

Video signal switcher

BA7644AN

The BA7644AN is a four-channel analog multiplexer with mute, designed for use in video cassette recorders. It features a wide dynamic range, and wide operating frequency range, and is suitable for switching audio and video signals.

●Applications

VCR, TV and audio signal switching

●Features

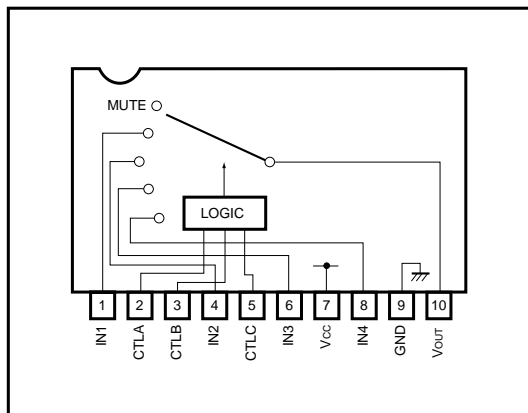
- 1) 4-input / 1-output switches.
- 2) Built-in mute.
- 3) Wide operating supply voltage range (4.5V to 13.0V).
- 4) Low power consumption (48mW Typ.).
- 5) Excellent frequency characteristics (10MHz, 0dB Typ.).
- 6) Wide dynamic range (3.5V_{P-P} Typ.).
- 7) High input impedance (20kΩ Typ.).
- 8) Low interchannel crosstalk (− 65dB Typ., f = 4.43MHz).

●Absolute maximum ratings (Ta = 25°C)

| Parameter | Symbol | Limits | Unit |
|-----------------------|------------------|--------------|------|
| Power supply voltage | V _{CC} | 13.5 | V |
| Power dissipation | P _d | 850* | mW |
| Operating temperature | T _{opr} | − 25 ~ + 75 | °C |
| Storage temperature | T _{stg} | − 55 ~ + 125 | °C |

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

●Block diagram



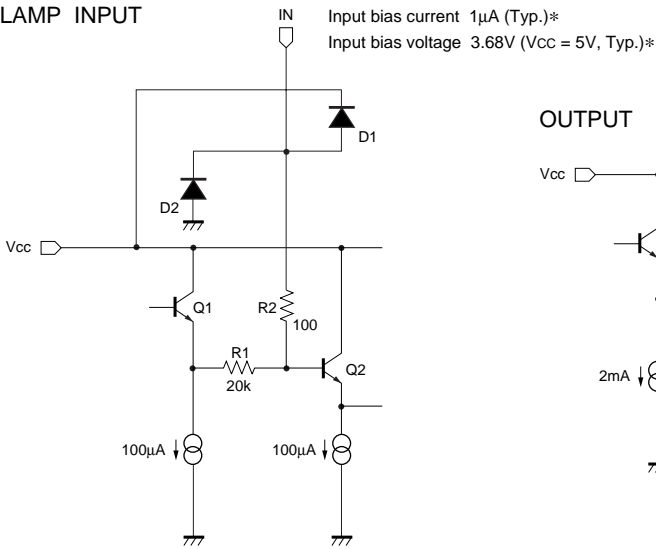
●Truth table

| CTL - A | CTL - B | CTL - C | 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 |

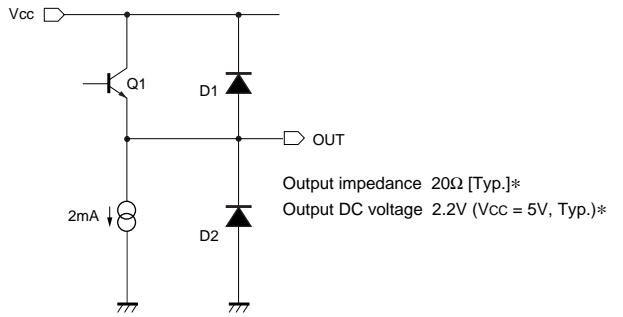
* Either "L (open)" or "H".

●Equivalent circuits

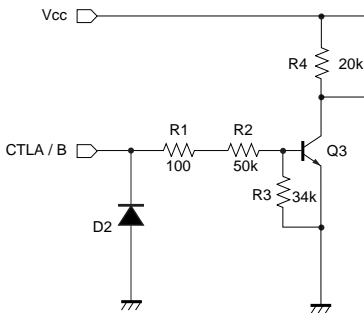
CLAMP INPUT



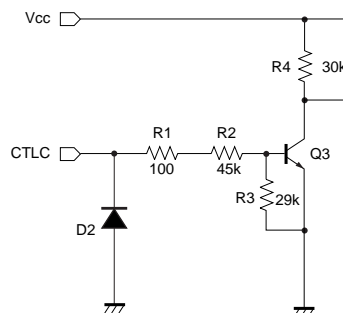
OUTPUT



CTLA / CTLB



CTLC



●Electrical characteristics (unless otherwise noted, Ta = 25°C and Vcc = 5V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions | |
|---------------------------|-------------------|------------------|-------|------|------------------|---|--|
| Operating voltage | V _{CC} | 4.5 | — | 13.0 | V | — | |
| Supply current | I _{CC} | — | 9.5 | 14.5 | mA | — | |
| Maximum output level | V _{om} | 3.0 | 3.5 | — | V _{P-P} | f = 1kHz, THD = 0.5% | |
| Voltage gain | G _V | -0.5 | 0 | 0.5 | dB | f = 1MHz, V _{IN} = 1.0V _{P-P} | |
| Interchannel crosstalk | IN - IN | C _{Tin} | - | -65 | - | dB | f = 4.43MHz, V _{IN} = 1.0V _{P-P} |
| | IN - MUTE | C _{TM} | - | -55 | - | dB | f = 4.43MHz, V _{IN} = 1.0V _{P-P} |
| Frequency characteristic | C _f | -3.0 | 0 | 1.0 | dB | f = 10MHz / 1MHz, V _{IN} = 1.0V _{P-P} | |
| Total-harmonic distortion | THD | - | 0.007 | - | % | f = 1kHz, V _{IN} = 1.0V _{P-P} | |
| Input impedance | Z _{IN} | 14 | 20 | 26 | kΩ | — | |
| CTL pin switching level A | V _{TH-A} | 1.0 | 2.0 | 3.0 | V | — | |
| CTL pin switching level B | V _{TH-B} | 1.0 | 2.0 | 3.0 | V | — | |
| CTL pin switching level C | V _{TH-C} | 1.0 | 2.0 | 3.0 | V | — | |

○Not designed for radiation resistance.

●Measurement circuit

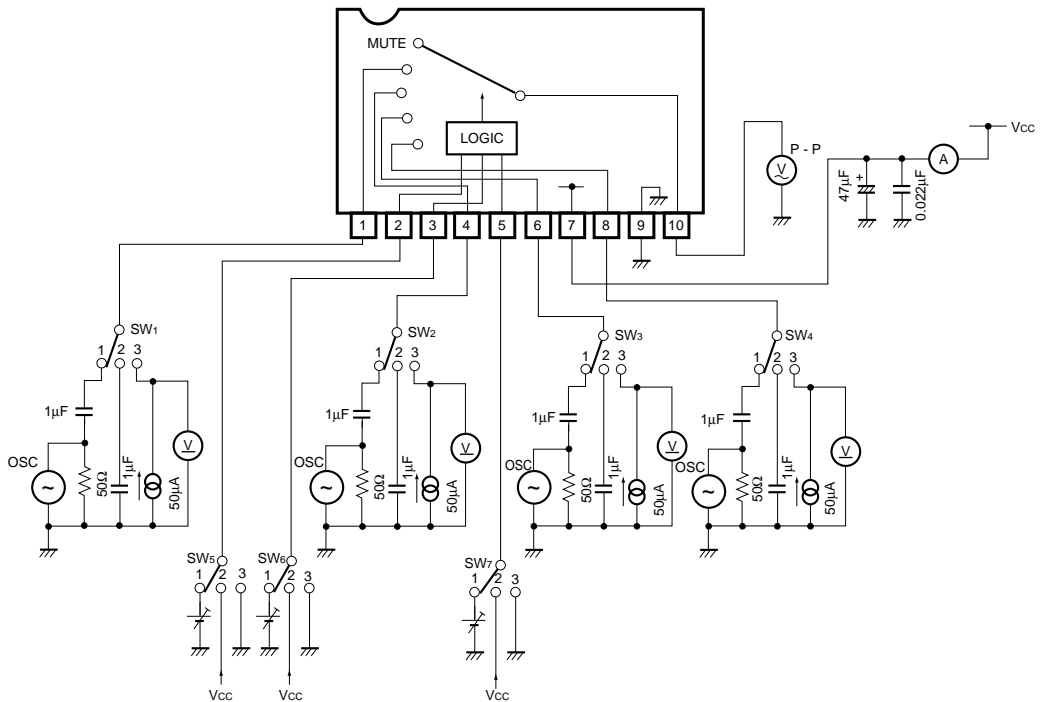


Fig. 1

● Measurement conditions

| Parameter | | Symbol | Switch settings | | | | | | | Measurement method |
|---------------------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---|
| | | | SW ₁ | SW ₂ | SW ₃ | SW ₄ | SW ₅ | SW ₆ | SW ₇ | |
| Current dissipation | | I _{cc} | 2 | 2 | 2 | 2 | 2 | 2 | 2 | Ammeter |
| Maximum output level | IN 1 | V _{om} | 1 | 2 | 2 | 2 | 3 | 3 | 3 | f = 1kHz, THD = 0.5% Note 1 |
| | IN 2 | V _{om} | 2 | 1 | 2 | 2 | 3 | 2 | 3 | |
| | IN 3 | V _{om} | 2 | 2 | 1 | 2 | 2 | 3 | 3 | |
| | IN 4 | V _{om} | 2 | 2 | 2 | 1 | 2 | 2 | 3 | |
| Voltage gain | IN1 | G _V | 1 | 2 | 2 | 2 | 3 | 3 | 3 | f = 1MHz, V _{IN} = 1V _{P-P} Note 2 |
| | IN2 | G _V | 2 | 1 | 2 | 2 | 3 | 2 | 3 | |
| | IN3 | G _V | 2 | 2 | 1 | 2 | 2 | 3 | 3 | |
| | IN4 | G _V | 2 | 2 | 2 | 1 | 2 | 2 | 3 | |
| Interchannel crosstalk | IN1→IN2 | C _T | 1 | 2 | 2 | 2 | 3 | 2 | 3 | f = 4.43MHz, V _{IN} = 1V _{P-P} Note 3 |
| | IN1→IN3 | C _T | 1 | 2 | 2 | 2 | 2 | 3 | 3 | |
| | IN1→IN4 | C _T | 1 | 2 | 2 | 2 | 2 | 2 | 3 | |
| | IN1→MUTE | C _T | 1 | 2 | 2 | 2 | * | * | 2 | |
| | IN2→IN3 | C _T | 2 | 1 | 2 | 2 | 2 | 3 | 3 | |
| | IN2→IN4 | C _T | 2 | 1 | 2 | 2 | 2 | 2 | 3 | |
| | IN2→MUTE | C _T | 2 | 1 | 2 | 2 | * | * | 2 | |
| | IN3→IN4 | C _T | 2 | 2 | 1 | 2 | 2 | 2 | 3 | |
| | IN3→MUTE | C _T | 2 | 2 | 1 | 2 | * | * | 2 | |
| IN4→MUTE | C _T | 2 | 2 | 2 | 1 | * | * | 2 | | |
| Frequency characteristic | IN 1 | G _f | 1 | 2 | 2 | 2 | 3 | 3 | 3 | f = 10MHz / f = 1MHz V _{IN} = 1V _{P-P} Note 4 |
| | IN 2 | G _f | 2 | 1 | 2 | 2 | 3 | 2 | 3 | |
| | IN 3 | G _f | 2 | 2 | 1 | 2 | 2 | 3 | 3 | |
| | IN 4 | G _f | 2 | 2 | 2 | 1 | 2 | 2 | 3 | |
| Total-harmonic distortion | IN 1 | THD | 1 | 2 | 2 | 2 | 3 | 3 | 3 | f = 1kHz V _{IN} = 1V _{P-P} Note 5 |
| | IN 2 | THD | 2 | 1 | 2 | 2 | 3 | 2 | 3 | |
| | IN 3 | THD | 2 | 2 | 1 | 2 | 2 | 3 | 3 | |
| | IN 4 | THD | 2 | 2 | 2 | 1 | 2 | 2 | 3 | |
| Input impedance | IN 1 | Z _{IN} | 3 | 2 | 2 | 2 | 3 | 3 | 3 | Note 6 |
| | IN 2 | Z _{IN} | 2 | 3 | 2 | 2 | 3 | 2 | 3 | |
| | IN 3 | Z _{IN} | 2 | 2 | 3 | 2 | 2 | 3 | 3 | |
| | IN 4 | Z _{IN} | 2 | 2 | 2 | 3 | 2 | 2 | 3 | |
| CTL pin switching level | CTL - A | V _{TH} | 2 | 2 | 1 | 2 | 1 | 3 | 3 | Note 7 Note 8 |
| | CTL - B | V _{TH} | 2 | 1 | 2 | 2 | 3 | 1 | 3 | |
| | CTL - C | V _{TH} | 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_{om} (V_{P-P}).

Note 2: Input a 1V_{P-P}, 1MHz sine wave. The voltage gain is given by G_V = 20 log (V_{OUT} / V_{IN}).

Note 3: Input a 1V_{P-P}, 4.43MHz sine wave. The interchannel crosstalk is given by C_T = 20 log (V_{OUT} / V_{IN}).

Note 4: Input 1V_{P-P}, 1MHz and 10MHz sine waves. The frequency characteristic is given by G_f = 20 log (V_{OUT} (f = 10MHz) / V_{OUT} (f = 1MHz)).

Note 5: Input a 1V_{P-P}, 1MHz sine wave and measure the total-harmonic distortion of the output using a total-harmonic distortion meter.

Note 6: Measure the input pin voltage V_{IN50} when a current of DC50μA is flowing into the input pin. Measure the input pin open-circuit voltage.

The input impedance is given by Z = (V_{IN50} - V_{IN0}) / 50 × 10⁻⁶ [Ω].

Note 7: Input a 1V_{P-P}, 1MHz sine wave. Reduce the CTL pin voltage from V_{CC}.

The CTL pin switching level (V_{TH}) is the CTL pin voltage at which the V_{OUT} level drops below 20mV_{P-P}.

Note 8: Input a 1V_{P-P}, 1MHz sine wave. Increase the CTL pin voltage from 0V.

The CTL pin switching level (V_{TH}) is the CTL pin voltage at which the V_{OUT} level goes above 1.0V_{P-P}.

●Electrical characteristic curves

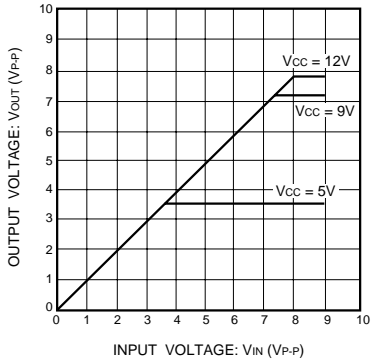


Fig. 2 VIN vs. VOUT (f = 1kHz)

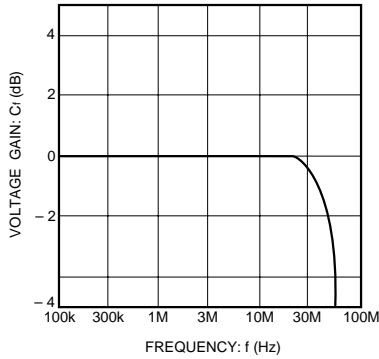


Fig. 3 Frequency characteristics

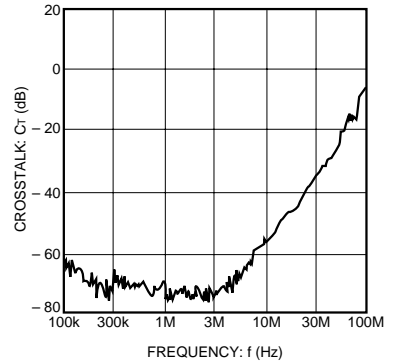


Fig. 4 Interchannel crosstalk

●External dimensions (Units: mm)

