

## Specification

|              |                       |
|--------------|-----------------------|
| Part Number: | MCT070LA12W1024600LML |
| Version:     | 1                     |
| Date:        | 21/06/2016            |

## Revision

| VERSION | DATE       | REVISED PAGE NO. | Note        |
|---------|------------|------------------|-------------|
| 0       | 2016/06/01 |                  | First issue |

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|                       |                          |
|-----------------------|--------------------------|
| Display Size          | 7.0"                     |
| Resolution            | 1024 x 600               |
| VGA Size              | WSVGA                    |
| Orientation           | Landscape                |
| Appearance            | RGB                      |
| Logic Voltage         | 3.3V                     |
| Interface             | LVDS                     |
| Brightness            | 600 cd/m <sup>2</sup>    |
| Touchscreen           | N/A                      |
| Module Size W x H x D | 164.80 x 99.80 x 5.65 mm |
| Operating Temperature | -20°C ~ +70°C            |
| Pin Out               | 40 - Way                 |



# Contents

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# Midas Active Matrix Display Part Number System

MC T 057 A 6 \* W 320240 L M L \* \*

1 2 3 4 5 6 7 8 9 10 11 12 13

- 1 = MC: Midas Components
- 2 = T: TFTA: Active Matrix OLED M: Monitor
- 3 = Size
- 4 = Series
- 5 = Viewing Angle: 6: 6 O'clock 12: 12 O'clock O: All Round Viewing Angle
- 6 = Blank: No Touch T: Resistive Touchscreen C: Capacitive Touchscreen
- 7 = Operating Temp Range: S: 0+50Deg C B: -20+60Deg C  
W: -20+70Deg C E: -30+85Deg C  
X: -30+80Deg C
- 8 = No of Pixels
- 9 = Orientation: P: Portrait L: Landscape
- 10 = Mode: R: Reflective M: Transmissive T: Transflective  
S: Sunlight Readable (Transmissive) W: White on Black (Monochrome)
- 11 = Backlight: Blank: None L: LED C: CCFL
- 12 = Blank: No Module/board C: Controller board module (E-Tech)
- 13 = Blank: None OB: Optically Bonded IPS: In-plane switching



## 2.Summary

This technical specification applies to 7.0' color TFT-LCD panel. The 7.0' color TFT-LCD panel is designed for camcorder, digital camera application and other electronic products which require high quality flat panel displays. This module follows RoHS.



### 3.General Specifications

- Size: 7.0 inch
- Dot Matrix: 1024 x RGBx600(TFT) dots
- Module dimension: 164.8(W) x 99.8(H) x 5.65(D) mm
- Active area: 154.2114 x 85.92 mm
- Dot pitch: 0.1506 x 0.1432 mm
- LCD type: TFT, Normally White, Transmissive
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Backlight Type: LED, Normally White
- With /Without TP: Without TP
- Interface: LVDS
- Surface: Anti-Glare

\*Color tone slight changed by temperature and driving voltage.



## 4.Interface

### 4.1. LCM PIN Definition

FPC Connector is used for the module electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

| Pin No. | Symbol   | I/O | Function                                                                                                                                                     | Remark |
|---------|----------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| 1       | VCOM     | P   | Common Voltage                                                                                                                                               |        |
| 2       | VDD      | P   | Digital circuit                                                                                                                                              |        |
| 3       | VDD      | P   | Digital circuit                                                                                                                                              |        |
| 4       | NC       | --- | No connection                                                                                                                                                |        |
| 5       | Reset    | I   | Global reset pin                                                                                                                                             |        |
| 6       | STBYB    | I   | Standby mode, Normally pulled high<br>STBYB = "1", normal operation<br>STBYB = "0", timing controller, source driver<br>will turn off, all output are High-Z |        |
| 7       | GND      | P   | Ground                                                                                                                                                       |        |
| 8       | RXIN0-   | I   | Negative LVDS differential data input                                                                                                                        |        |
| 9       | RXIN0+   | I   | Positive LVDS differential data input                                                                                                                        |        |
| 10      | GND      | P   | Ground                                                                                                                                                       |        |
| 11      | RXIN1-   | I   | Negative LVDS differential data input                                                                                                                        |        |
| 12      | RXIN1+   | I   | Positive LVDS differential data input                                                                                                                        |        |
| 13      | GND      | P   | Ground                                                                                                                                                       |        |
| 14      | RXIN2-   | I   | Negative LVDS differential data input                                                                                                                        |        |
| 15      | RXIN2+   | I   | Positive LVDS differential data input                                                                                                                        |        |
| 16      | GND      | P   | Ground                                                                                                                                                       |        |
| 17      | RXCLKIN- | I   | Negative LVDS differential clock input                                                                                                                       |        |
| 18      | RXCLKIN+ | I   | Positive LVDS differential clock input                                                                                                                       |        |
| 19      | GND      | P   | Ground                                                                                                                                                       |        |
| 20      | RXIN3-   | I   | Negative LVDS differential data input                                                                                                                        |        |
| 21      | RXIN3+   | I   | Positive LVDS differential data input                                                                                                                        |        |
| 22      | GND      | P   | Ground                                                                                                                                                       |        |
| 23      | NC       | --- | No connection                                                                                                                                                |        |
| 24      | NC       | --- | No connection                                                                                                                                                |        |

|    |      |     |                                          |  |
|----|------|-----|------------------------------------------|--|
| 25 | GND  | P   | Ground                                   |  |
| 26 | NC   | --- | No connection                            |  |
| 27 | DIMO | O   | Backlight CABC controller signal output  |  |
| 28 | SELB | I   | 6bit/8bit mode select<br>H:6bit / L:8bit |  |
| 29 | AVDD | P   | Power for Analog Circuit                 |  |
| 30 | GND  | P   | Ground                                   |  |
| 31 | LED- | P   | LED Cathode                              |  |
| 32 | LED- | P   | LED Cathode                              |  |
| 33 | L/R  | I   | Horizontal inversion                     |  |
| 34 | U/D  | I   | Vertical inversion                       |  |
| 35 | VGL  | P   | Negative power for TFT                   |  |
| 36 | GND  | P   | Ground                                   |  |
| 37 | GND  | P   | Ground                                   |  |
| 38 | VGH  | P   | Positive power for TFT                   |  |
| 39 | LED+ | P   | LED Anode                                |  |
| 40 | LED+ | P   | LED Anode                                |  |

I:input ,O:output,P:power

Note

When L/R="0",set right to left scan direction.

