Product Specification

(√) **Preliminary Specification**
( ) **Approval Specification**

The information described in this specification is preliminary and can be changed without prior notice.

CUSTOMER	KONKA		MODEL NO.	LSC320AN10
DATE OF ISSUE	2016/04/07		EXTENSION CODE	-

LCD Sales & Marketing Team
Samsung Display Co., Ltd

SAMSUNG DISPLAY

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2015/11/17	000	All	Initial Release
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SAMSUNG DISPLAY

1. GENERAL DESCRIPTION

DESCRIPTION

This model uses a liquid crystal display (LCD) of amorphous silicon TFT as switching components. This model is composed of a TFT LCD panel, a driver circuit, and an ass'y KIT of source PBA. This 32.0" model has a resolution of a 1366 x 768 and can display up to 16.7 million colors with the wide viewing angle of 89° or a higher degree in all directions. This panel is designed to support applications by providing a excellent performance function of the flat panel display such as home-alone multimedia TFT-LCD TV and a high definition TV.

FEATURES

RoHS compliance (Pb-free)
High contrast ratio & aperture ratio with the wide color gamut
SVA mode
Wide viewing angle (±178°)
High speed response
HD resolution (16:9)
DE (Data enable) mode
The interface (1Pixel/clock) of LVDS (Low voltage differential signaling)

GENERAL INFORMATION

Item	Specification	Unit	Note
Active Display Area	697.6845 (H) x 392.256 (V)	mm	
Switching Components	a-Si TFT Active matrix		
Glass size	TFT : 713.0(H) x 410.5(V) CF : 713.0(H) x 408.2(V)	mm	
Panel Size	713.0(H) x 410.5(V)	mm	±0.5
	1.30(D)	mm	±0.1
Weight	800	g	±10%
Display Colors	16.7M (True 8-bit)		
Number of Pixels	1,366 × 768		16:9
Pixel Arrangement	RGB Horizontal Stripe	mm	
Display Mode	Normally Black		
Surface Treatment	Anti-Glare		

2. ABSOLUTE MAXIMUM RATINGS

If the figures on measuring instruments exceed maximum ratings, it can cause the malfunction or the unrecoverable damage on the device.

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	V_{DD}	GND-0.5	14.0	V	(1)
Temperature for storage (Temperature of glass surface)	T_{STG}	-20	65	°C	(2), (4)
Humidity for storage	H_{STG}	5	90	%RH	(2), (4)
Operating temperature	T_{OPR}	0	50	°C	(2), (5)
Operating humidity	H_{STG}	20	90	%RH	(2), (5)
Endurance on static electricity	-	-	150	V	(3)

Note (1) The power supply voltage at Ta= 25 ± 2 °C

(2) Temperature and the range of relative humidity are shown in the figure below.

   a. 90 % RH Max. (Ta ≤ 39 °C)

   b. The relative humidity is 90% or less. (Ta > 39 °C)

   c. No condensation

(3) Keep the static electricity under 150V in Polarizer attaching process.

(4) Storage temperature condition including glass

(5) Operating condition with source PCB

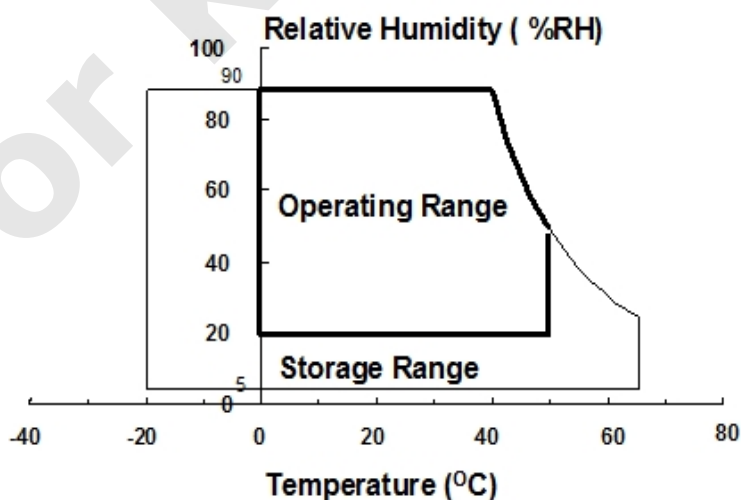(6) Condition without packing. (Unpacking condition)

Fig. Range for temperature and relative humidity (unpacking condition)

3. OPTICAL CHARACTERISTICS

The optical characteristics should be measured in the dark room or the space surrounded by the similar setting. Measuring equipment : TOPCON RD-80S, TOPCON SR-3 ,ELDIM EZ-Contrast

Ta = 25 ± 2°C, VDD=12.0V, fv=60Hz, fDCLK=78MHz, Light source: D65

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR		3000	5000	-	-	(1) SR-3
Response time	G to G	Tg		-	20	30	msec	(2) RD-80S
Transmittance (At the center of screen)		T	Normal q**L,R**=0 q**U,D**=0 Viewing Angle	6.21	6.9	-	%	(3) SR-3
Color Chromaticity (CIE)	Red	RX		TYP -0.03	0.660	TYP +0.03		(4),(5) SR-3
		RY			0.329			
	Green	GX			0.269			
		GY			0.585			
	Blue	BX			0.135			
		BY			0.117			
	White	WX			0.297			
		WY			0.361			
Viewing Angle	Hor.	q$_I$	CR ≥ 10 At center	79	89	-	Degrees	(5) SR-3 EZ-Contrast
		q$_R$		79	89	-		
	Ver.	q$_U$		79	89	-		
		q$_D$		79	89	-		
Color Gamut				65	68	-	%	
Color				-	7000	-	K	

Notice

(a) Setup for test equipment

The measurement should be executed in a stable, windless, and dark room for 40min and 60min after operating the panel at the given temperature for stabilization of the standard light. (SDC uses the standard luminance of the D65media).

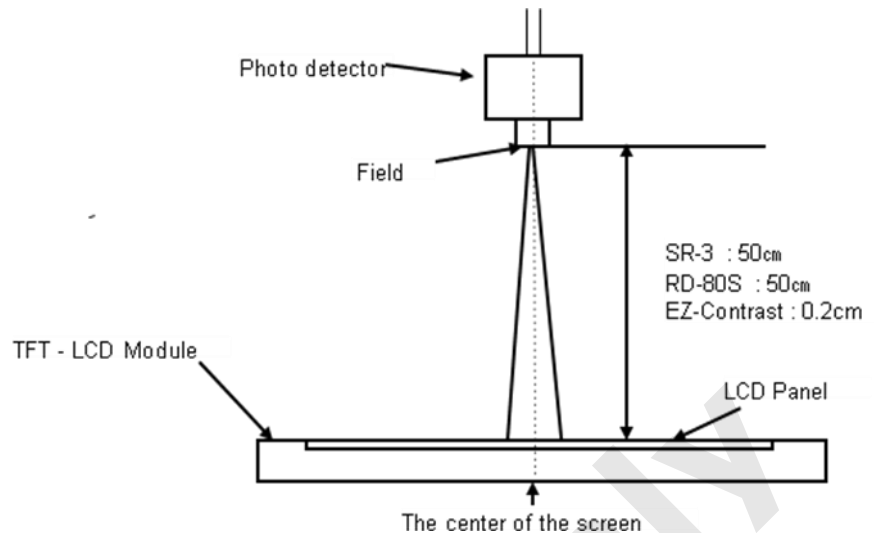This measurement should be measured at the center of screen.

The environment condition: Ta = 25 ± 2 °C

(b) D65media has the general light source.

The temperature of color is 6487K. The coordinate of color is Wx 0.313, Wy 0.329

The luminance of this product is 7217cd/㎡.

Photo detector	Field
SR-3	2°
RD-80S	1°

(c) The CIE positions D65 as the standard daylight illuminant:
[D65] is intended to represent average daylight and has a correlated color temperature of approximately 6500 K. CIE standard illuminant D65 should be used in all colorimetric calculations requiring representative daylight, unless there are specific reasons for using a different illuminant.

- Definition of the test point
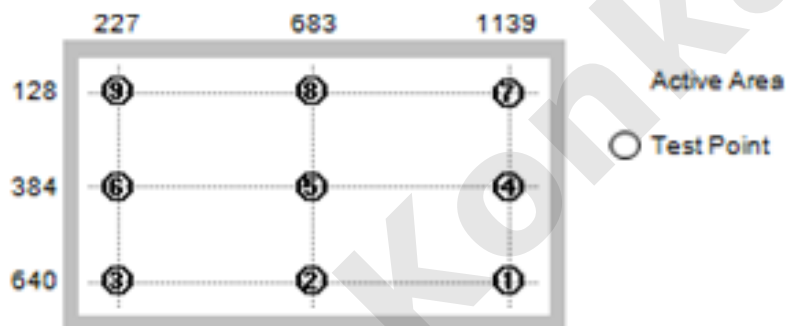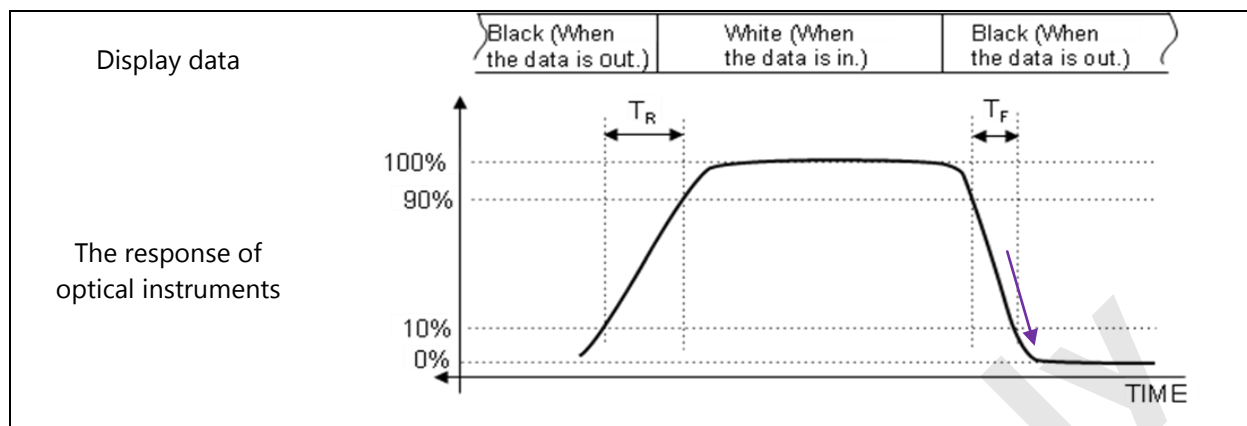

Note (1) Definition of contrast ratio (C/R)
: The ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel
The measurement goes in ELABO-LS Standard light source

$$C/R = \frac{G\max}{G\min}$$

Gmax : The luminance with all white pixels
Gmin : The luminance with all black pixels

Note (2) Definition of response time

※ **G to G** : Average response time between the whole gray scale to the whole gray scale.

