



SPECIFICATION

ORTUSTECH

COM31H3P76ULC

3.1" – 480x480 Round – RGB

Version: 0.0
Date: 15.02.2023

Note: This specification is subject to change without prior notice

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

Specifications for

Blanview TFT-LCD Monitor (TENTATIVE)

(3.1" 480 x RGB x 480 Portrait)

Version 0.0

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

MODEL COM31H3P76ULC

Customer's Approval

Signature :

Name :

Section :

Title :

Date :

ORTUSTECH

TOPPAN INC.
Electronics Division
Ortus Subdivision

Approved by

Checked by

Prepared by

Ver.	Date	Page	Description
0.0	Feb.15,2023	-	- Tentative issue

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1. Application

This Specification is applicable to 3.1 inch Round shape 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.

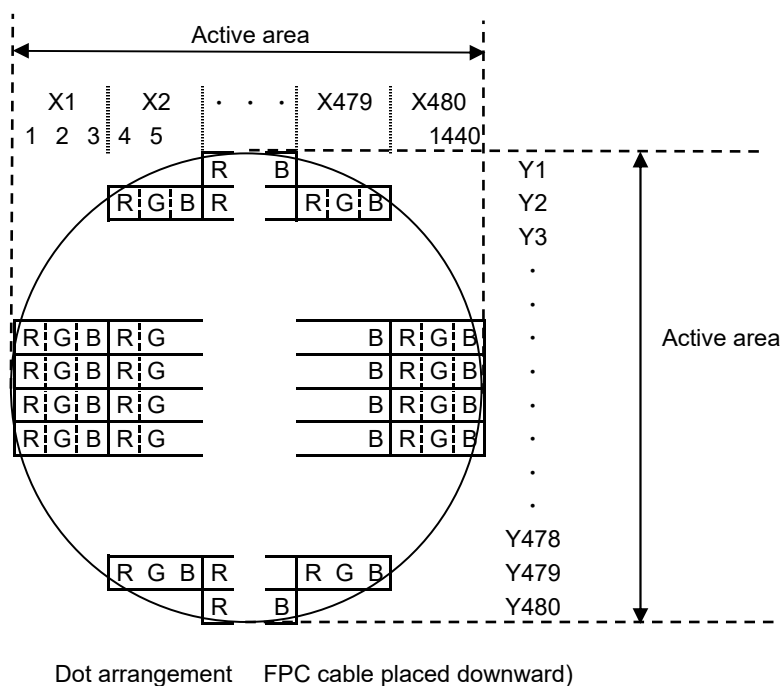
Object substance	Maximum content [ppm]
Cadmium and its compound	100
Hexavalent Chromium Compound	1000
Lead & Lead compound	1000
Mercury & Mercury compound	1000
Polybrominated biphenyl series (PBB series)	1000
Polybrominated biphenyl ether series (PBDE series)	1000
Bis(2-ethylhexyl)phthalate series(DEHP series)	1000
Butyl benzyl phthalate series(BBP series)	1000
Dibutyl phthalate series(DBP series)	1000
Diisobutyl phthalate series(DIBP series)	1000

2.1 Features of the Product

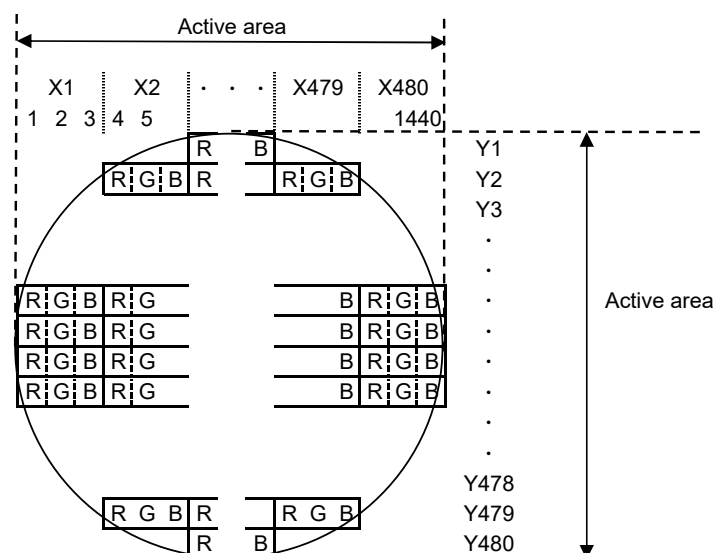
- 3.1 inch diagonal display, 480RGB [H] x 480 [V] dots.
- 8-bit 16,777,216 color display capability.
- Power supply operation of 3.3V.
- Built in Timing generator (TG), Counter-electrode driving circuitry and power supply circuit.
- Long life & high bright white LED back-light.
- Blaview TFT-LCD, improved 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

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 stripe arrangement.	Refer to "Dot arrangement" , "Number of effective pixels"
Signal input method	8-bit RGB, parallel input.	
Backlight type	Long life & high bright white LED.	
NTSC ratio	50 %	



