

# Video signal switcher

## BA7649A / BA7649AF

The BA7649A and BA7649AF are five-channel analog multiplexers (the IN5 pin can be used a mute input) designed for use in video cassette recorders. They feature large dynamic range, and wide operating frequency range, and have sync-tip inputs which are ideal for switching video signals.

### ● Applications

Video cassette recorders and televisions

### ● Features

- 1) 5-input / 1-output switches.
- 2) Built-in mute (the IN5 pin can be used a mute input).
- 3) Sync-tip clamp inputs.
- 4) Wide operating supply voltage range (4.5V to 13.0V).
- 5) Low power consumption (48mW Typ.).
- 6) Excellent frequency characteristics (10MHz, 0dB Typ.).
- 7) Wide dynamic range (3.5V<sub>P-P</sub> Typ.).
- 8) Low interchannel crosstalk (– 65dB Typ., f = 4.43MHz).
- 9) DIP / SOP 14 pin package.

### ● Absolute maximum ratings (Ta = 25°C)

BA7649A

| Parameter             | Symbol           | Limits       | Unit |
|-----------------------|------------------|--------------|------|
| Power supply voltage  | V <sub>cc</sub>  | 13.5         | V    |
| Allowable current     | P <sub>d</sub>   | 1100*        | mW   |
| Operating temperature | T <sub>opr</sub> | – 25 ~ + 75  | °C   |
| Storage temperature   | T <sub>stg</sub> | – 55 ~ + 125 | °C   |

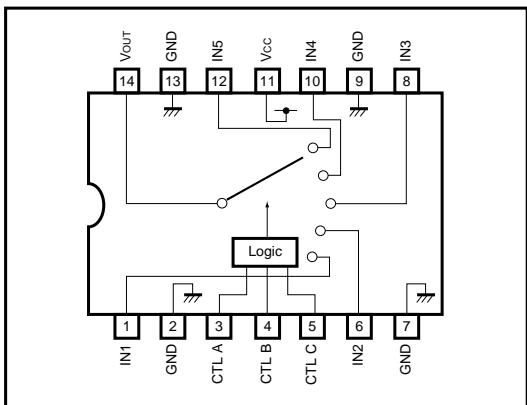
\* Reduced by 11.0mW for each increase in Ta of 1°C over 25°C.

BA7649AF

| Parameter             | Symbol           | Limits       | Unit |
|-----------------------|------------------|--------------|------|
| Power supply voltage  | V <sub>cc</sub>  | 13.5         | V    |
| Allowable current     | P <sub>d</sub>   | 450*         | mW   |
| Operating temperature | T <sub>opr</sub> | – 25 ~ + 75  | °C   |
| Storage temperature   | T <sub>stg</sub> | – 55 ~ + 125 | °C   |

\* Reduced by 4.5mW for each increase in Ta of 1°C over 25°C when mounted on a 50mm × 50mm PCB board.

## ● Block diagram

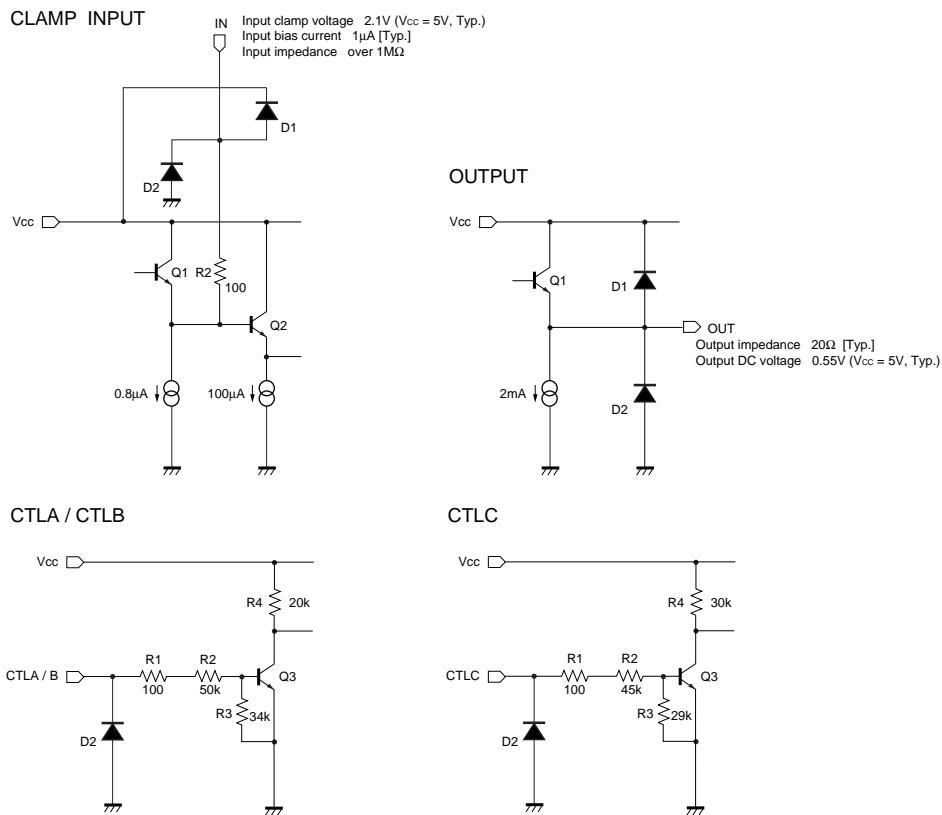


### ● Truth table

| CTLA     | CTLB     | CTLC     | OUT        |
|----------|----------|----------|------------|
| L (OPEN) | L (OPEN) | L (OPEN) | IN1        |
| L (OPEN) | H        | L (OPEN) | IN2        |
| H        | L (OPEN) | L (OPEN) | IN3        |
| H        | H        | L (OPEN) | IN4        |
| *        | *        | H        | MUTE (IN5) |

\* Either "L (open)" or "H".

## ● Equivalent circuits



- Electrical characteristics (unless otherwise noted,  $T_a = 25^\circ\text{C}$  and  $V_{cc} = 5\text{V}$ )

| Parameter                 | Symbol            | Min. | Typ. | Max. | Unit             | Conditions   |
|---------------------------|-------------------|------|------|------|------------------|--|
| Operating voltage         | V <sub>CC</sub>   | 4.5  | —    | 13.0 | V                | —  |
| Supply current            | I <sub>CC</sub>   | —    | 9.5  | 14.5 | mA               | —  |
| Maximum output level      | V <sub>OM</sub>   | 3.0  | 3.5  | —    | V <sub>P-P</sub> | f = 1kHz, THD = 0.5%                                       |
| Voltage gain              | G <sub>V</sub>    | -0.5 | 0    | 0.5  | dB               | f = 1MHz, V <sub>IN</sub> = 1.0V <sub>P-P</sub>            |
| Interchannel crosstalk    | C <sub>T</sub>    | —    | -65  | —    | dB               | f = 4.43MHz,<br>V <sub>IN</sub> = 1.0V <sub>P-P</sub>      |
| Frequency characteristics | G <sub>f</sub>    | -3.0 | 0    | 1.0  | dB               | f = 10MHz / 1MHz,<br>V <sub>IN</sub> = 1.0V <sub>P-P</sub> |
| CTL pin switching level A | V <sub>TH-A</sub> | 1.0  | 2.0  | 3.0  | V                | —  |
| CTL pin switching level B | V <sub>TH-B</sub> | 1.0  | 2.0  | 3.0  | V                | —  |
| CTL pin switching level C | V <sub>TH-C</sub> | 1.0  | 2.0  | 3.0  | V                | —  |

○Not designed for radiation resistance.

### ● Measurement circuit

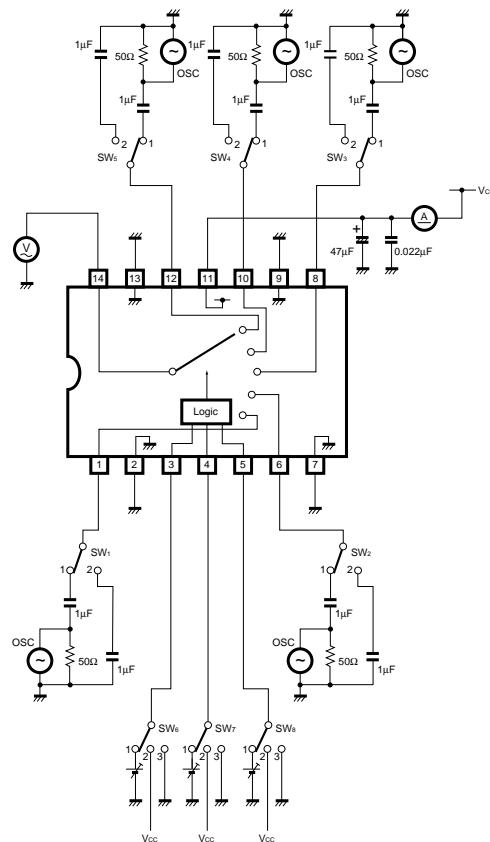


Fig. 1

## ● Measurement conditions

| Parameter                |         | Symbol          | Switch settings |     |     |     |     |     |     |     | Measurement method   |
|--------------------------|---------|-----------------|-----------------|-----|-----|-----|-----|-----|-----|-----|--|
|                          |         |                 | SW1             | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 | SW8 |  |
| Current dissipation      |         | I <sub>CC</sub> | 2               | 2   | 2   | 2   | 2   | 3   | 3   | 3   | Ammeter  |
| Maximum output level     | IN 1    | V <sub>om</sub> | 1               | 2   | 2   | 2   | 2   | 3   | 3   | 3   | f = 1kHz,<br>THD = 0.5%<br>Note 1  |
|                          | IN 2    | V <sub>om</sub> | 2               | 1   | 2   | 2   | 2   | 3   | 2   | 3   |  |
|                          | IN 3    | V <sub>om</sub> | 2               | 2   | 1   | 2   | 2   | 2   | 3   | 3   |  |
|                          | IN 4    | V <sub>om</sub> | 2               | 2   | 2   | 1   | 2   | 2   | 2   | 3   |  |
|                          | IN 5    | V <sub>om</sub> | 2               | 2   | 2   | 2   | 1   | *   | *   | 2   |  |
| Voltage gain             | IN 1    | G <sub>V</sub>  | 1               | 2   | 2   | 2   | 2   | 3   | 3   | 3   | f = 1MHz,<br>V <sub>IN</sub> = 1V <sub>P-P</sub><br>Note 2               |
|                          | IN 2    | G <sub>V</sub>  | 2               | 1   | 2   | 2   | 2   | 3   | 2   | 3   |  |
|                          | IN 3    | G <sub>V</sub>  | 2               | 2   | 1   | 2   | 2   | 2   | 3   | 3   |  |
|                          | IN 4    | G <sub>V</sub>  | 2               | 2   | 2   | 1   | 2   | 2   | 2   | 3   |  |
|                          | IN 5    | G <sub>V</sub>  | 2               | 2   | 2   | 2   | 1   | *   | *   | 2   |  |
| Interchannel crosstalk   | IN1→1N2 | C <sub>T</sub>  | 1               | 2   | 2   | 2   | 2   | 3   | 2   | 3   | f = 4.43MHz,<br>V <sub>IN</sub> = 1V <sub>P-P</sub><br>Note 3            |
|                          | IN1→1N3 | C <sub>T</sub>  | 1               | 2   | 2   | 2   | 2   | 2   | 3   | 3   |  |
|                          | IN1→1N4 | C <sub>T</sub>  | 1               | 2   | 2   | 2   | 2   | 2   | 2   | 3   |  |
|                          | IN1→1N5 | C <sub>T</sub>  | 1               | 2   | 2   | 2   | 2   | *   | *   | 2   |  |
|                          | IN2→1N3 | C <sub>T</sub>  | 2               | 1   | 2   | 2   | 2   | 2   | 3   | 3   |  |
|                          | IN2→1N4 | C <sub>T</sub>  | 2               | 1   | 2   | 2   | 2   | 2   | 2   | 3   |  |
|                          | IN2→1N5 | C <sub>T</sub>  | 2               | 1   | 2   | 2   | 2   | *   | *   | 2   |  |
|                          | IN3→1N4 | C <sub>T</sub>  | 2               | 2   | 1   | 2   | 2   | 2   | 2   | 3   |  |
|                          | IN3→1N5 | C <sub>T</sub>  | 2               | 2   | 1   | 2   | 2   | *   | *   | 2   |  |
|                          | IN4→1N5 | C <sub>T</sub>  | 2               | 2   | 2   | 1   | 2   | *   | *   | 2   |  |
| Frequency characteristic | IN 1    | G <sub>f</sub>  | 1               | 2   | 2   | 2   | 2   | 3   | 3   | 3   | f = 10MHz,<br>f = 1MHz,<br>V <sub>IN</sub> = 1V <sub>P-P</sub><br>Note 4 |
|                          | IN 2    | G <sub>f</sub>  | 2               | 1   | 2   | 2   | 2   | 3   | 2   | 3   |  |
|                          | IN 3    | G <sub>f</sub>  | 2               | 2   | 1   | 2   | 2   | 2   | 3   | 3   |  |
|                          | IN 4    | G <sub>f</sub>  | 2               | 2   | 2   | 1   | 2   | 2   | 2   | 3   |  |
|                          | IN 5    | G <sub>f</sub>  | 2               | 2   | 2   | 2   | 1   | *   | *   | 2   |  |
| CTL pin switching level  | CTLA    | V <sub>TH</sub> | 2               | 2   | 1   | 2   | 2   | 1   | 3   | 3   | Note 5   |
|                          | CTLB    | V <sub>TH</sub> | 2               | 1   | 2   | 2   | 2   | 3   | 1   | 3   |  |
|                          | CTLC    | V <sub>TH</sub> | 2               | 2   | 2   | 2   | 1   | *   | *   | 1   |  |

\* Anywhere is possible.

Note 1: Connect a distortion meter to the output, and input a f = 1kHz sine wave. Adjust the output level until the output distortion is 0.5%.

This output voltage at this time is the maximum output level V<sub>om</sub> (V<sub>P-P</sub>).Note 2: Input a 1V<sub>P-P</sub>, 1MHz sine wave. The voltage gain is given by G<sub>V</sub> = 20 log (V<sub>OUT</sub> / V<sub>IN</sub>).Note 3: Input a 1V<sub>P-P</sub>, 4.43MHz sine wave. The interchannel crosstalk is given by C<sub>T</sub> = 20 log (V<sub>OUT</sub> / V<sub>IN</sub>).Note 4: Input 1V<sub>P-P</sub>, 1MHz and 10MHz sine waves. The frequency characteristic is given by G<sub>f</sub> = 20 log (V<sub>OUT</sub> (f = 10MHz) / V<sub>OUT</sub> (f = 1MHz)).Note 5: Input a 1V<sub>P-P</sub>, 1MHz sine wave. Reduce the CTL pin voltage from V<sub>CC</sub>.The CTL pin switching level (V<sub>TH</sub>) is the CTL pin voltage at which the V<sub>OUT</sub> level drops below 20mV<sub>P-P</sub>.

## ● Electrical characteristic curves

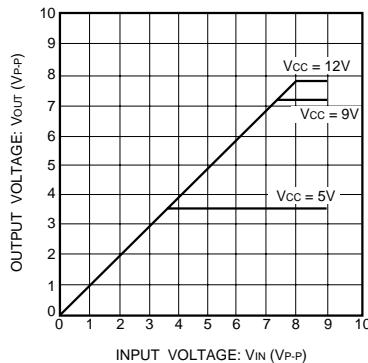
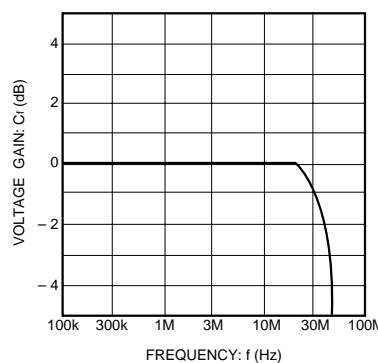
Fig. 2 V<sub>IN</sub> vs. V<sub>OUT</sub> (f = 1kHz)

Fig. 3 Frequency characteristics

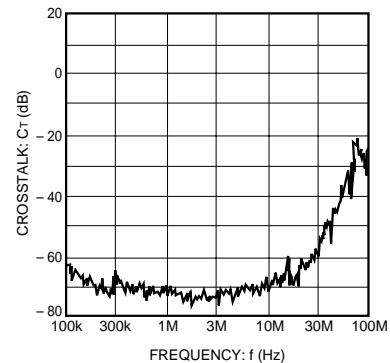
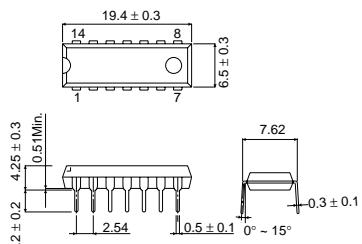


Fig. 4 Interchannel crosstalk

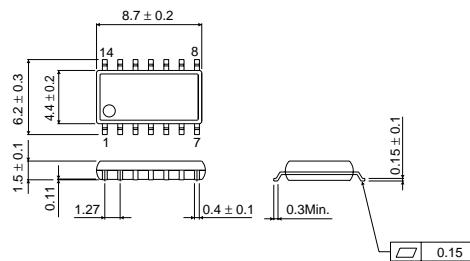
## ● External dimensions (Units: mm)

BA7469A



DIP14

BA7649AF



SOP14

## Appendix

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