

Video signal switcher

BA7613N / BA7613F

The BA7613N and BA7613F are three-channel analog multiplexers with built-in mute, 6dB amplifier and 75Ω driver. The ICs designed for use in video cassette recorders, and feature a large dynamic range and wide operating frequency range. Sync-tip clamp inputs make this an ideal switch for video signals.

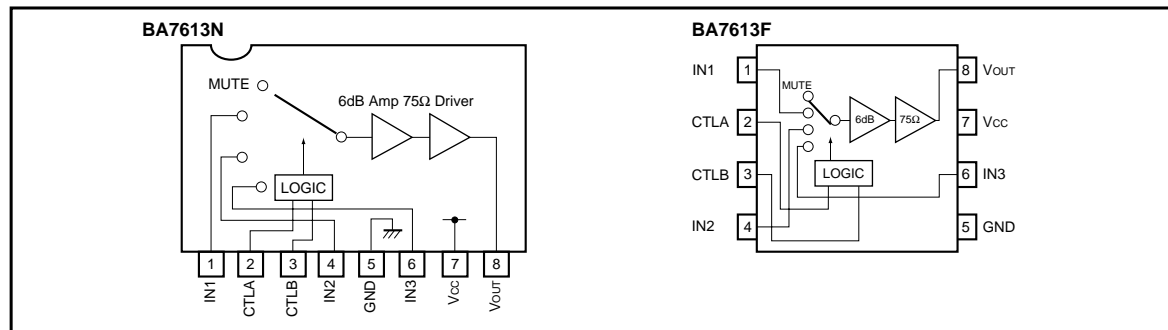
●Applications

Video cassette recorders and televisions

●Features

- 1) 3-input / 1-output switches.
- 2) Built-in 6dB amplifier and 75Ω driver.
- 3) Built-in mute.
- 4) Sync-tip clamp inputs.
- 5) Wide operating supply voltage range
(4.5V ~ 13.0V, BA7613N)
(4.5V ~ 9.5V, BA7613F).
- 6) Low power consumption (100mW Typ.).
- 7) Excellent frequency characteristics
(10MHz, 0dB Typ.).
- 8) Wide dynamic range (3.5V_{P-P} Typ.).
- 9) Low interchannel crosstalk
(- 65dB Typ., f = 4.43MHz).

●Block diagram



●Truth table

| CTL A | CTL B | OUT |
|----------|----------|------|
| L (OPEN) | L (OPEN) | IN 1 |
| L (OPEN) | H | IN 2 |
| H | L (OPEN) | IN 3 |
| H | H | MUTE |

●Absolute maximum ratings (Ta = 25°C)

| Parameter | Symbol | Limits | Unit |
|-----------------------|------------------|-------------------|------|
| Power supply voltage | V _{CC} | *113.5 / *210.0 | V |
| Power dissipation | P _d | *1900*3 / *2550*4 | mW |
| Operating temperature | T _{opr} | − 25 ~ + 75 | °C |
| Storage temperature | T _{stg} | − 55 ~ + 125 | °C |

