

MODEL NO. : TM035KBH02-09**ISSUED DATE: 2013-10-28****VERSION : 2.1**

- Preliminary Specification
 Final Product Specification

Customer : _____

| Approved by | Notes |
|-------------|-------|
| | |

TIANMA Confirmed :

| Prepared by | Checked by | Approved by |
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| | | |

This technical specification is subjected to change without notice

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Record of Revision

| Rev | Issued Date | Description | Editor |
|------------|--------------------|--|---------------|
| 2.0 | 2011-5-25 | Rev 2.0 was released. | Jin Zhao |
| 2.1 | 2013-10-28 | Change IC from NT39016D to NV3035C, update RGB timing and initial code | Jin Zhao |
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1 General Specifications

| Feature | | Spec |
|-----------------------------------|--------------------------------|------------------------|
| Display Spec. | Size | 3.5inch |
| | Resolution | 320(RGB) X 240 |
| | Technology Type | a-Si TFT |
| | Pixel Configuration | R.G.B. Vertical Stripe |
| | Pixel pitch(mm) | 0.219 x 0.219 |
| | Display Mode | TM with Normally White |
| | Surface Treatment | Anti-glare type (3H) |
| | Viewing Direction | 12 o'clock |
| | Gray Scale Inversion Direction | 6 o'clock |
| Mechanical Characteristics | LCM (W x H x D) (mm) | 76.90 x 63.90 x 4.00 |
| | Active Area(mm) | 70.08 x 52.56 |
| | With /Without TSP | With TSP |
| | Connection Type | ZIF connector |
| | LED Numbers | 6 LEDs Serial |
| | Weight (g) | 40g |
| Electrical Characteristics | Interface | RGB/CCIR656/601 |
| | Color Depth | 16.7M dithering |
| | Driver IC | NV3035C |

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: $\pm 5\%$

2 Input/Output Terminals

Recommend connector: Kyocera elco: 6240 serials

| No | Symbol | I/O | Description | Remark |
|-----|-------------|-----|-------------|----------|
| 1,2 | LED_Cathode | I | LED_Cathode | |
| 3,4 | LED_Anode | I | LED_Anode | |
| 5 | NC | - | No Connect | |
| 6 | RESET | I | Reset | |
| 7 | NC | - | No Connect | |
| 8 | YU | I | Y_Up | |
| 9 | XR | I | X_Right | |
| 10 | YD | I | Y_Bottom | |
| 11 | XL | I | X_Left | |
| 12 | D00 | I | Data 00 | Note 2-1 |
| 13 | D01 | I | Data 01 | Note 2-1 |
| 14 | D02 | I | Data 02 | Note 2-1 |
| 15 | D03 | I | Data 03 | Note 2-1 |
| 16 | D04 | I | Data 04 | Note 2-1 |
| 17 | D05 | I | Data 05 | Note 2-1 |
| 18 | D06 | I | Data 06 | Note 2-1 |
| 19 | D07 | I | Data 07 | Note 2-1 |
| 20 | D08 | I | Data 08 | Note 2-1 |
| 21 | D09 | I | Data 09 | Note 2-1 |
| 22 | D10 | I | Data 10 | Note 2-1 |
| 23 | D11 | I | Data 11 | Note 2-1 |
| 24 | D12 | I | Data 12 | Note 2-1 |
| 25 | D13 | I | Data 13 | Note 2-1 |
| 26 | D14 | I | Data 14 | Note 2-1 |
| 27 | D15 | I | Data 15 | Note 2-1 |
| 28 | D16 | I | Data 16 | Note 2-1 |
| 29 | D17 | I | Data 17 | Note 2-1 |
| 30 | D18 | I | Data 18 | Note 2-1 |
| 31 | D19 | I | Data 19 | Note 2-1 |

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| | | | | |
|----|-------|-----|--------------------------------|----------|
| 32 | D20 | I | Data 20 | Note 2-1 |
| 33 | D21 | I | Data 21 | Note 2-1 |
| 34 | D22 | I | Data 22 | Note 2-1 |
| 35 | D23 | I | Data 23 | Note 2-1 |
| 36 | HSYNC | I | Horizontal Synchronous Signal | |
| 37 | VSYNC | I | Vertical Synchronous Signal | |
| 38 | CLK | I | Data Clock | |
| 39 | NC | - | No Connect | |
| 40 | NC | - | No Connect | |
| 41 | VDD | P | power supply | |
| 42 | VDD | P | power supply | |
| 43 | SPENA | I | Serial port data enable signal | |
| 44 | NC | - | No Connect | |
| 45 | NC | - | No Connect | |
| 46 | NC | - | No Connect | |
| 47 | NC | - | No Connect | |
| 48 | NC | - | No Connect | |
| 49 | SPCK | I | SPI Serial Clock | |
| 50 | SPDA | I/O | SPI Serial Data Input/output | |
| 51 | NC | - | No Connect | |
| 52 | DEN | I | Data enabling signal | |
| 53 | GND | P | Ground | |
| 54 | GND | P | Ground | |

I: input O: output P: power

Note 2-1:

| Mode | D(23:16) | D(15:8) | D(7:0) | HSYNC | VSYNC | DEN |
|------------|----------|---------|--------|-------|-------|------------------|
| CCIR 656 | D(23:16) | GND | GND | NC | NC | NC |
| CCIR 601 | D(23:16) | GND | GND | HSYNC | VSYNC | NC |
| 8 Bit RGB | D(23:16) | GND | GND | HSYNC | VSYNC | NC for HV mode |
| | | | | | | DEN for DEN mode |
| 24 Bit RGB | R(7:0) | G(7:0) | B(7:0) | HSYNC | VSYNC | NC for HV mode |
| | | | | | | DEN for DEN mode |

3 Absolute Maximum Ratings

Ta = 25°C

| Item | Symbol | MIN | MAX | Unit | Remark |
|----------------------------|------------------|------|-----|------|---------|
| Power Supply Voltage | VDD | -0.3 | 5.0 | V | |
| Back Light Forward Current | I _{LED} | | 25 | mA | One LED |
| Operating Temperature | T _{OPR} | -20 | 60 | °C | |
| Storage Temperature | T _{STG} | -30 | 70 | °C | |

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4 Electrical Characteristics

4.1. Driving TFT LCD Panel

GND=0V, Ta=25°C

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|-------------------------------|------------------|----------|--------|--------|------|--------|
| Power Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | |
| Input Signal Voltage | Low Level | V_{IL} | 0 | 0.2VCC | V | |
| | High Level | V_{IH} | 0.8VCC | VCC | V | |
| (Panel+LSI) Power Consumption | Black Mode(60HZ) | | 45 | 65 | mW | |
| | Standby Mode | | 0.2 | 0.3 | mW | |

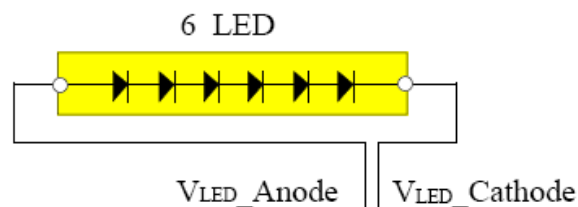
4.2 Driving Backlight

Ta=25°C

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|-----------------------------|----------|------|------|------|------|--------|
| Forward Current | I_F | -- | 20 | 25 | mA | |
| Forward Current Voltage | V_F | 16.8 | 19.2 | 21.6 | V | |
| Backlight Power Consumption | W_{BL} | -- | 384 | -- | mW | |

 Note 1: Each LED: $I_F=20\text{mA}$, $V=3.2\text{V}$.

