






SPECIFICATION

Product Model: PV07060Y0140M

| DESIGNED | CHECKED | Approved |
|---|---|---|
|  |  |  |

Ok

NG, Problem survey

Approved By _____



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1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by Kingtech Group Co.,Ltd.

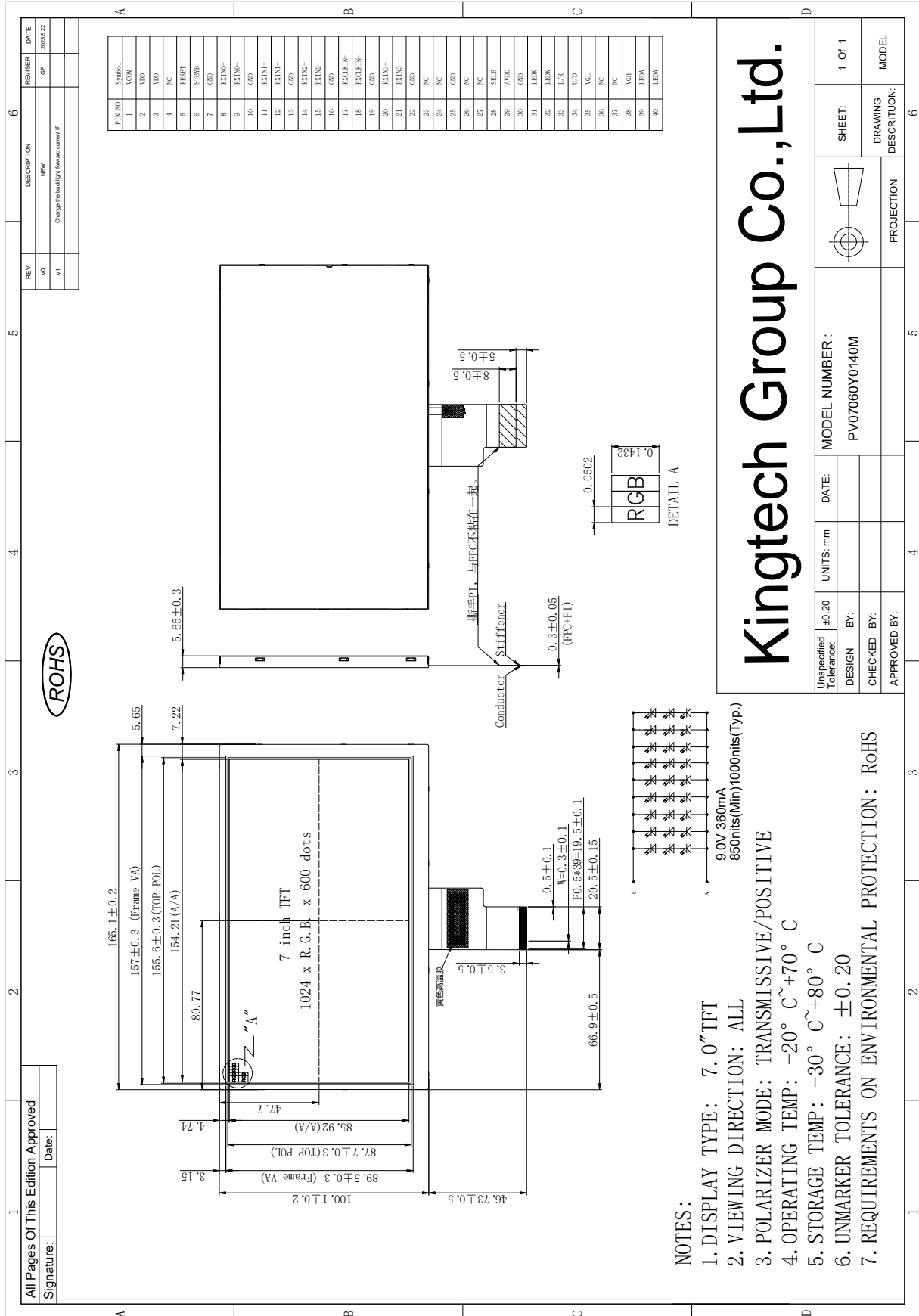
If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

2. General Information

| ITEM | STANDARD VALUES | UNITS |
|-----------------------|-----------------------------|-------|
| LCD type | 7.0" TFT | -- |
| Dot arrangement | 1024×3 (RGB)×600 | dots |
| Color filter array | RGB vertical stripe | -- |
| Display mode | Normally BLACK IPS | -- |
| Viewing Direction | ALL | -- |
| Module size | 164.90(W)×100.00(H)×5.65(T) | mm |
| Active area | 154.21(W)×85.92(H) | mm |
| Dot pitch | 0.1506(W)×0.1432(H) | mm |
| Interface | LVDS | -- |
| Operating temperature | -20 ~ +70 | °C |
| Storage temperature | -30 ~ +80 | °C |
| Module Weight | -- | g |



3. External Dimensions





4. Interface Description

| No. | Symbol | I/O | Function |
|-------|--------|-----|--|
| 1 | VCOM | P | Common voltage |
| 2,3 | VDD | P | Digital power |
| 4 | NC | - | Not connect |
| 5 | RESET | I | Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=100K _Ω , C=1μF) |
| 6 | STBYB | I | Standby mode, normally pull high STBYB="1", normal operation STBYB="0", timing control, source driver will turn off, all output |
| 7 | GND | P | Ground |
| 8 | RXIN0- | I | Negative LVDS differential data inputs |
| 9 | RXIN0+ | I | Positive LVDS differential data inputs |
| 10 | GND | P | Ground |
| 11 | RXIN1- | I | Negative LVDS differential data inputs |
| 12 | RXIN1+ | I | Positive LVDS differential data inputs |
| 13 | GND | P | Ground |
| 14 | RXIN2- | I | Negative LVDS differential data inputs |
| 15 | RXIN2+ | I | Positive LVDS differential data inputs |
| 16 | GND | P | Ground |
| 17 | RXCLK- | I | Negative LVDS differential clock inputs |
| 18 | RXCLK+ | I | Positive LVDS differential clock inputs |
| 19 | GND | P | Ground |
| 20 | RXIN3- | I | Negative LVDS differential data inputs |
| 21 | RXIN3+ | I | Positive LVDS differential data inputs |
| 22 | GND | P | Ground |
| 23,24 | NC | - | Not connect |
| 25 | GND | P | Ground |
| 26,27 | NC | - | Not connect |
| 28 | SELB | I | 6bit/8bit mode select H : 6bit / L : 8bit |
| 29 | AVDD | P | Power for Analog Circuit |
| 30 | GND | P | Ground |
| 31,32 | LED K | P | LED backlight (Cathode). |
| 33 | L/R | I | Horizontal inversion |
| 34 | U/D | I | Vertical inversion |
| 35 | VGL | P | Negative power for TFT |
| 36 | NC | - | Not connect |
| 37 | NC | - | Not connect |
| 38 | VGH | P | Positive power for TFT |
| 39,40 | LED A | P | LED backlight (Anode). |

I: input , O: output , P: Power

【Note】



*1): When L/R="0" , set right to left scan direction

When L/R="1" , set left to right scan direction

When U/D="0" , set top to bottom scan direction

When U/D="1" , set bottom to top scan direction

5. Absolute Maximum Ratings

| Item | Symbol | Min. | Max. | Unit |
|-----------------------|--------|------|------|------|
| Logic Supply Voltage | DVDD | -0.5 | 5 | V |
| Analog Supply Voltage | AVDD | -0.5 | 15 | V |
| High Supply Voltage | VGH | -0.3 | 40 | V |
| Low Supply Voltage | VGL | -20 | 0.3 | V |
| Operating Temperature | TOP | -20 | 70 | °C |
| Storage Temperature | TST | -30 | 80 | °C |

