Japan Display Inc.

FOR MESSRS :_____ DATE : Jan. 03rd ,2023

# CUSTOMER'S ACCEPTANCE SPECIFICATIONS

# TX40D200VM0BAA

## Contents



ACCEPTED BY:_____ PROPOSED BY: Oblack Tsai

# 2. RECORD OF REVISION

| TE | SHEET No. | SUMMARY |
|---|---|---|
| Nov.29,'19 | 7B64PS 2710 – TX40D200VM0BAA-3 Page 10-1/2 | 10.1 FRONT VIEW<br>Added : The dimensions of metal frame cut-out area |
| | 7B64PS 2713 – TX40D200VM0BAA-3 Page 13-1/1 | 13. DESIGNATION of LOT MARK<br>Added : Rev.B |
| Jul.14,'20 | 7B64PS 2710 – TX40D200VM0BAA-4 Page 10-2/2 | 10.2 REAR VIEW<br>Added : VR protected tape |
| Jan.3,'23 | 7B64PS 2701 – TX40D200VM0BAA-5 Page 1-1/1 | Company logo changed :<br>KOE JDI Taiwan Inc. → JDI Japan Display Inc. |
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| | | |

# 3. GENERAL DATA

## 3.1 DISPLAY FEATURES

This module is a 15.8” format amorphous silicon TFT. The pixel format is vertical stripe and sub pixels are arranged as R(red), G(green), B(blue) sequentially. This display is RoHS compliant, and COG (chip on glass) technology and LED backlight are applied on this display.

| | |
|---|---|
| Part Name | TX40D200VM0BAA |
| Module Dimensions | 409.8(W) mm x 109.5(H) mm x 14.5(D) mm (Except Connector) |
| LCD Active Area | 389.76(W) mm x 91.35(H) mm |
| Pixel Pitch | 0.15225(W) mm x 0.15225(H) mm |
| Resolution | 2560 x 3(RGB)(W) x 600(H) Dots |
| Color Pixel Arrangement | R, G, B Vertical Stripe |
| LCD Type | Transmissive Color TFT; Normally Black |
| Display Type | Active Matrix |
| Number of Colors | 16.7M |
| Backlight | Light Emitting Diode (LED) |
| Weight | 662g |
| Interface | Display Port |
| Power Supply Voltage | 12.0V for Total Power |
| Power Consumption | 6.6W for Total Power |
| Viewing Direction | Super Wide Version(In Plane Switching) |

# 4. ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Min. | Max. | Unit | Remarks |
|---|---|---|---|---|---|
| Input Voltage | $V_{in}$ | -0.5 | 14 | V | - |
| Operating Temperature | $T_{op}$ | -20 | 70 | ˚C | Note 1 |
| Storage Temperature | $T_{st}$ | -30 | 80 | ˚C | Note 1 |

Note 1: The maximum rating is defined as above based on the panel surface temperature, which might be different from ambient temperature after assembling the panel into the application. Moreover, some temperature-related phenomenon as below needed to be noticed:

- Background color, contrast and response time would be different in temperatures other than 25˚C.
- Operating under high temperature will shorten LED lifetime.

# 5. ELECTRICAL CHARACTERISTICS

## 5.1 SIGNAL ELECTRICAL CHARACTERISTICS

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Main Link Common Mode Voltage | $V_{IC}$ | - | 0 | - | 2.0 | V |
| Main Link Swing Voltage | $V_{ID}$ | 2.7 Gbps | ±60 | - | ±600 | mV |
| | | 1.6 Gbps | ±20 | | | |
| AUX Link Common Mode Voltage | $V_{IC}$-AUX | - | 0 | - | 2.0 | V |
| AUX Link Swing Voltage | $V_{ID}$-AUX | Transiting | ±0.195 | - | ±0.69 | V |
| | | Receiving | ±0.16 | | ±0.68 | |

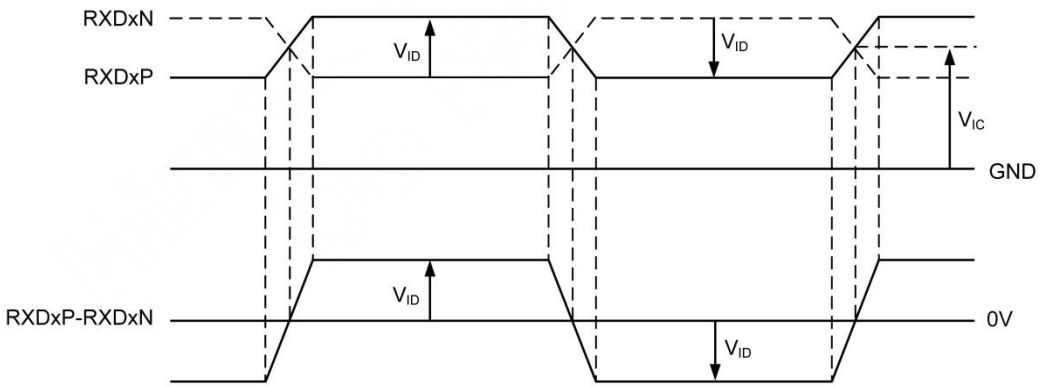



Figure 5.1：Main Link $V_{ID}$ and $V_{IC}$ definition

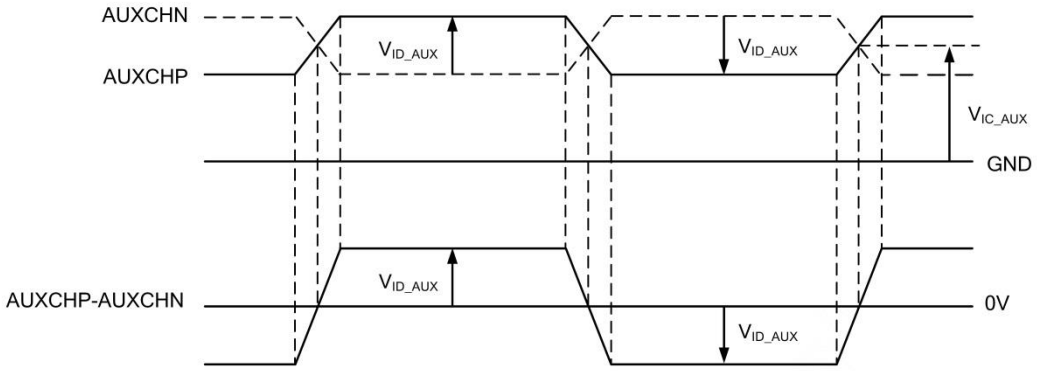



Figure 5.2：AUX CH $V_{ID\_AUX}$ and $V_{IC\_AUX}$ definition

## 5.2 LCM CHARACTERISTICS

$T_a = 25\,^{\circ}C$

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| Power Supply Voltage | $V_{DD}$ | - | 10.8 | 12 | 13.2 | V | - |
| Input Current | $I_{DD}$ | BL_PWM=100% | - | 550 | 660 | mA | Note 1,2,3 |
| | | BL_PWM=5% | - | 120 | - | | |
| Frame Frequency | $f_{Frame}$ | - | - | 60 | - | Hz | - |
| CLK Frequency | $f_{CLK}$ | - | - | 50.5 | - | MHz | - |
| PWM Signal Voltage | BL_PWM | High | 2 | 3.3 | 5 | V | - |
| | | Low | 0 | - | 0.8 | | |
| LED Lifetime | - | $I_{LED}$=42mA/ch. | - | 70K | - | hrs | Note 4 |

Note 1: An all white check pattern is used when measuring $I_{DD}$. $f_{Frame}$ is set to 60Hz. Moreover, 2A fuse is applied in the module for $I_{DD}$. For display activation and protection purpose, power supply is recommended larger than 5A to start the display and break fuse once any short circuit occurred.

