

IC for Headphone Stereos

Monolithic IC MM1006

Outline

This IC was developed for use in headphone stereos, and incorporates the basic functions of a tape player as well as dual preamp, power amp, and motor control circuits. It requires few external components and can be used in a simple circuit configuration.

Features

1. Broad operating voltage range of 2.0 to 5.0 V (amp system operates to 1.8 V)
2. Simple circuit configuration
3. Power amp fixed at 28 dB
4. Ripple filter included
5. Provided with pin to turn off preamps
6. With noise from motor driving unit suppressed

Package

SDIP-22A (MM1006D)
 SOP-24A (MM1006XF)

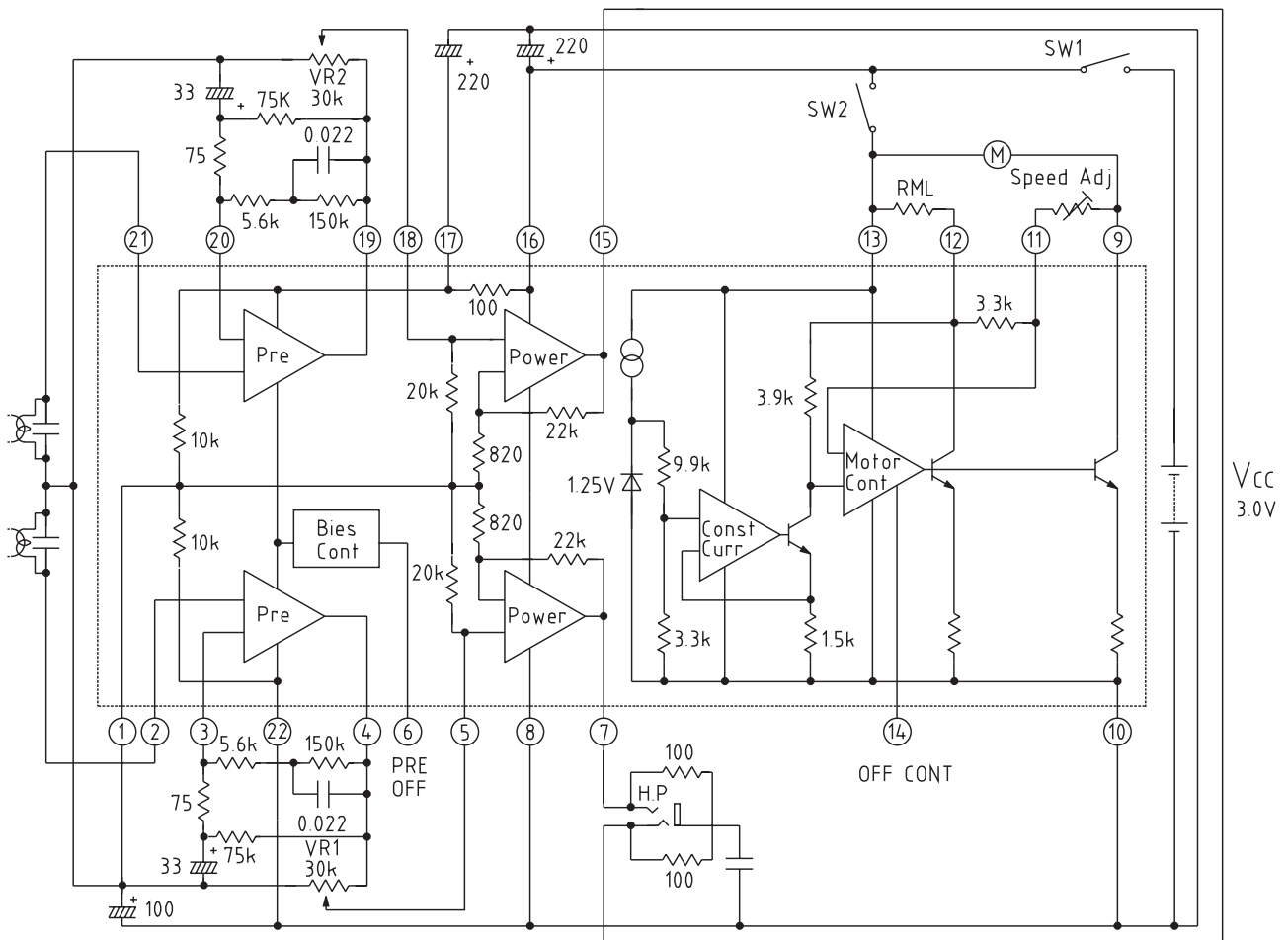
Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Operating temperature	T _{OPR}	-20~+65	°C
Storage temperature	T _{STG}	-40~+125	°C
Power supply current	V _{CC}	-0.3~+7.5	V
Operating voltage	V _{OP}	2.0~5.0	V
Power consumption	P _d	600 (SDIP-22A) 450 (SOP-24A)	mW

Electrical Characteristics (Except where noted otherwise, $V_{CC}=3.0V$, $f=1kHz$)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Consumption current	I_{CC}	$V_{IN}=0V$		5	10	mA
Preamp unit ($T_a=25^{\circ}C$)						
Open-circuit gain	G_{VO}	$V_o=-10dBm, R_L=\infty, f=100Hz$		72		dB
Closed-circuit gain	G_{VC}	$V_o=-10dBm$	40	42	44	dB
Maximum output voltage	V_{om}	THD=10%	0.30	0.45		V
Total harmonic distortion ratio	THD	$V_{OUT}=400mW, V_{OUT}=-10dBm$		0.05	0.5	%
Output noise voltage	V_{no}	$V_{IN}=0V, R_g=2.2k\Omega, BPF=30Hz\sim 20kHz$		150	300	μA
Crosstalk between channels	$C \cdot T$	$R_g=2.2k\Omega$	30			dB
Output voltage with preamp off	V_{ooff}	$V_{IN}=100mV_{rms} \star 1$			-50	dB
Output resistance with preamp off	R_{ooff}			10		k Ω
Input resistance with preamp off	R_{ioff}			10		k Ω
Measurement conditions: Preamp off pin: Open $\star 1$: Preamp off pin: Connect to V_{CC}						
Power amp unit ($T_a=25^{\circ}C$)						
Voltage gain	G_v	$P_{OUT}=5mW$	26	28	30	dB
Voltage gain difference between channels	ΔG_v	$VR1, 2=max.$		0	2	dB
Maximum output power I	P_{om1}	THD=10%, $R_L=32\Omega$	20	28		mW
Maximum output power II	P_{om2}	THD=10%, $R_L=16\Omega$	30			mW
Total harmonic distortion ratio	THD	$P_{OUT}=5mW$		0.6	2.0	%
Output noise voltage	V_n	$R_g=10k\Omega$		0.25	1.0	mVrms
Crosstalk between channels	$C \cdot T$	$P_{OUT}=5mW$	40	50		mVrms
Ripple rejection	RR	100Hz, 100mVp-p	40	50		dB
Noise of preamp + power amp	V_{nto}	$V_{IN}=0V, R_g=2.2k\Omega, VR1, 2 : max.$		6	9	mVrms
Measurement conditions: $R_L=16\Omega$						
Motor speed control unit ($T_a=25^{\circ}C$)						
Consumption current	I_{MC}	$I_M=0mA$		3.0	5.0	mA
Startup current	I_{MS}		500			mA
Reference voltage	V_{ref}	Between RML-ADJ pins	0.72	0.80	0.87	V
Reference voltage fluctuation I	ΔV_{ref1}	V_{CC} between 2.0 and 5.0V $\star 2$		0.05		%/V
Reference voltage fluctuation II	ΔV_{ref2}	I_M between 25 and 250 mA		0.01		%/mA
Reference voltage fluctuation III	ΔV_{ref3}	T_a between -10 and $50^{\circ}C$		0.01		%/ $^{\circ}C$
Current coefficient	K		32	38	43	
Current coefficient fluctuation I	$\Delta K1$	V_{CC} between 2.1 and 5.0 V		0.5		%/V
Current coefficient fluctuation II	$\Delta K2$	I_M between 25 and 250 mA		0.05		%/mA
Current coefficient fluctuation III	$\Delta K3$	T_a between -10 and $50^{\circ}C$		0.02		%/ $^{\circ}C$
Leakage current on forced off	I_{ML}				200	μA
Input resistance on forced off	R_{icon}			37		k Ω
Measurement conditions: $I_M=100$ mA Motor: M25E-5 (Mitsumi model) $\star 2$: Voltage fluctuation between motors						

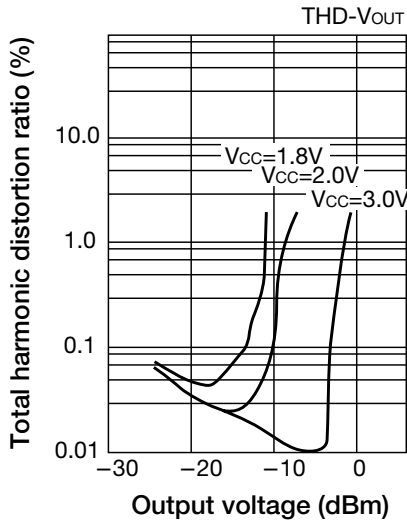
Block Diagram



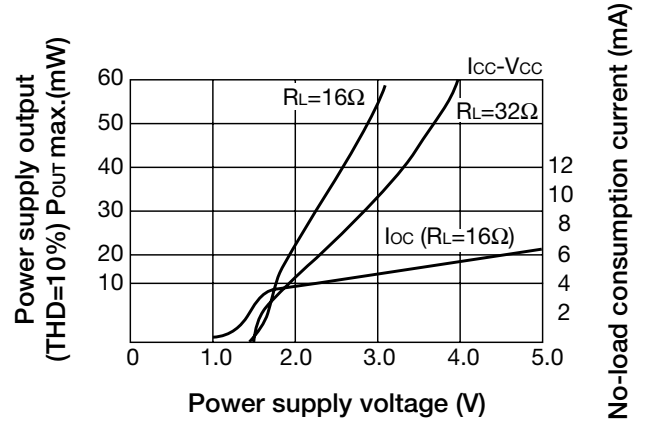
- Note 1: Speed Adj is 1.5 k Ω
(assuming the motor used is Mitsumi M25E-7;
if the optimal adjustment range is not obtained
using a different motor, add a fixed resistance).
- Note 2: RML (motor load correction resistance)
- Note 3: Connecting the preamp off pin to +Vcc
turns the preamp circuits off.
- Note 4: Connect the OFF CONT pin to +Vcc to turn the motor off.
- Note 5: VR1 and VR2 are two gang A-curve resistors.
- Note 6: Units of resistances and capacitances
are Ω and μ F respectively.

Characteristics

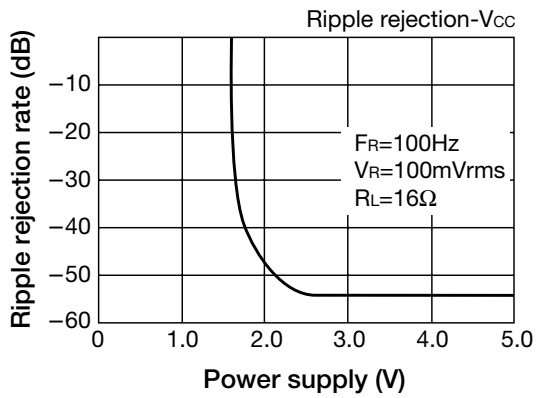
■ Preamp



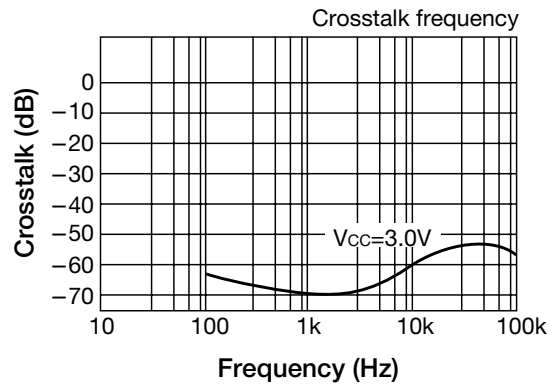
■ P_{OUT}



■ Power amp



■ Power amp



■ Voltage gain- Frequency

