| | Spec No. | CPD-365200AB-01 |
|---|---|---|
| **SPEC for Mass Production** | Date | September 5, 2022 |

# TYPE : C0650VG65200-BT-AB

< 6.5 inch VGA transmissive color TFT
with LED backlight and touch panel>

## CONTENTS

1. Application
2. Construction and outline
3. Mechanical specifications
4. Absolute maximum ratings
5. Electrical characteristics
6. Optical characteristics
7. Interface signals
8. Input timing characteristics
9. Backlight characteristics
10. Design guidance for analog touch panel
11. Lot number identification
12. Warranty
13. Precautions for use
14. Reliability test data
15. Visuals specification
16. Outline drawing

Issued
Sept. 9, 2022
KYOCERA Corp.

KYOCERA CORPORATION

This specification is subject to change without notice.
Consult Kyocera before ordering.

| Original Issue Date | Designed by: Engineering dept. | | | Confirmed by: QA dept. | |
|---|---|---|---|---|---|
| | Prepared | Checked | Approved | Checked | Approved |
| September 5, 2022 | K. Komurasaki | I. Kawajiri | A. Iwasaki | Y. Aritsubo | M. Aoyama |

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# Warning

1. This Kyocera LCD module has been specifically designed for use only in electronic devices and industrial machines in the area of audio control, office automation, industrial control, home appliances, etc. The module should not be used in applications where the highest level of safety and reliability are required and module failure or malfunction of such module results in physical harm or loss of life, as well as enormous damage or loss. Such fields of applications include, without limitation, medical, aerospace, communications infrastructure, atomic energy control. Kyocera expressly disclaims any and all liability resulting in any way to the use of the module in such applications.

2. Customer agrees to indemnify, defend and hold Kyocera harmless from and against any and all actions, claims, damages, liabilities, awards, costs, and expenses, including legal expenses, resulting from or arising out of Customer's use, or sale for use, or Kyocera modules in applications.

# Caution

1. Kyocera shall have the right, which Customer hereby acknowledges, to immediately scrap or destroy tooling for Kyocera modules for which no Purchase Orders have been received from the Customer in a two-year period.

2. Please note that we may not be able to respond to new environmental regulations after receiving the final mass production order for this product.

## Revision record

| Date | Designed by : Engineering dept. | | | Confirmed by : QA dept. | |
|---|---|---|---|---|---|
| | Prepared | Checked | Approved | Checked | Approved |
| | | | | | |

| Rev.No. | Date | Page | Descriptions |
|---|---|---|---|
| | | | |

## 1. Application

This document defines the specification of C0650VG65200-BT-AB.  (RoHS Compliant)

## 2. Construction and outline

| | |
| --- | --- |
| LCD | : Transmissive color dot matrix type TFT |
| Backlight system | : LED |
| Polarizer | : Anti-Glare treatment |
| Additional circuit | : Timing controller, Power supply (3.3V input)<br>   (without constant current circuit for LED Backlight) |
| Touch panel | : Analog type, Anti-Glare treatment |

## 3. Mechanical specifications

3-1. LCD

| Item | Specification | Unit |
| --- | --- | --- |
| Outline dimensions   1) | 158.0(W)×120.36(H)×12.15(D) | mm |
| Active area | 132.5(W)×99.4(H)<br>(16.5cm/6.5 inch(Diagonal)) | mm |
| Dot format | 640×(R,G,B)(W)×480(H) | dot |
| Dot pitch | 0.069(W)×0.207(H) | mm |
| Base color          2) | Normally White | - |
| Mass | 280 | g |

1) Projection not included. Please refer to outline for details.
2) Due to the characteristics of the LCD material, the color varies with environmental temperature.

3-2. Touch panel

| Item | Specification | Unit |
| --- | --- | --- |
| Input | Radius-0.8 stylus or Finger | - |
| Actuation Force | 10~100 | g |

# 4. Absolute maximum ratings

### 4-1. Electrical absolute maximum ratings

| Item | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Supply voltage | | $V_{CC}$ | 0 | 5.5 | V |
| Input signal voltage | 1) | $V_{IN}$ | -0.3 | 5.5 | V |
| LED forward current | 2) 3) | IF | - | 150 | mA |
| Supply voltage for touch panel | | $V_{TP}$ | - | 5.5 | V |

1) Input signal : CK, R0~R5, G0~G5, B0~B5, $H_{SYNC}$, $V_{SYNC}$, ENAB, R/L, U/D
2) For each "AN-CA"
3) Do not apply reversed voltage.

### 4-2. Environmental absolute maximum ratings

| Item | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Operating temperature | 1) | $T_{OP}$ | -20 | 70 | °C |
| Storage temperature | 2) | $T_{STO}$ | -20 | 70 | °C |
| Operating humidity | 3) | $H_{OP}$ | 10 | 4) | %RH |
| Storage humidity | 3) | $H_{STO}$ | 10 | 4) | %RH |
| Vibration | | - | 5) | 5) | - |
| Shock | | - | 6) | 6) | - |

1) Operating temperature means a temperature which operation shall be guaranteed. Since display
   performance is evaluated at 25°C, another temperature range should be confirmed.
2) Temp. = -20°C＜48h , Temp. = 70°C＜168h
   Store LCD at normal temperature/humidity.   Keep them free from vibration and shock.
   An LCD that is kept at a low or a high temperature for a long time can be defective due to
   other conditions, even if the low or high temperature satisfies the standard.
   (Please refer to "Precautions for Use" for details.)
3) Non-condensing
4) Temp.≦40°C, 85%RH Max.
   Temp.＞40°C, Absolute humidity shall be less than 85%RH at 40°C.
5)

| Frequency | 10~55 Hz | Acceleration value |
|---|---|---|
| Vibration width | 0.15mm | ($0.3$~$9$ m/s$^2$) |
| Interval | 10-55-10 Hz    1 minute | |

   2 hours in each direction X, Y, Z (6 hours total)
   EIAJ ED-2531
6) Acceleration: 490 m/s$^2$, Pulse width: 11 ms
   3 times in each direction: ±X, ±Y, ±Z
   EIAJ ED-2531

# 5. Electrical characteristics
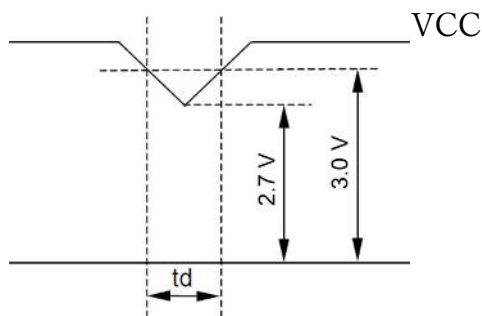
5-1. LCD

Temp. = 25°C

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
| --- | --- | --- | --- | --- | --- | --- |
| Supply voltage          1) | $V_{CC}$ | - | 3.0 | 3.3 | 3.6 | V |
| Current consumption | $I_{CC}$ | 2) | - | 120 | 160 | mA |
| Permissive input ripple voltage | $V_{RP}$ | - | - | - | 100 | mVp-p |
| Input signal voltage | $V_{IL}$ | "Low" level | - | - | 0.8 | V |
| | $V_{IH}$ | "High" level | 2.7 | - | 3.0 | V |

1) VCC-dip conditions:

　　When 2.7 V ≤ VCC < 3.0 V, td ≤ 10 ms
　　When VCC < 2.7 V
　　VCC-dip conditions should also follow the power and signals sequence.



