# Microtips

# T E C H N O L O G Y

Model No: WT ÙPË Í JÎ T ÖËI VÁ ÙÒXÖD

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# Revision record

| Document Revision | Model No. Version No. | Description | Revision by |
|---|---|---|---|
| 0 | UMSH-8596MD-T (UFSH-K106EY-FT) Version No. 0 | 7.0" TFT.( backlight luminance 300cd/㎡) | Y.D. Shie Zi Xin Ou 25-May-2011 |
| 1 | UMSH-8596MD-1T (UFSH-K106EY-FT) Version No. 0 | Modify the backlight luminance from 300cd/㎡ to 500cd/㎡. | Y.D. Shie Danny Jhuang 11-Aug-2014 |
| 2 | UMSH-8596MD-34T Version No. 0 | 1.Add the touch panel IC to ST1633i. 2.Modify the module number from UMSH-8596MD-1T to UMSH-8596MD-34T. | H.F. Kuo Zi Xin Ou 30-Apr-2015 |
| 3 | UMSH-8596MD-34T(REVD) Version No. 0 | 1. Change the TFT panel and backlight. 2. Modify the module number from UMSH-8596MD-34T to UMSH-8596MD-34T(REVD). | H.F. Kuo Zi Xin Ou 11-Dec-2015 |
| | | | |

# CONTENTS:

## 1. BASIC SPECIFICATION

### 1.1 Mechanical specifications

| Items | Nominal Dimension | Unit |
|---|---|---|
| Active screen size | 7.0" Diagonal | - |
| Dot Matrix | 800 x RGB x 480 | Pixel |
| Module Size (W x H x T) | 165.0 x 106.4 x 8.2 | mm. |
| Active Area (W x H) | 152.4 x 91.44 | mm. |
| Pixel Size ( W×H ) | 0.1905 x 0.1905 | mm. |
| Color depth | 262K | color |
| Interface | Parallel 18-bit RGB | - |
| Driving IC Package | COG | - |
| Module weight | 195±10% | g |

### 1.2 Display specification

| Display | Descriptions | Note |
|---|---|---|
| LCD Type | a-Si TFT | - |
| LCD Mode | TN / Normal white | - |
| Polarizer Mode | Transmissive | - |
| Polarizer Surface | Normal | - |
| Pixel arrangement | RGB-stripe | - |
| Backlight Type | LED | - |
| Viewing Direction(Gray inversion) | 6 O'clock Direction | 1 |

Color tone is slightly changed by temperature and driving voltage.

Note 1 : The viewing direction defined in this specification is according to the rubbing direction of
its TFT surface treatment by the TFT glass manufacturer. The grayscale inversion is at this
direction as well. However, the optimal viewing direction for human view is normally where
the color does NOT change to grayscale inversion, and this would be the opposite site of
the specified viewing direction in this specification. In any case we advise customers to
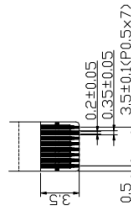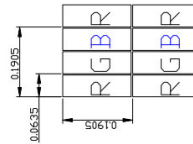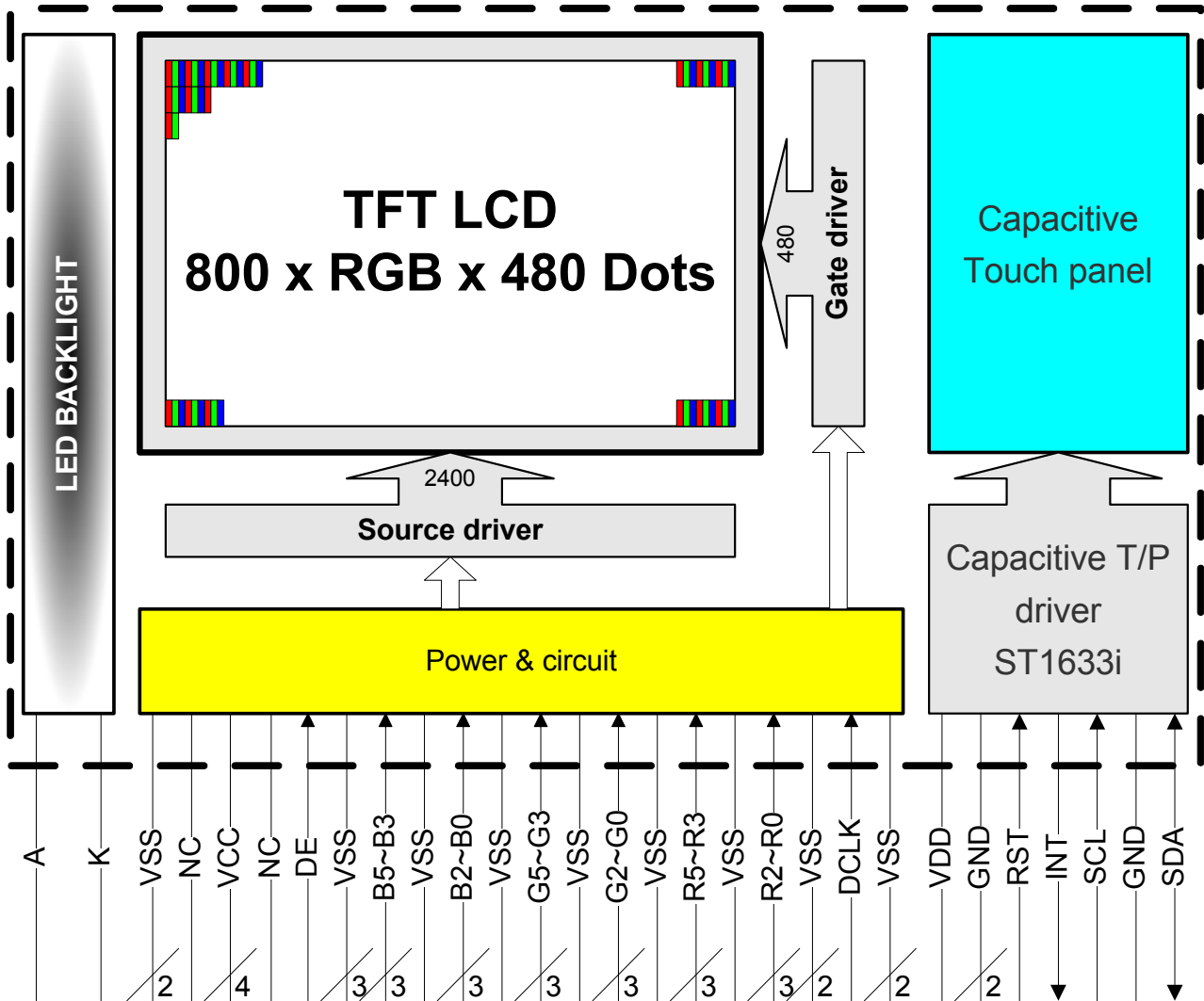judge by themselves, and be aware of this phenomenon.

# 1.3 Outline dimension



DETAIL A

0.2±0.05
0.35±0.05
3.5±0.1(P0.5×7)
3.5
0.5

CN2
A(RED)
K(WHITE)
CN1

1(VSS)
2(VSS)
3(NC)
38(DCLK)
39(VSS)
40(VSS)

FFC

COMPONENT AREA

BLACK TAPE T=0.0254mm

(104.0)
(67.4)

1.0MIN (UNBENING AREA)
12.5±0.5
5.0±0.5
2-R0.3

**Touch panel**

| PIN No. | PIN Name |
|---------|----------|
| 1 | VDD |
| 2 | GND |
| 3 | GND |
| 4 | RST |
| 5 | INT |
| 6 | SCL |
| 7 | GND |
| 8 | SDA |

DOTS DETAIL

R G B R
R G B R
0.1905
0.0635
0.1905

8.2(MAX)
5.5(LCM)
STIFFENER (t=1.2mm)
STIFFENER
CONDUCTOR
0.3±0.05
1.1
7.16(T/P+LCM)
1.5(T/P)

106.4(LCM O.D.)
105.3(T/P O.D.)
94.46(T/P V.A)
94.3(Bezel Window)
92.44±0.5(T/P A/A)
91.44(LCM A.A)
49.5±0.5
1.1±0.5
2.3±0.5
2.3±0.5
3.3±0.5
3.78±0.5

36.9±0.5
27.05.0MAX
14.55MIN
1.19±0.5
4.5
20.6
5.54
1.5MIN(UNBENING AREA)

A
8
1

165.0(LCM O.D.)
164.7(T/P O.D.)
156.2(T/P V.A)
155.3(Bezel Window)
154.0±0.5(T/P A/A)
152.4(LCM AA)
84.2±0.5

+0.5
0.3−0.3
2.82±0.5
3.15±0.5
3.75±0.5
4.6±0.5

100.0±5.0

VIEWING DIRECTION
800×RGB×480 DOTS

(0,479)    (799,0)
0,0

NOTE :
1. LCD : TFT TRANSMISSIVE TYPE , NORMAL WHITE
2. VIEWING DIRECTION : 6 O'CLOCK(GARYSCALE INVERSION)
3. TOP : -20~70°C , Tst : -30~80°C
4. LED COLOR : WHITE , 27 PCS DICE
   CONSTANT CURRENT : 210mA ; Vled=9.9V(TYP)
5. GENERAL TOLERANCE:±0.3
6. CN1:BHSR-02VS-1(JST) OR EQUIVALENT
7. CN2:IMSA-9681S-40Y901(IRISO) OR EQUIVALENT
8. PROJECTIVE CAPACITIVE TYPE TOUCH PANNEL
9. THE MINIMUM BENDABLE RADIUS(INNER) OF THE FPC IS 1.0 mm
10. T/P INTERFACE: I2C; IC : ST1633; FIVE POINT TOUCH
    THE METAL FRAME OF LCM DO NOT NEED COMMON-GROUNDED
11. COMPONENT AREA CAN NOT BENDING.

## 1.4 Block diagram:

## 1.5 Interface Pin Connection:

| Pin No. | Pin Symbol | I/O | Description |
|---|---|---|---|
| 1~2 | VSS | P | GND |
| 3 | NC | - | No connection |
| 4~7 | VCC | P | Power supply for Module (+3.3V) |
| 8 | NC | - | No connection |
| 9 | DE | I | Data enable |
| 10~12 | VSS | P | GND |
| 13~15 | B5~B3 | I | Blue data input |
| 16 | VSS | P | GND |
| 17~19 | B2~B0 | I | Blue data input |
| 20 | VSS | P | GND |
| 21~23 | G5~G3 | I | Green data input |
| 24 | VSS | P | GND |
| 25~27 | G2~G0 | I | Green data input |
| 28 | VSS | P | GND |
| 29~31 | R5~R3 | I | Red data input |
| 32 | VSS | P | GND |
| 33~35 | R2~R0 | I | Red data input |
| 36~37 | VSS | P | GND |
| 38 | DCLK | I | Dot clock |
| 39~40 | VSS | P | GND |

B/L interface pin：

| Pin No. | Pin Symbol | I/O | Description |
|---|---|---|---|
| 1 | A | P | Power supply for LED+ |
| 2 | K | P | Power supply for LED- |

Capacitive touch panel (I2C) Interface:

| Pin No. | Pin Symbol | I/O | Description |
|---|---|---|---|
| 1 | VDD | P | Power supply. (+3.3V) |
| 2~3 | GND | P | Ground. |
| 4 | RST | I | System reset signal input, active low. Note (1) |
| 5 | INT | O | Active low when data output from touch panel. |
| 6 | SCL | I | Serial Clock. |
| 7 | GND | P | Ground. |
| 8 | SDA | I/O | Serial data access. |

Note(1): Power On/Off Sequence.
Reset pin should be held low before power on and power off. During power on, after VDD reach normal voltage, Reset pin needs to be held low for 5ms to ensure internal block stable.



Figure - Power On/Off Sequence

Note(2): SDA / SCL pins must connect to 4.7Kohm(Pull-up resistor) at host

## 2. ELECTRICAL CHARACTERISTICS

### 2.1 Absolute Maximum Ratings

| Items | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| Power supply voltage | VCC | -0.3 | 7.0 | V |
| | VDD | -0.3 | 6.0 | V |
| Input voltage | Vin | -0.3 | VCC+0.3 | V |
| Operate temperature range | Top | -20 | 70 | ℃ |
| Storage temperature range | Tst | -30 | 80 | ℃ |

## 2.2 DC Characteristics

$T_a = 25°C$

| Items | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Supply voltage | VCC | - | 3.3 | - | V | - |
| | VDD | - | 3.3 | - | V | - |
| Input Voltage (LCM) | $V_{IL}$ | 0 | - | 0.3VCC | V | L level |
| | $V_{IH}$ | 0.7VCC | - | VCC | V | H level |
| Input Voltage (CTP) | $V_{IL}$ | - | - | 0.15VDD | V | L level |
| | $V_{IH}$ | 0.85VDD | - | - | V | H level |
| Current consumption | $I_{VCC}$ | - | 160 | 250 | mA | Note 1 |
| | $I_{VDD}$ | - | 14 | 28 | mA | - |

*Note1 :

Measuring Condition:

Standard Value MAX.

$T_a = 25°C$

VCC -GND = 3.3V

Display Pattern



0 gray black pattern

## 2.3 Back-light only Specification :

| PARAMETER | SYMBOL | MIN | TYP | MAX | Unit | Test Condition | NOTE |
|---|---|---|---|---|---|---|---|
| Supply Current | If | - | 210 | - | mA | Ta=25℃ | - |
| Supply Voltage | Vf | - | 9.9 | - | V | Ta=25℃ | - |
| Half-Life Time | Lf | - | 50000 | - | hrs | Ta=25℃ | 1 |

Note 1 : The " Half-Life Time" is defined as the LED chip brightness decreases to 50% than original brightness, Based on Ta 25±2℃,60±10% RH condition.

Note 2 : LED backlight is 27 LEDs.

27PCS LED
CONSTANT CURRENT 210mA
VLED = 9.9V (TYP)

A                                        K
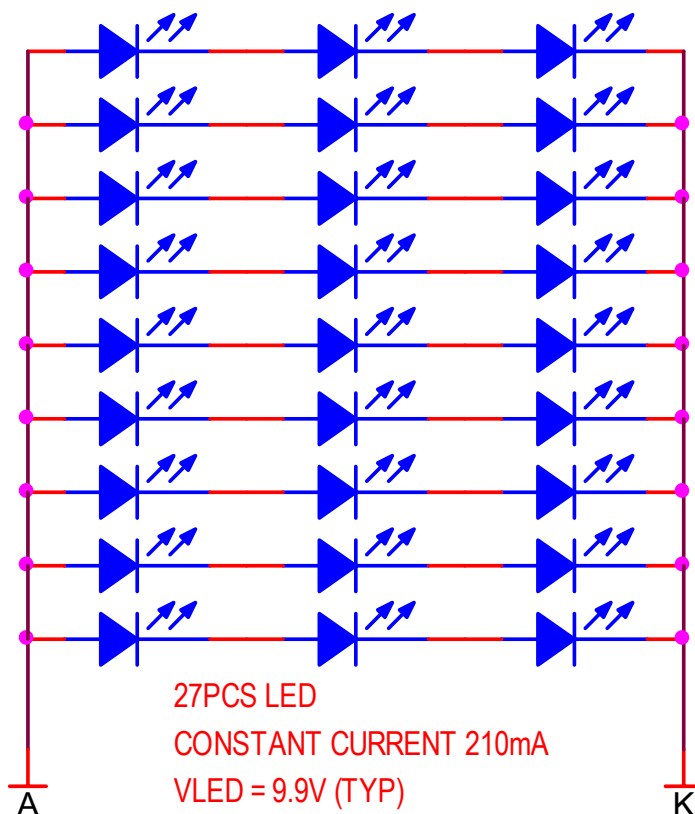
## 2.4 AC Characteristics

Switching characteristics

| PARAMETER | Symbol | Spec. | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Data setup time | $T_{dsu}$ | 6 | - | - | ns |
| Data hold time | $T_{dhd}$ | 6 | - | - | ns |
| DE setup time | $T_{esu}$ | 6 | - | - | ns |
| Source output settling time | $T_{ST}$ | - | - | 15 | µs |
| Source output loading R | $R_{SL}$ | - | 2 | - | K ohm |
| Source output loading C | $C_{SL}$ | - | 60 | - | pF |

