奇美電子
CHIMEI INNOLUX

Doc. Number:

☐ Tentative Specification
☐ Preliminary Specification
■ Approval Specification

MODEL NO.: N133HSG
SUFFIX: WJ1

Customer: Asus

APPROVED BY   **SIGNATURE**

<u>**Name / Title**</u>

Note

Asus T31 Project

Please return 1 copy for your confirmation with your signature and comments.

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2013-01-08	2013-01-07	2013-01-04
03:59:37 GMT	08:44:57 GMT	05:37:42 GMT

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REVISION HISTORY

Version	Date	Page	Description
3.0	Jan. 4, 2013	All	Approval Spec Ver 3.0 was first issued for Asus.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

N133HSG-WJ1 is a 13.3" Dual TFT Liquid Crystal Display module with LED Backlight unit and 30 pins eDP interface. This module supports 1920 x 1080 FHD mode and can display 16.7M colors. The optimum viewing angle is at 6 o'clock direction.

1.2 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Screen Size	13.3 diagonal		
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1080	pixel	-
Pixel Pitch	0.1529 (H) x 0.1529 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16,777,216	color	-
Transmissive Mode	Normally black	-	-
Surface Treatment	Hard coating (3H), Anti-Glare	-	-
Luminance, White	250/ Non-Touch Panel 280	Cd/m2	
Backlight Unit	LEDs 9 strings x 6 parallel		
Type of Touch Module	Windows Integrated Sensor (WIS)		
Material of Touch Module	Corning Fit		
Touch Active Area (L x W)	296.96 x 168.44	mm	
Touch Windows Visible Area (L x W)	294.96 x 166.44	mm	
Simultaneous Sensing	10 Points		
Touch Channels (X - Y)	70 - 40		
Sensor Pitch (X - Y)	4.27 – 4.225	mm	
Touch Panel Interface	USB		
Touch Panel Supply Voltage	3.3	V	
Touch Panel Transmittance	85%		
Touch Panel Reflectance	<14%	%	
Touch Panel Haze	<1%	%	
RoHs Compliance	Yes		
Power Consumption	Total 5.924 W(Max.) @ cell 0.924W(Max.), BL 5.0 W(Max.)		(1)

Note (1) The specified power consumption (with converter efficiency) is under the conditions at VCCS = 3.3 V, fv = 60 Hz, LED_VCCS = Typ, fPWM = 200 Hz, Duty=100% and Ta = 25 ± 2 ºC, whereas mosaic pattern is displayed.

2. MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size (With Frame)	Horizontal (H)	337	337.2	337.4	mm	(1)
	Vertical (V)	224.61	224.81	225.01	mm	
	Thickness (T)		5.27 5.39* (w/ protect film)	5.53 5.65* (w/ protect film)	mm	
Non-Touch Panel Side Outline	Horizontal (H) With Bracket	316.53	316.83	317.13	mm	
	Horizontal (H) W/o Bracket	305.05	305.35	305.65	mm	
	Vertical With PCBA	193	193.5	194	mm	
	Vertical W/o PCBA	183.11	183.41	183.71	mm	
Bezel Area (Non-Touch Panel Side)	Horizontal	296.17	296.42	296.67	mm	
	Vertical	167.67	167.97	168.27	mm	
Active Area (Both Panel)	Horizontal	293.46	293.76	294.06	mm	
	Vertical	164.94	165.24	165.54	mm	
Weight		--	--	525	g	Rear cover: AL 5052

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note* Do not consider the bubble because of the protect film.

2.1 CONNECTOR TYPE
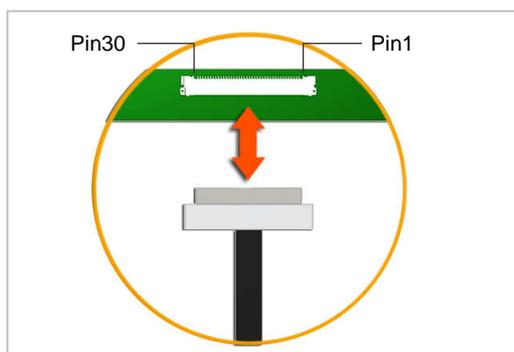
Please refer Appendix Outline Drawing for detail design.
Connector Part No.: IPEX-20455-030E-12
User's connector Part No: IPEX-20453-030T-01

3. ABSOLUTE MAXIMUM RATINGS
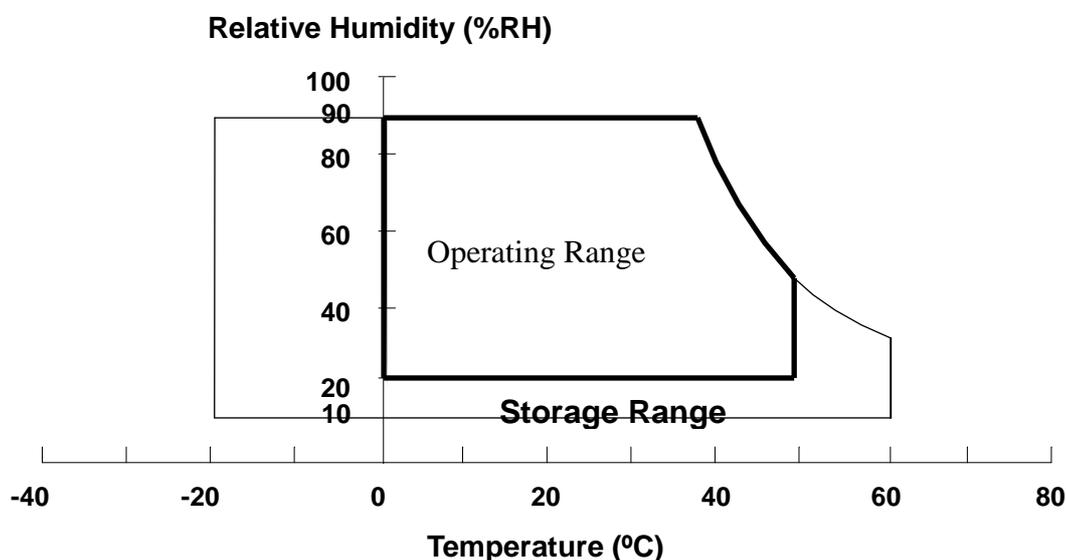
3.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)

Note (1)   (a) 90 %RH Max. (Ta <= 40 ºC).

              (b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

              (c) No condensation.

Note (2)   The temperature of panel surface should be 0 ºC min. and 60 ºC max.

Relative Humidity (%RH)

3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	+4.0	V	
Converter Input Voltage	LED_VCCS	-0.3	24	V	(1)
Converter Control Signal Voltage	LED_PWM,	-0.3	3.6	V	1)
Converter Control Signal Voltage	LED_EN	-0.3	3.6	V	(1)

Note (1) Stresses beyond those listed in above "ELECTRICAL ABSOLUTE RATINGS" may cause permanent damage to the device. Normal operation should be restricted to the conditions described in "ELECTRICAL CHARACTERISTICS".

3.2.2 TOUCH PANEL

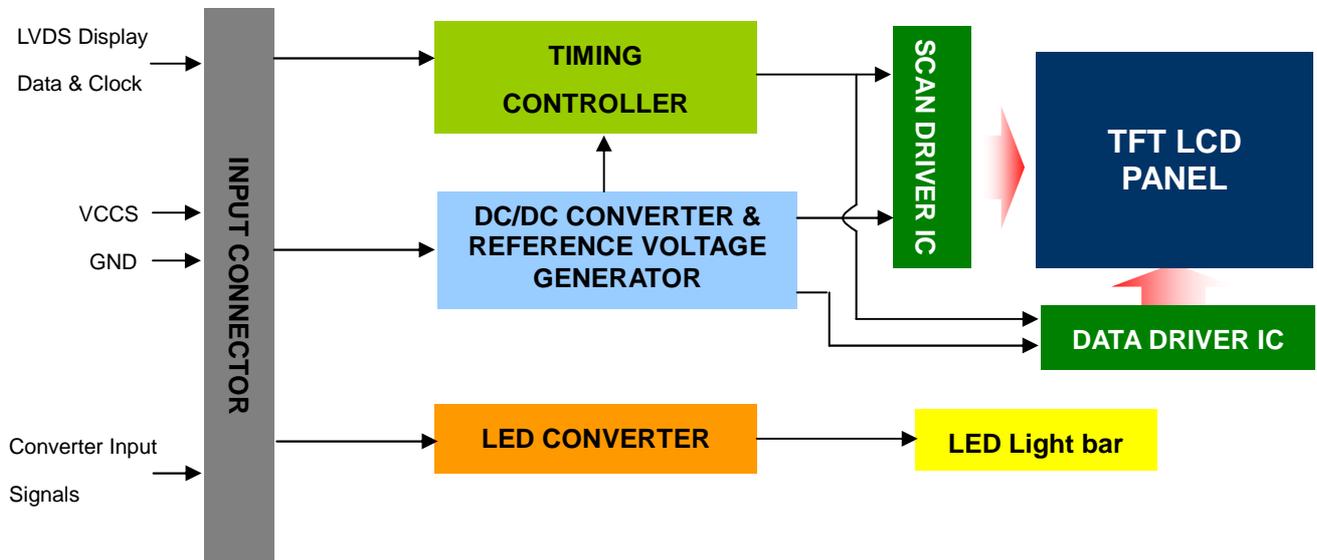| Item	Minimum	Maximum
Analog Power Supply Voltage	-0.5	4.6
Digital Power Supply Voltage	-0.5	1.8

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM

For **A side** Panel(TOUCH PANEL MODULE):
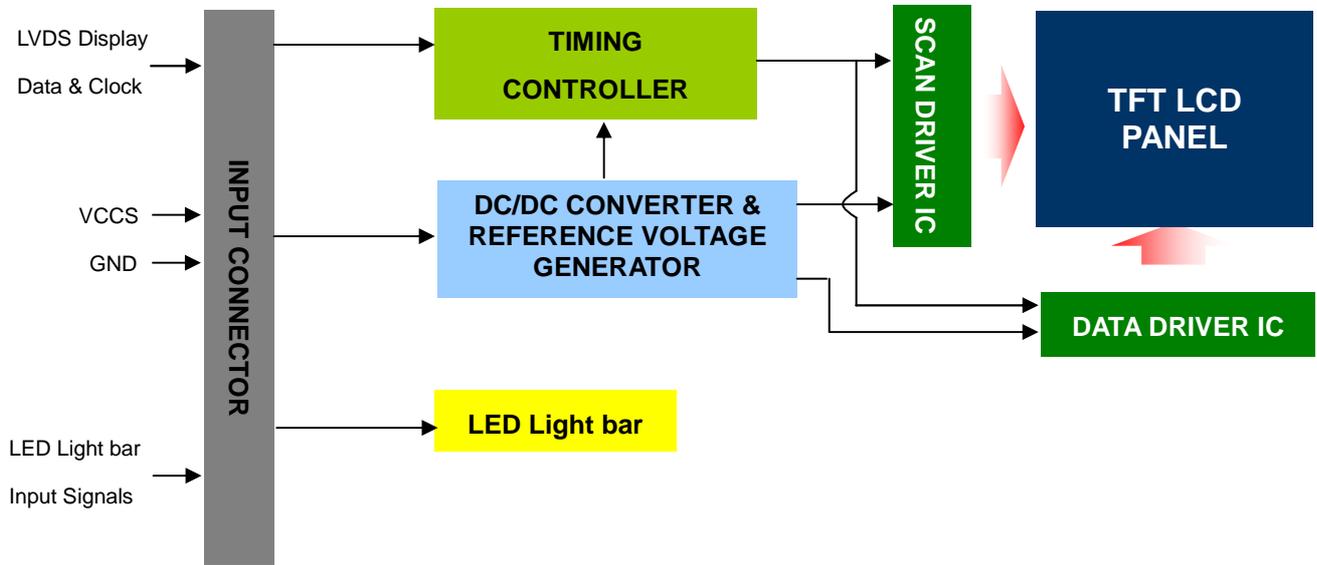
For **B side** Panel(NON-TOUCH PANEL MODULE):

