

# AN3360SB

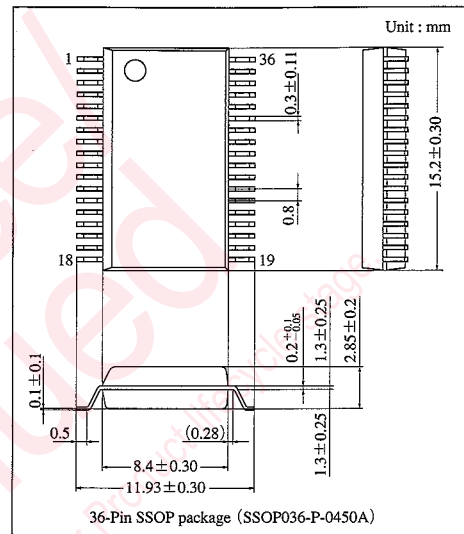
## 4-Head Hi-Fi VCR Recording/Playback Amplifier IC

### Overview

The AN3360SB is a recording/playback amplifier IC for 4-head Hi-Fi VCRs. It incorporates two head amplifiers for HiFi-Audio, and four amplifiers for video-signal REC/PB.

### Features

- Playback  $V_{CC}=5.0V$ , recording  $V_{CC}=5.0V$ , main  $V_{CC}=5.0V$
- Built-in RF-AGC circuit
- Built-in automatic tracking I/O circuit
- Built-in Hi-Fi audio recording AGC circuit



### Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage (1)	Main $V_{CC}$	6	V
Supply voltage (2)	PB $V_{CC}$	6	V
Supply voltage (3)	Rec $V_{CC}$	6	V
Power dissipation <sup>Note 2)</sup>	$P_D$	440	mW
Operating ambient temperature <sup>Note 1)</sup>	$T_{opr}$	-20 to +70	°C
Storage temperature <sup>Note 1)</sup>	$T_{stg}$	-55 to +125	°C

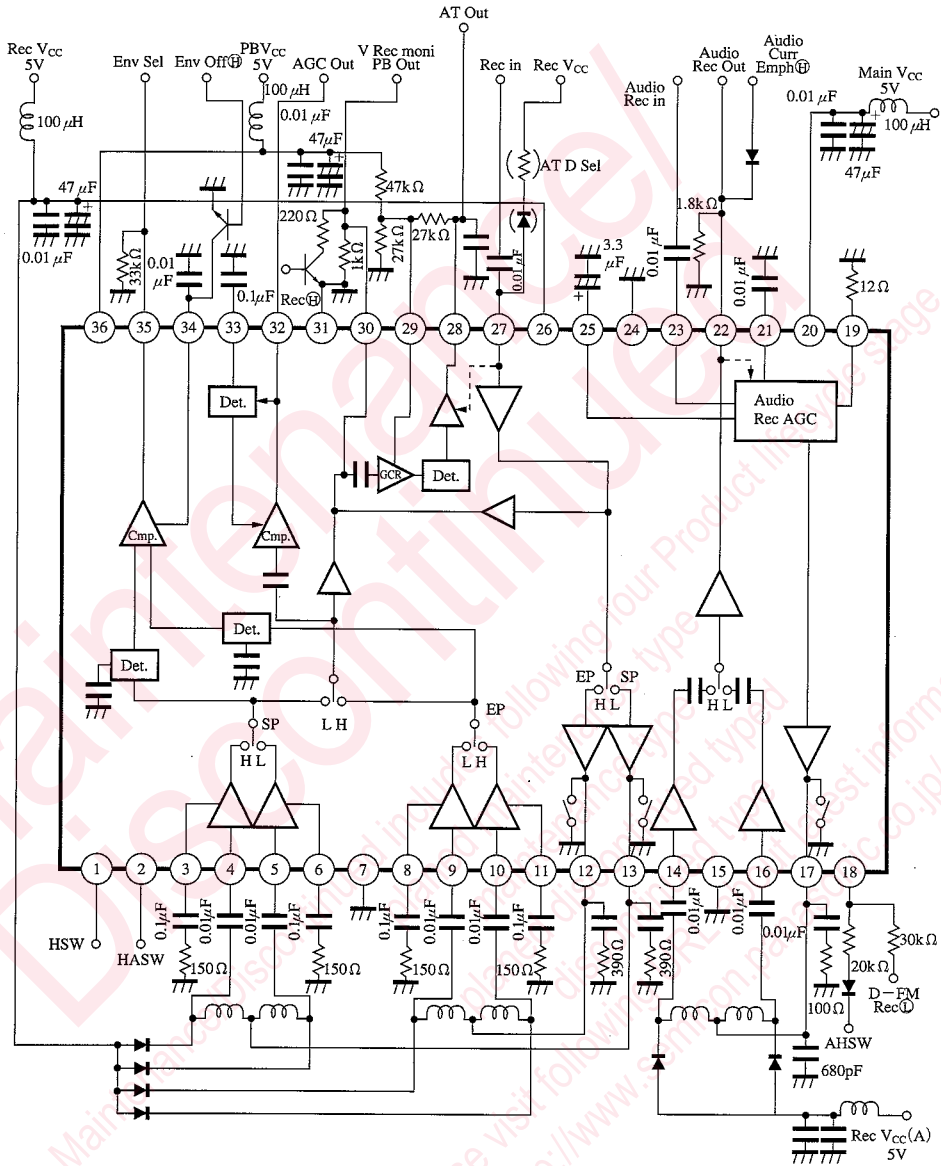
Note 1)  $T_a=25^\circ\text{C}$  except operating ambient temperature and storage temperatures.

