# Specification for Approval

Customer:_____

Model Name:_____

| Supplier Approval | | | Customer approval |
|---|---|---|---|
| R&D Designed | R&D Approved | QC Approved | |
| Peter | Peng Jun | | |

# Revision Record

| REV NO. | REV DATE | CONTENTS | Note |
|---|---|---|---|
| A | 2024-08-16 | NEW ISSUE | |
| B | 2024-09-23 | MODIFY ITEM 3 & ITEM 8 | P.5 & P.13 |
| C | 2024-12-12 | MODIFY LUMINANCE | P.5 & P.13 |
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# Table of Contents

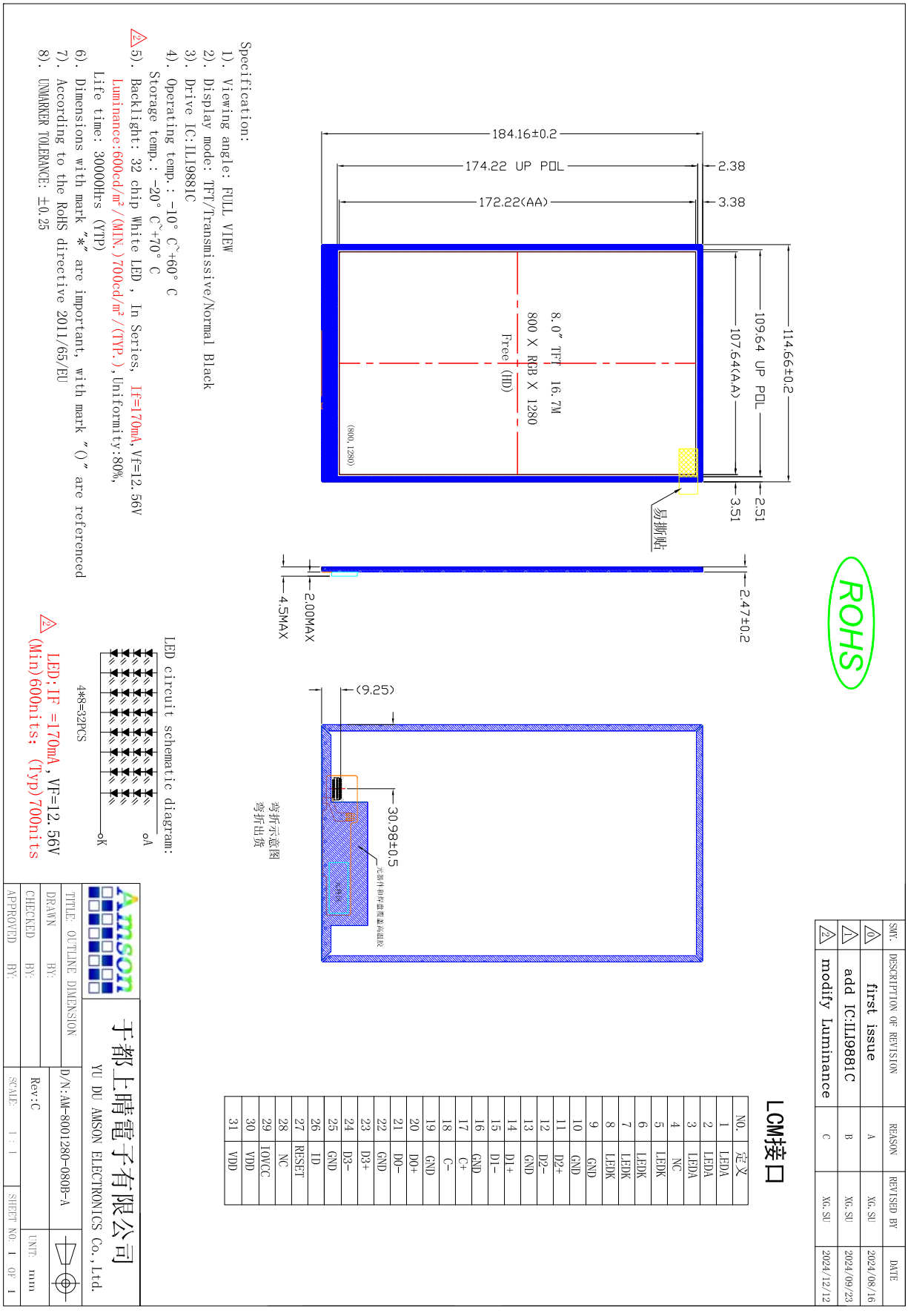
## 1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.
If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

## 2. General Information

| ITEM | STANDARD VALUES | UNITS |
|---|---|---|
| LCD type | 8.0”TFT | -- |
| Dot arrangement | 800×3(RGB)×1280 | dots |
| Color filter array | RGB vertical stripe | -- |
| Display mode | IPS/Normally Black | -- |
| Viewing Direction | 85/85/85/85 | -- |
| Module size | 114.66(W) × 184.16(H) × 2.47(T) | mm |
| Active area | 107.64× 172.22 | mm |
| Interface | 2&4 Lanes MIPI Interface | -- |
| Backlight | White LED x 32 | -- |
| Operating temperature | -10 ~ +60 | °C |

## 3. External Dimensions



## 4. Interface Description

| PIN | PIN NAME | DESCRIPTION | Remark |
|---|---|---|---|
| 1,2,3 | LEDA | Anode for light bar | |
| 4 | NC | NC | |
| 5,6,7,8 | LEDK | Cathode for light bar | |
| 9 | GND | Ground | |
| 10 | GND | Ground | |
| 11 | MIPI_D2+ | MIPI differential data2 input(Positive) | |
| 12 | MIPI_D2- | MIPI differential data2 input(Negative) | |
| 13 | GND | Ground | |
| 14 | MIPI_D1+ | MIPI differential data1 input(Positive) | |
| 15 | MIPI_D1- | MIPI differential data1 input(Negative) | |
| 16 | GND | Ground | |
| 17 | MIPI_CLK+ | MIPI differential clock input(Positive) | |
| 18 | MIPI_CLK- | MIPI differential clock input(Negative) | |
| 19 | GND | Ground | |
| 20 | MIPI_D0+ | MIPI differential data0 input(Positive) | |
| 21 | MIPI_D0- | MIPI differential data0 input(Negative) | |
| 22 | GND | Ground | |
| 23 | MIPI_D3+ | MIPI differential data3 input(Positive) | |
| 24 | MIPI_D3- | MIPI differential data3 input(Negative) | |
| 25 | GND | Ground | |
| 26 | ID | NC | |
| 27 | RESET | Device reset signal | |
| 28 | GND | Ground | |
| 29 | VDDIO | 1.8V/3.3V input | |
| 30 | VDD | 3.3V input | |
| 31 | VDD | 3.3V input | |