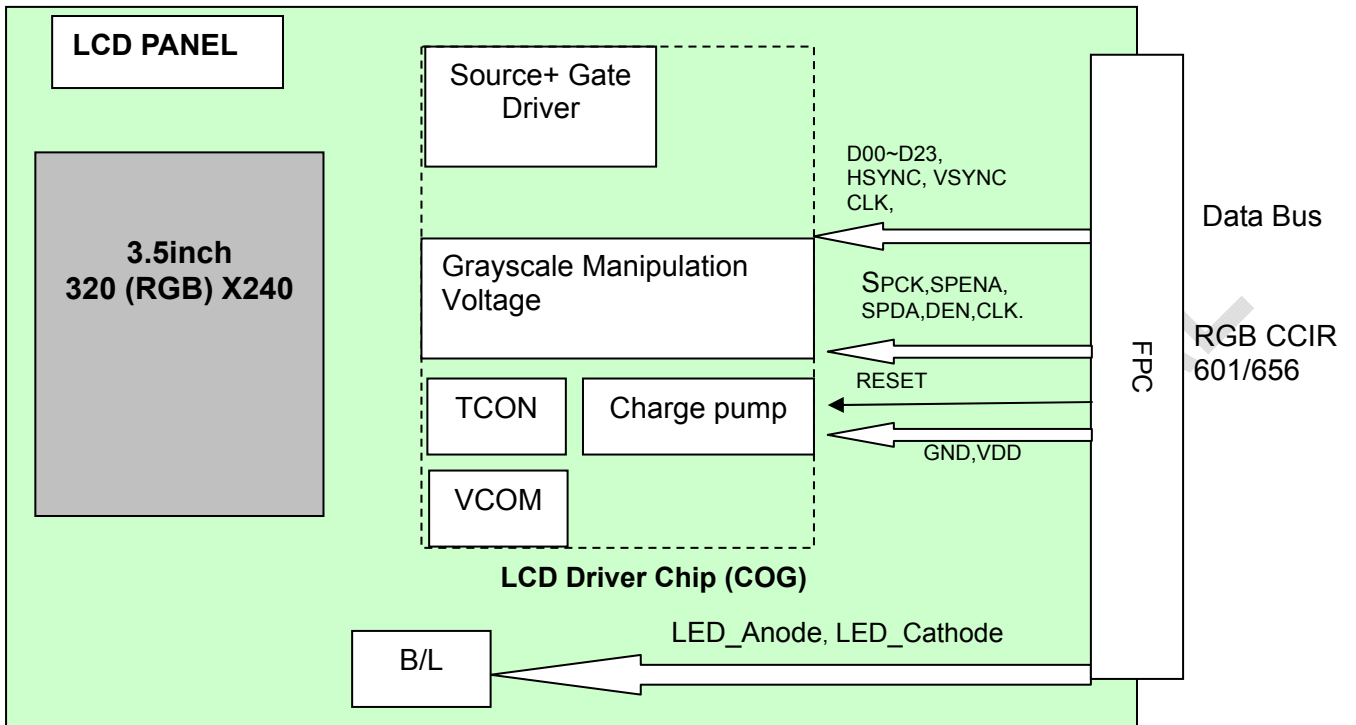
Note 2: The figure below shows the connection of LED


 Note 3: I_F is defined for one channel LED.

Optical performance should be evaluated at Ta=25°C only.

If LED is driven by high current, high ambient temperature & humidity condition, the life time of LED will be reduced.

4.3 Block Diagram



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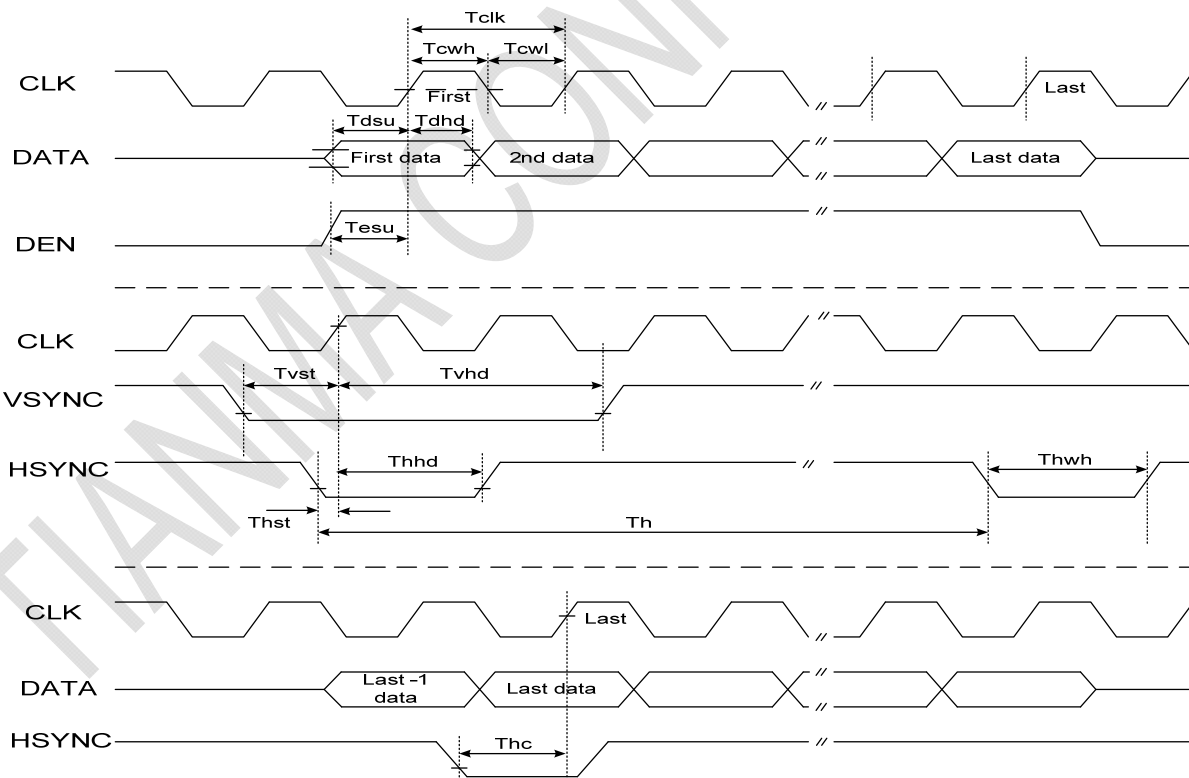
5 Timing Chart

5.1 Timing Parameter

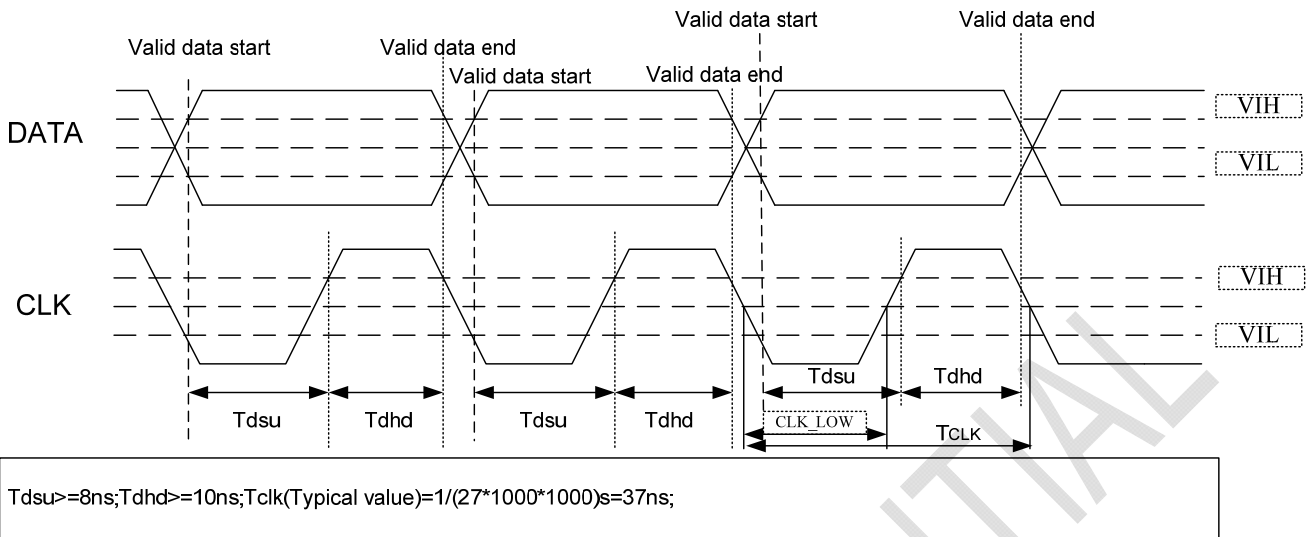
(VCC=3.3V GND =0V,Ta=25°C)

