Datasheet

Ortustech

COM60H6M10DRC

SPECIFICATIONS № 18TLM025	Issue: Oct.23,2018

Specifications for

Blanview TFT-LCD Monitor
(6.0" HVGA 640 x RGB x 240 Landscape)

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

MODEL   COM60H6M10DRC

Customer's Approval

Signature:

Name:

Section:

Title:

Date:

ORTUSTECH

ORTUS TECHNOLOGY CO., LTD.

Approved by

Y. Nakajima

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ORTUS TECHNOLOGY CO.,LTD.

SPECIFICATIONS № 18TLM025	Issue: Oct.23,2018

Version History

Ver.	Date	Page		Description
1.0	Oct. 23, 2018	-	-	First issue

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Contents

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1. Application

This Specification is applicable to 151.7mm (6.0 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.

◎ It must be noted as an mechanical design manner, especial attention in housing design to prevent
   arcuation/flexureor caused by stress to the LCD module shall be considered.

◎ 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.

◎ 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,
    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

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2. Outline Specifications

2.1 Features of the Product

- 6.0 inch diagonal display, 1,920 [H] x 240 [V] dots.
- 6-bit 262,144 color display capability.
- 3.3V[TFT-LCD module] + 12V[Backlight] is required.
- Built in Timing generator (TG).
- High brightness LED back-light,built in LED driver and Touch panel operation monitor.
- 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	High bright white LED.	
Touch panel	Resistance type,transmissive analog tablet	Surface finishing:Clear
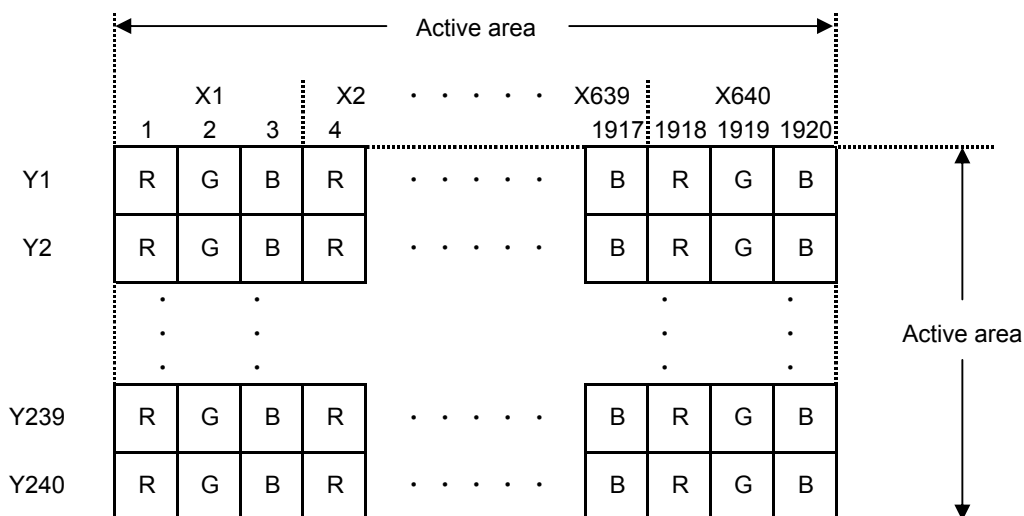
(When loading slot of user connector on the back is placed at the top side)

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<Features of Blanview>

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

*Comparison with our conventional products

Transmissive

Backlight power consumption (mW)

800

600

Transmissivity is low,
requiring a power-hungry
backlight

Power-hungry backlight
that competes effectively
with outdoor light is
required.

400

Transflective

Improved contrast,
whiteness and
outdoor visibility.

200

100

Blanview

0

| 10 | 100 | 1,000 | 10,000 | 100,000 |
| Moonlight | Warehouse | Office | Cloudy weather | Fine weather |

Surrounding illumination (lx)

- 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)

*Comparison with our conventional products

Contrast

Blanview

Transflective

Standard

Transmissive

| 0 | 200 | 400 | 600 | 800 | 1000 |

Panel surface brightness (cd/m^2)

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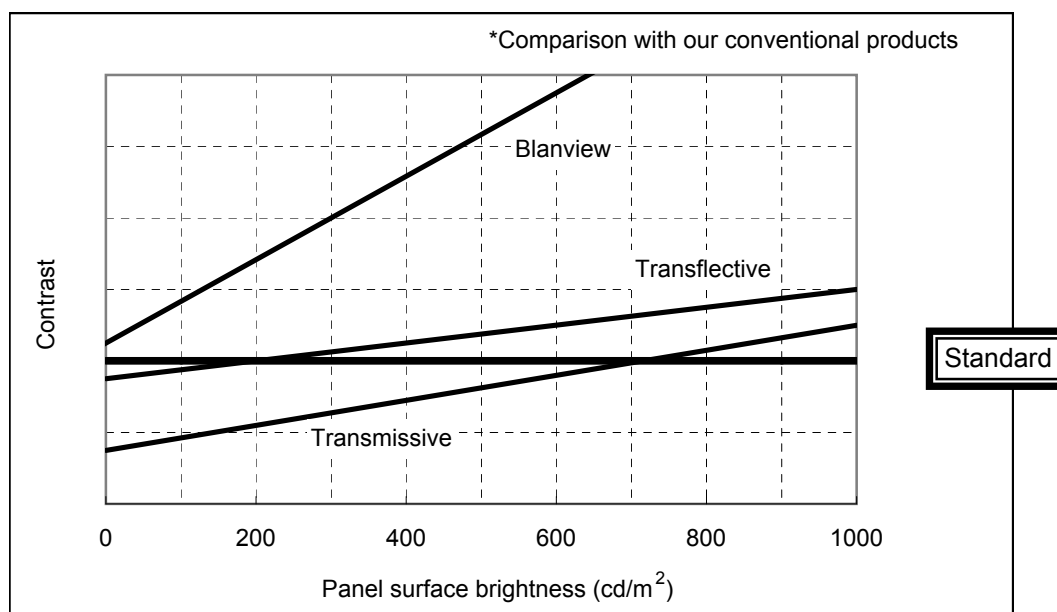
3. Dimensions and Shape

3.1 Dimensions

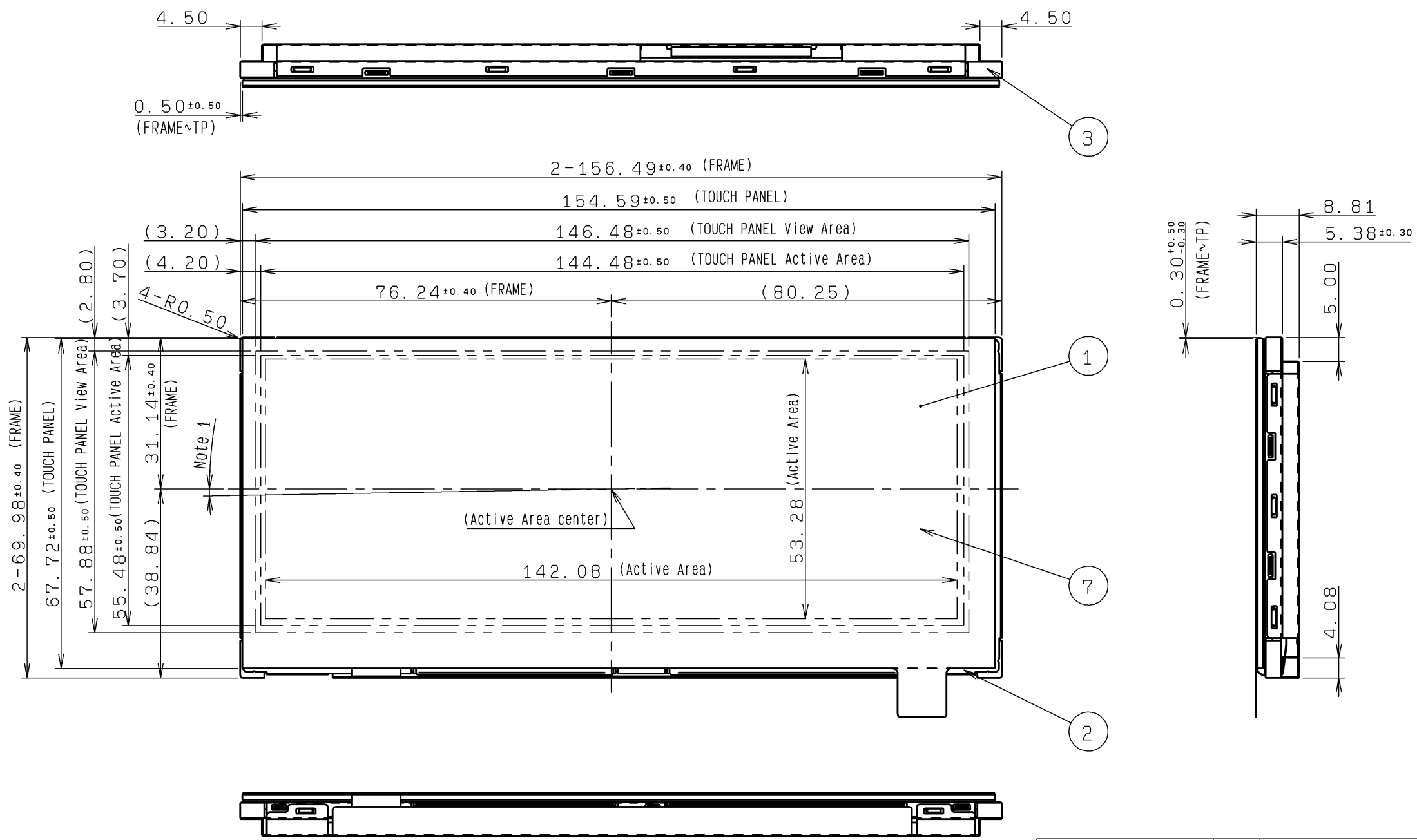| Items	Specifications	Unit	Remarks
Outline dimensions	156.49[H] × 69.98[V] × 8.81[D]	mm	
Active area	142.08[H] × 53.28[V]	mm	151.7mm diagonal
Number of dots	1,920[H] × 240[V]	dot	
Dot pitch	74[H] × 222[V]	µm	
Hardness of Touch Panel surface	3	H	Load:4.9N,Angle:45˚ Reference judgment standard:JIS-K5600
Weight	137	g	

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

Front

4.50   4.50

0.50±0.50
(FRAME~TP)

2-156.49±0.40 (FRAME)
154.59±0.50 (TOUCH PANEL)
146.48±0.50 (TOUCH PANEL View Area)
144.48±0.50 (TOUCH PANEL Active Area)
76.24±0.40 (FRAME)   (80.25)

8.81
5.38±0.30

0.30 +0.50/-0.30 (FRAME~TP)

5.00

(3.20)
(4.20)
4-R0.50

2-69.98±0.40 (FRAME)
67.72±0.50 (TOUCH PANEL)
57.88±0.50 (TOUCH PANEL View Area)
55.48±0.50 (TOUCH PANEL Active Area)
(2.80)
(3.70)
31.14±0.40 (FRAME)
Note 1
(38.84)

53.28 (Active Area)
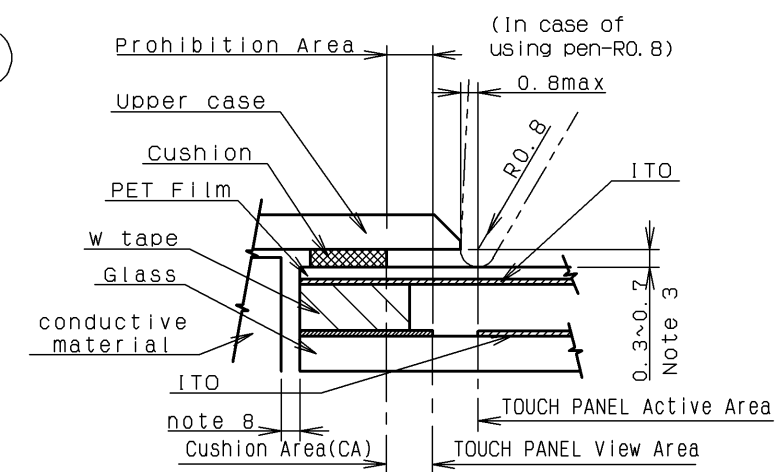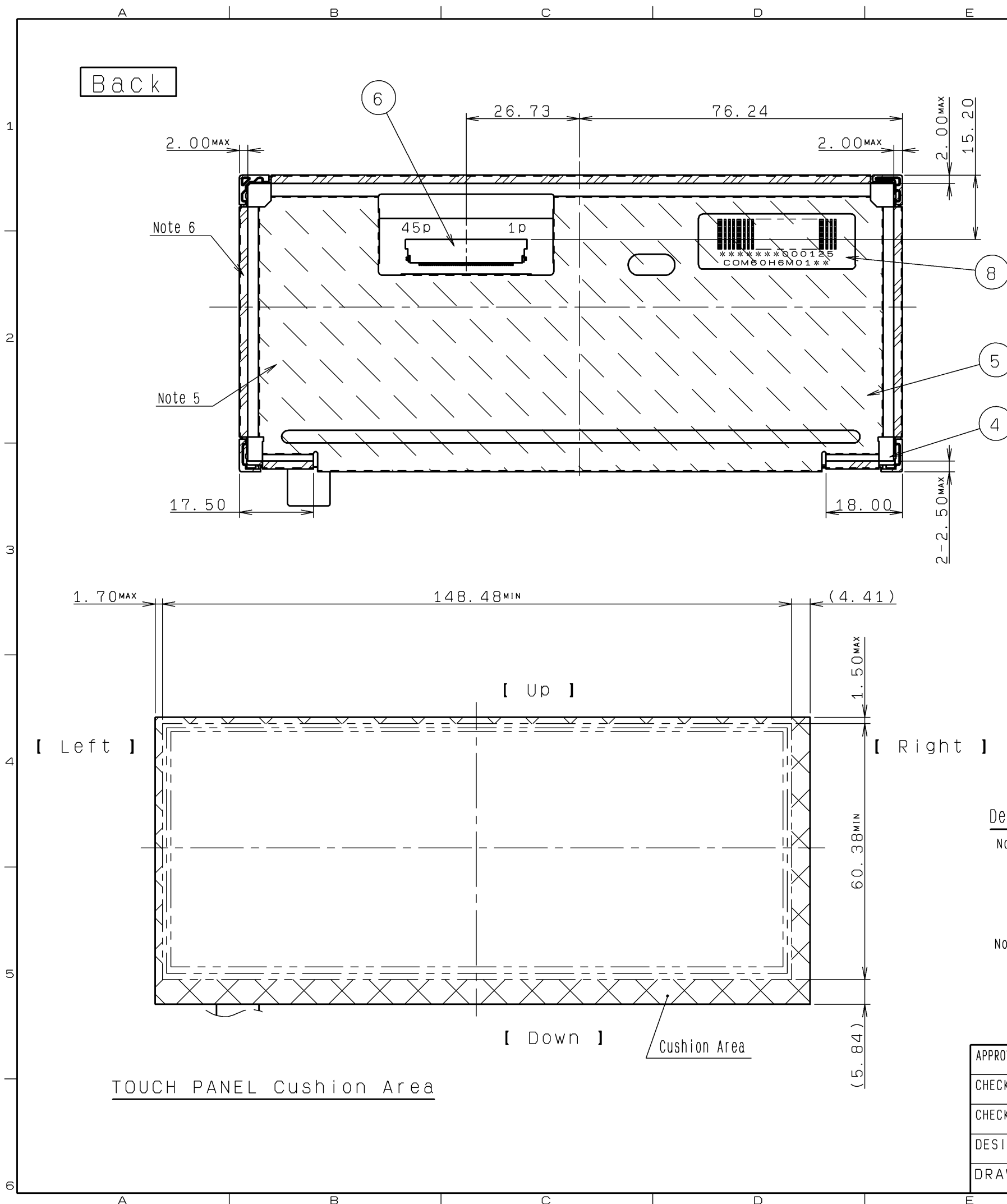(Active Area)

(Active Area center)

142.08 (Active Area)

4.08

Note 1. Angular deviation of LCD cell from the TFT-LCD monitor's reference
  axis shall be less than [±50'].
Note 2. Protective film is affixed on front surface of the screen.
  Location tolerance of the protective film shall be ±3.0 mm to the TOUCH PANEL.
Note 3. Keep a gap, for example 0.3 to 0.7mm between the bezel edge and touch panel surface
  to avoid the bezel edge from making contacting with the touch panel surface
  that may cause a "false touch" with the bottom layer.
Note 4. Linearity is guaranteed in the area surrounded by 3mm inside lines from TOUCH PANEL Active Area.
Note 5. Exercise care not to apply any forces to the hatching area of the S case D.
Note 6. The hatching area is recommended holding area.
Note 7. Recommended dimensions of housing in case of using pen(R0.8)
  (refer to 'Example of Housing Design')
Note 8. The end part of glass and film has conductivity.
  Please design the construction not to touch conductive material.
Note 9. Refer to "12.CRITERIA OF JUDGMENT" about the appearance specification of a polarizer and touch panel.

PART NAME	ITEM	MATERIAL GRADE	REMARK
B LABEL	8	Barcode(CODE39)	(37X13X0.075t)
TOUCH PANEL	7	Film-Glass(1.1t)	Surface finishing : Clear
CONNECTOR	6	04 6240 045 023 846+(FFC)(KYOCERA)	pitch0.5x45pin(Lower contact)
S CASE D	5		
S CASE C	4		
FRAME	3		
S CASE A	2		
TFT LCD PANEL	1	Glass substrate thickness=0.5t	

APPROVED 橋爪	GENERAL TOLERANCE ±1.0	SCALE 1/1	UNIT mm	**ORTUSTECH** ORTUS TECHNOLOGY CO.,LTD. DO NOT DUPLICATE. CONFIDENTIAL AND PROPRIETARY
CHECKED 平信	ISSUE (Y:M:D) 15:06:01	MODEL COM60H6M10D※※		
CHECKED	NAME			
DESIGN 原田竜仁		OUTLINE-D6M10		DRAWING NO. RJD527196D301	REV.	SHEET 1/2	DIV.	PART
DRAW 原田竜仁				

Back

Note 6

Note 5

45p   1p

COM60H6M01

26.73   76.24

15.20

2.00MAX

2.00MAX   2.00MAX

17.50   18.00   2-2.50MAX

1.70MAX   148.48MIN   (4.41)

1.50MAX

60.38MIN

(5.84)

[Up]

[Left]   [Right]

[Down]   Cushion Area

TOUCH PANEL Cushion Area

Note 7 Example of Housing Design
(S=Free)

Prohibition Area
Upper case
Cushion
PET Film
W tape
Glass
conductive
material
ITO
note 8
Cushion Area(CA)

(In case of
using pen-R0.8)
0.8max
R0.8
ITO
0.3~0.7 Note 3
TOUCH PANEL Active Area
TOUCH PANEL View Area

Design guidance for the Housing & the cushion

Note 9. Upper case opening
  a. Please place the upper case opening to maintain the operation
     by a stylus pen inside the TP response area.
  b. The any pressures in the area between TP response area and TP view area
     is prohibited.

Note10. Cushion design
  a. Please put the cushion on the upper case.
  b. Do not use an adhesive tape to stick on the TP surface.
  c. Please position the cushion over the cushion area to avoid a short.

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

APPROVED 橋爪	GENERAL TOLERANCE ±1.0	SCALE 1/1	UNIT mm	ORTUSTECH
CHECKED 平信	ISSUE (Y:M:D) 15:06:01	MODEL COM60H6M10D※※		ORTUS TECHNOLOGY CO.,LTD. DO NOT DUPLICATE, CONFIDENTIAL AND PROPRIETARY
CHECKED	NAME			
DESIGN 原田竜仁			DRAWING No.	REV. SHEET DIV.
DRAW 原田竜仁	OUTLINE-D6M10		RJD527196D301	2/2

A1D6 6M10 RJD527196D310103 2 10/19/18 14:20

2004.2 DEVICE-TFT

3.3 SERIAL LABEL (S-LABEL)

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

A section →

B section →

* * * * * * * 0 0 0 1 2 5
C O M 6 0 H 6 M 1 0 D R C
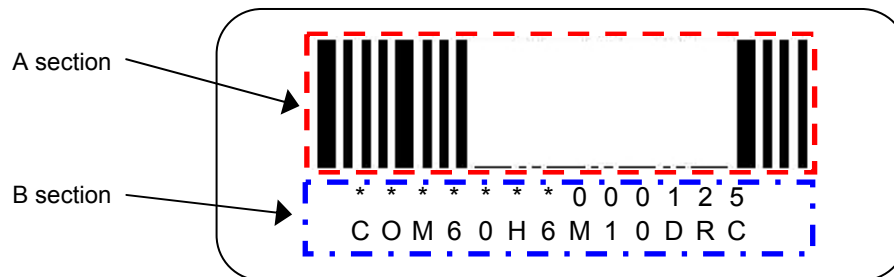
Details of B section

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

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

	Contents of display						
a	The least significant digit of manufacture year						
b	Manufacture month	Jan-A	Mar-C	May-E	Jul-G	Sep-I	Nov-K
		Feb-B	Apr-D	Jun-F	Aug-H	Oct-J	Dec-L
c	Model code	60HC (Made in Japan)					
		60JC (Made in Malaysia)					
d	Serial number						

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

    8J60HC000125   8J60JC000125

means "manufactured in October 2018, 6.0" H type,   means "manufactured in October 2018, 6.0" J type,
C specifications, serial number 000125"   C specifications, serial number 000125"

    Lower column: Model (13characters)

2) Location of Serial Label (S-label)
    Refer to 3.2 "Outward Form".

