DATA MODUL

ORTUSTECH

Specification

COM43H4N44ULC

4,3" - 480 x 272 – RGB

Spec Revision: 5.0
Revision Date: 26.12.2024

Note: This specification is subject to change without prior notice

Passion Displayed

G

Specifications for

Blanview TFT-LCD Monitor

(4.3" WQVGA 480 x RGB x 272 Landscape)

G **Sunlight readable TFT-LCD Monitor**

Version 5.0

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

MODEL COM43H4N44ULC

Customer's Approval

Signature:

Name:

Section:

Title:

Date:

ORTUSTECH

G

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Electronics Division
Technological Development Department IV

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Version History

Ver.	Date	Page	Description	
0.0	Mar.1,2018	-	-	Tentative issue
0.1	Apr.24,2018	8	correction	General tolerance 0.2 → 0.5
		12	add	Total LED current value IL1=IL2=(25) mA
△A ×3				Added LED VF value (reference value).
				Note 1, IL1 = IL2 recommended comment added
		18	correction	Number of LED lights changed. IL / IL 1 / IL 2 / VF 1 / VF 2.
				IL1 = IL2 Recommended comments added.
0.2	Aug.24,2018	23		
△B ×1			add	Lightfastness
1.0	Dec.21,2018			First issue
		3	correction	Serial Label (S-LABEL) → Serial №. print (S-print)
		7	add	Weight
△C ×13		11	add	LED direction current of order
		12	add	Current consumption
			correction	The backlight part
		19	correction	Optical Characteristics
		20	add	White Chromaticity Range
			correction	Temperature Characteristics
		21	add	Signal condition
		23	add	Reliability Test
		25	add	Packing Specifications
		29	correction	Figure of Protective film
		30	add	The backlight current value
2.0	Jul.1.2019	All page	correction	It is a company name change from ORTUS TECHNOLOGY CO.,LTD. to TOPPAN PRINTING CO.,LTD.
△D ×3		4	correction	RoHS(2.0) directive
		32	add	Measurement angle
3.0	Mar. 31,2021	19	change	Measuring instruments
		20	change	Measuring instruments
△E ×5		23	change	Test condition (Vibration test)
			correction	Temperature / humidity profile diagram
		30	change	Measuring instruments
		32	change	Measuring instruments
4.0	Jul.12,2023	All	change	It is a company name change from TOPPAN PRINTING CO.,LTD. to TOPPAN INC.
		1	change	Department name
△F ×9		11	correction	LED direction current
			add	Note
		12	correction	Estimated Life of LED
		19	correction	Center brightness
		19-21,30	correction	Notation of Bl current
5.0	Dec.26,2024	All		All
			Change	Company name font
△G ×7		P.1		Cover
			Add	Model specification
			Change	Department name
		P.4		Contents
			Add	Item
		P.6		2.1 Features of the Product
			Change	Note

Version History

Ver.	Date	Page	Description	
5.0	Dec.26,2024	P.7		<Features of Blanview>
			Change	Content
△G ×7		P.20		10.2 About Sunlight readable
			Add	Content

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1. Application

This Specification is applicable to 109mm (4.3 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/flexureor 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.

◎ TOPPAN is not responsible for any nonconformities and defects that are not specified in this specifications.

◎ 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

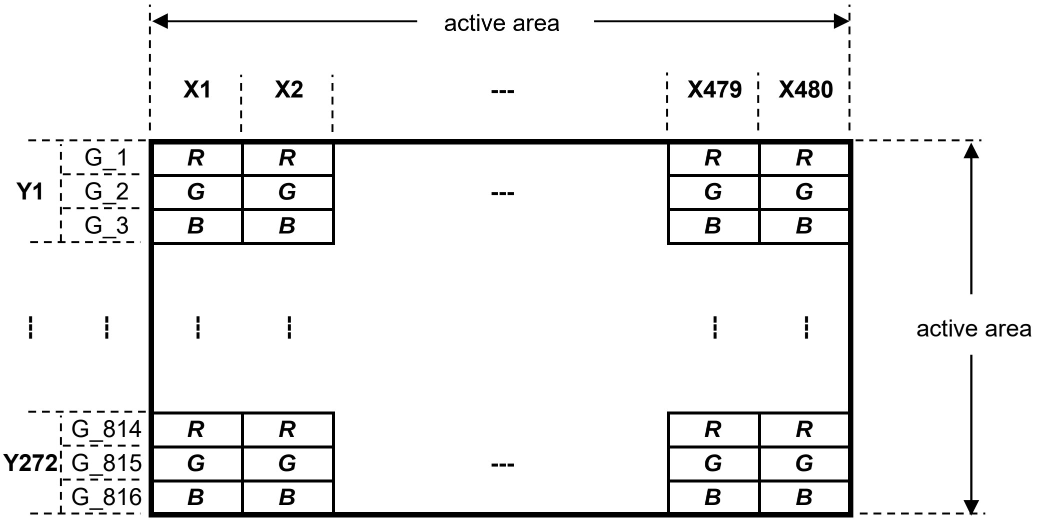
2.1 Features of the Product

- 4.3 inch diagonal display, 480 [H] x 272RGB [V] dots.
- 8-bit 16,777,216 color display capability.
- Single power supply operation of 3.3V.
- Built in Timing generator (TG), Counter-electrode driving circuitry and power supply circuit.
- 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	VA type 16,777,216 colors. Blanview, Normally black.	
Driving method	a-Si TFT Active matrix. Line-scanning, Non-interlace.	
Dot arrangement	RGB horizontal stripe arrangement.	Refer to "Dot arrangement".
Signal input method	8-bit RGB, parallel input.	
Backlight type	High bright white LED.	
NTSC ratio	50%	

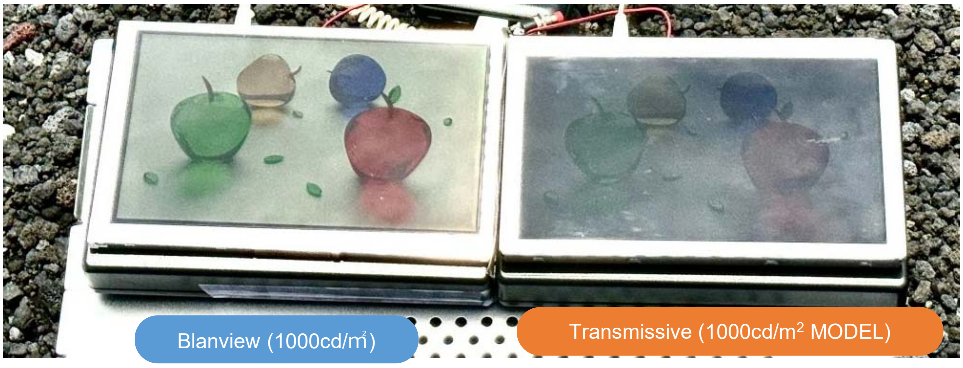


Dot arrangement (FPC cable placed downside)

<Features of Blanview>

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

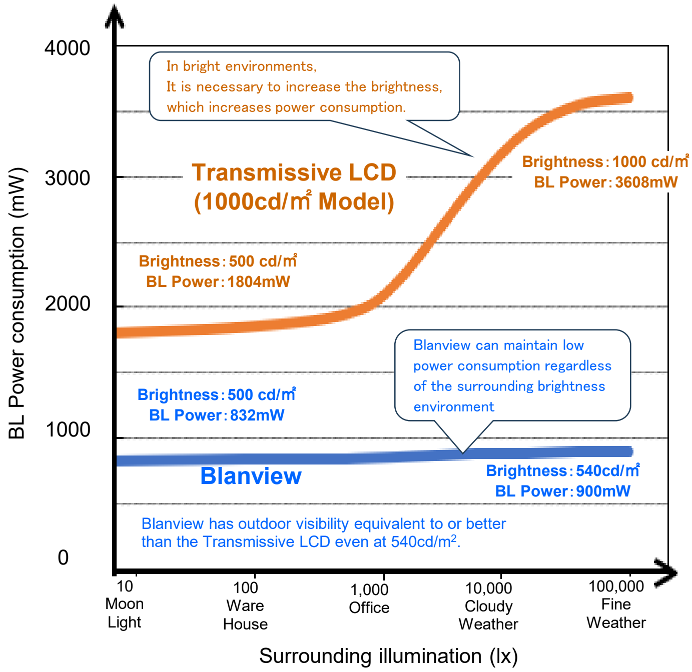
G Blanview is a TFT-LCD monitor that achieves sunlight readability with low power consumption.



*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/㎡ 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.)

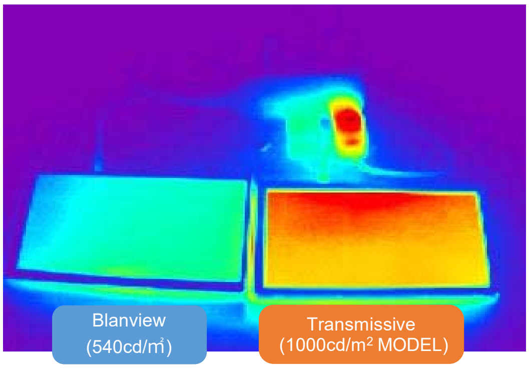
- Backlight power consumption required to assure visibility. (equivalent to 7.0"WVGA)



Sunlight Readable / BL Power comparison

	Sunlight Readable	BL Power
Transmissive LCD (1000cd/㎡ 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/m^2 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.

