# M51392P/M51399P

## WIDEBAND VIDEO AMPLIFIER

### DESCRIPTION

The M51392P and M51399P are semiconductor integrated circuits developed for a high-resolution display, which are video amplifiers having a broad band of 100MHz (50MHz for M51392P).

These ICs have outstanding functions available, including a video amplifier, clamp, gain and luminance (brightness) controls, and the band is as wide as 100MHz (at input $1V_{P-P}$ and output $3V_{P-P}$). The maximum gain is 16dB, and the output of $6V_{P-P}$ is transmitted at $1V_{P-P}$ input.

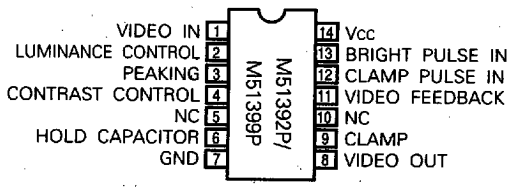
For a black & white display, a single IC is used per set, and for a color display, a single IC is used at each channel of R.G.B; therefore, three ICs are used per set.

### FEATURES

- Band ..... 100MHz [50MHz] (at $3V_{P-P}$ output)
- Maximum gain ..... 16dB (standard)
- Low power dissipation
  ..... $V_{CC}$ =12V, $I_{CC}$ = 43mA (standard)
- Rise & fall time
  ..... 2.5nsec [3nsec] standard (at $3V_{P-P}$ output)

[ ]For M51392P

### PIN CONFIGURATION (TOP VIEW)




Outline 14P4

NC:No connection

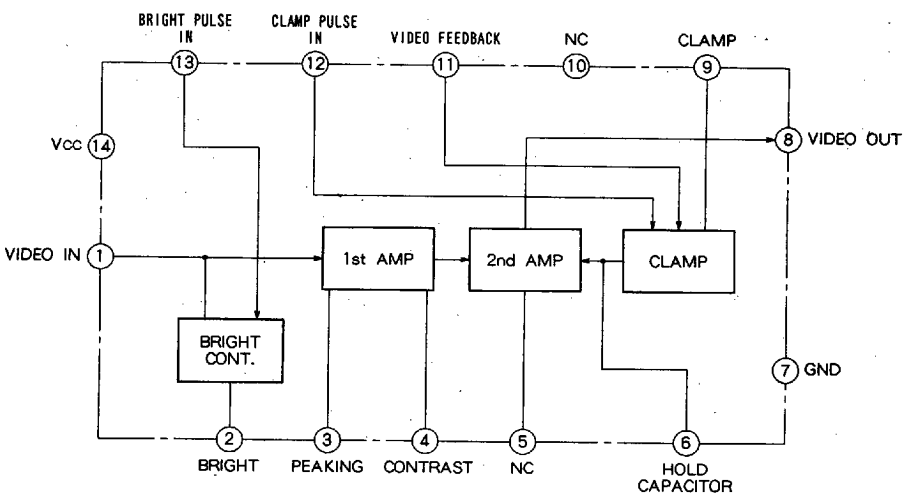
### APPLICATION

Analog input high-resolution display, broad-band amplifier and high-definition TV

### RECOMMENDED OPERATING CONDITION

Supply voltage range ..... 10.0 ~ 13.5 V
Rated supply voltage ..... 12.0 V

### BLOCK DIAGRAM



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## WIDEBAND VIDEO AMPLIFIER

### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Ratings | Unit |
|---|---|---|---|
| $V_{CC}$ | Supply voltage | 14.4 | V |
| $P_d$ | Internal power dissipation | 1.2 | W |
| $T_{opr}$ | Operating temperature | −20~75 | ℃ |
| $T_{stg}$ | Storage temperature | −40~125 | ℃ |

### ELECTRICAL CHARACTERISTICS (Ta = 25℃ unless otherwise noted)

| Symbol | Parameter | Test Point | Test Conditions: Input VIDEO | Input PULSE | External Supply Voltage $V_2$ | $V_4$ | $V_6$ | $V_9$ | Switch Setting $S_1$ | $S_2$ | See Note | Limits (See NOTE) Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $I_{CC1}$ | Circuit current Ⅰ | A | − | SG1 | 0 | 9 | − | 7 | 2 | 1 | (Note)1 | 33 | 42 | 50 | mA |
| $I_{CC2}$ | Circuit current Ⅱ | A | − | − | 0 | 9 | 4 | 7 | 2 | 2 | | 30 | 38 | 46 | mA |
| $V_{omax}$ | Output dynamic range | TP2 | SG2 | − | 0 | 9 | Variable | 7 | 1 | 2 | (Note)2 | 6.5 | 7.5 | | $V_{P-P}$ |
| $V_{inmax}$ | Maximum allowable input | TP2 | SG2 | − | 0 | 9 | Variable | 7 | 1 | 2 | (Note)3 | 1.05 | 1.26 | | $V_{P-P}$ |
| $G_V$ | Maximum gain | TP2 | SG3 | − | 0 | 9 | $V_T$ | 7 | 1 | 2 | (Note)4 | 14 | 16 | 18 | dB |
| $V_{CR-1}$ | Contrast control characteristics | TP2 | SG3 | − | 0 | 6 | $V_T$ | 7 | 1 | 2 | (Note)5 | −8.5 | −6.3 | −4 | dB |
| $V_{CR-2}$ | | | | | | 0 | | | | | | | −56 | −46 | dB |
| $F_{C-1}$ | Frequency characteristics | TP2 | SG4 | − | 0 | 6 | $V_T$ | 7 | 1 | 2 | (Note)6 | −1 | 1 | 4 | dB |
| $F_{C-2}$ | | | | | | | | | | | | −2 | 4(2.5) | 7(6) | dB |
| $F_{C-3}$ | | | | | | | | | | | | −2 | 5(4) | 9(7) | dB |
| $V_{B-1}$ | Bright control characteristics | TP2 | − | SG1 | 12 | 9 | − | 7.7 | 1 | 1 | (Note)7 | 5.8 | 6.6 | 7.4 | V |
| $V_{B-2}$ | | | | | 6 | | | | | | | 4.9 | 5.6 | 6.3 | V |
| $V_{B-3}$ | | | | | 0 | | | | | | | 4.0 | 4.6 | 5.2 | V |
| $V_{CL-1}$ | Clamping control characteristics | TP2 | − | SG1 | 0 | 9 | − | 7.7 | 1 | 1 | (Note)8 | 4.0 | 4.6 | 5.2 | V |
| $V_{CL-2}$ | | | | | | | | 6.3 | | | | 5.4 | 6.0 | 6.6 | V |
| $V_{6-1}$ | Hold voltage | TP1 | − | SG1 | 0 | 9 | − | 7.7 | 1 | 1 | (Note)9 | 3.7 | 4.4 | 5.1 | V |
| $V_{6-2}$ | | | | | | | | 6.3 | | | | 4.1 | 4.8 | 5.5 | V |
| $T_r$ | Pulse characteristics | TP2 | SG5 | − | 0 | 6 | $V_T$ | 7 | 1 | 2 | (Note)10 | | 2.5(3) | 4(6) | nsec |
| $T_f$ | | | | | | | | | | | | | 2.5(3) | 4(6) | nsec |

Note : ( ) : For M51392P

### ELECTRICAL CHARACTERISTICS TEST METHOD

**Note1:** In all measurements of PULSE IN, fix the variable resistor at pin ⑪ where the TP2 output becomes maximum.

**Note2:** Output dynamic range "Vomax"

a. Input SG2 to pin ①.

b. Set V4 voltage to 9V, and observe the output waveform on TP2 at this time, then adjust V6 for voltage at which uniform distortion starts. (Approx. 4.7V)

c. Increase the input field and read the peak-to-peak value at which the TP2 output waveform starts to be distorted.

**Note3:** Maximum allowable input "Vinmax"

a. The input level at which the TP2 output waveform starts to be distorted in the condition given in NOTE 1 above should be the maximum allowable input.

**Note4:** Maximum gain "Gv"

a. Input SG3 to pin ①.

b. Adjust $V_4$ = 9V and $V_6$ for voltage at which the TP2 output amplitude becomes the maximum point: it should be VT.

c. Read the output on TP2 at this time, and take it as V1, then calculate the ratio between this output and input.

$$GV = 20 \log \frac{VI\ (V_{P-P})}{0.5\ (V_{P-P})}$$

d. The maximum gain $G_V$ is defined as follows:

**Note5:** Contrast control characteristics "$V_{CR-1}$, $V_{CR-2}$"

a. Read the outputs on TP2 when $V_4$ voltage is $V_6$, 0V in the condition given in NOTE 4 above and take them as $V_2$ and $V_3$, then read the ratio between $V_2$, $V_3$ and $V_1$ in NOTE 4.
The contrast control characteristics $V_{CR-1}$, $V_{CR-2}$ are defined as follows:

b. $$V_{CR-1} = 20 \log \frac{V_2\ (V_{P-P})}{V_1\ (V_{P-P})}$$

$$V_{CR-2} = 20 \log \frac{V_3\ (V_{P-P})}{V_1\ (V_{P-P})}$$

**Note6:** Frequency characteristics "Fc-1, Fc-2, Fc-3"

a. Input SG4 to pin ①.

b. Set $V_4$ and $V_6$ to 6V and $V_T$ respectively, and measure 3 MHz point of SG4 with a spectrum analyzer: it should be taken as $f_1$.

c. Next, measure the 50, 100 (75) and 150 (100)MHz points, and take the measurements as $f_2$, $f_3$ and $f_4$ respectively.

d. The frequency characteristics Fc-1, Fc-2, Fc-3 are defined as follows:

$Fc\text{-}1 = f_2 - f_1$ (dB)

$Fc\text{-}2 = f_3 - f_1$ (dB)

$Fc\text{-}3 = f_4 - f_1$ (dB)

**Note7:** Luminance control characteristics "$V_{b\text{-}1}$, $V_{b\text{-}2}$, $V_{b\text{-}3}$"

a. Input SG1 to pins ⑫, ⑬.

b. Set $V_4$ voltage to 9V, and $V_9$ voltage to 7.7V.

c. Read TP2 black level voltage when $V_2$ voltage is 12, 6 and 0V: each voltage shall be $V_{b\text{-}1}$, $V_{b\text{-}2}$ and $V_{b\text{-}3}$.

**Note8:** Clamp control characteristics "$V_{CL\text{-}1}$, $V_{CL\text{-}2}$"

a. Input SG1 to pins ⑫, ⑬.

b. Set $V_2$ and $V_4$ to 0 and 9V respectively.

c. Read TP2 black level voltage when $V_9$ voltage is 7.7V, 6.3V: each voltage shall be $V_{CL\text{-}1}$ and $V_{CL\text{-}2}$.

**Note9:** Hold voltage "$V_{6\text{-}1}$, $V_{6\text{-}2}$"

a. Read TP1 voltage when $V_9$ voltage is 7.7V, 6.3V in the condition given in NOTE 8 above: each voltage shall be $V_{6\text{-}1}$ and $V_{6\text{-}2}$.

**Note10:** Pulse characteristics "Tr, Tf"

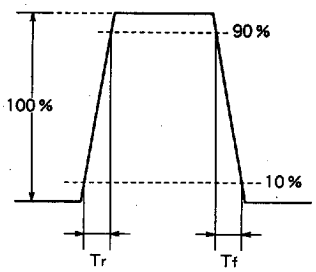
a. Input SG5 to pin ①.

b. Set $V_4$ and $V_6$ to 6V and $V_T$ respectively, and measure the rise $T_{r1}$ and fall $T_{f1}$ between 10 and 90% of the input pulse, using an active probe.

c. Next, measure the rise $T_{r2}$ and fall $T_{f2}$ between 10 and 90% of the output pulse on TP2 with an active probe, and define pulse characteristics Tr, Tf as follows:

$Tr\ (nsec) = \sqrt{(T_{r2})^2 - (T_{r1})^2}$

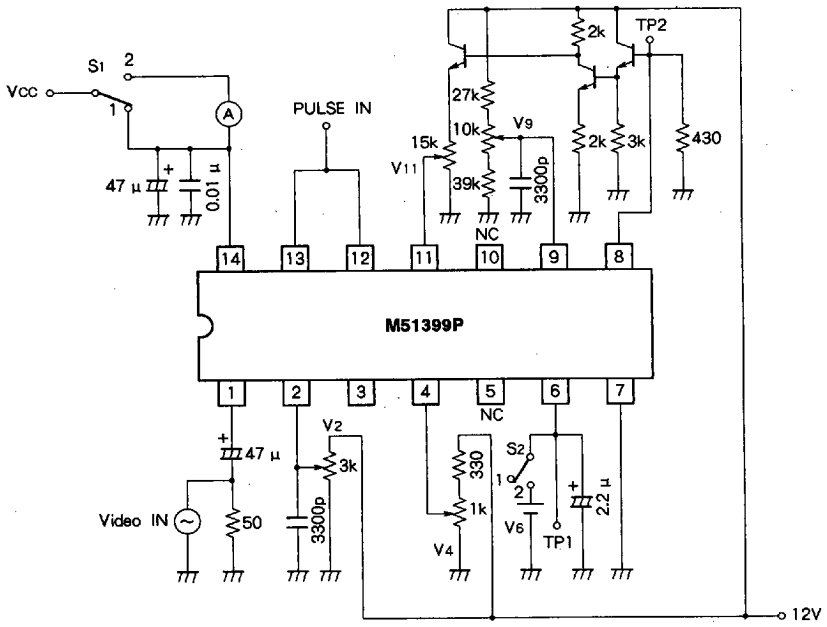
$Tf\ (nsec) = \sqrt{(T_{f2})^2 - (T_{f1})^2}$




**INPUT SIGNAL**

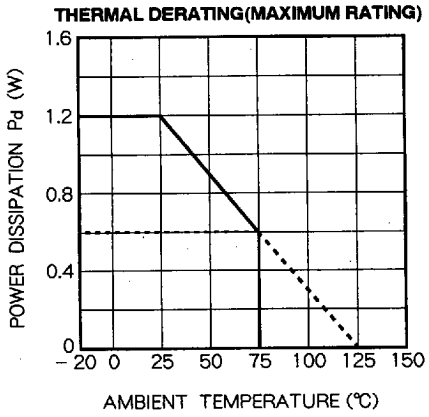
| SG No. | Signal (50 Ω termination) |
|---|---|
| SG1 | Pulse of 5 Vp-p synchronous with the standard video stepped wave pedestal |
| SG2 | $f_0$ = 100kHz, $V_i$ = 0.9$V_{P-P}$ (110dB μ) |
| SG3 | $f_0$ = 100kHz, $V_i$ = 0.5$V_{P-P}$ (105dB μ) |
| SG4 | $f_0$ = 0~150MHz, $V_i$ = 1$V_{P-P}$ |
| SG5 | $f_0$ = 25MHz pulse waveform, $V_i$ = 1$V_{P-P}$ |

## TEST CIRCUIT




Units Resistance: Ω
Capacitance: F

## TYPICAL CHARACTERISTICS



## APPLICATION EXAMPLE