

Panasonic Liquid Crystal Display Co.,Ltd.

Technical data

VVX07F015M00

CONTENTS

No.	Item	Sheet No.	Page
-	COVER	IPS4 2601 VVX07F015M00 - 4	1-1/1
-	RECORD OF REVISION	IPS4 2602 VVX07F015M00 - 4	2-1/1
-	DESCRIPTION	IPS4 2603 VVX07F015M00 - 4	3-1/1
1	ABSOLUTE MAXIMUM RATINGS	IPS4 2604 VVX07F015M00 - 4	4-1/2~2/2
2	INITIAL OPTICAL CHARACTERISTIC	IPS4 2605 VVX07F015M00 - 4	5-1/2~2/2
3	ELECTRICAL CHARACTERISTICS	IPS4 2606 VVX07F015M00 - 4	6-1/1
4	BLOCK DIAGRAM	IPS4 2607 VVX07F015M00 - 4	7-1/1
5	INTERFACE PIN ASSIGNMENT	IPS4 2608 VVX07F015M00 - 4	8-1/3~3/3
6	INTERFACE TIMING	IPS4 2609 VVX07F015M00 - 4	9-1/7~7/7
7	DIMENSIONAL OUTLINE	IPS4 2610 VVX07F015M00 - 4	10-1/3~3/3
8	LABEL FORMAT	IPS4 2611 VVX07F015M00 - 4	11-1/1
9	PRECAUTION	IPS4 2612 VVX07F015M00 - 4	12-1/5~5/5
10	PACKING	IPS4 2613 VVX07F015M00 - 4	13-1/1

Panasonic Liquid Crystal Display Co.,Ltd.	Date	Jun.27,2014	Sheet No.	IPS4 PS 2601 VVX07F015M00-4	Page	1-1/1
---	------	-------------	-----------	-----------------------------	------	-------

DESCRIPTION

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

Product Name : VVX07F015M00

General Specifications

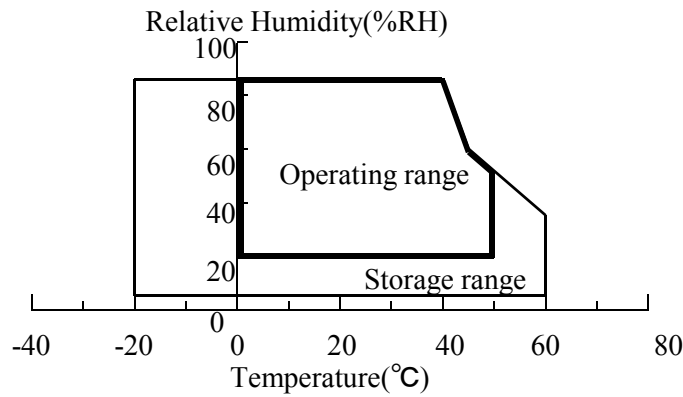
Effective display area	: (H) 94.50×(V) 151.2	(mm)
Number of pixels	: (H) 1200×RGB×(V) 1920	(pixels)
Pixel pitch	: (H) 0.07875×(V) 0.07875	(mm)
Color pixel arrangement	: R+G+B vertical stripe	
Display mode	: Transmissive mode Normally black mode	
Top polarizer type	: Hard Coat + Retardation Film	
Number of colors	: RGB × 8bit	(colors)
Input signal	: MIPI 4 Lanes	
Backlight	: 24 pieces of LED	
External dimensions	: (H) 104.52 × (V) 161.87 × (t) 2.4 (Max.)	
Weight	: 66g (Typ), 70g(Max)	
RoHS Directive	:RoHS compliant	

1. ABSOLUTE MAXIMUM RATINGS

ITEM	Operating		Storage		UNIT	NOTE
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	°C	1),3)
Humidity	2)		2)		%RH	1)
Vibration	-		4)		m/s²	
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) $T_a \leq 40\text{ }^\circ\text{C}$ ······ Relative humidity should be less than 85 %RH max. Dew is prohibited.
 $T_a > 40\text{ }^\circ\text{C}$ ······ Relative humidity should be lower than the moisture of the 85 %RH at 40 °C.



- 3) The temperature of LCD front surface would be 65 °C 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 peak, 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/

(1)TFT-LCD module

 $V_{SS} = 0\text{ V}$

ITEM	SYMBOL	Min.	Max.	UNIT	NOTE
Power Supply Voltage	VDD	-0.3	5.0	V	
Logic supply voltage	VCC	-0.3	2.5	V	
Logic signal input voltage	VI	-0.3	VCC+0.3	V	
Logic signal output voltage	VO	-0.3	VCC+0.3	V	
Electrostatic Durability	VESD0	6.0		kV	1)
	VESD1	2.0		kV	2)

- Note 1) Panel: Air condition, Human body model $R=1.5\text{k ohm} / C=100\text{pF}$
 2) components: Human body model $R=1.5\text{k ohm} / C=100\text{pF}$

(2) Backlight unit

ITEM	SYMBOL	Typ	UNIT	NOTE
Temperature Junction of LED	Tj	100	°C	1)
Forward Current	If	20	mA	2)

- Note 1) The specification shall be applied to each LED.
 2) The specification shall be applied at connector pins for LED at start-up.

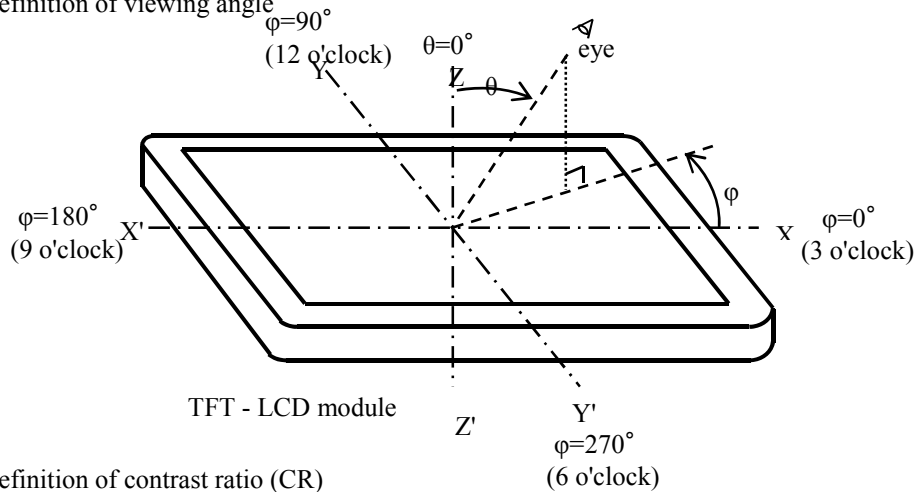
2. INITIAL OPTICAL CHARACTERISTICS

conditions. The measuring point is the center of display area unless otherwise noted.

Measuring equipment : CS-2000A, or equivalent
 Ambient Temperature =25 °C , AV_{DD}=3.3V , f v=60 Hz ,
If=20mA (on duty 100%)

ITEM	SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE	
Contrast ratio	CR	$\theta = 0^\circ$	750	1200	-	-	1),2)	
Response time (Rise + Fall)	Tr + Tf	$\theta = 0^\circ$	-	-	30	ms	1),3)	
Brightness of white	Bwh		380	450	-	cd/m ²	1),5),6)	
Brightness uniformity	Buni(9points)		70	80	-	%	1),4)	
Color chromaticity (CIE)	Red		x	0.590	0.640	0.690	-	1) 【Gray scale =255】
			y	0.280	0.330	0.380		
	Green		x	0.260	0.310	0.360		
			y	0.570	0.620	0.670		
	Blue		x	0.100	0.150	0.200		
			y	0.020	0.070	0.120		
	White		x	0.283	0.313	0.343		
		y	0.299	0.329	0.359			
View Angle	Right	-	CR>10 , $\varphi=0^\circ$	80	85	-	degree	1)
	Left	-	CR>10 , $\varphi=180^\circ$	80	85	-		
	Top	-	CR>10 , $\varphi=90^\circ$	80	85	-		
	Bottom	-	CR>10 , $\varphi=270^\circ$	80	85	-		
NTSC	-	$\theta = 0^\circ$	65	72	-	%	1)	
W,R,G,B Gamma	-	$\theta = 0^\circ$	1.9	2.2	2.5	-	1)	