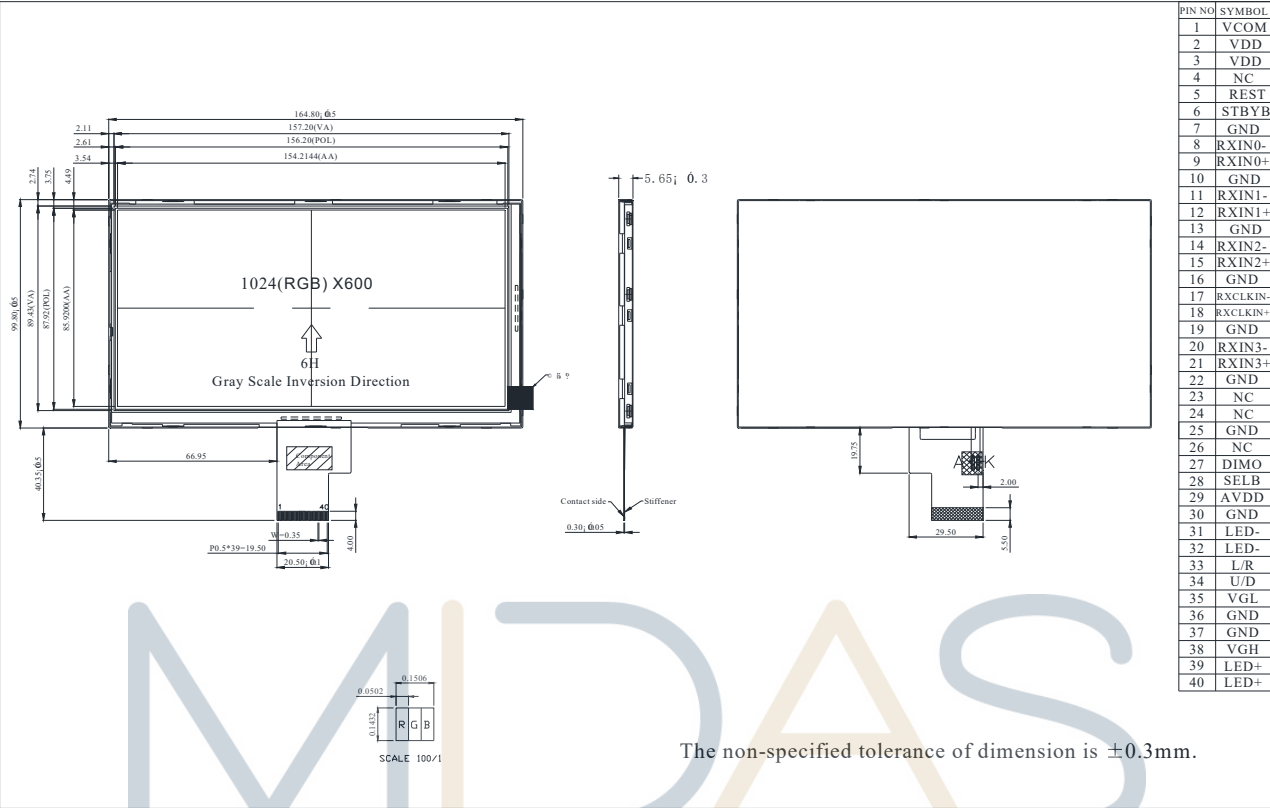
When L/R="1",set left to right scan direction.

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

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



5.Contour Drawing



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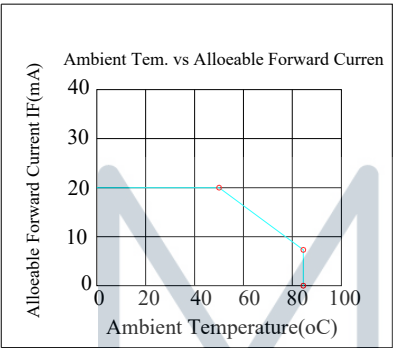


## 6.Absolute Maximum Ratings

| Item                  | Symbol | Min | Typ | Max | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Operating Temperature | TOP    | -20 | -   | +70 | °C   |
| Storage Temperature   | TST    | -30 | -   | +80 | °C   |

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

- Temp. ≤60°C, 90% RH MAX. Temp. > 60°C, Absolute humidity shall be less than 90% RH at 60°C



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## 7. Electrical Characteristics

### 7.1. Typical Operation Conditions

(Note 1)

| Item                     | Symbol | Values   |      |          | Unit | Remark |
|--------------------------|--------|----------|------|----------|------|--------|
|                          |        | Min.     | Typ. | Max.     |      |        |
| Power voltage            | DVDD   | 3.0      | 3.3  | 3.6      | V    | Note 2 |
|                          | AVDD   | 9.4      | 9.6  | 9.8      | V    |        |
|                          | VGH    | 17       | 18   | 19       | V    |        |
|                          | VGL    | -6.6     | -6.0 | -5.4     | V    |        |
| Input signal voltage     | VCOM   | 3.1      | 3.3  | 3.6      | V    |        |
| Input logic high voltage | VIH    | 0.7 DVDD | -    | DVDD     | V    | Note 3 |
| Input logic low voltage  | VIL    | 0        | -    | 0.3 DVDD | V    |        |

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note 2: DVDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: DCLK, HS, VS, RESET, U/D, L/R, DE, R0~R7, G0~G7, B0~B7, MODE, DITHB.

