

No.	LD-29904
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DATE 13-Sep-17  
REV.

DEVICE SPECIFICATION  
FOR  
**CGS CELL and SHEET GLASS**

MODEL No. **LX032A7NB01(SHEET)**

MODEL No. **LX032A7NA01(CELL)**

These parts are complied with the RoHS directive.

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DEVEROPMENT DEPARTMENT  
BU I BUSINESS UNIT IV  
DISPLAY DEVICE COMPANY  
SHARP CORPORATION

# RECORDS OF REVISION

Model No. : LX032A7NB01/LX032A7NA01

SPEC No.	DATE	REV No	PAGE	SUMMARY	NOTE
LD-29904	2017/9/13	-	-	First edition	

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### **[Handling Instructions]**

#### **【LCD Panel (SHEET) Handling Precautions】**

- (1) Basically styrofoam case should be in a state of standing and displaying of "UP" should be TOP side.  
Don't store styrofoam case in state of horizontal, upside down or lying.
- (2) Treat containing Styrofoam case of the SHEET carefully to prevent falling or tumbling.
- (3) Recommend operated at two people about unpacking the Styrofoam case of the SHEET.
- (4) Be careful, since the mirror mat is likely to be attached for the SHEET.
- (5) Don't in state of lying, when handling the SHEET. If SHEET be in a state that has both ends and laid down, the gravity is added to it.

#### **【LCD Panel (SHEET/CELL) Handling Precautions】**

- (1) Treat LCD panel in dustless surroundings.
- (2) Since the LCD panel is made of glass, it may break or crack if dropped or bumped on hard surface.  
Always handle with care.
- (3) Be careful to handle this LCD panel in order to avoid injury yourself as this panel is made of glass and have sharp edge. When the panel is broken, do not touch the glass. Although the panel is difficult to be scattered, touching the broken part may hurt your hands.
- (4) Since a long contact with water may cause discoloration or spots, wipe it with absorbent cotton or other soft cloth immediately.
- (5) This panel contains CGS. Please use appropriate anti-static protection methods for all contact with the LCD panel and its electrical circuits.
- (6) Do not expose to strong ultraviolet rays such as direct sunlight for a long time.
- (7) Liquid crystal contained in the panel may leak if the LCD is broken. If LC material should accidentally come in contact with the mouth or eyes rinse with water as soon as possible, following the instructions of the appropriate MSDS.
- (8) 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.
- (9) To avoid picture uniformity failure, do not put a seal or an adhesive material on the LCD panel surface.

**【Set-Design Precautions】**

- (1) Disassembly of the LCD panel in any way voids the warranty and may permanently damage the LCD panel.
- (2) Do not expose the side of LCD panel and gate driver, etc. on the panel (circuit area outside panel display area) to light as it may not operate properly. Design that shields the side of LCD panel and gate driver, etc. from light is required when mounting the LCD panel.
- (3) Support for the LCD panel should be carefully designed to avoid the outside of stress specification on glass surface. Be sure to design the cabinet so that the panel can be assembled without any extra stress such as warp or twist.
- (4) It causes an irregular display and the defective indication, etc., when always put constant pressure on the back of the panel. Please do not make the structure to press the back of the panel.
- (5) In case of attaching a cover glass or touch panel to the front surface, use appropriate measures to avoid degrading optical performance.
- (6) Be sure to follow the absolute maximum rating in the specification. The design should consider the surrounding temperature, the fluctuating input signal, and tolerance of the electronic parts. Exceeding values is possible to cause worse characteristic such as burn and/or broken of the parts on LCD panel.
- (7) Be sure to use LCD panel within the recommended Electrical Characteristics and Timing Characteristics of Input Signals conditions. Operating panel out of the recommended range is not guaranteed even if it is in the absolute maximum rating.
- (8) Follow the power, signal, and supply voltage sequence which the specification indicates, regarding on-off input signal after power on of LCD panel.
- (9) According to the using application, power circuit protection is recommended at Panel failure.
- (10) When handling LCD panel and assembling them into the cabinet, please avoid long-term storage in the environment of oxidization or deoxidization gas. The use of materials such as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the panel.  
Do not use the LCD panel under such environment.
- (11) To avoid picture uniformity failure, do not put a seal or an adhesive material on the LCD panel surface.
- (12) Panel is susceptible to mechanical stress and such stress may affect the display.  
Place the LCD panel on flat surface to avoid stress caused by twist, bend, etc.
- (13) To prevent reduction in optical quality and abnormal display, avoid exposure and contamination of the LCD panel from epoxy resin (mine system curing agent) that comes out from the material and the packaging material used for the set side, the silicon adhesive (dealcoholization system and oxime system), and the tray blowing agents ( azo-compound), etc. Please confirm LCD panel compatibility with materials employed in your manufacturing and shipping processes.
- (14) Since the LCD panel is made of glass, it may break or crack if dropped or bumped on hard surface. Always handle with care.
- (15) Please design part arrangement to consider the heat dissipation not to change the local temperature for Panel.
- (16) This product is not water-proof and dust-proof structure.

(17) As this LCD panel 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: 100Mohms 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 transportation 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.

**【Operation Precautions】**

- (1) Do not use polychloroprene (CR) with LCD panel.

It will generate chlorine gas, which will damage the reliability of the connection part on LCD panel.

- (2) Be sure to use LCD panel within the recommended operating conditions.

Operating panel out of the recommended range is not guaranteed even if it is in the absolute maximum rating.

- (3) When handling LCD panel and assembling them into cabinets, please avoid long-term storage in the environment of oxidization or deoxidization gas. The use of materials such as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the panels. Do not use the LCD panel under such environment.

- (4) To prevent reduction in optical quality and abnormal display, avoid exposure and contamination of the LCD panel from epoxy resin (amine system curing agent) that comes out from the material and the packaging material used for the set side, the silicon adhesive (dealcoholization system and oxime system), and the tray blowing agents ( azo-compound), etc.

Please confirm LCD panel compatibility with materials employed in your manufacturing and shipping processes.

- (5) If stored at the temperatures lower than the rated storage temperature, the LC may freeze and it may cause LCD panel damage. And If stored at the temperatures higher than the rated storage temperature, the LC will lose its characteristics, and it cannot recover. Please keep it at near room temperature.

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

- (7) Do not use the LCD panel under outside of specified driving timing chart.

Otherwise LCD panel may not have proper picture quality.

- (8) 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.

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

- (10) 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).

- (11) Be sure to follow the absolute maximum rating in the specification. The design should consider the surrounding temperature, the fluctuating input signal, and tolerance of the electronic parts. Exceeding values is possible to cause worse characteristic such as burn and/or broken of the parts on LCD panel.

- (12) Follow the power, signal, and supply voltage sequence which the specification indicates, regarding on-off input signal after power on of LCD panel.

- (13) According to the using application, power circuit protection is recommended at panel failure.

- (14) Nature of dew consideration prevention is necessary when LCD is used for long time under high-temperature and high-humidity.

## . [Precautions for Storage]

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

Store in the dark place.

(2) In temperature lower than specified rating, liquid crystal material will coagulate.

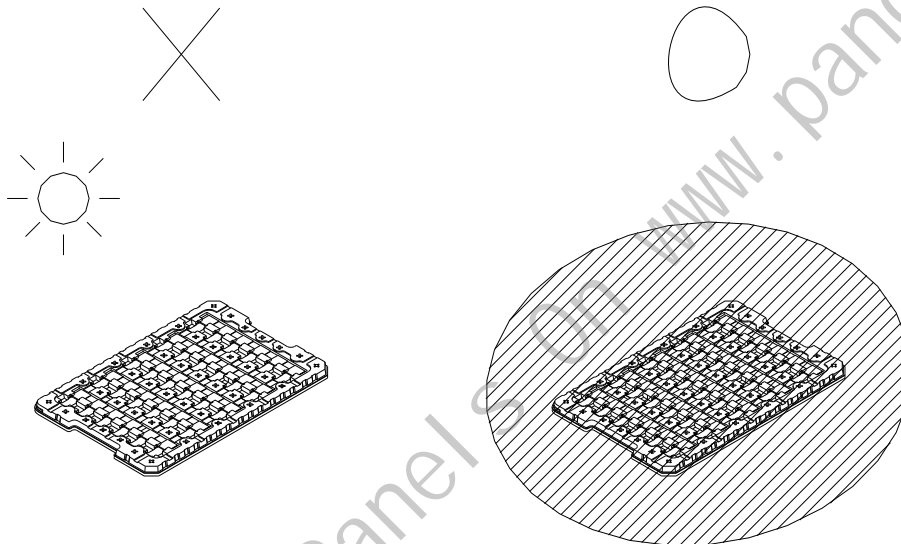
In temperature higher than specified rating, it will liquefy. In either condition, the liquid crystal may not recover its original condition. Store the LCD panel in at or around room temperature as much as possible.

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.



(4) LCD Panel (SHEET) must be cut into cell within 3 months after SHARP shipped out.

LCD Panel (SHEET) must be connected FPC and applied polarizer within 48 hours after cut into cell.

(5) LCD Panel (CELL) must be connected FPC and applied polarizer within 3 months after SHARP shipped out.

LCD Panel (CELL) must be connected FPC and applied polarizer within 48 hours after unpacking.



**[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 panel as much as possible.
- (3) 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. If mouth or eyes come in contact with liquid crystal, rinse with water as soon as possible, following the instructions of the appropriate MSDS.
- (4) ODS (specific chlorofluorocarbon, specific halon, 1-1-1 trichloroethane, carbon tetrachloride) are not used or contained in material or all production processes of this product.
- (5) Observe all other precautionary requirements in handling general electronic components.
- (6) The spec of the module "LS032B7DD02", please refer to the specifications issued by SHARP..

**Discarding liquid crystal panels**

Follow the regulations when LCD panel is scrapped. The government you stay may have some regulations about it.

LCD Panel : Dispose of as glass waste.

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. Applicable Memory liquid crystal display

This TFT-LCD panel is a reflective active-matrix with slightly transmissive memory liquid crystal display panel with CG silicone thin film transistor. SHEET and CELL outline is indicated in Figure 8-2 and 8-3.

## 2. Overview

- Reflective active-matrix with slightly transmissive panel of white and black.
- 3.16" screen has 336 x 536 resolution. (180,096 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 panel with monolithic technology.
- Super low power consumption TFT panel.