Note 2: Fig. 5.3 shows the LED backlight circuit and function.

Note3: Dimming function can be obtained by applying PWM signal from the display interface CN2. The recommended PWM signal is 1K ~ 20KHz with 3.3 V amplitude.

Note 4: The estimated lifetime is specified as the time to reduce 50% brightness by applying 42mA/ch. at 25°C.

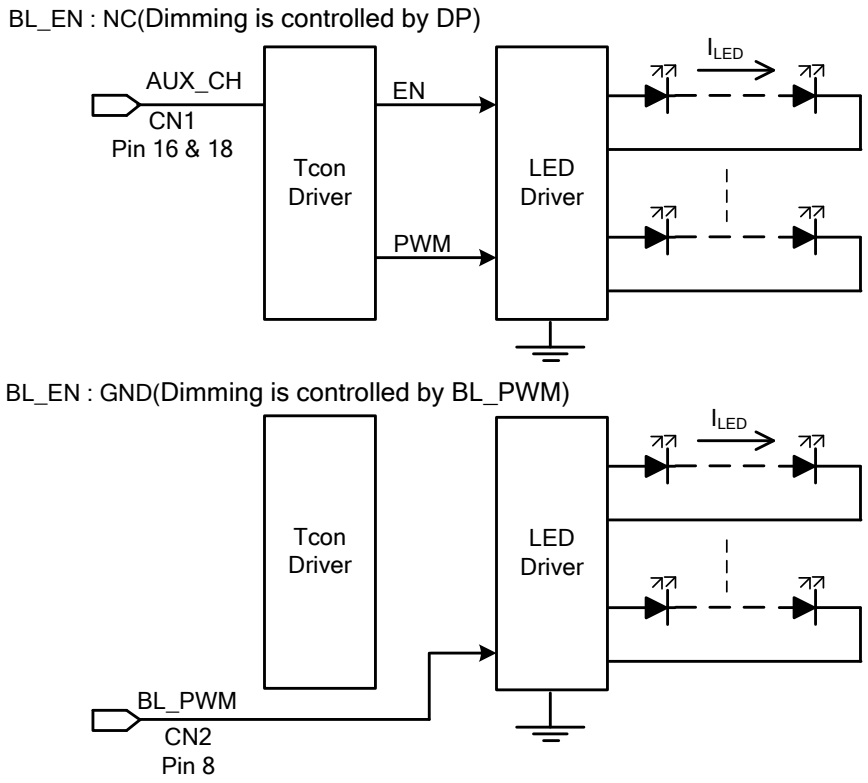



Fig 5.3

# 6. OPTICAL CHARACTERISTICS

The optical characteristics are measured based on the conditions as below:

- Supplying the signals and voltages defined in the section of electrical characteristics.
- The backlight unit needs to be turned on for 30 minutes.
- The ambient temperature is 25°C.
- In the dark room less than 100 lx, the equipment has been set for the measurements as shown in Fig 6.1.

$T_a = 25\,^{\circ}C,\ f_{Frame} = 60\,\text{Hz}, \text{Vin} = 12\text{V}$

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|---|
| Brightness of White | | - | $\phi = 0^{\circ}, \theta = 0^{\circ}$, BL_PWM=100% | 290 | 370 | - | cd/m$^2$ | Note 1 |
| Brightness Uniformity | | - | | 75 | - | - | % | Note 2 |
| Contrast Ratio | | CR | | - | 800 | - | - | Note 3 |
| Response Time | | Tr + Tf | $\phi = 0^{\circ}, \theta = 0^{\circ}$ | - | 25 | - | ms | Note 4 |
| NTSC Ratio | | - | $\phi = 0^{\circ}, \theta = 0^{\circ}$ | - | 70 | - | % | - |
| Viewing Angle | | $\theta$ x | $\phi = 0^{\circ}$, CR $\geq$ 10 | 80 | 85 | - | Degree | Note 5 |
| | | $\theta$ x′ | $\phi = 180^{\circ}$, CR $\geq$ 10 | 80 | 85 | - | | |
| | | $\theta$ y | $\phi = 90^{\circ}$, CR $\geq$ 10 | 80 | 85 | - | | |
| | | $\theta$ y′ | $\phi = 270^{\circ}$, CR $\geq$ 10 | 80 | 85 | - | | |
| Color Chromaticity | Red | X | $\phi = 0^{\circ}, \theta = 0^{\circ}$ | 0.58 | 0.63 | 0.68 | - | Note 6 |
| | | Y | | 0.28 | 0.33 | 0.38 | | |
| | Green | X | | 0.28 | 0.33 | 0.38 | | |
| | | Y | | 0.58 | 0.63 | 0.68 | | |
| | Blue | X | | 0.10 | 0.15 | 0.20 | | |
| | | Y | | 0.05 | 0.10 | 0.15 | | |
| | White | X | | 0.27 | 0.32 | 0.37 | | |
| | | Y | | 0.27 | 0.32 | 0.37 | | |

Note 1: The brightness is measured from the center point of the panel P5 in Fig. 6.2, for the typical value.

Note 2: The brightness uniformity is calculated by the equation as below:

$$\text{Brightness uniformity} = \frac{\text{Min. Brightness}}{\text{Max. Brightness}} \text{ X100\%}$$

which is based on the brightness values of the 9 points in active area measured by BM-5 as shown in Fig. 6.2.

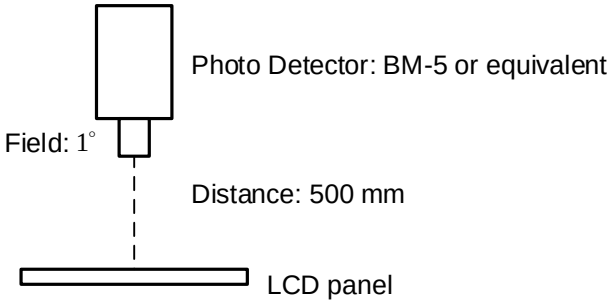



Fig 6.1

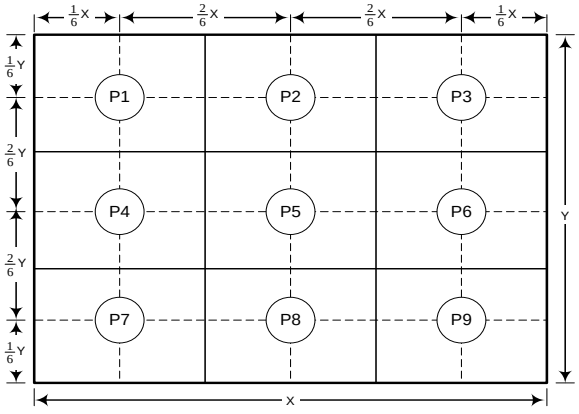



Fig 6.2

Note 3: The Contrast ratio is measured from the center point of the panel, P5, and defined as the following equation:

$$CR = \frac{\text{Brightness of White}}{\text{Brightness of Black}}$$

Note 4: The definition of response time is shown in Fig. 6.3. The rising time is the period from 10% brightness to 90% brightness when the data is from black to white. Oppositely, Falling time is the period from 90% brightness rising to 10% brightness.

