# SPECIFICATION
# FOR
# LCD Module
# RX070A-24

| | |
|---|---|
| **MODULE:** | **RX070A-24** |
| **CUSTOMER:** | |

| REV | DESCRIPTION | DATE |
|---|---|---|
| 1 | FIRST ISSUE | 2013.12.26 |
| | | |

| TZD | INITIAL | DATE |
|---|---|---|
| APREPARED BY | | |
| CHECKED BY | | |
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| CUSTOMER | INITIAL | DATE |
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| APPROVED BY | | |

## Revision History

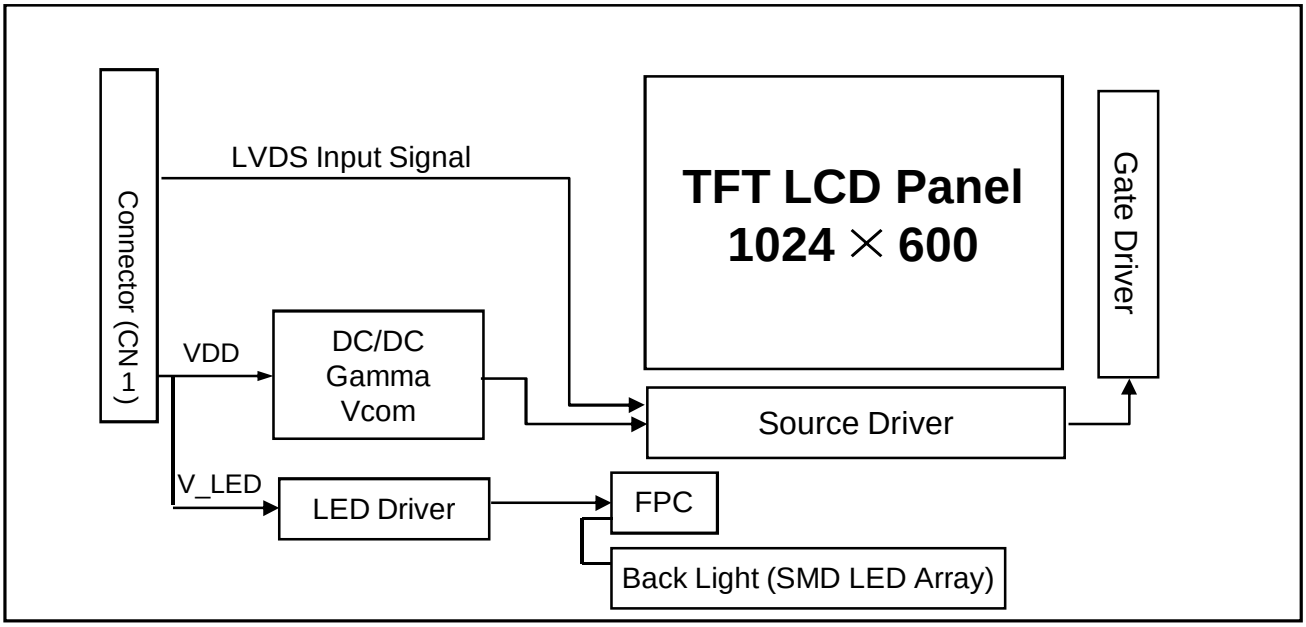
| Data | Rev. No. | Page | Summary |
|---|---|---|---|
| 2013.12.26 | 1.0 | | FIRST ISSUE |

# Contents

# 1.0 GENERAL DESCRIPTION

## 1.1 Introduction

RX070A-25 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 7.01 inch diagonally measured active area with WSVGA resolutions (1024 horizontal by 600 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.




## 1.2 Features

- 1 Channel LVDS Interface with 1 pixel / clock
- Thin and light weight
- Display 16.7M colors (Hi FRC)
- High luminance and contrast ratio, low reflection and wide viewing angle
- DE (Data Enable) signal mode
- 3.7V for Logic Power and LED Back Light Power
- RoHS Compliant

### 1.3 Application

- Tablet & Application Mini-PC (Wide Type)

### 1.4 General Specification

< Table 1. General Specifications >

| Parameter | Specification | Unit | Remarks |
|---|---|---|---|
| Active area | 153.6(H) × 90(V) | mm | |
| Number of pixels | 1024(H) ×600(V) | pixels | |
| Pixel pitch | 50(H) ×150(V)×RGB | ㎛ | |
| Pixel arrangement | Pixels RGB stripe arrangement | | |
| Display colors | 16.7M(6bits + H-FRC) | colors | |
| Display mode | Transmission mode, Normally Black | | |
| Outline Dimension | 165.0 (H) × 102.0 (V) × 3.4 (D) typ. | mm | |
| Weight | 90 (max) | gram | |
| Surface Treatment | Hard Coating, 3H, Low Reflection (Front Polarizer) | | |
| Back-light | Bottom edge side, 1-LED Lighting Bar Type | | 3*10 LED Array |

