

# APEX

APEX SCIENCE & ENGINEERING CORP

( OPTOELECTRONIC DIV. )




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## TBG2311NEFU30N

### ROHS

## DATA SHEET

Acceptance

ISSUE	VERSION	APPROVER	CHECKER	ENGINEER
	A			

<b>Messrs.</b>				
<b>Product Specification</b>	<b>Model:</b>	<b>TBG2311NEFU30N</b>	<b>Rev. NO.</b>	<b>Issued Date.</b>
			<b>A</b>	Jan.08,19

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### REVISION HISTORY

Version	Date	Section	Description
A	Jan . 08 '19		first issued.

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## 1. General Description

### 1.1 Introduction

TBG2311NEFU30N is a 23.1" wide TFT Liquid Crystal Display with Backlight unit. This monitor supports 1920 x 1584 resolution and can display 16.77M colors.

### 1.2 Features

- — 23.1" wide FHD + TFT LCD Panel
- — Micro-USB 2.0 x1 Input
- — Micro-SD card x1 Input
- — Super Wide Viewing Angle
- — RoHs compliance

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### 1.3 General Specifications

<b>Item</b>		<b>Specification</b>	<b>Unit</b>	<b>Note</b>
LCD panel	Active Area	585.6 (H) x 48.19 (V) (23.1" wide diagonal)	mm	
	Max Resolution	1920(H) x158(V)	-	
	Frame rate	60	Hz	
	Driver Element	a-si TFT Active Matrix	-	
	Pixel Number	1920 x R.G.B. x 158	pixel	
	Pixel Pitch	0.15245 (H) x 0.4494 (V)	mm	
	Pixel Arrangement	RGB Vertical Stripe	-	
	Transmissive Mode	Normally Black	-	
	Viewing Angle (H / V)	Typical 178 / 178	degree	
	Brightness	Typical 300	cd/m <sup>2</sup>	
	Contrast Ratio	Typical 5000	-	
	Response Time	9.5	msec	
	Performance	OSD Language	none	-
Input Connector		Micro-USB(2.0) x1, Micro-SD card x1	-	
Output Connector		none	-	
User Control		none		(1)
Tilt angle	Upward / Downward	15	degree	
Physical	Dimension, weight	902.1x513.8x64.5 / 6.8	mm, kg	
		902.1x571.5x200 / 6.9		

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### Environmental Characteristics

#### AC/DC Adaptor (Delta ADP36PH BZ)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T <sub>ST</sub>	-30	+80	°C	(1)
Operating Ambient Temperature	T <sub>OP</sub>	0	+40	°C	(1)

Note (1) The temperature and relative humidity range is shown in the figure below as Delta ADP36PH BZ.

- (a) 90 %RH Max. ( $T_a \leq 40$  °C).
- (b) Wet-bulb temperature should be 39 °C Max.
- (c) No condensation.

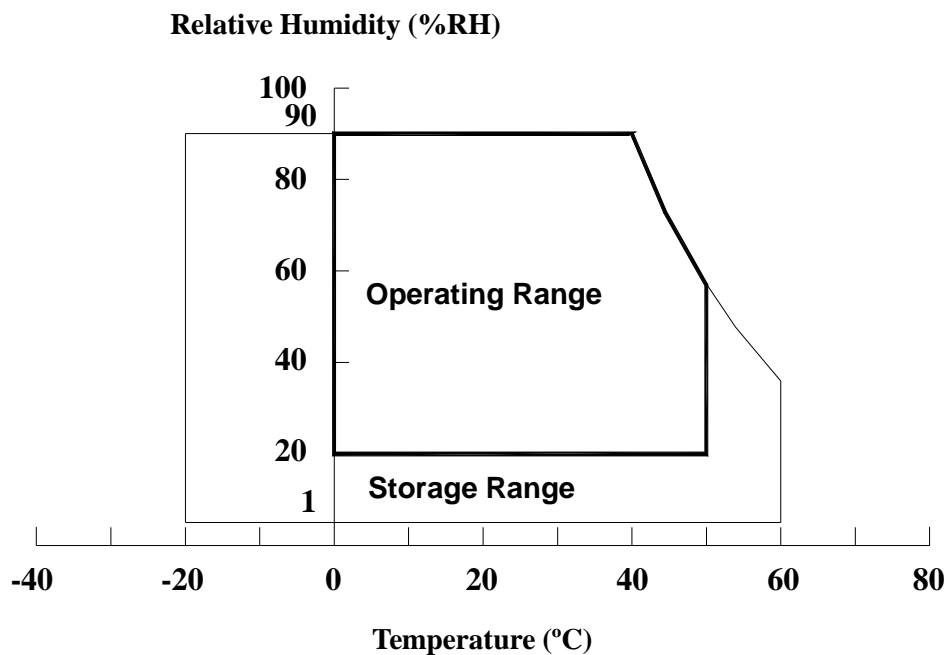
#### Display Set

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T <sub>ST</sub>	-20	+60	°C	(1)
Operating Ambient Temperature	T <sub>OP</sub>	0	+40	°C	(1), (2)

Note (1) Temperature and relative humidity range is shown in the figure below.

- (a) 90 %RH Max. ( $T_a \leq 40$  °C).
- (b) Wet-bulb temperature should be 39 °C Max.
- (c) No condensation.

Note (2) Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal



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## 1.4 Safety Specifications

### 1.4.1 Safety, EMC, Ergonomics and Compatibility Requirements

Safety	TBD
EMC	TBD
Compliance	TBD
Others	TBD

### 1.4.2 Electrostatic Discharge Requirements

Item	Spec	Remark
Electrostatic Discharge	+/-8KV air	Class B, Auto Recover
	+/-4KV contact	Class B, Auto Recover

### 1.4.3 Reliability

Items	Condition	Spec	Note
MTBF		$\geq 30,000$ Hours	
LED Lifetime	Luminance becomes 50%	$\geq 30,000$ Hours	(1)
Burn-in	System load and $25\pm 2^{\circ}\text{C}$ degree environment Temperature		

Note (1) LED life time is defined as the time when brightness becomes 50% of the original value in the continuous operation under the  $T_a = 25^{\circ}\text{C}$ .

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### 1.5 AC/DC adaptor Electrical Specifications

	<b>Item</b>	<b>Specification</b>	<b>Note</b>
Power Source	Maker/Model name	Delta ADP-36PH BZ	(1)
	Nominal Input Voltage	AC 100V-240V	(2)
	Rated Frequency	50/60Hz	
	Input Current	1A maximum at 100Vac input voltage.	
	Inrush Current limit	No damage at 240Vac	
	Power output	DC12V/ 3.0A maximum	
	Turn On delay time	Less than 5 seconds at input voltage is 100-240Vac	
	Hold-up time	5mS within regulation requirement after loss 100Vac and maximum load	
	Protection	<p><b>OVP:</b> The output shall be protected to latch off at over-voltage condition, maximum value can't be over 18V. That might be return to normal state by AC reset . The reset time must less than 2min</p> <p><b>OCP:</b> The maximum constant current shall be more than 3.0A and be less than 5.5A at 90Vac and 264Vac. The adaptor shall be auto-recovery.</p> <p><b>SCP:</b> Output can be shorted without damage. The adaptor shall be auto-recovery. (It will enter into normal condition when the fault condition is removed.)</p>	
Safety Test	Hi-Pot	3000Vac for 2 seconds between AC input terminals and output terminals. Cut off current 3mA	
	Leakage current	Less than 100uA at 240 Vac, 50Hz.	
	Insulation Resistance	The insulation resistance shall be not less than 30M ohms after application of 500Vdc/10mA for 1 minute.	

Note: (1) The specifications are summarized from Delta ADP-26PH BZ.

(2) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.



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### 1.6 Display Set Electrical Specifications

<b>Item</b>		<b>Specification</b>	<b>Note</b>
Power Input	Input Voltage	12V +/- 10%	
	Input Current	2A maximum	
Power Consumption	Operation Mode	24 Watt maximum	
	Stand-by Mode	TBD Watt	

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## 2. Input / Output Signal Specifications

### 2.1 Micro USB 2.0

Parameter	Min.	Typ.	Max.	Unit
Supply Voltage	+4.75	+5.0	+5.25	V
Output Current(USB2.0)			500	mA

#### 2.1.1 Micro USB Connector Pin Define

Pin No.	Pin Function
1	VCC
2	D-
3	D+
4	ID
5	GND

### 2.2 Micro SD card

SDSC/SDHC/SDXC card with 1-bit and 4-bit data bus width supporting spec version 2.x/3.x/4.x-DS/HS modes up to UHS-I SDR104

#### 2.2.1 Micro SD Connector Pin Define

Pin No.	Pin Function
1	DAT2
2	CD/DAT3
3	CMD
4	VDD
5	CLX
6	VSS
7	DAT0
8	DAT1
9	CD

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### 3. Optical Characteristics

#### 3.1 Test Conditions and Measurement Procedures

Item	Condition
Temperature	Normal room temperature (25±2°C)
Humidity	50±10%
AC input voltage	AC 110V ~240V/ 50/60HZ
Brightness	Maximum
Contrast	Middle
Resolution setting	1920x158 @60HZ
Color temperature	
Measuring instrument	Minolta CS-1000T Spectrometer and Photometer CA-210 or equivalent
Others	Before measuring, "Auto Adjust" & "Auto Balance" must be done in advance

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### 3.2 Optical Specifications

The relative measurement methods of optical characteristics are shown in 4.2. The following items should be measured under the test conditions described in 4.1 and stable environment shown in Note (4).