### 7.2. Current Consumption

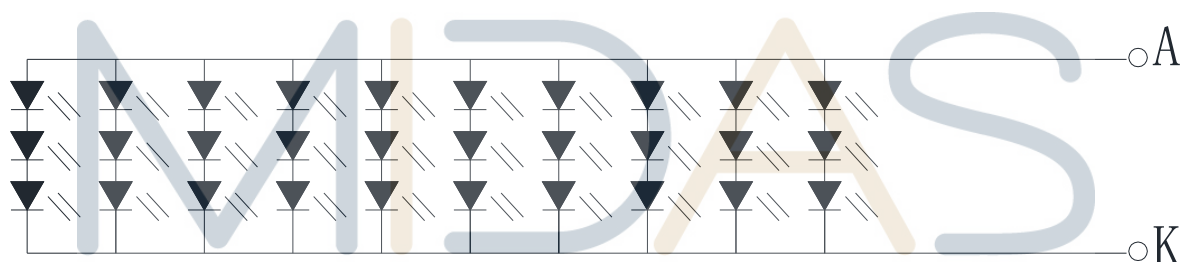
| Item               | Symbol | Values |      |      | Unit | Remark      |
|--------------------|--------|--------|------|------|------|-------------|
|                    |        | Min.   | Typ. | Max. |      |             |
| Current for Driver | IGH    | -      | 0.2  | 1.0  | mA   | VGH = 18.0V |
|                    | IGL    | -      | 0.2  | 1.0  | mA   | VGL = -6.0V |
|                    | IDVDD  | -      | 4.0  | 10   | mA   | DVDD = 3.3V |
|                    | IAVDD  | -      | 20   | 50   | mA   | AVDD = 9.6V |

### 7.3. Backlight Driving Conditions

| Item                      | Symbol | Values |        |      | Unit | Remark |
|---------------------------|--------|--------|--------|------|------|--------|
|                           |        | Min.   | Typ.   | Max. |      |        |
| Voltage for LED backlight | VL     | 8.4    | 9.8    | 10.8 | V    | Note 1 |
| Current for LED backlight | IL     | --     | 300    | --   | mA   |        |
| LED life time             | -      | -      | 50,000 | -    | Hr   | Note 2 |

Note 1: The LED Supply Voltage is defined by the number of LED at  $T_a=25^{\circ}\text{C}$  and  $I_L=300\text{mA}$ .

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at  $T_a=25^{\circ}\text{C}$  and  $I_L=300\text{mA}$ . The LED lifetime could be decreased if operating  $I_L$  is larger than 300mA.



Backlight 30LED Circuit

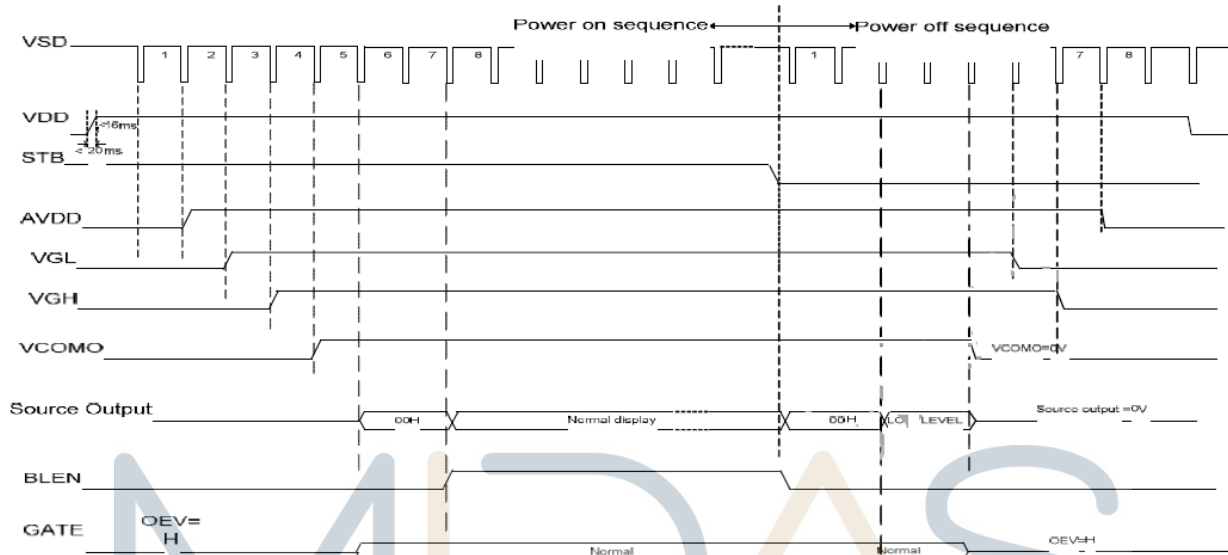
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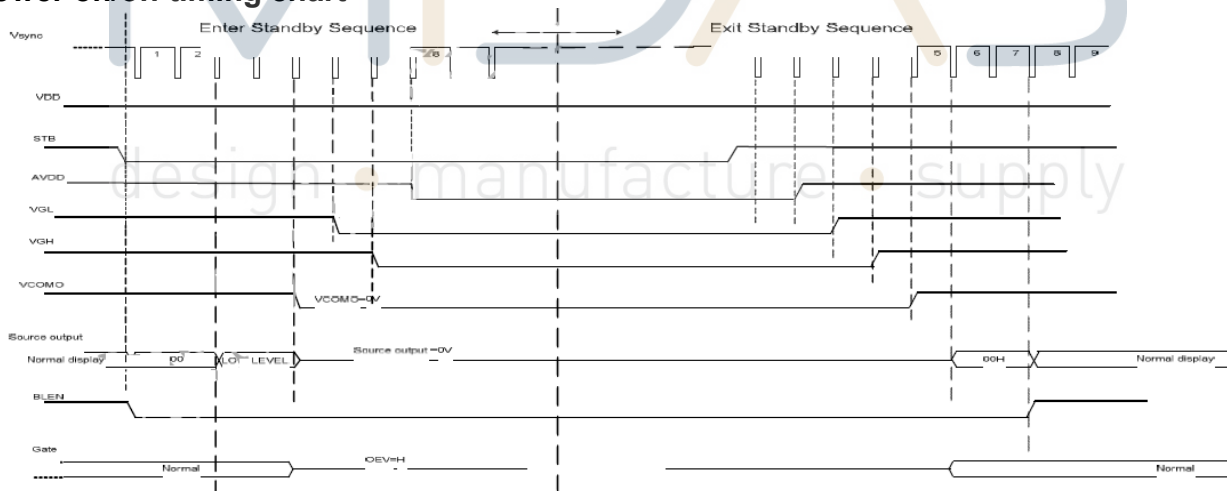
## 8.Operation Sequence

### 8.1. Power Sequence

In order to prevent IC from power on reset fail, the time (TPOR) of the digital power supply VDD should be maintained within the given specifications. Refer to “AC characteristics” for more detail on timing.



