SPEC. NO.	TQ3C-8EAC0-E1GZWC53-00
DATE	September 26, 1997

For Reference Only

S P E C

TYPE: KCS057QV1AA-G03

(KCS3224ASTT-X7)

CONTENTS

KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT

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

Original	Designed by: Engineering Dept.			Confirmed by: QA Dept.	
Issue Date	Prepared	Checked	Approved	Checked	Approved
September 26, 1997	S. Kojima	H. Taike	A. Nishino	S. Hayashi	Y. Yoshida

Revision Record

Date	Designed by: Engineering Dept.			Confirmed by: QA Dept.	
	Prepared	Checked	Approved	Checked	Approved

Rev. No.	Date	Page	Descriptions

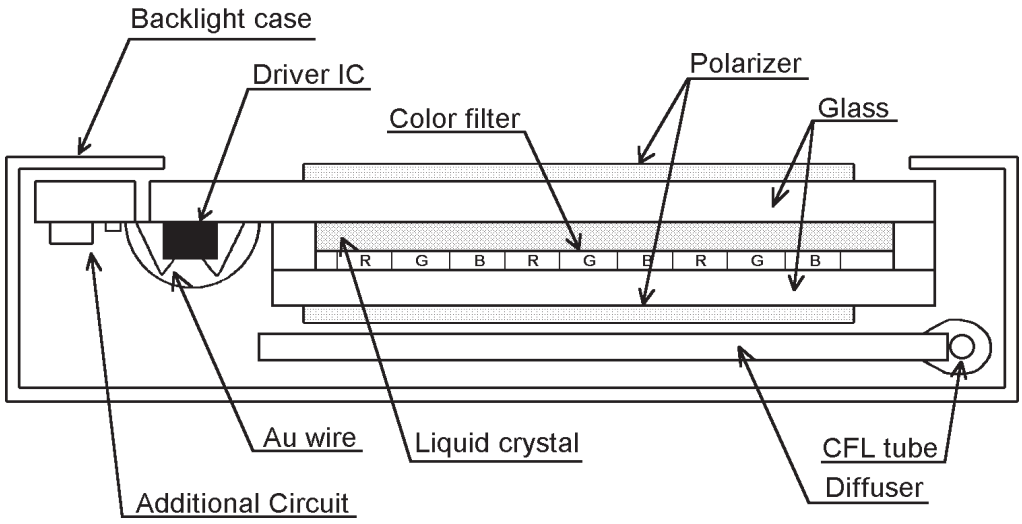
1. Application

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

2. Construction and Outline

(320 x 3) x 240 dots. COG type LCD with CFL backlight.

Backlight system:	Side-edge type CFL (1 tube)
Inverter:	Optional
	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) x 114.8 (H) x 8.5 (D)	mm
Effective Viewing Area	118.18 (W) x 89.38 (H)	mm
Dot Number	(320 x 3) (W) x 240 (H)	Dots
Dot Size	0.10 (W) x 0.34 (H)	mm
Dot Pitch	0.12 (W) x 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 colors 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 signal voltage	V_{in}	0	VDD	V

4.2 Environmental absolute maximum ratings

ITEM	SYMBOL	MIN.	MAX.	UNIT
Operating temperature	T_{op}	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 < 24 Hr., Temp. = 60°C < 24 Hr.
No vibration and shock

*2 Non-condensation

*3 Temp. ≤ 40°C, 85% RH Max.
Temp. > 40°C, Absolute Humidity shall be less than 85% 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 total) - EIAJ ED-2531

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

5. Electrical Characteristics

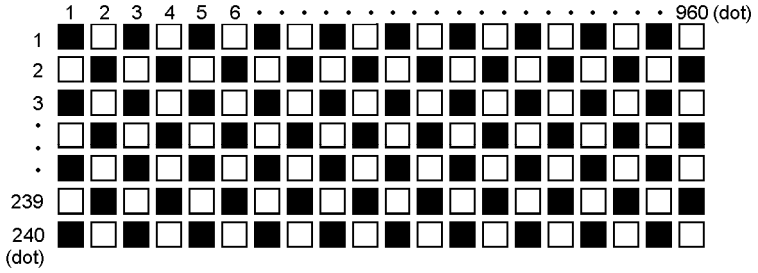
Temp. = 25°C, VDD = 5.0V ± 5%

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply voltage for logic	VDD	–	4.75	5.00	5.25	V
LCD driving voltage *1	V_{op} = VEE	0 °C	25.4	26.4	27.4	V
		25 °C	25.1	26.1	27.1	V
		40 °C	24.8	25.8	26.8	V
Input voltage	V_{in}	"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	P_{disp}		–	211	330	mW

*1 Maximum contrast ratio is obtained by adjusting the LCD supply voltage (V_{op} = VEE) for driving the LCD.

*2 In consideration of display quality, it is recommended that the 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 degrades.

