INNOLUX DISPLAY CORPORATION

Application Notes

Type : LCM

Customer: 宇华微科技

Model Name: EJ101IA-01G

Date: 2014/10/23

Version: V01

Approved by	Reviewed by	Prepared by
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Record of Revision

Version	Revise Date	Page	Content
V01	2014/10/27	ALL	Initial Release.

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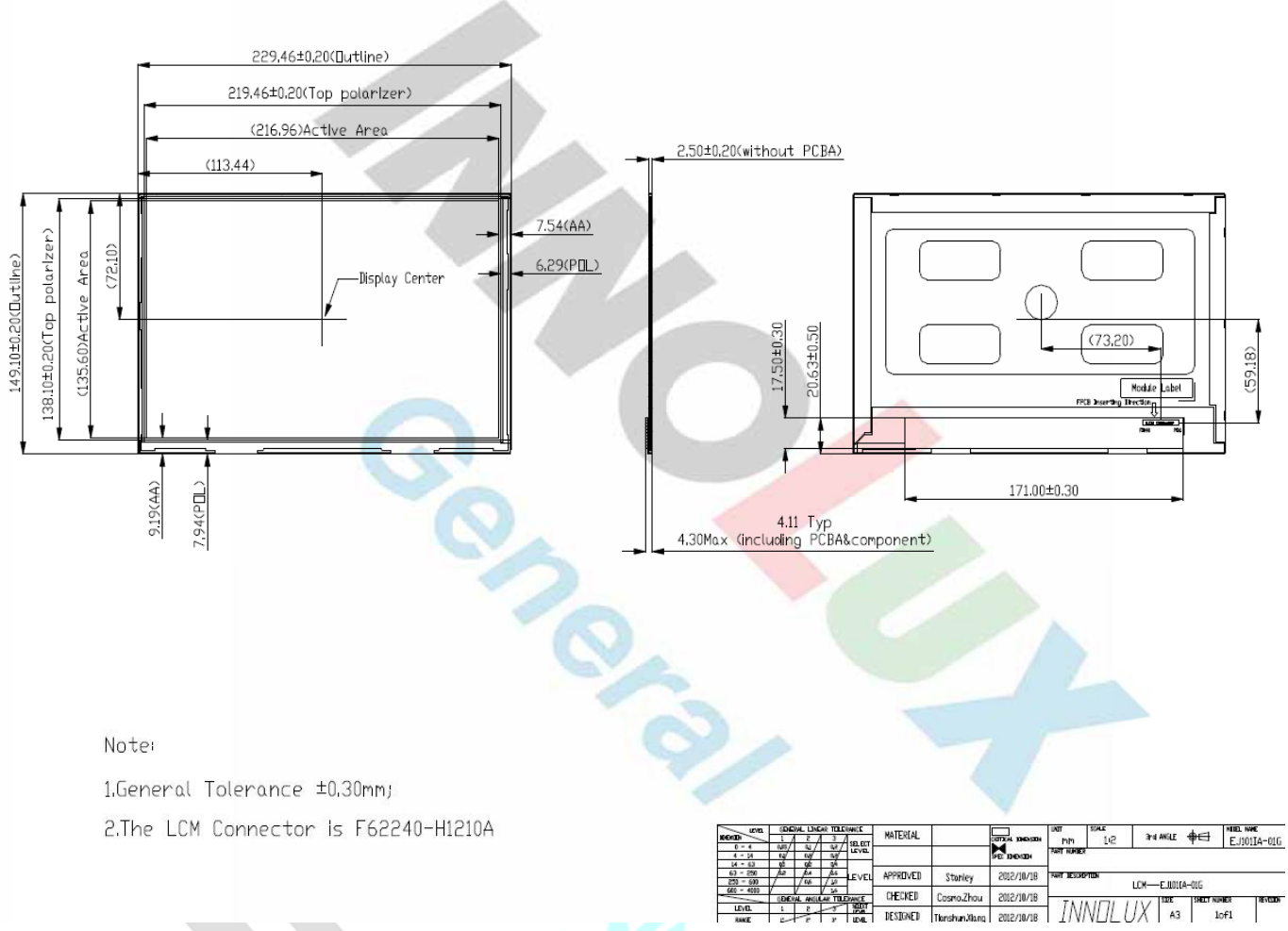
1. Module Introduction



2. Pin Assignment

2.1 TFT LCD Panel Driving Section

FPC connector is used for the module electronics interface. The recommended model is "AF 730L-A2G1T" manufactured by P-TWO.

Pin No.	Symbol	Description	Remark
1	VCOM	Common Voltage	
2	VDD	Power Supply	
3	VDD	Power Supply	
4	NC	No connection	
5	NC	No connection	
6	NC	No connection	
7	GND	Ground	

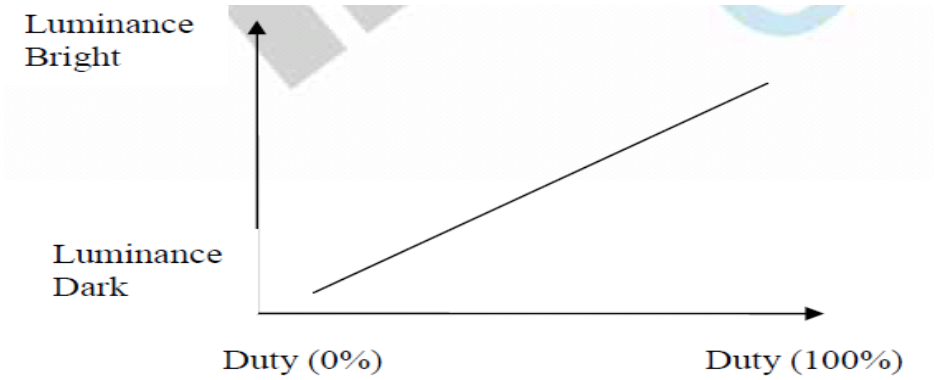
8	Rxin0-	-LVDS Differential Data Input	R0-R5, G0
9	Rxin0+	+LVDS Differential Data Input	
10	GND	Ground	
11	Rxin1-	-LVDS Differential Data Input	G1~G5, B0,B1
12	Rxin1+	+LVDS Differential Data Input	
13	GND	Ground	
14	Rxin2-	-LVDS Differential Data Input	B2-B5,HS,VS, DE
15	Rxin2+	+LVDS Differential Data Input	
16	GND	Ground	
17	RxCLK-	-LVDS Differential Clock Input	LVDS CLK
18	RxCLK+	+LVDS Differential Clock Input	
19	GND	Ground	
20	Rxin3-	-LVDS Differential Data Input	R6, R7, G6, G7,B6, B7
21	Rxin3+	+LVDS Differential Data Input	
22	GND	Ground	
23	NC	No connection	
24	NC	No connection	
25	GND	Ground	
26	NC	No connection	
27	LED_PWM	CABC controller signal output for backlight	Note2
28	NC	No connection	
29	AVDD	Power for Analog Circuit	
30	GND	Ground	
31	LED-	LED Cathode	
32	LED-	LED Cathode	
33	NC	No connection	
34	NC	No connection	
35	VGL	Gate OFF Voltage	
36	NC	No connection	
37	CABC_EN	CABC Enable Input	Note1
38	VGH	Gate ON Voltage	
39	LED+	LED Anode	
40	LED+	LED Anode	

I: input, O: output, P: Power

Note 1: Selection of scanning mode

Pin	Enable	Disable
CABC_EN	High Voltage	Low Voltage or open

Note2: LED_PWM is used to adjust backlight brightness.



3. Power Operation Conditions

3.1 Absolute Maximum Ratings

(Note2)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	VDD	-0.3	3.9	V	
	AVDD	-0.3	14	V	
	V_{GH}	-0.3	42	V	
	V_{GL}	-19	0.3	V	
	V_{GH}-V_{GL}	12	40.0	V	
Operation temperature	T_{OP}	-10	50	℃	
Storage temperature	T_{ST}	-20	60	℃	
LED Reverse Voltage	V_R	2.7	3.1	V	Each LED
LED Forward Current	I_F	-	50	mA	Each LED

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3.1.1 Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	-	705	750	uA	V_{GH}=22V
	I_{GL}	-	705	750	uA	V_{GL}=-7V

	IV_{DD}	-	95	120	mA	V_{DD}=2.5V
	IAV_{DD}	-	45	70	mA	AV_{DD}=8.2V

3.1.2 Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V_L	8.1	(8.8)	9.3	V	Note1
Current for LED backlight	I_L	180	200	220	mA	
LED life time	-	15000			Hr	Note2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and I_L =200mA.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_L =200mA. The LED lifetime could be decreased if operating I_L is lager than 200mA.

3.2 Typical Operation Conditions

(Note 1)

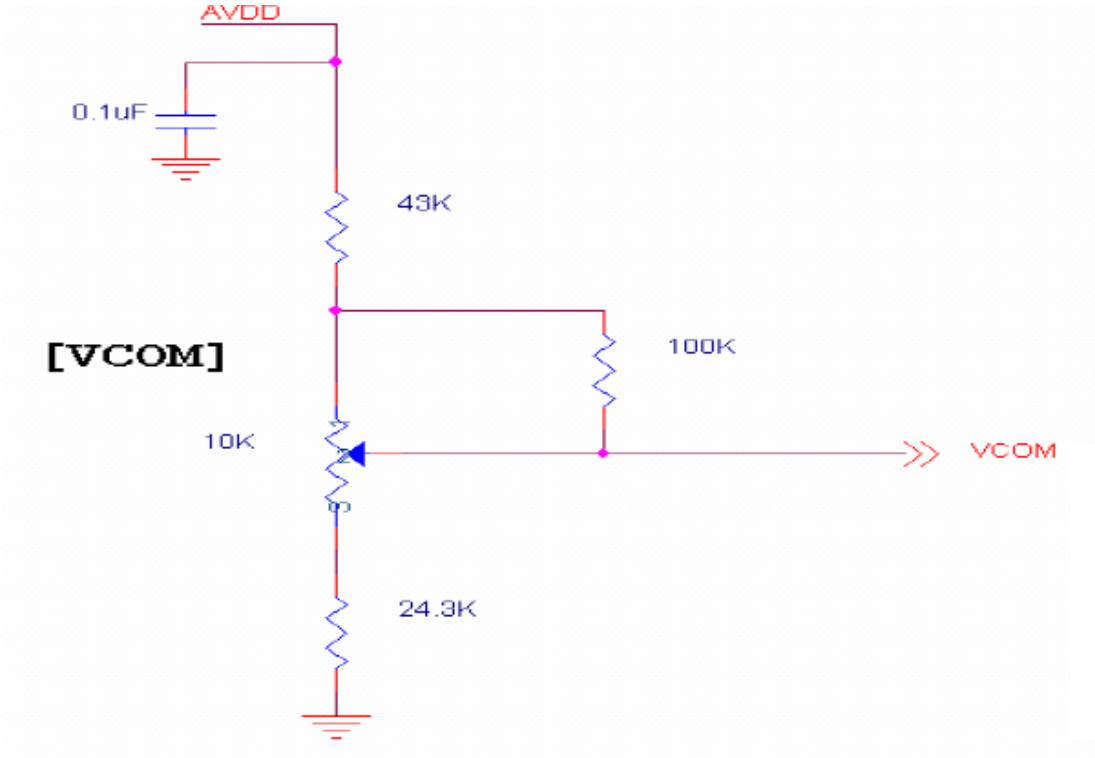
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	2.3	2.5	2.7	V	Note2
	AVDD	8.0	8.2	8.4	V	
	V_{GH}	21.7	22	22.3	V	
	V_{GL}	-7.3	-7	-6.7	V	
Input signal voltage	V_{COM}	2.7	3.0	3.3	V	Note4
Input logic high voltage	V_{IH}	0.8 VDD	-	3.6	V	Note3

Input logic low voltage	V_{IL}	0	-	0.2 VDD	V	

Note 1: Be sure to apply VDD and V_{GL} to the LCD first, and then apply V_{GH}.

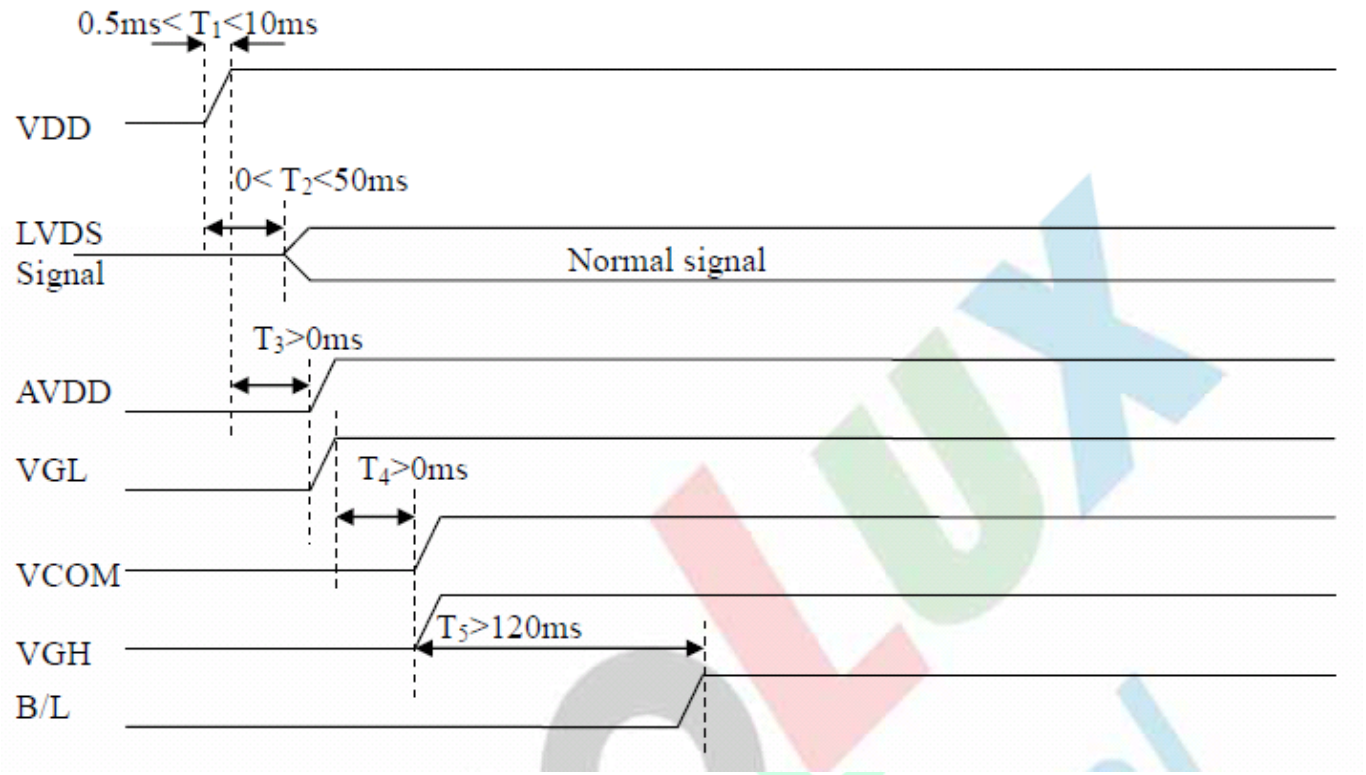
Note 2: VDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 4: Typical VCOM is only a reference value, it must be optimized according to each LCM. Be sure to use VR.

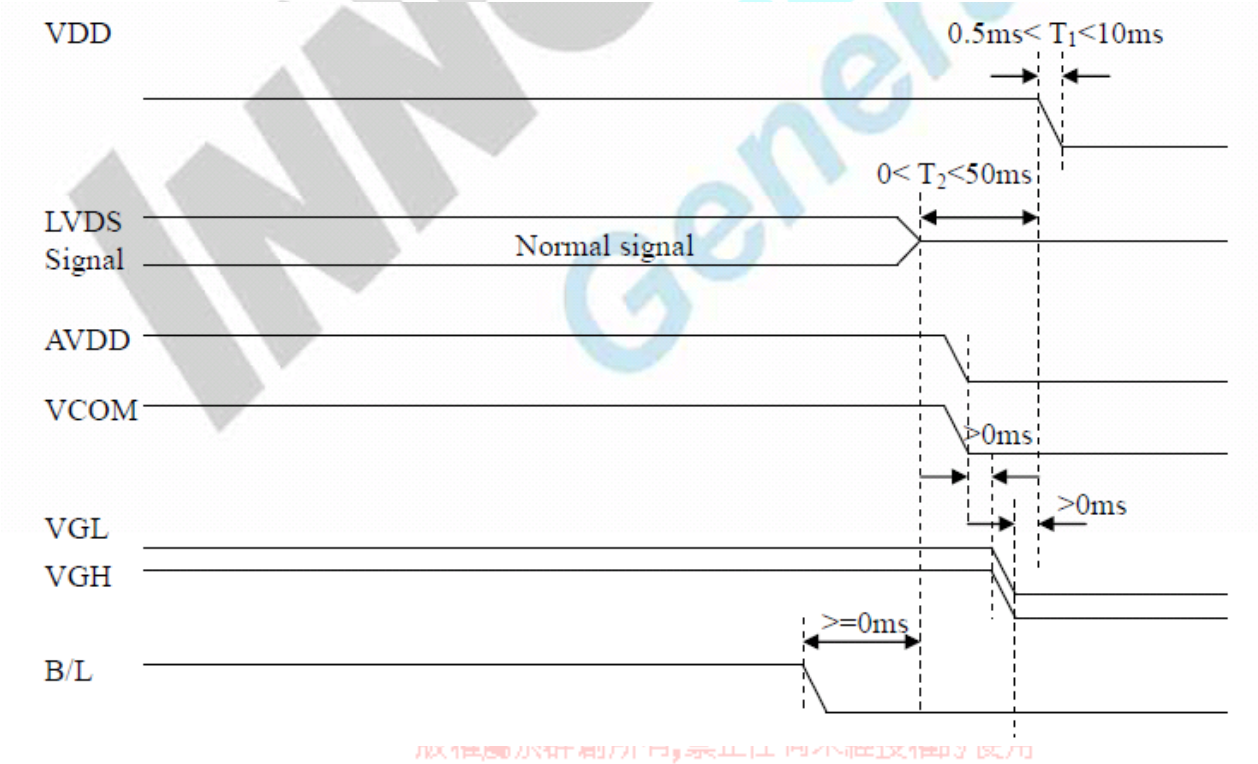


4. Power Sequence

4.1 Power on:



4.2 Power off:



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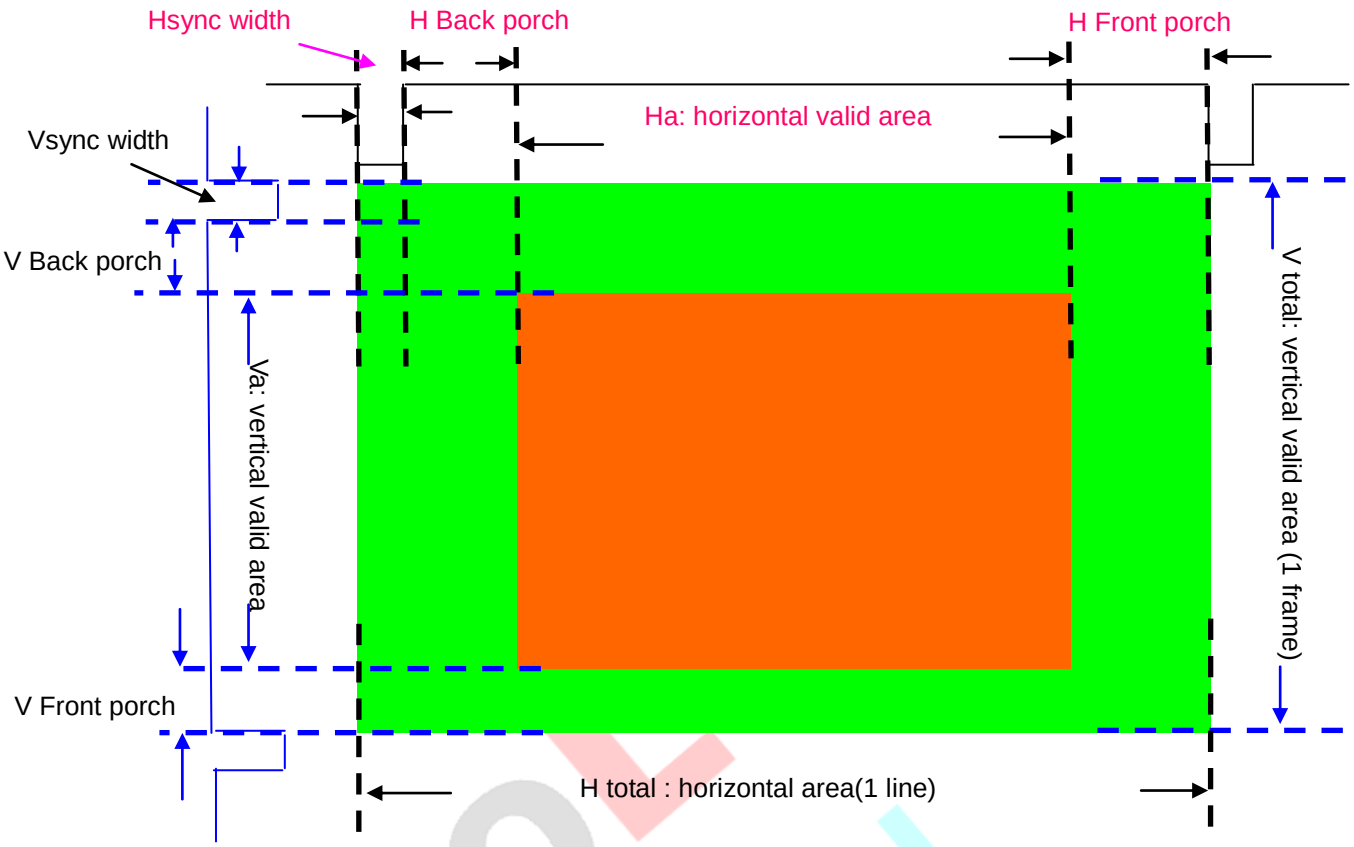
5. Timing Characteristics



Timing Formula:

DCLK = (Hw + Hbp + Ha +Hfp)*(Vw + Vbp + Va +Vfp)*Fvsync (Unit : Hz)

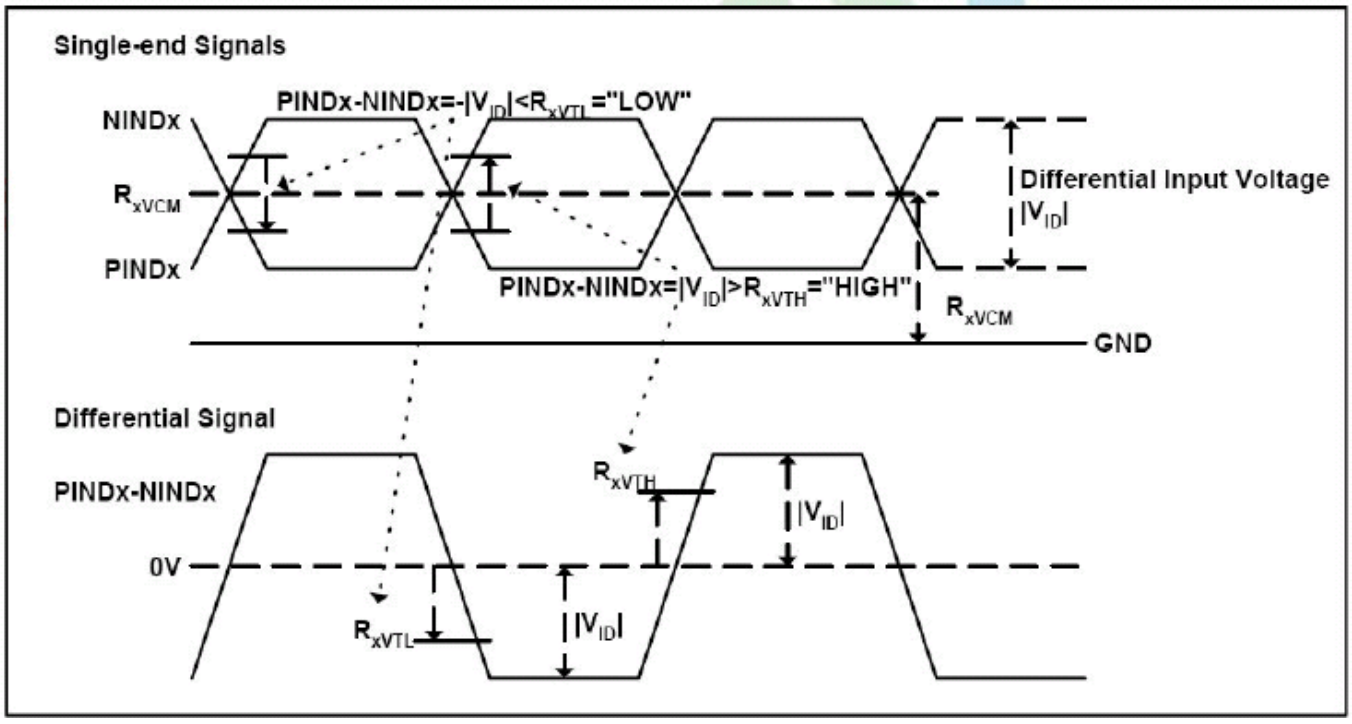
Fhsync = (Vw+ Vbp + Va +Vfp)*Fvsync (Unit: Hz)

Remark: 1. Fhsync is Hsync frequency, and Fvsync is Vsync frequency.

2. Parameter Table .

5.1 LVDS Signal Timing Characteristics

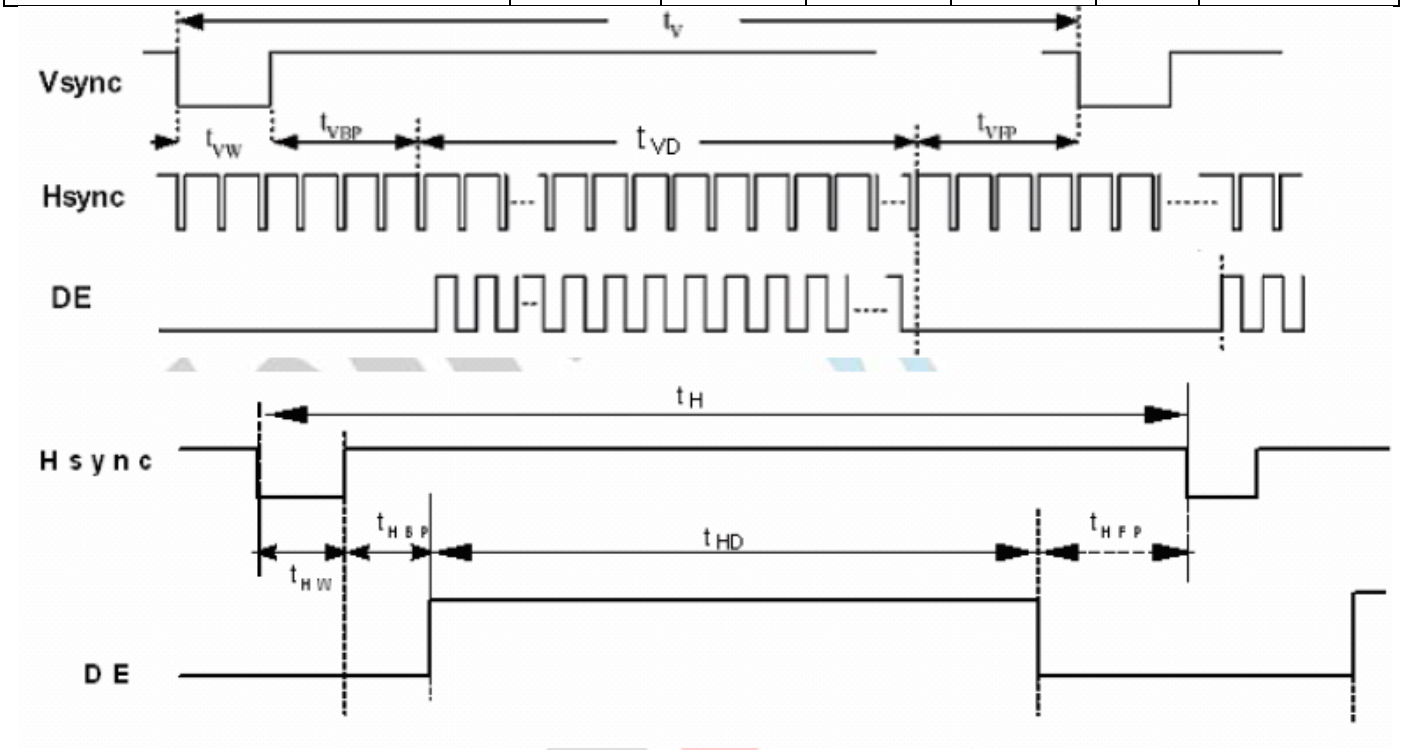
Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	R_{xVTH}	-	-	+100	mV	R_{XVCM}=1.2V
LVDS Differential input low Threshold voltage	R_{xVTL}	-100	-	-	mV	
LVDS Differential input common mode voltage	R_{xVCM}	0.7	-	1.6	V	Note2
LVDS Differential voltage	$\|V_{ID}\|$	200	-	600	mV	



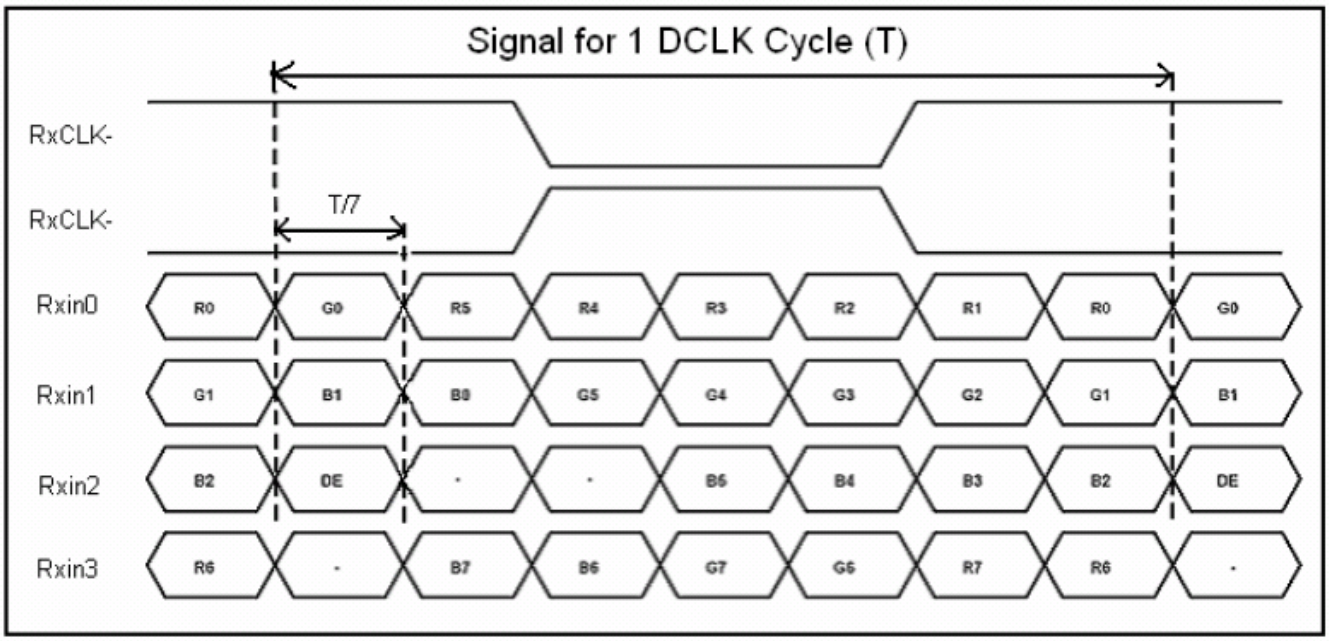
5.2 Timing Table

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	1/Tc	68.9	71.1	73.4	MHz	Frame rate =60Hz
Horizontal display area	tHD		1280		Tc	
HS period time	tH	1410	1440	1470	Tc	
HS Width +Back Porch +Front Porch	tHW+ tHBP +tHFP	130	160	190	Tc	
Vertical display area	tVD		800		T_H	

VS period time	tv	815	823	833	T_H	
VS Width +Back Porch +Front Porch	tvW+tvBP +tvFP	15	23	23	T_H	

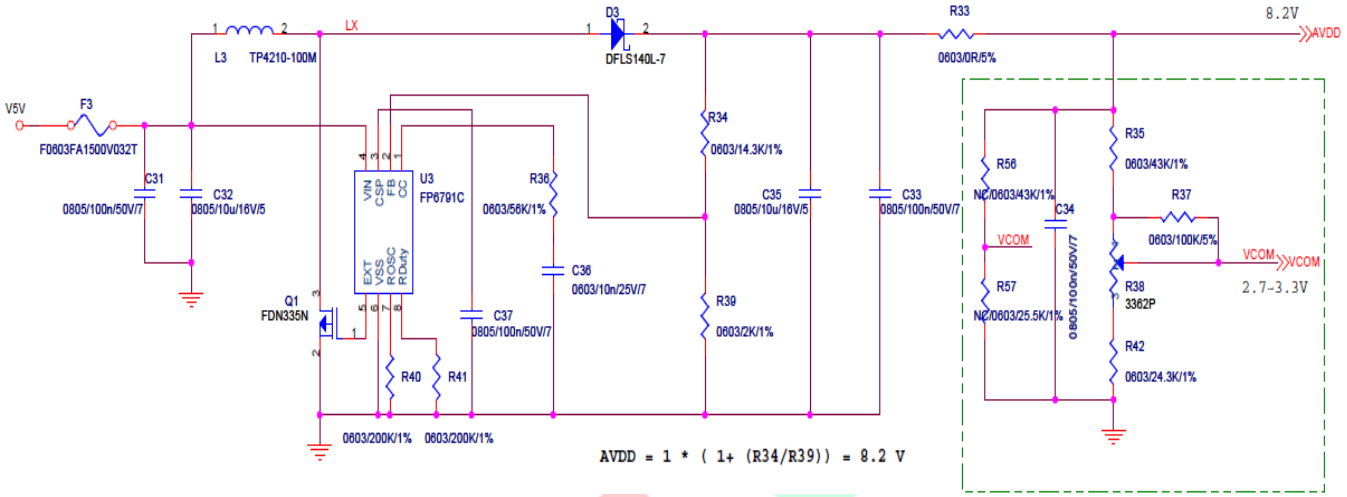


5.3 LVDS Data Input Format

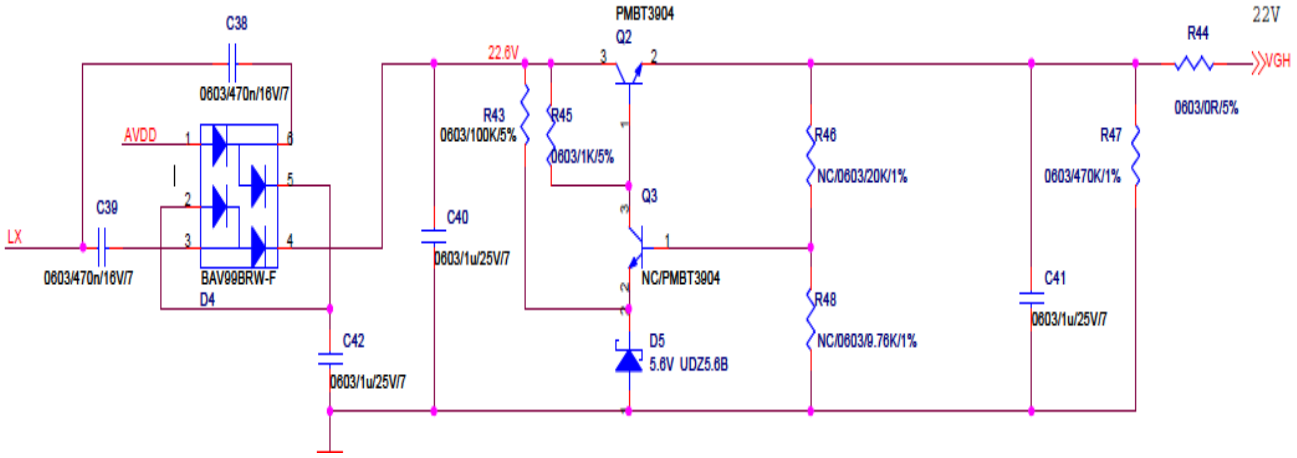


6. Reference circuit

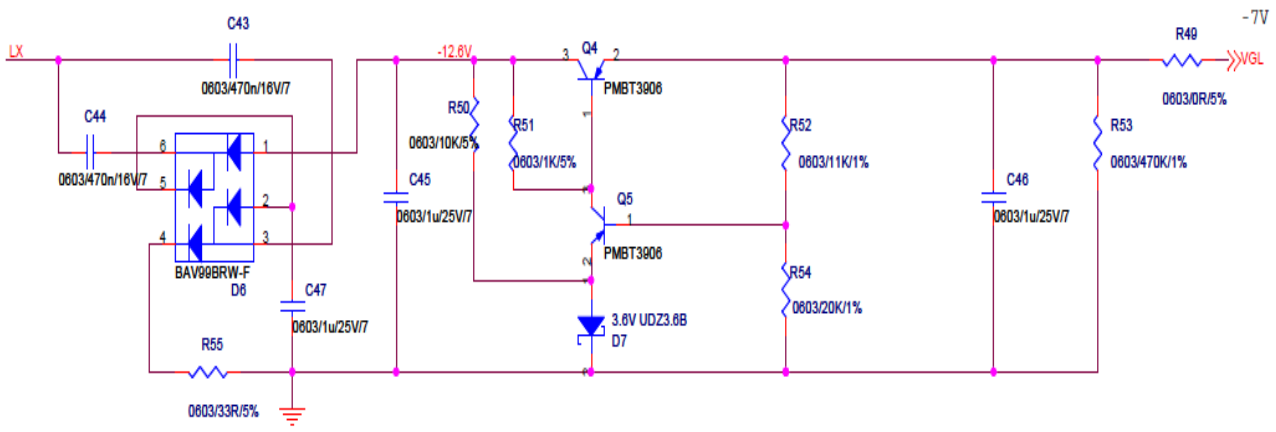
6.1 AVDD circuit



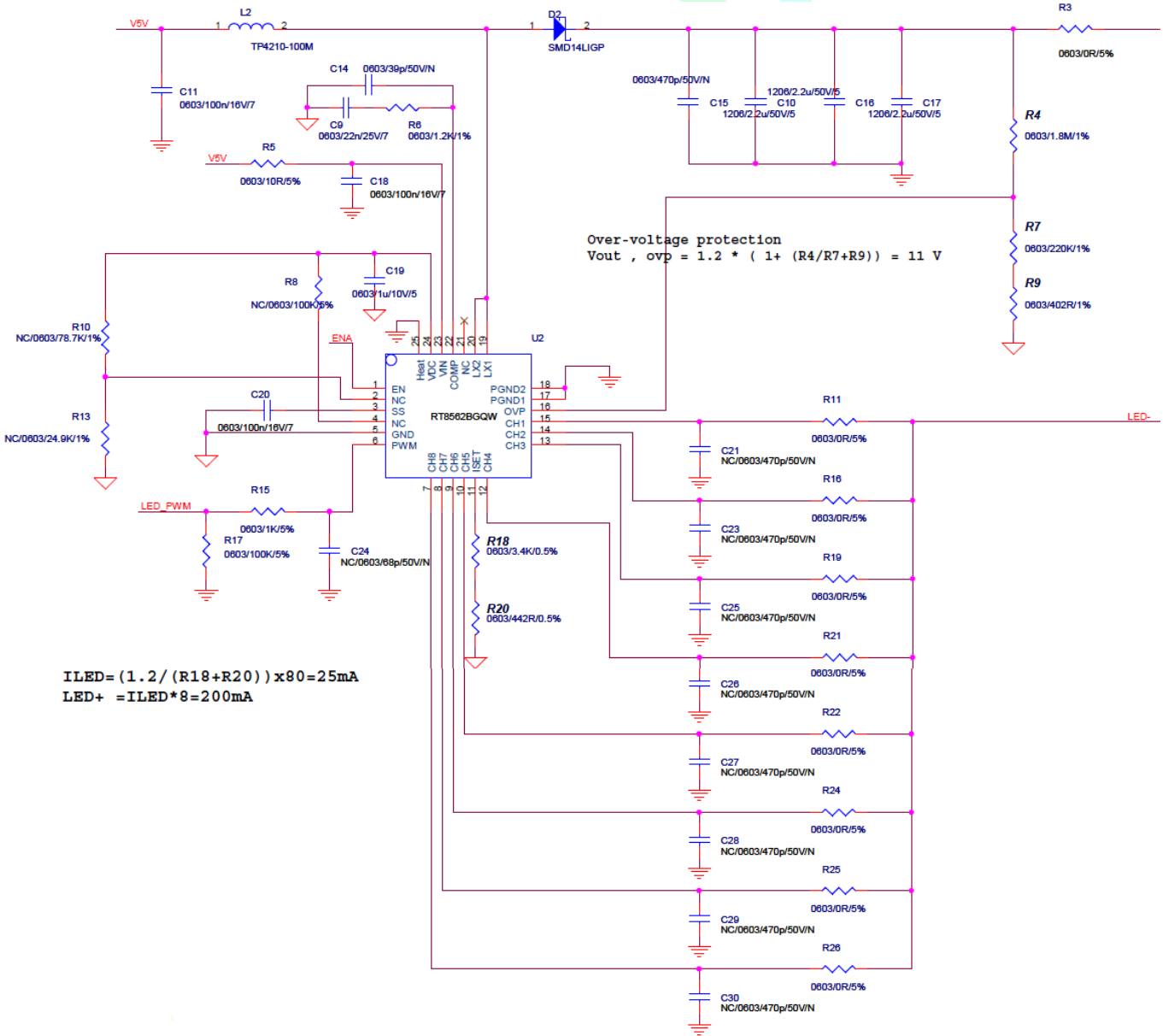
6.2 V_{GH} Reference Circuit



6.3 V_{GL} Reference Circuit



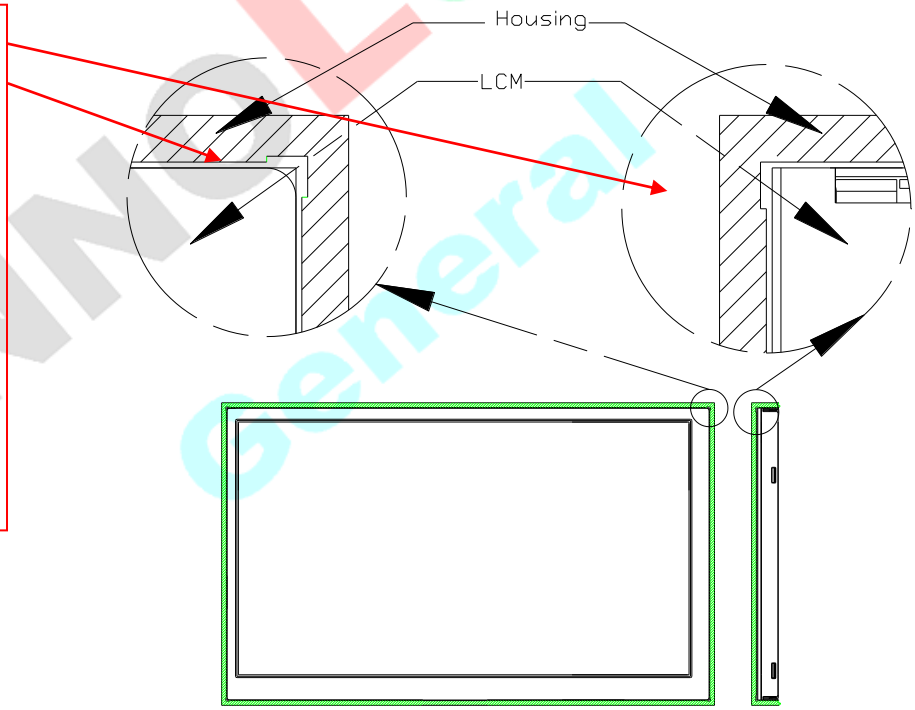
6.4 LED Driver Reference Circuit



7. Suggestion for housing design

7.1 LCM corner /edge avoidable cutting.

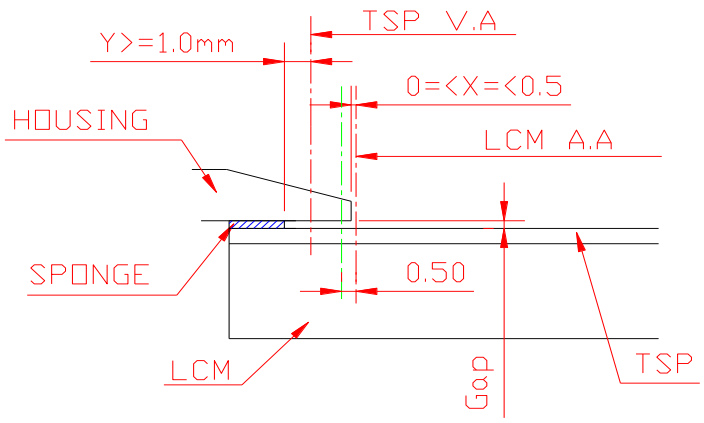
If you design a avoidable cutting as the right drawing. LCM will easier to assemble in the housing.
When you use the LCM with TSP, the cutting will avoid damage the edge or corner of TSP during the assembly.



7.2 Housing opening design guide.

7.2.1 With TSP

Because touch film is made of flexible PET, any unexpected touch with it would cause malfunction of touch panel. So here a sponge between touch panel and plastic housing is recommended for users. And the drawing will show you how to design the housing and sponge.

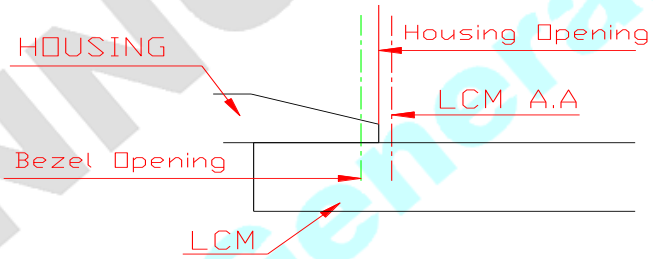


Section sketch (with TSP)

Notes: 1. X is the distance from LCM A.A to housing opening.
2. Y is the distance from TSP V.A to Sponge opening.
3. The active force will be bigger when you touch the area near the housing opening.
4. If you want to provide more protection for LCM, you can add same buffer material on the bottom of LCM.

7.2.2 Without TSP

7.2.2.1 If without TSP, the suggestion for housing design as below:



Notes: 1. Housing opening mast bigger than LCMA.A and cover the bezel .
2. If you want to provide more protection for LCM, you can add same buffer material on the top or bottom of LCM

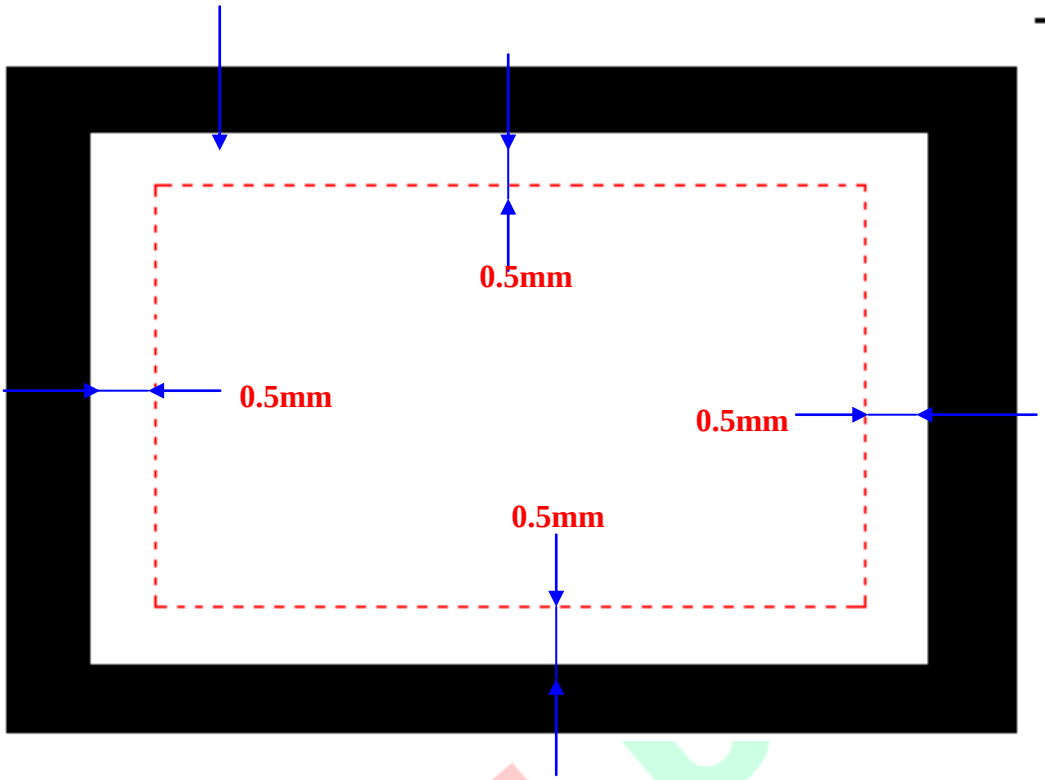
7.2.2.2 The CTP Ink open window design guide

If customer add the CTP on the LCM, the CTP Ink open window design guide as below:

The distance between the open window of CTP Ink and LCM AA should less than 0.5mm.

The open window of CTP Ink **The area of LCM AA**

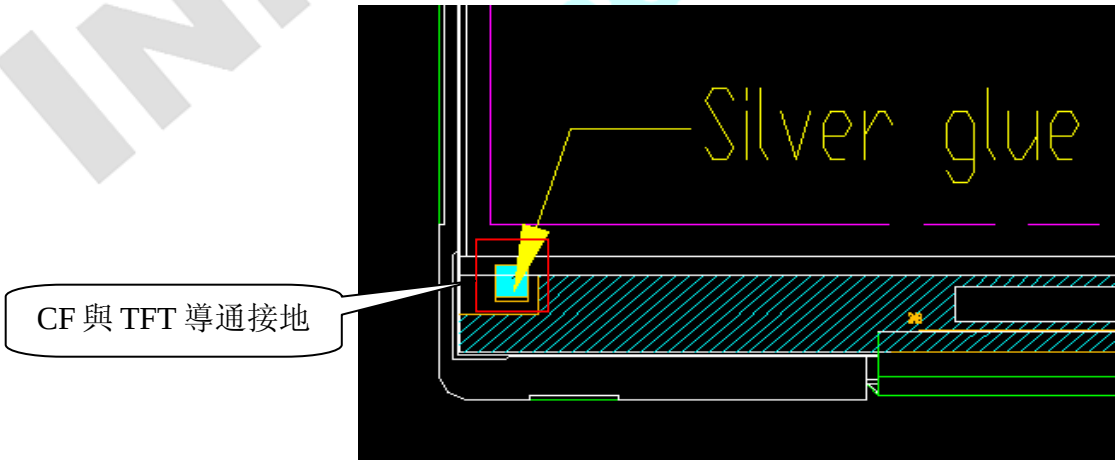
TP



7.3 Main FPC 設計建議（含 ESD 防護建議）

7.3.1 針對 IPS 機種，建議將 CF 靜電導出。

A：CF 與 TFT 接地位置點銀漿或貼導電膠帶導通；



B：CF 與 Bezel 通過導電膠帶導通；（需注意與 TFT 線路，PCBA 元器件絕緣處理）