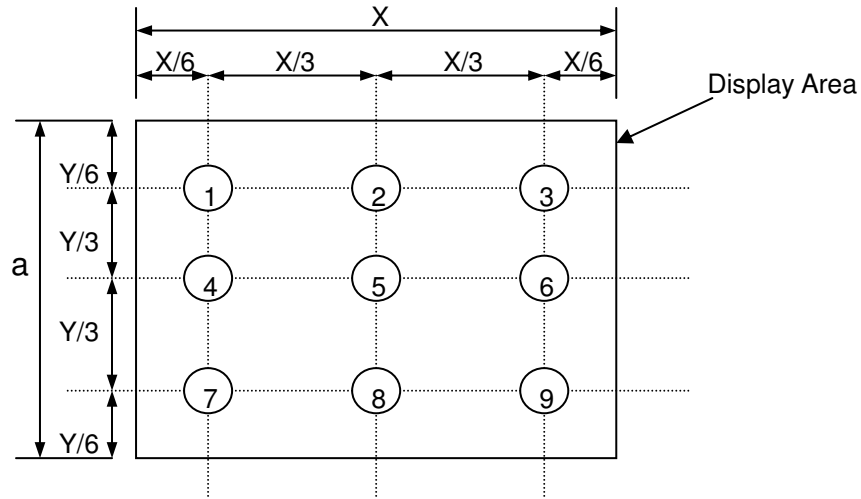


5.6. Definition of Surface Luminance, Uniformity and Transmittance

Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

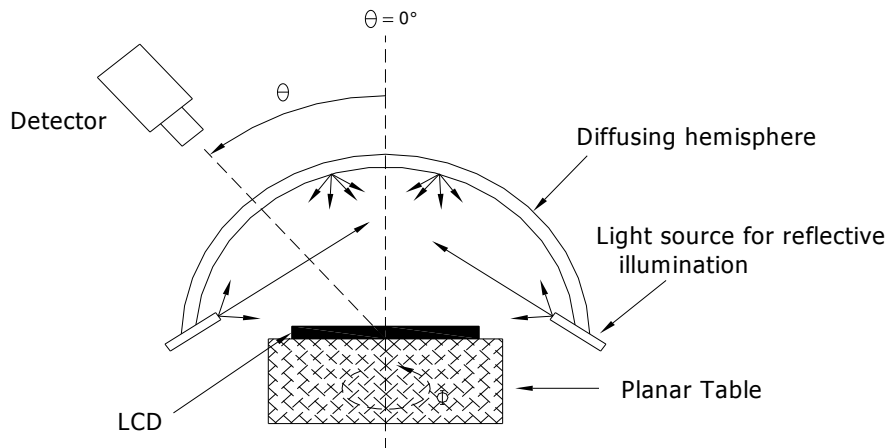
- 5.6.1. Surface Luminance: $L_V = \text{average } (L_{P1}:L_{P9})$
- 5.6.2. Uniformity = $\text{Minimal } (L_{P1}:L_{P9}) / \text{Maximal } (L_{P1}:L_{P9}) * 100\%$
- 5.6.3. Transmittance = $L_V \text{ on LCD} / L_V \text{ on Backlight} * 100\%$

Note : Measuring machine: BM-7 OR EQUIVALENT



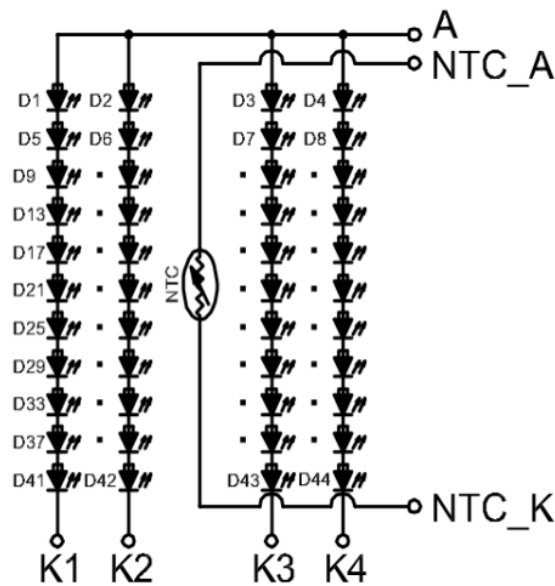
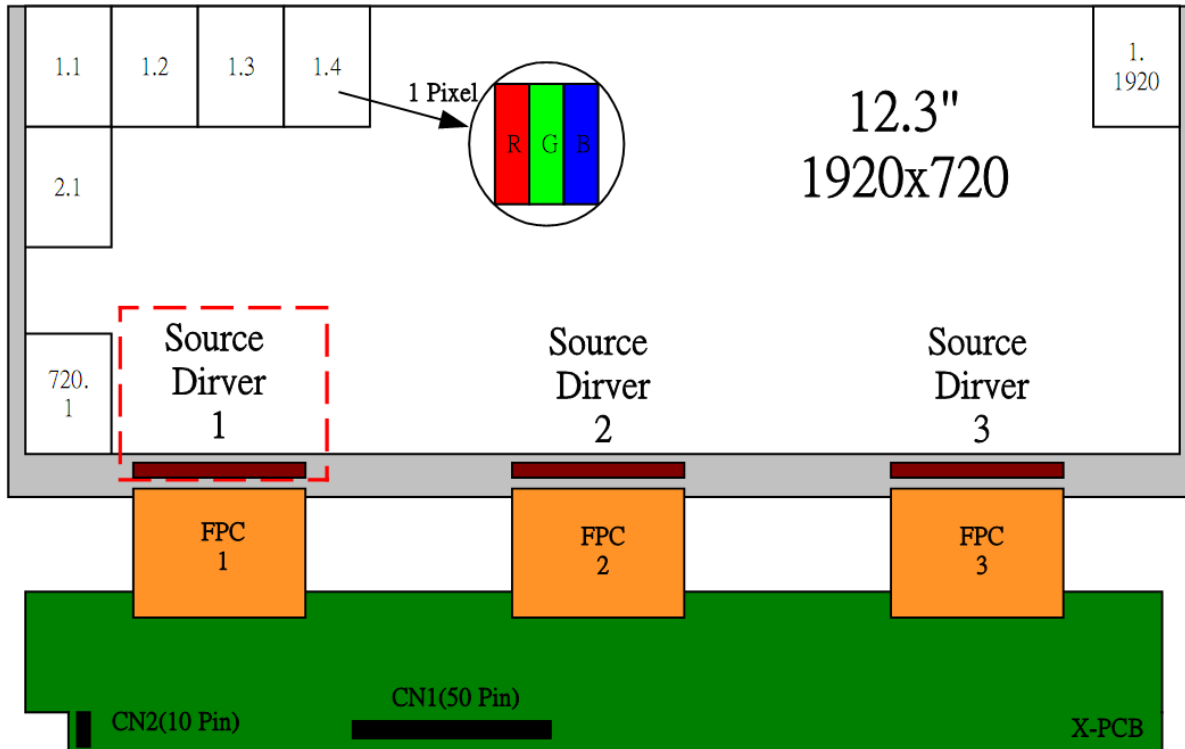
5.7. Definition of Reflectivity

To measure the reflectivity, the detector should be aligned to the normal direction of the LCD surface corresponding azimuthally angle $\theta=0^\circ$