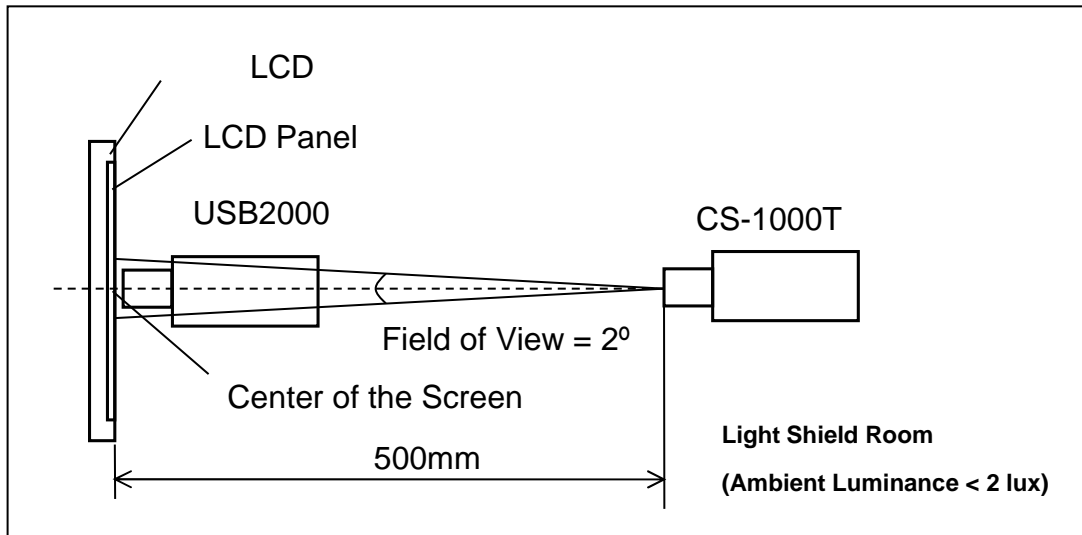
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle	2100	3000	-	-	(1), (2)
LC Response Time		G to G		-	9.5		ms	(4)
Luminance of center point		L		360	450	-	cd/m <sup>2</sup>	(1), (3)
Brightness Uniformity		Uni.		75	-	1.3	-	(5), (3)
Color Chromaticity	Red	Rx	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle at TV set standard mode	-0.03	0.649	+0.03	-	(1)
		Ry			0.338		-	
	Green	Gx			0.315		-	
		Gy			0.622		-	
	Blue	Bx			0.151		-	
		By			0.060		-	
	White	Wx			0.309		-	
		Wy			0.338		-	
Color Temperature	White 6500K	Wx	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle at TV set standard mode 80% IRE	-0.015	0.313	+0.015	-	(1)
		Wy			0.329		-	
	White 9300K	Wx			0.285		-	
		Wy			0.293		-	
	White 12000K	Wx			0.272		-	
		Wy			0.278		-	
Viewing Angle	Horizontal	$\theta_{x+}$	CR $\geq$ 10	80	89	-	Deg.	(5)
		$\theta_{x-}$			89			
	Vertical	$\theta_{y+}$			89			
		$\theta_{y-}$			89			

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Note (1) Luminance , Chromaticity and CCT Measurement

Measurement System Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression and figure below.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (1)$$

