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SPEC.NO. TQ3C-8EACO-E1AAWC44-01

DATE December 24, 1997

S P E C

FOR: _____

TYPE:KCS057QV1AA-G03
(KCS3224ASTT-X7)

C O N T E N T S

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KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT
LCD DIVISION

| | | | | | |
|---------------|--------------------------------|-----------|-----------|------------------------|------------|
| Original | Designed by :Engineering Dept. | | | Confirmed by :QA Dept. | |
| Issue Data | Prepared | Checked | Approved | Checked | Approved |
| June 19, 1997 | S. Kojima | S. Matsuo | A. hisano | S. Hayashi | J. Yodanis |

Revision Record

| Date | | Designed by : Engineering Dept. | | | Confirmed by : QA Dept. | |
|---------------|-------------|---------------------------------|--|----------|-------------------------|------------|
| | | Prepared | Checked | Approved | Checked | Approved |
| Dec. 24 ,1997 | | S. Kojima | S. Matsuo | M. Ishio | S. Hayashi | Y. Yoshida |
| Rev. No. | Date | Page | Descriptions | | | |
| 0 1 | Dec.24,1997 | - | Cover page -Change typename "KCS3224ASTT-X7" → "KCS057QV1AA-G03" | | | |
| | | 3 | 4-2 Environanental absolute maximum ratings ~ Change max operating humidity. " 8 5 " → " * 3 " | | | |
| | | 9 | 7-1 Power supply ~ Change type name. "KCS3224A" → "KCS057QV1A" | | | |
| | | 10 | 8-1 Interface signals ~Add note. | | | |
| | | 16 | 13-1 CFL ratings ~Change Starting discharge voltage, discharging tube voltage, "IL"value in Item "Operating life", reference value | | | |
| | | 17 | 14 Lot number Identification ~Change type name "KCS3224ASTT-X7" → "KCS057QV1AA-03" | | | |
| | | | | | | |

1. Application

This data sheet defines the specification for a $(320 \times 3) \times 240$ dot ,STN color dot matrix type Liquid Crystal Display with CFL backlight.

2. Construction and Outline

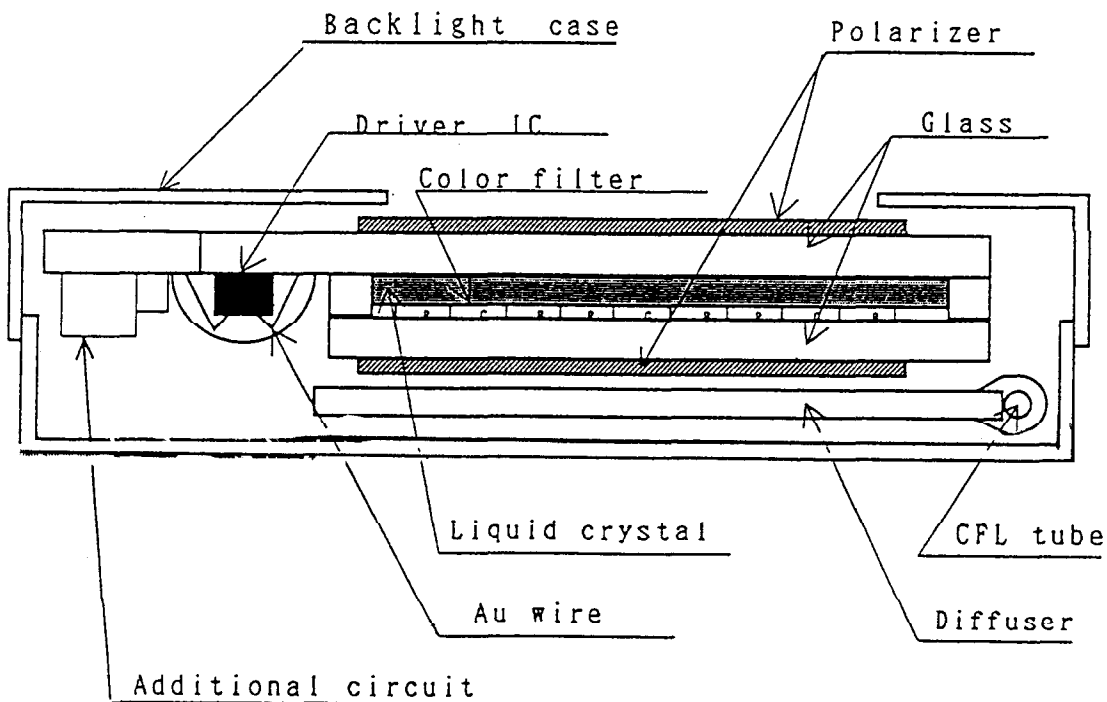
$(320 \times 3) \times 240$ dots, COG type LCD with CFL backlight.

Backlight system : Side-edge type CFL (1 tube)

Inverter : Option
Recommended Inverter : PH-BLC08-K3
(HITACHI MEDIA ELECTRONICS)
or equivalent.

Polarizer : Glare treatment.

Additional circuit : Bias voltage circuit, Randomizing circuit.



3. Mechanical Specifications

| ITEM | SPECIFICATION | UNIT |
|------------------------|------------------------------|------|
| Outline dimensions | 154.6(W) × 114.8(H) × 8.5(D) | mm |
| Effective viewing area | 118.18(W) × 89.38 (H) | mm |
| Dot number | (320×3)(W) × 240(H) | Dots |
| Dot size | 0.10(W) × 0.34(H) | mm |
| Dot pitch | 0.12(W) × 0.36(H) | mm |
| Display color #1 | White #2 | — |
| Base color #1 | Black #2 | — |
| Weight | 200 | g |

*1 Due to the characteristics of the LC material, the color vary with environmental temperature.

*2 Negative-type display

Display data "H" :R, G, B Dots ON : White

Display data "L" :R, G, B Dots OFF : Black

4. Absolute Maximum Ratings

4-1 Electrical absolute maximum ratings

Temp. = 25 °C

| ITEM | SYMBOL | MIN. | MAX. | UNIT |
|--------------------------------|--------|------|------|------|
| Supply voltage for logic | VDD | 0 | 7.0 | V |
| Supply voltage for LCD driving | VEE | 0 | 44.0 | V |
| Input voltage | Vin | 0 | VDD | V |

4-2 Environmental absolute maximum ratings

| ITEM | SYMBOL | MIN | MAX | UNIT |
|------------------------|------------------|-----|-----|------|
| Operating temperature | Top | 0 | 50 | °C |
| Storage temperature *1 | T _{STO} | -20 | 60 | °C |
| Operating humidity *2 | H _{OP} | 10 | *3 | %RH |
| Storage humidity *2 | H _{STO} | 10 | *3 | %RH |
| Vibration | — | *4 | *4 | — |
| Shock | — | *5 | *5 | — |

*1 Temp. = -20°C < 24Hr. , Temp = 60°C < 24Hr.
No vibration and shock.

