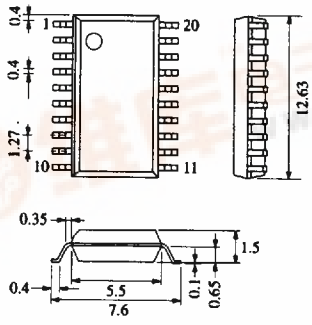
AN7389S

Dobly* B-type Noise Reduction Decorder for 1.5V HeadphoneStereo

■ Description

The AN7389S is an monolithic integrated circuits designed for dolby B-type noise reduction playback suitable for 1.5V headphone stereo and incorporates multi-purpose GND switch and stand-by function in a single chip.

AN7375N Unit : mm



20-Lead PANAFLAT Plastic Package (SO-20D)

■ Features

- Operating voltage range : V_{CC} = 1.0 to 3.6V
- Head room (Dobly Level +12dB) is guaranteed to 1.1V
- Low consumption current : I_{tot} = 3.6mA
- Fewer external components
- Multi-purpose GND switch pin
- Stand-by switches greatly saving the consumption current
- Small Package

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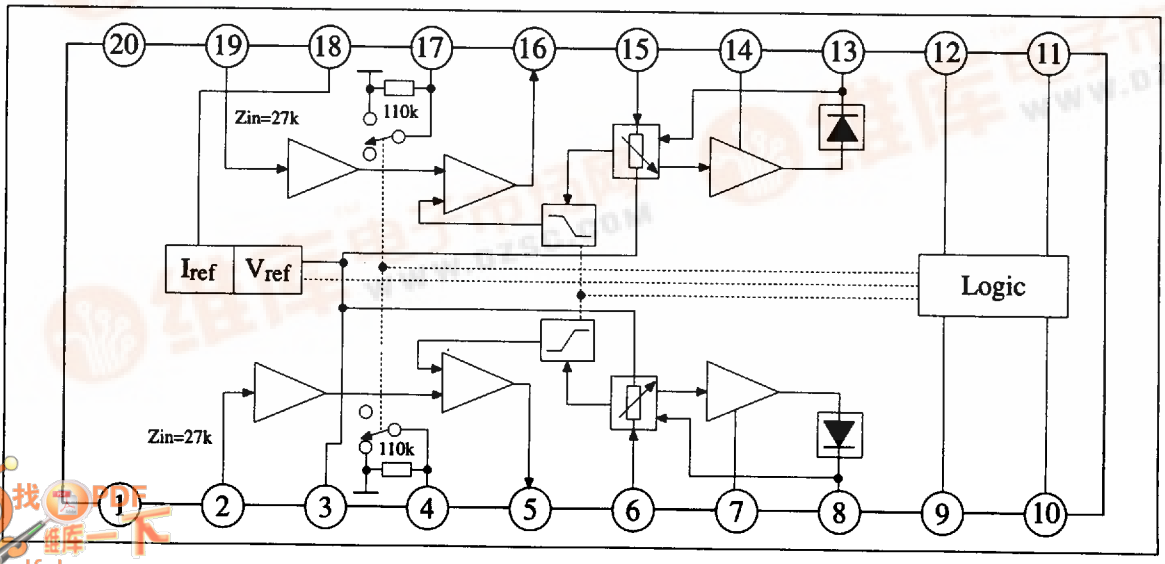
Note: When users use this product, licensing contract should be made between the Dolby Research Center. Details should be contacted with the following:
Dolby Research Center: Tokyo Office (Far Eastan Continental Inc.)
Tel: 03-3584-0039

■ Block Diagram



■ Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	4.5	V
Supply Current	I_{CC}	10	mA
Power Dissipation (Ta = 75°C)	P_D	45	mW
Operating Ambient Temperature	Topr	-20 ~ +75	°C
Storage Temperature		-55 ~ +125	°C

