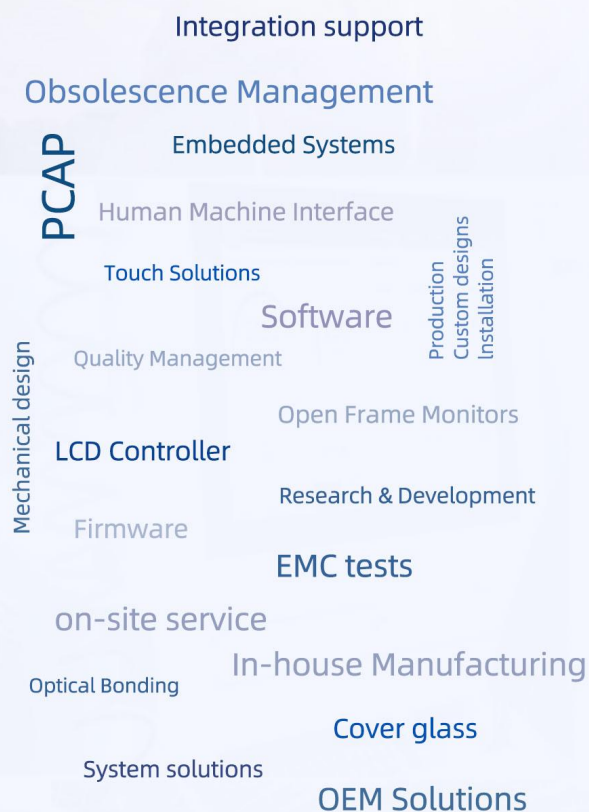


INDUSTRIAL STRENGTH... Start Your Application From YOURITECH



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

Specifications for

Blanview TFT-LCD Monitor (TENTATIVE)

(10.4"SVGA 800 x RGB x 600 Landscape)

Version 0.0

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

MODEL COM104H9M28SRS

Customer's Approval

Signature :

Name :

Section :

Title :

Date :

ORTUSTECH

TOPPAN INC.
Electronics Division
Technological Development Department III

Approved by

Checked by

Prepared by

TOPPAN INC.

Ver.	Date	Page	Description	
0.0	Dec.19,2023	-	-	Tentative issue

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1. Application

This Specification is applicable to 264.0 mm (10.4 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

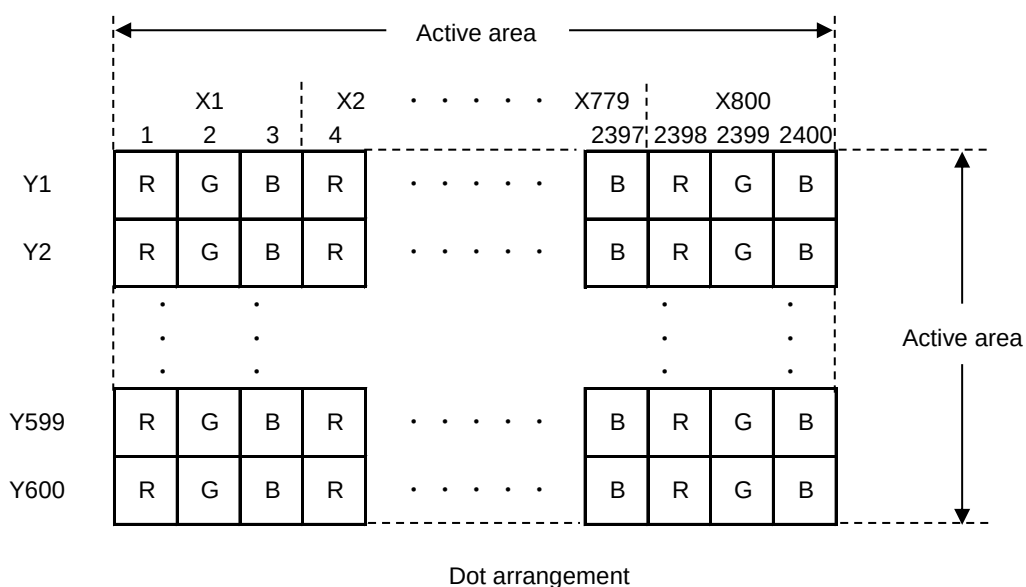
2.1 Features of the Product

- 10.4 inch diagonal display, 800 x RGB [H] x 600 [V] dots.
- 8bit / 16,777,216 colors, 6bit / 262,144 colors.
- Timing generator [TG], Counter-electrode driving circuitry, Built-in power supply circuit.
- High bright white LED back-light, Built-in backlight drive circuit.
- 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

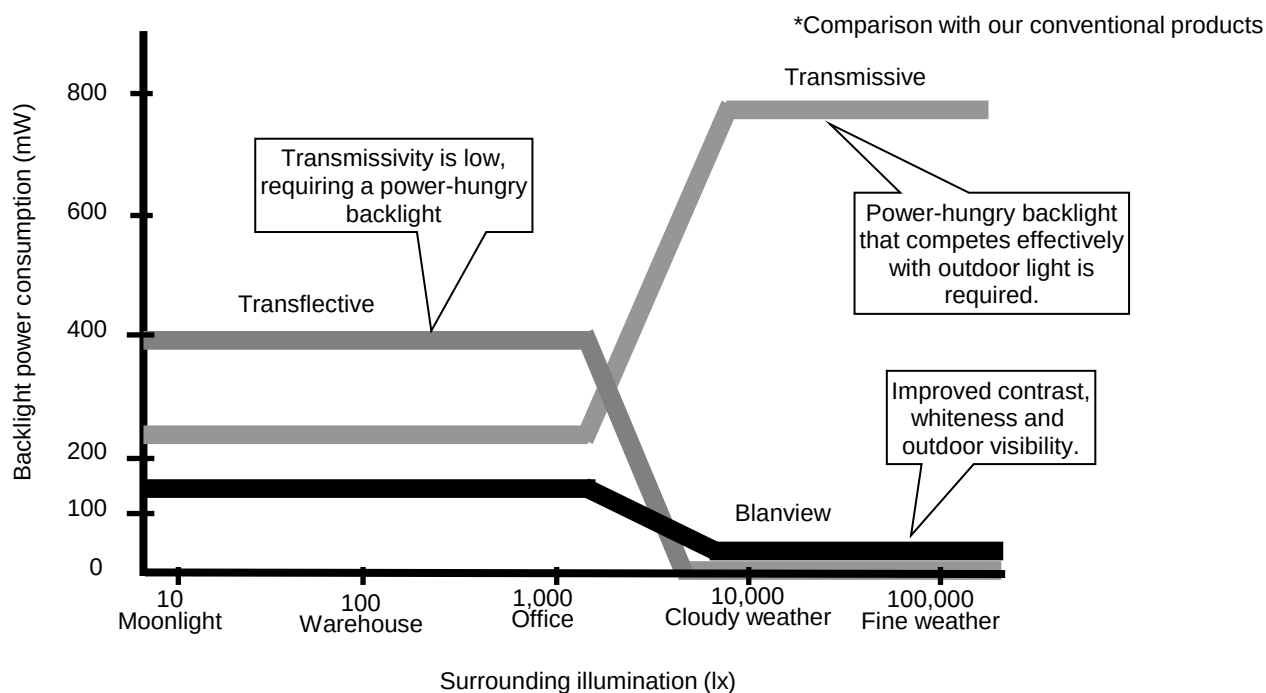
2.2 Display Method

Items	Specifications	Remarks
Display type	FFS 16,777,216 colors Blanview, 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	VESA/JEIDA LVDS Interface.	
Backlight type	High bright white LED.	
NTSC ratio	(TBD)	
Touch Panel	Resistive film transparent analog tablet	



<Features of Blanview>

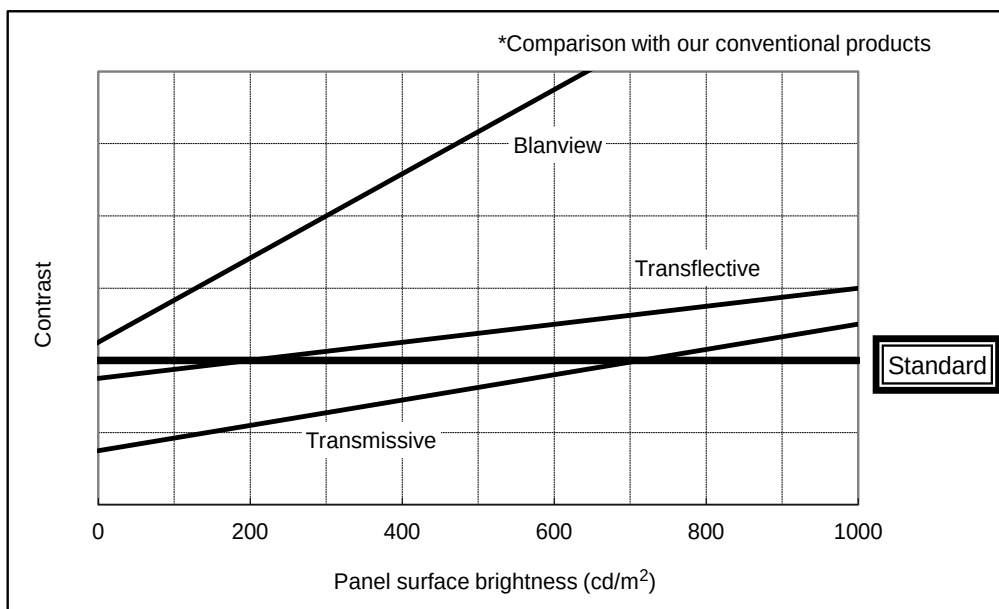
- Backlight power consumption required to assure visibility. (equivalent to 3.5"QVGA)



- 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)

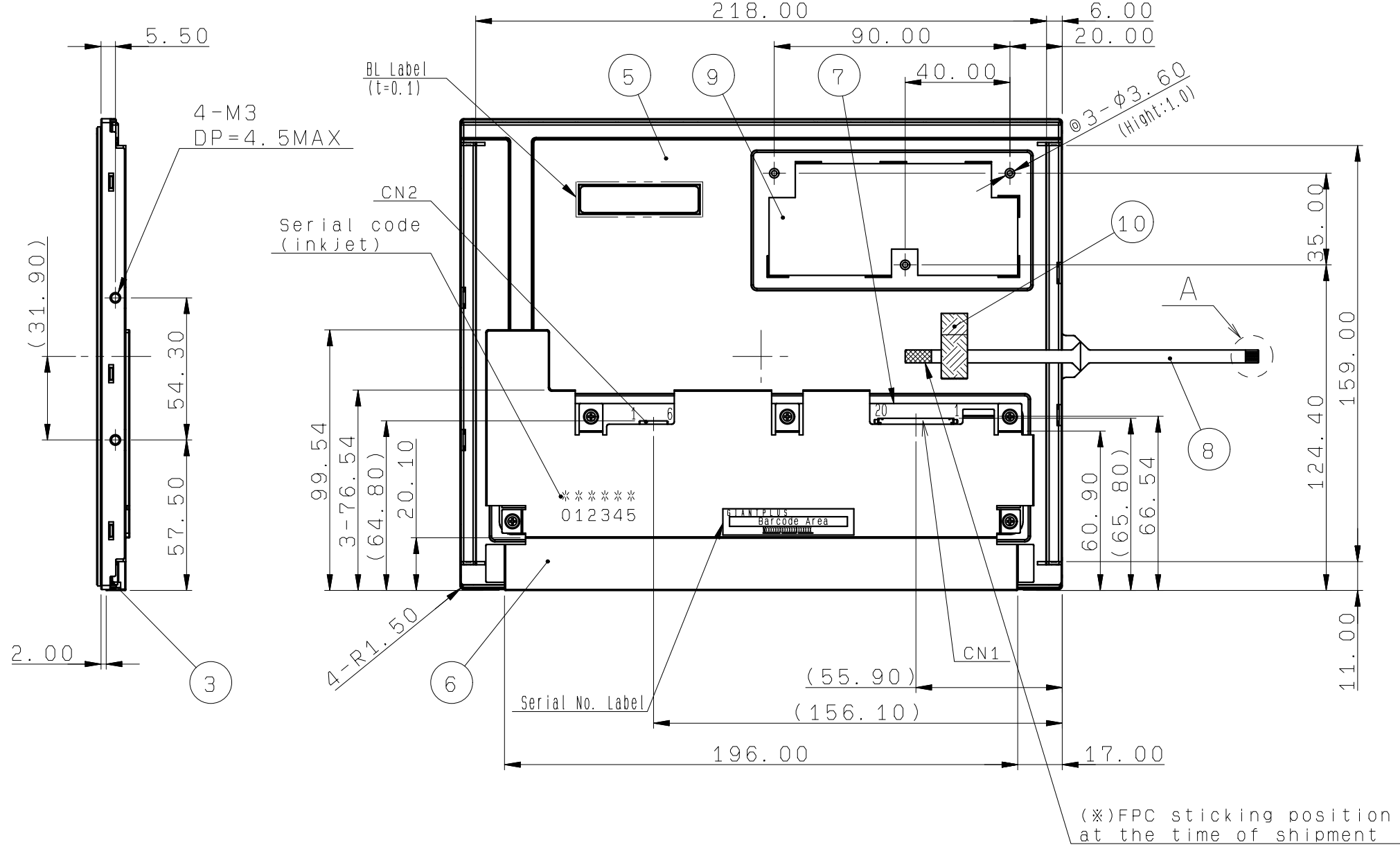
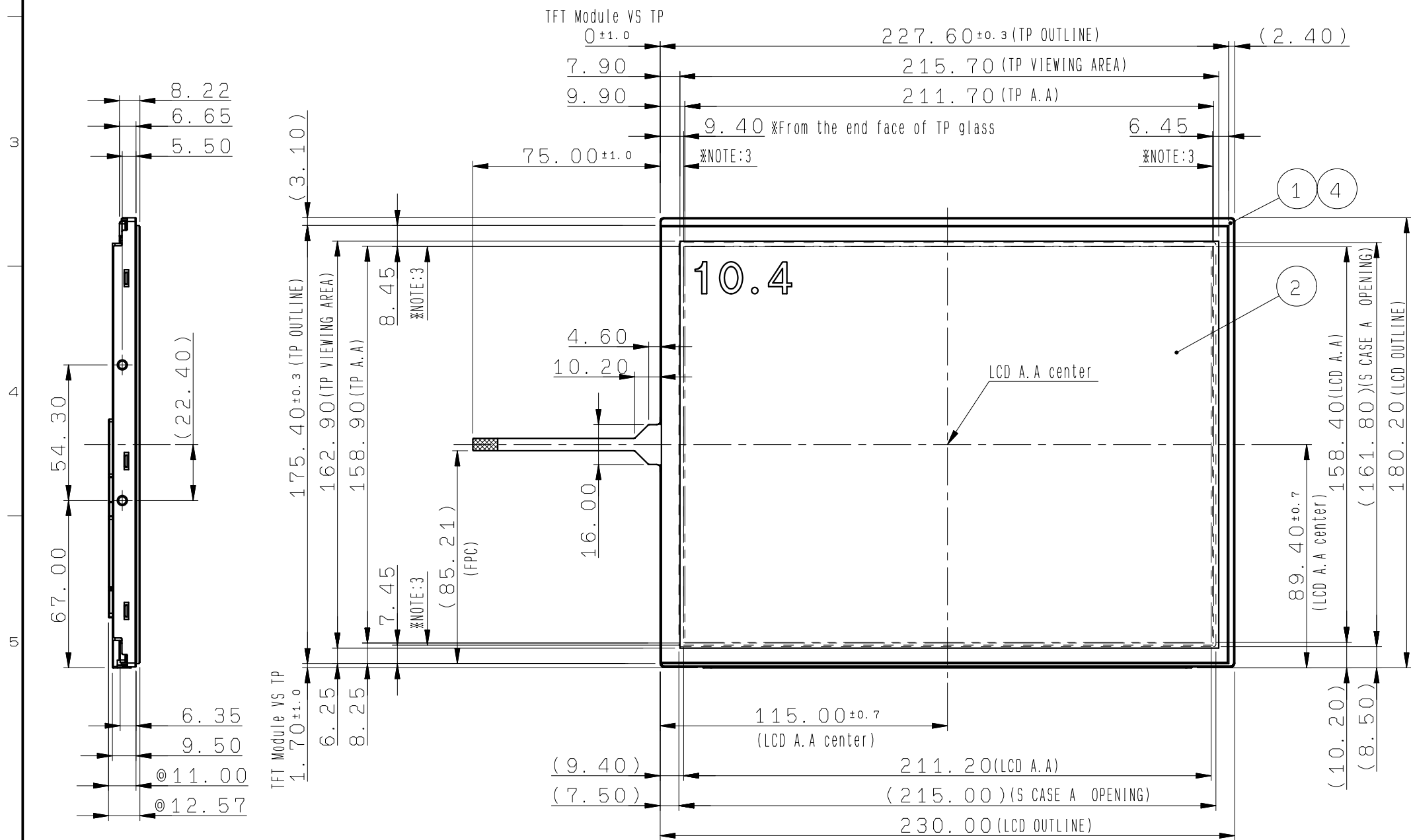
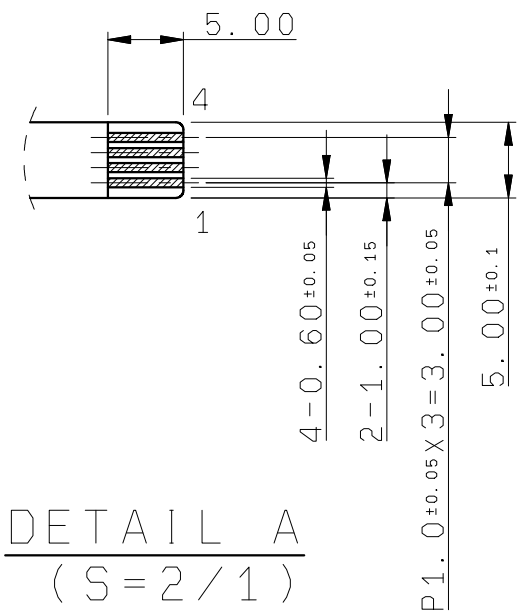
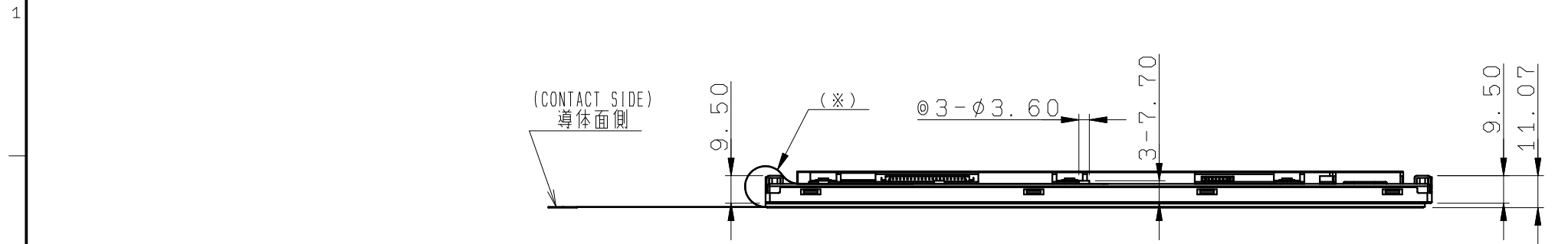


3. Dimensions and Shape

3.1 Dimensions

Items	Specifications	Unit	Remarks
Outline dimensions	230.00[H] × 180.20[V] × 11.07[D]	mm	Total thickness : 12.57mm [D] * Include Touch Panel
Active area	211.2[H] × 158.4[V]	mm	Diagonal 264.0 mm
Number of dots	2400[H] × 600[V]	dot	
Dot pitch	88.0[H] × 246.0[V]	um	
Touch panel surface hardness	3	H	Load: 4.9N, Angle: 45 Reference criteria : JIS K-5400
Weight	(T.B.D.)	g	

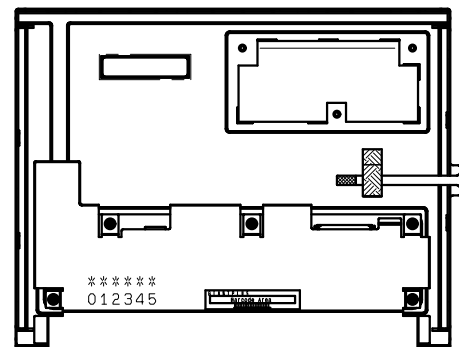
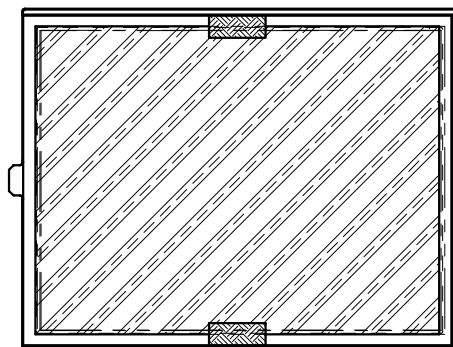
3.2 Outward Form



【Shipment appearance】

Front side

Back side



A protective film is attached to the touch panel surface at the time of shipment.

NOTE : 1.Connector :
CN1:F1-SEB20P-HFE(JAE).
CN2:F1-56P-HFE(JAE).
FPC for TOUCH PANEL:Recommended CONNECTOR is 04FMS-1.0SP-GB-TF(LF)(SN) 00 (JST).
NOTE : 2.When peeling off the Fixing tape @that temporarily fixes the FPC for Touch Panel, peel the tape off while pressing the base side of the FPC.
NOTE : 3.Edge of input prohibition area.

Holding Tape	10		Remove the Tape when assembling				
Insulation Film	9						
FPC	8		for TOUCH PANEL				
PCB	7						
S CASE E	6		SUS t=0.3				
S CASE C	5		AL t=0.8				
S CASE A	4		SUS t=0.3				
FRAME	3		PC				
TOUCH PANEL	2		Film/Glass Resistive Touch Panel				
TFT-LCD PANEL	1		Glass substrate thickness=0.5+0.5t				
PART NAME		ITEM	PART CODE	MODEL NUMBER	REMARK		
APPROVED 木下	GENERAL TOLERANCE ±0.5		SCALE 1/2	UNIT mm	TOPPAN TOPPAN INC. DO NOT DUPLICATE, CONFIDENTIAL AND PROPRIETARY		
CHECKED 加藤	ISSUE (Y:M:D) 23:10:31		MODEL COM104H9M28S**				
CHECKED	NAME						
DESIGN 前田創	OUTLINE-D9M28						
DRAW 前田創							
				DRAWING No.	REV.	SHEET	DIV.
				RJD604528D201		/	

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	104JS (Made in Japan) 104KS (Made in Malaysia)		
d	Serial number			

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

• Made in Japan

5L104JS000125

means "manufactured in December 2025, 10.4 inch, J type, S specifications, serial number 000125"

• Made in Malaysia

5L104KS000125

means "manufactured in December 2025, 10.4 inch, K type, S 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

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(-) *Note
18	Rx3+	LVDS DATA3(+) *Note
19	MODE	VESA/JEIDA switching terminal (Low: 8bit_JEIDA or 6bit_JEIDA / High: 8bit_VESA) *Note
20	SC	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)

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	BLDN	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.

4. 1 Touch panel

No.	Symbol	Details	Remark
1	YD	Y-axis lower terminal	
2	XL	X-axis left terminal	
3	YU	Y-axis upper terminal	
4	XR	X-axis right terminal	

- Recommended connector: 04FMS-1.0SP-GB-TF(LF)(SN) (JST)
- 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

Item	Symbol	Rating		Unit
		MIN	MAX	
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
Touch panel input voltage	VIT	-	7	V
Operational temperature range Note1	Top	(-20)	(70)	°C
Storage temperature range	Tstg	(-30)	(80)	°C

Note1: Panel surface temperature

6. Electrical Characteristics

6.1 DC Characteristics

6.1.1 LCD Display Module

(Unless otherwise noted, Ta=25 °C,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 Color bars	-	248	496	mA	VCC
Input Voltage for Logic	LCD_VIH		0.8×VCC	-	VCC	V	MODE, SC
	LCD_VIL		0	-	0.2×VCC	V	MODE, SC

6.1.2 Backlight

(Unless otherwise noted, Ta=25 °C,VL=12V,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	PWM duty=100%	--	241	482	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	High_VPDIM	ON	1.3	--	VL	V	VPDIM
	Low_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%	--	(70,000)	--	hrs	

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

6.1.3 Touch panel

Ta=25 °C

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Linearity	LE	Note	-4	—	4	%	
Insulation resistance	RI	DC 25V	10	—	—	MΩ	XR,XL-YU,YD
Terminal resistance		X	200	—	1000	Ω	XR,XL
		Y	100	—	800		YU,YD
Rated voltage		DC	—	5.0	7.0	V	XR,XL,YU,YD
ON/OFF chattering			—	—	20	ms	

Note: - Please refer to "3.2 Shape" for the linearity guarantee range.
 - For the linearity measurement method,
 refer to the attached document "Standard measurement of optical characteristics". (Load: 2.45N)

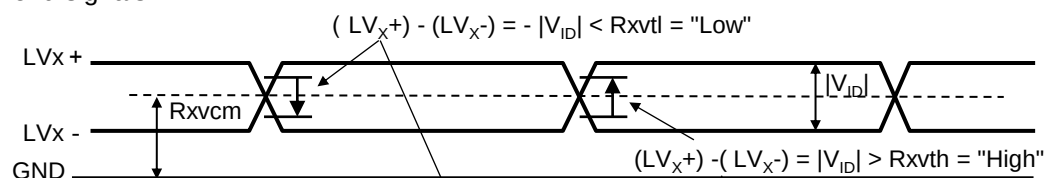
6.2 LVDS Interface

6.2.1 LVDS DC Characteristics

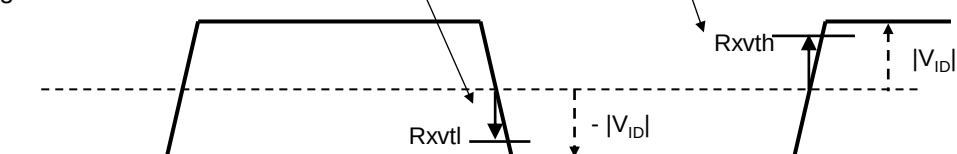
(Unless otherwise noted, $T_a=25\text{ }^{\circ}\text{C}$, $V_{CC}=3.3\text{V}$, $GND=0\text{V}$)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Differential input high threshold	Rxvth	$R_{XVCM}=1.2\text{V}$	-	-	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	$2.4- V_{ID} /2$	V	
Differential input voltage	$ V_{ID} $		0.2	0.4	0.6	V	
Differential input leakage current	RVXliz		-10	-	10	μA	

Single end signals



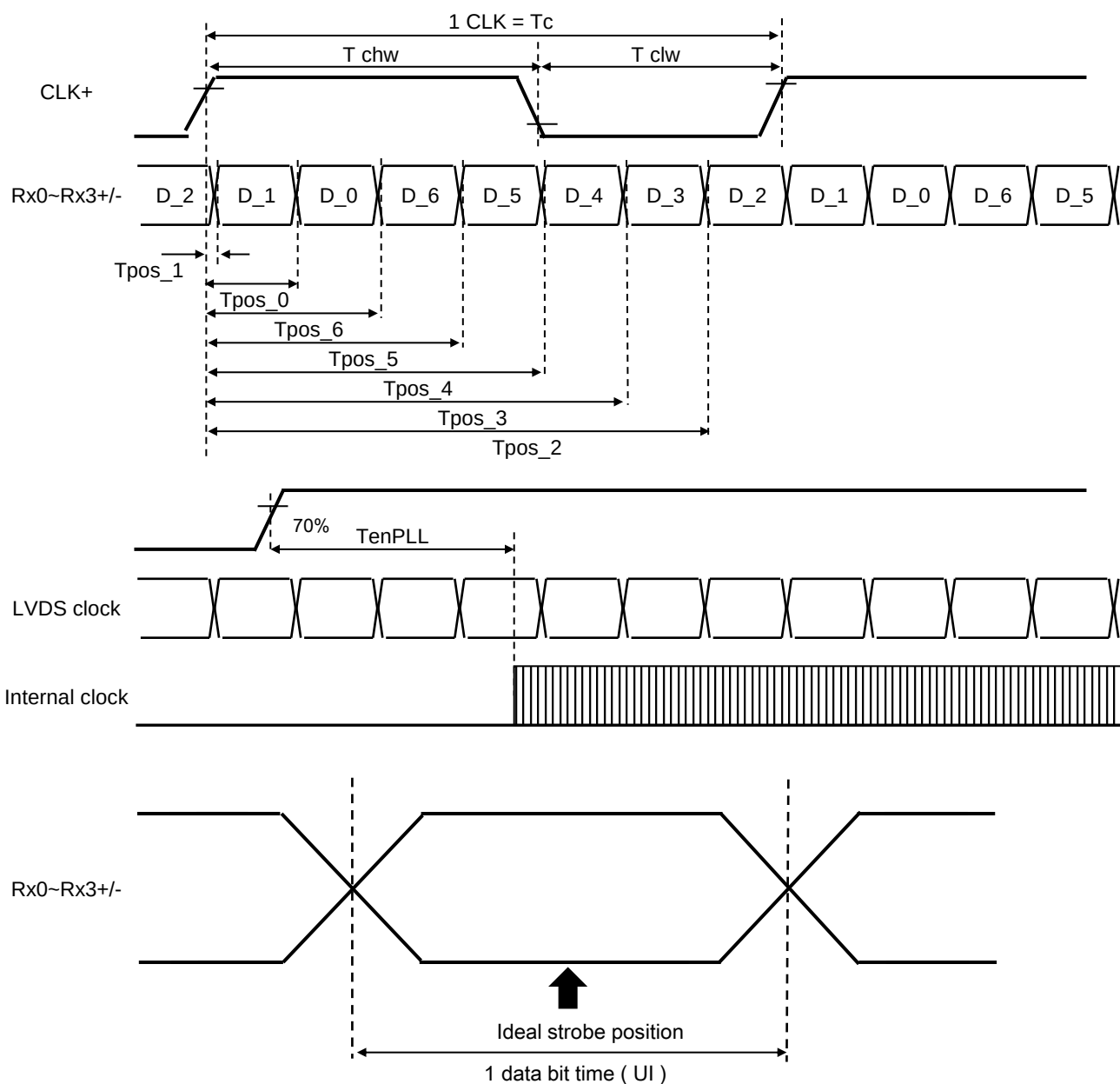
Differential signals



6.2.2 LVDS AC Characteristics

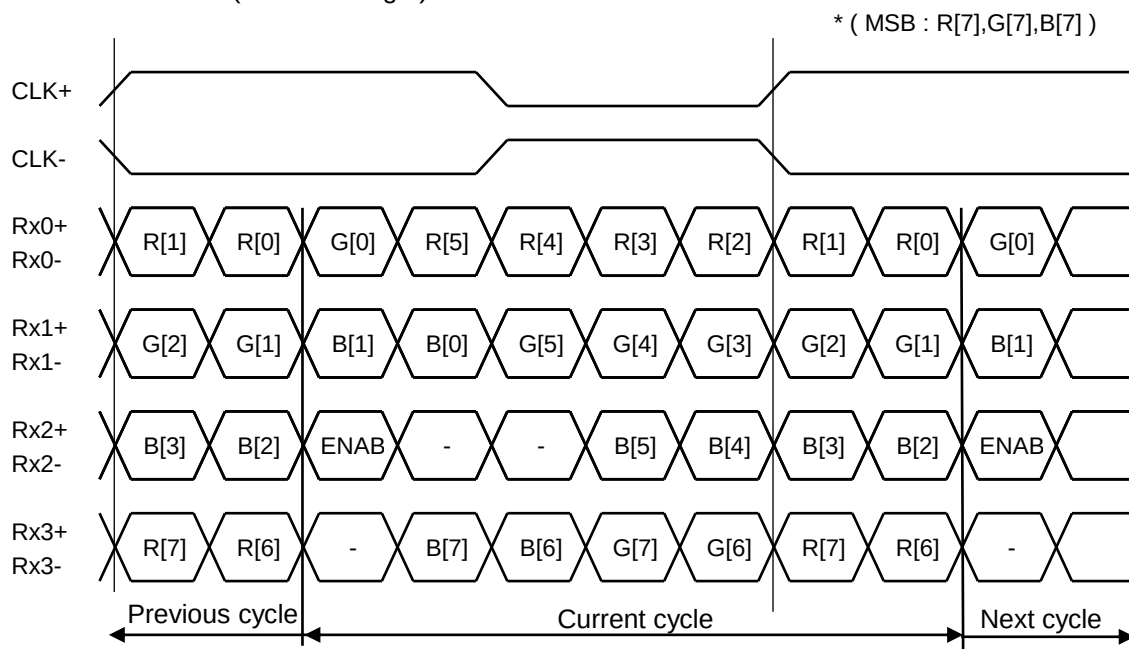
(Unless otherwise noted, $T_a=25\text{ }^{\circ}\text{C}$, $V_{CC}=3.3\text{V}$, $GND=0\text{V}$)

Item	Symbol	Rating			Unit	
		MIN	TYP	MAX		
CLK Frequency	f clk	35	-	42	MHz	
Clock period	Tc	23.8	-	28.6	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	

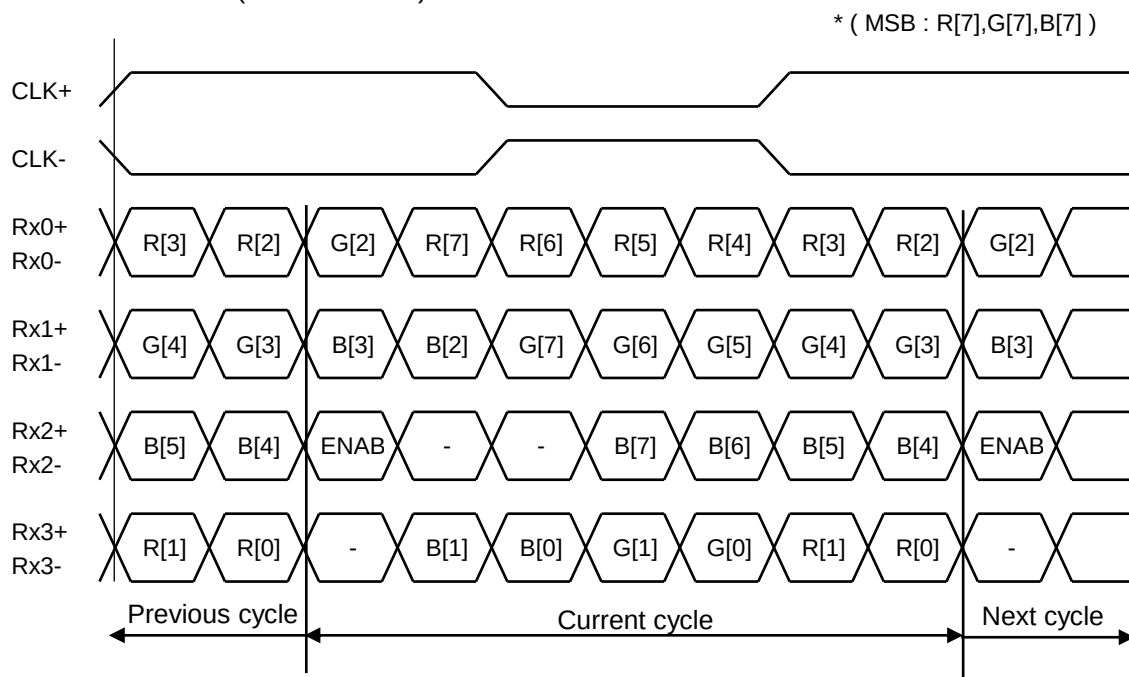


6.2.3 Input Data Format

VESA Format 8bit (MODE = High)