6. Operating Conditions

| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
|------------------------|--------|--------|------|--------|------|--------------|
| Digital Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | - |
| Analog Supply Voltage | AVDD | 8 | 9.7 | 13.5 | V | - |
| Gate On Voltage | VGH | 16 | 18 | 20.3 | V | - |
| Gate Off Voltage | VGL | -7.1 | -6.8 | -6.5 | V | - |
| Common Voltage | VCOM | 3.0 | 3.6 | 5.0 | V | NOTE1 |
| Analog Supply Current | VDD | - | 30 | 40 | mA | |
| Analog Supply Current | AVDD | - | 20 | 40 | mA | |
| Analog Supply Current | VGH | - | 5 | 10 | mA | |
| Analog Supply Current | VGL | - | 5 | 10 | mA | |
| Analog Supply Current | VCOM | - | 2 | 5 | mA | |
| Logic Input Voltage | VIH | 0.7VDD | - | VDD | V | - |
| | VIL | GND | - | 0.3VDD | V | - |

Note 1: Please adjust VCOM to make the flicker level be minimum. Typ VCOM 电压值

只做参考, 具体以实际效果为准 (根据FLICKER 状态可调整)

7. Timing Characteristics

7.1 POWER ON/OFF SEQUENCE

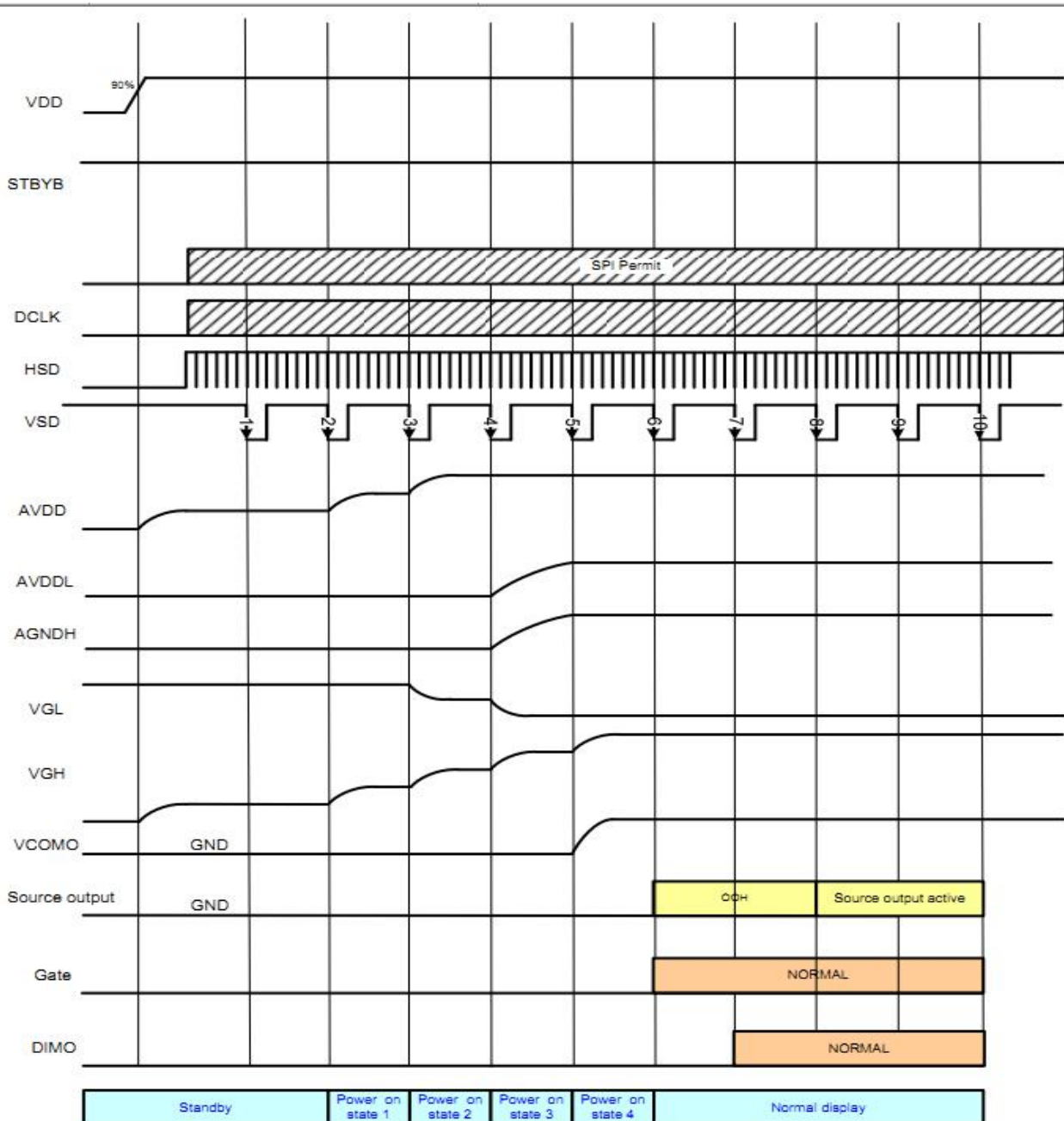


To prevent the device damage from latch up, the power on/off sequence shown below must be followed.

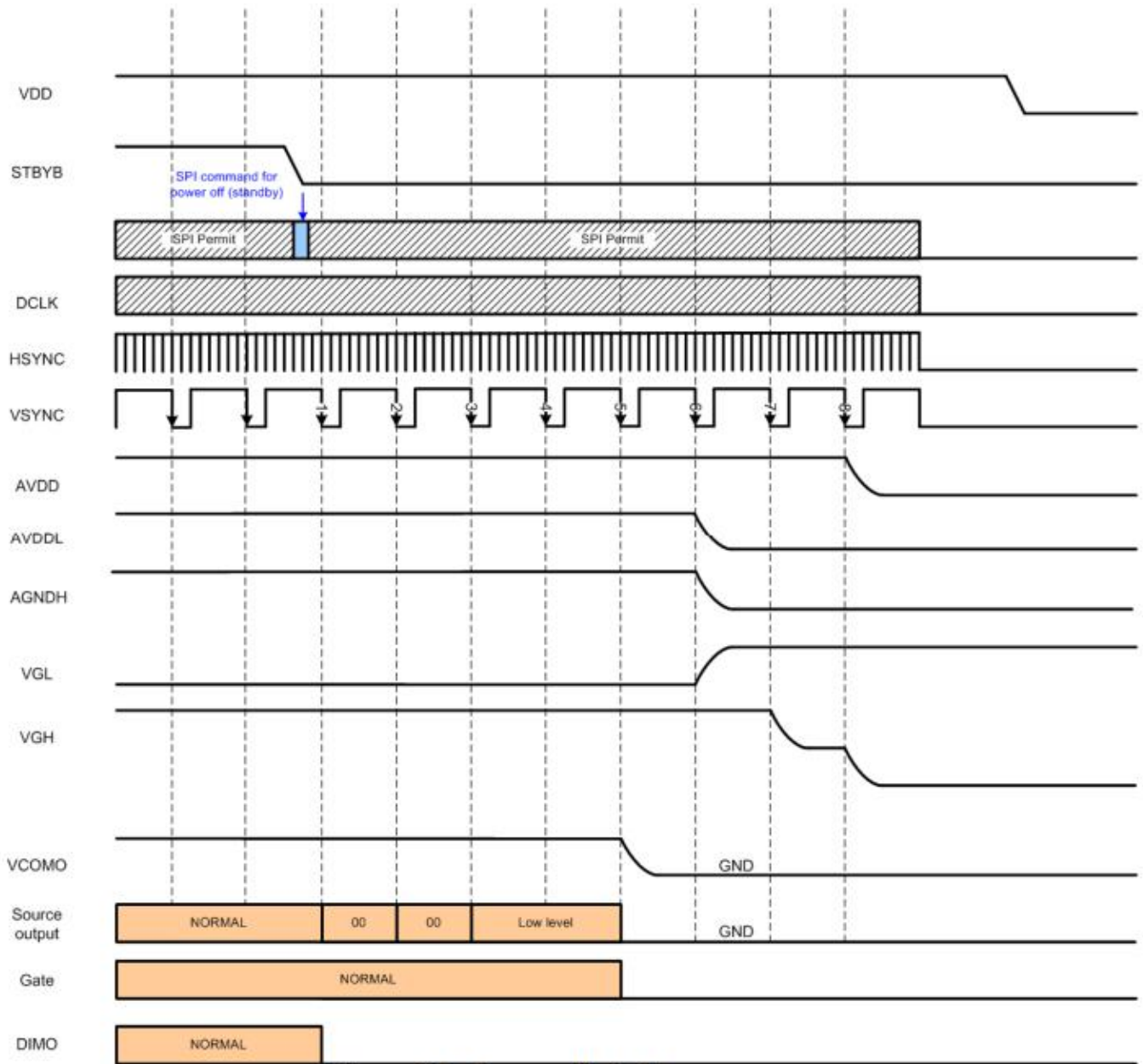
Power on: VDD, GND _ AVDD, AGND _ V1 to V14

