

SPEC

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| Spec No. | TQ3C-8EAS0-E1DAL05-00 |
| Date | January 24, 2008 |

TYPE : KG035QV0AN-G01
< 3.5 inch QVGA reflective monochrome STN >

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KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT
LCD DIVISION

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| Original Issue Date | Designed by: Engineering dept. | | | Confirmed by: QA dept. | |
|---------------------|--------------------------------|--------------|--------------|------------------------|----------|
| | Prepared | Checked | Approved | Checked | Approved |
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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 indemnity, 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.

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Revision record

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1. Application

This document defines the specification of KG035QV0AN-G01. (RoHS Compliant)

2. Construction and outline

LCD : Reflective monochrome dot matrix type STN
Duty ratio : 1/240 duty
Backlight system : None
Polarizer : Glare treatment
Additional circuit : None

3. Mechanical specifications

| Item | Specification | Unit |
|------------------------|--|------|
| Outline dimensions | 83.3 (W)× 66.5 (H) × 1.93 (D) *(FPC not included) | mm |
| Active area | 71.02 (W) × 53.26 (H) (8.9cm / 3.5 inch (Diagonal)) | mm |
| Effective viewing area | 73 (W) × 55.2 (H) | mm |
| Dot format | 320 (W) × 240 (H) | dot |
| Dot size | 0.202 (W) × 0.202 (H) | mm |
| Dot pitch | 0.222 (W) × 0.222 (H) | mm |
| Base color *1 | Normally White | - |
| Mass | (22) | g |

*1 Due to the characteristics of the LCD material, the color varies with environmental temperature.

4. Absolute maximum ratings

4-1. Electrical absolute maximum ratings

| Item | Symbol | Min. | Max. | Unit |
|--------------------------------|------------------|-----------------|-----------------|------|
| Supply voltage for logic | V _{DD} | 0 | 6.0 | V |
| Supply voltage for LCD driving | V _H | -0.3 | 25 | V |
| | V _M | -0.3 | V ₀ | |
| | V _L | -20 | 0.3 | |
| | V ₀ | -0.3 | 5.0 | |
| | V ₁ | -0.3 | V _M | |
| Input signal voltage *1 | V _{IN} | V _{SS} | V _{DD} | V |
| FRM frequency | f _{FRM} | - | 150 | Hz |

*1 Input signal : FRM, LOAD, CP, C-DISP, D0~D7, MWS0~MWS4

4-2. Environmental absolute maximum ratings

| Item | Symbol | Min. | Max. | Unit |
|--------------------------|------------------|------|------|------|
| Operating temperature *1 | T _{OP} | 0 | 60 | °C |
| Storage temperature *2 | T _{STO} | -20 | 60 | °C |
| Operating humidity *3 | H _{OP} | 10 | *4 | %RH |
| Storage humidity *3 | H _{STO} | 10 | *4 | %RH |
| Vibration | - | *5 | *5 | - |
| Shock | - | *5 | *5 | - |

*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. = 60°C < 168h

Store LCD panels at normal temperature/humidity. Keep them free from vibration and shock. An LCD panel 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 (0.3~9 m/s ²) |
| Vibration width | 0.15mm | |
| Interval | 10-55-10 Hz | 1 minutes |

2 hours in each direction X, Y, Z (6 hours total)

EIAJ ED-2531

*6 Acceleration: 490 m/s², Pulse width: 11 ms

3 times in each direction: ±X, ±Y, ±Z

EIAJ ED-2531

*These vibration and shock results above are based on our standard LCD module, hence offer reference only data. Please confirm using your LCD module or system.

5. Electrical characteristics

5-1. $V_{DD} = 5.0V$

$V_{DD} = +5.0V \pm 5\%$, Temp. = $0 \sim 60^\circ C$

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|----------------------|-------------------------------|-------------|----------|-------------|------|
| Supply voltage for logic | V_{DD} | — | 4.75 | 5.00 | 5.25 | V |
| Supply voltage for LCD driving *1, *2 | $V_H = V_{OP}$ *1 | 0°C | (17.85) | (18.85) | (19.85) | V |
| | | 25°C | (17.70) | (18.70) | (19.70) | V |
| | | 60°C | (17.35) | (18.35) | (19.35) | V |
| | V_M *3 | — | (1.69) | (1.79) | (1.89) | V |
| | V_L *3 | — | (-15.93) | (-15.12) | (-14.31) | V |
| | V_0 *3 | — | (3.39) | (3.58) | (3.77) | V |
| | V_1 *3 | — | 0.00 | 0.00 | 0.00 | V |
| Input signal voltage (FRM, LOAD, CP, D0~D7, C-DISP) | V_{IN} | "High" level | $0.8V_{DD}$ | — | V_{DD} | V |
| | | "Low" level | 0 | — | $0.2V_{DD}$ | mA |
| Input current | I_{IN} | $V_{IN} = V_{DD}$ or V_{SS} | -100 | — | 100 | mW |
| Clock frequency | f_{CP} | — | — | — | 10.0 | MHz |
| Frame frequency *3 | f_{FRM} | — | 70 | 75 | 80 | Hz |
| Current consumption for logic | I_{DD} | *5 | — | (0.80) | (1.20) | mA |
| Current consumption | I_H | *6 | — | (0.04) | (0.06) | mA |
| | I_M | *5 | — | (0.001) | (0.002) | mA |
| | I_L | *6 | (-0.06) | (-0.04) | — | mA |
| | I_0 | *5 | — | (1.11) | (1.67) | mA |
| | I_1 | | (-0.66) | (-0.44) | — | mA |

*1 Contrast ratio can be adjusted by changing V_M , V_L , V_0 and V_1 subject to relation with V_H explained in 5-3-1. The Condition of the Power Supply Voltage for LCD driving. (V_1 should be fixed as V_{SS}) The Value of V_H which makes the best contrast ratio is called V_{OP} .

*2 Frame frequency : $f_{FRM} = 75Hz$

*3 Regarding V_M , V_L , V_0 and V_1 , they are calculated to the second decimal place based on the condition of Temp.=25°C and subject to relation with V_H as explained in 5-3-1. The Condition of the Power Supply Voltage for LCD driving.

*4 In consideration of display quality, it is recommended that frame frequency be set in the range of 70-80Hz. When you have to use higher frame and clock frequencies, confirm the LCD's performance and quality prior to finalizing the frequency value. Generally, as frame and clock frequencies become higher current consumption increases and display quality will degrade.

*5 Display pattern:

$V_H = V_{OP}$, $f_{FRM} = 75\text{Hz}$, $f_{CP} = 1.44\text{MHz}$,
Temp. = 25°C

1 2 3 4 5 320(dot)
 1 ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 2 □ ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 3 ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 : ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 : □ ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 : ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 239 □ ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 240
 (dot)

*6 Display pattern:

$V_H = V_{OP}$, $f_{FRM} = 75\text{Hz}$, $f_{CP} = 1.44\text{MHz}$,
Temp. = 25°C

1 2 3 4 5 320(dot)
 1 □ □ □ □ □ □ □ □ □ □ □ □
 2 □ □ □ □ □ □ □ □ □ □ □ □
 3 □ □ □ □ □ □ □ □ □ □ □ □
 : □ □ □ □ □ □ □ □ □ □ □ □
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 239 □ □ □ □ □ □ □ □ □ □ □ □
 240 □ □ □ □ □ □ □ □ □ □ □ □
 (dot)

