SPECIFICATIONS № 21TLM090	Issue: Dec.8,2021

Specifications for

TFT-LCD Monitor (TENTATIVE)
(8.4" XGA 1024 x RGB x 768 Landscape)

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

MODEL   COM84T8M02SSS

Customer's Approval

Signature :

Name :

Section :

Title :

Date :

ORTUSTECH

TOPPAN INC.
Electronics Division
Ortus Subdivision

Approved by

_____

Checked by

_____

Prepared by

_____

TOPPAN INC.

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Version History

Ver.	Date	Page		Description
0.0	2021.12.8	-	-	Tentative issue

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Contents

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1. Application

This Specification is applicable to 213.5 mm (8.4 inch) 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

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2. Outline Specifications

2.1 Features of the Product

- 8.4 inch diagonal display, 1024 x RGB [H] x 768 [V] dots.
- 16.7 Million colors / 262 thousand colors.
- Timing generator [TG], Counter-electrode driving circuitry, Built-in power supply circuit.
- High bright white LED back-light, Built-in backlight drive circuit.

2.2 Display Method

Items	Specifications	Remarks
Display type	FFS 16.7 Million colors / 262 thousand colors. Normally black.	
Driving method	a-Si TFT Active matrix. Line-scanning, Non-interlace.	
Dot arrangement	RGB stripe arrangement.	Refer to "Dot arrangement"
Signal input method	JEIDA LVDS Interface.	
Backlight type	High bright white LED.	
NTSC ratio	(61%)	
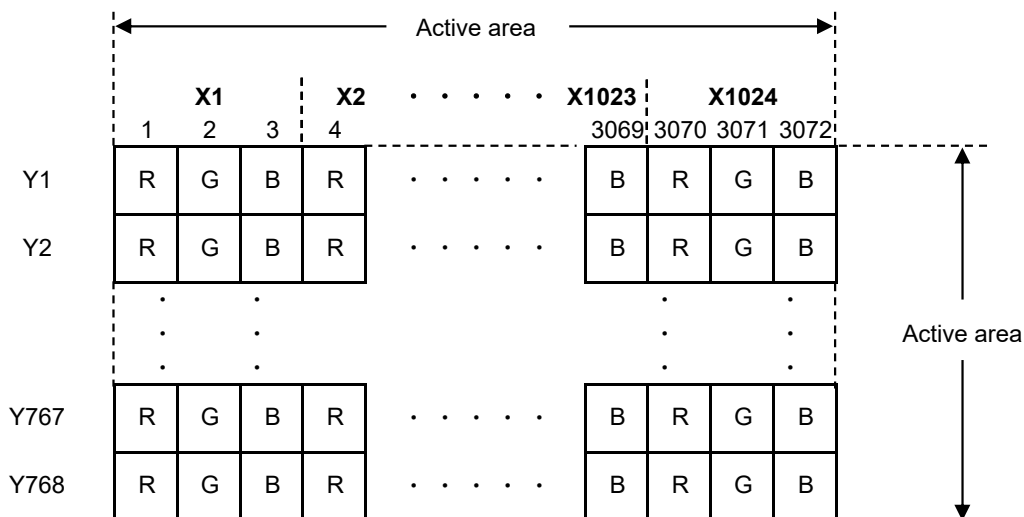
Fig.1 Dot arrangement

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3. Dimensions and Shape

3.1 Dimensions

Items	Specifications	Unit	Remarks
Outline dimensions	199.5[H]×149.0[V]×9.7[D]	mm	
Active area	170.8[H]×128.1[V]	mm	Diagonal 213.5 mm
Number of dots	3072[H]×768[V]	dot	
Dot pitch	166.8[H]×166.8[V]	um	
Weight	(TBD)	g	

板金と電子部品間の距離が小さいため、板金を押さないでください
Please do not push the sheet metal as the clearance
between the electronic components and the sheet metal is small.

