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$_{P-P}$ Typ.).
8) Low interchannel crosstalk (− 65dB Typ., f = 4.43MHz).

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limit	Unit
Power supply voltage	V$_{CC}$	13.5	V
Power dissipation	Pd	850*	mW
Operating temperature	Topr	− 25 ~ + 75	°C
Storage temperature	Tstg	− 55 ~ + 125	°C

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

●Block diagram
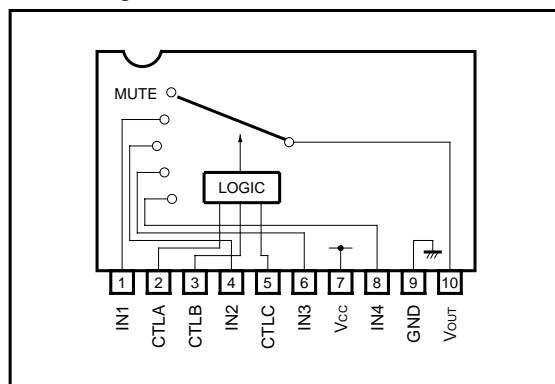
●Truth table

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

IN
Input bias current 1μA [Typ.]∗
Input clamp voltage 2.1V [Vcc = 5V, Typ.]∗

∗ Reference value

D1

D2

Vcc

Q1 R2 100

Q2

0.8μA 100μA

OUTPUT

Vcc

Q1 D1

OUT
Output impedance 20Ω [Typ.]∗
Output DC voltage 0.55V [Vcc = 5V, Typ.]∗

2mA D2

CTLA / CTLB

Vcc

R4 20k

CTLA / B

R1 100 R2 50k Q3

R3 34k

D2

CTLC

Vcc

R4 30k

CTLC

R1 100 R2 45k Q3

R3 29k

D2
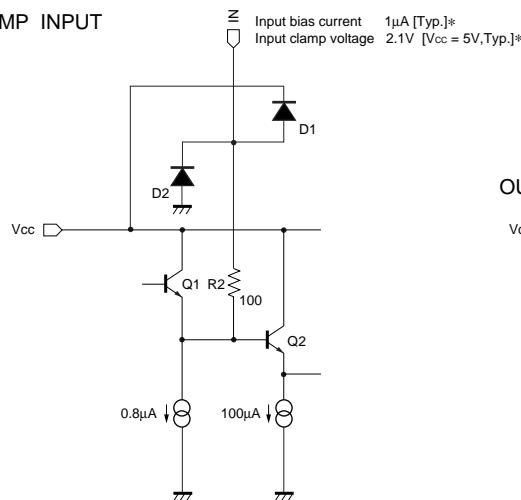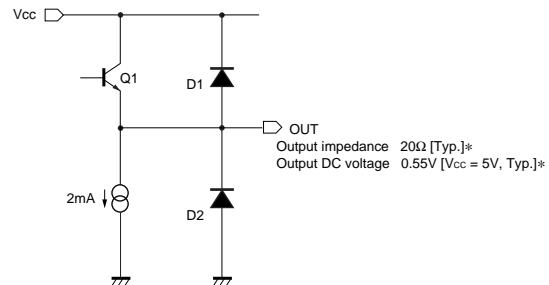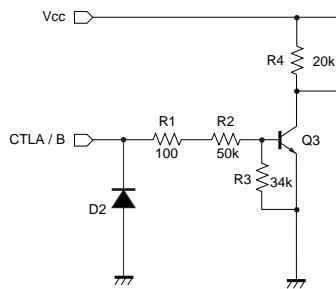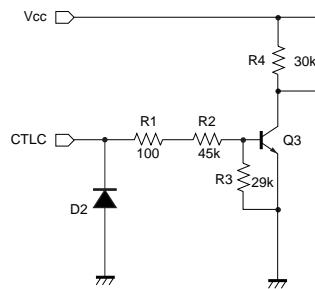
●Electrical characteristics (unless otherwise noted Ta = 25°C and Vcc = 5V)

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	C_T	—	− 65	—	dB	f = 4.43MHz, V_{IN} = 1.0V_{P-P}
Frequency characteristics	C_f	− 3.0	0	+ 1.0	dB	f = 10MHz / 1MHz, V_{IN} = 1.0V_{P-P}
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.

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●Measurement circuit
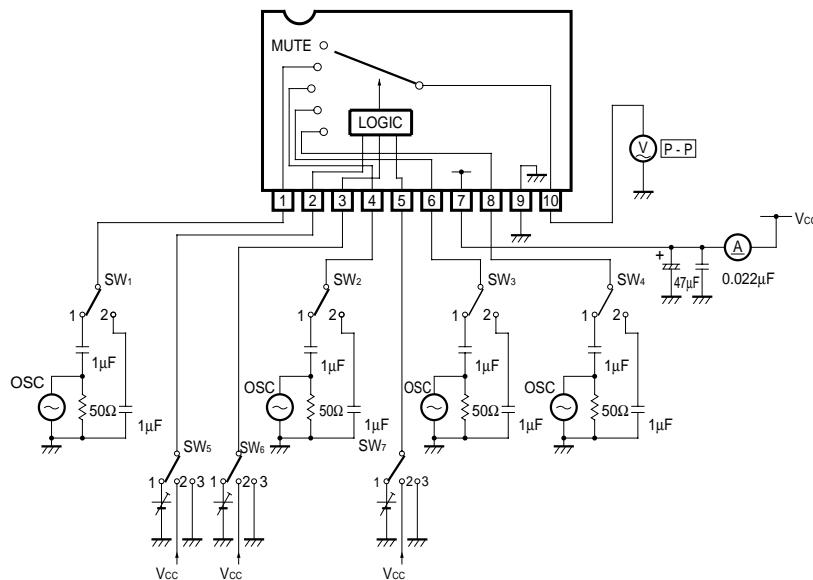
Fig. 1

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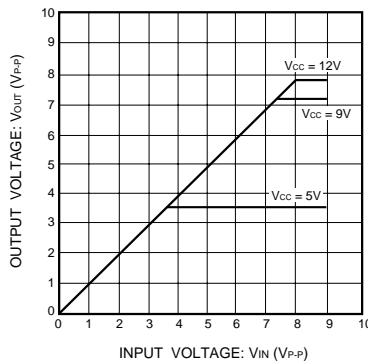
Fig. 2 V_{IN} vs. V_{OUT} (f = 1kHz)
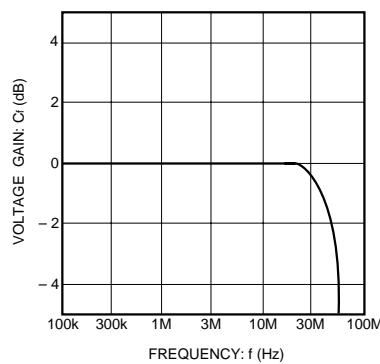
Fig. 3 Frequency characteristics
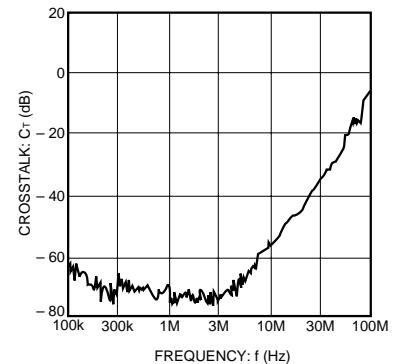
Fig. 4 Interchannel crosstalk

●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	IN 1	G$_V$	1	2	2	2	3	3	3	f = 1MHz, V$_{IN}$ = 1V$_{P-P}$ Note 2
	IN 2	G$_V$	2	1	2	2	3	2	3	
	IN 3	G$_V$	2	2	1	2	2	3	3	
	IN 4	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 / 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	
CTL pin switching level	CTLA	V$_{TH}$	2	2	1	2	1	3	3	Note 5 Note 6
	CTLB	V$_{TH}$	2	1	2	2	3	1	3	
	CTLC	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 f = 1MHz, V$_{IN}$ = 1V$_{P-P}$ sine wave. The voltage gain is given by G$_V$ = 20 log (V$_{OUT}$ / V$_{IN}$).

Note 3: Input a f = 4.43MHz, V$_{IN}$ = 1V$_{P-P}$ sine wave. The interchannel crosstalk is given by C$_T$ = 20 log (V$_{OUT}$ / V$_{IN}$).

Note 4: Input f = 1MHz and 10MHz, V$_{IN}$ = 1V$_{P-P}$ sine waves. The frequency characteristic is given by G$_f$ = 20 log (V$_{OUT}$ (f = 10MHz) / V$_{OUT}$ (f = 1MHz)).

Note 5: Input a f = 1MHz, V$_{IN}$ = 1V$_{P-P}$ 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 6: Input a f = 1MHz, V$_{IN}$ = 1V$_{P-P}$ 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 below 1.0VDC

●External dimensions (Units: mm)

SIP10
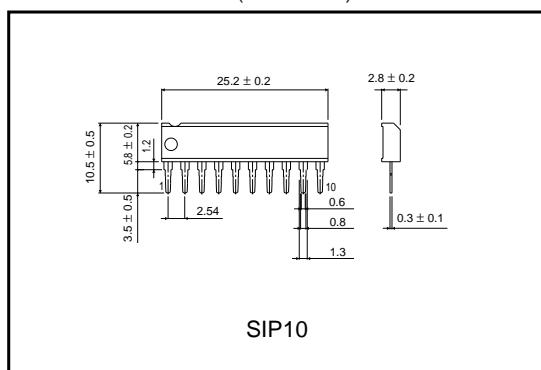
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Appendix

Notes
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