*2 Non-condensation.

*3 Temp. ≤ 40°C, 85% RH Max.
Temp. > 40°C, Absolute Humidity shall be less than 85%RH at 40°C.

*4

| | | |
|-----------------|----------------------|--|
| Frequency | 10~55 Hz | Converted to acceleration value : (0.03~0.91G) |
| Vibration width | 0.15 mm | |
| Interval | 10-55-10 Hz 1 minute | |

2 hours in each direction X/Y/Z (6 hours as total)
EIAJ ED-2531

*5 Acceleration: 50 G
Pulse width : 11 msec
3 times in each direction : ±X/±Y/±Z.
EIAJ ED-2531

5. Electrical Characteristics

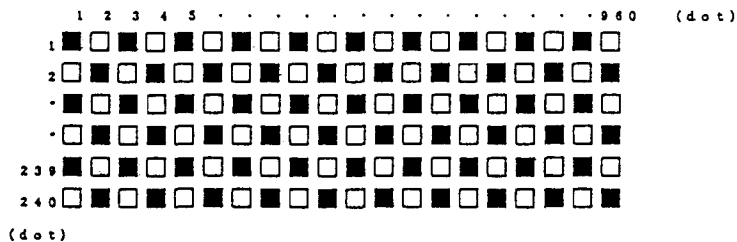
Temp. = 25°C, VDD = 5V ± 5%

| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|------------------|-----------|--------|------|--------|------|
| Supply voltage for logic | VDD | — | 4.75 | 5.00 | 5.25 | V |
| LCD driving voltage *1 | Vop= | 0 °C | 25.4 | 26.4 | 27.4 | V |
| | VEE | 25 °C | 25.1 | 26.1 | 27.1 | V |
| | | 40 °C | 24.8 | 25.8 | 26.8 | V |
| Input signalvoltage | Vin | "H" level | 0.8VDD | — | VDD | V |
| | | "L" level | 0 | — | 0.2VDD | V |
| Clock frequency | f _{cp} | | 2.02 | 2.16 | 12.0 | MHz |
| Frame frequency *2 | f _{FRM} | | 70 | 75 | 80 | Hz |
| Current consumption for logic | IDD | *3 | — | 3.0 | 4.5 | mA |
| Current consumption for LCD driving | IEE | | — | 7.5 | 11.3 | mA |
| Power consumption | Pdisp | | — | 211 | 330 | mW |

*1 Maximum contrast ratio is obtained by adjusting the LCD driving voltage (Vop = VEE) for driving LCD.

*2 In consideration of display quality, it is recommended that frame frequency is 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 values: Generally, as frame and clock frequencies become higher, current consumption will get bigger and display quality will be degraded.

*3 Display high frequency pattern, (see below).
VDD = 5V , Vop= VEE , f_{FRM}= 75 Hz , f_{cp}= 2.16 MHz



6. Optical Characteristics

Temp. = 25°C

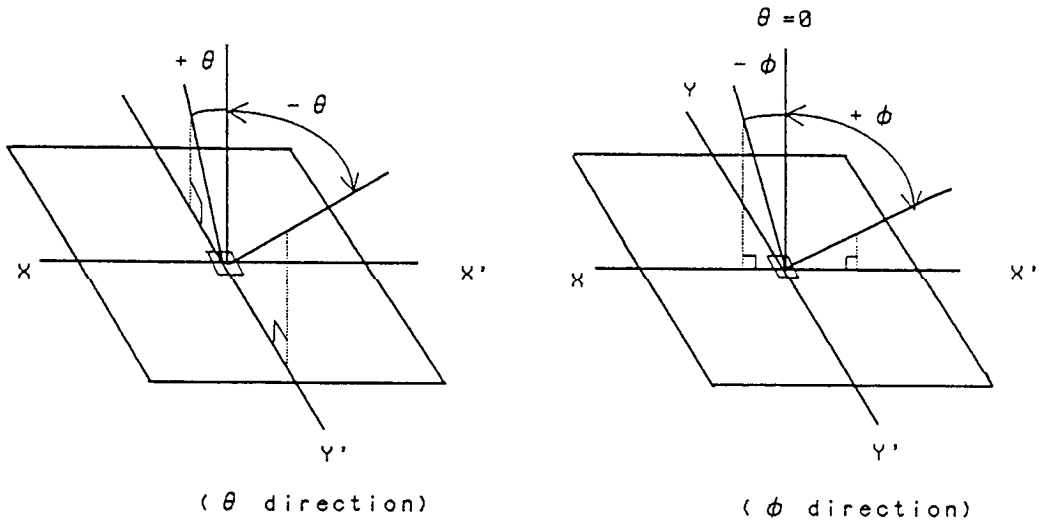
| ITEM | | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | |
|--------------------------|-------|----------|---------------------------|--------------------|------|------|------|------|
| Response time | Rise | Tr | $\theta = \phi = 0^\circ$ | — | 220 | 320 | ms | |
| | Down | Td | $\theta = \phi = 0^\circ$ | — | 110 | 210 | ms | |
| Viewing angle range | | θ | CR \geq 2 | $\phi = 0^\circ$ | -30 | — | 30 | deg. |
| | | ϕ | | $\theta = 0^\circ$ | -50 | — | 50 | deg. |
| Contrast ratio | | CR | $\theta = \phi = 0^\circ$ | 10.0 | 25.0 | — | — | |
| Chromaticity coordinates | Red | x | $\theta = \phi = 0^\circ$ | 0.47 | 0.52 | 0.57 | — | |
| | | y | | 0.29 | 0.34 | 0.39 | | |
| | Green | x | $\theta = \phi = 0^\circ$ | 0.24 | 0.29 | 0.34 | | |
| | | y | | 0.50 | 0.55 | 0.60 | | |
| | Blue | x | $\theta = \phi = 0^\circ$ | 0.11 | 0.16 | 0.21 | | |
| | | y | | 0.10 | 0.15 | 0.20 | | |
| | White | x | $\theta = \phi = 0^\circ$ | 0.25 | 0.30 | 0.35 | | |
| | | y | | 0.28 | 0.33 | 0.38 | | |
| | Black | x | $\theta = \phi = 0^\circ$ | 0.24 | 0.29 | 0.34 | | |
| | | y | | 0.26 | 0.31 | 0.36 | | |