Power on/off timing chart



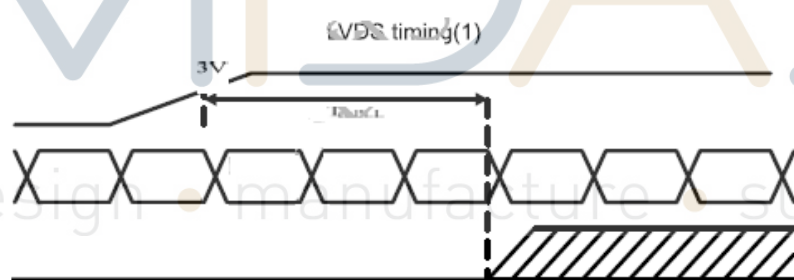
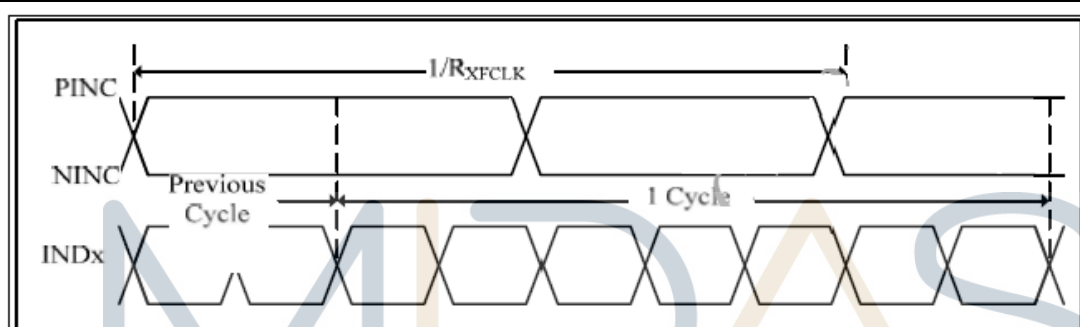
Enter and Exit standby Mode timing chart

Note : Low level=3Fh,when NBW=L (normally white)  
Low level=00h,when NBW=H (normally black)