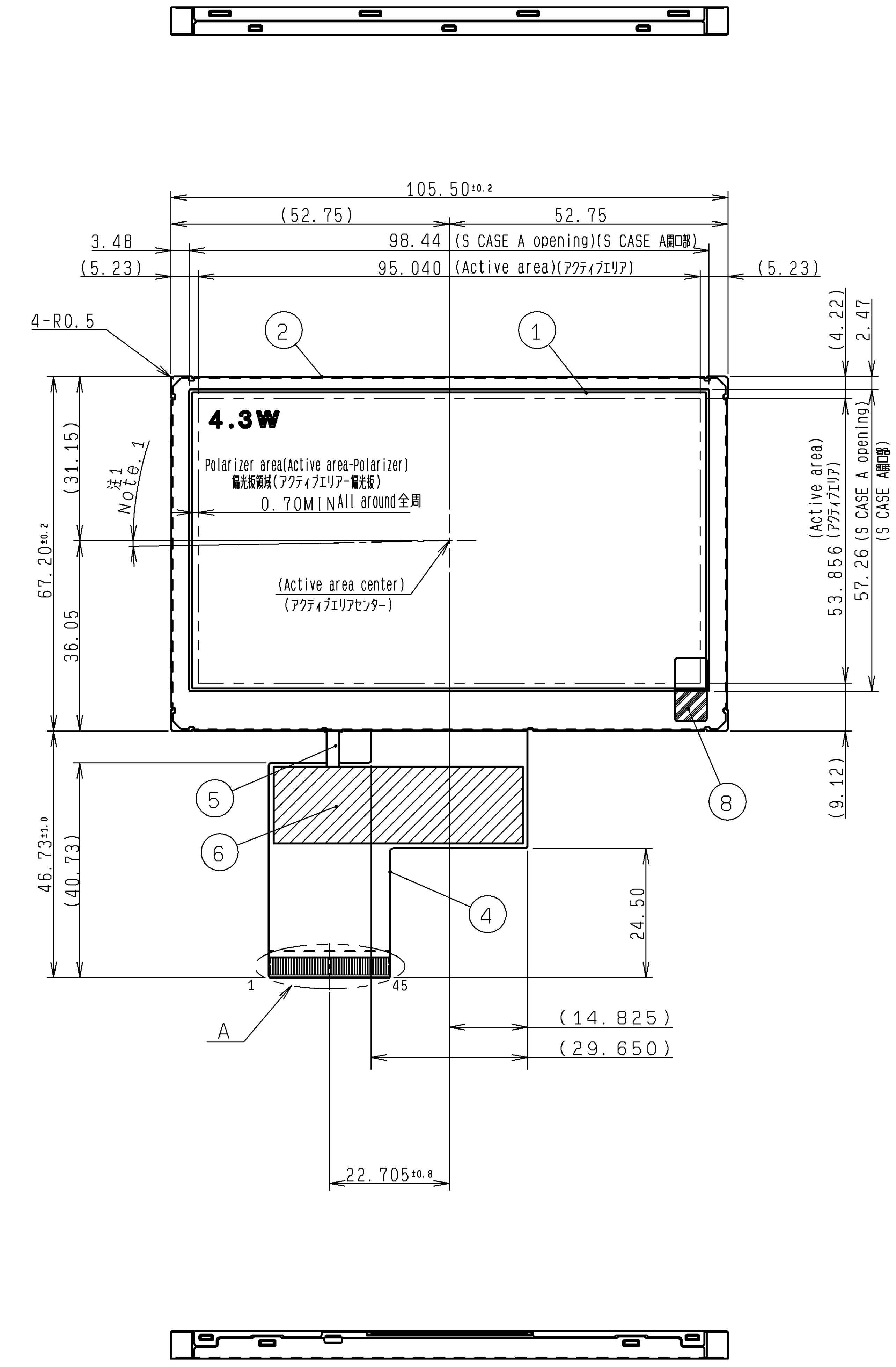
3. Dimensions and Shape

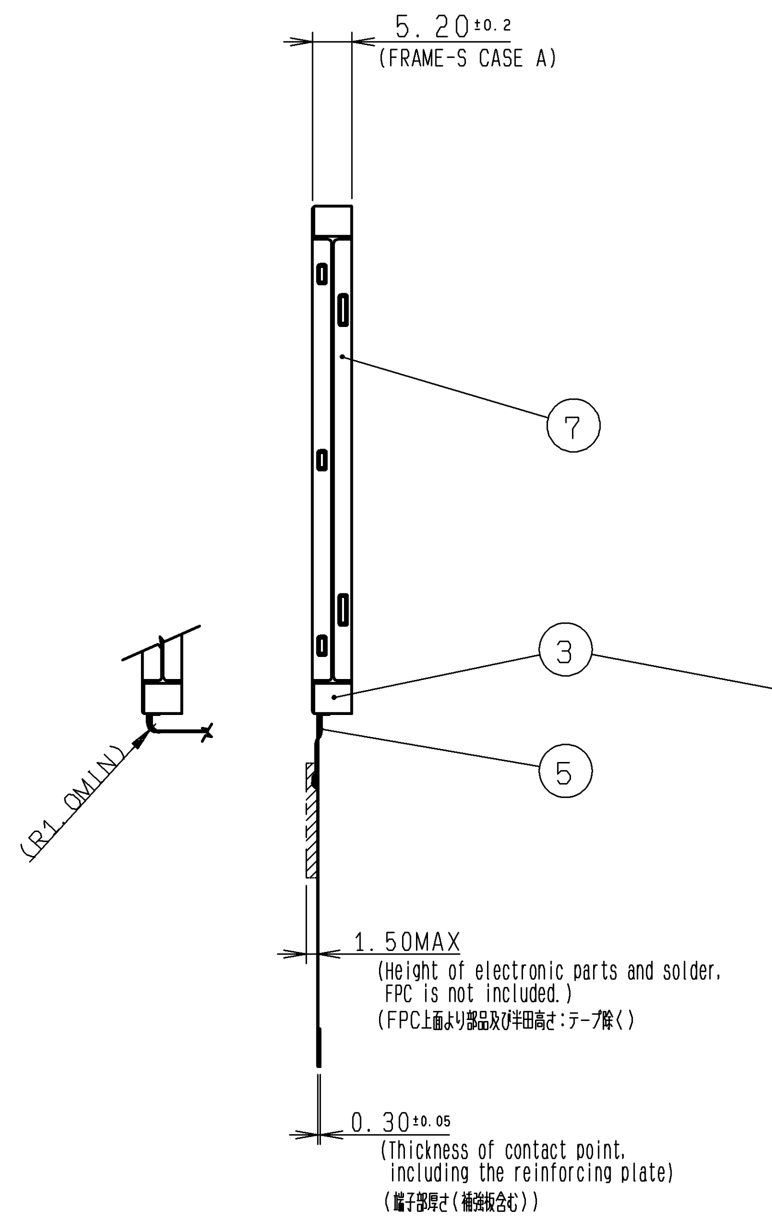
3.1 Dimensions

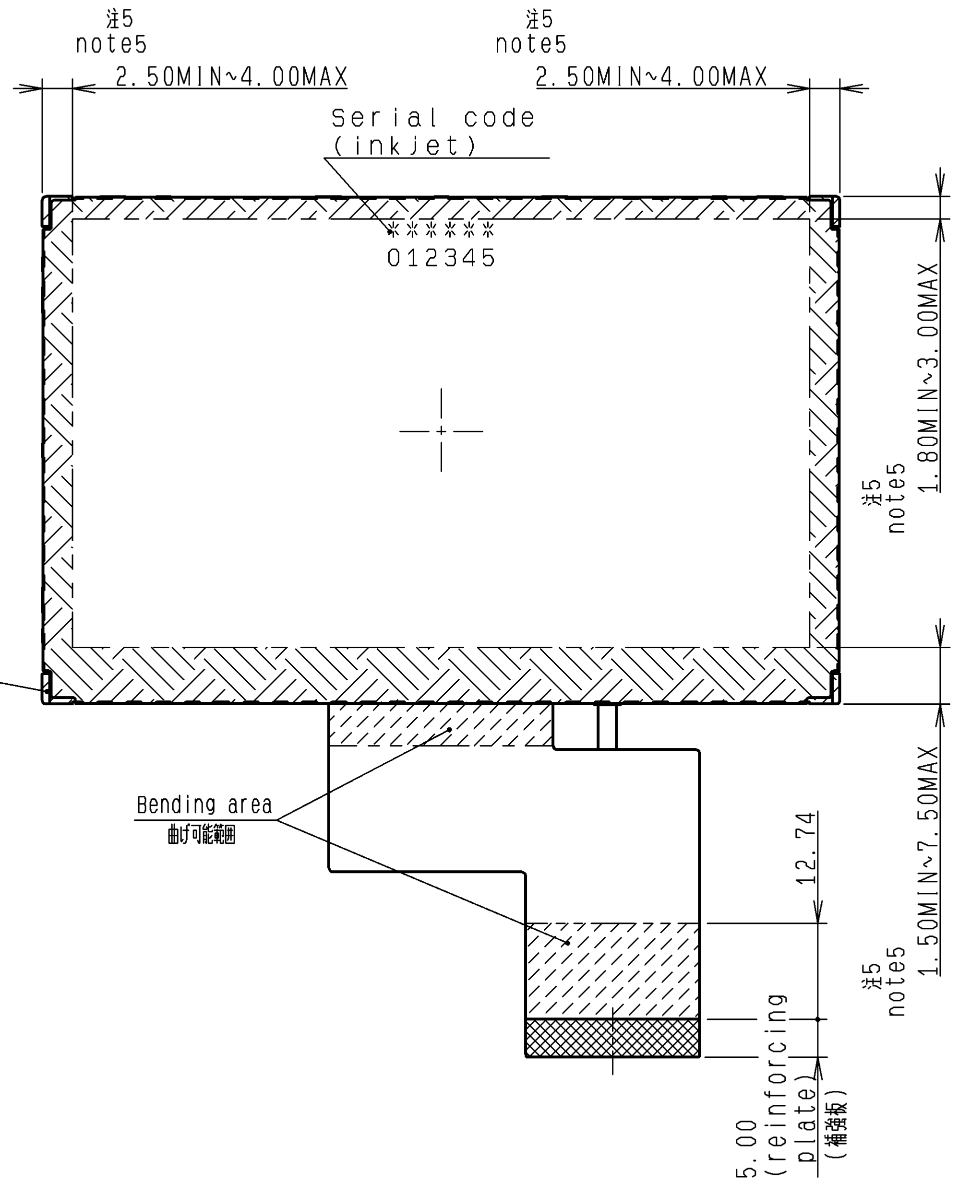
Items	Specifications	Unit	Remarks
Outline dimensions	105.50[H] × 67.20[V] × 5.20[D]	mm	Exclude FPC cable.
Active area	95.04[H] × 53.86[V]	mm	109mm diagonal.
Number of dots	480[H] × 816[V]	dot	
Dot pitch	198.0[H] × 66.0[V]	μm	
Surface hardness of the polarizer	2	H	Load:2.94N
Weight	62	g	Include FPC cable.