Panel No.	Quantity	Outline Dimension	Remark
LX032A7NB01	108 CELL / SHEET	620.00(W) × 750.00(H) × 0.4(D)	Figure 8-2
LX032A7NA01	1 CELL	46.98(W) × 75.96(H) × 0.4(D)	Figure 8-3

## 3. Mechanical Specification

Table 3-1 Panel mechanical specification

Item	Specification	unit
Screen size	3.16"	inch
Active Area	42.672(H) × 68.072(V)	mm
Dot configuration	336(H) × 536(V)	Dot
Dot pitch	0.127(H) × 0.127(V)	mm
Pixel Array	Square	-
Display mode	Normally White	-
Outline Dimension	46.98(W) × 75.96(H) × 0.4(D)	mm
Mass	3.6 Typ.	g
Operation temperature range*	TBD	°C
Storage temperature range*	TBD	°C

(Note) Detail dimension and tolerance are shown in Figure. 8-2 and 8-3.

(Note) \*: The conditions for module only (On cell surface)

## 4. Input terminal names and functions

Table4-1 Pin description

Terminal	Symbol	I/O	Configurations	Function	Remark
1	Test1	—	—	Test pin ※Make this terminal open on FPC when you use it usually.	
2	Test2	—	—	Test pin ※Make this terminal open on FPC when you use it usually.	
3	SCLK	INPUT	NoPull	Serial clock signal	
4	SI	INPUT	NoPull	Serial data input signal	
5	SCS	INPUT	NoPull	Chip select signal ( Active of Hi )	
6	EXTCOMIN	INPUT	NoPull	External COM inversion signal input ( Square wave)	【Note 4-2】
7	DISP	INPUT	NoPull	Display ON/OFF signal	【Note 4-1】
8	VDDA	POWER	—	Power supply (Analog)	
9	VDD	POWER	—	Power supply (Digital)	
10	EXTMODE	INPUT	NoPull	Control mode of COM inversion is select terminal	【Note 4-2】
11	VSS	GND	—	GND (Digital)	
12	VSSA	GND	—	GND (Analog)	
13	Test3	—	—	Test pin ※Make this terminal open on FPC when you use it usually.	
14	Test4	—	—	Test pin ※Make this terminal open on FPC when you use it usually.	

※ NoPull : Neither Pulled up nor Pulled down.

【Note 4-1】 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 "Hi", data in the memory will display, when it's "Lo", white color will display and data in the memory will be saved.

【Note 4-2】 When EXTMODE is "Hi", EXTCOMIN signal is enable.

When EXTMODE is "Lo", serial input flag is enable.

"Hi" mode ; connect the EXTMODE to VDD,

"Lo" mode ; connect the EXTMODE and EXTCOMIN to VSS.

## 4-1) Input Signal States

Table4-2 Input Signal States

Pin No	Symbol	I/O	Voltage	Boot	(Update & Hold mode)	Standby	Note
3	SCLK	Input	0 / 3V	Lo	Hi / Lo	Lo	EXTMODE=Hi
						Hi / Lo	EXTMODE=Lo ※1
4	SI	Input	0 / 3V	Lo	Hi / Lo	Lo	EXTMODE=Hi
						Hi / Lo	EXTMODE=Lo ※1
5	SCS	Input	0 / 3V	Lo	Hi	Lo	EXTMODE=Hi
						Hi / Lo	EXTMODE=Lo ※1
6	EXTCOMIN	Input	0 / 3V	Lo	Hi / Lo	Hi / Lo	EXTMODE=Hi ※2
					Lo	Lo	EXTMODE=Lo
7	DISP	Input	0 / 3V	Lo	Hi / ( Lo )	Hi / ( Lo )	※3
10	EXTMODE	Input	0 / 5V	Hi / Lo	—	—	※4

### ※Common condition

- 1) Each Voltage values show typical voltage.
- 2) Booting : When just input Power supply Between PowerON and Input Signal.
- 3) Data Update & Hold mode : Updates data in pixel memory. (1Line and Multiple Lines update )
- 4) Standby : Maintains memory internal data and maintain current display
- 5) Keep "Lo" Serial Signal (SCS / SI / SCLK ) without communicating..  
Not to make a SCS terminal "Hi" when it does not communicate.

※1 : To do VCOM control in a serial communication, a periodic signal transmission is necessary and is here.

※2 : Input (Clock pulse) is always needed during displaying.

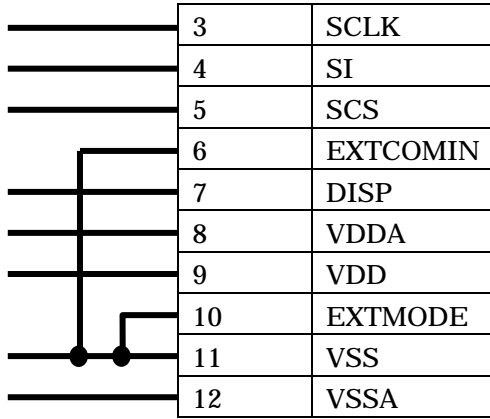
※3 : When displaying it, it's driven "Hi" fixing.

※4 : Recommend to connect VDD or GND(VSS)  
Not change after starting power supply and during ON.

**4-2) Recommended Circuit**

< EXTMODE="Lo" >

COM Signal Serial Flag Input



< EXTMODE="Hi" >

External COM Signal Input

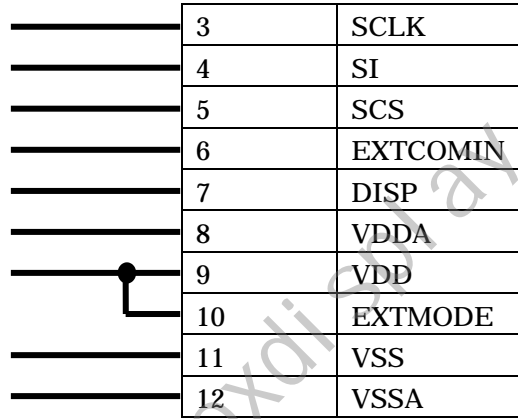


Figure 4-1 Recommended circuit

## 5. Absolute Maximum Rating

Table5-1 Absolute Maximum Rating

( GND=0V )

Item	Symbol	Min	Max	Unit	Remark	
Power supply voltage	Analog	VDDA	-0.3	+5.8	V	
	Logic	VDD	-0.3	+5.8	V	[Note 5-1]
Input signal voltage(high)	VHI	-	VDD	V	[Note 5-2]	
Input signal voltage(low)	VLI	-0.3	-	V		

[Note 5-1] Applies to EXTMODE.

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

## 6. Electrical characteristics

### 6-1) TFT LCD panel drive

Table6-1 Recommended operating Condition

VSS(GND)=0V, Ta= +25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
Power supply Voltage	Analog	VDDA	+4.8	+5.0	+5.5	V	[Note 6-1-3]
	Logic	VDD	+4.8	+5.0	+5.5	V	[Note 6-1-1] [Note 6-1-3]
Input signal voltage	Hi	VIH	+2.7	+3.0	VDD	V	[Note 6-1-2] [Note 6-1-4]
	Lo	VIL	VSS	VSS	VSS+0.15	V	[Note 6-1-2]

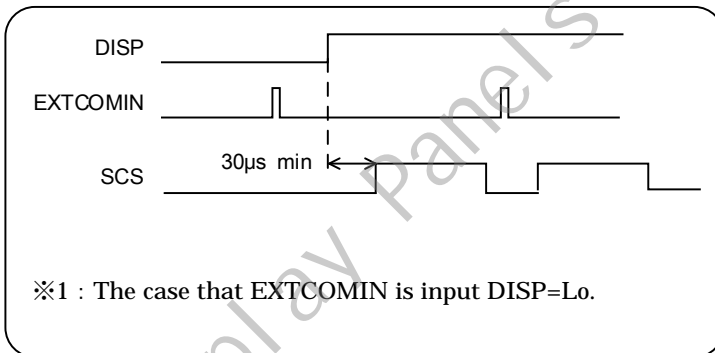
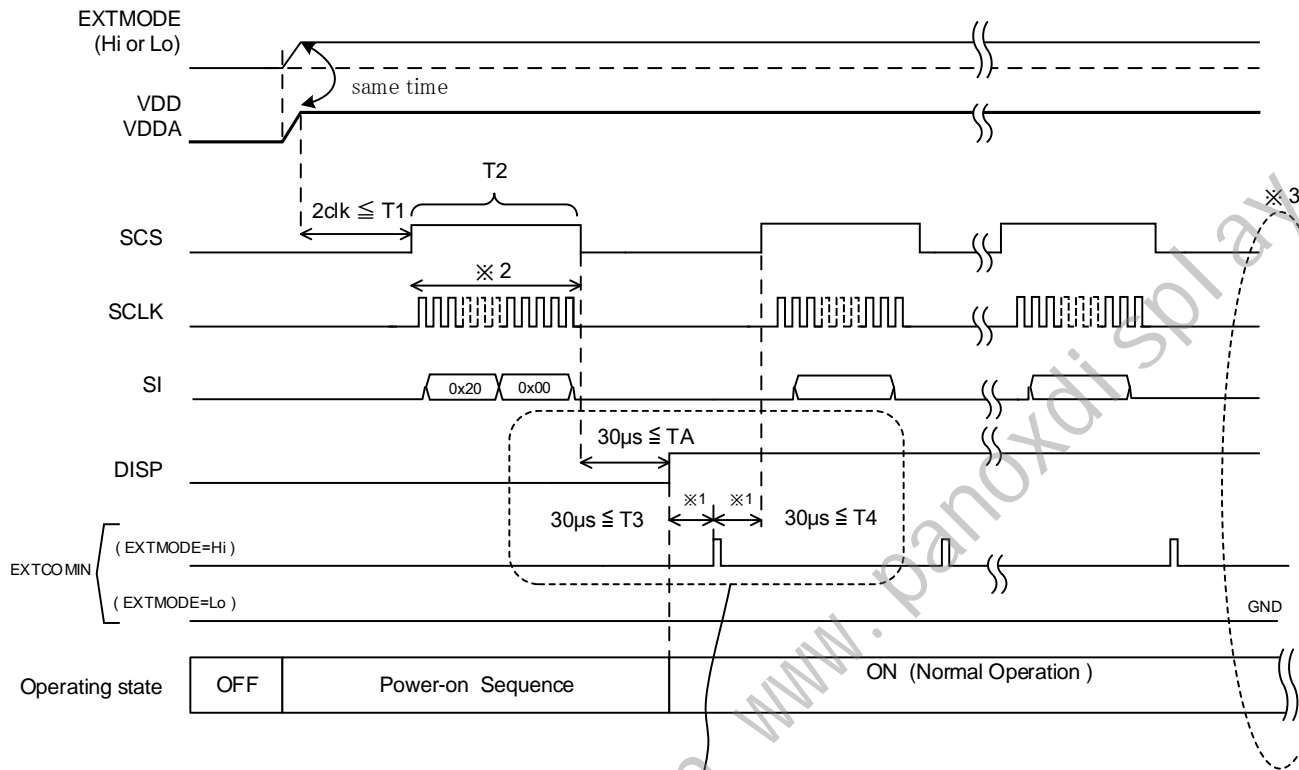
[Note 6-1-1] Applies to EXTMODE="Hi"

[Note 6-1-2] Applies to SCLK, SI, SCS, DISP, EXTCOMIN.