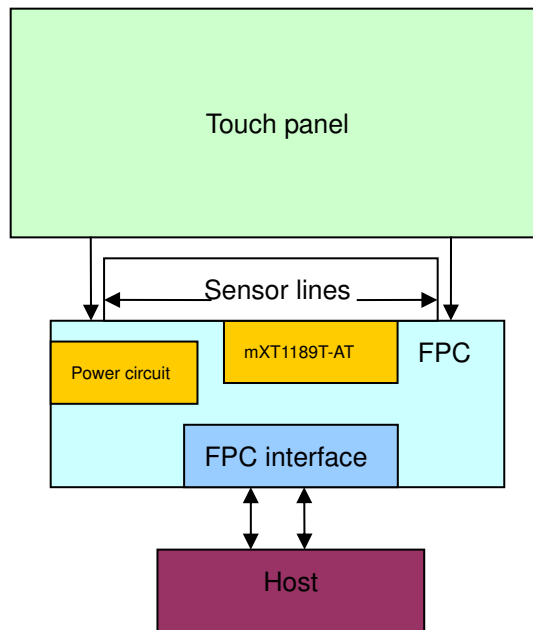


6. Block Diagram and Power Supply

6.1. Block Diagram and Power Supply for Module



6.2. Block Diagram and Power Supply for TP



7. Interface Pins Definition

7.1. TFT Interface Pins Definition

| No. | Symbol | I/O | Function |
|-----|---------|-----|--|
| 1 | GND | P | Power ground |
| 2 | NC/BIST | - | No connect(BIST Pin) |
| 3 | VCC | P | Digital power |
| 4 | VCC | P | Digital power |
| 5 | GND | P | Power ground |
| 6 | GND | P | Power ground |
| 7 | NC | - | No connect |
| 8 | NC | - | No connect |
| 9 | GND | P | Power ground |
| 10 | OR0- | I | Odd pixel LVDS differential data inputs |
| 11 | OR0+ | I | Odd pixel LVDS differential data inputs |
| 12 | OR1- | I | Odd pixel LVDS differential data inputs |
| 13 | OR1+ | I | Odd pixel LVDS differential data inputs |
| 14 | OR2- | I | Odd pixel LVDS differential data inputs |
| 15 | OR2+ | I | Odd pixel LVDS differential data inputs |
| 16 | ORC- | I | Odd pixel LVDS differential clock inputs |

| | | | |
|----|-------|---|---|
| 17 | ORC+ | I | Odd pixel LVDS differential clock inputs |
| 18 | OR3- | I | Odd pixel LVDS differential data inputs |
| 19 | OR3+ | I | Odd pixel LVDS differential data inputs |
| 20 | ER0- | I | Even pixel LVDS differential data inputs |
| 21 | ER0+ | I | Even pixel LVDS differential data inputs |
| 22 | ER1- | I | Even pixel LVDS differential data inputs |
| 23 | ER1+ | I | Even pixel LVDS differential data inputs |
| 24 | ER2- | I | Even pixel LVDS differential data inputs |
| 25 | ER2+ | I | Even pixel LVDS differential data inputs |
| 26 | ERC- | I | Even pixel LVDS differential clock inputs |
| 27 | ERC+ | I | Even pixel LVDS differential clock inputs |
| 28 | ER3- | I | Even pixel LVDS differential data inputs |
| 29 | ER3+ | I | Even pixel LVDS differential data inputs |
| 30 | GND | P | Power ground |
| 31 | FAULT | - | FAULT signal output(normal=H, abnormal=L) |
| 32 | RESET | - | Global reset pin, active High. |
| 33 | STBYB | - | Standby mode, active High |
| 34 | NC | - | No connect |
| 35 | NC | - | No connect |
| 36 | NC | - | No connect |
| 37 | NC | - | No connect |
| 38 | GND | P | Power ground |
| 39 | GND | P | Power ground |
| 40 | NC | - | No connect |
| 41 | LEDA | P | Backlight Anode. |
| 42 | LEDA | P | Backlight Anode. |
| 43 | LEDA | P | Backlight Anode. |
| 44 | NC | | No connect |
| 45 | LEDK | P | Backlight cathode1. |
| 46 | LEDK | P | Backlight cathode2. |
| 47 | LEDK | P | Backlight cathode3. |
| 48 | LEDK | P | Backlight cathode4. |
| 49 | NTC_A | P | NTC_ Anode |
| 50 | NTC_K | P | NTC_ Cathode |

Note: I – Input ; O – Output ; P – Power/ground.

7.2. TP Interface Definition(FPC PITCH=1.0mm)

| No | Symbol | I/O | Function |
|----|--------|-----|--|
| 1 | GND | P | Ground connection |
| 2 | RST | I | Active low reset, External pull-up required ,pull-up resistor recommend 100K |
| 3 | SDA | OD | I2C Data pin, external pull-up required ,pull-up resistor recommend 3.3K |
| 4 | SCL | OD | I2C Clock pin, external pull-up required, pull-up resistor recommend 3.3K |
| 5 | CHG | OD | Touch event output pin, low active, external pull-up required, pull-up resistor recommend 3.3K |
| 6 | NC | / | No connection |
| 7 | GND | P | Ground connection |
| 8 | GND | P | Ground connection |
| 9 | VDDIO | P | I/O power supply |
| 10 | VDD | P | Power supply |

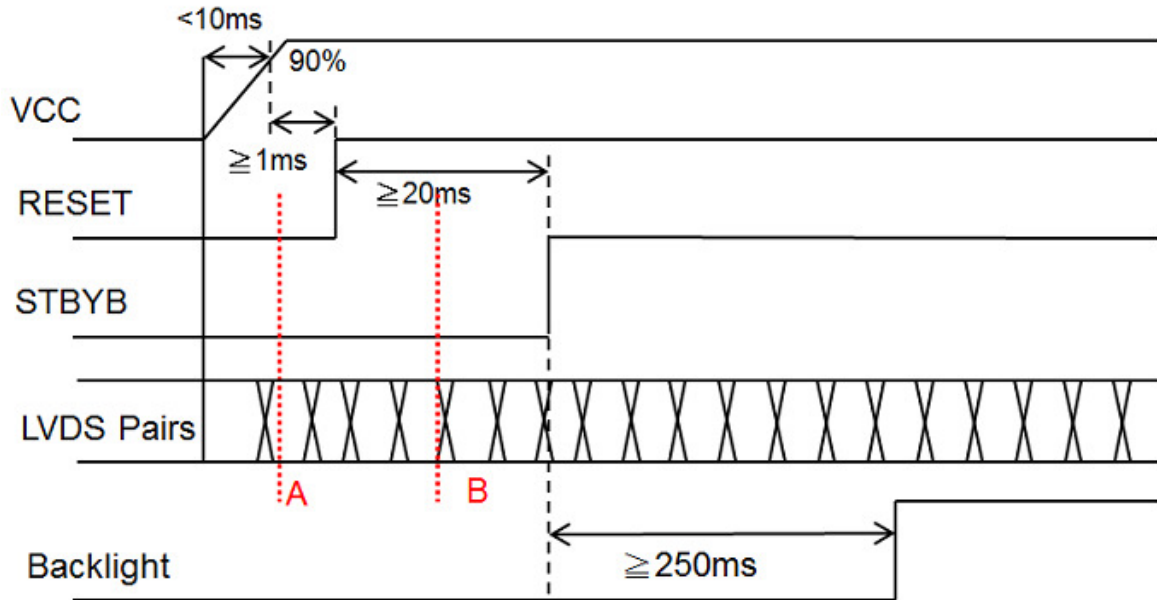
Note: P: Ground or Power OD :open drain output I :Input only NC: no connection. For more information, refer to the datasheet of this driver IC.

