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	Pd	850*	mW
Operating temperature	Topr	$-25 \sim +75$	°C
Storage temperature	Tstg	$-55 \sim +125$	°C

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

●Block diagram
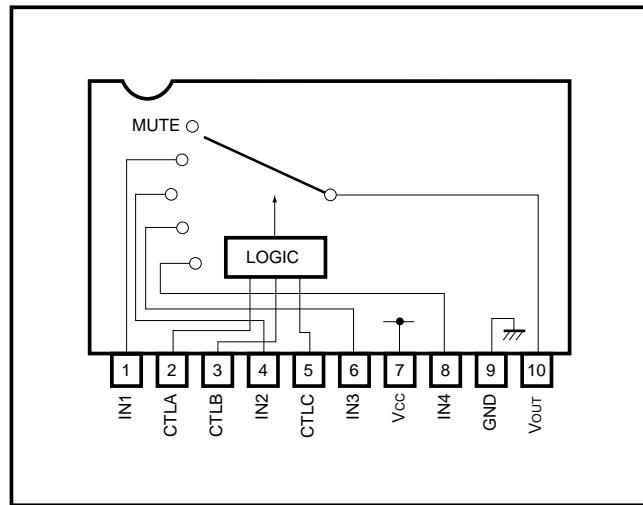
●Truth table

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".

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1

●Equivalent circuits

CLAMP INPUT

IN   Input bias current 1μA (Typ.)∗   ∗ Reference value
      Input bias voltage 3.68V (Vcc = 5V, Typ.)∗

OUTPUT

Output impedance 20Ω [Typ.]∗
Output DC voltage 2.2V (Vcc = 5V, Typ.)∗

CTLA / CTLB

CTLC

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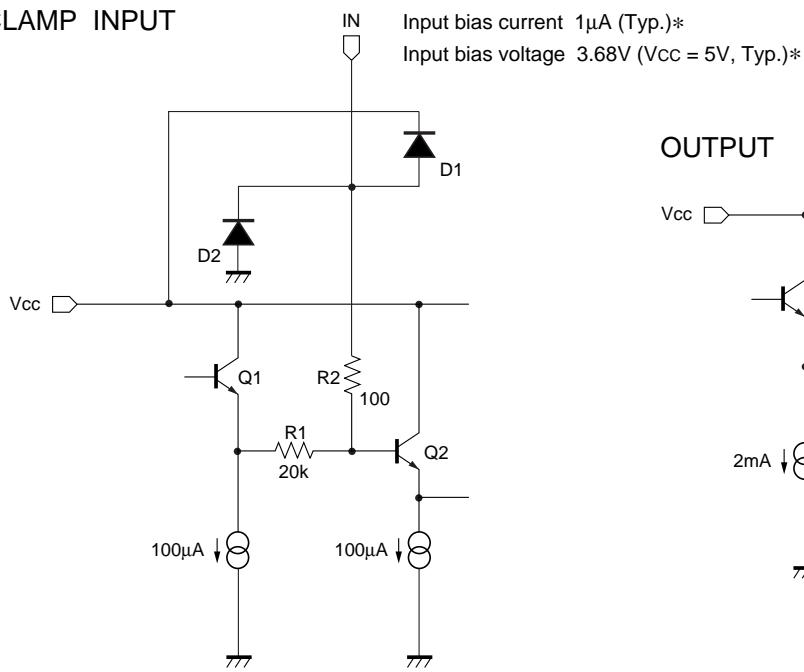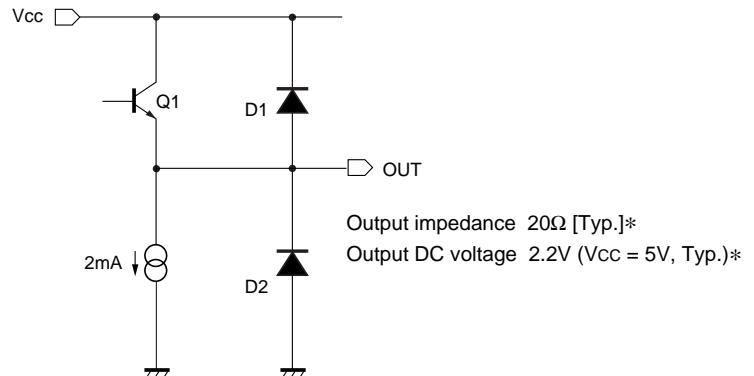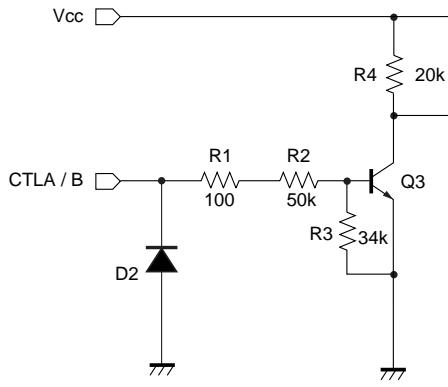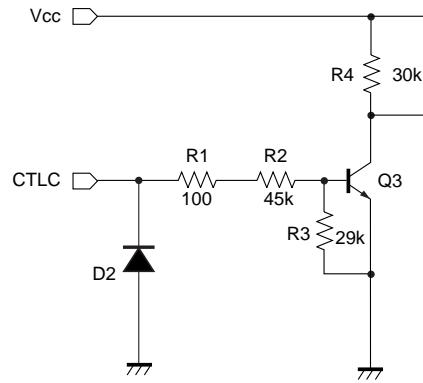
●Electrical characteristics (unless otherwise noted, Ta = 25°C and V_{CC} = 5V)

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
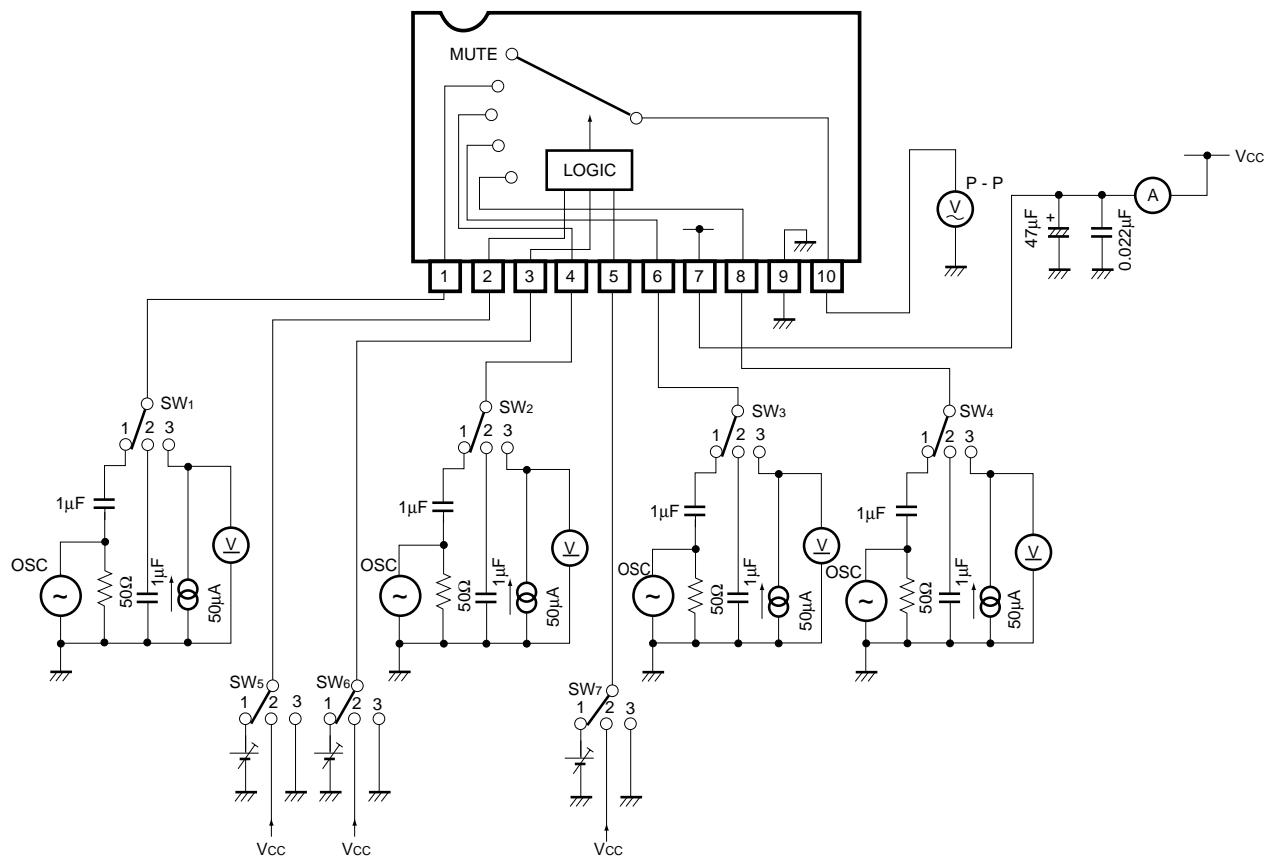
Fig. 1

●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$_{P-P}$.

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●Electrical characteristic curves
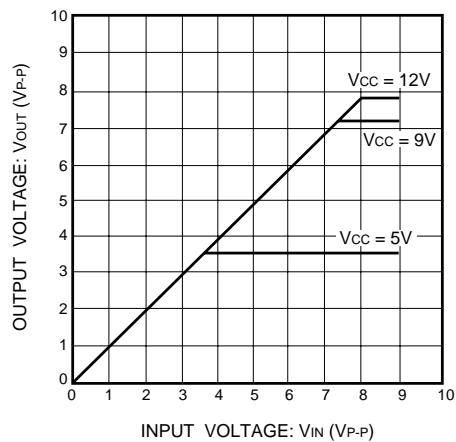
Fig. 2 V_{IN} vs. V_{OUT} (f = 1kHz)
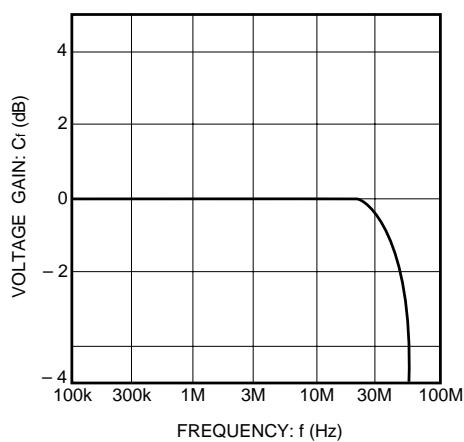
Fig. 3 Frequency characteristics
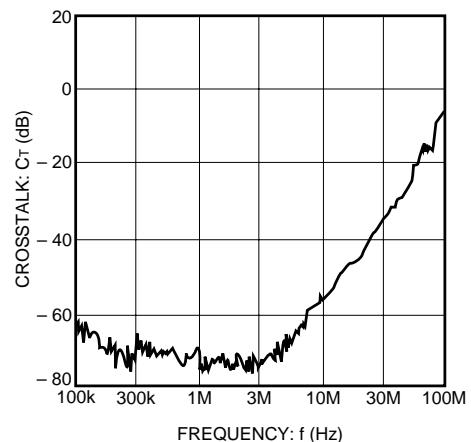
Fig. 4 Interchannel crosstalk

●External dimensions (Units: mm)

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