

# M52327SP

## WIDEBAND 3-CHANNEL VIDEO AMPLIFIER

### DESCRIPTION

M52327SP semiconductor integrated circuit is a wideband video amplifier. Its family products include M51392P, M51399P and M51387P. This IC has a 100 MHz band and 3 built-in channels. Each channel is provided with a wideband amplifier, contrast controls (main and sub), and brightness controls (main and sub). This IC is optimal for high-resolution color displays.

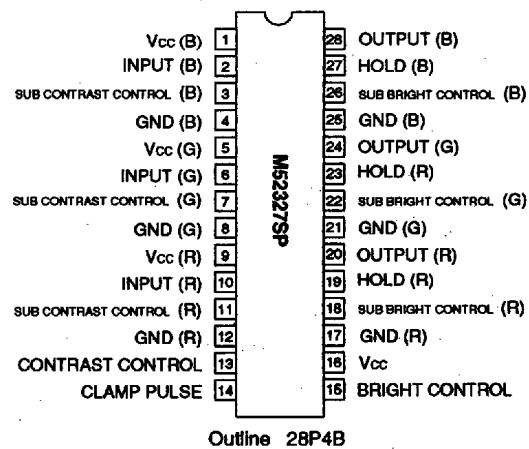
### FEATURES

- Produced by a new bipolar wafer processing method, this IC has 3 built-in channels, and operates with low power dissipation. (Vcc=12V, Icc=63mA)
- Input: 0.7VP-P(typ)  
Output: 4.5VP-P(max)  
Frequency band: 100 MHz(3VP-P)
- Contrast and brightness can be controlled with a main control and sub control. The main control changes contrast or brightness of 3 channels simultaneously. The sub control changes contrast or brightness of each channel independently.
- This IC has a built-in feedback circuit, ensuring stable DC output from IC output pin.

### APPLICATION

Cathode-ray tube displays

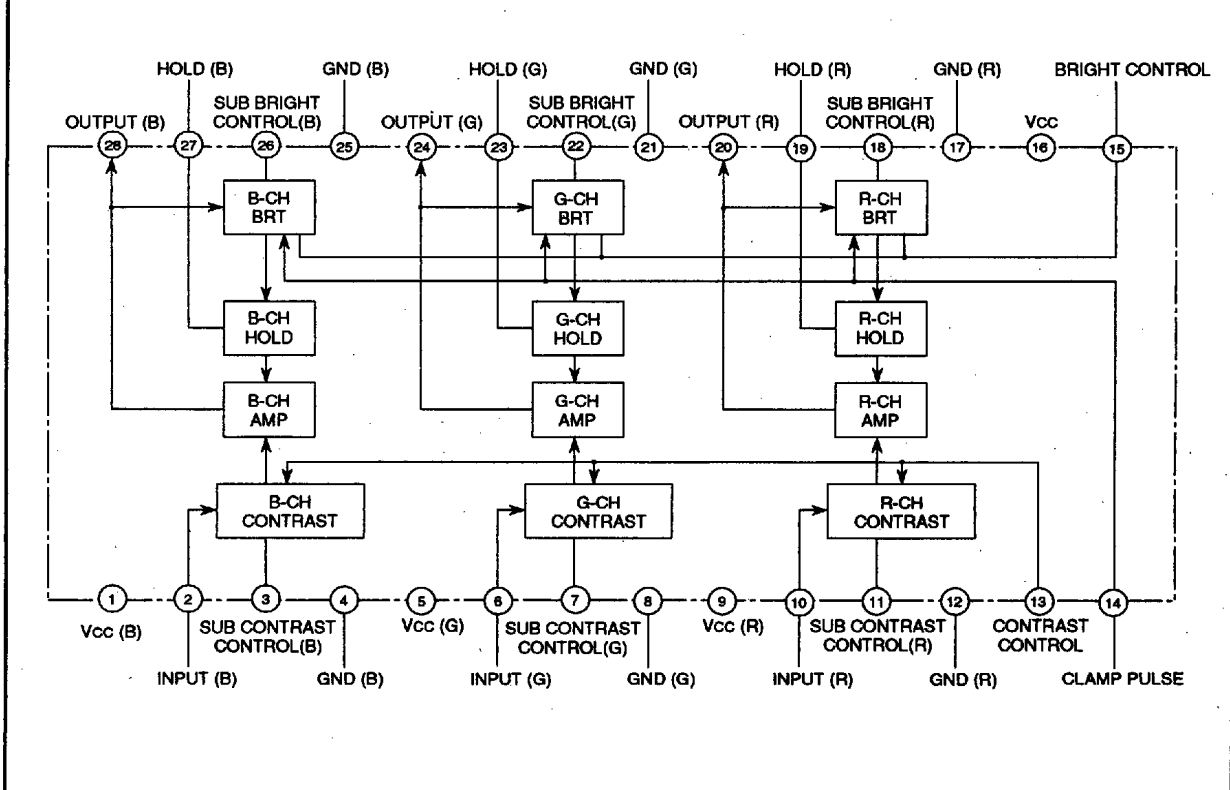
### PIN CONFIGURATION (TOP VIEW)



### RECOMMENDED OPERATING CONDITION

Supply voltage range ..... 11.5~12.5V  
Rated supply voltage ..... 12.0V

### BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter                                  | Ratings   | Unit |
|--------|--------------------------------------------|-----------|------|
| Vcc    | Supply voltage                             | 13.0      | V    |
| Pd     | Power dissipation                          | 1580      | mW   |
| Topr   | Operating temperature                      | -20~+85   | °C   |
| Tstg   | Storage temperature                        | -40~+150  | °C   |
| Vopr   | Recommended operating supply voltage       | 12.0      | V    |
| Vopr   | Recommended operating supply voltage range | 11.5~12.5 | V    |
| Surge  | Electrostatic discharge                    | ±200      | V    |

ELECTRICAL CHARACTERISTICS (Ta=25°C, Vcc=12V, unless otherwise noted.)