The response time is the value that was measured after it was operated in Samsung's standard BLU for one hour.(at room temperature)

Note (3) The definition of luminance of white: The luminance of white at the center point ⑤
The measurement shall be executed with the standard light source of D65

Note (4) The definition of chromaticity (CIE 1931)
The color coordinate of red, green, blue and white at the center point ⑤
The measurement shall be executed with the standard light source of D65

Note (5) Definition of viewing angle
: The range of viewing angle (C/R ≥10)
The measurement shall be executed with the standard light source of D65
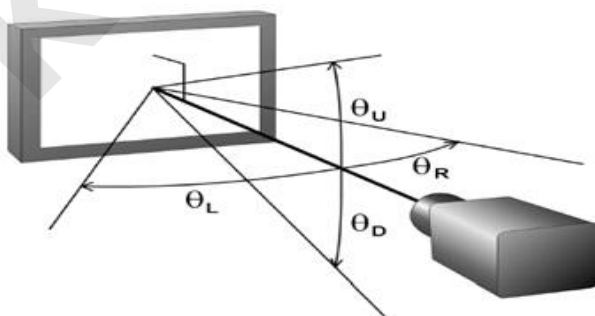
4. ELECTRICAL CHARACTERISTICS

4.1 TFT LCD MODULE

* Ta = 25 ± 2 °C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of power supply		VDD	10.8	12.0	13.2	V	(1)
Currnet of power supply	(a) Black	IDD	-	176	238	mA	(2),(3)
	(b) White		-	174	237	mA	
	(d)V-Stripe		-	248	337	mA	
Rush current		IRUSH	-	-	2	A	(4)

Note (1) The ripple voltage should be controlled fewer than 10% of V_{DD} (Typ.) voltage.

(2) fV=60Hz, fDCLK = 78MHz, V_{DD} = 12.0V, DC Current.

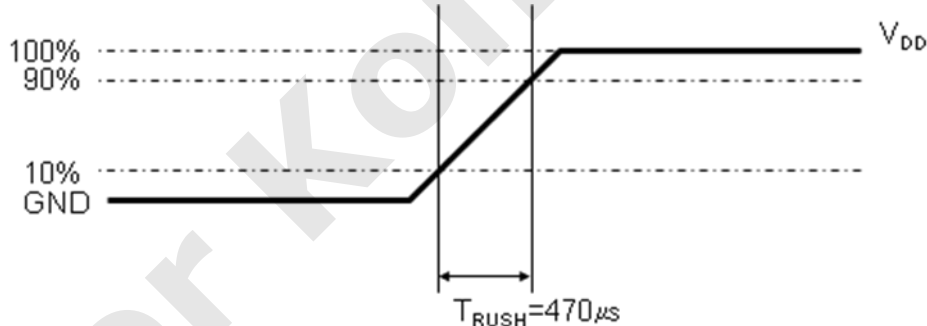(3) Power dissipation check pattern (LCD Module only)

a) Black pattern   b) White pattern   c) V-stripe

(4) Conditions for measurement

The rush current, I_{RUSH} can be measured when T_{RUSH} is 470μs.

5. INPUT TERMINAL PIN ASSIGNMENT

5.1 INPUT SIGNAL & POWER

Connector : 104236-3017(MOLEX)

Pin	Symbol	Description	Pin	Symbol	Description
1	12V	DC power supply	16	R1B_P	LVDS Signal +
2	12V	DC power supply	17	GND	Ground
3	12V	DC power supply	18	R1C_N	LVDS Signal -
4	12V	DC power supply	19	R1C_P	LVDS Signal +
5	GND	Ground	20	GND	Ground
6	GND	Ground	21	R1CLK_N	LVDS Clock -
7	GND	Ground	22	R1CLK_P	LVDS Clock +
8	GND	Ground	23	GND	Ground
9	LVDS SEL	LVDS Option Note (3)	24	R1D_N	LVDS Signal -
10	NC	NOTE (1)	25	R1D_P	LVDS Signal +
11	GND	Ground	26	GND	Ground
12	R1A_N	LVDS Signal -	27	NC	Note (2)
13	R1A_P	LVDS Signal +	28	NC	Note (2)
14	GND	Ground	29	NC	Note (2)
15	R1B_N	LVDS Signal -	30	GND	Ground

Note (1) No connection: These PINS are used only for the product of SAMSUNG.
(DO NOT CONNECT the input device to these pins.)

Note(2) These PINS are used only for I2C communication in flicker tuning process.
(DO NOT CONNECT the input device to these pins in System condition)

Note(3) LVDS OPTION : If this PIN is HIGH (3.3 V) → Normal LVDS format
LOW (GND) → JEIDA LVDS format

Note (2) Pin number which starts from the left side.
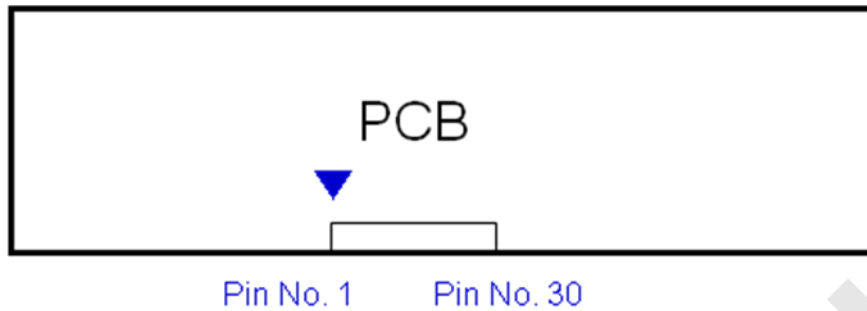
Fig . The diagram of connector

    a. Power GND pins should be connected to the LCD's metal chassis.
    b. All power input pins should be connected together.
    c. All NC pins should be separated from other signal or power.

5.2 LVDS INTERFACE

- LVDS receiver : T-con(merged)
- Data format

	LVDS pin	JEIDA -DATA	Normal-DATA
TxOUT/RxIN0	TxIN/RxOUT0	R2	*R0*
	TxIN/RxOUT1	R3	R1
	TxIN/RxOUT2	R4	R2
	TxIN/RxOUT3	R5	R3
	TxIN/RxOUT4	R6	R4
	TxIN/RxOUT6	R7	R5
	TxIN/RxOUT7	G2	G0
TxOUT/RxIN1	TxIN/RxOUT8	G3	G1
	TxIN/RxOUT9	G4	G2
	TxIN/RxOUT12	G5	G3
	TxIN/RxOUT13	G6	G4
	TxIN/RxOUT14	G7	G5
	TxIN/RxOUT15	B2	B0
	TxIN/RxOUT18	B3	B1
TxOUT/RxIN2	TxIN/RxOUT19	B4	B2
	TxIN/RxOUT20	B5	B3
	TxIN/RxOUT21	B6	B4
	TxIN/RxOUT22	B7	B5
	TxIN/RxOUT24	HSYNC	HSYNC
	TxIN/RxOUT25	VSYNC	VSYNC
	TxIN/RxOUT26	DEN	DE
TxOUT/RxIN3	TxIN/RxOUT27	R0	R6
	TxIN/RxOUT5	R1	R7
	TxIN/RxOUT10	G0	G6
	TxIN/RxOUT11	G1	G7
	TxIN/RxOUT16	B0	B6
	TxIN/RxOUT17	B1	B7
	TxIN/RxOUT23	RESERVED	RESERVED

5.3 INPUT COLOR DATA MAPPING

COLOR	DISPLAY (8bit)	DATA SIGNAL																								GRAY SCALE LEVEL
		RED								GREEN								BLUE								
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			R3~ R252
	↓	:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			
	LIGHT	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			G3~ G252
	↓	:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			
	LIGHT	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			B3~ B252
	↓	:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			
	LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B255

Note (1) Definition of gray : Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)

Note (2) Input signal: 0 =Low level voltage, 1=High level voltage

6. INTERFACE TIMING

6.1 TIMING PARAMETERS OF TIMING (Only DE Mode)

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Clock	Frequency	$1/T_C$	66	78	85	MHz	-
Hsync		F_H	44	48	53	KHz	-
Vsync		F_V	46	60	66	Hz	-
Term for the Vertical Display	Active display period	T_{VD}	-	768	-	Lines	-
	Total vertical	T_V	780	802	1000	Lines	-
Term for the Horizontal Display	Active display Period	T_{HD}	-	1366	-	Clocks	-
	Total Horizontal	T_H	1580	1624	1800	clocks	-

 Note) These products don't have to receive the signal of Hsync & Vsync from the input device.
(1)Key points when testing: TTL controls the signal and the CLK at the input terminal of LVDS Tx of the system.
(2) Internal VDD = 3.3V
(3) Spread spectrum

* The limit of spread spectrum's range of SET in which the LCD module is assembled should be within ±1.5 %.

6.2 TIMING DIAGRAMS OF INTERFACE SIGNAL
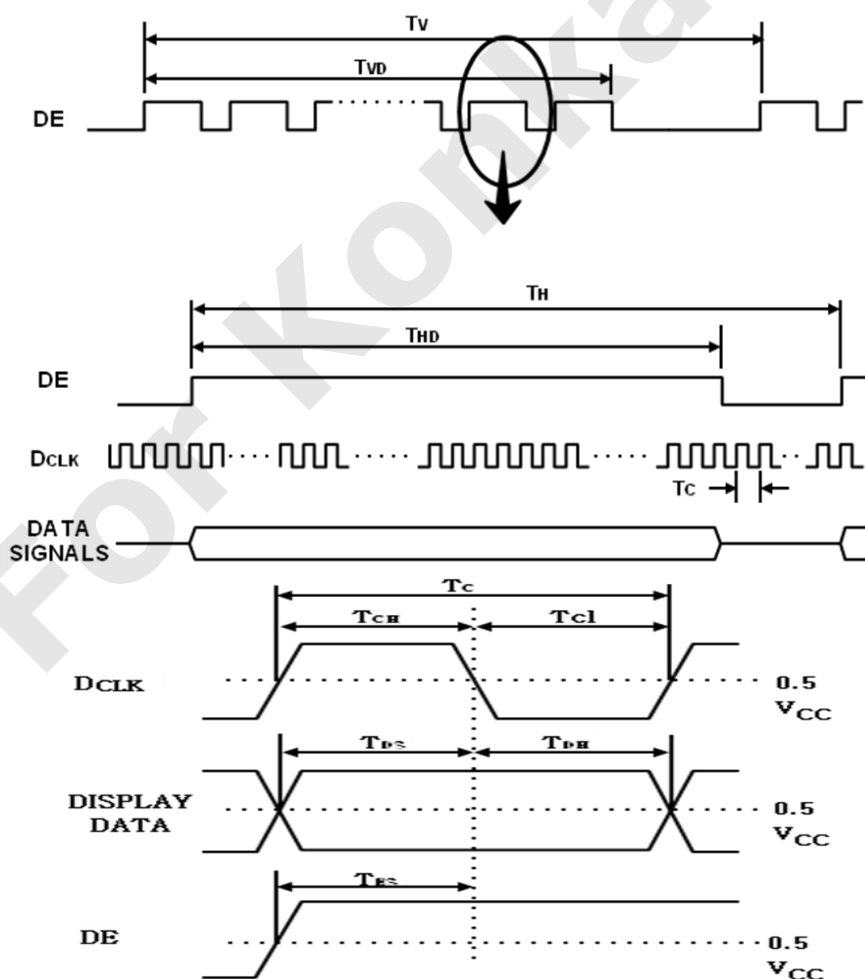
6.3 CHARACTREISTICS OF INPUT DATA OF LVDS

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Differential input high threshold voltage		VTH	-	-	100	mV	VCM=1.2V
Differential input low threshold voltage		VTL	-100	-	-	mV	
Input common mode voltage		V_{CM}	0.2	1.2	2.0	V	
Differential Input Voltage		$|V_{ID}|$	100	-	600	mV	
Input data position	F_{IN}=80MHz	t_{RSRM}	-	-	450	ps	
		t_{RSLM}	-450	-	-	ps	

Notice The spread spectrum should be 0% when the skew is measured.
Position of a measurement is T-CON LVDS input pin
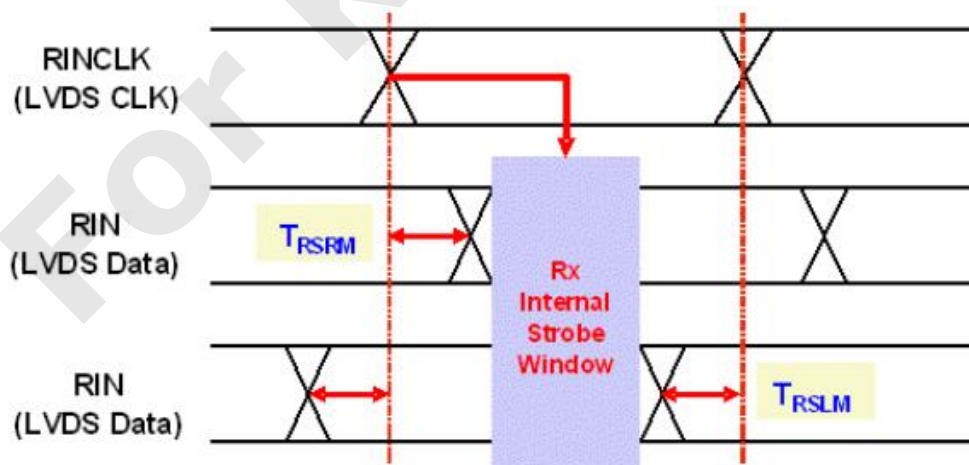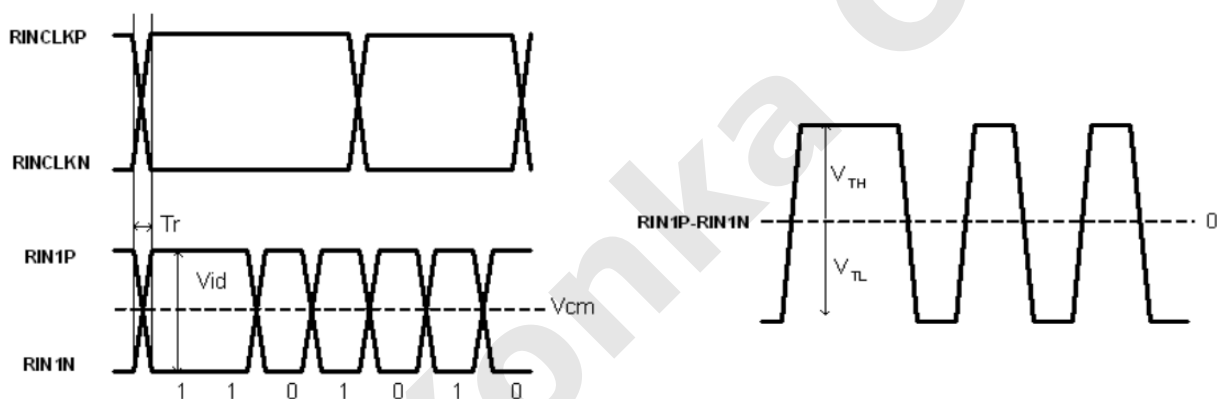
6.4 POWER ON/OFF SEQUENCE

To prevent the product from being latched up or the DC in the LCD module from starting an operation, the order to turn the power on and off should be changed to the order as shown in the diagram below.
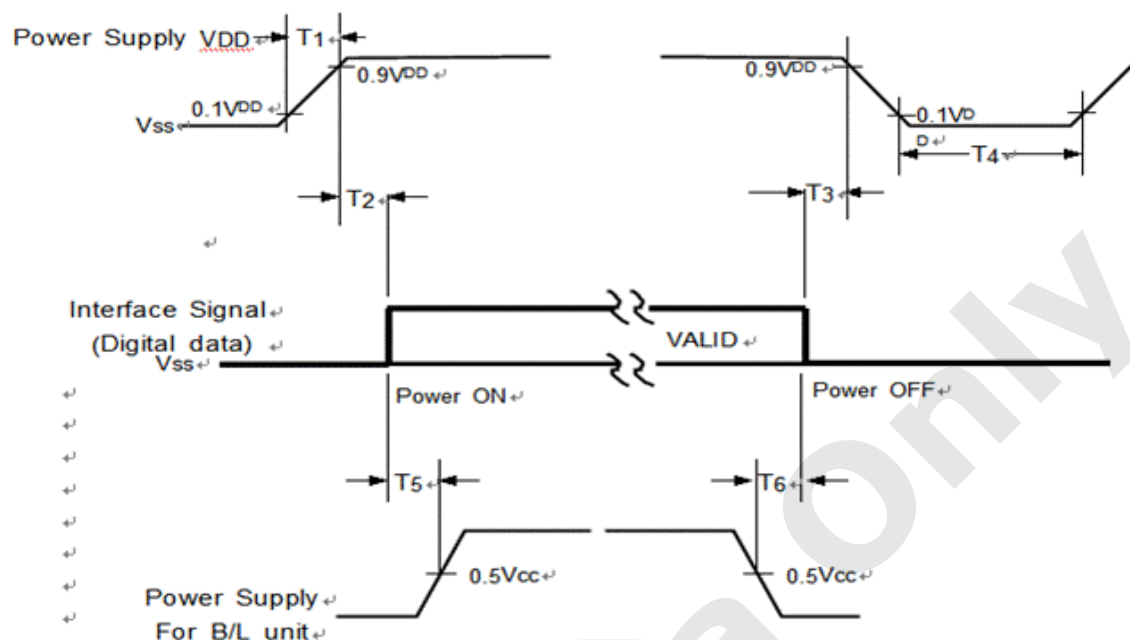
Timing	Spec	Remarks
T_1	0.5msec<T1≤10msec	The time, during which the level of V_{DD} is rising from 10% to 90%.
T_2	10msec≤T2	The changing time, during which the VDD starts rising beyond 90% until the valid data of signal started coming in.
T_3	0msec<T3≤50msec	The change for the time, during which the valid data of signal started coming until the VDD started coming out.
T_4	1000msec≤T4	The time, during which the VDD start coming out to restart the Windows.
T_5	1000msec≤T5 (BLU ON TIME)	The time, during which the valid data starts coming in until the power of B/L exceed 50%.
T_6	100msec≤T6 (BLU OFF TIME)	The time, during which the level of B/L's power falls below 50% until the valid data of signal starts coming out.

- The inputted V_{DD}'s value for supply voltage, BLU, and signal to the external system of the module shall be computed with referring to the former mentioned value.
- The method to apply the voltage to the lamp within the range, which the LCD operates. When the back-light is turned on before the LCD is operated or the power of LCD is turned off before the back-light is turned off, the abnormal display on the screen may be shown momentarily.
- Please keep the level of input signal low or keep the level of impedance high when the value of V_{DD} is off.
- The value shall be measured after the module has been fully discharged between the period, which the power is turned on and the period, which the power is turned off like the T4 timing. The backlight may be flashed if the interface signal remains floated when the above-mentioned signal becomes invalid

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ACTIVE CENTER

For Konka Only
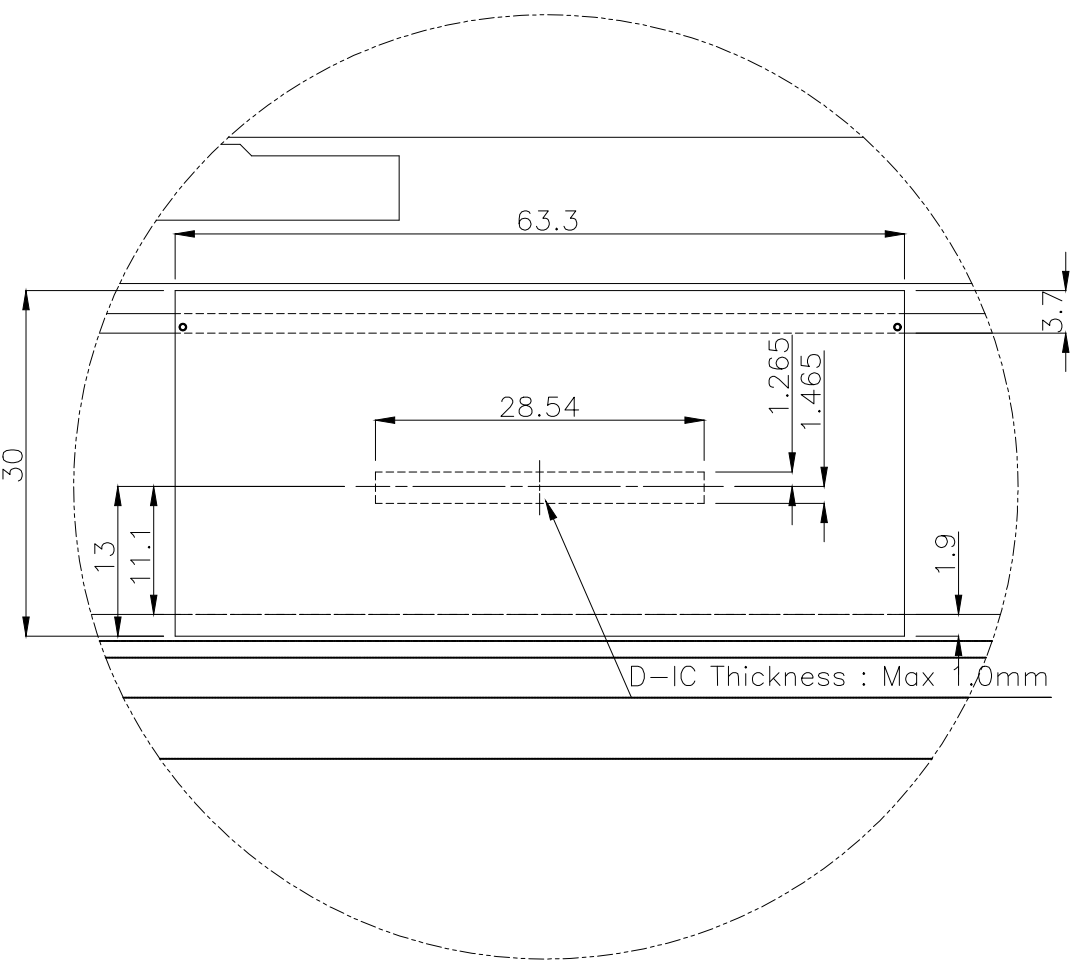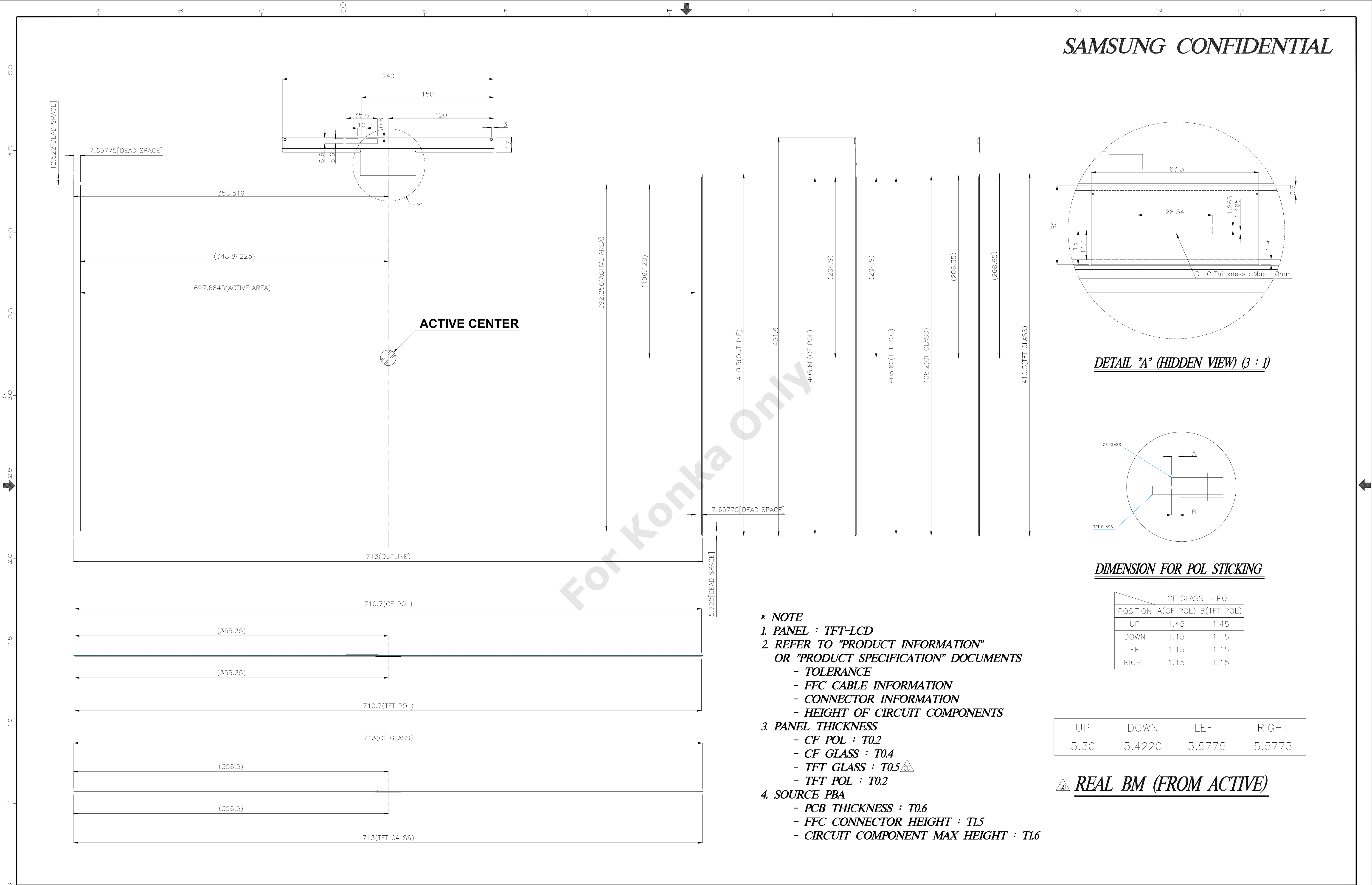
DETAIL "A" (HIDDEN VIEW) (3 : 1)

D-IC Thickness : Max 1.0mm
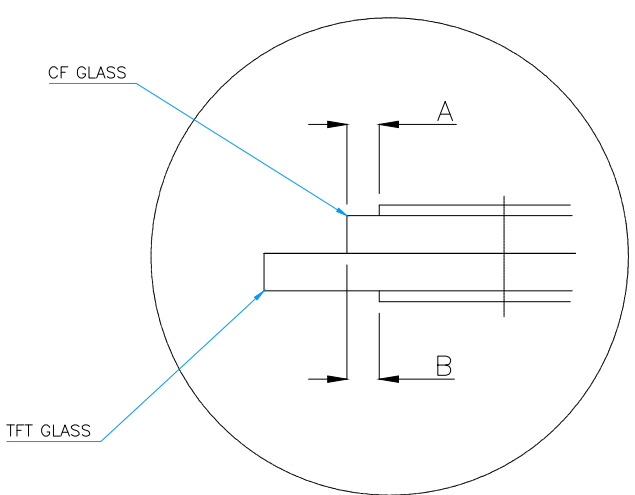
DIMENSION FOR POL STICKING

	CF GLASS ~ POL	
POSITION	A(CF POL)	B(TFT POL)
UP	1.45	1.45
DOWN	1.15	1.15
LEFT	1.15	1.15
RIGHT	1.15	1.15

UP	DOWN	LEFT	RIGHT
5.30	5.4220	5.5775	5.5775

⚠️2 REAL BM (FROM ACTIVE)

* NOTE
1. PANEL : TFT-LCD
2. REFER TO "PRODUCT INFORMATION"
   OR "PRODUCT SPECIFICATION" DOCUMENTS
   - TOLERANCE
   - FFC CABLE INFORMATION
   - CONNECTOR INFORMATION
   - HEIGHT OF CIRCUIT COMPONENTS
3. PANEL THICKNESS
   - CF POL : T0.2
   - CF GLASS : T0.4
   - TFT GLASS : T0.5 ①
   - TFT POL : T0.2
4. SOURCE PBA
   - PCB THICKNESS : T0.6
   - FFC CONNECTOR HEIGHT : T1.5
   - CIRCUIT COMPONENT MAX HEIGHT : T1.6

Dimensions (left view):
- 240
- 150
- 120
- 35.6
- 356.519
- (348.84225)
- 697.6845(ACTIVE AREA)
- 392.256(ACTIVE AREA)
- (196.128)
- 12.522[DEAD SPACE]
- 7.65775[DEAD SPACE]
- 7.65775[DEAD SPACE]
- 5.722[DEAD SPACE]
- 713(OUTLINE)
- 410.5(OUTLINE)
- 451.9
- 405.60(CF POL)
- (204.9)
- 405.60(TFT POL)
- 408.2(CF GLASS)
- (206.35)
- (208.65)
- 410.5(TFT GLASS)
- 710.7(CF POL)
- (355.35)
- (355.35)
- 710.7(TFT POL)
- 713(CF GLASS)
- (356.5)
- (356.5)
- 713(TFT GALSS)
- 63.3
- 28.54
- 30
- 11.1
- 1.3
- 1.265
- 1.465
- 1.9

PRELIMINARY

8. PACKING

8.1 CARTON

(1) Packing Form
   Corrugated Card board box as shock absorber.

(2) Packing Method

12.1 Packing Specification
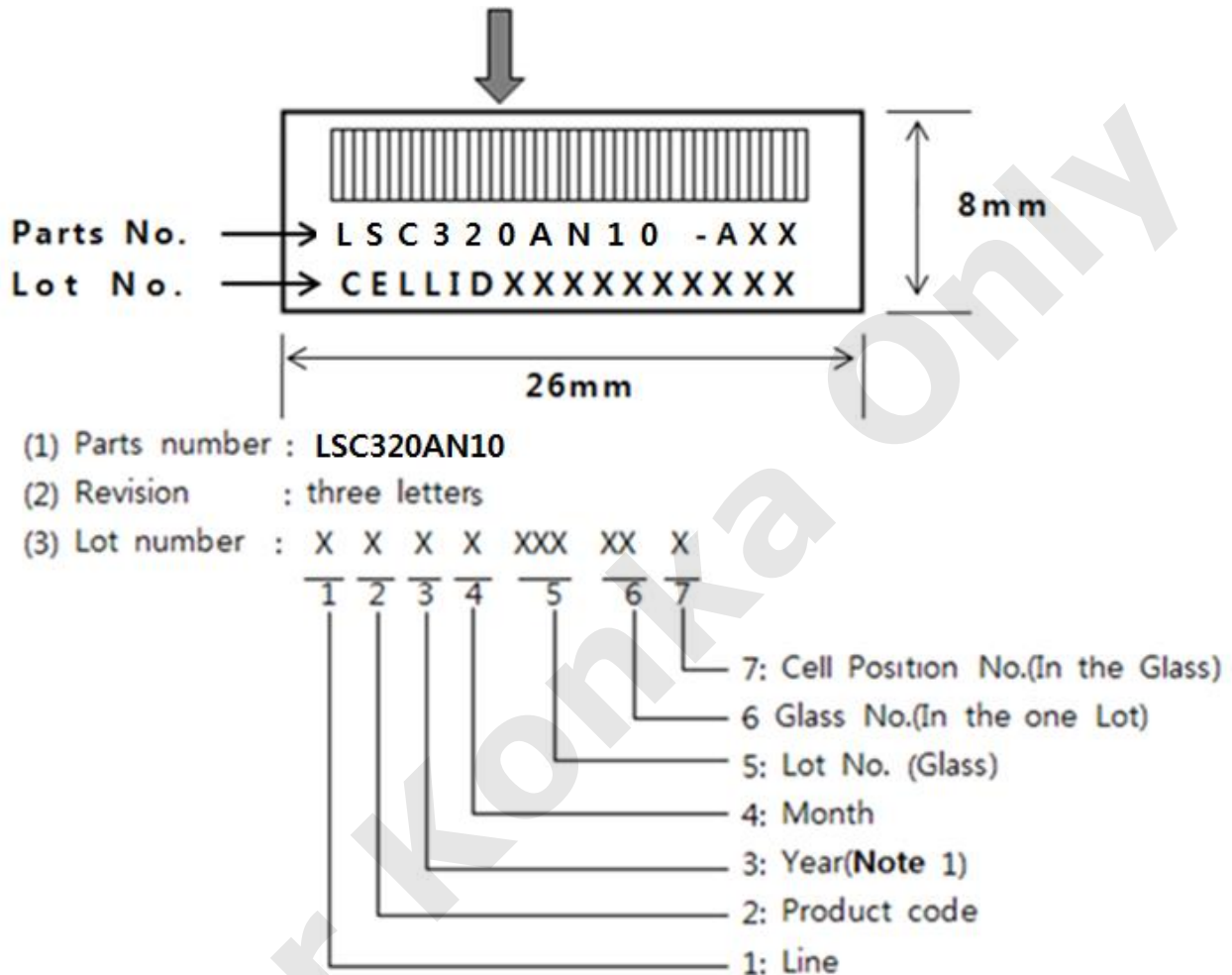
32"	Dimension	Weight	Q'ty / PLT	Total Weight
	W x L x H (mm)	g	pcs	Kg
Packing Tray	894 * 634 * 112	1056	20	
Pallet	1288 * 914 * 132	21000	1	
Panel	713.0 * 410.5 * T1.3	800	300	
Tray Top	894 * 634 * 40	590	2	
Pad cushion	752.5 * 487 * T1.0	14.75	340	275.4
Silica gel	-	60	80	
Packing cover	1282 * 908 * 120	1200	1	
Stack Layer	Max (Possible to be stacked 2levels in warehouse)	2	Pallet	
Total Size	1288 * 914 * 1197			

8.2 MARKING

A nameplate is affixed to the specified location on each product.

Parts No. ──→ L S C 3 2 0 A N 1 0 - A X X

Lot No. ──→ C E L L I D X X X X X X X X X

8mm

26mm

(1) Parts number : **LSC320AN10**

(2) Revision   : three letters

(3) Lot number : X X X X XXX XX X

             1 2 3 4 5 6 7

7: Cell Position No.(In the Glass)

6 Glass No.(In the one Lot)

5: Lot No. (Glass)

4: Month

3: Year(**Note 1**)

2: Product code

1: Line

8.3 Tray Label

(1) Nameplate Indication

Parts name   : LSC320AN02
Lot number   : XXXXXXXXXX
Product Revision Code : X01

(2) Packing box attach
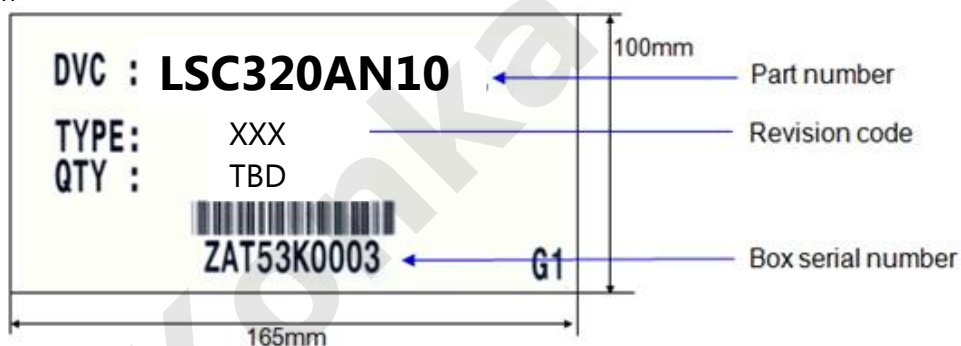
9. GENERAL PRECAUTIONS

9.1 HANDLING

(a) When the panel kit and BLU kit are assembled, the panel kit and BLU kit should be attached to the set system firmly by combining each mounted holes. Be careful not to give the mechanical stress.

(b) Be careful not to give any extra mechanical stress to the panel when designing the set, and BLU kit.

(c) Be cautious not to give any strong mechanical shock and / or any forces to the panel kit.
   Applying the any forces to the panel may cause the abnormal operation or the damage to the panel kit and the back light unit kit.

(d) Refrain from applying any forces to the source PBA and the drive IC in the process of the handling or installing to the set. If any forces are applied to the products, it may cause damage or a malfunction in the panel kit.

(e) Refrain from applying any forces which cause a constant shock to the back side of panel kit, the set Design and BLU kit. If any forces are applied to the products, it may cause an abnormal display, a functional failure and etc.

(f) Note that polarizer could be damaged easily.
   Do not press or scratch the bare surface with the material which is harder than a HB pencil lead.

(g) Wipe off water droplets or oil immediately. If you leave the droplets for a long time on the product, a staining or the discoloration may occur.

(h) If the surface of the polarizer is dirty, clean it using the absorbent cotton or the soft cloth.

(i) Desirable cleaners are water or IPA (Isopropyl Alcohol).
   Do not use Kenton type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. These might cause the permanent damage to the polarizer due to chemical reaction.

(j) If the liquid crystal material leaks from the panel, this should be kept away from the eyes or mouth.
   If this contacts to hands, legs, or clothes, you must washed it away with soap thoroughly and see a doctor for the medical examination.

(k) Protect the panel kit and BLU Kit out of the static electricity. Otherwise the circuit IC could be damaged.

- Reference : Process control standard of SDC

No.	Item	Control standard
1	Ionizer	All Equipment should be controlled under 150V.(Typ. 100V)
2	Carrying Roller	Carrying Roller should be controlled under 200V.
3	Equipment Ground Resistance	All Equipment Ground Should be less than 1ohm.

(l) Remove the stains with finger-stalls wearing soft gloves in order to keep the display clean in the process of

the incoming inspection and the assembly process.

(m) Do not pull or fold the source drive IC which connects to the source PBA and the panel or the gate drive IC.

(n) Do not pull, fold or bend the source drive IC and the gate drive IC in any processes.
   If not, the source drive IC could be bent one time in the process of assembling the panel Kit and the BLU Kit.

(o) Do not adjust the variable resistor located on the panel kit and BLU kit except when adjusting the flicker.

(p) Do not touch the pins of the interface connector directly with bare hands.

(q) Be cautious not to be peeled off the protection film.

- Make sure to peel off slowly
(It is recommended to peel it off at the speed of more than 8sec. constantly.)
- The peeling direction is shown at the Fig
- Instruct the ground worker to work with the adequate methods such as the antistatic wrist band.
- Maker sure to be grounded the source PBA while peeling of the protection film.
- Ionized air should be blown over during the peeling
- The protection film should not t be contacted to the source drive IC.
- If the adhesive stains remain on the polarizer after the protection film is peeled off, please move stains with isopropyl-alcohol liquid.

Fig. GND SR-Open Pattern – Be sure to be contacted to the ground while peeling of the protection film

(r) The protection film for the polarizer on the panel kit should be slowly peeled off just before using so that the electrostatic charge can be minimized.

(s) The panel kit and BLU kit have high frequency circuits. The sufficient suppression to the EMI should be done by the set manufacturers.
(t) The set of which the panel is assembled shall not be twisted. If the product is twisted, it may cause the damage on the product.
(u) Surface Temp. of IC should be controlled less than 100℃, operating over the Temp. can cause the damage or decrease of lifetime.

9.2 STORAGE

The storage condition for packing

ITEM	Unit	Min.	Max.
Storage Temperature	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage life	6 months		
Storage Condition	(1) The storage room should provide good ventilation and temperature control. (2) Products should not be placed on the floor, but on the Pallet away from a wall. (3) Prevent products from direct sunlight, moisture nor water; Be cautious of a buildup of condensation. (4) Avoid other hazardous environment while storing goods. (5) If products delivered or kept in conditions of the recommended temperature or humidity, we recommend you leave them at a circumstance which is shown in the following table.		

period	1 month	2 months	3 months	4 months	5 months	6 months
Baking Condition	No Baking		50℃, 10% 24Hr	50℃, 10%, 48Hr		

9.3 OPERATION

(a) Do not connect or disconnect the FFC cable during the "Power On" condition.

(b) Power supply should be always turned on and off by the "Power on/off sequence"

(c) The module has high frequency circuits. The sufficient suppression to the electromagnetic interference should be done by the system manufacturers. The grounding and shielding methods is important to minimize the interference.

(d) The cables between TV SET connector and Control PBA interface cable should be connected directly to have a minimized length. A longer cable between TV SET connector and Control PBA interface cable maybe operate abnormal display

(e) Recommend to age for over 1 hour at least in the state, which the product is driving initially to stabilize the characteristic of the initial TFT.

(f) Response time depends on the temperature.(In Lower temperature, it becomes longer)

9.4 OPERATION CONDITION GUIDE

(a) The LCD product shall be operated under normal conditions.
   The normal condition is defined as below;
   - Temperature : 20±15℃
   - Humidity : 55±20%
   - Display pattern : continually changing pattern (Not stationary)

   (b) If the product will be used under extreme conditions such as under the high temperature, humidity, display patterns or the operation time etc.., it is strongly recommended to contact SDC for the advice about the application of engineering . Otherwise, its reliability and the function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock markets, and controlling systems.

9.5 PROCESS EXECUTING GUIDE

(a) Aging
   Be sure to age for over 1 hour at least, which the product is driving initially to stabilize TFT Characteristic.
(b) Flicker Adjustment
  (1) Flicker should be adjusted by optimizing the Vcom value in customer LCM Line through the I2C Interface.
     (Master & Slave = I2C communication)

Pin. No.	Symbol	Function	Remark
27	TCON_WP	EN	Default : 0V Vcom tunning : 3.3V (Shouldn't be communicated with I2C device as output level "5V")
28	SCL_I	I2C Interface	I2C Bus Interface
29	SDA_I	I2C Interface	

  (2) Flicker should be tuned by correct method according to gamma IC type of each model and
      (LSC320AN10 – "Genie Type")

Type	Flicker data saving position	Slave Address
Genie Type	Gamma IC memory	B7=1, B6=0, B5=0, B4=1, B3=1, B2=1, B1=1, B0=R/W- Write B0 = "0"/Read B0 ="1"
Genie-lite Type	T-con EEPROM	1110101 (EEPROM data Address : 8161)

  (3) Flicker should be adjusted the pattern, where are displayed alternately at green sub-pixel. (Sub Checker 50% gray)
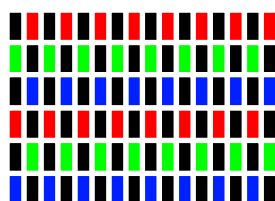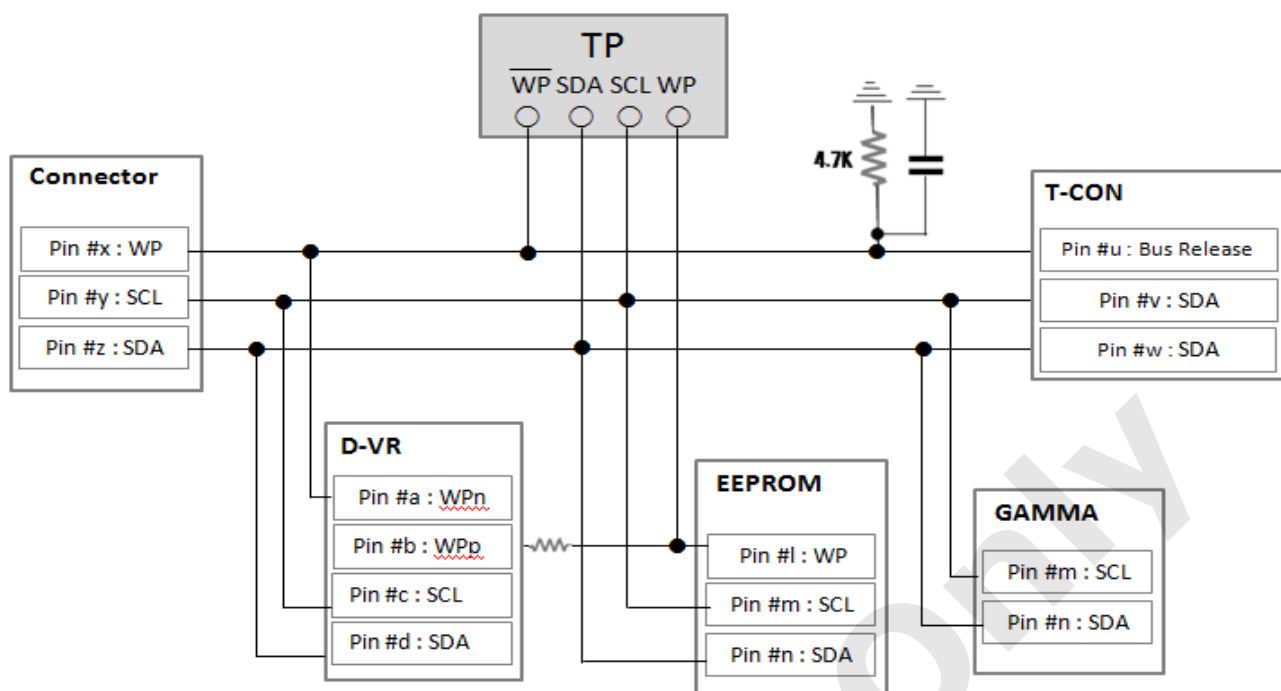
< **Flicker Adjust Circuit Block Diagram** >

9.6 OTHERS

(a) The ultra-violet ray filter is necessary for the outdoor operation.

(b) Avoid the condensation of water which may result in the improper operation of product or the disconnection of
electrode.

(c) Do not exceed the limit on the absolute maximum rating. (For example, the supply voltage variation, the input voltage variation, the variation in content of parts and environmental temperature, and so on) If not, panel may be damaged.

 (d) If the module keeps displaying the same pattern for a long period of time, the image may be remained to the screen. To avoid the image sticking, it is recommended to use a screen saver.

 (e) This Panel has its circuitry of PCB's on the rear side, so it should be handled carefully in order for a force not to be applied.

 (f) Please contact the SDC in advance when the same pattern is displayed for a long time

10. SPECIAL PRECAUSTIONS

No.	Component	Expected cause
1	Upholding part for panel	Prevent the panel from breaking by assigning gaps between the panel and the upholding part for panel on the drawing for the upholding part for panel. Refer to the (a), (b), (c) of 3-1 for the design of BLU.
2	The shape of the upholding part for panel	Design the upholding part for panel to fit to the panel appropriately when designing the BLU since the shape of the upholding part for panel may damage the panel. Refer to the (a), (b), (c) of 3-1 for the design of BLU.
3	The edge of upholding part for panel	Design the edge of panel to have a sufficient space with the upholding part for panel when designing the BLU since the edge of the upholding part for panel may damage the panel when assembling the panel and BLU. Refer to the (a), (b), (c) of 3-1 for the design of BLU.
4	Upholding part for panel	Place the upholding part for the panel in order for the shape of mold, which contacts with the panel not to interfere with the area of panel. Refer to the (a), (b), (c) of 3-1 for the design of BLU.
5	Drive IC	Design the BLU in order for the COF not to contain the lead crack resulted from the tensioned COF created when the product is twisted if the space between the D-IC COF and the middle mold isn't sufficient. Refer to the (a), (b), (c),(d),(e),(f), and (g)of 3-2 for the design of BLU.
6	Drive IC	Design the BLU in order for the product not to contain the lead crack resulted from the tensioned COF caused under the condition, which the product is twisted by fixing the source PCB. Refer to the (a), (b), (c),(d),(e),(f), and (g)of 3-2 for the design of BLU.
7	IC component	1) The temperature of each part of product suggested by our company and the second vendor shall meet the standard of temperature, which is recommended not to be exceeded by our company when the product is affected under the various temperature ranges. Apply over 1mm long separation distance stated in the safety standard between the electric part and each conductor. (Apply the rated separation distance when insulating.)
8	Thermal pad	Apply the thermal pad in a designated size to the product as a measure to lower the temperature of heat in order for each part to use the rated temperature.
9	POL	The surrounding area of the POL shall be treated with an electrification treatment since the external ESD may cause a phenomenon, which the POL is coming off. In addition, the GND portion of source PBA shall be grounded.
10	PBA	The GND portion of each PBA shall be contacted with the GND portion of BLU. Refer to the (a) and (b) of 3-3 for the design of BLU.
11	Circuit	The standardized approval from the client is required since the EMI is executed by a client. Our company can only measure the reference since the client measures the BLU.
12	The height of component	Design the BLU with considering the maximum height of parts, which our company suggests.
13	Between the FFC and the C-PBA	Design the instrument with considering the length between the FFC and the control PBA. (The marginal minimum length of 5mm or 8mm is required.)
14	Panel	The surface temperature of panel shall be maintained within 0℃ and 45℃ when the external ambient temperature is at 25℃. (Design the BLU with considering the increase of the temperature in the panel by the LED, CCFL, and etc.)
15	Aging	Recommend to age for over 1 hour at least in the state, which the product is driving initially to stabilize the characteristic of the initial TFT.
16	The attachment of gasket	The additional confirmation by our company is required If the attachment of gasket to the S-PBA of our company is required.(To fix the S-PBA or the EMI)
17	Drive IC	Design the top chassis and the driver IC to be contacted by placing the shape of emboss inside the top chassis as a measure to prevent the driver IC from heating. The size of emboss shall be designed in larger size than the size of IC inside the film of the driver IC. Refer to the (a), (b), (c),(d),(e),(f), and (g)of 3-2 for the design of BLU.
18	The prohibited bandwidth	Design the BLU in order for the BLU not to interfere with the area, where the control PBA and the source PBA are located densely according to the drawing for the BLU from our company.
19	S-PBA	The material, which contacts with the bottom side of S-PBA which has a pattern shall be non-conducting material or shall be insulated.

APPENDIX – RECOMMENDATION FOR THE BLU DESIGN

1. The schematic of panel
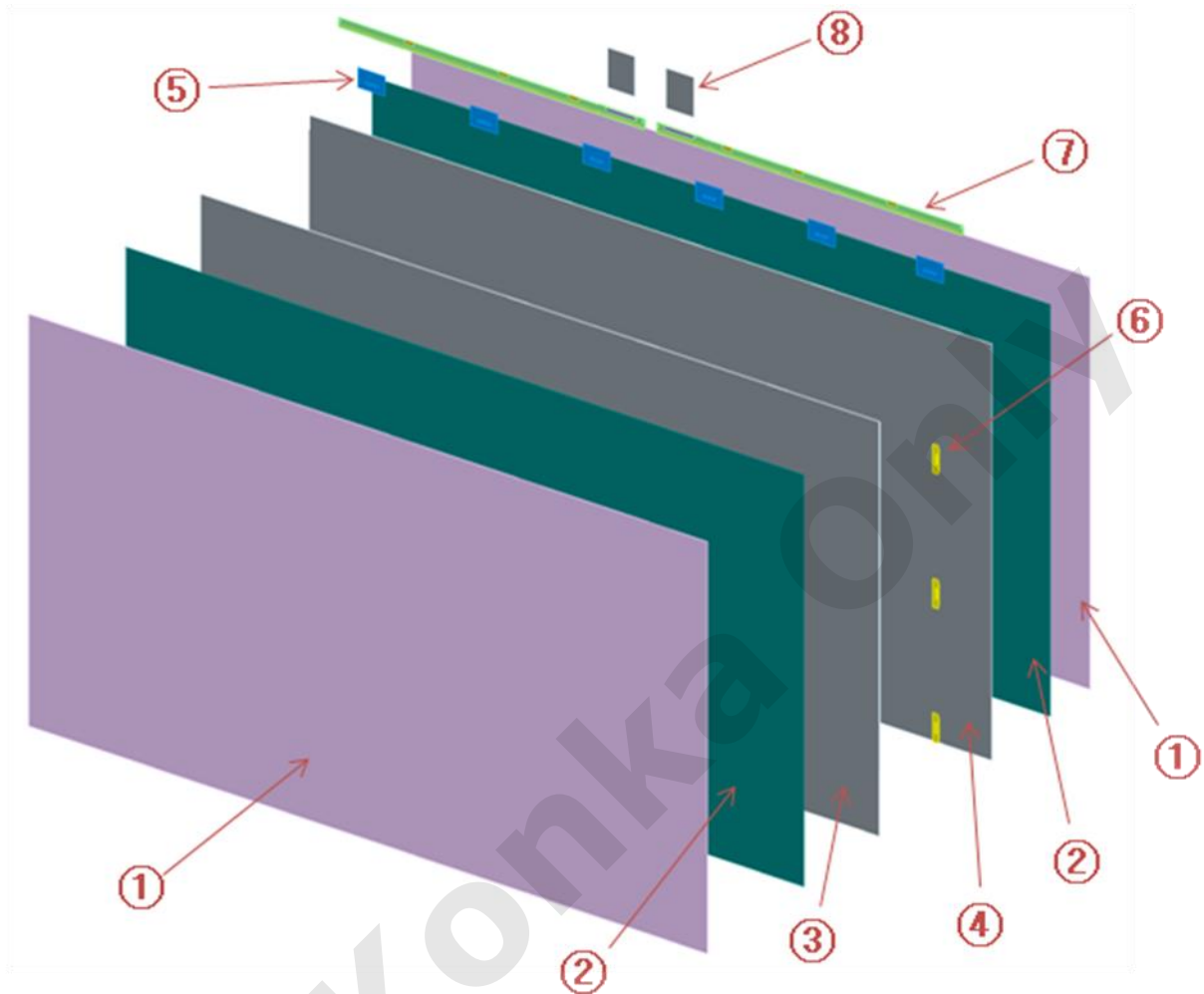
| Item	Symbol	Remark
Protector Film	①	Removable
Polaroid Film	②	
Color Filter Glass	③	
TFT Glass	④	
Source IC	⑤	
Gate IC	⑥	
Source PBA	⑦	
FFC	⑧	

2. The guide for the mechanical design

2.1 The panel guide

(a) When the panel guiding part is made of plastic resin, the gap between the panel and the guiding structure should be considered at the design process. The shrinkage of the plastic resin under the temperatures change can cause the light leakage. The gap should be determined to cover the temperature change from the guarantee condition and the BLU structure. SDC recommends the total gap between the panel and the guide structure as below, but the suggested dimension does not guarantee the quality of the products.

(b) It is recommended to follow the dimension and the shape of the guiding structure illustrated as below since the distortion of the panel can cause the light leakage.

Chamfer

Over 20mm

Round
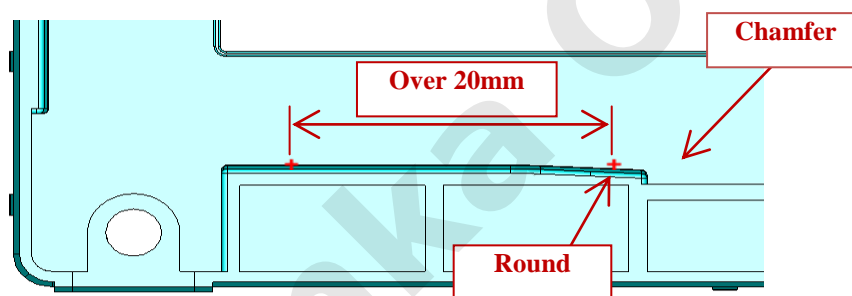
(c) When the panel guide is designed to be located at the corner of the BLU, the edge point of the panel shall not be in contact with the panel guide structures to prevent the crack of the panel caused by the burr at the edge of the glass. The distance larger than 2.5mm as shown in the picture is recommended.

(※ Suggested dimension does not guarantee the quality of the products.)

Over 2.5mm
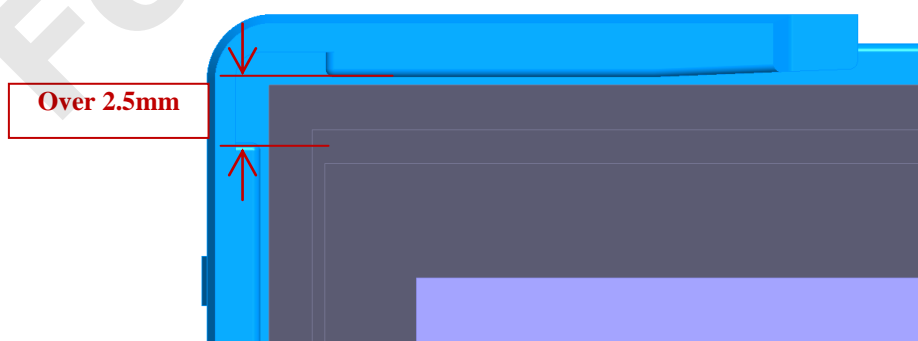
(d) It is recommended to keep the distance between the panel guides and other ribs over 1mm. If the ribs are placed at the same line with the panel guide, panel broken can be happen when the operator makes the mistake by placing the panel on the top of the ribs.

 (※ Suggested dimension does not guarantee the quality of the products.)
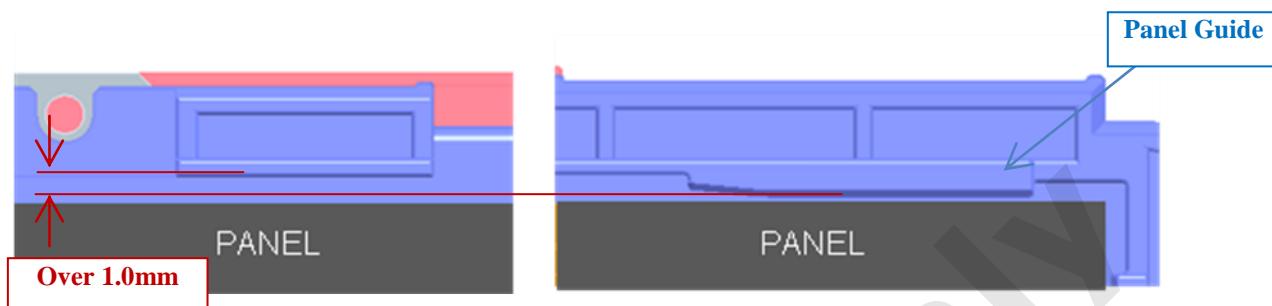
(e) The gap between the panel guide and the front cover (or front chassis) should be zero in z-direction. If there is gap, the panel is easily stuck into the gap and can be broken by external forces.
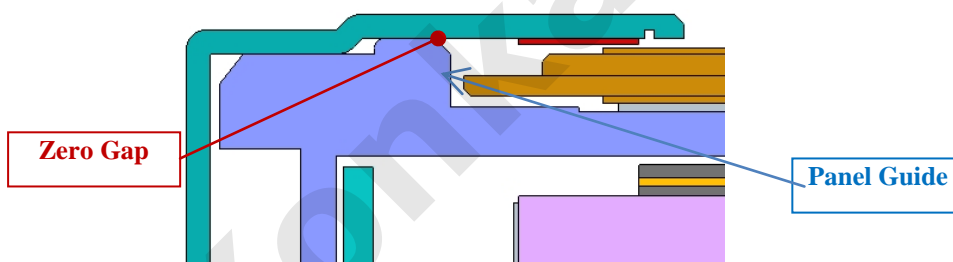
2.2 The COF and the Drive IC

(a) It is recommended to secure sufficient gap between the COF and the other parts, since the lack of gap can cause the damage on the COF such as the lead crack, under the vibration and twist condition.

(※ Over 3.0mm for moving space is recommended, but the suggested dimension does not guarantee the quality of the products.)

COF moving space
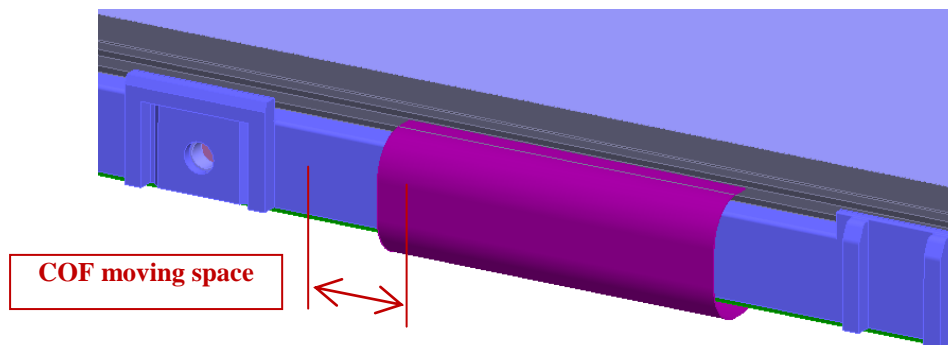
(b) The pattern of COF can be damaged at the sharp edge of the press part and the burr of mold part under the vibration condition. Therefore, it is recommended to avoid placing the gate position and parting line of the injection mold and sharp structure of metal parts around the COF.

(c) The temperature of the surface of Drive-IC should be less than 125℃.

(d) Sufficient space for the COF and the Drive-IC should be secured to prevent the damage on the Drive-IC from external forces by adding the ribs around COF. And it is also important to reduce the gap between the ribs and the front cover as small as possible

Front Cover
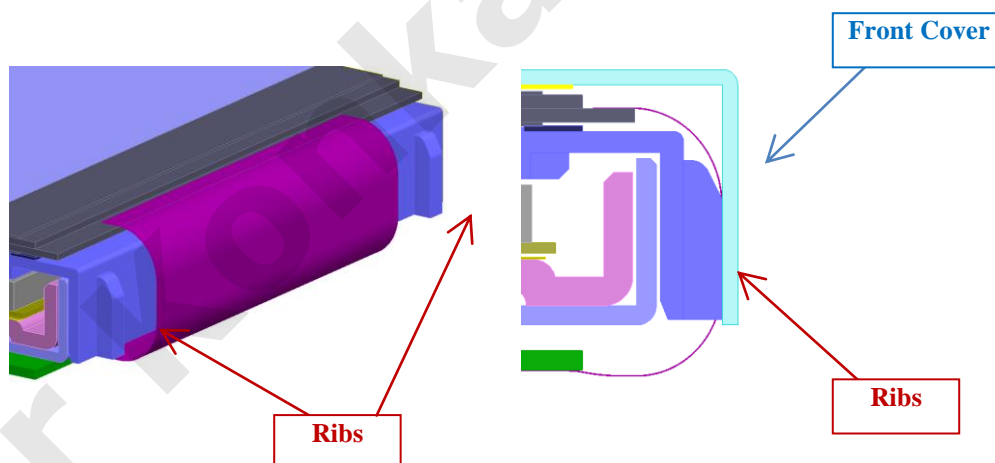
Ribs

Ribs

(e) It is recommended to make ribs for protecting Drive-IC as close as possible from the COF, otherwise forces from outside can deform the front cover and damage to the D-IC.
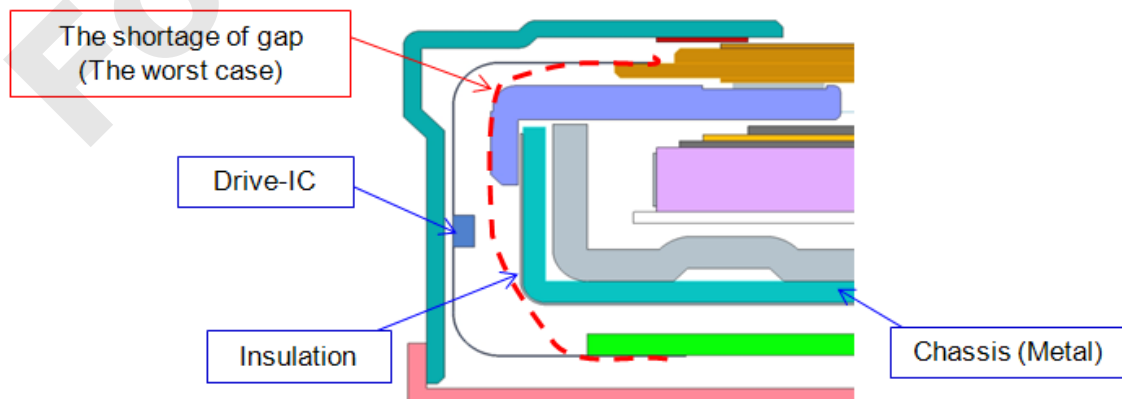
External Forces

(f) When metal parts are assembled next to the Drive-IC, the metal part should be insulated to avoid the damage on Drive-IC from electrostatic discharge.
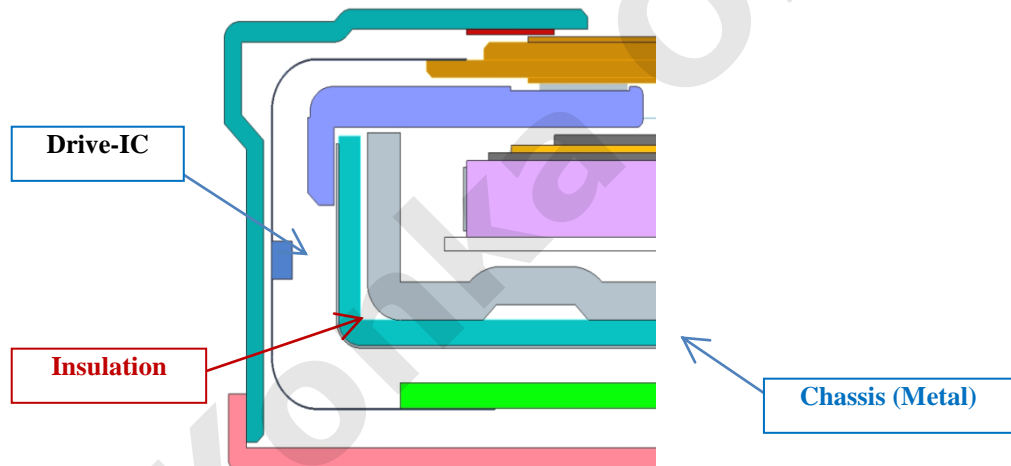

(g) If the length of COF is designed to be short, the lead crack can be occurred by applying the tension on the COF due to the drop, vibration and twist of the product.

(h) It is recommended that the source PCB should be easily moved in the direction which is parallel to the longer side of the panel, in order for the tension not to be applied to the COF under vibrating condition, such as transportation of the product.
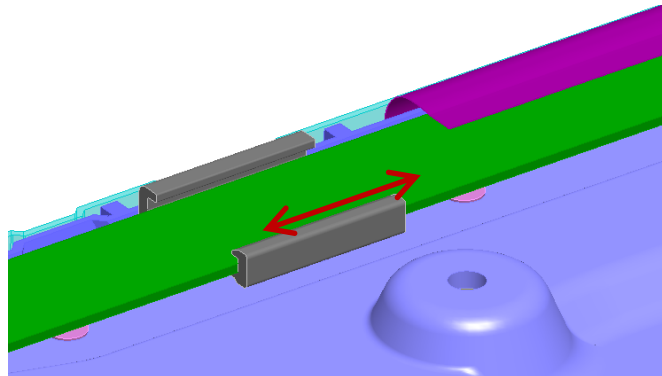

(I) It is suggested to make the holding structures of source PCB at the positions which is provided by SDC. They are marked at the 2D drawing and named as 'PCB guide area'.
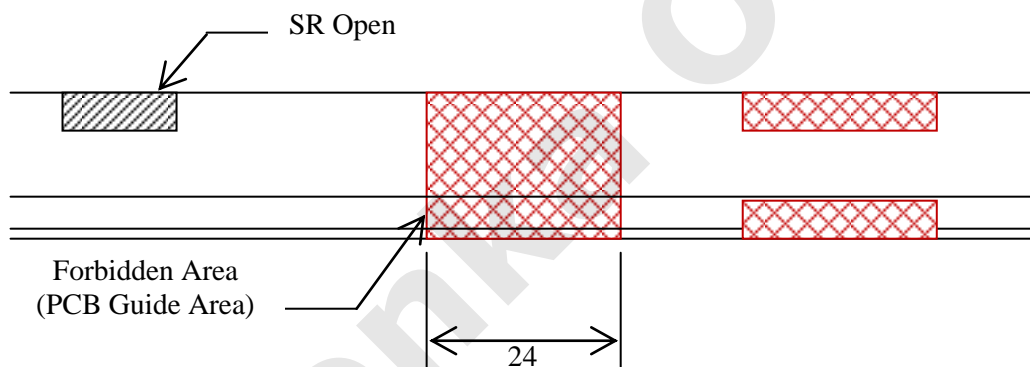
3.3 The control PBA and the Source PBA

(a) The gap between the circuit parts of the source PBA (or control PBA) and other parts should be considered to avoid damage on electrical parts by the static electrostatic discharge, short and external forces. If the shielding part is made of metal and if there is not enough distance from circuit parts, adding insulation is recommended. SDC will provide maximum height of circuit parts with 2D and 3D drawing, each customer can decide the distance under consideration of the material, thickness and other characteristics.

3D Drawing

Circuit Component's max. height : X.XX mm
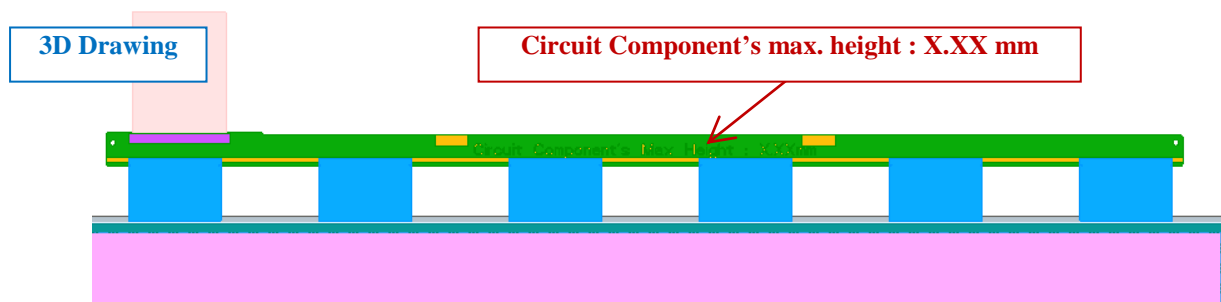
**2D Drawing**

```
4. SOURCE PBA
    - PCB THICKNESS : T1.0
    - PCB LAYER : 4
    - CONNECTOR HEIGHT : T1.5
    - CIRCUIT-PART MAX HEIGHT : T1.3
```

3. 4 The 4-Corner and the cloudy light leakage

(a) SDC recommends to design in a way that the heat from light source should be dissipated effectively. For example, it is recommended to make the contact area between the heat sink and the bottom chassis to be maximized. The sharp change of temperature or the large temperature gradient in the surface of panel can cause the light leakage.

Contact Design

Aluminum Bar

Bottom Chassis (Metal)
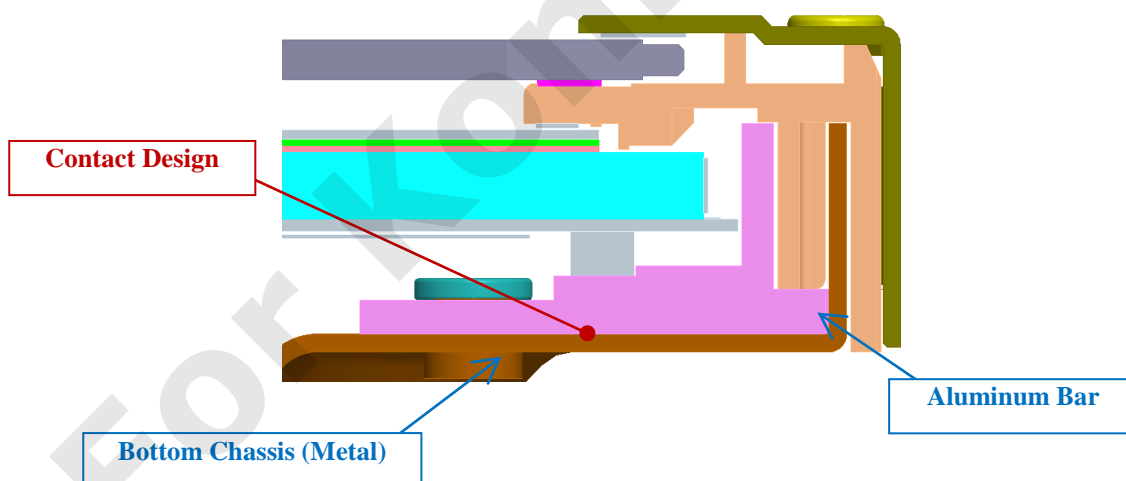
(b) The distortion of the panel by the lack of the stiffness of BLU can cause the light leakage and therefore it is recommended to design strong structure against distortion, such as place the strong beads at the corner of BLU to control the flatness of the panel.
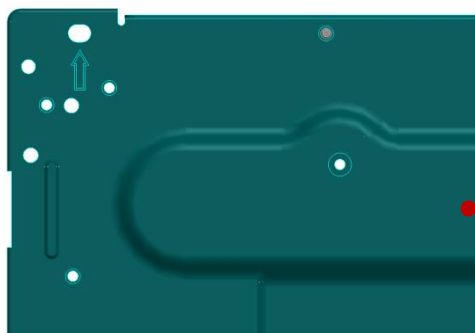
Bead or Forming

3.5 Others

(d) Sharp or the round shape near the panel should be changed to flat shape, such as screw point, gate point of the injection mold etc. Since the panel can be damaged by the concentrated force of the convex point when there is external force.
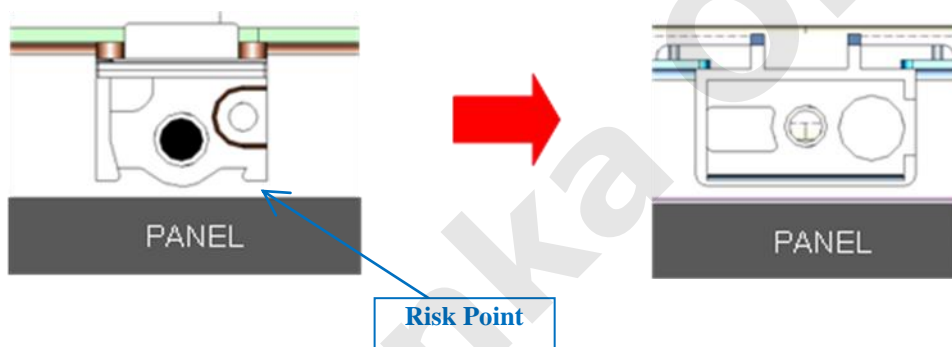
Risk Point

(b) It is recommended to design the temperature of the active area below 50℃ at room temperature for the protection from abnormalities in the screen due to the deterioration of the liquid crystal. In addition, each customer needs to consider all the guarantee conditions connected with temperature for this problem not to happen.