

# 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

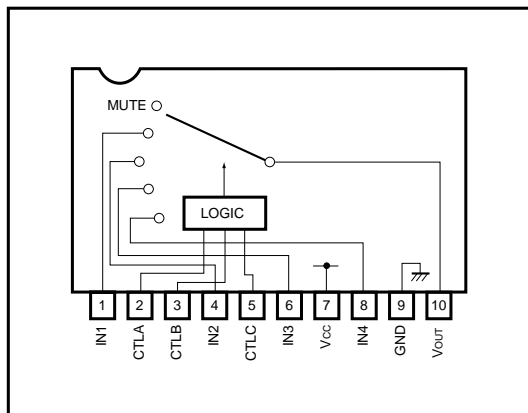
- 1) 4-input / 1-output switches.
- 2) Built-in mute.
- 3) Wide operating supply voltage range (4.5V to 13.0V).
- 4) Low power consumption (48mW Typ.).
- 5) Excellent frequency characteristics (10MHz, 0dB Typ.).
- 6) Wide dynamic range (3.5V<sub>P-P</sub> Typ.).
- 7) High input impedance (20kΩ Typ.).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

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <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



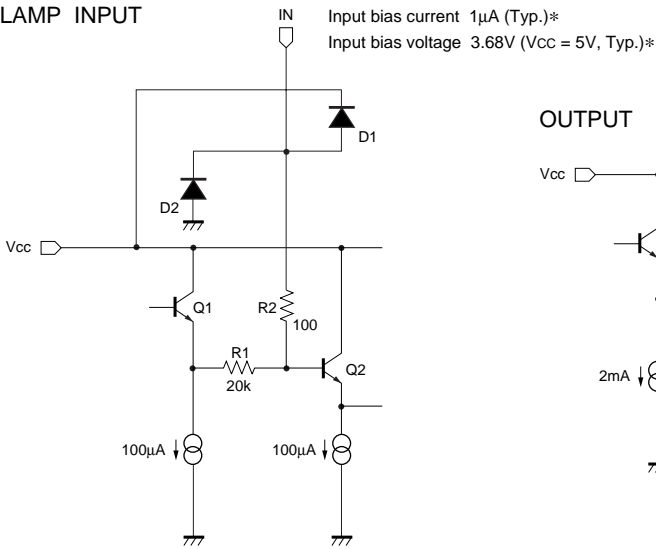
●Truth table

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

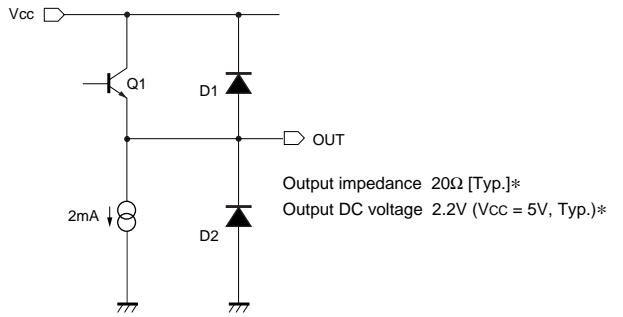
\* Either "L (open)" or "H".

●Equivalent circuits

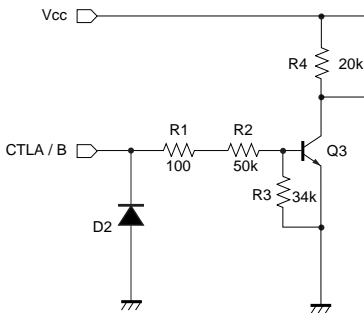
CLAMP INPUT



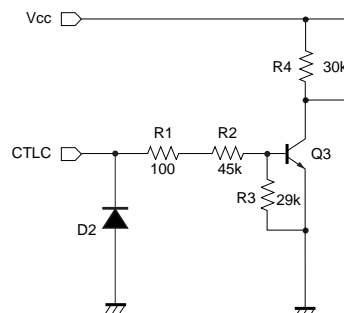
OUTPUT



CTLA / CTLB



CTLC



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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Operating voltage	V <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	IN - IN	C <sub>Tin</sub>	-	-65	-	dB	f = 4.43MHz, V <sub>IN</sub> = 1.0V <sub>P-P</sub>
	IN - MUTE	C <sub>TM</sub>	-	-55	-	dB	f = 4.43MHz, V <sub>IN</sub> = 1.0V <sub>P-P</sub>
Frequency characteristic	C <sub>f</sub>	-3.0	0	1.0	dB	f = 10MHz / 1MHz, V <sub>IN</sub> = 1.0V <sub>P-P</sub>	
Total-harmonic distortion	THD	-	0.007	-	%	f = 1kHz, V <sub>IN</sub> = 1.0V <sub>P-P</sub>	
Input impedance	Z <sub>IN</sub>	14	20	26	kΩ	—	
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

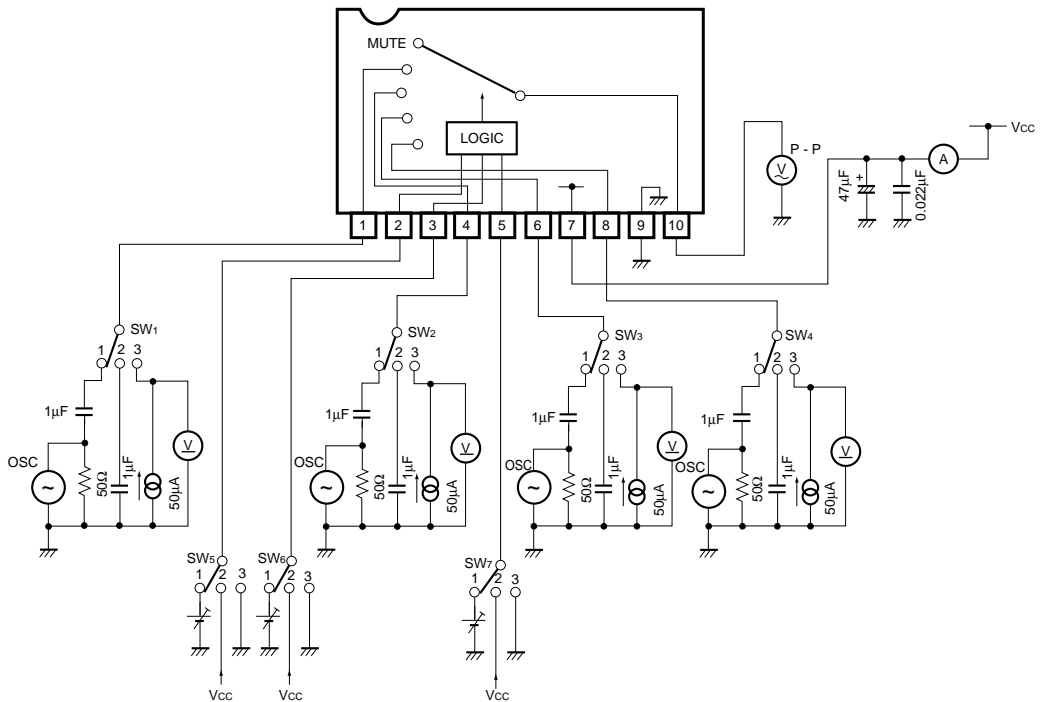


Fig. 1

## ● Measurement conditions

Parameter		Symbol	Switch settings							Measurement method
			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, THD = 0.5% 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	IN1	G <sub>V</sub>	1	2	2	2	3	3	3	f = 1MHz, V <sub>IN</sub> = 1V <sub>P-P</sub> Note 2
	IN2	G <sub>V</sub>	2	1	2	2	3	2	3	
	IN3	G <sub>V</sub>	2	2	1	2	2	3	3	
	IN4	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, V <sub>IN</sub> = 1V <sub>P-P</sub> 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 / f = 1MHz V <sub>IN</sub> = 1V <sub>P-P</sub> 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	
Total-harmonic distortion	IN 1	THD	1	2	2	2	3	3	3	f = 1kHz V <sub>IN</sub> = 1V <sub>P-P</sub> 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 <sub>IN</sub>	3	2	2	2	3	3	3	Note 6
	IN 2	Z <sub>IN</sub>	2	3	2	2	3	2	3	
	IN 3	Z <sub>IN</sub>	2	2	3	2	2	3	3	
	IN 4	Z <sub>IN</sub>	2	2	2	3	2	2	3	
CTL pin switching level	CTL - A	V <sub>TH</sub>	2	2	1	2	1	3	3	Note 7 Note 8
	CTL - B	V <sub>TH</sub>	2	1	2	2	3	1	3	
	CTL - C	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 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 and measure the total-harmonic distortion of the output using a total-harmonic distortion meter.

Note 6: Measure the input pin voltage V<sub>IN50</sub> 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<sub>IN50</sub> - V<sub>IN0</sub>) / 50 × 10<sup>-6</sup> [Ω].

Note 7: 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>.

Note 8: Input a 1V<sub>P-P</sub>, 1MHz 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 above 1.0V<sub>P-P</sub>.

●Electrical characteristic curves

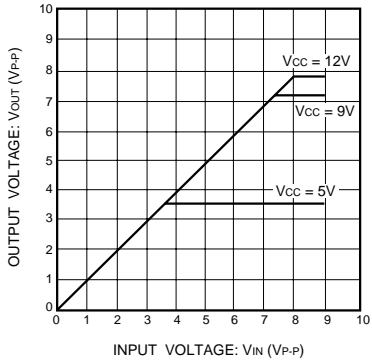


Fig. 2 VIN vs. VOUT (f = 1kHz)

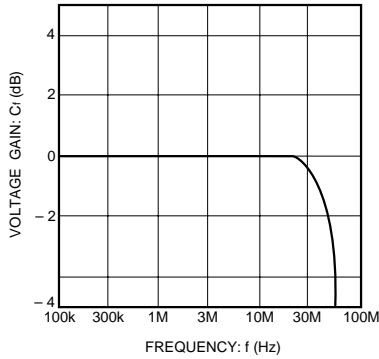


Fig. 3 Frequency characteristics

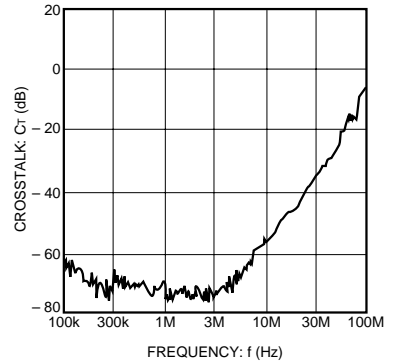
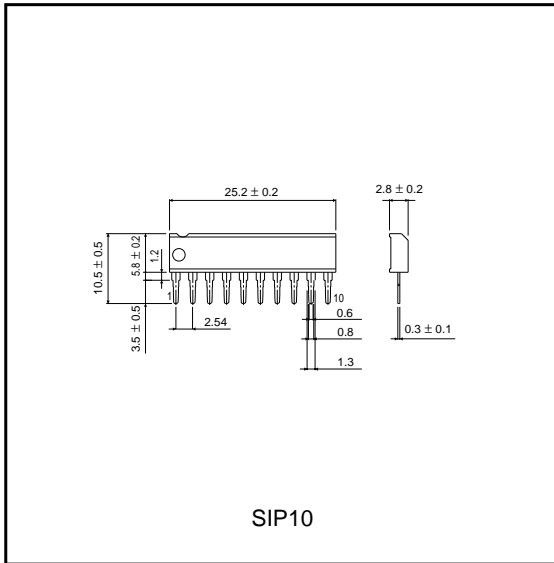


Fig. 4 Interchannel crosstalk

●External dimensions (Units: mm)



SIP10