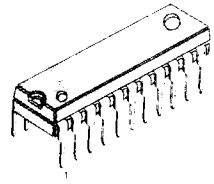
DUAL PRE-POWER AMPLIFIER AND DC MOTOR SPEED CONTROLLER

The KA22135 is a monolithic integrated circuit designed for use in low voltage and low power applications. It has all functions including a dual audio pre-power amplifier and motor speed controller in a single chip. It is suitable for portable tape recorders, head phone cassette tape recorders or battery-powered radios.

22 SDIP



FEATURES

- Low current consumption in a operating voltage range.
- Wide operating supply voltage range; V_{CC} = 2V ~ 7.5V.
- Only a few components to build headphone cassette tape recorders.
- Dual audio pre-power amplifier and motor speed controller in a single chip.
- Reduced input and output coupling capacitors because of 1/2 V_{CC} AMP adoption on chip as AC GND.

ORDERING INFORMATION

Device	Package	Operating Temperature
KA22135	22 SDIP	-20°C ~ +70°C

BLOCK DIAGRAM

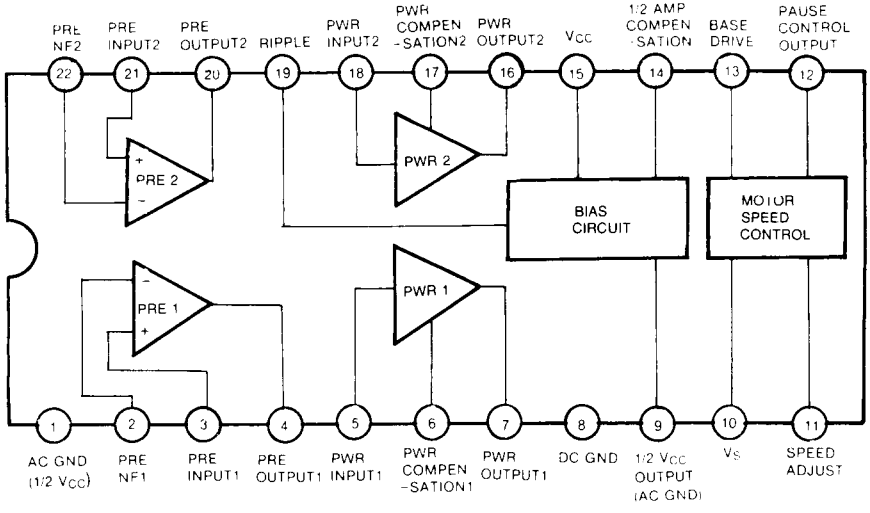


Fig. 1

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	10	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{OPR}	−20 ~ +70	°C
Storage Temperature	T_{STG}	−40 ~ +125	°C

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	I_{CCQ}	V_{CC} = 3V, V_I = 0, I_M = 0mA		15	25	mA

PRE AMPLIFIER SECTION
(Ta = 25°C, V_{CC} = 3V, f = 1KHz, R_{L1} = 10KΩ, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Open Loop Voltage Gain	G_{VO}	V_O = −10dBm, R_L = ∞		72		dB
Closed Loop Voltage Gain	G_{VC}	V_o = −10dBm	40	42	44	dB
Output Voltage	V_o	THD = 1%	0.35	0.6		V
Total Harmonic Distortion	THD	V_o = 400mV		0.05	0.5	%
Output Noise Voltage	V_{NO}	V_I = 0, R_G = 2.2KΩ BW(−3dB) = 30Hz ~ 20KHz		70	300	μV
Input Resistance	R_I	V_o = −10dBm	18	22		KΩ
Cross Talk	CT	R_G = 2.2KΩ, V_O = −10dBm	45	62		dB

POWER AMPLIFIER SECTION
(Ta = 25°C, V_{CC} = 3V, f = 1KHz, R_{L2} = 32Ω, unless otherwise specified)

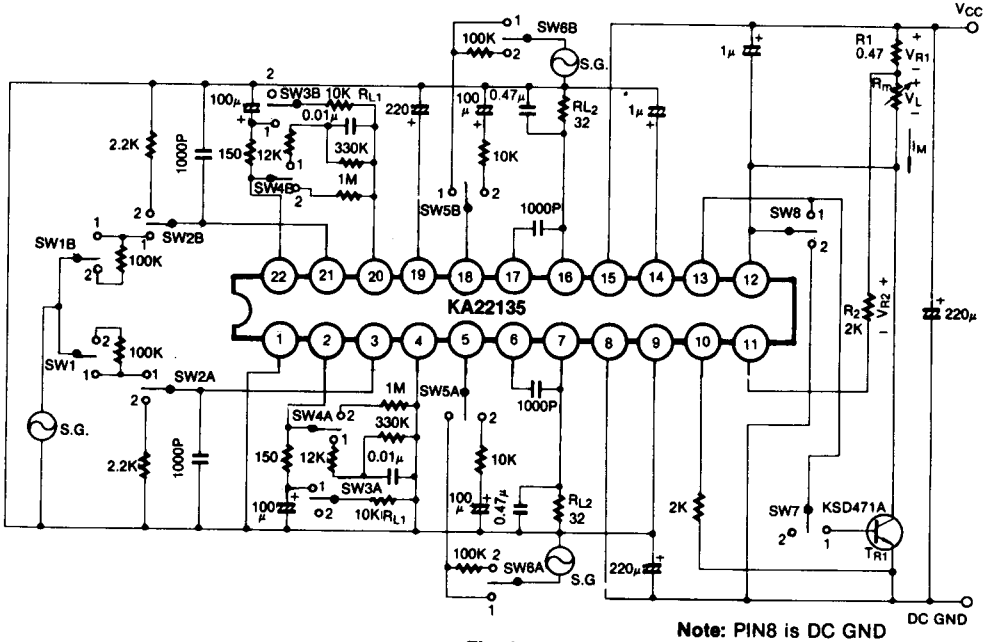
Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Closed Loop Voltage Gain	G_{VC}	P_o = 5mW	26	28	30	dB
Output Power	P_o	THD = 10%	20	28		mW
Total Harmonic Distortion	THD	P_o = 5mW		0.2	2.0	%
Output Noise Voltage	V_{NO}	R_G = 10KΩ, BW (−3dB) = 30Hz ~ 20KHz		0.25	1.0	mV
Input Resistance	R_I	P_o = 5mW	10	20		KΩ
Cross Talk	CT	P_O = 5mW, R_G = 10KΩ	35	50		dB

MOTOR SPEED CONTROLLER SECTION

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

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Base Driving Current	I_B		10	18		mA
Reference Voltage	V_{REF}		0.22	0.26	0.30	V
Reference Voltage Regulation 1	ΔV_{REF1}	V_{CC} = 2.0 ~ 6.5V		0.05		%/V
Reference Voltage Regulation 2	ΔV_{REF2}	I_M = 25 ~ 200mA		0.1		%/mA
Reference Voltage Regulation 3	ΔV_{REF3}	Ta = −10 ~ +60°C		0.01		%/°C
Current Coefficient	K	$K = \frac{V_L - V_{R2}}{V_{R1} + V_{R2}}$	3.7	4	4.3	
Current Coefficient Regulation 1	ΔK_1	V_{CC} = 2.0 ~ 6.5V		0.05		%/V
Current Coefficient Regulation 2	ΔK_2	I_M = 25 ~ 200mA		0.1		%/mA
Current Coefficient Regulation 3	ΔK_3	Ta = −10 ~ +60°C		0.1		%/°C

TEST CIRCUIT



Note: PIN8 is DC GND
PIN9 is AC GND

Fig. 2

TEST METHOD

TEST ITEM	SWITCH	SW1 A/B	SW2 A/B	SW3 A/B	SW4 A/B	SW5 A/B	SW6 A/B	SW7	SW8
	I_{CCQ}	1	2	1	1	2	1	1	2
Pre-Amplifier	CH1 G_{VO}	"	1	2	2	"	"	"	"
	CH1 G_{VC}	"	"	1	1	"	"	"	"
	CH1 V_O	"	"	"	"	"	"	"	"
	CH1 THD	"	"	"	"	"	"	"	"
	CH1 V_{NO}	"	2	"	"	"	"	"	"
	CH1 R_I	2	1	"	"	"	"	"	"
	CH2 G_{VO}	1	2	"	"	"	"	"	"
	CH2 G_{VC}	"	"	"	"	"	"	"	"
	CH2 V_O	"	"	"	"	"	"	"	"
	CH2 THD	"	"	"	"	"	"	"	"
	CH2 V_{NO}	"	"	"	"	"	"	"	"
	CH2 R_I	"	"	"	"	"	"	"	"
	CT_1 (2→1)	"	"	"	"	"	"	"	"
	CT_2 (1→2)	"	1	"	"	"	"	"	"
Power-Amplifier	CH1 G_V	"	2	"	"	"	"	"	"
	CH1 P_O		"	"	"	"	"	"	"
	CH1 THD	"	"	"	"	"	"	"	"
	CH1 V_{NO}	"	"	"	"	2	"	"	"
	CH1 R_I	"	"	"	"	1	2	"	"
	CH2 G_V	"	"	"	"	2	1	"	"
	CH2 P_O	"	"	"	"	"	"	"	"
	CH2 THD	"	"	"	"	"	"	"	"
	CH2 V_{NO}	"	"	"	"	"	"	"	"
	CH2 R_I	"	"	"	"	"	"	"	"
	CT_1 (2→1)	"	"	"	"	"	"	"	"
	CT_2 (1→2)	"	"	"	"	1	"	"	"
M.S.C	I_B	"	"	"	"	2	"	2	1
	V_{REF}	"	"	"	"	"	"	1	"
	ΔV_{REF}	"	"	"	"	"	"	"	"
	K	"	"	"	"	"	"	"	"
	ΔK	"	"	"	"	"	"	"	"

APPLICATION CIRCUIT

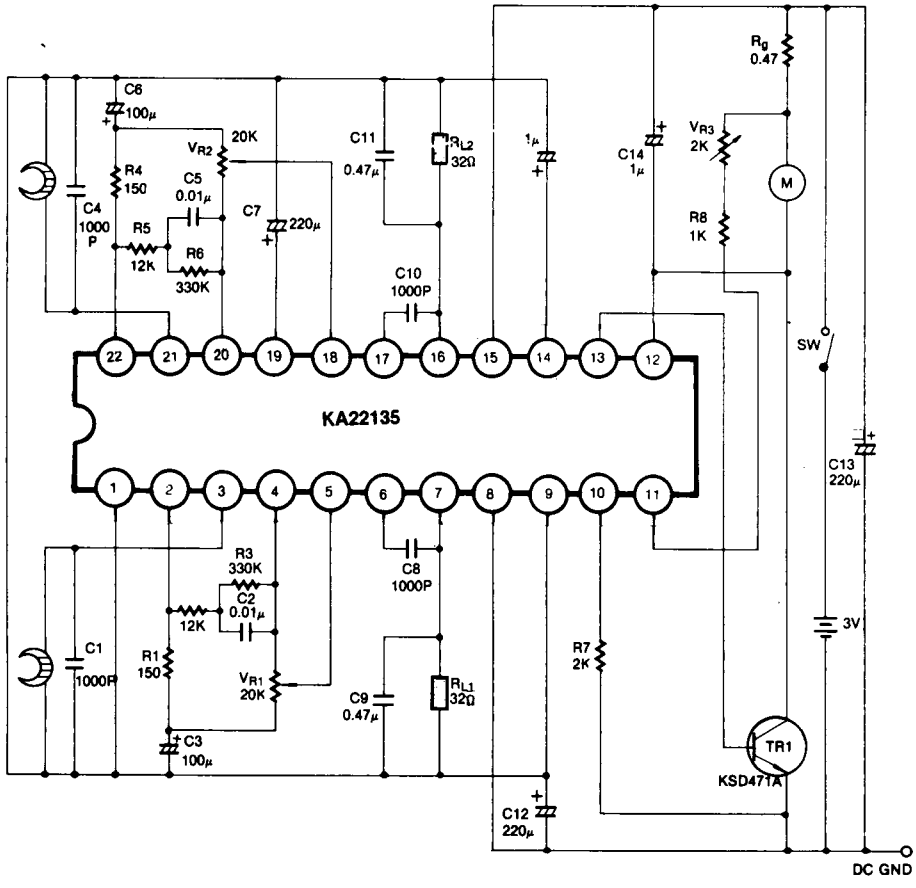


Fig. 3

Note: 1. For C12, use a capacitor of Low TANδ
2. For C9 and C11, use solid state capacitors with better characteristics at low temperature
3. Locate C7 just around the emitter TR1, KSD471A.