

19W DUAL POWER AMP

The KA22103 is a monolithic integrated circuit consisting of a 2-channel 19W power amplifier for car stereos. It is designed for high power, low distortion and multi functions. Since it uses an excellent 17-pin package, thermal characteristics are good with high performance.

FEATURES

- **High power: 19W/2-Ch**
($V_{CC} = 13.2V$, $f = 1KHz$, $THD = 10\%$, $R_L = 4\Omega$)
- **Minimum number of external parts required**
- **Low distortion: $THD = 0.04\%$**
- **Low noise: $V_{NO} = 0.25mVrms$**
($V_{CC} = 13.2V$, $R_L = 4\Omega$, $R_G = 10K\Omega$, $G_{VC} = 40dB$,
 $BW = 20Hz \sim 20KHz$)
- **Built-in stand-by and mute function**
- **Protector: Thermal shut down**
Over voltage protection
DC short protection with V_{CC} -output and GND
AC short protection with each output channel
- Operating supply voltage range: $V_{CC} = 9V \sim 18V$
- **Connect H/S to GND**

17ZSIP H/S



ORDERING INFORMATION

Device	Package	Operating Temperature
KA22103	17ZSIP H/S	-30 ~ +85°C

BLOCK DIAGRAM

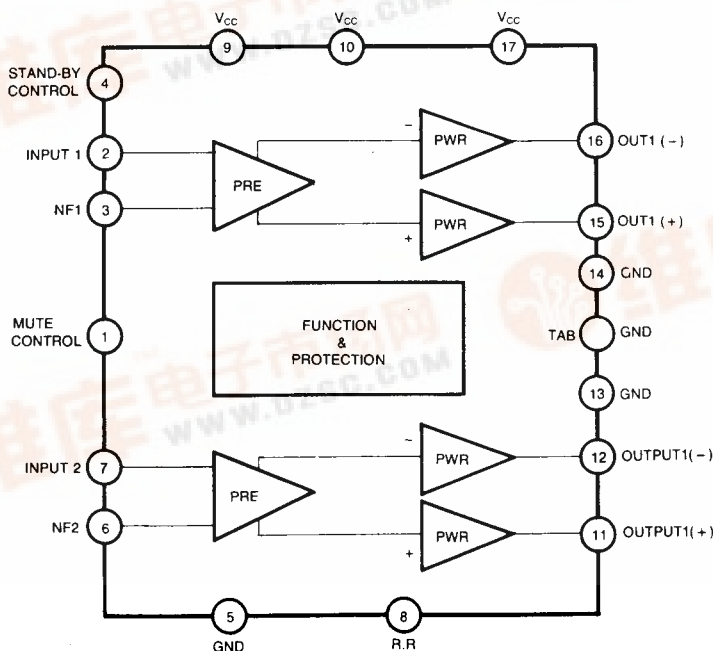


Fig. 1

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristic	Symbol	Value	Unit
Surge Voltage	V _{CC (SURGE)}	50	V
Supply Voltage	V _{CC}	25	V
Output Peak Current	I _{PK}	18	V
Power Dissipation	P _D	50	W
Operating Temperature	T _{OPR}	-30 ~ +85	°C
Storage Temperature	T _{STG}	-55 ~ +150	°C

ELECTRICAL CHARACTERISTICS

(V_{CC} = 13.2V, R_L = 4Ω, f = 1KHz, Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Quiescent Circuit Current	I _{CCQ}	V _I = 0		100	180	mA
Output Power	P _O	THD = 10%	16	19		W
Total Harmonic Distortion	THD	P _O = 1W		0.04	0.3	%
Closed Loop Voltage Gain	G _{VC}	R _F = 0	48	50	52	dB
Output Noise Voltage	V _{NO}	R _G = 10KΩ, BPF		0.25	1	mV
Ripple Rejection Ratio	RR	f _R = 120Hz, R _G = 0	43	50		dB
Input Resistance	R _I			30		KΩ
Output Offset Voltage	V _{OO}	V _I = 0	-80	0	+80	mV
Standby Current	I _{SB}	At stand-by		1		μA
Cross Talk	CT	R _G = 0	65	75		dB
Saturation Voltage	V _{SAT (SB)}	Pin 4, P _O = 1W > 100mW	1.8	2.1	2.4	V
Saturation Voltage	V _{SAT (MUTE)}	Pin 1, P _O = 1W > 100mW	1.4	1.7	3.0	V

TEST CIRCUIT

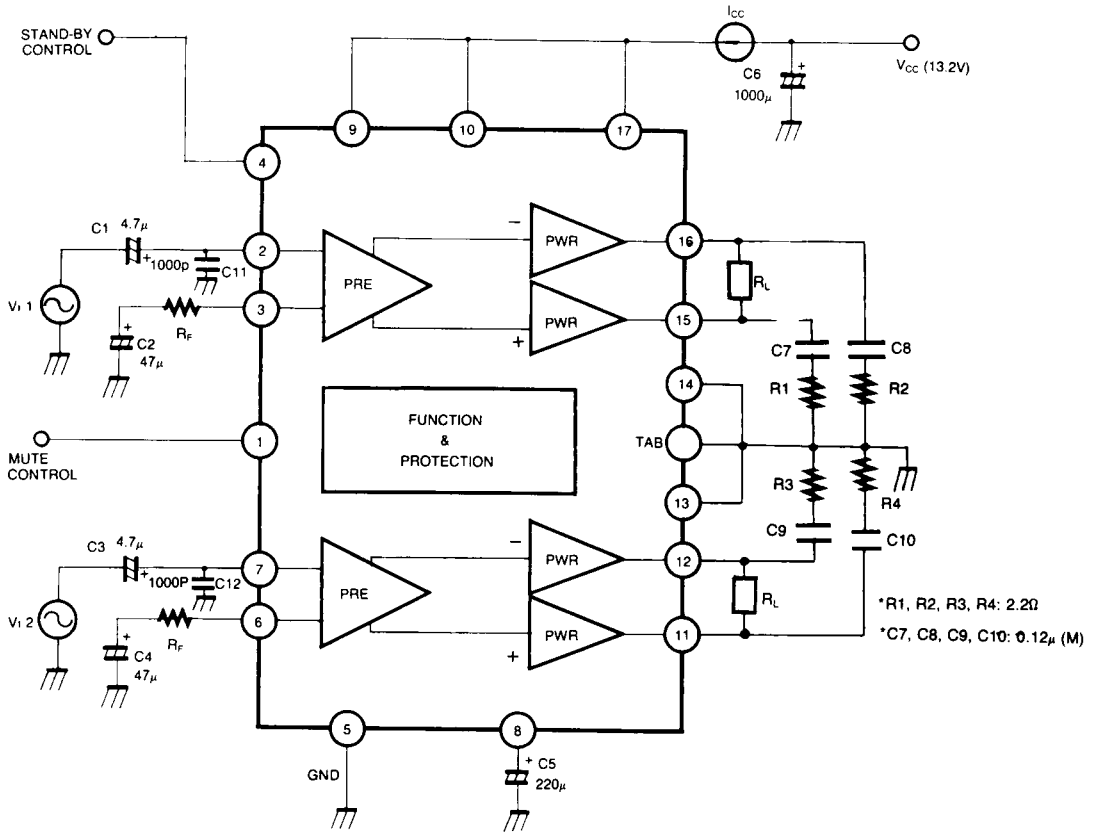


Fig. 2

APPLICATION INFORMATION

Parts	Recommended Value	Used for	Condition		Remark
			Small value	Large value	
C1, C3	4.7 μ F	DC coupling	Reduce the pop noise at V _{CC} -ON		Caution with gain
C2, C4	47 μ F	Feedback capacitor	Reduce the pop noise at V _{CC} -ON Concerned with the low cut-off frequency $C2 = 1/(6.28 \times f_L \times R_F)$		
C5	220 μ F	Reduce the ripple			
C7, C8, C9, C10	0.12 μ F	Compensation osc.	Easy to get oscillation	Increase the compensation	
C6	1000 μ F	Ripple filter	Used for ripple filter and Hum noise filter		
C11, C12	1000pF	Compensation osc	Reduction of noise increase the compensation		

FUNCTION DESCRIPTION

1. SELECTION OF FEEDBACK RESISTANCE

Since the KA22103 has a built-in pre-amp and power-amp, the amp gain is similar to the following equation.

$$\begin{aligned} \text{Pre-amp gain} &= G_v (\text{PRE}) \\ \text{Power-amp gain} &= G_v (\text{PWR}) \\ G_v &= G_v (\text{PRE}) + G_v (\text{PWR}) \end{aligned}$$

So, that voltage gain in next equation at BTL type.

$$G_v \text{ total} = G_v (\text{PRE}) + G_v (\text{PWR}) + 6 (\text{dB})$$

Depending on the internal circuit.

$$\begin{aligned} G_v (\text{PRE}) &= 20 \log [(3.2K + R_F) / (R_F + 200)] (\text{dB}) \\ G_v (\text{PWR}) &= 20 (\text{dB}) \end{aligned}$$

So, G_v total is

$$G_v \text{ total} = 20 \log [(3.2K + R_F) / (R_F + 200)] + 20 (\text{dB})$$

By using the last equation, R_F for total gain can be selected.

2. STAND-BY FUNCTION

It is available with supply voltage ON and OFF by using pin 4.

Because of the small control current, it can use a small capacitance switching relay and it can be controlled by micom directly (except the relay).

Operating voltage of pin 4 is 2.1 V typically and operating supply current is 1 μ A typically in stand-by ON mode.

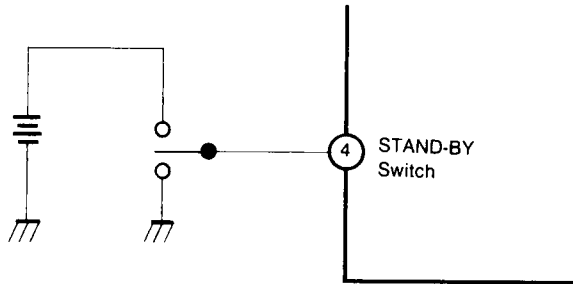


Fig. 3 STAND-BY FUNCTION

3. PREVENTION OF OSCILLATION

The sources of oscillation are listed below:

1. Gain of amplifier
2. Capacitance of capacitor
3. Kind of capacitor
4. Location of external components on the printed circuit board

Capacitor C4 for compensation of the OSC must use a polyester film capacitor to get better temperature and frequency variation characteristics.

Especially, if the feedback capacity is higher at low gain; the oscillation at high frequency of audio must be watched.

4. PREVENTION OF INPUT OFFSET AT V_{CC} -ON.

The input pin and negative feedback pin are the same voltage level with each pre-amp at V_{CC} -ON.

The KA22103 presses the offset voltage of the input stage and prevents pop noise of the supply voltage. So, C1 and C2 of the input stage and the NFB capacitor are varied by amp-gain.

<Example> At $G_v = 53.5$ (dB) ($R_F = 0$)
 $C_1 = 4.7\mu\text{F}$, $C_2 = 47\mu\text{F}$
 At $G_v = 40.5$ dB ($R_F = 470\Omega$)
 $C_1 = 3.3\mu\text{F}$, $C_2 = 33\mu\text{F}$.

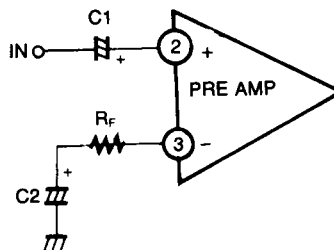


Fig. 4

5. PROTECTION CIRCUIT

The KA22103 consists of a short protection circuit between the output and GND, output- V_{CC} , output-output (each CH).

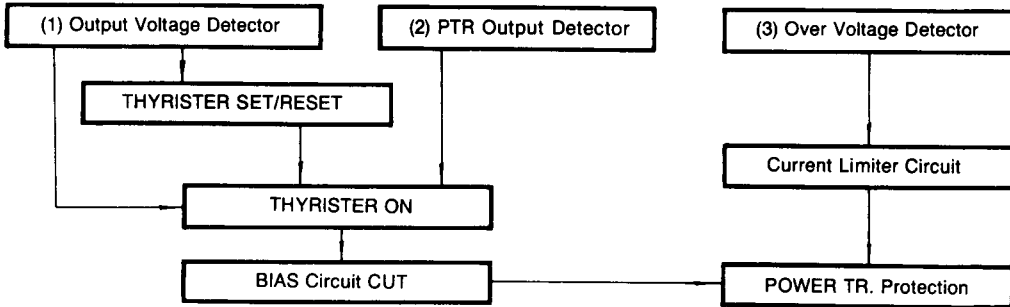


Fig. 5 FLOW CHART OF PROTECTION CIRCUIT

At Fig. 5, the output voltage detector divides the THYRISTER SET with RESET areas and sets on-mode by setting the THYRISTER circuit. When of released because of an output shortage the THYRISTER returns to the reset mode again and KA22103 is returned to the normal mode.

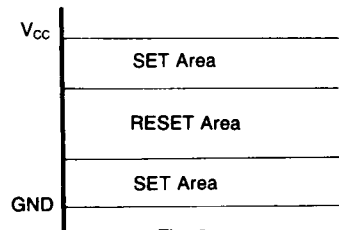


Fig. 6

6. MUTE FUNCTION

Mute is available by setting pin 1 at low level.

In Fig. 6 when the level is low, Q1 and Q2 is in turn-on and the ripple capacitor of Pin 8 is discharged. So, it cuts the bias voltage in the internal circuit. The mute attenuation ratio is above 60 dB.

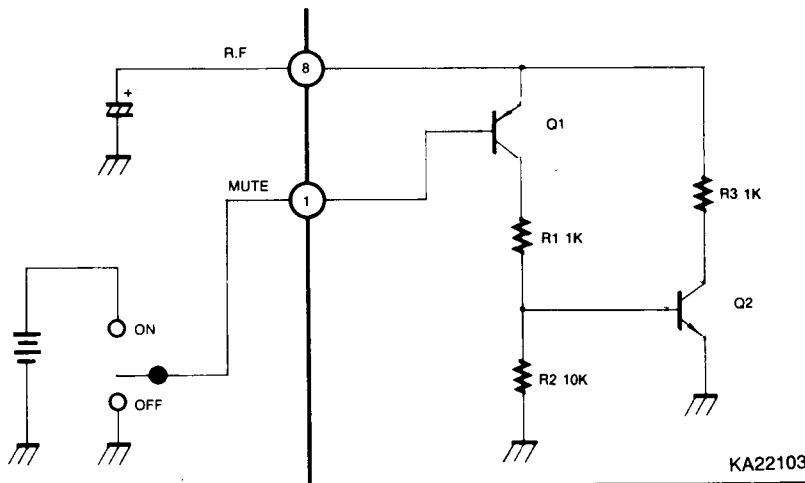


Fig. 7 MUTE Circuit