## 5. Absolute Maximum Ratings

| Item | Symbol | Min. | Max. | Unit | Remark |
|---|---|---|---|---|---|
| Digital Supply Voltage | VDD | -0.3 | 4.0 | V | |
| Operating Temperature | **TOP** | -10 | 60 | °C | |
| Storage Temperature | TST | -20 | 70 | °C | |

## 6. DC Characteristics

| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Digital Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | |
| I/O Supply Voltage | VDDIO | 1.7 | 1.8 | 3.6 | V | |
| Input logic high voltage | VIH | 0.7*VDD/ VDDIO | - | VDD/ VDDIO | V | |
| Input logic low voltage | VIL | GND | - | 0.3*VDD/ VDDIO | V | |

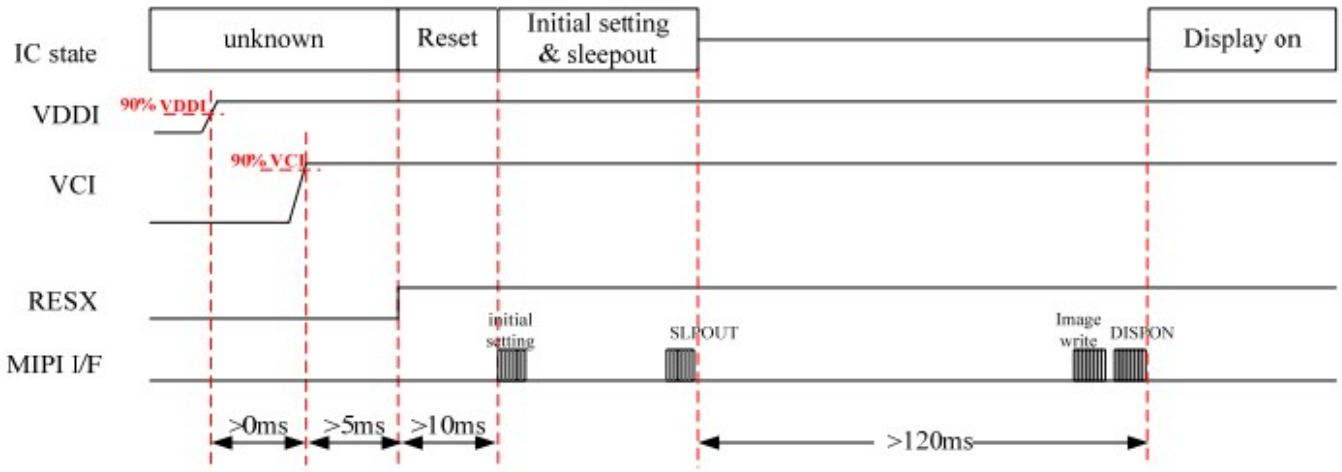
# 7. Timing Characteristics

## 7.1. Power ON/OFF Sequence

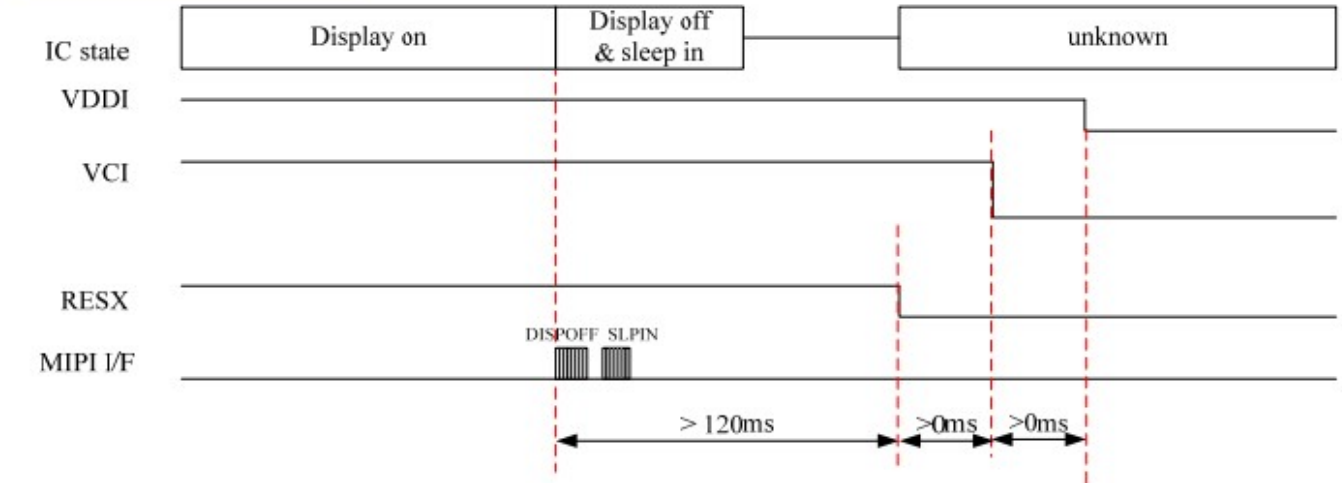
### 2-Power mode with Power IC or PFM mode

The power on/off sequence for 2-power mode, in which input powers are VCI and VDDI, is depicted in the following. Please follow the power input sequence to avoid triggering any abnormal state.

