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

## BA7182AS

The BA7182AS is a PRE / REC amplifier developed for use in video cassette recorders. It has been designed for use in two-head decks and features 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 59dB (Typ.), and has a low-noise preamplifier. Designed for VHS-band operation with low external parts count. The IC has 2 circuits for 2-head VCR applications.
2) Two playback output systems (throgh output and AGC output). The AGC output level is 270mV$_{P-P}$ (Typ.) ; suitable for FM brightness signal output.
3) Auto-tracking interface for automated tracking adjustment. An integrate and hold detector is used to reduce the load on the microcontroller.
4) The recording amplifier uses constant-current BLT drive that handles load variations (i.e. headimpedance) 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 |
|---|---|---|---|
| Applied voltage | $V_{CC}$ | 7.0 | V |
| Power dissipation | Pd | 1100* | mW |
| Operating temperature | Topr | – 20 ~ + 75 | °C |
| Storage temperature | Tstg | – 55 ~ + 125 | °C |

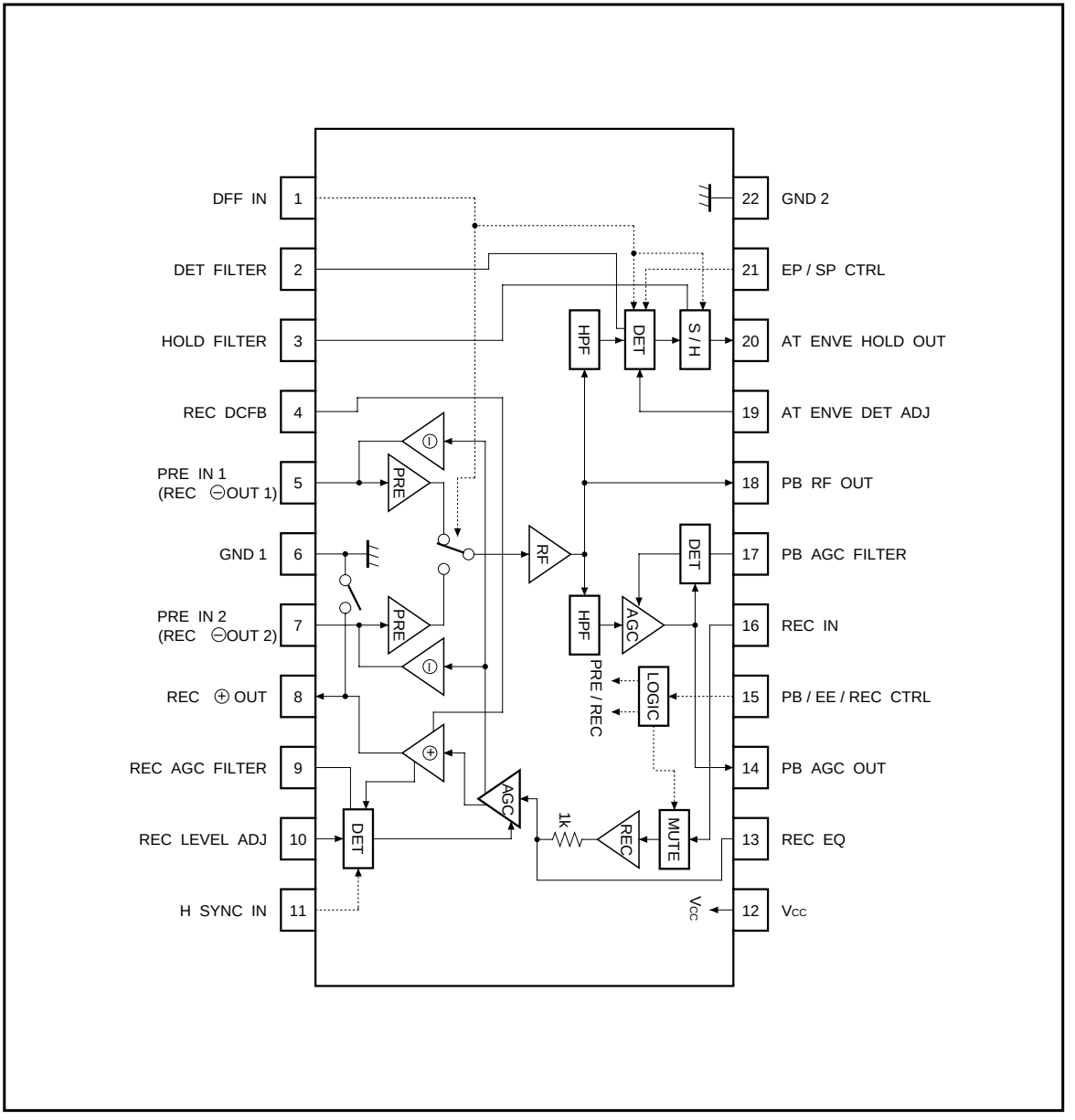
* Reduced by 11mW for each increase in Ta of 1°C over 25°C (free air).

