DATA MODUL ORTUSTECH

Specification

COM43H4P44ULC

4.3" - 480 x 272 – RGB

Spec Revision: 0.0
Revision Date: 02.07.2024

Note: This specification is subject to change without prior notice

Passion Displayed

This product is under development and specifications are subject to change.

Specifications for

Blanview TFT-LCD Monitor (TENTATIVE)

(4.3" WQVGA 480 x 272 x RGB Landscape)

Version 0.0
(Please be sure to check the specifications latest version.)

MODEL COM43H4P44ULC

Customer's Approval

Signature :

Name :

Section :

Title :

Date :

ORTUSTECH

TOPPAN INC.
Electronics Division
Technological Development Department IV

Approved by

Checked by

Prepared by

Version History

Ver.	Date	Page	Description	
0.0	2024.7.2	-	-	Tentative issue

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1. Application

This Specification is applicable to 109.2 mm (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/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

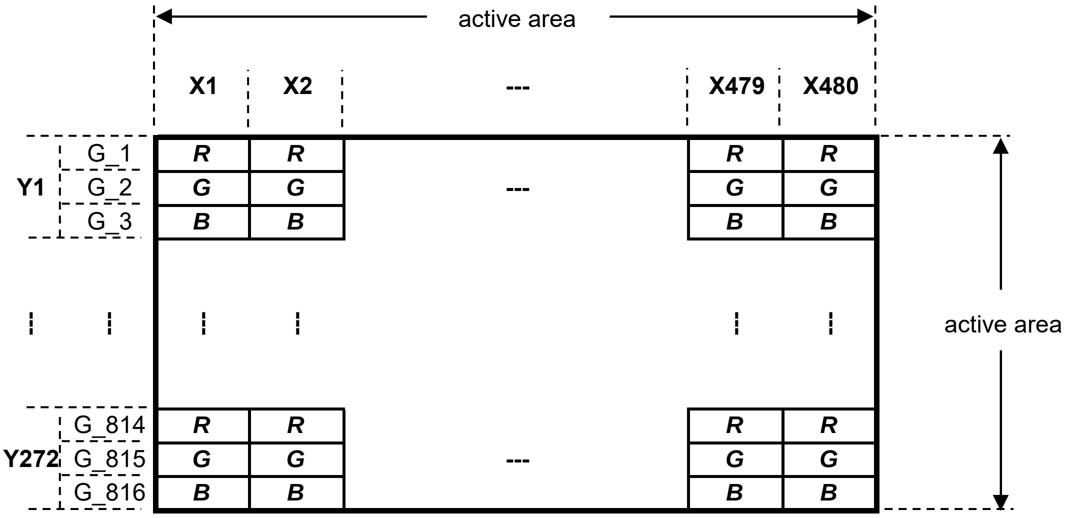
2.1 Features of the Product

- 4.3 inch diagonal display, 480 [H] x 272RGB [V] dots.
- 24-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.
- 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

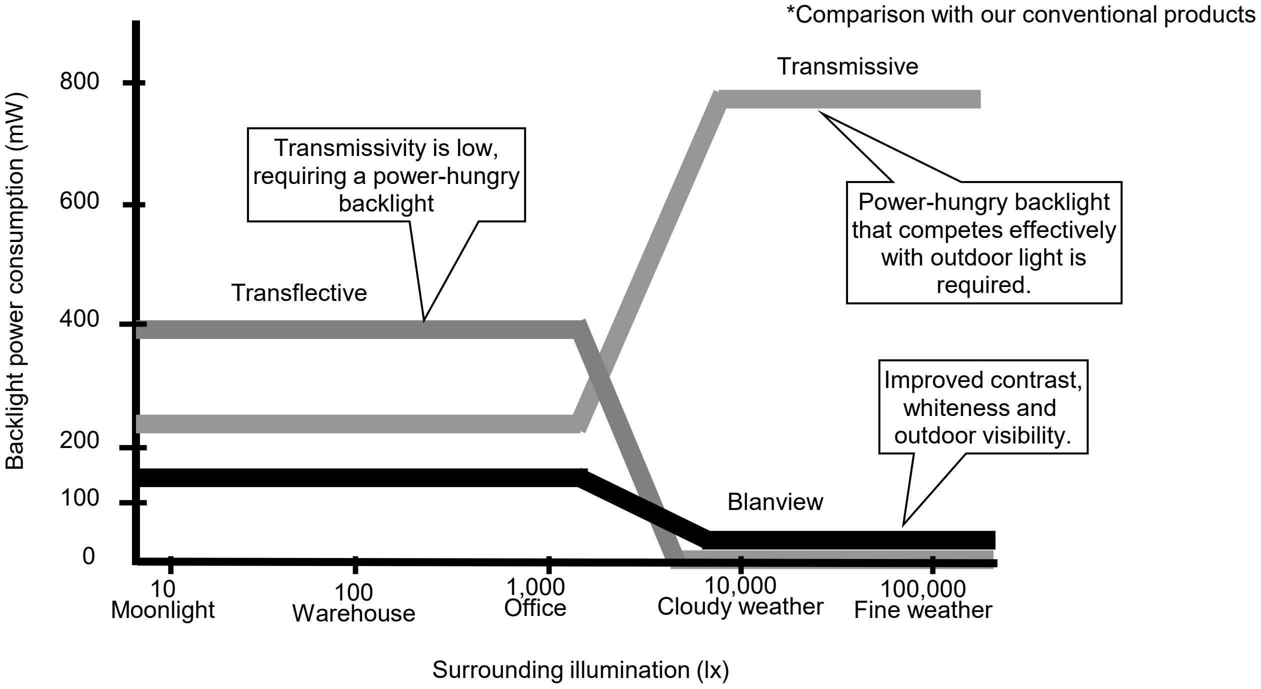
Items	Specifications	Remarks
Display type	VA type 16,777,216 colors. Blanview, Normally black.	
Driving method	a-Si TFT Active matrix. Line-scanning, Non-interlace.	
Dot arrangement	RGB horizontal stripe arrangement.	Refer to "Dot arrangement".
Signal input method	24-bit RGB interface	
Backlight type	Long life & high bright white LED.	
NTSC ratio	TBD	



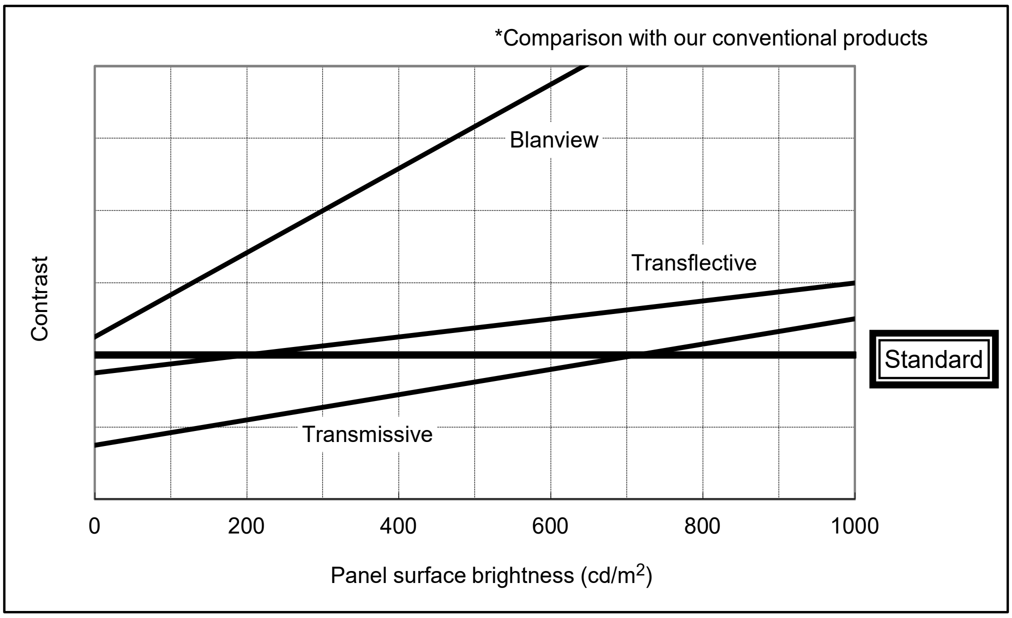
Dot arrangement (FPC cable placed downside)