**Power On sequence**

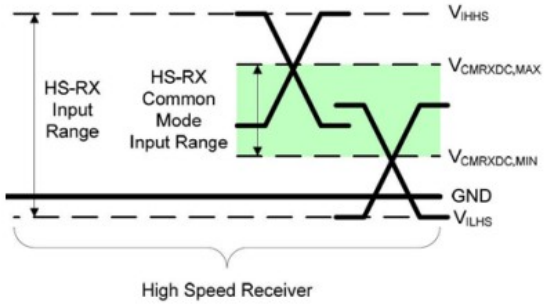



**Power Off sequence**



## 7.2 MIPI Characteristics

### 7.2.1 DC Specifications High-Speed Receiver Specification

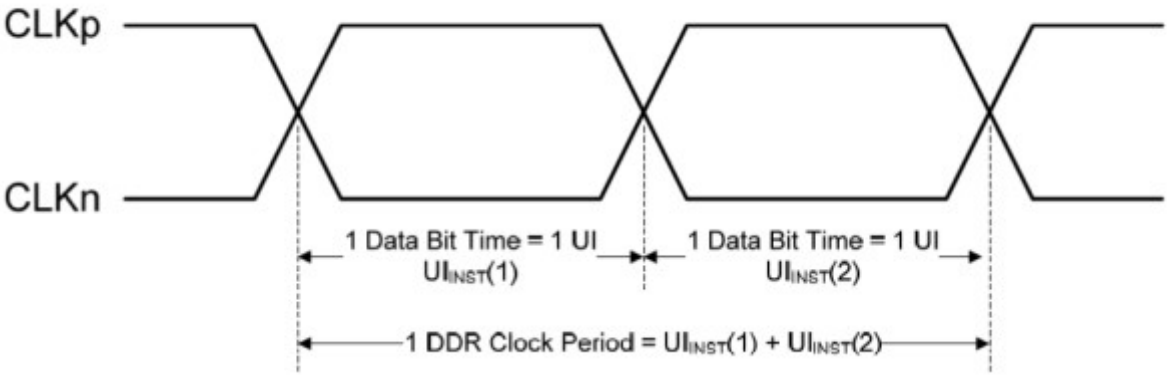



| Parameter | Description | Min | Nom | Max | Units | Note |
|---|---|---|---|---|---|---|
| VCMRX(DC) | Common-mode voltage for HS receiver | 70 | | 330 | mV | 1,2 |
| VIDTH | Differential input high threshold | | | 70 | mV | |
| VIDTL | Differential input low threshold | -70 | | | mV | |
| VIHHS | Single-ended input high voltage | | | 460 | mV | 1 |
| VILHS | Single-ended input low voltage | -40 | | | mV | 1 |
| ZID | Differential input impedance | 80 | 100 | 125 | Ω | |

Notes:
1. Excluding possible additional RF interference of 100mV peak sine wave beyond 450MHz.
2. Values in this table include a ground difference of 50mV between the transmitter and the receiver, the static common-mode level tolerance and variations below 450MHz

### 7.2.2 Forward high speed transmissions

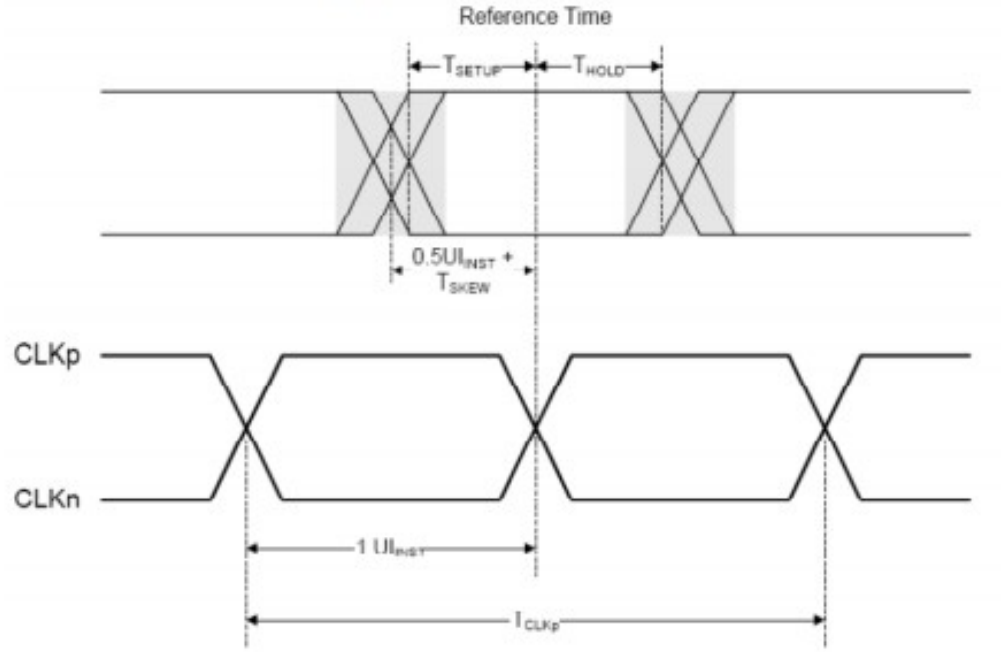
DDR Clock Definition




| Clock Parameter | Symbol | Min | Typ | Max | Units | Notes |
|---|---|---|---|---|---|---|
| UI instantaneous | $UI_{INST}$ | | | 12.5 | ns | 1,2 |

Notes:
1. This value corresponds to a minimum 80 Mbps data rate.
2. The minimum UI shall not be violated for any single bit period, i.e., any DDR half cycle within a data burst.

