



Product Specification

Part Name: 12.30 inch TFT Display Module

Customer Part ID:

Topovision Part ID: TVT1230C-IH (IPS)

Ver: A

| |
|-------------|
| Customer: |
| Approved by |

| |
|---------------------------------------|
| From: Topovision Technology Co., Ltd. |
| Approved by |

Notes:

1. Please contact Topovision Technology Co., Ltd. before assigning your product based on this module specification
2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by Topovision Technology Co., Ltd. for any intellectual property claims or other problems that may result from application based on the module described herein.

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1. General Description

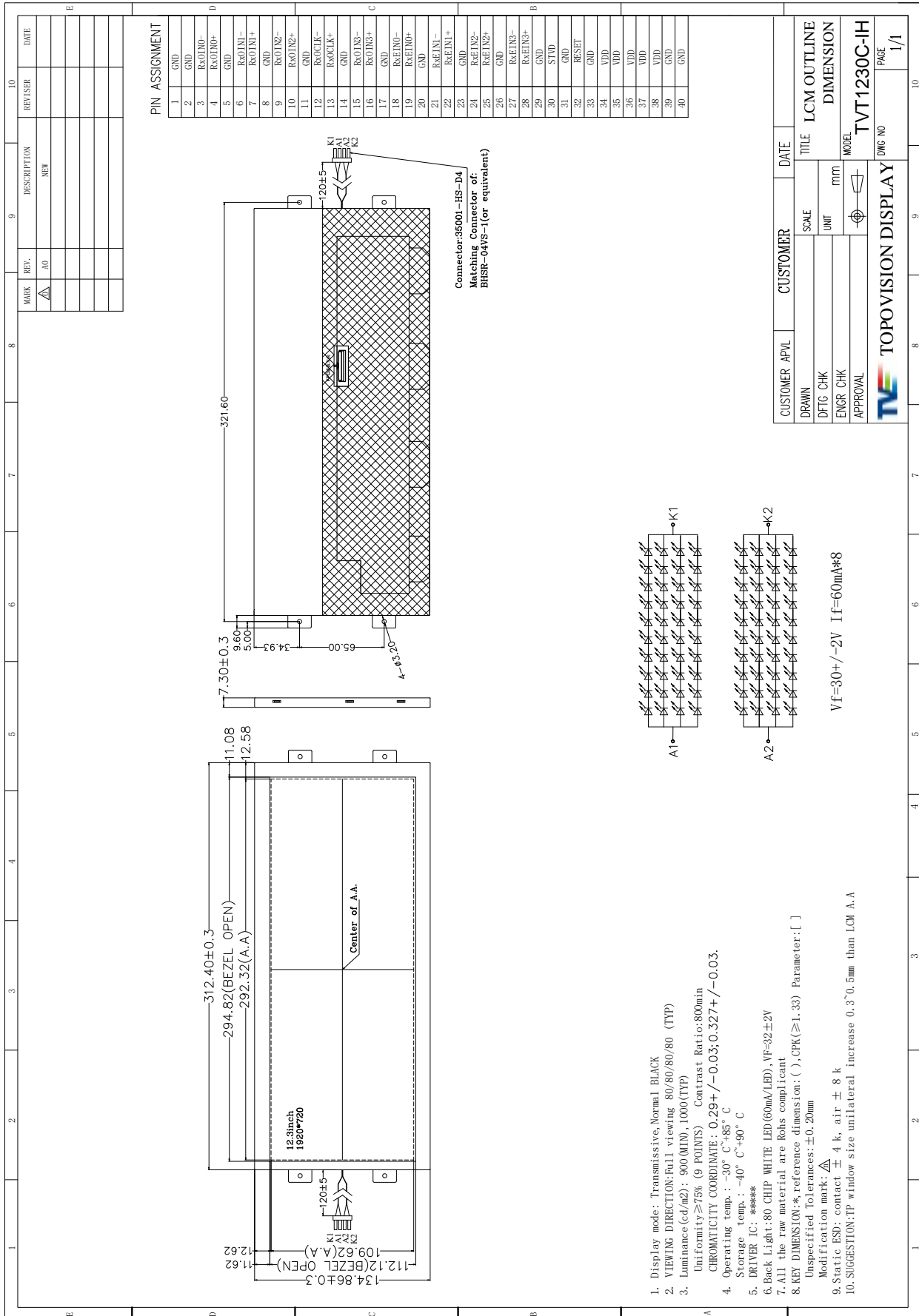
1.1 Description

TVT1230C-IH is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, Driver IC ,FPC and Backlight.