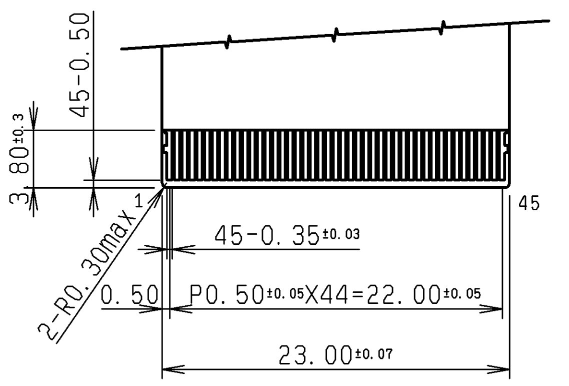
3.2 Outward form

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


105.50±0.2
(52.75)
52.75
3.48
98.44 (S CASE A opening)(S CASE A開口部)
(5.23)
95.040 (Active area)(アクティブエリア)
(5.23)
4-R0.5
②
①
(4.22)
2.47
4.3W
Polarizer area(Active area-Polarizer)
偏光板領域(アクティブエリア-偏光板)
0.70MIN All around全周
注1 Note.1
(31.15)
67.20±0.2
36.05
(Active area center)
(アクティブエリアセンター)
(Active area)(アクティブエリア)
53.856
57.26 (S CASE A opening)(S CASE A開口部)
(9.12)
⑧
⑤
⑥
④
46.73±1.0
(40.73)
24.50
1
45
A
(14.825)
(29.650)
22.705±0.8


5.20±0.2
(FRAME-S CASE A)
⑦
③
⑤
(R1.0MIN)
1.50MAX
(Height of electronic parts and solder. FPC is not included.)
(FPC上面より部品及び半田高さ:テープ除く)
0.30±0.05
(Thickness of contact point. including the reinforcing plate)
(端子部厚さ(補強板含む))


注5 note5
2.50MIN~4.00MAX
注5 note5
2.50MIN~4.00MAX
Serial code
(inkjet)
012345
注5 note5
1.80MIN~3.00MAX
Bending area
曲げ可能範囲
12.74
注5 note5
1.50MIN~7.50MAX
5.00
(reinforcing plate)
(補強板)


45-0.50
3.80±0.3
1
45
2-R0.30max
45-0.35±0.03
0.50
P0.50±0.05X44=22.00±0.05
23.00±0.07

DETAIL A
(S=2/1)

Note.1 Angular deviation of LCD cell from the TFT-LCD monitor's reference axis shall be less than [±40′].

注1. TFT-LCD PANELの角度ズレは、モニター基準軸に対し【±40′】以下とする。

Note.2 Recommended FPC connectors
For LCD : HIROSE/FH12A-45S-0.5SH(55)(Top contact)
FPC pin assignment differs from a position of Datum Pin of recommended FPC connector.
Please notice the difference when designing your circuit with much care.

2. FPCの推奨コネクターの規格を下記に示す。
・LCD-FPC用：ヒロセ電機／FH12A-45S-0.5SH(55)(上接点タイプ)
FPCの端子配列が、推奨コネクタ基準ピン位置と異なっています。
回路設計におかれましては、充分ご注意願います。

Note.3 Protective film is affixed on front surface of the screen.
Location tolerance of the protective film shall be ±1.5 mm to the polarizer.

3. 保護膜が表面側に貼られます。
保護膜貼付け位置は偏光板に対して【±1.5】とする。

Note 4. Exercise care not to apply any forces to the cable holder of the S CASE A.

4. S CASE A の LCD FPC保持部には負荷のかからない様注意願います。

Note.5 In case TFT-LCD monitor is fixed to the case of your product, it's recommended that monitor is fixed in to ▨ area.

5. モニターは ▨ 範囲内で固定することを推奨します。

PART NAME	ITEM	PART CODE	MODEL NUMBER	REMARK
R TAPE	8			
S CASE C	7			
I TAPE	6			
LED FPC	5			
LCD FPC	4			
FRAME	3			
S CASE A	2			
TFT-LCD PANEL	1		Glass substrate thickness=0.5t	

APPROVED 尾木
CHECKED 木下
CHECKED
DESIGN 前田創
DRAW 栗津
GENERAL TOLERANCE ±0.5
SCALE 1/1
UNIT mm
ISSUE (Y:M:D) 18:11:21
MODEL COM43H4N44U※※
NAME OUTLINE-D4N44

TOPPAN
TOPPAN INC.
DO NOT DUPLICATE, CONFIDENTIAL AND PROPRIETARY'

DRAWING No.	REV.	SHEET	DIV.
RJD529744D201			

ASS'Y

3.3 Serial № print (S-print)

1) Display Items

S-print indicates the least significant digit of manufacture year (1digit), manufacture month with below alphabet (1letter), model code (5characters), serial number (6digits).

* Contents of Display

*	*	*****	******
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	43EQC (Made in Japan) 43ERC (Made in Malaysia)		
d	Serial number			

* Example of indication of Serial № print (S-print)

・Made in Japan

8J43EQC000125

means "manufactured in October 2018, 4.3" EQ type, C specifications, serial number 000125"

・Made in Malaysia

8J43ERC000125

means "manufactured in October 2018, 4.3" ER type, C specifications, serial number 000125"

2) Location of Serial № print (S-print)

Refer to 3.2 "Outward Form".

3)Others

Please note that it is likely to disappear with an organic solvent about the Serial print.

4. Pin Assignment

No.	Symbol	Function
1	VSS	GND.
2	VSS	GND.
3	VDD	Power supply.
4	VDD	Power supply.
5	D00	Display data(R). 00h: Black D00:LSB D07:MSB Driver has internal gamma conversion. Connect unused pins to GND.
6	D01	
7	D02	
8	D03	
9	D04	
10	D05	
11	D06	
12	D07	
13	D10	Display data(G). 00h: Black D10:LSB D17:MSB Driver has internal gamma conversion. Connect unused pins to GND.
14	D11	
15	D12	
16	D13	
17	D14	
18	D15	
19	D16	
20	D17	
21	D20	Display data(B). 00h: Black D20:LSB D27:MSB Driver has internal gamma conversion. Connect unused pins to GND.
22	D21	
23	D22	
24	D23	
25	D24	
26	D25	
27	D26	
28	D27	
29	VSS	GND.
30	CLK	Clock signal.Latching data at the falling edge.
31	STBYB	Standby signal input. (Hi:Normal operation, Lo:Standby operation)
32	HSYNC	Horizontal sync signal input. (Low active)
33	VSYNC	Vertical sync signal input. (Low active)
34	DE	Input data effective signal. (It is effective for the period of "Hi")
35	NC	OPEN.
36	VSS	GND.
37	NC	OPEN.
38	NC	OPEN.
39	NC	OPEN.
40	NC	OPEN.
41	BLL2	Backlight drive (cathode side)
42	BLL1	Backlight drive (cathode side)
43	BLH	Backlight drive (anode side)
44	LR	Left/Right Display reverse(Hi or OPEN:normal display, Low:inversion display)
45	UD	Up/Down Display reverse(Hi or OPEN:normal display, Low:inversion display)

- Recommended connector: HIROSE ELECTRIC FH12 series [FH12A-45S-0.5SH(55)]
- 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	VDD	Ta=25˚C	-0.3	5.0	V	VDD
Input voltage for logic	VI		-0.3	VDD+0.3	V	CLK,VSYNC,HSYNC,DE D[27:20],D[17:10],D[07:00], STBYB,LR,UD
LED direction current of order	IL1,IL2	Ta=25˚C	--	70	mA	BLH - BLL1/BLL2
		Ta=85˚C	--	21		
Storage temperature range	Tstg		-40	95	˚C	
Storage humidity range	Hstg	Non condensing in an environmental moisture at or less than 40˚C90%RH.				

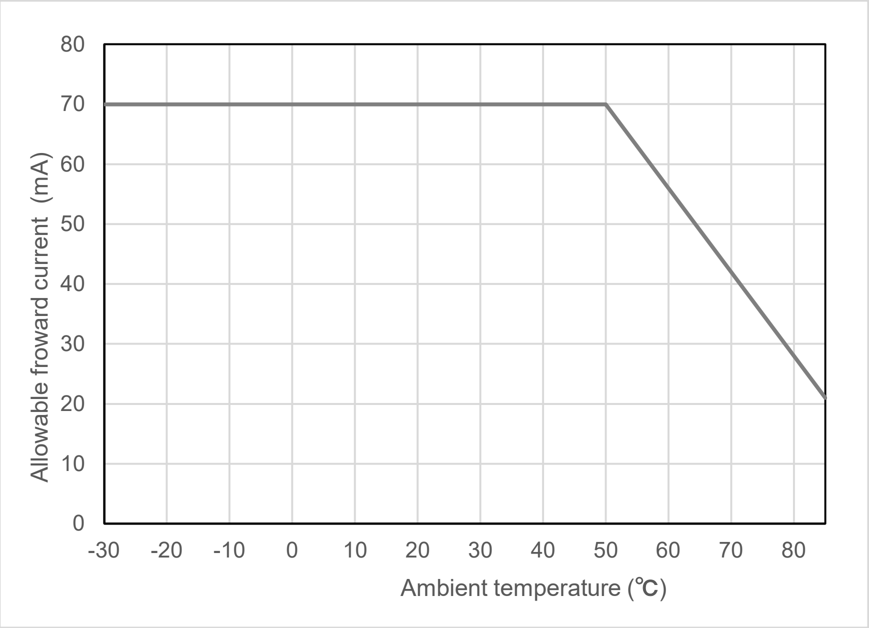
6. Recommended Operating Conditions

VSS=0V

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Supply voltage	VDD		3.0	3.3	3.6	V	VDD
Input voltage for logic	VI	VDD=3.0 to 3.6V	0	--	VDD	V	CLK,VSYNC,HSYNC, DE,D[27:20],D[17:10], D[07:00],STBYB,LR,UD
Operating temperature range	Top	Note	-30	25	85	˚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.				

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

Note : The maximum value of LED forward current "IL1,IL2" , do not exceed the following allowable current value.



7. 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	VDD=3.0 to 3.6V	0.7×VDD	--	VDD	V	CLK,VSYNC,HSYNC, DE,D[27:20],D[17:10], D[07:00],STBYB, LR,UD
	VIL		0	--	0.3×VDD	V	
Pull up resister value	Rpu		--	100	--	kΩ	LR,UD
Current consumption	IDD	fCLK=9MHz Color bar display	--	30	60	mA	VDD

7.1.2 Backlight

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Forward current	IL1	Ta=25˚C	--	20	50	mA	BLH - BLL1
	IL2	Note1	--	20	50	mA	BLH - BLL2
Forward voltage	VF1	Ta=25˚C	--	10.6	11.4	V	BLH - BLL1
*Reference value	VF2	IL1=IL2=20mA	--	10.6	11.4	V	BLH - BLL2
Estimated Life of LED	LL	Ta=25˚C IL1=IL2=20mA,Note2	--	70,000	--	hrs	

Note1: - Please control so that each current does not vary (IL1 = IL2).

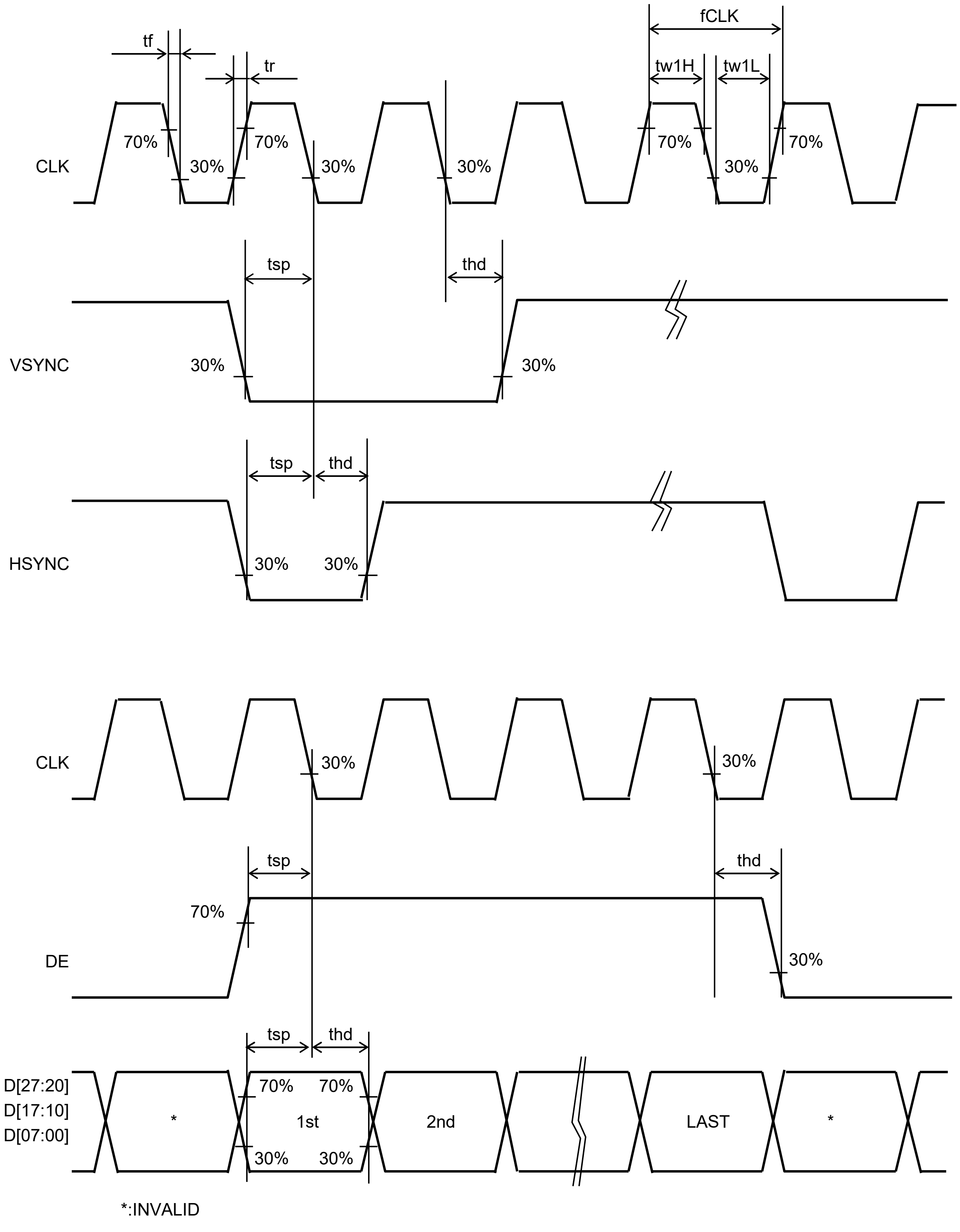
Note2: - The lifetime of the LED is defined as a period till the brightness of the LED decreases to the half of its initial value.
- This figure is given as a reference purpose only, and not as a guarantee.
- This figure is estimated for an LED operating alone.
As the performance of an LED may differ when assembled as a monitor together with a TFT panel due to different environmental temperature.
- 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		7.2	9.0	12.0	MHz	CLK
CLK rising time	tr		--	--	10	ns	
CLK falling time	tf		--	--	10	ns	
CLK Low period	tw1L	0.3×VDD or less.	26.4	--	--	ns	
CLK High period	tw1H	0.7×VDD or more.	26.4	--	--	ns	
Setup time	tsp		10.0	--	--	ns	CLK,VSYNC,HSYNC, DE,D[27:20],D[17:10], D[07:00]
Hold time	thd		16.0	--	--	ns	

Switching Waveform Characteristics


fCLK
tf
tr
tw1H
tw1L
CLK
70%
30%
70%
30%
30%
70%
30%
70%
tsp
thd
VSYNC
30%
30%
tsp
thd
HSYNC
30%
30%
CLK
30%
30%
tsp
thd
70%
DE
30%
tsp
thd
D[27:20]
D[17:10]
D[07:00]
70%
70%
30%
30%
*
1st
2nd
LAST
*

*:INVALID

7.3 Input Timing Characteristics

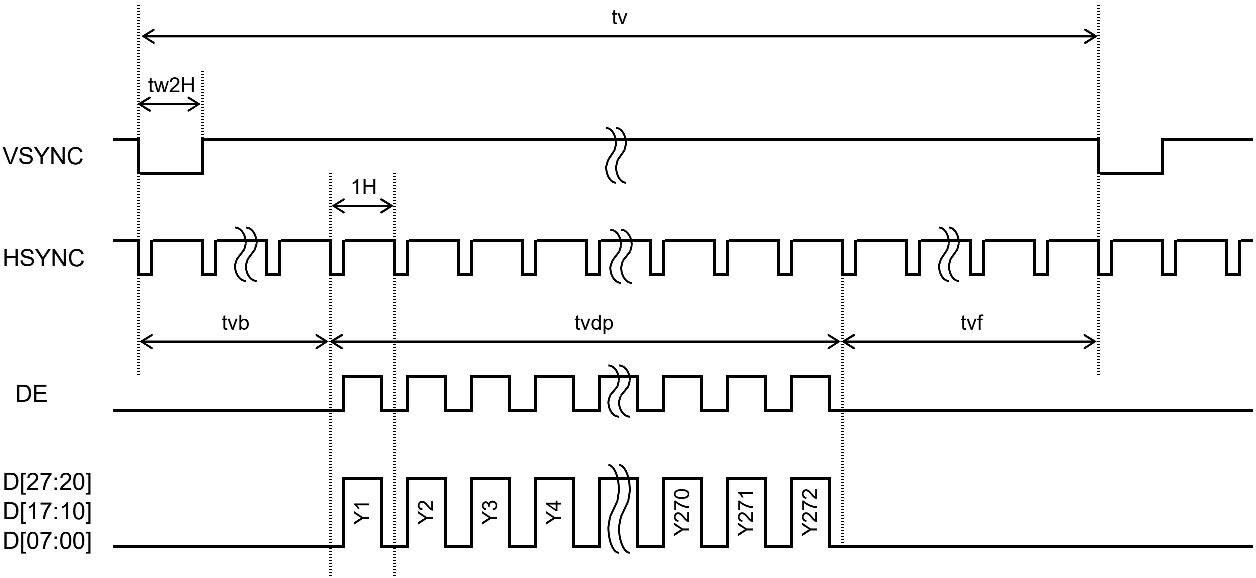
(Unless otherwise noted, Ta=25˚C,VDD=3.3V,VSS=0V)

Item	Symbol	Rating			Unit	Applicable terminal
		MIN	TYP	MAX		
CLK frequency	fCLK	7.2	9.0	12.0	MHz	CLK
VSYNC frequency Note	fVSYNC	54	60	66	Hz	VSYNC
VSYNC signal cycle time	tv	277	288	396	H	VSYNC,HSYNC
VSYNC pulse width	tw2H	1	--	--	H	
Vertical back porch	tvb	tw2H + 2	8	31	H	
Vertical front porch	tvf	2	8	93	H	
Vertical display period	tvdp	--	272	--	H	VSYNC,HSYNC,DE,D[27:20],D[17:10],D[07:00]
HSYNC frequency	fHSYNC	15.38	16.67	18.18	kHz	HSYNC
HSYNC signal cycle time	th	521	525	734	CLK	HSYNC,CLK
HSYNC pulse width	tw3H	1	--	--	CLK	
Horizontal back porch	thb	tw3H + 1	40	127	CLK	HSYNC,DE,CLK
Horizontal front porch	thf	1	5	127	CLK	
Horizontal display period	thdp	--	480	--	CLK	DE,D[27:20],D[17:10],D[07:00],CLK
DE pulse width	tw4H	--	480	--	CLK	DE,CLK

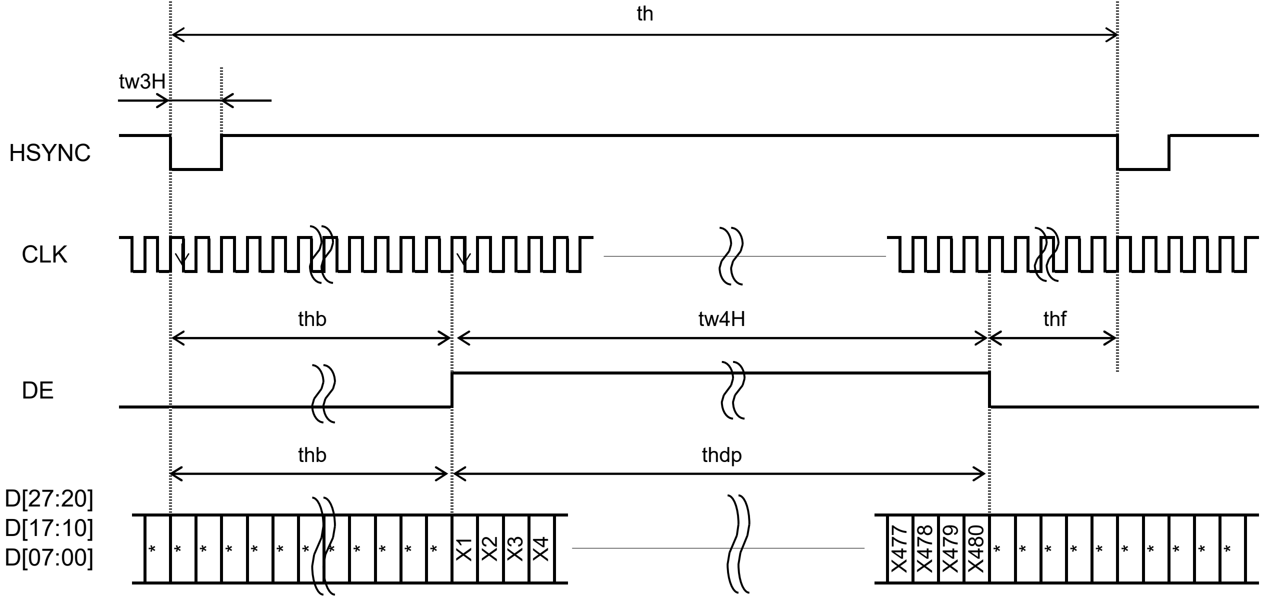
Note: The characteristic of this item is recommended standard.
Please use it after it confirms it enough like the display fineness etc.
When it comes off from this characteristic and it is used.

7.4 Driving Timing Chart

-Vertical Timing

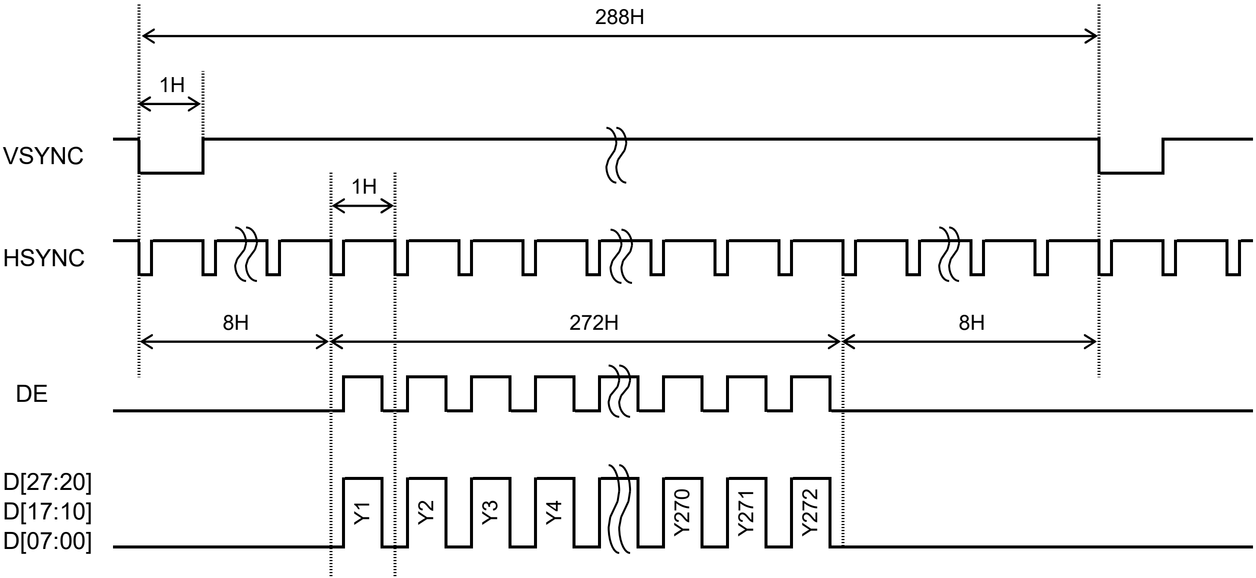

tv
tw2H
VSYNC
1H
HSYNC
tvb
tvdp
tvf
DE
D[27:20]
D[17:10]
D[07:00]
Y1
Y2
Y3
Y4
Y270
Y271
Y272

-Horizontal Timing

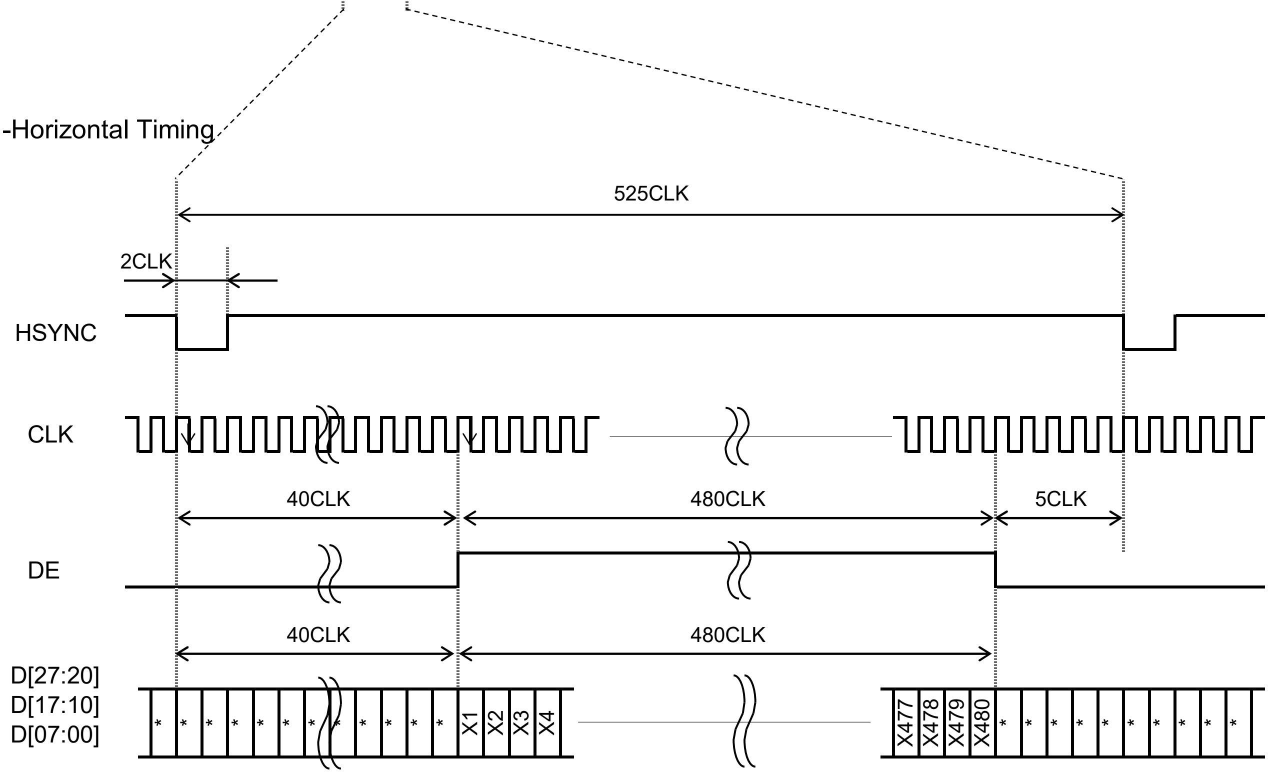

th
tw3H
HSYNC
CLK
thb
tw4H
thf
DE
thb
thdp
D[27:20]
D[17:10]
D[07:00]
X1
X2
X3
X4
X477
X478
X479
X480