Active Center
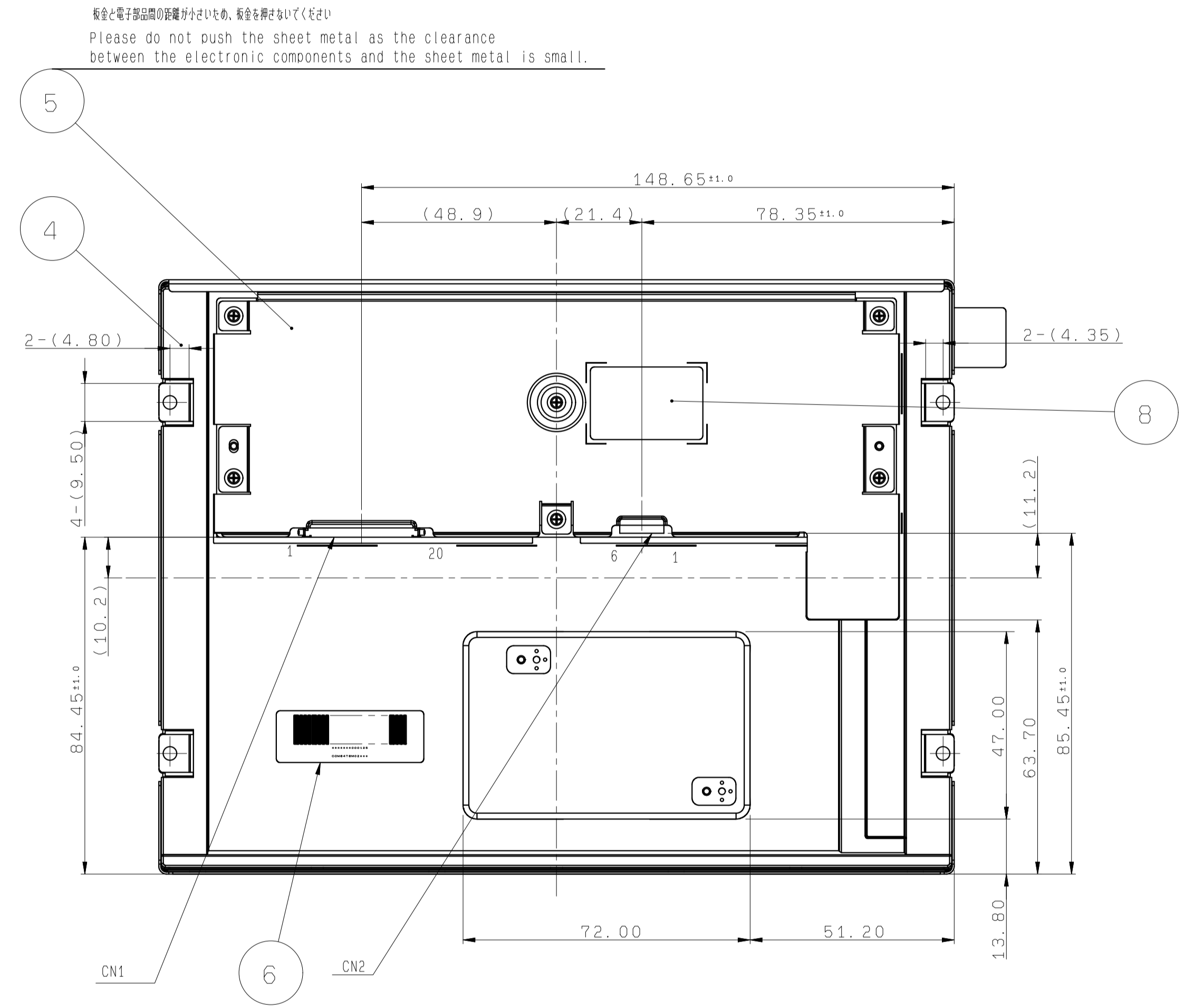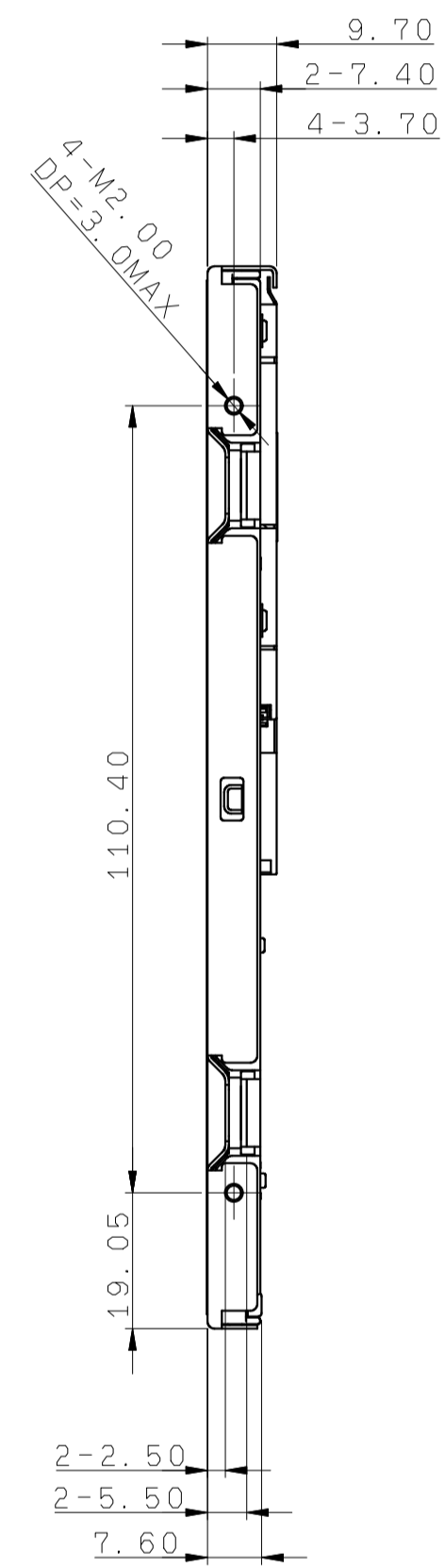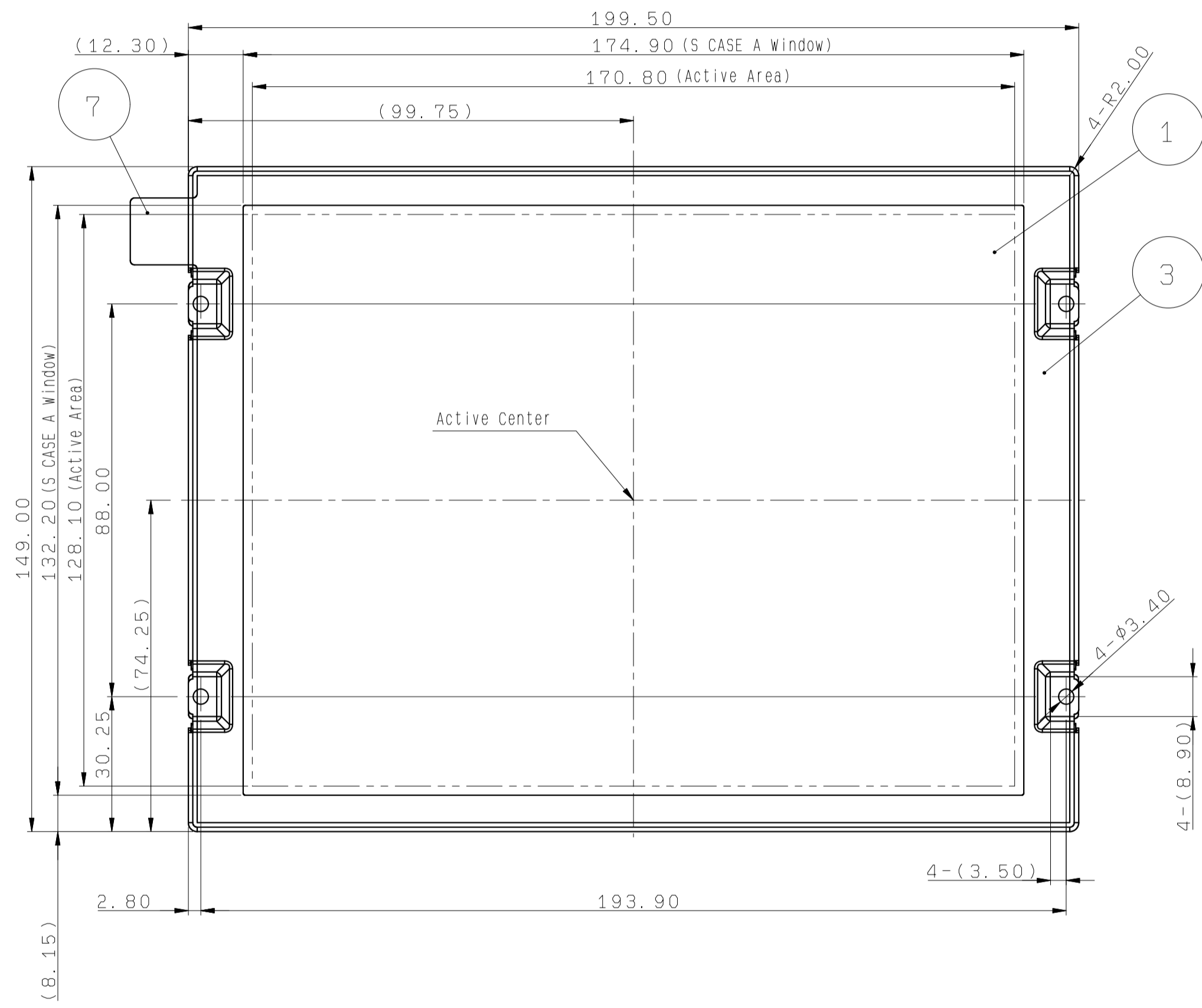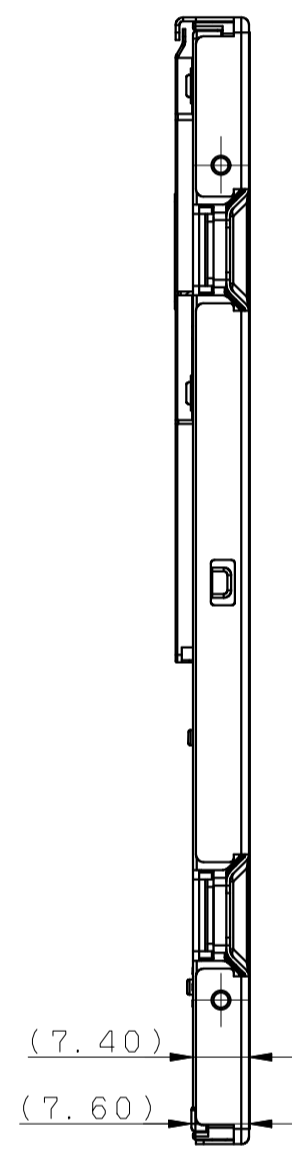
注 1. コネクタ:
CN1:201B6-020E-11F(I-PEX) 適合相手 FI-SEB20P-HFE(JAE)
CN2:3800K-F06N-03(E&T) 適合相手 FI-S6P-HFE(JAE)

Note: 1.Connector:
CN1:201B6-020E-11F(I-PEX) or FI-SEB20P-HFE(JAE)
CN2:3800K-F06N-03(E&T) or FI-S6P-HFE(JAE)

PART NAME	ITEM		REMARK
TAPE A	8		
Protective Film	7		
S LABEL	6		
S CASE D	5		SUS, t=0.3
S CASE C	4		AL, t=0.8
S CASE A	3		SUS, t=0.5
FRAME	2		PC
TFT-LCD PANEL	1		Glass substrate thickness 0.5±0.5

	GENERAL TOLERANCE ±0.5	SCALE 1/1	UNIT mm	
APPROVED 尾木				TOPPAN
CHECKED 木下	ISSUE 21:07:06	MODEL CCM84TBM02###		TOPPAN INC.
CHECKED	NAME			DO NOT DUPLICATE. CONFIDENTIAL AND PROPRIETARY
DESIGN 増田剛			DRAWING No.	REV. SHEET DIV.
DRAW 増田剛	OUTLINE-D8M02		SJD601928D101	# / 1

PART CODE   MODEL NUMBER

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3.3 Serial Label (S-label)

3.3.1 Display Items
A section : Bar code
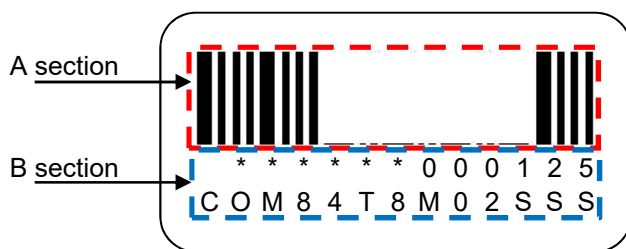B section : Combination of a character

A section

B section

```
* * * * * * 0 0 0 1 2 5
C O M 8 4 T 8 M 0 2 S S S
```

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 (4characters), 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	84AS (Made in Japan)					
		84BS (Made in Malaysia)					
d	Serial number						

* Example of indication of Serial label (S-label)
・Made in Japan

2L84AS000125

means "manufactured in December 2022, 8.4" A type, S specifications, serial number 000125"

・Made in Malaysia

2L84BS000125

means "manufactured in December 2022, 8.4" B type, S 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.

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4. Pin Assignment

LCD_CN

No.	Symbol	Details
1	VCC	Power supply (3.3V)
2	VCC	Power supply (3.3V)
3	GND	Ground
4	GND	Ground
5	Rx0-	LVDS DATA0(-)
6	Rx0+	LVDS DATA0(+)
7	GND	Ground
8	Rx1-	LVDS DATA1(-)
9	Rx1+	LVDS DATA1(+)
10	GND	Ground
11	Rx2-	LVDS DATA2(-)
12	Rx2+	LVDS DATA2(+)
13	GND	Ground
14	CLK-	LVDS CLK(-)
15	CLK+	LVDS CLK(+)
16	GND	Ground
17	Rx3-	LVDS DATA3(-)
18	Rx3+	LVDS DATA3(+)
19	bit6	High：6bit Low:8bit *Note
20	UD/LR	Display direction switching (Low: Normal display, High: Reverse display)

- Used connector: FI-SEB20P-HFE (JAE)
- Corresponding connector: FI-S20S[for discrete Wire], FI-SE20ME[for FPC] (JAE)
- Please connect using twisted pair cables for stable LVDS signal.

  Note) For 6-bits input, set MODE = 0 (JEIDA) and set pin numbers 17, 18 as the following recommended inputs.
   - Enter the Low data of the LVDS transmitter in 17 and 18.
     or
   - Connect pin 17 to VCC via 680Ω and pin 18 to GND via 620Ω.

BL_CN

No.	Symbol	Details	Remark
1	VL	Power supply (12V)	
2	VL	Power supply (12V)	
3	GNDL	Ground	
4	GNDL	Ground	
5	BLEN	Backlight ON-OFF	High: ON Low: OFF
6	VPDIM	Light Dimmer Control (PWM) input	High active

- Used connector: FI-S6P-HFE (JAE)
- Corresponding connector: FI-S6S (JAE)
- 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.

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5. Absolute Maximum Rating

Item	Symbol	Rating MIN	Rating MAX	Unit
LCD Supply Voltage	VCC	-0.3	4.0	V
Input Voltage for Logic	VI	-0.3	VCC+0.3	V
Backlight Power Supply Input Voltage	VL	-0.3	14.0	V
Backlight ON-OFF	BLEN	-0.3	VL	V
Light Dimmer Control (PWM) input Voltage	VPDIM	-0.3	VL	V
Operational temperature range Note1	Top	-30	(80)	℃
Storage temperature range	Tstg	-30	80	℃

Note1: Panel surface temperature

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6. Electrical Characteristics

6.1 DC Characteristics

6.1.1 LCD Display Module

(Unless otherwise noted, Ta=25 ℃,VCC=3.3V,GND=0V)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
LCD Supply Voltage	VCC		(3.0)	3.3	(3.6)	V	VCC
LCD operating current	ICC	input timing=typ	-	(TBD)	(TBD)	mA	VCC
Input Voltage for Logic	LCD_VIH		0.8×VCC	-	VCC	V	bit6, UD/LR
	LCD_VIL		0	-	0.2×VCC	V	bit6, UD/LR

6.1.2 Backlight

(Unless otherwise noted, Ta=25 ℃,VL=12.0V,GNDL=0V)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Supply Input Voltage	VL		(10.8)	12.0	(13.2)	V	VL
Supply Input Current	IL		--	(TBD)	(TBD)	mA	VL
Backlight ON-OFF	High_BLEN	ON	(2.0)	--	(VL)	V	BLEN
	Low_BLEN	OFF	0	--	(0.8)	V	
Light Dimmer Control PWM Input Voltage	Low_VPDIM	ON	(1.3)	--	(VL)	V	VPDIM
	High_VPDIM	OFF	0	--	(0.8)	V	
Pull-down resistor	Rpd		100	300	500	kΩ	BLEN,VPDIM
PWM frequency	f PDIM		100	500	1000	Hz	VPDIM
Dimming Rate (PWM Duty)	DR	VL=12.0V	(5)	--	100	%	VPDIM
Estimated Life of LED Note	LL	PWM Duty =100%	--	(100,000)	--	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.

