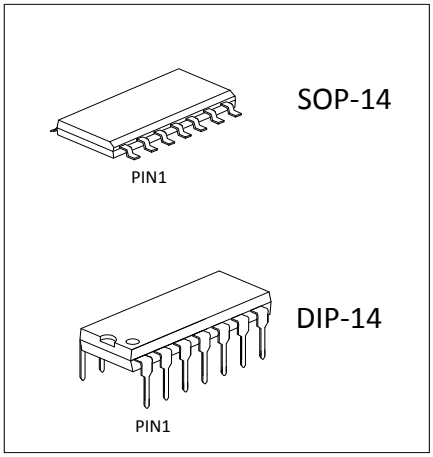
概述：

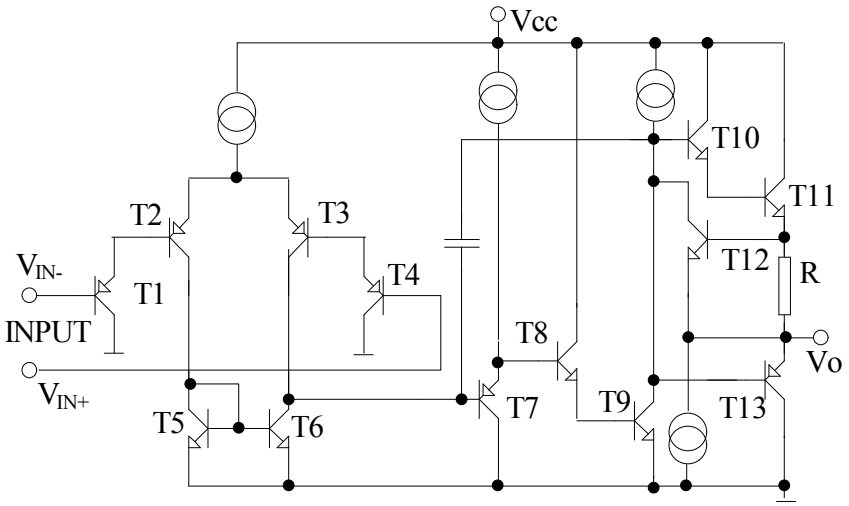
本电路为高性能、具有四个独立的运算放大器，内含相位补偿电路，适用于收录机和音调系统作音调均衡网络，也用于其他场合。采用SOP14/DIP14塑料封装.



主要特点：

- 无需外接相位补偿电路
- 电源电压范围宽：单电源时，Vcc=3~20V，双电源时，Vcc=±1.5V~10V
- 功耗电流小:Icc=0.7mA（典型）（RL=∞）
- 输入电压范围可接近地电平

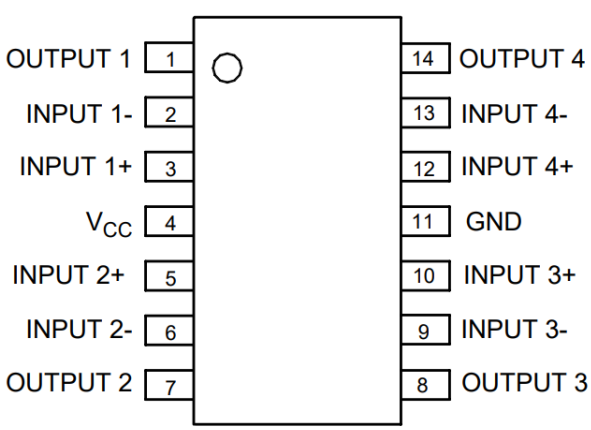
内部电路图



原理简介

LM324N 由四个完全相同的运算放大器组成，单元电路如上图所示,其工作原理简要说明如下：输入信号加T_1、T_4 基极，经差分放大后；T_8、T_9 予复合放大构成中间级；输出级由 T_{10}~T_{13} 组成。其中 T_{12} 为保护管，当输出电流过大时，R 上压降增大使 T_{12} 饱和导通，T_{12} 集电极电位下降，接近 1/2Vcc，使得推挽管 T_{10}、T_{11} 和 T_{13} 截止，从而起到保护作用。电容 C 为相位补偿电容。

引出端功能符号



引出端序号	功　能	符　号	引出端序号	功　能	符　号
1	输出 1	OUT_1	8	输出 3	OUT_3
2	反向输入 1	IN-（1）	9	反向输入 3	IN-（3）
3	正向输入 2	IN+（2）	10	正向输入 3	IN+（3）
4	电源	Vcc	11	地	GND
5	正向输入 2	IN+（2）	12	正向输入 4	IN+（4）
6	反向输入 2	IN-（2）	13	反向输入 4	IN-（4）
7	输出 2	OUT_2	14	输出 4	OUT_4