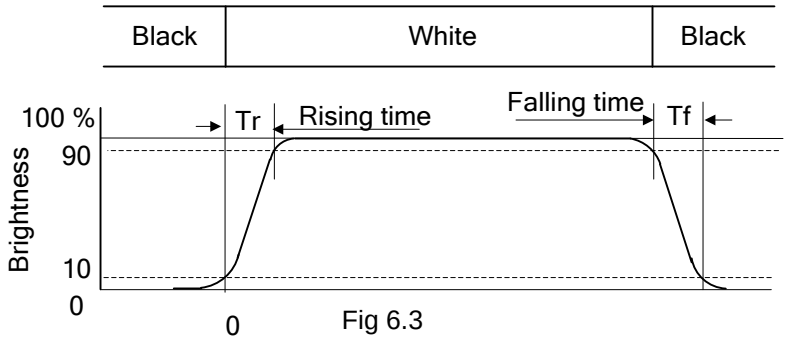



Fig 6.3

Note 5: The definition of viewing angle is shown in Fig. 6.4. Angle $\phi$ is used to represent viewing directions, for instance, $\phi = 270^\circ$ means 6 o'clock, and $\phi = 0^\circ$ means 3 o'clock. Moreover, angle $\theta$ is used to represent viewing angles from axis Z toward plane XY.

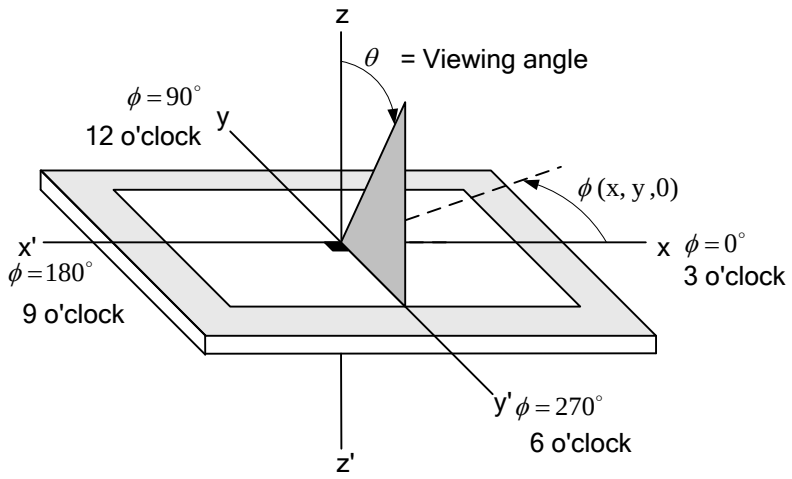
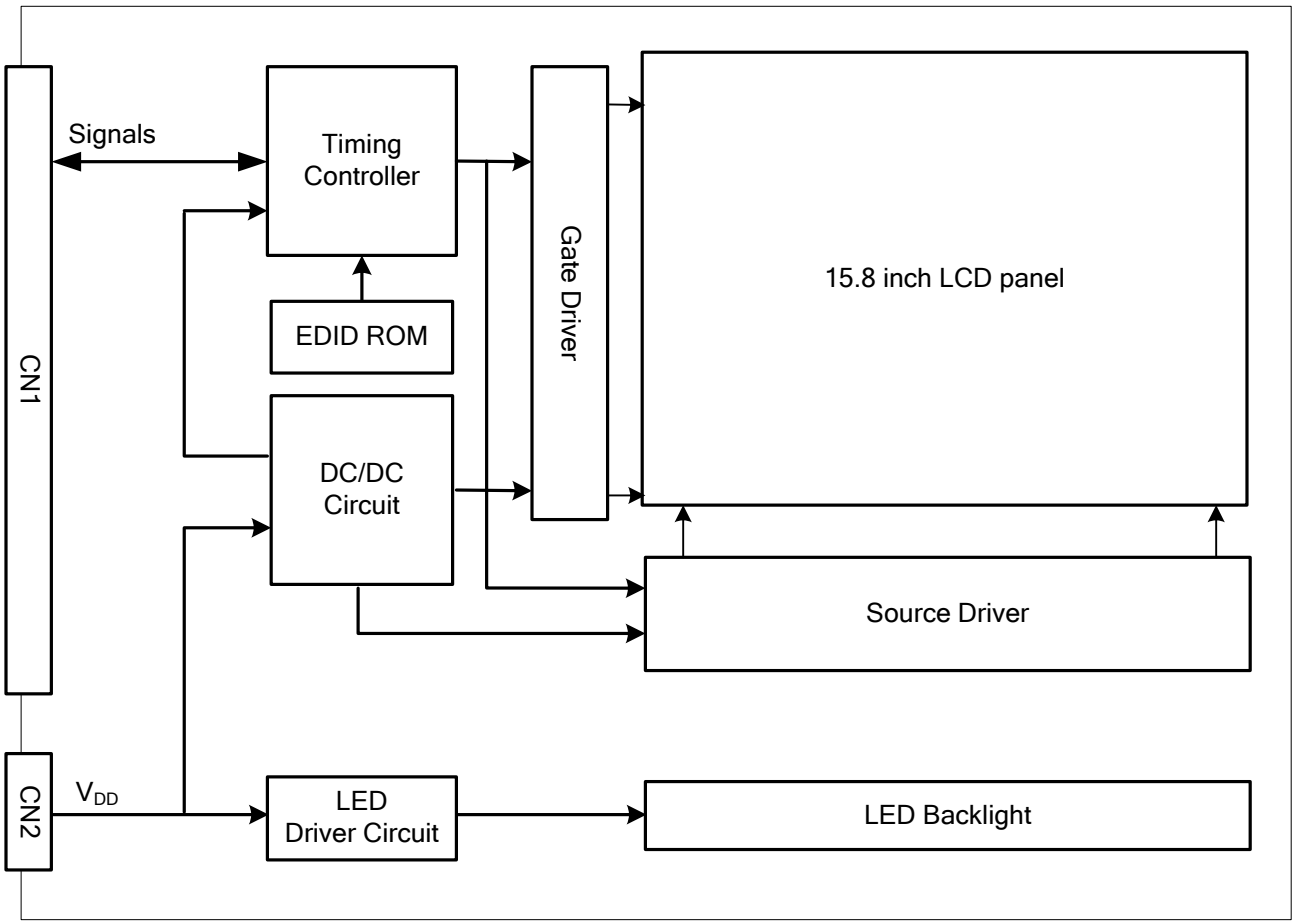



Fig 6.4

Note 6: The color chromaticity is measured from the center point of the panel, P5, as shown in Fig. 6.2.

# 7. BLOCK DIAGRAM



# 8. RELIABILITY TESTS

| Test Item | Condition | |
|---|---|---|
| High Temperature | 1) Operating<br>2) 70°C | 240 hrs |
| Low Temperature | 1) Operating<br>2) -20°C | 240 hrs |
| High Temperature | 1) Storage<br>2) 80°C | 240 hrs |
| Low Temperature | 1) Storage<br>2) -30°C | 240 hrs |
| Heat Cycle | 1) Operating<br>2) -20°C ~70°C<br>3) 3hrs~1hr~3hrs | 240 hrs |
| Thermal Shock | 1) Non-Operating<br>2) -35°C↔85°C<br>3) 0.5 hr↔0.5 hr | 240 hrs |
| High Temperature & Humidity | 1) Operating<br>2) 40°C & 85%RH<br>3) Without condensation | 240 hrs<br>(Note 3) |
| Vibration | 1) Non-Operating<br>2) 20～50 Hz<br>3) 2G<br>4) X, Y, and Z directions | 1 hr for each direction |
| Mechanical Shock | 1) Non-Operating<br>2) 3 ms<br>3) 50G<br>4) ±X, ± Y and ±Z directions | Once for each direction |
| ESD | 1) Operating<br>2) Tip: 200 pF, 250Ω<br>3) Air discharge for glass: ± 8KV<br>4) Contact discharge for metal frame: ± 8KV | 1) Glass: 9 points<br>2) Metal frame: 8 points<br>(Note 4) |

Note 1: Display functionalities are inspected under the conditions defined in the specification after the reliability tests.