2) Display pattern:
　　　$V_{DD}$ = 3.3V, Temp. = 25°C
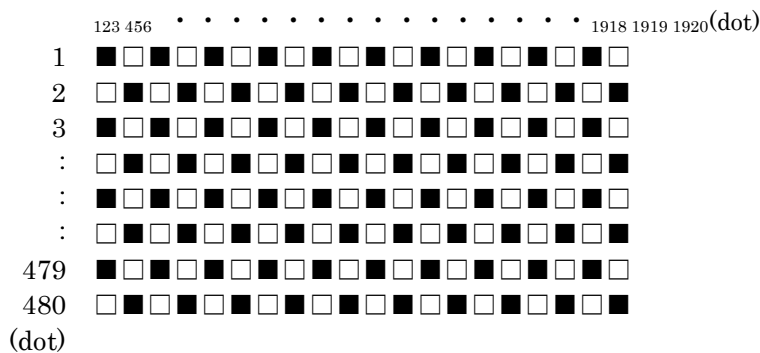


5-2. Touch panel

| Item | Specification |
| --- | --- |
| Supply voltage for touch panel | 5V |
| Terminal resistance | xL～xR : 300Ω～1,000Ω |
| | yU～yL : 100Ω～500Ω |
| Linearity | less than ±1.5%(when calibrated with 4 points) |
| Insulation resistance | 10MΩ or more at DC25V |

# 6. Optical characteristics

Measuring spot = $\phi$ 6.0mm, Temp. = 25°C

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Response time | Rise | $\tau_r$ | $\theta=\phi=0°$ | - | 15 | - | ms |
| | Down | $\tau_d$ | $\theta=\phi=0°$ | - | 16 | - | ms |
| Viewing angle range View direction : 6 o'clock (Gray inversion) | $\theta_{UPPER}$ | | CR > 10 | - | 50 | - | deg. |
| | $\theta_{LOWER}$ | | | - | 70 | - | |
| | $\phi_{LEFT}$ | | | - | 80 | - | deg. |
| | $\phi_{RIGHT}$ | | | - | 80 | - | |
| Contrast ratio | | CR | $\theta=\phi=0°$ | 400 | 800 | - | - |
| Brightness | | L | IF=35mA/Line | 560 | 800 | - | cd/m² |
| Chromaticity coordinates | Red | x | $\theta=\phi=0°$ | 0.555 | 0.605 | 0.655 | - |
| | | y | | 0.300 | 0.350 | 0.400 | |
| | Green | x | $\theta=\phi=0°$ | 0.275 | 0.325 | 0.375 | |
| | | y | | 0.515 | 0.565 | 0.615 | |
| | Blue | x | $\theta=\phi=0°$ | 0.100 | 0.150 | 0.200 | |
| | | y | | 0.080 | 0.130 | 0.180 | |
| | White | x | $\theta=\phi=0°$ | 0.260 | 0.310 | 0.360) | |
| | | y | | 0.285 | 0.335 | 0.385 | |

6-1. Definition of contrast ratio

$$CR(Contrast\ ratio) = \frac{Brightness\ with\ all\ pixels\ "White"}{Brightness\ with\ all\ pixels\ "Black"}$$

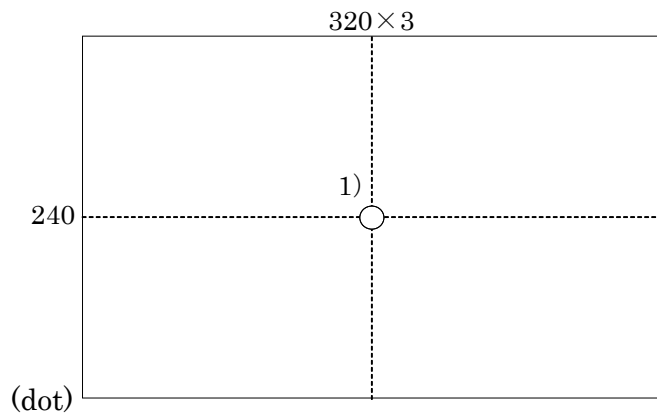6-2. Definition of response time



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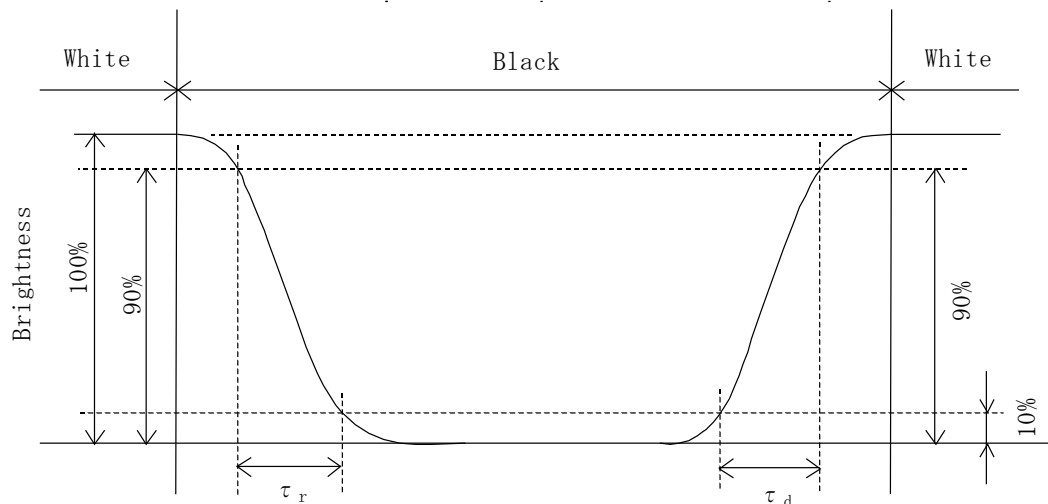
6-3. Definition of viewing angle