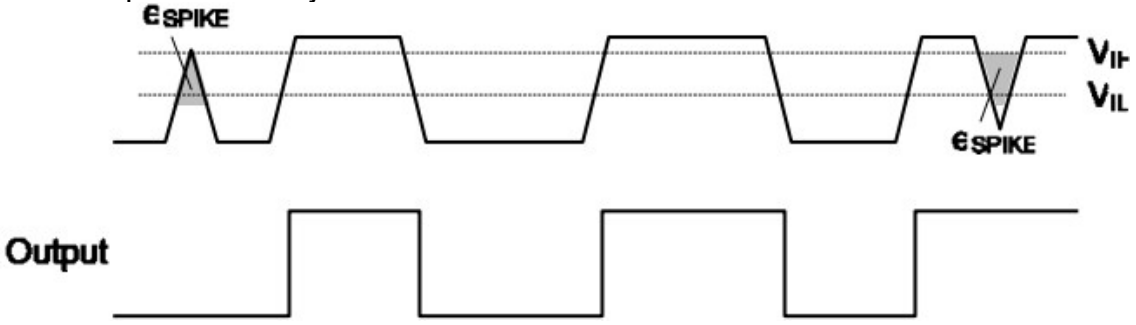
**Data to Clock Timing Definitions**




### 7.2.3 Low power transceiver specifications

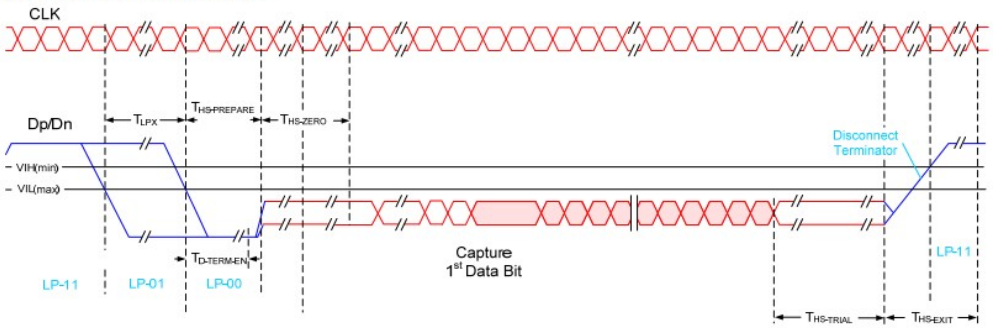
| Parameters | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Logic high level input voltage | VIHCD | Contention Detection (Lane_D0) | 450 | | 1350 | mV |
| Logic low level input voltage | VILCD | Contention Detection (Lane_D0) | 0 | | 200 | mV |
| Logic high level input voltage | VIH-LPRX | LP-Rx (Lane_CK, Lane_D0, Lane_D1) | 880 | - | 1350 | mV |
| Logic low level input voltage | VIL-LPRX | LP-Rx (Lane_CK, Lane_D0, Lane_D1 | 0 | | 550 | mV |
| Logic low level input voltage | VIL-ULPS | LP-Rx ULPS (Lane_CK, Lane_D0, Lane_D1) | 0 | | 300 | mV |
| Logic high level input voltage | VOH-LPTX | Contention Detection (Lane_D0) | 1.1 | 1.2 | 1.3 | V |
| Logic low level input voltage | VOL-LPTX | Contention Detection (Lane_D0) | -50 | 0 | 50 | mV |
| eSPIKE[1,2,3] | Fig. 2 | Input pulse rejection | | | 300 | V.ps |

Notes:
(1) Time-voltage integration of a spike above VIL when being in LP-0 state or below VIH when being in LP-1 state an impulse less than this will not change the receiver state.
(2) In addition to the required glitch rejection, implementers shall ensure rejection of known RF-interferers. Input Glitch Rejection of Low Power Receivers as follow.

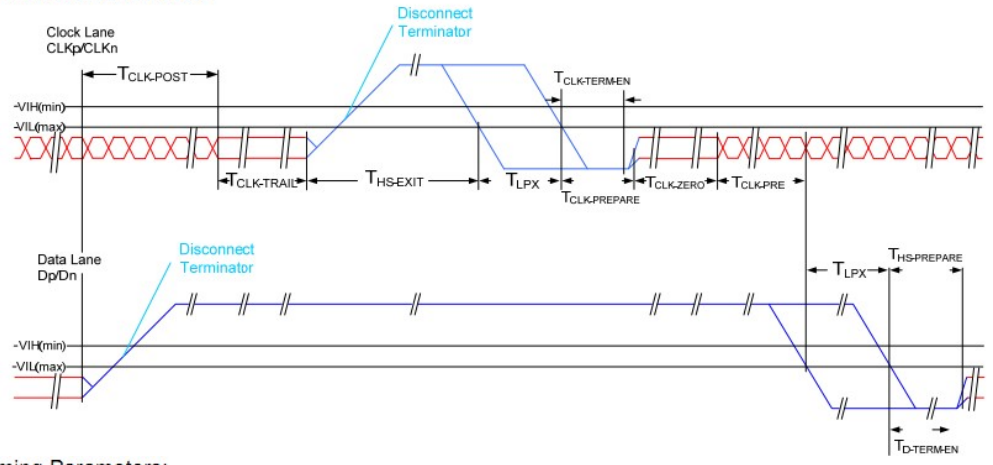


## 7.3 DSI Timing Characteristics

HS Data Transmission Burst



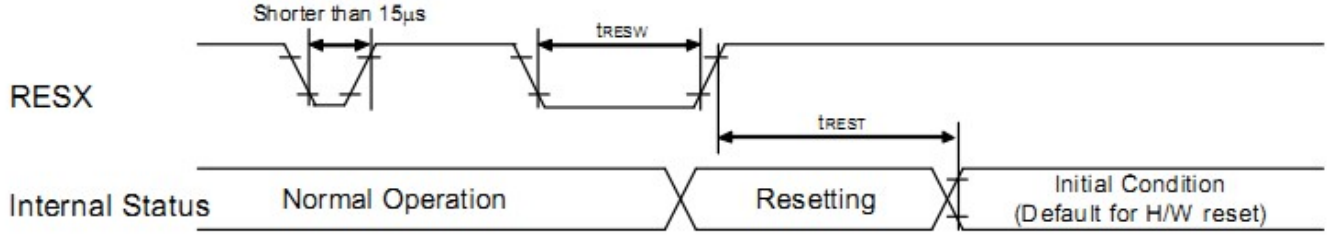

HS clock transmission




Timing Parameters:

| Parameter | Description | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $T_{CLK-POST}$ | Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of $T_{HS-TRAIL}$ to the beginning of $T_{CLK-TRAIL}$ . | 60ns + 52*UI | | | ns |
| $T_{CLK-TRAIL}$ | Time that the transmitter drives the HS-0 state after the last payload clock bit of a HS transmission burst. | 60 | | | ns |
| $T_{HS-EXIT}$ | Time that the transmitter drives LP-11 following a HS burst. | **300** | | | ns |
| $T_{CLK-TERM-EN}$ | Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$ . | Time for Dn to reach $V_{TERM-EN}$ | | 38 | ns |
| $T_{CLK-PREPARE}$ | Time that the transmitter drives the Clock Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission. | 38 | | 95 | ns |
| $T_{CLK-PRE}$ | Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode. | 8 | | | UI |
| $T_{CLK-PREPARE}$ + $T_{CLK-ZERO}$ | $T_{CLK-PREPARE}$ + time that the transmitter drives the HS-0 state prior to starting the Clock. | 300 | | | ns |
| $T_{D-TERM-EN}$ | Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$ . | Time for Dn to reach $V_{TERM-EN}$ | | 35 ns +4*UI | |
| $T_{HS-PREPARE}$ | Time that the transmitter drives the Data Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission | 40ns + 4*UI | | 85 ns + 6*UI | ns |
| $T_{HS-PREPARE}$ + $T_{HS-ZERO}$ | $T_{HS-PREPARE}$ + time that the transmitter drives the HS-0 state prior to transmitting the Sync sequence. | 145ns + 10*UI | | | ns |
| $T_{HS-TRAIL}$ | Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst | 60ns + 4*UI | | | ns |