Power off: V1 to V14 _ AVDD, AGND_ VDD, GND

Power on/off control



Power on timing sequence



Power off timing sequence

7.2 INPUT SIGNAL TIMING

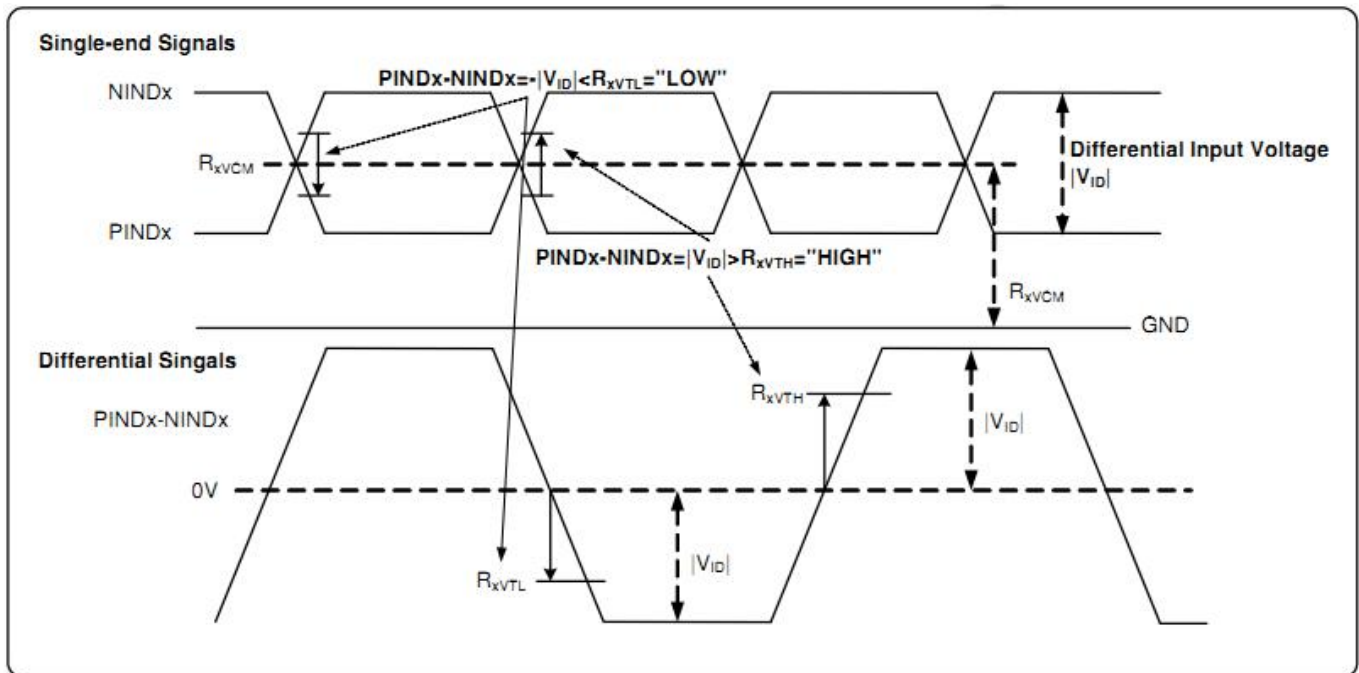


7.2.1 DC electrical characteristics

LVDS mode DC electrical characteristics

| Parameter | Symbol | Spec. | | | Unit | Condition |
|---|---------------|--------------|------|----------------------|---------|-----------------------------------|
| | | Min. | Typ. | Max. | | |
| Differential input high Threshold voltage | R_{XVTH} | - | - | +0.1 | V | $R_{XVCM}=1.2V$ |
| Differential input low threshold voltage | R_{XVTL} | -0.1 | - | - | V | |
| Input voltage range (singled-end) | R_{XVIN} | 0 | - | $VDD-1.2+ V_{ID} /2$ | V | - |
| Differential input common Mode voltage | R_{XVCM} | $ V_{ID} /2$ | - | $VDD-1.2$ | V | - |
| Differential input voltage | $ V_{ID} $ | 0.2 | - | 0.6 | V | - |
| Differential input leakage Current | $R_{V_{XIZ}}$ | -10 | - | +10 | μA | - |
| LVDS Digital Operating Current | I_{ddlvds} | - | 15 | 30 | mA | $F_{clk}=65MHz, VDD=3.3V$ |
| LVDS Digital Stand-by Current | I_{stlvds} | - | 10 | 50 | μA | Clock & all Functions are stopped |

