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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.

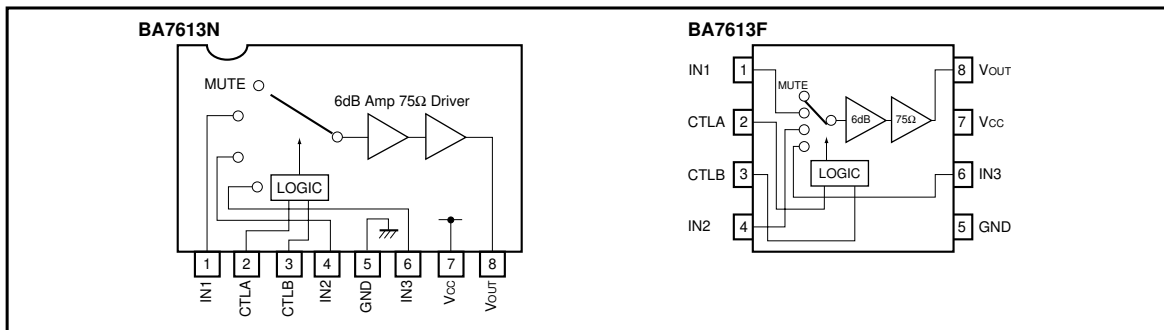
●Applications

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	Vcc	*113.5 / *210.0	V
Power dissipation	Pd	*1900*3 / *2550*4	mW
Operating temperature	Topr	- 25 ~ + 75	°C
Storage temperature	Tstg	- 55 ~ + 125	°C

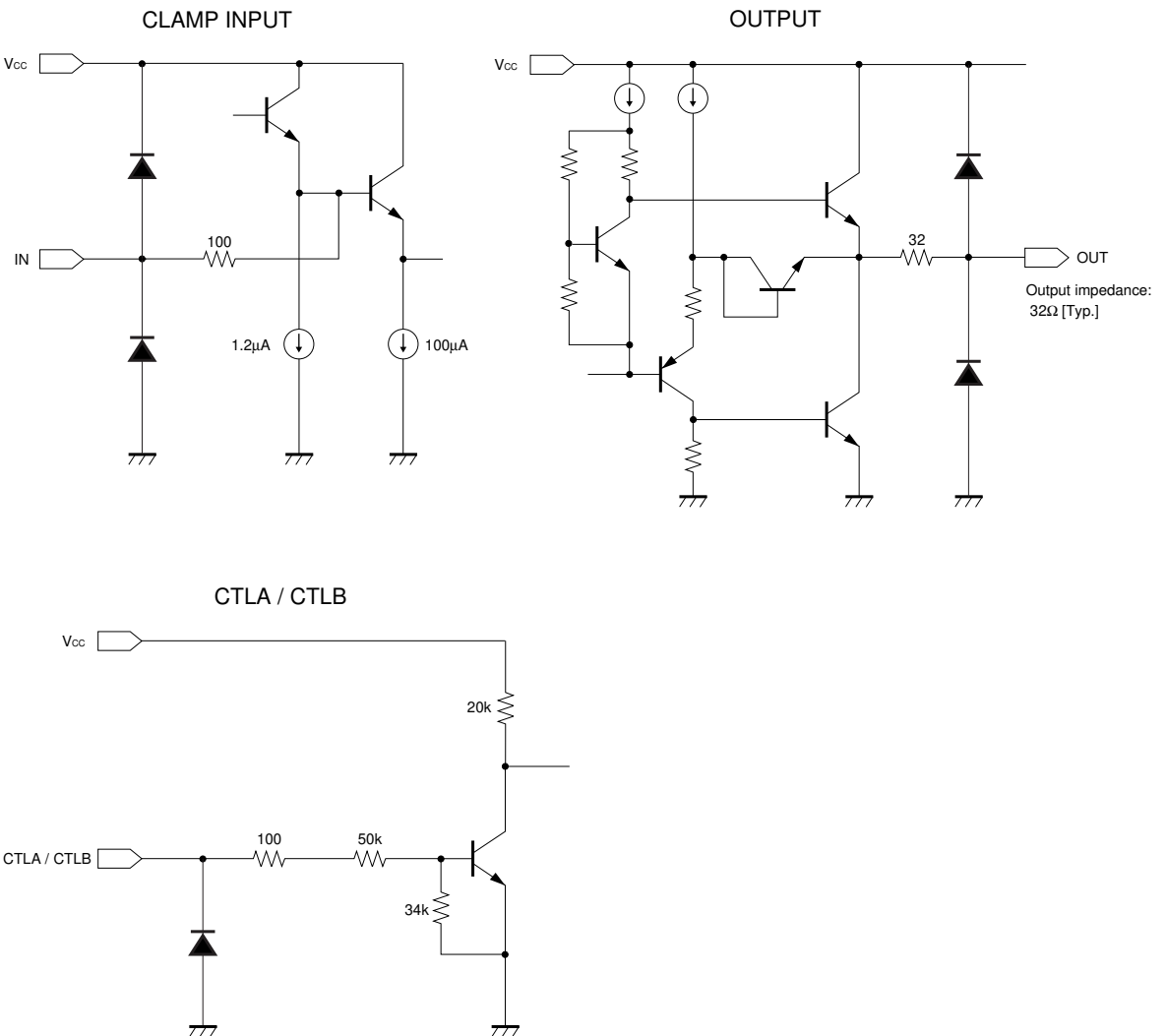
*1 BA7613N.

*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, $T_a = 25^\circ\text{V}$ 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}	$f = 1\text{kHz}$, 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

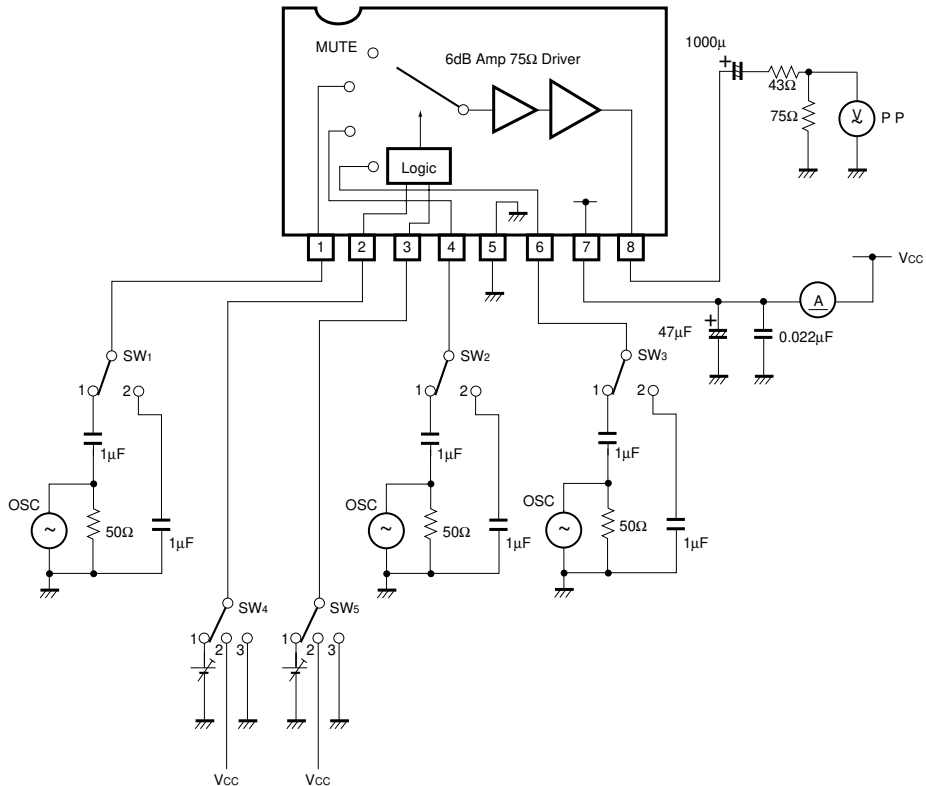


Fig. 1

●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 $G_f = 20 \log (V_{OUT} (f = 10MHz) / V_{OUT} (f = 1MHz))$.

*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

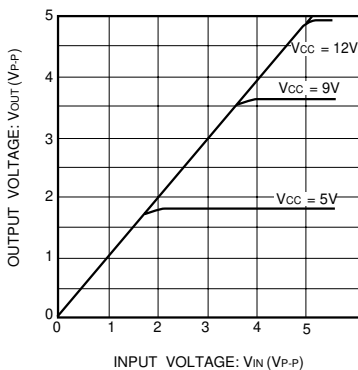


Fig. 2 VIN vs. VOUT (f = 1kHz)

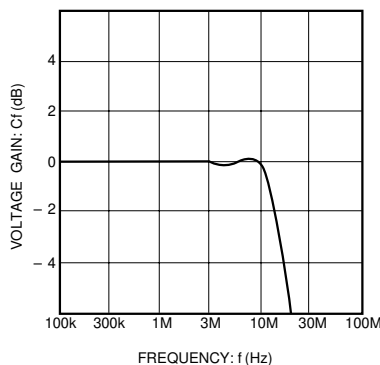


Fig. 3 Frequency characteristics

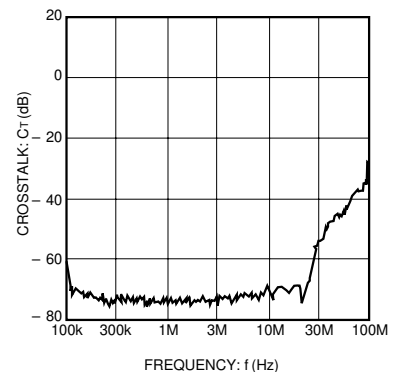
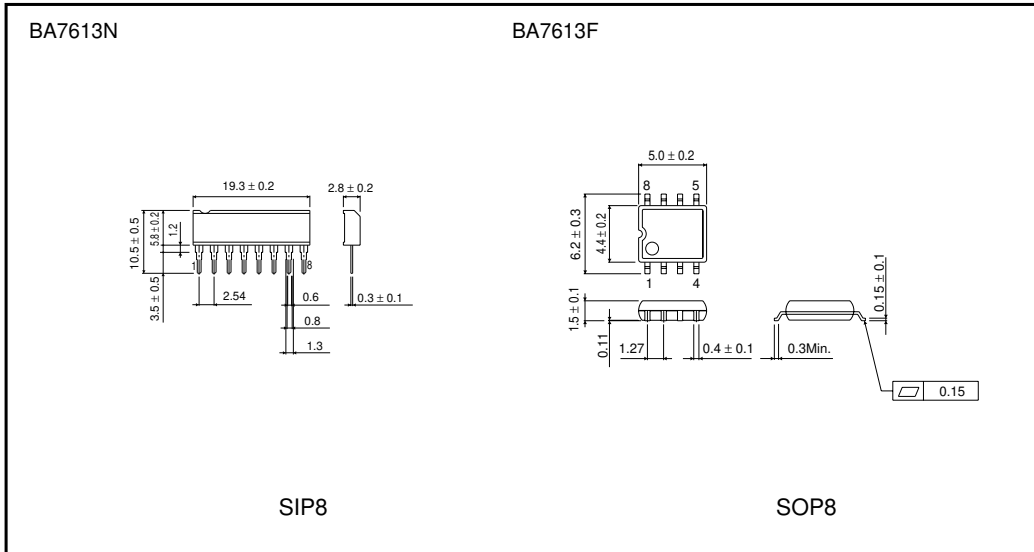


Fig. 4 Interchannel crosstalk

●Operation notes

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

● External dimensions (Units: mm)



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