

Dual operational amplifier

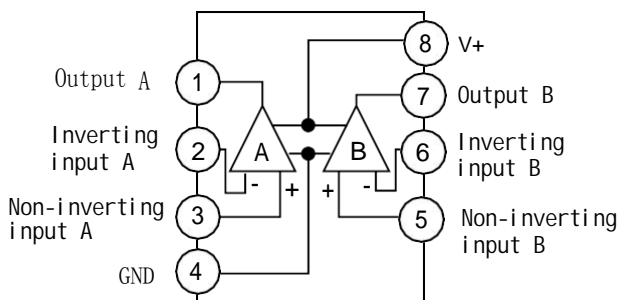
The LM2904DR consist of two independen hig gain operational amplifiers. It can work with a single power supply or with a dual power supply, and the current consumption of the power supply has nothing to do with the power supply voltage. Applications include variable frequency amplifiers, DC gain sections and all conventional op amp circuits.

Available in DIP8 or SOP8 packages.

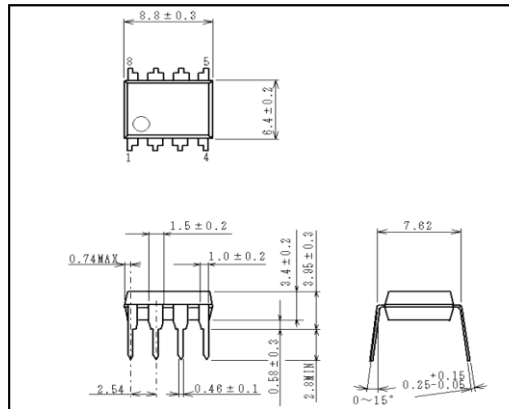
main features :

- Can work with single or dual power supply
- Two internally compensated op amps in one package.
- logic circuit matching.
- Low power consumption.
- Wide frequency range

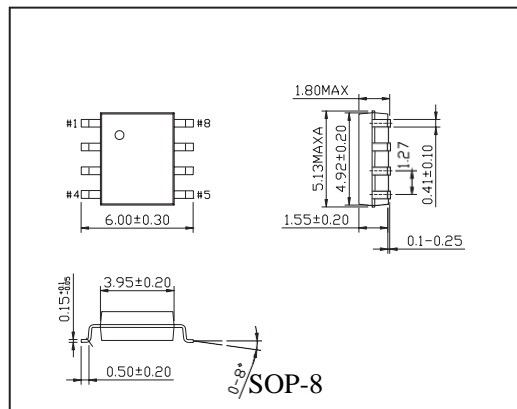
Functional Block Diagram and Pinout Diagram



Package Outline Drawing



DIP-8



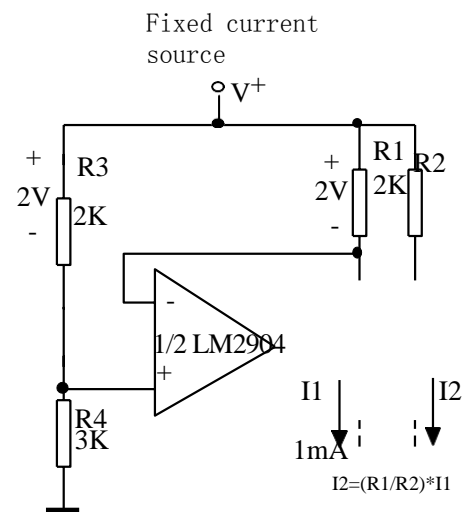
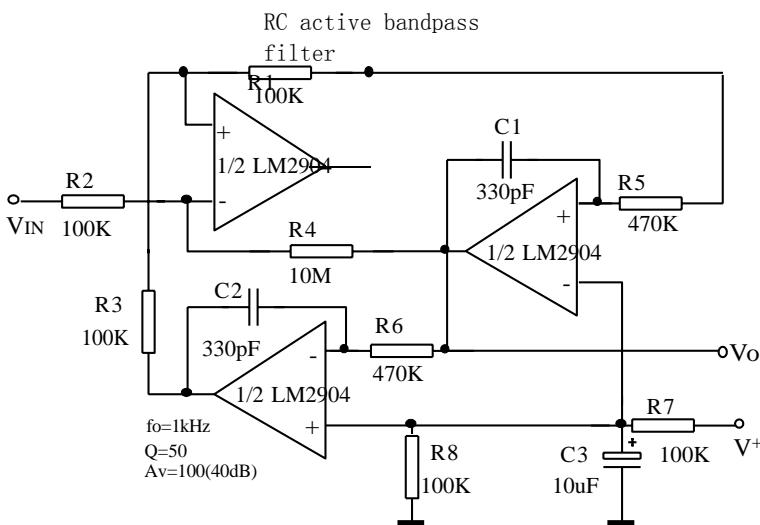
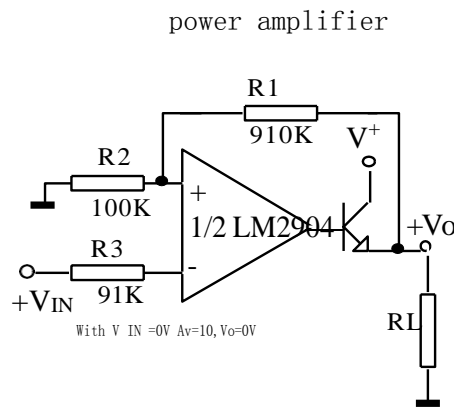
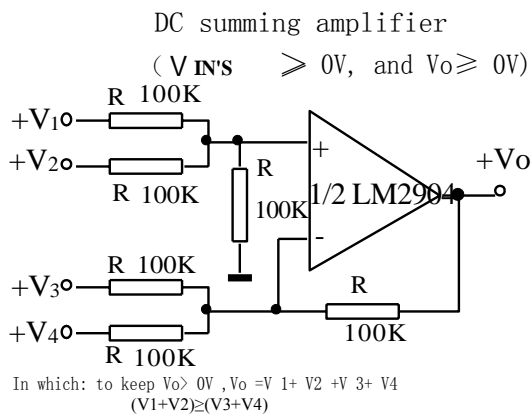
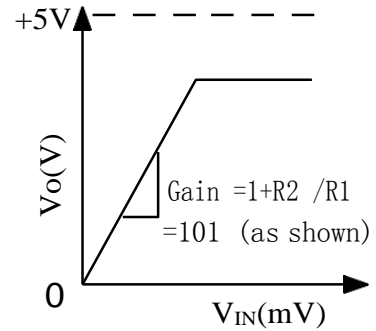
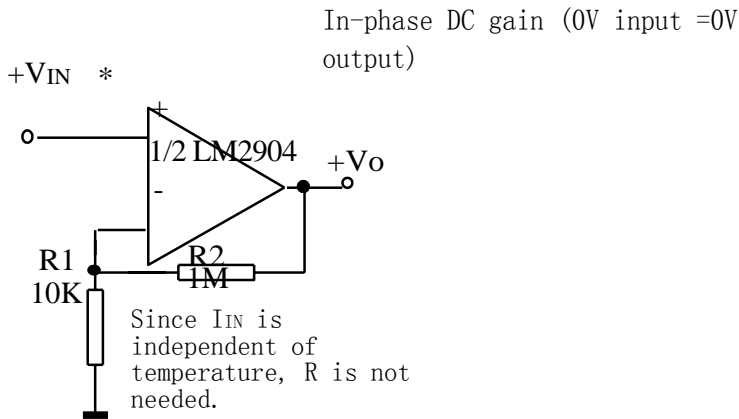
Limit value (absolute maximum rating, if not otherwise specified, Tamb=25°C)

| parameter name | | value | unit |
|-----------------------------------------------------------------------------------------------|-------------|-----------|------|
| voltage | | 26 or 13 | V |
| Differential input voltage | | 26 | V |
| Input voltage | | -0.3~36 | V |
| Power consumption (Note 1) | DIP package | 550 | mW |
| | SOP package | 530 | |
| Output short-circuit current to ground (1 amplifier) (Note 2) (V ⁺ ≤ 15V, Ta=25°C) | | continued | |
| Input current (VIN < -0.3V) (Note 3) | | 50 | mA |
| Working temperature | | -25~85 | °C |
| Storage temperature | | -65~150 | °C |

