SPECIFICATIONS № 10TLM104	Issue: Aug. 20, 2012

Specifications for

Blanview TFT-LCD Monitor

Version 3.0

MODEL COM57H5M25KLC

Customer's Approval
Signature:
Name:
Section:
Title:
Date:

ORTUSTECH

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Version History

Ver.	Date	Page	Description	
1.0	Jun. 16, 2011	-	-	First issue
2.0	Dec. 2, 2011	P.13		7.1.2 Backlight
	A ×1		Add	Estimated Life of LED.
3.0	Aug. 20, 2012	P.8		3.2 Outward Form
			Change	Company name
			Change	Specification (S LABEL)
	B ×10	P.9		3.3 Serial Label (S-Label)
			Change	Specification
		P.10		4.1 Display Module Part
			Change	Company name
		P.11		4.2 Backlight Part
			Change	Company name
		P.26		12. Reliability Test
			Correct	JIS № (Impact test)

Contents

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

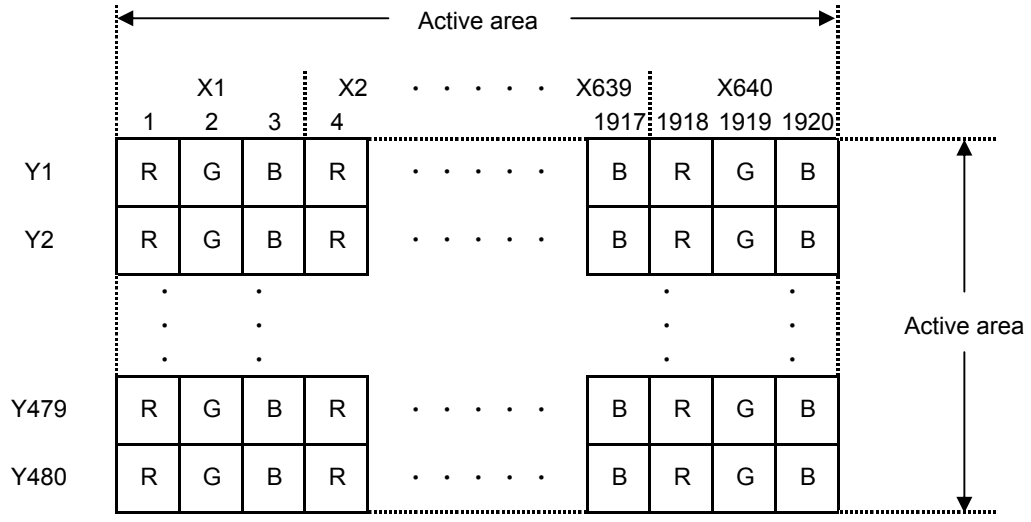
2.1 Features of the Product

- 5.7 inch diagonal display, 1,920 [H] x 480 [V] dots.
- 6-bit 262,144 color display capability.
- Built in Timing generator (TG).
- Long life & High bright white LED back-light.
- Blanview TFT-LCD, improved outdoor readability.

	Indoor		Outdoor	
	Readability	Power Efficiency (Battery Life)	Readability	Power Efficiency (Battery Life)
Transmissive	Good	Good	Fair	Poor
Transflective	Fair	Poor	Good	Good
Blanview	Good	Good	Good	Good

2.2 Display Method

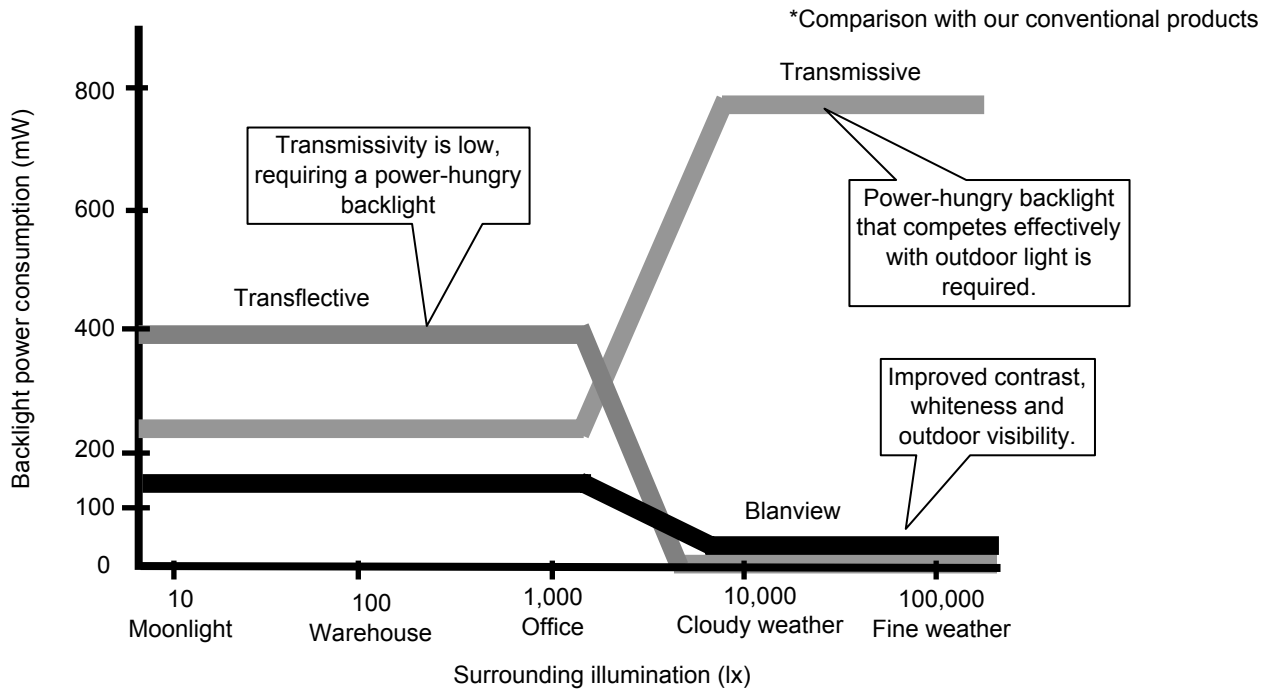
Items	Specifications	Remarks
Display type	TN type 262,144 colors. Blanview, Normally white.	
Driving method	a-Si TFT Active matrix. Line-scanning, Non-interlace.	
Dot arrangement	RGB stripe arrangement.	Refer to "Dot arrangement".
Signal input method	6-bit RGB, parallel input.	
Backlight type	Long life & High bright white LED.	



Dot arrangement
(FPC cable placed down)

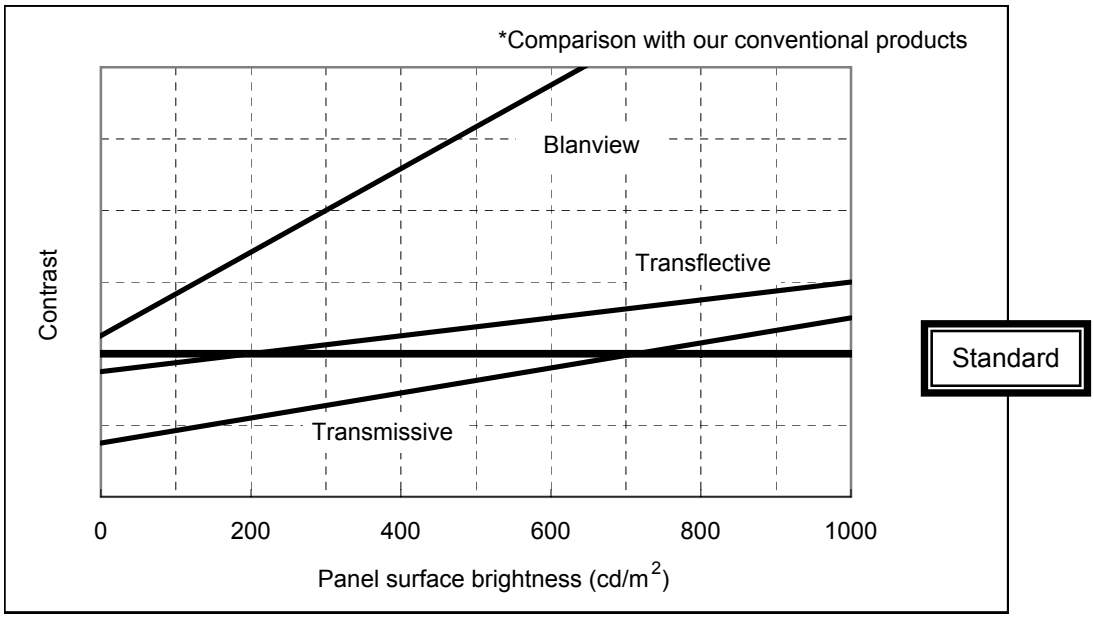
<Features of Blanview>

- 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.
(ORTUS TECHNOLOGY criteria)



3. Dimensions and Shape

3.1 Dimensions

Items	Specifications	Unit	Remarks
Outline dimensions	130.32[H] × 101.20[V] × 3.63[D]	mm	Exclude FPC cable.
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	85	g	Include FPC cable.

3.2 Outward Form

EC No.	REV. No.	REVISE	DATE (Y:M:D)	APPROVED	CHECKED	PREPARED
	Ⓐx6	Changing S LABEL(Barcode)	12:07:31	Hashizume	Hiranobu	Ide