$\theta$ direction

$\phi$ direction
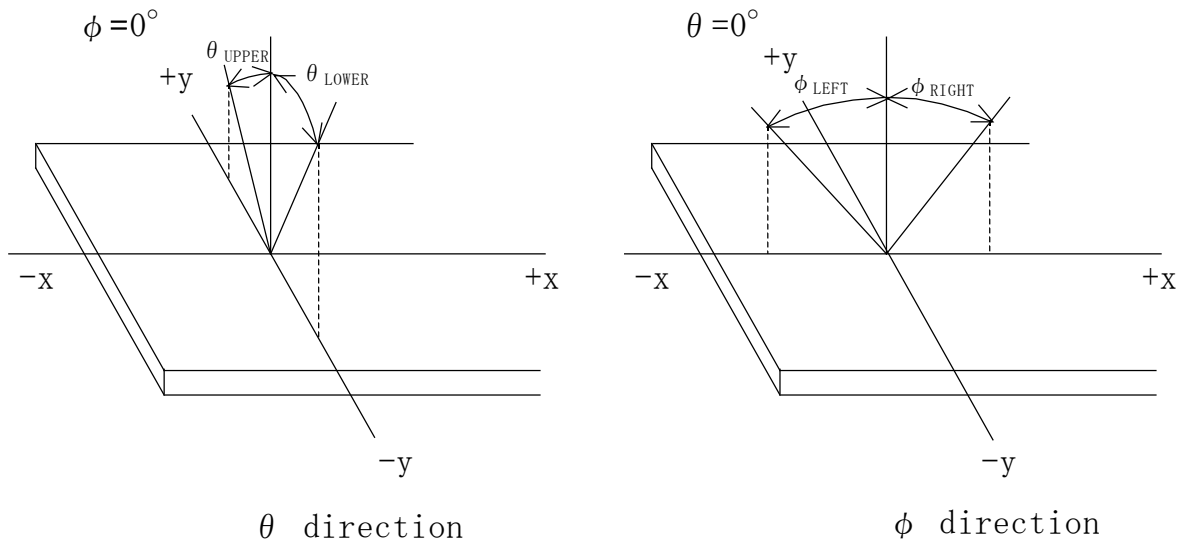
6-4. Brightness measuring point



1) Rating is defined as the white brightness at center of display screen.
2) Measured 5 minutes after the LED is powered on. (Ambient temp. = 25°C)

# 7. Interface signals

### 7-1. LCD

| No. | Symbol | Description |
|---|---|---|
| 1 | GND | |
| 2 | DCLK | Clock signal for sampling catch data signal |
| 3 | HD | Horizontal sync signal |
| 4 | VD | Vertical sync signal |
| 5 | GND | |
| 6 | R0 | Red data signal(LSB) |
| 7 | R1 | Red data signal |
| 8 | R2 | Red data signal |
| 9 | R3 | Red data signal |
| 10 | R4 | Red data signal |
| 11 | R5 | Red data signal(MSB) |
| 12 | GND | |
| 13 | G0 | Green data signal(LSB) |
| 14 | G1 | Green data signal |
| 15 | G2 | Green data signal |
| 16 | G3 | Green data signal |
| 17 | G4 | Green data signal |
| 18 | G5 | Green data signal(MSB) |
| 19 | GND | |
| 20 | B0 | Blue data signal(LSB) |
| 21 | B1 | Blue data signal |
| 22 | B2 | Blue data signal |
| 23 | B3 | Blue data signal |
| 24 | B4 | Blue data signal |
| 25 | B5 | Blue data signal(MSB) |
| 26 | GND | |
| 27 | DENA | Data enable signal(to settle the viewing area) |
| 28 | VCC | Power Supply (DC 3.3V) |
| 29 | VCC | Power Supply (DC 3.3V) |
| 30 | TEST | This pin should be open. Test signal output for only internal test use. |
| 31 | REV | Reverse scan control. L = Normal, H = Reverse |

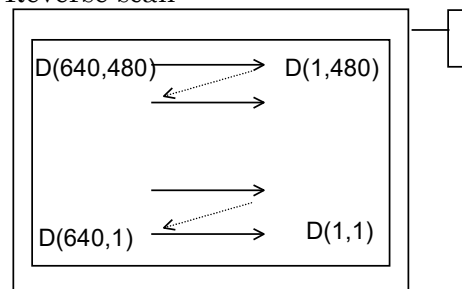\*) The shielding case is connected with GND

  LCD connector          :  DF9B-31P-1V(32) (HIROSE)

  Matching connector    :  DF9B-31S-1V (HIROSE)

Normal scan

D(1,1) → D(640,1)

D(1,480) → D(640,480)

Reverse scan

D(640,480) → D(1,480)

D(640,1) → D(1,1)
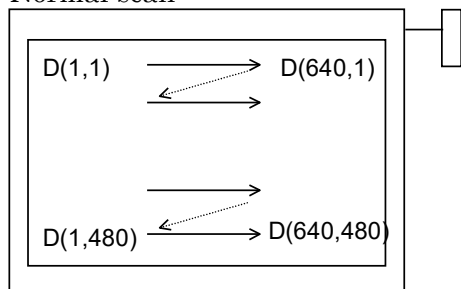
7-2.　LED

CN2

| No. | Symbol | Description |
|-----|--------|-------------|
| 1 | ANODE-1(RED) | LED Anode Terminal |
| 2 | ANODE-2(RED) | LED Anode Terminal |
| 3 | NC | Non Connection |
| 4 | NC | Non Connection |
| 5 | CATHODE-1(BLACK) | LED Cathode Terminal |
| 6 | CATHODE-2(BLACK) | LED Cathode Terminal |

LCD side connector　　　　　:　SHLP-06V-S-B　　　　　(JST)

Recommended matching connector

　　　　　　　　　　:　SM06B-SHLS-TF(LF)(SN)　　(JST)

CN3

| No. | Symbol | Description |
|-----|--------|-------------|
| 1 | ANODE-3(RED) | LED Anode Terminal |
| 2 | ANODE-4(RED) | LED Anode Terminal |
| 3 | NC | Non Connection |
| 4 | NC | Non Connection |
| 5 | CATHODE-3(BLACK) | LED Cathode Terminal |
| 6 | CATHODE-4(BLACK) | LED Cathode Terminal |

LCD side connector　　　　　:　SHLP-06V-S-B　　　　　(JST)

Recommended matching connector

　　　　　　　　　　:　SM06B-SHLS-TF(LF)(SN)　　(JST)

7-3. Touch panel

| No. | Symbol | Description |
|-----|--------|-------------|
| 1 | xL | x-Left terminal |
| 2 | yL | y-Lower terminal |
| 3 | xR | x-Right terminal |
| 4 | yU | y-Upper terminal |

Touch panel side connector　　:　1mm pitch

## 8. Input timing characteristics

8-1. Timing characteristics

| Item | | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| DCLK | Frequency | $f_{CLK}$ | 23.3 | 25.0 | 30.0 | MHz |
| | Period | $t_{CLK}$ | 33.3 | 40.0 | 42.9 | ns |
| | Low Width | $t_{WCL}$ | 12 | - | - | ns |
| | High Width | $t_{WCH}$ | 12 | - | - | ns |
| DATA<br>(R,G,B,DENA) | Set up time | $t_{DS}$ | 8 | - | - | ns |
| | Hold time | $t_{DH}$ | 16 | - | - | ns |
| DENA | Horizontal display area | $t_{HA}$ | 640 | 640 | 640 | $t_{CLK}$ |
| | Horizontal blanking time | $t_{HBP}+t_{HFP}$ | 120 | 154 | 640 | $t_{CLK}$ |
| | Horizontal period | $t_H$ | 760 | 794 | 1280 | $t_{CLK}$ |
| | Vertical display area | $t_{VA}$ | 480 | 480 | 480 | $t_H$ |
| | Vertical blanking time | $t_{VBP}+t_{VFP}$ | 30 | 45 | 80 | $t_H$ |
| | Vertical period | $t_V$ | 510 | 525 | 560 | $t_H$ |
| Display frame rate | | $f_R$ | 55 | 60 | 70 | Hz |