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

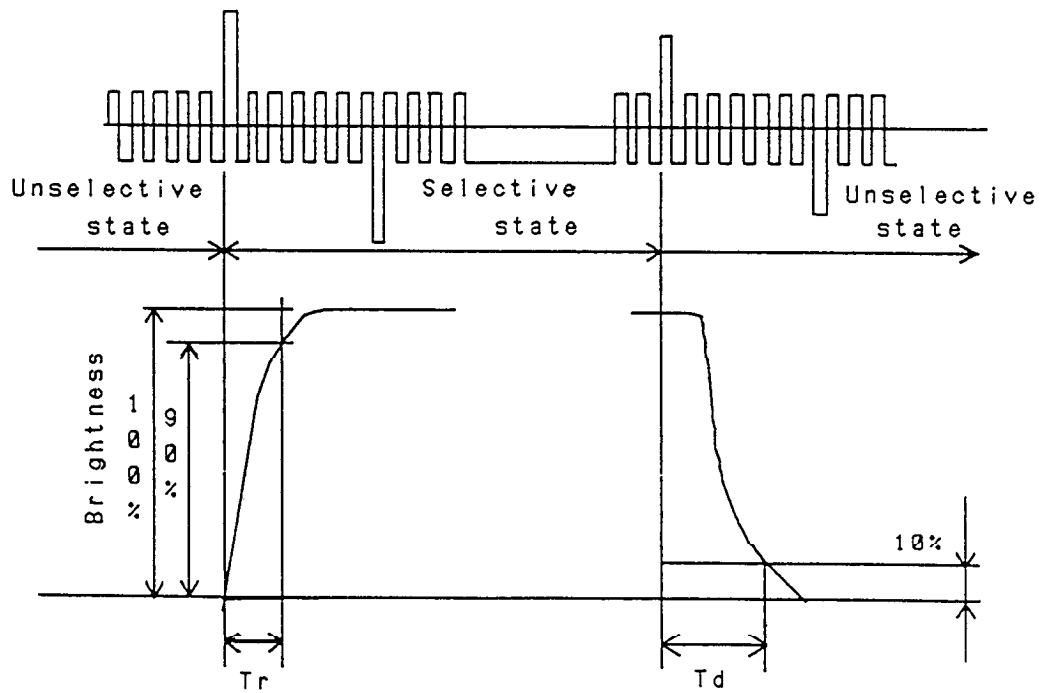
6-1. Contrast ratio is defined as follows:

$$CR = \frac{\text{Brightness all pixels "White"}}{\text{Brightness all pixels "Black"}}$$

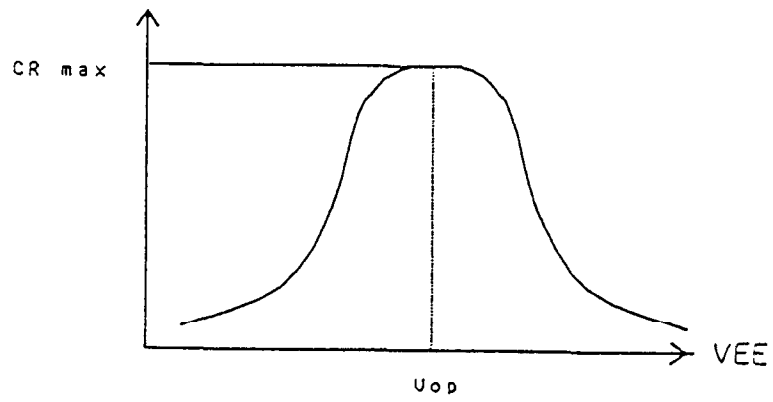
6-2. Definition of viewing angle



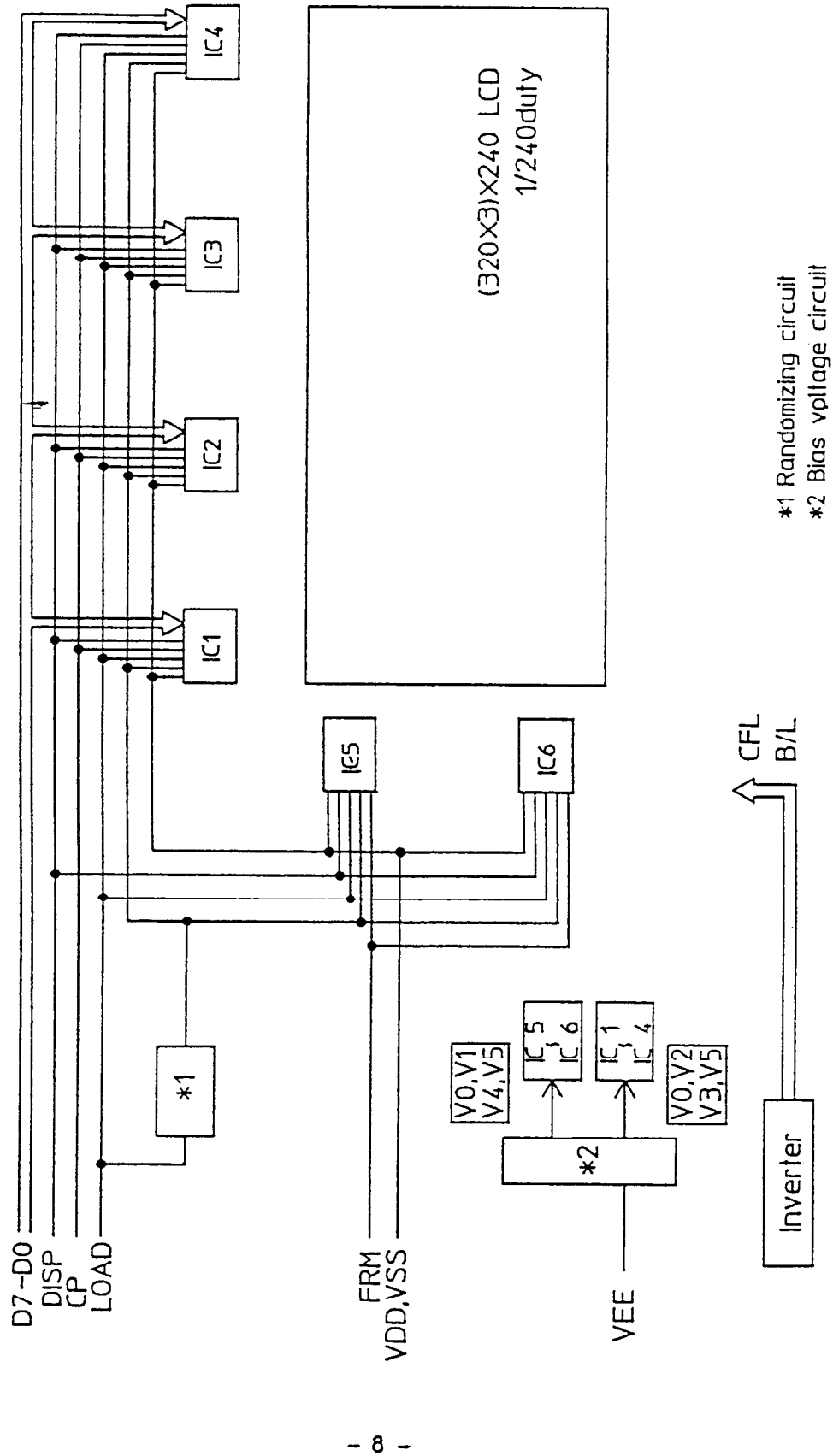
6-3. Definition of response time



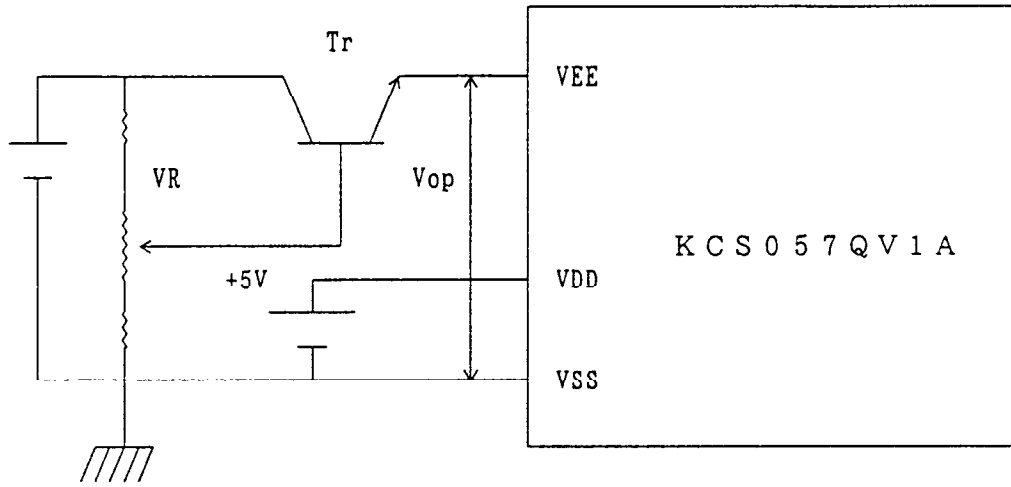
6-4. Definition of V_{op}



7. Circuit Block Diagram



7-1 Power Supply



8. Interface Signals

8-1.LCD

CN1:53261-1510(Molex)

| PIN NO. | SYMBOL | DESCRIPTION | LEVEL |
|---------|--------|--|--------------|
| 1 | FRM | Synchronous signal for driving scanning line | H |
| 2 | LOAD | Data signal latch clock | H → L |
| 3 | CP | Data signal shift clock | H → L |
| 4 | DISP | Display control signal | H(ON),L(OFF) |
| 5 | VDD | Power supply for logic | — |
| 6 | VSS | GND | — |
| 7 | VEE | Power supply for LCD | — |
| 8 | D7 | Display data | H(ON),L(OFF) |
| 9 | D6 | | |
| 10 | D5 | | |
| 11 | D4 | | |
| 12 | D3 | | |
| 13 | D2 | | |
| 14 | D1 | | |
| 15 | D0 | | |

Recommended matching connector:51021-1500(Molex)

NOTE) This pin assignment is the reverse of what Molex defined.

Remember that for your designing.

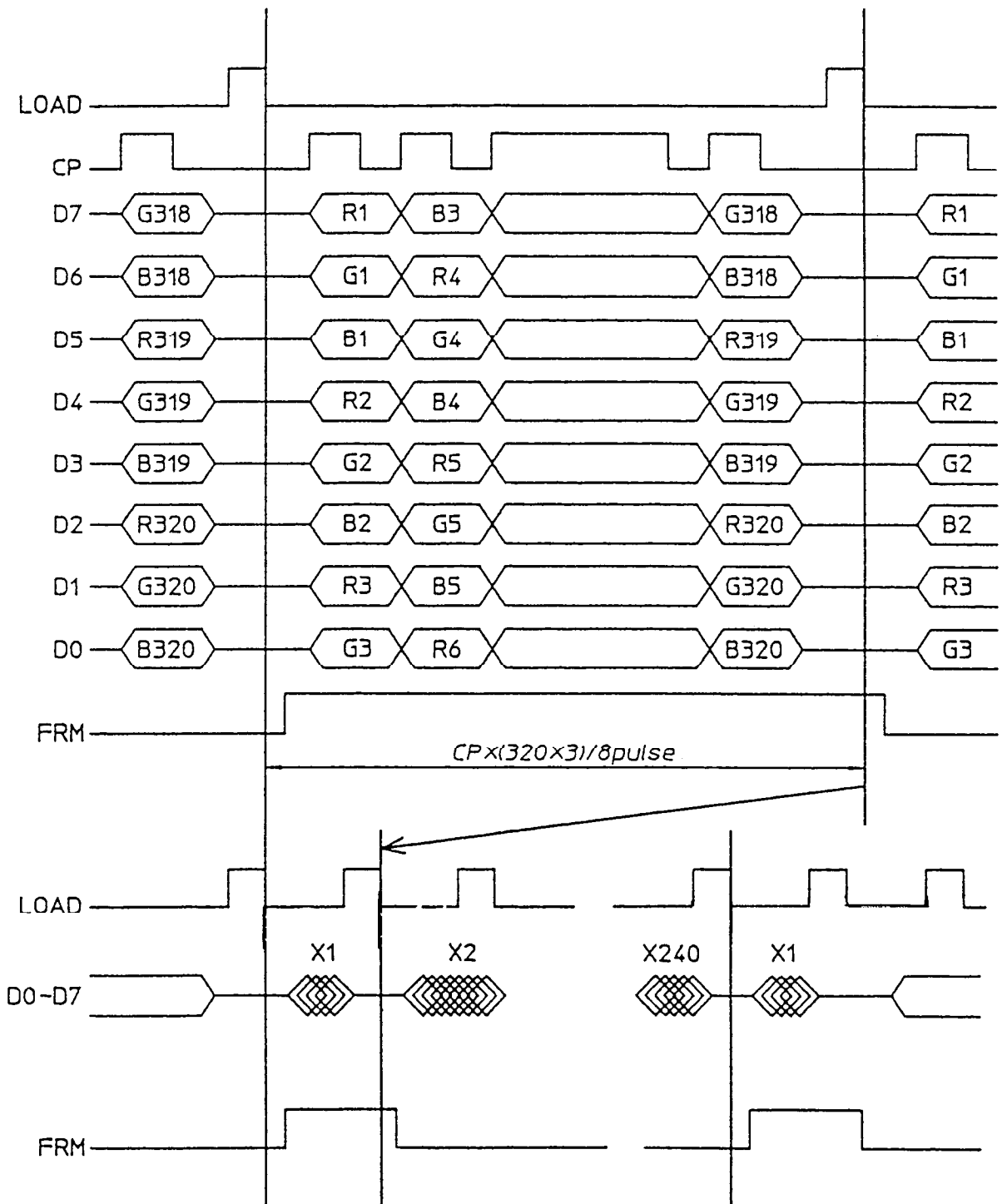
8-2.CFL

| PIN NO. | SYMBOL | DESCRIPTION | LEVEL |
|---------|--------|----------------------------|-------|
| 1 | HV | Power supply for CFL | AC |
| 2 | NC | — | — |
| 3 | GND | Ground line(from inverter) | — |

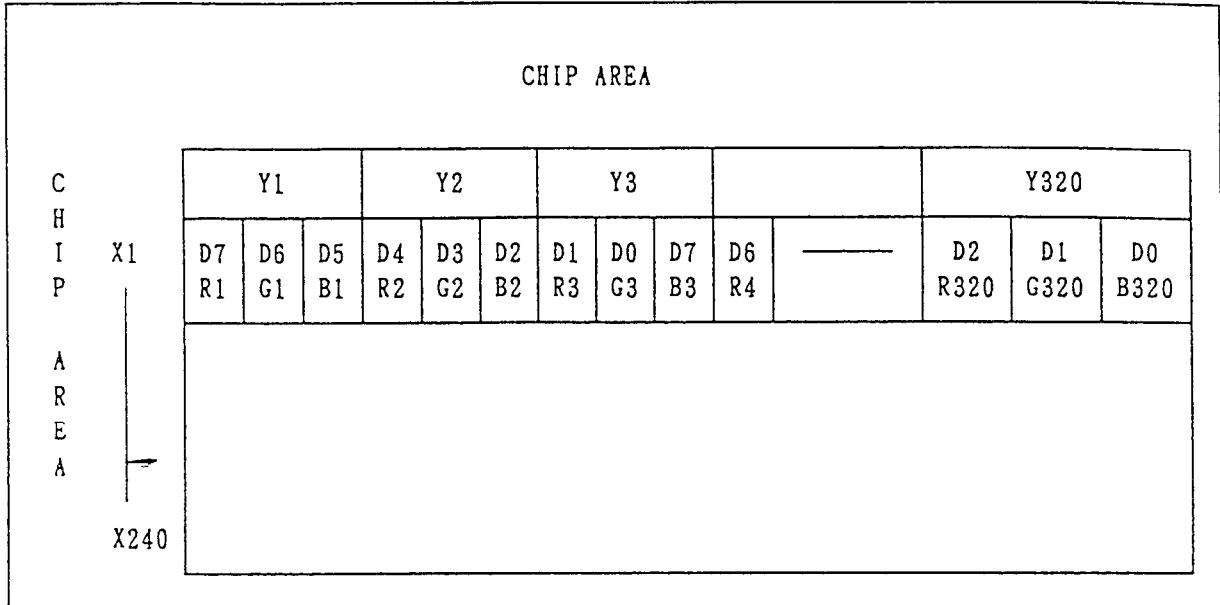
LCD side connector :BHR-03VS-1 (JST)

Recommended matching connector:SMO2-(8.0)B-BHS-1 (JST)

