

CosmoPLASMA

84 cm (33 type), 640 × 480 Pixels, Digital Module

Digital RGB signal 64 gradations each

DESCRIPTION

The NP3302MF01 is a 33-inch color plasma display module with a resolution of 640 (H) × 480 (V) pixels and 64 levels of gray scales per each RGB color. Furthermore, in order to improve the presentation of the deepest shades of black, black stripes are laid over the ribs which separate the cells. The display offers vibrant colors reproduced in a thin and low profile package. This device uses AC plasma technology developed by NEC and includes a 6-bit digital interface.

FEATURES

- Wide viewing angle
- 262,144 colors
- High resolution
- High brightness
- Slim profile
- Light weight
- Active contrast adjustment with PLE function
- Excellent contrast ratio improved by the black stripe

APPLICATIONS

- Large Screen TV
- Public Information Display
- Video Conferencing Systems
- Retail
- Education and Training Systems



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

STRUCTURE AND PRINCIPLE OPERATION OF PLASMA DISPLAY

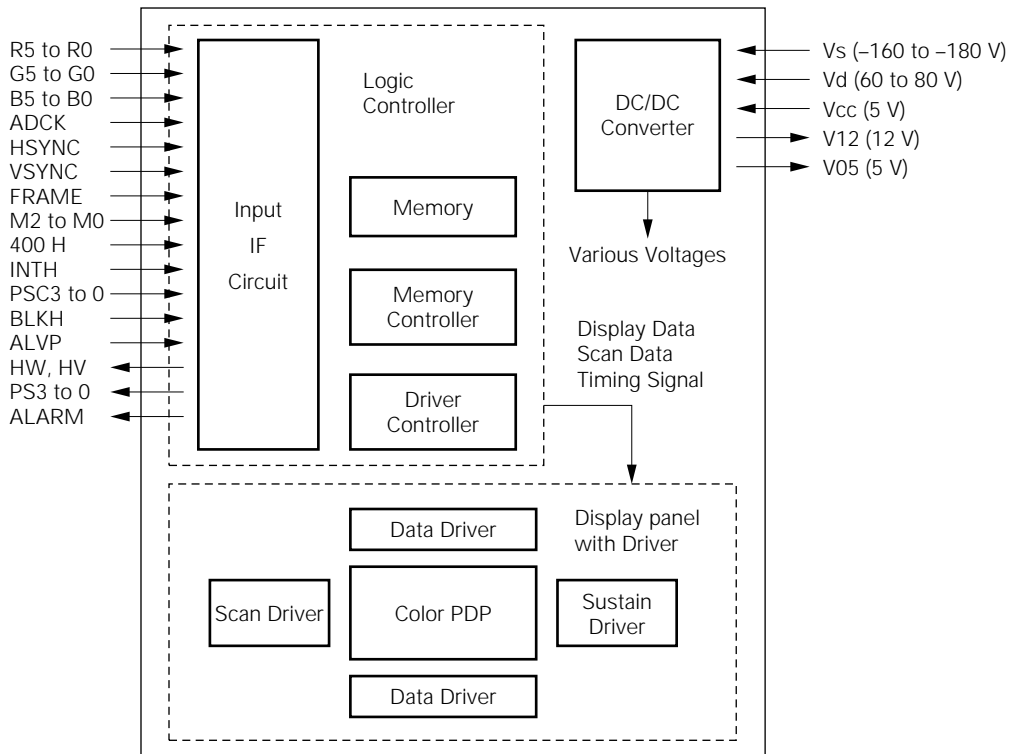
In a Plasma Display Panel, Row and Column electrodes are placed between 2 glass substrates. A rare gas is then filled between these substrates. When a high voltage is applied to these electrodes, the gas is activated resulting in the radiation of ultraviolet light, similar to the operation in fluorescent 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

NP3302MF01 requires 6-bit of digital video signals for each RGB color. In addition to the video signals, 10 kinds of digital control signals and 3 different DC voltages are required to operate the display. 4 digital signals and 2 DC power outputs are provided by the display for use by external circuits.

In addition, a "PLE" (Peak Luminance Enhancement) function is provided so that images can be displayed with the ideal contrast.

BASIC CONFIGURATION



GENERAL SPECIFICATIONS

Common conditions: Ta = 25°C

Display area	672 (H) × 504 (V) mm
Outline dimensions	756 (W) × 579 (H) × 53 (D) mm
Weight	13 kg (typ.)
Aspect ratio	4 : 3
Number of pixels	640 (H) × 480 (V) (1 pixel = RGB cells)
Pixel pitch	1.05 (H) × 1.05 (V) mm
Color arrangement	RGB vertical stripes
Number of gradations	64 gradations for each RGB
Peak brightness	350 cd/m ² (typ.) (VGA signal*, PLE** mode set to the maximum.)
Contrast ratio	350 : 1 (typ.) (VGA signal*, PLE** mode set to the maximum, measured in dark room)
Viewing angle	160 degrees (typ.) vertical and horizontal directions (angle at which brightness becomes 1/2 of front view brightness)

* Signal of fv = 59.94 Hz and fh = 31.47 kHz

** See PLE (Peak Luminance Enhancement) description.

OPERATING ENVIRONMENTAL CONDITIONS

Temperature	0 to 60°C
Humidity	20 to 80% RH (without condensation)
Atmospheric pressure	800 to 1100 hPa

STORAGE ENVIRONMENTAL CONDITIONS

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

MECHANICAL TEST CONDITIONS

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

LIFE EXPECTANCY

More than 10,000 hours in continuous operations
(Time when the brightness decreased to 1/2 of the initial)

ELECTRICAL CHARACTERISTICS

1) Interface signals absolute ratings

Common conditions: Ta=25°C, Vcc=5V

Item		Parameter	Symbol	Ratings	Units
Input Signals	R5 to R0, G5 to G0 B5 to B0, ADCK, HSYNC, VSYNC, FRAME, INTH, BLKH, M2 to M0, 400H, PSC3 to PSC0, ALVP	Input Voltage	Vi	-1.5 to 6.5	V
		Input current	li	±20	mA
Output Signals	HW, VW PS3 to PS0	Output voltage	Vo	-0.5 to 5.5	V
		Output current	Io	±35	mA
	ALARM	Output voltage	Vo	-0.5 to 5.5	V
		Output current	Io	±25	mA

2) Interface signals electrical characteristics

Common conditions: Ta=25°C, Vcc=5V

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
High Level Input Voltage	V _{IH}	-	2.0	-	-	V
Low Level Input Current	V _{IL}	-	-	-	0.8	V
Input Current	li	Vi=Vcc/GND	-	-	±60	μA
High Level Output Voltage*	V _{OH}	Io=-20 μA	4.8	-	-	V
Low Level Output Voltage*	V _{OL}	Io=20 μA	-	-	0.2	V

SIGNAL FUNCTION

Table 3. Interface signal function			
Symbol	I/O	Function	(Remarks)
R5 to R0	I	6-bit red video signal note 1	(R5:MSB, R0: LSB)
G5 to G0	I	6-bit green video signal note 1	(G5:MSB, G0:LSB)
B5 to B0	I	6-bit blue video signal note 1	(B5:MSB, B0:LSB)
ADCK	I	Clock signal which synchronized to video signal	(positive edge)
HSYNC	I	Horizontal synchronous signal	(negative pulse)
VSYNC	I	Vertical synchronous signal	(negative pulse)
FRAME	I	Field discriminate signal	("L" in odd field)
M2 to M0	I	Video mode selection	(refer to Table 4.)
400H	I	400-line display mode signal	("H" in 400 line mode)
INTH	I	Interlace mode signal	("L" in interlace mode)
PSC3 to 0	I	4-bit PLE control signal	(10 gradations, PSC3:MSB, PSC0:LSB)
BLKH	I	Video blanking and Muting note 2	("H" in muting)
ALVP	I	Stops panel driving ("O" pen or "H" in normal operation)	("L" in drive stop)
HW	O	H window display period indication signal	("H" in display period)
VW	O	V window display period indication signal	("H" in display period)
PS3 to 0	O	4-bit average brightness level signal	(10 gradations, PS3:MSB, PS0:LSB)
ALARM	O	Alarm signal for panel broken. note 3	("H" in alarmed status)
LVP	O	Alarm signal note 4	("L" in alarmed status)

MSB : Most Significant Bit

LSB : Least Significant Bit

- Notes 1.** The RGB video signal should be compensated with inverse γ circuit before inputted to the color plasma display module.
- 2.** When BLKH input is H level, all RGB data is read as L level (black color data).
- 3.** When ALARM output turns to H 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 appear at the electrode in glass cracked section and become a cause of electric shock. Failure of internal power-source causes over-power status and gives damage to the display panel and driver-circuits.
- 4.** This alarm signal is output via the power supply connector.
It has the same function as ALARM except the polarity.

VIDEO SIGNAL INPUT

Timing of the vertical and horizontal frequencies conform to the signals in table 4.

Video Signal Input				Video Mode Signal				
Signal name	Display resolution (dot-line)	Vertical frequency (Hz)	Horizontal frequency (kHz)	400H	INTH	M2	M1	M0
NTSC	640•480	59.94	15.73	L	L	L	L	L
NEC	640•400	56	24.83	H	H	L	H	L
NEC	640•400	70	31.47	H	H	L	H	H
NEC	640•480	60	31.47	L	H	L	H	H
VGA	640•480	60	31.47	L	H	L	H	H
MAC	640•480	66.6	35	L	H	H	L	L
VESA	640•480	72	37.86	L	H	H	L	H
VESA	640•480	75	37.5	L	H	H	H	L

In NTSC Video Signal Input Mode, images are displayed by the "2-line simultaneous selection interlace scanning" method. In this method, the same image is displayed on adjacent two lines for each NTSC signal line data, and displayed images are shifted one line between the odd and the even fields.

SIGNAL TIMING

Table 5. Relation between Input video signal and Module RGB signal input												
Input video signal format <small>note.1</small>					Module RGB data input						Recommended synchronous signal delay <small>note 6</small>	
Signal name	Display resolution (dot•line)	Vert. Freq. (Hz)	Horiz. Freq. (kHz)	Number of clock in 1H period <small>note 2</small>	<small>note 3</small> Data start timing		<small>note 4</small> RGB data read start timing		RGB data valid period		Vertical (Bv-Dv) (line)	Horizontal (Bh-Dh) (dot)
					Bv (line)	Bh (dot)	Dv (line)	Dh (dot)	Ev (line)	Eh (dot)		
NTSC	640•480	59.94	15.73	780*	17(even) 18(odd)	115*	2(even) 3(odd)	85	(note5)	640	15	30
NEC	640•400	56	24.83	848	33	149	17	119	400	640	16	30
NEC	640•400	70	31.47	800	36	143	19	114	400	640	17	29
NEC	640•480	60	31.47	800	39	145	19	114	480	640	20	31
VGA	640•480	60	31.47	800	35	144	19	114	480	640	16	30
MAC	640•480	66.6	35	864	42	160	26	130	480	640	16	30
VESA	640•480	72	37.86	832	31	168	15	138	480	640	16	30
VESA	640•480	75	37.5	840	19	184	3	154	480	640	16	30

* Reference value

Notes 1. Input video signal format is determined by Video Mode Signal (refer to Table 4).

2. "1H" shows 1 cycle period of HSYNC (Horizontal synchronous signal).

"1V" shows 1 cycle period of VSYNC (Vertical synchronous signal).

3. Period between "leading-edge of the synchronous pulses" and "start timing of video data valid period"

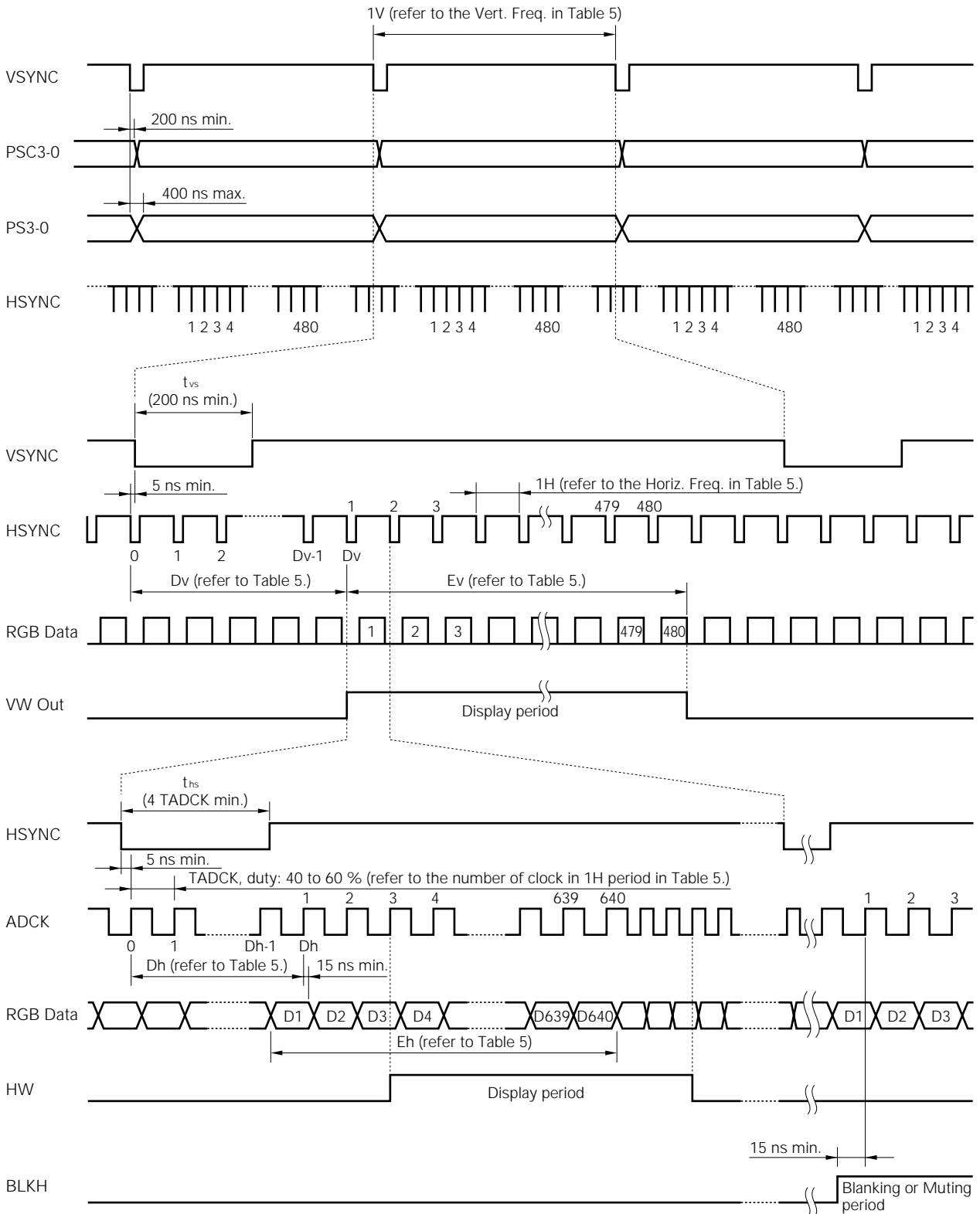
4. Period between "leading-edge of the synchronous pulses" and "start timing of RGB data valid period"

5. 230 or 240 can be selected (factory set: 240). When 230 is selected, upper 5 lines and lower 5 lines are masked with black pattern.