●Recommended operating conditions (Ta = 25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Playback / recording | $V_{CC}$ | 4.5 | 5.0 | 5.5 | V | 12pin |

○Not designed for radiation resistance.

●Block diagram



●Electrical characteristics (unless otherwise noted, Ta = 25°C, $V_{CC}$ = 5.0V and f = 4.0MHz)

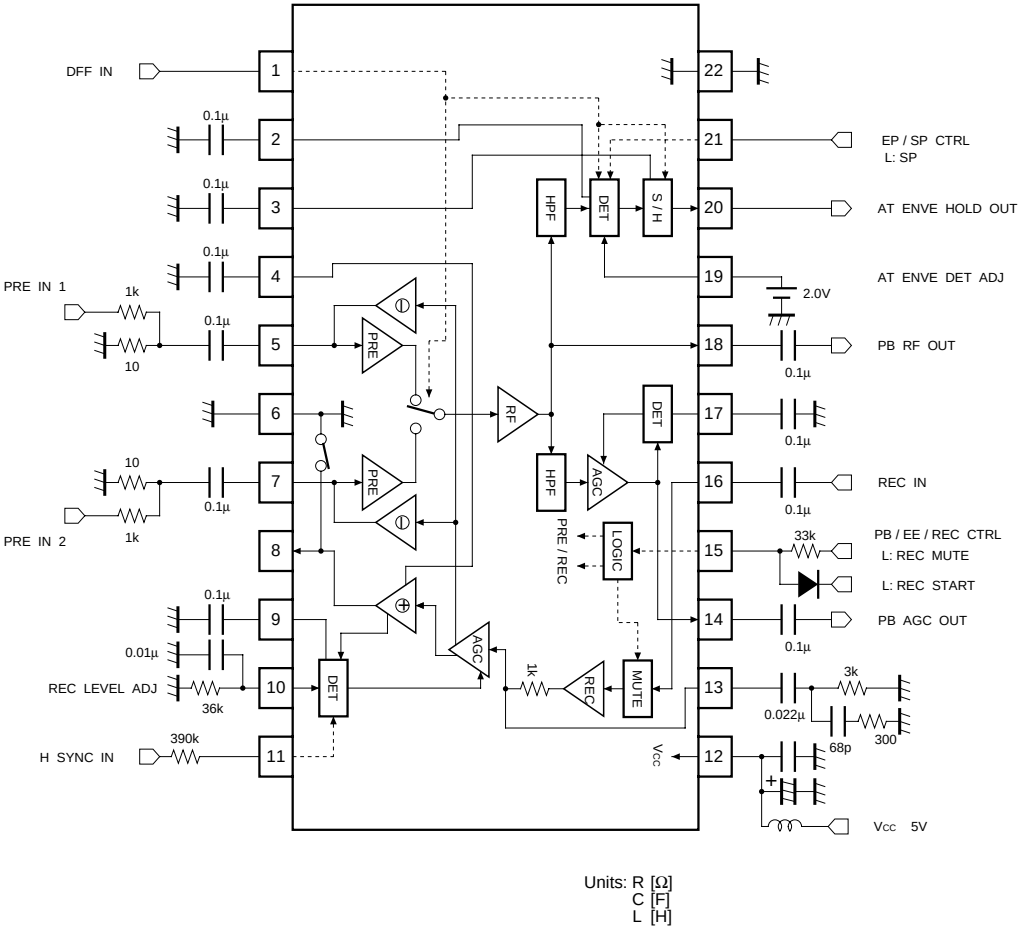
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions | Measurement circuit |
|---|---|---|---|---|---|---|---|
| ⟨Playback system⟩ (Pin 15: H) | | | | | | | |
| Quiescent current | $I_{q\ (P)}$ | — | 26 | 42 | mA | No signal | Fig.1 |
| Voltage gain ch-1 | $G_{VP1}$ | 56.5 | 59 | 61.5 | dB | Pin 5 input = 0.3m$V_{P-P}$, pin 1: L, pin 18 output measurement | Fig.1 |
| Voltage gain ch-2 | $G_{VP2}$ | 56.5 | 59 | 61.5 | dB | Pin 7 input = 0.3m$V_{P-P}$, pin 1: H, pin 18 output measurement | Fig.1 |
| Voltage gain differential | $\Delta G_{VP}$ | – 1 | 0 | 1 | dB | $\Delta G_{VP} = G_{VP1} - G_{VP2}$ | Fig.1 |
| Frequency characteristic | $\Delta G_{Vf}$ | – 6 | – 3 | – 1 | dB | Difference in pin 18 output level for f = 8.0 / 1.0MHz, $V_{IN}$ = 0.3m$V_{P-P}$ | Fig.1 |
| 2nd harmonic distortion | $2HD_P$ | — | – 45 | – 35 | dBc | $V_{IN}$ = 0.3m$V_{P-P}$, 8.0MHz spurious | Fig.1 |
| 3rd harmonic distortion | $3HD_P$ | — | – 50 | – 35 | dBc | $V_{IN}$ = 0.3m$V_{P-P}$, 12.0MHz spurious, guaranteed design value. | Fig.1 |
| Maximum output level | $V_{OMP}$ | 1.0 | 1.5 | — | $V_{P-P}$ | When pin 18 output 2nd harmonic distortion is – 30dBc | Fig.1 |
| Crosstalk | $CT_P$ | — | – 38 | – 33 | dBc | Difference in pin 18 output level for pin 1: H / L. | Fig.1 |
| Output DC offset | $\Delta V_{ODC}$ | – 150 | 0 | 150 | m$V_{P-P}$ | Pin 18 output DC offset for pin 1: H / L. | Fig.1 |
| Input conversion noise | $V_{NIN}$ | — | 0.25 | 1.0 | $\mu V_{rms}$ | Rg = 10Ω, input conversion of pin 18 output noise, guaranteed design value. | Fig.1 |
| AGC output level | $V_{AGC}$ | 220 | 270 | 320 | m$V_{P-P}$ | $V_{IN}$ = 0.3m$V_{P-P}$ Pin 14 output measurement | Fig.1 |
| AGC control sensitivity | $\Delta V_{AGC}$ | — | 0.3 | 2 | dB | Pin 14 output level difference for $V_{IN}$ = 0.15 and 0.6m$V_{P-P}$ | Fig.1 |
| AGC frequency characteristic | $\Delta G_{VAF}$ | – 2 | 0.5 | 2 | dB | Difference in pin 14 output level for f = 8.0 / 1.0MHz $V_{IN}$ = 0.3m$V_{P-P}$. | Fig.1 |
| PB switch ON resistance | $R_{ON8}$ | — | 5 | 10 | Ω | Pin 8 impedance | Fig.1 |
| PRE ch 2 holding voltage | $V_{TH1H}$ | 3.5 | — | $V_{CC}$ | V | Pin 1 DC voltage for ch 2 operation | Fig.1 |
| PRE ch 1 holding voltage | $V_{TH1L}$ | 0 | — | 1.2 | V | Pin 1 DC voltage for ch 1 operation | Fig.1 |
| ENVE output level SP-2 | $V_{EN-S2}$ | 1.4 | 2.2 | 3.0 | V | Pin 20 output measurement when pin 21 = L and pin 18 output = 250m$V_{P-P}$ | Fig.1 |
| ENVE sensitivity curve | $P_{CRV}$ | 150 | 200 | 250 | % | — | Fig.1 |
| ENVE saturation voltage | $V_{EN-MA}$ | 4.6 | 4.9 | — | V | Pin 21 = L, Pin 20 output measurement for large signal | Fig.1 |
| ENVE residual voltage | $V_{EN-MI}$ | — | 0.1 | 0.4 | V | Pin 21 = L, Pin 20 output measurement for no signal | Fig.1 |
| EP mode holding voltage | $V_{TH21H}$ | 3.5 | — | $V_{CC}$ | V | Pin 21 DC voltage for EP mode | Fig.1 |
| SP mode holding voltage | $V_{TH21L}$ | 0 | — | 1.2 | V | Pin 21 DC voltage for SP mode | Fig.1 |

(unless otherwise noted, Ta = 25°C, $V_{CC}$ = 5.0V, f = 4.0MHz and $I_{OAR}$ = 36mA$_{P-P}$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions | Measurement circuit |
|---|---|---|---|---|---|---|---|
| ⟨Recording system⟩ (Pin 15: L) | | | | | | | |
| Quiescent current | $I_{q\,(R)}$ | — | 72 | 108 | mA | No signal | Fig.2 |
| Recording AGC level | $I_{OAR}$ | 30 | 36 | 42 | mA$_{P-P}$ | Pin 16 input = 400mV$_{P-P}$, pin 8 output measurement | Fig.2 |
| AGC control sensitivity | $\Delta I_{OAR}$ | — | 0.15 | 2 | dB | Pin 8 output level difference for f = 4.0MHz, pin 16 input = 225mV$_{P-P}$ to 800mV$_{P-P}$. | Fig.2 |
| AGC frequency characteristic | $\Delta I_{OAF}$ | – 2 | 0 | 2 | dB | Pin 8 output level difference for f = 8.0 / 1.0MHz, pin 16 input = 400mV$_{P-P}$ | Fig.2 |
| 2nd harmonic distortion | $2HD_R$ | — | – 41 | – 35 | dBc | Pin 16 input = 400mV$_{P-P}$, 8.0MHz spurious. | Fig.2 |
| 3rd harmonic distortion | $3HD_R$ | — | – 50 | – 40 | dBc | Pin 16 input = 400mV$_{P-P}$, 12.0MHz spurious, guaranteed design value. | Fig.2 |
| Cross modulation distortion | $CMD_R$ | — | – 43 | – 38 | dBc | 4.0MHz ± 630kHz spurious, guaranteed design value. | Fig.2 |
| Maximum output level | $I_{OMR}$ | 42 | 50 | — | mA$_{P-P}$ | When pin 8 output 2nd harmonic distortion is – 30dB | Fig.2 |
| Recording current load characteristic | $\Delta I_{ORL}$ | – 2 | – 0.35 | — | dB | Pin 8 output level difference for load L: 8.2 ~ 12μH | Fig.2 |
| Mute attenuation ratio | $MU_R$ | — | – 44 | – 38 | dBc | Pin 8 output level difference for pin 15: M / H. | Fig.2 |
| Frequency characteristic | $\Delta I_{OEQ}$ | – 5.3 | – 7.8 | – 10.3 | dB | Pin 8 output level difference for f = 8.0 / 1.0MHz, AGC OFF | Fig.2 |
| AGC mode holding voltage | $V_{TH11H}$ | 2.7 | — | $V_{CC}$ | V | Pin 11 DC voltage to maintain recording AGC operation | Fig.2 |
| $\overline{\text{AGC}}$ mode holding voltage | $V_{TH11L}$ | 0 | — | 1.2 | V | Pin 11 DC voltage to maintain recording AGC stopped | Fig.2 |
| PB mode holding voltage | $V_{TH15H}$ | 3.8 | — | $V_{CC}$ | V | Pin 15 DC voltage for PB mode | Fig.2 |
| EE mode holding voltage | $V_{TH15M}$ | 2.2 | — | 2.8 | V | Pin 15 DC voltage for REC MUTE mode | Fig.2 |
| REC mode holding voltage | $V_{TH15L}$ | 0 | — | 1.2 | V | Pin 15 DC voltage for REC mode | Fig.2 |

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

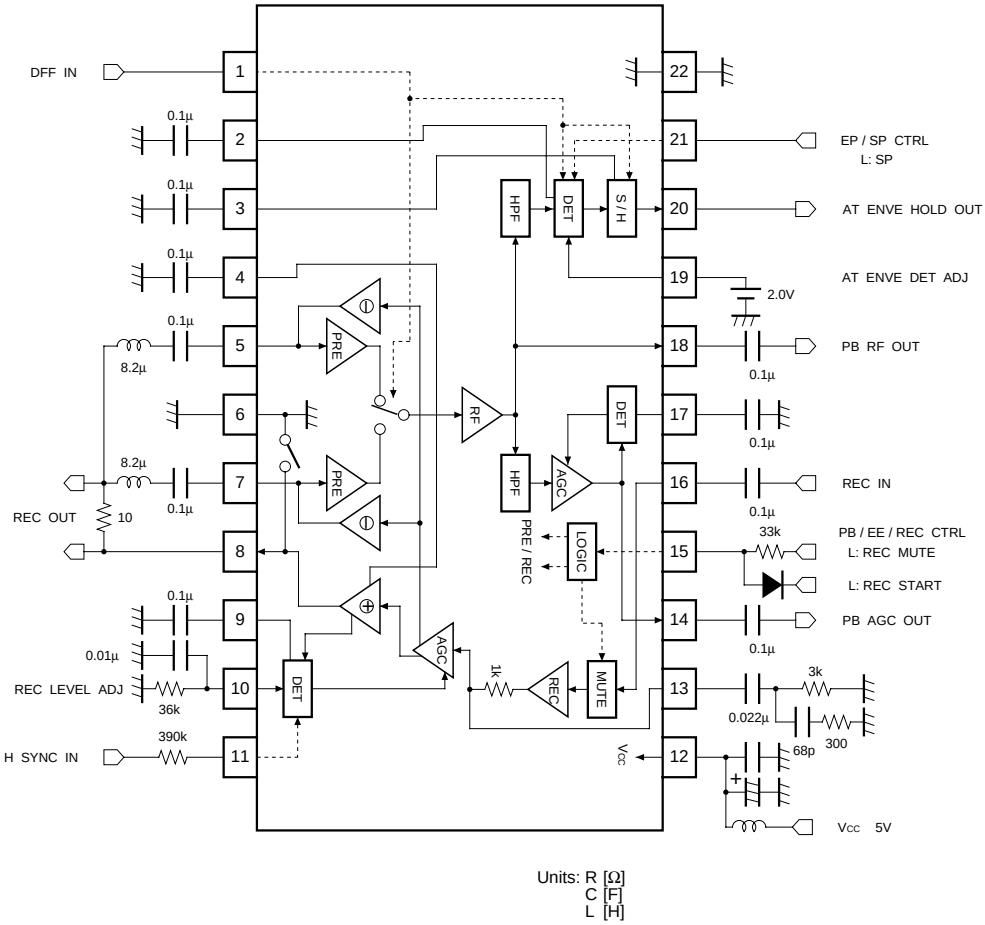
●Measurement circuits
(Playback system)




Units: R [Ω]
C [F]
L [H]

Fig. 1

(Recording system)




Units: R [Ω]
C [F]
L [H]

Fig. 2

●Control mode tables

(1) DFF IN (pin 1)

• Playback input selection (head switching)

• Playback output envelope detection timing control (integrate and hold one frame)

| Control pin | Function | | Control voltage $V_{CTRL1}$ [V] |
|---|---|---|---|
| DFF IN | Selected playback input | Envelope detect | |
| H | Ch2 (PRE IN2 7pin) | Reset on rising edge | 3.5 ~ $V_{CC}$ |
| L | Ch1 (PRE IN1 5pin) | — | 0.0 ~ 1.2 |

(2) H SYNC IN (pin 11)

• Controls recording AGC detector block operation.

| Control pin | Function | Control voltage $V_{CTRL11}$ [V] |
|---|---|---|
| H SYNC | AGC detect | |
| H | ON | 2.7 ~ $V_{CC}$ |
| L | OFF | 0.0 ~ 1.2 |

(3) PB / EE / REC CTRL (pin 15)

• Playback / recording mute / recording mode switching

| Control pin | Mode | Function | | | | Control voltage $V_{CTRL15}$ [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 |

✻ Pin 15 is pulled up to $V_{CC}$ via a 33kΩ resistor.

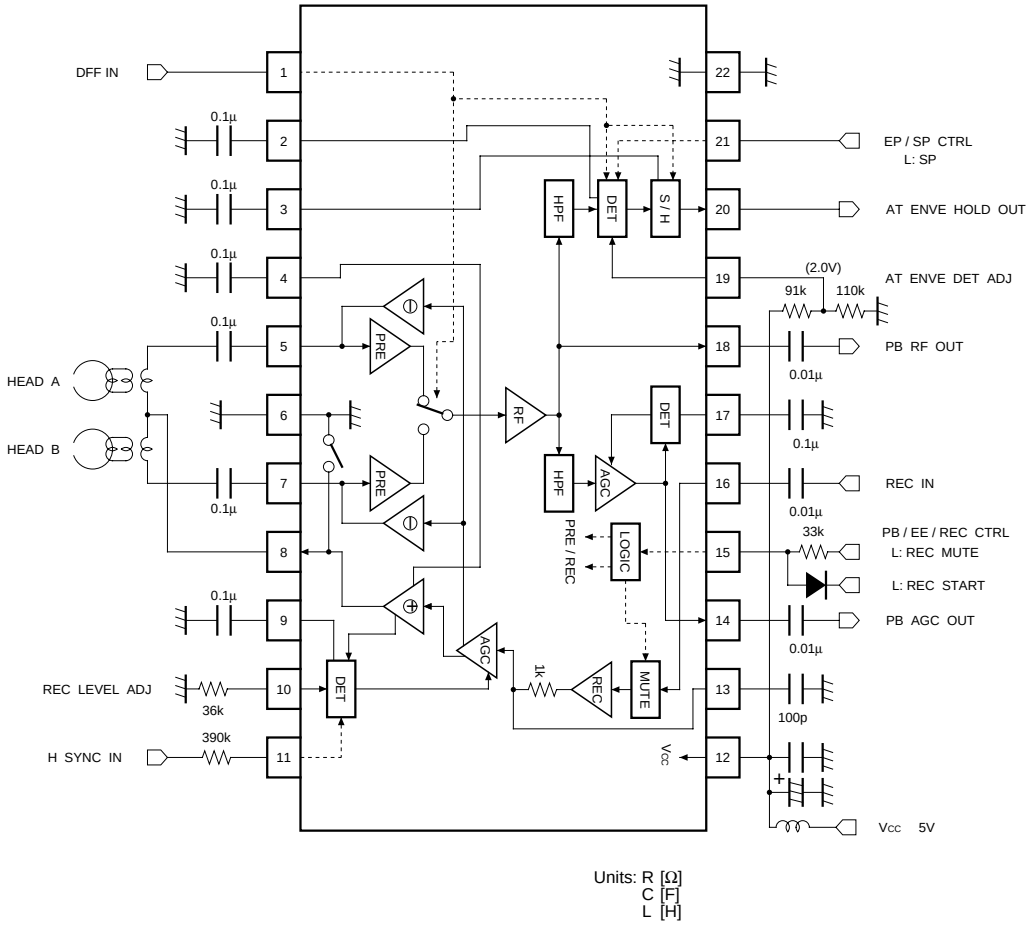
(4) EP / SP CTRL (pin 21)

• Switching for the detector gain of the playback envelope detector.

| Control pin | Function | Control voltage $V_{CTRL21}$ [V] |
|---|---|---|
| EP / SP | AT ENVE gain | |
| H | Typ. + 6dB | 3.5 ~ $V_{CC}$ |
| L | Typ. | 0.0 ~ 1.2 |

✻ Pin 21 is pulled up to $V_{CC}$ via a 50kΩ resistor.

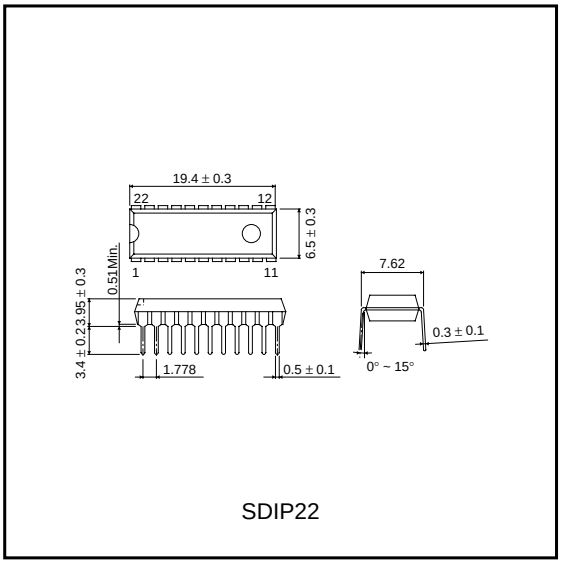
●Application example




Units: R [Ω]
C [F]
L [H]

Fig. 3

●External dimensions (Units: mm)

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