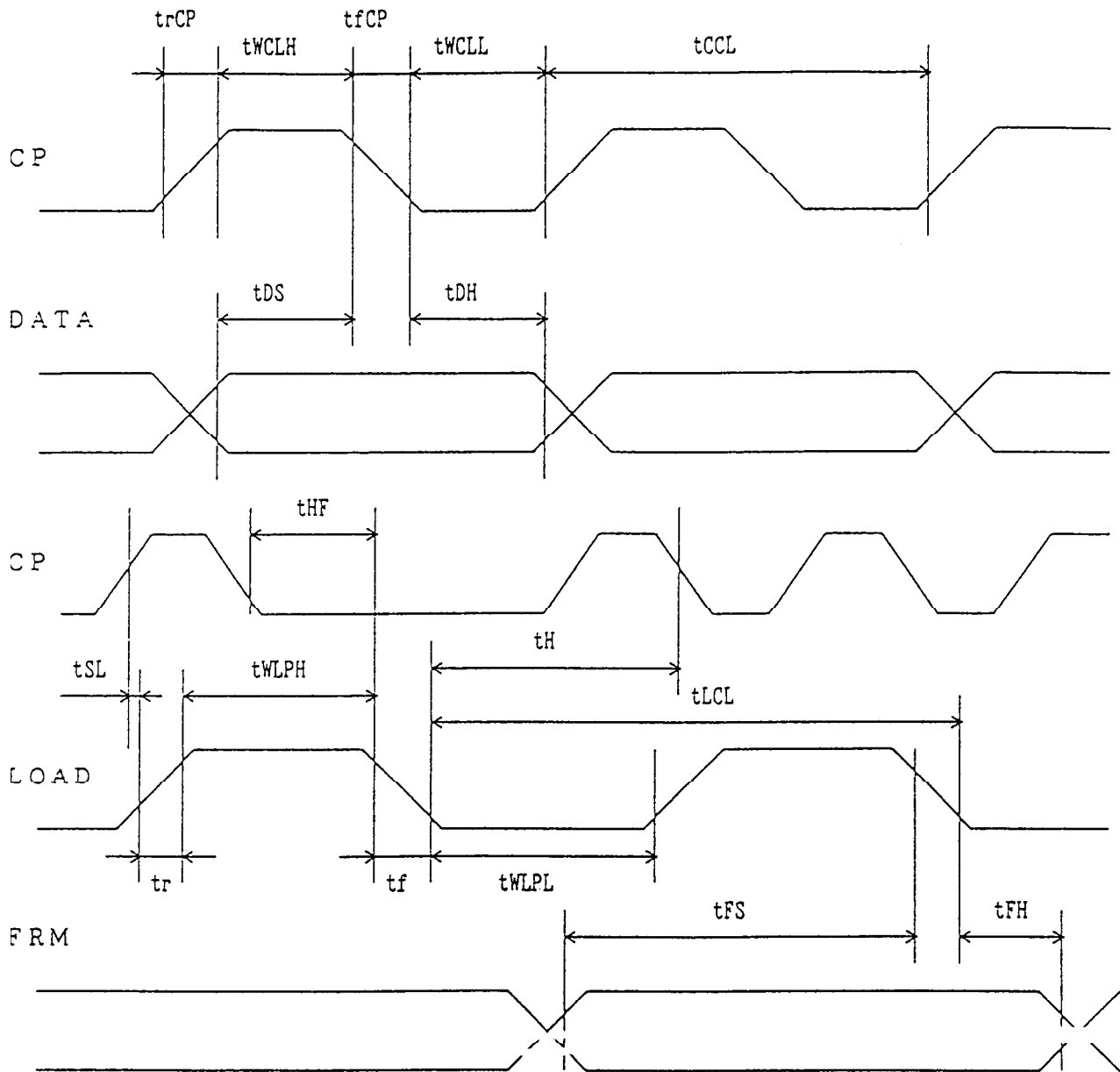
9. Interface Timing Chart



1 0 . Data and Screen



11. Input Timing Characteristics



11-1. Switching characteristics

Input characteristics ; VDD = +5V ± 5%

Temp.=25°C

| ITEM | SYMBOL | MIN. | MAX. | UNIT |
|--------------------------------|--------|------|------|------|
| CP Cycle *1 | tCCL | 82 | — | ns |
| CP "H" Pulse Width | tWCLH | 28 | — | ns |
| CP "L" Pulse Width | tWCLL | 28 | — | ns |
| CP Rise up Time | trCP | — | 13 | ns |
| CP Fall Down Time | tfCP | — | 13 | ns |
| Data Set up time | tDS | 28 | — | ns |
| Data Hold Time | tDH | 20 | — | ns |
| Load "H" Pulse Width | tWLPH | 55 | — | ns |
| Load "L" Pulse Width | tWLPL | 370 | — | ns |
| Load Cycle | tLCL | 400 | — | ns |
| Load Signal Hold Time | tHF | 25 | — | ns |
| Data Strobe Set up Time | tSL | 0 | — | ns |
| Data Strobe Hold Time | tH | 40 | — | ns |
| Input Signal Rise up Time *2 | tr | — | 30 | ns |
| Input Signal Fall down Time *2 | tf | — | 30 | ns |
| FRM Data Set up Time | tFS | 200 | — | ns |
| FRM Data Hold Time | tFH | 30 | — | ns |

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

*2 The formura of condition

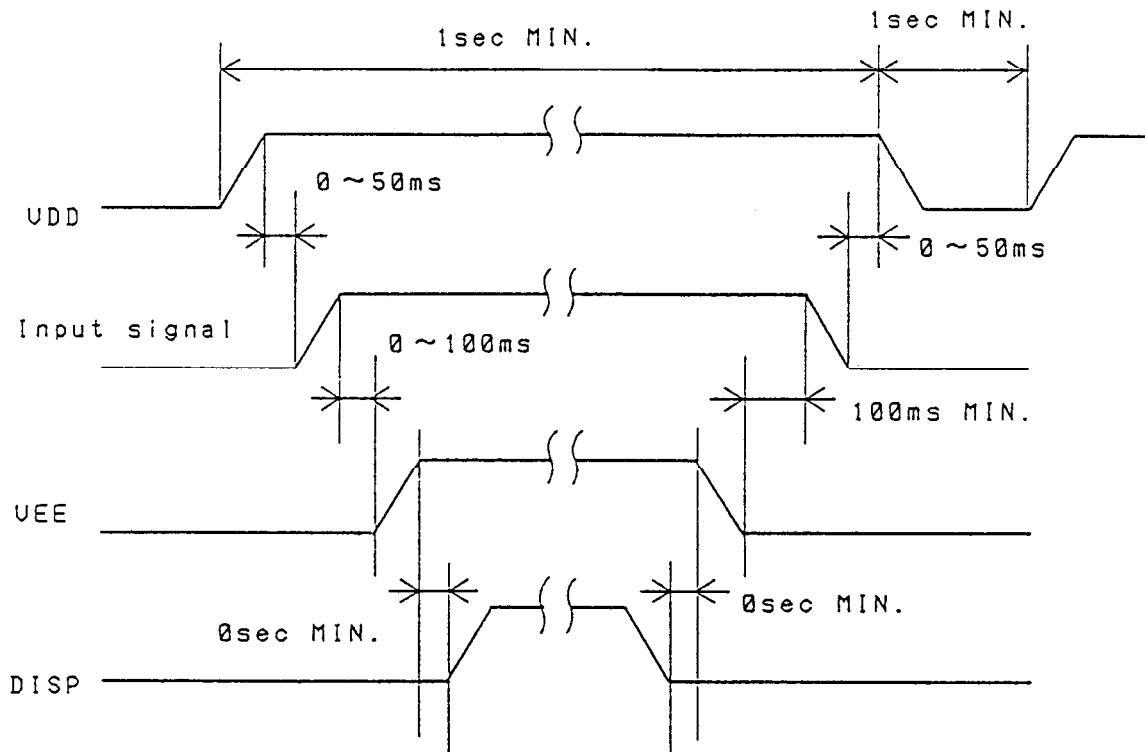
① $tr, tf < \{tCCL - (tWCLH + tWCLL)\} / 2$

② $tr, tf \leq 50(ns)$

Please use on condition that ①, ② are filled.

1 2 . Supply Voltage Sequence Condition

DO NOT apply DC voltage to the LCD panel. DC voltage induce irreversible electrochemical reactions and reduce LCD life. Always follow the power supply ON/OFF sequence of VDD first, input signal second, VEE third and finally DISP. This will prevent DC driving of the LCD or CMOS LSI latch-up as shown below.