Note 2: The display is not guaranteed for use in corrosive gas environments.

Note 3: Under the condition of high temperature & humidity, if the temperature is higher than 40℃, the humidity needs to be reduced as Fig. 8.1 shown.

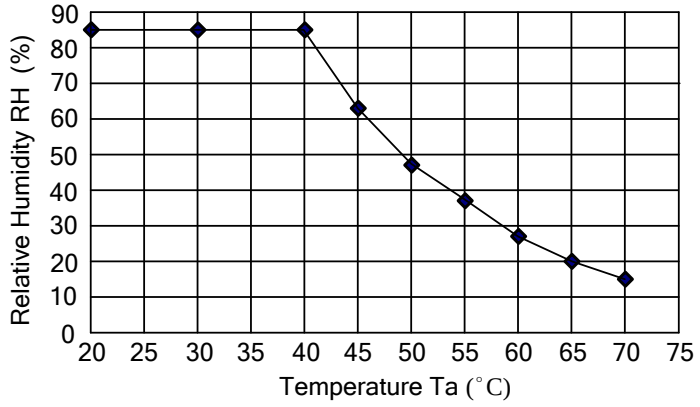



Fig. 8.1

Note 4: All pins of LCD interface(CN1) have been tested by ±100V contact discharge of ESD under non-operating condition, with 200pF, 250Ω at 25°C, 70%RH environment.

# 9. LCD INTERFACE

## 9.1 INTERFACE PIN CONNECTIONS

The display interface connector (CN1) is G3167-03010111-H0 made by Wieson and pin assignment is as below:

| Pin No. | Signal | Function | Pin No. | Signal | Function |
|---|---|---|---|---|---|
| 1 | ML_Lane3(n) | Lane 3 (negative) | 11 | $V_{SS}$ | GND |
| 2 | $V_{SS}$ | GND | 12 | ML_Lane(p) | Lane (positive) |
| 3 | ML_Lane3(p) | Lane 3 (positive) | 13 | $V_{SS}$ | GND |
| 4 | ML_Lane2(n) | Lane 2 (negative) | 14 | $V_{SS}$ | GND |
| 5 | $V_{SS}$ | GND | 15 | AUX_CH(p) | Auxiliary Channel (positive) |
| 6 | ML_Lane2(p) | Lane 2 (positive) | 16 | $V_{SS}$ | GND |
| 7 | ML_Lane1(n) | Lane 1 (negative) | 17 | AUX_CH(n) | Auxiliary Channel (negative) |
| 8 | $V_{SS}$ | GND | 18 | Hot Plug | Hot Plug Detection |
| 9 | ML_Lane1(p) | Lane 1 (positive) | 19 | DP_PWR (Return) | GND |
| 10 | ML_Lane(n) | Lane (negative) | 20 | DP_PWR | No Connection |

Note 1: Lane0(p/n), Lane1(p/n) use only.

The backlight interface connector (CN2) is SM15B-SRSS-TB made by JST, and pin assignment as below:

| Pin No. | Signal | Level | Function |
|---|---|---|---|
| 1 | $V_{DD}$ | - | Power Supply for LCM |
| 2 | $V_{DD}$ | - | Power Supply for LCM |
| 3 | $V_{DD}$ | - | Power Supply for LCM |
| 4 | $V_{SS}$ | - | GND |
| 5 | $V_{SS}$ | - | GND |
| 6 | $V_{SS}$ | - | GND |
| 7 | BL_EN | - | Note 1 |
| 8 | BL_PWM | - | Note 2 |
| 9 | $V_{SS}$ | - | GND |
| 10 | NC | - | - |
| 11 | NC | - | - |
| 12 | NC | - | - |
| 13 | NC | - | - |
| 14 | NC | - | - |
| 15 | NC | - | - |