Single-end signals

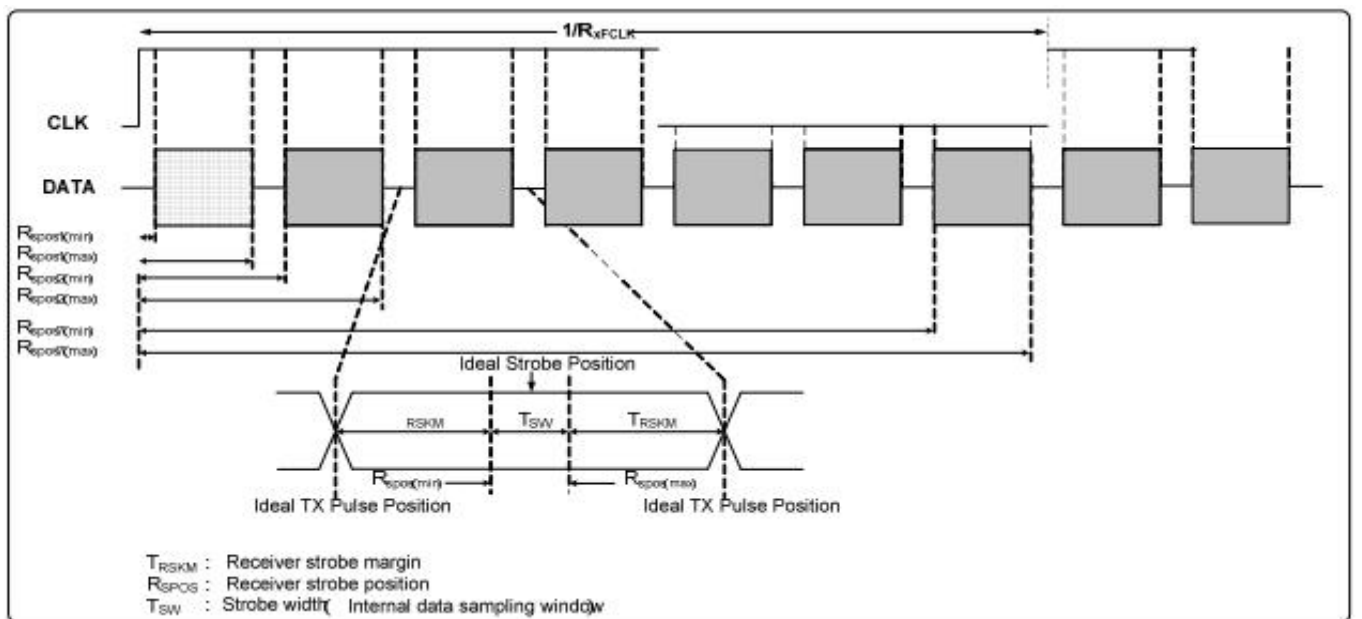
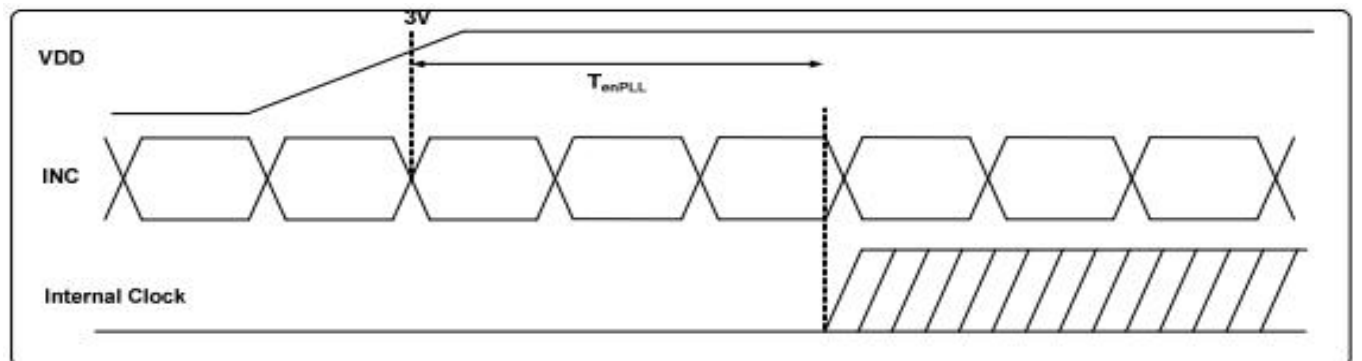
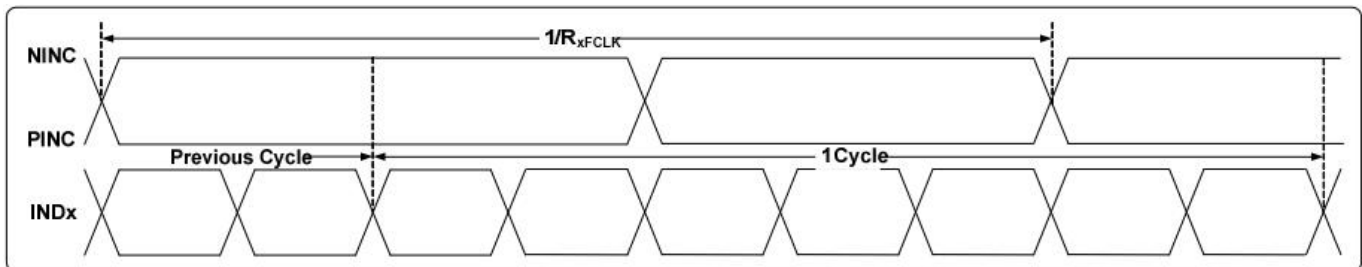


7.2.2AC ELECTRICAL CHARACTERISTICS

LVDS mode AC electrical characteristics

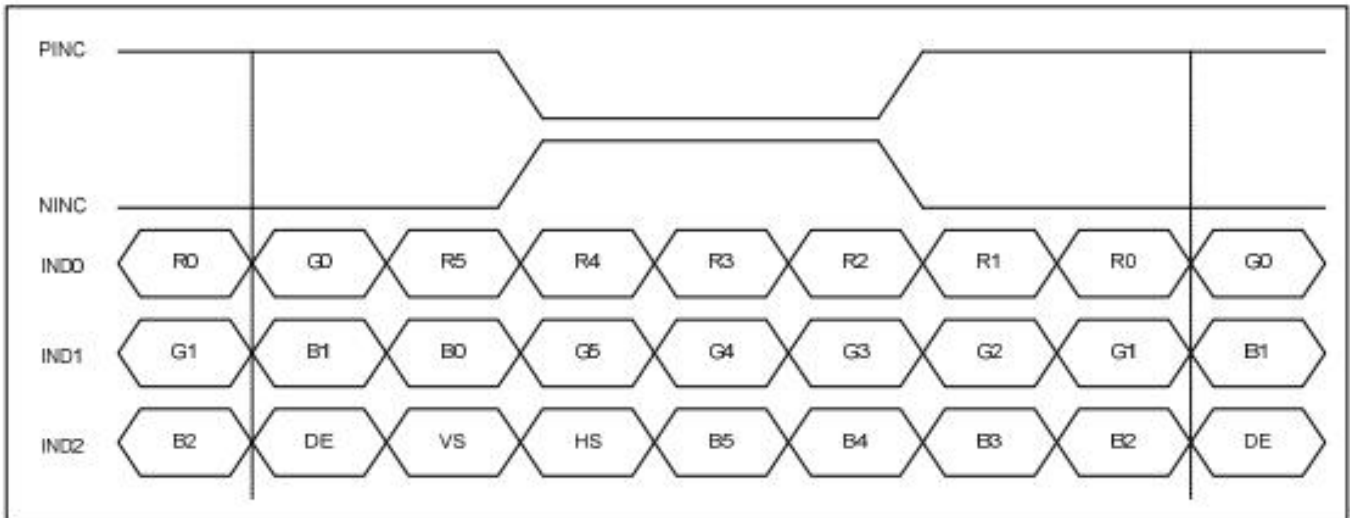


| Parameter | Symbol | Spec. | | | Unit | Condition |
|------------------------|-------------|-------|---------------------|------|---------|--|
| | | Min. | Typ. | Max. | | |
| Clock frequency | R_{XFCLK} | 20 | - | 71 | MHz | - |
| Input data skew margin | T_{RSKM} | 500 | - | - | pS | $ V_{ID} =400mV$ $R_{XVCM}=1.2V$ $R_{XFCLK}=71MHz$ |
| Clock high time | T_{LVCH} | - | $4/(7 * R_{XFCLK})$ | - | ns | - |
| Clock low time | T_{LVCL} | - | $3/(7 * R_{XFCLK})$ | - | ns | - |
| PLL wake-up time | T_{enPLL} | - | - | 150 | μs | - |