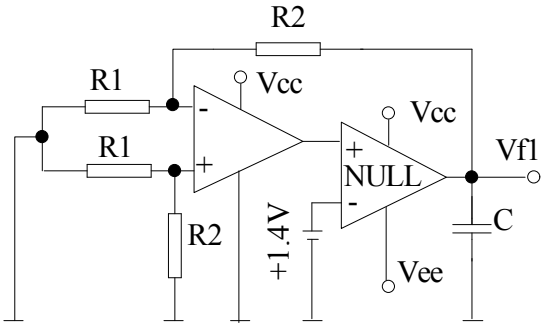
极限值（绝对最大额定值，若无其它规定，Tamb=25℃）

参　　数	符　号	测　试　条　件	额　定　值	单　位
电源电压	Vcc		24	V
差动输入电压	V_{ID}		24	V
最大输入电压	V_{IN}		-0.3~24	V
允许功耗	P_D		600	mW
工作温度	Topr		0~+70	℃
贮存温度	Tstg		-55~+125	℃

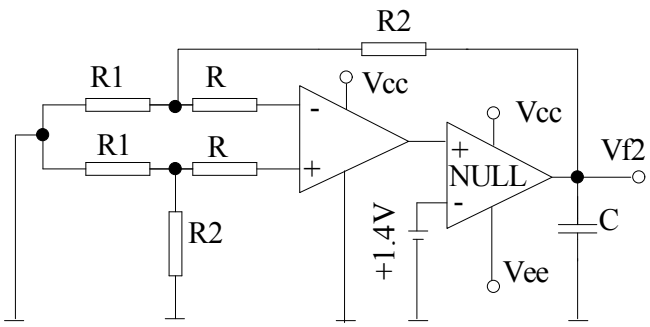
电特性 （若无其它规定，Vcc=5V，Tamb=25℃）

参数	符号	测试条件	最小植	典型值	最大值	单位
失调输入电压	V_{IO}			±2	±7	mV
输入失调电流	I_{IO}	Iin(+)/Iin(-)		±5	±50	nA
输入偏置电流	I_{BA}			45	250	nA
共模输入电压范围	V_{ICM}		0		Vcc-1.5	V
共模抑制比	K_{CMR}		65	80		dB
强信号电压增益	G_V	Vcc=15V,R_L≥2 kΩ	25	100		V/mV
输出电压范围	Vo		0		Vcc-1.5	V
电源纹波抑制比	PSRR		65	100		dB
通 道 分 离	C_S	f=1kHz~20kHz		120		dB
消耗电流（1）	Icc			0.7	2	mA
消耗电流（2）	Icc	Vcc=20V		1.5	3	mA
输出电流（1）	Io	Vin^+=1V,Vin^-=0V	20	40		mA
输出电流（2）	Io	Vin^+=0V,Vin^-=1V	10	20		mA

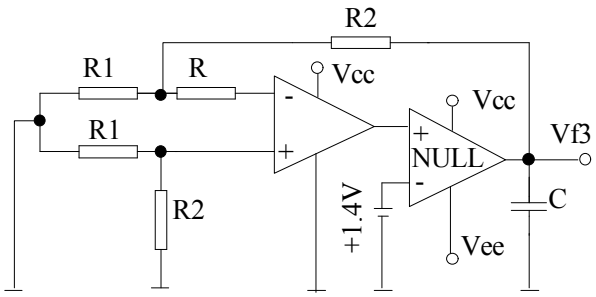
测试原理图（注：NULL 指零放大器）

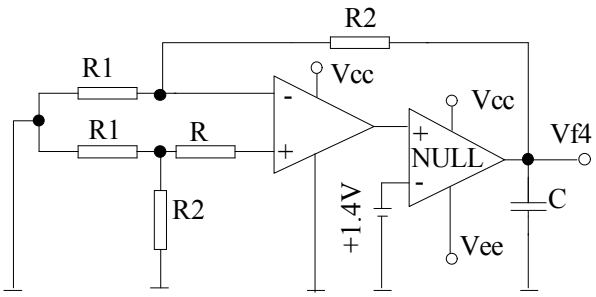


Vio=Vf1/（1+R2/R1）
输入失调电压 Vio 测试图

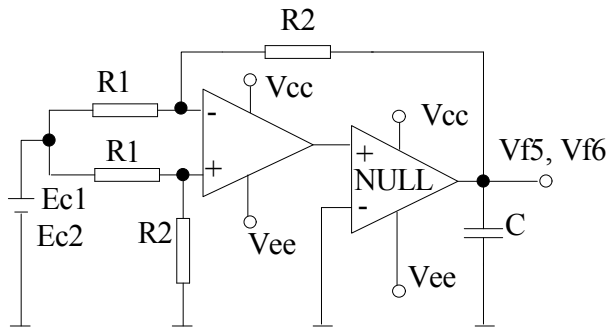


Iio=（Vf2-Vf1）/R（1+R2/R1）
输入失调电流 Iio 测试图



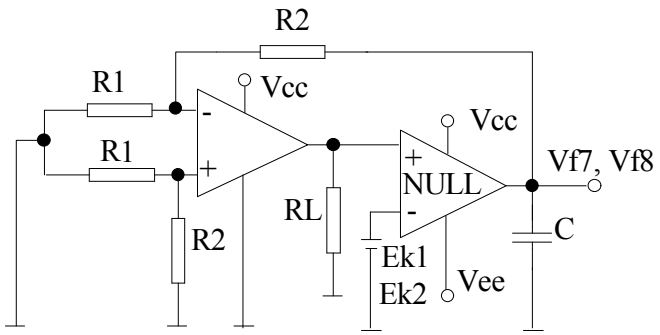


I_{BA}=（Vf4-Vf3）/2R（1+R2/R1）
输入偏置电流 I_{BA} 测试图



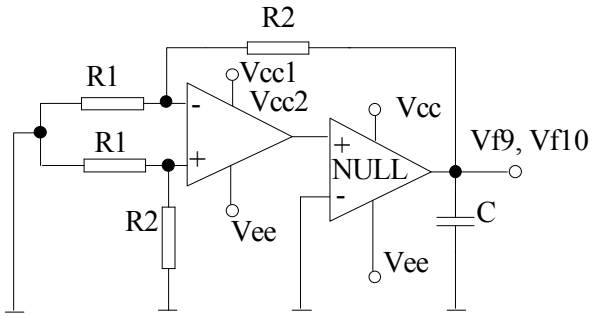
CMR=20log|（Ec1-Ec2）(1+R2/R1)/（Vf5-Vf6|

共模抑制比 CMR 及共模输入电压范围 V_{ICM} 测试图

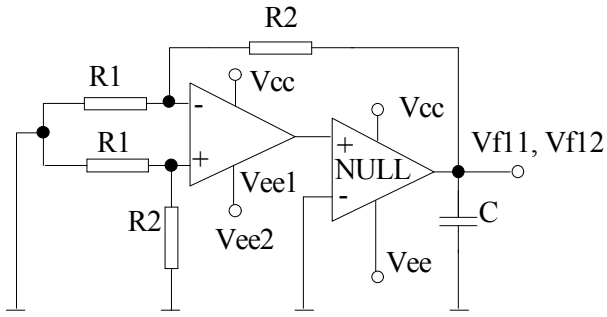


Gv=（Ek1-Ek2）(1+R2/R1)/（Vf8-Vf7）

电压增益 Gv 测试图

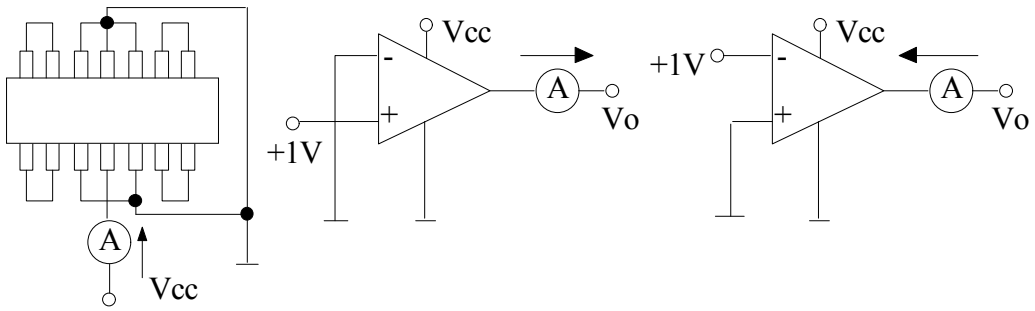


PSRR（+）=20log|（Vcc1-Vcc2）(1+R2/R1)/（Vf9-Vf10）|

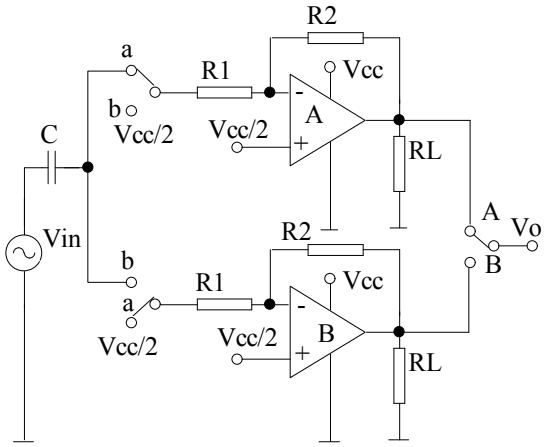


PSRR（-）=20log|（Vee1-Vee2）(1+R2/R1)/（Vf11-Vf12|

电源纹波抑制比 PSRR 测试图



消耗电流 Icc 及输出电流 Io 测试图



通道分离度 Cs 测试图

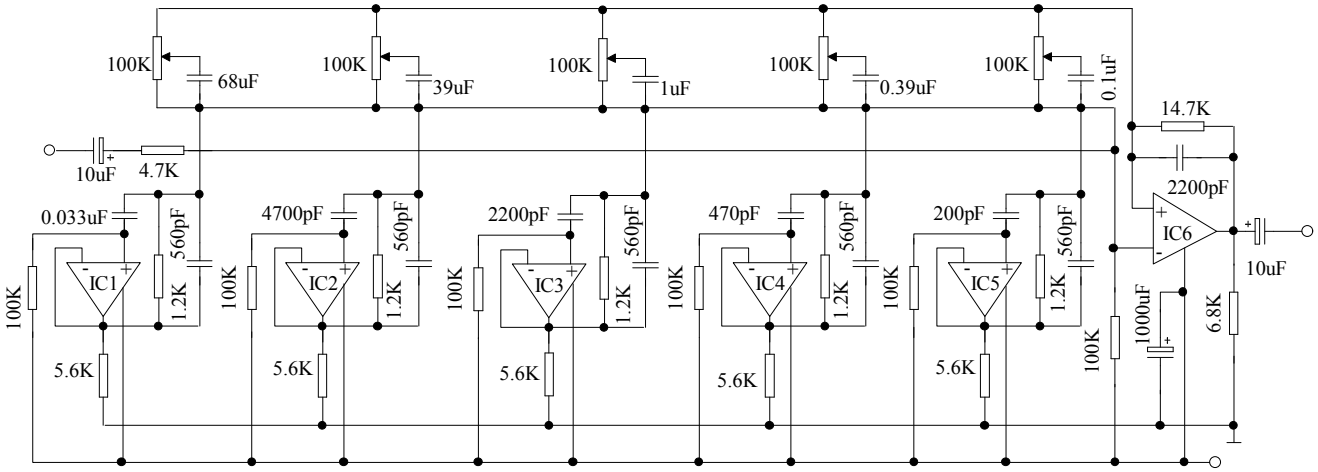
SW：A

Cs（A→B）=20log（R2*V_{OA}）/（R1*V_{OB}）

SW：B

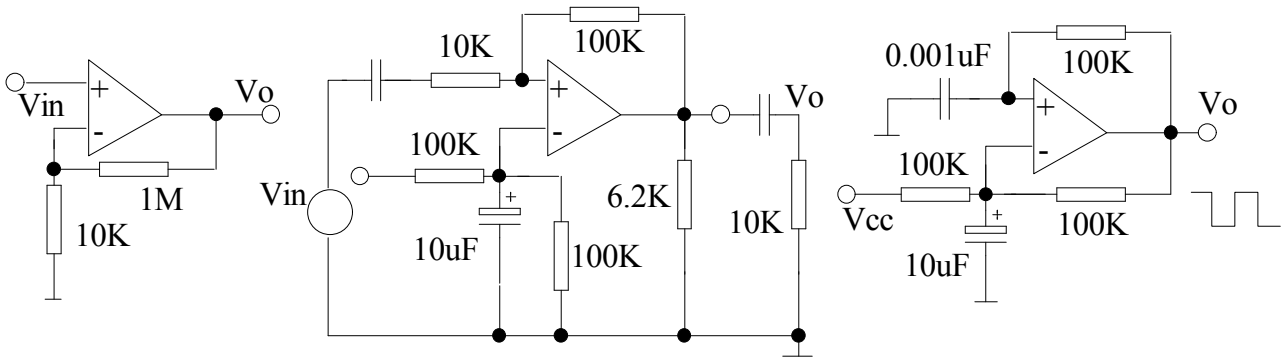
Cs（B→A）=20log（R2*V_{OB}）/（R1*V_{OA}）

应用图



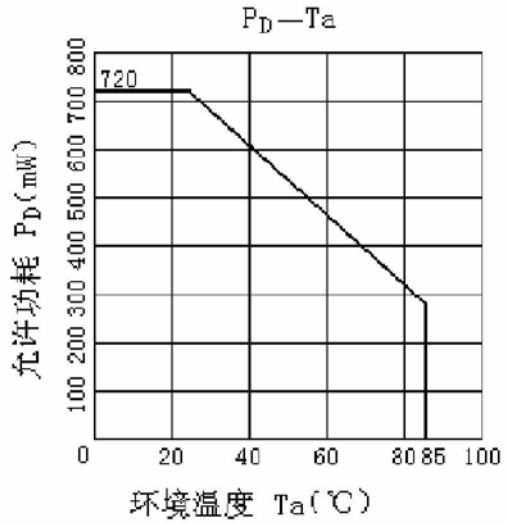
LM324N 用于五频率音调控制电路

直流放大器　　倒相放大器　　矩形波发生器

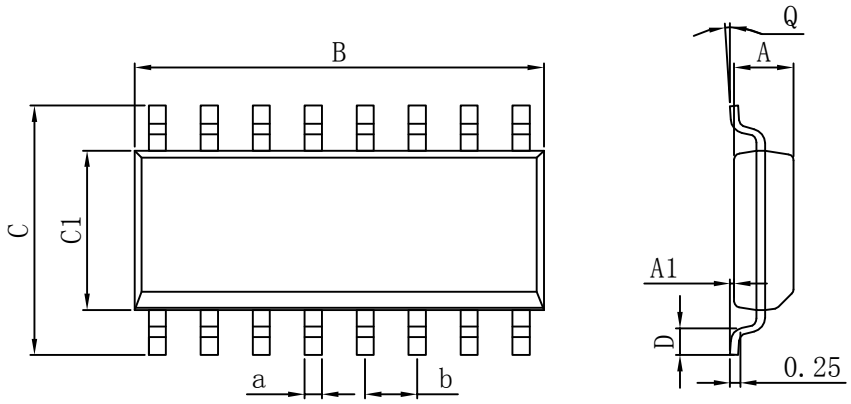


LM324N 的其它应用

特性曲线

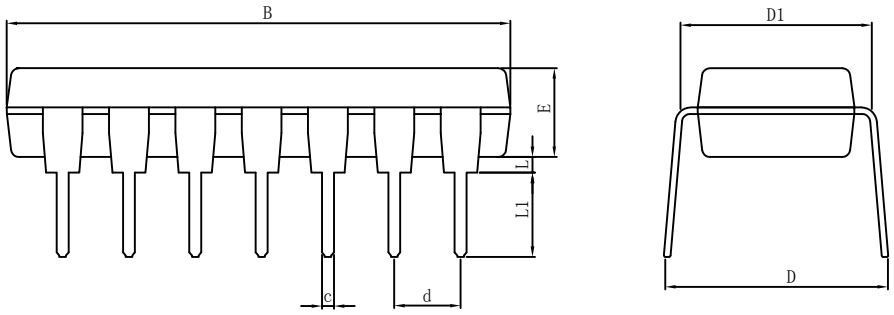


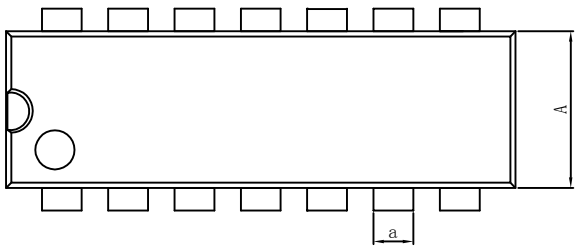
SOP14



UNIT: mm							
DIM.	MIN	TYP	MAX	DIM.	MIN	TYP	MAX
A	4.520	4.570	4.620	a	0.400	0.420	0.440
A1	0.100	–	0.250	b	1.260	1.270	1.280
B	8.500	8.750	9.000	Q	0°	–	8°
C	5.800	6.100	6.250				
C1	3.800	3.900	4.000				
D	0.400	–	0.950				

DIP14





UNIT: mm							
DIM.	MIN	TYP	MAX	DIM.	MIN	TYP	MAX
A	6.100	6.300	6.680	a	1.504	1.524	1.544
B	18.940	19.200	19.560	c	0.437	0.457	0.477
D	8.200	8.700	9.200	d	2.530	2.540	2.550
D1	7.42	7.62	7.82	L	0.500	–	0.800
E	3.100	3.300	3.550	L1	3.000	3.200	3.600

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