Parallel RGB Input Timing Requirement

## DE mode

| PARAMETER | Symbol | Spec. | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| CLK frequency | $F_{CPH}$ | - | 33.26 | - | MHz |
| CLK period | $T_{CPH}$ | - | 30.06 | - | ns |
| CLK pulse duty | $T_{CWH}$ | 40 | 50 | 60 | % |
| DE period | $T_{DEH}+T_{DEL}$ | 1000 | 1056 | 1200 | $T_{CPH}$ |
| DE pulse width | $T_{DEH}$ | - | 800 | - | $T_{CPH}$ |
| DE frame blanking | $T_{DEB}$ | 10 | 45 | 110 | $T_{DEH}+T_{DEL}$ |
| DE frame width | $T_{DE}$ | - | 480 | - | $T_{DEH}+T_{DEL}$ |

| PARAMETER | Symbol | Spec. | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| OEV pulse width | $T_{OEV}$ | - | 150 | - | $T_{CPH}$ |
| CKV pulse width | $T_{CKV}$ | - | 133 | - | $T_{CPH}$ |
| DE(internal)-STV time | $T_1$ | - | 4 | - | $T_{CPH}$ |
| DE(internal)-CKV time | $T_2$ | - | 40 | - | $T_{CPH}$ |
| DE(internal)-OEV time | $T_3$ | - | 23 | - | $T_{CPH}$ |
| DE(internal)-POL time | $T_4$ | - | 157 | - | $T_{CPH}$ |
| STV pulse width | - | - | 1 | - | $T_H$ |