[Note 6-1-3]  $VDD \geq VDDA$

[Note 6-1-4] It can be operated below VDD voltage, however, operation around 3V is recommended.

## 6-2) Power supply sequence



T1 :

Please start the Signal transmission after a power supply was stable.

TA:

Please set DISP to High Level after the completion of initialization.

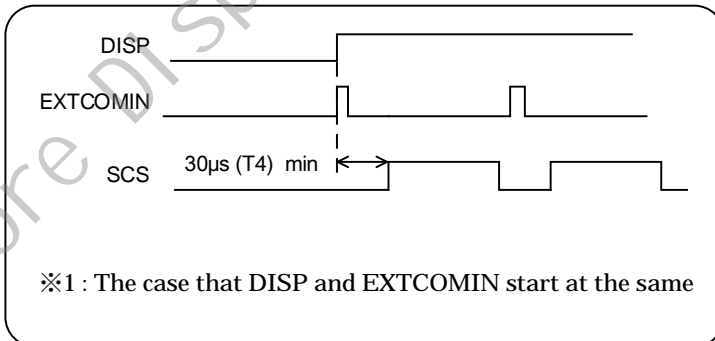


Figure 6-1 Power supply ON sequence



※Refer to timing chart and AC timing characteristics for detail

※1 TA and T3 may be opposite

(however, TCOM polarity inversion will not occur even with EXTCOMIN between DISP="Lo".

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) = "Hi" or write white

SCLK: Normal Driving

※3 One besides control Signal (DISP,EXTMODE,EXTCOMIN), Make all terminals "Lo" while it does not communicate

[ON Sequence]

(1) VDD and VDDA rise time (depends on IC)

(2) Pixel memory initialization

T2: 1 time 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

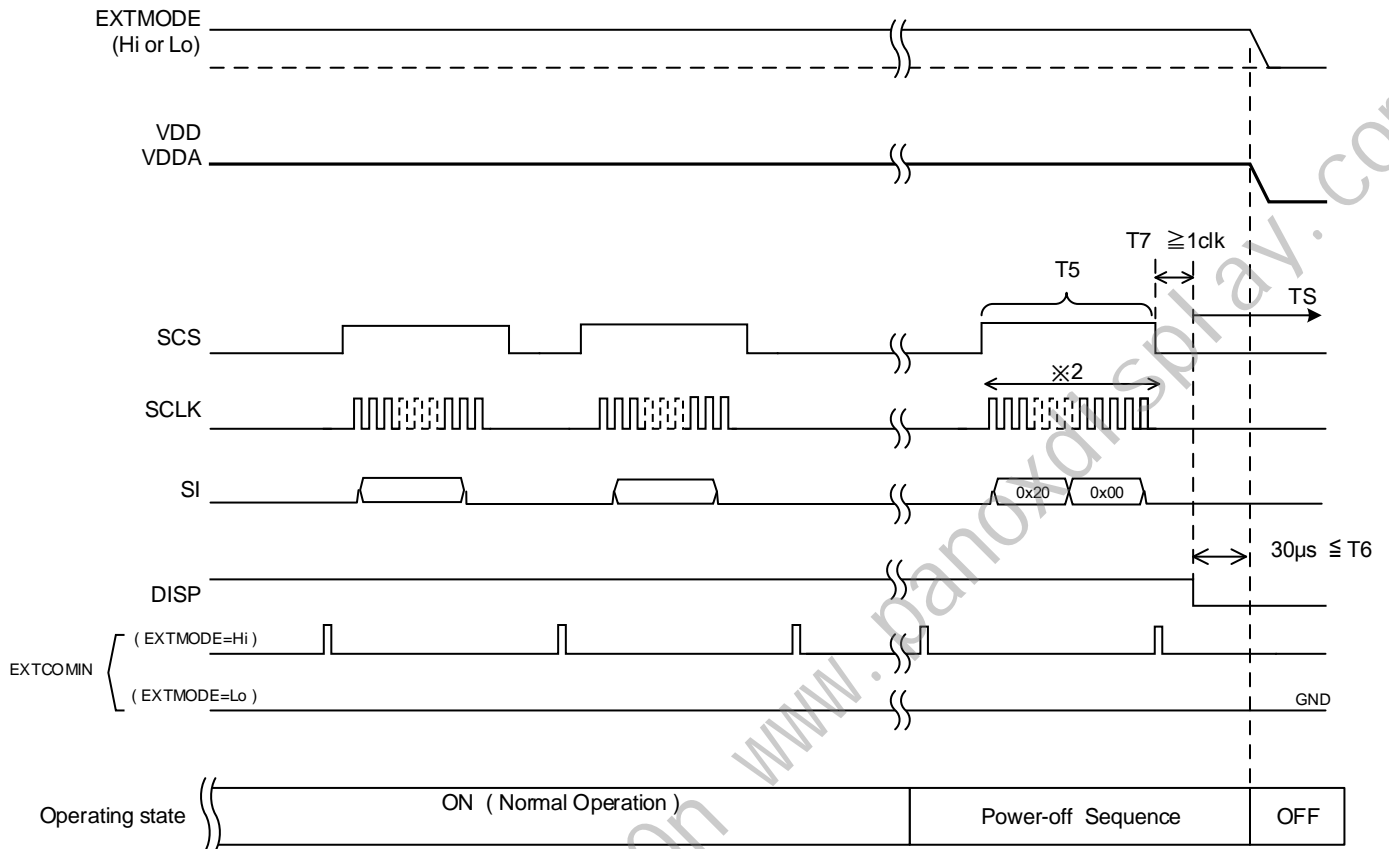
(4) TCOM polarity initialization time

T4: 30us or more

Time required initializing TCOM polarity accordingly to EXTCOMIN input

[Normal Operation]

Duration of normal driving



TS : Off control

Please turn off a power supply after making all the control signals into "Low Level", and passing the time of T6

Figure 6-2 Power supply OFF sequence

[Off Sequence]

(5) Pixel memory initialization

T5: Same (2)

(6) VA, VB, VCOM initialization time

T6: 30us or more

(7) VDD and VDDA falling time (Depends on IC)

(Note) Precautions at the time of power on and power off.

※1) When power on, VDD and VDDA are same time or VDD should be faster than the VDDA.

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

### 6-3) Input signal characteristics

**Table6-3-1 Recommend Operating Conditions and DC Characteristics**

VDDA=+5.0V、VDD=+5.0V、GND=0V、Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Frame frequency	fSCS	1	1	10	Hz	When EXTMODE=Lo 【Note 6-3-1】
		-	-	10	Hz	EXTMODE=Hi 【Note 6-3-1】
Clock frequency	fSCLK	-	1	2	MHz	
Vertical Interval	tV	100	-	1000	ms	
COM Frequency	fCOM	0.5	-	5	Hz	

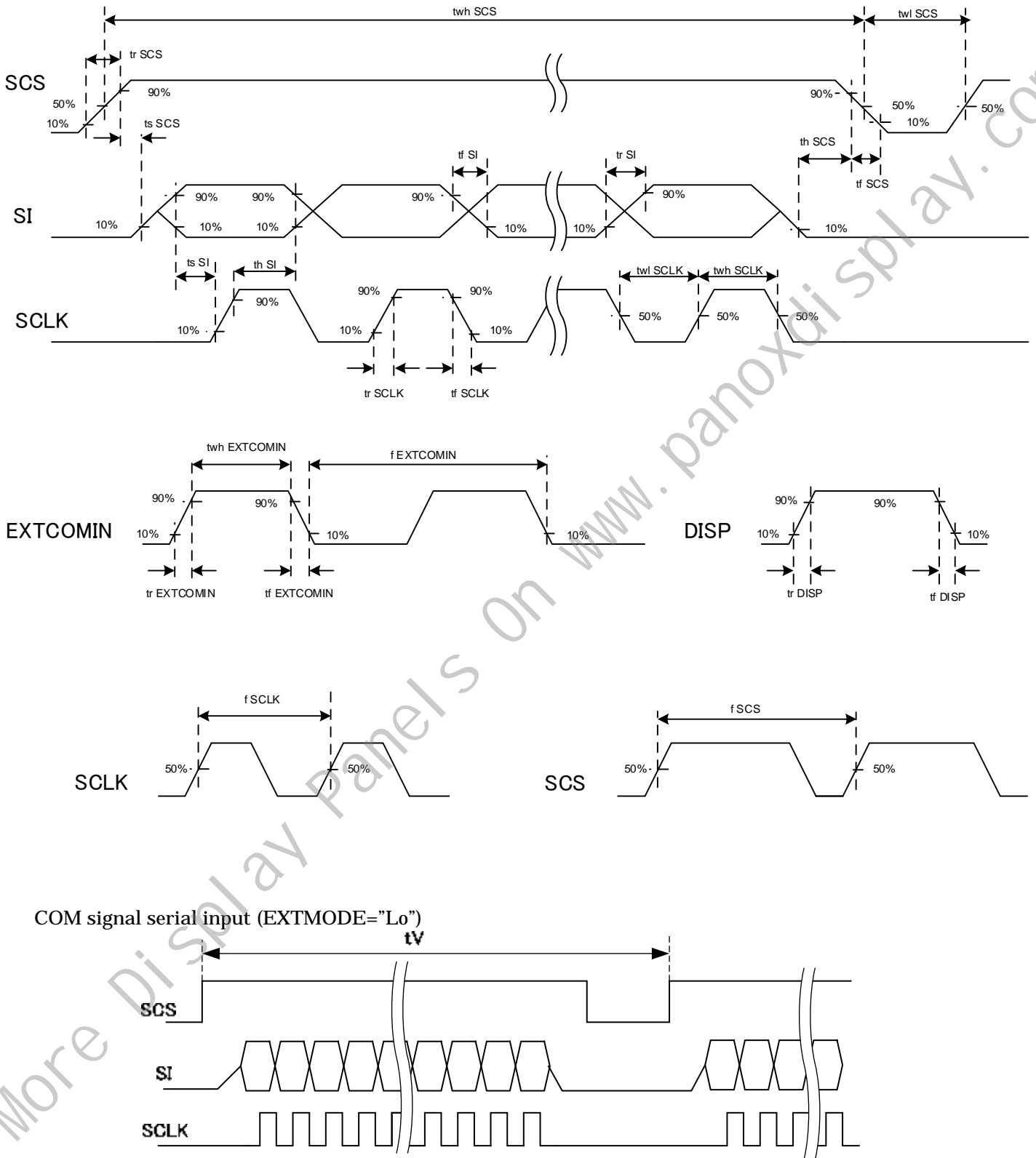
**【Note 6-3-1】** Please use frame frequency in the range where there are no problems with the display quality.