5-2. $V_{DD} = 3.3V$

$V_{DD} = +3.3V \pm 0.3V$, Temp. = $0 \sim 60^{\circ}C$

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|----------------------|-------------------------------|-------------|----------|-------------|------|
| Supply voltage for logic | V_{DD} | — | 3.0 | 3.3 | 3.6 | V |
| Supply voltage for LCD driving *1, *2 | $V_H = V_{OP}$ *1 | $0^{\circ}C$ | (17.85) | (18.85) | (19.85) | V |
| | | $25^{\circ}C$ | (17.70) | (18.70) | (19.70) | V |
| | | $60^{\circ}C$ | (17.35) | (18.35) | (19.35) | V |
| | V_M *3 | — | (1.69) | (1.79) | (1.89) | V |
| | V_L *3 | — | (-15.93) | (-15.12) | (-14.31) | V |
| | V_0 *3 | — | (3.39) | (3.58) | (3.77) | V |
| | V_1 *3 | — | 0.00 | 0.00 | 0.00 | V |
| Input signal voltage (FRM, LOAD, CP, D0~D7, C-DISP) | V_{IN} | "High" level | $0.8V_{DD}$ | — | V_{DD} | V |
| | | "Low" level | 0 | — | $0.2V_{DD}$ | mA |
| Input current | I_{IN} | $V_{IN} = V_{DD}$ or V_{SS} | -100 | — | 100 | mW |
| Clock frequency | f_{CP} | — | — | — | 10.0 | MHz |
| Frame frequency *3 | f_{FRM} | — | 70 | 75 | 80 | Hz |
| Current consumption for | I_{DD} | *5 | — | (1.24) | (1.86) | mA |
| Current consumption | I_H | *6 | — | (0.04) | (0.06) | mA |
| | I_M | *5 | — | (0.001) | (0.002) | mA |
| | I_L | *6 | (-0.06) | (-0.04) | — | mA |
| | I_0 | *5 | — | (1.11) | (1.67) | mA |
| | I_1 | | (-0.69) | (-0.44) | — | mA |

*1 Contrast ratio can be adjusted by changing V_M , V_L , V_0 and V_1 subject to relation with V_H explained in 5-3-1. The Condition of the Power Supply Voltage for LCD driving. (V_1 should be fixed as V_{SS}) The Value of V_H which makes the best contrast ratio is called V_{OP} .

*2 Frame frequency : $f_{FRM} = 75Hz$

*3 Regarding V_M , V_L , V_0 and V_1 , they are calculated to the second decimal place based on the condition of Temp.= $25^{\circ}C$ and subject to relation with V_H as explained in 5-3-1. The Condition of the Power Supply Voltage for LCD driving.

*4 In consideration of display quality, it is recommended that frame frequency be set in the range of 70-80Hz. When you have to use higher frame and clock frequencies, confirm the LCD's performance and quality prior to finalizing the frequency value. Generally, as frame and clock frequencies become higher current consumption increases and display quality will degrade.

*5 Display pattern:

$V_H = V_{OP}$, $f_{FRM} = 75\text{Hz}$, $f_{CP} = 1.44\text{MHz}$,
Temp. = 25°C

1 2 3 4 5 320(dot)
 1 ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 2 □ ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 3 ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 : ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 : □ ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 : ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 239 □ ■ □ ■ □ ■ □ ■ □ ■ □ ■ □
 240
 (dot)

*6 Display pattern:

$V_H = V_{OP}$, $f_{FRM} = 75\text{Hz}$, $f_{CP} = 1.44\text{MHz}$,
Temp. = 25°C

1 2 3 4 5 320(dot)
 1 □ □ □ □ □ □ □ □ □ □ □ □
 2 □ □ □ □ □ □ □ □ □ □ □ □
 3 □ □ □ □ □ □ □ □ □ □ □ □
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 239 □ □ □ □ □ □ □ □ □ □ □ □
 240 □ □ □ □ □ □ □ □ □ □ □ □
 (dot)

5-3-1. Condition of Power Supply Voltage for LCD driving

It is necessary to meet the conditions below for each power supply voltage level for LCD driving

1. $V_H / V_M = (10.45)(0^\circ\text{C})$
 $(10.76)(25^\circ\text{C})$
 $(11.26)(60^\circ\text{C})$

2. $V_1 = V_{SS}$

3. $|V_H - V_M| = |V_L - V_M|$

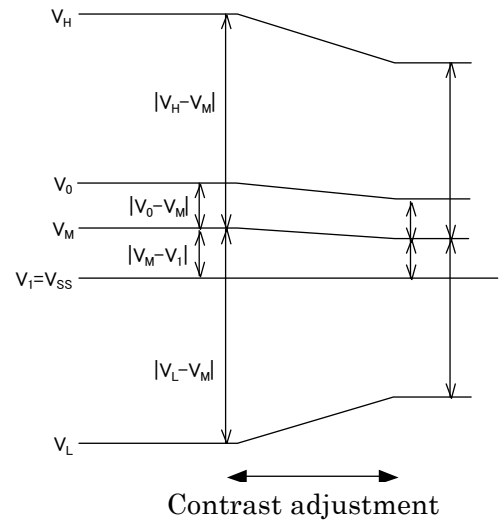
*The difference between $|V_H - V_M|$ and $|V_L - V_M|$ should be less than 0.05V.

If the difference is too large flicker or waving may be visible on displayed images.

4. $|V_0 - V_M| = |V_M - V_1|$

*The difference between $|V_0 - V_M|$ and $|V_M - V_1|$ should be less than 0.02V.

If the difference is too large crosstalk may be visible on displayed images.



5-3-2. Setting Randomizing Period.

The Randomizing circuit is built-into the Common driver IC. If you connect MWS0~MWS4 to V_{DD} or V_{SS} , the randomizing period is set up for every common line unit as shown in the table below. It is possible to set up by 2~31 line unit.

Please optimize the setting so that the display can have good image quality (Every 13 lines is the standard value at Kyocera).

Alternate current signal can be seen at No.15 (M) in an input terminal.

| MWS0 | MWS1 | MWS2 | MWS3 | MWS4 | Setting |
|-------------|------|------|------|------|--------------------|
| 0 | 0 | 0 | 0 | 0 | Circuit is stopped |
| 1 | 0 | 0 | 0 | 0 | (prohibited) |
| 0 | 1 | 0 | 0 | 0 | Every 2 line unit |
| 1 | 1 | 0 | 0 | 0 | Every 3 line unit |
| syncopation | | | | | |
| 0 | 1 | 1 | 1 | 1 | Every 30 line unit |
| 1 | 1 | 1 | 1 | 1 | Every 31 line unit |

* 0 : Connected to V_{SS} 1 : Connected to V_{DD}

6. Optical characteristics

Measuring spot = ϕ 6.0mm, Temp. = 25°C

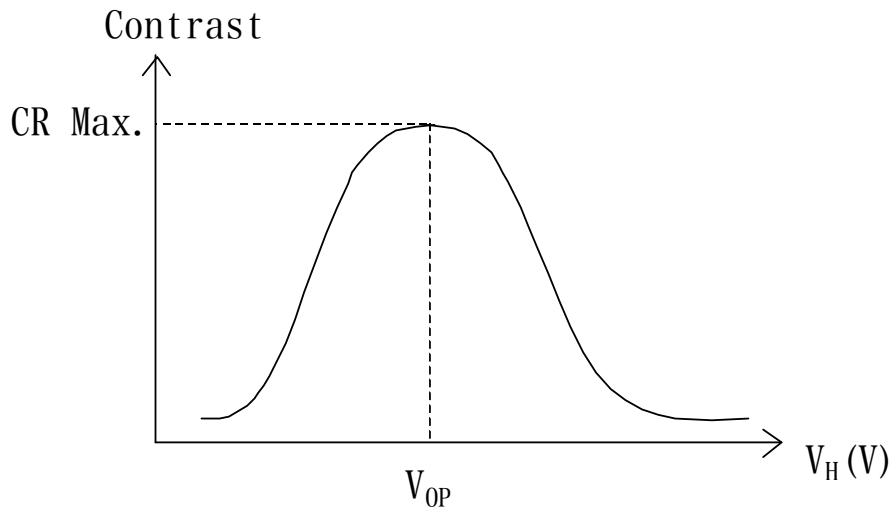
| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | |
|---------------------|------------------|---------------------------|---------------------------|------|-------|------|----|
| Response time | Rise | τ_r | $\theta = \phi = 0^\circ$ | - | (480) | TBD | ms |
| | Down | τ_d | $\theta = \phi = 0^\circ$ | - | (120) | TBD | ms |
| Viewing angle range | θ_{UPPER} | $CR \geq 2$ | - | TBD | - | deg. | |
| | θ_{LOWER} | | - | TBD | - | | |
| | ϕ_{LEFT} | | - | TBD | - | deg. | |
| | ϕ_{RIGHT} | | - | TBD | - | | |
| Contrast ratio | CR | $\theta = \phi = 0^\circ$ | (5) | (10) | - | - | |
| Reflectance | ρ | - | (25) | (50) | - | % | |

Optimum contrast is obtained by adjusting the LCD driving voltage (V_{OP}) while at the viewing angle of $\theta = \phi = 0^\circ$.

