SPEC.NO.	TQ3C-8EAC0-E1CUP79-01
DATE	August 4, 2006

SPEC

FOR :

TYPE:KCG057QV1DB-G70

CONTENTS

Issued
Date : August 9,2006
KYOCERA
Hayato LCD Division

KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT
LCD DIVISION

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
June 28, 2006	S. Kojima	M. Tokumoto	M. Fujitani		S. Hayashi

Warning

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

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

Caution

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

Revision Record

Date	Designed by: Engineering Dept.			Confirmed by: QA Dept.	
	Prepared	Checked	Approved	Checked	Approved
August 4, 2006	S. Kojima	M. Tokumoto	M. Fujitani	Y. Arai	S. Higuchi

Rev. No.	Date	Page	Descriptions
01	Aug. 4, 2006	4	5-1. VDD = 5.0V ～Add comment "*3 Frambe Frequency : f_{FRM} = 75Hz" ～Change "Frame frequency" MAX. "150Hz" → "80Hz"
		5	5-2. VDD = 3.3V ～Add comment "*3 Frambe Frequency : f_{FRM} = 75Hz" ～Change "Frame frequency" MAX. "150Hz" → "80Hz"
		22	18. Outline Drawing ～Change Drawing "121A5018300-1" → "121A5018300-2"

1. Application

This data sheet defines the specification for a (320×R.G.B)×240 dot, STN Transmissive color dot matrix type Liquid Crystal Display with CFL backlight. 『RoHS Compliant』

2. Construction and Outline

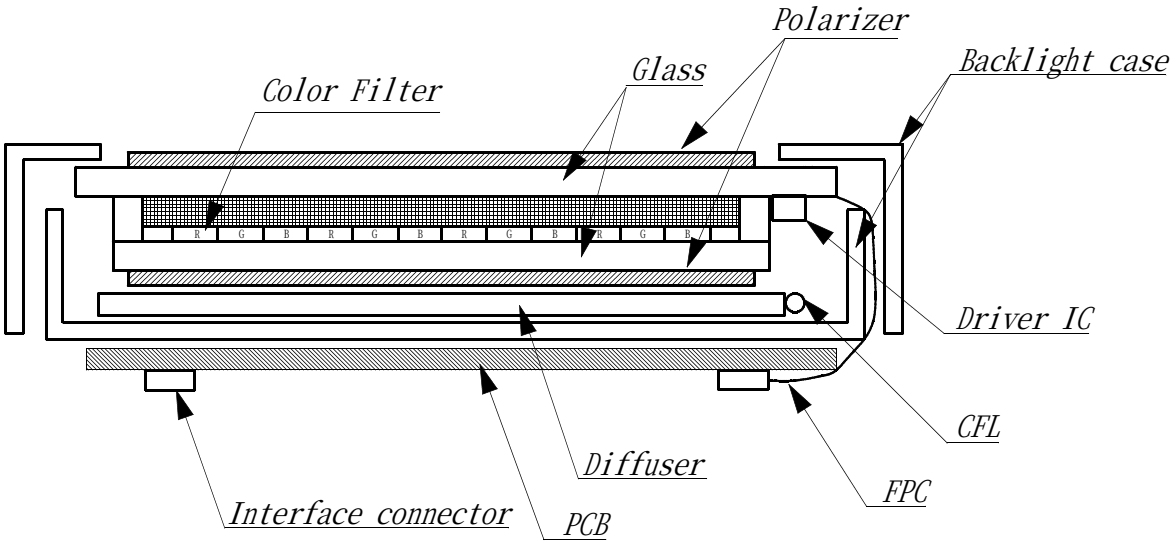
(320×R.G.B)×240 dots, COG type LCD with CFL backlight.

Backlight system : "U" figured type CFL (1 tube).

Inverter : Option.
Recommended Inverter : CXA-L0612A-VJL(TDK)
or Equivalent.

Polarizer : Glare treatment.

Additional circuit : Bias voltage circuit, Randomizing circuit, DC-DC Converter
Temperature Compensation Circuit (for Contrast).



This drawing is showing conception only.

3. Mechanical Specifications

ITEM	SPECIFICATION	UNIT
Outline dimensions	144 (W) × 104.8 (H) × 12.7 (D)	mm
Effective viewing area	117.2 (W) × 88.4 (H)	mm
Dot number	(320×R.G.B) (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	—
Mass	175	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

ITEM	SYMBOL	MIN.	MAX.	UNIT
Supply voltage for logic	VDD	0	6.0	V
Supply voltage for LCD driving	VCONT	0	VDD	V
Input signal voltage *1	Vin	0	VDD	V
FRM frequency	fFRM	—	150	Hz

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

4-2. Environmental absolute maximum ratings

ITEM	SYMBOL	MIN	MAX	UNIT
Operating temperature *1	Top	0	60	℃
Storage temperature *2	T_{STO}	-20	60	℃
Operating humidity *3	Hop	10	*4	%RH
Storage humidity *3	H_{STO}	10	*4	%RH
Vibration	—	*5	*5	—
Shock	—	*6	*6	—

*1 LCD's display quality shall not be guaranteed at the temperature range of : below 0℃ and upper 40℃.

*2 Temp. = -20℃ < 48 h , Temp = 60℃ < 168 h
Store LCD panel at normal temperature/humidity. Keep it free from vibration and shock. LCD panel that is kept at low or high temperature for a long time can be defective due to the other conditions, even if the temperature satisfies standard.
(Please refers to 16. Precautions for use as detail).

*3 Non-condensation.

*4 Temp. ≦ 40℃, 85% RH Max.
Temp. > 40℃, Absolute Humidity shall be less than 85%RH at 40℃.

*5

Frequency	10～55 Hz	Converted to acceleration value : (0.3～9 m/s^2)
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

*6 Acceleration: 490m/s^2
Pulse width : 11 ms
3 times in each direction : ±X/±Y/±Z.
EIAJ ED-2531

5. Electrical Characteristics

5-1. VDD = 5.0V

VDD = +5.0V ± 5%, Temp. = 0～60°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply voltage for logic	VDD	—	4.75	5.00	5.25	V
LCD driving voltage *1 *3	VCONT =Vop	0～50°C *2	1.30	1.80	2.30	V
		～60°C	—	—	2.40	V
Input voltage (FRM,LOAD,CP,DISP,D0～D7)	Vin	"H" level	0.8VDD	—	VDD	V
		"L" level	0	—	0.2VDD	V
Input current	Iin	Input signal	-100	—	100	μA
Rush current for logic	Irush	When rush current happens	3.0A(Peak) × 1ms			
Clock frequency	fcp	—	2.02	2.16	10.00	MHz
Frame frequency *4	f_{FRM}	—	70	75	80	Hz
Current consumption for logic	IDD	*5	—	27.0	40.5	mA
Power consumption	Pdisp		—	135.0	202.5	mW

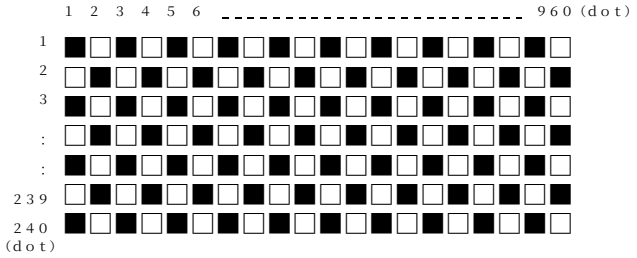
*1 Maximum contrast ratio is obtained by adjusting the LCD supply voltage (VCONT = Vop) for driving LCD.

*2 The LCD Module has the Temperature Compensation Circuit.

*3 Frame frequency : f_{FRM} = 75Hz

*4 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.

*5 Display high frequency pattern, (see below).
VDD = 5.0V , VCONT = Vop , f_{FRM} = 75 Hz , fcp = 2.16MHz, Temp. = 25°C
Pattern:



5-2. VDD = 3.3V

VDD = +3.3V ± 0.3V, Temp. = 0～60°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply voltage for logic	VDD	—	3.0	3.3	3.6	V
LCD driving voltage *1 *3	VCONT =Vop	0～50°C *2	1.30	1.80	2.30	V
		～60°C	—	—	2.40	V
Input voltage (FRM,LOAD,CP,DISP,D0～D7)	Vin	"H" level	0.8VDD	—	VDD	V
		"L" level	0	—	0.2VDD	V
Input current	Iin	Input signal	-100	—	100	μA
Rush current for logic	Irush	When rush current happens	3.0A(Peak) × 1ms			
Clock frequency	fcp	—	2.02	2.16	10.00	MHz
Frame frequency *4	f_{FRM}	—	70	75	80	Hz
Current consumption for logic	IDD	*5	—	40.5	60.8	mA
Power consumption	Pdisp		—	133.7	200.6	mW

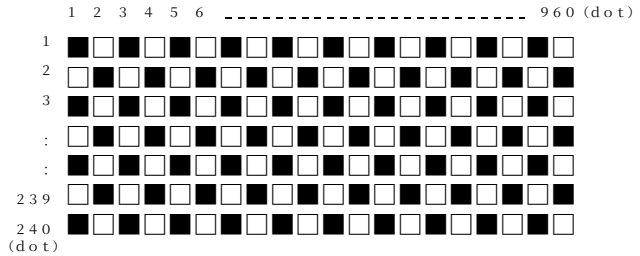
*1 Maximum contrast ratio is obtained by adjusting the LCD supply voltage (VCONT = Vop) for driving LCD.

*2 This LCD Module has the Temperature Compensation Circuit.

*3 Frame frequency : f_{FRM} = 75Hz

*4 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.

*5 Display high frequency pattern, (see below).
VDD = 3.3V , VCONT = Vop , f_{FRM} = 75 Hz , fcp = 2.16MHz, Temp. = 25°C
Pattern:



6. Optical Characteristics

Measuring Spot = φ6.0mm, Temp. = 25℃

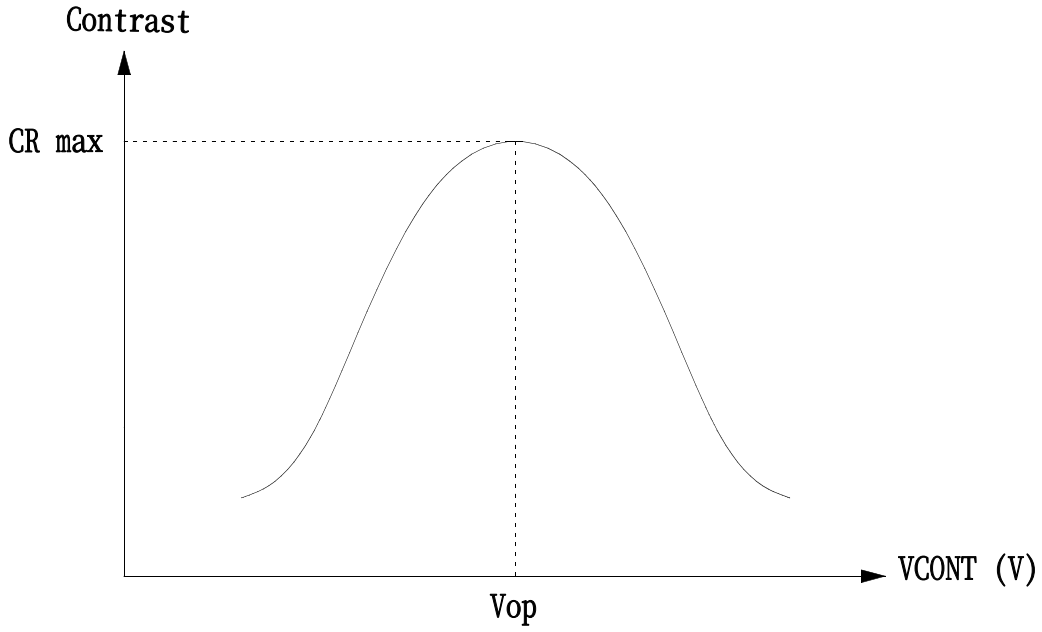
ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Response time	Rise	Tr	θ=φ=0°		—	180	280	ms
	Down	Td	θ=φ=0°		—	170	270	ms
Viewing angle range		θ	CR≧2	Upper	—	20	—	deg.
				Lower	—	35	—	
		φ		Left	—	50	—	deg.
				Right	—	50	—	
Contrast ratio		CR	θ=φ=0°		30	55	—	—
Luminance(Brightness)		L	IL=4.0mArms		300	400	—	cd/m²
Chromaticity coordinates	Red	x	θ=φ=0°		0.50	0.55	0.60	—
		y			0.28	0.33	0.38	
	Green	x	θ=φ=0°		0.24	0.29	0.34	
		y			0.44	0.49	0.54	
	Blue	x	θ=φ=0°		0.10	0.15	0.20	
		y			0.07	0.12	0.17	
	White	x	θ=φ=0°		0.25	0.30	0.35	
		y			0.25	0.30	0.35	

Optimum contrast is obtained by adjusting the LCD driving voltage(Vop) while at the viewing angle of θ = φ = 0°.

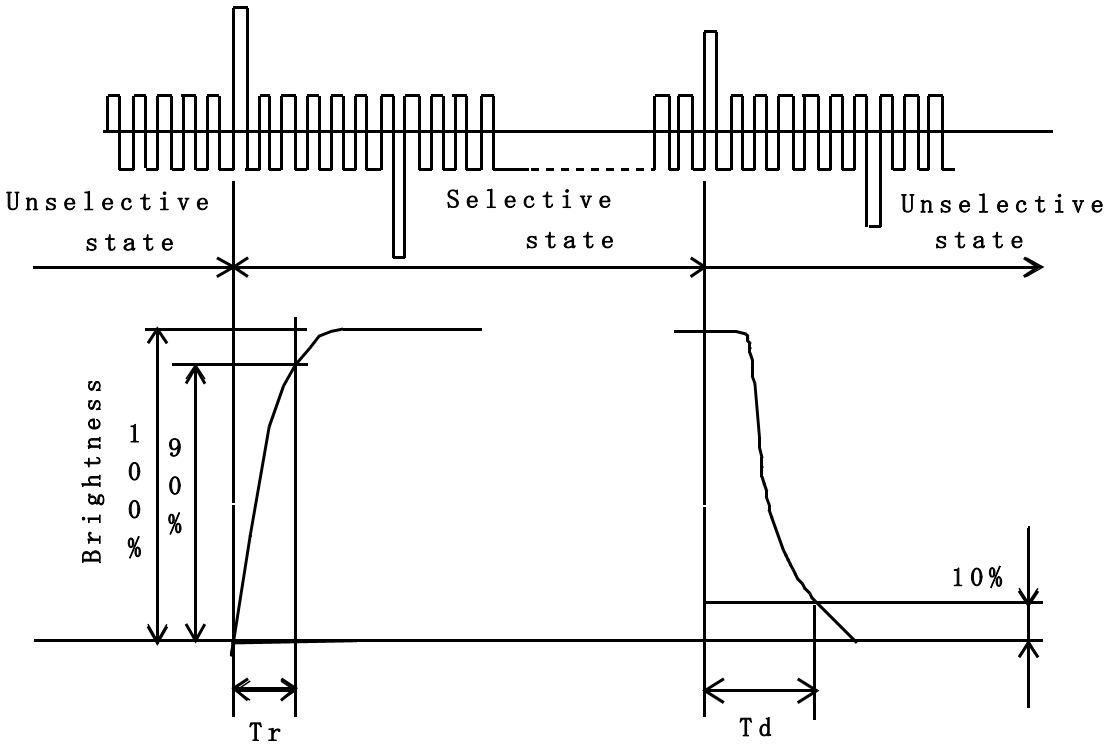
6-1. Contrast ratio is defined as follows:

$$CR = \frac{\text{Luminance(Brightness) at all pixels "White"}}{\text{Luminance(Brightness) at all pixels "Black"}}$$

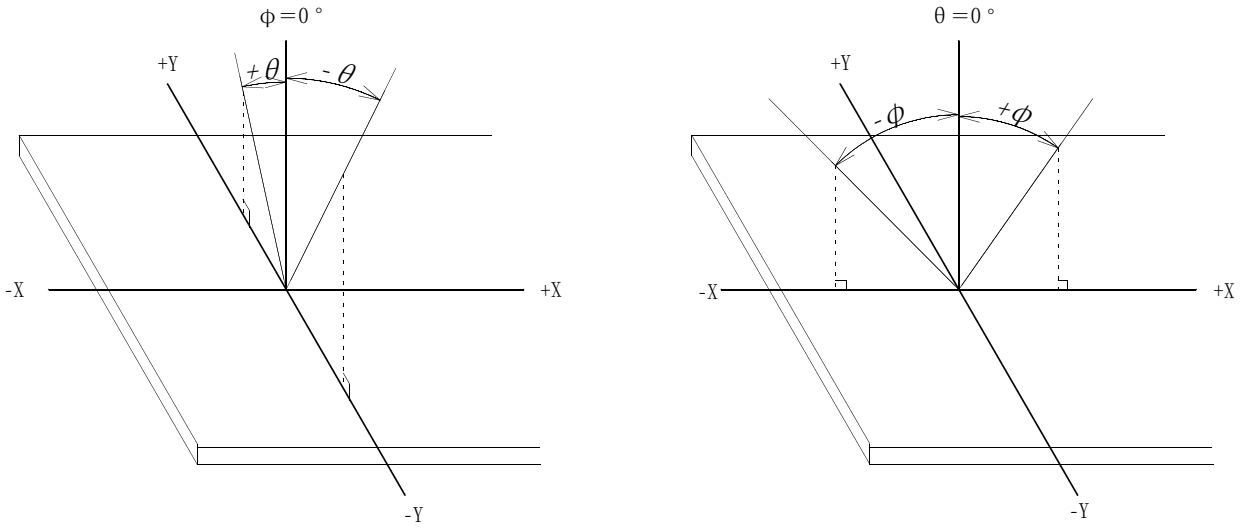
6-2. Definition of Vop



6-3. Definition of response time

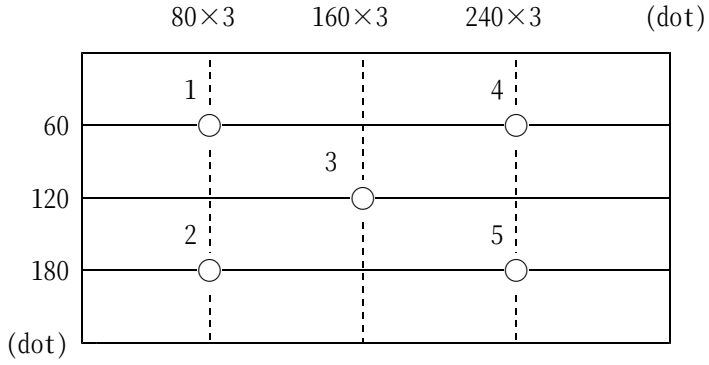


6-4. Definition of viewing angle



(θ direction)　　(φ direction)

6-5. Measuring points

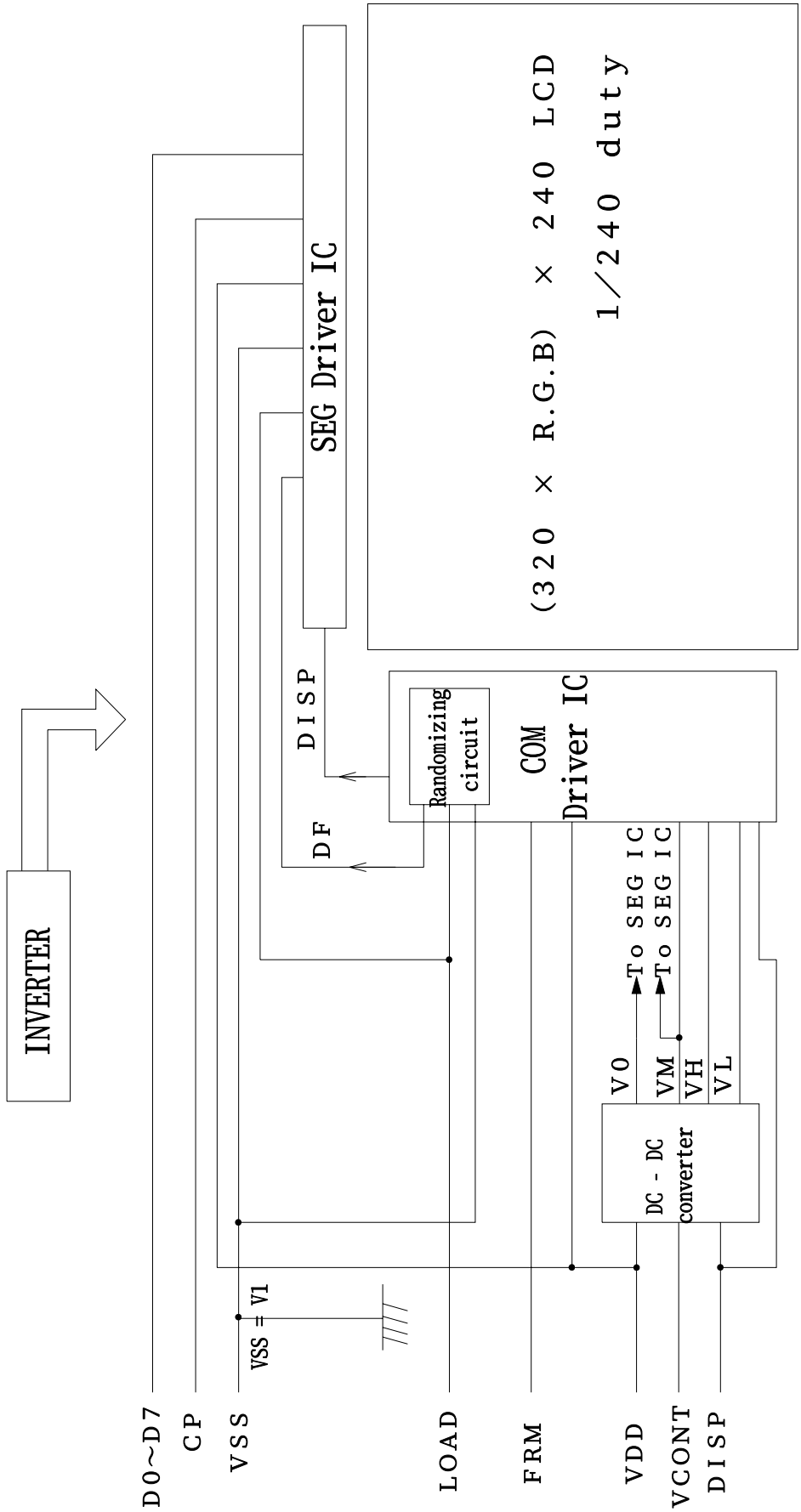


1) Rating is defined as the average brightness inside the viewing area.

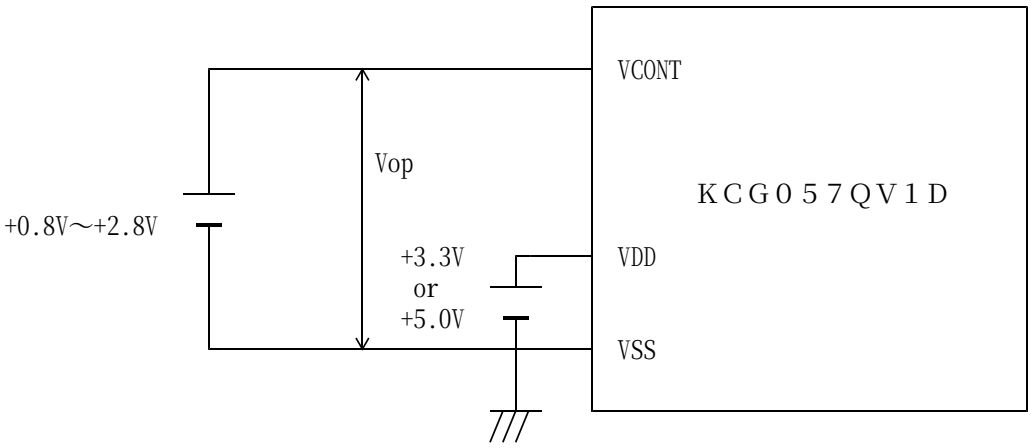
2) 30 minutes after CFL is turned on. (Ambient Temp.= 25°C)

3) The inverter should meet the rating of the CFL;
-Sine, symmetric waveform without spike in positive and negative.

7. Circuit Block Diagram



7-1. Power supply



8. Interface signals

8-1. LCD

PIN №	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	VCONT	LCD adjust voltage	—
8	D7	Display data	H(ON),L(OFF)
9	D6		
10	D5		
11	D4		
12	D3		
13	D2		
14	D1		
15	D0		
16	VDD	Power supply for logic	—
17	VDD		
18	VSS	GND	—
19	VSS		
20	VSS		

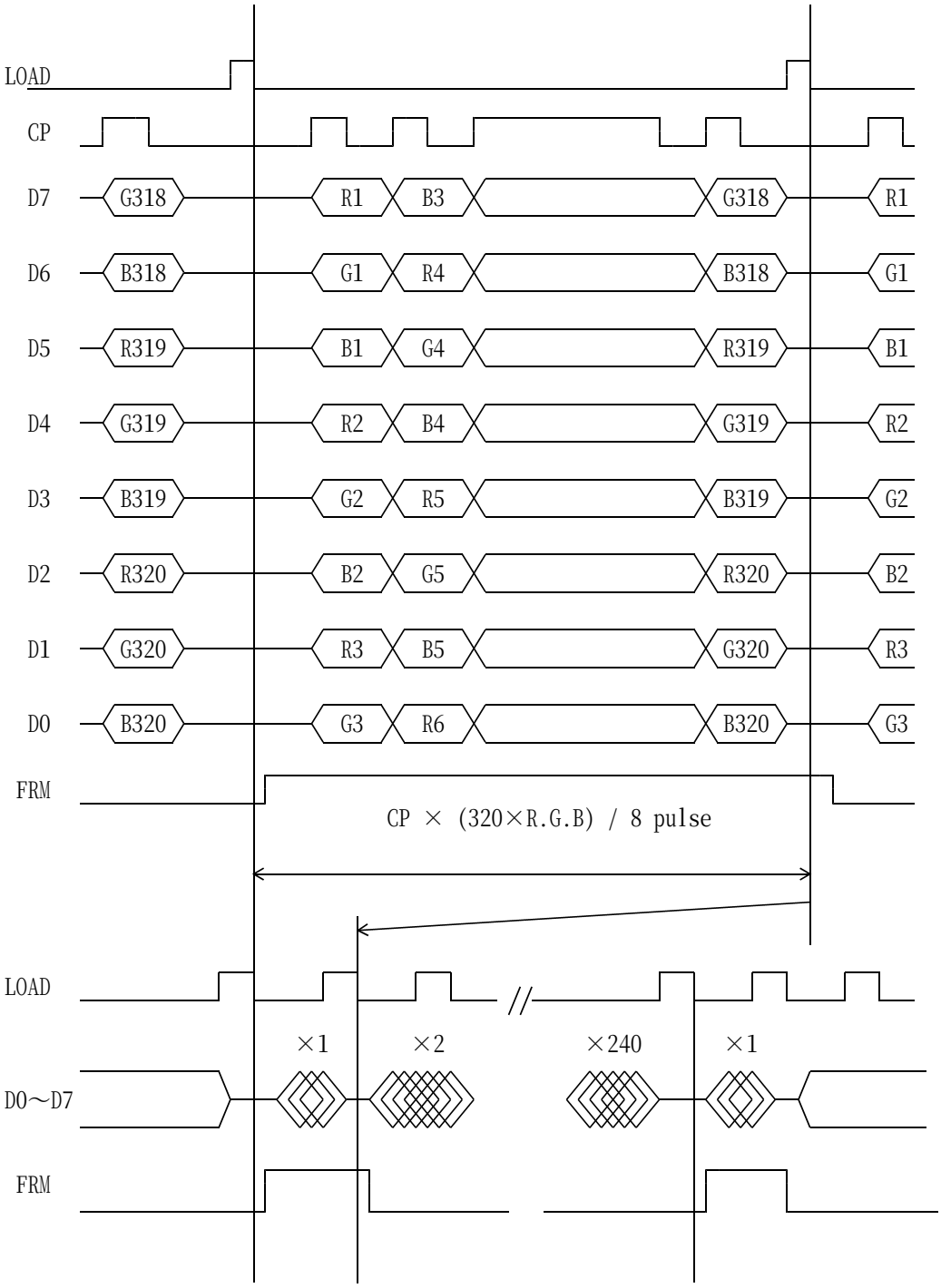
LCD connector : 08-6210-020-340-800+ (ELCO)
Recommended matching FFC or FPC : pitch = 0.5mm

8-2. CFL

PIN No	SYMBOL	DESCRIPTION
1	HOT	Inverter output high voltage side
2	NC	No connect
3	COLD	Inverter output low voltage side

LCD side connector : BHR-03VS-1 (JST)
Recommended matching connector : SM02(8.0)B-BHS-1 (JST)
: SM02(8.0)B-BHS-1-TB(LF)(SN) (JST)・・・(RoHS Compliant)

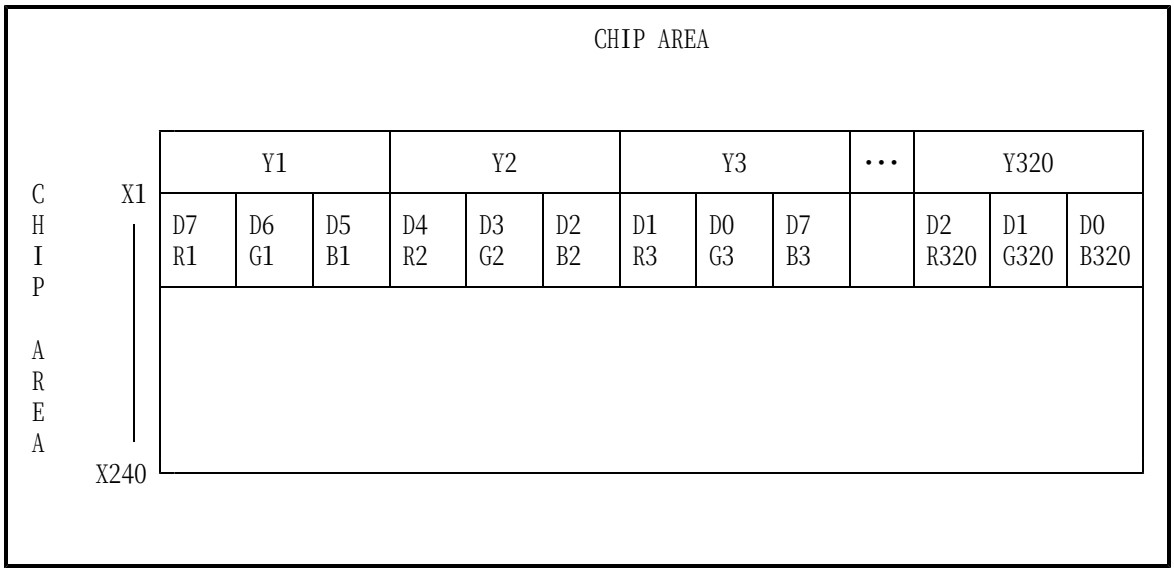
9. Interface Timing Chart



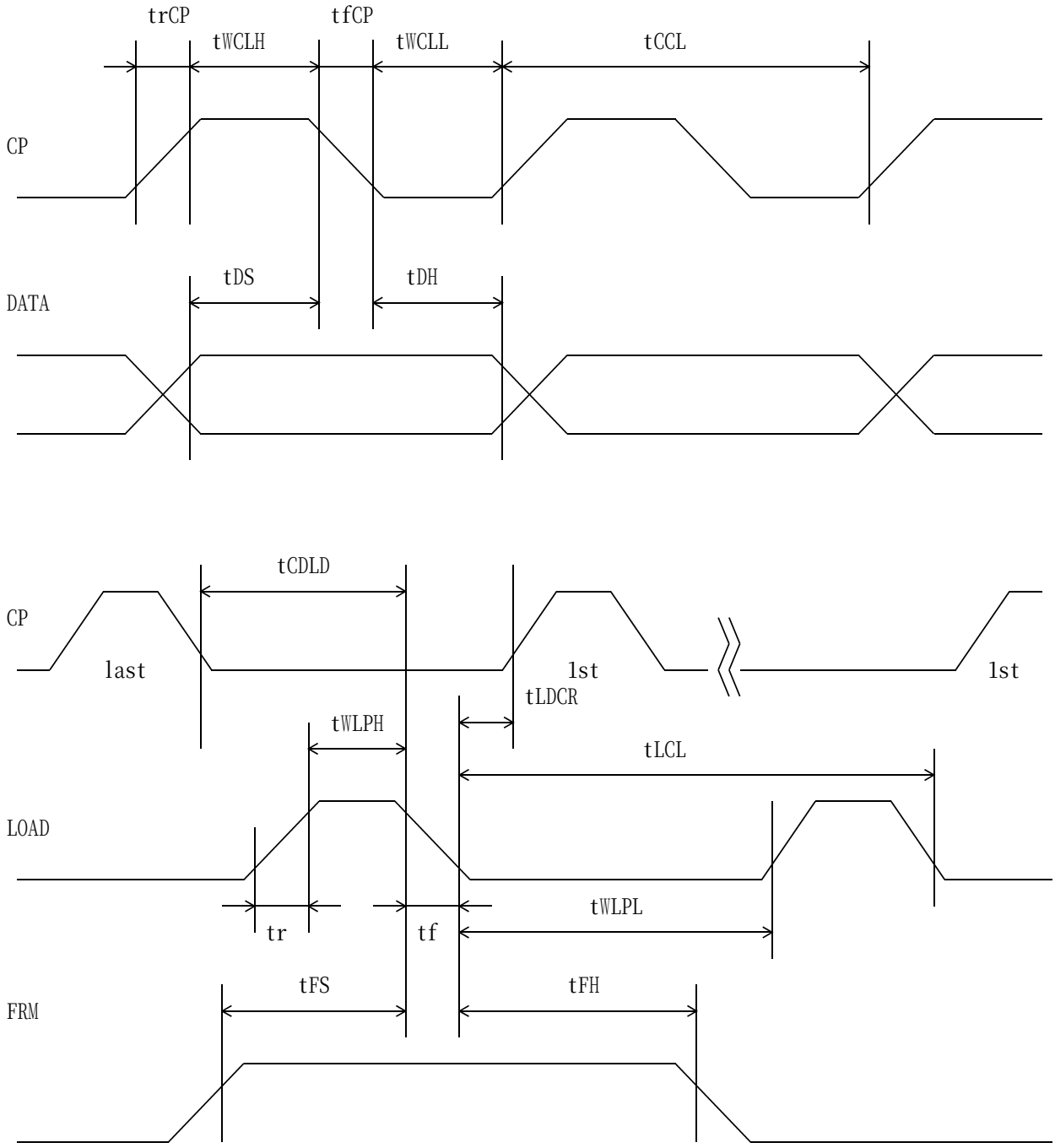
* The cycle of load signal should be stable and continuously applied without interruption.

* The above-mentioned timing chart shows a reference to set up a LCD module, not an electrical rating.

10. Data and Screen



11. Input Timing Characteristics



11-1. Switching characteristics (VDD = 5.0V)

Input Characteristics ; VDD = +5.0V ± 5%, Temp. = 0～60 ℃

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 Down→LOAD Down Delay Time	tCDLD	60	—	ns
LOAD Down→CP Rise 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 adjust so that FRM signal is 75Hz.

*2 LOAD Cycle is const.

11-2. Switching characteristics (VDD = 3.3V)

Input Characteristics ; VDD = +3.3V ± 0.3V, Temp. = 0～60 ℃

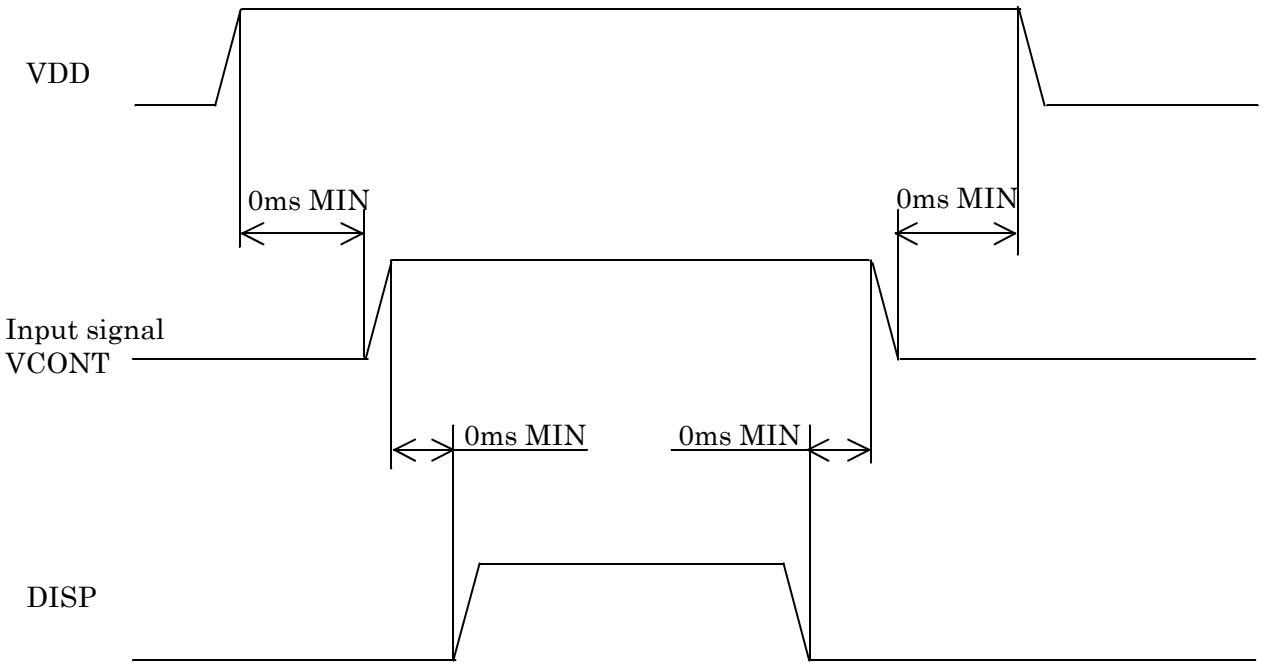
ITEM	SYMBOL	MIN.	MAX.	UNIT
CP Cycle *1	tCCL	100	—	ns
CP "H" Pulse Width	tWCLH	40	—	ns
CP "L" Pulse Width	tWCLL	40	—	ns
CP Rise Up Time	trCP	—	20	ns
CP Fall Down Time	tfCP	—	20	ns
Data Set Up Time	tDS	35	—	ns
Data Hold Time	tDH	35	—	ns
LOAD "H" Pulse Width	tWLPH	50	—	ns
LOAD "L" Pulse Width	tWLPL	400	—	ns
LOAD Cycle *2	tLCL	500	—	ns
CP Down→LOAD Down Delay Time	tCDLD	60	—	ns
LOAD Down→CP Rise 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 adjust so that FRM signal is 75Hz.

*2 LOAD Cycle is const.

12. 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, VCONT third and finally DISP. This will prevent DC driving of the LCD or CMOS LSI latch up as shown below.



* Input signal : CP,LOAD,FRM,D0～D7

* The above sequence should be designed as to keep each normal figure on condition that liquid crystal module is loaded on your system.

* Control the input signal and VCONT to the above ON - OFF timing when you switch ON/OFF the display during VDD and DISP are on.
  And also design the circuit as VCONT's OFF level become GND level.

* Control the supply voltage sequence not to float all signal line when the LCD panel is driving.

13. Backlight Characteristics

Temp. = 25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	NOTE
Starting discharge Voltage *1	VS	—	—	1550 Vrms	0 °C
		—	—	1035 Vrms	25 °C
Discharging tube current *2,*3	IL	3.0 mArms	4.0 mArms	6.0 mArms	—
Discharging tube voltage	VL	—	685 Vrms	—	—
Operating life *4 (IL=4.0 mArms)	T	60,000 h	75,000 h	—	—
Operating frequency	F	30 kHz	—	100 kHz	—

*1 The Non-load output voltage (VS) of the inverter should be 1.3 times the maximum VS at the low temperature to provide margin to assure that the CFL will start, because actual VS may increase due to leakage current from the CFL cables. (Reference value: 2015 Vrms MIN.)

*2 We recommend that you should set the discharging tube current at lower than typical value so as to prevent the heat accumulation of CFL tube from deteriorating a performance of the LCD.

*3 Do not apply more than 6.0mArms discharging tube current. Because CFL maybe broken due to over current.

*4 When the luminance or quantity of light has decreased to 50 % of the initial value. Average life time of CFL will be decreased when LCD is operating at lower and higher temperature.

* Prolonged storage in darkness and/or low temperature may slow the ignition and rise to full brightness of the CFL in an LCD Module. Please use an inverter designed to provide sufficient driving voltage for more than 1 second. Also a decreased Starting Discharge Voltage or shortened ignition time may not turn ON the CFL lamp.

14. Lot Number Identification

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

KCG057QV1DB-G70- □ □-□ □-□ MADE IN □□□□□

① ② ③ ④ ⑤

① YEAR
② MONTH
③ DATA
④ Version Number
⑤ Country of origin (Japan or China)

YEAR	2006	2007	2008	2009	2010	2011
CODE	6	7	8	9	0	1

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. Incoming inspection

Please inspect the LCD within one month after 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 for use

16-1. Installation of the LCD

1. Please ground the mounting (screw) holes 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.
7. Do not pull the CFL lead wires and do not bend the root of the wires.
   Housing should be designed to protect CFL lead wires from external stress.
8. A transparent protection sheet is attached to the polarizer. Please remove the protection film slowly before use, paying attention to static electricity.
9. 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.

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 may shorten life, and/or harm display images.
2. Adjust "LCD driving voltage" to obtain optimum 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. Always store the LCD so that it is free from external pressure onto it.

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.
6. Please do not use solid-base image pattern for long hours because a temporary afterimage may appear. We recommend to use screen saver etc. in cases where a solid-base image pattern must be used.
7. 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.

17. Reliability Data / Environmental Test

TEST ITEM	TEST CONDITION	TEST TIME	RESULT
High Temp. Atmosphere	70°C	240 h	Display Quality : No defect Display Function : No defect Current Consumption : No defect
Low Temp. Atmosphere	-20°C	240 h	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	240 h	Display Quality : No defect Display Function : No defect Peel-off of Organic Sealing : None Current Consumption : No defect
Temp. Cycle	-20°C 0.5 h R.T. 0.5 h 70°C 0.5 h	10 cycles	Display Quality : No defect Display Function : No defect Peel-off of Organic Sealing : None Bubble on Cell : None
High Temp. Operation	60°C Vop	500 h	Display Quality : No defect Display Function : 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.

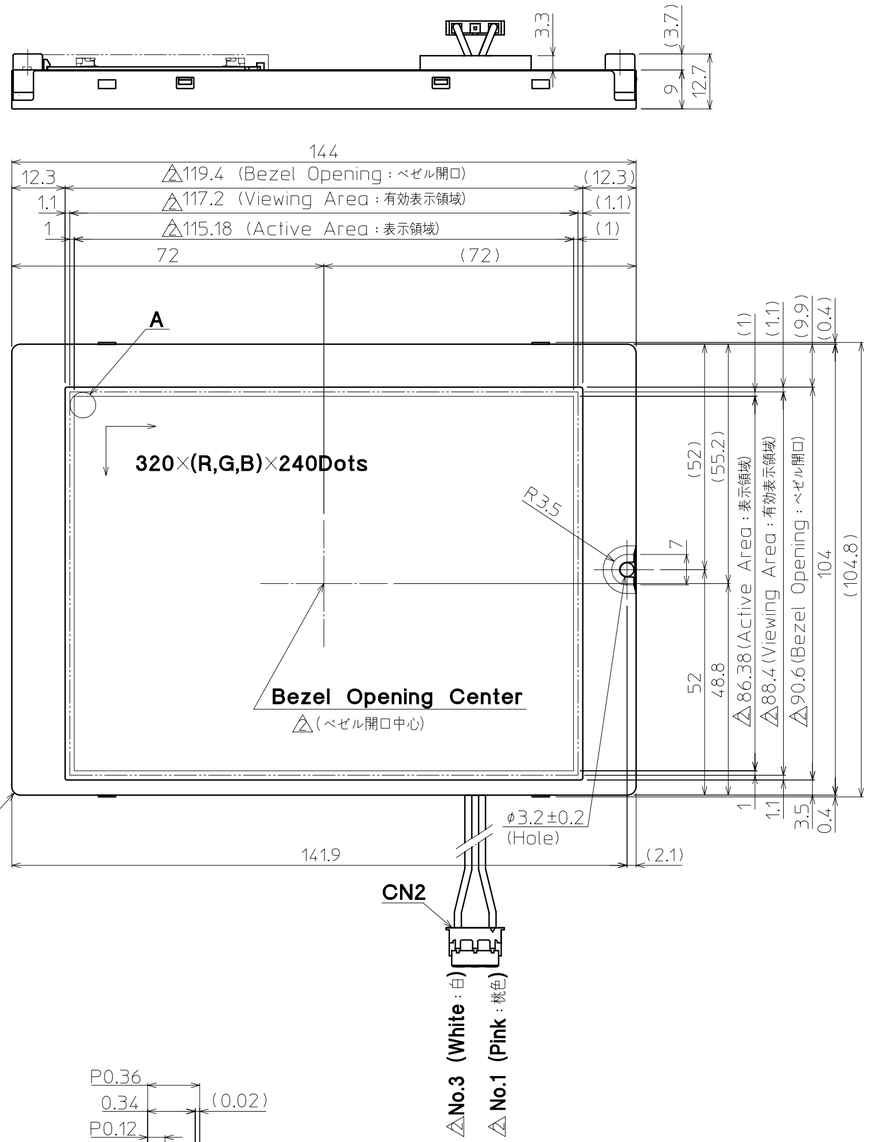
* The LCD is tested in circumstances in which there is no condensation.

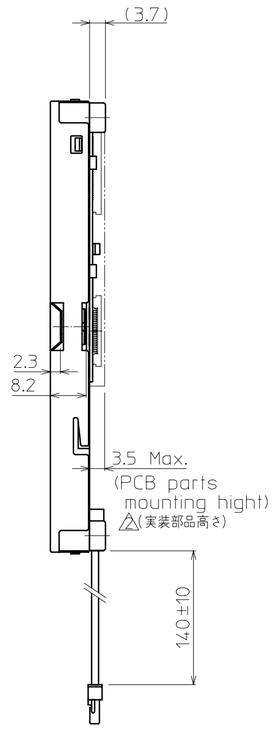
* The tested LCD is inspected after 24 hours of storage at room temperature and room humidity after each test is finished.

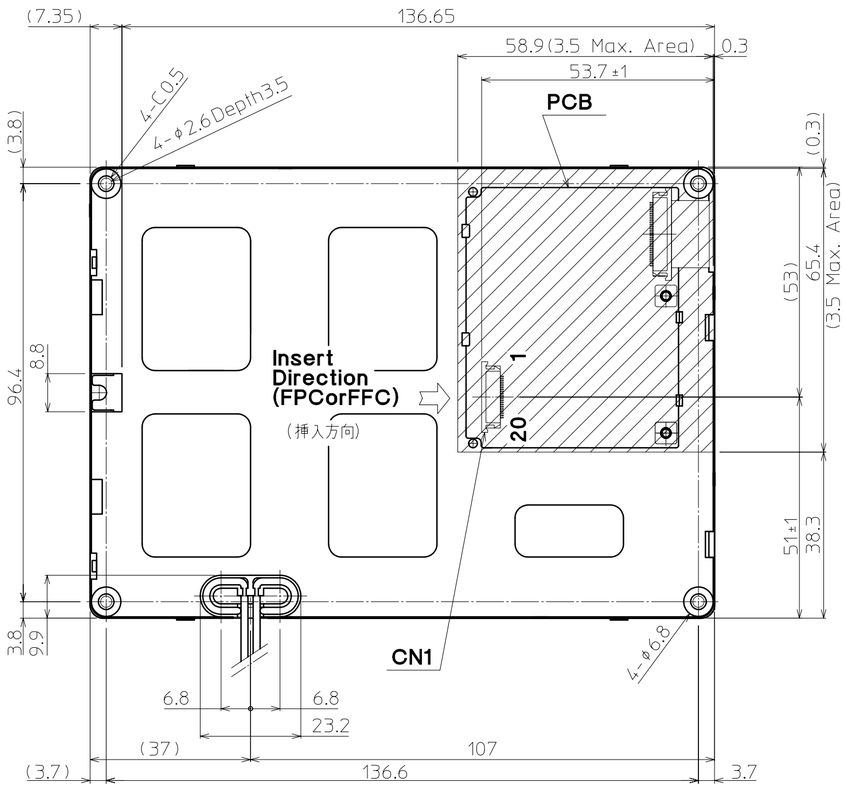
* The reliability test is not an out-going inspection.

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

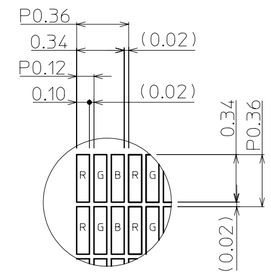
No	Description	Drawn	Checked	Checked	Approved
△1	・Change Connector(LEAD FREE). ・Add Matching Connector(LEAD FREE). ・Change Scale Back side drawing.	'05.01.12 倉元	'05.01.12 川田原		'05.01.12 阿部
△2	・Change the parts No. of Connector (Typographical error) (コネクター品名変更(誤記訂正)) ・Add Japanese Comment (日本語追記)	'06.05.15 野崎	'06.05.20 茶圓		'06.05.20 阿部







△ Back side drawing (1:2)



Detail A (Dot Size)

(NTS)

(Note.) △08-6210-020-340-800+

1. Connector CN1： ~~08-6210-020-340-800~~ (ELCO)
   (コネクター) CN2：BHR-03VS-1 (JST)
2. Matching Connector CN2：△SM02(8.0)B-BHS-1 (JST)
   (適合コネクター) △SM02(8.0)B-BHS-1-TB(LF)(SN) (JST)
   ~~SM02 (8.0)B-BHS-1-TB (JST)~~
   ~~△SM02 (8.0)B-BHS-1-TB (LF)(SN) (JST)~~
3. The drawing is the front view of the LCD.
   Information is displayed starting at the upper left hand corner, moving right then down to the lower right hand corner.
   (LCDの正面図において、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。)
4. Tolerance without indication： ±0.5
   (指示無き公差)

Material 材質	Treatment 処理	Approved '02.07.26	Checked	Checked '02.07.26	Drawn	Scale 1:1 (NTS)	Title KCG057QV1DB	KYOCERA	Year-Month-Day '02.07.26 / Size 2
Quantity 製作数	Description; RoHS 備考 05006AAA	阿部		今村	倉元		Outline Dimensions	Drawing No. 121A5018300-2	

SPEC. NO.	TQ3C-8EAC0-E2CUP71-00
DATE	June 28, 2006

FOR: _____

KYOCERA INSPECTION STANDARD

TYPE : KCG057QV1DB-G70

KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT
LCD DIVISION

Original	Designed by :Engineering Dept.			Confirmed by :QA Dept.	
Issue Date	Prepared	Checked	Approved	Checked	Approved
June 28, 2006	M. Usami	H. Tokumori	M. Fujitani	Y. Ito	T. Minami

Revision Record

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

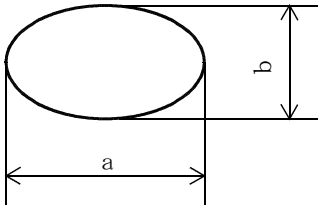
Rev. No.	Date	Page	Descriptions

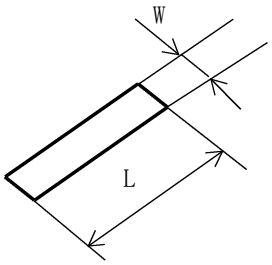
Visuals specification

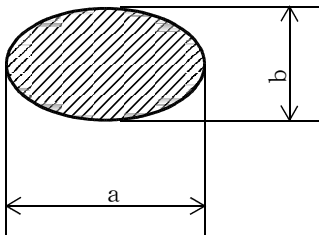
1)Note

Item	Note	
General	1.When defects specified in this Inspection Standards are 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) 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. 3.Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and Kyocera. 4.Inspection conditions Luminance : 500 Lux minimum . Inspection distance : 300 mm (from the sample) Temperature : 25 ± 5 ℃ Direction : right above	
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.

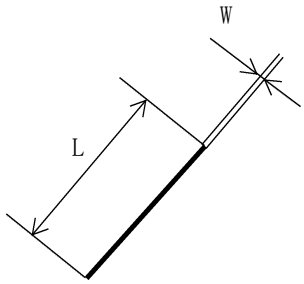
2)Standard

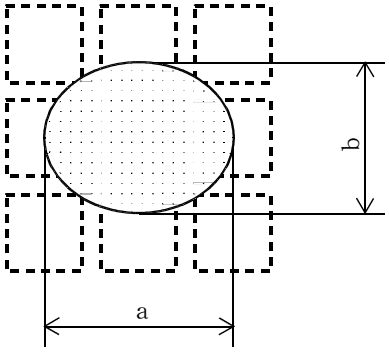
<table>
<tr><th>Inspection item</th><th>Judgement standard</th></tr>
<tr><td>Pinhole, Bright spot
Black spot,
Foreign particle</td><td>


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 ≦ 0.5</td><td>3</td></tr>
<tr><td>D</td><td>0.5 ＜ d</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>Scratch,Foreign particle</td><td>


<table>
<tr><th></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>

<table>
<tr><th>Inspection item</th><th>Judgement standard</th></tr>
<tr><td>Polarizer (Scratch, Bubble, Dent)</td><td>
(1) Scratch


<table>
<tr><th></th><th>Width (mm)</th><th>Length (mm)</th><th>Acceptable No.</th></tr>
<tr><td>A</td><td>W ≦ 0.1</td><td>—</td><td>neglected</td></tr>
<tr><td>B</td><td rowspan="2">0.1 ＜ W ≦0.3</td><td>L ≦ 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>
</table>
(2)Bubble (dent)


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 ≦ 0.5</td><td>3</td></tr>
<tr><td>D</td><td>0.5 ＜ d</td><td>0</td></tr>
</table>
</td></tr>
</table>