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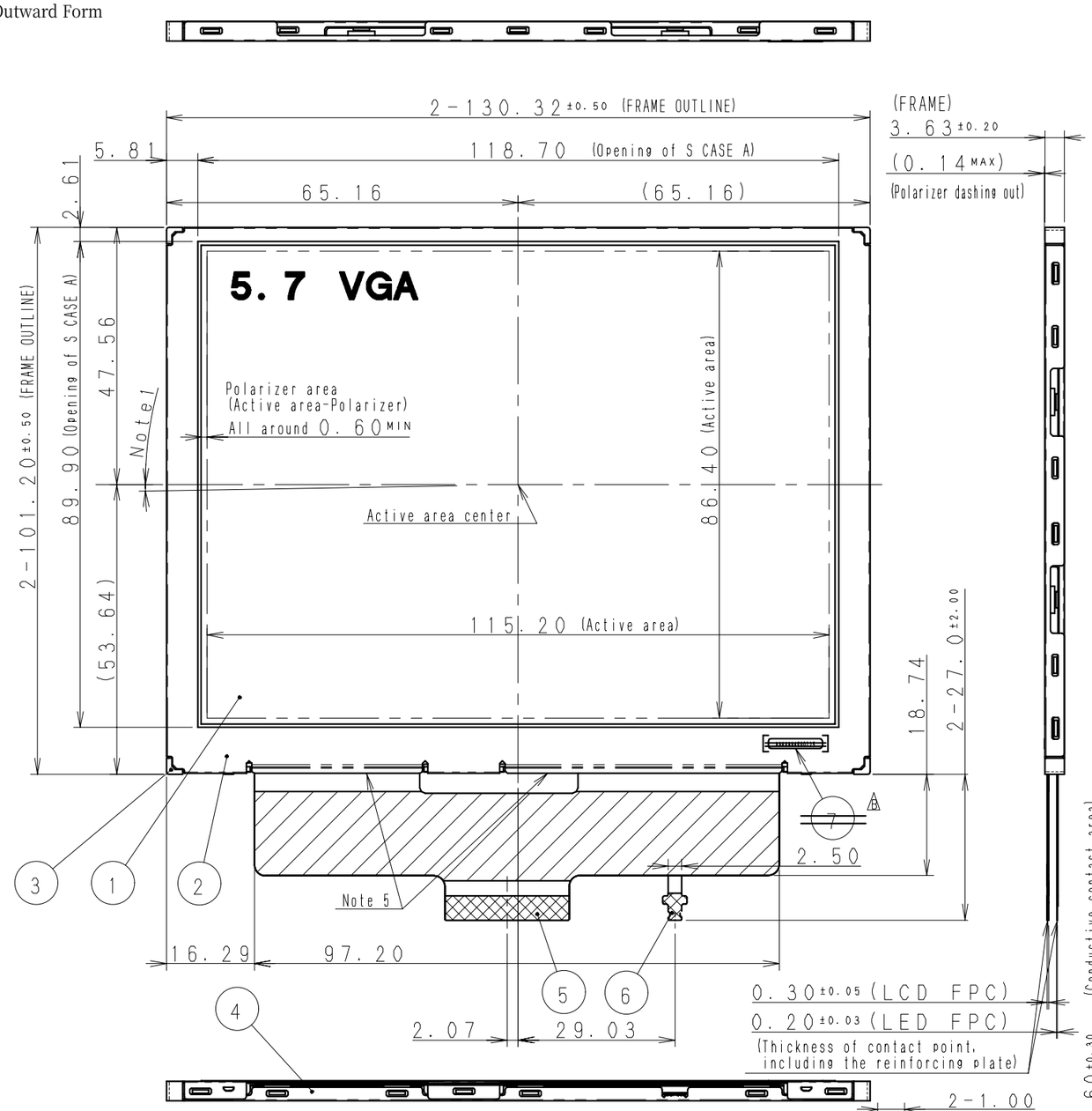

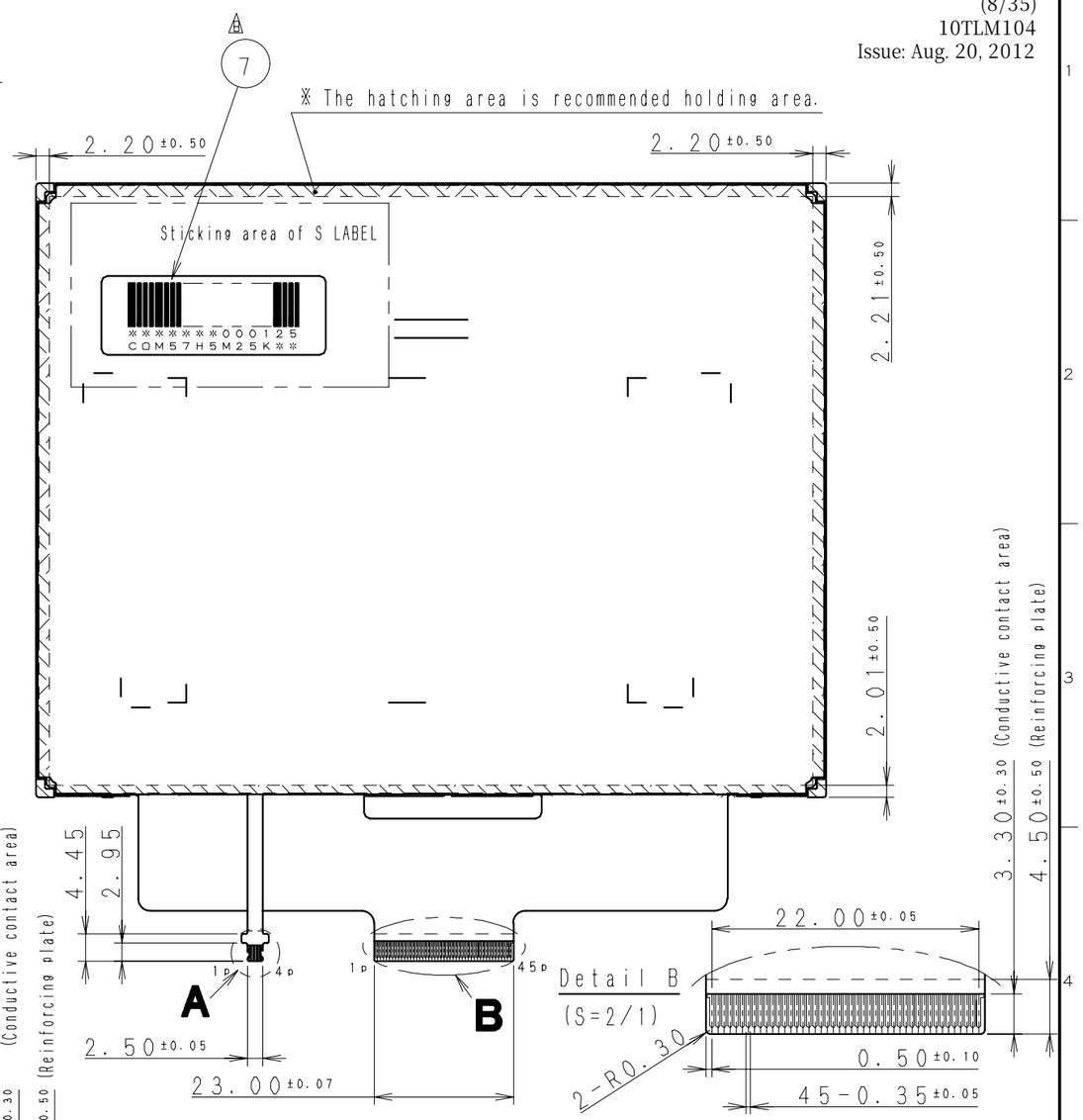

Note 1. Angular deviation of LCD cell from the TFT-LCD monitor's reference axis shall be less than [±50'].

Note 2. S label is affixed the area shown in the drawing.
The thickness of the S label will be added to that of S case's surface.

Note 3. Protective film is affixed on front surface of the screen.
Location tolerance of the protective film shall be ±1.5 mm to the polarizing film.

Note 4. Recommended FPC connectors
For LCD : KYOCERA Connector Products, Ⓐ ~~KYOCERA ELCO~~
part number: 04 6240 045 023 846+(Lower contact)
For LED FPC: KYOCERA Connector Products, Ⓐ ~~KYOCERA ELCO~~
part number: 04 6277 004 001 883+(Lower contact)

Note 5. Exercise care not to apply any forces to the cable holder of the S case A.

Note 6. Refer to "11. CRITERIA OF JUDGMENT" about the appearance specification of a polarizer.

PART NAME	ITEM	MATERIAL GRADE	REMARK
S LABEL	7	Ⓐ Barcode(CODE39)	(37x13x0.075t) Ⓐ ~~(10x1.85x0.075t)~~
LED FPC	6		
LCD FPC	5		
S CASE C	4		
FRAME	3		
S CASE A	2		
TFT-LCD PANEL	1	Glass substrate thickness=0.5t	

APPROVED Hashizume	GENERAL TOLERANCE ±1.00	SCALE 1/1, 2/1, 5/1	UNIT mm
CHECKED Hiranobu	ISSUE (Y:M:D) 10:11:10	MODEL COM57H5M25K**	
CHECKED	NAME	OUTLINE-D5M25	
DESIGN Yanai			
DRAW Ide			

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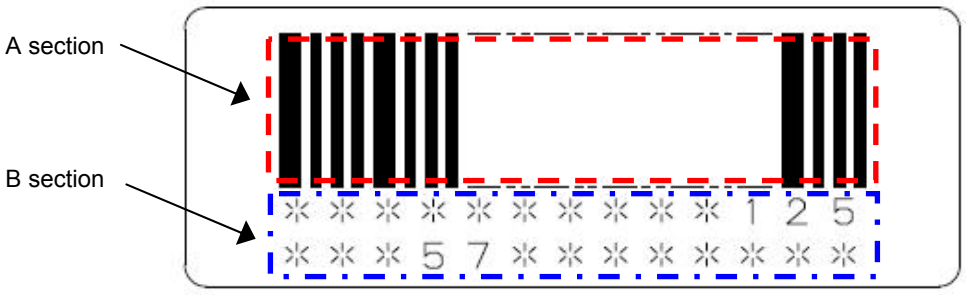
DRAWING No.	REV.	SHEET	DIV.
RJD521083D301			

B 3.3 SERIAL LABEL (S-LABEL)

1) Display Items

A section : Bar code

B section : Combination of a character



Details of B section

Upper culumn: It indicates The least significant digit of manufacture year (1 digit), manufacture month with below alphabet (1letter), model code (5characters), serial number (6digits).

*	*	*****	******
a	b	c	d

Lower culumn: Model (13characters)

	Contents of display						
a	The least significant digit of manufacture year						
b	Manufacture month	Jan-A	Mar-C	May-E	Jul-G	Sep-I	Nov-K
		Feb-B	Apr-D	Jun-F	Aug-H	Oct-J	Dec-L
c	Model code	57CKC (Made in Japan)					
		57CLC (Made in Malaysia)					
		57CMC (Made in China)					
d	Serial number						

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

・Made in Japan

1C57CKC000125

means "manufactured in March 2011, model 57CK, C specifications, serial number 000125"

・Made in Malaysia

1C57CLC000125

means "manufactured in March 2011, model 57CL, C specifications, serial number 000125"

・Made in China

1C57CMC000125

means "manufactured in March 2011, model 57CM, C specifications, serial number 000125"

2) Location of Serial Label (S-label)

Refer to 3.2 "Outward Form".

3) Others

Bar code readablity is excluded from quality assurance coverage.