8. AC Characteristics

8.1. Display Interface Timing

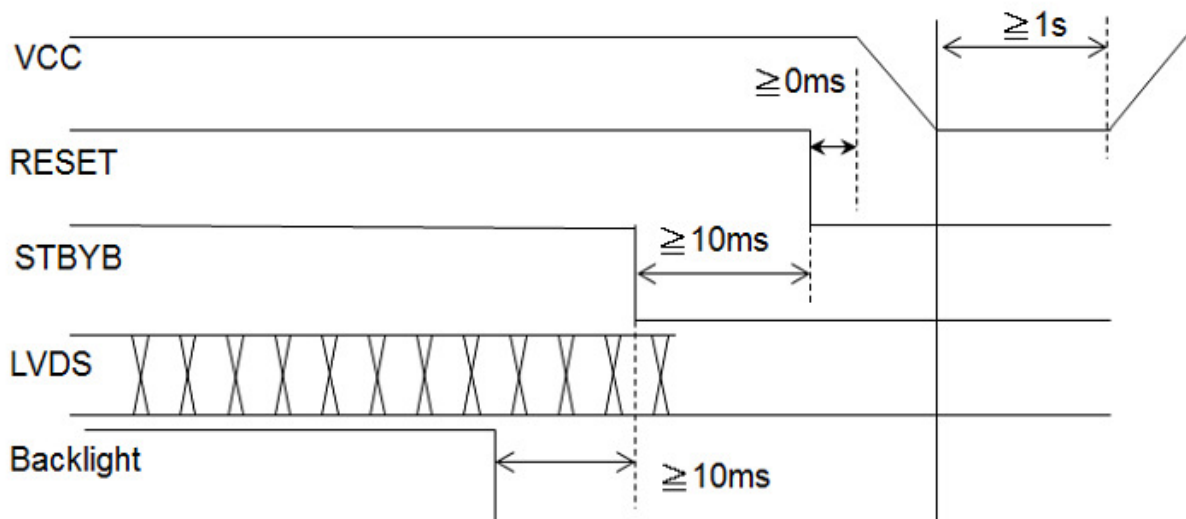
8.1.1. Power On/Off Sequence

Power ON

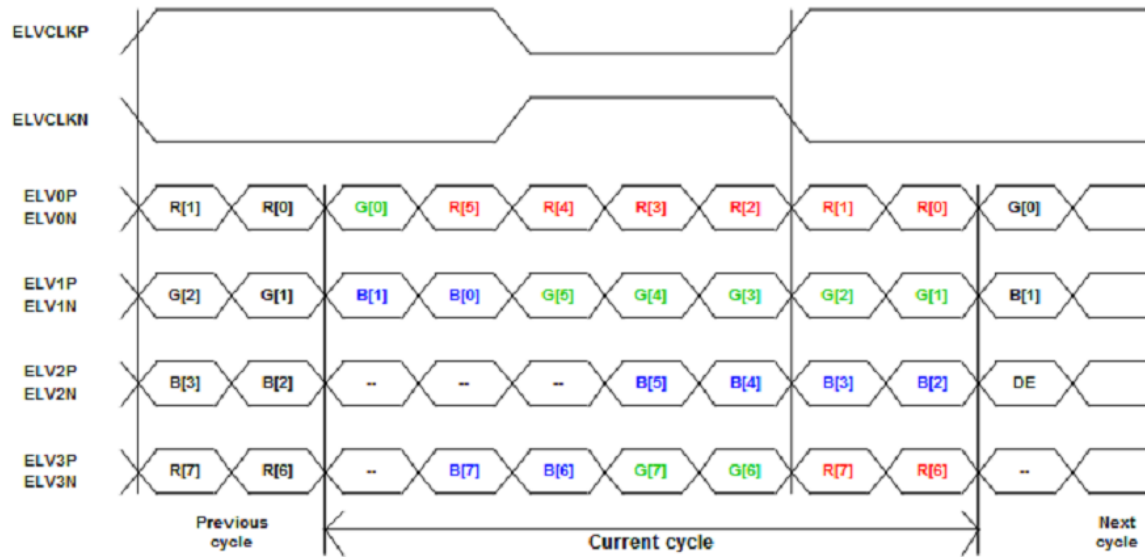
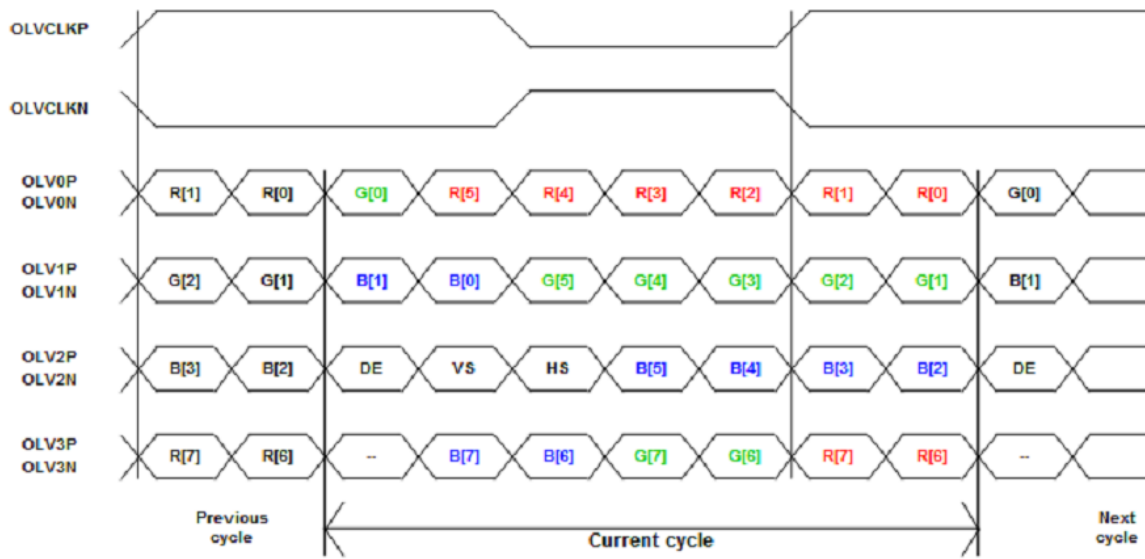


The Application system can apply LVDS signal from point A or B.

