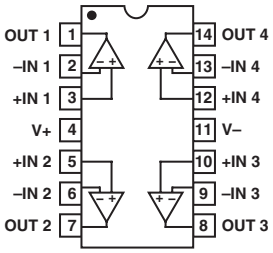
Quad Micropower Operational Amplifier

OP420

FEATURES

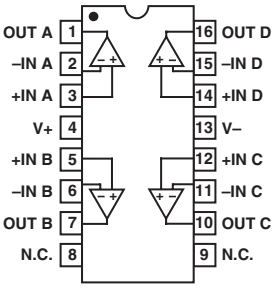
Low Supply Current: 200 μA Max @ V_S = 5 V
Single-Supply Operation: 5 V to 30 V
Dual-Supply Operation: 2.5 V to 15 V
Low Input Offset Voltage: 500 μV Typ
Low Input Offset Voltage Drift: 5 μV/°C Typ
High Common-Mode Input Range: V– to (V+ – 1.5 V)
High CMRR: 100 dB Typ
High Open-Loop Gain: 1100 V/mV Typ
LM 148 Pinout

PIN CONNECTIONS



14-Pin Hermetic DIP
(Y-Suffix)

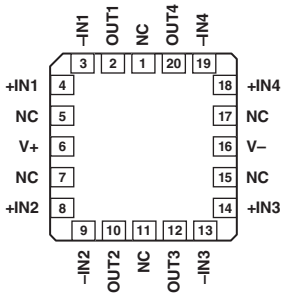
14-Pin Epoxy DIP
(P-Suffix)



16-Pin SOL
(S-Suffix)

GENERAL DESCRIPTION

The OP420 quad micropower operational amplifier is a single-chip quad patterned after the OP20 precision micropower single operational amplifier. A Darlington PNP input stage allows the input common-mode voltage to include V–. The wide input range combined with low power supply drain (~40 μA/section at 5 V) provides a unique solution for designs requiring high functional density and portable operation. Applications include 2-wire transmitters for process control loops, battery-operated remote-line filters, signal preconditioning amplifiers, and a variety of multiple-gain block arrays.



OP420CRC/883
20-Lead LCC
(RC-Suffix)

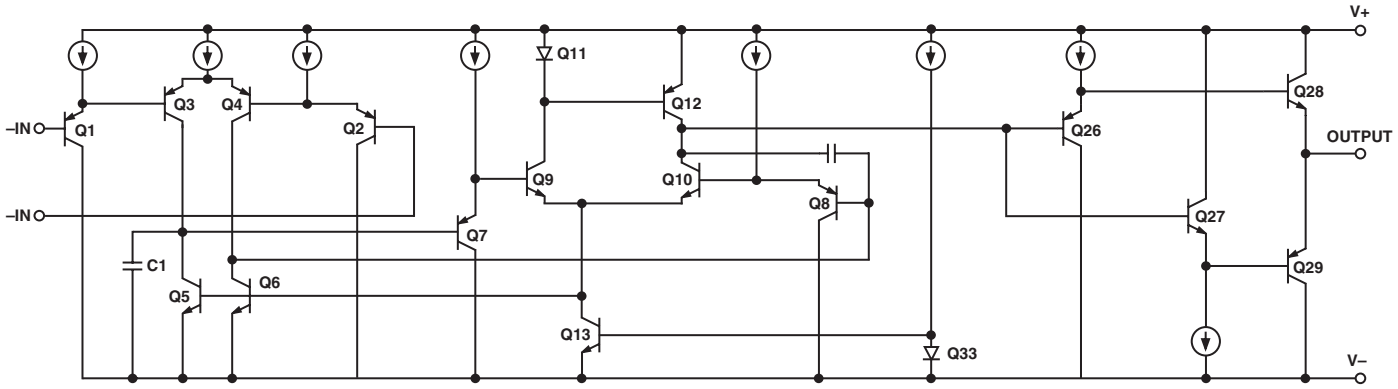


Figure 1. Simplified Schematic (1/4 Shown)

REV. A

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OP420–SPECIFICATIONS

ELECTRICAL CHARACTERISTICS (V_S = ±15 V, TA = 25°C, unless otherwise noted.)