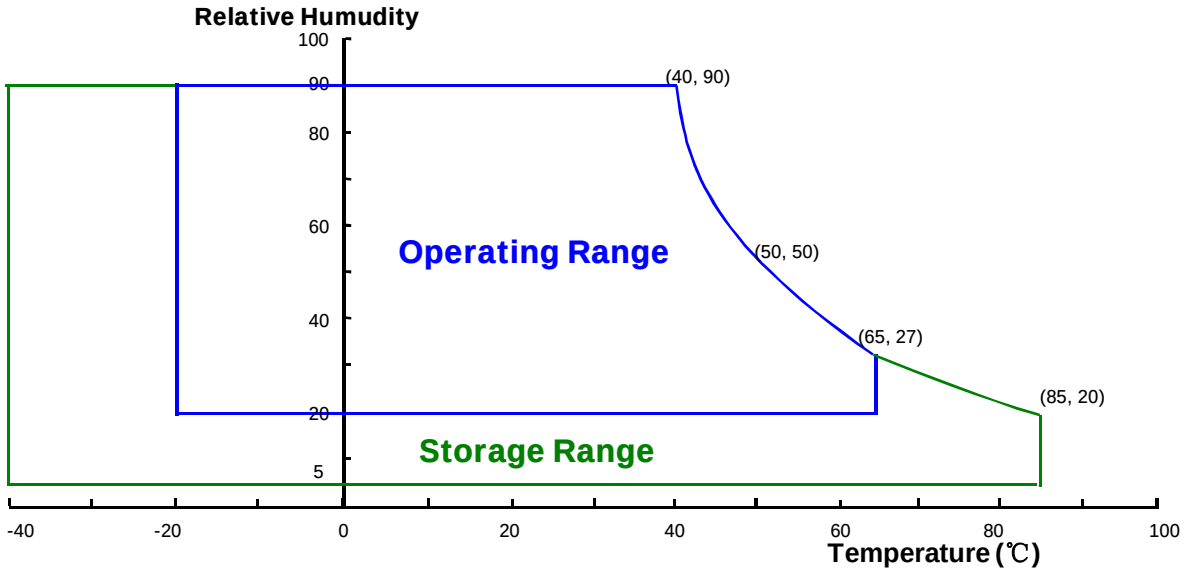
## 2.0 ABSOLUTE MAXIMUM RATINGS

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

< Table 2. LCD Module Electrical Specifications > [Ta =25±2 ℃]

| Parameter | Symbol | Min. | Max. | Unit | Remarks |
|---|---|---|---|---|---|
| Power Supply Voltage (LCD Module) | $V_{DD}$ | -0.3 | 4 | V | |
| Back-light Power Supply Voltage | $HV_{DD}$ | -0.3 | 40 | V | |
| Back-light LED Current | $I_{LED}$ | - | 443 | mA | |
| Back-light LED Reverse Voltage | $V_R$ | - | 2 | V | |
| Operating Temperature | $T_{OP}$ | -20 | +65 | ℃ | 1) |
| Storage Temperature | $T_{ST}$ | -40 | +85 | ℃ | |

Note : 1) Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 ℃ max. and no condensation of water.



# 3.0 ELECTRICAL SPECIFICATIONS

## 3.1 TFT LCD Module

< Table 3. LCD Module Electrical Specifications > [Ta =25±2 ℃]

| Parameter | Symbol | Values | | | Unit | Notes |
|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | |
| Power Supply Input Voltage | $V_{DD}$ | 3.2 | 3.7 | 4.2 | V | Note 1 |
| Power Supply Current | $I_{DD}$ | - | 220 | - | mA | |
| Back-light Power Supply Voltage | $H_{VDD}$ | 3.2 | 3.7 | 4.2 | V | Note 2 |
| Back-light Power Supply Current | $I_{HVDD}$ | - | 346 | - | mA | |
| LED Driver Efficiency | η | - | 82 | - | % | |
| Positive-going Input Threshold Voltage | $V_{IT+}$ | - | - | +100 | mV | Vcom = 1.2V typ. |
| Negative-going Input Threshold Voltage | $V_{IT-}$ | -100 | - | - | mV | |
| Differential input common mode voltage | $V_{com}$ | - | 1.2 | - | V | $V_{IH}$=100mV, $V_{IL}$=-100mV |
| Power Consumption | $P_D$ | - | 0.78 | | W | Note 1 |
| | $P_{BL}$ | | 1.54 | | W | Note 2 |
| | $P_{Total}$ | | 2.32 | | W | |

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.7V at 25 ℃
TYP : White Pattern

2. Calculated value for reference (VLED X ILED)

3. CTF of Power Supply Current: PD /PBL

### 3.2 Back-light Unit

< Table 4. LED Driving guideline specifications > Ta=25+/-2°C

| Parameter | | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| LED Forward Voltage | | $V_F$ | - | 3.15 | 3.4 | V | - |
| LED Forward Current | | $I_F$ | - | 18.8 | 20 | mA | - |
| LED Power Consumption | | $P_{LED}$ | - | 1.54 | 1.64 | W | Note 1 |
| LED Life-Time | | N/A | 15,000 | | | Hour | IF = 20mA<br>Note 2 |
| Power supply voltage for LED Driver | | $V_{LED}$ | 3.2 | 3.7 | 4.2 | V | |
| EN Control Level | Backlight on | | - | - | +100 | mV | |
| | Backlight off | | -100 | - | - | mV | |
| PWM Control Level | PWM High Level | | - | 2.8 | - | V | |
| | PWM Low Level | | - | 0 | 0.6 | V | |
| PWM Control Frequency | | $F_{PWM}$ | 5 | - | 100 | KHz | |
| Duty Ratio | | - | 90% | 93% | - | % | |

Notes : 1. Calculator Value for reference $I_{LED} \times V_{LED} = P_{LED}$

2. The LED Life-time define as the estimated time to 50% degradation of initial luminous.

# 4.0 OPTICAL SPECIFICATION

## 4.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θØ=0 (=θ3 ) as the 3 o'clock direction (the "right"), θØ=90 (= θ12 ) as the 12 o'clock direction ("upward"), θØ=180 (= θ9 ) as the 9 o'clock direction ("left") and θØ=270(= θ6 ) as the 6 o'clock direction ("bottom"). While scanning θand/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity should be tested by CA210. The backlight should be operating for 30 minutes prior to measurement. VDD shall be 3.7 ± 0.5V at 25°C. Optimum viewing angle direction is 6 'clock.

