Quad Micropower Operational Amplifier

OP420

FEATURES

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

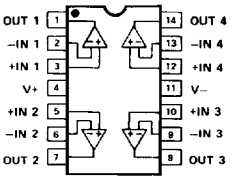
ORDERING INFORMATION †

T_A=+25°C V_{OS} MAX (mV)	PACKAGE CERDIP 14-PIN	PACKAGE LCC 20-CONTACT	PACKAGE PLASTIC	OPERATING TEMPERATURE RANGE
2.5	OP420BY	–	–	MIL
2.5	OP420FY	–	–	IND
4.0	OP420CY	OP420CRC/883	–	MIL
4.0	OP420GY	–	OP420GP	XIND
4.0	–	–	OP420GS	XIND
6.0	OP420HY	–	OP420HP	XIND
6.0	–	–	OP420HS	XIND

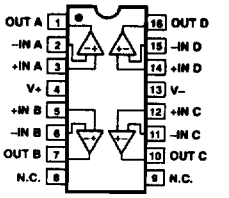
* For devices processed in total compliance to MIL-STD-883, add /883 after part number. Consult factory for 883 data sheet.

† Burn-in is available on commercial and industrial temperature range parts in CerDIP, plastic DIP, and TO-can packages.

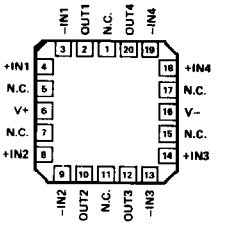
PIN CONNECTIONS



14-PIN HERMETIC DIP
(Y-Suffix)
14-PIN EPOXY DIP
(P-Suffix)



16-PIN SOL
(S-Suffix)



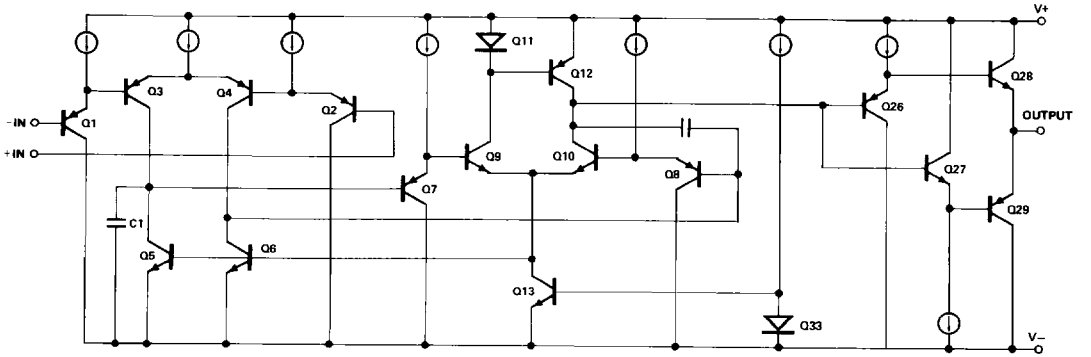
OP-420CRC/883
20-LEAD LCC
(RC-Suffix)

GENERAL DESCRIPTION

The OP-420 quad micropower operational amplifier is a single-chip quad patterned after the OP-20 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 (~40μA/section at 5V), provides a unique solution for designs requiring high functional density and portable operation. Applications include two-wire transmitters for process control loops, battery-operated remote-line filters, signal preconditioning amplifiers, and a variety of multiple-gain block arrays.

For micropower applications requiring offset nulling, see the OP-20, OP-21 and OP-22 data sheets.

SIMPLIFIED SCHEMATIC (1/4 Shown)



This is an abridged data sheet. To obtain the most recent version or complete data sheet, call our fax retrieval system at 1-800-446-6212.

ABSOLUTE MAXIMUM RATINGS (Note 1)

Supply Voltage ..... ±18V
Differential Input Voltage ..... ±30V
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
OP-420BY, OP-420CY, OP-420CRC ..... –55°C to +125°C
OP-420FY ..... –25°C to +85°C
OP-420G, OP-420H ..... –40°C to +85°C
Junction Temperature(T_J) ..... –65°C to +150°C

PACKAGE TYPE	Θ_{JA} (Note 2)	Θ_{JC}	UNITS
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 both DICE and 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.

ELECTRICAL CHARACTERISTICS at $V_S = \pm 15V$, $T_A = +25°C$, unless otherwise noted.