Note 1: NC: Dimming is controlled by DP ; GND: Dimming is controlled by BL_PWM

Note 2: Duty: 0~100% ; Frequency: 1~10kHz; 100% Brightness: PWM 100%

## 9.2 TIMING CHART

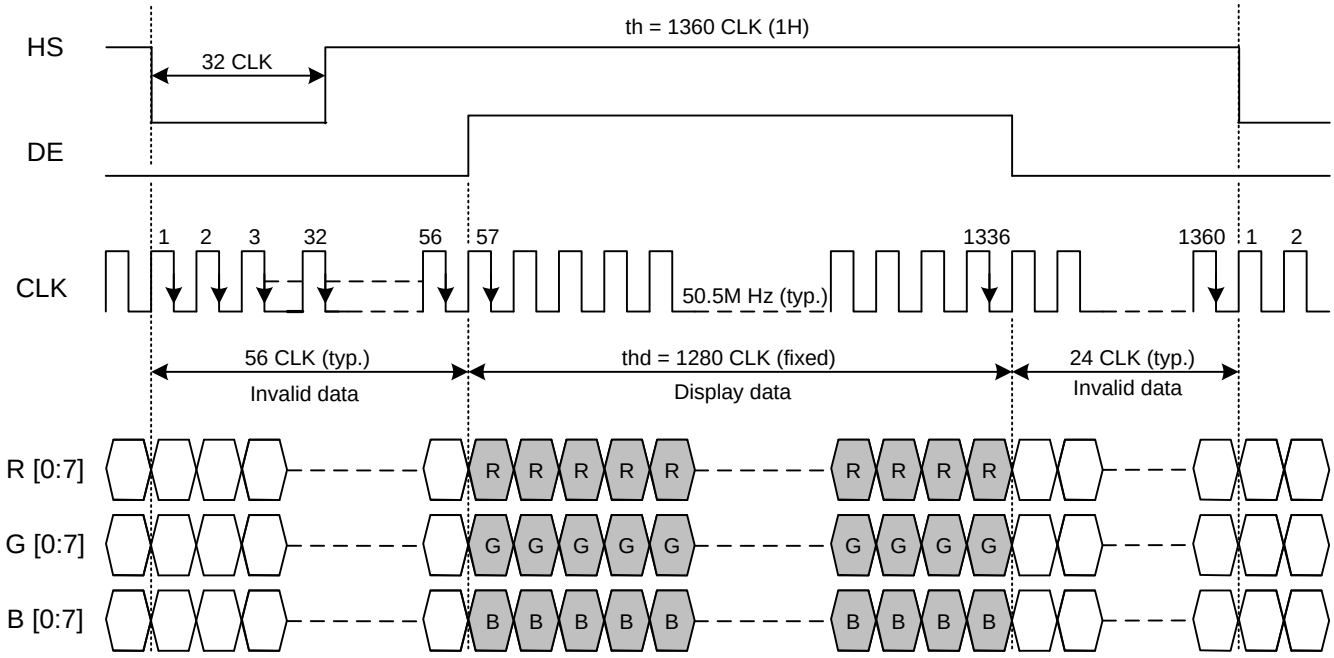



Fig. 9.1 Horizontal Timing

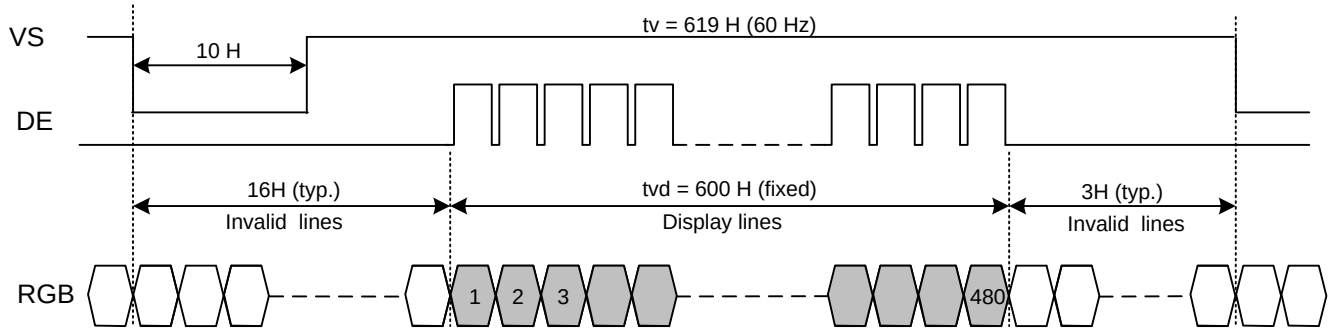



Fig. 9.2 Vertical Timing

## 9.3 TIME TABLE

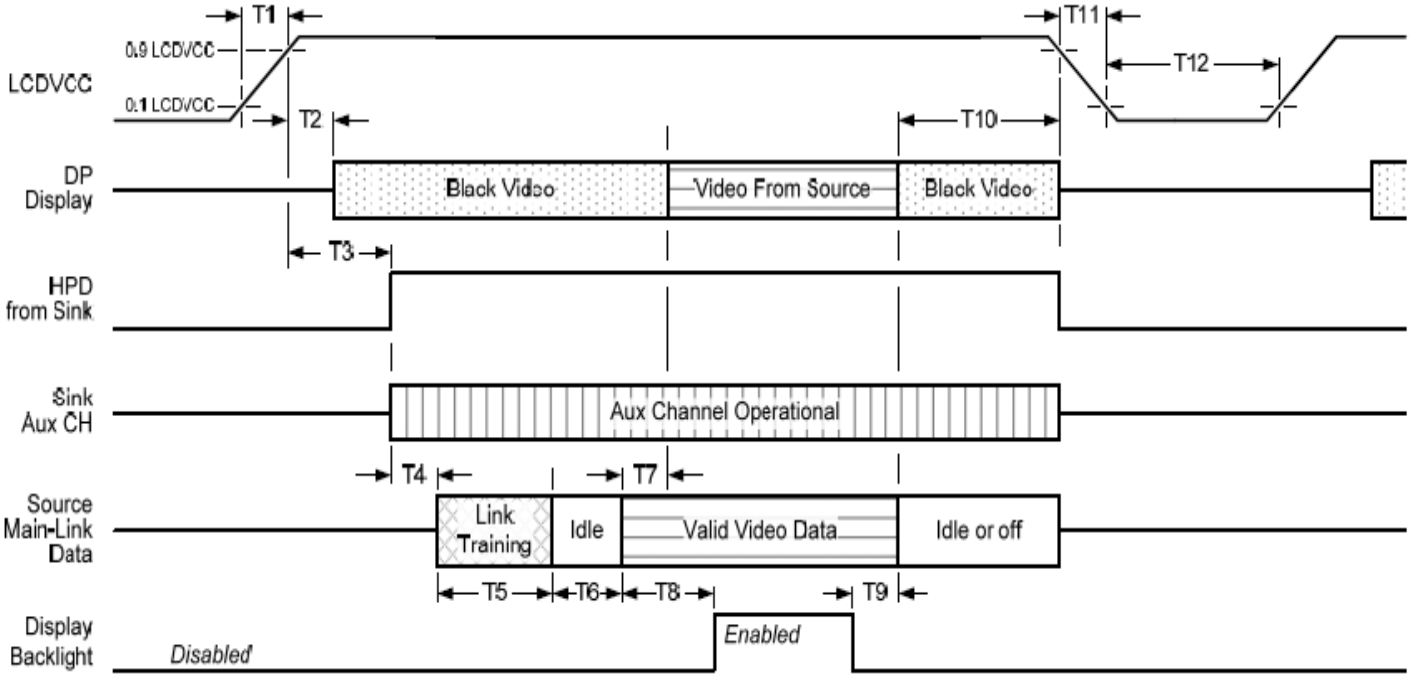
The column of timing sets including minimum, typical, and maximum as below are based on the best optical performance, frame frequency ( $f_{Frame}$) = 60 Hz to define. If 60 Hz is not the aim to set, less than 66 Hz for $f_{Frame}$ is recommended to apply for better performance by other parameter combination as the definitions in section 5.2.

A. Characteristics Timing

| Item | | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| CLK Frequency | | $1/T_{Clock}$ | - | 50.5 | - | MHz |
| Horizontal | Cycle Time | $T_H$ | 1324 | 1360 | 1541 | M Hz |
| | Display Data | $T_{HD}$ | 1280 | | | CLK |
| | Blanking | $T_{HB}$ | 44 | 80 | 261 | |
| Vertical | Cycle Time | $T_V$ | 604 | 619 | 733 | $T_{Line}$ |
| | Display Data | $T_{VD}$ | 600 | | | |
| | Blanking | $T_{VB}$ | 4 | 19 | 133 | |