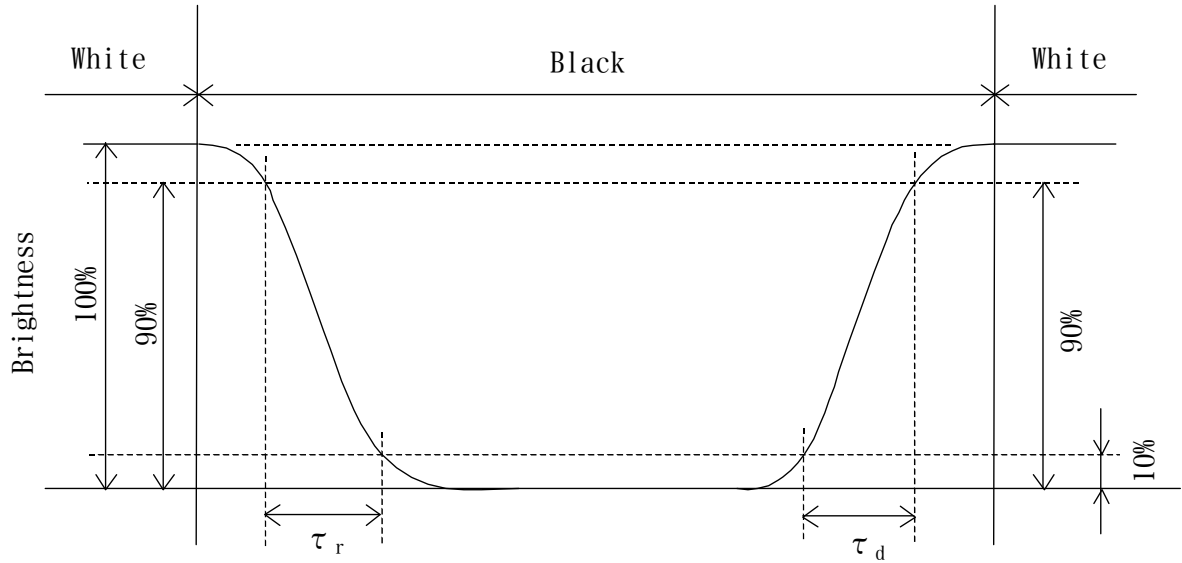
6-1. Definition of contrast ratio

$$CR(\text{Contrast ratio}) = \frac{\text{Reflectance at all pixels "White"}}{\text{Reflectance at all pixels "Black"}}$$