4. Pin Assignment

Ⓑ 4.1 Display Module Part

No.	Symbol	Function
1	VSS	GND.
2	VGL	Negative voltage for gate driver.
3	VDD	Power supply for logic circuit.
4	VGH	Positive voltage for gate driver.
5	AVDD	Power supply for analog circuit.
6	V10	Source driver output level voltage. (nagative case)
7	V6	Source driver output level voltage. (nagative case)
8	V5	Source driver output level voltage. (positive case)
9	V1	Source driver output level voltage. (positive case)
10	POCB	Power on clear. (Low: Active)
11	DISP	Display on/off control signal.(Lo：display off、Hi：display on)
12	RL	Horizontally Flipped (right/left) signal. (Lo: Horizontally Flipped Display, Hi: Normal display)
13	UD	Vertically Flipped (up/down) signal. (Lo: Normal display,Hi: Vertically Flipped Display)
14	VSS	GND.
15	VDD	Power supply for logic circuit.
16	DE	Input data effective signal. (It is effective for the period of "Hi")
17	HSYNC	Horizontal sync signal. (Low active)
18	VSYNC	Vertical sync signal. (Low active)
19	CLK	Clock signal.Latching data at the rising edge.
20	TEST5	Short to VSS.
21	TEST6	Short to VSS.
22	D00	Display data(R).
23	D01	00h: Black
24	D02	D00：LSB D05：MSB
25	D03	
26	D04	Driver has internal gamma conversion.
27	D05	
28	TEST3	Short to VSS.
29	TEST4	Short to VSS.
30	D10	Display data(G).
31	D11	00h: Black
32	D12	D10：LSB D15：MSB
33	D13	
34	D14	Driver has internal gamma conversion.
35	D15	
36	TEST1	Short to VSS.
37	TEST2	Short to VSS.
38	D20	Display data(B).
39	D21	00h: Black
40	D22	D20：LSB D25：MSB
41	D23	
42	D24	Driver has internal gamma conversion.
43	D25	
44	VCOM	Input signal for common electrode.
45	VSS	GND.

- Recommended connector: Kyocera connector products, 6240 series [04 6240 045 023 846+]
- 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.

△B 4.2 Backlight Part

No.	Symbol	Function
1	BLH1	Backlight drive 1 (anode side).
2	BLH2	Backlight drive 2 (anode side).
3	BLL2	Backlight drive 2 (cathode side).
4	BLL1	Backlight drive 1 (cathode side).

- Recommended connector: Kyocera connector products, 6277 series [04 6277 004 001 883+]
- Please make sure to check a consistency between pin assignment in "3.2 Outward Form" and your connector pin assignment when designing your circuit.
  Inconsistency in input signal assignment may cause a malfunction.
- Since FPC cable has gold plated terminals, gilt finish contact shoe connector is recommended.

5. Absolute Maximum Rating

VSS=0V

Item	Symbol	Condition	Rating		Unit	Applicable terminal
			MIN	MAX		
Supply voltage for logic	VDD	Ta=25°C Note 1	-0.3	7.0	V	VDD
Supply voltage for analog1	AVDD		-0.3	13.5	V	AVDD
Supply voltage for analog2	VGH		-0.3	42.0	V	VGH
Supply voltage for analog3	VGL		VGH-42.0	0.3	V	VGL
Supply voltage for analog4 Note 2	Vγ		-0.3	AVDD-0.1	V	V1,V5,V6,V10
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,TEST1~6,DISP,POCB
Common electrode voltage	VCOM		-0.3	10.0	V	VCOM
LED direction current of order	IL	Ta=25°C	--	35	mA	BLH1 - BLL1,BLH2 - BLL2
		Ta=70°C	--	15		
Storage temperature range	Tstg		-30	80	°C	
Storage humidity range	Hstg	Non condensing in an environmental moisture at or less than 40°C90%RH.				

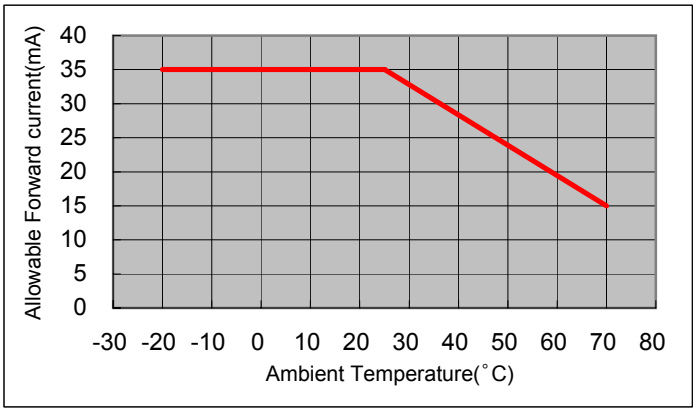
Note1: Please refer to the "Power On/Off Sequence" section of this document.
Note2: AVDD>V1>V5>V6>V10>VSS.

6. Recommended Operating Conditions

VSS=0V

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Supply voltage for logic	VDD	Ta=25°C	3.0	3.3	3.6	V	VDD
Supply voltage for analog1	AVDD		11.0	12.0	13.0	V	AVDD
Supply voltage for analog2	VGH		20.0	21.0	22.0	V	VGH
Supply voltage for analog3	VGL		-8.0	-7.0	-6.0	V	VGL
Common electrode voltage Note 1	VCOM		4.2	4.7	5.2	V	VCOM
Contrast range	V1		10.3	10.6	10.9	V	V1
	V5		6.9	7.2	7.5	V	V5
	V6		5.2	5.5	5.8	V	V6
	V10		0.7	0.8	0.9	V	V10
Input voltage for logic	VI		0	--	VDD	V	CLK,VSYNC,HSYNC, DE,D[25:20],D[15:10], D[05:00],RL,UD,DISP, POCB
Operating temperature range	Top	Note 2,3	-20	25	70	°C	Panel surface temperature
Operating humidity range	Hop	Ta≦30°C	20	--	80	%	
		Ta>30°C	Non condensing in an environmental moisture at or less than 30°C80%RH.				

Note1: This range indicates the most probable range for the optimal setting for VCOM.
It does not mean that the optimal settings for VCOM for all monitors will be in this range.
VCOM should be optimized by viewing/using the monitor.
Note2: This monitor is operatable in this temperature range. With regard to optical characteristics, refer to Item "10. CHARACTERISTICS".
Note3: Acceptable Forward Current to LED is up to 15mA, when Ta=+70°C.
Do not exceed Allowable Forward Current shown on the chart below.



7. Characteristics

7.1 DC Characteristics

7.1.1 Display Module

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

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Input voltage for logic	VIH		0.7×VDD	--	VDD	V	CLK,VSYNC,HSYNC, DE,D[25:20],D[15:10], D[05:00],RL,UD,DISP, POCB
	VIL		0	--	0.3×VDD	V	
Pull up resister value	Rpu		300	450	600	kΩ	DISP,POCB
Pull down resister value	Rpd		300	450	600	kΩ	DE,D[25:20],D[15:10], D[05:00],TEST1~6,
Current consumption	IDD	fCLK=25MHz Color bar display	--	7.0	14.0	mA	VDD
	IAVDD	VDD=3.3V AVDD=12.0V	--	14.0	28.0	mA	AVDD
	IGH	VGH=21.0V VGL=-7.0V	--	120	240	μA	VGH
	IGL		-240	-120	--	μA	VGL

A 7.1.2 Backlight

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Forward current	IL25	Ta=25℃	--	15.0	35.0	mA	BLH1 - BLL1
	IL70	Ta=70℃	--	--	15.0	mA	BLH2 - BLL2
Forward voltage	VL	Ta=25℃, IL=15.0mA	--	27.9	30.6	V	
Estimated Life of LED	LL	Ta=25℃, IL=15.0mA Note	--	(50,000)	--	hr	

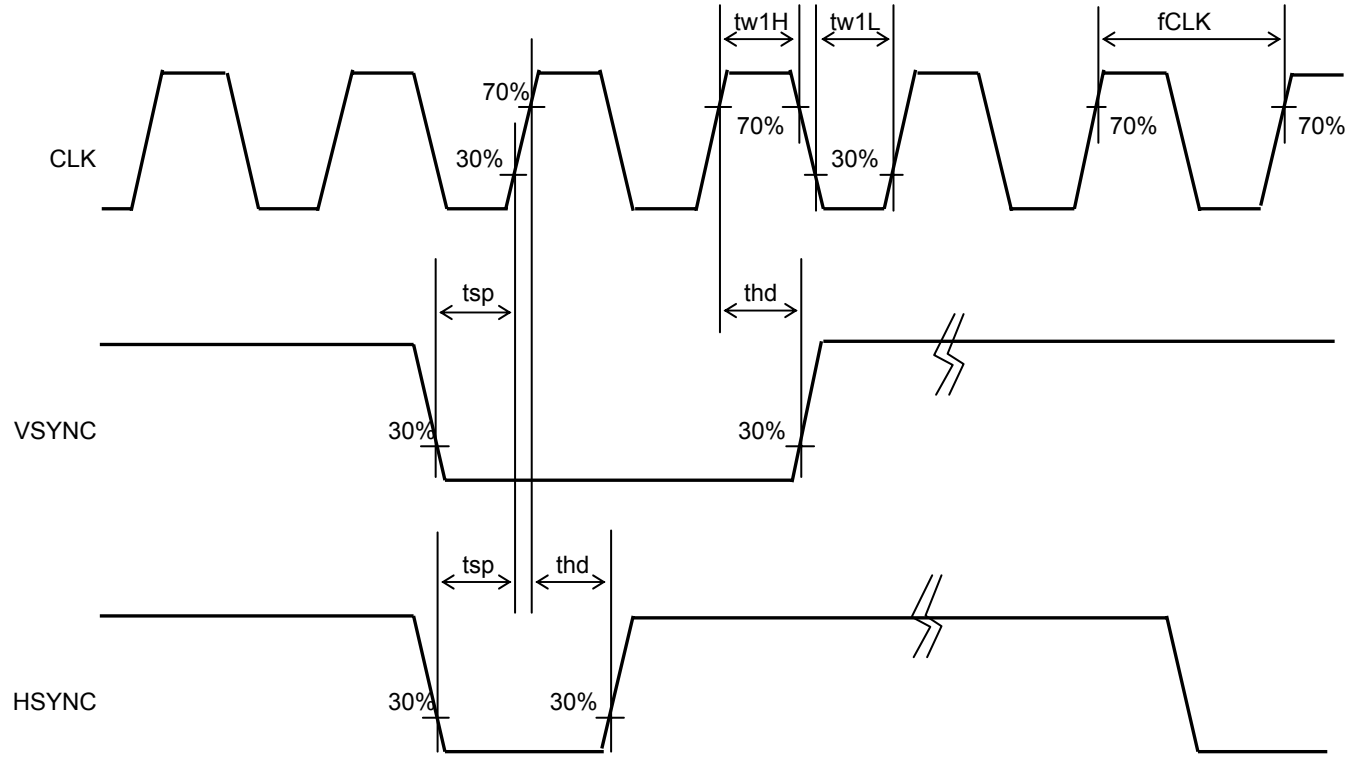
Note: - The lifetime of the LED is defined as a period till the brightness of the LED decreases to the half of its initial value.
- This figure is given as a reference purpose only, and not as a guarantee.
- This figure is estimated for an LED operating alone. As the performance of an LED may differ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

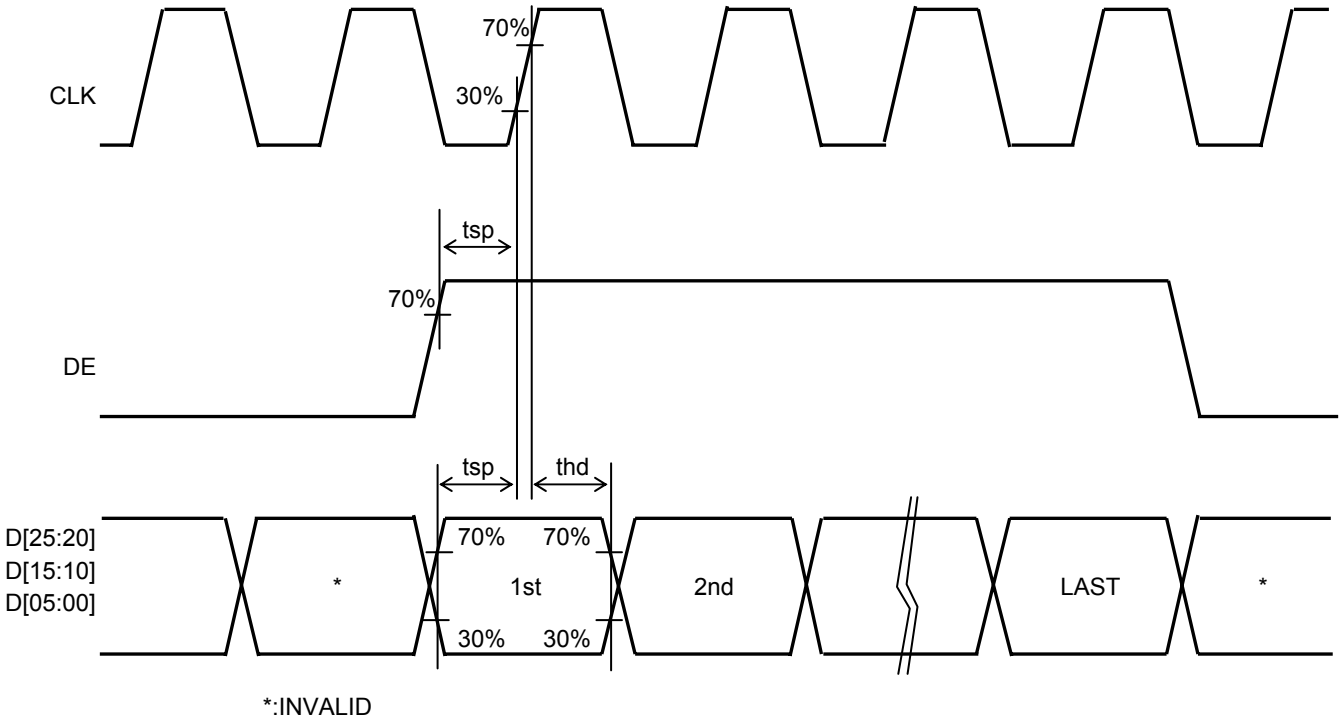
7.2 AC Characteristics

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

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
CLK frequency	fCLK		--	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	

Switching Waveform Characteristics





*:INVALID

7.3 Input Timing Characteristics

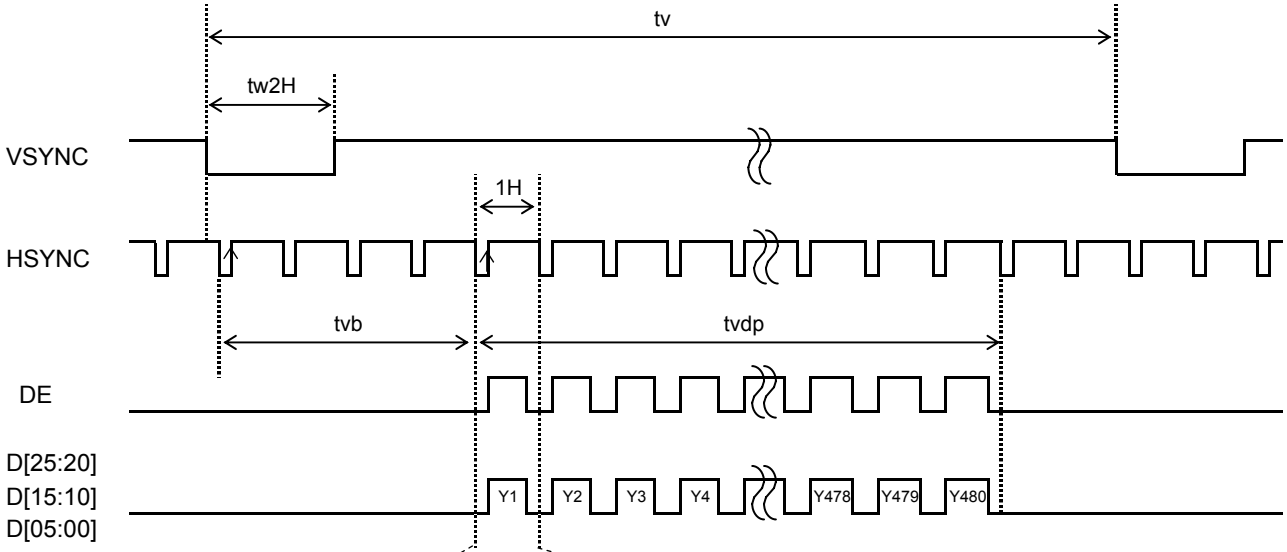
Item	Symbol	Rating			Unit	Applicable terminal
		MIN	TYP	MAX		
CLK frequency	fCLK	--	25	27	MHz	CLK
VSYNC signal cycle time	tv	--	525	--	H	VSYNC,HSYNC
VSYNC frequency Note1	fVSYNC	54	60	66	Hz	VSYNC
VSYNC pulse width	tw2H	1	3	5	H	VSYNC,HSYNC
Vertical back porch	tvb	--	35	--	H	VSYNC,HSYNC,DE,D[25:20], D[15:10],D[05:00]
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.

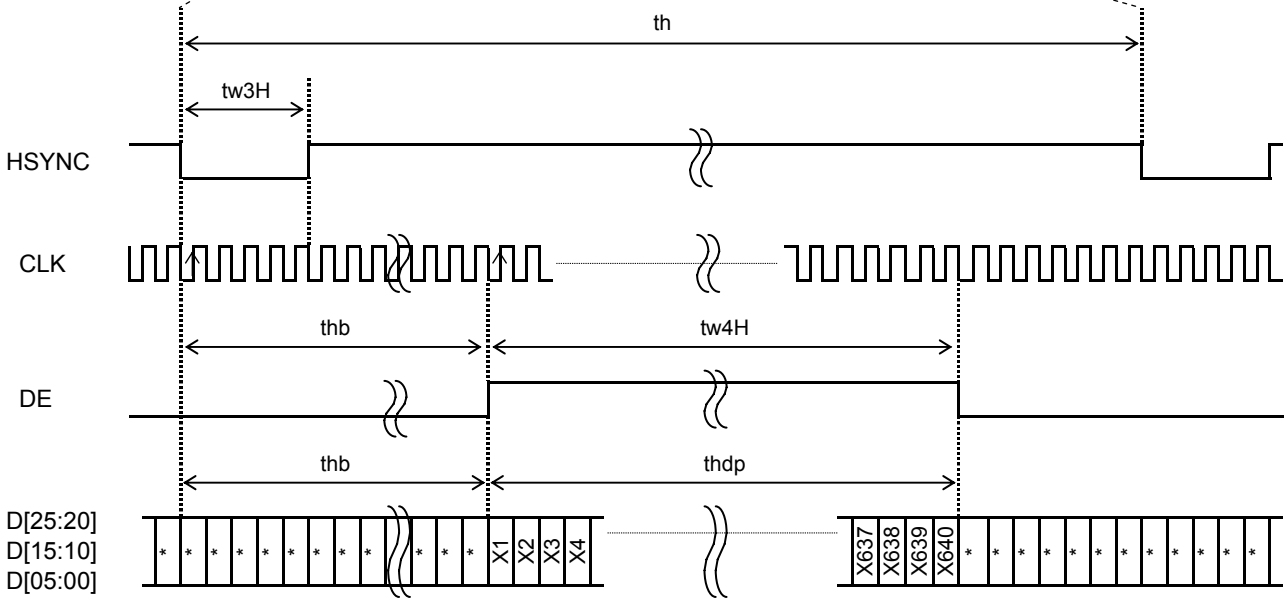
Note2: When "DE" keeps "Lo" for 144CLK or longer,start capturing data automatically from 144CLK.

7.4 Driving Timing Chart

-Vertical Timing

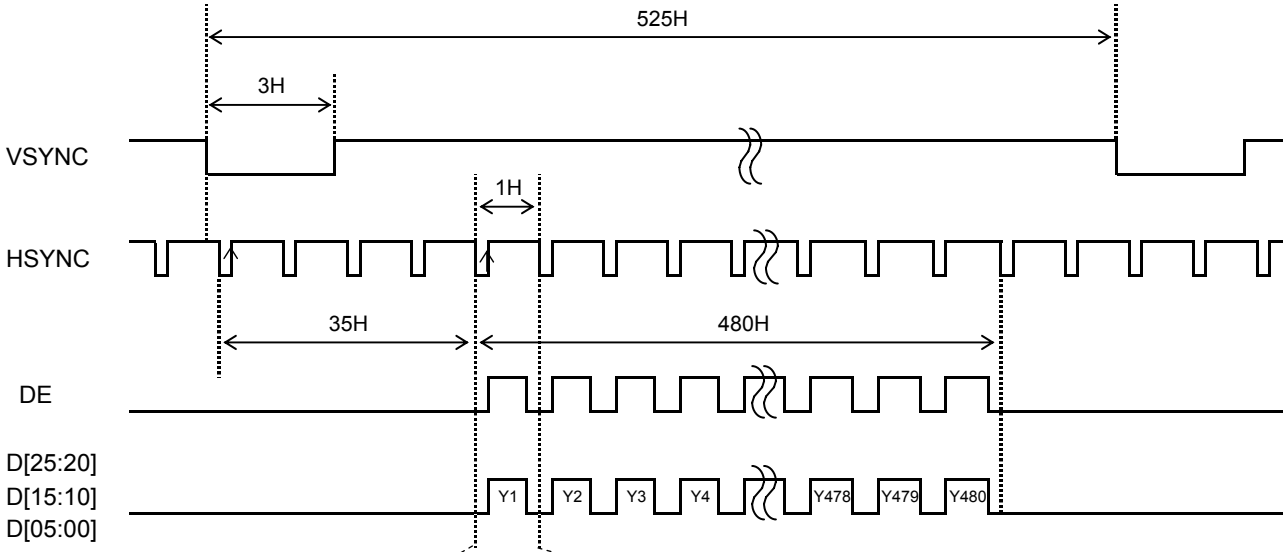


-Horizontal Timing

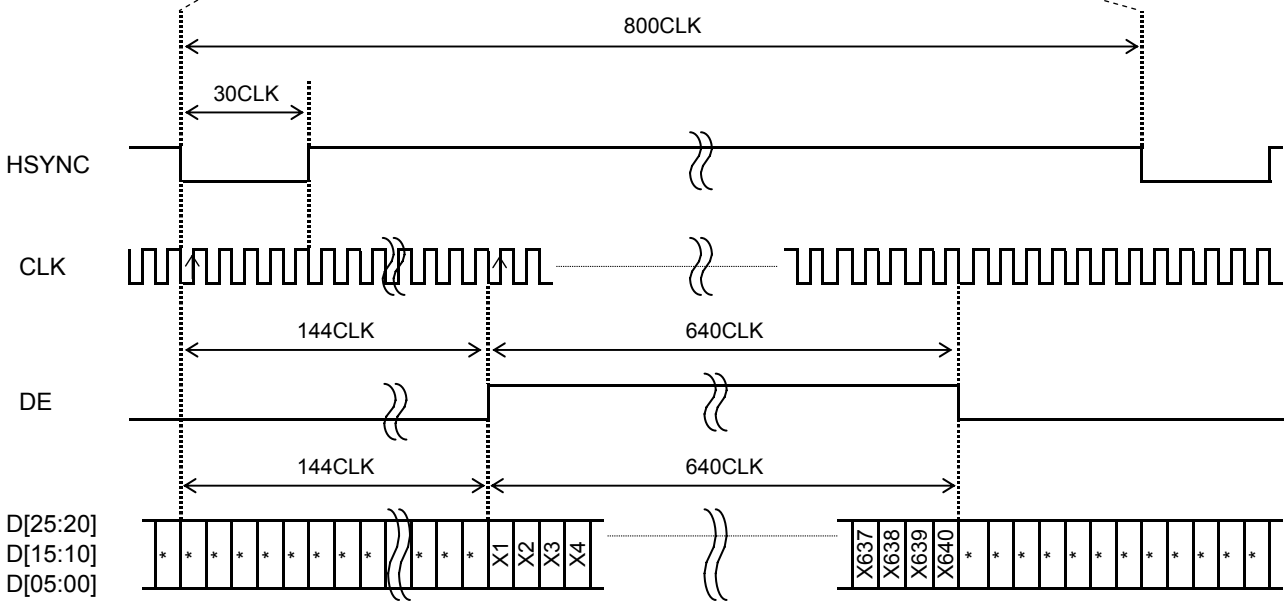


7.5 Example of Driving Timing Chart (fCLK=25MHz)

-Vertical Timing



-Horizontal Timing



8. Description of Operation

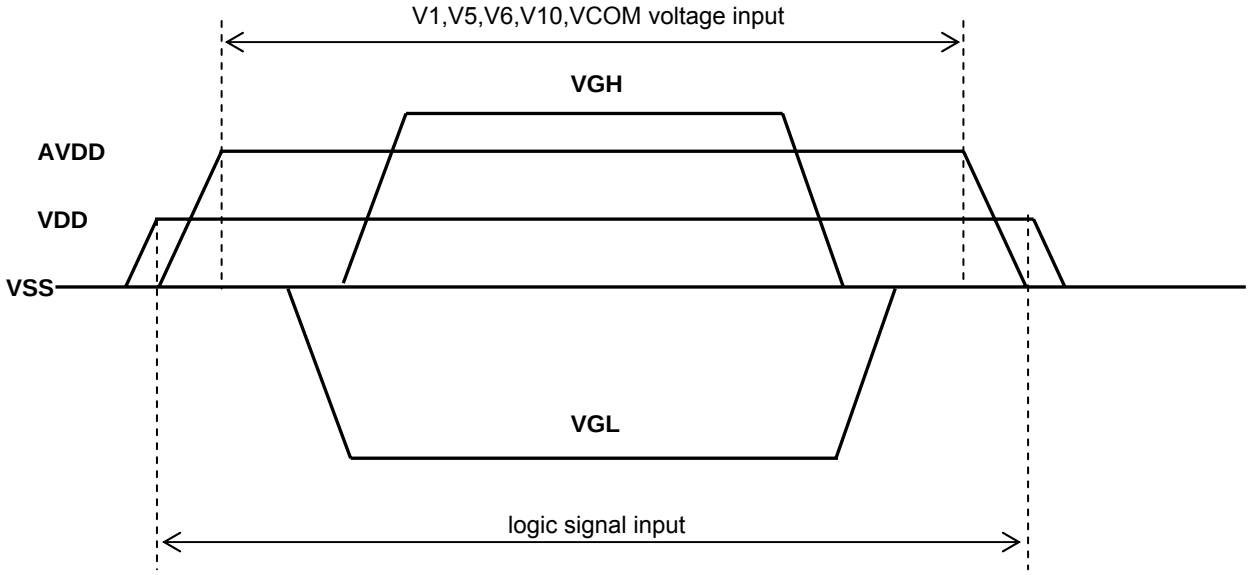
8.1 Power On/Off Sequence

The sequence of the Power On/Off and the signal input must defend the following conditions.

- Please input the logic signal after turning on VDD.
- Please input AVDD after turning on VDD or at the same time.
- Please input V1, V5, V6, V10 and VCOM voltage after turning on AVDD.
- Please input VGL after turning on VDD.
- Please input VGH after turning on VGL.

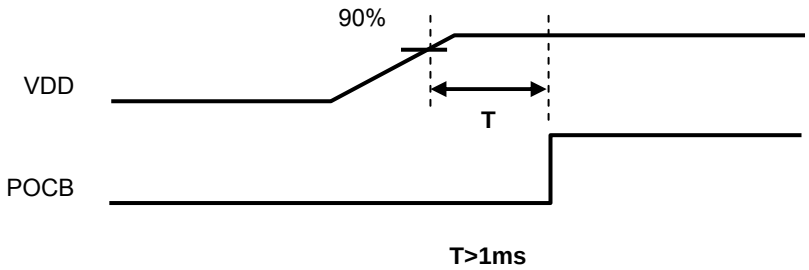
Power Off sequence is assumed to be opposite of the above mentioned sequence.

Please refer Power On/Off recommended sequence is shown in the figure below.



8.2 Power On Clear

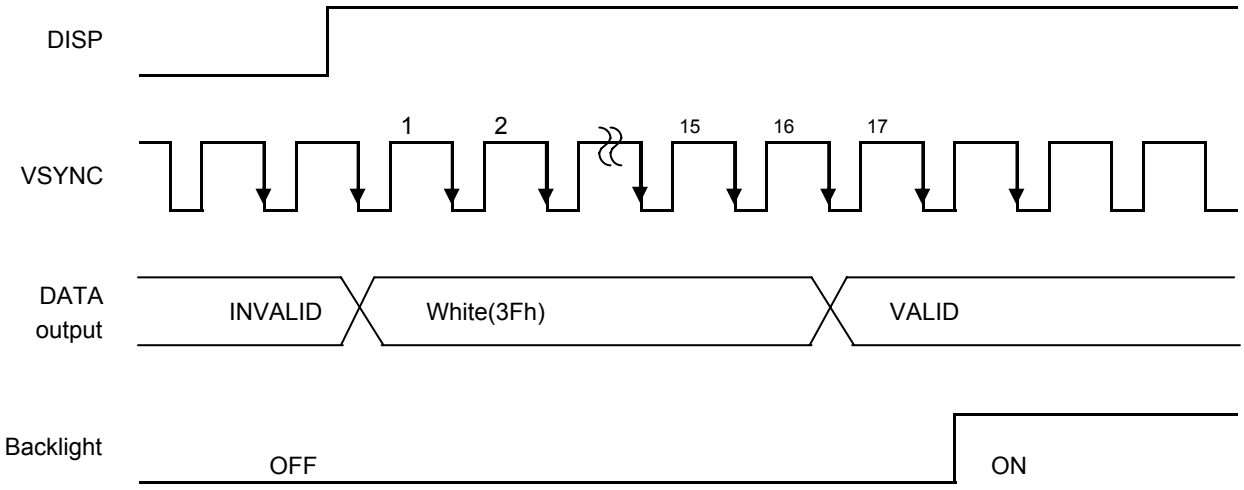
There is a limitation between Power On and POCB (power on clear) .
Please defend the following conditions.



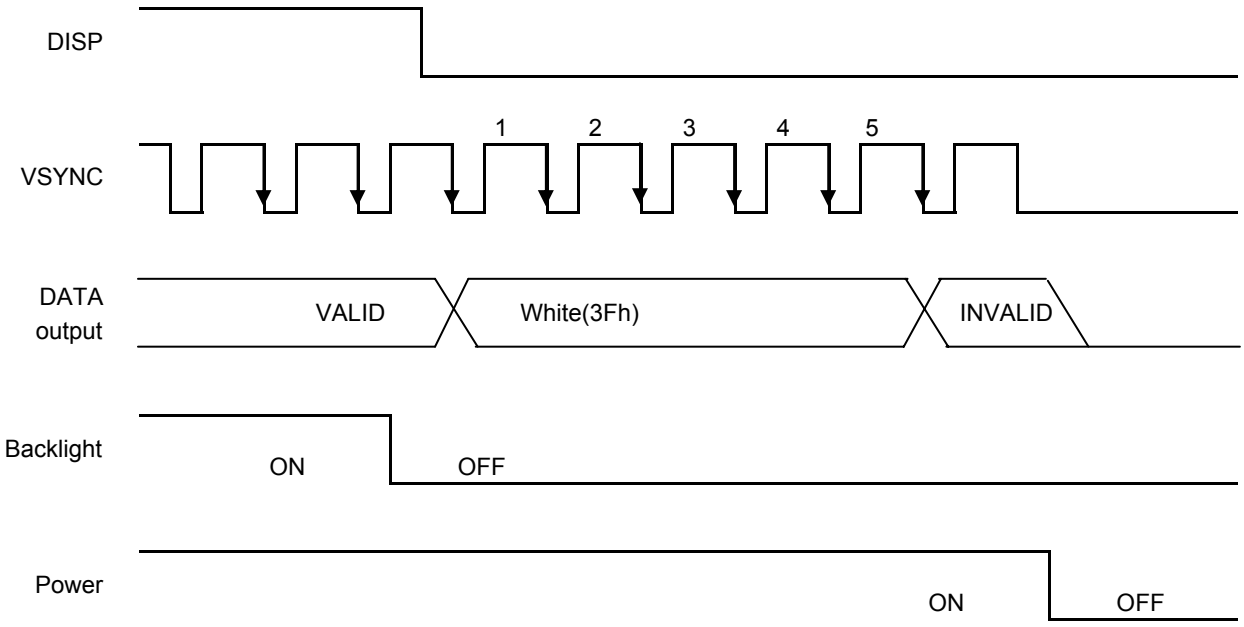
T>1ms

8.3 "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.

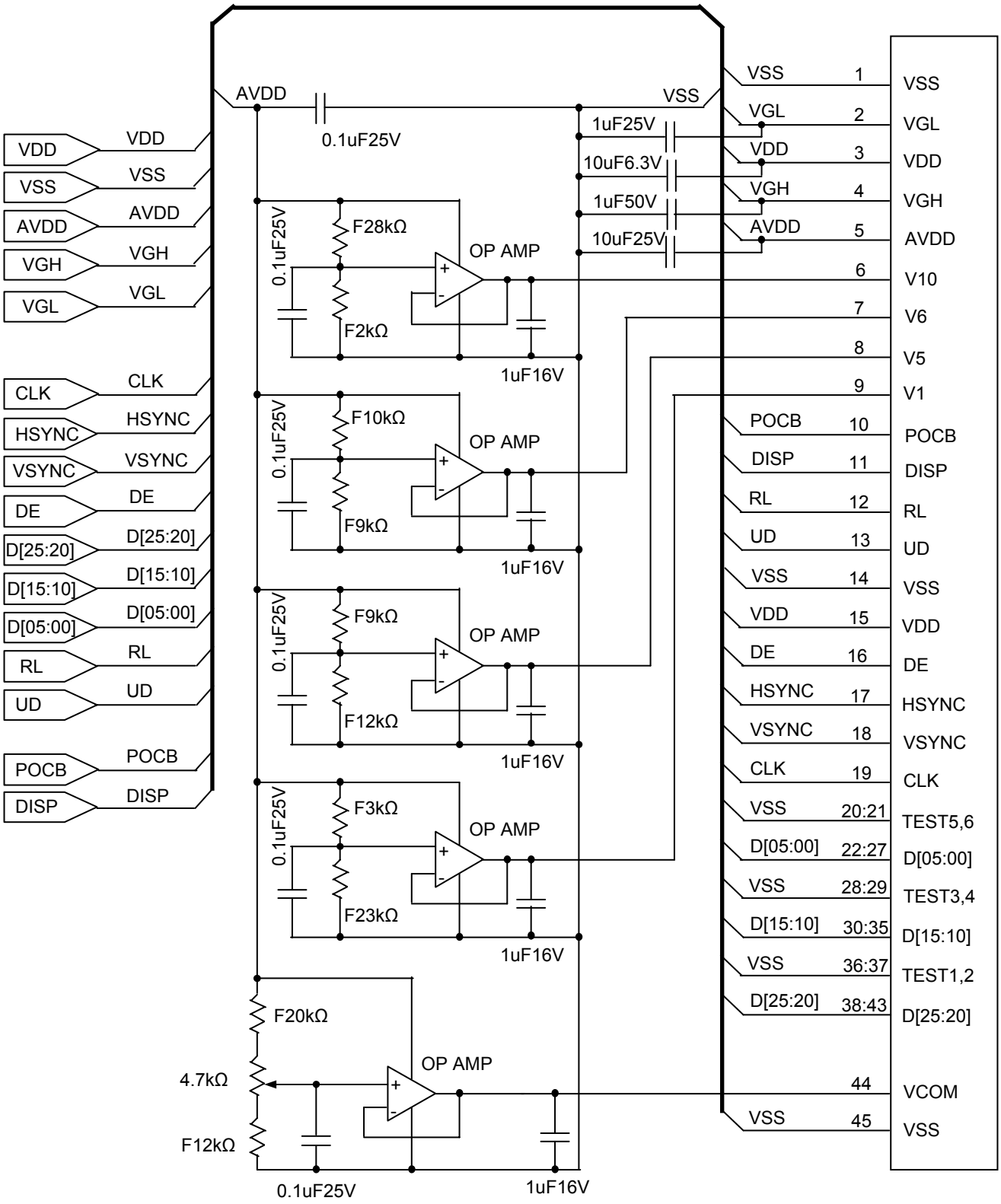


After Display off,"White" data is outputted for 5-Frames first,from the falling edge of the following VSYNC signal.
Please turn off the power supply promptly after OFF of "DISP".



9. Circuit

9.1 Driving Circuit Example (AVDD = 12.0V)

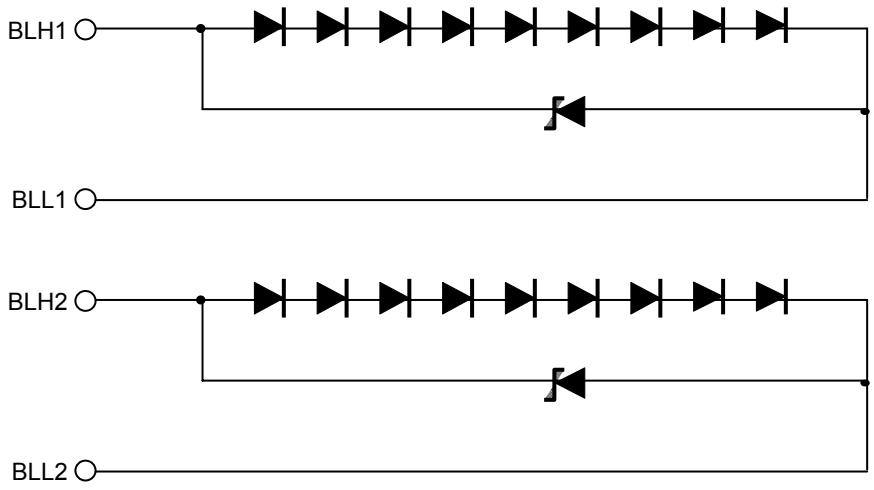


Example of OP AMP:NJM2742M

TFT-LCM Reference Circuit

This circuit design is for reference purposes only.Appropriate component values may be different.
Please evaluate on your side.

9.2 LED Circuit



10. Characteristics

10.1 Optical Characteristics

< Measurement Condition >

Measuring instruments: CS1000（KONICA MINOLTA）, LCD7000(OTSUKA ELECTRONICS）, EZcontrast160D（ELDIM）

Driving condition: Typical Rating of "6. Recommended Operating Conditions". Optimized VCOMDC VLCD= Vsigpp/2

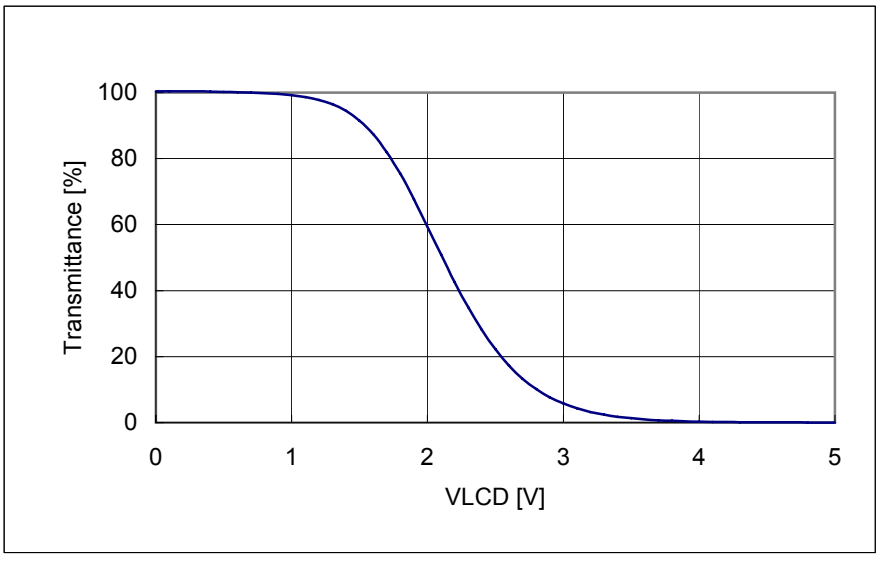
Backlight: IL=15mA

Measured temperature: Ta=25°C

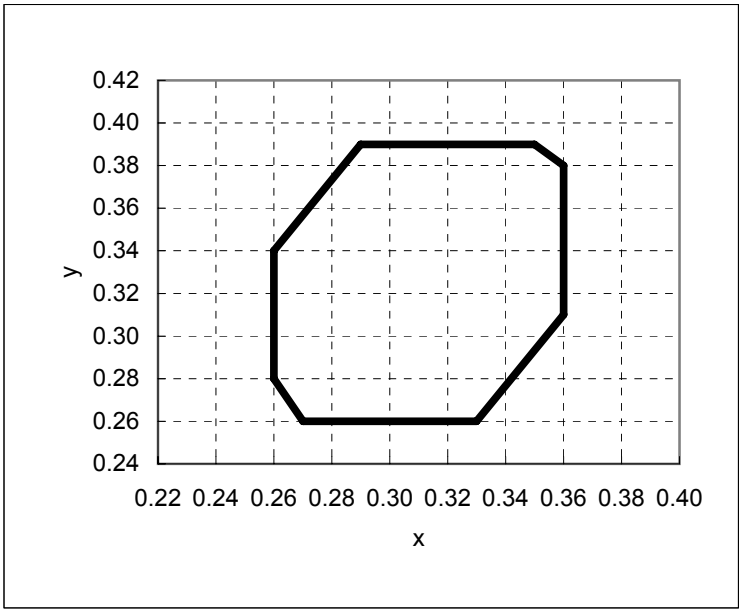
Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note No.	Remark
Response time	Rise time	TON	VLCD= 0.6V→4.9V	—	—	40	ms	1	※
	Fall time	TOFF	VLCD= 4.9V→0.6V	—	—	60	ms		
Contrast ratio	Backlight ON	CR	VLCD= 0.6V/4.9V	360	600	—		2	
	Backlight OFF			—	5.5	—			
Viewing angle	Left	θL	VLCD= 0.6V/4.9V CR≧10	80	80	—	deg	3	※
	Right	θR		80	80	—	deg		
	Up	φU		55	60	—	deg		
	Down	φD		60	55	—	deg		
V-T threshold voltage		V90		1.2	1.5	1.8	V	4	※
		V50		1.8	2.1	2.4	V		
		V10		2.5	2.8	3.1	V		
White V-T Curve				White V-T Curve					Reference
White Chromaticity		x	VLCD=0.6V	White chromaticity range				5	
		y							
Burn-in				No noticeable burn-in image should be observed after 0.5 hours of window pattern display.				6	
Center brightness			VLCD=0.6V	385	550	—	cd/m^2	7	
Brightness distribution			VLCD=0.6V	70	—	—	%	8	

* Note number 1 to 8: Refer to the APPENDIX of "Reference Method for Measuring Optical Characteristics".

