Specifications for

Blanview TFT-LCD Monitor

Version 1.0
(Please be sure to check the specifications latest version.)

MODEL COM57H5M85KSC

Customer's Approval

Signature:

Name:

Section:

Title:

Date:

ORTUSTECH

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Version History

Ver.	Date	Page	Description	
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1. Application

This Specification is applicable to 14.4cm (5.7 inch) Blanview TFT-LCD monitor for non-military use.

◎ ORTUS TECHNOLOGY 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 ORTUS TECHNOLOGY shall not grant to Purchaser any right to use any patent or other intellectual property rights owned by third parties. Since this Specification contains ORTUS TECHNOLOGY'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 ORTUS TECHNOLOGY'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 ORTUS TECHNOLOGY 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.

◎ ORTUS TECHNOLOGY 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.

◎ If any issue arises as to information provided in this Specification or any other information, ORTUS TECHNOLOGY and Purchaser shall discuss them in good faith and seek solution.

◎ ORTUS TECHNOLOGY 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 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

2. Outline Specifications

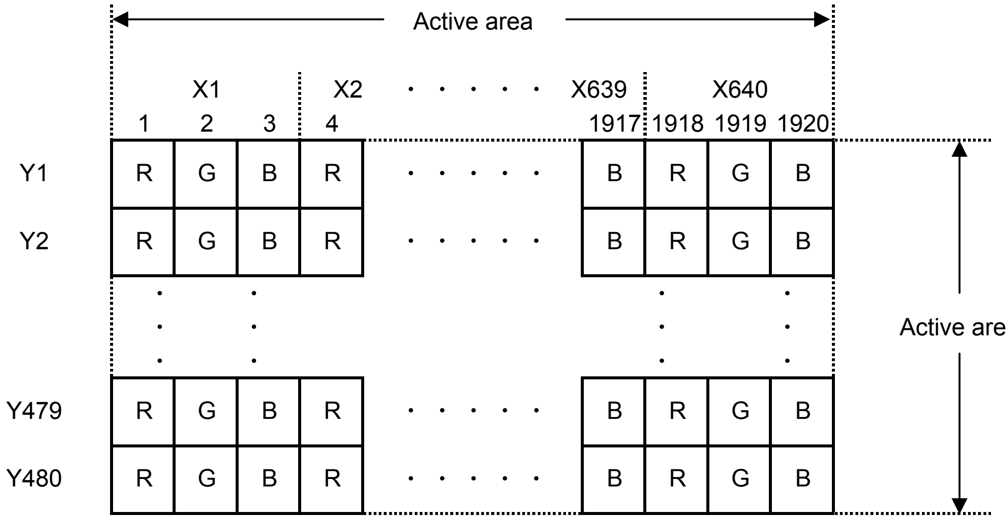
2.1 Features of the Product

- 5.7 inch diagonal display, 1,920 [H] x 480 [V] dots.
- 6-bit 262,144 color display capability.
- 3.3V[TFT-LCD module] + 12V[Backlight] is required.
- Built in Timing generator (TG).
- Long life & high brightness LED back-light and built in LED driver.
- All-in-one type monitor with lead-free mounting(Response to RoHS Phase 3A).
- 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	TN type 262,144 colors. Blanview, Normally white.	
Driving method	a-Si TFT Active matrix Line-scanning, Non-interlace	
Dot arrangement	RGB stripe arrangement	Refer to "Dot arrangement"
Signal input method	6-bit RGB, parallel input.	
Backlight type	Long life & High bright white LED.	

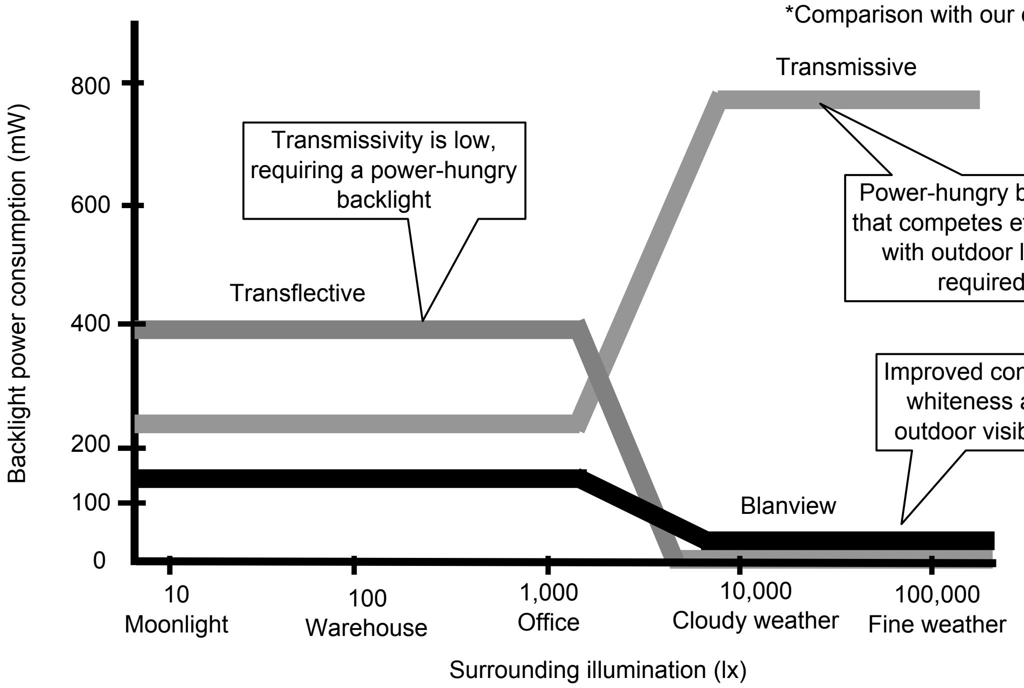


Dot arrangement
(When "S LABEL" on the front case is placed at the bottom)

<Features of Blanview>

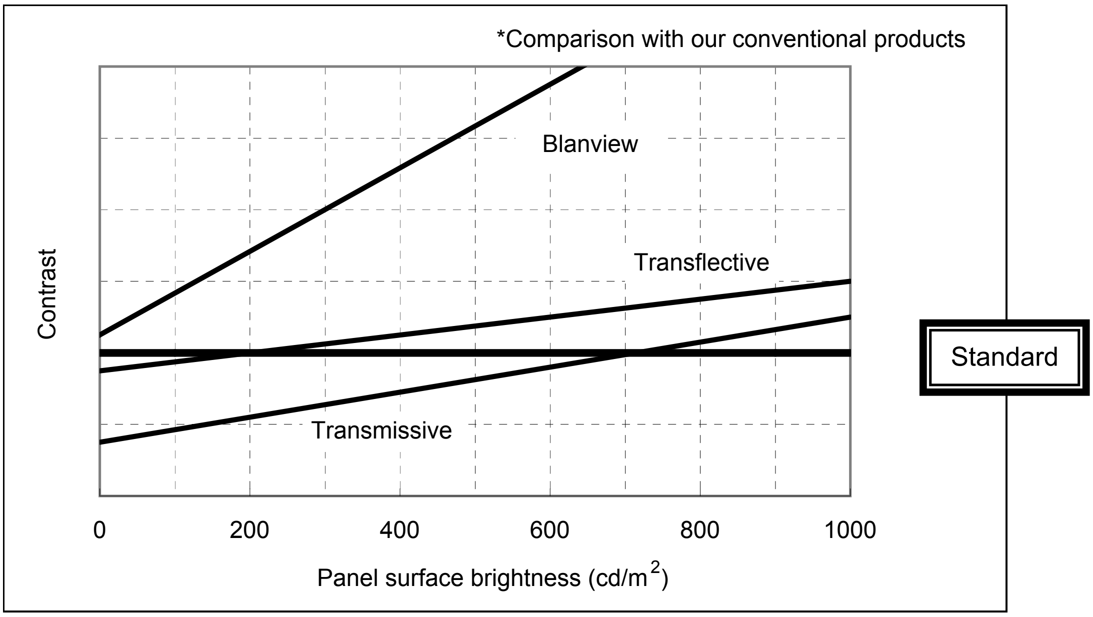
- Backlight power consumption required to assure visibility. (equivalent to 3.5”QVGA)

*Comparison with our conventional products



- 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. (ORTUS TECHNOLOGY criteria)



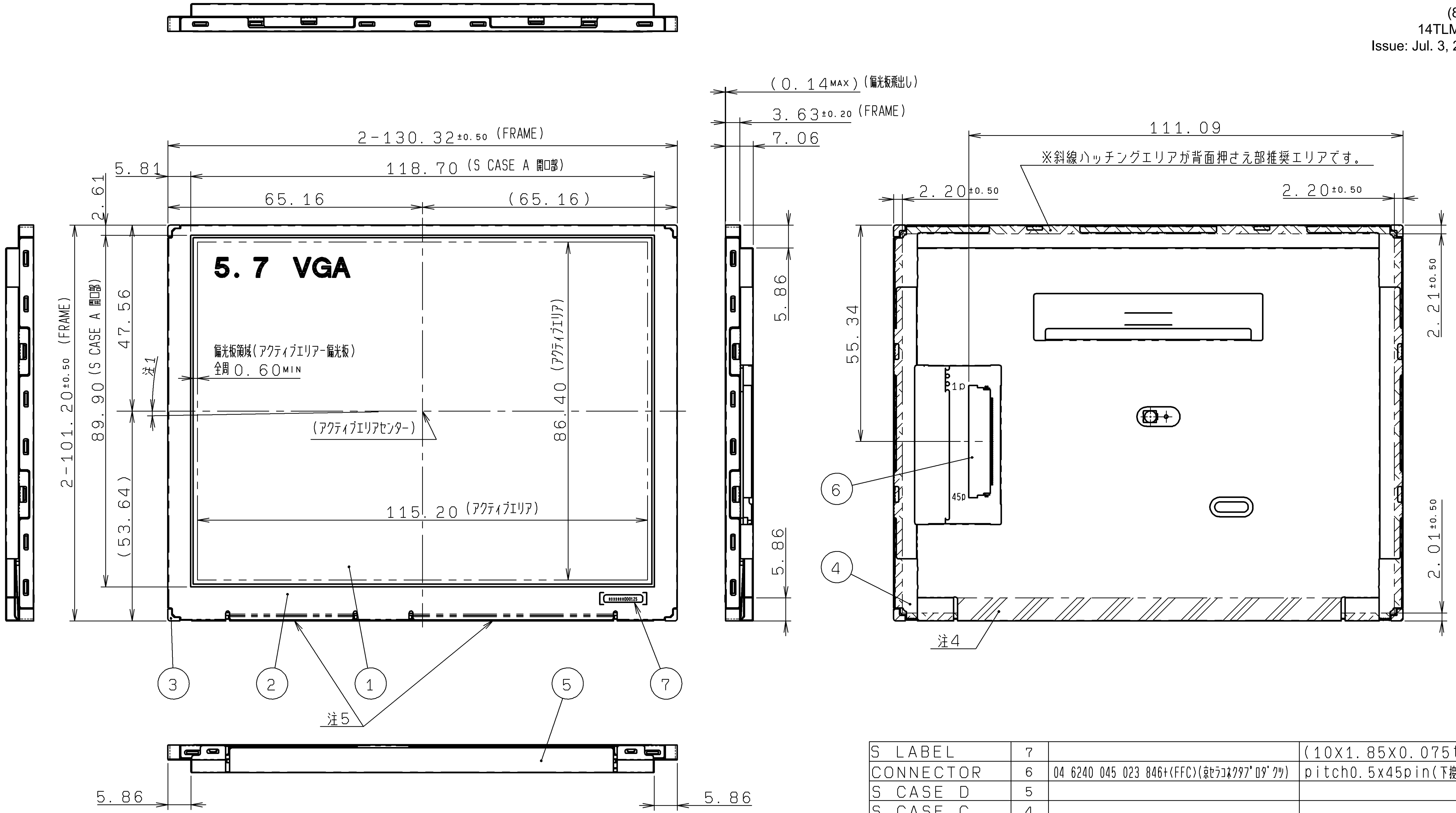
3. Dimensions and Shape

3.1 Dimensions

Items	Specifications	Unit	Remarks
Outline dimensions	130.32[H] × 101.20[V] × 7.06[D]	mm	
Active area	115.20[H] × 86.40[V]	mm	14.4cm diagonal
Number of dots	1,920[H] × 480[V]	dot	
Dot pitch	60.00[H] × 180.00[V]	μm	
Surface hardness of the polarizer	3	H	Load:2.0N
Weight	122	g	

3.2 Outward Form

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


(0. 14MAX)(偏光板飛出し)
3. 63±0.20 (FRAME)
7. 06
2-130. 32±0.50 (FRAME)
5. 81
118. 70 (S CASE A 開口部)
65. 16
(65. 16)
2. 61
2-101. 20±0.50 (FRAME)
89. 90 (S CASE A 開口部)
47. 56
(53. 64)
注1
5. 7 VGA
偏光板領域(アクティブエリアー偏光板)
全周 0. 60MIN
(アクティブエリアセンター)
86. 40 (アクティブエリア)
115. 20 (アクティブエリア)
5. 86
5. 86
111. 09
※斜線ハッチングエリアが背面押さえ部推奨エリアです。
2. 20±0.50
2. 20±0.50
55. 34
2. 21±0.50
2. 01±0.50
1p
45p
注4
注5
5. 86
5. 86
1
2
3
4
5
6
7

PART NAME	ITEM	MATERIAL GRADE	REMARK
S LABEL	7		(10X1. 85X0. 075t)
CONNECTOR	6	04 6240 045 023 846+(FFC)(京セラコネクタプロダクツ)	pitch0. 5x45pin(下接点)
S CASE D	5		
S CASE C	4		
FRAME	3		
S CASE A	2		
TFT-LCD PANEL	1	Glass substrate thickness=0. 5t	

注1. TFT PANELの角度ズレは、モニター基準軸に対し【±50′】以下とする。
2. S LABELが図示の位置に貼付されます。
S LABELは S CASE面よりLABEL厚み分凸となります。
3. 保護膜が表面側に貼られます。
表面側保護膜貼付け位置は偏光板に対して【±1. 5】とする。
4. S CASE Dの注記ハッチングエリアには負荷の掛からないよう注意願います。
5. S CASE Aの図示した部分には負荷の掛からないよう注意願います。
6. 偏光板の外観仕様につきましては〝11. 判定基準〝を参照願います。

APPROVED	GENERAL TOLERANCE ±1. 0	SCALE 1/1	UNIT mm
CHECKED	ISSUE (Y:M:D) 15:05:28	COM57H5M85K※※	
CHECKED	NAME		
DESIGN 小林宣幸	OUTLINE-D5M85		
DRAW 小林宣幸			

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RJD527155D301			

PART

3.3 Serial Label (S-LABEL)

1) Display Items

S-label 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	57EWC (Made in Japan) 57EXC (Made in Malaysia)		
d	Serial number			

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

・Made in Japan

6C57EWC000125

means "manufactured in March 2016, 5.7" EW type, C specifications, serial number 000125"

・Made in Malaysia

6C57EXC000125

means "manufactured in March 2016, 5.7" EX type, C specifications, serial number 000125"

2) Location of Serial Label (S-label)

Refer to 3.2 "Outward Form".

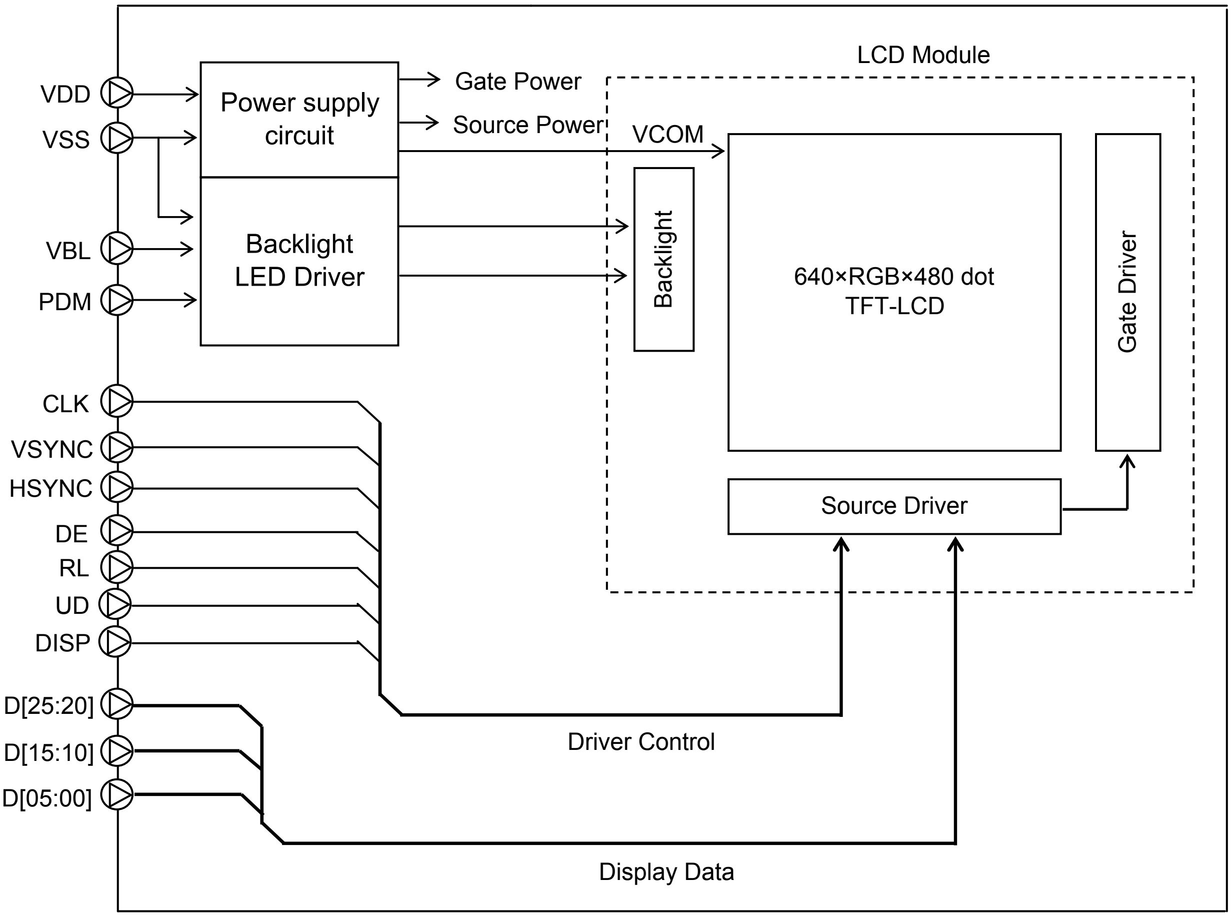
4. Pin Assignment

No.	Symbol	Function
1	VSS	GND.
2	CLK	Clock signal.Latching data at the rising edge.
3	VSS	GND.
4	HSYNC	Horizontal sync signal. (Low active)
5	VSYNC	Vertical sync signal. (Low active)
6	VSS	GND.
7	TEST1	Short to VSS.
8	TEST2	Short to VSS.
9	D20	Display data(B). 00h: Black D20：LSB D25：MSB Driver has internal gamma conversion.
10	D21	
11	D22	
12	D23	
13	D24	
14	D25	
15	VSS	GND.
16	TEST3	Short to VSS.
17	TEST4	Short to VSS.
18	D10	Display data(G). 00h: Black D10：LSB D15：MSB Driver has internal gamma conversion.
19	D11	
20	D12	
21	D13	
22	D14	
23	D15	
24	VSS	GND.
25	TEST5	Short to VSS.
26	TEST6	Short to VSS.
27	D00	Display data(R). 00h: Black D00：LSB D05：MSB Driver has internal gamma conversion.
28	D01	
29	D02	
30	D03	
31	D04	
32	D05	
33	VSS	GND.
34	RL	Horizontally Flipped (right/left) Signal. (Lo: Horizontally Flipped Display, Hi: Normal display)
35	VDD	Power supply input.
36	VDD	Power supply input.
37	DISP	Display on/off control signal.(Lo：display off、Hi：display on)
38	DE	Input data effective signal. (It is effective for the period of "Hi")
39	UD	Vertically Flipped (up/down) Signal. (Lo: Normal display,Hi: Vertically Flipped Display)
40	VSS	GND.
41	VBL	Power supply input.(Backlight)
42	VBL	Power supply input.(Backlight)
43	PDM	Brightness control pulse signal. (Lo:0%(Backlight off) brightness, Hi:100%)
44	VSS	GND.
45	VSS	GND.

- Used connector: KYOCERA CONNECTOR PRODUCTS 6240 series [04 6240 045 023 846+]
- Please refer to the section "3.2 Outward Form" for pin terminal order.
- The corrosion phenomenon by the different kind metal uniting is generated according to the system requirements, and there is a possibility of becoming a loose connection.
  Please select very carefully, and design the FPC cable used.

5. Block Diagram

Each arrow shows signal flow.


LCD Module
VDD
VSS
VBL
PDM
Power supply circuit
Gate Power
Source Power
VCOM
Backlight LED Driver
Backlight
640×RGB×480 dot
TFT-LCD
Gate Driver
Source Driver
CLK
VSYNC
HSYNC
DE
RL
UD
DISP
D[25:20]
D[15:10]
D[05:00]
Driver Control
Display Data

6. Absolute Maximum Rating

VSS=0V

Item	Symbol	Condition	Rating		Unit	Applicable terminal
			MIN	MAX		
Supply voltage	VDD	Ta=25℃	-0.3	6.0	V	VDD
Input voltage for logic	VI		-0.3	VDD+0.3	V	CLK,VSYNC,HSYNC,DE D[25:20],D[15:10],D[05:00], RL,UD,DISP
Supply voltage for Backlight	VBL		-0.3	14.0	V	VBL
Input voltage for Backlight	VIP		-0.3	7.0	V	PDM
Storage temperature range	Tstg		-30	80	˚C	
Storage humidity range	Hstg	Non condensing in an environmental moisture at or less than 40˚C90%RH.				

Note: Please input the logic signal after turning on VDD. Do not input the logic signal while blocking VDD.

Absolute maximum ratings is parametric values, should never be exceed any value at any moment.
Beyond which, it could be suffered from changes in characteristics and never be restored .
Moreover, it could even be suffered from permanent destruction.
Therefore, please note enough the fluctuation of input voltage, the characteristics of connected parts, I/O signal line serge, and ambient temperature, on designing the circuit.

7. Recommended Operating Conditions

VSS=0V

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Supply voltage	VDD		3.0	3.3	3.6	V	VDD
Supply voltage for Backlight	VBL	VDD=3.0~ 3.6V	10.8	12.0	13.2	V	VBL
Input voltage for logic	VI		0	--	VDD	V	CLK,VSYNC, HSYNC,D[25:20], D[15:10],D[05:00], DE,RL,UD,DISP
Input voltage for Backlight	VIP		0	--	VDD	V	PDM
Operating temperature range	Top	Note1,2	-20	25	70	˚C	Panel surface temperature
Operating humidity range	Hop	Ta≦30℃	20	--	80	%	
		Ta>30℃	Non condensing in an environmental moisture at or less than 30˚C80%RH.				

Note1: The temperature within the display will increase due to the heat radiated from the back light while in operation. Necessary measures have to be taken in the product design to make sure that the display has proper ventilation so that temperature on any surface of this display should not exceed 70 ℃.

Note2: This monitor is operatable in this temperature range. With regard to optical characteristics, refer to Item "10. CHARACTERISTICS".

8. Characteristics

8.1 DC Characteristics

8.1.1 Display Module

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

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Input voltage for logic	VIH		0.7×VDD	--	VDD	V	CLK,VSYNC,HSYNC, DE,D[25:20],D[15:10], D[05:00],RL,UD,DISP
	VIL		0	--	0.3×VDD	V	
Pull down resister value	Rpd		300	450	600	kΩ	DE,D[25:20],D[15:10], D[05:00]
Pull up resister value	Rpu		300	450	600	kΩ	DISP
Current consumption	IDD	fCLK=25MHz Color bar display	--	155	310	mA	VDD

8.1.2 Backlight

(Unless otherwise noted, Ta=25°C,VDD=3.3V,VBL=12.0V,VSS=0V)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Input voltage for Backlight	VIPH		1.4	--	VDD	V	PDM
	VIPL		0	--	0.2	V	
Pull down resister value	Rpd 2		300	500	700	kΩ	PDM
Operating Current	IBL	Brightness control ON Duty=100%	--	49	98	mA	VBL
Estimated Life of LED	LL	Note	--	(50,000)	--	hr	

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.

8.2 AC Characteristics

8.2.1 Display Module

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

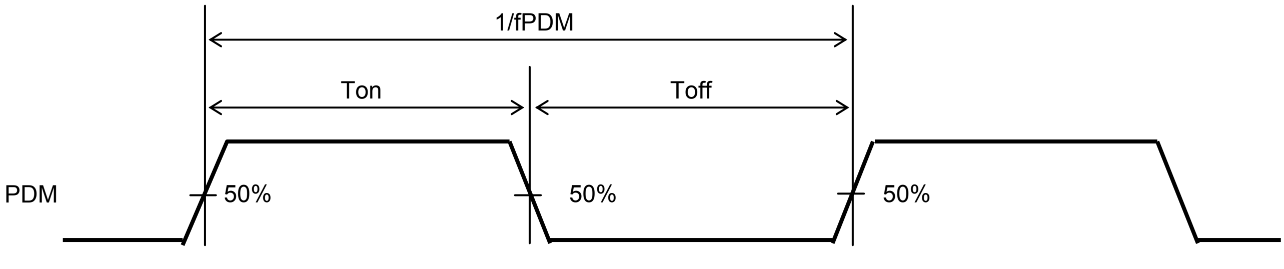
Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
CLK frequency	fCLK		--	25	27	MHz	CLK
CLK Low period	tw1L	0.3×VDD or less	14.8	--	--	ns	CLK
CLK High period	tw1H	0.7×VDD or more	14.8	--	--	ns	CLK
Setup time	tsp		10	--	--	ns	CLK,DE,D[25:20], D[15:10],D[05:00], HSYNC,VSYNC
Hold time	thd		10	--	--	ns	

8.2.2 Backlight

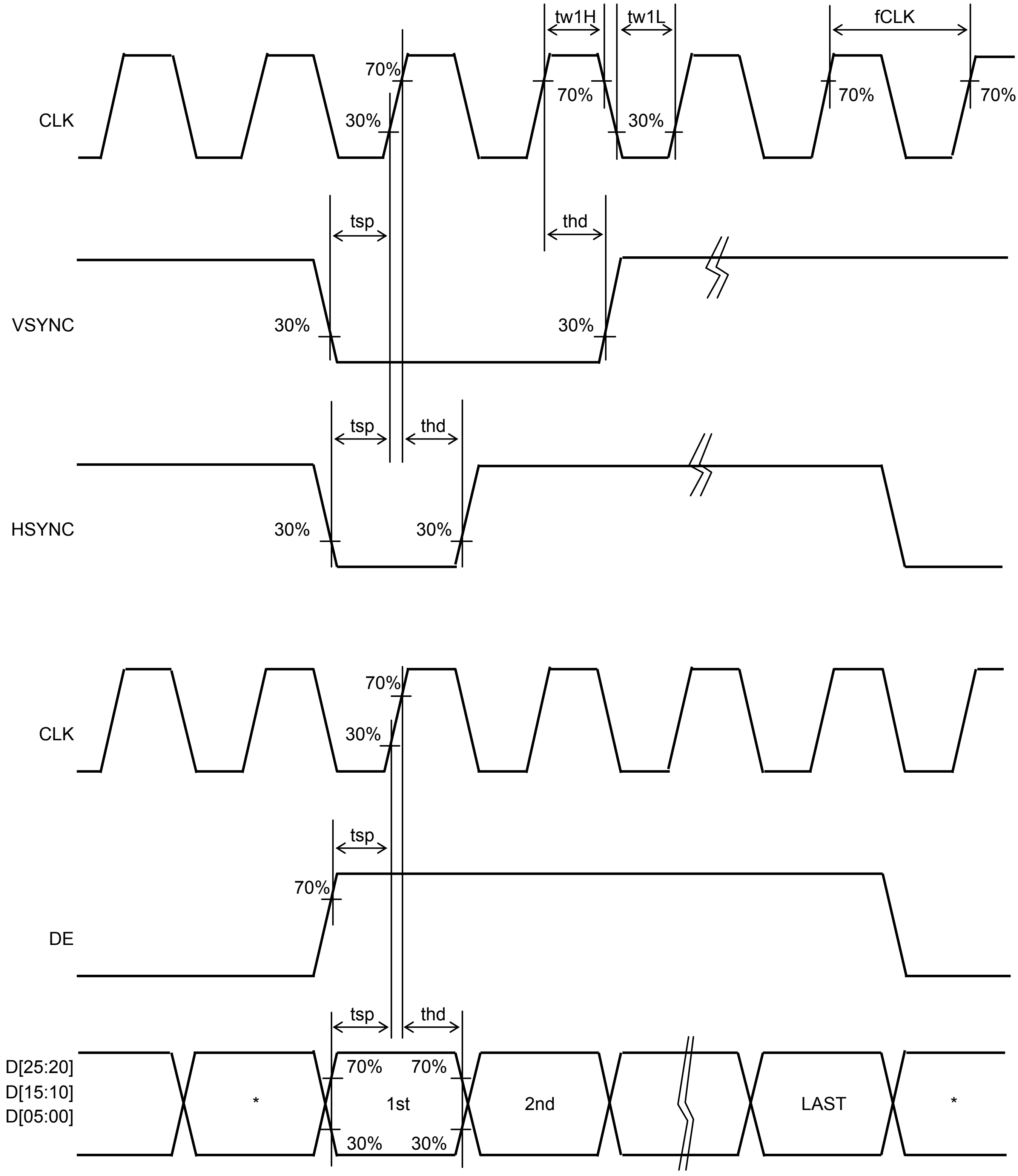
(Unless otherwise noted, Ta=25°C,VDD=3.3V,VBL=12.0V,VSS=0V)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
PDM frequency	fPDM		100	200	300	Hz	PDM
Brightness control ON Duty	ONduty	100×Ton/(Ton+Toff) Ton>20μsec,Toff>20μsec	0	--	100	%	