			OP-420B OP-420F			OP-420C OP-420G			OP-420H			
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
Input Offset Voltage	V_{OS}	$V_S = \pm 2.5V$ to $\pm 15V$	—	0.5	2.5	—	1	4	—	2	6	mV
Input Offset Current (Note 1)	I_{OS}	$V_S = \pm 2.5V$ to $\pm 15V$	—	0.5	1.5	—	0.8	2.5	—	1.2	6	nA
Input Bias Current (Note 1)	I_B	$V_S = \pm 2.5V$ to $\pm 15V$	—	9	20	—	12	30	—	18	40	nA
Input Noise Voltage Density	e_n	$f_O = 10Hz$ $f_O = 100Hz$	—	50	—	—	50	—	—	50	—	$nV/\sqrt{Hz}$
Input Noise Current Density	i_n	$f_O = 10Hz$ $f_O = 100Hz$	—	0.12	—	—	0.12	—	—	0.12	—	$pA/\sqrt{Hz}$
Input Voltage Range	IVR	V+ = +5V, V– = 0V $V_S = \pm 15V$	0/3.5 –15/13.5	—	—	0/3.5 –15/13.5	—	—	0/3.5 –15/13.5	—	—	V
Common-Mode Rejection Ratio	CMRR	V+ = +5V, V– = 0V $0V \le V_{CM} \le 3.5V$ $V_S = \pm 15V$ $-15V \le V_{CM} \le 13.5V$	83 83	100 100	—	80 80	96 96	—	76 76	90 90	—	dB
Power Supply Rejection Ratio	PSRR	$V_S = \pm 2.5V$ to $\pm 15V$; & V– = 0V, V+ = 5V to 30V	—	10	30	—	20	50	—	30	80	μV/V
Large-Signal Voltage Gain	A_{VO}	$R_L = 25k\Omega$, $V_O = \pm 10V$	600	1100	—	400	900	—	200	800	—	V/mV
Slew Rate	SR		—	0.05	—	—	0.05	—	—	0.05	—	V/μs
Closed-Loop Bandwidth	BW	$A_{VCL} = +1.0$ $R_L = 10k\Omega$	—	150	—	—	150	—	—	150	—	kHz
Output Voltage Swing	V_O	V+ = 5V, V– = 0V, $R_L = 10k\Omega$ $V_S = \pm 15V$, $R_L = 25k\Omega$	0.7/4.1 ±14.0	—	—	0.8/4.0 ±14.0	—	—	0.9/3.8 ±13.8	—	—	V
Supply Current (Four Amplifiers)	I_{SY}	$V_S = \pm 2.5V$, No Load $V_S = \pm 15V$, No Load	— —	140 330	200 360	— —	170 360	300 460	— —	200 390	400 600	μA

NOTE:
1. I_B and I_{OS} are measured at $V_{CM} = 0$.

ELECTRICAL CHARACTERISTICS at $V_S = \pm 15V$, $-55°C \le +125°C$ for OP-420B and OP-420C, $-25°C \le T_A \le +85°C$ for OP-420F, $-40°C \le T_A \le +85°C$ for OP-420G and OP-420H, unless otherwise noted.

			OP-420B OP-420F			OP-420C OP-420G			OP-420H			
PARAMETER	**SYMBOL**	**CONDITIONS**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**UNITS**
Average Input Offset Voltage Drift (Note 1)	TCV_{OS}	Unnulled	—	5	10	—	8	15	—	15	25	µV/°C
Input Offset Voltage	V_{OS}	$V_S = \pm 2.5V$ to $\pm 15V$	—	—	3.5	—	—	5.5	—	—	7.5	mV
Input Offset Current (Note 2)	I_{OS}	$V_S = \pm 2.5V$ to $\pm 15V$	—	—	3	—	—	4	—	—	8	nA
Input Bias Current (Note 2)	I_B	$V_S = \pm 2.5V$ to $\pm 15V$	—	—	30	—	—	40	—	—	60	nA
Input Voltage Range	IVR	V+ = +5V, V− = 0V	0/3.2	—	—	0/3.2	—	—	0/3.2	—	—	V
		$V_S = \pm 15V$	−15/13.2	—	—	−15/13.2	—	—	−15/13.2	—	—	
Common-Mode Rejection Ratio	CMRR	V+ = +5V, V− = 0V, $0V \le V_{CM} \le 3.2V$	76	96	—	73	92	—	73	86	—	dB
		$V_S = \pm 15V$, $-15V \le V_{CM} \le 13.2V$	76	96	—	73	92	—	73	86	—	
Power Supply Rejection Ratio	PSRR	$V_S = \pm 2.5V$ to $\pm 15V$ and V− = 0V, V+ = 5V to 30V	—	15	50	—	25	80	—	40	100	µV/V
Large-Signal Voltage Gain	A_{VO}	$V_S = \pm 15V$, $R_L = 50k\Omega$, $V_O = \pm 10V$	300	800	—	200	650	—	100	400	—	V/mV
Output Voltage Swing	V_O	V+ = 5V, V− = 0V, $R_L = 20k\Omega$	0.9/3.9	—	—	1.0/3.8	—	—	1.1/3.6	—	—	V
		$V_S = \pm 15V$, $R_L = 50k\Omega$	±13.8	—	—	±13.8	—	—	±13.6	—	—	
Supply Current (Four Amplifiers)	I_{SY}	$V_S = \pm 2.5V$, No Load	—	170	300	—	210	400	—	250	600	µA
		$V_S = \pm 15V$, No Load	—	390	500	—	420	640	—	500	800	

NOTES:
1. Sample tested.
2. I_B and I_{OS} are measured at $V_{CM} = 0$.