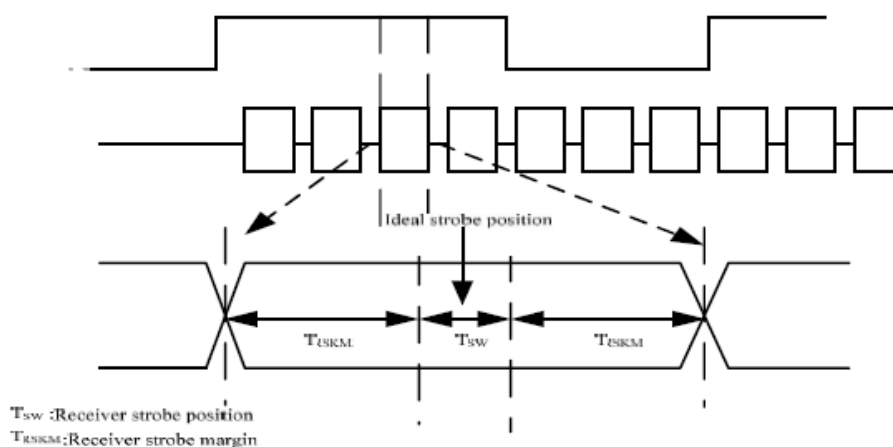
## 8.2. Timing Characteristics

### AC Electrical Characteristics

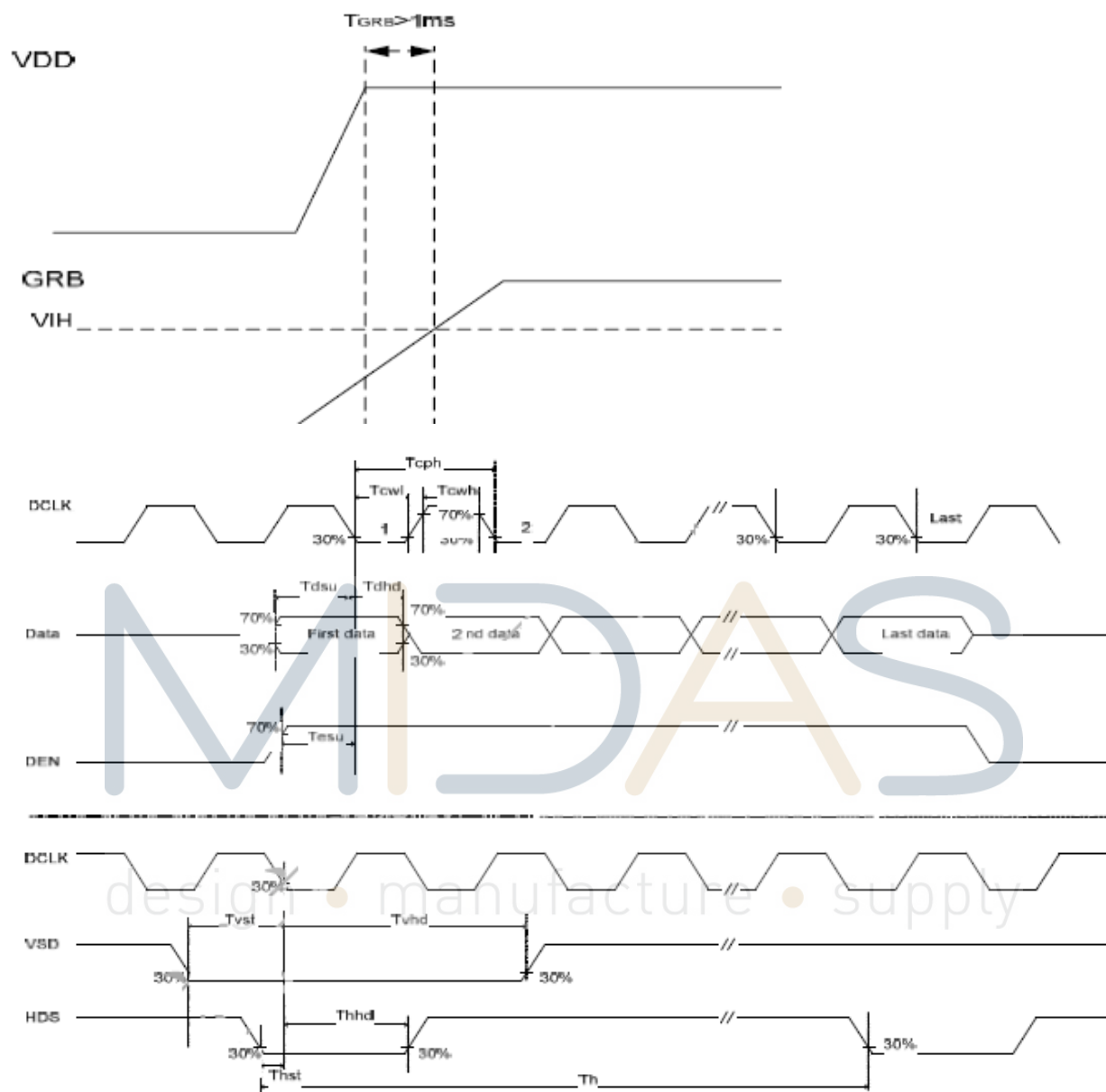
| Parameter              | Symbol | condition                                | Min. | Typ.             | Max. | Unit |
|------------------------|--------|------------------------------------------|------|------------------|------|------|
| Clock frequency        | RxFCLK |                                          | 20   | -                | 71   | MHz  |
| Input data skew margin | TRSKM  | VID =400mV<br>RxVCM=1.2V<br>RxFCLK=71MHz | 500  | -                | -    | ps   |
| Clock high time        | TLVCH  |                                          | -    | $4/(7 * RxFCLK)$ | -    | ns   |
| Clock low time         | TLVCL  |                                          | -    | $3/(7 * RxFCLK)$ | -    | ns   |
| PLL wake-up-time       | TenPLL |                                          |      |                  | 150  | us   |



LVDS timing(2)



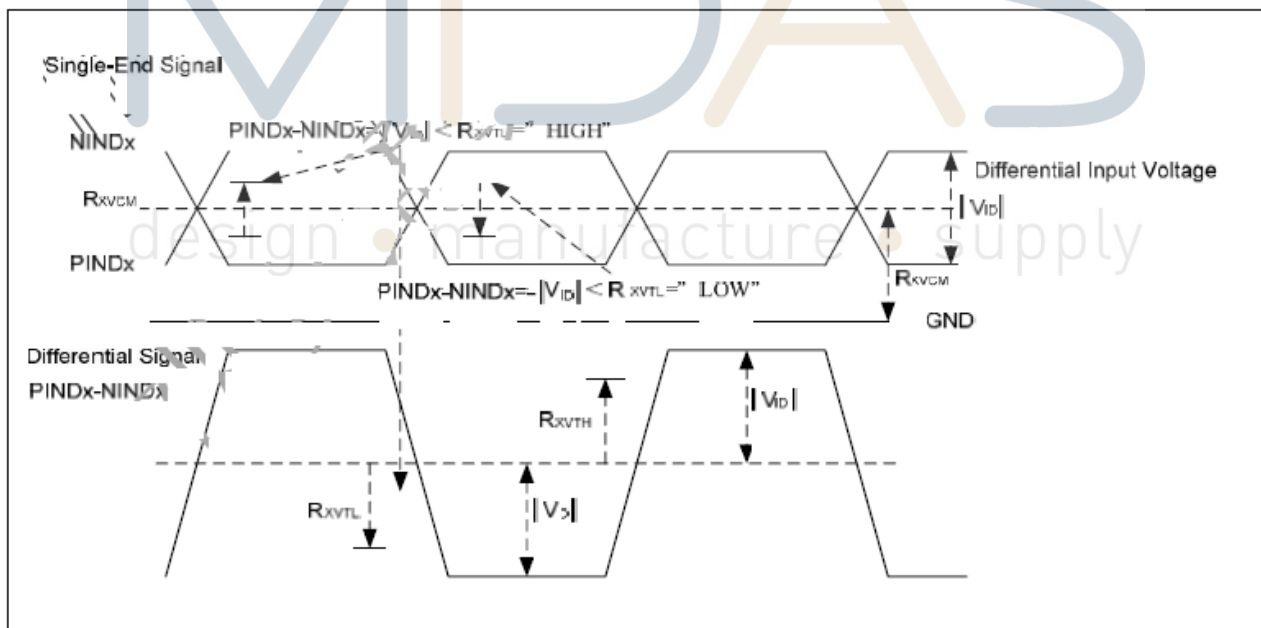
LVDS timing(3)



