

Specifications for
Blanview TFT-LCD Monitor
(4.3" WQVGA 480 x RGB x 272 Landscape)

Version 1.0

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

MODEL COM43H4P09UTC

Customer's Approval

Signature :

Name :

Section :

Title :

Date :

ORTUSTECH

TOPPAN INC.
Electronics Division
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TOPPAN INC.

Version History

Ver.	Date	Page	Description
0.0	Feb.4,2022	-	- Tentative issue
1.0	Mar.25,2022	-	- First issue
△ ×7		P.14	7.1.2 Backlight
		Change	Estimated Life of LED
		P.15	7.1.3 Touch Panel
		Change	Detectable activation force
		P.22	11.1 Optical Characteristics
		Add	Characteristics
		P.26	13. Reliability Test
		Add	number of failures / number of examinations
		P.28	14. Packing Specifications
Add	Packing Specifications		
P.31	15.4 Storage Condition for Shipping Cartons		
Add	Maximum piling up		
P.32	15.5 Precautions for Peeling off the Protective film		
Add	Work Environment		

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1. Application

This Specification is applicable to 109.0 mm (4.3 inch) Blanview TFT-LCD monitor with Touch Panel 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

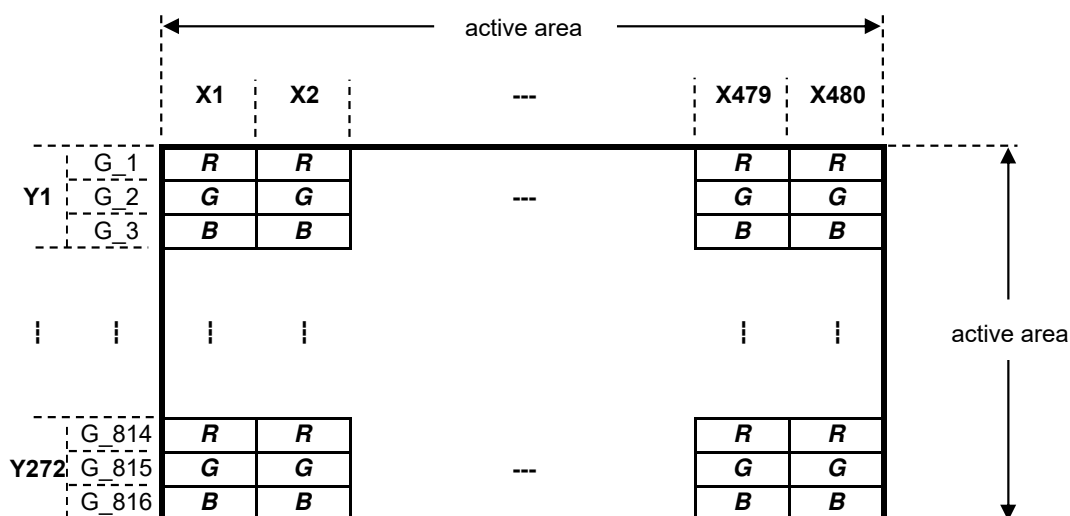
2.1 Features of the Product

- 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.
- Long life & High bright white LED back-light and Touch panel operation monitor.
- Blanview TFT-LCD, improved outdoor readability.

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

2.2 Display Method

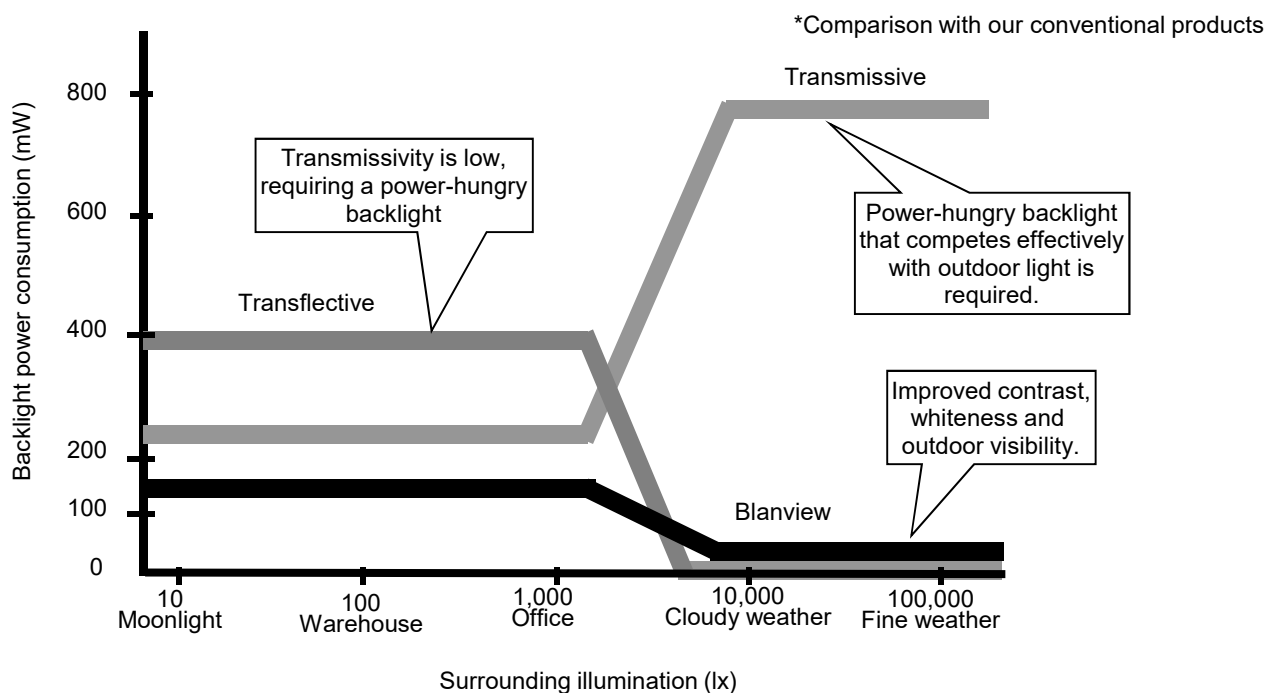
Items	Specifications	Remarks
Display type	VA type 16,777,216 colors. Blanview, Normally black.	
Driving method	a-Si TFT Active matrix. Line-scanning, Non-interlace.	
Dot arrangement	RGB horizontal stripe arrangement.	Refer to "Dot arrangement".
Signal input method	8-bit RGB, parallel input.	
Backlight type	Long life & high bright white LED.	
NTSC ratio	50%	
Touch panel	Resistance type	Surface finishing:AG



Dot arrangement (FPC cable placed downside)

<Features of Blanview>

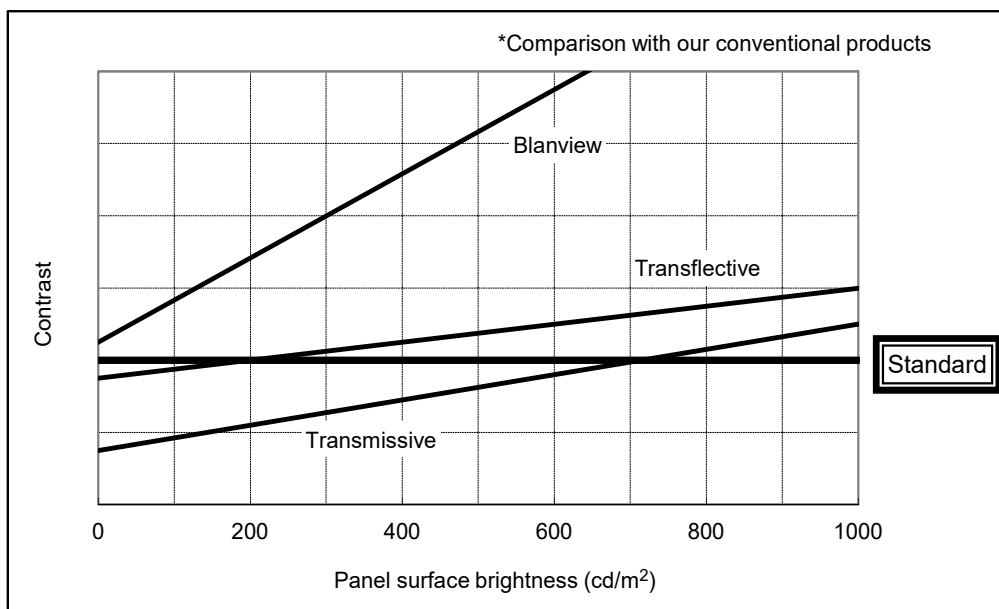
- Backlight power consumption required to assure visibility. (equivalent to 3.5"QVGA)



- Contrast characteristics under 100,000lx. (same condition as direct sunlight.)

With better contrast (higher contrast ratio), Blanview TFT-LCD has the best outdoor readability in three different types of TFT-LCD.

Below chart shows contrast value against panel surface brightness. (Horizontal: Panel surface brightness/ Vertical: Contrast value) LCD panel has enough outdoor readability above our Standard line. (TOPPAN criteria)

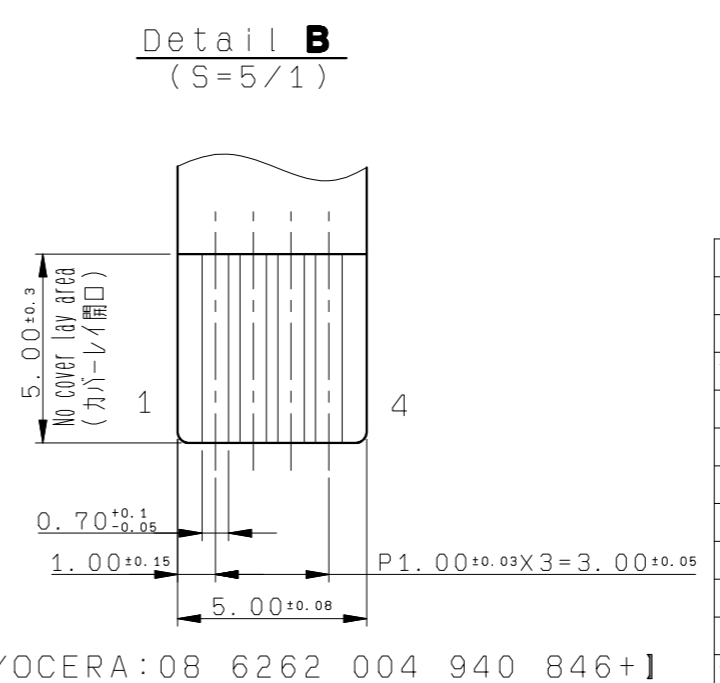
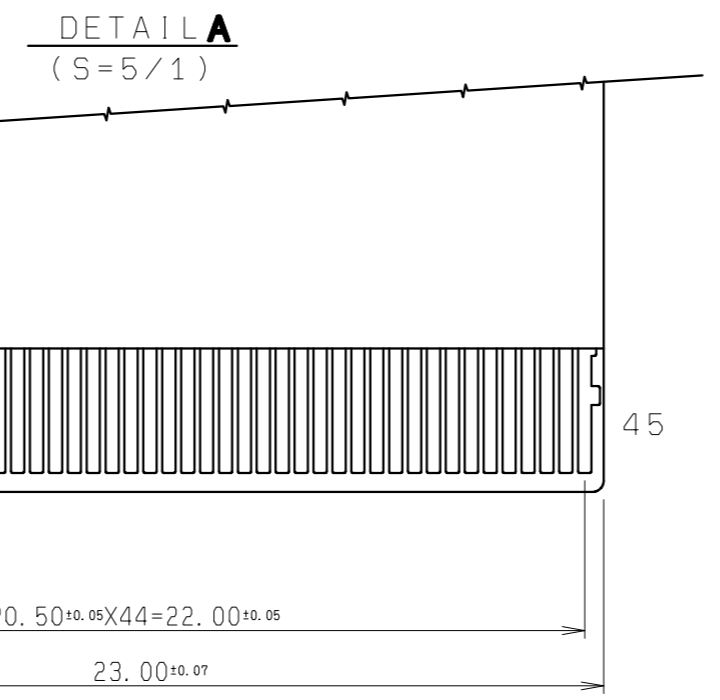
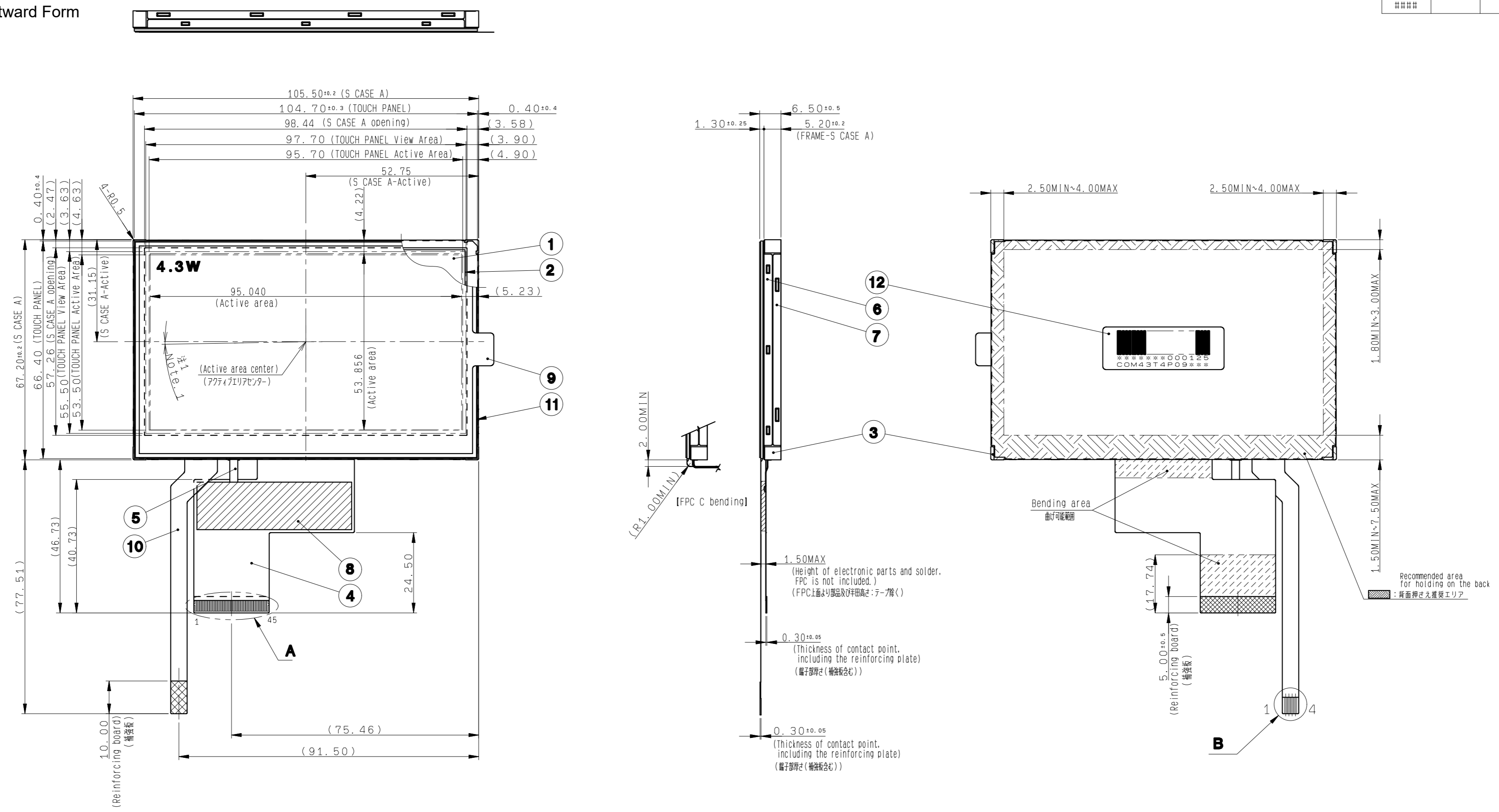


3. Dimensions and Shape

3.1 Dimensions

Items	Specifications	Unit	Remarks
Outline dimensions	105.50[H] × 67.20[V] × 6.50[D]	mm	Exclude FPC cable.
Active area	95.040[H] × 53.856[V]	mm	109.0 mm diagonal.
Number of dots	480[H] × 816[V]	dot	
Dot pitch	198.0[H] × 66.0[V]	μm	
Hardness of Touch Panel surface	2	H	JIS Pencil hardness test.
Weight	77	g	Include FPC cable.

3.2 Outward Form



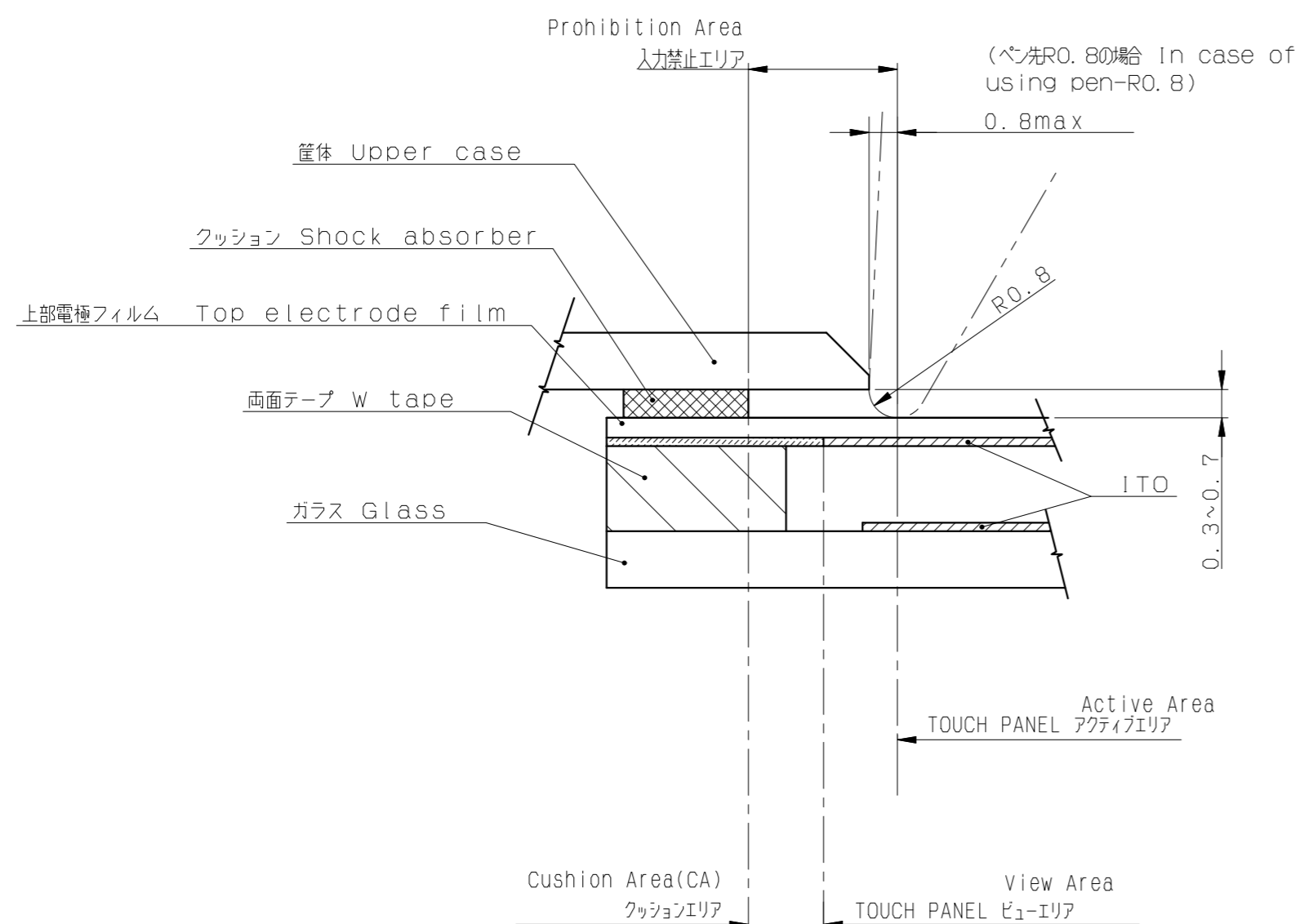
note Angular deviation of LCD cell from the TFT-LCD monitor's reference axis shall be less than $\pm 40'$.
 注1. TFT-LCD PANELの角度スレは、モニター基準軸に対し $\pm 40'$ 以下とする。
 Burrs direction of S CASE is outward. (Burrs size is less than 0.03mm.)
 2. S CASEのバリ方向は外側になります。(MAXO.03mm)
 Protective film is affixed on front surface of the screen.
 Location tolerance of the protective film shall be ± 3.0 mm to the TOUCH PANEL.
 3. 保護膜が表面側に貼られます。表面側保護膜貼付け位置はタッチパネルに対して ± 3.0 とする。
 Linearity is guaranteed in the area surrounded by 3.0mm inside lines from TOUCH PANEL Active Area.
 4. TOUCH PANEL アクティブエリアより内側3.0mmの範囲がリアリティー保証エリアです。

S LABEL	12	Barcode(CODE39) (37X13X0.075t)	For Monitor
Protection Film	11		
FPC C	10		Use for TOUCH PANEL
TOUCH PANEL	9	Film-Glass t=1.0	Surface finishing :AG
I TAPE A	8		
S CASE C	7		SUS(t=0.3)
S CASE A	6		SUS(t=0.15)
FPC B	5		Use for LED
FPC A	4		Use for LCD
FRAME	3		PC
POLARIZER	2		
TFT-LCD	1	Glass substrate thickness=0.5t±0.5t	
PART NAME	ITEM	MATERIAL GRADE	REMARK
APPROVED	尾木	GENERAL TOLERANCE ± 0.5	SCALE 1/1, 5/1 UNIT mm
CHECKED	木下	ISSUE (Y:M:D) 22:01:20	MODEL COM43H4P09U**
CHECKED		NAME	
DESIGN	増田剛		
DRAW	増田剛		
OUTLINE-D4P09			DRAWING No. RJD602644D201 # 1/2
TOPPAN TOPPAN INC. DO NOT DUPLICATE, CONFIDENTIAL AND PROPRIETARY			REV. SHEET DIV. # 1/2 ASS'Y

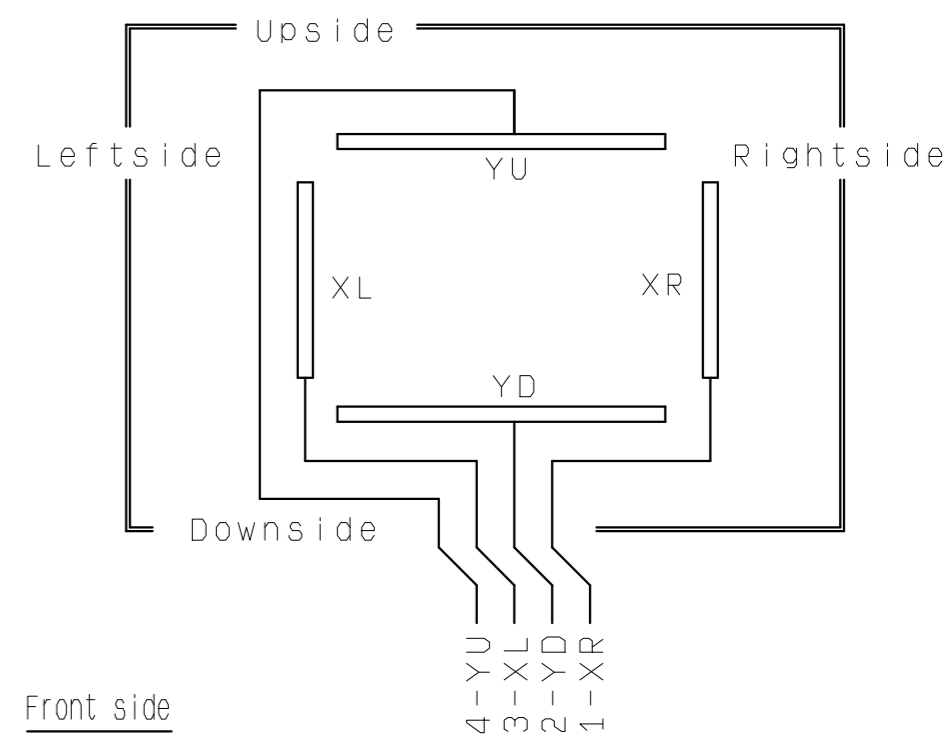
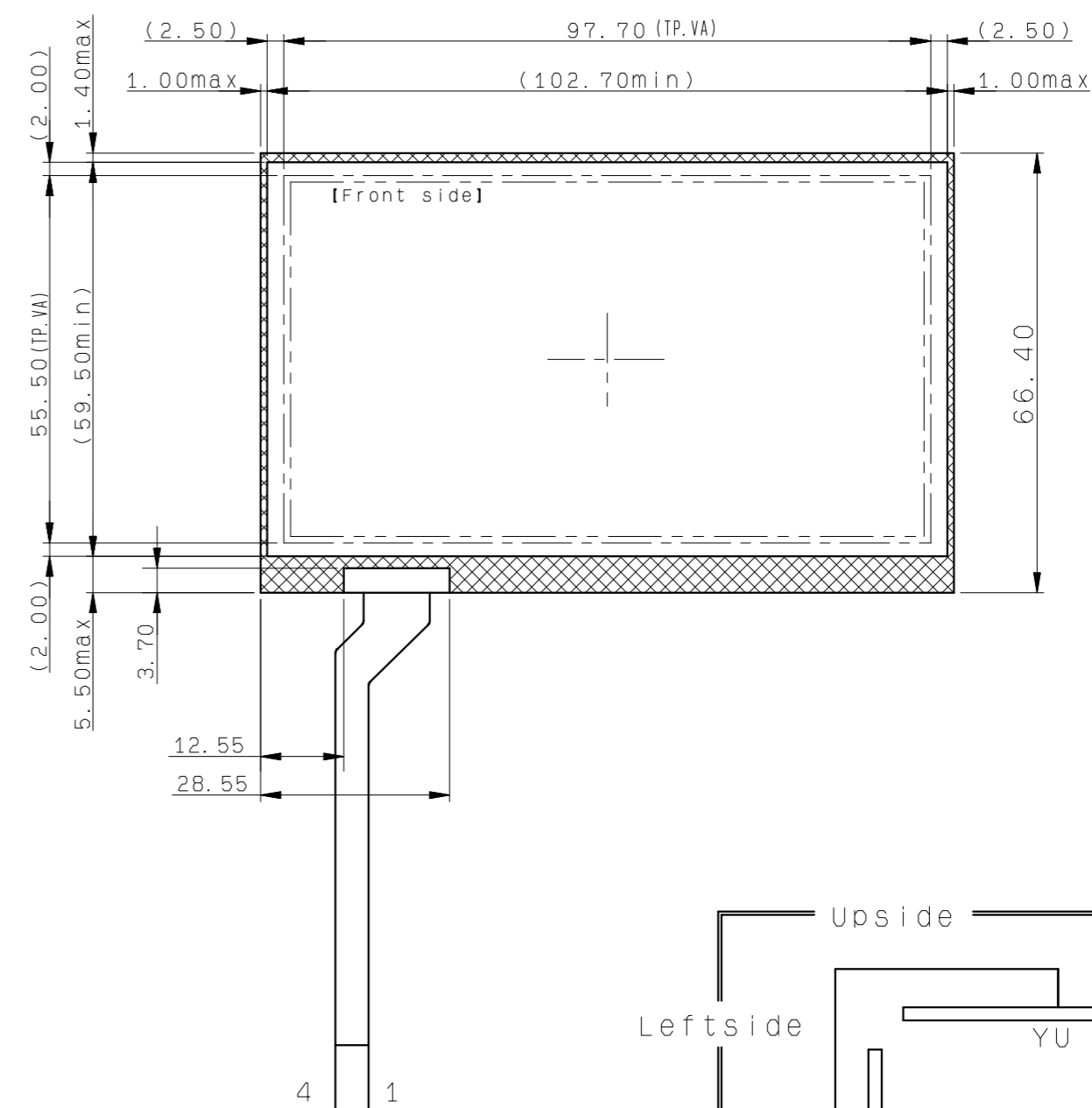
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####			##:##:##	##	##	

(9/37)
22TLM005
Issue:Mar.25,2022

TOUCHPANEL クッションエリア
(S=1/1)



筐体設計例 Example of Housing Design
(S=Free)



端子配列 Circuit diagram

Lower(glass) electrode
X: 上部(フィルム)電極
Upper(film) electrode
Y: 下部(ガラス)電極

Design guidance for the Housing & the cushion
筐体設計上の注意点

- Keep a gap, for example 0.3 to 0.7mm between the bezel edge and touch panel surface to avoid the bezel edge from making contacting with the touch panel surface that may cause a "false touch" with the bottom layer.
- 注5. 筐体の窓枠端とタッチパネル表面の接触による誤入力を選避するために、筐体の窓枠とタッチパネル表面の間にクリアランスを確保してください。(0.3~0.7mm推奨)
- Recommended dimensions of housing in case of using pen(R0.8)
(refer to 'Example of Housing Design')
6. 先端R0.8のペンを使用する場合の筐体窓枠の推奨寸法。(筐体設計例を参照のこと)
- Upper case opening
7. 筐体開口部
- Please place the upper case opening to maintain the operation by a stylus pen inside the TP response area.
- a. 筐体開口部は、ペン入力タッチパネルアクティブエリア内で行えるように設置してください。
- The any pressures in the area between TP response area and TP viewing area is prohibited.
- b. タッチパネルアクティブエリア端とタッチパネルビューエリアの端の間は、押圧が加わらないようにして下さい。

- Cushion design
- B. クッション
- Please put the cushion on the upper case.
- a. クッションを筐体側に設置してください。
- Do not use an adhesive tape to stick on the TP surface.
- b. クッションのタッチパネル面側には両面テープを使用しないでください。
- Please position the cushion over the cushion area to avoid a short.
- c. クッションは、エリア内に設置してください。

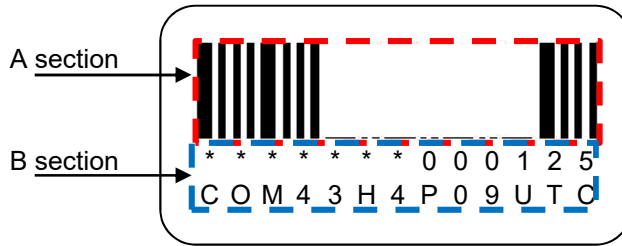
APPROVED 尾木	GENERAL TOLERANCE ±0.5	SCALE 1/1	UNIT mm	TOPPAN TOPPAN INC. DO NOT DUPLICATE, CONFIDENTIAL AND PROPRIETARY	
CHECKED 木下	ISSUE (Y-M-D) 22:01:20	MODEL COM43H4P09U**			
CHECKED	NAME	OUTLINE-D4P09		DRAWING No.	REV. SHEET DIV.
DESIGN 増田剛				RJD602644D201	# 2/2
DRAW 増田剛					

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	Mar-C	May-E	Jul-G	Sep-I	Nov-K
		Feb-B	Apr-D	Jun-F	Aug-H	Oct-J	Dec-L
c	Model code	43GDC (Made in Japan) 43GEC (Made in Malaysia)					
d	Serial number						

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

•Made in Japan

2L43GDC000125

means "manufactured in December 2022, 4.3" GD type, C specifications, serial number 000125"

•Made in Malaysia

2L43GEC000125

means "manufactured in December 2022, 4.3" GE 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	VSS	GND.
3	VDD	Power supply.
4	VDD	Power supply.
5	D00	Display data(R). 00h: Black D00:LSB D07:MSB
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
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
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.

4.2 Touch Panel Part

No.	Symbol	Function
1	XR	X-axis right terminal
2	YD	Y-axis down terminal
3	XL	X-axis left terminal
4	YU	Y-axis up terminal

- Recommended connector: KYOCERA Corporation 6262 series [08 6262 004 940 846+]
- 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.

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	IL		--	70	mA	BLH - BLL1/BLL2
Touch Panel input voltage	VIT		--	6	V	XR, XL, YU, YD
Storage temperature range	Tstg		-30	80	° 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	-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.				

Note : This monitor is operatable in this temperature range. With regard to optical characteristics, refer to Item "11. CHARACTERISTICS".

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	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 resistor 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 *Reference value	VF1	Ta=25°C	--	10.6	11.4	V	BLH - BLL1
	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.



7.1.3 Touch Panel

Ta=25° C

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Linearity	LE	Note	-2.0	--	2.0	%	4-point correction
Insulation resistance	RI	DC 25V	20	--	--	MΩ	XR,XL-YU,YD
Terminal resistance		X	299	--	697	Ω	XR,XL
		Y	177	--	413		YU,YD
Rated voltage		DC	--	5.0	6.0	V	XR,XL,YU,YD
on/off chattering		R4.0mm Hardness 60 degree test stick.	--	--	10	ms	

Note: (-Linearity Measurement:Refer to the APPENDIX of "Reference Method for Measuring Optical Characteristics".)

Mechanical Characteristics

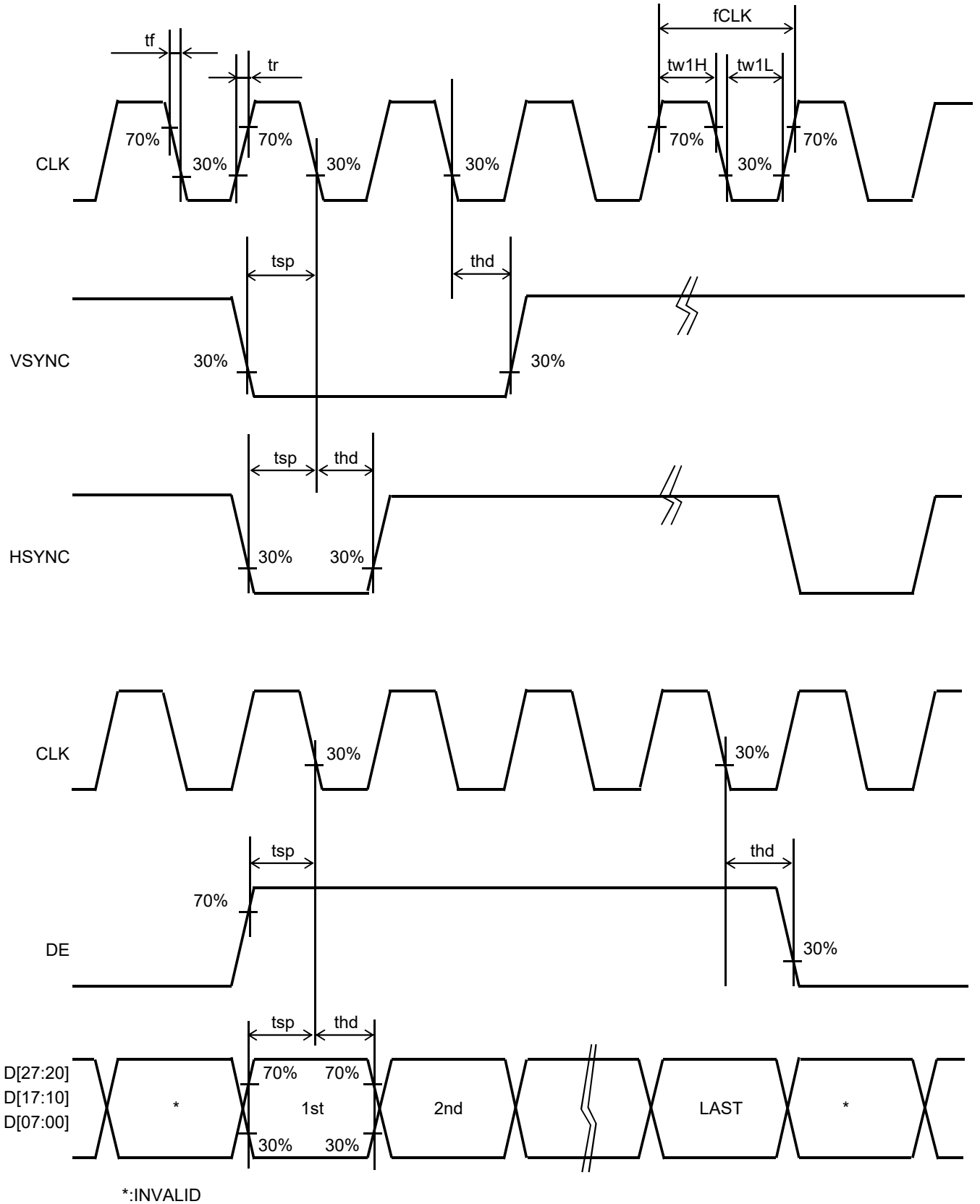
Item	Rating			Unit	Remark
	MIN	TYP	MAX		
Detectable activation force	0.05	--	1.2	N	R4.0mm Hardness 60 degree test stick. Resistance between X and Y axis must be equal or lower than 5 kΩ.
Keystroke durability (case of finger input)	10,000,000	--	--	times	key the same part by silicon rubber. (Touch panel Active area only) -R4.0mm Hardness 60 degree test stick. -Load:3.0 N -Speed:2 times/second

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,VSYN,HSYN,DE,D[27:20],D[17:10],D[07:00]
Hold time	thd		16.0	--	--	ns	

Switching Waveform Characteristics



7.3 Input Timing Characteristics

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

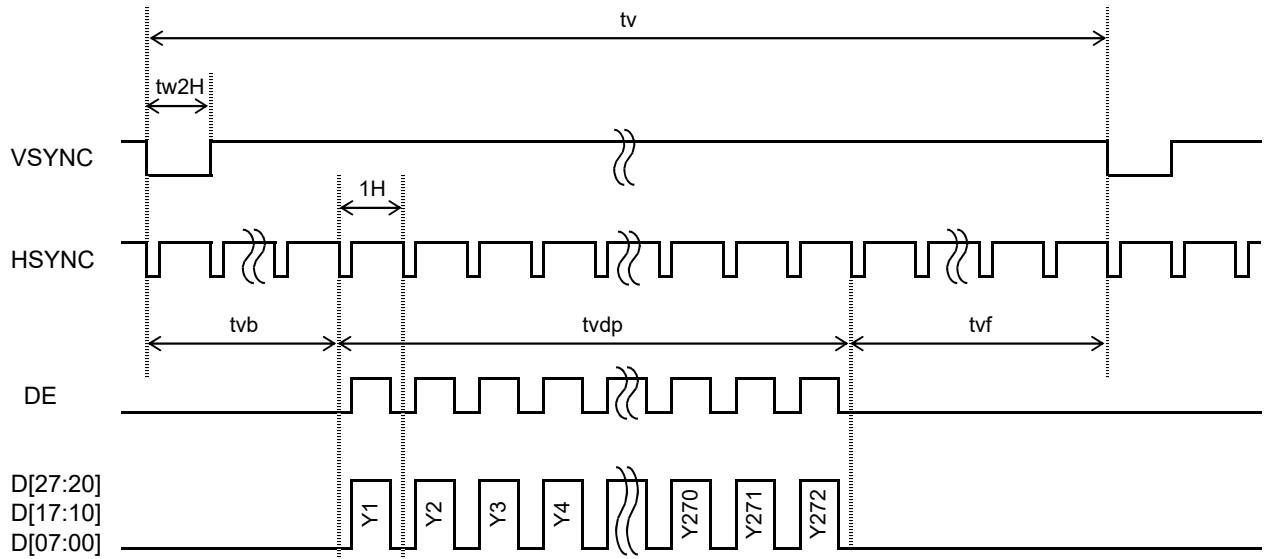
Item	Symbol	Rating			Unit	Applicable terminal
		MIN	TYP	MAX		
CLK frequency	fCLK	7.2	9.0	12.0	MHz	CLK
VSYNC frequency	Note fVSYNC	54	60	66	Hz	VSYNC
VSYNC signal cycle time	tv	277	288	396	H	VSYNC,HSYNC
VSYNC pulse width	tw2H	1	--	--	H	
Vertical back porch	tvb	tw2H + 2	8	31	H	
Vertical front porch	tvf	2	8	93	H	
Vertical display period	tvdp	--	272	--	H	
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 characteristics and values in the chart indicate recommended specifications.

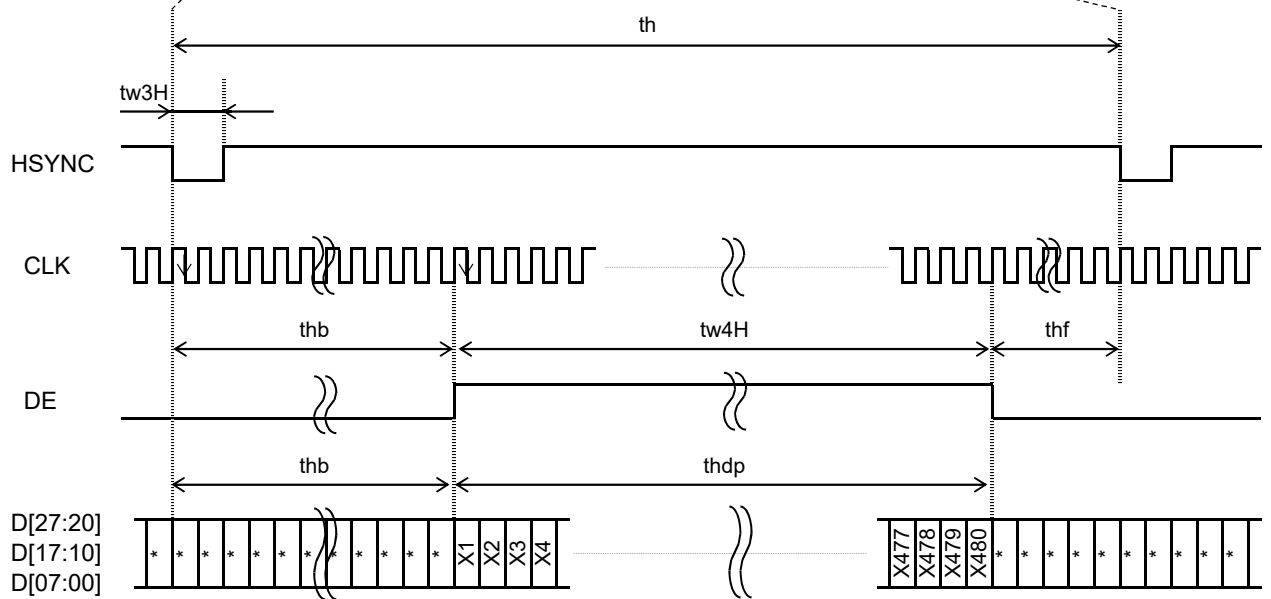
In the case that the product might be used NOT in compliant with the specifications, it is highly recommended to use the product after adequate verifications could be implemented and at your own risk.

7.4 Driving Timing Chart

-Vertical Timing

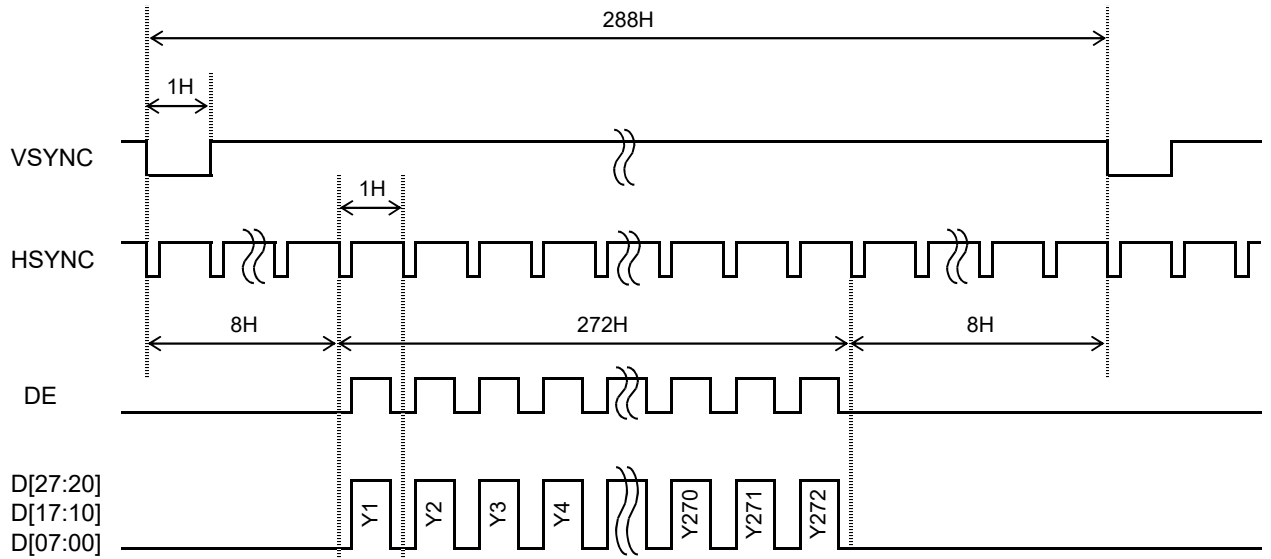


-Horizontal Timing

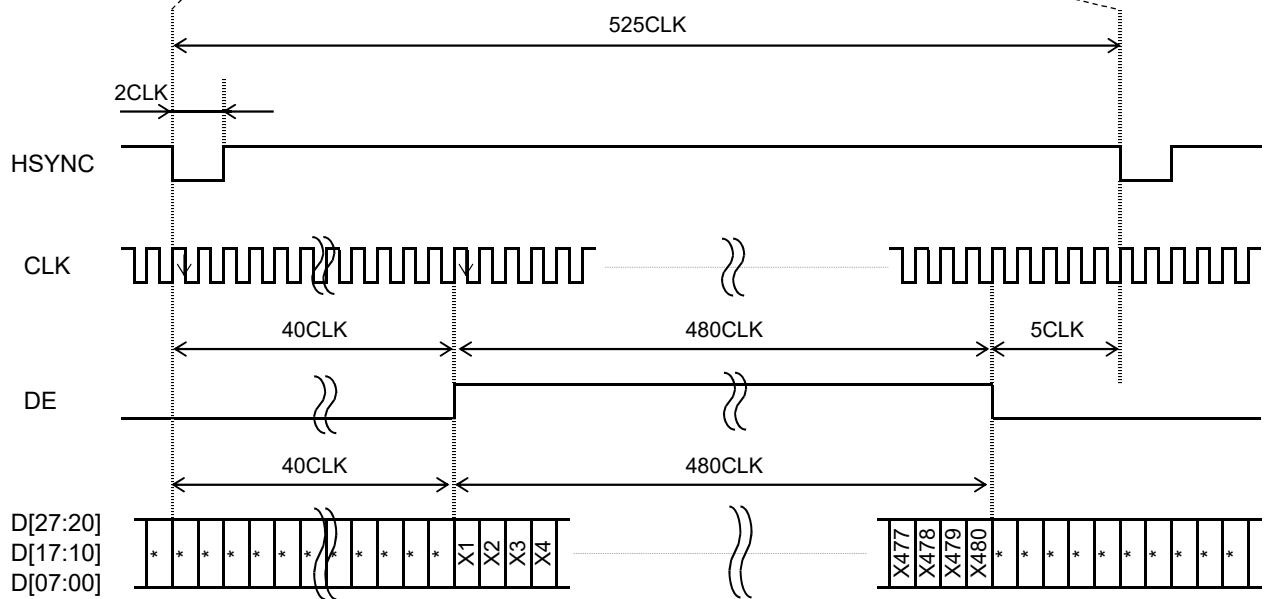


7.5 Example of Driving Timing Chart (fCLK=9.0MHz)

-Vertical Timing

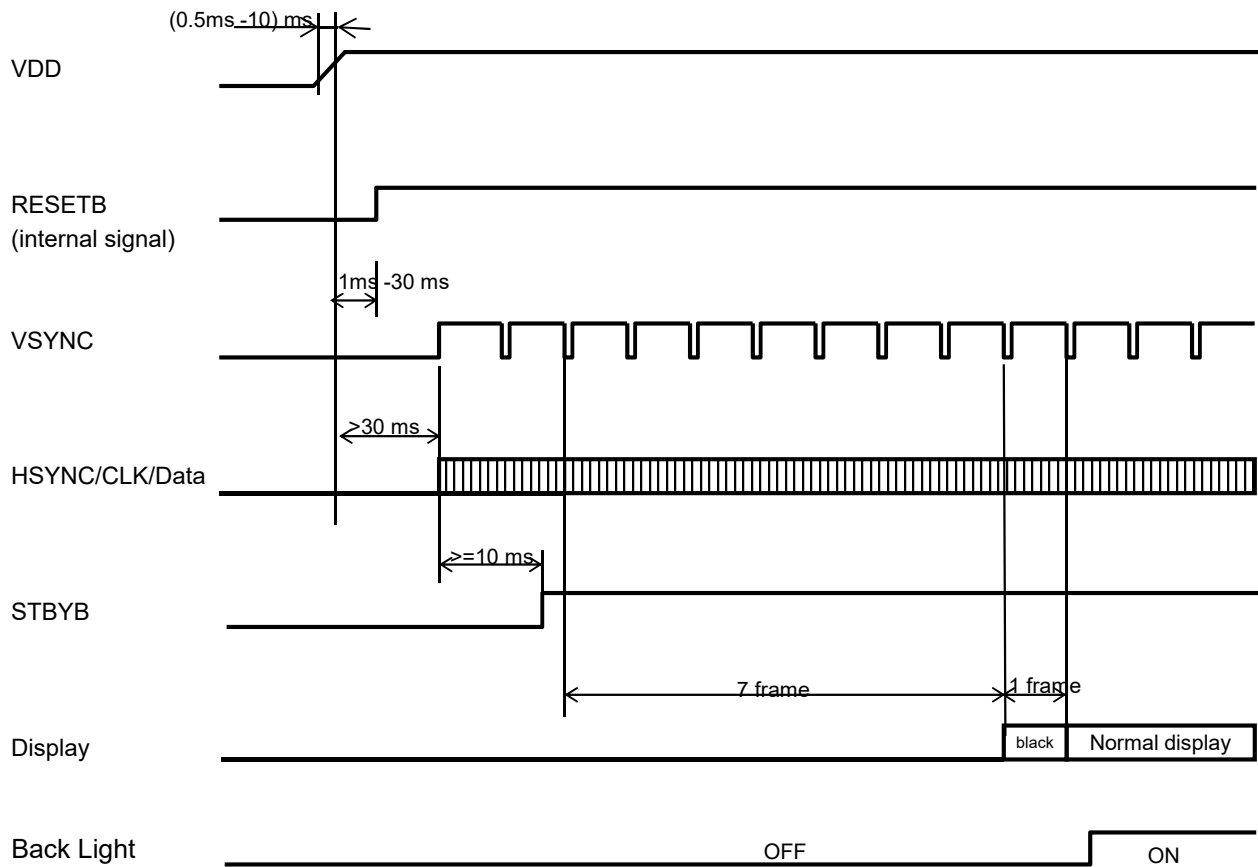


-Horizontal Timing

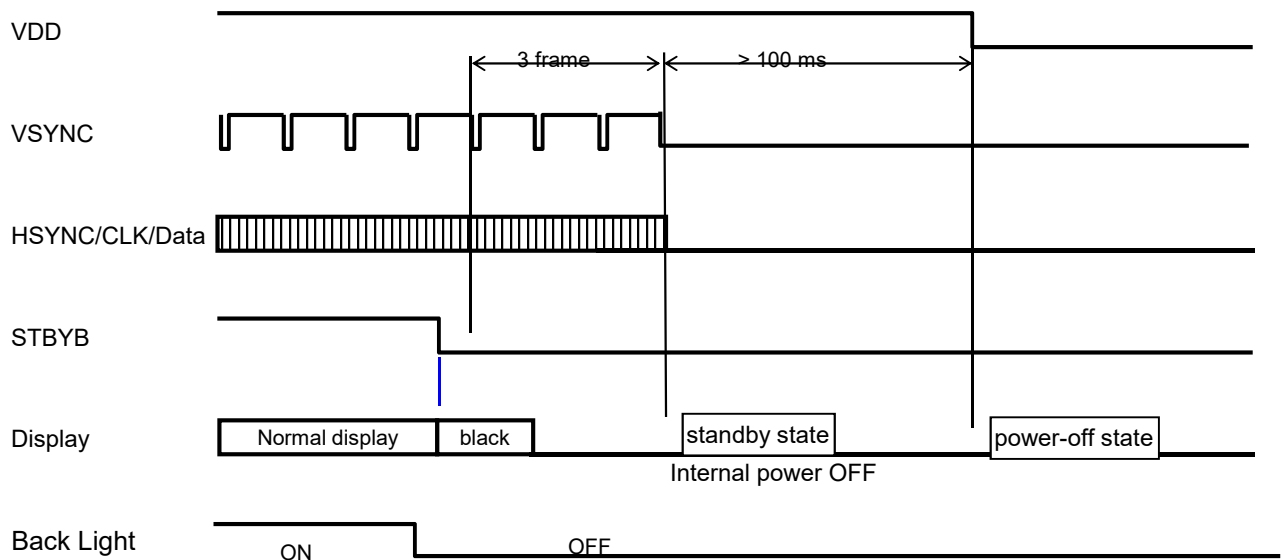


8. Power ON/OFF Sequence

8.1 Power ON Sequence

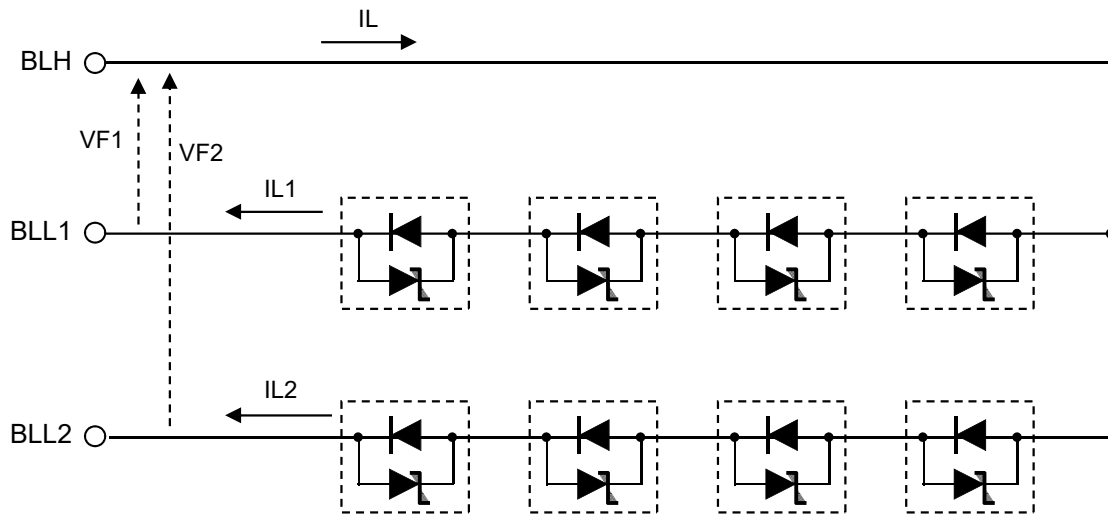


8.2 Standby / Power OFF Sequence



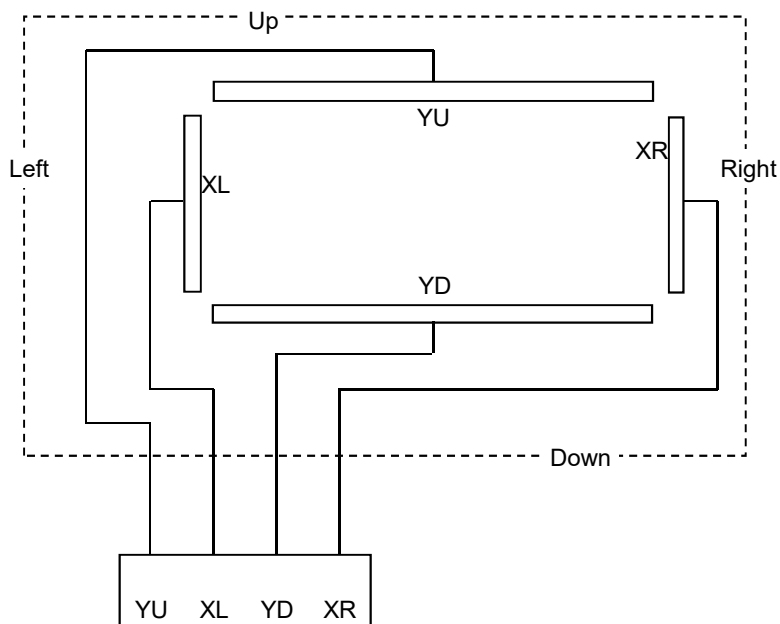
If CLK and VSYNC signals are stopped or the power supply is turned off to a regulated frame or less, the afterimage might remain.

9. LED Circuit



* It is recommended to control currents of BLL1 / BLL2 to equal current values ($I_{L1} = I_{L2}$).

10. Touch Panel Circuit



11. Characteristics

 11.1 Optical Characteristics

(Measurement Condition)

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

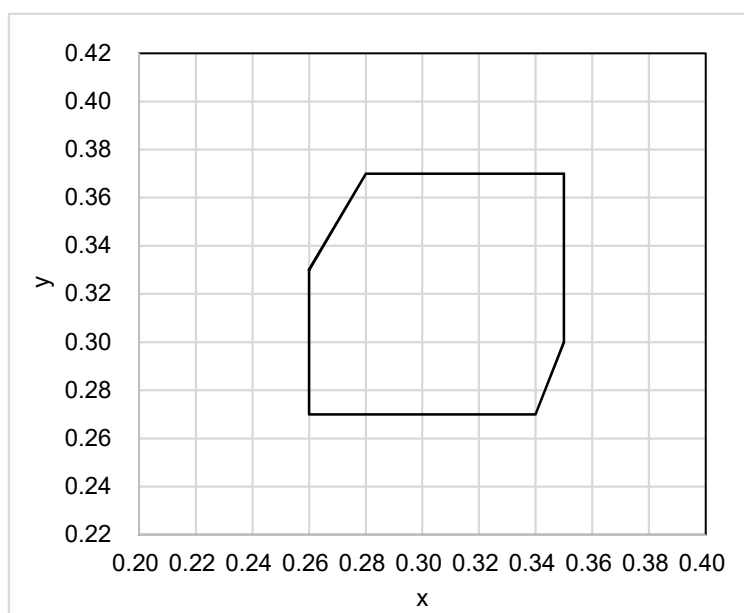
Driving condition: VDD=3.3V, VSS=0V, Optimized VCOMDC

Backlight: IL1=IL2=20mA

Measured temperature: Ta = 25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note №	Remark
Response time	Rise time	TON	[Data]= 00h← → FFh	-	-	100	ms	1	
	+ Fall time	TOFF							
Contrast ratio	Backlight ON	CR	[Data]= FFh / 00h	400	800	-		2	
	Backlight OFF			-	2	-			
Viewing angle	Left	θL	[Data]= FFh / 00h CR \geq 10	80	-	-	deg	3	
	Right	θR		80	-	-	deg		
	Up	φU		80	-	-	deg		
	Down	φD		80	-	-	deg		
White Chromaticity		x y	[Data]= FFh	White chromaticity range				4	
Center Brightness			[Data]= FFh	- 310	1100 480	- -	cd/m ²	5	*IL1=IL2=46mA *IL1=IL2=20mA
Brightness distribution			[Data]= FFh	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	0.33
0.26	0.27
0.34	0.27
0.35	0.30
0.35	0.37
0.28	0.37

White Chromaticity Range

11.2 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
			Ta = -20 °C	Ta = 70 °C	
Response time	Rise time + Fall time	TON + TOFF	1500 msec or less	80 msec or less	
Contrast ratio		CR	200 or more	200 or more	Backlight ON
Display Quality			No noticeable display defect or ununiformity should be observed.		

12. Criteria of Judgment

12.1 Defective Display and Screen Quality

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

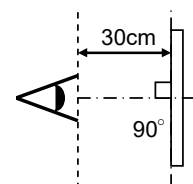
Driving Signal: Raster Patter (RGB, white, black)

Signal condition: [Data] : 00h, 94h, FFh (3steps)

Observation distance: 30 cm

Illuminance: 200 to 350 lx

Backlight: IL= 20.0mA



Defect item	Defect content	Criteria		
Display Quality	Line defect	Black, white or color line, 3 or more neighboring defective dots		
	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			
	Invisible through 5% ND filter at [Data]=00h	Acceptable		
Screen Quality	Stain	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	$0.30\text{mm} < \varphi$	
			$0.20\text{mm} < \varphi \leq 0.30\text{mm}$	
			$\varphi \leq 0.20\text{mm}$	
	Liner		$0.10\text{mm} < \text{Width and } 20.0\text{mm} < \text{Length}$	
			$\text{Width} \leq 0.10\text{mm}$ or $\text{Length} \leq 20.0\text{mm}$	
	Flaw	Flaw on the surface of Touch Panel	$0.10\text{mm} < W$	
			$0.05\text{mm} < W \leq 0.10\text{mm}$	$L \leq 4.0\text{mm}$
			$0.03\text{mm} < W \leq 0.05\text{mm}$	$L \leq 10.0\text{mm}$
$W \leq 0.03\text{mm}$			Acceptable	
Others		Use boundary sample for judgment when necessary		

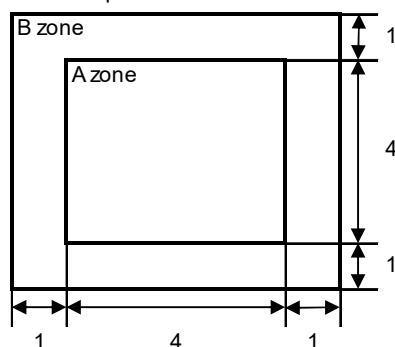
φ (mm): Average diameter = (major axis + minor axis)/2

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)

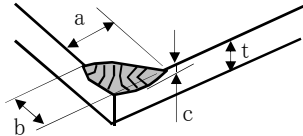
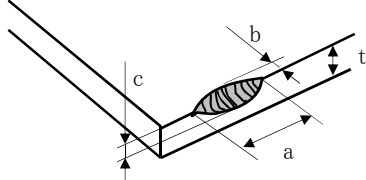
12.2 Screen and Other Appearance

Testing conditions

Observation distance: 30 cm

Illuminance: 1200 ~ 2000 lx

Item	Criteria	Remark
Polarizer Flaw Stain Dirt 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	No functional defect occurs	

Item	Appearance	Criteria
Touch Panel	Glass chipping Corner area 	Unit: mm $a \leq 3$ $b \leq 3$ $c \leq t$ (t: glass thickness) $a, b \leq 0.5$ is acceptable $n \leq 2$
	Others 	Unit: mm $a \leq 5$ $b \leq 3$ $c \leq t$ (t: glass thickness) $a, b \leq 0.5$ is acceptable Maximum permissible number of chipping off on a side is 5.
	Progressive crack	None
	Interference fringe	Ignore

13. 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	240hrs	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	240hrs	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.)

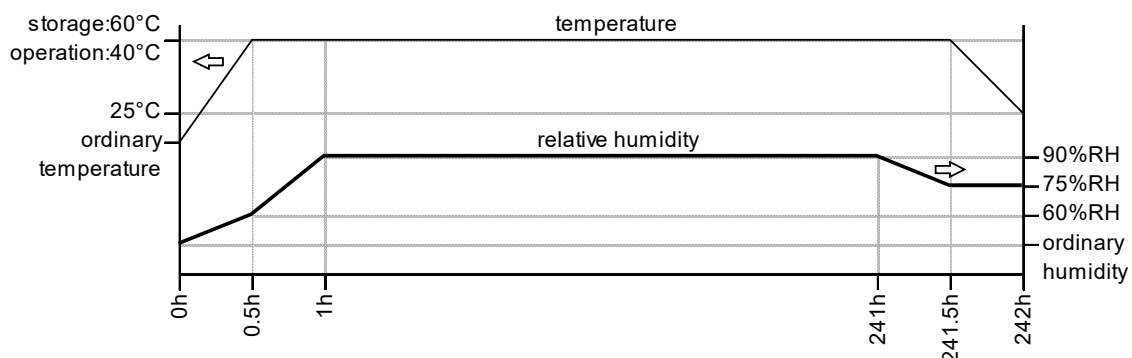
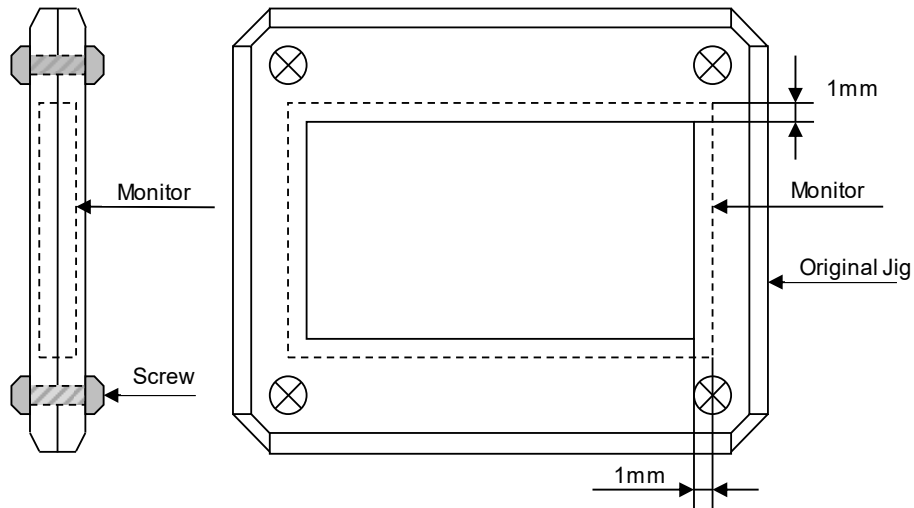


Table2. Reliability Criteria

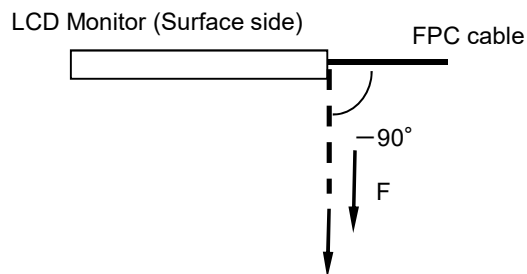
The parameters should be measured after leaving the monitor at the ordinary temperature for 24 hours or more after the test completion.

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

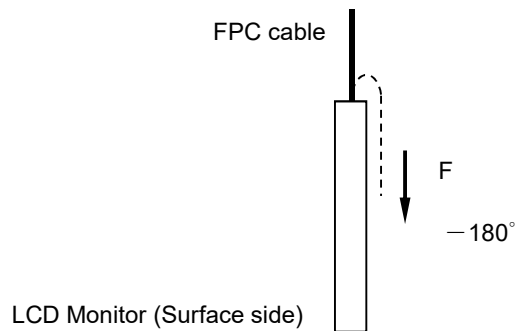
TOPPAN Original Jig



Tension Test Method for FPC cable

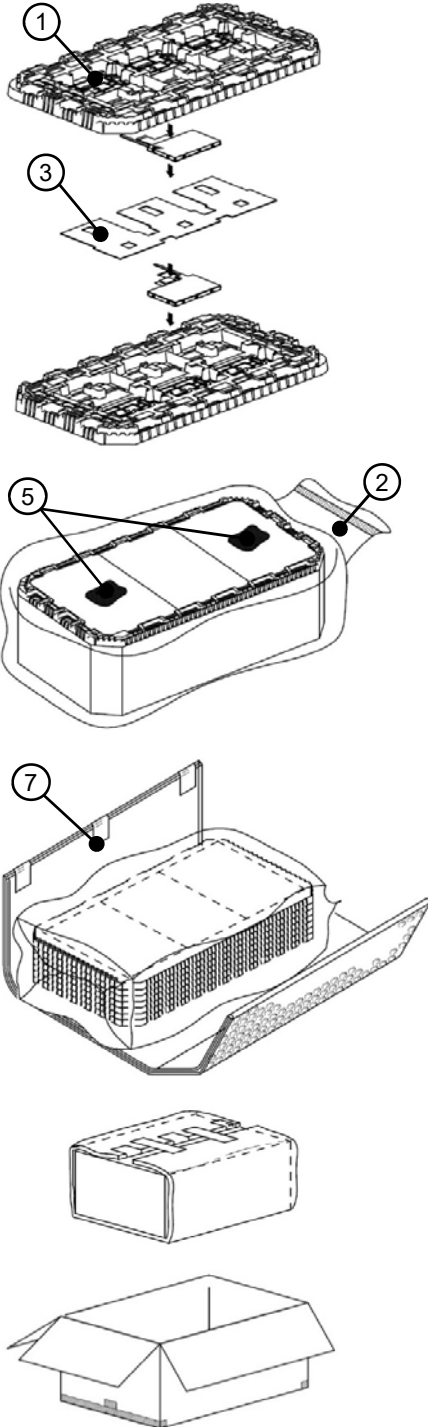


Bend Test Method for FPC cable





14. Packing Specifications



Step1. Each product is to be placed in one of the cut-outs of the tray with the display surface facing upward. (3 products per tray)
Foam sheet is to be placed on the products in the tray.
Each product is to be placed in one of the cut-outs of the tray with the display surface facing downward.(6products per tray)

Step2. The trays be in a stack of 4.(Rotate 180 degrees for each step)
One empty tray is to be put on the top of stack of 4 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.

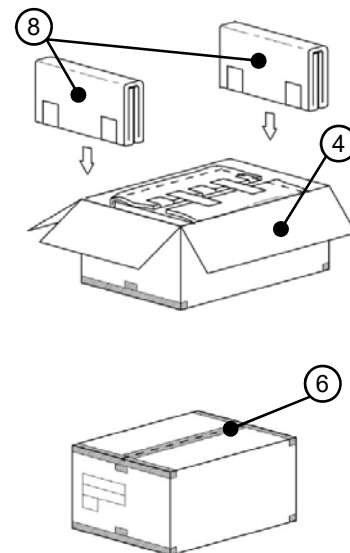
Step4. Vacuum and seal the sealing bag with the vacuum sealing machine.

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	Sealing bag	
③	FOAM SHEET	Anti-static polyethylene
④	Outer carton	Corrugated cardboard
⑤	Drier	Moisture absorber
⑥	Packing tape	
⑦	B SHEET A	Anti-static air bubble sheet
⑧	B SHEET B	Anti-static air bubble sheet

Dimension of extra outer carton	
D : Approx.	(356mm)
W : Approx.	(664mm)
H : Approx.	(182mm)
Quantity of products packed in one carton:	24
Gross weight : Approx.	4.1kg

15. Handling Instruction

15.1 Cautions for Handling LCD panels

**Caution**

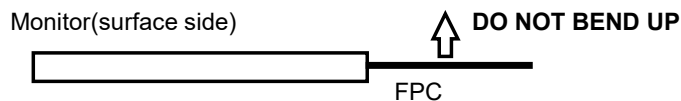
- (1) Do not make an impact on the LCD panel glass because it may break and you may get injured from it.
- (2) If the glass breaks, do not touch it with bare hands.
(Fragment of broken glass may stick you or you cut yourself on it.)
- (3) If you get injured, receive adequate first aid and consult a medial 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 end part of glass and film of touch panel has conductivity, and avoid contact (short-circuit) with electroconductive case etc.. There is a possibility of setting up a defective touch panel, and insulate it for the case suppression (cushion etc.) if necessary, please.
- (12) It may cause electrical corrosion if liquid material penetrates the edge of the touch panel, so handle with care so that no liquid adheres to the touch panel.
- (13) 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.

15.2 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 and Touch panel from deterioration by ultraviolet rays.
Deterioration caused by exposure to ultraviolet radiation is not warranted.
- 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 15.5 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.

15.3 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.



15.4 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.



15.5 Precautions for Peeling off the Protective film

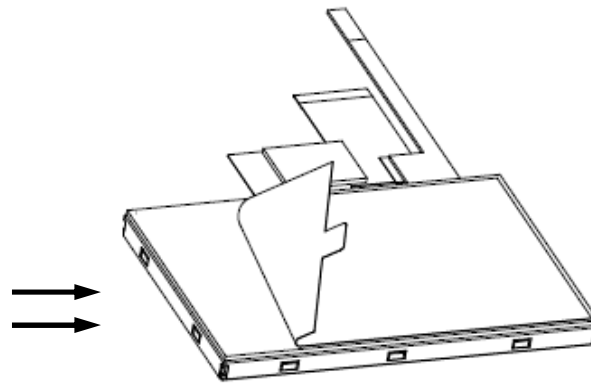
The followings work environment and work method are recommended to prevent the TFT monitors from static damage or adhesion of dust when peeling off the protective films.

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

- a) Use an electrostatic neutralization blower to blow air on the TFT monitors to its left when FPC is placed at the top.
Optimize direction of the blowing air and the distance between the TFT monitors and the electrostatic neutralization blower.
- b) Peel off the tab of protection film slowly (spending more than 2 secs to complete) by pulling it to opposite direction.



Blower wind direction
(Set an ion blower with its adequate conditions.)

15.6 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)

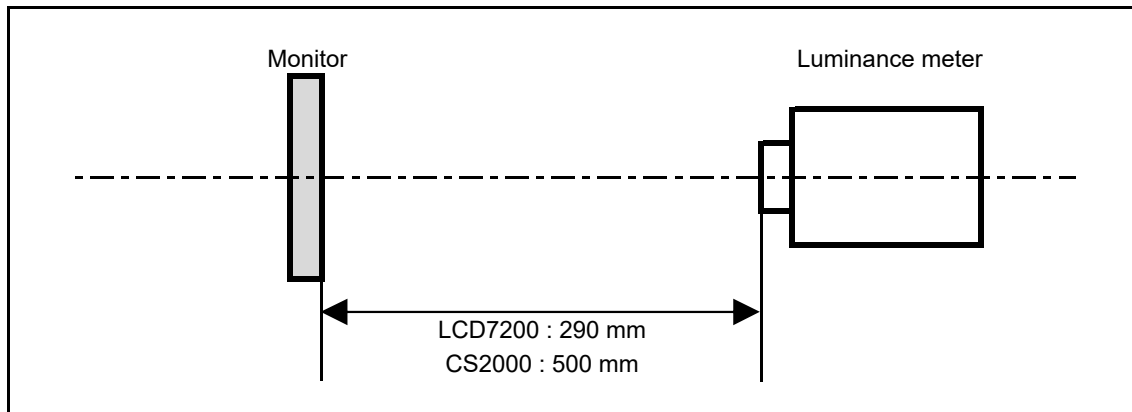
Driving condition: Refer to the section "Optical Characteristics"

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

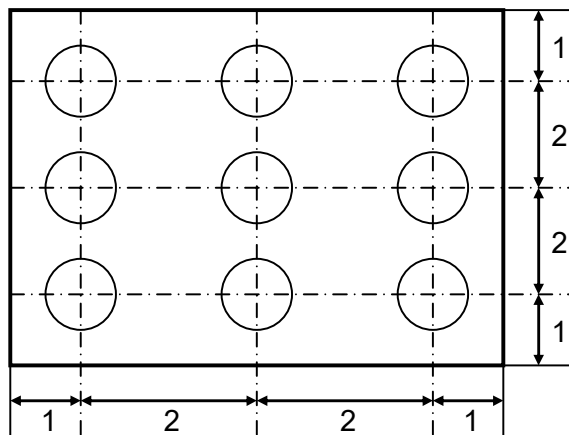


*Measurement is made after 30 minutes of lighting of the backlight.

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)

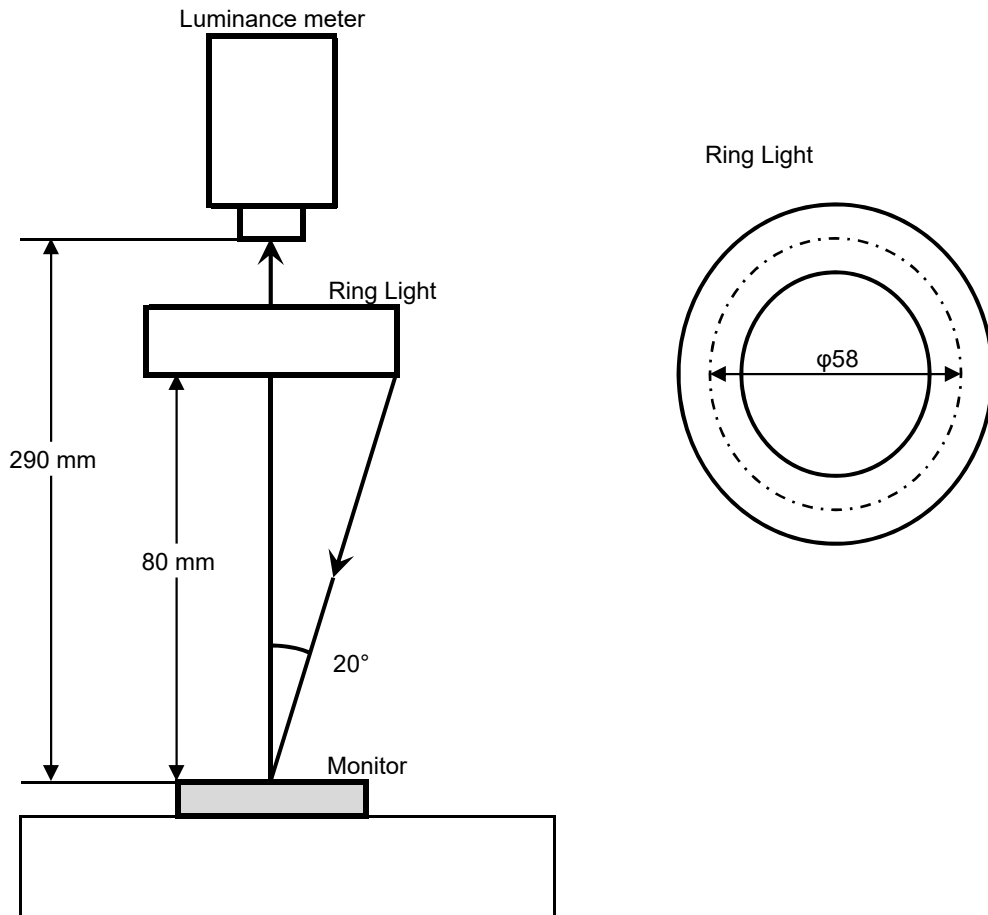
Measuring instruments: LCD7200(OTSUKA ELECTRONICS) , Ring Light (40,000 lx, $\phi 58$)

Driving condition: Refer to the section "Optical Characteristics"

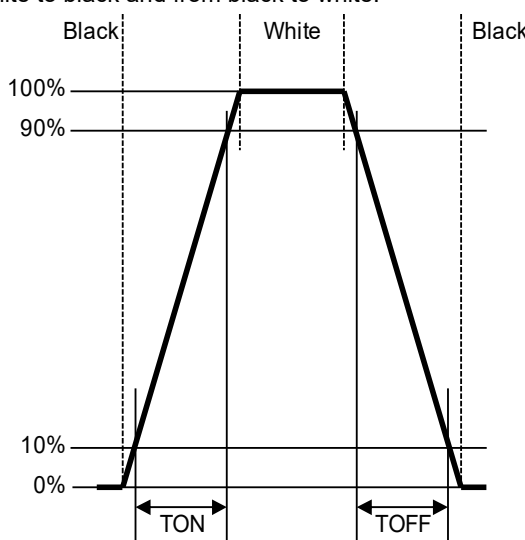
Measured temperature: 25°C unless specified

Measurement system: See the chart below.

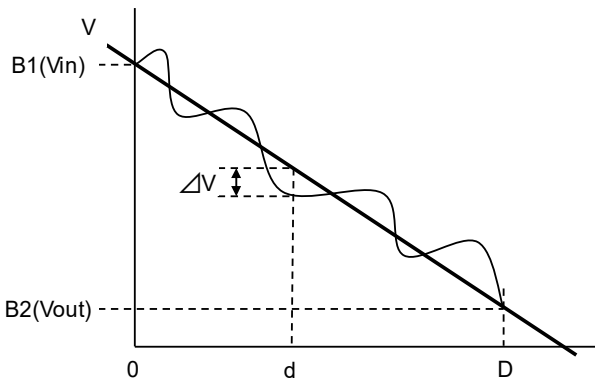
Measurement point: At the center of the screen unless otherwise specified



2. Test Method

Notice	Item	Test method	Measuring instrument	Remark
1	Response time	Measure output signal waveform by the luminance meter when raster of window pattern is changed 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. $\text{Contrast ratio} = Y1/Y2$ 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	Center brightness	Measure the brightness at the center of the screen.	CS2000	
6	Brightness distribution	$(\text{Brightness distribution}) = 100 \times B/A \%$ A : max. brightness of the 9 points B : min. brightness of the 9 points	CS2000	
7	Burn-in	Visually check burn-in image on the screen after 2 hours of "window display" ([Data]=00h/FFh).		At optimized VCOMDC

* Linearity Measurement of Touch Panel



$$LE(\%) = \frac{\Delta V}{(V_{in} - V_{out})} \times 100$$

$$LE_{max}(\%) = \frac{\Delta V_{max}}{(V_{in} - V_{out})} \times 100$$

■ Cautionary instruction to handle a Touch-panel

• Cushion (between Touch Panel Chassis) Design

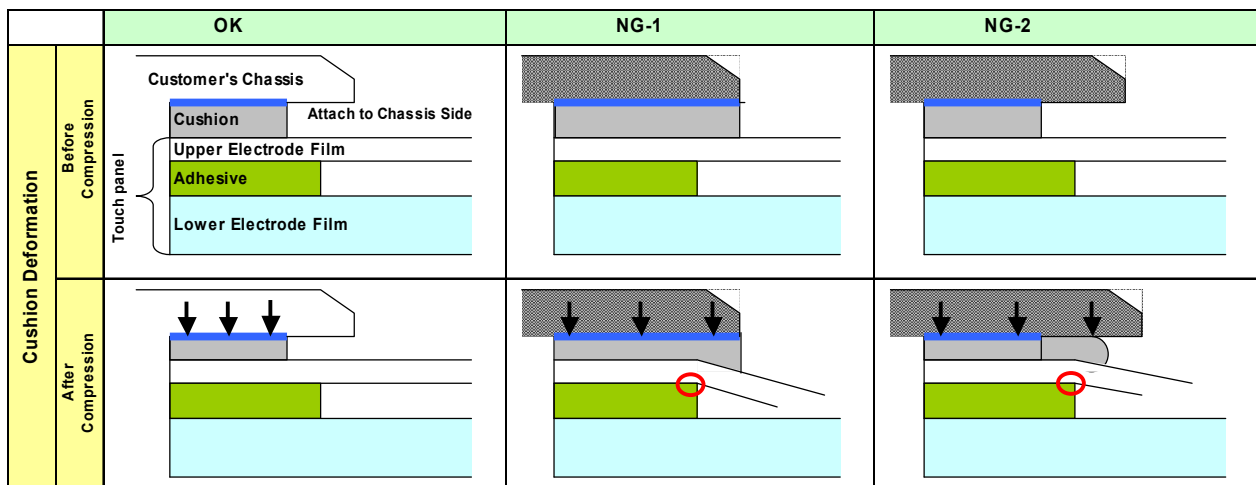
- 1) A cushion is required to be placed between Touch Panel and customer's chassis and there is a designated area to attach it. Attachment at area inside Input Prohibition Area must be forbidden.

If cushion was located inside Input Prohibition Area, Upper Electrode may be push constantly and which may cause the electrode breakage at the position falling on the edge of adhesive; it eventually results in Touch Panel malfunction in the future. (Please see "NG-1")

- 2) Be attention to the cushion material you use. In the case that too soft cushion was used, the cushion may protrude into Prohibition Area by being push strongly; which may result in the electrode breakage. Eventually there is a chance that the electrode breakage leads to the malfunction of Touch Panel in the future. (Please see "NG-2")

- 3) Cushion is required to be attached at the side of Customer's chassis.

Attaching a cushion at the side of Upper Electrode Film has a chance to deform the film and lead to the malfunction of Touch Panel in the future.



• Design Guidance of Chassis (Front Part)

- 4) Be attention to stay Input Prohibition Area away from touching and/or drawing by a stylus pens in order to avoid the electrode breakage and potential malfunction of Touch Panel. (Please see "NG-3")

We recommend customers to design chassis (front case) being able to protect Input Prohibition Area.

- 5) Clearance between customer's chassis and Touch Panel surface is certainly required in order to avoid erroneous input caused by a collision of the edge of chassis. (Please see "NG-4")

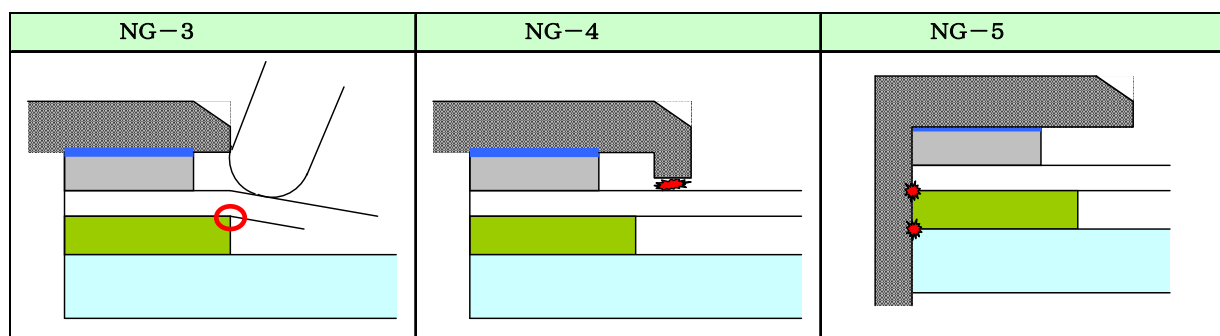
A clearance of 0.3 to 0.7mm is recommended.

• Design Guidance of Chassis (Side Part)

- 6) Upper Electrode and Lower Electrode fall on the edge of Touch Panel outline.

Redundant design having enough clearance to avoid electric short with chassis is highly recommended.

(Please see "NG-5")



• Example of Recommended Chassis Design

Refer to "3.2 Outward Form".

- As a terminal resistance has individual specificity, calibration to align the displaying and the sensing position one each is mandatory before use.