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|-------------------|-----------|------------------|-------|------------------|------|----------------|
| CLK Clock Time | T_{clk} | $1/Max(F_{clk})$ | -- | $1/Min(F_{clk})$ | ns | |
| CLK Pulse Duty | T_{chw} | 40 | 50 | 60 | % | T_{clk} |
| HSYNC to CLK | T_{hc} | -- | -- | 1 | CLK | -- |
| HSYNC Width | T_{hwh} | 1 | -- | -- | CLK | -- |
| VSYNC Width | T_{vwh} | 1 | -- | -- | ns | -- |
| HSYNC Period Time | T_h | 60 | 63.56 | 67 | ns | -- |
| VSYNC Set-up Time | T_{vst} | 12 | -- | -- | ns | -- |
| VSYNC Hold Time | T_{vhd} | 12 | -- | -- | ns | -- |
| HSYNC Setup Time | T_{hst} | 12 | -- | -- | ns | -- |
| HSYNC Hold Time | T_{hhd} | 12 | -- | -- | ns | -- |
| Data Set-up Time | T_{dsu} | 12 | -- | -- | ns | D00~D23 to CLK |
| Data Hold Time | T_{dhd} | 12 | -- | -- | ns | D00~D23 to CLK |
| DEN Set up Time | T_{esu} | 12 | -- | -- | ns | DEN to CLK |

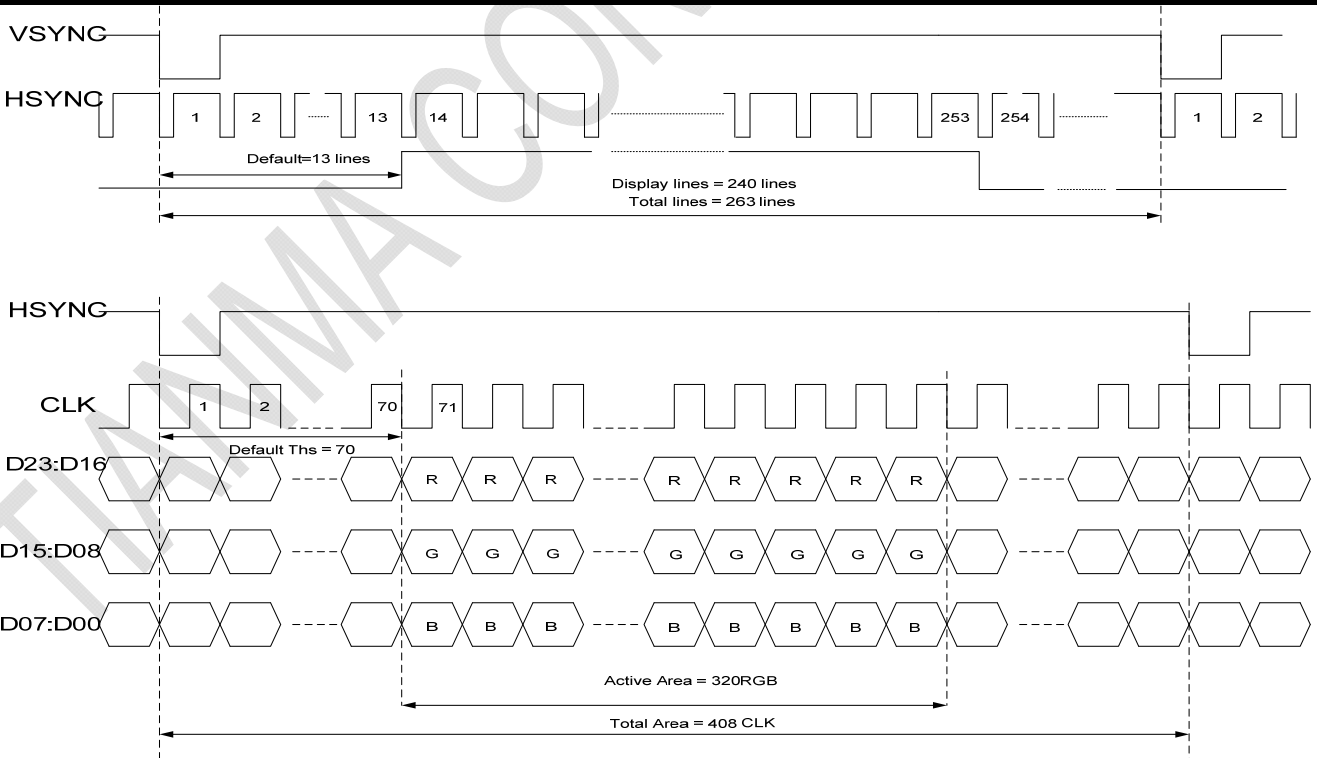
Note: Each CLK Frequency of 24 Bit RGB Mode,8 Bit RGB Mode,CCIR601and CCIR656 are different.



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5.2 24 Bit RGB Mode for 320RGB x 240

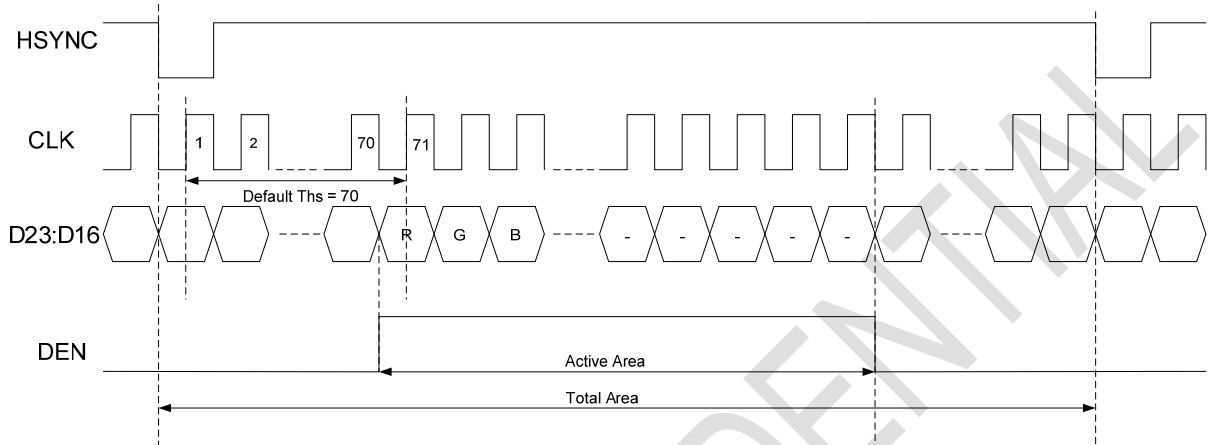
| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|--|-----------|-----|-----|-----|------|------------------------------|
| CLK Frequency | F_{clk} | 6.1 | 6.4 | 8.0 | MHz | VCC=3.0V~3.6V |
| CLK Cycle Time | T_{clk} | 125 | 156 | 164 | ns | |
| CLK Pulse Duty | T_{cwh} | 40 | 50 | 60 | % | |
| Time that HSYNC to 1 st data input(NTSC) | T_{hs} | 40 | 70 | 255 | CLK | DDLY =70, Offset = 0 (fixed) |