Parallel Input Clock and Data timing

### 8.3. LVDS DC Characteristics

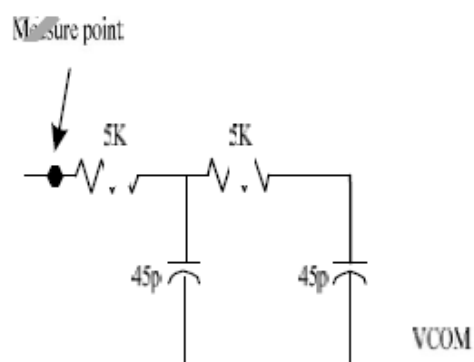
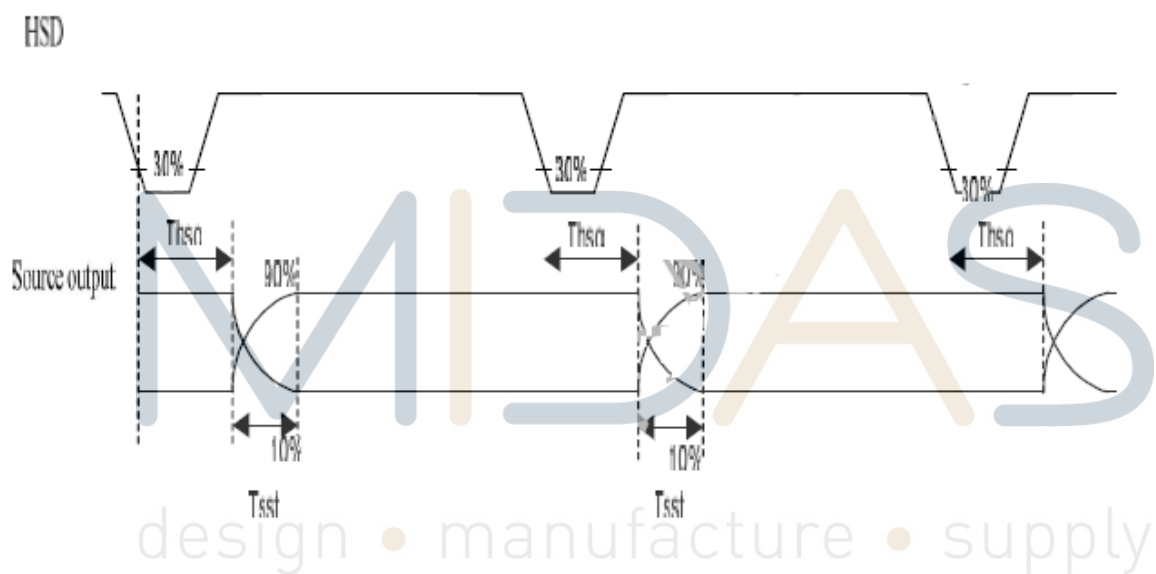
| Parameter                                 | Symbol  | Min.   | Typ.    | Max.        | Unit | Remark                    |
|-------------------------------------------|---------|--------|---------|-------------|------|---------------------------|
| Differential input high Threshold voltage | RxVTH   | -      | -       | +0.1        |      |                           |
| Differential input low Threshold voltage  | RxVTL   | -0.1   | -       | -           | V    |                           |
| Input voltage range (singled-end)         | RxVIN   | 0      | -       | 2.4         | V    |                           |
| Differential input common mode voltage    | RxVCM   | VID /2 | -       | 2.4- VID /2 | V    |                           |
| Differential input voltage                | VID     | 0.2    | -       | 0.6         | V    |                           |
| Differential input leakage current        | RVxliz  | -10    | -       | +10         | uA   |                           |
| LVDS Digital operating Current            | Iddlvds | -      | 40(TBD) | 50          | mA   | Fclk=65Mhz<br>VDD=3.3V    |
| LVDS Digital Standby Current              | Istlvds | --     | 10(TBD) | 50          | uA   | Clock & all Functions are |



LVDS DC Characteristics

## Output Timing table

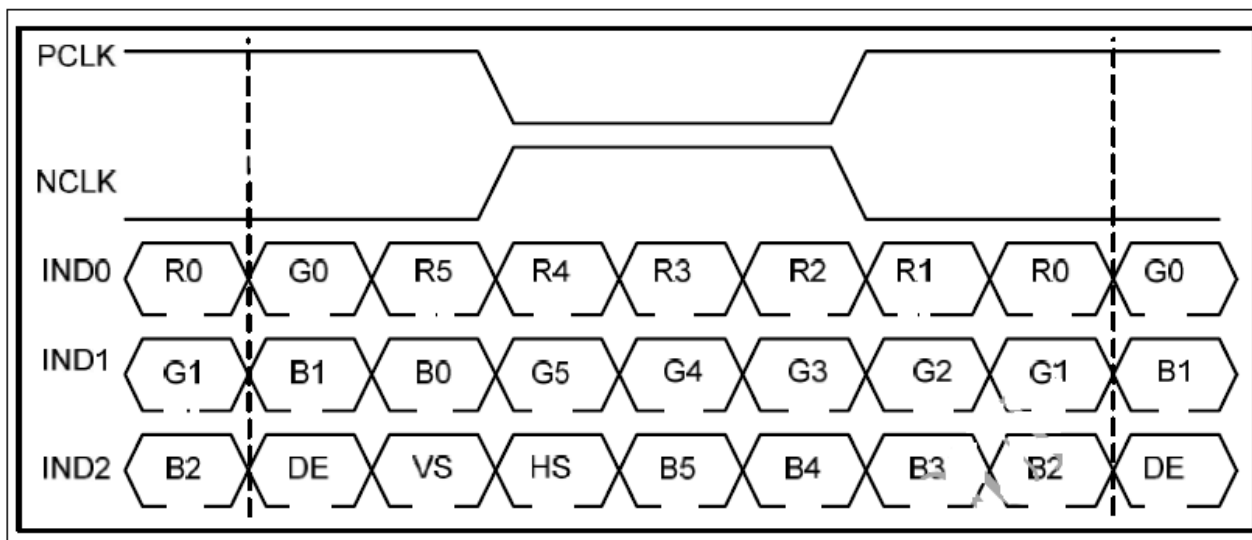
| Parameter                      | Symbol | Min. | Typ. | Max. | Unit | Condition     |
|--------------------------------|--------|------|------|------|------|---------------|
| DCLK frequency                 | Fclk   | -    | 65   | 71   | MHz  | VDD =2.3~3.6V |
| DCLK cycle time                | Tclk   | 14.1 | 15.4 |      | ns   |               |
| DCLK pulse duty                | Tcwh   | 40   | 50   | 60   | %    | Tclk          |
| Time from HSD to Source Output | Thso   | -    | 64   | -    | DCLK |               |
| Time from HSD to LD            | Thld   | -    | 64   | -    | DCLK |               |
| Time from HSD to STV           | Thstv  | -    | 2    | -    | DCLK |               |
| Time from HSD to CKV           | Thckv  | -    | 20   | -    | DCLK |               |
| Time from HSD to OEV           | Thoev  | -    | 4    | -    | DCLK |               |
| LD pulse width                 | Twld   | -    | 10   | -    | DCLK |               |
| CKV pulse width                | Twckv  | -    | 66   | -    | DCLK |               |
| OEV pulse width                | Twoev  | -    | 74   | -    | DCLK |               |