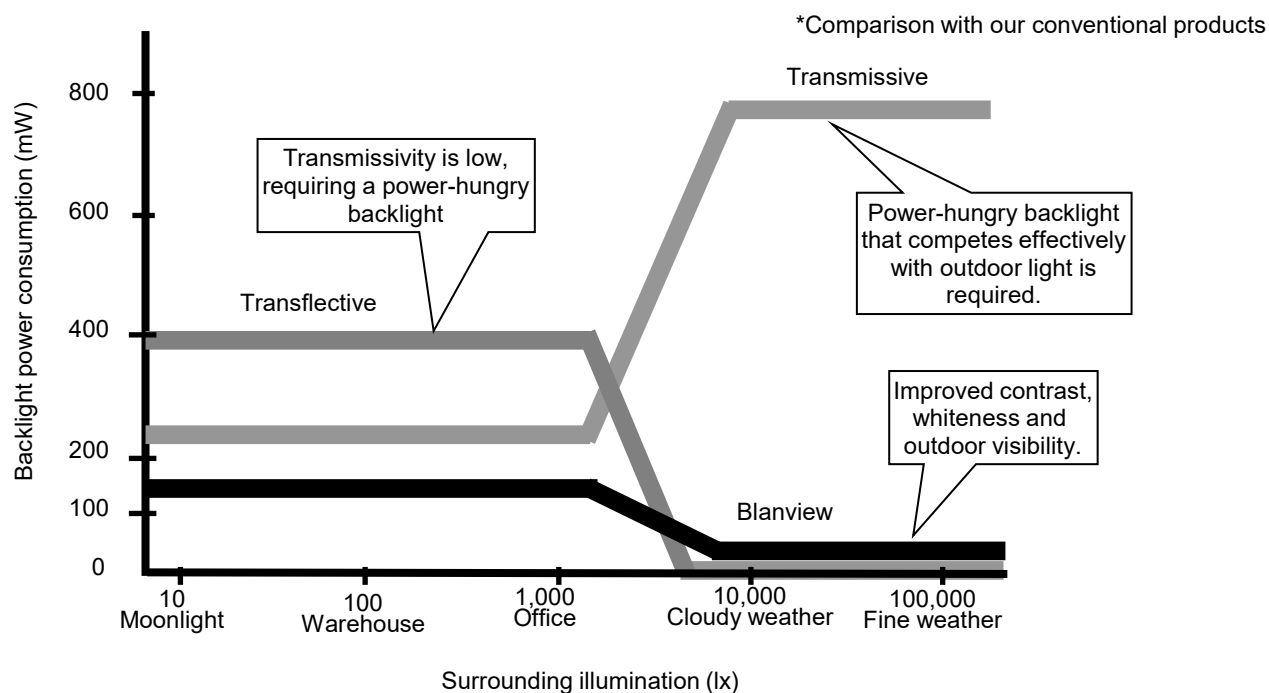
Y	X		Y	X		Y	X		Y	X		Y	X		Y	X	
1	218	263	41	106	375	81	61	420	121	32	449	161	14	467	201	4	477
2	209	272	42	105	376	82	60	421	122	32	449	162	14	467	202	4	477
3	203	278	43	103	378	83	59	422	123	31	450	163	13	468	203	3	478
4	197	284	44	102	379	84	58	423	124	30	451	164	13	468	204	3	478
5	192	289	45	101	380	85	57	424	125	30	451	165	13	468	205	3	478
6	187	294	46	99	382	86	56	425	126	29	452	166	12	469	206	3	478
7	183	298	47	98	383	87	56	425	127	29	452	167	12	469	207	3	478
8	179	302	48	97	384	88	55	426	128	28	453	168	12	469	208	3	478
9	175	306	49	95	386	89	54	427	129	28	453	169	11	470	209	3	478
10	172	309	50	94	387	90	53	428	130	27	454	170	11	470	210	2	479
11	169	312	51	93	388	91	52	429	131	27	454	171	11	470	211	2	479
12	166	315	52	91	390	92	52	429	132	26	455	172	10	471	212	2	479
13	163	318	53	90	391	93	51	430	133	26	455	173	10	471	213	2	479
14	160	321	54	89	392	94	50	431	134	25	456	174	10	471	214	2	479
15	157	324	55	88	393	95	49	432	135	25	456	175	10	471	215	2	479
16	154	327	56	86	395	96	49	432	136	24	457	176	9	472	216	2	479
17	152	329	57	85	396	97	48	433	137	24	457	177	9	472	217	2	479
18	149	332	58	84	397	98	47	434	138	23	458	178	9	472	218	2	479
19	147	334	59	83	398	99	46	435	139	23	458	179	8	473	219	1	480
20	145	336	60	82	399	100	46	435	140	22	459	180	8	473	220	1	480
21	142	339	61	81	400	101	45	436	141	22	459	181	8	473	221	1	480
22	140	341	62	80	401	102	44	437	142	21	460	182	8	473	222	1	480
23	138	343	63	78	403	103	43	438	143	21	460	183	7	474	223	1	480
24	136	345	64	77	404	104	43	438	144	21	460	184	7	474	224	1	480
25	134	347	65	76	405	105	42	439	145	20	461	185	7	474	225	1	480
26	132	349	66	75	406	106	41	440	146	20	461	186	7	474	226	1	480
27	130	351	67	74	407	107	41	440	147	19	462	187	6	475	227	1	480
28	128	353	68	73	408	108	40	441	148	19	462	188	6	475	228	1	480
29	126	355	69	72	409	109	39	442	149	18	463	189	6	475			



Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X				
241	1	480	281	4	477	321	14	467	361	33	448	401	62	419	441	108	373
242	1	480	282	4	477	322	15	466	362	33	448	402	63	418	442	109	372
243	1	480	283	4	477	323	15	466	363	34	447	403	63	418	443	111	370
244	1	480	284	4	477	324	15	466	364	34	447	404	64	417	444	112	369
245	1	480	285	5	476	325	16	465	365	35	446	405	65	416	445	114	367
246	1	480	286	5	476	326	16	465	366	36	445	406	66	415	446	116	365
247	1	480	287	5	476	327	16	465	367	36	445	407	67	414	447	117	364
248	1	480	288	5	476	328	17	464	368	37	444	408	68	413	448	119	362
249	1	480	289	5	476	329	17	464	369	38	443	409	69	412	449	121	360
250	1	480	290	6	475	330	18	463	370	38	443	410	70	411	450	123	358
251	1	480	291	6	475	331	18	463	371	39	442	411	71	410	451	124	357
252	1	480	292	6	475	332	18	463	372	39	442	412	72	409	452	126	355
253	1	480	293	6	475	333	19	462	373	40	441	413	73	408	453	128	353
254	1	480	294	6	475	334	19	462	374	41	440	414	74	407	454	130	351
255	1	480	295	7	474	335	20	461	375	41	440	415	75	406	455	132	349
256	1	480	296	7	474	336	20	461	376	42	439	416	76	405	456	134	347
257	1	480	297	7	474	337	21	460	377	43	438	417	77	404	457	136	345
258	1	480	298	7	474	338	21	460	378	43	438	418	78	403	458	138	343
259	1	480	299	8	473	339	21	460	379	44	437	419	80	401	459	140	341
260	1	480	300	8	473	340	22	459	380	45	436	420	81	400	460	142	339
261	1	480	301	8	473	341	22	459	381	46	435	421	82	399	461	145	336
262	1	480	302	8	473	342	23	458	382	46	435	422	83	398	462	147	334
263	2	479	303	9	472	343	23	458	383	47	434	423	84	397	463	149	332
264	2	479	304	9	472	344	24	457	384	48	433	424	85	396	464	152	329
265	2	479	305	9	472	345	24	457	385	49	432	425	86	395	465	154	327
266	2	479	306	9	472	346	25	456	386	49	432	426	88	393	466	157	324
267	2	479	307	10	471	347	25	456	387	50	431	427	89	392	467	160	321
268	2	479	308	10	471	348	26	455	388	51	430	428	90	391	468	163	318
269	2	479	309	10	471	349	26	455	389	52	429	429	91	390	469	166	315
270	2	479	310	11	470	350	27	454	390	52	429	430	93	388	470	169	312
271	2	479	311	11	470	351	27	454	391	53	428	431	94	387	471	172	309
272	3	478	312	11	470	352	28	453	392	54	427	432	95	386	472	175	306
273	3	478	313	12	469	353	28	453	393	55	426	433	97	384	473	179	302
274	3	478	314	12	469	354	29	452	394	56	425	434	98	383	474	183	298
275	3	478	315	12	469	355	29	452	395	56	425	435	99	382	475	187	294
276	3	478	316	13	468	356	30	451	396	57	424	436	101	380	476	192	289
277	3	478	317	13	468	357	30	451	397	58	423	437	102	379	477	197	284
278	3	478	318	13	468	358	31	450	398	59	422	438	103	378	478	202	279
279	4	477	319	14	467	359	32	449	399	60	421	439	105	376	479	209	272
280	4	477	320	14	467	360	32	449	400	61	420	440	106	375	480	218	263

