

# AN8849SB

Head amplifier IC for CD-ROM drive (for 24 times speed or more)

## ■ Overview

The AN8849SB is a head amplifier IC for digital servo. It can configure an efficient CD-ROM system in combination with the MN662752, and allows a full-automatic adjustment of tracking balance-gain-offset and focus balance-gain-offset with fewer external parts.

Built-in functions are a variable equalizer, wide band RF amp. and AGC which meet CAV playback with 24 times speed or more.

## ■ Features

- Variable equalizer which meets CAV playback with 24 times speed or more CAV playback.
- Wide band RF amp. and AGC ( $f_c = 20$  MHz or more ( $-3$  dB))
- Balance adjustment function built-in  
Focus error amp./tracking error amp.
- CD-RW playback compatible.

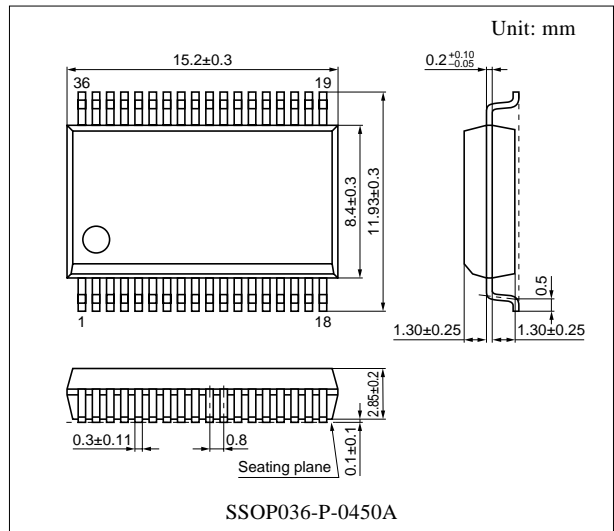
Variable gain

Focus error amp./tracking error amp.  
(to  $+16.9$  dB)

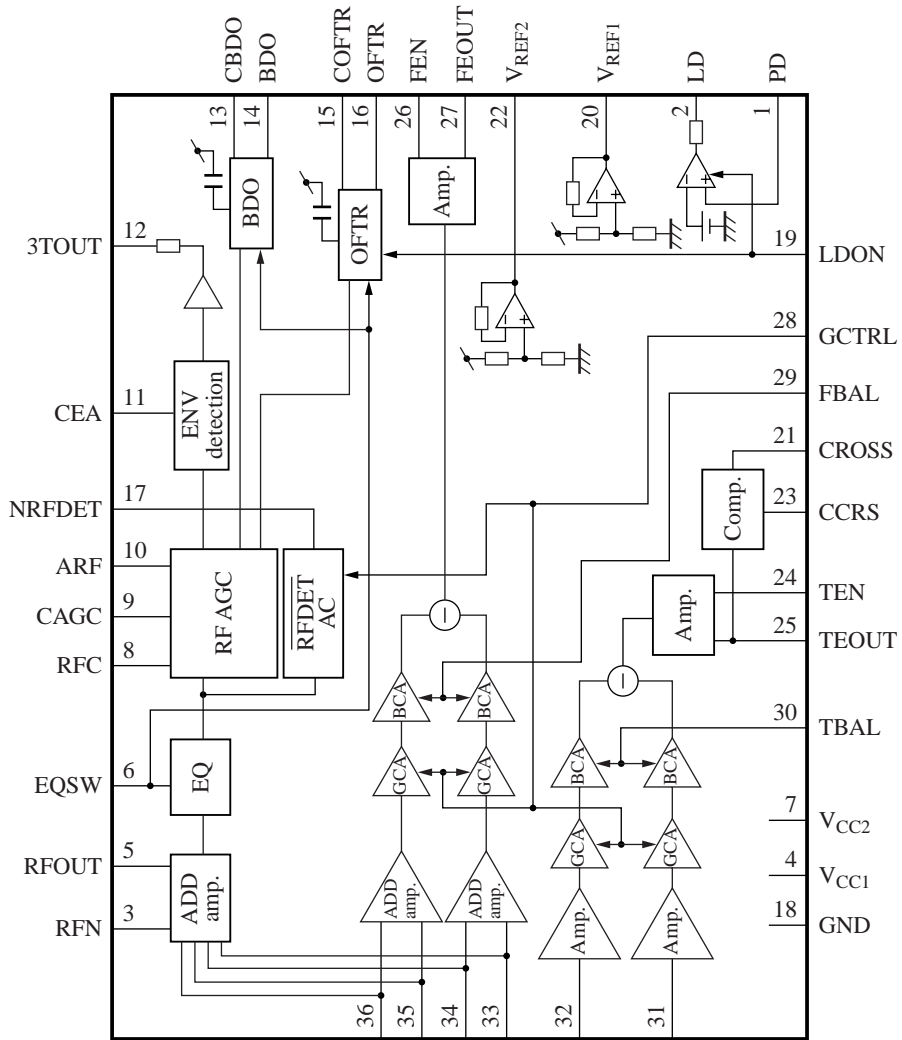
- OFTR/BDO detection
- APC amp.

## ■ Applications

- CD/CD-ROM drive



■ Block Diagram



### ■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	APC amp. input pin	18	GND pin
2	APC amp. output pin	19	APC & masking control pin
3	RF addition amp. inverted input pin	20	V <sub>REF1</sub> output pin
4	Power supply pin 1	21	CROSS output pin
5	RF addition amp. output pin	22	V <sub>REF2</sub> output pin
6	EQ characteristics control pin	23	Capacitor connection pin for CROSS
7	Power supply pin 2	24	TE amp. inverted input pin
8	Capacitor connection pin for HPF of AGC input	25	TE amp. output pin
9	AGC loop filter connection pin	26	FE amp. inverted input pin
10	AGC output pin	27	FE amp. output pin
11	Capacitor connection pin for HPF amp.	28	GCTRL pin
12	3TENV output pin	29	FBAL control pin
13	Capacitor connection pin for RF dark-side envelope detection	30	TBAL control pin
14	BDO output pin	31	Tracking signal input pin 1
		32	Tracking signal input pin 2
15	Capacitor connection pin for RF right-side envelope detection	33	Focus signal input pin 4
		34	Focus signal input pin 2
16	OFTR output pin	35	Focus signal input pin 3
17	NRFDET output pin	36	Focus signal input pin 1

### ■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage 1 *1	V <sub>CC1</sub>	5.8	V
Supply voltage 2 *1	V <sub>CC2</sub>	5.8	V
Supply current 1 *1	I <sub>CC1</sub>	55	mA
Supply current 2 *1	I <sub>CC2</sub>	2.5	mA
Power dissipation *1, *2	P <sub>D</sub>	333.5	mW
Operating ambient temperature *1	T <sub>opr</sub>	-20 to +75	°C
Storage temperature *1	T <sub>stg</sub>	-55 to +125	°C

Note) \*1: Except for the power dissipation, operating ambient temperature and storage temperature, all ratings are for T<sub>a</sub> = 25°C.

$$*2: P_D = V_{CC1} \cdot I_{CC1} + V_{CC2} \cdot I_{CC2}$$

### ■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage 1	V <sub>CC1</sub>	4.5 to 5.5	V
Supply voltage 2	V <sub>CC2</sub>	3.0 to 5.5	V

Note) Apply voltage to satisfy V<sub>CC2</sub> - V<sub>CC1</sub> < 0.3 V.

**■ Electrical Characteristics at  $T_a = 25^\circ\text{C}$** 

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Current consumption with no load 1	$I_{\text{TOTAL1}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{EQSW}} = V_{\text{REF2}} + 0.75 \text{ V}$	28.4	40.6	52.8	mA
Current consumption with no load 2	$I_{\text{TOTAL2}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$	1.20	1.72	2.24	mA
$V_{\text{REF1}}$ output voltage	$V_{\text{REF1}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$	2.27	2.50	2.73	V
$V_{\text{REF2}}$ output voltage	$V_{\text{REF2}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$	1.50	1.65	1.80	V
<b>Focus error amp.</b>						
Focus error amp. output offset voltage	$V_{\text{FO-OF}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$	-90	0	90	mV
Focus error offset balance crosstalk amount	$V_{\text{FO-OFB}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{FB}} = V_{\text{REF2}} \pm 0.5 \text{ V}$	-150	0	150	mV
Focus error amp. V-V conversion gain	$G_{\text{FO}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{GC}} = V_{\text{REF2}} - 0.75 \text{ V}$	12.3	14.4	16.5	dB
Focus error amp. V-V conversion relative gain	$\Delta G_{\text{FO}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{GC}} = V_{\text{REF2}} - 0.75 \text{ V}$	-1.5	0	1.5	dB
Focus error amp. balance output 1-H	$B_{\text{FO1-H}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{FB}} = V_{\text{REF2}} + 0.5 \text{ V}$	1.08	1.35	1.62	—
Focus error amp. balance output 1-L	$B_{\text{FO1-L}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{FB}} = V_{\text{REF2}} - 0.5 \text{ V}$	0.45	0.65	0.85	—
Focus error amp. balance relative output 2-H	$B_{\text{FOH}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{FB}} = V_{\text{REF2}} + 0.5 \text{ V}$	4.35	6.35	8.35	dB
Focus error amp. balance relative output 2-L	$B_{\text{FOL}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{FB}} = V_{\text{REF2}} - 0.5 \text{ V}$	-8.35	-6.35	-4.35	dB
Focus error amp. frequency characteristics	$G_{\text{FOF}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $f = 3 \text{ kHz}$ , $60 \text{ kHz}$	-4.5	-3.0	-1.5	dB
Focus error amp. GCTRL gain ratio $\times 4$	$B_{\text{FO4}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{GC}} = V_{\text{REF2}}$	3.3	4.3	5.3	—
<b>Tracking error amp.</b>						
Tracking error amp. output offset voltage	$V_{\text{TR-OF}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$	-60	0	60	mV
Tracking error offset balance crosstalk amount	$V_{\text{TR-OFB}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{TB}} = V_{\text{REF2}} \pm 0.5 \text{ V}$	-200	0	200	mV
Tracking error amp. V-V conversion gain	$G_{\text{TR}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{GC}} = V_{\text{REF2}} - 0.75 \text{ V}$	12.2	14.3	16.4	dB
Tracking error amp. V-V conversion relative gain	$\Delta G_{\text{TR}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{GC}} = V_{\text{REF2}} - 0.75 \text{ V}$	-1.5	0	1.5	dB
Tracking error amp. balance output 1-H	$B_{\text{TR1-H}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{TB}} = V_{\text{REF2}} + 0.5 \text{ V}$	0.45	0.65	0.85	—
Tracking error amp. balance output 1-L	$B_{\text{TR1-L}}$	$V_{\text{CC1}} = 5 \text{ V}$ , $V_{\text{CC2}} = 3.3 \text{ V}$ $V_{\text{TB}} = V_{\text{REF2}} - 0.5 \text{ V}$	1.08	1.35	1.62	—

■ Electrical Characteristics at  $T_a = 25^\circ\text{C}$  (continue)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Tracking error amp. (continued)						
Tracking error amp. balance relative output 2-H	$B_{TRH}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$ $V_{TB} = V_{REF2} + 0.5\text{ V}$	-8.35	-6.35	-4.35	dB
Tracking error amp. balance relative output 2-L	$B_{TRL}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$ $V_{TB} = V_{REF2} - 0.5\text{ V}$	4.35	6.35	8.35	dB
Tracking error amp. frequency characteristics	$G_{TRF}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$ $f = 30\text{ kHz}$ , $500\text{ kHz}$	-4.5	—	0	dB
Tracking error amp. GCTRL gain ratio $\times 4$	$B_{TR4}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$ $V_{GC} = V_{REF2}$	3.3	4.3	5.3	—
CROSS detection						
CROSS high-level output	$V_{CR-H}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$ , $f = 10\text{ kHz}$	4.2	—	—	V
CROSS low-level output	$V_{CR-L}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$ , $f = 10\text{ kHz}$	—	—	0.8	V
RF addition amp.						
RF addition amp. output offset voltage	$V_{RAOF}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$	-200	0	200	mV
RF addition amp. addition gain	$G_{RAD}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$	-2.1	0	2.1	dB
RF addition amp. addition relative gain 1	$\Delta G_{RAD1}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$	-1.0	0	1.0	dB
RF addition amp. addition relative gain 2	$\Delta G_{RAD2}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$	-1.0	0	1.0	dB
RF addition amp. addition relative gain 3	$\Delta G_{RAD3}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$	-1.0	0	1.0	dB
RF addition amp. full-addition gain	$G_{RADA}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$	9.9	12.0	14.1	dB
RF addition amp. full-addition frequency characteristics *	$G_{RADDf}$	$V_{CC1} = 5\text{ V}$ , $V_{CC2} = 3.3\text{ V}$ $f = 500\text{ kHz}$ , $30\text{ MHz}$	-3.1	-1.6	1.4	dB
Variable EQ characteristics						
EQ characteristics $\times 1-1$ *	$G_{EQ1-1}$	$f = 100\text{ kHz}$ $EQSW = V_{REF2} - 0.5\text{ V}$	-1.5	0	1.5	dB
EQ characteristics $\times 1-3$ *	$G_{EQ1-3}$	$f = 500\text{ kHz}$ $EQSW = V_{REF2} - 0.5\text{ V}$	0.5	2.0	3.5	dB
EQ characteristics $\times 20-1$ *	$G_{EQ20-1}$	$EQSW = V_{REF2} + 0.5\text{ V}$ $f = 2\text{ MHz}$	-1.5	0	1.5	dB
EQ characteristics $\times 20-3$ *	$G_{EQ20-3}$	$EQSW = V_{REF2} + 0.5\text{ V}$ $f = 13\text{ MHz}$	-1.3	0.2	1.7	dB
AGC						
AGC max. gain	$G_{MAGC}$	$f = 500\text{ kHz}$ , $V_{IN} = 20\text{ mV[p-p]}$	20.3	23.3	26.3	dB
AGC operating gain	$G_{AGC}$	$f = 500\text{ kHz}$ , $V_{IN} = 500\text{ mV[p-p]}$	3.0	6.0	9.0	dB
AGC compression factor	$\Delta G_{AGC}$	$f = 500\text{ kHz}$ , $V_{IN} = 125\text{ mV[p-p]}$	-1.20	1.30	3.80	dB
AGC frequency characteristics	$G_{FAGC}$	$f = 30\text{ MHz}$ , $V_{IN} = 20\text{ mV[p-p]}$	-4.5	-3.0	0	dB

Note) \*: The values mentioned above are subject to change according to the state of a printed circuit board, a socket, etc.

■ Electrical Characteristics at  $T_a = 25^\circ\text{C}$  (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>NRF detection</b>						
NRF det. detection level	$V_{\text{RDA1}}$	$f = 500 \text{ kHz}, V_{\text{GC}} = V_{\text{REF2}} - 0.75 \text{ V}$	73	105	137	mV[p-p]
NRF det. high-level output voltage	$V_{\text{RDAH}}$	$f = 500 \text{ kHz}, V_{\text{GC}} = V_{\text{REF2}} - 0.75 \text{ V}$	4.2	—	—	V
NRF det. low-level output voltage	$V_{\text{RDAL}}$	$f = 500 \text{ kHz}, V_{\text{GC}} = V_{\text{REF2}} - 0.75 \text{ V}$	—	—	0.8	V
NRF det. detection level ratio	$B_{\text{RDA}}$	$f = 500 \text{ kHz}, V_{\text{GC}} = V_{\text{REF2}}$	2.9	3.9	4.9	—
<b>BDO</b>						
CBDO detection current	$I_{\text{BDO}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$ $\text{EQSW} = V_{\text{REF2}} - 0.5 \text{ V}$	0.98	1.40	1.82	$\mu\text{A}$
CBDO detection current ratio	$B_{\text{IBD4}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$ $\text{EQSW} = V_{\text{REF2}}$	3.0	3.8	4.6	—
BDO high-level output voltage	$V_{\text{BDOH}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$ $f = 5 \text{ kHz}, \text{rectangular wave}$	4.2	—	—	V
BDO low-level output voltage	$V_{\text{BDOL}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$ $f = 5 \text{ kHz}, \text{rectangular wave}$	—	—	0.8	V
<b>OFTR</b>						
COFTR detection current	$I_{\text{OFTR}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$ $\text{EQSW} = V_{\text{REF2}} - 0.5 \text{ V}$	0.98	1.40	1.82	$\mu\text{A}$
COFTR detection current ratio	$B_{\text{IOFTR4}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$ $\text{EQSW} = V_{\text{REF2}}$	3.0	3.8	4.6	—
OFTR high-level output voltage	$V_{\text{OFTRH}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$ $f = 5 \text{ kHz}, \text{rectangular wave}$	4.2	—	—	V
OFTR low-level output voltage	$V_{\text{OFTRL}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$ $f = 5 \text{ kHz}, \text{rectangular wave}$	—	—	0.8	V
Masking operating voltage 1	$V_{\text{MASK1}}$	$f = 40 \text{ kHz}, V_{\text{IN}} = 100 \text{ mV[p-p]}$	—	—	0.35	V
Masking operating voltage 2	$V_{\text{MASK2}}$	$f = 40 \text{ kHz}, V_{\text{IN}} = 100 \text{ mV[p-p]}$	0.65	—	—	V
<b>3TENV</b>						
CEA to ENV transfer characteristics	$G_{\text{CEA-ENV}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$	20.0	23.0	26.0	dB
CEA input impedance	$Z_{\text{CEA}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$	6.8	8.8	10.8	$\text{k}\Omega$
ENV amp. output impedance	$Z_{\text{ENV}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$	6.4	8.4	10.4	$\text{k}\Omega$
ENV amp. offset voltage	$V_{\text{ENVOF}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$	-100	0	100	mV
ENV amp. operation	$V_{\text{ENV}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$ $f = 800 \text{ kHz}, \text{AM modulation}$	270	540	810	mV[p-p]
<b>LD APC</b>						
LD operating reference voltage	$V_{\text{LD}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$	135	170	205	mV
LDON operating voltage	$V_{\text{LDON}}$	$V_{\text{CC1}} = 5 \text{ V}, V_{\text{CC2}} = 3.3 \text{ V}$	—	—	-0.35	V

■ Application Circuit Example