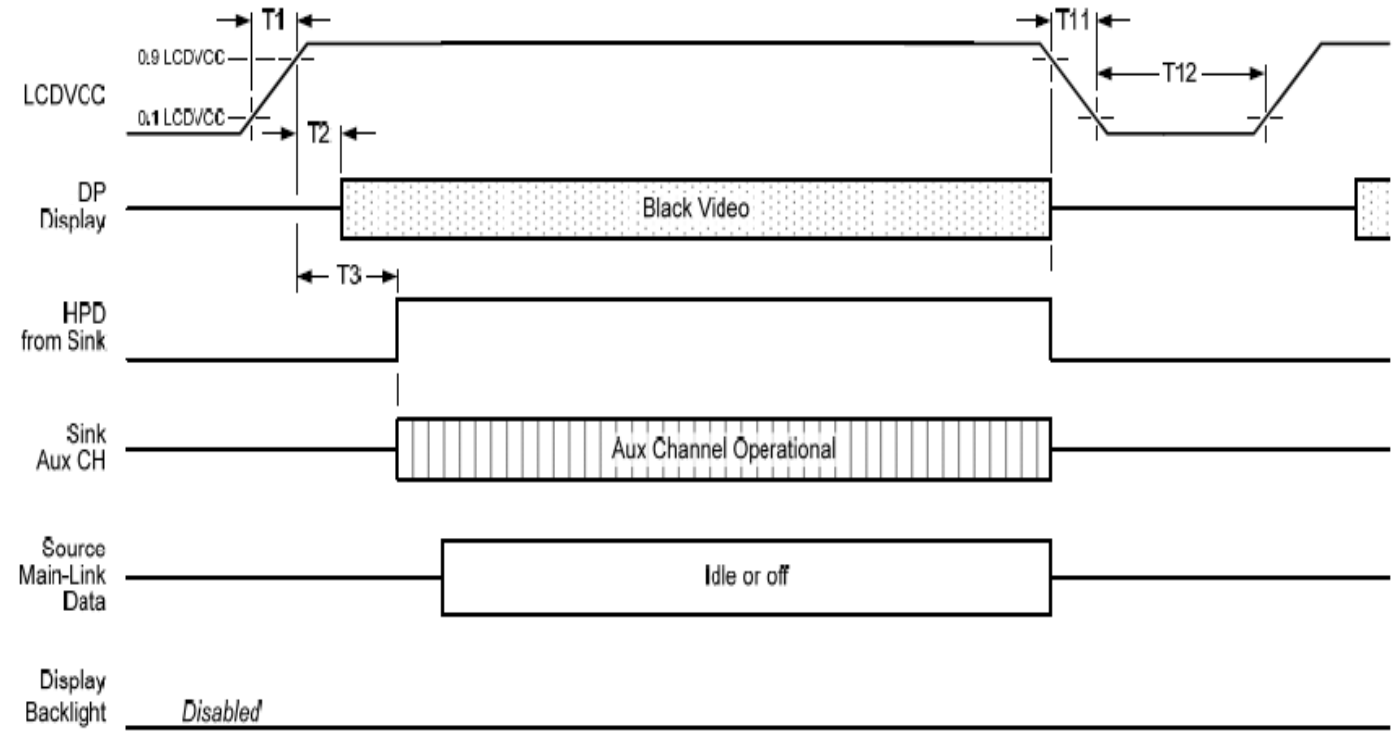
## 9.4 POWER ON/OFF SEQUENCE

Display Port panel power sequence:




Display port interface power up/down sequence, normal system operation.

Display Port AUX_CH transaction only:




Display port interface power up/down sequence, AUX_CH transaction only.

Display Port panel power sequence timing parameter:

| Timing Parameter | Description | Reqd.by | Limits | | | Notes |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| T1 | power rail rise time,10% to 90% | source | 0.5ms | - | 10ms | |
| T2 | delay from $V_{DD}$ to black video generation | sink | 0ms | - | 200ms | |
| T3 | delay from $V_{DD}$ to HPD high | sink | 0ms | - | 200ms | |
| T4 | delay from HPD high to link training initialization | source | - | - | - | |
| T5 | Link training duration | source | - | - | - | |
| T6 | Link idle | source | - | - | - | |
| T7 | delay from valid video data from source to video on display | sink | 0ms | - | 50ms | |
| T8 | delay from valid video data from source to backlight enable | source | - | - | - | |
| T9 | delay from backlight disable to end of valid video data | source | - | - | - | |
| T10 | delay from end of valid video data from source to power off | source | 0ms | - | 500ms | |
| T11 | power rail fall time,905 to 10% | source | - | - | 10ms | |
| T12 | Power off time | source | 500ms | - | - | |

## 9.5 DATA INPUT for DISPLAY COLOR(8BIT MODE)

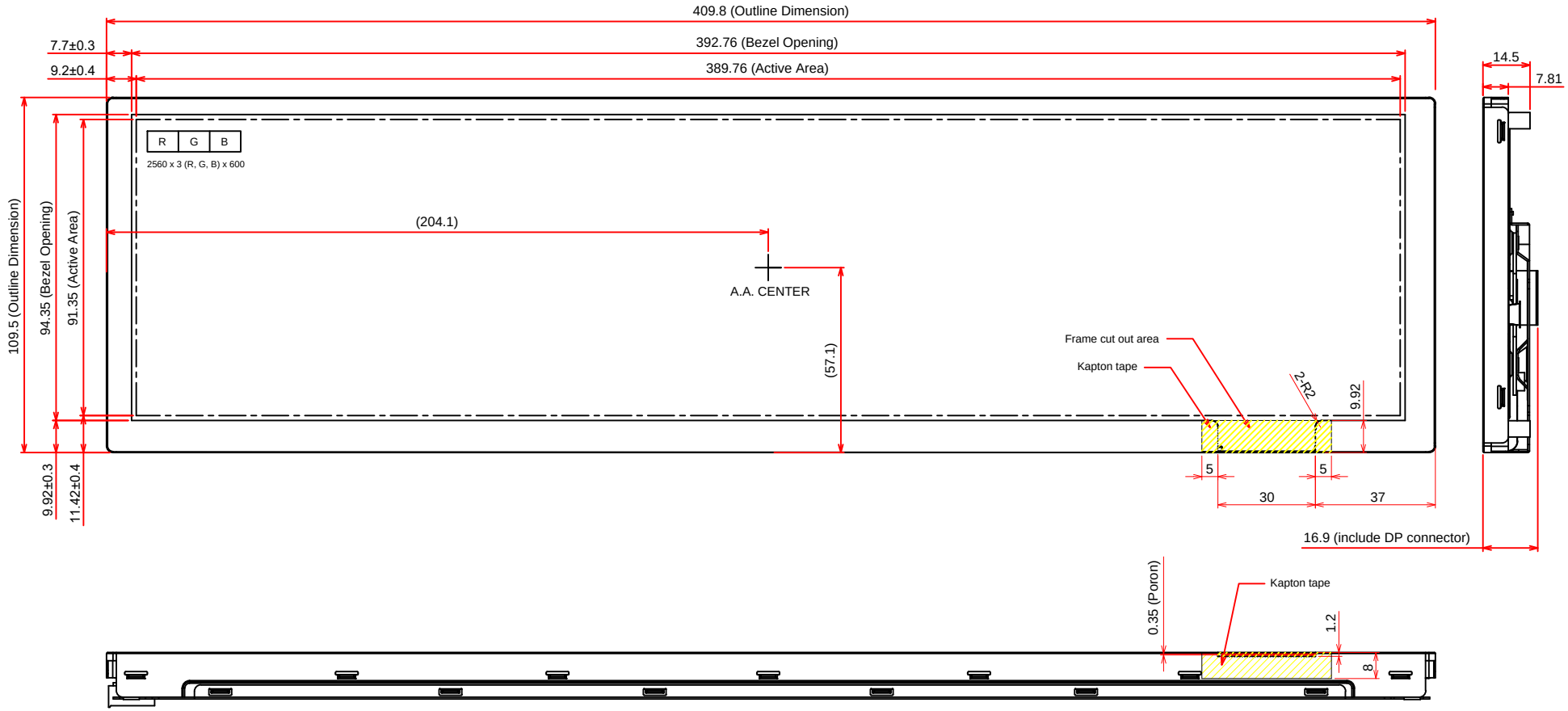
| Input color | | Red Data | | | | | | | | Green Data | | | | | | | | Blue Data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | | MSB | | | | | | | LSB | MSB | | | | | | | LSB | MSB | | | | | | | LSB |
| Basic Color | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Red | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(253) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(254) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Blue | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note 1: Definition of gray scale : Color(n) Number in parenthesis indicates gray scale level. Larger number corresponds to brighter level.

