

127 cm (50 type), Wide screen (1365 × 768 Pixels)
Digital RGB signal, 8bits signal each

CosmoPLASMA

DESCRIPTION

The NP50C2MF01 is a 50-inch wide color plasma display module with a resolution of 1365(H) × 768 (V) pixels. The display offers vibrant colors reproduced in a thin and low profile package. This device uses AC plasma technology by NEC and includes an 8-bit of digital video signal interface for each RGB color.

FEATURES

- Applied Capsulated Color Filter (CCF) technology, developed at NEC, which offers a high quality image match for CRT display. To offer remarkably pure colors, the color plasma display panel uses extremely clear, thin capsulated color filters to cut unnecessary light as the plasma discharges.
- Peak luminance of 620cd/m² (typical value) is achieved through a new driving method, which offers extremely vivid image with good contrast.
- Applied Advanced Peak Luminance Enhancement (Advanced-PLE) function that enables the display to operate with the ideal contrast. The PLE function makes it possible to adjust the average luminance level of the PDP display automatically in accordance with the average luminance level of an input video signal.

APPLICATIONS

- Wide Screen TV (aspect ratio 16:9)
- Public Information Display
- Video Conference Systems
- Retail
- Education and Training Systems



The information in this document is subject to change without notice.

STRUCTURE AND PRINCIPLE OPERATION OF PLASMA DISPLAY

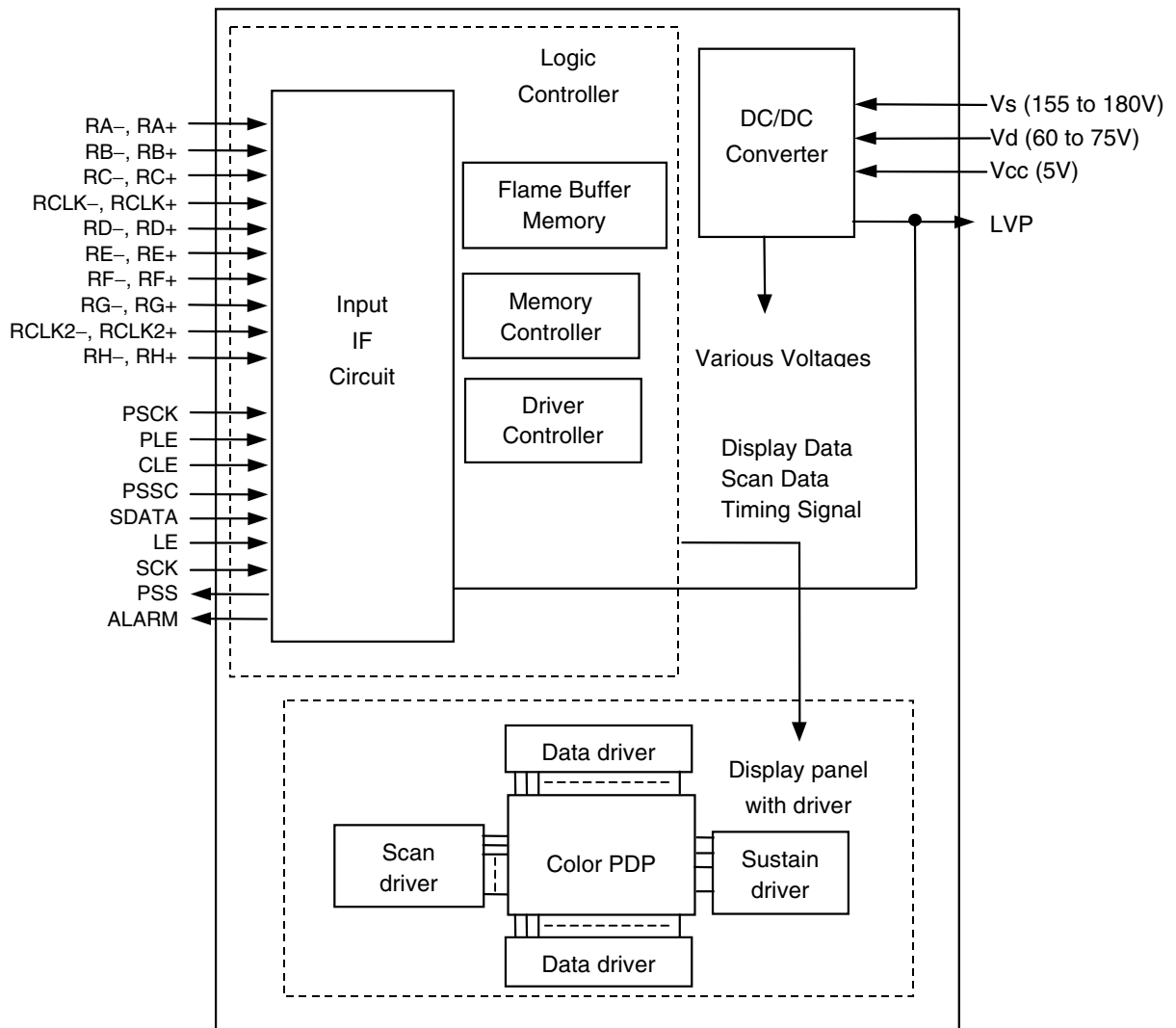
In a Plasma Display Panel, Row and Column electrodes are placed between two glass substrates. A rare gas is then filled between each substrate. When a high voltage is applied to these electrodes, the gas is activated resulting in the radiation of ultraviolet light, similar to the operation in fluorescent lamps. These ultraviolet rays then activate phosphor that has been coated on the inside of the glass substrate, and visible light is emitted from the panel.

ELECTRICAL INTERFACE OF PLASMA DISPLAY

NP50C2MF01 requires 8 bits of digital video signals for each RGB color. For the signal inputs, serial interface (LVDS video signal) is prepared in the module. In addition to the video signals, synchronous signals, mode control signals and 3 different DC voltages are required to operate the display.

This plasma display module has an “Advanced-PLE” (Advanced Peak Luminance Enhancement) function that adjusts the luminance and contrast to the suitable value in accordance with the input video signal level variance, so that images can be displayed with the ideal luminance and contrast.

BASIC CONFIGURATION



GENERAL SPECIFICATION

Display area	1106(H) × 622(V) mm
Outline dimensions	1191(W) × 701(H) × 48(D) mm
Weight	24 kg
Aspect ratio	16:9
Number of pixels	1365(H) × 768(V) (1pixel = 3 RGB cells)
Pixel pitch	0.81 (H) × 0.81(V) mm
Color arrangement	RGB vertical stripes
Number of gradations	8bits (256 steps)
Peak luminance	620cd/m ² typical Video signal*, 4 % white window, PLE** mode set to the maximum

* Signal of EDTV mode: $f_v = 59.94$ Hz and $f_h = 31.47$ kHz

** See PLE (Peak Luminance Enhancement) description.

OPERATION ENVIRONMENTAL CONDITIONS

Temperature	0 to 60°C (with forced-air cooling)
Humidity	20 to 80% R.H. (without condensation)
Atmospheric pressure	800 to 1100 hPa

STORAGE ENVIRONMENTAL CONDITIONS

Temperature	-20 to 60°C
Humidity	10 to 90% R.H. (without condensation)
Atmospheric pressure	700 to 1100 hPa

MECHANICAL TEST CONDITIONS

Vibration (operating)	4.9m/s ² (0.5 G), 10 to 100 Hz, 3 directions, 10 minutes each
Vibration (non-operating)	4.9m/s ² (0.5 G), 10 to 100 Hz, 3 directions, 2 hours each

LIFE EXPECTANCY

More than 10,000 hours of continuous operation.

(Time when the luminance decreased to half of the initial at full white display and internal PLE operation.)

POWER INPUT AND OUTPUT

1) Sustain Power Supply

Table 1. Sustain Power Supply						
Item	Symbol	Condition and Remarks	Min.	Typ.	Max.	Unit
Absolute Maximum	----	-----	----	----	200	V
Voltage	Vs	Dependent on the characteristics of each PDP (Note 1)	155	----	180	V
Voltage Stability	----	-----	----	----	±1.0	%
Average Current (Note 2)	Is-a	Under normal PLE operation	0.1	----	3.0	A
Peak Current	Is-peak	Duty: 1/8, Cycle: 60 to 75Hz	----	----	21	A
Voltage Regulation	----	At peak current	----	----	5	V
Ripple and Noise	----	-----	----	----	500	mVp-p

Note 1: Voltage should be set to a specified value, which is located on a label attached to the module.

Note 2: Average current that include rippled current

2) Data Power Supply

Table 2. Data Power Supply						
Item	Symbol	Condition and Remarks	Min.	Typ.	Max.	Unit
Absolute Maximum	----	----	----	----	80	V
Voltage	Vd	Dependent on the characteristics of each PDP (Note 1)	60	----	75	V
Voltage Stability	----	----	----	----	±1.5	%
Average Current (Note 2)	Id-a	Varied correspondence to the Image	0.4	----	3.0	A
Peak Current	Id-peak	----	----	----	4.0	A
Ripple and Noise	----	----	----	----	300	mVp-p

Note 1: Voltage should be set to a specified value, which is located on a label attached to the module.

Note 2: Average current that include rippled current.

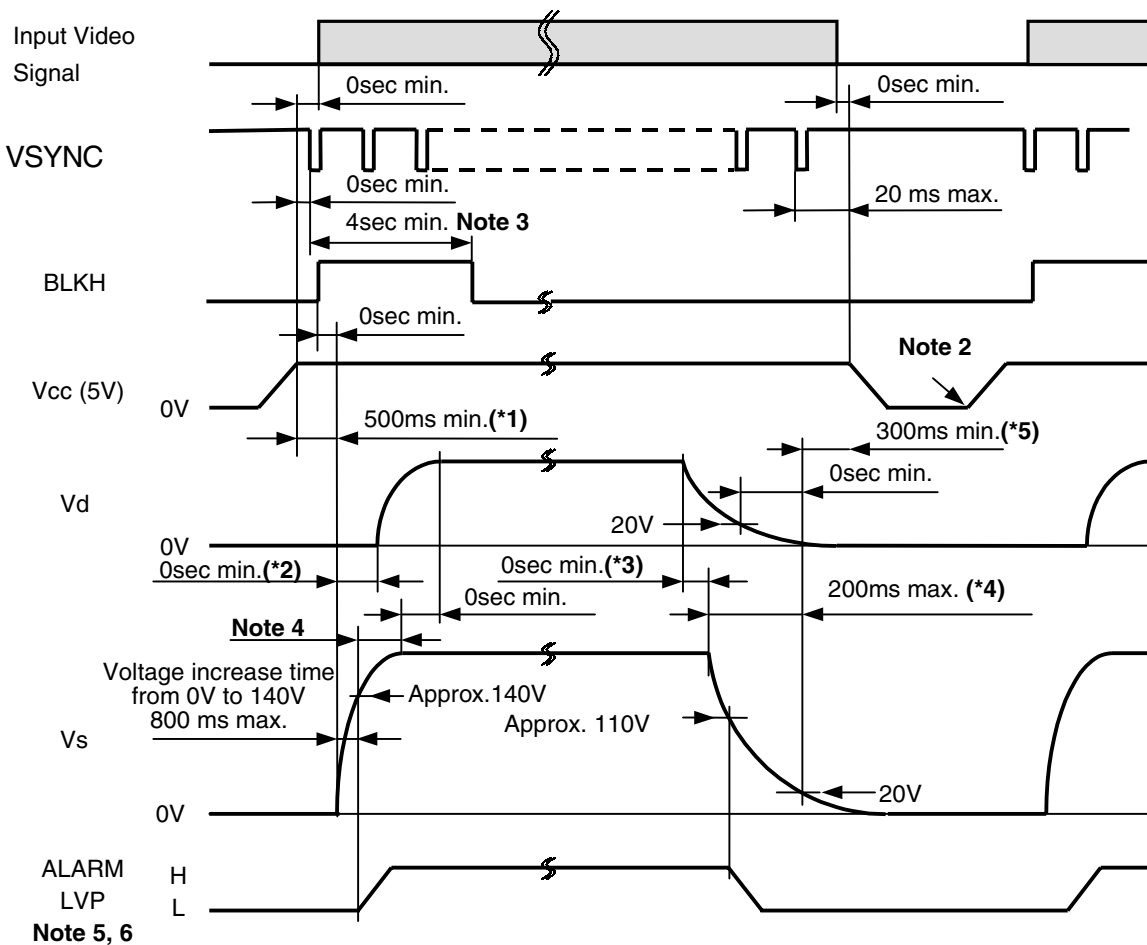
3) Logic Power Supply

Table 3. Logic Power Supply						
Item	Symbol	Condition and Remarks	Min.	Typ.	Max.	Unit
Absolute Maximum	----	-----	4.5	----	6.0	V
Voltage Range	Vcc	-----	4.75	5.0	5.25	V
Current (Note 1)	Icc	-----	----	----	6.0	A
Peak Current	Icc-peak	-----	----	----	7.0	A
Ripple	----	-----	----	----	30	mVp-p
Noise	----	-----	----	----	300	mVp-p

Note 1: Average of rippled current.

This module provides an automatic operation-stop function for internal malfunctions. When the module stops the operation, logic current may reduce to almost zero (0). Even if logic current becomes zero, applied voltage should be kept to less than 6.0 volts.

Supply Voltage and Signal Sequence



Note 1: Power ON/OFF sequence is as follows (refer to the above sequence diagram):

<p>Power ON sequence Vcc ON → 500ms min. (*1) → Vs ON → 0sec min. (*2) → Vd ON</p> <p>Power OFF sequence: Vd OFF → 0sec min. (*3) → Vs OFF → 200ms max. (*4) → 300ms min. (*5) → Vcc OFF</p>
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If power sequence does not meet to above sequence diagram, PDP drivers may have a permanent damage.

In order to decrease Vs and Vd voltages quickly to satisfy above sequence diagram, forced discharge circuits are essential in the power supply.

Note 2: Re-start (Power ON again) should be done after Vcc is reduced to 0.1V or less.

Note 3: Initial set-up period when power on.

Since unexpected image may be displayed while this set-up period, it is recommended to mute the display using BLKH signal.

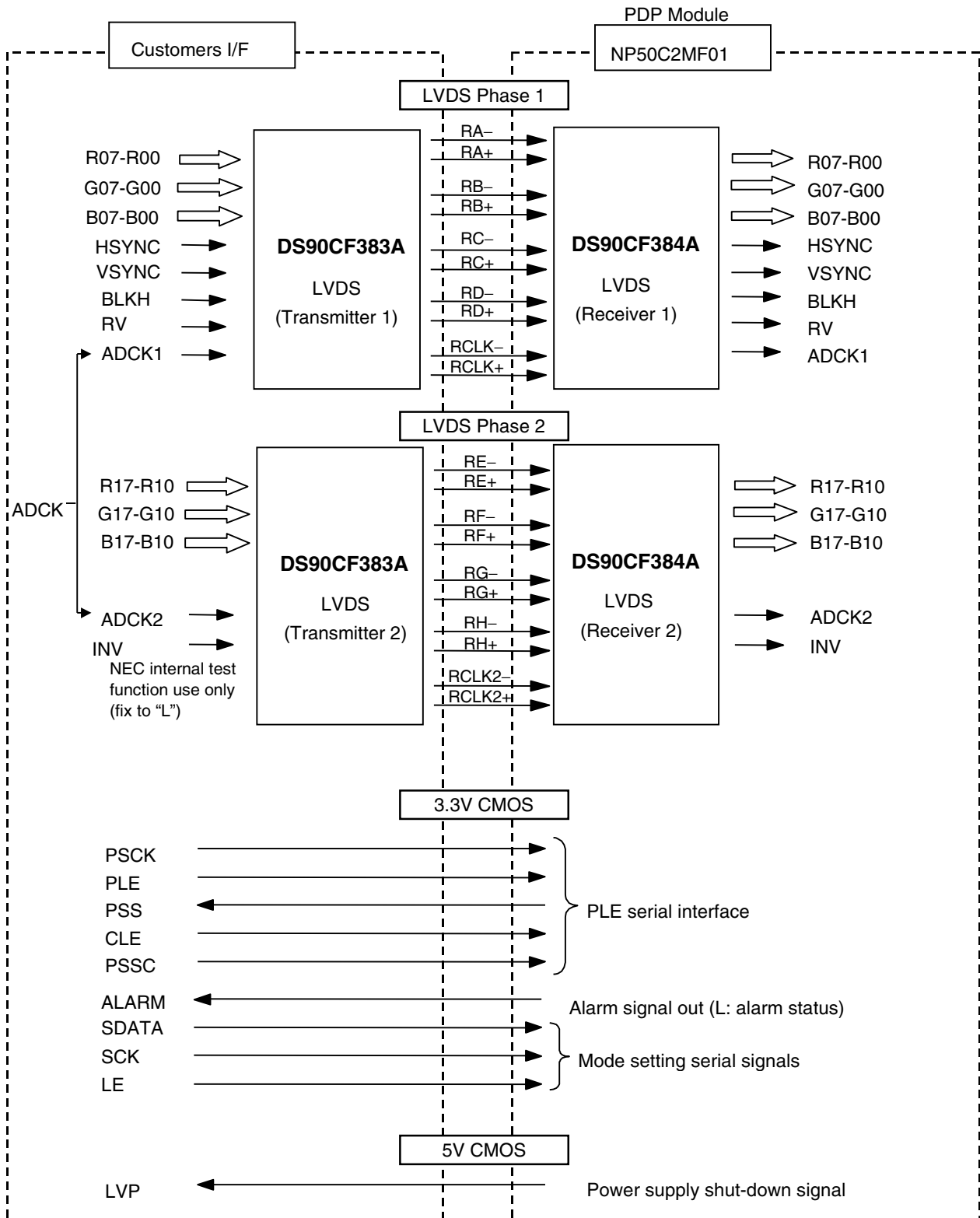
Note 4: Since image starts to display gradually according to the rising of Vs voltage, momentary unexpected image may be displayed while this period. In order to reduce this influence, it is recommended to set this period as short as possible (400ms or less).

Note 5: LVP is the power supply shutdown output signal when the panel is broken and/or failure of internal power source in the PDP module.

Note 6: When either ALARM or LVP signal is "L", high voltage should be shut down. However, when Vcc is applied at first, ALARM and LVP signals are kept "L" until Vs is applied. In order to enable "high voltage power supply" operation, the initial ALARM and LVP signals' status "L" should be disregarded.

INTERFACE SIGNAL

SERIAL INTERFACE CONFIGURATION



R07-R00, G07-G00, B07-B00: Odd pixel number data (D₁, D₃, -----, D_{2n-1})

R17-R10, G17-G10, B17-B10: Even pixel number data (D₂, D₄, -----, D_{2n})

ELECTRICAL CHARACTERISTICS

1) Interface Signals; Absolute Ratings

Common conditions: Ta = 25°C, Vcc = 5V

Table 4. Absolute Ratings						
Item		Parameter	Symbol	Ratings	Unit	
Input Signals	LVDS	RA-, RA+, RB-, RB+, RC-, RC+, RD-, RD+, RCLK-, RCLK+ RE-, RE+, RF-, RF+, RG-, RG+, RH-, RH+, RCLK2-, RCLK2+	Input Voltage	Vi	-0.3 to 3.6	V
			Input current	li	—————	mA
	3.3V CMOS	PSCK, PLE, CLE, PSSC SDATA, SCK, LE	Input Voltage	Vi	-0.5 to 4.6	V
			Input current	li	-15	mA
Output Signals	3.3V CMOS	PSS, ALARM	Output Voltage	Vo	-0.5 to 3.5	V
			Output current	lo	±20	mA
	5V CMOS	LVP	Output Voltage	Vo	-0.5 to 5.5	V
			Output current	lo	±35	mA

2) Interface Signals; Electrical Characteristics

Common conditions: Ta = 25°C, Vcc = 5V

Table 5. Electrical Characteristics							
Signal	Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
LVDS	Differential Input High Threshold	V _{TH}	V _{CM} = 1.2V	---	---	100	mV
	Differential Input Low Threshold	V _{TL}	V _{CM} = 1.2V	-100	---	---	mV
	Input Current	I _{IN}	V _{IN} = +2.4/GND	---	---	±10	μA
3.3V CMOS	High Level Input Voltage	V _{IH}	-----	2.0	---	---	V
	Low Level Input Voltage	V _{IL}	-----	---	---	0.8	V
	Input Current	li	Vi = Vcc or GND	---	---	±5.0	μA
	High Level Output Voltage	V _{OH}	Io = -1mA	2.4	---	---	V
	Low Level Output Voltage	V _{OL}	Io = 1mA	---	---	0.4	V
5V CMOS	High Level Output Voltage	V _{OH}	Io = -6mA	4.18	---	---	V
	Low Level Output Voltage	V _{OL}	Io = 6mA	---	---	0.26	V

INPUT SIGNAL FUNCTION of LVDS TRANSMITTER (DS90CF383A)

Table 6. Interface Signal Function		
Symbol	Function	(Remarks)
R07 to R00	Phase 1 8 bits red video signal (Note 1)	(R07: MSB*, R00: LSB**)
R17 to R10	Phase 2 8 bits red video signal (Note 1)	(R17: MSB*, R10: LSB**)
G07 to G00	Phase 1 8 bits green video signal (Note 1)	(G07: MSB*, G00: LSB**)
G17 to G10	Phase 2 8 bits green video signal (Note 1)	(G17: MSB*, G10: LSB**)
B07 to B00	Phase 1 8 bits blue video signal (Note 1)	(B07: MSB*, B00: LSB**)
B17 to B10	Phase 2 8 bits blue video signal (Note 1)	(B17: MSB*, B10: LSB**)
ADCK1, 2	Clock for video signal	(Input ADCK 1 and 2 with same clock phase)
HSYNC	Horizontal synchronous signal	Pulse width (ths) = 4TADCK min. (negative pulse)
VSYNC	Vertical synchronous signal	Pulse width (tvs) = 10TADCK min. (negative pulse)
BLKH	Video blanking and/or muting (Note 2)	("H" in blanking, muting)
RV	Reverse the RGB video data polarity	(Fix to "L" level)
INV	NEC internal test function use only	(Fix to "L" level)

* MSB: Most Significant Bit

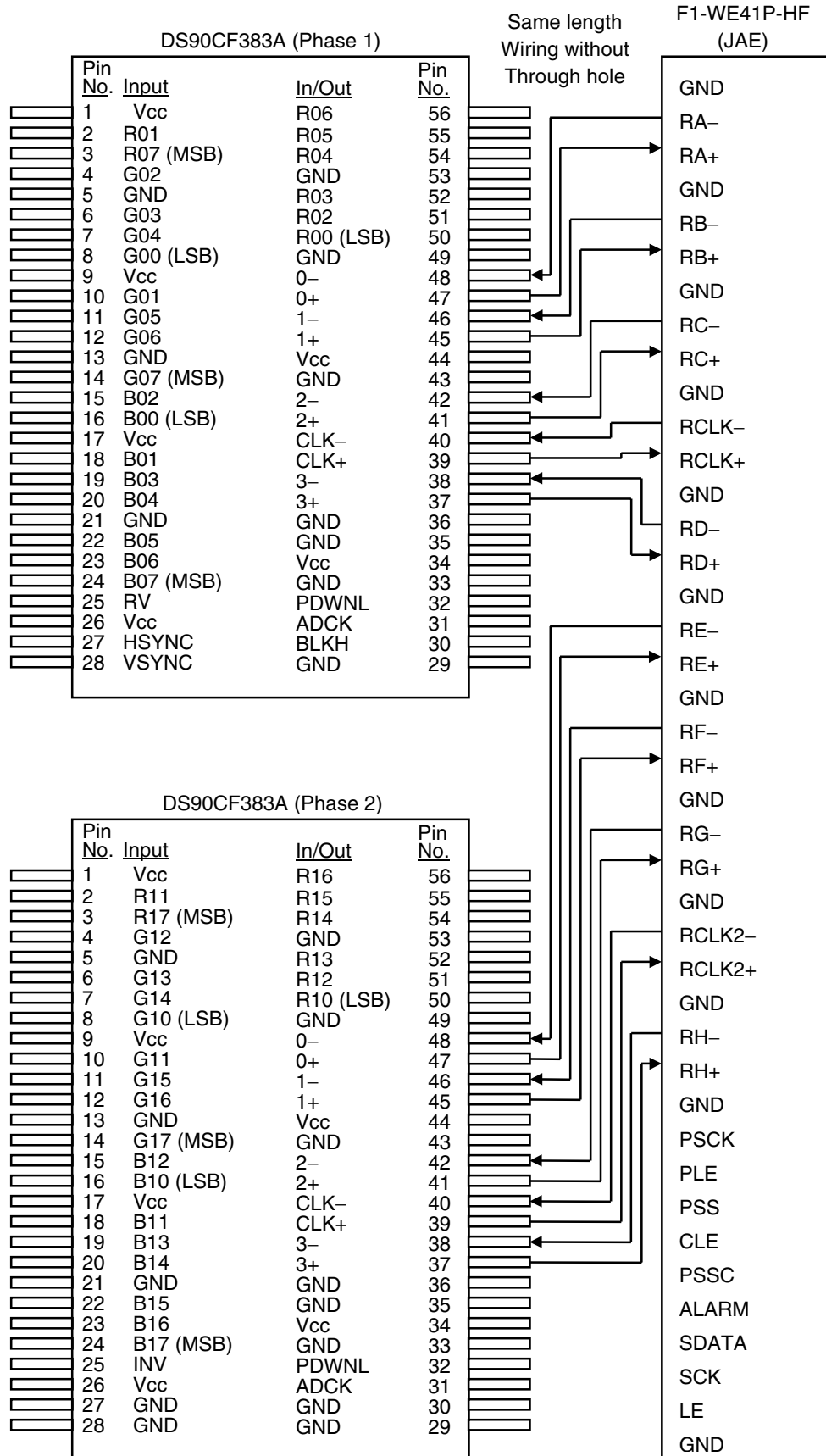
** LSB: Least Significant Bit

Note 1: The RGB video signal should be compensated with Inverse γ circuit before input to the color plasma display module.

LVDS signal 1 and 2 should be input with same clock phase.

Note 2: While BLKH input is "H" level, all display area image turns to black color display.

PIN ASSIGNMENT OF LVDS TRANSMITTER



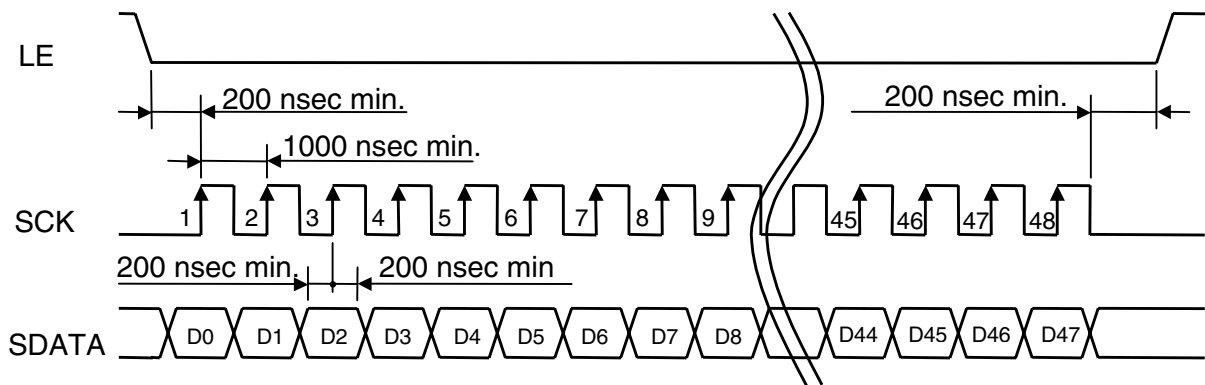
INPUT SIGNAL FUNCTION of PDP MODULE (NP50C2MF01)

Table 7. Interface Signal Function			
Symbol	I/O	Function	(Remarks)
RA-	I	Video signal input A-	LVDS signal 1
RA+	I	Video signal input A+	LVDS signal 1
RB-	I	Video signal input B-	LVDS signal 1
RB+	I	Video signal input B+	LVDS signal 1
RC-	I	Video signal input C-	LVDS signal 1
RC+	I	Video signal input C+	LVDS signal 1
RD-	I	Video signal input D-	LVDS signal 1
RD+	I	Video signal input D+	LVDS signal 1
RCLK-	I	Clock signal clock-	LVDS signal 1
RCLK+	I	Clock signal clock+	LVDS signal 1
RE-	I	Video signal input E-	LVDS signal 2
RE+	I	Video signal input E+	LVDS signal 2
RF-	I	Video signal input F-	LVDS signal 2
RF+	I	Video signal input F+	LVDS signal 2
RG-	I	Video signal input G-	LVDS signal 2
RG+	I	Video signal input G+	LVDS signal 2
RH-	I	Video signal input H-	LVDS signal 2
RH+	I	Video signal input H+	LVDS signal 2
RCLK2-	I	Clock signal clock-	LVDS signal 2
RCLK2+	I	Clock signal clock+	LVDS signal 2
SDATA	I	Mode setting serial data (48-bit)	3.3V CMOS
SCK	I	Clock signal for SDATA	3.3V CMOS
LE	I	SDATA write enable ("L" in SDATA write)	3.3V CMOS
PSCK (Note 2)	I	Clock signal for PSS, PSSC serial data	3.3V CMOS
PLE (Note 2)	I	PSS data read enable ("L" in PSS data read)	3.3V CMOS
PSS (Note 2)	O	PLE average luminance signal (10-bit serial)	3.3V CMOS
CLE (Note 2)	I	PSSC data write enable ("L" in data write)	3.3V CMOS
PSSC (Note 2)	I	PLE luminance control data (8-bit serial)	3.3V CMOS
ALARM	O	Alarm signal for panel broken and failure of internal power-source. (Note 1) ("L" in alarmed status)	3.3V CMOS

Note 1: When ALARM output turns to "L" level, high voltage power input (Sustain power supply: Vs, and Data power supply: Vd) should be switched off immediately. When glass panel is broken, high voltage may occur at the electrode section and cause electric shock. Failure of internal power-source causes over-power status and gives damage to the display panel and driver-circuits.

Note 2: When use the internal PLE function, these signals become invalid. In this case, it is recommended to keep these terminals open.

SET-UP OF CONTROL MODE SIGNALS AND DISPLAY POSITION



Set-up Sequence:

1. Set LE to "L" level.
2. Enter the 48 bits of SDATA into the module synchronizing to the serial clock signal (SCK)
3. Set LE to "H" level.

Note 1: SCK clock rate: 1MHz max.

Note 2: Serial input data should be refreshed at least in every 5 or 6 seconds or less.

Note 3: Serial input data (SDATA) is latched into the module at the falling edge of the VSYNC signal after "LE" signal is returned back to "H" level. When VSYNC is overlapped with the "LE" signal's "L" period, the serial data is latched with the next VSYNC timing.

Note 4: When only 48 SCK clocks are input while LE is "L" level period, SDATA become enabled, If SCK clocks number is not 48, SDATA is not refreshed.

Note 5: When powers are supplied to the module, serial data in the module has vague status. Therefore serial data should be refreshed after powered on.

MODE SETTING SIGNALS

Table8. Contents of SDATA (Mode setting serial input data)			
SDATA	Signal name	Function	Remarks
D0	RESERVE	Spare bit	Fix to "L" level
D1	CODE 2	Selection of Video / PC mode	Refer to Table 9
D2	CODE 1		
D3	CODE 0		
D4	RESERVE	NEC Internal use	Fix to "L" level
D5	RESERVE	NEC Internal use	Fix to "L" level
D6	RESERVE	NEC Internal use	Fix to "L" level
D7	LIFEH	Switch for PLE luminance level	L: PLE normal operation H: Fix PLE to low luminance level for longer life operation
D8	RESERVE	Spare bit	Fix to "L" level
D9	SELFPLEH	Switch for "Internal PLE" and "External PLE"	H: Internal PLE control L: External PLE control
D10	TSELB	Switch for ADCK data latch timing	Fix to "H" level
D11	FV 2	Vertical frequency selection bits	Refer to Table 9
D12	FV 1		
D13	FV 0		
D14	DISPLINE 2	Display line number Refer to the "DL" in the Table 10	Lines 400 480 600 624 720 768 640
D15	DISPLINE 1		DL2 L L L L H H H
D16	DISPLINE 0		DL1 L L H H L L H DL0 L H L H L H L
D17	DISPDOT 2	Display pixel number/line Refer to the "DD" in the Table 10	Pixels 640 800 832 853 864 1024 1280 1365
D18	DISPDOT 1		DD2 L L L L H H H H
D19	DISPDOT 0		DD1 L L H H L L H H DD0 L H L H L H L H
D20	VDELAY 256	Display start vertical position Refer to the "VD" in the Table 10 and item "Display position: p19"	Set the display start line numbers after the falling edge of the VSYNC. Range of setting line numbers: 0 to 511 This number should not exceed the total line numbers in one frame period (1V).
D21	VDELAY 128		
D22	VDELAY 64		
D23	VDELAY 32		
D24	VDELAY 16		
D25	VDELAY 8		
D26	VDELAY 4		
D27	VDELAY 2		
D28	VDELAY 1		
D29	HDELAY 512	Display start horizontal position Refer to the "HD" in the Table 10 and item "Display position: p19"	Set the display start pixel numbers after the falling edge of the HSYNC. Range of setting pixel numbers: 0 to 1023 This number should not exceed the total line numbers in one line period (1H).
D30	HDELAY 256		
D31	HDELAY 128		
D32	HDELAY 64		
D33	HDELAY 32		
D35	HDELAY 8		
D36	HDELAY 4		
D37	HDELAY 2		
D38	HDELAY 1		
D39	HPOS 3	Setting of horizontal display position in normal mode. Display position is adjustable by 2 pixel steps.	Position Left ----- Center ----- Right
D40	HPOS 2		POS3 L L L ----- H ----- H H H
D41	HPOS 1		POS2 L L L ----- L ----- H H H
D42	HPOS 0		POS1 L L H ----- L ----- L H H POS0 L H L ----- L ----- H L H
D43	MASKLEVEL 3	Gray level in black area (Possible to set 0-24% of white level)	Level (%) Dark ----- Light
D44	MASKLEVEL 2		ML2 L L L L L L L L H H H H H H H H
D45	MASKLEVEL 1		ML1 L L L L H H H H L L L L H H H H
D46	MASKLEVEL 0		ML0 L L H H L L H H L L H H L L H H MLL L H L H L H L H L H L H L H L H
D47	RESERVE	Spare bit	Fix to "L" level

Table 9 Video Signal Mode setting Code								
Input Signal	Mode setting serial Data						Maximum Vertical Synchronous Freq.	Remarks
	D1	D2	D3	D11	D12	D13		
	C O D E 2	C O D E 1	C O D E 0	F V 2	F V 1	F V 0		
Video 50Hz Standard mode	L	L	H	L	L	L	46 to 54Hz (Note 1)	LSB is deleted if the freq. \geq 51Hz(approx.)
Video 50Hz Reduced False contour Mode	H	H	L	L	L	L	46 to 54Hz (Note 1)	LSB is deleted if the freq. \geq 51Hz(approx.) Low luminance mode with reduced false contour
Video 60Hz Standard mode	L	H	L	L	L	H	55 to 64Hz (Note 1)	LSB is deleted if the freq. \geq 61Hz(approx.)
Video 60Hz Reduced False contour Mode	L	H	H	L	L	H	55 to 64Hz (Note 1)	LSB is deleted if the freq. \geq 61Hz(approx.) Low luminance mode with reduced false contour
Video 60Hz High luminance Mode (Note 2)	H	L	L	L	L	H	55 to 64Hz (Note 1)	LSB is deleted if the freq. \geq 61Hz(approx.) High luminance and contrast mode
PC 60Hz	L	L	L	L	L	H	55 to 64Hz	Low peak luminance mode for reducing Image-Sticking
PC 66Hz	L	L	L	L	H	L	65 to 67Hz	Low peak luminance mode for reducing Image-Sticking
PC 70Hz	L	L	L	L	H	H	65 to 71Hz	Low peak luminance mode for reducing Image-Sticking
PC 75Hz	L	L	L	H	L	L	72 to 75Hz	Low peak luminance mode for reducing Image-Sticking

Note 1: When Vertical synchronous freq. is over than the above maximum freq., the module is set to low luminance mode.

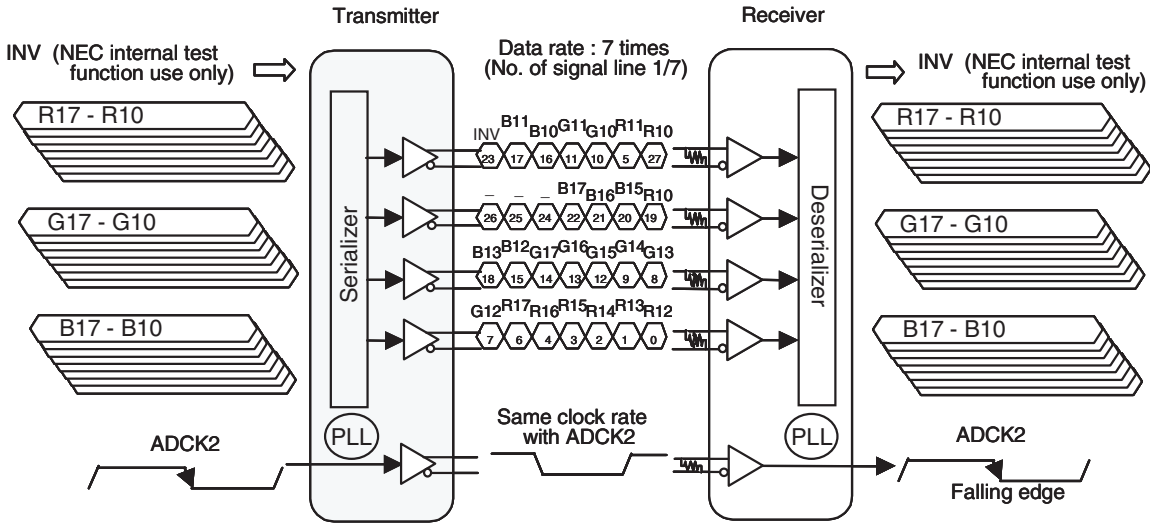
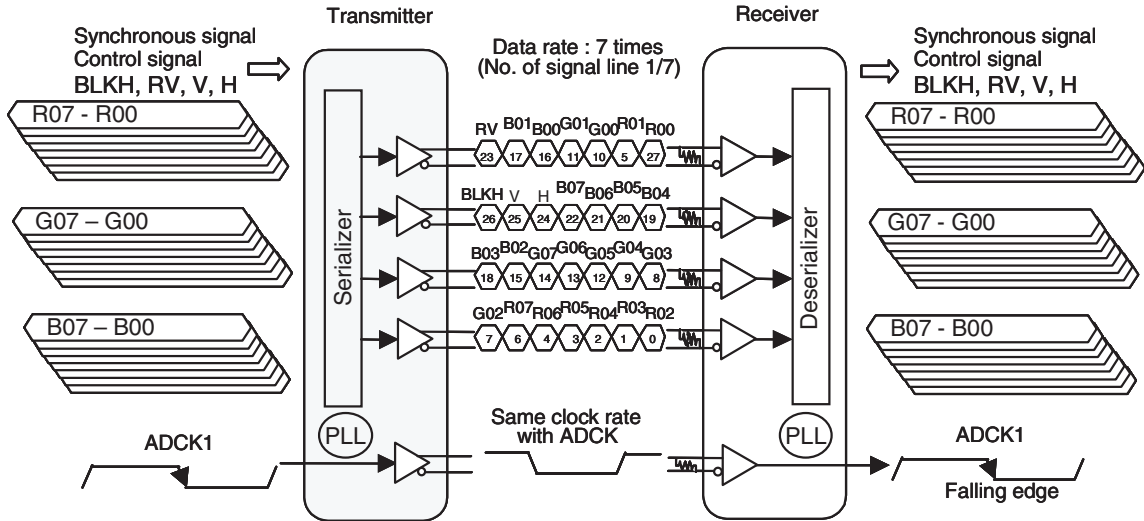
Note 2: In case of using this mode, If PDP-module display high luminance picture continuously, PDP-module will reduce luminance automatically. And then, after changing to normal luminance picture, PDP-module will return to normal operation. When design with this mode, please consult NEC in advance.

EXAMPLE OF VIDEO SIGNAL INPUT AND SIGNAL TIMING

Table10 Relation between Input and Module RGB signal input															
Standard format of video signal						Module signal data for PDP module									
No.	Signal Name	Display Resolution (Dot, Line)	Vertical Synchronous Freq. (Hz)	Total number of Dot, Line	Horizontal Synchronous Freq. (KHz)	Display Resolution (Dot, Line)	Horizontal Synchronous Freq. (KHz)	Recommended dot-clock (dot-clock number in 1H period)	C O D E	F V	D L	D D	VD	HD	
Video Mode	1	EU1	576lines	625/2lines	50.00	15.625	1365,768	41.67	69.3/2 (832)	1	0	5	7	59	272
	2	EDTV	480lines	525/2lines	59.94	15.734	1365,768	50.35	83.8/2 (832)	2	1	5	7	53	246
	3	1035 I (HiVision)	1035lines	2200,1125/2	60.00	33.75	1365,768	50.63	80.03/2 (791)	2	1	5	7	59	168
	4	1080 i	1920,1080	2200,1125/2	60.00/59.94	33.75 / 33.72	1365,768	50.61	83.51/2 (825)	2	1	5	7	29	176
	5	720 p	1280,720	1650,750	60.00 / 59.94	45.00 / 44.96	1280,720	45.00	74.25/2 (825)	2	1	4	6	24	300
PC Mode	6	NEC	640,400	848,440	56.42	24.83	640,400	24.83	21.05/2 (424)	0	1	0	0	32	148
	7	NEC	640,400	800,449	70.09	31.47	640,400	31.47	25.17/2 (400)	0	3	0	0	35	142
	8	IBM	640,400	800,449	70.09	31.47	640,400	31.47	25.17/2 (400)	0	3	0	0	35	146
	9	VGA	640,480	800,525	59.94	31.47	640,480	31.47	25.17/2 (400)	0	1	1	0	34	140
	10	IBM	640,480	800,525	59.94	31.47	640,480	31.47	25.17/2 (400)	0	1	1	0	26	136
	11	NEC	640,480	800,525	59.94	31.47	640,480	31.47	25.17/2 (400)	0	1	1	0	38	144
	12	MAC	640,480	864,525	66.67	35.00	640,480	35.00	30.24/2 (432)	0	2	1	0	41	160
	13	VESA	640,480	832,520	72.81	37.86	640,480	37.86	31.5/2 (416)	0	4	1	0	30	168
	14	VESA	640,480	840,500	75.00	37.5	640,480	37.5	31.5/2 (420)	0	4	1	0	18	184
	15	IBM	640,480	800,525	75.00	39.38	640,480	39.38	31.5/2 (400)	0	4	1	0	33	144
	16	VESA	800,600	1024,625	56.25	35.16	800,600	35.16	36.0/2 (512)	0	1	2	1	23	200
	17	VESA	800,600	1056,628	60.32	37.88	800,600	37.88	40.0/2 (528)	0	1	2	1	26	216
	18	VESA	800,600	1040,666	72.19	48.08	800,600	48.08	50.0/2 (520)	0	4	2	1	28	184
	19	VESA	800,600	1056,625	75.00	46.88	800,600	46.88	49.5/2 (528)	0	4	2	1	23	240
	20	MAC	832,624	1152,667	74.55	49.72	832,624	49.72	57.3/2 (576)	0	4	3	2	41	188
	21	VESA	1024,768	60.00	1344,806	48.36	1024,768	48.36	65.0/2 (672)	0	1	5	5	34	296
							1365,768	48.36	86.7/2 (896)	0	1	5	7	34	394
	22	EWS/L	1024,768	60.08	1344,806	48.36	1024,768	48.36	65.0/2 (672)	0	1	5	5	33	280
							1365,768	48.36	86.7/2 (896)	0	1	5	7	33	373
	23	VESA	1024,768	70.07	1328,806	56.48	1024,768	56.48	75.0/2 (664)	0	3	5	5	34	280
1365,768							56.48	100.0/2 (886)	0	3	5	7	34	373	
24	VESA	1024,768	75.03	1312,800	60.02	1024,768	60.02	78.75/2 (656)	0	4	5	5	30	272	
						1365,768	60.02	105.0/2 (875)	0	4	5	7	30	362	
25	MAC	1024,768	75.00	1328,803	60.24	1024,768	60.24	80.0/2 (664)	0	4	5	5	32	272	
						1365,768	60.24	106.7/2 (886)	0	4	5	7	32	362	

- Note 1:** Maximum data clock (ADCK) frequency is 57MHz.
- Note 2:** Maximum horizontal frequency in Video mode is 54 kHz
- Note 3:** Maximum horizontal frequency in PC mode is 65 kHz
- Note 4:** Maximum vertical frequency is 76Hz.
- Note 5:** Digital picture data should be applied to the module correctly according to the display pixel number. This module reads every 2 pixels digital picture data simultaneously in parallel. Therefore, clock frequency is half of the sampling frequency in analog-digital video data conversion.
- Note 6:** Above mode signal (CODE, FV, DL, DD, VD, HD) described in decimal notation should be set in binary notation.
- Note 7:** In case of EUTV, EDTV, 1035i and 1080i signals, progressive signal should be applied to the module after scan conversion according to the display pixel numbers.
- Note 8:** In case of 1365 X 768 mode expected, horizontal display position is set to the center of the screen and both sides become blank.
- Note 9:** First video data on each horizontal line should correspond to LVDS signal 1.
- Note 10:** D11 to D19 (Vertical freq., Display lines number and Display pixel number/line) of serial input data should be set correctly according to the display data. If not done correctly, PLE function is not operated correctly.
- Note 11:** In case input signal format is smaller than XGA / Wide-XGA format, input signal data should be applied the module after converting to the XGA / Wide-XGA format.

LVDS DATA TRANSFER FORMAT



(As for detail of LVDS interface, please refer to www.national.com.)

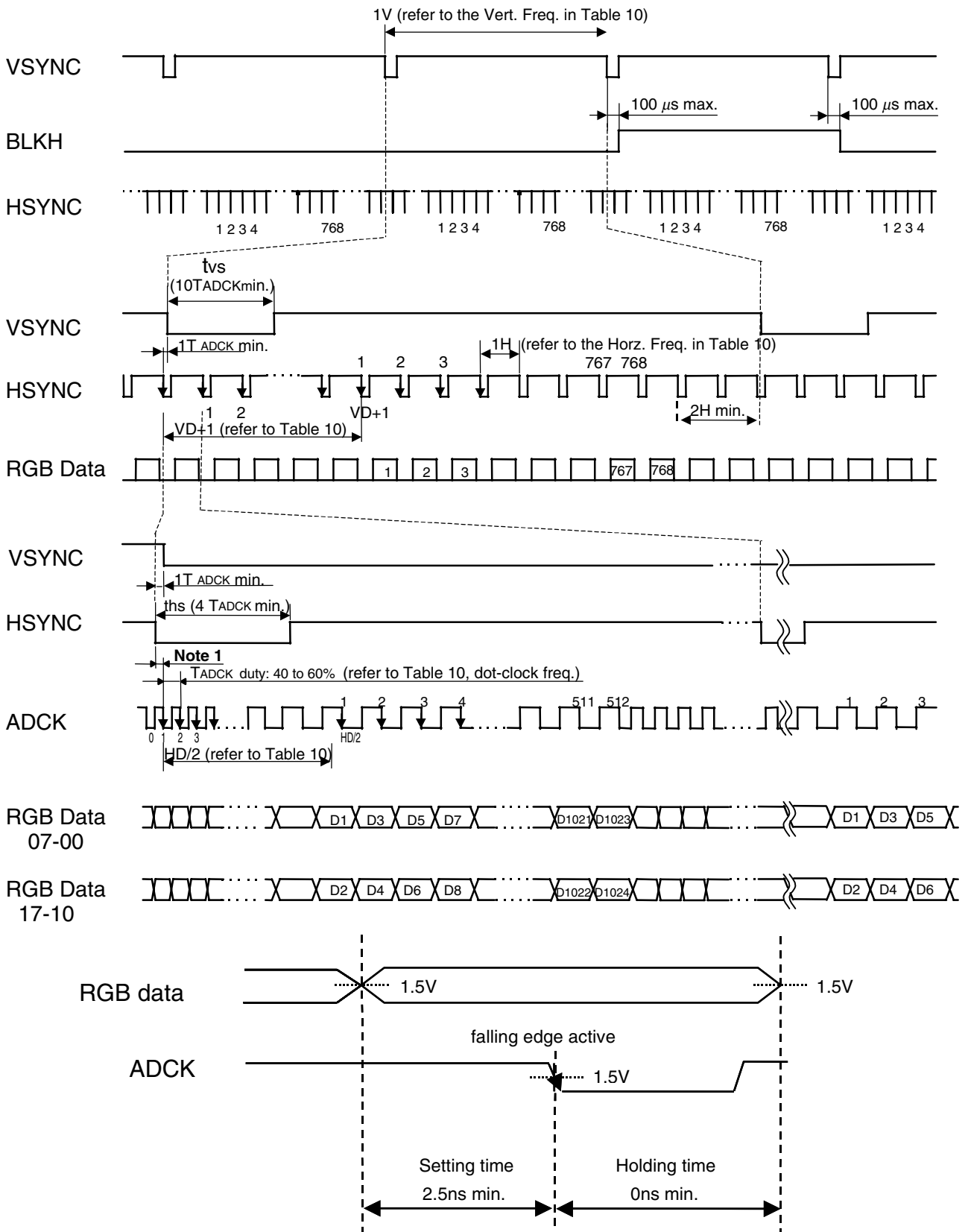
SIGNAL TIMING

Refer to the timing diagram on the following pages.

- Input video signal format is determined by Mode signal (refer to Table 9)
- “TADCK” shows 1 cycle period of ADCK.
- “tvs” shows negative pulse width of VSYNC.
- “tvh” shows negative pulse width of HSYNC.
- “1H” shows 1 cycle period of HSYNC (Horizontal Synchronous Signal).
- “1V” shows 1 cycle period of VSYNC (Vertical Synchronous Signal).
- “VD” is the data of Display start vertical position. It is set by “VDELAY 1 to 256” in the Mode Setting Signals (SDATA).
- “HD” is the data of Display start horizontal position. It is set by “HDELAY 1 to 512” in the Mode Setting Signals (SDATA).

Timing Diagram (Normal Display Mode, XGA)

(Input signal of LVDS transmitter DS90CF383A)

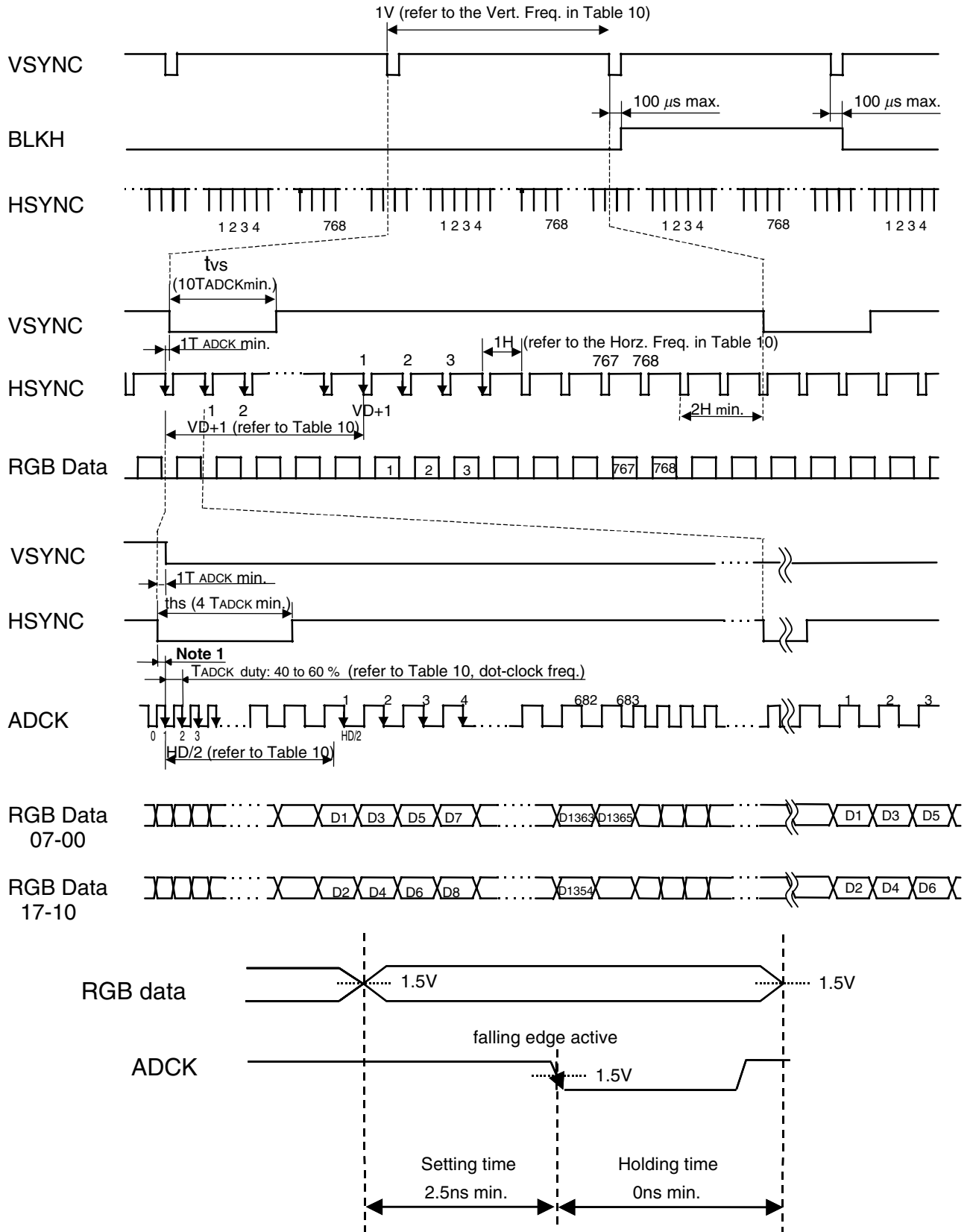


Note 1: This period is determined by each LVDS transmitter specification. And it should not be changed even if under the following conditions.

- * Power ON / OFF
- * Change the signal source (e.g. Video to PC)

Timing Diagram (Wide Mode, Wide-XGA)

(Input signal of LVDS transmitter DS90CF383A)

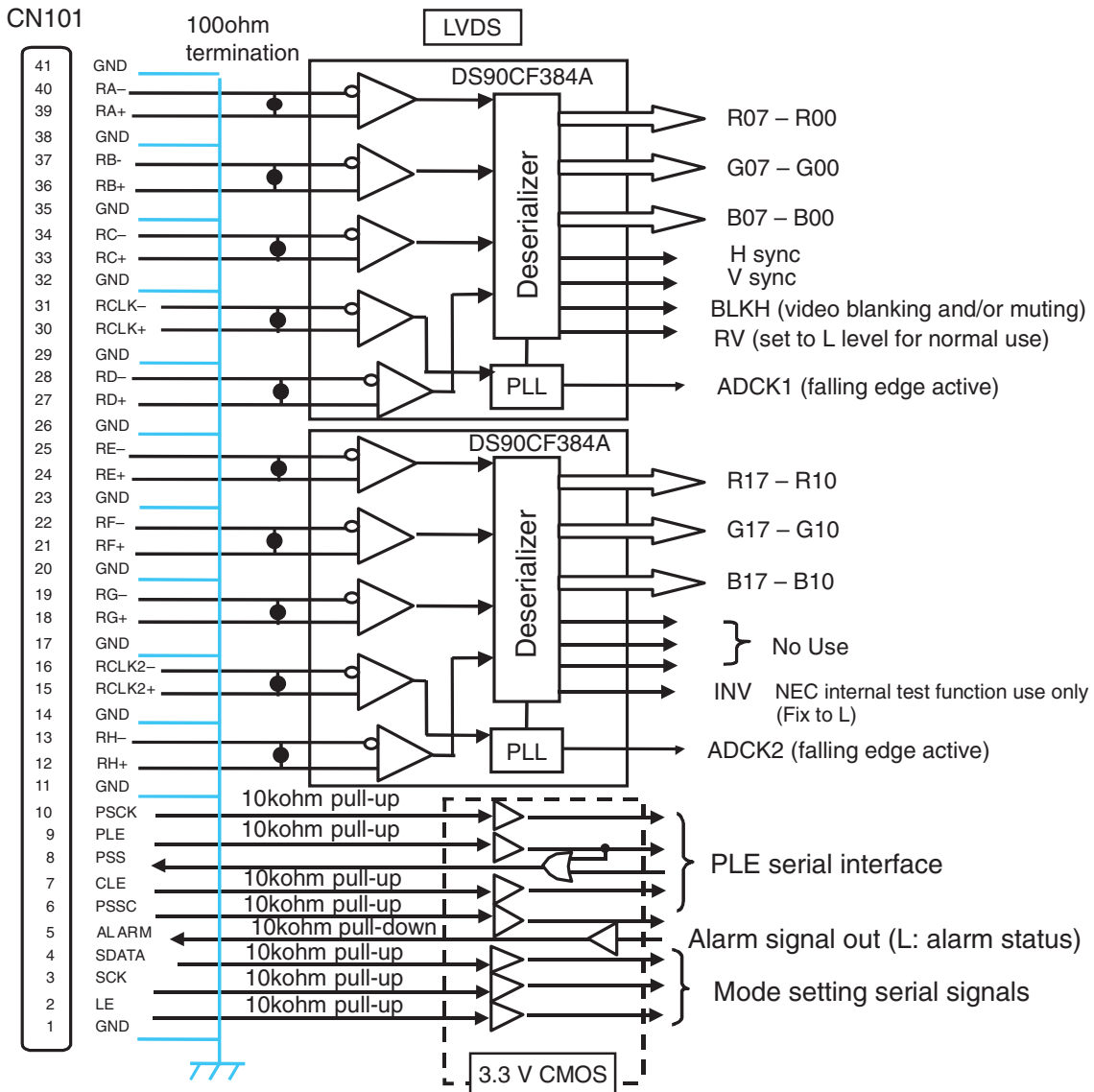


Note 1: This period is determined by each LVDS transmitter specification. And it should not be changed even if under the following conditions.

- * Power ON / OFF
- * Change the signal source (e.g. Video to PC)

INTERFACE CONNECTOR PIN ASSIGNMENT AND INPUT OUTPUT CIRCUITS

Following shows the interface connector pin assinging and input output circuits in the PDP module.



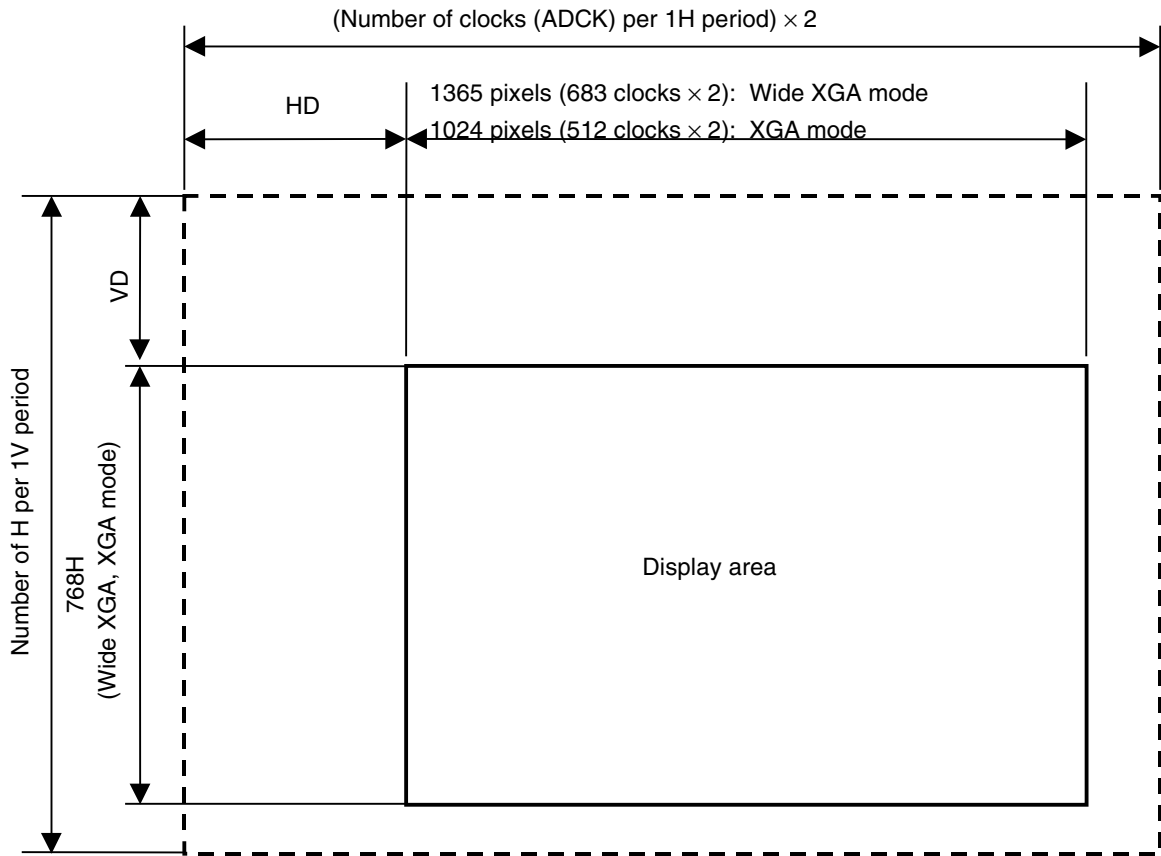
Type of serial interface connector

- Module side connector: FI-WE41P-HF
- Mating connector: FI-W41S (plug housing)
FI-C3-A1-15000 (contact)
- Connector supplier: Japan Aviation Electronics Industry, Limited (JAE)
- Fitting cable: AWG#28 to 32 twist pair cable

(Total cable assembly is recommend to be shielded)

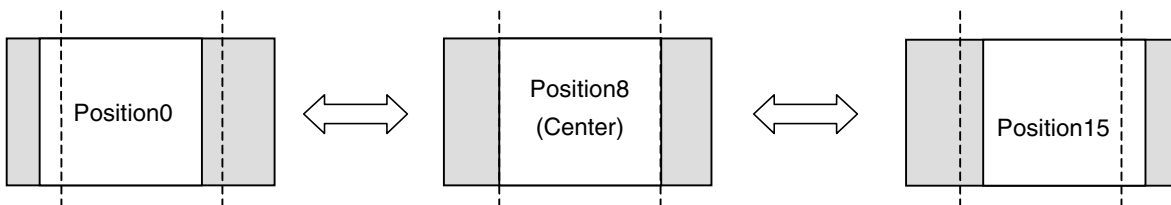
DISPLAY POSITION

The relation among VD, HD, and the display position is as shown below.



- 1) Relation between VD, HD and display start position
 Display start vertical position from falling edge of VSYNC= VD+1 (Number of lines or Number of H periods)
 Display start vertical position from falling edge of HSYNC = HD (Number of clocks × 2 or Number of pixels)
- 2) Setting range of VD and HD
 VD: 0 to 511 lines
 HD: 0 to ((Number of clocks per 1H-period × 2) – 1), Max.1023 pixels
- 3) Limitation of number of clocks per 1H period
 XGA mode: $2+512 \leq \text{Number of clocks per 1H period} \leq 3071$
 Wide XGA mode: $2+683 \leq \text{Number of clocks per 1H period} \leq 3071$
- 4) Limitation of number of HSYNC pulses per 1V period
 $768 + 2 \leq \text{Number of HSYNC pulses per 1V period} \leq 2047$ (HSYNC)
 (2 HSYNC pulse or more are necessary after display area)

Display horizontal position setting



16 positions can be set by 2-pixel pitch through "Mode setting serial data".

Protection against excessive load comes from unexpected image display.

Plasma display module has a characteristic when data write switching operation is repeated rapidly, the load of the driver circuits become large. For example, this high load status is appeared when the following pattern is displayed. (Cell base checker pattern by on/off cells alternately by each cell. In general operation, this kind of pattern does not exist).

In case this kind of image is displayed, this plasma display module gets into the protect-operation of driving circuits.

While in the protect-operation, some display image may be deteriorated a little. However as soon as the display image returns to normal pattern, the protect-operation is released, and returns to the formal operation

R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B

 Lit cell  Unlit cell

Guideline of general display images which make to carry out the protect-operation.

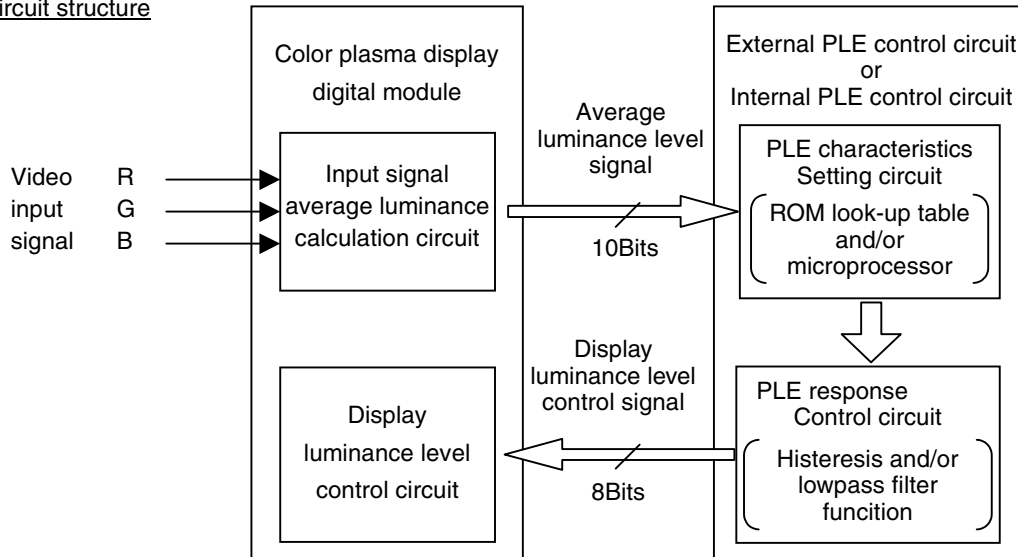
The protect-operation may be carried out when following patterns are displayed.

- 1) When the cell base checker pattern is displayed over 50% of the whole display area, or other patterns that give equivalent on/off display loads to the driver circuits are displayed.
- Or,
- 2) When the cell base checker pattern is displayed over 60% of 622mm in height (all screen height) × 50mm in width (about 1/22 of screen width) area, or other patterns that give equivalent on/off display loads to the driver circuits are displayed.

PLE (Peak Luminance Enhancement) FUNCTION

The PLE function makes it possible to increase the luminance level of the PDP display when the average luminance level of the input video signal is low. This PLE function reduces the maximum power by absorbing the luminance when the high-power-load-image is displayed, and results in a higher contrast level.

PLE circuit structure



This plasma display module has following two modes. These two modes can be selected by the mode control signal.

1. "Internal PLE" mode ---- Built-in PLE function in the PDP module itself.
 This PLE mode realizes one of the best PLE characteristics without any additional circuit.
 Therefore this mode is very convenient, and it is recommended to utilize this function actively.
2. "External PLE" mode --- Externally controlled PLE function from the customer's interface circuit.
 External PLE mode enables to make customer's original characteristics within the limitation range.
 The PLE characteristics is strongly related not only to the luminance characteristics of plasma display module but also to the power consumption and the generated heat, therefore it is required to obtain the acknowledgement of NEC concerning the external PLE characteristics to be set at the customer.

(Caution)

**When use the external PLE function, please use within the limitation range. If external PLE characteristic is set outside of the limitation range, plasma display module may have damage.
 Any trouble caused by this incorrect operation is not included in the warranty**

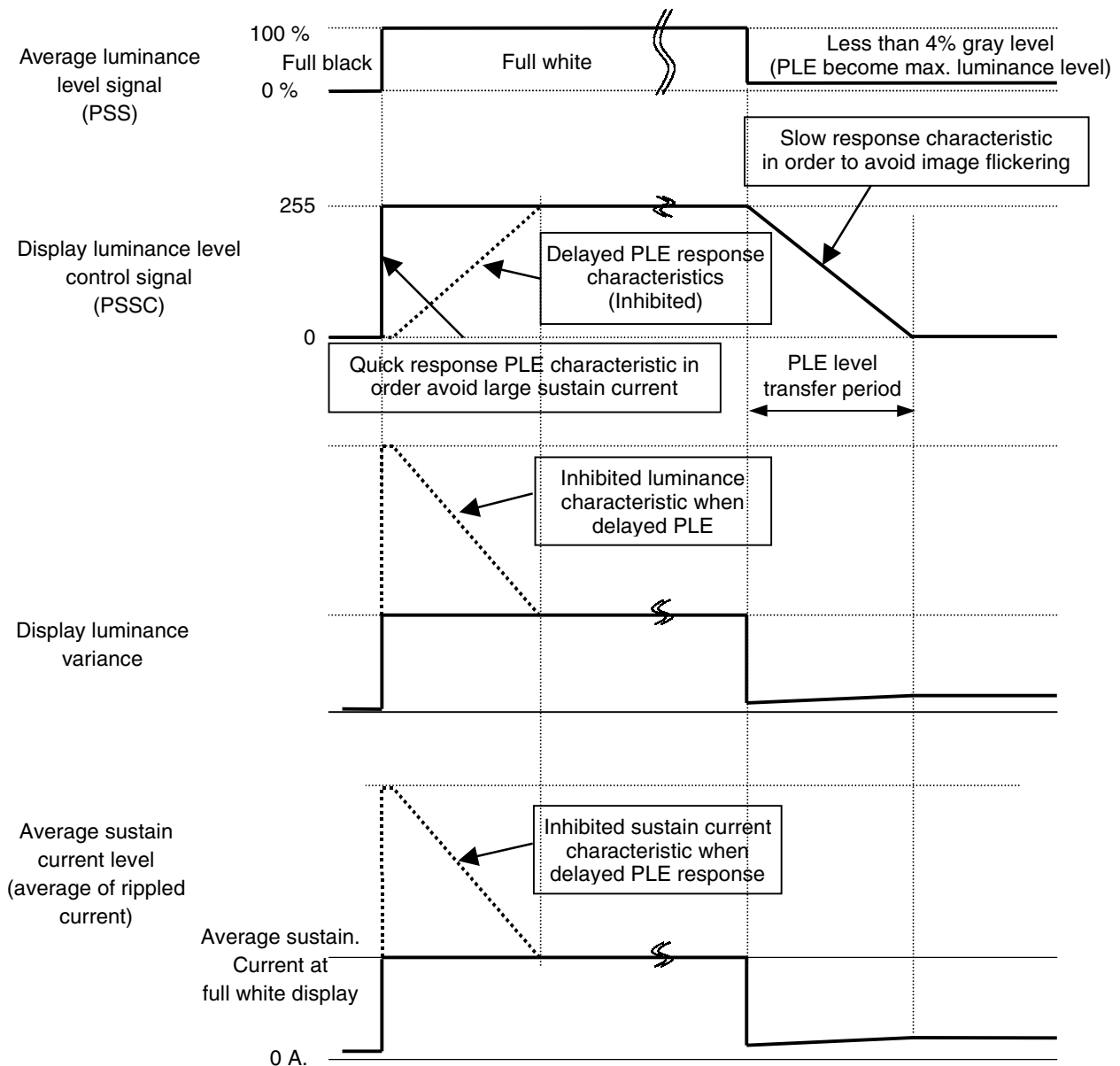
Power consumption and generated heat of plasma display module varies depending on the setting values of PLE characteristic. Therefore the temperature investigation and optimization of cooling design should be done in the state mounted in the plasma display set.

CHARACTERISTICS OF INTERNAL PLE

When PDP module displays full white with maximum luminance, or when PLE characteristic has some delayed response and display image is changed from full black to full white, large sustain current (I_s -ple) flows, and plasma display becomes over power status.

In the internal PLE function, when the "Average luminance level" increases, in order to avoid large sustain current flow and over power status, the "Display luminance level" is immediately reduced to the setting level with quick response. And when display load decreases, in order to avoid image flickering caused by the short-term average luminance level's fluctuations, the "Display luminance level" is gradually moved to the setting level with a slow response characteristic.

(Refer to the following figures)



CONNECTORS PIN ASSIGNMENT

(For the connector position, please refer to the Rear View in the Outline Drawing)

1. POWER INPUT CONNECTORS

Table 10. Connector CN104 Pin Assignment			
Pin No.	Symbol	Pin No.	Symbol
1	LVP	2	GND
3	GND	4	Vcc
5	GND	6	GND
7	Vd	8	N.C.
9	Vs	10	Vs

N.C.: non-connection pin.
 Module side connector: B10PS-VH
 Mating connector: VHR-10N (housing),
 SVH-21T-P1.1 (contact)
 Connector supplier: J.S.T. TRADING COMPANY, LTD.
 Fitting Cable: Equivalent to AWG#20

Table 11. Connector CN105 Pin Assignment			
Pin No.	Symbol	Pin No.	Symbol
1	Vs	2	Vs
3	N.C.	4	Vd
5	GND	6	GND
7	Vcc	8	GND
9	GND	---	---

N.C.: non-connection pin.
 Module side connector: B9PS-VH
 Mating connector: VHR-9N (housing),
 SVH-21T-P1.1 (contact)
 Connector supplier: J.S.T. TRADING COMPANY, LTD.
 Fitting Cable: Equivalent to AWG#20

(Note): If using a long cable, applied voltage may be dropped because of its resistance.
 Specified voltage should be applied correctly at the input of the module side connector.

2. SIGNAL INTERFACE CONNECTOR

Serial mode inter-face connector (LVDS, 3.3VCMOS)

Table 12. Connector CN101 Pin Assignment			
Pin No.	Symbol	Pin No.	Symbol
1	GND	2	LE
3	SCK	4	SDATA
5	ALARM	6	PSSC (Note 1)
7	CLE (Note 1)	8	PSS (Note 1)
9	PLE (Note 1)	10	PSCK (Note 1)
11	GND	12	RH+
13	RH-	14	GND
15 17	RCLK2+	16	RCLK2-
17	GND	18	RG+
19	RG-	20	GND
21	RF+	22	RF-
23	GND	24	RE+
25	RE-	26	GND
27	RD+	28	RD-
29	GND	30	RCLK+
31	RCLK-	32	GND
33	RC+	34	RC-
35	GND	36	RB+
37	RB-	38	GND
39	RA+	40	RA-
41	GND	---	---

Module side connector: FI-WE41P-HF

Mating connector: FI-W41S (housing),
FI-C3-A1-15000 (contact)

Connector supplier: Japan Aviation Electronics Industry, Limited (JAE)

Fitting Cable: AWG#28 to 32 twist pair cable

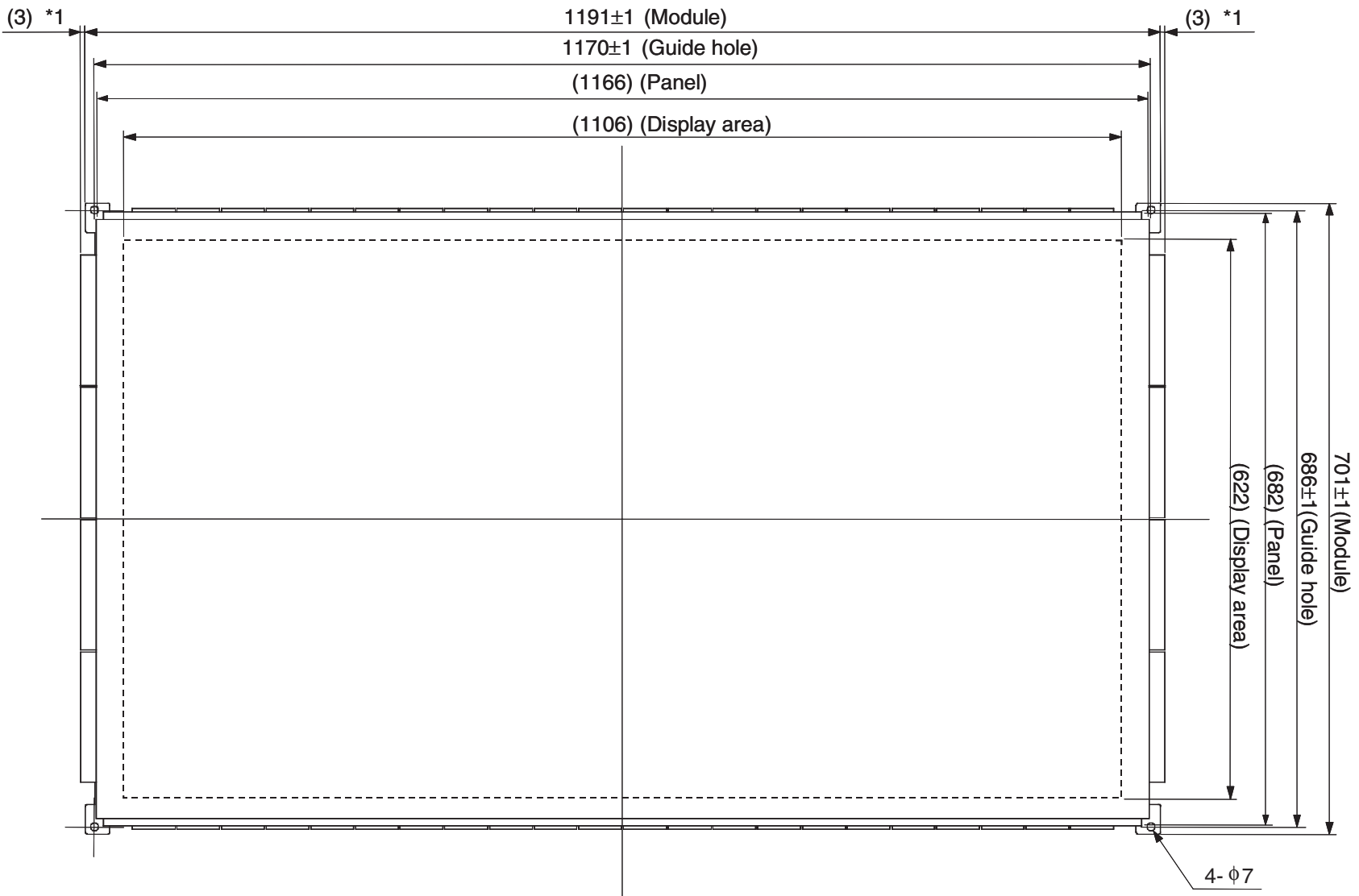
(Note 2) (Total cable assembly is recommended to be shielded.)

Note 1: When use the internal PLE function, it is recommended to keep these terminals open.

Note 2: If using a long cable, applied voltage may be dropped because of its resistance.

Specified voltage should be applied correctly at the input of the module side connector.

MECHANICAL DRAWING
FRONT VIEW (Unit: mm)

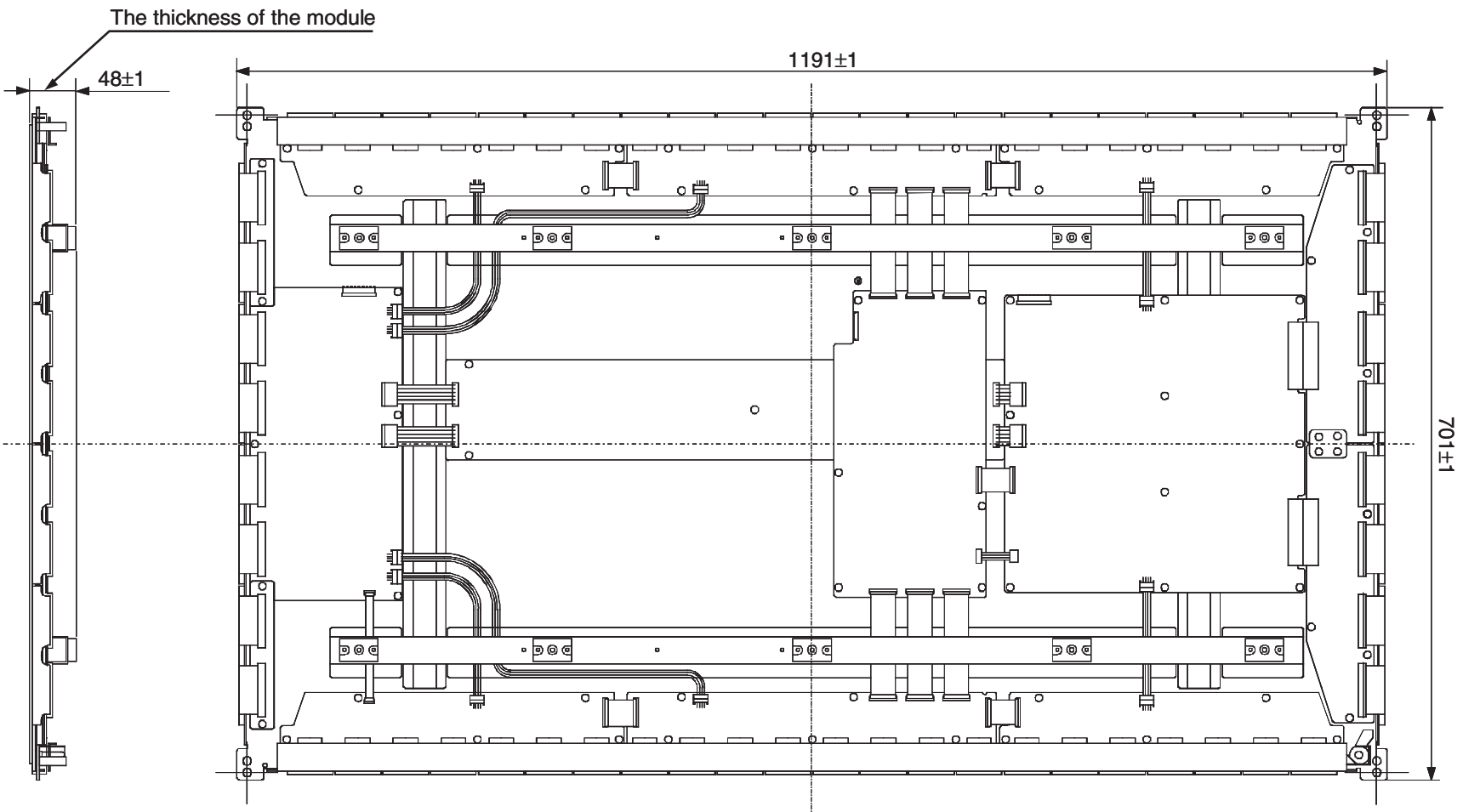


Note1: The values parentheses are for reference.

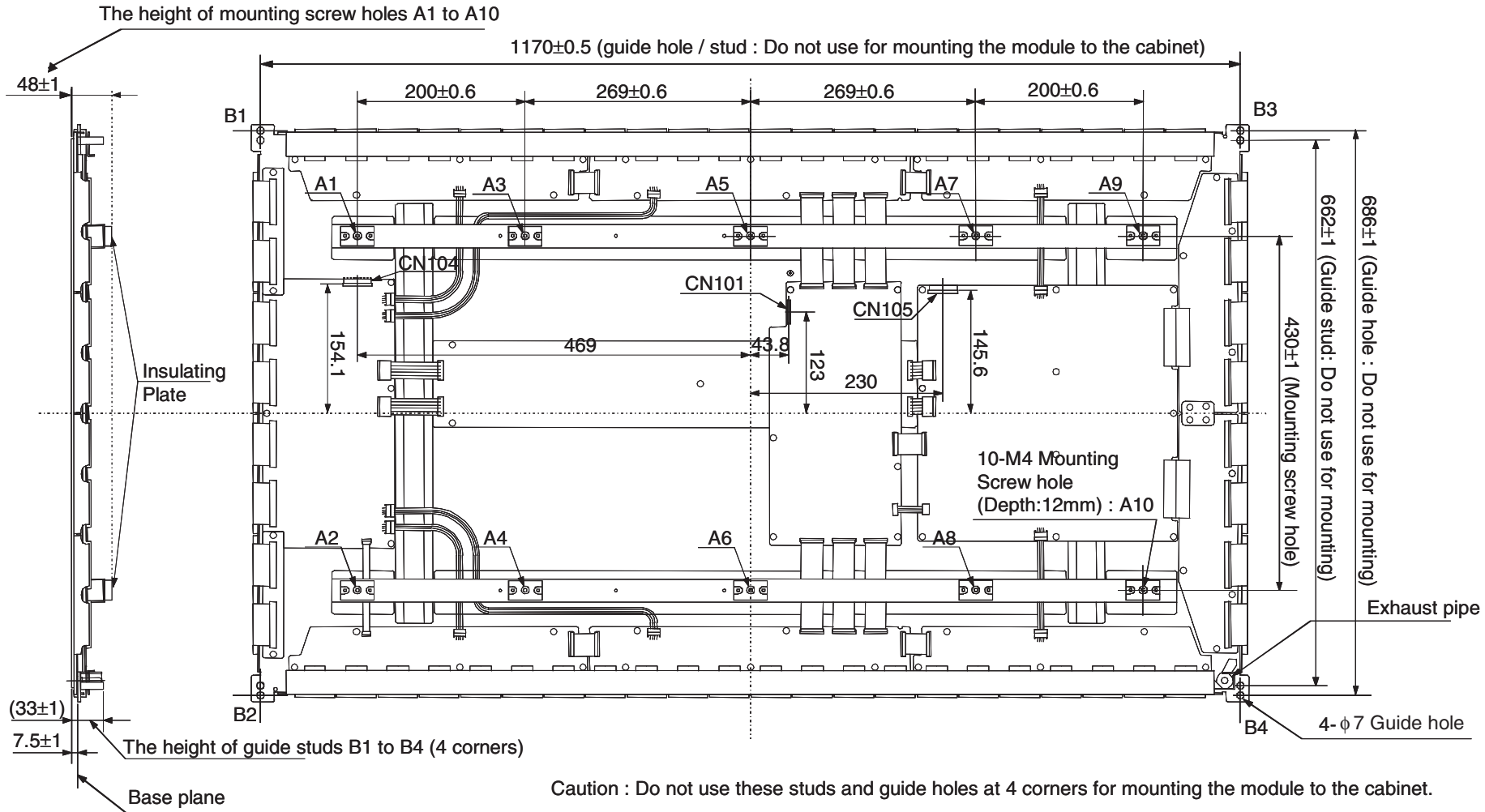
Note2: Do not use these guide holes for mounting the module to the cabinet.

*1 : The dimension of protruded FPC.

MECHANICAL DRAWING
REAR VIEW (Unit: mm)



MOUNTING POSITIONS AND CONNECTORS POSITION
 REAR VIEW (Unit: mm)

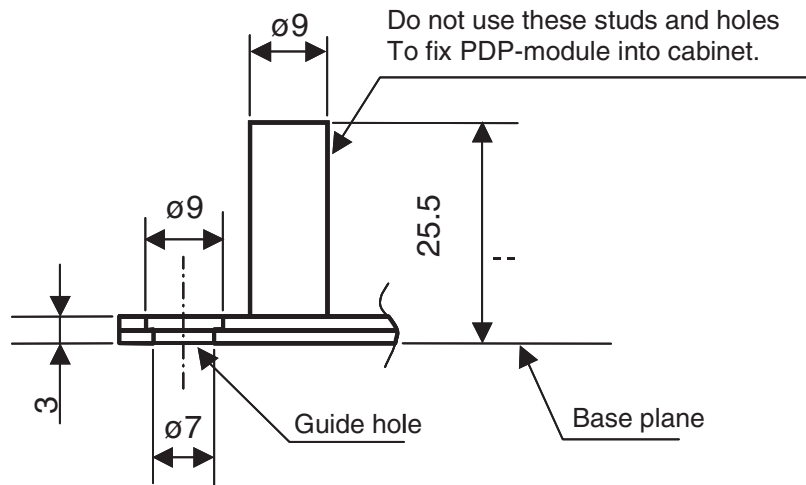


Caution : Do not use these studs and guide holes at 4 corners for mounting the module to the cabinet.

SHAPE OF GUIDE HOLE AND STUD

(Unit: mm)

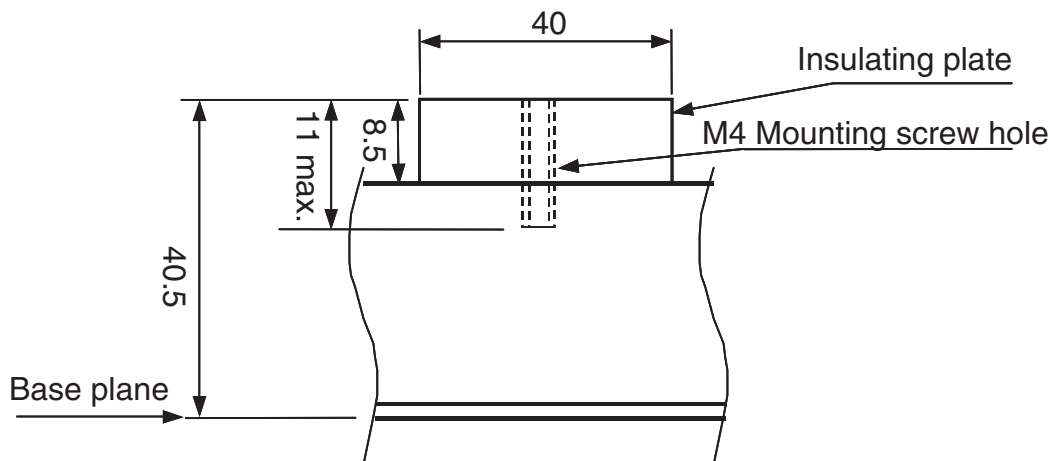
(Holes on the 4 corners of aluminum chassis, B1 to B4)



SHAPE OF MOUNTING SCREW HOLE

(Unit: mm)

(Holes on the behind of PDP module, A1 to A8)



Locatable position of other parts or structures adjacent to the PDP module
REAR VIEW (Unit: mm)

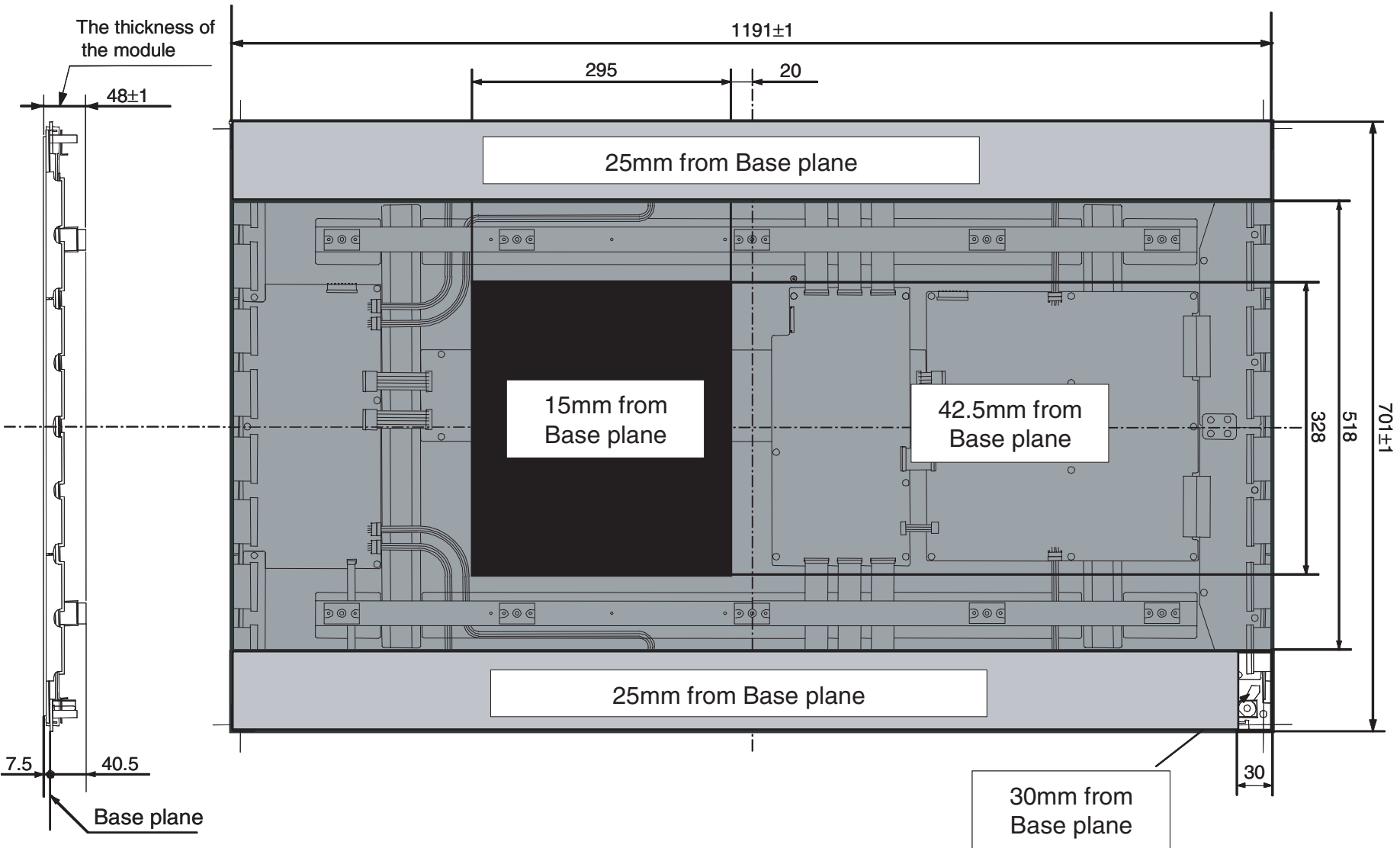


IMAGE STICKING CHARACTERISTICS

1) Image sticking

The fluorescent substance used in the plasma module loses its luminance with the lapse of lighting time. This deterioration in luminance appears to be a difference in luminance in relation to the surroundings, and comes to be recognized as image sticking.

In other words, the image sticking is defined as follows: when the same pattern (of the fixed display) is displayed for a long time, a difference in luminance is caused around the lighting area and non-lighting area due to deterioration in the fluorescent substance.

When the present pattern is changed over to another one, the boundary comes to be seen between the lighting area and non-lighting area due to difference in luminance in the pattern shown shortly before changeover. If this condition is accumulated, the boundary or image sticking comes to be seen with the naked eyes.

2) Secular change in luminance

The life of luminance, defined as the reduction to half of the initial level, is more than 10 thousand hours on average.

Conditions: All white (100% white) input at an ambient temperature of 25°C.

However, this lifetime is not a guaranteed value for life and luminance. It should be recognized simply as the data for reference.

3) Warranty

Image sticking and faults in luminance and picture elements are excluded from the warranty objects.

4) Cause of deterioration in luminance

A major possible cause of deterioration in luminance is damage in the fluorescent substance due to impact caused by ions generated at the time of plasma discharges.

5) Practical value for image sticking

The relationship between integrated lighting time and luminance in this plasma module is described in the attached material. In particular, the deterioration in luminance tends to be accelerated up to 100 hours in the initial period. In the initial period, the fixed display of patterns particularly tends to cause image sticking.

The practical value for image sticking is difficult to define in concrete numerals. As described below, you are advised to take proper measures to make the occurrence of image sticking as slow as possible.

6) Proposed measures taken to relieve image sticking

So long as there is the reduction of luminance in the fluorescent substance, it is impossible to avoid the occurrence of image sticking. Therefore, to relieve image sticking, we offer you a method of entering an image input that may ensure reluctance to the generation of the difference in luminance reduction among the displayed dots.

The images from TV broadcasting involve a high rate of motion picture displays.

Therefore, there is less chance of being a cause of difference in luminance reduction among the cells. Even when the fixed patterns are displayed, they generally last for a few minutes.

Since the same pattern is less liable to be displayed, there is almost no influence toward image sticking.

If the fixed patterns tend to be displayed for a long time, however, there occurs a substantial imbalance between the lighting and non-lighting areas, thus causing a difference in luminance as a result. In this document, we offer you some proposals of installation, paying attentions to the two points: the reduction of difference in luminance achieved by integrated lighting time leveling and the method of edge smearing to make image sticking hard to be discerned.

The result from these proposals can, however, greatly depend on the contents of images and the operating environment. Therefore, we consider that it is essential to take the suitable measures in consideration of the customer's operating environment.

Example of Proposal 1: The display position is moved while the fixed display pattern is changed over, or it is scrolled during the display.

Example of Proposal 2: If possible, a pattern of complementary color is incorporated (for integrated time leveling).

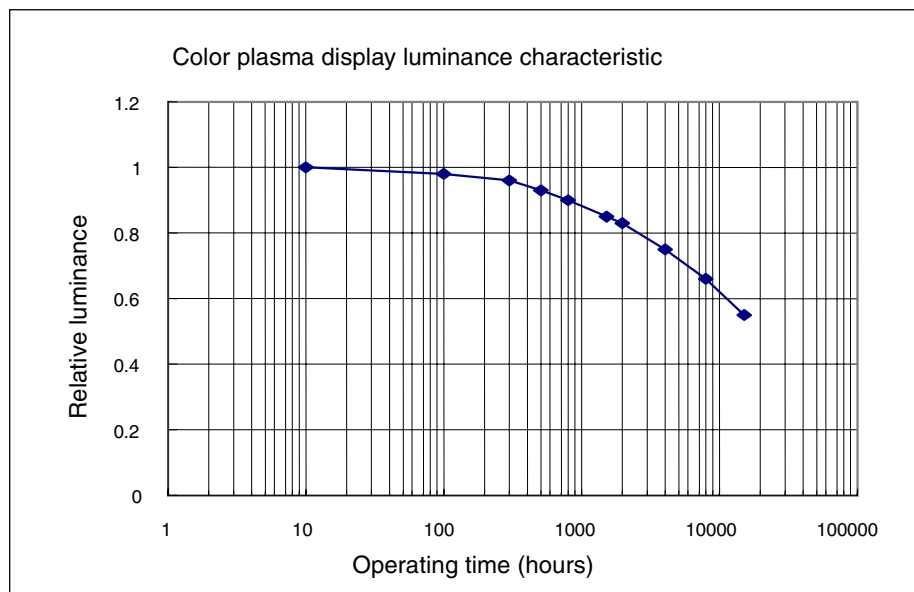
Example of Proposal 3: The fixed pattern and the motion picture display are reciprocally exchanged, in order to minimize the display period of the fixed pattern.

Example of Proposal 4: During operation, the luminance of screen is suppressed as low as possible. For the display patterns, characters are indicated not on the black ground (non-picture area) but on the colored ground (mixture of R, G, B recommended).

7) Proposed countermeasures for the plasma module

Since the PDP is a display that uses a fluorescent substance like the CRT, it is a fundamental phenomenon that image sticking occurs. Unlike the CRT, the PDP gives rise to deterioration in the fluorescent substance due to impact caused by ions generated during plasma display.

As a result of the above-mentioned improvements, it is possible to extend the PDP lifetime and relieve the effect of burning, but is impossible to realize the complete elimination of burning so far as a fixed pattern is displayed for a long time.



Usage Cautions

1) Cautions Regarding Handling of Module

- (1) When taking the product out of its box, be careful to prevent shocks and stress to the panel surface.
- (2) The display panel used in this product is made of glass. Since shocks or vibrations may cause it to break, be very careful during handling. In case the panel breaks, be careful not to get injured with glass fragments.
- (3) Since the panel surface gets easily scratched, be careful during handling not to press against the panel or scrape it with a hard object (anything harder than a 3H pencil lead). And do not place the glass panel side down on the hard material.
- (4) If the panel surface gets dirty, gently wipe it with a dry cloth. If a liquid gets on the panel, mop it up by gently applying a dry cloth without rubbing. In the case of a stubborn stain, wipe it with a cloth slightly wetted with a neutral detergent. Use only dry cloth for wiping, and avoid using the same cloth over and again. (Using an alcohol such as ethanol or chemicals such as those contained in a chemical cloth may cause discoloration of the panel surface or, depending on the type of stain, indelible fixing of the stain to the panel surface.)
Deleterious substances such as described above or water drops getting into the module or somewhere on the module surface other than the display panel may damage the product.
- (5) Handle the product with care, avoiding pressing against or scraping the glass panel surface, as this may leave the panel surface scratched or blemished.
- (6) Be careful not to touch the port for connecting the flexible cable exposed at the rear of the module because this may cause poor contact. And, since the flexible cables are easily breakable, when handle the plasma display module, be careful not to touch the flexible cables.
- (7) When moving the product, be sure to turn off the power and disconnect all the cables. While moving the product, watch your step. The product may be dropped or fall, leading to injuries or electric shock. Two or more persons should move this product. If one person attempts to carry this product alone, he/she may be injured.
- (8) Make sure that the connectors are connected tightly.

2) Cautions Regarding Design and Operation of Module

- (1) Do not pull out or insert the power cable from/to an outlet with wet hands. Doing so may cause electric shock.
- (2) This product emits near infrared rays (700 to 1100 nm) that may cause the remote controllers of other electric products to malfunction. To avoid this, use an infrared absorption filter and thoroughly evaluate the system and environment.
- (3) This product uses a high voltage (approx. 400V). Do not touch the circuitry of this product with your hands when power is supplied to the product or immediately after turning off the power. Be sure to confirm that the voltage has dropped to a sufficiently low level.
- (4) If you detect a strange smell or smoke coming out of the product, immediately turn off the power. Continuing to use the product under such conditions may cause electric shock or fire.
- (5) Do not use this product with a voltage that exceeds the rated voltage as this may cause product failure or fire. The warranty does not cover problems that occur when the product is used under conditions other than those described in the specifications.
- (6) When the product is used as a stationary text display device such as a text display board or for some similar display, it may get damaged by image sticking. Image sticking is a phenomenon whereby the luminance of parts of the screen where images are continuously displayed for a long time declines compared to parts of the screen where images are displayed for a shorter cumulative time, causing uneven screen luminance. The severity of image sticking is proportional to the cumulative display time and the brightness. Taking the following precautions reduces the possibility of image sticking.
 - <1> Lower the brightness as much as possible when displaying a stationary pattern.
 - <2> When displaying a stationary pattern, slightly vary the position of the pattern in the following sequence:
Top → Right → Down → Left → Top and so on, or use scroll display.
 - <3> If possible, incorporate complementary color patterns to smooth the cumulative display time.

<4> Reduce the stationary pattern display time by alternating stationary pattern display and moving image display.

<5> When displaying stationary text, avoid display against a black background, and use a colored background instead.

Image sticking and faults in luminance and picture elements are excluded from the warranty objects.

- (7) This product contains parts that generate heat during operation. During the set design stage, take into consideration the cooling method and design the frame based on careful evaluation of heating characteristics.
- (8) The temperature of the glass surface of the display may rise to high temperature depending on the conditions of use. If you touch the glass inadvertently, you may be burned.
- (9) This product uses a high-voltage drive pulse and emits electromagnetic noise. When this product is incorporated in a set, be sure to design the frame and fit an optical filter shield on the front side of the set so that the electromagnetic interference produced by the set falls within the allowed range.
- (10) When installing this product in the frame of a set, use the indicated fixing screw holes and guide holes. Since the display panel of the product is made of glass, design the frame so as to prevent a large weight or shocks from being applied to the glass.
- (11) If this product is operated after a long storage period, the screen's display performance may have deteriorated or become unstable depending on the storage conditions. In this case, it is recommended to use the product after subjecting it to two hours of aging (full-screen display).
- (12) Since this product uses precise lead pitch components, be careful to prevent any foreign materials such as metal particles come out from screw part, soldering part or metal parts of cabinet, or any liquid. These foreign materials cause the short or insulation failure of the circuit, and resulting in the product failure or fire.
- (13) Follow the procedure described in these specifications for the power ON/OFF sequence. Failure to do so will cause equipment failure.
- (14) This product uses highly integrated semiconductor devices. Since these devices can be damaged by static charge, be careful to handle at the place where antistatic measure is done.
- (15) The sulfide causes deterioration of the product and the failure. Therefore, be careful not to place the material contains sulfur such as vulcanized rubber closed to the product.
- (16) This product is designed to NEC's "Standard" quality grade. If you wish to use the product for applications outside the scope of the "Standard" grade, be sure to consult NEC in advance to assess the technological feasibility before starting to design your system.

3) Cautions Regarding Module Usage Environment

- (1) Operating this product when condensation has occurred may cause failure or electric shock.
- (2) Avoid using this product in locations that have a lot of dust, soot, humidity, steam, etc., as this may cause failure, electric shock, or fire.
- (3) Place this product on a level surface and make sure it is stably positioned because failure or electric shock may result if it falls or turns over.

4) Others

- (1) Do not overhaul or disassemble this product. When this module is repaired or modified without any acknowledgement of NEC, it voids the warranty and NEC does not have any responsibility.
- (2) When scrap the plasma display module or any sets installed the plasma display module, be careful to comply with laws or rules of the region or the country.
- (3) When the plasma display module is resold to the third party or person, NEC does not have any warranty to the third party or persons.
- (4) If you have any questions concerning design, such as on housing, storage, or operating environment, consult NEC in advance.

[MEMO]

[MEMO]

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"Standard," "Special," and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

(Note)

- (1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.
- (2) "NEC electronic component products" means any electronic component product developed or manufactured by or for NEC (as defined above).