

## CUSTOMER' S APPROVAL SPECIFICATIONS

**MODEL: CH070ILFL-CT1**

Distributed by:

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**ISSUE:APR.18.2014**

**Spec Condition: preliminary**

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## 2.RECORD OF REVISION

| Rev | DATE       | PAGE | SUMMARY                                     |
|-----|------------|------|---------------------------------------------|
| 0.1 | 2014.04.18 | ALL  | Preliminary specification was first issued. |

### 3.MECHANICAL SPECIFICATIONS

|      |                                |                                    |
|------|--------------------------------|------------------------------------|
| (1)  | Number Of Dots (Dots)          | 1024(R.G.B) X 600                  |
| (2)  | Module Size(mm)                | 181.6(W) X 127.6(H) X 13.5(D)      |
| (3)  | Active Area(mm)                | 153.6(H) X 90.0(V)                 |
| (4)  | Pixel Pitch(mm)                | 0.15 (H) X 0.15(V)                 |
| (5)  | LCD Model                      | TFT , Transmissive, Normally/White |
| (6)  | Polarizer Model                | Anti-glare                         |
| (7)  | LED Backlight Color            | White                              |
| (8)  | Viewing Direction              | Wide Viewing Angle                 |
| (9)  | Gray Scale Inversion Direction | 6 O'Clock                          |
| (10) | Color Configuration            | R.G.B Stripe                       |
| (11) | Module Weight(g)               | TBD                                |

\*\*Viewing direction for best image quality is different from TFT definition, there is the 180 degrees shift.



## 5. INTERFACE PIN CONNECTION

### 5.1 LCM PANEL DRIVING SECTION

CN1:STM MSB240420HD or equivalent

| PIN NO | SYMBOL | FUNCTION                                                   | REMARK |
|--------|--------|------------------------------------------------------------|--------|
| 1      | VDD    | Power Supply,3.3V(typical)                                 |        |
| 2      | VDD    | Power Supply,3.3V(typical)                                 |        |
| 3      | VSS    | Ground                                                     |        |
| 4      | REV    | Reverse Scan selection                                     |        |
| 5      | Rin1-  | LVDS receiver negative signal channel 0(G0,R5~R0)          |        |
| 6      | Rin1+  | LVDS receiver positive signal channel 0(G0,R5~R0)          |        |
| 7      | VSS    | Ground                                                     |        |
| 8      | Rin2-  | LVDS receiver negative signal channel 1(B1,B0,G5~G1)       |        |
| 9      | Rin2+  | LVDS receiver positive signal channel 1(B1,B0,G5~G1)       |        |
| 10     | VSS    | Ground                                                     |        |
| 11     | Rin3-  | LVDS receiver negative signal channel 2(DE,VS,HS,B5~B2)    |        |
| 12     | Rin3+  | LVDS receiver positive signal channel 2(DE,VS,HS,B5~B2)    |        |
| 13     | VSS    | Ground                                                     |        |
| 14     | ClkIN- | LVDS receiver negative signal clock                        |        |
| 15     | ClkIN+ | LVDS receiver positive signal clock                        |        |
| 16     | GND    | Ground                                                     |        |
| 17     | Rin4-  | LVDS receiver negative signal channel 3(B6,B7,G6,G7,R6,R7) |        |
| 18     | Rin4+  | LVDS receiver positive signal channel 3(B6,B7,G6,G7,R6,R7) |        |
| 19     | VSS    | Ground                                                     |        |
| 20     | BITS   | Internal use                                               |        |