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5.3 8 Bit RGB Mode for 320RGB x 240

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|--|------------------|-----|-----|-----|------|-------------------------------|
| CLK Frequency | F _{clk} | -- | 27 | 30 | MHz | VCC=3.0~3.6V |
| CLK Cycle Time | T _{clk} | -- | 37 | -- | ns | |
| Time that HSYNC to 1'st data input(NTSC) | T _{hs} | 35 | 70 | 255 | CLK | DDLY = 70, Offset = 0 (fixed) |

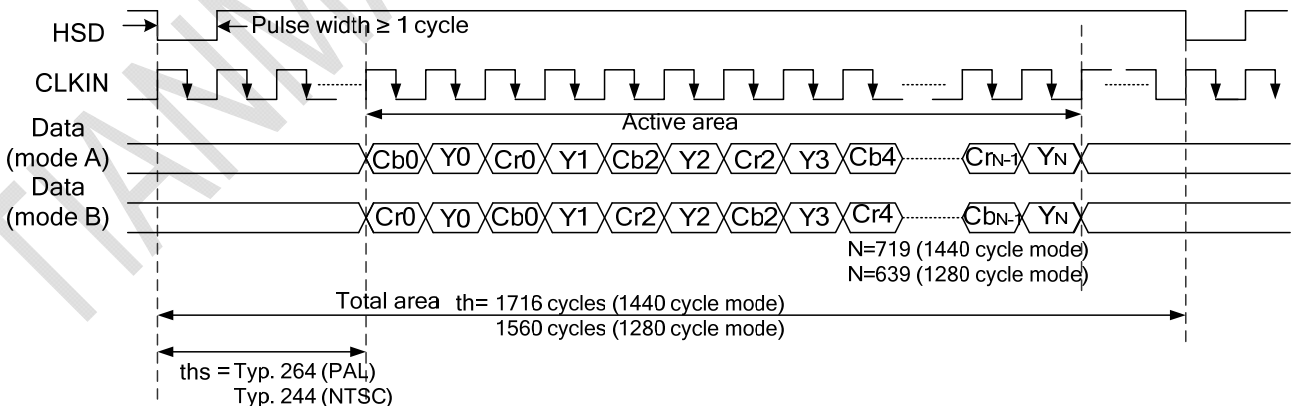

5.4 CCIR601

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|--|------------------|-----|--------------|-----|------|----------------------------------|
| CLK Frequency | F _{clk} | -- | 24.54/ 27 | 30 | MHz | VCC=3.0V~3.6V |
| CLK Cycle Time | T _{clk} | -- | 40/37 | -- | ns | |
| Time From HSYNC to 1 st data input(PAL) | T _{hs} | 128 | 264 | -- | CLK | DDLY = 136, Offset = 128 (fixed) |
| Time From HSYNC to 1 st data input(NTSC) | T _{hs} | 128 | 244 | -- | CLK | DDLY = 116, Offset = 128 (fixed) |

CLKIN frequency:

24.54MHz for 1280-cycle mode

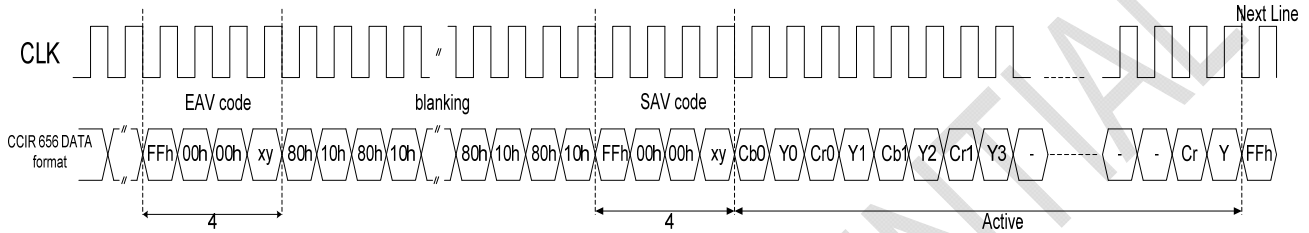
27MHz for 1440-cycle mode



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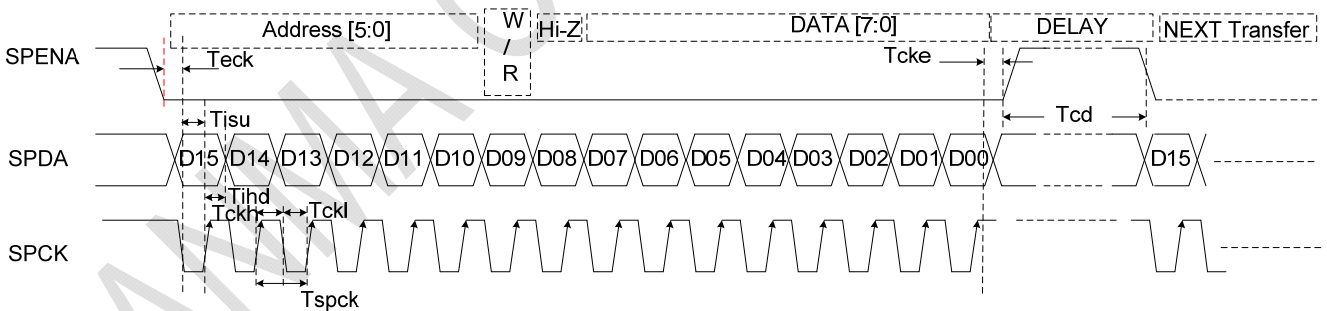
5.5 CCIR656

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|--|--------|-----|-----|-----|------|----------------------------------|
| CLK Frequency | Fclk | -- | 27 | 30 | MHz | VCC=3.0V~3.6V |
| CLK Cycle Time | Tclk | -- | 37 | -- | ns | |
| Time that EVA to 1'st data input(PAL) | Ths | 128 | 288 | -- | CLK | DDLY = 152, Offset = 128 (fixed) |
| Time that EVA to 1'st data input(NTSC) | Ths | 128 | 276 | -- | CLK | DDLY = 140, Offset = 128 (fixed) |



5.6 3-Wire Serial Communication AC Timing

| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|-------------------------|--------------------|-----|-----|-----|------|--------|
| Serial Clock | T _{SPCK} | 320 | -- | -- | ns | |
| SPCK Pulse Duty | T _{scdut} | 40 | 50 | 60 | % | |
| Serial Data Setup Time | T _{isu} | 120 | -- | -- | ns | |
| Serial Data Hold Time | T _{ihd} | 120 | -- | -- | ns | |
| Serial Clock High/Low | T _{ssw} | 120 | -- | -- | ns | |
| Chip Select Distinguish | T _{cd} | 1 | -- | -- | us | |