2) Others
    Bar code readability is excluded from quality assurance coverage.

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4. Pin Assignment

No.	Symbol	Function
1	YU	Y-axis upside terminal
2	XR	X-axis right terminal
3	YD	Y-axis downside terminal
4	XL	X-axis left terminal
5	NC	OPEN
6	GND	Ground
7	DISP	Display on/off control signal.(Lo：display off、Hi：display on)
8	DE	Input data effective signal. (It is effective for the period of "Hi")
9	VSYNC	Vertical sync signal. (Low active)
10	HSYNC	Horizontal sync signal. (Low active)
11	GND	Ground
12	DCLK	Clock signal.Latching data at the rising edge.
13	GND	Ground
14	B5	Display data(B).
15	B4	00h: Black
16	B3	B0:LSB B5:MSB
17	B2	
18	B1	
19	B0	
20	GND	Ground
21	G5	Display data(G).
22	G4	00h: Black
23	G3	G0:LSB G5:MSB
24	G2	
25	G1	
26	G0	
27	GND	Ground
28	R5	Display data(R).
29	R4	00h: Black
30	R3	R0:LSB R5:MSB
31	R2	
32	R1	
33	R0	
34	GND	Ground
35	RL	Horizontally Flipped (right/left) Signal. (Lo: Horizontally Flipped Display, Hi: Normal display)
36	GND	Ground
37	GND	Ground
38	VDD	Power supply input.(+3.3V)
39	VDD	Power supply input.(+3.3V)
40	VBL	Power supply input.(Backlight) (+12V)
41	VBL	Power supply input.(Backlight) (+12V)
42	PDM	Brightness control pulse signal. (Lo:0%(Backlight off) brightness, Hi:100%)
43	GND	Ground
44	GND	Ground
45	GND	Ground

- Used connector: KYOCERA 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.
- 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.

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5. Block Diagram

Each arrow shows signal flow.
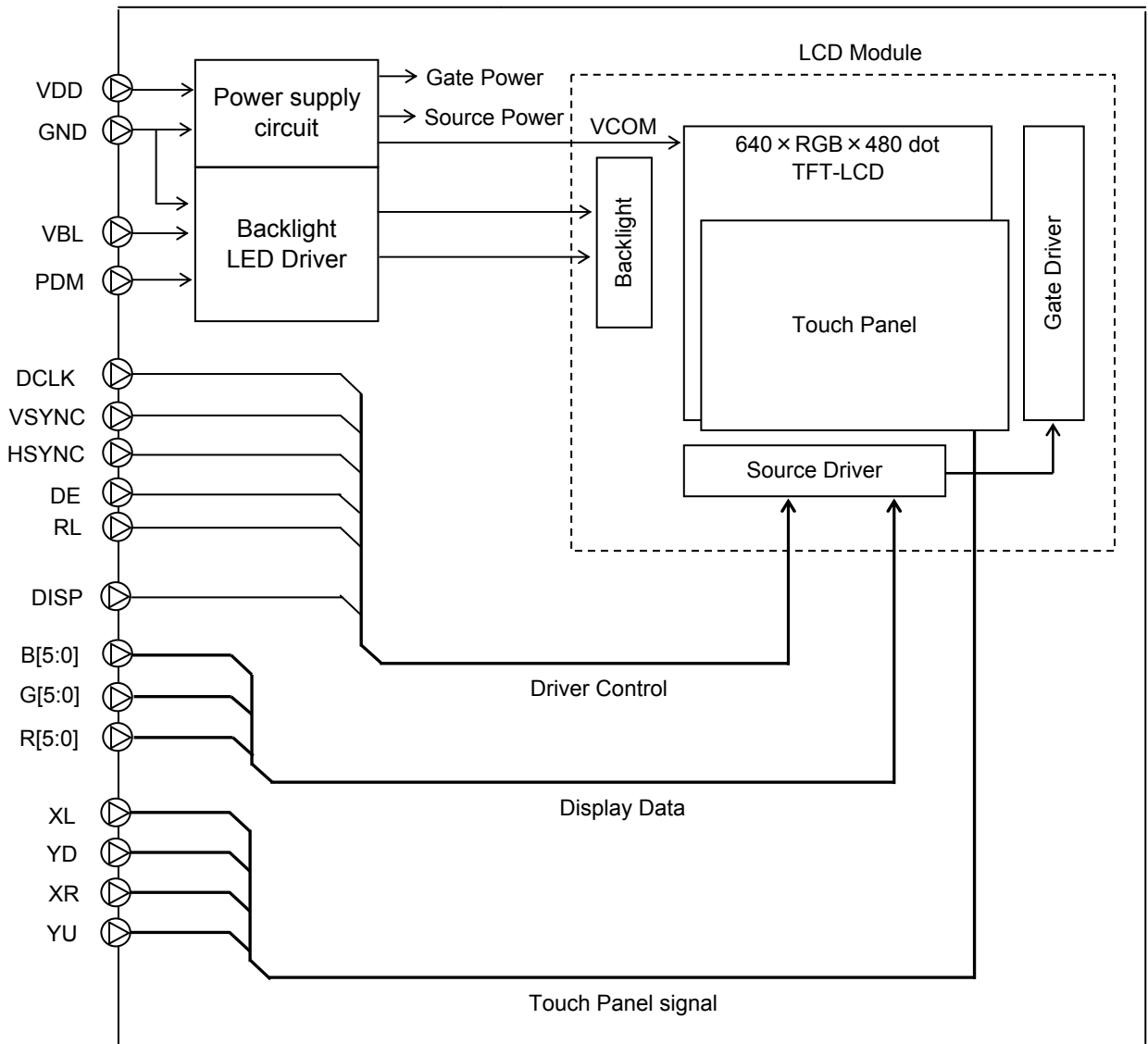
6. Absolute Maximum Rating

GND=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	DCLK,VSYNC,HSYNC,DE, B[5:0],G[5:0],R[5:0],RL,DISP
Supply voltage for Backlight	VBL		-0.3	14.0	V	VBL
Input voltage for Backlight	VIP		-0.3	7.0	V	PDM
Input voltage for Touch Panel	VIT		--	7.0	V	XR,XL,YU,YD
Storage temperature range	Tstg		-30	80	℃	
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

GND=0V

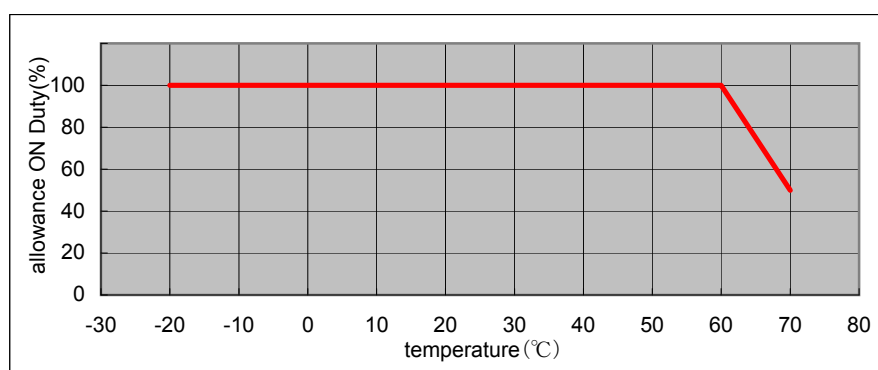| Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Supply voltage	VDD		3.0	3.3	3.6	V	VDD
Supply voltage for Backlight	VBL	VDD=3.0~	10.8	12.0	13.2	V	VBL
Input voltage for logic	VI	3.6V	0	--	VDD	V	DCLK,VSYNC,DE, HSYNC,RL,DISP, B[5:0],G[5:0],R[5:0]
Input voltage for Backlight	VIP		0	--	VDD	V	PDM
Operating temperature range	Top	Note1,2,3	-20	25	70	˚C	Touch 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 "11. CHARACTERISTICS".
Note3: Allowance ON Duty of LED changes depending on the ambient temperature.
Do not exceed Allowable ON Duty shown on the chart below.

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8. Characteristics

8.1 DC Characteristics

8.1.1 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×VDD	--	VDD	V	DCLK,VSYNC, HSYNC,DE,
	VIL		0	--	0.3×VDD	V	B[5:0],G[5:0],R[5:0], RL,DISP
Pull down resister value	Rpd		300	450	600	kΩ	DE,B[5:0],G[5:0], R[5:0]
Pull up resister value	Rpu		300	450	600	kΩ	DISP
Current consumption	IDD	fCLK=12.5MHz Color bar display	--	120	240	mA	VDD

8.1.2 Backlight

(Unless otherwise noted, Ta=25°C,VDD=3.3V,VBL=12.0V,GND=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%	--	65	100	mA	VBL
Estimated Life of LED	LL	Note1	―	50,000	―	hr	

Note1: <u>Life is defined as the brightness decrease to half of its initial brightness.</u>
  <u>This number is for reference, and not a guaranteed spec.</u>
  <u>This presumption value shows the estimated life expectancy in LED side light single purpose operation.</u>
  <u>It is different from presumption with the monitoring because the environment is different.</u>
  <u>Life is depend on environmental temperature. Especially using high temperature decreases life.</u>

8.1.3 Touch Panel

Ta=25°C

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Linearity	LE	Note	-3	--	+3	%	
Insulation resistance	RI	DC 25V	20	--	--	MΩ	XR,XL-YU,YD
Terminal resistance		X	400	--	1050	Ω	XR,XL
		Y	100	--	500		YU,YD
Rated voltage		DC	--	5.0	7.0	V	XR,XL,YU,YD
on/off chattering		R0.8mm Polyacetal pen.	--	--	10	ms	

Note: -Please refer to "3.2 Outward Form" for the range of the guarantee.
   -Linearity Measurement:Refer to the APPENDIX of "Reference Method for Measuring Optical Characteristics".
    Load:2.45N

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8.2 AC Characteristics

8.2.1 Display Module

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

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
CLK frequency	fCLK		--	12.5	15	MHz	DCLK
CLK Low period	tw1L	0.3×VDD or less	14.8	--	--	ns	DCLK
CLK High period	tw1H	0.7×VDD or more	14.8	--	--	ns	DCLK
Setup time	tsp		10	--	--	ns	DCLK,DE,B[5:0],
Hold time	thd		10	--	--	ns	G[5:0],R[5:0], HSYNC,VSYNC

8.2.2 Backlight

(Unless otherwise noted, Ta=25°C,VDD=3.3V,VBL=12.0V,GND=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.