[Note]

1) DATA is latched at fall edge of DCLK in this timing specification.
2) DENA (Data Enable) should always be positive polarity as shown in the timing specification.
3) Accepted only 640 data and 480 lines.
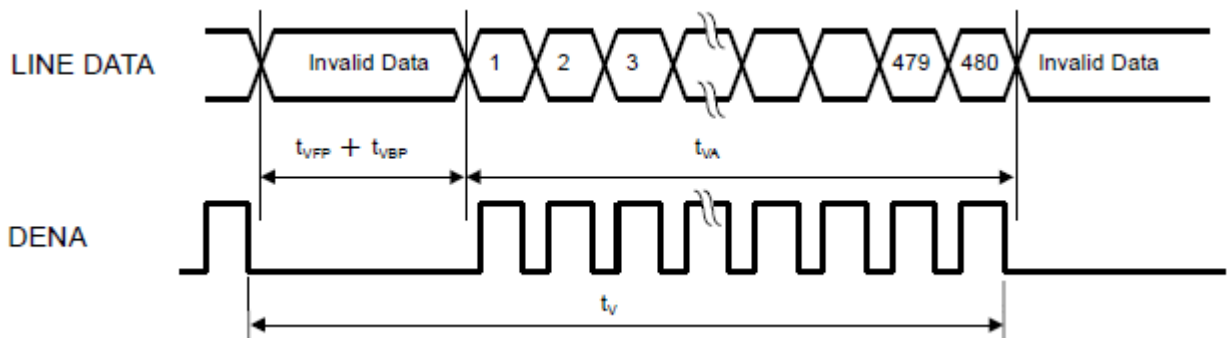4) REV should be stable during operation.

8-2. Timing chart

a. Pixel timing chart
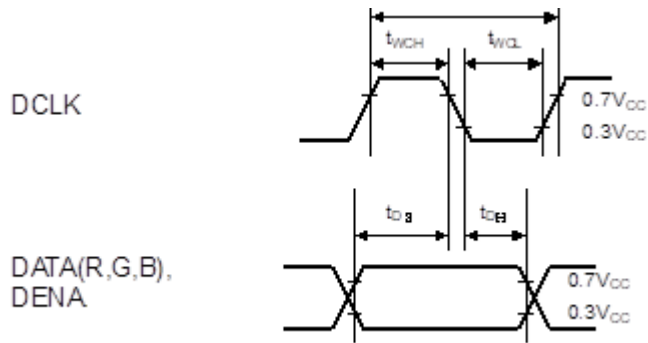


b. Horizontal timing chart
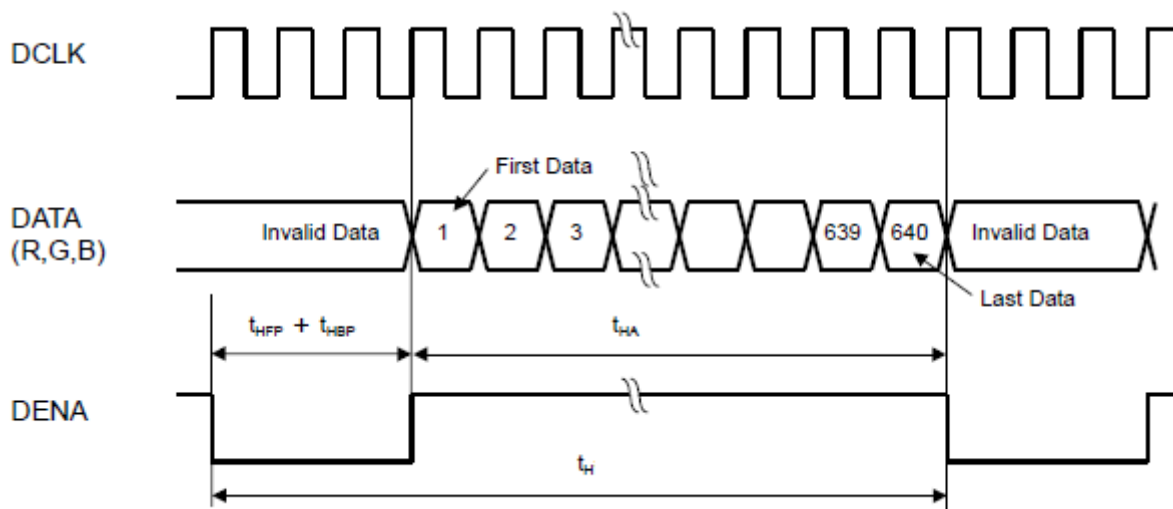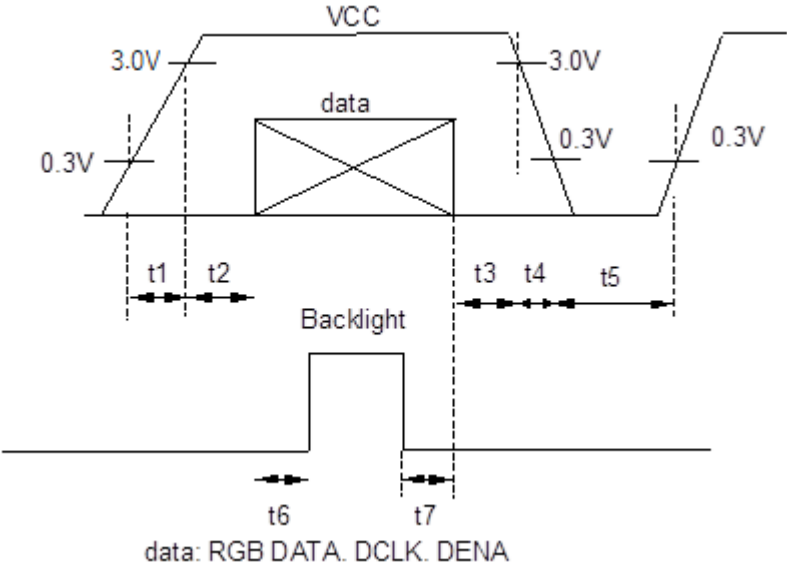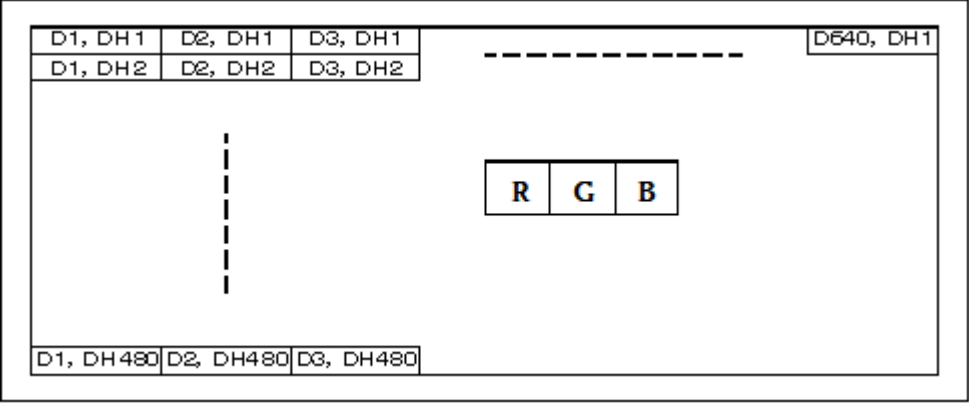


c. Vertical timing chart

8-3. Power and signals sequence

$$t1 \leq 10 \text{ ms} \qquad 200 \text{ ms} < t6$$
$$150 \text{ ms} \leq t2 \leq 190 \text{ ms} \qquad 0 \leq t7$$
$$t3 \leq 50 \text{ ms}$$
$$t4 \leq 50 \text{ ms}$$
$$500 \text{ ms} \leq t5$$

VCC

3.0V ———— 3.0V

data

0.3V      0.3V    0.3V

0.3V

t1   t2          t3   t4    t5

Backlight

t6          t7

data: RGB DATA. DCLK. DENA

8-4. Input data signals and display position on the screen

| D1, DH1 | D2, DH1 | D3, DH1 | | | D640, DH1 |
| D1, DH2 | D2, DH2 | D3, DH2 | | | |

R | G | B

| D1, DH480 | D2, DH480 | D3, DH480 |

## 8-5. Color data assignment

| COLOR | INPUT DATA | R DATA<br>MSB R5 | R4 | R3 | R2 | R1 | LSB R0 | G DATA<br>MSB G5 | G4 | G3 | G2 | G1 | LSB G0 | B DATA<br>MSB B5 | B4 | B3 | B2 | B1 | LSB B0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIC COLOR | BLACK | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED (63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN (63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | BLUE (63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | CYAN | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | MAGENTA | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | YELLOW | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 |
| RED | RED (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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED (2) | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | RED (62) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED (63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GREEN | GREEN (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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | GREEN (62) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN (63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| BLUE | BLUE (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 | 1 |
| | BLUE (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | BLUE (62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | BLUE (63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

[Note]

1) Definition of gray scale

   Color (n) --- n indicates gray scale level.

   Higher n means brighter level.

2) Data  1: High, 0: Low

## 9. Backlight characteristics

| Item | | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Forward current | 1) | IF | - | 35 | - | mA | Ta=-20～70°C |
| Forward voltage | 1) | VF | - | 24.0 | 27.2 | V | IF=35mA, Ta=-20℃ |
| | | | - | 22.4 | 25.6 | V | IF=35mA, Ta=25℃ |
| | | | - | 21.5 | 24.7 | V | IF=35mA, Ta=70℃ |
| Operating life time | 2), 3) | T | - | 70,000 | - | h | IF=35mA, Ta=25℃ |

1) For each "AN-CA"

2) When brightness decrease 50% of minimum brightness.

3) Life time is estimated data. (Condition : IF=35mA, Ta=25℃ in chamber).

4) An input current below 8.0mA may reduce the brightness uniformity of the LED backlight.
   This is because the amount of light from each LED chip is different. Therefore, please evaluate carefully
   before finalizing the input current.

## 10. Design guidance for analog touch panel

10-1. Electrical (In customer's design, please remember the following considerations.)
1) Do not use the current regulated circuit.
2) Keep the current limit with top and bottom layer.
   (Please refer to "Electrical absolute maximum ratings" for details.)
3) Analog touch panel cannot sense two points touching separately.
4) A contact resistance is appeared at the touch point between top and bottom layer. After this resistance has stable read of the touch panel position data.
5) Because noise of inverter or peripheral circuits may interfere signal of touch panel itself it is necessary to design carefully in advance to avoid these noise problem.

10-2. Software
1) Do the "User Calibration".
2) "User Calibration" may be needed with long term using. Include "User Calibration" menu in your software.
3) When drawing a line with a stylus, there may be a slight discontinuity when the stylus passes over a spacer-dot. If necessary, please provide a compensation feature within your software.

10-3. Mounting on display and housing bezel
1) Do not use an adhesive tape to bond it on the front of touch panel and hang it to the housing bezel.
2) Never expand the touch panel top layer (PET-film) like a balloon by internal air pressure. The life of the touch panel will be extremely short.
3) If a dew will be on the heat-sealed area or exposed traces at the end of a flexible tail, the migration of silver can occur. This will cause sometimes a short circuit.
4) Must maintain a gap between inside of bezel and touch panel to avoid malfunction or electrode damage of touch panel.

## 11. Lot number identification

The production lot of module is specified as follows.

```
□□ □ □ □ □ - □ □□
```

- Factory Control Number (00~99)
- Date of the Week (A~G)
- Factory Number (0~9)
- Factory Code (Alphabet)
- Production Week (1~5)
- Production Month (1~9, X, Y, Z)
- Production Year (Lower 2 digits)
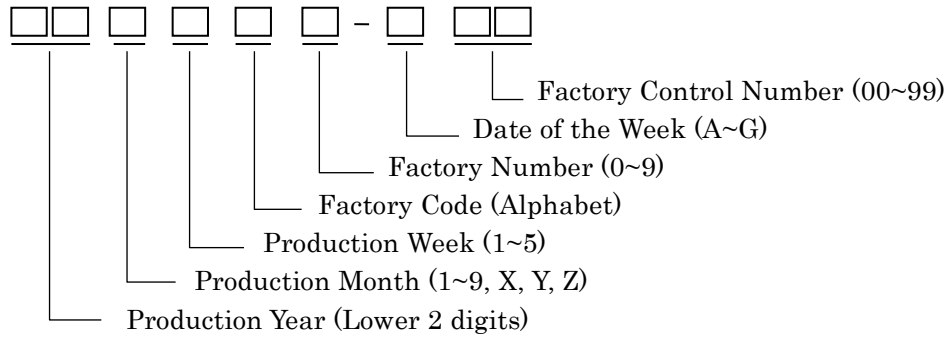
## 12. Warranty

12-1. Incoming inspection

Please inspect the LCD within one month after your receipt.

12-2. Production warranty

Kyocera warrants the LCDs for a period of 12 months from the ship date.　Kyocera shall, by mutual agreement, replace or re-work defective LCDs that are shown to be Kyocera's responsibility.

# 13. Precautions for use

13-1. Installation of the LCD
1) The LCD shall be installed so that there is no pressure on the LSI chips.
2) The LCD shall be installed flat, without twisting or bending.
3) Please design the housing window so that its edges are between the active area and the effective area of the LCD screen.

13-2. Static electricity
1) Since CMOS ICs are mounted directly onto the LCD glass, protection from static electricity is required.
2) Workers should use body grounding. Operator should wear ground straps.

13-3. LCD operation
1) The LCD shall be operated within the limits specified. Operation at values outside of these limits may shorten life, and/or harm display images.
2) Please select the best display pattern based on your evaluation because flicker, lines or nonuniformity or unevenness can be visible depending on display patterns.

13-4. Storage
1) The LCD shall be stored within the temperature and humidity limits specified.
   Store in a dark area, and protect the LCD from direct sunlight or fluorescent light.
2) Always store the LCD so that it is free from external pressure onto it.