Note: DDLY Description (Ths= DDLY+ Offset)
R04: Source Timing Delay Control Register

| Bit | Name | Initial | Description |
|-----------|-----------|---------|--|
| Bit [7:0] | DDLY[7:0] | 46h | Select the HSD signal to 1'st input data delay timing Under CCIR601 mode, Ths = DDLY[7:0] + 128, (Unit = CLKIN) Under CCIR656 mode, Ths = DDLY[7:0] + 136, (Unit = CLKIN) Under RGB 8/24 bit mode, Ths = DDLY[7:0], (Unit = CLKIN) The register value will be update to the different mode,such as 24RGB,8RGB,CCIR mode. Read the section of "24RGB, 8RGB, CCIR mode" for the detail. |

5.7 3-Wire Control Registers List

| 3-Wire Registers | | Register Description | | |
|------------------|------|----------------------|-----|--------------------------------------|
| D[15:10] | Name | Init | R/W | Function Description |
| 000000b | R00 | 03h | R/W | System control register |
| 000001b | R01 | 00h | R/W | Timing controller function register |
| 000010b | R02 | 03h | R/W | Operation control register |
| 000011b | R03 | CCh | R/W | Input data Format control register |
| 000100b | R04 | 46h | R/W | Source timing delay control register |
| 000101b | R05 | 0Dh | R/W | Gate timing delay control register |
| 000111b | R07 | 00h | R/W | Internal function control register |
| 001000b | R08 | 08h | R/W | RGB contrast control register |
| 001001b | R09 | 40h | R/W | RGB brightness control register |
| 001011b | R0B | 88h | R/W | R/B sub-contrast control register |
| 001100b | R0C | 20h | R/W | R sub-brightness control register |
| 001101b | R0D | 20h | R/W | B sub-brightness control register |
| 001110b | R0E | 2Bh | R/W | VCOMDC level control register |
| 001111b | R0F | A6h | R/W | VCOMAC level control register |
| 010000b | R10 | 04h | R/W | VGAM2 level control register |
| 010001b | R11 | 24h | R/W | VGAM3/4 level control register |
| 010010b | R12 | 24h | R/W | VGAM5/6 level control register |
| 011101b | R1D | 00h | R/W | OTP operation control register |
| 011110b | R1E | 00h | R/W | OTP operation control register |
| 011111b | R1F | 00h | R/W | OTP operation control register |

Note :

R03: C4h:CCIR656 Mode

C2h:CCIR601 Mode

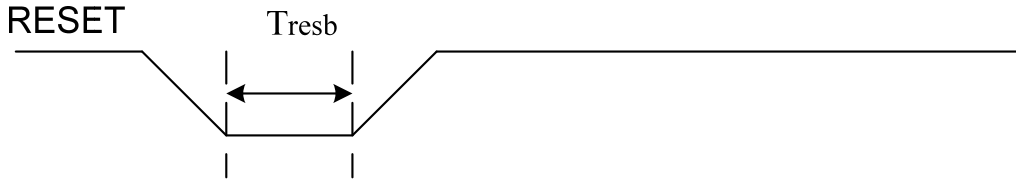
C8h:8 bit RGB Mode(HV Mode)

C9h:8 bit RGB Mode(DEN Mode)

CCh(default):24 bit RGB Mode (HV mode)

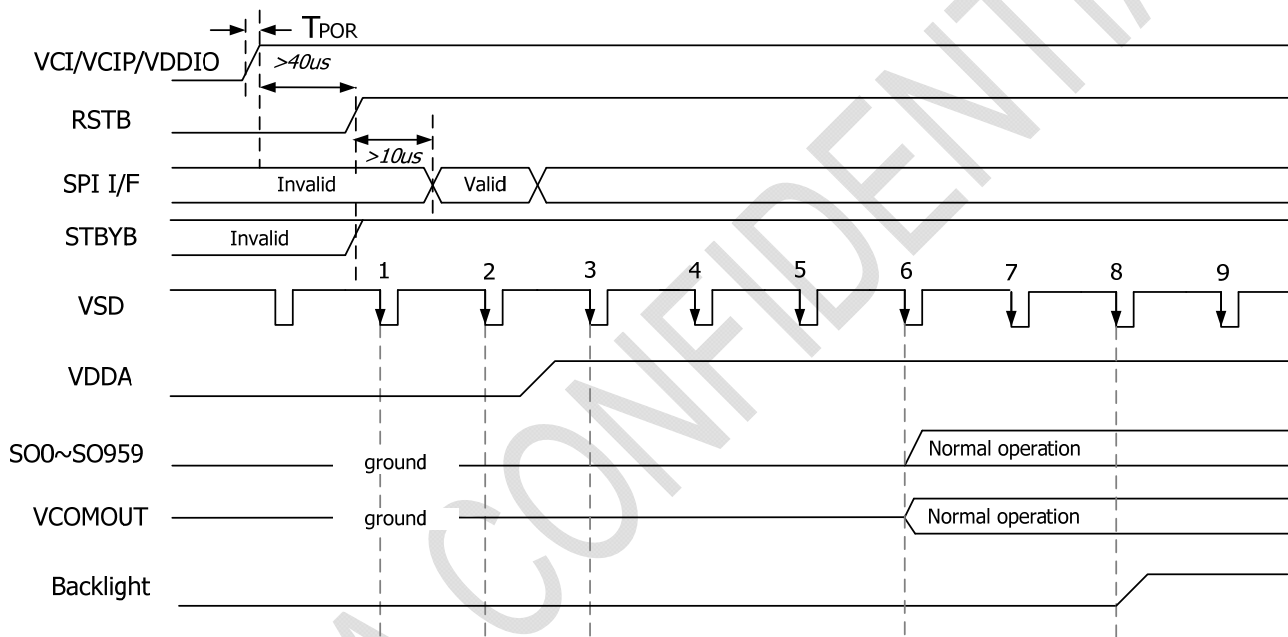
CDh:24 bit RGB Mode (DEN mode)

5.8 Reset Timing

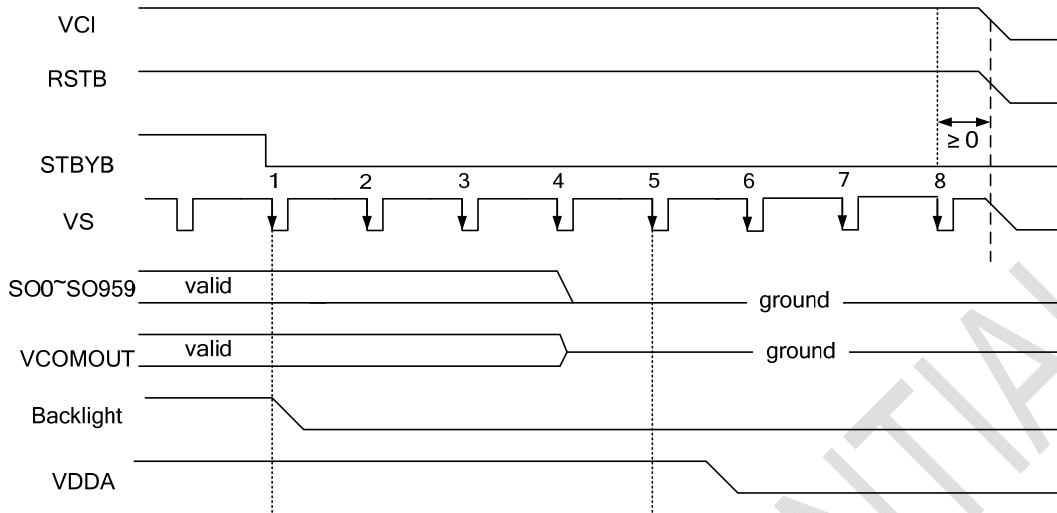


| Parameter | Min | Typ | Max | Unit | Conditions |
|-----------|-----|------|------|------|------------|
| Tresb | 40 | ---- | ---- | us | VCC = 3.3V |