(i). $T_{HS}+T_{HA}<T_H$

## Timing Controller Timing Chart
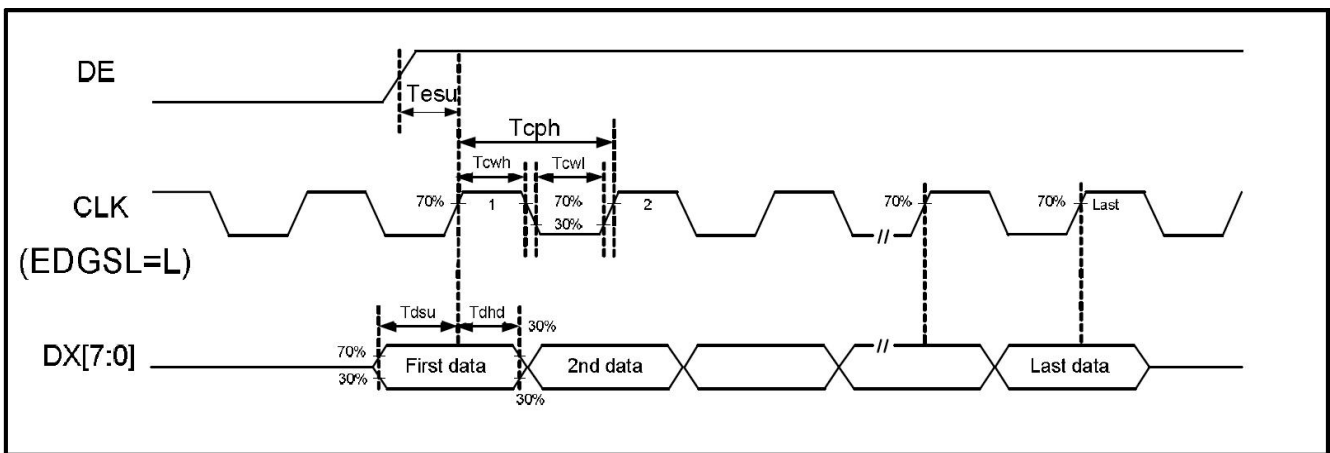


Clock and Data input waveforms
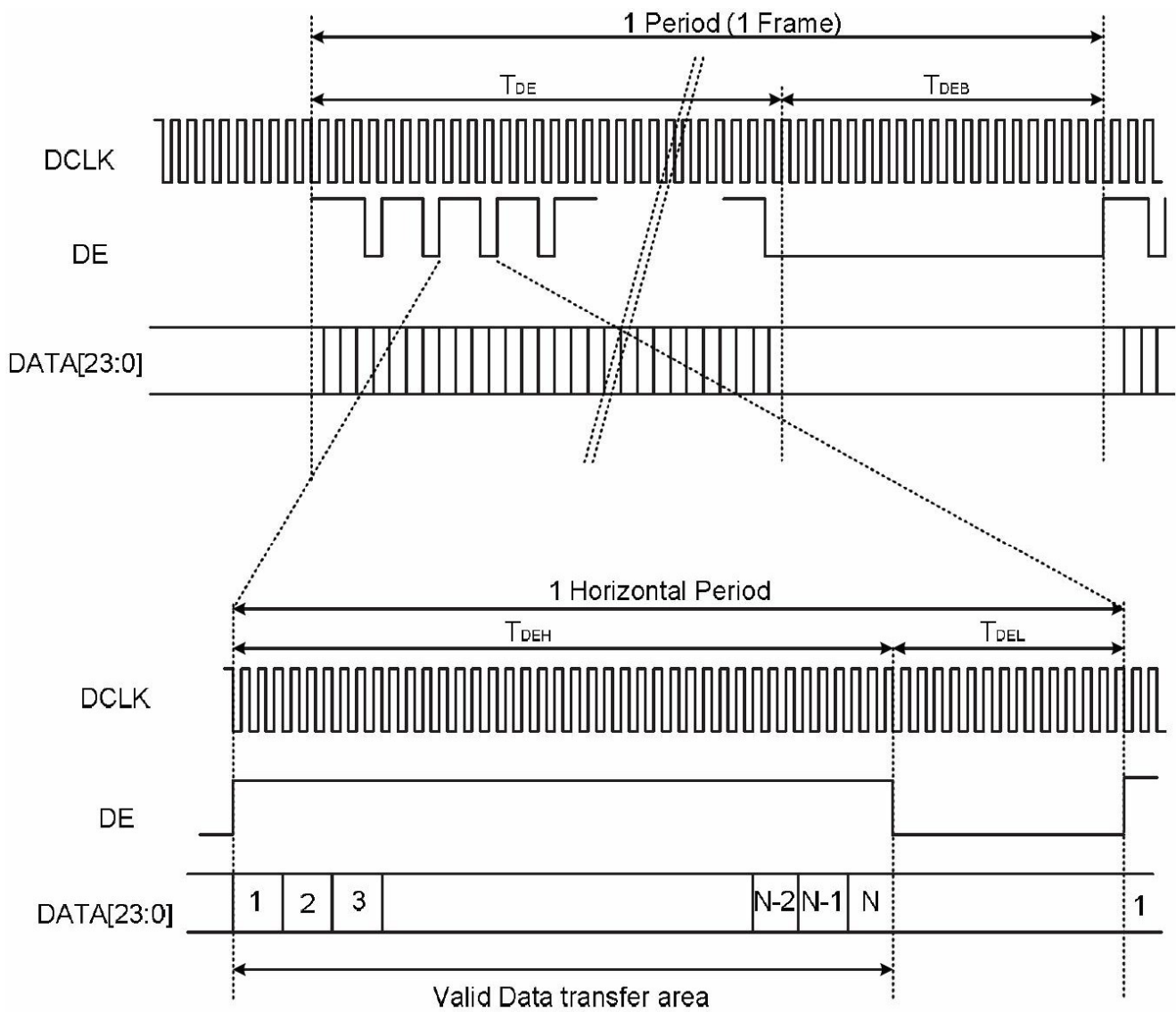


**DE Mode Data Format**

## 2-5 Capacitive touch panel controller AC Characteristics

**AC Electrical Characteristics**
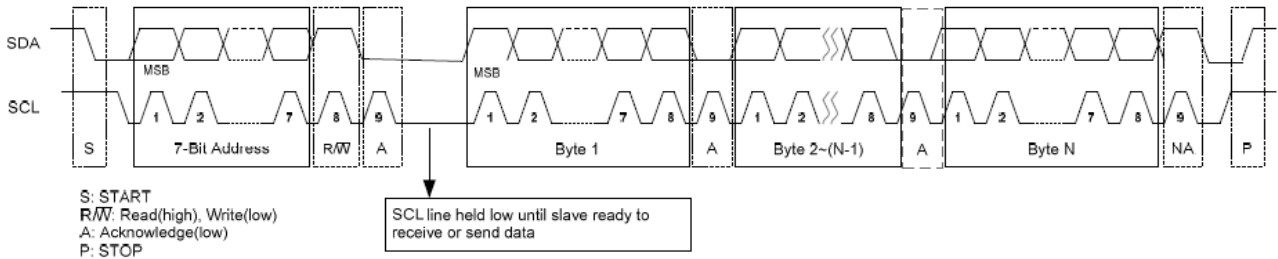


I2C Fast Mode Timing
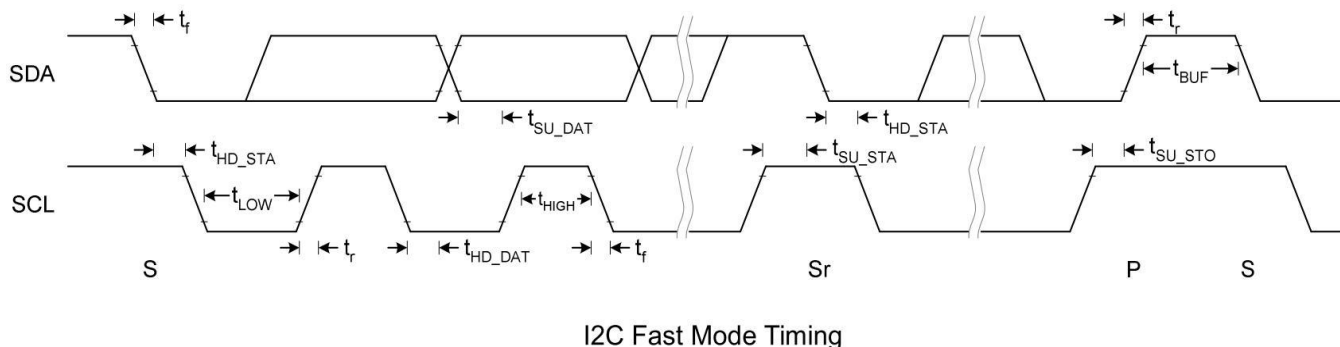
I2C Fast Mode Timing Characteristic

Conditions: VDD = IOVDD = 3.3V, GND = 0V, $T_A$ = 25°C

| Symbol | Parameter | Rating | | | Unit |
|--------|-----------|--------|--------|--------|------|
| | | Min. | Typ. | Max. | |
| $f_{SCL}$ | SCL clock frequency | 0 | - | 400 | kHz |
| $t_{LOW}$ | Low period of the SCL clock | 1.3 | - | - | us |
| $t_{HIGH}$ | High period of the SCL clock | 0.6 | - | - | us |
| $t_f$ | Signal falling time | - | - | 300 | ns |
| $t_r$ | Signal rising time | - | - | 300 | ns |
| $t_{SU\_STA}$ | Set up time for a repeated START condition | 0.6 | - | - | us |
| $t_{HD\_STA}$ | Hold time (repeated) START condition. After this period, the first clock pulse is generated | 0.6 | - | - | us |
| $t_{SU\_DAT}$ | Data set up time | 100 | - | - | ns |
| $t_{HD\_DAT}$ | Data hold time | 0 | - | 0.9 | us |
| $t_{SU\_STO}$ | Set up time for STOP condition | 0.6 | - | - | us |
| $t_{BUF}$ | Bus free time between a STOP and START condition | 1.3 | - | - | us |
| $C_b$ | Capacitive load for each bus line | - | - | 400 | pF |

## 2-6 I2C Host Interface Protocol

### 2.6.1 I2C Slave Interface
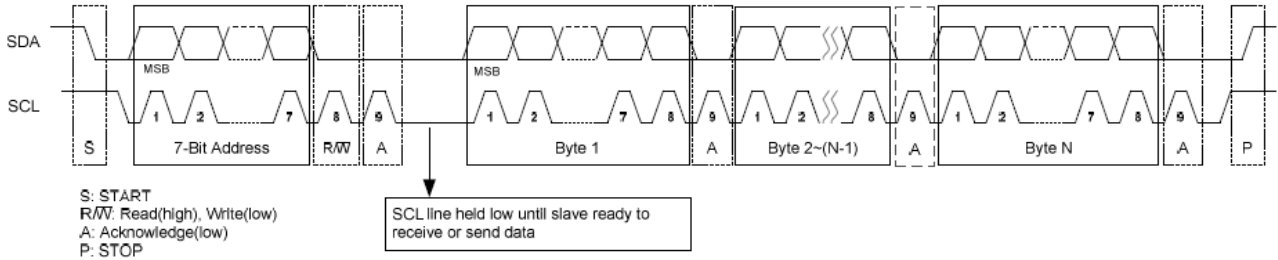


Note : I2C address is default to 0x55 (7-bits address)

### 2.6.2 Register Read

For reading register value from I2C device, host has to tell I2C device the *Start Register Address* before reading corresponding register value.

| I2C Start | I2C Header (W) | Start Reg. Addr. (a) | I2C Stop | I2C Start | I2C Header (R) | Value of Reg(a) | Value of Reg(a+1) | … | Value of Reg(a+n) | I2C Stop |
|---|---|---|---|---|---|---|---|---|---|---|
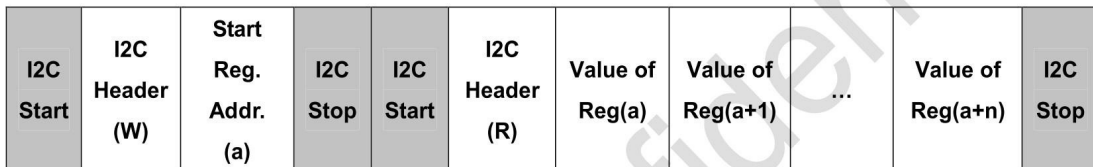
**Figure 1 - Register Read Format.**

Sitronix Touch IC I2C host interface protocol supports *Repeated Register Read*. That is, once the *Start Register Address* has been set by host, consequent I2C Read(R) transactions will directly read register values starting from the *Start Register Address* without setting address first, as shown in Figure 2.

| I2C Start | I2C Header (R) | Value of Reg(a) | Value of Reg(a+1) | … | Value of Reg(a+n) | I2C Stop | I2C Start | I2C Header (R) | Value of Reg(a) | Value of Reg(a+1) | … | Value of Reg(a+n) | I2C Stop |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**Figure 2 - Repeated Register Read.**

**Header Value(R) : 0xab**

## 2.6.3 Register Write

For writing register to I2C device, host has to tell I2C device the Start Register Address in each I2C Register Write transaction. Register values to the I2C device will be written to the address starting from the Start Register Address described in Register Write I2C transaction as shown in Figure 3.

| I2C Start | I2C Header (W) | Start Reg. Addr. (a) | Value to Reg(a) | Value to Reg(a+1) | … | Value to Reg(a+n) | I2C Stop |
|---|---|---|---|---|---|---|---|

**Figure 3 - Register Write Format.**

**Header Value(W) : 0xaa**

## 2.6.4  I2C Electrical Waveform
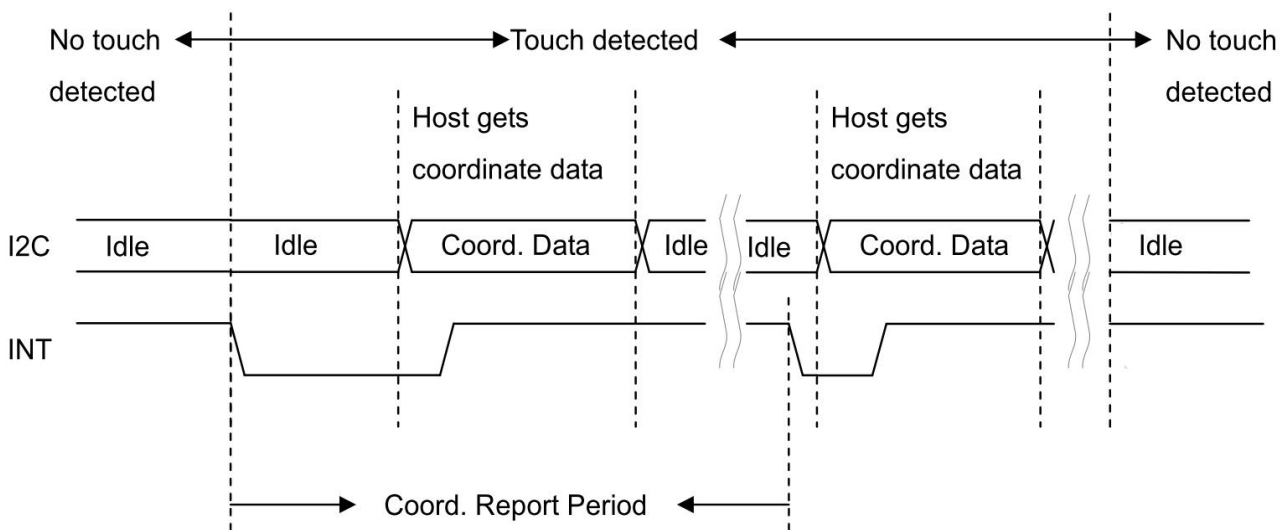
## 2.6.5 Registers

Sitronix Touch IC provides a register set for host to configure device attributes and retrieve information about Device Control , XY Coordinates through device host interface. Host interface registers are listed below.