NOTE:
The interference fringes might be generated by optical interference with the PDM frequency and the VSYNC frequency on the screen.
Please evaluate it enough in all operating temperature limits when you set the PDM frequency.



Switching Waveform Characteristics


tw1H
tw1L
fCLK
CLK
70%
30%
70%
30%
70%
70%
tsp
thd
VSYNC
30%
30%
tsp
thd
HSYNC
30%
30%
CLK
70%
30%
tsp
70%
DE
tsp
thd
D[25:20]
D[15:10]
D[05:00]
*
70%
70%
1st
30%
30%
2nd
LAST
*

*:INVALID

8.3 Input Timing Characteristics

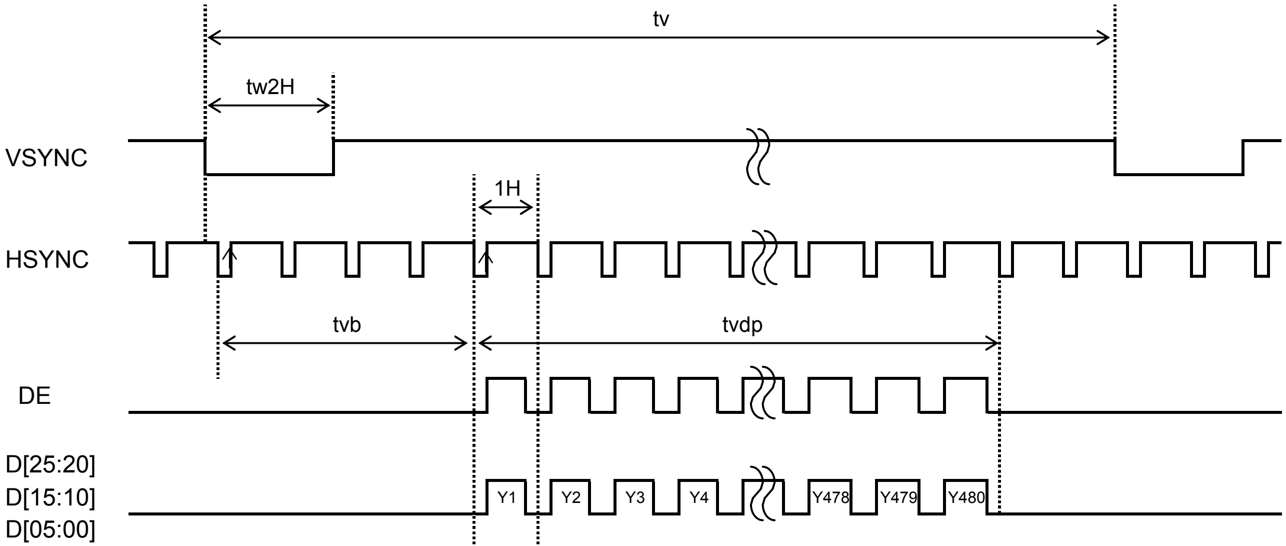
Item	Symbol	Rating			Unit	Applicable terminal
		MIN	TYP	MAX		
CLK frequency	fCLK	--	25	27	MHz	CLK
VSYNC signal cycle time	tv	--	525	--	H	VSYNC,HSYNC
VSYNC frequency Note1	fVSYNC	54	60	66	Hz	VSYNC
VSYNC pulse width	tw2H	1	3	5	H	VSYNC,HSYNC
Vertical back porch	tvb	--	35	--	H	VSYNC,HSYNC,DE,D[25:20], D[15:10],D[05:00]
Vertical display period	tvdp	--	480	--	H	
HSYNC signal cycle time	th	--	800	--	CLK	HSYNC,CLK
HSYNC pulse width	tw3H	5	30	--	CLK	
Horizontal back porch	thb	112	--	144 Note 2	CLK	HSYNC,CLK,DE,D[25:20], D[15:10],D[05:00]
Horizontal display period	thdp	--	640	--	CLK	
DE pulse width	tw4H	--	640	--	CLK	DE,CLK

Note1: The characteristic of this item is recommended standard.
Please use it after it confirms it enough like the display fineness etc.
When it comes off from this characteristic and it is used.

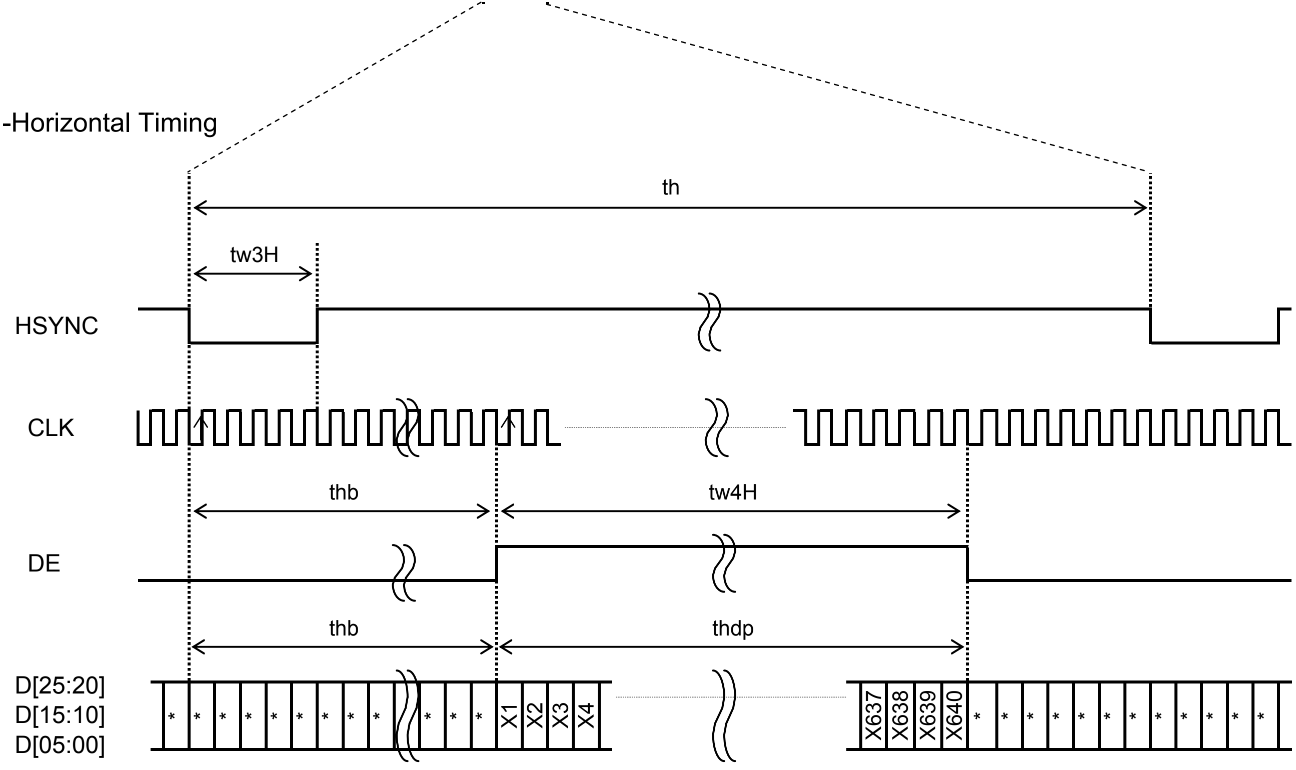
Note2: When "DE" keeps "Lo" for 144CLK or longer,start capturing data automatically from 144CLK.

8.4 Driving Timing Chart

-Vertical Timing

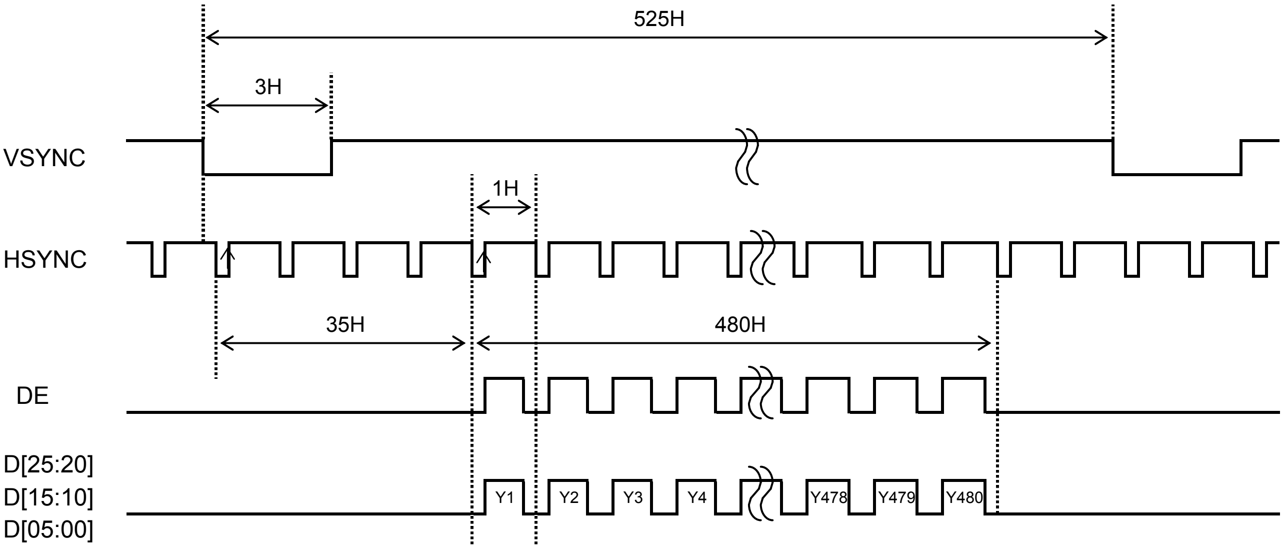

tv
tw2H
VSYNC
1H
HSYNC
tvb
tvdp
DE
D[25:20]
D[15:10]
D[05:00]
Y1
Y2
Y3
Y4
Y478
Y479
Y480

-Horizontal Timing

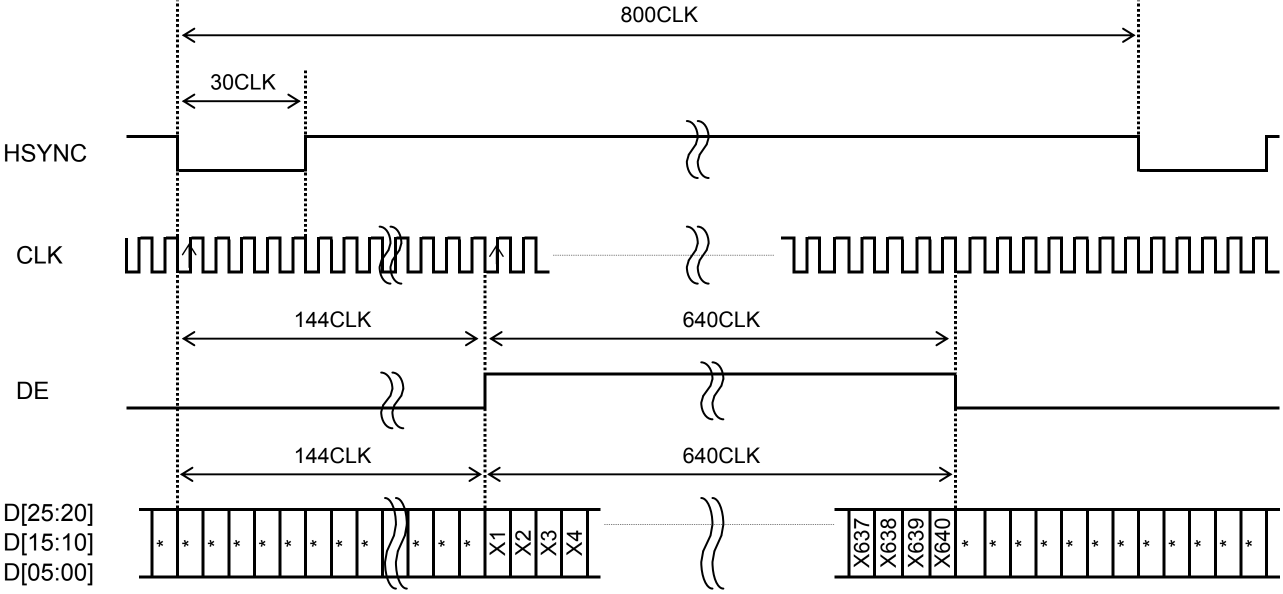

th
tw3H
HSYNC
CLK
thb
tw4H
DE
thb
thdp
D[25:20]
D[15:10]
D[05:00]
*
X1
X2
X3
X4
X637
X638
X639
X640

8.5 Example of Driving Timing Chart (fCLK=25MHz)

-Vertical Timing

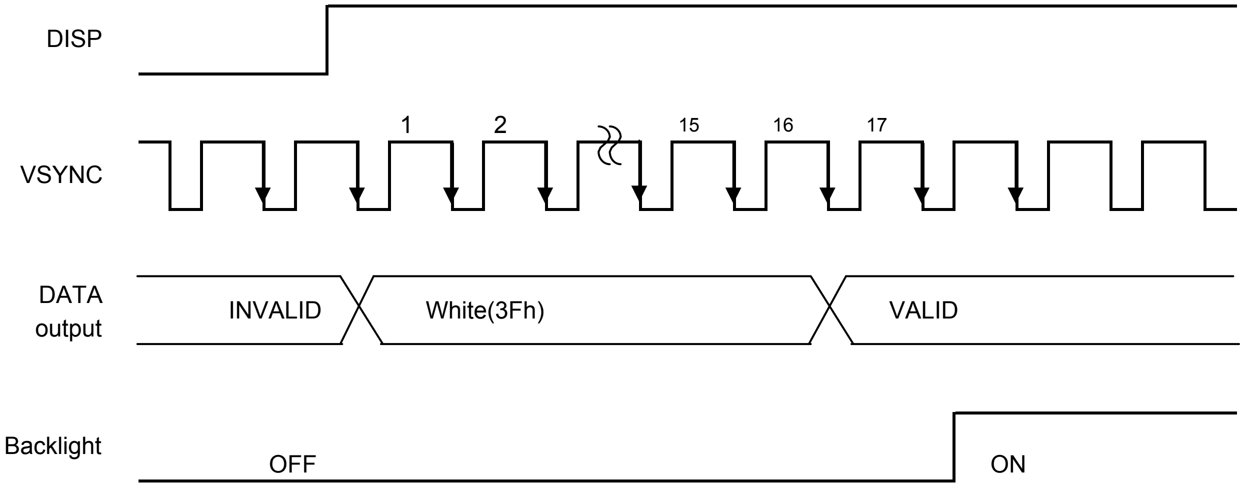

525H
3H
1H
35H
480H
VSYNC
HSYNC
DE
D[25:20]
D[15:10]
D[05:00]
Y1
Y2
Y3
Y4
Y478
Y479
Y480

-Horizontal Timing

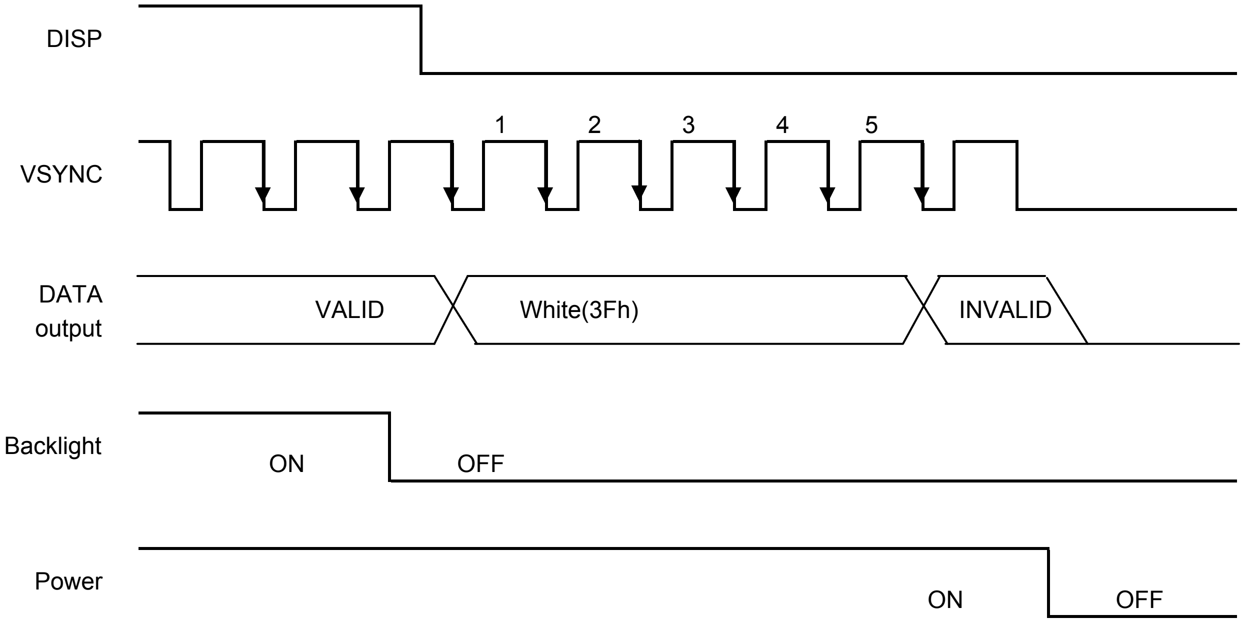

800CLK
30CLK
HSYNC
CLK
144CLK
640CLK
DE
144CLK
640CLK
D[25:20]
D[15:10]
D[05:00]
X1
X2
X3
X4
X637
X638
X639
X640

9. "DISP" on/off Sequence

It explains the Display on/off sequence.
After Display on,"White" data is outputted for 16-Frames first,from the falling edge of the following VSYNC signal.


DISP
VSYNC
1
2
15
16
17
DATA output
INVALID
White(3Fh)
VALID
Backlight
OFF
ON

After Display off,"White" data is outputted for 5-Frames first,from the falling edge of the following VSYNC signal.
Please turn off the power supply promptly after OFF of "DISP".


DISP
VSYNC
1
2
3
4
5
DATA output
VALID
White(3Fh)
INVALID
Backlight
ON
OFF
Power
ON
OFF

10. Characteristics

10.1 Optical Characteristics

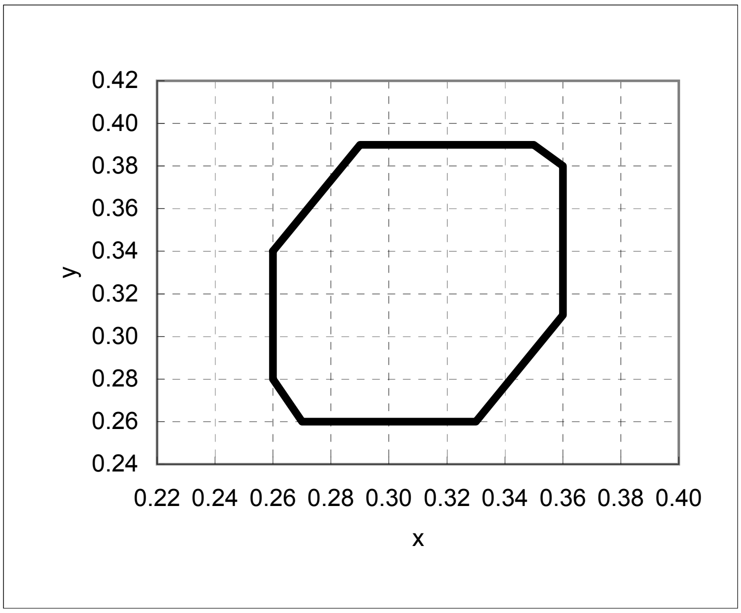
< Measurement Condition >

Measuring instruments:	CS1000（KONICA MINOLTA）, LCD7200(OTSUKA ELECTRONICS）, EZcontrast160D（ELDIM）
Driving condition:	VDD = 3.3V, VSS = 0V Optimized VCOMDC
Backlight:	VBL=12.0V（Brightness control ON Duty=100%）
Measured temperature:	Ta=25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note No.	Remark
Response time	Rise time	TON	[Data]= 3Fh→00h	—	—	40	ms	1	※
	Fall time	TOFF	[Data]= 00h→3Fh	—	—	60	ms		
Contrast ratio	Backlight ON	CR	[Data]= 3Fh/00h	360	600	—		2	
	Backlight OFF			—	5.5	—			
Viewing angle	Left	θL	[Data]= 3Fh/00h CR≧10	80	80	—	deg	3	※
	Right	θR		80	80	—	deg		
	Up	φU		55	60	—	deg		
	Down	φD		60	65	—	deg		
White Chromaticity		x	[Data]=3Fh	White chromaticity range				4	
		y							
Burn-in				No noticeable burn-in image shall be observed after 2 hours of window pattern display.				5	
Center brightness			[Data]=3Fh	385	550	—	cd/m^2	6	
Brightness distribution			[Data]=3Fh	70	—	—	%	7	

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

※ Measured in the form of LCD module.



White Chromaticity Range

【White Chromaticity Range】

x	y
0.26	0.34
0.26	0.28
0.27	0.26
0.33	0.26
0.36	0.31
0.36	0.38
0.35	0.39
0.29	0.39

10.2 Temperature Characteristics

< Measurement Condition >

Measuring instruments:	CS1000（KONICA MINOLTA）, LCD7200(OTSUKA ELECTRONICS)
Driving condition:	VDD = 3.3V, VSS = 0V Optimized VCOMDC
Backlight:	VBL=12.0V（Brightness control ON Duty=100%）

Item			Specification		Remark
			Ta＝－20°C	Ta＝70°C	
Contrast ratio		CR	40 or more	40 or more	Backlight ON
Response time	Rise time	TON	200 msec or less	30 msec or less	※
	Fall time	TOFF	300 msec or less	50 msec or less	※
Display Quality			No noticeable display defect or ununiformity should be observed.		Use the criteria for judgment specified in the section 11.

※ Measured in the form of LCD module.

11. Criteria of Judgment

11.1 Defective Display and Screen Quality

Test Condition:	Observed TFT-LCD monitor from front during operation with the following conditions
Driving Signal	Raster Patter (RGB, white, black)
Signal condition	[Data]:3Fh,18h,00h (3steps)
Observation distance	30 cm
Illuminance	200 to 350 lx
Backlight	VBL=12.0V（Brightness control ON Duty=100%）

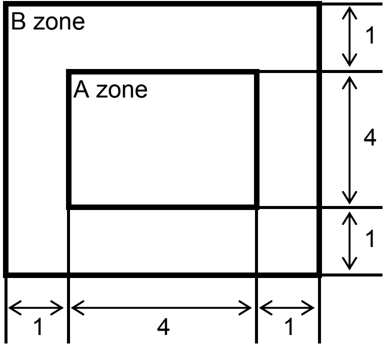
Defect item		Defect content		Criteria
Display Quality	Line defect	Black, white or color line, 3 or more neighboring defective dots		Not exists
	Dot defect	Uneven brightness on dot-by-dot base due to defective TFT or CF, or dust is counted as dot defect (brighter dot, darker dot) High bright dot: Visible through 2% ND filter at [Data]=00h Low bright dot: Visible through 5% ND filter at [Data]=00h Dark dot: Appear dark through white display at [Data]=18h		Refer to table 1
		Invisible through 5% ND filter at [Data]=18h		Ignored
Screen Quality	Dirt	Uneven brightness (white stain, black stain etc)		Invisible through 1% ND filter
	Foreign particle	Point-like	0.25mm< φ	N=0
			0.20mm< φ ≦0.25mm	N≦2
			φ ≦0.20mm	Ignored
		Liner	3.0mm<length and 0.08mm<width	N=0
			length≦3.0mm or width≦0.08mm	Ignored
	Others			Use boundary sample for judgment when necessary

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

Table 1

Area	High bright dot	Low bright dot	Dark dot	Total	Criteria
A	0	2	2	3	Permissible distance between same color bright dots (includes neighboring dots): 3 mm or more Permissible distance between same color high bright dots (includes neighboring dots): 5 mm or more
B	2	4	4	6	
Total	2	4	4	7	

<Landscape model>



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

11.2 Screen and Other Appearance

Testing conditions

Observation distance	30cm
Illuminance	1200～2000 lx

Item		Criteria	Remark
Polarizer	Flaw Stain Bubble Dust Dent	Ignore invisible defect when the backlight is on.	Applicable area: Active area only (Refer to the section 3.2 "Outward form")
S-case		No functional defect occurs	
Connector		No functional defect occurs	

12. Reliability Test

Test item		Test condition	number of failures /number of examinations
Durability test	High temperature storage	Ta=80° C 240hr	0／3
	Low temperature storage	Ta=-30° C 240hr	0／3
	High temperature & high humidity storage	Ta=60° C, RH=90% 240hr non condensing ※	0／3
	High temperature operation	Tp=70° C 240hr	0／3
	Low temperature operation	Tp=-20° C 240hr	0／3
	High temp & humid operation	Tp=40° C, RH=90% 240hr non condensing ※	0／3
	Thermal shock storage	-30←→80° C(30min/30min) 100 cycles	0／3
Mechanical environmental test	Surface discharge test (Non operation)	C=250pF, R=100Ω, V=±12kV Each 5 times of discharge in both polarities on the center of screen with the case grounded.	0／3
	Vibration test	Total amplitude 1.5mm, f=10～55Hz, X,Y,Z directions for each 2 hours	0／3
	Impact test	Use ORTUS TECHNOLOGY original jig (see next page)and make an impact with peak acceleration of 1000m/s2 for 6 msec with half sine-curve at 3 times to each X, Y, Z directions in conformance with JIS 60068-2-27-2011.	0／3
Packing test	Packing vibration-proof test	Acceleration of 19.6m/s^2 with frequency of 10→55→10Hz, X,Y, Zdirection for each 30 minutes	0／1 Packing
	Packing drop test	Drop from 75cm high. 1 time to each 6 surfaces, 3 edges, 1 corner	0／1 Packing