Power OFF



8.1.2. Data input format for LVDS

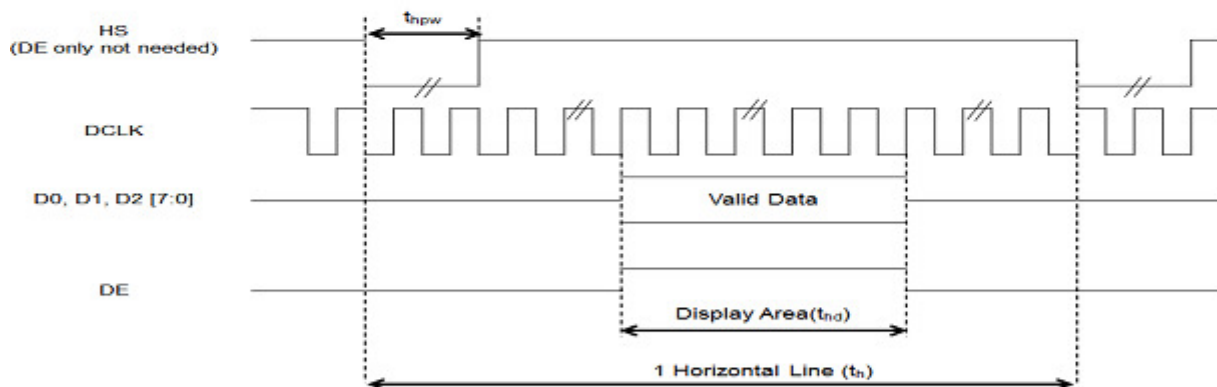


8.1.3. LVDS Interface Timing Characteristics

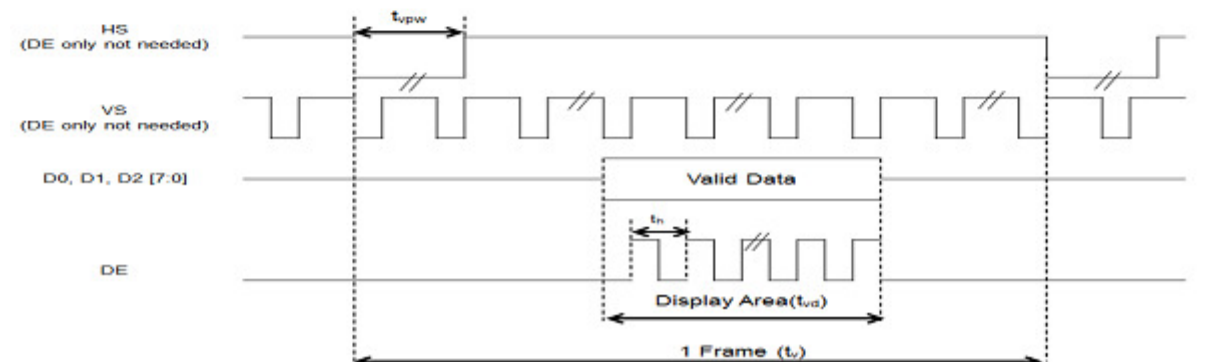
| Interface Timing (DE mode) | | | | | |
|-------------------------------------|------------|--------|--------|--------|------|
| Two Port LVDS Timing.(1920xRGBx720) | | | | | |
| Item | Symbol | Min. | Typ. | Max. | Unit |
| Frame Rate | FR | 55 | 60 | 65 | Hz |
| Vertical Display Time | T_{vd} | 720 | | | H |
| Vertical pulse width | T_{vpw} | (2) | (3) | (16) | H |
| Vertical back porch | T_{vbp} | (3) | (21) | (100) | H |
| Vertical front porch | T_{vfp} | (5) | (8) | (100) | H |
| Frame Period | T_v | (730) | (752) | (936) | H |
| Horizontal Display Time | T_{hd} | 960 | | | DCLK |
| Horizontal pulse width | T_{hpw} | (10) | (12) | (96) | DCLK |
| Horizontal back porch | T_{hbp} | (5) | (16) | (96) | DCLK |
| Horizontal front porch | T_{hfp} | (24) | (26) | (96) | DCLK |
| 1 Horizontal line | T_v | (999) | (1014) | (1248) | DCLK |
| Clock Rate | F_{DCLK} | (43.1) | (45.8) | (61.7) | MHz |

Timing Diagram of Interface Signal (DE mode)

(1) Horizontal input timing

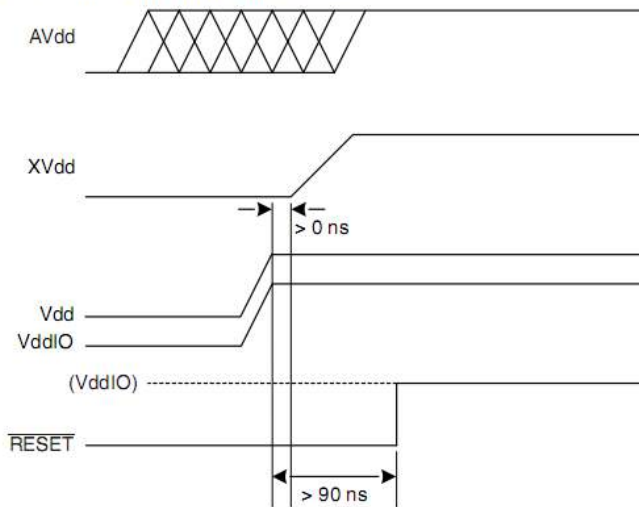


(2) Vertical input timing



8.1. Touch Panel Interface Timing

Power Sequencing on the mXT1189T-AT



- Note:**
- 1) When using external RESET at power-up VddIO must not be enabled after Vdd
 - 2) XVdd must not be powered up until after Vdd and must obey the rate-of-rise specification
 - 3) XVDD is derived from the VDD boost circuit

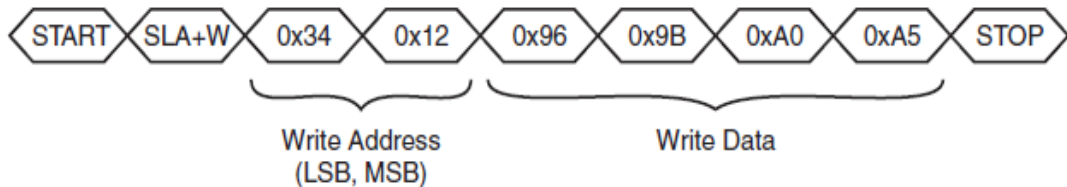
8.1.1. Interface Bus

The Touch Panel communicates with the host over an I2C bus.

Please refer to <http://www.i2c-bus.org> for more detail about the I2C bus.

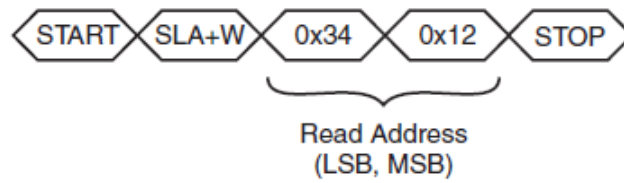
Please to <https://github.com/atmel-maxtouch/linux> for the Linux driver.

Example of a Four-byte Write Starting at Address 0x1234

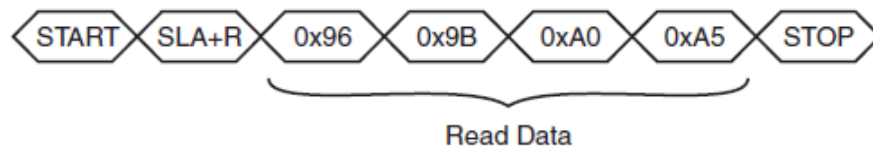


Example of a Four-byte Read Starting at Address 0x1234

Set Address Pointer



Read Data

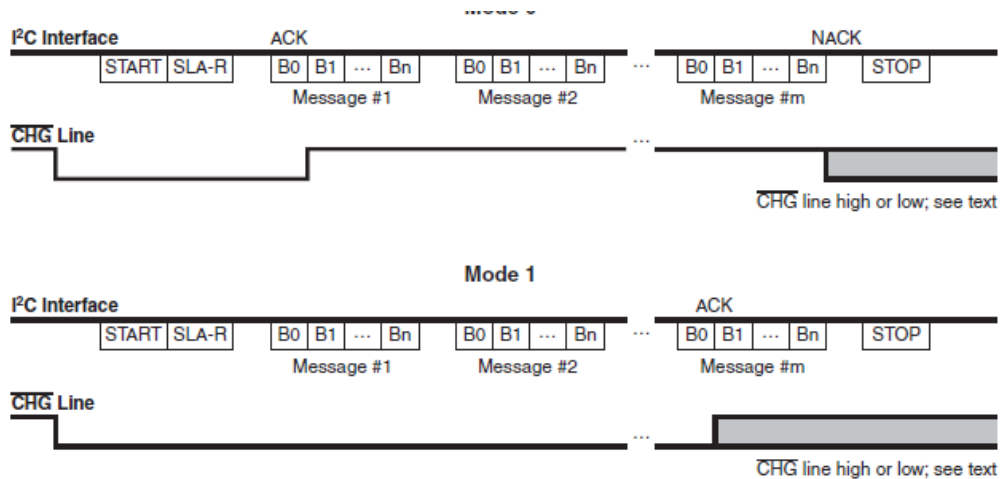


8.1.2. Touch event output

The INT line is an active-low, open-drain output that is used to alert the host that a new message is available in the Message Processor object. This provides the host with an interrupt-style interface with the potential for fast response times. It reduces the need for wasteful I2C-compatible communications.

The INT line remains low as long as there are messages to be read. The host should be configured so that the INT line is connected to an interrupt line that is level-triggered. The host should not use an edge-triggered interrupt as this means adding extra software precautions.

The INT line should be allowed to float during normal usage. This is particularly important after power-up or reset.



CHG Line = INT line

9. Recommended Setting and Initialization Flow for Reference

9.1. TFT Controller Setting

N/A

9.2. Touch Controller Setting

N/A

10. Quality Assurance

10.1.Purpose

The purpose of this specification is to establish the cosmetic standards for inspection and measurement of a NVD TFT & Touch Panel & Cover Glass Sub-Assembly.

10.2.Scope

This specification applies to all TFT & Touch Panels & Cover Glass Sub-Assemblies built by NVD and should be used as the inspection guideline for quality control. The individual drawing specification will have priority if this document conflicts with the drawing.

10.3.Standard for Quality Test

NVD performs the following tests to ensure the quality of product before shipment.

