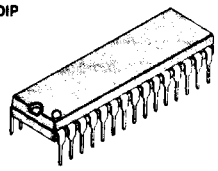
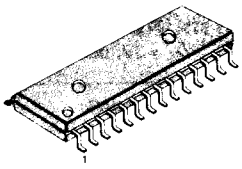
DUAL PRE-POWER AMPLIFIER, VOLUME CONTROLLER AND DC MOTOR SPEED CONTROLLER

The KA22136 is a molithic integrated circuit designed for use in low voltage and low power applications. It has all functions including dual audio pre-power amplifier, electronic volume controller and DC motor speed controller in a single chip. It is suitable for portable tape recorders headphone cassette tape recorders or radios by batteries.

28 SDIP



28 SOP



FEATURES

- **Low current consumption in a operating voltage range.**
- **Operating supply voltage range: V_{CC} = 2.1V ~ 5V**
- **Only a few components in composing headphone cassette tape recorder.**
- **Dual audio pre-power amplifier, electronic volume controller and DC motor speed controller in a single chip.**
- **Reduced input and output coupling capacitors because of ½ V_{CC} AMP adoption on chip as AC GND.**

ORDERING INFORMATION

Device	Package	Operating Temperature
KA22136	28SDIP	−20°C ~ +65°C
KA22136D	28SOP	

BLOCK DIAGRAM

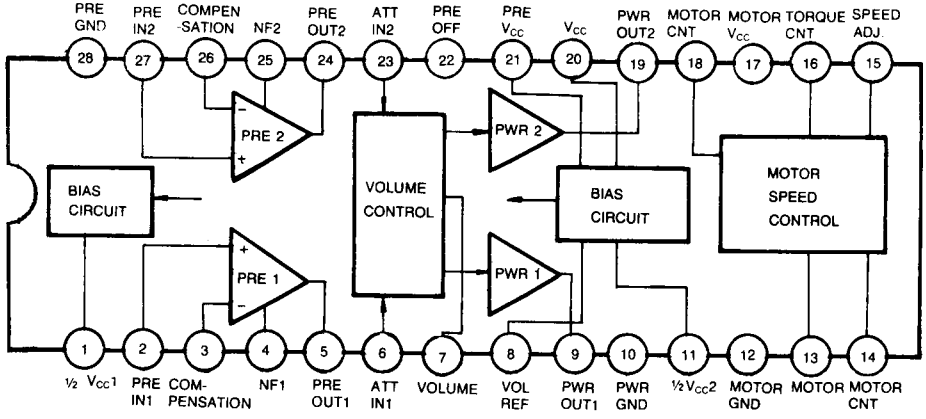


Fig. 1

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	7.5	V
Power Dissipation	P_D	450	mW
Operating Temperature	T_{OPR}	−20 ~ +70	°C
Storage Temperature	T_{STG}	−40 ~ +125	°C

ELECTRICAL CHARACTERISTICS

($Ta = 25°C$, $V_{CC} = 3V$, unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Quiescent circuit current	I_{CCQ}	$V_{CC} = 3V$, $V_I = 0$, $I_M = 0$		18	25	mA

PRE AMPLIFIER SECTION ($V_{CC} = 3V$, $f = 1KHz$, $R_{L1} = 10K\Omega$, unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Open Loop Voltage Gain	G_{VO}	$V_O = -10dBm$, $R_L = \infty$		72		dB
Closed Loop Voltage Gain	G_{VC1}	$V_O = -10dBm$	40	42	44	dB
Output Voltage	V_O	THD = 10%	0.45	0.6		V
Total Harmonic Distortion	THD_1	$V_O = 400mV$		0.05	0.5	%
Output Noise Voltage	V_{NO1}	$V_i = 0$, $R_g = 2.2K\Omega$, BPF (30 ~ 20KHz)		150	300	μV
Input Resistance	R_I	Vo = 10dBm	18	22		KΩ
Cross Talk	CT_1	$R_G = 2.2K\Omega$, $V_O = -10dBm$	30			dB
Output Voltage In Pre OFF	$V_{O(OFF)}$	$V_I = 100mV$ Pre OFF (pin 22) = V_{CC}			−50	dB

POWER AMPLIFIER SECTION ($Ta = 25°C$, $V_{CC} = 3V$, $f = 1KHz$, $R_L2 = 16\Omega$, unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Closed Loop Voltage Gain	G_{VC2}	Po = 5mW	26	28	30	dB
Voltage Gain Difference	ΔG_V	V_{CONT} = Max		0	3	dB
Output Power 1	P_{O1}	THD = 10%, $R_L = 32\Omega$	20	28		mW
Output Power 2	P_{O2}	THD = 10%, $R_L = 16\Omega$	30			mW
Total Harmonic Distortion	THD_2	Po = 5mW		0.2	2.0	%
Pre + Power Output Noise Voltage	V_{NO2}	$V_I = 0$, $R_G = 2.2K\Omega$, V_{CONT} = Max		6	10	mV
Output Noise Voltage	V_{NO3}	$R_G = 2.2K\Omega$, V_{CONT} = Min		0.25	1.0	mV
Cross Talk	CT_2	Po = 5mW	20	30		dB
Ripple Rejection Ratio	RR	Vcc = 3V, 100Hz, 100mVp-p	34	40		dB

ATTENUATOR SECTION (Ta = 25°C, V_{CC} = 3V, f = 1KHz, unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Maximum Input Voltage	$V_{I\,(MAX)}$		0.2			V
Maximum Attenuation	$V_{ATT\,(MAX)}$	V_{CONT} = Min	66			dB
Attenuation Error	$V_{ATT\,(ERR)}$	V_{CONT} = Max		0		dB
Input Impedance	Z_I		15	20		KΩ

MOTOR SPEED CONTROLLER (Ta = 25°C, V_{CC} = 3V, I_M = 100mA, unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Circuit Current	I_{CCQ}			3.0	5.0	mA
Starting Current	I_{ST}		500			mA
Reference Voltage	V_{REF}	V (pin 15, 16)	0.72	0.80	0.87	V
Reference Voltage Regulation 1	ΔV_{REF1}	* V_{CC} = 2.1 ~ 5.0V		0.05		%/V
Reference Voltage Regulation 2	ΔV_{REF2}	I_M = 25 ~ 250mA		0.01		%/mA
Reference Voltage Regulation 3	ΔV_{REF3}	Ta = −10 ~ 50°C		0.01		%/°C
Current Coefficient	K		32	38	43	
Current Coefficient Regulation 1	ΔK_1	V_{CC} = 2.1 ~ 5.0V		0.50		%/V
Current Coefficient Regulation 2	ΔK_2	I_M = 25 ~ 250mA		0.05		%/mA
Current Coefficient Regulation 3	ΔK_3	Ta = −10 ~ 50°C		0.02		%/°C
Saturation Voltage	V_{SAT}	I_M = 200mA, Pin14 = V_{CC}			0.6	V
Leakage Current	I_{LKG}	Pin 18 = V_{CC}		50	200	μA

*Voltage across Pin 13, 17

TEST CIRCUIT

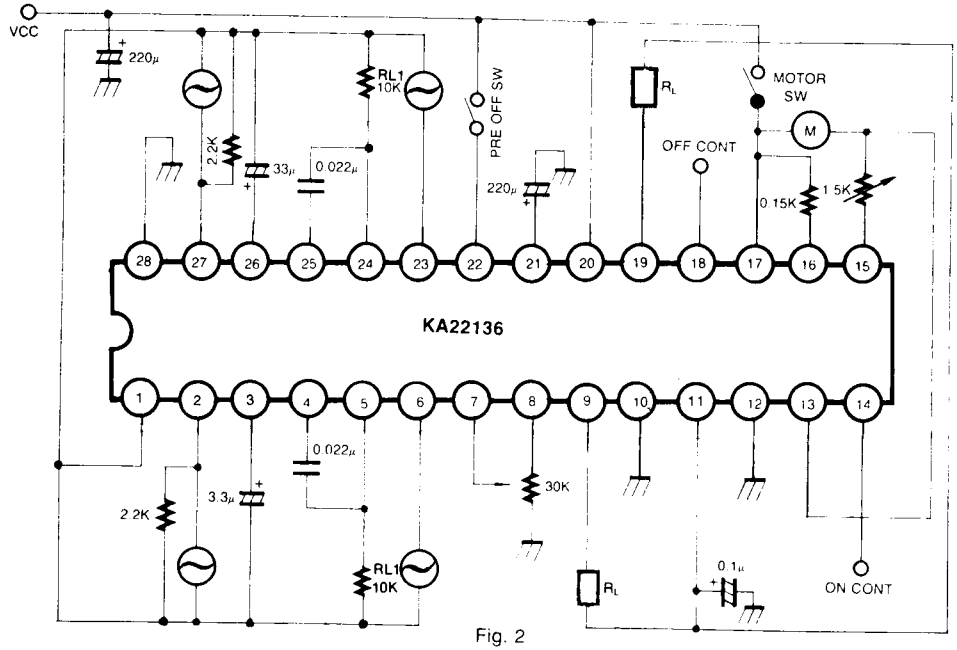


Fig. 2

APPLICATION CIRCUIT

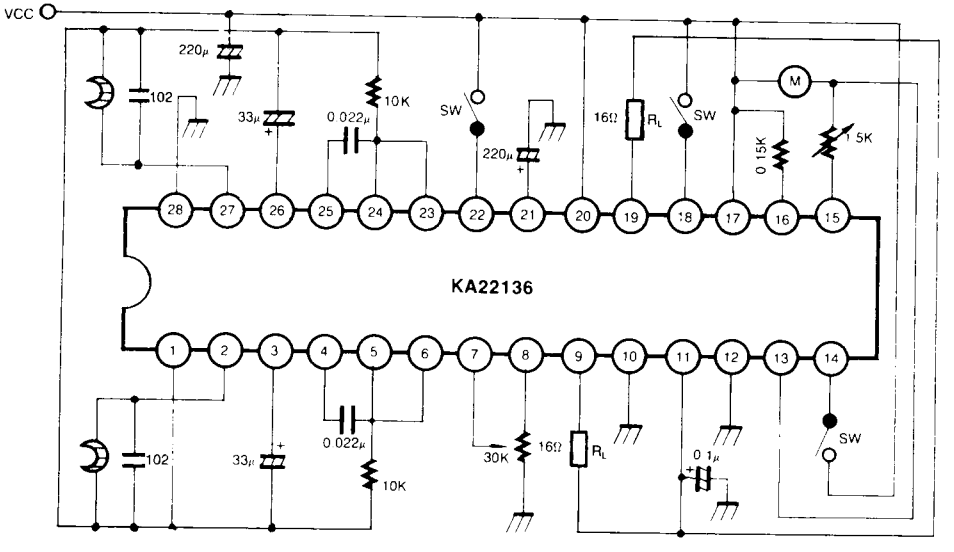


Fig. 3