5.9 Power On Sequence



5.10 Power off Sequence



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6 Optical Characteristics

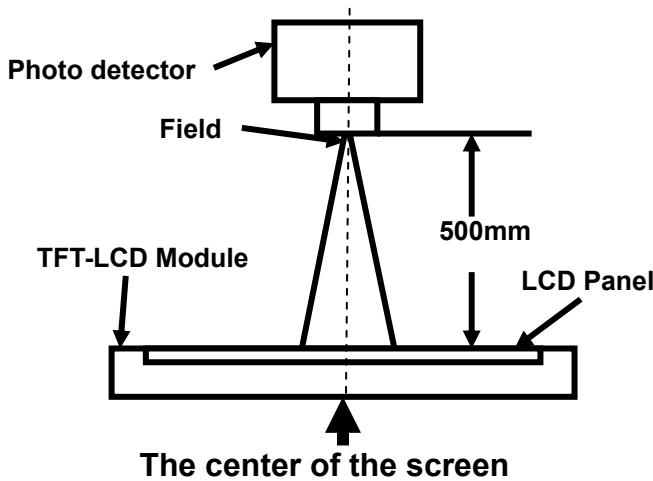
| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|----------------|------------|--------------------|-----|-------|-------|----------|----------|
| View Angles | θT | $CR \geq 10$ | 50 | 60 | | Degree | Note 2,3 |
| | θB | | 60 | 70 | | | |
| | θL | | 60 | 70 | | | |
| | θR | | 60 | 70 | | | |
| Contrast Ratio | CR | $\theta = 0^\circ$ | 400 | 500 | | | Note 3 |
| Response Time | T_{ON} | $25^\circ C$ | | 25 | 40 | ms | Note 4 |
| | T_{OFF} | | | | | | |
| Chromaticity | White | Backlight is on | x | 0.230 | 0.280 | 0.330 | Note 1,5 |
| | | | y | 0.260 | 0.310 | 0.360 | |
| | Red | | x | 0.530 | 0.580 | 0.630 | Note 1,5 |
| | | | y | 0.270 | 0.320 | 0.370 | |
| | Green | | x | 0.280 | 0.330 | 0.380 | Note 1,5 |
| | | | y | 0.535 | 0.585 | 0.635 | |
| | Blue | | x | 0.100 | 0.150 | 0.200 | Note 1,5 |
| | | | y | 0.050 | 0.100 | 0.150 | |
| Uniformity | U | | 75 | 80 | | % | Note 6 |
| NTSC | | | | 50 | | % | Note 5 |
| Luminance | L | | 280 | 350 | | cd/m^2 | Note 7 |

Test Conditions:

- $I_F = 20$ mA, and the ambient temperature is $25^\circ C$.
- The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

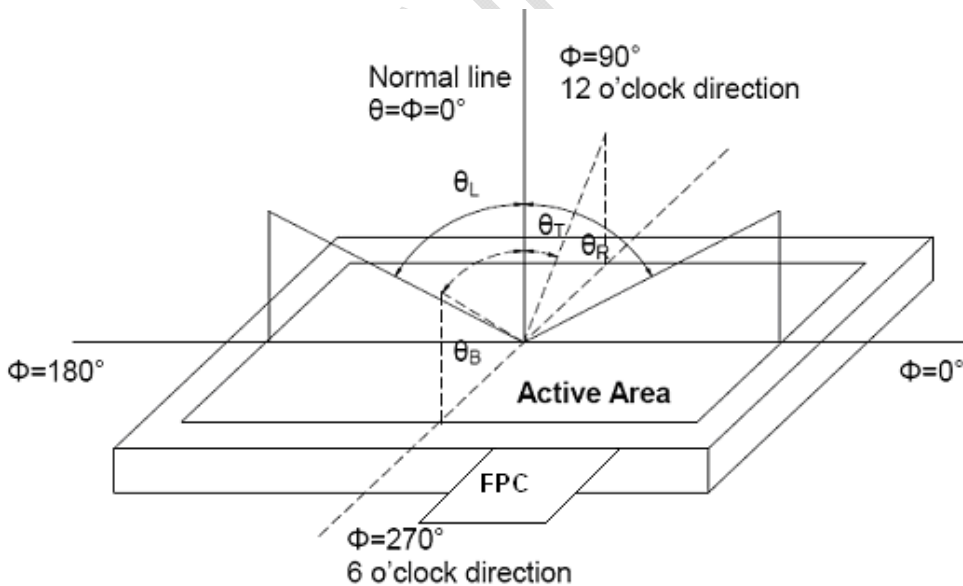
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



| Item | Photo detector | Field |
|----------------|----------------|-------|
| Contrast Ratio | SR-3A | 1° |
| Luminance | | |
| Chromaticity | | |
| Lum Uniformity | | |
| Response Time | BM-7A | 2° |

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

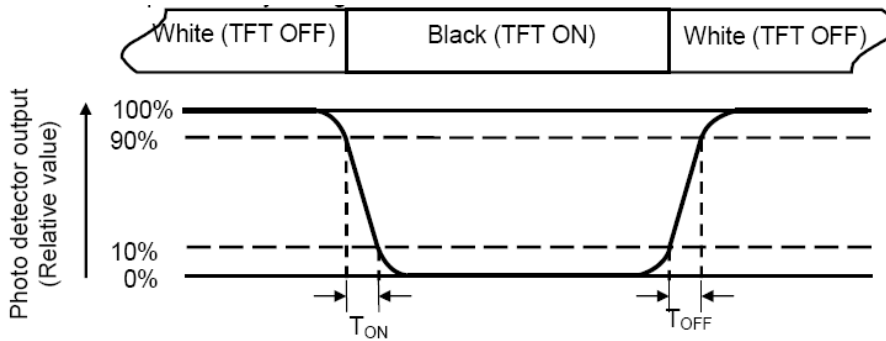
“White state “: The state is that the LCD should drive by V_{white}.

“Black state””: The state is that the LCD should drive by V_{black}.

V_{white}: To be determined V_{black}: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

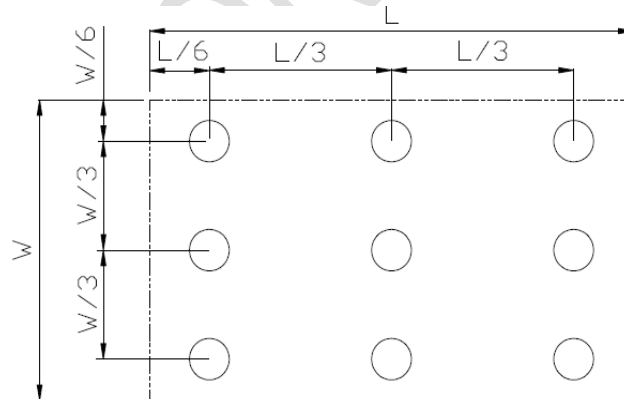
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = \text{Lmin} / \text{Lmax}$$

L-----Active area length W----- Active area width



L_{max}: The measured Maximum luminance of all measurement position.