13-5. Usage
1) DO NOT store in a high humidity environment for extended periods. Polarizer degradation bubbles, and/or peeling off of the polarizer may result.
2) Do not push or rub the touch panel's surface with hard to sharp objects such as knives, or the touch panel may be scratched.
3) When the touch panel is dirty, gently wipe the surface with a soft cloth, sometimes moistened by mild detergent or alcohol. If a hazardous chemical is dropped on the touch panel by mistake, wipe it off right away to prevent human contact.
4) Touch panel edges are sharp. Handle the touch panel with enough care to prevent cuts.
5) Always keep the LCD free from condensation during testing. Condensation may permanently spot or stain the polarizer.
6) Do not disassemble LCD because it will result in damage.
7) This Kyocera LCD has been specifically designed for use in general electronic devices, but not for use in a special environment such as usage in an active gas. Hence, when the LCD is supposed to be used in a special environment, evaluate the LCD thoroughly beforehand and do not expose the LCD to chemicals such as an active gas.
8) Please do not use solid-base image pattern for long hours because a temporary afterimage may appear. We recommend using screen saver etc. in cases where a solid-base image pattern must be used.
9) Liquid crystal may leak when the LCD is broken. Be careful not to let the fluid go into your eyes and mouth. In the case the fluid touches your body; rinse it off right away with water and soap.
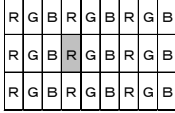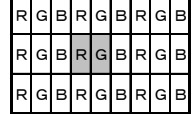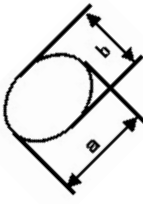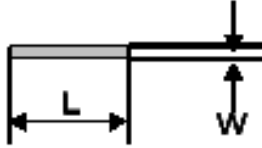
## 14. Reliability test data

| Test item | Test condition | Test time | Judgement | |
|-----------|----------------|-----------|-----------|---|
| High temp. atmosphere | 70°C | 240h | Display function<br>Display quality<br>Current consumption | : No defect<br>: No defect<br>: No defect |
| Low temp. atmosphere | -20°C | 240h | Display function<br>Display quality<br>Current consumption | : No defect<br>: No defect<br>: No defect |
| High temp. humidity atmosphere | 40°C 90% RH | 240h | Display function<br>Display quality<br>Current consumption | : No defect<br>: No defect<br>: No defect |
| Temp. cycle | -20°C   0.5h<br>R.T.   0.5h<br>70°C   0.5h | 10cycles | Display function<br>Display quality<br>Current consumption | : No defect<br>: No defect<br>: No defect |
| High temp. operation | 70°C | 500h | Display function<br>Display quality<br>Current consumption | : No defect<br>: No defect<br>: No defect |

1) Each test item uses a test LCD only once. The tested LCD is not used in any other tests.

2) The LCD is tested in circumstances in which there is no condensation.

3) The reliability test is not an out-going inspection.

4) The result of the reliability test is for your reference purpose only.
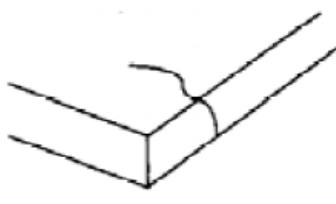   The reliability test is conducted only to examine the LCD's capability.
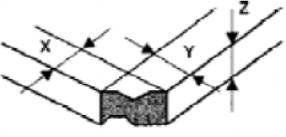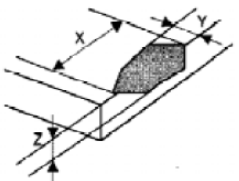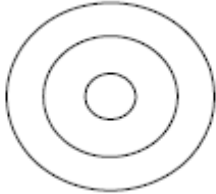
# 15. Visuals specification

1) Note

| | | | Note |
|---|---|---|---|
| General | 1. Customer identified anomalies not defined within this inspection standard shall be reviewed by Kyocera, and an additional standard shall be determined by mutual consent.<br>2. This inspection standard about the image quality shall be applied to any defect within the active area and shall not be applicable to outside of the area.<br>3. Inspection conditions<br>    Luminance           : 500 Lux min.<br>    Inspection distance  : 300 mm.<br>    Temperature      : 25 ± 5℃<br>    Direction         : Directly above | | |
| Definition of inspection item | Dot defect | Bright dot defect | The dot is constantly "on" when power applied to the LCD, even when all "Black" data sent to the screen.<br>Inspection tool: 5% Transparency neutral density filter.<br>Count dot: If the dot is visible through the filter.<br>Don't count dot: If the dot is not visible through the filter. |
| | | Black dot defect | The dot is constantly "off" when power applied to the LCD, even when all "White" data sent to the screen. Similar size compared to bright dot. |
| | | White dot (Circular/foreign particle) | Pixel works electrically, however, circular/foreign particle makes dot appear to be "on" even when all "Black" data is sent to the screen. |
| | | Adjacent dot | Adjacent dot defect is defined as two or more bright dot defects or black dot defects. |
| | External inspection | Bubble, Scratch, Foreign particle (Polarizer, Cell, Backlight) | Visible operating (all pixels "Black" or "White") and non operating. |
| | | Appearance inspection | Does not satisfy the value at the spec. |
| | Definition of size | Definition of circle size<br>Definition of linear size<br><br>a: major axis, b: minor axis<br>d = (a + b) / 2 | |

2) Standard

| Classification | | | | Inspection item | Judgement standard |
|---|---|---|---|---|---|
| Defect (in LCD glass) | Single dot | Bright dot defect | | | Acceptable number : 7<br>Bright dot spacing : 5mm or more |
| | | Black dot defect | | | Acceptable number : 7<br>Black dot spacing : 5mm or more |
| | Adjacent dot | 2 dots | Bright dot defect | | Acceptable number : 3 |
| | | | Black dot defect | | Acceptable number : 3 |
| | | 3 or more dots | | | Acceptable number : 0 |
| | Total dot defects | | | | Acceptable number : 10 Max |
| | Others | White dot, Dark dot (Circle) | | | (see table below) |

| Size (mm) | Acceptable number |
|---|---|
| 0.3 < d ≦ 0.5 | 4 |
| 0.5 < d | 0 |

| Classification | Inspection item | Judgement standard |
|---|---|---|
| External inspection (Defect on Polarizer or between Polarizer and LCD glass) | Polarizer (Scratch) | (see table below) |

| Width (mm) | Length | Acceptable number |
|---|---|---|
| 0.01 < W ≦ 0.05 | L ≦ 15 | 4 |
| 0.01 < W | 15 < L | 0 |
| 0.05 < W | — | 0 |

Polarizer (Bubble)

| Size (mm) | Acceptable number |
|---|---|
| 0.3 < d ≦ 0.5 | 5 |
| 0.5 < d | 0 |

Foreign particle (Circular shape)

| Size (mm) | Acceptable number |
|---|---|
| 0.3 < d ≦ 0.5 | 4 |
| 0.5 < d | 0 |

Foreign particle (Linear shape) Scratch

| Width | Length (mm) | Acceptable number |
|---|---|---|
| W ≦ 0.15 | L ≦ 3.0 | 4 |
| | 3.0 < L | 0 |
| 0.15 < W | — | (According to circular shape) |