## 7.4 Reset Timing Characteristics



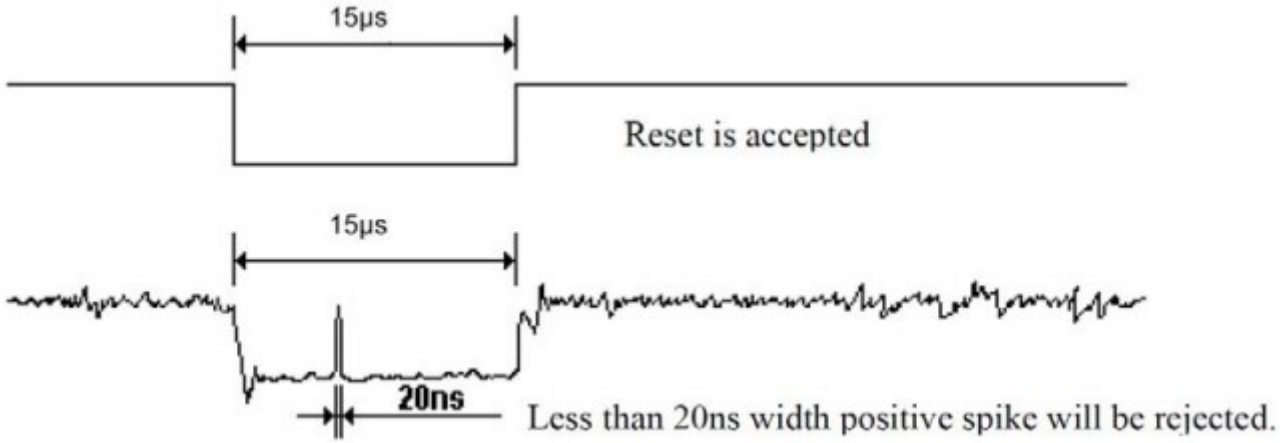

Reset timing:

IOVCC=1.65V to 3.6V, AGND=DGND=0V, Ta=-40 to 85℃

| Symbol | Parameter | Related Pins | MIN | TYP | MAX | Note | Unit |
|---|---|---|---|---|---|---|---|
| $t_{RESW}$ | *1) Reset low pulse width | RESX | 15 | - | - | | µs |
| $t_{REST}$ | *2) Reset complete time | - | - | - | 5 | When reset applied during sleep-in mode | ms |
| | | - | | - | 120 | When reset applied during sleep-out mode | ms |

| RESX Pulse | Action |
|---|---|
| Shorter than 5µs | Reset Rejected |
| Longer than 15µs | IC Reset |
| Between 5µs and 15µs | Reset starts<br>(It depends on voltage and temperature condition.) |

Note 1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.
Note 2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for H/W reset.
Note 3. During Reset Complete Time, data in MTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 5ms after a rising edge of RESX.
Note 4. Spike Rejection also applies during a valid reset pulse as shown below:




Note 5. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

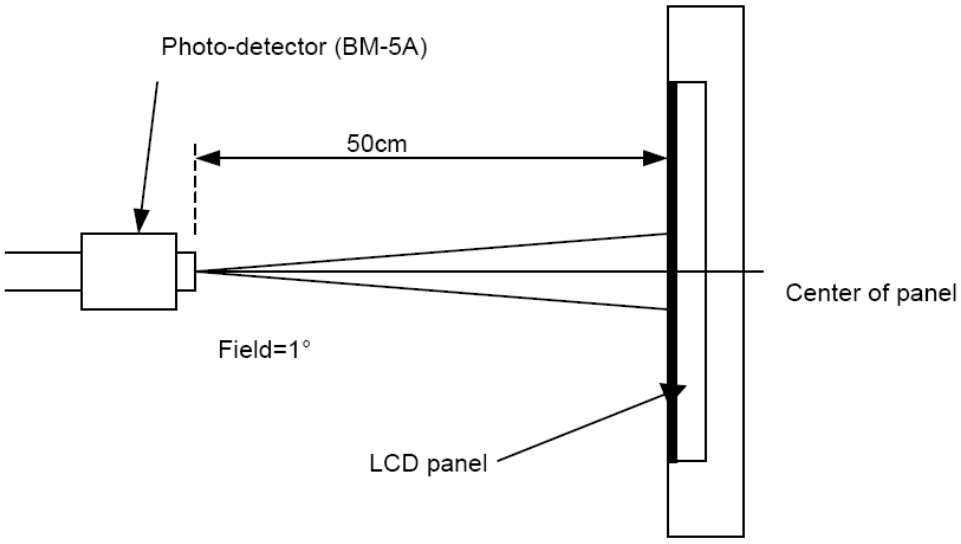
## 8. Backlight Characteristics

| Item | Symbol | MIN | TYP | MAX | UNIT | Test Condition |
|---|---|---|---|---|---|---|
| Supply Voltage | Vf | 11.3 | 12.56 | 14.0 | V | If=170mA |
| Supply Current | If | - | 170 | - | mA | - |
| Luminous Intensity for LCM | - | 600 | 700 | - | $cd/m^2$ | If=170mA |
| Uniformity for LCM | - | - | 80 | - | % | If=170mA |
| Life Time | - | - | 50000 | - | Hr | If=170mA |
| Backlight Color | White | | | | | |