*3 Display high frequency pattern (see below).
VDD = 5.0V, V_{op} = VEE, f_{FRM} = 75Hz, FCP = 2.16MHz
Pattern:



6. Optical Characteristics

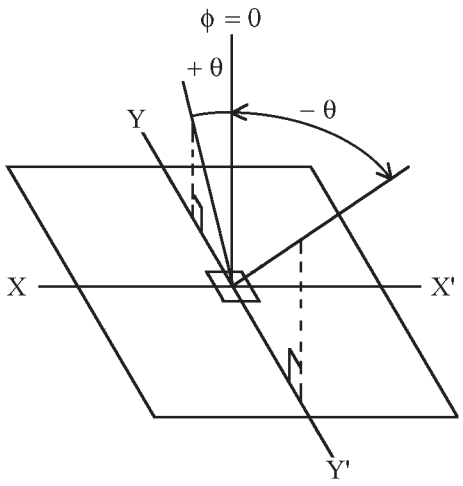
Temp. = 25°C

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Response Time	Rise	Tr	$\theta = \phi = 0°$	–	220	320	ms
	Down	Tf	$\theta = \phi = 0°$	–	110	210	ms
Viewing angle range		ø	CR ≥ 2, $\phi = 0°$	-30	–	30	deg.
		ϕ	CR ≥ 2, ø = 0°	-50	–	50	deg.
Contrast Ratio		CR	$\theta = \phi = 0°$	10.0	25.0	–	–
Chromaticity coordinates	Red	x	$\theta = \phi = 0°$	.47	.52	.57	–
		y	$\theta = \phi = 0°$	.29	.34	.39	–
	Green	x	$\theta = \phi = 0°$	.24	.29	.34	–
		y	$\theta = \phi = 0°$	.50	.55	.60	–
	Blue	x	$\theta = \phi = 0°$	.11	.16	.21	–
		y	$\theta = \phi = 0°$	.10	.15	.20	–
	White	x	$\theta = \phi = 0°$	.25	.30	.35	–
		y	$\theta = \phi = 0°$	.28	.33	.38	–
	Black	x	$\theta = \phi = 0°$	.24	.29	.34	–
		y	$\theta = \phi = 0°$	.26	.31	.36	–

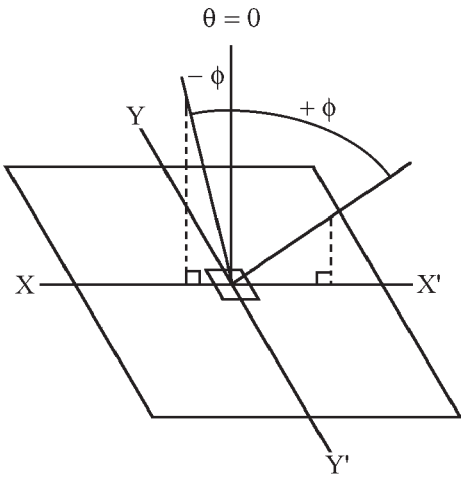
Optimum contrast is obtained by adjusting the LCD driving voltage (Vop) while at the viewing angle of $\theta = \phi = 0°$.

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.

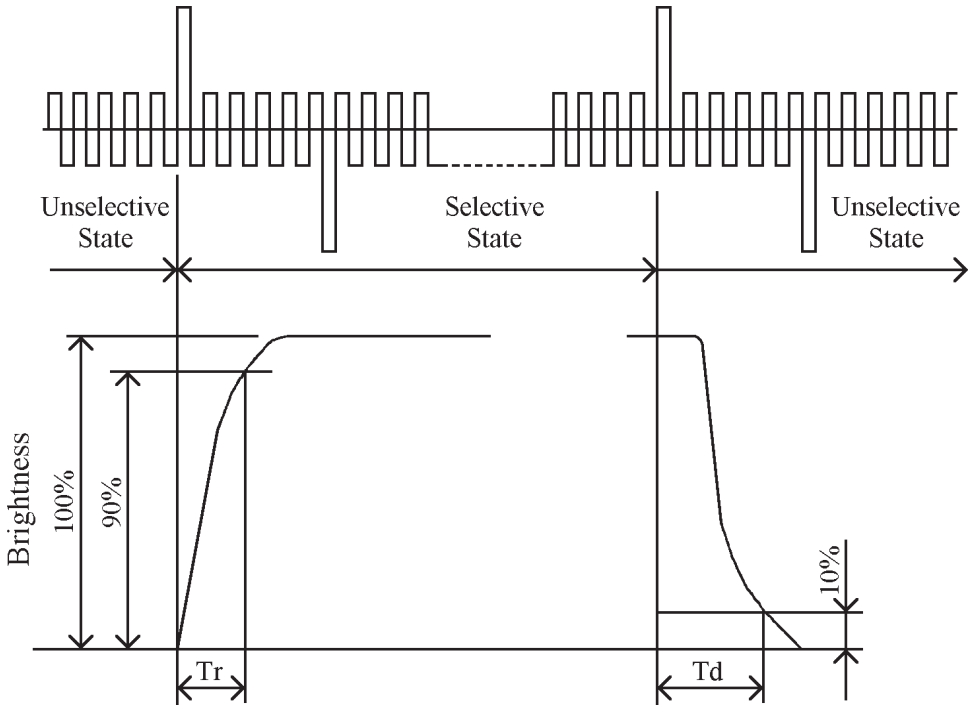


(θ Direction)

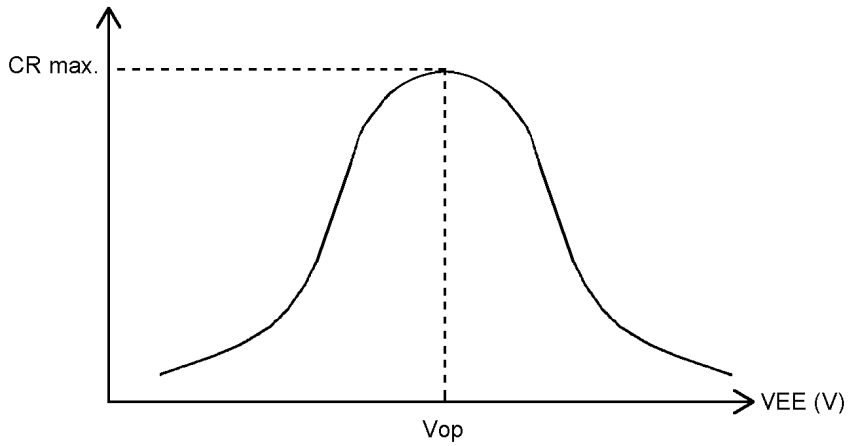


(φ Direction)

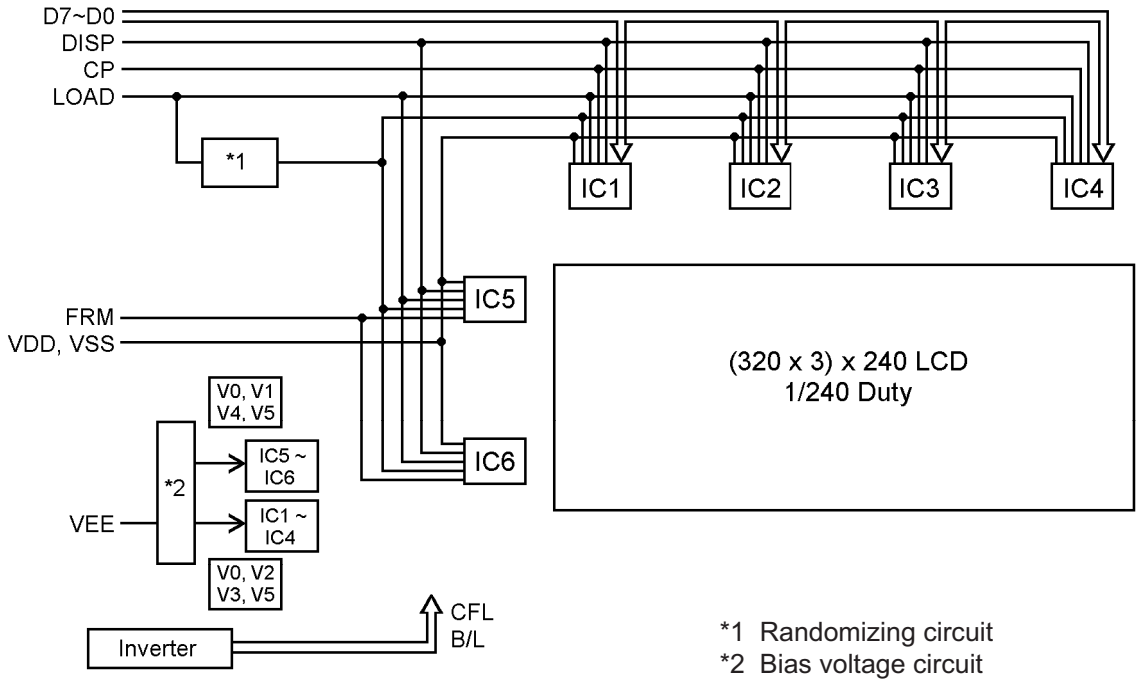
6 -3. Definition of response time.



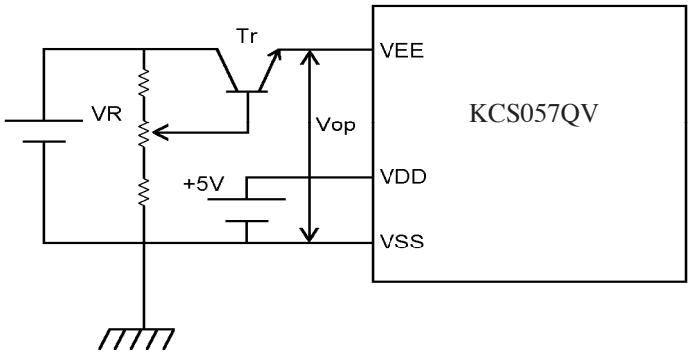
6 - 4. Definition of Vop



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		

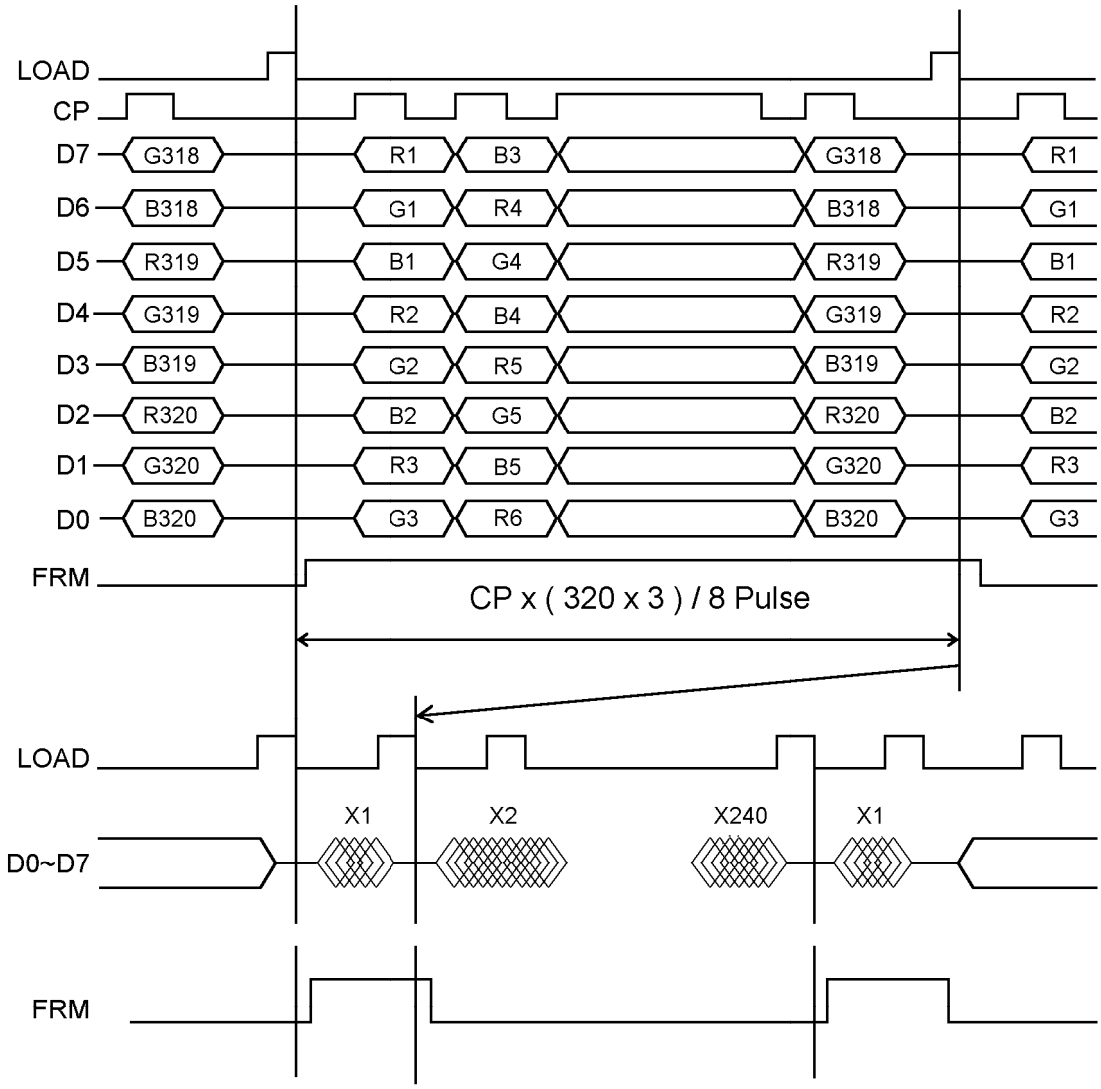
Recommended matching connector: Molex 51021-1500
(NOTE) This pin assignment is the reverse of what Molex defined.
Remember that for your designing.

8.2 CFL

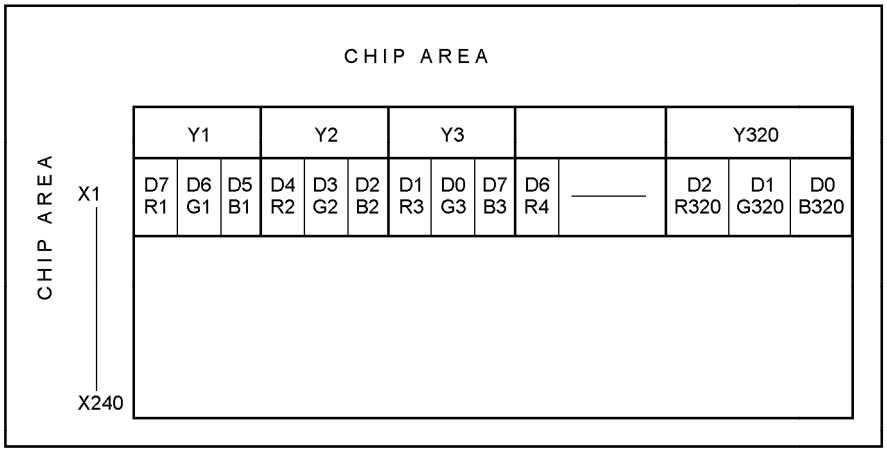
PIN NO.	SYMBOL	DESCRIPTION	LEVEL
1	HV	Power supply for CFL	AC
2	NC	–	–
3	GND	Ground line (from inverter)	–

LCD side connector: BHR-03VS-1 (JST)
Recommended matching connector: SM02-(8.0)B-BHS-1 (JST)

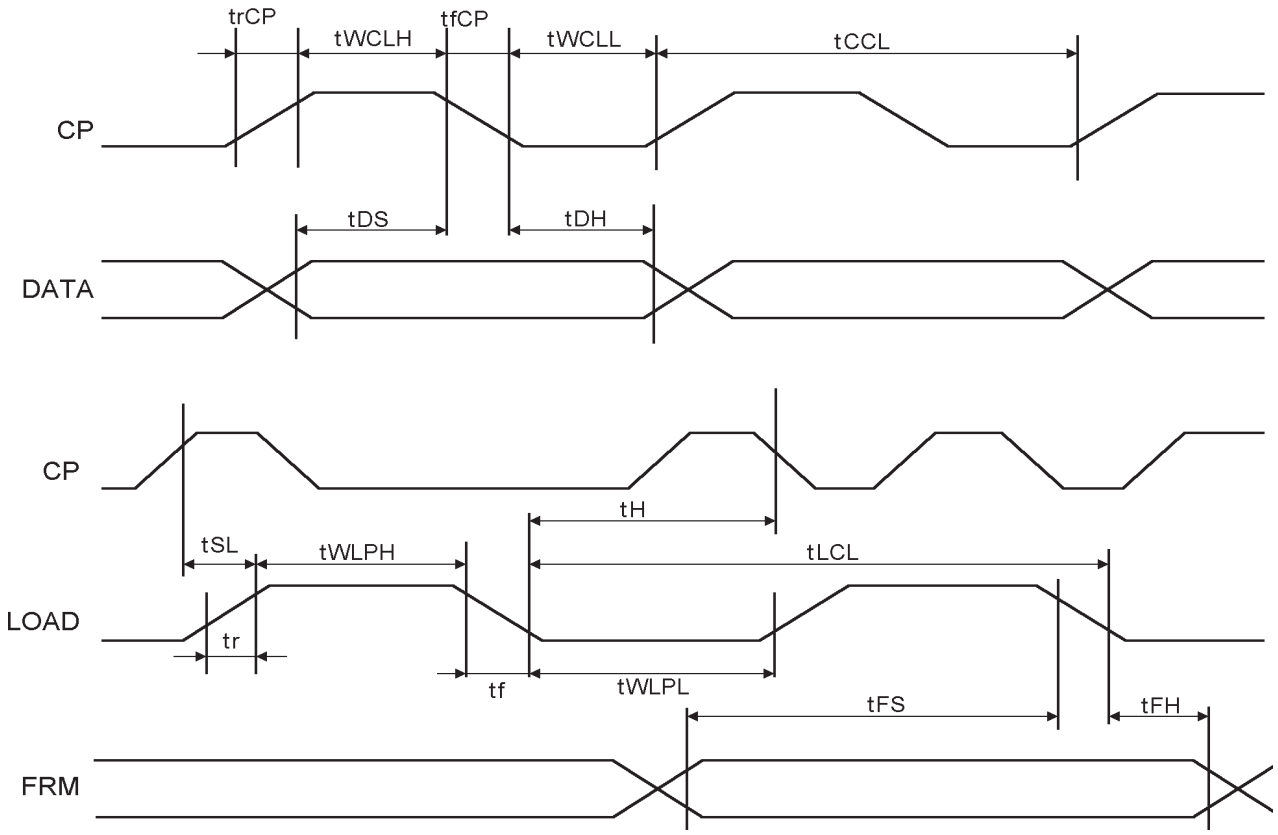
9. Interface Timing Chart



10. 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 Adjust CP Cycle so that the FRM signal is 75Hz

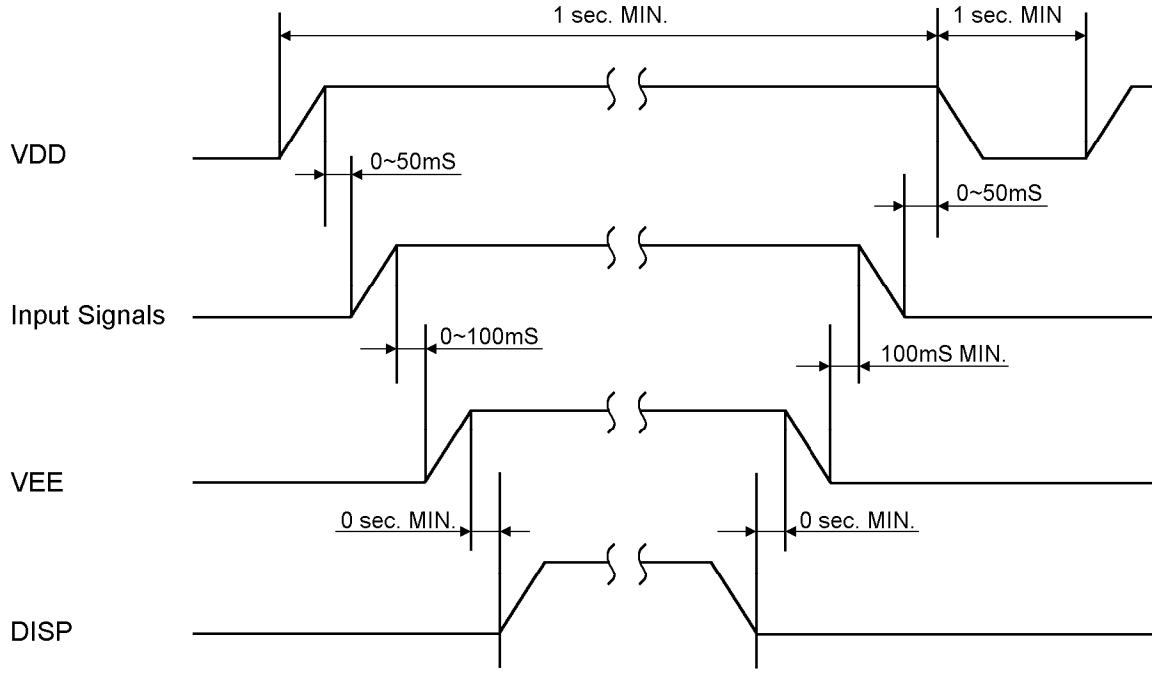
*2 The formula for the condition is:

1. tr, tf < {tCCL - (tWCLH + tWCLL)} / 2
2. tr, tf < or equal to 50(ns)

Please use on condition that 1, 2 are filled.

12. Supply Voltage Sequence Condition

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



13. Backlight Characteristics

13.1 CFL ratings

Measurements for Inverter: PH-BLC08-K2 (Hitachi Media Electronics) Temp. = 25°C

ITEM	SYM.	MIN.	TYP.	MAX	NOTE
Starting Discharge Voltage *1	VS	-	-	618 Vrms.	0 °C
		-	-	496 Vrms.	25 °C
Discharging tube current	IL	2.0 mArms.	5.0 mArms.	6.0 mArms.	-
Discharging tube voltage	VL	-	305 Vrms.	-	-
Operating life (IL =6.5mArms.) *2	T	-	25,000 Hr.	-	-
Operating frequency	F	30 kHz	-	100 kHz	-

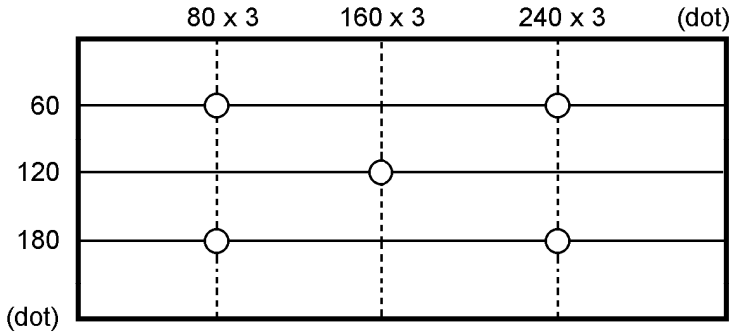
*1 The Non-load output voltage (VS) of the inverter should be designed to have some margin, because VS may increase due to the leak current which may be caused by wiring of the CFL cables. (Reference value: 800Vrms MIN.)

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

13.2 Surface brightness of the LCD (IL = 5.0 mArms), Temp. = 25 °C

ITEM	MIN.	TYP.	MAX.	UNIT
Brightness	80	110	–	cd/m^2

(Measuring points)



1) The rating is defined as the average brightness inside the viewing area.
2) Measurements are taken 30 min. after the CFL is turned on.
   (Ambient Temp. = 25 °C)
3) The inverter should meet the eccentric conditions:
   -Sine, symmetric waveform without a positive or negative spike

14. Lot Number Identification

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

KCS057QV1AA - G03 - □ □ - □ □

Date
Month
Year

YEAR	1995	1996	1997	1998	1999	2000
CODE	5	6	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

15. Warranty

15.1 Please inspect the LCD within 30 days of your receipt.

15.2 Production Warranty

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 in 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. Image quality outside the effective viewing area is not warranted.

16.2 Static electricity

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

16.3 LCD operation

1. The LCD shall be operated within the limits specified. Operation at values outside of the specified limits may shorten life and/or harm display images.

2. V_{op} must be adjusted to optimize viewing angle and contrast.

3. Operation of the LCD at temperatures 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 protect 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 polarizers 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.

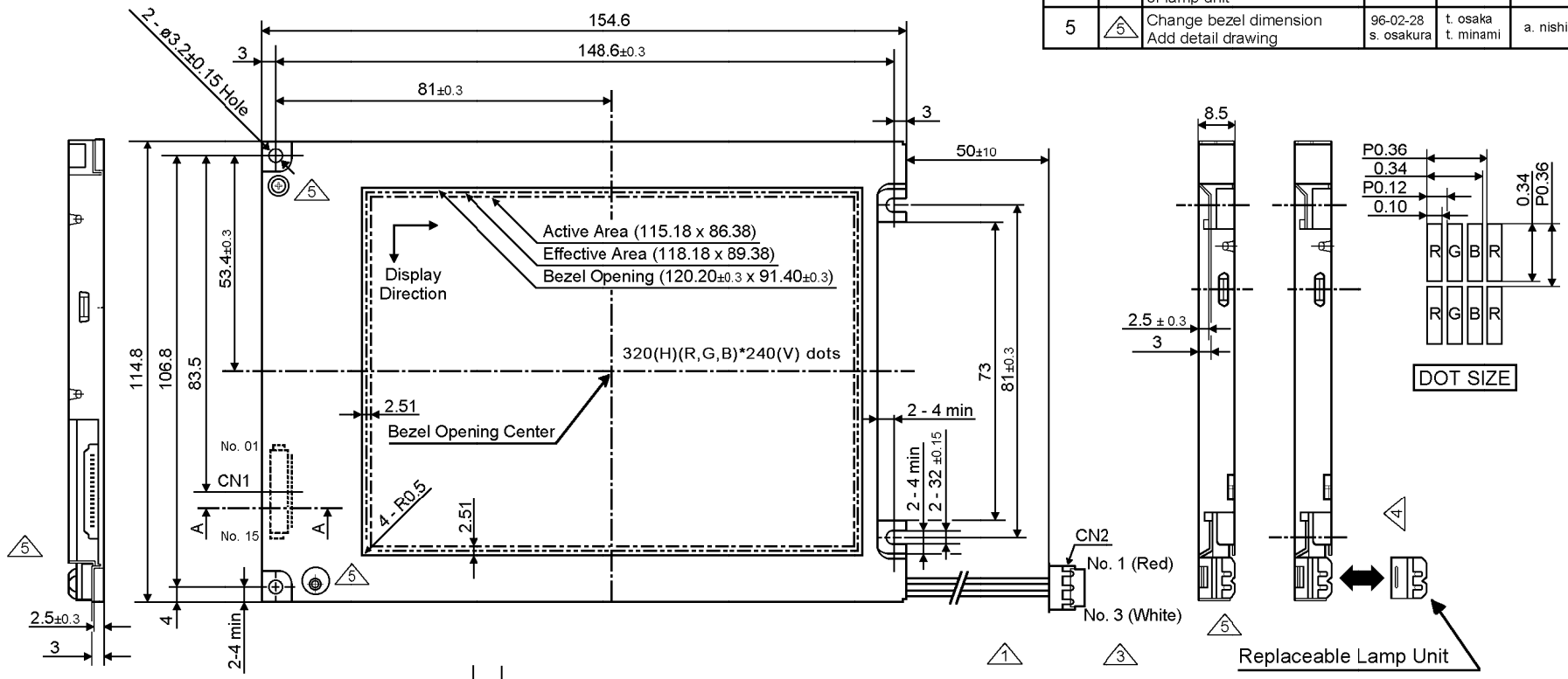
5. Always keep the LCD free from condensation during testing. Condensation may permanently spot or stain the polarizers.

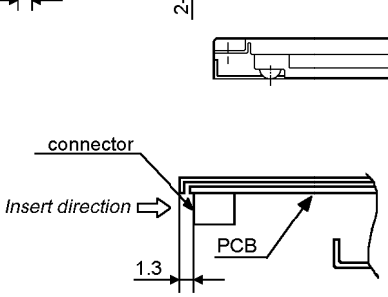
17. Reliability Data / Environmental Test

TEST ITEM	TEST CONDITION	TEST TIME	RESULT
High Temp. Atmosphere	70°C	240 hr.	Display Quality: No defect Display Function: No defect Current Consumption: No defect
Low Temp. Atmosphere	-20 °C	240 hr.	Low Temp. Bubble: None Crystalization of Liquid Crystal Material: None Display Quality: No defect Display Function: No defect Current Consumption: No defect
High Temp. & High Humidity	40 °C 90% RH	240 hr.	Display Quality: No defect Display Function: No defect Peeling of Organic Sealant: None Current Consumption: No defect
Temp. Cycle	-20 °C; 0.5 hr. R.T.; 0,5 hr. 70 °C; 0.5 hr.	10 cycles	Display Quality: No defect Display Function: No defect Peeling of Organic Sealant: None Bubble on Cell: None
High Temp. Operation	50 °C V_{op}	500 hr.	Display Quality: No defect Current Consumption: No defect

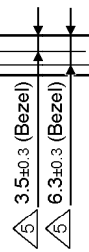
- Each test item uses a test LCD only once. The tested LCD is not used in any other test.
- The LCD is tested in circumstances in which there is no condensation.
- The test specimen is allowed to stabilize for 24 hours, at room temperature and room humidity, before post test measurements are taken.
- Reliability tests are NOT outgoing inspection tests.
- The results of reliability tests are for reference purposes only. Reliability tests are conducted only to examine an LCD's capability.