Note 2: Data Signal : 1 : High, 0 : Low

# 10. OUTLINE DIMENSIONS

## 10.1 FRONT VIEW




General Tolerance:±0.5mm
Scale : NTS
Unit : mm

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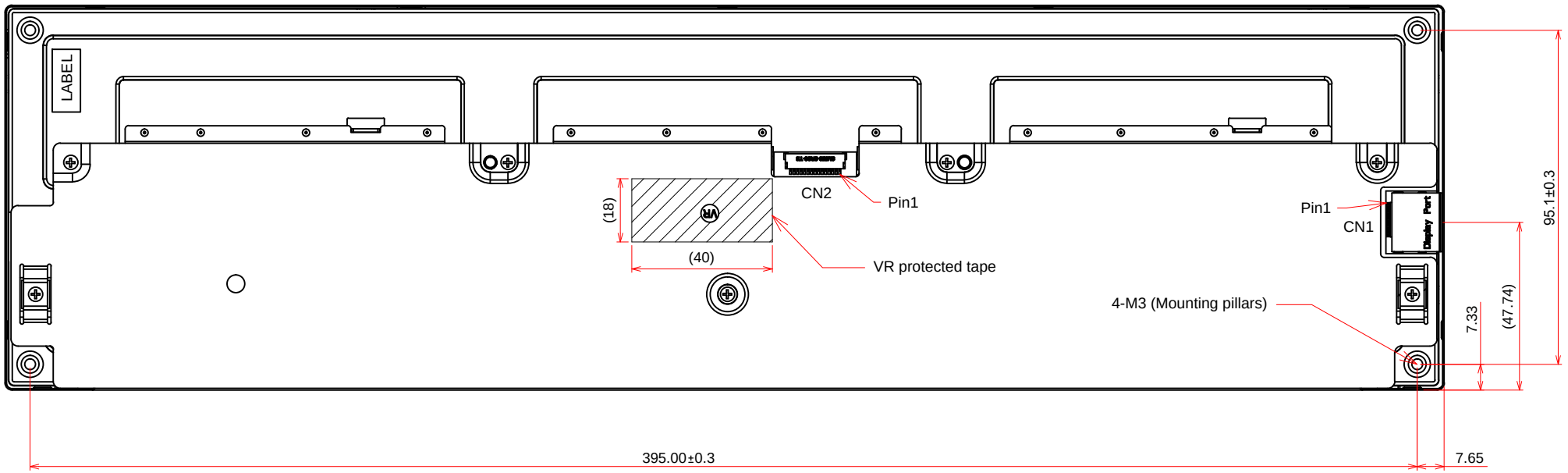
|---|---|---|---|---|

## 10.2 REAR VIEW




General Tolerance:±0.5mm
Scale : NTS
Unit : mm

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|---|---|---|---|---|

# 11. APPEARANCE STANDARD

The appearance inspection is performed in a dark room around 500~1000 lx based on the conditions as below:

- The distance between inspector's eyes and display is 30 cm.
- The viewing zone is defined with angle $\theta$ shown in Fig. 11.1 The inspection should be performed within $45^\circ$ when display is shutdown. The inspection should be performed within $5^\circ$ when display is power on.

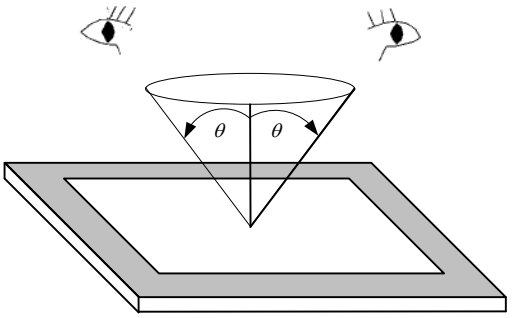



Fig. 11.1

## 11.1 THE DEFINITION OF LCD ZONE

LCD panel is divided into 3 areas as shown in Fig.11.2 for appearance specification in next section. A zone is the LCD active area (dot area); B zone is the area, between A zone and metal frame.

In terms of housing design, B zone is the recommended window area customers' housing should be located in.

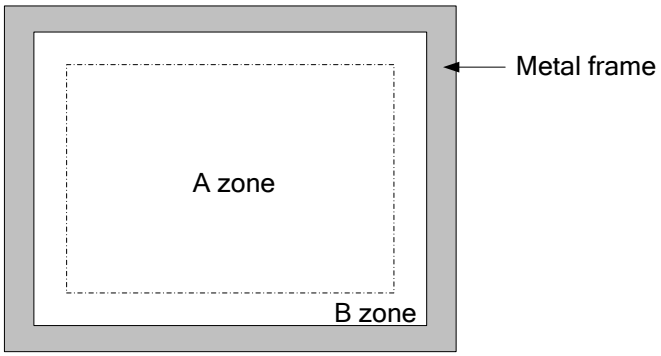



Fig. 11.2

## 11.2 LCD APPEARANCE SPECIFICATION

The specification as below is defined as the amount of unexpected phenomenon or material in different zones of LCD panel. The definitions of length, width and average diameter using in the table are shown in Fig. 11.4 and Fig. 11.5.

<table>
<tr><th>Item</th><th colspan="4">Criteria</th><th>Applied zone</th></tr>
<tr><td rowspan="4">Scratches</td><td>Length (mm)</td><td>Width (mm)</td><td>Maximum number</td><td>Minimum space</td><td rowspan="4">A, B</td></tr>
<tr><td>Ignored</td><td>W≦0.02</td><td>Ignored</td><td>-</td></tr>
<tr><td>L≦40</td><td>0.02＜W≦0.04</td><td>10</td><td>-</td></tr>
<tr><td>-</td><td>0.04＜W</td><td colspan="2">Not allowed</td></tr>
<tr><td>Dent</td><td colspan="4">Serious one is not allowed</td><td>A</td></tr>
<tr><td>Wrinkles in polarizer</td><td colspan="4">Serious one is not allowed</td><td>A</td></tr>
<tr><td rowspan="6">Bubbles on polarizer</td><td colspan="2">Average diameter (mm)</td><td colspan="2">Maximum number</td><td rowspan="6">A</td></tr>
<tr><td colspan="2">D≦0.2</td><td colspan="2">Ignored</td></tr>
<tr><td colspan="2">0.2＜D≦0.3</td><td colspan="2">12</td></tr>
<tr><td colspan="2">0.3＜D≦0.5</td><td colspan="2">3</td></tr>
<tr><td colspan="2">0.5＜D</td><td colspan="2">None</td></tr>
<tr><td rowspan="13">1) Stains<br>2) Foreign Materials<br>3) Dark Spot</td><td colspan="4">Filamentous (Line shape)</td><td rowspan="4">A, B</td></tr>
<tr><td>Length (mm)</td><td colspan="2">Width (mm)</td><td>Maximum number</td></tr>
<tr><td>L≦2.0</td><td colspan="2">W≦0.03</td><td>Ignored</td></tr>
<tr><td>L≦3.0</td><td colspan="2">0.03＜W≦0.05</td><td>6</td></tr>
<tr><td>L≦2.5</td><td colspan="2">0.05＜W≦0.1</td><td>1</td></tr>
<tr><td colspan="4">Round (Dot shape)</td><td rowspan="8">A, B</td></tr>
<tr><td>Average diameter (mm)</td><td>Maximum number</td><td colspan="2">Minimum Space</td></tr>
<tr><td>D＜0.2</td><td>Ignored</td><td colspan="2">-</td></tr>
<tr><td>0.2≦D＜0.3</td><td>10</td><td colspan="2">10 mm</td></tr>
<tr><td>0.3≦D＜0.4</td><td>5</td><td colspan="2">30 mm</td></tr>
<tr><td>0.4≦D</td><td>None</td><td colspan="2">-</td></tr>
<tr><td>In total</td><td colspan="3">Filamentous + Round=10</td></tr>
<tr><td colspan="4">Those wiped out easily are acceptable</td></tr>
<tr><td rowspan="8">Dot-Defect<br>(Note 1)</td><td></td><td>Type</td><td colspan="2">Maximum number</td><td rowspan="8">A</td></tr>
<tr><td rowspan="3">Bright dot-defect</td><td>1 dot</td><td colspan="2">4</td></tr>
<tr><td>2 dot</td><td colspan="2">1</td></tr>
<tr><td>In total</td><td colspan="2">5</td></tr>
<tr><td rowspan="3">Dark dot-defect</td><td>1 dot</td><td colspan="2">5</td></tr>
<tr><td>2 dot</td><td colspan="2">2</td></tr>
<tr><td>In total</td><td colspan="2">5</td></tr>
<tr><td colspan="2">In total</td><td colspan="2">10</td></tr>
</table>

Note 1: The Dot-Defect inspection within A zone (active area) would be divided into area ①, ② as Fig. 11.3 shown.

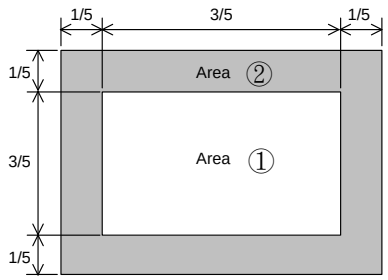



Fig. 11.3

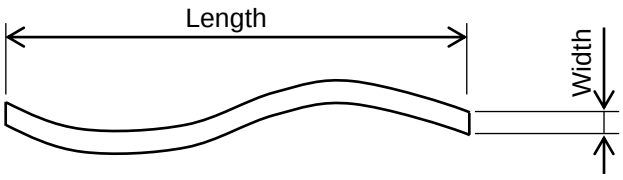
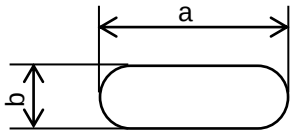



Fig 11.4




Average diameter = $\frac{a+b}{2}$

Fig 11.5

Note 2: The definitions of dot defect are as below:

- The defect area of the dot must be bigger than half of a dot.
- For bright dot-defect, showing black pattern, the dot's brightness must be over 30% brighter than others.
- For dark dot-defect, showing white pattern, the dot's brightness must be under 70% darker than others.
- The definition of 1-dot-defect is the defect-dot, which is isolated and no adjacent defect-dot.
- The definition of adjacent dot is shown as Fig. 11.6.

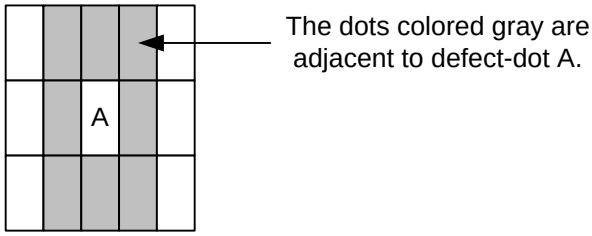



Fig. 11.6

# 12. PRECAUTIONS

## 12.1 PRECAUTIONS of ESD

1) Before handling the display, please ensure your body has been connected to ground to avoid any damages by ESD. Also, do not touch display's interface directly when assembling.

2) Please remove the protection film very slowly before turning on the display to avoid generating ESD.

## 11.2 PRECAUTIONS of HANDLING

1) In order to keep the appearance of display in good condition, please do not rub any surfaces of the displays by using sharp tools harder than 3H, especially touch panel, metal frame and polarizer.

2) Please do not stack the displays as this may damage the surface. In order to avoid any injuries, please avoid touching the edge of the glass or metal frame and wore gloves during handling.

3) Touching the polarizer or terminal pins with bare hand should be avoided to prevent staining and poor electrical contact.

4) Do not use any harmful chemicals such as acetone, toluene, and isopropyl alcohol to clean display's surfaces.

5) Please use soft cloth or absorbent cotton with ethanol to clean the display by gently wiping. Moreover, when wiping the display, please wipe it by horizontal or vertical direction instead of circling to prevent leaving scars on the display's surface, especially polarizer.

6) Please wipe any unknown liquids immediately such as saliva, water or dew on the display to avoid color fading or any permanent damages.

7) Maximum pressure to the surface of the display must be less than $1{,}96 \times 10^4$ Pa. If the area of applied pressure is less than $1\,cm^2$, the maximum pressure must be less than 1.96N.

## 12.3 PRECAUTIONS OF OPERATING

1) Please input signals and voltages to the displays according to the values defined in the section of electrical characteristics to obtain the best performance. Any voltages over than absolute maximum rating will cause permanent damages to this display. Also, any timing of the signals out of this specification would cause unexpected performance.

2) When the display is operating at significant low temperature, the response time will be slower than it at $25\,C^\circ$. In high temperature, the color will be slightly dark and blue compared to original pattern. However, these are temperature-related phenomenon of LCD and it will not cause permanent damages to the display when used within the operating temperature.

3) The use of screen saver or sleep mode is recommended when static images are likely for long periods of time. This is to avoid the possibility of image sticking.

4) Spike noise can cause malfunction of the circuit. The recommended limitation of spike noise is no bigger than $\pm$ 100 mV.

## 12.4 PRECAUTIONS of STORAGE

If the displays are going to be stored for years, please be aware the following notices.

1) Please store the displays in a dark room to avoid any damages from sunlight and other sources of UV light.
2) The recommended long term storage temperature is between 10℃~35℃ and 55%~75% humidity to avoid causing bubbles between polarizer and LCD glasses, and polarizer peeling from LCD glasses.
3) It would be better to keep the displays in the container, which is shipped from JDI, and do not unpack it.
4) Please do not stick any labels on the display surface for a long time, especially on the polarizer.

# 13. DESIGNATION of LOT MARK

1) The lot mark is showing in Fig.13.1. First 4 digits are used to represent production lot, T represented made in Taiwan, and the last 6 digits are the serial number.

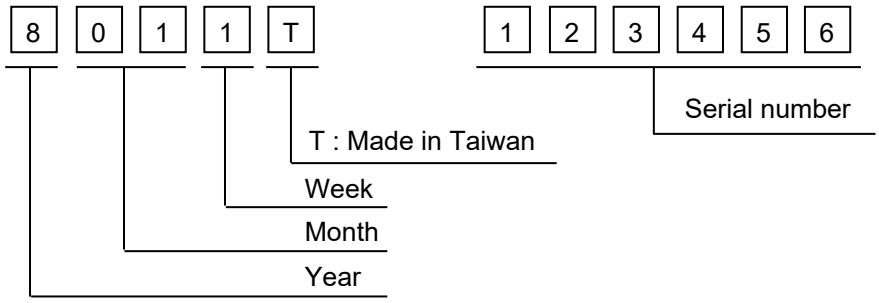



Fig. 13.1

2) The tables as below are showing what the first 4 digits of lot mark are shorted for.

| Year | Mark |
|---|---|
| 2018 | 8 |
| 2019 | 9 |
| 2020 | 0 |
| 2021 | 1 |
| 2022 | 2 |

| Month | Mark | Month | Mark |
|---|---|---|---|
| 1 | 01 | 7 | 07 |
| 2 | 02 | 8 | 08 |
| 3 | 03 | 9 | 09 |
| 4 | 04 | 10 | 10 |
| 5 | 05 | 11 | 11 |
| 6 | 06 | 12 | 12 |

| Week (Days) | Mark |
|---|---|
| 1~7 | 1 |
| 8~14 | 2 |
| 15~21 | 3 |
| 22~28 | 4 |
| 29~31 | 5 |

3) Except letters I and O, revision number will be showed on lot mark and following letters A to Z.

| REV No. | ITEM | REMARKS |
|---|---|---|
| A | - | - |
| B | Upper Frame Changed | - |

4) The location of the lot mark is on the back of the display.

Label example: