

APEX

APEX SCIENCE & ENGINEERING CORP

(OPTOELECTRONIC DIV.)




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TAP01166PFE30C

ROHS

DATA SHEET

Acceptance

ISSUE	VERSION	APPROVER	CHECKER	ENGINEER
	A			

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

Record of Revisions

Rev	Date	Sub-Model	Description of change
A	May 28, 2019	TAP01166PFE30C	Preliminary Product Specification was first issued.

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Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

Table of contents

- 1. General description**
- 2. Absolute maximum ratings**
- 3. Optical characteristics**
- 4. Block diagram**
- 5 Interface pin connection**
- 6. Electrical characteristics**
- 7. Reliability test items**
- 8. Outline dimension**
- 9. General precaution**
- 10. Package Specification**
- 11. Visuals Specification:**

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

1. General description

1.1 Introduction

APEX model TAP01166PFE30C is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 11.6 (16:9) inch diagonally measured active display area with Full HD (1920 horizontal by 1080 vertical pixel) resolution.

1.2 Features

- 11.6 (16:9 diagonal) inch configuration**
- LVDS interface**
- 1920x3x1080 dots panel with 262144 colors**
- LED Backlight**
- RoHS Compliance**

1.3 Applications

- Mobile NB,**
- Personal Navigation Device**
- Multimedia applications and Others AV system**

1.4 General information

Item		Specification	Unit
Outline Dimension		281.0 x 178. 0x 9.2(Typ.)	mm
Display area		256.32(H) x144.18(V)	mm
Number of Pixel		1920 RGB(H) x 1080(V)	pixels
Pixel pitch		0.1335(H) x 0.1335(V)	mm
Pixel arrangement		RGB Vertical stripe	
Display mode		Normally black(FFS)	
Surface treatment		Antiglare, Hard-Coating(3H)	
Weight		TBD	g
Back-light		Single LED (Side-Light type)	
Power Consumption	B/L System	TBD	w

1.5 Mechanical Information

item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	280.7	281.0	281.3	mm
	Vertical(V)	177.70	178.0	178.3	mm
	Depth(D)	8.7	9.2	9.7	mm

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit.	Note
Power supply voltage	VDD	-0.3	4.0	V	GND=0
				V	GND=0
				V	GND=0
				V	
				V	

2.1.2 Back-Light Unit

Item	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward voltage	Vf	--	30	35	V	(1)(2)(3)
Forward current	If	--	360		mA	(1)(2)(3)
Power Consumption	PBL	--	10.8	12	W	

Note:

(1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2) $T_a = 25 \pm 2^\circ\text{C}$

(3) Test Condition: LED current 360mA

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Remarks
Operating Temperature	Topa	-20	+70	$^\circ\text{C}$	
Storage Temperature	Tstg	-30	+80	$^\circ\text{C}$	

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification:

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit	Condition
Response Time	Tr	25°C	--	10	20	msec	$\theta = 0^\circ, \phi = 0^\circ$ (Note 1,3)
	Tf	25°C	--	15	30		
Contrast Rate	Cr	25°C	700	1000	--	--	$\theta = 0^\circ, \phi = 0^\circ$ LED:ON, LIGHT:OFF(Note1,2)
Brightness	YL	25°C	350	400		Cd/m2	(IL=360mA)(Note1,4)
Visual angle range front and rear	θ	25°C	(θ L) 85 (θ R) 85			De-gree	$\phi = 0^\circ, CR \geq 10$ LED:ON LIGHT:OFF(Note 1,4)
Visual angle range left and right	θ	25°C	(θ U) 85 (θ D) 85			De-gree	$\phi = 90^\circ, CR \geq 10$ LED:ON LIGHT:OFF(Note 1,4)
Brightness uniformity	BUNI		75			%	$\Theta = 0$ (Note5,7)
Visual angle			free				(Note 6)
Item	Symbol	Transmissive			Conditions		
		Min.	Typ.	Max.			
Red	XR	0.612	0.642	0.672	Reference: LCD Panel, CIE (x, y) chromaticity (Note 1,4)		
	YR	0.303	0.333	0.363			
Green	XG	0.271	0.301	0.331			
	YG	0.591	0.621	0.651			
Blue	XB	0.123	0.153	0.183			
	YB	0.025	0.055	0.085			
White	XW	0.283	0.313	0.343			
	YW	0.299	0.329	0.359			

3.2 Measuring Condition

Measuring surrounding: dark room ,LED current IL : 360mA

Ambient temperature: 25±2oC

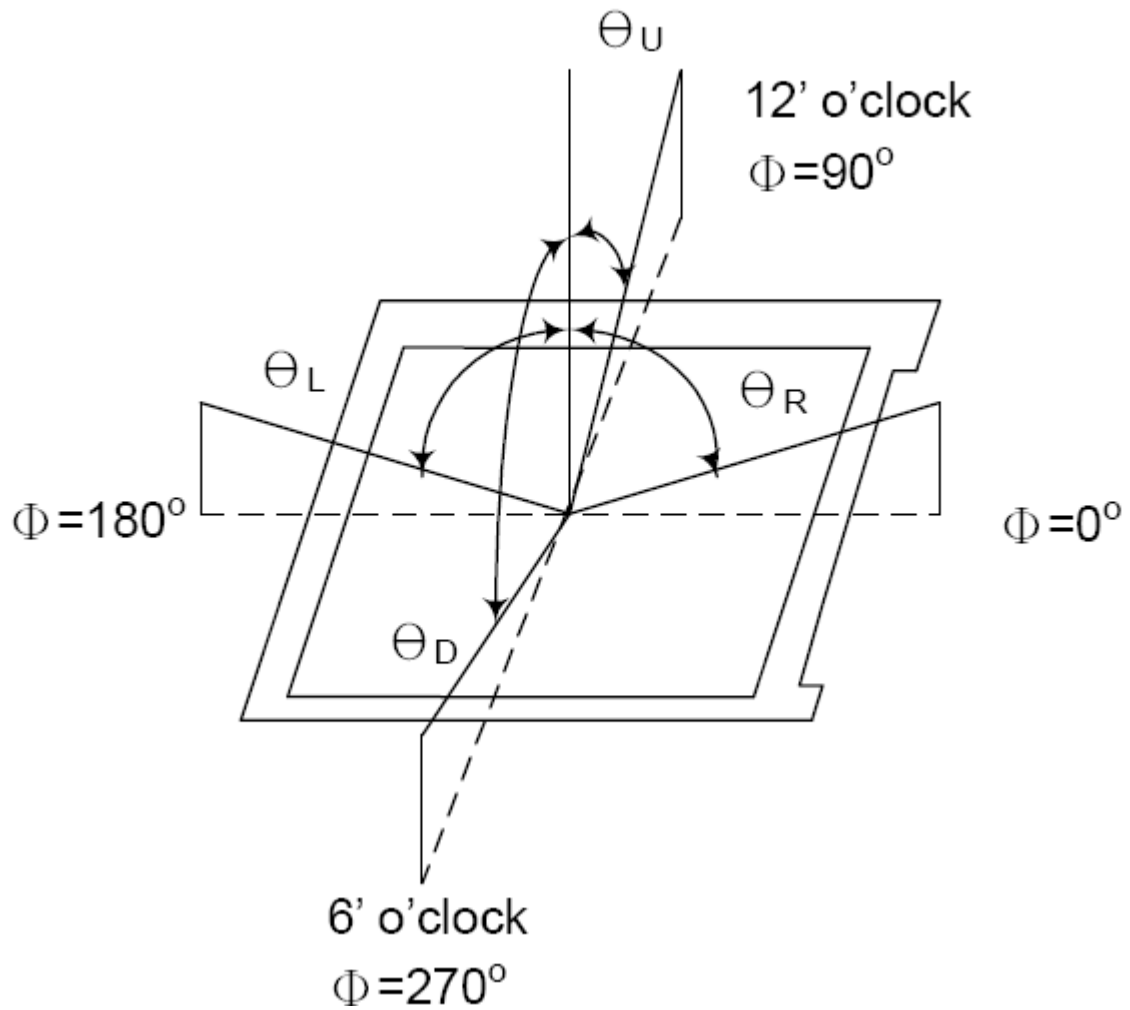
15min. warm-up time.

3.3 Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics. Measuring spot size: 20 ~ 21 mm

Note (1) Definition of Viewing Angle :

Messrs.			
Product Specification	Model:	TAP01166PFE30C	Rev. NO.
			A
			Issued Date.
			May,28.19

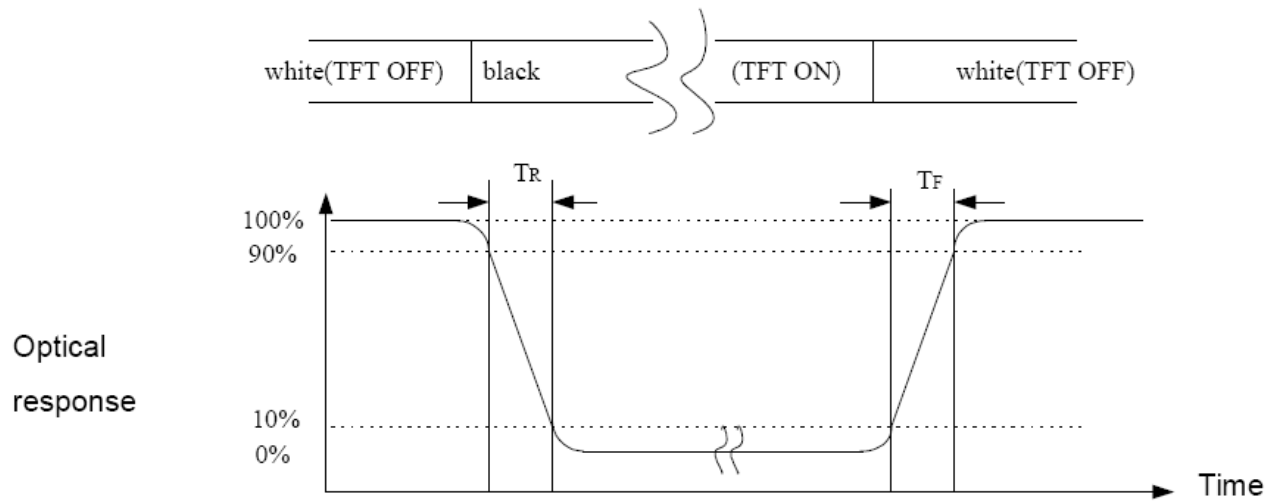


Note (2) Definition of Contrast Ratio (CR):
Measured at the center point of panel

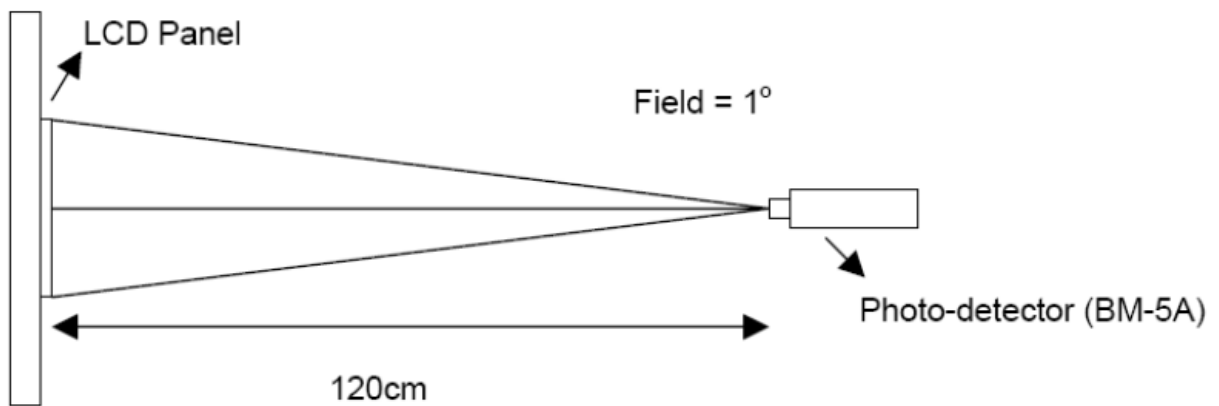
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Messrs.			
Product Specification	Model:	TAP01166PFE30C	Rev. NO.
			Issued Date.
			A
			May,28.19

Note (3) Definition of Response Time: Sum of TR and TF

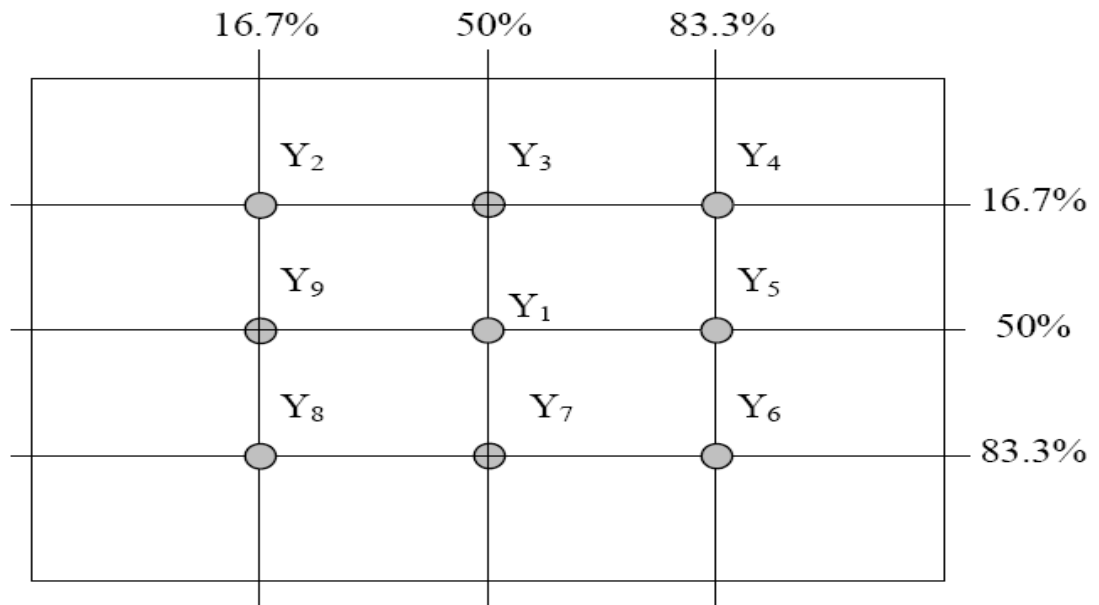


Note (4) Definition of optical measurement setup



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			A
			Issued Date.
			May,28.19

Note (5) Definition of brightness uniformity



$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction).

Note (7) Measured at the brightness of the panel when all terminals of LCD panel are electrically open.

Messrs.			
Product Specification	Model:	TAP01166PFE30C	Rev. NO.
			Issued Date.
			A
			May,28.19

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



Display position of input data(V·H)

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

5.0 Interface Pin Connection

5.1 CN1: (LVDS Signal , 3.3VDD Supply)

Pin No.	Symbol	I/O	Function	Remark
1	GND	P	Ground	
2	RXEIN0-	I	- LVDS differential data input	
3	RXEIN0+	I	+ LVDS differential data input	
4	GND	P	Ground	
5	RXEIN1-	I	- LVDS differential data input	
6	RXEIN1+	I	+ LVDS differential data input	
7	GND	P	Ground	
8	RXEIN2-	I	- LVDS differential data input	
9	RXEIN2+	I	+ LVDS differential data input	
10	GND	P	Ground	
11	RXECLKIN-	I	- LVDS differential clock input	
12	RXECLKIN+	I	+ LVDS differential clock input	
13	GND	P	Ground	
14	RXEIN3-	I	- LVDS differential data input	
15	RXEIN3+	I	+ LVDS differential data input	
16	GND	P	Ground	
17	RXOIN0-	I	- LVDS differential data input	
18	RXOIN0+	I	+ LVDS differential data input	
19	GND	P	Ground	
20	RXOIN1-	I	- LVDS differential data input	
21	RXOIN1+	I	+ LVDS differential data input	
22	GND	P	Ground	
23	RXEIN2-	I	- LVDS differential data input	
24	RXEIN2+	I	+ LVDS differential data input	
25	GND	P	Ground	
26	RXOCLKIN-	I	- LVDS differential clock input	

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

27	RXOCLKIN+	I	+ LVDS differential clock input	
28	GND	P	Ground	
29	RXEIN3-	I	- LVDS differential data input	
30	RXEIN3+	I	+ LVDS differential data input	
31	GND	P	Ground	
32	GND	P	Ground	
33	GND	P	Ground	
34	BL_ENABLE	P	Off:0V; On:3.3V	
35	BL_PWM_DM	P	Backlight Brightness Control, Typ: 20K HZ.	
36	BL_PWR	P	BL Power Input 11-15V Typ:12.9V	
37	BL_PWR	P	BL Power Input 11-15V Typ:12.9V	
38	VDD	P	Power for Analog Circuit(3.3V)	
39	VDD	P	Power for Analog Circuit(3.3V)	
40	GND	P	Ground	

Notes:

I: Input , O:Output.

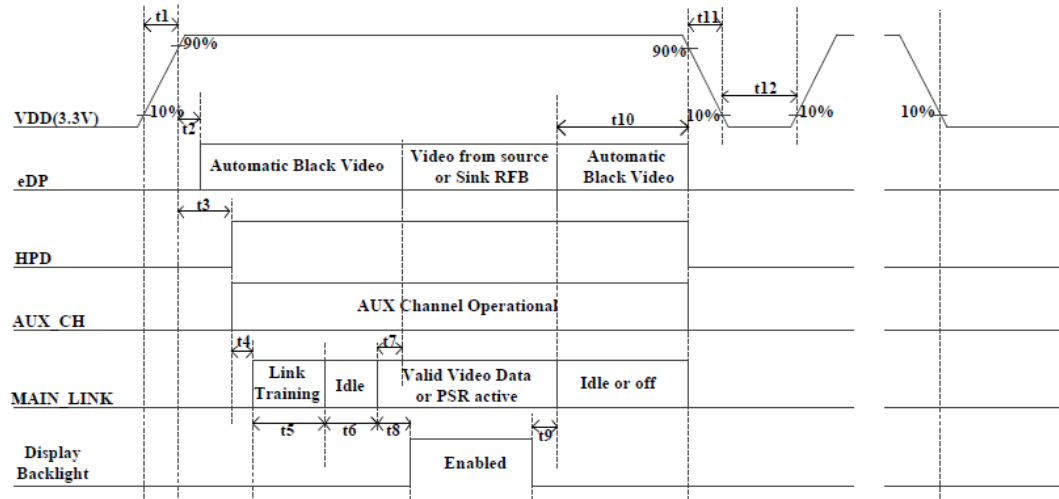
6.0 ELECTRICAL CHARACTERISTICS

Item	Symbol	Min.	Type	Max.	Unit.	Note
Power supply voltage	VDD	3.0	3.3	3.6	V	GND=0
	Vrp			100	mVp-p	Vcc=+3.3V
					V	GND=0
	IDD	-	212	364	mA	AGND=0
	Irush			1.0	A	
Operation Temperature	Top	-20		70	°C	
Storage Temperature	Tst	-30		80	°C	

Messrs.			
Product Specification	Model:	TAP01166PFE30C	Rev. NO.
			Issued Date.
			A May,28.19

6.1 TFT LCD Module

[Note 6-1-1] ON-OFF conditions for supply voltage



[Note] Do not keep the interface signal high-impedance or unusual signal when power is on.

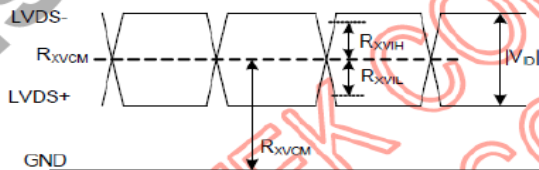
Symbol	Min	Max	Unit	Note
t1	0.5	10	ms	
t2	0	100	ms	
t3	0	100	ms	
t4	-	-	ms	
t5	-	-	ms	
t6	-	-	ms	
t7	0	50	ms	
t8			ms	
t9			ms	
t10	0	500	ms	
t11	1	50	ms	[Note1]
t12	500	-	ms	
t13	-	-	ms	
t14	0.5	10	ms	
t15	100		ms	
t16	-	-	ms	
t17	0	-	ms	
t18	-	-	ms	
t19	-	-	ms	
t20	0.1	-	ms	
t21	100		ms	

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

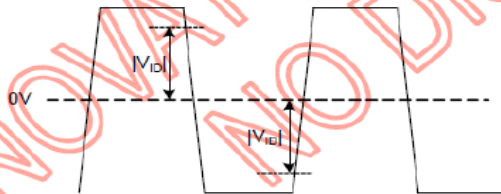
6.2 switching characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	R_{xVTH}	+100		+300	mV	
Differential Input Low Threshold	R_{xVTL}	-300		-100	mV	
Differential input common mode voltage	R_{xVCM}	1.0	1.2	1.7- $I_{VID}/2$	V	
Input leakage Current	I_{IN}	-10		10	uA	RX+/-, RxC+/-
Differential input Voltage	I_{VID}	200		600	mV	

Single-end Signal

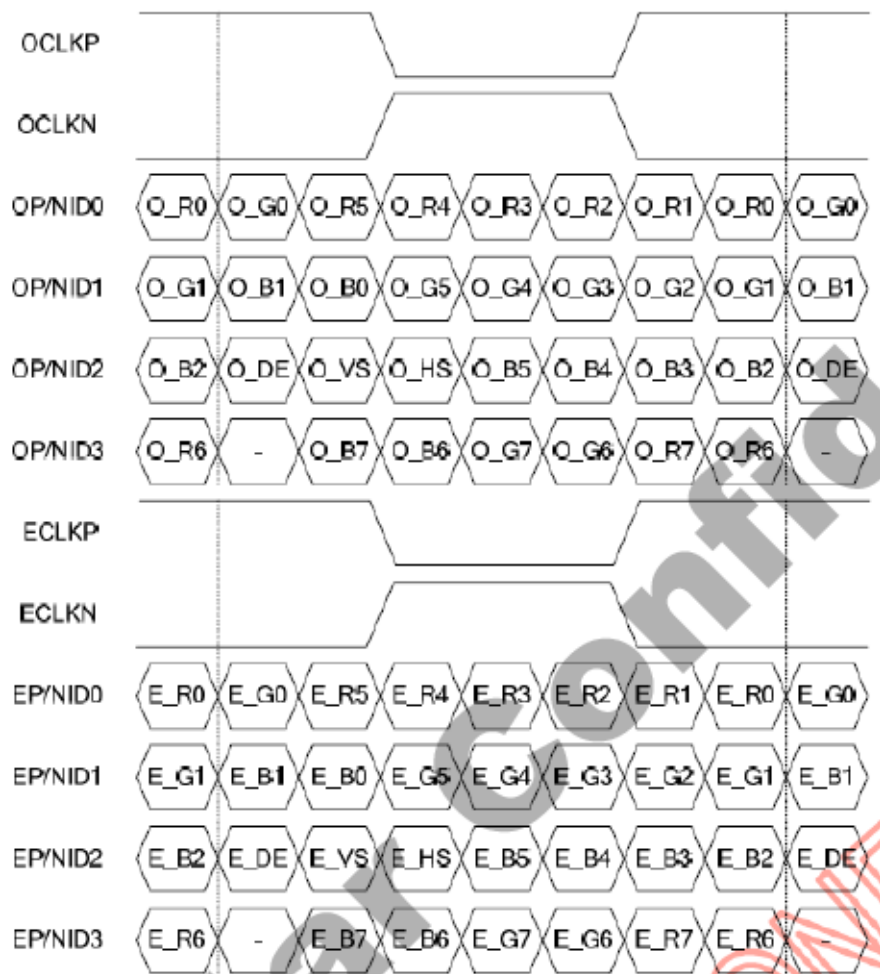


Differential Signal



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Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

6.3:8bit LVDS input

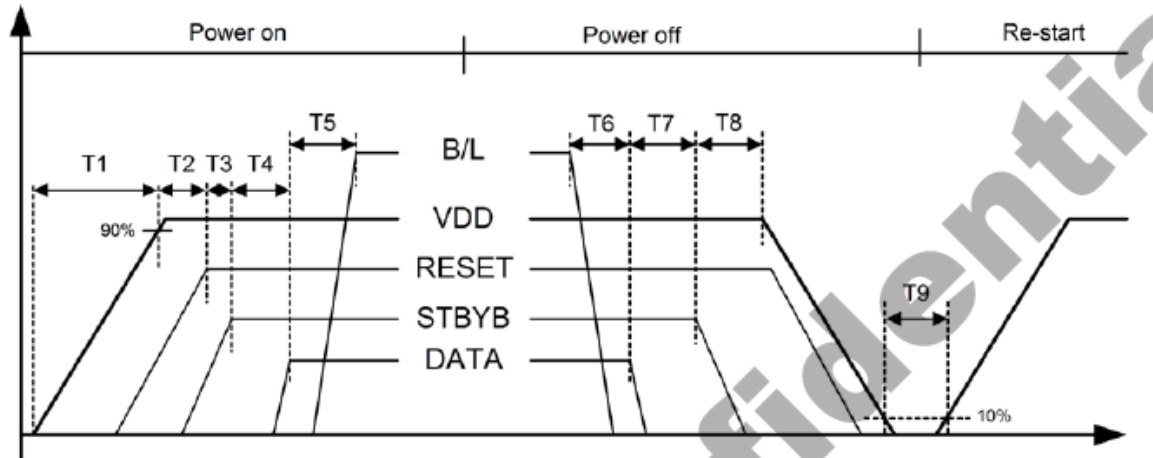


6.4 interface timing(DE mode)

Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	55	60	65	HZ
Vertical Total Time	TV	--	1111	--	line
Vertical Display Time	TVD	--	1080	--	
Vertical Blanking Time	TVB	--	31	--	line
Horizontal Total Time	TH	--	1040	--	clock
Horizontal Display Time	THD	--	960	--	
Horizontal Blanking Time	THB	--	80	----	clock
Clock Rate	1/Tclk	--	69	--	MHZ

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

6.5: Power on/off Sequence



Item	Min.	Typ.	Max.	Unit
T1	0.5	--	20	ms
T2	1	--	--	ms
T3	1	--	--	ms
T4	200	--	--	ms
T5	50	--	--	ms
T6	50	--	--	ms
T7	16	--	--	ms
T8	16	--	--	ms
T9	1000	--	--	ms

6.6 Back-Light Unit

The characteristics of the LED are shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED current	IL	-	360	-	mA	(2)
LED Voltage	VL	-	30	35	V	
Operating LED life time	Hr	50000	-	-	Hour	(1)(2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3\text{ }^\circ\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^\circ\text{C}$ and $IL=360\text{mA}$. The LED lifetime could be decreased if operating IL is larger than 360mA. The constant current driving method is suggested.

Messrs.					
Product Specification	Model:	TAP01166PFE30C		Rev. NO.	Issued Date.
				A	May,28.19

6.6.2 LED CONVERTER

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter power Supply Voltage		Vi	9	12.0	16	V	Duty 100%
Converter power Supply Current		Ii	1	1.5	2	A	@ Vi=12 (Duty 100%)
LED Converter power consumption		Pi	12	18	24	W	
EN control level	Power on		2	–	–	V	
	Power off		–	–	0.5	V	
PWM control level	High level		2	–	–	V	
	Low level		–	–	0.7	V	
PWM control duty ratio			1		100	%	
PWM control frequency			280	350	420	KHZ	

Messrs.			
Product Specification	Model:	TAP01166PFE30C	Rev. NO.
			A
			Issued Date. May,28.19

7.0 Reliability test items

NO.	Item	Conditions	Remark
1	High Temperature Storage	Ta= +80℃,240hrs	Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects 1. Air bubble in the LCD 2. Sealleak 3. non-display 4. missing segments 5. glass crack 6. current idd is twice higher than initial value.
2	Low Temperature Storage	Ta= -30℃,240hrs	
3	High Temperature Operation	Ta= +70℃,240hrs	
4	Low Temperature Operation	Ta= -20℃,240hrs	
5	High Temperature and High Humidity(Operation)	Ta= +60℃, 90%RH, 240hrs	
6	Thermal cycling Test (non operation)	-30℃(30min)→+80℃(30min),200cycles	
7	Electrostatic discharge	200V 200pf(0ohm) 1time/each terminal	
8	Vibration	1. Random: 1.04 Grms,5~500HZ, X/Y/Z,30min/each direction 2. Sine: Freq. Range:8~33.3hz Stoke:1.3mm Sweep:2.9G,33.3~400HZ X/Z:2hr,Y:4hr,cyc:15min	
9	Shock	100G,6ms,±X, ±Y, ±Z 3 times for each direction	
10	Vibration(with carton)	Random:0.015G ^ 2/HZ, 5~200HZ -6dB/octave,200~400HZ XYZ each dirction:2hr	
11	Drop (with carton)	Height:60cm 1corner,3edges,6surfaces	

Note:

1. There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.
2. the test samples should be applied to only one test item
3. for damp proof test, Pure water(resistance>10M ohm) should be used
4. in case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part
5. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic

Messrs.			
Product Specification	Model:	TAP01166PFE30C	Rev. NO.
			Issued Date.
			A
			May,28.19

7.1 Capacitance Touch Panel Specification

7.1.1 CN2 PIN assignment for USB interface

Terminal No.	Symbol	IO	Functions
1	GND	P	Power ground
2	D-	I	USB data input
3	D+	I	USB data input
4	VDD	P	Power supply for I/O[5V]

7.1.3 general features

General information Items	Specification	Unit	Note
Transmissivity	>86%		
Haze	<3%		
Screen			
Hardness	>6H		
Driver IC	ILI 2511		
Interface	USB		
Touch type	Projective capacitive		
Simultaneous touch points	5 points		
Structure	G+G(cover glass +ITO glass)		

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Product Specification

Model:

TAP01166PFE30C

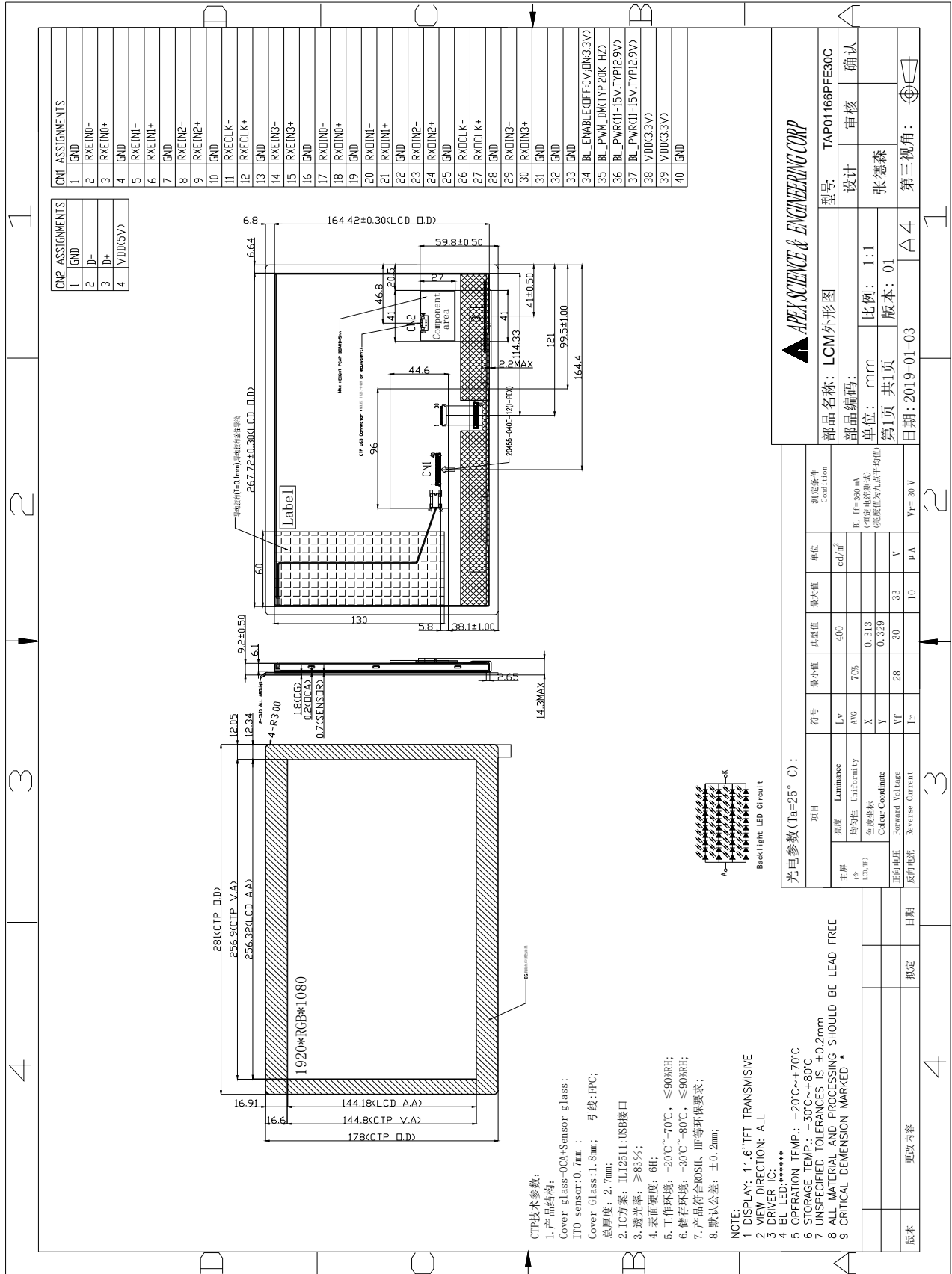
Rev. NO.

Issued Date.

A

May,28.19

8.0 OUTLINE DIMENSION



Messrs.			
Product Specification	Model:	TAP01166PFE30C	Rev. NO.
			Issued Date.
			A
			May,28.19

9.0 GENERAL PRECAUTION

9.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life threatening or otherwise catastrophic.

9.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

9.3 Breakage of LCD Panel

9.3.1. If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

9.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

9.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

9.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

9.4 Electric Shock

9.4.1. Disconnect power supply before handling LCD module.

9.4.2. Do not pull or fold the LED cable.

9.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

9.5 Absolute Maximum Ratings and Power Protection Circuit

9.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged. 9.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time. 11.5.3. It's recommended to employ protection circuit for power supply.

9.6 Operation

9.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

9.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

9.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

9.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

9.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

9.7 Mechanism

Please mount LCD module by using mouting holes arranged in four corners tightly.

9.8 Static Electricity

9.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

9.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

9.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

9.10 Disposal



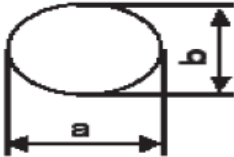
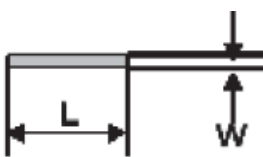
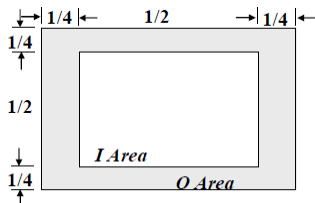
When disposing LCD module, obey the local environmental regulations.

10. Package Specification

10.1 Packing format

Messrs.			
Product Specification	Model:	TAP01166PFE30C	Rev. NO.
			A
			Issued Date.
			May,28.19

11. Visuals Specification: 1) Note

General	<p>1. Customer identified anomalies not defined within this inspection standard shall be reviewed by APEX, and an additional standard shall be determined by mutual consent.</p> <p>2. This inspection standard about the image quality shall be applied to any defect within the effective viewing area and shall not be applicable to outside of the area.</p> <p>3. Inspection conditions</p> <p>Luminance : 500 Lux min.</p> <p>Inspection distance : 300 mm.</p> <p>Temperature : 25±5°C</p> <p>Direction : Directly above</p>		
Definition of inspection item	Dot defect	Bright dot defect	<p>The dot is constantly “on” when power applied to the LCD, even when all “Black” data sent to the screen. Inspection tool: 5% Transparency neutral density filter. Count dot: If the dot is visible through the filter. Don’t count dot: If the dot is not visible through the filter.</p>  <p>dot defect</p>
		Black dot defect	<p>The dot is constantly “off” when power applied to the LCD, even when all “White” data sent to the screen.</p>
		Adjacent dot	<p>Adjacent dot defect is defined as two or more bright dot defects or black dot defects.</p>  <p>dot defect</p>
External inspection	Bubble ,scratch(foreign Particle polarizer, Cell, Backlight)		Visible operating (all pixels “Black” or “White”) and non operating.
	Appearance inspection	Does not satisfy the value at the spec.	
Others	LED wires	Damaged to the LED wires, connector, pin, functional failure or appearance failure.	
Definition of Size	<p>Definition of circle :</p>  <p>$d = (a + b) / 2$</p>	<p>definition of linear size</p> 	<p>definition Area I/O</p> 

Messrs.				
Product Specification	Model:	TAP01166PFE30C	Rev. NO.	Issued Date.
			A	May,28.19

2) Standard

Classification		Inspection item		Judgment Standard	
Defect (in LCD glass)	Dot defect	Area		I	O
		Bright dots(Note: Visible under:ND5%) 1:D≤0.15mm:No count); D>0.15mm acceptable: 2		N≤2	N≤3
		Dark dots (0.15mm<D≤0.3mm), D>0.3mm Not allowable		N≤5	
		Bright dot-2Adjacent		N≤0	
		Dark dot-2Adjacent		N≤0	
		Dark or bright dots-3 and more adjacent(note6)		N≤0	
		Total bright and dark dots		N≤5	
		Minimum distance between bright dots		5mm	
		Minimum distance between dark dots		5mm	
		Minimum distance between bright and bright dots		5mm	
	Other	White dot ,dark dot (circle)	Size (mm)		Acceptable number
d≤0.2			Neglected		
0.2mm<D≤0.3mm			N≤4		
0.3mm<D≤0.4mm			N≤2		
D>0.4mm			Not allowable		
Visual defect	Foreign partial	Circular foreign material: dark/bright sport	Visible under:ND5% 1:D≤0.2mm:No count 2:0.2mm<D≤0.3mm,N≤4 3:D>0.3mm:Not allowable		
		Linear foreign material: bright or dark line	Invisible under ND5% 0.1mm<W≤0.3mm, 0.3mm<L≤2mm,N≤4 Visible under ND5% 0.05mm≤w≤0.1mm, 0.3mm≤L≤0.7mm,N≤4		
	Polarizer	Linear scratch	1:BM:No Count 2:Pixel area 0.05mm≤w≤0.2mm, 1.0mm≤L≤5.0mm,N≤4		
		Bubble peeling	1:BM:No Count 2:Pixel area 0.15mm≤D<0.3mm,N≤4		
Mura & leak		ND5%			