

LF412

Low Offset, Low Drift Dual JFET Input Operational Amplifier

General Description

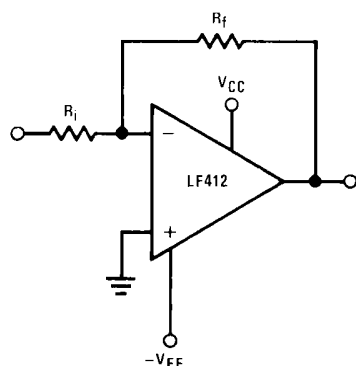
These devices are low cost, high speed, JFET input operational amplifiers with very low input offset voltage and guaranteed input offset voltage drift. They require low supply current yet maintain a large gain bandwidth product and fast slew rate. In addition, well matched high voltage JFET input devices provide very low input bias and offset currents. The LF412 dual is pin compatible with the LM1558, allowing designers to immediately upgrade the overall performance of existing designs.

These amplifiers may be used in applications such as high speed integrators, fast D/A converters, sample and hold circuits and many other circuits requiring low input offset voltage and drift, low input bias current, high input impedance, high slew rate and wide bandwidth.

Features

- Internally trimmed offset voltage: 1 mV (max)
- Input offset voltage drift: $10 \mu\text{V}/^\circ\text{C}$ (max)
- Low input bias current: 50 pA
- Low input noise current: $0.01 \text{ pA}/\sqrt{\text{Hz}}$
- Wide gain bandwidth: 3 MHz (min)
- High slew rate: $10\text{V}/\mu\text{s}$ (min)
- Low supply current: 1.8 mA/Amplifier
- High input impedance: $10^{12}\Omega$
- Low total harmonic distortion $\leq 0.02\%$
- Low 1/f noise corner: 50 Hz
- Fast settling time to 0.01%: 2 μs

Typical Connection



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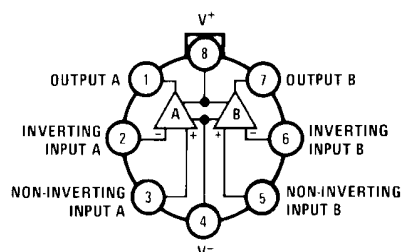
Ordering Information

LF412XYZ

- X** indicates electrical grade
- Y** indicates temperature range
"M" for military
"C" for commercial
- Z** indicates package type
"H" or "N"

Connection Diagrams

Metal Can Package

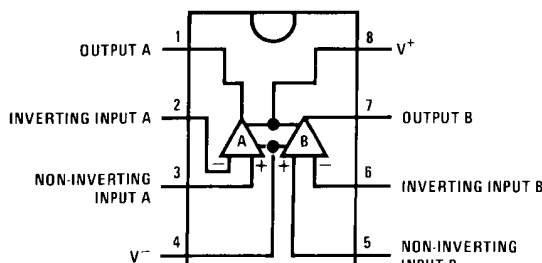


Note. Pin 4 connected to case.
TOP VIEW

Order Number LF412MH, LF412CH
See NS Package Number H08A
or LF412MH/883 (Note 1)
See NS Package Number H08C

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Dual-In-Line Package

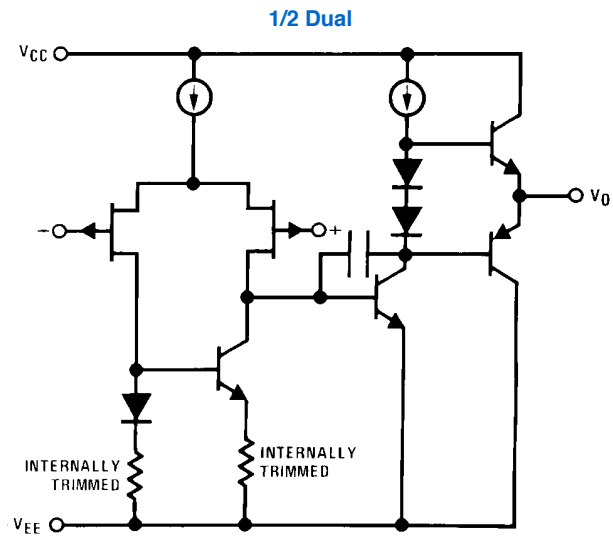


TOP VIEW

Order Number LF412ACN, LF412CN
or LF412MJ/883 (Note 1)
See NS Package Number J08A or N08E

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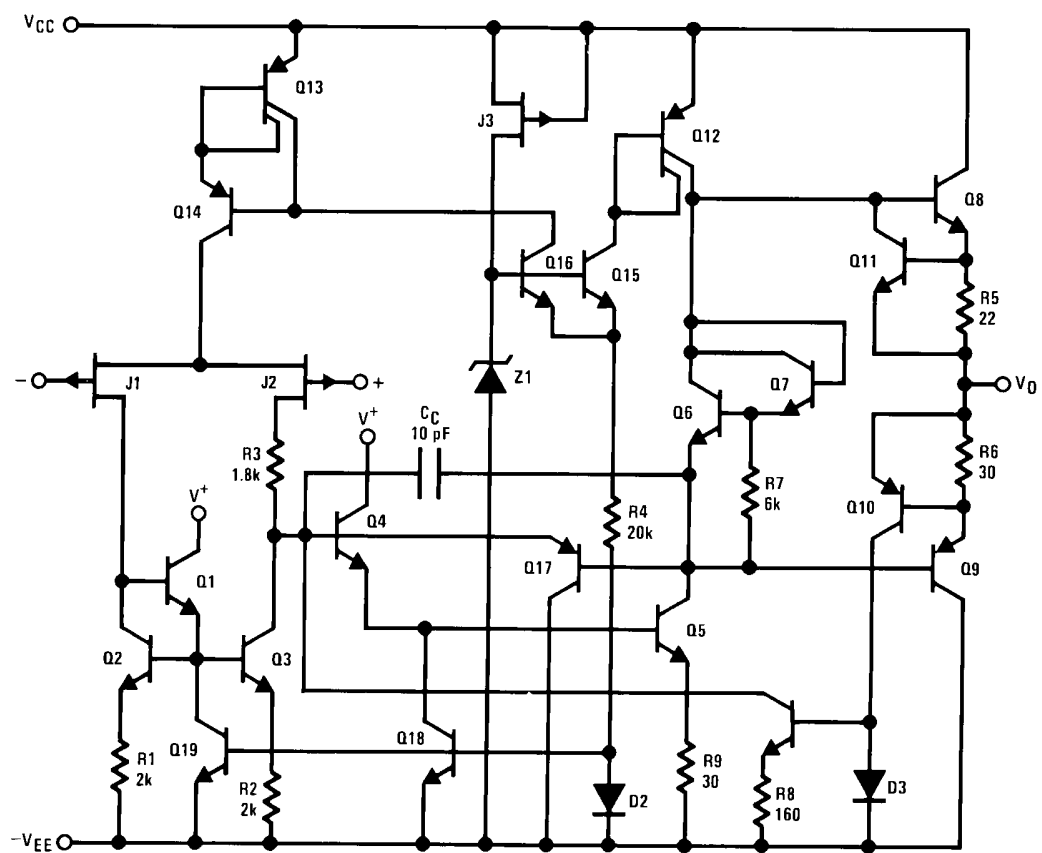
Simplified Schematic



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Note 1: Available per JM38510/11905

Detailed Schematic



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Absolute Maximum Ratings (Note 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

(Note 11)

	LF412A	LF412
Supply Voltage	±22V	±18V
Differential Input Voltage	±38V	±30V
Input voltage Range		
<small>(Note 3)</small>	±19V	±15V
Output Short Circuit		
Duration <small>(Note 4)</small>	Continuous	Continuous

Power Dissipation

(Note 12)

T_j max

θ_{JA} (Typical)

Operating Temp. Range

Storage Temp.

H Package

(Note 5)

150°C

152°C/W

(Note 6)

–65°C ≤ T_A ≤ 150°C

N Package

670 mW

115°C

115°C/W

(Note 6)

–65°C ≤ T_A ≤ 150°C

Range

Lead Temp.

(Soldering, 10 sec.)

ESD Tolerance

(Note 13)

260°C

1700V

260°C

1700V

DC Electrical Characteristics

(Note 7)

Symbol	Parameter	Conditions	LF412A			LF412			Units
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Input Offset Voltage	$R_S=10\text{ k}\Omega$, $T_A=25^\circ\text{C}$		0.5	1.0		1.0	3.0	mV
$\Delta V_{OS}/\Delta T$	Average TC of Input Offset Voltage	$R_S=10\text{ k}\Omega$ <small>(Note 8)</small>		7	10		7	20	$\mu\text{V}/^\circ\text{C}$
I_{OS}	Input Offset Current	$V_S=\pm 15\text{V}$ <small>(Note 7, Note 9)</small>	$T_j=25^\circ\text{C}$	25	100		25	100	pA
					2			2	nA
					25			25	nA
I_B	Input Bias Current	$V_S=\pm 15\text{V}$ <small>(Note 7, Note 9)</small>	$T_j=25^\circ\text{C}$	50	200		50	200	pA
			$T_j=70^\circ\text{C}$		4			4	nA
			$T_j=125^\circ\text{C}$		50			50	nA
R_{IN}	Input Resistance	$T_j=25^\circ\text{C}$		10^{12}			10^{12}		Ω
A_{VOL}	Large Signal Voltage Gain	$V_S=\pm 15\text{V}$, $V_O=\pm 10\text{V}$, $R_L=2\text{ k}\Omega$, $T_A=25^\circ\text{C}$	50	200		25	200		V/mV
		Over Temperature	25	200		15	200		V/mV
V_O	Output Voltage Swing	$V_S=\pm 15\text{V}$, $R_L=10\text{ k}\Omega$	±12	±13.5		±12	±13.5		V
V_{CM}	Input Common-Mode Voltage Range		±16	+19.5		±11	+14.5		V
				–16.5			–11.5		V
CMRR	Common-Mode Rejection Ratio	$R_S\leq 10\text{ k}\Omega$	80	100		70	100		dB
PSRR	Supply Voltage Rejection Ratio	<small>(Note 10)</small>	80	100		70	100		dB
I_S	Supply Current	$V_O=0\text{V}$, $R_L=\infty$		3.6	5.6		3.6	6.5	mA

Note 2: "Absolute Maximum Ratings" indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

AC Electrical Characteristics

(Note 7)

Symbol	Parameter	Conditions	LF412A			LF412			Units
			Min	Typ	Max	Min	Typ	Max	
	Amplifier to Amplifier Coupling	$T_A=25^\circ\text{C}$, $f=1\text{ Hz}$ –20 kHz (Input Referred)		–120			–120		dB
SR	Slew Rate	$V_S=\pm 15\text{V}$, $T_A=25^\circ\text{C}$	10	15		8	15		V/ μs
GBW	Gain-Bandwidth Product	$V_S=\pm 15\text{V}$, $T_A=25^\circ\text{C}$	3	4		2.7	4		MHz