

2-channel PRE/REC amplifier with auto-tracking interface

BA7180AS/BA7180AFS

The BA7180AS and BA7180AFS are PRE/REC amplifiers developed for use in video cassette recorders. They have been designed for use in two-head decks and feature built-in FB damping, two preamplifiers, a chroma output amplifier, an FM output amplifier (with AGC), an envelope detector, a constant-current BTL-drive REC amplifier (with AGC) and built-in channel and REC/PB switches on a single monolithic IC.

● Applications

VCRs

● Features

- 1) The playback amplifier has a total gain of 57dB (Typ.), and has a low-noise preamplifier. Designed for VHS-band operation with low external parts count. The ICs have 2 circuits for 2-head VCR applications.
- 2) Two playback output systems (through output and AGC output). The AGC output level is 300mV_{P-P} (Typ.); suitable for FM brightness signal output.
- 3) Auto-tracking interface for automated tracking adjustment. The detector characteristic is non-linear to improve tracking accuracy during playback of low signal levels.
- 4) The recording amplifier uses constant-current BLT drive that handles load variations (i.e. head impedance) well, and gives stable recording characteristics. A single circuit is provided for 2-head VCR use.
- 5) Built-in recording level AGC means adjustment of FM recording current is not necessary.
- 6) Head switches for 2-channel PRE/REC system provided.
- 7) Operates off a single 5V power supply, with low power dissipation.

● Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V _{CC}	7.0	V
Power dissipation	BA7180AS	Pd	mW
	BA7180AFS		
Operating temperature	T _{opr}	-20~65	°C
Storage temperature	T _{stg}	-55~150	°C

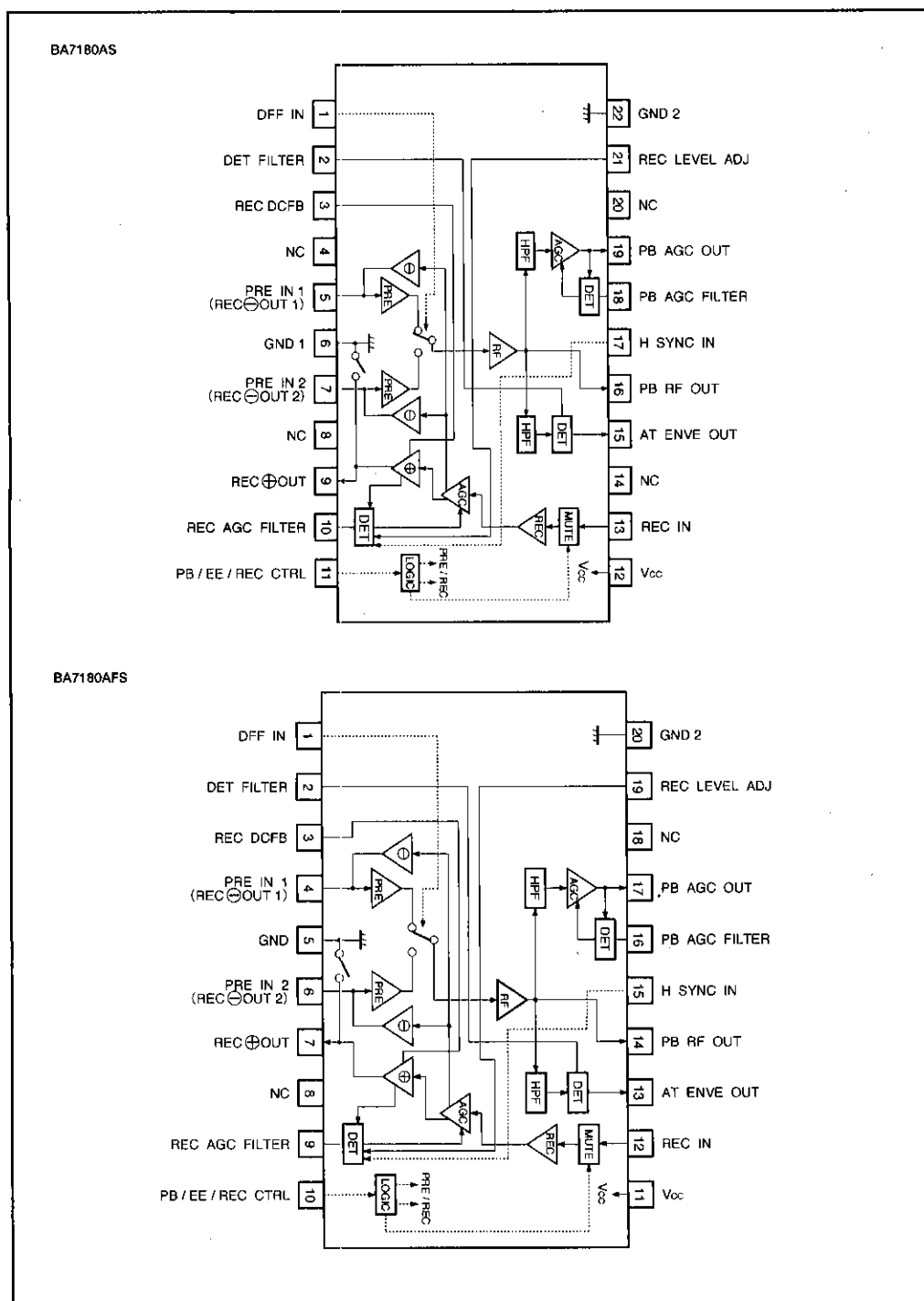
*1 Reduced by 10.0mW for each increase in Ta of 1°C over 25°C (free air).