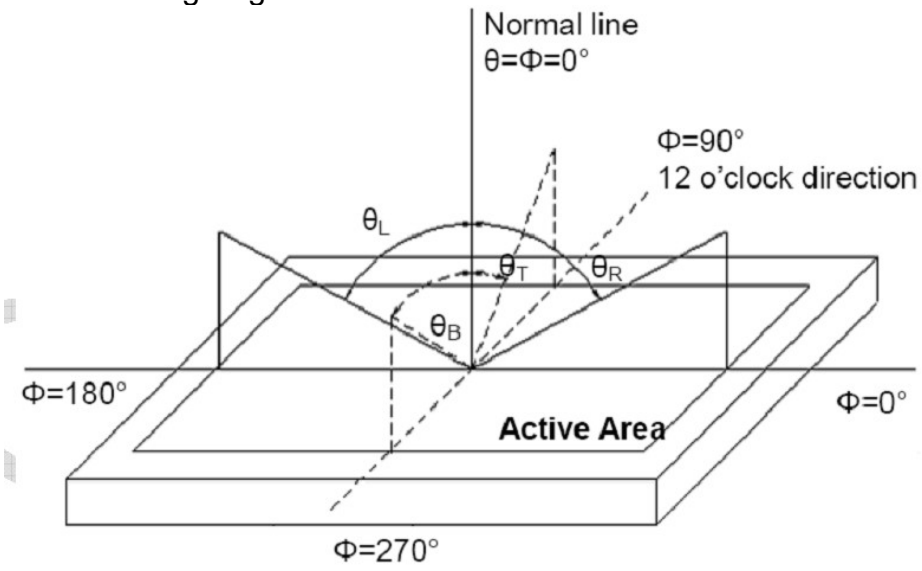
## 9. Optical Characteristics

| Item | Conditions | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Viewing Angle (CR>10) | Horizontal | $\theta_L$ | - | 85 | - | degree | (1),(2),(6) |
| | | $\theta_R$ | - | 85 | - | | |
| | Vertical | $\theta_T$ | - | 85 | - | | |
| | | $\theta_B$ | - | 85 | - | | |
| Contrast Ratio | Center | | 600 | 800 | - | - | (1),(3),(6) |
| Response Time | Rising | | - | 30 | 35 | ms | (1),(4),(6) |
| | Falling | | | | | | |
| CF Color Chromaticity (CIE1931) | Red x | | Typ. -0.05 | - | Typ. +0.05 | - | (1), (6) |
| | Red y | | | - | | - | |
| | Green x | | | - | | - | |
| | Green y | | | - | | - | |
| | Blue x | | | - | | - | |
| | Blue y | | | - | | - | |
| | White x | | | 0.319 | | - | |
| | White y | | | 0.329 | | - | |

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note (2) Definition of Viewing Angle



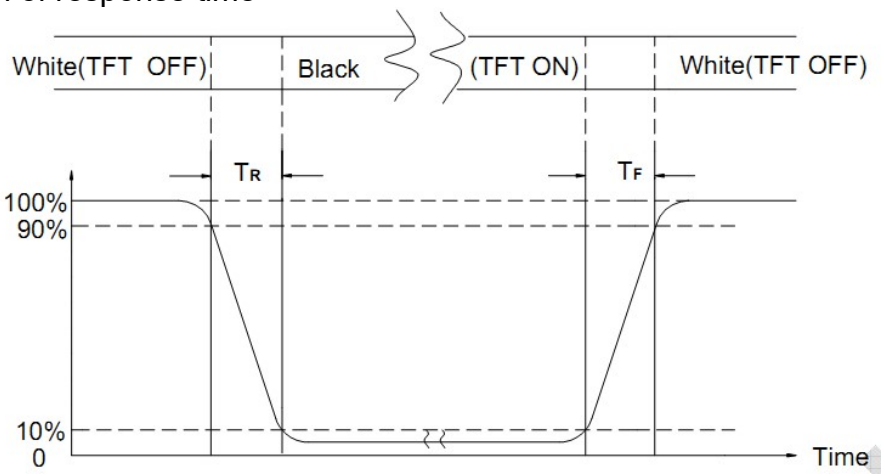

Note (3) Definition Of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63, L0: Luminance of gray level 0

Note (4) Definition of response time




Note (5) Definition of Transmittance (Module is without signal input)

Transmittance = Center Luminance of LCD / Center Luminance of Back Light x 100%

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD

## 10. Reliability Test Conditions and Methods

| NO. | TEST ITEMS | TEST CONDITION | INSPECTION AFTER TEST |
|---|---|---|---|
| ① | High Temperature Storage | 70°C±2°C×96Hours | Inspection after 2~4hours storage at room temperature, the samples should be free from defects:<br>1, Air bubble in the LCD.<br>2, Seal leak.<br>3, Non-display.<br>4, Missing segments.<br>5, Glass crack.<br>6, Current IDD is twice higher than initial value.<br>7, The surface shall be free from damage.<br>8, The electric characteristic requirements shall be satisfied.<br>9.Auxiliary materials are not included in the scope of testing |
| ② | Low Temperature Storage | -20°C±2°C×96Hours | |
| ③ | High Temperature Operating | 60°C±2°C×96Hours | |
| ④ | Low Temperature Operating | -10°C±2°C×96Hours | |
| ⑤ | Temperature Cycle(Storage) | -10°C ⟺ 50°C<br>(30min) (5min) (30min)<br>1cycle<br>Total 48cycle | |
| ⑥ | Damp Proof Test (Storage) | 60°C±5°C×90%RH×96Hours | |
| ⑦ | Vibration Test | Frequency:10Hz~55Hz~10Hz<br>Amplitude:1.5MM<br>X,Y,Z direction for total 3hours<br>(packing condition test will be tested by a carton) | |
| ⑧ | Drooping Test | Drop to the ground from 1M height one time every side of carton.<br>(packing condition test will be tested by a carton) | |
| ⑨ | ESD Test | Air Discharge: ± 8 kv 5 times each test location: LCD surface around the distance of 5 mm<br>contact discharge: ± 4 kv 5 times each test location: Product Four Corners, center point 150pF, 330 Ω | |

Reference Range of experimental project:①②③④⑤⑥⑦ : MIL-STD-202E
⑧: MIL-STD-810E
⑨: IEC-61000-4-2

REMARK:
1, The Test samples should be applied to only one test item.
2, Sample side for each test item is 3~10pcs.
3,For Damp Proof Test, Pure water(Resistance＞10MΩ)should be used.
4,In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
5, EL evaluation should be accepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic

# 11. Inspection Standard

## 11.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

### 11.1.1. INSPECTIONTOOLS AND INSTRUMENTS

Vernier calipers, film scales, multimeter, magnifying eyepiece, ND5%, luminance meter and so on.

### 11.1.2. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM AMSON TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10 TO 40 ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

### 11.1.3. INCOMING INSPECTION

(A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

(B) THE STANDARD OF QUALITY

ISO-2859-1 (SAME AS MIL-STD-105E ) ,LEVEL:II

| CLASS | AQL(%) |
|---|---|
| CRITICAL | 0.4 % |
| MAJOR | 0.65 % |
| MINOR | 1.5 % |

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

(C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

### 11.1.4. WARRANTY POLICY

AMSON WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. AMSON WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF AMSON.

## 11.2. CHECKING CONDITION

**11.2.1.**CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.

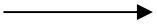
**11.2.2.**CHECKER SHALL SEE OVER 300±25 mm. WITH BARE EYES FAR FROM SAMPLE

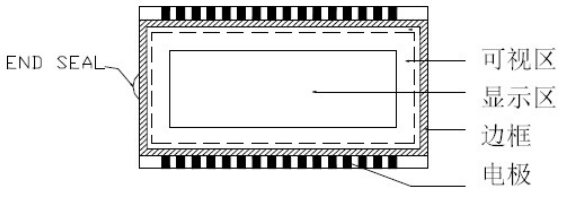
**11.2.3.**Ambient Illumination:

0 ~30 Lux for functional inspection

500 ~ 1200 Lux for external appearance inspection.