### 5.2 BACKLIGHT SECTION

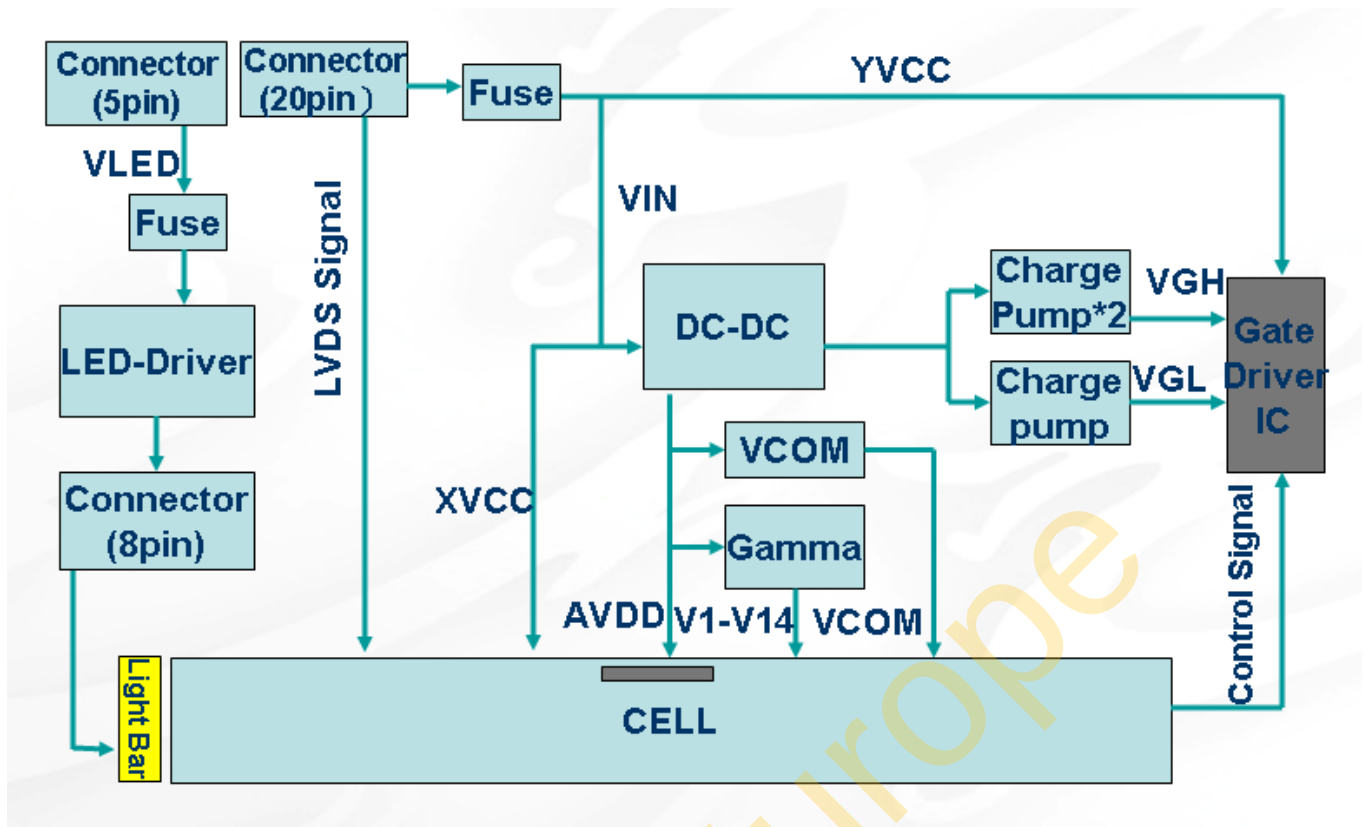
CN2:STM MSB24038P5A or equivalent

| PIN NO | SYMBOL | FUNCTION                  | REMARK |
|--------|--------|---------------------------|--------|
| 1      | VLED   | Power Supply,12V(typical) |        |
| 2      | GND    | Ground                    |        |
| 3      | EN     | 3.3V(typical)             |        |
| 4      | PWM    | 3.3V(typical)             |        |
| 5      | NC     | Not connection            |        |

### 5.2 CTP PIN ASSIGNMENT

| PIN NO. | SIGNAL | FUNCTION                         |
|---------|--------|----------------------------------|
| 1       | VCC    | Power Supply For Digital Circuit |
| 2       | GND    | Ground                           |
| 3       | SCL    | I2C Clock Input                  |
| 4       | SDA    | I2C Data Input and Output        |
| 5       | INT    | External Interrupt to the Host   |
| 6       | /RES   | External Reset , Low is Active   |
| 7       | WAKE   | Please Connect VCC               |

## 6. BLOCK DIAGRAM



## 7. ABSOLUTE MAXIMUM RATINGS

### 7.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

| ITEM                        | SYMBOL           | MIN. | MAX. | UNIT | REMARK |
|-----------------------------|------------------|------|------|------|--------|
| Logic Power Supply Voltage  | VDD              | 3.0  | 3.6  | V    |        |
| LED Backlight Drive Voltage | VLED             | 8.0  | 16.0 | V    |        |
| LVDS Input Signal           | V <sub>S</sub>   | -    | 3.6  | V    |        |
| PWM Dimming Voltage         | V <sub>PWM</sub> | 0.8  | 5.0  | V    |        |

### 7.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

| ITEM                    | OPERATING |     | STORAGE |     | COMMENT    |
|-------------------------|-----------|-----|---------|-----|------------|
|                         | MIN       | MAX | MIN     | MAX |            |
| Ambient Temperature(°C) | -20       | 70  | -30     | 80  | Note 1,2,3 |
| Humidity(% RH)          | -         | 90  | -       | 90  | Note 4     |

Note 1 : The response time will become lower when operated at low temperature.

Note 2 : Background color changes slightly depending on ambient temperature.

Note 3 : Operation Ta=70°C & -20°C ≤ 240Hrs.

Note 4 : Storage Ta=50°C & H=60% ≤ 240Hrs.

## 8. ELECTRICAL CHARACTERISTICS

### 8.1 ELECTRICAL CHARACTERISTICS OF LCD

Ta=25°C

| ITEM                                      | SYMBOL            | MIN. | TYP. | MAX. | UNIT | REMARK                                  |
|-------------------------------------------|-------------------|------|------|------|------|-----------------------------------------|
| Power Voltage For Digital                 | VDD               | 3.0  | 3.3  | 3.6  | V    |                                         |
|                                           | IDD**             | -    | -    | 153  | mA   |                                         |
| Input Inrush Current                      | I <sub>RUSH</sub> | -    | -    | 1.5  | A    |                                         |
| Input Power Voltage Ripple                | V <sub>RPL</sub>  | -    | -    | 200  | mV   | V <sub>p-p</sub>                        |
| REV                                       | VH                | 2.0  | 3.3  | 5.0  | V    |                                         |
|                                           | VL                | -    | -    | 0.8  | V    |                                         |
| Logic Input Voltage<br>(LVDS: Rin+, Rin-) | V <sub>CM</sub>   | 1.0  | 1.2  | 1.4  | V    | V <sub>TH</sub> -V <sub>TL</sub> =200mV |
|                                           | ΔV <sub>CM</sub>  | -50  | -    | +50  | mV   | V <sub>TH</sub> -V <sub>TL</sub> =200mV |
|                                           | VID               | 200  | -    | 600  | mV   |                                         |
|                                           | V <sub>TH</sub>   | -    | -    | +100 | mV   | V <sub>CM</sub> =+1.2V                  |
|                                           | V <sub>TL</sub>   | -100 | -    | -    | mV   | V <sub>CM</sub> =+1.2V                  |

\*\*Test pattern is Black at 60Hz

### 8.2 BACKLIGHT UNITS

Ta=25°C

| ITEM                | SYMBOL           | MIN.  | TYP. | MAX. | UNIT | REMARK |
|---------------------|------------------|-------|------|------|------|--------|
| LED Driving Voltage | VLED             | 8     | 12   | 16   | V    |        |
| LED Driving Current | ILED             | -     | -    | 543  | mA   |        |
| Brightness Control  | VIH              | 2     | 3.3  | 5    | V    |        |
|                     | VIL              | 0     | -    | 0.8  | V    |        |
| PWM Frequency       | F <sub>PWM</sub> | 100   |      | 1K   | Hz   |        |
| LED Life Time       | -                | 50000 | -    | -    | Hr   | Note1  |

Note1 : The LED life time define as the estimated time to 50% degradation of the initial value.

## 9. OPTICAL CHARACTERISTICS

Ta=25°C

| ITEM                 |       | SYMBOL                          | CONDITIONS                                            | MIN.    | TYP.    | MAX.    | UNIT  | REMARK   |
|----------------------|-------|---------------------------------|-------------------------------------------------------|---------|---------|---------|-------|----------|
| Contrast Ratio       |       | CR                              | Viewing                                               |         | (800)   | -       | -     | Note (1) |
| Response Time        |       | T <sub>R</sub> + T <sub>F</sub> | Normal Angle<br>Θ <sub>x</sub> =Θ <sub>y</sub><br>=0° | -       | TBD     | -       | ms    | Note (2) |
| Chromaticity         | White | x                               |                                                       | (0.255) | (0.305) | (0.355) | -     | Note (4) |
|                      |       | y                               |                                                       | (0.275) | (0.325) | (0.375) |       |          |
| Viewing Angle        | Hor.  | Θ <sub>x</sub> +                | Viewing                                               | (70)    | (80)    | -       | Deg.  | Note (3) |
|                      |       | Θ <sub>x</sub> -                | Angle                                                 | (70)    | (80)    | -       |       |          |
|                      | Ver.  | Θ <sub>y</sub> +                | Θ <sub>x</sub> =Θ <sub>y</sub><br>=0°                 | (70)    | (80)    | -       |       |          |
|                      |       | Θ <sub>y</sub> -                | CR≥ 10                                                | (50)    | (60)    | -       |       |          |
| Luminance            |       | L                               | Center                                                | (340)   | (430)   | -       | cd/m2 | Note (4) |
| Luminance uniformity |       | YU                              | PWM=100%                                              | 70      | 80      | -       | %     | Note (5) |