<Features of Blanview>

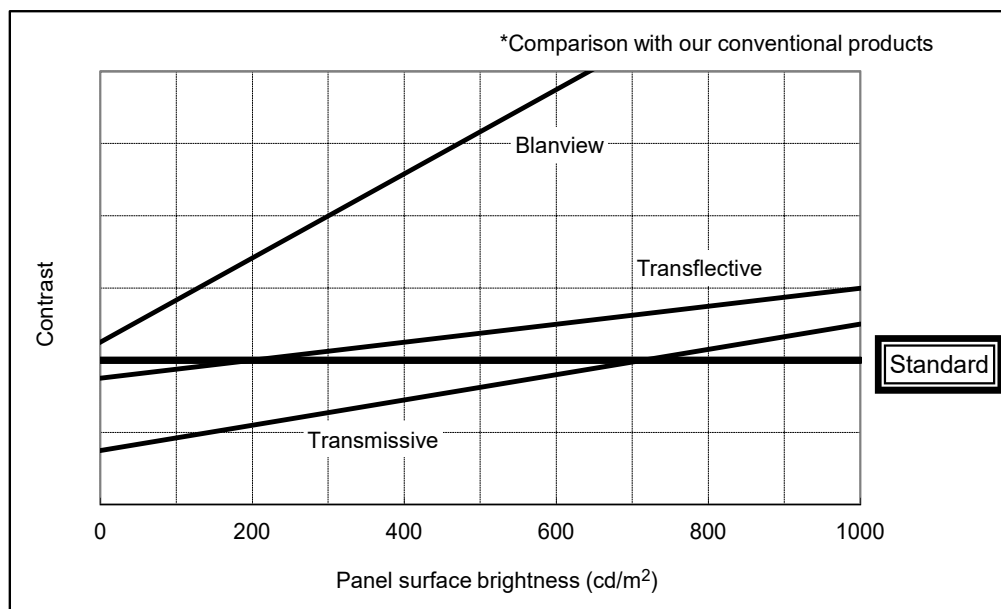
- Backlight power consumption required to assure visibility. (equivalent to 3.5"QVGA)



- 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

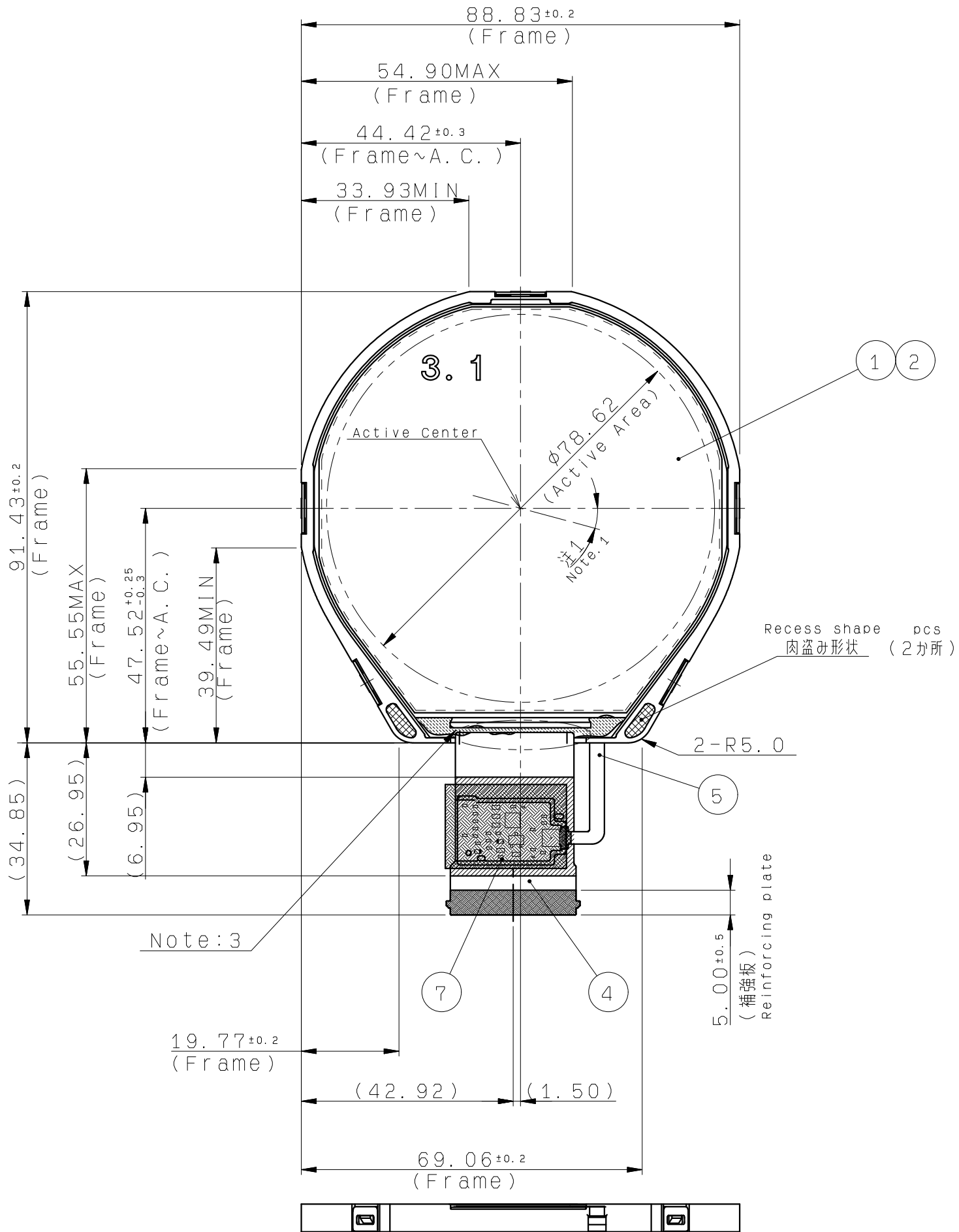
3.1 Dimensions

Items	Specifications	Unit	Remarks
Outline dimensions	(88.83)[H] × (91.43)[V] × (5.60)[D]	mm	Exclude FPC cable
Active area	Diameter (78.62)	mm	
Number of dots	1440[H] × 480[V]	dot	Maximum number of pixels Line
Dot pitch	(54.6)[H] × (163.8)[V]	um	
Surface hardness of the polarizer	TBD	H	Load:2.94N
Weight	(50.0)	g	Include FPC cable.