※ Measured in the form of LCD module.



White V-T Curve



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）, LCD7000(OTSUKA ELECTRONICS）
Driving condition: Typical Rating of "6. Recommended Operating Conditions".
Optimized VCOMDC
VLCD= Vsigpp/2
Backlight: IL=15mA

Item			Specification		Remark
			Ta＝－10˚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 in monochrome, white, black)
Signal condition	0.6V,2.4V,4.9V (3steps)
Observation distance	30 cm
Illuminance	200 to 350 lx
Backlight	IL=15mA

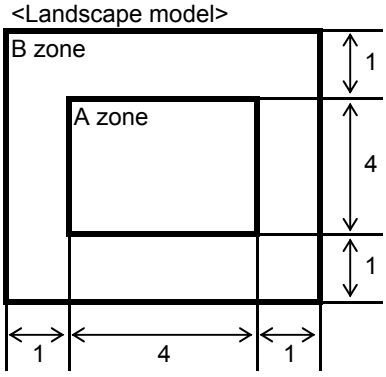
Defect item		Defect content		Criteria
Display Quality	Line defect	Black, white or color line, 3 or more neighboring defective dots		Not exists
	Dot defect	Uneven brightness on dot-by-dot base due to defective TFT or CF, or dust is counted as dot defect (brighter dot, darker dot) High bright dot: Visible through 2% ND filter at VLCD=4.9V Low bright dot: Visible through 5% ND filter at VLCD=4.9V Dark dot: Appear dark through white display at VLCD=2.4V		Refer to table 1
Screen Quality	Dirt	Point-like uneven brightness (white stain, black stain etc)		Invisible through 1% ND filter
	Foreign particle	Point-like	0.25mm<φ	N=0
			0.20<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	
FPC cable		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 240H	0／3
		Low temperature storage	Ta=-30°C 240H	0／3
		High temperature & high humidity storage	Ta=60°C, RH=90% 240H non condensing ※	0／3
		High temperature operation	Tp=70°C 240H	0／3
		Low temperature operation	Tp=-20°C 240H	0／3
		High temp & humid operation	Tp=40°C, RH=90% 240H non condensing ※	0／3
		Thermal shock storage	-30←→80°C(30min/30min) 100 cycles	0／3
B	Mechanical environmental test	Electrostatic discharge test (Non operation)	Confirms to EIAJ ED-4701/300 C=200pF,R=0Ω,V=±200V Each 3 times of discharge on and power supply and other terminals.	0／3
		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
		FPC tension test (FPC of LCD only)	Pull the FPC with the force of 3N for 10 sec. in the direction +/- 90-degree to its original direction.	0／3
		FPC bend test (FPC of LCD only)	Pull the FPC with the force of 3N for 10 sec. in the direction +/-180-degree to its original direction. Reciprocate it 3 times.	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.）

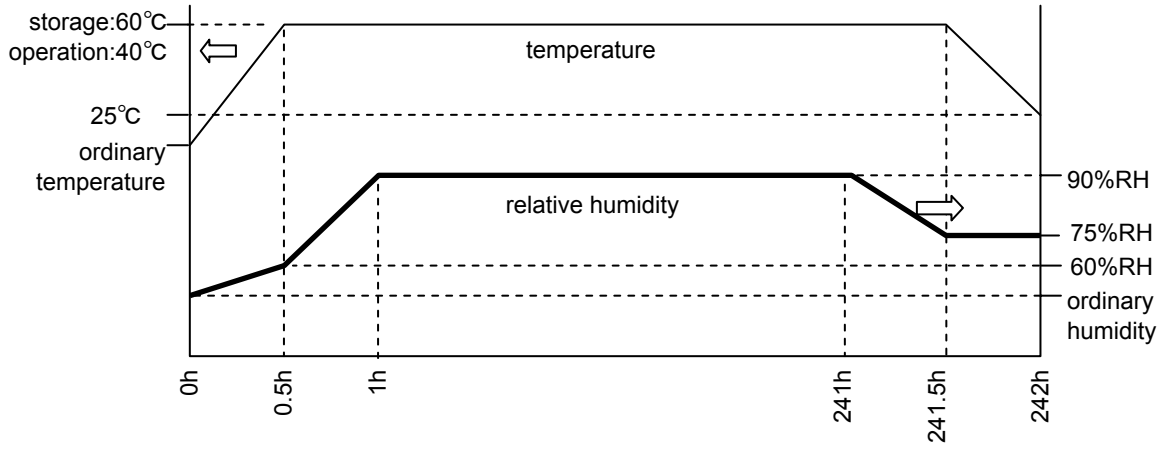
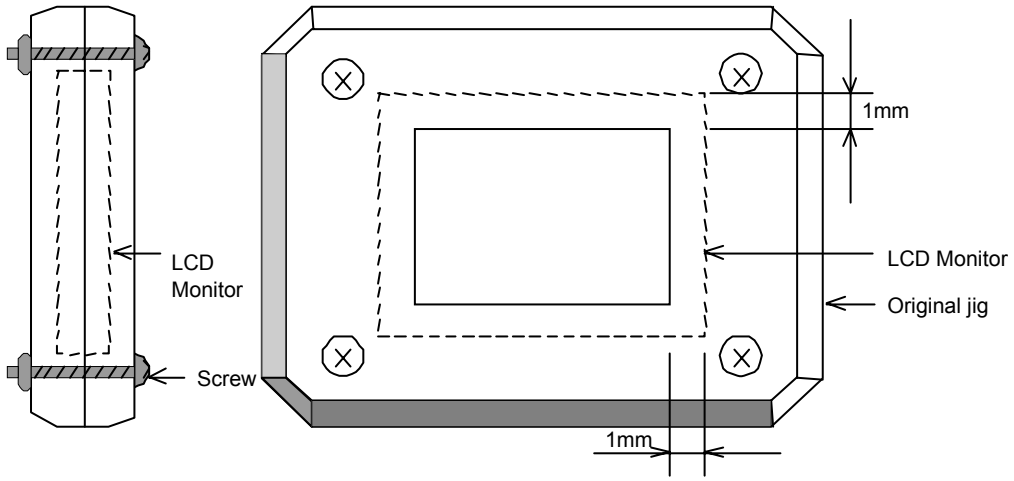


Table2.Reliability Criteria

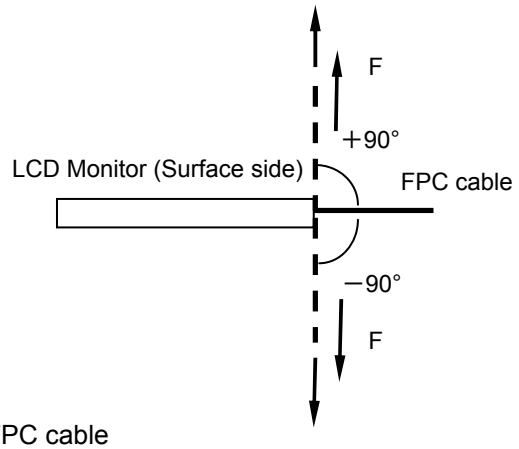
Measure the parameters after leaving the monitor at the ordinary temperature for 24 hours or more after the test completion.

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

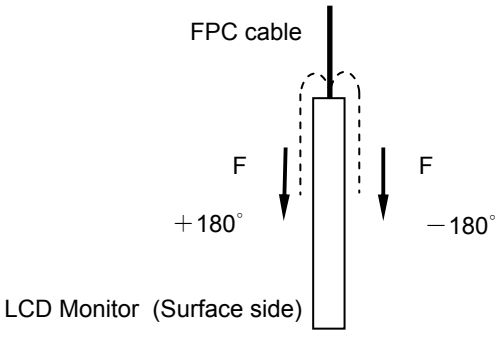
ORTUS TECHNOLOGY Original Jig



Tension Test Method for FPC cable

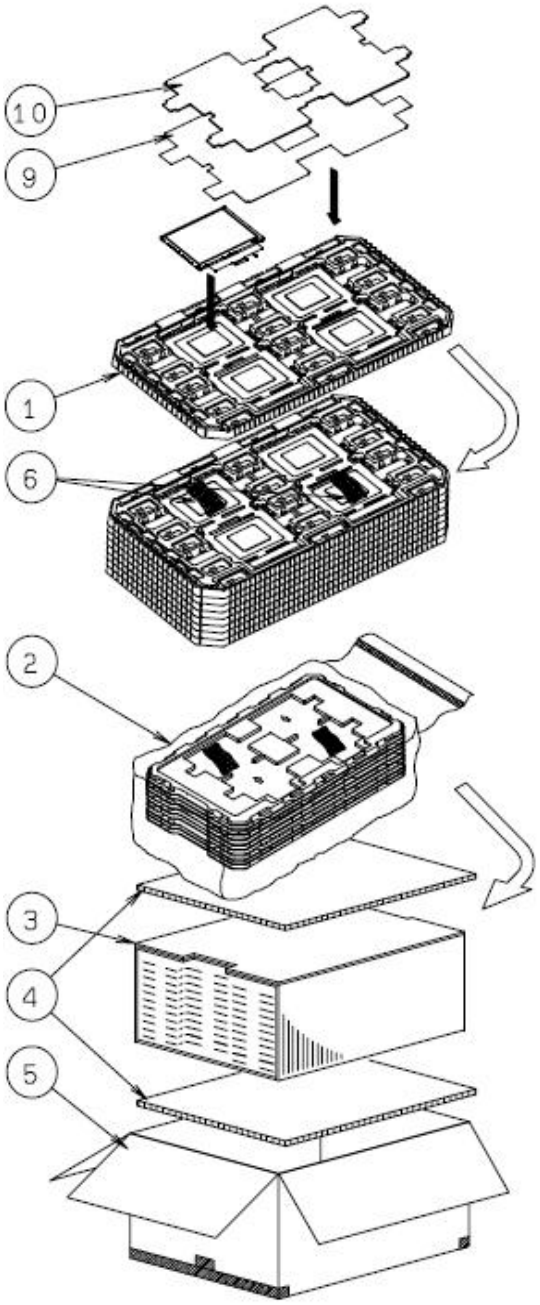


Bend Test Method for FPC cable



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.