<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)



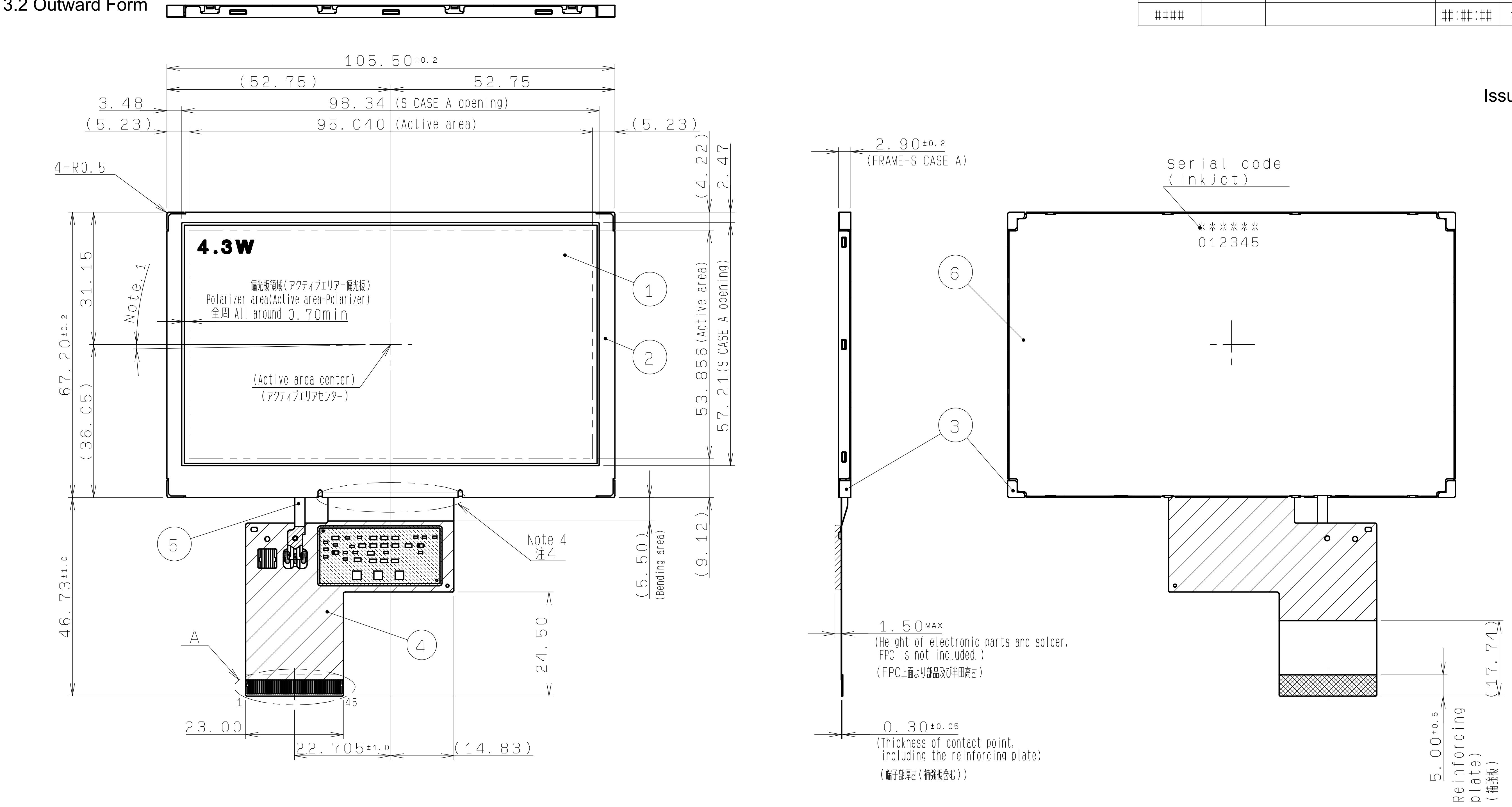
3. Dimensions and Shape

3.1 Dimensions

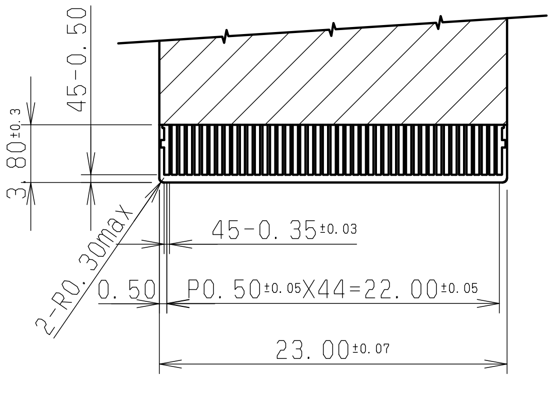
Items	Specifications	Unit	Remarks
Outline dimensions	105.50[H] × 67.20[V] × 2.90[D]	mm	Exclude FPC cable.
Active area	95.040[H] × 53.856[V]	mm	109.2 mm diagonal.
Number of dots	480[H] × 816[V]	dot	
Dot pitch	198.0[H] × 66.0[V]	μm	
Surface hardness of the polarizer	TBD	H	
Weight	TBD	g	Include FPC cable.

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

3.2 Outward Form


105.50±0.2
(52.75)
52.75
3.48
98.34 (S CASE A opening)
(5.23)
95.040 (Active area)
(5.23)
4-R0.5
4.3W
偏光板領域(アクティブエリアー偏光板)
Polarizer area(Active area-Polarizer)
全周 All around 0.70min
Note.1
(Active area center)
(アクティブエリアセンター)
31.15
67.20±0.2
(36.05)
(4.22)
2.47
53.856(Active area)
57.21(S CASE A opening)
(9.12)
(5.50)
(Bending area)
Note 4
注4
46.73±1.0
24.50
A
1
45
23.00
22.705±1.0
(14.83)
①
②
③
④
⑤
⑥
2.90±0.2
(FRAME-S CASE A)
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)
0.30±0.05
(Thickness of contact point, including the reinforcing plate)
(端子部厚さ(補強板含む))
Serial code
(inkjet)
******
012345
(17.74)
5.00±0.5
(Reinforcing plate)
(補強板)

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。


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

DETAIL A
(S=2/1)

Note.2 Recommended FPC connectors
For LCD : HIROSE/FH12A-45S-0.5SH(55)(Top contact)
FH12-45S-0.5SH(55)(Bottom contact)

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)
FH12-45S-0.5SH(55)(下接点タイプ)

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。

PART NAME	ITEM	PART CODE	MATERIAL GRADE	REMARK
S CASE C	6		SUS(t=0.15)	
LED FPC	5			
LCD FPC	4			
FRAME	3		PC	
S CASE A	2		SUS(t=0.2)	
TFT-LCD PANEL	1		Glass substrate thickness=0.5t	

APPROVED ##	GENERAL TOLERANCE ±0.5	SCALE 1/1	UNIT mm
CHECKED ##	ISSUE (Y:M:D) 24:05:13	MODEL DX-4P44ｼｻｸｿﾉﾀ	
CHECKED	NAME		
DESIGN 前田創	OUTLINE-D4P44		
DRAW 前田創			

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DRAWING No.	REV.	SHEET	DIV.
SJD605119D301	#	/	

PART

3.3 Serial № print (S-print)

3.3.1 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	43GHC (Made in Japan) 43GJC (Made in Malaysia)		
d	Serial number			

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

・Made in Japan

5L43GHC000125

means "manufactured in December 2025, 4.3 inch, GH type, C specifications, serial number 000125"

・Made in Malaysia

5L43GJC000125

means "manufactured in December 2025, 4.3 inch, GJ type, C specifications, serial number 000125"

3.3.2 Location of Serial № print (S-print)

Refer to 3.2 "Outward Form".

3.3.3 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.
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.
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.
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	NC	OPEN.
42	BLL	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),FH12-45S-0.5SH(55),FH12-45S-0.5SVA(55),FH12S-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		-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	Ta=25°C	--	35	mA	BLH - BLL
		Ta=70°C	--	15		
Storage temperature range	Tstg		-30	80	°C	
Storage humidity range	Hstg	Non condensing in an environmental moisture at or less than 40°C90%RH.				

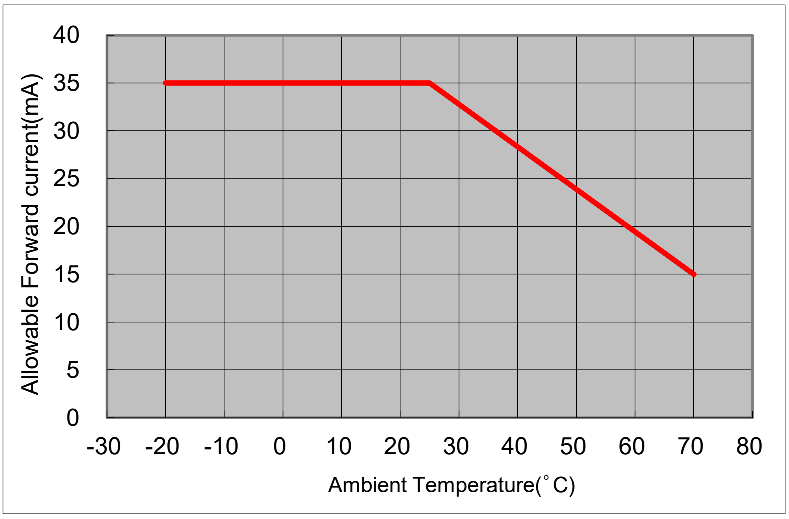
6. Recommended Operating Conditions

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 1,2	-20	25	70	°C	Panel surface temperature
Operating humidity range	Hop	Ta≦30°C	20	--	80	%	
		Ta>30°C	Non condensing in an environmental moisture at or less than 30°C80%RH.				

Note1: This monitor is operatable in this temperature range. With regard to optical characteristics, refer to Item "10. Characteristics".

Note2: Acceptable Forward Current to LED is up to 15mA, when Ta=+70°C.
Do not exceed Allowable Forward Current shown on the chart below.



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 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	--	(7.5)	35.0	mA	BLH - BLL
	IL2	Ta=70˚C	--	--	15.0	mA	
Forward voltage	VL	Ta=25˚ C, IL=(7.5)mA	--	(23.93)	(24.74)	V	
Estimated Life of LED	LL	Ta=25˚C, IL=(7.5)mA Note	--	(50,000)	--	hrs	

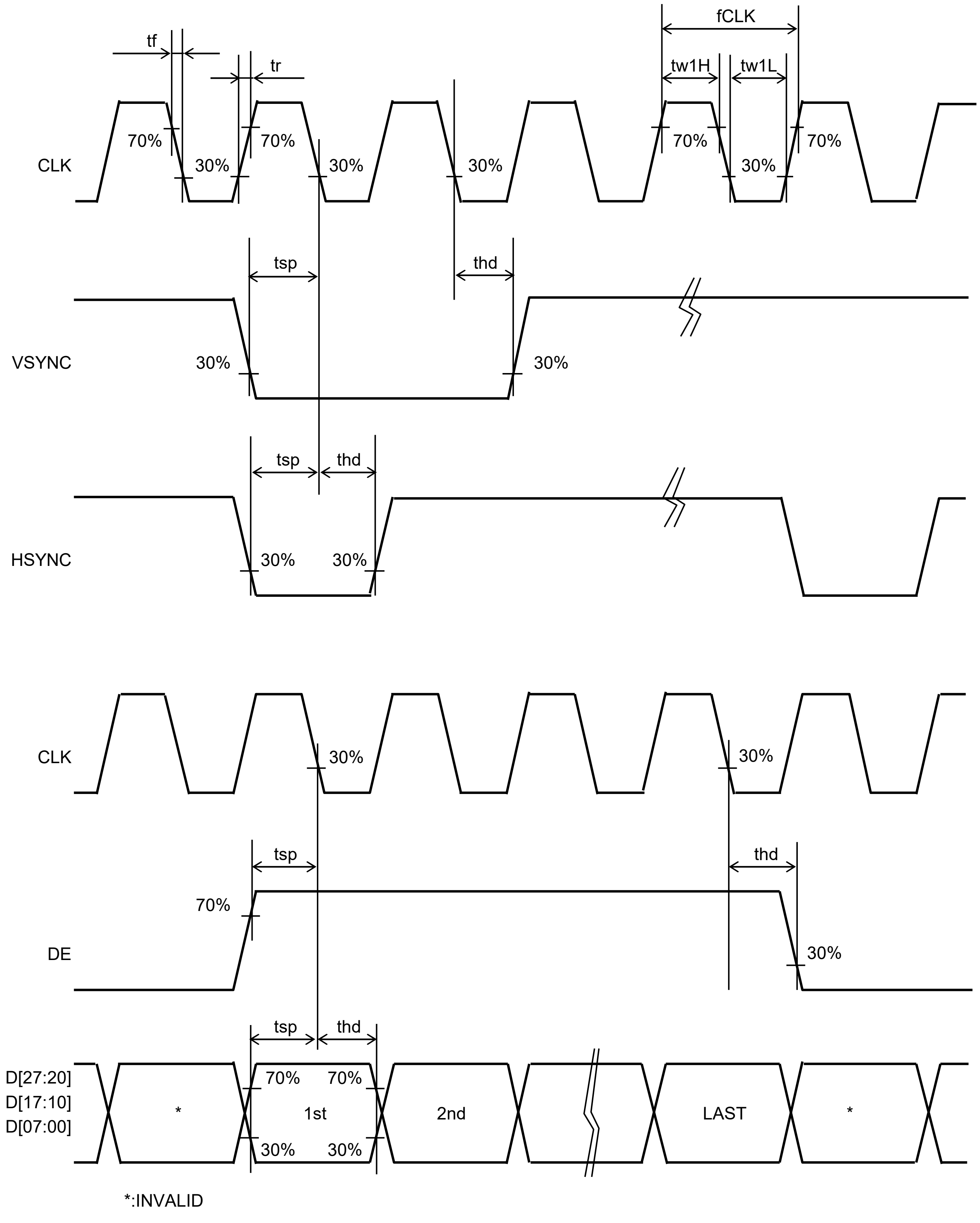
Note:
- The lifetime of the LED is defined as a period till the brightness of the LED decreases to the half of its initial value.
- This figure is given as a reference purpose only, and not as a guarantee.
- This figure is estimated for an LED operating alone. As the performance of an LED may differ when assembled as a monitor 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


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

7.3 Input Timing Characteristics

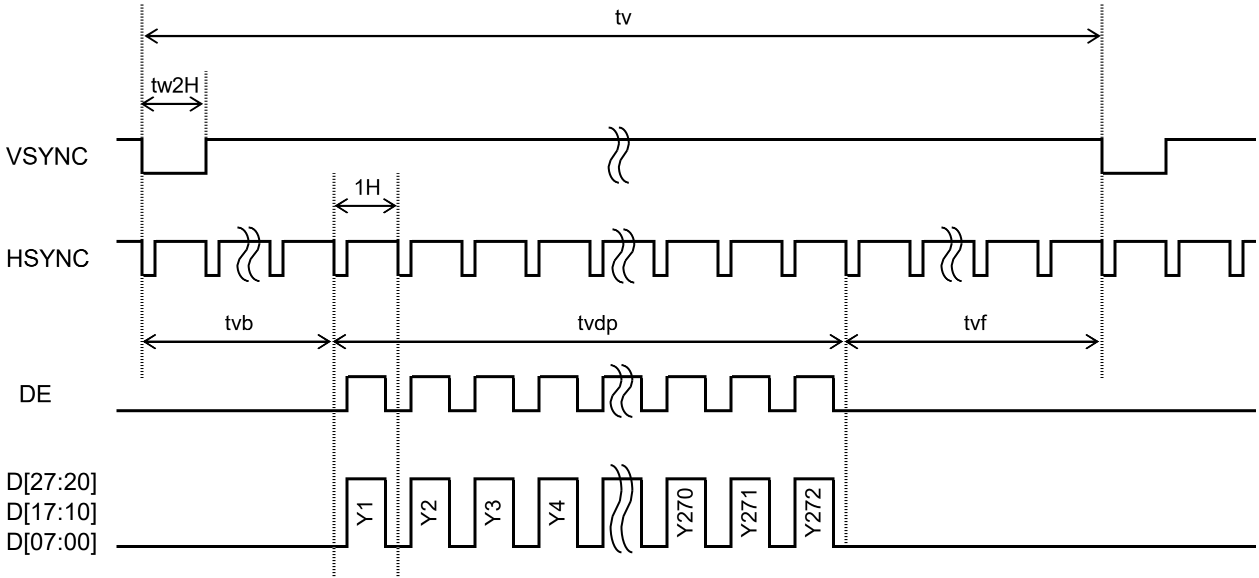
(Unless otherwise noted, Ta=25°C,VDD=3.3V,VSS=0V)

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

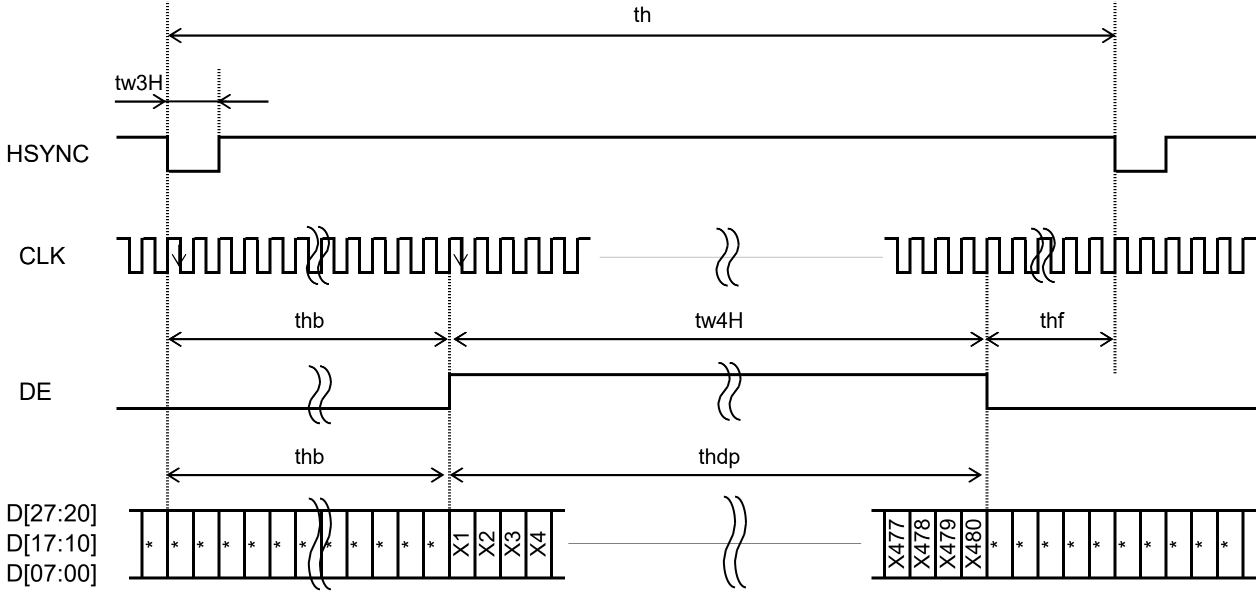
Note: The characteristics and values in the chart indicate recommended specifications.
In the case that the product might be used NOT in compliant with the specifications, it is highly recommended to use the product after adequate verifications could be implemented and at your own risk.

7.4 Driving Timing Chart

-Vertical Timing

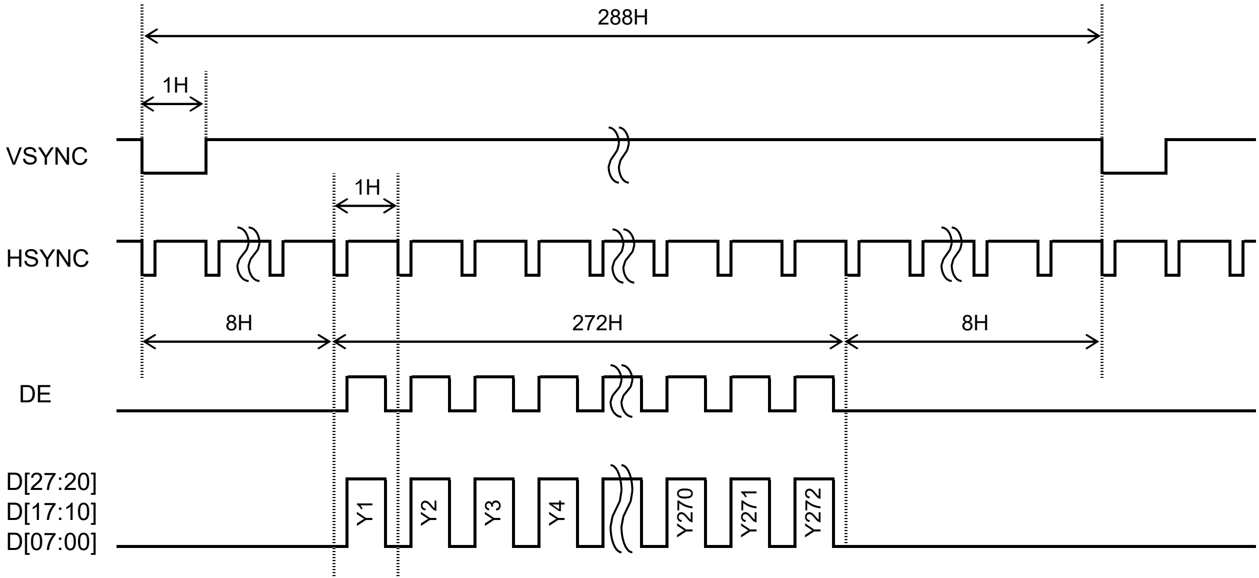

tv
tw2H
VSYNC
1H
HSYNC
tvb
tvdp
tvf
DE
D[27:20]
D[17:10]
D[07:00]
Y1
Y2
Y3
Y4
Y270
Y271
Y272

-Horizontal Timing

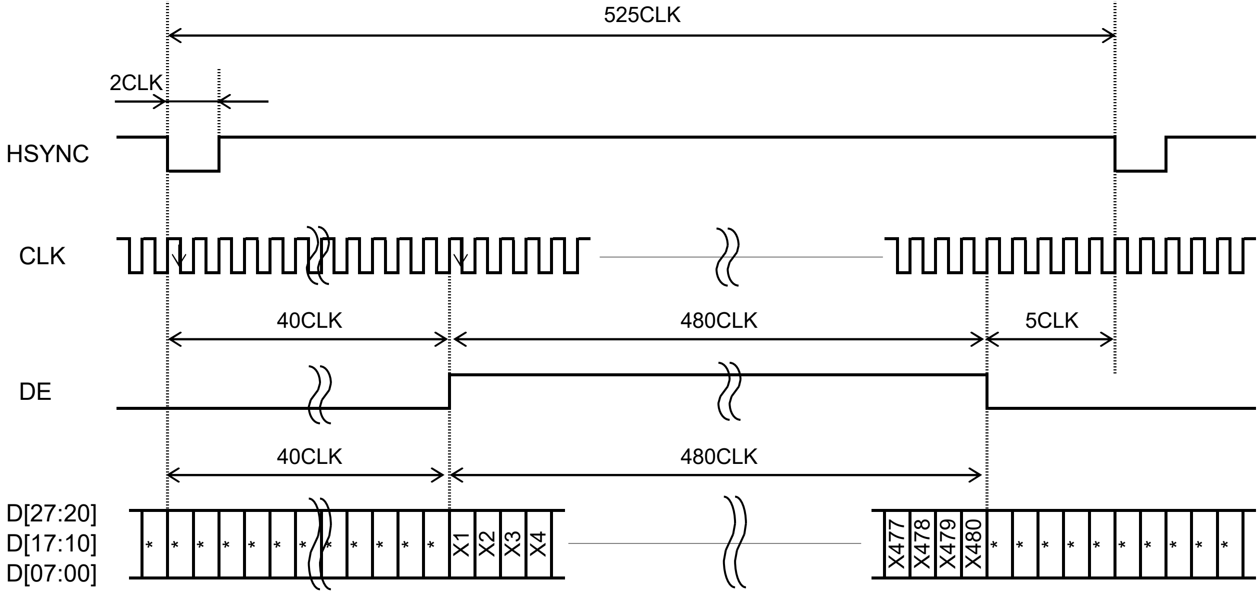

th
tw3H
HSYNC
CLK
thb
tw4H
thf
DE
thb
thdp
D[27:20]
D[17:10]
D[07:00]
X1
X2
X3
X4
X477
X478
X479
X480

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

-Vertical Timing

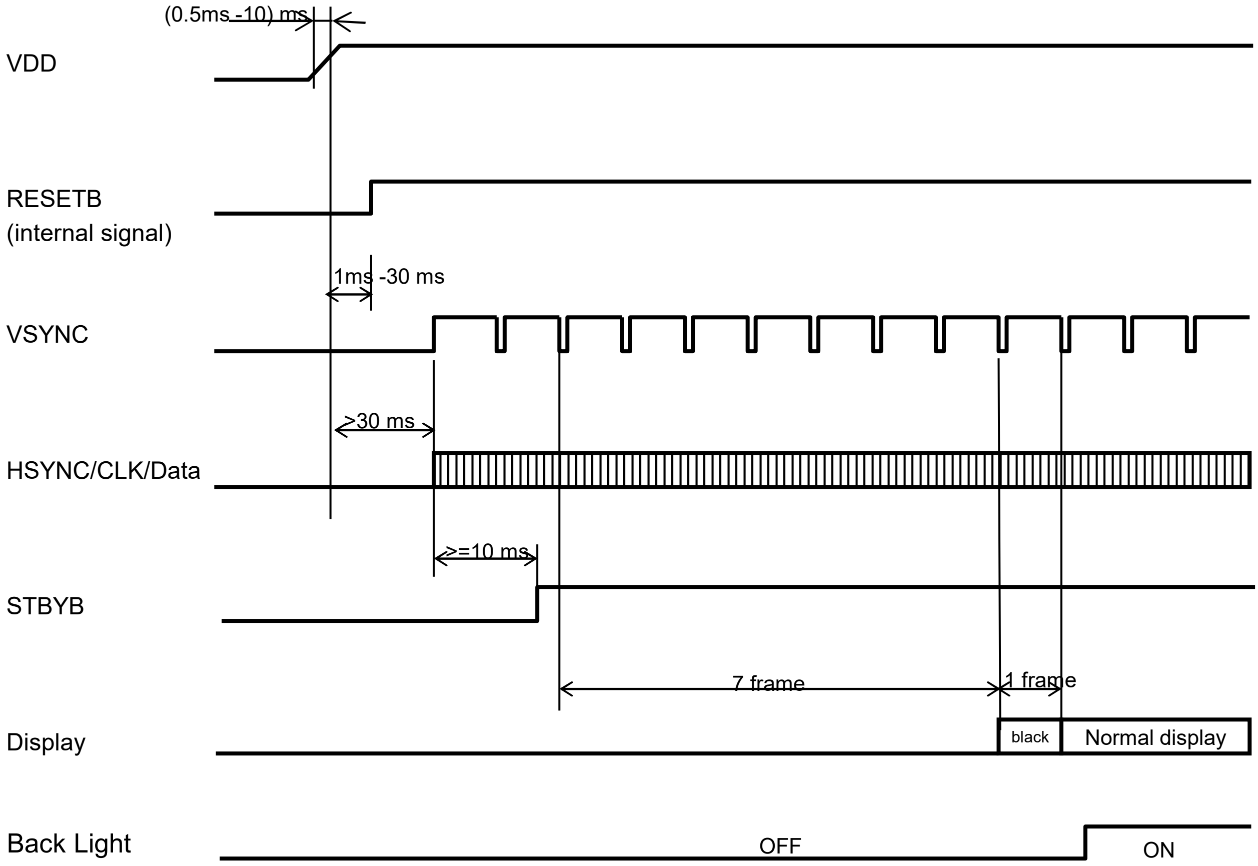

288H
1H
VSYNC
1H
HSYNC
8H
272H
8H
DE
D[27:20]
D[17:10]
D[07:00]
Y1
Y2
Y3
Y4
Y270
Y271
Y272

-Horizontal Timing

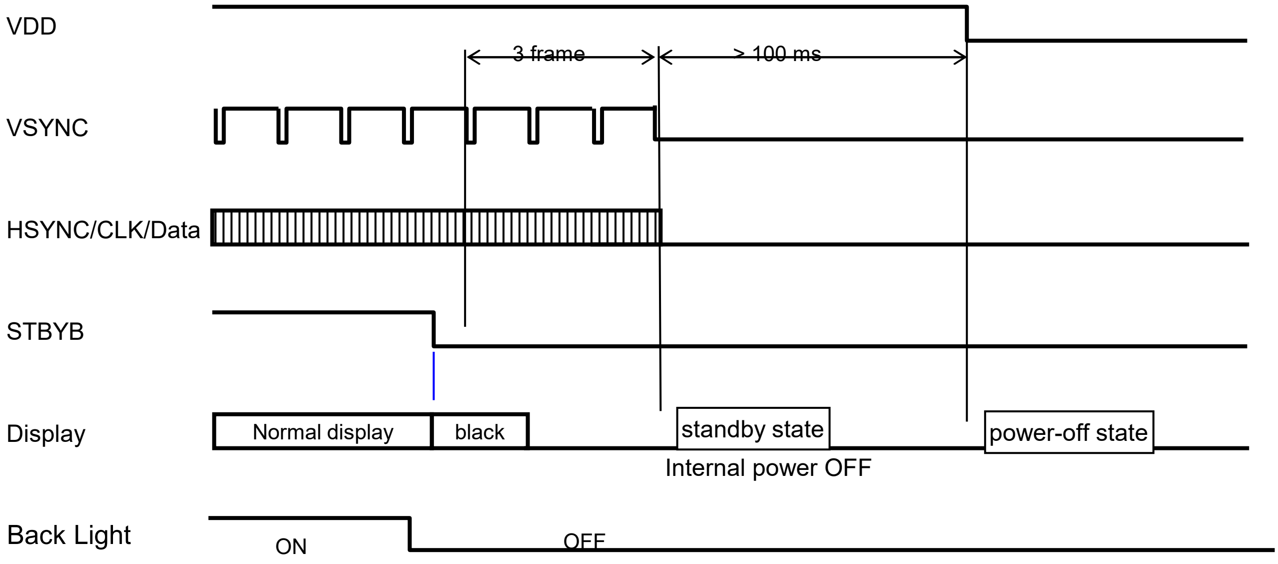

525CLK
2CLK
HSYNC
CLK
40CLK
480CLK
5CLK
DE
40CLK
480CLK
D[27:20]
D[17:10]
D[07:00]
X1
X2
X3
X4
X477
X478
X479
X480

8. Power ON/OFF Sequence

8.1 Power ON Sequence

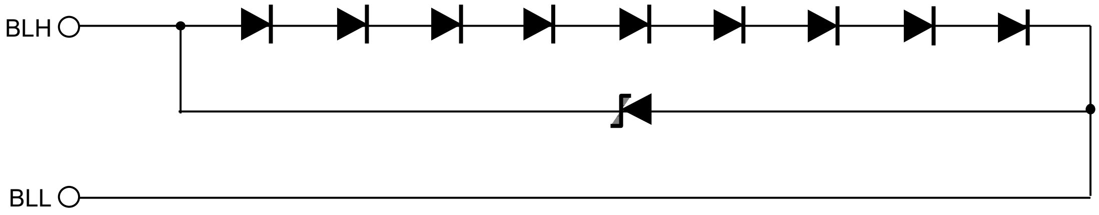

(0.5ms -10) ms
VDD
RESETB
(internal signal)
1ms -30 ms
VSYNC
>30 ms
HSYNC/CLK/Data
>=10 ms
STBYB
7 frame
1 frame
Display
black
Normal display
Back Light
OFF
ON

8.2 Standby / Power OFF Sequence


VDD
3 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



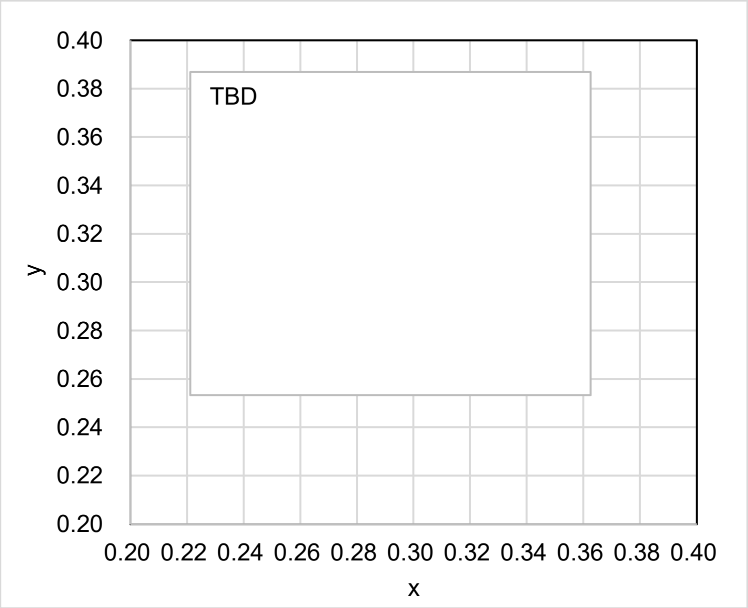
10. Characteristics

10.1 Optical Characteristics

(Measurement Condition)
Measuring instruments: CS2000 (KONICA MINOLTA), LCD7200 (OTSUKA ELECTRONICS), EZcontrastXL88 (ELDIM)
Driving condition: VDD=3.3V, VSS=0V, Optimized VCOMDC
Backlight: IL= (7.5) mA
Measured temperature: Ta = 25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note №	Remark
Response time	Rise time + Fall time	TON + TOFF	[Data]= 00h← → 3Fh	-	-	(TBD)	ms	1	
Contrast ratio	Backlight ON	CR	[Data]= 3Fh / 00h	(TBD)	(800)	-		2	
	Backlight OFF			-	(TBD)	-			
Viewing angle	Left	θL	[Data]= 3Fh / 00h CR ≧ (10)	(80)	-	-	deg	3	
	Right	θR		(80)	-	-	deg		
	Up	φU		(80)	-	-	deg		
	Down	φD		(80)	-	-	deg		
White Chromaticity		x	[Data]= 3Fh	White chromaticity range				4	
		y							
Center Brightness			[Data]= 3Fh	(TBD)	(450)	-	cd/㎡	5	
Brightness distribution			[Data]= 3Fh	(70)	-	-	%	6	
Burn-in				No noticeable burn-in image shall be observed after (2) hours of window pattern display.				7	

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



White Chromaticity Range

(White Chromaticity Range）

x	y
(TBD)	(TBD)
(TBD)	(TBD)
(TBD)	(TBD)
(TBD)	(TBD)
(TBD)	(TBD)
(TBD)	(TBD)
(TBD)	(TBD)
(TBD)	(TBD)

10.2 Temperature Characteristics

(Measurement Condition)

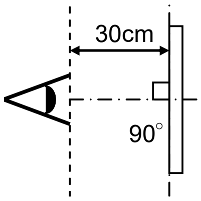
Measuring instruments: CS2000 (KONICA MINOLTA), LCD7200 (OTSUKA ELECTRONICS)
Driving condition: VDD=3.3V, VSS=0V, Optimized VCOMDC
Backlight: IL= (7.5) mA