1.2 LCM General Specification:

| Parameter | Specification | Unit | Remarks |
|------------------------------|-------------------------------|--------|-------------|
| LCD Size | 12.3 | inch | - |
| Active area | 292.32*109.62 | mm | - |
| Number of pixels | 1920*720 | pixels | - |
| Pixel pitch | 0.05075(H) * RGB * 0.15225(V) | um | - |
| Pixel arrangement | RGB | - | - |
| Display colors | 16.7M | colors | - |
| Display mode | Normally Black | - | - |
| Surface Treatment | An-Glare | - | - |
| LCM Outline Dimension | 312.4(H) x 130.4(V) x8.2(D) | mm | |
| LCD Inversion Type | Column | - | |
| Response Time | TYP. 30 | ms | |
| CR | Typ. 1000 Min:800 | | |
| Brightness | Typ:1000 Min:900 | nits | Lcm @Center |
| Brightness Uniformity | 80%Typ., 75% Min. | - | @9P |
| Viewing angle (CR \geq 10) | Min:70/70/70/70 | | |
| Interface | 2 port LVDS | - | - |

2. Mechanical Drawing



3.Pin Description

3.1 Display Interface

Connector= FH41-40S-0.5SH(05)

| Pin No. | Symbol | Type | Function |
|---------|---------|------|--|
| 1 | GND | G | Ground |
| 2 | GND | G | Ground |
| 3 | RxOIN0- | I | Negative LVDS differential data input (Odd data) |
| 4 | RxOIN0+ | I | Positive LVDS differential data input (Odd data) |
| 5 | GND | G | Ground |
| 6 | RxOIN1- | I | Negative LVDS differential data input (Odd data) |
| 7 | RxOIN1+ | I | Positive LVDS differential data input (Odd data) |
| 8 | GND | G | Ground |
| 9 | RxOIN2- | I | Negative LVDS differential data input (Odd data) |
| 10 | RxOIN2+ | I | Positive LVDS differential data input (Odd data) |
| 11 | GND | G | Ground |
| 12 | RxOCLK- | I | Negative LVDS differential clock input (Odd clock) |
| 13 | RxOCLK+ | I | Positive LVDS differential clock input (Odd clock) |
| 14 | GND | G | Ground |
| 15 | RxOIN3- | I | Negative LVDS differential data input (Odd data) |
| 16 | RxOIN3+ | I | Positive LVDS differential data input (Odd data) |
| 17 | GND | G | Ground |
| 18 | RxEIN0- | I | Negative LVDS differential data input (Even data) |
| 19 | RxEIN0+ | I | Positive LVDS differential data input (Even data) |
| 20 | GND | G | Ground |
| 21 | RxEIN1- | I | Negative LVDS differential data input (Even data) |
| 22 | RxEIN1+ | I | Positive LVDS differential data input (Even data) |
| 23 | GND | G | Ground |
| 24 | RxEIN2- | I | Negative LVDS differential data input (Even data) |
| 25 | RxEIN2+ | I | Positive LVDS differential data input (Even data) |
| 26 | GND | G | Ground |
| 27 | RxEIN3- | I | Negative LVDS differential data input (Even data) |
| 28 | RxEIN3+ | I | Positive LVDS differential data input (Even data) |
| 29 | GND | G | Ground |
| 30 | STVD | O | Feedback signal |
| 31 | GND | G | Ground |
| 32 | RESET | I | Global reset pin |
| 33 | GND | G | Ground |
| 34 | VDD | P | Power input |
| 35 | VDD | P | Power input |
| 36 | VDD | P | Power input |
| 37 | VDD | P | Power input |
| 38 | VDD | P | Power input |
| 39 | GND | G | Ground |
| 40 | GND | G | Ground |

4. Electrical Characteristics

4.1 Absolute Maximum Ratings

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2

| Parameter | Symbol | Min. | Max. | Unit |
|-----------------------|--------|------|---------|------|
| Power Supply Voltage | VDD | -0.3 | 4 | V |
| Input Signal Voltage | V_i | -0.3 | VDD+0.3 | V |
| Operating Temperature | TOP | -30 | 85 | °C |
| Storage Temperature | TOP | -40 | 90 | °C |

Notes : 1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions..

4.2 Power Consumption of TFT Panel

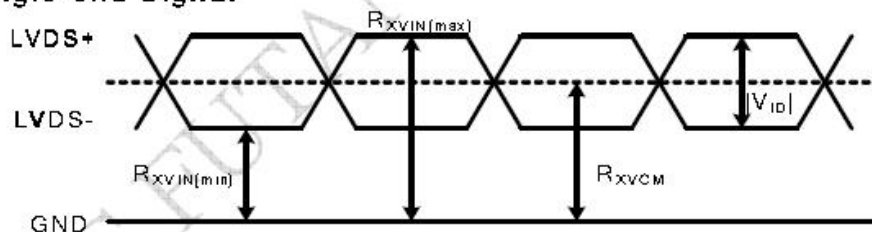
Frame =60HZ @ 25degC,

| Item | Symbol | Value | | | Unit | Remark |
|------------------|--------|-------|-----|-----|------|----------------|
| | | Min | Typ | Max | | |
| Power Supply | VDD | 3.0 | 3.3 | 3.6 | V | |
| Current of IOVCC | IVDD | - | 1.1 | 1.4 | mA | @White Pattern |