10.3.1. Sampling Plan:

ANSI / ASQC Z1.4-2008.

General inspection level II. Single sampling, normal inspection.

10.3.2. Sampling Criteria:

Visual inspection: AQL 1.0

Electrical functional: AQL 0.65

10.3.3. Reliability Test:

Detailed requirement refer to Reliability Test Specification.

10.4. Nonconforming Analysis & Disposition

10.4.1. Nonconforming analysis:

10.4.2. Customer should provide overall information of non-conforming sample for their complaints.

10.4.3. After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.

10.4.4. If NVD can not finish the analysis on time, customer will be notified with the progress status.

10.4.5. Disposition of nonconforming:

Non-conforming product over ppm level, NVD will offer corrective actions, not over PPM, NVD can offer FA if customer need. And the failures are confirmed to be NVD responsibility and within the shelf life of 1 year, they will be replaced.

10.5.Agreement Items

NVD and customer shall negotiate if the following situation occurs:

10.5.1. There is any discrepancy in standard of quality assurance.

10.5.2. Additional requirement to be added in product specification.

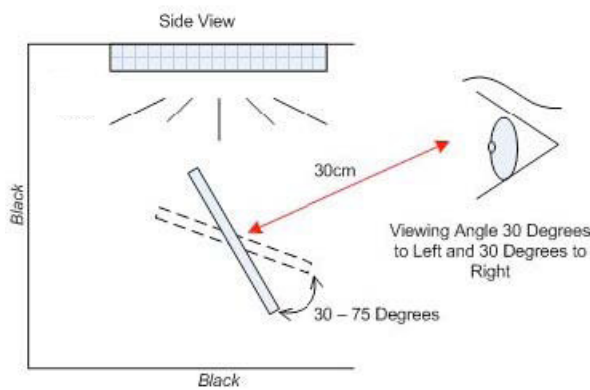
10.5.3. Any other special problem.

10.6. Standard Viewing Conditions

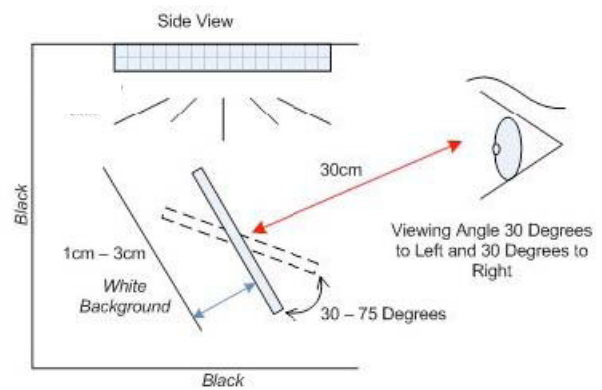
For the purpose of cosmetic inspection, all NVD touch panels are to be clean, dry and viewed under the following conditions:

- 10.6.1. Lighting: Daylight or cool white fluorescent lighting approximately from 70 to 140 foot-candles (approximately equal to 750 to 1500 Lux). Lighting should be diffused so that shadow is not a factor.
- 10.6.2. Distance: 12 inches (approximately equal to 30~40 cm) from the eyes.
- 10.6.3. Inspection Time: 10 seconds per surface for a touch panel and/or cover glass assembly.
- 10.6.4. Inspector qualification: Inspection must be made by an individual with 20/20 or corrected to 20/20 vision with color discrimination capability.
- 10.6.5. Parts shall not be manipulated to reflect a single light source in order to accentuate surface flaws. Parts shall be viewed without directly reflecting a light source.
- 10.6.6. Please refer below photos for the inspection environment.

Black Booth or Black Background



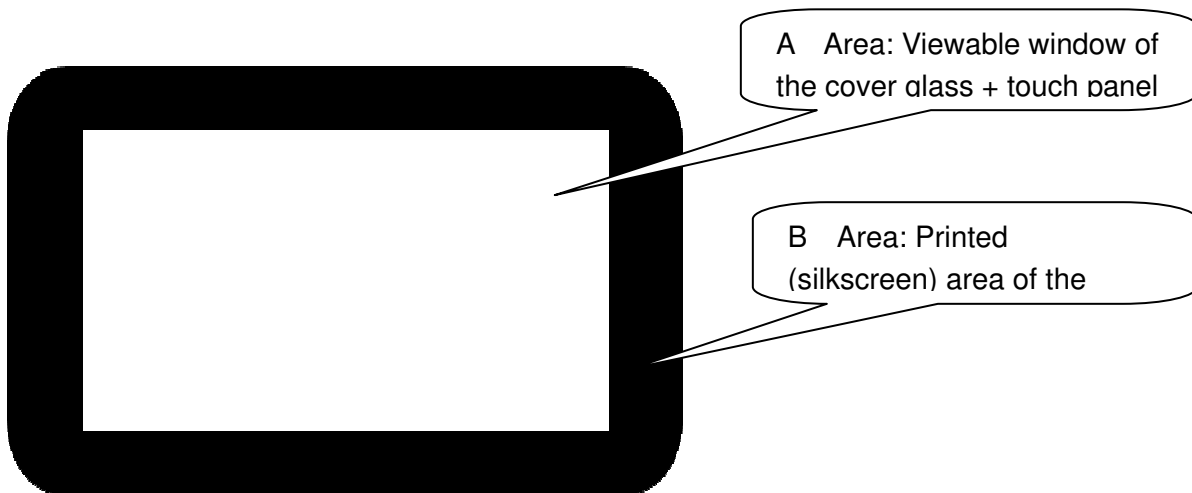
White Background



10.7. Cosmetic Specifications and Acceptance Criteria Guidelines

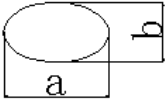
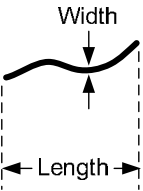
- 10.7.1. Defects must be found at Incoming Quality Control (IQC), prior to non-NVD cover glass (faceplate) or TFT display bonding, or before final manufacturing assembly.
- 10.7.2. Bubbles or contamination outside the viewing window area are acceptable. These anomalies do not impact functionality, performance or long term reliability.
- 10.7.3. If a surface blemish or defect can be wiped off easily, removed by cleaning or blown away using a compressed air gun, the touch panel is acceptable.
- 10.7.4. Blemishes or defects on the touch panel back side that are not visible from the front are acceptable. These anomalies do not impact performance, functionality or long term reliability.
- 10.7.5. Glass chips that do not impact functionality, performance or long term reliability and only observed from the back side are acceptable.
- 10.7.6. Glass cracks or fractures are not acceptable. This is a defect.
- 10.7.7. The FPC/PCBA refer to the IPC-A-610 (class 2) or IPC-6013.

