DESCRIPTION

The following specifications are applied to the following TFT open cell.

Product Name : AF094F030B

General Specifications

Effective Display Area	: (H) 819.36 × (V) 460.89	(mm)
Number of Pixels	: (H)1,920×(V)1,080	(pixels)
Pixel Pitch	: (H) 0.42675×(V) 0.42675	(mm)
Color Pixel Arrangement	: R+G+B Vertical Stripe	
Display Mode	: Transmissive Mode Normally Black Mode	
Top Polarizer Type	: Anti-Glare	
Number of Colors	: 16,777,216	(colors)
External Dimensions	: (H)864.1 x (V)519.6 x (t)6 typ	(mm)
Weight	:Typ. 1,755	(g)

1. ABSOLUTE MAXIMUM RATINGS

1.1 Environmental Absolute Maximum Ratings

ITEM	Operating		Storage		Unit	Note
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	℃	1),5),6)
Humidity	2)		2)		%RH	1),6)
Vibration	-	4.9(0.5G)	-	9.8(1.0G)	m/s^2	3),6)
Shock	-	29.4(3G)	-	196(20G)	m/s^2	4),6)
Corrosive Gas	Not Acceptable		Not Acceptable		-	6)

Note 1) Temperature and Humidity should be applied to the glass surface of a TFT module,
not to the system installed with a module.
The temperature at the center of rear surface should be less than 70℃ on the condition of operating.

2) Ta≦40 ℃ · · · · · · Relative humidity should be less than 85%RH max. Dew is prohibited.
Ta＞40 ℃ · · · · · · Relative humidity should be lower than the moisture of the 85%RH at 40℃.

3) Frequency of the vibration is between 15Hz and 100Hz. (Remove the resonance point)

4) Pulse width of the shock is 10 ms.

5) Long operation under low temperature may cause some portion of display area to be reddish for several minutes after turning on the product.
However, it does not affect the characteristics and reliability of the product.

6) Environmental Absolute Maximum Ratings is Based on IPS Alpha Technology TFT module AX094F030F.
Leave TFT open cell alone,this environmental ratings can't be guaranteed.The users have a responsibility in considering ability of other parts of TFT module and TFT module process.

1.2 Electrical Absolute Maximum Ratings

Based on IPS Alpha Technology, Ltd. Module AX094F030F Vss = 0 V

ITEM	SYMBOL	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	0	13.2	V	
Input Voltage for logic	V_I	-0.3	3.6	V	1)
Electrostatic Durability	V_{ESD0}	±100		V	2),3)
	V_{ESD1}	±8		kV	2),4)

Note 1)It is applied to pixel data signal and clock signal.
2)Discharge Coefficient：200pF-250Ω, Environmental：25℃-70%RH
3)It is applied to I/F connector pins.
4)It is applied to the surface of a metallic bezel and a LCD panel.

1.3 Environmental Absolute Ratings of TFT open cell

Storage Condition : With shipping package
Storage temperatue range : 25±5 ℃
Storage humidity range : 50±10%RH
Shelf life : a month

2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted.

The optical characteristics should be measured in a dark room or equivalent state.

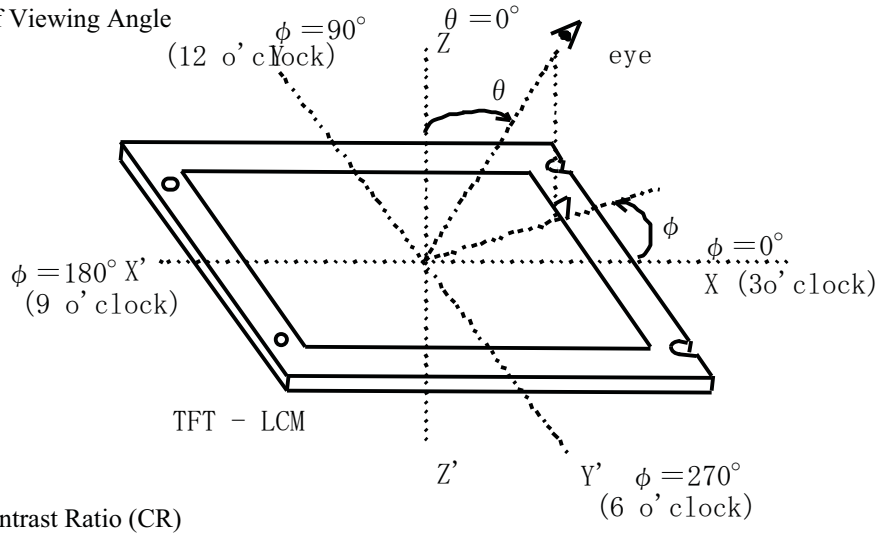
Measuring equipment：CS-1000A, or equivalent

Ambient Temperature =25℃、VDD=12.0V、f V=60Hz、

Light source is backlight of IPS Alpha Technology TFT module AX094F030F that voltage setting is VBL=24V, BRT=3.1V.

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast Ratio		C R	θ = 0° 1)	600	1100	-	-	2)
Response Time	Rise	ton		-	8	20	ms	3)
	Fall	toff		-	6	20	ms	3)
Brightness of white		Bwh		350	450	-	cd/m^2	
Brightness uniformity		Buni		-	-	30	%	4)
Color Chromaticity (CIE)	Red	χ		0.62	0.65	0.68	-	【Gray scale =255】
		y		0.30	0.33	0.36		
	Green	χ		0.27	0.30	0.33		
		y		0.59	0.62	0.65		
	Blue	χ		0.12	0.15	0.18		
		y		0.04	0.07	0.10		
	White	χ		0.243	0.273	0.303		
		y		0.245	0.275	0.305		
Variation of Color Position (CIE)	Red	Δ χ	θ =+50° φ =0°、90° 180°、270° 1)	-	-	0.04	-	5) 【Gray scale =255】
		Δ y		-	-	0.04		
	Green	Δ χ		-	-	0.04		
		Δ y		-	-	0.04		
	Blue	Δ χ		-	-	0.04		
		Δ y		-	-	0.04		
	White	Δ χ		-	-	0.04		
		Δ y		-	-	0.04		
Contrast Ratio at 85°		CR85	φ =0°, 90°, 180°, 270° 1)	10	-	-	-	Estimated value

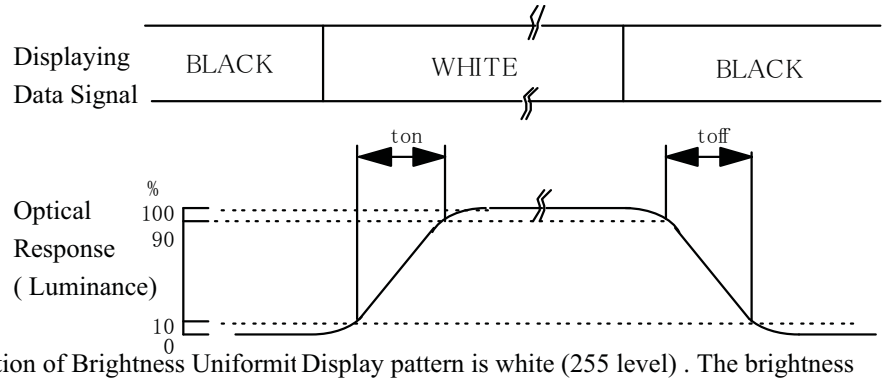
Note 1) Definition of Viewing Angle



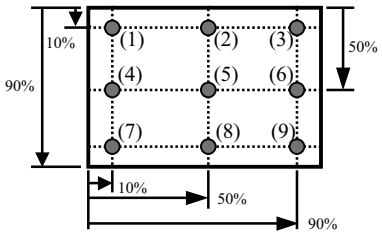
2) Definition of Contrast Ratio (CR)

$$CR = \frac{\text{(Luminance at displaying WHITE)}}{\text{(Luminance at displaying BLACK)}}$$

3) Definition of Response Time



4) Definition of Brightness Uniformit Display pattern is white (255 level) . The brightness uniformity is defined as the following equation. Brightness at each point is measured, and average, maximum and minimum brightness is calculated.



● : measuring points

$$Buni = \frac{\left| \text{Bmax or Bmin - Bave} \right|}{\text{Bave}} \times 100$$

where, Bmax = Maximum brightness

Bmin = Minimum brightness

$$Bave = \text{Average brightness} = \frac{\sum_{k=1}^{9} (B(k))}{9}$$

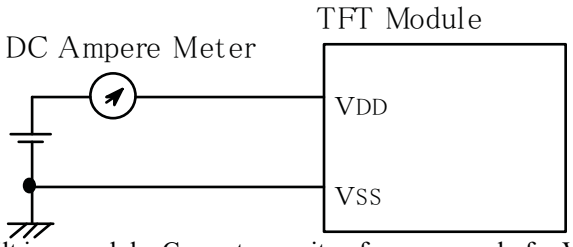
5) Variation of color position on CIE is defined as difference between colors at θ =0°and at θ =50°& ϕ =0°90°180°270°.