L_{min}: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

7 Environmental / Reliability Test

| No | Test Item | Condition | Remarks |
|----|--|--|---|
| 1 | High Temperature Operation | Ts=+60°C, 240hrs | IEC60068-2-1:2007 GB2423.2-2008 |
| 2 | Low Temperature Operation | Ta=-20°C, 240hrs | IEC60068-2-1:2007 GB2423.1-2008 |
| 3 | High Temperature Storage | Ta=+70°C, 240hrs | IEC60068-2-1:2007 GB2423.2-2008 |
| 4 | Low Temperature Storage | Ta=-30°C, 240hrs | IEC60068-2-1:2007 GB2423.1-2008 |
| 5 | Storage at High Temperature and Humidity | +60°C, 90% RH max,240 hours | IEC60068-2-78 :2001 GB/T2423.3—2006 |
| 6 | Thermal Shock (non-operation) | -30°C 30 min~+70°C 30 min, Change time:5min, 30 Cycle | Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002 |
| 7 | ESD | C=150pF, R=330Ω, 5points/panel Air:±8KV, 5times;Contact:±4KV, 5 times; (Environment: 15°C~35°C, 30%~ 60%, 86Kpa~106Kpa) | IEC61000-4-2:2001 GB/T17626.2-2006 |
| 8 | Vibration Test | Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.(package condition) | IEC60068-2-6:1982 GB/T2423.10—1995 |
| 9 | Mechanical Shock (Non OP) | 60G 6ms, ±X,±Y,±Z 3times for each di-rection | IEC60068-2-27:1987 GB/T2423.5—1995 |
| 10 | Package Drop Test | Height:80 cm, 1 corner, 3 edges, 6 surfaces | IEC60068-2-32:1990 GB/T2423.8—1995 |

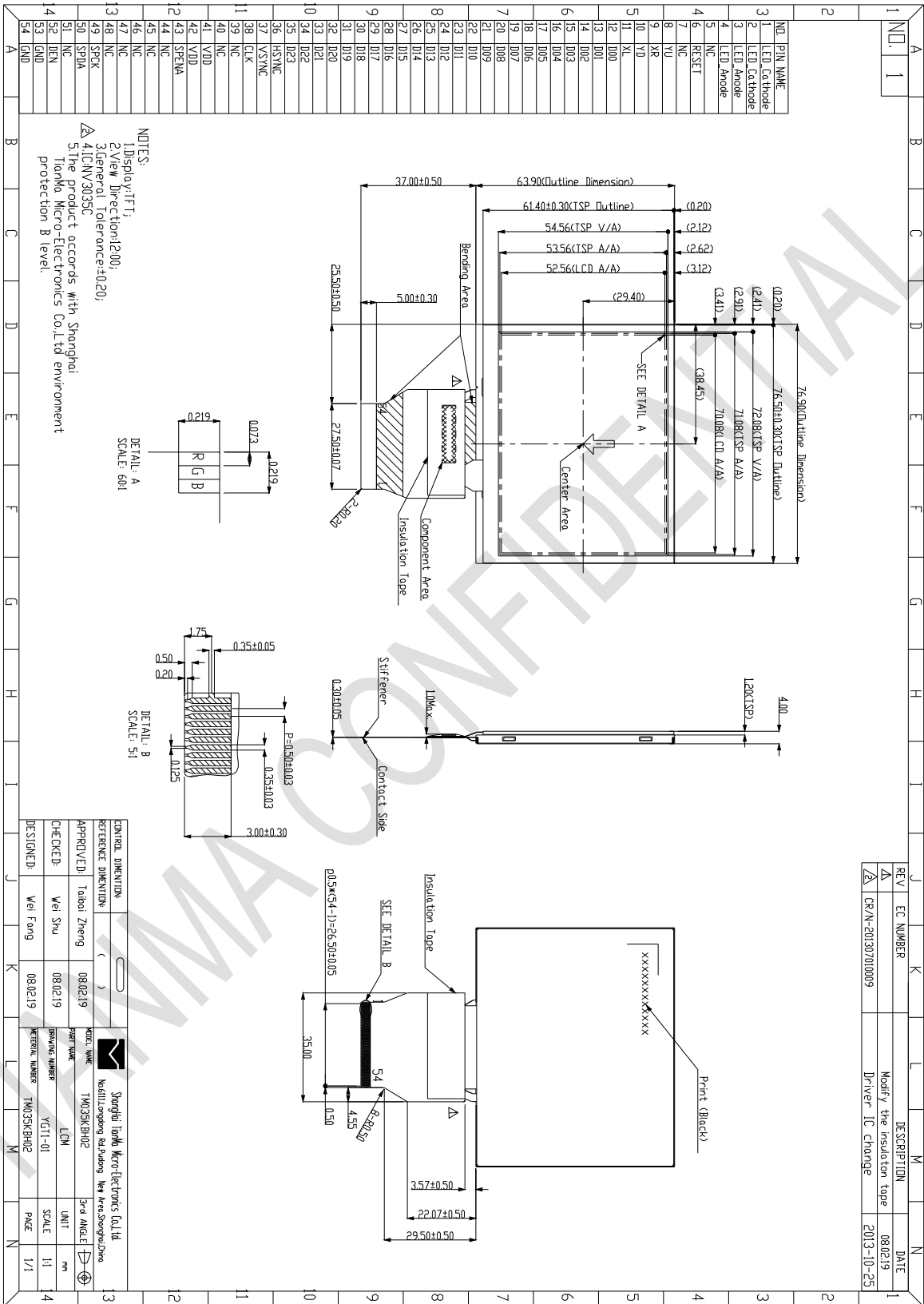
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

8 Mechanical Drawing



| NO. | PIN NAME |
|-----|-------------|
| 1 | LED Cathode |
| 2 | LED Cathode |
| 3 | LED Anode |
| 4 | LED Anode |
| 5 | NC |
| 6 | RESET |
| 7 | NC |
| 8 | YU |
| 9 | YU |
| 10 | YU |
| 11 | YU |
| 12 | YU |
| 13 | YU |
| 14 | YU |
| 15 | YU |
| 16 | YU |
| 17 | YU |
| 18 | YU |
| 19 | YU |
| 20 | YU |
| 21 | YU |
| 22 | YU |
| 23 | YU |
| 24 | YU |
| 25 | YU |
| 26 | YU |
| 27 | YU |
| 28 | YU |
| 29 | YU |
| 30 | YU |
| 31 | YU |
| 32 | YU |
| 33 | YU |
| 34 | YU |
| 35 | YU |
| 36 | YU |
| 37 | YU |
| 38 | YU |
| 39 | YU |
| 40 | YU |
| 41 | YU |
| 42 | YU |
| 43 | YU |
| 44 | YU |
| 45 | YU |
| 46 | YU |
| 47 | YU |
| 48 | YU |
| 49 | YU |
| 50 | YU |
| 51 | YU |
| 52 | YU |
| 53 | YU |
| 54 | YU |

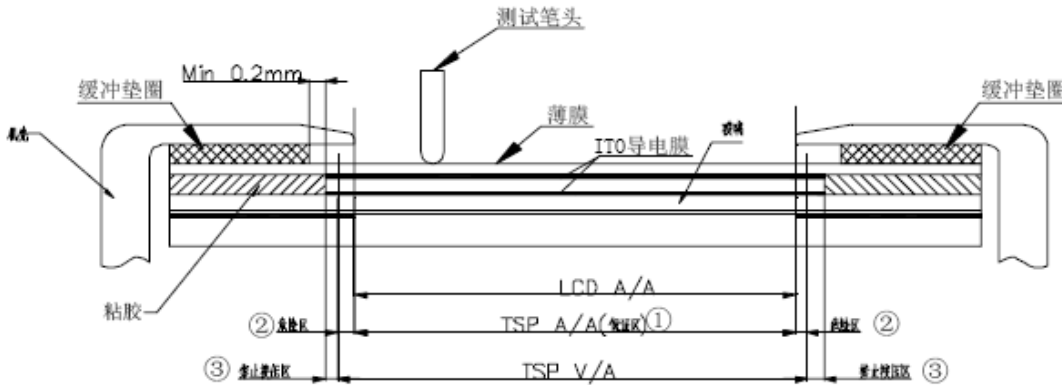
NOTES:
 1)Display:FTTj
 2)View Direction:200;
 3)General Tolerance:±0.20;
 4)IC:NV3035C
 5)The product accords with Shanghai TianMa Micro-Electronics Co.,Ltd environment Protection B level

| | | | |
|---------------------|-------------|-------------|----------------------------|
| ENVIRONMENT | () | DATE | 08.02.19 |
| REFERENCE DIMENSION | | DESCRIPTION | Modify the insulation tape |
| APPROVED: | Takoi Zheng | DATE | 08.02.19 |
| CHECKED: | Wei Shu | DATE | 08.02.19 |
| DESIGNED: | Wei Fong | DATE | 08.02.19 |

| | | | |
|-----|-----------------|----------------------------|------------|
| REV | EC NUMBER | DESCRIPTION | DATE |
| Δ | CRAN-2013070009 | Modify the insulation tape | 08.02.19 |
| Δ | | Driver IC Change | 2013-10-25 |

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8.1 Mechanical Design Guide



8.1.1. Explain:

① Active area

The area which guarantees a touch panel operation normally when pressed.