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6.2 LVDS Interface

6.2.1 LVDS DC Characteristics

(Unless otherwise noted, Ta=25 ℃,VCC=3.3V,GND=0V)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Differential input high threshold	Rxvth	R_{XVCM}=1.2V	-	-	0.1	V	CLK+, CLK-, Rx0+, Rx0-, Rx1+, Rx1-, Rx2+, Rx2-, Rx3+, Rx3-
Differential input low threshold	Rxvtl		-0.1	-	-	V	
Differential input Common-mode voltage	Rxvcm		0.6	1.2	2.4-|VID|/2	V	
Differential input voltage	$\|V_{ID}\|$		0.2	0.4	0.6	V	
Differential input leakage current	RVXliz		-10	-	10	uA	

Single end signals

$(LV_X+) - (LV_X-) = -|V_{ID}| < Rxvtl = "Low"$

$(LV_X+) - (LV_X-) = |V_{ID}| > Rxvth = "High"$
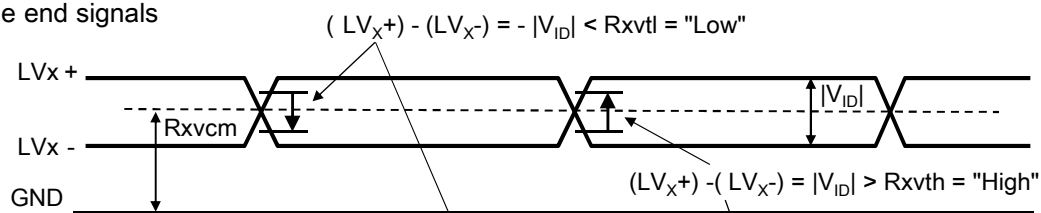
Differential signals

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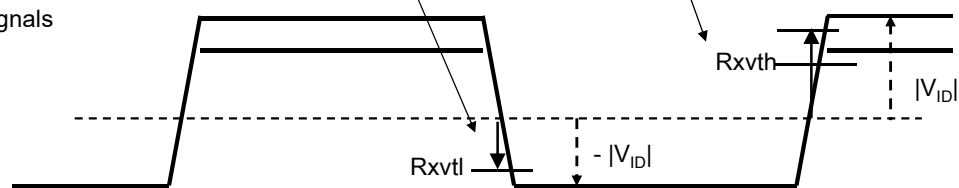
6.2.2 LVDS AC Characteristics

(Unless otherwise noted, Ta=25 ℃,VCC=3.3V,GND=0V)

Item	Symbol	MIN	TYP	MAX	Unit	
CLK Frequency	f clk	48.4	-	61.5	MHz	
Clock period	Tc	16.3	-	20.7	ns	
1 data bit time	UI	-	1/7	-	Tc	
CLK High level Width	T chw	-	4	-	UI	
CLK Low level Width	T clw	-	3	-	UI	
Position 1	Tpos_1	-0.25	0	0.25	UI	
Position 0	Tpos_0	0.75	1	1.25	UI	
Position 6	Tpos_6	1.75	2	2.25	UI	
Position 5	Tpos_5	2.75	3	3.25	UI	
Position 4	Tpos_4	3.75	4	4.25	UI	
Position 3	Tpos_3	4.75	5	5.25	UI	
Position 2	Tpos_2	5.75	6	6.25	UI	
PLL wake-up time	TenPLL	-	-	150	us	
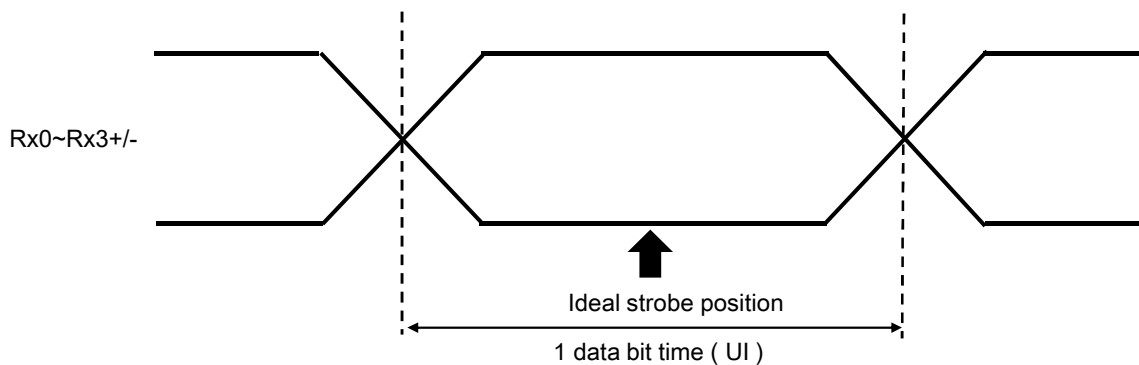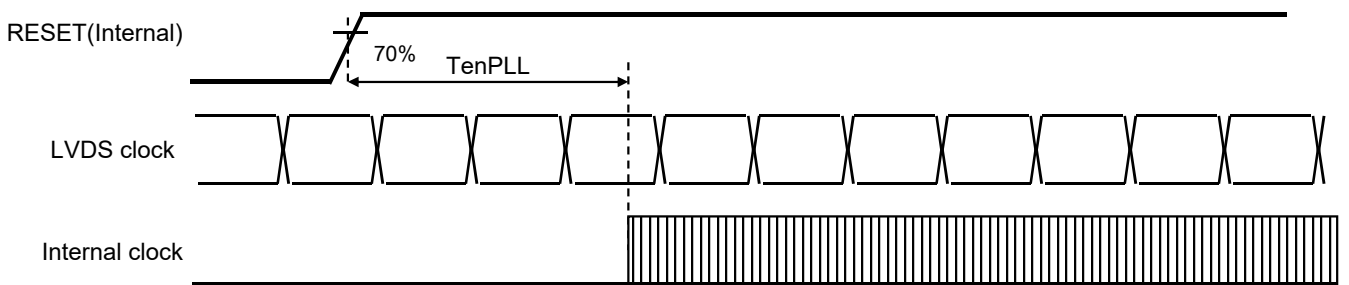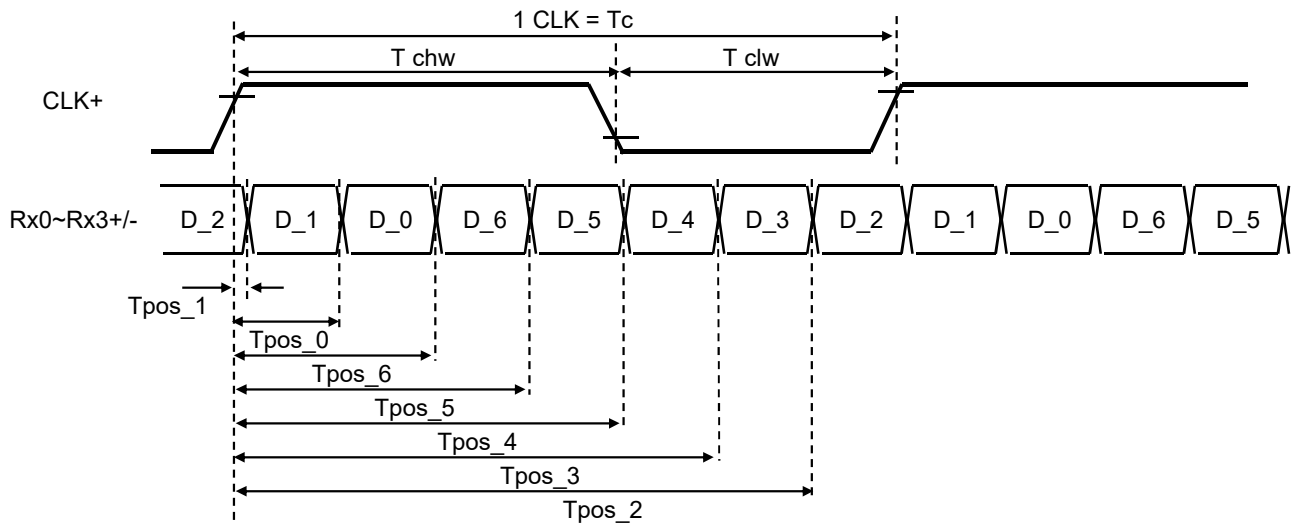
6.2.3 Input Data Format

JEIDA Format 6bit (bit6 = High)

* (MSB : R[5],G[5],B[5])

	Previous cycle		Current cycle								Next cycle
CLK+											
CLK-											
Rx0+ Rx0-	R[1]	R[0]	G[0]	R[5]	R[4]	R[3]	R[2]	R[1]	R[0]	G0	
Rx1+ Rx1-	G[2]	G[1]	B[1]	B[0]	G[5]	G[4]	G[3]	G[2]	G[1]	B[1]	
Rx2+ Rx2-	B[3]	B[2]	ENAB	-	-	B[5]	B[4]	B[3]	B[2]	ENAB	
Rx3+ Rx3-	–	–	–	–	–	–	–	–	–	–	
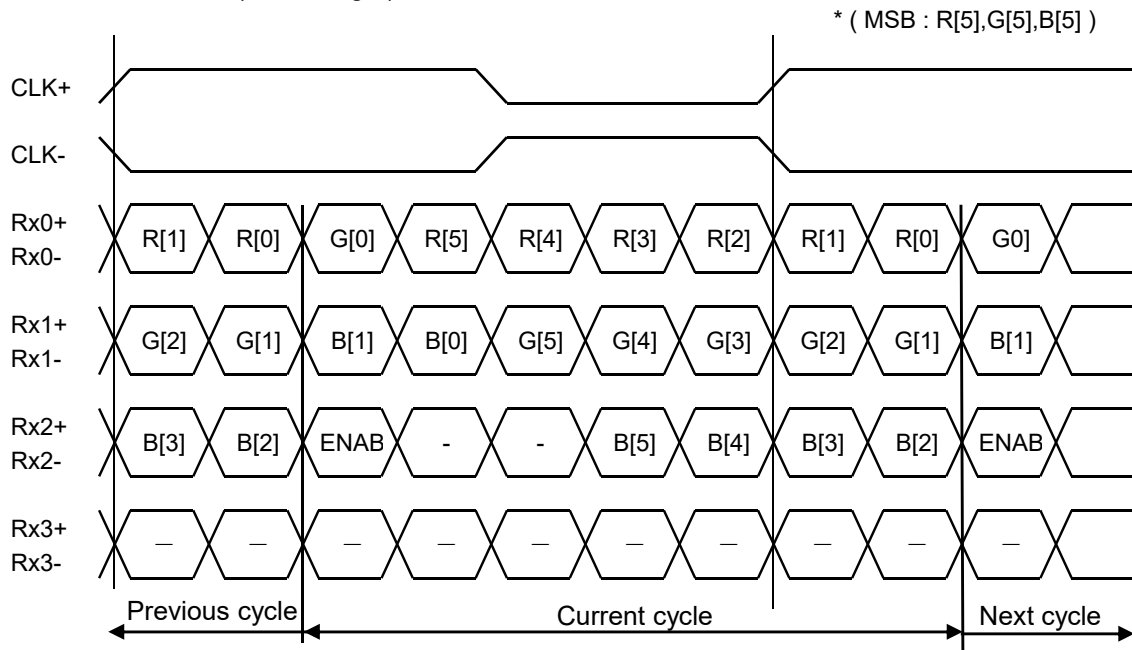
JEIDA Format 8bit (bit6 = Low)

* (MSB : R[7],G[7],B[7])

	Previous cycle		Current cycle								Next cycle
CLK+											
CLK-											
Rx0+ Rx0-	R[3]	R[2]	G[2]	R[7]	R[6]	R[5]	R[4]	R[3]	R[2]	G[2]	
Rx1+ Rx1-	G[4]	G[3]	B[3]	B[2]	G[7]	G[6]	G[5]	G[4]	G[3]	B[3]	
Rx2+ Rx2-	B[5]	B[4]	ENAB	-	-	B[7]	B[6]	B[5]	B[4]	ENAB	
Rx3+ Rx3-	R[1]	R[0]	–	B[1]	B[0]	G[1]	G[0]	R[1]	R[0]	–	

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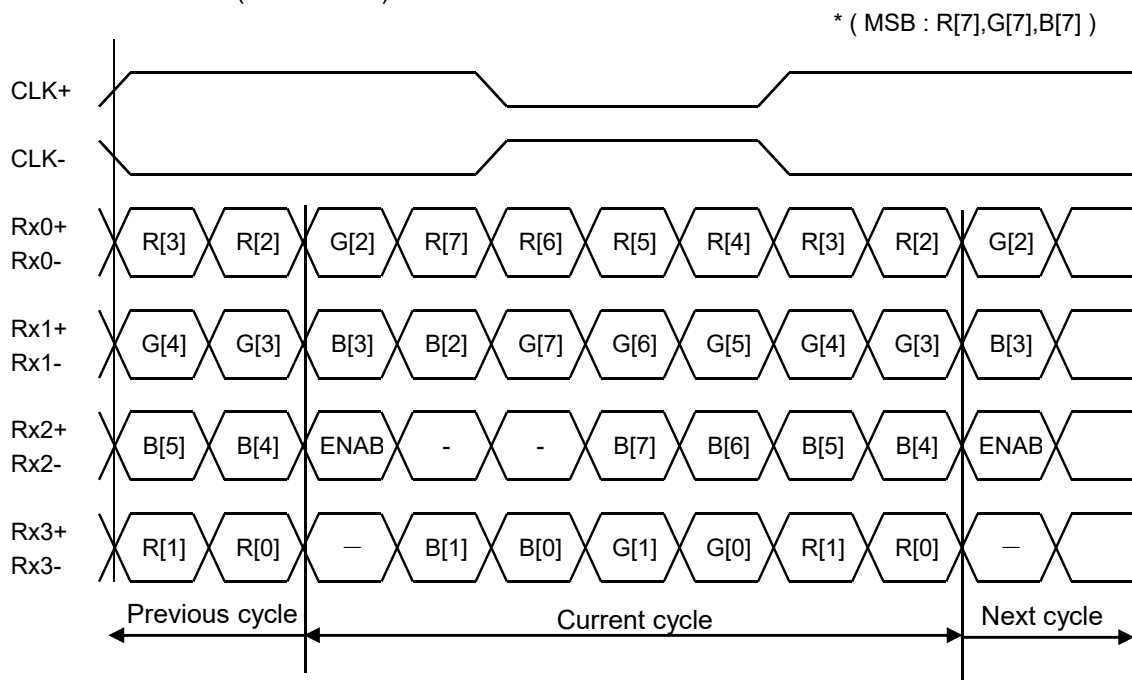
6.3 Input Timing Specifications

Item		Symbol	Rating			Unit	Signal (*)
			MIN	TYP	MAX		
CLK frequency		fCLK	(48.4)	(52.4)	(61.5)	MHz	CLK
Vertical	Frequency	fVD	-	(60)	-	Hz	ENAB
	Period	tv	(773)	(808)	(851)	H	R[7:0],G[7:0],B[7:0]
	Blanking Time	tvb	(5)	(40)	(83)	H	
	Active Time	tvdp		(768)		H	
Horizontal	Frequency	fHD	-	(48.5)	-	kHz	CLK,ENAB
	Period	th	(1044)	(1080)	(1204)	CLK	R[7:0],G[7:0],B[7:0]
	Blanking Time	thb	(20)	(56)	(180)	CLK	
	ENAB pulse width	tenp		(1024)		CLK	
	Active Time	thdp		(1024)		CLK	

(*) Input terminals are (Rx0+/- , Rx1+/- , Rx2+/- , Rx3+/- , CLK+/-).

<Vertical timing>

<Horizontal timing>

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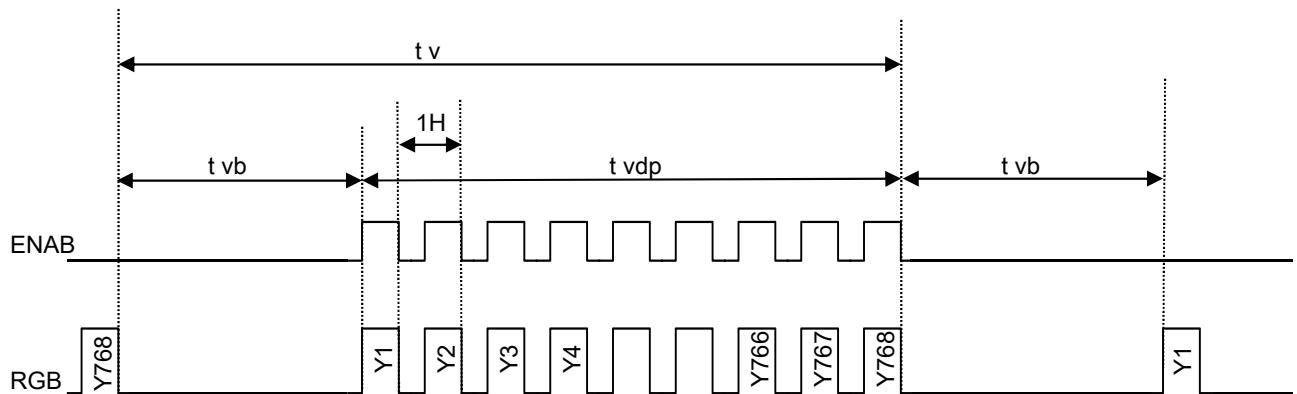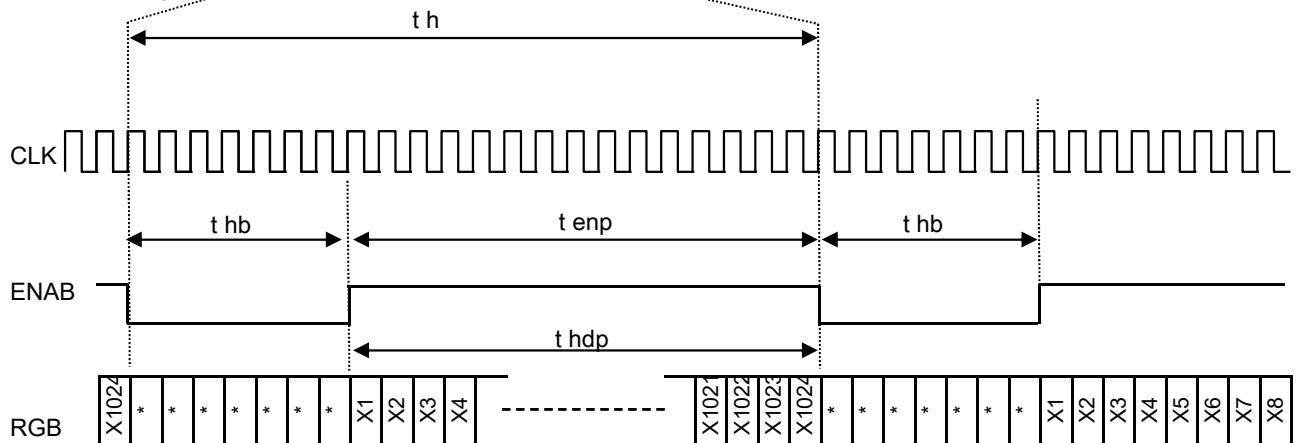
6.4 Power ON/OFF Sequence

【LCD】

VCC
Logic signal

（＜3ms）

90%

10%

（＞200ms）

LVDS

（＞5ms、＜100ms）

（＞100ms）

VL
Backlight Supply

（＞200ms）

（＞0ms）

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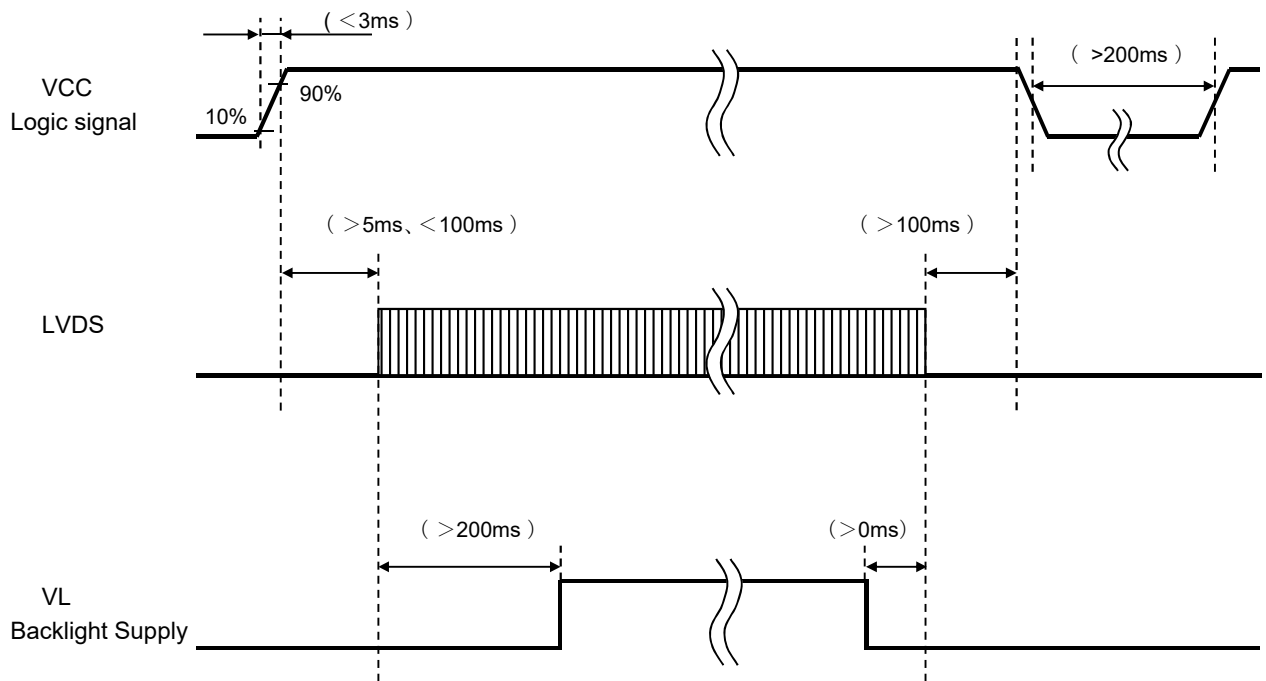| SPECIFICATIONS № 21TLM090	Issue: Dec.8,2021

7. Characteristics

7.1 Optical Characteristics

(Measurement Condition)
- Measuring instruments: CS2000 (KONICA MINOLTA), LCD7200 (OTSUKA ELECTRONICS), EZcontrastXL88 (ELDIM)
- Driving condition: VCC=3.3V, GND=0V, Optimized VCOMDC
- Backlight: PWM Duty = 100% (VL=12.0V, GDNL=0V)
- Measured temperature: Ta = 25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note №	Remark
Response time	Rise time + Fall time	TON + TOFF	[Data]= 00h← →FFh	-	-	(TBD)	ms	1	
Contrast ratio		CR	[Data]= FFh / 00h	(TBD)	(TBD)	-		2	
Viewing angle	Left	θL	[Data]= FFh / 00h CR ≧ (10)	(TBD)	-	-	deg	3	
	Right	θR		(TBD)	-	-	deg		
	Up	φU		(TBD)	-	-	deg		
	Down	φD		(TBD)	-	-	deg		
White Chromaticity		x	[Data]= FFh	White chromaticity range				4	
		y							
Center Brightness			[Data]= FFh	(TBD)	(TBD)	-	cd/㎡	5	
Brightness distribution			[Data]= FFh	(TBD)	-	-	%	6	

* Note number 1 to 6: Refer to the APPENDIX of "Reference Method for Measuring Optical Characteristics and Performance".
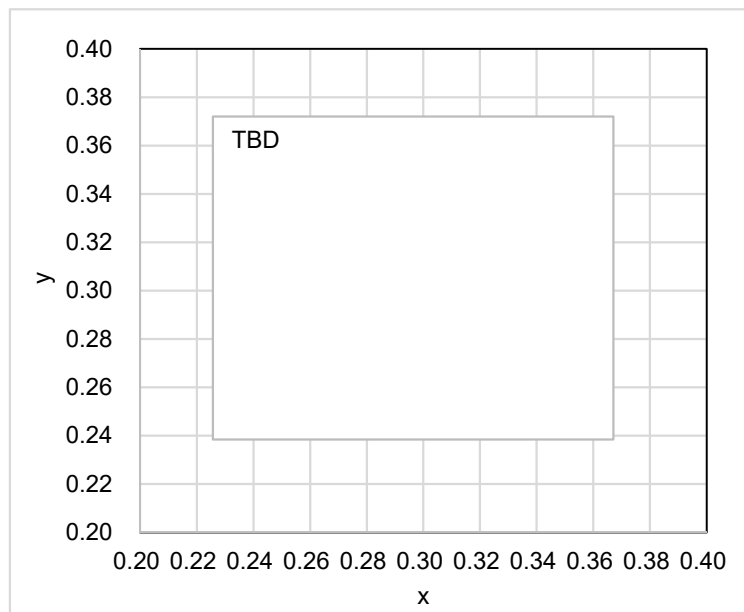
White Chromaticity Range

(White Chromaticity Range)

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

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8. Criteria of Judgment

8.1 Defective Display and Screen Quality

Test Condition: Observed TFT-LCD monitor from front during operation with the following conditions
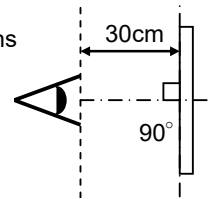Driving Signal: Raster Patter (RGB, white, black)
Signal condition: [Data]:00h, (TBD)h, FFh (3steps)
Observation distance: 30 cm
Illuminance: 200 to 350 lx
Backlight: PWM Duty = 100% (VL=12.0V, GDNL=0V)

30cm
90°

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) 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 Note1) 1dot : 1R / 1G / 1B Note2) Point defect area ≧ 1/2 dot.
		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	TBD	TBD
		Liner	TBD	TBD
	Others			Use boundary sample for judgment when necessary

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

Table1

TBD

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8.2 Screen and Other Appearance

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

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

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9. 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 = -40°C 240hrs	TBD
	High temperature & high humidity storage	Ta = 60°C, RH = 90%, 240hrs non condensing ※	TBD
	High temperature operation	Tp = 80°C 240hrs	TBD
	Low temperature operation	Tp = -30°C 240hrs	TBD
	High temperature & high humidity operation	Tp = 40°C, RH = 90%, 240hrs non condensing ※	TBD
	Thermal shock storage	-40°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 (10) times of discharge on and power supply and other terminals.	TBD
	Surface discharge test (Non operation)	C=250pF, R=100Ω, V=±(8)kV Each (10) times of discharge in both polarities on the center of screen with the case grounded.	TBD