Note:Ta=ambient temperature Tp=Panel temperature

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

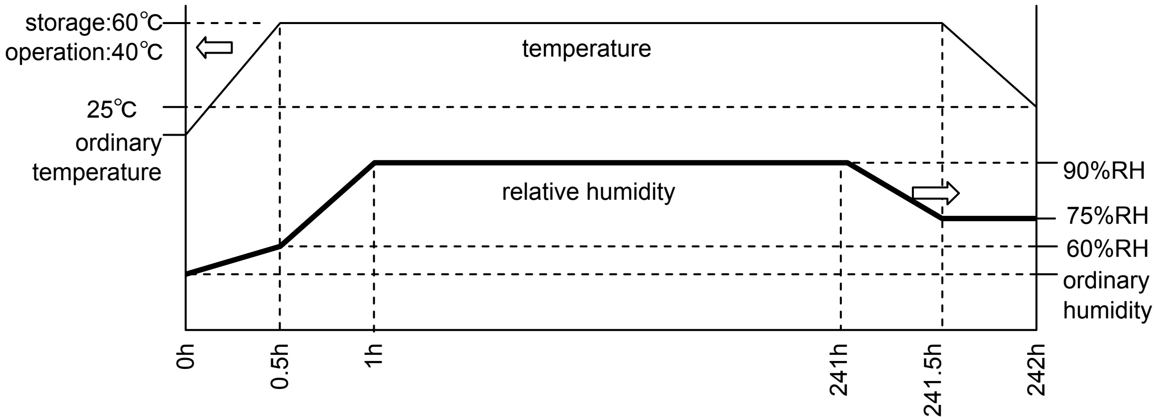
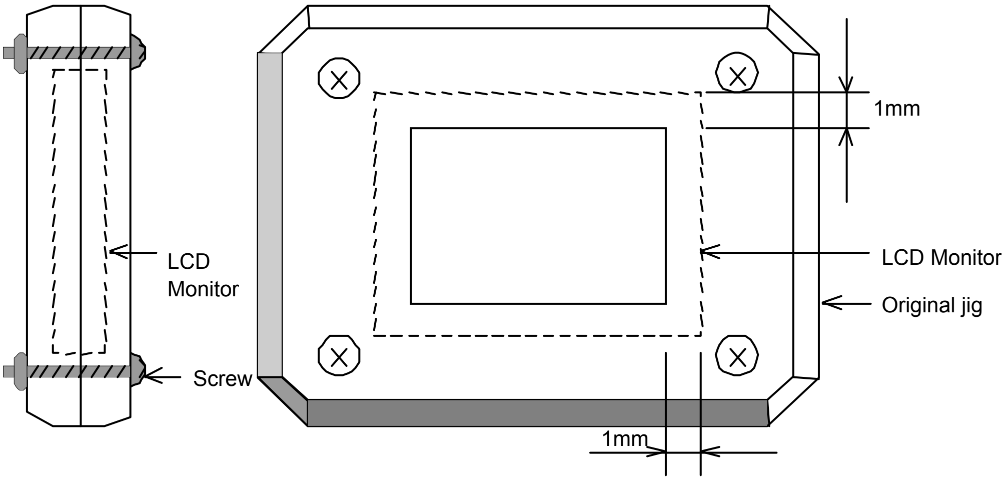


Table2.Reliability Criteria

Measure the parameters after leaving the monitor at the ordinary temperature for 24 hours or more after the test completion.

item	Standard	Remarks
Display quality	No visible abnormality shall be seen.	
Contrast ratio	40 or more	Backlight ON

ORTUS TECHNOLOGY Original Jig


LCD
Monitor
Screw
1mm
LCD Monitor
Original jig
1mm

13. Packing Specifications

Packing specification
（S=FREE）

Step 1. Each product is to be placed in one of the cut-outs of the tray with the display surface facing upward.
(4 products per tray)

Step 2. Each tray is to be piled up in same orientation and the trays be in a stack of 7.
One empty tray is to be put on the top of stack of 7 trays.

Step 3. 2 packs of moisture absobers are to be placed on the top tray as shown in the drawing.
Put piled trays into a sealing bag.
Vacuum and seal the sealing bag with the vacuum sealing machine.

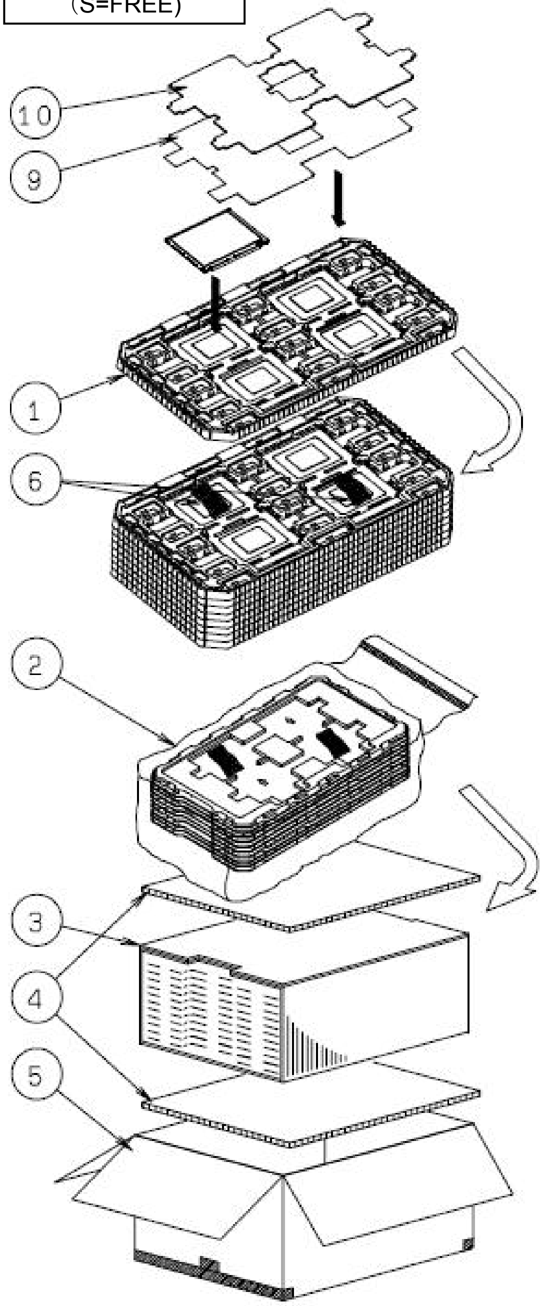
Step 4. The stack of trays in the plastic back is to be inserted into a inner carton.

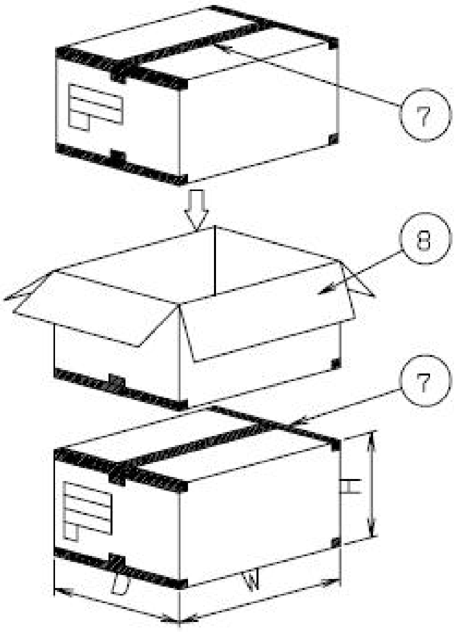
Step 5. A corrugated board is to be placed on the top and on the bottom of the inner carton.
The two corrugated boards and the inner carton is to be inserted into an outer carton.

Step 6. The outer carton needs to sealed with packing tape as shown in the drawing.
The model number, quantity of products, and shipping date are to be printed on the outer carton.
If necessary, shipping labels or impression markings are to be put on the outer carton.

Step 7. The outer carton is to be inserted into a extra outer carton with same direction.
The extra outer carton needs to sealed with packing tape as shown in the drawing.

Step 8. The model number, quantity of products, and shipping date are to be printed on the extra outer carton.
If necessary, shipping labels or impression markings are to be put on the extra outer carton.





Remark: The return of packing materials is not required.

	Packing item name	Specs., Material
①	Tray	A-PET Antistatic
②	Sealing bag	
③	Inner carton	Corrugated cardboard
④	Inner board	Corrugated cardboard
⑤	Outer carton	Corrugated cardboard
⑥	Drier	Moisture absorber
⑦	Packing tape	
⑧	Extra outer carton	Corrugated cardboard
⑨	Foam sheet A	PE foam
⑩	Foam sheet B	PE foam

Dimension of extra outer carton	
D : Approx.	（338mm）
W : Approx.	（549mm）
H : Approx.	（198mm）
Quantity of products in one carton:	28
Gross weight : Approx.	7.1Kg

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) 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.**

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 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 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.

8) The volume attached to the monitor is set to the optimal value at the time of shippment from our factory, so please do not change it.

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 connector while power supply is switch on.
Plug the connector in and out while power supply is switched off.

4) Do not operate the TFT monitors in the strong magnetic field. It may break the TFT monitors.

5) Do not display a fixed image on the screen for a long time.
Use a screen-saver or other measures to avoid a fixed image displayed on the screen for a long time.
Otherwise, it may cause burn-in image on the screen due the characteristics of liquid crystal.

14.4 Storage Condition for Shipping Cartons

Storage environment

・ Temperature	0 to 40˚C
・ Humidity	60%RH or less No-condensing occurs under low temperature with high humidity condition.
・ Atmosphere	No poisonous gas that can erode electronic components and/or wiring materials should be detected.
・ Time period	3 months
・ Unpacking	To prevent damages caused by static electricity, anti-static precautionary measures (e.g. earthing, anti-static mat) should be implemented.
・ Maximum piling up	7 cartons

14.5 Precautions for Peeling off the Protective film

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

A) Work Environment

a) Humidity: 50 to 70 %RH, Temperature15 to 27˚C

b) Operators should wear conductive shoes, conductive clothes, conductive finger tips and grounded wrist-straps. Anti-static treatment should be implemented to work area's floor.

c) Use a room shielded against outside dust with sticky floor mat laid at the entrance to eliminate dirt.