1 3 . Backlight Characteristics

13-1 CFL ratings

Temp.= 25°C

| ITEM | SYMBOL | MIN. | TYP. | MAX. | NOTE |
|-------------------------------------|--------|------------|------------|------------|-------|
| Starting discharge Voltage *1 | VS | — | — | 770 Vrms. | 0 °C |
| | | — | — | 510 Vrms. | 25 °C |
| Discharging tube current | IL | 3.0 mArms. | 5.0 mArms. | 6.0 mArms. | — |
| Discharging tube voltage | VL | — | 315 Vrms. | — | — |
| Operating life *2 (IL=5.0mArms.) | T | — | 25,000 Hr. | — | — |
| Operating frequency | F | 30 kHz | — | 100 kHz | — |

*1 The Non-load output voltage (VS) of the inverter should be designed to have some margin, because VS may increase due to the leak current which may be caused by wiring of CFL cables. (Reference value: 800 Vrms. MIN.)

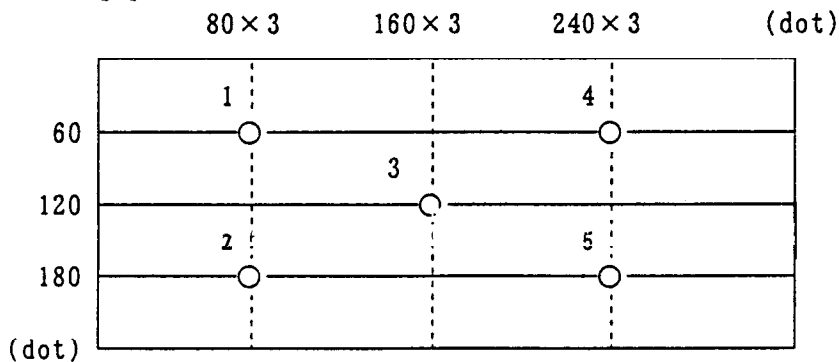
*2 When the illuminance or quantity of light has decreased to 50 % of the initial value.

13-2. Surface Brightness of LCD (IL = 5.0 mArms.)

Temp.=25°C

| ITEM | MIN. | TYP. | MAX. | UNIT |
|------------|------|------|------|-------------------|
| Brightness | 80 | 110 | — | cd/m ² |

(Measuring points)



1) Rating is defined as the average brightness inside the viewing area.

2) 30 minutes after CFL is turned on. (Ambient Temp.=25°C)

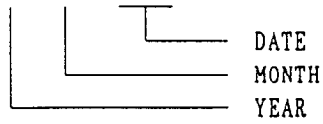
3) The inverter should meet the eccentric conditions;

-Sine, symmetric waveform without spike in positive and negative.

1 4 . Lot Number Identification

The lot number shall be indicated on the back of the backlight case of each LCD.

K C S 0 5 7 Q V 1 A A - G 0 3 - □ □ - □ □



| | | | | |
|------|------|------|------|------|
| YEAR | 1997 | 1998 | 1999 | 2000 |
| CODE | 7 | 8 | 9 | 0 |

| | | | | | | |
|-------|------|------|------|------|-----|-----|
| MONTH | JAN. | FEB. | MAR. | APR. | MAY | JUN |
| CODE | 1 | 2 | 3 | 4 | 5 | 6 |

| | | | | | | |
|-------|------|------|------|------|------|------|
| MONTH | JUL. | AUG. | SEP. | OCT. | NOV. | DEC. |
| CODE | 7 | 8 | 9 | X | Y | Z |

1 5 . Warranty

15-1. Incoming inspection

Please inspect the LCD within one month after your receipt.

15-2. Production Warrnaty

Kyocera warrants its LCDs for a period of 12 months after receipt by the purchaser, and within the limits specified. Kyocera shall, by mutual agreement, replace or rework defective LCDs that are shown to be Kyocera's responsibility.

16. Precautions for use

16-1. Installation of the LCD

1. Please ground either of the mounting(screw) holes located at each corner of an LCD module, in order to stabilize brightness and display quality.
2. A transparent protection plate shall be added to protect the LCD and its polarizers.
3. The LCD shall be installed so that there is no pressure on the LSI chips.
4. The LCD shall be installed flat, without twisting or bending.
5. The display window size should be the same as the effective viewing area.
6. In case you use outside frame of effective viewing area as outward appearance of your product, unevenness of its outward appearance is out of guarantee.

16-2. Static Electricity

1. Since CMOS ICs are mounted directly onto the LCD glass, protection from static electricity is required. Operation should wear ground straps.

16-3. LCD Operation

1. The LCD shall be operated within the limits specified. Operation at values outside of these limits shorten life, and/or harm display images.
2. Vop must be adjusted to optimize viewing angle and contrast.
3. Operation of the LCD at temperature below the limit specified may cause image degradation and/or bubbles. It may also change the characteristics of the liquid crystal. This phenomenon may not recover. The LCD shall be operated within the temperature limits specified.

16-4. Storage

1. The LCD shall be stored within the temperature and humidity limits specified. Store in a dark area, and protected the LCD from direct sunlight or fluorescent light.
2. The LCD should be packaged to prevent damage.

16-5. Screen Surface

1. DO NOT store in a high humidity environment for extended periods. Image degradation, bubbles, and/or peeling off of 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 with a soft cloth or cotton pad. Methanol, or Isopropyl Alcohol may be used, but insure that all solvent residue is removed.
4. Water may cause damage or discoloration of the polarizer. Clean any condensation or moisture from any source immediately.
5. Always keep the LCD free from condensation during testing. Condensation may permanently spot or stain the polarizers.

1 7 . Reliability Data / Environmental Test

| TEST ITEM | TEST CONDITION | TEST TIME | RESULT |
|--------------------------------|--|-----------|--|
| High Temp. Atmosphere | 70°C | 240hr. | Display Quality : No defect Display Function : No defect Current Consumption: No defect |
| Low Temp. Atmosphere | -20°C | 240hr. | Low Temp. Bubble : None Solid Crystallization of Liquid Crystal : None Display Quality : No defect Display Function : No defect Current Consumption: No defect |
| High Temp. Humidity Atmosphere | 40°C 90%RH | 240hr. | Display Quality : No defect Display Function : No defect Peel-off of Organic Sealing : None Current Consumption: No defect |
| Temp. Cycle | -20°C 0.5hr. R.T. 0.5hr. 70°C 0.5hr. | 10 cycles | Display Quality : No defect Display Function : No defect Peel-off of Organic Sealing : None Bubble on Cell : None |
| High Temp. Operation | 50°C Vop | 500hr. | 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 tested LCD is inspected after 24 hours of storage at room temperature and room humidity after each test is finished.