ORTUS TECHNOLOGY CO.,LTD.
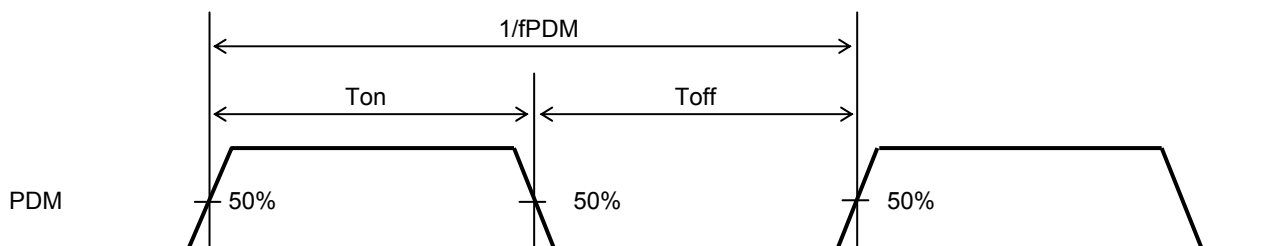
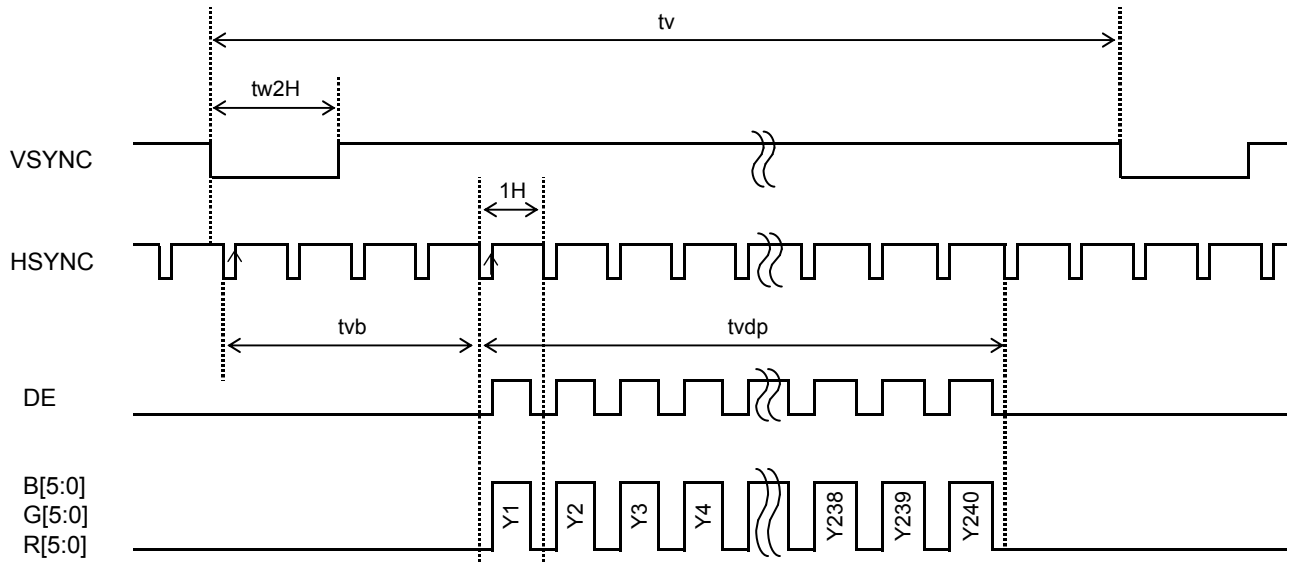Switching Waveform Characteristics

*:INVALID

ORTUS TECHNOLOGY CO.,LTD.
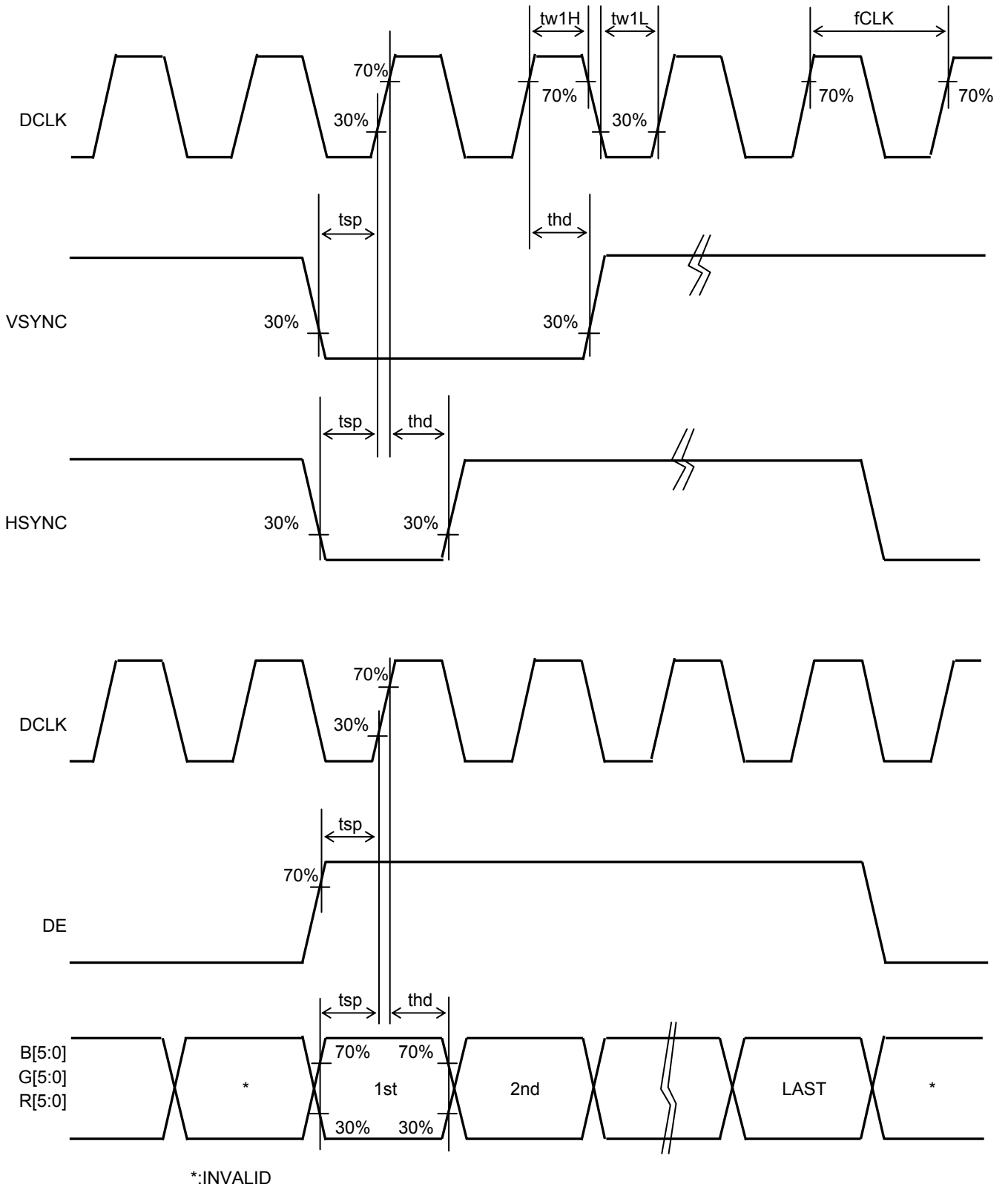
8.3 Input Timing Characteristics

Item	Symbol	Rating			Unit	Applicable terminal
		MIN	TYP	MAX		
CLK frequency	fCLK	--	12.5	15	MHz	DCLK
VSYNC signal cycle time	tv	250	260	--	H	VSYNC,HSYNC
VSYNC frequency	fVSYNC	54	60	66	Hz	VSYNC
VSYNC pulse width	tw2H	1	3	5	H	VSYNC,HSYNC
Vertical back porch	tvb	--	10	--	H	VSYNC,HSYNC,DE,
Vertical display period	tvdp	--	240	--	H	B[5:0],G[5:0],R[5:0]
HSYNC signal cycle time	th	--	800	--	CLK	HSYNC,DCLK
HSYNC pulse width	tw3H	5	30	--	CLK	
Horizontal back porch	thb	104	120	136	CLK	HSYNC,DCLK,DE,
Horizontal display period	thdp	--	640	--	CLK	B[5:0],G[5:0],R[5:0]
DE pulse width	tw4H	--	640	--	CLK	DE,DCLK

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8.4 Driving Timing Chart

-Vertical Timing

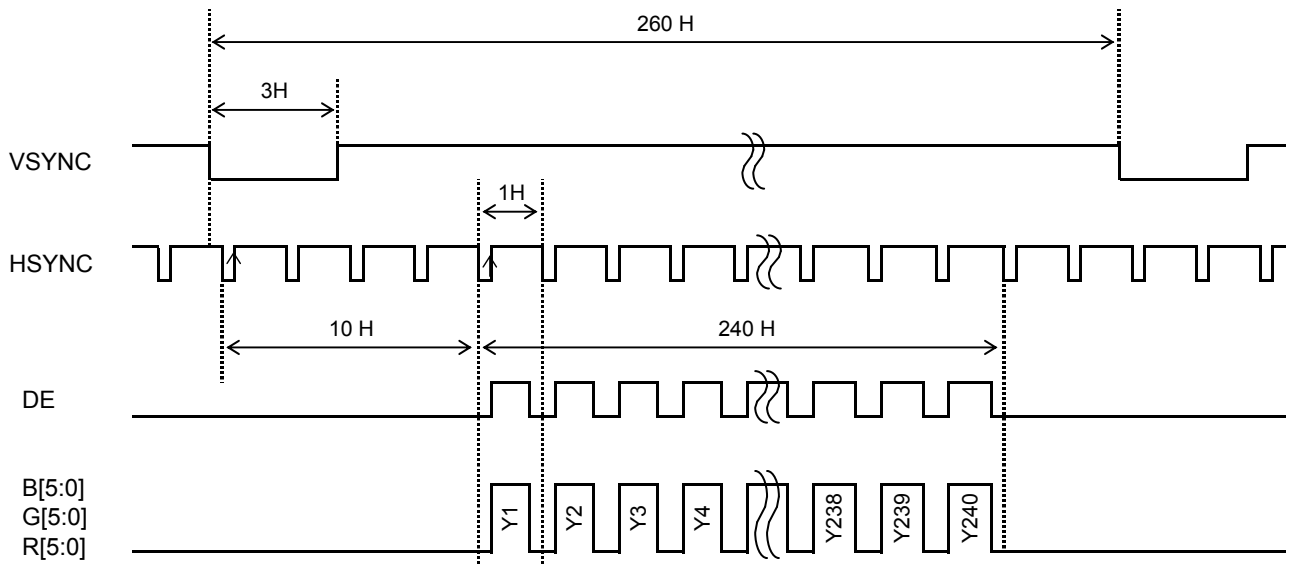-Horizontal Timing

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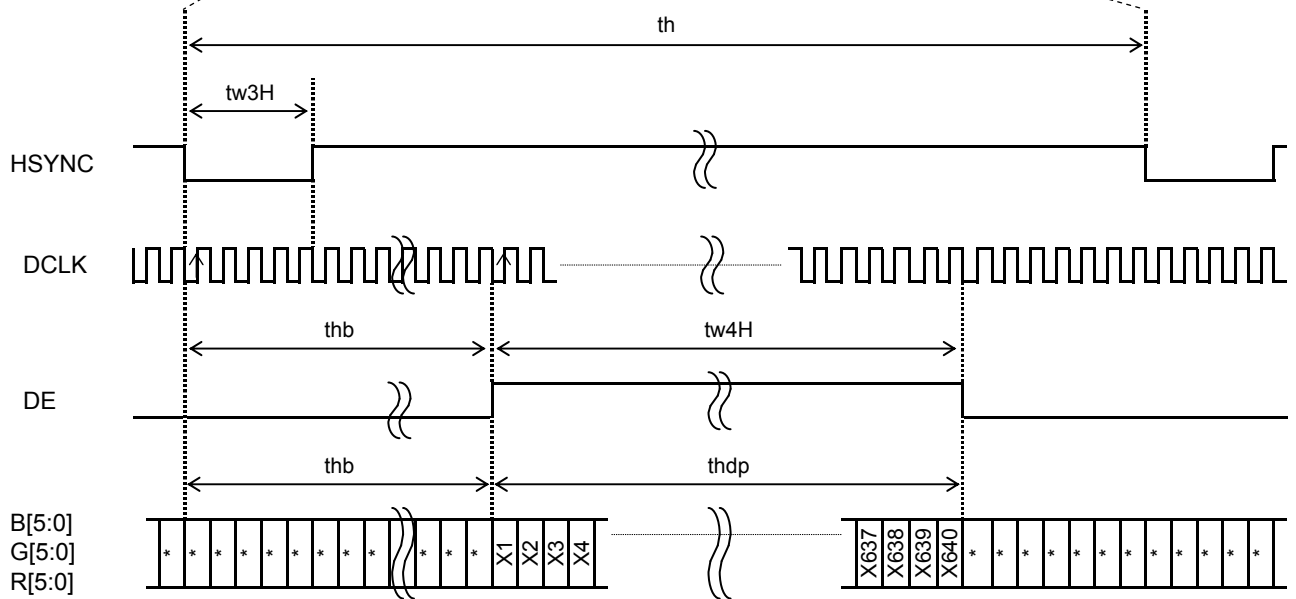
8.5 Example of Driving Timing Chart (fCLK=12.5MHz)
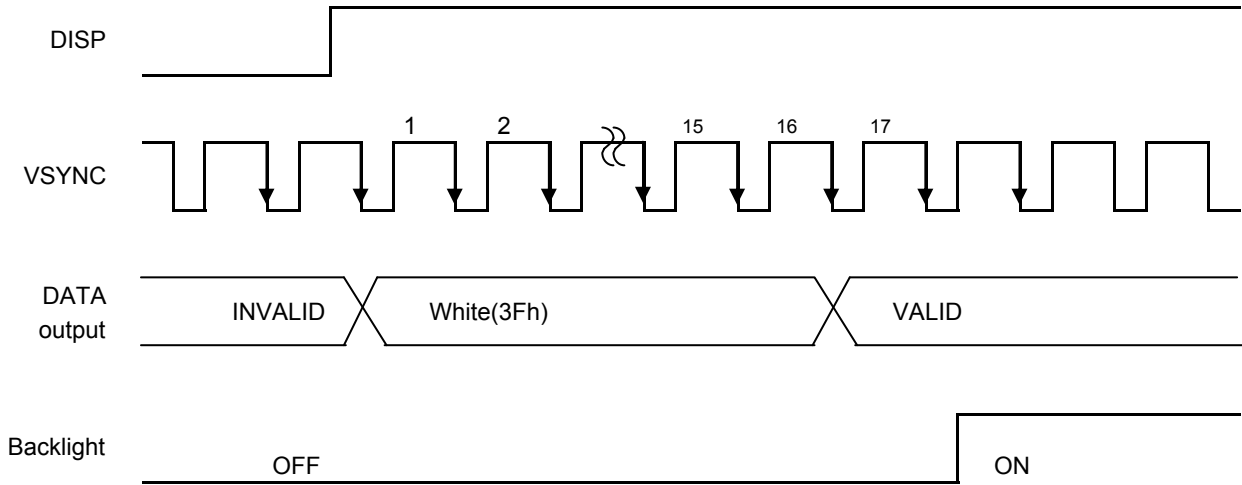
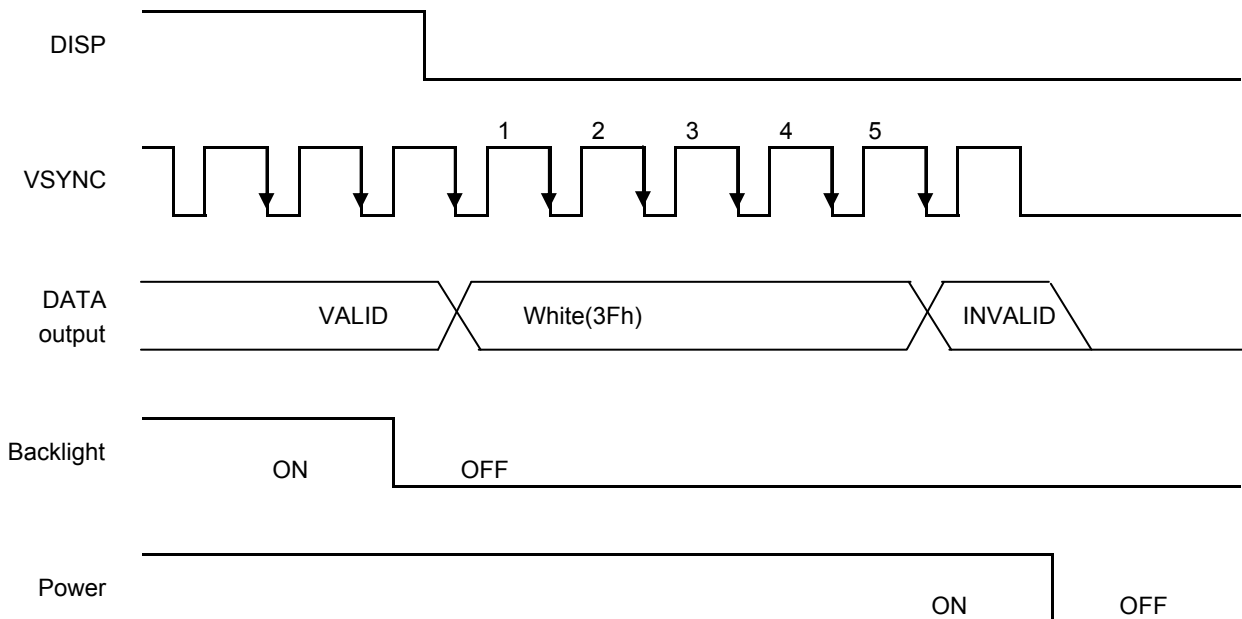-Vertical Timing

-Horizontal Timing

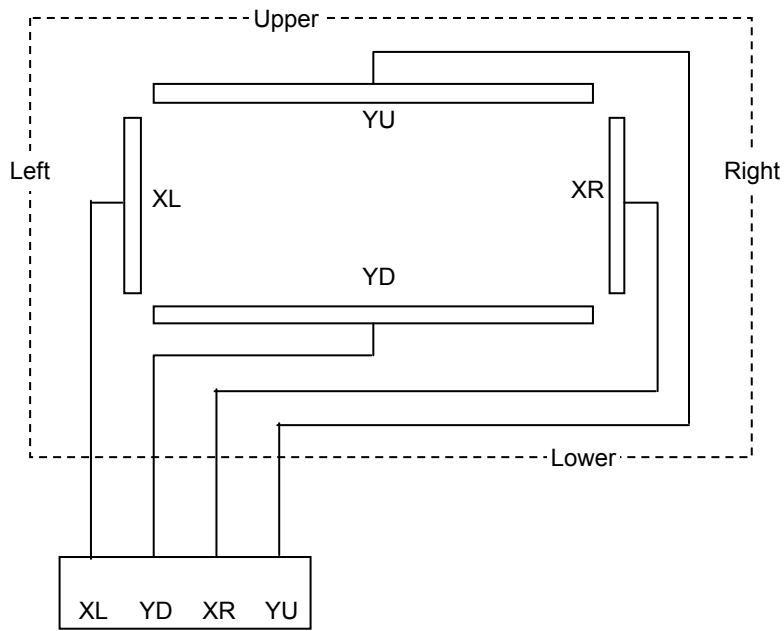ORTUS TECHNOLOGY CO.,LTD.
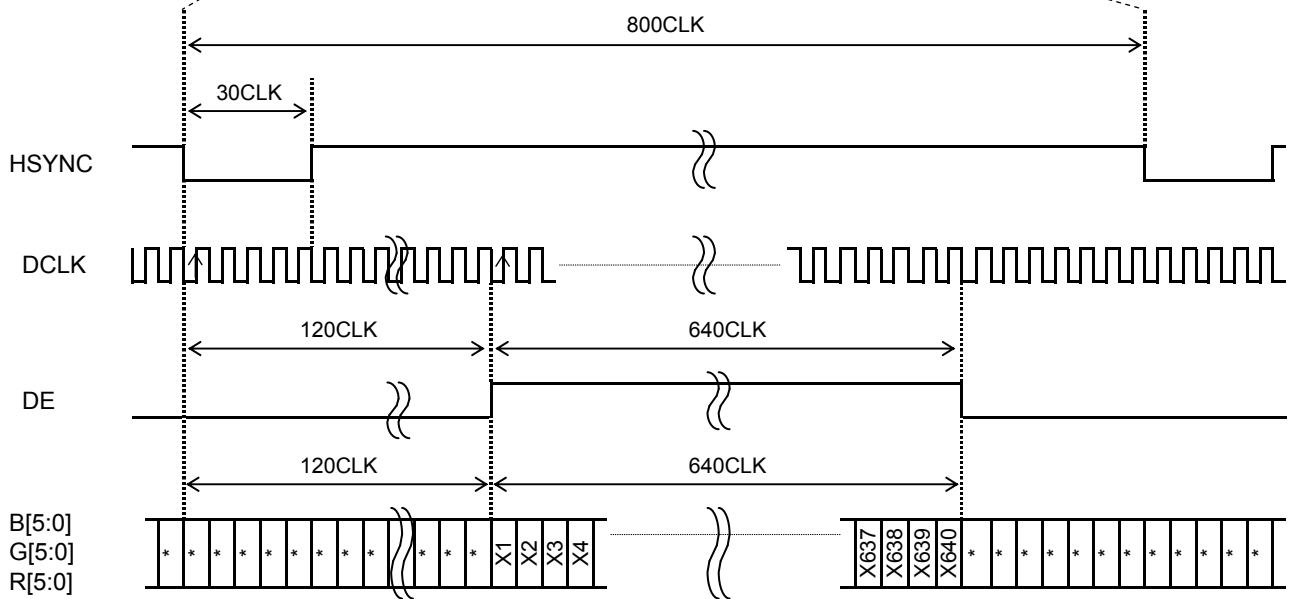
9. "DISP" on/off Sequence