Note 2) Allowable power dissipation of the package at  $T_a=70^\circ\text{C}$ .

### Recommended Operating Range ( $T_a=25^\circ\text{C}$ )

Parameter	Symbol	Range
Operating supply voltage range (1)	Main $V_{CC}$	4.5V to 5.5V
Operating supply voltage range (2)	PB $V_{CC}$	4.5V to 5.5V
Operating supply voltage range (3)	Rec $V_{CC}$	4.5V to 5.5V

■ Block Diagram



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### ■ Electrical Characteristics (Ta = 25 ± 2°C)

Parameter	Symbol	Condition	min	typ	max	Unit
PB V <sub>CC</sub> I <sub>total</sub>	I <sub>36</sub>	PB V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	16	26 *	36	mA
Main V <sub>CC</sub> I <sub>totalPB</sub>	I <sub>20PB</sub>	PB V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	5	10 *	15	mA
Video HSW threshold voltage	V <sub>TH1</sub>	PB V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	1.0	2.5 *	3.8	V
Video HASW (PB) threshold voltage	V <sub>TH2PB</sub>	PB V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	1.0	2.5 *	3.8	V
Video HASW (Rec) threshold voltage	V <sub>TH2Rec</sub>	Rec V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	0.5	1.0 *	2.5	V
Video AT Drange Sel threshold voltage	V <sub>TH27</sub>	PB V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	1.0	1.7 *	3.8	V
Audio HSW threshold voltage	V <sub>TH18a</sub>	PB V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	2.2	2.9 *	3.8	V
Video CH1 gain	G <sub>4-30</sub>	v <sub>in</sub> = 0.3mV <sub>P-P</sub> , f <sub>in</sub> = 3.58MHz	53	57 *	61	dB
Video CH2 gain	G <sub>5-30</sub>	v <sub>in</sub> = 0.3mV <sub>P-P</sub> , f <sub>in</sub> = 3.58MHz	53	57 *	61	dB
Video CH3 gain	G <sub>9-30</sub>	v <sub>in</sub> = 0.3mV <sub>P-P</sub> , f <sub>in</sub> = 3.58MHz	53	57 *	61	dB
Video CH4 gain	G <sub>10-30</sub>	v <sub>in</sub> = 0.3mV <sub>P-P</sub> , f <sub>in</sub> = 3.58MHz	53	57 *	61	dB
Audio CH1 gain	G <sub>14-22</sub>	v <sub>in</sub> = 0.1mV <sub>P-P</sub> , f <sub>in</sub> = 2MHz	76	80 *	84	dB
Audio CH2 gain	G <sub>16-22</sub>	v <sub>in</sub> = 0.1mV <sub>P-P</sub> , f <sub>in</sub> = 2MHz	76	80 *	84	dB
Video CH1 input conversion noise	N <sub>4-30</sub>	1MHzBPF output is divided by gain	—	—	1.0	μV <sub>rms</sub>
Video CH2 input conversion noise	N <sub>5-30</sub>	1MHzBPF output is divided by gain	—	—	1.0	μV <sub>rms</sub>
Video CH3 input conversion noise	N <sub>9-30</sub>	1MHzBPF output is divided by gain	—	—	1.0	μV <sub>rms</sub>
Video CH4 input conversion noise	N <sub>10-30</sub>	1MHzBPF output is divided by gain	—	—	1.0	μV <sub>rms</sub>
Audio CH1 input conversion noise	N <sub>14-22</sub>	1MHzBPF output is divided by gain	—	0.7 *	1.0	μV <sub>rms</sub>
Audio CH2 input conversion noise	N <sub>16-22</sub>	1MHzBPF output is divided by gain	—	0.7 *	1.0	μV <sub>rms</sub>
Video HSW DC unbalance (1)	ΔV <sub>HSW1</sub>	HASW : ⊖	—	—	100	mV <sub>P-P</sub>
Video HSW DC unbalance (2)	ΔV <sub>HSW2</sub>	HASW : ⊕	—	—	100	mV <sub>P-P</sub>
Video HASW DC unbalance (1)	ΔV <sub>HASW1</sub>	HSW : ⊖	—	—	100	mV <sub>P-P</sub>
Video HASW DC unbalance (2)	ΔV <sub>HASW2</sub>	HSW : ⊕	—	—	100	mV <sub>P-P</sub>
Video RF AGC output amplitude	v <sub>32</sub>	v <sub>in</sub> = 0.3mV <sub>P-P</sub> , f <sub>in</sub> = 3.58MHz	130	200 *	270	mV <sub>P-P</sub>
Video RF AGC control sensitivity	Δv <sub>32</sub>	$\frac{v_{in} = 0.6mV_{P-P}}{v_{in} = 0.15mV_{P-P}}$	—	—	3.0	dB
Video Envelope output amplitude	v <sub>35</sub>	v <sub>in</sub> = 0.3mV <sub>P-P</sub>	3.5	—	—	V <sub>P-P</sub>
Auto tracking output at no-input	V <sub>28min.1</sub>	PB V <sub>CC</sub> = 5.0V	0	0.5 *	1.0	V
Auto tracking output difference at no-input	$\frac{V_{28min.2}}{-V_{28min.1}}$	PB V <sub>CC</sub> = 5.0V	0.25	0.55 *	0.85	V
Auto tracking max. output	V <sub>28max.</sub>	v <sub>in</sub> = 1000mV <sub>P-P</sub> , f <sub>in</sub> = 3.58MHz	4.2	4.8 *	—	V
Audio HSW DC unbalance	ΔV <sub>AHSW</sub>	PB V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	—	—	20	mV <sub>P-P</sub>
Main V <sub>CC</sub> I <sub>totalRec</sub>	I <sub>20Rec</sub>	Rec V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	8	14 *	20	mA
Rec V <sub>CC</sub> I <sub>total</sub>	I <sub>26</sub>	Rec V <sub>CC</sub> = 5.0V, Main V <sub>CC</sub> = 5.0V	46	73 *	100	mA
Video SP rec-current output	i <sub>13</sub>	v <sub>in</sub> = 130mV <sub>P-P</sub> , f <sub>in</sub> = 3.58MHz	17	25 *	32	mA <sub>P-P</sub>
Video EP rec-current output ratio	i <sub>12</sub> /i <sub>13</sub>	v <sub>in</sub> = 130mV <sub>P-P</sub> , f <sub>in</sub> = 3.58MHz	-3.5	-1.8 *	0	dB
Video Rec f characteristics ratio	$\frac{i_{13H}(8MHz)}{i_{13}(3.58MHz)}$		-4	—	—	dB
Audio rec-current output	i <sub>17</sub>	v <sub>in</sub> = 130mV <sub>P-P</sub> , f <sub>in</sub> = 2MHz	46	50 *	54	mA <sub>P-P</sub>
Audio Rec AGC control characteristics	Δi <sub>17</sub>	$\frac{v_{in} = 260mV_{P-P}}{v_{in} = 70mV_{P-P}}$	—	0.2 *	1.0	dB
Audio Rec current emphasis ratio	i <sub>CE</sub> /i <sub>17</sub>	v <sub>in</sub> = 130mV <sub>P-P</sub> , f <sub>in</sub> = 2MHz	1.3	1.8 *	2.3	dB

Note) Values with an asterisk are typical ones and not guaranteed value.

### ■ Electrical Characteristics (cont.) (Ta=25±2°C)

Parameter	Symbol	Condition	min	typ	max	Unit
Audio D-Rec threshold voltage	V <sub>TH18b</sub>	Rec V <sub>CC</sub> =5.0V, Main V <sub>CC</sub> =5.0V	0.4	1.0 *	1.7	V
Audio Rec current emphasis threshold voltage	V <sub>TH22</sub>	Rec V <sub>CC</sub> =5.0V, Main V <sub>CC</sub> =5.0V	1.0	2.5 *	3.2	V
Auto tracking SP output voltage (1)	V <sub>28SP1</sub>	Pin <sup>Ⓢ</sup> input v <sub>in</sub> =400mV <sub>P-P</sub> , f <sub>in</sub> =3.58MHz	(3.6)	(3.9)	(4.2)	V
Auto tracking SP output voltage (2)	V <sub>28SP2</sub>	v <sub>in</sub> =100mV <sub>P-P</sub> , f <sub>in</sub> =3.58MHz	(1.6)	(2.0)	(2.4)	V
Auto tracking SP output voltage difference	V <sub>28EP</sub> -V <sub>28SP2</sub>	v <sub>in</sub> =100mV <sub>P-P</sub> , f <sub>in</sub> =3.58MHz	(0.25)	(0.45)	(0.65)	V
Video Rec SP rec-current 2nd harmonics distortion	D <sub>13</sub>	v <sub>in</sub> =130mV <sub>P-P</sub> , f <sub>in</sub> =3.58MHz	—	(-43)	(-37)	dB
Video Rec. cross modulation distortion	MD <sub>13</sub>	3.58MHz±630kHz	—	(-48)	—	dB
Audio Rec.rec.-current 2nd harmonics	D <sub>17</sub>	v <sub>in</sub> =130mV <sub>P-P</sub> , f <sub>in</sub> =2MHz	—	(-45)	(-40)	dB
Audio Rec. cross modulation distortion 0.4MHz	MD <sub>0.4M</sub>	0.4MHz-1.3MHz	—	(-50)	—	dB
Audio Rec. cross modulation distortion 0.9MHz	MD <sub>0.9M</sub>	0.9MHz-1.3MHz	—	(-55)	—	dB
Video PB f characteristics ratio	v <sub>30H</sub> /v <sub>30</sub>	$\frac{v_{30H}(8\text{MHz})}{v_{30H}(3.58\text{MHz})}$	(-4)	(-2.5)	—	dB
Video Rec monitor output ratio	K <sub>i13a/13</sub>	v <sub>in</sub> =130mV <sub>P-P</sub> , f <sub>in</sub> =3.58MHz	(-0.25)	(0)	(0.25)	dB

Note) Values with an asterisk are typical ones and not guaranteed values.

The characteristics value in parentheses is not a guaranteed value, but reference one on design.

### ■ Pin Descriptions

Pin No.	Pin name	Pin No.	Pin name
1	Video Head SW	19	Audio Rec. Curr. Moni/Ctrl
2	Video Head Amp. SW	20	Main V <sub>CC</sub> (Audio)
3	Video Head Amp. dumping CH1	21	Audio Rec AGC Det
4	Video Head Amp. Input CH1	22	Audio PB Out/Curr. Emph
5	Video Head Amp. Input CH2	23	Audio Rec Input
6	Video Head Amp. dumping CH2	24	GND (Audio)
7	GND (Video Small Signal)	25	Audio Rec. C
8	Video Head Amp. dumping CH3	26	Rec. V <sub>CC</sub> (Video)
9	Video Head Amp. Input CH3	27	Video Rec. Input/AT D Sel
10	Video Head Amp. Input CH4	28	Auto-tracking Out
11	Video Head Amp. dumping CH4	29	Auto-tracking GCA Ctrl
12	Video Rec Out EP (CH3, CH4)	30	Video Chroma Out/Rec Moni
13	Video Rec Out SP (CH1, CH2)	31	GND (Video)
14	Audio Head Amp. Input CH1	32	Video RF AGC Out
15	GND (Audio Small Signal)	33	Video RF AGC Det
16	Audio Head Amp. Input CH2	34	Envelope Comparator C
17	Audio Rec. Out	35	Envelope Comparator (Select) Out
18	Audio Head SW/D-Rec. SW	36	PB V <sub>CC</sub> (Video)

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## ■ Functional Descriptions

### ① Playback mode

#### ★Mode setting

•Pin⑳ (Video PB  $V_{CC}$ ) = 5.0V

•Pin㉑ (Audio Main  $V_{CC}$ ) = 5.0V

(When the video playback  $V_{CC}$  is applied, the audio subsystem switches to playback mode.)

•Pin㉒ (Video Rec  $V_{CC}$ ) = either 0V or open

(Note : Do not apply both playback  $V_{CC}$  and recording  $V_{CC}$  at the same time. Otherwise overcurrent could result.)

#### ★Video subsystem

##### (1) Selecting a head amplifier output channel

	Channel	Input pin	Head SW Pin①	HASW Pin②
SP	1	4	H	L
	2	5	L	L
EP	3	9	L	H
	4	10	H	H

##### (2) Automatic tracking interface

#### •SP/EP mode switching

HASW Pin②	Mode
L	SP
H	EP

The inner circuit gain increases 3dB when the mode changes from SP to EP.

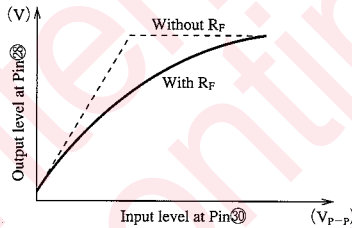
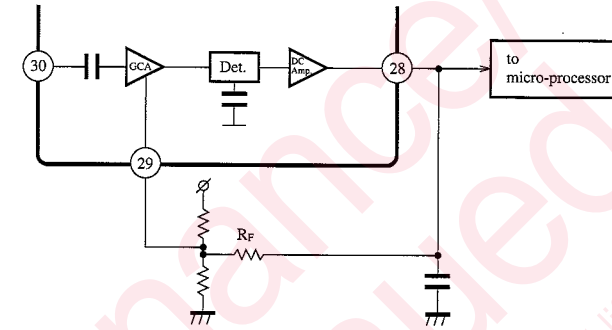
#### •Output offset switching

Pin㉓	Voltage at Pin㉓ with no input
Open	Approx. 0.5V
Low	Approx. 1.0V

■ Functional Descriptions (cont.)

•Automatic-tracking inner gain control

Increasing the voltage at Pin<sup>29</sup> (GCA control) decreases the tracking gain. If an external resistor  $R_F$  is connected between Pins<sup>28</sup> and <sup>29</sup> for feedback control as shown below, the input/output characteristics are modified and become less dependent on individual IC.



(3) Envelope comparator

	Output level at Pin <sup>35</sup>
SP-side input level > EP-side input level	H
SP-side input level < EP-side input level	L

★Audio subsystem

Selecting a head amplifier output channel

Channel	Input pin	AHSW at Pin <sup>18</sup>
1	14	H
2	16	L

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■ Functional Descriptions (cont.)

② Recording mode

★ Mode setting

- Pin⑳ (Video Rec  $V_{CC}$ ) = 5.0V
- Pin㉑ (Audio Main  $V_{CC}$ ) = 5.0V
- Pin㉒ (Video PB  $V_{CC}$ ) = either 0V or open

★ Video subsystem

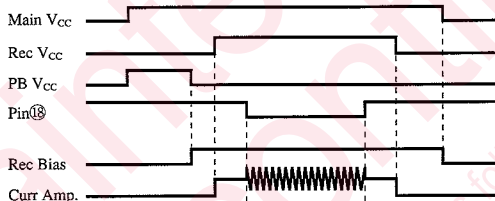
- Recording amplifier SP/EP switching

HASW at Pin②	Mode	Rec. amp. output pin
L	SP	13
H	EP	12

The gain of the internal circuit in the SP mode is about 1.8 dB higher than that of the internal circuit in the EP mode.

★ Audio subsystem

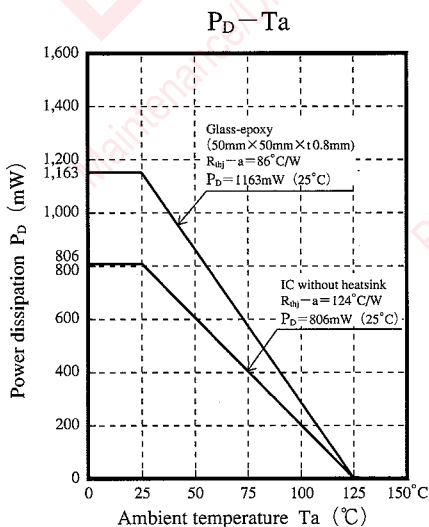
(1) Starting



(2) Adjusting the recording current level

Decreasing the external resistance at Pin⑱ increases the recording current. (The recording AGC functions so that the voltage at Pin⑱ has a voltage amplitude of 600mV<sub>P.P.</sub>.)

■ Reference



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