Parameter	Symbol	Conditions	OP420C OP420G Min	Typ	Max	Unit
INPUT OFFSET VOLTAGE	V_{OS}	V_S = ±2.5 V to ±15 V		1	4	mV
INPUT OFFSET CURRENT*	I_{OS}	V_S = ±2.5 V to ±15 V		0.8	2.5	nA
INPUT BIAS CURRENT*	I_B	V_S = ±2.5 V to ±15 V		12	30	nA
INPUT NOISE VOLTAGE DENSITY	e_n	f_O = 10 Hz f_O = 100 Hz		50 50		nV/$\sqrt{\text{Hz}}$ nV/$\sqrt{\text{Hz}}$
INPUT NOISE CURRENT DENSITY	i_n	f_O = 10 Hz f_O = 100 Hz		0.12 0.12		pA/$\sqrt{\text{Hz}}$ pA/$\sqrt{\text{Hz}}$
INPUT VOLTAGE RANGE	IVR	V+ = 5 V, V– = 0 V V_S = ±15 V	0/3.5 –15/13.5			V V
COMMON-MODE REJECTION RATIO	CMRR	V+ = 5 V, V– = 0 V 0 V ≤ V_{CM} ≤ 3.5 V V_S = ±15 V –15 V ≤ V_{CM} ≤ 13.5 V	 80 80	 96 96		 dB dB
POWER SUPPLY REJECTION RATIO	PSRR	V_S = ±2.5 V to ± 15 V, V– = 0 V, V+ = 5 V to 30 V		20	50	µV/V
LARGE SIGNAL VOLTAGE GAIN	A_{VO}	R_L = 25 kΩ, V_O = ±10 V	 400	 900		 V/mV
SLEW RATE	SR			0.05		V/µs
CLOSED-LOOP BANDWIDTH	BW	A_{VCL} = 1.0 R_L = 10 kΩ		150 150		kHz kHz
OUTPUT VOLTAGE SWING	V_O	V+ = 5 V, V– = 0 V, R_L = 10 kΩ V_S = ±15 V R_L = 25 kΩ	 0.8/4.0 ±14.0			 V V
SUPPLY CURRENT (Four Amplifiers)	I_{SY}	V_S = ±2.5 V, No Load V_S = ±15 V, No Load	—	170 360	300 460	µA µA

NOTE
*I_{OS} and I_B are measured at V_{CM} = 0°.

Specifications subject to change without notice.

ELECTRICAL CHARACTERISTICS

(V_S = ±15 V, –55°C ≤ +125°C for OP420C, –40°C ≤ T_A ≤ +85°C for OP420G, unless otherwise noted.)

Parameter	Symbol	Conditions	OP420C/OP420G Min	Typ	Max	Unit
AVERAGE INPUT OFFSET Voltage Drift[1]	TCV_{OS}	Unnulled		8	15	µV°C
INPUT OFFSET						
VOLTAGE	V_{OS}	V_S = ±2.5 V to ±15 V			5.5	mV
INPUT OFFSET						
CURRENT[2]	I_{OS}	V_S = ±2.5 V to ±15 V			4	nA
INPUT BIAS CURRENT[2]	I_B	V_S = ±2.5 V to ±15 V			40	nA
INPUT VOLTAGE RANGE	IVR	V+ = 5 V, V– = 0 V V_S = ±15 V	0/3.2 –15/13.2			V V
COMMON-MODE Rejection Ratio	CMRR	V+ = 5 V, V– = 0 V, 0 V ≤ V_{CM} ≤ 3.2 V V_S = ±15 V –15 V ≤ V_{CM} ≤ 13.2 V	73 73	92 92		dB dB
POWER SUPPLY Rejection Ratio	PSRR	V_S = ±2.5 V to ±15 V, V– = 0 V, V+ = 5 V to 30 V		25	80	µV/V
LARGE-SIGNAL VOLTAGE GAIN	A_{VO}	V_S = ±15 V, R_L = 50 kΩ, V_O = 10 V	200	650		V/mV
OUTPUT VOLTAGE SWING	V_O	V+ = 5 V, V– = 0 V, R_L = 20 kΩ V_S = ±15 V, R_L = 50 kΩ	1.0/3.8 ±13.8			V V
SUPPLY CURRENT (Four Amplifiers)	I_{SY}	V_S = ±2.5 V, No Load V_S = ±15 V, No Load		210 420	400 640	µA µA

NOTES
[1]Sample tested.
[2]I_{OS} and I_B are measured at V_{CM} = 0°.

ABSOLUTE MAXIMUM RATINGS[1]

Supply Voltage . . . . . ±18 V
Differential Input Voltage . . . . . ±30 V
Input Voltage . . . . . Supply Voltage
Output Short-Circuit Duration . . . . . Continuous
. . . . . (One Amplifier Only)
Storage Temperature Range . . . . . –65°C to +150°C
Lead Temperature Range (Soldering, 60 sec) . . . . . 300°C
Operating Temperature Range
OP420CY, OP420CRC . . . . . –55°C to +125°C
OP420G . . . . . –40°C to +85°C
Junction Temperature (T_J) . . . . . –65°C to +150°C

Package Type	θ_{JA}[2]	θ_{JC}	Unit
14-Pin Hermetic DIP (Y)	99	12	°C/W
14-Pin Plastic DIP (P)	76	33	°C/W
16-Pin SOL (S)	92	27	°C/W

NOTES
[1]Absolute Maximum Ratings apply to packaged parts, unless otherwise noted.
[2]θ_{JA} is specified for worst-case mounting conditions, i.e., θ_{JA} is specified for device in socket for CerDIP and P-DIP packages; θ_{JA} is specified for device soldered to printed circuit board for SOL package.

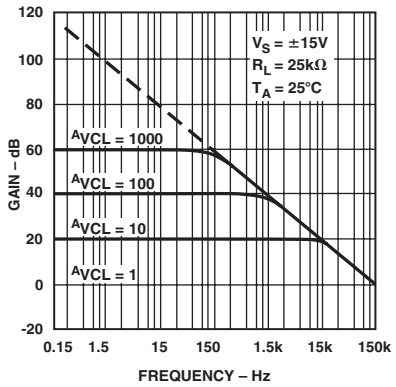
ORDERING GUIDE

	Package Options			
T_A = 25°C V_{OS} Max (mV)	**Cer DIP 14-Pin**	**LCC 20-Contact**	**Plastic**	**Operating Temperature Range**
4.0	OP420CY*	OP420CRC/883		MIL
4.0			OP420GP*	XIND
4.0			OP420GS*	XIND

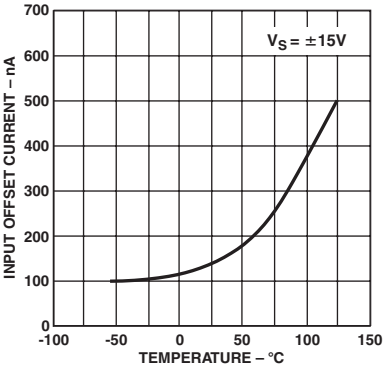
*Not for new design; obsolete April 2002.

CAUTION

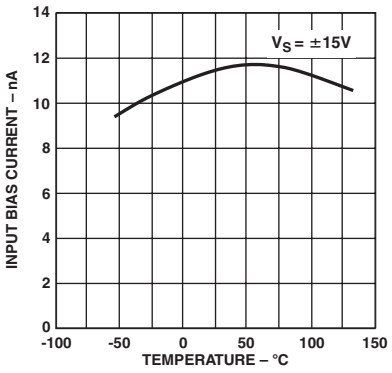
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the OP420 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high-energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



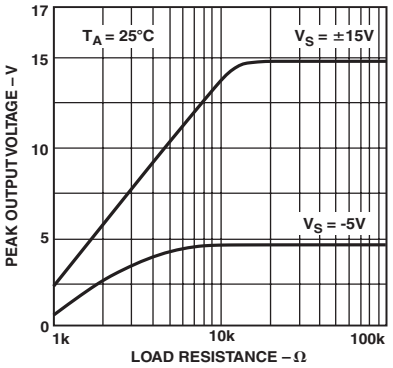
TPC 1. Closed-Loop Gain vs. Frequency



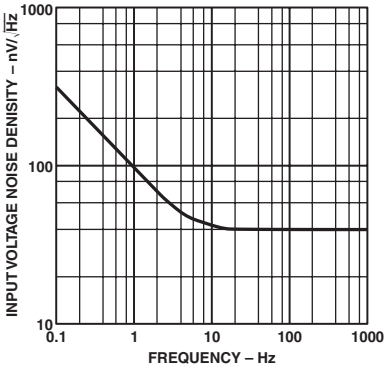
TPC 2. Input Offset Current vs. Temperature



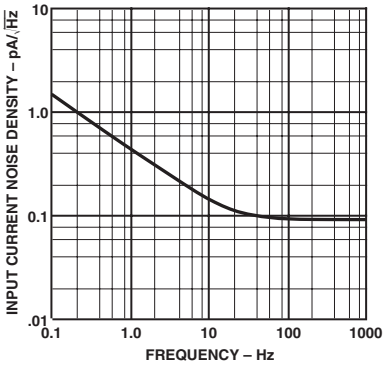
TPC 3. Input Bias Current vs. Temperature