3. ELECTRICAL CHARACTERISTICS

Based on IPS Alpha Technology, Ltd. Module AX094F030F　　Ta=25℃、Vss=0V

ITEM		SYSTEM	Min.	Typ	Max	単位	備考
Power supply Voltage		VDD	11.4	12.0	12.6	V	
Power supply Current		IDD	-	0.82	1.25	A	1),2)
Ripple voltage of power Supply		VDDR	-	-	150	mV	
LVDS select	High	LVDSSEL	2.2	2.5	3.6	V	
	Low		0	0	0.4	V	

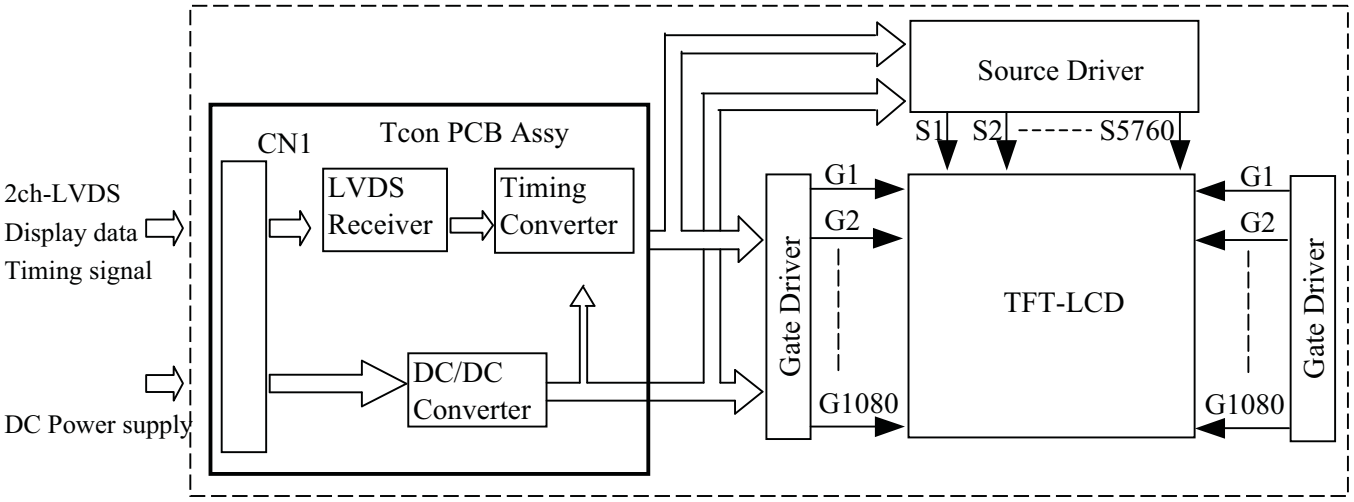
Note 1)fV=60.0Hz， fCLK=66MHz， VDD=12.0V， and Display pattern is horizontal stripe.



2) Current fuse is built in a module. Current capacity of power supply for VDD should be larger than 4A, so that the fuse can be opened at the trouble of electrical circuit of module.

4. BLOCK DIAGRAM

Based on IPS Alpha Technology, Ltd. Module AX094F030F



5. INTERFACE PIN ASSIGNMENT

5. 1 TFT-LCD MODULE

Based on IPS Alpha Technology, Ltd. Module AX094F030F.

CN1:JAE FI-R51S-HF

(Matching connector : JAE FI-R51-HL)

PIN No.	Symbol	Description	Note
1	VSS	GND(0V)	2)
2	IC	Internally Connected , Keep Open	
3	IC		
4	IC		
5	IC		
6	IC		
7	LVDSSEL	Select LVDS Data Format	
8	IC	Internally Connected, Keep Open	
9	IC		
10	IC		
11	VSS	GND(0V)	2)
12	RxA0-	ODD Pixel Data	3)
13	RxA0+		
14	RxA1-	ODD Pixel Data	3)
15	RxA1+		
16	RxA2-	ODD Pixel Data	3)
17	RxA2+		
18	VSS	GND(0V)	2)
19	CLKA-	ODD Pixel Clock	3)
20	CLKA+		
21	VSS	GND(0V)	2)
22	RxA3-	ODD Pixel Data	3)
23	RxA3+		
24	IC	Internally Connected, Keep Open	
25	IC		
26	VSS	GND(0V)	2)
27	VSS		

PIN No.	Symbol	Description	Note
28	RxB0-	EVEN Pixel Data	3)
29	RxB0+		
30	RxB1-	EVEN Pixel Data	3)
31	RxB1+		
32	RxB2-	EVEN Pixel Data	3)
33	RxB2+		
34	VSS	GND(0V)	2)
35	CLKB-	EVEN Pixel Clock	3)
36	CLKB+		
37	VSS	GND(0V)	2)
38	RxB3-	EVEN Pixel Data	3)
39	RxB3+		
40	IC	Internally Connected, Keep Open	
41	IC		
42	VSS	GND(0V)	2)
43	VSS		
44	VSS		
45	VSS		
46	VSS		
47	NC	No Connection	
48	VDD	Power Supply (typ.+12V)	1)
49	VDD		
50	VDD		
51	VDD		

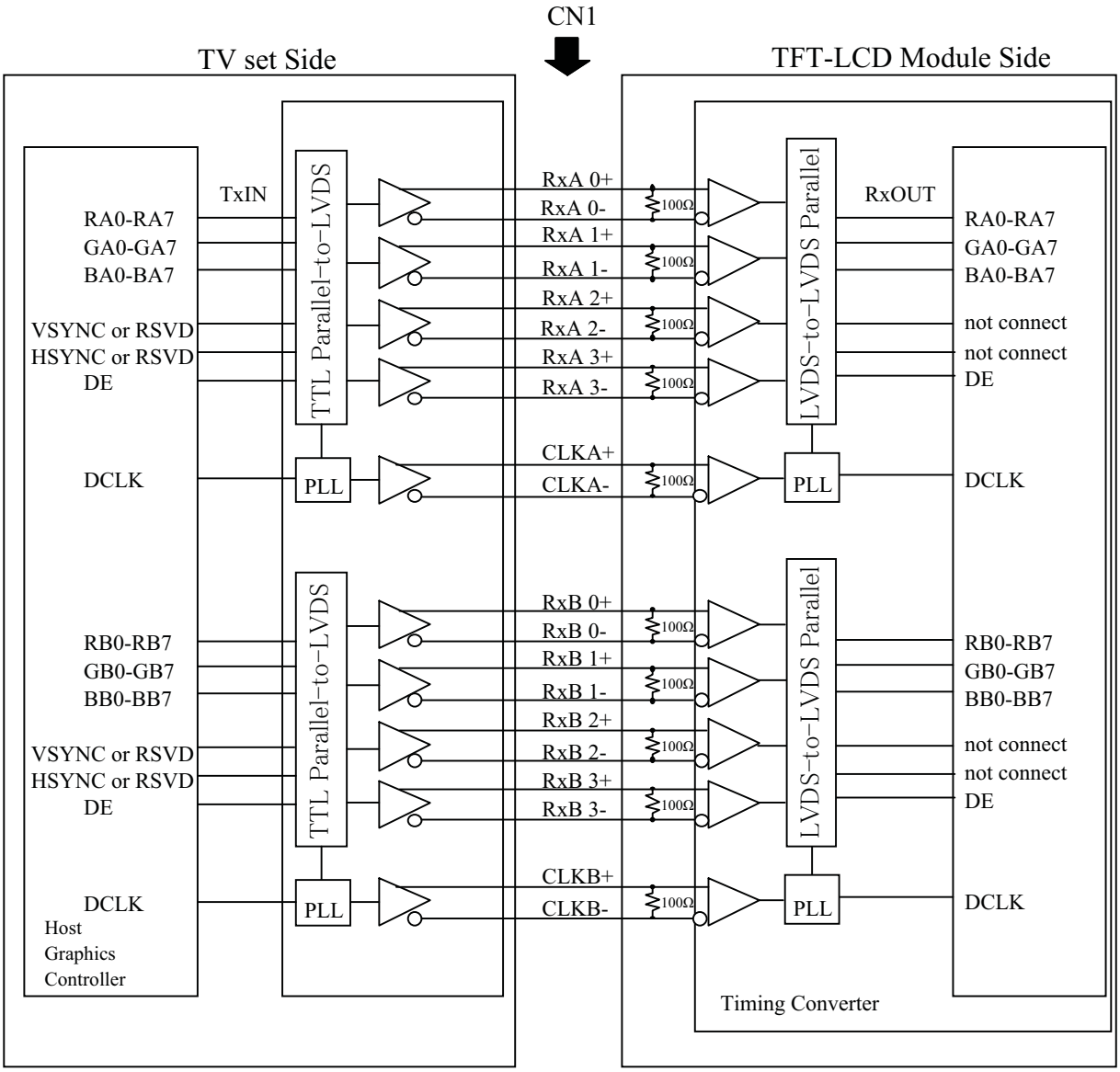
Notes 1) All VDD pins shall be connected to +12.0V(Typ.).

2) All VSS pins shall be grounded. Metal bezel is internally connected to VSS.

3) Rx n+ and Rx n- (n=0,1,2,3) should be wired by twist-pairs or side-by-side FPC patterns, respectively.

5.2 BLOCK DIAGRAM OF INTERFACE

Based on IPS Alpha Technology, Ltd. Module AX094F030F.