Source output timing (cascade)

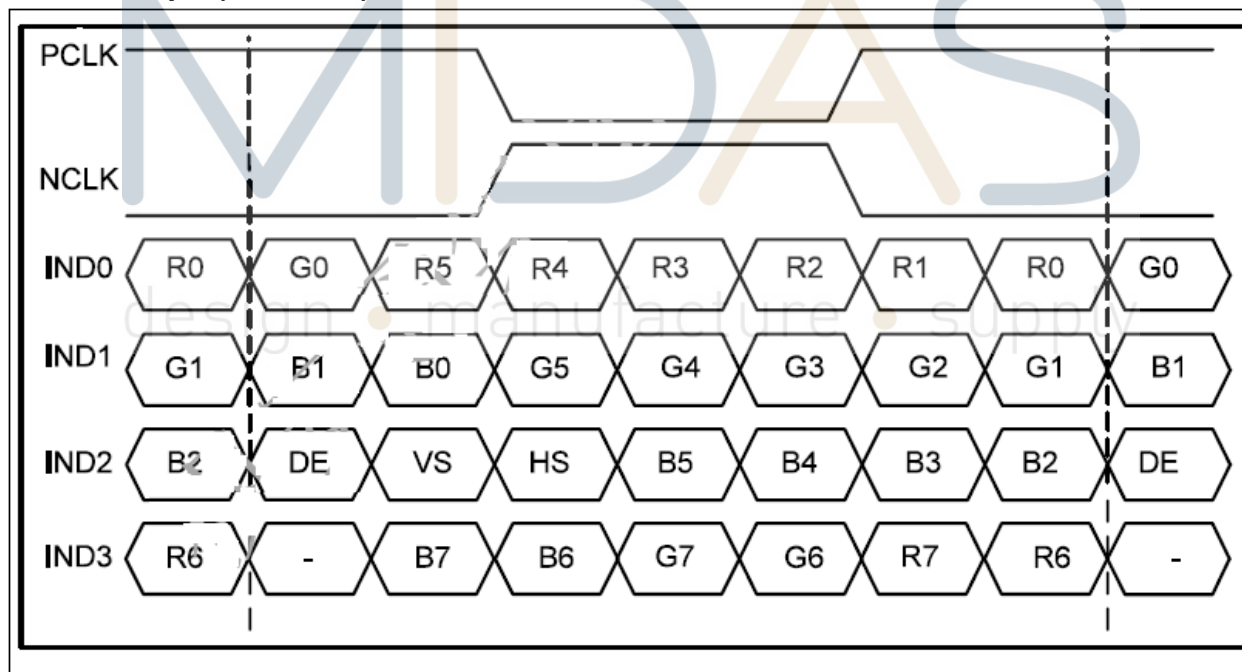
## Data Input Format

### 6bit LVDS input(HSD="H")



6-bit LVDS input timing chart

### 8bit LVDS input(HSD="L")



8-bit LVDS input timing chart

## 9.Optical Characteristics

| Item                                              | Symbol | Condition.                        | Min  | Typ. | Max. | Unit              | Remark            |
|---------------------------------------------------|--------|-----------------------------------|------|------|------|-------------------|-------------------|
| Response time                                     | $T_r$  | $\theta=0^\circ$ 、 $\phi=0^\circ$ | -    | 25   | 40   | .ms               | Note 3            |
|                                                   | $T_f$  |                                   |      |      |      |                   |                   |
| Contrast ratio                                    | CR     | At optimized viewing angle        | 600  | 800  | -    | -                 | Note 4            |
| Color Chromaticity                                | White  | $\theta=0^\circ$ 、 $\phi=0^\circ$ | 0.26 | 0.31 | 0.36 | -                 | Note 2,5,6        |
|                                                   |        |                                   | 0.28 | 0.33 | 0.38 | -                 |                   |
| Viewing angle<br>(Gray Scale Inversion Direction) | Hor.   | $\Theta_R$                        | 70   | 80   | -    | Deg.              | Note 1            |
|                                                   |        | $\Theta_L$                        | 70   | 80   | -    |                   |                   |
|                                                   | Ver.   | $\Phi_T$                          | 50   | 60   | -    |                   |                   |
|                                                   |        | $\Phi_B$                          | 60   | 70   | -    |                   |                   |
| Brightness                                        | -      | -                                 | 500  | 600  | -    | cd/m <sup>2</sup> | Center of display |