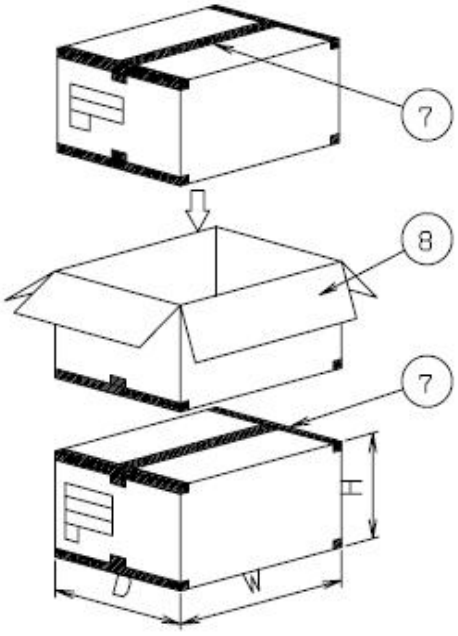
Step 4. The stack of trays in the plastic back is to be inserted into a inner carton.

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
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	Anti-static polyethilene
⑩	FOAM SHEET B	Anti-static polyethilene

Dimension of extra outer carton		
D : Approx.	(338mm)	
W : Approx.	(549mm)	
H : Approx.	(198mm)	
Quantity of products in one carton:		#REF!
Gross weight : Approx.	#REF!	

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 abnoramal operation is generated.
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 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.

8) Peel off the protective film on the TFT monitors during mounting process.
Refer to the section 14.5 on how to peel off the protective film.
We are not responsible for electrostatic discharge failures or other defects occur when peeling off the protective film.

14.3 Precautions for Operation

1) Since this TFT monitors are not equipped with light shielding for the driver IC, do not expose the driver IC to strong lights during operation as it may cause functional failures.

2) When turning off the power, turn off the input signal before or at the same timing of switching off the power.

3) Optimize VCOMDC within recommended operating conditions.
* When VCOMDC is not an optimal value, flicker and image sticking will be occuerd.

4) 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.

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

6) 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.

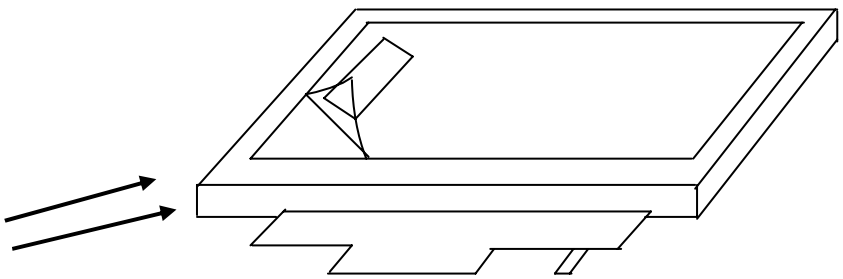
A) Work Environment

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.



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

APPENDIX

Reference Method for Measuring Optical Characteristics and Performance

1. Measurement Condition (Backlight ON)

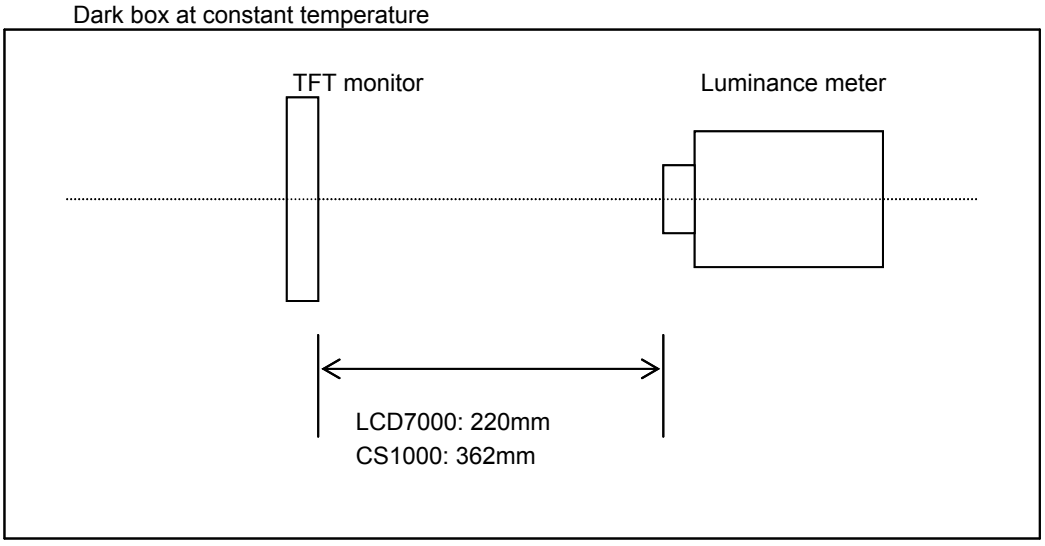
Measuring instruments: CS1000（KONICA MINOLTA）, LCD7000(OTSUKA ELECTRONICS）,EZcontrast160D（ELDIM）

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.

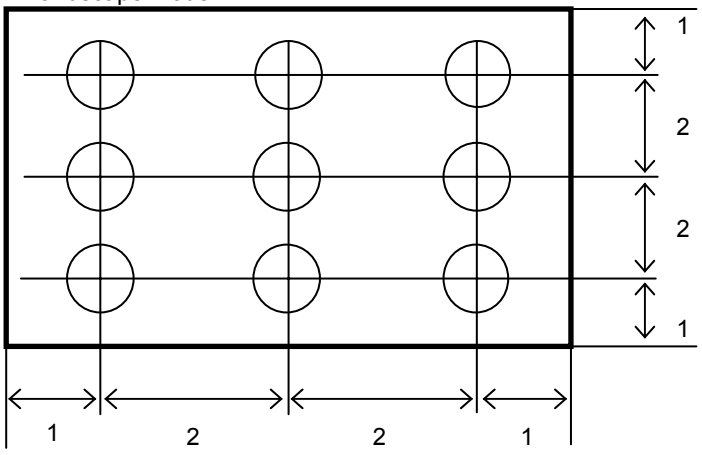
Measurement point: At the center of the screen unless otherwise specified



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>

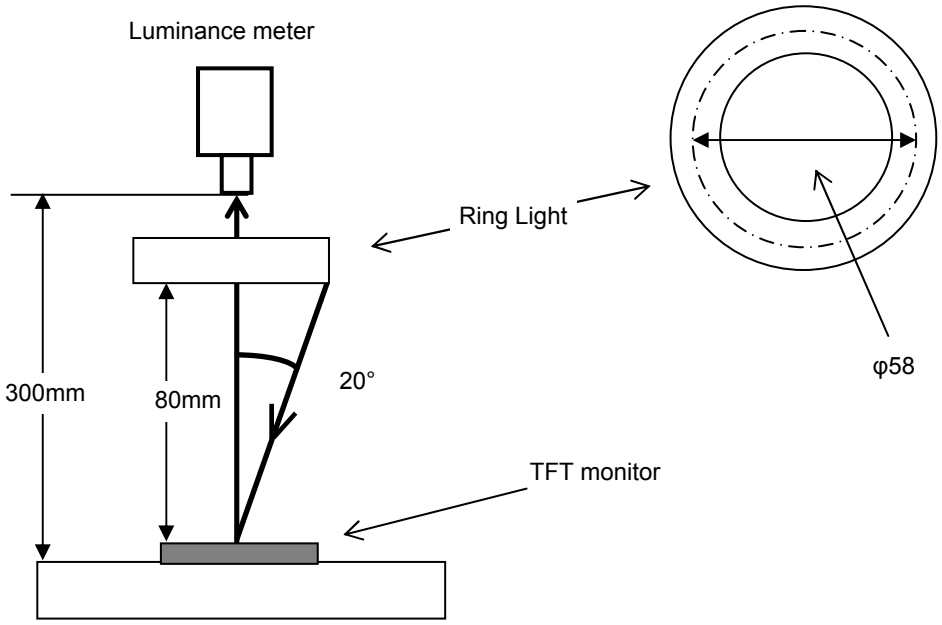


Dimensional ratio of active area

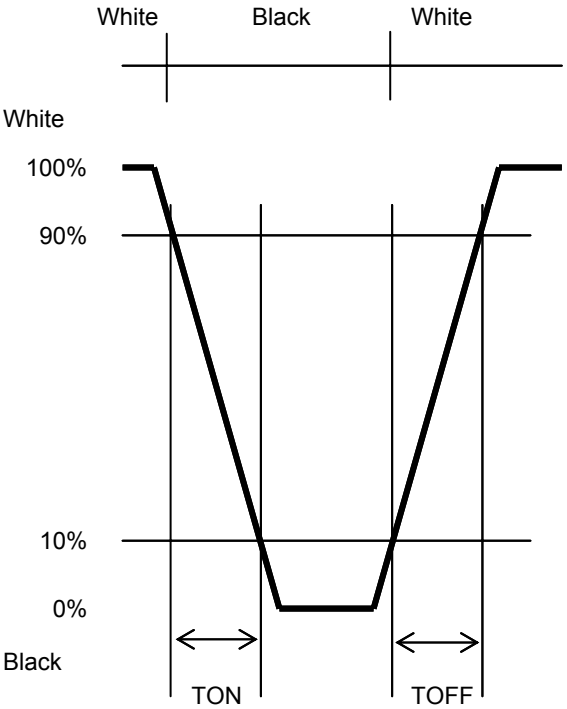
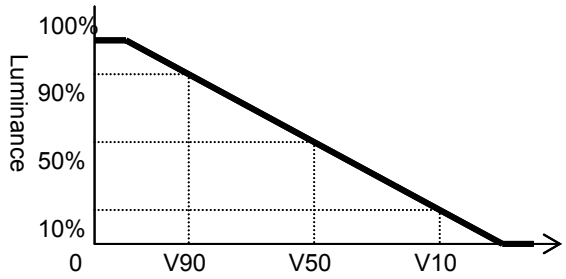
Backlight IL=15mA

Measurement Condition (Contrast ratio Backlight OFF only)

Measuring instruments:	LCD7000(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.



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.  	LCD7000	Black display VLCD=4.9V White display VLCD=0.6V TON Rise time TOFF Fall time
2	Contrast ratio	Measure maximum luminance Y1(VLCD=0.6V) and minimum luminance Y2(VLCD=4.9V) 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 LCD7000	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	V-T threshold value	Change VLCD by 0.1V step and plot the points where the luminance is 90% as V90, 50% as V50 and 10% as V10 of maximum luminance.  	LCD7000	
5	White chromaticity	Measure chromaticity coordinates x and y of CIE1931 colorimetric system at VLCD = 0.6V Color matching faction: 2°view	CS1000	

Notice	Item	Test method	Measuring instrument	Remark
6	Burn-in	Visually check burn-in image on the screen after 0.5 hours of "window display" (VLCD=0.6V/4.9V).		At optimized VCOMDC
7	Center brightness	Measure the brightness at the center of the screen.	CS1000	
8	Brightness distribution	(Brightness distribution) = 100 x B/A % A : max. brightness of the 9 points B : min. brightness of the 9 points	CS1000	