

## Features

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- Internally frequency compensated for unity gain
- Large DC voltage gain: 100dB
- Wide power supply range: 3V ~ 32V (or  $\pm 1.5V \sim \pm 16V$ )
- Input common-mode voltage range includes ground
- Large output voltage swing: 0V DC to VCC-1.5V DC
- Power drain suitable for battery operation
- Low input offset voltage and offset current
- Differential input voltage range equal to the power supply voltage

## Description

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The CBM2902 contains four independent high gain operational amplifiers with internal frequency compensation. The four op-amps operate over a wide voltage range from a single power supply. Also use a split power supply. The device has low power supply current drain, regardless of the power supply voltage. The low power drain also makes the CBM2902 a good choice for battery operation.

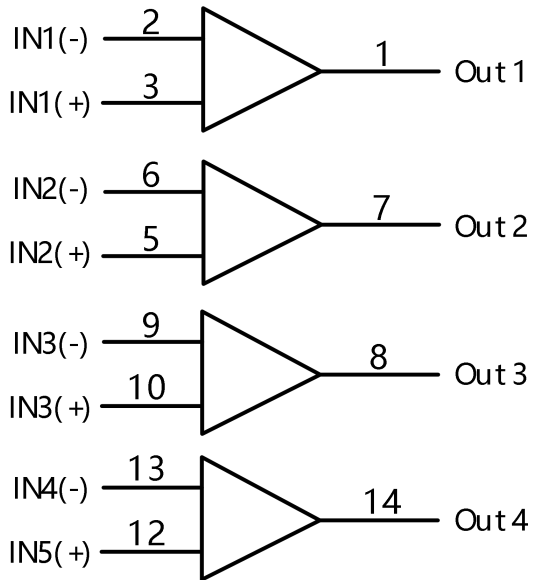
When your project calls for a traditional op-amp function, now you can streamline your design with a simple single power supply. Use ordinary +5V DC common to practically any digital system or personal computer application, without requiring an extra 15V power supply just to have the interface electronics you need.

The CBM2902 is a versatile, rugged workhorse with a thousand-and-one uses, from amplifying signals from a variety of transducers to dc gain blocks, or any op-amp function. The attached pages offer some recipes that will have your project cooking in no time.

## CATALOG

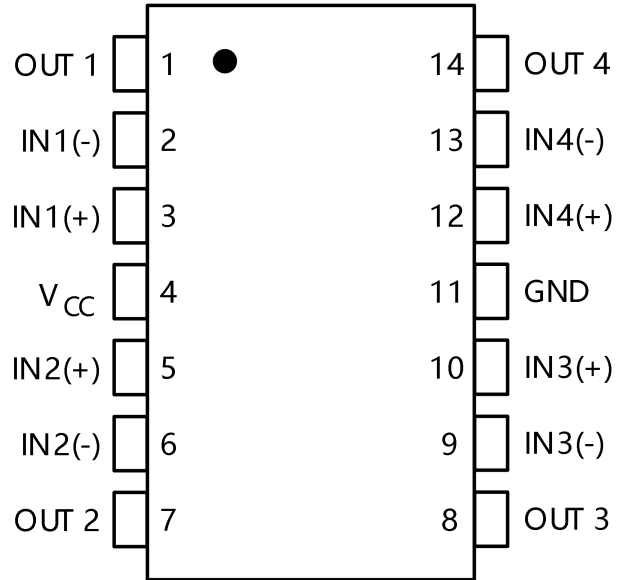
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## Logic Diagram



PIN 4 =  $V_{CC}$   
PIN 11 = GND

## Pin Configurations



## Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
$V_{CC}$	DC Supply Voltage	$\pm 2.5$ or 5.0	$\pm 15$ or 30	V
$T_A$	Operating Temperature, All Package Types	-40	+105	$^{\circ}\text{C}$

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation,  $V_{IN}$  and  $V_{OUT}$  should be constrained to the range  $G_{ND} \leq (V_{IN} \text{ or } V_{OUT}) \leq V_{CC}$ .

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either  $G_{ND}$  or  $V_{CC}$ ).

Unused outputs must be left open.

## Maximum Ratings\*

Symbol	Parameter	Value	Unit
$V_{CC}$	Power Supply Voltages • Single Supply • Split Supplies	32 $\pm 16$	V
$V_{IDR}$	Input Differential Voltage Range (1)	$\pm 32$	V
$V_{ICR}$	Input Common Mode Voltage Range	-0.3 to 32	V
$I_{SC}$	Output Short Circuit Duration	Continuous	
$T_J$	Junction Temperature (Plastic Packages)	150	$^{\circ}C$
$T_{stg}$	Storage Temperature (Plastic Packages)	-55 to +125	$^{\circ}C$
$I_{IN}$	Input Current, per pin (2)	50	mA
$T_L$	Lead Temperature, 1mm from Case for 10 Seconds	260	$^{\circ}C$

\* Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device.

These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Functional operation should be restricted to the Recommended Operating Conditions.

+Derating - Plastic DIP : - 10 mW/ $^{\circ}C$  from 65 $^{\circ}$  to 125 $^{\circ}C$

SOIC Package : - 7 mW/ $^{\circ}C$  from 65 $^{\circ}$  to 125 $^{\circ}C$

### Notes:

1.Split Power Supplies.

2. $V_{IN} < -0.3V$ . This input current will only exist when voltage at any of the input leads is driven negative.

## DC ELECTRICAL CHARACTERISTICS (TA=-40 to +105 °C)

Symbol	Parameter	Test Conditions	Guaranteed Limit			Unit
			Min	Typ	Max	
V <sub>IO</sub>	Maximum Input Offset Voltage	V <sub>O</sub> =1.4V V <sub>CC</sub> =5.0-30V; R <sub>S</sub> =0Ω			9.0	mV
		V <sub>ICM</sub> =0V to V <sub>CC</sub> -1.7V			5.0*	
ΔV <sub>IO</sub> /ΔT	Input Offset Voltage Drift	R <sub>S</sub> =0Ω, V <sub>CC</sub> =30V		7.0		μV/°C
I <sub>IO</sub>	Maximum Input Offset Current	V <sub>CC</sub> =5.0V			150	nA
					50*	
ΔI <sub>IO</sub> /ΔT	Input Offset Current Drift	R <sub>S</sub> =0Ω, V <sub>CC</sub> =30V		10		pA/°C
I <sub>IB</sub>	Maximum Input Bias Current	V <sub>CC</sub> = 5.0V			500	nA
					250*	
V <sub>ICR</sub>	Input Common Mode Voltage Range	V <sub>CC</sub> = 30V	0		28	V
I <sub>CC</sub>	Maximum Power Supply Current	R <sub>L</sub> =∞, V <sub>CC</sub> =30V, V <sub>O</sub> =0V			3	mA
		R <sub>L</sub> =∞, V <sub>CC</sub> =5V, V <sub>O</sub> =0V			1.2	
A <sub>VOL</sub>	Minimum Large Signal Open-Loop Voltage Gain	V <sub>CC</sub> = 15V, R <sub>L</sub> ≥ 2KΩ	15			V/mV
			25*			
V <sub>OH</sub>	Minimum Output	V <sub>CC</sub> =30V, R <sub>L</sub> =2KΩ	26			V
	High-Level Voltage Swing	V <sub>CC</sub> =30V, R <sub>L</sub> =10KΩ	27			
V <sub>OL</sub>	Maximum Output Low-Level Voltage Swing	V <sub>CC</sub> =5V, R <sub>L</sub> =10KΩ			20	mV
C <sub>MR</sub>	Common Mode Rejection	V <sub>CC</sub> =30V, R <sub>S</sub> =10KΩ	65*			dB
P <sub>SR</sub>	Power Supply Rejection	V <sub>CC</sub> =30V	65*			dB
C <sub>S</sub>	Channel Separation	f=1KHz to 20KHz, V <sub>CC</sub> =30V	120			dB
I <sub>SC</sub>	Maximum Output Short Circuit to GND	V <sub>CC</sub> =5.0V			60*	mA
I <sub>source</sub>	Minimum Output Source Current	V <sub>IN+</sub> =1V, V <sub>IN-</sub> =0V, V <sub>CC</sub> =15V, V <sub>O</sub> =0V	10			mA
I <sub>sink</sub>	Minimum Output Sink Current	V <sub>IN+</sub> =0V, V <sub>IN-</sub> =1V, V <sub>CC</sub> =15V,	5			mA
		V <sub>O</sub> =15V	10*			
		V <sub>IN+</sub> =0V, V <sub>IN-</sub> =1V, V <sub>CC</sub> =15V, V <sub>O</sub> =0.2V	12*			μA
V <sub>IDR</sub>	Differential Input Voltage Range	All V <sub>IN</sub> ≥ GND or V-Supply (if used)			V <sub>CC</sub> *	V

\*=@25°C

## Typical Characteristics

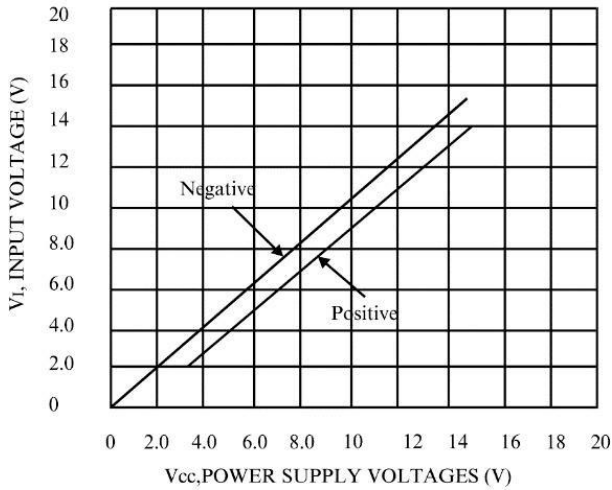
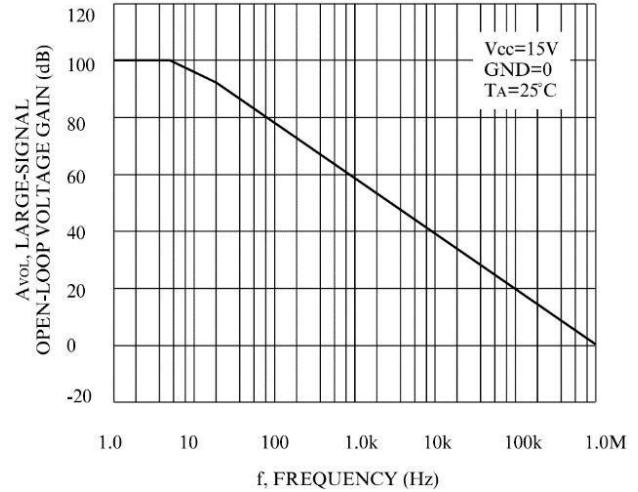


Figure 1. Input Voltage Range Figure



2. Open-Loop Frequency

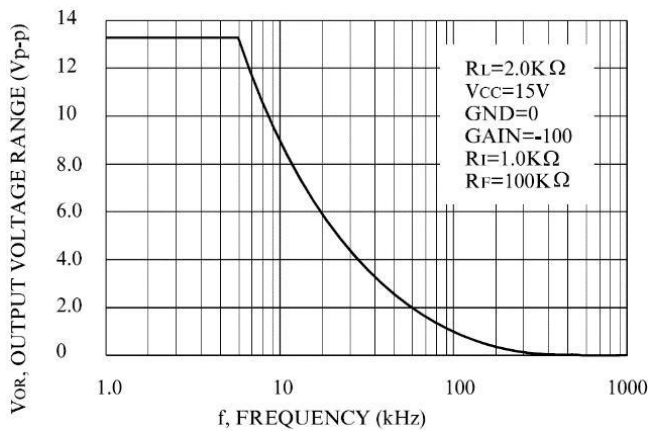


Figure 3. Large-Signal Frequency Response

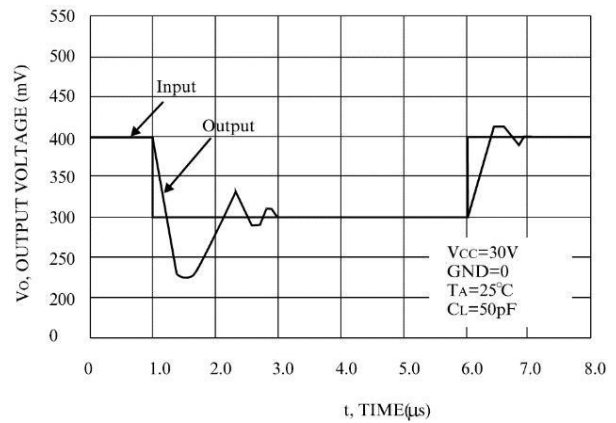


Figure 4. Small-Signal Voltage Follower Pulse Response (Noninverting)

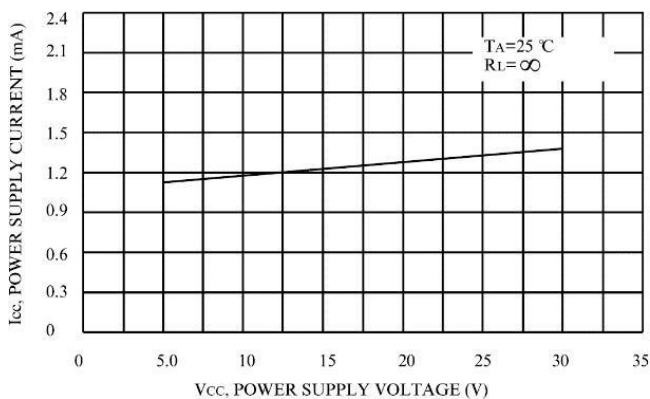


Figure 5. Power Supply Current versus Power Supply Voltage

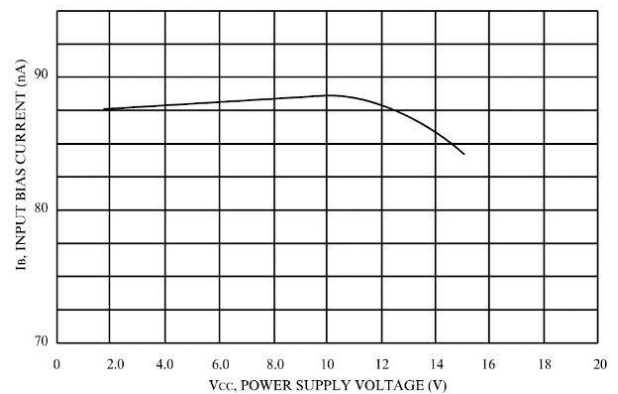
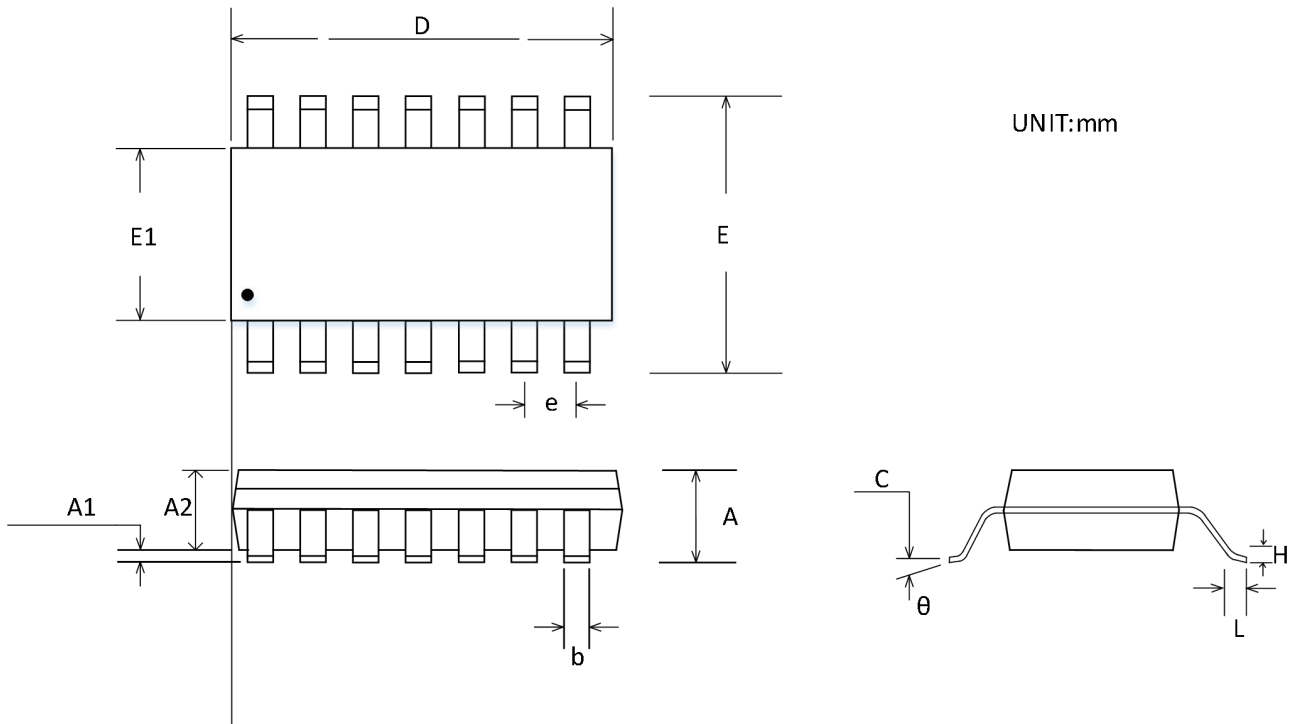


Figure 6. Input Bias Current versus Power Supply Voltage

## Package Outline Dimensions

### SOIC-14(SOP14)



Symbol	Dimensions In Millimeters		Dimensions Inches	
	Min	Max	Min	Max
<b>A</b>	1.350	1.750	0.053	0.069
<b>A1</b>	0.100	0.250	0.004	0.010
<b>A2</b>	1.350	1.550	0.053	0.061
<b>b</b>	0.310	0.510	0.012	0.020
<b>c</b>	0.100	0.250	0.004	0.010
<b>D</b>	8.450	8.850	0.333	0.348
<b>E</b>	5.800	6.200	0.228	0.244
<b>E1</b>	3.800	4.000	0.150	0.157
<b>e</b>	1.270 BSC		0.050 BSC	
<b>L</b>	0.400	1.270	0.016	0.050
<b>θ</b>	0°	8°	0°	8°

## Package/Ordering Information

PRODUCT	ORDERING NUMBER	TEMPRANGE	PACKAGE	PAKEAGE MARKING	TRANSPOT MEDIA, QUANTILY
CBM2902	CBM2902AS14	-40°C~105°C	SOP-14	CBM2902A	Tape and Reel,2500
	CBM2902ATS14	-40°C~105°C	TSSOP-14	CBM2902AT	Tape and Reel,3000