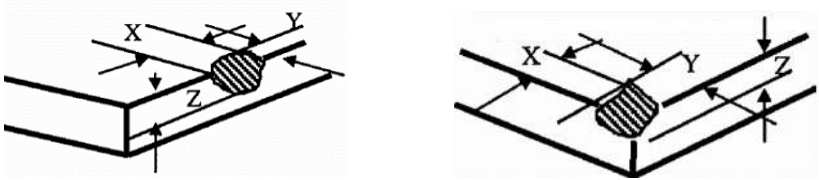
10.8. Product surface area definition

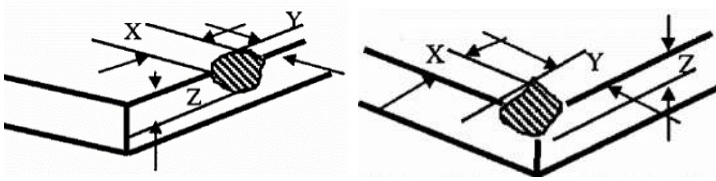

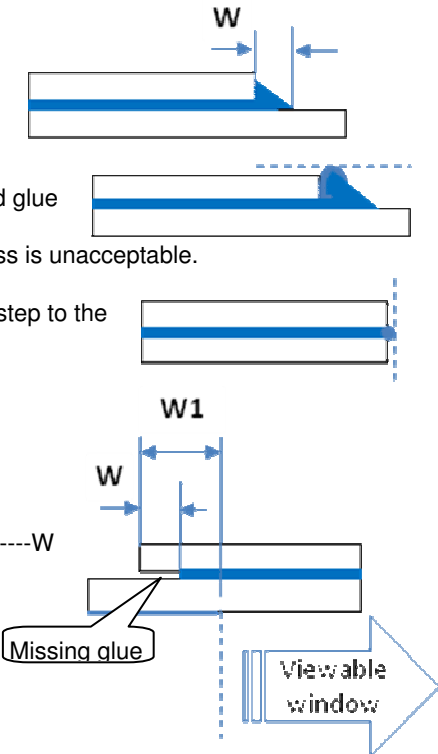


11. Inspection items and acceptance criteria

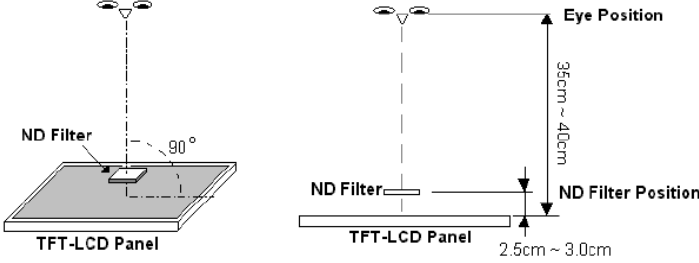
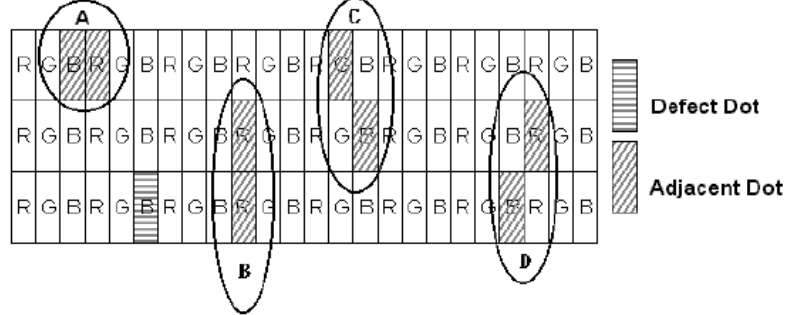
11.1. Visual defect

| Item # | Inspection Item | Acceptance Criteria | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|---|---|------------------------------------|------------------------------------|--|--|----------------------|------------|--------------------------------|------------------------------------|------------------------------------|-----------------|------------------|---------|-----------------------|---|----------------|---------------------|---|---|----------------------|----------------|----------------------------|------------------------------------|---------------|-----------------|-------------|------------|-----------------------|---|-------|--------------|---|---|
| 11.1.1 | <p>Circular defect (Include contamination, black or white dots/spots, pin hole, bubble etc.)</p>  <p>$\Phi = (a+b) / 2$</p> | <p>a) A area circular defect:</p> <table border="1" data-bbox="595 470 1273 739"> <thead> <tr> <th colspan="2">Diameter Φ (mm)</th> <th>Accept. qty. within A area</th> <th>Minimum distance between blemishes</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Dots or Spots</td> <td>$\Phi \leq 0.2$</td> <td>Ignored</td> <td>/</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td>5</td> <td>15 mm</td> </tr> <tr> <td>$\Phi > 0.5$</td> <td>0</td> <td>/</td> </tr> </tbody> </table> <p>b) B area circular defect:</p> <table border="1" data-bbox="595 801 1273 1070"> <thead> <tr> <th colspan="2">Diameter Φ (mm)</th> <th>Accept. qty. within B area</th> <th>Minimum distance between blemishes</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Dots or Spots</td> <td>$\Phi \leq 0.2$</td> <td>Ignored</td> <td>/</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td>4</td> <td>15 mm</td> </tr> <tr> <td>$\Phi > 0.5$</td> <td>0</td> <td>/</td> </tr> </tbody> </table> | | | | | Diameter Φ (mm) | | Accept. qty. within A area | Minimum distance between blemishes | Dots or Spots | $\Phi \leq 0.2$ | Ignored | / | $0.2 < \Phi \leq 0.5$ | 5 | 15 mm | $\Phi > 0.5$ | 0 | / | Diameter Φ (mm) | | Accept. qty. within B area | Minimum distance between blemishes | Dots or Spots | $\Phi \leq 0.2$ | Ignored | / | $0.2 < \Phi \leq 0.5$ | 4 | 15 mm | $\Phi > 0.5$ | 0 | / |
| Diameter Φ (mm) | | Accept. qty. within A area | Minimum distance between blemishes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dots or Spots | $\Phi \leq 0.2$ | Ignored | / | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | $0.2 < \Phi \leq 0.5$ | 5 | 15 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | $\Phi > 0.5$ | 0 | / | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Diameter Φ (mm) | | Accept. qty. within B area | Minimum distance between blemishes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dots or Spots | $\Phi \leq 0.2$ | Ignored | / | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | $0.2 < \Phi \leq 0.5$ | 4 | 15 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | $\Phi > 0.5$ | 0 | / | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.1.2 | <p>Linear fibers, scratches, etc.</p>  | <p>Linear defects:</p> <table border="1" data-bbox="595 1137 1457 1489"> <thead> <tr> <th>Length (mm)</th> <th>Width (mm)</th> <th>Accept. Quantity within A area</th> <th>Accept. Quantity within B area</th> <th>Minimum distance between blemishes</th> </tr> </thead> <tbody> <tr> <td>Ignored</td> <td>$W \leq 0.08$ mm</td> <td colspan="2">Ignored</td> <td>/</td> </tr> <tr> <td>$L \leq 20$ mm</td> <td>$0.08 < W \leq 0.1$</td> <td>3</td> <td>2</td> <td>15 mm</td> </tr> <tr> <td>$L \leq 10$ mm</td> <td>$0.1 < W \leq 0.20$</td> <td>3</td> <td>2</td> <td>15 mm</td> </tr> <tr> <td>$L > 10$ mm</td> <td>$W > 0.20$</td> <td>0</td> <td>0</td> <td>/</td> </tr> </tbody> </table> <p>Remarks:</p> <ul style="list-style-type: none"> a) Bubbles or contamination outside viewing area is acceptable. b) It is acceptable if any above defects can be wiped off, or blown away by using a compressed air gun. c) It is acceptable if any above blemish or defects only can be seen from the rear view (the blemish or defects can't be seen from the front view). | | | | | Length (mm) | Width (mm) | Accept. Quantity within A area | Accept. Quantity within B area | Minimum distance between blemishes | Ignored | $W \leq 0.08$ mm | Ignored | | / | $L \leq 20$ mm | $0.08 < W \leq 0.1$ | 3 | 2 | 15 mm | $L \leq 10$ mm | $0.1 < W \leq 0.20$ | 3 | 2 | 15 mm | $L > 10$ mm | $W > 0.20$ | 0 | 0 | / | | | |
| Length (mm) | Width (mm) | Accept. Quantity within A area | Accept. Quantity within B area | Minimum distance between blemishes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ignored | $W \leq 0.08$ mm | Ignored | | / | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 20$ mm | $0.08 < W \leq 0.1$ | 3 | 2 | 15 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 10$ mm | $0.1 < W \leq 0.20$ | 3 | 2 | 15 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L > 10$ mm | $W > 0.20$ | 0 | 0 | / | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Item # | Inspection Item | Acceptance Criteria | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------|----------------------------|--|-------------------------------------|----------------------------|------------------------------------|------------------|---------|---|------------------------|---|------------------------|----------------|------------------------|-------------|------------------------------------|--|--|----------------------------|--|---|---|---|---------|---|------------------------|------------------------|----------------|------------------------|-------------|
| 11.1.3 | Polarizer bubble | <table border="1"> <thead> <tr> <th>Diameter Φ (mm)</th> <th>Accept. qty. within A area</th> <th>Minimum distance between blemishes</th> </tr> </thead> <tbody> <tr> <td>$\phi \leq 0.25$</td> <td>Ignored</td> <td>/</td> </tr> <tr> <td>$0.25 < \phi \leq 0.5$</td> <td>4</td> <td>15mm</td> </tr> <tr> <td>$0.5 < \phi$</td> <td>0</td> <td>/</td> </tr> </tbody> </table> | Diameter Φ (mm) | Accept. qty. within A area | Minimum distance between blemishes | $\phi \leq 0.25$ | Ignored | / | $0.25 < \phi \leq 0.5$ | 4 | 15mm | $0.5 < \phi$ | 0 | / | | | | | | | | | | | | | | | |
| Diameter Φ (mm) | Accept. qty. within A area | Minimum distance between blemishes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\phi \leq 0.25$ | Ignored | / | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.25 < \phi \leq 0.5$ | 4 | 15mm | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.5 < \phi$ | 0 | / | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.1.4 | Dent, AG defects | <table border="1"> <thead> <tr> <th>Diameter Φ (mm)</th> <th>Accept. qty. within A area</th> <th>Minimum distance between blemishes</th> </tr> </thead> <tbody> <tr> <td>$\phi \leq 0.25$</td> <td>Ignored</td> <td>/</td> </tr> <tr> <td>$0.25 < \phi \leq 0.5$</td> <td>4</td> <td>15mm</td> </tr> <tr> <td>$0.5 < \phi$</td> <td>0</td> <td>/</td> </tr> </tbody> </table> | Diameter Φ (mm) | Accept. qty. within A area | Minimum distance between blemishes | $\phi \leq 0.25$ | Ignored | / | $0.25 < \phi \leq 0.5$ | 4 | 15mm | $0.5 < \phi$ | 0 | / | | | | | | | | | | | | | | | |
| Diameter Φ (mm) | Accept. qty. within A area | Minimum distance between blemishes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\phi \leq 0.25$ | Ignored | / | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.25 < \phi \leq 0.5$ | 4 | 15mm | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.5 < \phi$ | 0 | / | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.1.5 | Glass chips on the edge | <p>a) Chipping on the cover glass (faceplate):</p> <p><u>Surface</u> of the Cover Glass: Very small chips on the surface, if any, will be regarded as dot blemishes and evaluated using the dot (circular) defect criteria.</p> <p><u>Edge</u> of Cover Glass: Below are the criteria for faceplate chipping:</p>  <table border="1"> <thead> <tr> <th colspan="2">Chip on any other area – Front View</th> <th colspan="2">Chip on corner – Front View</th> </tr> </thead> <tbody> <tr> <td>X and Y</td> <td>Z</td> <td>X and Y</td> <td>Z</td> </tr> <tr> <td>Ok $\leq 0.5\text{mm}$</td> <td>Ok $\leq 1/2t$</td> <td>Ok $\leq 0.5\text{mm}$</td> <td>Ok $\leq t$</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="3">Chip on any other area – Rear View</th> <th colspan="2">Chip on corner – Rear View</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>Y</td> <td>Z</td> <td>X and Y</td> <td>Z</td> </tr> <tr> <td>Ok $\leq 1.5\text{mm}$</td> <td>Ok $\leq 1.0\text{mm}$</td> <td>Ok $\leq 1/2t$</td> <td>Ok $\leq 1.0\text{mm}$</td> <td>Ok $\leq t$</td> </tr> </tbody> </table> <p>b) Chipping on the Touch Sensor (Touch sensor glass) or TFT display:</p> | Chip on any other area – Front View | | Chip on corner – Front View | | X and Y | Z | X and Y | Z | Ok $\leq 0.5\text{mm}$ | Ok $\leq 1/2t$ | Ok $\leq 0.5\text{mm}$ | Ok $\leq t$ | Chip on any other area – Rear View | | | Chip on corner – Rear View | | X | Y | Z | X and Y | Z | Ok $\leq 1.5\text{mm}$ | Ok $\leq 1.0\text{mm}$ | Ok $\leq 1/2t$ | Ok $\leq 1.0\text{mm}$ | Ok $\leq t$ |
| Chip on any other area – Front View | | Chip on corner – Front View | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X and Y | Z | X and Y | Z | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ok $\leq 0.5\text{mm}$ | Ok $\leq 1/2t$ | Ok $\leq 0.5\text{mm}$ | Ok $\leq t$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chip on any other area – Rear View | | | Chip on corner – Rear View | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X | Y | Z | X and Y | Z | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ok $\leq 1.5\text{mm}$ | Ok $\leq 1.0\text{mm}$ | Ok $\leq 1/2t$ | Ok $\leq 1.0\text{mm}$ | Ok $\leq t$ | | | | | | | | | | | | | | | | | | | | | | | | | |