| Reg Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Host Interface Registers ( Report Page ) | | | | |
| 0x00 | ---- | Reserved | | | | | | | |
| 0x01 | ---- | | | | | | | | |
| 0x02 | Device Control Reg | Reserved | | | | Reserved | Reserved | Power Down (R/W) | Reset (R/W) |
| 0x03 | Timeout to Idle Register | Timeout to Idle ( Sec ) (R/W) | | | | | | | |
| 0x04 ~ 0x11 | ------ | Reserved | | | | | | | |
| 0x12 | XY0 Coord ( High Byte ) | Valid 0 ( RO) | X0_H(RO) | | | Reserved | Y0_H (RO) | | |
| 0x13 | X0 Coord ( Low Byte ) | X0_L(RO) | | | | | | | |
| 0x14 | Y0 Coord ( Low Byte ) | Y0_L(RO) | | | | | | | |
| 0x15 | | Reserved | | | | | | | |
| 0x16 | XY1 Coord ( High Byte ) | Valid 1 ( RO) | X1_H(RO) | | | Reserved | Y1_H (RO) | | |
| 0x17 | X1 Coord ( Low Byte ) | X1_L(RO) | | | | | | | |
| 0x18 | Y1 Coord ( Low Byte ) | Y1_L(RO) | | | | | | | |
| 0x19 | | Reserved | | | | | | | |
| 0x1A | XY2 Coord ( High Byte ) | Valid 2 ( RO) | X2_H(RO) | | | Reserved | Y2_H (RO) | | |
| 0x1B | X2 Coord ( Low Byte ) | X2_L(RO) | | | | | | | |
| 0x1C | Y2 Coord ( Low Byte ) | Y2_L(RO) | | | | | | | |
| 0x1D | | Reserved | | | | | | | |
| 0x1E | XY3 Coord ( High Byte ) | Valid 3 ( RO) | X3_H(RO) | | | Reserved | Y3_H (RO) | | |
| 0x1F | X3 Coord ( Low Byte ) | X3_L(RO) | | | | | | | |
| 0x20 | Y3 Coord ( Low Byte ) | Y3_L(RO) | | | | | | | |
| 0x21 | | Reserved | | | | | | | |
| 0x22 | XY4 Coord ( High Byte ) | Valid 4 ( RO) | X4_H(RO) | | | Reserved | Y4_H (RO) | | |
| 0x23 | X4 Coord ( Low Byte ) | X4_L(RO) | | | | | | | |
| 0x24 | Y4 Coord ( Low Byte ) | Y4_L(RO) | | | | | | | |

## 2.6.6 Device Control Register

| Reg Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|
| 0x02 | Device Control Reg | Reserved | | | | Reserved | Reserved | Power Down (R/W) | Reset (R/W) |

Device Control Register provides device control bits for host to reset the device , power down the device.

## 2.6.7 Timeout to Idle Register

| Reg Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|
| 0x03 | Timeout to Idle Register | Timeout to Idle ( Sec ) (R/W) | | | | | | | |

Timeout to Idle Register provides timeout control to entering Idle Mode for host.

The touch controller will enter Idle Mode after the number of seconds specified in Timeout to Idle Register if there is no touch detected in this period.

Set the field to 0xFF will disable Idle Mode. Set the field to 0 will entering Idle Mode immediately.

The default value of Timeout to Idle Register is set to 0x08 for 8 seconds to Idle Mode.

## 2.6.8 XY Coordinate Registers

| 0x12 | XY0 Coord ( High Byte ) | Valid 0 ( RO) | X0_H(RO) | | Reserved | Y0_H (RO) | |
|---|---|---|---|---|---|---|---|
| 0x13 | X0 Coord ( Low Byte ) | X0_L(RO) | | | | | |
| 0x14 | Y0 Coord ( Low Byte ) | Y0_L(RO) | | | | | |
| 0x15 | | Reserved | | | | | |
| 0x16 ~ 0x21 | ... | ... | | | | | |
| 0x22 | XY4 Coord ( High Byte ) | Valid 4 ( RO) | X4_H(RO) | | Reserved | Y4_H (RO) | |
| 0x23 | X4 Coord ( Low Byte ) | X4_L(RO) | | | | | |
| 0x24 | Y4 Coord ( Low Byte ) | Y4_L(RO) | | | | | |

XY Coordinate Registers represent the XY coordinates for each touch point ID.

Valid bit field tells that this point ID is valid and the XY information represents a real touch point on touch sensor.

# 3. OPTICAL CHARACTERISTICS

## 3.1  Characteristics

Electrical and Optical Characteristics

| No. | Item | | | symbol / temp. | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Response Time | | | Tr | 25 ℃ | - | 5 | 10 | ms | 2 |
| | | | | Tf | 25 ℃ | - | 15 | 20 | | |
| 2 | Viewing Angle | Hor. | Center CR≧10 | $\Theta_{2+}$ | Φ= 0° | 60 | 85 | - | degree | 3 |
| | | | | $\Theta_{2-}$ | Φ= 180° | 60 | 85 | - | | |
| | | Ver. | | $\Theta_{1+}$ | Φ= 270° | 60 | 85 | - | | |
| | | | | $\Theta_{1-}$ | Φ= 90° | 60 | 85 | - | | |
| 3 | Contrast Ratio | | | Cr | 25 ℃ | 700 | 1000 | - | - | 4 |
| 4 | Red x-code | | | Rx | 25 ℃ | 0.59 | 0.64 | 0.69 | - | 5 |
| | Red y-code | | | Ry | | 0.29 | 0.34 | 0.39 | | |
| | Green x-code | | | Gx | | 0.28 | 0.33 | 0.38 | | |
| | Green y-code | | | Gy | | 0.58 | 0.63 | 0.68 | | |
| | Blue x-code | | | Bx | | 0.10 | 0.15 | 0.20 | | |
| | Blue y-code | | | By | | 0.00 | 0.05 | 0.10 | | |
| | White x-code | | | Wx | | 0.25 | 0.30 | 0.35 | | |
| | White y-code | | | Wy | | 0.27 | 0.32 | 0.37 | | |
| | Brightness | | | Y | | 320 | 450 | - | $cd/m^2$ | |
| 5 | Brightness Uniformity | | | | 25 ℃ | 80 | - | - | % | 6 |

# 3.2 Definition of optical characteristics

**Measurement condition :**

Transmissive and Transflective type



PHOTAL LCD-5000
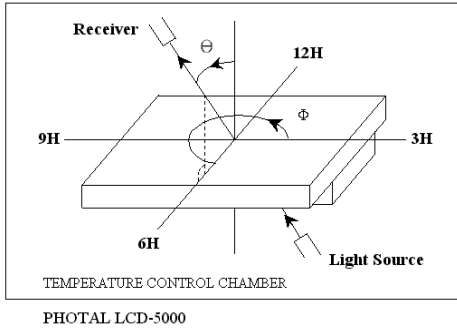
**[Note 1]  Definition of LCD Driving Vop and Waveform :**



Vop Definition

Vop= Driving Voltage at
Max. Contrast Ratio

Selected Waveform          Non-Selected Waveform
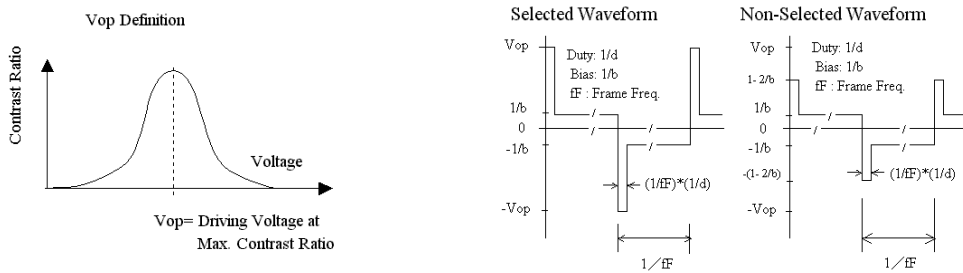
**[Note 2]  Definition of Response Time**

for Positive type :
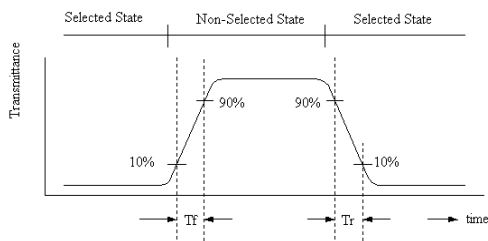


**[Note 3]  Definition of Viewing Angle :**          **[Note 4]  Definition of Contrast Ratio :**



for Positive type
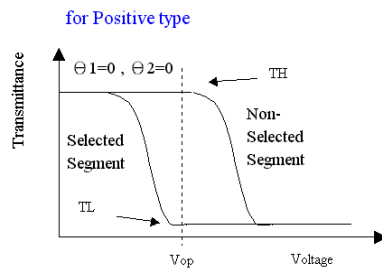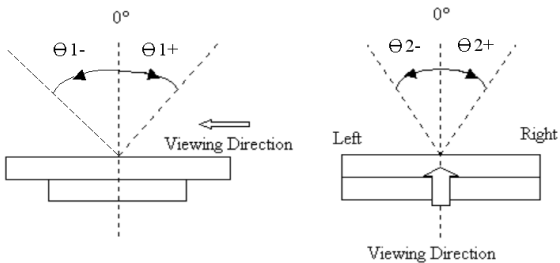
$$\text{Contrast Ratio} = \frac{TH}{TL}$$

