Panasonic Liquid Crystal Display Co.,Ltd.

Feb.03,2012

TECHNICAL DATA

VVX10F004B90

10.1"WUXGA

CONTENTS

RECORD OF REVISION

Date	The upper section : Previous revision The lower section : New revision Sheet No.	Page	Summary

DESCRIPTION

The following specifications are applied to the following TFT LCD module.

Product Name : VVX10F004B90

General Specifications

Effective display area	: (H) 217.44 × (V) 135.90	(mm)
Number of pixels	: (H) 1,920 × (V) 1,200	(pixels)
Pixel pitch	: (H) 0.11325 × (V) 0.11325	(mm)
Color pixel arrangement	: R+G+B vertical stripe	
Display mode	: Transmissive mode Normally black mode	
Top polarizer type	: Low Reflection + Hard Coat (w/o Retardation Film)	
Number of colors	:16,777,216	(colors)
Input signal	: MIPI 4 Lanes	
Backlight	: 60 pieces of LED	
External dimensions	: Typ. (H) 228.86 × (V) 152.5 × (t) 2.5 (PCB side 4.35)	(mm)
Weight	:Typ. 137	(g)

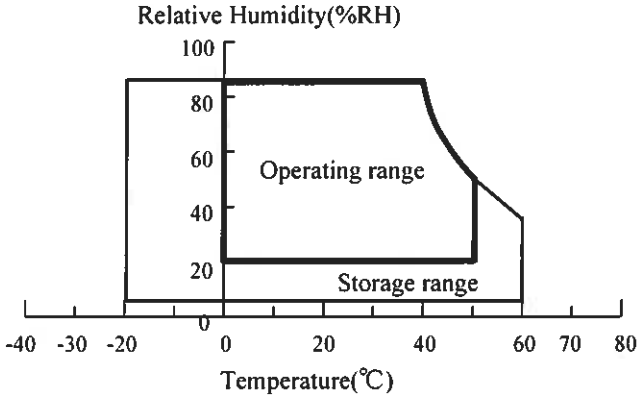
1. ABSOLUTE MAXIMUM RATINGS

1. 1 Environmental Absolute Maximum Ratings

ITEM	Operating		Storage		UNIT	NOTE
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	℃	1),3)
Humidity	2)		2)		%RH	1)
Vibration	-	-	4)		m/s^2	
Shock	-	-	5)		m/s^2	
Corrosive Gas	Not Acceptable		Not Acceptable		-	
Illumination at LCD Surface	-	50,000	-	50,000	1x	

Note 1) Temperature and Humidity should be applied to the glass surface of a IPS-Pro TFT LCD module, not to the system installed with a module.

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) The temperature of LCD front surface would be 65 ℃ in operating, it may affect the optical characteristics however it does not damage the function of the module.

4) Sine vibration (Non-OP) 3.5 G Zero-to pe ak, 30min One sweep, 10 to 500 Hz, all 3 axes (X, Y, Z) .

5) Shock (Non-OP) Half sine 30.6 G, duration time 18 ms. Velocity change :3.4 m/s

1. 2 Electrical Absolute Maximum Ratings

(1)TFT-LCD module

V_{SS} = 0 V

ITEM	SYMBOL	Min.	Max.	UNIT	NOTE
Power Supply Voltage	VDD	0	5.0	V	
Input Voltage for logic	V_I	-0.3	2.8	V	1)
LED Power Supply Voltage	VLED	-0.3	28.0	V	
Electrostatic Durability	V_{ESD0}	+ / - 6 kV		kV	2)
	V_{ESD1}	+ / - 8 kV		kV	3)

Note 1) It is applied to LEDEN, LEDPWMI.

2) Non-OP, Contact discharge , 150pF/330 ohms

3) Non-OP, Air discharge , 150pF/ 330 ohms

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.

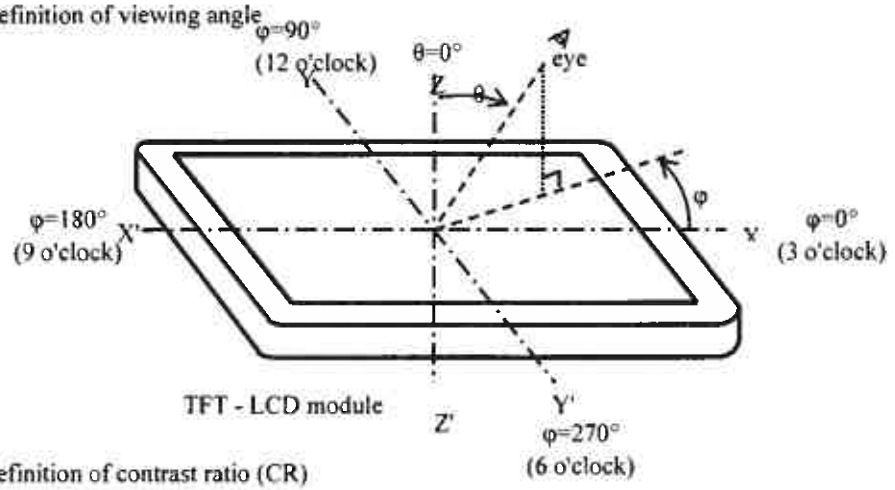
Measuring equipment : CS-1000A, or equivalent

Ambient Temperature =25 ℃ , V_{DD}=3.3V , V_{LED}=6.0～8.4 , f v=60 Hz ,

If=20mA (on duty 100%)

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast ratio		CR	θ = 0 ° 1)	650	1000	-	-	1),2)
Response time (Rise + Fall)		Tr + Tf	θ = 0 ° 1)	-	-	30	ms	1),3)
Brightness of white		Bwh		600	-	-	cd/m^2	1)
Brightness uniformity		Buni(9points)		70	80	-	%	1),4)
Color chromaticity (CIE)	Red	x		0.580	0.610	0.640	-	1) 【Gray scale =255】
		y		0.310	0.340	0.370		
	Green	x		0.290	0.320	0.350		
		y		0.520	0.550	0.580		
	Blue	x		0.120	0.150	0.180		
		y		0.080	0.110	0.140		
	White	x		0.280	0.310	0.340		
		y		0.290	0.320	0.350		
View Angle	Right	-	θ=80 °, ϕ =0°	100	-	-	-	1)
	Left	-	θ=80 °, ϕ =180°	100	-	-		
	Top	-	θ=80 °, ϕ =90°	100	-	-		
	Bottom	-	θ=80 °, ϕ =270°	100	-	-		
NTSC		-	θ = 0 ° 1)	40	50	-	%	1)
W,R,G,B Gamma		-	θ = 0 °	2.2	2.5	2.8	-	1)
Cross talk		-	θ= 0 °	-	-	3	%	1),5)

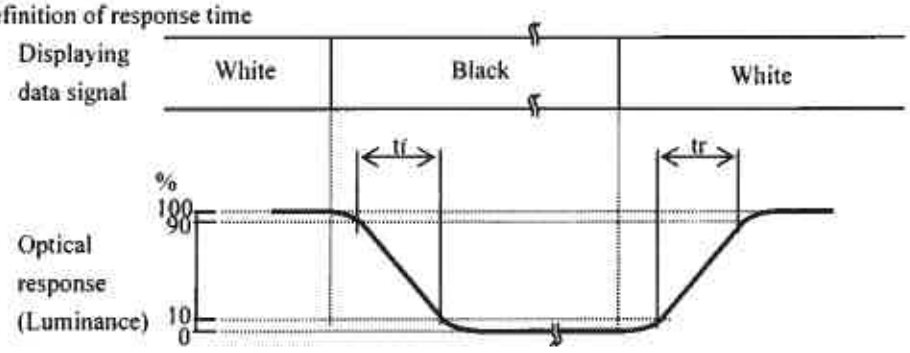
Note 1) Definition of viewing angle



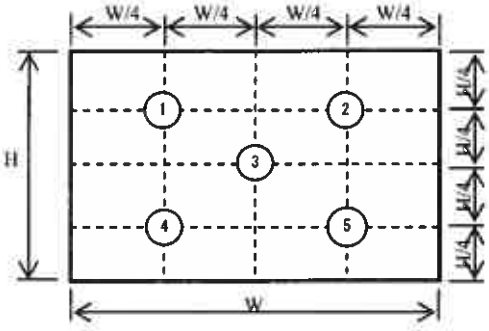
2) Definition of contrast ratio (CR)

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

3) Definition of response time



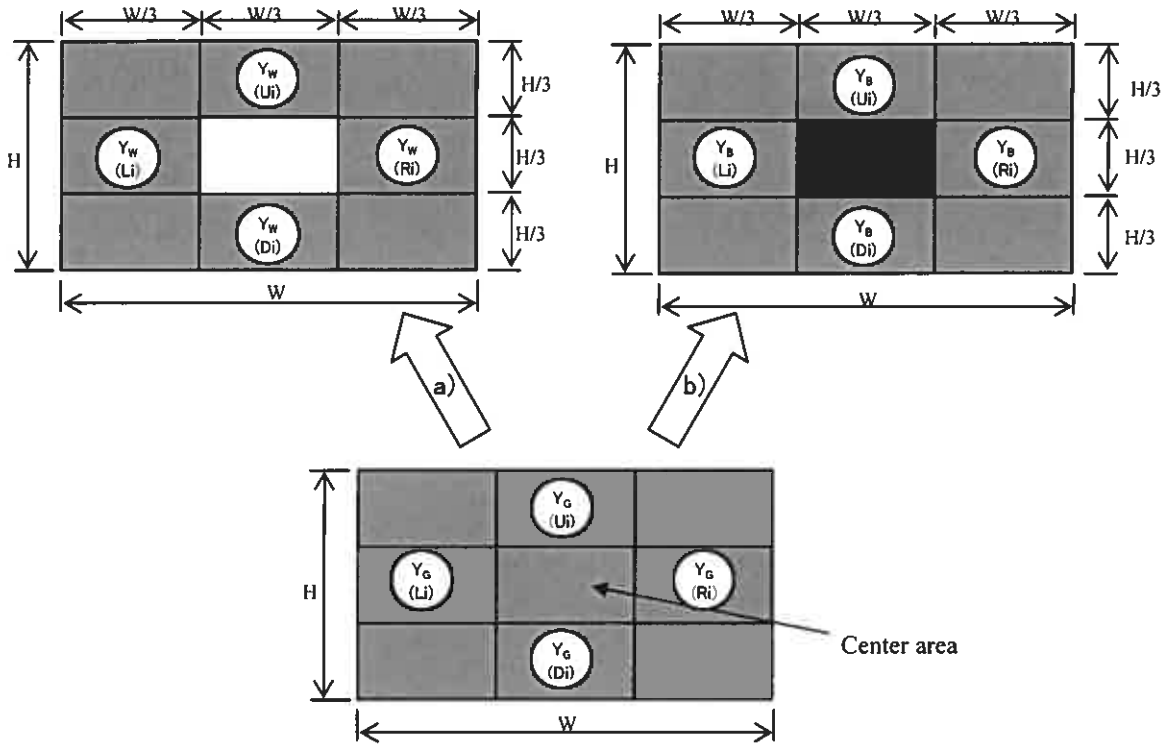
4) Definition of Uniformity



①~⑤ measuring points

Buni (9 Points) = min(①~⑤)/max(①~⑤)

Note 5) Definition of Cross talk



a) Center area : White

$$CT = \frac{|\ Y_W(X_{127}) - Y_G(X_{127})\ |}{Y_G(X_{127})} \times 100\%$$

b) Center area : Black

$$CT = \frac{|\ Y_B(X_{127}) - Y_G(X_{127})\ |}{Y_G(X_{127})} \times 100\%$$

Note: x=U,D,L and R, X_{127}=Gray scale 127

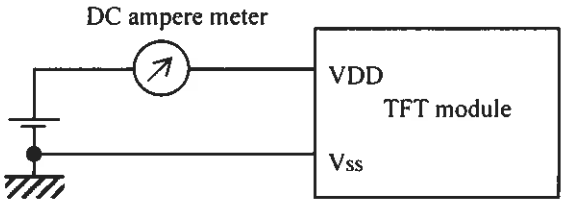
3. ELECTRICAL CHARACTERISTICS

3. 1 TFT-LCD module

Ta = 25 ℃ , Vss = 0 V

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power supply voltage		VDD	3.0	3.3	3.6	V	
LED Power supply voltage		VLED	6.0	-	8.4	V	
Power supply current		IDD	-	(0.4)	(0.6)	A	1)
Ripple voltage of power supply		VDDR	-	-	(100)	mV	
Logic signals input voltage	High	VIH	2.0	-	-	V	LEDEN, LEDPWMI
	Low	VIL	-	-	0.65	V	

Note 1)



3. 2 Backlight unit

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power Consumption		Pbl	-	3.5	4.0	W	1), 2)
PWM	Duty	PD	0	-	100	%	
	Frequency	PF	0.1	-	20	kHz	LEDPWMI, 3)

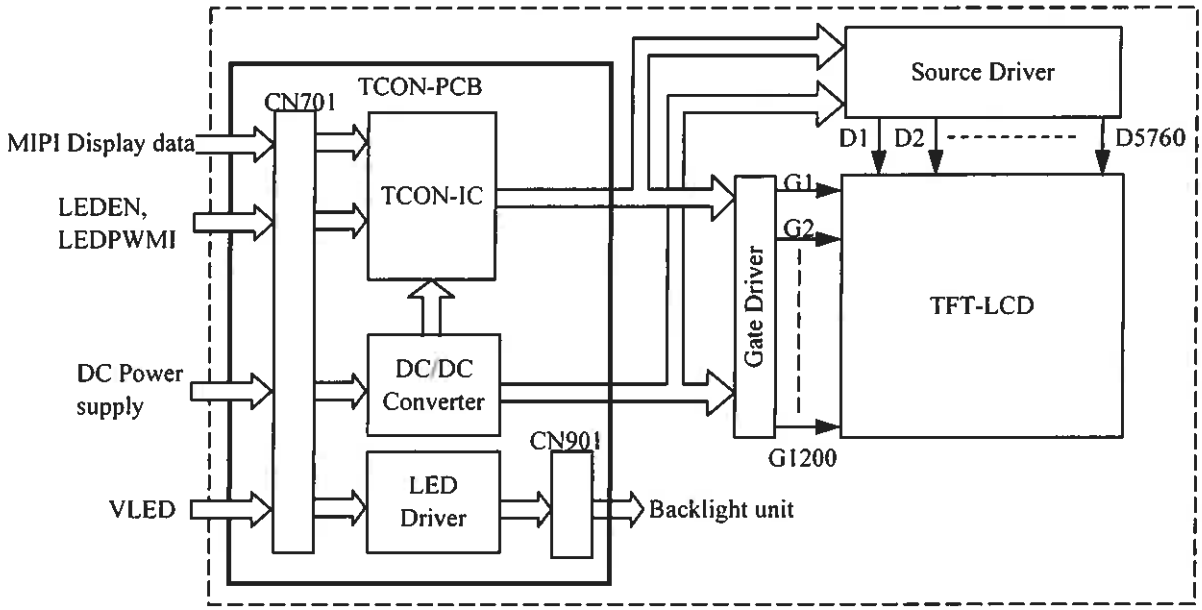
Note 1) This characteristics should be applied putting on the LED about 60 minutes later with ambient temperature. (Ta = 25 ℃ ± 2 ℃)

2) This value is not include LED driver loss.

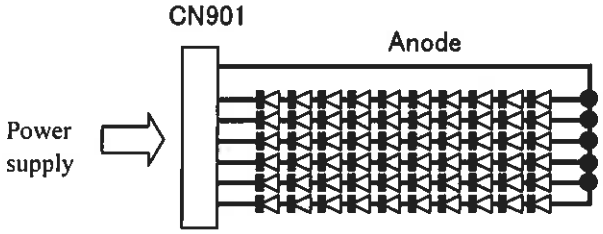
3) Duty (Min) is 1%

4. BLOCK DIAGRAM

4. 1 TFT-LCD module



4. 2 Backlight unit



5. INTERFACE PIN ASSIGNMENT

5. 1 TFT-LCD module

CN701:Panasonic (AYF334535)

PIN No.	SYMBOL	DESCRIPTION	Note
1	VDD	Power Supply	1)
2	VDD		
3	VDD		
4	VDD		
5	NC	Keep Open	
6	SCL	I2C-bus Clock	
7	GND	GND(0V)	3)
8	SDA	I2C-bus Data	5)
9	GND	GND(0V)	3)
10	GND	GND(0V)	3)
11	MIPI 3N	MIPI data pair 3 negative signal	
12	NC	Keep Open	
13	MIPI 3P	MIPI data pair 3 positive signal	
14	NC	Keep Open	
15	GND	GND(0V)	3)
16	GND	GND(0V)	3)
17	MIPI 0N	MIPI data pair 0 negative signal	
18	NC	Keep Open	
19	MIPI 0P	MIPI data pair 0 positive signal	
20	NC	Keep Open	
21	GND	GND(0V)	3)
22	GND	GND(0V)	3)
23	CLKN	MIPI Clock negative signal	

PIN No.	SYMBOL	DESCRIPTION	Note
24	NC	Keep Open	
25	CLKP	MIPI Clock positive signal	
26	NC	Keep Open	
27	GND	GND(0V)	3)
28	GND	GND(0V)	3)
29	MIPI 1N	MIPI data pair 1 negative signal	
30	NC	Keep Open	
31	MIPI 1P	MIPI data pair 1 positive signal	
32	NC	Keep Open	
33	GND	GND(0V)	3)
34	GND	GND(0V)	3)
35	MIPI 2N	MIPI data pair 2 negative signal	
36	NC	Keep Open	
37	MIPI 2P	MIPI data pair 2 positive signal	
38	LEDEN	LED enable input level	
39	GND	GND(0V)	3)
40	BIST	Keep open or connect to GND	4)
41	LEDPWMI	PWM input to backlight LED driver	
42	VLED	LED Power Supply	2)
43	VLED		
44	VLED		
45	VLED		

Notes 1) All VDD pins shall be connected to +3.3V.

2) All VLED pins shall be connected to +6.0～8.4V.

3) All GND pins shall be grounded. Metal bezel is internally connected to GND.

4) Note. pin. 40

Our T-CON (NT71391) has CABC function, but it cannot be controlled by connector pin.

CABC can be controlled by the configuration data (disenable or enable) of T-CON installed in EEPROM through I2C.

Please keep pin.40 open setting.

5) Please do not use the following address.

A0(hex),E8 (hex)

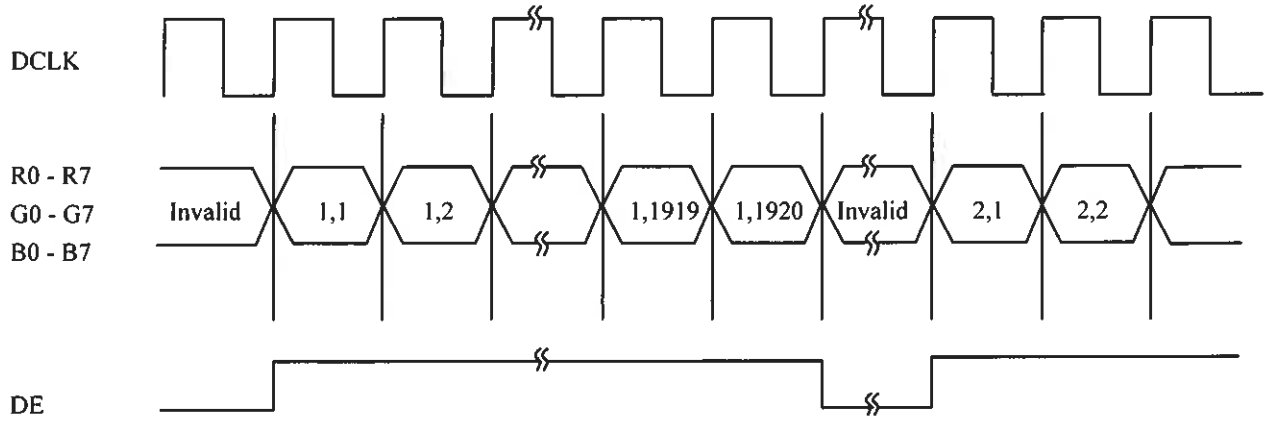
5. 2 Correspondence between input data and display image

Display data of adjacent two pixel is latched during four cycle of CLK.

R (1,1)	G (1,1)	B (1,1)

Pixel : R0 - R7 : R (x,y)
G0 - G7 : G (x,y)
B0 - B7 : B (x,y)

1 , 1	1 , 2	1 , 3	----------	1 , 1920
2 , 1	2 , 2	2 , 3	----------	2 , 1920
3 , 1	3 , 2	3 , 3	----------	3 , 1920
⋮	⋮	⋮		⋮
1200 , 1	1200 , 2	1200 , 3		1200 , 1920



5. 3 Relationship between display colors and input signals

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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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

Note 1) Definition of gray scale :

Color(n) • • • •Number in parenthesis indicates gray scale level.

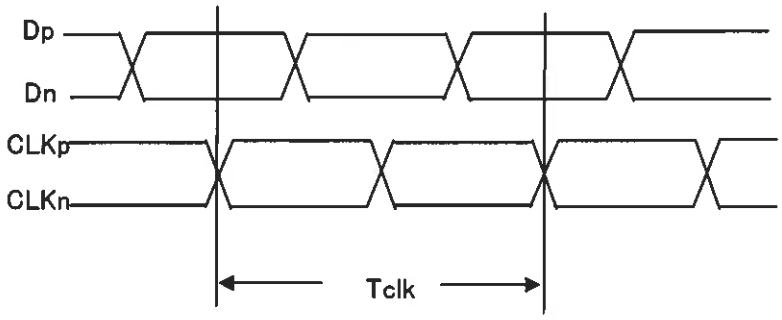
Larger n corresponds to brighter level.

2) Data : 1 : High, 0 : Low

6. INTERFACE TIMING

6. 1 MIPI receiver timing

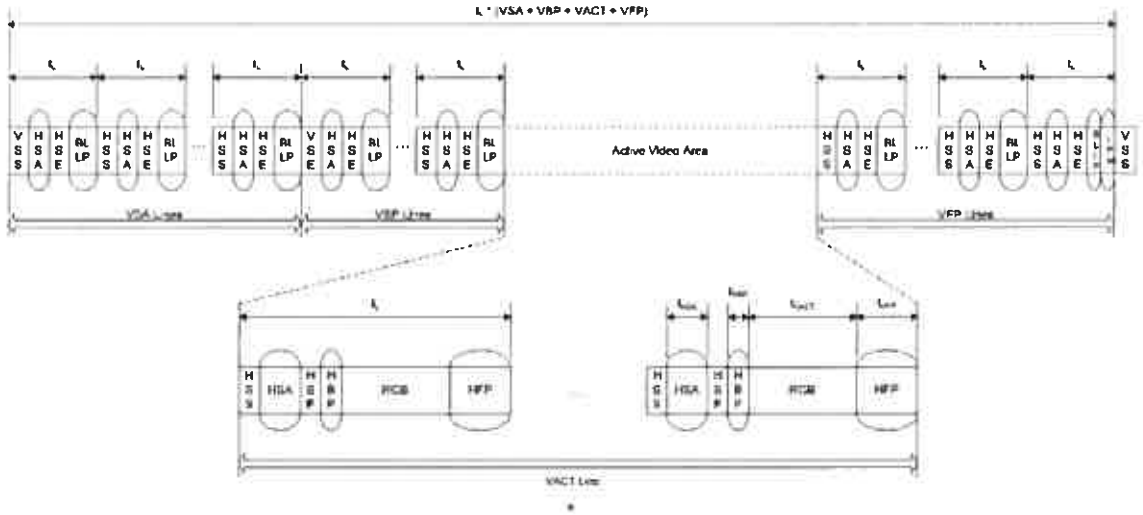
(1) High Speed CLK Timing



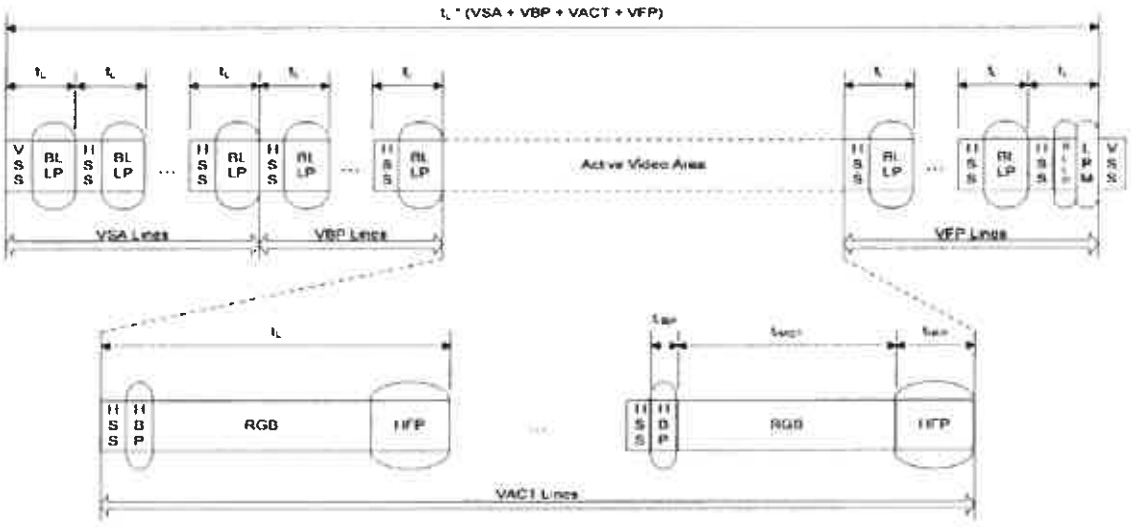
	Min	Max
Tclk	2ns(500MHz)	10ns(100MHz)

(2) Data Transmission Timing

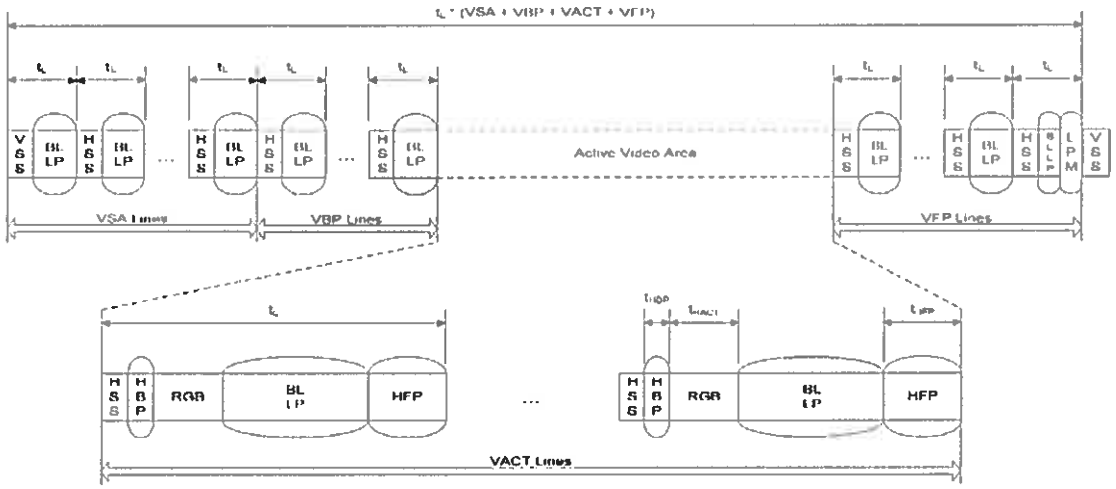
(i) Non-Burst Transmission with Sync Start and End (Pulse Mode)



(ii) Non-Burst Transmission with Sync Events (Event Mode)



(iii) Burst Mode



(iv) Supplemental Information

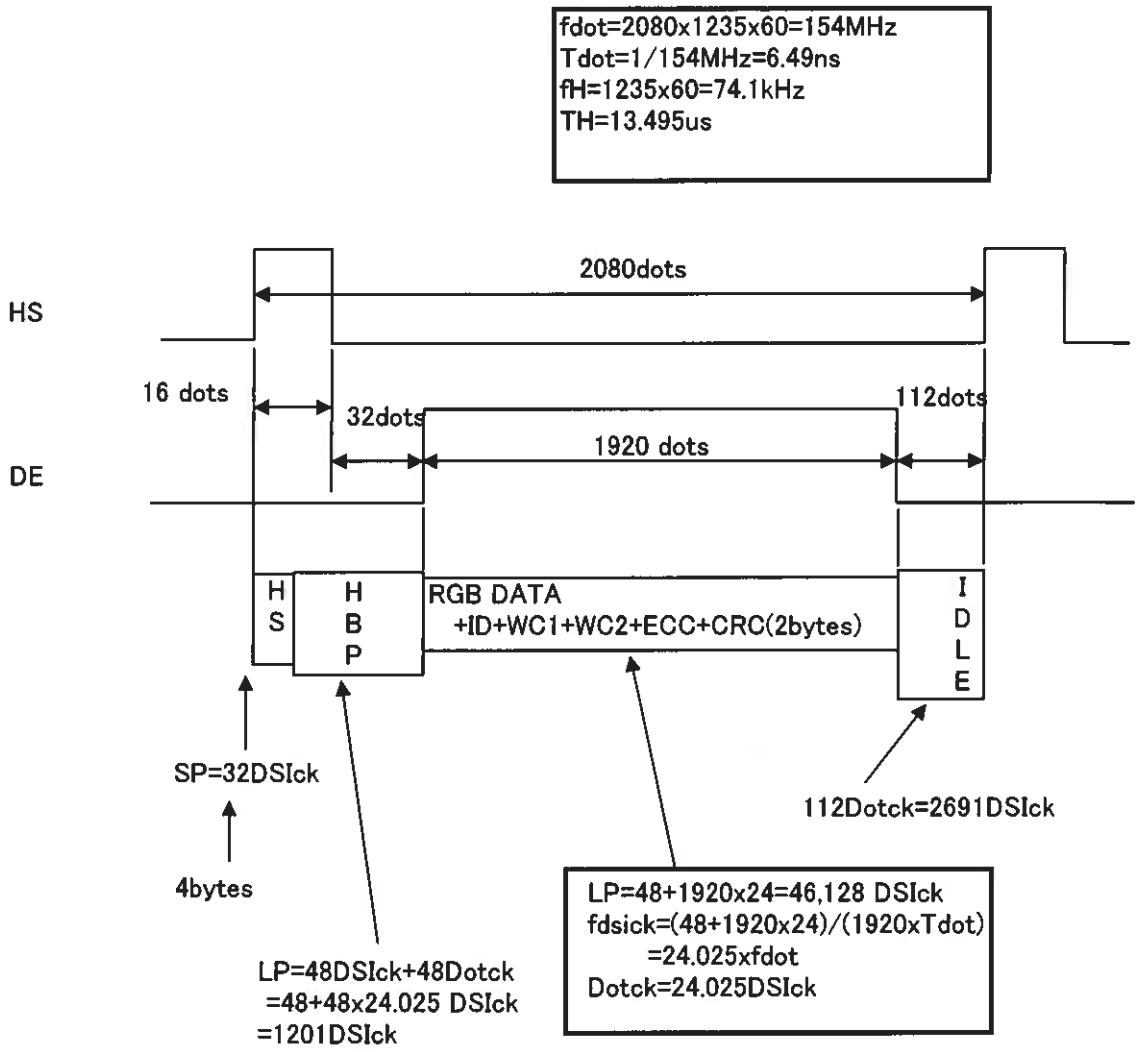
(1) HFP in any above three modes can be replaced with LP-11 state (Idle mode). Length of LP-11 state and transition period from LP-11 state to HS ($T_{HS\text{-}SETTLE}$) and the period from HS to LP-11 ($T_{HS\text{-}TRAIL}$+$T_{HS\text{-}EXIT}$) shall meet the specification of the timing specified in the D-PHY standard of the MIPI interface.

(2) Data can be transferred in any mode of above three without telling the panel which mode is used.

(3) No EoT packet(not EoT protocol) is required.

(4) The line frequency (fH) and frame frequency (fV) of the timing in any above three modes shall fall in the range between Min and Max value specified in the table in the section 6.2.

(v) An Example of Non-Burst Event Mode DSI Timing (Line Period)



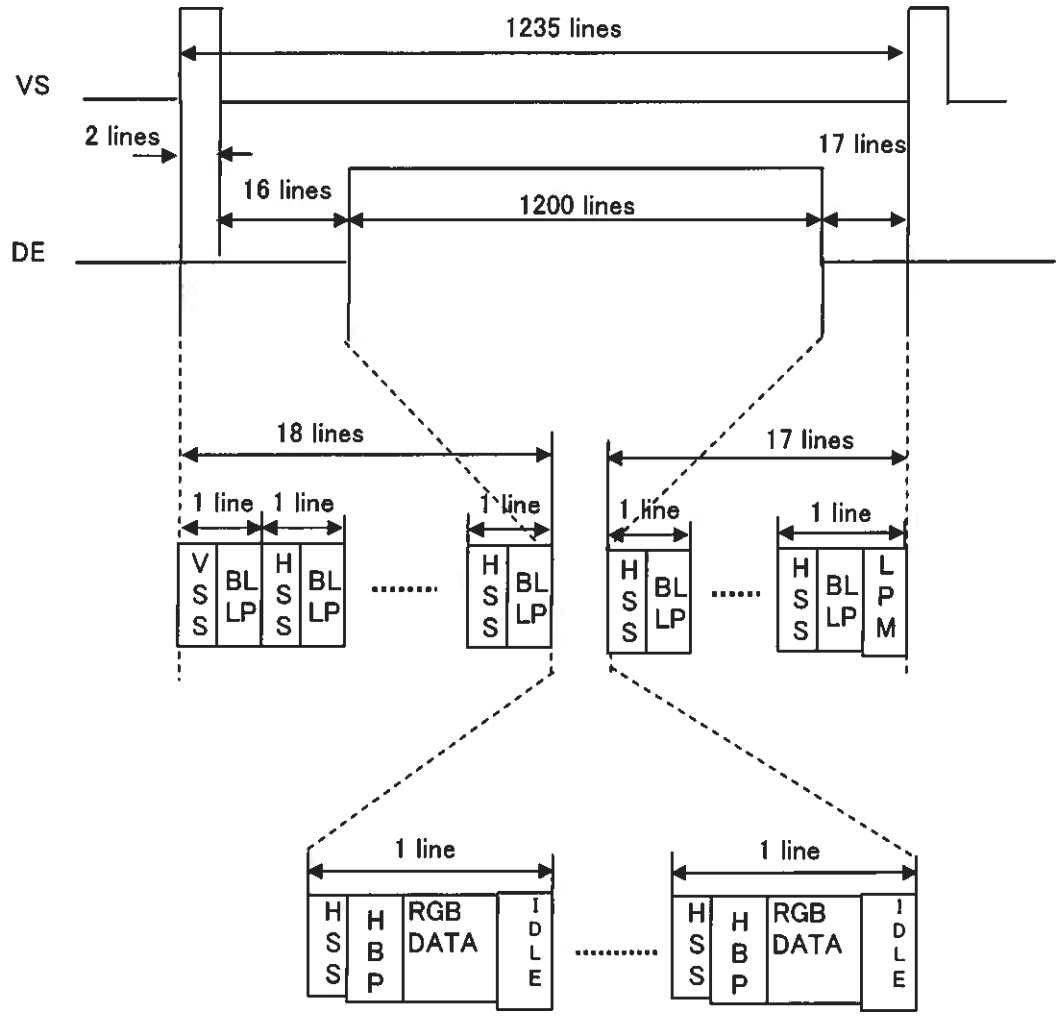
fdsick=24.025x154MHz=3.6999GHz,
Data Transfer Rate/Lane=fdsick/4=925Mbps(MHz)

SP:Short Packet

LP:Long Packet

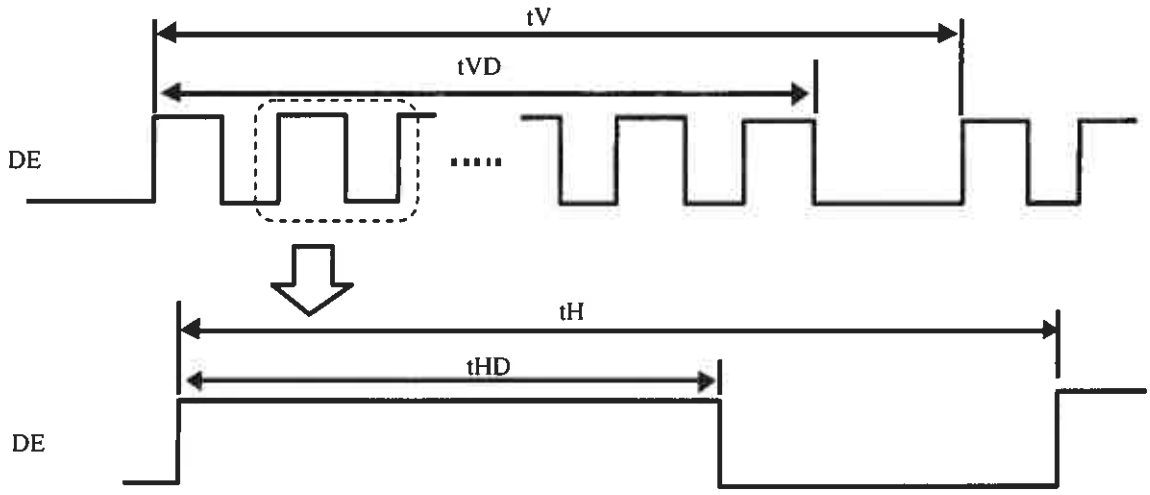
DSIck: Hypothetical DSI clock assuming one lane data transmission and single edge data latch

(vi) An Example of Non-Burst Event Mode DSI Timing (Frame Period)



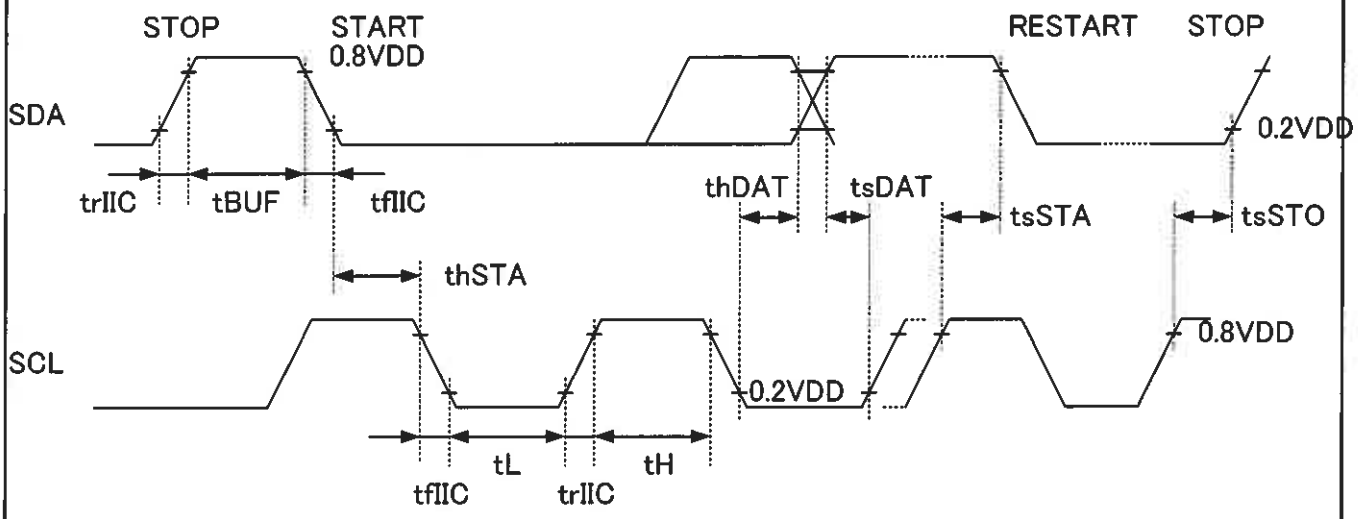
1 Line =50,052 DSIck
TH=50,052/3.699GHz=13.5us
TV=1235xTH
=1235x50,052/3.6999GHZ
=16.7ms
fV=1/TV=60Hz

6.2 SYNCRONIZATION SIGNAL TIMING



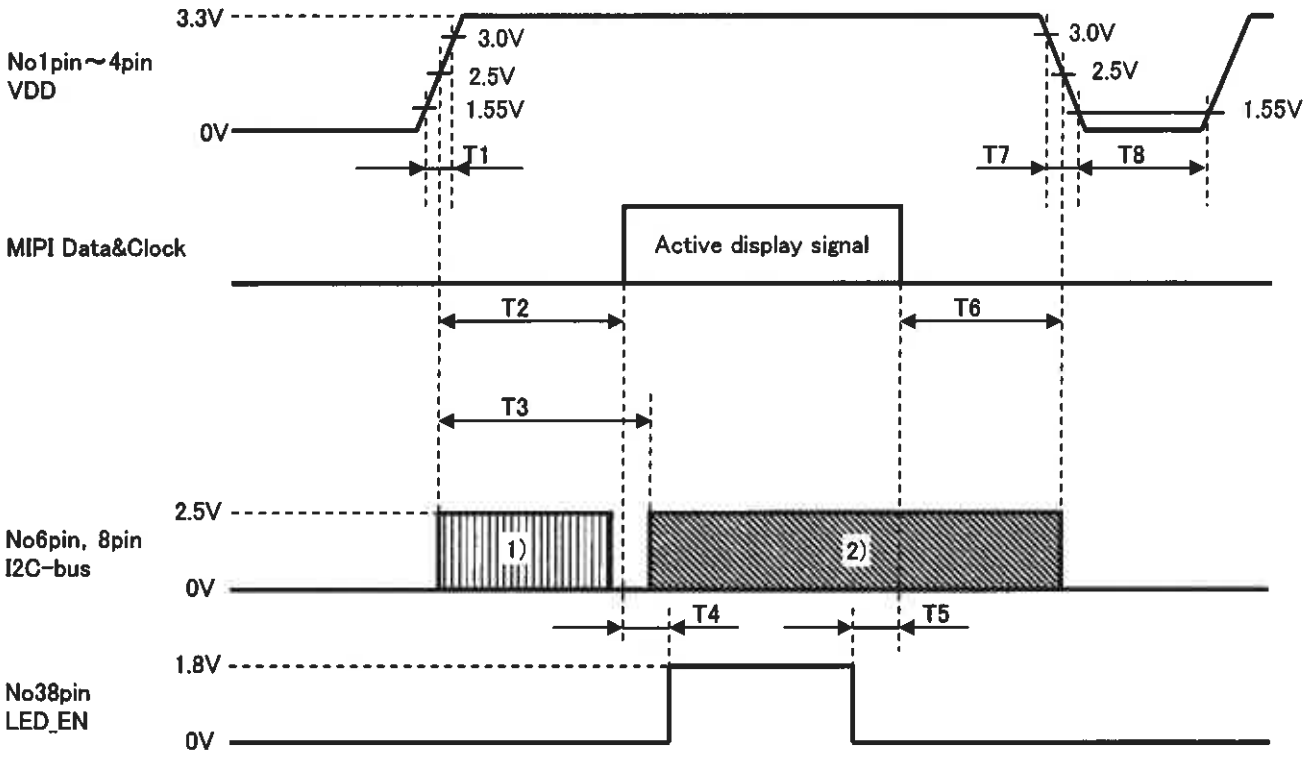
ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical Frequency	fV	58	60	62	Hz	
	Vertical Period	tV	1216	1235	1262	tH	
	Vertical Valid	tVD		1200		tH	
	Horizontal Frequency	fH	70	74	78	kHz	
	Horizontal Period	tH	1980	2080	2200	tCLK	
	Horizontal Valid	tHD		1920		tCLK	

6.3 I2C timing



Parameter	Symbol	Conditions	Rating			Unit
			MIN	TYP	MAX	
SCL Clock Frequency	fscl	See. Upper Fig.	1	-	100	kHz
STOP START Interval	tBUF		4.7	-	-	μs
START HOLD Time	thSTA		4.0	-	-	μs
RESTART SETUP Time	tsSTA		4.7	-	-	μs
STOP SETUP Time	tsSTO		4.7	-	-	μs
Rize Time	trIIC		-	-	1.0	μs
Fall Time	tfIIC		-	-	0.3	μs
Clock Low Time	tL		4.7	-	-	μs
Clock High Time	tH		4.0	-	-	μs
Data Setup Time	tsDAT		0.2	-	-	μs
Data Hold Time	thDAT	-	0.2	-	-	μs

Timing between interface signals and power supply

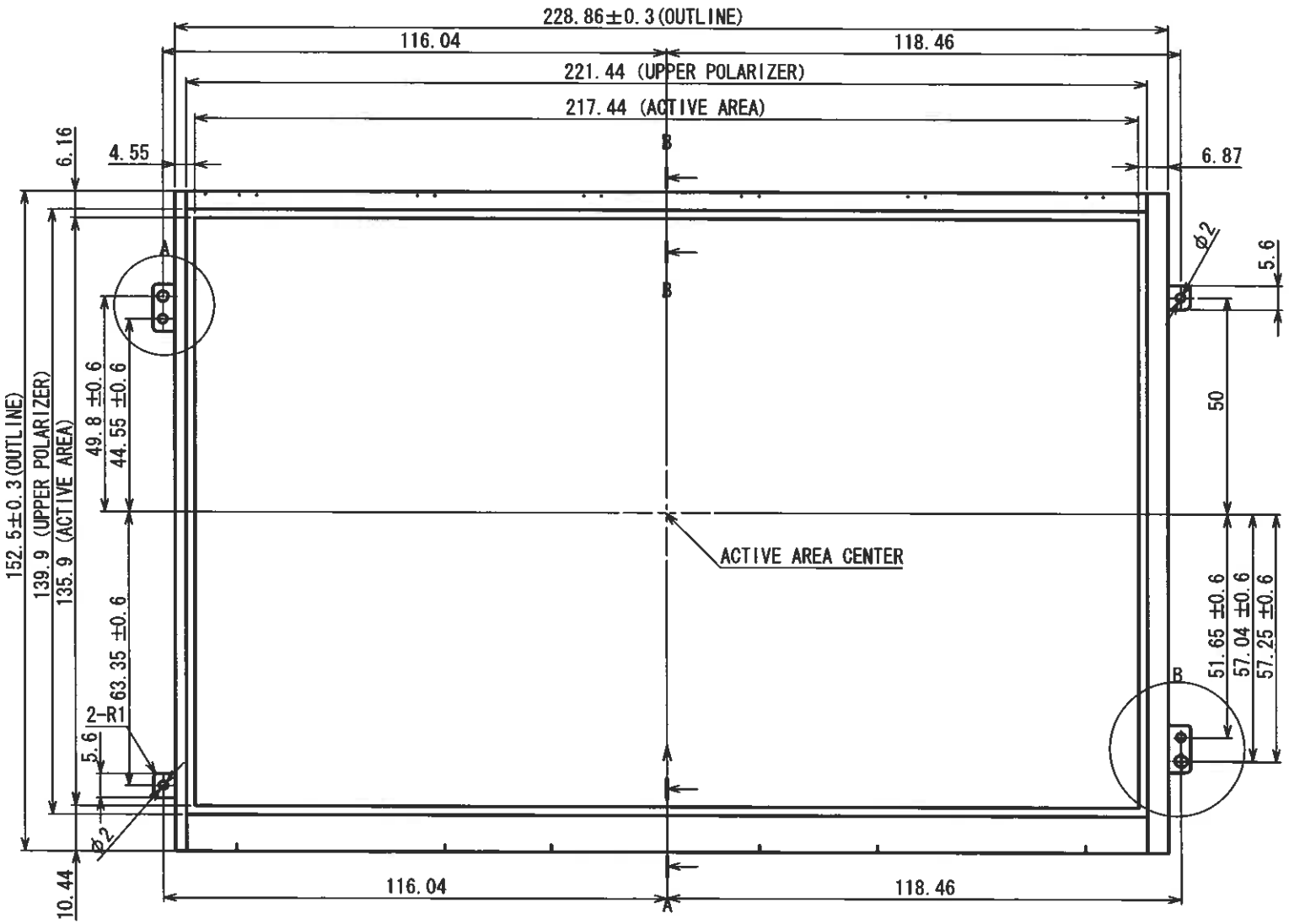


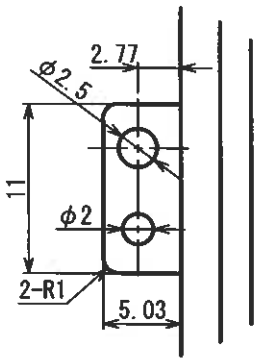
SYMBOL	Min.	Typ.	Max.	UNIT	Note
T1	1	–	195	ms	
T2	100	–	–	ms	
T3	100	–	–	ms	
T4	35	–	–	ms	
T5	0	–	–	ms	
T6	85	–	–	ms	
T7	0	–	55	ms	
T8	10	–	–	ms	

Note

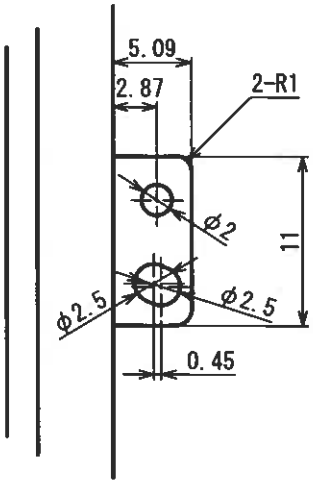
1) Module side will use I2C bus as a bus master during this period. System side must keep I2C bus high impedance to avoid signal collision.
2) System side can use I2C bus as a bus master during this period.

7. DIMENSIONAL OUTLINE



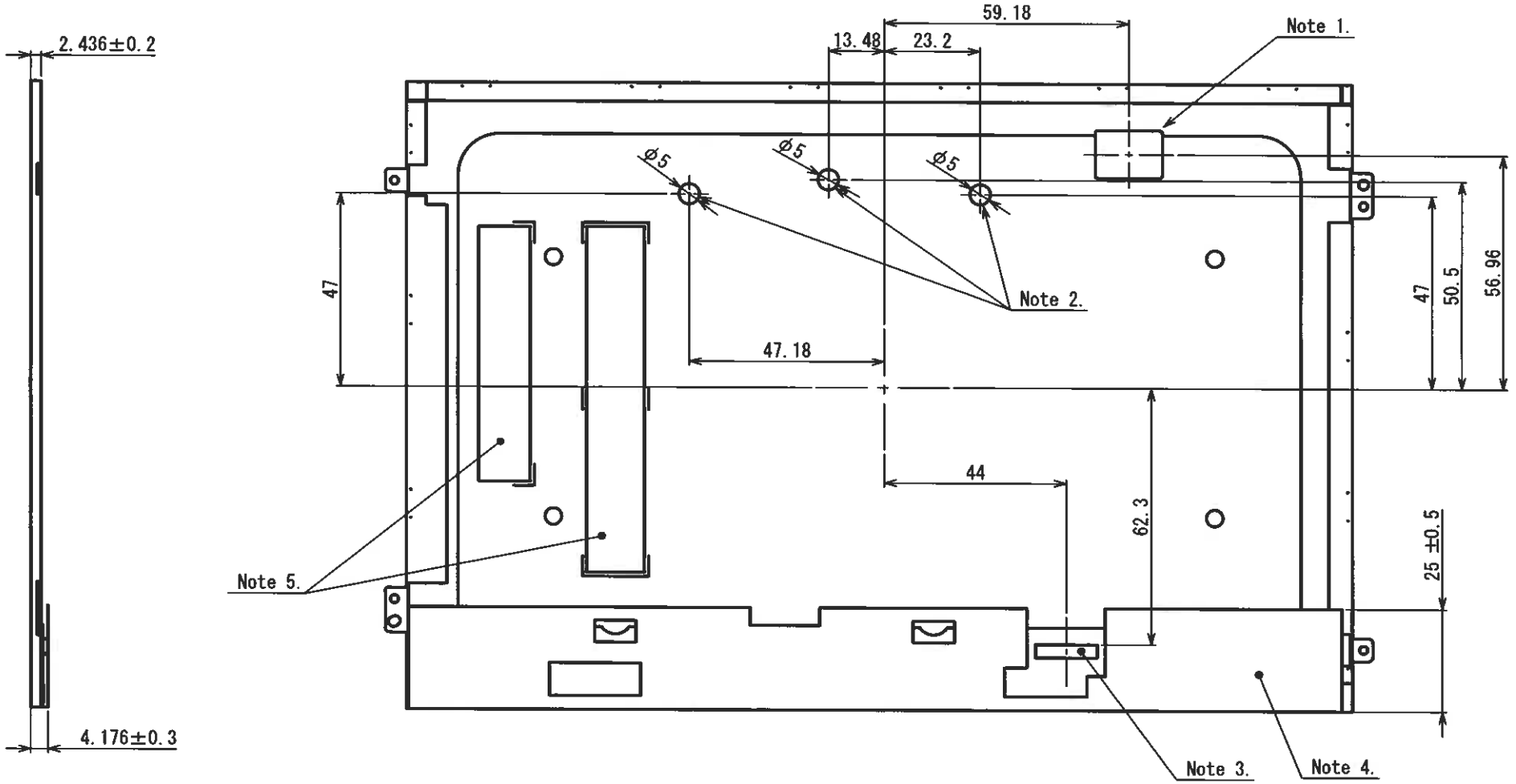


Detail A

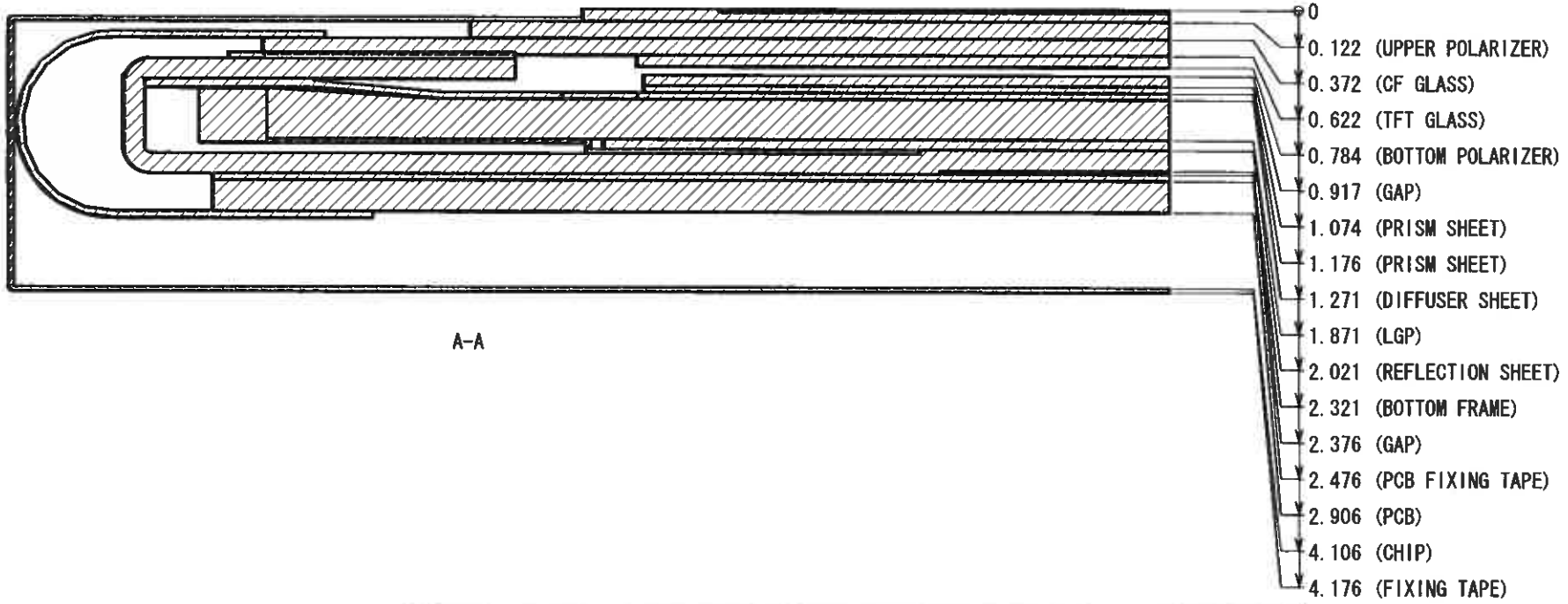


Detail B

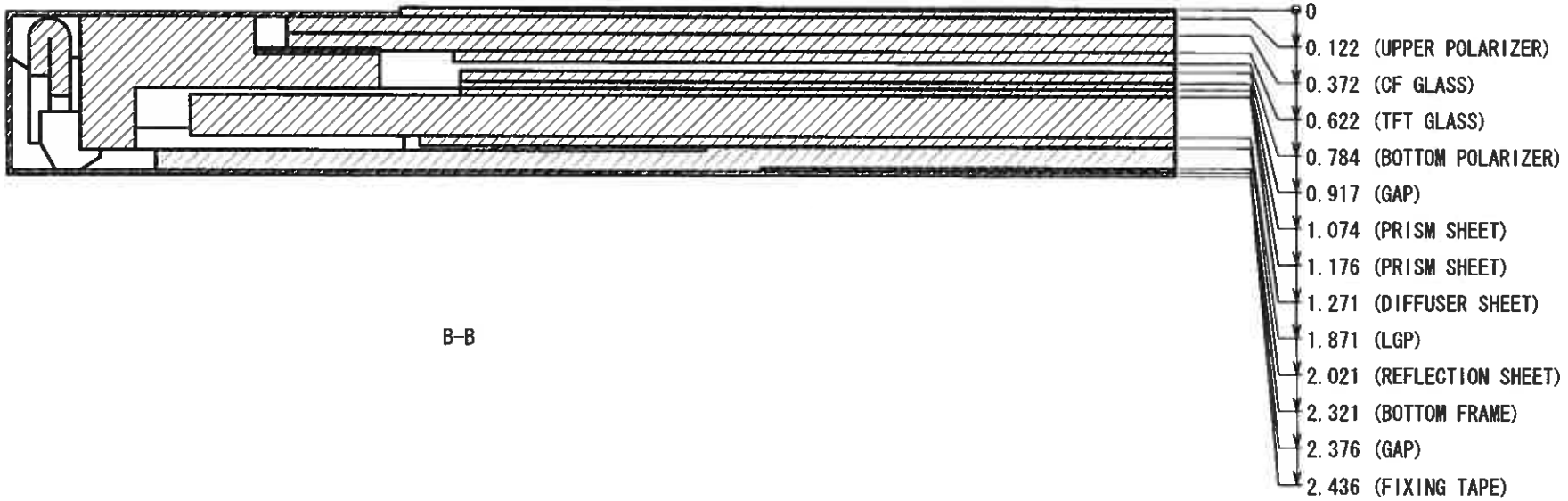
Panasonic Liquid Crystal Display Co., Ltd	Date	Feb.03,2012	Sheet No.	ATD5485-1	Page	10-1/3



Note:
1. This square is hole area on the bottom side of AL meral frame.
2. These three circles are hole area on the bottom side of AL meral frame.
3. FPC conn PANASONIC AYF334535.
4. This area is Fixing tape.
5. This is a maker Label.


0
0.122 (UPPER POLARIZER)
0.372 (CF GLASS)
0.622 (TFT GLASS)
0.784 (BOTTOM POLARIZER)
0.917 (GAP)
1.074 (PRISM SHEET)
1.176 (PRISM SHEET)
1.271 (DIFFUSER SHEET)
1.871 (LGP)
2.021 (REFLECTION SHEET)
2.321 (BOTTOM FRAME)
2.376 (GAP)
2.476 (PCB FIXING TAPE)
2.906 (PCB)
4.106 (CHIP)
4.176 (FIXING TAPE)

A-A


0
0.122 (UPPER POLARIZER)
0.372 (CF GLASS)
0.622 (TFT GLASS)
0.784 (BOTTOM POLARIZER)
0.917 (GAP)
1.074 (PRISM SHEET)
1.176 (PRISM SHEET)
1.271 (DIFFUSER SHEET)
1.871 (LGP)
2.021 (REFLECTION SHEET)
2.321 (BOTTOM FRAME)
2.376 (GAP)
2.436 (FIXING TAPE)

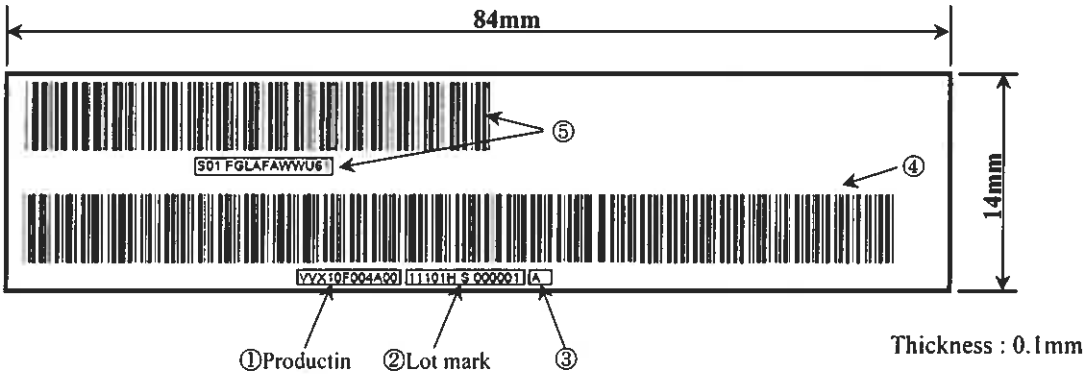
B-B

8. LABEL FORMAT

8.1 Label

The label is on the metallic bezel as shown in 7. External Dimensional.

The style of character will be changed without notice.



Thickness : 0.1mm

① VVX10F004B90

② Please refer to 8.3.

③ Please refer to 8.2.

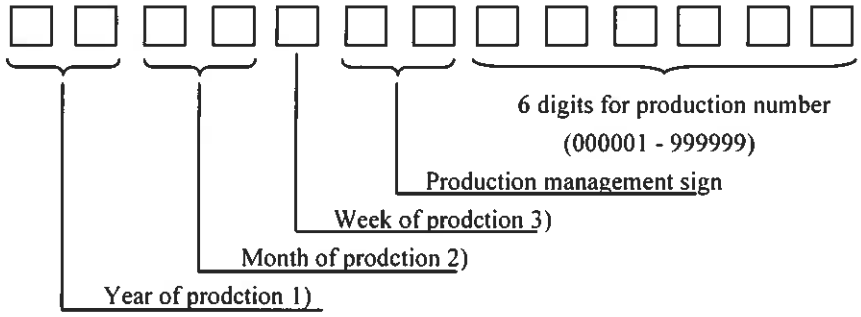
④ Contents of ①～③ are indicated by bar codes.【Express by the code 39.】

⑤ A cord for production of PLD inside management.

8.2 Revision (REV.) control

REV. is the column for manufacturing convenience. A-Z except I and O may be written on this column.

8.3 Lot mark



1)

Mark	Year
11	2011
12	2012
13	2013

2)

Mark	Month	Mark	Month
01	1	07	7
02	2	08	8
03	3	09	9
04	4	10	10
05	5	11	11
06	6	12	12

3)

Week mark	Day
1	1～7
2	8～14
3	15～21
4	22～28
5	29～31