**11.2.4.** TEST AREA：






**11.2.5.** Inspection should be carried out with rope electrostatic ring and static finger cover (both hands except small fingers must be worn)

**11.2.6.** The inspector may make a visual inspection or a comparative examination with a film ruler and a magnifying eyepiece. Individual defects shall be determined according to the limited samples.

**11.2.7.** Functional testing uses electrical testing fixtures or test fixtures required by customers.

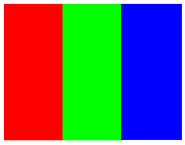
**11.2.8.** the ion fan should be used when testing.

**11.2.9. the principle of judgment**

11.3.1 If the defect outside the visual area does not affect the assembly and display, it will be judged as a good product.

11.3.2 Poor definition

Pixel:
A combination of three sub-pixels (Red + Green + Blue).



**Dot**:
Any of the sub-pixels (Red or Green or Blue).

**Bright and dark dots:**

A point pixel (sub-pixel: R, G, B pixels) is lit or turned off during the display function test.

**Highlights**:

Usually considered to be shown on a black screen.

**Dark spots:**

They are generally considered to be shown on R, G, B solid colors or white images.

**Neighborhood**:

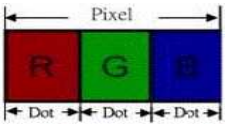
Two or three adjacent point pixels (dot: sub-pixel) connected together (R, G or G, B or B, R or RGB).

## 11.3 Inspection Plans:

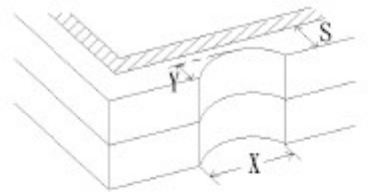
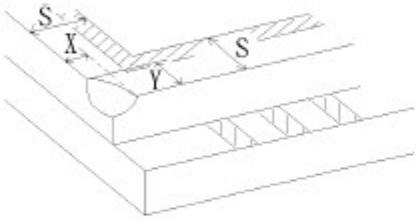
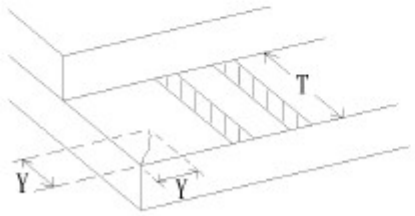
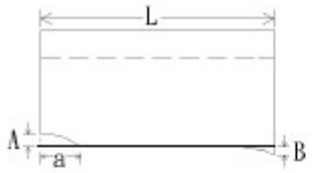
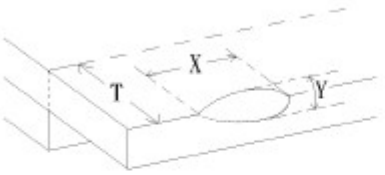
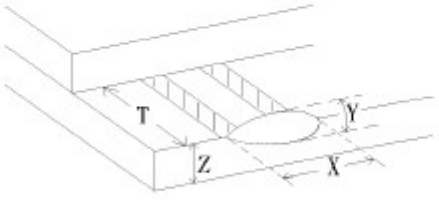
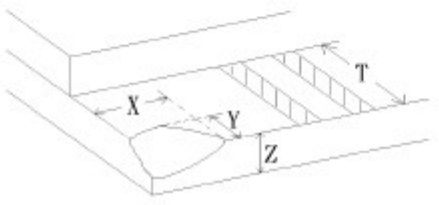
11.3. INSPECTION PLAN :

| CLASS | ITEM | JUDGEMENT | CLASS |
|---|---|---|---|
| PACKING & INDICATE | 1. OUTSIDE AND INSIDE PACKAGE | "MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE. | Minor |
| | 2. MODEL MIXED AND QUANTITY | OTHER MODEL MIXED.....REJECTED<br>QUANTITY SHORT OR OVER.....REJECTED | Critical |
| | 3. PRODUCT INDICATION | "MODEL NO." SHOULD INDICATE ON THE PRODUCT | Major |
| ASSEMBLY | 4. DIMENSION,<br>LCD GLASS SCRATCH<br>AND SCRIBE DEFECT. | ACCORDING TO SPECIFICATION OR DRAWING. | Major |
| APPEARANCE | 5. VIEWING AREA | POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA<br>.....REJECTED | Minor |
| | 6. BLEMISH、BLACK SPOT、<br>WHITE SPOT IN THE LCD<br>AND LCD GLASS CRACKS | ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA) | Minor |
| | 7. BLEMISH、BLACK SPOT<br>WHITE SPOT AND SCRATCH<br>ON THE POLARIZER | ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA) | Minor |
| | 8. BUBBLE IN POLARIZER | ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA) | Minor |
| | 9. LCD'S RAINBOW COLOR | STRONG DEVIATION COLOR ( OR NEWTON RING) OF LCD.....REJECTED.<br>OR ACCORDING TO LIMITED SAMPLE<br>( IF NEEDED, AND INSIDE VIEWING AREA ) | Minor |
| ELECTRICAL | 10. ELECTRICAL AND OPTICAL<br>CHARACTERISTICS<br>( CONTRAST、VOP、<br>CHROMATICITY ... ETC ) | ACCORDING TO SPECIFICATION OR DRAWING . ( INSIDE VIEWING AREA ) | Critical |
| | 11.MISSING LINE | MISSING DOT、LINE、CHARACTER<br>....REJECTED | Critical |
| | 12.SHORT CIRCUIT、<br>WRONG PATTERN DISPLAY | NO DISPLAY、WRONG PATTERN DISPLAY、CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED | Critical |
| | 13. DOT DEFECT (FOR COLOR AND TFT) | ACCORDING TO STANDARD OF VISUAL INSPECTION | Minor |

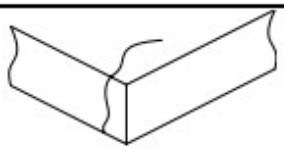
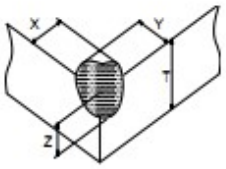
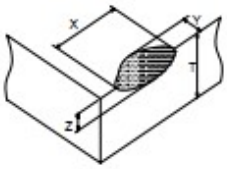
## 11.4. Inspection Plans:

<table>
<tr><th>NO.</th><th>CLASS</th><th>ITEM</th><th>JUDGEMENT</th></tr>
<tr><td>11.4.1</td><td>MINOR</td><td>BLACK AND WHITE SPOT<br>FOREIGN MATERIEL DUST IN THE CELL<br>BLEMISH<br>SCRATCH</td><td>(A) ROUND TYPE: unit: mm
<table>
<tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>∅ ≤ 0.2</td><td>Disregard (interval ≥ 1mm)</td></tr>
<tr><td>0.2 < ∅ ≤ 0.3</td><td>2 (Distance ≥ 15mm)</td></tr>
<tr><td>0.3 < ∅</td><td>0</td></tr>
</table>
NOTE: ∅=(LENGTH*WIDTH)/2<br>(S) ROUND TYPE: unit: mm
<table>
<tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE QTY</th></tr>
<tr><td>……</td><td>W ≤ 0.05</td><td>Disregard</td></tr>
<tr><td>L ≤5.0</td><td>0.05 < W ≤ 0.01</td><td>3 (Distanced ≥ 15mm)</td></tr>
<tr><td>……</td><td>0.1 < W</td><td>FOLLOW ROUND TYPE</td></tr>
</table>
NOTE: ∅=(LENGTH*WIDTH)/2</td></tr>
<tr><td>11.4.2</td><td>MINOR</td><td>BUBBLE IN POLARIZER<br>DENT ON POLARIZER</td><td>unit: mm.
<table>
<tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>∅ < 0.2</td><td>Disregard</td></tr>
<tr><td>0.2 < ∅ ≤ 0.3</td><td>2 (Distance ≥ 15mm)</td></tr>
<tr><td>0.3 < ∅</td><td>0</td></tr>
</table></td></tr>
<tr><td>11.4.3</td><td>MINOR</td><td>Dot Defect</td><td>Pixel Define :
<table>
<tr><th>Items</th><th>ACC. Q'TY</th></tr>
<tr><td>Bright dot</td><td>N ≤ 1</td></tr>
<tr><td>Dark dot</td><td>N ≤ 2 (Distance ≥ 5mm)</td></tr>
</table>


Note:<br>1. The definition of dot: The size of a defective dot over 1 of whole dot is regarded as one defective dot.<br>Definition:<1/2 dot and visible by 5% ND filter<br>2. Bright dot: Dots appear bright and unchanged in size which LCD panel is displaying under black pattern.<br>3. Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure Red, Green, Blue pattern.</td></tr>
<tr><td>11.4.3.1</td><td>MINOR</td><td>Mura</td><td>Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary</td></tr>
</table>

| NO. | CLASS | ITEM | JUDGEMENT |
|---|---|---|---|
| 11.4.4 | MINOR | LCD GLASS CHIPPING |  Y > S Reject |
| 11.4.5 | MINOR | LCD GLASS CHIPPING |  X or Y > S Reject |
| 11.4.6 | MAJOR | LCD GLASS GLASS CRACK |  Y > (1/2) T Reject |
| 11.4.7 | MAJOR | LCD GLASS SCRIBE DEFECT |  1. a> L/3 , A>1.5mm. Reject<br>2. B : ACCORDING TO DIMENSION |
| 11.4.8 | MINOR | LCD GLASS CHIPPING ( ON THE TERMINAL AREA ) |  Φ= (x+y)/2 > 2.5 mm Reject |
| 11.4.9 | MINOR | LCD GLASS CHIPPING ( ON THE TERMINAL SURFACE ) |  Y > (1/3) T Reject |
| 11.4.10 | MINOR | LCD GLASS CHIPPING |  Y > T Reject |

## 11.5 Inspection Plans:

| NO. | CLASS | ITEMS | | JUDGEMENT | |
|---|---|---|---|---|---|
| 11.5.1 | MAJOR | Touch Panel Crack | |  | Reject |
| 11.5.2 | MINOR | Touch Panel Chipping | Corner |  | Not CNC Products: X≦2mm, Y≦2mm, Z<1/2T — Accept<br>CNC Products: For CNC Outline Dimension — Accept |
| | | | Edge |  | Not CNC Products: X≦3mm, Y≦3mm, Z<1/2T — Accept<br>CNC Products: For CNC Outline Dimension — Accept |
| 11.5.3 | MINOR | Scratch Dust and Foreign materiel (Linear Type) | | W≦0.05, L≦10mm | Accept |
| | | | | 0.05mm<W≦0.07mm ; L≦5.0mm<br>Distance between seratch>5.0mm | Accept<br>3 ea Max. |
| | | | | W>0.07mm | Reject |
| 11.5.4 | MINOR | Scratch Dust and Foreign materiel (Round Type ; Φ=(Length+Width)/2) | | Φ≦0.15mm | Accept |
| | | | | 0.15mm<Φ≦0.25mm<br>Distance between seratch>5.0mm | Accept<br>5 ea Max. |
| | | | | Φ>0.25mm | Reject |
| 11.5.5 | MINOR | Touch Panel Dent / Fish Eyes (Φ=(Length+Width)/2) | | Φ≦0.35mm | Accept |
| | | | | 0.35mm<Φ≦1.0mm<br>Distance >5.0mm | Accept<br>3 ea Max. |
| | | | | Φ>1.0mm | Reject |
| 11.5.6 | MINOR | Touch Panel Air Bubble (Φ=(Length+Width)/2) | | Φ≦0.15mm | Accept |
| | | | | 0.15mm<Φ≦0.25mm<br>Distance between bubbles>5.0mm | Accept<br>3 ea Max. |
| | | | | Φ>0.25mm | Reject |
| 11.5.7 | MINOR | Touch Panel Printing area Scratch | | W≦0.03, L≦10mm | Accept |
| | | | | 0.03mm<W≦0.05mm, L≦5mm | Accept<br>3 ea Max. |
| | | | | W>0.05mm or L>5mm<br>( W>0.05 Follow 8.5.4 Round type ) | Reject |
| 11.5.8 | MINOR | Touch Panel White Haze Mark / Dust | | Can not be removed | Reject |

# 12. Handling Precautions

## 12.1 Mounting method

The LCD panel of AMSON TFT module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

## 12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent

[Recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

## 12.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to power or ground, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

## 12.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

## 12.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

### 12.6 storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us.

### 12.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

## 13. Precaution for Use

### 13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

### 13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification.
- When a new problem is arisen this is not specified in this specification.
- When an inspection specifications change or operating condition change in customer is reported to AMSON TFT and some problem is arisen in this specification due to the change.
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

## 14. Packing Method

**TBD**