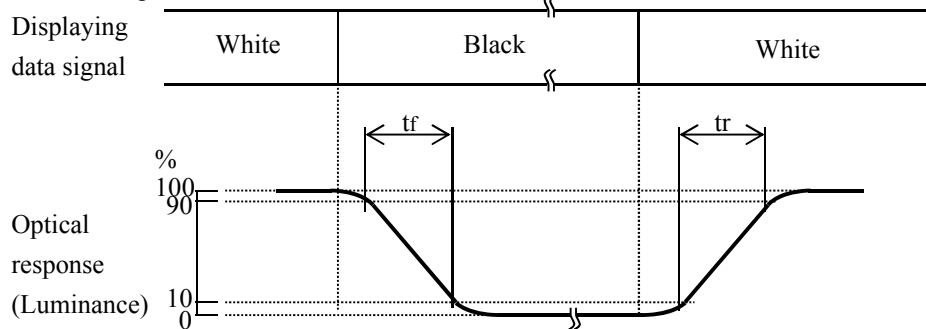
Note 1) Definition of viewing angle



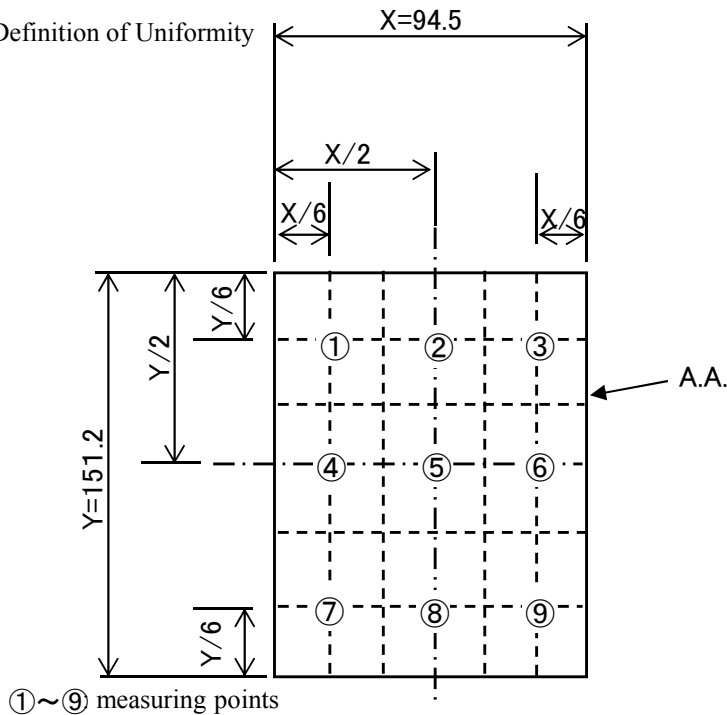
2) Definition of contrast ratio (CR)

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

3) Definition of response time



4) Definition of Uniformity



①~⑨ measuring points

$$\text{Buni (9Points)} = \frac{\min(\text{①} \sim \text{⑨})}{\max(\text{①} \sim \text{⑨})}$$

5) PLD define min 380nit by PLD's measured data or DSI measured data x 1.1.

Min 380nit is based on the measurement data by CS 2000A(or 1000A) or equivalent with standard measurement condition after calibration.

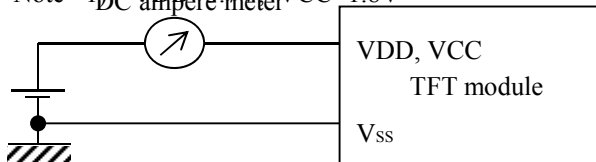
Note 6) Refer to Special Agreement document "ATD-8215_New brightness spec agreement appendix 20131031.pdf"

3. ELECTRICAL CHARACTERISTICS

Ta = 25 °C , Vss = 0 V

ITEM	SYMBOL	Min.	Typ.	Max.	UNIT	NOTE	
Power supply voltage	VDD	3.3	3.7	5.0	V		
Input voltage for logic	VCC	1.7	1.8	1.9	V		
Power consumption (Full White Raster)	P_VDD	-	360	400	mW	1)	
	P_VCC	-	90	100	mW	1)	
	P_Total	-	450	500	mW	1) 2)	
Power consumption (Full Black Raster)	P_VDD	-	360	400	mW	1)	
	P_VCC	-	90	100	mW	1)	
	P_Total	-	450	500	mW	1) 2)	
Ripple voltage of power supply	V _{DDR}	-	-	200	mV		
Logic signals input voltage	Low	V _{IL}	0.0	-	0.3 x V _{cc}	V	PWMI
	High	V _{IH}	0.7xV _{cc}	-	V _{cc}	V	PWMI
Logic signals output voltage	Low	V _{OL}	0.0	-	0.3 x V _{cc}	V	PWMO
	High	V _{OH}	0.7xV _{cc}	-	V _{cc}	V	PWMO

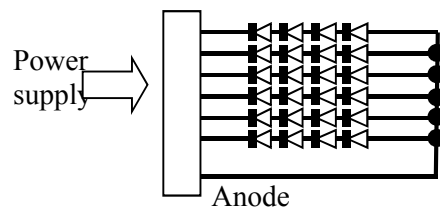
Note 1) VDD=3.7V, VCC=1.8V
DC amperemeter



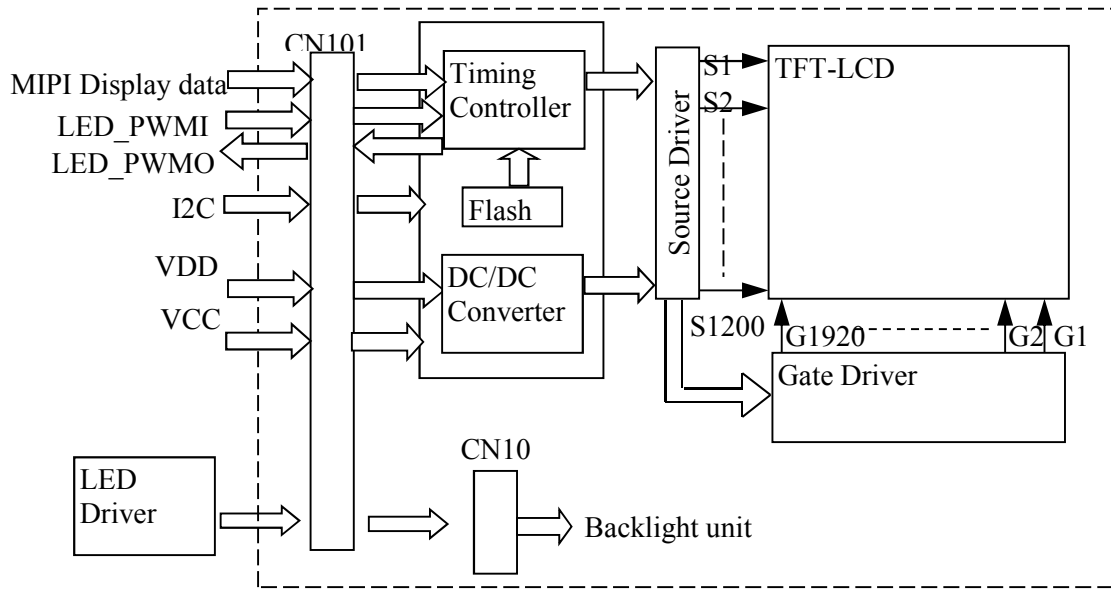
Note 2) P_{Total} = P_{VDD} + P_{VCC}

ITEM	SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power Consumption	Pbl	-	1.392	1.5	W	1), 2)
Forward Current(each LED)	I _f	-	20	20	mA	

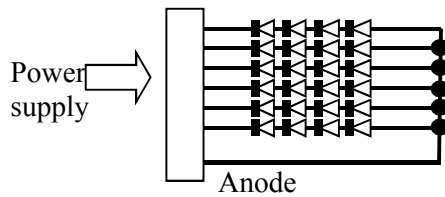
- 1) This characteristics should be applied putting on the LED about 60 minutes later with ambient temperature.
(Ta = 25 °C ± 2 °C)
- 2) This value is not include LED driver loss.
- 3) The Backlight circuit is the following.



4. BLOCK DIAGRAM



4.2 Backlight unit



C102:HIROSE(FH19C-10S-0_5SH(18))

PIN No.	Function	Note
1	Cathode 6	
2	Cathode 5	
3	Cathode 4	
4	Cathode 3	
5	Cathode 2	
6	Cathode 1	
7	NC	
8	NC	
9	Anode	
10	Anode	

5. INTERFACE PIN ASSIGNMENT

CN101:Panasonic (AXT640124)

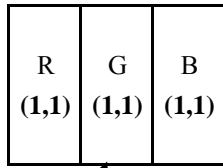
PIN No.	SYMBOL	DESCRIPTION	Note
2	LED_VOLTAGE+	LED Anode	
4	LED_VOLTAGE	LED Anode	
6	GND	GND(0V)	2)
8	LED6_RETURN	LED Cathode	
10	LED5_RETURN	LED Cathode	
12	LED4_RETURN	LED Cathode	
14	LED3_RETURN	LED Cathode	
16	LED2_RETURN	LED Cathode	
18	LED1_RETURN	LED Cathode	
20	BIST	Keep open (VCC for BIST mode)	
22	PWM_OUT		
24	PWM_IN		
26	GND	GND(0V)	2)
28	VCC	VCC(1.8V)	
30	VCC	VCC(1.8V)	
32	GND	GND(0V)	2)
34	VDD	VDD(3.7Vtyp)	1)
36	VDD	VDD(3.7Vtyp)	1)
38	VDD	VDD(3.7Vtyp)	1)
40	GND	GND(0V)	2)

PIN No.	SYMBOL	DESCRIPTION	Note
1	GND	GND(0V)	2)
3	GND	GND(0V)	2)
5	MIPI_D4+	MIPI data pair 3 positive signal	
7	MIPI_D4-	MIPI data pair 3 negative signal	
9	GND	GND(0V)	2)
11	MIPI_D3+	MIPI data pair 2 positive signal	
13	MIPI_D3-	MIPI data pair 2 negative signal	
15	GND	GND(0V)	2)
17	MIPI_CKL+	MIPI data clock positive signal	
19	MIPI_CLK-	MIPI data clock negative signal	
21	GND	GND(0V)	2)
23	MIPI_D2+	MIPI data pair 1 positive signal	
25	MIPI_D2-	MIPI data pair 1 negative signal	
27	GND	GND(0V)	2)
29	MIPI_D1+	MIPI data pair 1 positive signal	
31	MIPI_D1-	MIPI data pair 1 negative signal	
33	GND	GND(0V)	2)
35	SDA	I2C data signal	
37	SCL	I2C clock signal	
39	GND	GND(0V)	2)

Notes 1) All VDD pins shall be connected to +3.7V.

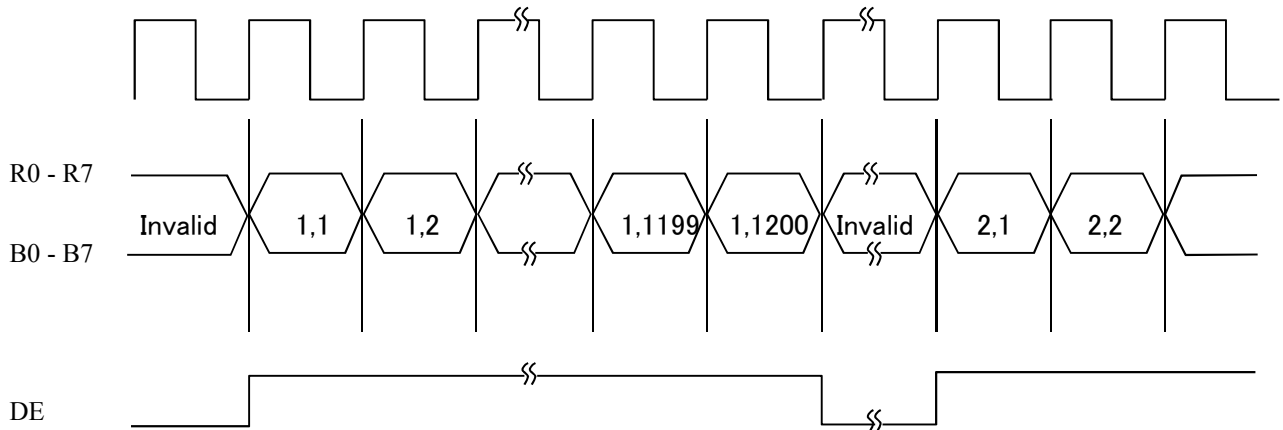
2) All GND pins shall be grounded. Metal bezel is internally connected to GND.

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



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

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



Input Color		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	
	Green(255)	0	0	0	0	0	0	0	0	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	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	
	Magenta	1	1	1	1	1	1	1	1	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	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	
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	
	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	
	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	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	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	
	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	
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	
	Green (1)	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	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	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	
	Green(255)	0	0	0	0	0	0	0	0	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	
	Blue (1)	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	1	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Blue (254)	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	1	1	1	1	1	1	1	1	

Note 1) Definition of gray scale :

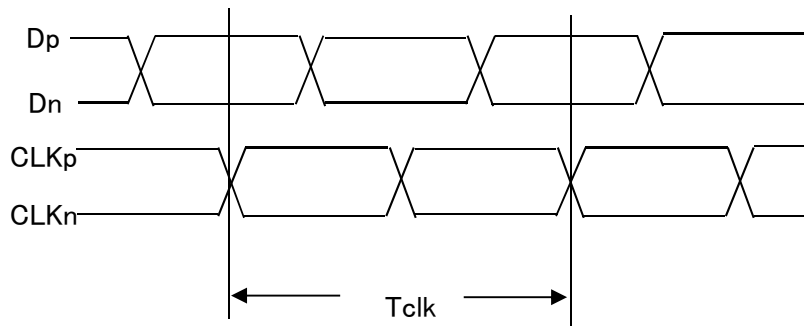
Color(n) Number in parenthesis indicates gray scale level.

Larger n corresponds to brighter level.

2) Data : 1 : High, 0 : Low

6. INTERFACE TIMING

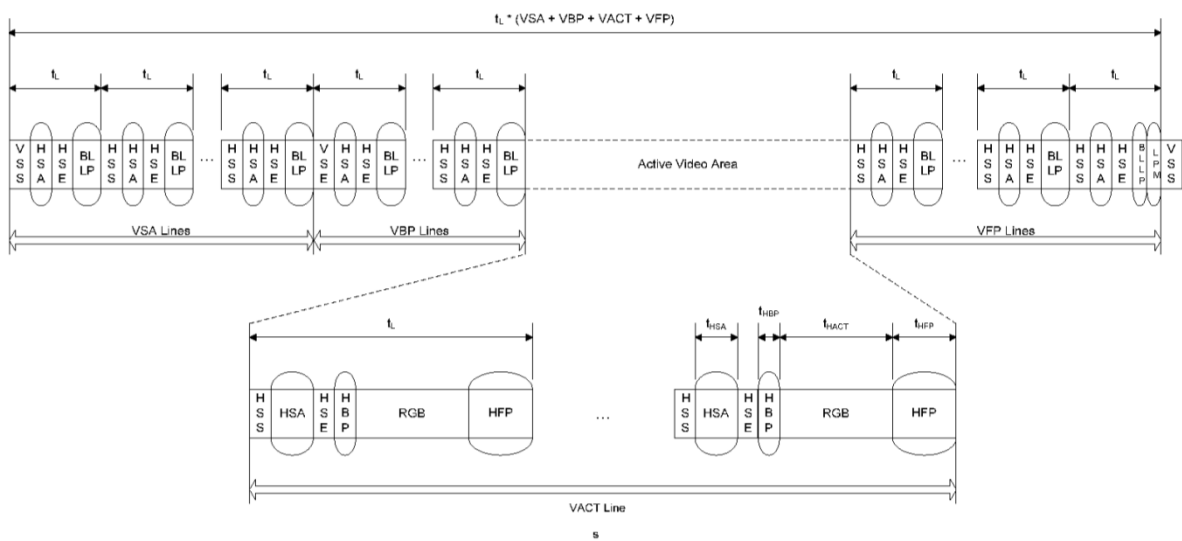
(1) High Speed CLK Timing



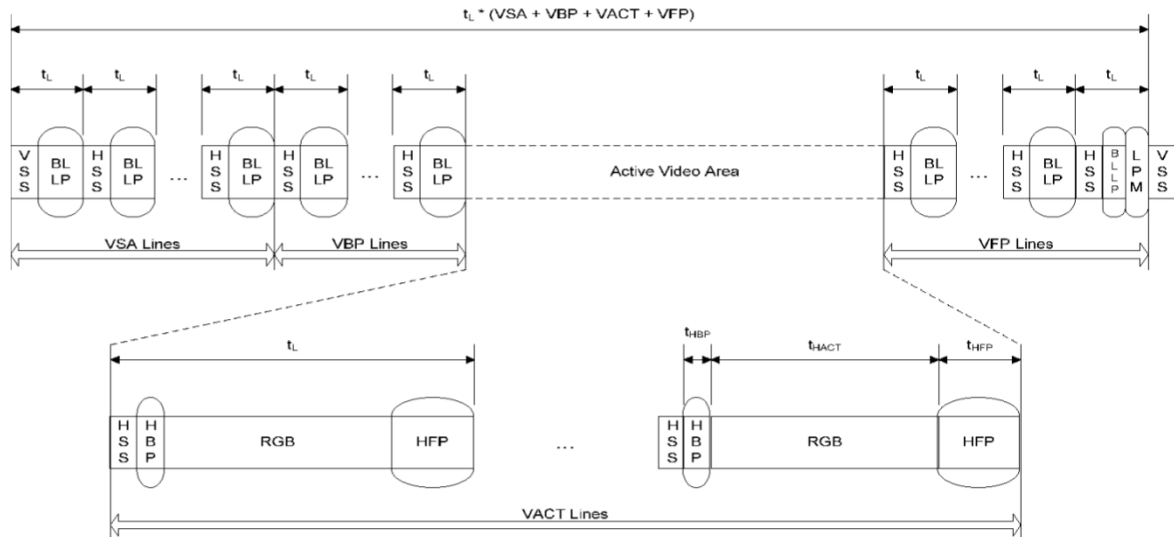
	Min	Max
T_{clk}	6.02ns(166MHz)	12.5ns(80MHz)

(2) Data Transmission Timing

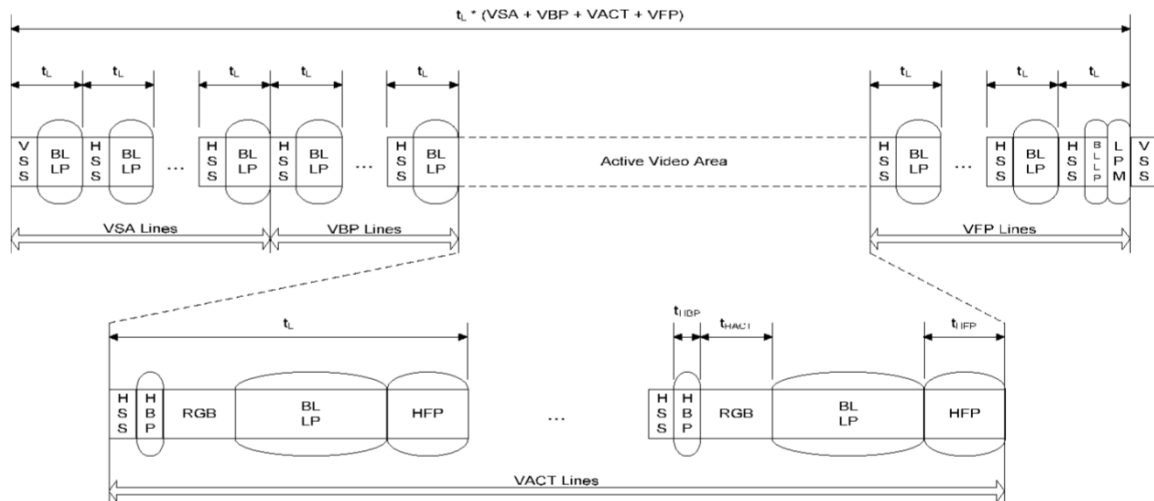
(i) Non-Burst Transmission with Sync Start and End (Pulse Mode)



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



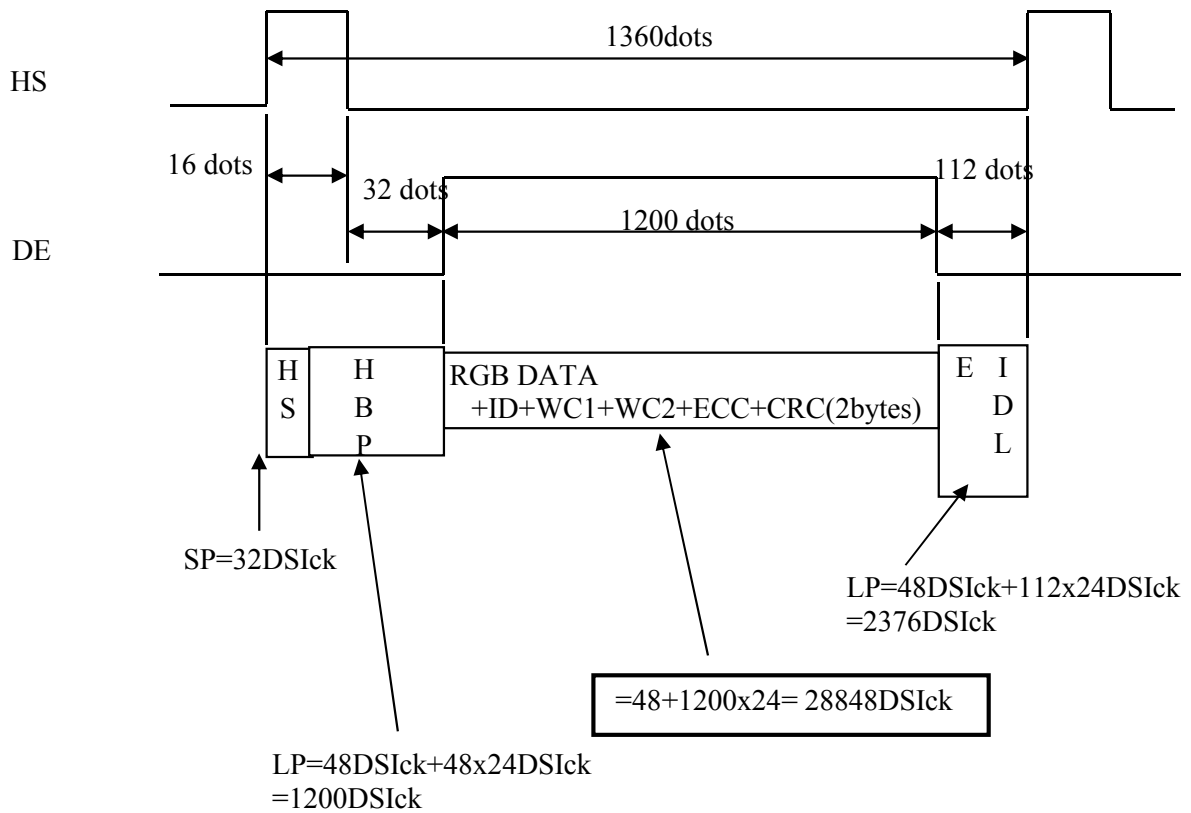
(iii) Burst Mode



(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 ($T_{HS-SETTLE}$) and the period from HS to LP-11 ($T_{HS-TRAIL} + T_{HS-EXIT}$) 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 9.5.
- (5) The data type is 3Eh (packed-RGB 888), and you need to send peripheral command (0x32)

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



$f_{dsick} = 32456 \times 117.6 \text{ KHz} = 3.82 \text{ Gbps}$,
 Data Transfer Rate/Lane = $f_{dsick} / 4 = 954.6 \text{ Mbps}$

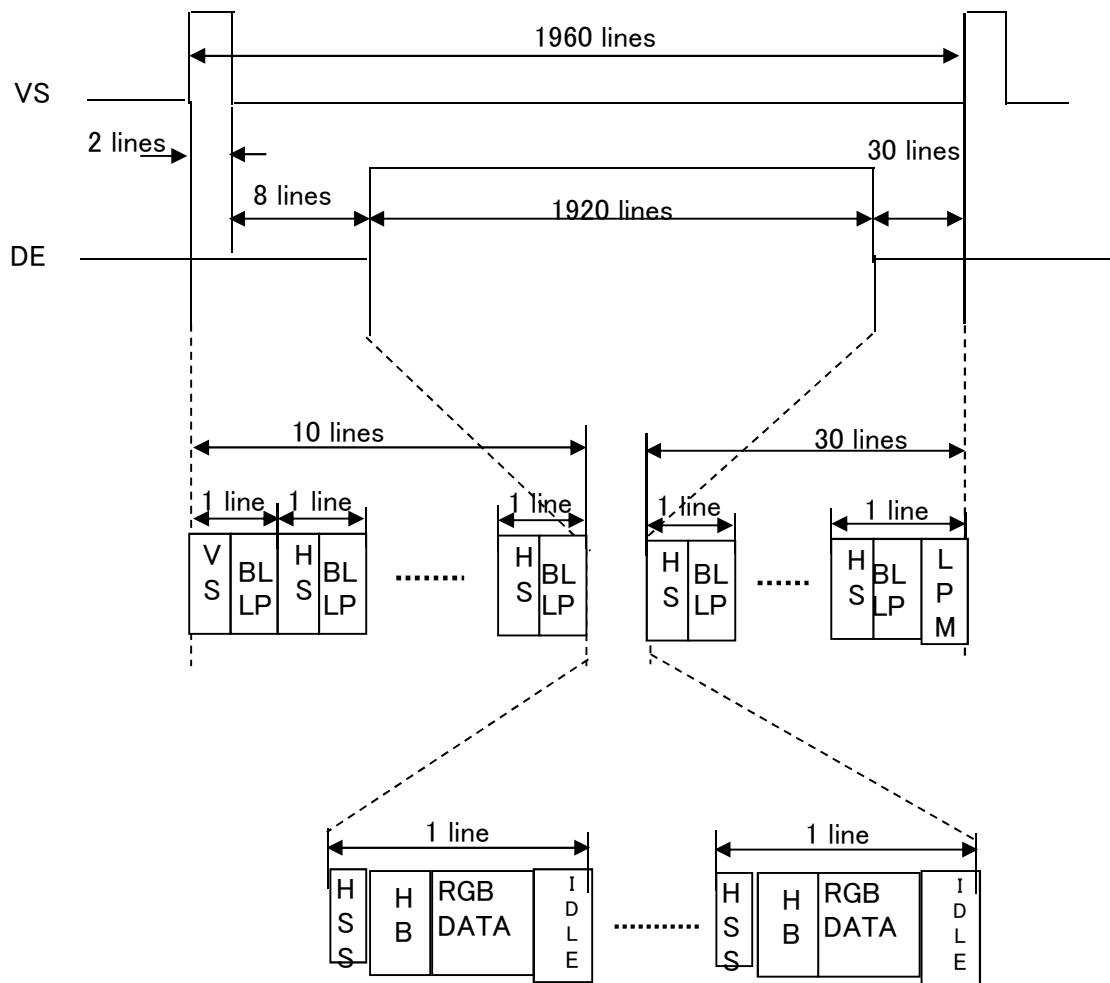
Total LP =
 $32 \text{ DSICK} + 1200 \text{ DSICK} + 28848 \text{ DSICK} + 2376 \text{ DSICK}$
 $= 32456 \text{ (bits)}$
 $H_{total} = 32456 \text{ DSICK} / 4 \text{ lane} = 8114 \text{ DSICK/lane}$

 $f_H = 1960 \times 60 = 117.6 \text{ kHz}$
 $T_H = 8.50 \mu\text{s}$

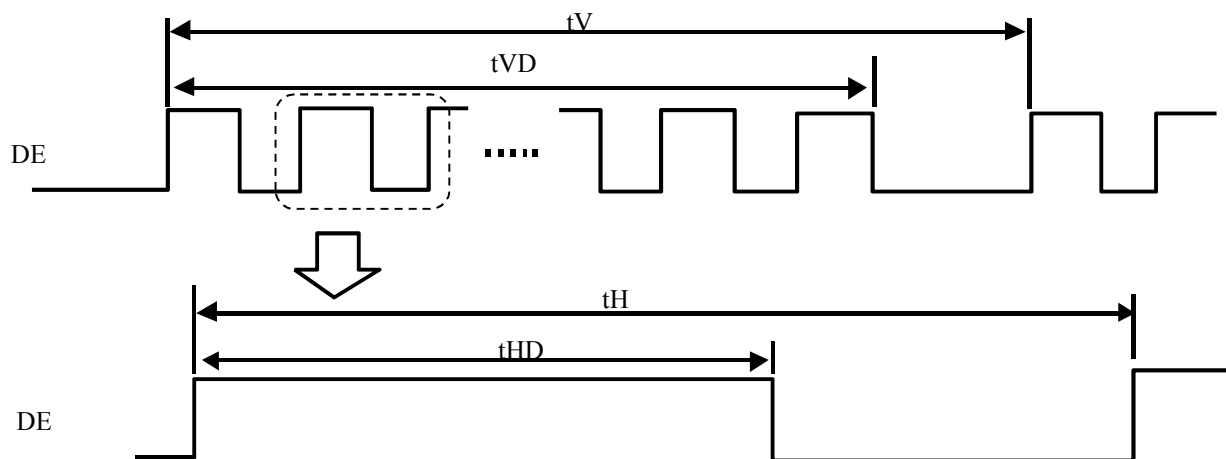
 $8.50 \mu\text{s} / 8114 = 1.05 \text{ ns}$
 $1 / 1.05 / 2 = 477 \text{ Mbps}$

SP: Short Packet
 LP: Long Packet
 DSICK: Hypothetical DSI clock
 assuming one lane data transmission
 and single edge data latch

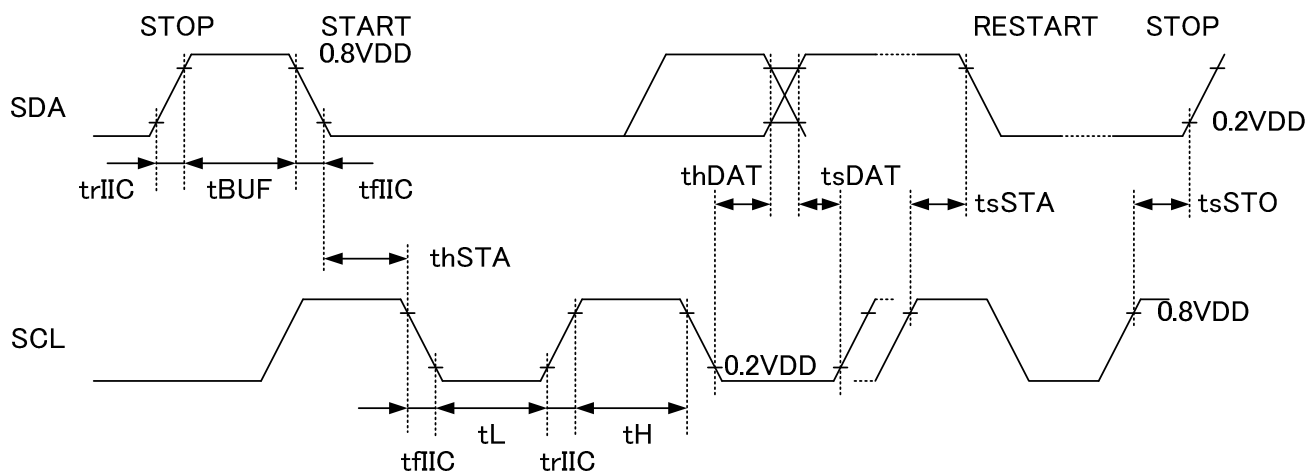
(vi) An Example of Non-Burst Event Mode DSI Timing (Frame Period)



1 line = 8114DSIck/lane
 TH=8114x1.05=8.50us
 TV=1960xTH
 =1960x8.50us
 =16.7ms
 fV=1/TV=60Hz

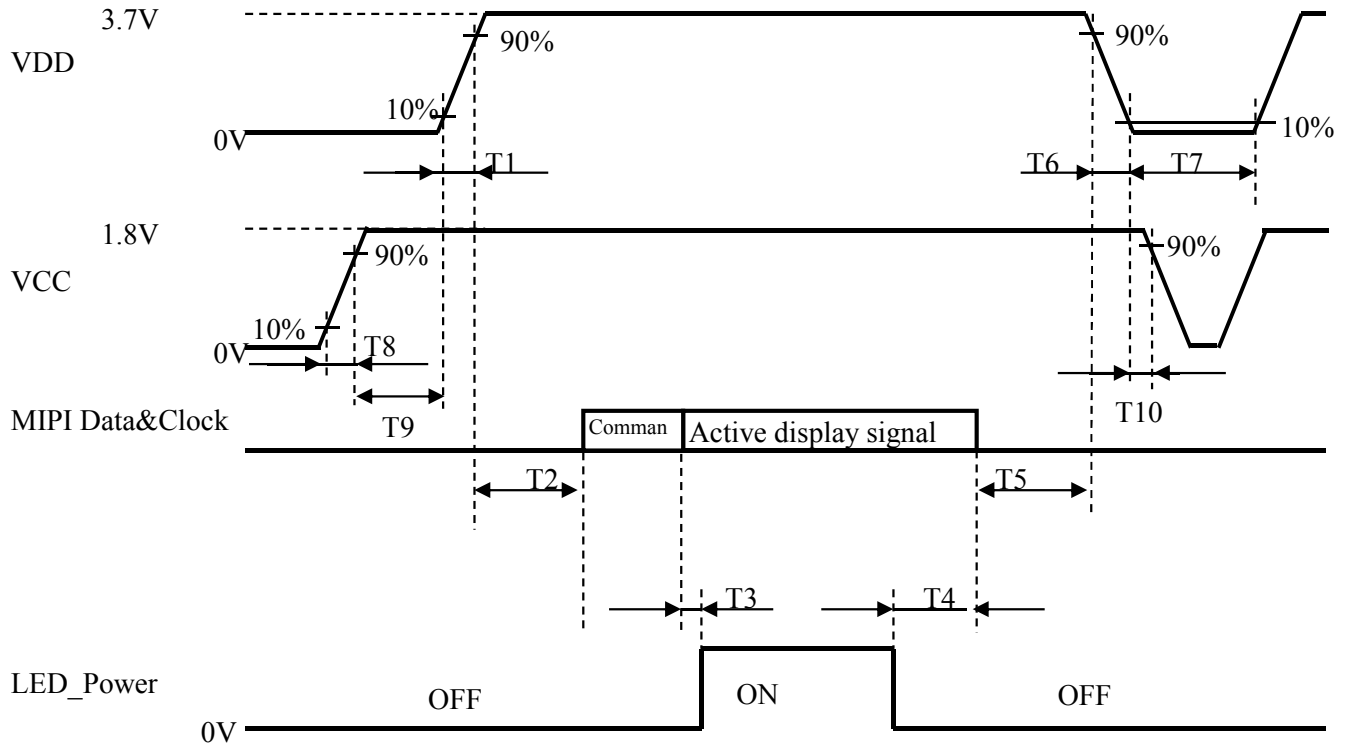


	ITEM	SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical Frequency	fV	40	60	62	Hz	
	Vertical Period	tV	1940	1960	4095	tH	
	Vertical Valid	tVD	1920			tH	
	Horizontal Frequency	fH	116.4	117.6	120.3	kHz	
	Horizontal Period	tH	1264	1360	4095	tCLK	
	Horizontal Valid	tHD	1200			tCLK	



Parameter	Symbol	Conditions	Rating			Unit
			MIN	TYP	MAX	
SCL Clock Frequency	fsc1	See. Upper Fig.	-	-	400	kHz
STOP START Interval	tBUF		1.2	-	-	μ s
START HOLD Time	thSTA		0.6	-	-	μ s
RESTART SETUP Time	tsSTA		0.6	-	-	μ s
STOP SETUP Time	tsSTO		0.6	-	-	μ s
Rize Time	trIIC		-	-	0.3	μ s
Fall Time	tfIIC		-	-	0.3	μ s
Clock Low Time	tL		1.2	-	-	μ s
Clock High Time	tH		0.6	-	-	μ s
Data Setup Time	tsDAT		0.1	-	-	μ s
Data Hold Time	thDAT		0	-	-	μ s

* Power Up/Off sequence



SYMBOL	Min.	Typ.	Max.	UNIT	Note
T1	0.5	-	10	ms	
T2	100	-	-	ms	
T3	2	-	-	frame	
T4	30	-	-	ms	
T5	0	-	50	ms	
T6	3	-	10	ms	
T7	400	-	-	ms	
T8	0.5	-	10	ms	
T9	0	-	10	ms	
T10	0	-	10	ms	

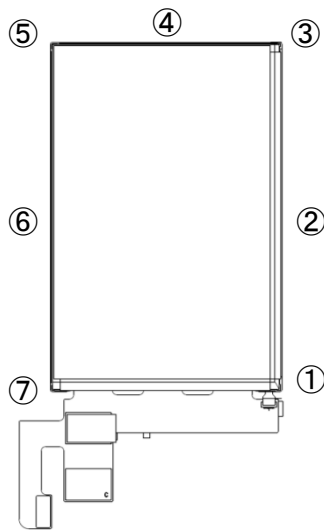
7.1 TFT-LCD module outline

To refer to 10-2/3

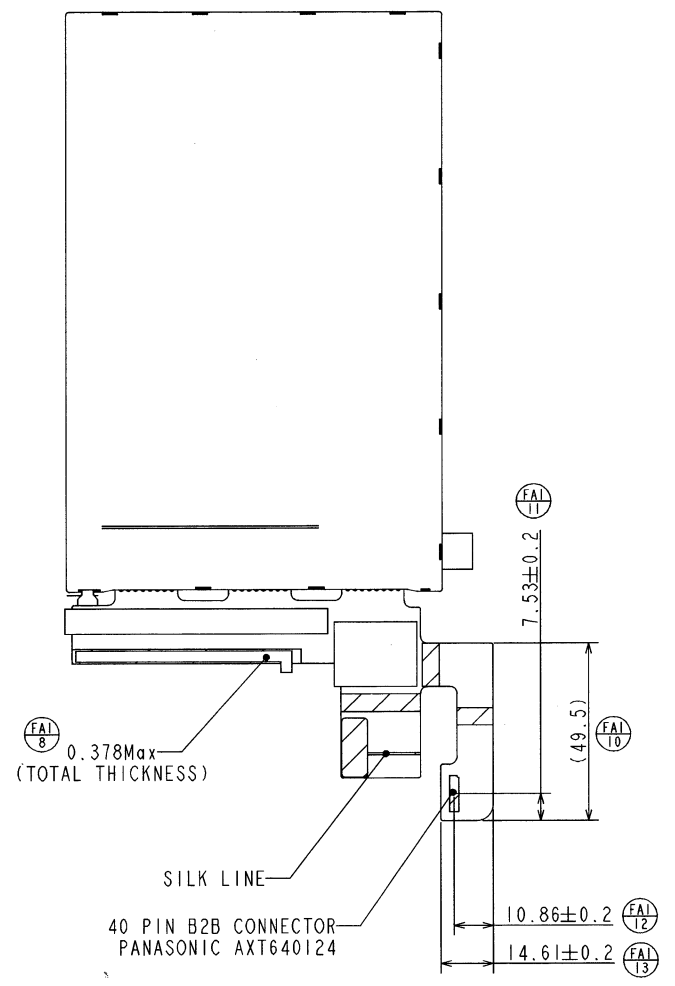
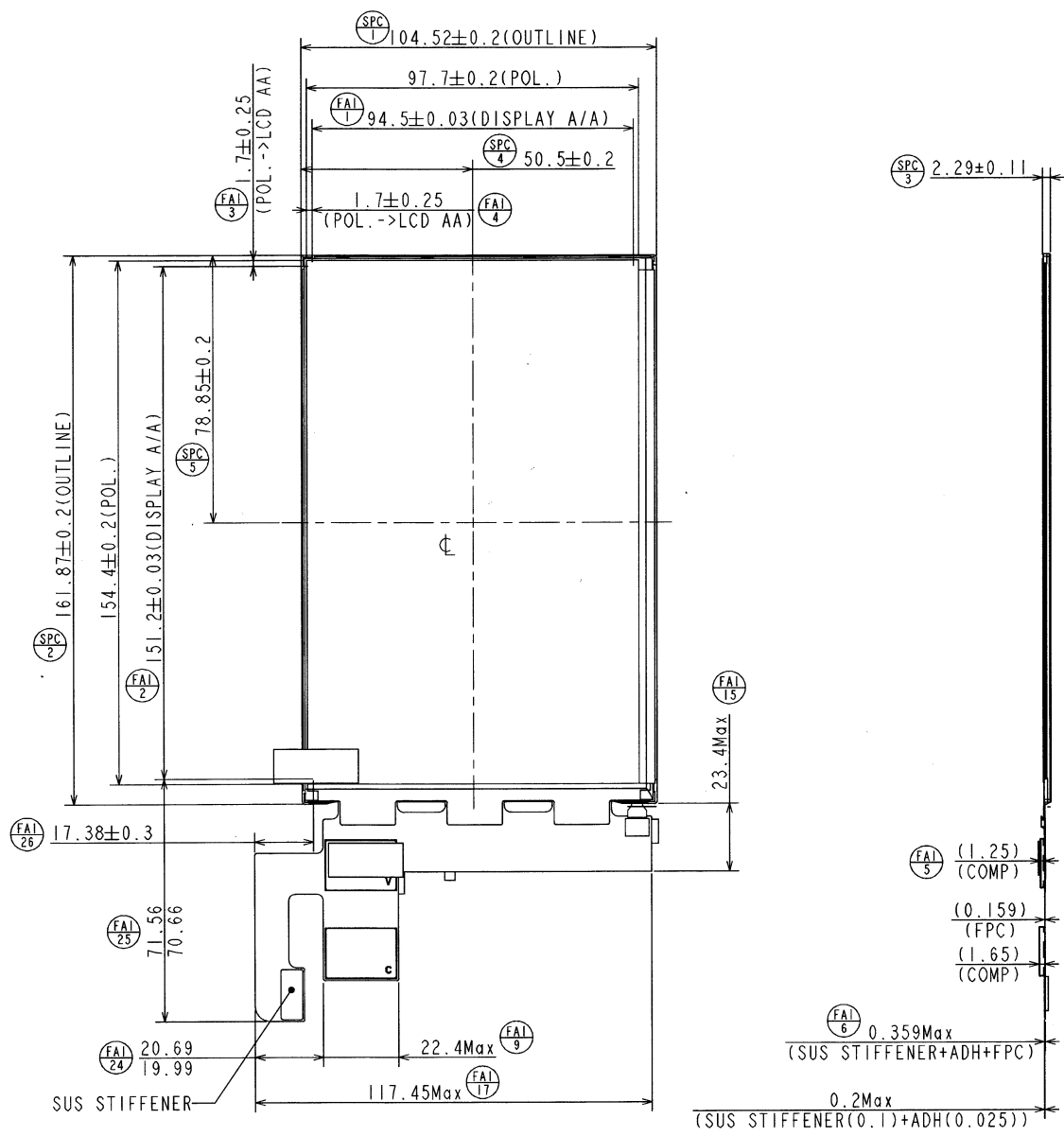
7.2 The flatness of TFT-LCD module

Not to exceed 1.0mm over the entire surface.

①~⑦ measuring points

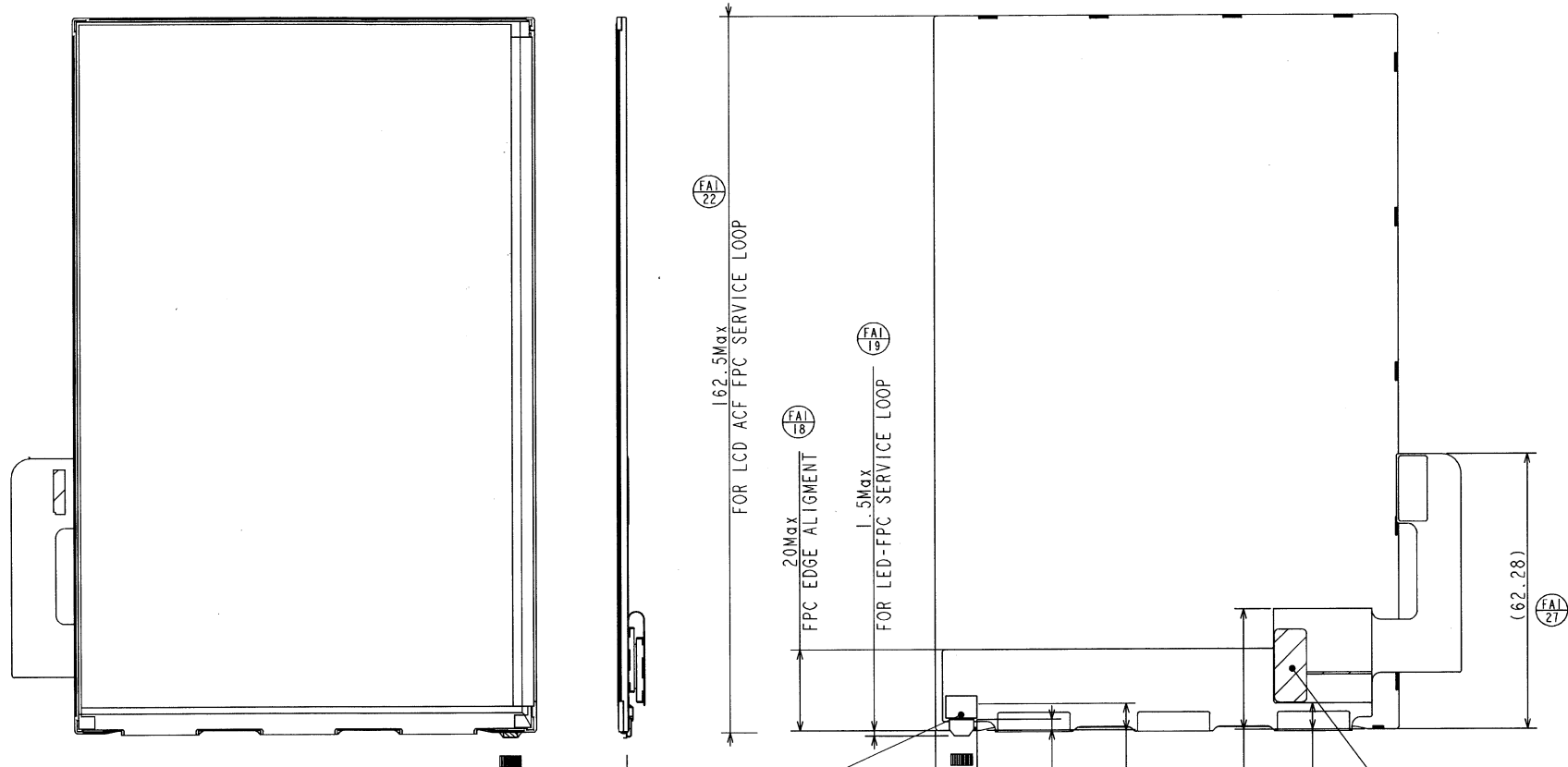


7" MODULE OUTLINE



- Note
1. UNDESIGNATED TOLERANCES OF DIMENSION ARE ±0.5mm.
 2. THE DIMENSIONS WITH () ARE REFERENCE.
 3. THE DIMENSIONS OF THICKNESS ARE TO BE MEASURED WITH A MICROMETER.
 4. REFER TO THE CAD DATA FILES FOR QUESTIONS CONCERNING DIMENSIONS OR DETAILS.
 5. DIMENSIONS MARKED WITH SPC ARE TO BE USED FOR STATISTICAL PROCESS CONTROL OF CPK 1.33 OR STATISTIALS EQUIVALENT.
 6. FAL INDICATES FIRST ARTICLE INSPECTION.
 7. ECN INDICATES FIRST ARTICLE INSPECTION.

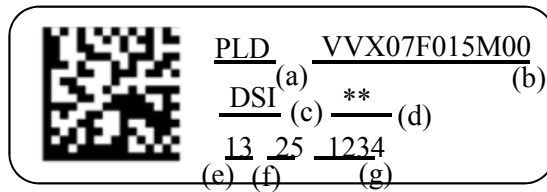
7" MODULE OUTLINE



FAI 18 LED CONNECTOR/COMPONENT REGION
 (INCLUDING CONNECTOR LEADS)
 MAX CONNECTOR + SOLIDER HEIGHT = 1.1MM
 APPLY 0.05 MM THICK KAPTON TAPE
 OVER EXPOSED CONNECTOR LEADS

8. LABEL FORMAT

8.1 Label



mark	Print item	Print content
(a)	Vender code	PLD
(b)	Production Name	VVX07F015M00
(c)	Production Factory	DSI
(d)	Suffix	** PLD use suffix for revision management.
(e)	Production Year	Year 2013→13 Year 2014→14
(f)	Production Week	1week,January:01 2week,January:02 : 4week or 5week,December:5*
(g)	Serie No.	0001~ZZZZ (except for I, O, U, V)

It is the mark that was opened up by production person to take correspondence with production number.

9. PRECAUTION

- (1) Applying strong force to a part of the module may cause partial deformation of frame or mold, and cause damage to the display.
- (2) **The module should gently and firmly be held by both hands. Never hold by just one hand in order to avoid any internal damage.** Never drop or hit the module.
- (3) The module should be installed with mounting holes of a module.
- (4) Uneven force such as twisted stress should not be applied to a module when a module is mounted on the cover case. The cover case must have sufficient strength so that external force can not be transmitted directly to a module.
- (5) It is recommended to leave a space between a module and a holding board of a module so that partial force is not applied to a module.

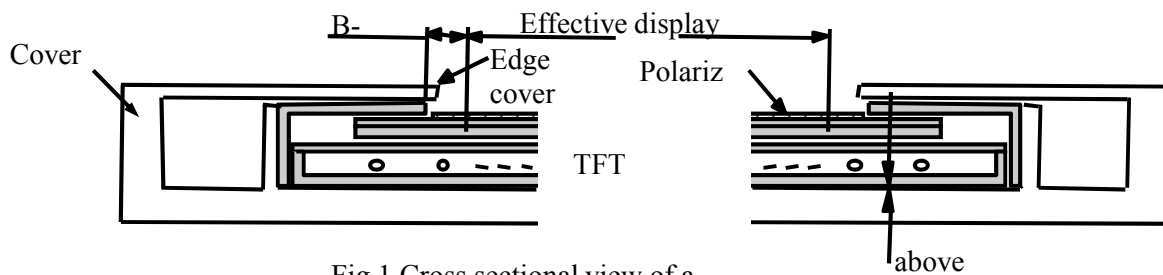
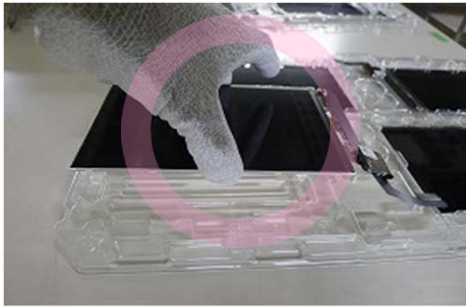


Fig.1 Cross sectional view of a

- (6) The edge of a cover case should be located inside more than 1mm from the edge of a module front frame.
- (7) A transparent protective plate should be added on the display area of a module in order to protect a polarizer and TFT cell. The transparent protective plate should have sufficient strength so that the plate can not touch a module by external force.
- (8) Materials included acetic acid and choline should not be used for a cover case as well as other parts and boards near a module. Acetic acid attacks a polarizer. Choline attacks electric circuits due to electro-chemical reaction.
- (9) 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 harder than HB pencil lead. The surface of a polarizer should not be touched and rubbed with bare hand, greasy clothes or dusty clothes.
- (10) 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 or Isopropyl alcohol as cleaning chemicals is recommended in order to clean adhesives which fix front/rear polarizers 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.
- (11) Saliva or water drops should be immediately wiped off. Otherwise, the portion of a polarizer may be deformed and its color may be faded.
- (12) The module should not be opened or modified. It may cause not to operate properly.
- (13) Metallic bezel of a module should not be handled with bare hand or dirty gloves. Otherwise, color of a metallic frame may become dirty during its storage. It is recommended to use clean soft gloves and clean finger stalls when a module is handled at incoming inspection process and production (assembly) process.
- (14) LCD-FPC and LED-FPC should not be pulled and held.

(A)How to take the liquid crystal display module out from the tray.

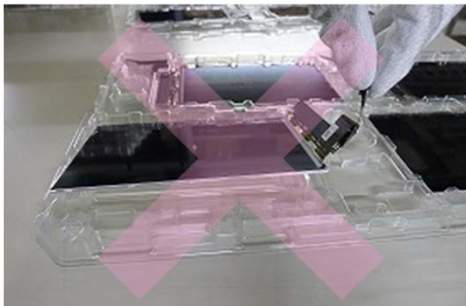
Please note the following points when taking out the liquid crystal display module from the tray.



Hold the side of the center part of the module.



Do not lift with holding the end of the module
(The other side of the FPC)



Do not lift with holding the FPC.



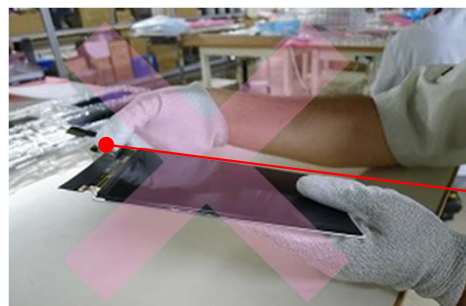
Do not lift with holding the FPC.

(B)Handle with care of the FPC part.

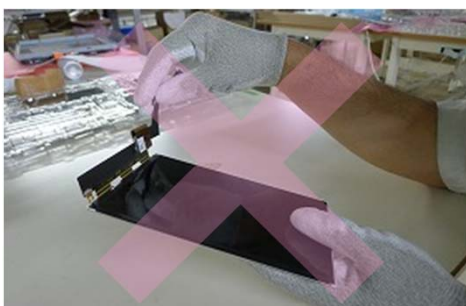
Please note the following points when handling the shielding case and the FPC of the liquid crystal module.



FPC



Shielding case



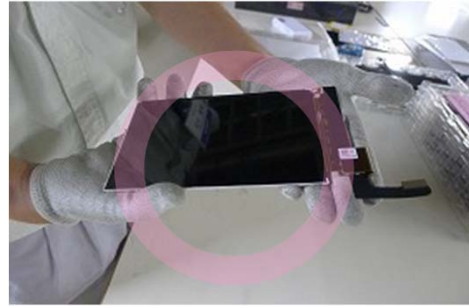
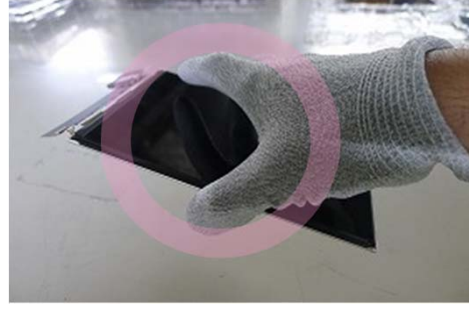
Folding of the FPC to the front side
of the panel is not allowed.



Folding of the FPC to the front side
of the panel is not allowed.

(C)Handle with care of the liquid crystal display module at the time of carrying (Good example)

Please note the following points when carrying the liquid crystal module.

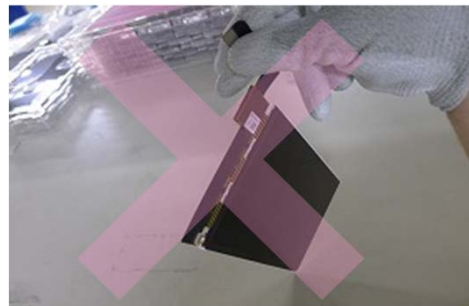
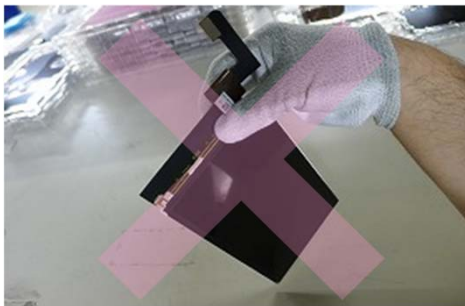
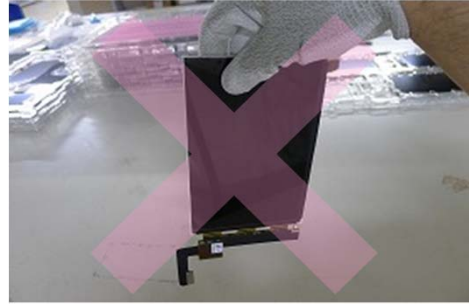
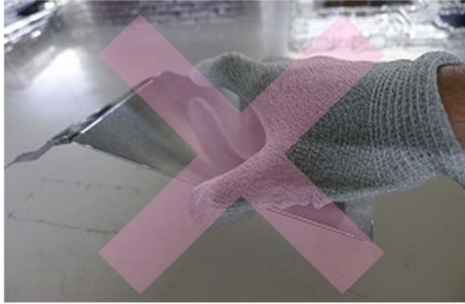


Make sure that the display surface is turned to the top when carrying.

Hold the FPC for support if necessary, so that it does not swing when carrying.

(D)Handle with care of the liquid crystal display module at the time of carrying (Bad example)

Please note the following points when carrying the liquid crystal module.



Carrying methods, such as holding the display surface of the liquid crystal module is turned down, holding the FPC part only and applying stress to the FPC part, are forbidden.

- (1) The ambient temperature near the operated module should be satisfied with the absolute maximum ratings. Unless it meets the specifications, sufficient cooling system should be adopted to system.
- (2) The spike noise causes the mis-operation of a module. The level of spike noise should be as follows:
 $-200\text{mV} \leq \text{over- and under- shoot of VDD} \leq +200\text{mV}$

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 module.
 - (4) Sudden temperature change may cause dew on and/or in the a module. Dew makes damage to a polarizer and/or electrical contacting portion. Dew causes fading of displayed quality.
 - (5) Fixed patterns displayed on a module for a long time may cause after-image. It will be recovered soon.
 - (6) A module 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 backlight is operated. If necessary, sufficient suppression should be done by system manufacturers.
 - (8) The module should not be connected or removed while a main system works.
 - (9) Inserting or pulling I/F connectors causes any trouble when power supply and signal data are on-state.
 I/F connectors should be inserted and pulled after power supply and signal data are turned off.
-
- (1) Since a module consists of a TFT cell and electronic circuits with CMOS-ICs, which are very weak to electrostatic discharge, persons who are handling a module should be grounded through adequate methods such as a list band.
 I/F connector pins should not be touched directly with bare hands.
 - (2) Protection film for a polarizer on a module should be slowly peeled off so that the electrostatic charge can be minimized.

- (1) A module should not be exposed under strong light. Otherwise, characteristics of a polarizer and color filter in a module may be degraded.

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

- (1) Modules should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during storage. Modules should be stored at 0 to 35°C 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 modules should be stored in the Panasonic Liquid Crystal Display's shipping box.
- (1) The protection film for polarizers should be peeled 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 module with protection film should be stored on the conditions explained in 10.5 (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 module 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 or Isopropyl alcohol. 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 or Isopropyl alcohol.

- (1) Since a TFT cell and lamps are made of glass, handling to the broken module should be taken care sufficiently in order not to be injured. Hands touched liquid crystal from a broken cell should be washed sufficiently.
- (2) The module should not be taken apart during operation so that backlight drives by high voltage.

Flexible printed circuits and printed circuits board used in a module contain small amount of lead. Please follow local ordinance or regulations for its disposal.

- (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 Panasonic Liquid Crystal Display Co.,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 contract, breach of warranty, negligence, strict liability, misrepresentation and other torts.
- (1)Electrical components which may not affect electrical performance are subjective to change without notice because of their availability.
- (2) Because the optical film which contains Cadmium is used in this product according to Lab126's request, please take the proper treatment of waste when disposing.

Panasonic Liquid Crystal Display Co.,Ltd.	Date	Jun.27,2014	Sheet No.	IPS4PS 2613 VVX07F015M00-4	Page	12-5/5
---	------	-------------	-----------	----------------------------	------	--------

10.PACKING

1) Standard packing specification

