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		APPLICABLE DIVISION <div>■ Mobile LCD DIVISION I</div>

DEVICE SPECIFICATION
For TFT LCD Module Model No

LQ070LLYV01

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[For handling and system design]

- (1) Do not scratch the surface of the polarizer film as it is easily damaged.
- (2) If the cleaning of the surface of the LCD panel is necessary, wipe it swiftly with cotton or other soft cloth. Do not use organic solvent as it damages polarizer.
- (3) Water droplets on polarizer must be wiped off immediately as they may cause color changes, or other defects if remained for a long time.
- (4) Since this LCD panel is made of thin glass, dropping the module or banging it against hard objects may cause cracks or fragmentation
- (5) Certain materials such as epoxy resin (amine's hardener) or silicone adhesive agent (de-alcohol or de-oxy) emits gas to which polarizer reacts (color change). Check carefully that gas from materials used in system housing or packaging do not hurt polarizer.
- (6) Liquid crystal material will freeze below specified storage temperature range and it will not get back to normal quality even after temperature comes back within specified temperature range. Liquid crystal material will become isotropic above specified temperature range and may not get back to normal quality. Keep the LCD module always within specified temperature range.
- (7) Do not expose LCD module to the direct sunlight or to strong ultraviolet light for long time.
- (8) If the LCD driver IC (COG) is exposed to light, normal operation may be impeded. It is necessary to design so that the light is shut off when the LCD module is mounted.
- (9) Do not disassemble the LCD module as it may cause permanent damage.
- (10) As this LCD module contains components sensitive to electrostatic discharge, be sure to follow the

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instructions in below.

- ① Operators Operators must wear anti-static wears to prevent electrostatic charge up to and discharge from human body.
- ② Equipment and containers Process equipment such as conveyer, soldering iron, working bench and containers may possibly generate electrostatic charge up and discharge. Equipment must be grounded through 100Mohms resistance. Use ion blower.
- ③ Floor Floor is an important part to leak static electricity which is generated from human body or equipment. There is a possibility that the static electricity is charged to them without leakage in case of insulating floor, so the countermeasure(electrostatic earth:1×108Ω) should be made.
- ④Humidity Proper humidity of working room may reduce the risk of electrostatic charge up and discharge. Humidity should be kept over 50% all the time.
- ⑤Transportation/storage Storage materials must be anti-static to prevent causing electrostatic discharge.
- ⑥Others Protective film is attached on the surface of LCD panel to prevent scratches or other damages. When removing this protective film, remove it slowly under proper anti-ESD control such as ion blower.
- (11) Hold LCD very carefully when placing LCD module into the system housing. Do not apply excessive stress or pressure to LCD module. Do not to use chloroprene rubber as it may affect on the reliability of the electrical interconnection.
- (12) Do not hold or touch LCD panel to flex interconnection area as it may be damaged.
- (13) As the binding material between LCD panel and flex connector mentioned in 12) contains an organic material, any type of organic solvents are not allowed to be used. Direct contact by fingers is also prohibited.
- (14) When carrying the LCD module, place it on the tray to protect from mechanical damage. It is recommended to use the conductive trays to protect the CMOS components from electrostatic discharge. When holding the module, hold the Plastic Frame of LCD module so that the panel, COG and other electric parts are not damaged.
- (15) Do not touch the COG's patterning area. Otherwise the circuit may be damaged.
- (16) Do not touch LSI chips as it may cause a trouble in the inner lead connection.
- (17) Place a protective cover on the LCD module to protect the glass panel from mechanical damages.
- (18) LCD panel is susceptible to mechanical stress and even the slightest stress will cause a color change in background. So make sure the LCD panel is placed on flat plane without any continuous twisting, bending or pushing stress.
- (19) Protective film is placed onto the surface of LCD panel when it is shipped from factory. Make sure to peel it off before assembling the LCD module into the system. Be very careful not to damage LCD module by electrostatic discharge when peeling off this protective film. Ion blower and ground strap are recommended.
- (20) Make sure the mechanical design of the system in which the LCD module will be assembled matches specified viewing angle of this LCD module.
- (21) This LCD module does not contain nor use any ODS (1,1,1-Trichloroethane, CCL4) in all materials used, in all production processes.

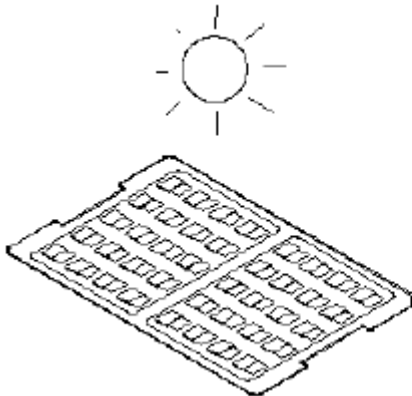
[For operating LCD module]

- (1) Do not operate or store the LCD module under outside of specified environmental conditions.
- (2) At the shipment, adjust the contrast of each LCD module with electric volume. LCD contrast may vary from panel to panel depending on variation of LCD power voltage from system.
- (3) As opt-electrical characteristics of LCD will be changed, dependent on the temperature, the confirmation of display quality and characteristics has to be done after temperature is set at 25 °C and it becomes stable.

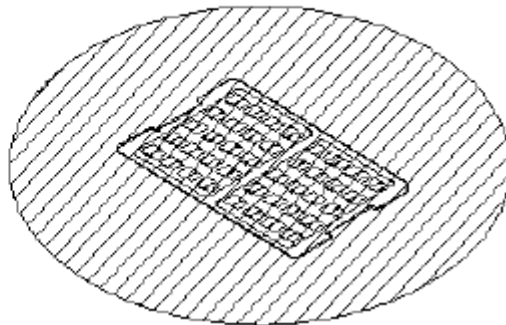
[Precautions for Storage]

- (1) Do not expose the LCD module to direct sunlight or strong ultraviolet light for long periods. Store in a dark place.
- (2) The liquid crystal material will solidify if stored below the rated storage temperature and will become an isotropic liquid if stored above the rated storage temperature, and may not retain its original properties. Only store the module at normal temperature and humidity (25±5°C, 60±10%RH) in order to avoid exposing the front polarizer to chronic humidity.
- (3) Keeping Method
 - a. Don't keeping under the direct sunlight.
 - b. Keeping in the tray under the dark place.

DON'T



DO



- (1) Do not operate or store the LCD module under outside of specified environmental conditions.
- (2) Be sure to prevent light striking the chip surface.

[Other Notice]

- (1) Do not operate or store the LCD module under outside of specified environmental conditions.
- (2) As electrical impedance of power supply lines (VCC-VSS) are low when LCD module is working, place the de-coupling capacitor near by LCD module as close as possible.
- (3) Reset signal must be sent after power on to initialize LSI. LSI does not function properly until initialize it by reset signal.
- (4) Generally, at power on, in order not to apply DC charge directly to LCD panel, supply logic voltage first and initialize LSI logic function including polarity alternation. Then supply voltage for LCD bias. At power off, in order not to apply DC charge directly to LCD panel, execute Power OFF sequence and Discharge command.

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- (5) Don't touch to PWB surface, exposed IC chip, electric parts and other parts, to any electric, metallic materials. (6) No bromide specific fire-retardant material is used in this module.
 (7) Do not display still picture on the display over 2 hours as this will damage the liquid crystal.

[Precautions for Discarding Liquid Crystal Modules]

COG: After removing the LSI from the liquid crystal panel, dispose of it in a similar way to circuit boards from electronic devices.

LCD panel: Dispose of as glass waste. This LCD module contains no harmful substances. The liquid crystal panel contains no dangerous or harmful substances. The liquid crystal panel only contains an extremely small amount of liquid crystal (approx.100mg) and therefore it will not leak even if the panel should break.

-Its median lethal dose (LD50) is greater than 2,000 mg/kg and a mutagenetic (Aims test: negative) material is employed.

FPC: Dispose of as similar way to circuit board from electric device.

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1. Application

This data sheet is to introduce the temporary specification of LQ070LLYV01 active matrix 262,144color LCD module.

Main color LCD module is controlled by Driver IC.

If any problem occurs concerning the items not stated in this temporary specification, it must be solved sincerely by both parties after deliberation.

As to basic specification of driver IC refer to the IC specification and handbook.

The applications are Portable DVD, Multimedia applications and others AV system.

- Utilizes a panel with a 16:9 aspect ratio, which makes the module suitable for use in wide-screen systems.
- Wide viewing angle technology is employed.
- By adopting an active matrix drive, a picture with high contrast is realized.
- By adopting a high aperture panel, high transmittance color filter and high transmission polarizing plates,transmittance ratio is realized.

2. Construction and Outline

Construction: LCD panel, Driver (COG), FPC with electric components, 24 White LED lump, prism sheet, diffuser, light guide and reflector, plastic frame to fix them mechanically.

Outline: See page 22

Connection: 50 pins;

There shall be no scratches, stains, chips, distortions and other external drawbacks that may affect the display function.

In order to realize thin module structure, double-sided adhesive tapes are used to fix LCD panels.

So please make sure to design the system to hold the edges of LCD panel by the soft material such as sponge when LCD module is assembled into the cabinet.

3. Mechanical Specification

Table 1

Item	Specifications	Unit
Screen size	7.0	inch
Active area	152.4(W)×91.44 (H)	mm
Display format	800 (H) ×RGB×480 (V)	-
Dot pitch	0.1905×0.1905	mm
Pixel confinguration	R. G. B. strip	
Outline Dimensions(typ)	164.2(W)×104.4(H)×3.8(D)	mm
Most Suitable View Angle	6 o'clock	
Base color Notes	Normaly white	-
Mass	TBD	g

(Note1) Display module general parameters

4. Interface signals

This LCD employs two interface connections, a 50 pin connector is used for the module electronics interface and the other connector is used for the integral backlight system.

Table 2

Pin No.	Symbol	I/O	Description	Remarks
1	VGH	-	Gate Driver Positive Voltage	
2	VGL	-	Gate Driver Negative Voltage	
3	GVCC	-	Power Line For Gate Driver IC Logic	
4	GSP1	I	Gate Scanning Start Signal 1	
5	GSP2	I	Gate Scanning Start Signal 2	
6	GSC	I	Gate Driver Scanning Clock Pulse	
7	U_D	I	Up/Down Scanning Change	
8	GOE	I	Gate Driver Output Enable Control	
9	VCOM	I	Voltage Applied To Color Filter Substrate	
10	VCOM	I	Voltage Applied To Color Filter Substrate	
11	VDD	I	Source Driver Supply Voltage	VDD=3.3V
12	VREF5	I	Voltage For Gamma Correction	
13	VREF4	I	Voltage For Gamma Correction	
14	VREF3	I	Voltage For Gamma Correction	
15	VREF2	I	Voltage For Gamma Correction	
16	VREF1	I	Voltage For Gamma Correction	
17	VREF0	I	Voltage For Gamma Correction	
18	GND	-	Ground	
19	VCC	I	Power Line For Logic	
20	VCC	I	Power Line For Logic	
21	SSP2	I	Source Scanning Right Start Signal	
22	SSP1	I	Source Scanning Left Start Signal	
23	SOE	I	Source Driver Output Enable Control	
24	SSC	I	Source Driver Clock Input	
25	POL	I	Polarity Reversal Signal	
26	GND	-	Ground	
27	R0	I	Red Data 0[LSB]	
28	R1	I	Red Data 1	
29	R2	I	Red Data 2	
30	R3	I	Red Data 3	
31	R4	I	Red Data 4	

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Pin No.	Symbol	I/O	Description	Remarks
32	R5	I	Red Data 5[MSB]	
33	GND	-	Ground	
34	G0	I	Green Data 0 [LSB]	
35	G1	I	Green Data 1	
36	G2	I	Green Data 2	
37	G3	I	Green Data 3	
38	G4	I	Green Data 4	
39	G5	I	Green Data 5[MSB]	
40	GND	-	Ground	
41	B0	I	Blue Data 0 [LSB]	
42	B1	I	Blue Data 1	
43	B2	I	Blue Data 2	
44	B3	I	Blue Data 3	
45	B4	I	Blue Data 4	
46	B5	I	Blue Data 5 [MSB]	
47	GND	-	Ground	
48	REV	I	Reverse of Input R,G,B Data Code	
49	L_R	I	Left/Right Scanning Change	
50	VCOM	I	Voltage Applied To Color Filter Substrate	

**The matching connector part number is FH19SC-50S-0.5SH (Bottom Contact Type, 0.5mm-Pitch) manufactured by Hirose or equivalent.

5. Absolute Maximum Ratings

Table 2

Parameter	Symbol	Condition	Min	Max	Unit	Rating
Logic Voltage	VCC	T=25℃	-0.5	4.0	V	
Source Driver Voltage	VDD	T=25℃	-0.3	14.5	V	
Digital Input Signals	VI1	T=25℃	-0.5	VCC+0.5	V	[Note 1]
Analog Input Signals	VI2	T=25℃	-0.5	VDD+0.5	V	[Note 2]
Gate Driver Voltage	VGH	T=25℃	-0.3	40	V	
	VGL	T=25℃	-20	0.3	V	
	VGH-VGL	T=25℃	-0.3	40	V	
	GVCC	T=25℃	-0.3	4	V	
Operating Temperature (Ambient Temperature)	Top	-	-10	60	℃	[Note 3,4,5,6]
Storage Temperature	Tst	-	-20	70	℃	[Note 3,4]

[Note 1] U_D,GSP1/2,GSC,GOE, SSP1/2, SOE, SSC, POL, REV, L_R, R0-5/G0-5/B0-5

[Note 2] VCOM,VREF0/1/2/3/4/5

[Note 3] This rating applies to all parts of the module and should not be exceeded.

[Note 4] Maximum wet-bulb temperature is 46℃. Condensation of dew must be avoided as electrical current leaks will occur, causing a degradation of performance specifications.

[Note 5] The operating temperature only guarantees operation of the circuit and doesn't guarantee all the contents of Electro-optical specification.

[Note 6] Ambient temperature when the backlight is lit (reference value).

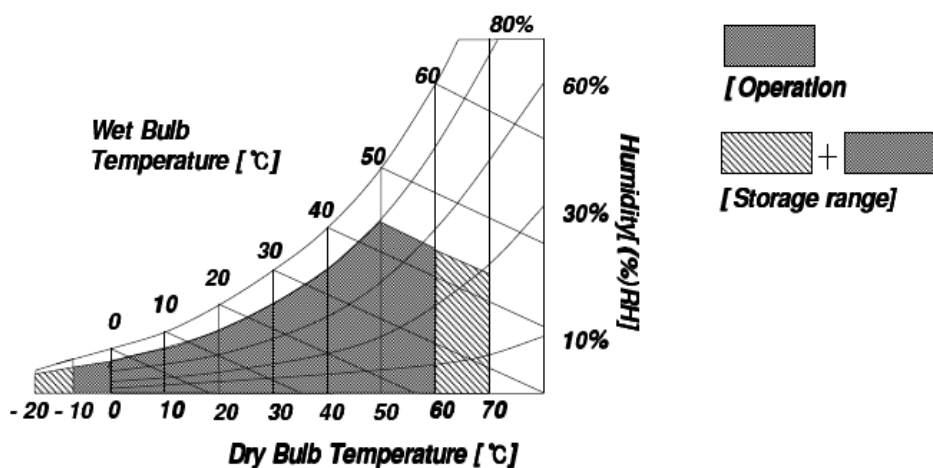


FIG 1

6. Electrical Specifications

(6-1) Electrical characteristics

Table 4

Parameter			Symbol	Min	Typ	Max	Unit	Remark
Logic Supply Voltage			VCC	3.0	3.3	3.6	V	
Digital Input Signal		High Level	V IH	0.7VCC	-	VCC	V	
		Low Level	V IL	0	-	0.3VCC	V	
Source Driver Supply Voltage			VDD	11.0	12.0	13.0	V	
Gate Driver	TFT	Hi	VGH	18.5	19.5	20.5	V	
		Lo	GVCC	3.0	3.3	3.6		
	Logic Supply Voltage		VGL	-10	(-4.5)	-4		
Gamma Correction Voltage		DC	VREF0~2	0.4VDD	-	VDD-0.2	V	
			VREF3~5	GND+0.2	-	0.6VDD	V	
Color Filter Substrate Voltage		DC	VCOM	4.8	5.0	5.2	V	
Source Driver Supply Current			IDD	-	36	50	mA	VDD = 12V
Logic Supply Current			ICC	-	11	30	mA	VCC = 3.3V
Gate Driver Logic Supply Current			GICC	-	0.02	0.1	mA	GVCC = 3.3V
Gate Driver High Supply Current			IGH	-	0.15	0.75	mA	VGH = 19.5V
Gate Driver Low Supply Current			IGL	-	0.45	2	mA	VGL = -4.5V

Notes:

***** Cautionary Matter : When applying or disconnecting power, please be sure that such action is sequentially carried out for all power supplies. In addition, apply input signals only after power has been turned on.

[Power Sequence]

-Source Driver :

Power on sequence : Case.1) VCC > Logic input > VDD > VREF0 to VREF5.

Case.2) VCC > VDD > VREF0 to VREF5 > Logic input.

Power off sequence is reverse turn of this.

-Gate Driver :

Power on sequence : GVCC > VGL > Input signal > VGH.

Power off sequence is reverse turn of this.

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(6-2) LED back light

At main panel the back light uses 4pcs edge light type white LED.

Table 5

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Voltage	VLED	-	9.6	-	V	[Note 5-2]
LED Current	ILED	-	160	-	NmA	
Power Consumption	WLED	-	1536	-	mW	[Note 5-2]
Number of LED components		18			PCS	
Connection Type (Serial/Parallel/Other)		3 Serial×6LEDs in Parallel				

Note:

*18pcs of LED

*Please consider Allowable Forward Current on used temperature

*Schematics drawing of lighting

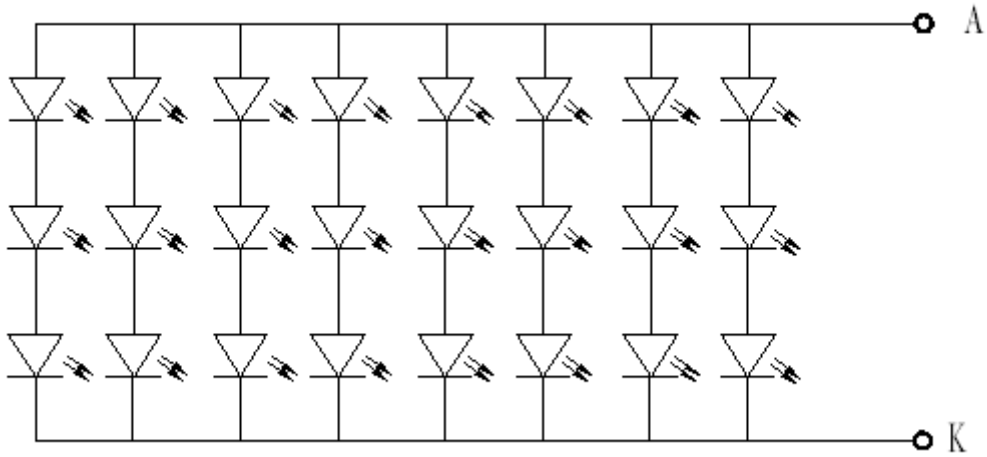


Fig.2

(6-3) Signal Timing Specifications

Table 6 Timing Characteristics of input signals

Parameter I		Symbol	Min	Typ	Max	Unit	Remark
S O U R C E	SSC Frequency	fclk	26	33.26	40	MHz	SSC
	High level SSC pulse width duration	twh	4	-	-	ns	
	Low level SSC pulse width duration	twl	4	-	-	ns	
	DATA/REV Setup Time	ts1	2	-	-	ns	DATA,REV
	DATA/REV Hold Time	th1	2	-	-	ns	
	Start Pulse Setup Time	ts2	3	-	-	ns	SSP1/2
	Start Pulse Hold Time	th2	3	-	-	ns	
	SOE Signal Setup Time	ts3	3	-	-	SSC cycle	SOE
	SOE Low Hold Time from final data SSC	th3	2	-	-	SSC cycle	
	High level SOE signal pulse width duration	twtp1	1	2.5	4	us	
	POL Signal SOE Setup Time	ts4	6	-	-	ns	SOE,POL
	POL Signal SOE Hold Time	th4	6	-	-	ns	
G A T E	GSC Frequency	fclk	-	-	200	KHz	Note
	GSC Rise Time	trck	-	-	100	ns	
	GSC Falling Time	tfck	-	-	100	ns	
	GSC Pulse Width	pwclk	500	-	-	ns	
	GSP1/2 Setup Time	tsu	200	-	-	ns	
	GSP1/2 Hold Time	thd	300	-	-	ns	
	GOE Pulse Width	twcl	1	-	-	us	

Note:

At least input one cycle of GSC during "L" period of GSP1.

(6-4) Timing Diagram

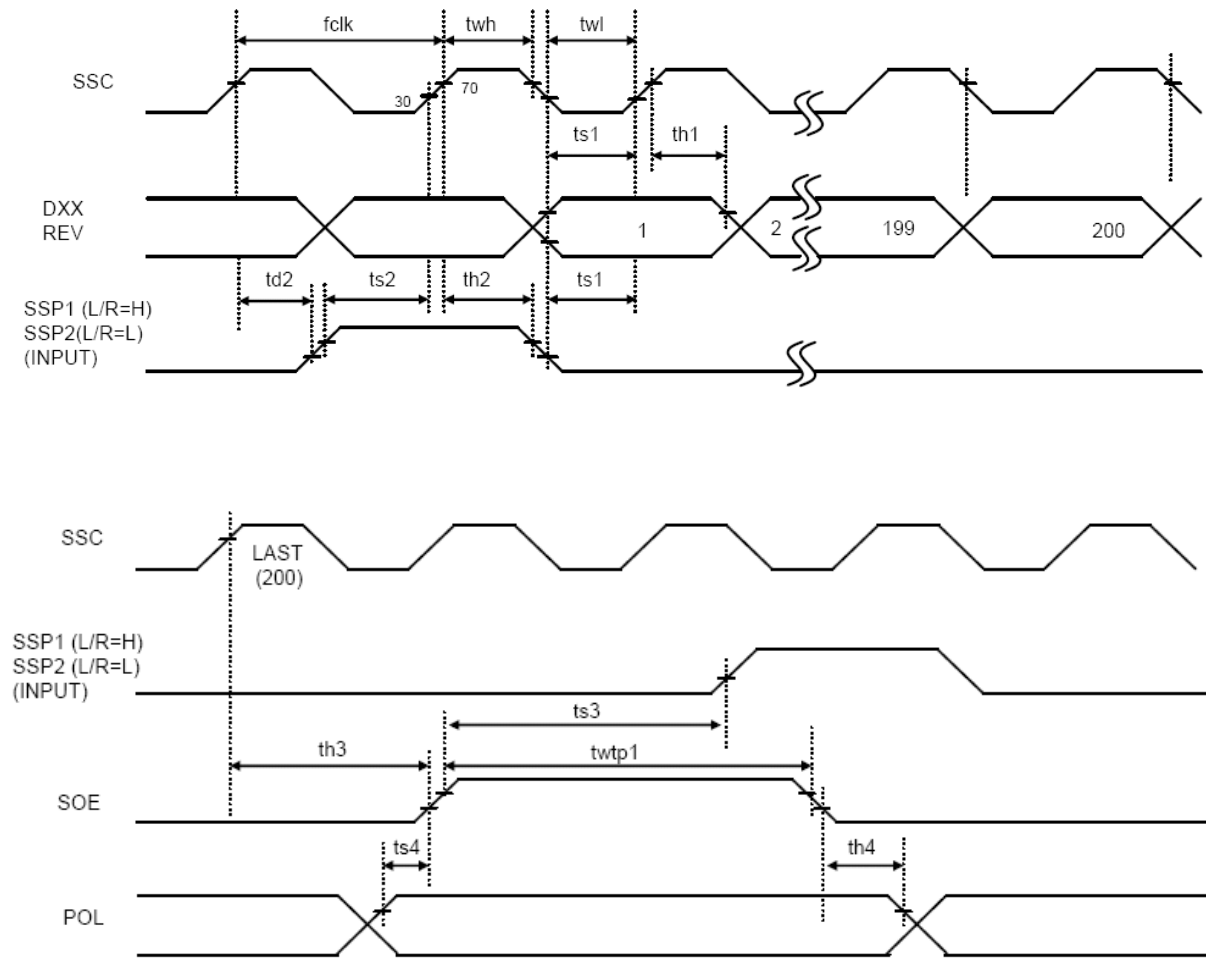


Fig.3 Source D-IC Timing Diagram

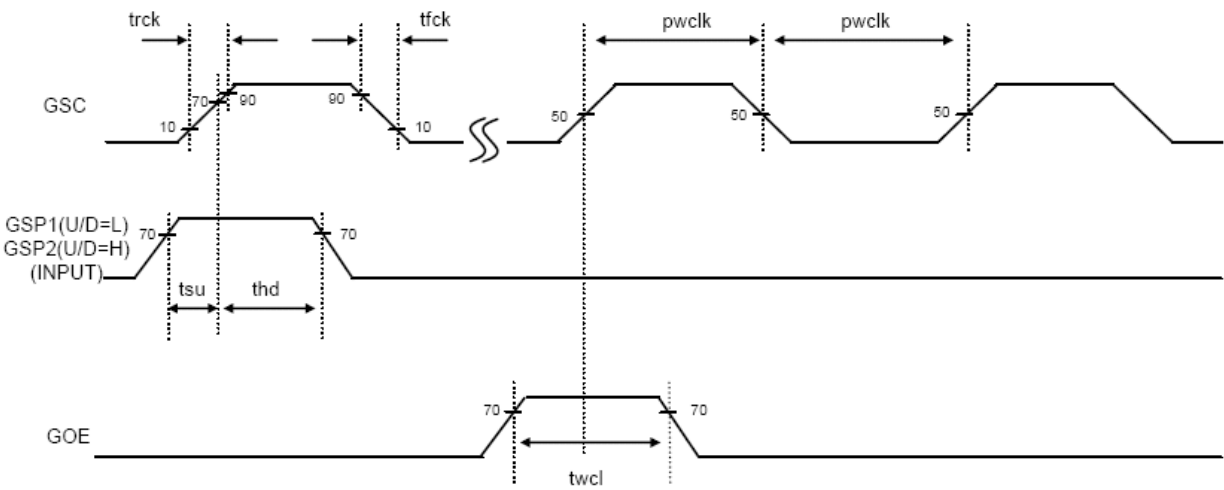


Fig.4 Gate D-IC Timing Diagram

(6-5) Detail Description of Pin Functions

1. U_D is used as input pin for selecting the shifting direction of bi-directional shift register.

. Table 7

U_D	Output Shift	GSP Input Pin
H	Up to Down	GSP2
L	Down to Up	GSP1

2. L_R is is used as input pin for the horizontal scanning direction. If L_R is H, SSP1 is the Input Pin for the Source Start Pulse(SSP). Otherwise(If L_R is L), SSP2 is the Input Pin for the Source Start Pulse.

Table 8

L_R	Scanning Direction	SSP Input Pin
H	Form Left to Right	SSP1
L	From Right to Left	SSP2

3.. Recommended Gamma Correction Voltage [VREF0 to VREF5]

Table 9

VDD=12V

Symbol	Values(Typ)	Unit	Remark
VREF0	(9.16)	V	[Note]
VREF1	(7.51)		
VREF2	(6.23)		
VREF3	(5.06)		
VREF4	(3.59)		
VREF5	(1.54)		

[Note] Be sure to maintain the voltage relationships of

VDD > VREF0 > VREF1 > VREF2 > VREF3 > VREF4 > VREF5 > GND

7. Electro-Optical Characteristics

Table 11

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	Tr	$\theta=0^\circ$	(8)	20	ms	Note 4
	Fall	Tf		(17)	30	ms	
Brightness	Br	$\theta=0^\circ$	300	350	-	Cd/m ²	Note 1,2
Contrast	Co	Optimal	280	400	-	-	Note 1,2,3
Viewing angle(with Polarizer)	Top	CR \geq 10	60	-	-	degree	Note 1
	Bottom		60	-	-		
	Left		40	-	-		
	Right		50	-	-		
White Chromaticity	U'	-	-	0.283	0.313	0.343	-
	V'		-	0.299	0.329	0.359	-
NTSC	%	-	-	60	-	-	-

*Ta=25℃, VCC=3.3V, fV=60Hz, fCLK= 33.26MHz

Note 1) Definition of range of visual angle

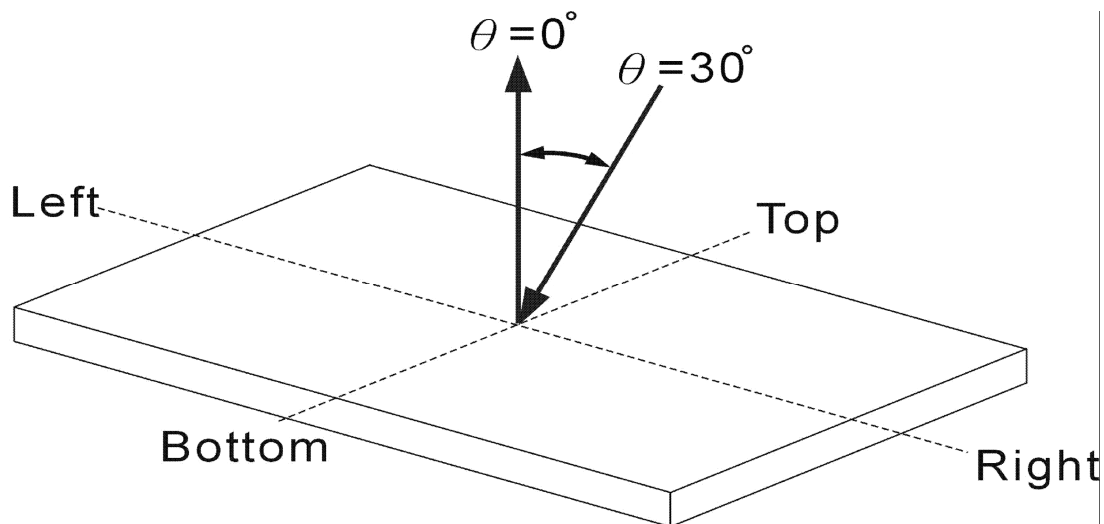


Fig.6

(Note 2) To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation (module).

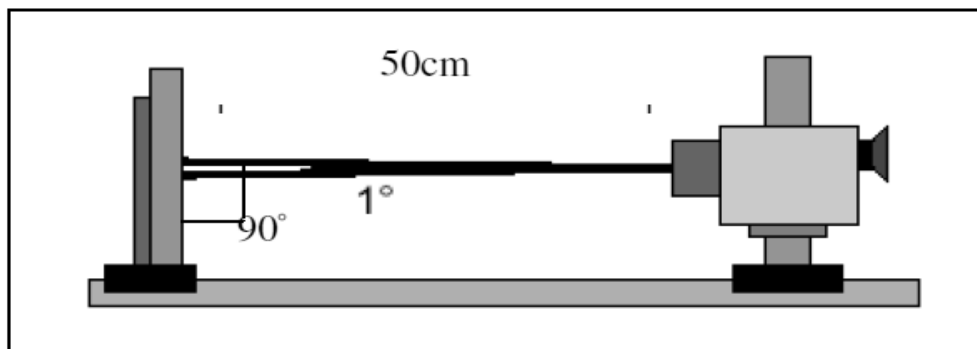


Fig. 7

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Note 3) Contrast ratio is defined as follows:

$$Co = \frac{\text{Luminance(brightness) all pixels "White"}}{\text{Luminance(brightness) all pixels "Black"}}$$

Note 4) Response time is defined as follows:

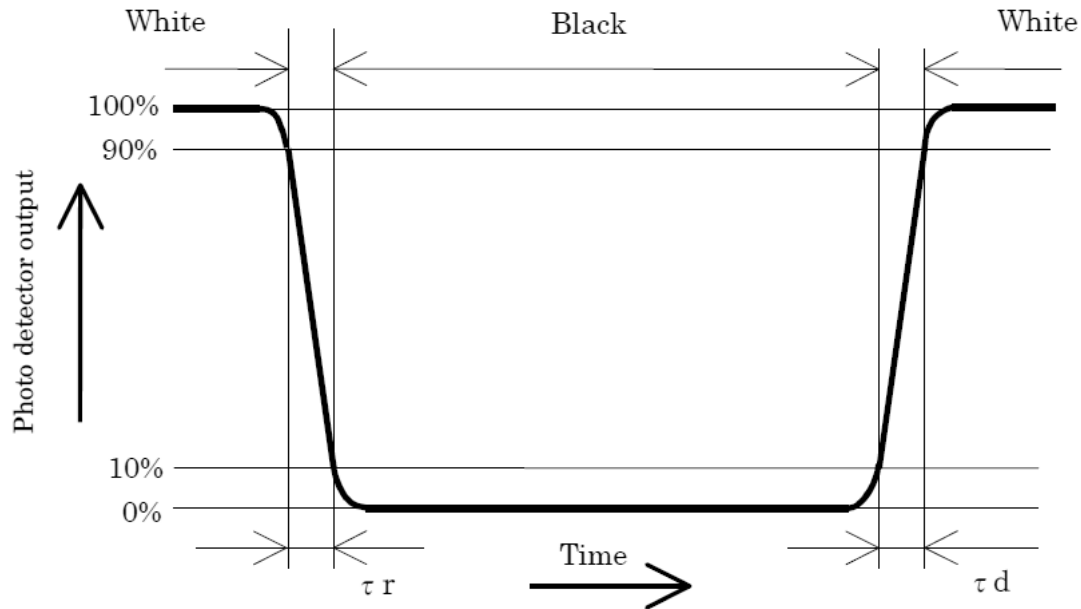


Fig. 8

8. Reliability

No.	Test Items	Test Condition	Remark
1	High Temperature Storage Test	Ta=70℃ 240h	[Note 6-1,2,3]
2	Low Temperature Storage Test	Ta=-20℃ 240h	[Note 6-1,2,3]
3	High Temperature Operation Test	Ta=60℃ 240h	[Note 6-1,2,3]
4	Low Temperature Operation Test	Ta=-10℃ 240h	[Note 6-1,2,3]
5	High Temperature and High Humidity Operation Test	Ta=50℃ 80%RH 240h	[Note 6-1,2,3]
6	Thermal Shock Test	-10℃(0.5h) ~ 60℃(0.5h) / 100 cycles	

[Note 6-1] Ta = Ambient Temperature

[Note 6-2] In the Reliability Test, Confirm performance after leaving in room temp.

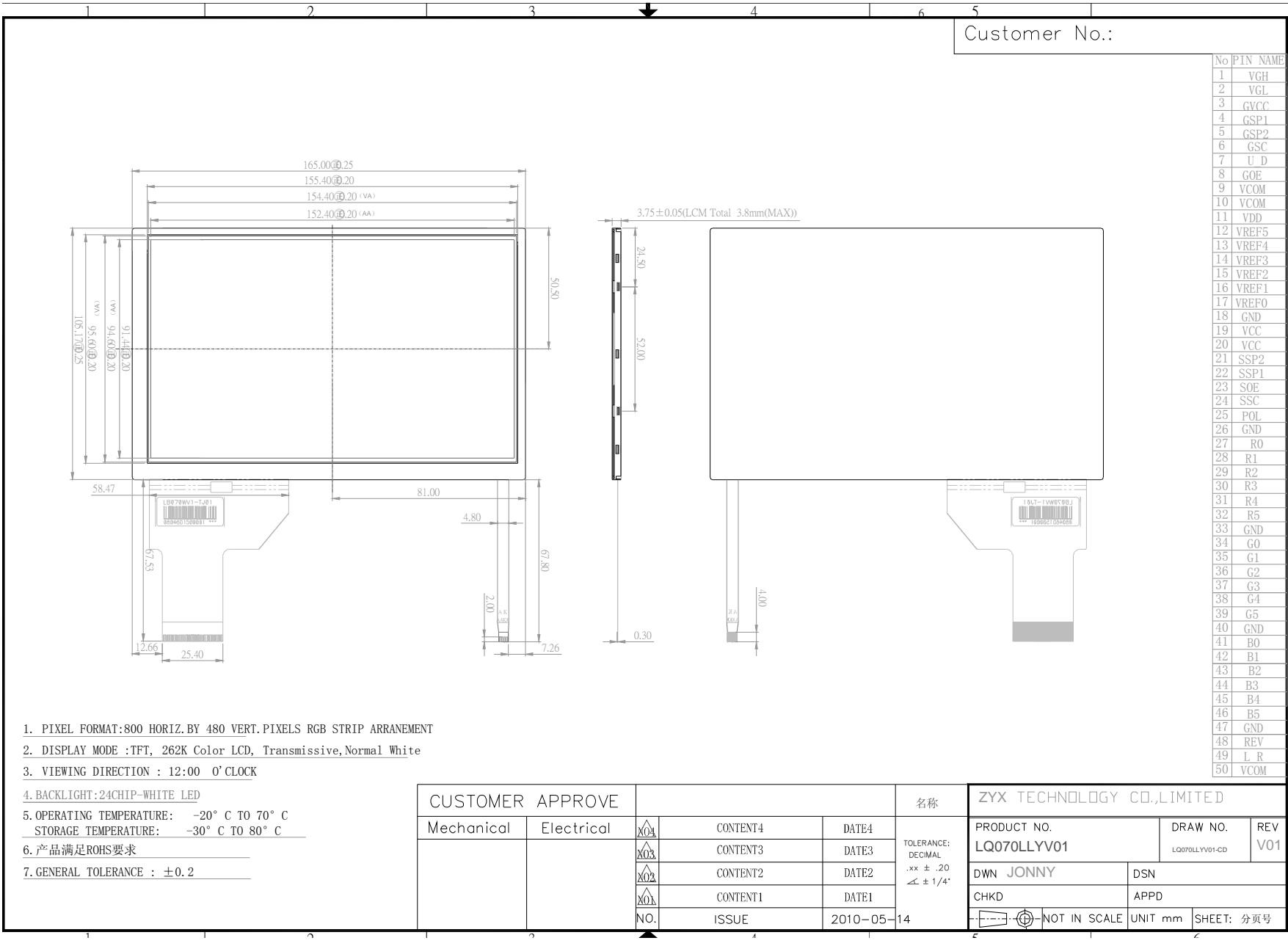
[Note 6-3] In the standard condition, there shall be no practical problems that may affect the display function.

※ Ta= Ambient Temperature

{ Result Evaluation Criteria }

There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.

9. LCD Module Outline dimensions



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10. Packaging specification(TBD)