\*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

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

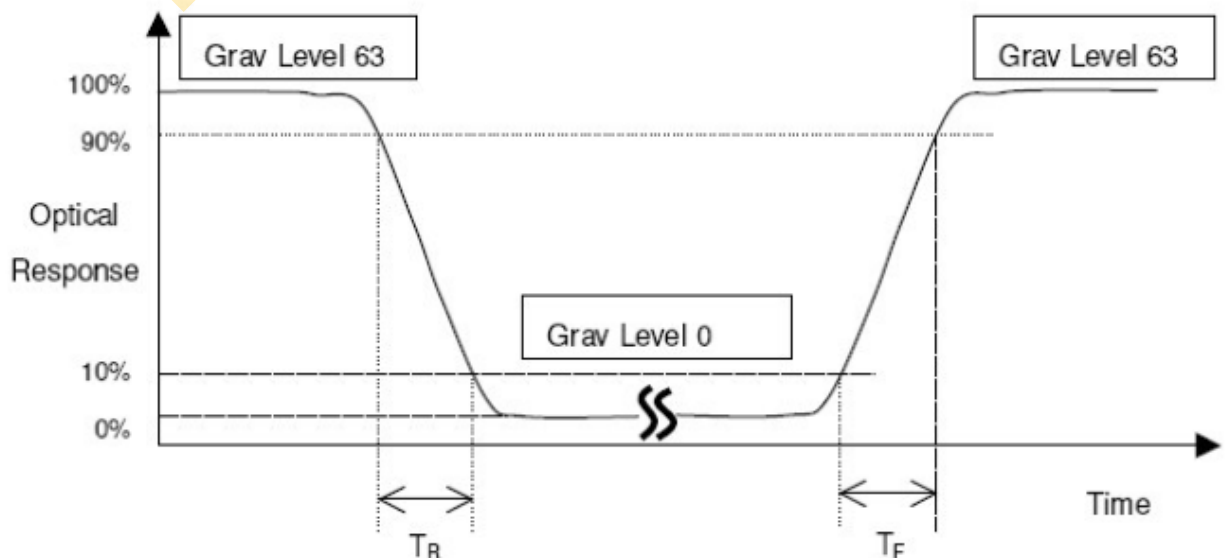
L63: Luminance of gray level 63

L0: Luminance of gray level 0

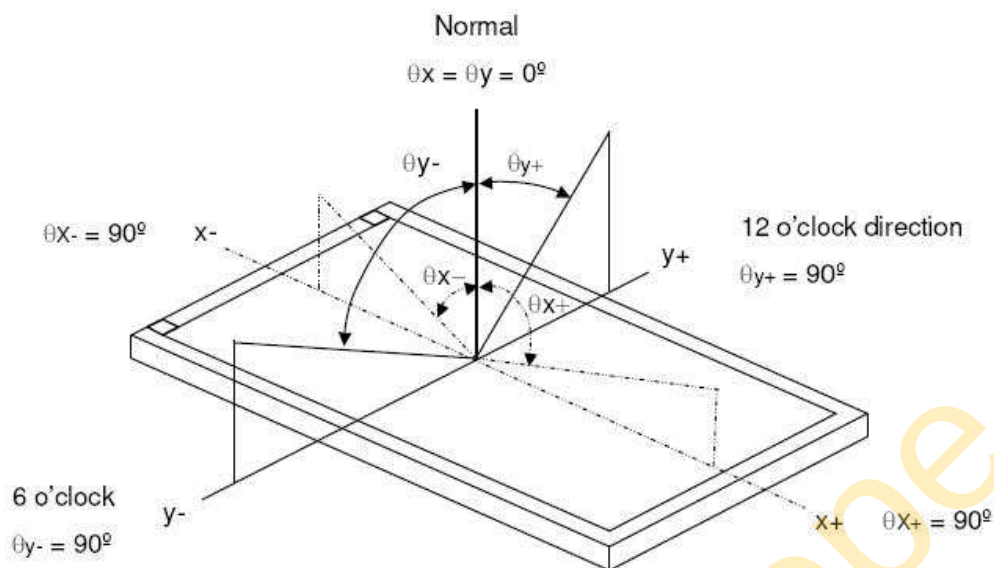
$$CR = CR(5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

\*Note (2) Definition of Response Time ( $T_R$ ,  $T_F$ ):