**Table 6-3-2 Input Signal timing Parameters**

VDDA=+5.0V、VDD=+5.0V、GND=0V、Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark	
SCS	Rise time	trSCS	-	-	50	ns	
	Fall Time	tfSCS	-	-	50	ns	
	High duration	twhSCS	188	-	-	us	Data update mode
			12	-	-	us	Hold mode
	Low duration	twlSCS	1	-	-	us	
	Set up time	tsSCS	3	-	-	us	
Hold time	thSCS	1	-	-	us		
SI	Rise time	trSI	-	-	50	ns	
	Fall time	tfSI	-	-	50	ns	
	Set up time	tsSI	120	-	-	ns	
	Hold time	thSI	190	-	-	ns	
SCLK	Rise time	trSCLK	-	-	50	ns	
	Fall time	tfSCLK	-	-	50	ns	
	High duration	twhSCLK	200	450	-	ns	
	Low duration	twlSCLK	200	450	-	ns	
EXTCOMIN	Frequency	fEXTCOMIN	1	1	10	Hz	【Note 6-3-2】 【Note 6-3-3】
	Rise time	trEXTCOMIN	-	-	50	ns	
	Fall time	tfEXTCOMIN	-	-	50	ns	
	High duration	twhEXTCOMIN	1	-	-	us	
DISP	Rise time	trDISP	-	-	50	ns	
	Fall time	tfDISP	-	-	50	ns	

## 6-4) Signal Timing



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

Figure 6-3 Signal Timing

## 6-5) Power consumption

Table6-4 Power Consumption Ta=25°C, SCS SCLK, SI, DISP, EXTCOMIN = +3V, VDD=+5V, VDDA=+5V

Operating Mode	Power consumption	Min	Typ	Max	Unit	Remark
Condition 1	Hold mode (no display data update) Display pattern : <b>IBack stripe display</b>	—	30	330	μW	[Note 6-5-1]
Condition 2	Data update mode with display update 1Hz (1fram/sec) Display pattern : <b>Vertical stripe display</b>	—	250	750	μW	[Note 6-5-2]

[Note 6-5-1]

- 1) After writed Vertical stripe data, set to 「SCLK=Lo , SCS=Lo , SI=Lo」
- 2) It measures during 1).

[Note 6-5-2]

fSCS=1.0Hz (Except in the time of writing, it is set to SCS=Lo.)

Common condition

VDD=5.0V、VDDA=5.0V、fCLK=1.0MHz、EXTMODE=VDD、EXTCOMIN=1Hz

( Common Note )

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.)

\*LC inversion : LC material is needed alternative polarity driving as changing timing which should be 1Hz.

( LC inversion frequency 1Hz is COM frequency 0.5Hz)

as shown Figure 6-4

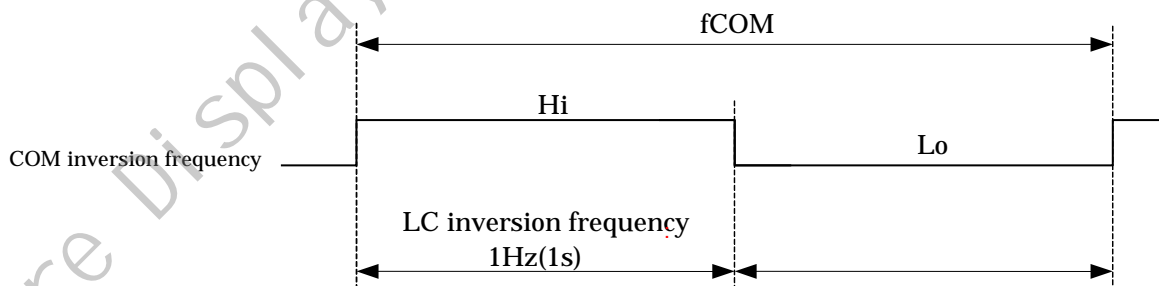


Figure 6-4 COM inversion frequency

## 6-6) Input Signal Timing Chart

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

Updates data of only one specified line. (M0="Hi", M2="Lo")

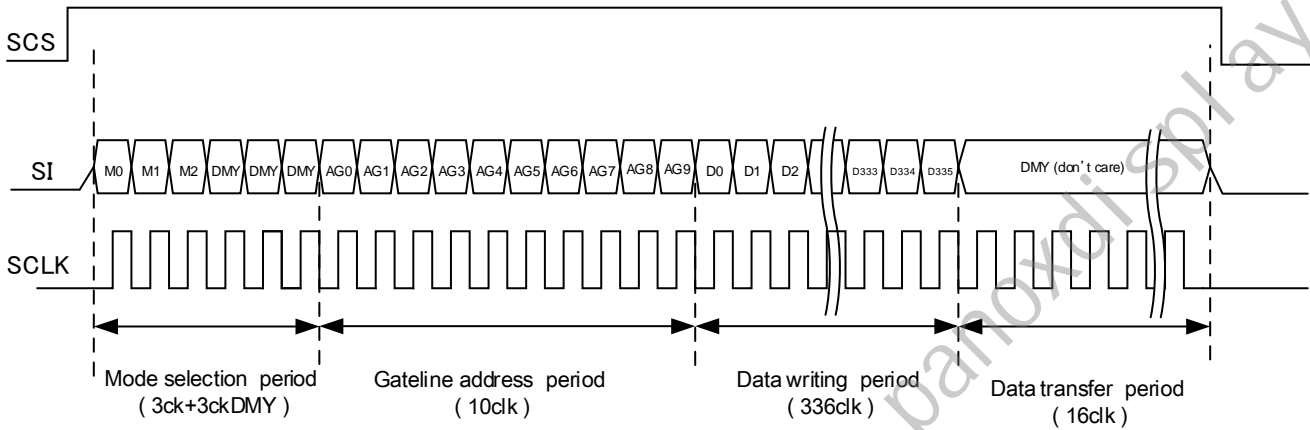


Figure 6-5 Data update mode by 1line

M0: Mode flag.

Set for "Hi": Data update mode (Memory internal data update).  
Set for "Lo": Hold mode (maintain memory internal data).

M1: Frame inversion flag.

When "Hi", outputs VCOM="Hi", and when "Lo", outputs VCOM="Lo".  
When EXTMODE="Hi", it can be "Hi" or "Lo".

M2: All clear flag.

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

DUMMY DATA:

Dummy data.: It can be "Hi" or "Lo" ("Lo" is recommended.)

D0 - D335:

Image data. "L"=Black display, "H"= White display

※ Data write period

Data is being stored in 1<sup>st</sup> latch block of binary driver on panel.

※ Data transfer period

Data written in 1<sup>st</sup> 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 enabled when EXTMODE="Lo".

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

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

Updates arbitrary multiple lines data. (M0="Hi", M2="Lo")

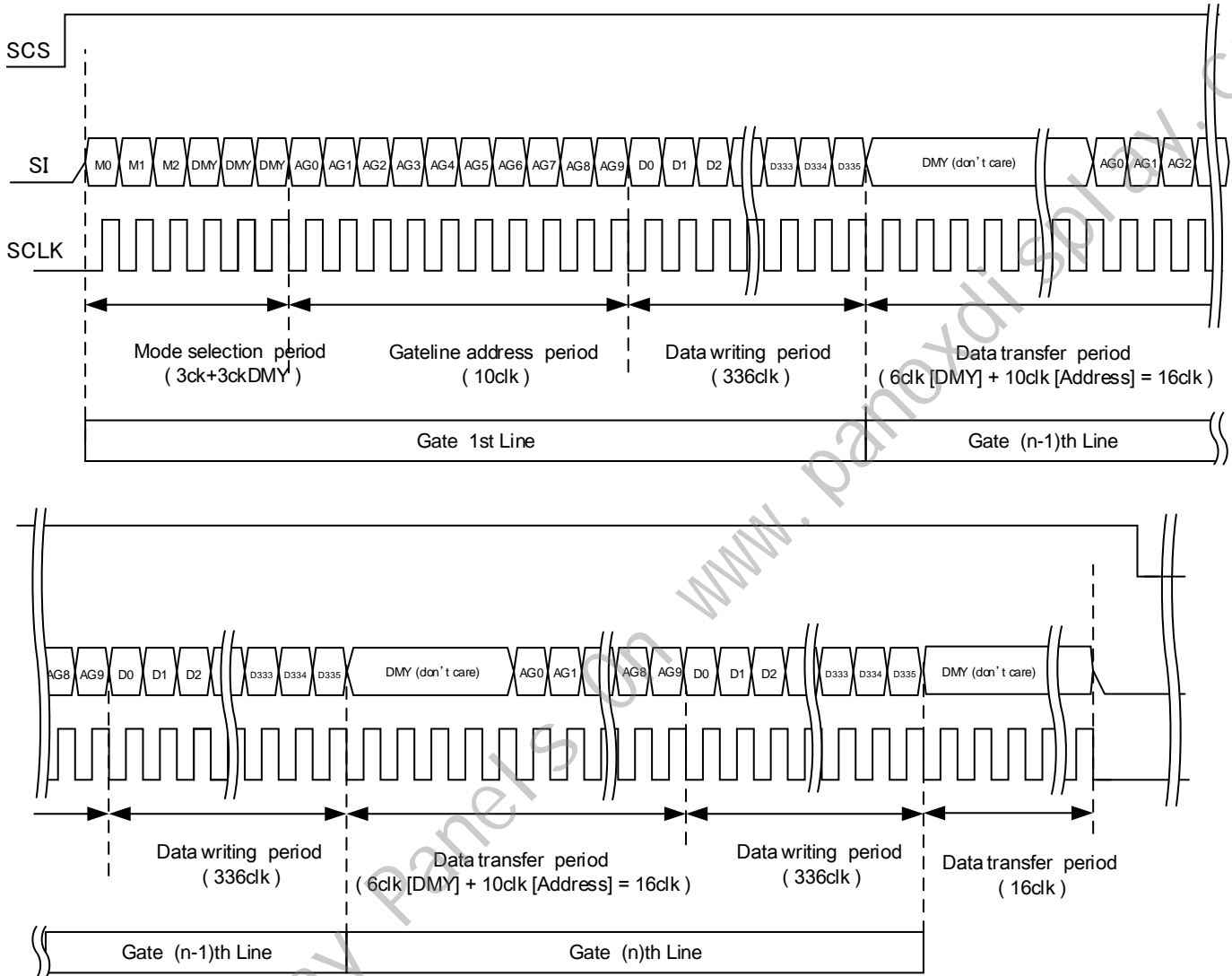


Figure 6-6 Data update mode by Multiple Lines

**M0: Mode flag.**

Set for "Hi": Data update mode (Memory internal data update)  
Set for "Lo": Hold mode (maintain memory internal data).