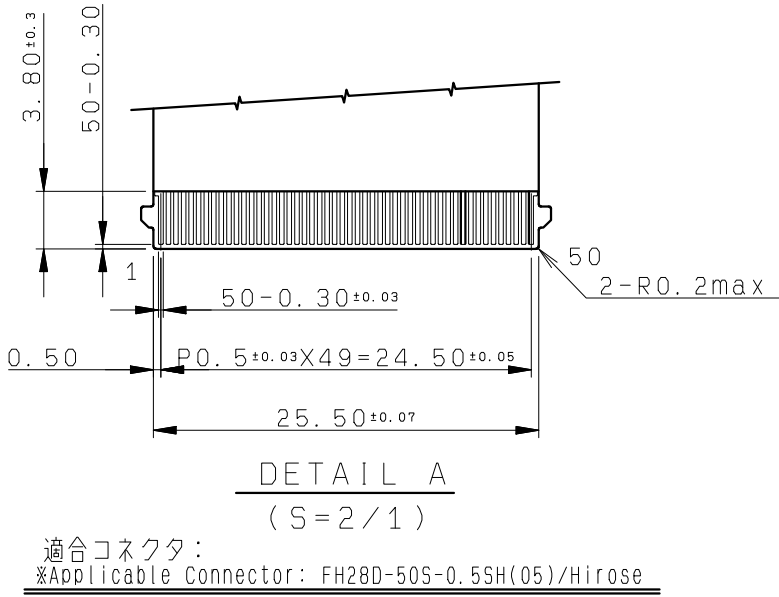
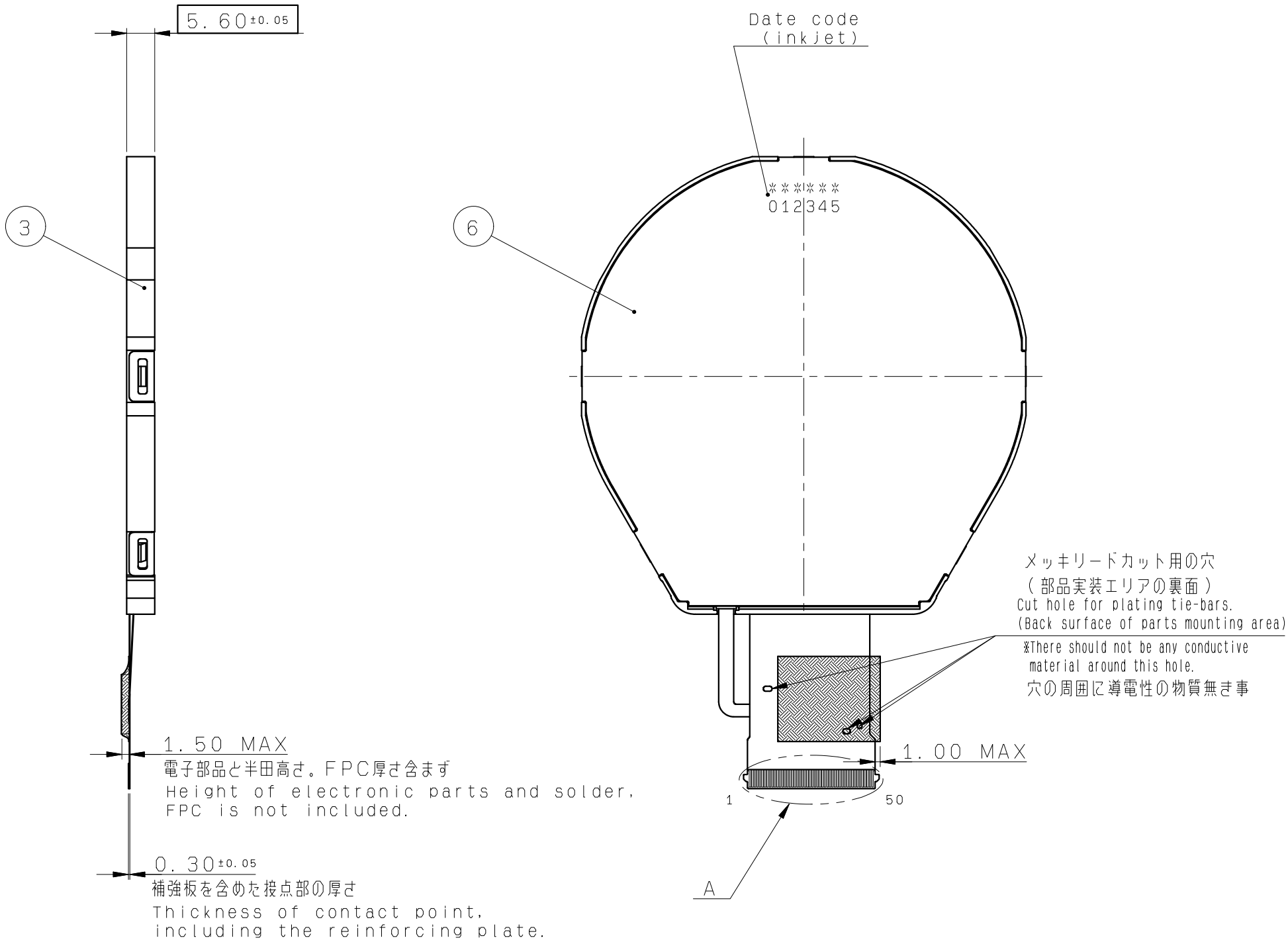
3.2 Outward Form

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

(10/29)
22TLM118
Issue: Feb.15,2023



- Note.1 Angular deviation of LCD cell from the TFT-LCD monitor's reference axis shall be less than [±50'].
注1. TFT-LCD PANELの角度ズレは、モニター基準軸に対し【±50' 】以下とする。
- Note.2 Protective film is affixed on front surface of the screen.
2. 保護膜が表面側に貼られます。
- Note 3. Exercise care not to apply any forces to the cable holder.
3. LCD FPC保持部には負荷のかからない様注意願います。
- Note 4. The incliation of Insulation TAPE and surface wrinkles are unquestioned..
4. Insulation TAPEの傾き、表面のしわについては不問とする。
- Note5. Mounted parts may not be completely hidden by Insulating tape.
5. Insulation TAPEによって実装部品が完全に隠れない事がある。
- Note6. Insulating tape may be partially floating.
6. Insulation TAPEは部分的に貼り付いていない場合がある。



Insulation TAPE	7			
S CASE C	6		AL(t=0.5)	
FPC B	5			Use of LED
FPC A	4			Use of LCD
Frame	3		PC	
Polarizer	2			With protection film
TFT-LCD PANEL	1		Glass thickness=0.50±0.50t	
PART NAME	ITEM	PART CODE	MODEL NUMBER	REMARK
APPROVED 木下	GENERAL TOLERANCE ±0.5	SCALE 1/1	UNIT mm	TOPPAN TOPPAN INC. DO NOT DUPLICATE, CONFIDENTIAL AND PROPRIETARY
CHECKED 加藤	ISSUE (Y:M:D) 22:06:21	MODEL COM31H3P76***		
CHECKED	NAME			
DESIGN 増田剛				
DRAW 増田剛				
OUTLINE-G3P76				DRAWING No. RJD603059D201
				REV. SHEET DIV. # /