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

*The results of the reliability test are for your reference purpose only. The reliability test is conducted only to examine the LCD's capability.

| | |
|----------|------------------------|
| SPEC.NO. | TQ3C-8EAC0-E2AAWC44-01 |
| DATE | December 24, 1997 |

FOR: _____

KYOCERA INSPECTION STNDARD

TYPE : KCS057QV1AA-G03
 (KCS3224ASTT-X7)
 (LIQUID CRYSTAL DISPLAY MODULE)

KYOCERE CORPORATION
 KAGOSHIMA HAYATO PLANT
 LCD DIVISION

| | | | | | |
|---------------|--------------------------------|------------------|------------------|------------------------|-------------------|
| Original | Designed by :Engineering Dept. | | | Confirmed by :QA Dept. | |
| Issue Data | Prepared | Checked | Approved | Checked | Approved |
| June 19, 1997 | <i>S. Kajima</i> | <i>S. Matsuo</i> | <i>M. Ishino</i> | <i>S. Hayashi</i> | <i>Y. Yoshida</i> |

Revision Record

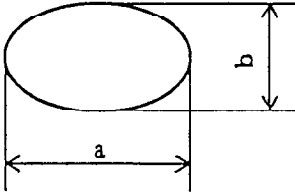
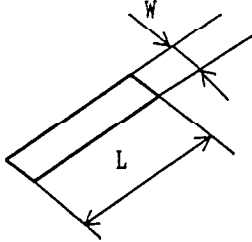
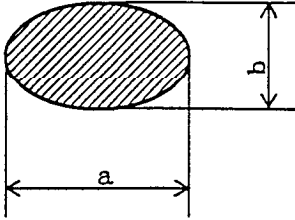
| Date | | Designed by : Engineering Dept. | | | Confirmed by : QA Dept. | |
|---------------|-------------|---------------------------------|---|-----------------|-------------------------|-------------------|
| | | Prepared | Checked | Approved | Checked | Approved |
| Dec. 24, 1997 | | <i>S. Kojima</i> | <i>S. Matsuo</i> | <i>N. Ishio</i> | <i>S. Hayaashi</i> | <i>Y. Yoshida</i> |
| Rev. No. | Date | Page | Descriptions | | | |
| 0 1 | Dec.24,1997 | - | Cover page ~Change type name "KCS3224ASTT-X7" → "KCS057QV1AA-G03" | | | |
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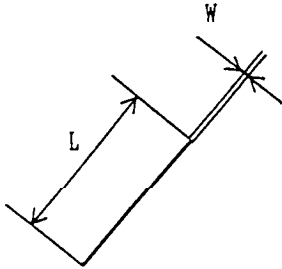
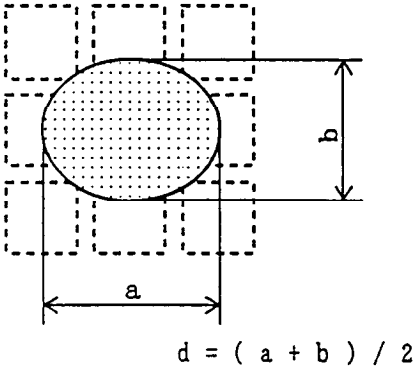
Visuals specification

1)Note

| Item | Note | |
|-------------------------------|---|--|
| General | <p>1. When defects specified in this Inspection Standards are inspected, operating voltage (Vop) 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>Luminance : 500 Lux minimum . Inspection distance : 300 mm (from the sample) Temperature : 25 ± 5 °C Direction : right above</p> | |
| Definition of Inspection item | Pinhole, Bright spot Black spot, Scratch Foreign particle | The color of a small area is different from the remainder. The phenomenon does not change with voltage. |
| | Contrast variation | The color of a small area is different from the remainder. The phenomenon changes with voltage. |
| | Polarizer (Scratch, Bubble, Dent) | Scratch, Bubble and Dent in the polarizer which can be observed in on / off state. |

2)Standard

| Inspection item | Judgement standard | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--------------------|-----------------------|-------------------|----------------|--------------|---------------|---|--------------------|---|---------------------|--------------------|-----------|---|--------------------|---|---|-----------|---|---|-----------|---|-----------------------|
| Pinhole, Bright spot Black spot, Foreign particle | <div style="text-align: center;">  $d = (a + b) / 2$ <table border="1" data-bbox="618 512 1365 726"> <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> </div> | 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 | <div style="text-align: center;">  <table border="1" data-bbox="589 1073 1390 1352"> <thead> <tr> <th></th> <th>Width (mm)</th> <th>Length (mm)</th> <th>Acceptable No.</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>$W \leq 0.03$</td> <td>—</td> <td>neglected</td> </tr> <tr> <td>B</td> <td rowspan="3">$0.03 < W \leq 0.1$</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>$0.1 < W$</td> <td>—</td> <td>According to Circular</td> </tr> </tbody> </table> </div> | | Width (mm) | Length (mm) | Acceptable No. | A | $W \leq 0.03$ | — | neglected | B | $0.03 < W \leq 0.1$ | $L \leq 2.0$ | neglected | C | $2.0 < L \leq 4.0$ | 3 | D | $4.0 < L$ | 0 | E | $0.1 < W$ | — | According to Circular |
| | Width (mm) | Length (mm) | Acceptable No. | | | | | | | | | | | | | | | | | | | | |
| A | $W \leq 0.03$ | — | neglected | | | | | | | | | | | | | | | | | | | | |
| B | $0.03 < W \leq 0.1$ | $L \leq 2.0$ | neglected | | | | | | | | | | | | | | | | | | | | |
| C | | $2.0 < L \leq 4.0$ | 3 | | | | | | | | | | | | | | | | | | | | |
| D | | $4.0 < L$ | 0 | | | | | | | | | | | | | | | | | | | | |
| E | $0.1 < W$ | — | According to Circular | | | | | | | | | | | | | | | | | | | | |
| Contrast variation | <div style="text-align: center;">  $d = (a + b) / 2$ <table border="1" data-bbox="618 1698 1365 1871"> <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> </div> | 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 data-bbox="570 201 727 233">(1) Scratch</p>  <table border="1" data-bbox="586 621 1398 930"> <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> | | 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 |
| | 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 | | | | | | | | | | | | | | | | | |
| | <p data-bbox="570 972 821 1003">(2)Bubble (dent)</p>  <table border="1" data-bbox="618 1539 1369 1850"> <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 | | | | |
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| B | $0.2 < d \leq 0.3$ | 5 | | | | | | | | | | | | | | | | | | |
| C | $0.3 < d \leq 0.5$ | 3 | | | | | | | | | | | | | | | | | | |
| D | $0.5 < d$ | 0 | | | | | | | | | | | | | | | | | | |