Display Elektronik GmbH

DATA SHEET

MIP Display

DE MIP336536A-W

(3,16” Memory in Pixel, Mono)

Product Specification **Ver.: 2**

25.05.2026

Revise Records

Rev.	Date	Contents	Written	Approved
0	27.12.2023	Preliminary Specification	S	A
1	01.02.2024	Update Power Consumption	J	A
2	25.05.2026	Page5,15: Updated Backlight specification deleted, confirmed module is without backlight.	CC	A

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

Contents

1. General Description and Features

This TFT-LCD module is a reflective active-matrix with slightly transmissive memory liquid crystal display module with CG silicone thin film transistor.

1.1 Features

- Reflective active-matrix with slightly transmissive panel of white and black.
- 3.16" WQVGA screen has 336 x 536 resolution. (180,096 pixels stripe array)
- Display control by serial data signal communication.
- Super low power consumption TFT panel.

1.2 LCD Module

Item	Specification	Unit
Screen Size	3.16 Inches	Diagonal
Display Resolution	336 x 536	Pixel
Active Area	42.672 x 68.072	mm
Outline Dimension	47.02 x 76.00 x 0.705	mm
Display Mode	Memory in Pixel, Normally White	--
Pixel Arrangement	Square	--
Pixel Size	0.127 x 0.127	mm
Surface Hardness	3H	--
Surface treatment	HC (Hard Coated)	--
Operating temperature	-20~70	℃
Storage temperature	-30~80	℃

2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	46.52	47.02	47.52	mm	--
	Vertical (V)	75.50	76.00	76.50	mm	--
	Thickness (T)	0.675	0.705	0.735	mm	(1)
Weight		--	5.5	--	g	--

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

3. Electrical Specifications

3.1 Absolute Max. Ratings

3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

(Ta=25±2°C, V_{SS}=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T_{STG}	-30	80	°C	(1)
Operating Temperature	T_{OPR}	-20	70	°C	(1,2,3)

Note (1) 95 % RH Max. (40°C ≥ Ta). Maximum wet-bulb temperature at 39°C or less. (Ta > 40°C) No condensation.

Note (2) In case of below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

3.1.2 Electrical Absolute Maximum Ratings

3.1.2.1 TFT-LCD Module

Parameter		Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	Analog	VDDA	-0.3	5.8	V	--
	Logic	VDD	-0.3	5.8	V	(1)
Input Signal Voltage (Hi)		VHI	--	VDD	V	(2)
Input Signal Voltage (Lo)		VLI	-0.3	--	V	--

Note (1) Applies to EXTMODE.

Note (2) Applies to SCLK, SI, SCS, DISP, EXTCOMIN.

3.1.3 DC Electrical Characteristics of the TFT LCD

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply		VDD	4.8	5.0	5.5	V	--
		VDDA	4.8	5.0	5.5	V	--
Input Voltage for Logic	Hi	VIH	2.7	3.0	VDD	V	--
	Lo	VIL	VSS	VSS	VSS+0.15	V	--

(Ta=25°C±2°C, V_{SS}=GND=0)

Note (1) fv =60Hz, Ta=25°C, Display pattern: white pattern

3.2 AC Timing Characteristic of The LCD

3.2.1 Recommend Operating Conditions and DC Characteristics

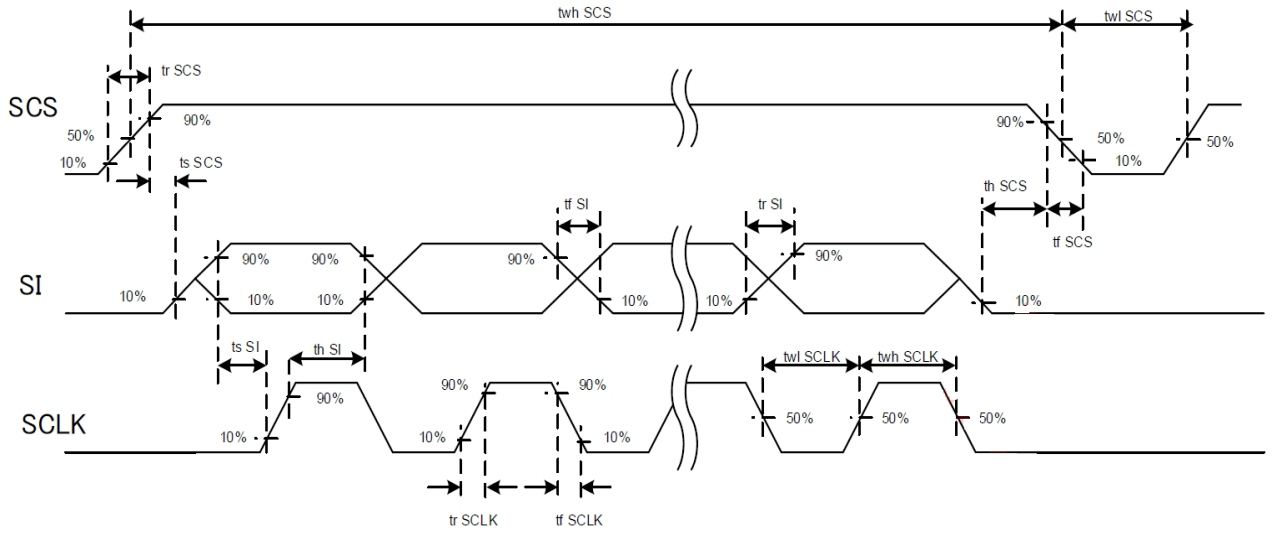
Parameter	Symbol	Min.	Typ.	Max.	Unit.	Remark
Frame frequency	fSCS	1	1	10	Hz	Where EXTMODE=Lo (1)
		--	--	10	Hz	Where EXTMODE=Hi (1)
Clock frequency	fSCLK	--	1	2	MHz	--
Vertical Interval	tV	100	--	1000	ms	--
COM frequency	fCOM	0.5	--	5	Hz	--

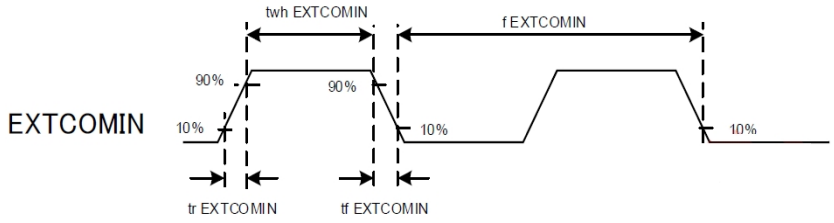
Note (1) Please use a frame frequency in the range where there are no problems with the display quality.

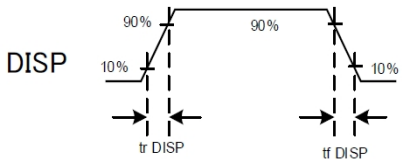
3.2.2 AC Input Signal Timing Parameters VDDA=5.0V、VDD=5.0V、GND=0V、Ta=25℃

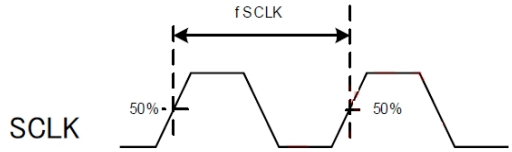
Item	Item	Symbol	Min.	Typ.	Max.	Unit	Remark
SCS	Rise time	trSCS	--	--	50	ns	
	Fall time	tfSCS	--	--	50	ns	
	High duration	twhSCS	188	--	--	us	Data update mode
			12	--	--	us	Hold mode
	Low duration	twlSCS	1	--	--	us	
	Set up time	tsSCS	3	--	--	us	
	Hold time	thSCS	1	--	--	us	
SI	Rise time	trSI	--	--	50	ns	
	Fall time	trSI	--	--	50	ns	
	Set up time	trSI	120	--	--	ns	
	Hold time	trSI	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	
	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	

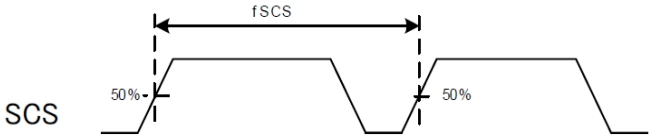
3.2.3 AC Signal Timing



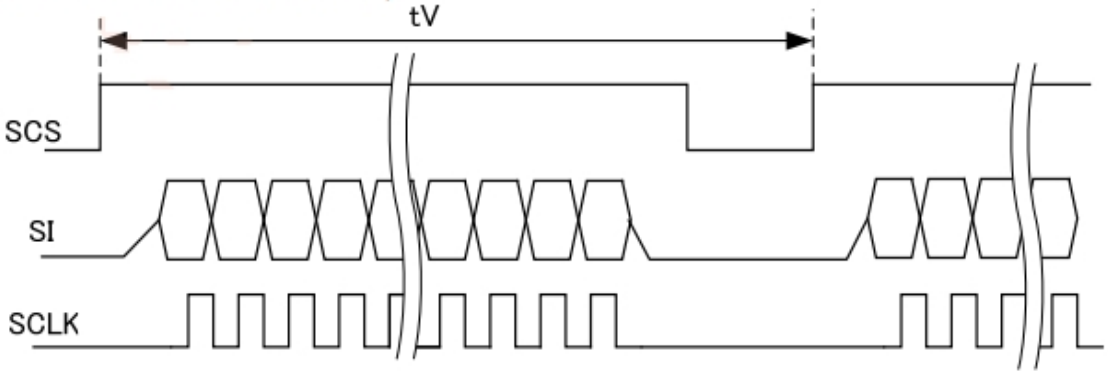








COM signal serial input (EXTMODE="Lo")

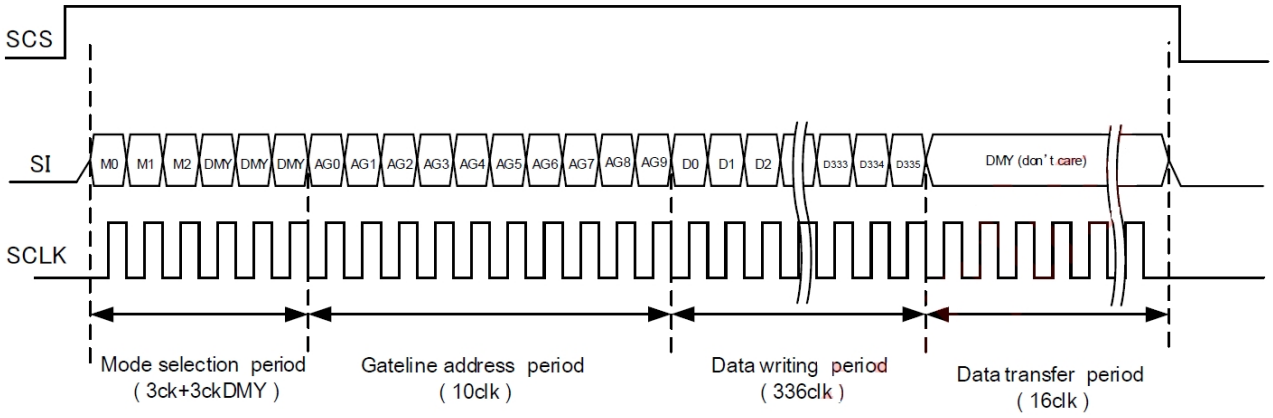


※SCS,SI,SCLK,DISP,EXTCOMIN : 3V input voltage

3.2.4 Input Signal Timing Chart

3.2.4.1 Data Update Mode (1 line)

Updates data of only one specified line. (M0 = “Hi”、 M2 = “Lo”)



M0 : Mode flag.

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

Set for “Lo”: Hold mode (Maintain memory internal data update)

M1 : Mode 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 All Clear Mode to execute clear.

DUMMY DATA:

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

D0 – D335:

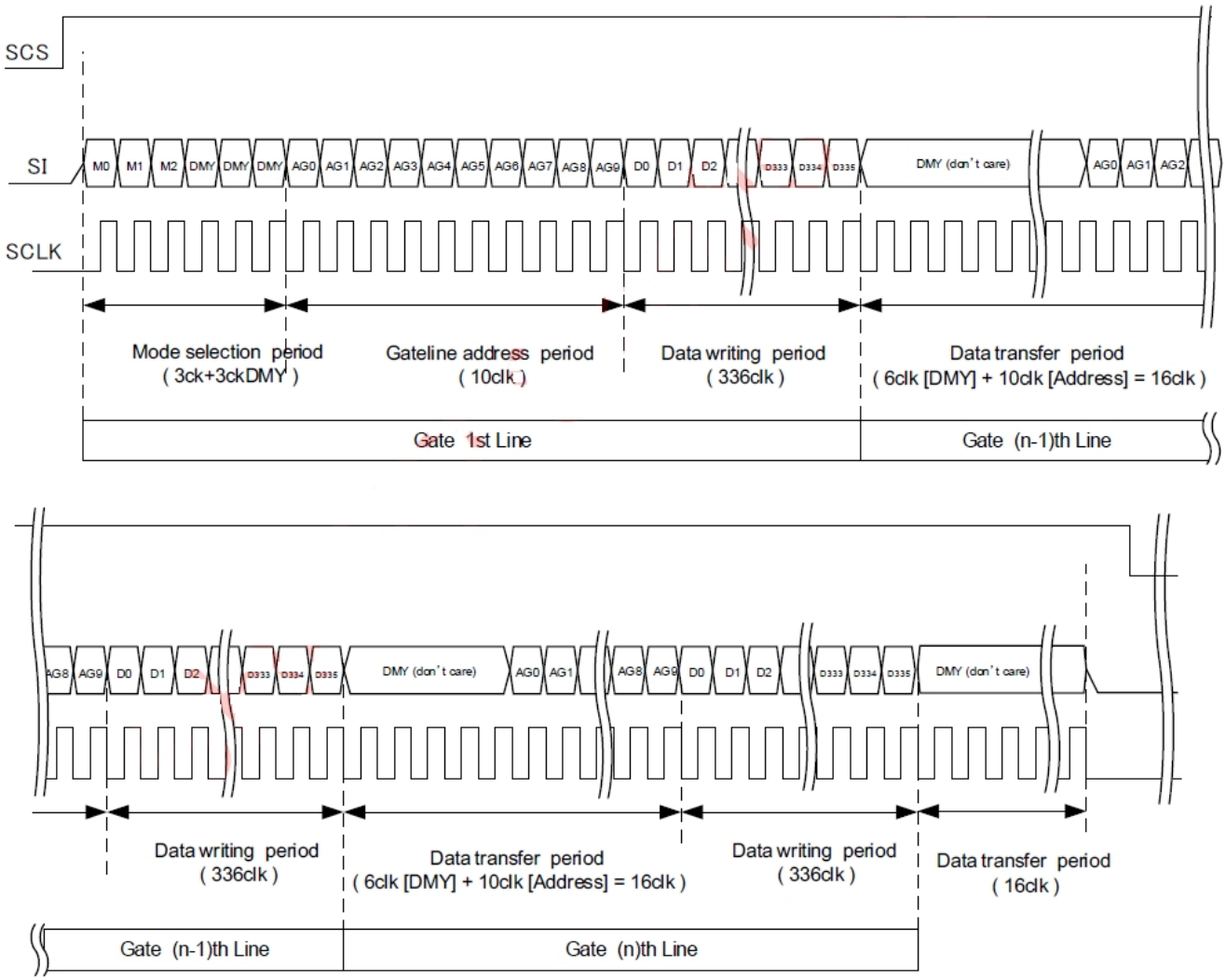
Writing Image data (Horizontal Line data)

Hi : White

Lo : Black

3.2.4.2 Data Update Mode (Multiple lines)

Updates arbitrary multiple lines data. (M0 = “Hi”、 M2 = “Lo”)



M0 : Mode flag.

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

Set for “Lo”: Hold mode (Maintain memory internal data update)

M1 : Mode 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 All Clear Mode to execute clear.

DUMMY DATA:

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

D0 – D335:

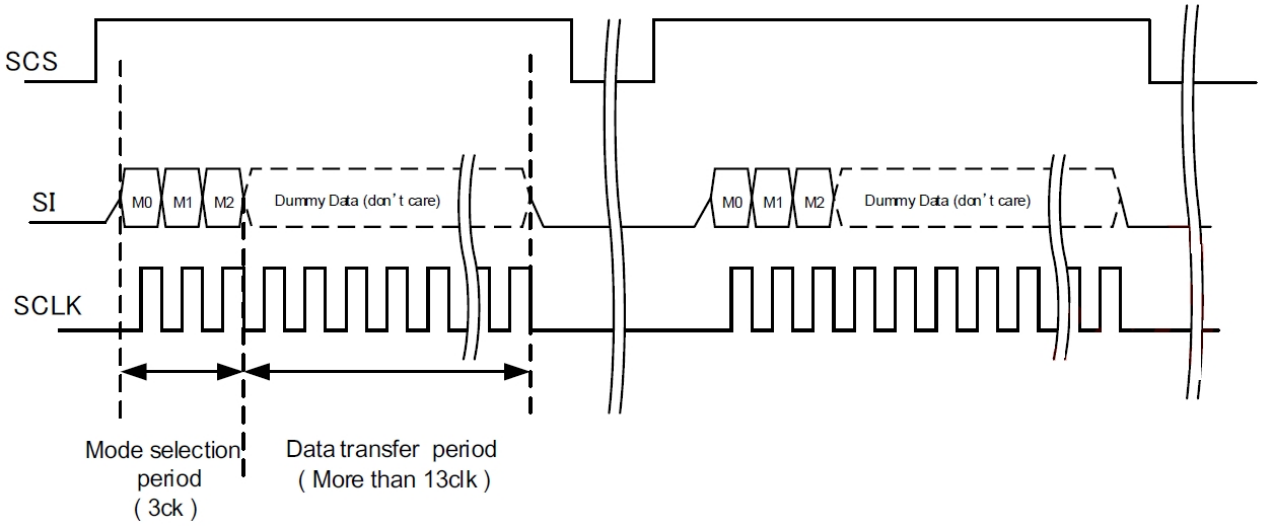
Writing Image data (Horizontal Line data)

Hi : White

Lo : Black

3.2.4.3 Old Mode

Maintains memory internal data (maintains current display). (M0 = “Lo”、 M2 = “Lo”)



M0 : Mode flag.

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

Set for “Lo”: Hold mode (Maintain memory internal data update)

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 All Clear Mode to execute clear.

DUMMY DATA:

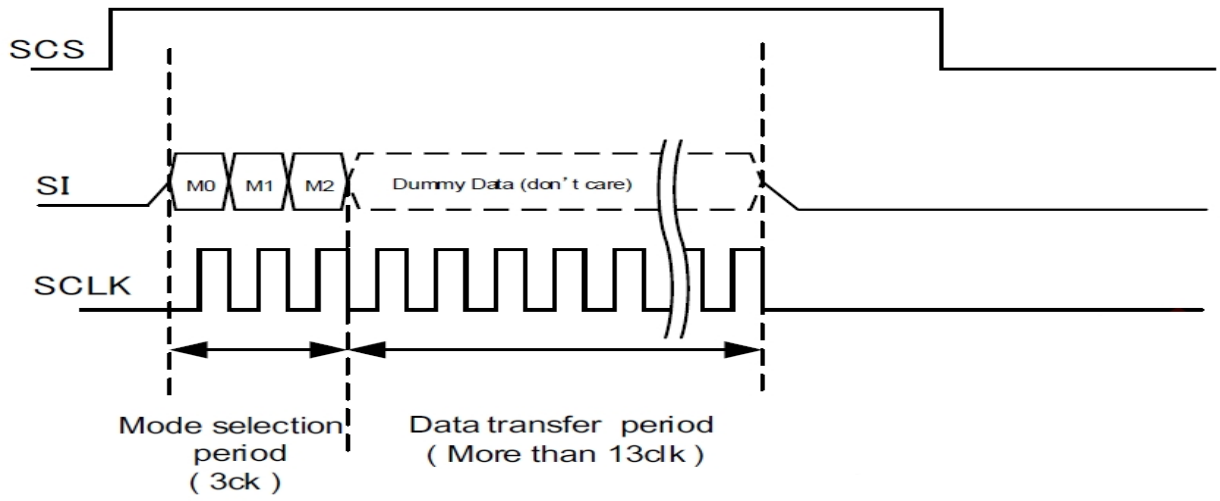
Dummy data: It can be “Hi” or “Lo” (“Lo” is recommended.)

M1 : Frame inversion flag is enabled when EXTMDOE= “Lo”.

When SCS becomes “Lo”, M0 and M2 are cleared.

3.2.4.4 All Clear Mode

Clears memory internal data and writes white. (M0 = “Lo”、 M2 = “Hi”)



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.)

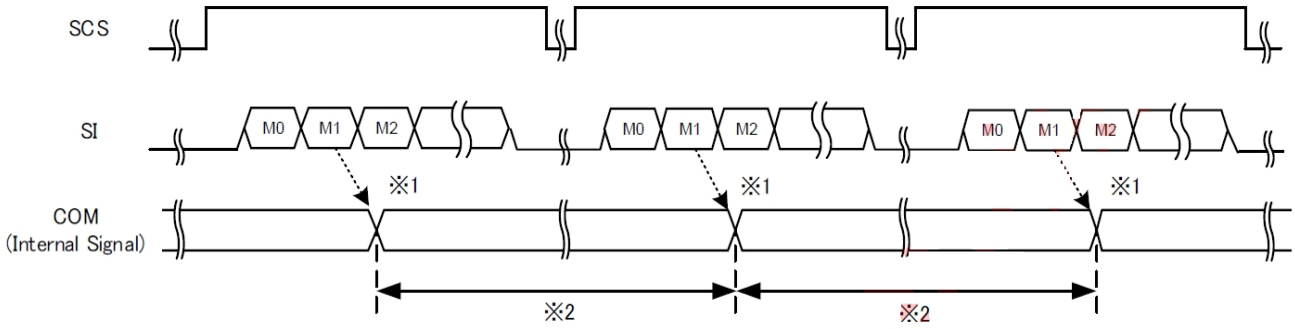
M1 : Frame inversion flag is enabled when EXTMDOE= “Lo”.

When SCS becomes “Lo”, M0 and M2 are cleared.

3.2.4.5 COM Inversion

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

EXTMODE= “Lo”



M1 : COM polarity inversion flag.

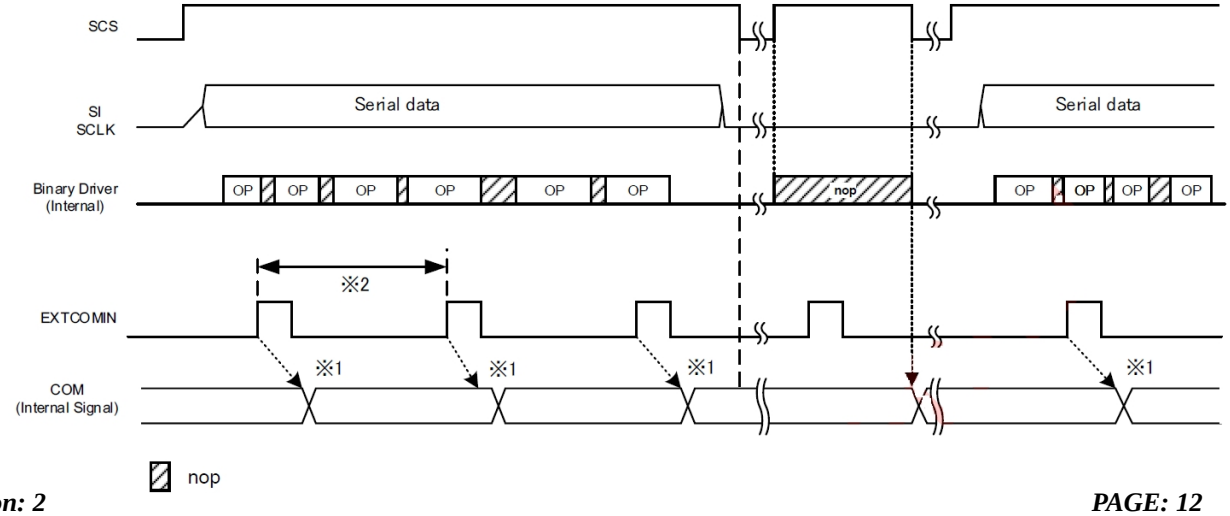
If M1 is “Hi” then VCOM= “Hi” is output. If M1 is “Lo” then VCOM= “Lo” is output.

COM inversion has been changed by M1 flag statement.

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

EXTMODE= “Hi” (COM inversion timing has two conditions)

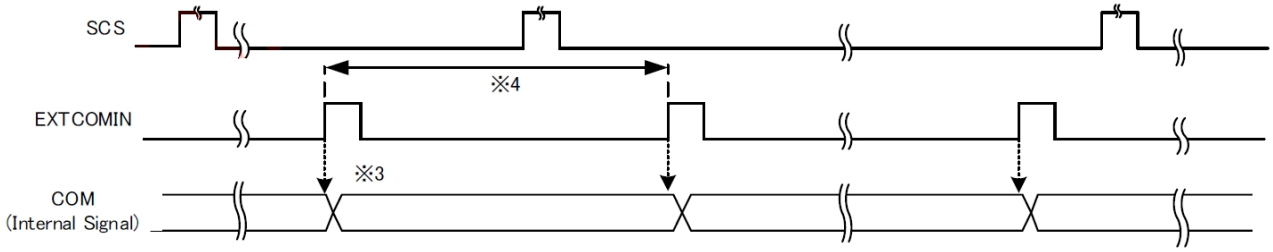
① EXTCOMIN input during high period of the SCS signal



1: Make “COM” reversal depending.

2: The periods of EXTCOMIN should be constant and the period of COM inversion should be constant depending on EXTCOMIN. (with Send a serial data or making the period of “SCS=Lo”)

② EXTCOMIN input during low period of the SCS signal



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

4: The periods of EXTCOMIN should be constant.

3.3 Power Consumption

Ta=25℃. 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: Vertical stripe display	--	30	330	μW	(Note 1)
Condition 2	Data update mode with display update 1Hz(1frarm/sec) Display pattern : Vertical stripe display	--	250	750	μW	(Note 2)

Note 1: After writed Vertical stripe data, set to (SCLK=L0, SCS=L0, SI=L0), It measures during

Note 2: fSCS=1.0Hz, Except in the time of writing, it is set to SCS=L0

4. Optical Characteristics

4.1 Optical characteristic of the LCD

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods.

Measuring equipment: BM-7A

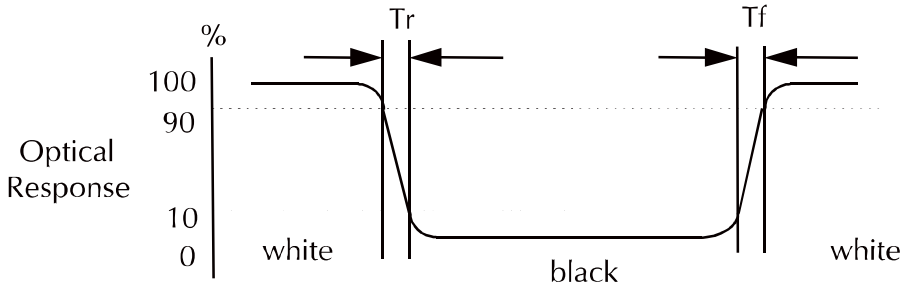
Item		Symbol	Condition	Min	Type	Max	Unit	Note
Response Time		Rise	θ=0°	-	10	--	ms	CM700d LCD-5200 DMS803
		Fall		-	20	--	ms	
Reflectivity Ratio			R	10	14	--	%	
Transmissivity Ratio			T	--	0.20	--	%	
Contrast ratio		CR	At optimized viewing angle	20	35	--	--	LCD-5200 DMS803
Color Chromaticity (CIE 1931)	White	Wx	θ=0° Normal Viewing Angle		0.31		--	CM700d
		Wy			0.33			
Viewing Angle	Hor.	θ_R	CR≥2	40	60	--	Degree	--
		θ_L		40	60	--		
	Ver.	θ_U		40	60	--		
		θ_D		40	60	--		

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

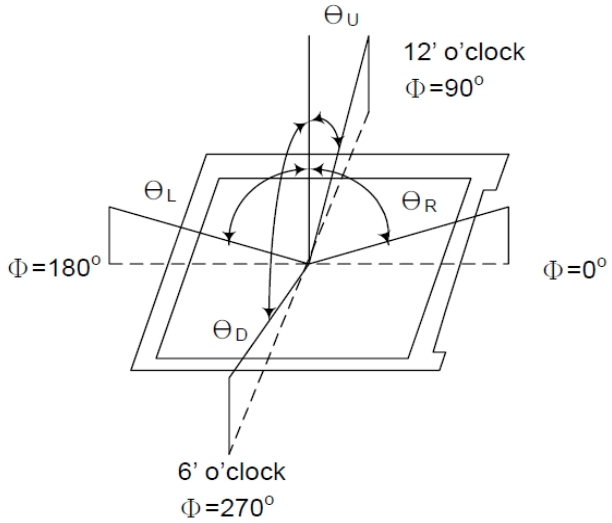


c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at “white state”}}{\text{Brightness measured when LCD is at “black state”}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type

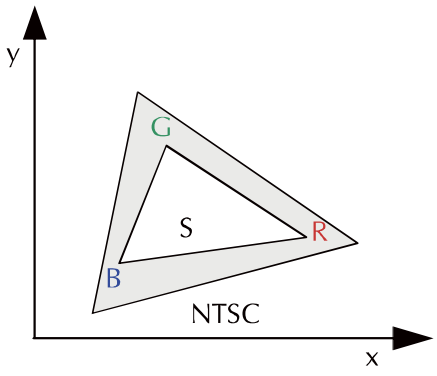
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut: NTSC(%) = (RGB Triangle Area / NTSC Triangle Area) x 100



5. I/O Terminal

5.1 LCM Pin Definition

Recommended Connector : AYF531035 (Panasonic) or FH34SRJ-10-0.5SH(HRS) or compatible

Pin No.	Symbol	I/O	Function	Remark
1	SCLK	I	Serial clock signal	
2	SI	I	Serial input signal	
3	SCS	I	Chip select signal	
4	EXTCOMIN	I	COM inversion polarity input pin	(2)
5	DISP	I	Display ON / OFF switching signal	(1)
6	VDDA	P	Power Source for Analog	
7	VDD	P	Power Source for Logic	
8	EXTMODE	I	COM inversion mode switch terminal	(2)
9	VSS	P	Logic ground	
10	VSSA	P	Analogue ground	

I: Input, P: Power

Note (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.

(2) When EXTMODE is "Hi", EXTCOMIN signal is enable.