3.3 Serial № print (S-print)

TBD

4. Pin Assignment

No.	Symbol	Function
1	GND	Ground
2	BL_A	LED drive power source. (Anode side)
3	BL_C	LED drive power source. (Cathode side)
4	BL_C	LED drive power source. (Cathode side)
5	IOVDD	Power supply for IO (3.3V).
6	IOVDD	Power supply for IO (3.3V).
7	VDD	Power supply for circuit (3.3V).
8	VDD	Power supply for circuit (3.3V).
9	R7	Red data input [MSB]
10	R6	Red data input
11	R5	Red data input
12	R4	Red data input
13	R3	Red data input
14	R2	Red data input
15	R1	Red data input
16	R0	Red data input [LSB]
17	G7	Green data input [MSB]
18	G6	Green data input
19	G5	Green data input
20	G4	Green data input
21	G3	Green data input
22	G2	Green data input
23	G1	Green data input
24	G0	Green data input [LSB]
25	B7	Blue data input [MSB]
26	B6	Blue data input
27	B5	Blue data input
28	B4	Blue data input
29	B3	Blue data input
30	B2	Blue data input
31	B1	Blue data input
32	B0	Blue data input [LSB]
33	GND	Ground
34	HSYNC	Horizontal Synchronization (negative polarity). Note
35	NC	OPEN
36	VSYNC	Vertical Synchronization (negative polarity). Note
37	GND	Ground
38	DE	Data Enable (positive polarity)
39	GND	Ground
40	CLK	Clock signal.Latching data at the falling edge.
41	GND	Ground
42	IOVDD	Power supply for IO (3.3V).
43	GND	Ground
44	GND	Ground
45	GND	Ground
46	STBYB	Standby signal input. (High:Normal operation, Low:Standby operation)
47	NC	OPEN
48	RESETB	Reset signal input. (Low-Active)
49	NC	OPEN
50	GND	Ground

Note : This monitor supports DE mode. Therefore, it can be used by fixing High or Low.

5. Absolute Maximum Rating

GND=0V

Item	Symbol	Condition	Rating		Unit	Applicable terminal
			MIN	MAX		
Supply voltage	VDD	Ta=25° C	-0.3	5.0	V	VDD
Supply voltage	IOVDD		-0.3	5.0	V	IOVDD
Input voltage for logic	VI		-0.3	IOVDD+0.3	V	CLK, VSYNC, HSYNC, DE, R[7:0], G[7:0], B[7:0], STBYB, RESETB
LED direction current of order	IL		--	40	mA	BL_A - BL_C
Storage temperature range	Tstg		-40	95	° C	
Storage humidity range	Hstg	Non condensing in an environmental moisture at or less than 40° C90%RH.				

6. Recommended Operating Conditions

GND=0V

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Supply voltage	VDD		3.0	3.3	3.6	V	VDD
Supply voltage	IOVDD		3.0	3.3	3.6	V	IOVDD
Input voltage for logic	VI		0	--	IOVDD	V	CLK, VSYNC, HSYNC, DE, R[7:0], G[7:0], B[7:0], STBYB, RESETB
Operating temperature range	Top	Note	-30	25	85	° C	Panel surface temperature
Operating humidity range	Hop	Ta ≤ 40° C	20	--	85	%	
		Ta > 40° C	Non condensing in an environmental moisture at or less than 40° C85%RH.				

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

7. Electrical Characteristics

7.1 DC Characteristics

7.1.1 Display Module

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

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Input voltage for logic	VIH		0.7×IOVDD	--	IOVDD	V	CLK, VSYNC, HSYNC, DE,
	VIL		0	--	0.3×IOVDD	V	R[7:0], G[7:0], B[7:0], STBYB, RESETB
Operating Current	IDD	fCLK=15.72MHz Color bar display	--	(54)	(108)	mA	VDD
	IOIDD		--	(25)	(50)	uA	IOVDD

7.1.2 Backlight

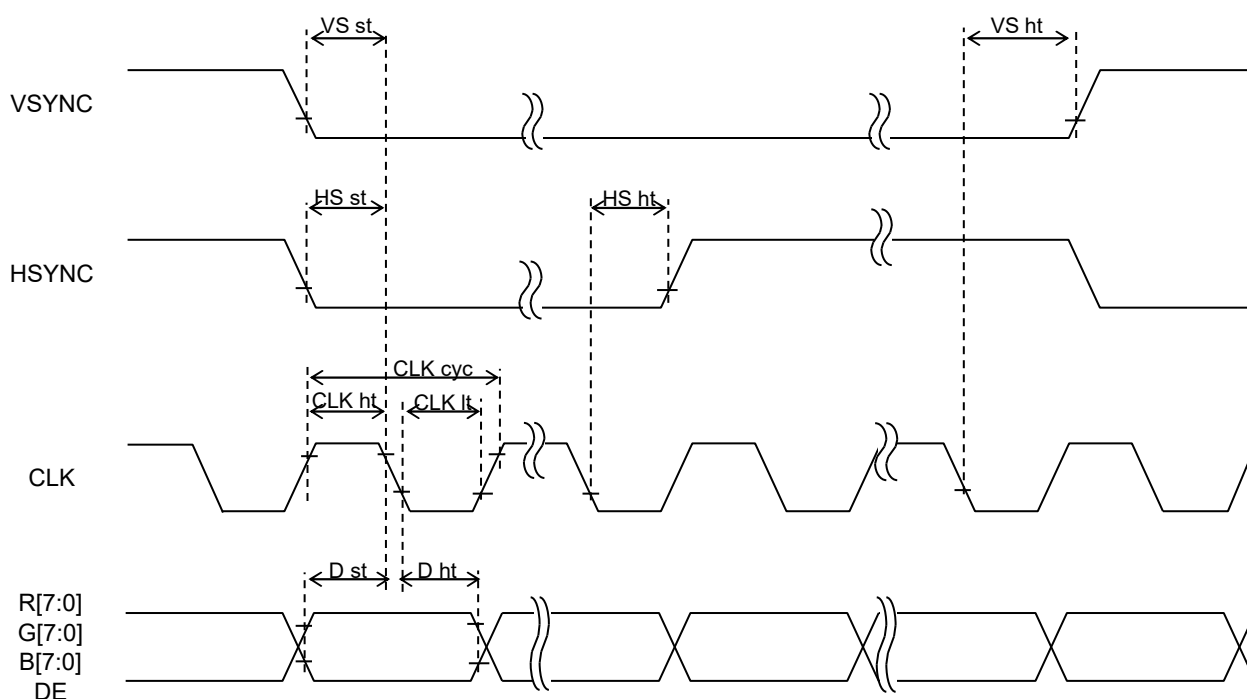
Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Forward current	IL	Ta=25° C Note1	--	(14)	40	mA	BL_A - BL_C
Forward voltage *Reference value	VF	Ta=25° C IL=(14)mA	--	(18.3)	(19.6)	V	BL_A - BL_C
Estimated Life of LED	LL	Ta=25° C IL=(14)mA	--	(50,000)	--	hrs	

- 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.
- 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=IOVDD=3.3V, GND=0V)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
CLK Frequency	fCLK		14.15	15.72	17.30	MHz	CLK
CLK Low period	CLK lt		8	-	-	ns	
CLK High period	CLK ht		12	-	-	ns	
VSYNC Setup time	VS st		5	-	-	ns	VSYNC
VSYNC hold time	VS ht		5	-	-	ns	
HSYNC Setup time	HS st		5	-	-	ns	HSYNC
HSYNC hold time	HS ht		5	-	-	ns	
Data Setup time	D st		5	-	-	ns	R[7:0],G[7:0],B[7:0], DE
Data hold time	D ht		12	-	-	ns	