Ta=25±2℃,

Note 1: Definition of viewing angle range

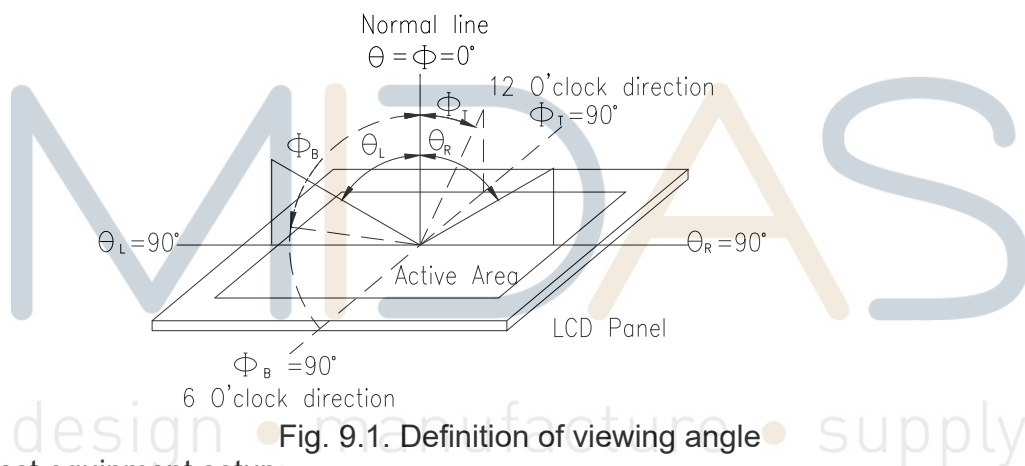


Fig. 9.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

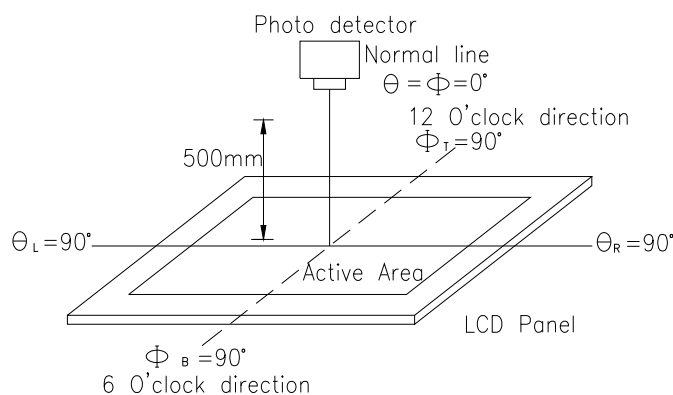
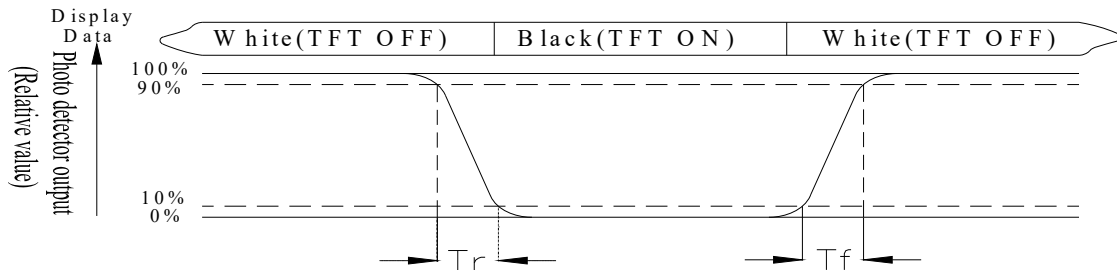


Fig. 9.2. Optical measurement system setup

**Note 3: Definition of Response time:**

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time,  $T_r$ , is the time between photo detector output intensity changed from 90% to 10%. And fall time,  $T_f$ , is the time between photo detector output intensity changed from 10% to 90%.



**Note 4: Definition of contrast ratio:**

The contrast ratio is defined as the following expression.

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

**Note 5: White  $V_i = V_{i50} \pm 1.5V$**

**Black  $V_i = V_{i50} \pm 2.0V$**

“ $\pm$ ” means that the analog input signal swings in phase with VCOM signal.

“ $\pm$ ” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

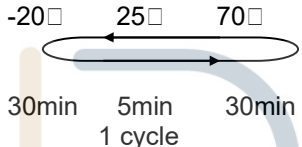
**Note 6: Definition of color chromaticity (CIE 1931)**

Color coordinates measured at the center point of LCD

**Note 7:** Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

## 10. Reliability

Content of Reliability Test (Wide temperature, -20℃~70℃)

| Environmental Test                   |                                                                                                                                                                                                                                                                        |                                                                                                                                                                   |      |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Test Item                            | Content of Test                                                                                                                                                                                                                                                        | Test Condition                                                                                                                                                    | Note |
| High Temperature storage             | Endurance test applying the high storage temperature for a long time.                                                                                                                                                                                                  | 80℃<br>200hrs                                                                                                                                                     | 2    |
| Low Temperature storage              | Endurance test applying the low storage temperature for a long time.                                                                                                                                                                                                   | -30℃<br>200hrs                                                                                                                                                    | 1,2  |
| High Temperature Operation           | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.                                                                                                                                                 | 70℃<br>200hrs                                                                                                                                                     | —    |
| Low Temperature Operation            | Endurance test applying the electric stress under low temperature for a long time.                                                                                                                                                                                     | -20℃<br>200hrs                                                                                                                                                    | 1    |
| High Temperature/ Humidity Operation | The module should be allowed to stand at 60℃,90%RH max                                                                                                                                                                                                                 | 60℃,90%RH<br>96hrs                                                                                                                                                | 1,2  |
| Thermal shock resistance             | <p>The sample should be allowed stand the following 10 cycles of operation</p>  <p style="text-align: center;">-20℃      25℃      70℃<br/>30min      5min      30min<br/>1 cycle</p> | -20℃/70℃<br>10 cycles                                                                                                                                             | —    |
| Vibration test                       | Endurance test applying the vibration during transportation and using.                                                                                                                                                                                                 | <p>Total fixed amplitude : 3<br/>15mm<br/>Vibration Frequency :<br/>10~55Hz<br/>One cycle 60<br/>seconds to 3<br/>directions of X,Y,Z for<br/>Each 15 minutes</p> | 3    |
| Static electricity test              | Endurance test applying the electric stress to the terminal.                                                                                                                                                                                                           | <p>VS=±600V(contact)<br/>,±800v(air),<br/>RS=330Ω<br/>CS=150pF<br/>10 times</p>                                                                                   | —    |

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.