

# AN7322/S

## 'Live' IC for PRC & Stereo Headphone Player

### ■ Description

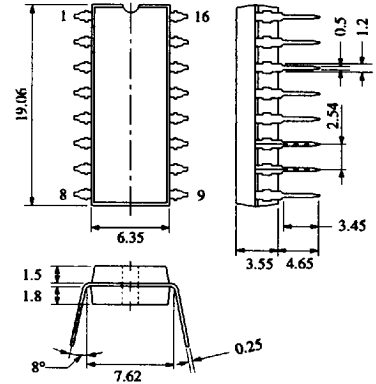
The AN7322/S are the monolithic integrated circuits designed for use in PRC & Stereo Headphone Player. Signals from channel 1 and channel 2 are processed and mixed to produced a Live Effect output, centred at the frequency of 400Hz, with 3 different gain modes. Built-in switches allow the selection of Live OFF, Middle and Heavy effect.

### ■ Features

- Few external components.
- Selection modes : Live OFF, Middle and Heavy
- Built-in switches can be controlled by microprocessor

AN7322

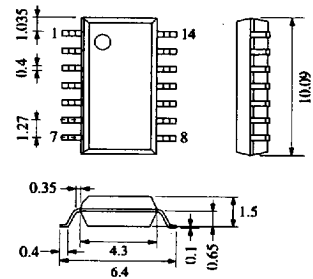
Unit : mm



16-Lead DIL Plastic Package (16-DIP)

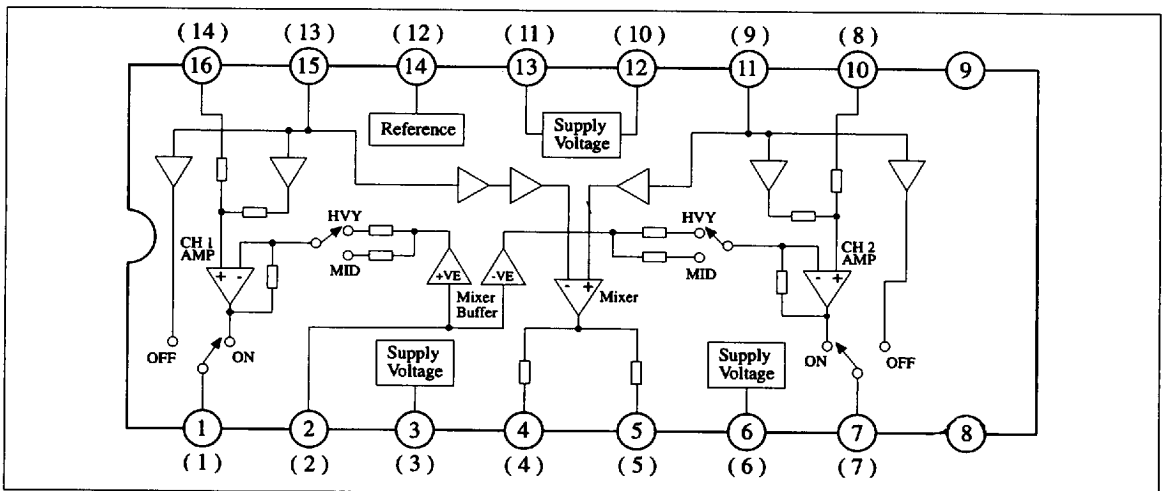
AN7322S

Unit : mm



14-Lead PANAFLAT Plastic Package (SO-14D)

### ■ Block Diagram



## ■ Absolute Maximum Ratings (Ta=25°C)

| Item                          | Symbol           | Rating     | Unit |
|-------------------------------|------------------|------------|------|
| Supply Voltage                | V <sub>CC</sub>  | 14         | V    |
| Supply Current                | I <sub>CC</sub>  | 30         | mA   |
| Power Dissipation *1          | P <sub>D</sub>   | 420        | mW   |
| Power Dissipation *2          | P <sub>D</sub>   | 351        | mW   |
| Operating Ambient Temperature | T <sub>opr</sub> | -20 ~ +75  | °C   |
| Storage Temperature *1        | T <sub>stg</sub> | -55 ~ +150 | °C   |
| Storage Temperature *2        | T <sub>stg</sub> | -55 ~ +125 | °C   |

Operating Supply Voltage Range: V<sub>CC</sub> = 1.8V ~ 6.9V

\*1 For DIL-16 Pin Plastic Package.

\*2 For DIL-14 Pin Plastic Package (SO-Type).

## ■ Electrical Characteristics (V<sub>CC</sub>=3V, f=1kHz, Ta=25°C)

| Item                         | Symbol           | Condition                                                    | min. | typ. | max. | Unit |
|------------------------------|------------------|--------------------------------------------------------------|------|------|------|------|
| Total Current                | I <sub>tot</sub> | V <sub>sw</sub> = V <sub>in</sub> = 0 V                      | 3.0  | 4.3  | 5.0  | mA   |
| Ripple Rejection             | RR               | V <sub>ripple</sub> = - 20 dBv, V <sub>sw</sub> =0V, f=100Hz | 35   | 45   | -    | dB   |
| Channel 1 ( Live Off )       |                  | V <sub>sw</sub> = 0 V                                        |      |      |      |      |
| Path Gain                    | G <sub>v1</sub>  | V <sub>in1</sub> = 100mV                                     | -1   | 0    | 1.5  | dB   |
| Maximum Output voltage       | V <sub>om1</sub> | THD = 1 %                                                    | 0.15 | 0.25 | -    | V    |
| Total Harmonic Distortion *1 | THD <sub>1</sub> | V <sub>o1</sub> = 0.1 V <sub>rms</sub>                       | -    | 0.15 | 0.5  | %    |
| Output Noise Voltage *1      | V <sub>no1</sub> | V <sub>in1</sub> = 0 V                                       | -    | 40   | 80   | μV   |
| Channel Separation           | CS               | V <sub>in1</sub> = 100mV, Measure V <sub>out2</sub>          | 35   | 45   | -    | dB   |
| Channel Balance              | CB               | V <sub>in1</sub> =V <sub>in2</sub> =100mV                    | -1   | 0    | 1    | dB   |
| Channel 1 ( Live Mid )       |                  | V <sub>sw</sub> = 1.5V                                       |      |      |      |      |
| Total Harmonic Distortion *1 | THD <sub>1</sub> | V <sub>o1</sub> = 0.1 V <sub>rms</sub>                       | -    | 0.4  | 1.0  | %    |
| Output Noise Voltage *1      | V <sub>no1</sub> | V <sub>in</sub> = 0 V                                        | -    | 45   | 90   | μV   |
| Channel 1 Mixed Gain (1)     | G <sub>vm1</sub> | V <sub>in1</sub> = 100mV, f = 400Hz                          | 1.5  | 2.5  | 3.5  | dB   |
| Channel 2 Mixed Gain (2)     | G <sub>vm2</sub> | V <sub>in1</sub> =100mV, f=400Hz, Measure V <sub>out2</sub>  | -8.0 | -6.0 | -4.0 | dB   |
| Channel 1 ( Live Hvy )       |                  | V <sub>sw</sub> = 3 V                                        |      |      |      |      |
| Total Harmonic Distortion *1 | THD <sub>1</sub> | V <sub>o1</sub> = 0.1 V <sub>rms</sub>                       | -    | 0.4  | 1.0  | %    |
| Output Noise Voltage *1      | V <sub>no1</sub> | V <sub>in</sub> = 0 V                                        | -    | 60   | 100  | μV   |
| Channel 1 Mixed Gain (1)     | G <sub>vm1</sub> | V <sub>in1</sub> = 100mV, f = 400Hz                          | 4.5  | 5.8  | 7.0  | dB   |
| Channel 2 Mixed Gain (2)     | G <sub>vm2</sub> | V <sub>in1</sub> =100mV, f=400Hz, Measure V <sub>out2</sub>  | 0.2  | 1.0  | 1.8  | dB   |

\*1 DIN AUDIO filter used.

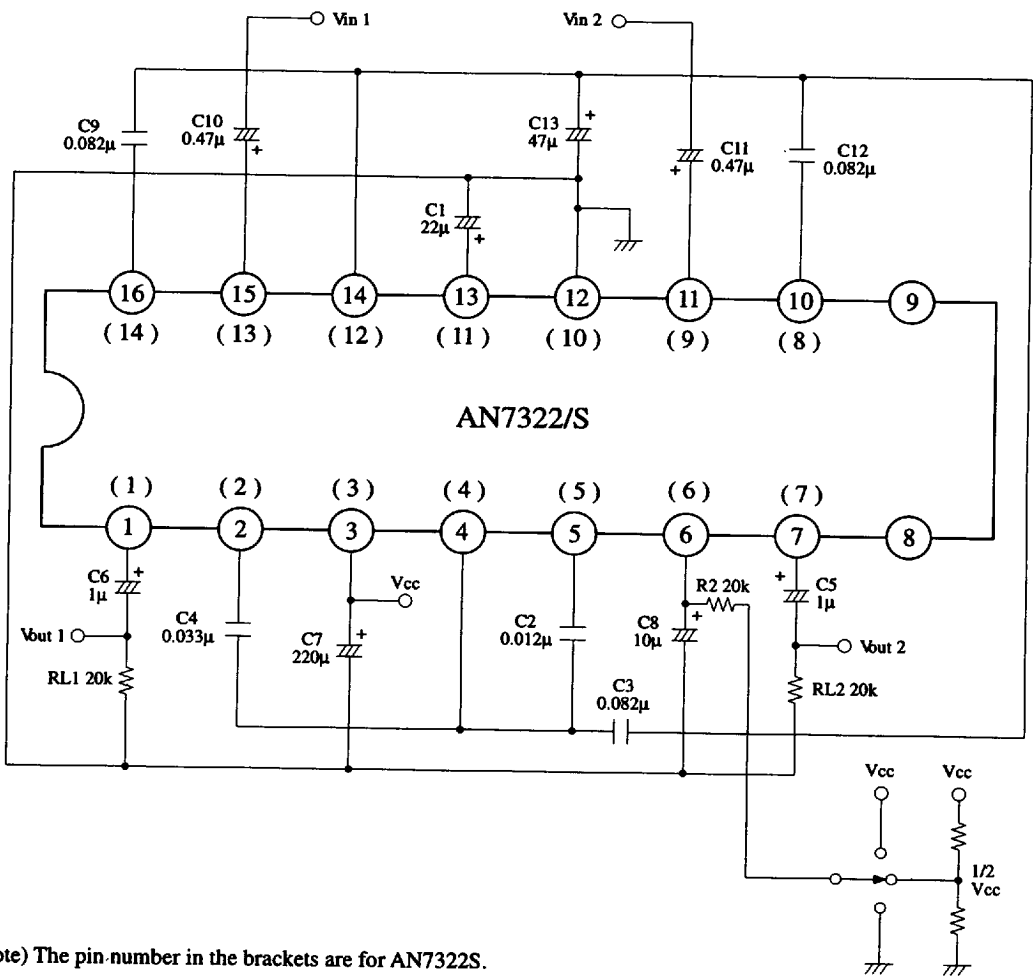
Note) Input only at V<sub>in1</sub> and measure at V<sub>out1</sub>, unless otherwise specified.

Pin

| Pin No  | Pin Name         | Pin No    | Pin Name          |
|---------|------------------|-----------|-------------------|
| 1 ( 1 ) | Channel 1 Output | 9         | NC                |
| 2 ( 2 ) | Mixer Input      | 10 ( 8 )  | Channel 2 Filter  |
| 3 ( 3 ) | Vcc              | 11 ( 9 )  | Channel 2 Input   |
| 4 ( 4 ) | Mixer Output 1   | 12 ( 10 ) | Ground            |
| 5 ( 5 ) | Mixer Output 2   | 13 ( 11 ) | Ripple Filter     |
| 6 ( 6 ) | Live switch      | 14 ( 12 ) | Reference Voltage |
| 7 ( 7 ) | Channel 2 Output | 15 ( 13 ) | Channel 1 Input   |
| 8       | NC               | 16 ( 14 ) | Channel 1 Filter  |

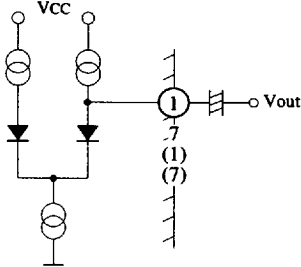
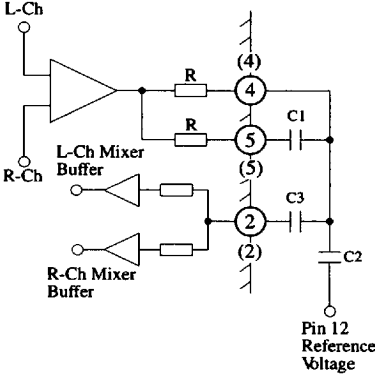
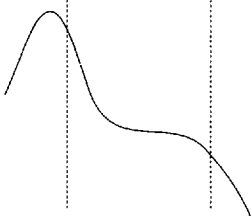
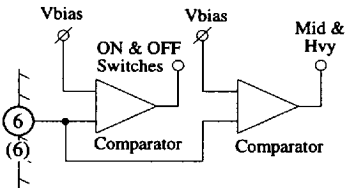
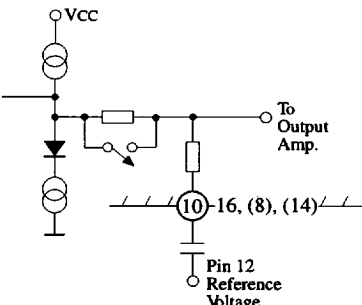
Note) 1. The Ripple Filter pin is weaker in the surge of negative side than other pins.  
2. The pin number in the bracket are for AN7322S.

Application Circuit



Note) The pin-number in the brackets are for AN7322S.

■ Pin Descriptions

| Pin No.           | Pin Name      | DC Bias Voltage | Equivalent Circuit                                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------|---------------|-----------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1, 7<br>(1, 7)    | Output        | 1.63            |    | 'LIVE' ON & OFF Output pin.<br>Output impedance ≈ 2.6kΩ                                                                                                                                                                                                                                                                                                                                                           |
| 2<br>(2)          | Mixer In      | 1.65            |   | These 3 pins are used for high frequency cut for the mixed signal. The mixed signal is feedback to the L-Ch & R-Ch output amplifier respectively.<br><br>$f_1 = \frac{1}{2\pi R_1 C_2} \quad f_2 = \frac{1}{2\pi (R_1 // R_2) C_2}$<br>NB : f <sub>1</sub> & f <sub>2</sub> can be varied by varying C <sub>2</sub> externally. |
| 4<br>(4)          | Mixer Out 1   | 1.68            |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 5<br>(5)          | Mixer Out 2   | 1.68            |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 3<br>(3)          | VCC           |                 |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 6<br>(6)          | 'LIVE' Switch |                 |  | This pin select 'LIVE' OFF, MID & HVY.<br><br>'LIVE' OFF ( DC ) = 0V<br>'LIVE' MID ( DC ) = 1/2 Vcc<br>'LIVE' HVY ( DC ) = Vcc                                                                                                                                                                                                                                                                                    |
| 10, 16<br>(8, 14) | Filter        | 0.95            |  | These 2 pins are for low frequency cut before the original signal is mix with the mixed signal at the output amplifier.                                                                                                                                                                                                                                                                                           |

Note) The pin number in brackets are for AN7322S.

■ Pin Descriptions (Continue)

| Pin No.             | Pin Name          | DC Bias Voltage | Equivalent Circuit | Description                                                                                                       |
|---------------------|-------------------|-----------------|--------------------|-------------------------------------------------------------------------------------------------------------------|
| 11, 15<br>( 9, 13 ) | Input             | 1.65            |                    | These are the inputs to the IC.<br>These inputs can be from PRE & VOL block.<br>I/P impedance $\approx 30k\Omega$ |
| 12<br>( 10 )        | GND               |                 |                    |                                                                                                                   |
| 13<br>( 11 )        | Ripple Filter     | 1.67            |                    | Connect with a capacitor to minimize ripple from Vcc.                                                             |
| 14<br>( 12 )        | Reference Voltage | 1.67            |                    | This pin provide a fixed DC bias.<br>The capacitor connect externally is to minimize oscillation.                 |
| 8, 9                | NC                |                 |                    |                                                                                                                   |

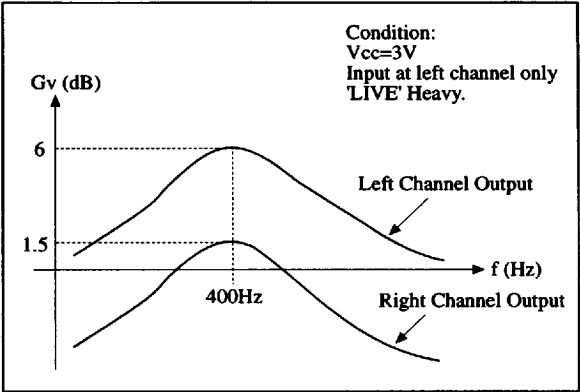
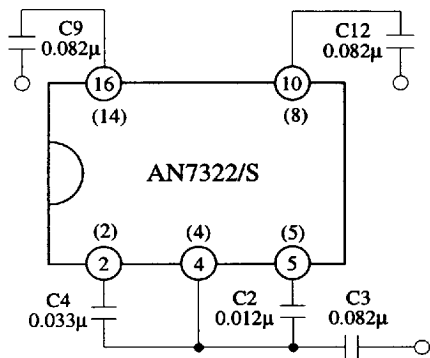
Note) The pin number in brackets are for AN7322S.

■ Supplementary Explanation

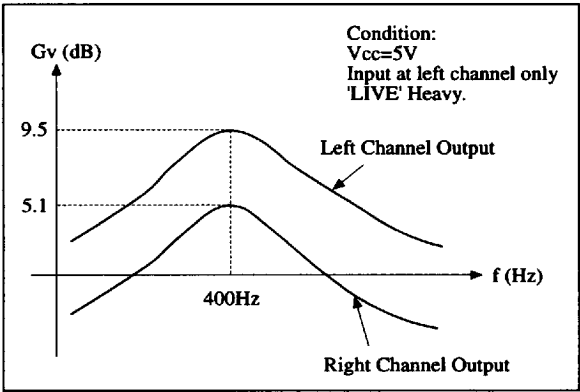
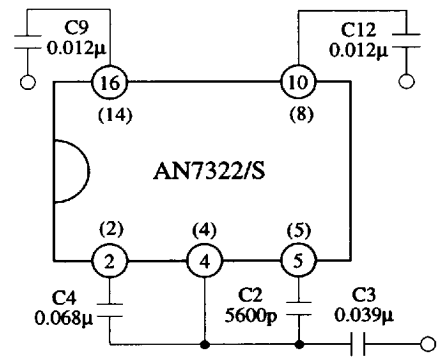
● Application Notes

This IC provides a 'LIVE' effect for stereo signal. It is situated between Pre-amplifier and Power amplifier. Signals from Left and Right channels are mixed to a certain level and this provides an ambient effect to the audible signal.  
Below are 2 application examples of this IC.

( 1 ) Application 1



( 2 ) Application 2



Other than the values shown above, the rest of the components values are the same as application circuit. With the set of values shown above, this IC will give the same type of characteristics curve as the Application 1 except that the gain is higher. The characteristics curve are as shown on the above right diagram. All the above characteristics curves are for 'LIVE' HEAVY only. In the MID position, the characteristics curve are the same as HEAVY except for the gain.  
The gain for both 'LIVE' Mid and Heavy at 400Hz are as follows :-

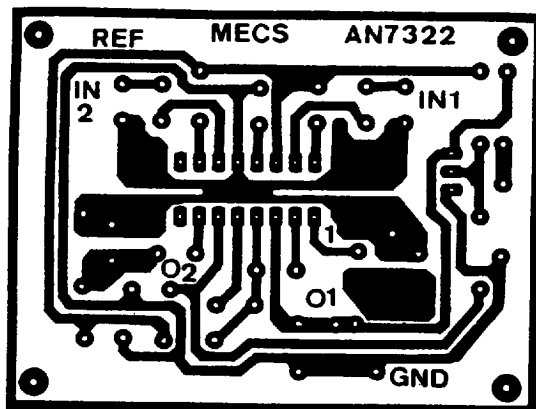
| 'LIVE' MID          | Application 1 | Application 2 |
|---------------------|---------------|---------------|
| Left Channel Output | 3dB           | 5.6dB         |
| Right Chanel Output | -5.6dB        | -2dB          |

| 'LIVE' HEAVY        | Application 1 | Application 2 |
|---------------------|---------------|---------------|
| Left Channel Output | 6dB           | 9.5dB         |
| Right Chanel Output | 1.5dB         | 5.1dB         |

Note) The pin number in the brackets are for AN7322S.

■ Printed Circuit Board Layout (Scale: 1:1)

PCB artwork of AN7322



PCB artwork of AN7322S