**M1: Frame inversion flag.**

When "Hi", outputs VCOM="Hi", and when "Lo", outputs VCOM="Lo".  
When EXTMODE="Hi", it can be "Hi" or "Lo".

**M2: All clear flag.**

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

**DUMMY DATA:**

Dummy data.: It can be "Hi" or "Lo" ("Lo" is recommended.)

**D0 - D335:**

Image data. "L"=Black display, "H"= White display

**※ Data write period**

Data is being stored in 1<sup>st</sup> latch block of binary driver on panel.

**※ Data transfer period**

For example, during GL2<sup>nd</sup> line data transfer period, GL 2<sup>nd</sup> line address is latched and GL1<sup>st</sup> line data is transferred from 1<sup>st</sup> 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="Lo".

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



## 6-6-3 Hold Mode

Maintains memory internal data (maintains current display). (M0="Lo", M2="Lo")

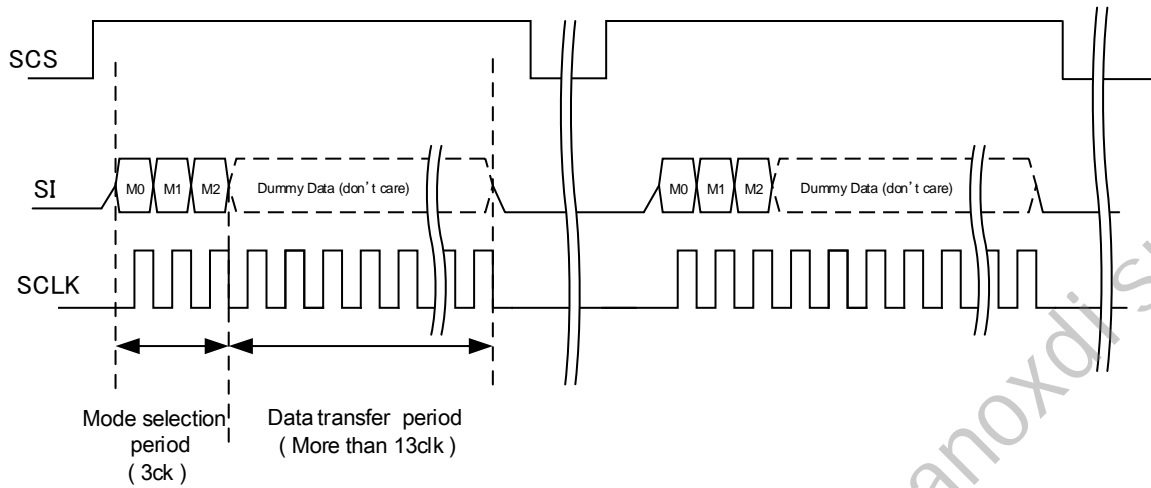


Figure 6-7 Hold mode

M0: Mode flag.

Set for "Hi": Data update mode (Memory internal data update)

Set for "Lo": Hold mode (maintain memory internal data).

M1: Frame inversion flag.

When "Hi", outputs VCOM="Hi", and when "Lo", outputs VCOM="Lo".

When EXTMODE="Hi", it can be "Hi" or "Lo".

M2: All clear flag.

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

DUMMY DATA:

Dummy data. It can be "Hi" or "Lo" ("Lo" is recommended.)

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

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

## 6-6-4 All Clear Mode

Clears memory internal data and writes white. (M0="Lo", M2="Hi")

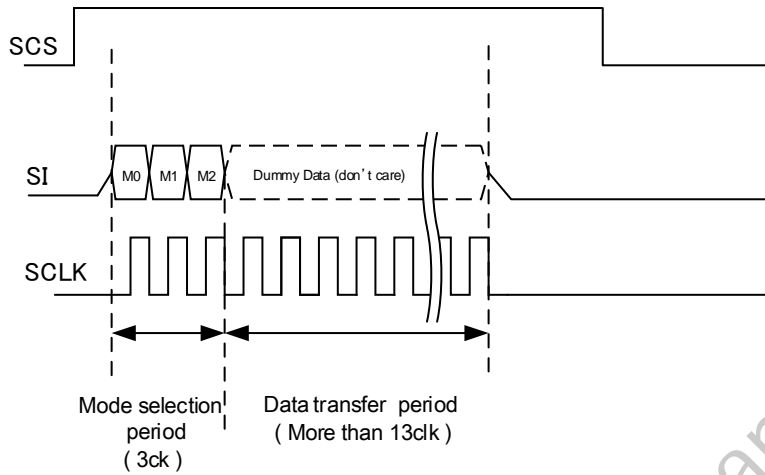


Figure 6-8 All Clear mode

M0: Mode flag.  
Set it "Lo".

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

M2: All clear flag.  
Set it "Hi"

DUMMY DATA:  
Dummy data. It can be "Hi" or "Lo" ("Lo" is recommended.)

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

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

## 6-6-5 COM Inversion

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

### EXTMODE="Lo"

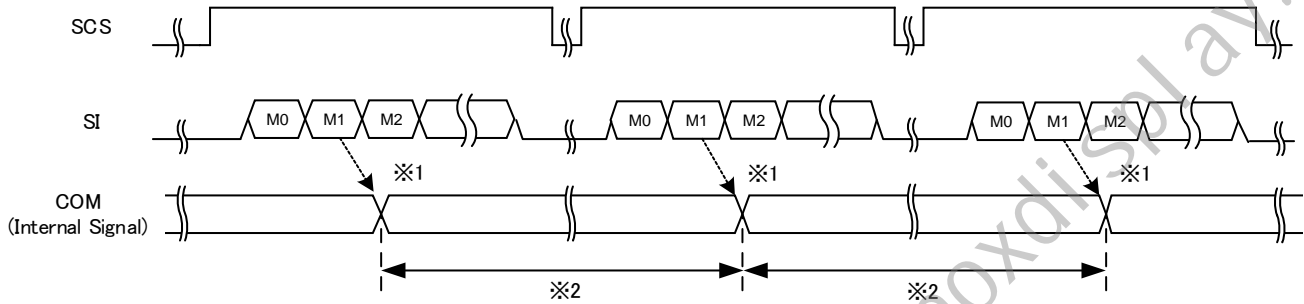


Figure 6-9 COM Inversion (EXTMODE=Lo)

M1 : LC polarity inversion flag:

If M1 is "Hi" then VCOM="Hi" is output.

If M1 is "Lo" then VCOM="Lo" is output.

※1 : COM 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="Hi" (COM inversion timing has two conditions )

① EXTCOMIN input during high period of the SCS signal

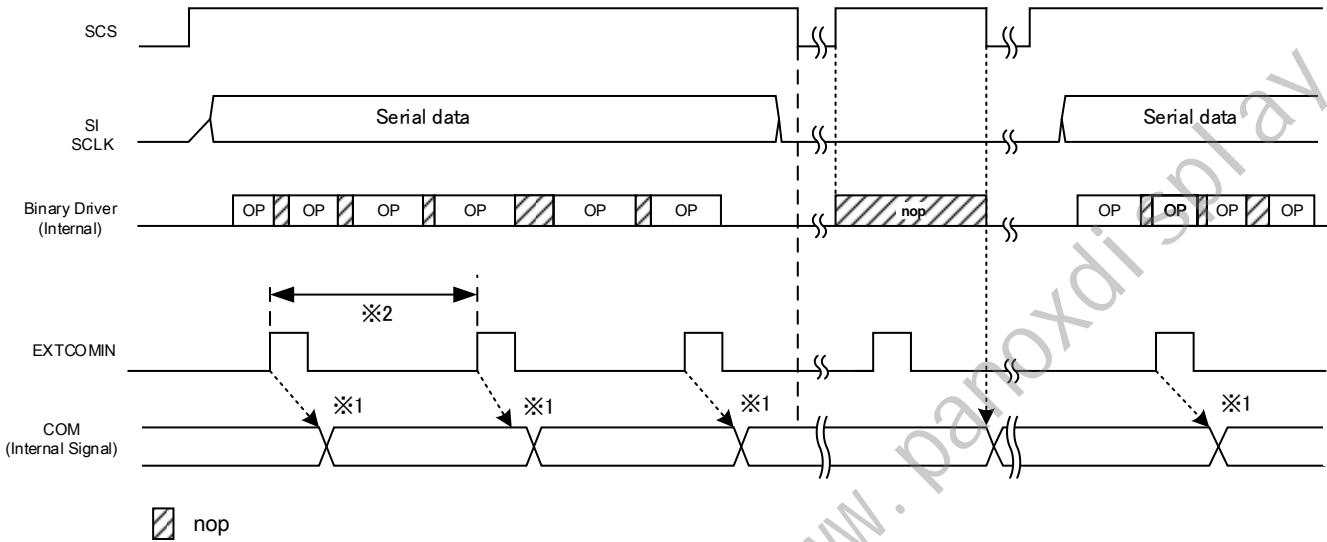


Figure 6-10 COM Inversion (EXTMODE = Hi )1

※1 : COM inversion has been set by the falling edge of SCS signal  
(\*not\* toggle EXTCOMIN more than once while SCS is hight)

※2 : The period of EXTCOMIN should be constant.

② EXTCOMIN input during low period of the SCS signal

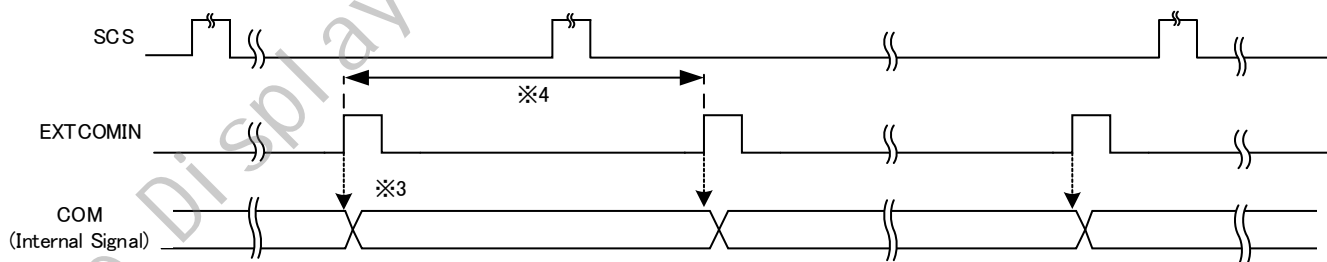


Figure 6-11 COM Inversion (EXTMODE=Hi ) 2

※3 : COM inversion polarity ha been set by rising edge of EXTCOMIN.

※4 : The period of EXTCOMIN should be constant.

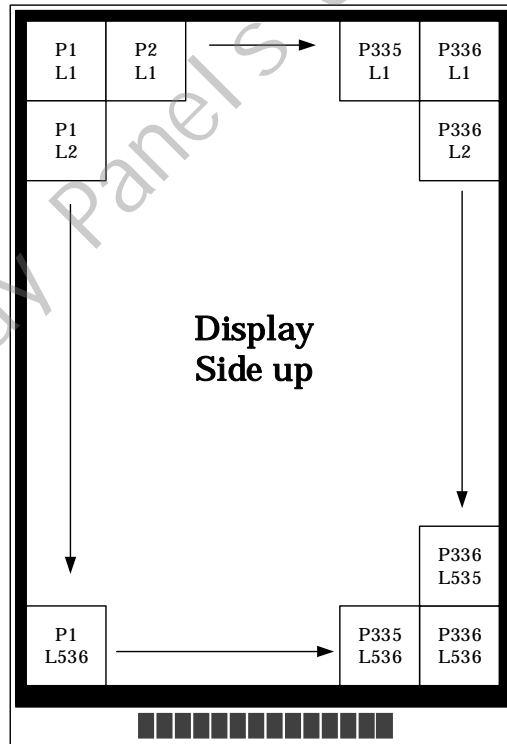




**Table 6-5-3 Gate line address setting-3**

GL	AG0	AG1	AG2	AG3	AG4	AG5	AG6	AG7	AG8	AG9	GL	AG0	AG1	AG2	AG3	AG4	AG5	AG6	AG7	AG8	AG9
481	1	0	0	0	0	1	1	1	1	0	511	1	1	1	1	1	1	1	1	1	0
482	0	1	0	0	0	1	1	1	1	0	512	0	0	0	0	0	0	0	0	0	1
483	1	1	0	0	0	1	1	1	1	0	513	1	0	0	0	0	0	0	0	0	1
484	0	0	1	0	0	1	1	1	1	0	514	0	1	0	0	0	0	0	0	0	1
485	1	0	1	0	0	1	1	1	1	0	515	1	1	0	0	0	0	0	0	0	1
486	0	1	1	0	0	1	1	1	1	0	516	0	0	1	0	0	0	0	0	0	1
487	1	1	1	0	0	1	1	1	1	0	517	1	0	1	0	0	0	0	0	0	1
488	0	0	0	1	0	1	1	1	1	0	518	0	1	1	0	0	0	0	0	0	1
489	1	0	0	1	0	1	1	1	1	0	519	1	1	1	0	0	0	0	0	0	1
490	0	1	0	1	0	1	1	1	1	0	520	0	0	0	1	0	0	0	0	0	1
491	1	1	0	1	0	1	1	1	1	0	521	1	0	0	1	0	0	0	0	0	1
492	0	0	1	1	0	1	1	1	1	0	522	0	1	0	1	0	0	0	0	0	1
493	1	0	1	1	0	1	1	1	1	0	523	1	1	0	1	0	0	0	0	0	1
494	0	1	1	1	0	1	1	1	1	0	524	0	0	1	1	0	0	0	0	0	1
495	1	1	1	1	0	1	1	1	1	0	525	1	0	1	1	0	0	0	0	0	1
496	0	0	0	0	1	1	1	1	1	0	526	0	1	1	1	0	0	0	0	0	1
497	1	0	0	0	1	1	1	1	1	0	527	1	1	1	1	0	0	0	0	0	1
498	0	1	0	0	1	1	1	1	1	0	528	0	0	0	0	1	0	0	0	0	1
499	1	1	0	0	1	1	1	1	1	0	529	1	0	0	0	1	0	0	0	0	1
500	0	0	1	0	1	1	1	1	1	0	530	0	1	0	0	1	0	0	0	0	1
501	1	0	1	0	1	1	1	1	1	0	531	1	1	0	0	1	0	0	0	0	1
502	0	1	1	0	1	1	1	1	1	0	532	0	0	1	0	1	0	0	0	0	1
503	1	1	1	0	1	1	1	1	1	0	533	1	0	1	0	1	0	0	0	0	1
504	0	0	0	1	1	1	1	1	1	0	534	0	1	1	0	1	0	0	0	0	1
505	1	0	0	1	1	1	1	1	1	0	535	1	1	1	0	1	0	0	0	0	1
506	0	1	0	1	1	1	1	1	1	0	536	0	0	0	1	1	0	0	0	0	1
507	1	1	0	1	1	1	1	1	1	0											
508	0	0	1	1	1	1	1	1	1	0											
509	1	0	1	1	1	1	1	1	1	0											
510	0	1	1	1	1	1	1	1	1	0											

<Data position in display[H,V] >



P\*: Pixels position  
L\*:Gate address line

(Terminal side)

Figure 6-12 Data position

## 7. Optical specification( Reference Value )

Table 7-1 Optical specification

VDD=VDDA=5V, Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
Viewing angle range CR $\geq$ 2	Horizontal	$\theta_{21}$	(40)	(60)	-	°(degree)	[Note 7-1]
		$\theta_{22}$	(40)	(60)	-	°(degree)	
	Vertical	$\theta_{11}$	(40)	(60)	-	°(degree)	
		$\theta_{12}$	(40)	(60)	-	°(degree)	
Contrast ratio	CR	-	(35)	-		[Note 7-2, 3]	
Reflectivity ratio	R	-	(14)	-	%	[Note 7-3]	
Transmissivity ratio	T	-	(0.20)	-	%		
Response time	Rise	$\tau_r$	-	(10)	-	ms	[Note 7-3,4]
	Fall	$\tau_d$	-	(20)	-	ms	
Panel Chromaticity	White	x	-	(0.31)	-		[Note 7-3]
		y	-	(0.33)	-		

(Note) Above characteristics are taken using SHARP corresponding materials and module components.

[Note 7-1] Defintion of Viewing Angle

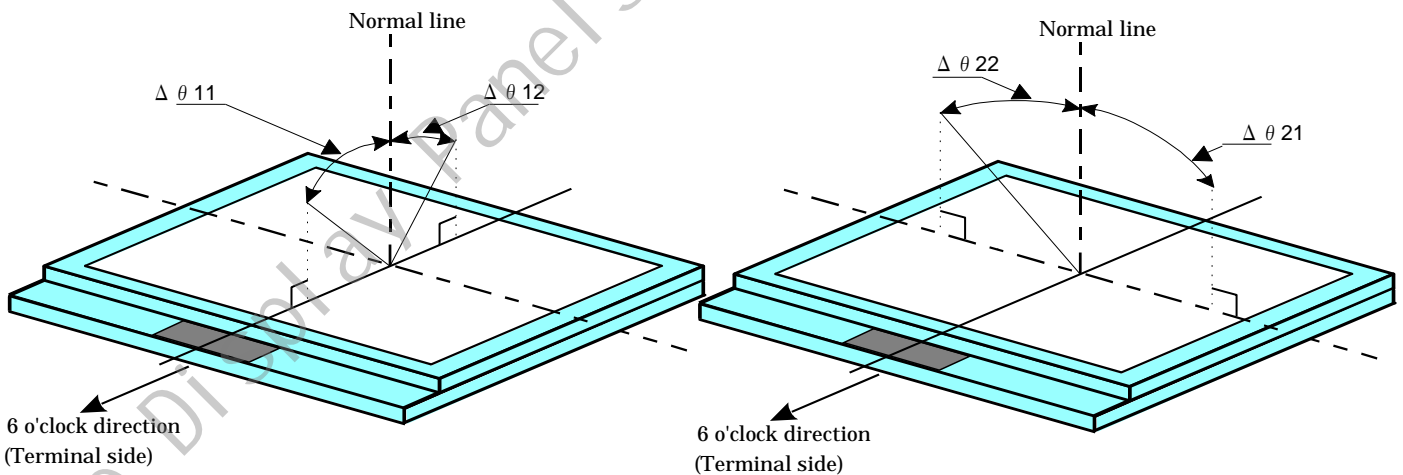


Figure 7-1 Defintion of Viewing Angle



[Note 7-2] Definition of Contrast Ratio

The contrast ratio is defined as the following.

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

[Note 7-3] 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  
(CM700d)

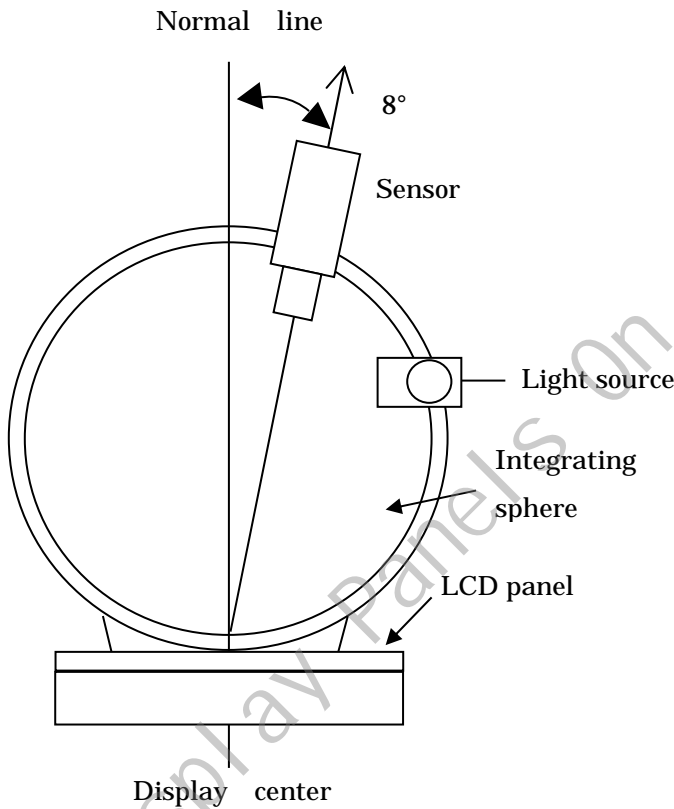


Figure 7-2 Contrast ratio, Reflection ratio, Panel chromaticity

Measurement equipment  
(LCD-5200 / DMS803)

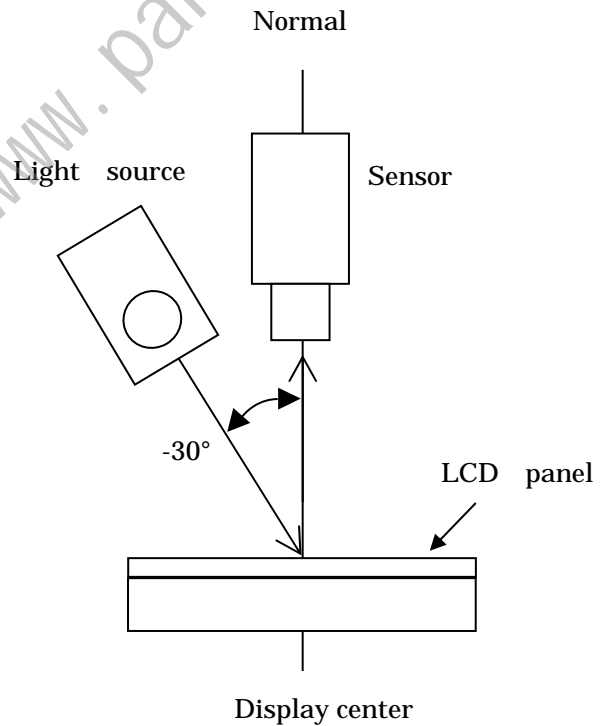


Figure 7-3 Response time

[Note 7-4] Response time (Change in reflection ratio)

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

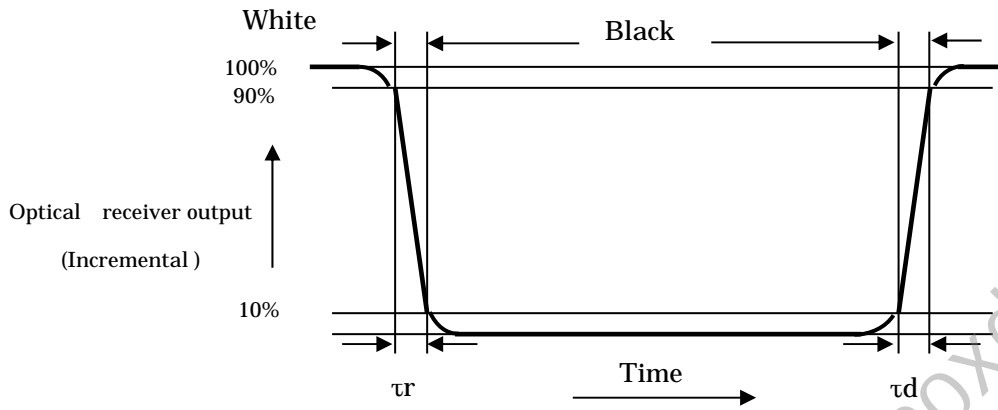
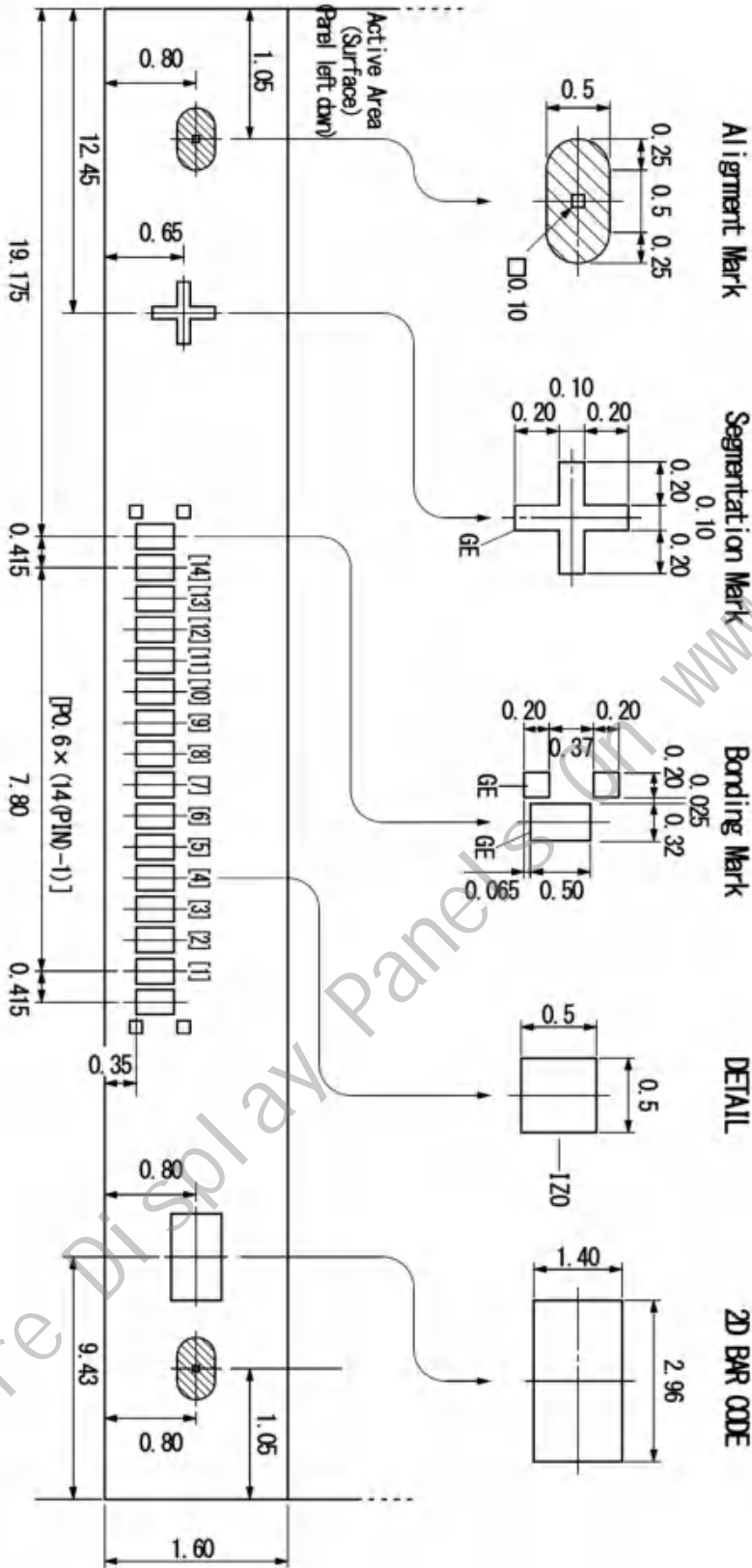


Figure 7-4 Response time

## 8. Outline dimension

### 8-1) PAD outline dimension



Please clean the terminals before FPC assembled.

Please use a proper ACF for IZO terminal condition.

Figure 8-1 PAD outline dimension

**8-2) SHEET outline dimension of the 3.16" (336 x 536) panel**

The outline dimensions are shown in Figure 8-2

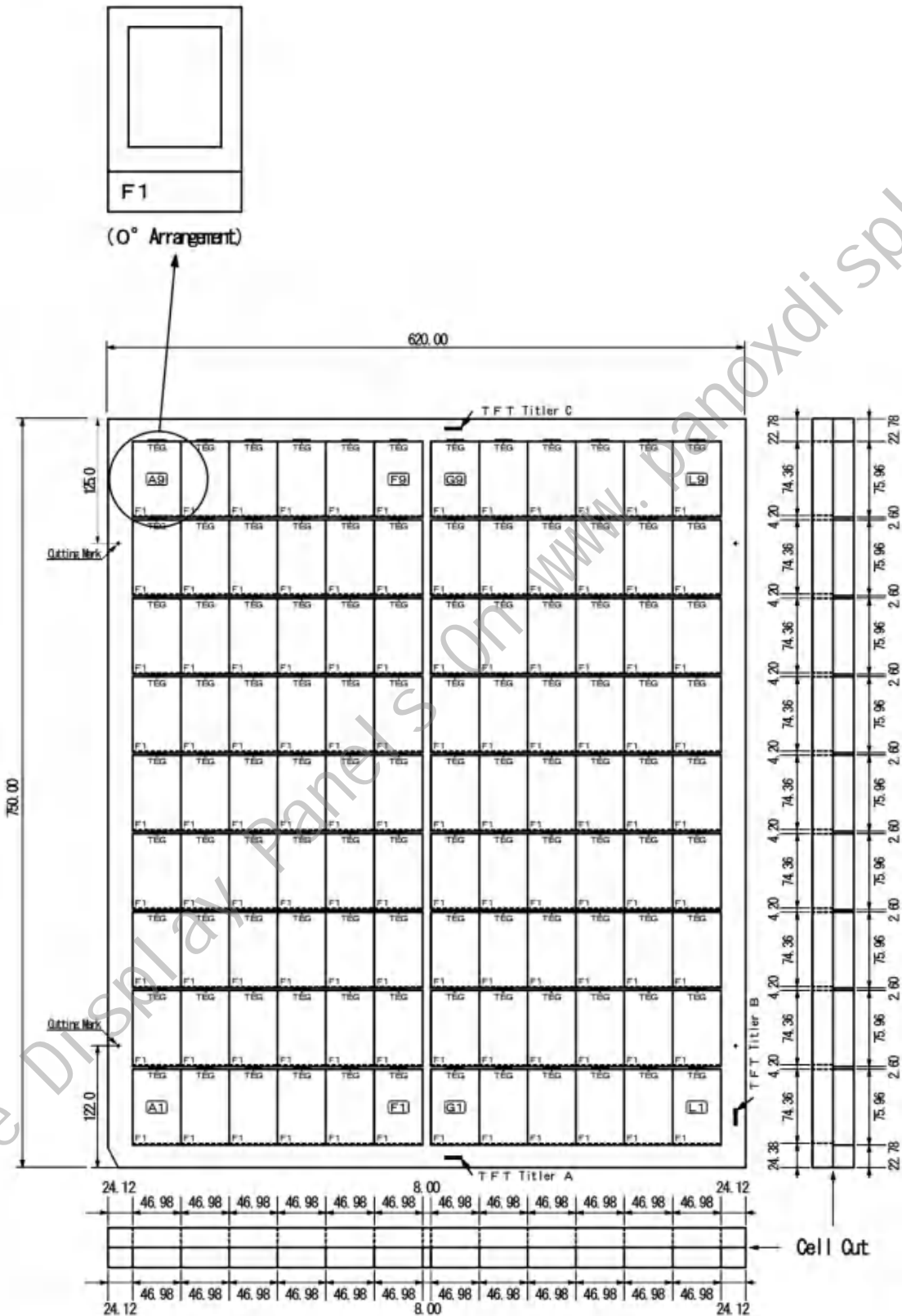


Figure 8-2 SHEET outline dimension(LX032A7NB01)