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

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10. Touch Panel Circuit

11. Characteristics

11.1 Optical Characteristics

< Measurement Condition >

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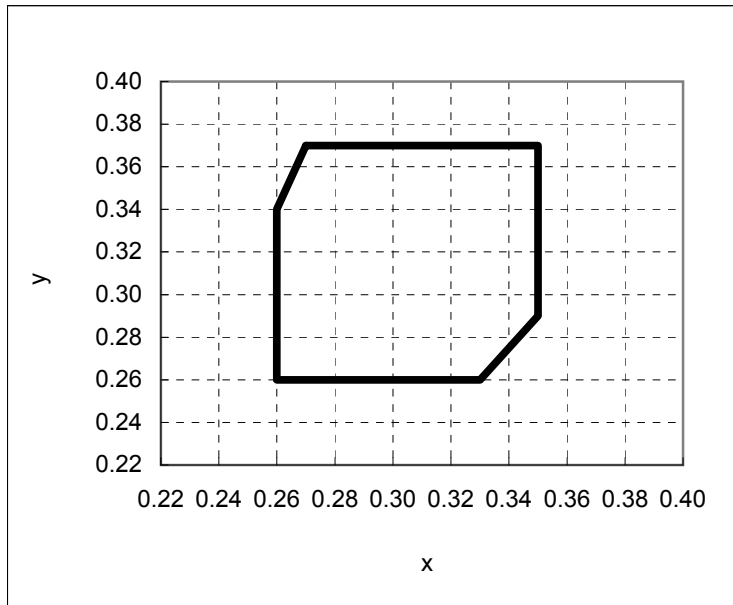Driving condition:　　　VDD = 3.3V, VSS = 0V
　　　　　　　　　　　　Optimized VCOMDC
Backlight:　　　　　　　VBL=12.0V（Brightness control ON Duty=100%）
Measured temperature:　Ta=25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Note No.	Remark
Response time	Rise time	TON	[Data]= 00h→3Fh	—	—	40	ms	1	
	Fall time	TOFF	[Data]= 3Fh→00h	—	—	60	ms		
Contrast ratio	Backlight ON	CR	[Data]= 3Fh / 00h	180	300	—		2	
	Backlight OFF			—	5	—			
Viewing angle	Left	θL	[Data]= 3Fh / 00h CR≧10	35	—	—	deg	3	
	Right	θR		35	—	—	deg		
	Up	φU		15	—	—	deg		
	Down	φD		60	—	—	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	350	500	—	cd/m^2	6	Iled=40mA
Brightness distribution			[Data]=3Fh	70	—	—	%	7	

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

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【White Chromaticity Range】

x	y
0.27	0.37
0.26	0.34
0.26	0.26
0.33	0.26
0.35	0.29
0.35	0.37

White Chromaticity Range

11.2 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.		

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12. Criteria of Judgment

12.1 Defective Display and Screen Quality

Test Condition: Observed TFT-LCD monitor from front during operation
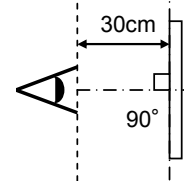   with the following conditions

Driving Signal   Raster Patter (RGB, white, black)
Signal condition   [Data]:3Fh, 1Ah, 00h (3steps)
Observation distance 30 cm
Illuminance   200 to 350 lx
Backlight   VBL=12.0V（Brightness control ON Duty=100%）

30cm

90°

Defect item		Defect content		Criteria
Display Quality	Line defect	Black, white or color line, 3 or more neighboring defective dots		Not exists
	Dot defect	Uneven brightness on dot-by-dot base due to defective TFT or CF, or dust is counted as dot defect (brighter dot, darker dot) 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]=1Ah		Refer to table 1
		Invisible through 5% ND filter at [Data]=00h		Acceptable
Screen Quality	Dirt	Uneven brightness (white stain, black stain etc)		Invisible through 5% ND filter at Black screen. Invisible through 1% ND filter at other screen.
	Foreign particle	Point-like	0.25mm< φ	N=0
			0.20mm< φ ≦0.25mm	N≦3
			φ ≦0.20mm	Acceptable
		Liner	3.0mm<length and 0.08mm<width	N=0
			length≦3.0mm or width≦0.08mm	Acceptable
	Flaw	Flaw on the surface of the Touch panel	0.05mm<W	Conform to the criteria of point-like foreign particles.
		0.03<W≦0.05mm	2<L≦5mm	N≦5
			L≦2mm	Acceptable
		W≦0.03mm		Acceptable
	Others			Use boundary sample for judgment when necessary

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

Table 1

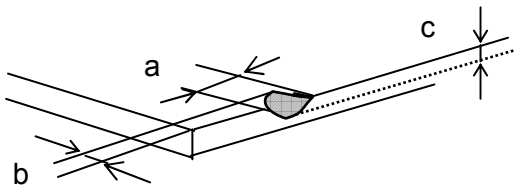| Area	High bright dot	Low bright dot	Dark dot	Total	Criteria
A	0	2	2	3	Permissible distance between same color bright dots (includes neighboring dots): 3 mm or more
B	2	4	4	6	Permissible distance between same color high bright dots (includes neighboring dots): 5 mm or more
Total	2	4	4	7	

<Landscape model>

B zone

A zone

1

4

1

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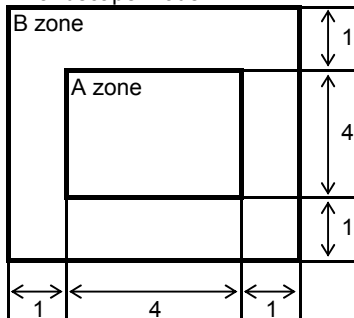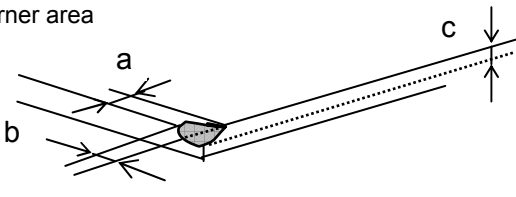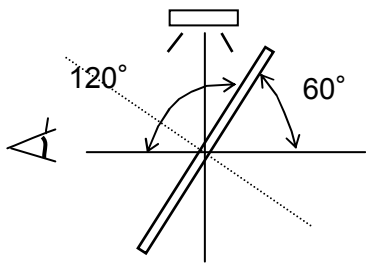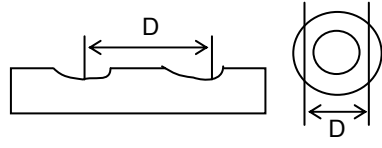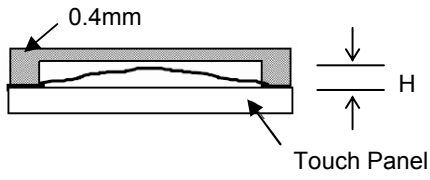
Division of A and B areas
    B area: Active area
    Dimensional ratio between A and B areas: 1: 4: 1
    (Refer to the left figure)

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12.2 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	

Item		Appearance	Criteria
Touch Panel	Glass chipping	Corner area 	Unit:mm $a \leqq 3$ $b \leqq 3$ $c \leqq t$　　　（t: glass thickness） $a, b \leqq 0.5$ is acceptable $n \leqq 2$
		Others 	Unit:mm $a \leqq 5$ $b \leqq 1$ $c \leqq t$　　　（t:glass thickness） $a, b \leqq 0.5$ is acceptable Maximum permissible number of chipping off on a side is 5.
		Progressive crack	None
	Interference fringe	Concentric interference fringe （Test method） Observe the Panel surface from 60 degrees angle to the surface under white fluorescent lamp (Triple band fluorescent lamp) 	Size: 1/3 or less of Active area. Darkness: comply with the boundary sample
	Fisheye Film surface	 (D: Average diameter of valley part)	$D \leqq \varphi 0.2mm$　　　　Ignored $\varphi 0.2 < D \leqq \varphi 0.6mm$　　$N \leqq 2$ $\varphi 0.6mm < D$　　　　$N=0$
	Puffiness		$H \leqq 0.4mm$ is acceptable.

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13. Reliability Test

Test item		Test condition	number of failures /number of examinations
Durability test	High temperature storage	Ta=80°C 240hrs	0／3
	Low temperature storage	Ta=-30°C 240hrs	0／3
	High temperature & high humidity storage	Ta=60°C, RH=90% 240hrs non condensing ※	0／3
	High temperature operation	Tp=70°C 240hrs	0／3
	Low temperature operation	Tp=-20°C 240hrs	0／3
	High temp & humid operation	Tp=40°C, RH=90% 240hrs 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 C 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.）
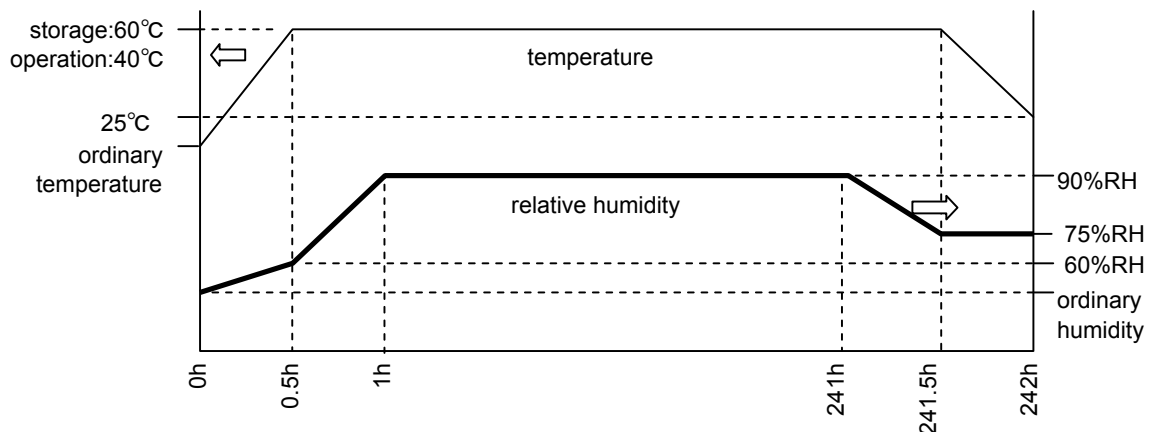