| Symbol | Parameter                                                   | Test point              | Input                                     |             |             | External Supply(V) |      |          |     | Pulse input | Limits |       |       | Unit  |
|--------|-------------------------------------------------------------|-------------------------|-------------------------------------------|-------------|-------------|--------------------|------|----------|-----|-------------|--------|-------|-------|-------|
|        |                                                             |                         | SW10<br>R-ch                              | SW6<br>G-ch | SW2<br>B-ch | V3                 | V13  | V15      | V26 | SW14        | Min.   | Typ.  | Max.  |       |
| Icc    | Circuit current                                             | A                       | a                                         | a           | a           | 12.0               | 12.0 | 5.0      | —   | b<br>SG6    | 45     | 72    | 110   | mA    |
| Vomax  | Output dynamic range                                        | T.P20<br>T.P24<br>T.P28 | b<br>SG1                                  | b<br>SG1    | b<br>SG1    | 12.0               | 12.0 | Variable | —   | a           | 5.8    | 6.8   | 9.0   | Vp-p  |
| Vimax  | Maximum allowable input                                     | T.P20<br>T.P24<br>T.P28 | b<br>SG1                                  | b<br>SG1    | b<br>SG1    | 12.0               | 6.0  | Variable | —   | a           | 1.9    | 2.4   | 2.9   | Vp-p  |
| Gv     | Maximum gain                                                | T.P20<br>T.P24<br>T.P28 | b<br>SG1                                  | b<br>SG1    | b<br>SG1    | 12.0               | 12.0 | VT       | —   | a           | 13.0   | 17.0  | 20.0  | dB    |
| ΔGv    | Relative maximum gain                                       |                         | Relative values to the measurements above |             |             |                    |      |          |     |             | 0.8    | 1.0   | 1.2   | —     |
| VCR1   | Contrast control characteristic (typ)                       | T.P20<br>T.P24<br>T.P28 | b<br>SG1                                  | b<br>SG1    | b<br>SG1    | 12.0               | 6.0  | VT       | —   | a           | 4.0    | 7.4   | 10.1  | dB    |
| ΔVCR1  | Relative contrast control characteristic (typ)              |                         | Relative values to the measurements above |             |             |                    |      |          |     |             | 0.8    | 1.0   | 1.2   | —     |
| VCR2   | Contrast control characteristic (min)                       | T.P20<br>T.P24<br>T.P28 | b<br>SG1                                  | b<br>SG1    | b<br>SG1    | 12.0               | 3.5  | VT       | —   | a           | 5      | 30.0  | 70.0  | mVp-p |
| ΔVCR2  | Relative contrast control characteristic (min)              |                         | Relative values to the measurements above |             |             |                    |      |          |     |             | 0.8    | 1.0   | 1.3   | —     |
| VSCR1  | Sub contrast control characteristic (typ)                   | T.P20<br>T.P24<br>T.P28 | b<br>SG1                                  | b<br>SG1    | b<br>SG1    | 6.0                | 12.0 | VT       | —   | a           | 9.9    | 14.0  | 18.1  | dB    |
| ΔVSCR1 | Relative sub contrast control characteristic (typ)          |                         | Relative values to the measurements above |             |             |                    |      |          |     |             | 0.8    | 1.0   | 1.2   | —     |
| VSCR2  | Sub contrast control characteristic (min)                   | T.P20<br>T.P24<br>T.P28 | b<br>SG1                                  | b<br>SG1    | b<br>SG1    | 3.0                | 12.0 | VT       | —   | a           | 100.0  | 300.0 | 860.0 | mVp-p |
| ΔVSCR2 | Relative sub contrast control characteristic (min)          |                         | Relative values to the measurements above |             |             |                    |      |          |     |             | 0.8    | 1.0   | 1.2   | —     |
| VCR3   | Contrast/Sub contrast control characteristic (typ)          | T.P20<br>T.P24<br>T.P28 | b<br>SG1                                  | b<br>SG1    | b<br>SG1    | 6.0                | 6.0  | VT       | —   | a           | 900    | 1300  | 1700  | mVp-p |
| ΔVCR3  | Relative contrast/sub contrast control characteristic (typ) |                         | Relative values to the measurements above |             |             |                    |      |          |     |             | 0.8    | 1.0   | 1.2   | —     |

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ELECTRICAL CHARACTERISTICS (cont.)

| Symbol | Parameter                                              | Test point              | Input                                     |             |            | External Supply (v) |      |                |     | Pulse input | Limits |      |       | Unit |
|--------|--------------------------------------------------------|-------------------------|-------------------------------------------|-------------|------------|---------------------|------|----------------|-----|-------------|--------|------|-------|------|
|        |                                                        |                         | SW10<br>R-ch                              | SW6<br>G-ch | SW<br>B-ch | V3                  | V13  | V15            | V26 | SW14        | Min.   | Typ. | Max.  |      |
| VB1    | Brightness control characteristic (max)                | T.P20<br>T.P24<br>T.P28 | a<br>—                                    | a<br>—      | a<br>—     | 12.0                | 12.0 | 5.5            | —   | b<br>SG6    | 3.6    | 4.3  | 5.0   | V    |
| ΔVB1   | Relative brightness control characteristic (max)       |                         | Relative values to the measurements above |             |            |                     |      |                |     |             | -100   | 0.0  | 100.0 | mV   |
| VB2    | Brightness control characteristic (typ)                | T.P20<br>T.P24<br>T.P28 | a<br>—                                    | a<br>—      | a<br>—     | 12.0                | 12.0 | 5.0            | —   | b<br>SG6    | 3.0    | 3.7  | 4.4   | V    |
| ΔVB2   | Relative brightness control characteristic (typ)       |                         | Relative values to the measurements above |             |            |                     |      |                |     |             | -100   | 0.0  | 100.0 | mV   |
| VB3    | Brightness control characteristic (min)                | T.P20<br>T.P24<br>T.P28 | a<br>—                                    | a<br>—      | a<br>—     | 12.0                | 12.0 | 4.5            | —   | b<br>SG6    | 2.5    | 3.2  | 4.0   | Vdc  |
| ΔVB3   | Relative brightness control characteristic (min)       |                         | Relative values to the measurements above |             |            |                     |      |                |     |             | -100   | 0.0  | 100.0 | mV   |
| VSB1   | Sub brightness control characteristic (max)            | T.P20<br>T.P24<br>T.P28 | a<br>—                                    | a<br>—      | a<br>—     | 12.0                | 12.0 | 5.0            | 4.0 | b<br>SG6    | 2.3    | 3.1  | 3.9   | Vdc  |
| VSB2   | Sub brightness control characteristic (min)            | T.P20<br>T.P24<br>T.P28 | a<br>—                                    | a<br>—      | a<br>—     | 12.0                | 12.0 | 5.0            | 3.5 | b<br>SG6    | 2.2    | 3.0  | 3.8   | Vdc  |
| Fc1    | Frequency characteristic I (f=50MHz,maximum)           | T.P20<br>T.P24<br>T.P28 | b<br>SG3                                  | b<br>SG3    | b<br>SG3   | 12.0                | 7.5  | V <sub>T</sub> | —   | a<br>—      | -2     | -1   | 3     | dB   |
| ΔFc1   | Relative frequency characteristic I (f=50MHz,maximum)  |                         | Relative values to the measurements above |             |            |                     |      |                |     |             | -1.0   | 0.0  | 1.0   | dB   |
| Fc1'   | Frequency characteristic I (f=100MHz,maximum)          | T.P20<br>T.P24<br>T.P28 | b<br>SG4                                  | b<br>SG4    | b<br>SG4   | 12.0                | 7.5  | V <sub>T</sub> | —   | a<br>—      | -3     | -2   | 3     | dB   |
| ΔFc1'  | Relative frequency characteristic I (f=100MHz,maximum) |                         | Relative values to the measurements above |             |            |                     |      |                |     |             | -1.0   | 0.0  | 1.0   | dB   |
| Fc2    | Frequency characteristic II (f=50MHz,maximum)          | T.P20<br>T.P24<br>T.P28 | b<br>SG3                                  | b<br>SG3    | b<br>SG3   | 12.0                | 6.5  | V <sub>T</sub> | —   | a<br>—      | -1     | 0    | 3     | dB   |
| Fc2'   | Frequency characteristic II (f=100MHz,maximum)         | T.P20<br>T.P24<br>T.P28 | b<br>SG4                                  | b<br>SG4    | b<br>SG4   | 12.0                | 6.5  | V <sub>T</sub> | —   | a<br>—      | -2.5   | 0    | 3     | dB   |
| Fc5    | Frequency characteristic III (f=50MHz,maximum)         | T.P20<br>T.P24<br>T.P28 | b<br>SG3                                  | b<br>SG3    | b<br>SG3   | 12.0                | 5.0  | V <sub>T</sub> | —   | a<br>—      | -0.5   | 0    | 2     | dB   |
| Fc5'   | Frequency characteristic III (f=100MHz,maximum)        | T.P20<br>T.P24<br>T.P28 | b<br>SG4                                  | b<br>SG4    | b<br>SG4   | 12.0                | 5.0  | V <sub>T</sub> | —   | a<br>—      | -0.5   | 0    | 2     | dB   |
| C.T.1  | Cross talk I (f=50MHz)                                 | T.P20<br>T.P24<br>T.P28 | b<br>SG3                                  | a<br>—      | a<br>—     | 12.0                | 12.0 | V <sub>T</sub> | —   | a<br>—      | —      | -32  | -20   | dB   |
| C.T.1' | Cross talk I (f=100MHz)                                | T.P20<br>T.P24<br>T.P28 | b<br>SG4                                  | a<br>—      | a<br>—     | 12.0                | 12.0 | V <sub>T</sub> | —   | a<br>—      | —      | -22  | -15   | dB   |
| C.T.2  | Cross talk II (f=50MHz)                                | T.P20<br>T.P24<br>T.P28 | a<br>—                                    | b<br>SG3    | a<br>—     | 12.0                | 12.0 | V <sub>T</sub> | —   | a<br>—      | —      | -32  | -20   | dB   |
| C.T.2' | Cross talk II (f=100MHz)                               | T.P20<br>T.P24<br>T.P28 | a<br>—                                    | b<br>SG4    | a<br>—     | 12.0                | 12.0 | V <sub>T</sub> | —   | a<br>—      | —      | -22  | -15   | dB   |

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ELECTRICAL CHARACTERISTICS (cont.)

| Symbol            | Parameter                           | Test point              | Input        |             |             | Exterminal Supply (v) |      |                |     | Pulse input | Limits |      |      | Unit             |
|-------------------|-------------------------------------|-------------------------|--------------|-------------|-------------|-----------------------|------|----------------|-----|-------------|--------|------|------|------------------|
|                   |                                     |                         | SW10<br>R-ch | SW6<br>G-ch | SW2<br>B-ch | V3                    | V13  | V15            | V26 | SW14        | Min.   | Typ. | Max. |                  |
| C.T.3             | Cross talk III (f=50MHz)            | T.P20<br>T.P24<br>T.P28 | a<br>—       | a<br>—      | b<br>SG3    | 12.0                  | 12.0 | V <sub>T</sub> | —   | a<br>—      | —      | -32  | -20  | dB               |
| C.T.3'            | Cross talk III (f=100MHz)           | T.P20<br>T.P24<br>T.P28 | a<br>—       | a<br>—      | b<br>SG4    | 12.0                  | 12.0 | V <sub>T</sub> | —   | a<br>—      | —      | -22  | -15  | dB               |
| T <sub>r</sub>    | Pulse characteristic I              | T.P20<br>T.P24<br>T.P28 | b<br>SG5     | b<br>SG5    | b<br>SG5    | 12.0                  | 7.0  | 3.0            | —   | b<br>SG6    | —      | 2    | 6    | nsec             |
| T <sub>f</sub>    | Pulse characteristic II             | T.P20<br>T.P24<br>T.P28 | b<br>SG5     | b<br>SG5    | b<br>SG5    | 12.0                  | 7.0  | 3.0            | —   | b<br>SG6    | —      | 5    | 8    | nsec             |
| V <sub>14th</sub> | Clamp pulse threshold voltage       | T.P20<br>T.P24<br>T.P28 | a<br>—       | a<br>—      | a<br>—      | 12.0                  | 12.0 | 3.0            | —   | b<br>SG6    | 0.7    | 1.5  | 2.5  | V <sub>bcc</sub> |
| W <sub>14</sub>   | Clamp pulse operating minimum width | T.P20<br>T.P24<br>T.P28 | a<br>—       | a<br>—      | a<br>—      | 12.0                  | 12.0 | 3.0            | —   | b<br>SG6    | —      | 0.3  | 1.5  | μsec             |
| V <sub>27</sub>   | Hold voltage                        | T.P20<br>T.P24<br>T.P28 | a<br>—       | a<br>—      | a<br>—      | 12.0                  | 12.0 | 3.0            | —   | b<br>SG6    | 4.0    | 5.2  | 6.4  | V <sub>bcc</sub> |

Note 1. Only external power supply switch numbers will be mentioned in the electrical characteristic testing procedure described below, because the signal input pin switch numbers and pulse input pin switch numbers are specified in the electrical characteristic table.  
2. Sub brightness voltages V18, V22, V26 are always set to the same level, and V26 represents the other two in the electrical characteristic table. Sub contrast voltages V3, V7, V11 are also always set to the same level, therefore V3 represents the other two in the table.

ELECTRICAL CHARACTERISTIC TEST METHOD

I<sub>cc</sub>

1. Set SW18, SW22, SW26 to "b."
2. Set other conditions as specified in the electrical characteristic table. Set SW1 to "a" and measure current with ammeter A.

V<sub>o max</sub>

1. Set SW18, SW22, SW26 to "b."
2. Set V15 in the following procedure.
  - a) Input SG1 to pin ⑩ (pin ⑥, pin ②). Increase V15 gradually, and read V15 when T.P20(T.P24, T.P28) output waveform peak distortion starts. This voltage is referred to as V<sub>TR1</sub>(V<sub>TG1</sub>, V<sub>TB1</sub>).  
Next, decrease V15 gradually, and read V15 when T.P20(T.P24, T.P28) output waveform pedestal distortion starts. This voltage is referred to as V<sub>TR2</sub>(V<sub>TG2</sub>, V<sub>TB2</sub>).

- b) V<sub>T</sub> (V<sub>TR</sub>, V<sub>TG</sub>, V<sub>TB</sub>) can be calculated with the measured voltages, as follows:

$$V_{TR} (V_{TG}, V_{TB}) = \frac{V_{TR1}(V_{TG1}, V_{TB1}) + V_{TR2}(V_{TG1}, V_{TB1})}{2}$$

Use adequate voltages according to the output pin: 250

T.P20 output is tested → V<sub>TR1</sub>  
T.P24 output is tested → V<sub>TG1</sub>  
T.P28 output is tested → V<sub>TB</sub>

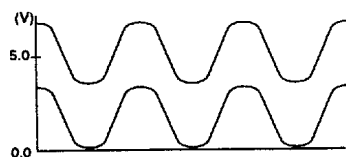
3. After setting V<sub>TR</sub> (V<sub>TG</sub>, V<sub>TB</sub>), increase SG1 amplitude gradually starting from 700mV, and read output amplitude when T.P20(T.P24, T.P28) output waveform peak and pedestal distortion starts.

V<sub>i max</sub>

Starting from a V<sub>o max</sub> state, change V13 to 6.0 V as specified in the electrical characteristic table. Increase input signal amplitude gradually, starting from 700 mV<sub>P-P</sub>, and read input signal amplitude when output signal distortion starts.

G<sub>v</sub> and ΔG<sub>v</sub>

1. SW18, SW22, SW26 are all set to "b." Other conditions are as specified in the electric characteristic table.
2. Input SG1 to pin ⑩ (pin ⑥, pin ②), and read output amplitude of T.P20 (T.P24, T.P28). The amplitude is referred to as V<sub>OR1</sub> (V<sub>OG1</sub> or V<sub>OB1</sub>).



T.P20 Output Waveform (T.P24 and T.P28 waveforms are the same.)

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3. Maximum gain  $G_v$  is calculated using the equation shown below:

$$G_v = 20 \log \frac{V_{OR1}(V_{OG1}, V_{OB1})[V_{P-P}]}{0.7[V_{P-P}]}$$

4. Relative maximum gain  $\Delta G_v$  is calculated using the equation shown below:

**VCR1 and  $\Delta VCR1$**

1. Test conditions are the same as specified in the electrical characteristic table, except that V13 is set to 6.0 V.
2. Read T.P20(T.P24, T.P28) amplitude. This amplitude is referred to as  $V_{OR2}$  ( $V_{OG2}, V_{OB2}$ ).
3. Contrast control characteristic  $VCR1$  and relative contrast control characteristic  $\Delta VCR1$  are calculated as shown below:

$$VCR1 = 20 \log \frac{V_{OR2}(V_{OG2}, V_{OB2})[V_{P-P}]}{0.7[V_{P-P}]}$$

$$\Delta VCR1 = V_{OR2}/V_{OG2}, V_{OG2}/V_{OB2}, V_{OB2}/V_{OR1}$$

**VCR2 and  $\Delta VCR2$**

1. Test conditions are the same as specified in the electrical characteristic table, except that V13 is set to 3.0 V.
2. Read T.P20(T.P24, T.P28) amplitude. This amplitude is referred to as  $V_{OR3}$  ( $V_{OG3}, V_{OB3}$ ), and is evaluated as  $VCR2$ .
3. Relative contrast control characteristic  $\Delta VCR2$  is calculated as follows:

$$\Delta VCR2 = V_{OR3}/V_{OG3}, V_{OG3}/V_{OB3}, V_{OB3}/V_{OR3}$$

**VSCR1 and  $\Delta VSCR1$**

1. Test conditions are the same as specified in the electrical characteristic table, except that V3, V7 and V11 are set to 6.0 V.
2. Read T.P20(T.P24, T.P28) amplitude. This amplitude is called  $V_{OR4}$  ( $V_{OG4}, V_{OB4}$ ).
3. Sub contrast control characteristic  $VSCR1$  and relative sub contrast control characteristic  $\Delta VSCR1$  are calculated as shown below:

$$VSCR1 = 20 \log \frac{V_{OR4}(V_{OG4}, V_{OB4})[V_{P-P}]}{0.7[V_{P-P}]}$$

$$\Delta VSCR1 = V_{OR4}/V_{OG4}, V_{OG4}/V_{OB4}, V_{OB4}/V_{OR4}$$

**VSCR2 and  $\Delta VSCR2$**

1. Test conditions are the same as specified in the electrical characteristic table, except that V3, V7 and V11 are set to 3.0 V.
2. Read T.P20(T.P24, T.P28) amplitude. This amplitude is called  $V_{OR5}$  ( $V_{OG5}, V_{OB5}$ ), is evaluated as  $VSCR2$ .
3. Relative contrast control characteristic  $\Delta VSCR2$  is calculated as shown below:

$$\Delta VSCR2 = V_{OR5}/V_{OG5}, V_{OG5}/V_{OB5}, V_{OB5}/V_{OR5}$$

**VCR3 and  $\Delta VCR3$**

1. Test conditions are the same as specified in the electrical characteristic table, except that V3, V7 and V11 are set to 6.0 V and V13 to 6.0 V.
2. Read T.P20(T.P24, T.P28) amplitude. This amplitude is called  $V_{OR6}$  ( $V_{OG6}, V_{OB6}$ ).
3. The gain and relative gain of contrast and sub contrast controls at the standard level are calculated as shown below:

$$VCR3 = 20 \log \frac{V_{OR6}(V_{OG6}, V_{OB6})[V_{P-P}]}{0.7[V_{P-P}]}$$

$$\Delta VCR3 = V_{OR6}/V_{OG6}, V_{OG6}/V_{OB6}, V_{OB6}/V_{OR6}$$

**VB1 and  $\Delta VB1$**

1. SW18, SW22 and SW26 are set to "b." Other test conditions are the same as specified in the electrical characteristic table.
2. Read T.P20(T.P24, T.P28) output amplitude. This amplitude is called  $V_{OR7}$  ( $V_{OG7}, V_{OB7}$ ), and is evaluated as  $VB1$ .
3. The relative brightness control characteristic is obtained by calculating the difference among the channels with  $V_{OR7}$ ,  $V_{OG7}$  and  $V_{OB7}$ .

$$\begin{aligned} \Delta VB1 &= V_{OR7} - V_{OG7} \text{ [mV]} \\ &= V_{OG7} - V_{OB7} \\ &= V_{OB7} - V_{OR7} \end{aligned}$$

**VB2 and  $\Delta VB2$**

1. SW18, SW22 and SW26 are set to "b." Other test conditions are the same as specified in the electrical characteristic table.
2. Read T.P20(T.P24, T.P28) output amplitude. This amplitude is called  $V_{OR7'}$  ( $V_{OG7'}$ ,  $V_{OB7'}$ ), and is evaluated as  $VB2$ .
3. Relative brightness control characteristic  $\Delta VB2$  is obtained by calculating the difference among the channels with  $V_{OR7'}$ ,  $V_{OG7'}$  and  $V_{OB7'}$ .

$$\begin{aligned} \Delta VB2 &= V_{OR7'} - V_{OG7'} \text{ [mV]} \\ &= V_{OG7'} - V_{OB7'} \\ &= V_{OB7'} - V_{OR7'} \end{aligned}$$

**VB3 and  $\Delta VB3$**

1. SW18, SW22 and SW26 are set to "b." Other test conditions are as specified in the electrical characteristic table.
2. Read T.P20(T.P24, T.P28) output amplitude. This amplitude is called  $V_{OR7''}$  ( $V_{OG7''}$ ,  $V_{OB7''}$ ), and is evaluated as  $VB3$ .
3. The relative brightness control characteristic is obtained by calculating the difference among the channels with  $V_{OR7''}$ ,  $V_{OG7''}$  and  $V_{OB7''}$ .

$$\begin{aligned} \Delta VB3 &= V_{OR7''} - V_{OG7''} \\ &= V_{OG7''} - V_{OB7''} \\ &= V_{OB7''} - V_{OR7''} \end{aligned}$$

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**VSB1 and VSB2**

Set SW18, SW22 and SW26 to "a.", and set SUB BRIGHT (V18, V22 and V26) to 4.0 V or 3.5 V. Other conditions are the same as for  $V_{B1}$  and  $\Delta V_{B1}$  test conditions, except that step 3 in the  $V_{B1}$  and  $\Delta V_{B1}$  test procedure does not apply.

**FC1,  $\Delta FC1$ , FC1' and  $\Delta FC1'$** 

1. Set SW18, SW22 and SW26 to "b." Other test conditions are as specified in the electrical characteristic table.
2. SG3 and SG4 are input. Measure T.P20 (T.P24 or T.P28) output amplitude in the same way as  $G_v$  and  $\Delta G_v$  testing procedure.
3. This measured value is referred to as:  
Output amplitude  $V_{OR1}$  ( $V_{OG1}, V_{OB1}$ ) (when SG1 is input),  
Output amplitude  $V_{OR3}$  ( $V_{OG3}, V_{OB3}$ ) (when SG3 is input), or  
Output amplitude  $V_{OR4}$  ( $V_{OG4}, V_{OB4}$ ) (when SG4 is input),  
Frequency characteristics  $FC1$  and  $FC1'$  are calculated as follows:

$$FC1 = 20 \log \frac{V_{OR3}(V_{OG3}, V_{OB3})[VP-P]}{V_{OR1}(V_{OG1}, V_{OB1})[VP-P]}$$

$$FC1' = 20 \log \frac{V_{OR4}(V_{OG4}, V_{OB4})[VP-P]}{V_{OR1}(V_{OG1}, V_{OB1})[VP-P]}$$

4. To obtain relative frequency characteristics  $\Delta FC1$  and  $\Delta FC1'$ , calculate difference between  $FC1$  and  $FC1'$  for each channel.

**FC2 and FC2'**

The testing conditions are the same as those for testing  $FC1$ ,  $\Delta FC1$ ,  $FC1'$  and  $\Delta FC1'$ , except that CONTRAST (V13) is set to 6.5 V.

**FC3 and FC3'**

The testing conditions are the same as those for testing in the  $FC1$ ,  $\Delta FC1$ ,  $FC1'$  and  $\Delta FC1'$ , except that CONTRAST (V13) is set to 4.5 V.

**C.T.1 and C.T.1'**

1. Set SW18, SW22 and SW26 to "b." Other test conditions are as specified in the electrical characteristic table.
2. Input SG3 (or SG4) to pin ⑩ (R-ch) only, and measure T.P20 (T.P24, T.P28) output waveform amplitude. The measurement is called  $V_{OR}$  ( $V_{OG}, V_{OB}$ ).
3. Cross talk C.T.1 is calculated as shown below:

$$\frac{C.T.1}{(C.T.1')} = 20 \log \frac{V_{OG} \text{ or } V_{OB} [VP-P]}{V_{OR}[VP-P]} \quad [dB]$$

**C.T.2 and C.T.2'**

1. Change input from pin ⑩ (R-ch) to pin ⑥ (G-ch). Read output in the same manner as that for C.T.1 and C.T.1'.
2. Cross talk C.T.2 is calculated as shown below:

$$\frac{C.T.2}{(C.T.2')} = 20 \log \frac{V_{OR} \text{ or } V_{OB} [VP-P]}{V_{OG}[VP-P]} \quad [dB]$$

**C.T.3 and C.T.3'**

1. Change input from pin ⑩ (R-ch) to pin ② (B-ch). Read output in the same manner as that for C.T.1 and C.T.1'.

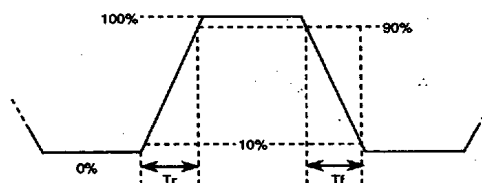
$$\frac{C.T.3}{(C.T.3')} = 20 \log \frac{V_{OR} \text{ or } V_{OG} [VP-P]}{V_{OB}[VP-P]} \quad [dB]$$

**Tr and Tf**

1. SW18, SW22 and SW26 are set to "b." Other test conditions are as specified in the electrical characteristic table.
2. Read rise time  $Tr1$  and fall time  $Tf1$  with an active probe, while input pulse is fluctuating between 10%~90%.
3. Read rise time  $Tr2$  and fall time  $Tf2$  with an active probe, while changing output pulse between 10%~90%.
4. Pulse characteristics  $Tr$  and  $Tf$  are calculated as follows:

$$Tr (ns) = \sqrt{(Tr2)^2 - (Tr1)^2}$$

$$Tf (ns) = \sqrt{(Tf2)^2 - (Tf1)^2}$$

**V14th**

1. SW18, SW22 and SW26 are set to "b." Other test conditions are as specified in the electrical characteristic table.
2. Monitoring output (2.0 Vcc), lower the SG6 level, and measure the level when output is 0 V.

**WIDEBAND 3-CHANNEL VIDEO AMPLIFIER****W14**

Under the same conditions as for V14th measurement, decrease SG6 pulse gradually, monitoring output.

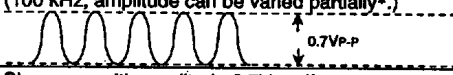
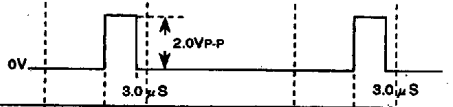
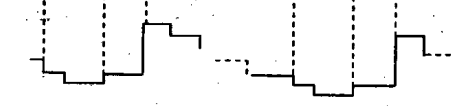
Measure the SG6 pulse width when output is 0 V.

**V27**

1. Set SW18, SW22 and SW26 to "b."

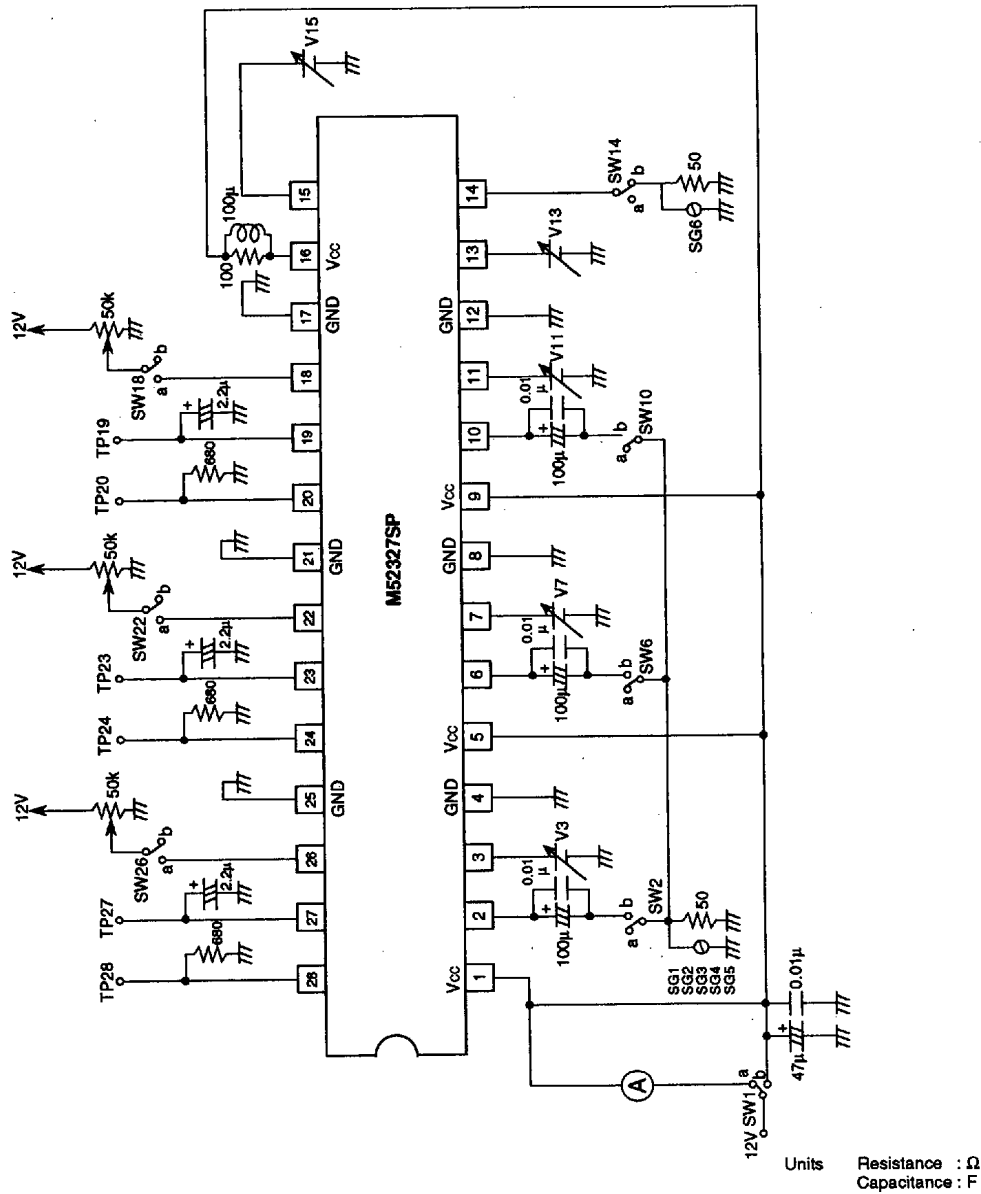
2. Read T.P19, T.P23 and T.P27 outputs with voltmeter.

**INPUT SIGNAL**

| SG No.                                | Input signal                                                                                                                                                                                       |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SG1                                   | Sine wave with amplitude 0.7V <sub>P-P</sub><br>(100 kHz, amplitude can be varied partially*).<br>                |
| SG2                                   | Sine wave with amplitude 0.7V <sub>P-P</sub> (f = 10MHz)                                                                                                                                           |
| SG3                                   | Sine wave with amplitude 0.7V <sub>P-P</sub> (f = 50MHz)                                                                                                                                           |
| SG4                                   | Sine wave with amplitude 0.7V <sub>P-P</sub> (f = 100MHz)                                                                                                                                          |
| SG5                                   | Square wave with amplitude 0.7 V <sub>P-P</sub> (f = 1 MHz, duty = 50%)<br>                                       |
| SG6                                   | Pulse (amplitude 2.0 V <sub>P-P</sub> and pulse width 3.0 μs).<br>Synchronous with standard video staircase.<br> |
| SG7<br>standard<br>video<br>staircase |                                                                                                                 |

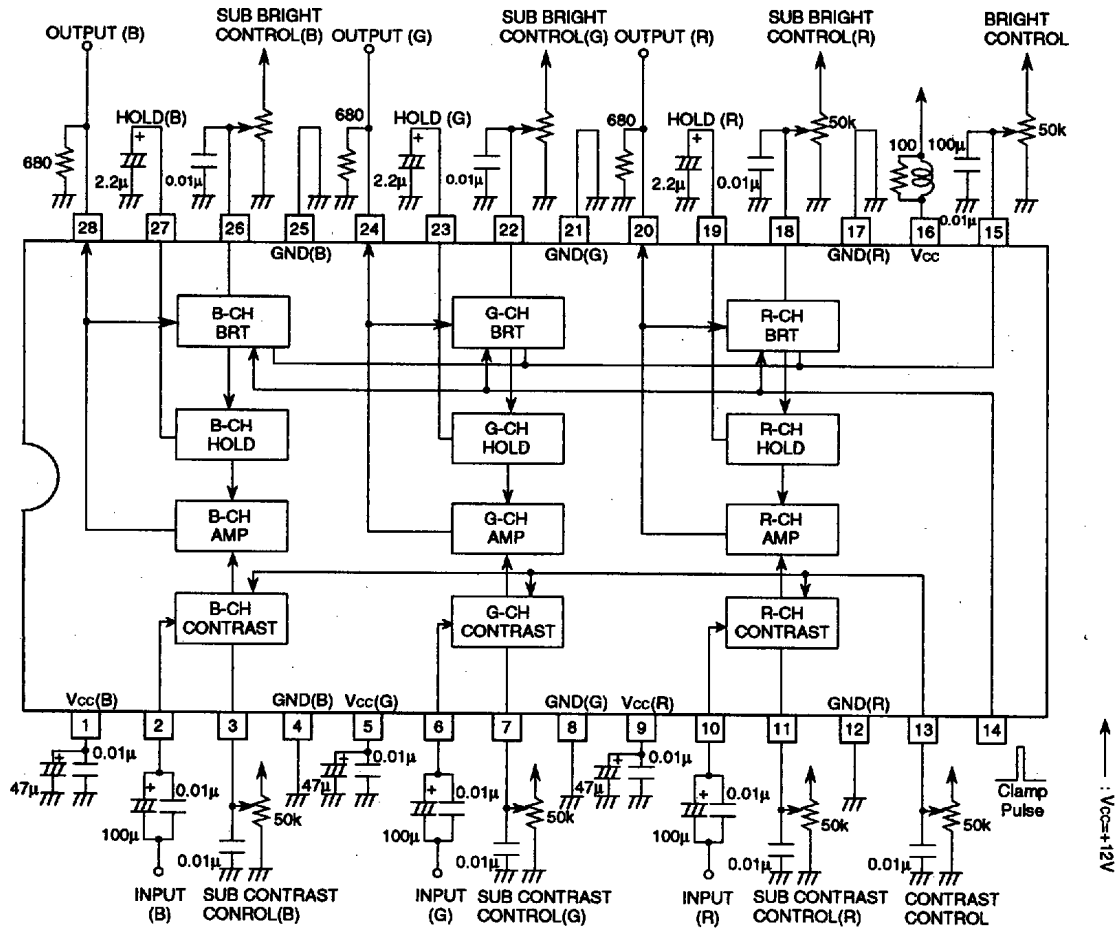
\*Refer to the electrical characteristic test procedure.

## TEST CIRCUIT



WIDEBAND 3-CHANNEL VIDEO AMPLIFIER

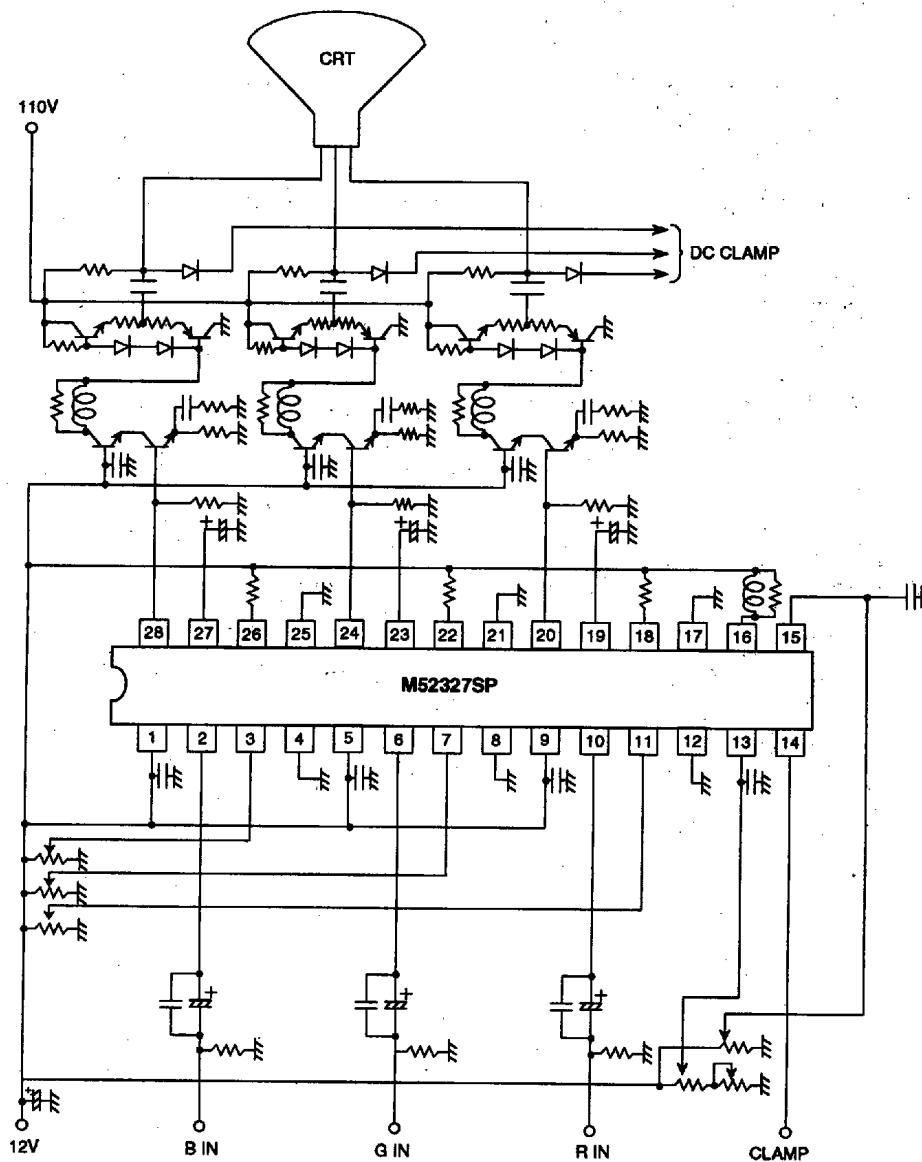
APPLICATION EXAMPLE 1



Units Resistance:  $\Omega$   
Capacitance: F

WIDEBAND 3-CHANNEL VIDEO AMPLIFIER

APPLICATION EXAMPLE 2



Units Resistance:  $\Omega$   
Capacitance: F

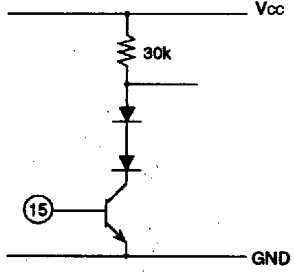
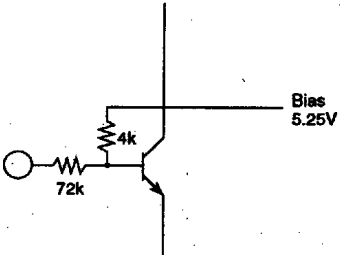
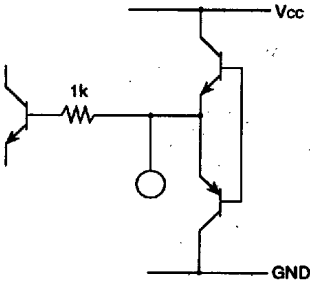
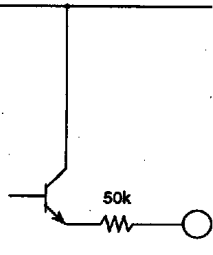
WIDEBAND 3-CHANNEL VIDEO AMPLIFIER

DESCRIPTION OF PIN

| Pin No.     | Name                                               | Voltage and wave information | Peripheral circuit of pins | Remark                                  |
|-------------|----------------------------------------------------|------------------------------|----------------------------|-----------------------------------------|
| ①<br>⑤<br>⑨ | VCC (B-ch)<br>VCC (G-ch)<br>VCC (R-ch)             | 12V                          | —                          | Apply equivalent voltage to 3 channels. |
| ②<br>⑥<br>⑩ | B-IN<br>G-IN<br>R-IN                               | 2.9V                         |                            | —                                       |
| ③<br>⑦<br>⑪ | B SUB CONTRAST<br>G SUB CONTRAST<br>R SUB CONTRAST | 4.0V                         |                            | —                                       |
| ④<br>⑧<br>⑫ | GND(B-ch)<br>GND(G-ch)<br>GND(R-ch)                | GND                          | —                          | —                                       |
| ⑬           | CONTRAST                                           | 6.9V                         |                            | —                                       |
| ⑭           | CLAMP PULSE                                        | —                            |                            | —                                       |

WIDEBAND 3-CHANNEL VIDEO AMPLIFIER

DESCRIPTION OF PIN (cont.)

| Pin No.     | Name                                         | Voltage and wave information | Peripheral circuit of pins                                                           | Remark                                                                                                                             |
|-------------|----------------------------------------------|------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| ⑮           | BRIGHT                                       | —                            |    | —                                                                                                                                  |
| ⑯           | Vcc                                          | 12V                          | —                                                                                    | —                                                                                                                                  |
| ⑰<br>⑳<br>㉑ | R SUB BRIGHT<br>G SUB BRIGHT<br>B SUB BRIGHT | —                            |   | —                                                                                                                                  |
| ㉒<br>㉓<br>㉔ | R HOLD<br>G HOLD<br>B HOLD                   | Variable                     |  | —                                                                                                                                  |
| ㉕<br>㉖<br>㉗ | R OUT<br>G OUT<br>B OUT                      | Variable                     |  | Resistance is necessary on the GND side. Set the resistance for current to be no more than 15mA, according to the driver capacity. |

# WIDEBAND 3-CHANNEL VIDEO AMPLIFIER

## APPLICATION INSTRUCTIONS

### 1) Clamp pulse input

The clamp pulse is wired as shown in the illustration.

The inputs are:

$V_{TH} = 2.2V - \text{Diode} \times 1$

$V_{TH} = 1.5V$

Voltage in excess of 2.2V is suppressed. The recommended voltage level is as shown in the illustration.

The recommended pulse width is as follows:

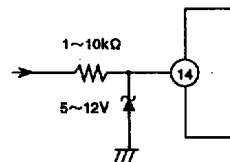
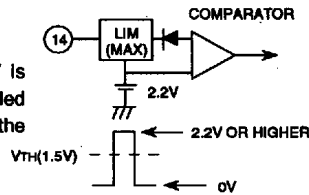
1.0  $\mu$  sec or more at 15 kHz

0.5  $\mu$  sec or more at 30 kHz

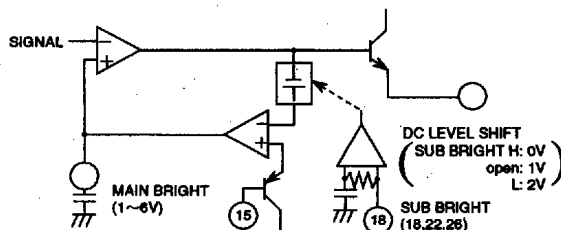
0.3  $\mu$  sec or more at 64 kHz

The clamp pulse wiring is usually long in TV sets. It is sometimes led from the high voltage side, or connected indirectly to an external pin.

Under such conditions, the wiring may possibly be exposed to high surge voltage. It is recommended that a safety circuit be provided as shown in the illustration on the right.



### 2) Main/sub brightness control

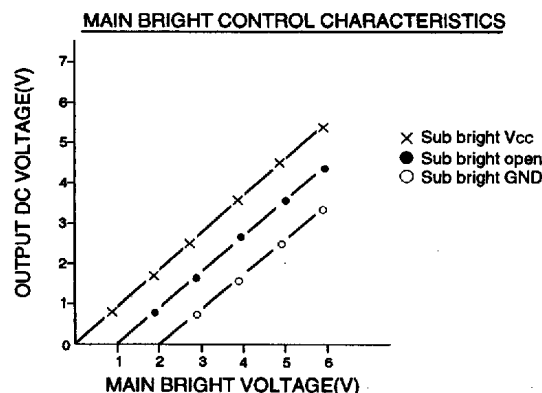


The mechanism is as shown in the illustration above. While M51387P has a sub brightness pin built directly in the signal feedback group, this IC has the pin built indirectly, preventing signal output to the sub brightness pin.

### 2-1) Main brightness pin

Use in a range between 1V~6V.

The control characteristics are as shown below:



### 2-2) Sub brightness pin

As described above, this pin's internal layout is completely different from that of M51387P.

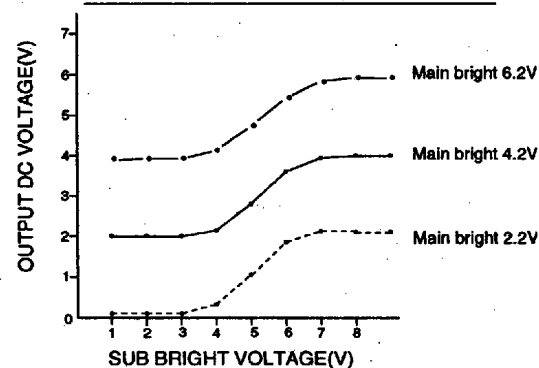
a) When sub brightness control is set to be unvariable:

Set all control pins to Vcc. If external voltage may interfere with the sub brightness pin due to the circuit board layout and this may influence IC output, consider adding bypass capacitors.

b) When sub brightness control is set to be variable:

Control characteristics are as shown below:

### SUB BRIGHT CONTROL CHARACTERISTICS



### 2-3) Hold capacitor capacitance

Capacitance of no less than 1,000 pF is required when f<sub>H</sub> is 15 kHz. However, the required capacitance varies depending on the hold period (operating period except during clamping). Larger capacitance may be necessary if the hold period is longer.

The smaller the capacitance, the quicker the response, and the larger the capacitance, the stable the response. Set the capacitance according to clamp pulse conditions (especially vertical sync timing pulse conditions).

### M52327SP Cross talk

Measuring conditions

Main: Contrast pin voltage 12V

Sub: Contrast pin voltage 12V

Main: Brightness pin voltage 5V

Sub: Brightness pin voltage Open

Input signal 0.7 V<sub>P-P</sub> sine wave

|     |     | Input frequency |       |       |        | Unit |
|-----|-----|-----------------|-------|-------|--------|------|
|     |     | 10MHz           | 50MHz | 75MHz | 100MHz |      |
| CT1 | R→G | -45             | -29   | -23   | -18    | dB   |
|     | R→B | -60             | -38   | -30   | -20    | dB   |
| CT2 | G→R | -60             | -34   | -23   | -18    | dB   |
|     | G→B | -45             | -26   | -20   | -18    | dB   |
| CT3 | B→R | -65             | -35   | -23   | -19    | dB   |
|     | B→G | -60             | -40   | -29   | -26    | dB   |

WIDEBAND 3-CHANNEL VIDEO AMPLIFIER

Cross talk CT1 inputs signals only to pin ⑩ (R-ch). The output waveform amplitudes at pin ②, ④ and ⑥ are called, respectively, V<sub>OR</sub>, V<sub>OG</sub> and V<sub>OB</sub>.

$$CT1 = 20 \log_{10} \frac{V_{OG} \text{ or } V_{OB}}{V_{OR}} \quad [\text{dB}]$$

Cross talk CT2 can be calculated in the same way, except that signals are input to pin ⑥ (G-ch).

$$CT2 = 20 \log_{10} \frac{V_{OR} \text{ or } V_{OB}}{V_{OG}} \quad [\text{dB}]$$

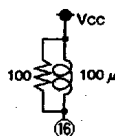
Cross talk CT3 can be calculated in the same way, except that signals are input to pin ② (B-ch).

$$CT3 = 20 \log_{10} \frac{V_{OR} \text{ or } V_{OG}}{V_{OB}} \quad [\text{dB}]$$

**CIRCUIT BOARD PRODUCTION INSTRUCTIONS**

This IC has a built-in wideband amplifier, therefore oscillation may be generated depending on the circuit board wiring layout. Follow the instructions listed below to prevent it.

- Make wiring between output pin and resistance as short as possible.
- Minimize output pin loading capacitance.
- Provide V<sub>CC</sub>-GND-line and DC-line bypass capacitors close to the pin.
- Use a stable supply for V<sub>CC</sub>. (The four supplies are desired to be independent of each other.)
- To reduce oscillation, connect a resistance of dozens of ohms between each output pin and the next stage.
- Connecting a coil and a resistor to pin ⑩ V<sub>CC</sub> may also be effective depending on the circuit board.



- Check if signals are not deviated from the power stage.
- GND should be as wide as possible. It should be an allover spread GND pattern as a matter of rule.
- Hold capacitance should be connected to stable GND to be as close to the pin as possible.

**IC OPERATION REMARKS**

- It is recommended to control pedestal voltage between 2V ~ 3 V for reduction of distortion.
- Apply sufficiently low impedance to each input.