| | |  <table border="1" data-bbox="606 414 1476 548"> <thead> <tr> <th colspan="3">Chip on edge</th> <th colspan="3">Chip on corner</th> </tr> <tr> <th>X</th> <th>Y</th> <th>Z</th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$Ok \leq 4mm$</td> <td>$Ok \leq 2mm$</td> <td>$Ok \leq t$</td> <td>$Ok \leq 4mm$</td> <td>$Ok \leq 3mm$</td> <td>$Ok \leq t$</td> </tr> </tbody> </table> <p>Remarks:</p> <ul style="list-style-type: none"> a. The variable t = thickness of glass. b. The touch panel top glass is bonded to the cover glass (faceplate). NVD will ensure that if there are glass chips, they are not visible from the front. Glass cracks or fractures are not acceptable. c. Edge chipping cannot be close to the ITO trace/PAD. Chipping if present will not impact function, performance or reliability. | Chip on edge | | | Chip on corner | | | X | Y | Z | X | Y | Z | $Ok \leq 4mm$ | $Ok \leq 2mm$ | $Ok \leq t$ | $Ok \leq 4mm$ | $Ok \leq 3mm$ | $Ok \leq t$ |
|---------------|--------------------|---|----------------|---------------|-------------|----------------|--|--|---|---|---|---|---|---|---------------|---------------|-------------|---------------|---------------|-------------|
| Chip on edge | | | Chip on corner | | | | | | | | | | | | | | | | | |
| X | Y | Z | X | Y | Z | | | | | | | | | | | | | | | |
| $Ok \leq 4mm$ | $Ok \leq 2mm$ | $Ok \leq t$ | $Ok \leq 4mm$ | $Ok \leq 3mm$ | $Ok \leq t$ | | | | | | | | | | | | | | | |
| <p>11.1.6</p> | <p>Glass Crack</p> | <p>Glass cracks or fractures are not acceptable.</p>  | | | | | | | | | | | | | | | | | | |
| <p>11.1.7</p> | <p>Glue Defect</p> | <p>a) Exceed glue:</p> <ol style="list-style-type: none"> 1) Width of exceed glue----W $W \leq 2\text{ mm}$ 2) The thickness of the exceed glue higher than smaller glass is unacceptable. 3) The exceed glue can't overstep to the edge of the glass. <p>b) Missing glue:</p> <p>Width of missing glue----W Width of frame----$W1$ $W \leq 1/2 W1$</p>  <p>Remarks: The large air bubble should be looked as missing glue and can't extend to viewable window.</p> | | | | | | | | | | | | | | | | | | |