**[Note 5]  Definition of measurement of Color Chromaticity and Brightness**

BM-7

500mm

LCD Module
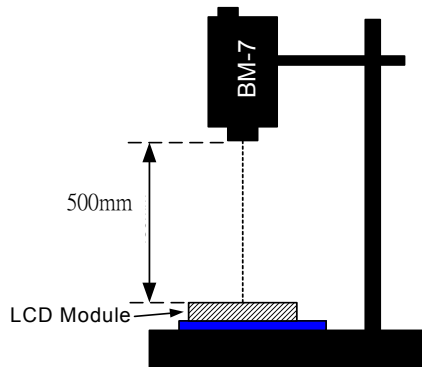
**[Note 6]  Definition of Brightness Uniformity**

W / 4

Active Area Height : H

H / 4

① ② ③

④ ⑤ ⑥

⑦ ⑧ ⑨

Active Area Width : W
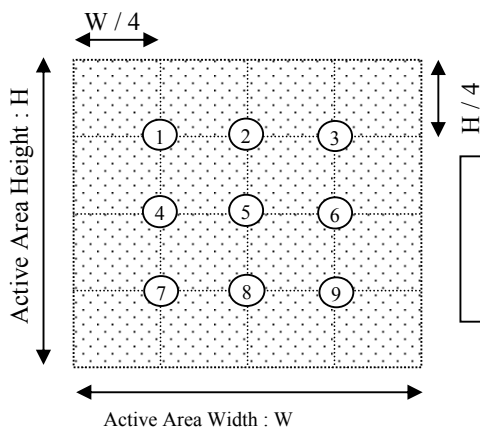
$$\text{Brightness Uniformity} = \frac{\text{Minimum Brightness of Point } 1\sim9}{\text{Maximum Brightness of Point } 1\sim9}$$

**[Note 7]  Definition of Measurement of Reflectance**

BM-7

White Light Source
(Ring)

500mm

15 deg.

LCD Module
or referance
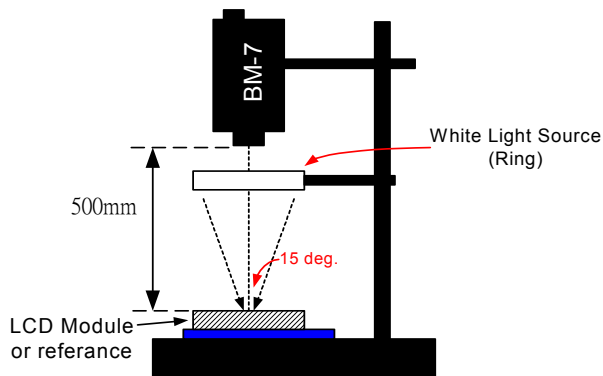
## 4. RELIABILITY :

| Item No | Items | Condition | Note |
|---------|-------|-----------|------|
| 1 | High temperature operating | 70 ℃ , 200 hours | 1 |
| 2 | Low temperature operating | -20 ℃ , 200 hours | 1 |
| 3 | High temperature storage | 80 ℃ , 200 hours | 1 |
| 4 | Low temperature storage | -30 ℃ , 200 hours | 1 |
| 5 | High temperature & humidity | 60℃, 90%RH, 100 hours | 2 |
| 6 | Thermal Shock storage | -30℃, 30min.<=> 80℃, 30min. 10 Cycles | 1 |
| 7 | Vibration test | 10 => 55 =>10 => 55 => 10 Hz , within 1 minute Amplitude : 1.5mm. 15 minutes for each Direction ( X,Y,Z ) | |
| 8 | Drop test | Packed, 100CM free fall, 6 sides, 1 corner, 3edges | |
| 9 | Life time | 50,000 hours 25℃ , 60%RH , specification condition driving | |

Note 1：The product move into the room temperature for at least 2 hours with no condensation.

Note 2：The product move into the room temperature for at least 24 hours with no condensation.

Note 3 : Please change the display picture (autorun) during operating mode. Avoid displaying static images to avoid image sticking , and the image sticking is accelerated by temperature.

　＊ One single product test for only one item.

　＊ Judgment after test : keep in room temperature for more than 2 hours.
- Current consumption < 2 times of initial value
- Contrast > 1/2 initial value
- Function : work normally

# 5. PRODUCT HANDLING AND APPLICATION

## ☐ PRECAUTION FOR HANDLING LCM

● The LCD module contains a C-MOS LSI. People who operate the LCM should wear
  ESD protection eguipement to prevent ESD hurt on products.

● Do not input any signal before power is turned on.

● Do not take LCM from its packaging bag until it is assembled.

● Peel off the LCM protective film slowly since static electricity may be generated.

● Pay attention to the humidity of the work shop, 50~60%RH is satisfactory.

● Use a non-leak iron for soldering LCM.

● Do not touch the display surface or connection terminals area with bare hands.Smudges on
  the display surface reduce the insulation between terminals.

● Cautions for soldering to LCM:

  Condition for soldering I/O terminals:

  Temperature at iron tip :350℃±15℃ .

  Soldering time : 3~4sec./ terminals.

  Type of solder : Eutectic solder(rosin flux filled).


## ☐ PRECAUTION IN USE OF LCM

● Do not contact or scratch the front surface and the contact pads of a LCM with hard
  materials such as metal or glass or with one's nail.

● To clean the surface , wipe it gently with soft cloth dampened by alcohol.

● Do not attempt to wiped off the contact pads.

● Keep LCM panels away from direct sunlight , also avoid them in high-temperature & high
  humidity environment for a long period.

● Do not drive LCM by DC voltage.

● Do not expose LCM to organic solvent.

● Liquid in LCM is hazardous substance. In case a contact with liquid crystal material is occured,
  be sure to immediately wash such material away by soap and water.

● The polarizer is easily damaged and should be handle with special care. Don't press or rub it
  with hard objects.


## ☐ PRECAUTION FOR STORING AND USE OF LCM

● To avoid degradation of the device , do not store the module under the conditions of direct
  sunlight , high temperature or high humidity . Keep the module in bags designed to prevent
  static electricity charging under low temperature / normal humidity conditions(avoid high
  temperature / high humidity and low temperature below 0℃)

● Never use the LCD , LCM under 45 Hz , the liquid crystal will decomposition and cause permently
  damage on display !!

## ☐ USING ON MEDICAL CARE , SAFETY OR HAZARDOUS APPLICATION OR SYSTEM

● For the application in medical care, safety and hazardous prodcuts or systems, an
  authorization from MT is required. MT will not responsible for any damage or loss
  which caused by the products without any authorization given by URT.

● This product is not allowed to be designed and used for military application and/or purpose.

● The delivery of this product to the countries and/or regions where the embargoes
   are imposed by U.N. is prohibited.

● The application and delivery of this product must comply with Startegic High-Tech Commodities (SHTC)
   export control and  the sales to the embargoed and/or sanctioned countries or regions are strictly prohibited.

☐ USING ON MEDICAL CARE , SAFETY OR HAZARDOUS APPLICATION OR SYSTEM

● For the application in medical care, safety and hazardous prodcuts or systems, an

authorization from MT is required. MT will not responsible for any damage or loss

which caused by the products without any authorization given by MT.

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● The delivery of this product to the countries and/or regions where the embargoes
are imposed by U.N. is prohibited.

● The application and delivery of this product must comply with Startegic High-Tech Commodities (SHTC)
export control and  the sales to the embargoed and/or sanctioned countries or regions are strictly prohibited.


☐ **RoHS COMPLIANCE**

● This product is RoHS compliance .

