Panasonic Liquid Crystal Display Co.,Ltd.

May.18,2012

TECHNICAL DATA

VVX07H005A10

CONTENTS

RECORD OF REVISION

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DESCRIPTION

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

Product Name : VVX07H005A10

General Specifications

Effective display area	:(H) 94.20×(V) 150.72	(mm)
Number of pixels	:(H) 800×RGB×(V) 1280	(pixels)
Pixel pitch	:(H) 0.11775×(V) 0.11775	(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	: 262k (8bit)	(colors)
Input signal	: MIPI 4 Lanes	
Backlight	: 25 pieces of LED	
External dimensions	: (H) 104.32 × (V) 161.67 × (t) 2.3 (Max.)	(mm)
Weight	: 78g	

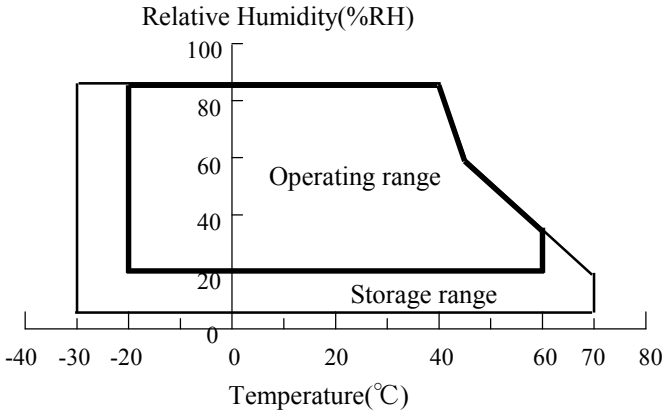
1. ABSOLUTE MAXIMUM RATINGS

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/

1. 2 Electrical Absolute Maximum Ratings

(1)TFT-LCD module V_{SS} = 0 V

ITEM	SYMBOL	Min.	Max.	UNIT	NOTE
Power Supply Voltage	VDD	−0.3	5.0	V	
Input Voltage for logic	VCC	−0.3	2.0	V	
Electrostatic Durability	V_{ESD0}	200		V	1)
	V_{ESD1}	2.0		kV	2)

Note 1) Machine model R=0 ohm / C=200pF

2) Human body model R=1.5k ohm / C=100pF

(2) Backlight unit

ITEM	SYMBOL	Typ	UNIT	NOTE
Temperature Junction of LED	Tj	105	℃	1)
Forward Current	If	35	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

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.

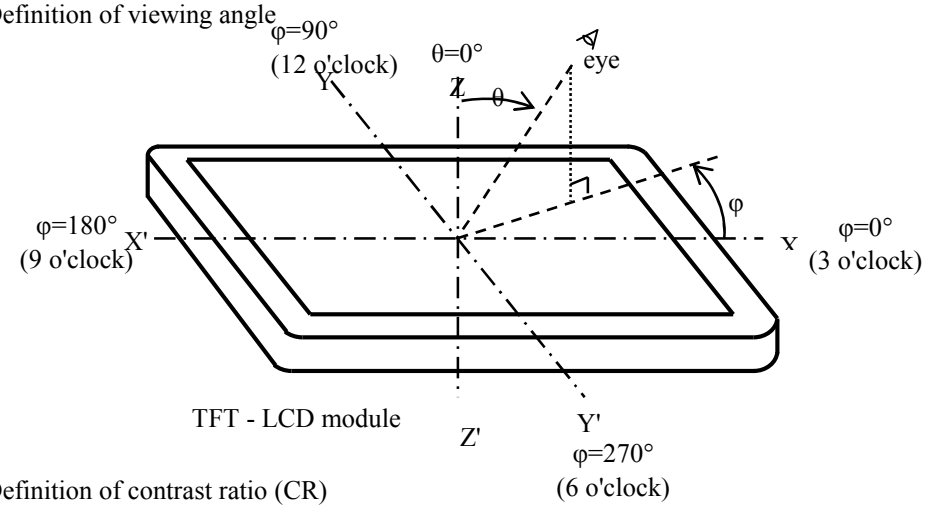
Measuring equipment : CS-1000A, or equivalent

Ambient Temperature =25 ℃ , AV_{DD}=3.3V , f V=60 Hz ,

If=20mA (on duty 100%)

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast ratio		CR	θ = 0 ° 1)	600	1000	-	-	1),2)
Response time (Rise + Fall)		Tr + Tf	θ = 0 ° 1)	-	-	30	ms	1),3)
Brightness of white		Bwh		400	450	-	cd/m^2	1)
Brightness uniformity		Buni(5points)		70	80	-	%	1),4)
Color chromaticity (CIE)	Red	x		0.590	0.620	0.650	-	1) 【Gray scale =255】
		y		0.310	0.340	0.370		
	Green	x		0.290	0.320	0.350		
		y		0.550	0.580	0.610		
	Blue	x		0.120	0.150	0.180		
		y		0.050	0.080	0.110		
	White	x		0.275	0.310	0.345		
		y		0.305	0.340	0.375		
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)	50	60	-	%	1)
W,R,G,B Gamma		−	θ = 0 °	1.8	2.2	2.6	-	1)

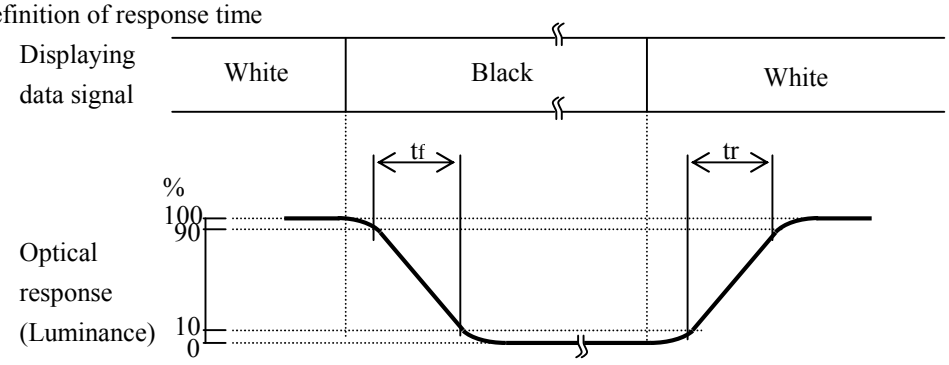
Note 1) Definition of viewing angle



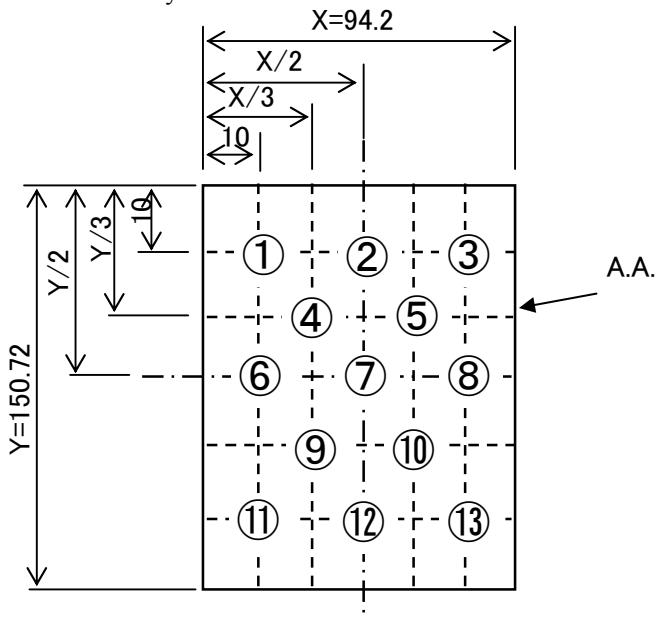
2) Definition of contrast ratio (CR)

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

3) Definition of response time



4) Definition of Uniformity



①～⑬ measuring points

Buni (13Points) = min(①～⑬)/max(①～⑬)

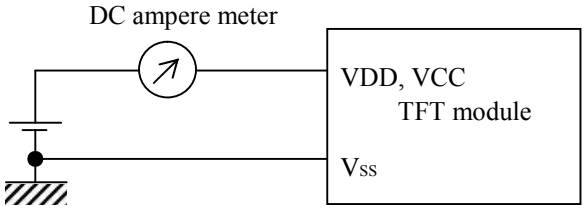
3. ELECTRICAL CHARACTERISTICS

3. 1 TFT-LCD module

Ta = 25 ℃ , V_{SS} = 0 V

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power supply voltage		VDD	3.0	3.3	3.6	V	
Input voltage for logic		VCC	1.7	1.8	1.95	V	
Power comsumption		P_VDD		210		mW	1), 2)
		P_VCC		55		mW	1), 2)
Ripple voltage of power supply		V_{DDR}	-	-	(100)	mV	
Logic signals input voltage	Low	VIL	0.0	-	0.2 x Vcc	V	
	High	VIH	0.8 x Vcc	-	Vcc	V	
Logic signals output voltage	Low	VOL	-	-	GND+0.4	V	Iout=+0.4mA
	High	VOH	VDD-0.4	-	-	V	Iout=-0.4mA

Note 1)



Note 2) Display image: Full white raster

3. 2 Backlight unit

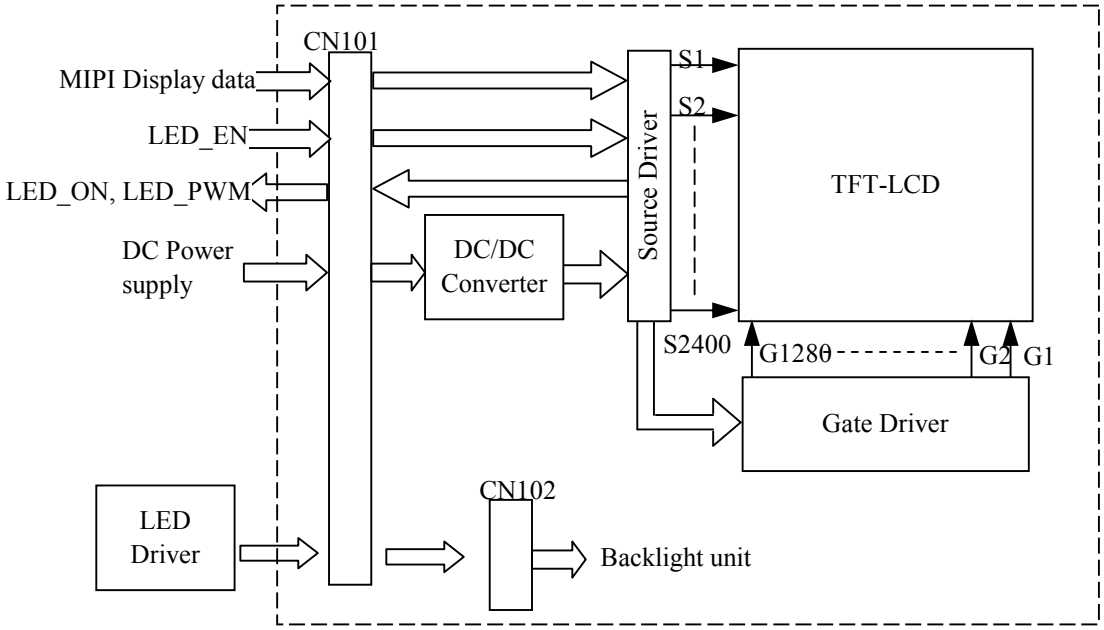
ITEM	SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power Consumption	Pbl	1.3	1.5	1.65	W	1), 2)

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

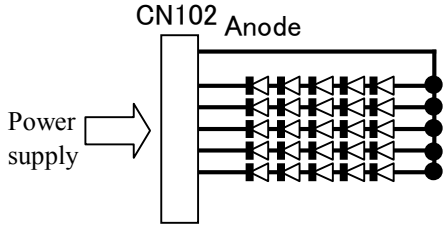
2) This value is not include LED driver loss.

4. BLOCK DIAGRAM

4. 1 TFT-LCD module



4. 2 Backlight unit



C102:HIROSE(FH19C-8S-0_5SH(18))

PIN No.	機能	備考
1	Anode	
2	Anode	
3	NC	
4	Cathode 1	
5	Cathode 2	
6	Cathode 3	
7	Cathode 4	
8	Cathode 5	

5. INTERFACE PIN ASSIGNMENT

5. 1 TFT-LCD module

CN101:Panasonic (AXT634124)

PIN No.	SYMBOL	DESCRIPTION	Note
2	VDD	3.3V	1)
4	VDD	3.3V	1)
6	VDD	3.3V	1)
8	GND	GND(0V)	2)
10	VCC	1.8V	
12	VCC	1.8V	
14	GND	GND(0V)	2)
16	LED_EN	input	
18	LED_PWM	output	
20	LED_ON	output	
22	Anode		
24	Anode		
26	Cathode1		
28	Cathode2		
30	Cathode3		
32	Cathode4		
34	Cathode5		

PIN No.	SYMBOL	DESCRIPTION	Note
1	GND	GND(0V)	2)
3	D0N	MIPI data pair 0 negative signal	
5	D0P	MIPI data pair 0 positive signal	
7	GND	GND(0V)	2)
9	D1N	MIPI data pair 1 negative signal	
11	D1P	MIPI data pair 1 positive signal	
13	GND	GND(0V)	2)
15	CLKN	MIPI Clock negative signal	
17	CLKP	MIPI Clock positive signal	
19	GND	GND(0V)	2)
21	D2N	MIPI data pair 2 negative signal	
23	D2P	MIPI data pair 2 positive signal	
25	GND	Keep Open	
27	D3N	MIPI data pair 3 negative signal	
29	D3P	MIPI data pair 3 positive signal	
31	GND	GND(0V)	2)
33	BIST	Keep open.(GND for BIST mode)	

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

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

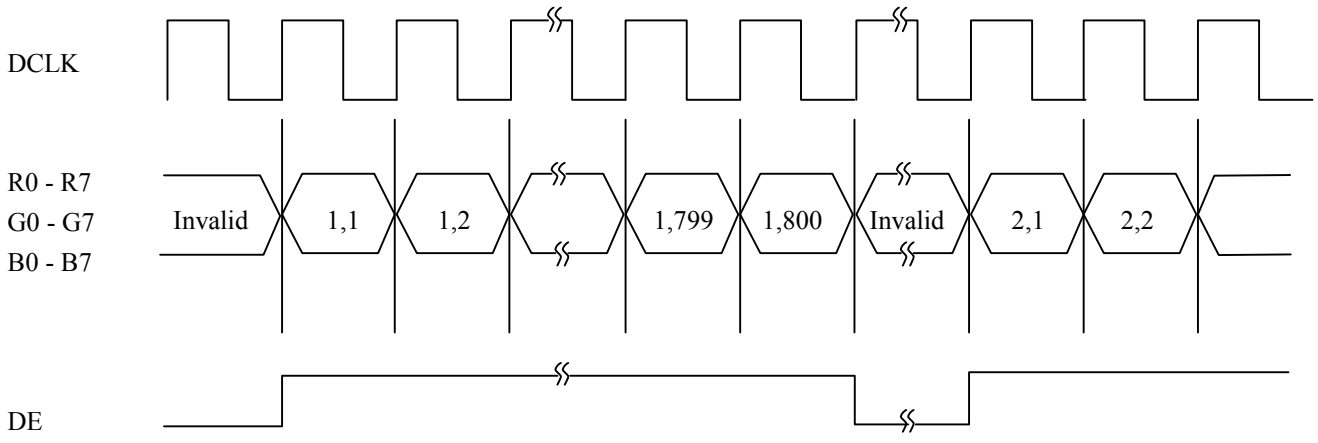
5. 2 Correspondence between input data and display image

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 , 800
2 , 1	2 , 2	2 , 3	- -	2 , 800
3 , 1	3 , 2	3 , 3	- -	3 , 800
⋮	⋮	⋮		⋮
1280 , 1	1280 , 2	1280 , 3		1280 , 800



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.

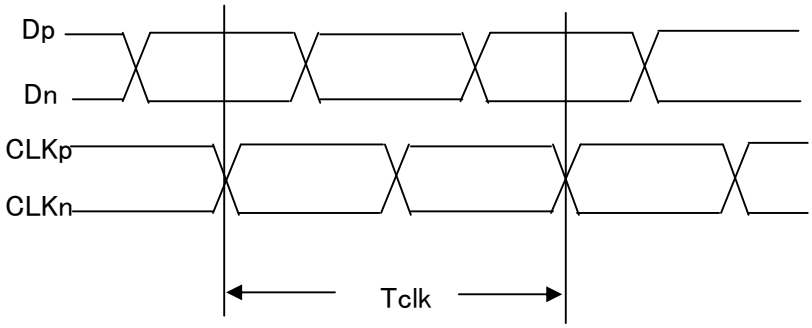
Larger n corresponds to brighter level.

2) Data : 1 : High, 0 : Low

6. INTERFACE TIMING

6. 1 MIPI receiver timing

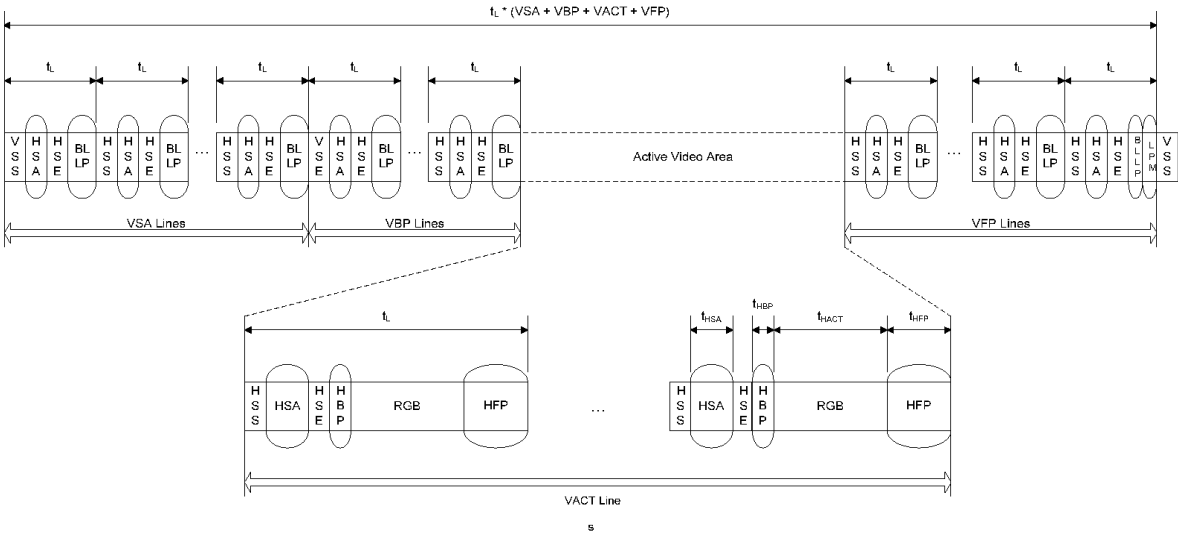
(1) High Speed CLK Timing



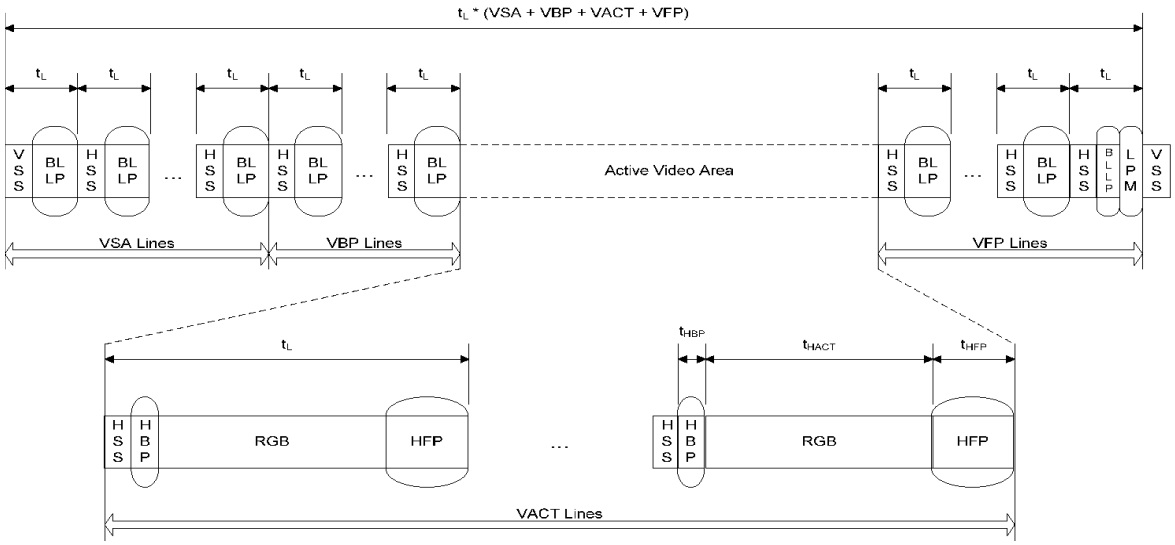
	Min	Max
Tclk	6.25ns(160MHz)	11.1ns(90MHz)

(2) Data Transmission Timing

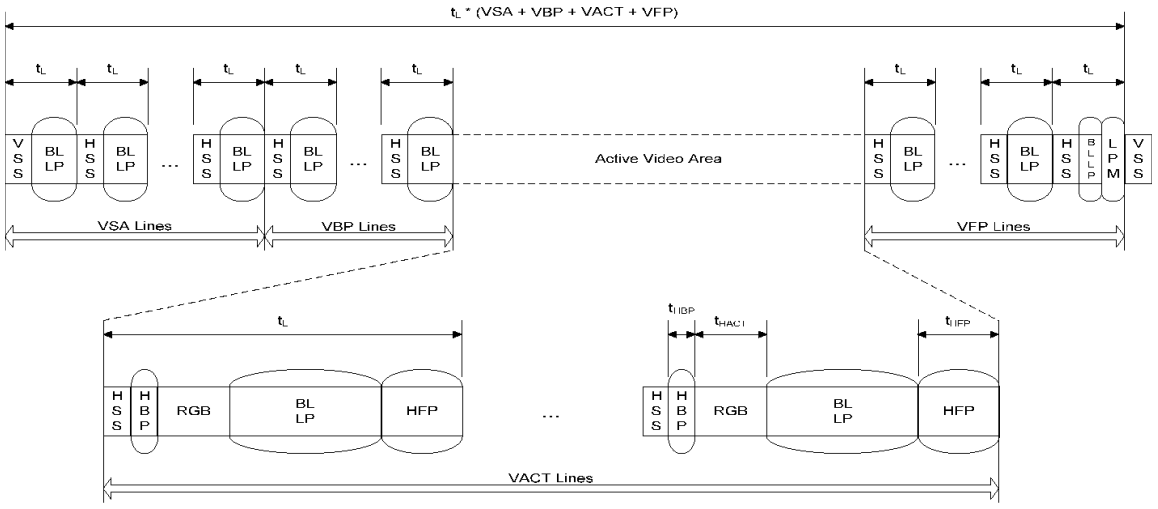
(i) Non-Burst Transmission with Sync Start and End (Pulse Mode)



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



(iii) Burst Mode



(iv) Supplemental Information

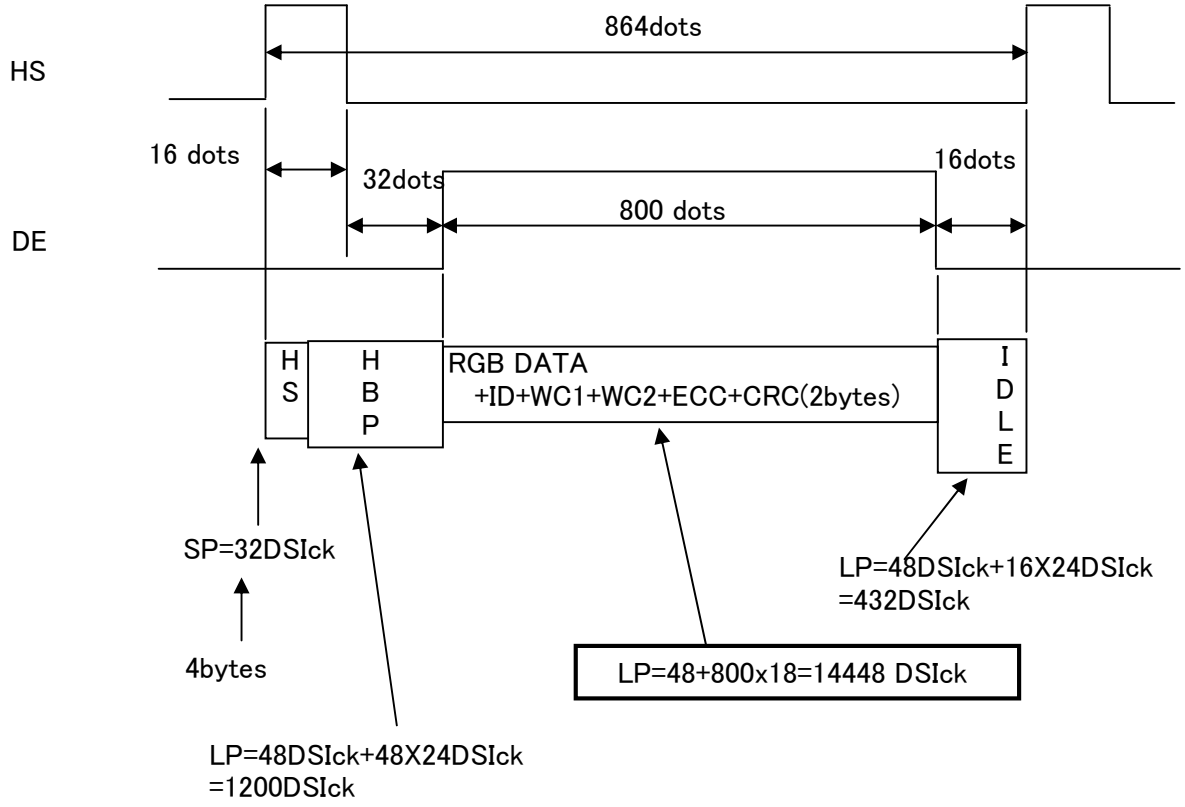
(1) HFP in any above three modes can be replaced with LP-11 state (Idle mode). Length of LP-11 state and transition period from LP-11 state to HS ($T_{HS\text{-}SETTLE}$) and the period from HS to LP-11 ($T_{HS\text{-}TRAIL}$+$T_{HS\text{-}EXIT}$) shall meet the specification of the timing specified 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=16112x77.28KHz=1.245Gbps,
Data Transfer Rate/Lane=fdsick/4=311.28Mbps(MHz)

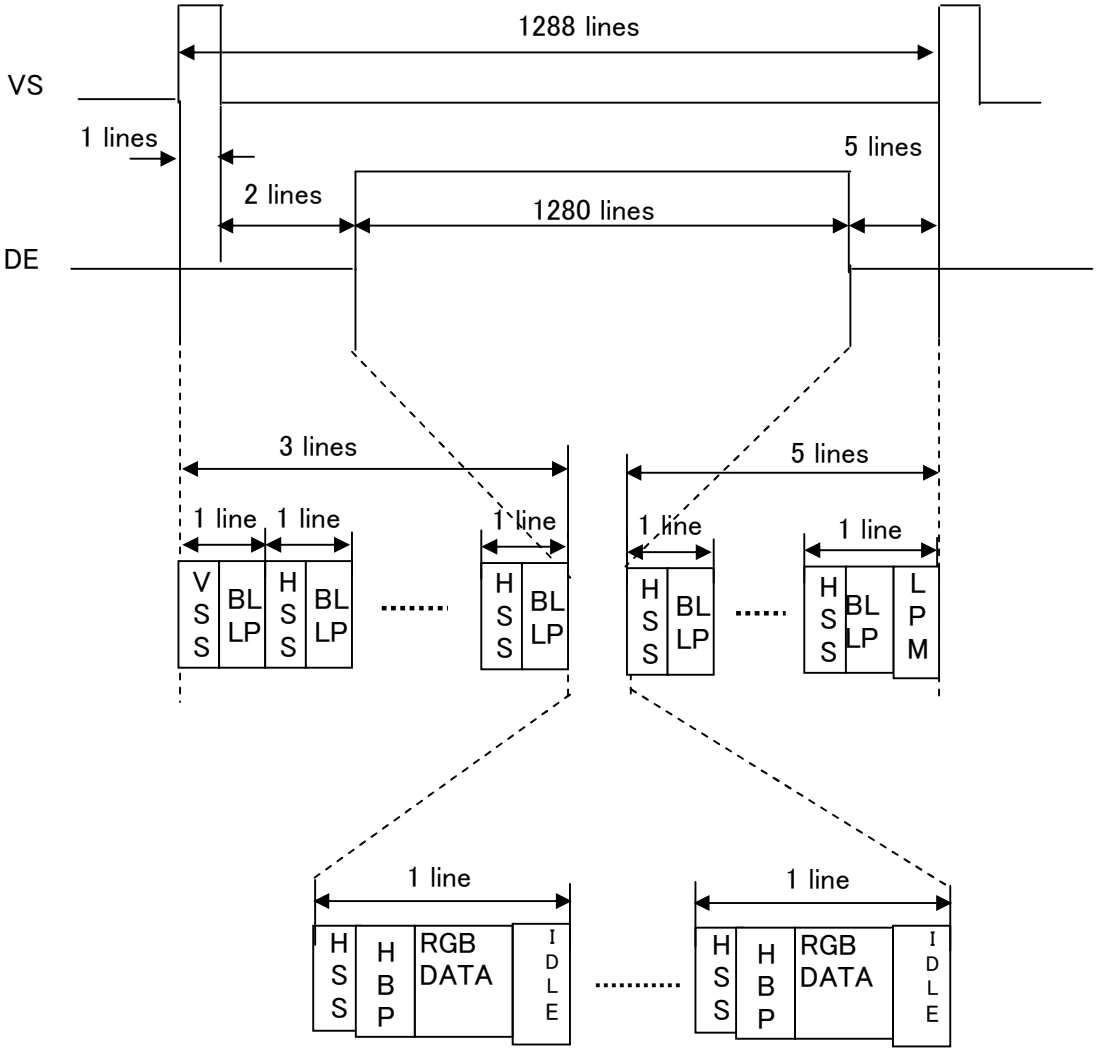
Total LP= 32DSIck+1200DSIck+14448DSIck+432DSIck
=16112 (bits)
Htotal = 16112DSIck/4lane=4028DSIck/lane

fH=1288x60=77.28kHz
TH=12.94us

12.94us /4028=3.213ns
1/3.213=311.28Mbps(Data rate)

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)



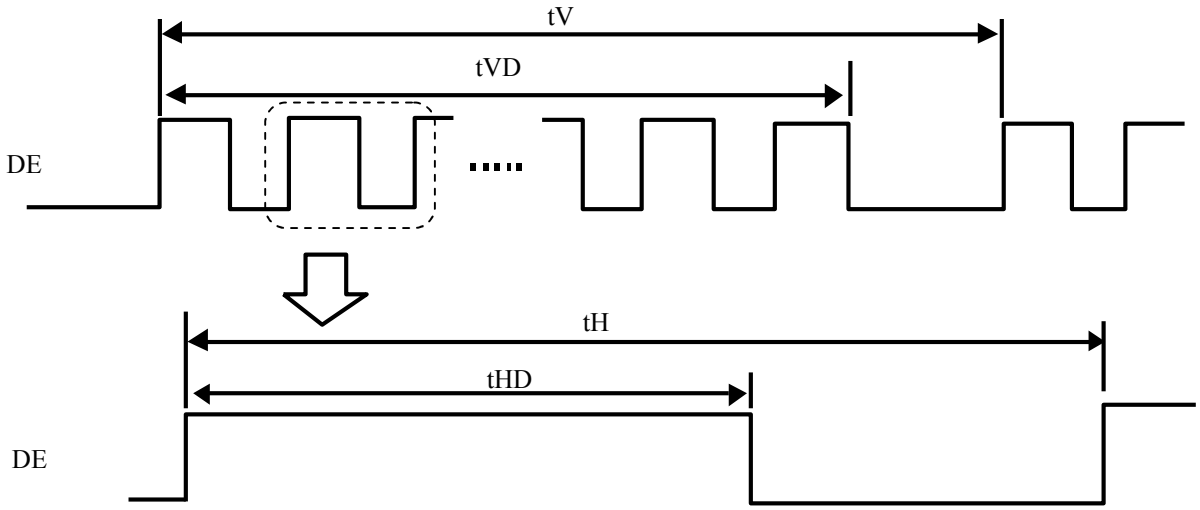
1 Line = 4028DSIck/lane

TH=4028x3.213ns=12.94us

TV=1288xTH
=1288x12.94us
=16.7ms

fV=1/TV=60Hz

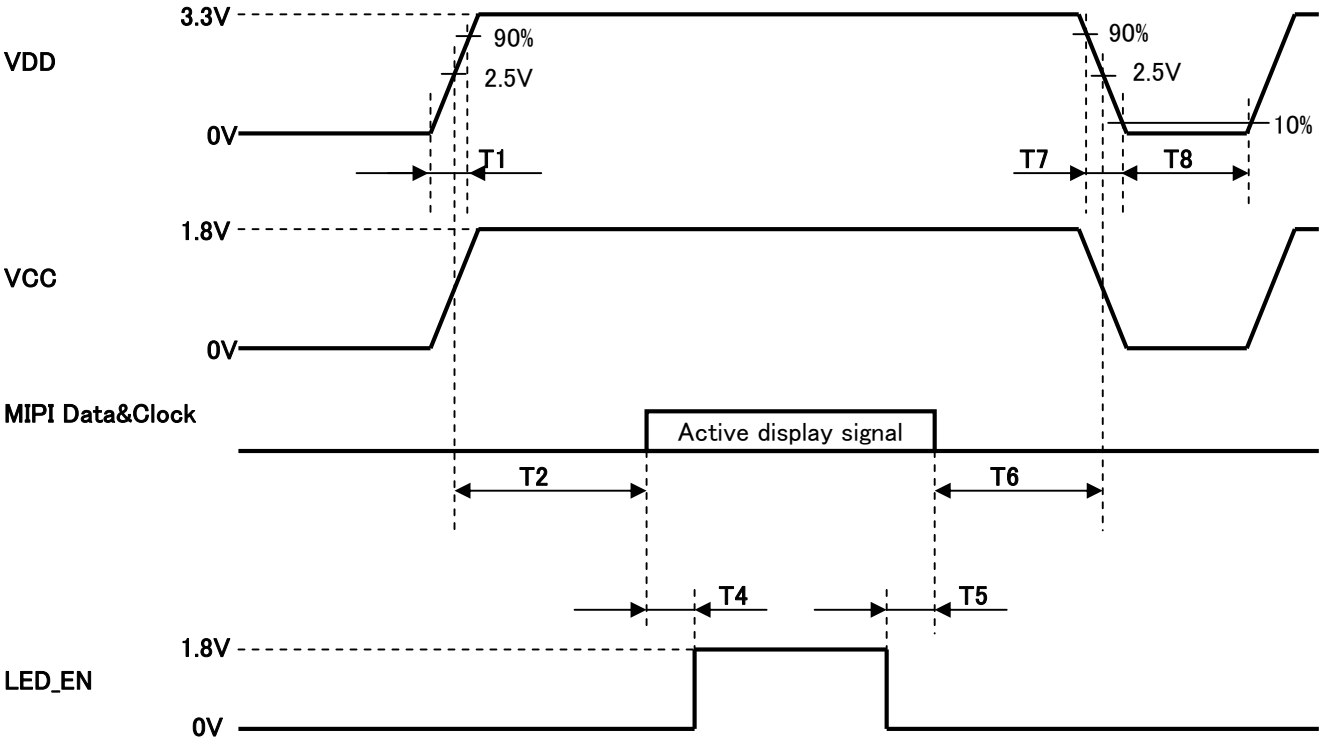
6.2 SYNCRONIZATION SIGNAL TIMING



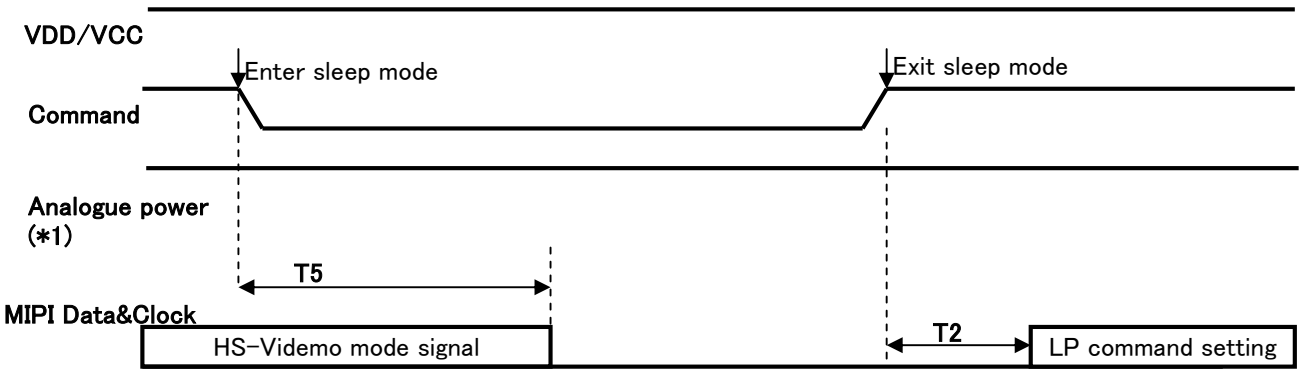
ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical Frequency	fV		60		Hz	
	Vertical Period	tV	1286	1288	1510	tH	
	Vertical Valid	tVD		1280		tH	
	Horizontal Frequency	fH	77.17	77.28	90.6	kHz	
	Horizontal Period	tH	860	864	1344	tCLK	
	Horizontal Valid	tHD		800		tCLK	

Timing between interface signals and power supply

* Power Up/Off sequence



* Sleep In/Out Sequence



(*1) Please notice that analogue power supply voltage is always switched as long as VDD voltage is supplied to LCD module.

SYMBOL	Min.	Typ.	Max.	UNIT	Note
T1	1	–	20	ms	
T2	7	–	–	VSD	
T4	1	–	–	ms	
T5	8	–	–	VSD	
T6	0	–	–	VSD	
T7	0	–	–	ms	
T8	1	–	–	sec	

Command setting

The following command setting through MIPI interface are required for each sequence.

(1) Power Up Sequence

It is necessary to input the commands sequentially.

Address	Parameter	Description
0xAE	0x0B	Control register
0xBE	0x02	Selection of amplifier
0xB5	0x90	Adjust a driving timing 1
0xB6	0x09	Adjust a driving timing 2

(2) Sleep In Sequence

Address	Parameter	Description
0x11	-	Enter sleep mode "Sleep out" command perform to enter sleep mode.

↓Wait 160msec(min)

Turn off MiPI-HS data lane

↓Wait 1usec (min)

Turn off MiPI-HS clk lane

(3) Sleep Out Sequence

Address	Parameter	Description
0x10	-	Exit sleep mode "Sleep in" command perform to exit sleep mode.

↓wait 5msec (min)

Address	Parameter	Description
0xAE	0x0B	Control register
0xBE	0x02	Selection of amplifier
0xB5	0x90	Adjust a driving timing 1
0xB6	0x09	Adjust a driving timing 2

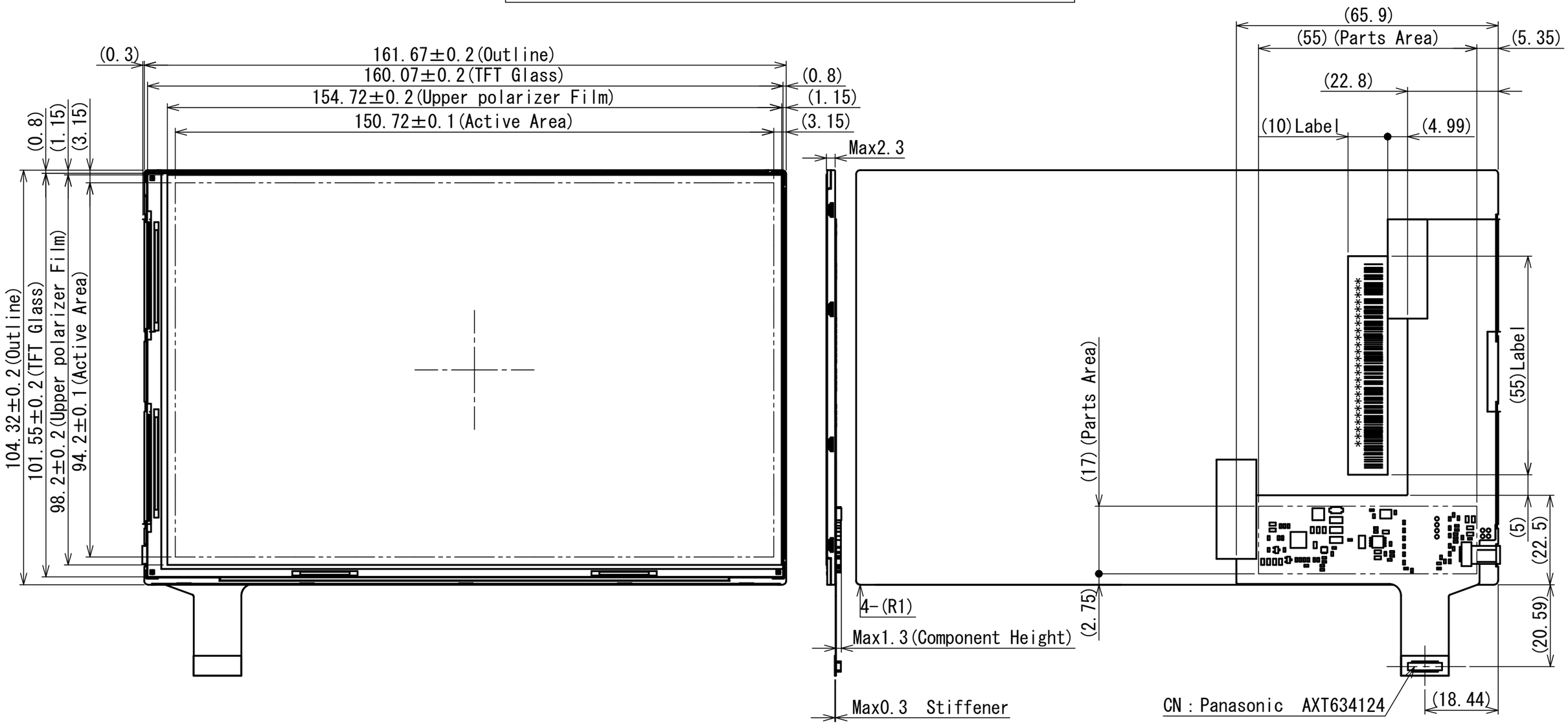
↓Wait 140msec(min)

Turn on MiPI-HS clk lane

↓wait 1usec (min)

Turn on MiPI-HS data lane

TENTATIVE



Note
1. Undesignated tolerances of dimension are ±0.5 mm.
2. Undesignated radiuses are 0.5 mm.
3. The dimensions with ( ) are reference.
4. The dimensions of thickness are to be measured with a micrometer.

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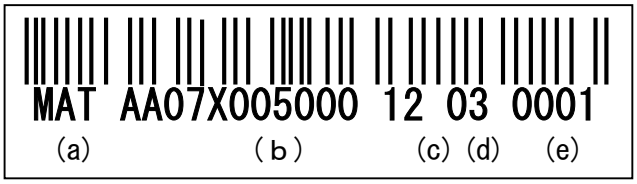
8. LABEL FORMAT

8.1 Label



(a)	Vender code	MAT
(b)	Quanta P/N	AA07X005000
(c)	Year	Year 2012→12 Year 2013→13
(d)	Week	1week, January:0 1 2week, January:02 : 4week or 5week, December : 5*
(e)	Series	0001～ZZZZ

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

10. PRECAUTION

Please pay attention to the followings when a TFT module with a backlight unit is used, handled and mounted.

10.1 Precaution to handling and mounting

(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.

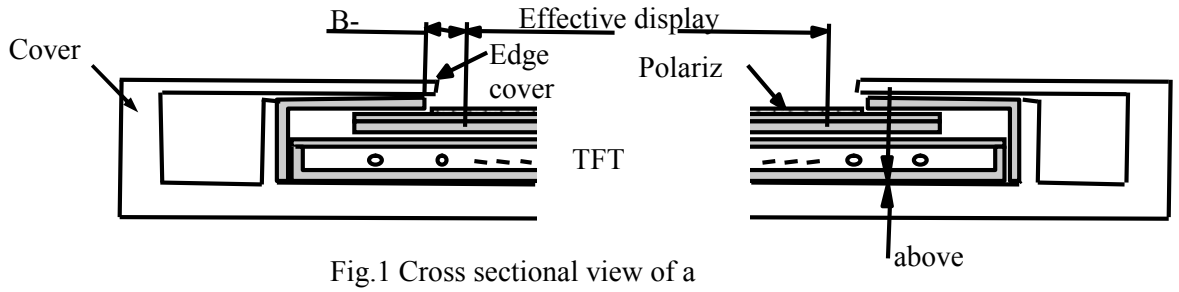


Fig.1 Cross sectional view of a

(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) Lamp(CCFL) cables should not be pulled and held.

10.2 Precaution to operation

(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:

$-200\text{mV} \leqq$ over- and under- shoot of VDD $\leqq +200\text{mV}$

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. Response time and saturation time of CCFL luminance become longer at lower temperature operation.
(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.

10.3 Electrostatic discharge control

(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.

10.4 Precaution to strong light exposure

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

10.5 Precaution to storage

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℃ 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 IPS Alpha's shipping box.

10.6 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 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.

10.7 Safety

(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.

10.8 Environmental protection

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.

10.9 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 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 contact, breach of warranty, negligence, strict liability, misrepresentation and other torts.

10.10 Others

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