

# AN8839NSB

## CD-DA head amplifier IC for 3-beam system optical pick-up

### ■ Overview

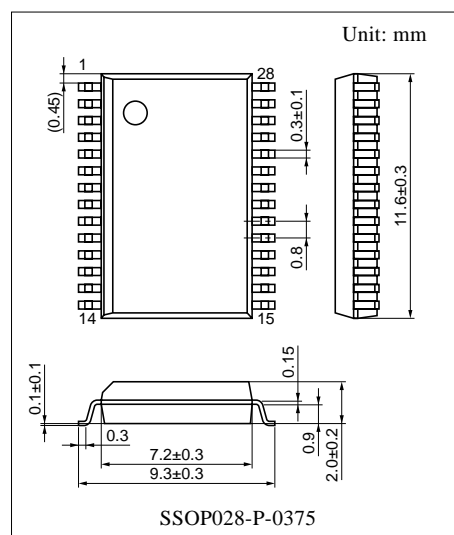
The AN8839NSB is a head amplifier IC for digital servo. It can configure an efficient CD system in combination with the MN6627XX series, and allows a full-automatic adjustment of tracking balance-gain-offset and focus balance-gain-offset with fewer external parts.

### ■ Features

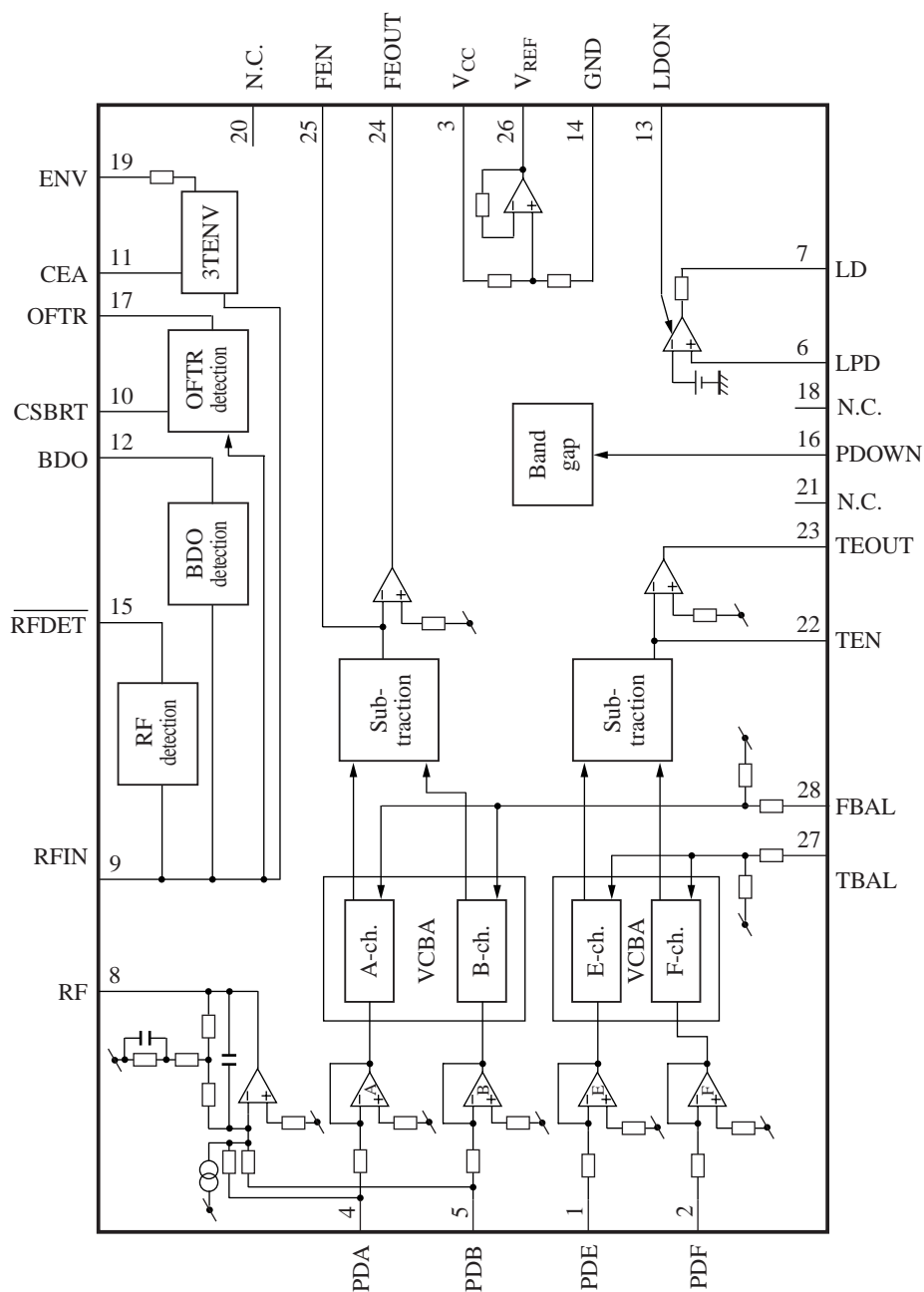
- Operating supply voltage  $V_{CC} = 2.4 \text{ V}$  to  $5.5 \text{ V}$
- Balance adjustment function built-in  
Focus error amp./tracking error amp.
- OFTR/BDO detection
- Standby function built in
- APC amp.

