

# IC for Headphone Stereos (with volume-limiting circuit) Monolithic IC MM1336

December 19, 1995

## Outline

This IC was developed for use in 3V headphone stereos. In addition to the basic functions required by headphone stereos, it incorporates a circuit for limiting volume. In some parts of Europe 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 trend is expected to gain momentum in the U.S. as well.

This IC uses an internal ALC circuit to suppress headphone stereo output, avoiding the above problem.

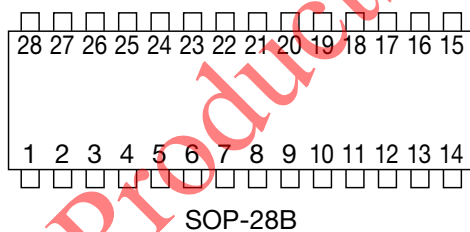
## Features

1. Configuration: Pre-and power amps, ALC circuit, motor control
2. Internal tape selector: A selector switch allows the user to select between normal and metal tapes.
3. Internal OCL circuit: There is no need for a capacitor for high-volume output, so sets can be kept thin.
4. With preamp off pin while connected to radio
5. Designed for low shock noise  
Reduced noise occurring when the power supply is turned on and off

## Package

SOP-28B (MM1336CF, MM1336DF)

## Pin Assignment



1	COM1	15	VS
2	PIN1	16	C
3	PNF1	17	Vcc2
4	PBU1	18	OUT2
5	POUT1	19	Vcc1
6	IN1	20	RF
7	RECT	21	Pre OFF
8	AVNF	22	N/M
9	OUT1	23	IN2
10	COM2	24	POUT2
11	GND1	25	PBU2
12	GND2	26	PNF2
13	PCOUT	27	PIN2
14	PHASE	28	GND3

## Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Operating temperature	T <sub>OPR</sub>	-20~+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>	700	mW

**Recommended Operating Conditions**

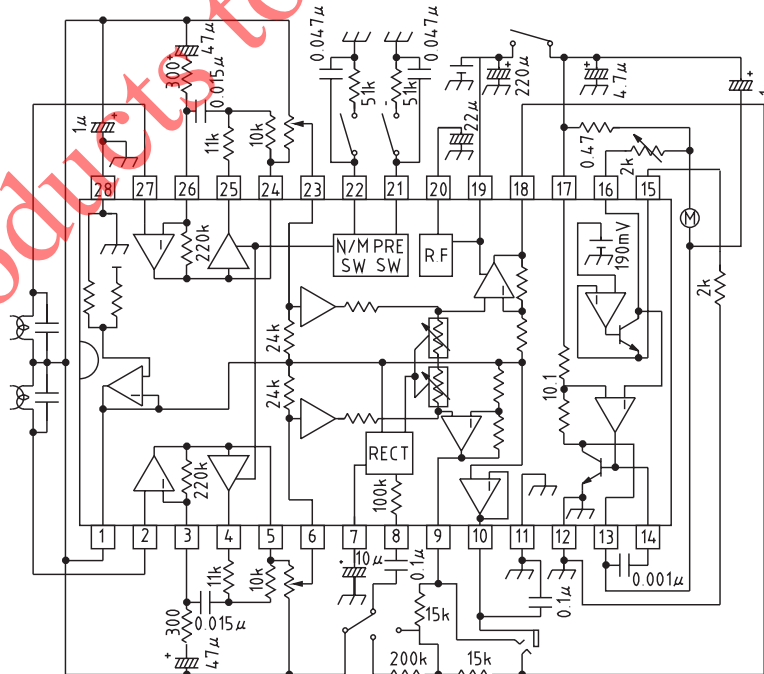
Item	Symbol	Ratings	Units
Operating temperature	T <sub>OPR</sub>	-20~65	°C
Operating voltage	V <sub>OPR</sub>	2.0~5.0	V

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

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I <sub>CC</sub>	V <sub>IN</sub> =0V, when motor is off	6	12	20	mA
<b>Preamp unit</b>						
Open-circuit gain	G <sub>vo</sub>			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	V <sub>om</sub>	THD=10%	0.30	0.45		V <sub>rms</sub>
Total harmonic distortion ratio	THD	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	C · T	R <sub>g</sub> =2.2kΩ, V <sub>OUT</sub> =-10dBm	50	70		dB
Ripple rejection rate	RR	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>ooff</sub>	V <sub>IN</sub> =100mV <sub>rms</sub> , Pre off		-80	-60	dBm
<b>ALC (off) + power amp</b>						
Voltage gain	G <sub>v</sub>	P <sub>OUT</sub> =5mW	24	26	28	dB
Voltage gain difference between channels	ΔGV		-2	0	2	dB
	2CH					
Maximum output current	P <sub>om</sub>	THD=10% R <sub>L</sub> =16Ω	30	50		mW
Total harmonic distortion ratio	THD	P <sub>OUT</sub> =5mW		0.5	1.5	%
Crosstalk between channels	C · T	P <sub>OUT</sub> =5mW	35	45		dB
Output noise voltage	V <sub>n</sub>	R <sub>g</sub> =0Ω, BPF (400~30kHz)		85	200	μV <sub>rms</sub>
Ripple rejection rate	RR	V <sub>CC</sub> =3V, V <sub>R</sub> =-20dBm, f <sub>r</sub> =100Hz, R <sub>g</sub> =0Ω	35	45		dB
Input resistance	R <sub>i</sub>		19	24	29	kΩ
<b>ALC (on) + power amp</b>						
Power amp output voltage	VOA	V <sub>IN</sub> =-40dBm	-34	-30	-26	dBm
ALC initiation input voltage	V <sub>INA</sub>			-56		dBm
ALC width	WALC	Input width for output from start of up to +4dB	30	40		dB
ALC total harmonic distortion	THD	V <sub>IN</sub> =-40dBm		0.5	1.5	%
Noise of preamp+power amp+ALC	V <sub>nto</sub>	R <sub>g</sub> =2.2kΩ (preamp)		1.5	6	mV <sub>rms</sub>

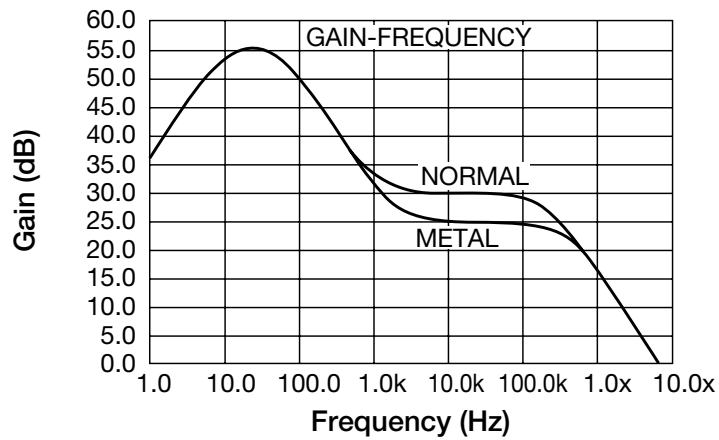
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
<b>Motor control unit</b>						
Consumption current	Id	A2 measurement IM=0mA		1.5	3.5	mA
Startup current	IMS	At Rv=1.5Ω	500			mA
Reference voltage	VS	At SW1=OFF, IM=100mA	0.09	0.10	0.11	V
Reference voltage fluctuation I	ΔVS1	VS fluctuation rate for Vcc between 1.8 and 3.5V with Vcc=3.0 V as reference, IM=100mA		0.1	0.5	%/V
Reference voltage fluctuation II	ΔVS2	VS fluctuation rate for Im between 25 and 200 mA with IM=100 mA as reference		0.005	0.05	%/mA
Reference voltage fluctuation III	ΔVS3	VS fluctuation rate for Ta between -10 and 50°C with Ta=25°C as reference		0.01		%/°C
Output saturation voltage	VoSAT	IM=200mA, V8 measurement, SW2=on		0.2	0.3	V
Bridge ratio	K	ΔV7/ΔV6 measurement	9	10	11	
Bridge ratio fluctuation I	ΔK1	K fluctuation rate for Vcc between 1.8 and 3.5V with Vcc=3V as reference		0.1	0.2	%/V
Bridge ratio fluctuation II	ΔK2	K fluctuation rate for Im between 25 and 250mA with IM=100mA as reference		0.05	0.2	%/mA
Bridge ratio fluctuation III	ΔK3	K fluctuation rate for Ta between -10 and 60°C with Ta=25°C as reference		0.01		%/°C

**Block Diagram**



Characteristics

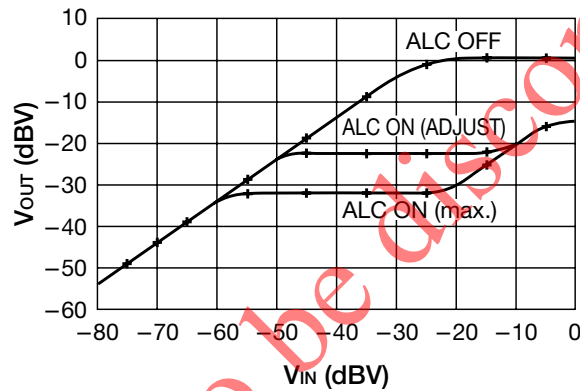
■ Preamp



MM1336AALC+power amp (26dB)

$V_{IN}-V_{OUT}$  Specifications

$R_L=16\Omega$



Note: The above characteristics are representative, and are not guaranteed.

Products to be discontinued