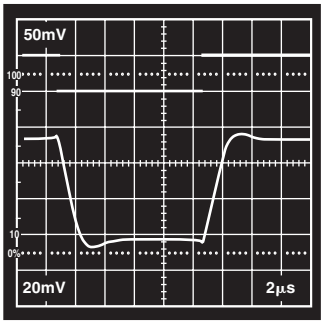
TPC 4. Maximum Output Voltage vs. Load Resistance



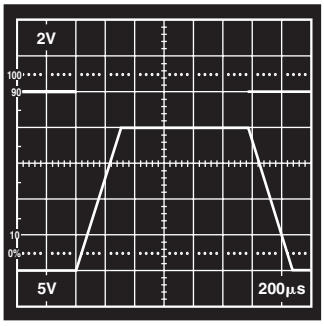
TPC 5. Input Voltage Noise Density (e_n) vs. Frequency



TPC 6. Input Current Noise Density (i_n) vs. Frequency



TPC 7. Small-Signal Transient Response



TPC 8. Large-Signal Transient Response

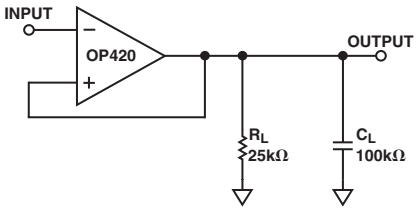


Figure 2. Small-Signal Transient Response

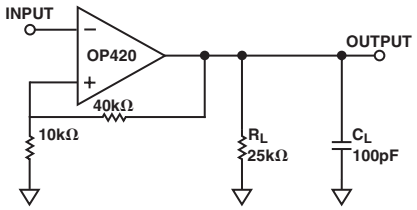
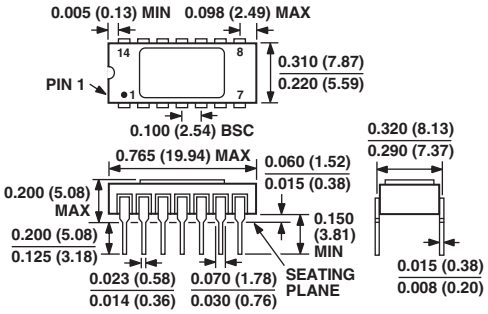


Figure 3. Large-Signal Transient Response

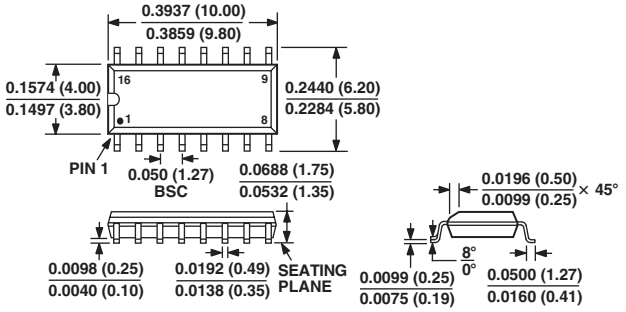
OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

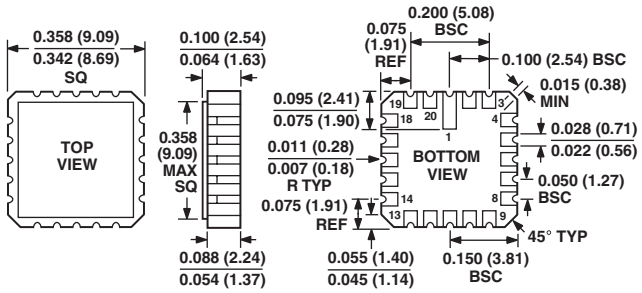
14-PIN HERMETIC DIP
14-PIN EPOXY DIP



16-PIN SOL



OP420CRC/883 20-LEAD LCC



Revision History

Location	Page
11/01—Data Sheet changed from REV. 0 to REV. A.	
Edits to GENERAL DESCRIPTION	1
Edits to ELECTRICAL CHARACTERISTICS	2, 3
Edits to ORDERING INFORMATION	4
Edits to ABSOLUTE MAXIMUM RATINGS	4
Deleted DICE CHARACTERISTICS	4
Deleted WAFER TEST LIMITS	4

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