

# IC for Headphone Stereos Monolithic IC MM1104

## Outline

This IC was developed for use in 3 V headphone stereos. It incorporates all the basic functions of tape players.

Mitsumi has previously offered the LAG665, LAG668, LAG673 and MM1006 as one-chip versions. However, this IC is the result of a through review and redesign extending to circuit details.

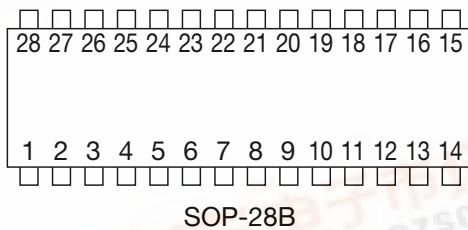
## Features

1. Configuration: Pre-and power amp, motor control
2. Adoption of shock noise prevention circuitry  
Through the use of a circuit which suppresses noise occurring when the power supply is turned on and off, noise output is reduced without muting.
3. Stable motor speed control circuit  
A bridge circuit employing power transistors provides motor speed control with minimal drift.
4. Preamp off pin is convenient for radio connections
5. Radiation pin: When radio wave-induced noise is a problem, this pin can be used to cut the frequency characteristic.

## Package

SOP-28B (MM1104AF, MM1104BF, MM1104CF)

## Pin Assignment



1	1/2Vcc	15	N.C
2	PreIN1	16	Speed
3	NFB1	17	Phase
4	PreOUT1	18	Vs
5	Pre Off	19	PowerOUT2
6	PowerIN1	20	Amp Vcc
7	Radiation1	21	Filter
8	PowerOUT1	22	Radiation2
9	GND	23	PowerIN2
10	Governor Vcc	24	N.C
11	N.C	25	PreOUT2
12	PCOUT	26	NFB2
13	GND	27	PreIN2
14	Governor GND	28	Amp GND

**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 (Ta=25°C)	mW
Operating voltage	V <sub>op</sub>	+2.0~+5.0	V

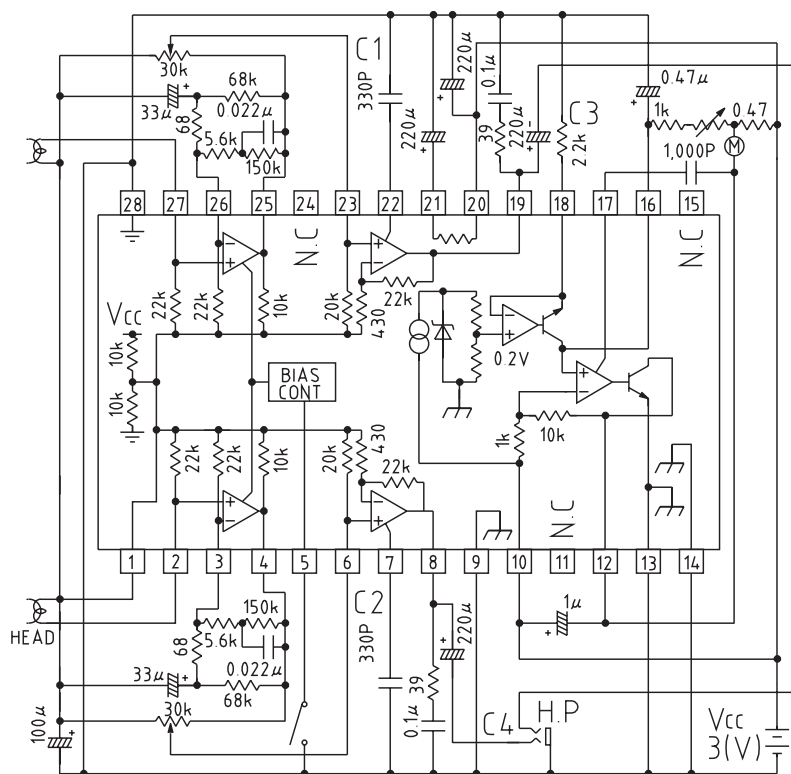
**Electrical Characteristics** (Except where noted otherwise, Ta=25°C)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I <sub>CC</sub>	Amp. only		11	18	mA
<b>Preamp unit (Ta=25°C)</b>						
Open-circuit gain	G <sub>Vo</sub>	V <sub>o</sub> =-10dBm f=100Hz		86		dB
Closed-circuit gain	G <sub>Vc</sub>	V <sub>o</sub> =-10dBm		42		dB
Maximum output voltage	V <sub>om</sub>	THD=10%	0.5	0.74		V <sub>rms</sub>
Total harmonic distortion ratio	THD	V <sub>o</sub> =-10dBm		0.06	0.5	%
Output noise voltage	V <sub>no</sub>	R <sub>g</sub> =2.2kΩ, CCIR waiting		240	500	μV <sub>rms</sub>
Crosstalk between channels	CH <sub>CT</sub>	V <sub>o</sub> =-10dBm	45	60		dB
Ripple rejection	RR	V <sub>CC</sub> =3V, V <sub>R</sub> =-20dBm, f <sub>R</sub> =100Hz	30	42		dB
Output voltage with preamp off	V <sub>oOff</sub>	V <sub>o</sub> =-10dBm, when pre operation		-100	-70	dBm
Input resistance with preamp off	R <sub>iOff</sub>		7	10	13	kΩ
Output resistance with preamp off	R <sub>oOff</sub>		7	10	13	kΩ
Measurement conditions: Except where noted otherwise, V <sub>CC</sub> =3V, R <sub>g</sub> =2.2kΩ, R <sub>L</sub> =30kΩ, f=1kHz						
<b>Power amp unit (Ta=25°C)</b>						
Input resistance	R <sub>i</sub>		14	20	26	kΩ
Voltage gain	G <sub>v</sub>	P <sub>o</sub> =5mW	32	34	36	dB
Voltage gain difference between channels	ΔG <sub>v</sub>			0	2	dB
Maximum output power I	P <sub>om1</sub>	THD=10%, R <sub>L</sub> =16Ω	40	62		mW
Maximum output power II	P <sub>om2</sub>	THD=10%, R <sub>L</sub> =32Ω	20	34		mW
Total harmonic distortion ratio	THD	P <sub>o</sub> =5mW		0.4	2	%
Crosstalk between channels	CH <sub>CT</sub>	P <sub>o</sub> =5mW	45	62		dB
Output noise voltage	V <sub>n</sub>	R <sub>g</sub> =1kΩ, CCIR waiting		150	300	μV <sub>rms</sub>
Ripple rejection	RR	V <sub>CC</sub> =3V, V <sub>R</sub> =-20dBm, f <sub>R</sub> =100Hz	40	50		dB
Measurement conditions: Except where noted otherwise, V <sub>CC</sub> =3V, R <sub>g</sub> =1kΩ, R <sub>L</sub> =16Ω, f=1kHz						
<b>Motor governor (Ta=25°C)</b>						
Consumption current	I <sub>d</sub>	A <sub>2</sub> measured		2.0	7.0	mA
Startup current	I <sub>ms</sub>	I <sub>M</sub> measured when R <sub>v</sub> =1.5Ω	500			mA
Reference voltage	V <sub>ref</sub>	V <sub>5</sub> measured with SW12 off	0.09	0.10	0.11	V
Reference voltage fluctuation I	ΔV <sub>ref1</sub>	VS fluctuation for V <sub>CC</sub> =1.5 to 3.5V, V <sub>CC</sub> =3.0V ref.		0.1	0.5	%/V
Reference voltage fluctuation II	ΔV <sub>ref2</sub>	VS fluctuation for I <sub>M</sub> =25 to 200mA, I <sub>M</sub> =100mA ref.		0.005	0.05	%/mA
Reference voltage fluctuation III	ΔV <sub>ref3</sub>	VS fluctuation for T <sub>a</sub> =-10 to 60°C, T <sub>a</sub> =25°C ref.		0.01		%/°C
Output saturation voltage	V <sub>oSAT</sub>	Reference voltage V <sub>8</sub> measured I <sub>M</sub> =200mA with SW12 on		0.2	0.3	V
Bridge ratio	K	V <sub>7</sub> /V <sub>6</sub> measured	9	10	11	

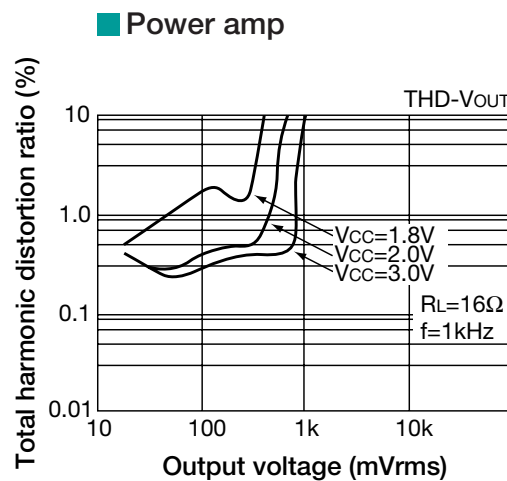
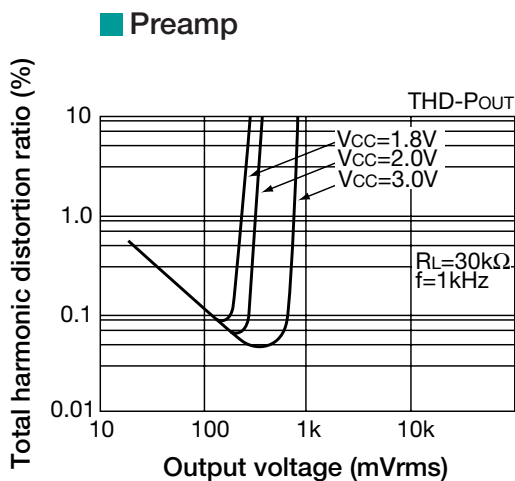
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Bridge ratio fluctuation I	$\Delta K1$	K fluctuation for $V_{CC}=1.5$ to $3.5V$ , $V_{CC}=3.0V$ ref.		0.1	0.2	%/V
Bridge ratio fluctuation II	$\Delta K2$	K fluctuation for $I_M=25$ to $200m A$ , $I_M=100mA$ ref.		0.05	0.2	%/mA
Bridge ratio fluctuation III	$\Delta K3$	K fluctuation for $T_a=-10$ to $60^\circ C$ , $T_a=25^\circ C$ ref.		0.01		%/°C

Measurement conditions: Except where noted otherwise,  $V_{CC}=3V$ ,  $I_M=100mA$ , SW11=OFF, SW12=ON

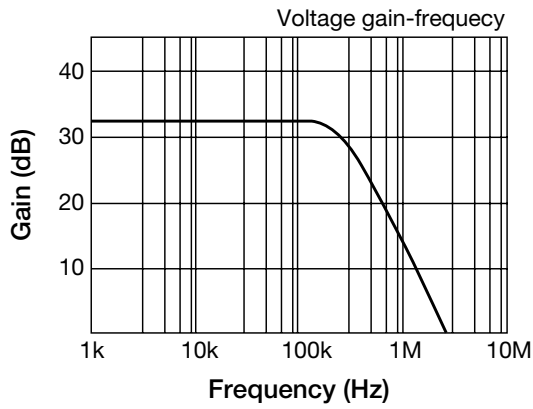
**Block Diagram** (Example of Application Circuits)



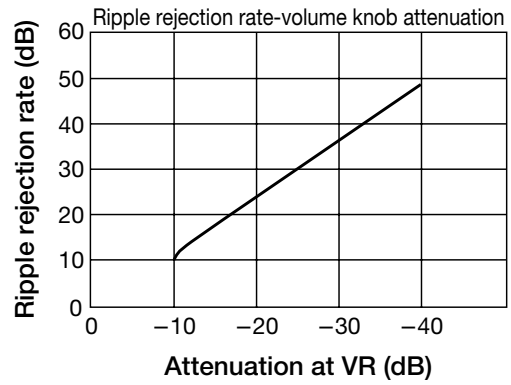
**Characteristics**



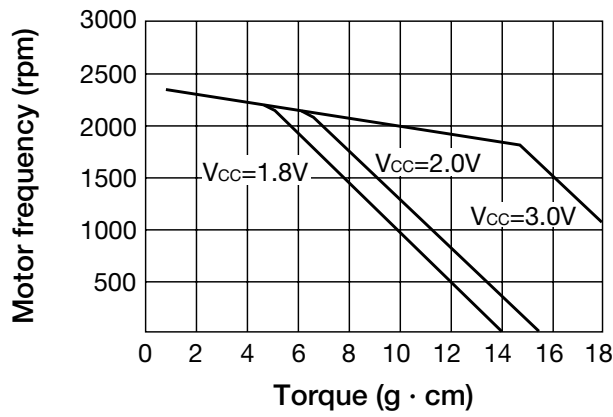
■ Power amp



■ Pre+power amp



N-T characteristic



- ◇ Motor: RF300C
- ◇ Measurement circuit:

