# SPEC for Mass Production

| Spec No. | TQ3C-8EAF0-E1YBJ11-00 |
|---|---|
| Date | November 20, 2019 |

# TYPE: TN0104ANVAANN-GN00
## < 1.04 inch Reflective (slightly transmissive) Dot Matrix Memory LC Display>

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Issued
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KYOCERA CORPORATION

| Original Issue Date | Designed by: Engineering dept. | | | Confirmed by: QA dept. | |
|---|---|---|---|---|---|
| | Prepared | Checked | Approved | Checked | Approved |
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## 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 TN0104ANVAANN-GN00. (RoHS Compliant)

# 2. Construction and Outline

LCD                        : Reflective (slightly transmissive) dot matrix Monochrome TFT
Backlight System           : None
Polarizer                  : Glare type
Additional circuit         : 1-bit pixel memory function in LCD

# 3. Mechanical Specifications

| Item | Specification | Unit |
|---|---|---|
| Outline dimensions      1) | 29.5(W) × 31.0(H) | mm |
| Active area | 26.5(W) × 26.5(H)<br>(Octagon 1.04 inch) | mm |
| Dot format | 176(W) × 176(H) | Dot |
| Dot pitch | 0.1505(W) × 0.1505(H) | mm |
| Color | Black-and-White (Binary) | - |
| LC Mode | ECB mode (Normally black) | - |
| Mass | 2.5 | g |

1) FPC is not included. Please refer to the drawing for details.

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# 4. Absolute Maximum Ratings

4-1. Electrical absolute maximum ratings

| Item | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Supply voltage | | $V_{DD}$ | -0.3 | 4.0 | V |
| LCD common voltage | | VCOM | -0.3 | 4.0 | V |
| Input signal voltage | 1) | - | -0.3 | 4.0 | V |

1) Input signals : SCLK, SI[7:0], DEN, ENBG, ENBS, XRST

4-2. Environmental absolute maximum ratings

| Item | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Operating temperature | 1) | $T_{OP}$ | -20 | 80 | ℃ |
| Storage temperature | 2) | $T_{STO}$ | -30 | 85 | ℃ |
| Operating humidity | 3) | $H_{OP}$ | - | 4) | %RH |
| Storage humidity | 3) | $H_{STO}$ | - | 4) | %RH |

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) 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℃ , 95%RH Max.
 Temp. ＞40℃, Absolute humidity shall be less than 95%RH at 40°C

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# 5. Electrical Characteristics

### 5-1. LCD driving characteristics

Temp. = 25℃

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Supply voltage | | $V_{DD}$ | － | 2.7 | 3.0 | 3.3 | V |
| LCD common voltage | | VCOM | "Low" level | GND | － | GND+0.1 | V |
| | | | "High" level | VDD-0.1 | － | VDD | V |
| Input signal voltage | 1) | $V_{IL}$ | "Low" level | GND | － | GND+0.1 | V |
| | | $V_{IH}$ | "High" level | VDD-0.1 | － | VDD | V |
| Input leak current | 1) | $I_{IN}$ | $T_{OP}$=25℃ | － | 4 | 15 | nA |
| Current consumption | 4) | $I_{DD\_opr}$ | 2) | － | 3.5 | 8.0 | μA |
| | | $I_{DD\_stb}$ | 3) | － | 0.5 | 1.5 | μA |
| Input capacitance | 1) | $C_{IN1}$ | － | － | 3 | 10 | pF |
| LCD common voltage terminal capacitance | | $C_{VCOM}$ | － | － | 60 | 90 | nF |

1) SCLK, SI[7:0], DEN, ENBG, ENBS, XRST

2) 1 Hz full display rewriting
   Using address auto increment mode for horizontal direction

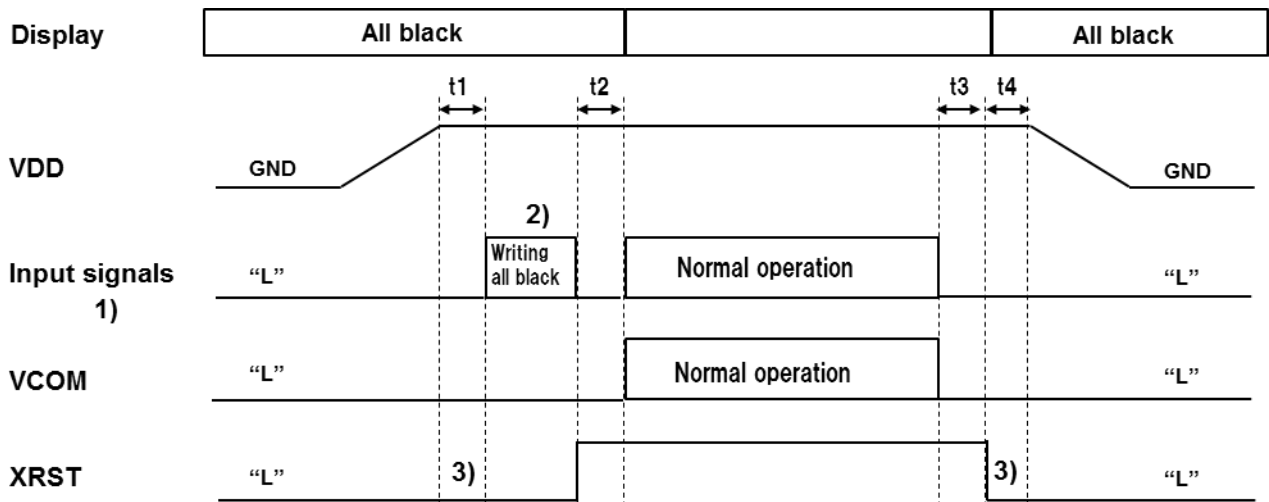3) Keeping static image, and polarity inversion of VCOM with a period of 1 sec.
   SCLK, SI [7:0], DEN, ENBG, ENBS: "L" state.
   XRST: "H" state.

4) Current consumption : VDD and VCOM

\* Value of the current consumption is without smoothing capacitor.

5-2. Power ON-OFF sequence



| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Power ON-OFF sequence | t1 | 0 | – | – | μsec |
| | t2 | 1 | – | – | msec |
| | t3 | 1 | – | – | msec |
| | t4 | 1 | – | – | msec |

1) SCLK, SI[7:0], DEN, ENBG, ENBS
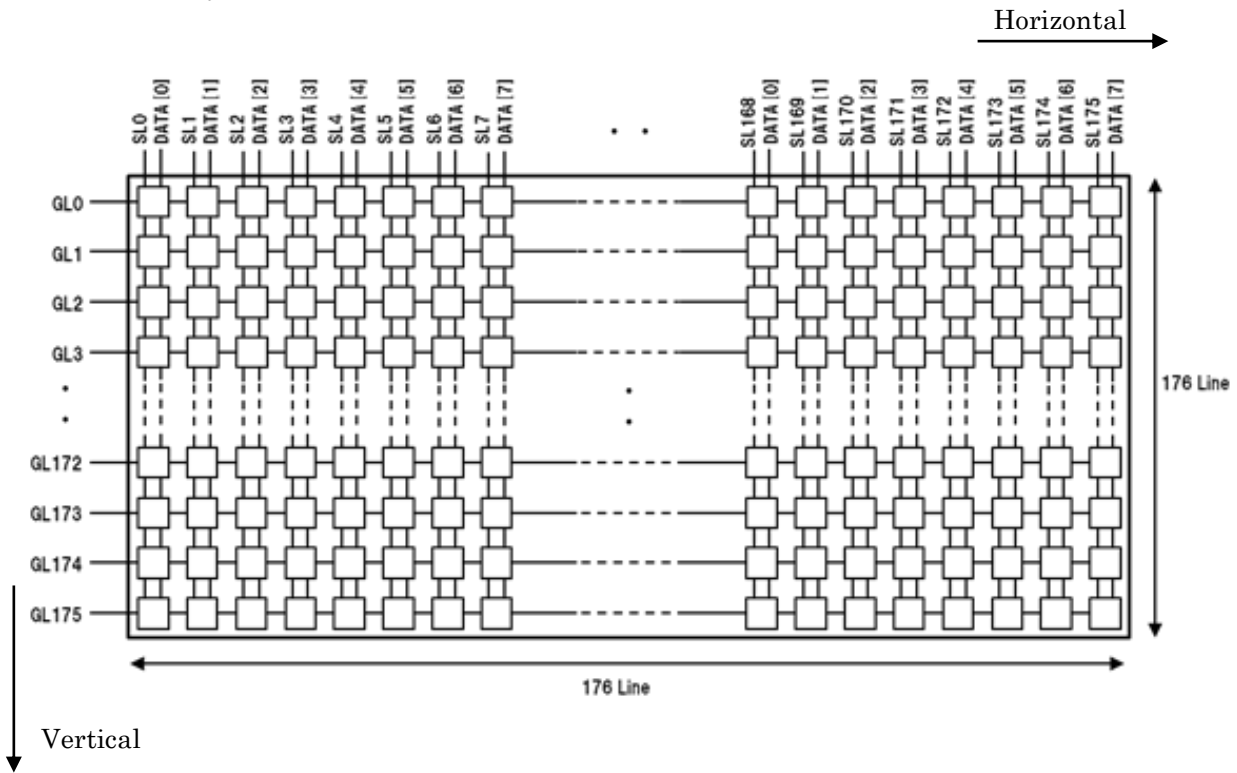2) Rewriting to black for all addresses.
3) Display OFF when XRST = "L".
   VCOM = "L" is necessary when XRST = "L".
   Black display when display is OFF.

Data in pixel memory is random with black or white at power ON.
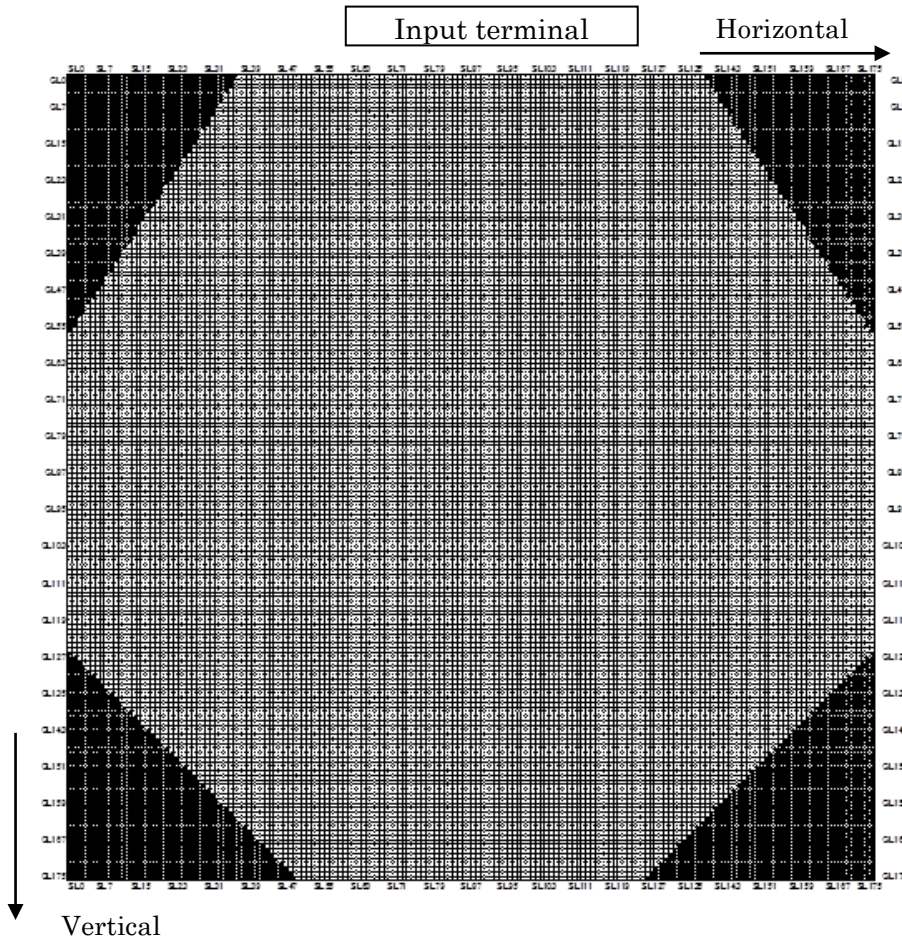Possible to prevent black-white random data display by black display when XRST = "L".

5-3. Address Mapping

    5-3-1. Physical location



    5-3-2. Valid pixel

## 5-3-3. Valid pixel (V,H)

| GL | Valid pixel range | | GL | Valid pixel range | | GL | Valid pixel range | |
|---|---|---|---|---|---|---|---|---|
| | SL left side | SL right side | | SL left side | SL right side | | SL left side | SL right side |
| GL0 | SL37 | SL138 | GL64 | SL0 | SL175 | GL128 | SL3 | SL172 |
| GL1 | SL36 | SL139 | GL65 | SL0 | SL175 | GL129 | SL4 | SL171 |
| GL2 | SL36 | SL139 | GL66 | SL0 | SL175 | GL130 | SL5 | SL170 |
| GL3 | SL35 | SL140 | GL67 | SL0 | SL175 | GL131 | SL6 | SL169 |
| GL4 | SL34 | SL141 | GL68 | SL0 | SL175 | GL132 | SL7 | SL168 |
| GL5 | SL34 | SL141 | GL69 | SL0 | SL175 | GL133 | SL8 | SL167 |
| GL6 | SL33 | SL142 | GL70 | SL0 | SL175 | GL134 | SL9 | SL166 |
| GL7 | SL32 | SL143 | GL71 | SL0 | SL175 | GL135 | SL10 | SL165 |
| GL8 | SL32 | SL143 | GL72 | SL0 | SL175 | GL136 | SL11 | SL164 |
| GL9 | SL31 | SL144 | GL73 | SL0 | SL175 | GL137 | SL12 | SL163 |
| GL10 | SL31 | SL144 | GL74 | SL0 | SL175 | GL138 | SL13 | SL162 |
| GL11 | SL30 | SL145 | GL75 | SL0 | SL175 | GL139 | SL14 | SL161 |
| GL12 | SL29 | SL146 | GL76 | SL0 | SL175 | GL140 | SL15 | SL160 |
| GL13 | SL29 | SL146 | GL77 | SL0 | SL175 | GL141 | SL16 | SL159 |
| GL14 | SL28 | SL147 | GL78 | SL0 | SL175 | GL142 | SL17 | SL158 |
| GL15 | SL27 | SL148 | GL79 | SL0 | SL175 | GL143 | SL18 | SL157 |
| GL16 | SL27 | SL148 | GL80 | SL0 | SL175 | GL144 | SL19 | SL156 |
| GL17 | SL26 | SL149 | GL81 | SL0 | SL175 | GL145 | SL20 | SL155 |
| GL18 | SL25 | SL150 | GL82 | SL0 | SL175 | GL146 | SL21 | SL154 |
| GL19 | SL25 | SL150 | GL83 | SL0 | SL175 | GL147 | SL22 | SL153 |
| GL20 | SL24 | SL151 | GL84 | SL0 | SL175 | GL148 | SL23 | SL152 |
| GL21 | SL23 | SL152 | GL85 | SL0 | SL175 | GL149 | SL24 | SL151 |
| GL22 | SL23 | SL152 | GL86 | SL0 | SL175 | GL150 | SL25 | SL150 |
| GL23 | SL22 | SL153 | GL87 | SL0 | SL175 | GL151 | SL26 | SL149 |
| GL24 | SL21 | SL154 | GL88 | SL0 | SL175 | GL152 | SL27 | SL148 |
| GL25 | SL21 | SL154 | GL89 | SL0 | SL175 | GL153 | SL28 | SL147 |
| GL26 | SL20 | SL155 | GL90 | SL0 | SL175 | GL154 | SL29 | SL146 |
| GL27 | SL19 | SL156 | GL91 | SL0 | SL175 | GL155 | SL30 | SL145 |
| GL28 | SL19 | SL156 | GL92 | SL0 | SL175 | GL156 | SL31 | SL144 |
| GL29 | SL18 | SL157 | GL93 | SL0 | SL175 | GL157 | SL32 | SL143 |
| GL30 | SL17 | SL158 | GL94 | SL0 | SL175 | GL158 | SL33 | SL142 |
| GL31 | SL17 | SL158 | GL95 | SL0 | SL175 | GL159 | SL34 | SL141 |
| GL32 | SL16 | SL159 | GL96 | SL0 | SL175 | GL160 | SL35 | SL140 |
| GL33 | SL15 | SL160 | GL97 | SL0 | SL175 | GL161 | SL36 | SL139 |
| GL34 | SL15 | SL160 | GL98 | SL0 | SL175 | GL162 | SL37 | SL138 |
| GL35 | SL14 | SL161 | GL99 | SL0 | SL175 | GL163 | SL38 | SL137 |
| GL36 | SL14 | SL161 | GL100 | SL0 | SL175 | GL164 | SL39 | SL136 |
| GL37 | SL13 | SL162 | GL101 | SL0 | SL175 | GL165 | SL40 | SL135 |
| GL38 | SL12 | SL163 | GL102 | SL0 | SL175 | GL166 | SL41 | SL134 |
| GL39 | SL12 | SL163 | GL103 | SL0 | SL175 | GL167 | SL42 | SL133 |
| GL40 | SL11 | SL164 | GL104 | SL0 | SL175 | GL168 | SL43 | SL132 |
| GL41 | SL10 | SL165 | GL105 | SL0 | SL175 | GL169 | SL44 | SL131 |
| GL42 | SL10 | SL165 | GL106 | SL0 | SL175 | GL170 | SL45 | SL130 |
| GL43 | SL9 | SL166 | GL107 | SL0 | SL175 | GL171 | SL46 | SL129 |
| GL44 | SL8 | SL167 | GL108 | SL0 | SL175 | GL172 | SL47 | SL128 |
| GL45 | SL8 | SL167 | GL109 | SL0 | SL175 | GL173 | SL48 | SL127 |
| GL46 | SL7 | SL168 | GL110 | SL0 | SL175 | GL174 | SL49 | SL126 |
| GL47 | SL6 | SL169 | GL111 | SL0 | SL175 | GL175 | SL50 | SL125 |
| GL48 | SL6 | SL169 | GL112 | SL0 | SL175 | | | |
| GL49 | SL5 | SL170 | GL113 | SL0 | SL175 | | | |
| GL50 | SL4 | SL171 | GL114 | SL0 | SL175 | | | |
| GL51 | SL4 | SL171 | GL115 | SL0 | SL175 | | | |
| GL52 | SL3 | SL172 | GL116 | SL0 | SL175 | | | |
| GL53 | SL2 | SL173 | GL117 | SL0 | SL175 | | | |
| GL54 | SL2 | SL173 | GL118 | SL0 | SL175 | | | |
| GL55 | SL1 | SL174 | GL119 | SL0 | SL175 | | | |
| GL56 | SL0 | SL175 | GL120 | SL0 | SL175 | | | |
| GL57 | SL0 | SL175 | GL121 | SL0 | SL175 | | | |
| GL58 | SL0 | SL175 | GL122 | SL0 | SL175 | | | |
| GL59 | SL0 | SL175 | GL123 | SL0 | SL175 | | | |
| GL60 | SL0 | SL175 | GL124 | SL0 | SL175 | | | |
| GL61 | SL0 | SL175 | GL125 | SL0 | SL175 | | | |
| GL62 | SL0 | SL175 | GL126 | SL1 | SL174 | | | |
| GL63 | SL0 | SL175 | GL127 | SL2 | SL173 | | | |

5-4. Address select table

5-4-1. Vertical address select table

| GS[7] | GS[6] | GS[5] | GS[4] | GS[3] | GS[2] | GS[1] | GS[0] | Select GL |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | GL0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | GL1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | GL2 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | GL3 |
| . | . | . | . | . | . | . | . | . |
| . | . | . | . | . | . | . | . | . |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | GL172 |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | GL173 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | GL174 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | GL175 |
| 1 | 0 | 1 |  | 0 | 0 | 0 | 0 | Invalid 1) |
| . | . | . | . | . | . | . | . |  |
| . | . | . | . | . | . | . | . |  |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |  |

1) When invalid address is set, display does not change.

5-4-2. Horizontal address select table

| SS[7] | SS[6] | SS[5] | SS[4] | SS[3] | Select SL | Direction of auto address increment |
|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | SL0～7 |  |
| 0 | 0 | 0 | 0 | 1 | SL8～15 |  |
| 0 | 0 | 0 | 1 | 0 | SL16～23 |  |
| 0 | 0 | 0 | 1 | 1 | SL24～31 |  |
| . | . | . | . | . | . |  |
| . | . | . | . | . | . |  |
| 1 | 0 | 0 | 1 | 0 | SL144～151 |  |
| 1 | 0 | 0 | 1 | 1 | SL152～159 |  |
| 1 | 0 | 1 | 0 | 0 | SL160～167 |  |
| 1 | 0 | 1 | 0 | 1 | SL168～175 |  |
| 1 | 0 | 1 | 1 | 0 | Invalid 1) |  |
| . | . | . | . | . |  |  |
| . | . | . | . | . |  |  |
| 1 | 1 | 1 | 1 | 1 |  |  |

1) When invalid address is set, display does not change.
   In case of using address auto increment mode, the internal address returns to SL0-7
   in the next cycle and then starts auto increment.

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5-4-3. Data select table

| Select SL | | | | | DATA sigal |
|---|---|---|---|---|---|
| SL0 | SL8 | ・・ | SL160 | SL168 | DATA[0] |
| SL1 | SL9 | ・・ | SL161 | SL169 | DATA[1] |
| SL2 | SL10 | ・・ | SL162 | SL170 | DATA[2] |
| SL3 | SL11 | ・・ | SL163 | SL171 | DATA[3] |
| SL4 | SL12 | ・・ | SL164 | SL172 | DATA[4] |
| SL5 | SL13 | ・・ | SL165 | SL173 | DATA[5] |
| SL6 | SL14 | ・・ | SL166 | SL174 | DATA[6] |
| SL7 | SL15 | ・・ | SL167 | SL175 | DATA[7] |

5-4-4. Table of Serial input signal and Address / Data

| I/F信号 | Address / Data | | | |
|---|---|---|---|---|
| | 1st cycle | 2nd cycle | 3rd cycle | After 4th cycle 1) |
| SI[0] | GS[0] | don't care | DATA[0] | DATA[0] |
| SI[1] | GS[1] | don't care | DATA[1] | DATA[1] |
| SI[2] | GS[2] | don't care | DATA[2] | DATA[2] |
| SI[3] | GS[3] | SS[3] | DATA[3] | DATA[3] |
| SI[4] | GS[4] | SS[4] | DATA[4] | DATA[4] |
| SI[5] | GS[5] | SS[5] | DATA[5] | DATA[5] |
| SI[6] | GS[6] | SS[6] | DATA[6] | DATA[6] |
| SI[7] | GS[7] | SS[7] | DATA[7] | DATA[7] |

1) In case of using address auto increment mode

5-4-5. Data signal and Display

| DATA Signal | Display |
|---|---|
| 0 | White |
| 1 | Black |

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## 6. Interface Signals

| No. | Symbol | Description | I/O  1) | Voltage | Unit | Note |
|---|---|---|---|---|---|---|
| 1 | VCOM | LCD common voltage | P | 0.0/3.0 | V | |
| 2 | VDD | Supply voltage（3.0V） | P | 3.0 | V | |
| 3 | VSS | GND | P | 0.0 | V | |
| 4 | ENBS | Write enable signal (Horizontal) | I | 0.0/3.0 | V | 3) |
| 5 | XRST | Reset signal | I | 0.0/3.0 | V | 2) 3) |
| 6 | SI[7] | Serial input signal | I | 0.0/3.0 | V | |
| 7 | SI[6] | Serial input signal | I | 0.0/3.0 | V | |
| 8 | SI[5] | Serial input signal | I | 0.0/3.0 | V | |
| 9 | SI[4] | Serial input signal | I | 0.0/3.0 | V | |
| 10 | SI[3] | Serial input signal | I | 0.0/3.0 | V | |
| 11 | SI[2] | Serial input signal | I | 0.0/3.0 | V | |
| 12 | SI[1] | Serial input signal | I | 0.0/3.0 | V | |
| 13 | SI[0] | Serial input signal | I | 0.0/3.0 | V | |
| 14 | DEN | Serial input control signal | I | 0.0/3.0 | V | |
| 15 | SCLK | Serial clock signal | I | 0.0/3.0 | V | 3) |
| 16 | ENBG | Write enable signal (Vertical) | I | 0.0/3.0 | V | 3) |
| 17 | VSS | GND | P | 0.0 | V | |
| 18 | VDD | Supply voltage（3.0V） | P | 3.0 | V | |
| 19 | VCOM | LCD common voltage | P | 0.0/3.0 | V | |

1) P: Power supply
   I: Input

2) XRST = "H": Display ON
   XRST = "L": Display OFF (Display become "All black", pixel memory is maintained)
   VCOM = "L" is necessary when XRST = "L"

3) Need to guard from signal noise
   If there is an abnormal signal not described in the timing chart on these signals, display may
   be distorted. Please carefully guard these signals since even if signal noise with small pulse
   width may cause malfunction.

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# 7. Input Timing Characteristics

7-1. Writing operation specifications (Display update mode)

・Any point of pixels can be written randomly .

・The unit of writing pixel is 8 dot.

・Address/Data is transferred sequentially by SI[7:0] signal synchronized with SCLK.
  1st cycle : Vertical Address,  2nd cycle : Horizontal Address,  3rd cycle : Writing Data

・SI[7:0] signal input is recognized as Address or Data by serial input control signal(DEN) .
    DEN="L" : SI[7:0] is Address input,  DEN="H" : SI[7:0] is Data input

・After Address/Data is transferred, Data is written to pixel memory with activating ENBG and
  ENBS.

・Address auto increment mode is implemented.

・After horizontal start address is transferred, internal horizontal address is incremented
  automatically synchronized with SCLK by keeping DEN="H".

・In case of writing data to pixels in horizontal consecutive address, the period of writing pixels
  becomes shorter because address input  is not needed after 2nd address of writing pixels.

・When internal horizontal address reaches to the end of address by auto increment, it returns to 0
  next. Vertical address is not incremented.

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## 7-2. Input timing characteristics

| Item | | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Input sinal 1) | Signal rise time | trSIG | − | − | 50 | ns | 2) |
| | Signal fall time | tfSIG | − | − | 50 | ns | 2) |
| SCLK | SCLK high width | twSCLKH | 0.9 | − | − | μs | 4) |
| | SCLK low width | twSCLKL | 0.9 | − | − | μs | 4) |
| SI[7:0] | SI set-up time | tsSI | 0.9 | − | − | μs | 4) |
| | SI hold time | thSI | 0.9 | − | − | μs | 4) |
| DEN | DEN set-up time | tsDEN | 0.9 | − | − | μs | 4) |
| | DEN hold time | thDEN | 0.9 | − | − | μs | 4) |
| ENBG ENBS | ENBG,S high width | twENBH | 4.5 | − | − | μs | 4) |
| | SCLK rise→ENBG,S rise | toENB | 1.8 | − | − | μs | 4) |
| | ENBG,S fall→SCLK rise | tbENB | 1.8 | − | − | μs | 4) |
| VCOM | VCOM duty | − | − | 50 | − | % | − |
| | VCOM rise time | trVCOM | − | 100 | 200 | μs | 3) 6) |
| | VCOM fall time | tfVCOM | − | 100 | 200 | μs | 3) 6) |
| | VCOM cycle time | tcVCOM | − | 1000 | − | ms | 5) |
| | VCOM rise/fall → ENBG,S rise | tsVCOM | 4 | − | − | ms | 5) |
| | ENBG,S fall → VCOM rise/fall | thVCOM | 1 | − | − | ms | 5) |

1) SCLK, SI [7:0], DEN, ENBG, ENBS, XRST

2) Signal transition time of 10%⇔90% level

3) Signal transition time of 1%⇔99% level, All pixel Black

4) Timing is defined at 50% level

5) Timing is defined at 1%/99% level with VCOM, 50% with other signals

6) For the stable operation, resistor insertion to VCOM input outside of LCD panel is needed.
   The resistance is estimated 500Ω, but is not the fixed value.
   Timing spec of VCOM rise/fall time is the value including the VCOM resistor 500Ω.
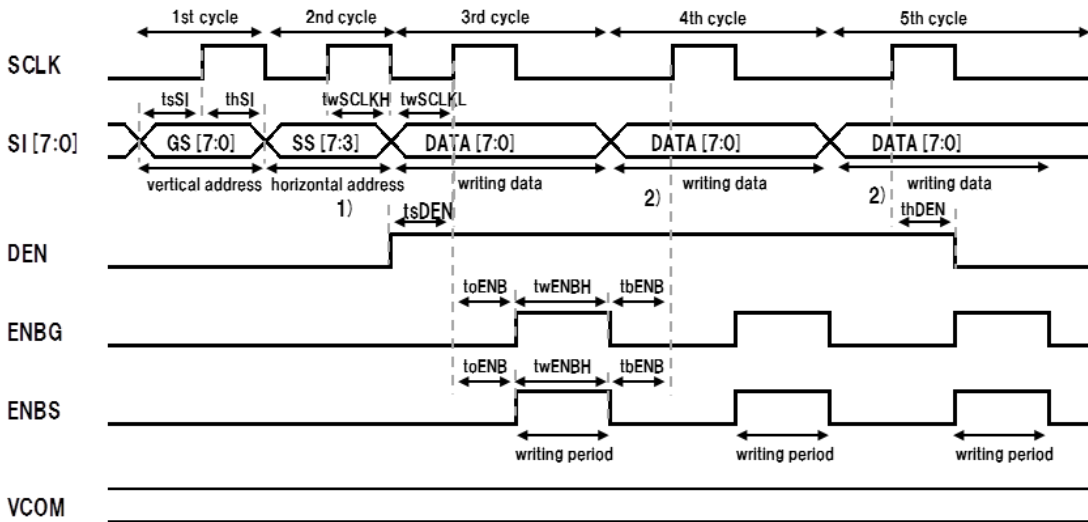
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7-3. Timing chart

7-3-1. Writing operation (random access)
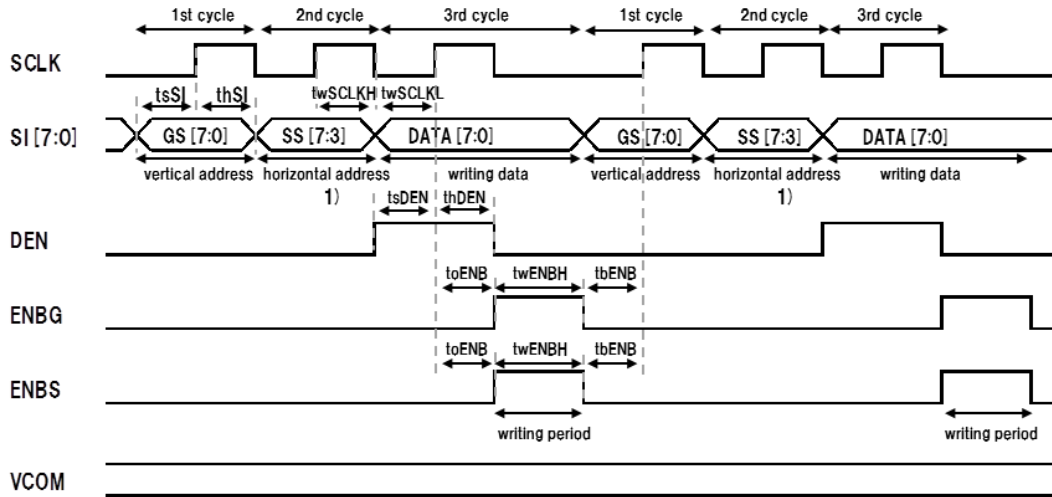


1) SI[2:0] is invalid because horizontal address bit width is 5 bits.
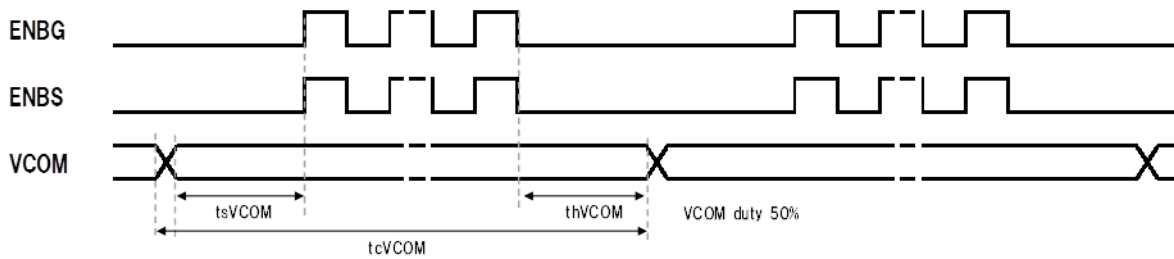
7-3-2. Writing operation (consecutive access: horizontal address auto increment mode)



1) SI[2:0] is invalid because horizontal address bit width is 5 bits.
2) After horizontal start address is transferred, internal horizontal address is incremented automatically during DEN="H".

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7-3-3. VCOM AC drive



## 8. Optical Characteristics

VDD=3.0V, VCOM=1Hz, Temp. = 25℃

| Item | | Symbol | Temp. | Unit | Min. | Typ. | Max. |
|---|---|---|---|---|---|---|---|
| Contrast ratio 1) | | CR | 25℃ | - | - | 37 | - |
| Reflectance | | - | 25℃ | % | - | 16 | - |
| Response time 2) 3) | Rise | τr | -20℃ | msec | - | 14 | - |
| | | | 25℃ | | - | 3 | - |
| | | | 40℃ | | - | 3 | - |
| | Fall | τf | -20℃ | msec | - | 33 | - |
| | | | 25℃ | | - | 7 | - |
| | | | 40℃ | | - | 6 | - |
| Viewing angle CR≧2 4) 5) | θupper | | 25℃ | deg. | - | 60 | - |
| | θlower | | | | - | 60 | - |
| | θleft | | | | - | 60 | - |
| | θright | | | | - | 60 | - |
| Chromaticity coordinates | Wx | - | 25℃ | - | - | 0.305 | - |
| | Wy | - | | | - | 0.335 | - |

1) Definition of contrast ratio

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

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2) Definition of response time
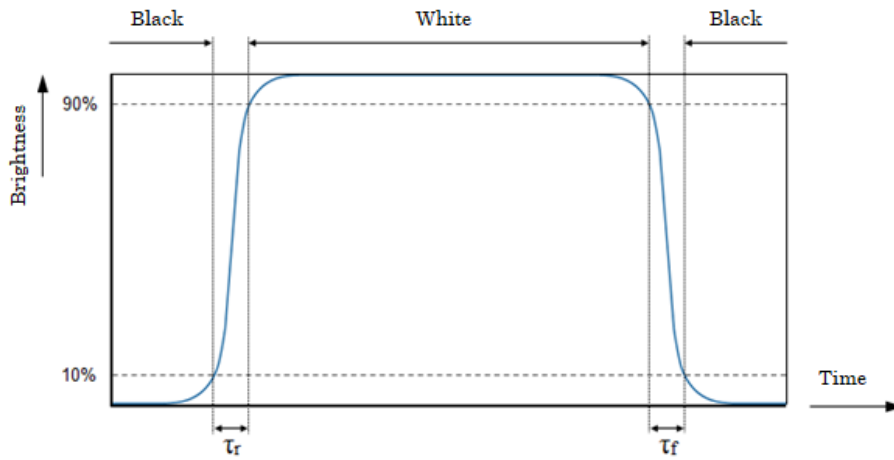


3) About the measurement of Response time
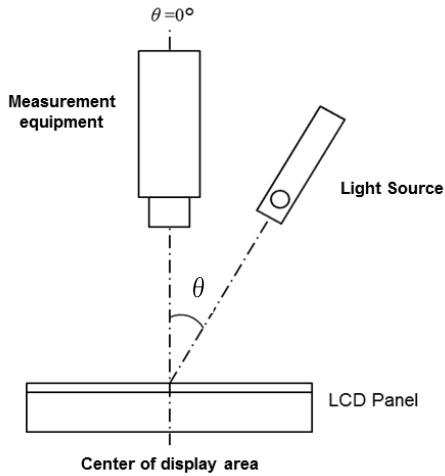   Measurement Equipment (LCD-5200)
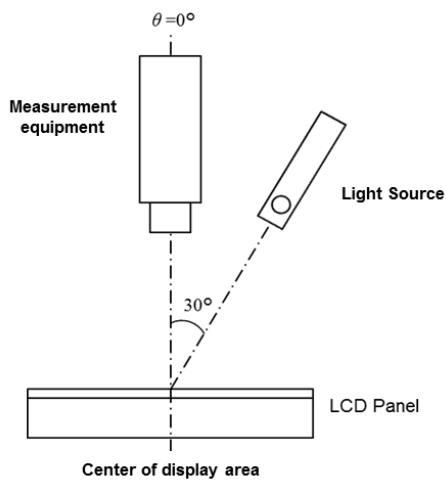


4) Definition of viewing angle
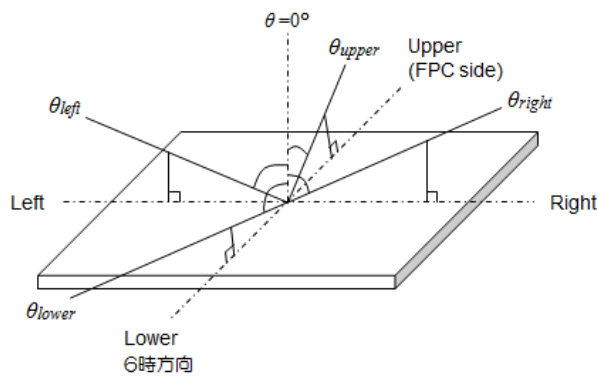
5) About the measurement of viewing angle
   Measurement Equipment (LCD-5200)
   The viewing angle is measured by changing the angle of the light source.



# 9. Warranty

9-1. Incoming inspection

   Please inspect the LCD within one month after your receipt.

9-2. Production warranty

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

# 10. Precautions for Use

10-1. Installation of the LCD
1) A transparent protection plate shall be added to protect the LCD and its polarizer.
2) The LCD shall be installed flat, without twisting or bending.
3) A transparent protection sheet is attached to the polarizer. Please remove the protection film slowly before use, paying attention to static electricity.
4) FPC shall be installed after fixing the glass.
5) Do not apply a load to the FPC.
6) Do not use an assembly structure where the FPC is pulled or partially stressed.

10-2. Static electricity
1) Protect the LCD from static electricity.
2) Workers should use body grounding. Operator should wear ground straps.

10-3. 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.

10-4. 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.
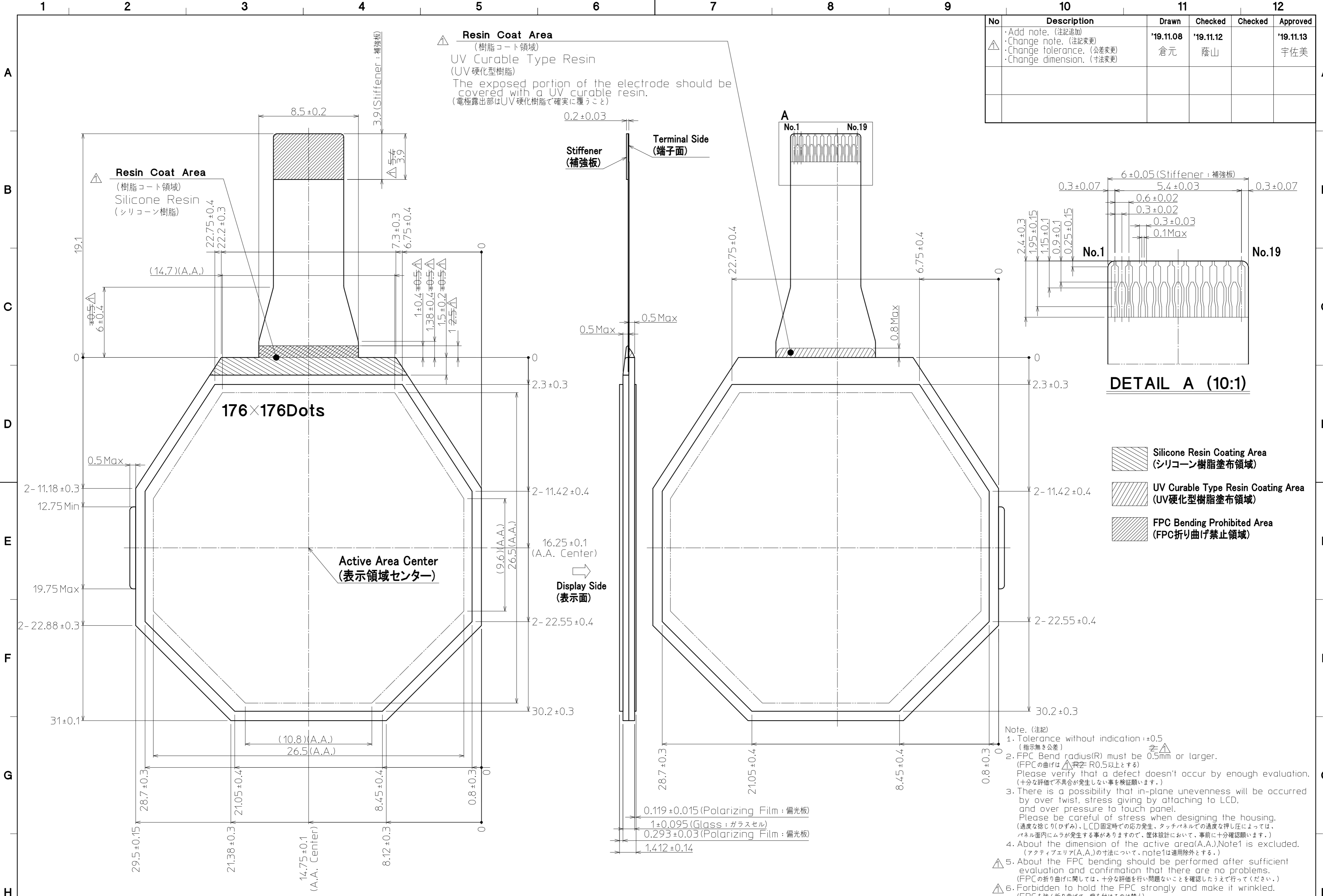2) Always store the LCD so that it is free from external pressure onto it.

10-5. 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) The front polarizer is easily scratched or damaged. Prevent touching it with any hard material, and from being pushed or rubbed.
3) The LCD screen may be cleaned by wiping the screen surface with a soft cloth or cotton pad using a little Ethanol
4) Water may cause damage or discoloration of the polarizer. Clean condensation or moisture from any source immediately.
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) 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.
10) Do not hold the FPC alone while working.
11) Do not scratch or damage the exposed conductor of the FPC or FPC.
12) Do not touch the exposed conductor of the FPC.
13) Do not bend the FPC toward the surface of LCD near the glass.
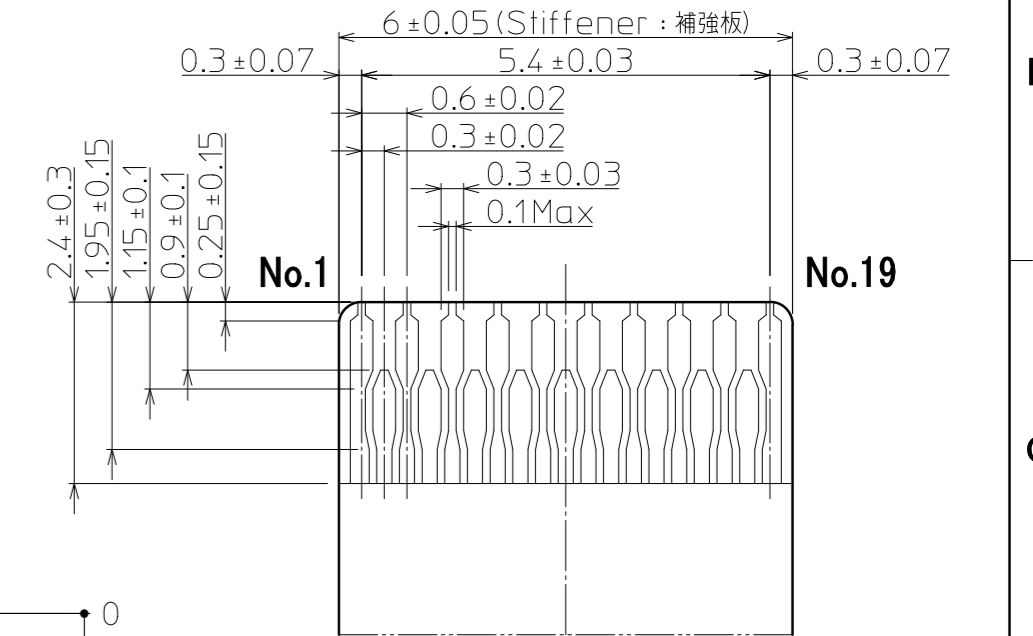14) Do not bend the FPC so that stress is concentrated on the FPC.

## 11. Reliability Test Data

| Test item | Test condition | Test time | Judgement | |
|---|---|---|---|---|
| High temp. atmosphere | 70℃ | 240h | Function/Display<br>Current consumption | : No defect<br>: No defect |
| Low temp. atmosphere | -30℃ | 240h | Function/Display<br>Current consumption | : No defect<br>: No defect |
| High temp. humidity atmosphere | 40℃ 95%RH | 240h | Function/Display<br>Current consumption | : No defect<br>: No defect |
| Temp. cycle | -30℃　0.5h<br>R.T.　0.5h<br>80℃　0.5h | 10cycles | Function/Display<br>Current consumption | : No defect<br>: No defect |
| High temp. operation | 60℃ | 240h | Function/Display<br>Current consumption | : No defect<br>: No defect |
| Low temp. operation | -20℃ | 240h | Function/Display<br>Current consumption | : 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.

M303011

**KYOCERA**

**Resin Coat Area**
(樹脂コート領域)
UV Curable Type Resin
(UV硬化型樹脂)
The exposed portion of the electrode should be covered with a UV curable resin.
(電極露出部はUV硬化樹脂で確実に覆うこと)

**Resin Coat Area**
(樹脂コート領域)
Silicone Resin
(シリコーン樹脂)

8.5 ±0.2
3.9 (Stiffener : 補強板)
22.75 ±0.4
22.2 ±0.3
(14.7)(A.A.)
19.1
6 ±0.5
6 ±0.4
0.2 ±0.03

**Stiffener**
(補強板)

**Terminal Side**
(端子面)

7.3 ±0.3
6.75 ±0.4
1 ±0.4 ±0.5
1.38 ±0.4 ±0.5
1.5 ±0.2 ±0.5
1.2 ±0.5

**176×176Dots**

0.5 Max
0.5 Max

2.3 ±0.3

0.5 Max
2-11.18 ±0.3
12.75 Min

2-11.42 ±0.4

**Active Area Center**
(表示領域センター)

(9.6)(A.A.)
26.5 (A.A.)
16.25 ±0.1
(A.A. Center)

**Display Side**
(表示面)

19.75 Max
2-22.88 ±0.3

2-22.55 ±0.4

31 ±0.1
(10.8)(A.A.)
26.5 (A.A.)

30.2 ±0.3

29.5 ±0.15
28.7 ±0.3
21.05 ±0.4
21.38 ±0.3
14.75 ±0.1 (A.A. Center)
8.45 ±0.4
8.12 ±0.3
0.8 ±0.3

A
No.1   No.19

22.75 ±0.4
6.75 ±0.4
0.8 Max
2.3 ±0.3
2-11.42 ±0.4
2-22.55 ±0.4
30.2 ±0.3

28.7 ±0.3
21.05 ±0.4
8.45 ±0.4
0.8 ±0.3

0.119 ±0.015 (Polarizing Film : 偏光板)
1 ±0.095 (Glass : ガラスセル)
0.293 ±0.03 (Polarizing Film : 偏光板)
1.412 ±0.14

**DETAIL A （10:1)**

6 ±0.05 (Stiffener : 補強板)
5.4 ±0.03
0.3 ±0.07
0.6 ±0.02
0.3 ±0.02
0.3 ±0.03
0.1 Max
2.4 ±0.3
1.95 ±0.15
1.15 ±0.1
0.9 ±0.1
0.25 ±0.15
No.1          No.19

| | Silicone Resin Coating Area (シリコーン樹脂塗布領域) |
|---|---|
| | UV Curable Type Resin Coating Area (UV硬化型樹脂塗布領域) |
| | FPC Bending Prohibited Area (FPC折り曲げ禁止領域) |

Note. (注記)
1. Tolerance without indication : ±0.5
   （指示無さ公差）
2. FPC Bend radius(R) must be 0.5mm or larger.
   (FPCの曲げは R≧ R0.5以上とする)
   Please verify that a defect doesn't occur by enough evaluation.
   (十分な評価で不具合が発生しない事を検証願います.)
3. There is a possibility that in-plane unevenness will be occurred
   by over twist, stress giving by attaching to LCD,
   and over pressure to touch panel.
   Please be careful of stress when designing the housing.
   (過度な捻じり(ひずみ)、LCD固定時での応力発生、タッチパネルでの過度な押し圧によっては、
   パネル面内にムラが発生する事がありますので、筐体設計において、事前に十分確認願います.)
4. About the dimension of the active area(A.A.),Note1 is excluded.
   （アクティブエリア(A.A.)の寸法について、note1は適用除外とする.）
5. About the FPC bending should be performed after sufficient
   evaluation and confirmation that there are no problems.
   (FPCの折り曲げに関しては、十分な評価を行い問題ないことを確認したうえで行ってください.)
6. Forbidden to hold the FPC strongly and make it wrinkled.
   (FPCを強く折り曲げて、癖を付けるのは禁止)