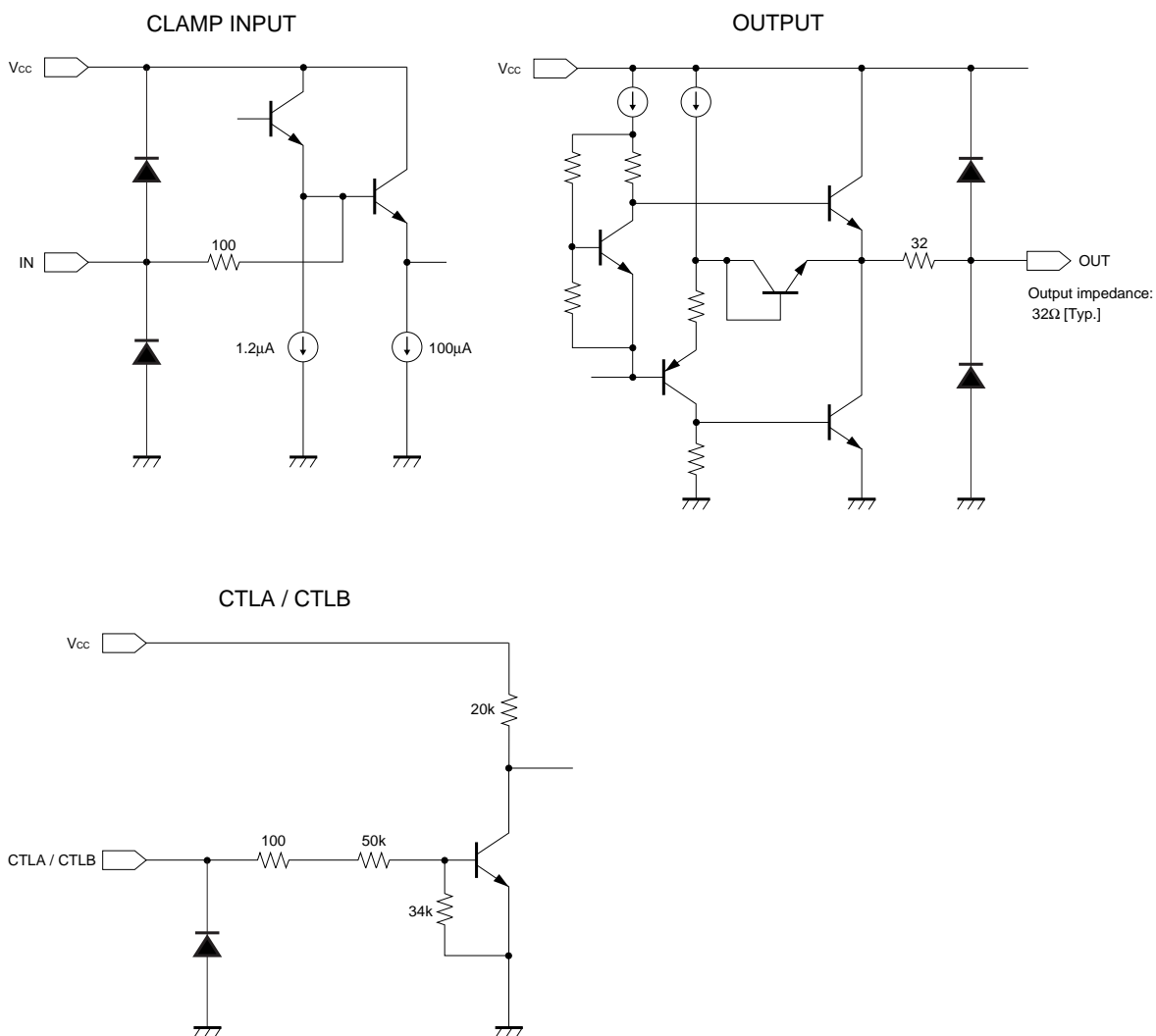
*1 BA7613N.

*2 BA7613F.

*3 Reduced by 9.0mW for each increase in Ta of 1°C over 25°C.

*4 Reduced by 5.5mW for each increase in Ta of 1°C over 25°C.

●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_{CC} | 4.5 | — | 13.0 | V | BA7613F is Max.9.5V |
| Supply current | I_{CC} | — | 20.0 | 28.5 | mA | — |
| Maximum output level | V_{om} | 3.0 | 3.5 | — | V_{P-P} | $f = 1\text{kHz}$, $\text{THD} = 0.5\%$ |
| Voltage gain | G_V | 5.5 | 6.0 | 6.5 | dB | $f = 1\text{MHz}$, $V_{IN} = 1.0V_{P-P}$ |
| Interchannel crosstalk | C_T | — | -65 | — | dB | $f = 4.43\text{MHz}$, $V_{IN} = 1.0V_{P-P}$ |
| Frequency characteristic | C_f | -3.0 | 0 | 1.0 | dB | $f = 10\text{MHz} / 1\text{MHz}$, $V_{IN} = 1.0V_{P-P}$ |
| CTL pin switch level A | V_{TH-A} | 1.0 | 2.0 | 3.0 | V | — |
| CTL pin switch level B | V_{TH-B} | 1.0 | 2.0 | 3.0 | V | — |

○Not designed for radiation resistance.

●Measurement circuit

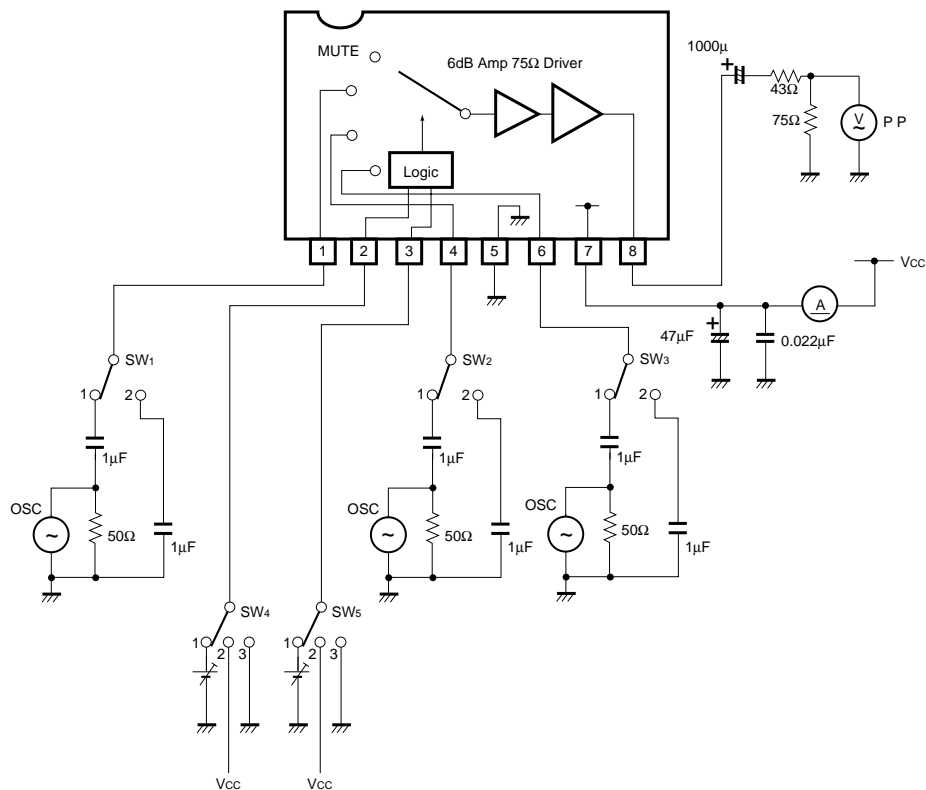


Fig. 1

●Measurement conditions

| Parameter | | Symbol | Switch settings | | | | | Measurement method |
|--------------------------|----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------------------------------------------|
| | | | SW ₁ | SW ₂ | SW ₃ | SW ₄ | SW ₅ | |
| Current dissipation | | I _{CC} | 2 | 2 | 2 | 2 | 2 | Ammeter |
| Maximum output level | IN ₁ | V _{om} | 1 | 2 | 2 | 3 | 3 | f = 1kHz THD = 0.5% *1 |
| | IN ₂ | V _{om} | 2 | 1 | 2 | 3 | 2 | |
| | IN ₃ | V _{om} | 2 | 2 | 1 | 2 | 3 | |
| Voltage gain | IN ₁ | G _V | 1 | 2 | 2 | 3 | 3 | f = 1MHz, V = 1V _{P-P} *2 |
| | IN ₂ | G _V | 2 | 1 | 2 | 3 | 2 | |
| | IN ₃ | G _V | 2 | 2 | 1 | 2 | 3 | |
| Interchannel crosstalk | IN ₁ →IN ₂ | C _T | 1 | 2 | 2 | 3 | 2 | f = 4.43MHz, V = 1V _{P-P} *3 |
| | IN ₁ →IN ₃ | C _T | 1 | 2 | 2 | 2 | 3 | |
| | IN ₁ →MUTE | C _T | 1 | 2 | 2 | 2 | 2 | |
| | IN ₂ →IN ₃ | C _T | 2 | 1 | 2 | 2 | 3 | |
| | IN ₂ →MUTE | C _T | 2 | 1 | 2 | 2 | 2 | |
| | IN ₃ →MUTE | C _T | 2 | 2 | 1 | 2 | 2 | |
| Frequency characteristic | IN ₁ | G _f | 1 | 2 | 2 | 3 | 3 | f = 10MHz / f = 1MHz, V = 1V _{P-P} *4 |
| | IN ₂ | G _f | 2 | 1 | 2 | 3 | 2 | |
| | IN ₃ | G _f | 2 | 2 | 1 | 2 | 3 | |
| CTL pin switching level | CTLA | V _{TH} | 2 | 2 | 1 | 1 | 3 | *5 |
| | CTLB | V _{TH} | 2 | 1 | 2 | 3 | 1 | |

*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 multiplied by 2 is the maximum output level V_{om} (V_{P-P}).

*2: Input a 1V_{P-P}, 1MHz sine wave. The voltage gain is given by $G_V = 20 \log (V_{OUT} / V_{IN}) + 6$.

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

*4: Input 1V_{P-P}, 1MHz and 10MHz sine waves.

The frequency characteristic is given by $G_f = 20 \log (V_{OUT} (f = 10\text{MHz}) / V_{OUT} (f = 1\text{MHz}))$.

*5: 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}.

●Electrical characteristic curves

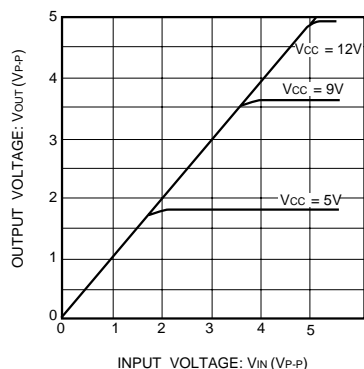
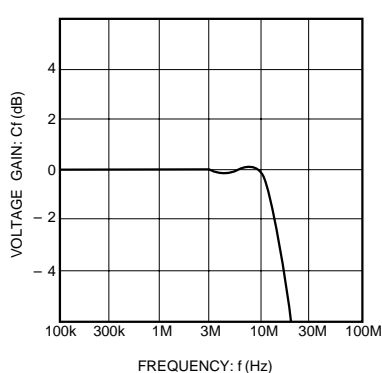
Fig. 2 V_{IN} vs. V_{OUT} (f = 1kHz)

Fig. 3 Frequency characteristics

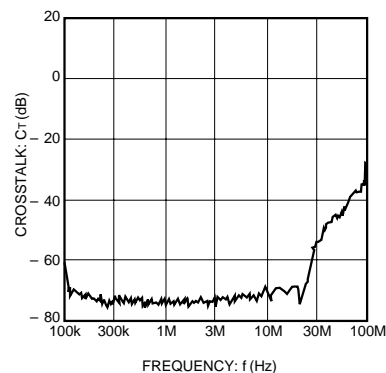


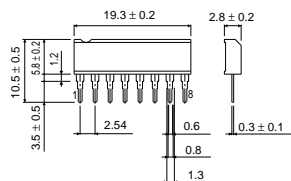
Fig. 4 Interchannel crosstalk

●Operation notes

The output impedance is approximately 32Ω. Therefore, to ensure output matching, connect an external resistor of 43Ω.

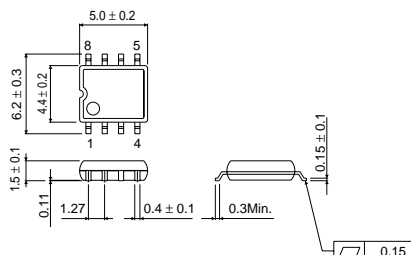
● External dimensions (Units: mm)

BA7613N



SIP8

BA7613F



SOP8

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