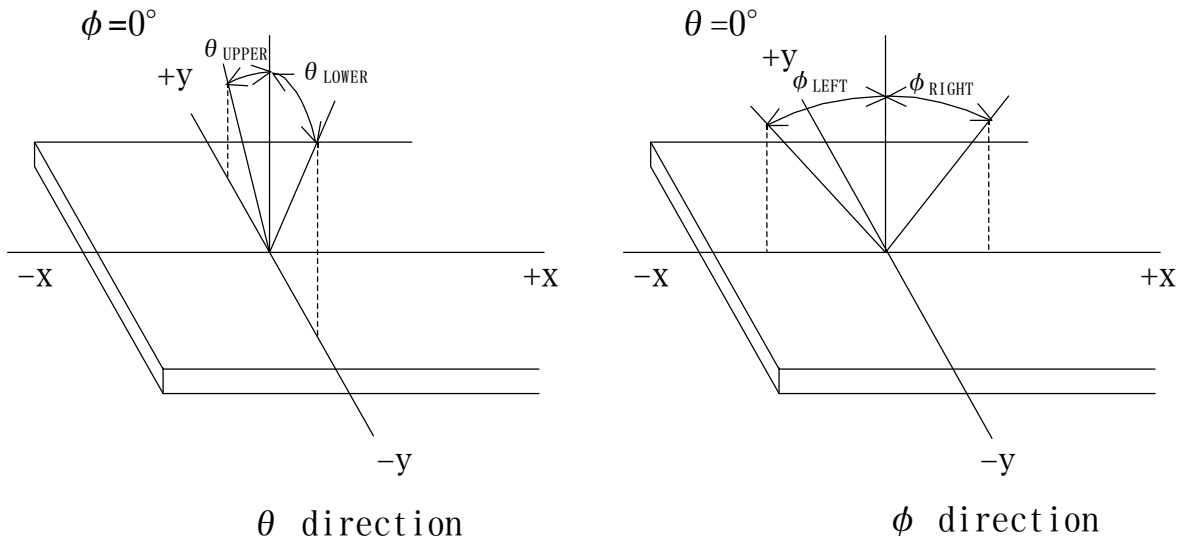
6-2. Definition of V_{OP}



6-3. Definition of response time



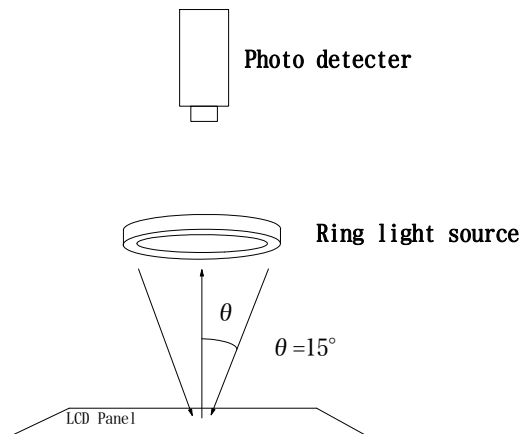
6-4. Definition of viewing angle



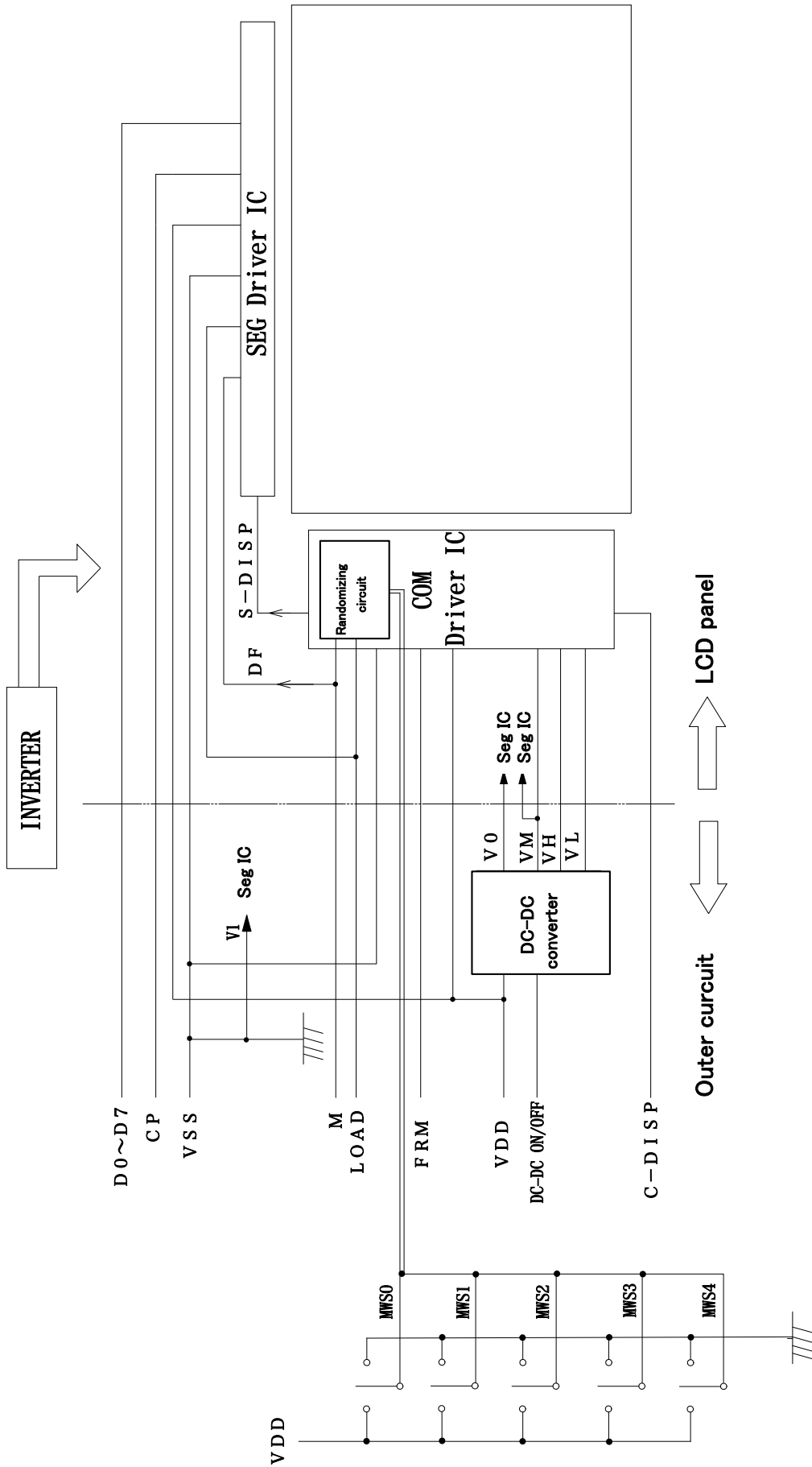
6-5. Definition of Reflectance

$$\rho \text{ (Reflectance)} = \frac{\text{Measured Reflection Brightness}}{\text{Reflection Brightness against Standard White Board}} \times 100 \text{ [\%]}$$

6-6. Measuring method of reflectance



7. Circuit block diagram



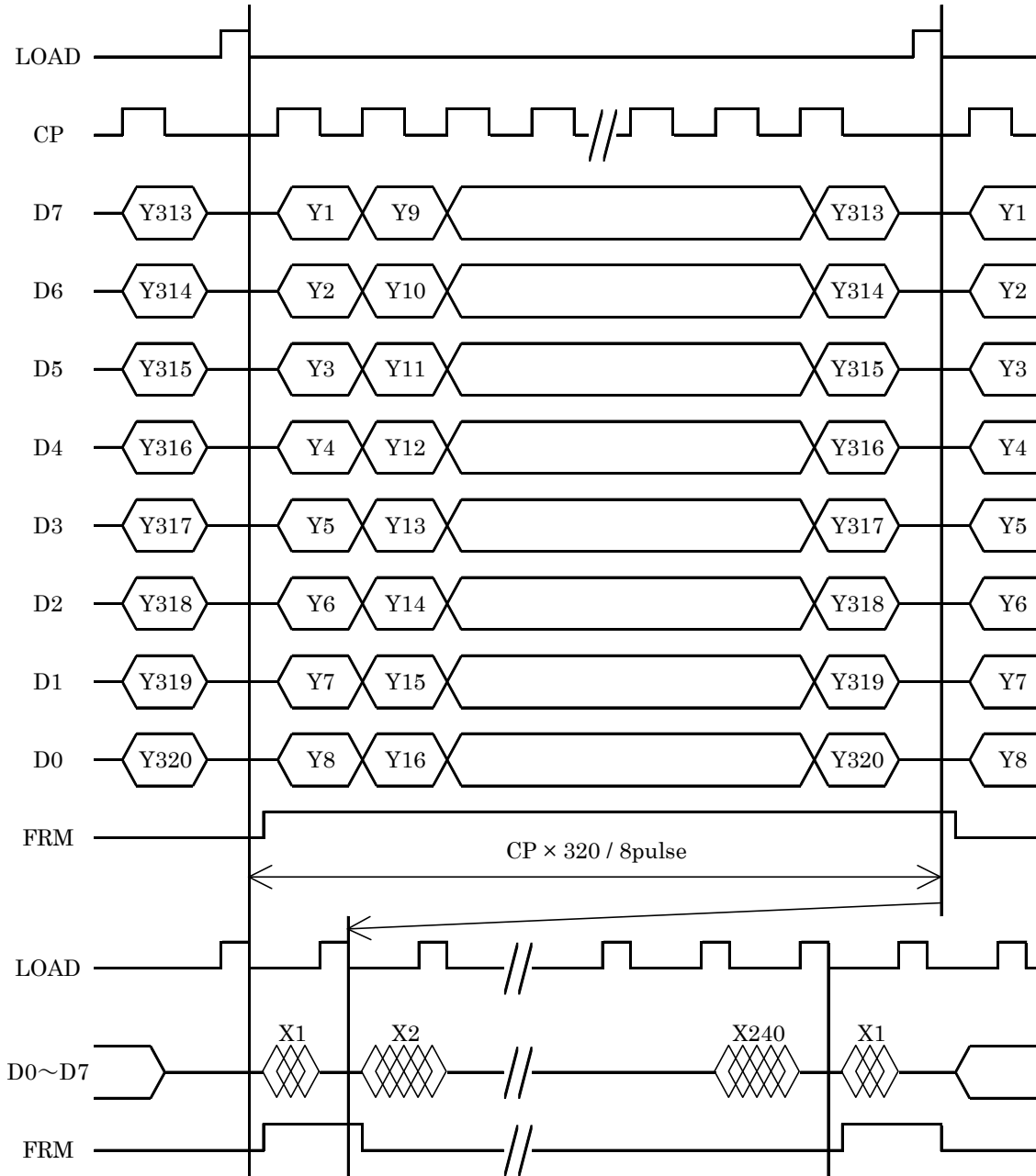
8. Interface signals

| Pin No. | Symbol | Description | Level |
|---------|-----------------|---|--------------|
| 1 | V _H | Power supply for LCD driving | — |
| 2 | V _M | | |
| 3 | V _L | | |
| 4 | LOAD | Data signal latch clock | H → L |
| 5 | GND | V _{SS} = GND | — |
| 6 | GND | | |
| 7 | C-DISP | Display control signal | H(ON),L(OFF) |
| 8 | V _{DD} | Power supply for logic | — |
| 9 | V _{DD} | | |
| 10 | MWS0 | Setting the randomizing period | — |
| 11 | MWS1 | | |
| 12 | MWS2 | | |
| 13 | MWS3 | | |
| 14 | MWS4 | | |
| 15 | M | Randomizing signal monitor : NC | |
| 16 | FRM | Synchronous signal for driving scanning | H |
| 17 | V ₀ | Power supply for LCD driving | — |
| 18 | V ₁ | | |
| 19 | GND | V _{SS} = GND | — |
| 20 | NC | NC | |
| 21 | CP | Data signal shift clock | H → L |
| 22 | D7 | 8bit parallel data | H(ON),L(OFF) |
| 23 | D6 | | |
| 24 | D5 | | |
| 25 | D4 | | |
| 26 | D3 | | |
| 27 | D2 | | |
| 28 | D1 | | |
| 29 | D0 | | |
| 30 | V _{DD} | Power supply for logic | — |