## 4.2 Optical Specifications

<Table 5. Optical Specifications>

| Parameter | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Viewing Angle range | Horizontal | $\Theta_3$ | CR > 10 | 70 | 80 | - | Deg. | Note 1 |
| | | $\Theta_9$ | | 70 | 80 | - | Deg. | |
| | Vertical | $\Theta_{12}$ | | 70 | 80 | - | Deg. | |
| | | $\Theta_6$ | | 70 | 80 | - | Deg. | |
| Color Gamut | | | | 46.7 | 51.7 | - | % | |
| Luminance Contrast ratio | | CR | Θ = 0° | 700 | 900 | | | Note 2 |
| Luminance of White | 5 Points | $Y_w$ | Θ = 0° | | 600 | - | $cd/m^2$ | Note 3 |
| White Luminance uniformity | 5 Points | ΔY5 | | 80 | 90 | - | | Note 4 |
| White balance | | Color Temp | Θ = 0° | 6000 | 7000 | 8000 | K | Note 5 |
| | | Δuv | | 0 | 0.01 | 0.02 | | |
| Reproduction of color | Red | $R_x$ | Θ = 0° | Typ. -0.03 | 0.600 | Typ. +0.03 | | |
| | | $R_y$ | | | 0.340 | | | |
| | Green | $G_x$ | | | 0.315 | | | |
| | | $G_y$ | | | 0.565 | | | |
| | Blue | $B_x$ | | | 0.145 | | | |
| | | $B_y$ | | | 0.125 | | | |
| Response Time (Rising + Falling) | | $T_{RT}$ | Ta= 25° C Θ = 0° | - | 30 | - | ms | Note 6 |
| Cross Talk | | CT | Θ = 0° | - | - | 2.0 | % | Note 7 |

Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Center Luminance of white is defined as luminance values of 5point average across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display. The luminance is measured by CA210 when the LED current is set at 18.8m.

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4. The White luminance uniformity on LCD surface is then expressed as : ΔY = Minimum Luminance of 5 points / Maximum Luminance of 5 points (see FIGURE 2).

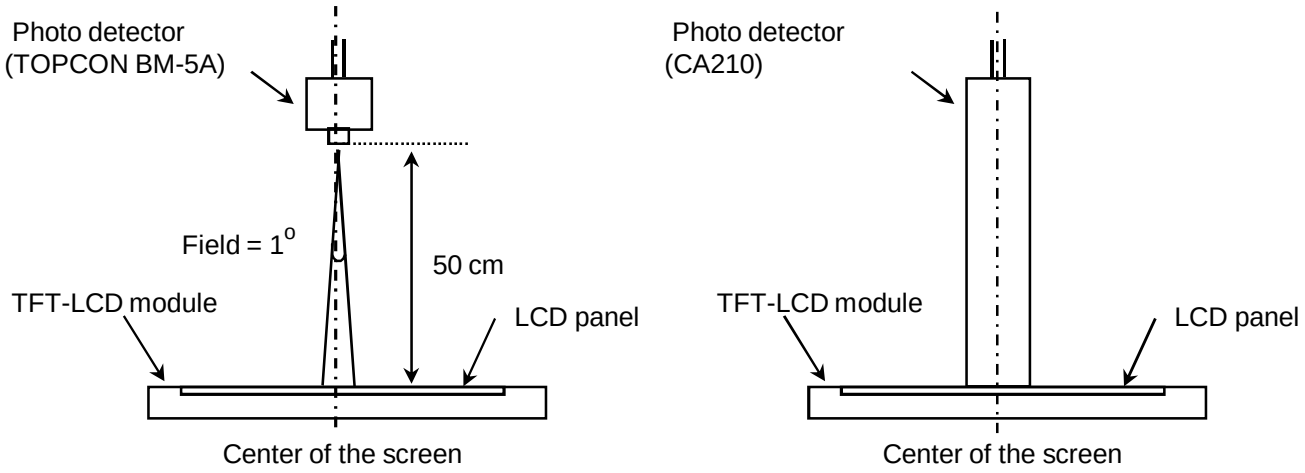
5. The color chromaticity coordinates specified in Table 5 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

6. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark. (See FIGURE 4).

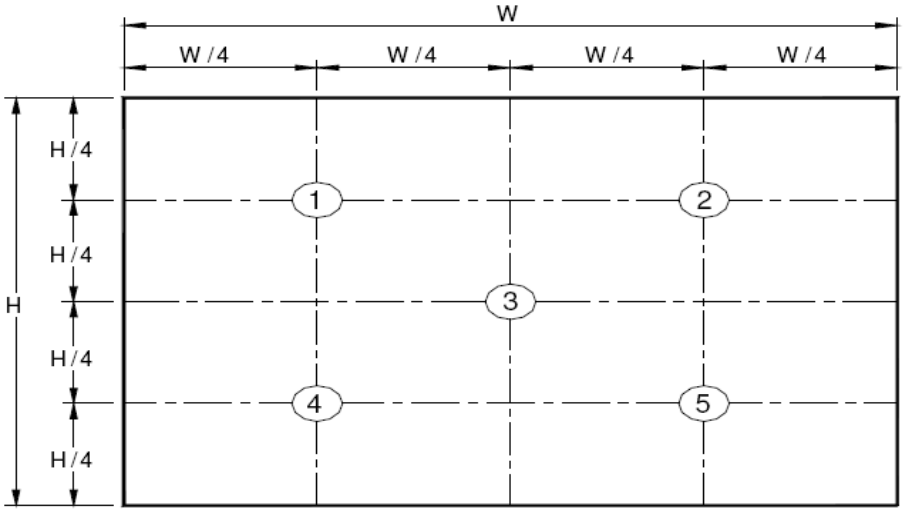
### 4.3 Optical measurements

**Figure 1. Measurement Set Up**



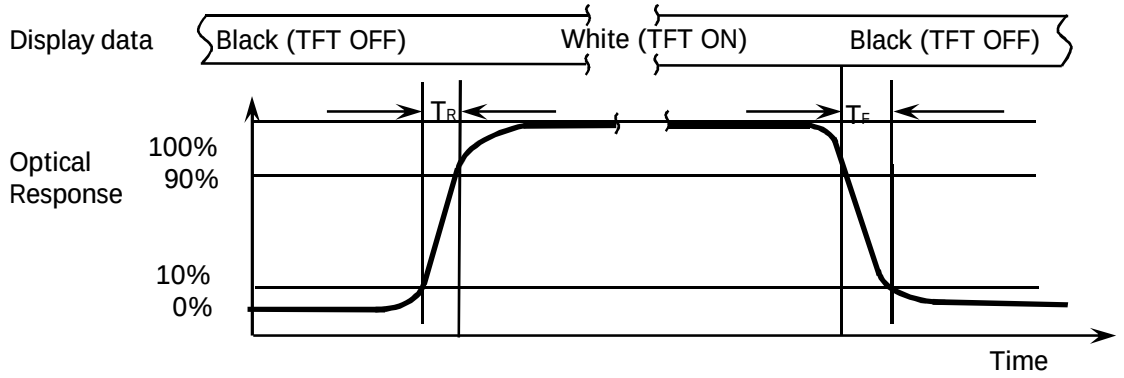

View angel range measurement setup  Luminance , uniformity and color measurement setup

**Figure 2. White Luminance and Uniformity Measurement Locations (9 points)**



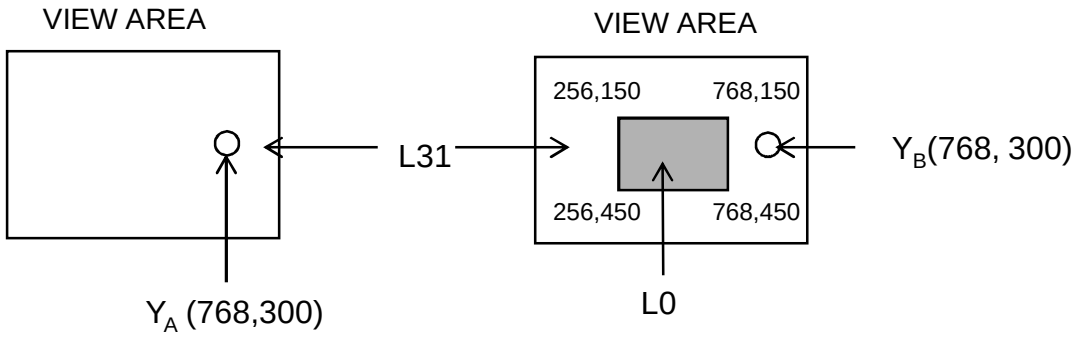

Center Luminance of white is defined as luminance values of center 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.
The White luminance uniformity on LCD surface is then expressed as : ΔY5 = Minimum Luminance of 5 points / Maximum Luminance of 5points (see FIGURE 2).

**Figure 3. Response Time Testing**




The electro-optical response time measurements shall be made as shown in FIGURE 3 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr and 90% to 10% is Td.

**Figure 4. Cross Modulation Test Description**




$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where:

$Y_A$ = Initial luminance of measured area (cd/m$^2$)
$Y_B$ = Subsequent luminance of measured area (cd/m$^2$)

The location measured will be exactly the same in both patterns

Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark (Refer to FIGURE 4).

## 5.0 INTERFACE CONNECTION.

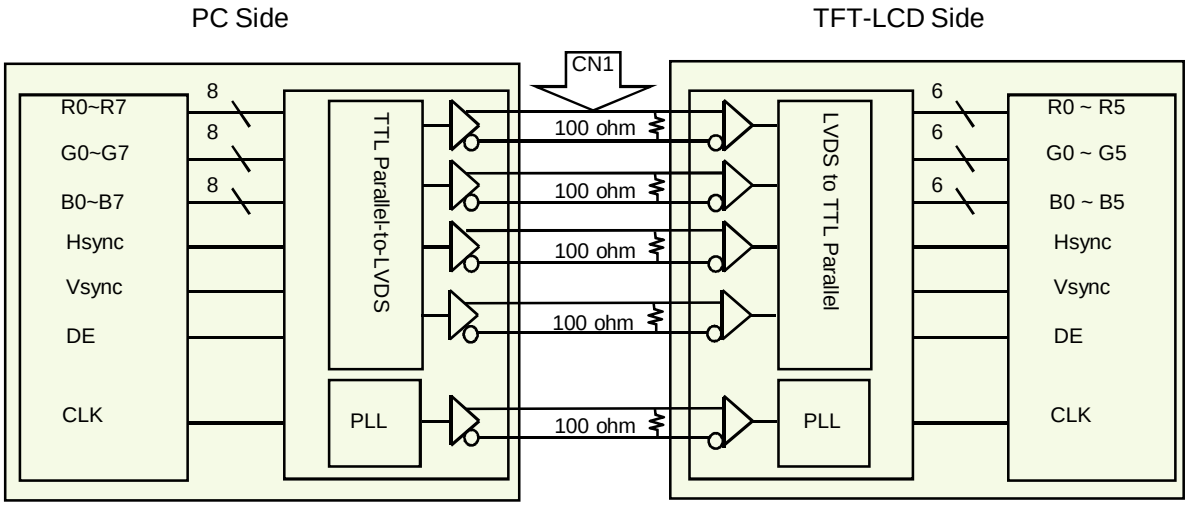
### 5.1 Electrical Interface Connection

The electronics interface connector is FF12-31A-R11B.
The connector interface pin assignments are listed in Table 6.