7.3 Input Timing Characteristics

Item	Symbol	Rating			Unit	Applicable terminal
		MIN	TYP	MAX		
CLK Frequency	f CLK	14.15	15.72	17.30	MHz	CLK
VSYNC Frequency	f VSYNC	54	60	66	Hz	VSYNC
VSYNC Cycle	VP	494	500	508	H	VSYNC,HSYNC
VSYNC Pulse Width	VS	2	2	4	H	VSYNC,HSYNC,DE R[7:0],G[7:0],B[7:0]
Vertical Back Porch	VBP	10	15	20	H	
Vertical Front Porch	VFP	2	3	4	H	
Vertical Blanking Period	VLK	14	-	28	H	HSYNC,DE,R[7:0],G[7:0],B[7:0]
Vertical Display Period	VDISP	-	480	-	H	
HSYNC Frequency	f HSYNC	-	30	-	kHz	HSYNC
HSYNC Cycle	HP	504	524	568	CLK	CLK,HSYNC
HSYNC Pulse Width	HS	5	10	78	CLK	CLK,HSYNC,DE R[7:0],G[7:0],B[7:0]
Horizontal Back Porch	HBP	5	23	78	CLK	
Horizontal Front Porch	HFP	5	11	78	CLK	
Horizontal Blanking Period	HBLK	24	-	88	CLK	CLK,DE,R[7:0],G[7:0],B[7:0]
Horizontal Display Period	HDISP	-	480	-	CLK	

Note1: The characteristics and values in the chart indicate recommended specifications.

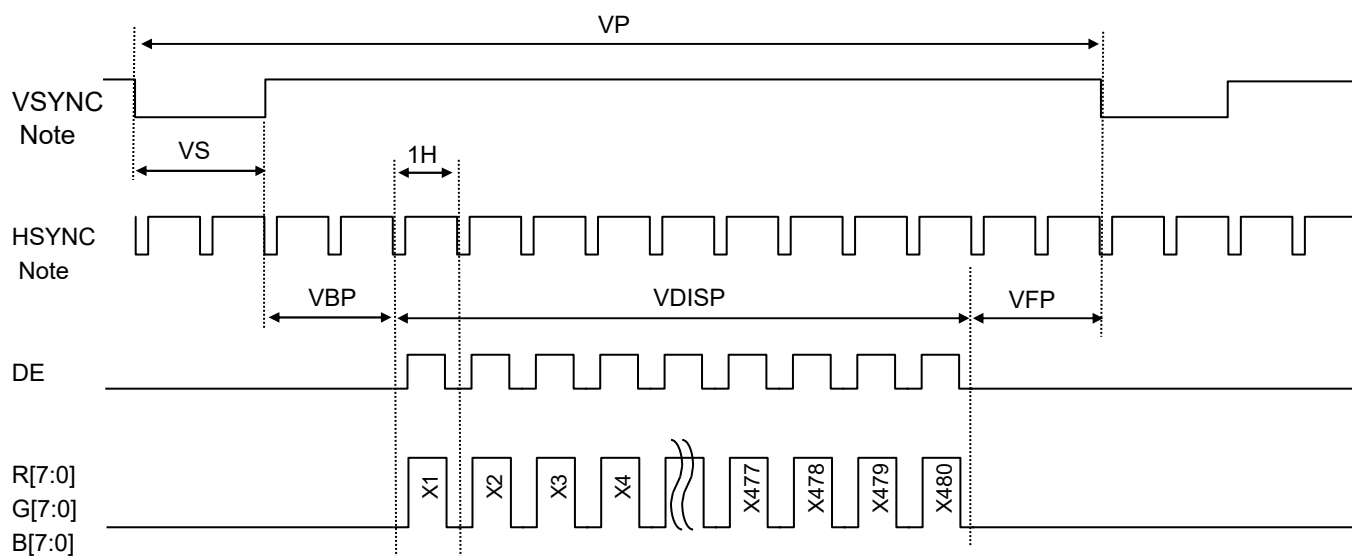
In the case that the product might be used NOT in compliant with the specifications, it is highly recommended to use the product after adequate verifications could be implemented and at your own risk.

Note2: $VLK = VS + VBP + VFP$

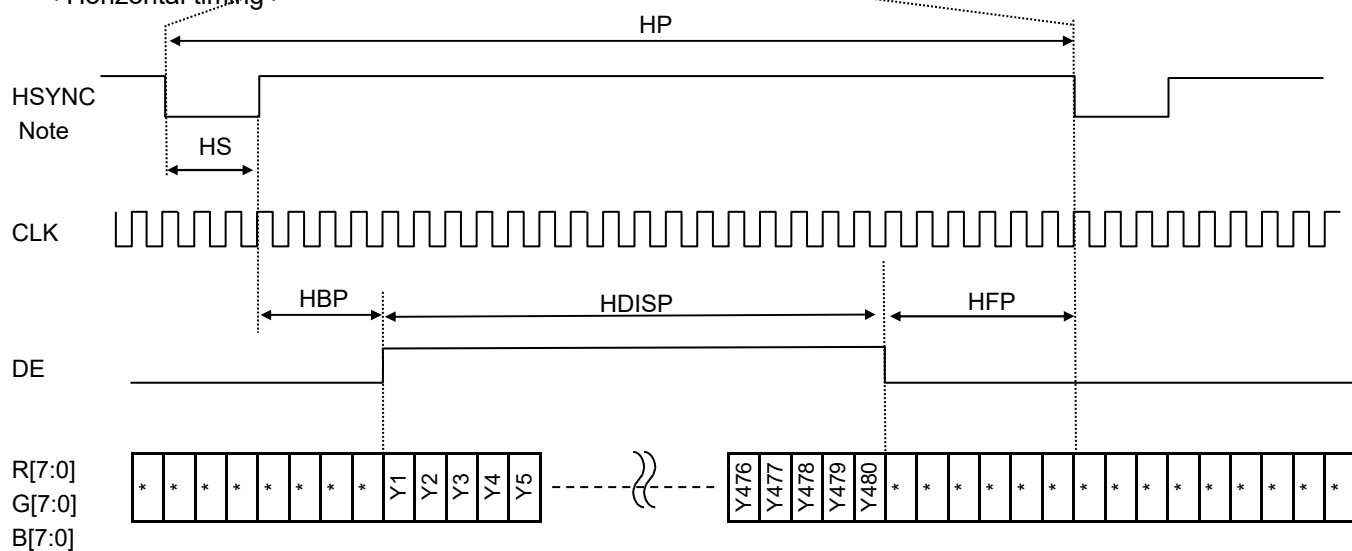
$HBLK = HS + HBP + HFP$

7.4 Driving Timing Chart

< Vertical timing >

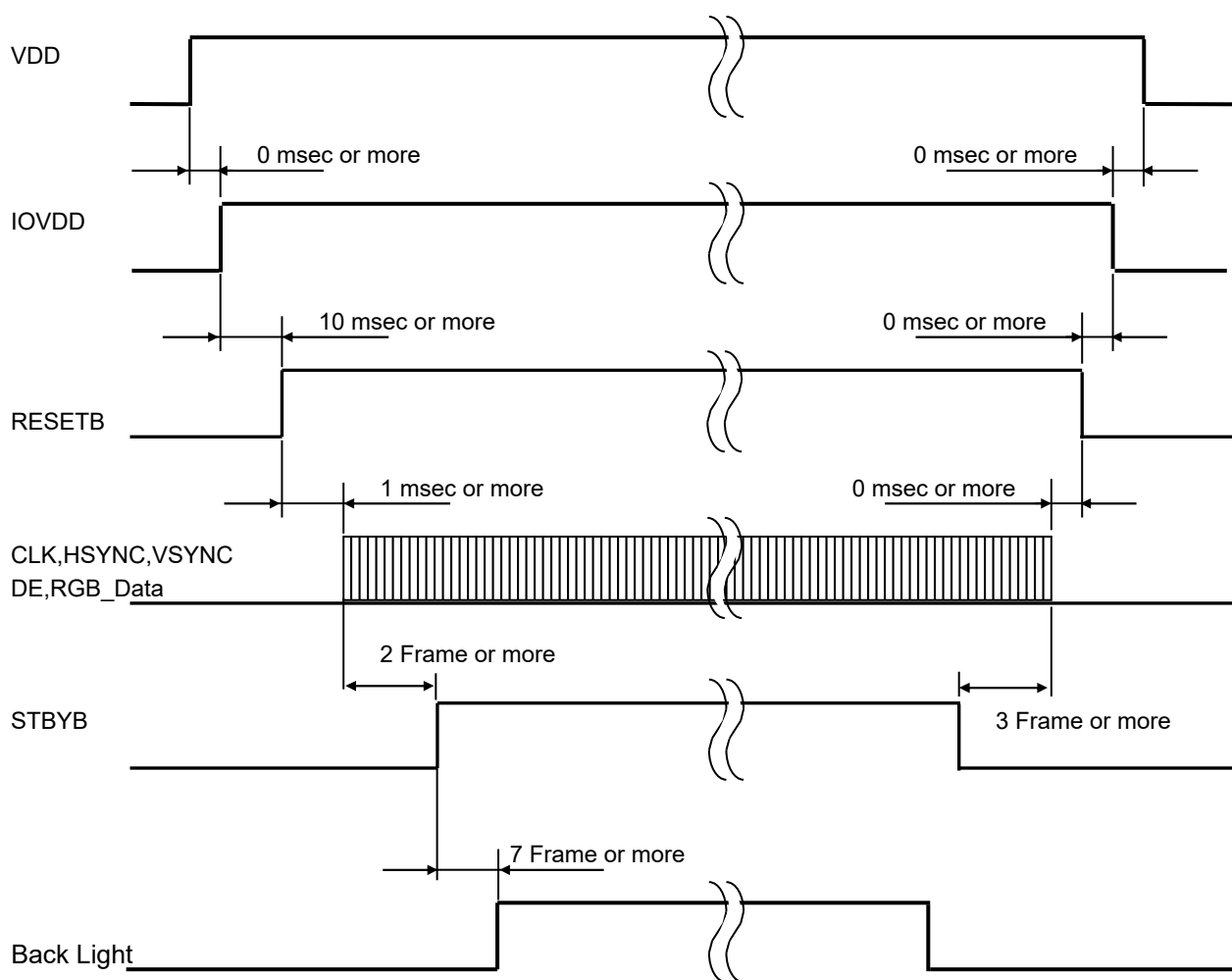


< Horizontal timing >



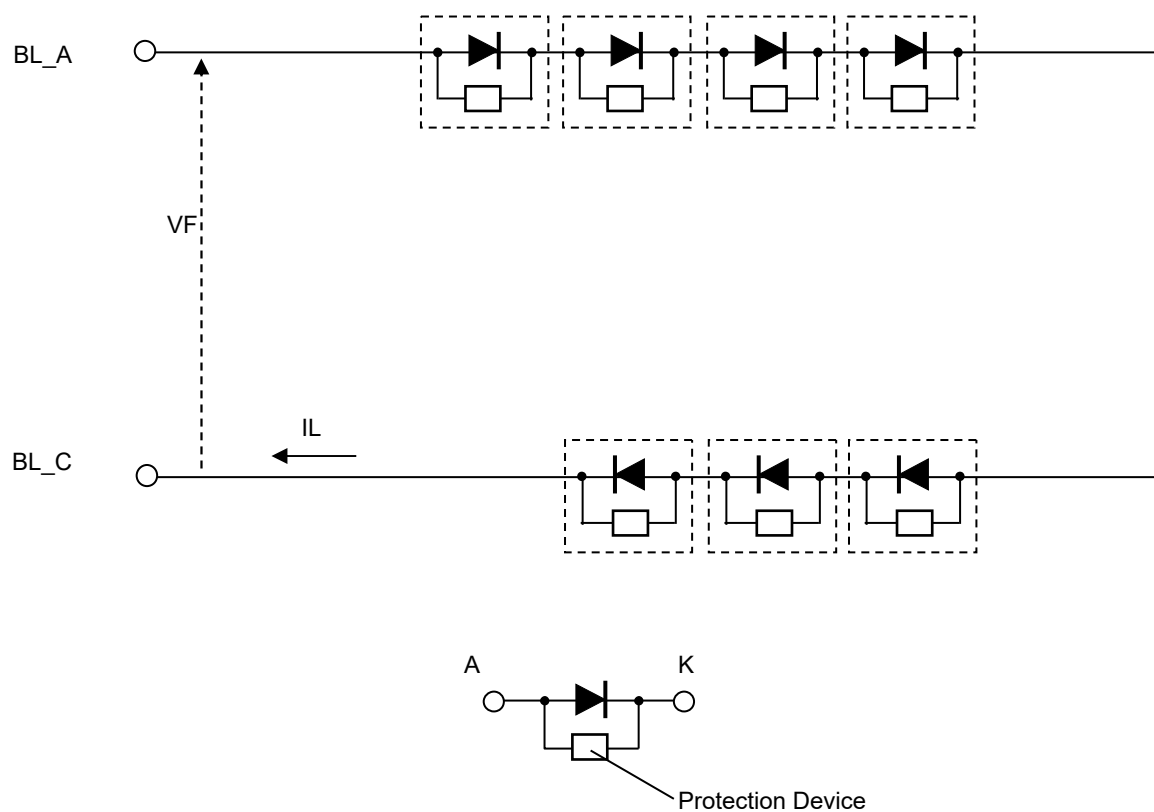
Note: This monitor supports DE mode. Therefore, it can be used by fixing High or Low.

8. Power ON/OFF Sequence



* It is recommended that backlight is turned ON after display-on and turned OFF before entering display-off.