Item		Symbol	Specification		Remark
			Ta = (-20) °C	Ta = (70) °C	
Response time	Rise time + Fall time	TON + TOFF	(TBD) msec or less	(TBD) msec or less	
Contrast ratio		CR	(TBD) or more	(TBD) or more	
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 Pattern (RGB, white, black)
Signal condition: [Data]:00h, (TBD)h, 3Fh (3steps)
Observation distance: 30 cm
Illuminance: 200 to 350 lx
Backlight: IL=(7.5)mA

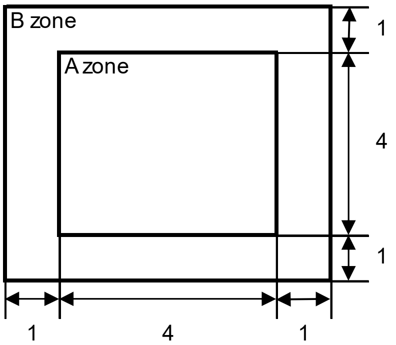


Defect item		Defect content		Criteria
Display Quality	Line defect	Black, white or color line, 3 or more neighboring defective dots		Not exists
	Dot defect	Uneven brightness on dot-by-dot base due to defective TFT or CF, or dust is counted as dot defect (brighter dot, darker dot) High bright dot: Visible 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]=(TBD)h		Refer to table 1
		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	$0.25\mathrm{mm} < \varphi$	$N=0$
			$0.20\mathrm{mm} < \varphi \leqq 0.25\mathrm{mm}$	$N \leqq 2$
			$\varphi \leqq 0.20\mathrm{mm}$	Acceptable
		Liner	$3.0\mathrm{mm} < L$ and $0.08\mathrm{mm} < W$	$N=0$
			$L \leqq 3.0\mathrm{mm}$ or $W \leqq 0.08\mathrm{mm}$	Acceptable
	Others			Use boundary sample for judgment when necessary

* φ (mm): Average diameter = (major axis + minor axis) / 2, W (mm): Width, L (mm): Length, N: Permissible number

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	



Division of A and B areas
B area: Active area
Dimensional ratio between A and B areas: 1: 4: 1
(Refer to the left figure)

11.2 Screen and Other Appearance

Testing conditions
Observation distance : 30 cm
Illuminance : 1200 ～ 2000 lx

Item		Criteria	Remark
Polarizer	Flaw 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	

12. Reliability Test

Test item		Test condition	number of failures / number of examinations
Durability test	High temperature storage	Ta = 80°C 240hrs	TBD
	Low temperature storage	Ta = -30°C 240hrs	TBD
	High temperature & high humidity storage	Ta = 60°C, RH = 90%, 240hrs non condensing ※	TBD
	High temperature operation	Tp = 70°C 240hrs	TBD
	Low temperature operation	Tp = -20°C 240hrs	TBD
	High temperature & high humidity operation	Tp = 40°C, RH = 90%, 240hrs non condensing ※	TBD
	Thermal shock storage	-30°C ↔ 80°C (30min / 30min) 100cycles	TBD
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.	TBD
	Surface discharge test (Non operation)	C=250pF, R=100Ω, V=±(TBD)kV Each 5 times of discharge in both polarities on the center of screen with the case grounded.	TBD
	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.	TBD
	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.	TBD
	Vibration test	Total amplitude 1.5mm, f=10～55Hz, X,Y,Z directions for each 2 hours	TBD
	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.	TBD
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.	TBD
	Packing drop test	Drop from 75cm high. 1 time to each 6 surfaces, 3 edges, 1 corner	TBD

Note:Ta=ambient temperature Tp=Panel temperature

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

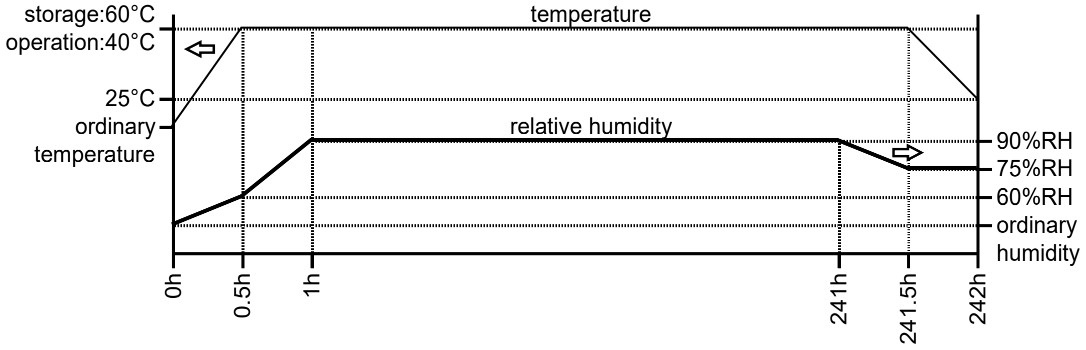
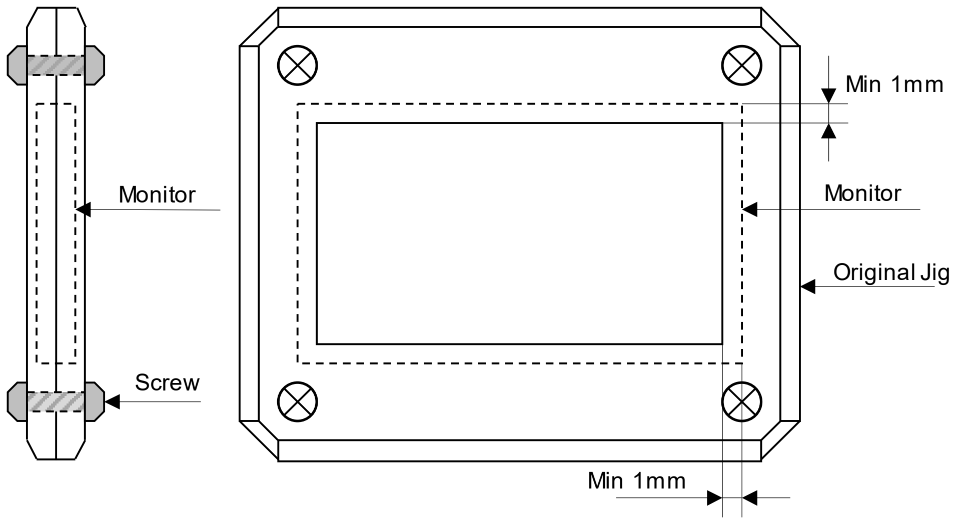


Table2. Reliability Criteria

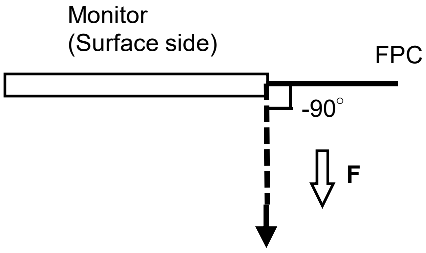
The parameters should be measured after leaving the monitor at the ordinary temperature for 24 hours or more after the test completion.

