AN3360SB

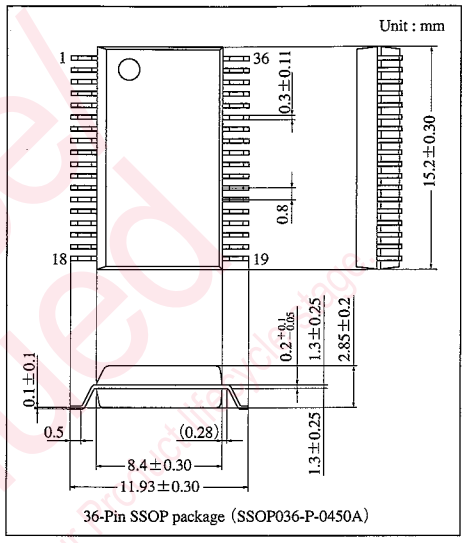
4-Head Hi-Fi VCR Recording/Playback Amplifier IC

■ 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 ampifiers 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



36-Pin SSOP package (SSOP036-P-0450A)

■ Absolute Maximum Ratings

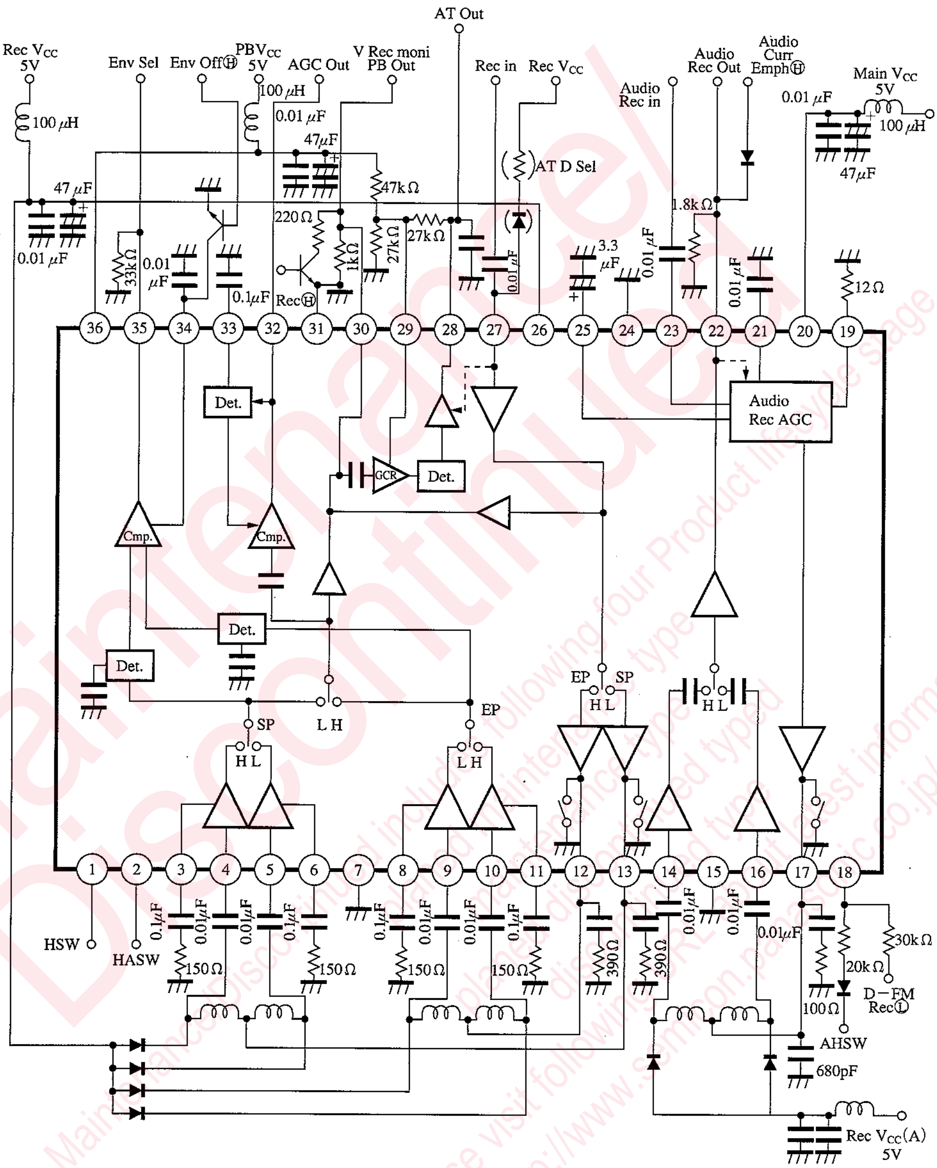
Parameter	Symbol	Rating	Unit
Supply voltage (1)	Main V_{CC}	6	V
Supply voltage (2)	PB V_{CC}	6	V
Supply voltage (3)	Rec V_{CC}	6	V
Power dissipation Note 2)	P_D	440	mW
Operating ambient temperature Note 1)	T_{opr}	−20 to +70	℃
Storage temperature Note 1)	T_{stg}	−55 to +125	℃

Note 1) Ta=25℃ except operating ambient temperature and storage temperatures.
Note 2) Allowable power dissipation of the package at Ta=70℃.

■ Recommended Operating Range (Ta=25℃)

Parameter	Symbol	Range
Operating supply voltage range (1)	MainV_{CC}	4.5V to 5.5V
Operating supply voltage range (2)	PBV_{CC}	4.5V to 5.5V
Operating supply voltage range (3)	RecV_{CC}	4.5V to 5.5V

■ Block Diagram



ICs for VCR

■ Electrical Characteristics (Ta=25±2℃)

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

Parameter	Symbol	Condition	min	typ	max	Unit
Audio D-Rec threshold voltage	V_{TH18b}	Rec V_{CC}=5.0V, Main V_{CC}=5.0V	0.4	1.0 *	1.7	V
Audio Rec current emphasis threshold voltage	V_{TH22}	Rec V_{CC}=5.0V, Main V_{CC}=5.0V	1.0	2.5 *	3.2	V
Auto tracking SP output voltage (1)	V_{28SP1}	Pin㉘ input $v$in=400mV_{P-P}, fin=3.58MHz	(3.6)	(3.9)	(4.2)	V
Auto tracking SP output voltage (2)	V_{28SP2}	$v$in=100mV_{P-P}, fin=3.58MHz	(1.6)	(2.0)	(2.4)	V
Auto tracking SP output voltage difference	V_{28EP} −V_{28SP2}	$v$in=100mV_{P-P}, fin=3.58MHz	(0.25)	(0.45)	(0.65)	V
Video Rec SP rec-current 2nd harmonics distortion	D_{13}	$v$in=130mV_{P-P}, fin=3.58MHz	—	(−43)	(−37)	dB
Video Rec. cross modulation distortion	MD_{13}	3.58MHz±630kHz	—	(−48)	—	dB
Audio Rec.rec.-current 2nd harmonics	D_{17}	$v$in=130mV_{P-P}, fin=2MHz	—	(−45)	(−40)	dB
Audio Rec. cross modulation distortion 0.4MHz	$MD_{0.4M}$	0.4MHz−1.3MHz	—	(−50)	—	dB
Audio Rec. cross modulation distortion 0.9MHz	$MD_{0.9M}$	0.9MHz−1.3MHz	—	(−55)	—	dB
Video PB f characteristics ratio	v_{30H}/v_{30}	$\frac{v_{30H}\ (8MHz)}{v_{30H}\ (3.58MHz)}$	(−4)	(−2.5)	—	dB
Video Rec monitor output ratio	$K \cdot i_{13a}/i_{13}$	$v$in=130mV_{P-P}, fin=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_{CC} (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_{CC} (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	Envlope Comparator C
17	Audio Rec. Out	35	Envlope Comparator (Select) Out
18	Audio Head SW/D−Rec. SW	36	PB V_{CC} (Video)

■ Functional Descriptions

[1] Playback mode

★Mode setting

•Pin㊱ (Video PB V_{CC}) =5.0V

•Pin⑳ (Audio Main V_{CC}) =5.0V

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

•Pin㉖ (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.

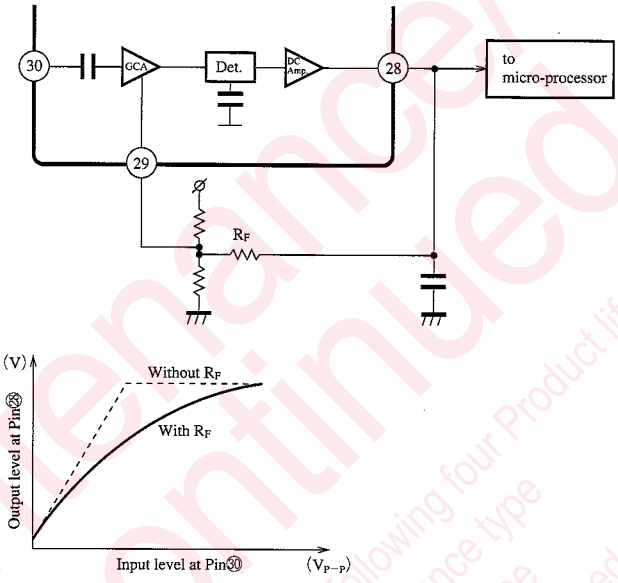
•Output offset switching

Pin㉗	Voltage at Pin㉘ with no input
Open	Approx. 0.5V
Low	Approx. 1.0V

■ Functional Descriptions (cont.)

•Automatic-tracking inner gain control

Increasing the voltage at Pin㉙ (GCA control) decreases the tracking gain. If an external resistor RF is connected between Pins㉘ and ㉙ 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 Pin㉟
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 Pin⑱
1	14	H
2	16	L

■ Functional Descriptions (cont.)

2 Recording mode

★Mode setting

- Pin㉖ (Video Rec V_{CC}) =5.0V
- Pin⑳ (Audio Main V_{CC}) =5.0V
- Pin㊱ (Video PB V_{CC}) =either 0V or open

★Video subsystem

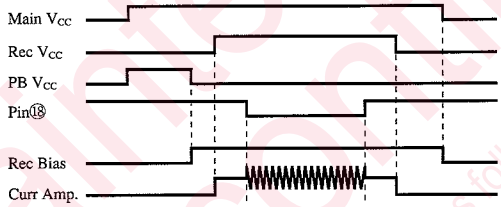
- Recording amplifier SP/EP switching

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

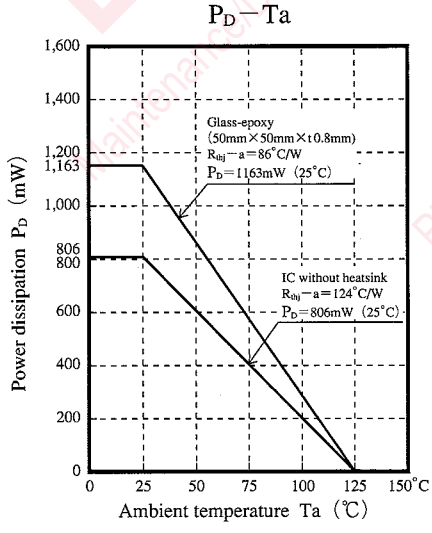
(1) Starting



(2) Adjusting the recording current level

Decreasing the external resistance at Pin⑲ increases the recording current. (The recording AGC functions so that the voltage at Pin⑲ has a voltage amplitude of $600mV_{P-P}$.)

■ Reference



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