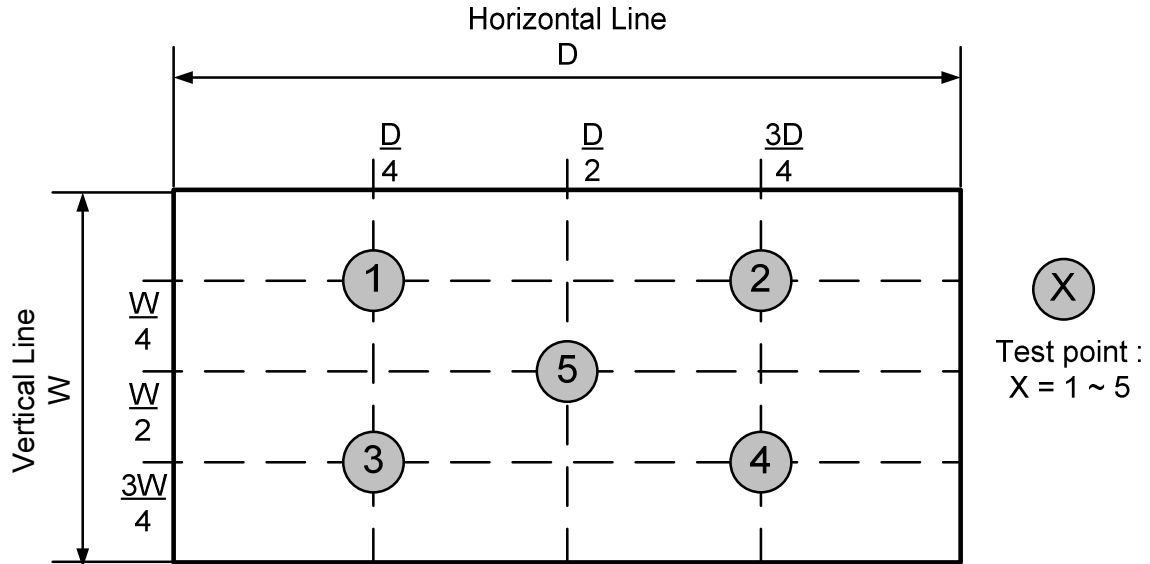
CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (3).

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Note (3) Definition of White Variation ( $\delta W$ ) :

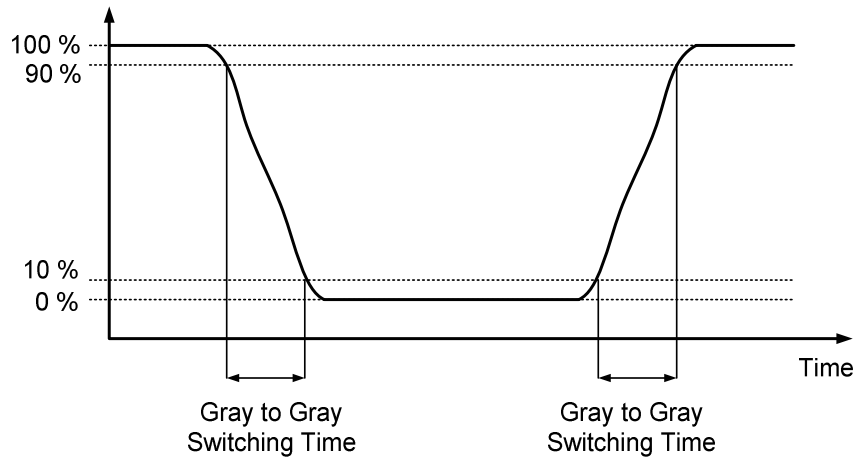
Measure the luminance of gray level 1023 at 5 points

$$\delta W = \frac{\text{Maximum [L (1), L (2), L (3), L (4), L (5)]}}{\text{Minimum [L (1), L (2), L (3), L (4), L (5)]}}$$



Note (4) Definition of Response Time (G to G) and Measurement Method:

**Optical Response**

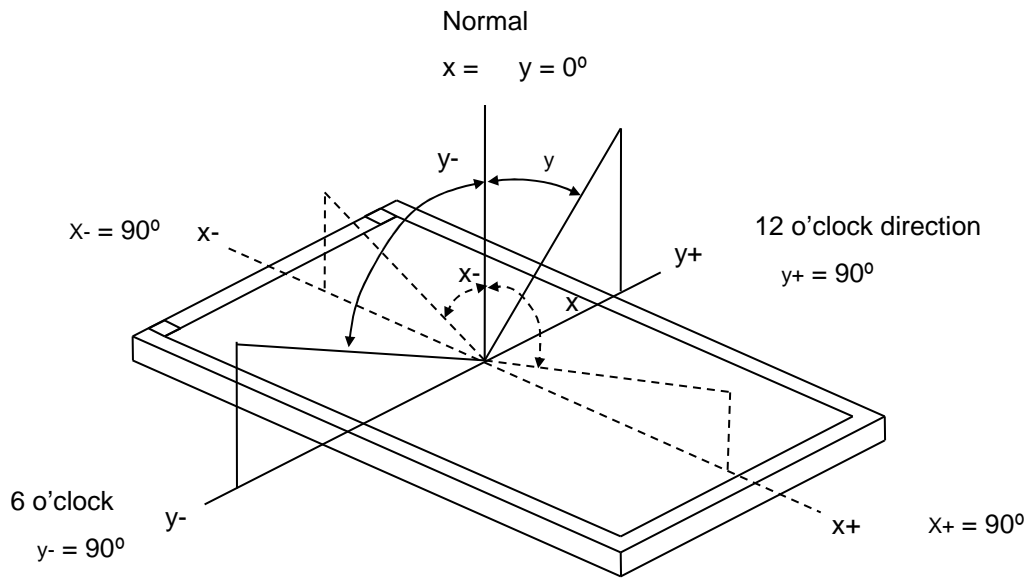


The driving signal means the signal of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255.

Gray to gray average time means the average switching time of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255. to each other.

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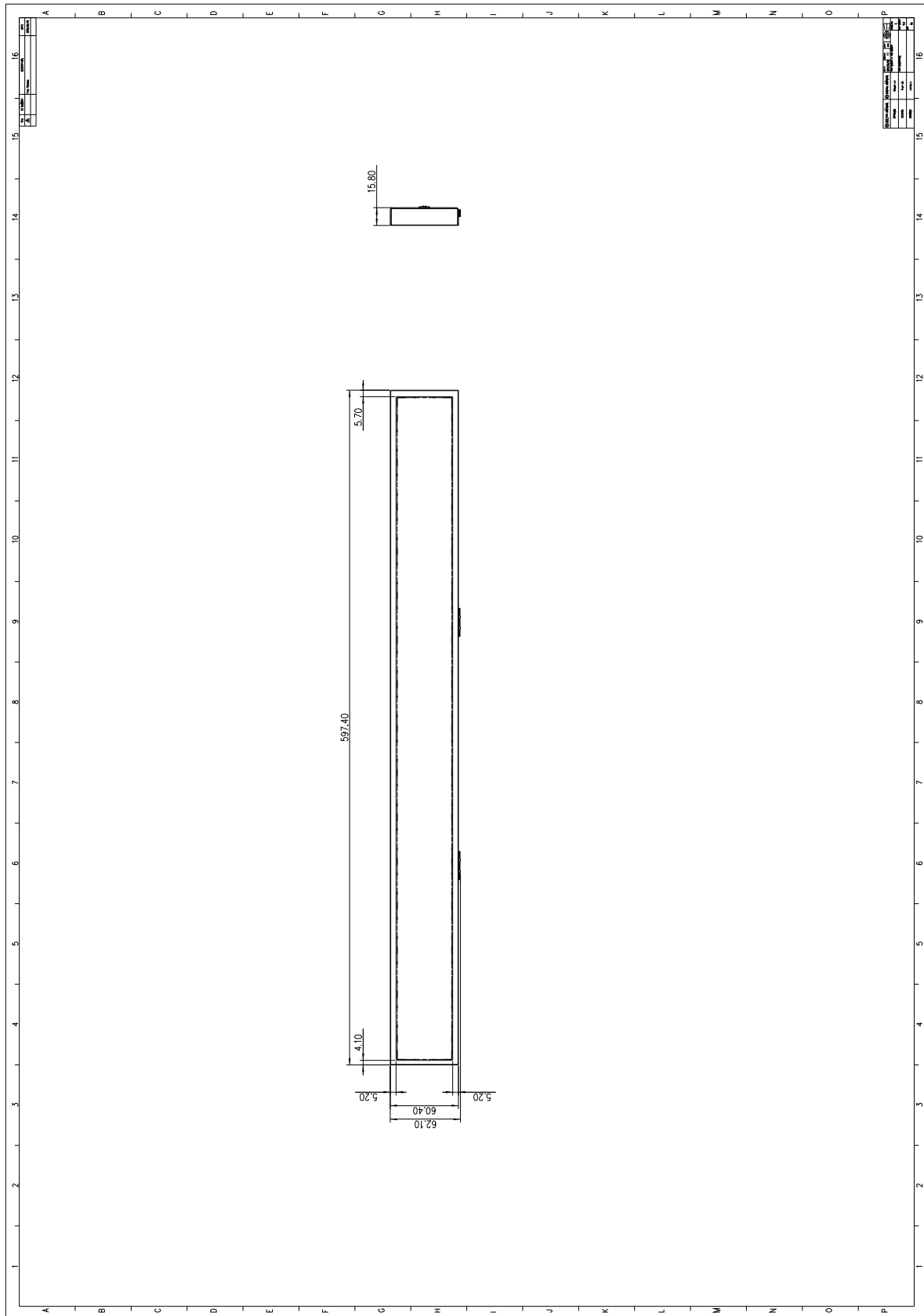
Note (5) Definition of Viewing Angle ( $\theta_x, \theta_y$ ):



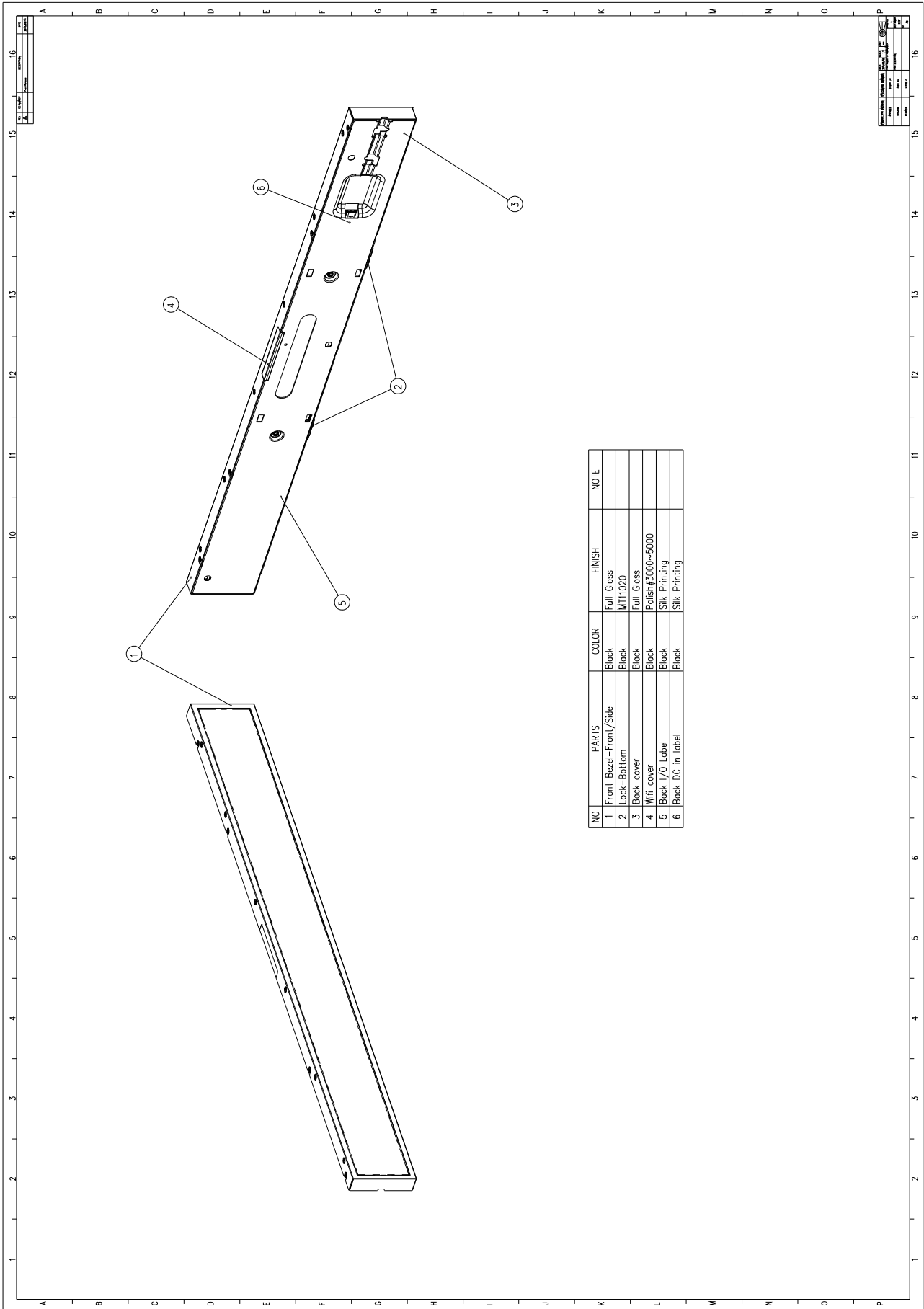
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#### 4. Mechanical Characteristics

##### 4.1







NO	PARTS	COLOR	FINISH	NOTE
1	Front Bezel—Front/Side	Black	Full Gloss	
2	Lock—Bottom	Black	M11020	
3	Back cover	Black	Full Gloss	
4	Wifi cover	Black	Polish#3000~#0000	
5	Back I/O Label	Black	Silk Printing	
6	Back DC in label	Black	Silk Printing	



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#### 4.2

<b>Dimension</b>	<b>Spec</b>
Width	W/wall-mount bracket : 597.4 mm ; WO/ wall-mount bracket : 597.4 mm
Height	W/wall-mount bracket : 62.1 mm ; WO/ wall-mount bracket : 62.1 mm
Depth	W/wall-mount bracket : 18 mm ; WO/ wall-mount bracket : 15. 8 mm
TV Weight	W/wall-mount bracket : 0.72±0.3kg ; WO/ wall-mount bracket : 0.67±0.3kg

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## 5. Accessories

	<b>Cable type</b>	<b>Include</b>	<b>Note</b>
Included cables	Adaptor	YES	
	Power Cable	YES	
Publications	Carton, QSG, manual ,labels...	YES	
Hanging Bracket		YES	
Screw for stand bracket		NO	
Others		TBD	

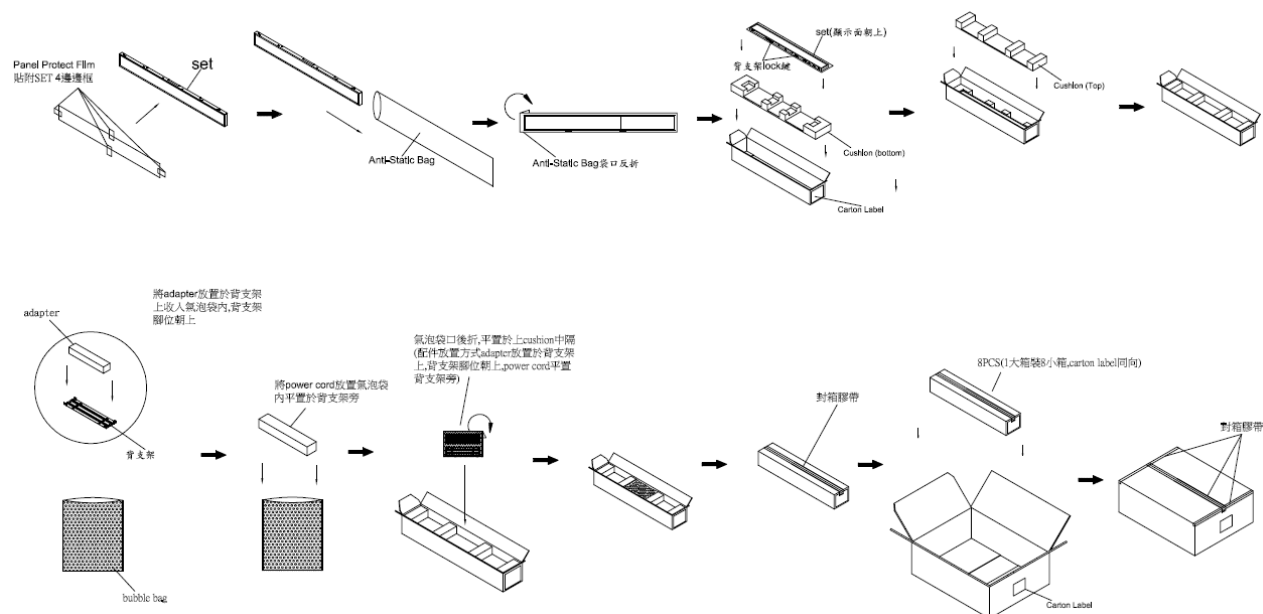
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## 6. Package

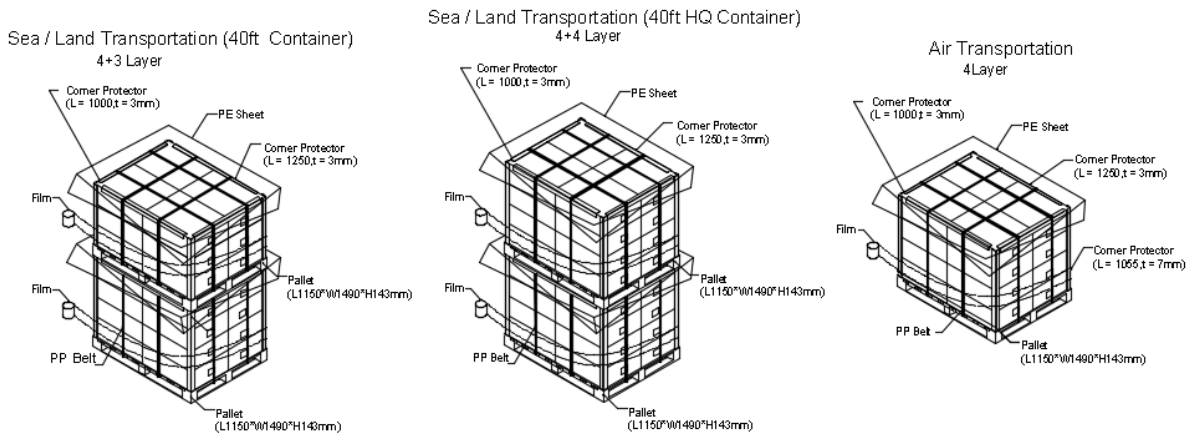
### 6.1 Unit package specifications

Items	Spec
Ink	Flexo Printing
Shipping Carton Type	A1 Type
Shipping Carton Hand Holds	NO
Length(mm)	713
Height(mm)	115
Width(mm)	135
Gross Weight(Kg)	NA
Units per Pallet	128
Container Loading	128*2*16 = 4096

### 6.2 Carton Packaging



### 6.3 Pallet Packaging



#### Pallet Dim.:1150x1490x140(mm)

45ft(HQ) Container(13540x2350x2690)  
18 Pallets

1	3	5	7	9	11	13	15	17
2	4	6	8	10	12	14	16	18

130

40ft(HQ) Container(12020x2350x2690)  
40ft Container(12020x2350x2390)  
16 Pallets

1	3	5	7	9	11	13	15
2	4	6	8	10	12	14	16

100

20ft Container(5890x2340x2380)  
7 Pallets

1	3	5	7
2	4	6	

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## 7. Reliabilities

No	Category	Test Item	Test Equipment
1	Environment	Light Leakage	illuminometer
2	Environment	High Temperature Start	Walk in constant temperature chamber
3	Environment	High Temperature Operation Test	Walk in constant temperature chamber
4	Environment	Low Temperature Start	Walk in constant temperature chamber
5	Environment	Low Temperature Operation Test	Walk in constant temperature chamber
6	Environment	High Temperature Storage Test(With Carton)	Walk in constant temperature chamber
7	Environment	Low Temperature Storage Test(With Carton)	Walk in constant temperature chamber
8	Environment	High Temperature/High Humidity Operation Test	Walk in Constant temperature and humidity chamber
9	Environment	Heat Shock Test(With Carton)	Walk in constant temperature chamber
10	Environment	Package Stacking Test	Walk in Constant temperature and humidity chamber
11	Environment	Dust Test	Dust Test Chamber
12	Environment	Temperature Cycling	Walk in constant temperature chamber
13	Environment	Package Storage Test	Walk in Constant temperature and humidity chamber
14	Acoustic	Confirmation of the Howling	Hemi-anechoic chamber
15	Acoustic	Sound Vibration	Hemi-anechoic chamber
16	Acoustic	Jar Sound Check of Mechanical Parts After Temperature Variation	Hemi-anechoic chamber
17	Acoustic	Noise Test	Hemi-anechoic chamber
18	Safety	Operational Minimum Power Supply Voltage	EE Lab AC Source
19	Safety	Operational Maximum Power Supply Voltage	EE Lab AC Source
20	Safety	Dielectric Strength Test	EE Lab Hi-pot machine
21	Safety	Insulation Resistor Test	EE Lab Hi-pot machine
22	Safety	Touch Current(Leak Current) Test	AC Voltage Source
23	Safety	Consecutive Drop Test of 50 Times(Bump Test)	---
24	Safety	1m Bottom Side Drop Test	Bridge Crane
25	Safety	Product Unit Drop Test	Drop Test machine
26	Safety	Swivel/Tilt Endurance Longevity Test	---
27	Safety	Impact Hammer Test	Impact Hammer
28	Safety	Stand Strength Test 1	Thrust Meter
29	Safety	Stand Strength Test 2	30Kg Weight/Belt
30	Safety	Wall Hanging Strength Test	Wall Mount/Belt
31	Safety	Stability Test	Sloping Platform
32	Safety	Fall Vertical Load Examination	10Kg Weight/Belt

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33	Safety	Fall Test by Horizontal Load	Thrust Meter
34	Durability	ON/OFF Test	EE Lab AC Source
35	Durability	Low Impedance Test	EE Lab AC Source
36	Durability	Life Test	EE Lab AC Source
37	IR	Remote Controller Arrival Distance Test	EE Lab with JIG
38	Mechanical	Package Vibration And Bumping Complex Test	Vibration test machine
39	Mechanical	Package Vibration Test	Vibration test machine
40	Mechanical	LTS+Package Drop Test	Walk in constant temperature chamber
41	Mechanical	Operation Button Strength Test	Key life test machine
42	Mechanical	Torture Test on Door and Button on R/C	Key life test machine



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## 8. Other

### Appendix Block Diagram

