

PRODUCT SPECIFICATION

Doc. Number:

- Tentative Specification
- Preliminary Specification
- Approval Specification

MODEL NO.: N140JCN
SUFFIX: GS9 Rev.C1

Customer:	
APPROVED BY	SIGNATURE
<u>Name / Title</u>	_____
Note	_____
_____ Please return 1 copy for your confirmation with your signature and comments.	

Approved By	Checked By	Prepared By

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Tel: +86 13728663670
Email: andeic@andesource.com
www.andelectronics.com

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REVISION HISTORY

Version	Date	Page	Description
1.0	Apr.10, 2020	All	Tentative Spec Ver.1.0 was issued.
2.0	Oct.14.2020	All	Preliminary Spec Ver.2.0 was issued.
3.0	Dec.10.2020	All	Approval Spec Ver.3.0 was issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

N140JCN-GS9 is a 14.0" (14.0" diagonal) TFT Liquid Crystal Display NB module with LED Backlight unit and 40 pins eDP interface. This module supports 1920 x 1200 FHD mode and can display 16,777,216 colors.

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	14.0 diagonal		
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1200	pixel	-
Pixel Pitch	0.15708 (H) x 0.15708 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16,777,216	color	-
Interface	eDP1.4		
Transmissive Mode	Normally Black	-	-
Surface Treatment	Hard coating (3H), Anti-Glare	-	-
Luminance, White	400	Cd/m2	
Color Gamma	100%	sRGB	
Power Consumption	Total 2.7Max.) @ cell 0.6w(Max.), BL 2.1w (Max.)		(1)
Special Function Support	G-sync DD(support) G-sync nVSR(Not support) Free-sync (48 Hz ~ 60Hz) PSR2(support) LRR 48Hz support Low Blue Light, TUV Method-2		
TP Module			
Item	Specification	Unit	Note
Number of Channels	42 x 67	-	-
Touch Method	Finger	-	-
Numbers of Touch	10 points	-	-
Accuracy	Meet WHLK	mm	-
Linearity	Meet WHLK	-	-
Reporting rate	Meet WHLK	Hz	-
Interface	HID/I2C	-	-
Power Consumption	Active mode (300)mW(MAX), Idle mode (120)mW(Max)	-	(3)

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 °C, whereas **Mosaic** pattern is displayed.

Note (2) Display port interface signals should follow VESA DisplayPort Standard Version1. Revision 1a and VESA Embedded DisplayPort™ Standard Version 1.3(eDP1.4) There are many optional items described in eDP1.4 If some optional item is requested, please contact us.

Note (3) The active mode is under the conditions at 10 fingers touch.

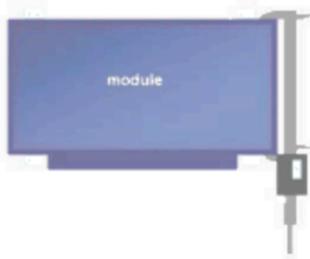
2. MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	306.29	306.59	306.89	mm	(1)(2)(3)
	Vertical (V)	198.30	198.60	198.90	mm	
	Thickness (T) (w/o PCB)		2.25	2.4	mm	
	Thickness (T) (with PCB)			4.5	mm	
Active Area	Horizontal	301.49	301.59	301.69	mm	
	Vertical	188.40	188.50	188.60	mm	
	Weight	-	210	220	g	

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

Note (2) Dimensions are measured by caliper.

(3) Panel thickness is measured with calipers clamping mylar or tape tightly



2.1 CONNECTOR TYPE

Please refer appendix outline drawing for detail design.

Connector Part No.: IPEX-20455-040E

User's connector Part No: IPEX-20453-040T-03

3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

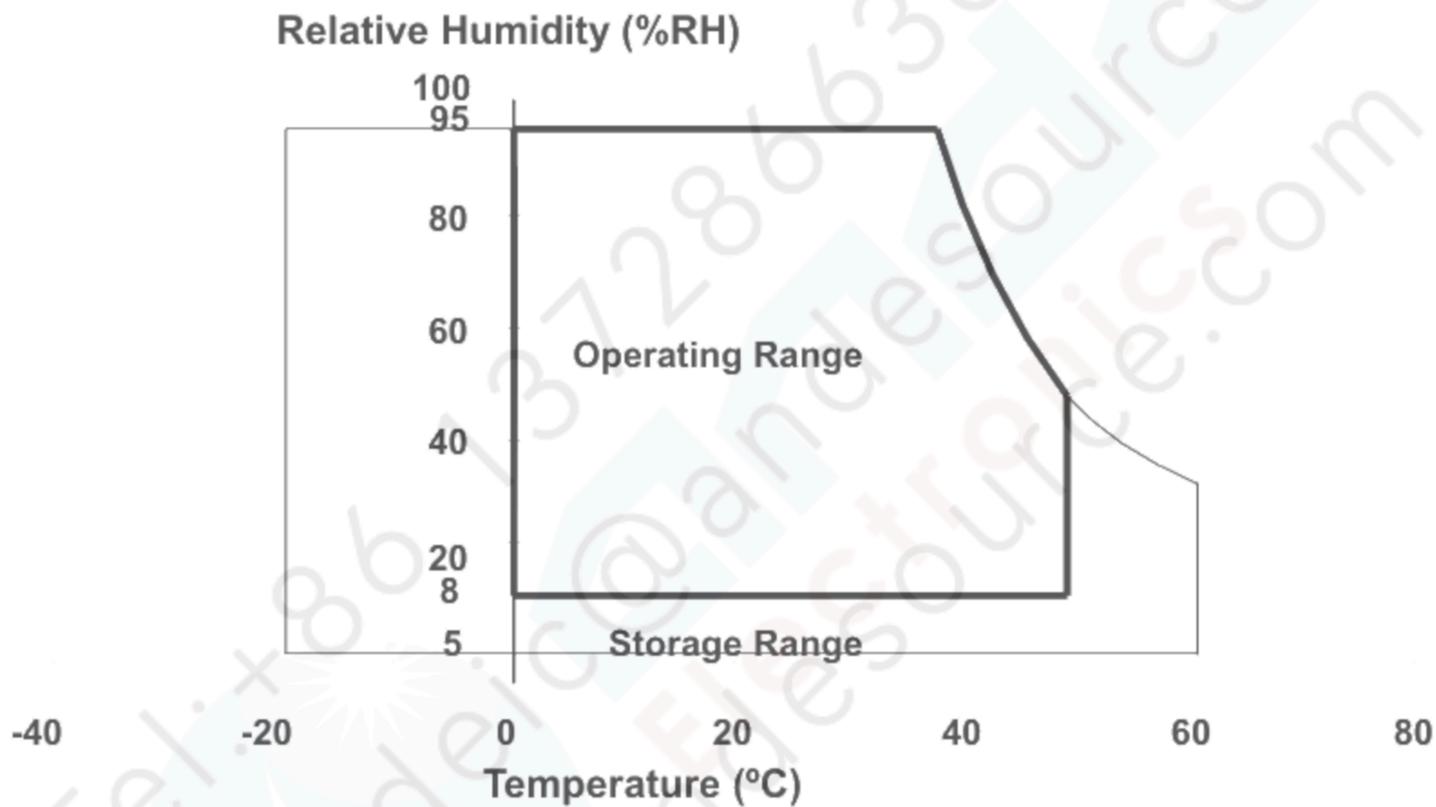
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	(1)
Operating Ambient Temperature	T _{OP}	0	+50	°C	(1), (2)

Note (1) (a) 95 %RH Max. (Ta < 40 °C).

(b) Wet-bulb temperature should be 39 °C Max.

(c) No condensation.

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



3.2 ELECTRICAL ABSOLUTE RATINGS

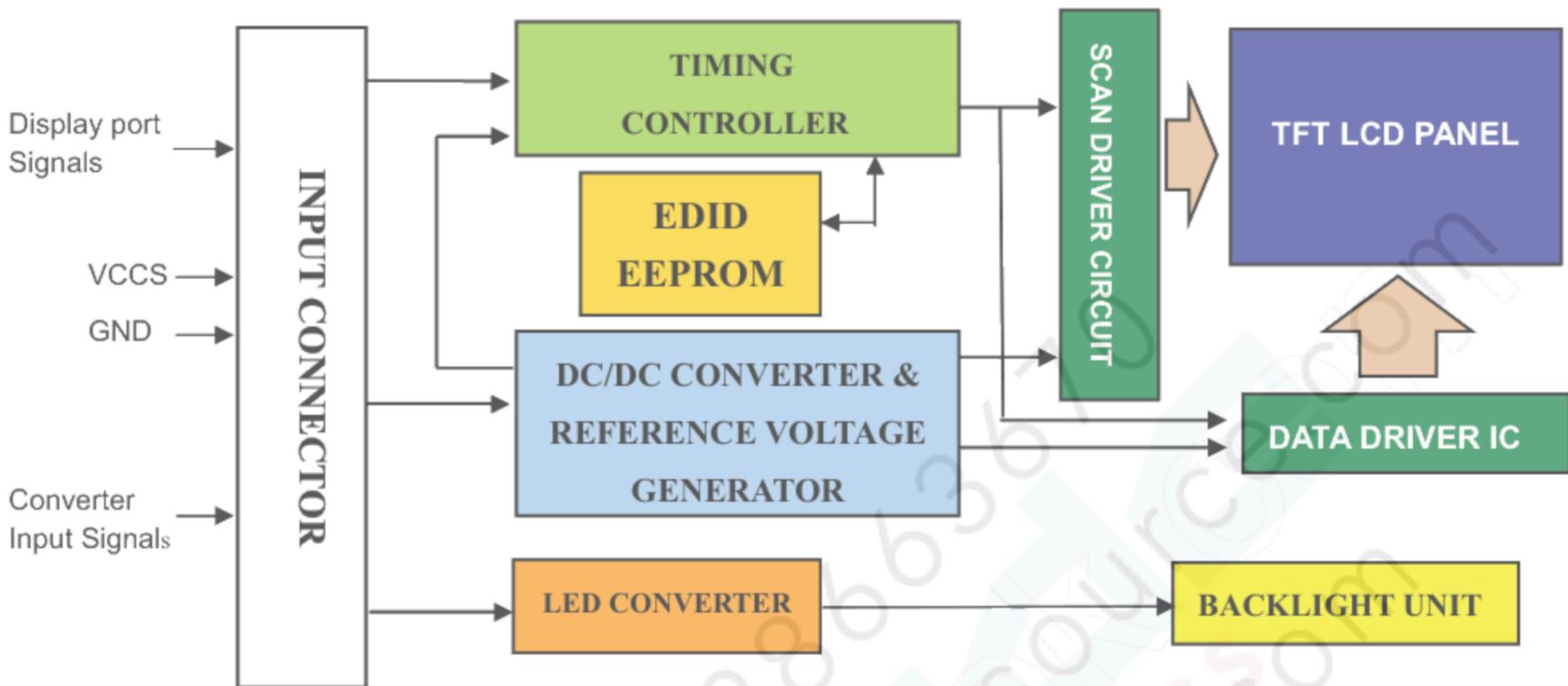
3.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	+4.0	V	(1)
Logic Input Voltage	V _{IN}	-0.3	VCCS+0.3	V	(1)
Converter Input Voltage	LED_VCCS	-0.3	26	V	(1)
Converter Control Signal Voltage	LED_PWM,	-0.3	5	V	(1)
Converter Control Signal Voltage	LED_EN	-0.3	5	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".

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM



4.2. INTERFACE CONNECTIONS

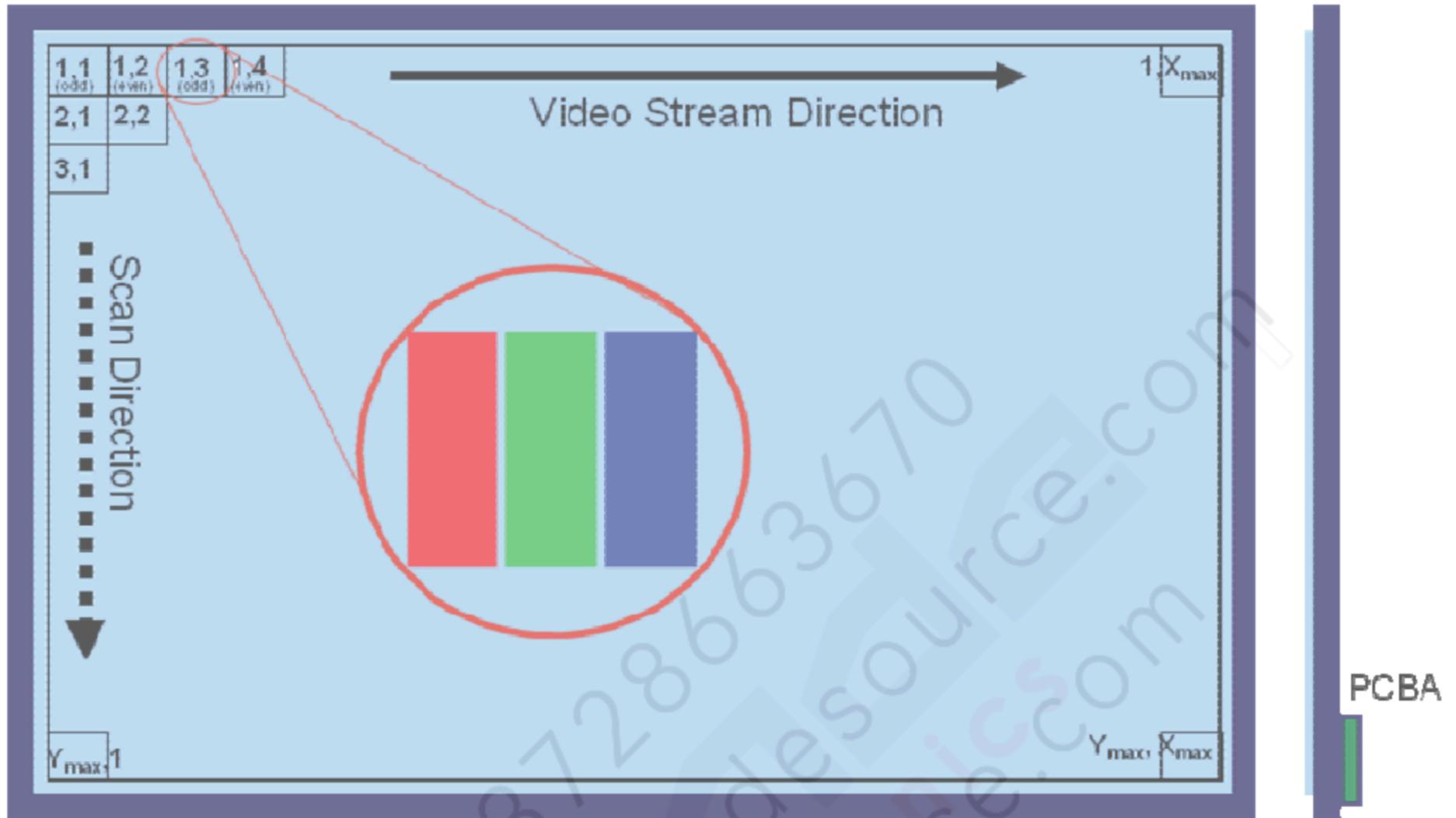
PIN ASSIGNMENT

Pin	Symbol	Description	Remark
1	NC	No Connection (Reserve)	
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-Lane 0	
7	Lane0_P	True Signal-Main 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 for LCD	
13	VCCS	Power Supply for LCD	
14	BIST_EN	Panel Built In Self Test Enable	
15	VSS	Ground	
16	VSS	Ground	
17	HPD	Hot Plug Detect	
18	LED_GND	LED Ground	
19	LED_GND	LED Ground	
20	LED_GND	LED Ground	
21	LED_GND	LED Ground	
22	LED_EN	Enable Control Signal of LED Converter	
23	LED_PWM	PWM Control Signal of LED Converter	
24	NC	No Connection (Reserve)	

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25	NC	No Connection (Reserve)	
26	LED_VCCS	LED Power Supply	
27	LED_VCCS	LED Power Supply	
28	LED_VCCS	LED Power Supply	
29	LED_VCCS	LED Power Supply	
30	NC	No Connection (Reserve)	
31	TP_Reset	Reset signal for Touch panel (High: Normal, Low: Reset)	
32	TP_SCL	I2C Clock for Touch (NC for USB Input)	Open Drain, Pull high 2.2Kohm
33	TP_SDA	I2C Data for Touch (NC for USB Input)	Open Drain, Pull high 2.2Kohm
34	TP_INT	Interrupt for Touch (NC for USB Input)	Output, Pull high 10Kohm
35	TP_VSS	Ground for Touch panel	-
36	NC	No Connection (Reserved for USB Data+)	-
37	NC	No Connection (Reserved for USB Data-)	-
38	TP_VSS	Ground for Touch panel	-
39	TP_RS	Touch panel report switch (High: Enable, Low: Disable)	Input, Pull high 10Kohm
40	TP_VCCS	Power Supply for Touch panel(3.3V)	-

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



Note (2) The setting of BIST function are as follows.

Pin	Enable	Disable
BIST_EN	High Level	Low Level or Open

4.3 ELECTRICAL CHARACTERISTICS

4.3.1 LCD ELETRONICS SPECIFICATION

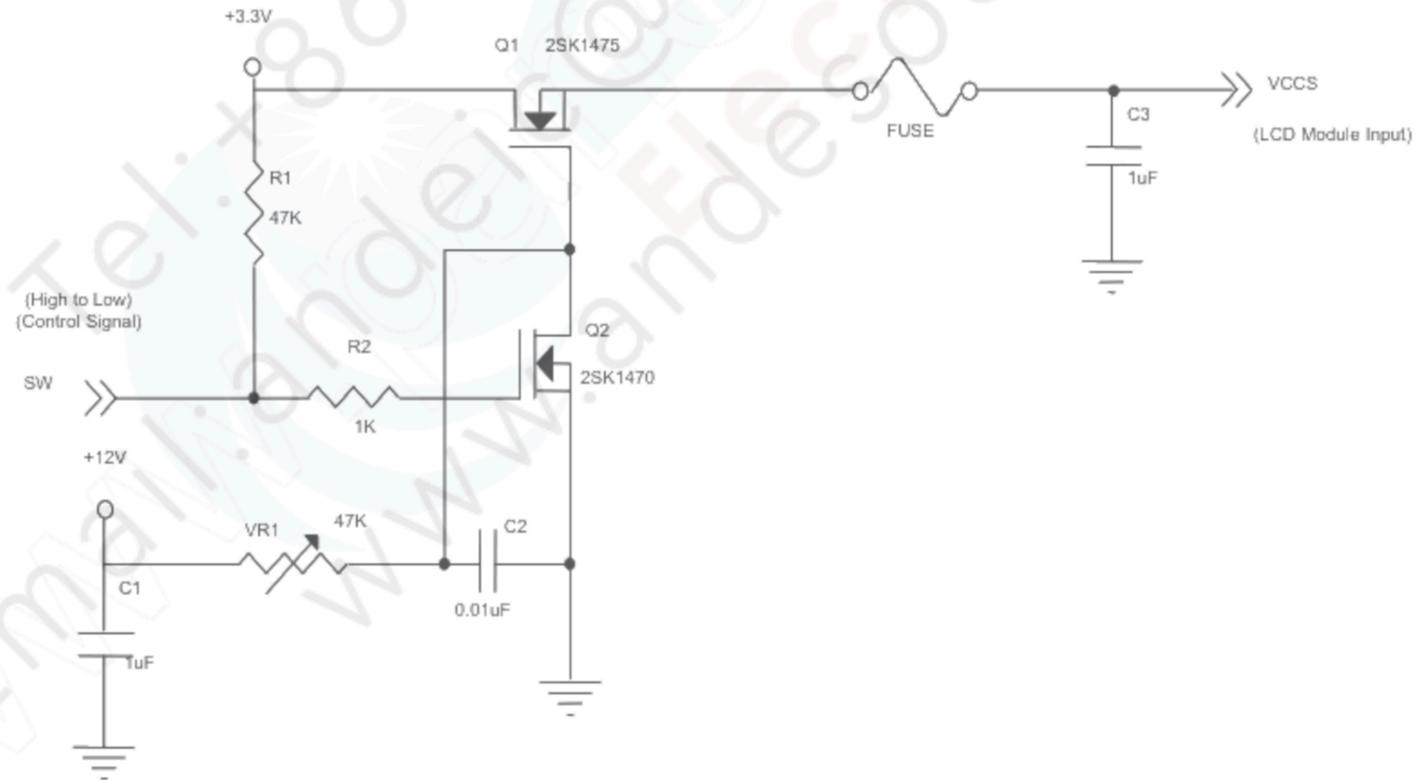
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	VCCS	3.0	3.3	3.6	V	(1)
Ripple Voltage	V_{RP}	-	-	100	mV	(1)
Inrush Current	I_{RUSH}	-	-	1.5	A	(1),(2)
Power Supply Current	Mosaic		140	(182)	mA	(3)a
	Black		131	(182)	mA	(3)
	(Solid Pattern)		250	(303)	mA	(3)b
HPD Impedance	R_{HPD}	30K				(4)
HPD	High Level	(2.5)	-	(3.60)	V	(5)
	Low Level	0	-	0.4	V	(5)
BIST_EN	High Level	3.0	-	3.6	V	
	Low Level	0	-	0.6	V	

Note (1) The ambient temperature is $T_a = 25 \pm 2 \text{ }^\circ\text{C}$.

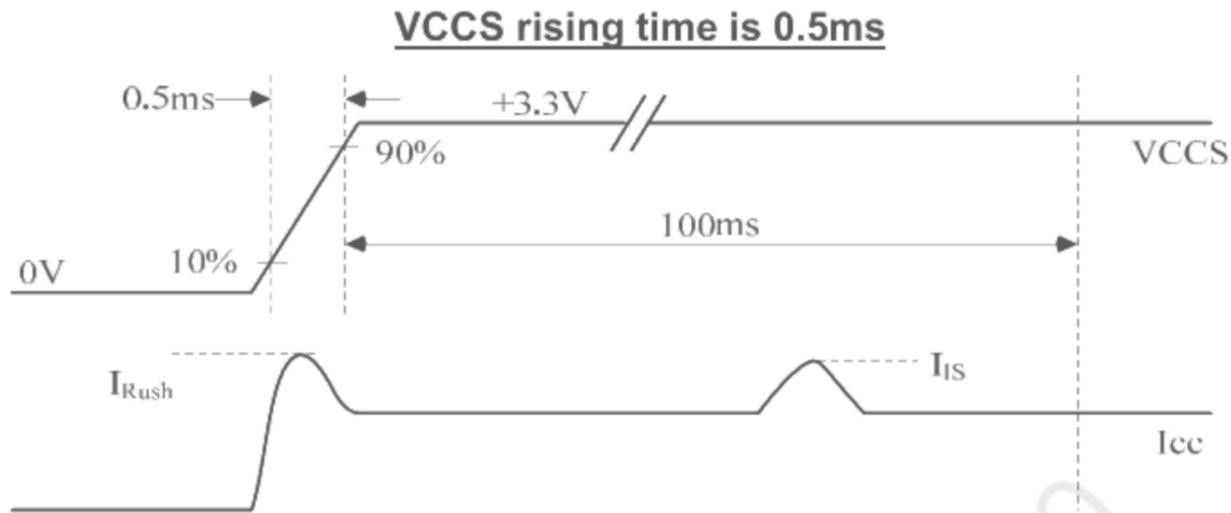
Note (2) I_{RUSH} : the maximum current when VCCS is rising

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

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

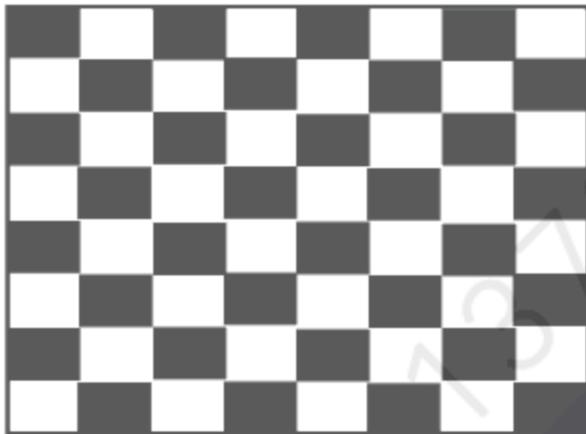


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Note (3) The specified power supply current is under the conditions at VCCS = 3.3 V, $T_a = 25 \pm 2 \text{ }^\circ\text{C}$, DC Current and $f_v = 60 \text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. Mosaic Pattern



Active Area

b. The Solid Pattern is the largest one of R/G/B pattern

Note (4) The specified signals have equivalent impedances pull down to ground in the LCD module respectively. Customers should keep the input signal level requirement with the load of LCD module. Please refer to Note (4) of 4.3.2 LED CONVERTER SPECIFICATION to obtain more information.

Note (5) When a source detects a low-going HPD pulse, it must be regarded as a HPD event. Thus, the source must read the link / sink status field or receiver capability field of the DPCD and take corrective action.

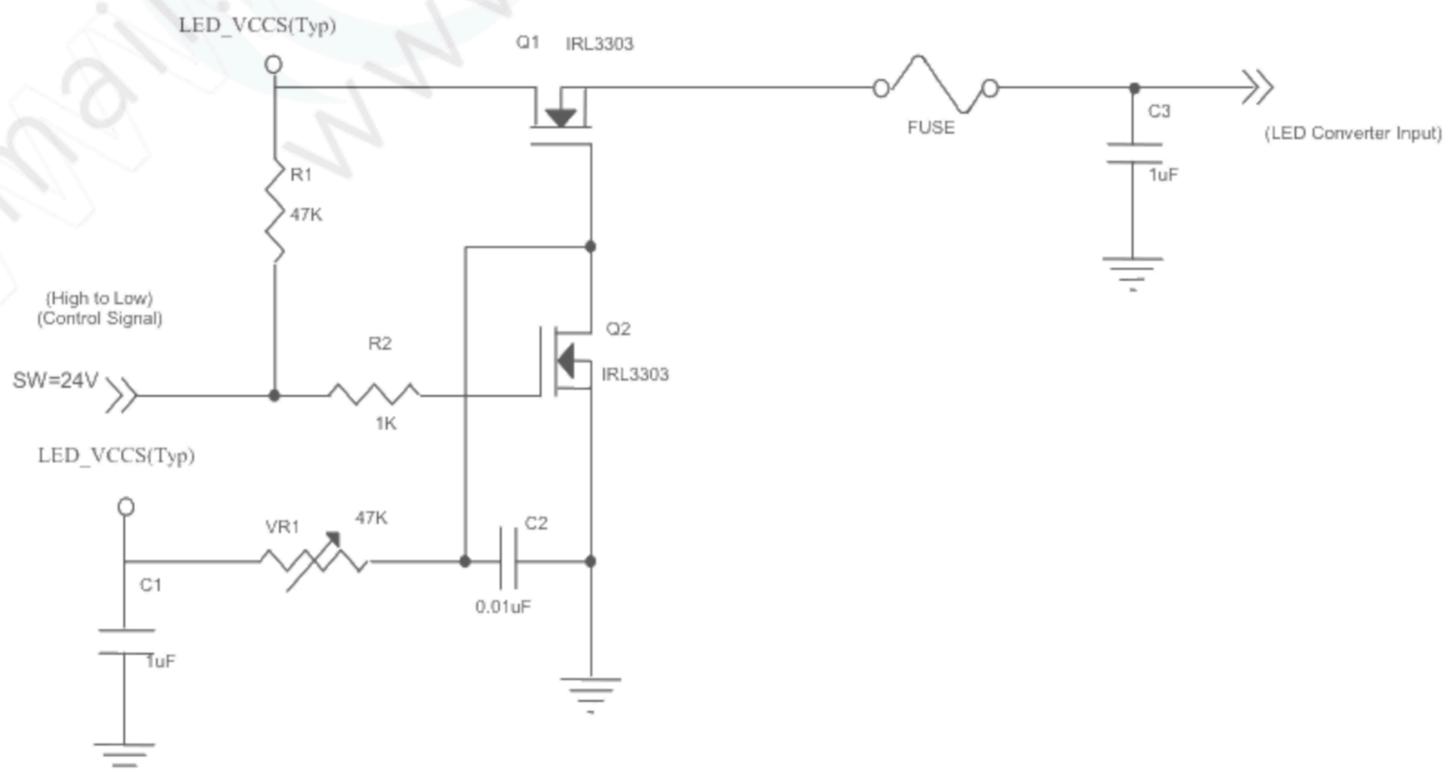
4.3.2 LED CONVERTER SPECIFICATION

Parameter	Symbol	Value			Unit	Note	
		Min.	Typ.	Max.			
Converter Input Power Supply Voltage	LED_Vccs	5.0	12.0	21.0	V		
Converter Inrush Current	I _{LED_RUSH}	-	-	1.5	A	(1)	
LED_EN Control Level	Backlight On	2.2	-	5.0	V	(4)	
	Backlight Off	0	-	0.6	V	(4)	
LED_EN Impedance	R _{LED_EN}	30K	-	-	ohm	(4)	
PWM Control Level	PWM High Level	2.2	-	5	V	(4)	
	PWM Low Level	0	-	0.6	V	(4)	
PWM Impedance	R _{PWM}	30K	-	-	ohm	(4)	
PWM Control Duty Ratio		1	-	100	%	(5)	
PWM Control Permissible Ripple Voltage	V _{PWM_pp}	-	-	100	mV		
PWM Control Frequency	f _{PWM}	190	-	2K	Hz	(2)	
LED Power Current	LED_VCCS =Typ.	I _{LED}	143	165	172	mA	(3)
LED dimming control method by LED controller			(DC Mode)				

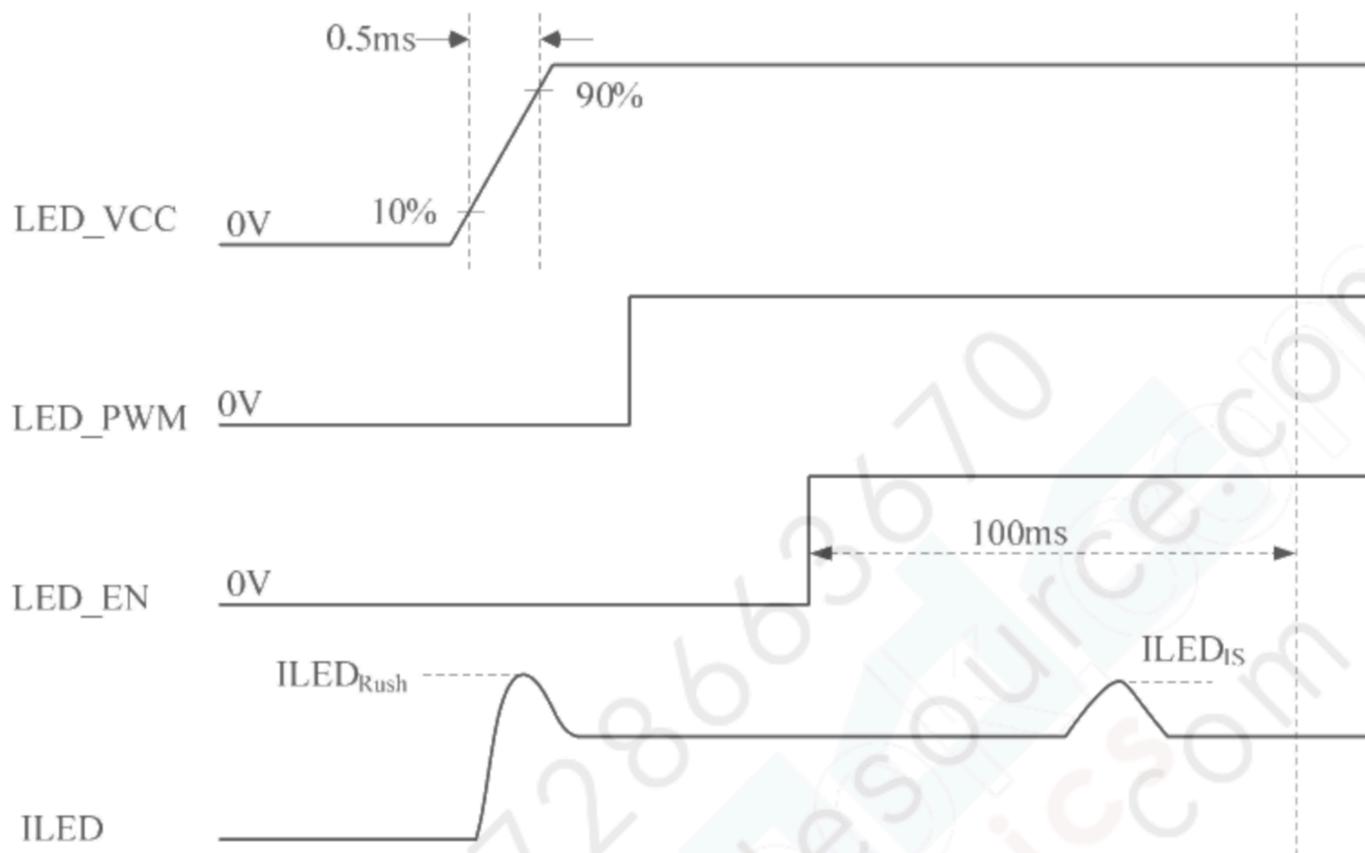
Note (1) I_{LED_RUSH}: the maximum current when LED_VCCS is rising,

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

Measurement Conditions: Shown as the following figure. LED_VCCS = Typ, Ta = 25 ± 2 °C, f_{PWM} = 200 Hz, Duty=100%.



VLED rising time is 0.5ms



Note (2) 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

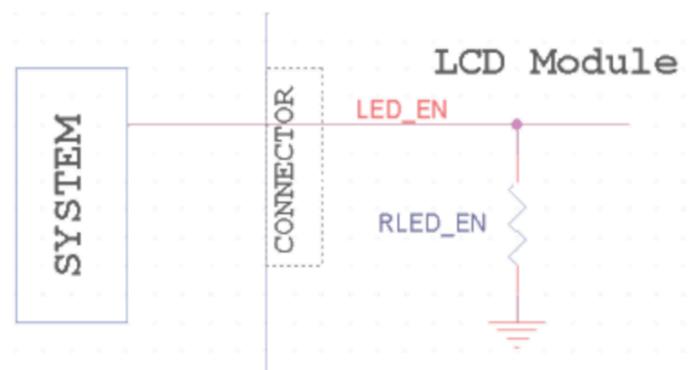
$$(N + 0.33) * f \leq f_{PWM} \leq (N + 0.66) * f$$

N : Integer ($N \geq 3$)

f : Frame rate

Note (3) The specified LED power supply current is under the conditions at “LED_VCCS = Typ.”, $T_a = 25 \pm 2 \text{ }^\circ\text{C}$, $f_{PWM} = 200 \text{ Hz}$, Duty=100%.

Note (4) The specified signals have equivalent impedances pull down to ground in the LCD module respectively. Customers should keep the input signal level requirement with the load of LCD module. For example, the figure below describes the equivalent pull down impedance of LED_EN (If it exists). The rest pull down impedances of other signals (eg. HPD, PWM ...) are in the same concept.



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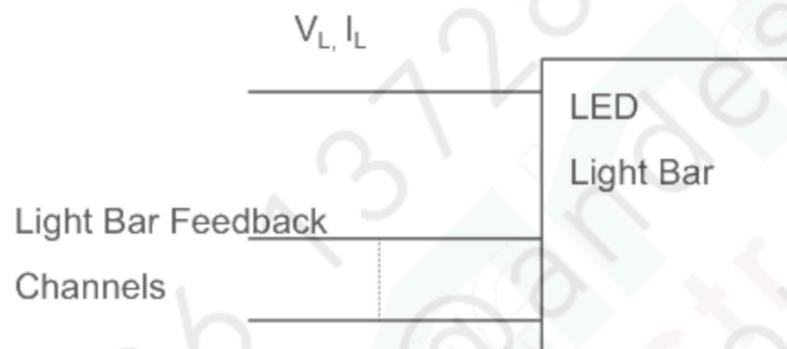
Note (5) If the cycle-to-cycle difference of PWM duty exceeds 0.1%, especially when the PWM duty is low, slight brightness change might be observed.

4.3.3 BACKLIGHT UNIT

Ta = 25 ± 2 °C

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Power Supply Voltage	V _L	31.2	34.2	36	V	(1)(2)(Duty100%)
LED Light Bar Power Supply Current	I _L	--	(52.8)	--	mA	
Power Consumption	P _L	--	(1.806)	(1.901)	W	(3)
LED Life Time	L _{BL}	15000	-	-	Hrs	(4)

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



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) $P_L = I_L \times V_L$ (Without LED converter transfer efficiency)

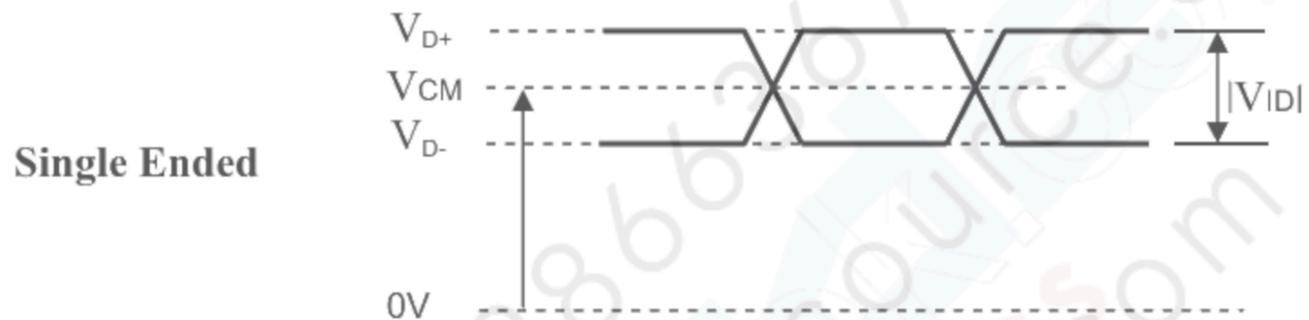
Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ± 2 °C and I_L = 8.8 mA(Per EA) until the brightness becomes ≤ 50% of its original value.

4.4 DISPLAY PORT INPUT SIGNAL TIMING SPECIFICATIONS

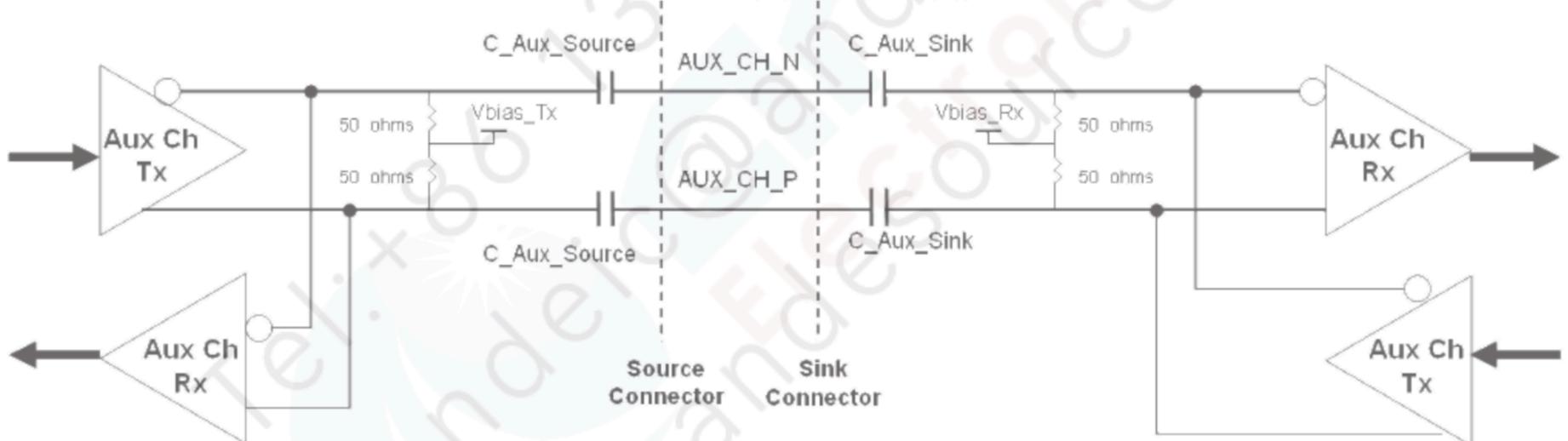
4.4.1 ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Differential Signal Common Mode Voltage(MainLink and AUX)	VCM	0		2	V	(1)(4)
AUX AC Coupling Capacitor	C_Aux_Source	75		200	nF	(2)
Main Link AC Coupling Capacitor	C_ML_Source	75		200	nF	(3)

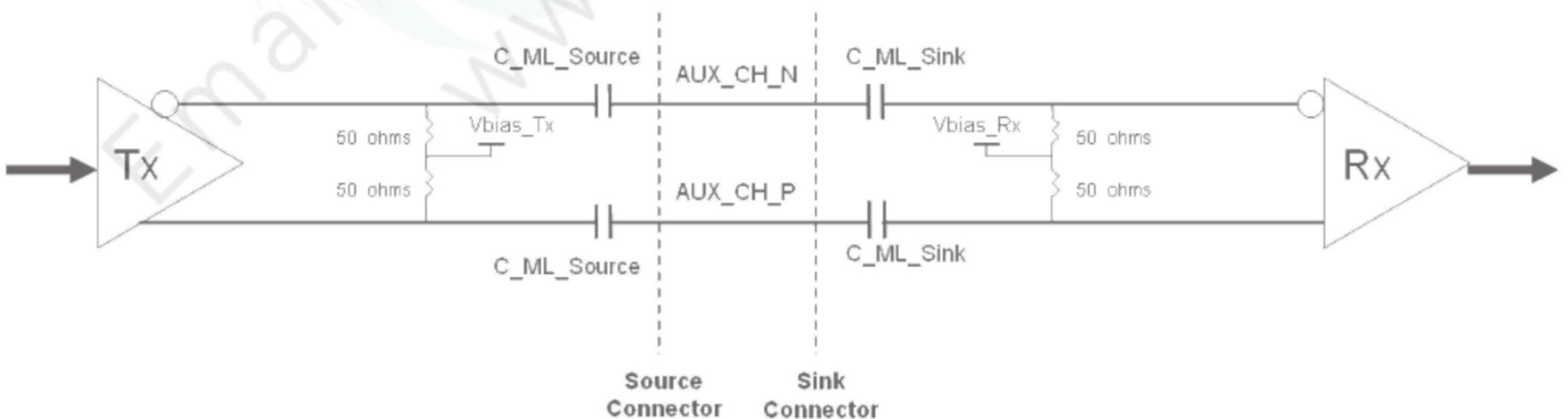
Note (1) Display port interface related AC coupled signals should follow VESA DisplayPort Standard Version1. Revision 1a and VESA Embedded DisplayPort™ Standard Version 1.2. There are many optional items described in eDP1.2. If some optional item is requested, please contact us.



(2) Recommended eDP AUX Channel topology is as below and the AUX AC Coupling Capacitor (C_Aux_Source) should be placed on the source device.



(3) Recommended Main Link Channel topology is as below and the Main Link AC Coupling Capacitor (C_ML_Source) should be placed on the source device.



(4) The source device should pass the test criteria described in DisplayPortCompliance Test Specification (CTS) 1.1

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	(152.28)	(154.26)	(156.24)	MHz	-
	Vertical Total Time	TV	(1232)	(1236)	(1240)	TH	-
DE	Vertical Active Display Period	TVD	(1200)	(1200)	(1200)	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	(32)	TV-TVD	TH	-
	Horizontal Total Time	TH	(2060)	(2080)	(2100)	Tc	-
	Horizontal Active Display Period	THD	(1920)	(1920)	(1920)	Tc	-
	Horizontal Active Blanking Period	THB	TH-THD	(160)	TH-THD	Tc	-

Refresh rate 50Hz (Power Saving Mode)

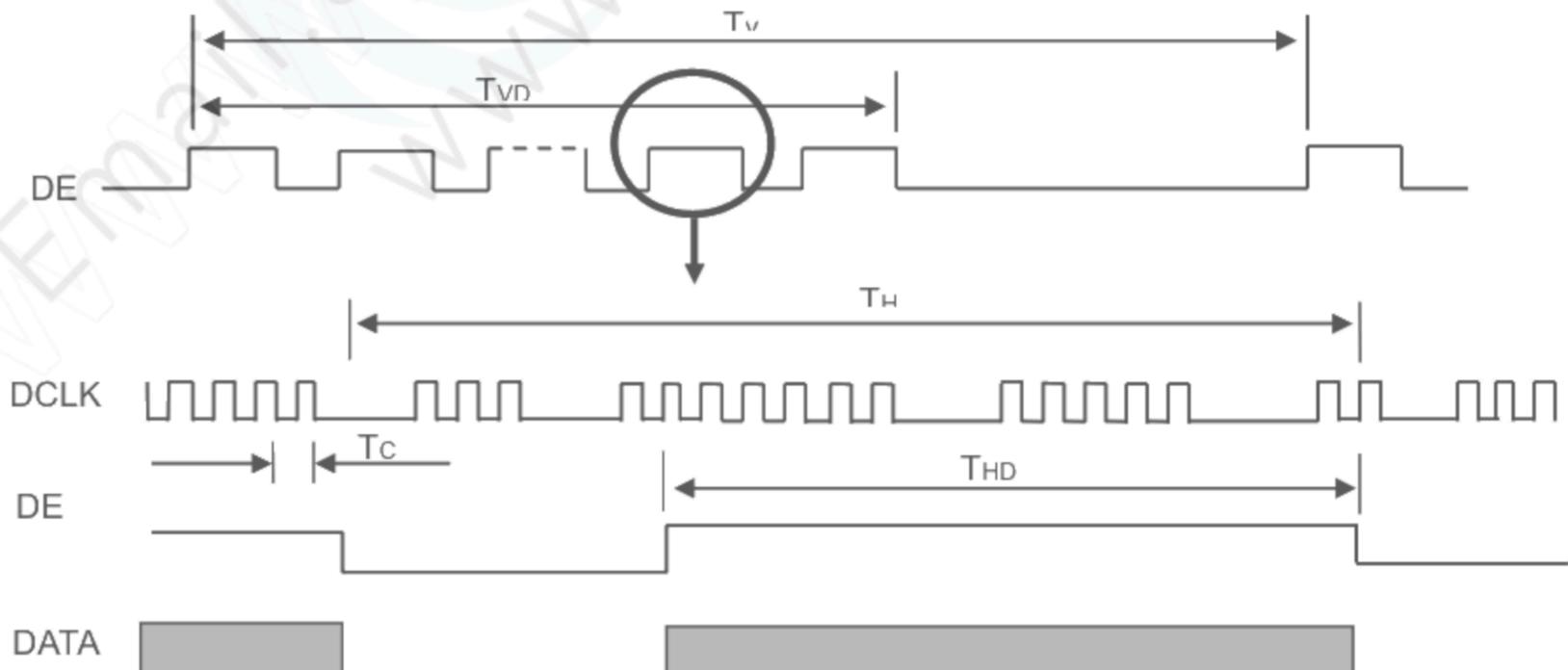
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	(126.9)	(128.55)	(130.2)	MHz	-
DE	Vertical Total Time	TV	(1232)	(1236)	(1240)	TH	-
	Vertical Active Display Period	TVD	(1200)	(1200)	(1200)	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	(32)	TV-TVD	TH	-
	Horizontal Total Time	TH	(2060)	(2080)	(2100)	Tc	-
	Horizontal Active Display Period	THD	(1920)	(1920)	(1920)	Tc	-
	Horizontal Active Blanking Period	THB	TH-THD	(160)	TH-THD	Tc	-

Refresh rate 48Hz (Power Saving Mode)

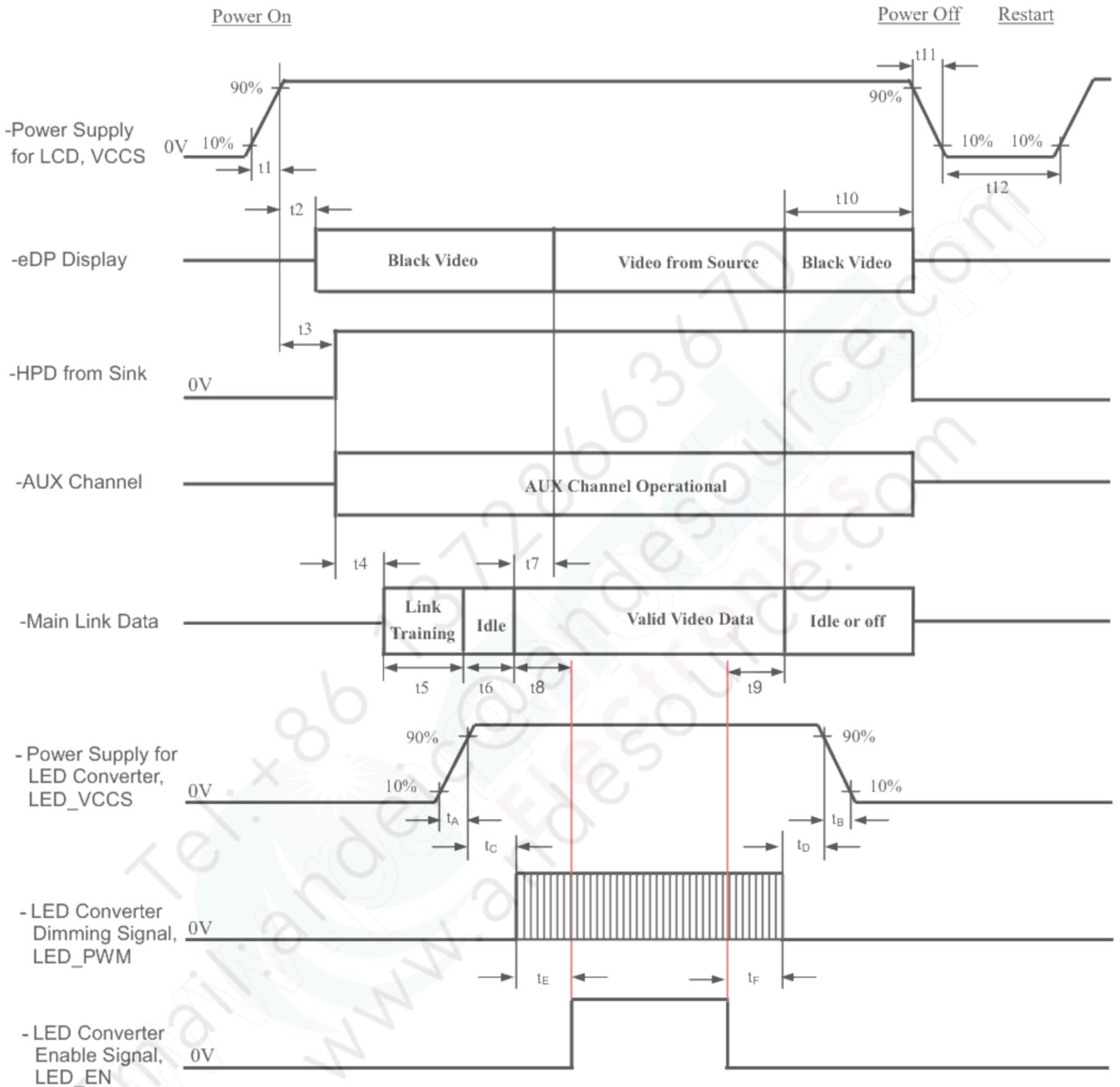
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	121.82	123.4	124.99	MHz	-
DE	Vertical Total Time	TV	(1232)	(1236)	(1240)	TH	-
	Vertical Active Display Period	TVD	1200	1200	1200	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	32	TV-TVD	TH	-
	Horizontal Total Time	TH	2060	2080	2100	Tc	-
	Horizontal Active Display Period	THD	1920	1920	1920	Tc	-
	Horizontal Active Blanking Period	THB	TH-THD	160	TH-THD	Tc	-

Note (1) The panel can operate at 60Hz normal mode and power saving mode, respectively. All reliability tests are based on specific timing of 60Hz refresh rate. We can only assure the panel's electrical function at power saving mode.

INPUT SIGNAL TIMING DIAGRAM



4.6 POWER ON/OFF SEQUENCE



Timing Specifications

Parameter	Description	Reqd. By	Value		Unit	Notes
			Min	Max		
t1	Power rail rise time, 10% to 90%	Source	0.5	10	ms	See Note 5 below-
t2	Delay from LCD,VCCS to black video generation	Sink	0	200	ms	Automatic Black Video generation prevents display noise until valid video data is received from the Source (see Notes:2 and 3 below)
t3	Delay from LCD,VCCS to HPD high	Sink	0	200	ms	Sink AUX Channel must be operational upon HPD high (see Note:4 below)
t4	Delay from HPD high to link training initialization	Source	0	-	ms	Allows for Source to read Link capability and initialize
t5	Link training duration	Source	0	-	ms	Dependant on Source link training protocol
t6	Link idle	Source	0	-	ms	Min Accounts for required BS-Idle pattern. Max allows for Source frame synchronization
t7	Delay from valid video data from Source to video on display	Sink	0	50	ms	Max value allows for Sink to validate video data and timing. At the end of T7, Sink will indicate the detection of valid video data by setting the SINK_STATUS bit to logic 1 (DPCD 00205h, bit 0), and Sink will no longer generate automatic Black Video
t8	Delay from valid video data from Source to backlight on	Source	80	-	ms	Source must assure display video is stable *: Recommended by INX. To avoid garbage image.
t9	Delay from backlight off to end of valid video data	Source	50	-	ms	Source must assure backlight is no longer illuminated. At the end of T9, Sink will indicate the detection of no valid video data by setting the SINK_STATUS bit to logic 0 (DPCD 00205h, bit 0), and Sink will automatically display Black Video. (See Notes: 2 and 3 below) *: Recommended by INX. To avoid garbage image.
t10	Delay from end of valid video data from Source to power off	Source	0	500	ms	Black video will be displayed after receiving idle or off signals from Source
t11	VCCS power rail fall time, 90% to 10%	Source	0.5	10	ms	See Note 5 below-

t ₁₂	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	1	-	ms	-
t _D	Delay from LED dimming signal to LED power falling	Source	1	-	ms	-
t _E	Delay from LED dimming signal to LED enable signal	Source	(0)	-	ms	-
t _F	Delay from LED enable signal to LED dimming signal	Source	(0)	-	ms	-

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

Note (2) The Sink must include the ability to automatically generate Black Video autonomously. The Sink must automatically enable Black Video under the following conditions:

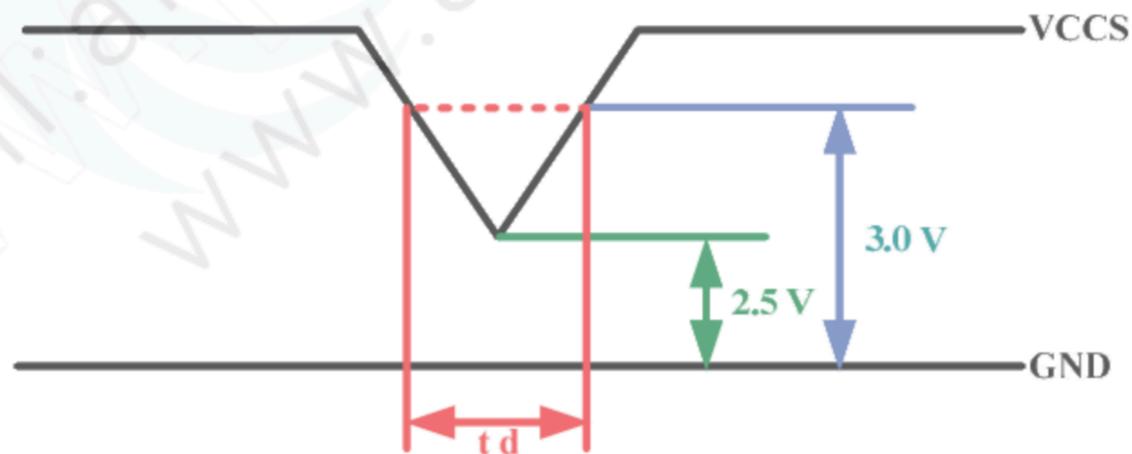
- Upon LCDVCC power-on (within T2 max)
- When the "NoVideoStream_Flag" (VB-ID Bit 3) is received from the Source (at the end of T9)

Note (3) The Sink may implement the ability to disable the automatic Black Video function, as described in Note (2), above, for system development and debugging purposes.

Note (4) The Sink must support AUX Channel polling by the Source immediately following LCDVCC power-on without causing damage to the Sink device (the Source can re-try if the Sink is not ready). The Sink must be able to response to an AUX Channel transaction with the time specified within T3 max.

Note (5) The VCCS power rail is recommended to rise and fall linearly. If not, please contact us to conduct risk assessment

4.7 MOMENTARY VOLTAGE DROPS



(1) When $2.5V \leq V_{cc} < 3.0V$ and $t_d \leq 10ms$, the unit must work normally when VCC return to 3.0V.

(2) When $V_{cc} < 2.5V$, momentary voltage shall conform to the input voltage sequence.

5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

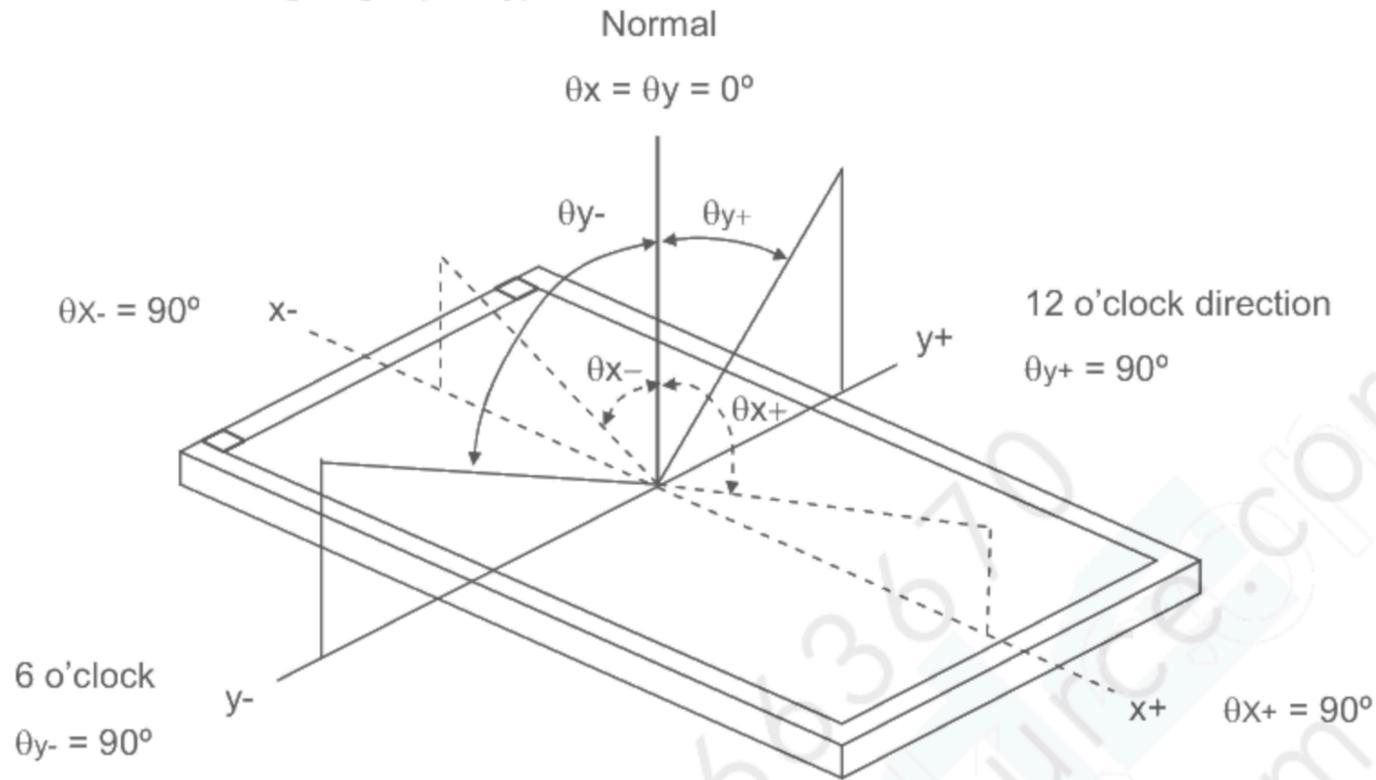
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I _L	52.8	mA

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).

5.2 OPTICAL SPECIFICATIONS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio	CR		1000	1500	-	-	(2), (5),(7)
Response Time	T _R		-	16	19	ms	(3),(7)
	T _F		-	14	16	ms	
Average Luminance of White	L _{Ave}		340	400	460	cd/m ²	(4), (6),(7)
Color Chromaticity	Red	R _x	θ _x =0°, θ _y =0° Viewing Normal Angle	0.640	Typ - 0.025	Typ + 0.025	-
		R _y		0.330			-
	Green	G _x		0.300			-
		G _y		0.600			-
	Blue	B _x		0.150			-
		B _y		0.060			-
	White	W _x		0.313			-
W _y	0.329	-					
Color gamut	sRGB	C.G	96	100	-	%	(8)
Viewing Angle	Horizontal	θ _{x+}	80	89	-	Deg.	(1),(5), (7)
		θ _{x-}	80	89	-		
	Vertical	θ _{y+}	80	89	-		
		θ _{y-}	80	89	-		
White Variation		θ _x =0°, θ _y =0°	80	-	-	%	(5),(6), (7)
		θ _x =0°, θ _y =0°	65	-	-	%	(7)
(Free sync)	White	FS _W			0.03	Nits/H	(1),(5), (7),(9)
	Gray(50%)	FS _G			0.04	z	
Low Blue Light	BLR		-	-	50	%	(1), (5),(7), (10)
	CCT	θ _x =0°, θ _y =0°	5500	-	7000	K	

Note (1) Definition of Viewing Angle (θ_x, θ_y):



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

The contrast ratio can be calculated by the following expression.

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

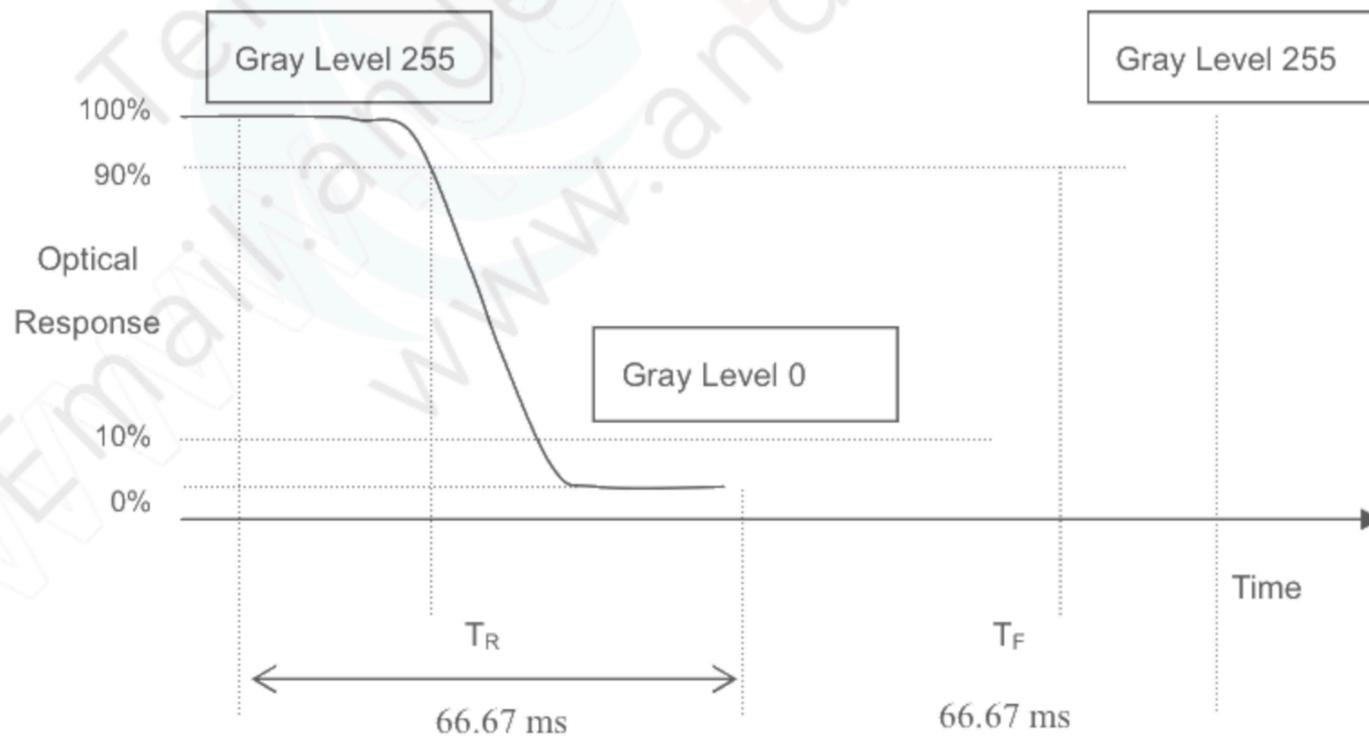
L63: Luminance of gray level 255

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 (6).

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



Note (4) Definition of Average Luminance of White (L_{AVE}):

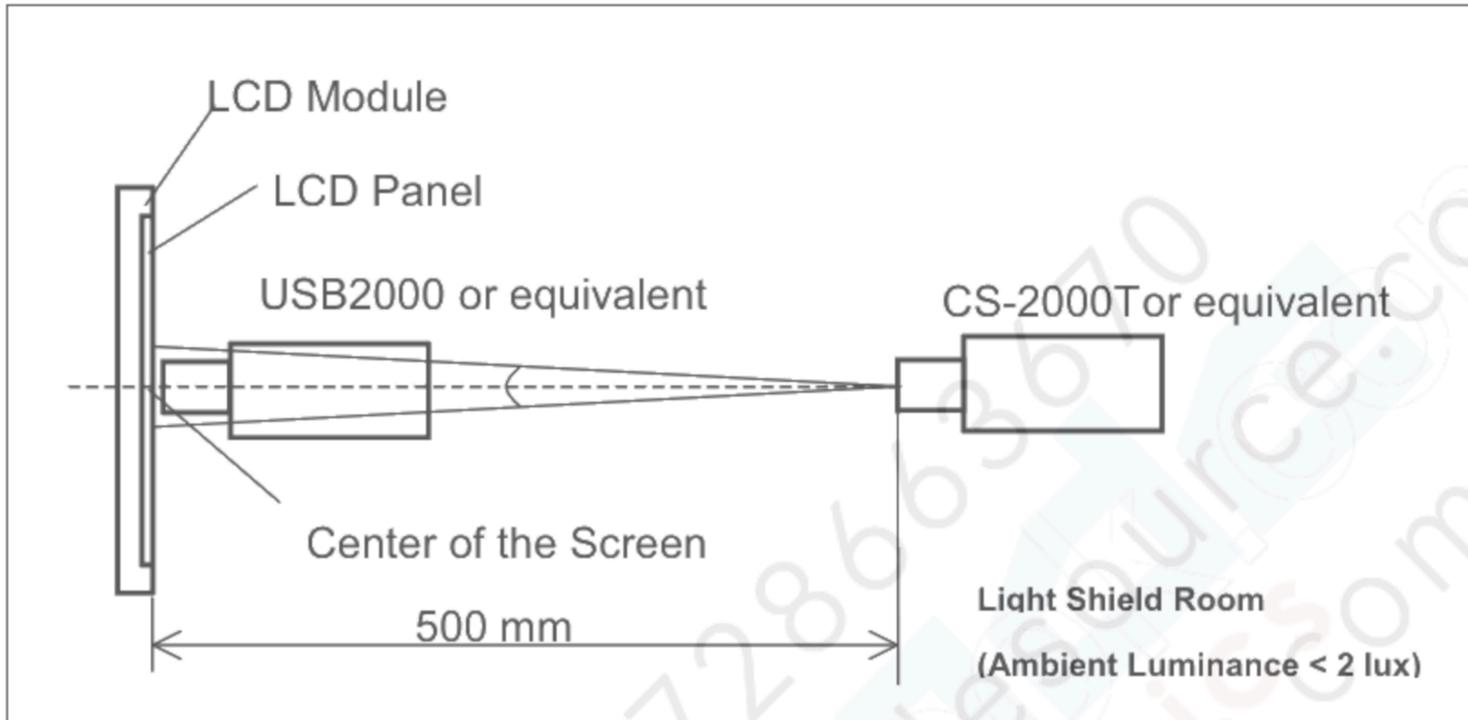
Measure the luminance of gray level 255 at 5 points

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

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.

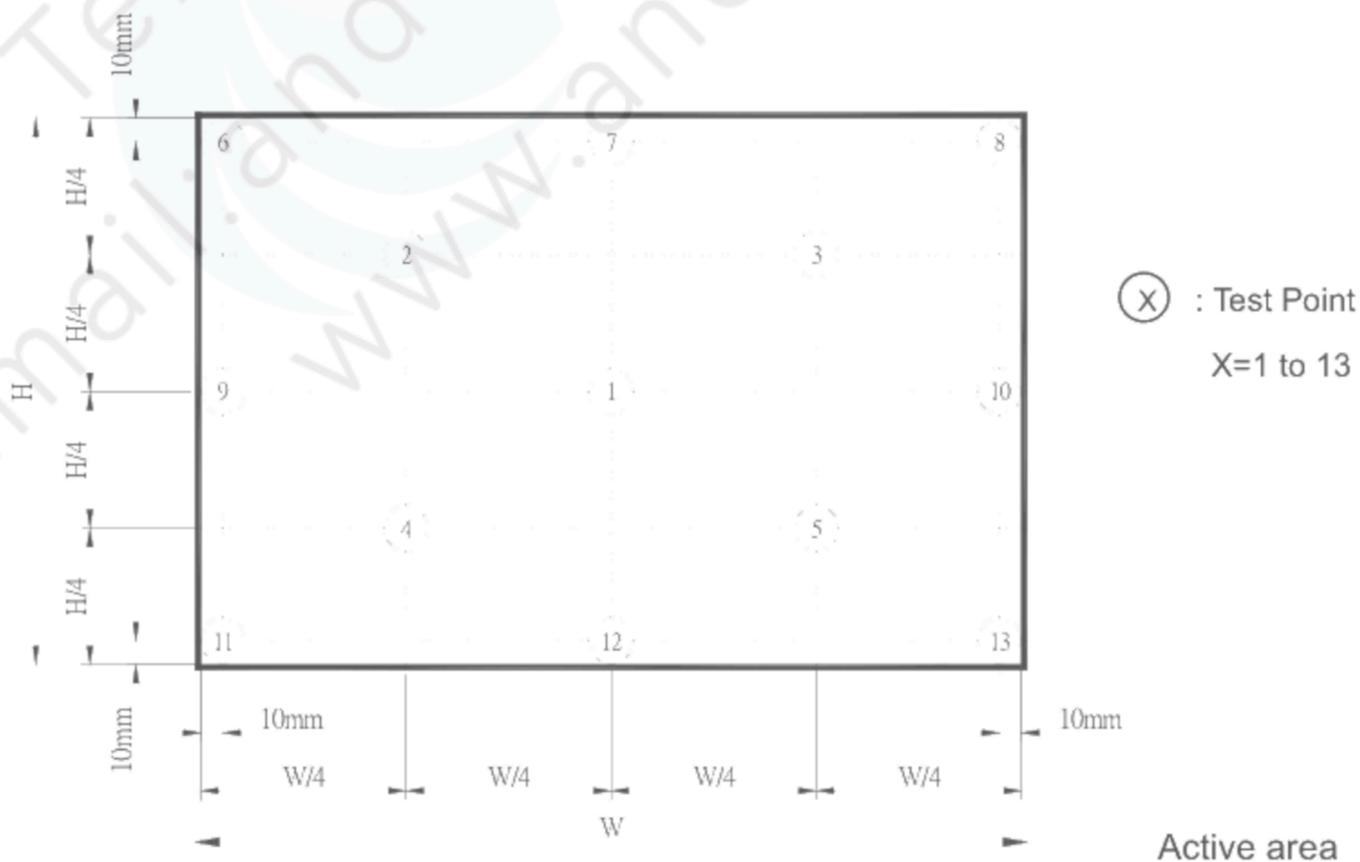


Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

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

$$\delta W_{13p} = \{ \text{Minimum} [L(1) \sim L(13)] / \text{Maximum} [L(1) \sim L(13)] \} * 100\%$$



PRODUCT SPECIFICATION

Note (7) 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.

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

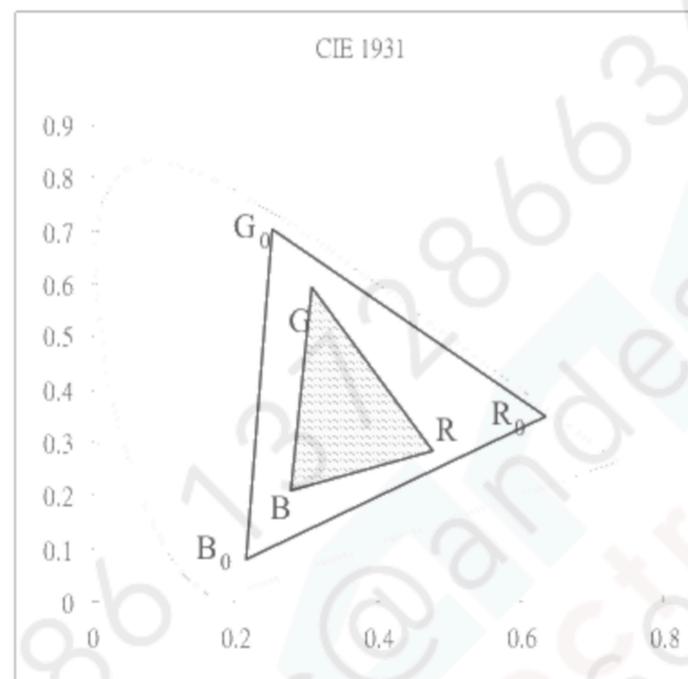
$$C.G\% = R G B / R_0 G_0 B_0 * 100\%$$

R_0, G_0, B_0 : color coordinates of red, green, and blue defined by NTSC, respectively.

R, G, B : color coordinates of module on 255 gray levels of red, green, and blue, respectively.

$R_0 G_0 B_0$: area of triangle defined by R_0, G_0, B_0

$R G B$: area of triangle defined by R, G, B



Note(9) Free Sync (FS):

$$FS = |L(60) - L(40)| / (F(60) - F(40))$$

$L(x)$: Luminance of x Hz

$F(x)$: x Hz frame rate

Note (10) Definition of Low Blue Light (LBL)

Measure the luminance of gray level 255 at center points

$$Blue\ Light\ Ratio(BLR) = \left[\frac{Range\ (415\sim 455\ nm)}{Range\ (400\sim 500\ nm)} \right] \times 100\%$$

Range (415~455 nm): Light intensity between 415 nm and 455 nm

Range (400~500 nm): Light intensity between 400 nm and 500 nm

$LBL = LBL(1)$

$LBL(X)$ is corresponding to the Low Blue Light of the point X at Figure in Note (6)

6. TP MODULE ELECTRICAL CHARACTERISTICS

6.1 TP MODULE ELECTRICAL ABSOLUTE RATINGS

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Voltage from TP_VCCS to AGND and DGND	TP_VCCS	-	(3.6)	V	-
Logic Input Voltage	-	-	3.6)	V	-

6.2 TP MODULE ELECTRICAL CHARACTERISTICS

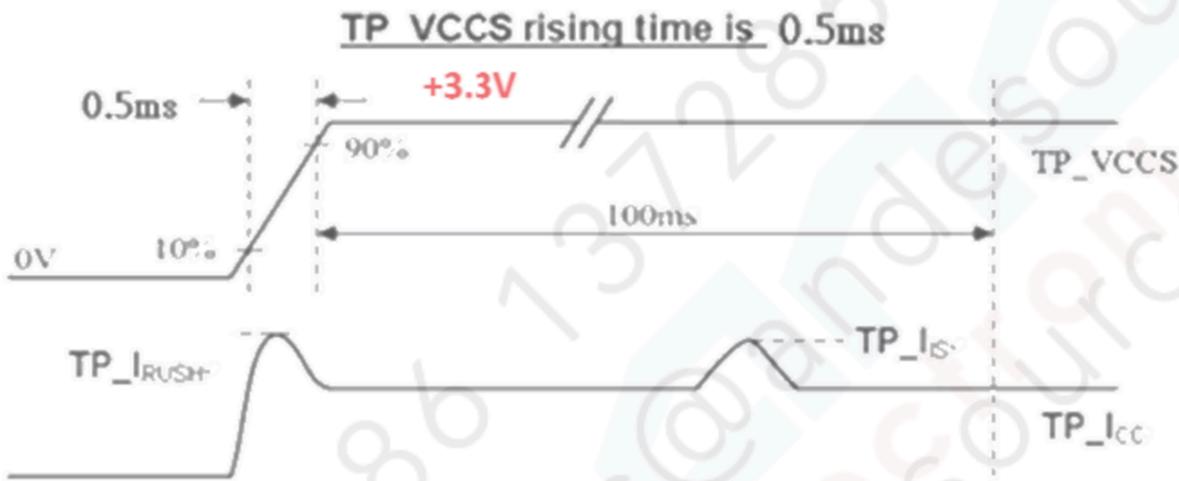
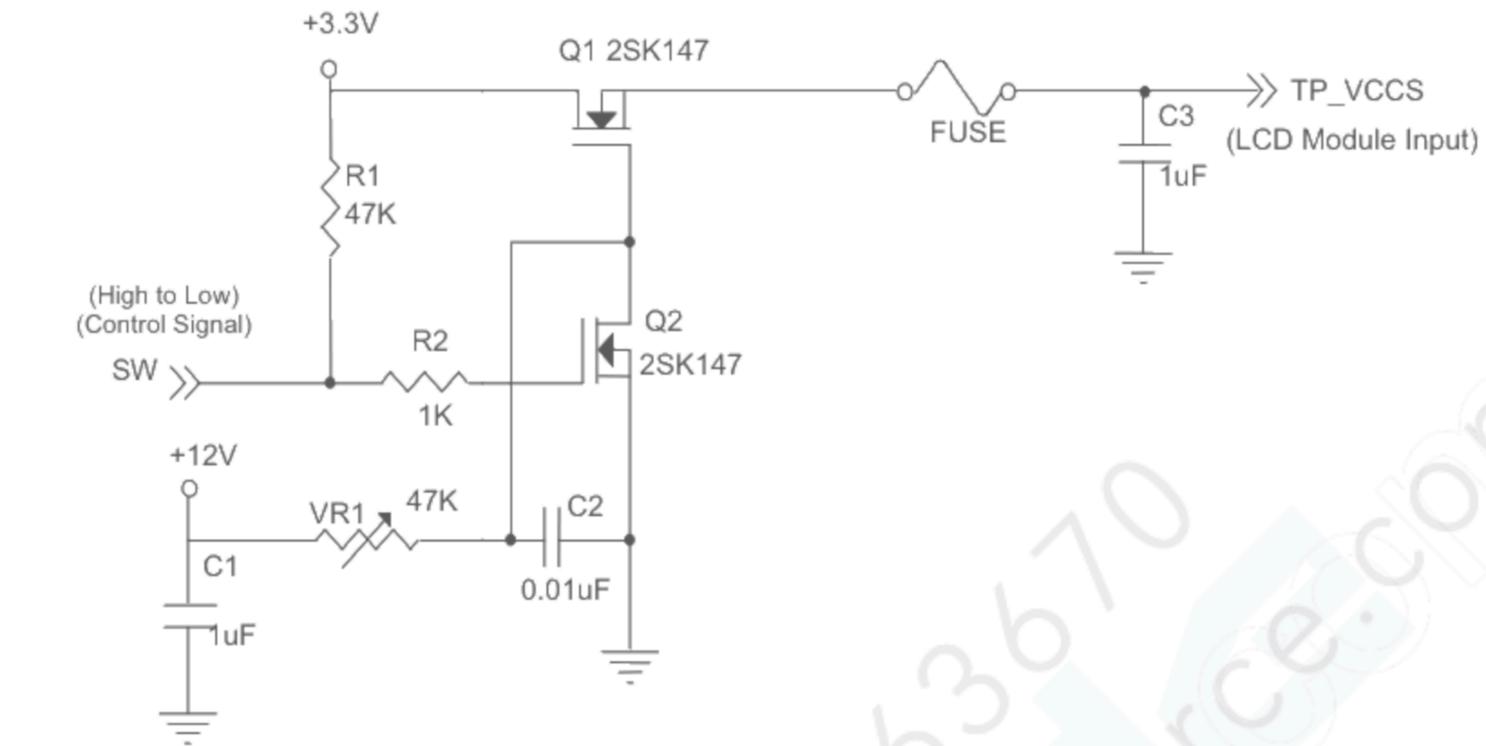
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		TP_VCCS	(3.0)	(3.3)	(3.6)	V	(1)
Ripple Voltage		TP_V _{RP}	-	-	(100)	mV	(1)
Inrush Current		TP_I _{RUSH}	-	-	(1.1)	A	(1),(2)
Power Supply Current	Active Mode	TP_I _{CC}	-	-	(90.9)	mA	-
	Idle Mode		-	-	(36.3)	mA	-
TP_RESET	Normal	-	(2.5)	-	TP_VCCS	V	(3)
	Active	-	0	-	(0.5)	V	(3)
TP_RS	RS High Level	-	(2.5)	-	TP_VCCS	V	-
	RS Low Level	-	0	-	(0.5)	V	-
I2C Signal (SCL ,SDA)	High Level	SCL ,SDA	(2.7)	-	TP_VCCS	V	-
	Low Level		0	-	(0.4)	V	-

Note (1) The ambient temperature is $T_a = 25 \pm 2$ °C.

Note (2) TP_I_{RUSH}: the maximum current when TP_VCCS is rising

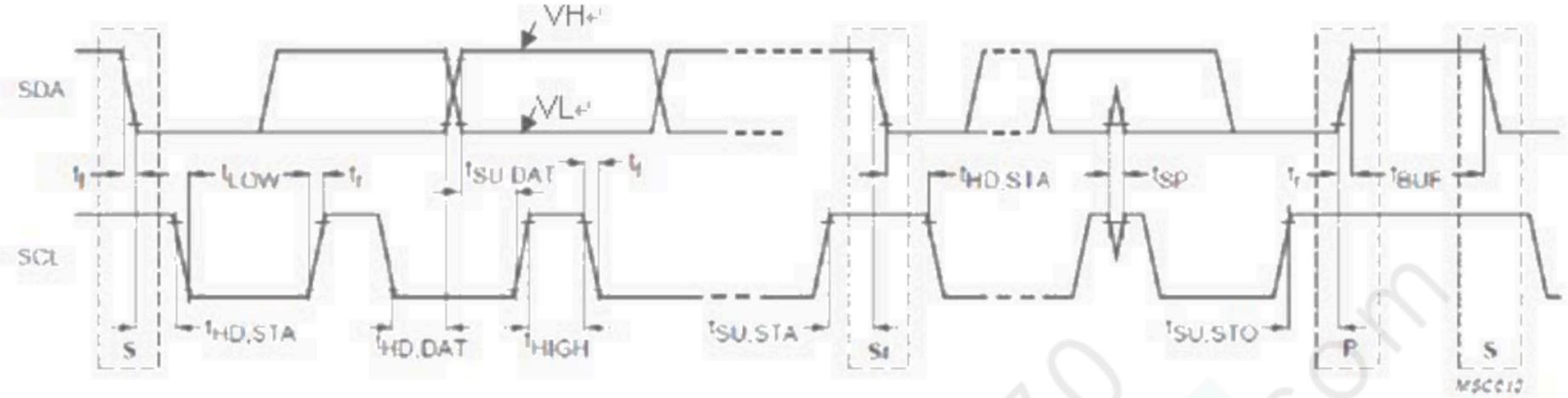
TP_I_{IS}: the maximum current of the first 100ms after power-on

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



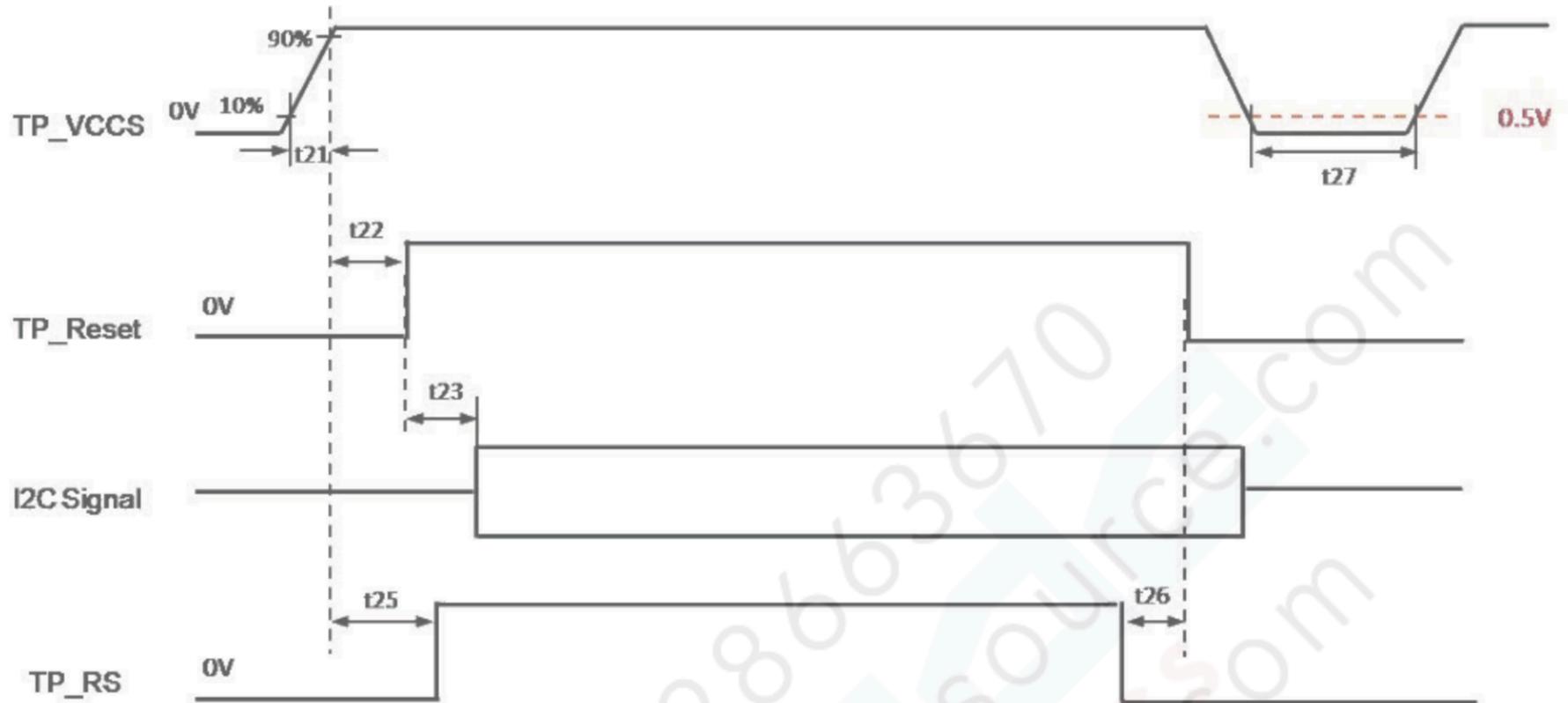
Note (3) TP_RESET is a Schmitt Trigger input. Low to reset Touch IC

6.3 I2C AC ELECTRICAL CHARACTERISTICS



Signal	Description	Min.	Typ.	Max.	Unit
1.INT	VL,LH	NONE	NONE	0.4	V
	High level voltage	2.7	NONE	NONE	V
2.SCL	VL,VH	NONE	NONE	0.4	V
	High level voltage	2.7	NONE	NONE	V
	Freq	0	NONE	400	KHZ
	T_low	1.3	NONE	NONE	us
	T_high	0.6	NONE	NONE	us
	Tr	20	NONE	300	ns
3.SDA	VL,VH	NONE	NONE	0.4	V
	High level voltage	2.7	NONE	NONE	V
	Tr	20	NONE	300	ns
	Tf	20	NONE	300	ns
4.Bus lines	tHD_STA	0.6	NONE	NONE	us
	tHD_DAT	0.2	NONE	NONE	us
	tSU_DAT	100	NONE	NONE	ns
	tSU_STO	0.6	NONE	NONE	us
	tSU_Sr	0.6	NONE	NONE	us
	tHD_Sr	0.6	NONE	NONE	us
	tBUF	1.3	NONE	NONE	us

6.4 TP MODULE POWER ON/OFF SEQUENCE



Timing Specifications:

Parameter	Description	Value		Unit	Notes
		Min	Max		
t_{21}	TP_VCCS rail rise time, 10% to 90%	0.5	-	ms	
t_{22}	Delay from TP_VCCS to TP_Reset	5	-	ms	
t_{23}	Delay from TP_Reset to I2C Signal	20	-	ms	(1)
t_{25}	Delay from TP_VCCS to TP_RS	20	-	ms	
t_{26}	Delay from TP_RS to TP_Reset	2	-	ms	
t_{27}	TP_VCCS power off duration	500	-	ms	

Note (1) It represents touch device is able to response ACK for host only. And it is recommended for host to do enumeration when $t_{23} > 300\text{ms}$.

7. RELIABILITY TEST ITEM

Test Item	Test Condition	Note
High Temperature Storage Test	60°C, 240 hours	(1) (2)
Low Temperature Storage Test	-20°C, 240 hours	
Thermal Shock Storage Test	-20°C, 0.5hour←→60°C, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	50°C, 240 hours	
Low Temperature Operation Test	0°C, 240 hours	
High Temperature & High Humidity Operation Test	50°C, 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

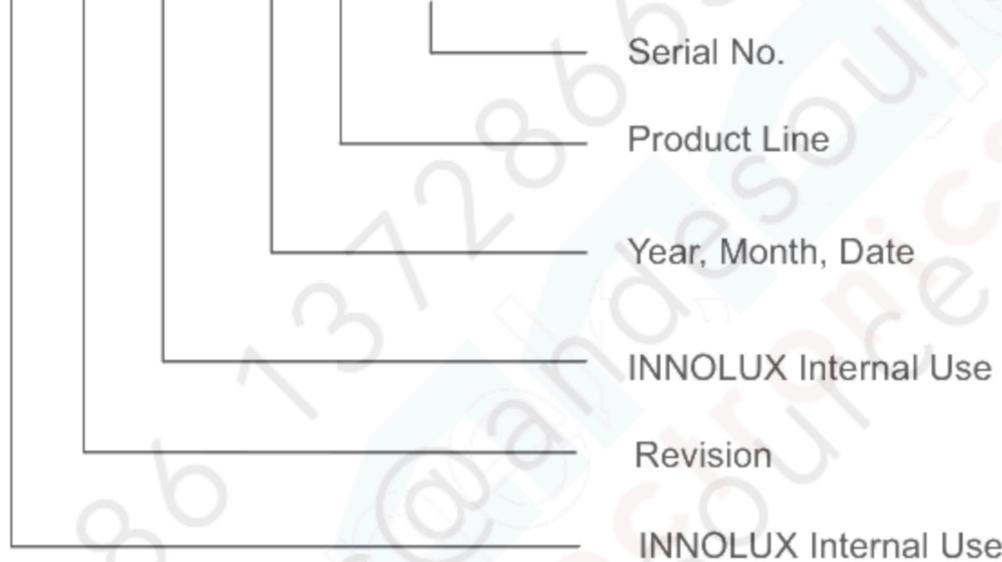
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



Model Name: N140JCN-GS9

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

(b) Serial ID: XXXXXYYMDLNNNN



(c) Production Location: MADE IN XXXX.

(d) UL logo: XXXX especially stands for panel manufactured by INNOLUX China satisfying UL requirement.

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.

PRODUCT SPECIFICATION

For barcode content 8S XXXXXXXXXXXXB1NBYMDSSSS

- (a) 8S: Fixed characters.
- (b) XXXXXXXXXXX : Customer part number XXXXXXXXXXX, fixed characters.
- (c) C: Fixed characters
- (d) 1: Revision History, 1~9, A~Z, exclude I , O , Q and U.
- (e) XX: Fixed characters.

- (f) YMD: Production date: Year: 0~9, for 2010~2019
Month: 1~9, A~C, for Jan. ~ Dec.
Day: 1~9, A~Z, for 1st to 31st, exclude I , O , Q and U
- (g) SSSS: Series number: exclude I , O , Q and U

8.2 CARTON

- (1) Box Dimensions : 435(L)*350(W)*320(H)
- (2) 20 Module/Carton

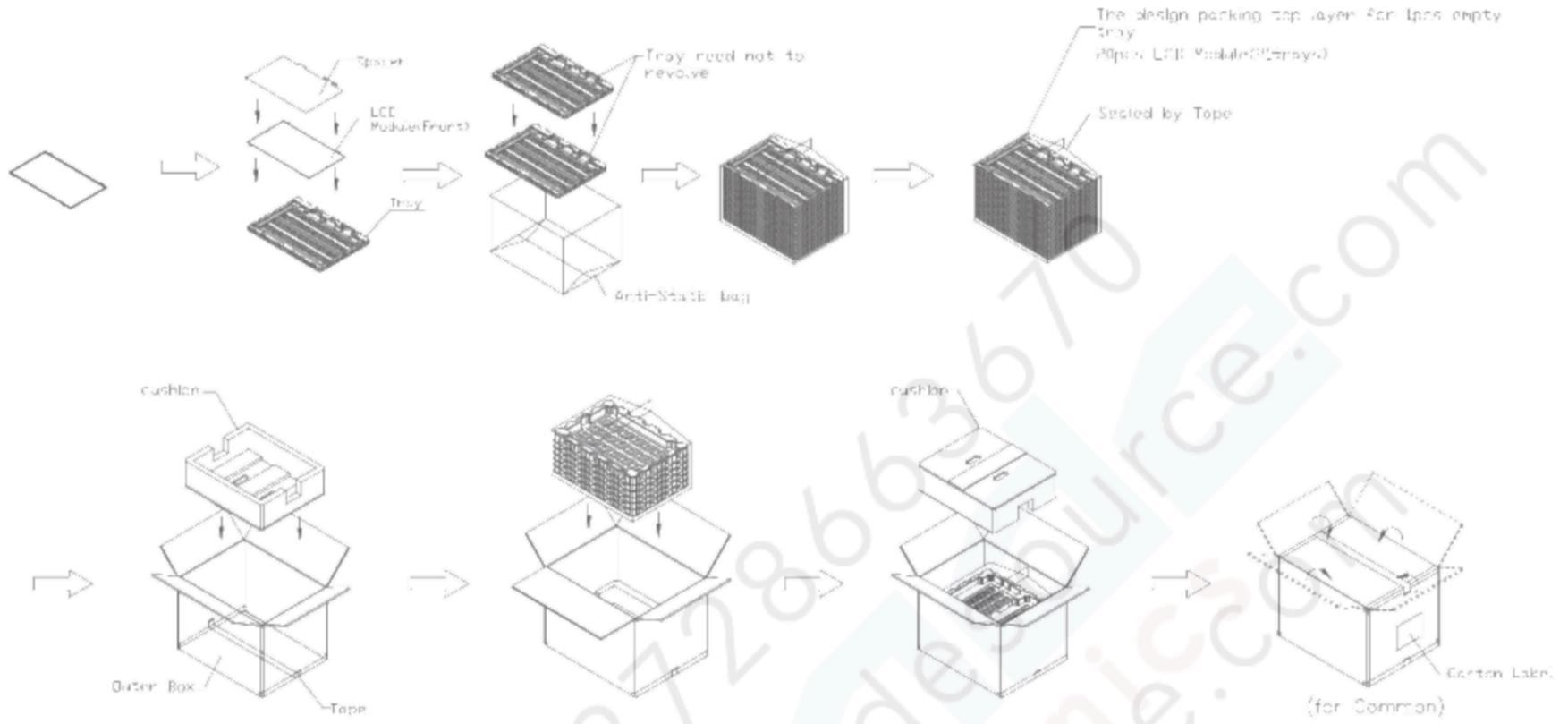


Figure. 7-2 Packing method

8.3 PALLET

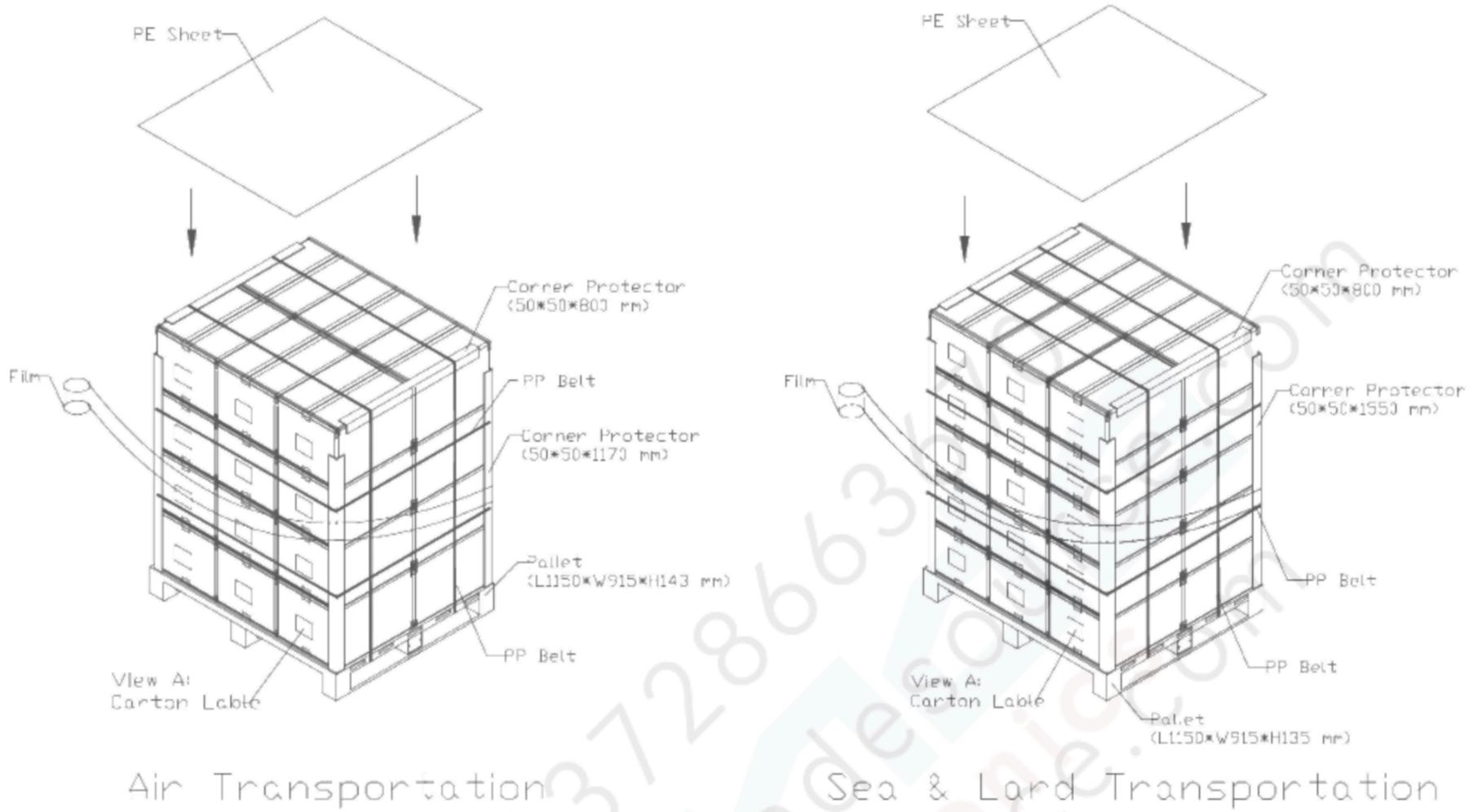


Figure. 7-3 Packing method

8.4 UN-PACKAGING METHOD

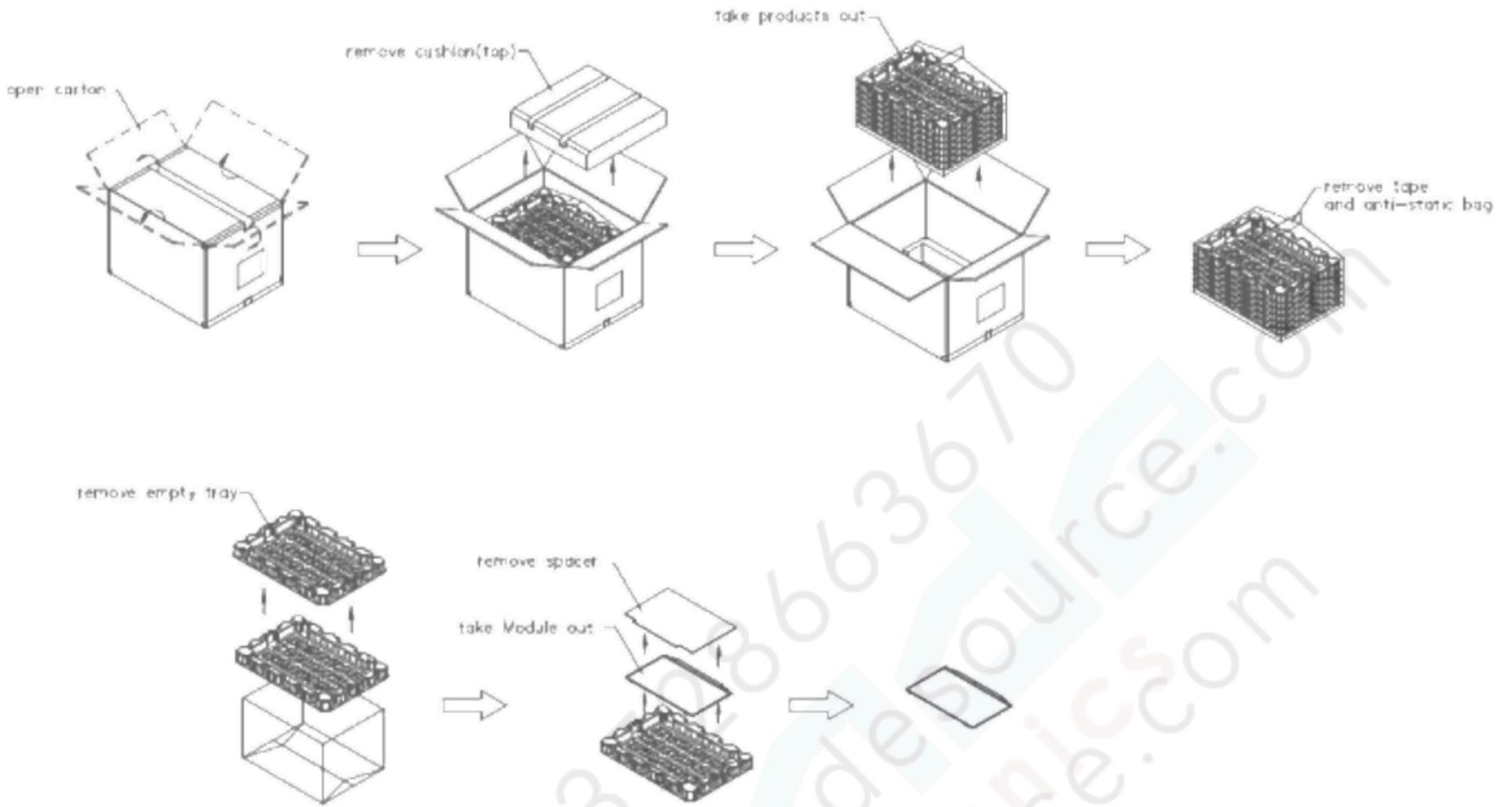


Figure. 7-4 un-packing method

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.

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 °C. 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 FPDID standards.

Byte # (decimal)	Byte # (hex)	Field Name and Comments	Value (hex)	Value (binary)
0	00	Header	00	00000000
1	01	Header	FF	11111111
2	02	Header	FF	11111111
3	03	Header	FF	11111111
4	04	Header	FF	11111111
5	05	Header	FF	11111111
6	06	Header	FF	11111111
7	07	Header	00	00000000
8	08	EISA ID manufacturer name ("CMN")	0D	00001101
9	09	EISA ID manufacturer name	AE	10101110
10	0A	ID product code (LSB)	17	00010111
11	0B	ID product code (MSB)	14	00010100
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)	00	00000000
17	11	Year of manufacture (fixed year code)	1E	00011110
18	12	EDID structure version ("1")	01	00000001
19	13	EDID revision ("4")	04	00000100
20	14	Video I/P definition ("Digital")	A5	10100101
21	15	Active area horizontal ("30.159cm")	1E	00011110
22	16	Active area vertical ("18.85cm")	13	00010011
23	17	Display Gamma (Gamma = "2.2")	78	01111000
24	18	Feature support ("RGB, Non-continuous")	03	00000011
25	19	Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0	EE	11101110
26	1A	Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0	95	10010101
27	1B	Rx=0.640	A3	10100011
28	1C	Ry=0.330	54	01010100
29	1D	Gx=0.300	4C	01001100
30	1E	Gy=0.600	99	10011001
31	1F	Bx=0.150	26	00100110
32	20	By=0.060	0F	00001111
33	21	Wx=0.313	50	01010000
34	22	Wy=0.329	54	01010100
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

PRODUCT SPECIFICATION

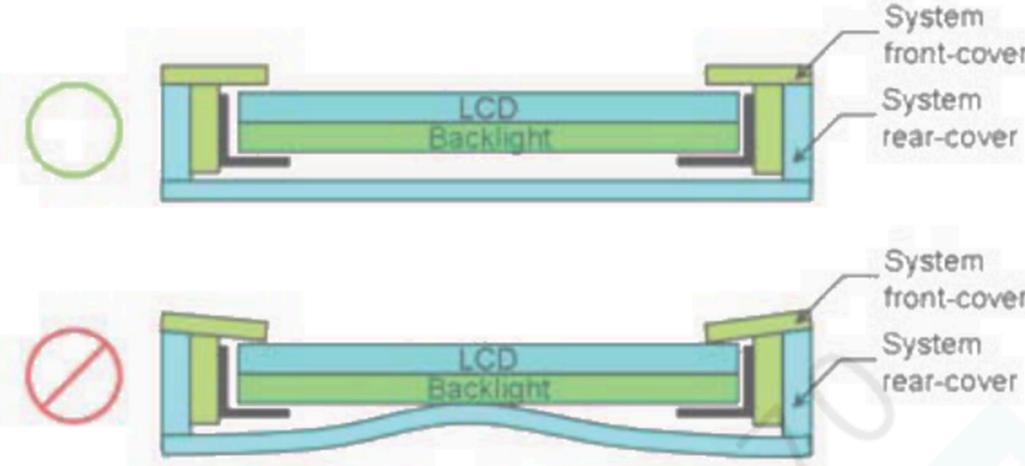
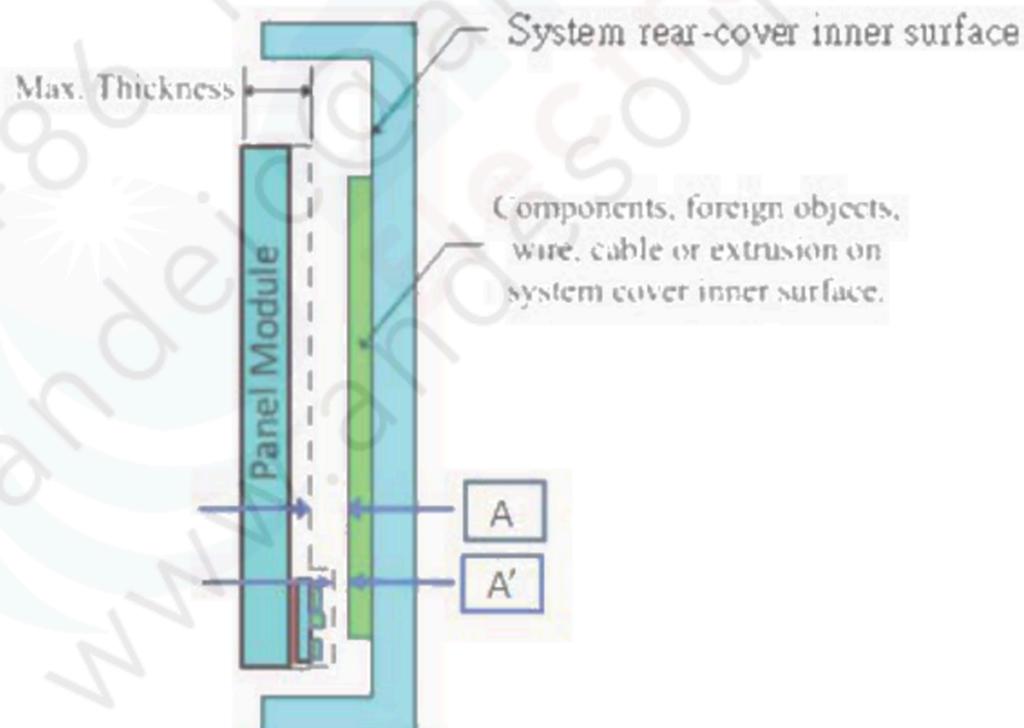
42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001
44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard 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 ("154.26MHz")	42	01000010
55	37	# 1 Pixel clock (hex LSB first)	3C	00111100
56	38	# 1 H active ("1920")	80	10000000
57	39	# 1 H blank ("160")	A0	10100000
58	3A	# 1 H active : H blank	70	01110000
59	3B	# 1 V active ("1200")	B0	10110000
60	3C	# 1 V blank ("36")	24	00100100
61	3D	# 1 V active : V blank	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")	A6	10100110
65	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width	00	00000000
66	42	# 1 H image size ("301 mm")	2D	00101101
67	43	# 1 V image size ("188 mm")	BC	10111100
68	44	# 1 H image size : V image size	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	Indicates that this 18 byte descriptor is a Display Descriptor	00	00000000
73	49	Indicates that this 18 byte descriptor is a Display Descriptor	00	00000000
74	4A	Set to 00h when 18 byte descriptor is used as a Display Descriptor	00	00000000
75	4B	Tag Number for Display Range Limits Descriptor	FD	11111101
76	4C	Display Range Limits Offset : FLAGS	00	00000000
77	4D	Minimum Vertical Rate	30	00110000
78	4E	Maximum Vertical Rate	3C	00111100
79	4F	Minimum Horizontal Rate	4A	01001010
80	50	Maximum Horizontal Rate	4A	01001010
81	51	Maximum Pixel Clock	0F	00001111
82	52	Video Timing Support Flags : Bytes 10 --> 17 indicate support for additional video timings	01	00000001
83	53	Line Feed (0Ah if Byte 10 = 00h or 01h) or Video Timing Data (00h-->FFh If Byte 10 = 02h or 04h)	0A	00001010
84	54	Space (20h if Byte 10 = 00h or 01h) or Video Timing Data (00h-->FFh If Byte 10 = 02h or 04h)	20	00100000
85	55	Space (20h if Byte 10 = 00h or 01h) or Video Timing Data (00h-->FFh If Byte 10 = 02h or 05h)	20	00100000

PRODUCT SPECIFICATION

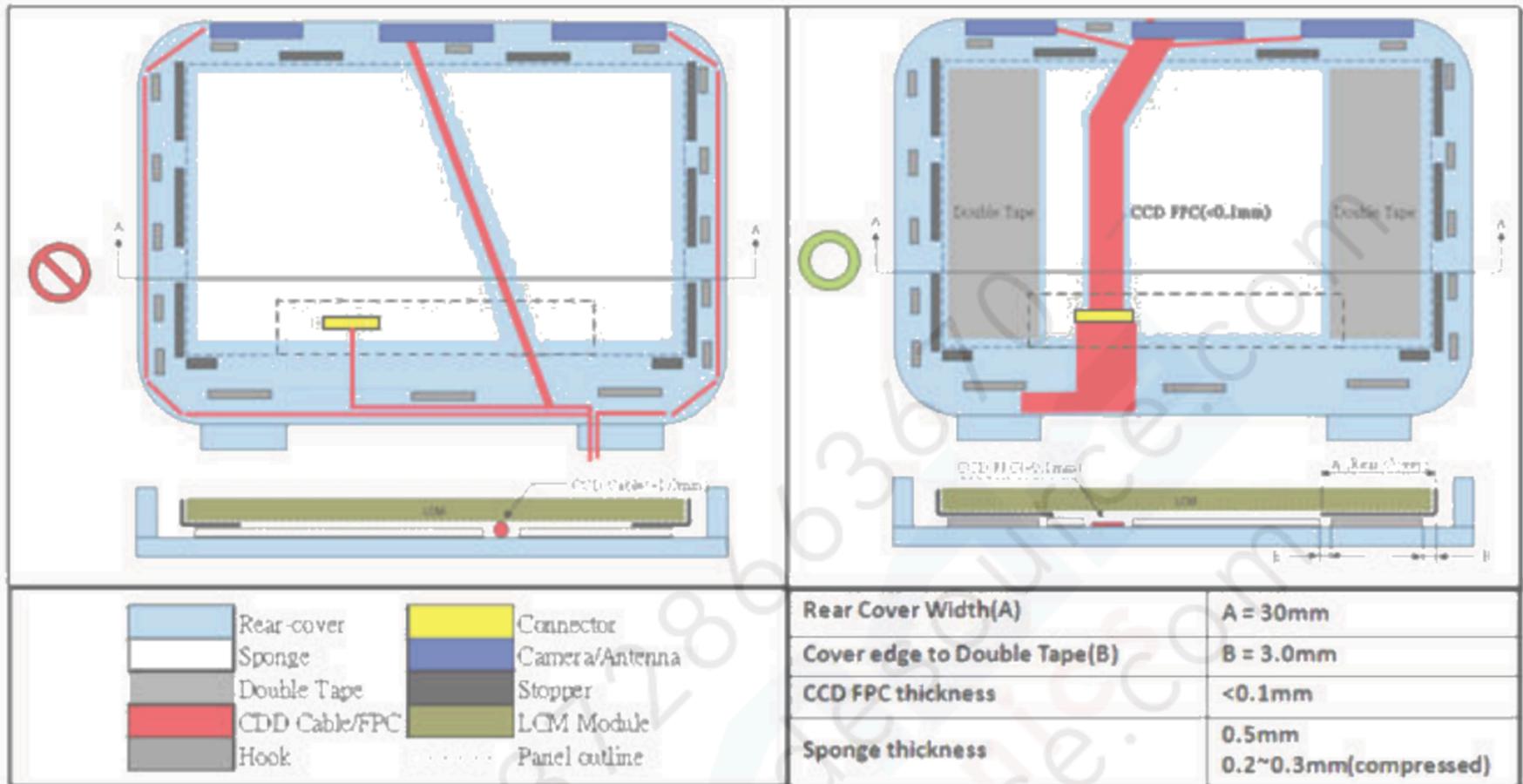
86	56	Space (20h if Byte 10 = 00h or 01h) or Video Timing Data (00h-->FFh If Byte 10 = 02h or 06h)	20	00100000
87	57	Space (20h if Byte 10 = 00h or 01h) or Video Timing Data (00h-->FFh If Byte 10 = 02h or 07h)	20	00100000
88	58	Space (20h if Byte 10 = 00h or 01h) or Video Timing Data (00h-->FFh If Byte 10 = 02h or 08h)	20	00100000
89	59	Space (20h if Byte 10 = 00h or 01h) or Video Timing Data (00h-->FFh If Byte 10 = 02h or 09h)	20	00100000
90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 ASCII string Vendor	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# 3 Character of string ("C")	43	01000011
96	60	# 3 Character of string ("M")	4D	01001101
97	61	# 3 Character of string ("N")	4E	01001110
98	62	# 3 INX EDID version (ex:01、02、.....、N)	01	00000001
99	63	# 3 New line character indicates end of ASCII string	0A	00001010
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 ASCII string Model Name	FE	11111110
112	70	# 4 Flag	00	00000000
113	71	# 4 Character of Model name ("N")	4E	01001110
114	72	# 4 Character of Model name ("1")	31	00110001
115	73	# 4 Character of Model name ("4")	34	00110100
116	74	# 4 Character of Model name ("0")	30	00110000
117	75	# 4 Character of Model name ("J")	4A	01001010
118	76	# 4 Character of Model name ("C")	43	01000011
119	77	# 4 Character of Model name ("N")	4E	01001110
120	78	# 4 Character of Model name ("-")	2D	00101101
121	79	# 4 Character of Model name ("G")	47	01000111
122	7A	# 4 Character of Model name ("S")	53	01010011
123	7B	# 4 Character of Model name ("9")	39	00111001
124	7C	# 4 New line character indicates end of ASCII string	0A	00001010
125	7D	# 4 Padding with "Blank" character	20	00100000
126	7E	Extension flag	00	00000000
127	7F	Checksum	9B	10011011

Note (1) Rx, Ry, Gx, Gy, Bx, By, Wx, Wy and checksum are updated after measurement

Appendix. SYSTEM COVER DESIGN GUIDANCE

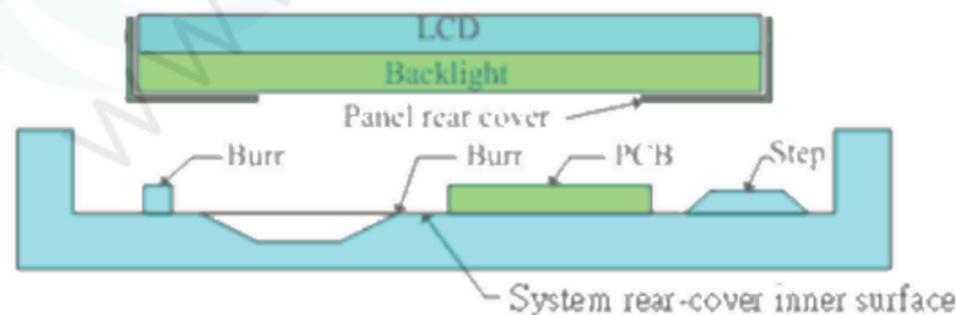
0.	Permanent deformation of system cover after reliability test
	
Definition	<p>System cover including front and rear cover may deform during reliability test. Permanent deformation of system front and rear cover after reliability test should not interfere with panel. Because it may cause issues such as pooling, abnormal display, white spot, and also cell crack.</p> <p>Note: If the interference can not be avoided, please feel free to contact INX FAE Engineer for collaboration design. We can help to verify and pass risk assessment for customer reference.</p>
1	Design gap A and A' between panel & any components on system rear-cover
	
Definition	<p>Gap between panel's maximum thickness boundary & system's inner surface components such as wire, cable, extrusion is needed for preventing from backpack or pogo test fail. Because zero gap or interference may cause stress concentration. Issues such as pooling, abnormal display, white spot, and cell crack may occur.</p> <p>Maximum flatness of panel and system rear-cover should be taken into account for gap design.</p> <p>Note: If the interference can not be avoided, please feel free to contact INX FAE Engineer for collaboration design. We can help to verify and pass risk assessment for customer reference.</p>
2	Design gap C between system front-cover & panel surface.

- To prevent panel damage, we suggest using CCD FPC to replace CCD cable
- Using double tape to fix LCM module for no bracket design.



If the antenna cable or Web Cam wire must overlap with the panel outline, both sides of the antenna cable or Web Cam wire must have a sponge(Sponge material can not contain NH3) and sponge require higher antenna cable or Web Cam wire.(Antenna cable or Web Cam wire should not overlap with TCON,COF/FPC,Driver IC)
Note: If the interference can not be avoided, please feel free to contact INX FAE Engineer for collaboration design. We can help to verify and pass risk assessment for customer reference.

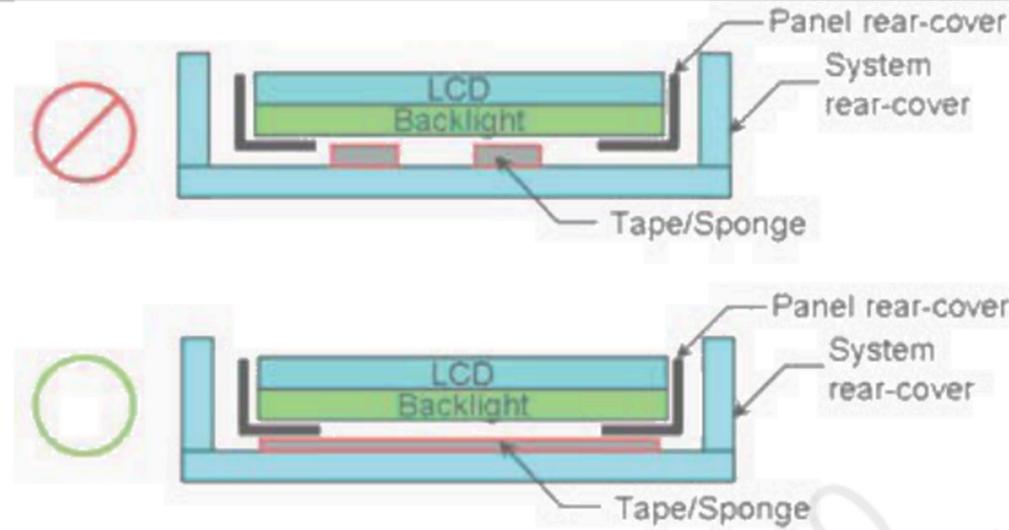
5 System rear-cover inner surface examination



Definition Burr at logo edge, steps, protrusions or PCB board may cause stress concentration. White spot or glass broken issue may occur during reliability test.

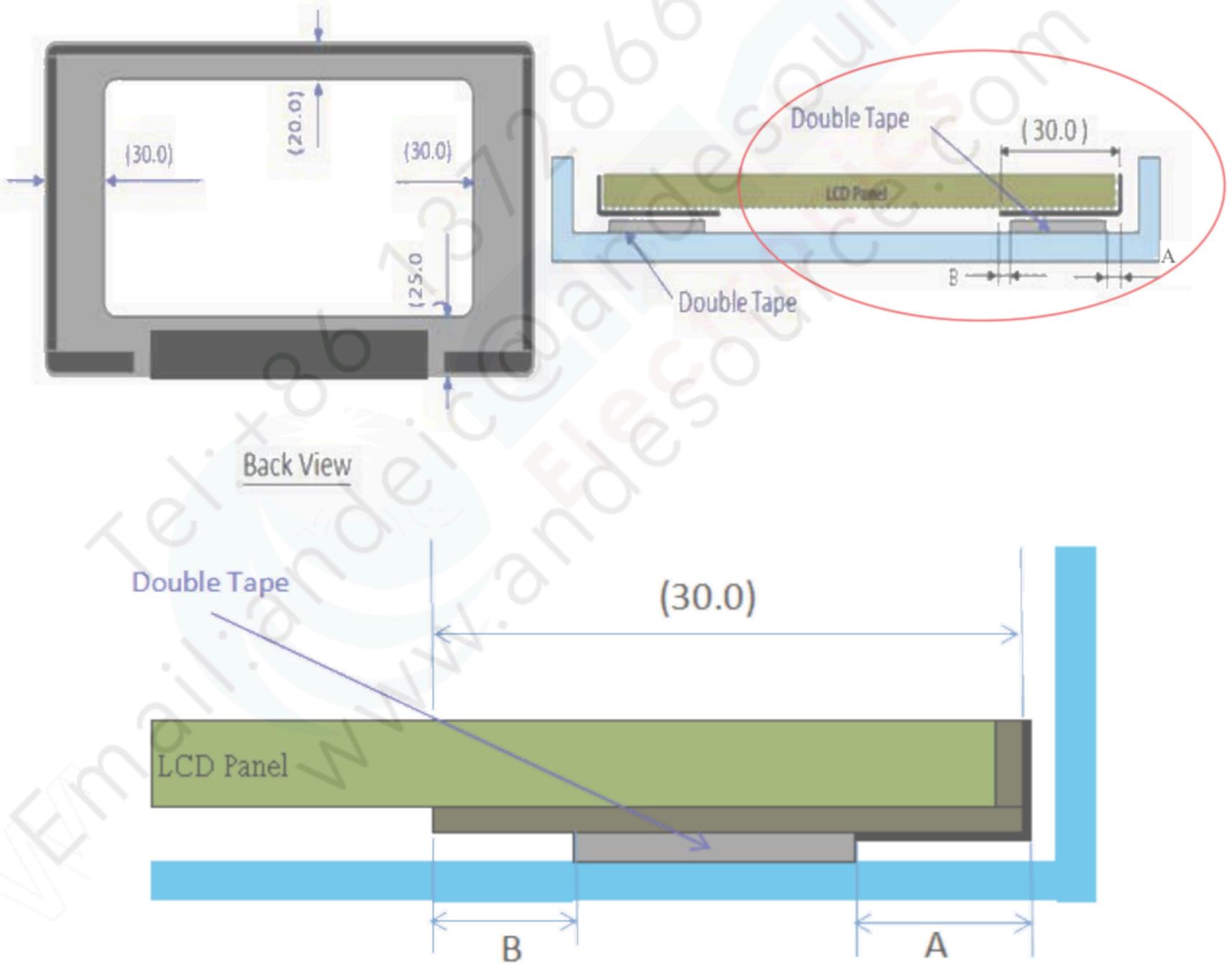
6-1 Tape/sponge design on system inner surface

PRODUCT SPECIFICATION



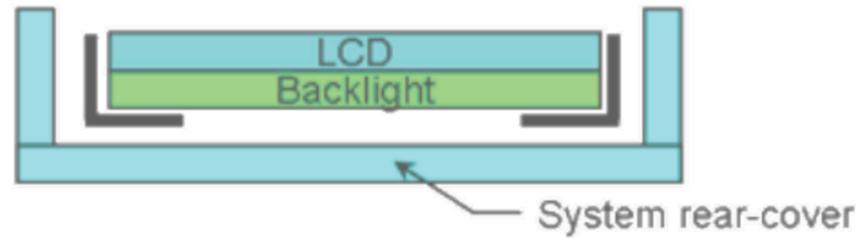
Definition To prevent abnormal display & white spot after scuffing test, hinge test, pogo test, backpack test, tape/sponge should be well covered under panel rear-cover. Because tape/sponge in separate location may act as pressure concentration location.

6-2 Tape/sponge design on system inner surface



Definition To prevent peeling the bezel tape in rework process. The length of double tape is $30 - (A+B)$, A is bezel tape length and B is the double tape attaching tolerance.
Ex :A :2mm, B:2mm, the length of double tape is $30-(2+2)=26$ mm.

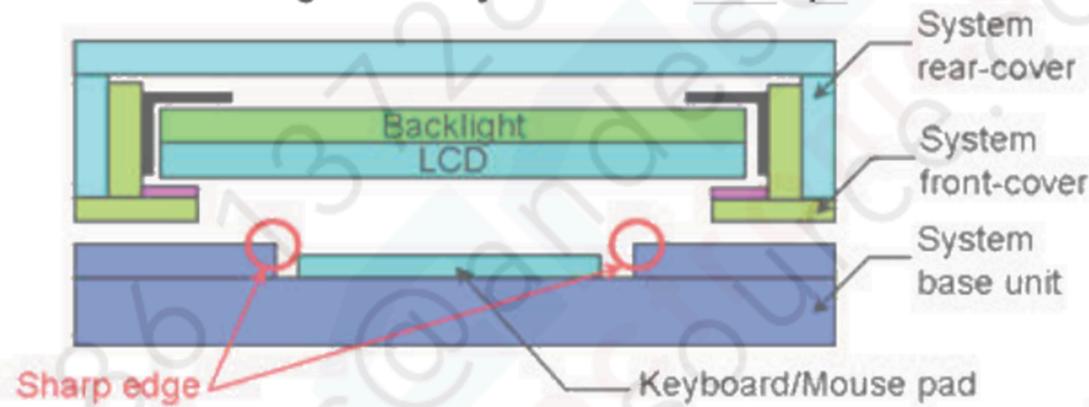
7 Material used for system rear-cover



System rear-cover material: Al-Mg alloy
System rear-cover thickness: 1.5mm MIN

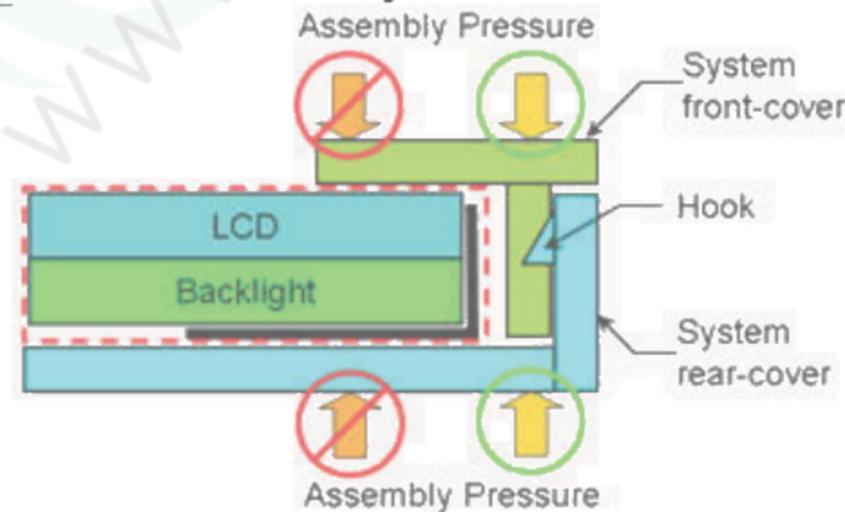
Definition System rear-cover material with high rigidity is needed to resist deformation during scuffing test, hinge test, pogo test, or backpack test. Abnormal display, white spot, pooling issue may occur if low rigidity material is used. Solid structure design of system rear-cover may also influence the rigidity of system rear-cover. The deformation of system rear-cover should not caused interference.

8 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, sharp edge design in keyboard surface may damage panel during the test. We suggest to use slope edge design, or to reduce the thickness difference of keyboard/mouse pad from the nearby surface.

9 Assembly SOP examination for system front-cover with Hook design



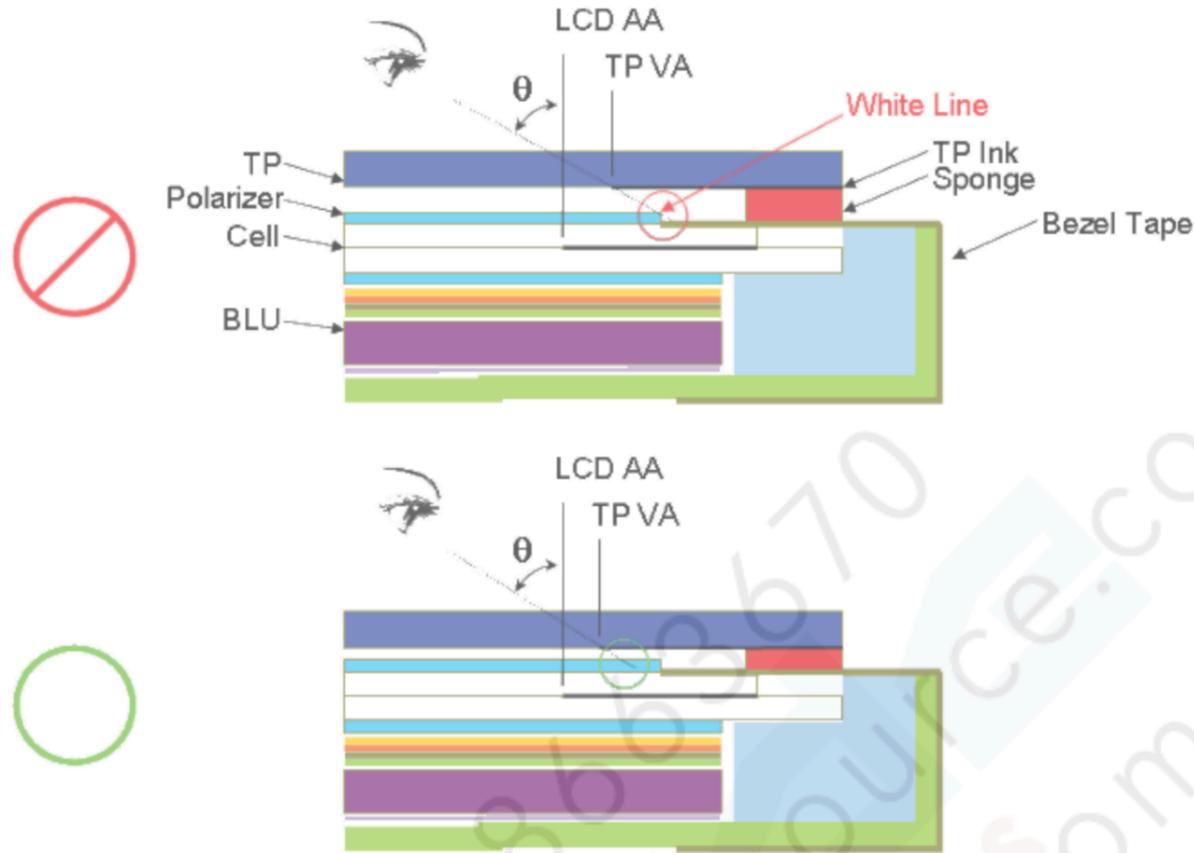
Definition To prevent panel crack during system front-cover assembly process with hook design, it is not recommended to press panel or any location that related directly to the panel.

10 Assembly SOP examination for system front-cover with Double tape design

	<p>1.00mm</p> <p>B-Cover</p> <p>CF Pol</p> <p>Adhesive</p> <p>A.A.</p>
<p>Definition</p>	<p>To prevent panel crack during system front-cover assembly process with double tape design, When system applied adhesive between B-Cover and LCD module, please design a distance 1.00mm between B-Cover's adhesive and CF pol. Do NOT put adhesive on CF pol.</p>
<p>11</p>	<p>System front-cover assembly reference with Double tape design</p>
	<p>0.1 mm</p> <p>B-Cover</p> <p>CF Pol</p> <p>A.A.</p>
<p>Definition</p>	<p>To prevent system front-cover peeling at double tape contact area, A gap between B-Cover & CF-Pol. Is 0.1mm min.</p>
<p>12</p>	<p>System front-cover opening area reference with TFT-LCD module</p>
	<p>≥ 0.65mm</p> <p>B-Cover</p> <p>CF Pol</p> <p>CF Glass</p> <p>A.A.</p>
<p>Definition</p>	<p>To prevent panel the noise of B-cover & CF Pol. Distance from CF Pol. edge to front-cover edge more than 0.65mm.</p>

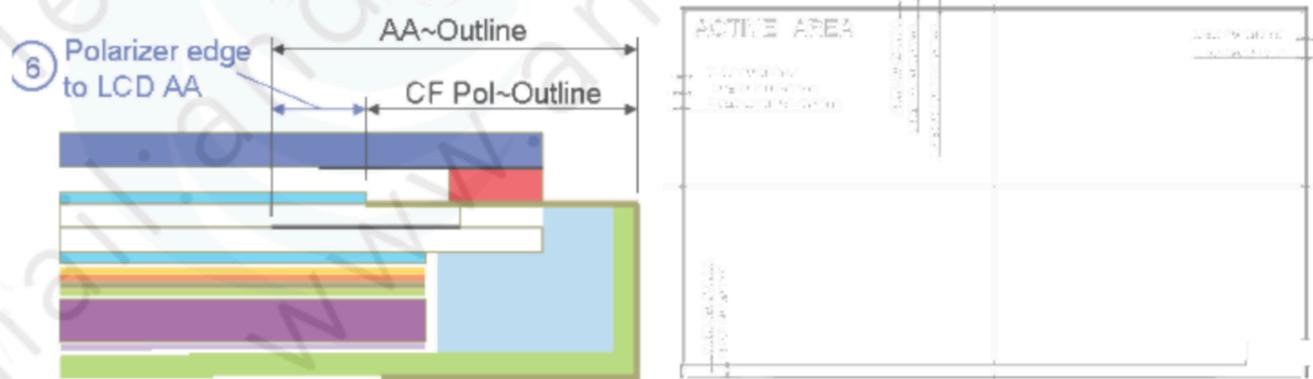
13

Touch Application : TP and LCD Module Combination for White Line Prevention



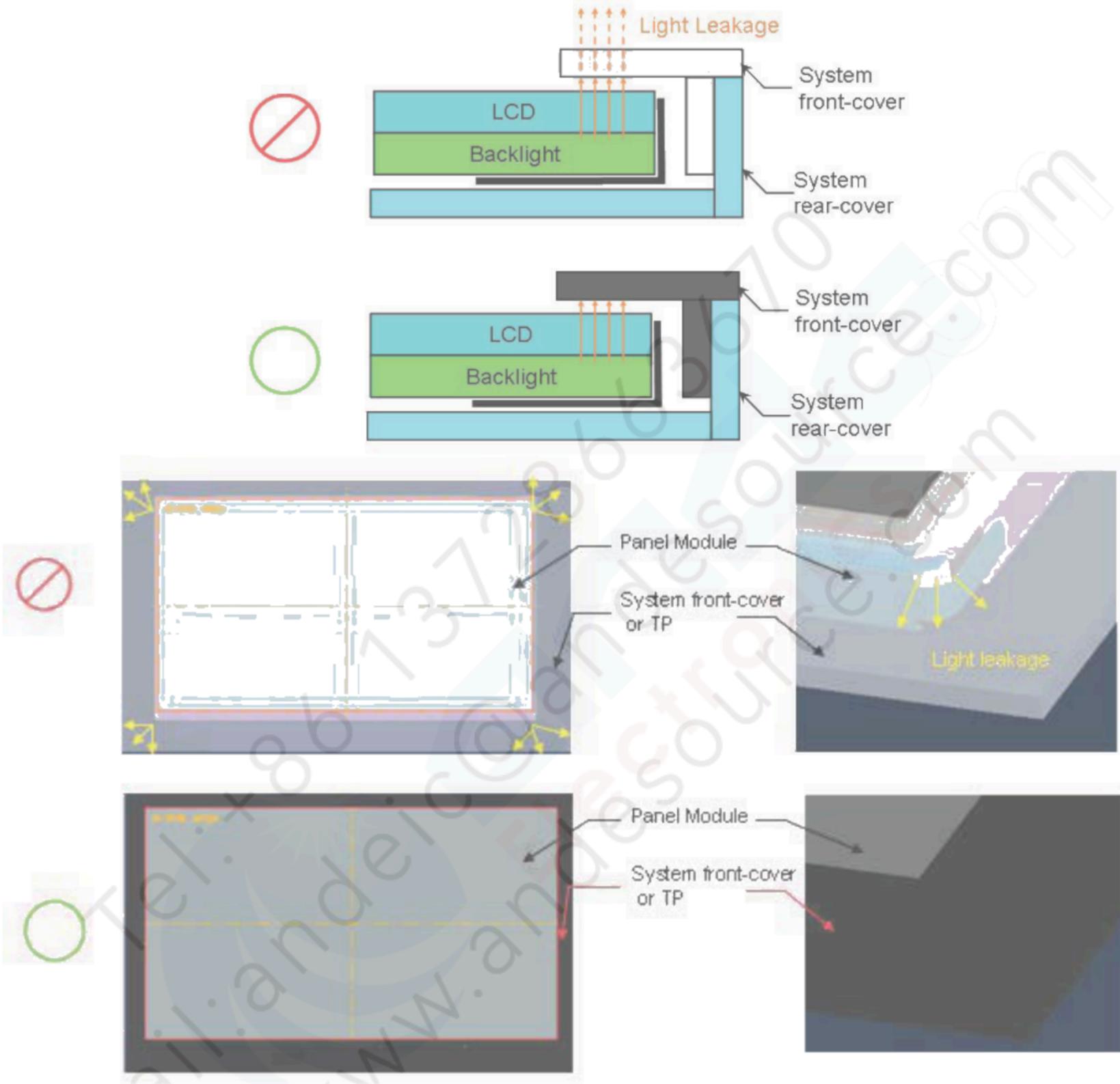
Parameter consideration for White Line Issue :	
1	TP VA to LCD AA distance
2	TP Assembly tolerance
3	TP Ink Printing tolerance
4	Sponge thickness and tolerance
5	Inspection/Viewing Angle specification
6	Polarizer edge to LCD AA distance and tolerance

Polarizer edge to LCD AA distance can be derived by "AA~Outline" – "CF Pol~Outline" with respect to INX 2D Outline Drawing on each side.



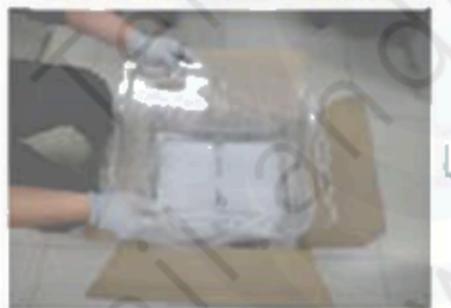
Definition

For using in Touch Application: to prevent White Line appears between TP and LCD module combination, the maximum inspection angle location must not fall onto LCD polarizer edge, otherwise light line near edge of polarizer will be appear.
Parameters such as TP VA to LCD AA distance, TP assembly tolerance, TP Ink printing tolerance, Sponge thickness and tolerance, and Maximum Inspection/Viewing Angle, must be considered with respect to LCD module's Polarizer edge location and tolerance. This consideration must be taken at all four edges separately.
The goal is to find parameters combination that allow maximum inspection angle falls inside polarizer black margin area.
Note: Information for Polarizer edge location and its tolerance can be derived from INX 2D Outline Drawing ("AA ~Outline" - "CF Pol~Outline").
Note: Please feel free to contact INX FAE Engineer. By providing value of parameters above on each side, we can help to verify and pass the white line risk assessment for customer

	reference.
14	<p>Color of system front-cover material</p>  <p>The diagrams illustrate two design approaches to prevent light leakage from the system front-cover:</p> <ul style="list-style-type: none"> Incorrect Design (Red Prohibited Sign): Shows a light-colored (white) system front-cover. Light rays from the LCD backlight pass through the transparent front-cover, causing visible light leakage. This is also shown in a 3D perspective view where light rays escape from the edges of the front-cover. Correct Design (Green Allowed Sign): Shows a dark-colored (black) system front-cover. The dark material absorbs the light rays, preventing them from escaping and causing leakage. This is also shown in a 3D perspective view where the light is contained within the front-cover. <p>Labels in the diagrams include: LCD, Backlight, System front-cover, System rear-cover, Panel Module, System front-cover or TP, and Light Leakage.</p> <p>Definition To prevent light leakage is seen at system front-cover due to material transparency, we suggest using dark color material (black) for system front-cover design.</p>

15	AA to front cover opening distance
Definition	To prevent CF polarizer edge leakage .We suggest front cover opening no more than 0.7mm larger than active area on all 4 sides.
16	Use OCR Lamination
Definition	OCR glue as possible beyond module, in order to avoid Line Pooling
17	Use OCA Lamination
Definition	OCA glue as possible plastered throughout the module, in order to avoid Line Pooling.

Appendix. LCD MODULE HANDLING MANUAL

<p>Purpose</p>	<ul style="list-style-type: none"> • This SOP is prepared to prevent panel dysfunction possibility through incorrect handling procedure. • This manual provides guide in unpacking and handling steps. • Any person which may contact / related with panel, should follow guide stated in this manual to prevent panel loss.
<p>1.</p>	<p>Unpacking</p>
<div style="display: flex; justify-content: space-around; text-align: center;"> <div data-bbox="357 626 808 1025">  </div> <div data-bbox="819 829 883 917">  </div> <div data-bbox="894 626 1345 1025"> <p>Open carton</p>  </div> <div data-bbox="1356 829 1420 917">  </div> <div data-bbox="1431 626 1882 1025"> <p>Remove EPE Cushion</p>  </div> </div> <div style="display: flex; justify-content: space-around; text-align: center; margin-top: 20px;"> <div data-bbox="357 1141 808 1479">  </div> <div data-bbox="819 1266 883 1354">  </div> <div data-bbox="894 1141 1345 1479">  </div> <div data-bbox="1356 1266 1420 1354">  </div> <div data-bbox="1431 1141 1882 1479">  </div> </div> <div style="display: flex; justify-content: space-around; text-align: center; margin-top: 10px;"> <div data-bbox="416 1499 728 1549"> <p>Open plastic bag</p> </div> <div data-bbox="950 1499 1306 1549"> <p>Cut Adhesive Tape</p> </div> <div data-bbox="1440 1499 1845 1549"> <p>Remove EPE Cushion</p> </div> </div>	
<p>2.</p>	<p>Panel Lifting</p>
<div style="display: flex; justify-content: space-around; text-align: center;"> <div data-bbox="357 1630 808 2026"> <p>Remove PET Cover</p>  </div> <div data-bbox="819 1849 883 1936">  </div> <div data-bbox="894 1630 1345 2026"> <p>Remove PE Foam</p>  </div> <div data-bbox="1356 1849 1420 1936">  </div> <div data-bbox="1431 1630 1882 2026"> <p>Handle with care (see next page)</p>  </div> </div> <div style="display: flex; justify-content: center; margin-top: 20px;"> <div data-bbox="357 2119 916 2483">  </div> </div> <div style="text-align: center; margin-top: 10px;"> <p>Finger Slot</p> <p>Use slots at both sides for finger insertion. Handle panel upward with care.</p> </div>	

3.

Do and Don't

Do :

- Handle with both hands.
- Handle panel at left and right edge.



Don't :

- Lifting with one hand.



- Handle at PCBA side.



Don't :

- Stack panels.

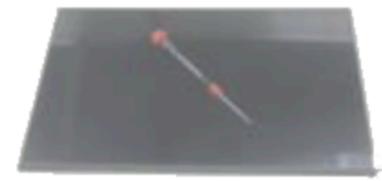


- Press panel.



Don't :

- Put foreign stuff onto panel



- Put foreign stuff under panel



Don't :

- Hold at panel corner.



Don't :

- Twist panel.



Do :

- Remove panel protector film starts from pull tape



Don't :

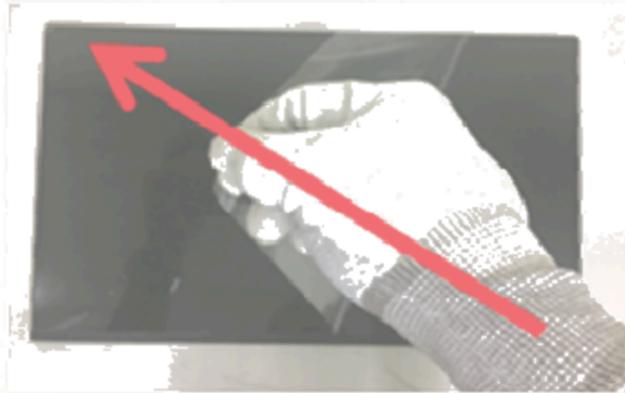
- Remove panel protector film From film another side.



PRODUCT SPECIFICATION

Do:

- Remove panel protector film starts from Lower-right corner to Top-left

**Don't:**

- Remove panel protector Film parallel X-direction

**Don't :**

- Touch or Press PCBA Area.