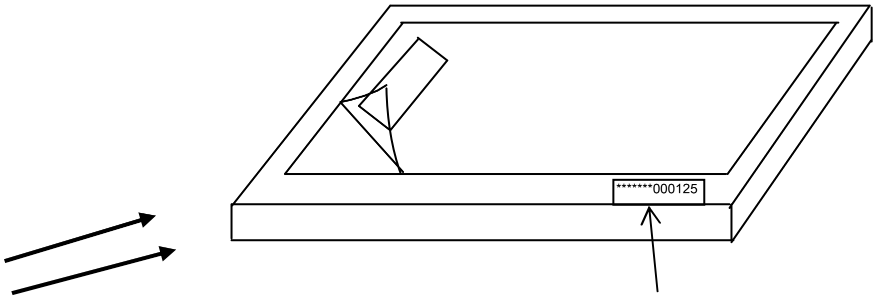
B) Work Method

The following procedures should taken to prevent the driver ICs from charging and discharging.

a) Use an electrostatic neutralization blower to blow air on the TFT monitors to its lower left when "S LABEL" on the front case is placed at the bottom. Optimize direction of the blowing air and the distance between the TFT monitors and the electrostatic neutralization blower.

b) Put an adhesive tape (Scotch tape, etc) at the lower left corner area of the protective film to prevent scratch on surface of TFT monitors.

c) Peel off the adhesive tape slowly (spending more than 2 secs to complete) by pulling it to opposite direction.



When "S LABEL" on the front case is placed at the bottom.

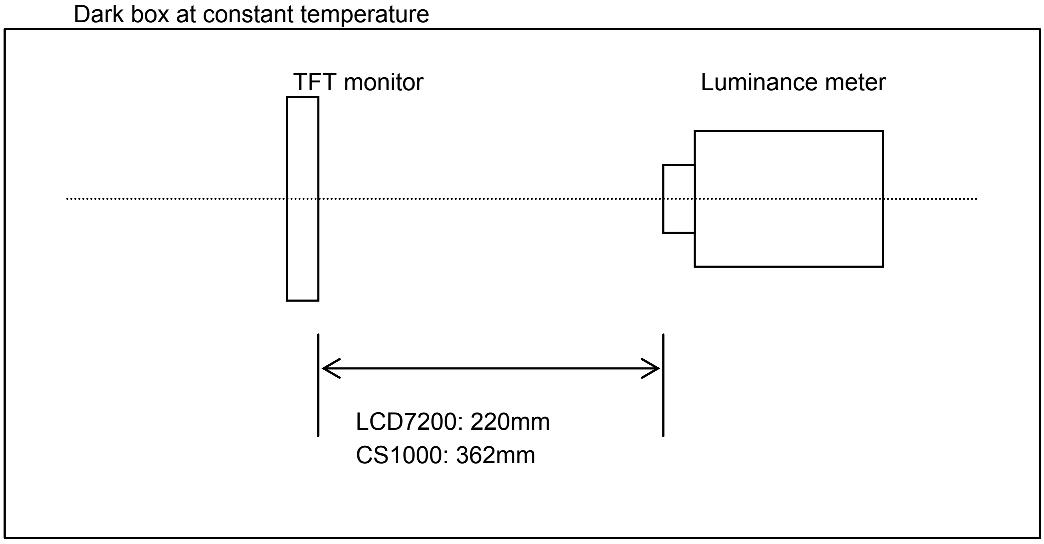
Direction of blowing air
（Optimize air direction and the distance)

APPENDIX

Reference Method for Measuring Optical Characteristics and Performance

1. Measurement Condition (Backlight ON)

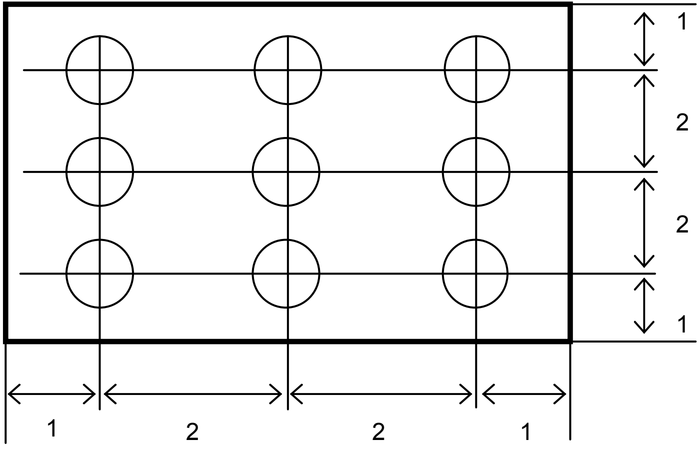
Measuring instruments:	CS1000（KONICA MINOLTA）, LCD7200(OTSUKA ELECTRONICS）,EZcontrast160D（ELDIM）
Driving condition:	Refer to the section "Optical Characteristics"
Measured temperature:	25°C unless specified
Measurement system:	See the chart below. The luminance meter is placed on the normal line of measurement system.
Measurement point:	At the center of the screen unless otherwise specified


Dark box at constant temperature
TFT monitor
Luminance meter
LCD7200: 220mm
CS1000: 362mm

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>

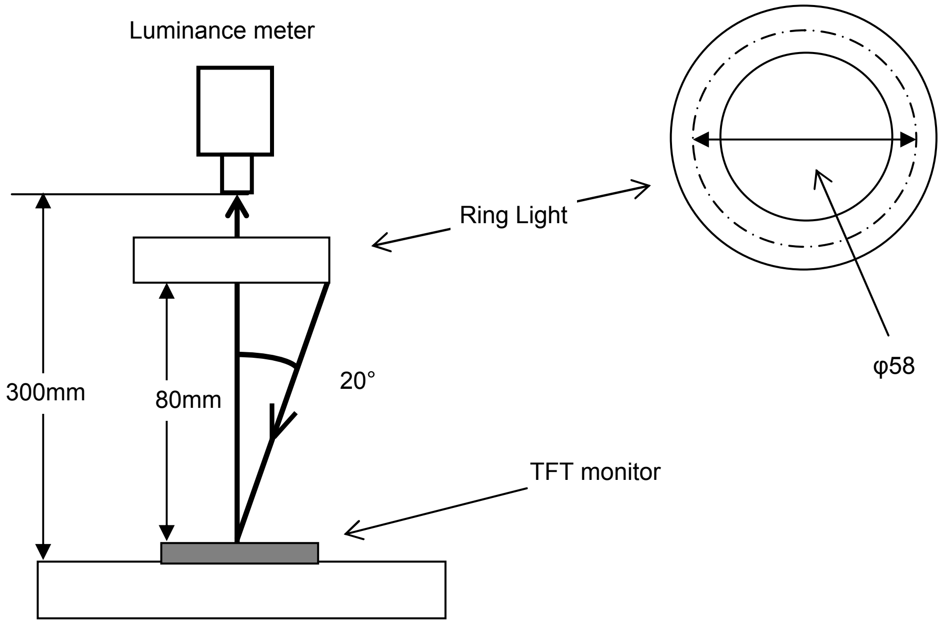


Dimensional ratio of active area

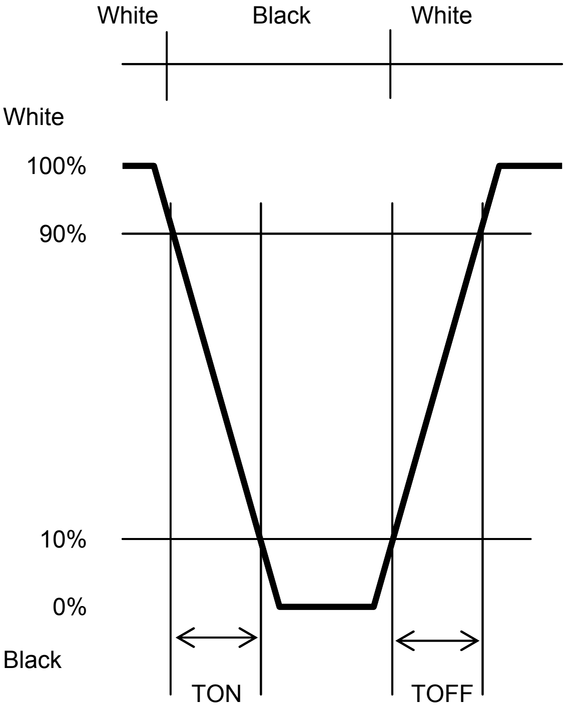
Backlight VBL=12.0V（Brightness control ON Duty=100%）

Measurement Condition (Contrast ratio Backlight OFF only)

Measuring instruments:	LCD7200(OTSUKA ELECTRONICS),Ring Light(40,000 lx,φ58)
Driving condition:	Refer to the section "Optical Characteristics"
Measured temperature:	25˚C unless specified
Measurement system:	See the chart below.
Measurement point:	At the center of the screen.


Luminance meter
Ring Light
300mm
80mm
20°
φ58
TFT monitor

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]=3Fh TON Rise time TOFF Fall time
2	Contrast ratio	Measure maximum luminance Y1([Data]=3Fh) and minimum luminance Y2([Data]=00h) at the center of the screen by displaying raster or window pattern. Then calculate the ratio between these two values. Contrast ratio = Y1/Y2 Diameter of measuring point: 8mmφ(CS1000) Diameter of measuring point: 3mmφ(LCD7200)	CS1000 LCD7200	Backlight ON Backlight OFF
3	Viewing angle Horizontalθ Verticalφ	Move the luminance meter from right to left and up and down and determine the angles where contrast ratio is 10.	EZcontrast160D	
4	White chromaticity	Measure chromaticity coordinates x and y of CIE1931 colorimetric system at [Data] = 3Fh Color matching faction: 2°view	CS1000	
5	Burn-in	Visually check burn-in image on the screen after 2 hours of "window display" ([Data]=3Fh/00h).		At optimized VCOMDC
6	Center brightness	Measure the brightness at the center of the screen.	CS1000	
7	Brightness distribution	(Brightness distribution) = 100 x B/A % A : max. brightness of the 9 points B : min. brightness of the 9 points	CS1000	