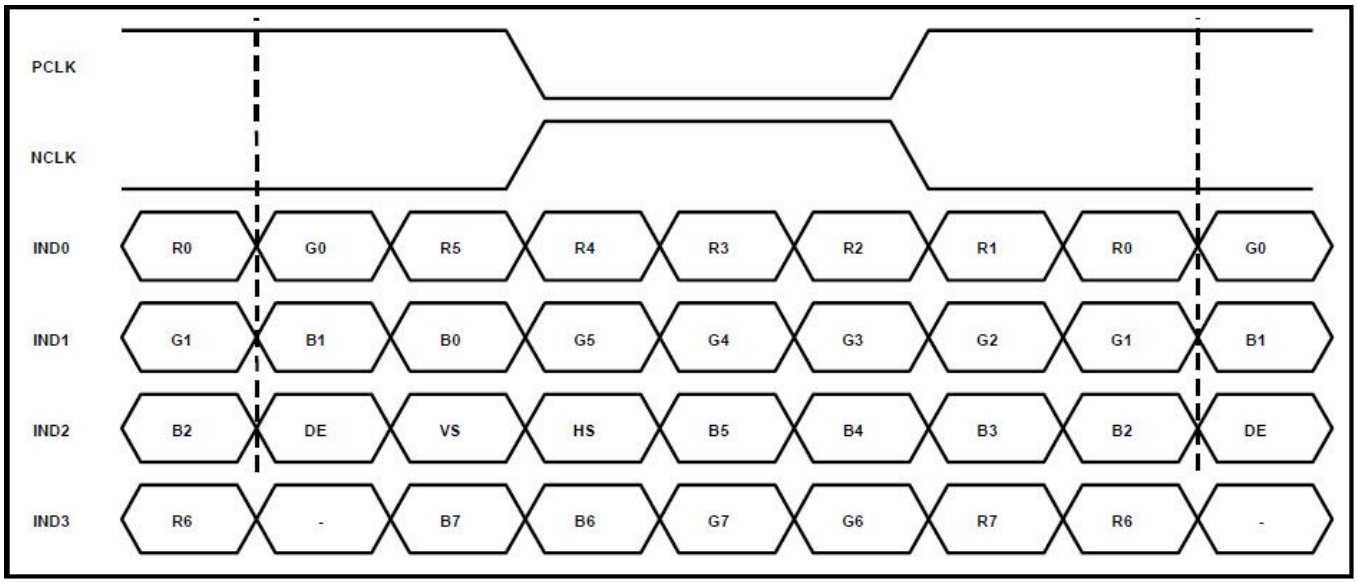
<Table 6. Pin Assignments for the Interface Connector>

| Terminal | Symbol | Functions |
|---|---|---|
| Pin No. | Symbol | Description |
| 1 | VDDIN | Power supply VDDIN=3.7V (Typ.) |
| 2 | VDDIN | |
| 3 | VDDIN | |
| 4 | VDDIN | |
| 5 | VDDIN | |
| 6 | VDDIN | |
| 7 | VDDIN | |
| 8 | NC | Non Connection |
| 9 | NC | Non Connection |
| 10 | LDO_EN | LDO enable for driver IC |
| 11 | GND | GROUND |
| 12 | GND | GROUND |
| 13 | RIN0- | LVDS Negative data signal (-) |
| 14 | RIN0+ | LVDS Positive data signal (+) |
| 15 | GND | GROUND |
| 16 | RIN1- | LVDS Negative data signal (-) |
| 17 | RIN1+ | LVDS Positive data signal (+) |
| 18 | GND | GROUND |
| 19 | RIN2- | LVDS Negative data signal (-) |
| 20 | RIN2+ | LVDS Positive data signal (+) |
| 21 | GND | GROUND |
| 22 | LVDS_CLK- | LVDS Negative CLK signal (-) |
| 23 | LVDS_CLK+ | LVDS Positive CLK signal (+) |
| 24 | GND | GROUND |
| 25 | RIN3- | LVDS Negative data signal (-) |
| 26 | RIN3+ | LVDS Positive data signal (+) |
| 27 | GND | GROUND |
| 28 | LED_EN | LED enable |
| 29 | GND | GROUND |
| 30 | DVDD | 1.5V Power |
| 31 | GND | GROUND |

