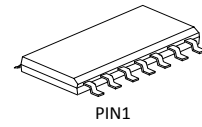


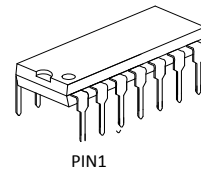


概述:

HLM2902DR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 14 引线双列直插式塑料封装 DIP14，功耗 720mW,以及贴片 SOP14 封装,功耗 400mW。



SOP14



DIP14

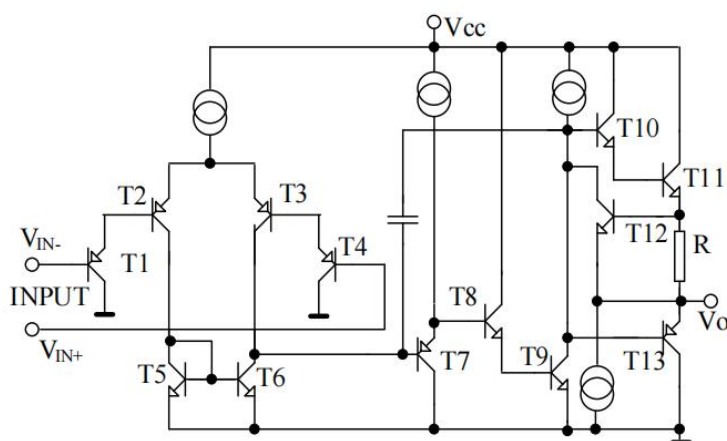
主要特点:

- 无需外接相位补偿电路
- 电源电压范围宽：单电源时， $V_{CC}=3\sim 32V$ ，双电源时， $V_{CC}=\pm 1.5V\sim 16V$
- 功耗电流小： $I_{CC}=0.6mA$ （典型）（ $R_L=\infty$ ）
- 输入电压范围可接近地电平

原理简介

LM2902由四个完全相同的运算放大器组成，单元电路如图所示,其工作原理简要说明如下：输入信号加到T1、T4基极，经差分放大后；T8、T9于复合放大构成中间级；输出级由T10~T13组成。其中T12为保护管，当输出电流过大时，R上压降增大使T12饱和导通，T12集电极电位下降，接近 $1/2V_{CC}$ ，使得推挽管T10、T11和T13截止，从而起到保护作用。电容C为相位补偿电容。

内部电路图





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	OUT1	8	输出 3	OUT3
2	反向输入 1	IN- (1)	9	反向输入 3	IN- (3)
3	正向输入 1	IN+ (1)	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	OUT2	14	输出 4	OUT4

极限值 (绝对最大额定值, 若无其它规定, Tamb=25℃)

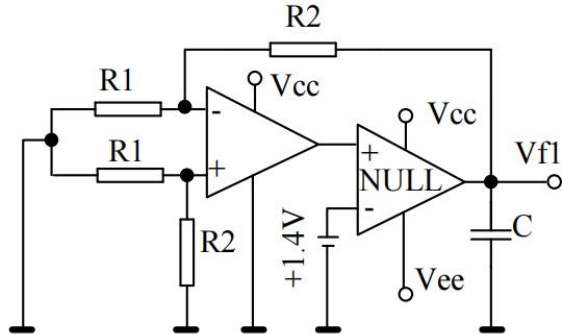
参 数	符 号	测 试 条 件	额 定 值	单 位
电源电压	Vcc		32	V
差动输入电压	V _{ID}		32	V
最大输入电压	V _{IN}		-0.3~32	V
允许功耗	P _D	DIP-14	720	mW
		SOP-14	400	
工作温度	T _{opr}		0~+70	℃
贮存温度	T _{stg}		-55~+125	℃

电特性 (若无其它规定, Vcc=5V, Tamb=25℃)

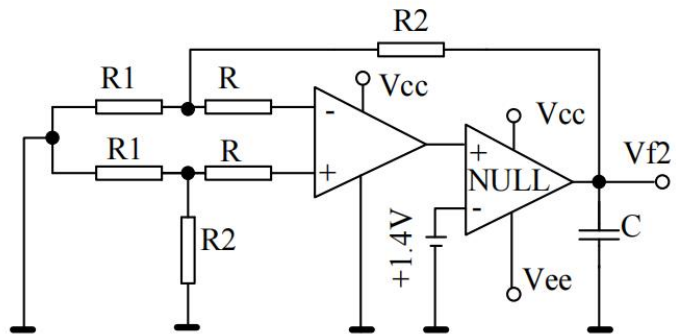
参数	符号	测试条件	最小植	典型值	最大值	单位
失调输入电压	V _{IO}			±2	±5	mV
输入失调电流	I _{IO}	I _{in(+)} /I _{in(-)}		±5	±50	nA
输入偏置电流	I _{BA}		45	250	nA	
共模输入电压范围	V _{ICM}		0		Vcc-1.5	V
共模抑制比	K _{CMR}		65	80		dB
强信号电压增益	G _V	Vcc=15V, R _L ≥ 2 kΩ	25	100		V/mV
输出电压范围	V _O		0		Vcc-1.5	V
电源纹波抑制比	PSRR		65	100		dB
通道分离	C _S	f=1kHz~20kHz		120		dB
静态消耗电流(1)	I _{cc}	Vcc=5V		0.6	2	mA
静态消耗电流(2)	I _{cc}	Vcc=30V		1.5	3	mA
输出拉电流	I _o	V _{in+} =1V, V _{in-} =0V	20	35		mA
输出灌电流	I _o	V _{in+} =0V, V _{in-} =1V	10	13		mA



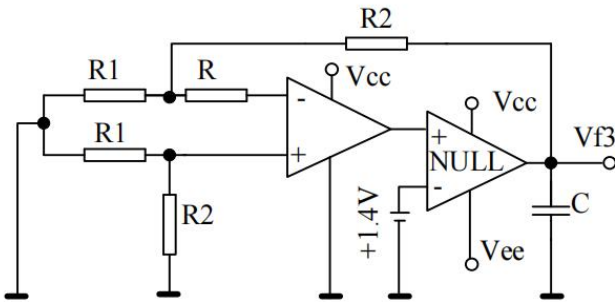
测试原理图 (注: NULL 指零放大器)



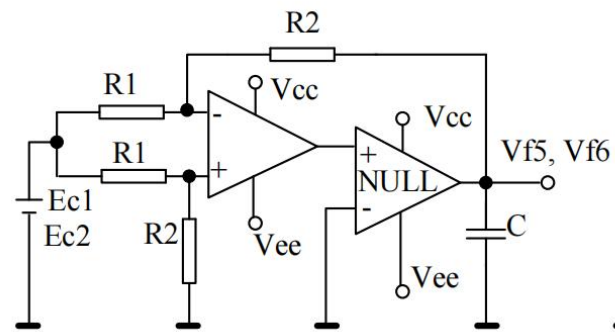
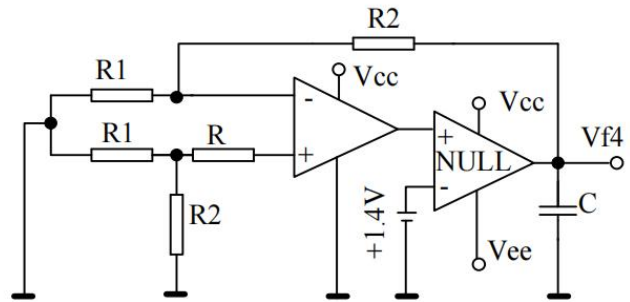
$V_{io} = V_{f1} / (1 + R_2/R_1)$
输入失调电压 V_{io} 测试图



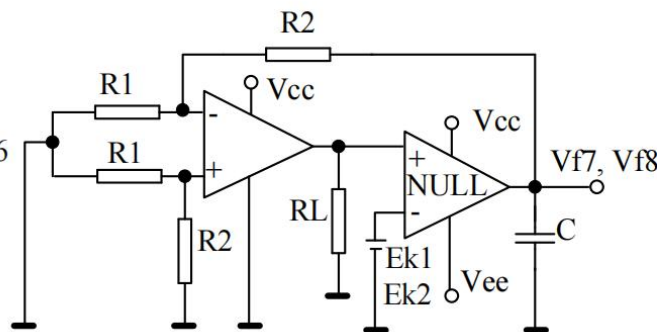
$I_{io} = (V_{f2} - V_{f1}) / R (1 + R_2/R_1)$
输入失调电流 I_{io} 测试图



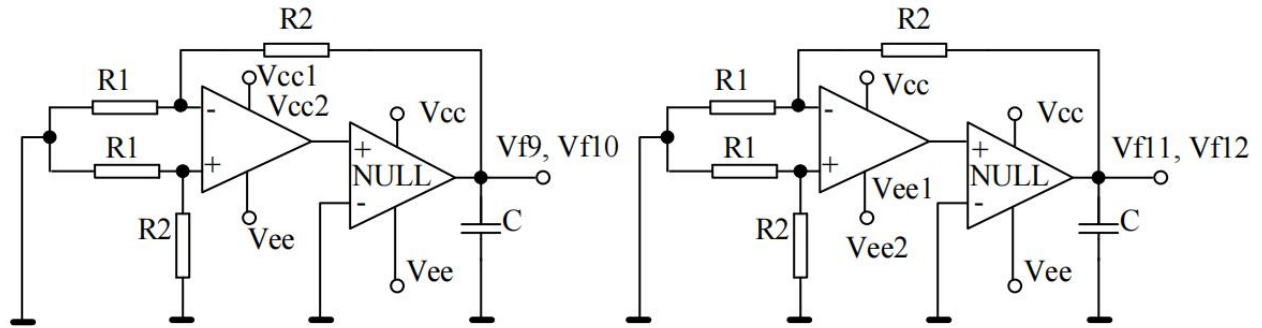
$I_{BA} = (V_{f4} - V_{f3}) / 2R (1 + R_2/R_1)$
输入偏置电流 IBA 测试图



$CMR = 20 \log \left| \frac{(E_{c1} - E_{c2}) (1 + R_2/R_1)}{(V_{f5} - V_{f6})} \right|$
共模抑制比 CMR 及共模输入电压范围 VICM 测试图

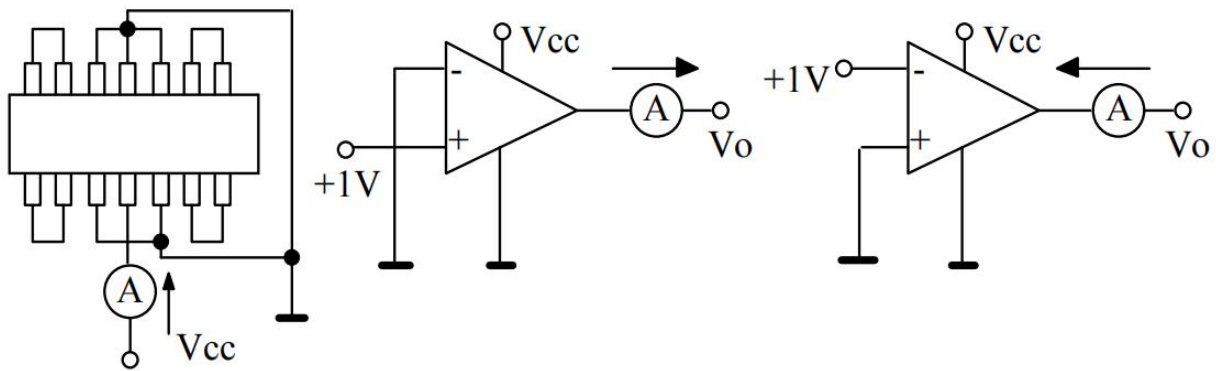


$G_v = \frac{(E_{k1} - E_{k2}) (1 + R_2/R_1)}{(V_{f8} - V_{f7})}$
电压增益 G_v 测试图

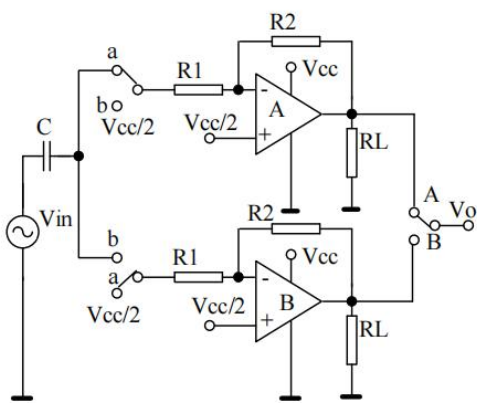


$$PSRR (+) = 20 \log \left| \frac{(V_{cc1} - V_{cc2}) (1 + R2/R1)}{(V_{f9} - V_{f10})} \right| \quad PSRR (-) = 20 \log \left| \frac{(V_{ee1} - V_{ee2}) (1 + R2/R1)}{(V_{f11} - V_{f12})} \right|$$

电源纹波抑制比 PSRR 测试图



消耗电流 I_{cc} 及输出电流 I_o 测试图



通道分离度 C_s 测试图

SW: A

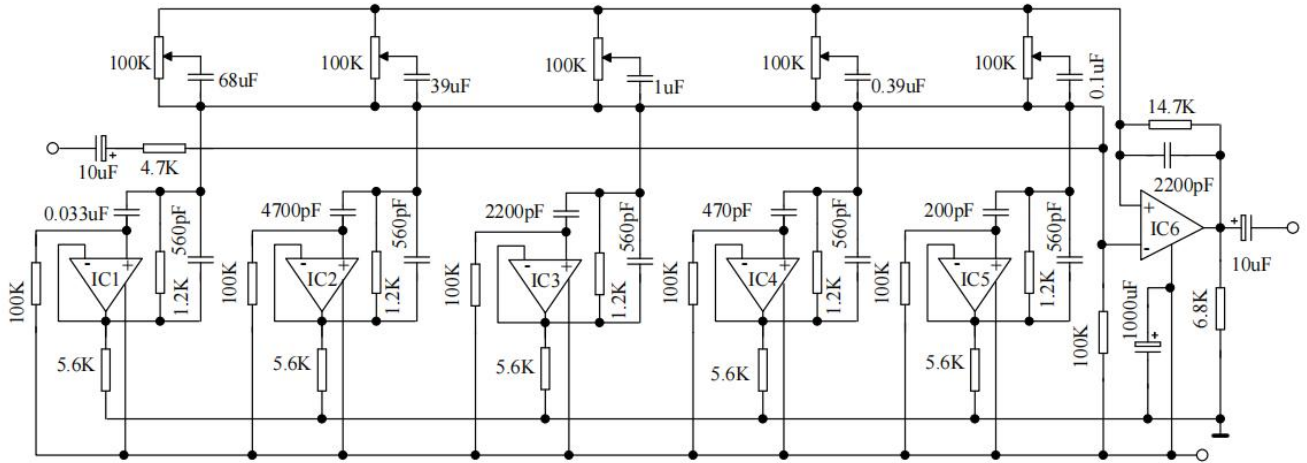
$$C_s (A \rightarrow B) = 20 \log \left(\frac{R2 \cdot V_{OA}}{R1 \cdot V_{OB}} \right)$$

SW: B

$$C_s (B \rightarrow A) = 20 \log \left(\frac{R2 \cdot V_{OB}}{R1 \cdot V_{OA}} \right)$$

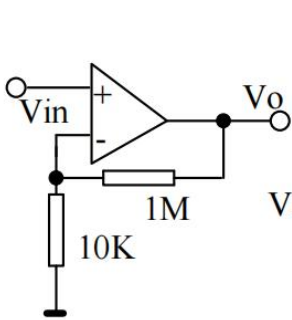


应用图

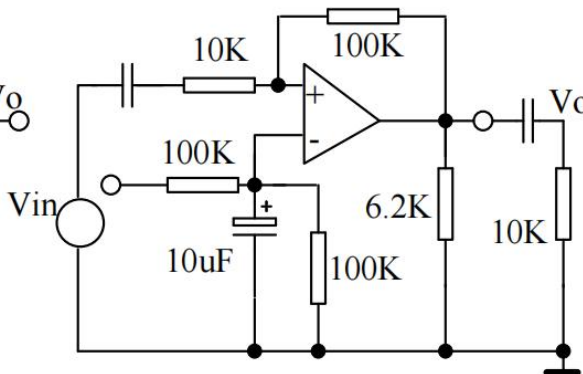


LM2902 用于五频率音调控制电路

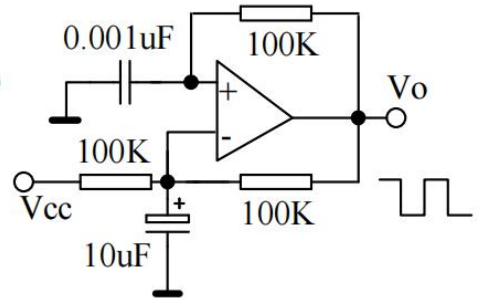
直流放大器



倒相放大器

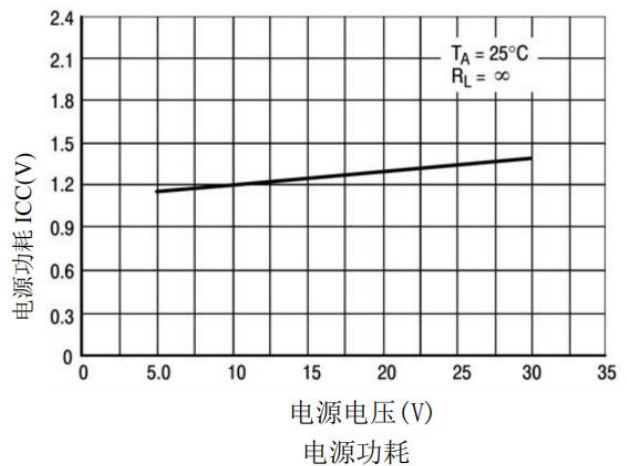
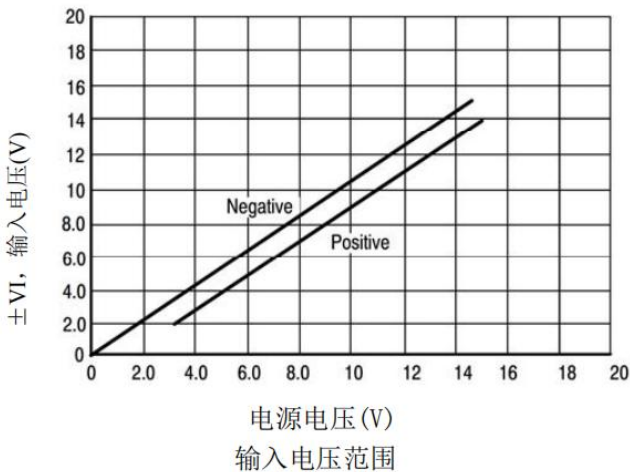


矩形波发生器



HLM2902DR 的其它应用

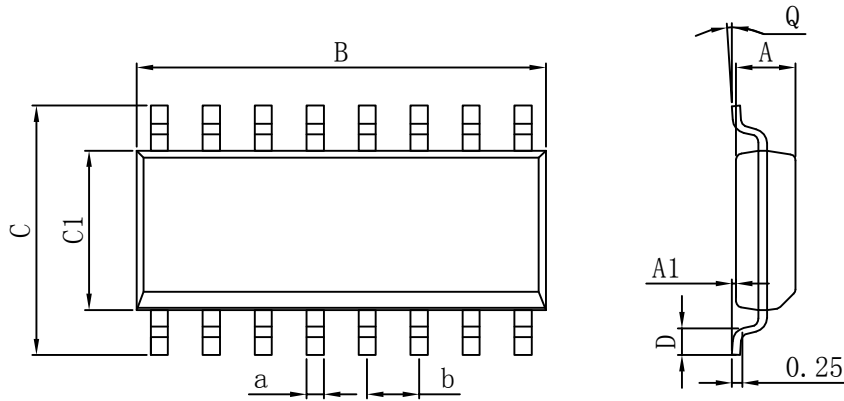
特性曲线





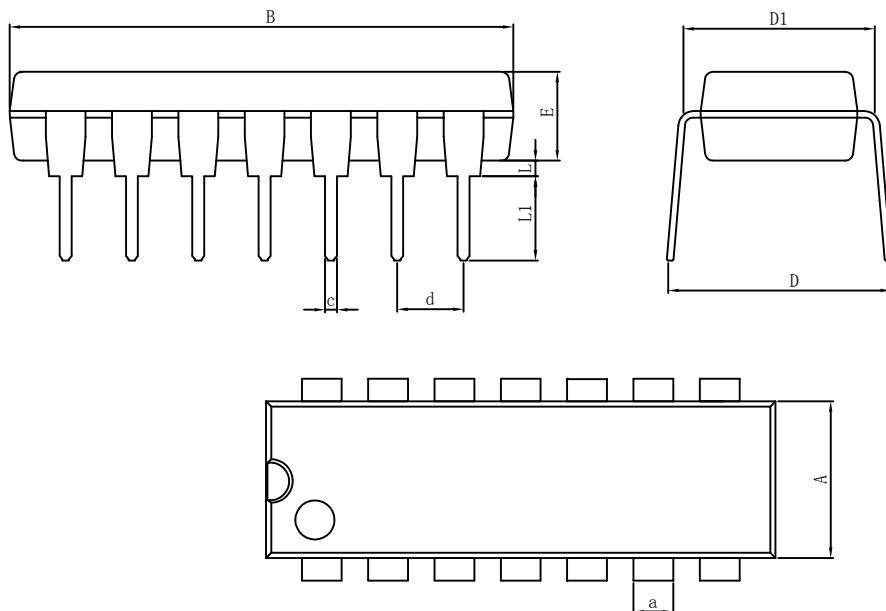
应用

SOP-14



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				

DIP-14



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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