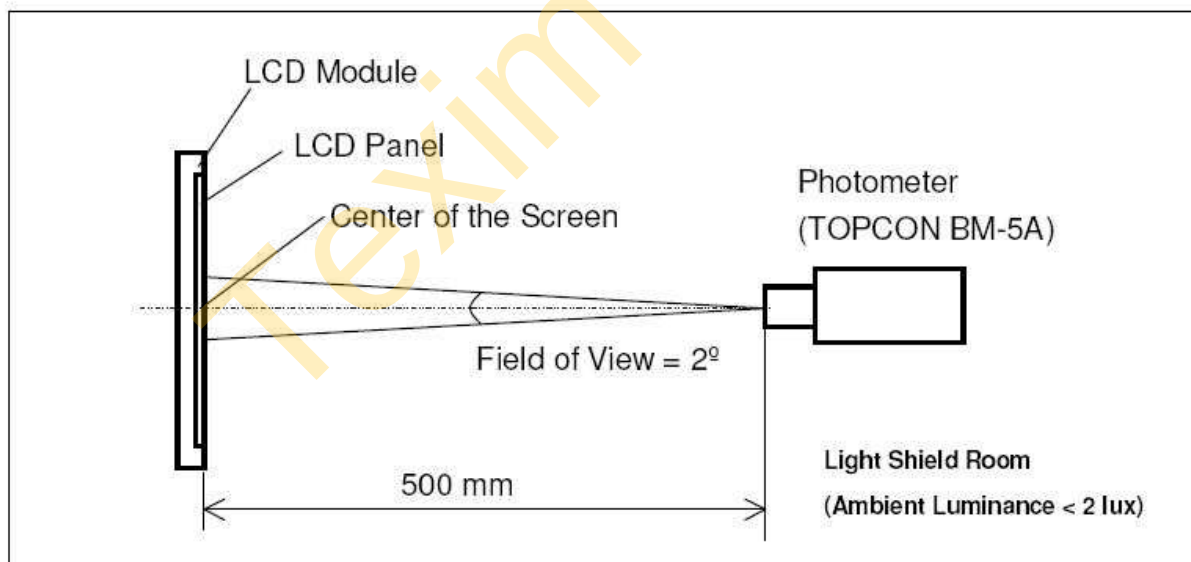


\*Note(3) Definition of Viewing Angle

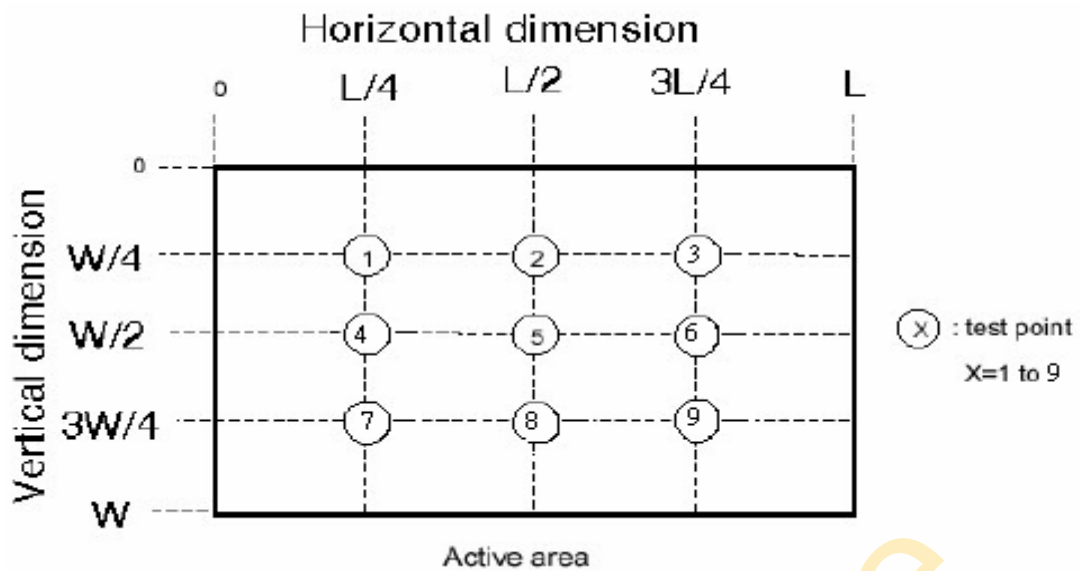


\*Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



\*Note (5)

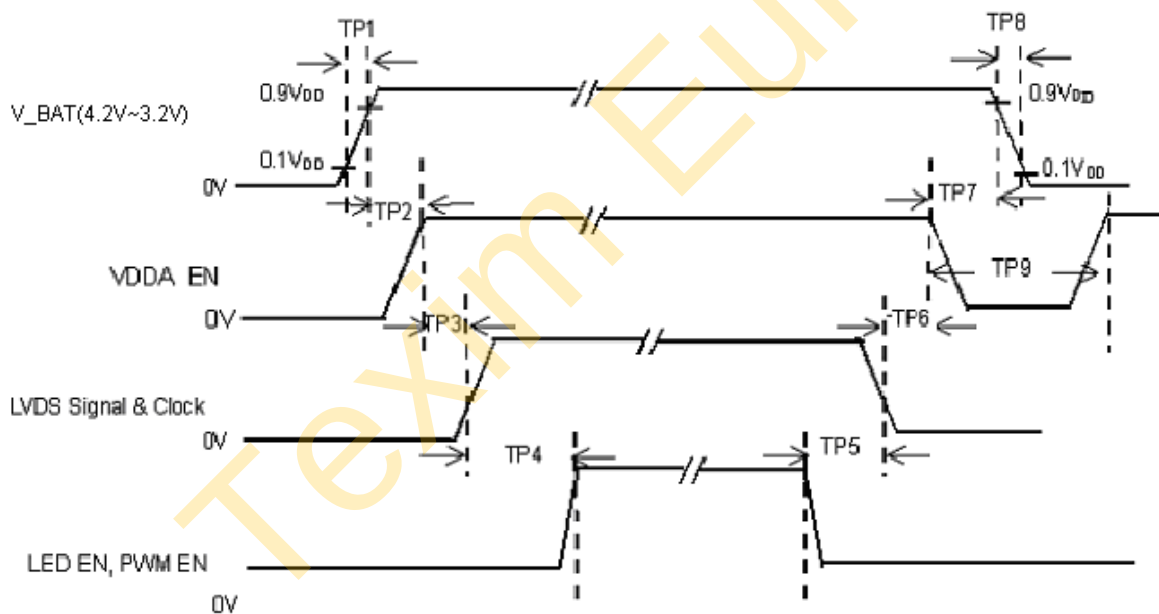


$$\left( 1 - \frac{\text{MAX Luminance} - \text{Average Luminance}}{\text{Average Luminance}} \right) \times 100\% > 70\%$$

