SAMSUNG SDI

FOR MESSRS: DATE:
16.October.2002

SPECIFICATIONS

106cm (42 Inch) Wide Plasma Display Module

MODEL : **S42SD-YD01**

(PAL/NTSC)

- This specification will be approved by both Creative Technology Ltd and Samsung SDI Co.,Ltd.

* Please return one of this specification with your signature for approval.

Proposed by:

Signature

Manager

Customer Quality Group,

PDP Business Division,

Samsung SDI CO.,LTD

Approved by:

Signature

CONFIDENTIAL Spec. Rev. : Version 3

SAMSUNG SDI CO.,LTD.

Document: VSC-PRO-FSPPDP-01
Version # 1.0
Date: November 20, 2000

Revision History

Revision	Date	Description Of Changes	Approval
0	14.Feb.2002	Newly established	
1	07.May.2002	- Display Performance(6p) - Brightness Variation Specification(11p) - Input Signal Specifications(13-14p)	
2	25.June.2002	- Input Power Voltage Specification(20-22p)	
3	16.October.2002	- Input Power Specification(21p)	

TABLE OF CONTENTS

1. DESCRIPTION

The S42SD-YD01 is a 42-inch wide full color plasma display module with a resolution of 852(H) × 480(V) pixels. The display module includes Display Panel, Panel driving electronics, Logic controller and Power supply .

2. FEATURES

- Wide aspect ratio(16:9) 42 inch diagonal display screen. The display screen is 920㎜ wide and 518㎜ high.
- Slim and light weight. The display module is 71㎜ in depth and 22.5㎏ in weight.
- 16.77 million colors by combination of 8 bits R,G and B digital data
- High brightness, High contrast, Wide viewing angle. The screen has a white peak brightness of Typical 500cd/㎡, contrast of Typical 550:1 and a viewing angle of greater than 160° comparable to that achievied with CRTs.

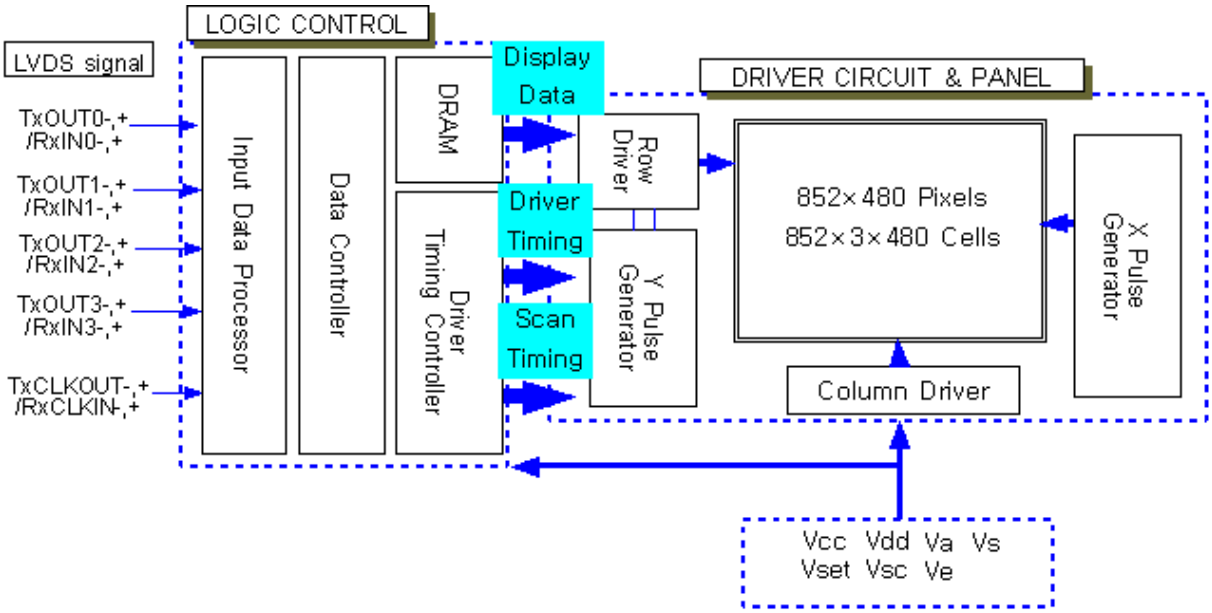
3. PRODUCT NAME AND MODEL NUMBER

- Product name : 42-inch Full Color Plasma Display Module (abbreviation : PDP Module)
- Model number : S42SD-YD01

4. FUNCTION OUTLINE

- The plasma display module has APC(Automatic Power Control) function which restrict power consumption within certain value without regard to display load ratio.
- The plasma display module is operated at 50HZ or 60Hz frame rate. It is required external frame rate conversion in order to display the other formats.
- The plasma display module is made up of 4 types of input power voltages; Voltage for operating Logic, Voltage for FET driver, Voltage for Column driver, and Voltage for Display driver.
- The plasma display module is operated at progressive signal only. It is required external progressive scan conversion in order to display the other formats.
- The plasma display module requires 90~240V, 50~60Hz of input power voltage

5. BLOCK DIAGRAM



Reference

-Vcc : Voltage for operating Logic
-Vdd : Voltage for FET driver
-Va : Voltage for column pulse
-Vs : Voltage for display driver
-Vsc : Voltage for display driver
-Ve : Voltage for display driver
-Vset : Voltage for display driver

6. DISPLAY CHARACTERISTICS

6.1 Display Performance

No	Item	Rating	
1	Display Pixels	Horizontal 852 × Vertical 480 pixels (1 pixel = 1 R,G,B cells)	
2	Display Cells	Horizontal 2556 × Vertical 480 cells	
3	Pixel Pitch	Horizontal 1.08 × Vertical 1.08 ㎜	
4	Cell Arrangement	R,G,B Stripe	
5	Effective Display Size	Horizontal 920.16㎜ × Vertical 518.4㎜ [36.23 inch (H) × 20.41 inch (V)]	
6	Number of Color	16.77 million colors	
7	Brightness *1 (Peak Brightness)	Typical 500cd/㎡(module, LVDS input)	
8	Contrast Ratio *2 (in dark room)	Typical 550:1	
9	Chromaticity Coordinates (Typical Value)	White	X = 0.285±0.03, Y = 0.290±0.03
		Red	X= 0.645±0.03, Y= 0.345±0.03
		Green	X= 0.250±0.05, Y= 0.665±0.04
		Blue	X= 0.155±0.04, Y= 0.090±0.04
10	Viewing Angle *3	Over 160°	

(Note)

* 1. Brightness and Color Coordinates are the value that measured with 1% load ratio white pattern. The condition for measurement is shown in Figure-3.
* 2. Contrast Ratio is calculated from the display brightness and the non-display brightness value, and display condition is shown in Figure-3.
* 3. Viewing angle is the critical angle at which the brightness is reduced to 50% to the brightness perpendicular to the PDP unit.

6.2 Display Cell Arrangement

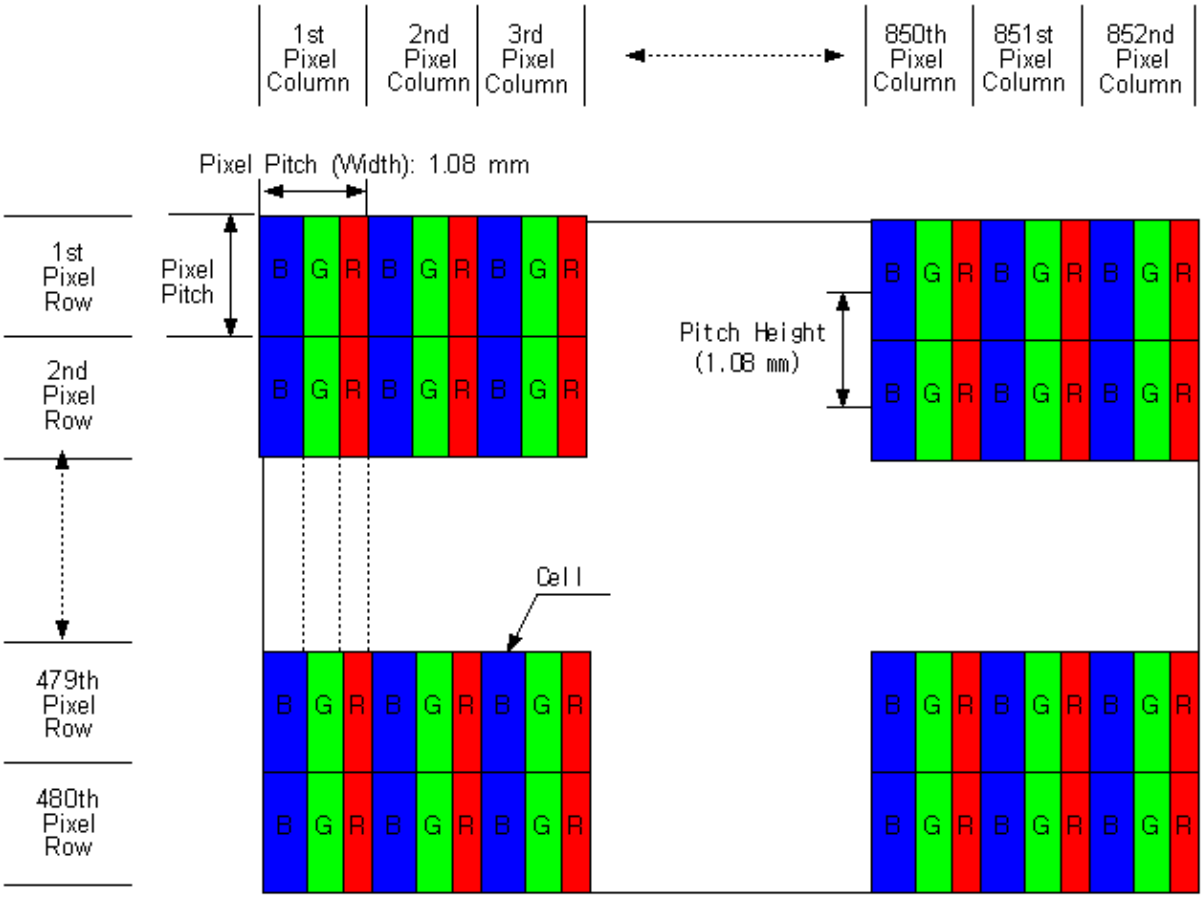


Figure-2. Display Cell Arrangement

6.3 Brightness Measurement Condition

(1) Display Pattern

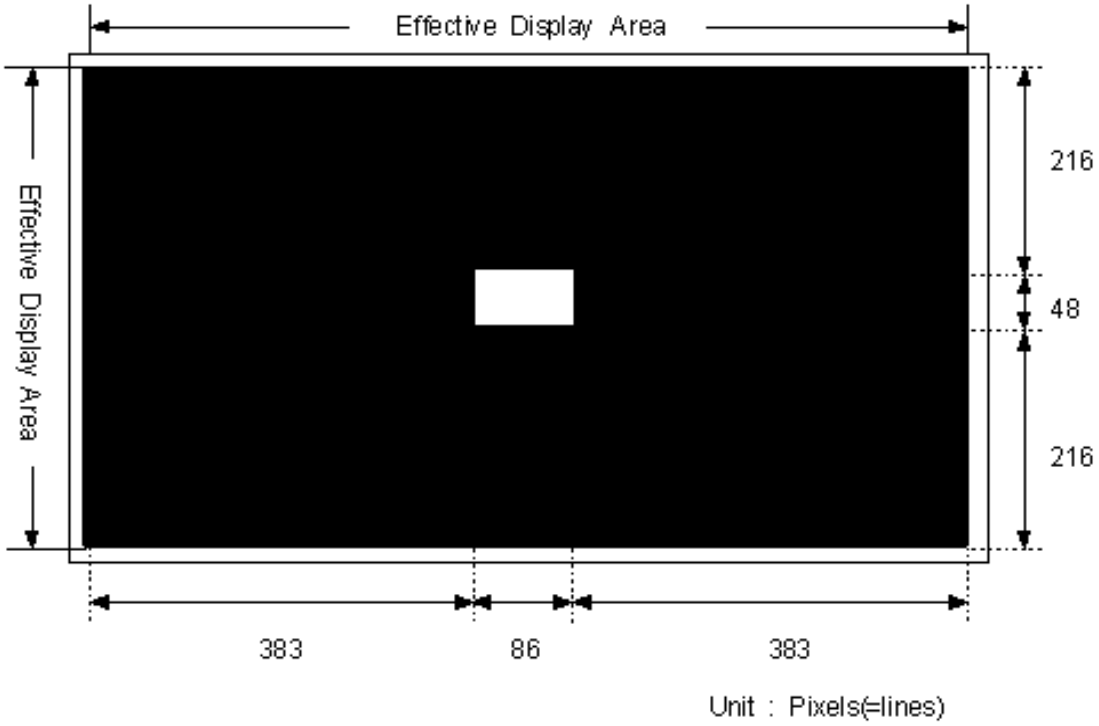


Figure-3. Display Pattern for Brightness & Contrast Ratio Measurement

(2) Display Area ratio : 1% white window

(3) Vsync : 16.7msec

(4) Measuring equipment : MINOLTA CA-100

(5) Ambient Temperature : Room Temperature

(6) Ambient Light : dark Room (<2 lux)

6.4 Contrast Measurement Condition

(1) Measurement point

.

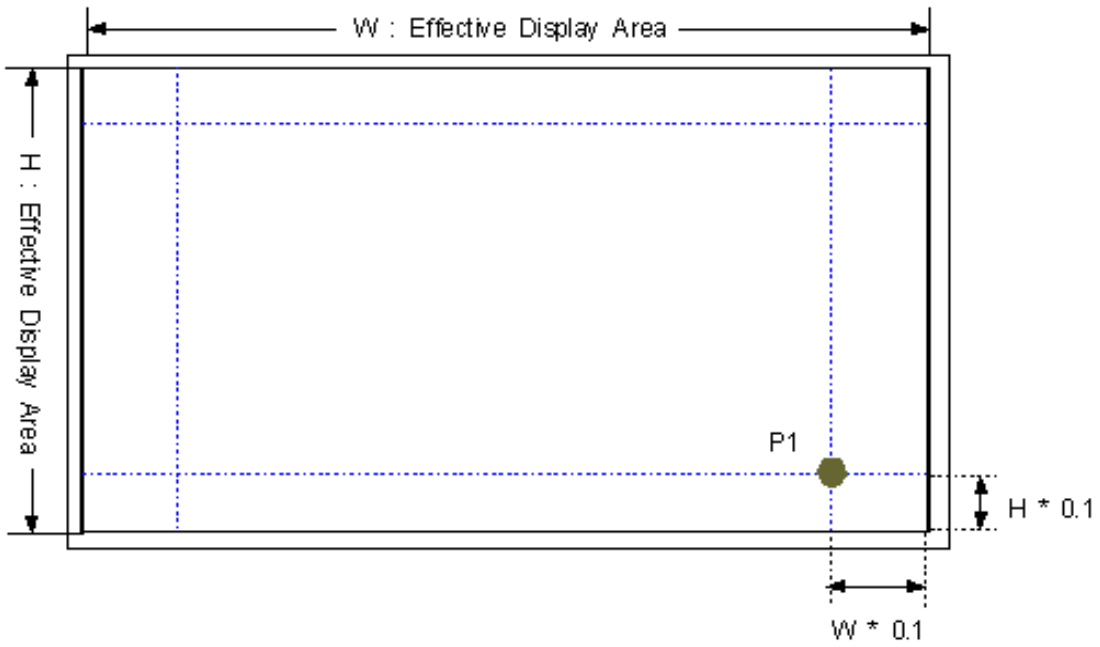


Figure-4. Measurement point

(2) Vsync : 16.7 msec

(3) Measuring Equipment : MINOLTA CA-100
Pattern Generator(VG-828, LVDS Output).

(4) Contrast Calculation fomula

$$Contrast\ ratio = \frac{Brightness\ of\ 1\%\ white\ window\ Area\ at\ the\ center\ of\ the\ screen}{Brightness\ of\ black\ Area^{*1}}$$

【Note】

1. For mass production test purposes, it is recommended to measure just 1 point, P1 of Figure.-4 on display pattern of Fig.-3.

(5) Ambient Light : Dark Room (<2 lux)

6.5 Display Cell Defect Specification

In some cases, a panel may have defective cells that cannot be controlled.

These defective cells can be categorized into three types;
(1) Non-lighting cell defect : defect in which the cell is always off
(2) Non-extinguishing cell defect : defect in which the cell is always on
(3) Flickering cell defect : defect in which the cell is flickering

The display cell defect specifications define the allowed limits for display cell defects and are used as the criteria in determining wether a panel is shipped.

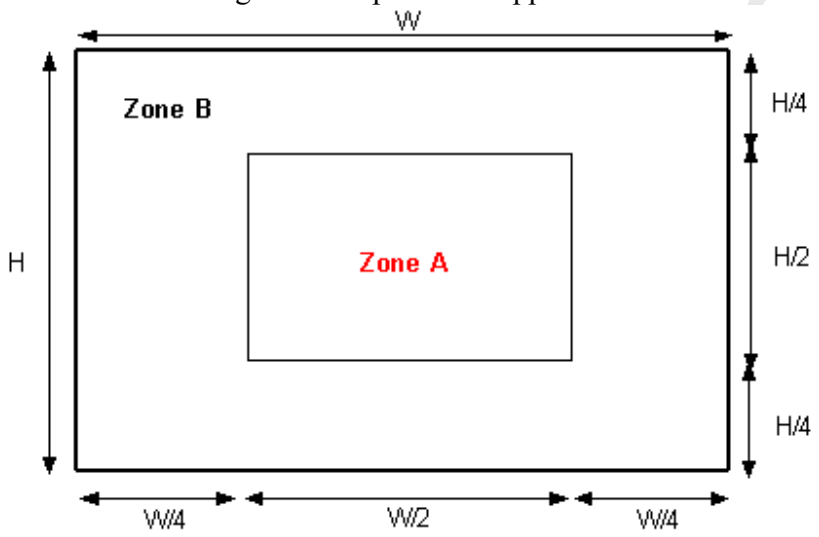


Figure-5. Measuring Area

Item	Specification	
	Number of cell defects	Distance between cell defects
Non-lighting cell defect	● Zone A: 4 and less ● Zone B: 10 and less	Regardless of A and B zone, The Distance between cell defects is over 10mm. (single R,G,B and Black)
Non-extinguishing cell defect	● Zone A: 1 and less ● Zone B: 3 and less	
Flickering cell defect	● Zone A: 1 and less ● Zone B: 3 and less	
Total defect	**Total number of cell defects in Zone A and B is 12 and less**	

6.6 Brightness Variation Specification

The color-PDP uses ultraviolet light produced by gas discharge to illuminate phosphor. Uneven phosphor coating and inconsistent discharge characteristics cause slight difference in brightness among the sections in a panel.
The brightness variation specifications define the allowed limits for brightness differences and the criteria in determining whether a panel is shipped.

Item	Definition	Specification
Full white brightness variation	The brightness is measured at 9 points (A1~A9 of Fig-6) on full white pattern. The full white brightness variation as then calculated from the following equations.	10% and less
Color variation	The Chromaticity Coordinates on Full white window; Chromaticity Coordinates is measured at 9 points (A1~A9 of Fig-6) on full white pattern	x ± 0.015(average) y ± 0.015(average)

The brightness variation is calculated from the following equation;

$$\frac{Max - \bar{x}}{\bar{x}} \times 100\% \quad \& \quad \frac{\bar{x} - Min}{\bar{x}} \times 100\%$$

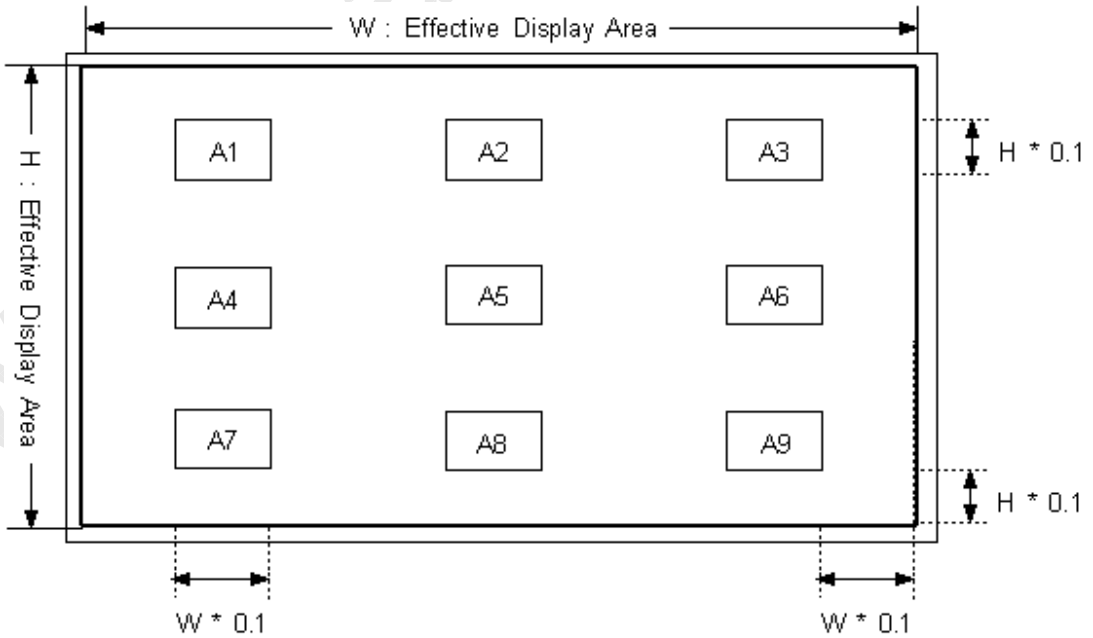


Figure-6. Measuring areas

7. MECHANICAL CHARACTERISTICS

7.1 Mechanical Specifications

No	Item	Rating
1	Outer Dimensions	Width 1019.2㎜ × Height 616㎜ × Thickness 71㎜ *see Appendix A1, A2 (Mechanical Dimensions Drawing)
2	Weight	Approx. 22.5 kg

7.2 Mechanical Characteristics

No	Item	Rating
1	Vibration	Frequency : 10 to 55Hz Sweep rate : 1minute/octave Stroke : x,y direction : 0.35㎜ z-direction : 0.175㎜ Applied time : 30minutes/dir.
2	Shock	Acceleration : less than 20G (X,Y-direction) less than 10G (Z-direction) Test time : 11 ms

Notes: (Test condition) Non-Packaging, Non-Operational

8. ENVIRONMENTAL CONDITIONS

8.1 Recommended Environment Condition

No.	Item	Rating	
1	Temperature	Operational	0 to 50℃
		Storage	-15 to 60℃
		Temperature Slope	1.5℃/minute max.
	* MAXIMUM GLASS SURFACE TEMPERATURE MUST BE KEPT LESS THAN 80℃		
2	Humidity	Operational	20 to 70 % RH (no condensation)
		Storage	20 to 80 % RH (no condensation)
3	Pressure	Operational	800 to 1114 hPa (Altitude : 0 to 2,000 m)
		Storage	600 to 1114 hPa (Altitude : 0 to 4,500 m)

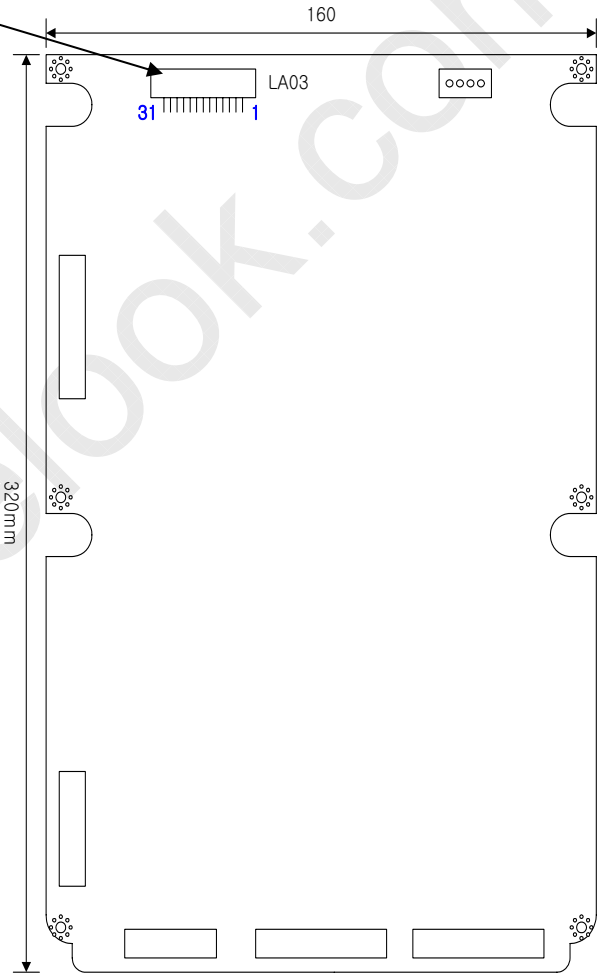
9. INTERFACE SPECIFICATIONS

9.1 Input Signal Specifications

* The Location No. is possible to change to PBA Revision

(1) Input signal name and Pin assignment

Pin No.	Pin Name (LA03)
1	GND
2	GND
3	TxOUT0-/RxIN0-
4	TxOUT0+/RxIN0+
5	GND
6	GND
7	TxOUT1-/RxIN1-
8	TxOUT1+/RxIN1+
9	GND
10	GND
11	TxOUT2-/RxIN2-
12	TxOUT2+/RxIN2+
13	GND
14	GND
15	TxCLKOUT-/RxCLKIN-
16	TxCLKOUT+/RxCLKIN+
17	GND
18	GND
19	TxOUT3-/RxIN3-
20	TxOUT3+/RxIN3+
21	GND
22	GND
23	GND
24	GND
25	NC
26	GND
27	NC
28	GND
29	NC
30	GND
31	NC



【Note】

1. LA3 connector is located in Logic Board.
2. Pin to Pin pitch of connector LA3 is 0.625㎜.
3. Connector LA3(parts #:1554A-3141R) is supplied by UJU Electronics. This Item is compatible with FI-WE*P.HF (JAE, JAPAN)
4. The length of mating cable to LA3 is recommended to be not longer than 25.0㎝.
5. Pin numbering order : right to left view from component side of Logic Board.
6. Reserved for factory use only. This pin should be disconnected in case of customer's use. This pin is output pin. In case of fan failure, this signal becomes high.

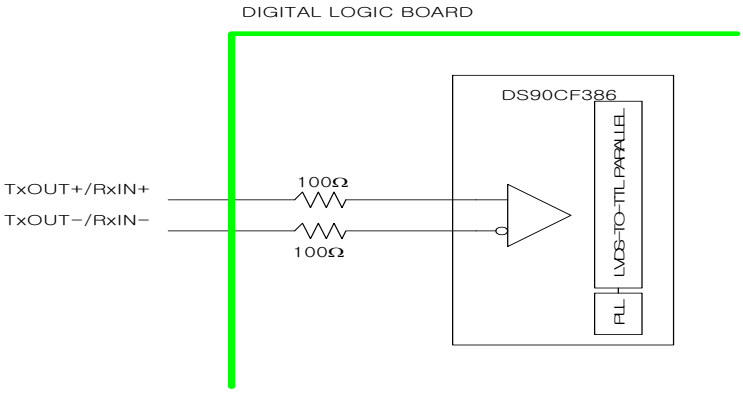
● Scaler Board/Logic Board LVDS Pin Definition

SCALER BOARD LVDS (DS90C385)		LOGIC BOARD LVDS (DS90CF386)		SIGNAL NAME
PIN #	PIN NAME	PIN #	PIN NAME	
31	TxCLKIN	26	RxCLKOUT	DCLK
51	TxIN0	27	RxOUT0	R0(LSB DATA)
52	TxIN1	29	RxOUT1	R1
54	TxIN2	30	RxOUT2	R2
55	TxIN3	32	RxOUT3	R3
56	TxIN4	33	RxOUT4	R4
2	TxIN5	34	RxOUT5	R7(MSB DATA)
3	TxIN6	35	RxOUT6	R5
4	TxIN7	37	RxOUT7	G0
6	TxIN8	38	RxOUT8	G1
7	TxIN9	39	RxOUT9	G2
8	TxIN10	41	RxOUT10	G6
10	TxIN11	42	RxOUT11	G7(MSB DATA)
11	TxIN12	43	RxOUT12	G3
12	TxIN13	45	RxOUT13	G4
14	TxIN14	46	RxOUT14	G5
15	TxIN15	47	RxOUT15	B0(LSB DATA)
16	TxIN16	49	RxOUT16	B6
18	TxIN17	50	RxOUT17	B7(MSB DATA)
19	TxIN18	51	RxOUT18	B1
20	TxIN19	53	RxOUT19	B2
22	TxIN20	54	RxOUT20	B3
23	TxIN21	55	RxOUT21	B4
24	TxIN22	1	RxOUT22	B5
25	TxIN23	2	RxOUT23	
27	TxIN24	3	RxOUT24	Hsync
28	TxIN25	5	RxOUT25	Vsync
30	TxIN26	6	RxOUT26	D_EN
50	TxIN27	7	RxOUT27	R6

【Note】

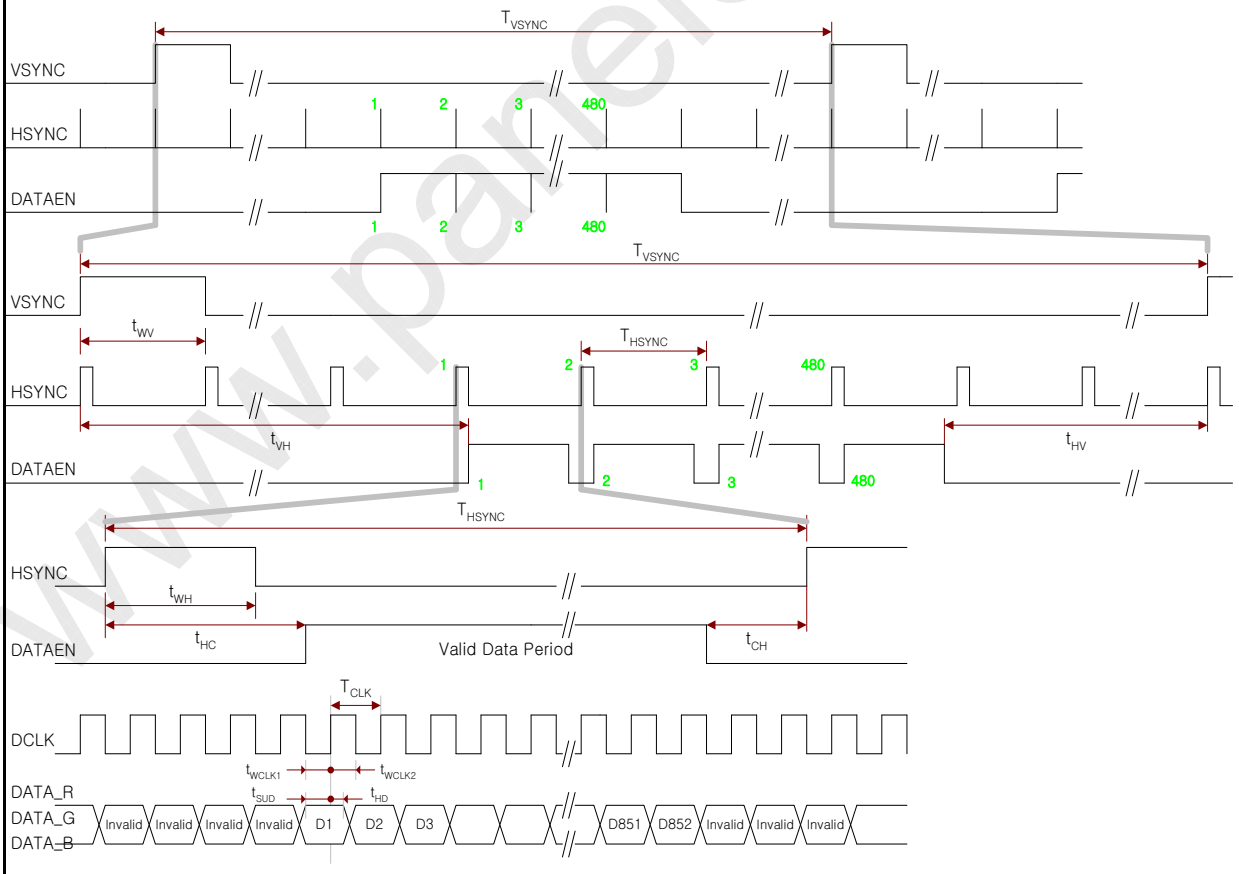
1. LVDS Chip is supplied by National Semiconductor.

(2) Interface Circuit Diagram



(3) Input signal Timing specification

(3-1) PAL System



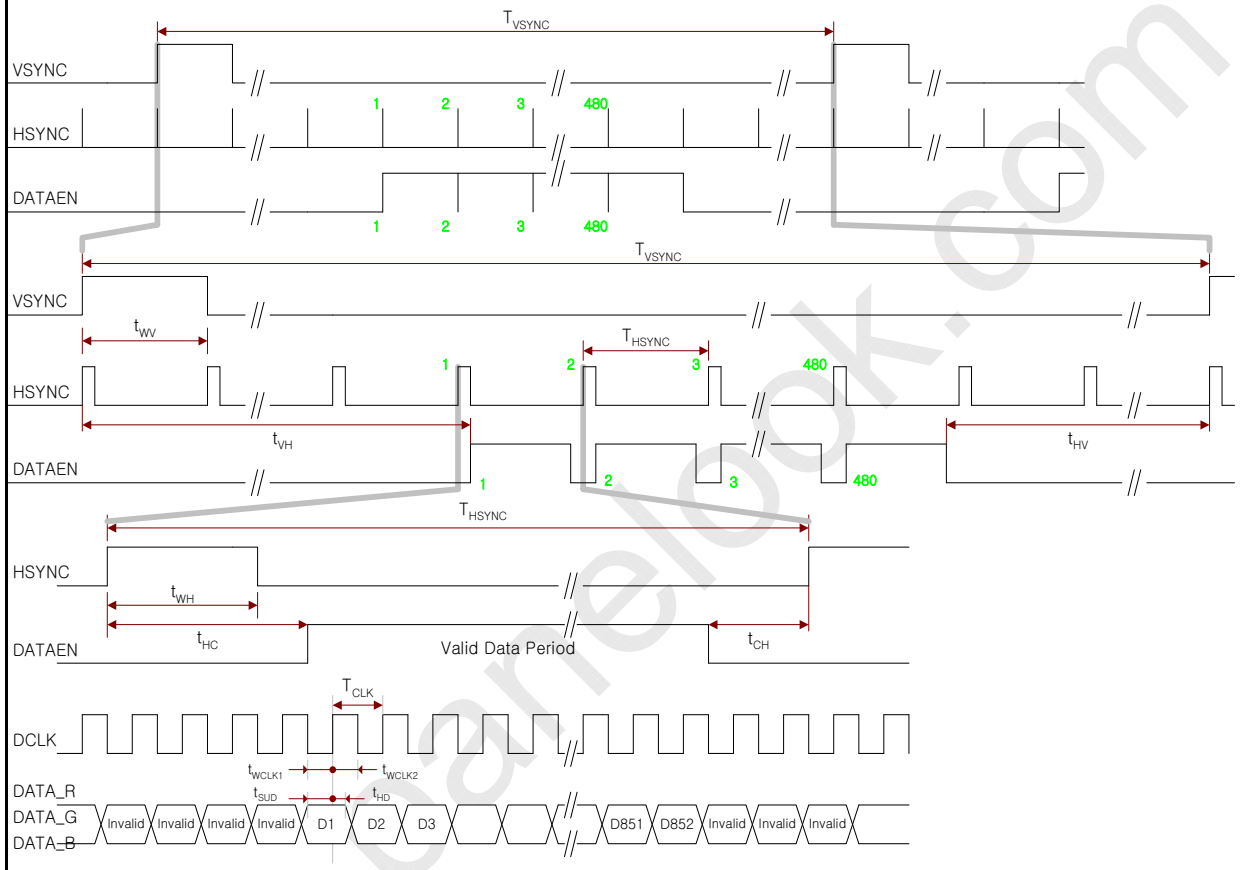
Symbol	TIMING			Unit	Remark
	Minimum	Typical	Maximum		
T_{VSYNC}	19.5	20.0	20.5	ms	Frame Frequency : 50Hz Typical
t_{WV}	1	1	4	H*1	
t_{VH}	3	3	—	H*1	
t_{HV}	1	97	—	H*1	
T_{HSYNC}	28.5	34.46	34.46	μs	
t_{WH}	4	8	16	D	
t_{HC}	16	22	—	D	
t_{CH}	16	22	—	D	
T_{CLK}	34	38.5	38.5	ns	
t_{WCLK1}	15	$T_{CLK}/2$	T_{CLK}-15	ns	
t_{WCLK2}	15	$T_{CLK}/2$	T_{CLK}-15	ns	
t_{SUD}	10	—	—	ns	
t_{HD}	10	—	—	ns	

Notes :
1. 1H = One cycle of Horizontal sync signal(=THSYNC)
2. 1D = One cycle of Dot clock signal(=TCLK)
3. If input display data in a horizontal period is 852 and less, the incorrect image is displayed

(1) Electrical characteristics of Input signal

No.	Items	Symbol	Condition	Value			Unit
				min.	typical	max.	
1	Input Voltage: LVDS Level		-				
	1) "H" Level	VIH		2.0	-	5.25	V
	2) "L" Level	VIL		-0.5	-	0.8	V
2	Input Current: LVDS Level						
	1) "H" Level	IIH	VI =2.75V VCC =5.25V	-	-	1	mA
	2) "L" Level	IIL	VI =0.4V VCC =5.25V	-	-	1	mA

(3-2) NTSC System



Symbol	TIMING			Unit	Remark
	Minimum	Typical	Maximum		
T_{VSYNC}	16.2	16.7	17.2	ms	Frame Frequency : 60Hz Typical
t_{WV}	1	1	4	H*1	
t_{VH}	3	3	—	H*1	
t_{HV}	1	1	—	H*1	
T_{HSYNC}	28.5	34.46	34.46	μs	
t_{WH}	4	8	16	D	
t_{HC}	16	22	—	D	
t_{CH}	16	22	—	D	
T_{CLK}	34	38.5	38.5	ns	
t_{WCLK1}	15	$T_{CLK}/2$	T_{CLK}-15	ns	
t_{WCLK2}	15	$T_{CLK}/2$	T_{CLK}-15	ns	
t_{SUD}	10	—	—	ns	
t_{HD}	10	—	—	ns	

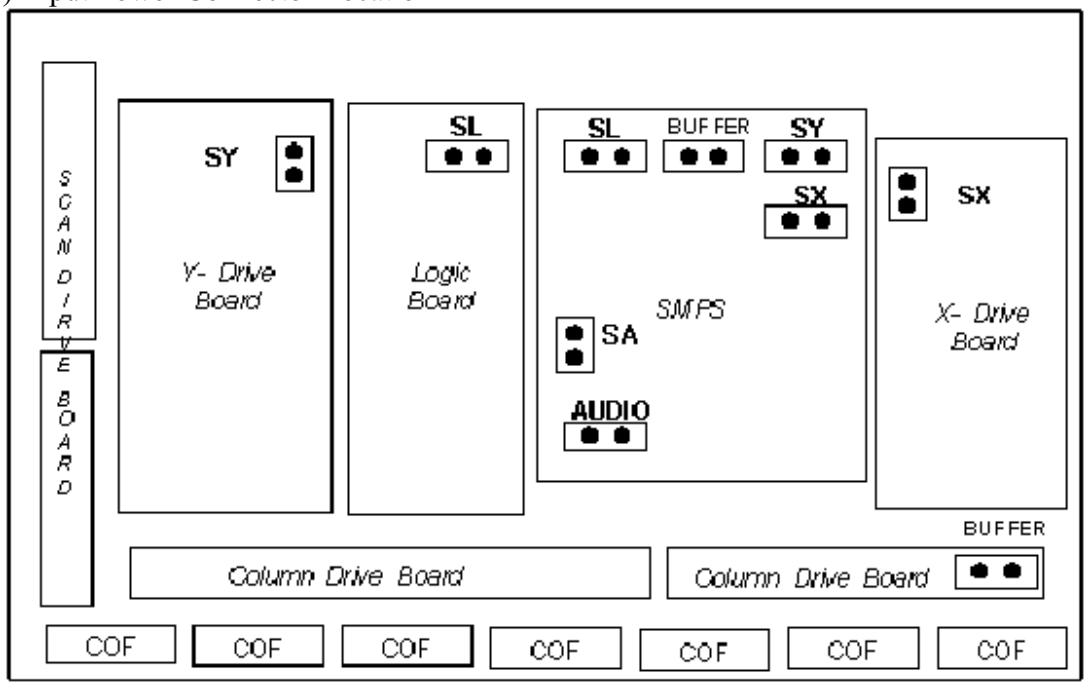
Notes :
1. 1H = One cycle of Horizontal sync signal(=THSYNC)
2. 1D = One cycle of Dot clock signal(=TCLK)
3. If input display data in a horizontal period is 852 and less, the incorrect image is displayed

(1) Electrical characteristics of Input signal

No.	Items	Symbol	Condition	Value			Unit
				min.	typical	max.	
1	Input Voltage: LVDS Level		-				
	1) "H" Level	V_{IH}		2.0	-	5.25	V
	2) "L" Level	V_{IL}		-0.5	-	0.8	V
2	Input Current: LVDS Level						
	1) "H" Level	I_{IH}	V_I =2.75V V_{CC} =5.25V	-	-	1	mA
	2) "L" Level	I_{IL}	V_I =0.4V V_{CC} =5.25V	-	-	1	mA

9.2 Input Power Voltage Specifications

(1) Input Power Connector Location



【Note】

1. Layout Schematic is viewed from back side of PDP Module.
2. Input Power Connector is denoted as ●●
3. The Input Power Connector in Y-Drive Board is named as "SY".
4. The Input Power Connector in X-Drive Board is named as "SX".
5. The Input Power Connector in Logic Board is named as "SL".

. The Input Power Connector in Column Drive Board is named as "BUFFER".

(2) Input Power Voltage Source and Pin Assignment

Caution : If you would controll at will(not in spec), SMPS may operate 'protection' mode.

Connector Name: SY	
Pin No	Voltage Source
1	5Vd
2	GND
3	18Vg
4	GND
5	75Vscan
6	GND
7	220Vset
8	No Connection
9	GND
10	GND
11	165Vs
12	165Vs
13	165Vs

Connector Name: SX	
Pin No	Voltage Source
1	Vd(5V)
2	GND
3	18Vg
4	GND
5	185Ve
6	GND
7	75Vscan
8	GND
9	GND
10	165Vs
11	165Vs
12	165Vs

Connector Name: SA for Image Board which is not provided	
Pin no	Voltage Source
1	5Vsb
2	GND
3	GND-D
4	V5d1
5	RELAY
6	No Connection
7	FAN_DET
8	GND-A
9	GND-A
10	No Connection
11	V12(A)
12	V5a
13	NC

Connector Name: SL	
Pin No	Voltage Source
1	Vd(5V)
2	GND
3	Vd(5V)
4	GND

Connector Name: BUFFER	
Pin no	Voltage Source
1	75Va
2	75Va
3	No Connection
4	GND
5	GND

Connector Name: AUDIO for Audio Amp Board which is not provided	
Pin no	Voltage Source
1	V5A
2	GND-A
3	V9A
4	V12A
5	GND-A
6	VAMP
7	VAMP
8	GNDS
9	GNDS

* These pins are connected each other exactly.

1 'SA' part : GND-D(pin3) and V5d1(pin4) / GND-A(pin8) and V12(A)(pin11) / GND-A(pin9) and V5a(12pin)

2 'AUDIO' part : V5A(pin1) and GND-A(pin2) / V9A(pin3) and GND-A(pin2) / V12A(4pin) and GND-A(pin5) / VAMP(pin6) and GNDS(pin8) / VAMP(pin7) and GNDS(pin9)

(3) Input Power Specification

Output Voltage (V)	Voltage Setting (Nominal Load시)	Output Current(A)		
		Min	Nom	Max
165Vs	165V± 1%	0.2	2.0	2.5
75Va	75V± 1%	0.2	2.0	3.0
185Ve	185V± 1%	0.01	0.1	0.5
220Vset	220V± 1%	0.01	→	0.1
75Vscan	75V± 1%	0.01	→	0.1
5Vd	5.2V± 1%	0.3	→	3.0
18Vg	18V± 5%	0.07	→	0.7
5Vd1	5.2V± 1%	0.2	→	2.0
5Va	5.2V± 5%	0.1	→	1.0
9Vcc	9.2V± 5%	0.07	→	0.7
12Vcc	9.0V± 5%	0.07	→	0.7
12Vsp	24V± 5%	0.15	1.5	2.0
12Vfan	11V ~ 15V	0.5	→	1.0
5Vsb	5.2V± 1%	0.1	1.0	1.5

【Note】

1. Typical Voltage of Va and Vs varies depending on Display Panel
2. More detail specification is described in next page.
3. '9Vcc' is same 'V9A' pin. in 'SA' connector.
4. '12Vcc' is same 'V12(A)' in 'SA' connector or 'V12A' in 'AUDIO' connector.
5. 12Vsp is same 'VAMP' pin in 'AUDIO' connector.

(4) Detail Input Power Specification

No.	Item		Symbol	Term/ Condition	Value			Unit
					Min.	typ.	max.	
1	Voltage for Logic	Voltage	Vcc		4.5	5.2	5.5	V
		Ripple/Noise	V_{RMS}		-	-	50	mVp-p
		Line Regulation			-2	-	2	%
		Current (average)	Icc		-		3.0	A
2	Voltage for FET driver	Voltage	Vdd		-	18	-	V
		Ripple/Noise	V_{RMS}		-	-	-	mVp-p
		Line Regulation			-2	-	2	%
		Current (average)	Idd		0.07	0.7	-	A
3	Voltage for Column driver	Voltage	Va	Depend on Panel	60.0	75.0	85.0	V
		Ripple/Noise	V_{RMS}		-	-	500	mVp-p
		Line Regulation			-2		2	%
		Current (average)	Ia		0.2	2.0	3.0	A
4	Voltage for Display driver	Voltage	Vs	Depend on Panel	160.0	165.0	190.0	V
		Ripple/Noise	V_{RMS}		-	-	1000	mVp-p
		Line Regulation			-1	-	1	%
		Current (average)	Is		0.2	2.0	2.5	A
		Current (instant)	Isp		-	-	5.0	A

(5) Protection

Output Voltage (V)	Overcurrent Limit (A)	Lower Trip Limit (V)	Upper Trip Limit (V)
165Vs	5.0 7.0	135V~145V	190V ~ 220V
75Va	3.0 ~ 4.0	50V~65V	85V ~ 100V

① Each outputs have protection circuit by itself.
② PDP-PS-421S may shutdown, unless all outputs are good.
③ The PFC(Power Factor Correction) circuit has OVP, OCP, Power Good signal.
④ The Protection circuit has any delay circuit for set matching.

① Overcurrent Protection (PDP-PS-421S is the name of SMPS)
The PDP-PS-421S shall not be damaged by a overcurrent from the output to return line. Protection is invoked if current exceeds the rating shown in Table 4
② Open Circuit Protection When a primary power is applied without load on any output level, no damage or hazardous conditions shall occur.
③ Over/ Undervoltage Protection
The voltage shall not exceed the upper trip limit. Noise spikes that exceed the lower trip limit for less than 10㎲ shall not clamp the output voltage to zero.

(6) Output Over/ Undershoot
5% max over/undershoot on turn on/off.

(7) Auxiliary Circuit
The PDP-PS421S shall include the Active Discharge Circuits for Vs for power sequence because +5V System Logic and Imging Processing Vcc must sustain as long as system reset time(The Hold-up time for 5V is about 2s)The Power Sequence Diagram shall be as shown Fig1.

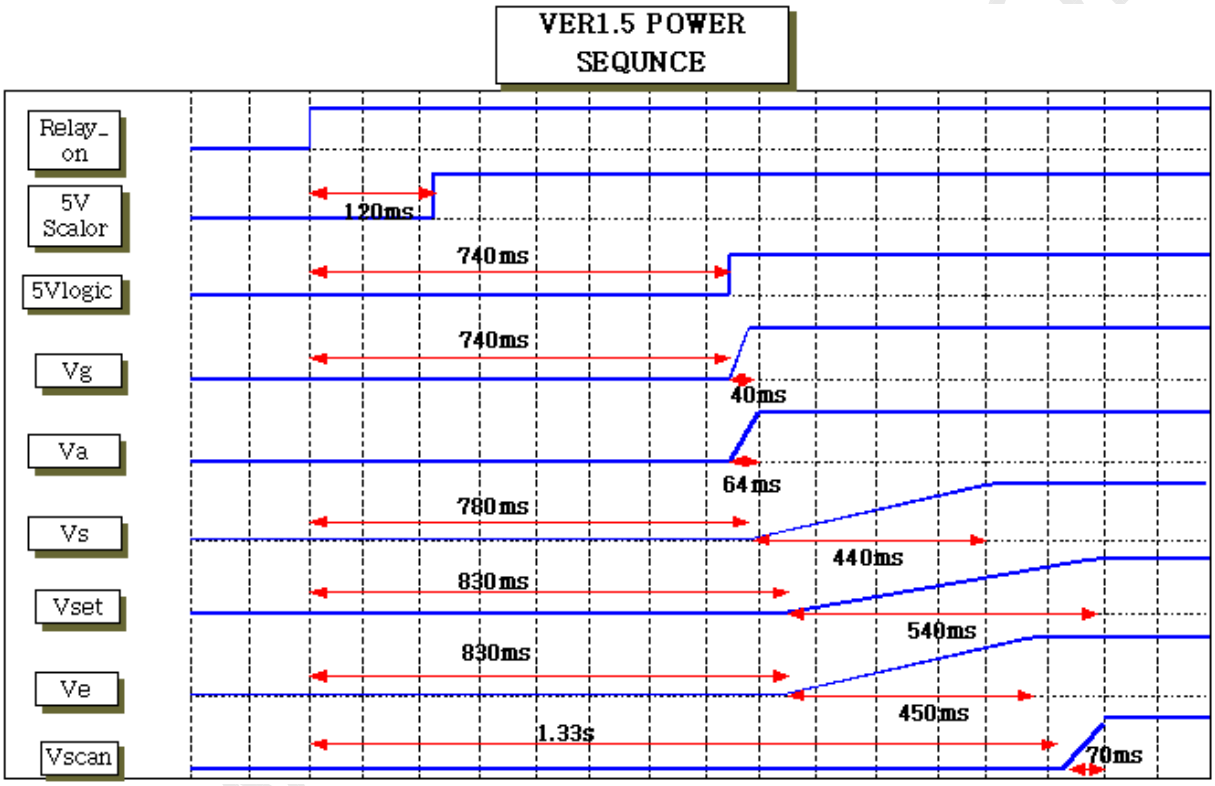
(8) Power Supply Electrical Safety Standards
The PDP-PS421S shall satisfy the Design Standards for SMPS written by Samsung SDI(Reference Ⅰ). Safety requirements specified by UL, CSA, and CE shall be met certification,the organizations shall be made.

(9) Sampling Test(Temperature Cycle Test)
The temperature cycle test is executed for sure to relibility of PDP-PS-421S. 3ea, PDP-PS-421S are executed sampling test for every lots.
The test method is written by Samsung SDI(Reference Ⅱ).

(10) Power Applying Sequence

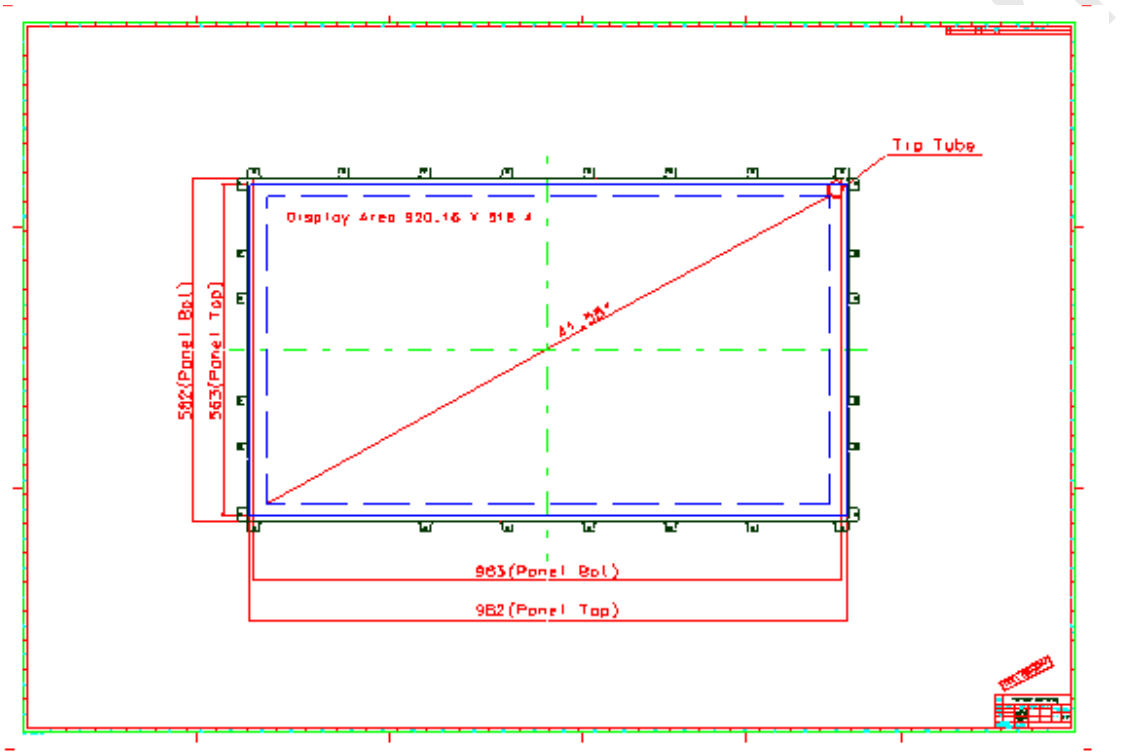
(This Sequence is applicated only for Danam communication's SMPS)

Vcc applied → Vdd applied → Vs applied → Va applied

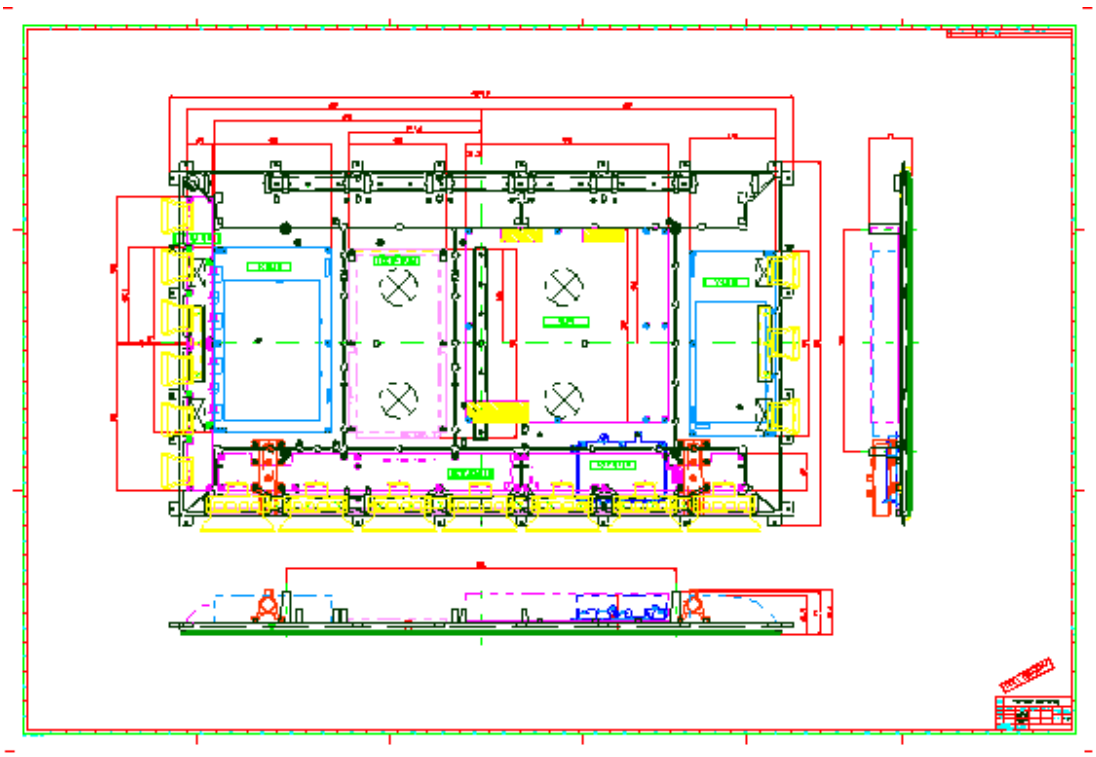


10. Appendix

10.1. Mechanical Dimensions Drawing Front Side



10.2. Mechanical Dimensions Drawing Rear Side



11. RELIABLITY

11.1 MTBF Value

Mean Time Between Failure is dependent on overall PDP module design.

MTBF : 20,000hours (environmental temperature : 25℃)

※ Condition : 25℃, Used moving Picture Signal

11.2 Expected Service Life

#1. Definition

The expected service life is defined by the following two categories.
And the life time is defined by the reached time either (1) or (2).

(1) The white color brightness level becomes half (50%) of its initial value, which is determined by the phosphor characteristics.

(2) The number of display cell deffects increases to double the specification value, which is depending on the discharge characteristics.

#2. Test condition and life time

The expected service life time differs with display conditions as below.

(1) Full screen white color display

Life time : 30,000 hours (this is not the guaranteed life)

* Test condition : 8Hr/Day

12. WARNING / CAUTION / NOTICE

TO PREVENT POSSIBLE DANGER, DAMAGE, AND BODILY HARM, PLEASE CONSIDER AND OBSERVE ALL WARNINGS AND CAUTIONS CONTAINED IN THIS PARAGRAPH.

12.1 Warning

If you don't consider the following warnings, it could result in death or serious injury

(1) The PDP module is controlled by high voltage about 350V. If you need to handle the module during operation or just after power-off, you must take proper precautions against electric shock and never touch the drive circuit portion and metallic part of PDP module.
The capacitors in the drive circuit portion remain temporarily charged even after the power off. After turning off the power, you must be sure to wait at least one minute before touching the module. If the remain voltage is strong enough, it could result in electric shock.

(2) Do not use any other power supply voltage than the specified voltage in this product specifications. If you use deviated power voltage from the specifications, it could result infire hazard or product failure.

(3) Do not operate or install under the deviated surroundings from the environmental specification such as in moisture or rain; near water-for example, bath tub, laundary tub, kitchen sink; in a wet basement; or near a swimming pool; and also near fire or heater - for example, near or over radiator or heat resistor; or where it is exposed to direct sunlight; or somewhere like that. If you use the PDP module in places above, it could result in electric shock, fire hazard or product failure.

(4) If any foreign objects (e.g. water, liquid and metallic chip or dust) entered the PDP module, the power supply voltage to the PDP module must be turned off immediately. Also, never push objects of any kind into the PDP module as they may touch dangerous voltage point or make short circuits that could result in fire hazard or electric shock.

(5) If smoke, offensive smell or unusual noise should come from the PDP module, the power supply voltage to the PDP module must be turned off immediately.
Also, when the PDP screen cannot display any picture after the power-on or during operation, the power supply must be turned off immediately. Never continue to operate the PDP module under these conditions.

(6) Do not disconnect or connect the PDP module's connector while the power supply is on, or just after power off. Because the PDP module is operated by high voltage, and the capacitors in drive circuit remain temporarily changed even after the power is turned off. If you need to disconnect or connect it, you have to wait at least one minute after power off.

(7) Do not disconnect or connect the power connector by wet hand. The voltage of the product may be strong enough to cause an electric shock.

(8) Do not damage the power cable of the PDP module, also do not modify it.

(9) When the power cable or connector is damaged or frayed, do not use it.

(10) When the power connector is covered with dust, please wipe it with a dry cloth before the power on.

12.2 Caution

If you don't consider the following cautions, it may result in personal injury or damage to a propertied facilities.

(1) Do not set the PDP module on an unstable place, vibrating place and inclined place. The PDP module may fall or drop, and it may cause serious injury to a person, and serious damage to the product.

(2) If you need to remove the PDP module to another place, you must turn off the power supply and detach the interface cable and power cable from the PDP module, and watch your steps during the work. If the cable has a damage, it may result in fire hazard or electric shock. Also if the PDP module drop or fall, it may result in personal injury

(3) When you draw or insert the PDP's cable, you must turn off the power supply and do it with holding the connector. If you draw the cable, the electric wire in the cable is exposed or broken. It may result in fire hazard or electric shock.

(4) When you carry the PDP module, you must do it by two workers in order to avoid unexpected accidents.

(5) The PDP module has a glass-plate. If the PDP module is inflicted with excessive stress - for example; shock, vibration, bending and heat-shock, the glass plate could break. It may result in personal injury. And also, do not press or strike the glass surface.

(6) If the glass panel was broken, do not touch it with bare hand. It may result in a cut injury.

(7) Do not place any object on the glass panel. It may be the cause of the scratch or break the glass panel.

(8) Do not place any object on the PDP module. It may result in personal injury due to fall or drop.

12.3 Notice

When you apply the PDP module to your system or handling it, you must make sure to follow the notices described below.

☐ Notice to your system design

(1) The PDP module radiates the infrared rays of between 800 and 1000㎚. It may bring a miss operation to the IR-remote controller or another electric system. Please consider to provide the IR absorb filter in your system, and to take enough evaluation.

(2) The PDP module has high-voltage switching circuit and high-speed clock circuit. Therefore, you have to apply and evaluate the EMC consideration in your system.

(3) The PDP module has a glass plate. In your mechanical design, please consider to avoid a excessive shock and stress to the glass surface. Also be careful not to demage the tip-tube at the corner of glass plate. If the glass plate and tip-tube are demaged, the PDP module may fail.

(4) In your system, for your safety, please consider that remain voltage of the PDP module should be leaked immediately after power-off.

(5) As the PDP module generates heat during operation, please consider the well-radiation and well-ventilation in your system design. The PDP module may be defected on the usage out of specified ambient temperature.

(6) The ventilation design in your system should be considered to provide the moisture-proof and dust proof because the PDP module has high-density dielectric parts with high-voltage. If the driver circuit has condensation or dusts, it may cause a short circuit or dielectric breakdown.

(7) If the PDP module displays a fixed pattern on the screen for extended periods of time, it could make the differences of brightness and chromaticity between fixed pattern area and other areas. This is because the brightness of fixed pattern area becomes lower than the other areas due to degrading of the phosphor, but this phenomenon is not failure,.
On the other hand, when the display pattern is changed, the areas where were illunminated may remain temporarily (few minutes) their brightness.
This phenomenon is a characteristic of color PDP itself due to activation of the discharge surface in the PDP panel, and also it is not abnormal.
If you have a intention to display the fixed pattern, the screen-saver technic should be applied to your systems in order to minimize image retention.

(8) The PDP module is not intended for use with equipments which require extremely high reliability such as aerospace equipments, nuclear control systems or medical equipments for life support.

(9) Based on the requirements of the safty standard (UL, EN etc.), be sure to add the filter that come up to the impact test to the glass plate.

☐ Notice to the operation and handling of the PDP module.

(1) To prevent defect or failure, please check the cable connections and power-supply condition before power-on.

(2) The PDP module is controlled by high voltage. Not only during operation but also immediately after power-off, never disconnect or connect the PDP module's connector because it may result in failure. If you need to disconnect or connect, you have to wait at least one minute after power-off.

(3) The PDP module is equipped with various protection circuits that automatically stop the module operation if an interface signal or the power voltage becomes abnormal during operation. If the PDP module stop suddenly during operation, please check the conditions of input signal and power source before restart.

(4) For protection of the circuit, if the abnormal situation is occured, the high output voltage will be shut downed by watching the input voltage (Vs/ Va/ Vcc) internally. In this case, the module power resetting is necessary to recover.
There are also fuses in the Vs and Va power supply system to prevent smoking and firing by the excessive current. The protection function of the address driver by keeping watch for the internal current is provided in the Va power supply system. Therefore the number of sub-frames decreases to a proper value when the Ia current exceeds a constant value occasionally.

(5) If the abnormal situation such as disconnecting of the input connector is occurred, this module will be on stan-by which high output voltage is stopped even if an external power is supplied. If a normal signal is input after this, normal operation state, operations will start again by re-inputting a normal signal. However it is necessary to rest th module power when tVH and/or tHV are less than the minimum value provide with specification

(6) To ensure reliable operation of the PDP module and to protect it from overheating, never wrap or cover it with a cloth or like a sheet during power-on period. Also, never place the PDP module in a confined space or any other places of poor ventilation.

(7) If you continue to watch the PDP screen for a long time, your eyes become fatigued. It is necessary to rest your eyes occasionally.

(8) The PDP screen is controlled with the display-data signals and synchronized signals. If noise interferes with those signals, the PDP screen could become unstable and, in some case, would be led to failure. Do not place any equipment that generates exessive EMI/RFI noise near the interface cable of the PDP module, and keep the cables as short as possible.

(9) Be careful not to break the glass panel when you handle the PDP module. Also, when handling the PDP module, you must wear gloves or other hand protection to prevent injuries that can occur if the glass panel breaks.

(10) The glass panel section and drive circuit section of the PDP module are closely connected and functioned as a pair. If the module is arbitrarily recombined, restructured, or

disassembled, SDI will not be responsible for the fuction, quality, or operational integrity of the modified module. Do not recombine, restructure, or disassemble it.

(11) To avoid possible electric shock, you must make sure the power supply voltage of PDP module is turned off before cleaning. To clean the PDP's glass panel, apply water or a natural detergent to a piece of soft cloth or gauze, and wring the cloth tightly before wiping the screen. Make sure that no water contacts the connecting terminals on the side of the glass panel. Never use chemical solvents, such as paint thinner or benzene, to clean the glass panel.

(12) The drive circuit section of PDP module uses C-MOS intergrated circuits that must be protected from static electricity. Therefore when transporting or delivering the module, be sure to put the module in an antistatic bag. When handling the PDP module, take adequate grounding precautions to prevent static electricity.

(13) When delivering or transporting the PDP module, you must take special precautions because excessive vibration or shock sould not be applied to it. If the module is dropped or if excessive vibration or shock is applied, the glass panel of the PDP module may be broken and the drive circuit may become damaged. The packing for delivering or transporting should be made with tough structure.

(14) When storing the PDP module, you must select an environmentally controlled place. Avoid any environmet in which the temperature or humidity exceeds specification values. If you are storing it for a long period of time, you must place the module together with a dehumidifying agent, such as sillica gel, in a moisture-proof bag and keep it in an environmentally controlled place.

(15) The PDP module is composed of many kind of materials such as glass plate, metals and plastics. When you dispose it, you must ask a qualified service technician.

☐ Notice of the PDP module performance

The PDP module is the newest display device utilized the gas discharge technology and digital signal processing technology, and its performances are mostly similar to the CRT's. However, some display performances of the PDP module is different from the CRT's. Please consider the following notices when you see the PDP screen.

(1) There is a slight Neon luminence shown outside of the effective display area on the glass panel. Mask this parts so that it may not be seen on the display surface.

(2) Depending on the type and time of usage, there may be a slight change in the brightness and color. There may be an increase of both X-value and Y-value by 0.05 maximum in chromaticity. In this case, adjust it using external data signal.

(3) Because the PDP module uses phosphor to emit light, the phosphor, like a CRT, deteriorates in proportion to display signal and brightness settings. If the same pattern is displayed continuously (fixed display) for an extended of time, the brightness of that area will be

decreased over non-lit areas due to the fact that the discharge surface will be more activated compared to other areas.

(4) The PDP module is possible to be operated by plural Vsync; 50㎐, 60㎐ that is called Multi-Vsync function. And the PDP screen is scanned according to each frequency, and also PDP's subframes to display the grayscale is arranged in this Vsync period. Due to this reason, at the low frequency operation especially 50㎐, you may sometimes find the flickering in the screen . But this is not a failure.

(5) When the Vsync signal timing becomes shorter just after the changing of Vsync frequency (e.g. from 50㎐ to 60H) depend on Multi-Vsync function, an initial Vsync signal of the changed frequency will be ignored and the PDP screen will be interrupted for maximum 1 frame period.

(6) Because the PDP module is a digital processing display devices, this module is equipped with Error diffusion technology and Duplicated Sub-Frame method to display the grayscale and false contour improvement. However, you may sometimes find a color false contour especially in human face contour at moving picture due to difference of display performance compared with the TV-tube.

(7) If the PDP module displays some video test pattern that are mostly used in a laboratory or inspection process of the manufacturing facilities, you may find the following subjects. But these sujects should not be recognized in the failure or defects because the display performance of the PDP module is equipped with Error diffusion technology and Duplicated Sub-Frame method based on digital processing technique.

<a> Linearity in the grayscale test pattern
If the PDP module displays the grayscale test pattern (e.g. white color brightness is gradually changed horizontally or vertically) in a screen, you may find the disparity of brightness at adjacent grayscale patterns. This behavior is caused by duplicated sub-frame condition, display load correction and electroad dependency.

<b> Color contouring and dithering at the stationary picture
If the stationary picture such as a human face or the like is shown in the PDP screen, you may feel some unstable noise at the contour area. This behavior is called the color contouring or dithering, and is caused by the error diffusion condition, display load correction and electroad dependency.

(8) If the PDP module is operated under inadeqate conditions or harsh environment, the screen may become unstable or noisy. This instability is mostly related to ambient temperature, air pressure, input signal instability (include signal noise), input power voltage and strong magnetic field like a MRI/NMR application or superconducting magnetic application. Please don't apply the PDP module to inadequate conditions or harsh environment mentioned above.