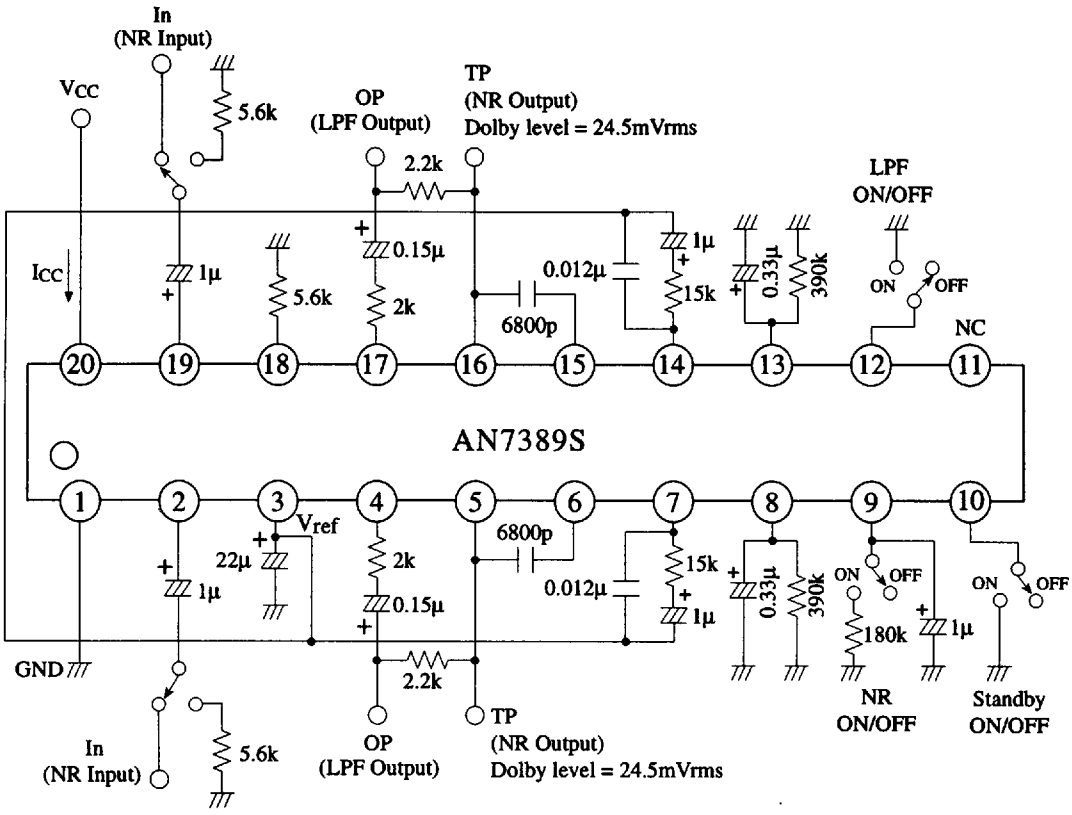
Operating Supply Voltage Range: V_{CC} = 1.0V ~ 3.6V
Note : The minimum operating voltage to confirm to the standards of Dobly B type NR is 1.1V

■ Electrical Characteristics (V_{CC}=3V, Ta=25±2°C)

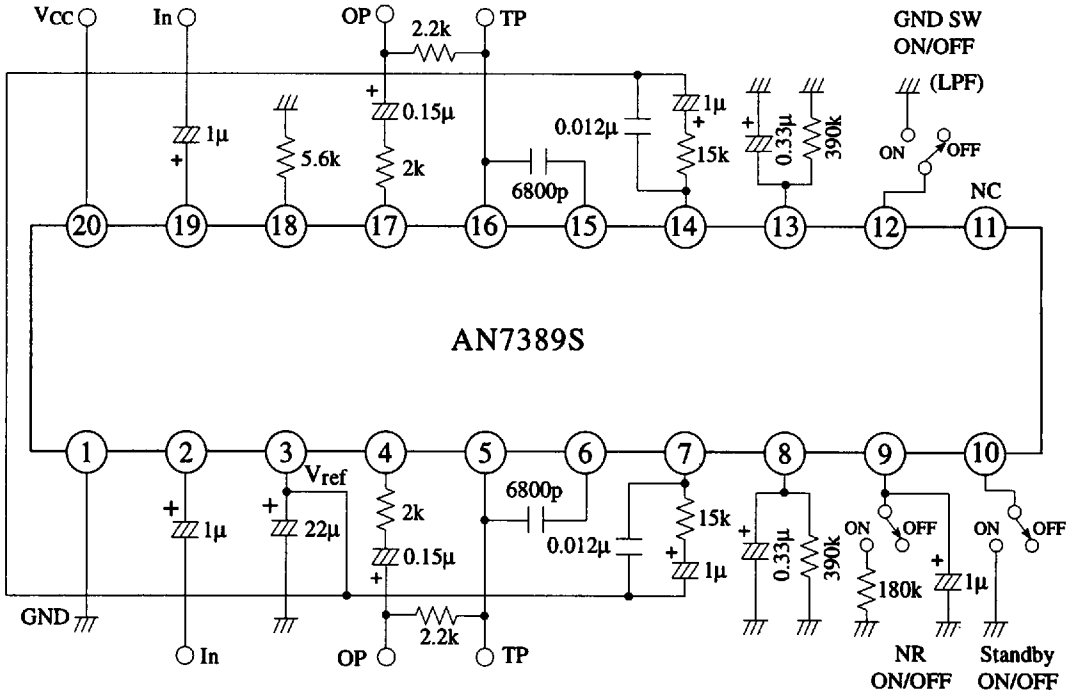
Item	Symbol	Test Cct	Condition	min.	typ.	max.	Unit
Total Circuit Stabdby OFF Current	I_{CC1}	1	NR OFF, LPF OFF, no signals	2.8	3.8	5.0	mA
Total Circuit Stabdby OFF Current	I_{CC2}	1	NR ON, LPF OFF, no signals	2.8	3.9	5.1	mA
Total Circuit Stabdby ON Current	I_{CC3}	1	NR OFF, LPF OFF, no signals		0	0.5	mA
Reference Input Level*1	Vin	1	NR OFF, LPF OFF f=1kHz, V_O=24.5mV_{rms}	20	23	26	mV_{rms}
Channel Balance	CB	1	(CAL) Channel ratio of the above Vin.	-1	0	1	dB
NR Decoder Characteristics 1*2	NRD1	1	NR ON, LPF OFF f=10kHz, Vin=-29.6dB, CAL NRD=V_O+40[dB]	-2	0	2	dB
NR Decorder Characteristics 2*2	NRD2	1	NR ON, LPF OFF f=1kHz, Vin=-23.9dB CAL NRD=V_O+30[dB]	-2	0	2	dB
NR Decorder Characteristics 3*2	NRD3	1	NR ON, LPF OFF f=1kHz, Vin=-15.8dB CAL NRD=V_O+20[dB]	-2.5	0	2.5	dB
NR Decorder Characteristics 4*2	NDR4	1	NR ON, LPF OFF f=10kHz, Vin=-17.4dB, CAL NRD=V_O+20[dB]	-2.5	0	2.5	dB
NR Decorder Characteristics 5*2	NDR5	1	NR ON, LPF OFF f=10kHz, Vin=0.4dB, CAL NRD=V_O[dB]	-2	0	2	dB
Total Harmonic Distortion 1*3	THD1	1	NR OFF, LPF ON f=1kHz, V_{in}=+10dB		0.2	0.5	%
Total Harmonic Distortion 2*3	THD2	1	NR ON, LPF OFF f=1kHz, V_{in}=+10dB		0.3	0.8	%
Total Harmonic Distortion 3*3	THD3	1	NR ON, LPF OFF f=1kHz, V_{in}=+12dB VCC=1.1V		0.3	1	%
Signal to Noise Ratio NR ON*4	S/N	1	NR ON, LPF OFF Input pin Rg=5.6kΩ CCIR/ARM filter	70	72		dB
Optional Filter Characteristics - 1*5	GV1	1	NR OFF, LPF OFF f=1kHz, V_{in}=0dB	-1.5	-0.5	0.5	dB
Optional Filter Characteristics - 2*5	GV2	1	NR OFF, LPF ON f=1kHz, V_{in}=0dB	-8	-6.5	-5	dB
Channel Crosstalk NR ON*6	CT1	1	NR ON, LPF OFF f=1kHz, Vin=0dB		50		dB
Channel Crosstalk NR OFF*6	CT2	1	NR OFF, LPF OFF f=1kHz, Vin=0dB		50		dB

Note 1 : Adjust input level for output level equal to 24.5mV_{rms} at measurement's point TP, and set it to 0dB.
Note 2 : In CAL, V_O is a output level as compared with standard 0dB=24.5mV_{rms}. Measurement's point : TP.
Note 3 : Measurement's point : OP.
Note 4 : Measurement's point : TP.
Note 5 : Measurement's point as compared with 24.5V_{rms} : Output Level at OP.
Note 6 : The above characteristics are reference values on design but not on guaranteed values. In this case where problem does occur, we will respond and discuss the problem sincerely.

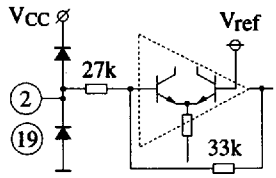
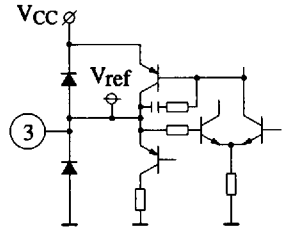
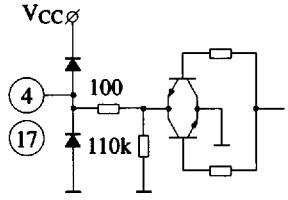
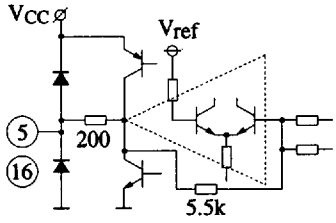
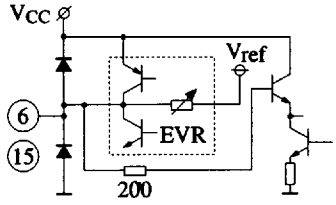
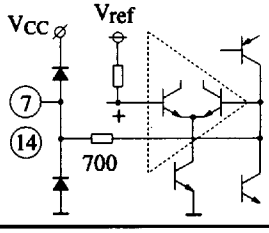
Test Circuit 1



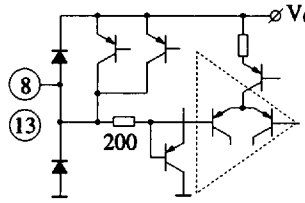
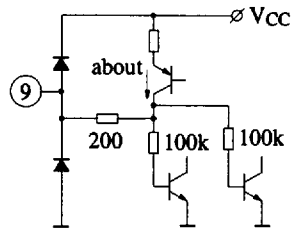
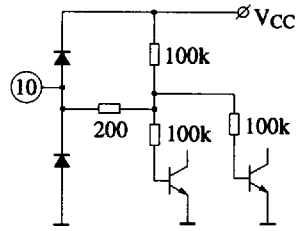
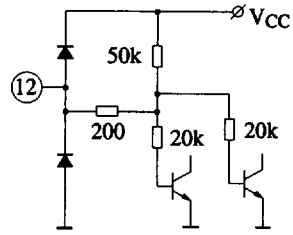
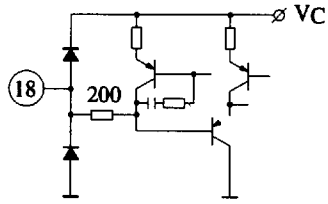
■ Application Circuit



■ Pin Descriptions

Pin No.	Pin Name	Input/Output Resistance / Pin Voltage)	Equivalent Circuit	Description
1	GND	0V		GND Pin.
2 19	NR Decode Input	R_{in} = 27kΩ (std) 0.78V		NR Decoder Input Pin.
3	Vref	R_O ≈ 35Ω 0.78V		Reference Voltage Output Pin.
4 17	GND Switch	R_{in} ≈ 130Ω (std) when GS ON R_{in} ≈ 110kΩ (std) when GS OFF 0V		GND Switch. Transistor is OFF when pin 12 open or voltage Hi, transistor is ON when pin 12 voltage Lo.
5 16	NR Decode Output	R_O = 300Ω (std) 0.78V		NR Decoder Output Pin.
6 15	Side Chain Filter	Rin : According to input signal. 0.78V		Side Chain Input Pin.
7 14	Weighting-Amp Filter	0.78V		Weighting-Amp Filter Pin.

■ Pin Descriptions (Continue)

Pin No.	Pin Name	Input/Output Resistance / Pin Voltage)	Equivalent Circuit	Description
8 13	Control Voltage Rectifier	0V (Applied external resistance when no signal.)		Control Voltage Rectified Filter Pin.
9	NR ON/OFF Control	Rin ≈ 50kΩ 0.8V		NR ON/OFF Control Pin. NR OFF Pin Open or Voltage Hi $0.75V<V_{9-1}<Vcc+0.3V$ NR ON Voltage Lo $-0.3V<V_{9-1}<0.4V$
10	Standby ON/OFF Control	Rin ≈ 50kΩ 0.87V		Standby ON/OFF Control Pin. Standby OFF Pin Open or Voltage Hi $0.75V<V_{10-1}<Vcc+0.3V$ Standby ON Voltage Lo $-0.3V<V_{10-1}<0.4V$
11	NC			
12	GND Switch ON/OFF Control	Rin ≈ 9kΩ 0.78V		GND Switch. ON/OFF Control Pin. GS Cont OFF Pin Open or Pin Voltage Hi $0.75V<V_{12-1}<Vcc+0.3V$ GS Cont ON Pin Voltage Lo $-0.3V<V_{12-1}<+0.4V$
18	Iref	0.15V		Reference Current Resistance Pin.
20	Vcc	1.2V		Voltage Supply Pin.

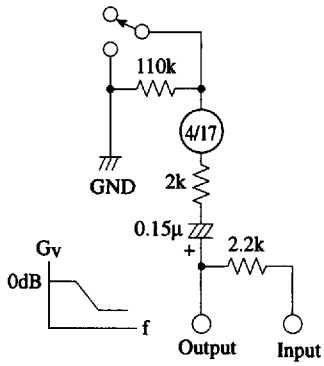
■ Supplementary Explanation

(1) GND Switch
The GND Switch can be used for the application of output mute circuit as well as LPF shown in Fig. 1.

(2) Regarding the external circuit of pin 7 and 14
GND connected point of external circuit for pin 7, 14 should be connected to Vref (Pin 3) like Test Circuit 1, because it can prevent transient change of NR (Noise Reduction) characteristics when Vcc rises. However, if there is no problem in sound quality evaluation, it may be connected to GND like in Fig. 2 application circuit.

(3) Regarding the external circuit of pin 9
Basically, pin 9 is not necessary to connect any external circuit like resistance and capacitance (see Fig. 2 application circuit). There is usually no shock noise problem when NR is ON/OFF. However if problem occured, it can be reduced completely by connecting 180kΩ resistance and capacitance with proper value like Test Circuit 1.

(Fig. 1)
Application for LPF



(Fig. 2) Application Circuit Example