9. LED Circuit



10. Characteristics

10.1 Optical Characteristics

(Measurement Condition)

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

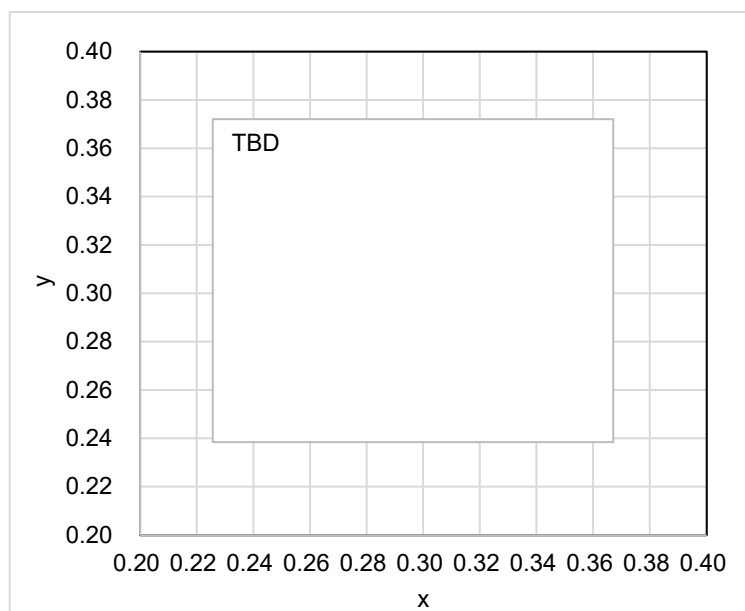
Driving condition: VDD=3.3V, GND=0V, Optimized VCOMDC

Backlight: IL= (14.0) mA

Measured temperature: Ta = 25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note №	Remark
Response time	Rise time	TON	[Data]= 00h ← → FFh	-	-	(50)	ms	1	
	Fall time	TOFF							
Contrast ratio		CR	[Data]= FFh / 00h	(420)	(700)	-		2	
Viewing angle	Left	θL	[Data]= FFh / 00h CR ≥ (10)	(80)	-	-	deg	3	
	Right	θR		(80)	-	-	deg		
	Up	φU		(80)	-	-	deg		
	Down	φD		(80)	-	-	deg		
White Chromaticity		x	[Data]= FFh	White chromaticity range				4	
		y							
Center Brightness			[Data]= FFh	(420)	(600)	-	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".



White Chromaticity Range

(White Chromaticity Range)

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

11. Criteria of Judgment

TBD

12. Reliability Test

TBD

13. Packing Specifications

TBD

14. Handling Instruction

14.1 Cautions for Handling LCD panels

**Caution**

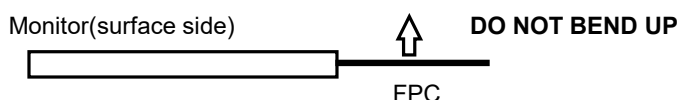
- (1) Do not make an impact on the LCD panel glass because it may break and you may get injured from it.
- (2) If the glass breaks, do not touch it with bare hands.
(Fragment of broken glass may stick you or you cut yourself on it.)
- (3) If you get injured, receive adequate first aid and consult a medial 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.
- 9) It is recommended to employ the structure of which polarizer peripheral area of LCD panel being pressed by cushioning materials, in order to prevent a cause of display brightness unevenness.

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.

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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, Temperature 15 to 27 °C
- b) Operators should wear conductive shoes, conductive clothes, conductive finger tips and grounded wrist-straps.
Use an electrostatic neutralization blower.
- c) Anti-static treatment should be implemented to work area's floor.
Use a room shielded against outside dust with sticky floor mat laid at the entrance to eliminate dirt.

B) Work Method

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 (Backlight ON)

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

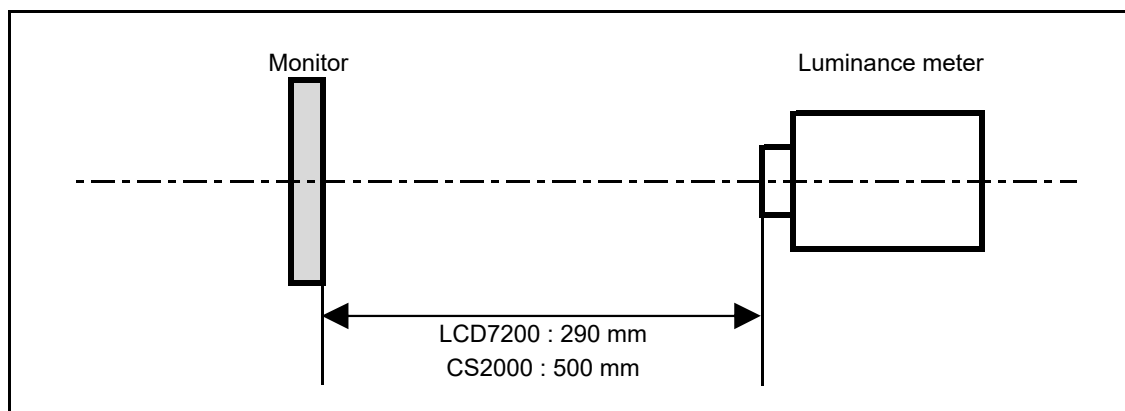
Driving condition: Refer to the section "Optical Characteristics"

Measured temperature: 25°C unless specified

Measurement system: See the chart below. The luminance meter is placed on the normal line of measurement system.

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

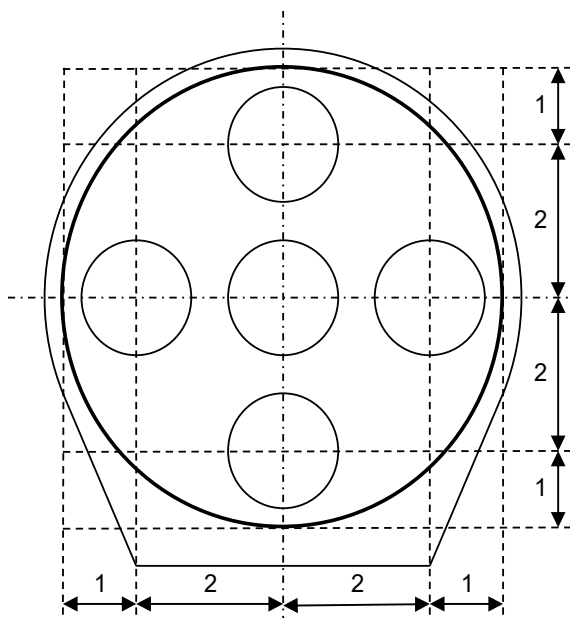
Dark box at constant temperature



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

Measurement point: At the center point of the screen

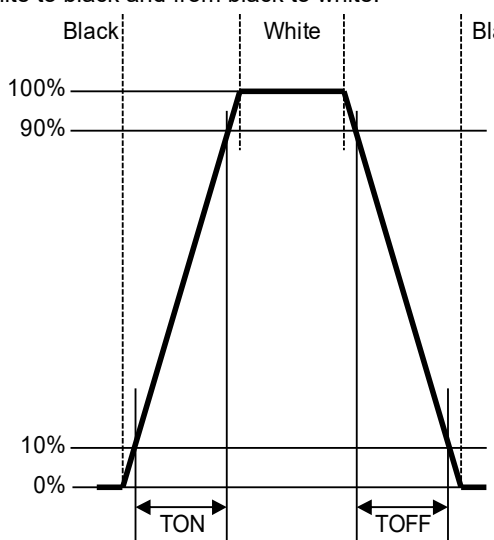
Brightness distribution: 5 points shown in the following drawing.



Dimensional ratio of active area

Backlight IL=(14.0)mA

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	Backlight ON
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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