IC for Headphone Stereos
Monolithic IC MM1104

August 6, 1994

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.

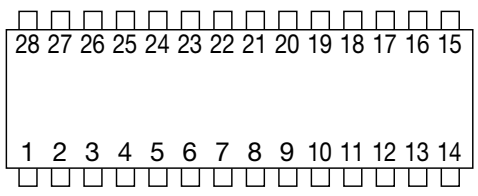
Features

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



SOP-28B

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

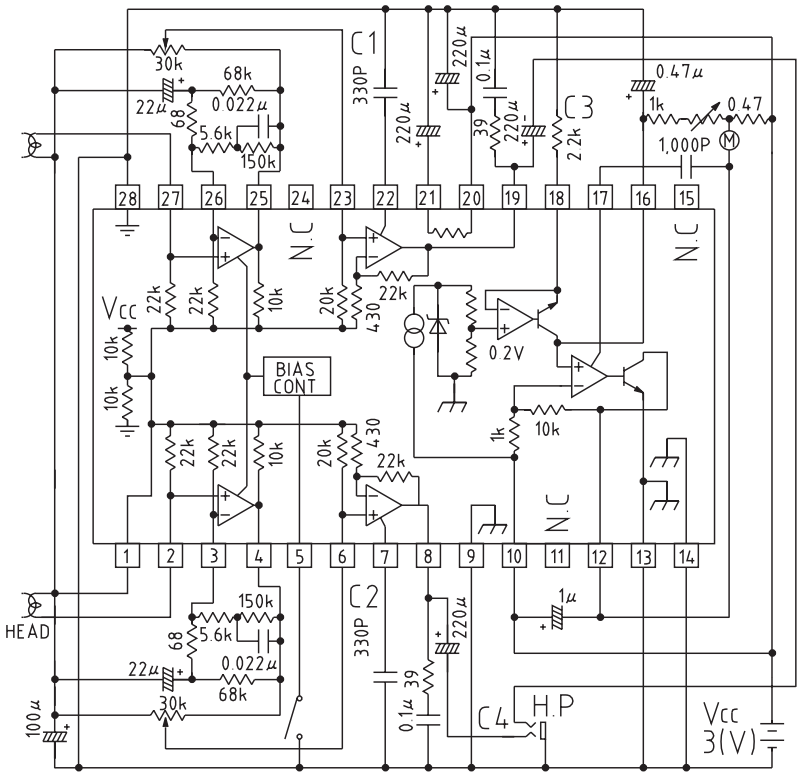
Item	Symbol	Ratings	Units
Operating temperature	T_{OPR}	–20~+65	℃
Storage temperature	T_{STG}	–40~+125	℃
Power supply current	V_{CC}	–0.3~+7.5	V
Power consumption	Pd	700 (Ta=25℃)	mW
Operating voltage	Vop	+2.0~+5.0	V

Electrical Characteristics (Except where noted otherwise, Ta=25℃)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I_{CC}	Amp. only		11	18	mA
Preamp unit (Ta=25℃)						
Open-circuit gain	GVo	Vo=–10dBm f=100Hz		86		dB
Closed-circuit gain	GVc	Vo=–10dBm		42		dB
Maximum output voltage	Vom	THD=10%	0.5	0.74		Vrms
Total harmonic distortion ratio	THD	Vo=–10dBm		0.06	0.5	%
Output noise voltage	Vno	Rg=2.2kΩ, CCIR waiting		240	500	μVrms
Crosstalk between channels	CH_{CT}	Vo=–10dBm	45	60		dB
Ripple rejection	RR	V_{CC}=3V, V_R=–20dBm, f_R=100Hz	30	42		dB
Output voltage with preamp off	VoOff	Vo=–10dBm, when pre operation		–100	–70	dBm
Input resistance with preamp off	RiOff		7	10	13	kΩ
Output resistance with preamp off	RoOff		7	10	13	kΩ
Measurement conditions: Except where noted otherwise, V_{CC}=3V, Rg=2.2kΩ, R_L=30kΩ, f=1kHz						
Power amp unit (Ta=25℃)						
Input resistance	Ri		14	20	26	kΩ
Voltage gain	Gv	Po=5mW	32	34	36	dB
Voltage gain difference between channels	⊿Gv			0	2	dB
Maximum output power Ⅰ	Pom1	THD=10%, R_L=16Ω	40	62		mW
Maximum output power Ⅱ	Pom2	THD=10%, R_L=32Ω	20	34		mW
Total harmonic distortion ratio	THD	Po=5mW		0.4	2	%
Crosstalk between channels	CH_{CT}	Po=5mW	45	62		dB
Output noise voltage	Vn	Rg=1kΩ, CCIR waiting		150	300	μVrms
Ripple rejection	RR	V_{CC}=3V, V_R=–20dBm, f_R=100Hz	40	50		dB
Measurement conditions: Except where noted otherwise, V_{CC}=3V, Rg=1kΩ, R_L=16Ω, f=1kHz						
Motor governor (Ta=25℃)						
Consumption current	Id	A_2 measured		2.0	7.0	mA
Startup current	I_{MS}	I_M measured when R_V=1.5Ω	500			mA
Reference voltage	Vref	V5 measured with SW12 off	0.09	0.10	0.11	V
Reference voltage fluctuation Ⅰ	⊿Vref1	VS fluctuation for V_{CC}=1.5 to 3.5V, V_{CC}=3.0V ref.		0.1	0.5	%/V
Reference voltage fluctuation Ⅱ	⊿Vref2	VS fluctuation for I_M=25 to 200m A, I_M=100mA ref.		0.005	0.05	%/mA
Reference voltage fluctuation Ⅲ	⊿Vref3	VS fluctuation for Ta=–10 to 60℃, Ta=25℃ ref.		0.01		%/℃
Output saturation voltage	VoSAT	Reference voltage V8 measured I_M=200mA with SW12 on		0.2	0.3	V
Bridge ratio	K	V7/V6 measured	9	10	11	

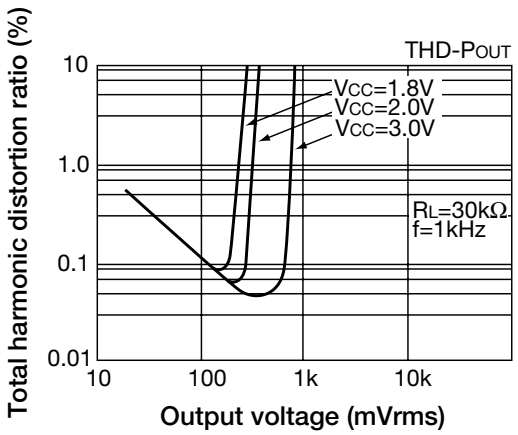
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Bridge ratio fluctuation Ⅰ	⊿K1	K fluctuation for VCC=1.5 to 3.5V, VCC=3.0V ref.		0.1	0.2	%/V
Bridge ratio fluctuation Ⅱ	⊿K2	K fluctuation for IM=25 to 200m A, IM=100mA ref.		0.05	0.2	%/mA
Bridge ratio fluctuation Ⅲ	⊿K3	K fluctuation for Ta=–10 to 60°C, Ta=25°C ref.		0.01		%/°C
Measurement conditions: Except where noted otherwise, VCC=3V, IM=100mA, SW11=OFF, SW12=ON						

Block Diagram (Example of Application Circuits)

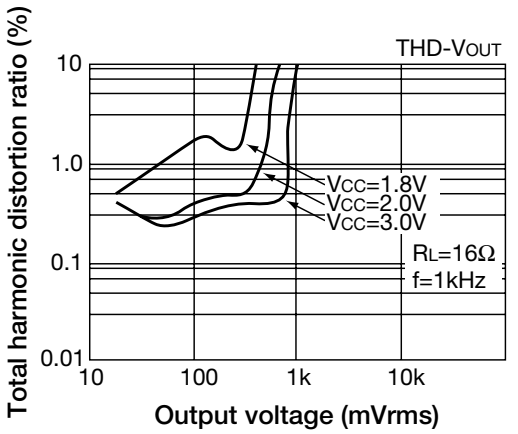


Characteristics

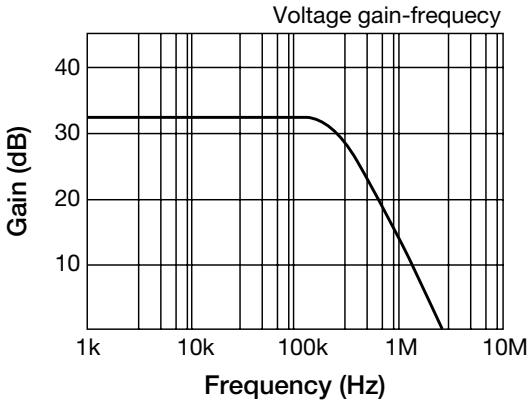
Preamp



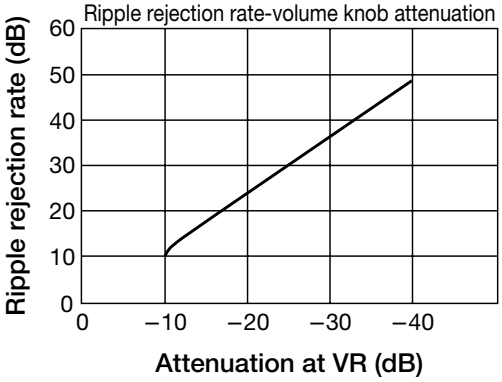
Power amp



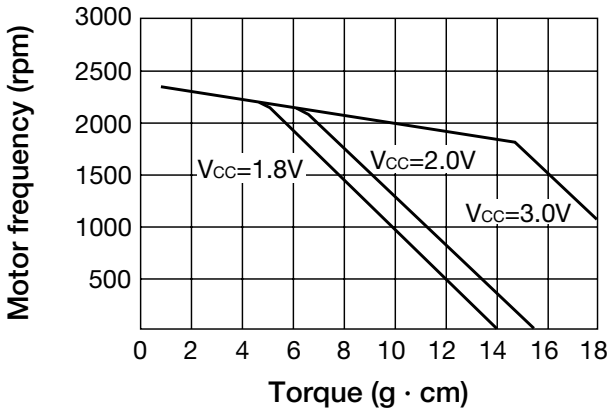
Power amp



Pre+power amp



N-T characteristic



◇ Motor: RF300C

◇ Measurement circuit: