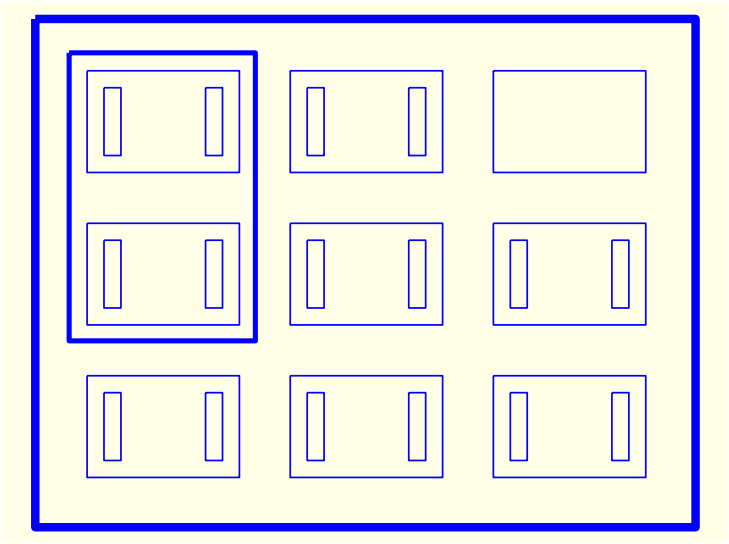
体

体



A/D D/A

事

U/F F/U

JP11 JP12 JP13 JP14 JP15

220V

220V 些 体 ±5V ±12V ±15V 0 30V

体

ON

OFF

220V

一

1

2

3

4 介 体 介

5 介

6

7

1 U_{OS} I_{OS}
A_{ud} *CMRR* U_{oppm} *GW*
2
3
4

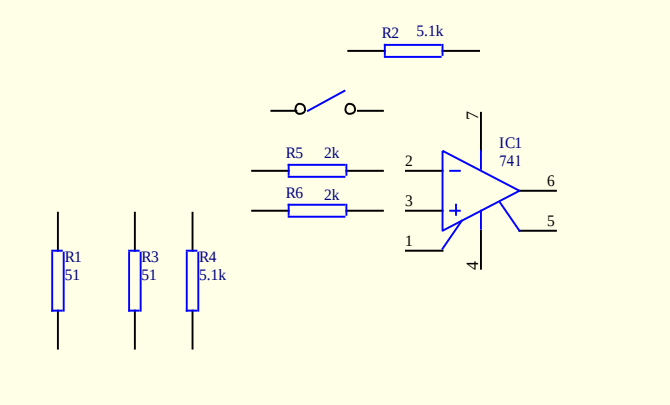
1
2
3
4

1 $\boldsymbol{U_{OS}}$

mV U_{OS}

8-DIP
TO-99
2 3 6 7 4
8 1 5 1 5
1 5

1-1



1-1

S1 S2 U_{O1}

$$A_{uf}=\frac{U_{O1}}{U_{OS}}=\frac{R_1+R_2}{R_1}$$

$$U_{OS}=\frac{R_1}{R_1+R_2}\cdot U_{O1}=\frac{1}{101}\cdot U_{O1} \qquad 1\text{-}1$$

U_{OS} ± 1 20 mV U_{OS} 1mV

2 $\boldsymbol{I_{OS}}$

$$I_{OS}=\left|I_{B+}-I_{B-}\right|$$

I_{OS} 一

1-1 I_{OS} S1 S2 U_{O1}'

$$I_{OS}=\frac{U_{O1}'-U_{O1}}{A_{uf}\cdot R_5}=\frac{R_1}{R_1+R_2}\cdot\frac{U_{O1}'-U_{O1}}{R_5} \qquad 1\text{-}2$$

I_{OS} 1nA

3 $\boldsymbol{A_{ud}}$

体 ΔU_o

ΔU_{id}

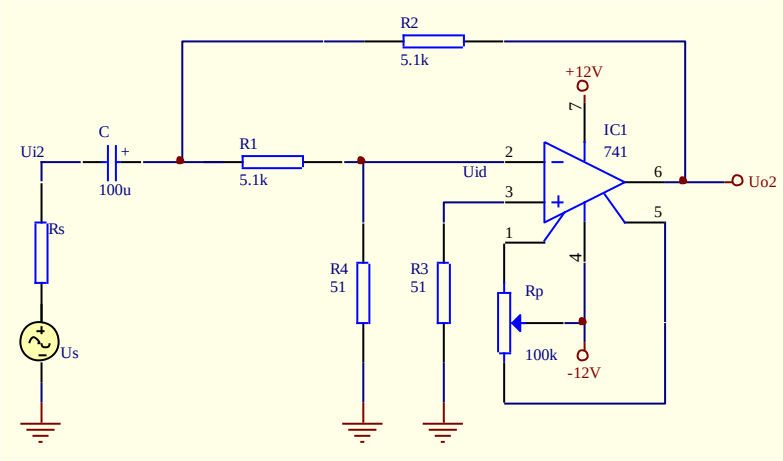
$$A_{ud}=\frac{\Delta U_o}{\Delta U_{id}}$$

dB

$$A_{ud}(\text{dB})=20\lg\left(\frac{\Delta U_o}{\Delta U_{id}}\right)\ (\text{dB})$$

Hz 些

1-2



1-2

1-2 R_2 R_1 R_4 R_2 Rs 些

R_1 R_4 U_{id} 体 C

A_{ud}

$$A_{ud}(\mathrm{dB}) = 20\lg\left(\frac{\Delta U_{o2}}{\Delta U_{id}}\right) = 20\lg\left[\left(1+\frac{R_1}{R_4}\right)\cdot\frac{U_{O2}}{U_{i2}}\right]\cdot(\mathrm{dB}) \qquad 1\text{-}3$$

A_{ud} 60 70dB A_{ud} 80dB A_{ud} 100dB

4 ***CMRR***

体 A_{ud} A_{uc}

$$CMRR = \frac{A_{ud}}{A_{uc}}$$

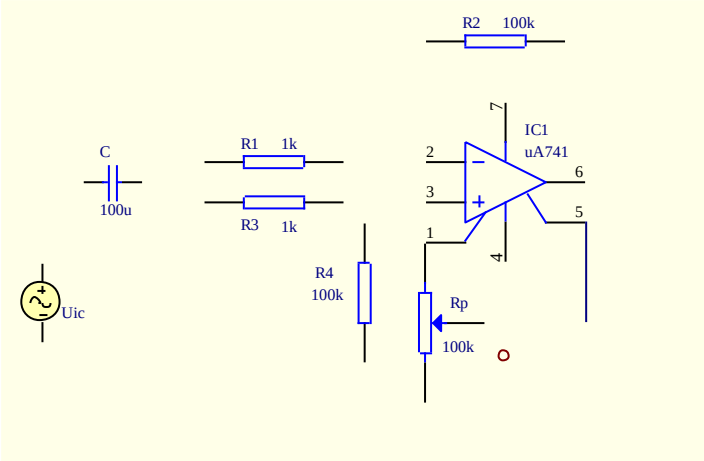
dB *CMRR*

$$\mathrm{CMRR} = 20\lg\left(\frac{A_{ud}}{A_{uc}}\right)(\mathrm{dB})$$

CMRR

CMRR

1-3 *CMRR*



1-3 *CMRR*

体 $|A_{ud}| = \frac{R_2}{R_1}$

$|A_{uc}| = \frac{U_{oc}}{U_{ic}}$ *CMRR*

$$CMRR = 20\lg\left(\frac{R_2 U_{ic}}{R_1 U_{oc}}\right) \text{ (dB)} \qquad 1\text{-}4$$

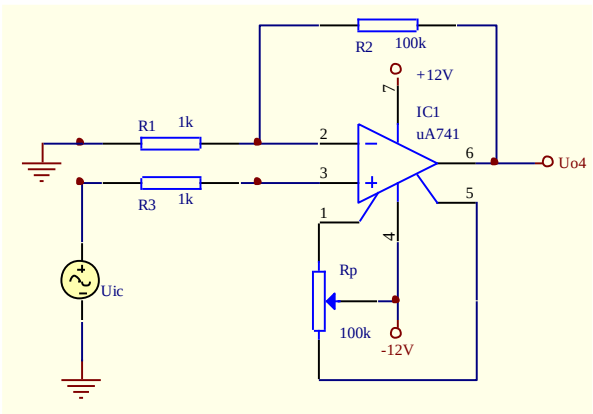
U_{oc} U_{ic} *CMRR* *CMRR* 80dB

5 $\boldsymbol{U_{oppm}}$

U_{oppm}

10V

1-4 U_{oppm}



1-4 U_{oppm}

6 ***GW***

GW 1

0.707

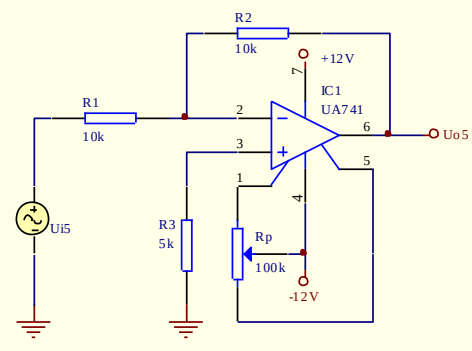
$$GW = A_{ud} f \qquad 1\text{-}5$$

体 *GW*

体 100~200mV 体

体

1-5 *GW*



1-5 *GW*

1 U_{OS} I_{OS}

1 Sa ON

2 S1 S2

U_{O1} U_{O1}

3 S1 S2 U_{O1}'

U_{O1}'

4 1-1 1-2 U_{OS} I_{OS}

Sa OFF

2 A_{ud}

1 Sb ON

2 U_{i2} 100Hz 50mV

U_{O2} U_{i2} U_{O2}

3 1-3 A_{ud}

Sb OFF

3 ***CMRR***

1 Sc ON S3 S5 S7

2 U_{i3} 100Hz 1V

U_{O3} U_{i3} U_{O3}

U_{O3} U_{O3} A1

3 1-4 *CMRR*

Sc OFF

4 U_{oppm}

1 Sc ON S4 S6 S8

2 U_{i4} 100Hz

U_{O4}

U_{oppm}

Sc OFF

5 ***GW***

1 Sd ON

2 U_{i5} 100mV

S_{R2}

$$A_u = \frac{U_{o5}}{U_{i5}} = 0.707$$

Sd OFF

事

1 U_{OS} I_{OS} A_{ud} *CMRR* U_{oppm} *GW*

2

3

1 U_{OS} I_{OS}

2 U_{OS} I_{OS}

3

4

5

1
2

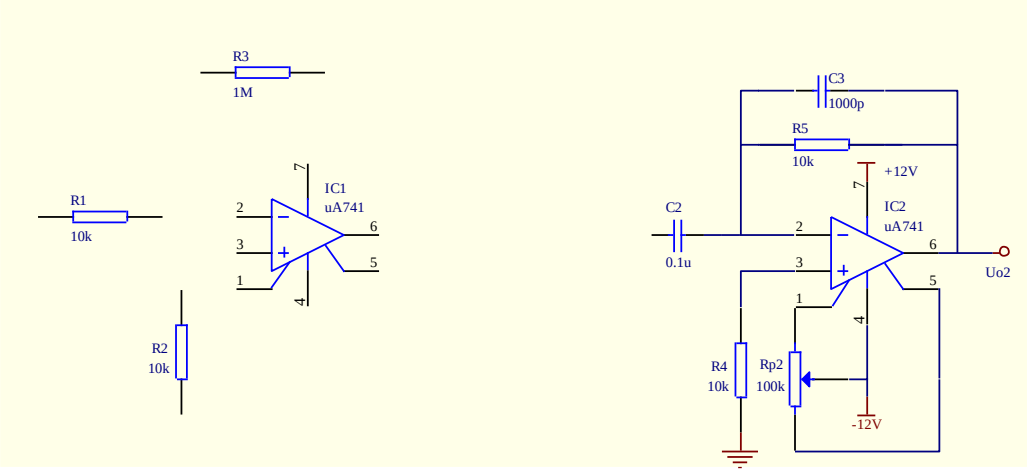
1
2
3
4

一

1

体

8-DIP TO-99



2-1

2-1 S1 IC1

$$u_{o1}(t) = -\frac{1}{R_1 C_1}\int u_{i1}(t)\mathrm{d}t \qquad 2\text{-}1$$

3

2-1 S1 S2 IC2

$$u_{o2}(t) = -R_5 C_2 \frac{\mathrm{d}u_{i2(t)}}{\mathrm{d}t} \qquad 2\text{-}2$$

4

2-1 S2 S1 IC1 IC2

1

1 S1

2 u_{i1} u_{O1} Rp1 U_{O1}=0 U_{O1}

3 u_{i1} 1kHz ±2V u_{i1} u_{O1} u_{i1} u_{O1} u_{i1} u_{O1} u_{i1} u_{O1}

4 u_{i1} 160Hz 1V u_{i1} u_{O1} u_{i1} u_{O1} u_{i1} u_{O1}

2

1 S1 S2

2 u_{i2} u_{O2} Rp2

u_{O2}=0 U_{O2}

3 u_{i2} 300Hz

±2V u_{i2} u_{O2} u_{i2} u_{O2}

4 u_{i2} 160Hz

1V u_{i2} u_{O2}

u_{i2} u_{O2}

3

1 S2 S1

2 u_{i1} 300Hz

±2V u_{O1} u_{O2} u_{O1} u_{O2}

事

1

2

3

一　　LM311

1　　体
2　　LM311
3

1
2
3
4
5

一

体
上

上　　3
5ns　　上

TTL　ECL　HTL　NMOS　PMOS
上　　LM311

1　LM311

LM311　上　　±5V　±l5V　　100nA
6.0nA　　±30V　　TTL　DTL　MOS

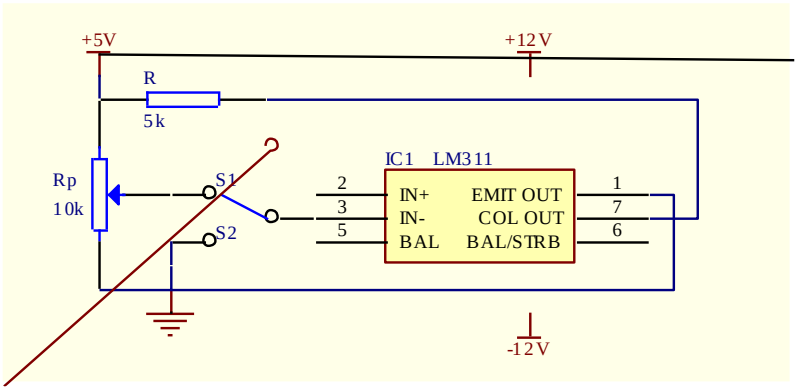
LM311　　8-DIP　　TO-99　　3-1　　LM311

3-1　LM311

1	GND	3	IN	5	BALANCE	7	OUT
2	IN+	4	V	6	BALANCE/STROBE	8	V+

2

3-1



3-1

1

S2 S1 U_i

U_o'=5V U_i' 0 U_o'=0

2

S1 S2 Rp

E_r 0 E_r U_i E_r U_o'=5V

U_i' E_r U_o'=0

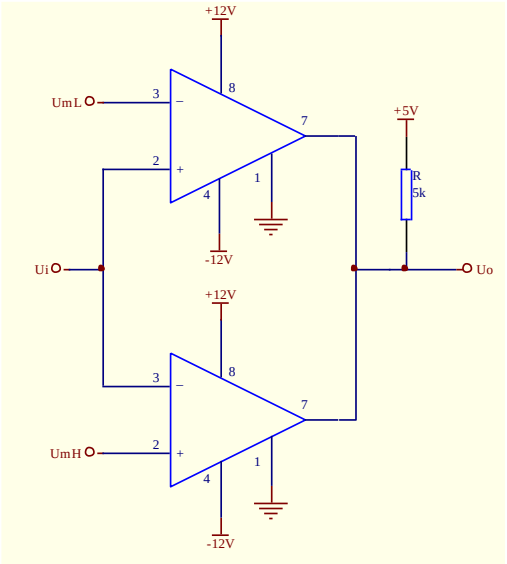
3

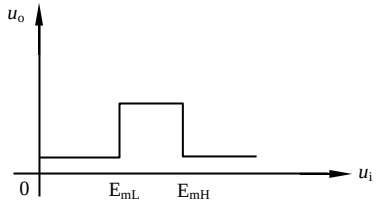
u_i

E_{mL} E_{mH}

ΔE_m u_i ΔE_m

3-2





3-2 3-3

3-2 IC2 IC3 上 LM311 LM311

一

U_i E_{mL} E_{mH} IC2 IC3

U_i E_{mH} IC2 IC3

E_{mL} U_i E_{mH} IC2 IC3

3-3

1

1

S2 u_i' 1kHz

2V u_i' u_o'

u_o' u_o' A1

S2 u_i'

u_i' u_o'

u_i' u_o'

u_o' u_o' A1

2

S1 Rp E_r

u_i' 1kHz 2V

u_i' u_o' u_o' u_o' A1

S1 Rp E_r

u_i'

u_i' u_o'

u_i' u_o' u_o' u_o' A1

2

1 E_{mL} E_{mH} E_{mL}=2V E_{mH}=4V

u_i 1kHz 10V

u_i u_o

2 E_{mH} E_{mL} u_i u_o

事

1

2

3

ICL8038

1 ICL8038
2 ICL8038 体
3

1
2

一

1 ICL8038

ICL8038 一
IC ICL8038 IC 体
代

ICL8038
体 0.001Hz 500kHz
0.5
一 一
+10V +30V ±5V ±15V
50ppm/ºC

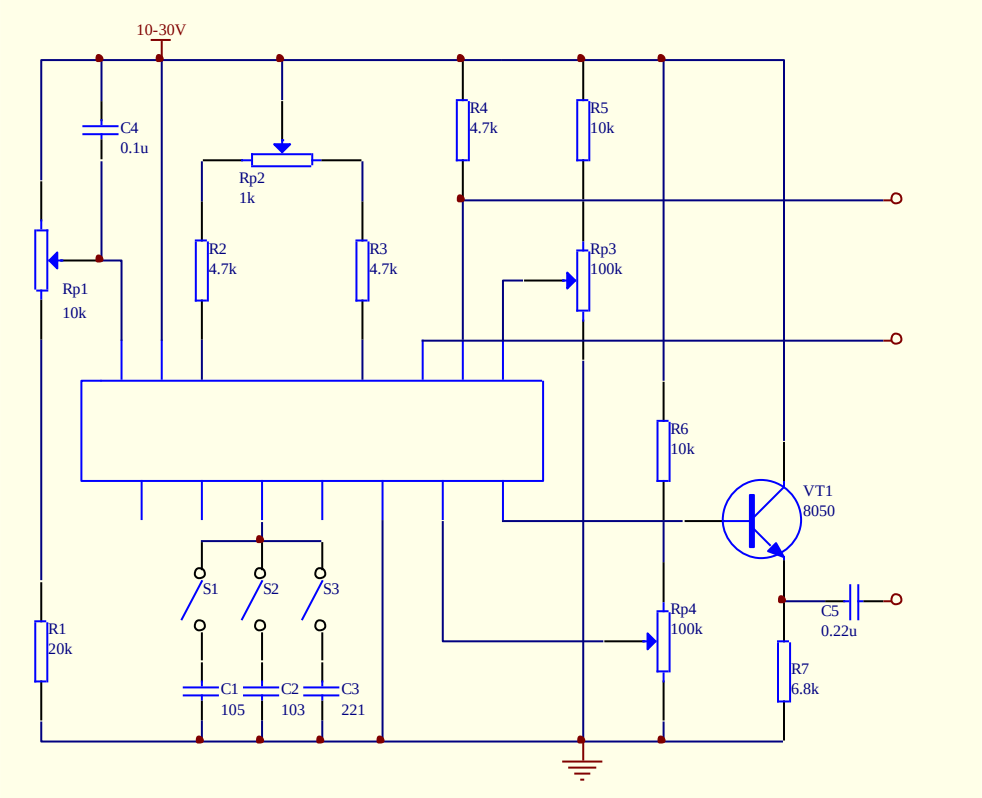
ICL8038 14-DIP 4-1 ICL8038

4-1 ICL8038

1	SINE WAVE SINADJ$_1$	6	V_+	11	V^- OR AND
2	SINE WAVE OUT	7	FM BIAS	12	SINE WAVE SINADJ$_2$
3	TRIANGLE OUT	8	FM SWEEP INPUT	13	NC
4	DUTY CYCLE	9	SQUARE WAVE OUT	14	NC
5	FREQUENCY DFADJ	10	TIMING CAPACITOR		

2 ICL8038

4-1 ICL8038



4-1 ICL8038

4-1 8

9 R_3=4.7K R_{P2} 体

R_{P1} R_{P2} R_{P3}

R_{P1} 体 R_{P3} 体 R_{P2}

R_{P1} $+V_{CC}$ 8

R_{P2} R_{P2}

—

1 S2 S1 S3

R_{p2} 50

R_{p1}

R_{p1}

2 S2 S1 S3 50

R_{p4} R_{p3} R_{p1}

R_{p1}

3 S2 S1 S3 50

— R_{p1} —

—

4 3 S1 S2 S3 S2
S1 S3 S3 S1 S2 R_{p2}
10 90 —
5 4 R_{p1} R_{p2} R_{p3} R_{p4}
—
—

事

1 1 2 3 —
2 4
3 5
4