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

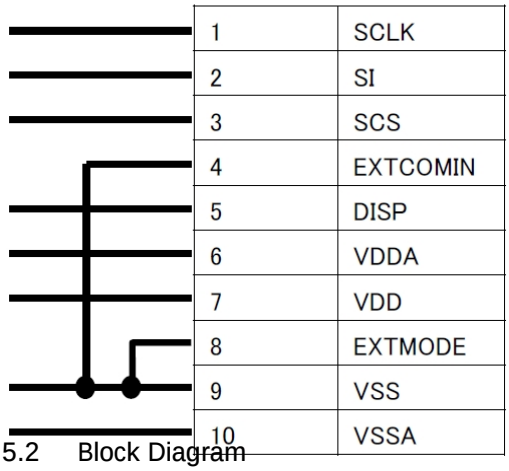
"Hi" mode ; connect the EXTMODE to VDD,

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

Recommended Circuit

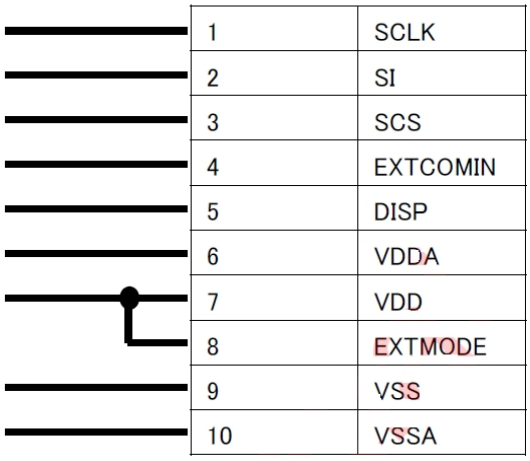
< EXTMODE="Lo" >

COM Signal Serial Flag Input

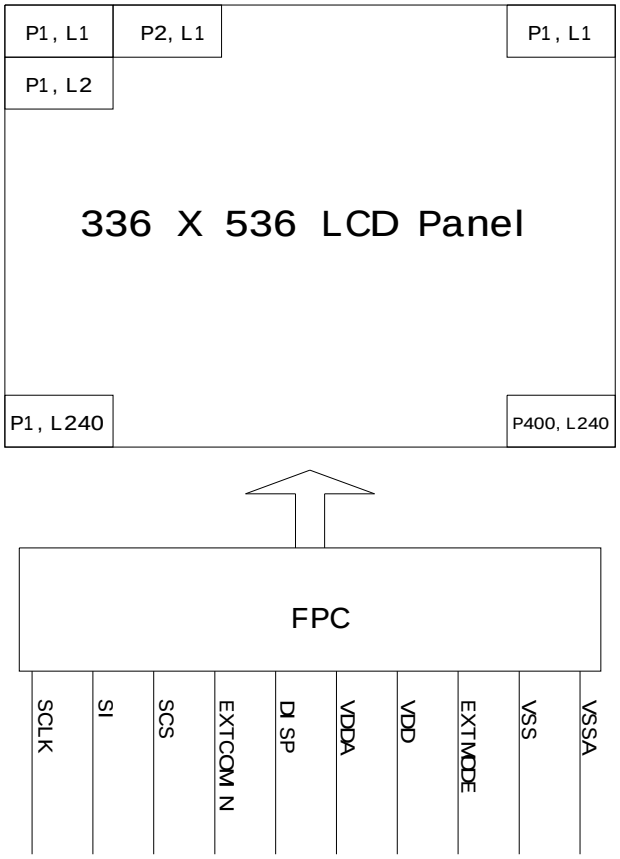


< EXTMODE="Hi" >

External COM Signal Input



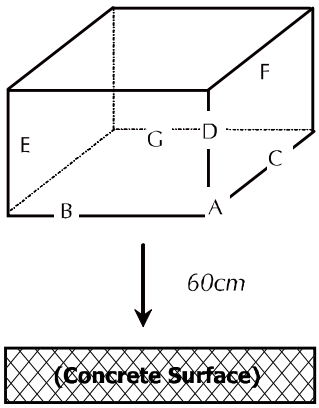
5.2 Block Diagram


P1, L1
P2, L1
P1, L1
P1, L2
336 X 536 LCD Panel
P1, L240
P400, L240
FPC
SCLK
SI
SCS
EXTCOMMIN
DISP
VDDA
VDD
EXTMODE
VSS
VSSA

6. Reliability Condition

No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.
Temperature: 20°C±5°C.
Humidity: 65%±5% RH.
Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	+70°C ± 2°C, 240hrs (Operation state).	
2	Low Temperature Operating	-20°C ± 2°C, 240hrs (Operation state).	1
3	High Temperature Storage	+80°C ± 2°C, 240hrs.	2
4	Low Temperature Storage	-30°C ± 2°C, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	40°C ± 2°C, 95%, 240hrs.	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10~55Hz. One cycle 60 seconds to 3 direction of Random 15 minutes.	3
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  *Dropping method corner dropping:* *A corner: Once edge dropping.* *B, C, D edge: Once face dropping.* *E, F, G face: Once.*	

Notes: 1. No dew condensation to be observed.
2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
3. Vibration test will be conducted to the product itself without putting I in a container.

7. Dimensional Outlines