FPC : P=0.5mm

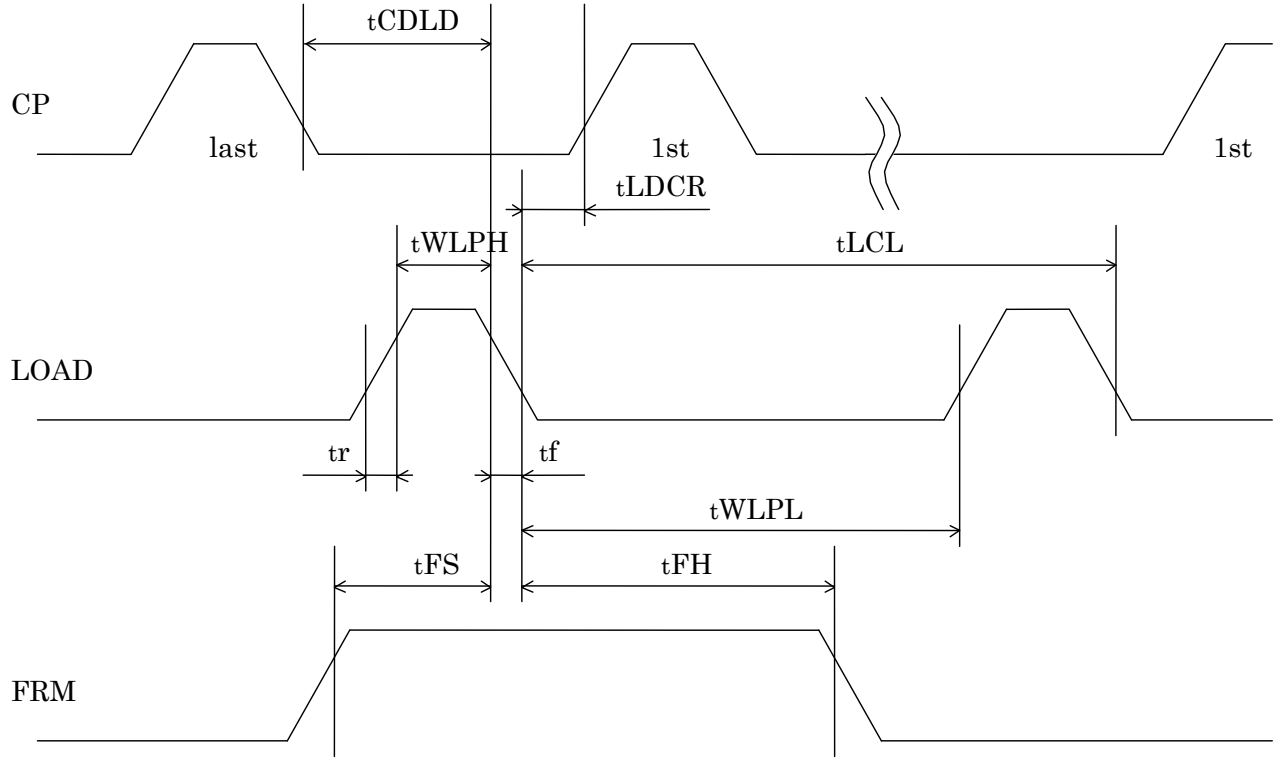
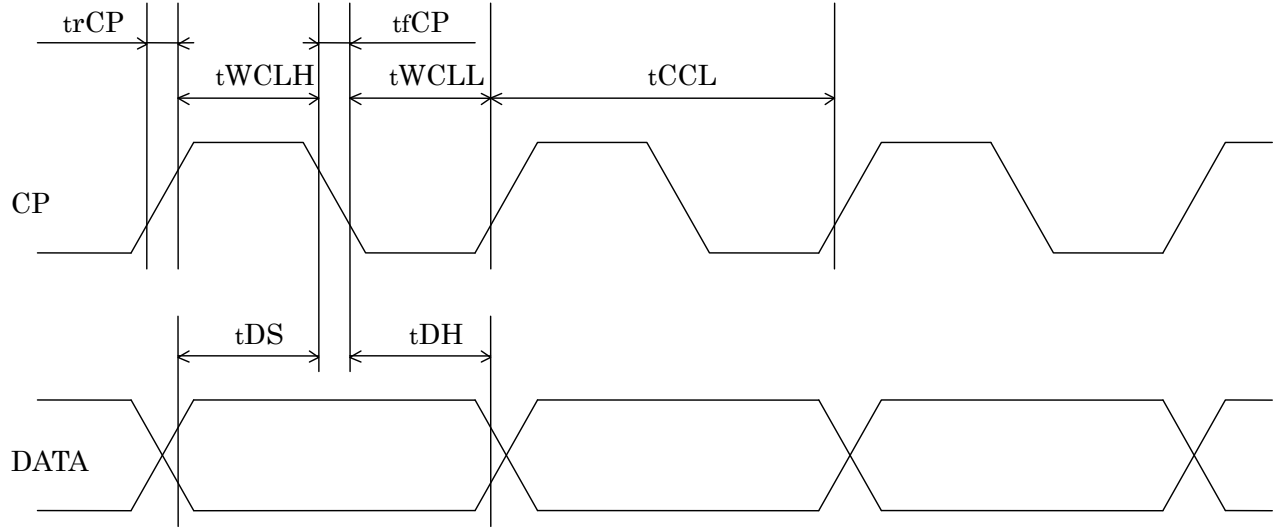
*1 If C-DISP is L, both the segment and the common driver ICs should produce an output power level equivalent to V_M, which makes the display off.

9. Interface timing chart



- * The cycle of the LOAD signal should be stable and continuously applied without interruption.
- * The above-mentioned timing chart is a reference to set up a LCD module, not an electrical rating.

10. Input timing characteristics



10-1. Switching characteristics ($V_{DD} = 5.0V$)

Input characteristics : $V_{DD} = +5.0V \pm 5\%$, Temp. = $0 \sim 60^{\circ}C$

| Item | Symbol | Min. | Max. | Unit |
|-----------------------------|--------|------|------|------|
| CP cycle *1 | tCCL | 100 | - | ns |
| CP "H" pulse width | tWCLH | 30 | - | ns |
| CP "L" pulse width | tWCLL | 30 | - | ns |
| CP rise up time | trCP | - | 15 | ns |
| CP fall down time | tfCP | - | 15 | ns |
| Data set up time | tDS | 25 | - | ns |
| Data hold time | tDH | 25 | - | ns |
| LOAD "H" pulse width | tWLPH | 40 | - | ns |
| LOAD "L" pulse width | tWLPL | 400 | - | ns |
| LOAD cycle *2 | tLCL | 500 | - | ns |
| CP → LOAD delay time | tCDLD | 60 | - | ns |
| LOAD → CP delay time | tLDCR | 60 | - | ns |
| Input signal rise up time | tr | - | 20 | ns |
| Input signal fall down time | tf | - | 20 | ns |
| FRM data set up time | tFS | 120 | - | ns |
| FRM data hold time | tFH | 30 | - | ns |

*1 CP cycle is adjusted so that FRM signal is 75Hz.

*2 LOAD cycle is constant.

