SPECIFICATION
FOR
TFT MODULE

MODULE NO. : AVD-TT70WS-NN-014-S

CUSTOMER NO. :

Rev No. : O

AVD	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE	叶嘉峰	李弘燊	李孚
DATE	2022.04.20	2022.04.20	2022.04.20

CUSTOMER APPROVAL	SIGNATURE	DATE

Notes :

1、Please contact AVD before assigning your product based on this module specification.

2、To improve the quality of product, and this product specification is subject to change without any notice.

REVISION RECORD

Rev No.	Rev date	Contents	Remarks
O	2022-04-20	First release	Preliminary

CONTENTS

1. GENERAL INFORMATION

No.	Item	Contents	Unit
1	LCD size	7.0 inch (Diagonal)	/
2	Display mode	IPS/Normally Black/ Transmissive(ANTI-GLARE)	/
3	Viewing direction(eye)	FREE	/
4	Gray scale inversion direction	/	/
5	Resolution(H*V)	1024*600 Pixels	/
6	Module size (L*W*H)	164.90*100.00*3.45	mm
7	Active area (L*W)	154.21*85.92	mm
8	Pixel pitch (L*W)	0.1506*0.1432	mm
9	Interface type	LVDS	/
10	Color Depth	16.7M	/
11	Module power consumption	TBD	W
12	Back light type	EDGE,WIHTE	/
13	Driver IC	EK79001HF3+EK73217 OR COMPATIBLE	/
14	Weight	TBD	G

2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power supply input voltage for TFT	VDD	-0.3	5.0	V	
Backlight current (normal temp.)	ILED	-	150	mA	
Operation temperature	Top	-20	+70	°C	Note1
Storage temperature	Tst	-30	+80	°C	Note1
Humidity	RH	20%	90%	RH	Note1

Note1 :

1).The relative humidity and temperature range are as below sketch,90%RH Max.

2).The maximum wet bulb temperature ≦40℃ and without dewing.
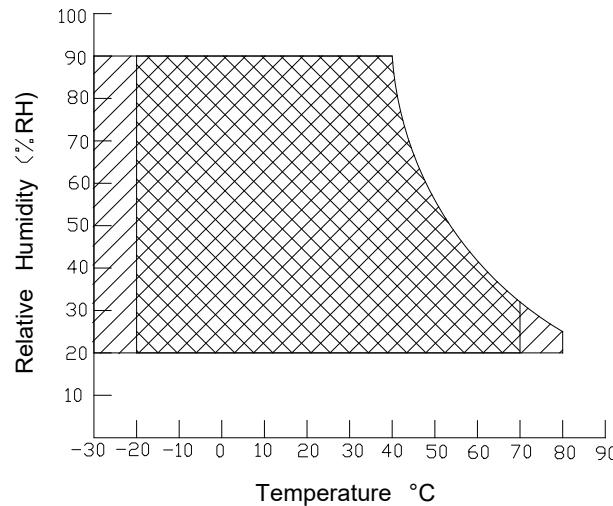
3. ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS(at Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply input voltage	VDD	3.1	3.3	3.5	V	
I/O logic voltage	VDDIO	-	-	-	V	
Input voltage 'H' level	VIH	0.7VDD	-	VDD	V	
Input voltage 'L' level	VIL	VSS	-	0.3VDD	V	
Power supply current	IVDD	-	TBD	-	mA	
TFT gate on voltage	VGH	-	18	-	V	
TFT gate off voltage	VGL	-	-6	-	V	
Analog power supply voltage	AVDD	-	9.6	-	V	
TFT common electrode voltage	VCOM	-	3.8	-	V	Note1

Note1 : The value is just the reference value. The customer can optimize the setting value by the different D-IC
VCOM must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc..

4. BACKLIGHT CHARACTERISTICS

(at Ta=25°C,RH=60%)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED forward voltage	VF	8.4	9.3	10.2	V	
LED forward current	IF	-	120	-	mA	IF=20*6mA
LED power consumption	PLED	-	1.116	-	W	Note1
Number of LED	-		18		PCS	
Connection mode	-	3 in series 6 in parallel			/	
LED life-time	-	30000	-	-	Hrs	Note2

Note1 : Calculator value for reference : IF*VF = PLED

Note2 : The LED life-time define as the estimated time to 50% degradation of initial brightness at Ta=25°C and
IF =120mA. The LED lifetime could be decreased if operating IF is larger than 120mA.

5. EXTERNAL DIMENSIONS

PIN DEFINE

PIN No.	SYMBOL	PIN No.	SYMBOL
1	VCOM	21	RXIN3+
2	VDD	22	GND
3	VDD	23	NC
4	NC	24	NC
5	REST	25	GND
6	STBYB	26	NC
7	DIMO	27	DIMO
8	RXIN0-	28	SELB
9	RXIN0+	29	AVDD
10	GND	30	GND
11	RXIN1-	31	LEDK
12	RXIN1+	32	LEDK
13	GND	33	L/R
14	RXIN2-	34	U/D
15	GND	35	VGL
16	RXIN2+	36	CABCEN1
17	RXCLKIN-	37	CABCEN0
18	RXCLKIN+	38	VGH
19	GND	39	LEDA
20	RXIN3-	40	LEDA

CONSTANT CURRENT:120mA,9.3V(REF.)
BACKLIGHT DRIVER CIRCUIT DIAGRAM

16.40

(0.20)
3.50±0.30
*6.00±0.50

TAPE

*3.45±0.20

*1.50MAX COMPONENT
STIFFENER
BACK
FRONT
CONTACT SIDE
*0.30±0.05

PULL TAPE

5.59
(6.83)

7.0 inch
1024*600 PIXELS

*164.90±0.30(OUTLINE)
156.70(BEZEL V.A)
154.21(LCD A.A)

P0.50*(40-1)=*19.50±0.05
*68.28±0.50

W=*0.35±0.05
*0.50±0.10
*20.50±0.10
11.30
40
34.50
*4.00±0.30

(4.83)
3.47
85.92(LCD A.A)
89.10(BEZEL V.A)
*100.00±0.30(OUTLINE)
*45.19±1.00

REV.	SYMBOL	DESCRIPTION	NAME	DATE
O		FIRST ISSUE		JAN-12-2022

ITEM	PARAMETERS
LCD SIZE	7.0 inch(DIAGONAL)
LCD TYPE	IPS/NORMALLY BLACK
RESOLUTION(H*V)	1024*600 PIXELS
POLARIZER TYPE	TRANSMISSIVE(ANTI-GLARE)
POWER SUPPLY INPUT VOLTAGE	3.3V(VDD)
I/O LOGIC VOLTAGE	/

ITEM	PARAMETERS
VIEWING DIRECTION(EYE)	FREE
OPERATING TEMPERATURE	-20°C TO +70°C
STORAGE TEMPERATURE	-30°C TO +80°C
IC	EK7900IHF3 + EK73217 OR COMPATIBLE
BACKLIGHT	EDGE,WHITE
CONNECTOR	ZIF

RoHS/REACH COMPLIANT	YES	
UNMARKED TOLERANCE	±0.30	
SCALE	FIT	UNIT	mm
SHEET	1 OF 1	REV.	O
TITLE	TFT MODULE	
PART NO.		
MODULE NO.	AVD-TT70WS-NN-014-S	
CUSTOMER NO.	/	

	NAME	DATE		NAME	DATE
DRAWN		JAN-12-2022			
CHECKED		JAN-12-2022			
APPROVED		JAN-12-2022			

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MARK"*"ARE IMPORTANT DIMENSIONS,MARK"()"ARE REFERENCE DIMENSIONS,MARK"★"ARE SPECIAL CHARACTERISTICS RELATED TO SAFETY,MARK"☆" ARE SPECIAL CHARACTERISTICS IRRELEVANT TO SAFETY,MARK"●"ARE IMPORTANT CHARACTERISTICS EXCEPT FOR THE SPECIAL CHARACTERISTICS.

6. ELECTRO - OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time	Tr+ Tf	-	-	25	40	ms	FIG.1	Note 1
Contrast ratio	Cr	-	600	800	-	-	FIG.2	Note 2
Surface luminance	Lv	θ=0°	180	250	-	cd/m^2	FIG.2	Note 3
Luminance uniformity	Yu	θ=0°	75	80	-	%	FIG.2	Note 4
NTSC	-	θ=0°	-	50	-	%	FIG.2	Note 5
Viewing angle	□	□=90°	-	85	-	deg	FIG.3	Note 6
		□=270°	-	85	-	deg	FIG.3	
		□=0°	-	85	-	deg	FIG.3	
		□=180°	-	85	-	deg	FIG.3	
CIE (x,y) chromaticity	Red x	θ=0° □=0° Ta=25°C	Typ -0.04	TBD	Typ +0.04	-	FIG.2 CIE1931	Note 5
	Red y			TBD		-		
	Green x			TBD		-		
	Green y			TBD		-		
	Blue x			TBD		-		
	Blue y			TBD		-		
	White x			TBD		-		
	White y			TBD		-		

Note1. Definition of response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black"state.Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%. For additional information see FIG1.

Note2.Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula. For more information see FIG.2.

$$\text{Contrast ratio} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Measured at the center area of the LCD

Note3.Definition of surface luminance

Surface luminance is the luminance with all pixels displaying white. For more information see FIG.2. Lv = Average Surface Luminance with all white pixels(P1,P2,P3, ...,Pn)

Note4.Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance.For more information see FIG.2.

$$Yu = \frac{\text{Minimum surface luminance with all white pixels (P1,P2,P3,......,Pn)}}{\text{Maximum surface luminance with all white pixels (P1,P2,P3,......,Pn)}}$$

Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity,The x,y value is determined by screen active area center position P5.For more information see FIG.2.

Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope or DMS series Instruments or compatible. For contrast ratio, Surface Luminance, Luminance uniformity and CIE,the testing data is base on TOPCON's BM-5or BM-7 photo detector or compatible.

FIG.1. The definition of response Time
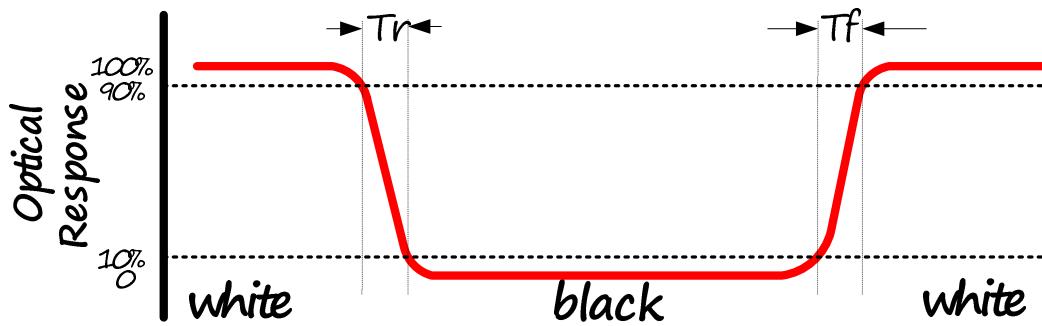
FIG.2. Measuring method for contrast ratio, surface luminance, luminance uniformity, CIE (x,y) chromaticity

Note ：The TFT module should be stabilized at a given temperature for 10 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 10 minutes in a windless room.

H,V : Active area

Light spot size □ =5mm (CS-2000/BM-7)50cm distance or compatible distance from the LCM surface to detector lens.

Test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter   CS2000/BM-7 or compatible ,see Figure b.
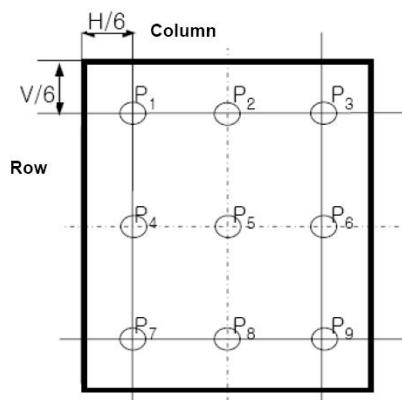
Figure a
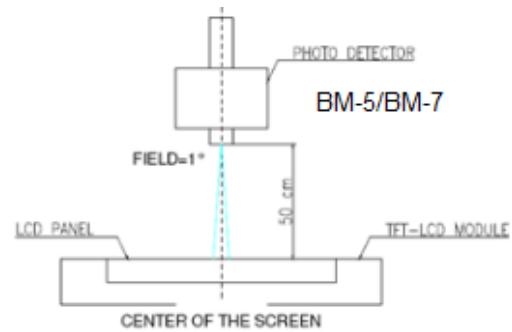
Figure b

FIG.3. The definition of viewing angle
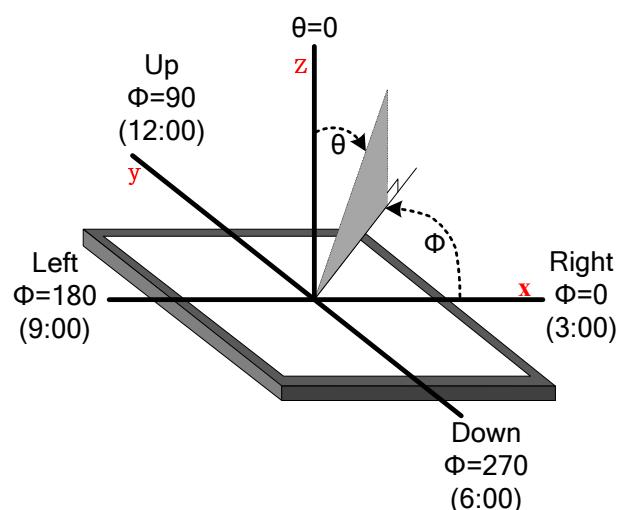
7. INTERFACE DESCRIPTION

Module Interface description

Interface No.	Name	I/O or connect to	Description
1	VCOM	P	Commom Voltage
2-3	VDD	P	Power supply for digital
4	NC	/	no connect
5	REST	I	Global reset pin. Active Low. Normally pull high.
6	STBYB	I	Standby mode & Normally pulled high.
7	GND	P	Ground
8	RXIN0-	I	LVDS data lane 0-
9	RXIN0+	I	LVDS data lane 0+
10	GND	P	Ground
11	RXIN1-	I	LVDS data lane 1-
12	RXIN1+	I	LVDS data lane 1+
13	GND	P	Ground
14	RXIN2-	I	LVDS data lane 2-
15	RXIN2+	I	LVDS data lane 2+
16	GND	P	Ground
17	RXCLKIN-	I	LVDS clk lane -
18	RXCLKIN+	I	LVDS clk lane +
19	GND	P	Ground
20	RXIN3-	I	LVDS data lane 3-
21	RXIN3+	I	LVDS data lane 3+
22	GND	P	Ground
23-24	NC	/	no connect
25	GND	P	Ground
26	NC	/	no connect
27	DIMO	/	no connect
28	SELB	I	LVDS Horizontal Sync input,L:8bits,H:6bits
29	AVDD	P	Power supply for analog
30	GND	P	Ground
31-32	LEDK	P	LED Cathode for BL
33	L/R	I	Source Right or Left sequence control. Normally pull high.
34	U/D	I	Gate Up or Down scan control. Normally pull low.
35	VGL	P	Voltage for gate off
36	CABCEN1	/	no connect
37	CABCEN0	/	no connect
38	VGH	P	Voltage for gate on
39-40	LEDA	P	LED ANODE for BL

I: input, O: output, P: Power,NC or / : No connection

8.AC CHARACTERISTICS

(TA = -20 to 85°C, VDD = 2.3 to 3.6V, AVDD = 8 to 13.5V, GND = AGND = 0V)

LVDS DC characteristic

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential input high threshold voltage	RxVTH			+0.1V	V	RxVCM=1.2V
Differential input low threshold voltage	RxVTL	-0.1			V	
Input voltage range(single-end)	RxVIN	0		2.4	V	
Differential input common mode voltage	RxVCM	$|V_{ID}|/2$		$2.4 - |V_{ID}|/2$	V	
Differential input voltage	$|V_{ID}|$	0.2		0.6	V	
Differential input leakage current	RxVTH	-10		+10	V	
LVDS Digital Operating Current	Iddlvsd	-	40(TBD)	50	mA	Fclk=65Mhz, VDD=3.3V
LVDS Digital Standby Current	Istlvds	-	10(TBD)	50	uA	Clock & all functions are stop
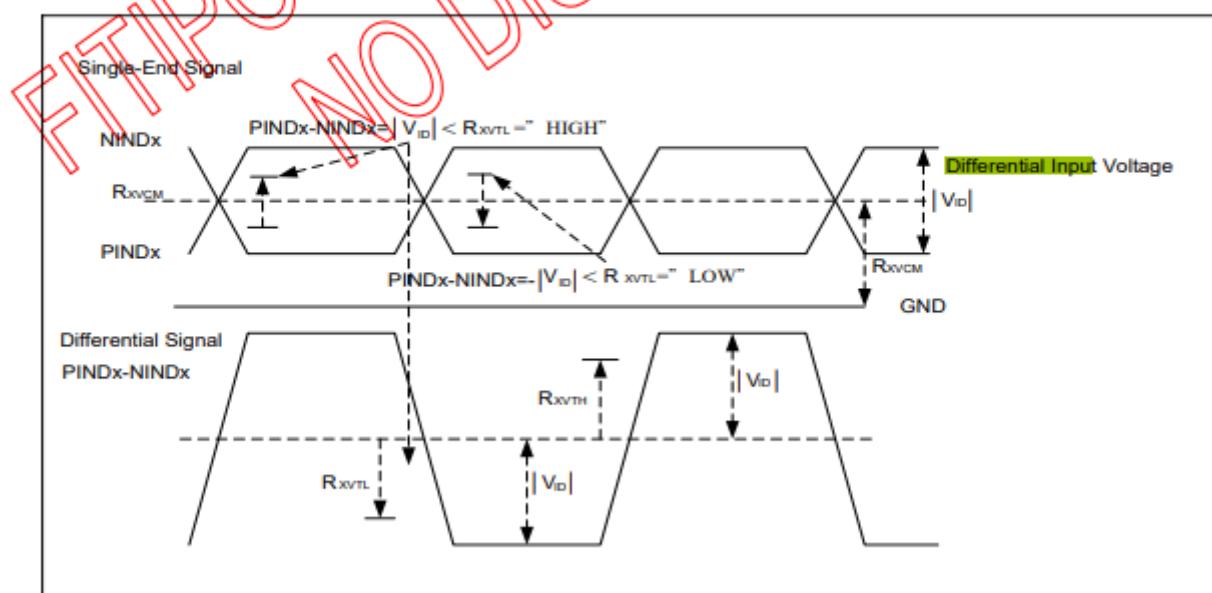
DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	600			H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	35	200	H

HV mode(1)

HV mode
Horizontal input timing

Parameter		Symbol	Value			Unit
Horizontal display area		thd	1024			DCLK
DCLK frequency@ Frame rate=60hz		fclk	Min.	Typ.	Max.	
			44.9	51.2	63	Mhz
1 Horizontal Line		th	1200	1344	1400	DCLK
HSYNC pulse width	Min.	thpw	1			DCLK
	Typ.		—			
	Max.		140			
HSYNC back porch		thbp	160	160	160	
HSYNC front porch		thfp	16	160	216	

HV mode(2)

Vertical input timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tvpw	1	—	20	H
VSYNC back porch	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

6.6.1. 6-bit LVDS input(HSD="H")

PCLK									
NCLK									
IND0	R0	G0	R5	R4	R3	R2	R1	R0	G0
IND1	G1	B1	B0	G5	G4	G3	G2	G1	B1
IND2	B2	DE	VS	HS	B5	B4	B3	B2	DE
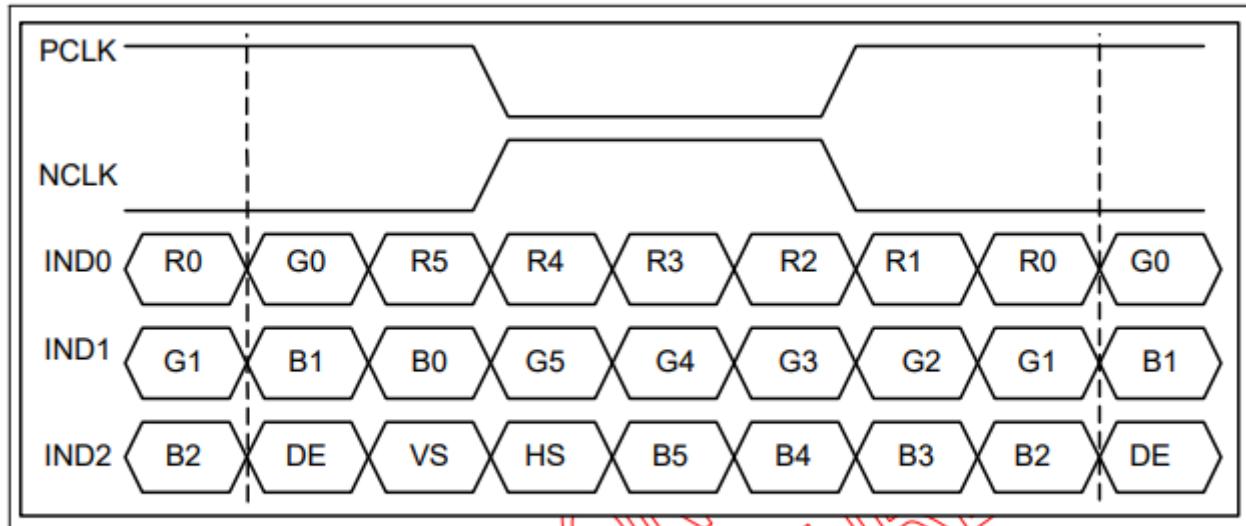
6-bit LVDS Input Timing chart

6.6.2. 8-bit LVDS input(HSD="L")