**8-3) CELL outline dimension of the 3.16" (336 x 536) panel**

The outline dimensions are shown in Figure 8-3

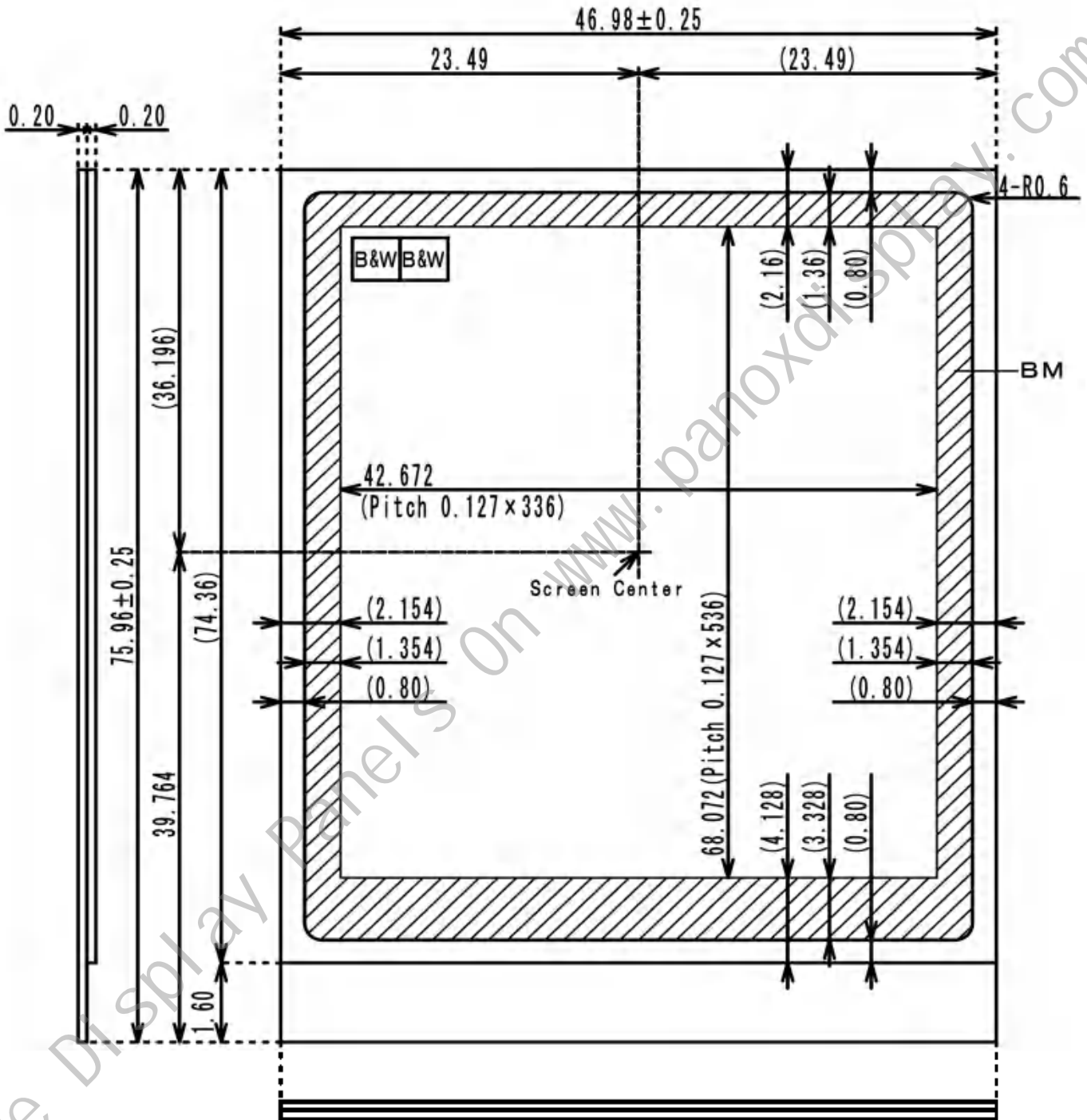


Figure 8-3 CELL outline dimension(LX032A7NA01)

## 9. Packaging form

### 9-1) Carton storage conditions

- |                                          |                                                                   |
|------------------------------------------|-------------------------------------------------------------------|
| (1) Piling number of palette(Max)        | 2 ※SHEET<br>2 ※CELL                                               |
| (2) Package quantity in one carton (Max) | 350sheets ※SHEET<br>432pcs ※CELL                                  |
| (3) Carton size (Typ)                    | 968 mm x 845 mm x 891 mm ※SHEET<br>578 mm x 382 mm x 255 mm ※CELL |
| (4) Storage environment                  |                                                                   |
- Temperature 0~40°C
  - Humidity 60%RH or lower (at 40°C)  
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.
  - Unpacking In order to prevent electrostatic damage to TFT panels,  
room humidity should be made over 50% RH and take effective measure  
such as use of earth when opening the package.
  - Direct sunlight Please keep the product in a dark room or cover the product to protect  
from direct sunlight.
  - Atmospheric condition  
Please refrain from keeping the product with possible corrosive gas or volatile flux.
  - Prevention of dew  
Do not place directly on the floor, and please store the product carton either on a wooden  
pallet or a stand to avoid dew condensation.  
In order to obtain moderate ventilation in the pallet's bottom surfaces,  
arrange correctly in the fixed direction.  
Please place the product cartons away from the storage wall.  
Be careful of the inside of a warehouse to ventilate well  
and please consider installation of a ventilator.  
Manage to rapid temperature change under natural environment.
  - Vibration Please refrain from keeping the product in the place which always has vibration.

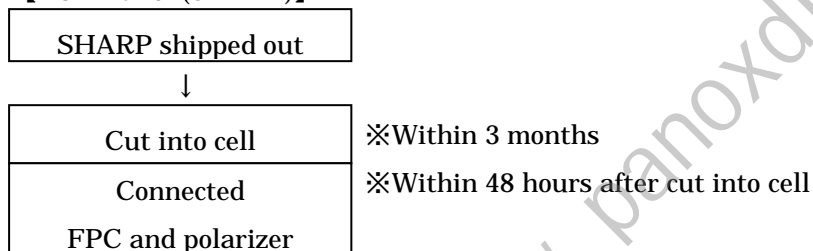
**•Expiration Period**

LCD Panel (SHEET) must be cut into cell within 3 months after SHARP shipped out.

LCD Panel (SHEET) must be connected FPC and applied polarizer within 48 hours after cut into cell.

LCD Panel (CELL) must be connected FPC and applied polarizer within 3 months after SHARP shipped out.

LCD Panel (CELL) must be connected FPC and applied polarizer within 48 hours after unpacking.

**【LCD Panel (SHEET)】****【LCD Panel (CELL)】**

## 9-2) Packaging form figure

The packing condition is shown in Figure. 9-1

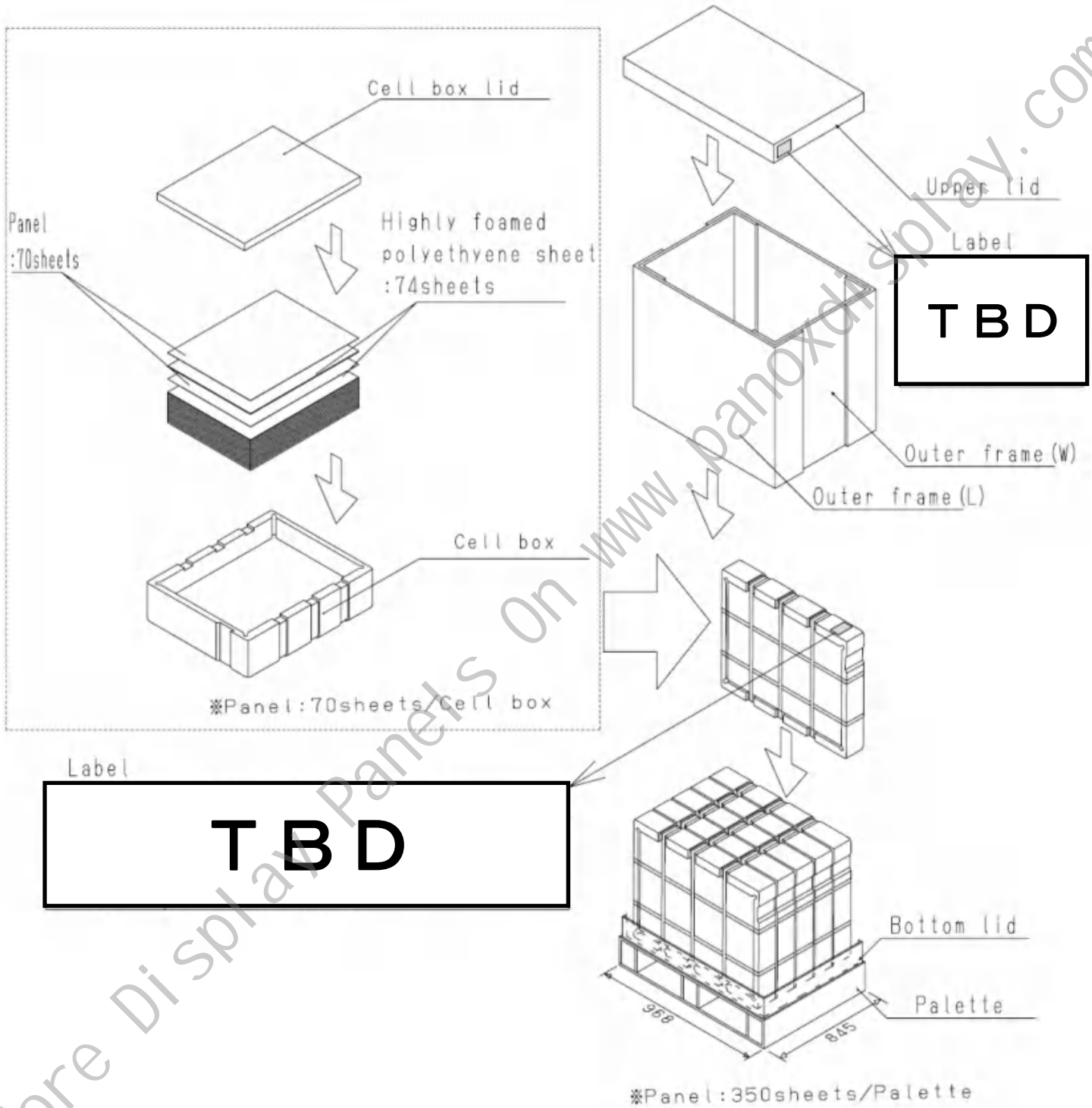


Figure. 9-1 SHEET Packaging Form(LX032A7NB01)