10-2. Switching characteristics ($V_{DD} = 3.3V$)

Input characteristics : $V_{DD} = +3.3V \pm 0.3V$, Temp. = $0 \sim 60^{\circ}C$

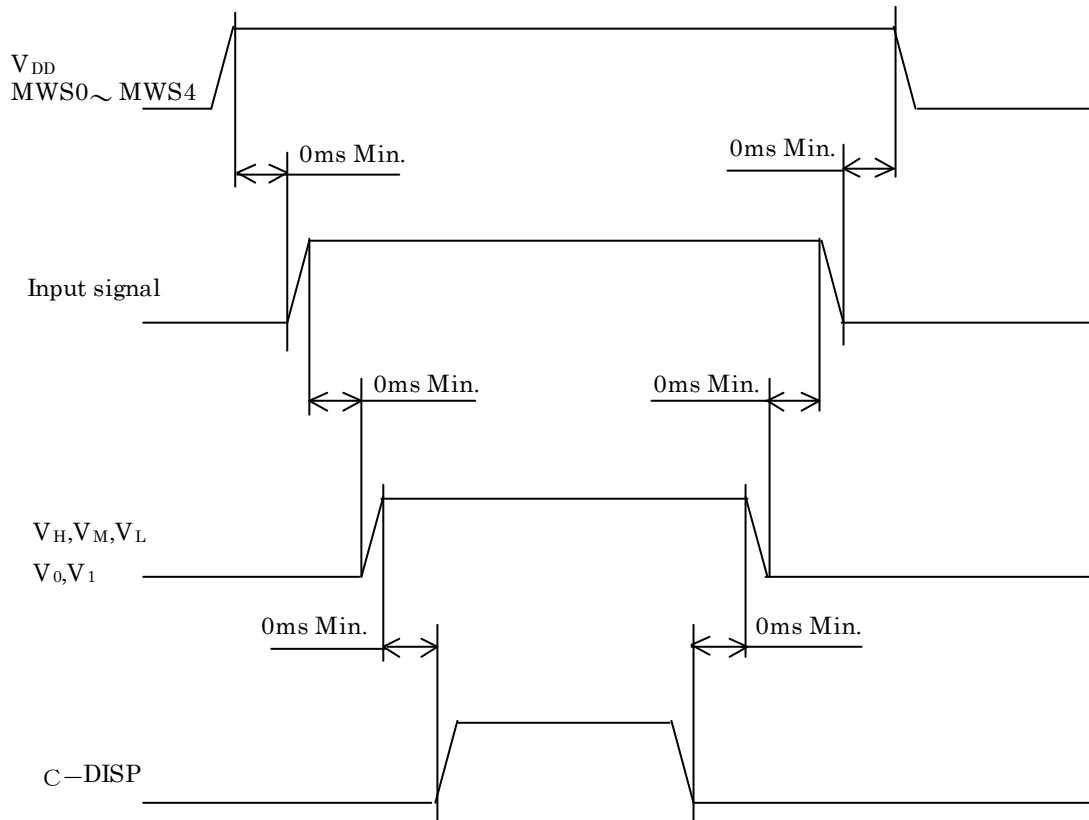
| Item | Symbol | Min. | Max. | Unit |
|-----------------------------|--------|------|------|------|
| CP cycle *1 | tCCL | 100 | - | ns |
| CP "H" pulse width | tWCLH | 40 | - | ns |
| CP "L" pulse width | tWCLL | 40 | - | ns |
| CP rise up time | trCP | - | 20 | ns |
| CP fall down time | tfCP | - | 20 | ns |
| Data set up time | tDS | 35 | - | ns |
| Data hold time | tDH | 35 | - | ns |
| LOAD "H" pulse width | tWLPH | 50 | - | ns |
| LOAD "L" pulse width | tWLPL | 400 | - | ns |
| LOAD cycle *2 | tLCL | 500 | - | ns |
| CP → LOAD delay time | tCDLD | 60 | - | ns |
| LOAD → CP delay time | tLDCR | 80 | - | ns |
| Input signal rise up time | tr | - | 20 | ns |
| Input signal fall down time | tf | - | 20 | ns |
| FRM data set up time | tFS | 120 | - | ns |
| FRM data hold time | tFH | 30 | - | ns |

*1 CP cycle is adjusted so that FRM signal is 75Hz.

*2 LOAD cycle is constant.

11. Supply voltage sequence condition

In normal operation, logic within the LCD module reverses the polarity of the drive voltage every few lines to prevent DC damage to the liquid crystal material. But when a voltage is present on LCD driving voltage outside of the time when the V_{DD} logic voltage is stable, a drive voltage is applied to the liquid crystal material without the polarity reversals. This sometimes result in a deterioration of display quality and a reduction in life time.



* Input signal: FRM, LOAD, CP, D0~D7

* The above sequence should be designed as to maintain each normal voltage when the liquid crystal module load is applied to your system.

* Control the supply voltage sequence to not float any signal line when the LCD panel is being driven.

1 2 . Lot number identification

The lot number shall be indicated on the front side of LCD panel.

| | | | | | | | | | |
|------|---|---|---|---|---|---|---|---|---|
| M | G | 0 | 1 | □ | □ | □ | □ | □ | □ |
| ↓ | | | | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Mono | | | | ① | ② | ③ | ④ | ⑤ | |

No1. - No5. above indicate

1. Year code
2. Month code
3. Date
4. Version Number
5. Country of origin (Japan or China)

1 3 . Warranty

13-1. Incoming inspection

Please inspect the LCD within one month after your receipt.

13-2. 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.

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

14. Precautions for use

14-1. 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 so that there is no pressure on the LSI chips.
- 3) The LCD shall be installed flat, without twisting or bending.
- 4) Please design the housing window so that its edges are between the active area and the effective area of the LCD screen.
- 5) A transparent protection sheet is attached to the polarizer. Please remove the protection film slowly before use, paying attention to static electricity.

14-2. 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.

14-3. 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) Adjust the "Supply voltage for LCD driving" to obtain optimum viewing angle and contrast ratio.

14-4. 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.

14-5. 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 module because it will result in damage.
- 7) This Kyocera LCD module 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 module 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.

1 5 . Reliability test data

| Test item | Test condition | Test time | Judgement |
|--------------------------------|--------------------------------------|-----------|--|
| High temp. atmosphere | 60°C | 240h | Display function : No defect Display quality : No defect Current consumption : No defect |
| Low temp. atmosphere | -20°C | 240h | Display function : No defect Display quality : No defect Current consumption : No defect |
| High temp. humidity atmosphere | 40°C 90% RH | 240h | Display function : No defect Display quality : No defect Current consumption : No defect |
| Temp. cycle | -20°C 0.5h R.T. 0.5h 60°C 0.5h | 10cycles | Display function : No defect Display quality : No defect Current consumption : No defect |
| High temp. operation | 60°C | 500h | Display function : No defect Display quality : No defect Current consumption : No defect |

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

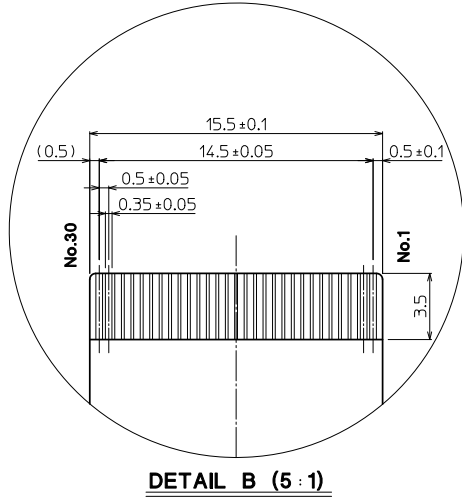
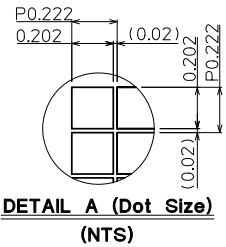
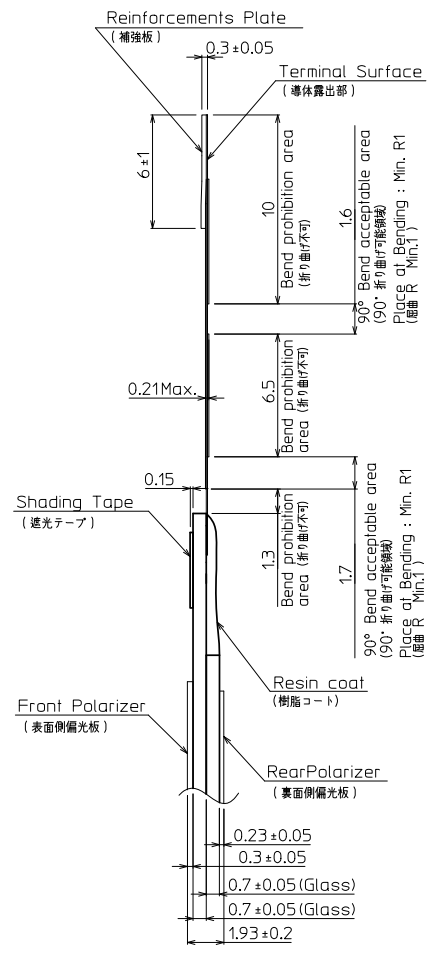
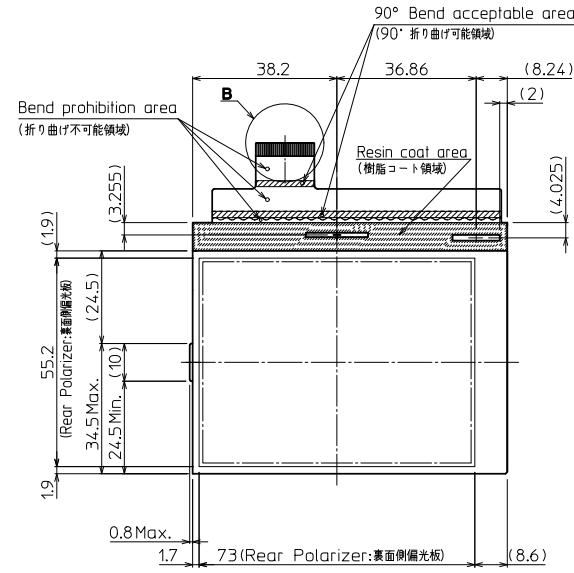
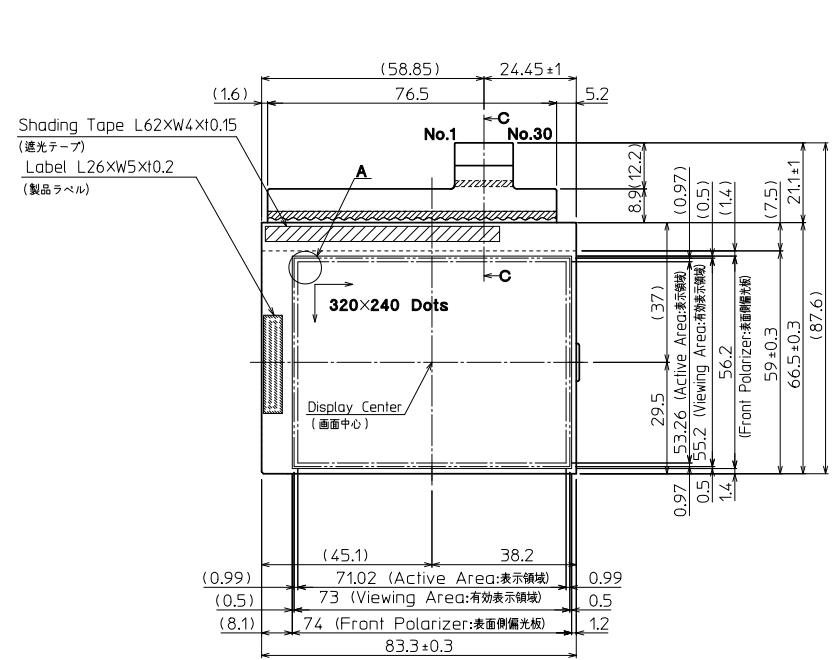
* The LCD is tested in circumstances in which there is no condensation.

* The reliability test is not an out-going inspection.

* The result of the reliability test is for your reference purpose only.

The reliability test is conducted only to examine the LCD's capability.

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



Note(注記)

- Recommended Matching Connector : 08-6260-030-340-829+ (ELCO) (推奨コネクタ)
- The Information of LCD is displayed starting at the upper left hand corner, moving right then down to the lower right hand corner. (LCDにおいて、画像データの表示は左上コーナーから始まり、右へ進み下へ送られ右下コーナーへ向かう。)
- Tolerance without indication: ±0.5 (指示無き公差)

| | | | | | | | | | | |
|-----------------|-------------------|-----------------------|---------|----------------------|-------------|-----------------------|----------------------------|---------|----------------------------|-----------|
| Material 材質 | Treatment 処理 | Approved '08.01.31 | Checked | Checked '08.01.31 | Drawn 中尾 | Scale 1:1(5:1,NTS) | Title KG035QV0AN-G01 | KYOCERA | Year-Month-Day '08.1.28 | Size 2 |
| Quantity 製作数 | Description 備考 | RoHS 08016AAA | 鶴崎 | 倉元 | | Outline Dimensions | Drawing No. 121A5066900 | | | |

| | |
|----------|-----------------------|
| Spec No. | TQ3C-8EAS0-E2DAL05-00 |
| Date | January 24, 2008 |

KYOCERA INSPECTION STANDARD

TYPE : KG035QV0AN-G01

KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT
LCD DIVISION

| Original Issue Date | Designed by : Engineering dept. | | | Confirmed by : QA dept. | |
|---------------------|---------------------------------|-------------|--------------|-------------------------|----------|
| | Prepared | Checked | Approved | Checked | Approved |
| January 24, 2008 | S. Kojima | T. Jofunawa | Y. Matsumoto | J. Sakaguchi | T. Itoh |

| | | |
|-----------------------------------|----------------------------|-----------|
| Spec No. TQ3C-8EAS0-E2DAL05-00 | Part No. KG035QV0AN-G01 | Page - |
|-----------------------------------|----------------------------|-----------|

Revision record

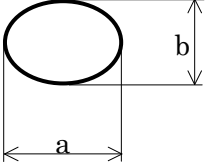
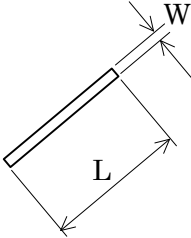
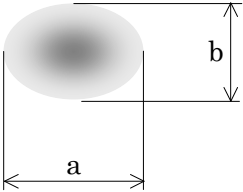
| Date | | Designed by : Engineering dept. | | | Confirmed by : QA dept. | |
|---------|------|---------------------------------|--------------|----------|-------------------------|----------|
| | | Prepared | Checked | Approved | Checked | Approved |
| | | | | | | |
| Rev.No. | Date | Page | Descriptions | | | |
| | | | | | | |

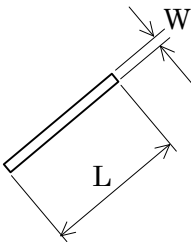
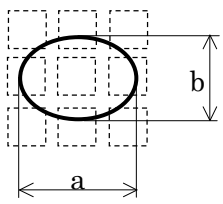
Visuals specification

1) Note

| Item | Note |
|-------------------------------|--|
| General | <p>1. When defects specified in this Inspection Standards are inspected, operating voltage (V_{OP}) shall be set at the level where optimized contrast is available. Display quality is applied up to effective viewing area. (Bi-level INSPECTION)</p> <p>2. This inspection standard about the image quality shall be applied to any defect within the effective viewing area and shall not be applicable to outside of the area.</p> <p>3. Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and Kyocera.</p> <p>4. Inspection conditions</p> <p style="margin-left: 40px;">Luminance : 500 Lux minimum.</p> <p style="margin-left: 40px;">Inspection distance : 300 mm (from the sample)</p> <p style="margin-left: 40px;">Temperature : $25 \pm 5^{\circ}\text{C}$</p> <p style="margin-left: 40px;">Direction : right above</p> |
| Definition of inspection item | <p>Pinhole, Bright spot Black spot, Scratch Foreign particle</p> <p>The color of a small area is different from the remainder. The phenomenon does not change with voltage.</p> |
| | <p>Contrast variation</p> <p>The color of a small area is different from the remainder. The phenomenon change with voltage.</p> |
| | <p>Polarizer (Scratch, Bubble, Dent)</p> <p>Scratch, Bubble and Dent in the polarizer which can be observed in on / off state.</p> |

