2-channel head switch for radio cassette recorders

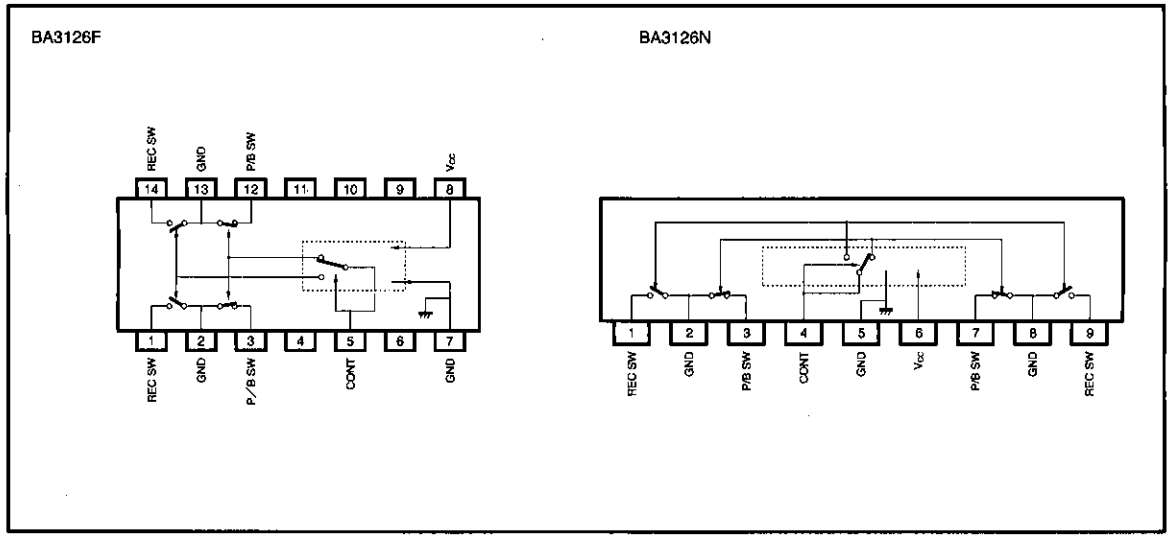
BA3126F/BA3126N

The BA3126F and BA3126N are dual-channel tape head switching ICs designed for use in radio cassette players. These ICs are designed to withstand voltages of up to 120$V_{P\text{-}P}$Min., and can handle large-amplitude bias signals during recording. Both devices have two channels, and are ideal for use in radio-cassette players.
The package types are 14-pin SOP for the BA3126F, and 9-pin SIP for the BA3126N.

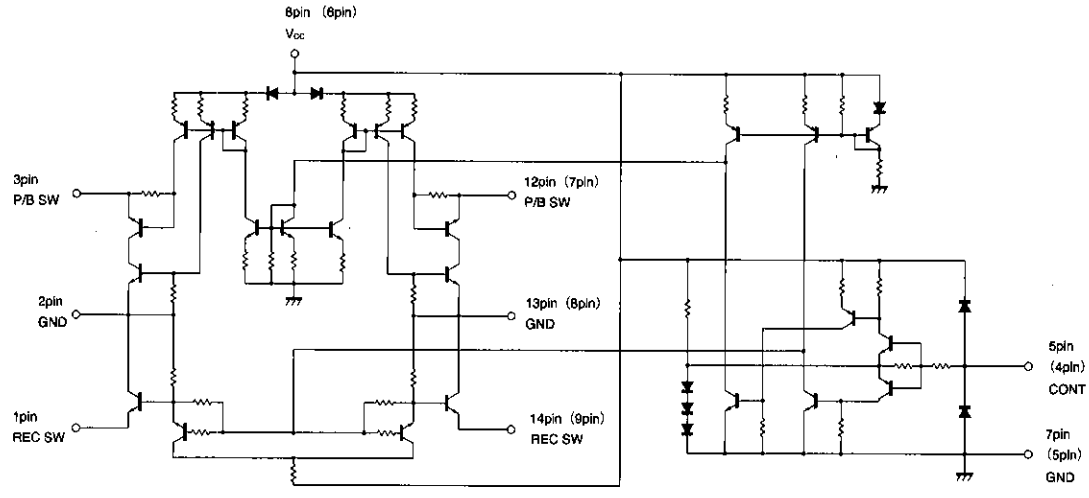
●Applications
Radio-cassette players

●Features
1) High withstanding voltage (120$V_{P\text{-}P}$Min. at f = 100kHz)
2) Low "on" resistance (P/B SW : 8Ω, REC SW : 5Ω)
3) Low offset voltage (P/B SW : 5mV, REC SW : 0.6mV)

●Block diagram



●Circuit diagram



Pin numbers for the BA3126F (BA3126N pin numbers are in brackets).