### ■ Applications

- CD player



## ■ Block Diagram



## ■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	Tracking signal input pin 1	15	NRFDDET output pin
2	Tracking signal input pin 2	16	Power-down input pin
3	Power supply pin	17	OFTR output pin
4	Focus signal input pin 1	18	N.C.
5	Focus signal input pin 2	19	3TENV output pin
6	APC amp. input pin	20	N.C
7	APC amp. output pin	21	N.C
8	RF adding output pin	22	TE amp. input pin
9	Input pin for the detection circuits	23	TE amp. output pin
10	Capacitor connection pin for OFTR	24	FE amp. output pin
11	Capacitor connection pin for HPF amp.	25	FE amp. input pin
12	BDO output pin	26	V <sub>REF</sub> output pin
13	APC control pin	27	TBAL control pin
14	GND pin	28	FBAL control pin

## ■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	5.8	V
Supply current	I <sub>CC</sub>	20	mA
Power dissipation	P <sub>D</sub>	116	mW
Operating ambient temperature *	T <sub>opr</sub>	−20 to +75	°C
Storage temperature *	T <sub>stg</sub>	−55 to +125	°C

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

## ■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V <sub>CC</sub>	2.4 to 5.5	V

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Current consumption with no load	$I_{\text{TOT}}$	$V_{\text{CC}} = 3\text{ V}$	4.0	6.0	8.0	mA
No load current at power down	$\text{PDI}_{\text{TOT}}$	$V_{\text{CC}} = 3\text{ V}$	—	—	300	$\mu\text{A}$
$V_{\text{REF}}$ output pin	$V_{\text{REF}}$	$V_{\text{CC}} = 3\text{ V}$	1.37	1.50	1.63	V
Focus error amplification						
Focus error amp. output offset voltage	$V_{\text{FO-OF}}$	$V_{\text{CC}} = 3\text{ V}$	-100	0	100	mV
Focus error offset balance crosstalk amount	$V_{\text{FO-OFB}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}} \pm 0.375\text{ V}$	-120	0	120	mV
Focus error amp. V-V conversion gain	$G_{\text{FO1}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}}$	10.7	13.2	15.7	dB
Focus error amp. V-V conversion relative gain	$\Delta G_{\text{FO2}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}}$	-1.5	0	1.5	dB
Focus balance variable range 1-H	$B_{\text{FO1-H}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}} + 0.375\text{ V}$	1.29	1.49	1.69	—
Focus balance variable range 1-L	$B_{\text{FO1-L}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}} - 0.375\text{ V}$	0.25	0.5	0.75	—
Focus balance variable range 2-H	$B_{\text{FO2-H}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}} + 0.375\text{ V}$	0.25	0.5	0.75	—
Focus balance variable range 2-L	$B_{\text{FO2-L}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}} - 0.375\text{ V}$	1.29	1.49	1.69	—
Tracking error amplification						
Tracking error amp. output offset voltage	$V_{\text{TR-OF}}$	$V_{\text{CC}} = 3\text{ V}$	-97	0	97	mV
Tracking error offset balance crosstalk amount	$V_{\text{TR-OFB}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}} \pm 0.375\text{ V}$	-120	0	120	mV
Tracking error amp. I-V conversion gain	$R_{\text{TR1}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}}$	580	750	920	$\text{k}\Omega$
Tracking error amp. I-V conversion relative gain	$\Delta R_{\text{TR2}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}}$	-18	0	18	%
Tracking balance variable range 1-H	$B_{\text{TR1-H}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}} + 0.375\text{ V}$	0.77	0.83	0.9	—
Tracking balance variable range 1-L	$B_{\text{TR1-L}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}} - 0.375\text{ V}$	1.07	1.17	1.27	—
Tracking balance variable range 2-H	$B_{\text{TR2-H}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}} + 0.375\text{ V}$	1.07	1.17	1.27	—
Tracking balance variable range 2-L	$B_{\text{TR2-L}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}} - 0.375\text{ V}$	0.77	0.83	0.9	—
TEMUTE operation 1	$V_{\text{TEM}}$	$V_{\text{CC}} = 3\text{ V}$	-125	0	125	mV

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>RF amplification</b>						
RF amp. offset voltage	$V_{\text{RF-OF}}$	$V_{\text{CC}} = 3\text{ V}$	-910	-710	-510	mV
RF amp. transfer gain	$G_{\text{RF}}$	$V_{\text{CC}} = 3\text{ V}$	7.7	9.3	10.9	dB
RF-amp. frequency characteristics *	$G_{\text{RFF}}$	$V_{\text{CC}} = 3\text{ V}$ $f = 500\text{ kHz}, 3\text{ MHz}$	-2.8	-0.6	1.6	dB
RF-amp. EQ characteristics *	$G_{\text{EQ1}}$	$V_{\text{CC}} = 3\text{ V}$ $f = 500\text{ kHz}, 1.5\text{ MHz}$	-0.8	1.0	2.9	dB
RF-amp. capable drive current	$I_{\text{RFO}}$	$V_{\text{CC}} = 3\text{ V}$	220	—	—	$\mu\text{A}$
<b>RF detection</b>						
RFDET det. operation	$V_{\text{NRF}}$	$V_{\text{CC}} = 3\text{ V}, f = 500\text{ kHz}$	88	132	176	mV[p-p]
RFDET high-level	$V_{\text{NRF-H}}$	$V_{\text{CC}} = 3\text{ V}, f = 500\text{ kHz}$	2.6	—	—	V
RFDET low-level	$V_{\text{NRF-L}}$	$V_{\text{CC}} = 3\text{ V}, f = 500\text{ kHz}$	—	—	0.4	V
<b>BDO</b>						
BDO detection level	$V_{\text{BDO}}$	$V_{\text{CC}} = 3\text{ V}$	-63	-37	-11	mV
BDO high-level	$V_{\text{BDO-H}}$	$f = 5\text{ kHz}, 170\text{ mV[p-p]}, V_{\text{CC}} = 3\text{ V}$	2.6	—	—	V
BDO low-level	$V_{\text{BDO-L}}$	$f = 5\text{ kHz}, 170\text{ mV[p-p]}, V_{\text{CC}} = 3\text{ V}$	—	—	0.4	V
<b>OFTR</b>						
OFTR detection current	$I_{\text{CSOFTR}}$	$V_{\text{CC}} = 3\text{ V}$	1.03	1.45	1.87	$\mu\text{A}$
OFTR high-level	$V_{\text{OFT-H}}$	$V_{\text{CC}} = 3\text{ V}, f = 5\text{ kHz}, 700\text{ mV[p-p]}$	2.6	—	—	V
OFTR low-level	$V_{\text{OFT-L}}$	$V_{\text{CC}} = 3\text{ V}, f = 5\text{ kHz}, 700\text{ mV[p-p]}$	—	—	0.4	V
<b>LD APC</b>						
APC operating voltage	$V_{\text{APC}}$	$V_{\text{CC}} = 3\text{ V}$	147	170	193	mV
<b>3TENV</b>						
ENV-amp. offset voltage	$V_{\text{ENV-OF}}$	$V_{\text{CC}} = 3\text{ V}$	-125	0	125	mV
CEA-ENV transfer characteristics	$G_{\text{CENV}}$	$V_{\text{CC}} = 3\text{ V}$	6	7.6	9.2	times
CEA input impedance	$Z_{\text{CEA}}$	$V_{\text{CC}} = 3\text{ V}$	8.1	10.5	12.9	$\text{k}\Omega$
ENV output impedance	$Z_{\text{ENV}}$	$V_{\text{CC}} = 3\text{ V}$	8.1	10.5	12.9	$\text{k}\Omega$
ENV amp. operation	$V_{\text{OP-ENV}}$	$V_{\text{CC}} = 3\text{ V}, f = 800\text{ kHz}, \text{AM modulation}$	70	100	130	mV[p-p]
<b>Focus error amp.</b>						
Focus error amp. dead zone width 1	$X_{\text{FEDZ1}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}}$	-10	0	10	mV
Focus error amp. dead zone width 2	$X_{\text{FEDZ2}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}}$	-10	0	10	mV
Focus error amp. relative dead zone width	$\Delta X_{\text{FEDZ1}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{FB}} = V_{\text{REF}}$	-8	0	8	mV

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
Tracking error amplification						
Tracking error amp. dead zone width 1	$X_{\text{TEDZ1}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}}$	-10	0	10	mV
Tracking error amp. dead zone width 2	$X_{\text{TEDZ2}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}}$	-10	0	10	mV
Tracking error Amp. relative dead zone width	$\Delta X_{\text{TEDZ}}$	$V_{\text{CC}} = 3\text{ V}$ $V_{\text{TB}} = V_{\text{REF}}$	-8	0	8	mV
Power down pin						
PDOWN pin high-level input voltage	$V_{\text{PD-H}}$	$V_{\text{CC}} = 3\text{ V}$	2.2	—	—	V
PDOWN pin low-level input voltage	$V_{\text{PD-L}}$	$V_{\text{CC}} = 3\text{ V}$	—	—	0.3	V

## ■ Application Circuit Example