2)Standard

| Inspection item | Judgement standard | | | | | | | | | | | | | | | | | | | | | | |
|---|---|--------------------|-------------------------|-------------------|-------------------|--------------|---------------|---|--------------------|---|----------------------|--------------------|-----------|---|--------------------|---|---|-----------|---|---|------------|---|-------------------------|
| Pinhole, Bright spot, Black spot, Foreign particle |  $d = (a + b) / 2$ <table border="1" data-bbox="608 573 1417 775"> <thead> <tr> <th>Category</th> <th>Size(mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>$d \leq 0.2$</td> <td>Neglected</td> </tr> <tr> <td>B</td> <td>$0.2 < d \leq 0.3$</td> <td>5</td> </tr> <tr> <td>C</td> <td>$0.3 < d \leq 0.5$</td> <td>3</td> </tr> <tr> <td>D</td> <td>$0.5 < d$</td> <td>0</td> </tr> </tbody> </table> | Category | Size(mm) | Acceptable number | A | $d \leq 0.2$ | Neglected | B | $0.2 < d \leq 0.3$ | 5 | C | $0.3 < d \leq 0.5$ | 3 | D | $0.5 < d$ | 0 | | | | | | | |
| Category | Size(mm) | Acceptable number | | | | | | | | | | | | | | | | | | | | | |
| A | $d \leq 0.2$ | Neglected | | | | | | | | | | | | | | | | | | | | | |
| B | $0.2 < d \leq 0.3$ | 5 | | | | | | | | | | | | | | | | | | | | | |
| C | $0.3 < d \leq 0.5$ | 3 | | | | | | | | | | | | | | | | | | | | | |
| D | $0.5 < d$ | 0 | | | | | | | | | | | | | | | | | | | | | |
| Scratch, Foreign particle |  <table border="1" data-bbox="608 1149 1417 1473"> <thead> <tr> <th></th> <th>Width (mm)</th> <th>Length (mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>$W \leq 0.03$</td> <td>-</td> <td>Neglected</td> </tr> <tr> <td>B</td> <td rowspan="3">$0.03 < W \leq 0.10$</td> <td>$L \leq 2.0$</td> <td>Neglected</td> </tr> <tr> <td>C</td> <td>$2.0 < L \leq 4.0$</td> <td>3</td> </tr> <tr> <td>D</td> <td>$4.0 < L$</td> <td>0</td> </tr> <tr> <td>E</td> <td>$0.10 < W$</td> <td>-</td> <td>According to 'Circular'</td> </tr> </tbody> </table> | | Width (mm) | Length (mm) | Acceptable number | A | $W \leq 0.03$ | - | Neglected | B | $0.03 < W \leq 0.10$ | $L \leq 2.0$ | Neglected | C | $2.0 < L \leq 4.0$ | 3 | D | $4.0 < L$ | 0 | E | $0.10 < W$ | - | According to 'Circular' |
| | Width (mm) | Length (mm) | Acceptable number | | | | | | | | | | | | | | | | | | | | |
| A | $W \leq 0.03$ | - | Neglected | | | | | | | | | | | | | | | | | | | | |
| B | $0.03 < W \leq 0.10$ | $L \leq 2.0$ | Neglected | | | | | | | | | | | | | | | | | | | | |
| C | | $2.0 < L \leq 4.0$ | 3 | | | | | | | | | | | | | | | | | | | | |
| D | | $4.0 < L$ | 0 | | | | | | | | | | | | | | | | | | | | |
| E | $0.10 < W$ | - | According to 'Circular' | | | | | | | | | | | | | | | | | | | | |
| Contrast variation |  $d = (a + b) / 2$ <table border="1" data-bbox="608 1787 1417 1951"> <thead> <tr> <th>Category</th> <th>Size (mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>$d \leq 0.5$</td> <td>Neglected</td> </tr> <tr> <td>B</td> <td>$0.5 < d \leq 0.7$</td> <td>3</td> </tr> <tr> <td>C</td> <td>$0.7 < d$</td> <td>0</td> </tr> </tbody> </table> | Category | Size (mm) | Acceptable number | A | $d \leq 0.5$ | Neglected | B | $0.5 < d \leq 0.7$ | 3 | C | $0.7 < d$ | 0 | | | | | | | | | | |
| Category | Size (mm) | Acceptable number | | | | | | | | | | | | | | | | | | | | | |
| A | $d \leq 0.5$ | Neglected | | | | | | | | | | | | | | | | | | | | | |
| B | $0.5 < d \leq 0.7$ | 3 | | | | | | | | | | | | | | | | | | | | | |
| C | $0.7 < d$ | 0 | | | | | | | | | | | | | | | | | | | | | |

| Inspection item | Judgement standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|-------------------|----------------|-------------|----------------|---|--------------|---|-----------|---|--------------------|--------------|-----------|---|-----------|---|---|-----------|---|---|----------|-----------|-------------------|---|--------------|-----------|---|--------------------|---|---|--------------------|---|---|-----------|---|
| Polarizer (Scratch, Bubble, Dent) | <p>(1) Scratch</p>  <table border="1" data-bbox="606 728 1412 1019"> <thead> <tr> <th></th> <th>Width (mm)</th> <th>Length (mm)</th> <th>Acceptable No.</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>$W \leq 0.1$</td> <td>-</td> <td>Neglected</td> </tr> <tr> <td>B</td> <td rowspan="2">$0.1 < W \leq 0.3$</td> <td>$L \leq 5.0$</td> <td>Neglected</td> </tr> <tr> <td>C</td> <td>$5.0 < L$</td> <td>0</td> </tr> <tr> <td>D</td> <td>$0.3 < W$</td> <td>-</td> <td>0</td> </tr> </tbody> </table> <p>(2) Bubble (dent)</p>  $d = (a + b) / 2$ <table border="1" data-bbox="606 1579 1412 1848"> <thead> <tr> <th>Category</th> <th>Size (mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>$d \leq 0.2$</td> <td>Neglected</td> </tr> <tr> <td>B</td> <td>$0.2 < d \leq 0.3$</td> <td>5</td> </tr> <tr> <td>C</td> <td>$0.3 < d \leq 0.5$</td> <td>3</td> </tr> <tr> <td>D</td> <td>$0.5 < d$</td> <td>0</td> </tr> </tbody> </table> | | Width (mm) | Length (mm) | Acceptable No. | A | $W \leq 0.1$ | - | Neglected | B | $0.1 < W \leq 0.3$ | $L \leq 5.0$ | Neglected | C | $5.0 < L$ | 0 | D | $0.3 < W$ | - | 0 | Category | Size (mm) | Acceptable number | A | $d \leq 0.2$ | Neglected | B | $0.2 < d \leq 0.3$ | 5 | C | $0.3 < d \leq 0.5$ | 3 | D | $0.5 < d$ | 0 |
| | Width (mm) | Length (mm) | Acceptable No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | $W \leq 0.1$ | - | Neglected | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | $0.1 < W \leq 0.3$ | $L \leq 5.0$ | Neglected | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C | | $5.0 < L$ | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D | $0.3 < W$ | - | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Category | Size (mm) | Acceptable number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | $d \leq 0.2$ | Neglected | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | $0.2 < d \leq 0.3$ | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C | $0.3 < d \leq 0.5$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D | $0.5 < d$ | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |