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TECHNICAL LITERATURE

FOR

LCD module

MODEL No. **LS013B7DH05**

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☐ CUSTOMER'S APPROVAL

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NOTICE

<<Precautions>>

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[For handling and system design]

(1) Handle with care as glass is used in this LCD panel. Dropping or contact against hard object may cause cracks or chips.

(2) Be careful to handle this LCD panel in order to avoid injury yourself by panel`s edge as this panel is made of glass and might be a sharp edge.

(3) Do not scratch the surface of the polarizer as it is easily damaged.

(4) Water droplets on the polarizer must be wiped off immediately as they may cause color changes, or other defects if remained for a long time.

(5)Do not leave the LCD panel in direct sun or under ultraviolet ray.

(6) To clean LCD panel surface, wipe clean with absorbent cotton or soft cloth. If further cleaning is needed, use IPA (isopropyl alcohol) and wipe clean lightly on surface only. Do not use organic solvents as it may damage the LCD panel terminal area which uses organic material. Also, do not directly touch with finger. When the terminals cleaning are needed, those should be wiped by a soft cloth or a cotton swab without directly touching by hand.

(7) Do not expose gate driver, etc. on the panel (circuit area outside panel display area) to light as it may not operate properly. Design that shields gate driver, etc. from light is required when mounting the LCD module.

(8) To avoid circuit failure, do not touch panel terminal area.

(9) Support for the LCD panel should be carefully designed to avoid stress that exceeds specification on glass surface.

(10) When handling LCD module and assembling them into cabinets, be noted that storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, and etc. which generate these gasses, may cause corrosion and discoloration of LCD modules.

(11)To avoid picture uniformity failure, do not put a seal or an adhesive material on the panel surface.

(12) Do not use chloroprene rubber as it generates chlorine gas and affects reliability in LCD panel connective area.

(13) Protective film is attached to the surface of polarizer on LCD panel to prevent scratches or other damages. Remove this protective film before use. In addition, do not attach the protective film which is removed from LCD module again. When the LCD panel which has the reattached protective film is needed to storage for a long time, the polarizer might have a damage with picture quality failure.

(14) Panel is susceptible to mechanical stress and such stress may affect the display. Place the panel on flat surface to avoid stress caused by twist, bend, etc.

(15) When transporting LCD panels, secure them in LCD panel tray to avoid mechanical stress. The tray should be conductive to protect LCD panels from static charge.

Material used in set or epoxy resin (amine type hardening agent) from packaging, and silicon adhesive (dealcoholized or oxime) all release gas which may affect quality of polarizer. Do confirm compatibility with user materials.

(16) As this LCD module is composed electronic circuits, it is sensitive to electrostatic discharge of 200V or more. Handle with care using cautions for the followings:

- Operators

  Operators must wear anti-static wears to prevent electrostatic charge up to and discharge from human body.

- 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.

- Floor

  Floor plays an important role in leaking static electricity generated in human body or equipment. If the floor is made of insulated material (such as polymer or rubber material), such static electricity may charge. Proper measure should be taken to avoid static electricity charge (electrostatic earth: 100Mohms).There is a possibility that the static electricity is charged to them without leakage in case of insulating floor, so the electrostatic earth:$1\times10^{8}\Omega$ should be made.

- Humidity

  Humidity in work area relates to surface resistance of the persons or objects that generate electrostatics, and it can be manipulated to prevent electrostatic charge. Humidity of 40% or lower increases electrostatic earth resistance and promotes electrostatic charging. Therefore, the humidity in the work area should be kept above 40%. Specifically for film peeling process or processes that require human hands, humidity should be kept above 50% and use electricity removal blower.

- Transportation/Storage

  Containers and styroform used in transporation and storage may charge electrostatic (from friction and peeling) or electrostatic charge from human body, etc. may cause containers and styroform to have induced charge. Proper electrostatic measure should be taken for containers and storage material.

[For operating LCD module]

(1) Do not operate the LCD panel under outside of electrical specification. Otherwise LCD panel may be damaged.

(2) Do not use the LCD panel under outside of specified driving timing chart. Otherwise LCD panel may not have proper picture quality.

(3) A still image should be displayed less than two hours, if it is necessary to display still image longer than two hour, display image data must be refreshed in order to avoid sticking image on LCD panel.

(4) If LCD module takes a static electricity, as the display image which is written into pixel memory might not be displayed, Data update should be executed frequently.

(5) It is neither a breakdown nor a defective indication though very slight change in black level might be periodically seen in a black part on the black display image according to the source of light (angle of the luminance and the source of light).

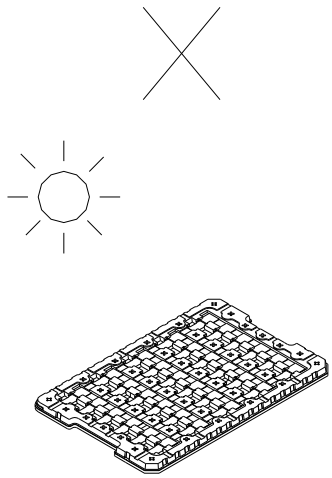
[Precautions for Storage]

(1) After opening the package, do not leave the LCD panel in direct sun or under strong ultraviolet ray. Store in dark place.

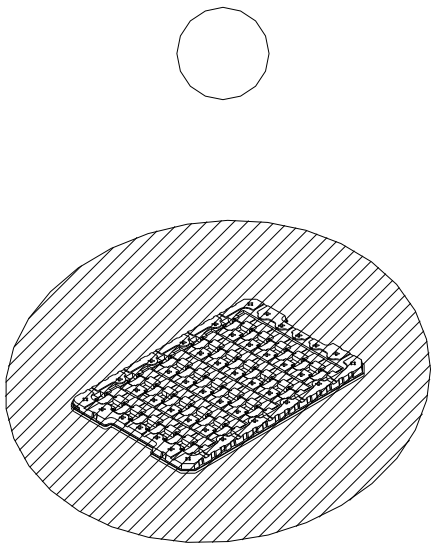
(2) In temperature lower than specified rating, liquid crystal material will coagulate. In temperature higher than specified rating, it isotropically liquefies. In either condition, the liquid crystal may not recover its original condition. Store the LCD panel in at or around room temperature as much as possible.
Also, storing the LCD panel in high humidity will damage the polarizer. Store in normal room temperature as much as possible.

(3) Keeping Method

a. Don't keeping under the direct sunlight.



b. Keeping in the tray under the dark place.



[Other Notice]

(1) Operation outside specified environmental conditions cannot be guaranteed.

(2) As power supply (VDD-GND、VDDA-GND) impedance is lowered during use, bus controller should be inserted near LCD module as much as possible.

(3) Polarizer is applied over LCD panel surface. Liquid crystal inside LCD panel deteriorates with ultraviolet ray. The panel should not be left in direct sun or under strong ultraviolet ray for prolonged period of time even with the polarizer.

(4) Disassembling the LCD module will cause permanent damage to the module. Do not disassemble the module.

(5) If LCD panel is broken, do not ingest the liquid crystal from the broken panel. If hand, leg, or clothes come in contact with liquid crystal, wash off immediately with soap.

(6) ODS (specific chlorofuorocarbon, specific halon, 1-1-1 trichloroethane, carbon tetrachloride) are not used or contained in material or all production processes of this product.

(7) Observe all other precautionary requirements in handling general electronic components.

Discarding liquid crystal modules

LCD Panel: Dispose of as glass waste. This LCD module contains no harmful substances.
The liquid crystal panel contains no dangerous or harmful substances.
This liquid crystal panel contains only an extremely small amount of
liquid crystal (approximately 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 used.

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1. Outline

This TFT-LCD module is a reflective active-matrix with slightly transmissive memory liquid crystal display module with CG silicone thin film transistor.
Module outline is indicated in fig 8-1.

2. Characteristics

- Transflective panel of white and black
- 1.26” screen has 144 x 168 resolusion. (24192 pixels stripe array)
- Display control by serial data signal communication.
- Arbitrary line data renewable.
- 1bit internal memory for data storage within the panel.
- Thin, light-weight and compact module with monolithic technology.
- Super low power consumption TFT panel.

3. Mechanical Specification

Table 3-1 Mechanical Specification

Item	Specification	unit
Screen size	3.2 (1.26”)	cm
Viewing Area	20.88 (Horizontal) × 24.36 (Vertical)	mm
Dot configuration	144 (Horizontal) × 168 (Vertical)	Dot
Dot pitch	0.145 (Horizontal) × 0.145 (Vertical)	mm
Pixel Array	Stripe Array	-
Outline Dimension	24.68 (W) × 30.00 (H) × 0.745 (D)	mm
Mass	3.0	g
Surface Hardness	3H	Pencil hardness

(Note) Detail dimension and tolerance are shown in fig. 8-1

4. Input terminal names and functions

Table4-1 Signal name

Terminal	symbol	Type	Description	Remark
1	SCLK	INPUT	Serial clock signal	
2	SI	INPUT	Serial data input signal	
3	SCS	INPUT	Chip select signal	
4	EXTCOMIN	INPUT	External COM inversion signal input (H: enable)	【4-1】
5	DISP	INPUT	Display ON/OFF signal	【4-2】
6	VDDA	POWER	Power supply (Analog)	
7	VDD	POWER	Power supply (Digital)	
8	EXTMODE	INPUT	COM inversion select terminal	【4-3】
9	VSS	GND	GND(Digital)	
10	VSSA	GND	GND(Analog)	

【4-1】

When EXTMODE is ”Lo”, connect the EXTCOMIN to VSS.

【4-2】

The display ON/OFF signal is only for display. Data in the memory will be saved at the time of ON/OFF.

When it’s ”H”, data in the memory will display, when it’s ”L”, white color will diaplay and data in the memory will be saved.

4-1）Recommended Circuit

< EXTMODE=”L” >

COM Signal Serial Input

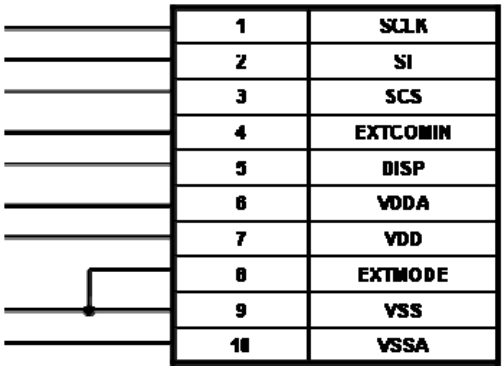


Fig 4-1 EXTMODE_Lo

< EXTMODE=”H” >

External COM Signal Input

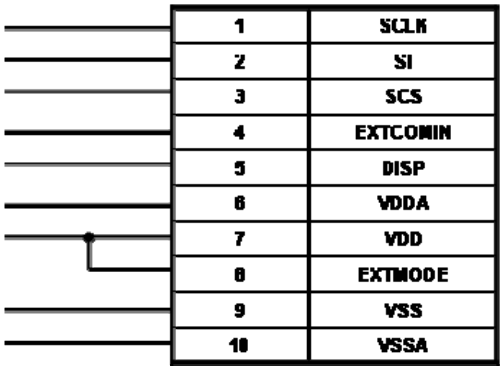


Fig 4-2 EXTMODE_Hi

【4-3】

When EXTMODE is ”H”, EXTCOMIN signal is enable.

When EXTMODE is ”L” ,serial input flag is enable.

“H”mode; connect the EXTMODE toVDD,

”L” mode; connect the EXTMODE to VSS

5. Absolute Maximum Rating

Table5-1 Absolute Maximum Rating (VSS=0V , VSSA＝0V)

Item		Symbol	MIN.	MAX.	Unit	Remark
Power supply voltage	Analog	VDDA	-0.3	+3.6	V	
	Logic	VDD	-0.3	+3.6	V	[5-1]
Input signal voltage(high)				VDD	V	[5-2]
Input signal voltage(low)			-0.3		V	
Strage Temperature		Tstg	-30	+80	℃	[5-3,4]
Operation Temperature (at panel surface)		Topr1	-20	+70	℃	[5-4,5]

[5-1] Applies to EXTMODE.

[5-2] Applies to SCLK, SI, SCS, DISP, EXTCOMIN.

[5-3] Do not exceed this temperature in any parts of module.

[5-4] Maximum wet bulb temperature is 57℃ or lower. No condensation is allowed.
Cndensation will cause electeical leak and may cause the module to not meet this specification.

[5-5] Operating temperature is the temperature that guarantees only for the operation.
For contrast, response time, and other display quality determination, use Ta＝＋25℃.

6. Electrical characteristics

6-1) TFT LCD panel drive

Table6-1 Recommended operating Condition VSS＝0V、VSSA=0V、Ta＝＋25℃

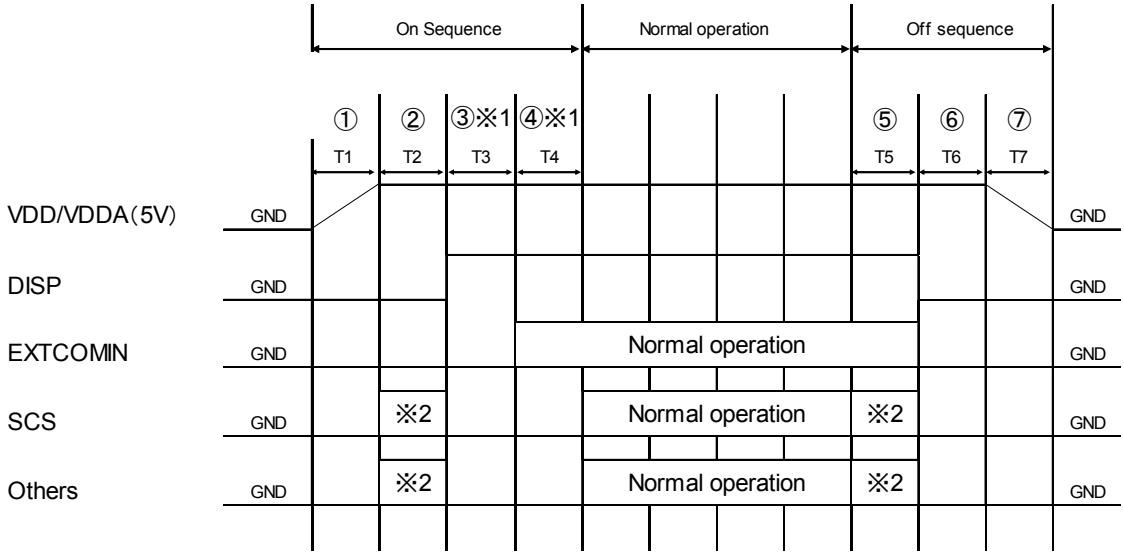
Item		symbol	MIN.	TYP.	MAX.	Unit	Remark
Power supply	Analog	VDDA	+2.7	+3.0	+3.3	V	
	Logic	VDD	+2.7	+3.0	+3.3	V	[6-1]
Input signal voltage	Hi	VIH	+2.70	+3.00	∗VDD	V	[6-2]
	Lo	VIL	VSS	VSS	VSS+0.1	V	

∗It can be operated below VDD voltage, however, operation around 3V is recommended.

[6-1] Applies to EXTMODE=”H”

[6-2] Applies to SCLK, SI, SCS, DISP, EXTCOMIN.

6-2) Power supply sequence



※Refer to timing chart and AC timing characteristics for detail

※1 ③ and ④ may be opposite (however, TCOM polarity inversion will not occur even with EXTCOMIN between DISP=”L”. Also, when DISP and EXTCOMIN are simultaneously started up, allow 30us or more before SCS starts up (It may be less than 60us).

※2 Setting value for pixel memory initialization

SCS=Driving accordingly to clear pixel internal memory method (use all clear flag or write all screen white)

S1=M2 (all clear flag) = “H” or write white

SCLK: Normal Driving

[ON Sequence]

(1) 3V rise time (depends on IC)

(2) Pixel memory initialization

T2: 1time or more Initialize with M2 (all clear flag) or write all screen white

(3) Release time for initialization of TCOM latch T3: 30us or more

Time required to release COM related latch circuit initialization which is initializing using DISP signals

(4) TCOM polarity initialization time T4: 30us or more

Time required initializing TCOM polarity accordingly to EXTCOMIN input

[Normal Operation]

Duration of normal driving

[Off Sequence]

(5) Pixel memory initialization time T5: 1time or more

(6) VA, VB, VCOM initialization time T6: 30us or more

[Remark] Precaustions at ehte time of power on and power off.

Remark 1)When power on , VDDand VDDA are same timem or VDD should be faster than the VDDA.

Remark 2) When power off, VDD and VDDA are same time or VDDA shoud be faster than the VDD.

6-3) Input signal characteristics

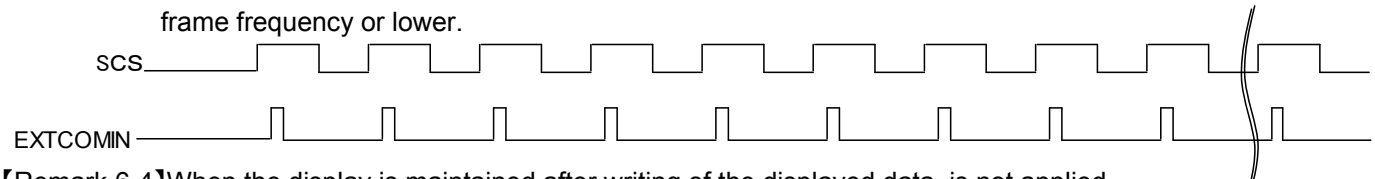
Table6-3-1 VDDA=＋3.0V、VDD=＋3.0V、VSS=0V、VSSA=0V、Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Frame frequency	fSCS	57	60	66	Hz	
Clock frequency	fSCLK		1	1.1	MHz	
Vertical Interval	tV	15.0	-	17.54	ms	
COM Frequency	fCOM	28.5	-	33	Hz	

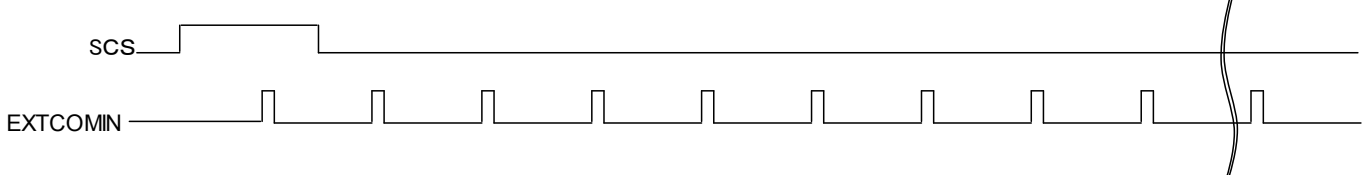
Table 6-3-2 VDDA=＋3.0V、VDD=＋3.0V、VSS=0V、VSSA=0V、Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
SCS Rising time	trSCS	-	-	50	ns	
SCS Falling Time	tfSCS	-	-	50	ns	
SCS High duration	twSCSH	168	-	-	us	
		22.54	-	-	us	
SCS Low duration	twSCSL	6	-	-	us	
SCS set up time	tsSCS	6	-	-	us	
SCS hold time	thSCS	2	-	-	us	
SI Rising time	trSI	-	-	50	ns	
SI Folling time	tfSI	-	-	50	ns	
SI set up time	tsSI	250	-	-	ns	
SI hold time	thSI	350	-	-	ns	
SCLK Rising time	trSCLK	-	-	50	ns	
SCLK Folling time	tfSCLK	-	-	50	ns	
SCLK High duration	twSCLKH	404.55	450	-	ns	
SCLK Low duration	twSCLKL	404.55	450	-	ns	
EXTCOMIN signal frequency	fEXTCOMIN	57	60	66	Hz	[Remark6-3] [Remark6-4]
EXTCOMIN signal rising time	trEXTCOMIN	-	-	50	ns	
EXTCOMIN signal folling time	twEXTCOMIN	-	-	50	ns	
EXTCOMIN signalHigh duration	thlEXTCOMIN	2			us	
DISP Rising time	trDISP	-	-	50	ns	
DISP Folling time	tfDISP	-	-	50	ns	

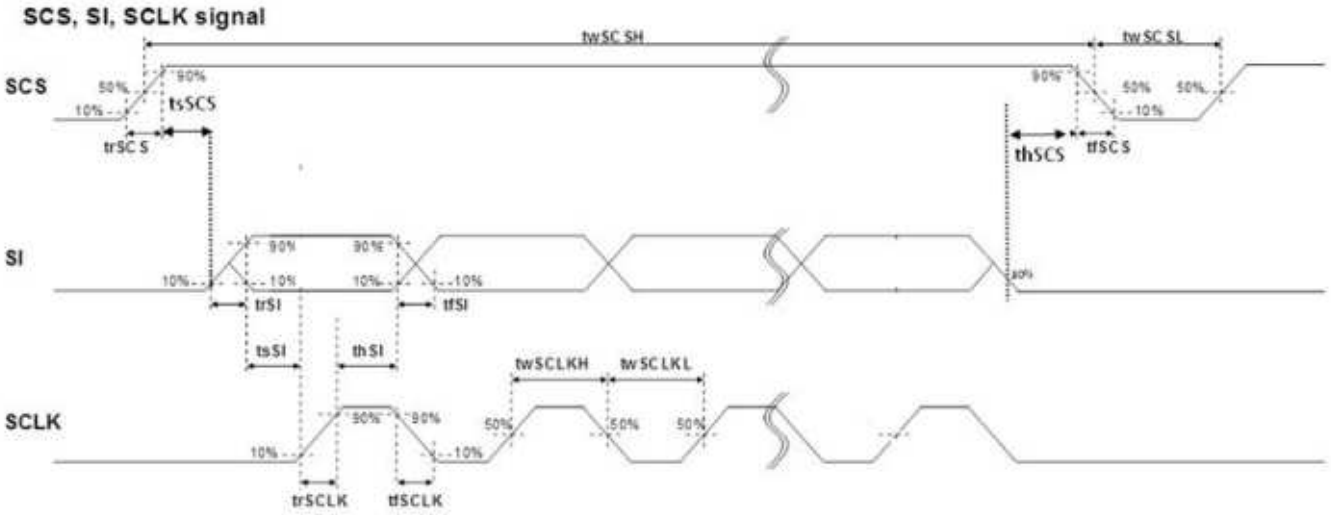
【Remark 6-3】When data is writtne for displaying continuously, EXTCOMIN frequency should be made the same frame frequency or lower.

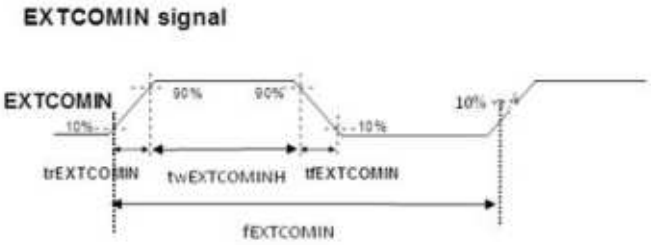


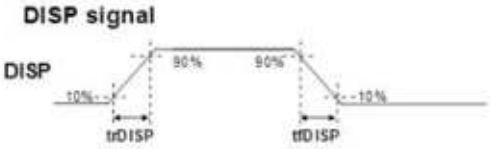
【Remark 6-4】When the display is maintained after writing of the displayed data, is not applied.
(Please keep SCS in the state of L when you maintain current display after writing of the display data.)



6-4) Signal Timing







※SCS,SI,SCLK、DISP、EXTCOMIN:　3V input voltage

6-5) Power consumption

Table6-4 Power consumption (Ta=25℃,SCS SCLK,Si,DISP,EXTCOMIN=3V ,VDD=3V, VDDA=3V)

LC inversion frequency	Operatin Model	MIN	TYP	MAX	unit	Condiion
60Hz	Display mode		TBD	TBD	uW	no display data update
	Data update mode (SCLK=1.1MHz)		TBD	TBD	uW	display data update: 1frame/sec

*Power consumption Display pattern : Black display

*LC inversion : LC material is needed alternative polarity driving as changing timing which should be 60Hz.
(LC inversion frequency 60Hz is COM frequency 30Hz)
as shown fig6-4.

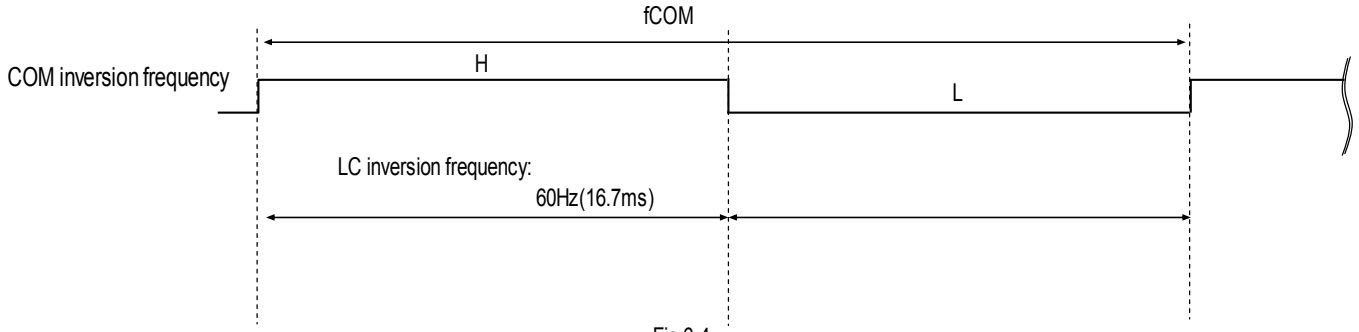


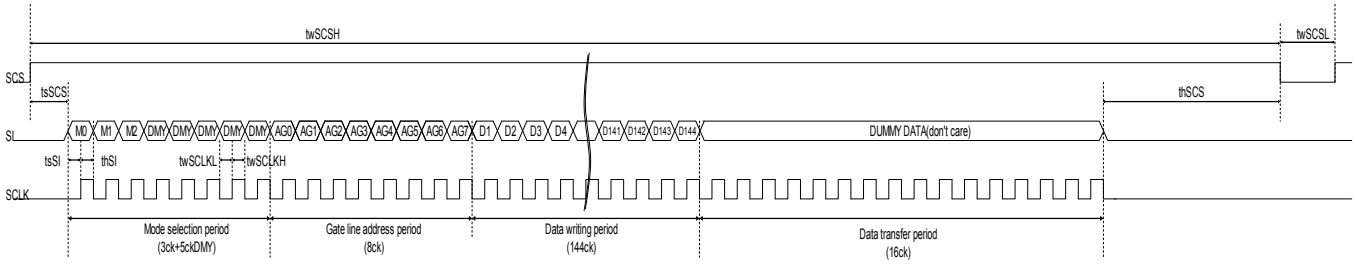
Fig 6-4

【Remark 6-5】This is value in steady condition, not the falue of peak power at the time of COM operation. Some marging for power supply is recommended. We recommend capacitor for VDD and VDDA.
(If VDD and VDDA are on separate systems, we recommend capacitor for each.)

6-6) Input Signal Timing Chart

6-6-1 Data update mode (1 line)

Updates data of only one specified line. (M0="H"、M2＝"L")



M0: Mode flag. Set for "H". Data update mode (Memory internal data update)
When "L", display mode (maintain memory internal data).
M1: Frame inversion flag.
When "H", outputs VCOM="H", and when "L", outputs VCOM="L".
When EXTMODE="H", it can be "H" or "L".
M2: All clear flag.
Refer to 6-6-4) All Clear Mode to execute clear.
DUMMY DATA: Dummy data. It can be "H" or "L" ("L" is recommended.)

※ Data write period
Data is being stored in 1st latch block of binary driver on panel.
※ Data transfer period
Data written in 1st latch is being transferred (written) to pixel internal memory circuit.

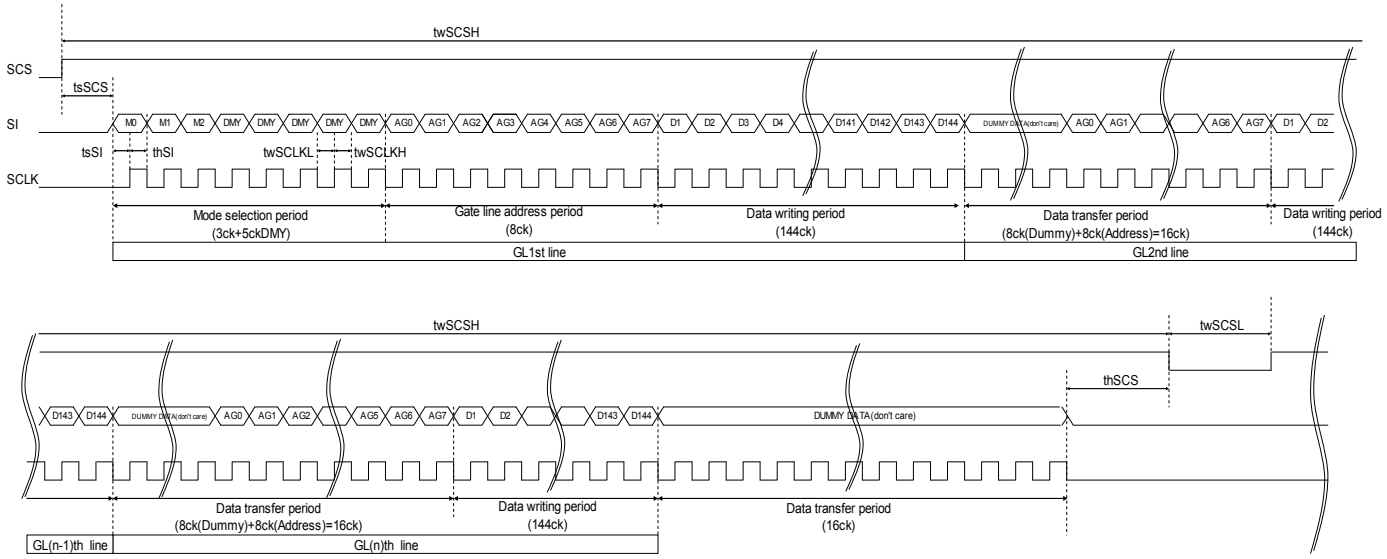
※For gate line address setting, refer to 6-7) Input Signal and Display.

※M1: Frame inversion flag is enaled when EXTMODE="L".

※When SCS becomes "L", M0 and M2 are cleared.

6-6-2 Data Update Mode (Multiple Lines)

Updates arbitrary multiple lines data. (M0="H"、M2＝"L")



M0: Mode flag. Set for "H". Data update mode (Memory internal data update)
When "L", display mode (maintain memory internal data).

M1: Frame inversion flag.
When "H", outputs VCOM="H", and when "L", outputs VCOM="L".
When EXTMODE="H", it can be "H" or "L".

M2: All clear flag.
Refer to 6-6-4) All Clear Mode to execute clear.

DUMMY DATA: Dummy data. It can be "H" or "L" ("L" is recommended.)

※ Data write period
Data is being stored in 1st latch block of binary driver on panel.

※ Data transfer period
For example, during GL2nd line data transfer period, GL 2nd line address is latched and GL1st line data is transferred from 1st latch to pixel internal memory circuit at the same time.

※ For gate line address setting, refer to 6-7) Input Signal and Display.

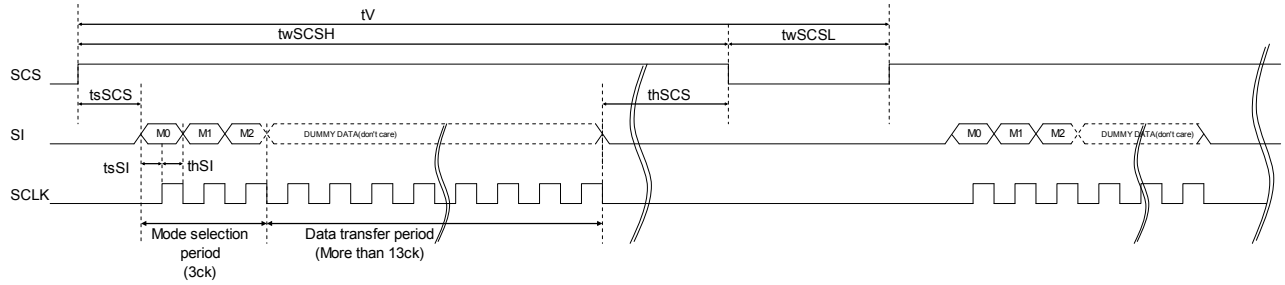
※ Input data continuously.

※ M1: Frame inversion flag is enabled when EXTMODE="L".

※ When SCS becomes "L", M0 and M2 are cleared.

6-6-3 Display Mode

Maintains memory internal data (maintains current display). (M0="L"、M2＝"L")



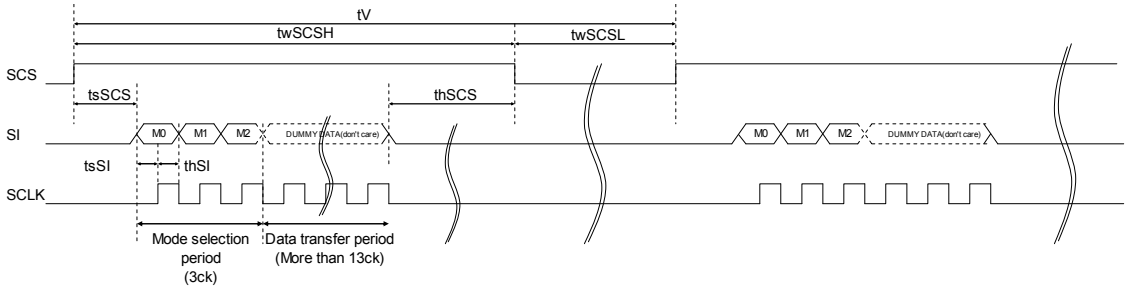
M0: Mode flag. Set for "H". Data update mode (Memory internal data update)
When "L", display mode (maintain memory internal data).
M1: Frame inversion flag.
When "H", outputs VCOM="H", and when "L", outputs VCOM="L".
When EXTMODE="H", it can be "H" or "L".
M2: All clear flag.
Refer to 6-5-4) All Clear Mode to execute clear.
DUMMY DATA: Dummy data. It can be "H" or "L" ("L" is recommended.)

※ M1: Frame inversion flag is enabled when EXTMODE="L"

※ When SCS becomes "L", M0 and M2 are cleared.

6-6-4 All Clear Mode

Clears memory internal data and writes white. (M0="L"、M2＝"H")



M0: Mode flag.
Set it "L".
M1: Frame inversion flag.
When "H", outputs VCOM="H", and when "L", outputs VCOM="L".
When EXTMODE="H", it can be "H" or "L".
M2: All clear flag.
Set it "H"
DUMMY DATA: Dummy data. It can be "H" or "L" ("L" is recommended.)

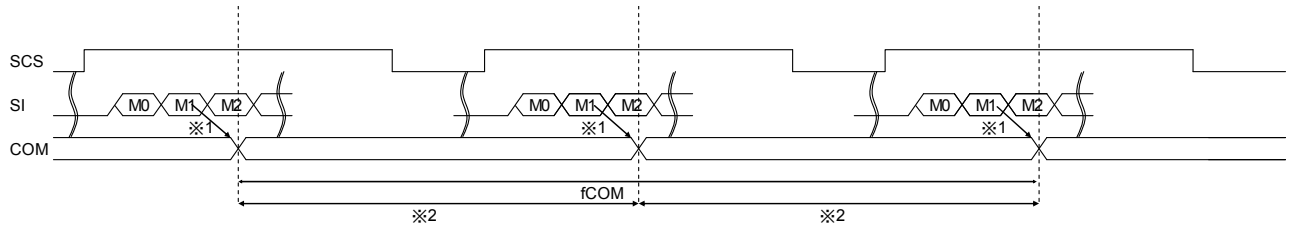
※ M1: Frame inversion flag is enabled when EXTMODE="L".

※ When SCS becomes "L", M0 and M2 are cleared.

6-6-5 COM Inversion

There are two types of inputs, COM signal serial input (EXTMODE="L") and external COM signal input (EXTMODE="H").

EXTMODE="L"

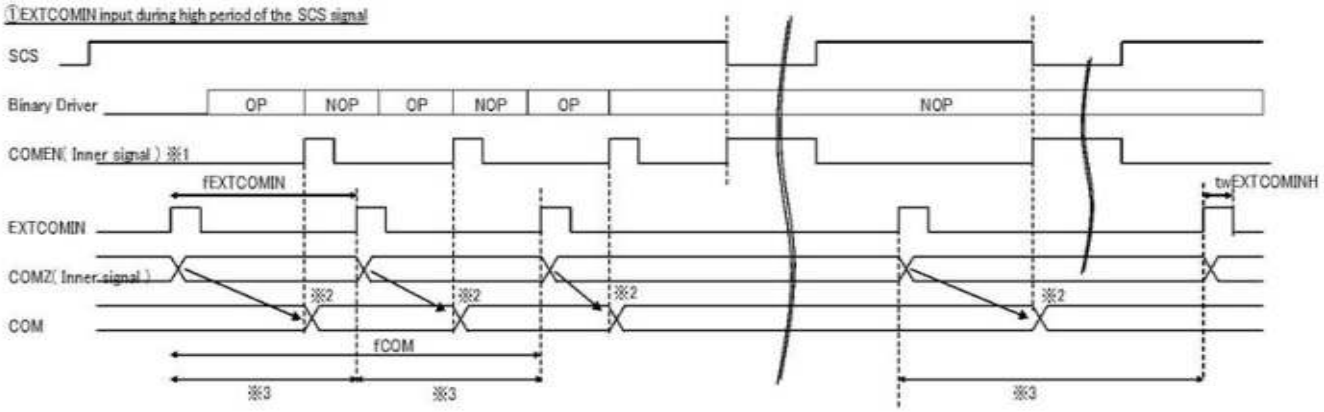


M1 : LC polarity inversion flag: If M1 is "H" then VCOM="H" is output. If M1 is "L" then VCOM="L" is output.

※1 : LC inversion has been changed by M1 flag statement.

※2 : The periods of plus polarity and minus polarity should be same length as much as possible.

EXTMODE="H" （COM inversion timing has two conditions ）

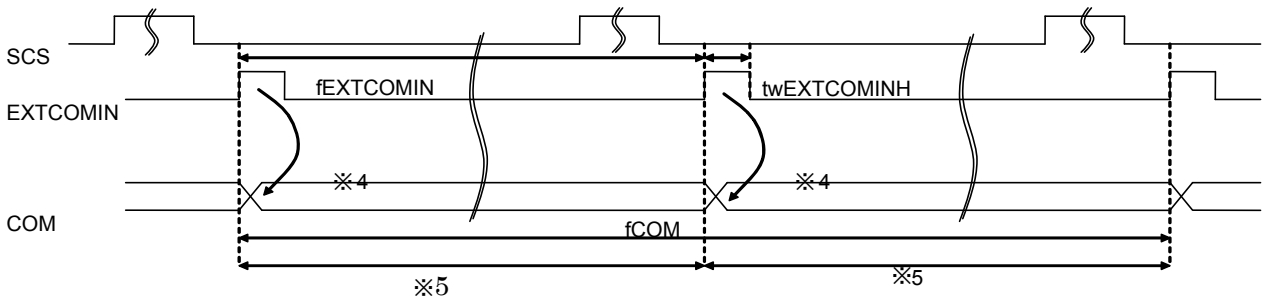


※1 : COMEN is High when "SCS = Low" and certain period after Binary Drivere operation.

※2 : Make "COM" reversal depending on COMZ at the COMEN's rise time.

※3 : The period of EXTCOMIN should be constant.
And the period of COM inversion should be constant depending on EXTCOMIN. (with Binary Driver operate or making the period of "SCS = Low")

② : the EXTCOMIN input during low period of the SCS signal .

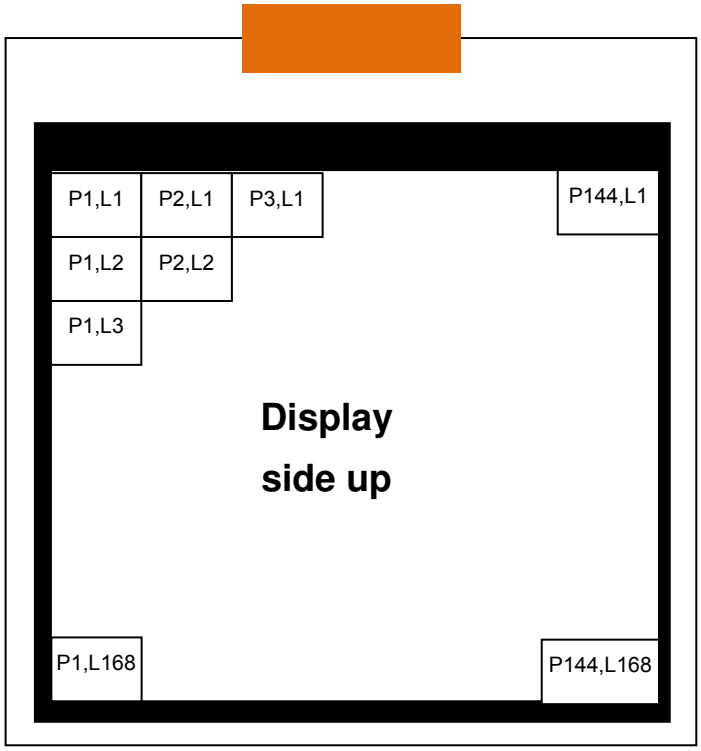


※4 : LC inversion polarity has been set by the rising edge of EXTCOMIN.

※5 : The period of EXTCOMIN should be constant.

6-7) Input Signal and Display, Gate address(Line) Setting

Data position in display〔H,V〕



Gate line address setting

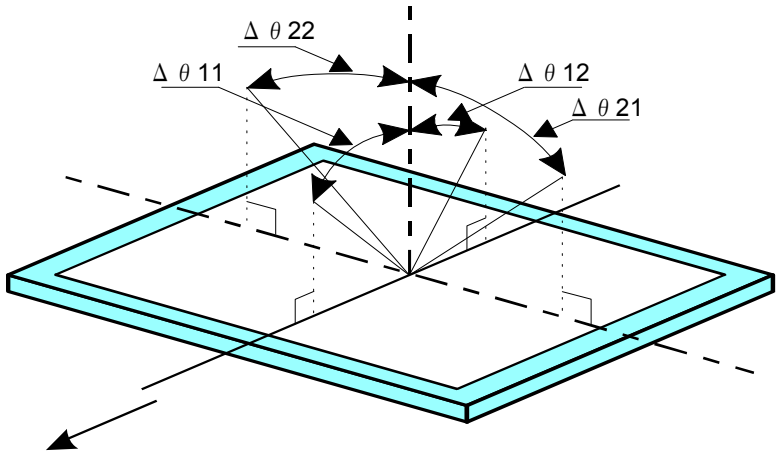
GL	AG0	AG1	AG2	AG3	AG4	AG5	AG6	AG7
1	1	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0
5	1	0	1	0	0	0	0	0
6	0	1	1	0	0	0	0	0
7	1	1	1	0	0	0	0	0
8	0	0	0	1	0	0	0	0
:	:	:	:	:	:	:	:	:
161	1	0	0	0	0	1	0	1
162	0	1	0	0	0	1	0	1
163	1	1	0	0	0	1	0	1
164	0	0	1	0	0	1	0	1
165	1	0	1	0	0	1	0	1
166	0	1	1	0	0	1	0	1
167	1	1	1	0	0	1	0	1
168	0	0	0	1	0	1	0	1

7. Optical characteristics

Table 7-1 Ta=25℃

Item		Symbol	MIN.	TYP.	MAX.	unit	Remark
Viewing angle CR≧2	H	θ21,θ22	(40)	60		°(degree)	[Remark7-1]
	V	θ11	(40)	60		°(degree)	
		θ12	(40)	60		°(degree)	
Contrast ratio		CR.	(12)	(20)			[Remark7-2, 3]
Reflecivity ratio		R	(11)	(14.5)		%	[Remark7-3]
Transmissivity ratio		T	-	0.3		%	
Response time	Rise	τr	-	10		ms	[Remark 7-3,4]
	Fall	τd	-	20		ms	
Panel Chromaticity	White	x		(0.307)			[Remark7-3]
		y		(0.330)			

[Remark7-1] Defintion of Viewing Angle



6 o'clock direction

[Remark7-2] Defintion of Contrast Retio

$$\text{Contrast ratio(CR)} = \frac{\text{Reflection intensity in white display}}{\text{Reflection intensity in black display}}$$

[Remark7-3] Optical characteristics measurement equipment.

Figure 7-2 is for contrast ratio, reflectivity ratio, and panel chromaticity measurement, and figure 7-3 is for response time measurement. Both are to be conducted in a dark or room equipment to a dark room

Measurement equipment
(CM-700D)

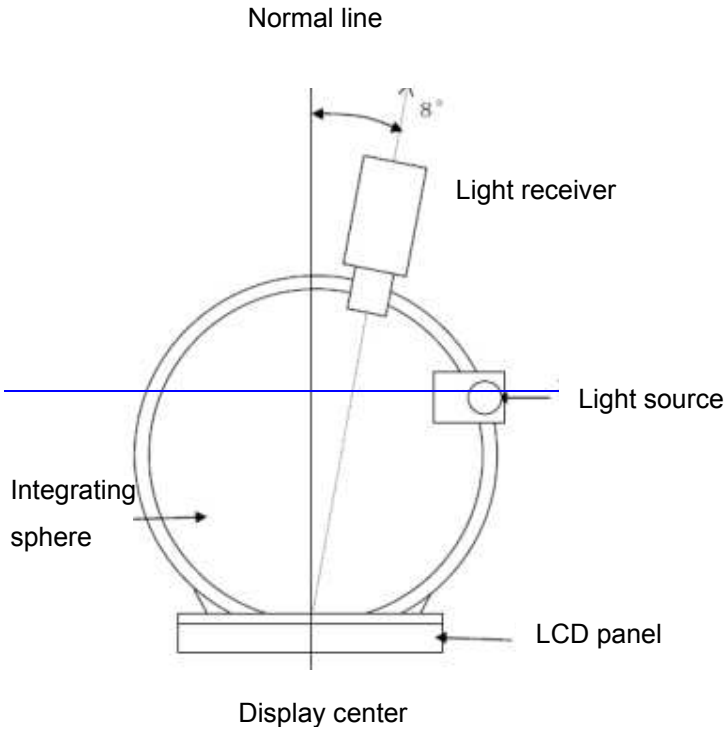


Fig7-2 Contrast ratio, Reflection ratio, Panel chromaticity of white

Measurement equipment
(LCD-5200)

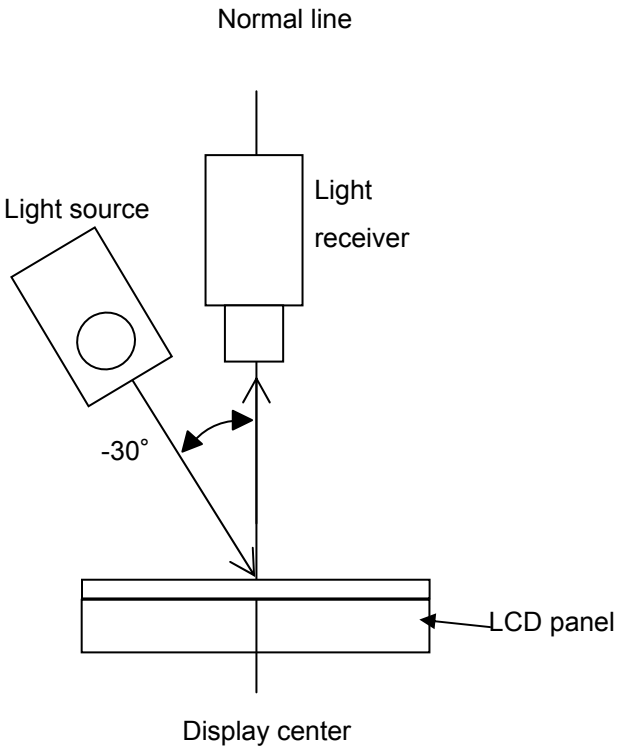
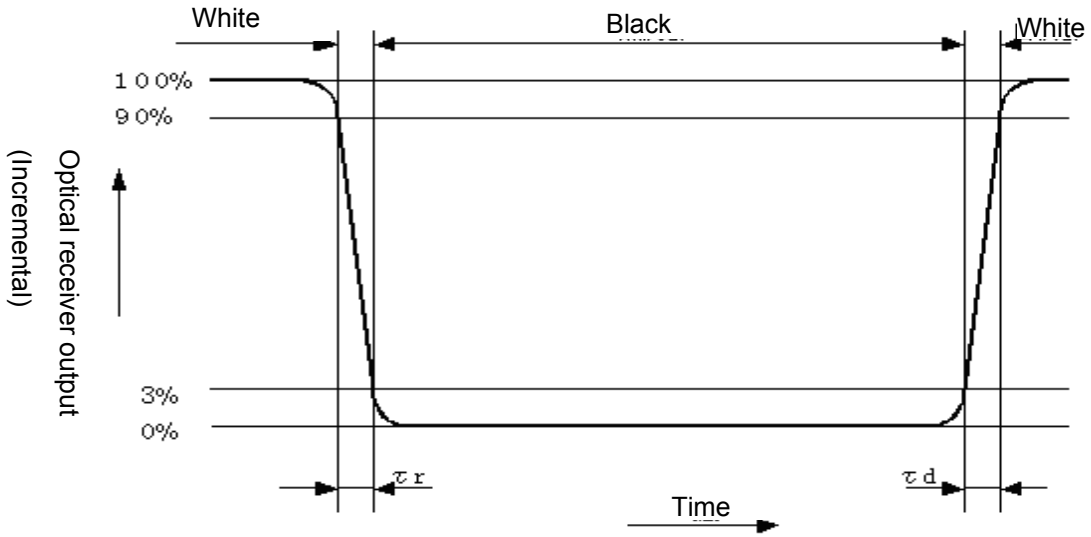


Fig7-3 response time

[Remark7-4] Respons time (Change in reflection ratio)

It's difined by the time change of optical receiver output when signal is input to display white or black