② Operation non-guaranteed area

The area which does not guarantee a touch panel operation and its function. When this area is pressed, touch panel shows degradation of its performance and durability such as a pen sliding durability becomes about one-tenth compared. With the active area (Area-a) as guaranteed area and its operation force requires about double. About 0.5mm~1mm outside form a boundary of the active corresponds to this area.

③ Pressing prohibition area

The area which forbids pressing, because an excessive load is applied a transparent electrode and a serious damage is given to touch panel function by pressing.

④ Non-Active area

The area which does not activate even if passed.

8.1.2. The handling of sensitive area:

(1) The sensitive area is between the edge of the double-side tape and the edge of the active area. Because the double-side tape has a certain height, the more transformative the ITO layer is pressed, the easier it would be to be broken. So it is suggested that pointed tools should be put away from the sensitive area to avoid them touching the sensitive area during operation.

(2) When assembling the touch panel, it would be better to add a protective gasket on the surface of the product before assembling on to the housing. The gasket should be placed on the double-side tape and should not go beyond it.

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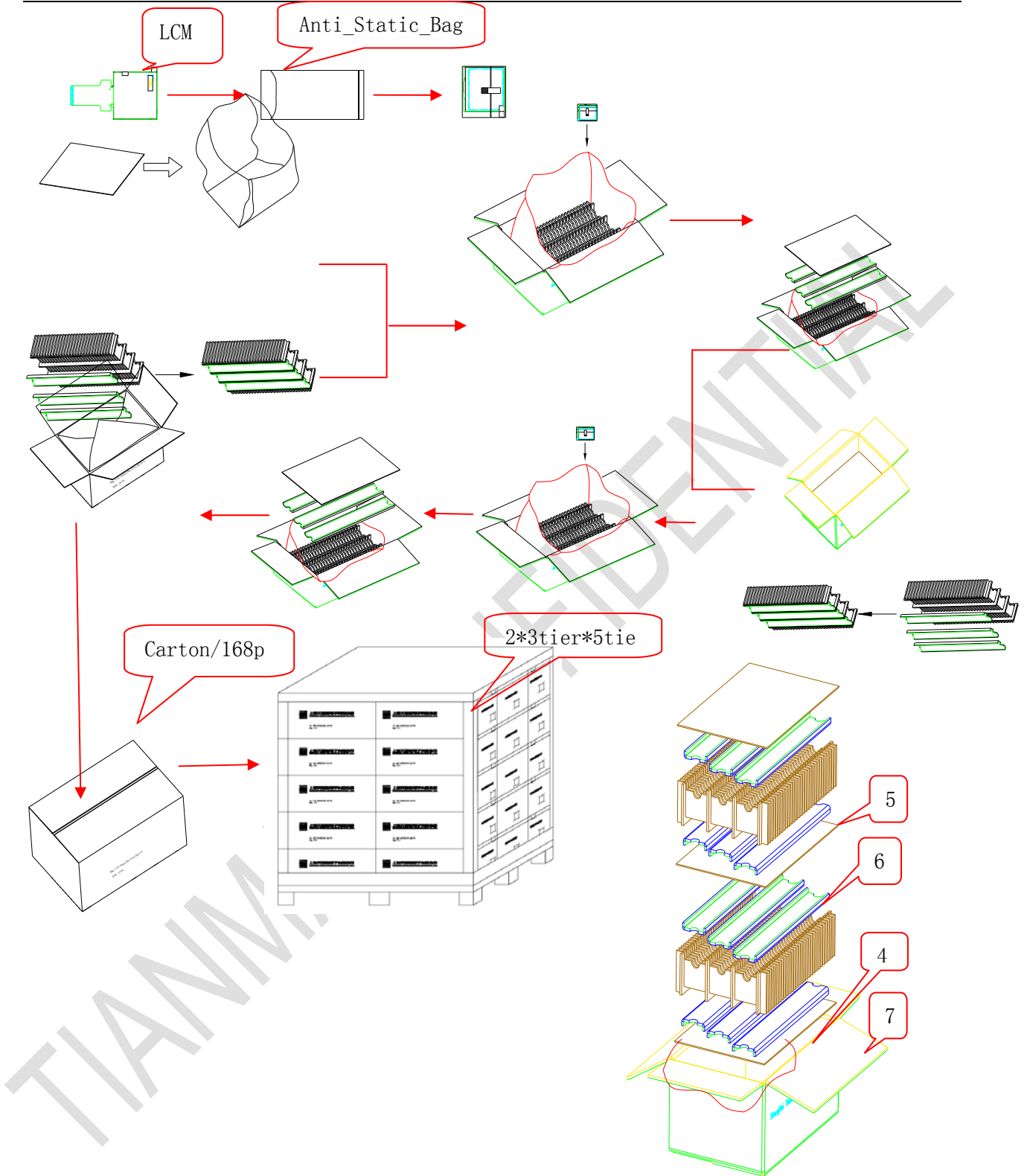
(3) If the housing is designed bigger than the active area, the edge of the sensitive area would be left outside of it. In addition, the protective gasket adds the thickness of this area, so do not use pens or other pointed tools to score along with the screen edge which may cause the damage of the ITO layer. If the panel is drawn with large force, the glass would even be broken.

(4) If the housing is designed smaller than the active area, it can cover the sensitive area completely, in which case the scoring along with screen edge does no harm to the ITO layer. Nevertheless, due to the housing extending into the active area, the thickness of the gasket is very important. If it is too thick, the gap between the housing and the ITO film surface would be too wide which may affect the appearance of the product. If it is too thin, the housing would be pressed on the film surface which may cause short-circuit. The gap between the housing and the film should better be kept between 0.2mm and 0.3mm.

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9 Packing Drawing

| No | Item | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Quantity | Remark |
|----|-----------------|------------------|----------------------|-----------------|----------|-------------|
| 1 | LCM module | TM035KBH02 | 76.90 x 63.90 x 4.00 | 0.04 | 168 | |
| 2 | Partition_1 | Corrugated Paper | 513*333*106 | 0.782 | 2 | |
| 3. | Anti-Static Bag | PE | 155*85*0.05 | 0.003 | 168 | Anti-static |
| 4 | Dust-Proof Bag | PE | ----- | 0.060 | 1 | |
| 5 | Partition_2 | Corrugated Paper | 505*332*4.00 | 0.095 | 3 | |
| 6 | Corrugated Bar | Corrugated Paper | 513*117*4 | 0.032 | 12 | |
| 7 | Carton | Corrugated Paper | 530*350*250 | 1.1000 | 1 | |
| 8 | Total weight | 10.617±5% | | | | |



10 Precautions for Use of LCD Modules

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0°C ~ 40°C Relatively humidity: ≤80%

10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

10.3.1 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.