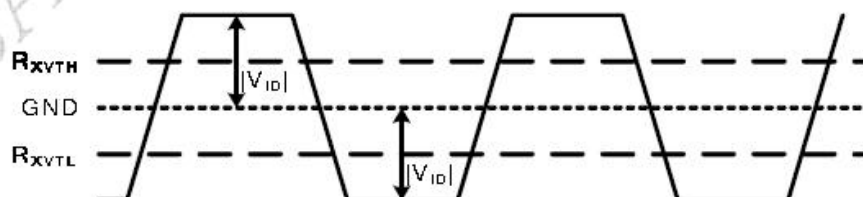
4.3 Signal DC Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit | Notes |
|--|------------|------|-----|-----|------|-----------------|
| Differential input high threshold | R_{XVTH} | - | - | 200 | mV | $R_{XVCM}=1.2V$ |
| Differential input low threshold | R_{XVTL} | -200 | - | - | mV | $R_{XVCM}=1.2V$ |
| Input voltage range (singled-end) | R_{XVIN} | 0.7 | - | 1.6 | V | |
| Input differential voltage | $ V_{ID} $ | 200 | - | 600 | mV | |
| Differential Input Common Mode Voltage | R_{XVCM} | 1.0 | 1.2 | 1.3 | V | |

Single-end Signal



Differential Signal



4.4 Power Consumption of Backlight

Test Condition : ILED=60mA

Warning: LCM Brightness must match Optical Spec requirement when ILED=60mA

Backlight Unit Schematic:

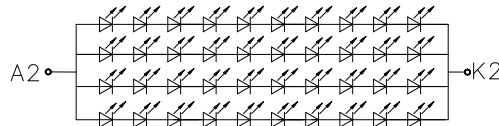
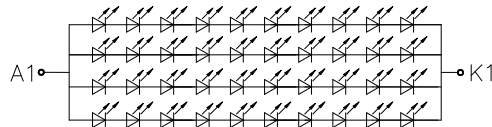
Ta=25°C

| Item | Symbol | Value | | | Unit | Remark |
|-------------------------|--------|-------|-------|-------|------|----------|
| | | Min | Typ | Max | | |
| Forward Voltage VLED | VF | 30 | 32 | 34 | V | IF=60mA |
| Forward Current Per LED | IF | - | 60 | - | mA | |
| Forward Current ILED | ILED | - | 480 | 520 | mA | |
| Power Consumption | PLED | - | 15.36 | 17.68 | W | Note 1 |
| LED Life Time | TLED | 30000 | - | - | Hrs | |
| LED Quantity | | 80 | | | pcs | 10S * 8P |

Note 1 : When ILED=20mA, the VBL must be in the range of above table specified.

The FPC wire resistance between LED+ and LED- must be less than 0.15ohm

PBL= ILEDX VBL



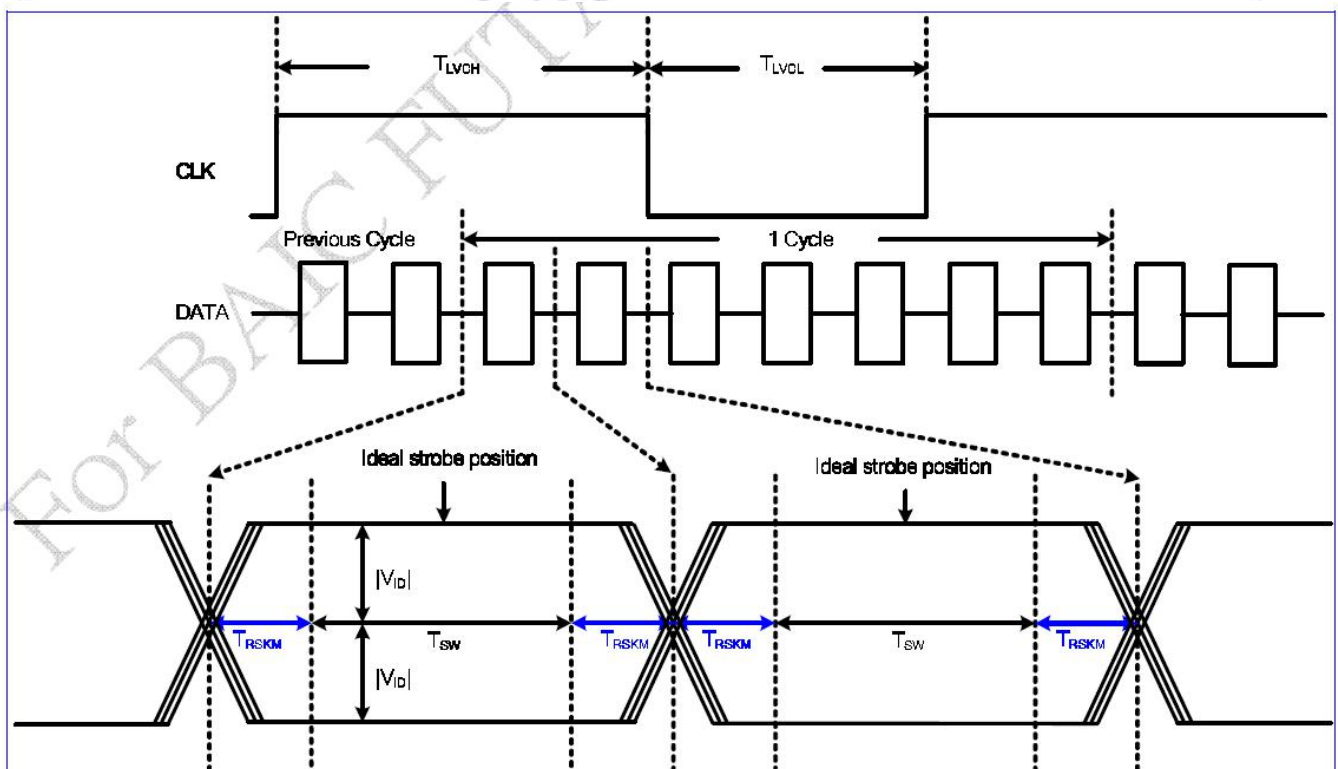
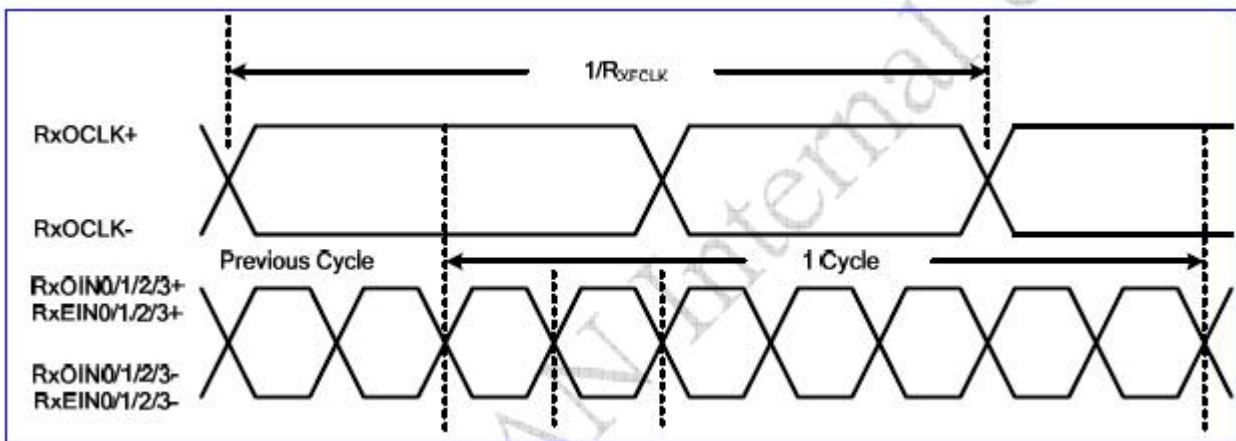
$$V_f = 30 \pm 2V \quad I_f = 60mA * 8$$

4.5 AC Electrical Characteristics

a. Differential signal AC characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|------------------------|-------------|------|---------------------|------|------|---|
| Clock frequency | R_{XFCLK} | 44.7 | 47.5 | 61 | MHz | |
| Input data skew margin | T_{RSKM} | - | - | 200 | ps | $ VID =200mV$ $R_{XVCM}=1.2V$ Note1 |
| Clock strobe width | T_{SW} | 1200 | - | - | ps | |
| Clock High Time | T_{LVCH} | - | $4/(7 * R_{XFCLK})$ | - | ns | |
| Clock Low Time | T_{LVCL} | - | $3/(7 * R_{XFCLK})$ | - | ns | |

Note1. For the Data Skew Margin, "Input Signal Skew + Input Signal Jitter" must be smaller than T_{RSKM} .



4.6 Dta skew margin Differential Input Data Format

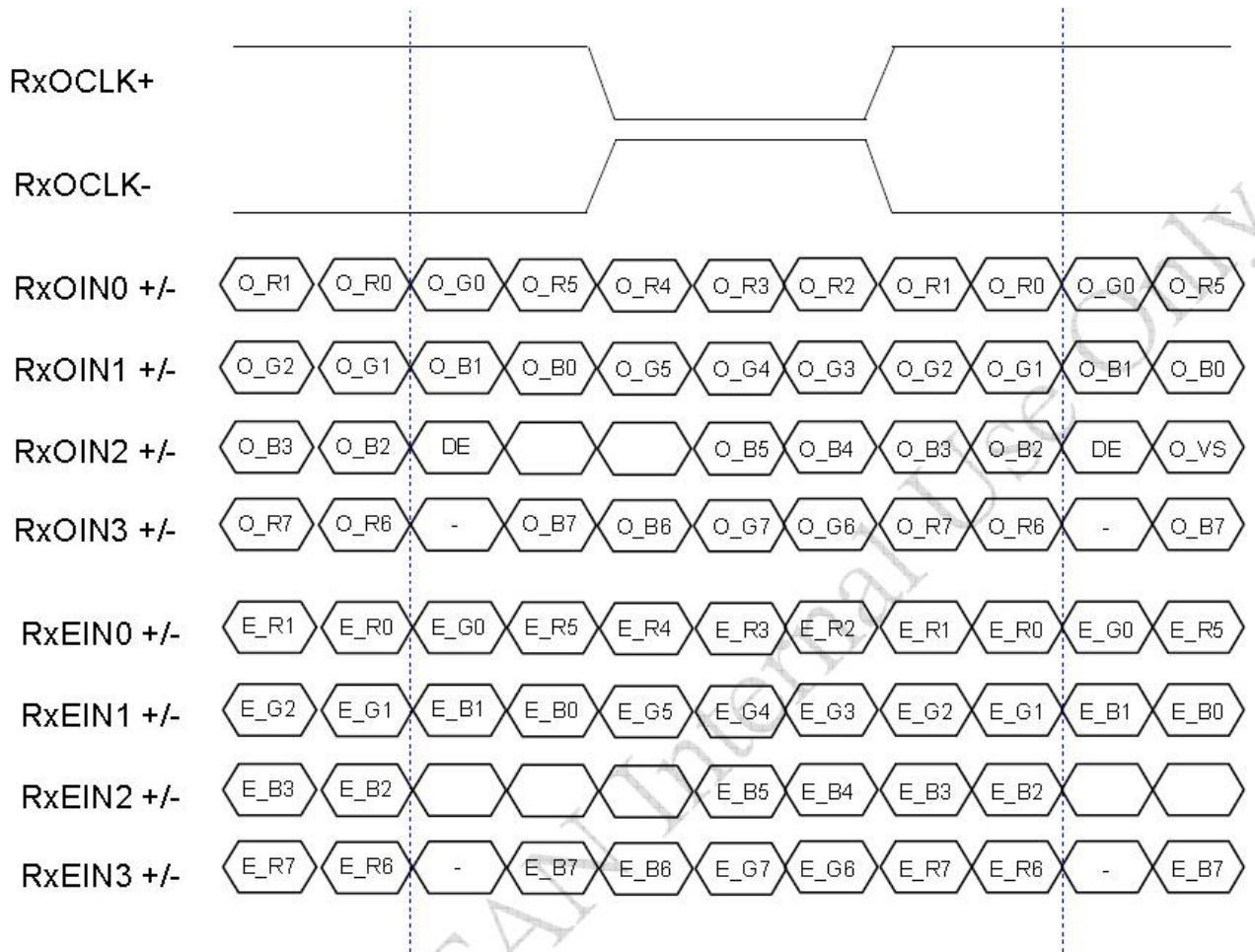


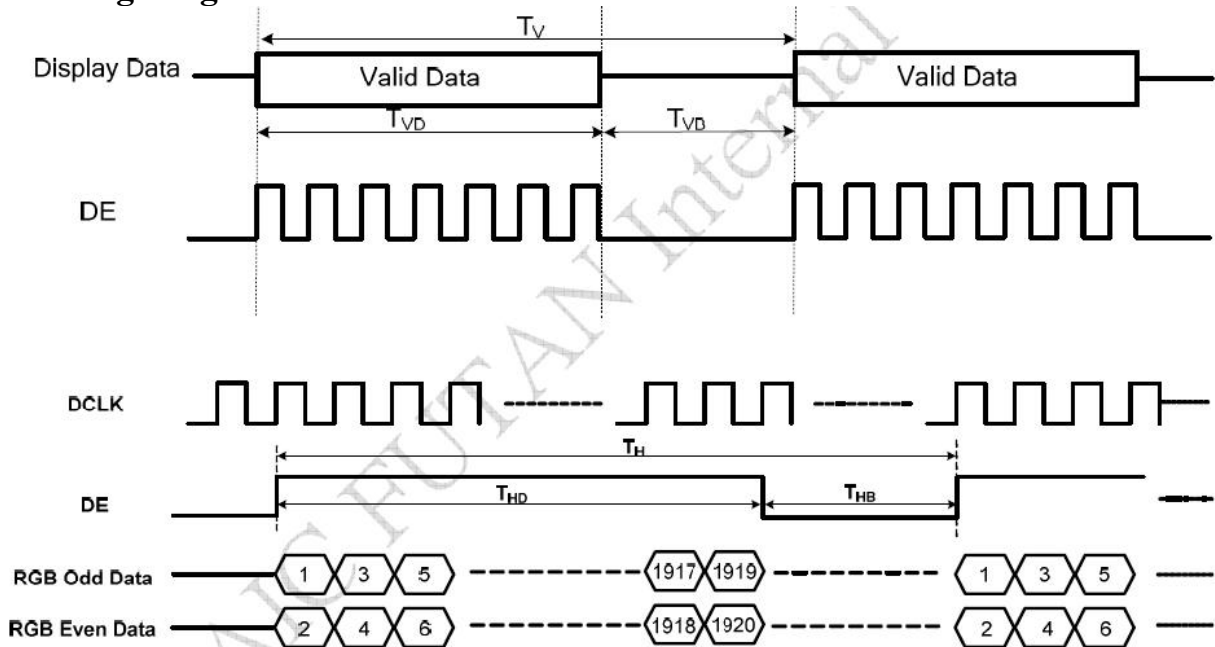
Fig.1 LVDS input data VESA format

5. Timing Condition

5.1 DE Mode

| Item | Symbol | Min | Typ. | Max | Unit | Remark |
|--------------------------|------------|------|------|------|-------|--------|
| Clock frequency | F_{DCLK} | 44.7 | 47.5 | 61 | MHZ | |
| Horizontal period area | T_H | 1020 | 1040 | 1200 | DCLK | |
| Horizontal display area | T_{HD} | 960 | 960 | 960 | DCLK | |
| Horizontal blanking area | T_{HB} | 60 | 80 | 240 | DCLK | |
| Vertical period area | T_V | 730 | 760 | 840 | T_H | |
| Vertical display area | T_{VD} | 720 | 720 | 720 | T_H | |
| Vertical blanking area | T_{VB} | 10 | 40 | 120 | T_H | |
| Frame rate | F_R | 55 | 60 | 65 | Hz | |

5.2 Timing Diagram



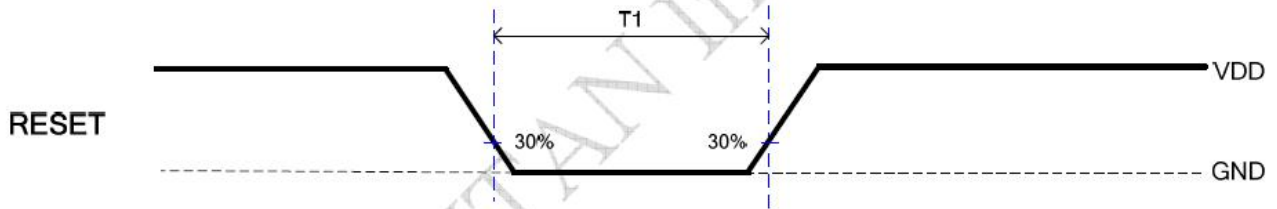
5.3 Feedback Signal Timing for Detected Function

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|------------------|--------------|---------|------|---------|------|--------------------------|
| STVD | V_{STVD-H} | VDD-0.3 | -- | VDD | V | $I_{STVD-H} = 200\mu A$ |
| | V_{STVD-L} | GND | -- | GND+0.3 | V | $I_{STVD-L} = -200\mu A$ |
| STVD frequency | F_{STVD} | 55 | 60 | 65 | HZ | |
| STVD period | T_{STVD} | 15.4 | 16.6 | 18.2 | ms | |
| STVD pulse width | T_{WSTVD} | 19 | 21 | 23 | us | |



5.4 RESET Function

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|-------|--------|-----|-----|-----|------|--------|
| RESET | T1 | 1 | -- | 20 | ms | |



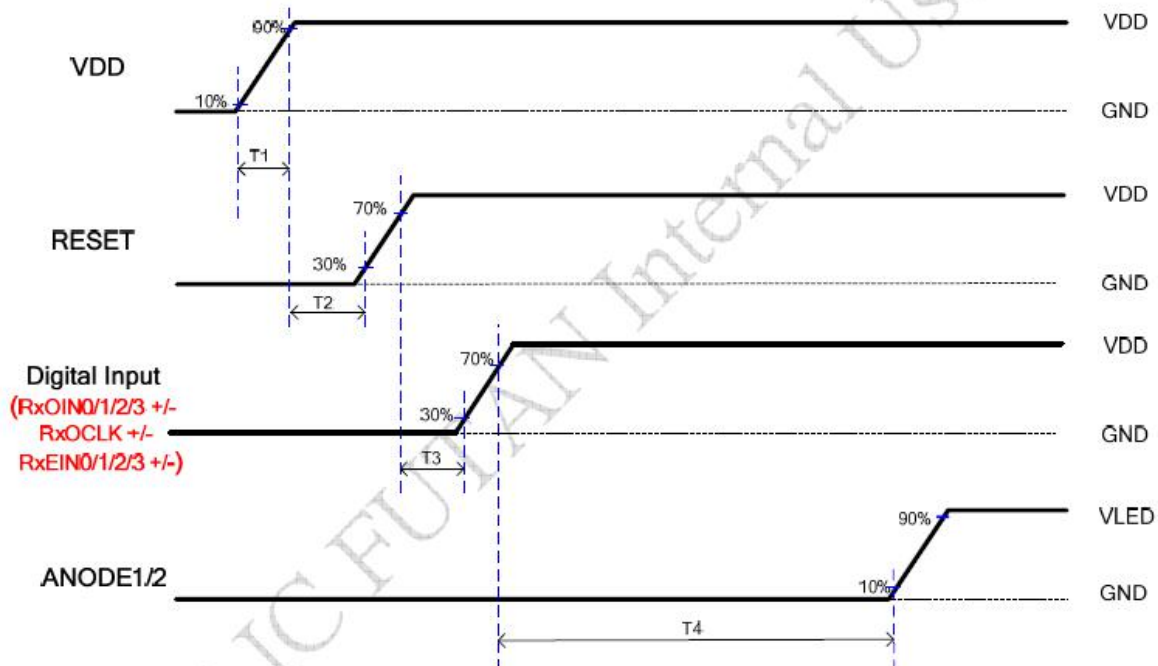
5.5 Power ON/OFF Sequence

The LCD adopts high voltage driver IC, so it could be permanently damaged under a wrong power on/off sequence. The suggested LCD power sequence is below:

a. Power ON sequence

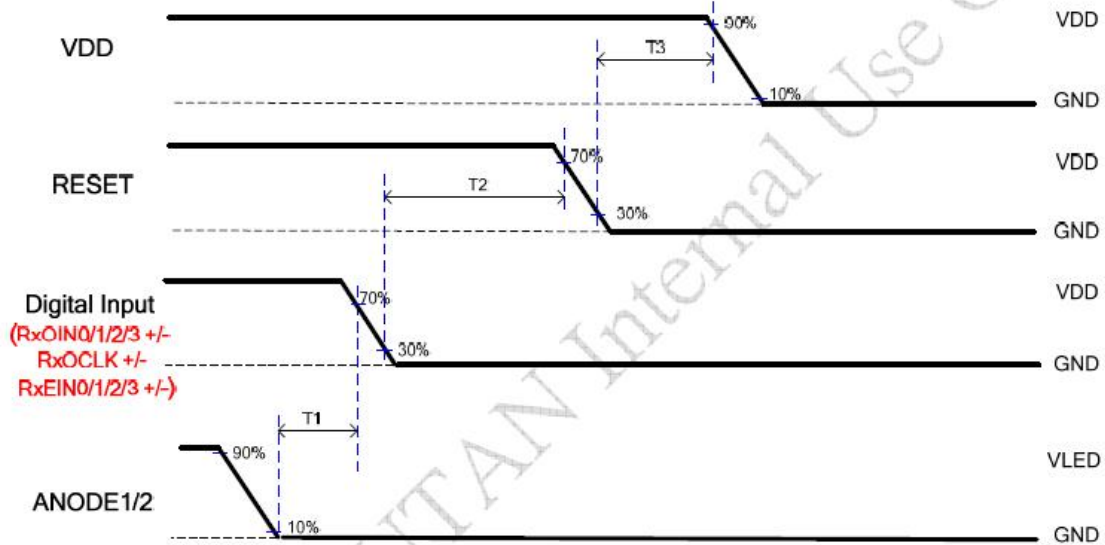
| Parameter | Value | | | Unit |
|-----------|-------|------|------|------|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | -- | 15 | ms |
| T2 | 1 | -- | 20 | ms |
| T3 | 0 | -- | 20 | ms |
| T4 | 500 | -- | -- | ms |

Power on sequence

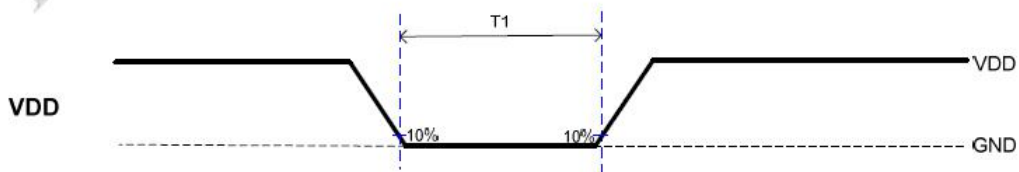


b. Power OFF sequence

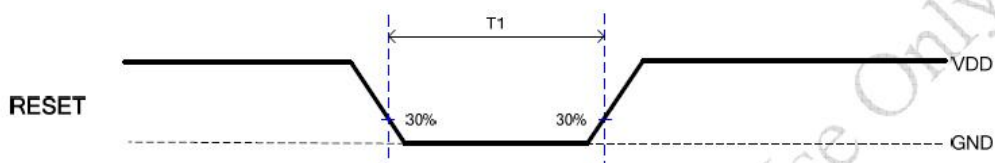
| Parameter | Value | | | Unit |
|-----------|-------|------|------|------|
| | Min. | Typ. | Max. | |
| T1 | 200 | -- | -- | ms |
| T2 | 0 | -- | 20 | ms |
| T3 | 1 | -- | 20 | ms |

Power off sequence

c. VDD ON / OFF

| Parameter | Value | | | Unit |
|-----------|-------|------|------|------|
| | Min. | Typ. | Max. | |
| T1 | 1000 | -- | - | ms |

VDD ON / OFF

d. RESET ON / OFF

| Parameter | Value | | | Unit |
|-----------|-------|------|------|------|
| | Min. | Typ. | Max. | |
| T1 | 1000 | -- | - | ms |