8. Module outline

8-1) Outline dimension of the 1.26" (144 x 168) panel

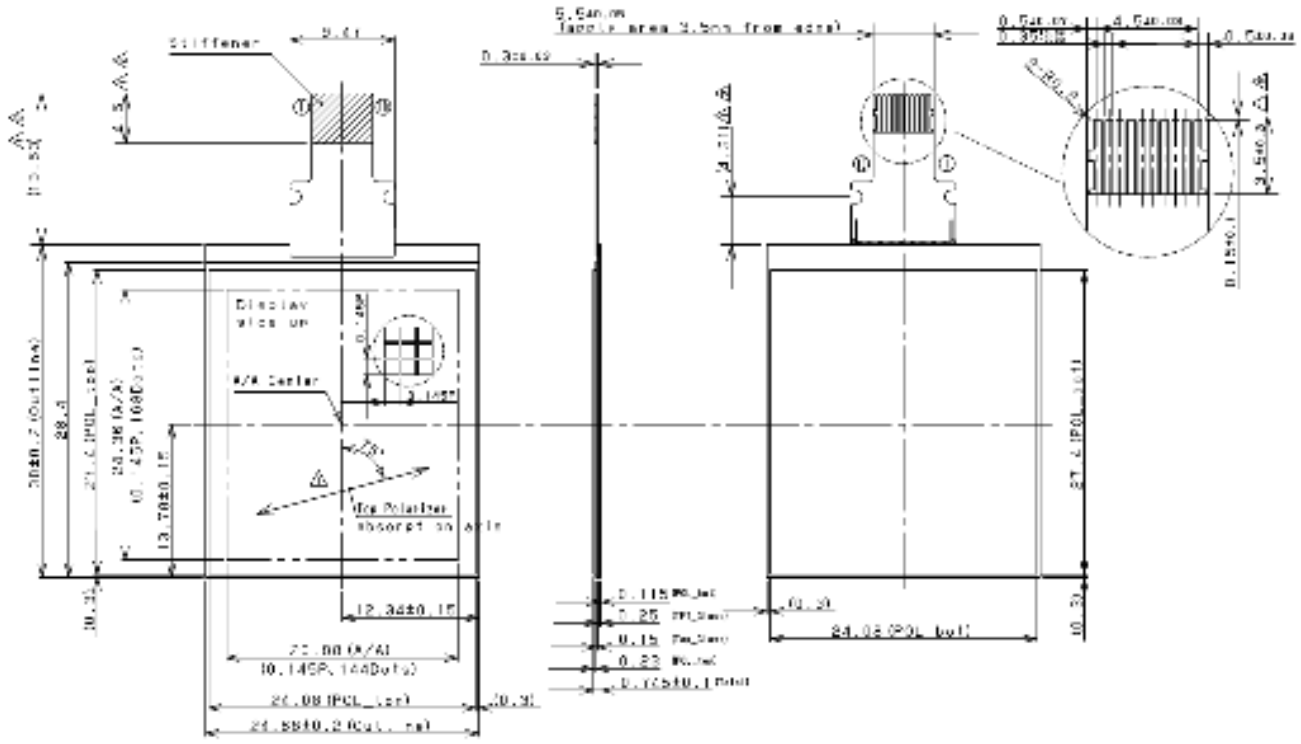


Figure 8-1

<Recommended Connector> Panasonic: AYF531035 (Contact: Bottom side)

SMK FP12 Series: CFP-4610-0150F(Contact: Bottom side)

Molex: 51441-1093(Contact: Bottom side)

8-2) FPC Bend Specification

When bending FPC, bend where specified in Condition (1) and the bend R should be more than R specified in Condition (2). FPC is not to contact glass edge, and there should be no stress to connective area between panel and FPC.

Condition (1) FPC bend recommended area: 0.8mm – 6.0mm from glass edge.

Condition (2) Minimum bend R: Inner diameter R0.45

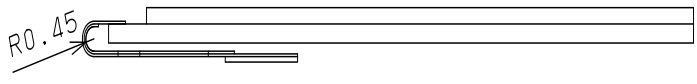


Figure 8-2

【Remark 8-1】 Do not bend backward (toward polarizer film side)

【Remark 8-2】Bend frequency: 3 times or less (Repeat bend condition: 180° ～ 0°)

<Recommended Connector> Panasonic: AYF531035 (Contact: Upper side)

SMK FP12 series : CFP-4510-0150F (Contact: Upper side)

9. External capacitors

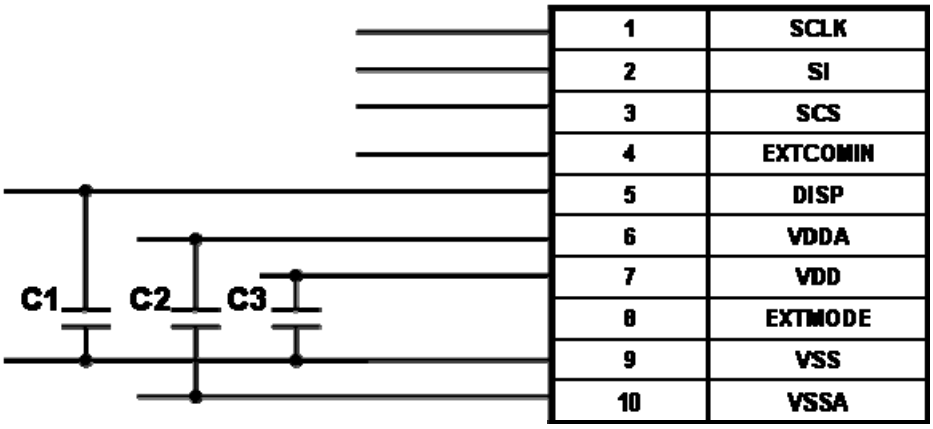


Fig. 9-1 External capacitor recommendation capacity value

＜Recommended capacity value＞

C1：DISP- VSS: rank B 0.1uF Ceramic capacitor

C2：VDDA- VSS: rank B 1uF Ceramic capacitor

C3：VDD- VSS: rank B 1uF Ceramic capacitor

※Above circuit and parts are only recommendation.

For actual use, please evaluate their conformity with your system and design.

(Capacitor pressure resistance can be larger than resistance indicated above.)

10. Marking

TBD

12. Packaging

12-1) Serial number (Ink-jet print)

12-2) Forwarding form

1) Piling number of cartons. : T B D cartons

LCD modules quantity in a carton : TBD pcs

2) Storage condition

Temperature: 0～40°

Humidity: 60%RH or lower (at 40°)

There should be no condensation at low temperature and high humidity.

Atmosphere: No harmful gas, such as acid or alkali, which causes severe corrosion on electronic parts and wiring, are to be detected.

Period: About 3 months

Opening the package: In order to prevent electrostatic damage to TFT modules, room humidity should be made over 50%RH and take effective measure such as use of earth when opening the package.

12-3) Packaging

TBD

Fig. 12-2 Packaging Form

13. Reliability Test Conditions

13-1) Reliability test items

Table13-1

	Test Item	Test condition	Remark
1	High temperature storage test	Ta=80degrees Celsius 240h	
2	Low temperature storage test	Ta=-30degrees Celsius 240h	
3	High temperature and high humidity operating test	Tp=40degrees Celsius/95%RH 240h	
4	High temperature operating test	Tp=70degrees Celsius 240h	
5	Low temperature operating test	Tp=-20degrees Celsius 240h	
6	Shock test (Non operating test)	Ta=-30degrees Celsius (1h)～+80 degrees Celsius (1h) / 5 cycle	
7	Electro static discharge test	±200V、200pF(0Ω) each terminai: 1 time	

[Remark] Ta = Ambient temperature, Tp = Panel temperature

(Evaluation method)

In the standard condition, there shall be no practical problems that may affect the display function.