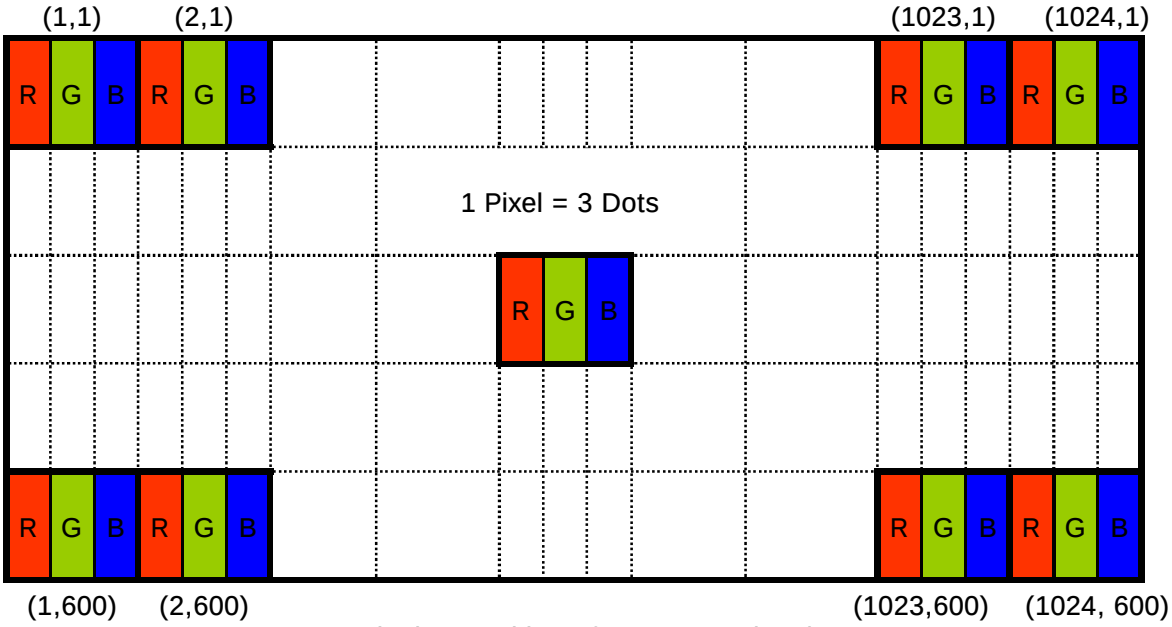
## 5-2. LVDS Interface




## 5.3.LVDS Input signal



### 5.4 Data Input Format




Display Position of Input Data (V-H)

## 6.0 SIGNAL TIMING SPECIFICATION

### 6.1 The RX070A-25 is operated by the DE only.

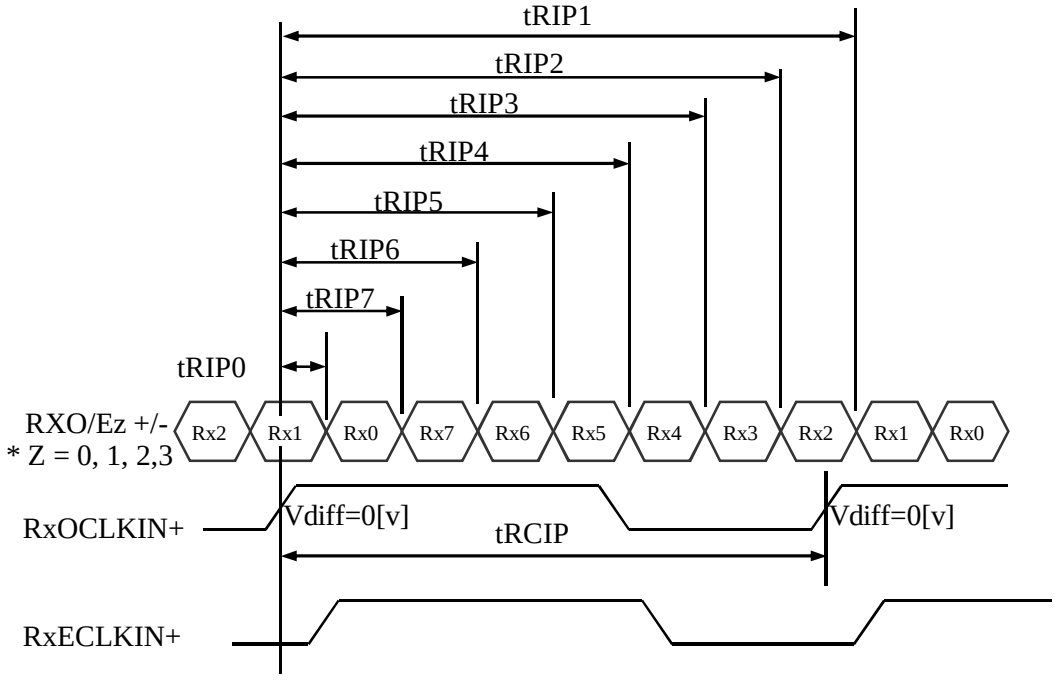
| Item | | Symbols | Min | Typ | Unit |
|---|---|---|---|---|---|
| Clock | Frequency | 1/Tc | 40.8 | 51.2 | MHz |
| | High Time | Tch | 40% | 50% | Tc |
| | Low Time | Tcl | 60% | 50% | Tc |
| Frame Period | | Tv | 610 | 635 | lines |
| | | | 60 | 60 | Hz |
| | | | 16.6 | 16.6 | ms |
| Vertical Display Period | | Tvd | 600 | 600 | lines |
| One line Scanning Period | | Th | 1114 | 1344 | clocks |
| Horizontal Display Period | | Thd | 1024 | 1024 | clocks |

### 6.2 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 8.

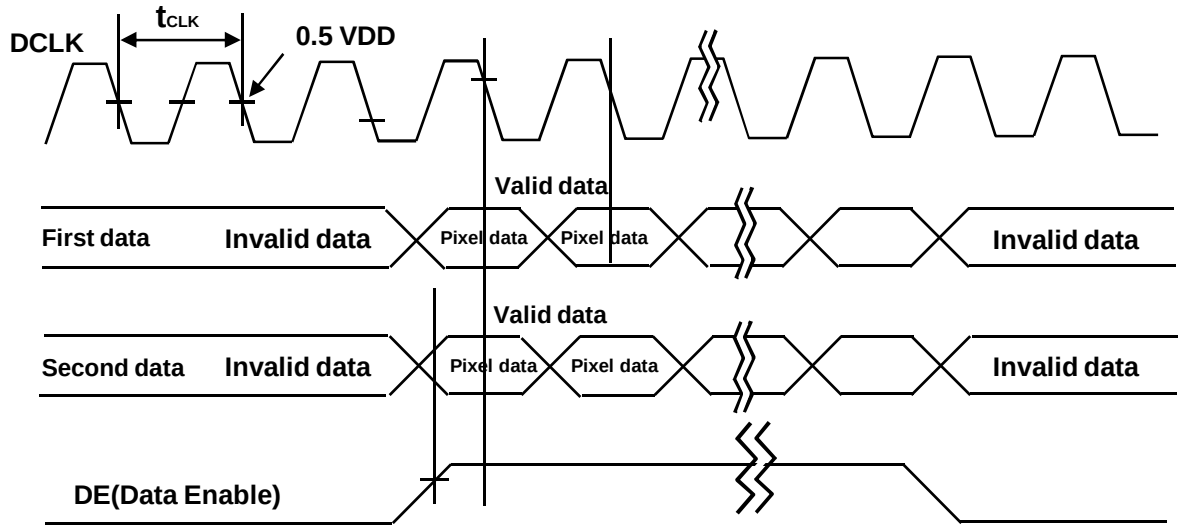
<Table 8. LVDS Rx Interface Timing Specification>

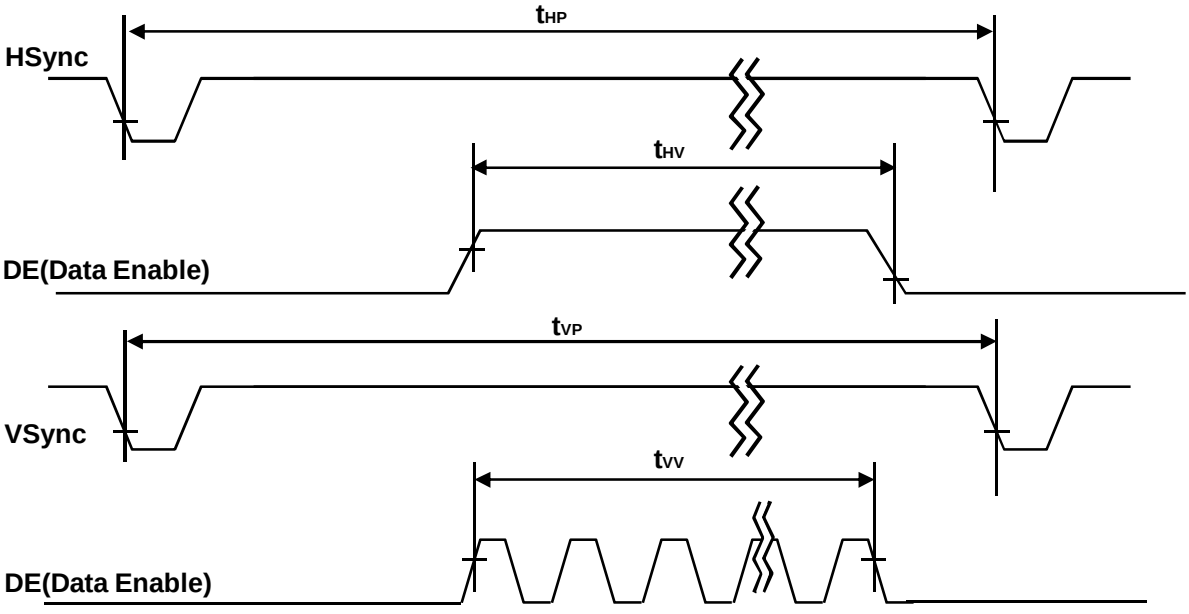
| Item | Symbol | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|
| CLKIN Period | tRCIP | 19.53 | 24.51 | nsec | |
| Input Data 0 | tRIP1 | 0.0 | +0.4 | nsec | |
| Input Data 1 | tRIP0 | tRICP/7 | tRICP/7+0.4 | nsec | |
| Input Data 2 | tRIP7 | 2 ×tRICP/7 | 2 ×tRICP/7+0.4 | nsec | |
| Input Data 3 | tRIP6 | 3 ×tRICP/7 | 3 ×tRICP/7+0.4 | nsec | |
| Input Data 4 | tRIP5 | 4 ×tRICP/7 | 4 ×tRICP/7+0.4 | nsec | |
| Input Data 5 | tRIP4 | 5 ×tRICP/7 | 5 ×tRICP/7+0.4 | nsec | |
| Input Data 6 | tRIP3 | 6 ×tRICP/7 | 6 ×tRICP/7+0.4 | nsec | |
| Input Data 7 | tRIP2 | 7 ×tRICP/7 | 7 ×tRICP/7+0.4 | nsec | |




* Vdiff = (RXO/Ez+)-(RXO/Ez-),…. ,(RXO/ECLK+)-(RXO/ECLK-)