11.2. Electrical defect

| Item # | Inspection Item | Acceptance Criteria | | | | | | | | | | | | | | | | |
|----------------------------|---|---|---------------|-------------|------------|------------|----------|------------|-----------|------------|------------------|------------|----------------------------|-------------|-------------|-------------|------|---|
| 11.2.1 | Dot(Pixel Defect) | <table border="1" data-bbox="518 353 1353 786"> <tr> <td>Defected item</td> <td>Active area</td> </tr> <tr> <td>Bright Dot</td> <td>$N \leq 3$</td> </tr> <tr> <td>Dark Dot</td> <td>$N \leq 4$</td> </tr> <tr> <td>Total Dot</td> <td>$N \leq 6$</td> </tr> <tr> <td>Two Adjacent Dot</td> <td>$N \leq 1$</td> </tr> <tr> <td>Three or More Adjacent Dot</td> <td>Not Allowed</td> </tr> <tr> <td>Line Defect</td> <td>Not Allowed</td> </tr> <tr> <td>Mura</td> <td>Accept if it can not be visible by 5% ND filter in 50% gray pattern. Refer to limit sample if need.</td> </tr> </table> <p data-bbox="518 831 997 860">Distance between 2 defects should ≥ 5mm.</p> <p data-bbox="518 875 614 904">Remark:</p> <p data-bbox="518 920 1348 949">a. One pixel consists of 3 sub-pixels, including R,G and B dot(Sub-pixel=Dot)</p> <p data-bbox="518 965 1444 1032">b. The defective area of the dot is larger than 50% of one sub-pixel area as one defect; less than 50% of one sub-pixel area will be not made as one failure.</p> <p data-bbox="518 1048 1268 1077">c. Bright dot is defined through 5% transmission ND filter as following:</p> <div data-bbox="534 1093 1236 1355">  </div> <p data-bbox="518 1368 1412 1480">d. Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dark adjacent dot. And they will be counted as 2 defect dots in total quantity.</p> <div data-bbox="614 1503 1412 1816">  </div> <p data-bbox="518 1832 1396 1899">Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.</p> | Defected item | Active area | Bright Dot | $N \leq 3$ | Dark Dot | $N \leq 4$ | Total Dot | $N \leq 6$ | Two Adjacent Dot | $N \leq 1$ | Three or More Adjacent Dot | Not Allowed | Line Defect | Not Allowed | Mura | Accept if it can not be visible by 5% ND filter in 50% gray pattern. Refer to limit sample if need. |
| Defected item | Active area | | | | | | | | | | | | | | | | | |
| Bright Dot | $N \leq 3$ | | | | | | | | | | | | | | | | | |
| Dark Dot | $N \leq 4$ | | | | | | | | | | | | | | | | | |
| Total Dot | $N \leq 6$ | | | | | | | | | | | | | | | | | |
| Two Adjacent Dot | $N \leq 1$ | | | | | | | | | | | | | | | | | |
| Three or More Adjacent Dot | Not Allowed | | | | | | | | | | | | | | | | | |
| Line Defect | Not Allowed | | | | | | | | | | | | | | | | | |
| Mura | Accept if it can not be visible by 5% ND filter in 50% gray pattern. Refer to limit sample if need. | | | | | | | | | | | | | | | | | |
| 11.2.2 | Electrical Defect | <p data-bbox="518 1906 901 1935">The below defects must be rejected.</p> <ol data-bbox="518 1935 981 2065" style="list-style-type: none"> 1) Missing vertical / horizontal segment, 2) Abnormal Display. 3) No function or no display. 4) Current exceeds product specifications. 5) LCD viewing angle defect. | | | | | | | | | | | | | | | | |

| | | |
|--|--|---|
| | | 6) No Backlight. 7) Dark Backlight. 8) Touch Panel no function. |
|--|--|---|

11.3. Identification/marketing criteria:

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

11.4. Packing:

- 11.4.1. There should be no damage of the outside carton box, each packaging box should have one identical label.
- 11.4.2. Modules inside package box should have compliant mark.
- 11.4.3. All direct package materials shall offer ESD protection.

12. Reliability Specification for TP

| Item | Condition | Cycle Time | Quantity | Remark |
|---|---|------------|------------------|---------------------------------------|
| High Temp. (storage) Test | +90 °C | 120hrs | 5pcs | |
| Low Temp. (storage) Test | -40 °C | 120hrs | 5pcs | |
| High Temperature and High Humidity(storage) | Ta=+60 °C, 90%RH | 120 hrs | 5pcs | |
| Thermal Shock Test(storage) | -30°C (30min) → +80°C (30min) | 10cycles | 5pcs | |
| Laminative load test (for packaging) | First place the sample carton on a plane, then load the standard weight object on the top of the sample carton, finally observe the status of the sample carton | 24 hrs | One inner carton | Refer to NVD WI Document, WI-Q4L-0196 |
| Packing Drop test (for packaging) | 1 drop on a corner, 1 drop on three arris, 1 drop on six sides | 1time | One inner carton | |
| ESD(On Final Product) | 150pF,330Ω, ±8KV & ±10KV air & contact test | 10times | 5pcs | *4 |

- Note:**
- For humidity test, DI water should be used.
Inspection Standard: Inspect after 1-2hrs storage at room temperature, the sample shall be free from the following defects:
 - Air bubble in the LCD
 - Seal Leakage
 - Non-display
 - Missing Segment
 - Glass Crack
 - IDD is greater than twice initial value.
 - Others as per QA Inspection Criteria
 - No defect is allowed after testing.
 - ESD should be applied to LCD glass panel, not other areas (such as on IC and so on)
IDD should be within twice initial value.
In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
 - For the item in end product, the test should be implemented by customer.

13. Precautions and Warranty

13.1. Safety

- 13.1.1. The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.
- 13.1.2. Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

13.2. Handling

- 13.2.1. Reverse and use within ratings in order to keep performance and prevent damage.
- 13.2.2. Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

13.3. Storage

- 13.3.1. Do not store the LCD module beyond the specified temperature ranges.

13.4. Metal Pin (Apply to Products with Metal Pins)

13.4.1. Pins of LCD and Backlight

13.4.1.1. Solder tip can touch and press on the tip of Pin LEAD during the soldering

13.4.1.2. Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

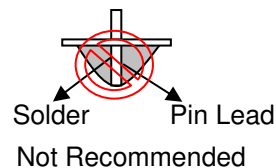
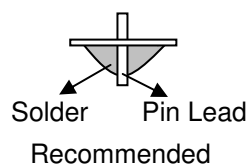
Maximum Solder Temperature: 370°C

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20°C

Typical Soldering Time: ≤3s

13.4.1.3. Solder Wetting



13.4.2. Pins of EL

13.4.2.1. Solder tip can touch and press on the tip of EL leads during soldering.

13.4.2.2. No Solder Paste on the soldering pad on the motherboard is recommended.

13.4.2.3. Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270~290°C

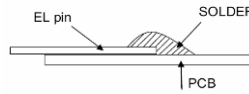
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body): 2.0mm

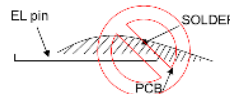
13.4.2.4. No horizontal press on the EL leads during soldering.

13.4.2.5. 180° bend EL leads three times is not allowed.

13.4.2.6. Solder Wetting

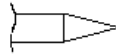


Recommended

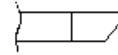


Not Recommended

13.4.2.7. The type of the solder iron:

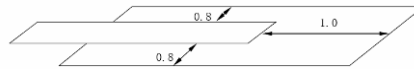


Recommended



Not Recommended

13.4.2.8. Solder Pad



13.5. Operation

- 13.5.1. Do not drive LCD with DC voltage
- 13.5.2. Response time will increase below lower temperature
- 13.5.3. Display may change color with different temperature
- 13.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear "fractured".

13.6. Static Electricity

- 13.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.
- 13.6.2. The normal static prevention measures should be observed for work clothes and benches.
- 13.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

13.7. Limited Warranty

- 13.7.1. Unless otherwise agreed between New Vision Display and customer, New Vision Display will replace or repair any of its LCD and LCM which New Vision Display found to be defective electrically and visually when inspected in accordance with New Vision Display Quality Standards, for a period of one year from date of shipment.
- 13.7.2. The warranty liability of New Vision Display is limited to repair and/or replacement. New Vision Display will not be responsible for any consequential loss.
- 13.7.3. If possible, we suggest you use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.
- 13.7.4. Excluded from this limited warranty are parts not performing to specification as a consequence of initializing the driver with parameters other than recommended by NVD.

14. Parking Drawing

TBD

15. Outline Drawing