4.2. INTERFACE CONNECTIONS

4.2.1 TOUCH PANEL MODULE

Pin	Symbol	Description	Remark
1	NC	No Connection (Reserved)	
2	H_GND	High Speed Ground	
3	LANE1_N	Complement Signal Link Lane 1	
4	LANE1_P	True Signal Link Lane 1	
5	H_GND	High Speed Ground	
6	LANE0_N	Complement Signal Link Lane 0	
7	LANE0_P	True Signal Link Lane 0	
8	H_GND	High Speed Ground	
9	AUX_CH_P	True Signal Auxiliary Channel	
10	AUX_CH_N	Complement Signal Auxiliary Channel	
11	H_GND	High Speed Ground	
12	VCCS	Power Supply +3.3 V (typical)	
13	VCCS	Power Supply +3.3 V (typical)	
14	BIST	LCD Panel Self Test Enable(Reserved for CMI test)	
15	GND	Ground	
16	GND	Ground	
17	HPD	Hot Plug Detect	
18	NC	No Connection (Reserved)	
19	NC	No Connection (Reserved)	
20	LB_FB1	LED Light bar feedback CH1 (Cathode).	22mA
21	LB_FB2	LED Light bar feedback CH2 (Cathode).	22mA
22	LB_FB3	LED Light bar feedback CH3 (Cathode).	22mA
23	LB_FB4	LED Light bar feedback CH4 (Cathode).	22mA
24	LB_FB5	LED Light bar feedback CH5 (Cathode).	22mA
25	LB_FB6	LED Light bar feedback CH6 (Cathode).	22mA
26	NC	No Connection (Reserved)	
27	NC	No Connection (Reserved)	
28	LB_VCC	LED Light bar VCC.	25.2~29.7V
29	LB_VCC	LED Light bar VCC.	25.2~29.7V
30	LOGO_VCCS	LOGO LED Power Supply +5V, (typical)	

4.2.2 NON-TOUCH PANEL MODULE

Pin	Symbol	Description	Remark
1	NC	No Connection (Reserved)	
2	H_GND	High Speed Ground	
3	LANE1_N	Complement Signal Link Lane 1	
4	LANE1_P	True Signal Link Lane 1	
5	H_GND	High Speed Ground	
6	LANE0_N	Complement Signal Link Lane 0	
7	LANE0_P	True Signal Link Lane 0	
8	H_GND	High Speed Ground	
9	AUX_CH_P	True Signal Auxiliary Channel	
10	AUX_CH_N	Complement Signal Auxiliary Channel	

11	H_GND	High Speed Ground	
12	VCCS	Power Supply +3.3 V (typical)	
13	VCCS	Power Supply +3.3 V (typical)	
14	BIST	LCD Panel Self Test Enable	
15	GND	Ground	
16	GND	Ground	
17	HPD	Hot Plug Detect	
18	BL_GND	Backlight Ground	
19	BL_GND	Backlight Ground	
20	BL_GND	Backlight Ground	
21	BL_GND	Backlight Ground	
22	LED_EN	Backlight Enable Signal of LED Converter	
23	LED_PWM	PWM Dimming Control Signal of LED Converter	
24	NC	No Connection (Reserved)	
25	NC	No Connection (Reserved)	
26	LED_VCCS	Backlight Power	
27	LED_VCCS	Backlight Power	
28	LED_VCCS	Backlight Power	
29	LED_VCCS	Backlight Power	
30	NC	No Connection (Reserved)	

4.2.3 TOUCH PANEL

Pin.	Description	Remark
1	CGND	
2	GND	
3	USBN	
4	USBP	
5	3.3V	
6	DNU	
7	DNU	
8	DNU	
9	DNU	
10	CGND	

Note (1) The first pixel is odd as shown in the following figure.
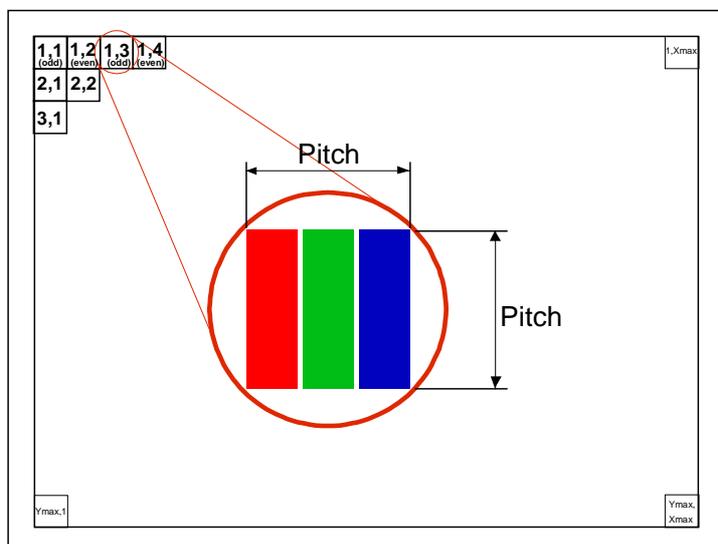
4.3 ELECTRICAL CHARACTERISTICS

4.3.1 LCD ELETRONICS SPECIFICATION

For **A side** Panel(TOUCH PANEL MODULE):

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VCCS	3.0	3.3	3.6	V	(1)-
HPD	High Level		2.25	-	2.75	V	
	Low Level		0	-	0.4	V	
Ripple Voltage		V_{RP}	-	50	-	mV	(1)-
Inrush Current		I_{RUSH}	-	-	1.5	A	(1),(2)
Power Supply Current	Mosaic	Icc	220	250	280	mA	(3)a
	White		250	280	310	mA	(3)b

For **B side** Panel(NON-TOUCH PANEL MODULE):

| Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VCCS	3.0	3.3	3.6	V	(1)-
HPD	High Level		2.25	-	2.75	V	
	Low Level		0	-	0.4	V	
Ripple Voltage		V_{RP}	-	50	-	mV	(1)-
Inrush Current		I_{RUSH}	-	-	1.5	A	(1),(2)
Power Supply Current	Mosaic	Icc	240	270	300	mA	(3)a
	White		270	300	330	mA	(3)b

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) I_{RUSH}: the maximum current when VCCS is rising

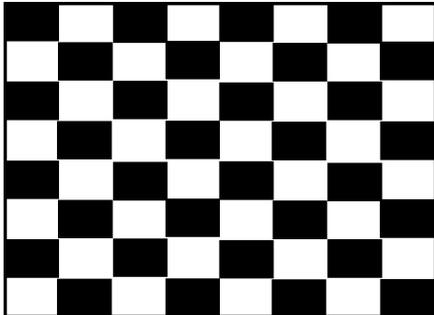I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.

VCCS rising time is 0.5ms
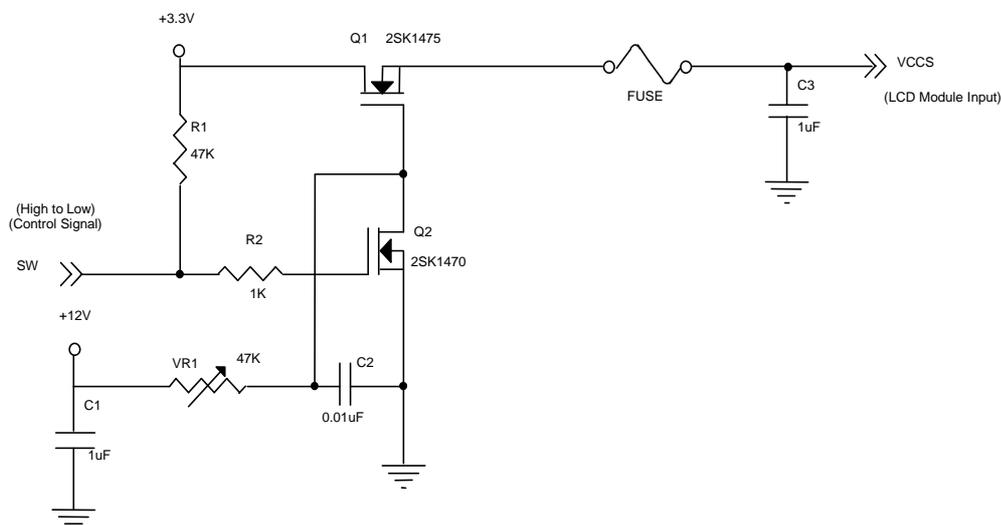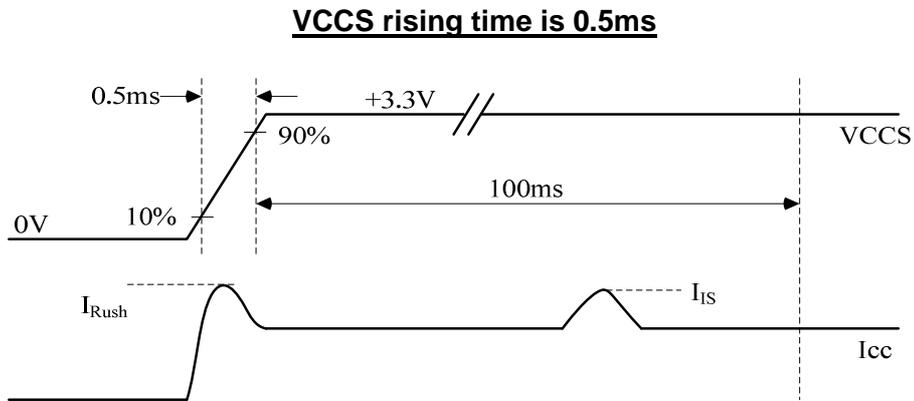
Note (3) The specified power supply current is under the conditions at VCCS = 3.3 V, Ta = 25 ± 2 ºC, DC
Current and f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. Mosaic Pattern

b. White Pattern

Active Area

Active Area

4.3.2 TOUCH PANEL ELETRONICS SPECIFICATION

Item	Symbol	Specification			Unit	Remark
		Min.	Typ.	Max.		
3.3V Power Supply Voltage	VDDE	3.0	3.3	3.6	V	
1.2V Power Supply Voltage	VDD	1.14	1.2	1.26	V	

4.3.3 LED CONVERTER SPECIFICATION

For **B side** Panel(NON-TOUCH PANEL MODULE)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Input power supply voltage		LED_Vccs	7	12.0	21.0	V	
Converter Inrush Current		ILED$_{RUSH}$	-	-	1.5	A	(2)
EN Control Level	Backlight On		3	-	3.6	V	
	Backlight Off		0	-	0.5	V	
PWM Control Level	PWM High Level		3	-	3.6	V	
	PWM Low Level		0	-	0.5	V	
PWM Control Duty Ratio			10	-	100	%	
			5	-	100	%	(3)
PWM Control Permissive Ripple Voltage		VPWM_pp	-	-	100	mV	
PWM Control Frequency		f$_{PWM}$	190	-	2K	Hz	(4)
LED Power Current	LED_VCCS =Typ.	ILED	299	357	413	mA	(5)

Note (1):LED light bar configuration is shown as below.

PS:$I_L =(I_{CH1}+..+I_{CHn})$mA
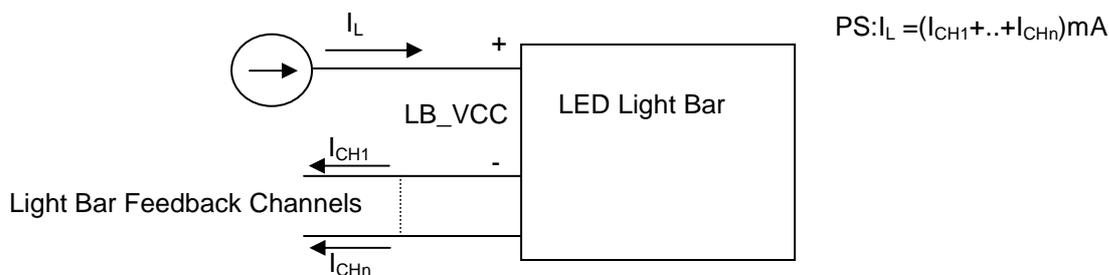
Note(2)LED$_{RUSH}$: the maximum current when LED_VCCS is rising,

ILED$_{IS}$: the maximum current of the first 100ms after power-on,

Measurement Conditions: Shown as the following figure. LED_VCCS = Typ, Ta = 25 ± 2 ºC, f$_{PWM}$ = 200 Hz, Duty=100%.

VLED rising time is 0.5ms

Note (3) If the PWM control duty ratio is less than 10%, there is some possibility that acoustic noise or backlight flash can be found. And it is also difficult to control the brightness linearity.