7.5 Example of Driving Timing Chart (fCLK=9.0MHz)

-Vertical Timing

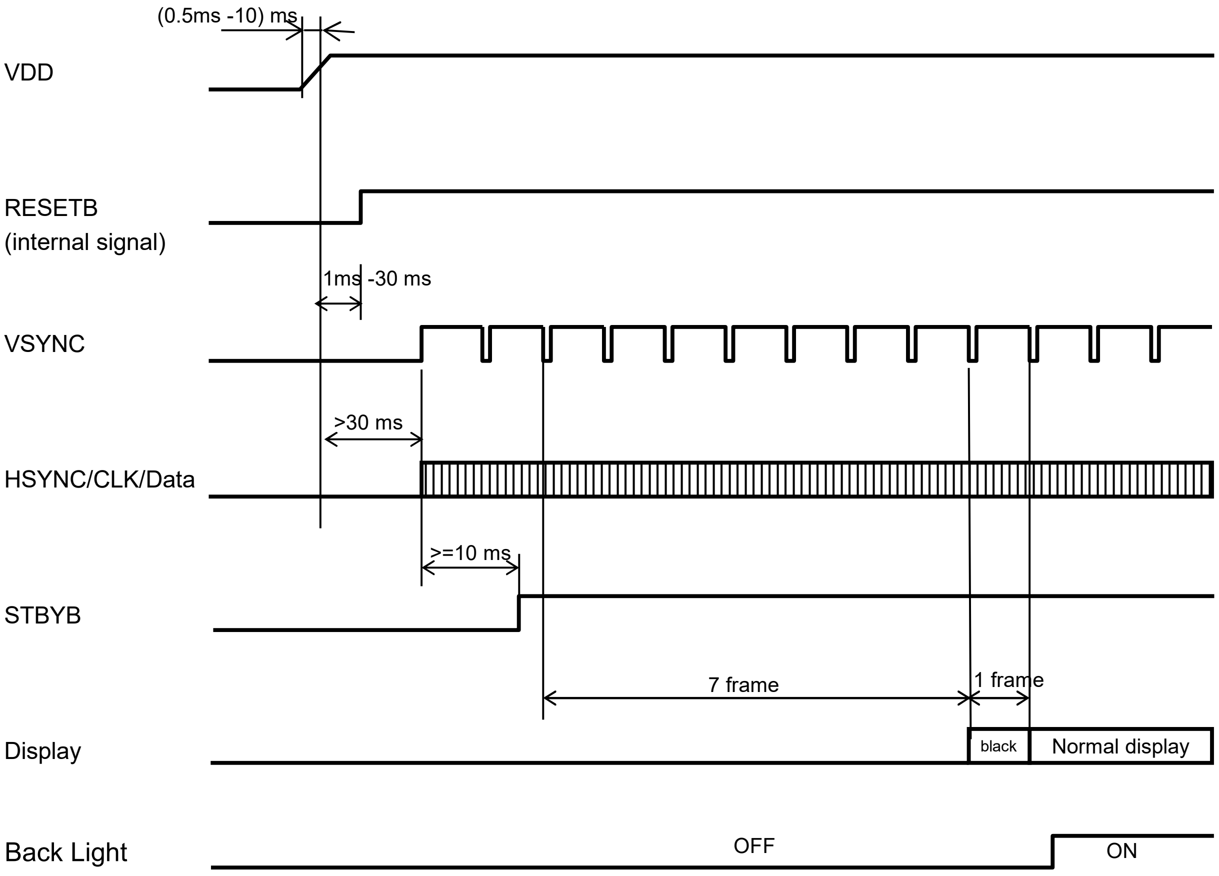

288H
1H
VSYNC
1H
HSYNC
8H
272H
8H
DE
D[27:20]
D[17:10]
D[07:00]
Y1
Y2
Y3
Y4
Y270
Y271
Y272

-Horizontal Timing

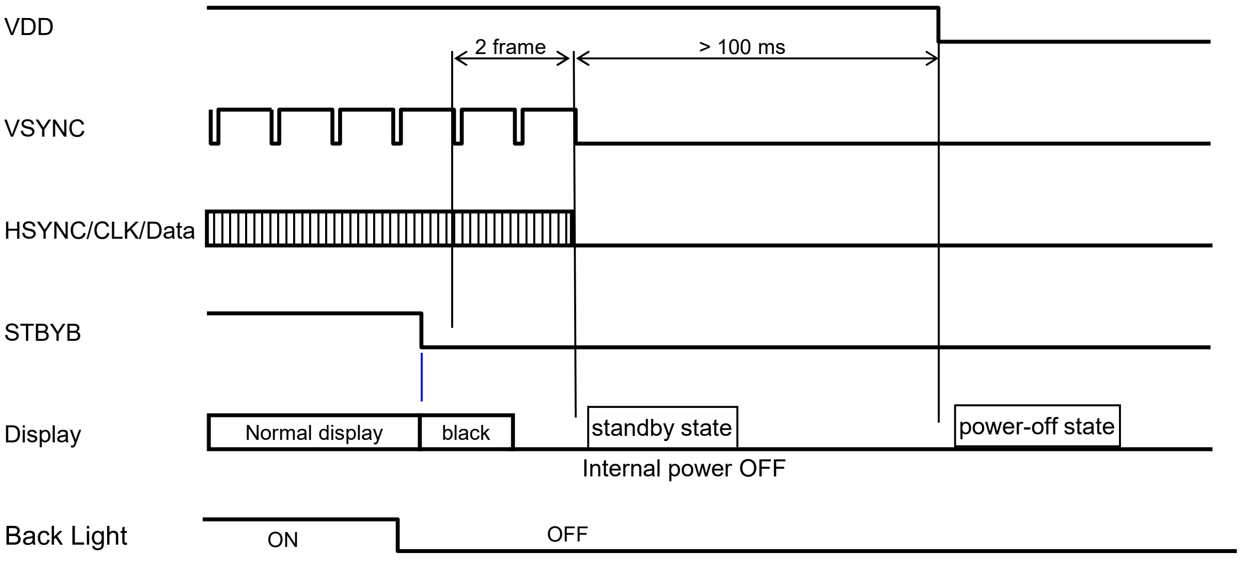

525CLK
2CLK
HSYNC
CLK
40CLK
480CLK
5CLK
DE
40CLK
480CLK
D[27:20]
D[17:10]
D[07:00]
X1
X2
X3
X4
X477
X478
X479
X480

8. Power ON/OFF Sequence

8.1 Power ON Sequence

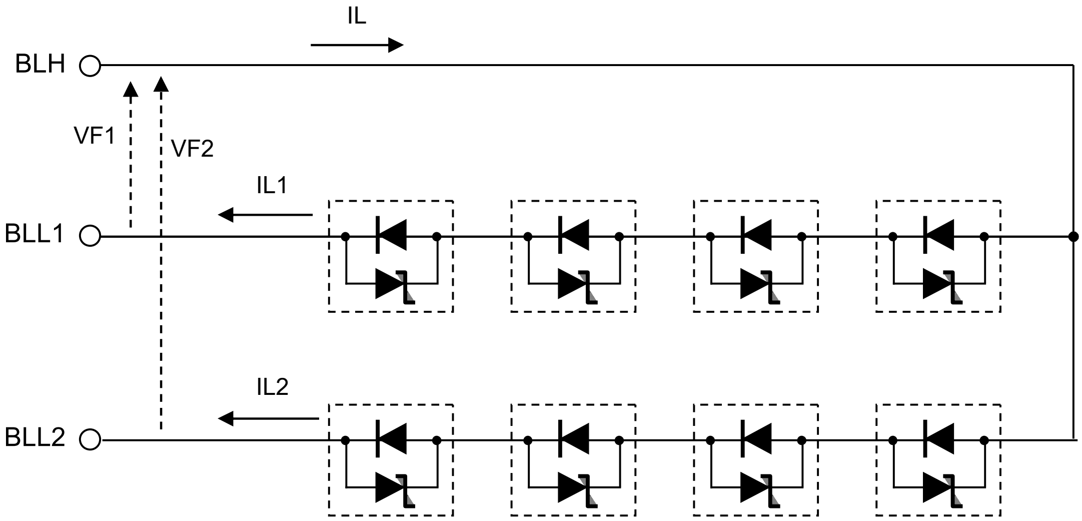

(0.5ms -10) ms
VDD
RESETB
(internal signal)
1ms -30 ms
VSYNC
>30 ms
HSYNC/CLK/Data
>=10 ms
STBYB
7 frame
1 frame
Display
black
Normal display
Back Light
OFF
ON

8.2 Standby / Power OFF Sequence


VDD
2 frame
> 100 ms
VSYNC
HSYNC/CLK/Data
STBYB
Display
Normal display
black
standby state
power-off state
Internal power OFF
Back Light
ON
OFF

If CLK and VSYNC signals are stopped or the power supply is turned off to a regulated frame or less, the afterimage might remain.

9. LED Circuit


IL
BLH
VF1
VF2
IL1
BLL1
IL2
BLL2

* It is recommended to control currents of BLL1 / BLL2 to equal current values (IL1 = IL2).

10. Characteristics

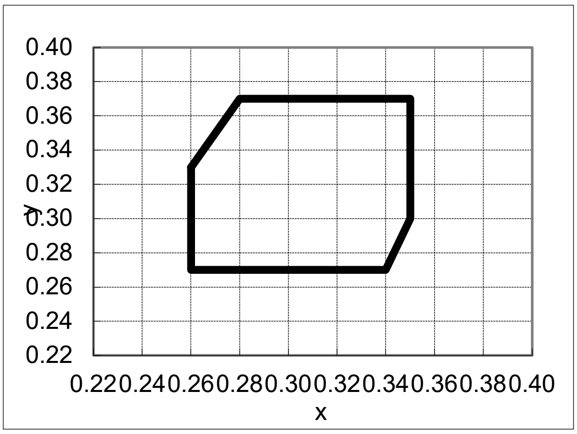
10.1 Optical Characteristics

< Measurement Condition >

Measuring instruments:	CS2000 (KONICA MINOLTA), LCD7200 (OTSUKA ELECTRONICS), EZcontrastXL88 (ELDIM)
Driving condition:	VDD = 3.3V, VSS = 0V Optimized VCOMDC
Backlight:	IL1=IL2=20mA
Measured temperature:	Ta=25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note No.	Remark
Response time	Rise time +	TON	[Data]= 00h→FFh	—	50	100	ms	1	
	Fall time	TOFF	[Data]= FFh→00h						
Contrast ratio	Backlight ON	CR	[Data]= FFh/00h	400	800	—		2	
	Backlight OFF			—	2	—			
Viewing angle	Left	θL	[Data]= FFh/00h CR≧10	80	—	—	deg	3	
	Right	θR		80	—	—	deg		
	Up	φU		80	—	—	deg		
	Down	φD		80	—	—	deg		
White Chromaticity		x		White chromaticity range				4	
		y							
Burn-in				No noticeable burn-in image shall be observed after 2 hours of window pattern display.				5	
Center brightness			[Data]=FFh	—	1200	—	cd/m^2	6	IL1=IL2=38mA *Reference
				390	600	—			IL1=IL2=20mA
Brightness distribution			[Data]=FFh	70	—	—	%	7	

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



White Chromaticity Range

【White Chromaticity Range】

x	y
0.26	0.33
0.26	0.27
0.34	0.27
0.35	0.30
0.35	0.37
0.28	0.37

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 >

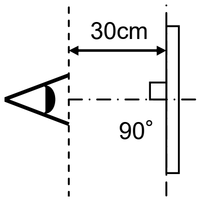
Measuring instruments:	CS2000（KONICA MINOLTA）, LCD7200(OTSUKA ELECTRONICS）
Driving condition:	VDD = 3.3V, VSS = 0V Optimized VCOMDC
Backlight:	IL1=IL2=20mA

Item		Symbol	Specification			Remark
			MIN	TYP	MAX	
Contrast ratio		CR	200	–	–	Ta=-30℃ Backlight ON
			200	–	–	Ta=85℃ Backlight ON
Response time	Rise time + Fall time	TON + TOFF	–	980 ms	1500 ms	Ta=-30℃
			–	40 ms	80 ms	Ta=85℃
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, 94h, FFh (3steps)
Observation distance	30 cm
Illuminance	200 to 350 lx
Backlight	IL1=IL2=20mA



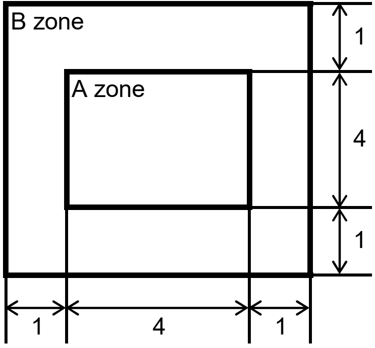
Defect item		Defect content		Criteria
Display Quality	Line defect	Black, white or color line, 3 or more neighboring defective dots		Not exists
	Dot defect	Uneven brightness on dot-by-dot base due to defective TFT or CF, or dust is counted as dot defect (brighter dot, darker dot) High bright dot: Visible 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]=94h		Refer to table 1
		Invisible through 5% ND filter at [Data]=00h		Acceptable
Screen Quality	Dirt	Uneven brightness (white stain, black stain etc)		Invisible through 5% ND filter at Black screen. Invisible through 1% ND filter at other screen.
	Foreign particle	Point-like	0.25mm< φ	N=0
			0.20mm< φ ≦0.25mm	N≦2
			φ ≦0.20mm	Acceptable
		Liner	3.0mm<length and 0.08mm<width	N=0
			length≦3.0mm or width≦0.08mm	Acceptable
	Others			Use boundary sample for judgment when necessary

φ(mm): Average diameter = (major axis + minor axis)/2
Permissible number: N

Table 1

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	30cm
Illuminance	1200～2000 lx

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

12. Reliability Test

Test item		Test condition		number of failures / number of examinations
Durability test	High temperature storage	Ta = 95℃	500hrs	0 / 3
	Low temperature storage	Ta = -40℃	500hrs	0 / 3
	High temperature & high humidity storage	Ta = 60℃, RH = 90%, non condensing ※	500hrs	0 / 3
	High temperature operation	Tp = 85℃	500hrs	0 / 3
	Low temperature operation	Tp = -30℃	500hrs	0 / 3
	High temperature & high humidity operation	Tp = 40℃, RH = 90%, non condensing ※	500hrs	0 / 3
	Thermal shock storage	-40℃ ↔ 85℃ (30min / 30min)	100cycles	0 / 3
	Lightfastness	Xenon Blackpanel 63±3℃ non-shower 450W/㎡(300～700nm）non-operating Integral dose 800MJ/㎡		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	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	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 (Non operation)	Use TOPPAN original jig (see next page) Vibration Acceleration : 66.64 m/s^2 (6.8 G) Frequency : 20 ~ 500 Hz , Cycle : 10 min/sweep Orientation : X,Y,Z-directions 10 hours per direction (Total 30 hrs)		0 / 3
	Impact test (Non operation)	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.）

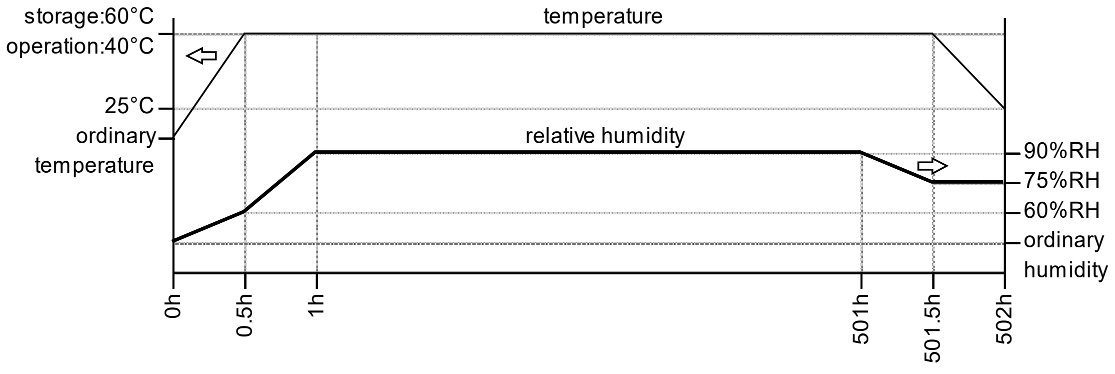
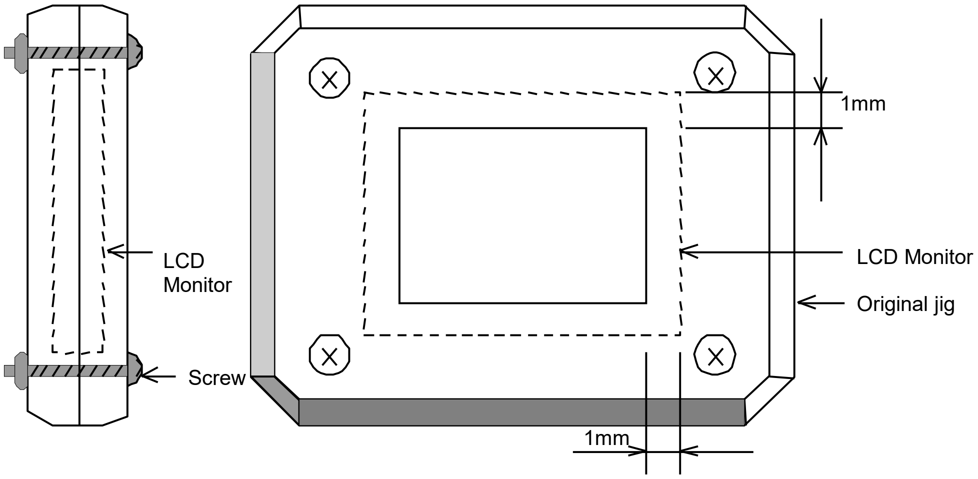


Table2.Reliability Criteria

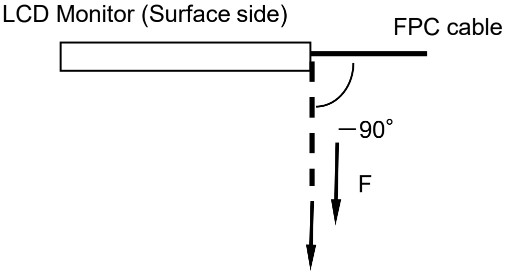
The parameters should be measured after leaving the monitor at the ordinary temperature for 24 hours or more after the test completion.

item	Standard	Remarks
Display quality	No visible abnormality shall be seen. (Except for unevenness by Pol deterioration.)	
Contrast ratio	200 or more	Backlight ON

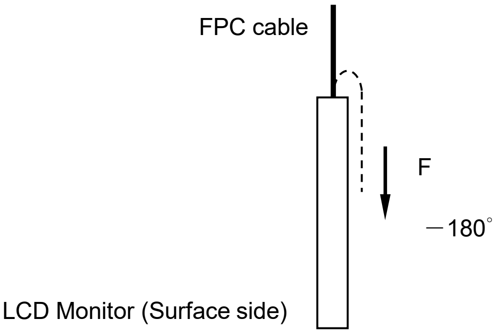
TOPPAN Original Jig


LCD
Monitor
Screw
1mm
LCD Monitor
Original jig
1mm

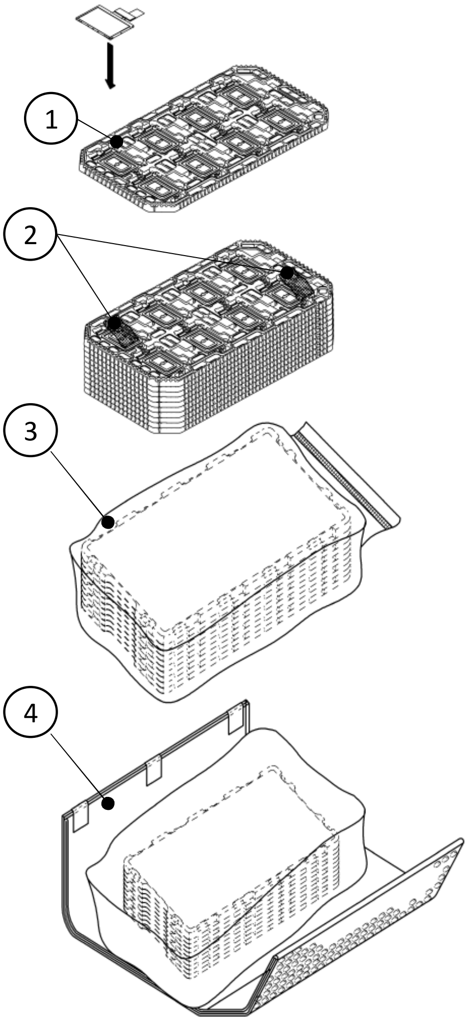
Tension Test Method for FPC cable


LCD Monitor (Surface side)
FPC cable
−90°
F

Bend Test Method for FPC cable


FPC cable
F
−180°
LCD Monitor (Surface side)

13. Packing Specifications



Step 1. Each product is to be placed in one of the cut-outs of the tray with the display surface facing upward. (8products per tray)

Step 2. Each tray is to be piled up in same orientation and the trays be in a stack of 9.
One empty tray is to be put on the top of stack of 9 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.

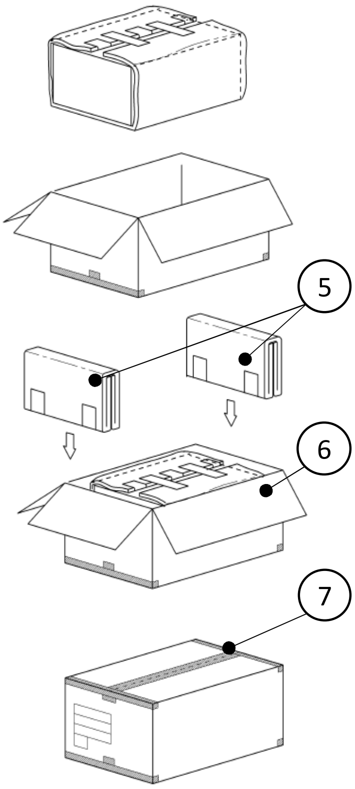
Step4. Vacuum and seal the sealing bag with the vacuum sealing machine.

Step5. The stack of trays in the sealing bag is to be wrapped with a bubble cushioning sheet.

Step6. The wrapped trays are placed in the outer carton.

Step7. Bubble cushioning sheets are to be inserted into the outer carton with same orientation. The outer carton is to be sealed in H-shape with packing tape as shown in the drawing.

Step8. 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.



Remark: The return of packing materials is not required.

	Packing item name	Specs., Material
①	Tray	A-PET
②	Drier	Moisture absorber
③	Sealing bag	
④	B SHEET C	Antistatic air bubble sheet
⑤	B SHEET D	Antistatic air bubble sheet
⑥	Outer carton	Corrugated cardboard
⑦	Packing tape	

Dimension of outer carton	
D : Approx.	(356mm)
W : Approx.	(664mm)
H : Approx.	(182mm)
Quantity of products packed in one carton:	72
Gross weight : Approx.	7.2kg

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.

(11) The devices on the FPC are damageable to electrostatic discharge, because the terminals of the devices are exposed.
Wear grounded wrist-straps and use electrostatic neutralization blowers to prevent static charge and discharge when handling the TFT monitors.
Designate an appropriate operating area, and set equipment, tools, and machines properly when handling this product.

⚠ **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.

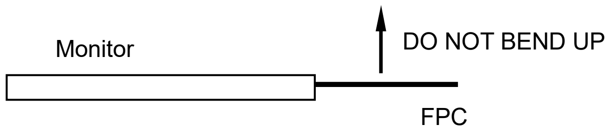
3) Avoid strong mechanical shock including knocking, hitting or dropping to the TFT monitors for protecting their glass parts. Do not use the TFT monitors that have been experienced dropping or strong mechanical shock.

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.
Especially, it will cause mechanical damage or critical defect if FPC is pull up or bent up to short of display.



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.

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	7 cartons

*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, Temperature15 to 27˚C

b) Operators should wear conductive shoes, conductive clothes, conductive finger tips and grounded wrist-straps.
Use an electrostatic neutralization blower.
Anti-static treatment should be implemented to work area's floor.

c) Use a room shielded against outside dust with sticky floor mat laid at the entrance to eliminate dirt.

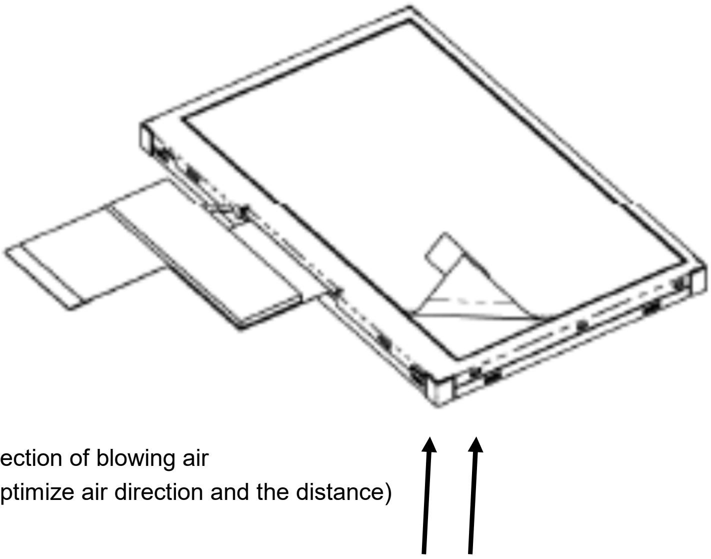
B) Work Method

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 right 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.



Direction of blowing air
（Optimize air direction and the distance)

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

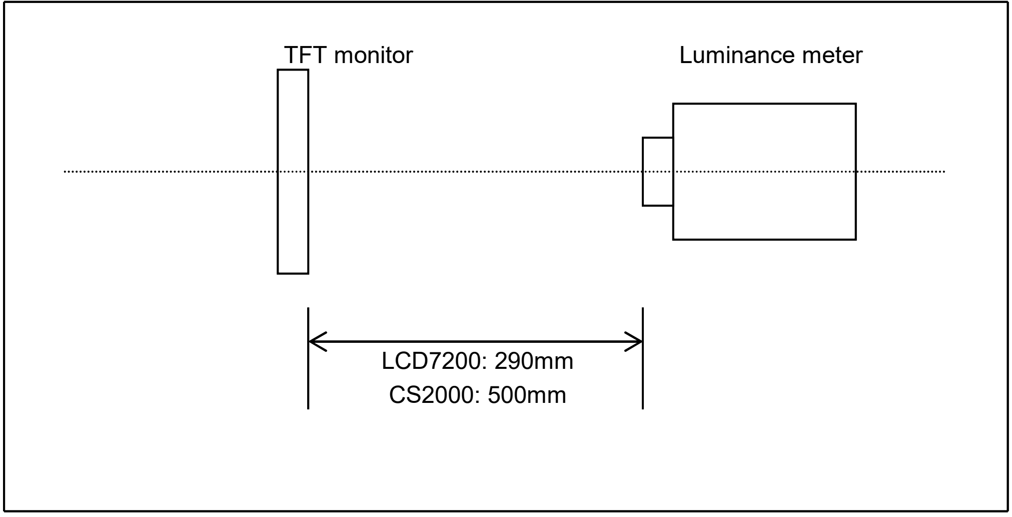
APPENDIX

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

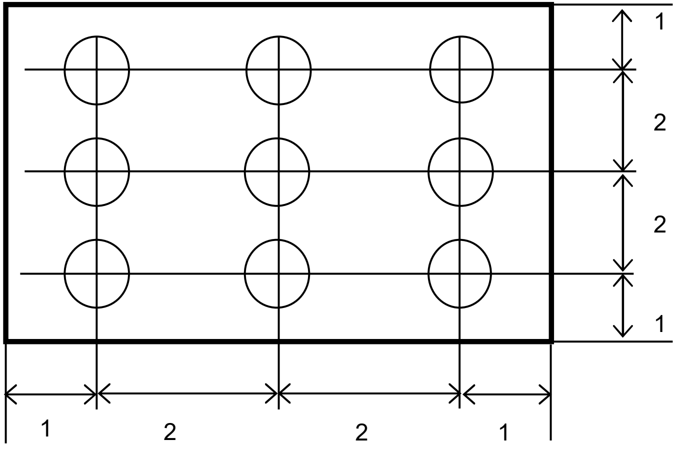
Dark box at constant temperature



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>

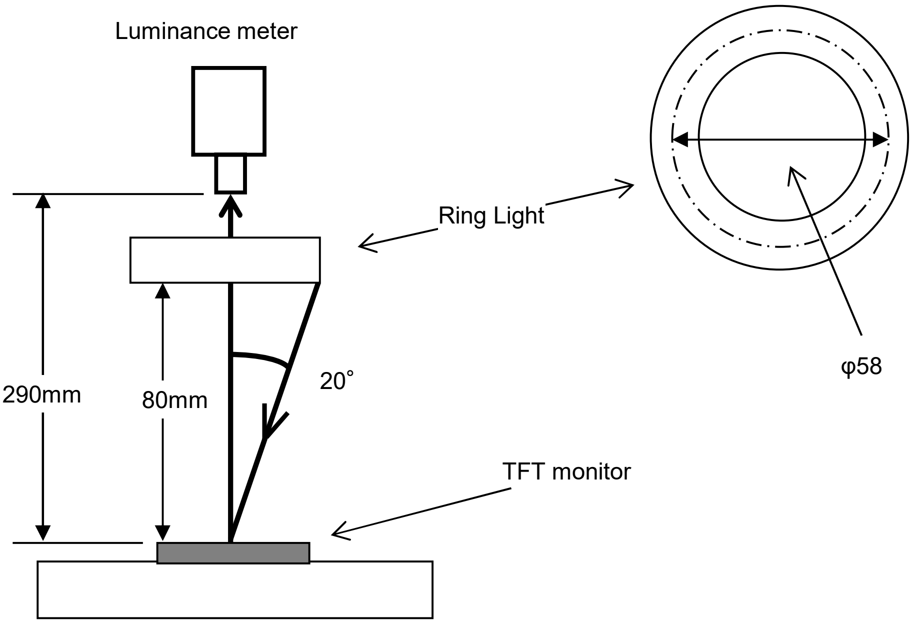


Dimensional ratio of active area

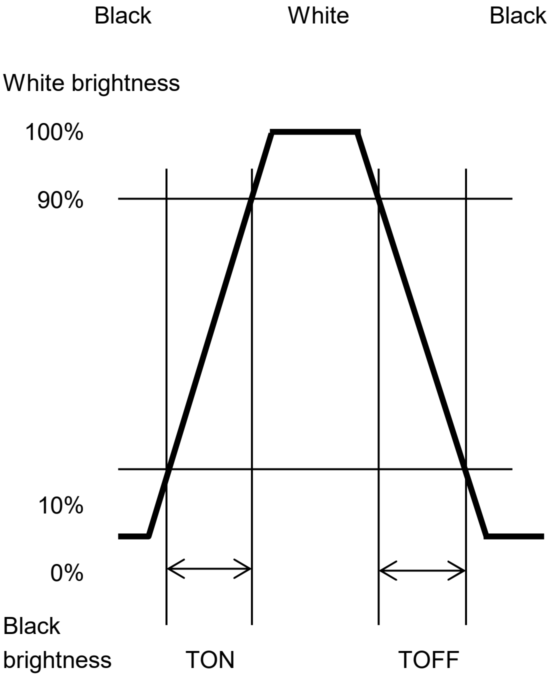
Backlight IL1=IL2=20mA

Measurement Condition (Contrast ratio Backlight OFF only)

Measuring instruments:	LCD7200(OTSUKA ELECTRONICS),Ring Light(40,000 lx,φ58)
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.


Luminance meter
Ring Light
290mm
80mm
20˚
φ58
TFT monitor

2. Test Method

Notice	Item	Test method	Measuring instrument	Remark
1	Response time	Measure output signal waves with a brightness meter when the raster or window pattern is changed over from white to black and from black to white  	LCD7200	Black display [Data]=00h White display [Data]=FFh TON Rise time TOFF Fall time
2	Contrast ratio	Measure maximum luminance Y1([Data]=FFh) 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. Contrast ratio = Y1/Y2 Diameter of measuring point: 7.8mmφ(CS2000) Diameter of measuring point: 3mmφ(LCD7200)	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	Measure chromaticity coordinates x and y of CIE1931 colorimetric system at [Data] = FFh Color matching function: 2°view Measurement angle: 1°	CS2000	
5	Burn-in	Visually check burn-in image on the screen after 2 hours of "window display" ([Data]=00h/FFh).		At optimized VCOMDC
6	Center brightness	Measure the brightness at the center of the screen.	CS2000	
7	Brightness distribution	(Brightness distribution) = 100 x B/A % A : max. brightness of the 9 points B : min. brightness of the 9 points	CS2000	

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