RA0～RA7, RB0～RB7	: Pixel R Data	(7; MSB, 0; LSB)
GA0～GA7, RB0～RB7	: Pixel G Data	(7; MSB, 0; LSB)
BA0～BA7, BB0～BB7	: Pixel B Data	(7; MSB, 0; LSB)
DE	: Data Enable	

Notes 1) The system must have the transmitter to drive the module.

2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

5.3 LVDS INTERFACE

Based on IPS Alpha Technology, Ltd. Module AX094F030F.

The 7st LVDSSEL signal of the connector pin specification is “L”or open.【LVDSSEL = L or open】

	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER		TFT CONTROL
		PIN	INPUT	TV Set	TFT-LCD	PIN	OUTPUT	INPUT
24bit	RA0/RB0	51	Tx IN0	TA OUT0+	RxA/B 0+	27	Rx OUT0	RA0/RB0
	RA1/RB1	52	Tx IN1			29	Rx OUT1	RA1/RB1
	RA2/RB2	54	Tx IN2			30	Rx OUT2	RA2/RB2
	RA3/RB3	55	Tx IN3			32	Rx OUT3	RA3/RB3
	RA4/RB4	56	Tx IN4			33	Rx OUT4	RA4/RB4
	RA5/RB5	3	Tx IN6	TA OUT0-	RxA/B 0-	35	Rx OUT6	RA5/RB5
	GA0/GB0	4	Tx IN7			37	Rx OUT7	GA0/GB0
	GA1/GB1	6	Tx IN8	TA OUT1+	RxA/B 1+	38	Rx OUT8	GA1/GB1
	GA2/GB2	7	Tx IN9			39	Rx OUT9	GA2/GB2
	GA3/GB3	11	Tx IN12			43	Rx OUT12	RA3/RB3
	GA4/GB4	12	Tx IN13			45	Rx OUT13	RA4/RB4
	GA5/GB5	14	Tx IN14			46	Rx OUT14	RA5/RB5
	BA0/BB0	15	Tx IN15	TA OUT1-	RxA/B 1-	47	Rx OUT15	RA0/RB0
	BA1/BB1	19	Tx IN18			51	Rx OUT18	RA1/RB1
	BA2/BB2	20	Tx IN19	TA OUT2+	RxA/B 2+	53	Rx OUT19	RA2/RB2
	BA3/BB3	22	Tx IN20			54	Rx OUT20	RA3/RB3
	BA4/BB4	23	Tx IN21			55	Rx OUT21	RA4/RB4
	BA5/BB5	24	Tx IN22			1	Rx OUT22	RA5/RB5
	HSYNC/RSVD 1)	27	Tx IN24			3	Rx OUT24	HSYNC/RSVD 1)
	VSYNC/RSVD 1)	28	Tx IN25	TA OUT2-	RxA/B 2-	5	Rx OUT25	VSYNC/RSVD 1)
	DE	30	Tx IN26			6	Rx OUT26	DE
	RA6/RB6	50	Tx IN27	TA OUT3+	RxA/B 3+	7	Rx OUT27	RA6/RB6
	RA7/RB7	2	Tx IN5			34	Rx OUT5	RA7/RB7
	GA6/GB6	8	Tx IN10			41	Rx OUT10	GA6/GB6
	GA7/GB7	10	Tx IN11			42	Rx OUT11	GA7/GB7
	BA6/BB6	16	Tx IN16			49	Rx OUT16	BA6/BB6
	BA7/BB7	18	Tx IN17	TA OUT3-	RxA/B 3-	50	Rx OUT17	BA7/BB7
	RSVD 1)	25	Tx IN23			2	Rx OUT23	RSVD 1)
	DCLK	31	TxCLK IN	TxCLK OUT+ TxCLK OUT-	RxCLKA/B IN+ RxCLKA/B IN-	26	RxCLK OUT	DCLK

RA0～RA7, RB0～RB7 :Pixel R Data (7;MSB, 0;LSB)

GA0～GA7, GB0～GB7 :Pixel G Data (7;MSB, 0;LSB)

BA0～BA7, BB0～BB7 :Pixel B Data (7;MSB, 0;LSB)

DE :Data Enable

Notes 1)RSVD(reserved)pins on the transmitter shall be tied to"H"or"L".

The 7st LVDSSEL signal of the connector pin specification is “H”.【LVDSSEL = H】

	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER		TFT CONTROL
		PIN	INPUT	TV Set	TFT-LCD	PIN	OUTPUT	INPUT
24bit	RA2/RB2	51	Tx IN0	TA OUT0+	RxA/B 0+	27	Rx OUT0	RA2/RB2
	RA3/RB3	52	Tx IN1			29	Rx OUT1	RA3/RB3
	RA4/RB4	54	Tx IN2			30	Rx OUT2	RA4/RB4
	RA5/RB5	55	Tx IN3			32	Rx OUT3	RA5/RB5
	RA6/RB6	56	Tx IN4			33	Rx OUT4	RA6/RB6
	RA7/RB7	3	Tx IN6	TA OUT0-	RxA/B 0-	35	Rx OUT6	RA7/RB7
	GA2/GB2	4	Tx IN7			37	Rx OUT7	GA2/GB2
	GA3/GB3	6	Tx IN8	TA OUT1+	RxA/B 1+	38	Rx OUT8	GA3/GB3
	GA4/GB4	7	Tx IN9			39	Rx OUT9	GA4/GB4
	GA5/GB5	11	Tx IN12			43	Rx OUT12	GA5/GB5
	GA6/GB6	12	Tx IN13			45	Rx OUT13	GA6/GB6
	GA7/GB7	14	Tx IN14			46	Rx OUT14	GA7/GB7
	BA2/BB2	15	Tx IN15	TA OUT1-	RxA/B 1-	47	Rx OUT15	BA2/BB2
	BA3/BB3	19	Tx IN18			51	Rx OUT18	BA3/BB3
	BA4/BB4	20	Tx IN19	TA OUT2+	RxA/B 2+	53	Rx OUT19	BA4/BB4
	BA5/BB5	22	Tx IN20			54	Rx OUT20	BA5/BB5
	BA6/BB6	23	Tx IN21			55	Rx OUT21	BA6/BB6
	BA7/BB7	24	Tx IN22			1	Rx OUT22	BA7/BB7
	HSYNC/RSVD 1)	27	Tx IN24			3	Rx OUT24	HSYNC/RSVD 1)
	VSYNC/RSVD 1)	28	Tx IN25	TA OUT2-	RxA/B 2-	5	Rx OUT25	VSYNC/RSVD 1)
	DE	30	Tx IN26			6	Rx OUT26	DE
	RA0/RB0	50	Tx IN27	TA OUT3+	RxA/B 3+	7	Rx OUT27	RA0/RB0
	RA1/RB1	2	Tx IN5			34	Rx OUT5	RA1/RB1
	GA0/GB0	8	Tx IN10			41	Rx OUT10	GA0/GB0
	GA1/GB1	10	Tx IN11			42	Rx OUT11	GA1/GB1
	BA0/BB0	16	Tx IN16			49	Rx OUT16	BA0/BB0
	BA1/BB1	18	Tx IN17	TA OUT3-	RxA/B 3-	50	Rx OUT17	BA1/BB1
	RSVD 1)	25	Tx IN23			2	Rx OUT23	RSVD 1)
	DCLK	31	TxCLK IN	TxCLK OUT+ TxCLK OUT-	RxCLKA/B IN+ RxCLKA/B IN-	26	RxCLK OUT	DCLK

RA0～RA7, RB0～RB7 :Pixel R Data (7;MSB, 0;LSB)
GA0～GA7, GB0～GB7 :Pixel G Data (7;MSB, 0;LSB)
BA0～BA7, BB0～BB7 :Pixel B Data (7;MSB, 0;LSB)
DE :Data Enable

Notes 1)RSVD(reserved)pins on the transmitter shall be tied to"H"or"L".

5.4 CORRESPONDENCE BETWEEN INPUT DATA AND DISPLAY IMAGE

Based on IPS Alpha Technology, Ltd. Module AX094F030F.

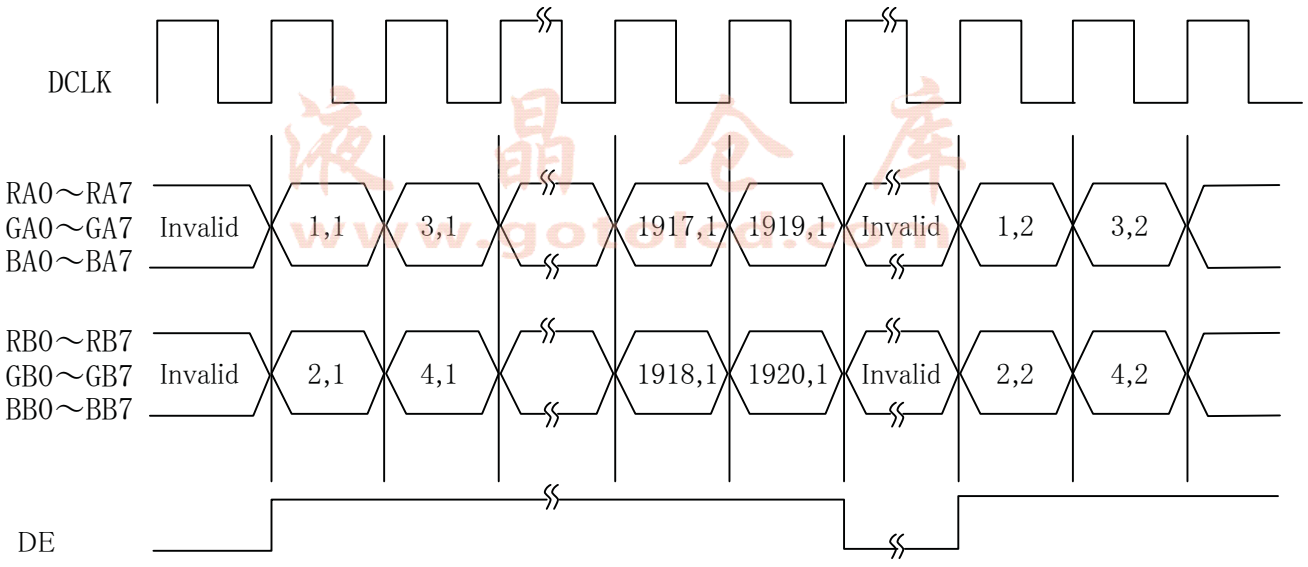
Display data of adjacent one pixel is latched during one cycle of DCLK.

	(1,1)			(1,2)	
RA	GA	BA	RB	GB	BB

odd pixel : RA0～RA7 :R data
GA0～GA7 :G data
BA0～BA7 :B data

Even pixel: RB0～RB7 :R data
GB0～GB7 :G data
BB0～BB7 :B data

1, 1	1, 2	1, 3	----------	1, 1920
2, 1	2, 2	2, 3	----------	2, 1920
3, 1	3, 2	3, 3	----------	3, 1920
⋮	⋮	⋮		⋮
1080, 1	1080, 2	1080, 3	----------	1080, 1920



5.5 RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNALS

Based on IPS Alpha Technology, Ltd. Module AX094F030F.

Color	Input	Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
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
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	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
	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
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
	Red (1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
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
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

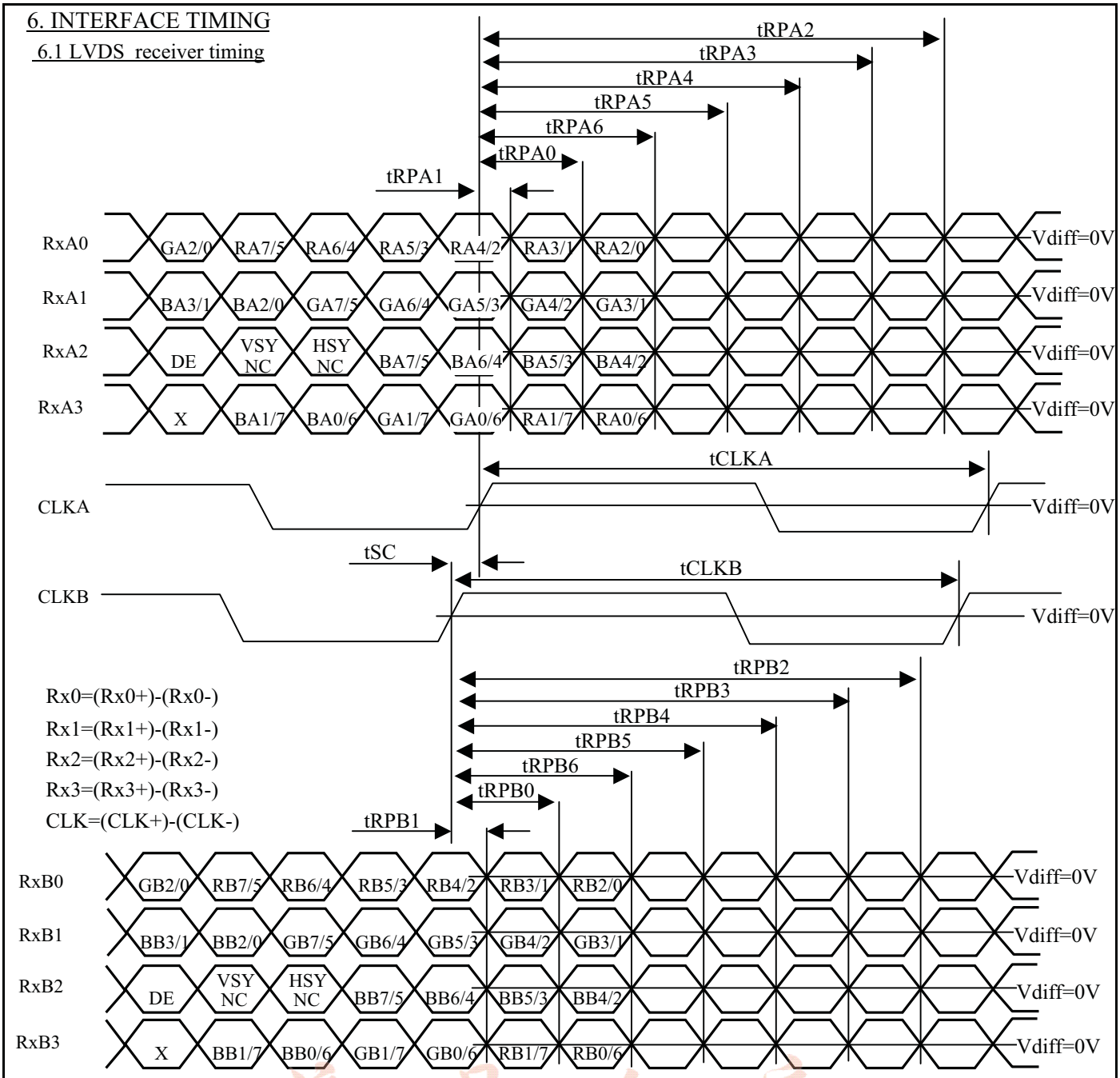
Notes 1) Definition of gray scale:

Color(n) ・・・・ Number in parenthesis indicates gray scale level. Larger n corresponds to brighter level.

2) Data: 1:High, 0:Low

6. INTERFACE TIMING

6.1 LVDS receiver timing

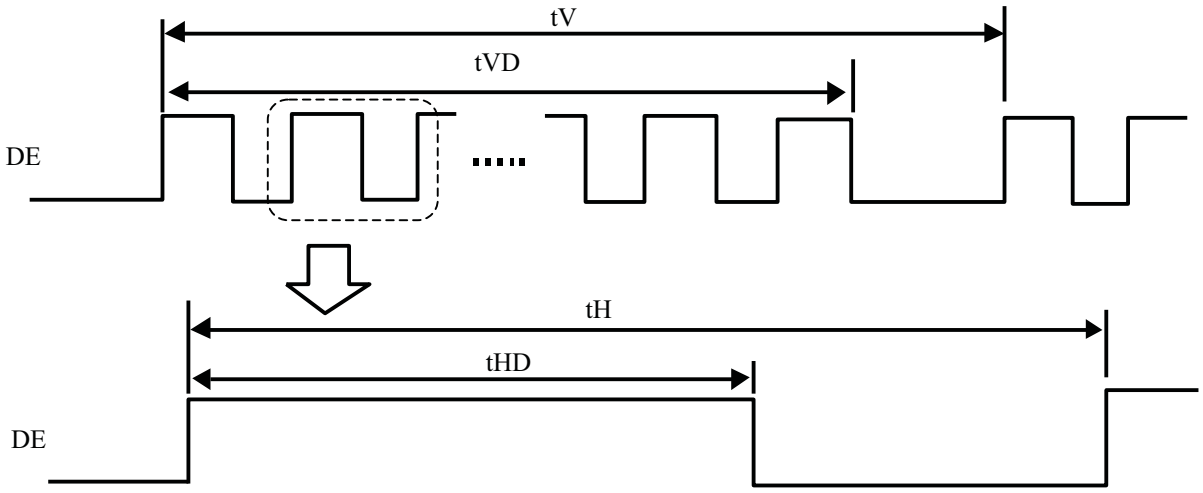


Item		Symbol	Min	Typ	Max	Unit	Note
CLK	Frequency	DCLK	65	66	71	MHz	=1/tclk
	CLK Skew	tSC	-4.0	0	+4.0	ns	
	0 data position	tRP0	1/7tCLK - 0.4	1/7tCLK	1/7tCLK +0.4	ns	
	1st data position	tRP1	-0.4	0	+0.4		
Rx*0	2nd data position	tRP2	6/7tCLK -0.4	6/7tCLK	6/7tCLK +0.4		
Rx*1	3rd data position	tRP3	5/7tCLK -0.4	5/7tCLK	5/7tCLK + 0.4		
Rx*2	4th data position	tRP4	4/7tCLK - 0.4	4/7tCLK	4/7tCLK +0.4		
Rx*3	5th data position	tRP5	3/7tCLK - 0.4	3/7tCLK	3/7tCLK + 0.4		
	6th data position	tRP6	2/7tCLK - 0.4	2/7tCLK	2/7tCLK + 0.4		

Based on IPS Alpha Technology, Ltd. Module AX094F030F.

6.2 SYNCRONIZATION SIGNAL TIMING

Based on IPS Alpha Technology, Ltd. Module AX094F030F.

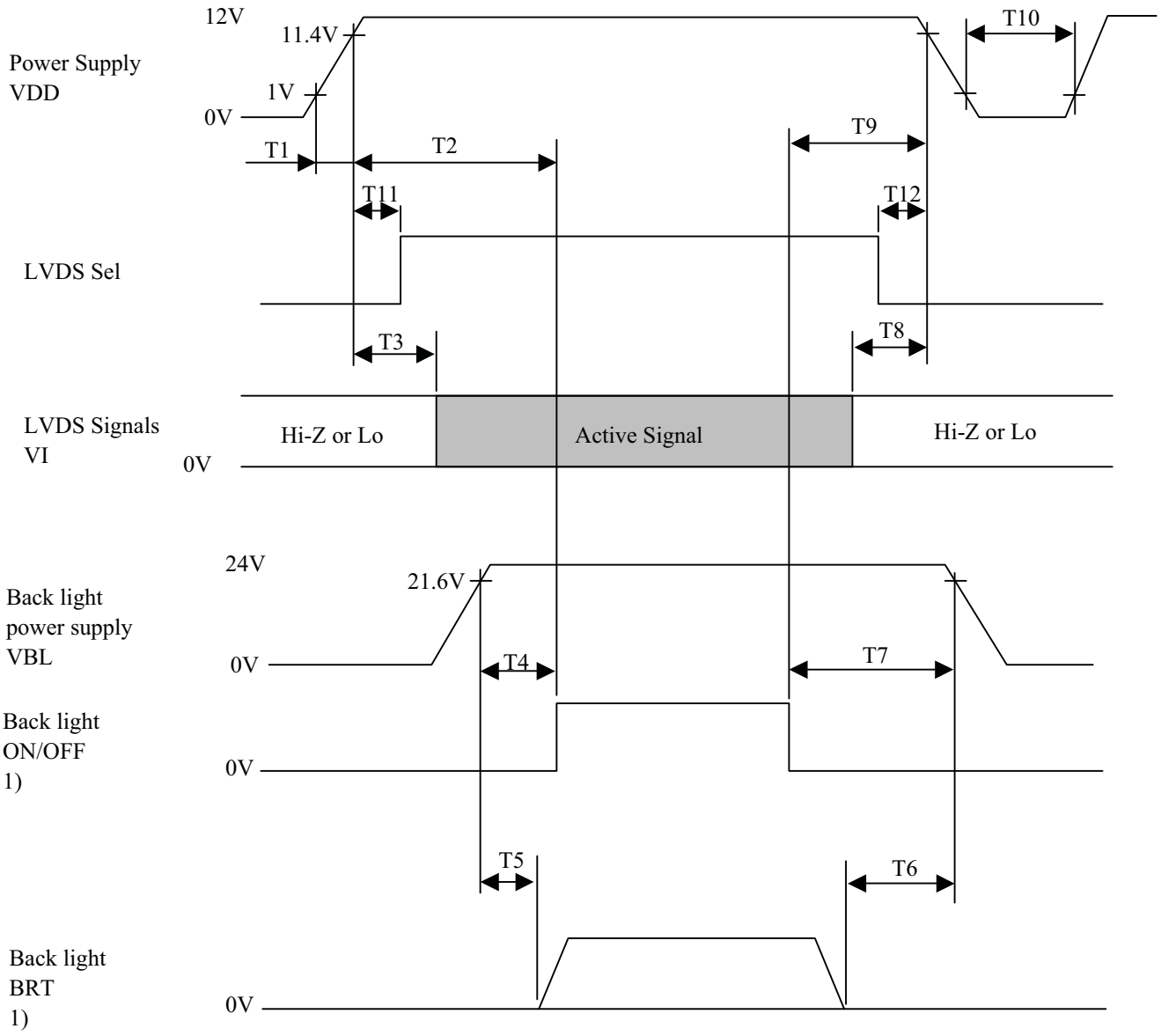


2pxl/clk

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical Frequency	fV	48	60	62	Hz	
	Vertical Period	tV	1090	1100	1350	tH	
	Vertical Valid	tVD		1080		tH	
	Horizontal Frequency	fH	63	66	68	kHz	
	Horizontal Period	tH	990	1000	1049	tCLK	
	Horizontal Valid	tHD		960		tCLK	

6.3 TIMING BETWEEN INTERFACE SIGNALS POWER SUPPLY

Based on IPS Alpha Technology, Ltd. Module AX094F030F.



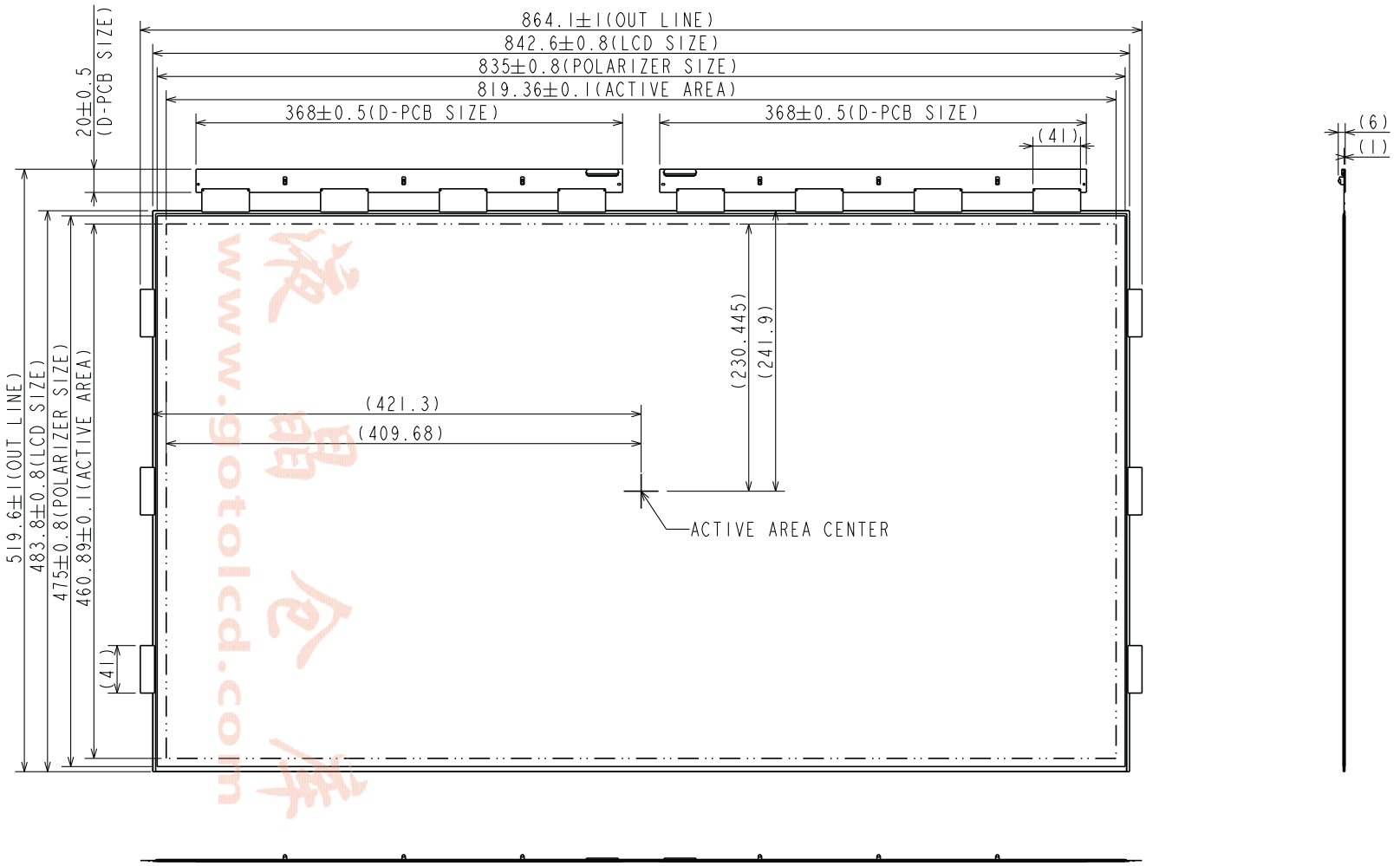
0 ≦ T1 ≦ 10	0 ≦ T6	10 ≦ T11 ≦ T2-150
350 ≦ T2	0 ≦ T7	0 ≦ T12
10 ≦ T3	0 ≦ T8	
0 ≦ T4	0 ≦ T9	
0 ≦ T5	350 ≦ T10	

Unit : ms

Note 1) In all periods, the backlight ON/OFF signal voltage and the BRT signal voltage should be lower than the backlight power supply voltage.

7. DIMENSIONAL OUTLINE

(1)FRONT VIEW



Note 1) The dimension in a parenthesis is a reference value
2) Unspecified tolerance to be ±0.8

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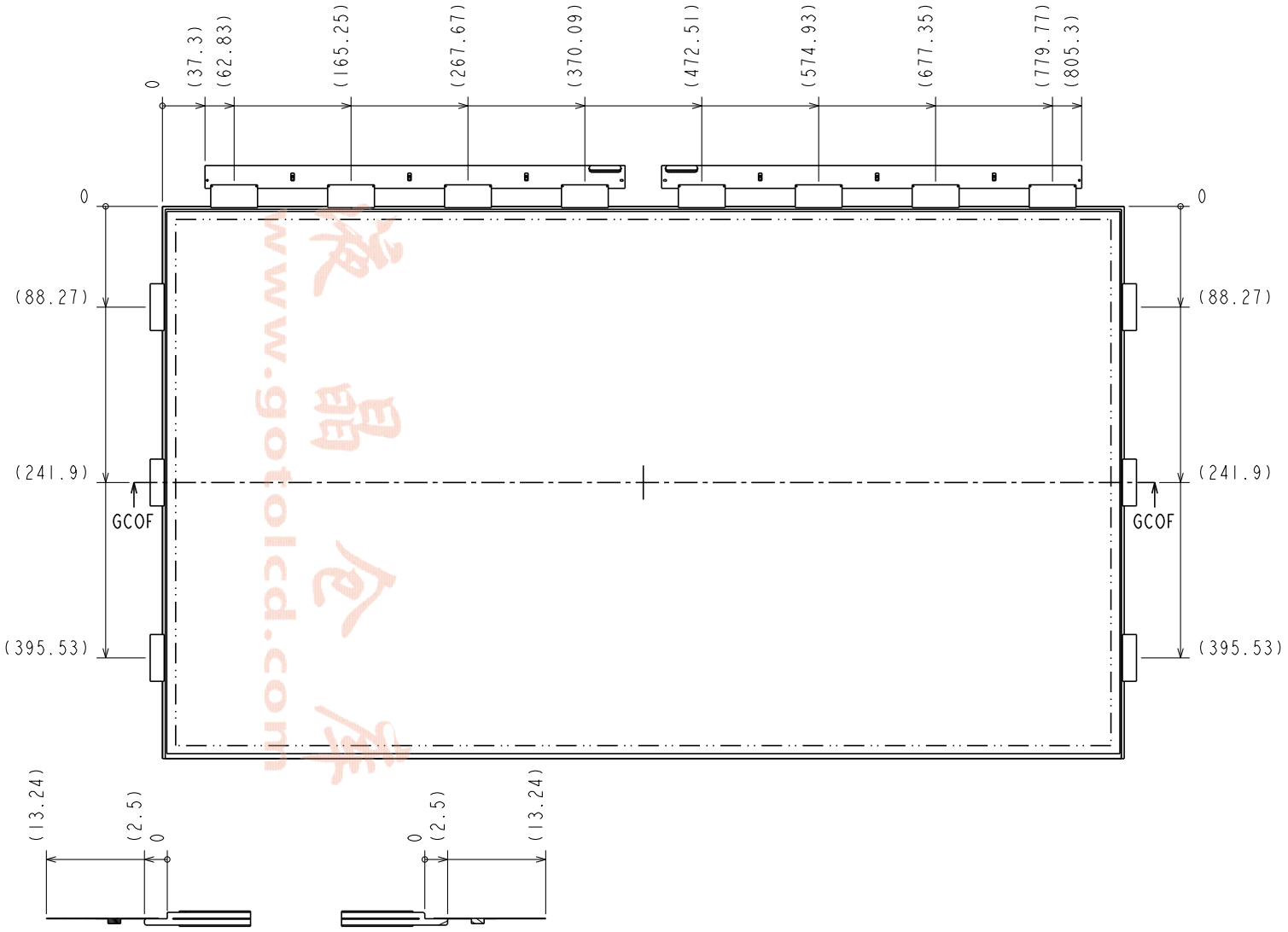
(1)FRONT VIEW 2



断面　GCOF-GCOF
スケール　2:1

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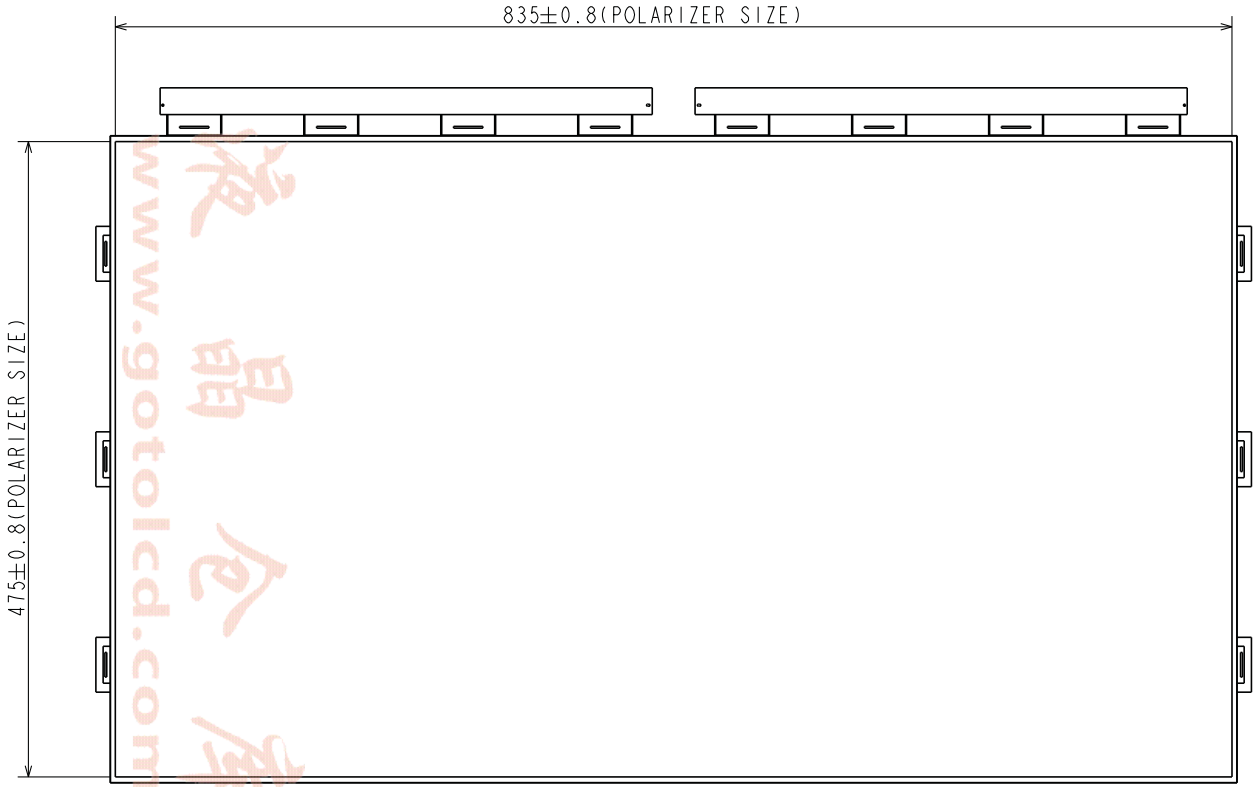
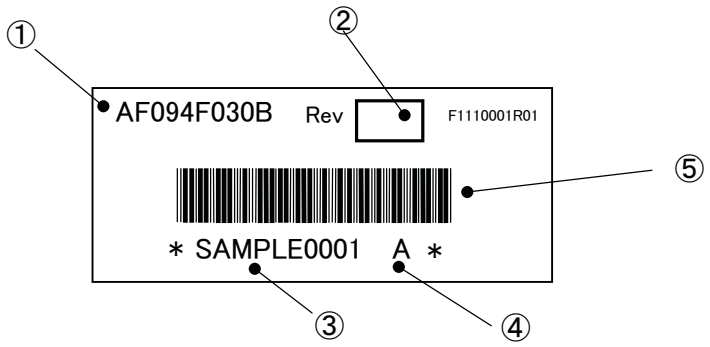
(2)BACK VIEW



8. DESIGNATION OF LABEL

The barcode label is pasted on each TFT open cell.
Users use this bar code label to write adjustment Vcom value and γ data to Tcon ROM which is specified by IPS Alpha Technology,Ltd..



Item	Description
①	Product Name
②	Rev. is the column for manufacturing convinience. A-Z except I and O may be written on this column.
③	Lot mark
④	γ information
⑤	Bar code(③+④)

9. COSMETIC SPECIFICATIONS

Based on IPS Alpha Technology, Ltd. Module AX094F030F.

9.1 Condition for cosmetic inspection

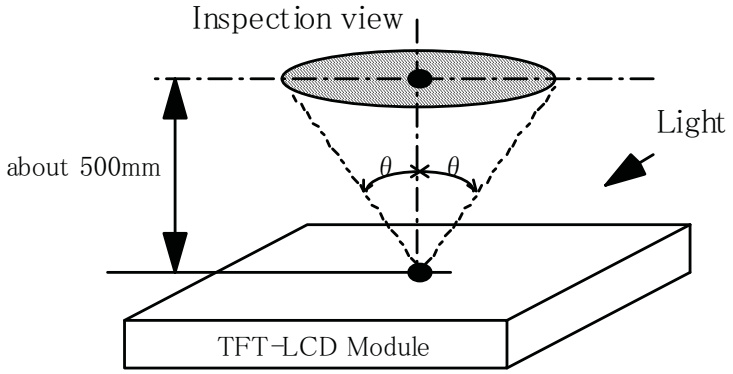
(1) Viewing zone

a) The figure shows the correspondence between eyes (of inspector) and TFT-LCD module.

$\theta \leqq 45^{\circ}$: when non-operating inspection

$\theta \leqq 5^{\circ}$: when operating inspection

b) Inspection should be executed only from front side and only A-zone.
Cosmetic of B-zone and C-zone are ignore.
(refer to 9.2 Definition of zone)



(2) Environmental

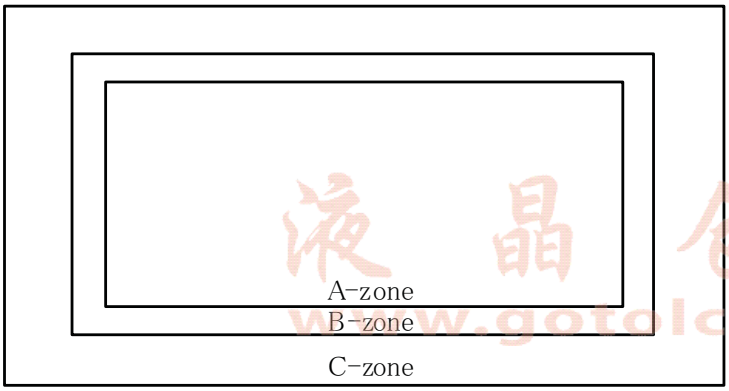
a) Temperature : 25 degrees

b) Ambient light : about 700 lx and non-directive when operating inspection.
: about 1000 lx and non-directive when non-operating inspection.

c) Back-light : when non-operating inspection, back-light should be off .

9.2 Definition of zone

・A-zone : Display area (pixel area)
・B-zone : Area between A-zone and C-zone
・C-zone : Metallic bezel area



9.3 COSMETIC SPECIFICATIONS

When displaying conditions are not stable (ex. at turn on or off), the following specifications are not applied.

	No	ITEM			Max. acceptable number A-zone S grade	Max. acceptable number A-zone A grade	Unit	Note
Operating inspection	1	Dot defect	Sparkle mode	1-dot	0	2	pcs	1),2),4)
				2-dots	0	0	Units	1),2),5)
				3-dots	0	0		
				Density	0	2	pcs/ ϕ 20mm	1),2),6)
				Total	0	2	pcs	1),2)
			Black mode	1-dot	5	7	pcs	1),3),4)
				2-dots	1	1	Units	1),3),5)
				3-dots	0	0		
				Density	3	4	pcs/ ϕ 20mm	1),3),6)
				Total	5	7	pcs	1),3)
				Total	5	7	pcs	1)
	2	Line defect			Serious one is not allowed		-	-
	3	Uneven brightness						
	4	Stain inclusion (Line shape W : width (mm) L : length (mm))	W≦0.02	L : Ignore	Ignore		pcs	7)
			W≦0.04	L≦4.0	8			
				L>4.0	0			
			W≦0.08	L≦2.0	8			
				L>2.0	0			
			W>0.08	-	(See dot shape)			
	5	Stain inclusion (Dot shape D : ave. dia (mm))	D≦0.22		Ignore		pcs	7)
			D≦0.5		8			
			D>0.5		0			
	6	Scratch on polarizer (Line shape W : width (mm) L : length (mm))	W≦0.02	L : Ignore	Ignore		pcs	8)
			W≦0.08	L≦20	10			
				L>20	0			
			W>0.08	-	0			
	7	Scratch on polarizer (Dot shape D : ave. dia (mm))	D≦0.2		Ignore		pcs	8)
			D≦0.6		10			
			D>0.6		0			

	No	ITEM		Max. acceptable number A-zone	Unit	Note
	8	Bubbles, peeling in polarizer (D : ave. dia (mm))	D≦0.2	Ignore	pcs	8)
			D≦0.5	10		
			D>0.5	0		
	9	Wrinkles on polarizer		Serious one is not allowed.	-	-

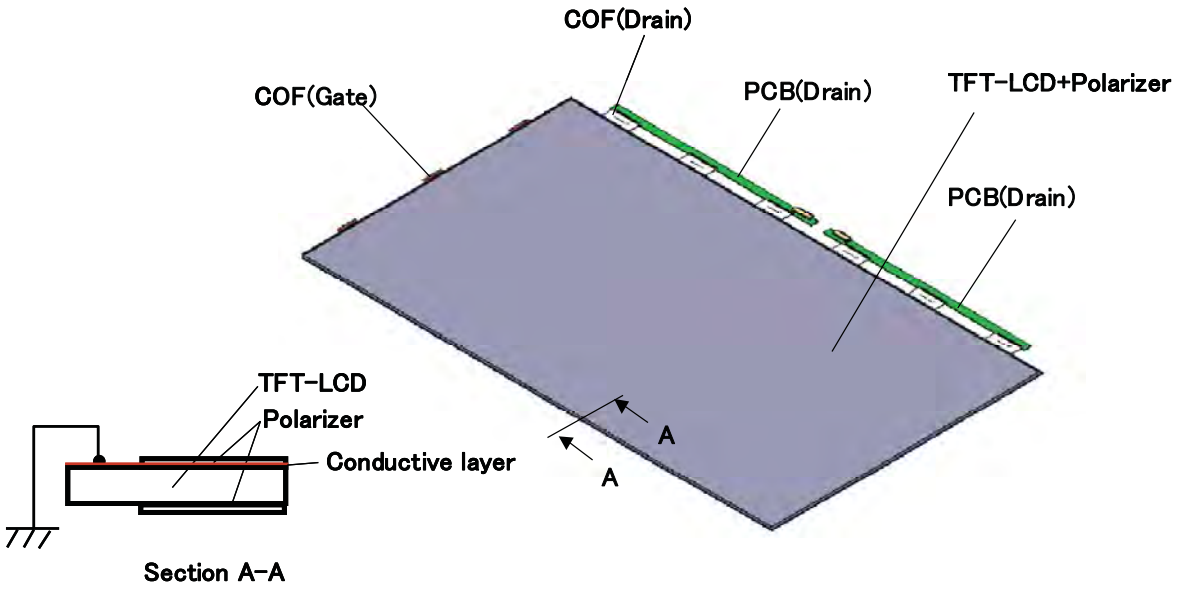
Note 1) Dot defect : defect area > 1/2 dot
2) Sparkle mode : brightness of dot is more than 30% at black. (visible to eye)
3) Black mode : brightness of dot is less than 70% of L255 brightness.
4) 1 dot : defect dot is isolated, not attached to other defect dot.
5) N dots : N defect dots are consecutive. (N means the number of defects dots)
6) Density : number of defect dots inside 20mm ϕ .
7) Those stains which can be wiped out easily are acceptable.
8) Polarizer area inside of B-zone is not applied.
9) No major (serious) defects when viewed in gray scale mode.

10. PRECAUTION

Please pay attention to the followings when a TFT open cell is used, handled and mounted.

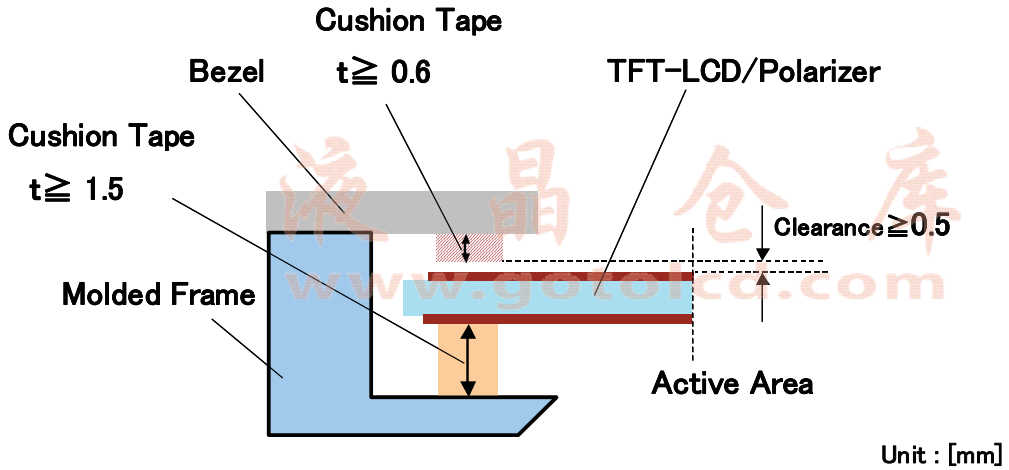
10.1 Recommendation of GND connection of TFT open cell

(1) Please connect LCD surface (front side) to GND for prevention of static charge.



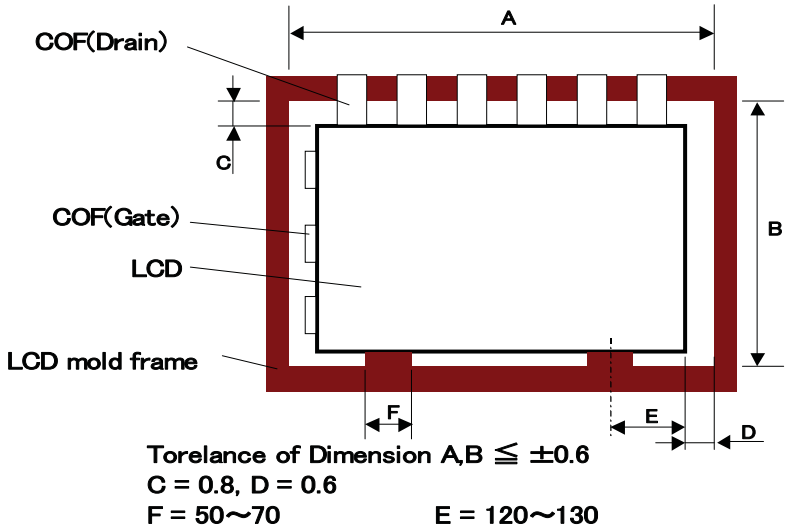
10.2 Recommendation of structure for supporting TFT-LCD Rim

(1) When the LCD is applied by stress, it occurs abnormal image quality.
(It is confirmed visually especially in case of gray raster.)
The system shown on the drawing down below is recommended to maintain the LCD by cutting down the LCD stress.



Unit : [mm]

(2)The dimension of mold frame and LCD is reccomended as follows.

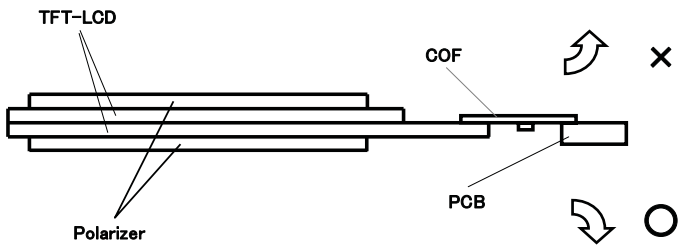


Unit : [mm]

(3)The wall of the mold frame should be laid on whole sides of the LCD as much as possible.
(4)The holding space for the LCD should be maintained by the mold frame and the bezel.
(5)Screw the mold frame to the lower frame at many places to keep flatness of LCD support area.
(6)The mold frame should be the structure that is divided into four sides to keep flatness of LCD support area.
(7)LCD support surface at lower side should smooth to cutting down the LCD stress.
(Put PET tape between LCD and support area, etc.)
(8)At the time of ground connection, take a method that does not put a load to the LCD.
(9)Use silicon rubber with hardness 20 for cushion to the mold frame side.
(10)Use foaming cushion to Bezel side.
(11)Flatness of the Bezel should be 0.5 which also should be the shape does not have partial changing points.
(12)The bezel should be the structure that is divided into four sides and screwed from the upper side.
(13)The surface of the cushion (the surface which attaches to the LCD) should be mat finishing or should put PET tape to avoid the LCD and the cushion from sticking together.

10.3 Precaution to handling and mounting

(1)The polarizer on a TFT cell should carefully be handled due to its softness, and should not be touched, pushed or rubbed with glass, tweezers or anything than HB pencil lead. The surface of a polarizer should not be touched and rubbed with bare hand,greasy clothed or dusty clothes.
(2)The surface of a polarizer should be gently wiped with absorbent cotton, chamois or other soft materials slightly contained petroleum benzene when the surface becomes dirty. Normal-hexane on a TFT cell . Other cleaning chemicals such as acetone, toluen and alcohol should not be used to clean adhesives because they cause chemical damage to a polarizer.
(3)Saliva or water drops should be immediately wiped off. Otherwise, the portion of a polarizer and electronic parts may be deformed.
(4)Applying upward bend to COF may cause a malfunction electrically and mechanically.



(5)Applying too much force and stress to PCB and COF may cause a malfunction electrically and mechanically.

10.4 Precaution to operation

(1) The ambient temperature near the operated cell and electronic parts should be satisfied with the ratings. Unless it meets the specifications, sufficient cooling system should be adopted to system.

(2) The spike noise causes the mis-operation of a TFT open cell. The level of spike noise should be as follows:
-200mV<=over- and under- shoot of VDD<= +200mV
VDD including over- and under- shoot should be satisfied with the absolute maximum ratings.

(3) Optical response time, luminance and chromaticity depend on the temperature of a TFT open cell.

(4) Sudden temperature change may cause dew on and/or in the a TFT open cell. Dew males damage to a polarizer and/or electrical contacting portion. Dew causes fading of displayed quality.

(5) Fixed patterns displayed on a TFT open cell for a long time may cause after-image. It will be recovered soon.

(6) The TFT open cell has high frequency circuits. Sufficient suppression to electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be effective to minimize the interference.

(7) Noise may be heard when a back-light is operated. If necessary, sufficient suppression should be done by system manufacturers.

(8) Inserting or pulling I/F connectors causes any trouble when power supply and signal dates are on-state.I/F connectors should be inserted and pulled after power supply and signal dates are turned off.

10.5 Electrostatic discharge control

(1) Since a TFT open cell consists of a TFT cell and electronic circuits with CMOS-ICs, which are very weak to electrostatic discharge, persons who are handling a TFT open cell should be grounded through adequate methods such as a list band. Connector pins should not be touched directly with bare hands.

(2) Protection film for a polarizer on a TFT open cell should be slowly peeled off so that the electrostatic charge can be minimized.

10.6 Precaution to strong light exposure

(1) The TFT open cell should not be exposed under strong light. Otherwise, characteristics of a polarizer and color filter in a TFT open cell may be degraded.

10.7 Precaution to storage

When TFT open cells for replacement are stored for a long time, following precautions should be taken care of:

(1) TFT open cells should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during storage. TFT open cells should be stored at 0 to 35℃ at normal humidity (60%RH or less).

(2) The surface of polarizers should not come in contact with any other object. It is recommended that TFT open cells should be stored in the IPS Alpha Technology's shipping box.

10.8 Precaution to handling protection film

(1) The protection film for polarizers should be pealed off slowly and carefully by persons who are electrically grounded with adequate methods such as a list band. Besides, ionized air should be blown over during peeling action. Dusts on a polarizer should be blown off by an ionized nitrogen gun and so on.

(2) The protection film should be peeling off without rubbing it to the polarizer. Because, if the film is rubbed together with the polarizer, since the film is attached to the polarizer with a small amount of adhesive, the adhesive may remain on a polarizer.

(3) The TFT open cell with protection film should be stored on the conditions explained in 10.7 (1). However, in case that the storage time is too long, adhesive may remain on a polarizer even after a protection film is peeled off. Besides, in case that a TFT open cell is stored at higher temperature and/or higher humidity, adhesive may remain on a polarizer. The remained adhesive may cause non-uniformity of display image.

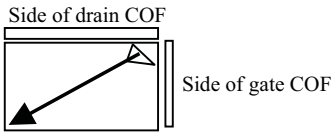
(4) The adhesive can be removed easily with Normal-Hexane. The remained adhesive or its vestige on the polarizer should be wiped off with absorbent cotton or other soft materials such as chamois slightly contained Normal-Hexane.

(5) The procedure of peeling protection film on polarizer is recommended as follows.

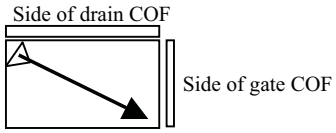
(5-1)Set up LCD on the rest of the cell as the lower polarizer film comes on top gently.

(5-2)Peel off protection film from lower polarizer film with tape.

The protection film should be peeled as Drawing 1 or 2.



Drawing 1



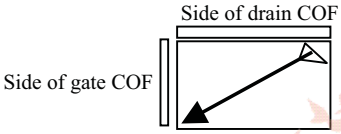
Drawing 2

(5-3)Set up LCD on the Backlight unit as the upper polarizer film comes on top gently.

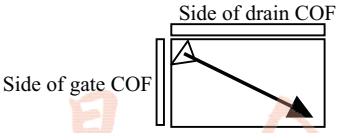
(5-4)Connect LCD surface to GND.

(5-5)Peel off protection film from upper polarizer film with tape.

The protection film should be peeled as Drawing 3 or 4.



Drawing 3



Drawing 4

10.9 Safety

(1) Since a TFT cell is made of glass, handling to the broken TFT open cell should be taken care sufficiently in order not to be injured. Hands touched liquid crystal from a broken TFT open cell should be washed sufficiently.

10.10 Environmental protection

(1) Flexible printed circuits and printed circuits board contain small amount of lead.
Please follow local ordinance or regulations for its disposal.

10.11 Use restrictions and limitations

(1) This product is not authorized for use in life support devices or systems, military applications or other applications which pose a significant risk of personal injury.

(2) In no event shall IPS Alpha Technology, Ltd., be liable for any incidental, indirect or consequential damages in connection with the installation or use of this product, even if informed of the possibility thereof in advance. These limitations apply to all causes of action in the aggregate, including without limitation breach of contact, breach of warranty, negligence, strict liability, misrepresentation and other torts.

10.12 Others

(1) Electrical components which may not affect electrical performance are subjective to change without notice because of their availability.