●Absolute maximum ratings (Ta = 25℃)

Parameter		Symbol	Limit	Unit
Power supply voltage		V_{CC}	16	V
Power dissipation	BA3126F	Pd	450*1	mW
	BA3126N		950*2	
Operating temperature range		Topr	−25~75	℃
Storage temperature		Tstg	−55~125	℃
DC withstanding voltage of P/B switch		BV_{DC}	±65	V

*1 Reduced by 4.5mW for each increase in Ta of 1°C over 25°C
(when mounted on a 50mm x 50mm, t = 1.6 mm, glass-epoxy PCB substrate).

*2 Reduced by 9.5mW for each increase in Ta of 1°C over 25°C

●Recommended operating conditions (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage range	V_{CC}	4.5	—	15	V

●Electrical characteristics (Unless otherwise specified Ta = 25℃, V_{CC} = 9.0V, test circuit : Figs. 7 and 8).

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Circuit current 1 (P/B)	$I_{CC}P$	—	12.0	24.0	mA	V_{cont}=0V
Circuit current 2 (REC)	$I_{CC}R$	—	5.0	12.0	mA	V_{cont}=5V
Resistance when REC switch on	$R_{on}R$	—	5.0	10.0	Ω	V_{cont}=5V
Resistance when P/B switch on	$R_{on}P$	—	8.0	15.0	Ω	V_{cont}=0V
REC switch leak current	$I_{LOFF}R$	—	0	±4	μA	V_{cont}=0V, E_2=±0.1V
P/B switch leak current	$I_{LOFF}P$	—	0	±10	μA	V_{cont}=5V, E_1=±65V
REC switch offset voltage	$V_{OFS}R$	—	0.6	6.0	mV	V_{cont}=5V, I_R=0mA
P/B switch offset voltage	$V_{OFS}P$	—	5.0	15.0	mV	V_{cont}=0V, I_P=0mA
P/B switch AC withstanding voltage	BV_{AC}	120	160	—	V_{P-P}	V_{cont}=5V, f=100kHz
Sink current when control pin is high	I_{HIGH}	—	110	180	μA	V_{cont}=5V (REC MODE)
Source current when control pin is low	I_{LOW}	—	45	120	μA	V_{cont}=0V (P/B MODE)
Control pin high threshold voltage	V_{THH}	—	3.5	3.9	V	
Control pin low threshold voltage	V_{THL}	0.5	0.7	—	V	

◎ Not designed for radiation resistance.

●Electrical characteristics curves

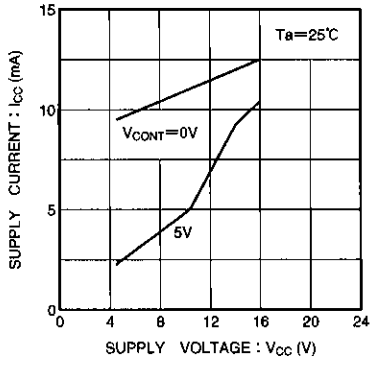


Fig. 1 Circuit current vs. supply voltage

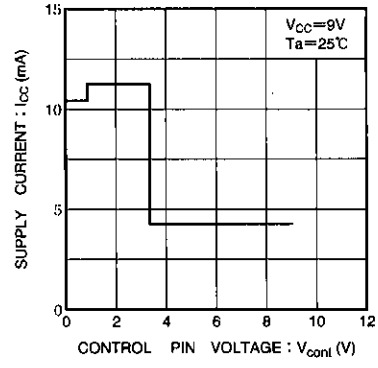


Fig. 2 Circuit current vs. control pin voltage

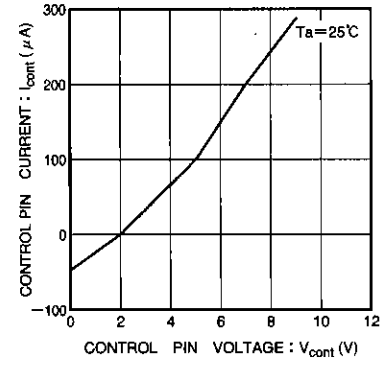


Fig. 3 Control current vs. control voltage

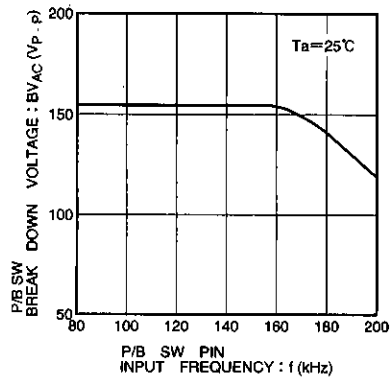


Fig. 4 P/B SW AC withstanding voltage vs. frequency

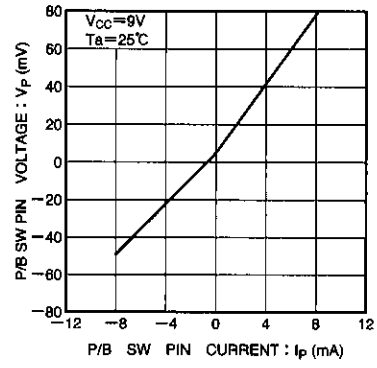


Fig. 5 P/B SW pin voltage vs. P/B SW pin current

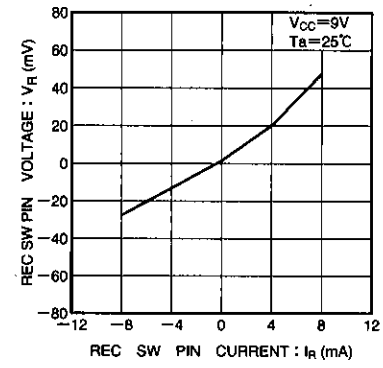


Fig. 6 REC SW pin voltage vs. REC SW pin current

●Measurement circuit

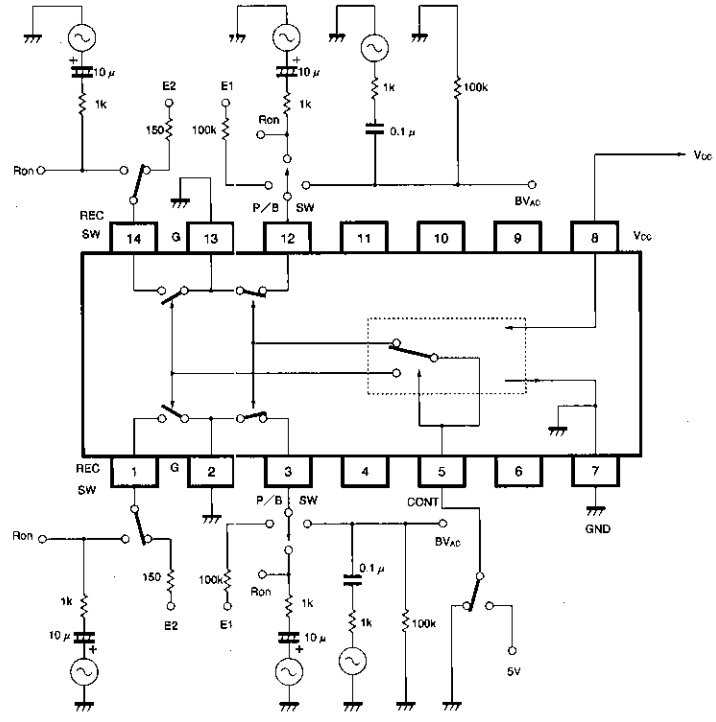


Fig. 7 BA3126F measurement circuit

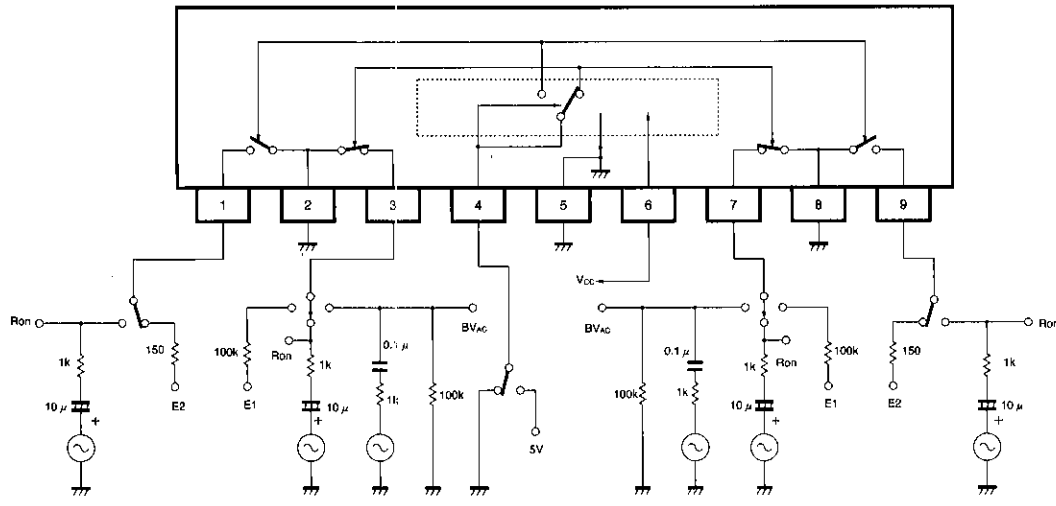


Fig. 8 BA3126N measurement circuit

●Circuit operation

(1) Playback mode

When the control pin voltage goes below 0.5V, the REC SW goes off and the P/B SW goes on to put the IC into playback mode. In this mode, the playback signal from the head is sent to the P/B amplifier via the REC SW.

●Operation notes

(1) When the voltage on the control pin drops below 0.5V, (pin 5 for the BA3126F, and pin 4 for the BA3126N) the IC switches to P/B mode. When the voltage is 0V, the maximum source current generated is 120 μA (ILOW).

When the voltage on the control pin goes above 3.9V the IC switches to REC mode. When the voltage is 5V, the maximum sink current generated is 180 μA (I_{HIGH}). When the control pin is open, the voltage on it is $3V_F$ (approximately 2V). All switches are on at this time.

REC SW	P/B SW	Control pin voltage	Control pin sink current
OFF	ON	0~0.5V	−120 μA~
ON	ON	1.5~2.5V	±50 μA
ON	OFF	3.9~V_{CC}	~180 μA

(2) P/B switch (BA3126F : pins 3 and 12, BA3126N : pins 3 and 7)

This switch is on during playback. Due to the characteristics of the transistor switch, the following DC voltage is generated :

V_{OFSP} < 15mV (V_{CC} = 9V, V_{cont} = 0V)

This switch is off during recording. A built-in, high-withstanding voltage switch means that it can handle the large-amplitude bias signal generated by the bias generator.

Due to variations between individual ICs, we recommend that you keep the voltage below $120V_{P-P}$ (at f = 100kHz).

(3) REC switch (BA3126F : pins 1 and 14, BA3126N : pins 1 and 9)

This switch is on during recording. Due to the characteristics of the transistor switch, the following DC voltage is generated :

V_{OFSP} < 6mV (V_{CC} = 9V, V_{cont} = 5V)

The switch is off during playback, and the playback signal from the head is transmitted to the playback amplifier.

(2) REC mode

When the control pin voltage goes above 3.9V, the P/B SW goes off and the REC SW goes on to put the IC into record mode. In this mode, the recording signal from REC amplifier is transmitted to the head via the P/B SW.

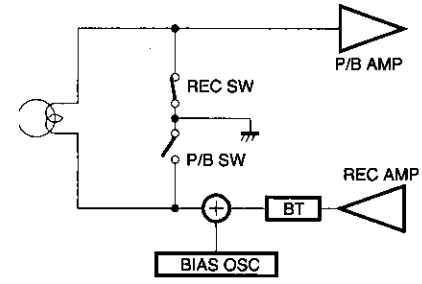


Fig. 9

(4) Power supply voltage range

Operation of the basic functions of the application example circuit are guaranteed if operated within the stipulated power supply voltage and ambient temperature ranges. We cannot guarantee the ratings for the electrical characteristics, but they will not change radically if the circuit is operated within the stipulated power supply voltage and ambient temperature ranges.

(5) Transient characteristics during power supply switching

When the power is switched on and of in P/B mode (control pin low), a transient current may flow from the P/B SW to the REC SW.

If the head is in contact with the tape, and this current flows into the head, the frequency component will be recorded as a pop sound on the tape. Pay due consideration to the power supply on/off timing and the head position relationship.

(6) Playback-to-recording switching timing

If a large-amplitude signal from the bias oscillator is applied when the P/B SW is on, the P/B switch may latch if there is excessive current from the bias oscillator. If this happens, the P/B SW will not switch off when the control pin is driven high, and the IC will not enter REC mode.

Design the timing so that when the IC is switched from playback to recording mode, the P/B SW goes off before the large-amplitude signal from the bias oscillator is applied to the P/B SW.

●Application example

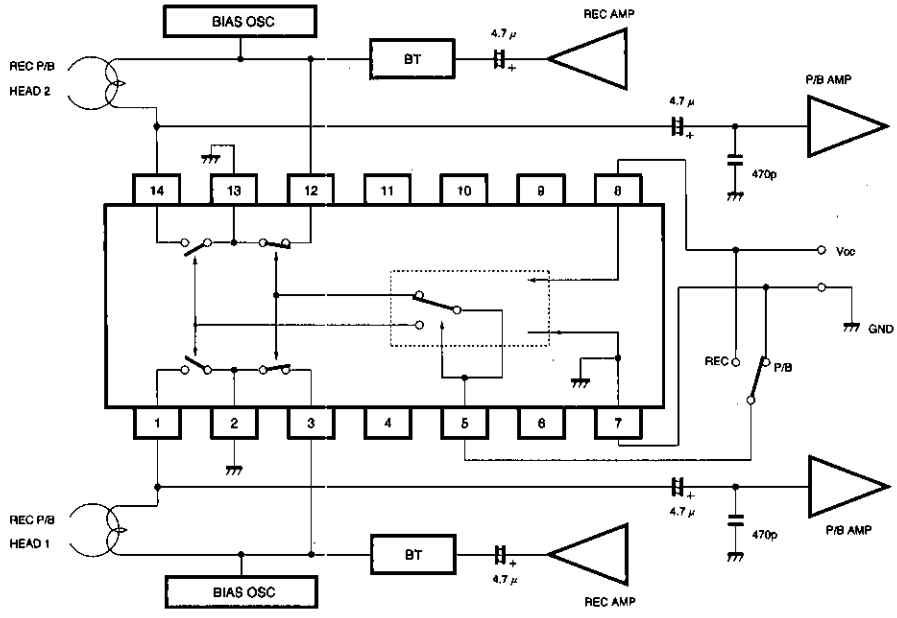


Fig. 10 BA3126F application example

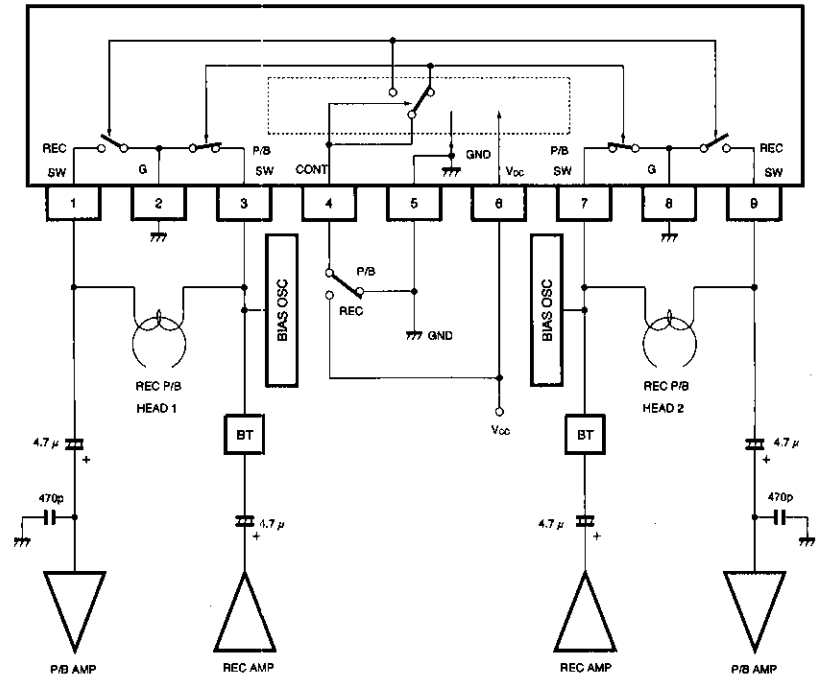
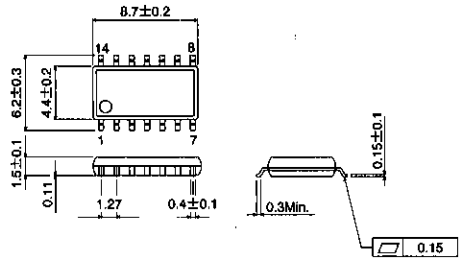


Fig. 11 BA3126N application example

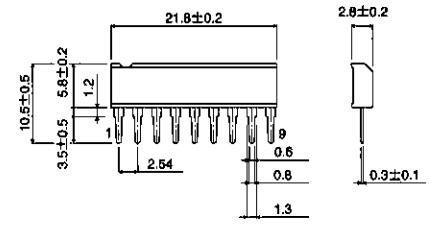
●External dimensions (Unit: mm)

BA3126F



SOP14

BA3126N



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