Part number: DSAM-07X0ETTX30003U1

Description: 7”W TFT FLT-0700X0ETTXBHM1 with internal 1 pcs DSA tape and Touch Screen RTPC070W-X30003-U

Revision Number: 0_2

Prepared By: Roger

Prepared Date: December 16, 2015

Approved By: Ricky

Approved Date: December 16 2015

Record of Revision

<table>
<tr><th>Version and Date</th><th>Page</th><th>Old Description</th><th>New Description</th><th>Remark</th></tr>
<tr><td>0_1

October 19, 2015</td><td>All</td><td>1.First Edition Specification
2.Consigned Product:<table><tr><th>Products</th><th>FutureLabs</th><th>Customer</th></tr><tr><td>LCD</td><td>V</td><td></td></tr><tr><td>Touch/Glass</td><td>V</td><td></td></tr><tr><td>DSA</td><td>V</td><td></td></tr><tr><td>OCR Bonding</td><td></td><td></td></tr></table></td><td></td><td></td></tr>
<tr><td>0_2

December 16, 2015</td><td>20</td><td>1.General Specifications:
Surface treatment is Anti-reflective.</td><td>1.General Specifications:
Surface treatment is Clear.</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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Trademarks

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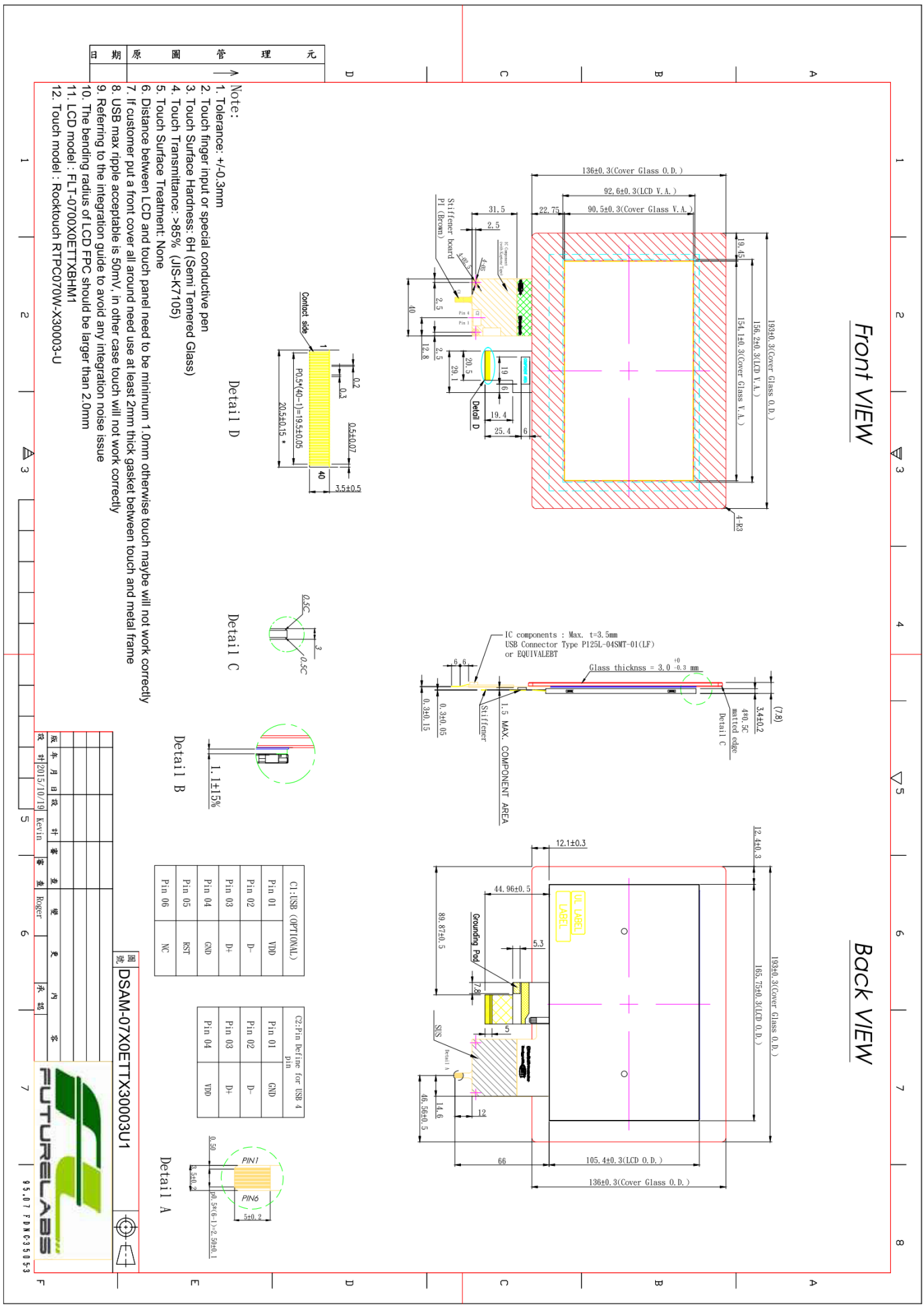
Copyright

A) Assembly Product Drawing and DSA P/N
B) Touch screen Specifications and IIS
C) LCD display Specifications and IIS

A) Assembly Product Drawing and P/N


Front VIEW
Back VIEW
Note:
1. Tolerance: +/-0.3mm
2. Touch finger input or special conductive pen
3. Touch Surface Hardness: 6H (Semi Tenered Glass)
4. Touch Transmittance: >85% (JIS-K7105)
5. Touch Surface Treatment: None
6. Distance between LCD and touch panel need to be minimum 1.0mm otherwise touch maybe will not work correctly
7. If customer put a front cover all around need use at least 2mm thick gasket between touch and metal frame
8. USB max ripple acceptable is 50mV, in other case touch will not work correctly
9. Referring to the integration guide to avoid any integration noise issue
10. The bending radius of LCD FPC should be larger than 2.0mm
11. LCD model : FLT-0700X0ETTXBHM1
12. Touch model : Rocktouch RTPC070W-X30003-U
Detail A
Detail B
Detail C
Detail D
C1:USB (OPTIONAL)
C2:Pin Define for USB 4 pin
IC components : Max. t=3.5mm
USB Connector Type P125L-04SMT-01(LF)
or EQUIVALEBT
Glass thickness = 3.0 +0 -0.3 mm
1.5 MAX. COMPONENT AREA
Stiffener
Grounding Pad
UL LABEL
LABEL
SUS
136±0.3(Cover Glass O.D.)
193±0.3(Cover Glass O.D.)
154.1±0.3(Cover Glass V.A.)
136.2±0.3(LCD V.A.)
105.4±0.3(LCD O.D.)
165.75±0.3(LCD O.D.)
DSAM-07X0ETTX30003U1
FUTURELABS

B)Touch Screen Specifications and IIS

1. 適用範圍 Application

此規格書是適用志膳企業有限公司所製作的觸控面板。

This specification is applied to TOUCH PANEL made by RockTouch Enterprise CO., Ltd。

【製品圖號 Product No.】

品　名 Name	製 品 圖 號 P/No.	尺寸 Size	備　註 Remark
觸控面板 TOUCH PANEL	RTPC070W-X30003-U	7”	指輸入專用 Finger input type or Passive Conductive Pen (RoHS)

2. 概要 Function

此製品是裝置在像 LCD 等平面顯示器上使用投射電容式的觸控面板。以手指按下觸控面板的表面，面板會檢出迴路將觸控點檢測出來。

RockTouch TOUCH PANEL is projective capacitance type that customer uses with flat display such as LCD. Once user touches it by FINGER directly, the circuit of TOUCH PANEL will send the contact point to PC.

3. 製造者 Manufacturer

志膳企業有限公司 RockTouch Enterprise CO., Ltd.

所在地: 台南市仁德區義林路 250 號

Address: NO. 250 YiLin RD., Rende Dist., Tainan City 717, Taiwan R.O.C.

4. 外型 Outline

4.1 外型圖 Drawing

詳見最後附加圖面

Please refer the last page of this spec.

部　　材	規　　格
Sensor Film	Outline：160.86±0.15mm , 102.57±0.15mm
	View Area：154.7±0.15mm , 93.77±0.15mm
	T=0.35mm±0.1mm
Cover Glass	Outline：193±0.3mm , 136±0.3mm
	View Area：153.4±0.3mm , 92.44±0.3mm
	T=2.85mm±0.15mm

Structure:

Cover Glass T=2.85mm
OCA T=0.1mm
Film T=0.1mm
OCA T=0.05mm
Film T=0.1mm

Fig.1 產品結構圖

4.2 用語定義 Definition of words

用　語 Words	定　義 Definition
動作保證範圍 Guaranteed active area	觸控面板的特性保證範圍。 An area to be guaranteed all characteristics stated on this spec.
透明範圍 View (transparent) area	Cover Glass 內側的透明範圍。 A view area which is inside Cover Glass. Top enclosure must not be fixed by this area.

5. 特性 Characteristics

5.1 光學特性 Optical characteristics

	項　目 Item	規　格 Specification	備　註 Remarks
1	全光線透過率 TRANSPARENCY	85% Min. (動作保證範圍內) (Inside of guaranteed active area)	JIS K-7105
2	HAZE	1% Typ.	JIS K-7105

5.2 電性特性 Electric characteristics

5.2-1 操作條件 Operation condition

介面 Interface	USB
系統需求 Support OS	Mostly of Win OS System/Android/Linux
反應時間 Response time	Max 35ms
支援觸控點數 Touch number	10 points
操作電壓 Power Supply Voltage	3.5V~5.5V DC (5.0V Typ.)
操作電流 Power Supply Current	50mA(Normal) 8mA(Low Power)
回報率 Report Rate	100 Hz Min. (Single point)；70 Hz Min. (Dual points)
韌體版本 Firmware Version	TBD

5.2-2 介面 Communication Interface

請參考 4.1 外型圖上說明

5.3 環境特性 Environmental characteristics

	項　目 Item	規　格 Specification	備　註 Remarks
1	動作溫度 Operation temperature	-20ºC ~ 70ºC	Max. wet Temp. is 38ºC(No dew) 以上條件不代表環境測試規格
2	保存溫度 Storage temperature	-30ºC ~ 80ºC	
3	動作濕度 Operation Humidity	20% ~ 90%RH	
4	保存濕度 Storage Humidity	10% ~ 90%RH	

5.4 機械特性 Mechanical characteristics

	項　目 Item	規　格 Specification	備　註 Remarks
1	表面硬度 Hardness of surface	鉛筆硬度 6H Pencil hardness 6H	JIS K-5600-5-4
2	FPC 剝離強度 FPC peeling strength	5N 以上 5N Min.	向上垂直剝離 Peeling upward by 90°
3	FPC 彎曲 Bending	彎曲 3 回 Bending 3 times	R1.0mm Bending angle: 90°
4	FPC 插拔 FPC Plug in-out	插拔 5 回 Plug in-out 5 times	

5.5 驅動 IC 特性 IC Chip characteristics

5.5-1 HARDWARE OVERVIEW

MCU – EXC3132	
Operating Power	3.0VDC to 3.6VDC
Operating Temperature	-40 to 85℃
Storage Temperature	-40 to 125℃
ESD	4000V (HBM)
Package	WFBGA 5.5mmx9mmx0.8mm
Peripherals	Analog Modules * Up to 32 RX channels * Up to 18 TX channels * Signal generator
	Communication Interface * USB 2.0 compliant full speed with LPM L1 supported. * Configurable Serial Interface. * UART: baud rate 19200, none parity, 8 data bits and 1 stops bit * I2C: up to 400 KHz, support 1.8V and 3.3V
	Memory * 32KB SRAM + 1KB (USB FIFO) * 128KB embedded flash
Application	Touchscreen Controller

5.5-2.ELECTRICAL CHARACTERISTIC

MCU – EXC3132						
Voltage characteristics						
Symbol	Parameter	Condition	Min	TYP	Max	Unit
VDD-GND	Digital Supply Power		3.0	3.3	3.6	V
Crystal Clock	Crystal Clock			12		MHz
VIH	Input high level voltage		VDD-0.8			V
VIL	Input low level				0.8	V
VOH	Output high voltage	I = 2mA	VDD-0.4			V
VOL	Output low voltage	I = 2mA			0.4	V
VDDH	High Voltage Power		13	13.5	14	V

5.5-3 Maximum Ratings

MCU – EXC3132				
Symbol	Parameter	Min	Max	Unit
VDD-GND	Maximum power supply voltage	-0.3	4	V
Vin	Input I/O pin voltage	GND-0.3	VDD+0.3	V
IVDD	Total current at power		100	mA
IGND	Total current at Gnd		100	mA
Vesd	Electrostatics Discharge Voltage(HBM)	4000		V

6. 耐久性 life test condition

6.1 機械特性 Mechanical characteristics

1	打點壽命 Input Life	1000 萬次以上 10 million times min.	動作保證範圍內 Within" guaranteed active area"

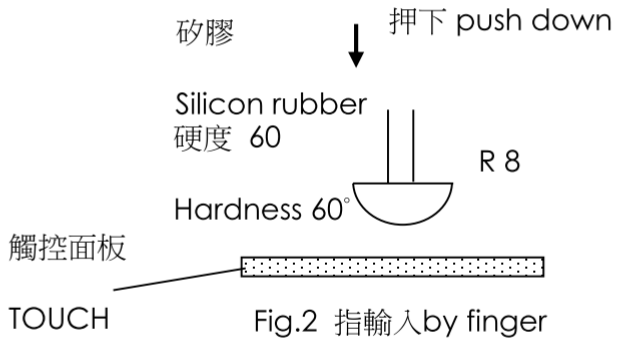


Fig.2 指輸入by finger

※ 打點壽命(耐久性)試驗條件 Input life test condition(by finger)

使用矽膠在同一地方連續打點

By silicone rubber tapping at same point.

- 橡膠尖端 Sharp of rubber end : R8 硬度 Hardness 60°(Refer fig.2)
- 操作力 Load : 200g
- 操作頻率 Frequency : 5Hz

6.2 環境測試條件 Environmental test condition

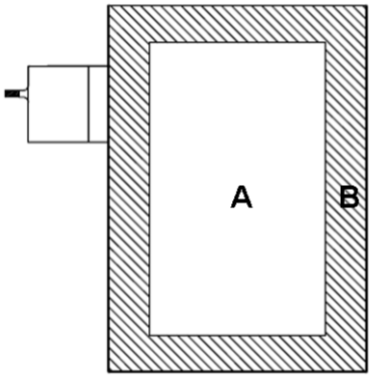
	項　目 Item	規　格 Specification	備　註 Remarks
1	高溫保存試驗 High temperature storage	80ºC, 240 hr	
3	低溫保存試驗 Low temperature storage	-30ºC, 240 hr	
3	高溫高濕保存試驗 High temperature high humidity storage	60ºC, 90%RH, 240 hr	
4	溫度衝擊循環試驗 Temperature Cycling	-30ºC ~ +80ºC (0.5hr each), 100 cycles	

Note1: The test sample have recovery time for 24 hours at room temperature before the function check. In the standard conditions, there is no any touch panel function NG issue occurred.

7. 外觀規格 Appearance.

7.1 外觀基準適用領域(範圍) Scope of reject criteria.

Note: All the cosmetic specifications are judged before the reliability stress.

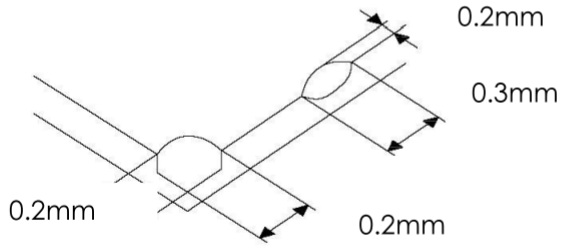


領域 Area	外觀仕樣 Specification
A/B	使用上不會有可視的缺失而影響正常操作。檢查基準依據 7-2 項。 Without any defect point to effect on normal operation.

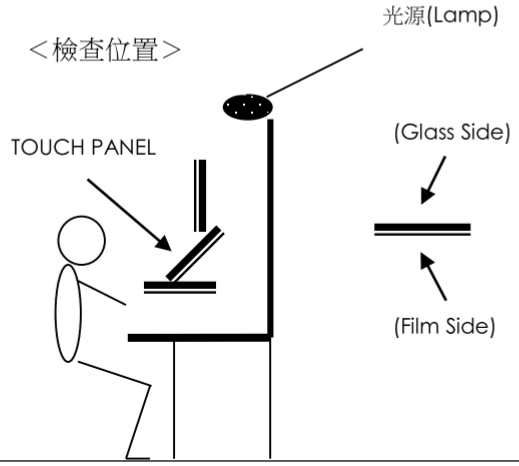
A：可視區域　　B：可視區域以外

View area.　　View area besides.

7.2 檢查基準 Reject criteria.

項　目 Description	檢 查 基 準 Reject criteria
玻璃瑕疵 Glass flaw	不超過下述的規範值，數量不限。 厚度方向的瑕疵(缺角)最大到板厚為止。 To be no flaw which size is over the drawing Specified as below. Number of flaw doesn't specify. Traveling flaw is none. The maximal flaw of thickness direction size is the glass thickness. 

項　目 Description	檢 查 基 準 Reject criteria		
汙漬和斑點 Spot And Dots	Diameter:	0.5mm<D	Zero
		0.2mm<D≤0.5mm d>20mm	Max: 5 points
		D≤0.2mm	Disregard
刮傷 Scratch	Width: Width: Length: Width:	0.07mm<W	zero
		0.03mm<W≤0.07mm L≤10mm ; d>20mm	Max: 5 points
		W≤0.03mm	Disregard
線狀異物 Linear Foreign Particle	Width: Width: Length: Width:	0.07mm<W	zero
		0.03mm<W≤0.07mm L≤10mm ; d>20mm	Max: 5 points
		W≤0.03mm	Disregard
點狀異物 Particle	Diameter:	0.5mm<D	Zero
		0.2mm<D≤0.5mm d>20mm	Max: 5 points
		D≤0.2mm	disregard
打痕(魚眼) Dent/Fish eye	Diameter:	0.5mm<D	Zero
		0.2mm<D≤0.5mm d>20mm	Max: 5 points
		D≤0.2mm	disregard
氣泡 Bubble	Diameter:	0.5mm<D	Zero
		0.2mm<D≤0.5mm d>20mm	Max: 5 points
		D≤0.2mm	disregard
漏光 Pin Hole	Diameter:	D≤0.2mm	disregard

異色點 Color Stain	有色物質不可存在於 TP 內層中 Color stain/material can not exist inside of sensor.
OCA 痕 OCA Waving	依照限度樣品判定 Judged by limited sample.
FPC 異物/髒污 Foreign material	Film 內層雜質不可跨越兩迴路。 Foreign material can not short two patterns.
FPC 刮傷 FPC Scratch	會造成製品電氣特性障礙的刮傷皆不可。 Any caused scratch which effects electrical characteristic is prohibited
FPC 皺折 FPC Crumple	會造成製品電氣特性障礙的皺折皆不可。 Any caused crumple which effects electrical chara cteristic is prohibited
	

※ D：Diameter[D=(長徑+短徑)/2], W：寬(Width), L：長(Length) , d：距離(distance)

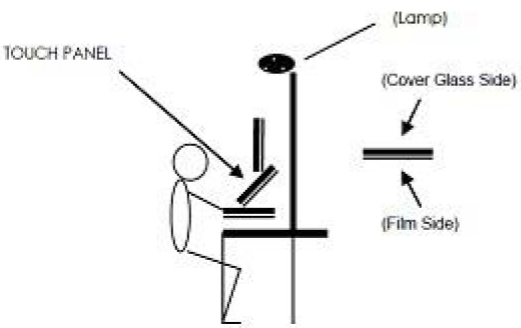
TEST CONDITIONS FOR SIZE BELOW 12''(Included)

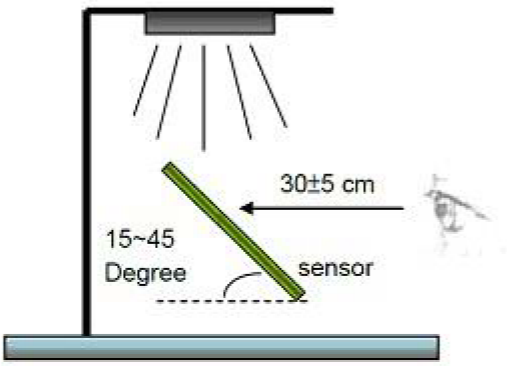
(Check environment):

a. (Check time): (In 15 Seconds)

b.(Lamp illumination) :800~1200 Lux

c.(Check distance):Touch Panel 30cm (From eyes to touch panel about 30cm)





8. 注意事項 Attention

(1) 本產品是使用玻璃所製，因為玻璃的邊、角是銳利的，在使用觸控面板時請多注意。
在使用觸控面版時請戴手套作業。
Since Touch Panel is consist of glass, please be careful your hands to be injured during handling. You must wear gloves during handling.

(2) 本產品是使用玻璃所製，在使用觸控面板時，請注意不要施加強力衝擊。
Do not strike touch panel.

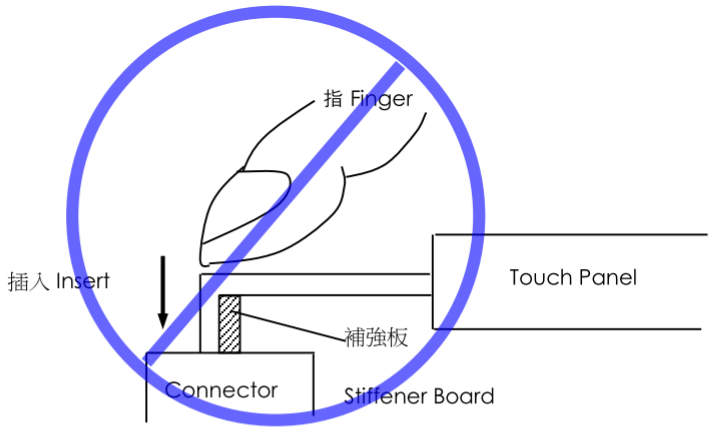
(3) 拿起觸控面板時請勿從 FPC 拿取。
Do not lift touch panel by cable (FPC).

(4) 請勿施加重力於 TP。(例: 在組裝時勿從 Cover Glass 吸取移動)
Excessive force onto the TP is prohibited.
(Ex. Don't transfer the panel from TP with vacuum)

(5) 表面清潔時，請使用「乾的柔性布」或「浸泡過中性清潔液擰乾的布」或「沾有酒精的柔性布」。請勿使用有機溶劑、酸、鹼類溶劑。
Please use dry cloth or soft cloth with neutral detergent (after wring dry) or one with ethanol at cleaning. Do not use any organic solvent, acid or alkali solution.

(6) 保存時請勿重疊放置。特別是請勿用重物壓著。
Do not stack the touch panels together. Do not put heavy objects on touch panels.

(7) FPC 請勿折彎，有可能使迴路線斷裂。特別是對於連結器的插入部分，因為貼有補強板，在插入連結器時請勿施加過多的力量。請避免以下圖方式插入。
Do not bend the cable (FPC) of touch panel to prevent the circuit broken.
Please don't use following method for inserting into FPC tail to connector.



(8) 在實際組裝設計時，請注意以下事項。
Please pay attention for the matters stated below at mounting design of touch panel & enclosure

-1. 觸控面板的上蓋支撐物請設定在透明範圍的外側。(上蓋請勿壓在透明範圍上，會有誤動作的情況發生)
Enclosure support to fix touch panel must be out of view (transparent) area. (Do not design enclosure presses the view area to protect from miss input)

-2. 上蓋的外框請設定在透明範圍的內側、動作保證範圍的外側。(上蓋的外框請勿接觸到透明範圍)。
The enclosure edge must be between view area & Guaranteed active area. (Enclosure edge must not touch the view area)

-3. 觸控面板上下部的壓合，請以橡膠等彈性材質。
Elastic materials are recommended as a support to fix touch panel.

-4. 觸控面板上部的邊角，因為玻璃導電層有傳導性，在組裝設計時請注意不要與金屬材質接觸。
The corners and edges of touch panel (fig.*) may be conductive. Do not touch it with metallic components after mounting.

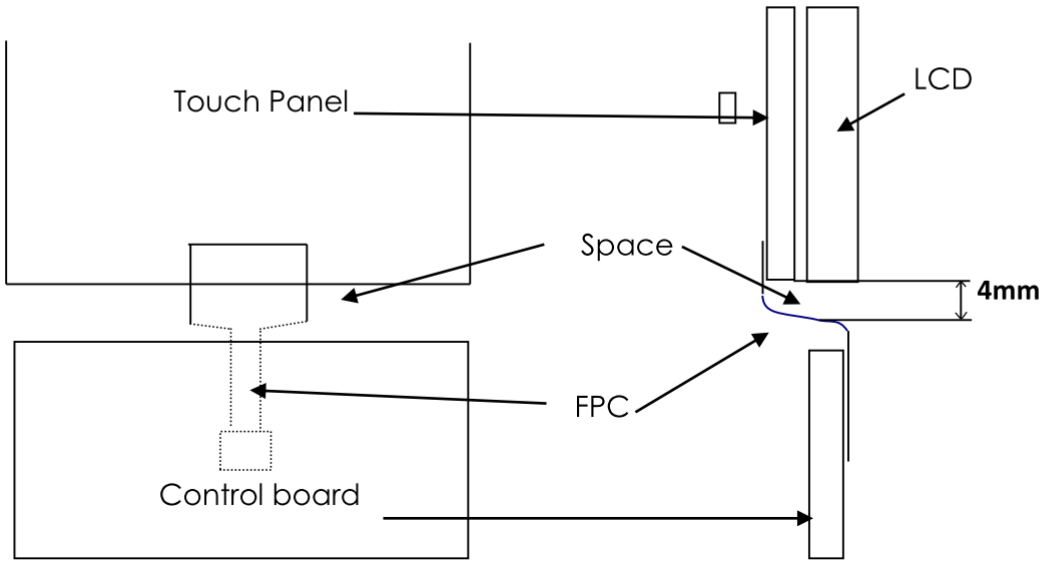
-5. 有防水需求時，請考慮用橡膠等材質對迴路週邊做防水。
Special design is required for water resistance.

-6. 當使用 Air gun 向觸控面板吹氣時, 建議 Air 壓力調整為 2kg/cm^2 以下, 並且勿從玻璃側朝 FPC 直接吹氣, 以免 FPC 在強烈 Air 壓力下, 造成脫落.
Cleaning touch panel by Air gun, pressure below 2kg/cm^2 is suggested.
To prevent FPC to be peeled off, air blowing to the FPC is avoided from glass side.

-7. 當觸控面板組裝時，在 LCD 外框與觸控面板間必須留有間隔，以避免 LCD 的電磁波造成的雜訊影響觸控面板的特性。建議機構預留 0.5mm 以上組裝空間。
The mounting structure must has a reserved space between LCD and TP to avoid the noise from LCD influence the performance of TP. Assembly space is recommended at least 0.5mm. Refer to mounting condition example 2 & 3.

-8. 必須在靠近 FPC 位置處預留 FPC 線路空間, 絕對避免外殼或其他零件碰觸或擠壓 FPC, 造成 FPC 脫落. 建議機構預留 4mm 以上組裝空間, 請參考實裝構造圖.
The mounting structure must has a reserved space for the FPC tail and never touch or squeeze the FPC by case or another components preventing FPC to peel off. Assembly space is recommended at least 4mm. Refer to mounting condition example 2 & 3.

【實裝構造例 Mounting condition example】



C) LCD Specifications and IIS

1. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen Size	7 (diagonal)	inch
Display Format	1024(H) x (R,G,B) x 600(V)	dot
Active Area	153.6(W) × 90.0(H) mm	mm
Dot Pitch	0.05(W) × 0.15(H) mm	mm
Pixel Configuration	Stripe	
Outline Dimension	165.75(W) x 105.39(H) x 3.4 (D)	mm
Surface treatment	Clear	
Back-light	LED	
Display mode	Normally white	
Weight	106(typ.)	g
View Angle direction	6 o'clock	
Our components and processes are compliant to RoHS standard		

2. ABSOLUTE MAXIMUM RATINGS

GND=0V

Parameter		Symbol	MIN.	MAX.	Unit	Remark
Power supply voltage		VDD	-0.3	5.0	V	Ta=25°C
		AVDD	6.5	13.5	V	
		VGH	-0.3	42.0	V	
		VGL	-20	0.3	V	
		VGH-VGL	-	40	V	
Operating temperature		Top	-20	70	°C	Module surface*
Storage temperature		Tst	-30	70	°C	-
Humidity	Operation	20%~90% relative humidity				T 38°C
	Non Operation	5%~90% relative humidity				Ta 38°C

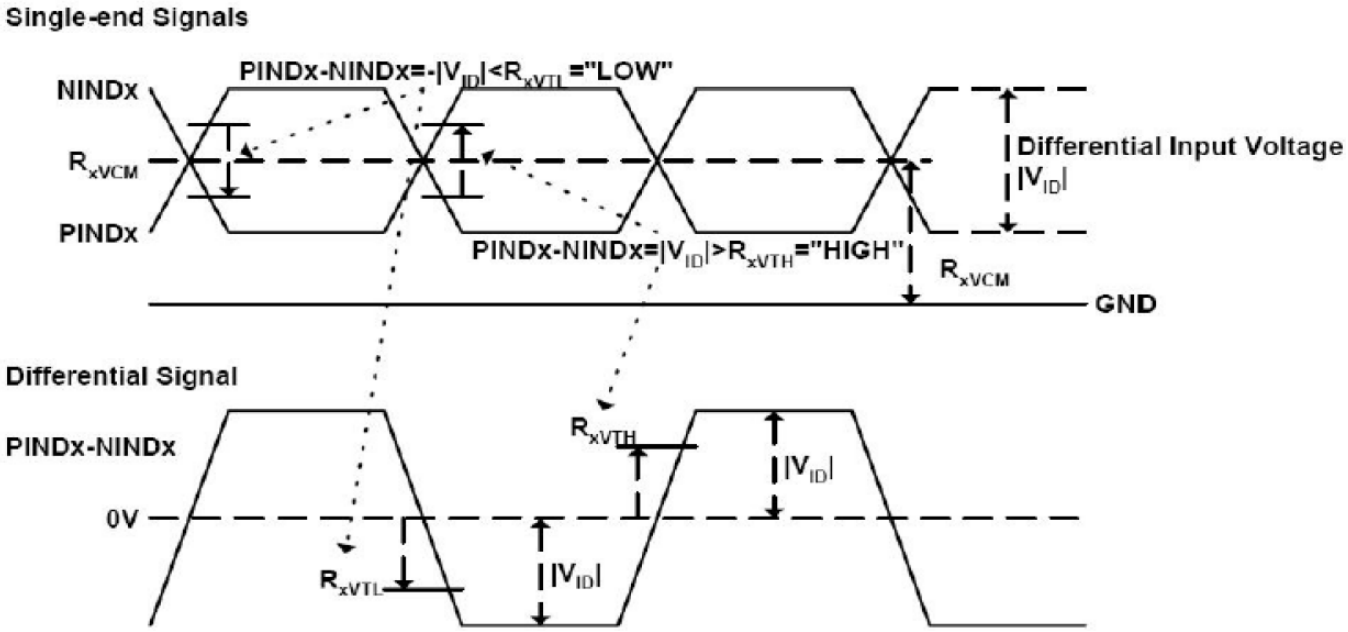
3. ELECTRICAL CHARACTERISTICS

3.1 Operating Conditions

GND=0V, fH=38.1KHz, fV=60Hz, fCLK=50.2MHz,Ta=25°C

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	VDD	3.0	3.3	3.6	V	
	AVDD	10.8	11	11.2	V	
	VGH	19.7	20	20.3	V	
	VGL	-6.5	-6.8	-7.1	V	
Input signal voltage	VCOM	2.8	3.8	4.8	V	Note3
Differential Input High Threshold	R_{xVTH}	-	-	100	[mV]	R_{xVCM}=1.2V Note 2
Differential input Low Threshold	R_{xVTL}	-100	-	-	[mV]	
Input voltage range (singled-end)	R_{xVIN}	0		2.4	V	
Differential input common mode voltage	R_{xVCM}	$\|V_{ID}\|/2$		2.4-$\|V_{ID}\|/2$	V	
Differential voltage	$\|V_{ID}\|$	0.2		0.6	V	
Differential input leakage current	RV_{xliz}	-10		+10	uA	
"H" level logical input voltage	V_{IH}	0.7VDD	--	VDD	V	Note1
"L" level logical input voltage	V_{IL}	0	--	0.3 VDD	V	

Note 1: LVDS, Reset.
Note 2: LVDS Signal Waveform.



Note 3: Typical VCOM is only a reference value, it must be optimized according to each LCM. Be sure to use VR;

3.2 Current Consumption

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Current for Driver	I_{GH}	-	0.25	1.0	mA	VGH=20V
	I_{GL}	-	0.25	1.0	mA	VGL=-6.8V
	I_{VDD}	-	38	60	mA	VDD=3.3V
	I_{AVDD}	-	20	30	mA	AVDD=11V

3.3 Backlight Driving Consumption

Ta= 25 ℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED voltage	V_L	-	9.9	10.5	V	Note 1
LED current	I_L	-	180	--	mA	
LED life time	-	-	20000	--	hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and IL =180mA.
Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL =180mA. The LED lifetime could be decreased if operating IL is lager than 180mA.

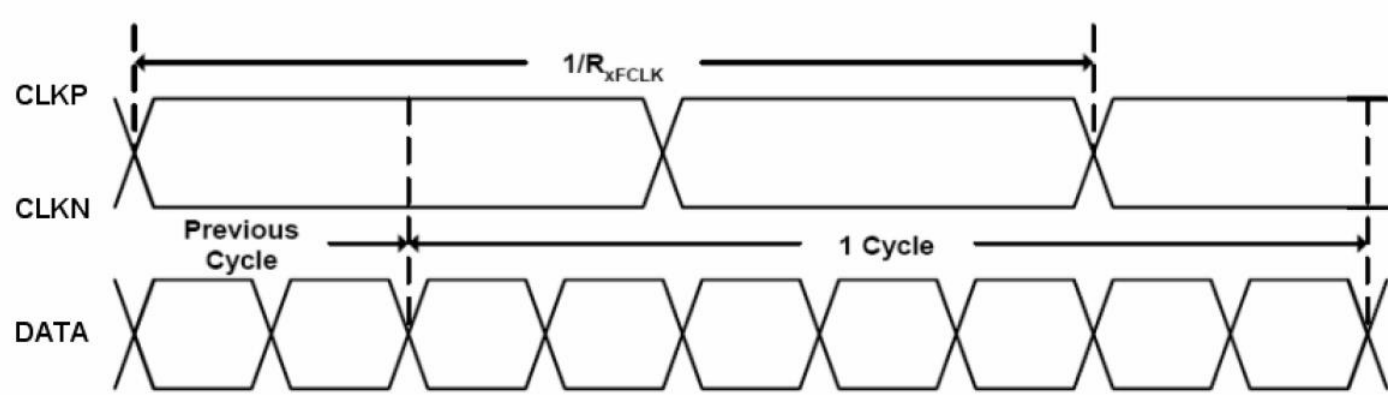
4. INPUT SIGNAL CHARACTERISTICS

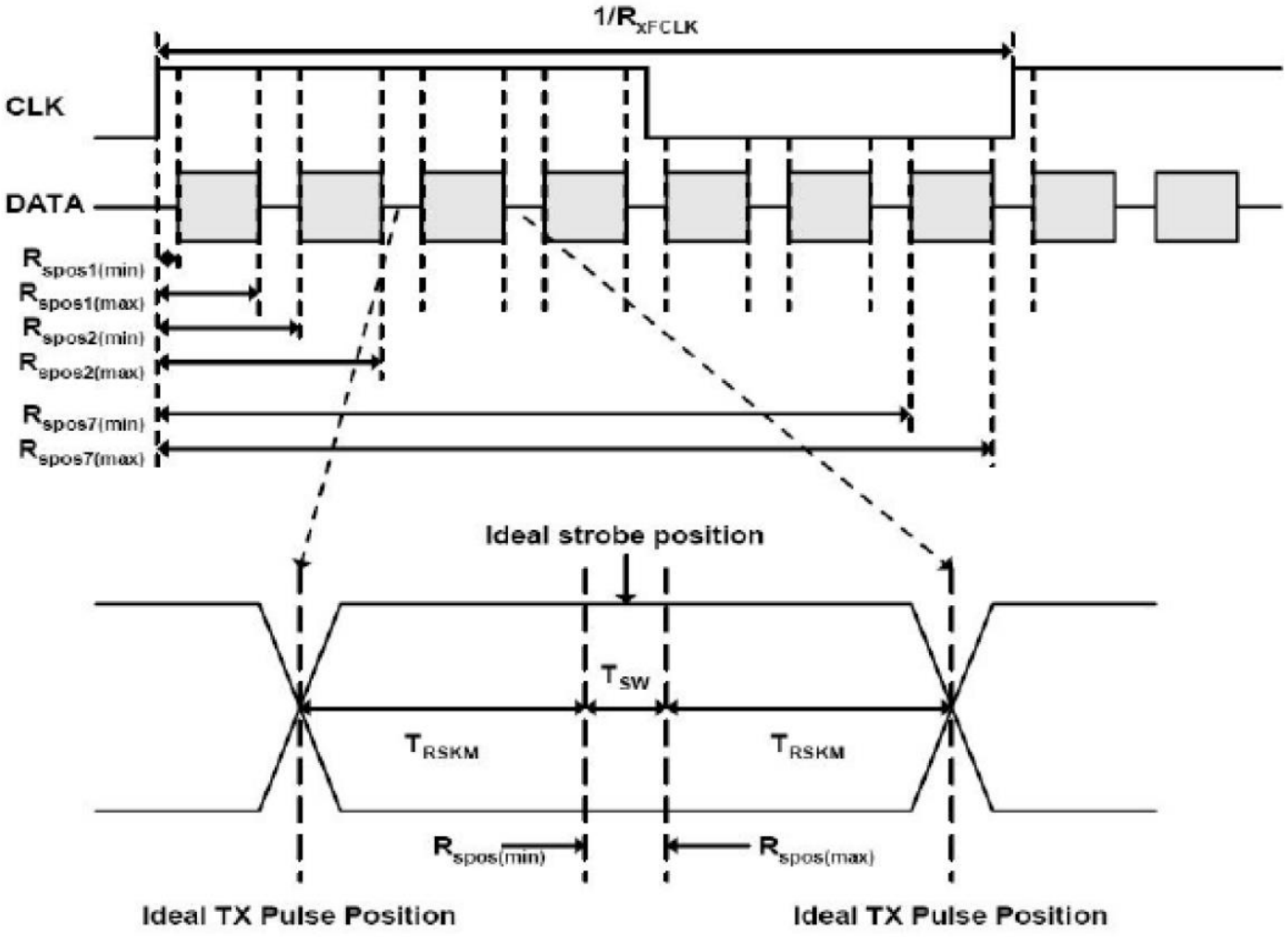
4.1 AC Characteristics

4.1.1 AC Electrical Characteristics

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Clock Frequency	RxFCLK	40.8	51.2	67.2	MHz	Frame rate =60Hz
Input data skew margin	TRSKM	500	-	-	ps	
Clock high time	TLVCH	-	4/(7*RxFCLK)	-	ns	
Clock low time	TLVCL	-	3/(7*RxFCLK)	-	ns	
Horizontal display area	TDEH	-	1024		RxFCLK	
HS period time	TDEH+TDEL	1114	1344	1400	RxFCLK	
HS Blanking	TDEL	90	320	376	RxFCLK	
Vertical display area	TDE	-	600	-	TDEH+TDEL	
VS period time	TDE+TDEB	610	635	800	TDEH+TDEL	
VS Blanking	TDEB	10	35	200	TDEH+TDEL	

4.1.2 Input Clock and Data Timing Diagram



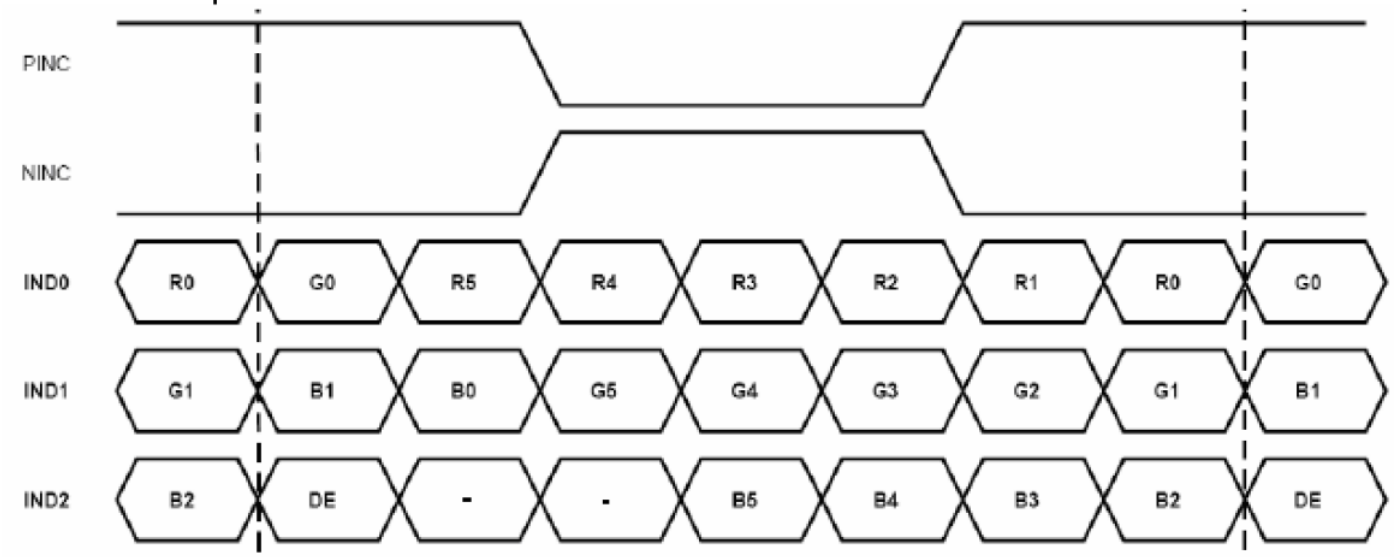


T_{RSKM}: Receiver strobe margin
R_{SPOS}: Receiver strobe position
T_{SW} : Strobe width (Internal data sampling window)

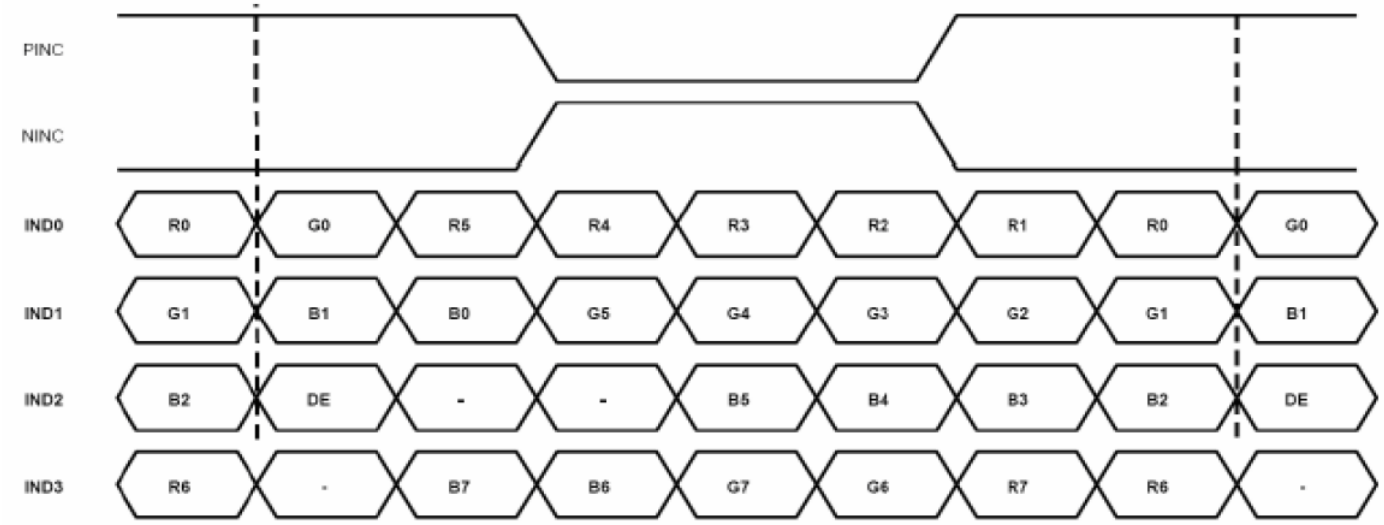
4.2 Timing Controller Timing Chart

4.2.1 Data Input format

6bit LVDS input



8bit LVDS input



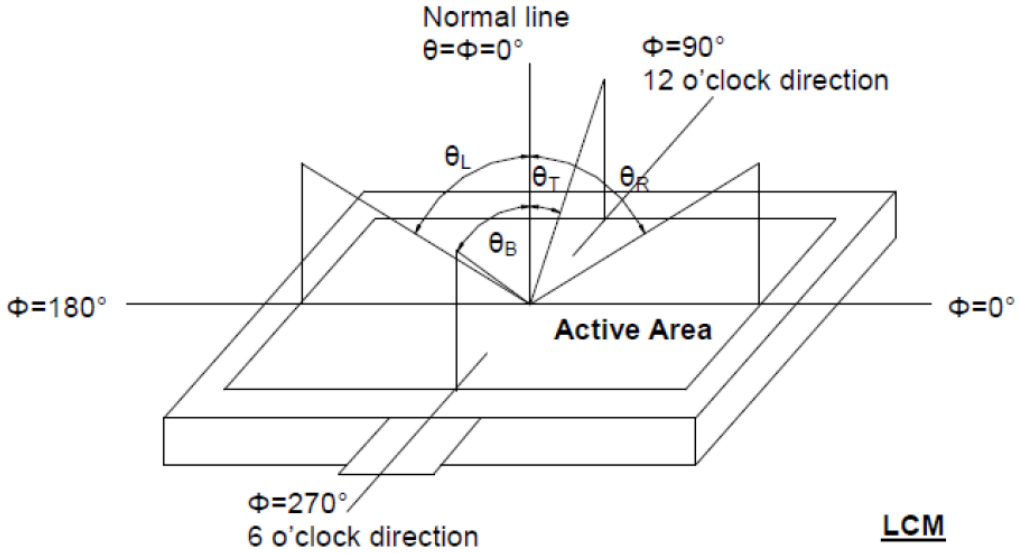
Note:Support DE timing mode only,SYNC mode not supported

5. OPTICAL CHARACTERISTIC

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle		θL	Center CR≥10	65	75	--	deg	Note 1,2,3
		θR		65	75	--		
		θT		60	70	--		
		θB		65	75	--		
Contrast Ratio		CR	at optimized viewing angle	500	700	--		Note 2,3,4
Response time	Rise	Tr	Center θx=θy =0°	-	10	20	ms	Note 2,3,6
	Fall	Tf		-	10	20	ms	
Uniformity		B-uni	θx=θy =0°	70	--	--	%	Note 2,3,5
Brightness		L	θx=θy =0°	400	500	--	cd/㎡	Note 2,3
Chromaticity		x_W	Center θx=θy =0°	0.26	0.31	0.36		Note 2,3,7
		y_W		0.28	0.33	0.38		
Transmittance		Tr		3.15%	3.5%	-		

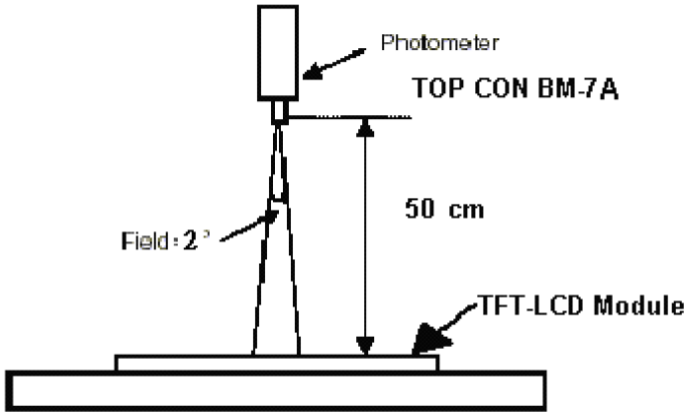
The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25°C±2°C and LED Backlight Current IL=160mA. The measurement method is shown in Note1.

Note 1: Definition of viewing angle range



Note 2: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=160mA .

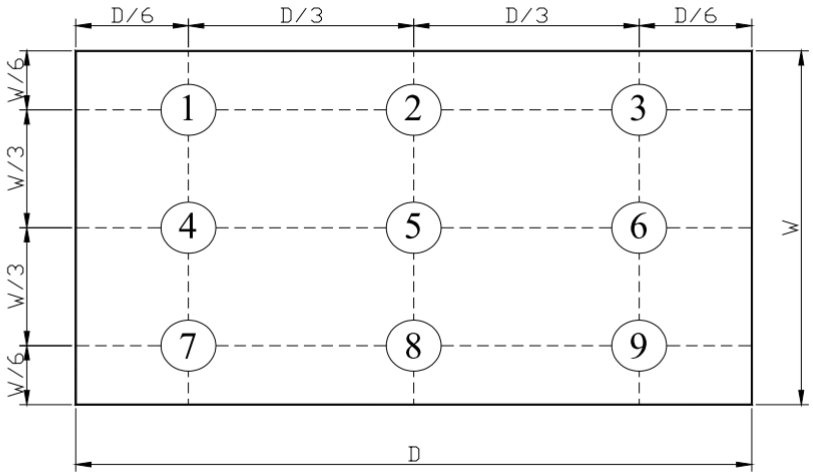
Note 3: Measured at the center area of the panel and at the viewing angle of the θx=θy =0°



Note 4: Definition of Contrast Ratio (CR):

$$CR = \frac{\text{Luminance with all pixels in white state}}{\text{Luminance with all pixels in Black state}}$$

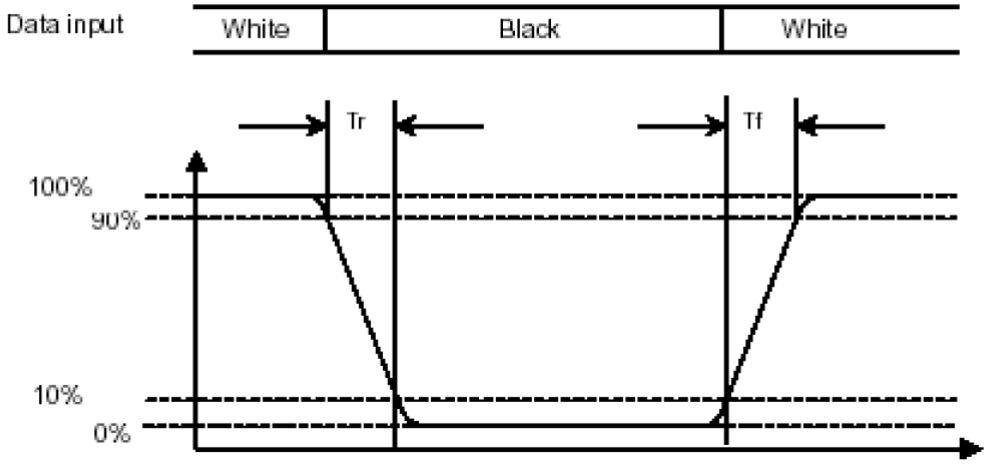
Note 5: Definition of Brightness Uniformity (B-uni):



$$\text{B-uni} = \frac{\text{Minimum luminance of 9 points}}{\text{Maximum luminance of 9points}} \quad \text{(Note 5).}$$

Note 6: Definition of Response Time:

The Response Time is set initially by defining the “Rising Time (Tr)” and the “Falling Time (Tf)” respectively. Tr and Tf are defined as following figure.

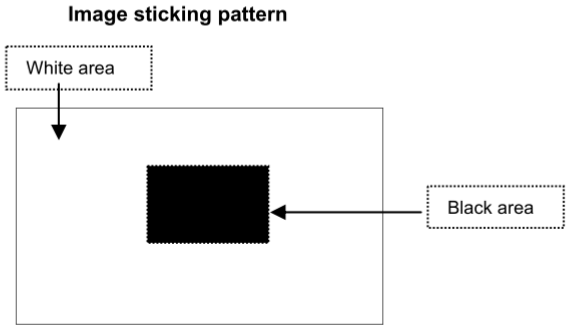


Note 7: Definition of Chromaticity:

The color coordinates (x_W,y_W) are obtained with all pixels in the viewing field at white states, respectively.

Note 8: Definition of Image sticking (tis):

Continuously display the test pattern shown in the figure below for 2 hours. Then display a completely white screen. The previous image shall not persist more than 2 sec at 25 °C



6. PIN CONNECTIONS

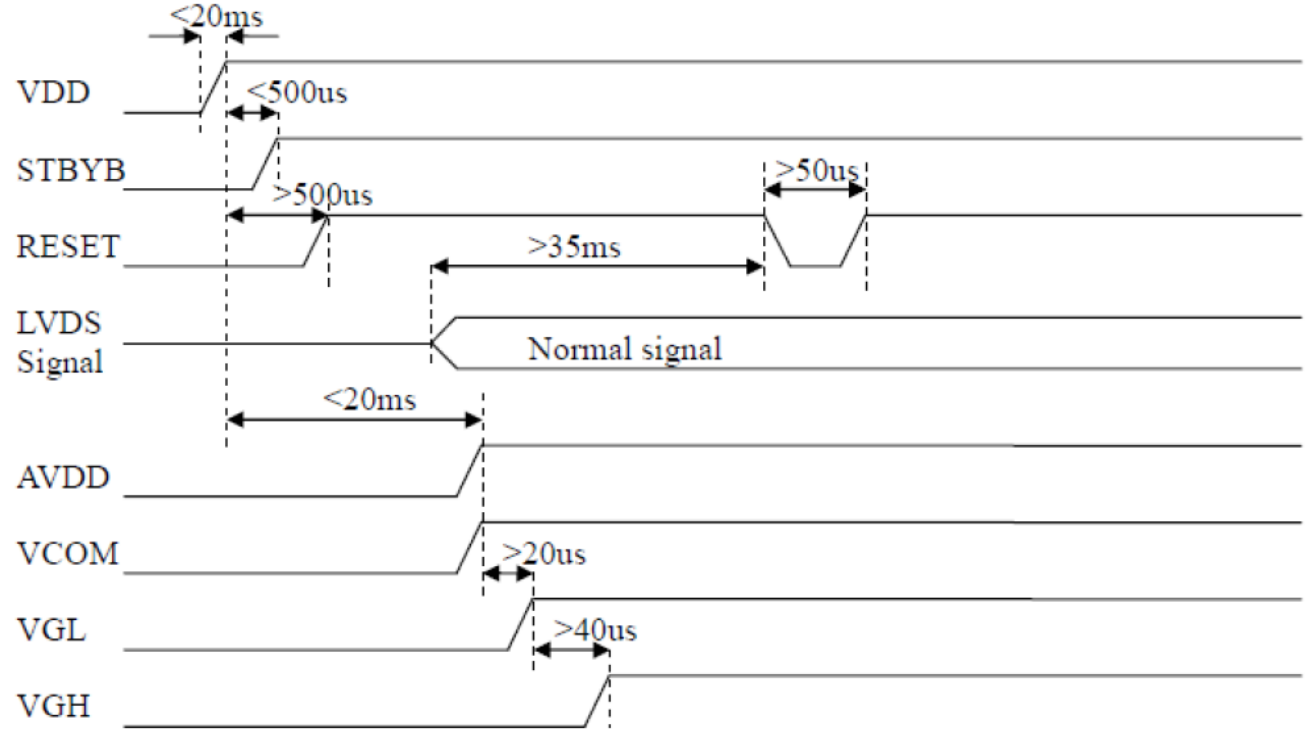
Pin No	Symbol	Description	Remark
1	VCOM	Common Voltage	
2	VDD	Power Voltage for digital circuit	
3	VDD	Power Voltage for digital circuit	
4	NC	No connection	
5	Reset	Global reset pin	
6	STBYB	Standby mode, Normally pulled high STBYB = “1”, normal operation STBYB = “0”, timing controller, source driver will turn off, all output are High-Z	Note 1
7	GND	Ground	
8	RXIN0-	- LVDS differential data input	
9	RXIN0+	+ LVDS differential data input	
10	GND	Ground	
11	RXIN1-	- LVDS differential data input	
12	RXIN1+	+LVDS differential data input	
13	GND	Ground	
14	RXIN2-	- LVDS differential data input	
15	RXNI2+	+LVDS differential data input	
16	GND	Ground	
17	RXCLKIN-	- LVDS differential data input	
18	RXCLKIN+	+ LVDS differential data input	
19	GND	Ground	
20	RXIN3-	- LVDS differential data input	
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	DIMO	Backlight CABC controller signal output	
28	SELB	6bit/8bit mode select	
29	AVDD	Power for Analog Circuit	
30	GND	Ground	
31	LED-	LED Cathode	
32	LED-	LED Cathode	
33	L/R	Horizontal inversion	Note 3
34	U/D	Vertical inversion	Note 3
35	VGL	Gate OFF Voltage	
36	CABCEN1	CABC H/W enable	Note 2
37	CABCEN0	CABC H/W enable	Note 2
38	VGH	Gate ON Voltage	

39	LED+	LED Anode	
40	LED+	LED Anode	

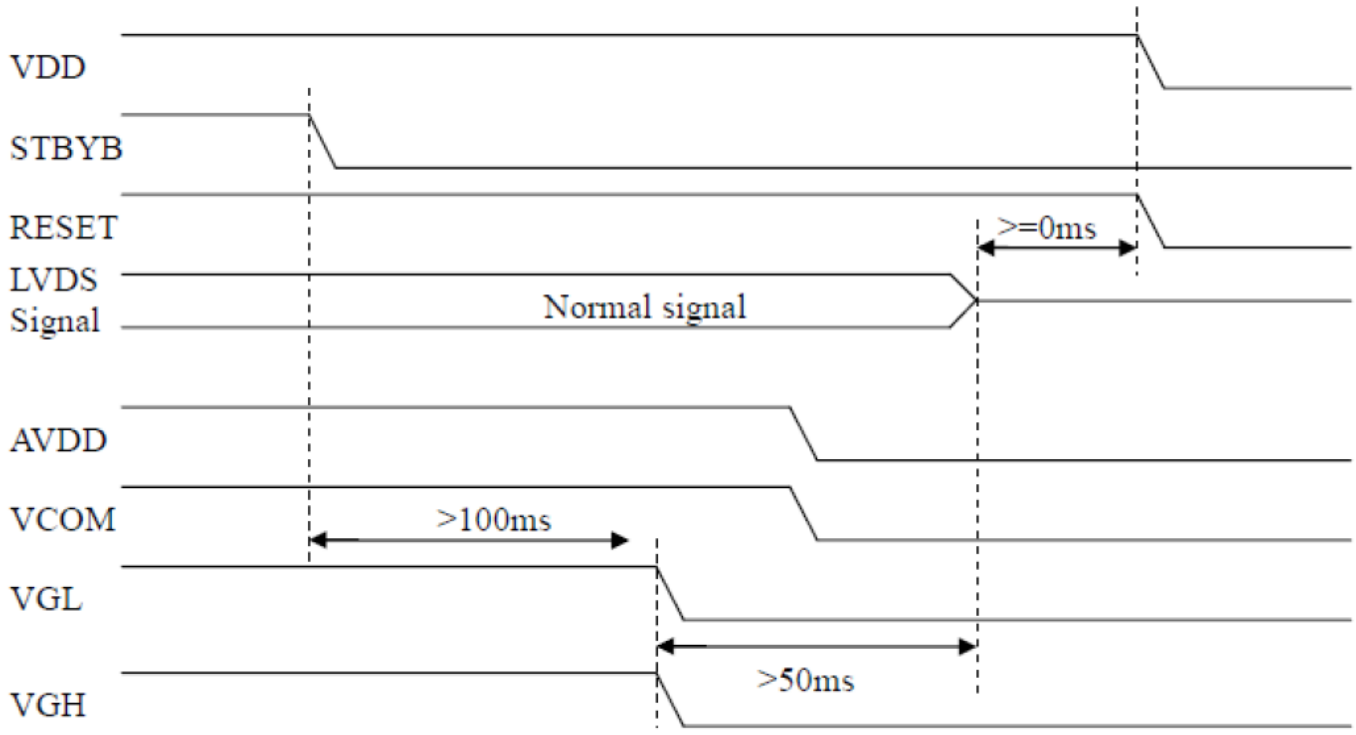
Note 1: If LVDS input data is 6 bits ,SELB must be set to High;
If LVDS input data is 8 bits ,SELB must be set to Low.
Note 2: When CABC_EN="00", CABC OFF.
When CABC_EN="0", user interface image.
When CABC_EN="10", still picture.
When CABC_EN="11", moving image.
When CABC off, don't connect DIMO, else connect it to backlight.
Note 3: When L/R="0", set right to left scan direction.
When L/R="1", set left to right scan direction.
When U/D='0", set top to bottom scan direction.
When U/D="1", set bottom to top scan direction.

6.1 power ON/OFF sequence:

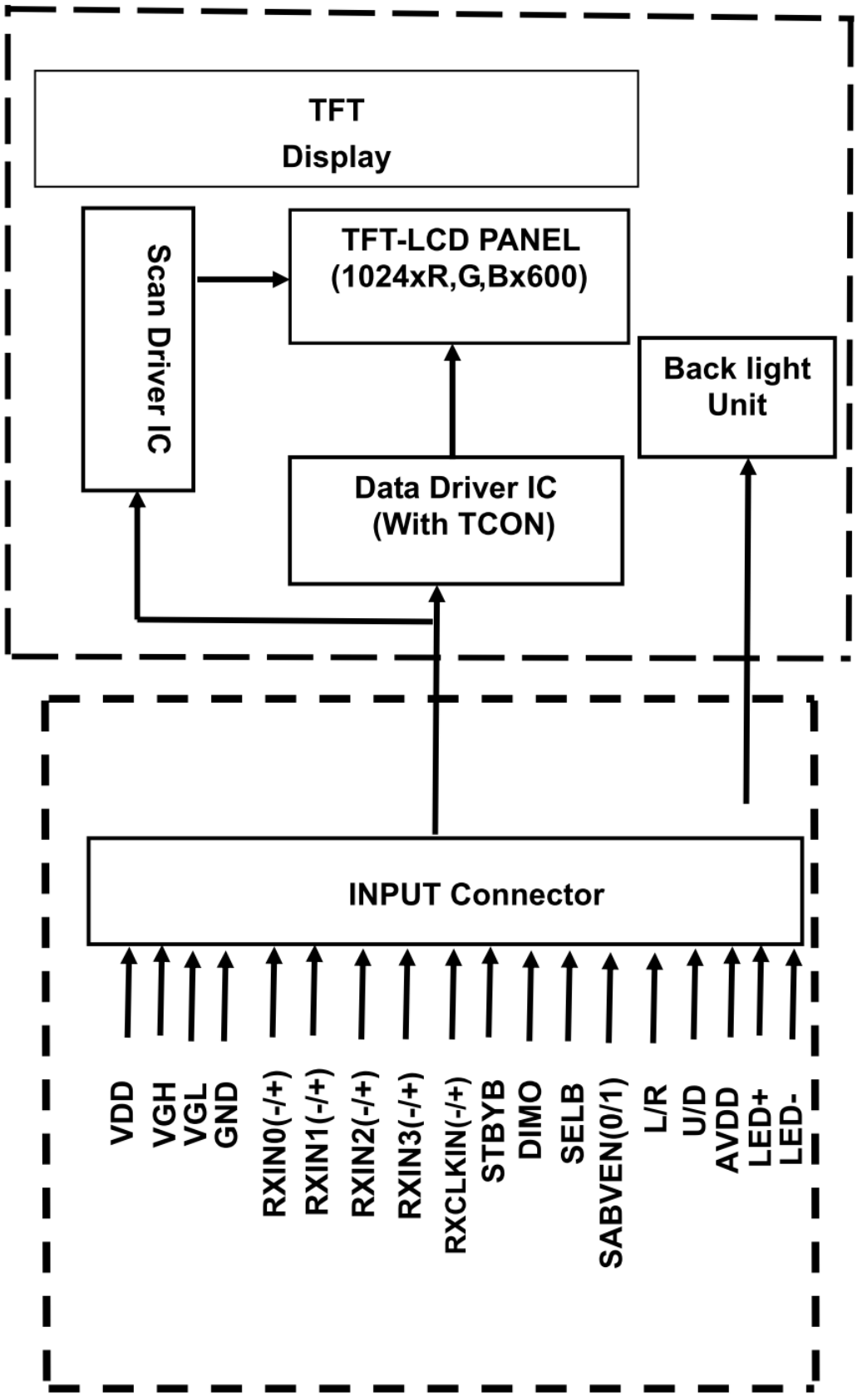
Power on:



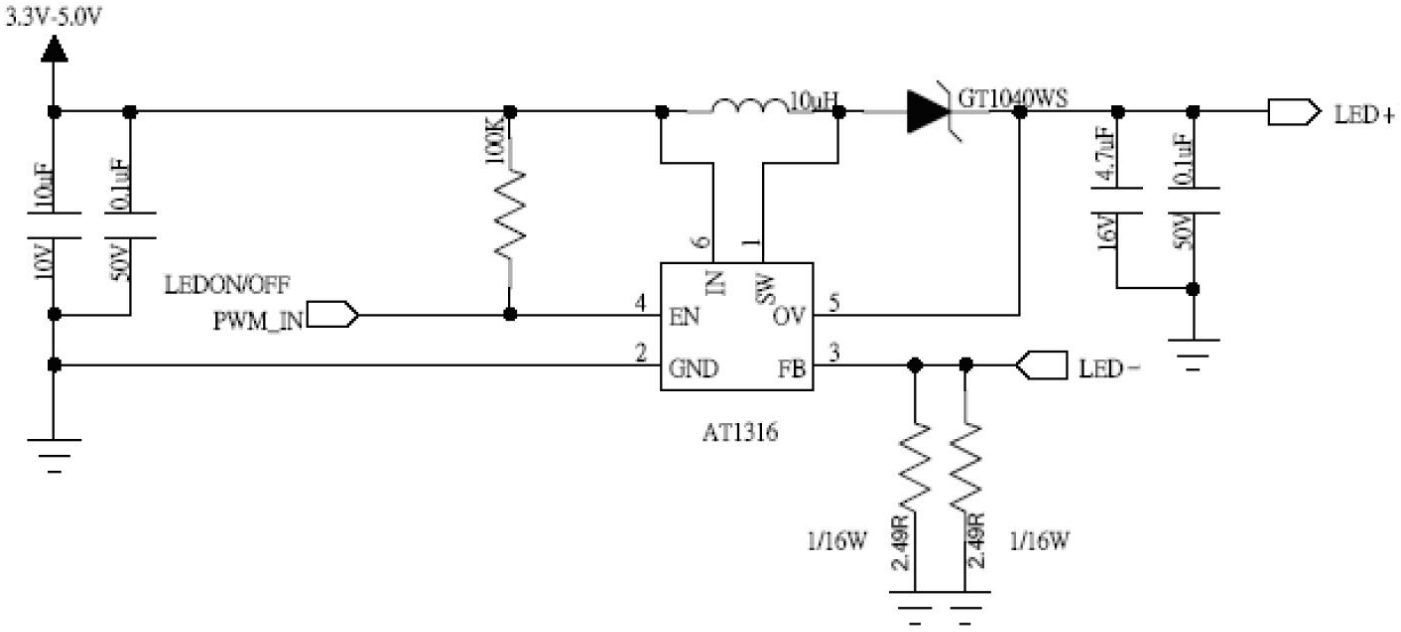
Power off:



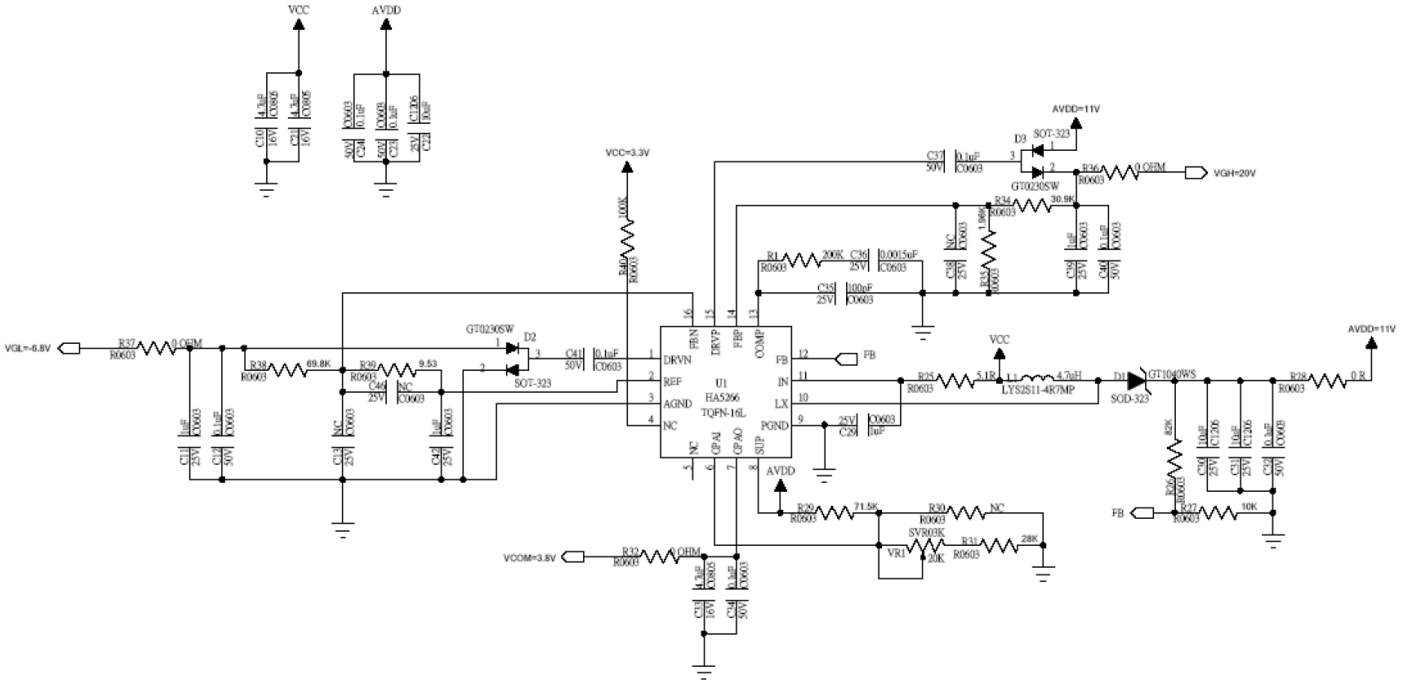
7. BLOCK DIAGRAM



8. APPLICATION CIRCUIT



B/L circuit



DC-DC circuit

10. QUALITY ASSURANCE

10.1 RA Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

10.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

10.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

10.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

10.1.5 Test Method

Reliability Test Item & Level		Test Level	Remark
No.	Test Item		
1	High Temperature Storage Test	T=70℃,240hrs	IEC68-2-2
2	Low Temperature Storage Test	T=-30℃,240hrs	IEC68-2-1
3	High Temperature Operation Test	T=70℃,240hrs	IEC68-2-2
4	Low Temperature Operation Test	T=-20℃,240hrs	IEC68-2-1
5	High Temperature and High Humidity (No operation)	T=40℃,90%RH,240hrs	IEC68-2-3
6	Thermal Cycling Test (No operation)	-30℃ → +25℃ → +70℃, 100 Cycles 30 min 5 min 30 min	IEC68-2-14
7	Vibration Test (No operation)	Frequency :10 ~ 55 H_Z Amplitude :1.5 mm Sweep time : 11 mins Test Period: 6 Cycles for each direction of X, Y, Z	IEC68-2-6

10.2 Inspection condition

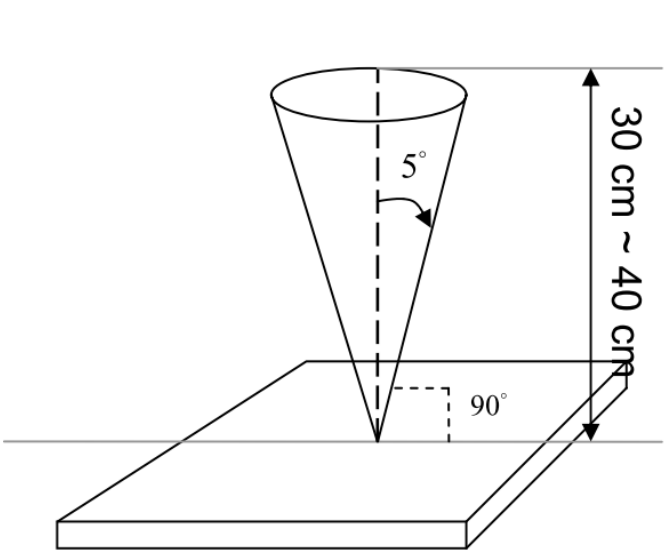
10.2.1 Inspection conditions

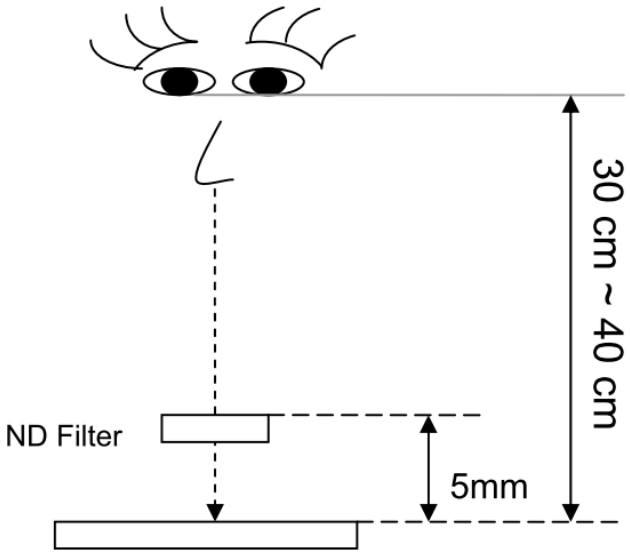
10.2.1.1 Inspection Distance : 35 ± 5 cm

10.2.1.2 View Angle :

(1) Inspection under operating condition : ±5°

(2) Inspection under non-operating condition : ± 45°





10.2.2 Environment conditions :

Ambient Temperature :		25±5℃
Ambient Humidity :		65±5%
Ambient Illumination	Cosmetic Inspection	more than 600 lux
	Functional Inspection	300 ~ 800 lux

10.2.3 Definition of applicable Zones

10.2.4 Inspection Parameters

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td rowspan="6">1</td><td rowspan="6">Operating</td><td>Display function: No Display malfunction (Major)</td></tr>
<tr><td>Contrast ratio (Black, White):
Does not meet specified range in the spec. (Major)</td></tr>
<tr><td>Line Defect:
No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major)</td></tr>
<tr><td>Point Defect: Active area ≦ 8 dots (Minor) (Note:1)
<table>
<tr><th colspan="2" rowspan="2">Item</th><th>Acceptable number
Active Area</th><th rowspan="2">Total</th></tr>
<tr><td rowspan="2">Bright</td><td>Random</td><td>3</td><td rowspan="4">8</td></tr>
<tr><td>Two dots adjacent</td><td>1</td></tr>
<tr><td rowspan="2">Dark</td><td>Random</td><td>5</td></tr>
<tr><td>Two dots adjacent</td><td>2</td></tr>
</table></td></tr>
<tr><td>Non-uniformity:
Visible through 2 %ND filter White , R , G ,B and gray 50% pattern. (Minor)</td></tr>
<tr><td>Foreign material in Black or White spots shape (W>1/4L)
<table>
<tr><th>Zone / Dimension</th><th>Acceptable number</th><th>Class of Defects</th></tr>
<tr><td>D> 0.5</td><td>0</td><td rowspan="3">Minor</td></tr>
<tr><td>0.3 ＜ D ≦ 0.5</td><td>5</td></tr>
<tr><td>0.3≦ D</td><td>*</td></tr>
</table>
D = (Long + Short) / 2 *: Disregard</td></tr>
<tr><td>Foreign Material in Line or spiral shape (W ≦1/4L) (Note: 4)
<table>
<tr><th>Zone / L (mm)</th><th>Zone / W(mm)</th><th>Acceptable number</th><th>Class of Defects</th></tr>
<tr><td>L ＞5</td><td>W>0.1</td><td>0</td><td rowspan="3">Minor</td></tr>
<tr><td>L ≦5</td><td>0.05 ＜W≦ 0.1</td><td>5</td></tr>
<tr><td>L ≦5</td><td>W≦ 0.05</td><td>*</td></tr>
</table>
L : Length W : Width * : Disregard</td></tr>
<tr><td>2</td><td>External</td><td>Dimension: Outline (Major)</td></tr>
</table>

<table>
<tr><td></td><td>Inspection
(non-operating)</td><td>Bezel appearance: uneven (Minor)</td></tr>
<tr><td></td><td></td><td>Scratch on the polarize: (Note:2)
<table>
<tr><th>Zone
L (mm)</th><th>Zone
W(mm)</th><th>Acceptable number</th><th>Class of Defects</th></tr>
<tr><td>L ＞10</td><td>W>0.1</td><td>0</td><td rowspan="3">Minor</td></tr>
<tr><td>L ≦10</td><td>0.05 ＜W≦ 0.1</td><td>5</td></tr>
<tr><td>L ≦10</td><td>W≦ 0.05</td><td>*</td></tr>
</table>
L : Length W : Width * : Disregar</td></tr>
<tr><td></td><td></td><td>Dent or bubble on the polarize (Note:2)
<table>
<tr><th>Zone
Dimension</th><th>Acceptable number</th><th>Class of Defects</th></tr>
<tr><td>D> 0.8</td><td>0</td><td rowspan="3">Minor</td></tr>
<tr><td>0.3 ＜ D ≦ 0.8</td><td>5</td></tr>
<tr><td>0.3≦ D</td><td>*</td></tr>
</table>
D = (Long + Short) / 2 *: Disregard</td></tr>
<tr><td></td><td></td><td>Polarizer flaw or leak out resin : Defect is defined as the active area.</td></tr>
<tr><td>3</td><td>Others</td><td>Issues which is not defined defect :defect must be visible through 2% ND Filter.</td></tr>
</table>

11. PRECAUTIONS IN USE LCM

1. ASSEMBLY PRECAUTIONS
   (1) You must mount a module using holes arranged in four corners or four sides.
   (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
   (3) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
   (4) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
   (5) Do not open the case because inside circuits do not have sufficient strength.
   (6) Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
   (7) Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.
   (8) Please pay attention to handling lead wire of backlight so that it is not tugged in connecting with inverter.

2. OPERATING PRECAUTIONS
   (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
   (2) Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification

(3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(5) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
(6) Please consider that LCD backlight takes longer time to become stable of radiation characteristics in low temperature than in room temperature.

3. ELECTROSTATIC DISCHARGE CONTROL
(1) The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such the copper leads on the PCB and the interface terminals with any parts of the human body.
(2) The modules should be kept in antistatic bags or other containers resistant to static for storage.
(3) Only properly grounded soldering irons should be used.
(4) If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.
(5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
(6) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

4. STORAGE PRECAUTIONS
(1) When you store LCDs for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
(2) Please do not leave the LCDs in the environment of high humidity and high temperature such as 60°C 90%RH
(3) Please do not leave the LCDs in the environment of low temperature; below -20°C.

5. OTHERS
(1) A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight Land strong UV rays
(2) Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
(3) For the packaging box, please pay attention to the followings:
(4) Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
(5) Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
(6) Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)

6. LIMITED WARRANTY

Unless otherwise agreed between FUTURELABS and customer, FUTURELABS will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with FUTURELABS acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of FUTURELABS is limited to repair and/or replacement on the terms set forth above. FUTURELABS will not responsible for any subsequent or consequential events.

12. OUTLINE DRAWING