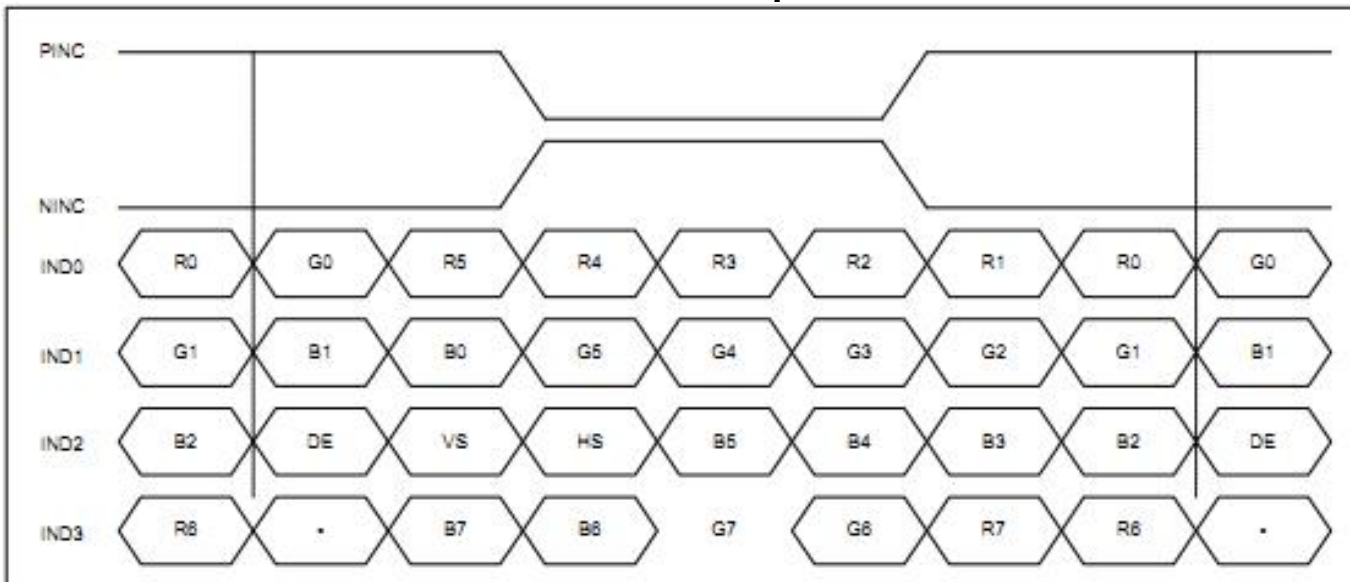


LVDS mode data input format

7.2.3 LVDS mode data input format



6-bit LVDS input



8-bit LVDS input

7.3 PARALLEL RGB INPUT TIMING TABLE

DE mode

| DE mode | | | | | |
|---------------------------------|----------|-------|------|------|------|
| Parameter | Symbol | Value | | | Unit |
| | | Min. | Typ. | Max. | |
| DCLK frequency @Frame rate=60hz | fclk | 40.8 | 51.2 | 67.2 | Mhz |
| Horizontal display area | thd | 1024 | | | DCLK |
| HSYNC period time | th | 1114 | 1344 | 1400 | DCLK |
| HSYNC blanking | thb+thfp | 90 | 320 | 376 | DCLK |
| Vertical display area | tvd | 600 | | | H |
| VSYNC period time | tv | 610 | 635 | 800 | H |
| VSYNC blanking | tvb+tvfp | 10 | 35 | 200 | H |

HV mode



HV mode
Horizontal input timing

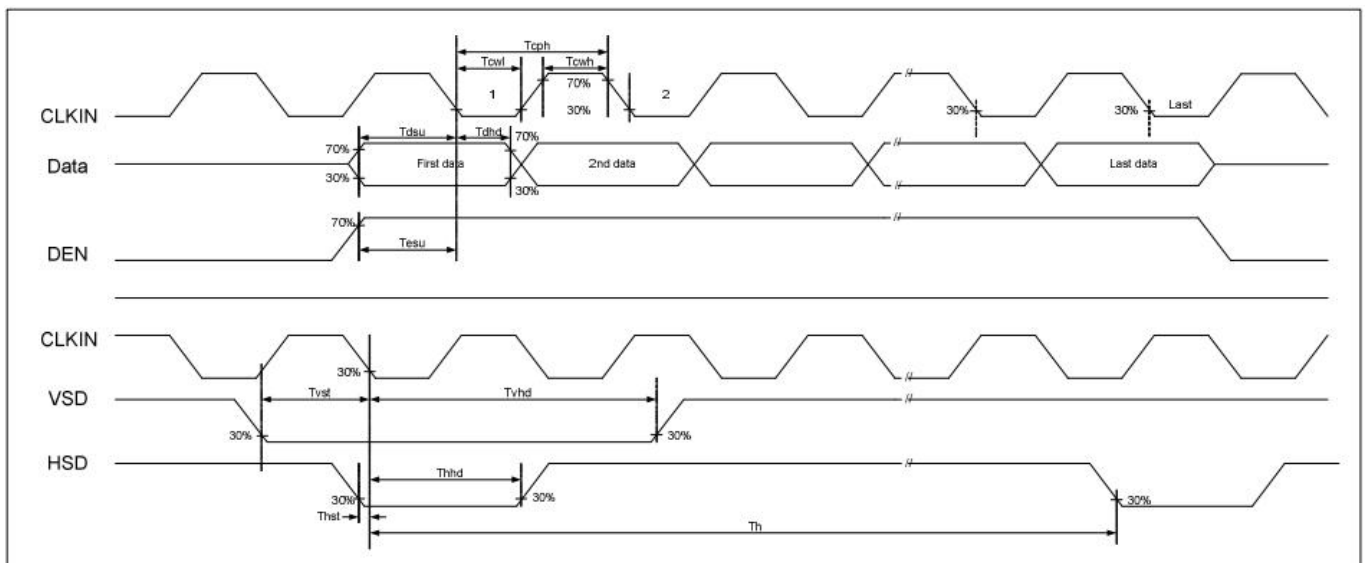
| Parameter | Symbol | Value | | | Unit |
|---------------------------------|--------|-------|------|------|------|
| Horizontal display area | thd | 1024 | | | DCLK |
| DCLK frequency@ Frame rate=60hz | fclk | Min. | Typ. | Max. | Mhz |
| | | 44.9 | 51.2 | 63 | |
| 1 Horizontal Line | th | 1200 | 1344 | 1400 | DCLK |
| HSYNC pulse width | thpw | Min. | 1 | | |
| | | Typ. | — | | |
| | | Max. | 140 | | |
| HSYNC back porch | thbp | 160 | 160 | 160 | |
| HSYNC front porch | thfp | 16 | 160 | 216 | |

Vertical input timing

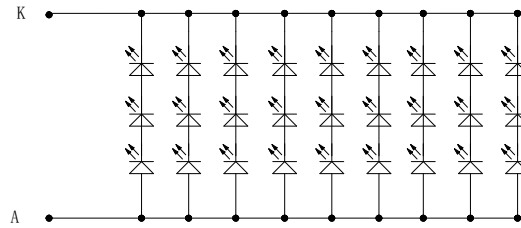
| Parameter | Symbol | Value | | | Unit |
|-----------------------|--------|-------|------|------|------|
| | | Min. | Typ. | Max. | |
| Vertical display area | tvd | 600 | | | H |
| VSYNC period time | tv | 624 | 635 | 750 | H |
| VSYNC pulse width | tvpw | 1 | — | 20 | H |
| VSYNC back porch | tvb | 23 | 23 | 23 | H |
| VSYNC front porch | tvfp | 1 | 12 | 127 | H |

7.4 TIMING DIAGRAM

Input Clock and Data Timing Diagram



8. Backlight Characteristic

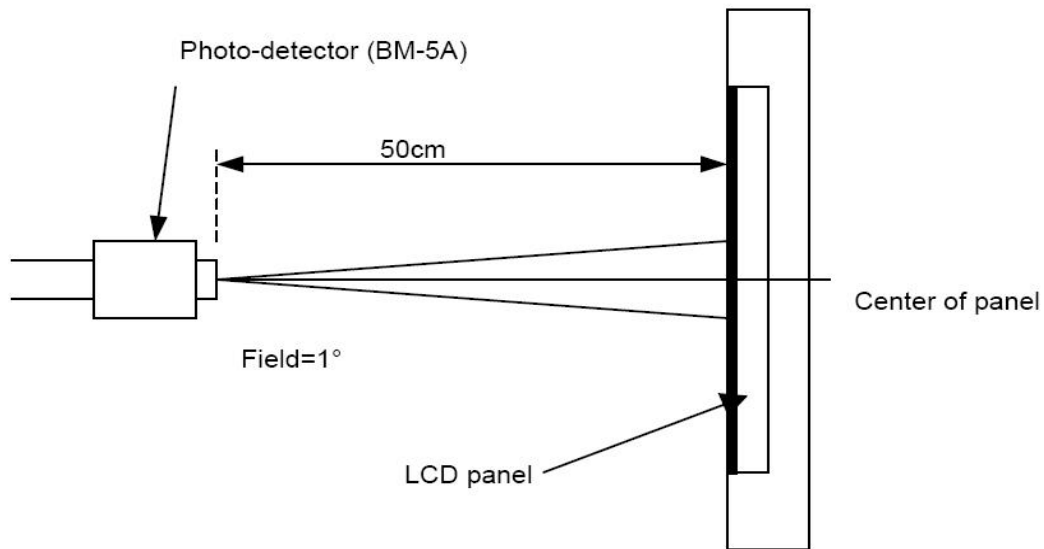


| Item | Symbol | MIN | TYP | MAX | UNIT | Test Condition |
|----------------------------|--------|-----|-------|-----|-------------------|----------------|
| Supply Voltage | Vf | 8.1 | 9.0 | 9.9 | V | If=360mA |
| Supply Current | If | - | 360 | - | mA | - |
| Luminous Intensity for LCM | - | 850 | 1000 | - | cd/m ² | If=360mA |
| Uniformity for LCM | - | 80 | - | - | % | If=360mA |
| Life Time | - | - | 30000 | - | Hr | If=360mA |
| Backlight Color | White | | | | | |

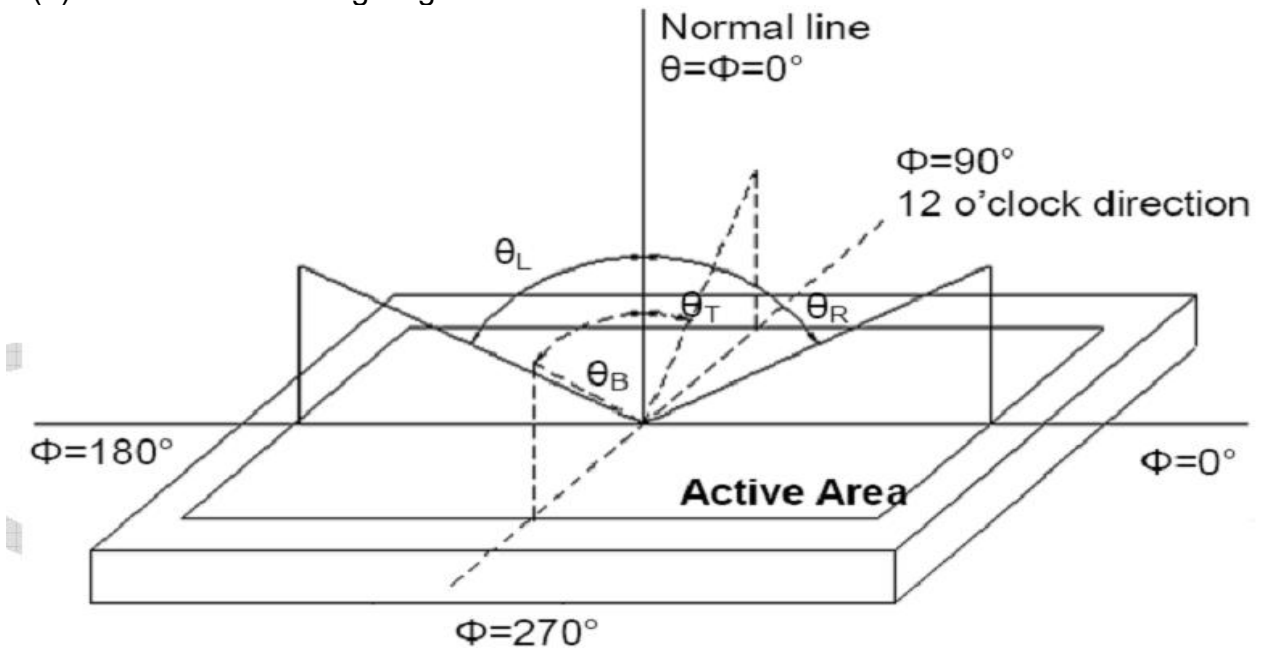
9. Optical Characteristics

| Item | Conditions | Min. | Typ. | Max. | Unit | Note |
|---------------------------------|------------|------------|-------|------------|--------|-------------|
| Viewing Angle (CR>10) | Horizontal | θ_L | 80 | - | degree | (1),(2),(6) |
| | | θ_R | 80 | - | | |
| | Vertical | θ_T | 80 | - | | |
| | | θ_B | 80 | - | | |
| Contrast Ratio | Center | 800 | 100 | - | - | (1),(3),(6) |
| Response Time | Rising | - | 25 | 35 | ms | (1),(4),(6) |
| | Falling | | | | | |
| CF Color Chromaticity (CIE1931) | Red x | Typ. -0.05 | TBD | Typ. +0.05 | - | (1), (6) |
| | Red y | | TBD | | - | |
| | Green x | | TBD | | - | |
| | Green y | | TBD | | - | |
| | Blue x | | TBD | | - | |
| | Blue y | | TBD | | - | |
| | White x | | 0.313 | | - | |
| | 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



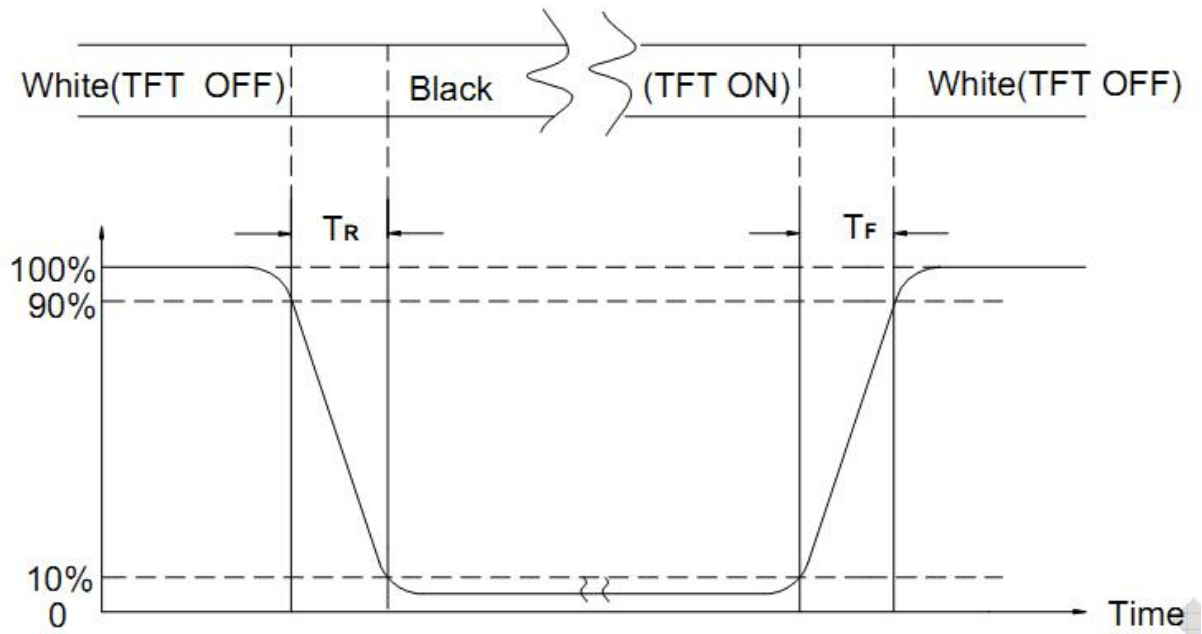
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

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)

$$\text{Transmittance} = \frac{\text{Center Luminance of LCD}}{\text{Center Luminance of Back Light}} \times 100\%$$

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD

Note (7) Transmittance is the Value with WV Polarizer and BLU



10. Reliability Test Conditions and Methods

| NO. | TEST ITEMS | TEST CONDITION | |
|-----|---|--|---|
| ① | High Temperature Storage | Keep in 80°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs. | |
| ② | High Temperature Operating | Keep in 70°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs. | |
| ③ | Low Temperature Storage | Keep in -30°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs. | |
| ④ | Low Temperature Operating | Keep in -20°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs. | |
| ⑤ | High Temperature / High Humidity Storage Test | Keep in 50 / 90% R.H duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer) | |
| ⑥ | Temperature Cycling Storage Test | $ \begin{array}{ccccccc} -10^{\circ}\text{C} & \rightarrow & +25^{\circ}\text{C} & \rightarrow & 60^{\circ}\text{C} & \rightarrow & +25^{\circ}\text{C} \\ (30\text{mins}) & & (5\text{mins}) & & (30\text{mins}) & & (5\text{mins}) \\ & & \longleftarrow & & \longrightarrow & & \\ & & & & 10 \text{ Cycle} & & \end{array} $ Surrounding temperature, then storage at normal condition 4hrs. | |
| ⑦ | ESD Test | Air Discharge: Apply 2 KV with 5 times Discharge for each polarity +/- | Contact Discharge: Apply 250 V with 5 times discharge for each polarity +/- |
| | | 1. Temperature ambience : 15°C ~ 35°C 2. Humidity relative : 30% ~ 60% 3. Energy Storage Capacitance(Cs + Cd) : 150pF ± 10% 4. Discharge Resistance(Rd) : 330Ω ± 10% 5. Discharge, mode of operation : Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : ±5%) | |
| ⑧ | Vibration Test (Packaged) | 1. Sine wave 10 ~ 55 Hz frequency (1 min/sweep) 2. The amplitude of vibration : 1.5 mm 3. Each direction (X、Y、Z) duration for 2 Hrs | |
| ⑨ | Drop Test (Packaged) | Drop Direction : ※ 1 corner / 3 edges / 6 sides each 1time Height: 45cm | |



11. Inspection Standard

11.1. QUALITY :

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

11.1.1. INSPECTION TOOLS 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 KINGTECH 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

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

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:

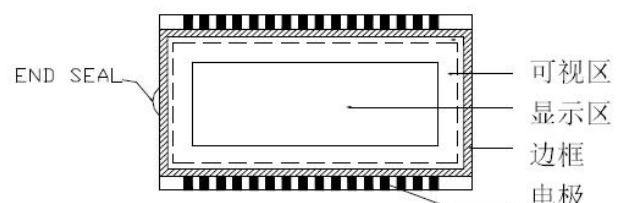
0 ~30 Lux for functional inspection

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
Rev.V1



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.

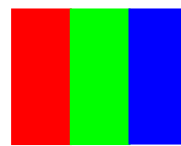
11.2.9. the principle of judgment

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

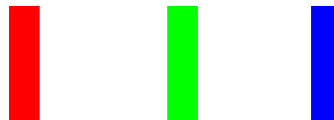
Pixel:

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).

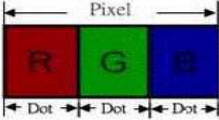


11.3. INSPECTION PLAN :

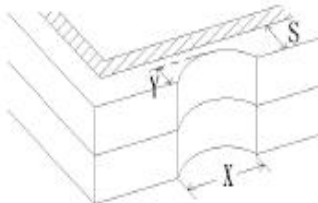
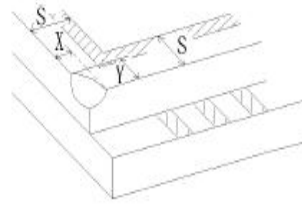
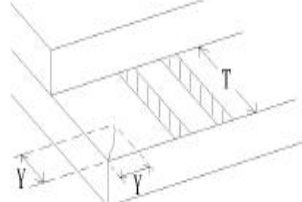
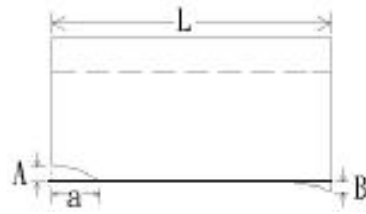
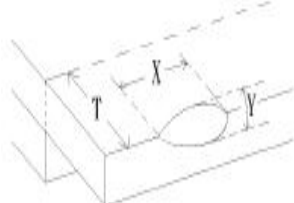
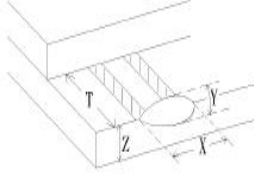
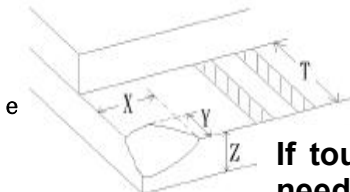
| CLASS | ITEM | JUDGEMENT | CLASS |
|--------------------|--|--|----------|
| PACKING & INDICATE | 1. OUTSIDE AND INSIDE PACKAGE | "MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE. | Minor |
| | 2. MODEL MIXED AND QUANTITY | OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED | Critical |
| | 3. PRODUCT INDICATION | "MODEL NO." SHOULD INDICATE ON THE PRODUCT | Major |
| ASSEMBLY | 4. DIMENSION, LCD GLASS SCRATCH 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 AREAREJECTED | Minor |
| | 6. BLEMISH · BLACK SPOT · WHITE SPOT IN THE LCD AND LCD GLASS CRACKS | ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA) | Minor |
| | 7. BLEMISH · BLACK SPOT WHITE SPOT AND SCRATCH 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. OR ACCORDING TO LIMITED SAMPLE (IF NEEDED, AND INSIDE VIEWING AREA) | Minor |
| ELECTRICAL | 10. ELECTRICAL AND OPTICAL CHARACTERISTICS (CONTRAST· VOP · CHROMATICITY ... ETC) | ACCORDING TO SPECIFICATION OR DRAWING . (INSIDE VIEWING AREA) | Critical |
| | 11.MISSING LINE | MISSING DOT · LINE · CHARACTERREJECTED | Critical |
| | 12.SHORT CIRCUIT· 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. STANDARD OF VISUAL INSPECTION

| NO. | CLASS | ITEM | JUDGEMENT | | | | | | | | | | |
|---|---|--|---|-----------------|------------------|----------------------------|---|------------------------------|---|------------------------------|----------------------------------|---------------------|---|
| 11.4.1 | MINOR | BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH | <p>(A) ROUND TYPE: unit: mm</p> <table border="1"> <thead> <tr> <th>DIAMETER (mm.)</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td>$\varnothing \leq 0.2$</td> <td>Distances $\geq 1\text{mm}$</td> </tr> <tr> <td>$0.2 < \varnothing \leq 0.3$</td> <td>3 (Distance $\geq 5\text{mm}$)</td> </tr> <tr> <td>$0.3 < \varnothing \leq 0.4$</td> <td>2 (Distance $\geq 5\text{mm}$)</td> </tr> <tr> <td>$0.4 < \varnothing$</td> <td>0</td> </tr> </tbody> </table> <p>NOTE: $\varnothing = (\text{LENGTH} * \text{WIDTH}) / 2$</p> | DIAMETER (mm.) | ACCEPTABLE Q'TY | $\varnothing \leq 0.2$ | Distances $\geq 1\text{mm}$ | $0.2 < \varnothing \leq 0.3$ | 3 (Distance $\geq 5\text{mm}$) | $0.3 < \varnothing \leq 0.4$ | 2 (Distance $\geq 5\text{mm}$) | $0.4 < \varnothing$ | 0 |
| | | | DIAMETER (mm.) | ACCEPTABLE Q'TY | | | | | | | | | |
| $\varnothing \leq 0.2$ | Distances $\geq 1\text{mm}$ | | | | | | | | | | | | |
| $0.2 < \varnothing \leq 0.3$ | 3 (Distance $\geq 5\text{mm}$) | | | | | | | | | | | | |
| $0.3 < \varnothing \leq 0.4$ | 2 (Distance $\geq 5\text{mm}$) | | | | | | | | | | | | |
| $0.4 < \varnothing$ | 0 | | | | | | | | | | | | |
| <p>(S) LINE TYPE: unit: mm</p> <table border="1"> <thead> <tr> <th>LENG</th> <th>WIDTH</th> <th>ACCEPTABLE QTY</th> </tr> </thead> <tbody> <tr> <td>.....</td> <td>$W \leq 0.03$</td> <td>Distance $\geq 1\text{mm}$</td> </tr> <tr> <td>L</td> <td>$0.03 < W \leq 0.05$</td> <td>3 (Distanced $\geq 15\text{mm}$)</td> </tr> <tr> <td>.....</td> <td>$0.05 < W$</td> <td>FOLLOW ROUND TYPE</td> </tr> </tbody> </table> <p>NOTE: $\varnothing = (\text{LENGTH} * \text{WIDTH}) / 2$</p> | LENG | WIDTH | ACCEPTABLE QTY | | $W \leq 0.03$ | Distance $\geq 1\text{mm}$ | L | $0.03 < W \leq 0.05$ | 3 (Distanced $\geq 15\text{mm}$) | | $0.05 < W$ | FOLLOW ROUND TYPE | |
| LENG | WIDTH | ACCEPTABLE QTY | | | | | | | | | | | |
| | $W \leq 0.03$ | Distance $\geq 1\text{mm}$ | | | | | | | | | | | |
| L | $0.03 < W \leq 0.05$ | 3 (Distanced $\geq 15\text{mm}$) | | | | | | | | | | | |
| | $0.05 < W$ | FOLLOW ROUND TYPE | | | | | | | | | | | |
| 11.4.2 | MINOR | BUBBLE IN POLARIZER DENT ON POLARIZER | <p style="text-align: right;">unit: mm.</p> <table border="1"> <thead> <tr> <th>DIAMETER</th> <th>ACCEPTABLE Q' TY</th> </tr> </thead> <tbody> <tr> <td>$\varnothing < 0.2$</td> <td>Distance $\geq 1\text{mm}$</td> </tr> <tr> <td>$0.2 < \varnothing \leq 0.3$</td> <td>4 (Distance $\geq 15\text{mm}$)</td> </tr> <tr> <td>$0.3 < \varnothing \leq 0.4$</td> <td>3 (Distance $\geq 15\text{mm}$)</td> </tr> <tr> <td>$0.4 < \varnothing$</td> <td>0</td> </tr> </tbody> </table> | DIAMETER | ACCEPTABLE Q' TY | $\varnothing < 0.2$ | Distance $\geq 1\text{mm}$ | $0.2 < \varnothing \leq 0.3$ | 4 (Distance $\geq 15\text{mm}$) | $0.3 < \varnothing \leq 0.4$ | 3 (Distance $\geq 15\text{mm}$) | $0.4 < \varnothing$ | 0 |
| DIAMETER | ACCEPTABLE Q' TY | | | | | | | | | | | | |
| $\varnothing < 0.2$ | Distance $\geq 1\text{mm}$ | | | | | | | | | | | | |
| $0.2 < \varnothing \leq 0.3$ | 4 (Distance $\geq 15\text{mm}$) | | | | | | | | | | | | |
| $0.3 < \varnothing \leq 0.4$ | 3 (Distance $\geq 15\text{mm}$) | | | | | | | | | | | | |
| $0.4 < \varnothing$ | 0 | | | | | | | | | | | | |
| 11.4.3 | MINOR | Dot Defect | <table border="1"> <thead> <tr> <th>Items</th> <th>ACC. Q' TY</th> </tr> </thead> <tbody> <tr> <td>Bright dot</td> <td>$N \leq 1$ (Distance $\geq 15\text{mm}$)</td> </tr> <tr> <td>Dark dot</td> <td>$N \leq 3$ (Distance $\geq 15\text{mm}$)</td> </tr> </tbody> </table> <p>Pixel Define :</p>  <p>Note</p> <ol style="list-style-type: none"> The definition of dot: The size of a defective dot over 1 of whole dot is regarded as one defective dot. Definition: $< 1/2$ dot and visible by 5% ND filter Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern. Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern. | Items | ACC. Q' TY | Bright dot | $N \leq 1$ (Distance $\geq 15\text{mm}$) | Dark dot | $N \leq 3$ (Distance $\geq 15\text{mm}$) | | | | |
| Items | ACC. Q' TY | | | | | | | | | | | | |
| Bright dot | $N \leq 1$ (Distance $\geq 15\text{mm}$) | | | | | | | | | | | | |
| Dark dot | $N \leq 3$ (Distance $\geq 15\text{mm}$) | | | | | | | | | | | | |
| 11.4.4 | MINOR | Mura | Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary | | | | | | | | | | |



| NO. | CLASS | ITEM | JUDGEMENT |
|---------|-------|--|--|
| 11.4.5 | MINOR | LCD GLASS CHIPPING |  <p>X ≥ 3mm Y > S</p> <p>Reject</p> |
| 11.4.6 | MINOR | LCD GLASS CHIPPING |  <p>X OR Y > S</p> <p>Reject</p> |
| 11.4.7 | MINOR | LCD GLASS CRACK |  <p>Continuous burst NG</p> <p>Reject</p> |
| 11.4.8 | MINOR | LCD GLASS SCRIBE DEFECT |  <p>According to dimension</p> |
| 11.4.9 | MINOR | LCD GLASS CHIPPING (on the terminal area) |  <p>Y < 1/2Z Y ≥ 0.5mm X ≥ 3mm</p> <p>Reject</p> |
| 11.4.10 | MINOR | LCD GLASS CHIPPING (on the terminal surface) |  <p>Y < 1/2Z Y ≥ 0.5mm X ≥ 3mm</p> <p>Reject</p> |
| 11.4.11 | MINOR | LCD GLASS CHIPPING |  <p>X ≥ 3mm Y > T</p> <p>If touch the electrode lines the need to retain the two-thirds electrode lines</p> <p>R</p> |



12. Handling Precautions

12.1 Mounting method

The LCD panel of KINGTECH TFT module consists of two thin glass plates with polarizers which easily be damaged. And since the module is 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 happens 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 uses C-MOS LSI drivers, so we recommend 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 than the limit causes 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 than the operating temperature range and on the other hand at higher temperature LCD's show 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 which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to KINGTECH 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