## 7.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL



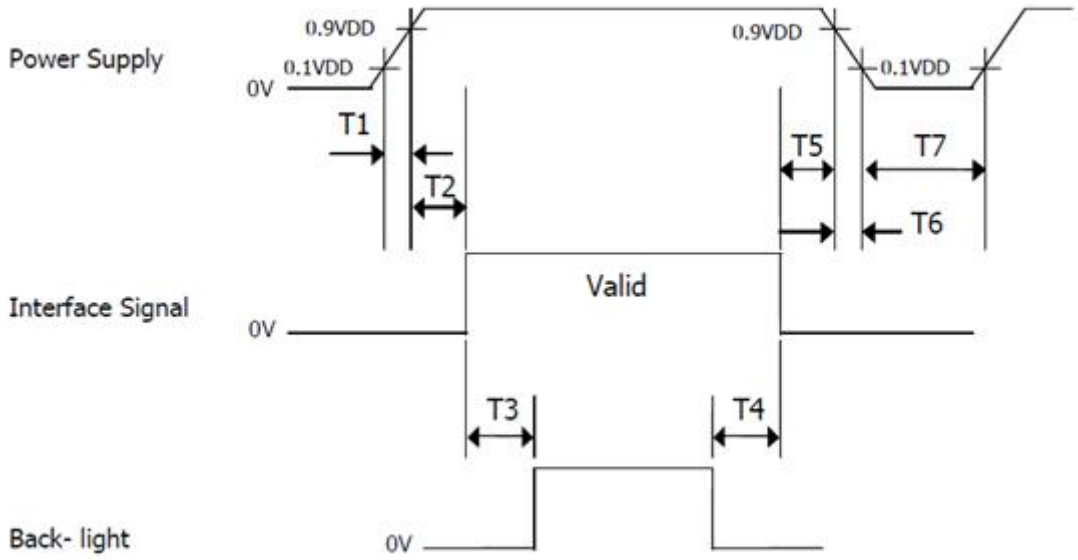



## 8.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

| Color & Gray Scale | | Input Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 |
| Basic Colors | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 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 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 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 |
| Gray Scale of 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 |
| | △ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ▽ | 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 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale of 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 |
| | △ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ▽ | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale of 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 |
| | △ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | ▽ | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale of White | 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 |
| | △ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | ▽ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 |

## 9.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below




| Parameter | Values | | | Units |
|---|---|---|---|---|
| | Min | Typ | Max | |
| T1 | 0.5 | - | 10 | ms |
| T2 | 0 | - | 50 | ms |
| T3 | 200 | - | - | ms |
| T4 | 200 | - | - | ms |
| T5 | 0.5 | - | 50 | ms |
| T6 | 0 | - | 10 | ms |
| T7 | 500 | - | - | ms |

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

## 10.0 Connector Description

Physical interface is described as for the connector on LCM.
These connectors are capable of accommodating the following signals and will be following components.

### 10.1 TFT LCD Module

| Connector Name /Description | For Signal Connector |
|---|---|
| Manufacturer | DDK or Compatible |
| Type/ Part Number | FF12-31A-R11B or Compatible |

### 10.2 LED Connector

| Pin No. | Symbol | For Signal Connector |
|---|---|---|
| 1 | VLEDP | LED Anode Power Supply |
| 2 | VLEDN1 | LED Cathode Power Supply |
| 3 | VLEDN2 | |
| 4 | VLEDN3 | |
| 5 | VLEDN4 | |

# 11.0 MECHANICAL CHARACTERISTICS

## 11.1 Dimensional Requirements

FIGURE 5 shows mechanical outlines for the model RX070A-25
Other parameters are shown in Table 9.

<Table 9. Dimensional Parameters>

| Parameter | Specification | Unit |
|---|---|---|
| Active Area | 153.6 (H) ×90 (V) | |
| Number of pixels | 1024(H) X600 (V) (1 pixel = R + G + B dots) | |
| Pixel pitch | 0.150 (H) X 0.150 (V) | |
| Pixel arrangement | RGB Vertical stripe | |
| Display colors | 16.7M | |
| Display mode | Normally Black | |
| Dimensional outline | 165 * 102 * 3.4 (Typ.) | mm |
| Weight | 90 (Max) | gram |
| Back-light | LED, Horizontal-LED Array type | |

## 11.2 Mounting

See FIGURE 6.

## 11.3 Glare and Polarizer Hardness.

The surface of the LCD has an low reflection coating and hard coating to reduce scratching.

## 11.4 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 150lux.

## 12.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

<Table 10. Reliability test>

| No | Test Items | Conditions |
|---|---|---|
| 1 | High temperature storage test | Ta = 85 ℃, 24 hrs |
| 2 | Low temperature storage test | Ta = -40 ℃, 24 hrs |
| 3 | High temperature & high humidity operation test | Ta = 60 ℃, 90%RH, 96 hrs |
| 4 | High temperature operation test | Ta = 60 ℃, 24 hrs |
| 5 | Low temperature operation test | Ta = -20 ℃, 24 hrs |
| 6 | Thermal shock | Ta = -40 ℃ ↔ 85 ℃ (2 hr), 30 cycle |

## 13.0 HANDLING & CAUTIONS

(1) Cautions when taking out the module
- Ÿ Pick the pouch only, when taking out module from a shipping package.

(2) Cautions for handling the module
- Ÿ As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- Ÿ As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- Ÿ As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Ÿ Do not pull the interface connector in or out while the LCD module is operating.
- Ÿ Put the module display side down on a flat horizontal plane.
- Ÿ Handle connectors and cables with care.

(3) Cautions for the operation
- Ÿ When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- Ÿ Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

(4) Cautions for the atmosphere

- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(5) Cautions for the module characteristics

- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

(6) Other cautions

- Do not disassemble and/or re-assemble LCD module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

## 14.0 PACKING INFORMATION

TBD

## 15.0 MECHANICAL OUTLINE DIMENSION