JEIDA Format 8bit (MODE = Low)



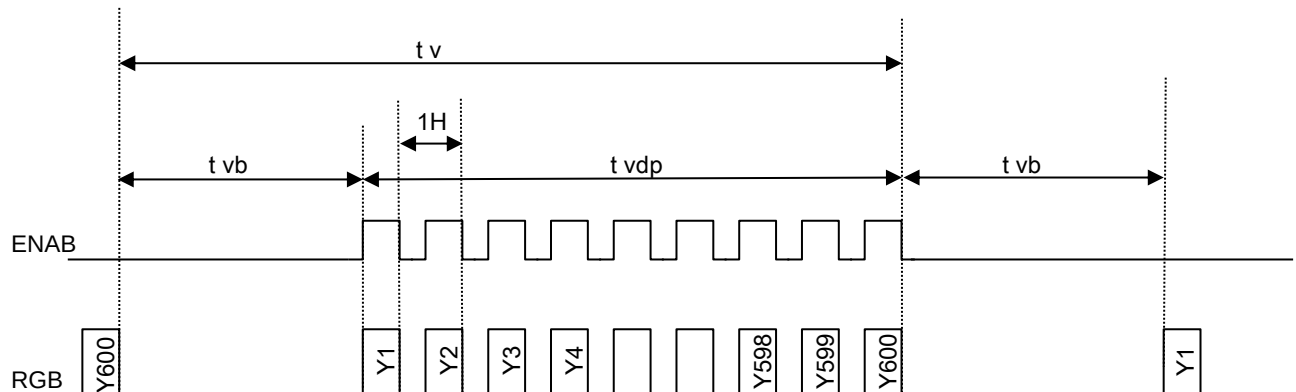
Note) For 6-bits input, MSB : R[7],G[7],B[7] and LSB : R[2],G[2],B[2].

6.3 Input Timing Specifications

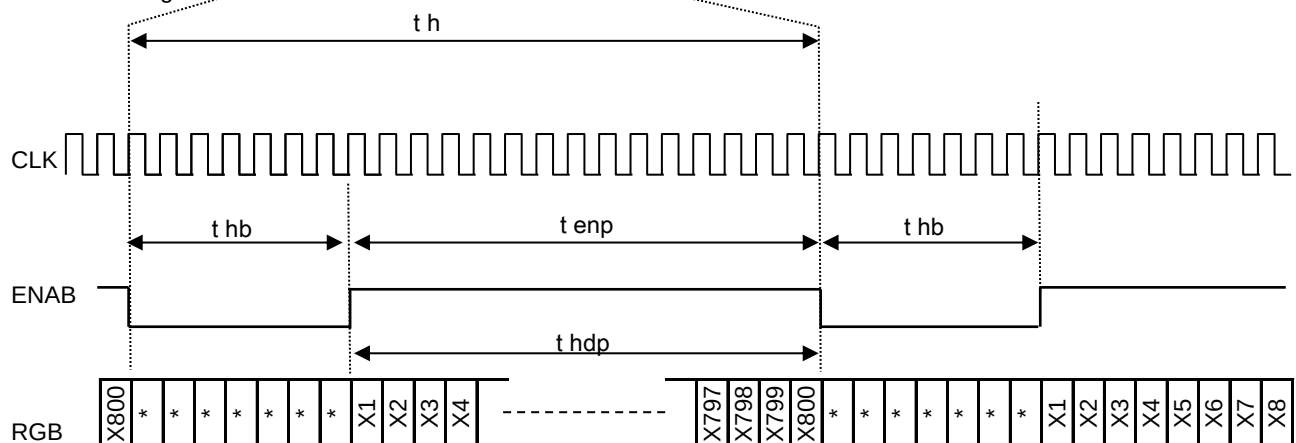
Item		Symbol	Rating			Unit	Signal (*)
			MIN	TYP	MAX		
CLK frequency		fCLK	35	40	42	MHz	CLK
Vertical	Frequency	fVD	55	60	64.2	Hz	R[7:0],G[7:0],B[7:0]
	Period	tv	613	628	-	H	
	Blanking Time	tvb	13	28	-	H	
	Active Time	tvdp	600			H	
Horizontal	Frequency	fHD	35.2	37.9	39.2	kHz	CLK,ENAB R[7:0],G[7:0],B[7:0]
	Period	th	826	1056	-	CLK	
	Blanking Time	thb	26	256	-	CLK	
	ENAB pulse width	tenp	800			CLK	
	Active Time	thdp	800			CLK	

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

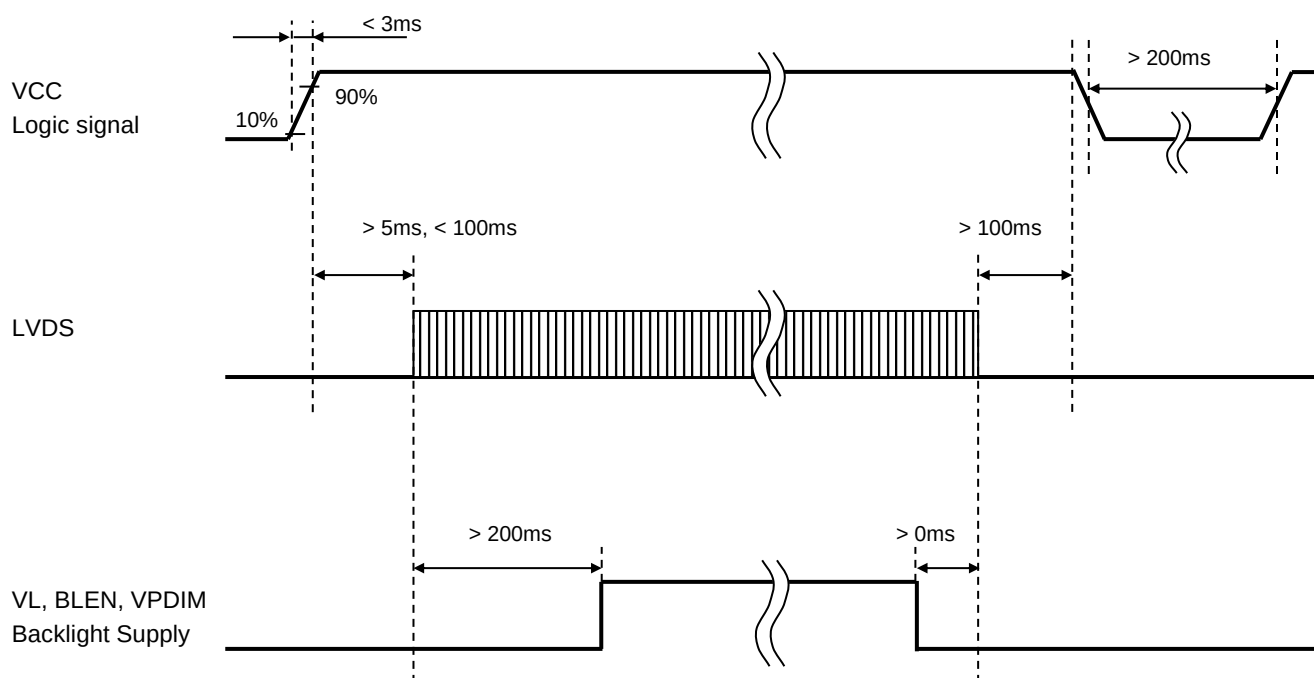
<Vertical timing>



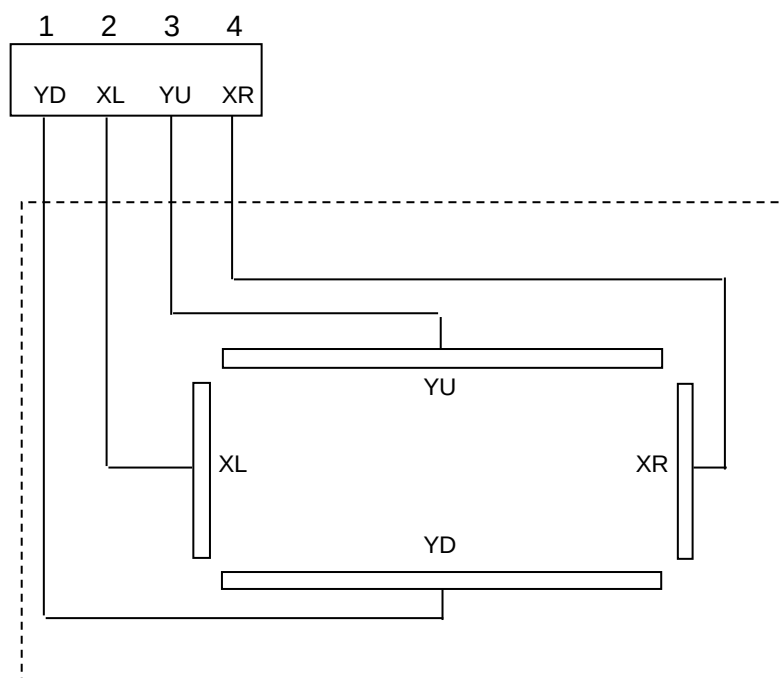
<Horizontal timing>



6.4 Power ON/OFF Sequence



7. Touch panel circuit



8. Characteristics

8.1 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,GNDL=0V)

Measured temperature: Ta = 25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note №	Remark
Response time	Rise time	TON	[Data]= 00h ← → FFh	-	-	(40)	ms	1	
	+ Fall time	TOFF							
Contrast ratio		CR	[Data]= FFh / 00h	(TBD)	(TBD)	(-)		2	
Viewing angle	Left	θL	[Data]= FFh / 00h CR ≥ (10)	-	(88)	-	deg	3	
	Right	θR		-	(88)	-	deg		
	Up	φU		-	(88)	-	deg		
	Down	φD		-	(88)	-	deg		
White Chromaticity		x	[Data]= FFh	(TBD)	(TBD)	(TBD)		4	
		y		(TBD)	(TBD)	(TBD)			
Center Brightness			[Data]= FFh	(470)	(680)	-	cd/m ²	5	
Brightness distribution			[Data]= FFh	(70)	-	-	%	6	

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

9. Inspection Criteria

TBD

10. Item and Criteria

10.1 Visual inspection criterion in cosmetic

TBD

10.2 Defective Display and Screen Quality

TBD

11. 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%, non condensing ※	240hrs	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%, non condensing ※	240hrs	TBD
	Thermal shock storage	-30°C ↔ 80°C (30min / 30min)	100cycles	TBD
Mechanical environmental	Vibration test	Total amplitude 1.5mm, f=10~55Hz, X,Y,Z directions for each 2 hours		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.)

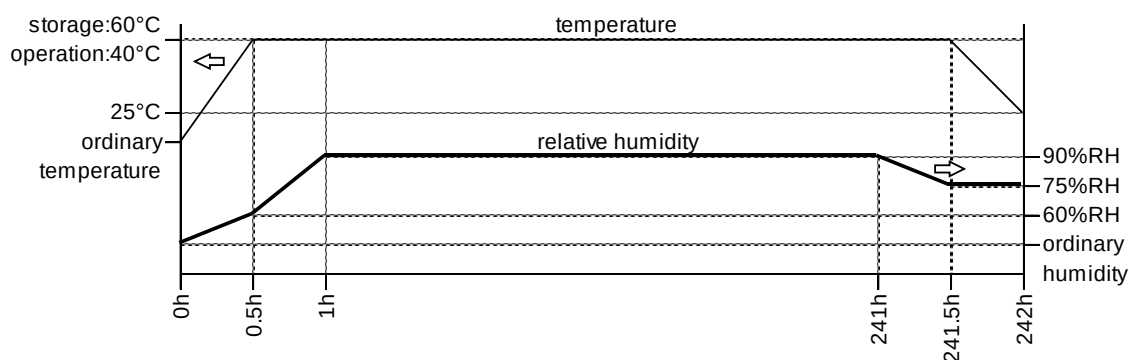
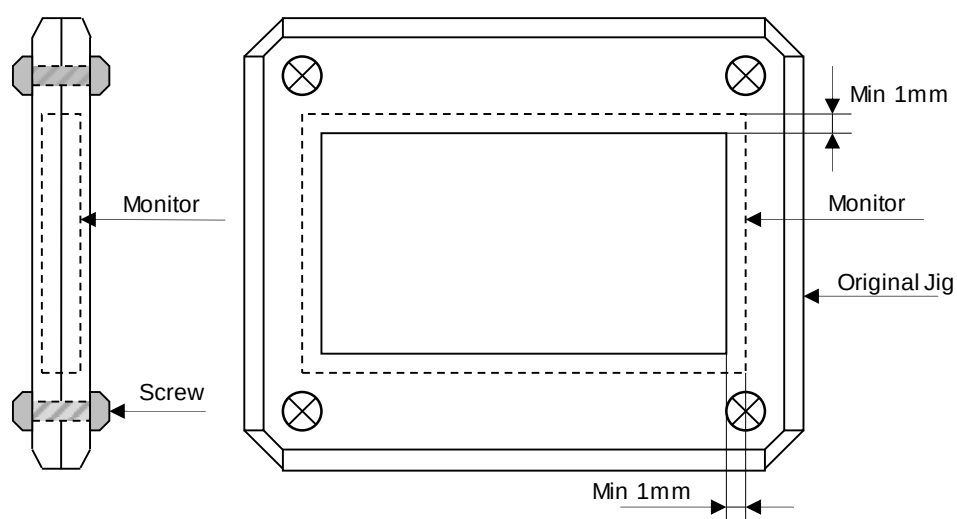


Table2. Reliability Criteria

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

TOPPAN Original Jig



12. Packing Specifications

TBD

13. Handling Instruction

13.1 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 medical 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 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.
- (10) 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.
- (11) 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.
- (12) For protection your circuit, we recommend you to add excess current protection circuit to power supply.

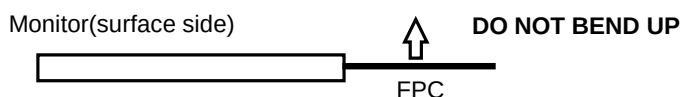


Caution

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

13.2 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) 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.
- 8) 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.



- 9) Peel off the protective film on the TFT monitors during mounting process.
Refer to the section 13.5 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.

13.3 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.

13.4 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.

13.5 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.

TBD

13.6 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)

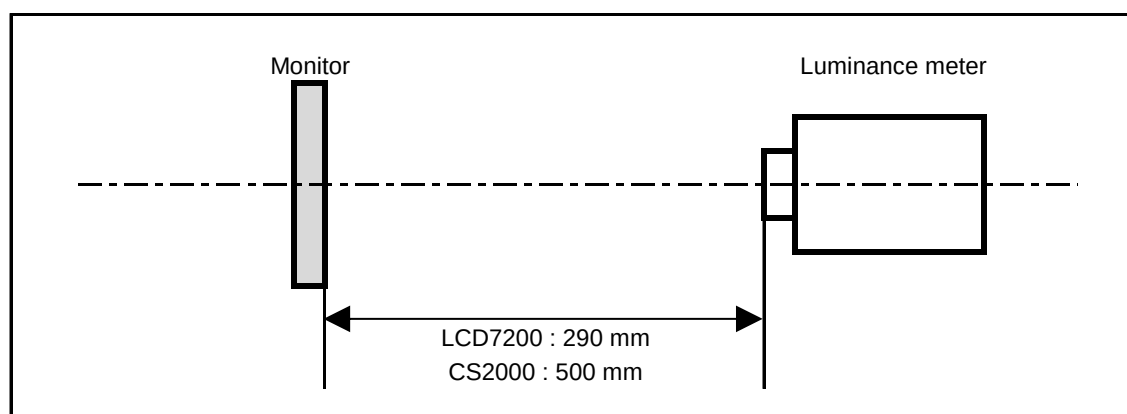
Driving condition: Refer to the section "Optical Characteristics"

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

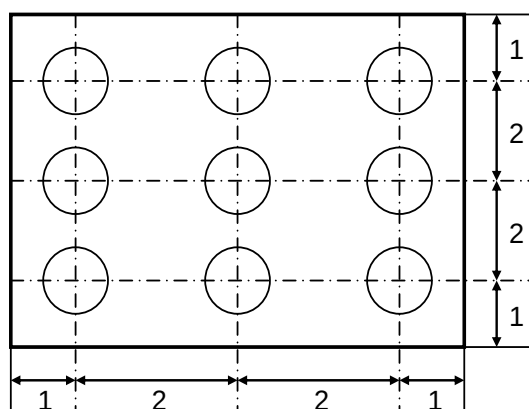


*Measurement is made after 30 minutes of lighting of the backlight.

Measurement point: At the center point of the screen

Brightness distribution: 9 points shown in the following drawing.

<Landscape model>



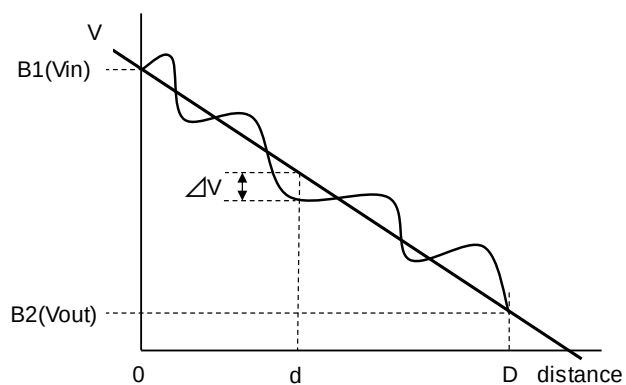
Dimensional ratio of active area

Backlight PWM duty=100%(VL=12.0V,GNDL=0V)

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. 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) = $100 \times B/A \%$ A : max. brightness of the 9 points B : min. brightness of the 9 points	CS2000	

* Linearity Measurement of Touch Panel



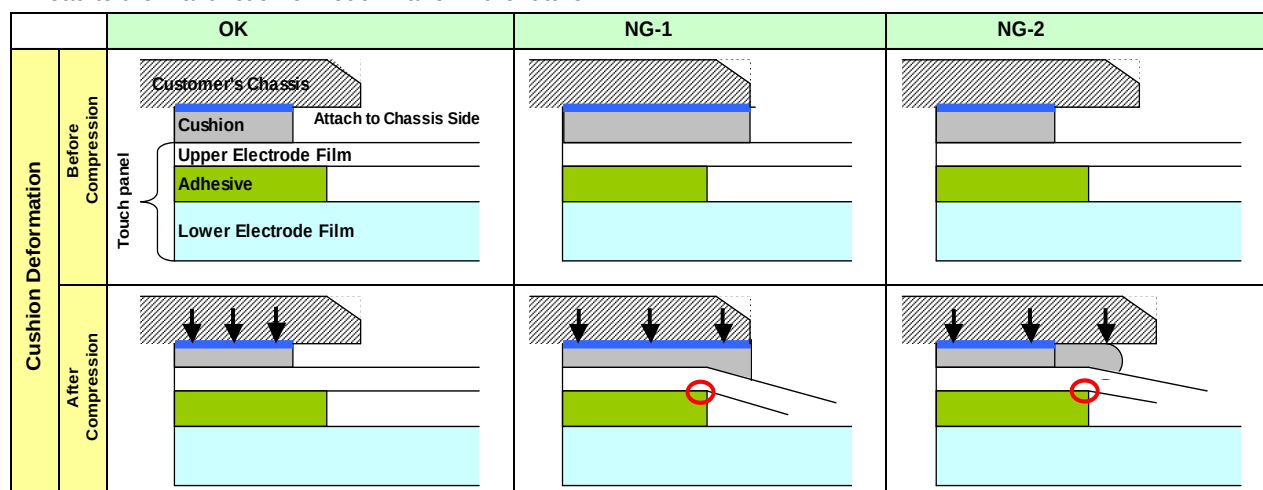
$$LE(\%) = \Delta V / (V_{in} - V_{out}) \times 100$$

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

■ 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.

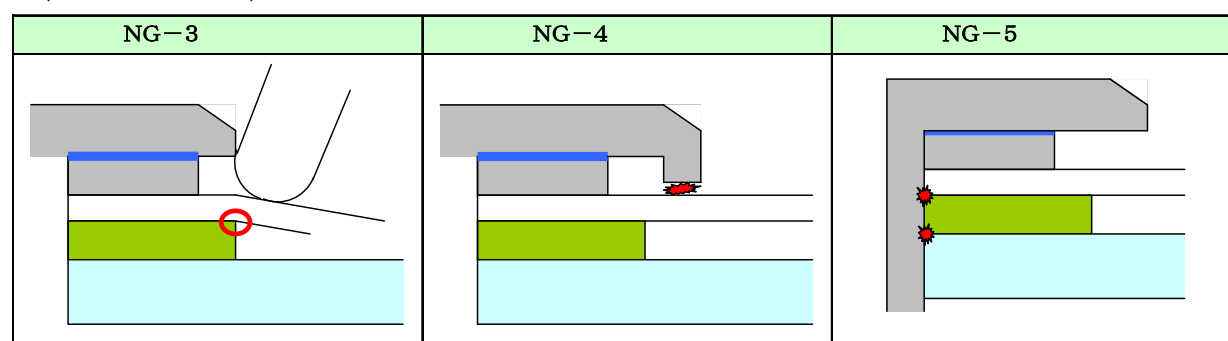


• Design Guidance of Chassis (Front Part)

- 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.