

# IC for Headphone Stereos

## Monolithic IC MM1376

### Outline

This IC was developed for use in 3V headphone stereos, and combines all the basic audio circuitry for headphone stereos on a single chip.

Recently hearing impairment caused by the high volumes of headphone stereos has become a problem, and there has been strong demand for functions for limiting loud volumes in the sets themselves. This IC incorporates an ALC circuit and has functions to hold the output from the headphone to a fixed level; it also eliminates the ordinary electronic governor circuit in order to accommodate trends toward thinner sets, as seen in the adoption of BSL motors.

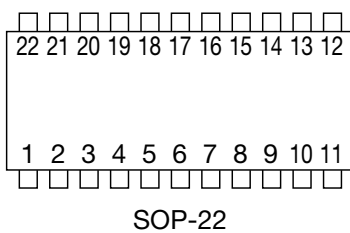
### Package

1. Configuration: Pre-and power amps, ALC circuit
2. Internal tape selector: A selector switch allows the user to select between normal and metal tapes.
3. Internal OCL circuit: No need for large-capacitance output capacitor
4. Preamp off function: Preamp alone can be turned off for connection to radio etc.
5. MM1376CF amp gain takes Dolby noise reduction into account

### Package

SOP-22

### Pin Assignment



1	COM1	12	Power output
2	Preamp non-inverted input	13	V <sub>CC</sub>
3	Preamp inverted input	14	Ripple filter
4	Metal switching output	15	Preamp off
5	Preamp output	16	Tape selector
6	Power input	17	Power input
7	Rectifier pin	18	Preamp output
8	ALC control	19	Metal switching output
9	Power output	20	Preamp inverted input
10	COM2	21	Preamp non-inverted input
11	GND1	22	GND2

### Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Operating temperature	T <sub>OPR</sub>	-10~+65	°C
Storage temperature	T <sub>STG</sub>	-40~+125	°C
Power supply current	V <sub>CC</sub>	-0.3~+7.5	V
Power consumption	P <sub>d</sub>	350	mW

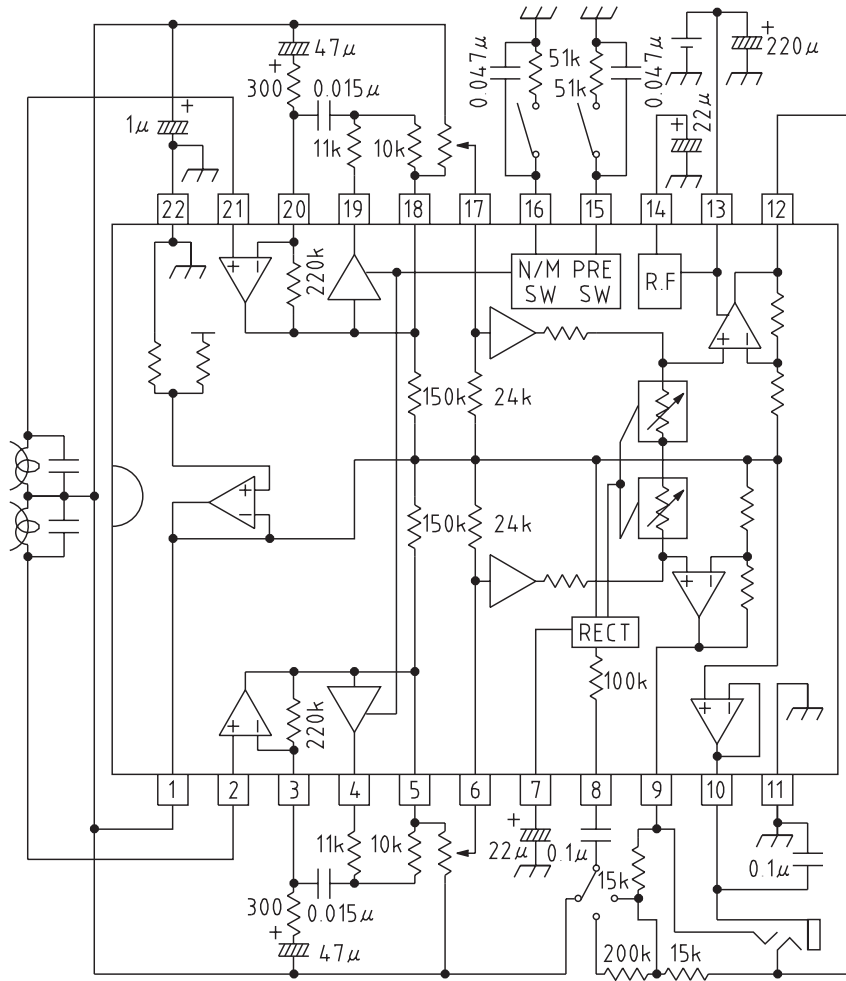
## Recommended Operating Conditions

Item	Symbol	Ratings	Units
Operating temperature	T <sub>OPR</sub>	-10~65	°C
Operating voltage	V <sub>OPR</sub>	2.0~5.0	V

## Electrical Characteristics (Except where noted otherwise, Ta=25°C, V<sub>CC</sub>=3V, f=1kHz, R<sub>L1</sub>=10kΩ, R<sub>L2</sub>=16Ω)

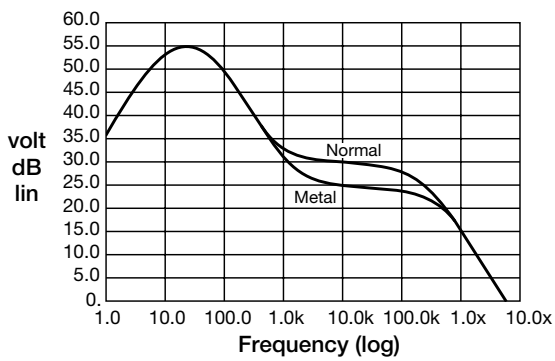
Item	Measurement conditions		Min.	Typ.	Max.	Units	
Consumption current	V <sub>IN</sub> =0V		6	14	22	mA	
<b>Preamp unit</b>							
Open-circuit gain				72		dB	
Closed-circuit gain I	Normal	V <sub>O</sub> =-10dBm, f=1kHz	31	33.5	36	dB	
	Metal		29.5	32	34.5		
Closed-circuit gain II	Normal	V <sub>O</sub> =-10dBm, f=5kHz	28	30.5	33	dB	
	Metal		23	25.5	28		
Maximum output voltage	THD=10%		0.30	0.45		V <sub>rms</sub>	
Total harmonic distortion ratio	V <sub>OUT</sub> =-10dBm			0.05	0.5	%	
Output noise voltage	Normal	R <sub>g</sub> =2.2k, BPF (400~30kHz)	30	75	150	μV <sub>rms</sub>	
	Metal		20	45	100		
Crosstalk between channels	R <sub>g</sub> =2.2kΩ, V <sub>OUT</sub> =-10dBm		50	70		dB	
Ripple rejection	V <sub>CC</sub> =3V, V <sub>R</sub> =-20dBm, f <sub>R</sub> =100Hz R <sub>g</sub> =2.2kΩ		45	55		dB	
Output voltage with preamp off	V <sub>IN</sub> =100mV <sub>rms</sub> , Pre off			-80	-60	dBm	
<b>ALC (off) + power amp</b>							
Voltage gain	P <sub>OUT</sub> =5mW		CF	24	26	28	dB
			DF	30	32	34	
Voltage gain difference between channels			-2	0	2	dB	
Maximum output current	THD=10%, R <sub>L</sub> =16Ω		30	50		mW	
Total harmonic distortion ratio	P <sub>OUT</sub> =5mW			0.5	1.5	%	
Crosstalk between channels	P <sub>OUT</sub> =5mW		35	45		dB	
Output noise voltage	R <sub>g</sub> =0Ω, BPF (400~30kHz)		CF	85	200	μV <sub>rms</sub>	
			DF	135	250		
Ripple rejection	V <sub>CC</sub> =3V, V <sub>R</sub> =-20dBm f <sub>R</sub> =100Hz, R <sub>g</sub> =0Ω		CF	35	45	dB	
			DF	35	40		
Input resistance			19	24	29	kΩ	
<b>ALC (on) + power amp</b>							
Power amp output voltage	V <sub>IN</sub> =-40dBm		-34	-30	-26	dBm	
ALC initiation input voltage			CF	-56		dBm	
			DF	-62			
ALC width	Input width for output from start of up to +4dB		30	40		dB	
ALC total harmonic distortion	V <sub>IN</sub> =-40dBm			0.5	1.5	%	
Noise of preamp+power amp+ALC	R <sub>g</sub> =2.2kΩ (Pre amp), Noise of preamp+power amp		CF	1.5	6	mV <sub>rms</sub>	
			DF	2.8	6		

Application Circuits



Characteristics

■ Preamp Gain- Frequency



■ ALC + power amp (32 dB)  $V_{IN}-V_{OUT}$   $R_L=16\Omega$