## 10. TIMING SPECIFICATIONS

### 10.1 POWER ON/OFF SEQUENCE

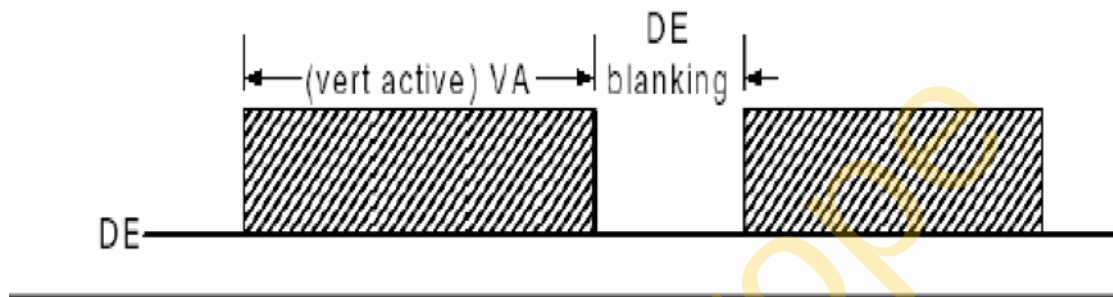
| Symbol | Unit | Min  | Typ | Max | Remark        |
|--------|------|------|-----|-----|---------------|
| TP1    | ms   | 0.5  | -   | 10  | -             |
| TP2    | ms   | 10   | -   | -   | -             |
| TP3    | ms   | 30   | 40  | 90  | -             |
| TP4    | ms   | 200  | -   | -   | -             |
| TP5    | ms   | 110  | -   | -   | -             |
| TP6    | ms   | 0    | 16  | 80  | -             |
| TP7    | ms   | 0    | -   | -   | Must exceed 0 |
| TP8    | ms   | -    | 10  | 30  | -             |
| TP9    | ms   | 1000 | -   | -   | -             |



## 10.2 TIMING CHARACTERISTICS

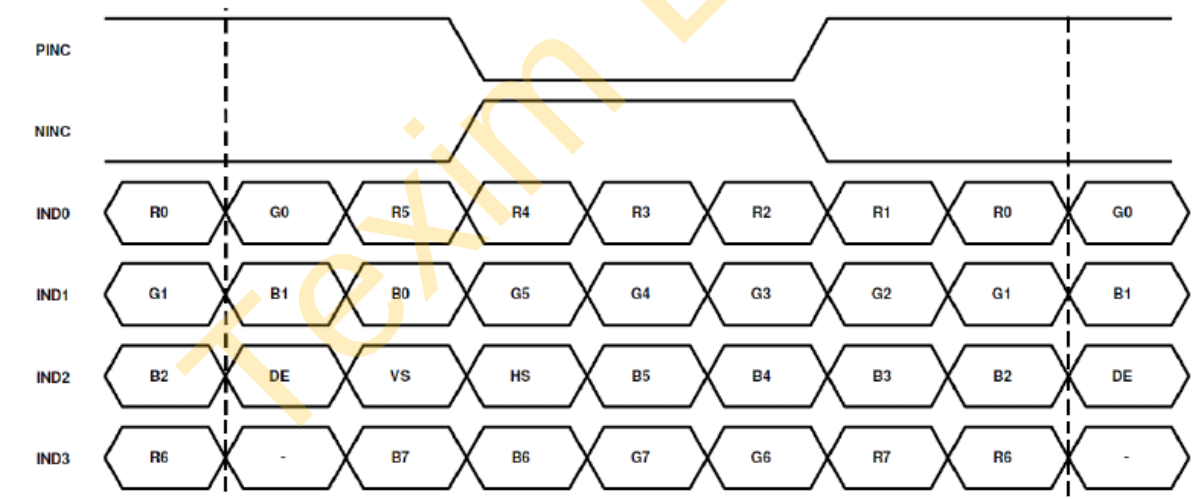
Synchronization Method : DE only

| ITEM                          | SYMBOL              | MIN. | TYP. | MAX. | UNIT   | REMARK |
|-------------------------------|---------------------|------|------|------|--------|--------|
| LVDS Clock Frequency (single) | $f_{\text{dck}}$    | 45   | 51.2 | 57   | MHz    |        |
| H Total Time                  | $T_{\text{hp}}$     | 1324 | 1344 | 1364 | clocks |        |
| H Active Time                 | HA                  | 1024 | 1024 | 1024 | clocks |        |
| H Blanking Time               | $TH_{\text{BLANK}}$ | 300  | 320  | 340  | clocks |        |
| V Total Time                  | $T_{\text{VP}}$     | 625  | 635  | 645  | lines  |        |
| V Active Time                 | VA                  | 600  | 600  | 600  | lines  |        |
| V Blanking Time               | $TV_{\text{BLANK}}$ | 25   | 35   | 45   | lines  |        |
| V Frequency                   | $f_{\text{V}}$      | 55   | 60   | 65   | Hz     |        |



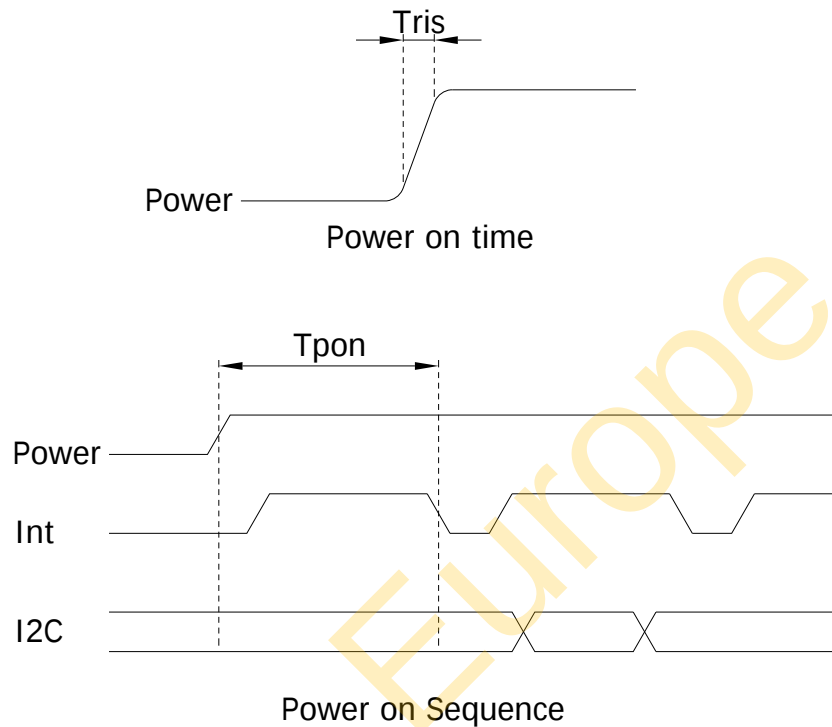
## 10.3 TIMING DIAGRAM OF INTERFACE SIGNAL

LVDS Mapping

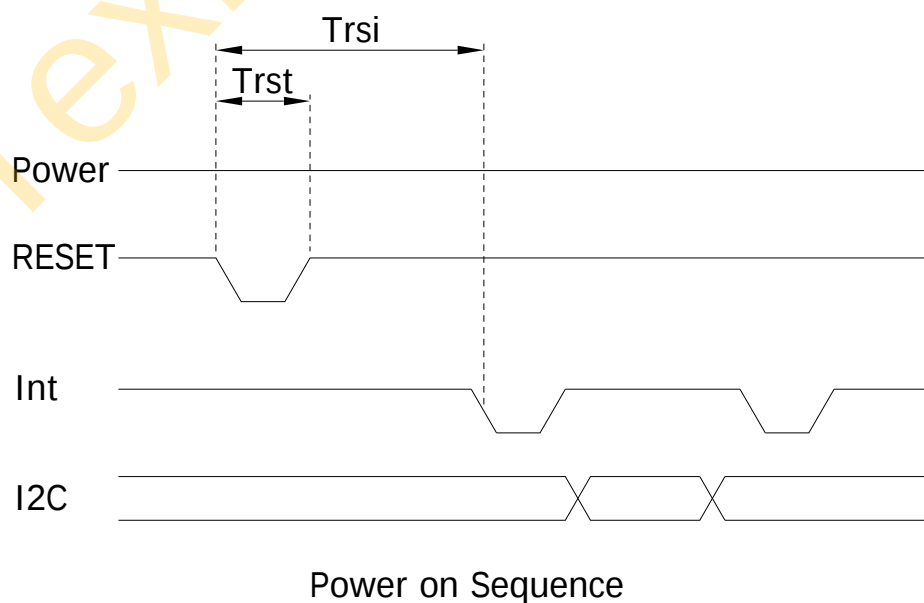


## 10.4 CTP POWER SUPPLY VOLTAGE SEQUENCE

INT and I2C should be pulled down to be low before powering on. The signal of waking up should be set be high after powering on. INT signal will be sent the host after initializing all parameters and then start to report points to the host



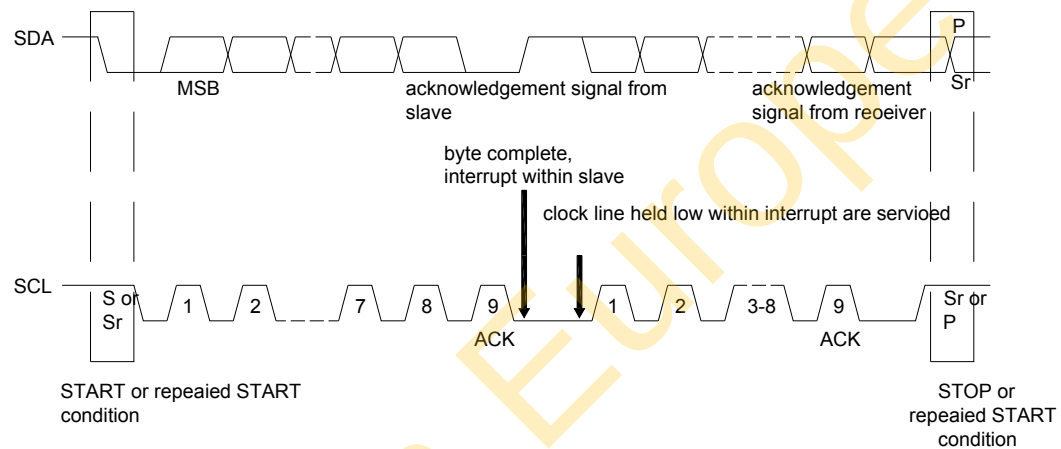
Reset time must be enough to guarantee reliable reset. The time of starting to report point after resetting approach to the time of starting to report point after power on.



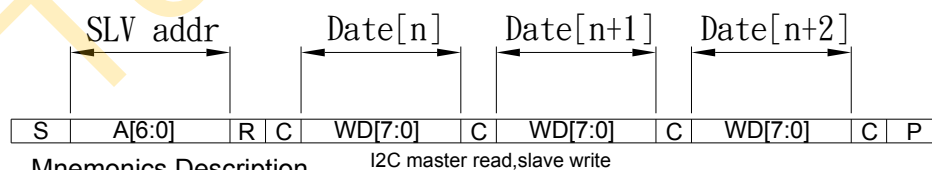
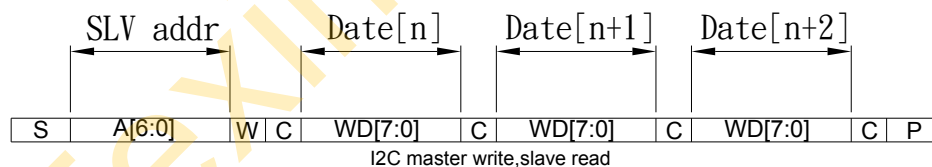
| ITEM | DESCRIPTION                                        | MIN. | MAX. | UNIT |
|------|----------------------------------------------------|------|------|------|
| Tris | Rise time from 0.1VCC to 0.9VCC                    | -    | 10   | ms   |
| Tpon | Time of starting to report point after powering on | 300  | -    | ms   |
| Trst | Time of starting to report point after resetting   | 300  | -    | ms   |
| Trst | Rese time                                          | 5    | -    | ms   |

## 10.5 CTP I2C BUS INTERFACE

The I2C is always configured in the Slave mode.



I2C Serial Data Transfer Format



Mnemonics Description

| ITEM   | DESCRIPTION                                                                                                                                          |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| S      | I2C Start or I2C Restart                                                                                                                             |
| A[6:0] | Slave address<br>A[6:4]:3'b011<br>A[3:0]:data bits are identical to those of I2CCON[7:4]register                                                     |
| W      | 1'b0;Write                                                                                                                                           |
| R      | 1'b1;Read                                                                                                                                            |
| C      | ACK                                                                                                                                                  |
| P      | STOP : the indication of the end of a packet(if this bit is missing , Swill indicate the end of the current packet and beginning of the next packet) |

I2C Interface timing Characteristics is shown in Table

I2C Timing Characteristics

| ITEM                                             | MIN. | MAX. | UNIT. |
|--------------------------------------------------|------|------|-------|
| SCL frequency                                    | 0    | 400  | KHz   |
| Bus free time between a STOP and START condition | 4.7  | -    | µs    |
| Hold time (repeated) START condition             | 4.0  | -    | µs    |
| Data setup time                                  | 250  | -    | µs    |
| Setup time for a repeated START condition        | 4.7  | -    | µs    |
| Setup Time for STOP condition                    | 4.0  | -    | µs    |

## 10.7 CTP ELECTRICAL CHARACTERISTICS

| ITEM                  | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK         |
|-----------------------|--------|------|------|------|------|----------------|
| Power Voltage For CTP | VCC    | 2.8  | -    | 3.5  | V    |                |
| Power Current For CTP | ICC1   | -    | -    | 15   | mA   | Active Current |
| Power Current For CTP | ICC2   | -    | -    | 0.1  | mA   | Sleep Current  |

## 11. RELIABILITY TEST

Ta = 25°C

| Environmental Test |                                   |                                                |             |         |
|--------------------|-----------------------------------|------------------------------------------------|-------------|---------|
| NO.                | ITEM                              | CONDITIONS                                     | TIME PERIOD | REMARK  |
| 1                  | High Temperature Storage          | 80°C                                           | 240HRS      |         |
| 2                  | Low Temperature Storage           | -30±3°C                                        | 240HRS      |         |
| 3                  | High Temperature Humidity Storage | 50°C<br>85%RH                                  | 240HRS      | NOTE(2) |
| 4                  | High Temperature Operation        | 70°C                                           | 240HRS      | NOTE(2) |
| 5                  | Low Temperature Operation         | -20°C                                          | 240HRS      | NOTE(2) |
| 6                  | Temperature Cycle                 | -30°C ← -25°C → 75°C<br>(30min) (5min) (30min) | 100CYCLE    | NOTE(2) |

NOTE (1): a. THE MODULE SHOULD WORK PROPERLY.

b. BEFORE AND AFTER FUNCTION TEST, THE DIFFERENCE OF CONSUMPTIVE CURRENT SHOULD BE WITHIN 10%

NOTE (2): a. THE MODULE SHOULD WORK PROPERLY.

b. THE MODULE WON'T BE DEFORMATIVE, COLOR CHANGEABLE OR BROKEN.

c. THE MODULES CAN'T BE APART.

NOTE (3): BEFORE COSMETIC AND FUNCTION TEST, THE PRODUCT MUST HAVE ENOUGH RECOVERY TIME, AT LEAST 2 HOURS AT ROOM TEMPERATURE.

## 12. PACKAGE METHOD

TBD

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