*2 When installed on a 90mm×90mm, t = 1.6mm glass epoxy PCB, reduced by 7.5mW for each increase in Ta of 1°C over 25°C.

● Recommended operating conditions (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Playback/recording	V _{CC}	4.5	5.0	5.5	V

●Block diagram



●Electrical characteristics (Unless otherwise specified, Ta=25°C, Vcc=5.0V and f=4.0MHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions (BA7180AS)	Measurement Circuit
(Playback system)						11pin : "H"	Fig.1
Quiescent current	I _q (P)	—	18	45	mA	No signal	Fig.1
Voltage gain CH-1	G _{VP1}	54	57	60	dB	Pin 5 input = 0.3mV _{P-P} , pin 1: L, pin 16 output measurement	Fig.1
Voltage gain CH-2	G _{VP2}	54	57	60	dB	Pin 7 input = 0.3mV _{P-P} , pin 1: L, pin 16 output measurement	Fig.1
Voltage gain differential	ΔG _{VP}	-1	0	+1	dB	ΔG _{VP} =G _{VP1} -G _{VP2}	Fig.1
Frequency characteristic	ΔG _{VI}	-7	-3	0	dB	Difference in pin 16 output level for f = 8.0/1.0MHz, V _{IN} = 0.3mV _{P-P}	Fig.1
2nd harmonic distortion	2HD _P	—	-45	-38	dBc	V _{IN} = 0.3mV _{P-P} , 8.0MHz spurious	Fig.1
3rd harmonic distortion	3HD _P	—	-45	-40	dBc	V _{IN} = 0.3mV _{P-P} , 12.0MHz spurious, guaranteed design value.	Fig.1
Maximum output level	V _{OMP}	1.0	1.5	—	V _{P-P}	When pin 16 output 2nd harmonic distortion is -30dBc	Fig.1
Crosstalk	CT _P	—	-38	-32	dBc	Difference in pin 16 output level for pin 1: H/L.	Fig.1
Output DC offset	ΔV _{OOC}	-150	0	+150	mV _{P-P}	Pin 16 output DC offset for pin 1: H/L.	Fig.1
Input conversion noise	V _{NIN}	—	0.25	1.0	μVrms	R _G = 10Ω, input conversion of pin 14 output noise, guaranteed design value.	Fig.1
AGC output level	V _{AGC}	250	300	350	mV _{P-P}	V _{IN} = 0.3mV _{P-P} , Pin 19 output measurement	Fig.1
AGC control sensitivity	ΔV _{AGC}	—	0.3	2.0	dB	Pin 19 output level difference for V _{IN} = 0.15 ~ 0.6mV _{P-P} ,	Fig.1
AGC amp frequency characteristic	ΔG _{VAF}	-3	0.5	+3	dB	Difference in pin 19 output level for f = 8.0/1.0MHz, V _{IN} = 0.3mV _{P-P} , guaranteed design value.	Fig.1
PB switch ON resistance	R _{ONB}	—	4	10	Ω	Pin 9 impedance, guaranteed design value.	Fig.1
PRE CH 2 threshold voltage	V _{TH1H}	3.5	—	V _{CC}	V	Pin 1 DC voltage for CH 2 operation	Fig.1
PRE CH 1 threshold voltage	V _{TH1L}	0	—	1.2	V	Pin 1 DC voltage for CH 1 operation	Fig.1
ENVE output level	V _{ENV2}	1.9	2.4	2.9	V	Pin 15 output measurement when pin 16 output = 100mV _{P-P}	Fig.1
ENVE output level	V _{ENV3}	3.45	3.7	3.95	V	Pin 15 output measurement when pin 16 output = 400mV _{P-P}	Fig.1
ENVE saturation voltage	V _{ENV4}	4.0	4.5	—	V	Pin 15 output measurement for large signal	Fig.1
PB mode threshold voltage	V _{TH10H}	3.8	—	V _{CC}	V	Pin 11 DC voltage for PB mode	Fig.1
EE mode threshold voltage	V _{TH10M}	2.2	—	2.8	V	Pin 11 DC voltage for REC MUTE mode	Fig.1
REC mode threshold voltage	V _{TH10L}	0	—	1.2	V	Pin 11 DC voltage for REC mode	Fig.1

PRE/REC amplifiers

VCR components

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions (BA7180AS)	Measurement Circuit
(Recording system)						Pin 11 in Fig. 2 test circuit "L"	Fig.2
Quiescent current	$I_{Q(R)}$	—	72	110	mA	No signal	Fig.2
Recording AGC level	I_{OAR}	27	30	33	mA _{P-P}	Pin 13 input = 125mV _{P-P} , pin 9 output measurement	Fig.2
AGC control sensitivity	ΔI_{OAR}	—	0.3	1.5	dB	Pin 9 output level difference for pin 13 input = 62.5mV _{P-P} ~ 250mV _{P-P}	Fig.2
REC amplifier frequency characteristic	ΔI_{OAF}	—4	—1.5	—	dB	Pin 9 output level difference for f = 8.0/1.0MHz, pin 12 input = 125mV _{P-P} , guaranteed design value.	Fig.2
2nd harmonic distortion	$2HD_R$	—	—45	—38	dBc	Pin 13 input = 125mV _{P-P} 8MHz spurious	Fig.2
3rd harmonic distortion	$3HD_R$	—	—50	—40	dBc	Pin 13 input = 125mV _{P-P} 12MHz spurious, guaranteed design value.	Fig.2
Cross modulation distortion	CMD_R	—	—50	—40	dBc	4.0MHz ± 630kHz spurious, guaranteed design value.	Fig.2
Maximum output level	I_{OMR}	40	50	—	mA _{P-P}	When pin 9 output 2nd harmonic distortion is -30dB	Fig.2
Recording current load characteristic	ΔI_{ORL}	—1.5	—0.35	—	dB	Pin 9 output level difference for load L: 8.2 ~ 12 μ H, guaranteed design value.	Fig.2
Mute attenuation ratio	MUR	—	—45	—38	dBc	Pin 9 output level difference for pin 11: M/H.	Fig.2
AGC mode threshold voltage	V_{TH15H}	2.7	—	V_{CC}	V	Pin 17 DC voltage to maintain recording AGC operation	Fig.2
AGC mode threshold voltage	V_{TH15L}	0	—	1.2	V	Pin 17 DC voltage to maintain recording AGC stopped	Fig.2

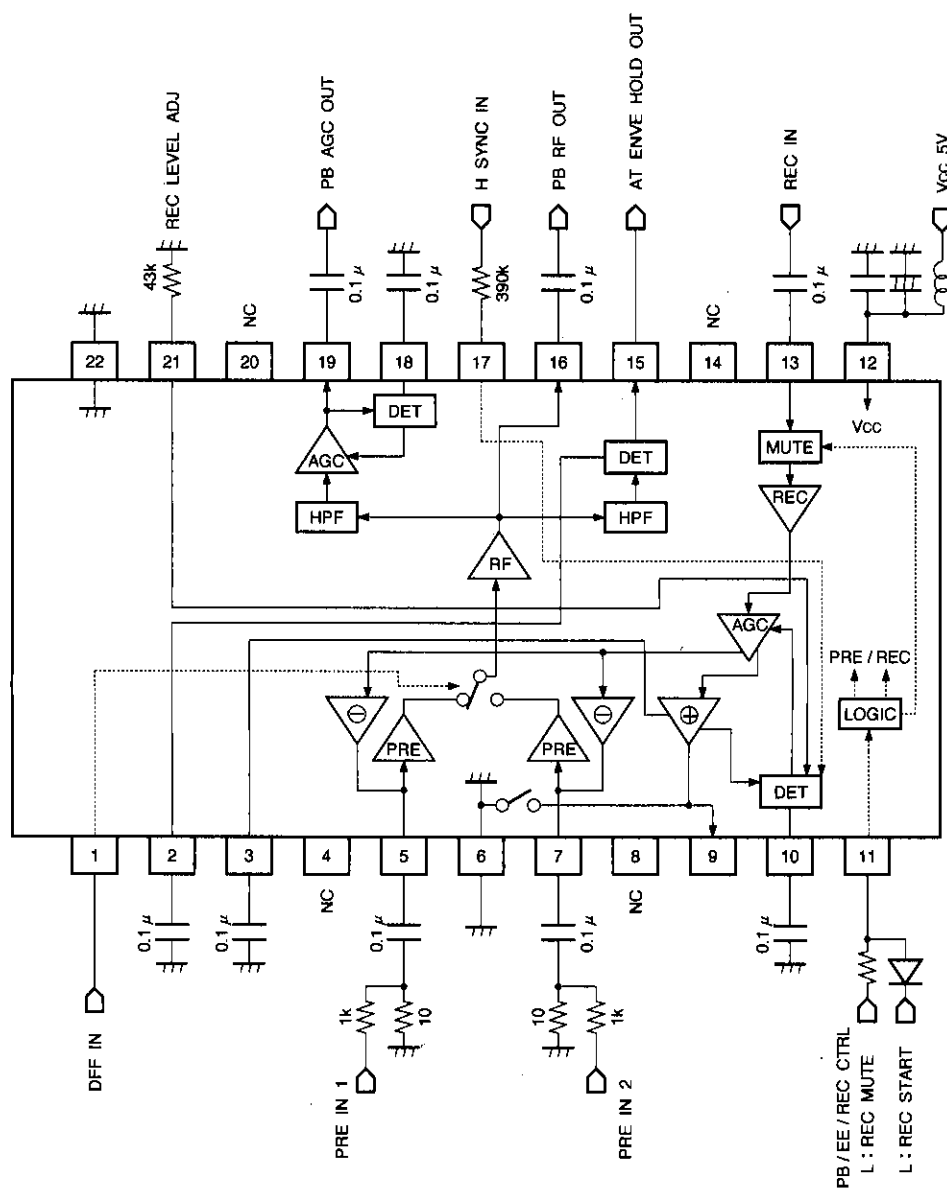
* Note: dBc: dB below carrier (used to express relative level from carrier reference for convenience sake)

●Reference values (Unless otherwise specified, Ta=25°C, V_{CC}=4.8V and f=4.0MHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions (BA7180AS)
ENVE output level	$V_{ENV2'}$	1.8	2.3	2.8	V	Pin 15 output measurement when pin 16 output = 100mV _{P-P} .
ENVE output level	$V_{ENV3'}$	3.35	3.6	3.85	V	Pin 15 output measurement when pin 16 output = 400mV _{P-P} .

● Measurement circuit

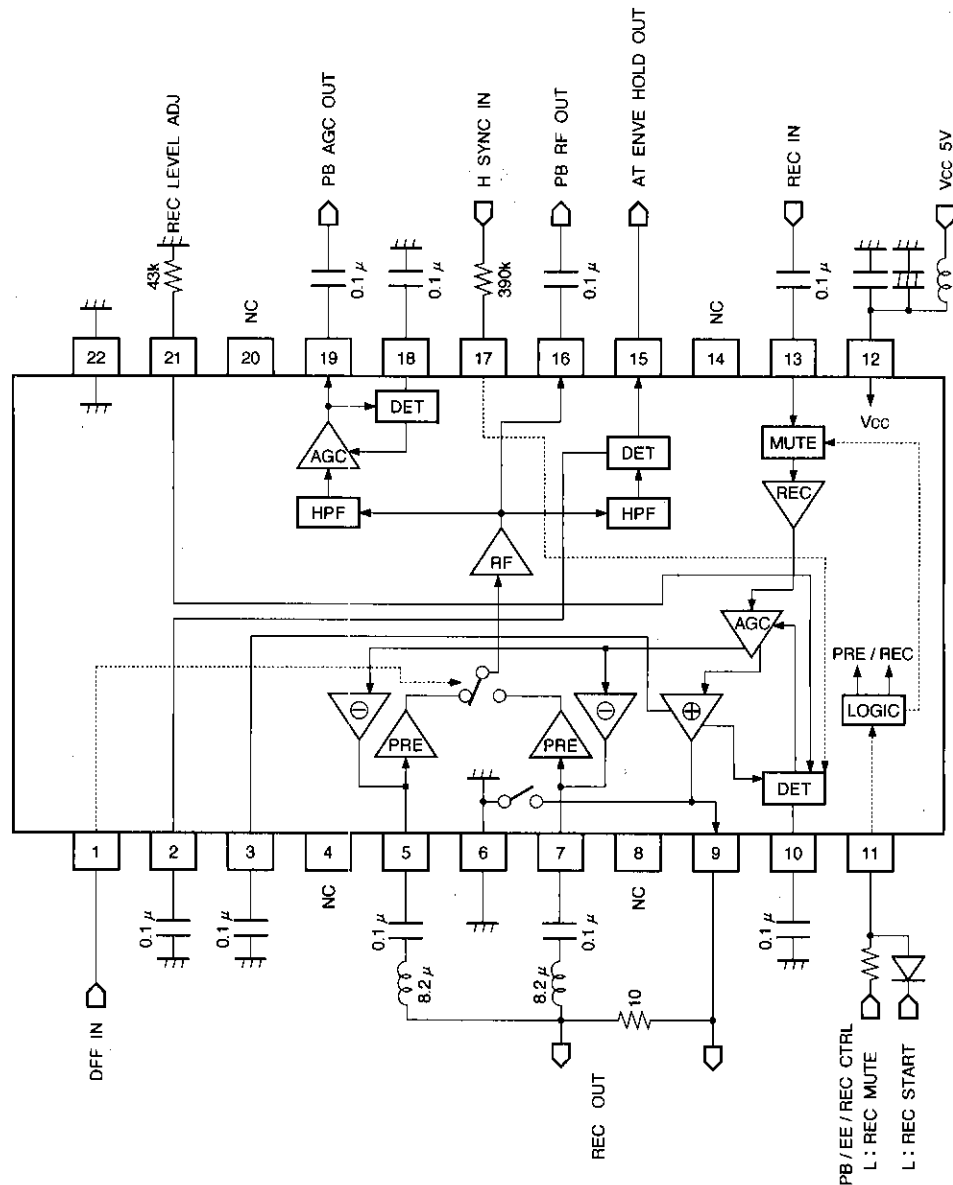
BA7180AS (playback system)



Unit : R [Ω]
 C [F]
 L [H]

Fig.1

BA7180AS (recording system)

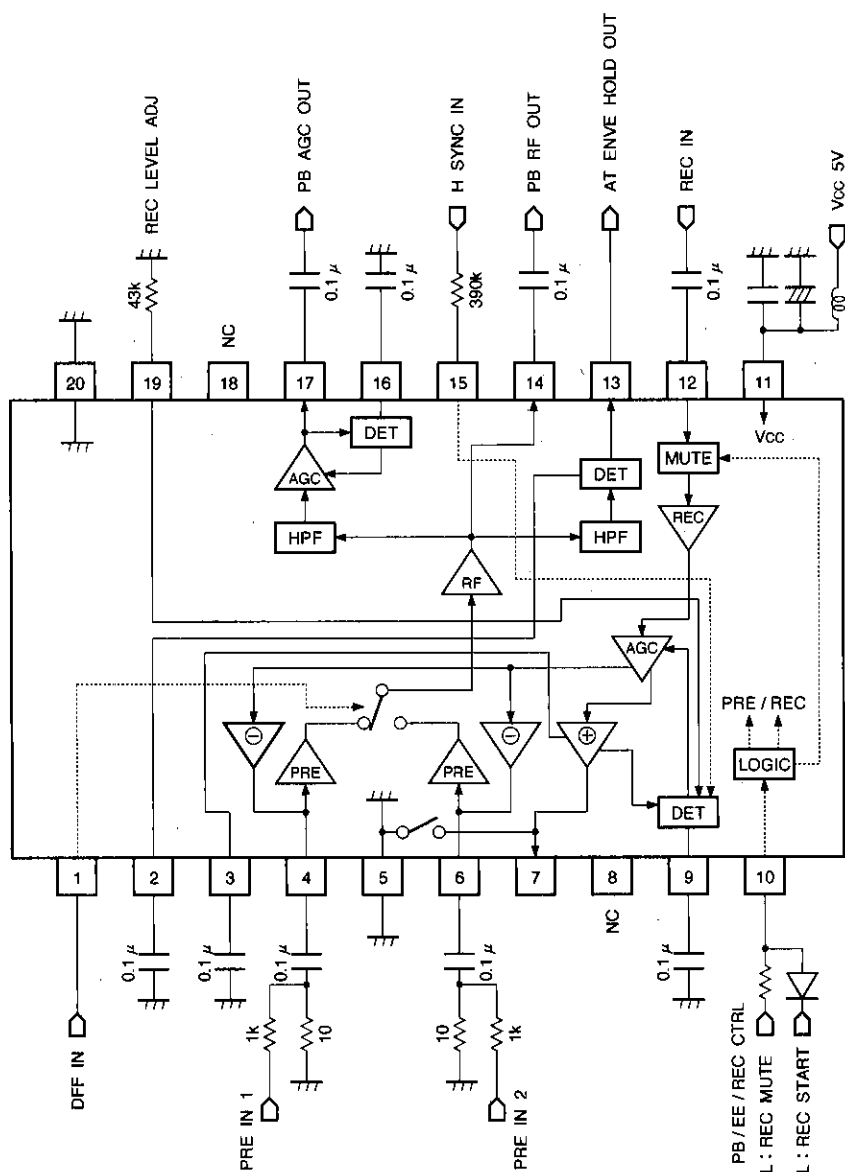


Unit : R [Ω]
 C [F]
 L [H]

Fig.2

● Measurement circuit

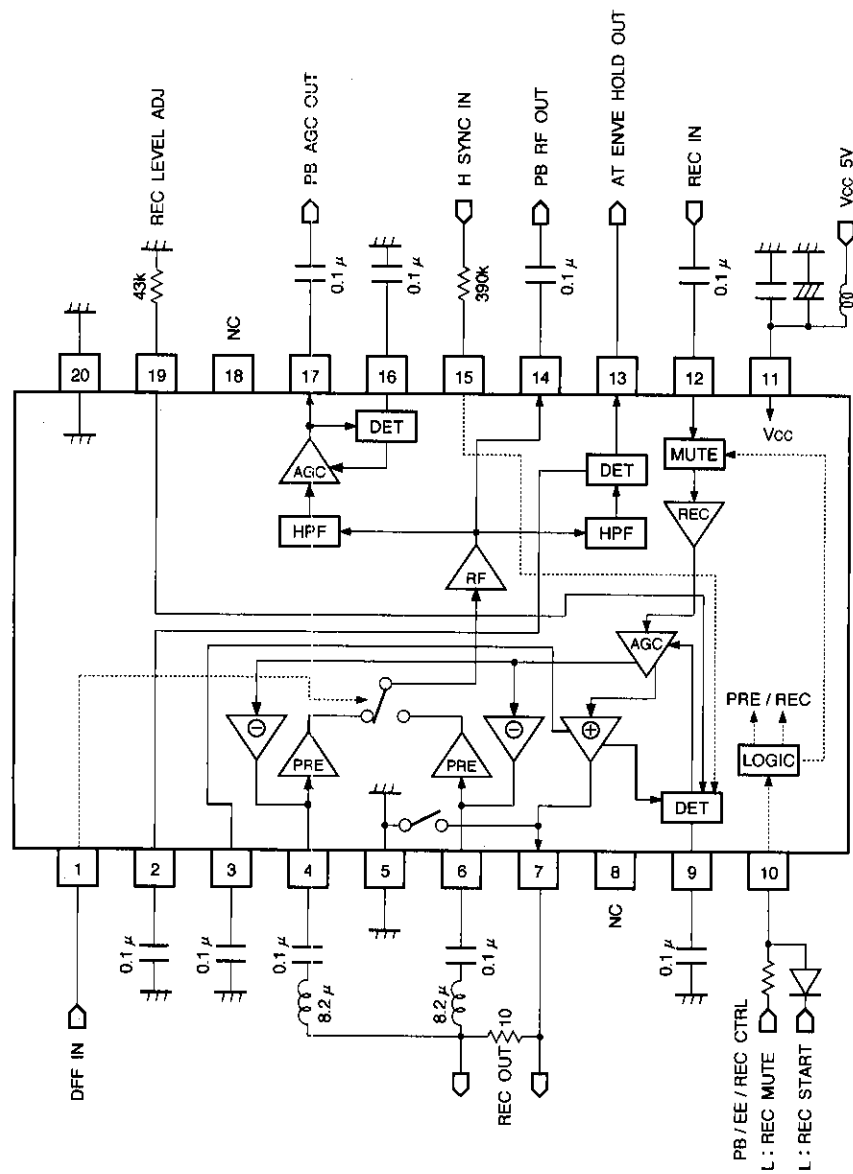
BA7180AFS (playback system)



Unit : R [Ω]
 C [F]
 L [H]

Fig.3

BA7180AFS (recording system)



Unit : R [Ω]
 C [F]
 L [H]

Fig.4

●Circuit operation

Control system logic table

(1) DFF IN (pin 1)

•Playback input selection (head switching)

Control pin	Function	Control voltage V _{CTRL1} [V]
DFF IN	Selected playback input	
H	CH2 (PRE IN2)	3.5~V _{CC}
L	CH1 (PRE IN1)	0.0~1.2

(2) H SYNC IN (BA7180AS: pin 17, BA7180AFS: pin 15)

•Controls recording AGC detector block operation.

Control pin	Function	Control voltage V _{CTRL1} [V]
H SYNC	AGC detector	
H	ON	2.7~V _{CC}
L	OFF	0.0~1.2

(3) PB/EE/REC CTRL (BA7180AS: pin 11, BA7180AFS: pin 10)

•Playback/recording mute/ recording mode switching

Control pin	Mode	Function				Control voltage V _{CTRL1} [V]
PB / EE / REC		PRE AMP	AT ENVE	REC MUTE	REC AMP	
H	PB	ON	ON	OFF	OFF	3.8~V _{CC}
M	REC MUTE	OFF	OFF	ON	ON	2.2~2.8
L	REC	OFF	OFF	OFF	ON	0.0~1.2

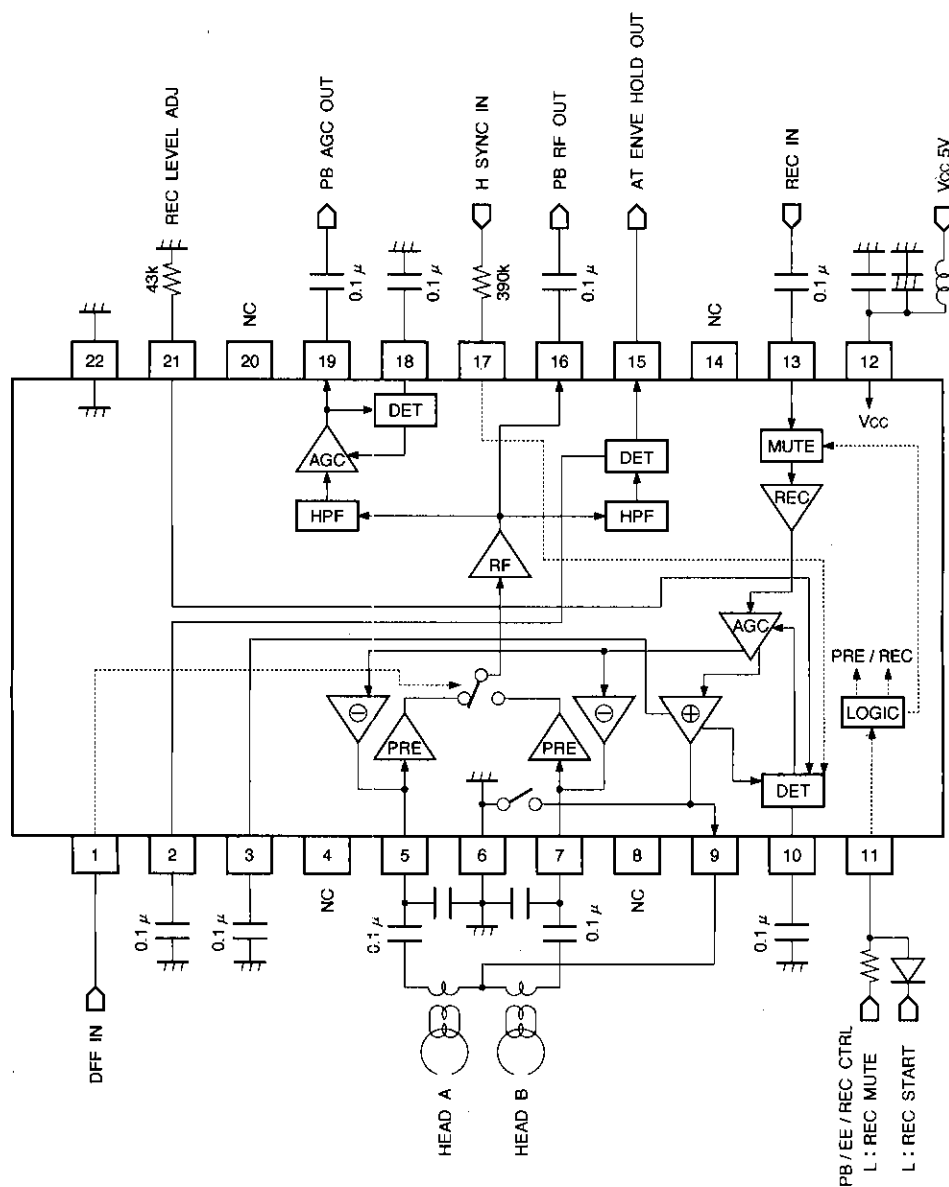
• The PB/EE/REC CTRL pin is pulled up to V_{CC} via a 33kΩ resistor.

●Operation notes

NC pins can be connected to GND.

●Application example

BA7180AS

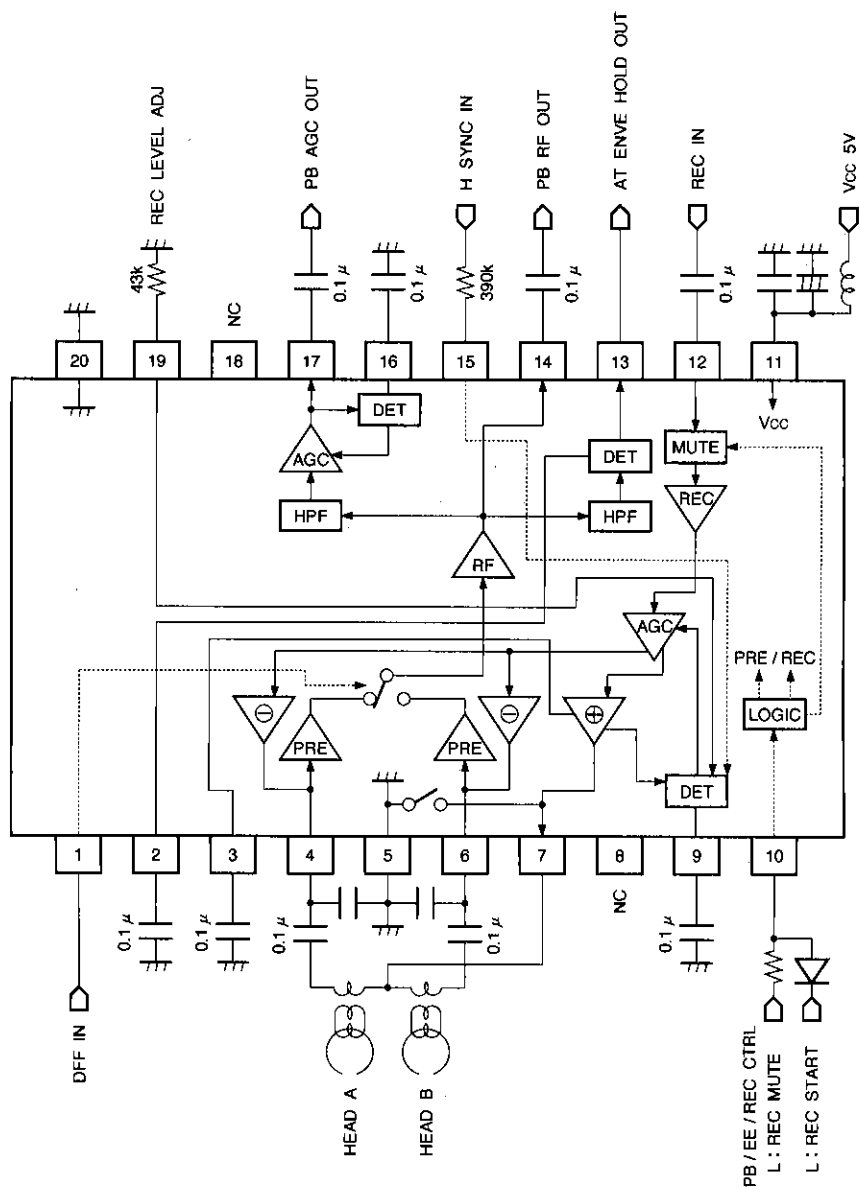


Unit : R [Ω]
 C [F]
 L [H]

Fig.5

●Application example

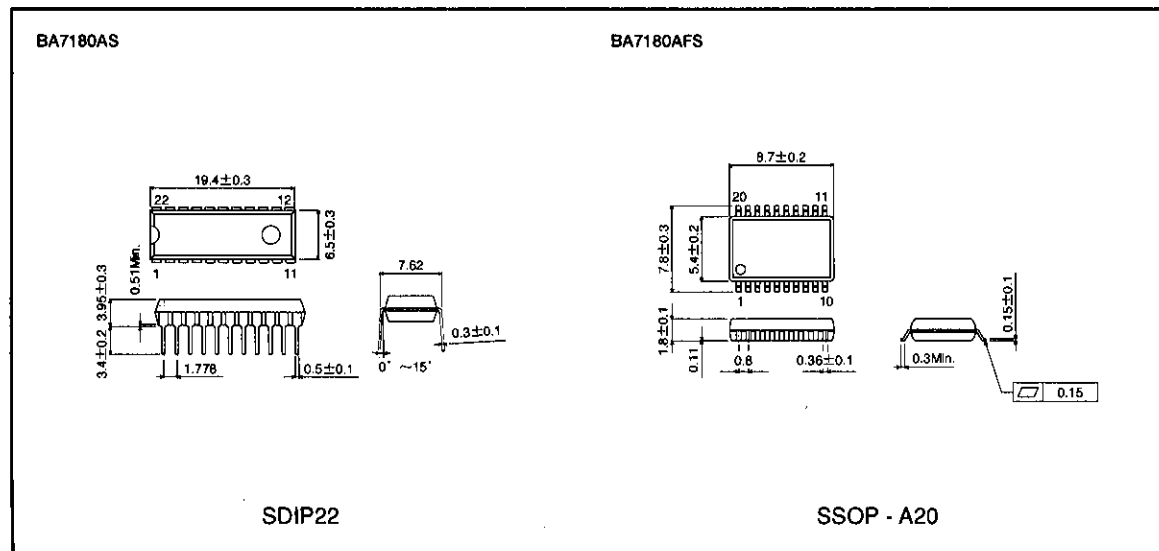
BA7180AFS



VCR components PRE/REC amplifiers

Fig.6

● External dimensions (Units: mm)



Notes

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