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

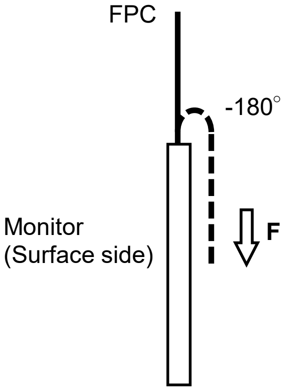
TOPPAN Original Jig


Monitor
Screw
Min 1mm
Monitor
Original Jig
Min 1mm

FPC tension test


Monitor
(Surface side)
FPC
-90°
F

FPC bend test


FPC
-180°
Monitor
(Surface side)
F

13. Packing Specifications

TBD

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.

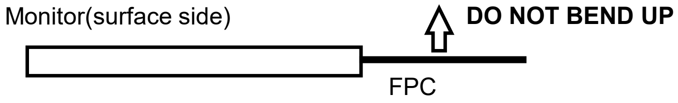
3) Avoid strong mechanical shock including knocking, hitting or dropping to the TFT monitors for protecting their glass parts.
Do not use the TFT monitors that have been experienced dropping or strong mechanical shock.

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	(TBD) 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.
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

TBD

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.

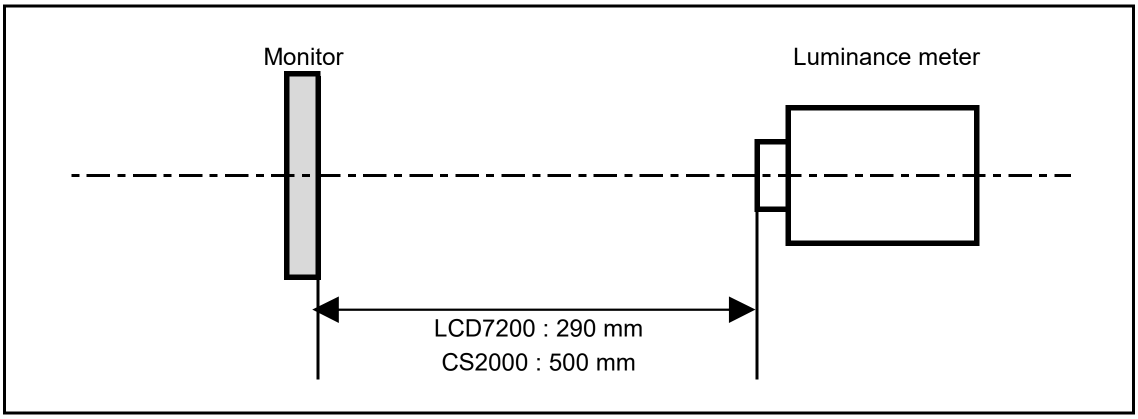
APPENDIX

Reference Method for Measuring Optical Characteristics and Performance

1. Measurement Condition

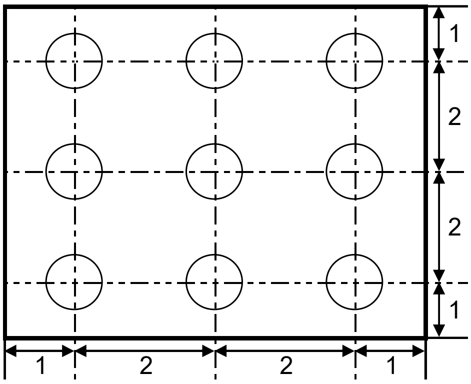
Measuring instruments:	CS2000（KONICA MINOLTA）, LCD7200(OTSUKA ELECTRONICS）,EZcontrastXL88（ELDIM）
Driving condition:	Refer to the section "Optical Characteristics"
Measured temperature:	25°C unless specified
Measurement system:	See the chart below. The luminance meter is placed on the normal line of measurement 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.

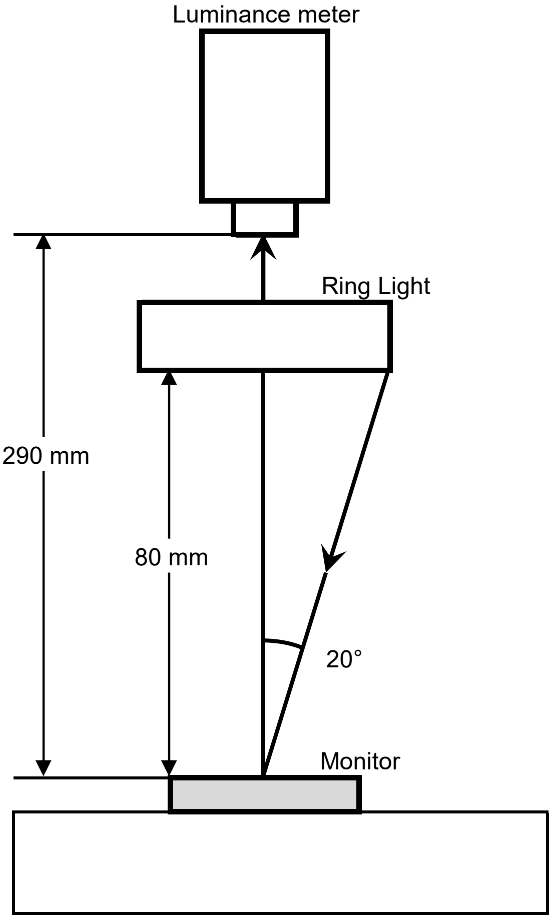


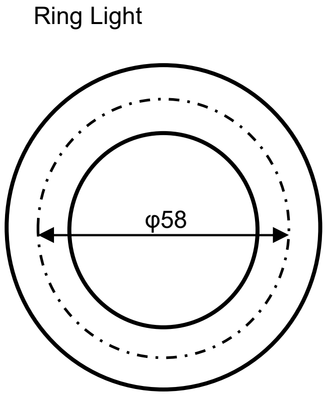
Dimensional ratio of active area

Backlight IL=(7.5)mA

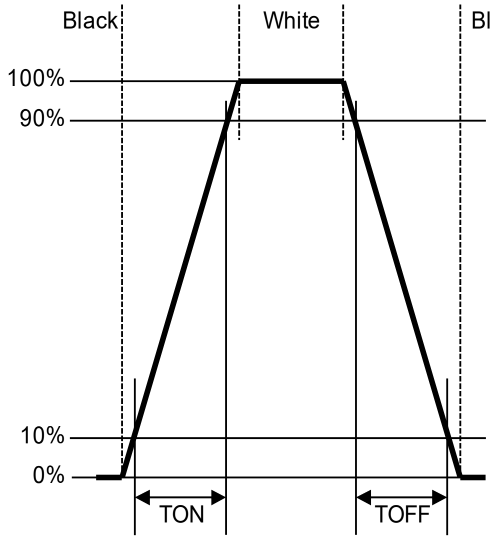
Measurement Condition (Contrast ratio Backlight OFF only)

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 unless otherwise specified


Luminance meter
Ring Light
290 mm
80 mm
20°
Monitor


Ring Light
φ58

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.  Black White Black 100% 90% 10% 0% TON TOFF	LCD7200	Black display [Data]=00h White display [Data]=3Fh TON Rise time TOFF Fall time
2	Contrast ratio	Measure maximum luminance Y1([Data]=3Fh) and minimum luminance Y2([Data]=00h) at the center of the screen by displaying raster or window pattern. Then calculate the ratio between these two values. Contrast ratio = Y1/Y2 Diameter of measuring point: 7.8mmφ(CS2000) Diameter of measuring point: 3 mmφ(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] = 3Fh 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	(Brightness distribution) = 100 x 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/3Fh).		At optimized VCOMDC

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