Follow RoHS Directive 2011/65/EU.

| | | | |
|---|---|---|---|
| Pb | < 1000 ppm | Pb | : Lead |
| Cd | < 100  ppm | Cd | : Cadmium |
| Hg | < 1000 ppm | Hg | : Mercury |
| $Cr^{6+}$ | < 1000 ppm | $Cr^{6+}$ | : Chromium VI |
| PBB | < 1000 ppm | PBB | : Polybrominated biphenyls |
| PBDE | < 1000 ppm | PBDE | : Polybrominated biphenyl ethers |

## 6. DATE CODE OF PRODUCTS

● Date code will be shown on each product :

● **YY MM DD - XXXX**

Year Month Day - Production lots no.

● Example: 141108 - 0 0 0 3 ==> Year 2014, November,8th , Production lots no.0003

Note ： The lot no. attached on the packing box will be used for tracking once
the part is too small to print the date code.

## 7. PACKING

Instruction of lot number:

LOT NO. : 0 0 0 8 3 5 2 5 (EX)

| | |
|---|---|
| Date | 01—1 st<br>02—2 nd<br>\|   \|<br>31—31 th |
| Week | 1 ———— 7 |
| Week of Month | 1 ———— 5 |
| Month | 01—January<br>02—February<br>\|   \|<br>12—December |
| Year | 00—2000<br>01—2001 |

Lable of carton:

Packing tray must be stacked with alternated direction to each others.
To tacks packing trays in same direction will cause product damaged.

# NOTE:

**50 PCS/CARTON** Kg/carton (gross weight)
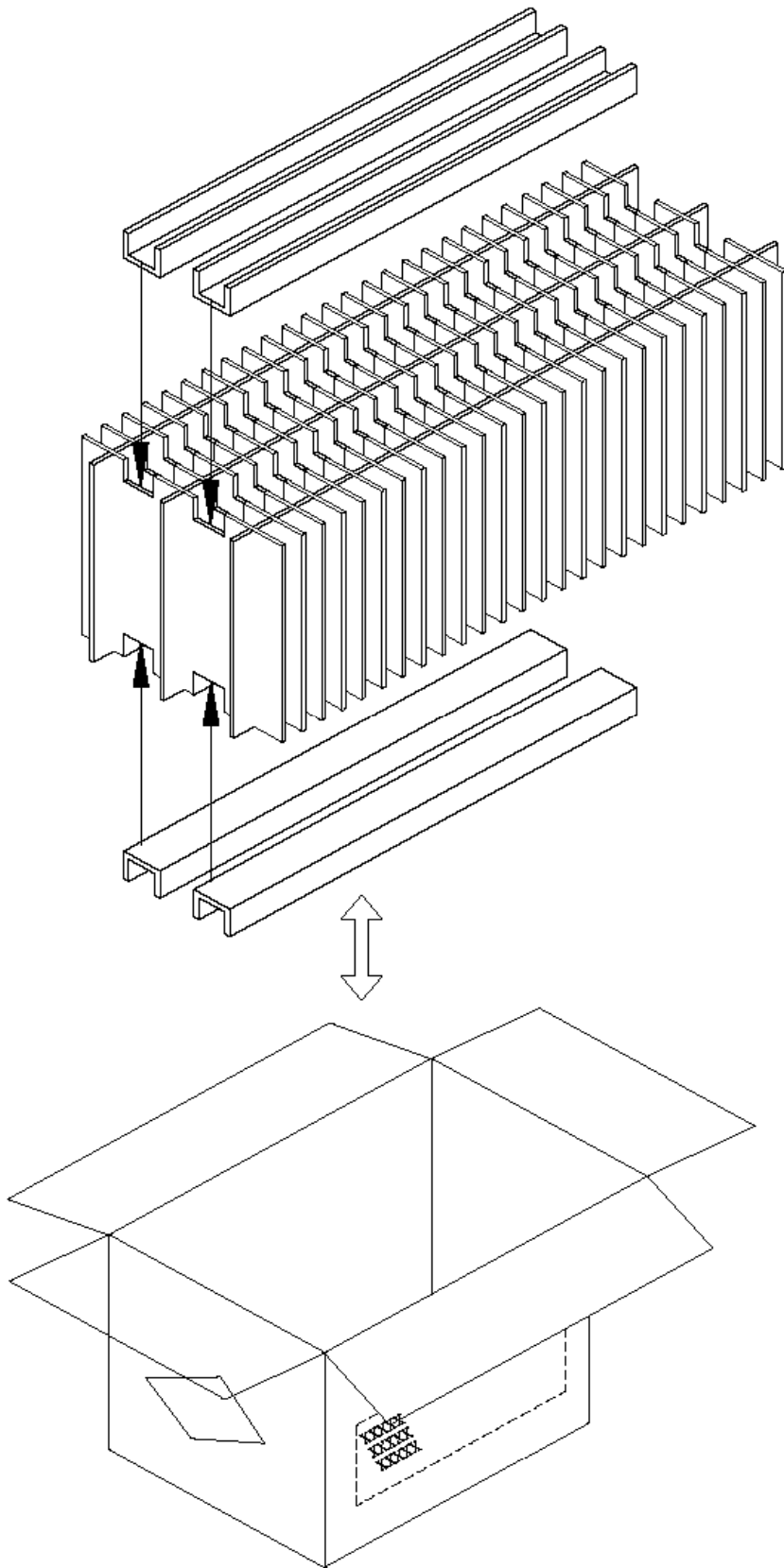
# 8. INSPECTION STANDARD

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

### 8.1.1. THE METHOD OF PRESERVING GOODS
AFTER DELIVERY OF GOODS FROM MT TO PURCHASER. PURCHASER SHALL CONTROL THE LCM

AT -10 ℃ TO 40 ℃ ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE

AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

### 8.1.2. INCOMING INSPECTION
(A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

(B) THE STANDARD OF QUALITY

ISO-2859-1 ( SAME AS MIL-STD-105E ) , LEVEL Ⅱ SINGLE PLAN.

| CLASS | AQL(%) |
|---|---|
| CRITICAL | 0.4 % |
| MAJOR | 0.65 % |
| MINOR | 1.5 % |
| TOTAL | 1.5 % |

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

(C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

### 8.1.3. WARRANTY POLICY

**MT** WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION

OPERATING CONDITIONS. MT WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCT WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF MT.

## 8.2. CHECKING CONDITION
**8.2.1.** CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA FROM VIEWING DIRECTION.
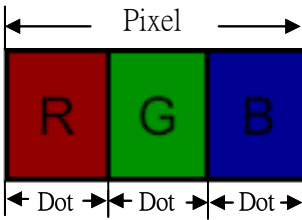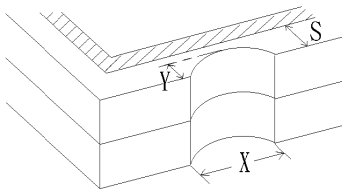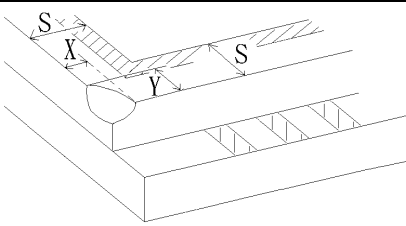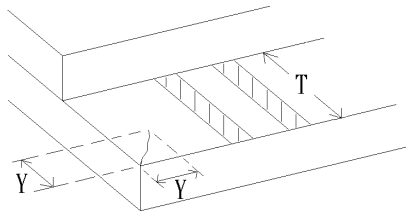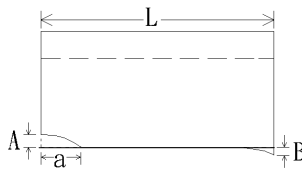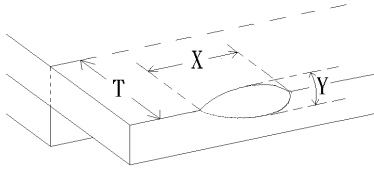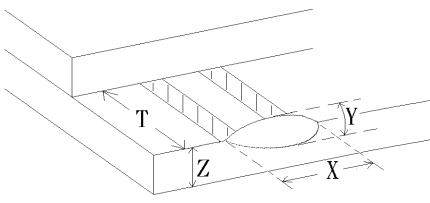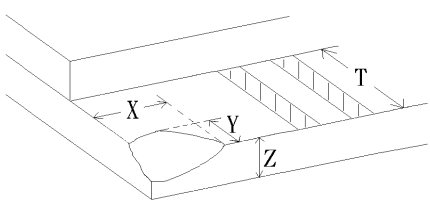
**8.2.2.** CHECKER SHALL SEE OVER 300±25 mm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