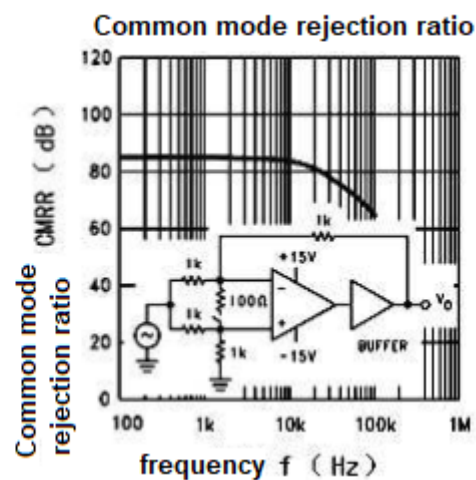
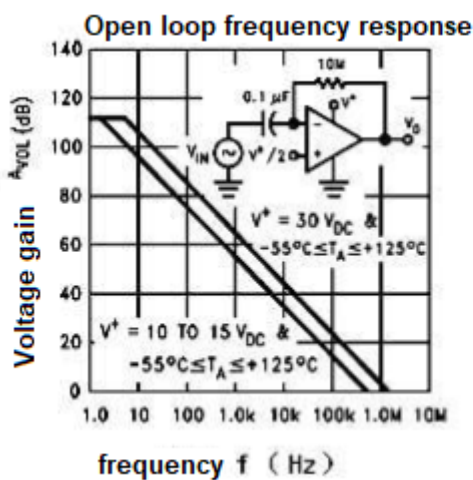
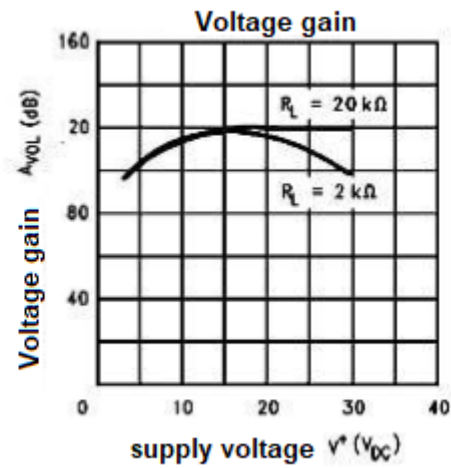
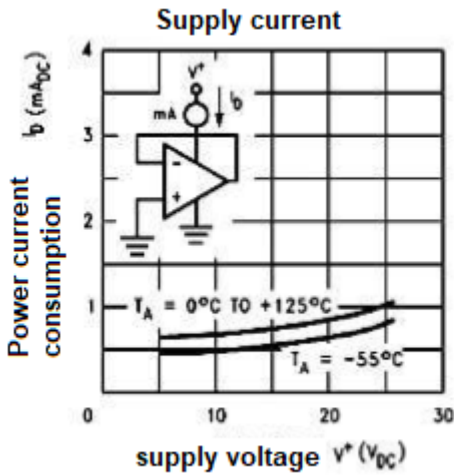
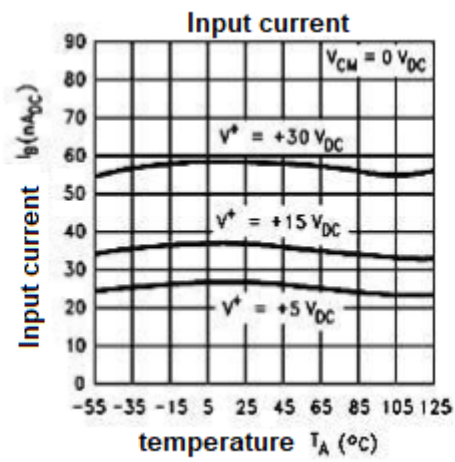
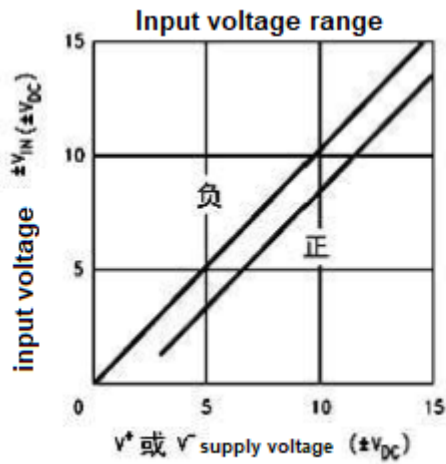
Electrical characteristics (if not otherwise specified, $V^+=5.0V$)

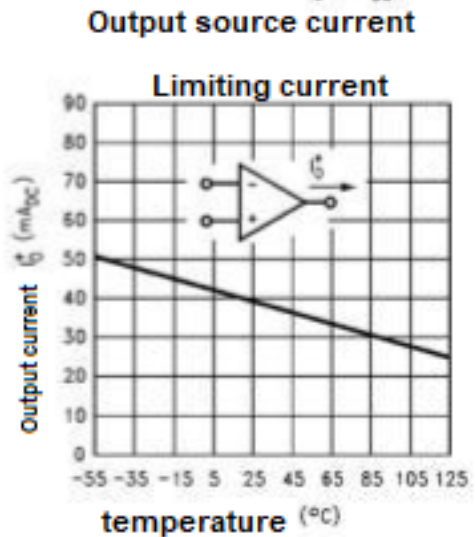
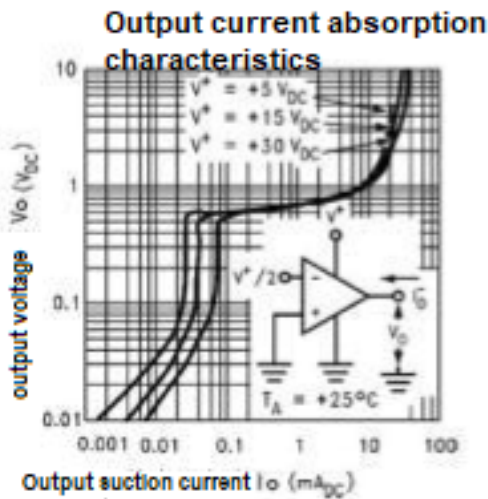
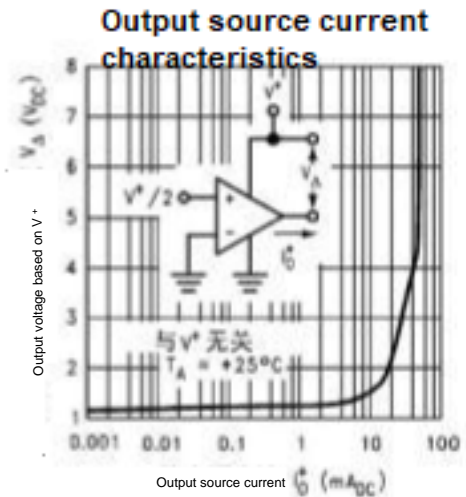
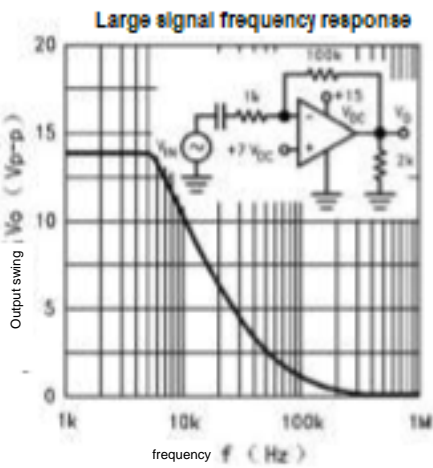
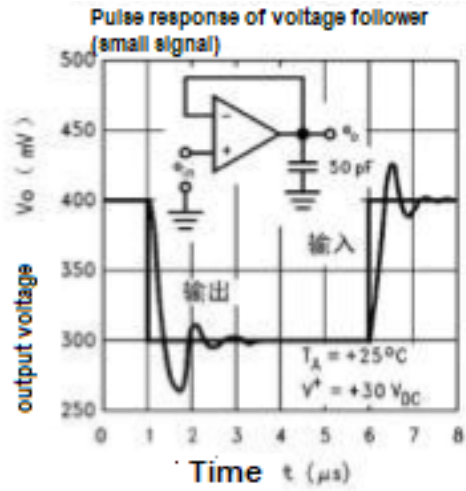
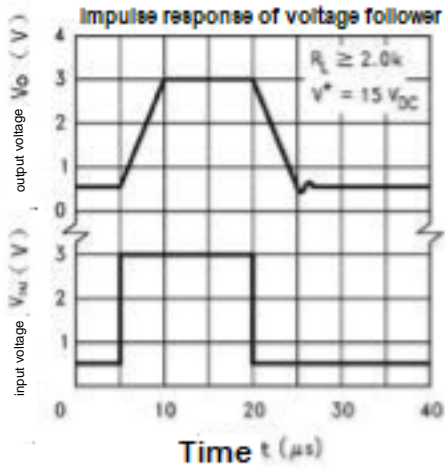
| Features | Test Conditions | | Specification value | | | Unit |
|-------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------|------|-----------|------------------------------|
| | | | MIN | TYP | MAX | |
| Input offset voltage | $T_a = 25$ | | | 2 | 5 | mV |
| input bias current | $T_a = 25\text{ }^\circ\text{C}$, $I_{IN(+)}$ or $I_{IN(-)}$, $V_{CM} = 0V$ | | | 45 | 150 | nA |
| Input offset current | $T_a=25\text{ }^\circ\text{C}$, $I_{IN(+)} - I_{IN(-)}$, $V_{CM}=0V$ | | | 3 | 30 | nA |
| Input Common Mode Voltage Range | $T_a=25\text{ }^\circ\text{C}$, $V^+=30V$ | | 0 | | $V^+-1.5$ | V |
| supply current | Over the entire temperature range, $R_L = \infty$ on all operational amplifiers | $V^+=30V$ | | 1 | 2 | mA |
| | | $V^+=5V$ | | 0.5 | 1.2 | |
| Large signal voltage gain | $V^+ = 15V$, $T_a=25\text{ }^\circ\text{C}$, $R_L \geq 2k\Omega$ (for $V_o=1\sim 11V$) | | 50 | 100 | | V/mV |
| Common Mode Rejection Ratio | DC, $T_a=25\text{ }^\circ\text{C}$, $V_{CM}=0\sim V^+-1.5V$ | | 70 | 85 | | dB |
| power supply rejection ratio | DC, $T_a=25\text{ }^\circ\text{C}$, $V^+=5\sim 30V$ | | 65 | 100 | | dB |
| Coupling system between amplifiers number | $T_a=25\text{ }^\circ\text{C}$, $f=1\sim 20\text{kHz}$ (all inputs) | | | -120 | | dB |
| Output source current | $V_{IN(+)}=1V$, $V_{IN(-)}=0V$, $V^+=15V$, $V_o=2V$, $T_a=25\text{ }^\circ\text{C}$ | | 20 | 40 | | mA |
| output current sink | $V_{IN(-)}=1V$, $V_{IN(+)}=0V$, $V^+=15V$, $V_o=2V$, $T_a=25\text{ }^\circ\text{C}$ | | 10 | 20 | | mA |
| | $V_{IN(-)}=1V$, $V_{IN(+)}=0V$, $V^+=15V$, $V_o=200\text{mV}$, $T_a=25\text{ }^\circ\text{C}$ | | 12 | 50 | | μA |
| short-circuit current to ground | $V^+=15V$, $T_a=25\text{ }^\circ\text{C}$ | | | 40 | 60 | mA |
| Input offset voltage | | | | | 7 | mV |
| Input offset voltage drift | $R_s=0\Omega$ | | | 7 | | $\mu\text{V}/^\circ\text{C}$ |
| Input offset current | $I_{IN(+)} - I_{IN(-)}$ | | | | 100 | on |
| Input offset current drift | $R_s=0\Omega$ | | | 10 | | $\text{pA}/^\circ\text{C}$ |
| Input bias current | $I_{IN(+)}$ or $I_{IN(-)}$ | | | 40 | 300 | nA |
| Input Common Mode Voltage Range | $V^+=30V$ | | 0 | | V^+-2 | V |
| Large signal voltage gain | $V^+ = 15V$, ($V_o = 1 \sim 11V$), | | 25 | | | V/mV |
| Output voltage swing | V_{OH} | $V^+=30V$ | $R_L=2k\Omega$ | 26 | | V |
| | | | $R_L=10k\Omega$ | 27 | 28 | V |
| | V_{OL} | $V^+=5V$, $R_L=10k\Omega$ | | 5 | 20 | mV |
| Output current | source current | $V_{IN(+)}=1V$, $V_{IN(-)}=0V$, $V^+=15V$, $V_o=2V$ | 10 | 20 | | mA |
| | current sink | $V_{IN(-)}=1V$, $V_{IN(+)}=0V$, $V^+=15V$, $V_o=2V$ | 5 | 8 | | mA |

typical application

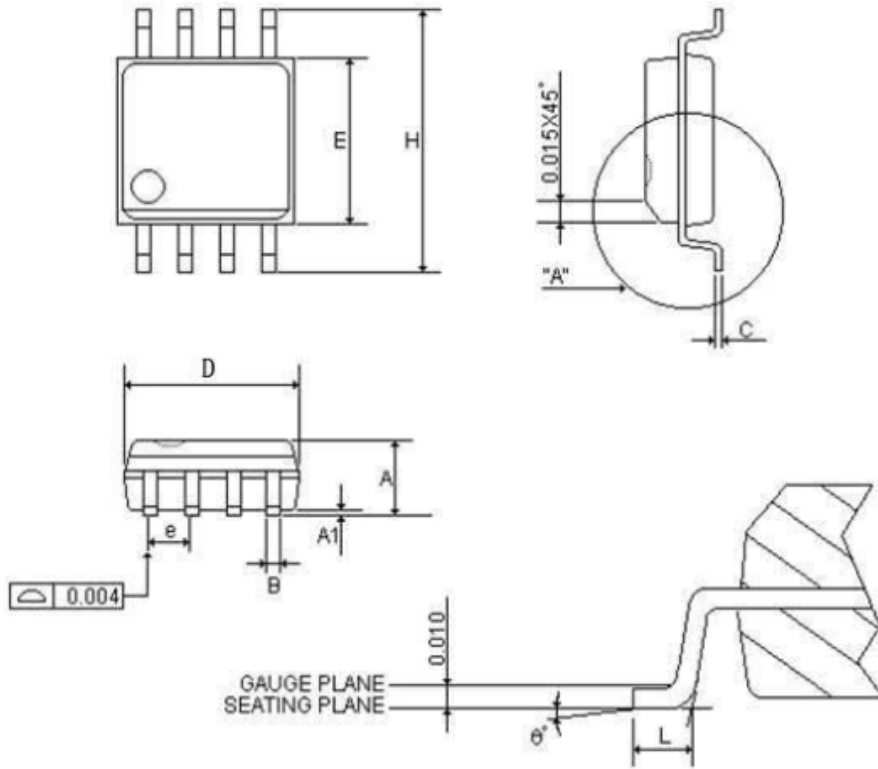


Typical characteristic curve





SOP 8



| SYMBOLS | MIN | NOR | MAX | MIN | NOR | MAX |
|---------|--------|-------|--------|--------|--------|--------|
| | (inch) | | | (mm) | | |
| A | 0.058 | 0.064 | 0.068 | 1.4732 | 1.6256 | 1.7272 |
| A1 | 0.004 | - | 0.010 | 0.1016 | - | 0.254 |
| B | 0.013 | 0.016 | 0.020 | 0.3302 | 0.4064 | 0.508 |
| C | 0.0075 | 0.008 | 0.0098 | 0.1905 | 0.2032 | 0.2490 |
| D | 0.186 | 0.191 | 0.196 | 5.9944 | 6.1214 | 6.1976 |
| E | 0.150 | 0.154 | 0.157 | 3.81 | 3.9116 | 3.9878 |
| e | - | 0.050 | - | - | 1.27 | - |
| H | 0.228 | 0.236 | 0.244 | 5.7912 | 5.9944 | 6.1976 |
| L | 0.015 | 0.025 | 0.050 | 0.381 | 0.635 | 1.27 |
| 0° | 0° | - | 8° | 0° | - | 8° |