Note:Ta=ambient temperature   Tp=Panel temperature

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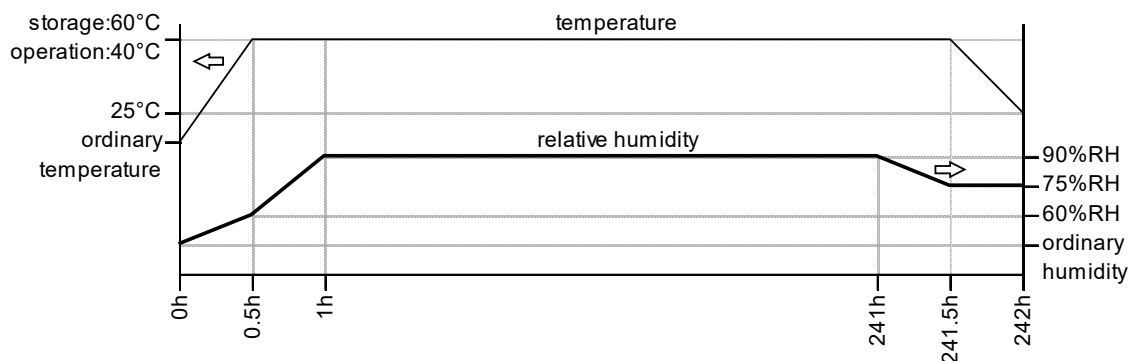 (Pure water of over 10MΩ·cm shall be used.）

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	200 or more	Backlight ON

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10. Packing Specifications

TBD

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11. Handling Instruction

   11.1 Cautions for Handling LCD panels

<table>
<tr><td colspan="2" style="text-align:center">⚠   Caution</td></tr>
<tr><td>(1)</td><td>Do not make an impact on the LCD panel glass because it may break and you may get injured from it.</td></tr>
<tr><td>(2)</td><td>If the glass breaks, do not touch it with bare hands.
（Fragment of broken glass may stick you or you cut yourself on it.）</td></tr>
<tr><td>(3)</td><td>If you get injured, receive adequate first aid and consult a medial doctor.</td></tr>
<tr><td>(4)</td><td>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.)</td></tr>
<tr><td>(5)</td><td>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.</td></tr>
<tr><td>(6)</td><td>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.</td></tr>
<tr><td>(7)</td><td>Do not connect or disconnect this product while its application products is powered on.</td></tr>
<tr><td>(8)</td><td>Do not attempt to disassemble or modify this product as it is precision component.</td></tr>
<tr><td>(9)</td><td>If a part of soldering part has been exposed, and avoid contact (short-circuit)
with a metallic part of the case etc. about Circuit board 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.</td></tr>
<tr><td>(10)</td><td>For protection your circuit, we recommend you to add excess current protection circuit to power supply.</td></tr>
</table>

⚠ **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.

11.2 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 Connector
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 Connector.

7) Peel off the protective film on the TFT monitors during mounting process.
Refer to the section 11.5 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.

11.3 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.

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11.4 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.

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11.5 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

11.6 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.

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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
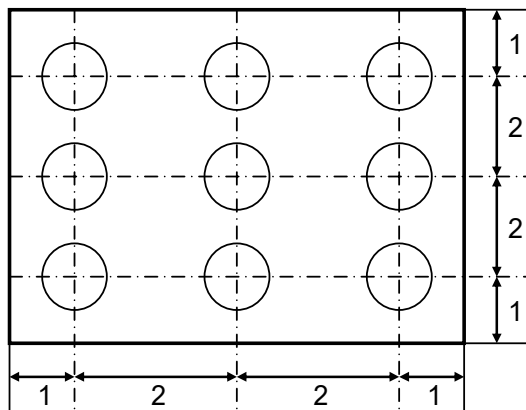
Dark box at constant temperature

Monitor   Luminance meter

LCD7200 : 290 mm
CS2000 : 500 mm
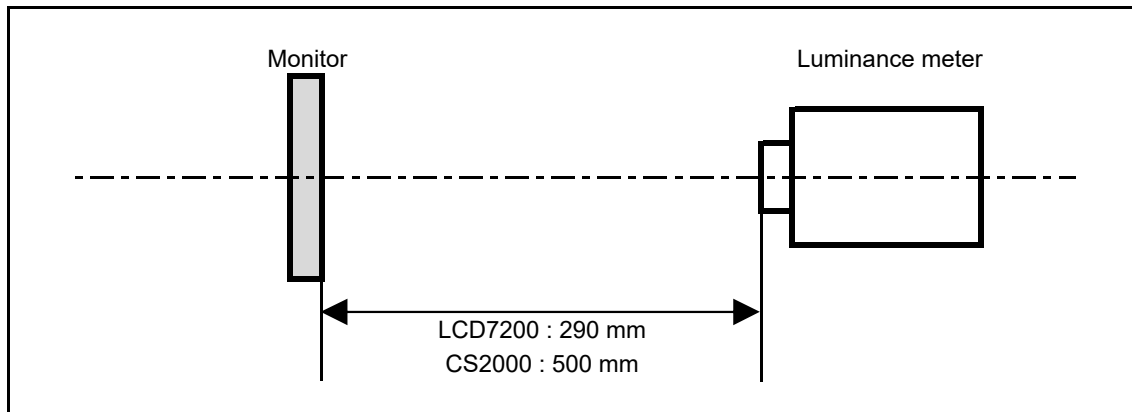
*Measurement is made after 30 minutes of lighting of the backlight.

Measurement point: At the center point of the screen
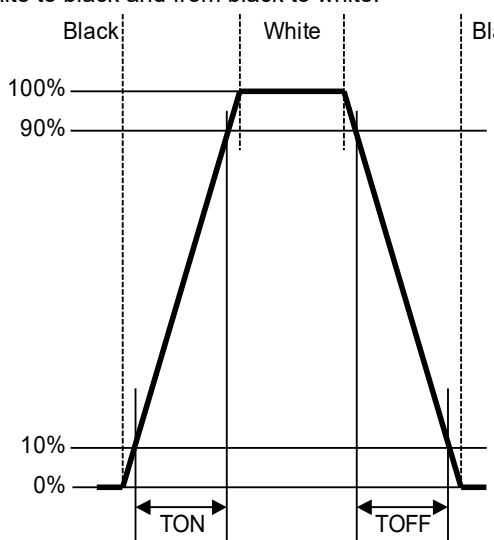Brightness distribution: 9 points shown in the following drawing.

<Landscape model>

1
2
2
1

1   2   2   1

Dimensional ratio of active area

Backlight   PWM Duty = 100% (VL=12.0V, GDNL=0V)

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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]=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)	CS2000	
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	(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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