## 8.3. INSPECTION PLAN :
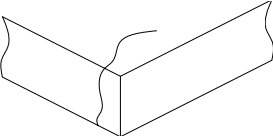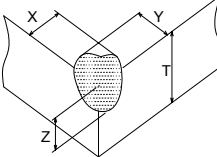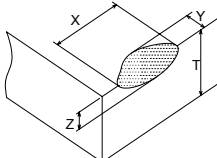
| CLASS | ITEM | JUDGEMENT | CLASS |
|---|---|---|---|
| PACKING & INDICATE | 1. OUTSIDE AND INSIDE PACKAGE | "MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE. | Minor |
| | 2. MODEL MIXED AND QUANTITY | OTHER MODEL MIXED...............REJECTED QUANTITY SHORT OR OVER......REJECTED | Critical |
| | 3. PRODUCT INDICATION | "MODEL NO." SHOULD INDICATE ON THE PRODUCT | Major |
| ASSEMBLY | 4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT. | ACCORDING TO SPECIFICATION OR DRAWING. | Major |
| APPEARANCE | 5. VIEWING AREA | POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA ……..REJECTED | Minor |
| | 6. BLEMISH、BLACK SPOT、 WHITE SPOT IN THE LCD AND LCD GLASS CRACKS | ACCORDING TO STANDARD OF VISUAL INSPECTION ( INSIDE VIEWING AREA ) | Minor |
| | 7. BLEMISH、BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER | ACCORDING TO STANDARD OF VISUAL INSPECTION ( INSIDE VIEWING AREA ) | Minor |
| | 8. BUBBLE IN POLARIZER | ACCORDING TO STANDARD OF VISUAL INSPECTION ( INSIDE VIEWING AREA ) | Minor |
| | 9. LCD'S RAINBOW COLOR | STRONG DEVIATION COLOR ( OR NEWTON RING) OF LCD......REJECTED. OR ACCORDING TO LIMITED SAMPLE ( IF NEEDED, AND INSIDE VIEWING AREA ) | Minor |
| ELECTRICAL | 10. ELECTRICAL AND OPTICAL CHARACTERISTICS ( CONTRAST、VOP、 CHROMATICITY … ETC ) | ACCORDING TO SPECIFICATION OR DRAWING . ( INSIDE VIEWING AREA ) | Critical |
| | 11.MISSING LINE | MISSING DOT、LINE、CHARACTER ....REJECTED | Critical |
| | 12.SHORT CIRCUIT、 WRONG PATTERN DISPLAY | NO DISPLAY、WRONG PATTERN DISPLAY、CURRENT CONSUMPTION OUT OF SPECIFICATION...... REJECTED | Critical |
| | 13. DOT DEFECT (FOR COLOR AND TFT) | ACCORDING TO STANDARD OF VISUAL INSPECTION | Minor |

## 8.4. STANDARD OF VISUAL INSPECTION

| NO. | CLASS | ITEM | JUDGEMENT |
|---|---|---|---|
| 8.4.1 | MINOR | BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH | (A) ROUND TYPE:                                    unit : mm. <br><br>| DIAMETER (mm.) | ACCEPTABLE Q'TY | <br>| Φ ≦ 0.1 | DISREGARD | <br>| 0.1 < Φ ≦ 0.25 | 3(Distance>5mm) | <br>| 0.25 < Φ | 0 | <br><br>NOTE: Φ=(LENGTH+WIDTH)/2 <br><br>(B) LINEAR TYPE:                                    unit : mm. <br><br>| LENGTH | WIDTH | ACCEPTABLE Q'TY | <br>| ------ | W ≦0.03 | DISREGARD | <br>| L ≦ 5.0 | 0.03 < W ≦0.07 | 3(Distance>5mm) | <br>| ------ | 0.07< W | FOLLOW ROUND TYPE | |
| 8.4.2 | MINOR | BUBBLE IN POLARIZER DENT ON POLARIZER | unit : mm. <br><br>| DIAMETER | ACCEPTABLE Q'TY | <br>| Φ ≦0.2 | DISREGARD | <br>| 0.2 < Φ ≦ 0.5 | 2(Distance>5mm) | <br>| 0.5 < Φ | 0 | |
| 8.4.3 | MINOR | Dot Defect | | Items | ACC. Q'TY | <br>| Bright dot | N≦ 4(Distance>5mm) | <br>| Dark dot | N≦ 4(Distance>5mm) | <br><br>Pixel Define : <br><br> <br><br>Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot. <br>Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern. <br>Note 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern. |

| NO. | CLASS | ITEM | JUDGEMENT | |
|------|-------|------|-----------|---|
| 8.4.4 | MINOR | LCD GLASS<br>CHIPPING | $Y > S$ | Reject |
| 8.4.5 | MINOR | LCD GLASS<br>CHIPPING | $X$ or $Y > S$ | Reject |
| 8.4.6 | MAJOR | LCD GLASS<br>GLASS CRACK | $Y > (1/2) T$ | Reject |
| 8.4.7 | MAJOR | LCD GLASS<br>SCRIBE DEFECT | 1. $a > L/3$, $A > 1.5$mm.  Reject<br><br>2. B : ACCORDING<br>   TO DIMENSION | |
| 8.4.8 | MINOR | LCD GLASS<br>CHIPPING<br>( ON THE TERMINAL<br>AREA ) | $\Phi = (x+y)/2 > 2.5$ mm | Reject |
| 8.4.9 | MINOR | LCD GLASS<br>CHIPPING<br>( ON THE TERMINAL<br>SURFACE ) | $Y > (1/3) T$ | Reject |
| 8.4.10 | MINOR | LCD GLASS<br>CHIPPING | $Y > T$ | Reject |

## 8.5 INSPECTION STANDARD OF TOUCH PANEL

| NO. | CLASS | ITEMS | | JUDGEMENT | | |
|---|---|---|---|---|---|---|
| 8.5.1 | MAJOR | Touch Panel Crack | |  | Reject | |
| 8.5.2 | MINOR | Touch Panel Chipping | Corner |  | Not CNC Products: $X \leqq 2mm, Y \leqq 2mm, Z < 1/2T$ → Accept | CNC Products: For CNC Outline Dimension → Accept |
| | | | Edge |  | Not CNC Products: $X \leqq 3mm, Y \leqq 3mm, Z < 1/2T$ → Accept | CNC Products: For CNC Outline Dimension → Accept |
| 8.5.3 | MINOR | Scratch Dust and Foreign material (Linear Type) | | $W \leqq 0.05, L \leqq 10mm$ | Accept | |
| | | | | $0.05mm < W \leqq 0.07mm ; L \leqq 5.0mm$ Distance between seratch $> 5.0mm$ | Accept 3 ea Max. | |
| | | | | $W > 0.07mm$ | Reject | |
| 8.5.4 | MINOR | Scratch Dust and Foreign material (Round Type：$\Phi$=(Length+Width)/2) | | $\Phi \leqq 0.15mm$ | Accept | |
| | | | | $0.15mm < \Phi \leqq 0.25mm$ Distance between seratch $> 5.0mm$ | Accept 5 ea Max. | |
| | | | | $\Phi > 0.25mm$ | Reject | |
| 8.5.5 | MINOR | Touch Panel Dent / Fish Eyes ($\Phi$=(Length+Width)/2) | | $\Phi \leqq 0.35mm$ | Accept | |
| | | | | $0.35mm < \Phi \leqq 1.0mm$ Distance $> 5.0mm$ | Accept 3 ea Max. | |
| | | | | $\Phi > 1.0mm$ | Reject | |
| 8.5.6 | MINOR | Touch Panel Air Bubble ($\Phi$=(Length+Width)/2) | | $\Phi \leqq 0.15mm$ | Accept | |
| | | | | $0.15mm < \Phi \leqq 0.25mm$ Distance between bubbles $> 5.0mm$ | Accept 3 ea Max. | |
| | | | | $\Phi > 0.25mm$ | Reject | |
| 8.5.7 | MINOR | Touch Panel Printing area Scratch | | $W \leqq 0.03, L \leqq 10mm$ | Accept | |
| | | | | $0.03mm < W \leqq 0.05mm, L \leqq 5mm$ | Accept 3 ea Max. | |
| | | | | $W > 0.05mm$ or $L > 5mm$ ( W>0.05 Follow 8.5.4 Round type ) | Reject | |
| 8.5.8 | MINOR | Touch Panel White Haze Mark / Dust | | Can not be removed | Reject | |

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