Table2.Reliability Criteria

   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

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| SPECIFICATIONS № 18TLM025	Issue: Oct.23,2018
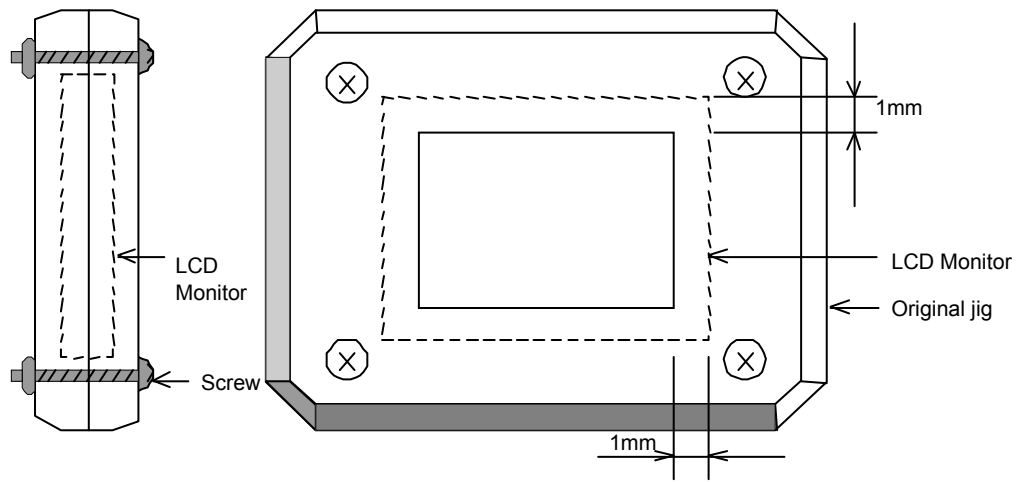
14. Packing Specifications
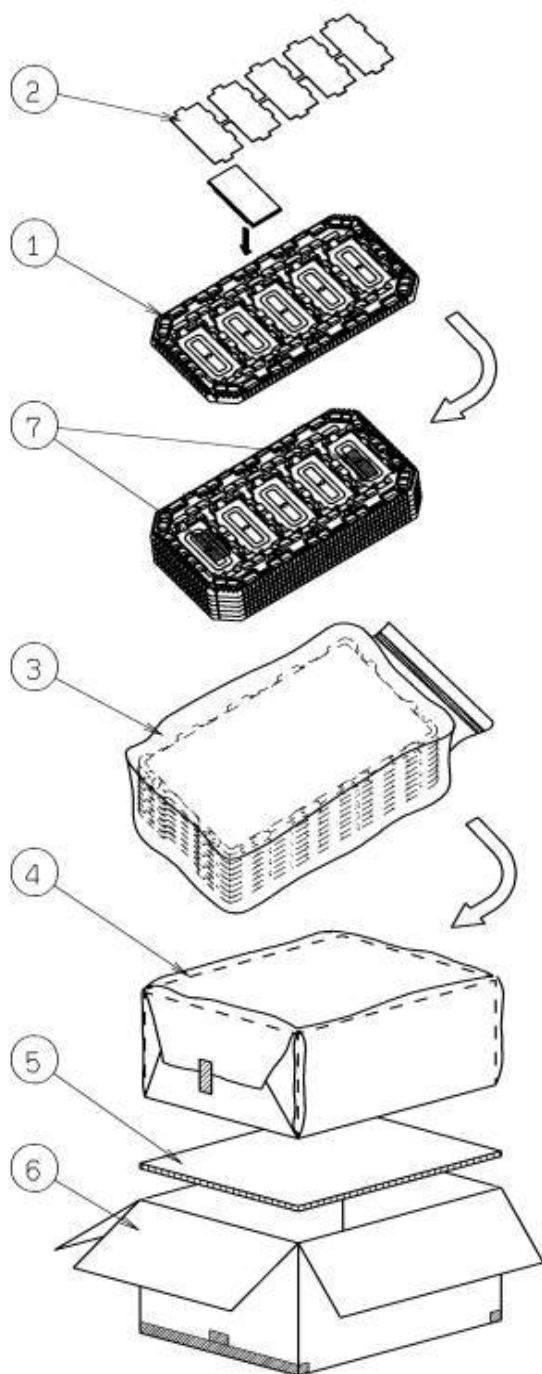
Step 1. Each product is to be placed in one of the cut-outs of the tray with the display surface facing upward.(5products per tray)
Antistatic foam sheet is to be placed on the products in the tray.

Step 2. Each tray needs to be same orientation respect to the tray below or above it and the trays be in a stack of 5.
One empty tray is to be put on the top of stack of 5 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 piled trays are to be wrapped with a bubble cushioning sheet, and to be fixed with adhesive tape.

Step 5. The wrapped trays are to be put in the 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.
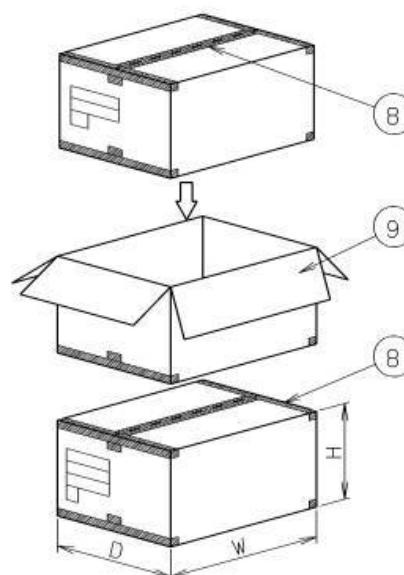
Remark: The return of packing materials is not required.

	Packing item name	Specs., Material
①	TRAY	A-PET
②	Antistatic foam sheet	
③	SEALING BAG	
④	B SHEET A	Anti-static air babble sheet
⑤	INNER BOARD	Corrugated cardboard
⑥	OUTER CARTON	Corrugated cardboard
⑦	Drier	Moisture absorber
⑧	Packing tape	
⑨	EXTRA OUTER CARTON	Corrugated cardboard

Dimension of extra outer carton	
D : Approx.	(321mm)
W : Approx.	（594mm）
H : Approx.	（147mm）
Quantity of products packed in one carton:	5pcsx5=25pcs
Gross weight : Approx.	6.2Kg

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15. Handling Instruction
   15.1 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)   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.

(10)   The end part of glass and film of touch panel has conductivity, and avoid contact (short-circuit)
       with electroconductive case etc.. There is a possibility of setting up a defective touch panel,
       and insulate it for the case suppression (cushion etc.) if necessary, please.

⚠   **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.

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15.2 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) Peel off the protective film on the TFT monitors during mounting process.
Refer to the section 13.5 on how to peel off the protective film.
We are not responsible for electrostatic discharge failures or other defects
occur when peeling off the protective film.

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

15.3 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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15.4 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   7 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 ORTUS.

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15.5 Precautions for Peeling off the Protective film

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

  A) Work Environment
     a) Humidity: 50 to 70 %RH, Temperature15 to 27˚C
     b) Operators should wear conductive shoes, conductive clothes, conductive finger tips and grounded wrist-straps.
       Use an electrostatic neutralization blower.
       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.
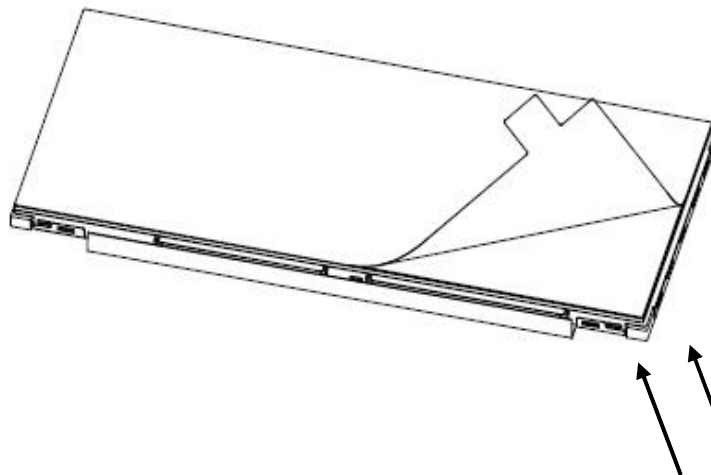
Blower wind direction
(Set an ion blower with its
adequate conditions.)

15.6 Warranty

  ORTUS is only liable to defective goods which is stored and used under the condition complying
  with this specifications and returned within 1 (one) year.
  Warranty caused by manufacturing defect shall be conducted by replacement of goods or refundment at unit price.

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APPENDIX

Reference Method for Measuring Optical Characteristics and Performance

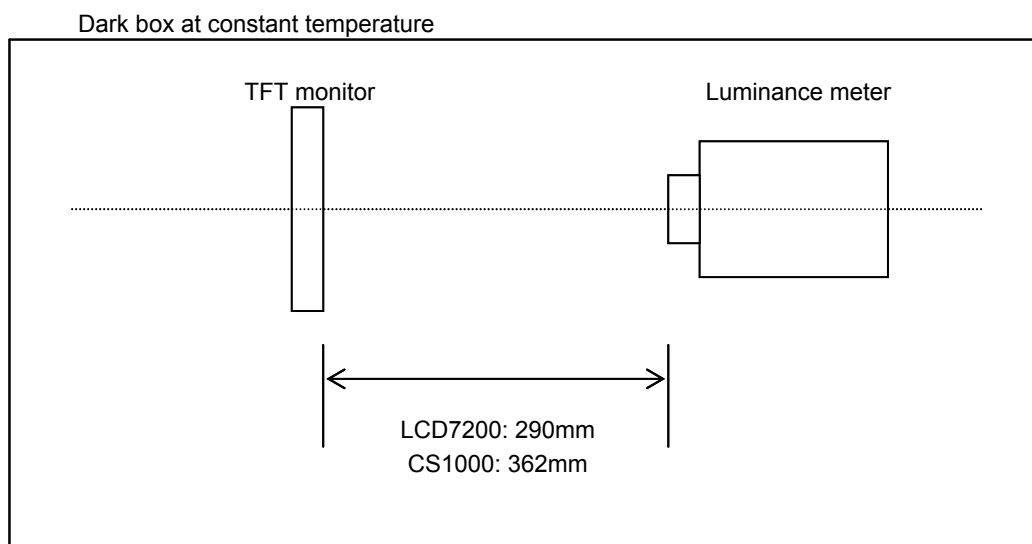1. Measurement Condition (Backlight ON)

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: 290mm
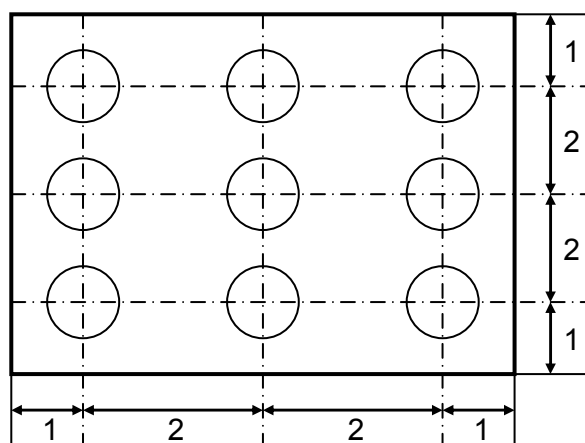CS1000: 362mm

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

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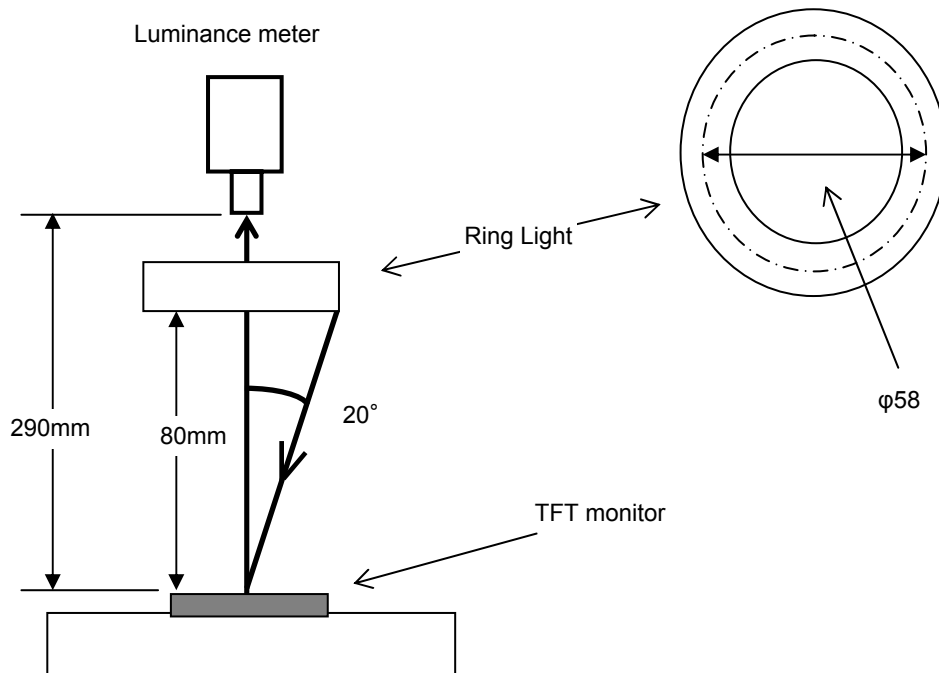   Brightness distribution: 9 points shown in the following drawing.

<Landscape model>

1

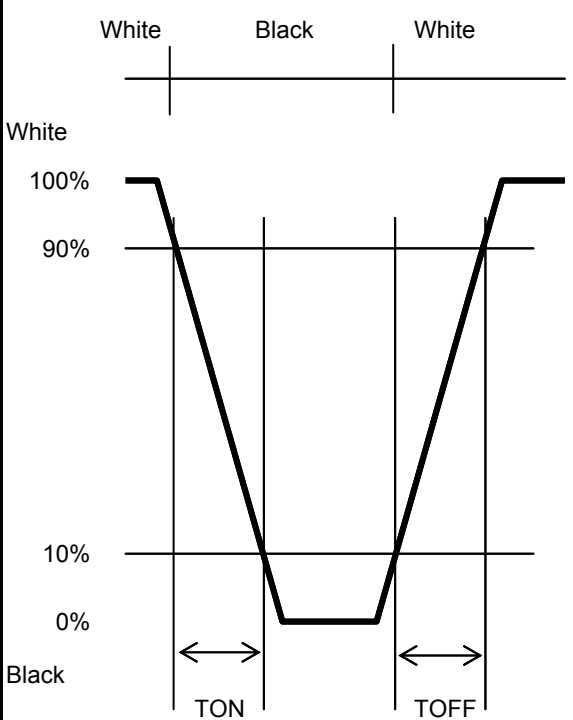2

2

1

1   2   2   1

Dimensional ratio of active area

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

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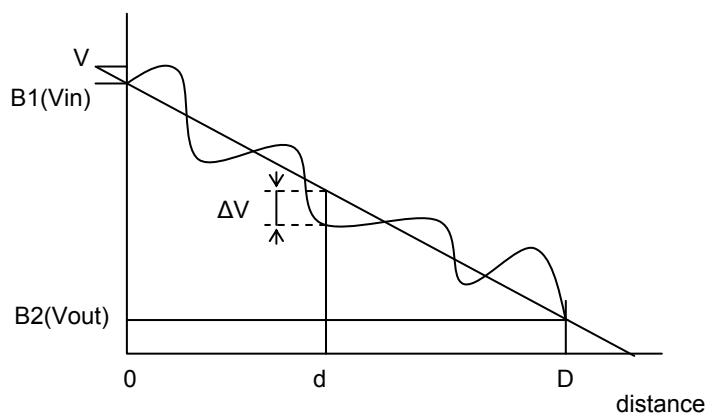Measurement Condition (Contrast ratio Backlight OFF only)

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

290mm

80mm

20°

TFT monitor

φ58

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2. Test Method

Notice	Item	Test method	Measuring instrument	Remark
1	Response time	Measure output signal waveform by the luminance meter when raster of window pattern is changed from white to black and from black to white. White Black White White 100% 90% 10% 0% Black TON TOFF	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 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	Maximum contrast angle	Move the luminance meter vertically to the display from its normal line and measure the angles where contrast ratio reaches its highest value.	EZcontrast160D	
6	Burn-in	Visually check burn-in image on the screen after 2 hours of "window display" ([Data]= 3Fh / 00h).		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	

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* Linearity Measurement of Touch Panel

$$LE(\%)=\Delta V/(Vin-Vout)\times100$$

$$LEmax(\%)=\Delta Vmax/(Vin-Vout)\times100$$

distance

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■ Cautionary instruction to handle a Touch-panel

● Cushion (between Touch Panel Chassis) Design
   1) A cushion is required to be placed between Touch Panel and customer's chassis and there is a designated area
      to attach it. Attachment at area inside Input Prohibition Area must be forbidden.
      If cushion was located inside Input Prohibition Area, Upper Electrode may be push constantly
      and which may cause the electrode breakage at the position falling on the edge of adhesive;
      it eventually results in Touch Panel malfunction in the future.   (Please see "NG-1")
   2) Be attention to the cushion material you use.   In the case that too soft cushion was used,
      the cushion may protrude into Prohibition Area by being push strongly; which may result in the electrode breakage.
      Eventually there is a chance that the electrode breakage leads to the malfunction of Touch Panel in the future.
      (Please see "NG-2")
   3) Cushion is required to be attached at the side of Customer's chassis.
      Attaching a cushion at the side of Upper Electrode Film has a chance to deform the film and
      lead to the malfunction of Touch Panel in the future.
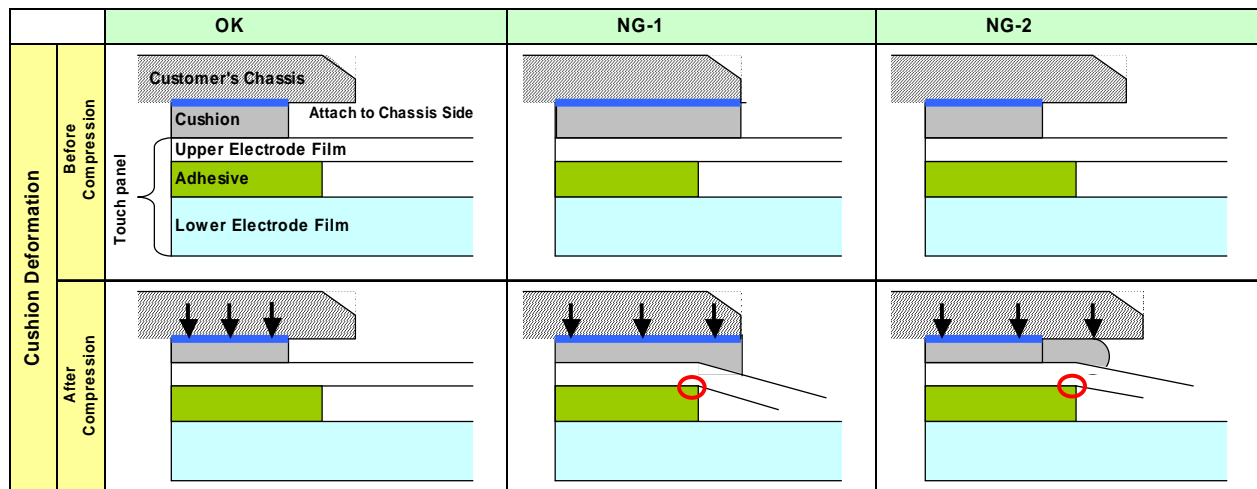
● Design Guidance of Chassis (Front Part)
   4) Be attention to stay Input Prohibition Area away from touching and/or drawing by a stylus pens in order to
      avoid the electrode breakage and potential malfunction of Touch Panel.   (Please see "NG-3")
      We recommend customers to design chassis (front case) being able to protect Input Prohibition Area.
   5) Clearance between customer's chassis and Touch Panel surface is certainly required in order to avoid
      erroneous input caused by a collision of the edge of chassis.   (Please see "NG-4")
      A clearance of 0.3 to 0.7mm is recommended.
● Design Guidance of Chassis (Side Part)
   6) Upper Electrode and Lower Electrode fall on the edge of Touch Panel outline.
      Redundant design having enough clearance to avoid electric short with chassis is highly recommended.
      (Please see "NG-5")
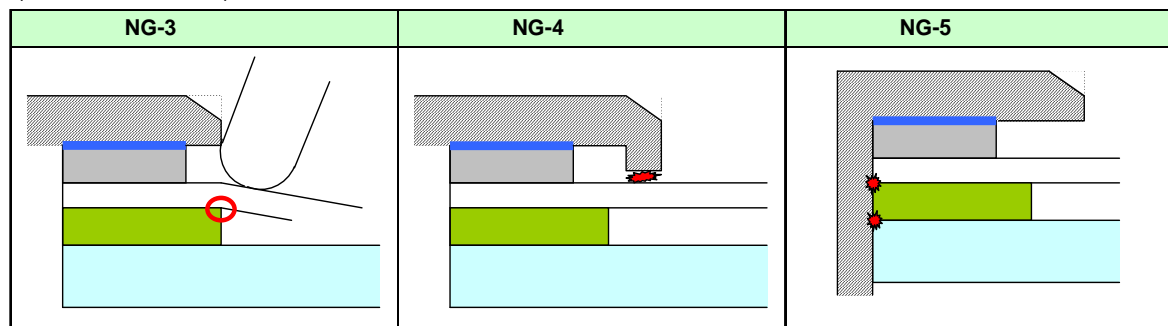
● Example of Recommended Chassis Design
      Refer to "3.2 Outward Form".
● As a terminal resistance has individual specificity, calibration to align the displaying and
   the sensing position one each is mandatory before use.

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