Color variation (Mura): Not to be significantly visible. Consultation shall be held as necessary.
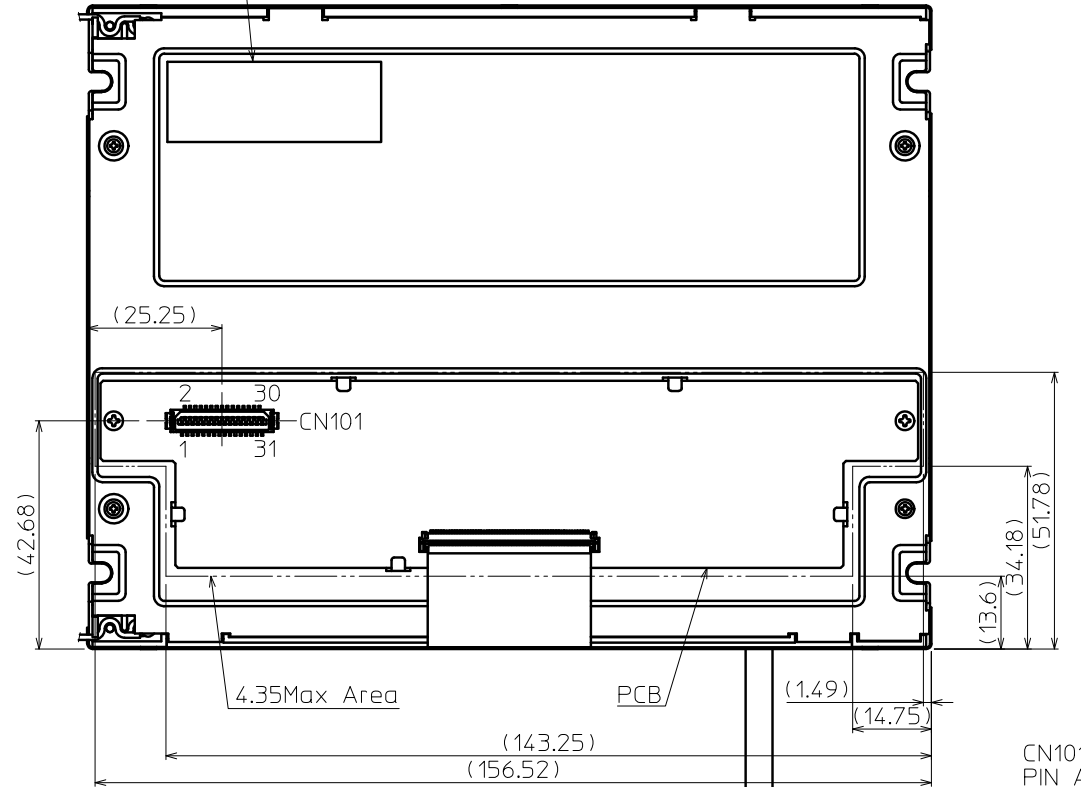
| Inspection item | Judgement standard |

**Scratch, Foreign particle (Touch panel portion)**

| Item | Width(mm) | Length(mm) | Acceptable number |
|---|---|---|---|
| Scratch | W < 0.03 | L ≦ 10 | Neglected |
| | 0.03 < W < 0.05 | L ≦ 10 | Distance from any other scratch object >20mm：Neglected <20mm：1pc |
| | 0.03 < W < 0.05 | L > 10 | 0 |
| | 0.05 < W | | 0 |
| Foreign particle (line like) | W < 0.025 | | Neglected |
| | 0.025 < W < 0.035 | L ≦ 2.5 | Distance from any other scratch object >20mm：Neglected <20mm：Less than 2pcs |
| | 0.035 < W < 0.05 | L ≦ 1.5 | Less than 2pcs |
| | 0.05 < W | L < 5 | 0 |
| Foreign particle (circle like) | d ≦ 0.15 | | Neglected |
| | 0.15< d < 0.25 | | Distance from any other scratch object >20mm：Neglected <20mm：Less than 2pcs |
| | 0.25 < d | | 0 |

Above are applied to the visible area.

Unless there are foreign particle and damage affected seriously to the electrical performance out of the active area, we approve of this product.

**Glass crack (Touch panel portion)**

| Item | Size (mm) | | | Acceptable number |
|---|---|---|---|---|
| Corner crack |  | X | ≦3 | Neglected |
| | | Y | ≦3 | |
| | | Z | <t | |
| Crack in other area than in corner |  | X | <4 | Neglected |
| | | Y | <2 | |
| | | Z | <t | |
| Progressive crack |  | | | 0 pcs |

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| Fish eye on film, Dent on film and Air bubble | | |
|---|---|---|
| | Size (mm) | Acceptable number |
| | d ≦ 0.2 | Neglected |
| | 0.2 < d ≦ 0.4 | Less than 5pcs |
| | 0.4 < d ≦ 0.5 | Less than 2pcs |
| | d > 0.5 | 0 |

| Newton's ring | Visual inspection shall be done at a distance of 0.3 m between eyes and a product with an angles of 60° ± 10° to the surface of the product under a ceiling fluorescent light (40W, natural color).<br><br>1. Regular<br>A) When Newton ring dimension is more than 1/3 of sample dimension; it is regarded as a defect.<br>B) When Newton ring dimension that is less than 1/3 of sample dimension and is not affect font effect and line distortion under a ceiling fluorescent light, it is acceptable.<br><br>2. Irregular<br>A) Newton ring dimension is more than 1/2 without lighting; it is regarded as a defect.<br>B) As long as Newton ring affects font effect and line distortion under a ceiling fluorescent light, it is regarded as a defect.<br>C) When Newton ring dimension is less than 1/2 of sample dimension and is not affect font effect and line distortion under a ceiling fluorescent light, it is acceptable. | Regular<br><br>Irregular |

| Miss matching of film and plastic board. | All round of film is inside of plastic board. | |

| No | Description | Drawn | Checked | Checked | Approved |
|----|-------------|-------|---------|---------|----------|
|    |             |       |         |         |          |
|    |             |       |         |         |          |
|    |             |       |         |         |          |

☆158
2-110±10
(7.26)
143.48(TTS Outline)
11.27
135.46±0.5(Bezel Opening)
(12.06)
133.88(TTS Key Area)
12.75
132.5±0.1(Active Area)
(79)
A
640X(R,G,B)X480Dots
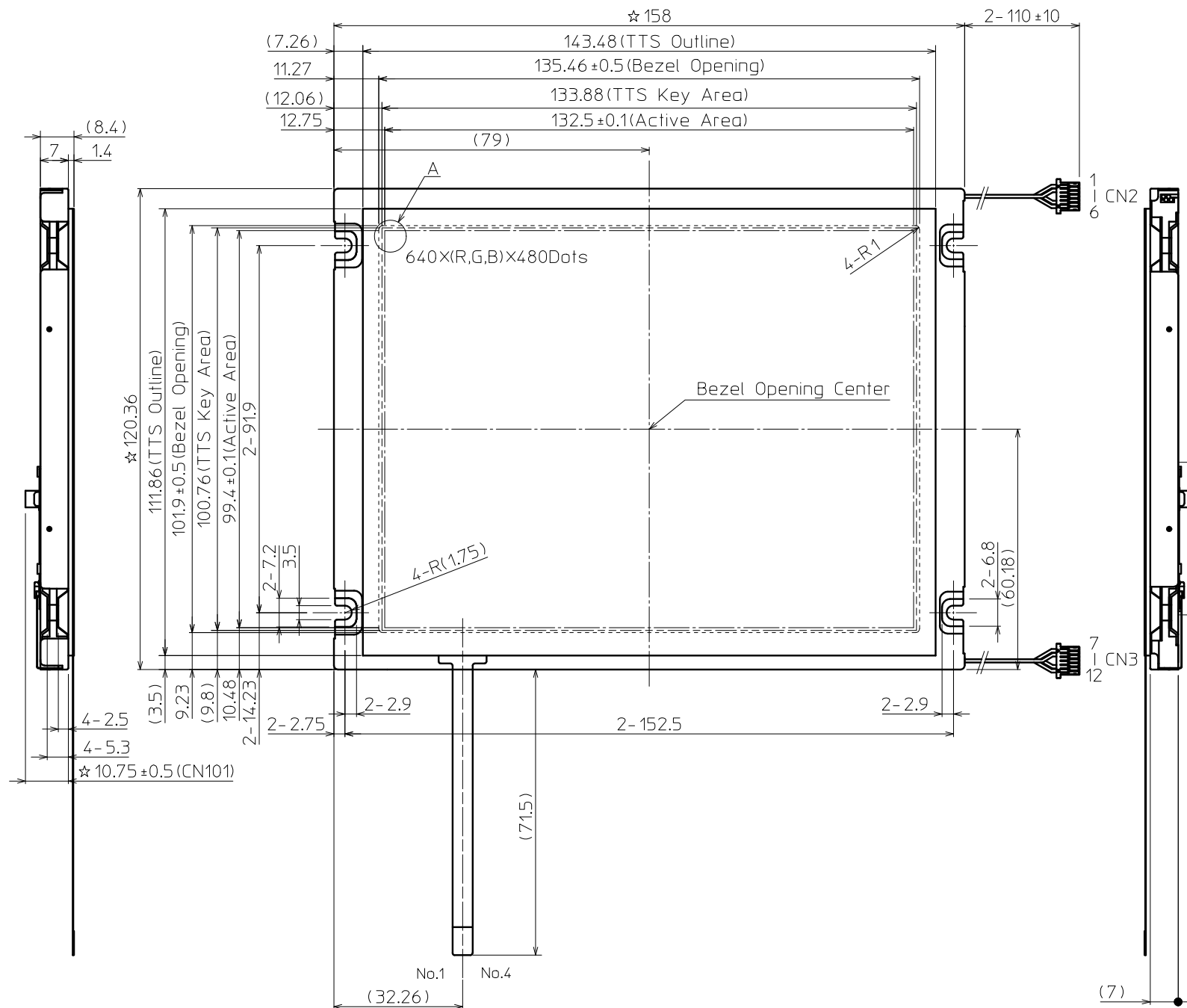
Label
KYOCERA Corporation
Model Name
Country of origin
Lot No.

1   CN2
6

4-R1

Bezel Opening Center

☆120.36
111.86(TTS Outline)
101.9±0.5(Bezel Opening)
100.76(TTS Key Area)
99.4±0.1(Active Area)
2-91.9

Parts
Mount
Area

(25.25)
2   30   CN101
1   31

(42.68)

4-R(1.75)

2-7.2
3.5

2-6.8
(60.18)

7   CN3
12

(51.78)
(34.18)
(13.6)

(8.4)
7   1.4

(3.5)
9.23
(9.8)
10.48
2-14.23

4-2.5
4-5.3
☆10.75±0.5(CN101)

2-2.75
2-2.9
2-152.5
2-2.9

4.35Max Area
PCB
(1.49)
(14.75)

(143.25)
(156.52)

(71.5)

No.1   No.4
(32.26)

(7)
4.35Max

**CN101 PIN ASSIGNMENT**

| No. | Symbol |
|-----|--------|
| 1 | GND |
| 2 | DCLK |
| 3 | HD |
| 4 | VD |
| 5 | GND |
| 6 | R0 |
| 7 | R1 |
| 8 | R2 |
| 9 | R3 |
| 10 | R4 |
| 11 | R5 |
| 12 | GND |
| 13 | G0 |
| 14 | G1 |
| 15 | G2 |
| 16 | G3 |
| 17 | G4 |
| 18 | G5 |
| 19 | GND |
| 20 | B0 |
| 21 | B1 |
| 22 | B2 |
| 23 | B3 |
| 24 | B4 |
| 25 | B5 |
| 26 | GND |
| 27 | DENA |
| 28 | VCC |
| 29 | VCC |
| 30 | TEST |
| 31 | REV |

**CN2 PIN ASSIGNMENT**

| No. | Symbol |
|-----|--------|
| 1 | ANODE-1(RED) |
| 2 | ANODE-2(RED) |
| 3 | NC |
| 4 | NC |
| 5 | CATHODE-1(BLACK) |
| 6 | CATHODE-2(BLACK) |

**CN3 PIN ASSIGNMENT**

| No. | Symbol |
|-----|--------|
| 7 | ANODE-3(RED) |
| 8 | ANODE-4(RED) |
| 9 | NC |
| 10 | NC |
| 11 | CATHODE-3(BLACK) |
| 12 | CATHODE-4(BLACK) |

Notes:
1. The dimensions with the mark (☆) are
   controlled as a particular characteristic.
2. Don't use material which are prohibited by RoHS.
3. CN101:DF9B-31P-1V(32)(HRS)
4. CN2/CN3:SHLP-06V-S-B(JST)
5. Tolerances unless otherwise specified: General Tolerance
6. Touch Panel (TTS) P/N : TSW51750B

**Detail A (NTS)**

R G B R G B
R G B R G
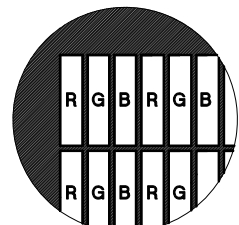
| TOLERANCE | | | |
|-----------|---|---|---|
| MEASURE | A | B | C |
| L≦16 | ±0.1 | ±0.3 | ±1 |
| 16<L≦63 | ±0.2 | ±0.5 | ±1.5 |
| 63<L≦250 | ±0.3 | ±0.8 | ±2 |
| 250<L≦500 | ±0.5 | ±1.2 | ±3 |
| 500<L | ±0.8 | ±2 | ±4 |
| ANGLE | ±1° | ±5° | ±10° |

| Material 材質 | Treatment 処理 | Approved '22.09.05 S.Kuramoto | Checked | Checked '22.08.30 T.Homma | Drawn M.Kageyama | Scale 1:1(NTS) | Title C0650VG65200-BT-AB | KYOCERA | Year-Month-Day '22.08.29 | Size 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Quantity 製作数 | Description; 備考 RoHS 22046-06448 | | | | | | Outline Dimensions | Drawing No. 121A9025300 | | |