

Specification

COM57H5N27XLC

5.7" - 640 x 480 – RGB

Spec Revision: 2.0
Revision Date: 26.12.2024

Note: This specification is subject to change without prior notice



Specifications for

Blanview TFT-LCD Monitor

(5.7" VGA 640 x RGB x 480 Landscape)



Sunlight readable TFT-LCD Monitor

Version 2.0

(Please be sure to check the specifications latest version.)

MODEL COM57H5N27XLC

Customer's Approval

Signature :

Name :

Section :

Title :

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ORTUSTECH



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Contents

1. Application	4
2. Outline Specifications		
2.1 Features of the Product	5
2.2 Display Method	.....	5
3. Dimensions and Shape		
3.1 Dimensions	.....	7
3.2 Outward Form	.....	8
3.3 Serial Label (S-Label)	.....	9
4. Pin Assignment		
4.1 Display Module Part	.....	10
4.2 Backlight Part	.....	11
5. Absolute Maximum Rating	.....	12
6. Recommended Operating Conditions	.....	12
7. Electrical Characteristics	.....
7.1 DC Characteristics	.....	13
7.2 AC Characteristics	.....	13
7.3 Input Timing Characteristics	.....	15
7.4 Driving Timing Chart	.....	16
7.5 Example of Driving Timing Chart (fCLK=25MHz)	.....	17
8. Description of Operation		
8.1 Power On/Off Sequence	.....	18
8.2 Power On Clear	.....	18
8.3 "DISP" On/Off Sequence	.....	19
9. Circuit		
9.1 Driving Circuit Example(The case of AVDD = 12.0V)	.....	20
9.2 LED Circuit	.....	21
10. Characteristics		
10.1 Optical Characteristics	.....	22
10.2 About Sunlight readable	.....	22
10.3 Temperature Characteristics	.....	23
11. Criteria of Judgment		
11.1 Defective Display and Screen Quality	.....	24
11.2 Screen and Other Appearance	.....	25
12. Reliability Test	.....	26
13. Packing Specifications	.....	28
14. Handling Instruction		
14.1 Cautions for Handling LCD panels	.....	29
14.2 Precautions for Handling	.....	30
14.3 Precautions for Operation	.....	30
14.4 Storage Condition for Shipping Cartons	.....	31
14.5 Precautions for Peeling off the Protective film	.....	32
14.6 Warranty	.....	32
APPENDIX	.....	33

1. Application

This Specification is applicable to 144.0 mm (5.7 inch) Blanview TFT-LCD monitor for non-military use.

- ◎ TOPPAN makes no warranty or assume no liability that use of this Product and/or any information including drawings in this Specification by Purchaser is not infringing any patent or other intellectual property rights owned by third parties, and TOPPAN shall not grant to Purchaser any right to use any patent or other intellectual property rights owned by third parties. Since this Specification contains TOPPAN's confidential information and copy right, Purchaser shall use them with high degree of care to prevent any unauthorized use, disclosure, duplication, publication or dissemination of TOPPAN's confidential information and copy right.
- ◎ If Purchaser intends to use this Products for an application which requires higher level of reliability and/or safety in functionality and/or accuracy such as transport equipment (aircraft, train, automobile, etc.), disaster-prevention/security equipment or various safety equipment, Purchaser shall consult TOPPAN on such use in advance.
- ◎ This Product shall not be used for application which requires extremely higher level of reliability and/or safety such as aerospace equipment, telecommunication equipment for trunk lines, control equipment for nuclear facilities or life-support medical equipment.
- ◎ It must be noted as an mechanical design manner, especial attention in housing design to prevent arcuation/flexure caused by stress to the LCD module shall be considered.
- ◎ TOPPAN assumes no liability for any damage resulting from misuse, abuse, and/or miss-operation of the Product deviating from the operating conditions and precautions described in the Specification.
- ◎ It shall be mutually conferred if nonconforming defect which result from unspecified cause in this specification arises.
- ◎ If any issue arises as to information provided in this Specification or any other information, TOPPAN and Purchaser shall discuss them in good faith and seek solution.
- ◎ TOPPAN assumes no liability for defects such as electrostatic discharge failure occurred during peeling off the protective film or Purchaser's assembly process.
- ◎ This Product is compatible for RoHS(2.0) directive.

Object substance	Maximum content [ppm]
Cadmium and its compound	100
Hexavalent Chromium Compound	1000
Lead & Lead compound	1000
Mercury & Mercury compound	1000
Polybrominated biphenyl series (PBB series)	1000
Polybrominated biphenyl ether series (PBDE series)	1000
Bis(2-ethylhexyl)phthalate series(DEHP series)	1000
Butyl benzyl phthalate series(BBP series)	1000
Dibutyl phthalate series(DBP series)	1000
Diisobutyl phthalate series(DIBP series)	1000

2. Outline Specifications



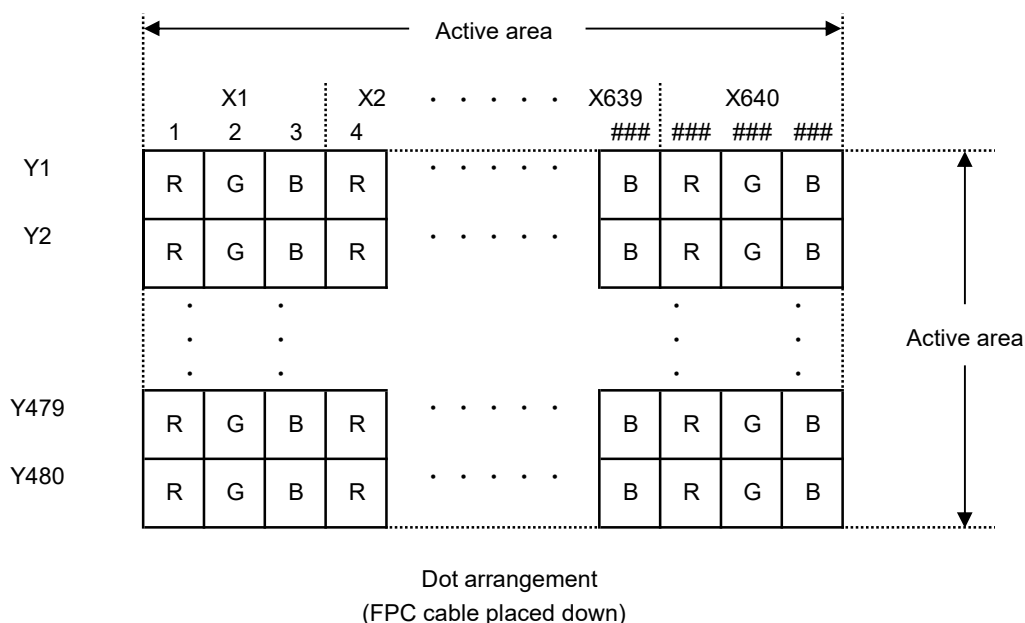
2.1 Features of the Product

- 5.7 inch diagonal display, 1,920 [H] x 480 [V] dots.
- 6-bit 262,144 color display capability.
- Built in Timing generator (TG).
- Long life & High bright white LED back-light.
- Blanview TFT-LCD, improved outdoor readability.

	Indoor		Outdoor	
	Readability	Power Efficiency (Battery Life)	Readability	Power Efficiency (Battery Life)
Transmissive	Good	Good	Average	Poor
Transflective	Average	Poor	Good	Good
Blanview	Good	Good	Excellent	Excellent

2.2 Display Method

Items	Specifications	Remarks
Display type	TN type 262,144 colors. Blanview, Normally white.	
Driving method	a-Si TFT Active matrix. Line-scanning, Non-interlace.	
Dot arrangement	RGB stripe arrangement.	Refer to "Dot arrangement".
Signal input method	6-bit RGB, parallel input.	
NTSC ratio	50%	
Backlight type	Long life & High bright white LED.	

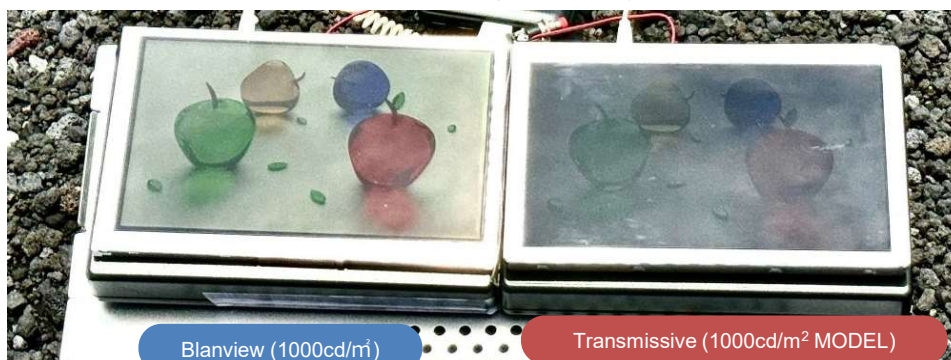


<Features of Blanview>

(A 7.0" WVGA display is shown as a typical sample)



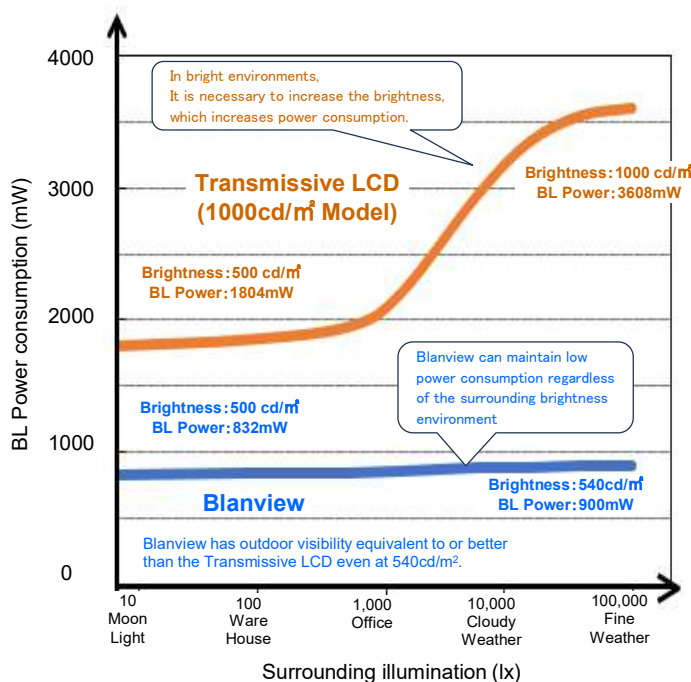
Blanview is a TFT-LCD monitor that achieves sunlight readability with low power consumption.



*Display image comparison photo outdoors (at 100,000lx)

* When compared at the same power consumption, Blanview's contrast at 100,000lx is more than two times higher than that of a transmissive LCD (1000cd/m² model). Blanview's contrast is 17.5, while that of a transmissive LCD is 7.5. Sunlight readability is Good with a contrast of 8 or higher on the TOPPAN index. (Contrast at 100,000lx is reference data.)

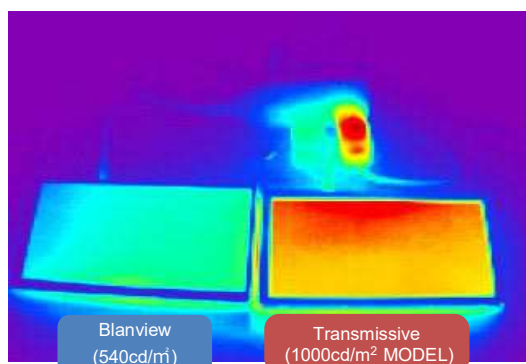
- Backlight power consumption required to assure visibility. (equivalent to 7.0" WVGA)



Sunlight Readable / BL Power comparison

	Sunlight Readable	BL Power
Transmissive LCD (1000cd/m ² Model)	Average	Poor
Blanview	Excellent	Excellent

In bright environment, other companies' products require higher brightness, which increases power consumption, However TOPPAN' Blanview can maintain low power consumption without increasing brightness (visibility is not easily affected by the environment).



*Observation image with thermograph

Transmissive LCD (1000cd/m² MODEL) consume a lot of power, which places a large load on the customer's power circuit, causing problems such as heat generation.

Blanview has low power consumption, so it places a low load on the customer's power supply circuit and does not cause any harmful effects such as heat generation.

3. Dimensions and Shape

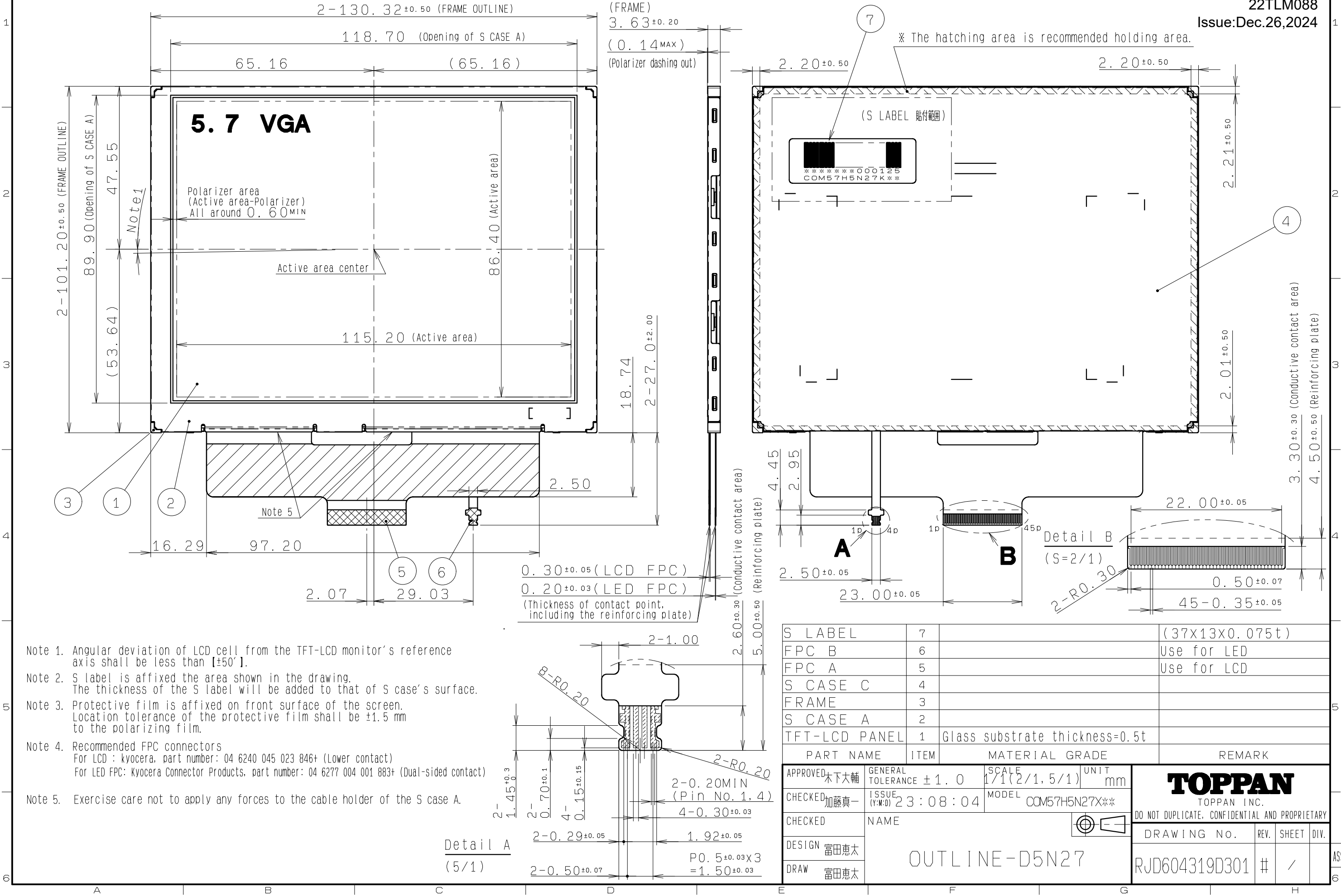
3.1 Dimensions

Items	Specifications	Unit	Remarks
Outline dimensions	130.32[H] × 101.20[V] × 3.63[D]	mm	Exclude FPC cable.
Active area	115.20[H] × 86.40[V]	mm	144.0mm diagonal.
Number of dots	1,920[H] × 480[V]	dot	
Dot pitch	60.00[H] × 180.00[V]	μm	
Surface hardness of the polarizer	3	H	Load:2.0N
Weight	81	g	Include FPC cable.

3.2 Outward Form

EC No.	REV. No.	REVISE	DATE (Y:M:D)	APPROVED	CHECKED	PREPARED
####			##:##:##	##	##	

(8/35)
22TLM088
Issue:Dec.26,2024

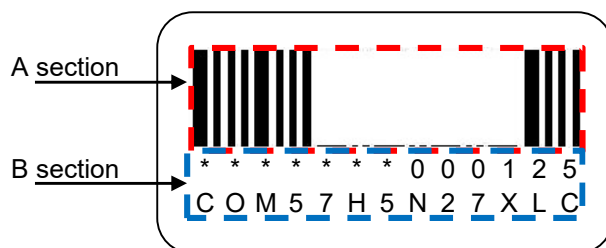


3.3 Serial Label (S-label)

3.3.1 Display Items

A section : Bar code

B section : Combination of a character



Details of B section

Upper column: It indicates The least significant digit of manufacture year (1 digit), manufacture month with below alphabet (1letter), model code (5characters), serial number (6digits).

*	*	*****	*****
—	—	—	—
a	b	c	d

Contents of display							
a	The least significant digit of manufacture year						
b	Manufacture month	Jan-A Feb-B	Mar-C Apr-D	May-E Jun-F	Jul-G Aug-H	Sep-I Oct-J	Nov-K Dec-L
c	Model code	57FXC (Made in Japan) 57FYC (Made in Malaysia)					
d	Serial number						

* Example of indication of Serial label (S-label)

•Made in Japan

2L57FXC000125

means "manufactured in December 2022, 5.7" FX type,
C specifications, serial number 000125"

•Made in Malaysia

2L57FYC000125

means "manufactured in December 2022, 5.7" FY type,
C specifications, serial number 000125"

Lower column: Model (13characters)

3.3.2 Location of Serial Label (S-label)

Refer to 3.2 "Outward Form".

3.3.3 Others

Bar code readability is excluded from quality assurance coverage.

4. Pin Assignment

4.1 Display Module Part

No.	Symbol	Function
1	VSS	GND.
2	VGL	Negative voltage for gate driver.
3	VDD	Power supply for logic circuit.
4	VGH	Positive voltage for gate driver.
5	AVDD	Power supply for analog circuit.
6	V10	Source driver output level voltage. (negative case)
7	V6	Source driver output level voltage. (negative case)
8	V5	Source driver output level voltage. (positive case)
9	V1	Source driver output level voltage. (positive case)
10	POCB	Power on clear. (Low: Active)
11	DISP	Display on/off control signal. (Lo: display off, Hi: display on)
12	RL	Horizontally Flipped (right/left) signal. (Lo: Horizontally Flipped Display, Hi: Normal display)
13	UD	Vertically Flipped (up/down) signal. (Lo: Normal display, Hi: Vertically Flipped Display)
14	VSS	GND.
15	VDD	Power supply for logic circuit.
16	DE	Input data effective signal. (It is effective for the period of "Hi")
17	HSYNC	Horizontal sync signal. (Low active)
18	VSYNC	Vertical sync signal. (Low active)
19	CLK	Clock signal. Latching data at the rising edge.
20	TEST5	Short to VSS.
21	TEST6	Short to VSS.
22	D00	Display data(R). 00h: Black D00: LSB D05: MSB Driver has internal gamma conversion.
23	D01	
24	D02	
25	D03	
26	D04	
27	D05	
28	TEST3	Short to VSS.
29	TEST4	Short to VSS.
30	D10	Display data(G). 00h: Black D10: LSB D15: MSB Driver has internal gamma conversion.
31	D11	
32	D12	
33	D13	
34	D14	
35	D15	
36	TEST1	Short to VSS.
37	TEST2	Short to VSS.
38	D20	Display data(B). 00h: Black D20: LSB D25: MSB Driver has internal gamma conversion.
39	D21	
40	D22	
41	D23	
42	D24	
43	D25	
44	VCOM	Input signal for common electrode.
45	VSS	GND.

- Recommended connector: Kyocera, 6240 series [04 6240 045 023 846+]
- Please make sure to check a consistency between pin assignment in "3.2 Outward Form" and your connector pin assignment when designing your circuit.
Inconsistency in input signal assignment may cause a malfunction.
- Since FPC cable has gold plated terminals, gilt finish contact shoe connector is recommended.

4.2 Backlight Part

No.	Symbol	Function
1	BLH1	Backlight drive 1 (anode side).
2	BLH2	Backlight drive 2 (anode side).
3	BLL2	Backlight drive 2 (cathode side).
4	BLL1	Backlight drive 1 (cathode side).

- Recommended connector: Kyocera, 6277 series [04 6277 004 001 883+]
- Please make sure to check a consistency between pin assignment in "3.2 Outward Form" and your connector pin assignment when designing your circuit.
Inconsistency in input signal assignment may cause a malfunction.
- Since FPC cable has gold plated terminals, gilt finish contact shoe connector is recommended.

5. Absolute Maximum Rating

VSS=0V

Item	Symbol	Condition	Rating		Unit	Applicable terminal
			MIN	MAX		
Supply voltage for logic	VDD	Ta=25° C Note 1	-0.3	7.0	V	VDD
Supply voltage for analog1	AVDD		-0.3	13.5	V	AVDD
Supply voltage for analog2	VGH		-0.3	42.0	V	VGH
Supply voltage for analog3	VGL		VGH-42.0	0.3	V	VGL
Supply voltage for analog4 Note 2	Vy		-0.3	AVDD-0.1	V	V1,V5,V6,V10
Input voltage for logic	VI	Ta=25° C Note 1	-0.3	VDD+0.3	V	CLK,VSYNC,HSYNC,DE D[25:20],D[15:10],D[05:00],RL, UD,TEST1~6,DISP,POCB
Common electrode voltage	VCOM		-0.3	10.0	V	VCOM
LED direction current of order	IL		--	35	mA	BLH1 - BLL1, BLH2 - BLL2
		Ta=70° C	--	15		
Storage temperature range	Tstg		-30	80	°C	
Storage humidity range	Hstg	Non condensing in an environmental moisture at or less than 40°C90%RH.				

Note1: Please refer to the "Power On/Off Sequence" section of this document.

Note2: AVDD>V1>V5>V6>V10>VSS.

6. Recommended Operating Conditions

VSS=0V

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Supply voltage for logic	VDD	Ta=25° C	3.0	3.3	3.6	V	VDD
Supply voltage for analog1	AVDD		11.0	12.0	13.0	V	AVDD
Supply voltage for analog2	VGH		20.0	21.0	22.0	V	VGH
Supply voltage for analog3	VGL		-8.0	-7.0	-6.0	V	VGL
Common electrode voltage Note 1	VCOM		4.2	4.7	5.2	V	VCOM
Contrast range	V1		10.3	10.6	10.9	V	V1
	V5		6.8	7.2	7.5	V	V5
	V6		5.2	5.5	5.8	V	V6
	V10		0.7	0.8	0.9	V	V10
Input voltage for logic	VI		0	--	VDD	V	CLK,VSYNC,HSYNC, DE,D[25:20],D[15:10], D[05:00],RL,UD,DISP, POCB
Operating temperature range	Top	Note 2,3	-20	25	70	°C	Panel surface temperature
Operating humidity range	Hop	Ta≤40° C	20	--	85	%	
		Ta>40° C	Non condensing in an environmental moisture at or less than 40°C85%RH.				

Note1: This range indicates the most probable range for the optimal setting for VCOM.

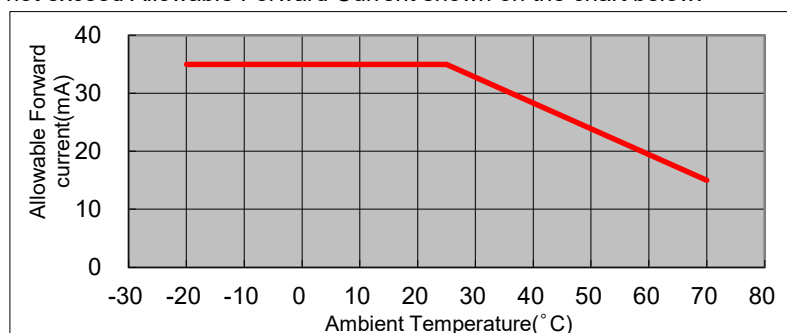
It does not mean that the optimal settings for VCOM for all monitors will be in this range.

VCOM should be optimized by viewing/using the monitor.

Note2: This monitor is operatable in this temperature range. With regard to optical characteristics, refer to Item "10. Characteristics".

Note3: Acceptable Forward Current to LED is up to 15mA, when Ta=+70° C.

Do not exceed Allowable Forward Current shown on the chart below.

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7. Electrical Characteristics

7.1 DC Characteristics

7.1.1 Display Module

(Unless otherwise noted, Ta=25°C, VDD=3.3V, VSS=0V)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Input voltage for logic	VIH		0.7×VDD	--	VDD	V	CLK, VSYNC, HSYNC, DE, D[25:20], D[15:10], D[05:00], RL, UD, DISP, POCB
	VIL		0	--	0.3×VDD	V	
Pull up resistor value	Rpu		300	450	600	kΩ	DISP, POCB
Pull down resistor value	Rpd		300	450	600	kΩ	DE, D[25:20], D[15:10], D[05:00], TEST1~6,
Current consumption	IDD	fCLK=25MHz Color bar display	--	7.0	14.0	mA	VDD
	IAVDD	VDD=3.3V AVDD=12.0V	--	14.0	28.0	mA	AVDD
	IGH	VGH=21.0V VGL=-7.0V	--	120	240	μA	VGH
	IGL		-240	-120	--	μA	VGL

7.1.2 Backlight

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Forward current	IL25	Ta=25°C	--	14.4	35.0	mA	BLH1 - BLL1
	IL70	Ta=70°C	--	--	15.0	mA	BLH2 - BLL2
Forward voltage	VL	Ta=25°C, IL= 14.4 mA	23.02	24.72	25.50	V	*Reference only
Estimated Life of LED	LL	Ta=25°C, IL= 14.4 mA Note	--	50,000	--	hrs	

Note: - The lifetime of the LED is defined as a period till the brightness of the LED decreases to the half of its initial value.

- This figure is given as a reference purpose only, and not as a guarantee.
- This figure is estimated for an LED operating alone.

As the performance of an LED may differ when assembled as a monitor.

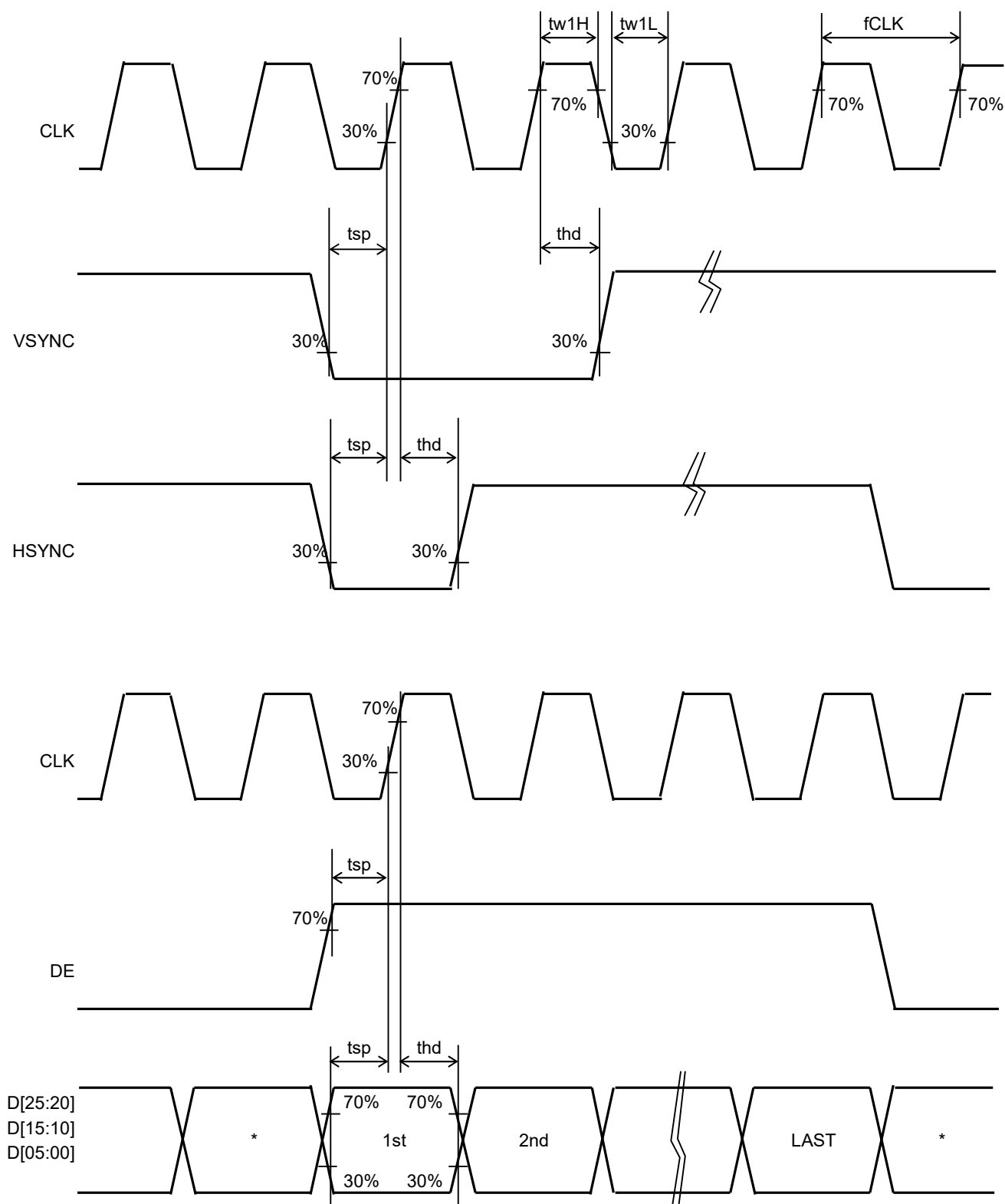
- Estimated lifetime could vary on a different temperature and usually higher temperature could reduce the life significantly.

7.2 AC Characteristics

(Unless otherwise noted, Ta=25°C, VDD=3.3V, VSS=0V)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
CLK frequency	fCLK		--	25	27	MHz	CLK
CLK Low period	tw1L	0.3×VDD or less.	14.8	--	--	ns	CLK
CLK High period	tw1H	0.7×VDD or more.	14.8	--	--	ns	CLK
Setup time	tsp		10	--	--	ns	CLK, DE, D[25:20], D[15:10], D[05:00], HSYNC, VSYNC
Hold time	thd		10	--	--	ns	

Switching Waveform Characteristics



7.3 Input Timing Characteristics

Item	Symbol	Rating			Unit	Applicable terminal
		MIN	TYP	MAX		
CLK frequency	fCLK	--	25	27	MHz	CLK
VSYNC signal cycle time	tv	--	525	--	H	VSYNC,HSYNC
VSYNC frequency Note1	fVSYNC	54	60	66	Hz	VSYNC
VSYNC pulse width	tw2H	1	3	5	H	VSYNC,HSYNC
Vertical back porch	tvb	--	35	--	H	VSYNC,HSYNC,DE,D[25:20], D[15:10],D[05:00]
Vertical display period	tvdp	--	480	--	H	
HSYNC signal cycle time	th	--	800	--	CLK	HSYNC,CLK
HSYNC pulse width	tw3H	5	30	--	CLK	HSYNC,CLK,DE,D[25:20], D[15:10],D[05:00]
Horizontal back porch	thb	112	--	144 Note 2	CLK	
Horizontal display period	thdp	--	640	--	CLK	
DE pulse width	tw4H	--	640	--	CLK	DE,CLK

Note1: The characteristic of this item is recommended standard.

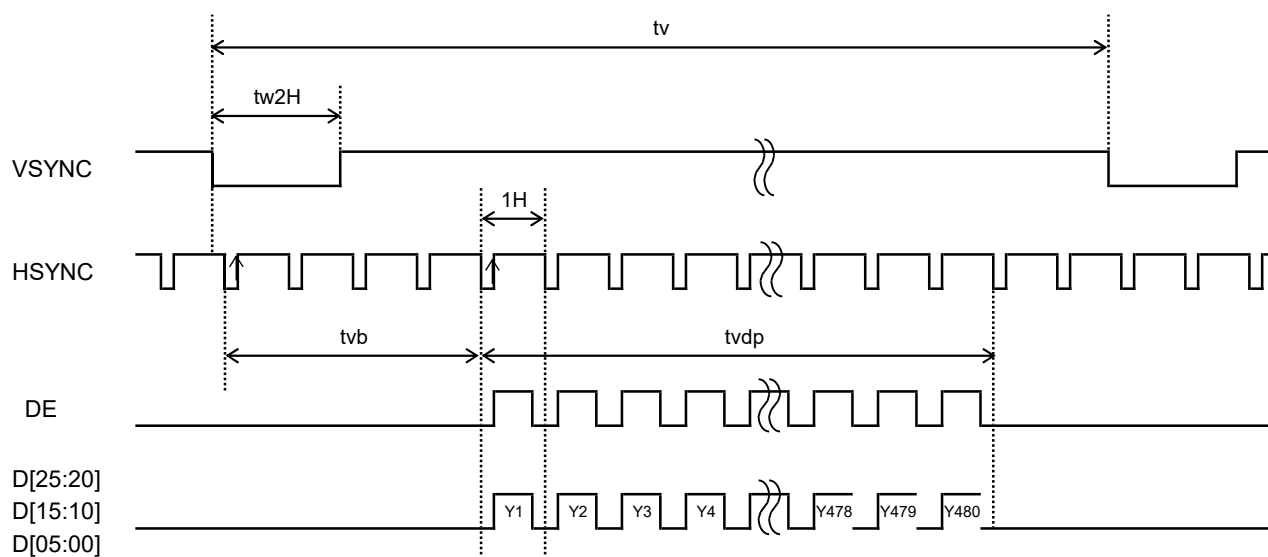
Please use it after it confirms it enough like the display fineness etc.

When it comes off from this characteristic and it is used.

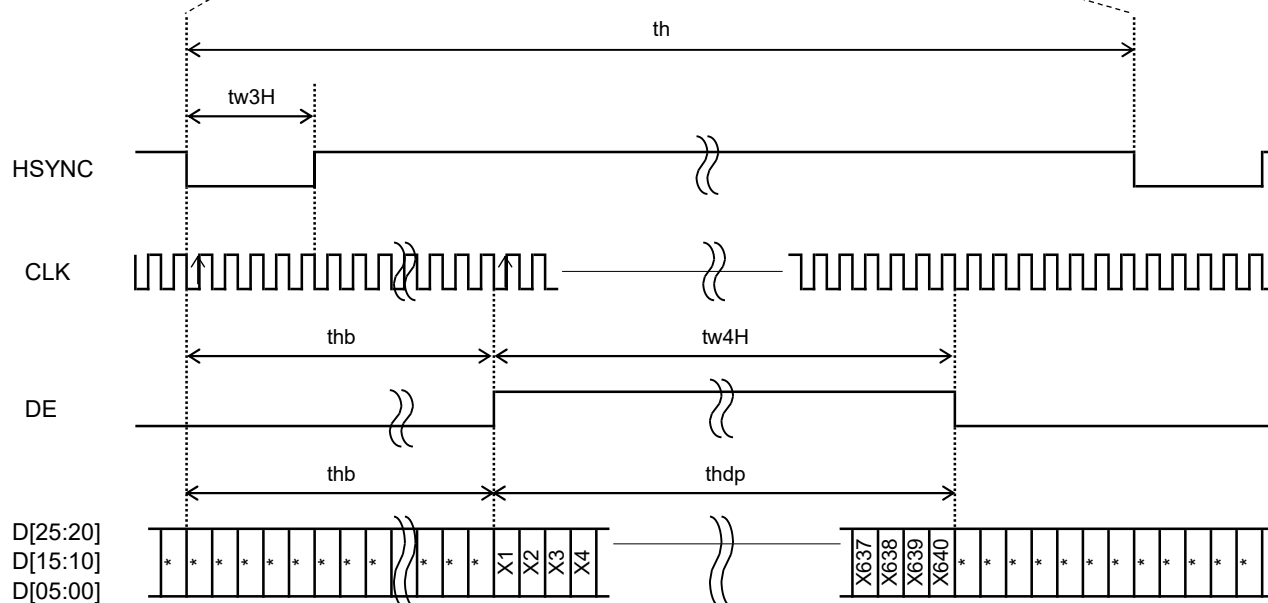
Note2: When "DE" keeps "Lo" for 144CLK or longer,start capturing data automatically from 144CLK.

7.4 Driving Timing Chart

-Vertical Timing

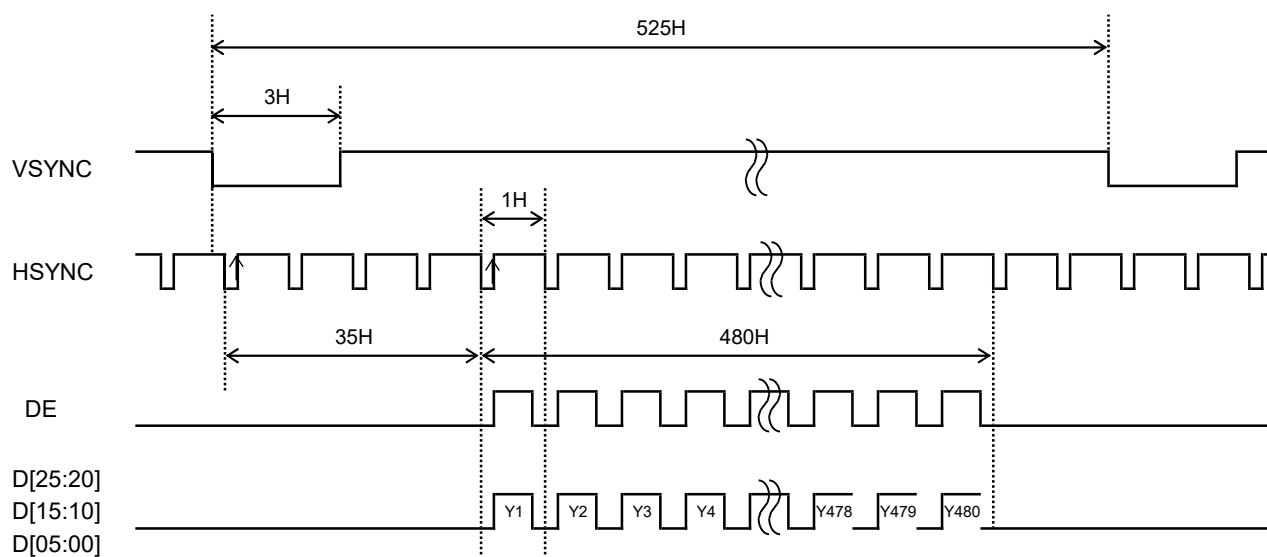


-Horizontal Timing

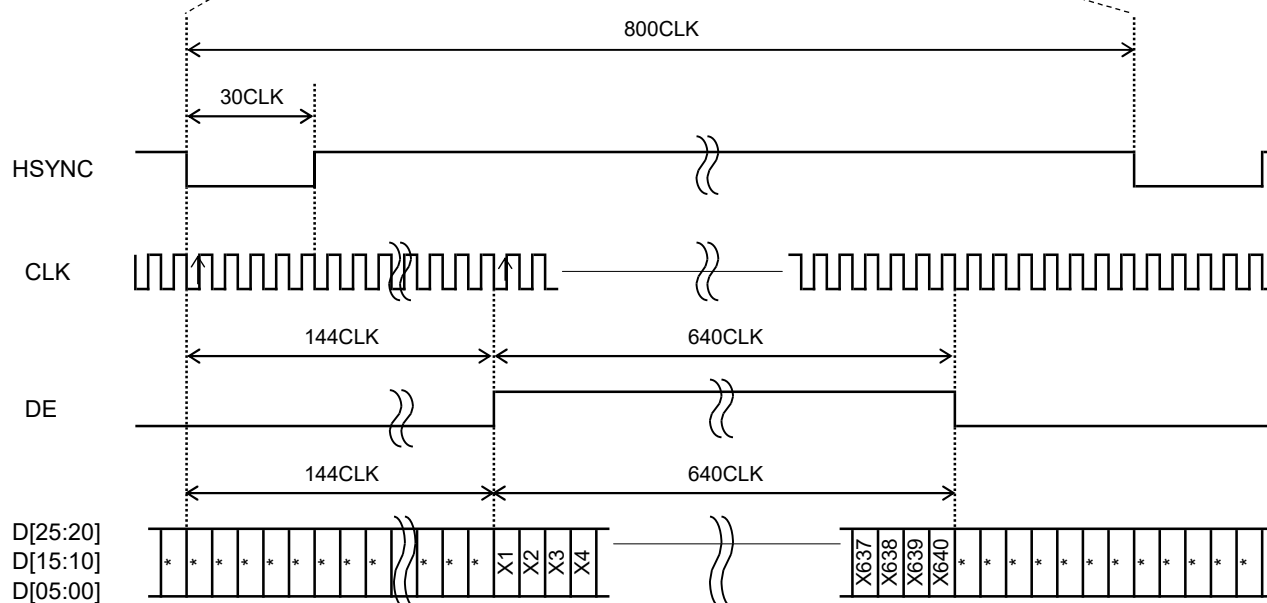


7.5 Example of Driving Timing Chart (fCLK=25MHz)

-Vertical Timing



-Horizontal Timing



8. Description of Operation

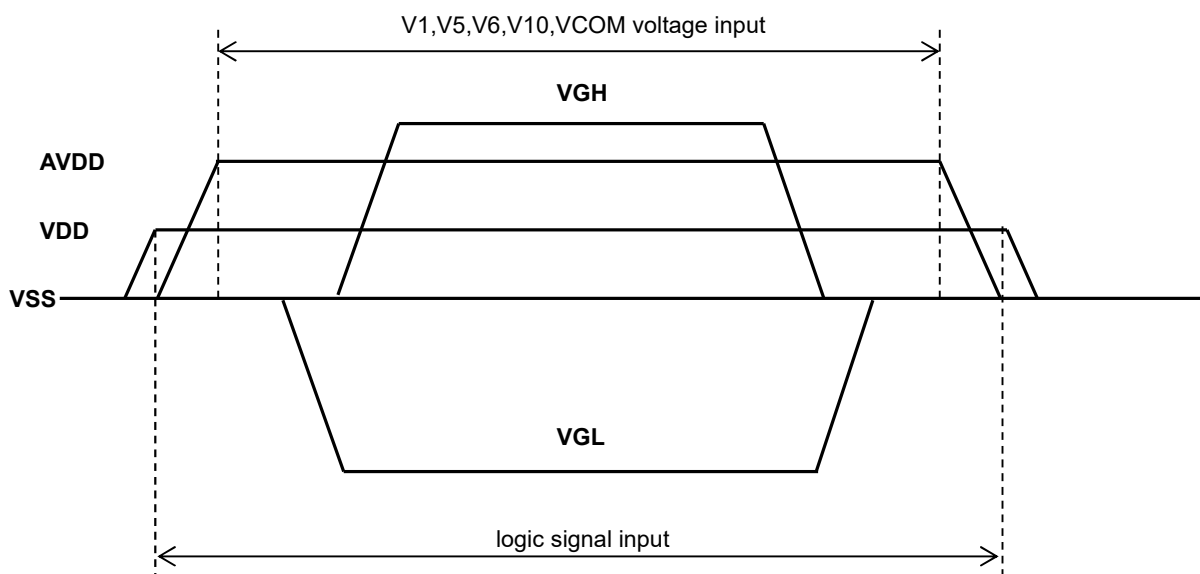
8.1 Power On/Off Sequence

The sequence of the Power On/Off and the signal input must defend the following conditions.

- Please input the logic signal after turning on VDD.
- Please input AVDD after turning on VDD or at the same time.
- Please input V1, V5, V6, V10 and VCOM voltage after turning on AVDD.
- Please input VGL after turning on VDD.
- Please input VGH after turning on VGL.

Power Off sequence is assumed to be opposite of the above mentioned sequence.

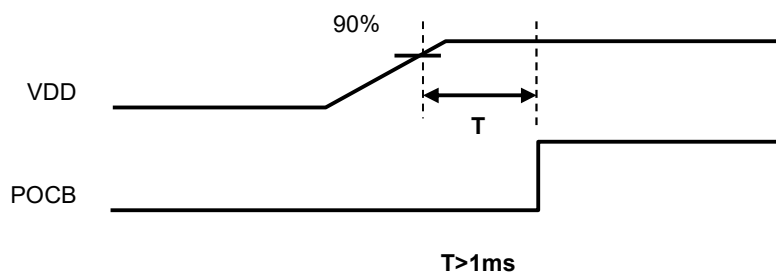
Please refer Power On/Off recommended sequence is shown in the figure below.



8.2 Power On Clear

There is a limitation between Power On and PO CB (power on clear) .

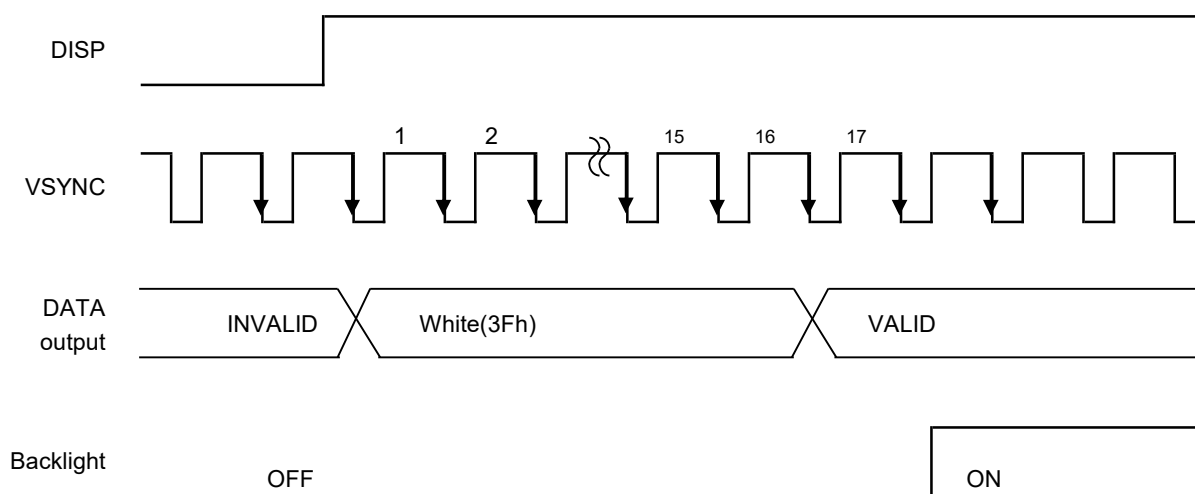
Please defend the following conditions.



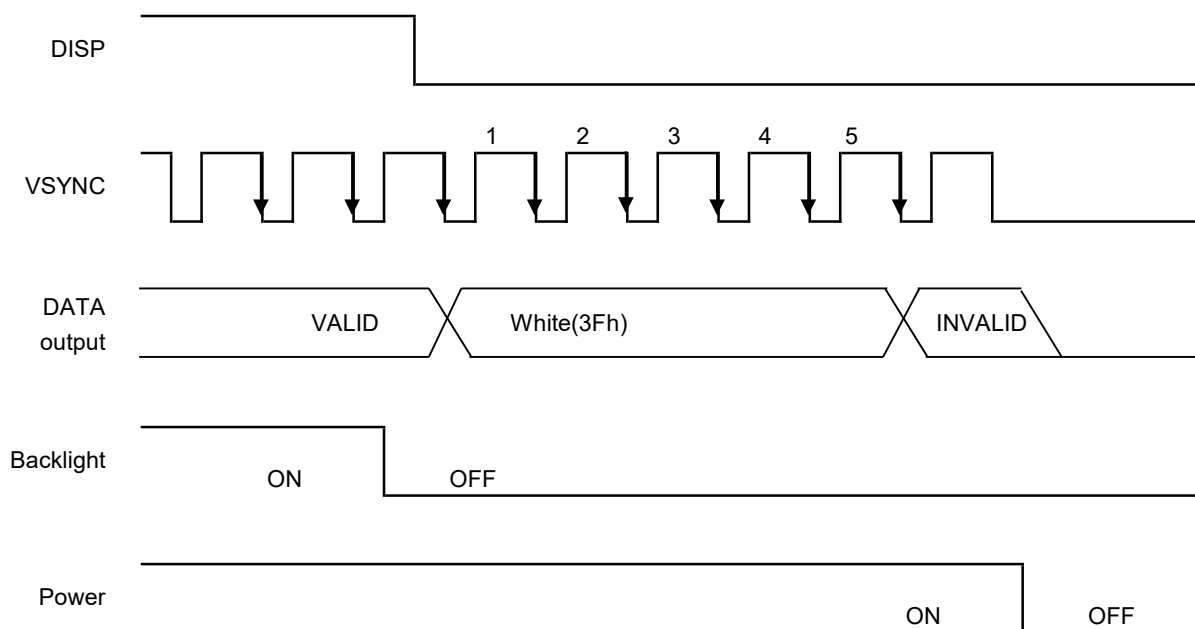
8.3 "DISP" On/Off Sequence

It explains the Display on/off sequence.

After Display on,"White" data is outputted for 16-Frames first,from the falling edge of the following VSYNC signal.

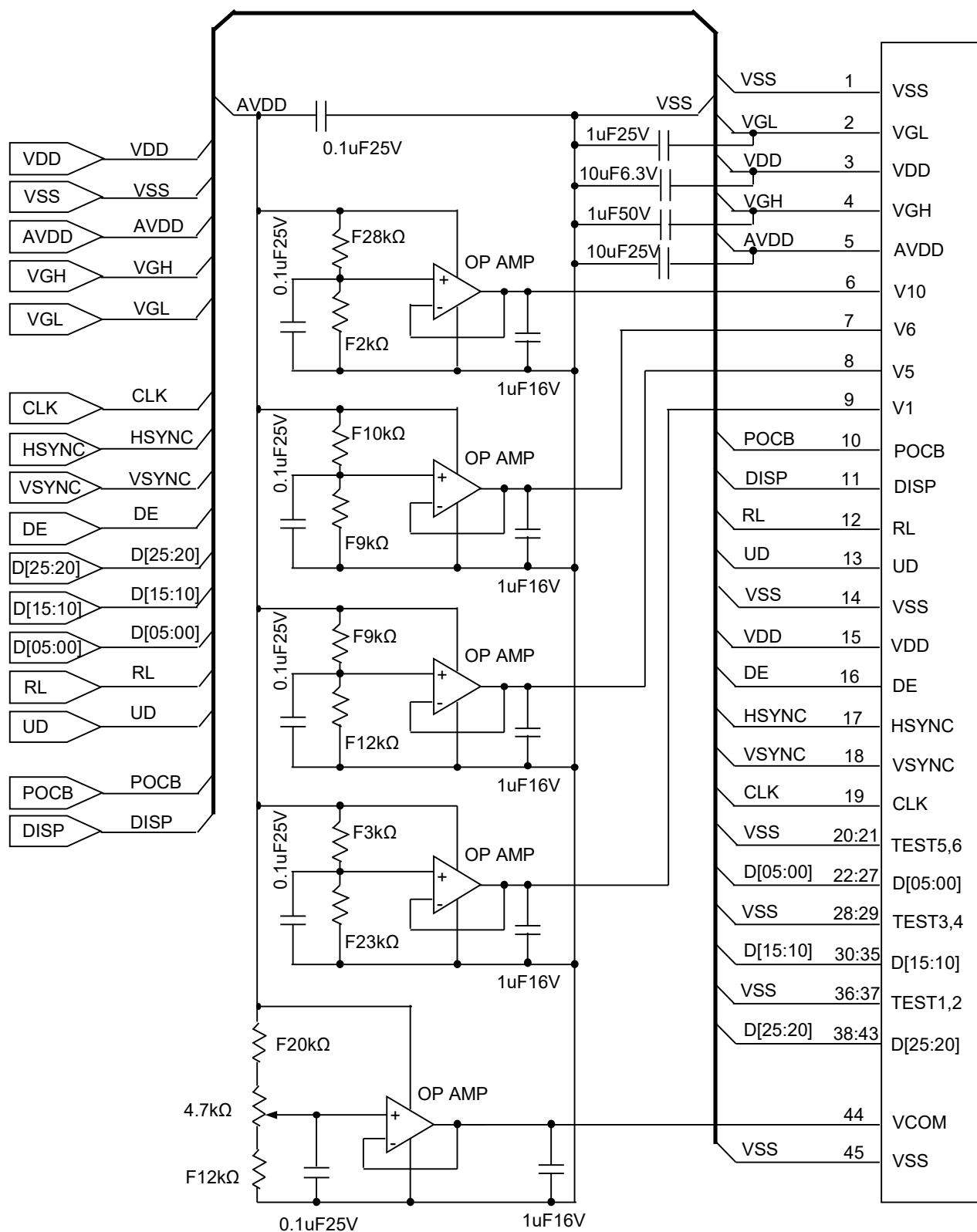


After Display off,"White" data is outputted for 5-Frames first,from the falling edge of the following VSYNC signal.
Please turn off the power supply promptly after OFF of "DISP".



9. Circuit

9.1 Driving Circuit Example(The case of AVDD = 12.0V)

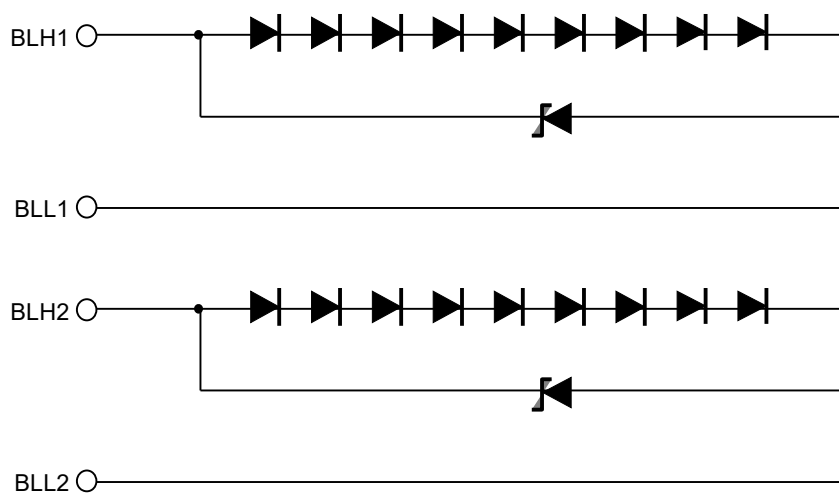


Example of OP AMP: NJM2742M

TFT-LCM Reference Circuit

This circuit design is for reference purposes only. Appropriate component values may be different.
Please evaluate on your side.

9.2 LED Circuit



10. Characteristics

10.1 Optical Characteristics

(Measurement Condition)

Measuring instruments: CS2000 (KONICA MINOLTA), LCD7200 (OTSUKA ELECTRONICS), EZcontrastXL88 (ELDIM)

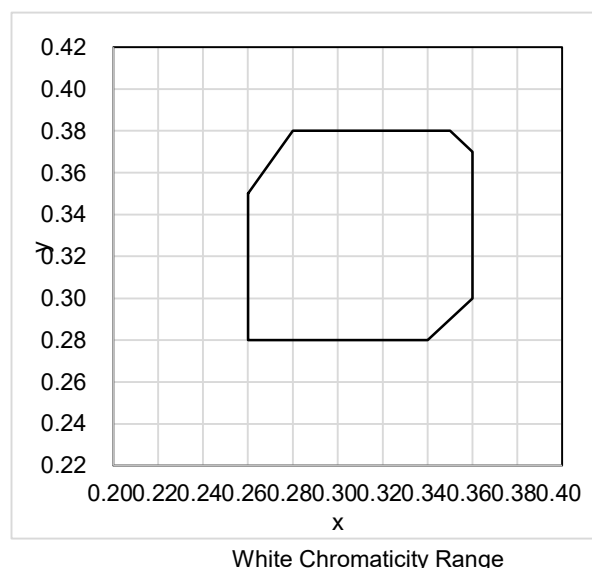
Driving condition: VDD=3.3V, VSS=0V, Optimized VCOMDC

Backlight: IL= 14.4 mA

Measured temperature: Ta = 25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note №	Remark
Response time	Rise time	TON + TOFF	[Data]= 00h← → 3Fh	-	-	100	ms	1	
	Fall time								
Contrast ratio	Backlight ON	CR	[Data]= 3Fh / 00h	360	600	-		2	
	Backlight OFF			-	5	-			
Viewing angle	Left	θL	[Data]= 3Fh / 00h CR ≥ 10	-	80	-	deg	3	
	Right	θR		-	80	-	deg		
	Up	φU		-	60	-	deg		
	Down	φD		-	65	-	deg		
White Chromaticity		x	[Data]= 3Fh	White chromaticity range				4	
		y							
Center Brightness			[Data]= 3Fh	385	550	-	cd/m ²	5	
Brightness distribution			[Data]= 3Fh	70	-	-	%	6	
Burn-in				No noticeable burn-in image shall be observed after 2 hours of window pattern display.				7	

* Note number 1 to 7: Refer to the APPENDIX of "Reference Method for Measuring Optical Characteristics and Performance".



(White Chromaticity Range)

x	y
0.26	0.35
0.26	0.28
0.34	0.28
0.36	0.30
0.36	0.37
0.35	0.38
0.28	0.38

10.2 About Sunlight readable

Item	Illuminance	Display visibility	Remarks
Sunlight readable	100,000 lx	Possible	Refer to <Features of Blanview>

10.3 Temperature Characteristics

(Measurement Condition)

Measuring instruments: CS2000 (KONICA MINOLTA), LCD7200 (OTSUKA ELECTRONICS)

Driving condition: VDD=3.3V, VSS=0V, Optimized VCOMDC

Backlight: IL= 14.4 mA

Item		Symbol	Specification		Remark
			Ta = -20 °C	Ta = 70 °C	
Response time	Rise time + Fall time	TON + TOFF	500 msec or less	80 msec or less	
Contrast ratio		CR	40 or more	40 or more	Backlight ON
Display Quality			No noticeable display defect or ununiformity should be observed.		

11. Criteria of Judgment

11.1 Defective Display and Screen Quality

Test Condition: Observed TFT-LCD monitor from front during operation with the following conditions:

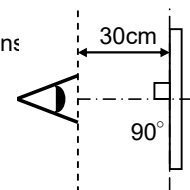
Driving Signal: Raster Patter (RGB, white, black)

Signal condition: [Data]:00h, 17h, 3Fh (3steps)

Observation distance: 30 cm

Illuminance: 200 to 350 lx

Backlight: IL=14.4mA



Defect item	Defect content		Criteria
Display Quality	Line defect	Black, white or color line, 3 or more neighboring defective dots	Not exists
	Dot defect	Uneven brightness on dot-by-dot base due to defective TFT or CF, or dust is counted as dot defect (brighter dot, darker dot) High bright dot: Visible through 2% ND filter at [Data]=00h Low bright dot: Visible through 5% ND filter at [Data]=00h Dark dot: Appear dark through white display at [Data]=17h Invisible through 5% ND filter at [Data]=00h	Refer to table 1 Acceptable
	Stain	Uneven brightness (white stain, black stain etc)	Invisible through 1% ND filter.
	Foreign particle	Point-like $0.25\text{mm} < \varphi$ $0.20\text{mm} < \varphi \leq 0.25\text{mm}$ $\varphi \leq 0.20\text{mm}$ Liner $3.0\text{mm} < \text{length and } 0.08\text{mm} < \text{width}$ $\text{length} \leq 3.0\text{mm or width} \leq 0.08\text{mm}$	N=0 N≤2 Acceptable N=0 Acceptable
Others			Use boundary sample for judgment when necessary

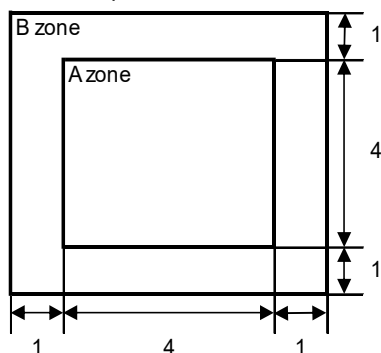
$\varphi(\text{mm})$: Average diameter = (major axis + minor axis)/2

Permissible number: N

Table1

Area	High bright dot	Low bright dot	Dark dot	Total	Criteria
A	0	2	2	3	Permissible distance between same color bright dots (includes neighboring dots): 3 mm or more Permissible distance between same color high bright dots (includes neighboring dots): 5 mm or more
B	2	4	4	6	
Total	2	4	4	7	

<Landscape model>



Division of A and B areas

B area: Active area

Dimensional ratio between A and B areas: 1: 4: 1

(Refer to the left figure)

11.2 Screen and Other Appearance

Testing conditions

Observation distance: 30 cm

Illuminance: 1200 ~ 2000 lx

Item		Criteria	Remark
Polarizer	Flaw	Ignore invisible defect when the backlight is on.	Applicable area: Active area only (Refer to the section 3.2 Outward Form)
	Stain		
	Dirt		
	Bubble		
	Dust		
	Dent		
S case		No functional defect occurs	
Connector		No functional defect occurs	

12. Reliability Test

Test item		Test condition	number of failures / number of examinations
Durability test	High temperature storage	Ta = 80°C 240hrs	0 / 3
	Low temperature storage	Ta = -30°C 240hrs	0 / 3
	High temperature & high humidity storage	Ta = 60°C, RH = 90%, non condensing ※	0 / 3
	High temperature operation	Tp = 70°C 240hrs	0 / 3
	Low temperature operation	Tp = -20°C 240hrs	0 / 3
	High temperature & high humidity operation	Tp = 40°C, RH = 90%, non condensing ※	0 / 3
	Thermal shock storage	-30°C ↔ 80°C (30min / 30min) 100cycles	0 / 3
Mechanical environmental test	Electrostatic discharge test (Non operation)	Confirms to EIAJ ED-4701/300, C=200pF, R=0Ω, V=±200V Each 3 times of discharge on and power supply and other terminals.	0 / 3
	Surface discharge test (Non operation)	C=250pF, R=100Ω, V=±12kV Each 5 times of discharge in both polarities on the center of screen with the case grounded.	0 / 3
	FPC tension test (FPC of LCD only)	Pull the FPC with the force of 3N for 10 sec. in the direction +/- 90-degree to its original direction.	0 / 3
	FPC bend test (FPC of LCD only)	Pull the FPC with the force of 3N for 10 sec. in the direction +/-180-degree to its original direction. Reciprocate it 3 times.	0 / 3
	Vibration test	Total amplitude 1.5mm, f=10~55Hz, X,Y,Z directions for each 2 hours	0 / 3
	Impact test	Use TOPPAN original jig (see next page) and make an impact with peak acceleration of 1000m/s ² for 6 msec with half sine-curve at 3 times to each X, Y, Z directions in conformance with JIS C 60068-2-27-2011.	0 / 3
Packing test	Packing vibration-proof test	Acceleration of 19.6m/s ² with frequency of 10→55→10Hz, X,Y, Zdirection for each 30 minutes.	0 / 1 packing
	Packing drop test	Drop from 75cm high. 1 time to each 6 surfaces, 3 edges, 1 corner	0 / 1 packing

Note: Ta=ambient temperature Tp=Panel temperature

※ The profile of high temperature/humidity storage and High Temperature/humidity operation (Pure water of over 10MΩ·cm shall be used.)

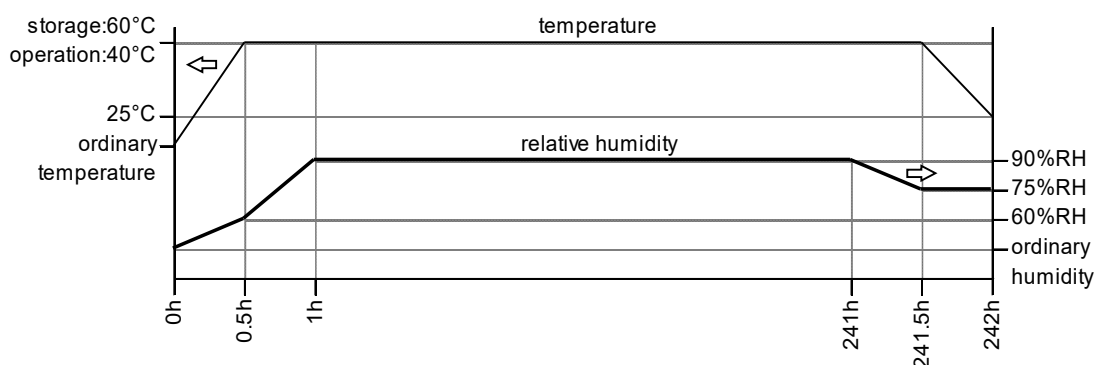
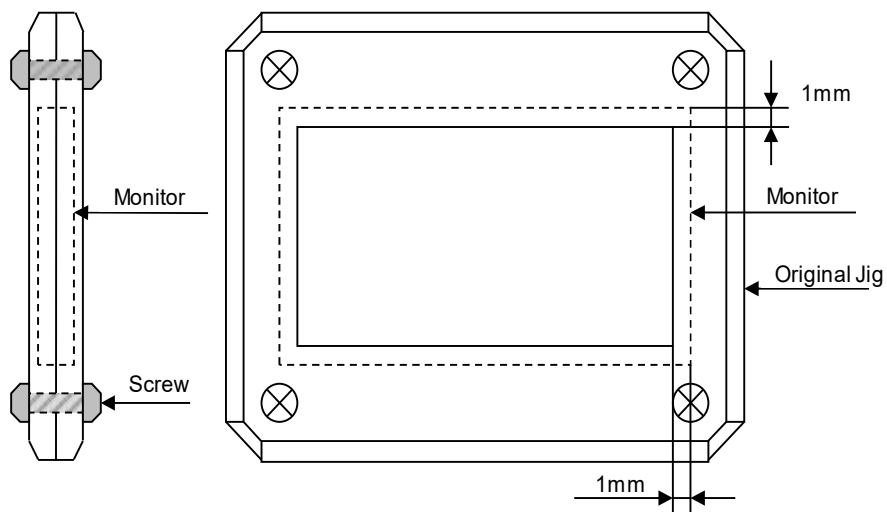


Table2. Reliability Criteria

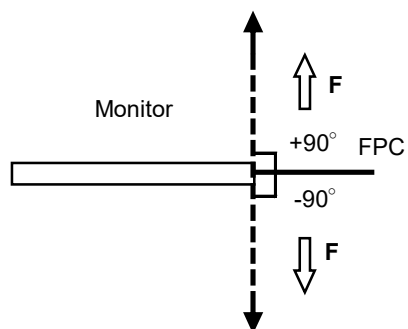
The parameters should be measured after leaving the monitor at the ordinary temperature for 24 hours or more after the test completion.

Item	Standard	Remark
Display quality	No visible abnormality shall be seen. (Except for unevenness by Pol deterioration.)	
Contrast ratio	40 or more	Backlight ON

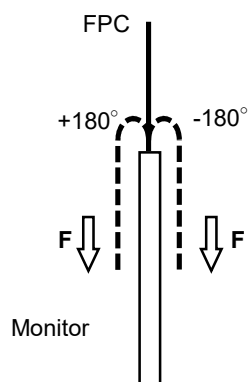
TOPPAN Original Jig



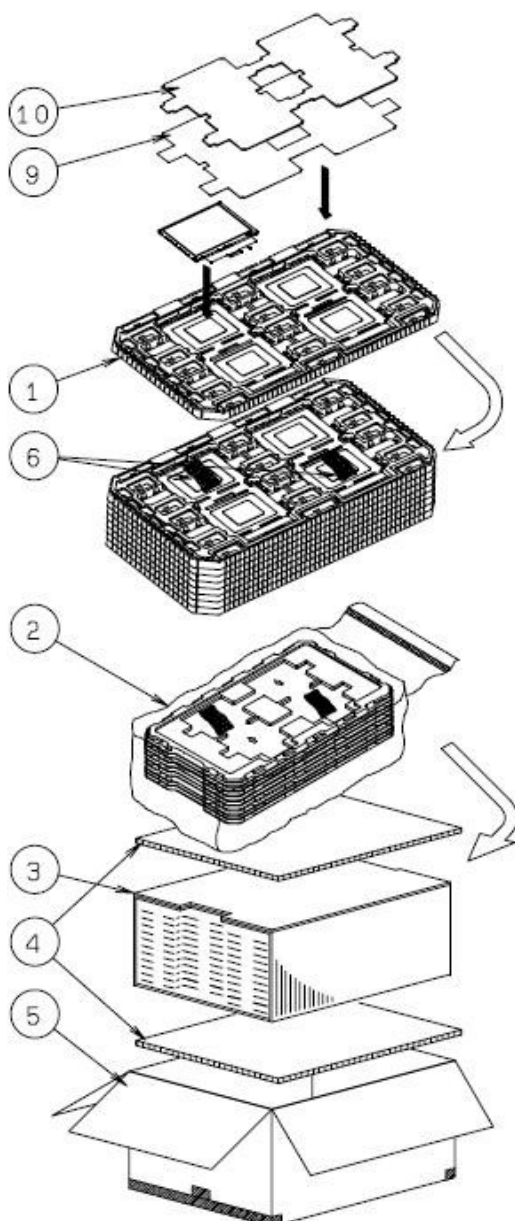
FPC tension test



FPC bend test



13. Packing Specifications



Step1. Each product is to be placed in one of the cut-outs of the tray with the display surface facing upward. (4 products per tray)

Step2. Each tray is to be piled up in same orientation and the trays be in a stack of 7.
One empty tray is to be put on the top of stack of 7 trays.

Step3. 2 packs of moisture absorbers are to be placed on the top tray as shown in the drawing.
Put piled trays into a sealing bag.
Vacuum and seal the sealing bag with the vacuum sealing machine.

Step4. The stack of trays in the plastic back is to be inserted into a inner carton.

Step5. A corrugated board is to be placed on the top and on the bottom of the inner carton.
The two corrugated boards and the inner carton is to be inserted into an outer carton.

Step6. The outer carton needs to sealed with packing tape as shown in the drawing.
The model number, quantity of products, and shipping date are to be printed on the outer carton.
If necessary, shipping labels or impression markings are to be put on the outer carton.

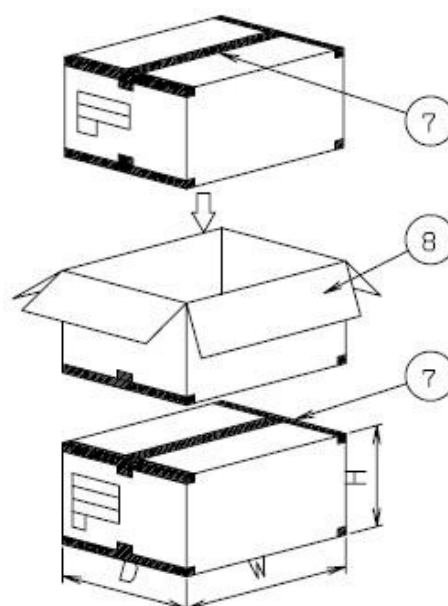
Step7. The outer carton is to be inserted into a extra outer carton with same direction.

Step8. The extra outer carton needs to sealed with packing tape as shown in the drawing.
The model number, quantity of products, and shipping date are to be printed on the extra outer carton.
If necessary, shipping labels or impression markings are to be put on the extra outer carton.

Remark: The return of packing materials is not required.

Packing item name		Specs., Material
①	Tray	A-PET
②	Sealing bag	
③	Inner carton	Corrugated cardboard
④	Inner carton	Corrugated cardboard
⑤	Outer carton	Corrugated cardboard
⑥	Drier	Moisture absorber
⑦	Packing tape	
⑧	Extra outer carton	Corrugated cardboard
⑨	Foam sheet A	Anti-static polyethylene
⑩	Foam sheet B	Anti-static polyethylene

Dimension of extra outer carton	
D : Approx.	(338 mm)
W : Approx.	(549 mm)
H : Approx.	(198 mm)
Quantity of products in one carton:	28
Gross weight : Approx.	6.0 kg



14. Handling Instruction

14.1 Cautions for Handling LCD panels

**Caution**

- (1) Do not make an impact on the LCD panel glass because it may break and you may get injured from it.
- (2) If the glass breaks, do not touch it with bare hands.
(Fragment of broken glass may stick you or you cut yourself on it.)
- (3) If you get injured, receive adequate first aid and consult a medial doctor.
- (4) Do not let liquid crystal get into your mouth.
(If the LCD panel glass breaks, try not let liquid crystal get into your mouth even toxic property of liquid crystal has not been confirmed.)
- (5) If liquid crystal adheres, rinse it out thoroughly.
(If liquid crystal adheres to your cloth or skin, wipe it off with rubbing alcohol or wash it thoroughly with soap.
If liquid crystal gets into eyes, rinse it with clean water for at least 15 minutes and consult an eye doctor.
- (6) If you scrap this products, follow a disposal standard of industrial waste that is legally valid in the community, country or territory where you reside.
- (7) Do not connect or disconnect this product while its application products is powered on.
- (8) Do not attempt to disassemble or modify this product as it is precision component.
- (9) If a part of soldering part has been exposed, and avoid contact (short-circuit) with a metallic part of the case etc. about FPC of this model, please.
Please insulate it with the insulating tape etc. if necessary.
The defective operation is caused, and there is a possibility to generation of heat and the ignition.
- (10) Since excess current protection circuit is not built in this TFT module, there is the possibility that LCD module or peripheral circuit become feverish and burned in case abnormal operation is generated.
We recommend you to add excess current protection circuit to power supply.

Caution

This mark is used to indicate a precaution or an instruction which, if not correctly observed, may result in bodily injury, or material damages alone.

14.2 Precautions for Handling

- 1) Wear finger tips at incoming inspection and for handling the TFT monitors to keep display quality and keep the working area clean.
Do not touch the surface of the monitor as it is easily scratched.
- 2) Wear grounded wrist-straps and use electrostatic neutralization blowers to prevent static charge and discharge when handling the TFT monitors as the LED in this TFT monitors is damageable to electrostatic discharge.
Designate an appropriate operating area, and set equipment, tools, and machines properly when handling this product.
- 3) Avoid strong mechanical shock including knocking, hitting or dropping to the TFT monitors for protecting their glass parts.
Do not use the TFT monitors that have been experienced dropping or strong mechanical shock.
- 4) Do not use or storage the TFT monitors at high temperature and high humidity environment.
Particularly, never use or storage the TFT monitors at a location where condensation builds up.
- 5) Avoid using and storing TFT monitors at a location where they are exposed to direct sunlight or ultraviolet rays to prevent the LCD panels from deterioration by ultraviolet rays.
- 6) Do not stain or damage the contacts of the FPC cable .
FPC cable needs to be inserted until it can reach to the end of connector slot.
During insertion, make sure to keep the cable in a horizontal position to avoid an oblique insertion.
Otherwise, it may cause poor contact or deteriorate reliability of the FPC cable.
- 7) Do not bend or pull the FPC cable or carry the TFT monitor by holding the FPC cable.
- 8) Peel off the protective film on the TFT monitors during mounting process.
Refer to the section 14.5 on how to peel off the protective film.
We are not responsible for electrostatic discharge failures or other defects occur when peeling off the protective film.

14.3 Precautions for Operation

- 1) Since this TFT monitors are not equipped with light shielding for the driver IC,
do not expose the driver IC to strong lights during operation as it may cause functional failures.
- 2) In case of powering up or powering off this LCD module,
be sure to comply the sequence as instructed in this specification.
- 3) Do not plug in or out the FPC cable while power supply is switch on.
Plug the FPC cable in and out while power supply is switched off.
- 4) Do not operate the TFT monitors in the strong magnetic field. It may break the TFT monitors.
- 5) Do not display a fixed image on the screen for a long time.
Use a screen-saver or other measures to avoid a fixed image displayed on the screen for a long time.
Otherwise, it may cause burn-in image on the screen due the characteristics of liquid crystal.
- 6) Optimize VCOMDC within recommended operating condition.
* When VCOMDC is not an optimal value, flicker and image sticking will be occurred.

14.4 Storage Condition for Shipping Cartons

(Storage environment)

- Temperature 0 to 40° C
- Humidity 60%RH or less
No-condensing occurs under low temperature with high humidity condition.
- Atmosphere No poisonous gas that can erode electronic components and/or wiring materials should be detected.
- Time period 1 year
- Unpacking To prevent damages caused by static electricity, anti-static precautionary measures (e.g. earthing, anti-static mat) should be implemented.
After unpack, keep product in the appropriate condition, otherwise bubble seal of Protective film may be printed on Polarizer.
- Maximum piling up 8 cartons (excluding the bottom)

*Conditions to storage after unpacking

(Storage environment)

- Temperature 0 to 40° C
- Humidity 60%RH or less
No-condensing occurs under low temperature with high humidity condition.
- Atmosphere No poisonous gas that can erode electronic components and/or wiring materials should be detected.
- Time period 1 year (Shelf life)
- Others Keep/ store away from direct sunlight
Storage goods on original tray made by TOPPAN.

14.5 Precautions for Peeling off the Protective film

The followings work environment and work method are recommended to prevent the TFT monitors from static damage or adhesion of dust when peeling off the protective films.

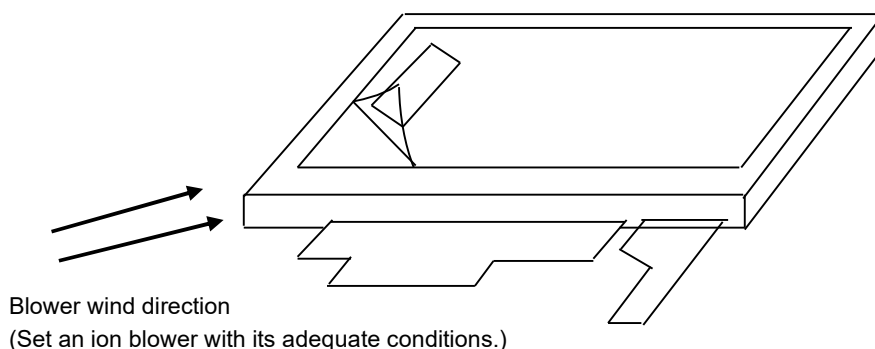
A) Work Environment

- a) Humidity: 50 to 70 %RH, Temperature 15 to 27° C
- b) Operators should wear conductive shoes, conductive clothes, conductive finger tips and grounded wrist-straps.
Use an electrostatic neutralization blower.
- c) Anti-static treatment should be implemented to work area's floor.
Use a room shielded against outside dust with sticky floor mat laid at the entrance to eliminate dirt.

B) Work Method

The following procedures should taken to prevent the driver ICs from charging and discharging.

- a) Use an electrostatic neutralization blower to blow air on the TFT monitors to its lower left when FPC is placed at the bottom.
Optimize direction of the blowing air and the distance between the TFT monitors and the electrostatic neutralization blower.
- b) Put an adhesive tape (Scotch tape, etc) at the lower left corner area of the protective film to prevent scratch on surface of TFT monitors.
- c) Peel off the adhesive tape slowly (spending more than 2 secs to complete) by pulling it to opposite direction.



14.6 Warranty

TOPPAN is only liable to defective goods which is stored and used under the condition complying with this specifications and returned within 1 (one) year.

Warranty caused by manufacturing defect shall be conducted by replacement of goods or refundment at unit price.

APPENDIX**Reference Method for Measuring Optical Characteristics and Performance****1. Measurement Condition (Backlight ON)**

Measuring instruments: CS2000 (KONICA MINOLTA), LCD7200 (OTSUKA ELECTRONICS), EZcontrastXL88 (ELDIM)

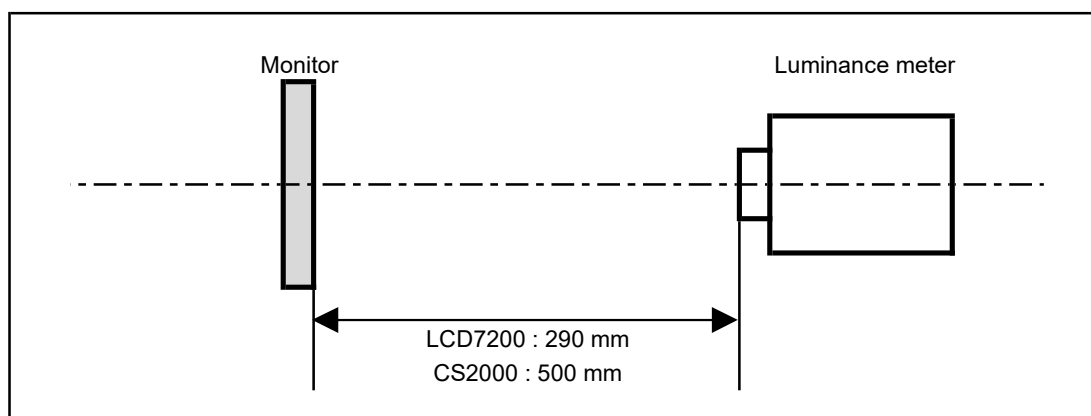
Driving condition: Refer to the section "Optical Characteristics"

Measured temperature: 25°C unless specified

Measurement system: See the chart below. The luminance meter is placed on the normal line of measurement system.

Measurement point: At the center of the screen unless otherwise specified

Dark box at constant temperature

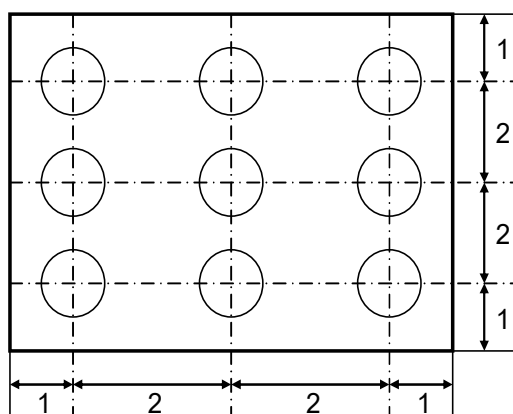


*Measurement is made after 30 minutes of lighting of the backlight.

Measurement point: At the center point of the screen

Brightness distribution: 9 points shown in the following drawing.

<Landscape model>



Dimensional ratio of active area

Backlight IL=14.4mA

Measurement Condition (Contrast ratio Backlight OFF only)

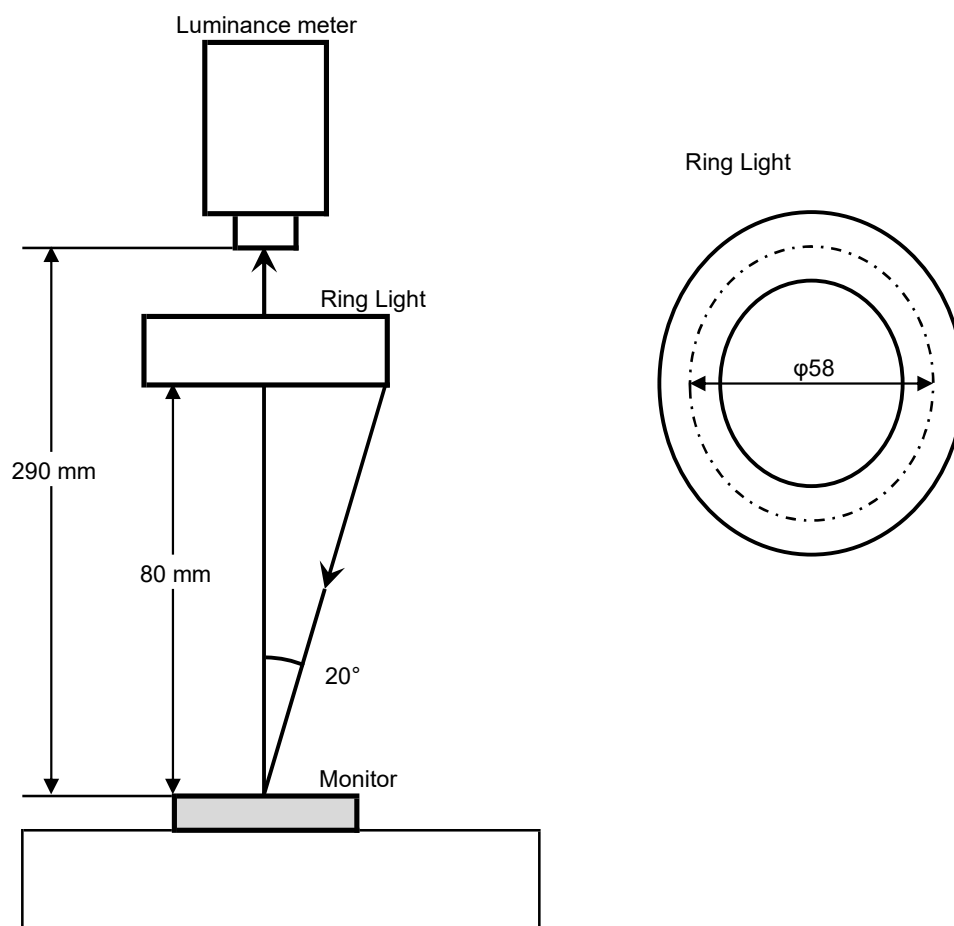
Measuring instruments: LCD7200(OTSUKA ELECTRONICS), Ring Light (40,000 lx, $\phi 58$)

Driving condition: Refer to the section "Optical Characteristics"

Measured temperature: 25°C unless specified

Measurement system: See the chart below.

Measurement point: At the center of the screen unless otherwise specified



2. Test Method

Notice	Item	Test method	Measuring instrument	Remark
1	Response time	<p>Measure output signal waveform by the luminance meter when raster of window pattern is changed from white to black and from black to white.</p>	LCD7200	<p>Black display [Data]=00h White display [Data]=3Fh TON Rise time TOFF Fall time</p>
2	Contrast ratio	<p>Measure maximum luminance Y1([Data]=3Fh) and minimum luminance Y2([Data]=00h) at the center of the screen by displaying raster or window pattern. Then calculate the ratio between these two values.</p> <p>Contrast ratio = Y1/Y2 Diameter of measuring point: 7.8mmφ(CS2000) Diameter of measuring point: 3mmφ(LCD7200)</p>	CS2000 LCD7200	Backlight ON Backlight OFF
3	Viewing angle Horizontalθ Verticalφ	Move the luminance meter from right to left and up and down and determine the angles where contrast ratio is 10.	EZcontrastXL88	
4	White chromaticity	<p>Measure chromaticity coordinates x and y of CIE1931 colorimetric system at [Data] = 3Fh Color matching function: 2°view measurement angle: 1°</p>	CS2000	
5	Center brightness	Measure the brightness at the center of the screen.	CS2000	
6	Brightness distribution	<p>(Brightness distribution) = 100 x B/A % A : max. brightness of the 9 points B : min. brightness of the 9 points</p>	CS2000	
7	Burn-in	Visually check burn-in image on the screen after 2 hours of "window display" ([Data]=00h/3Fh).		At optimized VCOMDC

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