Note (4)   If PWM control frequency is applied in the range less than 1KHz, the "waterfall" phenomenon on the screen may be found. To avoid the issue, it's a suggestion that PWM control frequency should follow the criterion as below.

PWM control frequency f_{PWM} should be in the range

$$(N + 0.33) * f \leq f_{PWM} \leq (N + 0.66) * f$$

N : Integer $(N \geq 3)$

f : Frame rate

Note (5) The specified LED power supply current is under the conditions at "LED_VCCS = Typ.", Ta = 25 ± 2 °C, f_{PWM} = 200 Hz, Duty=100%.

4.3.4 BACKLIGHT UNIT

Ta = 25 ± 2 °C

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Power Supply Voltage	V_L	25.2	27	29.7	V	(1)(2)(Duty100%)
LED Light Bar Power Supply Current	I_L		132		mA	
Power Consumption	P_L	-	3.564	3.9204	W	(3)
LED Life Time	L_{BL}	12,000	-	-	Hrs	(4)

Note (1)   LED current is measured by utilizing a high frequency current meter as shown below :

$V_{L,}$ I_L

LED
Light Bar

Light Bar Feedback

Channels
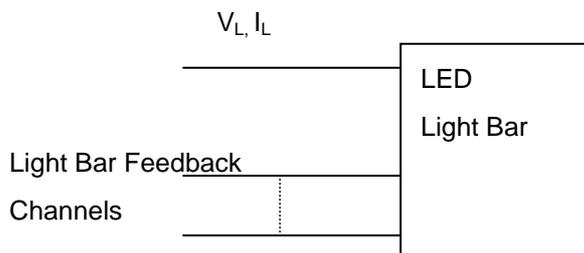
Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

Note (3) $P_L = I_L \times V_L$ (With LED converter transfer efficiency)

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 °C and I_L = 20 mA(per EA) until the brightness becomes $\leqq$ 50% of its original value.
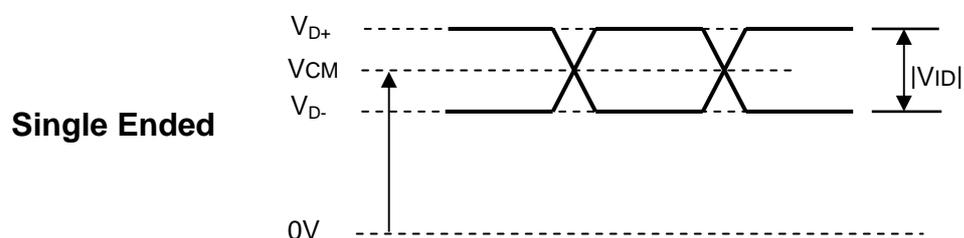
4.4 DISPLAY PORT INPUT SIGNAL TIMING SPECIFICATIONS

4.4.1 ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Differential Signal Common Mode Voltage(MainLink and AUX)	VCM	0		2	V	(1)(3)
AUX AC Coupling Capacitor	C_{AUX}	75		200	nF	(2)

Note (1) Display port interface related AC coupled signals should follow VESA DisplayPort Standard

Version1. Revision 1a and VESA Embedded DisplayPort^{TM} Standard Version 1.1.

(2) The AUX AC Coupling Capacitor should be placed on Source Devices.

(3)The source device should pass the test criteria described in DisplayPortCompliance Test

Specification (CTS) 1.1

Single Ended
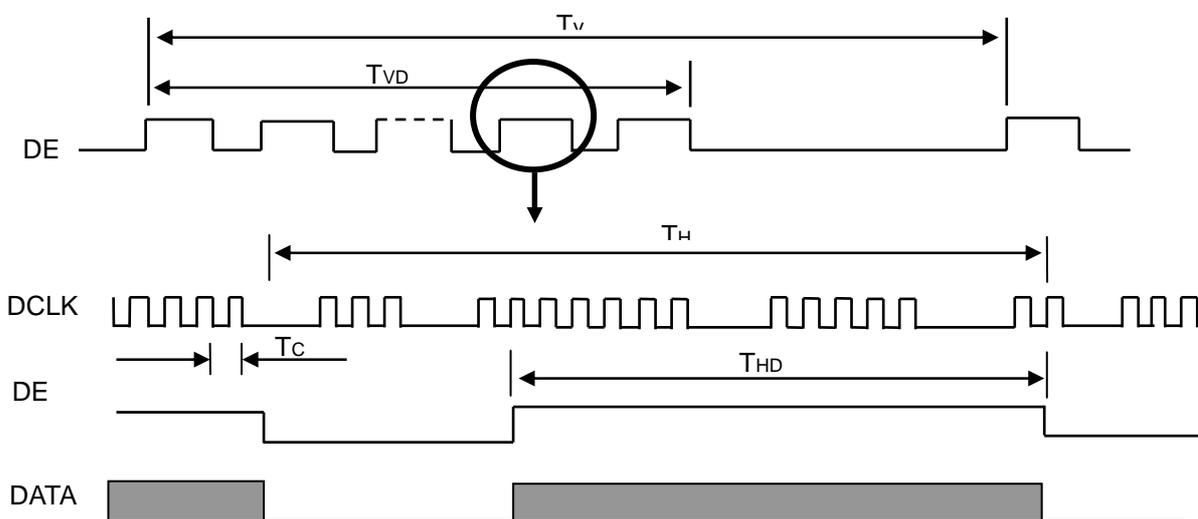
4.5 DISPLAY TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Refresh rate 60Hz

| Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	136.86	138.78	140.69	MHz	-
DE	Vertical Total Time	1102	1112	1122	1102	TH	-
	Vertical Active Display Period	1080	1080	1080	1080	TH	-
	Vertical Active Blanking Period	TV-TVD	32	TV-TVD	TV-TVD	TH	-
	Horizontal Total Time	2070	2080	2090	2070	Tc	-
	Horizontal Active Display Period	1920	1920	1920	1920	Tc	-
	Horizontal Active Blanking Period	TH-THD	160	TH-THD	TH-THD	Tc	-

Note (1) Because this module is operated by DE only mode, Hsync and Vsync are ignored.
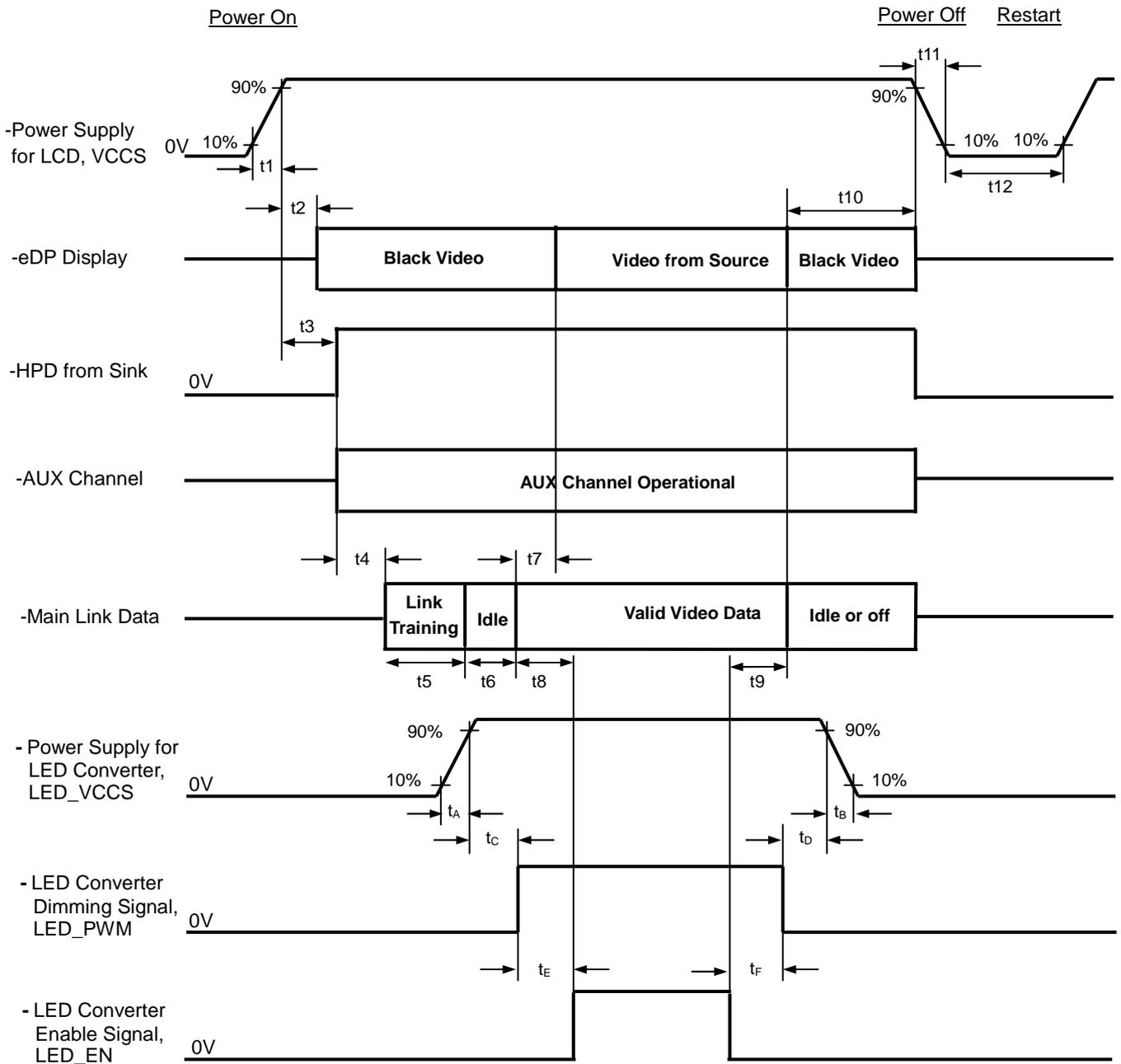
INPUT SIGNAL TIMING DIAGRAM

4.6 POWER ON/OFF SEQUENCE

TOUCH PANEL MODULE:
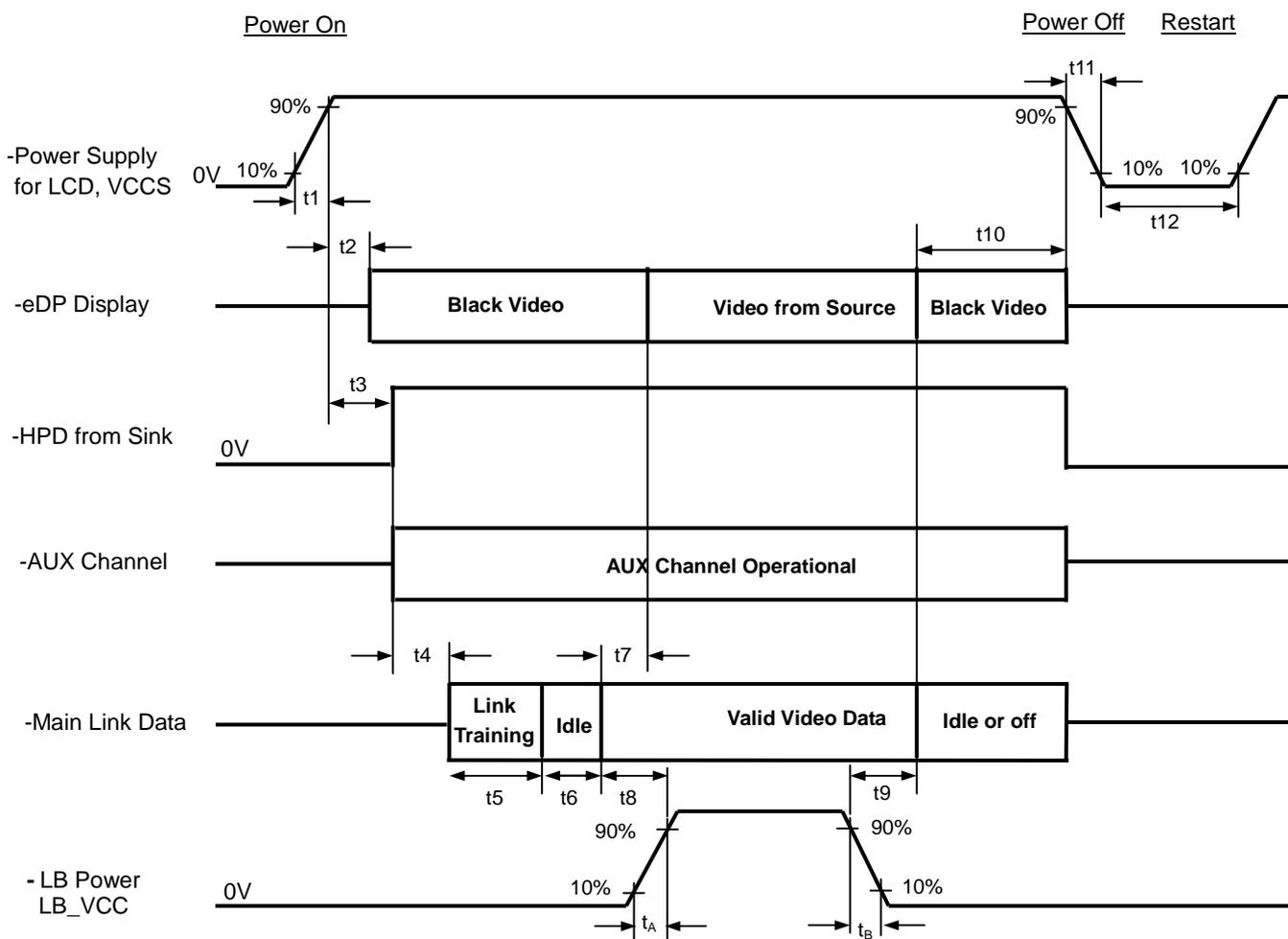
NON-TOUCH PANEL MODULE:

Timing Specifications: Follow VESA Embedded Display Port Standard Version 1

Parameter	Description	Reqd. By	Value Min	Value Max	Unit	Notes
t1	Power rail rise time, 10% to 90%	Source	0.5	10	ms	-
t2	Delay from LCD,VCCS to black video generation	Sink	0	200	ms	-
t3	Delay from LCD,VCCS to HPD high	Sink	0	200	ms	-
t4	Delay from HPD high to link training initialization	Source	-	-	ms	-
t5	Link training duration	Source	-	-	ms	-
t6	Link idle	Source	-	-	ms	-
t7	Delay from valid video data from Source to video on display	Sink	0	50	ms	-
t8	Delay from valid video data from Source to backlight on	Source	-	-	ms	-
t9	Delay from backlight off to end of valid video data	Source	-	-	ms	-
t10	Delay from end of valid video data from Source to power off	Source	0	500	ms	-
t11	VCCS power rail fall time, 90% to 10%	Source	0.5	10	ms	-
t12	VCCS Power off time	Source	500	-	ms	-
t_A	LED power rail rise time, 10% to 90%	Source	0.5	10	ms	-
t_B	LED power rail fall time, 90% to 10%	Source	0	10	ms	-
t_C	Delay from LED power rising to LED dimming signal	Source	10	-	ms	-
t_D	Delay from LED dimming signal to LED power falling	Source	10	-	ms	-
t_E	Delay from LED dimming signal to LED enable signal	Source	10	-	ms	-
t_F	Delay from LED enable signal to LED dimming signal	Source	10	-	ms	-

Note (1) Please don't plug or unplug the interface cable when system is turned on.

Note (2) Please avoid floating state of the interface signal during signal invalid period.

Note (3) It is recommended that the backlight power must be turned on after the power supply for LCD and the interface signal is valid

5. TOUCH GENERAL DESCRIPTION

5.1 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Supply Voltage	3.3	V	
Oscillator Frequency	32M	Hz	
Interface	USB	-	
Support OS	WIN8	-	
Support Points	10	-	
Min. Report Rate	100	Hz	
Resolution	1920*1080	-	
Power Consumption	(1) Action：~380mW, (2) Idle：300mW, (3) Off：0W	-	
Touch Panel RAW count	N/A	-	

5.2 Sensor Specification

Item	Spec
Glass	Corning_FIT 0.55 mm
BM	1.4um
ITO Sheet Resistance	<50 ohm/sq
OC1	1.6um
Matel Sheet Resistance	<0.3 ohm/sq
OC2	2.3um

5.3 Optical Specification

Transmittance (min.)	>85%
Haze (Max.)	<1%
Chromaticity (a*,b*) (Max.)	NA
Reflection (Max.)	<14%
Transmittance Chromaticity	NA
Reflectivity Chromaticity	NA

5.4 Touch Structure

Sensor structure

Module structure
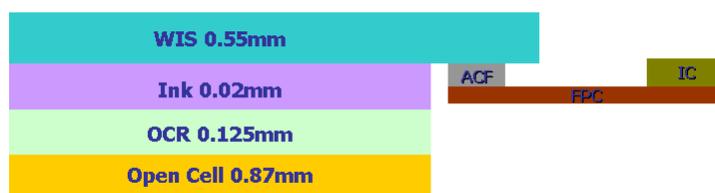
6. OPTICAL CHARACTERISTICS
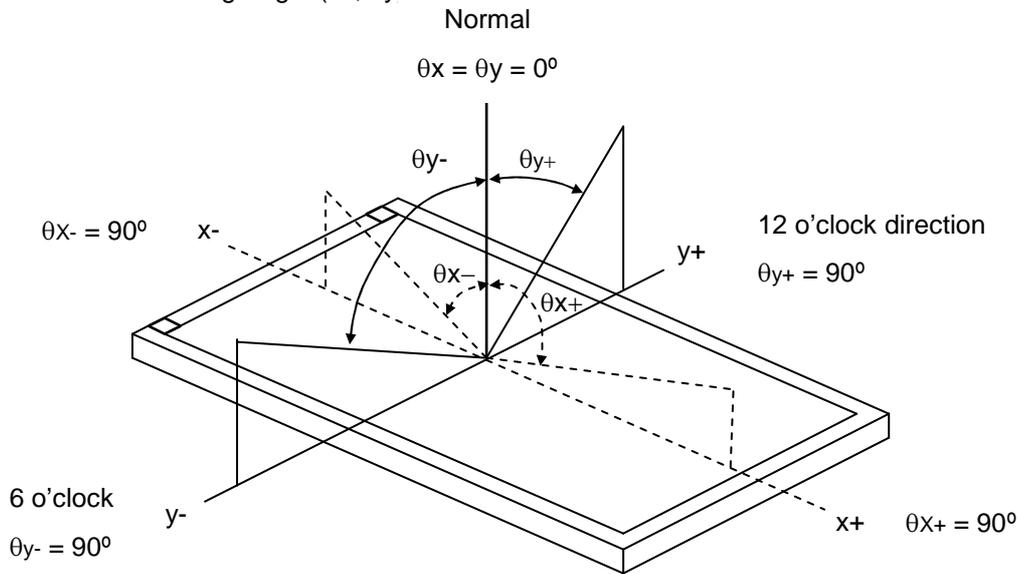
6.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I_L	132	mA

The measurement methods of optical characteristics are shown in Section 5.2. The following items should be measured under the test conditions described in Section 5.1 and stable environment shown in Note (5).

6.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR		500	700	-	-	(2),(5),(9)
Response Time		T_R		-	14	19	ms	(3),(9)
		T_F		-	11	16	ms	
Cross Talk		CT		-	-	4	%	(7)
Average Luminance of White (Touch Panel Module)		L_{AVE}		210	250	-	cd/m²	(4),(6),(9)
Average Luminance of White (Non-Touch Panel Module)		L_{AVE}		235	280	-	cd/m²	(4),(6),(9)
Color Chromaticity (Touch Panel Module)	Red	Rx	$\theta_x=0°$, $\theta_Y=0°$ Viewing Normal Angle		0.650		-	(1),(5),(9)
		Ry			0.338		-	
	Green	Gx			0.329		-	
		Gy			0.608		-	
	Blue	Bx			0.148		-	
		By			0.047		-	
	White	Wx			0.318		-	
		Wy		Typ − 0.03	0.334	Typ + 0.03	-	
Color Chromaticity (Non-Touch Panel Module)	Red	Rx			0.650		-	
		Ry			0.338		-	
	Green	Gx			0.329		-	
		Gy			0.608		-	
	Blue	Bx			0.148		-	
		By			0.047		-	
	White	Wx			0.313		-	
		Wy			0.329		-	
Color Gamut		CG		-	72	-	%	(5),(8),(9)
Viewing Angle	Horizontal	θ_x+	CR≥10	85	89		Deg.	(1),(5),(9)
		θ_x-		85	89	-		
	Vertical	θ_Y+		85	89	-		
		θ_Y-		85	89	-		
White Variation of 5 Points		δW_{5p}	$\theta_x=0°$, $\theta_Y=0°$	70	80	-	%	(5),(6),(9)

Note (1) Definition of Viewing Angle (θx, θy)

Normal

$\theta x = \theta y = 0^o$

$\theta y-$ $\theta y+$

$\theta X- = 90^o$ x-

12 o'clock direction

$\theta y+ = 90^o$

y+

$\theta x-$

$\theta x+$

6 o'clock   y-

$\theta y- = 90^o$

x+ $\theta X+ = 90^o$

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

The contrast ratio can be calculated by the following expression.
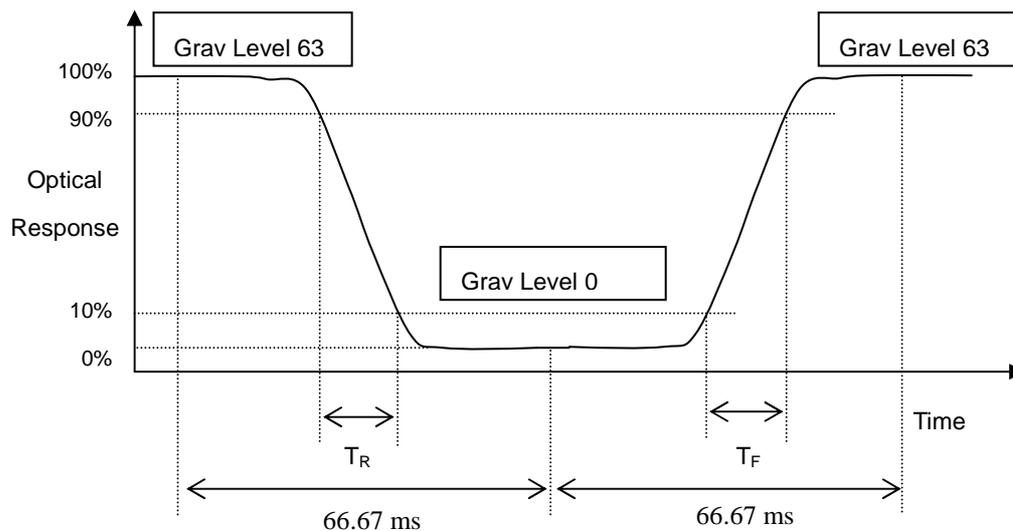
Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (1)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):

Grav Level 63   Grav Level 63

100%

90%

Optical

Response

Grav Level 0

10%

0%

T_R T_F Time

66.67 ms   66.67 ms

Note (4) Definition of Average Luminance of White (L_{AVE}):
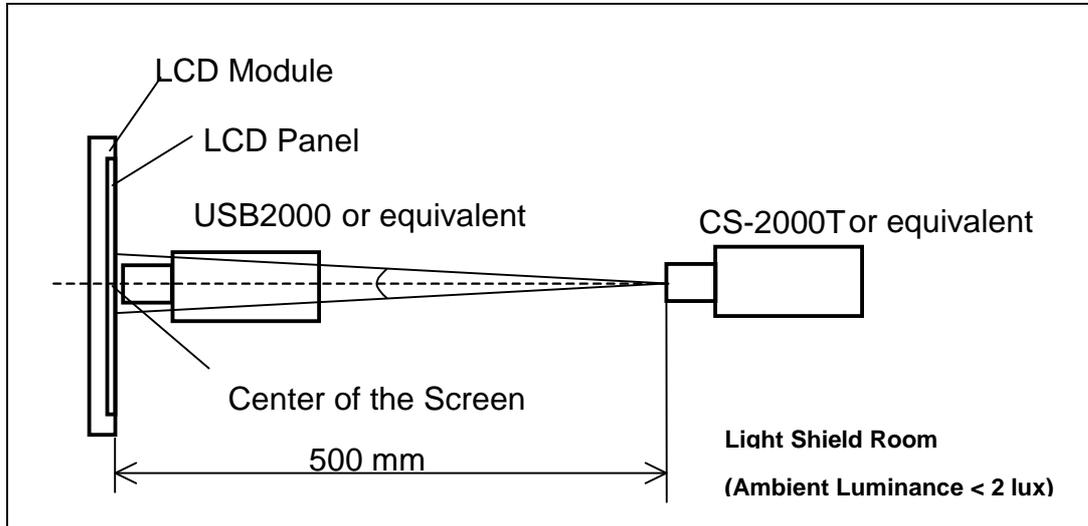
Measure the luminance of gray level 63 at 5 points

L_{AVE} = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (6)

Note (5) Measurement 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.

LCD Module

LCD Panel

USB2000 or equivalent

CS-2000T or equivalent

Center of the Screen

500 mm

Light Shield Room

(Ambient Luminance < 2 lux)

Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

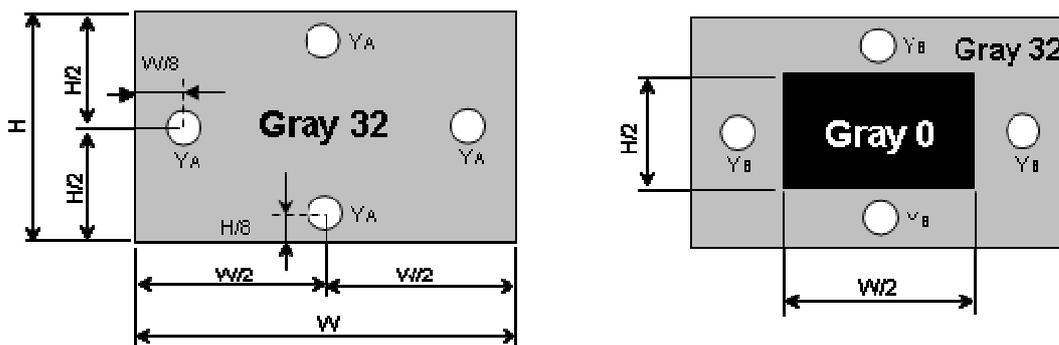$\delta W_{5p} = \{\text{Minimum } [L(1) \sim L(5)] / \text{Maximum } [L(1) \sim L(5)]\}*100\%$

X : Test Point

X=1 to 13

Active area
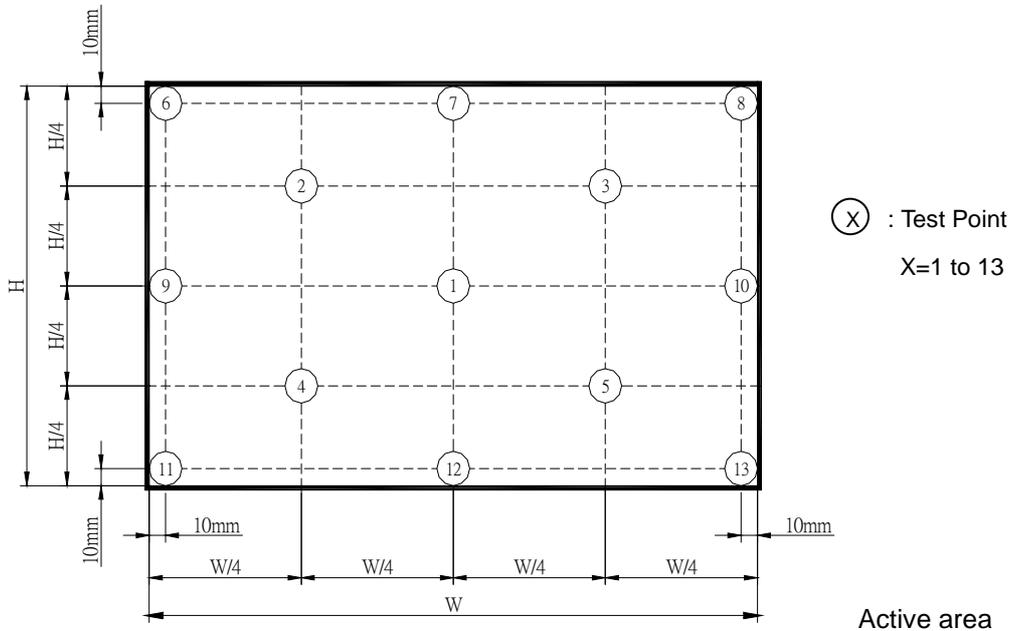
Note (7) Cross Talk (CT):

CT= $|Y_B - Y_A| / Y_A \times 100\%$

Where

YA=Luminance of measured location in left figure

YB=Luminance of measured location in right figure
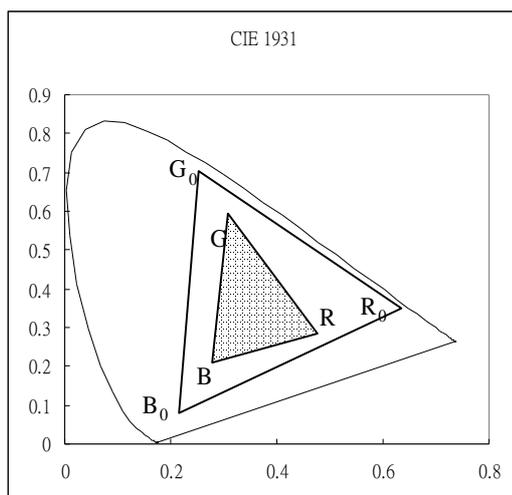

Note (8) Definition of color gamut (C.G%):

C.G%= Area (R, G, B) / Area (R$_0$, G$_0$, B$_0$,)* 100%

R$_0$, G$_0$, B$_0$: CIE1931 coordinates of red, green, and blue defined by NTSC.

R, G, B: CIE1931 coordinates of red, green, and blue in module at 63 gray level.

Area (R$_0$, G$_0$, B$_0$): Area of the triangle defined by coordinate R0, G0, B0.

Area(R, G, B): Area of the triangle defined by coordinate R, G, B

Note (9) The listed optical specifications refer to the initial value of manufacture, but the condition of the specifications after long-term operation will not be warranted.

7. RELIABILITY TEST ITEM

Test Item	Test Condition	Note
High Temperature Storage Test	60ºC, 240 hours	(1) (2)
Low Temperature Storage Test	-20ºC, 240 hours	
Thermal Shock Storage Test	-20ºC, 0.5hour←→60℃, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	50ºC, 240 hours	
Low Temperature Operation Test	0ºC, 240 hours	
High Temperature & High Humidity Operation Test	50ºC, RH 80%, 240hours	
ESD Test (Operation)	150pF, 330Ω, 1sec/cycle Condition 1 : Contact Discharge, ±8KV Condition 2 : Air Discharge, ±15KV	(1)
Shock (Non-Operating)	220G, 2ms, half sine wave,1 time for each direction of ±X,±Y,±Z	(1)(3)
Vibration (Non-Operating)	1.5G / 10-500 Hz, Sine wave, 30 min/cycle, 1cycle for each X, Y, Z	(1)(3)

Note (1) criteria : Normal display image with no obvious non-uniformity and no line defect.

Note (2) Evaluation should be tested after storage at room temperature for more than two hour

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.
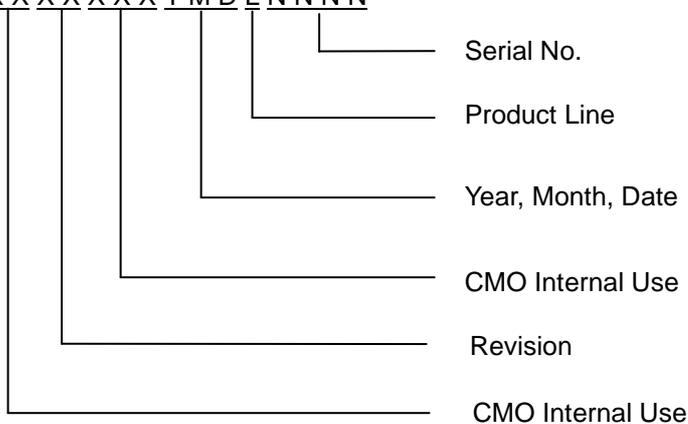
8. PACKING

8.1 MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

(a) Model Name: N133HSG – WJ1

(b) Revision: Rev. XX, for example: C1, C2 …etc.

(c) Serial ID: X X X X X X X Y M D L N N N N

```
                                  Serial No.

                              Product Line

                          Year, Month, Date

                      CMO Internal Use

                  Revision

              CMO Internal Use
```

Serial ID includes the information as below:

   (a) Manufactured Date: Year: 0~9, for 2010~2019

   Month: 1~9, A~C, for Jan. ~ Dec.

   Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

   (b) Revision Code: cover all the change

   (c) Serial No.: Manufacturing sequence of product

   (d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

8.2 CARTON

Box Dimensions : 490(L)*350(W)*320(H)
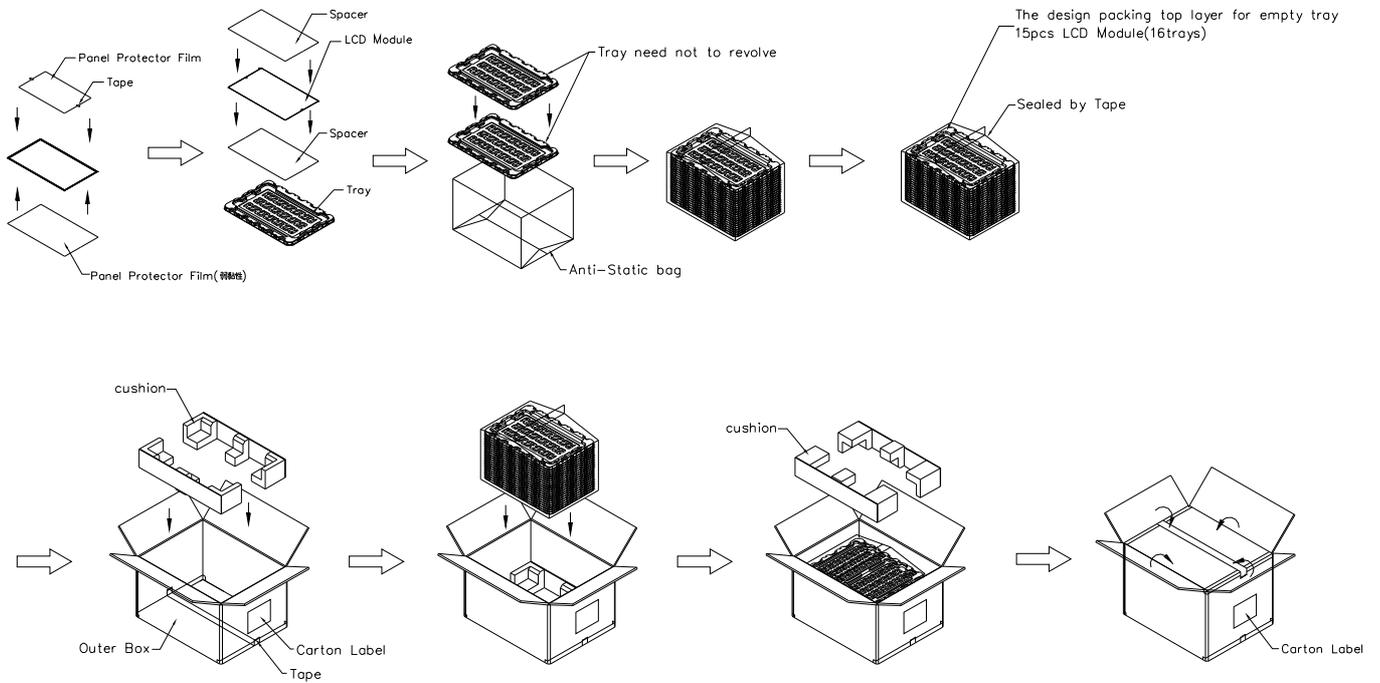Weight : Approx. TBD Kg (15 module .per. 1box)

Figure. 7-2 Packing method

8.3 PALLET

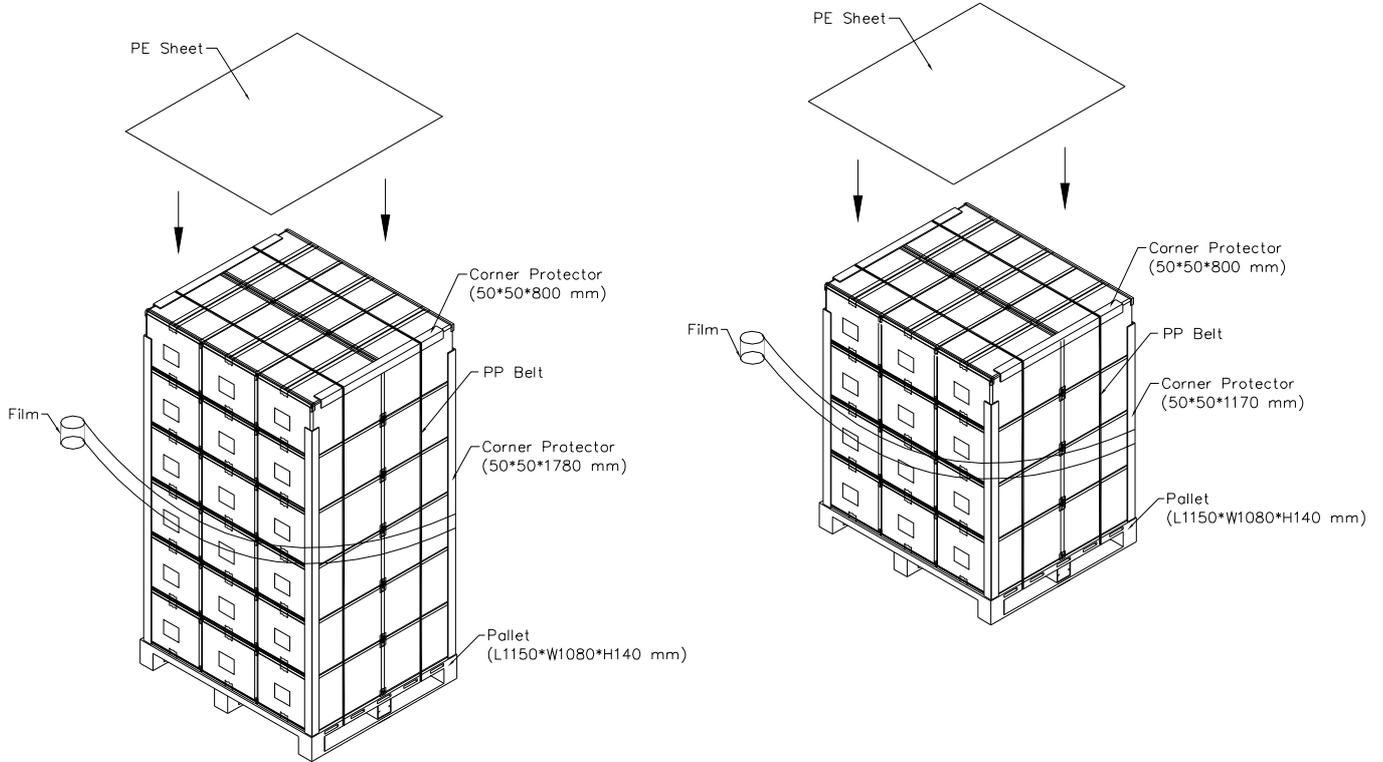Sea & Land Transportation

Air Transportation

Figure. 7-3 Packing method

9. PRECAUTIONS

9.1 HANDLING PRECAUTIONS

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the LED wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

(12) Always using two hands to hold and handle the modules. And do not hold the corner.

9.2 STORAGE PRECAUTIONS

(1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slowly, and the starting voltage of LED will be higher than the room temperature.

9.3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with converter. Do not disassemble the module or insert anything into the Backlight unit.

Appendix. EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the

VESA Plug & Display and FPDI standards.

Touch Panel Module:

Byte # (decimal)	Byte # (hex)	Field Name and Comments	Value (hex)	Value (binary)
0	0	Header	00	00000000
1	1	Header	FF	11111111
2	2	Header	FF	11111111
3	3	Header	FF	11111111
4	4	Header	FF	11111111
5	5	Header	FF	11111111
6	6	Header	FF	11111111
7	7	Header	00	00000000
8	8	EISA ID manufacturer name ("CMN")	0D	00001101
9	9	EISA ID manufacturer name (Compressed ASCII)	AE	10101110
10	0A	ID product code (N133HSG-WJ1)	46	01000110
11	0B	ID product code (hex LSB first; N133HSG-WJ1)	13	00010011
12	0C	ID S/N (fixed "0")	00	00000000
13	0D	ID S/N (fixed "0")	00	00000000
14	0E	ID S/N (fixed "0")	00	00000000
15	0F	ID S/N (fixed "0")	00	00000000
16	10	Week of manufacture (fixed week code)	34	00110100
17	11	Year of manufacture (fixed year code)	15	00010101
18	12	EDID structure version # ("1")	01	00000001
19	13	EDID revision # ("4")	04	00000100
20	14	Vedio Input Definition	A5	10100101
21	15	Max H image size ("28.186cm")	1C	00011100
22	16	Max V image size ("16.524cm")	10	00010000
23	17	Display Gamma (Gamma = "2.2")	78	01111000
24	18	Feature support	02	00000010
25	19	Red/Green (Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	93	10010011
26	1A	Blue/White (Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	AD	10101101
27	1B	Red-x (Rx = "0.662")	A9	10101001
28	1C	Red-y (Ry = "0.325")	53	01010011
29	1D	Green-x (Gx = "0.296")	4C	01001100
30	1E	Green-y (Gy = "0.588")	96	10010110
31	1F	Blue-x (Bx = "0.146")	25	00100101
32	20	Blue-y (By = "0.068")	11	00010001
33	21	White-x (Wx = "0.311")	4F	01001111
34	22	White-y (Wy = "0.325")	53	01010011
35	23	Established timings 1	00	00000000
36	24	Established timings 2	00	00000000
37	25	Manufacturer's reserved timings	00	00000000
38	26	Standard timing ID # 1	01	00000001
39	27	Standard timing ID # 1	01	00000001
40	28	Standard timing ID # 2	01	00000001

41	29	Standard timing ID # 2	01	00000001
42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001
44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard timing ID # 6	01	00000001
50	32	Standard timing ID # 7	01	00000001
51	33	Standard timing ID # 7	01	00000001
52	34	Standard timing ID # 8	01	00000001
53	35	Standard timing ID # 8	01	00000001
54	36	Detailed timing description # 1 Pixel clock ("138.78MHz", According to VESA CVT Rev1.4)	36	00110110
55	37	# 1 Pixel clock (hex LSB first)	36	00110110
56	38	# 1 H active ("1920")	80	10000000
57	39	# 1 H blank ("160")	A0	10100000
58	3A	# 1 H active : H blank ("1920 :160")	70	01110000
59	3B	# 1 V active ("1080")	38	00111000
60	3C	# 1 V blank ("32")	20	00100000
61	3D	# 1 V active : V blank ("1080 :32")	40	01000000
62	3E	# 1 H sync offset ("46")	2E	00101110
63	3F	# 1 H sync pulse width ("30")	1E	00011110
64	40	# 1 V sync offset : V sync pulse width ("2 : 4")	24	00100100
65	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width ("46: 30 : 2 : 4")	00	00000000
66	42	# 1 H image size ("282 mm")	1A	00011010
67	43	# 1 V image size ("165 mm")	A5	10100101
68	44	# 1 H image size : V image size ("282 : 165")	10	00010000
69	45	# 1 H boarder ("0")	00	00000000
70	46	# 1 V boarder ("0")	00	00000000
71	47	# 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
72	48	Detailed timing description # 2 Pixel clock ("92.52MHz", According to VESA CVT Rev1.4)	24	00100100
73	49	# 2 Pixel clock (hex LSB first)	24	00100100
74	4A	# 2 H active ("1920")	80	10000000
75	4B	# 2 H blank ("160")	A0	10100000
76	4C	# 2 H active : H blank ("1920 :160")	70	01110000
77	4D	# 2 V active ("1080")	38	00111000
78	4E	# 2 V blank ("32")	20	00100000
79	4F	# 2 V active : V blank ("1080 :32")	40	01000000
80	50	# 2 H sync offset ("46")	2E	00101110
81	51	# 2 H sync pulse width ("30")	1E	00011110
82	52	# 2 V sync offset : V sync pulse width ("2 : 4")	24	00100100
83	53	# 2 H sync offset : H sync pulse width : V sync offset : V sync width ("46: 30 : 2 : 4")	00	00000000
84	54	# 1 H image size ("282 mm")	1A	00011010

85	55	# 1 V image size ("165 mm")	A5	10100101
86	56	# 1 H image size : V image size ("282 : 165")	10	00010000
87	57	# 2 H boarder ("0")	00	00000000
88	58	# 2 V boarder ("0")	00	00000000
89	59	# 2 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 FE (hex) defines ASCII string (Vendor "CMN", ASCII)	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# 3 1st character of string ("C")	43	01000011
96	60	# 3 2nd character of string ("M")	4D	01001101
97	61	# 3 3rd character of string ("N")	4E	01001110
98	62	# 3 New line character indicates end of ASCII string	0A	00001010
99	63	# 3 Padding with "Blank" character	20	00100000
100	64	# 3 Padding with "Blank" character	20	00100000
101	65	# 3 Padding with "Blank" character	20	00100000
102	66	# 3 Padding with "Blank" character	20	00100000
103	67	# 3 Padding with "Blank" character	20	00100000
104	68	# 3 Padding with "Blank" character	20	00100000
105	69	# 3 Padding with "Blank" character	20	00100000
106	6A	# 3 Padding with "Blank" character	20	00100000
107	6B	# 3 Padding with "Blank" character	20	00100000
108	6C	Detailed timing description # 4	00	00000000
109	6D	# 4 Flag	00	00000000
110	6E	# 4 Reserved	00	00000000
111	6F	# 4 FE (hex) defines ASCII string (Model Name"N133HSG-WJ1", ASCII)	FE	11111110
112	70	# 4 Flag	00	00000000
113	71	# 4 1st character of name ("N")	4E	01001110
114	72	# 4 2nd character of name ("1")	31	00110001
115	73	# 4 3rd character of name ("3")	33	00110011
116	74	# 4 4th character of name ("3")	33	00110011
117	75	# 4 5th character of name ("H")	48	01001000
118	76	# 4 6th character of name ("S")	53	01010011
119	77	# 4 7th character of name ("G")	47	01000111
120	78	# 4 8th character of name ("-")	2D	00101101
121	79	# 4 9th character of name ("W")	57	01010111
122	7A	# 4 Ath character of name ("J")	4A	01001010
123	7B	# 4 Bth character of name ("1")	31	00110001
124	7C	# 4 New line character indicates end of ASCII string	0A	00001010
125	7D	# 4 Padding with "Blank" character	20	00100000
126	7E	No extension	00	00000000
127	7F	Checksum	AD	10101101

Non-Touch Panel Module

Byte # (decimal)	Byte # (hex)	Field Name and Comments	Value (hex)	Value (binary)
0	0	Header	00	00000000
1	1	Header	FF	11111111
2	2	Header	FF	11111111
3	3	Header	FF	11111111
4	4	Header	FF	11111111
5	5	Header	FF	11111111
6	6	Header	FF	11111111
7	7	Header	00	00000000
8	8	EISA ID manufacturer name ("CMN")	0D	00001101
9	9	EISA ID manufacturer name (Compressed ASCII)	AE	10101110
10	0A	ID product code (N133HSG-WJ1)	47	01000111
11	0B	ID product code (hex LSB first; N133HSG-WJ1)	13	00010011
12	0C	ID S/N (fixed "0")	00	00000000
13	0D	ID S/N (fixed "0")	00	00000000
14	0E	ID S/N (fixed "0")	00	00000000
15	0F	ID S/N (fixed "0")	00	00000000
16	10	Week of manufacture (fixed week code)	34	00110100
17	11	Year of manufacture (fixed year code)	15	00010101
18	12	EDID structure version # ("1")	01	00000001
19	13	EDID revision # ("4")	04	00000100
20	14	Vedio Input Definition	A5	10100101
21	15	Max H image size ("28.186cm")	1C	00011100
22	16	Max V image size ("16.524cm")	10	00010000
23	17	Display Gamma (Gamma = "2.2")	78	01111000
24	18	Feature support	02	00000010
25	19	Red/Green (Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	93	10010011
26	1A	Blue/White (Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	AD	10101101
27	1B	Red-x (Rx = "0.662")	A9	10101001
28	1C	Red-y (Ry = "0.325")	53	01010011
29	1D	Green-x (Gx = "0.296")	4C	01001100
30	1E	Green-y (Gy = "0.588")	96	10010110
31	1F	Blue-x (Bx = "0.146")	25	00100101
32	20	Blue-y (By = "0.068")	11	00010001
33	21	White-x (Wx = "0.311")	4F	01001111
34	22	White-y (Wy = "0.325")	53	01010011
35	23	Established timings 1	00	00000000
36	24	Established timings 2	00	00000000
37	25	Manufacturer's reserved timings	00	00000000
38	26	Standard timing ID # 1	01	00000001
39	27	Standard timing ID # 1	01	00000001
40	28	Standard timing ID # 2	01	00000001
41	29	Standard timing ID # 2	01	00000001
42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001

44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard timing ID # 6	01	00000001
50	32	Standard timing ID # 7	01	00000001
51	33	Standard timing ID # 7	01	00000001
52	34	Standard timing ID # 8	01	00000001
53	35	Standard timing ID # 8	01	00000001
54	36	Detailed timing description # 1 Pixel clock ("138.78MHz", According to VESA CVT Rev1.4)	36	00110110
55	37	# 1 Pixel clock (hex LSB first)	36	00110110
56	38	# 1 H active ("1920")	80	10000000
57	39	# 1 H blank ("160")	A0	10100000
58	3A	# 1 H active : H blank ("1920 :160")	70	01110000
59	3B	# 1 V active ("1080")	38	00111000
60	3C	# 1 V blank ("32")	20	00100000
61	3D	# 1 V active : V blank ("1080 :32")	40	01000000
62	3E	# 1 H sync offset ("46")	2E	00101110
63	3F	# 1 H sync pulse width ("30")	1E	00011110
64	40	# 1 V sync offset : V sync pulse width ("2 : 4")	24	00100100
65	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width ("46: 30 : 2 : 4")	00	00000000
66	42	# 1 H image size ("282 mm")	1A	00011010
67	43	# 1 V image size ("165 mm")	A5	10100101
68	44	# 1 H image size : V image size ("282 : 165")	10	00010000
69	45	# 1 H boarder ("0")	00	00000000
70	46	# 1 V boarder ("0")	00	00000000
71	47	# 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
72	48	Detailed timing description # 2 Pixel clock ("92.52MHz", According to VESA CVT Rev1.4)	24	00100100
73	49	# 2 Pixel clock (hex LSB first)	24	00100100
74	4A	# 2 H active ("1920")	80	10000000
75	4B	# 2 H blank ("160")	A0	10100000
76	4C	# 2 H active : H blank ("1920 :160")	70	01110000
77	4D	# 2 V active ("1080")	38	00111000
78	4E	# 2 V blank ("32")	20	00100000
79	4F	# 2 V active : V blank ("1080 :32")	40	01000000
80	50	# 2 H sync offset ("46")	2E	00101110
81	51	# 2 H sync pulse width ("30")	1E	00011110
82	52	# 2 V sync offset : V sync pulse width ("2 : 4")	24	00100100
83	53	# 2 H sync offset : H sync pulse width : V sync offset : V sync width ("46: 30 : 2 : 4")	00	00000000
84	54	# 1 H image size ("282 mm")	1A	00011010
85	55	# 1 V image size ("165 mm")	A5	10100101
86	56	# 1 H image size : V image size ("282 : 165")	10	00010000
87	57	# 2 H boarder ("0")	00	00000000

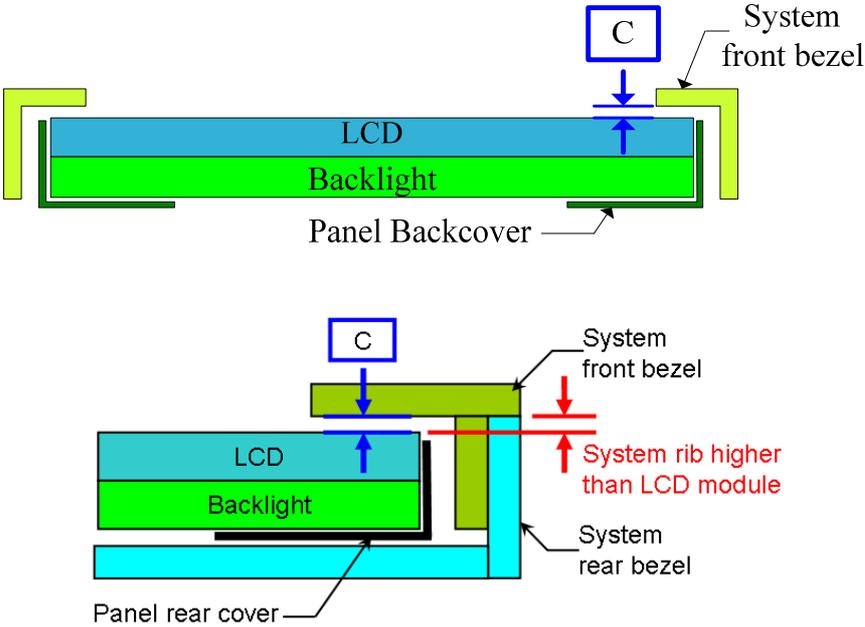| 88	58	# 2 V boarder ("0")	00	00000000
89	59	# 2 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 FE (hex) defines ASCII string (Vendor "CMN", ASCII)	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# 3 1st character of string ("C")	43	01000011
96	60	# 3 2nd character of string ("M")	4D	01001101
97	61	# 3 3rd character of string ("N")	4E	01001110
98	62	# 3 New line character indicates end of ASCII string	0A	00001010
99	63	# 3 Padding with "Blank" character	20	00100000
100	64	# 3 Padding with "Blank" character	20	00100000
101	65	# 3 Padding with "Blank" character	20	00100000
102	66	# 3 Padding with "Blank" character	20	00100000
103	67	# 3 Padding with "Blank" character	20	00100000
104	68	# 3 Padding with "Blank" character	20	00100000
105	69	# 3 Padding with "Blank" character	20	00100000
106	6A	# 3 Padding with "Blank" character	20	00100000
107	6B	# 3 Padding with "Blank" character	20	00100000
108	6C	Detailed timing description # 4	00	00000000
109	6D	# 4 Flag	00	00000000
110	6E	# 4 Reserved	00	00000000
111	6F	# 4 FE (hex) defines ASCII string (Model Name"N133HSG-WJ1", ASCII)	FE	11111110
112	70	# 4 Flag	00	00000000
113	71	# 4 1st character of name ("N")	4E	01001110
114	72	# 4 2nd character of name ("1")	31	00110001
115	73	# 4 3rd character of name ("3")	33	00110011
116	74	# 4 4th character of name ("3")	33	00110011
117	75	# 4 5th character of name ("H")	48	01001000
118	76	# 4 6th character of name ("S")	53	01010011
119	77	# 4 7th character of name ("G")	47	01000111
120	78	# 4 8th character of name ("-")	2D	00101101
121	79	# 4 9th character of name ("W")	57	01010111
122	7A	# 4 Ath character of name ("J")	4A	01001010
123	7B	# 4 Bth character of name ("1")	31	00110001
124	7C	# 4 New line character indicates end of ASCII string	0A	00001010
125	7D	# 4 Padding with "Blank" character	20	00100000
126	7E	No extension	00	00000000
127	7F	Checksum	AC	10101100

Appendix. OUTLINE DRAWING

294.96±0.05 (TP VA)
293.76±0.3 (Active Area)
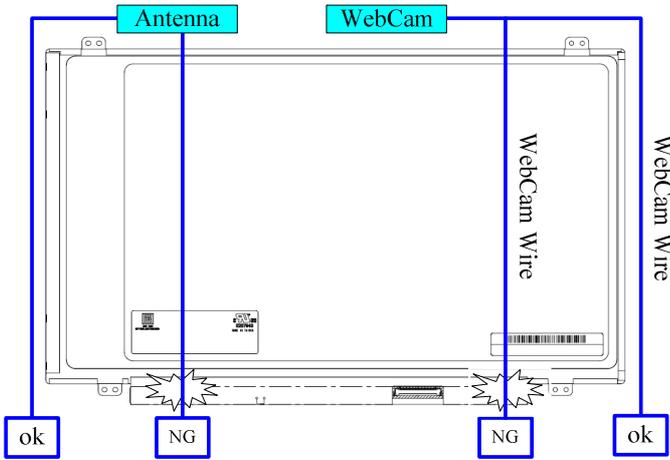166.44±0.05 (TP VA)
165.24±0.3 (Active Area)
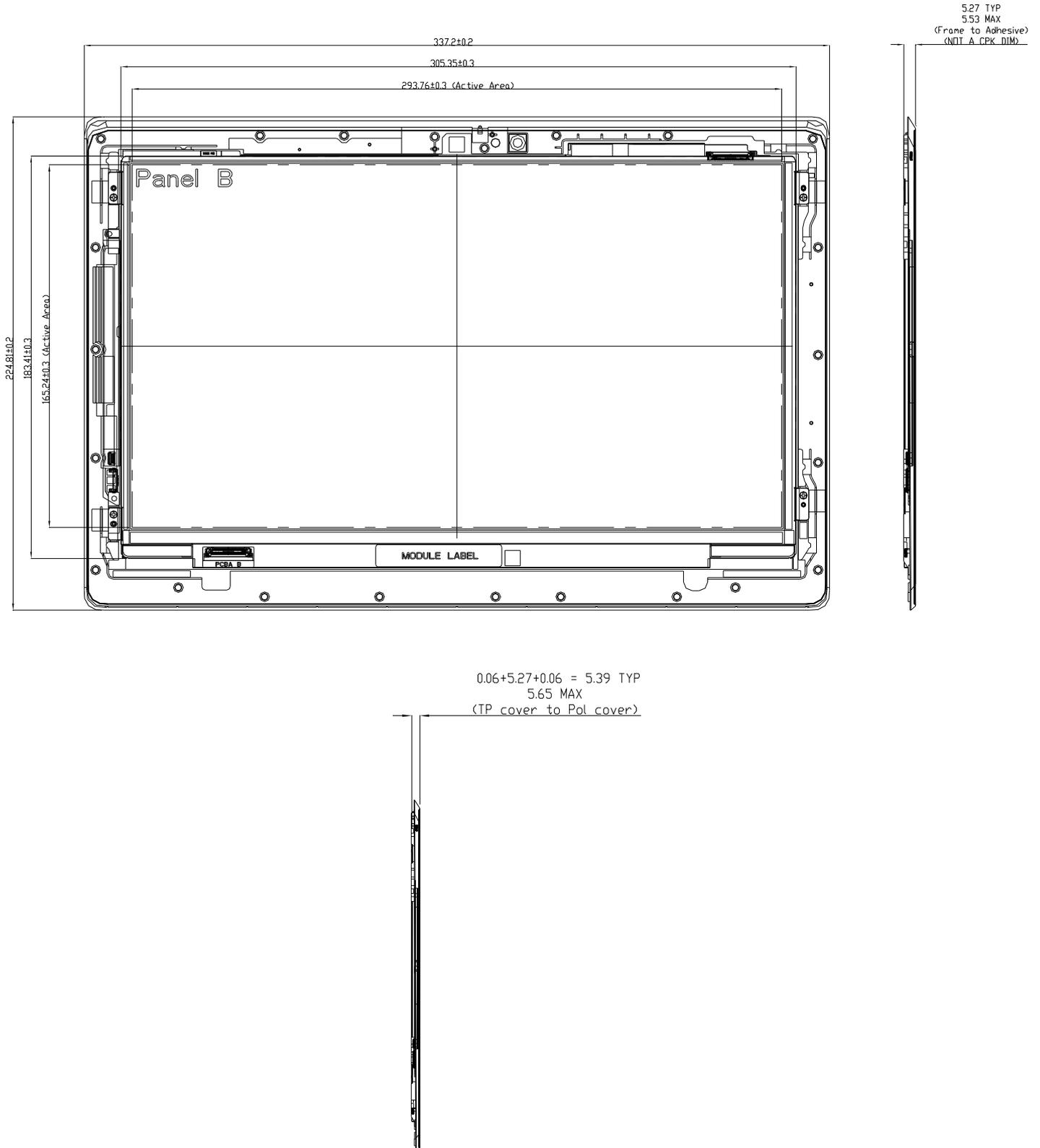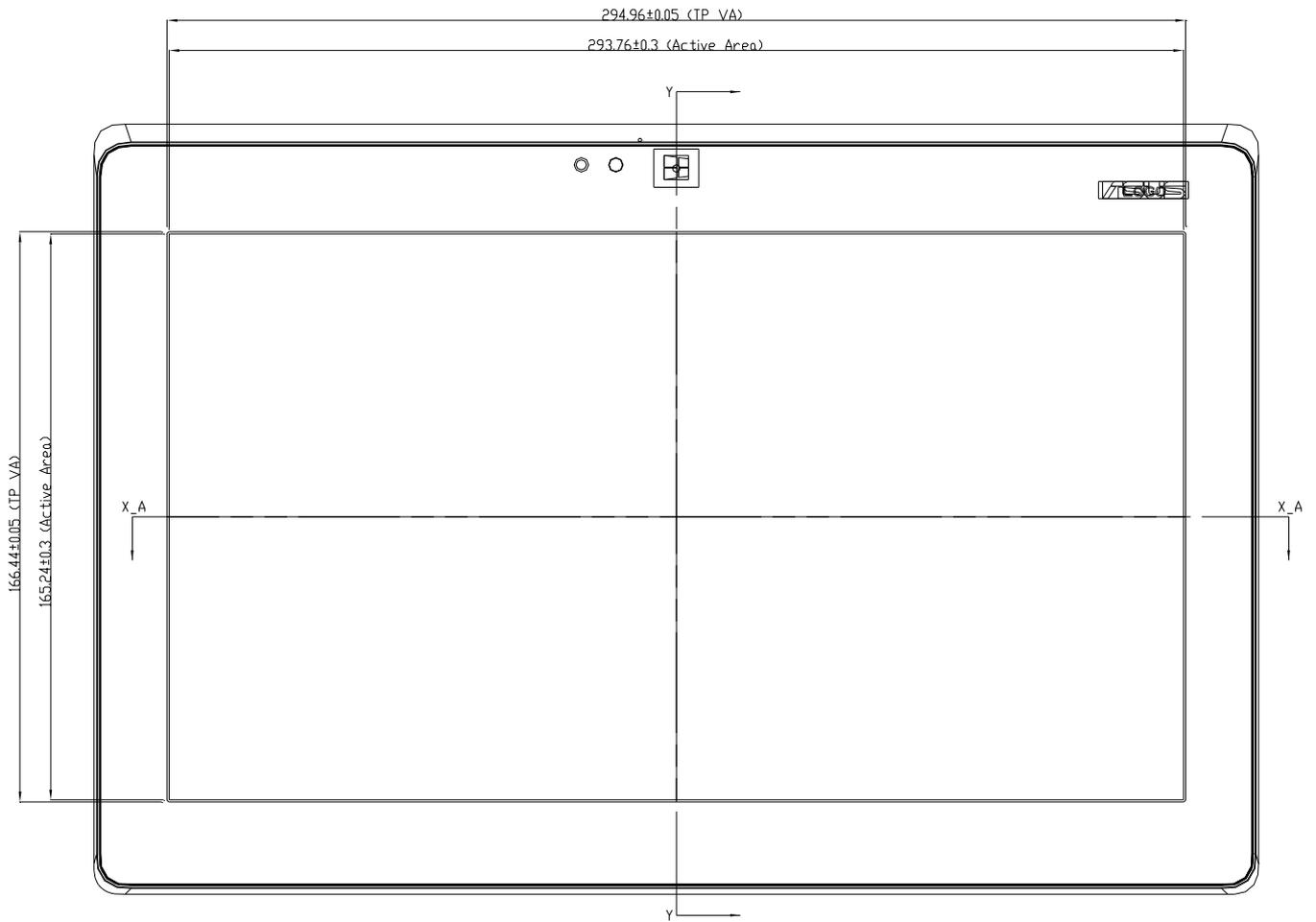
Appendix. SYSTEM COVER DESIGN NOTICE

1.	Design gap A between panel & any components on system cover

System cover inner surface

Max. Thickness

Panel Module

Components, foreign objects, wire, cable or extrusion on system cover inner surface.

A

Definition	a). At least 0.5mm gap between panel & system is recommended for preventing from backpack or pogo test fail. b). Zero gap from panel's maximum thickness boundary to any components, foreign objects, wire, cable or extrusion on system cover inner surface is forbidden.

2	Design gap B1 & B2 between panel & protrusions

B1 — Protrusion

Protrusion — B2

Definition	2.0mm min. gap is recommended between panel & protrusions for preventing from shock related failures.

3	Design gap C between system front bezel & panel surface.

Definition	a). Sufficient gap between system front bezel & panel surface is a must for preventing from pooling or glass broken. b). Zero gap or interference is forbidden. c). Zero gap is also forbidden in the act of system front bezel deformation during swing test, hinge test, knock test, or during pooling inspection procedure. d). To remain sufficient gap, design with system rib higher than maximum panel thickness is recommended.

4	Design gap D1 & D2 between system front bezel & PCB Assembly.
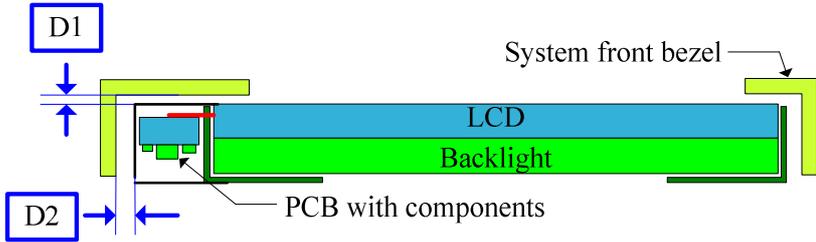
Definition	a). Sufficient gap between system front bezel & PCB assembly is a must for preventing from abnormal display after backpack test, hinge test, twist test or pogo test. b). Zero gap or interference is forbidden. c). Zero gap is also forbidden in the act of system front bezel deformation during hinge test, twist test, or during pooling inspection procedure. d). To remain sufficient gap, design with system rib higher than maximum panel thickness is recommended.

5	Interference examination of antenna cable and WebCam wire

Definition	a). Antenna cable or WebCam wire overlap with panel outline is forbidden for preventing from abnormal display & white spot after backpack test, hinge test, twist test or pogo test. b). Antenna cable or WebCam wire bypass panel outline is recommended.

6	System inner surface examination
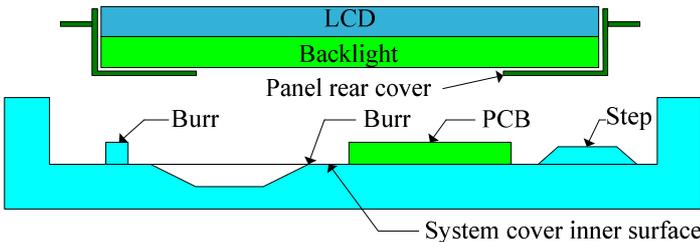
Definition	a). Burr at logo edge, step, protrusion or PCB board will easily cause white spot or glass broken. b). Keeping flat surface underneath backlight is recommended.

7	Tape/sponge design on system inner surface

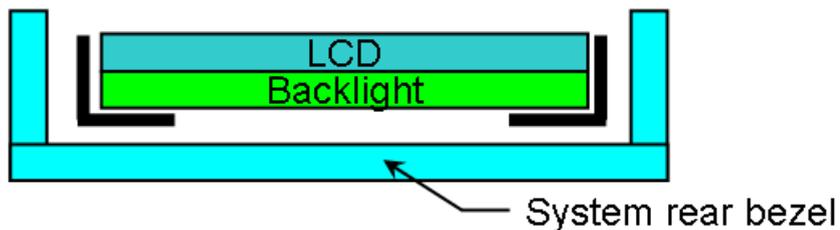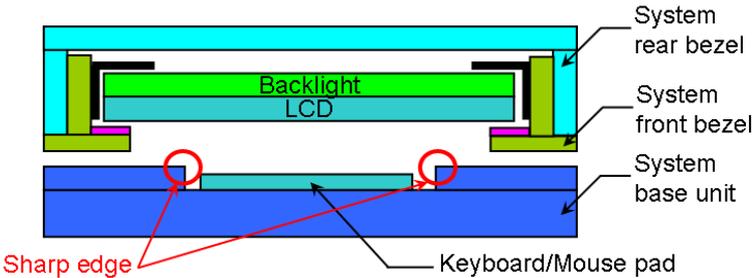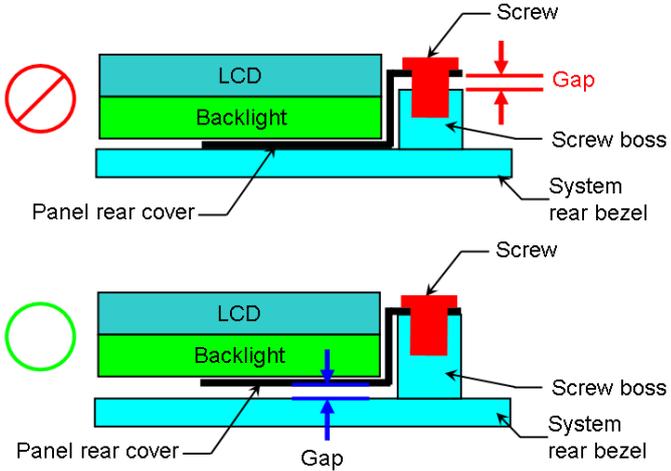| Definition	a) To prevent abnormal display & white spot after scuffing test, hinge test, pogo test, backpack test, it is not recommended to add tape/sponge in separate location. Since each tape/sponge may act as pressure concentration location. b) We suggest to design with a tape/sponge that well covered under panel rear cover.
8	**Assembly SOP examination**
Definition	To prevent panel crack during system front bezel assembly process with hook design, it is prohibited to press panel or any location that related directly to the panel.
9	**Material used for system rear bezel**
Definition	To prevent panel crack during system front bezel assembly process without hook design, it is only allowed to give slight pressure with large contact area. This can help to distribute the stress and prevent stress concentration. Also it is suggest to put the system on a flat surface stage during the assembly.
10	**Material used for system rear bezel**
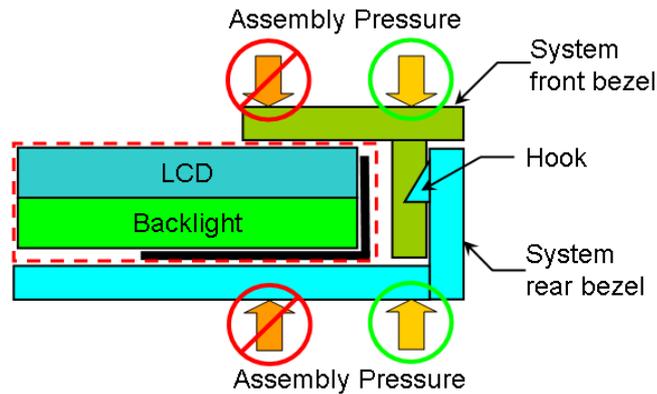
Definition	a) To prevent abnormal display & white spot after scuffing test, hinge test, pogo test, backpack test, as the poor rigidity result from deformation of system rear cover during the test. b) We suggest using aluminum-magnesium alloy as the rear frame material with thickness min 1.5mm, instead of using PC/ABS.
11	**System base unit design near keyboard and mouse pad**
Definition	To prevent abnormal display & white spot after scuffing test, hinge test, pogo test, backpack test, no sharp edge design is allowed in any area that may damage the panel during the test. We suggest to remove all sharp edges, or to reduce the thickness difference of keyboard/mouse pad from the nearby surface.
12	**Screw boss height design**
Definition	a). Gap left between panel rear cover bracket and screw boss surface is prohibited. b). To remain sufficient gap between panel and system rear bezel, screw boss height must be designed with respet to the height of bracket bottom surface to panel bottom surface + flatness change of panel itself.