Rev.	No.	Description	Drwn	Chk	App
1	1	Change position of lamp wire	95-08-07 s. osakura	t. osaka	a. nishino
2	2	Change replaceable direction of lamp unit	95-09-04 s. osakura	t. osaka	t. minami
3	3	Change connector terminal number	95-09-06 s. osakura	t. osaka	t. minami
4	4	Change replaceable direction of lamp unit	95-10-02 s. osakura	t. osaka t. minami	a. nishino
5	5	Change bezel dimension Add detail drawing	96-02-28 s. osakura	t. osaka t. minami	a. nishino





SECTION A - A



All dimensions in mm

Note
1. Connectors CN1: 53261-1510 (Molex)
   CN2: BHR-03VS-1 (JST)
2. Matching Connector: 51021-1500 (Molex)
   SM02-(8.0)B-BHS-1 (JST)
3. The drawing seen from the front, information is displayed on the screen in the direction of from the upper left hand corner to the right.
4. Tolerance without indication: ±0.5

Approved	Checked	Drawn	Scale	Title		Year-Month-Day	Size
a. nishino	t. minami	t. osaka	1/1	KCS3224ASTT	KYOCERA	'95-04-11	3
				Outline Dimensions	Drawing No.	121A0058800-5	

SPEC. NO.	TQ3C-8EAC0-E2GZWC53-00
DATE	September 26, 1997

For Reference Only

KYOCERA INSPECTION STANDARD

TYPE: KCS057QV1AA-G03

(KCS3224ASTT-X7)
(LIQUID CRYSTAL DISPLAY MODULE)

KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT

Original Issue Date	Designed by: Engineering Dept.			Confirmed by: QA Dept.	
	Prepared	Checked	Approved	Checked	Approved
September 26, 1997	S. Kojima	H. Taike	A. Nishino	S. Hayashi	Y. Yoshita

Revision Record

Date	Designed by: Engineering Dept.			Confirmed by: QA Dept.	
	Prepared	Checked	Approved	Checked	Approved

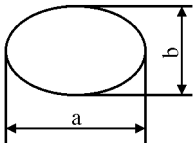
Rev. No.	Date	Page	Descriptions

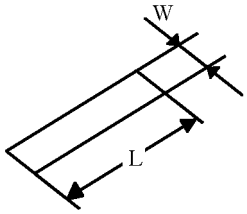
Visuals Specification

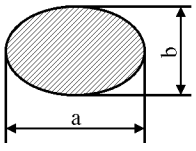
1) Note

Item	Note	
General	1. When defects specified in this Inspection Standards are inspeceted, 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) 2. The inspection standard about the image quality shall be applied to any defect within the effective viewing area and shall not applicable to outside the of the area. 3. Should any defects which are not specified in this standard happen, additional standards shall be determined by mutual agreement between the customer and Kyocera. 4. Inspection conditions Luminance: 500 Lux minimum Inspection Distance: 300mm (from the sample) Temperature: 25±5°C Direction: Right above	
Definition of Inspection Items	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 seen in the ON/OFF state.

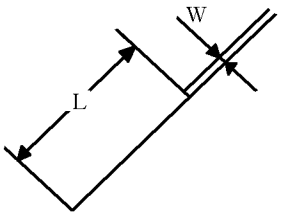
2) Standard

<table>
<tr><th>Inspection Item</th><th>Judgement Standard</th></tr>
<tr><td>Pinhole, Bright spot, Black spot, Foreign particle</td><td>


d = (a + b) / 2
<table>
<tr><th>Category</th><th>Size (mm)</th><th>Acceptable Number</th></tr>
<tr><td>A</td><td>d ≤ 0.2</td><td>neglected</td></tr>
<tr><td>B</td><td>0.2 < d ≤ 0.3</td><td>5</td></tr>
<tr><td>C</td><td>0.3 < d</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>Scratch, Foreign particle</td><td>


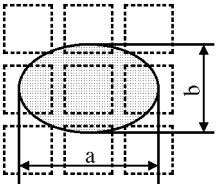
<table>
<tr><th>Category</th><th>Width (mm)</th><th>Length (mm)</th><th>Acceptable No.</th></tr>
<tr><td>A</td><td>W ≤ 0.03</td><td>-</td><td>neglected</td></tr>
<tr><td>B</td><td rowspan="3">0.03 < W ≤ 0.1</td><td>L ≤ 2.0</td><td>neglected</td></tr>
<tr><td>C</td><td>2.0 < L ≤ 4.0</td><td>3</td></tr>
<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>
</table>
</td></tr>
<tr><td>Contrast variation</td><td>


d = (a + b) / 2
<table>
<tr><th>Category</th><th>Size (mm)</th><th>Acceptable Number</th></tr>
<tr><td>A</td><td>d ≤ 0.5</td><td>neglected</td></tr>
<tr><td>B</td><td>0.5 < d ≤ 0.7</td><td>3</td></tr>
<tr><td>C</td><td>0.7 < d</td><td>0</td></tr>
</table>
</td></tr>
</table>

Inspection Item	Judgement Standard
Polarizer (Scratch, Bubble, Dent)	(1) Scratch 

Category	Width (mm)	Length (mm)	Acceptable No.
A	W ≤ 0.1	-	neglected
B	0.1 < W ≤ 0.3	L ≤ 5.0	neglected
C		5.0 < L	0
D	0.3 < W	-	0

(2) Bubble (dent)



d = (a + b) / 2

Category	Size (mm)	Acceptable Number
A	d ≤ 0.2	neglected
B	0.2 < d ≤ 0.3	5
C	0.3 < d ≤ 0.5	3
D	0.5 < d	0