6. If synchronous signal delay values are set to above numbers, display position is set to the center of the display area. Display position can be moved to up, down, right, and left by adjusting the numbers of the delay values.

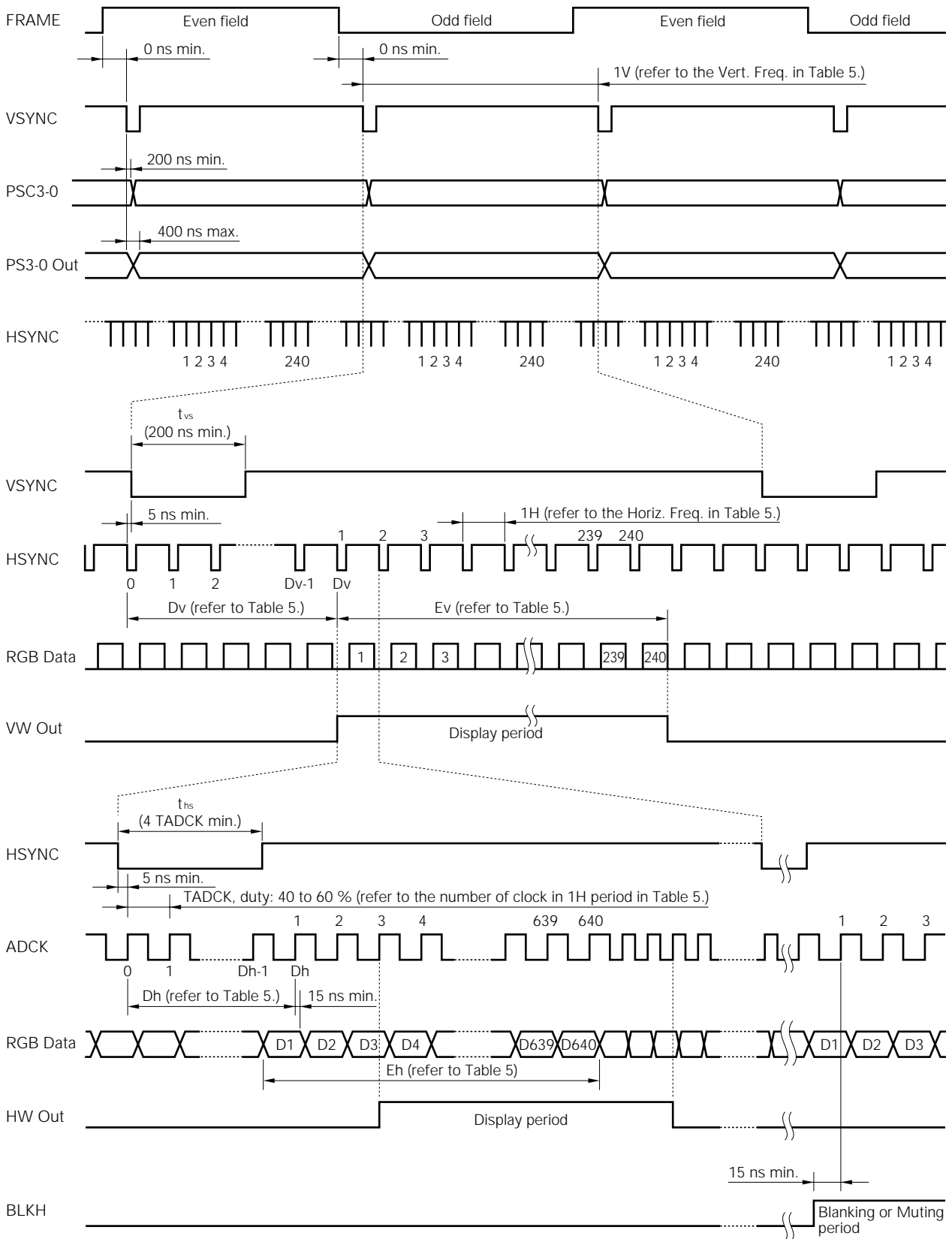
SIGNAL TIMING

Progressive Scan 480 Line Mode



SIGNAL TIMING

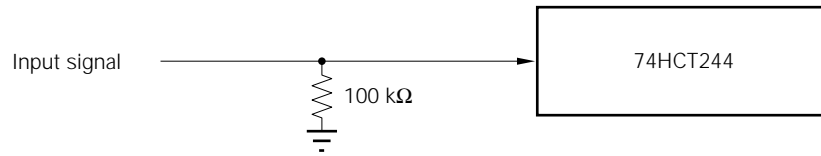
Interlace Scan 240 Line Mode



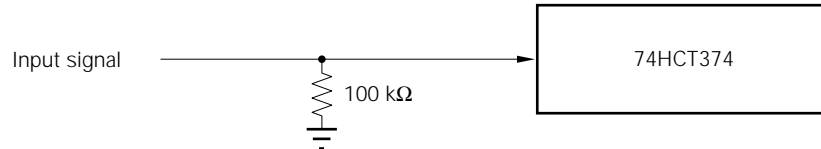
INPUT OUTPUT DRIVE CIRCUITS

The following are definitions of the input and output drive circuits for all interface signals on the PDP module.

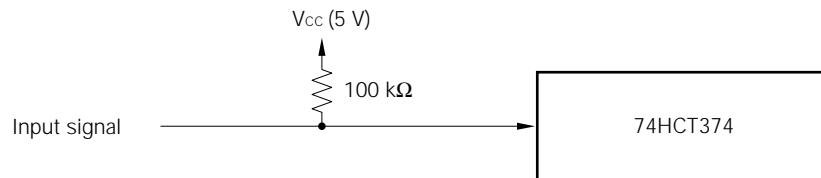
1) R5-R0, G5-G0, B5-B0, ADCK, HSYNC, VSYNC, FRAME, INTH, BLKH



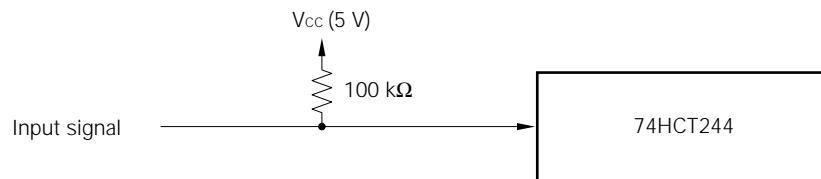
2) M2-M0, 400H



3) PSC3-PSC0



4) ALVP



5) HW, VW, PS3-PS0



6) ALARM



7) LVP

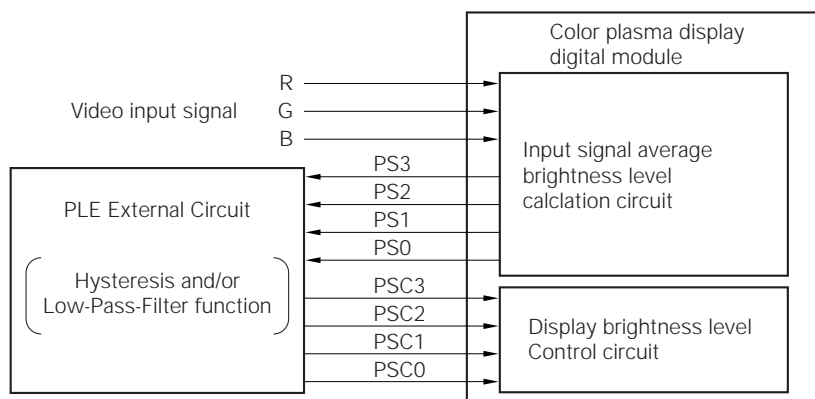


PLE (Peak Luminance Enhancement) FUNCTION

The PLE function makes it possible to increase or decrease the average brightness level of the PDP display when the typical brightness level of the input video signal is lower or higher than the average brightness of the previous frame. This PLE function control reduces power consumption and results in a higher contrast level. External circuitry is required to take advantage of the PLE function.

The PLE control circuits can be constructed by connecting external hysteresis and/or low-pass-filter circuits between PSC3-0 (PLE control signal input) and PS3-0 (PLE control signal output).

The PLE brightness change response characteristic depends on the characteristics of the external hysteresis and/or low-pass-filter circuit. Customers can design their favorite response characteristics by use of this external circuit.



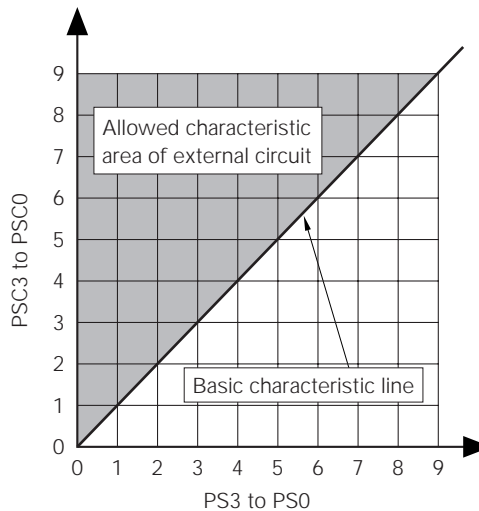
Characteristic of PLE external circuit

This digital module is designed subject to use PLE function, and input signal (PSC3-PSC0) should vary linearly to the output signal (PS3-PS0). (A short time of delayed response is allowed).

Right figure shows the basic characteristic line for module design and allowed characteristic area of the external circuit.

If PLE function is not used, PSC3-PSC0 inputs should be set to "H" level or be kept open. In this case the brightness level is set to a minimum level.

PS3-PS0 output signals are refreshed in every frame.



PLE response characteristic and variance of brightness and display (sustain) current

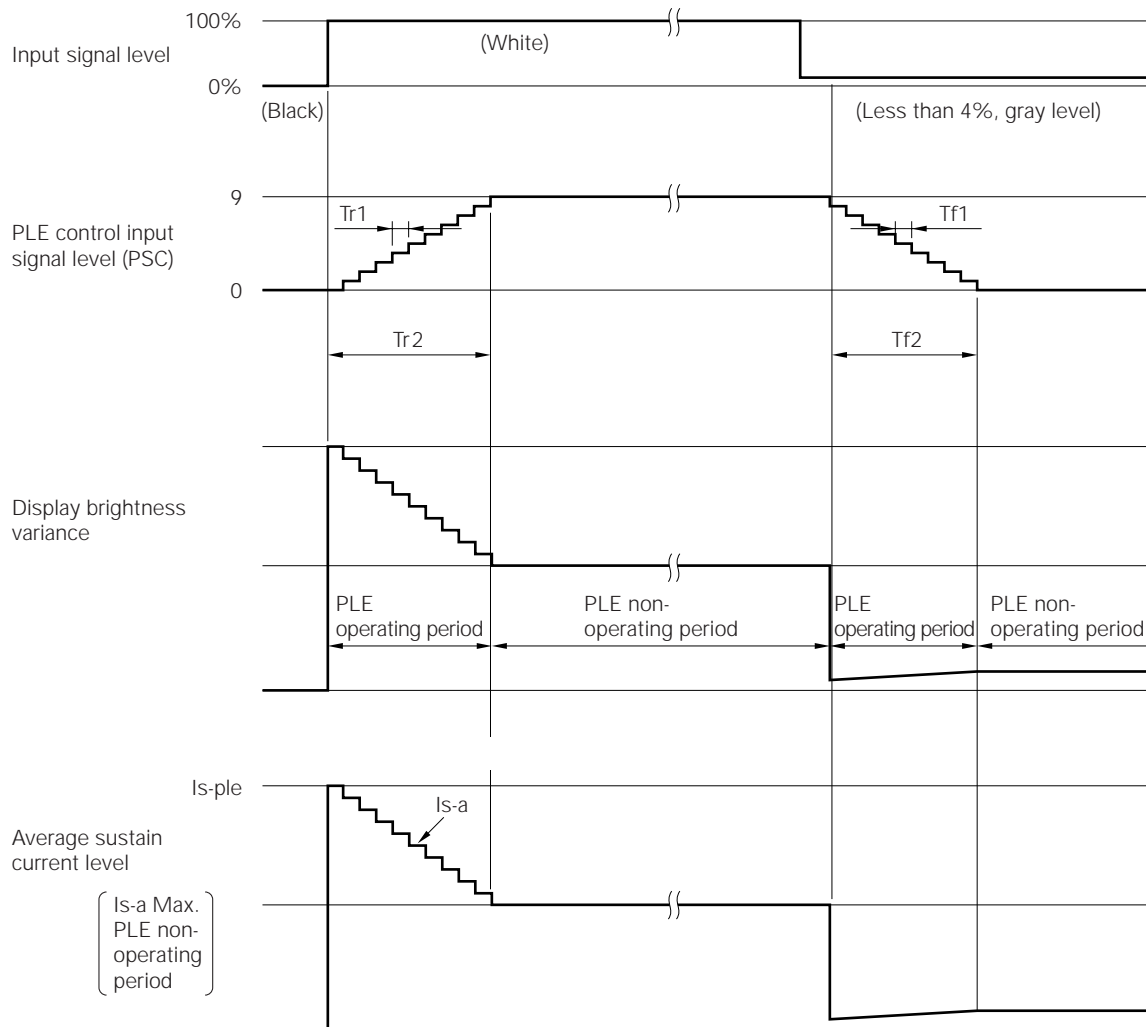
PLE response time is depend on the external circuit (Hysteresis and/or Low-Pass-Filter) which is connected to the module.

Generally these kind of external circuit have delayed response, and this delayed response occasionally make the module to flow large current while response period.

In order to avoid over power status, the PLE response is specified as follows.

Item	Symbol	Min.	Max.	Recommendation	Unit
1 step decrement time	Tf1	0	----	0.2 to 0.5	s
All steps decrement time	Tf2	0	----	3 to 7.5	s
1 step increment time	Tr1	0	5	0.2 to 0.5	s
All steps increment time	Tr2	0	45	2 to 5	s

Condition: Input signal jumps up and down with following sequence.



POWER INPUT AND OUTPUT

1) Sustain Power Supply (Vs)

Table 6. Sustain Power Supply (Vs)						
Item	Symbol	Condition and Remarks	Min.	Typ.	MAX.	Unit
Absolute Maximum	----	-----	----	----	-200	V
Adjustable Range ^{note}	Vs	Depend on the characteristics of each PDP	-160	----	-180	V
Voltage Stability	----	-----	----	----	±1.0	%
Average Current	Is-a	At PLE operation mode	0.1	----	1.4	A
	Is-ple	At PLE non-operation mode				
Peak Current	Is-peak	When "black" turns "white"	----	----	10	A
Voltage Regulation	----	At peak current	----	----	5 p-p	V
Ripple and Noise	----	-----	----	----	500	mV

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

2) Data Power Supply (Vd)

Table 7. Data Power Supply (Vd)						
Item	Symbol	Condition and Remarks	Min.	Typ.	Max.	Unit
Absolute Maximum	----	-----	----	----	100	V
Adjustable Range ^{note}	Vd	Depend on the characteristics of each PDP	60	----	80	V
Voltage Stability	----	-----	----	----	±1.5	%
Average Current	Id-a	Varied correspondence to the image	0.005	0.6	1.3	A
Ripple and Noise	----	-----	----	----	300	mV

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

(3) Logic Power Supply (Vcc)

Table 8. Logic Power Supply (Vcc)						
Item	Symbol	Condition and Remarks	Min.	Typ.	Max.	Unit
Absolute Maximum	----	-----	----	----	6.0	V
Voltage Range ^{note}	Vcc	-----	4.75	----	5.25	V
Current	Icc	-----	4.0	5.0	6.0	A
Ripple	----	-----	----	----	30	mV
Noise	----	-----	----	----	300	mV

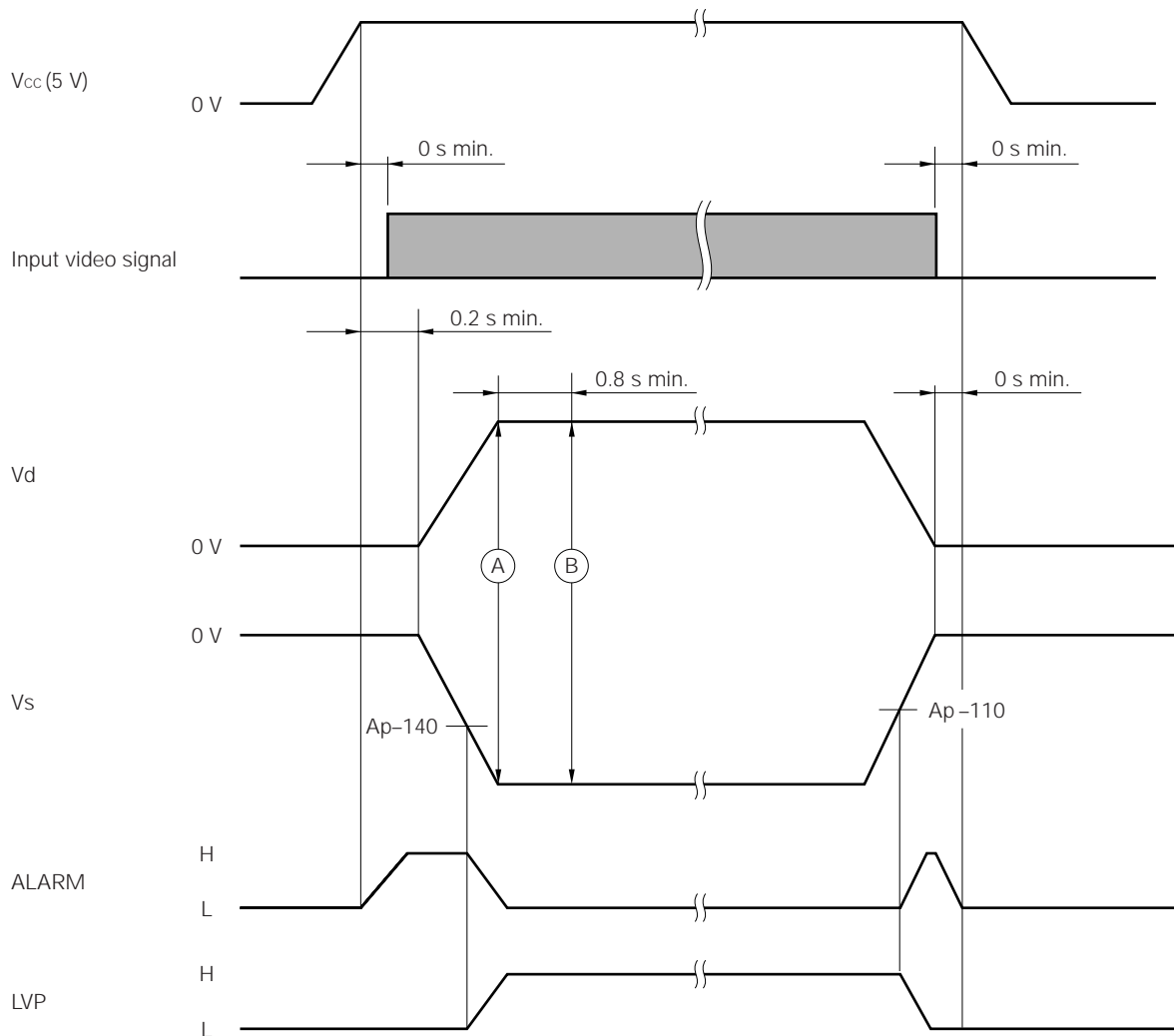
note : This module provides an automatic operation-stop function for internal malfunctions. When the module stops the operation, logic current may reduce to almost zero (0).
Even if logic current becomes zero, applied voltage should be kept less than 6.00 volts.

POWER OUTPUT

Low noise DC power sources are provided by the module using internal series regulators. These power sources can be utilized for external analog signal circuits.

Item	V05	V12	Unit
Rated voltage	5	12	V
Voltage regulation	±5	±5	%
Rated current	350	750	mA
Current range	70 to 350	130 to 750	mA
Ripple voltage	50 max.	50 max.	mV
Noise voltage	100 max.	250 max.	mV

Supply Voltage and Signal Sequence



- Notes**
1. When high voltages are put into the module, a distorted image is displayed at point (A). In order to avoid this phenomenon, it is recommended to keep the RGB signal to "Black" or to keep BLKH signal to "H" (muting mode) until point (B).
 2. Basically power source for Input signal circuit and VCC can be switched on and off at the same time.
 3. Sequence of Vd and Vs does not determined. It is recommended to switch on and off simultaneously.
 4. Turn off the high-voltage power supplies (Vs and Vd) when ALARM is H or when LVP is L. If Vcc is applied first, however, the ALARM signal remains H and LVP signal remains L until Vs is applied. Ignore the ALARM and LVP signal until Vs is applied.

CONNECTORS PIN ASSIGNMENT

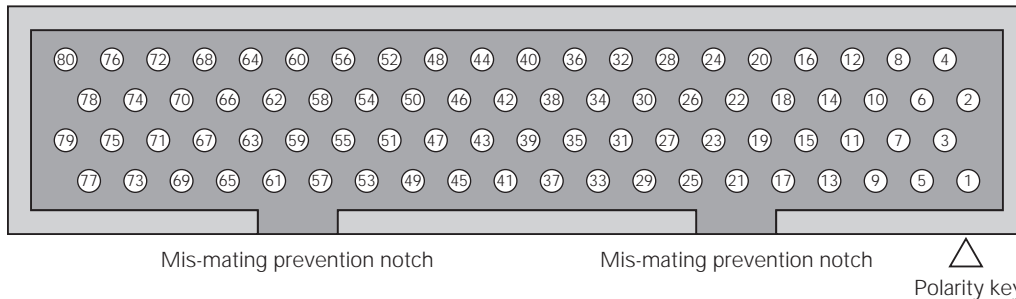
(for the connector position, please refer to the Rear View in the Outline drawing)

1) SIGNAL INTERFACE CONNECTOR

Table 10. Connector CN101 Pin Assignment							
Pin No.	Symbol	Pin No.	Symbol	Pin No.	Symbol	Pin No.	Symbol
1	R5	2	GND	41	VSYNC	42	GND
3	R4	4	GND	43	FRAME	44	GND
5	R3	6	GND	45	M2	46	GND
7	R2	8	GND	47	M1	48	GND
9	R1	10	GND	49	M0	50	GND
11	R0	12	GND	51	400H	52	GND
13	G5	14	GND	53	INTH	54	GND
15	G4	16	GND	55	HW	56	GND
17	G3	18	GND	57	VW	58	GND
19	G2	20	GND	59	PS3	60	GND
21	G1	22	GND	61	PS2	62	GND
23	G0	24	GND	63	PS1	64	GND
25	B5	26	GND	65	PS0	66	GND
27	B4	28	GND	67	PSC3	68	GND
29	B3	30	GND	69	PSC2	70	GND
31	B2	32	GND	71	PSC1	72	GND
33	B1	34	GND	73	PSC0	74	GND
35	B0	36	GND	75	ALARM	76	GND
37	ADCK	38	GND	77	BLKH	78	GND
39	HSYNC	40	GND	79	NC	80	GND

Module side connector : TX3-80P-D2ST-SN1
 Mating connector : TX1-80S-D2P1-1D
 Connector supplier : Japan Aviation Electronics Industry, Limited (JAE)
 Fitting Cable : 80 conductors flat-cable, 0.635mm pitch (equivalent to AWG#30)

TX3-80P-D2ST (Top view of pin hole numbers on board (viewed from connector))



2) POWER INPUT CONNECTORS

Pin No.	Symbol
1	Vcc
2	Vcc
3	GND
4	GND
5	Vs
6	GND
7	Vd
8	GND
9	N.C.

Pin No.	Symbol
1	Vcc
2	Vcc
3	GND
4	GND
5	Vs
6	GND
7	Vd
8	GND
9	LVP

Module side connector : B 9P-VH-B

Mating connector : VHR-9M (housing), BVH-21T-P1.1 (contact)

Connector supplier : J.S.T TRADING COMPANY, LTD.

Fitting Cable : Equivalent to AWG#18

(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.

3) POWER OUTPUT CONNECTOR

Pin No.	Symbol
1	V12
2	V05
3	GND

Module side connector : B 3B-EH

Mating connector : EHR-3 (housing), SEH-001T-P0.6 (contact)

Connector supplier : J.S.T TRADING COMPANY, LTD.

Fitting Cable : Equivalent to AWG#22

GENERAL CAUTION

1. Warnings and Cautions

Warning: Indicates a hazard that can lead to death or injury if the warning is ignored and the product is handled incorrectly.

Caution: Indicates a hazard that can lead to injury or damage to property if the caution is ignored and the product is handled incorrectly.

[Warning]

- (1) This product uses a high voltage (350 V MAX.). 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.
- (2) Do not supply a voltage higher than that specified to this product. This can damage the product and may cause a fire.
- (3) Do not use this product in locations where the humidity is extremely high, where it may be splashed with water, or where it is surrounded by flammable materials. Do not install or use the product in a location that does not satisfy the specified environmental conditions. This can damage the product and may cause a fire.
- (4) If a foreign substance (such as water, metal, or liquid) gets inside the product, immediately turn off the power. Continuing to use the product as it is may cause fire or electric shock.
- (5) If the product emits smoke, an abnormal smell, or makes an abnormal sound, immediately turn off the power. If nothing is displayed or if the display goes out during use, immediately turn off the power. Continuing to use the product as it is may cause fire or electric shock.
- (6) Do not disconnect or connect the connector while power to the product is on. It takes some time for the voltage to drop to a sufficiently low level after the power has been turned off. Confirm that the voltage has dropped to a safe level before disconnecting or connecting the connector. Otherwise, this may cause fire, electric shock, or malfunctioning.
- (7) Do not pull out or insert the power cable from/to an outlet with wet hands. Doing so may cause electric shock.
- (8) Do not damage or modify the power cable. Doing so may cause fire or electric shock.
- (9) If the power cable is damaged, or if the connector is loose, do not use the product; otherwise, this can lead to fire or electric shock.
- (10) If the power connector or the connector of the power cable becomes dirty or dusty, wipe it with a dry cloth. Otherwise, this can lead to fire.

[Caution]

- (1) Do not place this product in a location that is subject to heavy vibration, or on an unstable surface such as an inclined surface. The product may fall off or fall over, causing injuries.
- (2) 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.
- (3) Before disconnecting cables from the product, be sure to turn off the power. Be sure to hold the connector when disconnecting cables. Pulling a cable with excessive force may cause the core of the cable to be exposed or break the cable, and this can lead to fire or electric shock.
- (4) This product should be moved by two or more persons. If one person attempts to carry this product alone, he/she may be injured.
- (5) This product contains glass. The glass may break, causing injuries, if shock, vibration, heat, or distortion is applied to the product.
- (6) The temperature of the glass surface of the display may rise to 50°C or more depending on the conditions of use. If you touch the glass inadvertently, you may be burned.

- (7) Do not poke or strike the glass surface of the display with a hard object. The glass may break or be scratched. If the glass breaks, you may be injured.
- (8) If the glass surface of the display breaks or is scratched, do not touch the broken pieces or the scratches with bare hands. You may be injured.
- (10) Do not place an object on the glass surface of the display. The glass may break or be scratched.

2. Cautions on Design

- (1) This product may be damaged if it is subject to excessive stresses (such as excessive voltage, current, or temperature). The absolute maximum ratings specify the limits of these stresses, and system design must ensure that none of the absolute maximum ratings are exceeded.
- (2) The recommended operating conditions are conditions in which the normal operation of this product is guaranteed. All the rated values of the electrical specifications are guaranteed within these conditions. Always use the product within the range of the recommended operating conditions. Otherwise, the reliability of the product may be degraded. Use of the product with a combination of parameters, conditions, or logic not specified in the specifications of this product is not guaranteed. If intending to use the product in such a way, be sure to consult NEC in advance.
- (3) This product emits near infrared rays (800 to 1000 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.
- (4) This product uses high-voltage switching and a high-speed clock. A system using this product should be designed so that it does not affect the other systems, and should be thoroughly evaluated.
- (5) This product has a glass display surface. Design your system so that excessive shock and load are not applied to the glass. Exercise care that the vent at the corner of the glass panel is not damaged. If the glass panel or vent is damaged, the product is inoperable.
- (6) There are some exposed components on the rear panel of this product. Touching these components may cause an electric shock.
- (7) This product uses a high voltage. Design your system so that any residual voltage in this product is dissipated quickly when power is turned off, observing the specifications.
- (8) This product uses heat-emitting components. Take the heat emitted by these components into consideration when designing your system. If the product is used outside the specified temperature range, it may malfunction.
- (9) This product uses a high voltage and, because of its compact design, components are densely mounted on the circuit boards. If dust collects on these components, it can cause short-circuiting between the pins of the components and moisture can cause the insulation between the components to break down, causing the product to malfunction.
- (10) Regulations and standards on safety and electromagnetic interference differ depending on the country. Design your system in compliance with the regulations and standards of the country for which your system is intended.
- (11) To obtain approval under certain safety standards (such as UL and EN), a filter that passes a shock test must be fitted over the glass surface of the finished product. In addition, it must be confirmed that the level of UV emissions is within the range specified by such standards.
- (12) If this product is used as a display board to display a static image, image "burn-in" occurs. This means that the luminance of areas of the display that remain lit for a long time drops compared with the luminance of areas that are lit for a shorter time, causing uneven luminance across the display. The degree to which this occurs is in proportion to the luminance at which the display is used. To prevent this phenomenon, therefore, avoid static images as much as possible and design your system so that it is used at a low luminance, by setting PLE to the maximum level (PSC = 9).
- (13) Within the guarantee period, general faults that occur due to defects in components such as ICs will be rectified by NEC without charge. However, faults due to "burn-in" are not included because such faults can be avoided by using the product correctly. Repairs due to the other faults may be charged for depending on responsibility for the faults.

- (14) 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 on Use

- (1) Because this product uses a high voltage, connecting or disconnecting the connectors while power is supplied to the product may cause malfunctioning. Never connect or disconnect the connectors while the power is on. Immediately after power has been turned off, a residual voltage remains in the product. Be sure to confirm that the voltage has dropped to a sufficiently low level.
- (2) Watching the display for a long time can tire the eyes. Take a break at appropriate intervals.
- (3) Do not cover or wrap the product with a cloth or other covering while power is supplied to the product.
- (4) Before turning on power to the product, check the wiring of the product and confirm that the supply voltage is within the rated voltage range. If the wiring is wrong or if a voltage outside the rated range is applied, the product may malfunction or be damaged.
- (5) Do not store this product in a location where temperature and humidity are high. This may cause the product to malfunction. Because this product uses a discharge phenomenon, it may take time to light (operation may be delayed) when the product is used after it has been stored for a long time. In this case, it is recommended to light all cells for about 2 hours (aging).
- (6) If the glass surface of the display becomes dirty, wipe it with a soft cloth moistened with a neutral detergent. Do not use acidic or alkaline liquids, or organic solvents.
- (7) This product is made from various materials such as glass, metal, and plastic. When discarding it, be sure to contact a professional waste disposal operator.

4. Repair and Maintenance

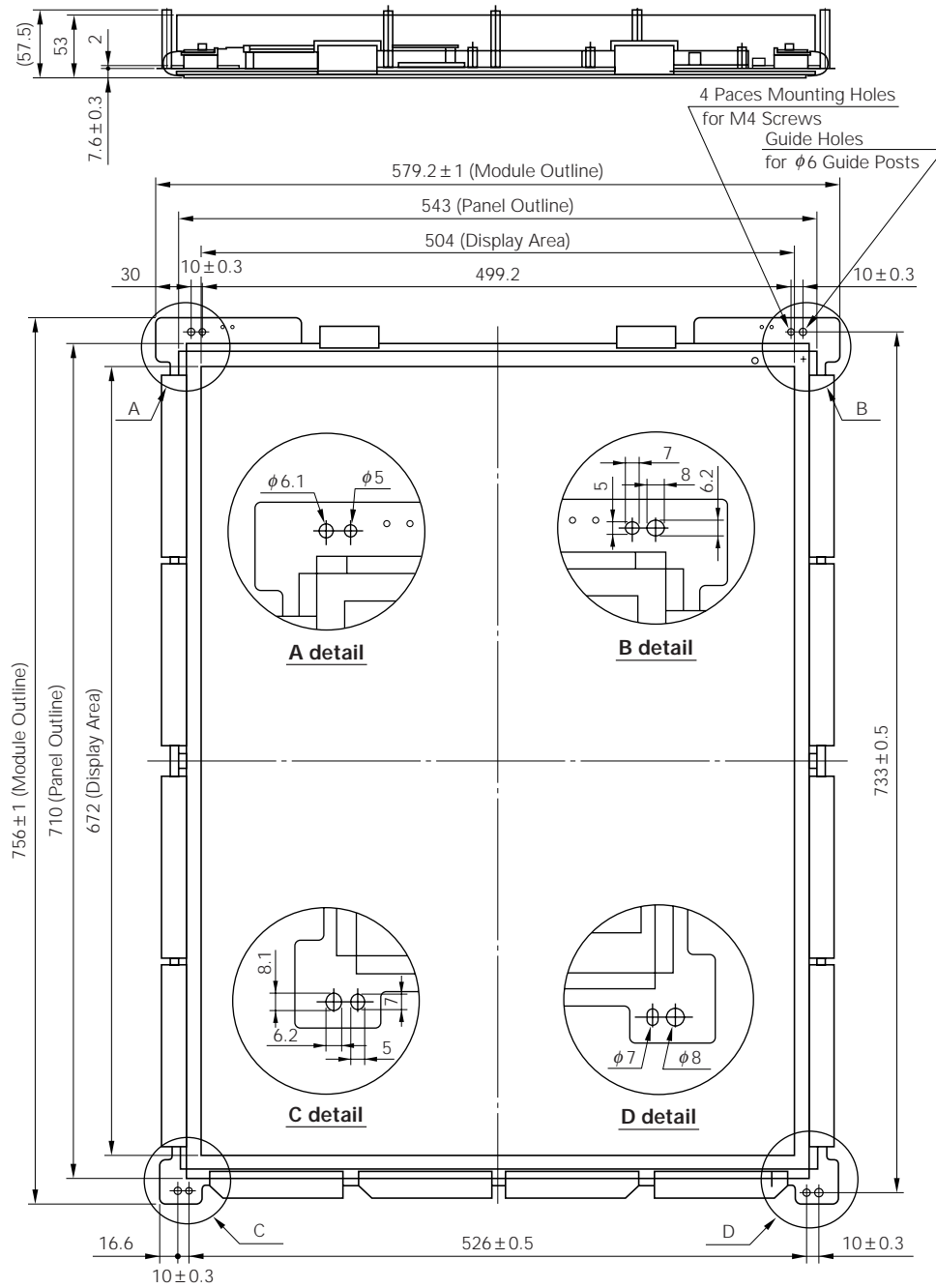
Because this product combines the display panel and driver circuits in a single module, it cannot be repaired or maintained at users' office or plant. Arrangements for maintenance and repair will be determined later.

5. Others

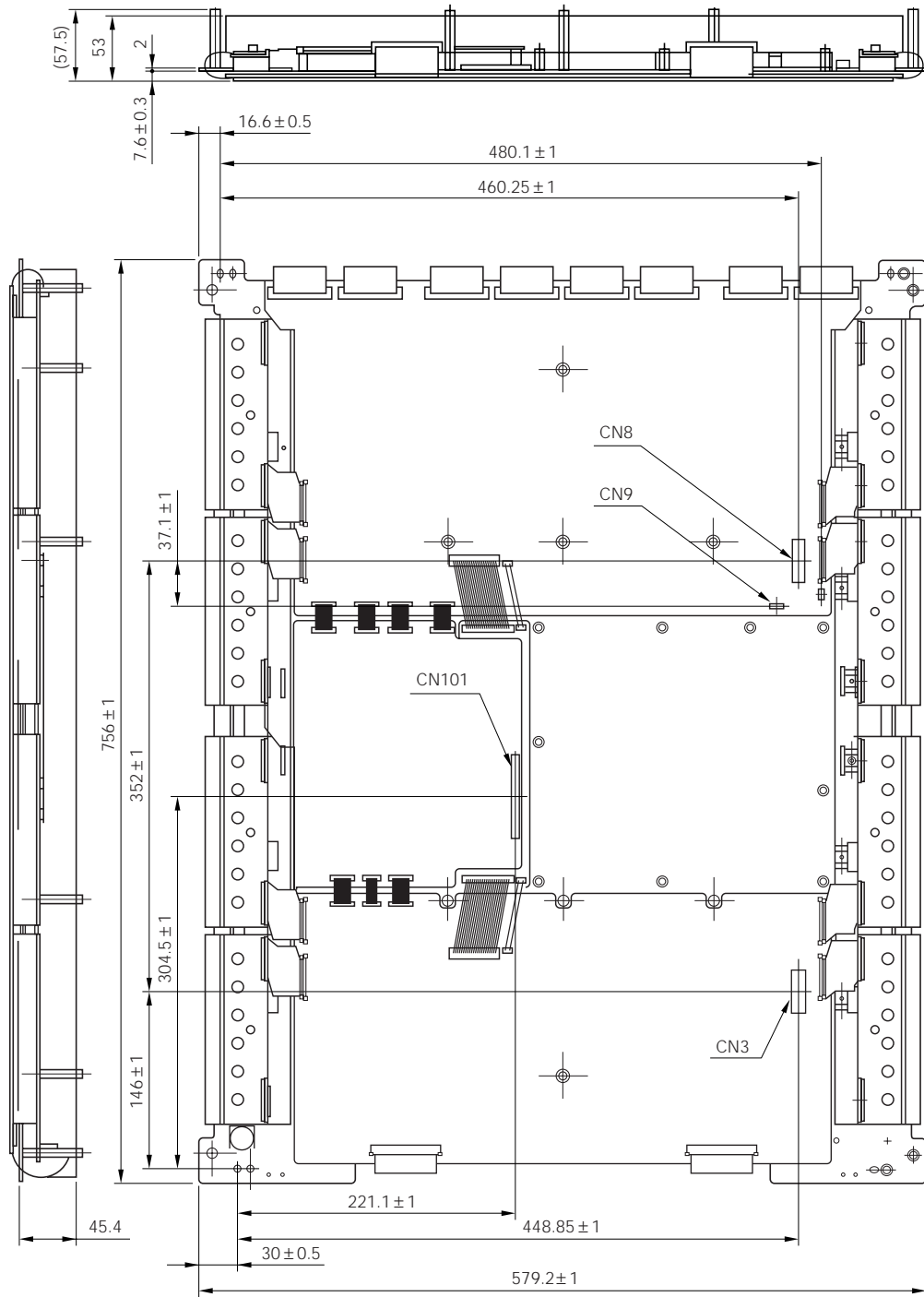
- (1) If your system requires the user to observe any particular precautions, in addition to the above warnings and cautions, include such caution and warning statements in the manual for your system.
- (2) If you have any questions concerning design, such as on housing, storage, or operating environment, consult NEC in advance.

MECHANICAL DRAWING

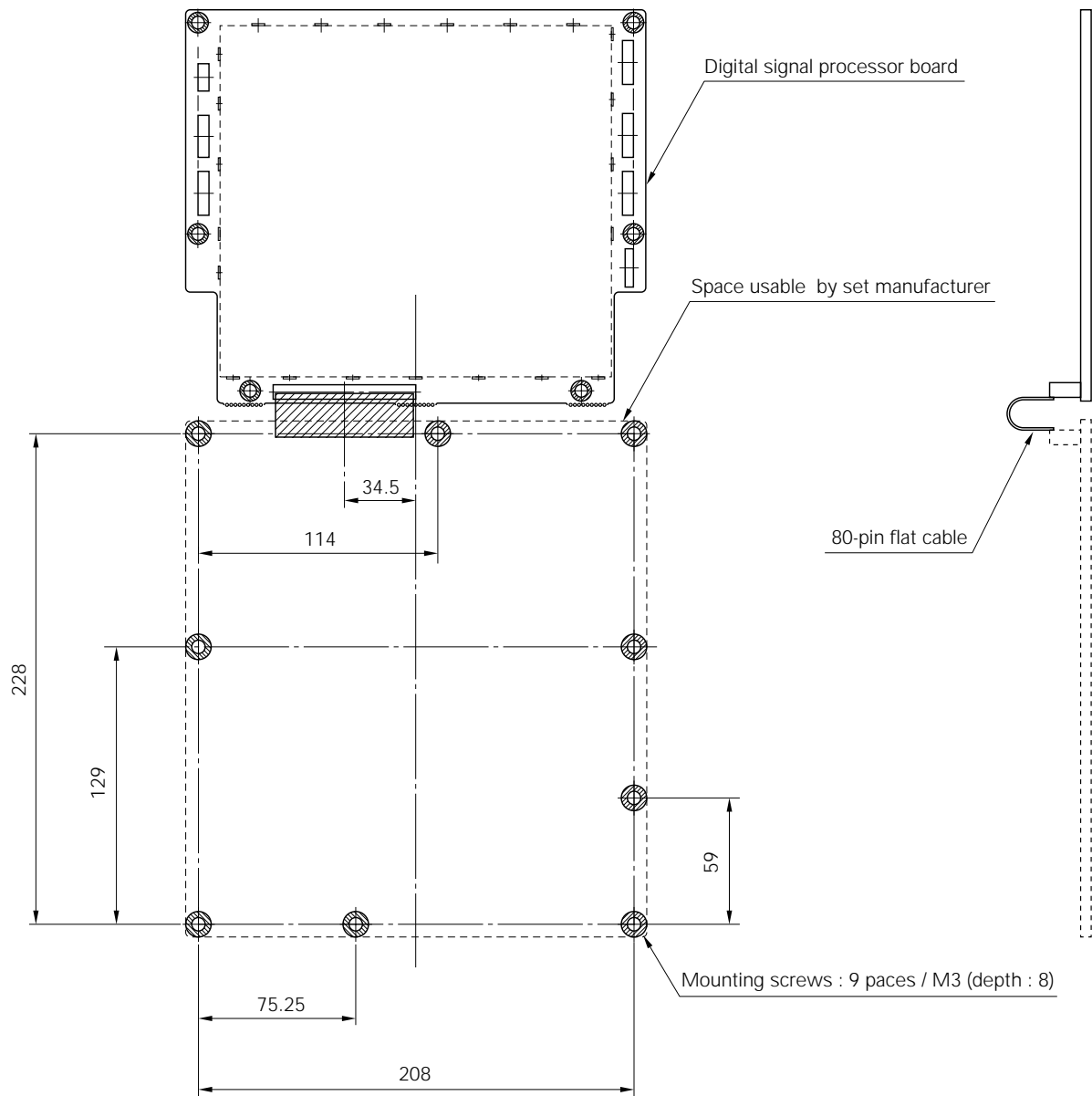
FRONT VIEW (Unit : mm)



MECHANICAL DRAWING
 REAR VIEW (Unit : mm)



SIGNAL PROCESSOR BOARD MOUNTING DIAGRAM (Unit : mm)



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NEC devices are classified into the following three quality grades:

"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.

Anti-radioactive design is not implemented in this product.