

# Video signal switcher

## BA7645N

The BA7645N is a four-channel analog multiplexer with mute, designed for use in video cassette recorders. It features a large dynamic range, and wide operating frequency range, and has sync-tip inputs which are ideal for switching video signals.

### ●Applications

Video cassette recorders and televisions

### ●Features

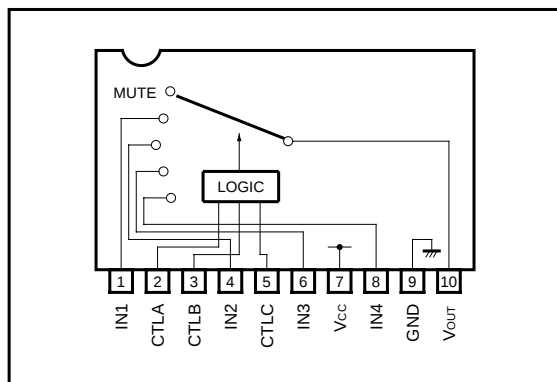
- 1) 4-input / 1-output switches.
- 2) Built-in mute.
- 3) Sync-tip inputs.
- 4) Wide operating supply voltage range (4.5V to 13.0V).
- 5) Low power consumption (48mW Typ.).
- 6) Excellent frequency characteristics (10MHz, 0dB Typ.).
- 7) Wide dynamic range (3.5V<sub>P-P</sub> Typ.).
- 8) Low interchannel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

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

| Parameter             | Symbol           | Limit        | Unit |
|-----------------------|------------------|--------------|------|
| Power supply voltage  | V <sub>CC</sub>  | 13.5         | V    |
| Power dissipation     | P <sub>d</sub>   | 850*         | mW   |
| Operating temperature | T <sub>opr</sub> | – 25 ~ + 75  | °C   |
| Storage temperature   | T <sub>stg</sub> | – 55 ~ + 125 | °C   |

\* Reduced by 8.5mW for each increase in Ta of 1°C over 25°C.

### ●Block diagram



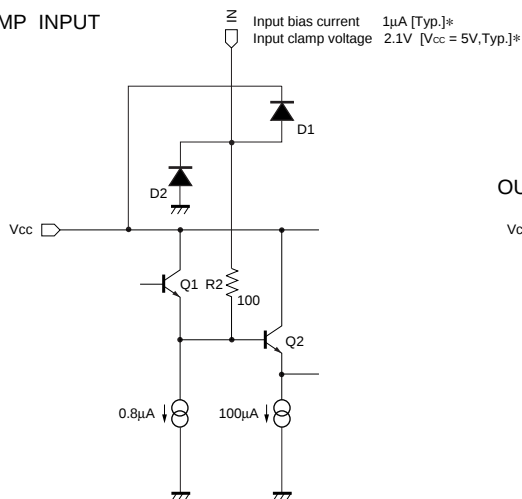
### ●Truth table

| 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 |

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

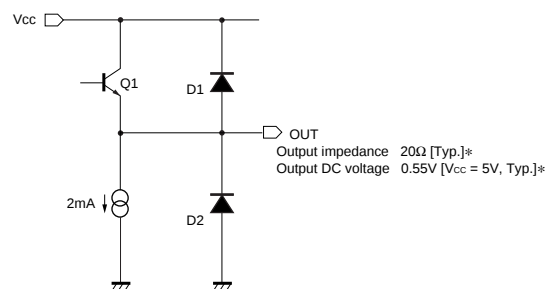
## ●Equivalent circuits

CLAMP INPUT

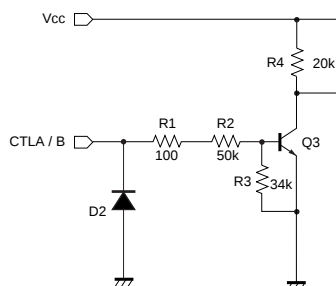


\* Reference value

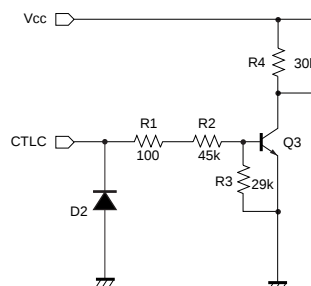
OUTPUT



CTLA / CTLB



CTLC

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

| Parameter                 | Symbol            | Min. | Typ. | Max. | Unit             | Conditions                                                                       |
|---------------------------|-------------------|------|------|------|------------------|----------------------------------------------------------------------------------|
| Operating voltage         | $V_{\text{CC}}$   | 4.5  | —    | 13.0 | V                | —                                                                                |
| Supply current            | $I_{\text{CC}}$   | —    | 9.5  | 14.5 | mA               | —                                                                                |
| Maximum output level      | $V_{\text{om}}$   | 3.0  | 3.5  | —    | $V_{\text{P-P}}$ | $f = 1\text{kHz}$ , $\text{THD} = 0.5\%$                                         |
| Voltage gain              | $G_V$             | -0.5 | 0    | +0.5 | dB               | $f = 1\text{MHz}$ , $V_{\text{IN}} = 1.0\text{V}_{\text{P-P}}$                   |
| Interchannel crosstalk    | $C_T$             | —    | -65  | —    | dB               | $f = 4.43\text{MHz}$ ,<br>$V_{\text{IN}} = 1.0\text{V}_{\text{P-P}}$             |
| Frequency characteristics | $C_f$             | -3.0 | 0    | +1.0 | dB               | $f = 10\text{MHz} / 1\text{MHz}$ ,<br>$V_{\text{IN}} = 1.0\text{V}_{\text{P-P}}$ |
| CTL pin switching level A | $V_{\text{TH-A}}$ | 1.0  | 2.0  | 3.0  | V                | —                                                                                |
| CTL pin switching level B | $V_{\text{TH-B}}$ | 1.0  | 2.0  | 3.0  | V                | —                                                                                |
| CTL pin switching level C | $V_{\text{TH-C}}$ | 1.0  | 2.0  | 3.0  | V                | —                                                                                |

○Not designed for radiation resistance.

## ● Measurement circuit

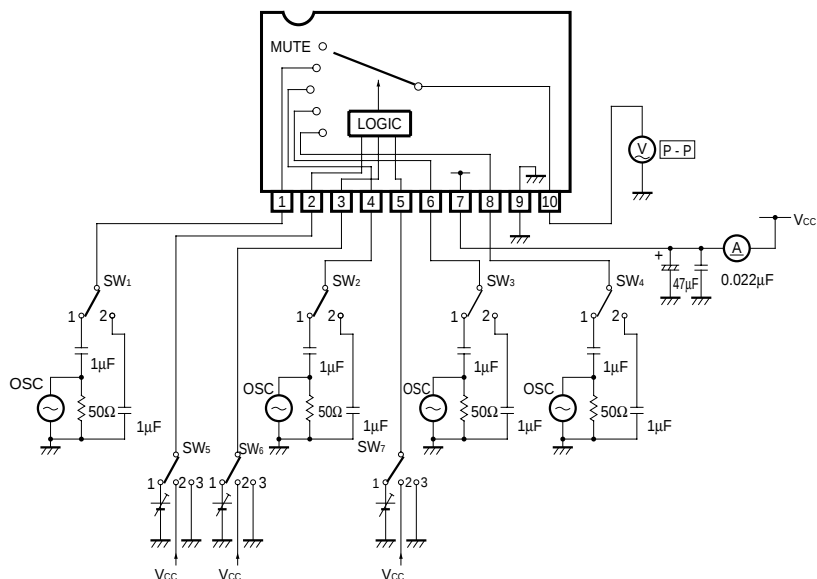


Fig. 1

## ● Electrical characteristic curves

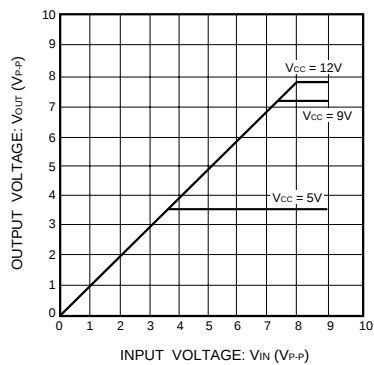
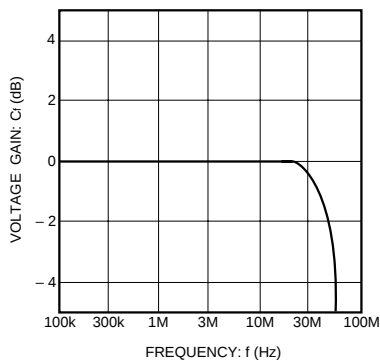
Fig. 2  $V_{IN}$  vs.  $V_{OUT}$  ( $f = 1\text{kHz}$ )

Fig. 3 Frequency characteristics

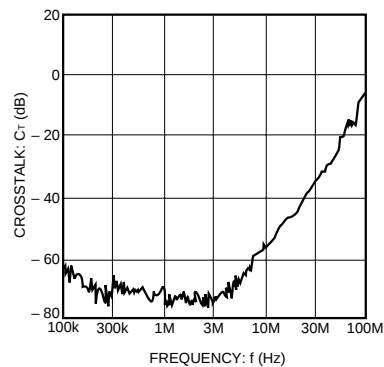


Fig. 4 Interchannel crosstalk

## ● Measurement conditions

| Parameter                |          | Symbol          | Switch settings |                 |                 |                 |                 |                 |                 | Measurement method                                                   |
|--------------------------|----------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------------------------------------------------------|
|                          |          |                 | SW <sub>1</sub> | SW <sub>2</sub> | SW <sub>3</sub> | SW <sub>4</sub> | SW <sub>5</sub> | SW <sub>6</sub> | SW <sub>7</sub> |                                                                      |
| Current dissipation      |          | I <sub>CC</sub> | 2               | 2               | 2               | 2               | 2               | 2               | 2               | Ammeter                                                              |
| Maximum output level     | IN 1     | V <sub>OM</sub> | 1               | 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               | 3               | 2               | 3               |                                                                      |
|                          | IN 3     | V <sub>OM</sub> | 2               | 2               | 1               | 2               | 2               | 3               | 3               |                                                                      |
|                          | IN 4     | V <sub>OM</sub> | 2               | 2               | 2               | 1               | 2               | 2               | 3               |                                                                      |
| Voltage gain             | IN 1     | G <sub>V</sub>  | 1               | 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               | 3               | 2               | 3               |                                                                      |
|                          | IN 3     | G <sub>V</sub>  | 2               | 2               | 1               | 2               | 2               | 3               | 3               |                                                                      |
|                          | IN 4     | G <sub>V</sub>  | 2               | 2               | 2               | 1               | 2               | 2               | 3               |                                                                      |
| Interchannel crosstalk   | IN1→IN2  | C <sub>T</sub>  | 1               | 2               | 2               | 2               | 3               | 2               | 3               | f = 4.43MHz,<br>V <sub>IN</sub> = 1V <sub>P-P</sub><br>Note 3        |
|                          | IN1→IN3  | C <sub>T</sub>  | 1               | 2               | 2               | 2               | 2               | 3               | 3               |                                                                      |
|                          | IN1→IN4  | C <sub>T</sub>  | 1               | 2               | 2               | 2               | 2               | 2               | 3               |                                                                      |
|                          | IN1→MUTE | C <sub>T</sub>  | 1               | 2               | 2               | 2               | *               | *               | 2               |                                                                      |
|                          | IN2→IN3  | C <sub>T</sub>  | 2               | 1               | 2               | 2               | 2               | 3               | 3               |                                                                      |
|                          | IN2→IN4  | C <sub>T</sub>  | 2               | 1               | 2               | 2               | 2               | 2               | 3               |                                                                      |
|                          | IN2→MUTE | C <sub>T</sub>  | 2               | 1               | 2               | 2               | *               | *               | 2               |                                                                      |
|                          | IN3→IN4  | C <sub>T</sub>  | 2               | 2               | 1               | 2               | 2               | 2               | 3               |                                                                      |
|                          | IN3→MUTE | C <sub>T</sub>  | 2               | 2               | 1               | 2               | *               | *               | 2               |                                                                      |
|                          | IN4→MUTE | C <sub>T</sub>  | 2               | 2               | 2               | 1               | *               | *               | 2               |                                                                      |
| Frequency characteristic | IN 1     | G <sub>f</sub>  | 1               | 2               | 2               | 2               | 3               | 3               | 3               | f = 10MHz /<br>1MHz<br>V <sub>IN</sub> = 1V <sub>P-P</sub><br>Note 4 |
|                          | IN 2     | G <sub>f</sub>  | 2               | 1               | 2               | 2               | 3               | 2               | 3               |                                                                      |
|                          | IN 3     | G <sub>f</sub>  | 2               | 2               | 1               | 2               | 2               | 3               | 3               |                                                                      |
|                          | IN 4     | G <sub>f</sub>  | 2               | 2               | 2               | 1               | 2               | 2               | 3               |                                                                      |
| CTL pin switching level  | CTLA     | V <sub>TH</sub> | 2               | 2               | 1               | 2               | 1               | 3               | 3               | Note 5                                                               |
|                          | CTLB     | V <sub>TH</sub> | 2               | 1               | 2               | 2               | 3               | 1               | 3               | Note 6                                                               |
|                          | CTLC     | V <sub>TH</sub> | 1               | 2               | 2               | 2               | 3               | 3               | 1               |                                                                      |

\* Anywhere is possible.

Note 1: Connect a distortion meter to the output, and input a f = 1kHz sine wave. Adjust the input 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 f = 1MHz, V<sub>IN</sub> = 1V<sub>P-P</sub> 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 f = 4.43MHz, V<sub>IN</sub> = 1V<sub>P-P</sub> 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 f = 1MHz and 10MHz, V<sub>IN</sub> = 1V<sub>P-P</sub> 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 f = 1MHz, V<sub>IN</sub> = 1V<sub>P-P</sub> 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>.Note 6: Input a f = 1MHz, V<sub>IN</sub> = 1V<sub>P-P</sub> sine wave. Increase the CTL pin voltage from 0V. The CTL pin switching level (V<sub>TH</sub>) is the CTL pin voltage at which the V<sub>OUT</sub> level goes below 1.0VDC

## ● External dimensions (Units: mm)