PCLK									
NCLK									
IND0	R0	G0	R5	R4	R3	R2	R1	R0	G0
IND1	G1	B1	B0	G5	G4	G3	G2	G1	B1
IND2	B2	DE	VS	HS	B5	B4	B3	B2	DE
IND3	R6	-	B7	B6	G7	G6	R7	R6	-
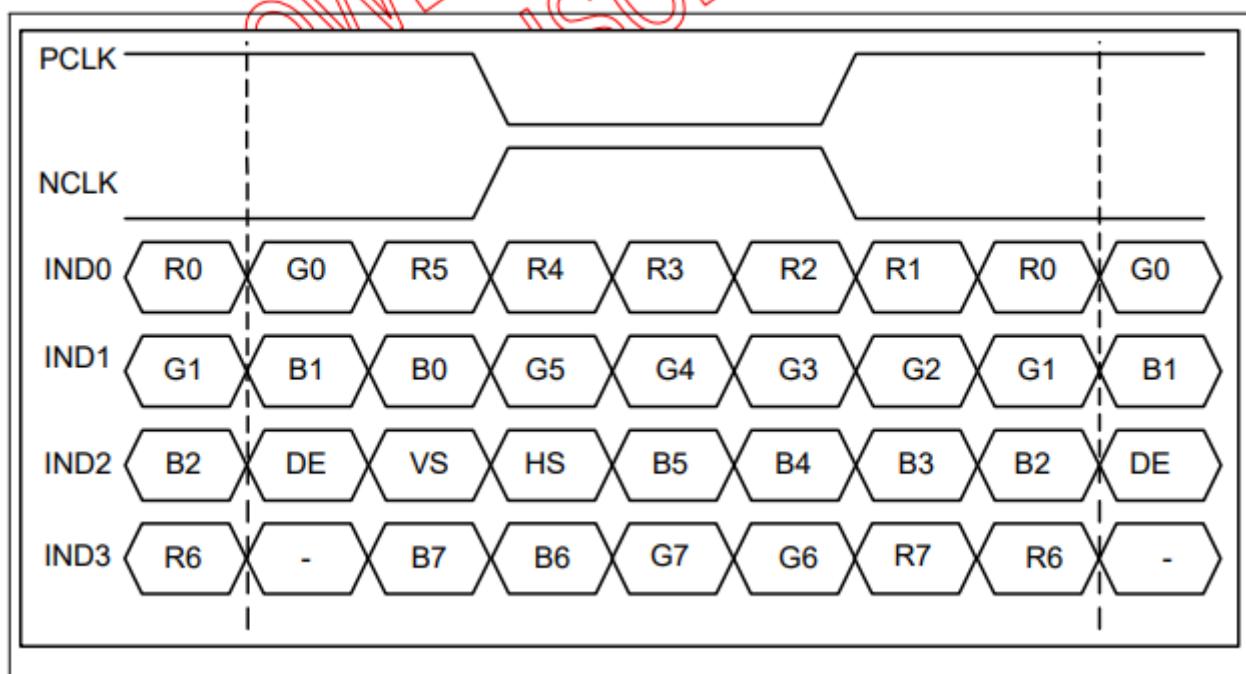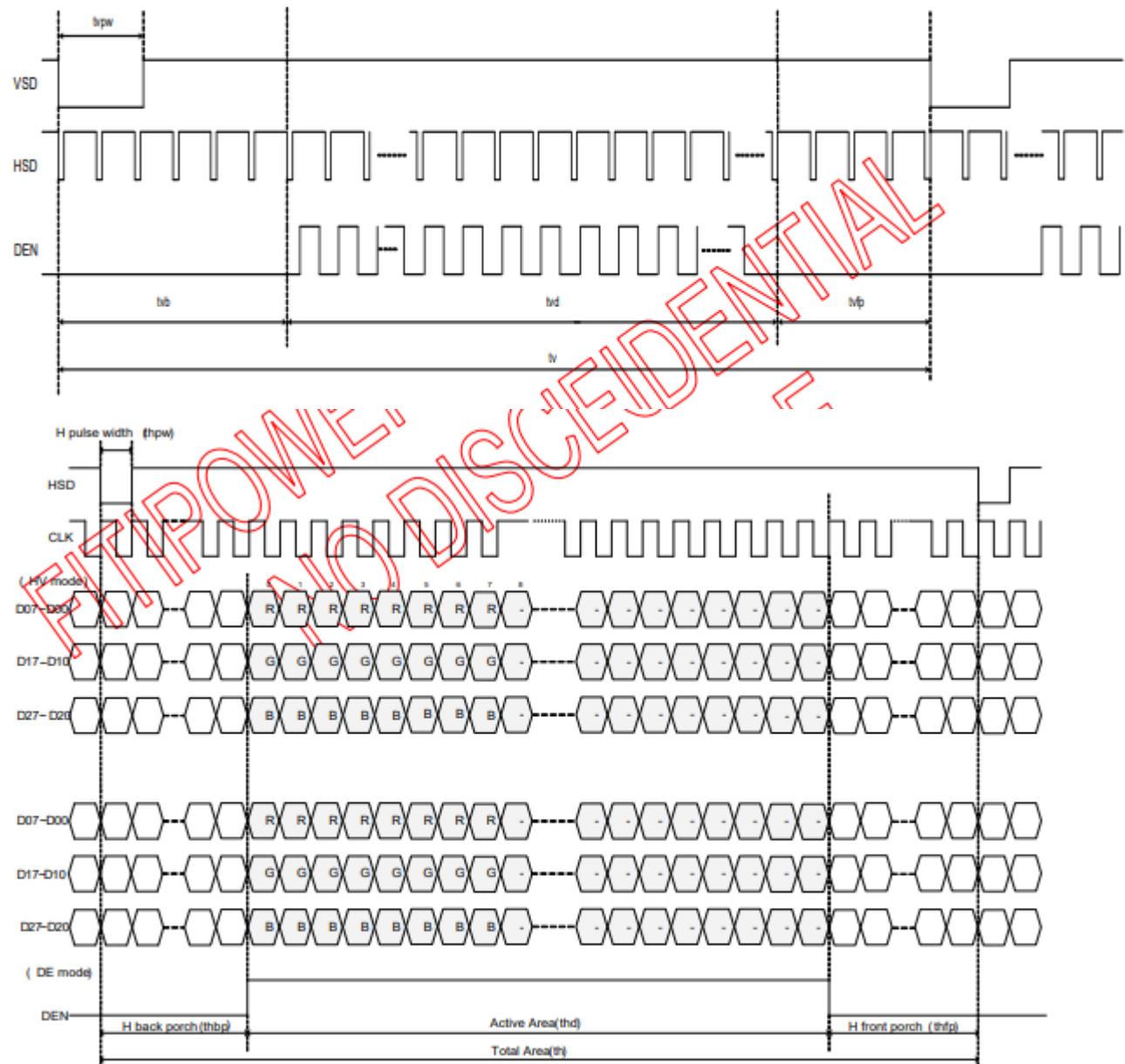
9. POWER SEQUENCE

To prevent the device damage from latch up and Improve subjective display effect,the power ON/OFF sequence shown below must be followed.
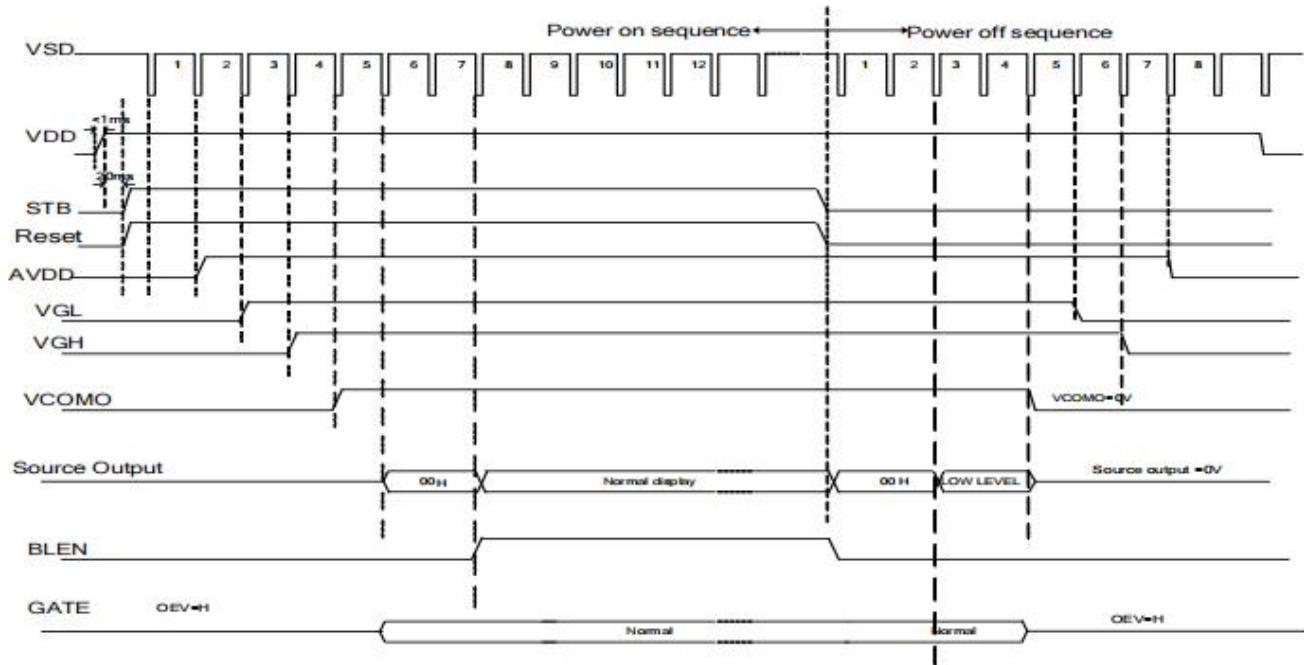
Power On/Off timing chart
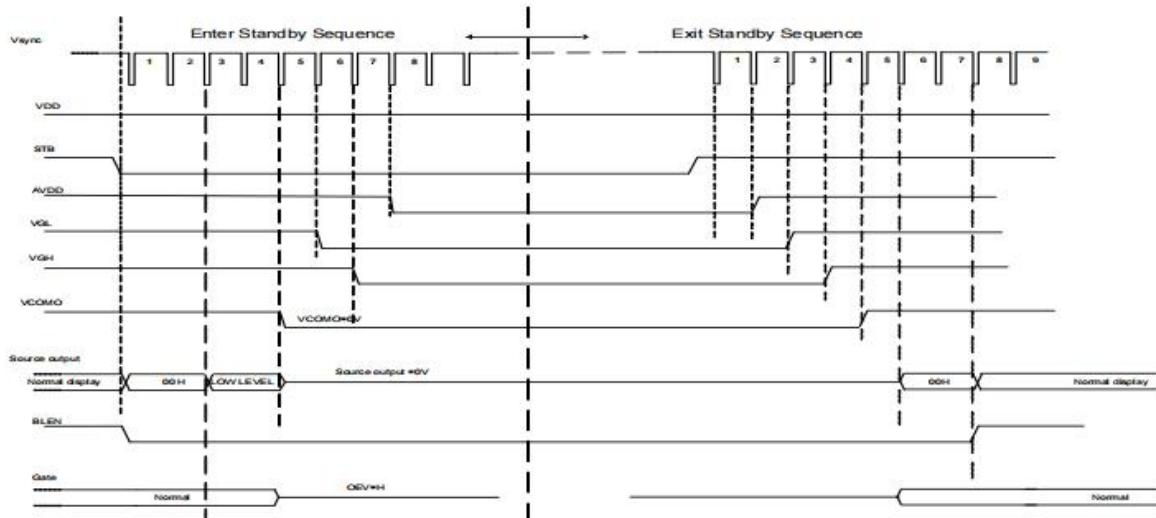
Enter and Exit Standby Mode timing chart

Note: Low level=3Fh,when NBW=L(Normally white)
Low level=00h,when NBW=H(Normally black)

Note:
Low level=3Fh,when NBW=L(Normally white) Low level=00h,when NBW=H(Normally black)

10. RELIABILITY TEST CONDITIONS

No.	Test item	Test condition		Inspection after test
10.1	High temperature storage test	+80°C/240 hours		Inspection after 2~4hours storage at room temperature, the sample shall be free from defects : 1.Current changing value before test and after test is 50% larger; 2. Function defect : Non-display,abnormal-display,missing lines, Short lines,ITO corrosion; 3.Visual defect : Air bubble in the LCD,Seal leak,Glass crack.
10.2	Low temperature storage test	-30°C/240 hours		
10.3	High temperature operating test	+70°C/120 hours		
10.4	Low temperature operating test	-20°C/120 hours		
10.5	Thermal Shock (non-operation)	-30°C ←→ +80°C/10cycles (30min.)(<30sec.) (30min.)		
10.6	High temperature high humidity test	+50°C*90% RH/120 hours		
10.7	Vibration test for Packaging	Frequency : 250 r/min Amplitude : 1 inch Time: 45min		
10.8	Drop test for Packaging	Drop direction: 1 corner/3 edges/6 sides 10 times		
		Packing weight(kg)	Drop height(cm)	
		〈11	80±1.6	
		11≦G〈21	60±1.2	
		21≦G〈31	50±1.0	
		31≦G〈40	40±0.8	
10.9	ESD test	Air discharge: ±8KV, 10times Contact discharge: ±4KV, 10times		

Remark :
1.The test samples should be applied to only one test item.
2.Sample size for each test item is 3~5pcs.
3.For High temperature high humidity test, Pure water(Resistance>10MΩ) 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.B/L evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence B/L has.
6.Failure judgment criterion: Basic specification, Electrical characteristic, Mechanical characteristic, Optical characteristic.
7.After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

11.INSPECTION CRITERION

Refer to 《Inspection Criterion for TFT Products-To customer》, DOCUMENT NO.: AVD(WI)-00-QA-048

12. HANDLING PRECAUTIONS

12.1 Mounting method

The LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.
Extreme care should be needed when handling the LCD modules.

12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent
[recommended below] and wipe lightly :

●.Isopropyl alcohol

●.Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent :

●.Water

●.Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated :

●.Soldering flux

●.Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

12.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you :

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

12.4 Packing

Module employ LCD elements and must be treated as such.

●.Avoid intense shock and falls from a height.

●.To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity.

12.5 Caution for operation

●.It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.

●.An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

●.Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.

●.If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.

●.A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

●.Usage under the maximum operating temperature, 50%Rh or less is required.

●.When fixed patterns are displayed for a long time,remnant image is likely to occur.

12.6 Storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

●.Storing in an ambient temperature 10°C to 30°C, and in a relative humidity of 45% to 75%. Don't expose to sunlight or fluorescent light.

●.Storing in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.

●.Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.

●.Storing with no touch on polarizer surface by the anything else.
It is recommended to store them as they have been contained in the inner container at the time of delivery from us.

12.7 Safety
●.It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
●.When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

13. PRECAUTION FOR USE

13.1 A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

13.2 On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.
●.When a question is arisen in this specification.
●.When a new problem is arisen which is not specified in this specifications.
●.When an inspection specifications change or operating condition change in customer is reported to AVD, and some problem is arisen in this specification due to the change.
●.When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

14. PACKING SPECIFICATION

Please consult our technical department for detail information.

15. INITIALIZATION CODE

Please consult our technical department for detail information.

16. HSF COMPLIANCE

●.This products complies with ROHS 2011/65/EU and 2015/863/EU 、REACH 1907/2006/EC requirements, and the packaging complies with 94-62-EC.