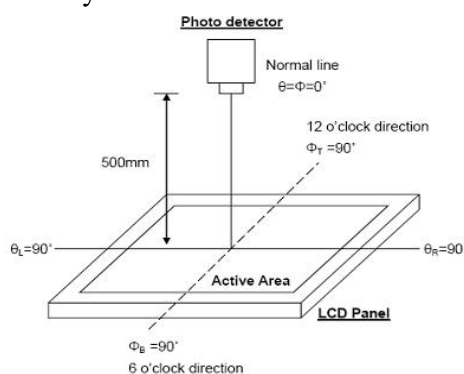
RESET ON / OFF


6. Optical Characteristics

 $T_a = 25^{\circ}\text{C} \pm 2$

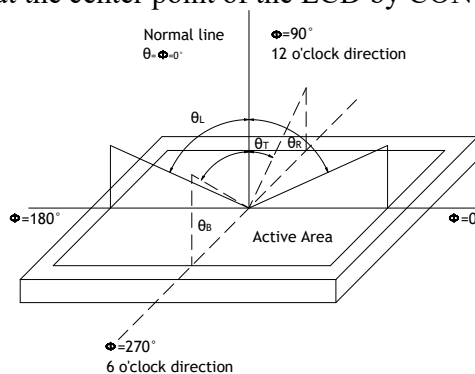
| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Note | |
|-------------------------------------|------------|--|----------|-------|-------|-------------------|-------------------------|-------------------------|
| Contrast Ratio | CR | $\Theta = 0^{\circ}$ | 800 | 1000 | - | | Note1 Note4 | |
| Luminance | YL | | 900 | 1000 | - | cd/m ² | Note1 Note6 Note7 | |
| Luminance Uniformity | IV-M | | 75 | 80 | - | % | | |
| Response Time (Rising + Falling) | TRT | $T_a = 25^{\circ}\text{C}$ $\Theta = 0^{\circ}$ | - | 30 | 40 | ms | Note1 Note3 | |
| Viewing Angle range | Horizontal | Θ_L | CR = 10 | 70 | 80 | - | | Note2 |
| | | Θ_R | | 70 | 80 | - | | |
| | Vertical | Θ_U | | 70 | 80 | - | | |
| | | Θ_D | | 70 | 80 | - | | |
| Color Chromaticity | White | x | CIE 1931 | 0.26 | 0.29 | 0.32 | | Note1 Note5 Note7 |
| | | y | | 0.297 | 0.327 | 0.357 | | |
| | Red | x | | TBD | TBD | TBD | | |
| | | y | | TBD | TBD | TBD | | |
| | Green | x | | TBD | TBD | TBD | | |
| | | y | | TBD | TBD | TBD | | |
| | Blue | x | | TBD | TBD | TBD | | |
| | | y | | TBD | TBD | TBD | | |

Note1: Definition of optical measurement system



Note2: Definition of viewing angle range and measurement system

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



Note3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and

“Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

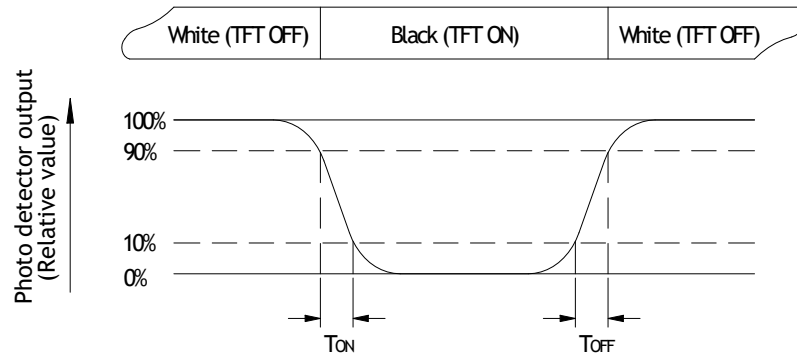


Fig. 6-3 Definition of response time

Note4: Definition of contrast ratio

Contrast ratio(CR)=

“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.

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

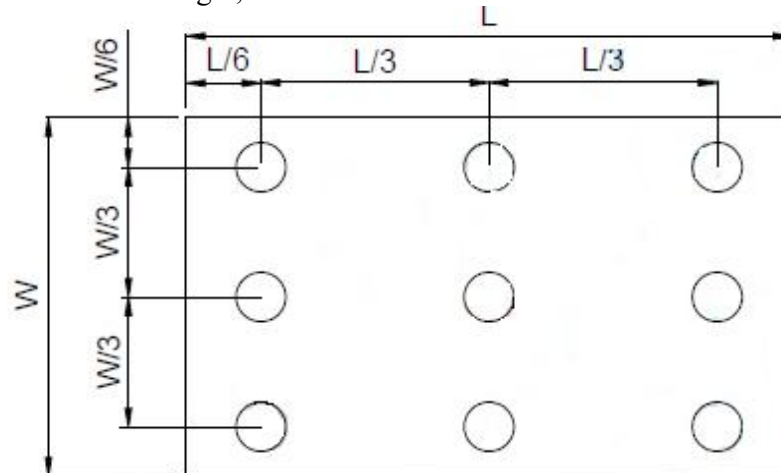
Note6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_L=184mA$

Note7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas. Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = L_{min} / L_{max}

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



B_{max} : The measured maximum luminance of all measurement position.

B_{min} : The measured minimum luminance of all measurement position.

7. Quality Assurance System

7.1 Temperature and Humidity

| Test Item | Test Condition | Remark |
|--|---|---|
| HighTemperatureStorage | Ta=90°C; 480hrs | IEC60068-2-2 GB2423.2-89 |
| Low Temperature Storage | Ta=-40°C; 480hrs | IEC60068-2-1 GB2423.1-89 |
| High Temperature Operation | Ta=85°C; 480hrs | IEC60068-2-2 GB2423.2-89 |
| Low Temperature Operation | Ta=-30°C; 480hrs | IEC60068-2-1 GB2423.1-89 |
| High Temperature High Humidity Operation | Ta=60 °C , 90%RH , 160Hrs(no condensation) | IEC60068-2-3 GB/T2423.3-2006 |
| Thermal Shock | -40 °C (0.5h) ~ 90 °C (0.5h) / 30cycles | Start with cold temperature , End with high temperature, IEC60068-2-14,GB2423.22-87 |

7.2ESD

| Test item | Conditions | Remark | |
|---|---------------------------------------|--------|--|
| Electro Static Discharge Test (non-operation) | 150pF, 330Ω, Contact:±4KV,Air:±8KV | 1 | IEC61000-4-2: 2001 GB/T17626.2-2006 |
| | 200pF, 0Ω, ±200V contact test | 2 | |

Note: Measure point :

1. LCD glass and metal bezel
2. IF connector pins

8. Package Drawing

TBD