

LF442

Dual Low Power JFET Input Operational Amplifier

General Description

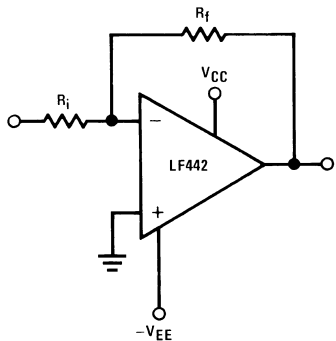
The LF442 dual low power operational amplifiers provide many of the same AC characteristics as the industry standard LM1458 while greatly improving the DC characteristics of the LM1458. The amplifiers have the same bandwidth, slew rate, and gain (10 kΩ load) as the LM1458 and only draw one tenth the supply current of the LM1458. In addition the well matched high voltage JFET input devices of the LF442 reduce the input bias and offset currents by a factor of 10,000 over the LM1458. A combination of careful layout design and internal trimming guarantees very low input offset voltage and voltage drift. The LF442 also has a very low equivalent input noise voltage for a low power amplifier.

The LF442 is pin compatible with the LM1458 allowing an immediate 10 times reduction in power drain in many applications. The LF442 should be used where low power dissipation and good electrical characteristics are the major considerations.

Features

- 1/10 supply current of a LM1458: 400 μA (max)
- Low input bias current: 50 pA (max)
- Low input offset voltage: 1 mV (max)
- Low input offset voltage drift: 10 μV/°C (max)
- High gain bandwidth: 1 MHz
- High slew rate: 1 V/μs
- Low noise voltage for low power: 35 nV/√Hz
- Low input noise current: 0.01 pA/√Hz
- High input impedance: 10¹²Ω
- High gain V_O = ±10V, R_L = 10k: 50k (min)

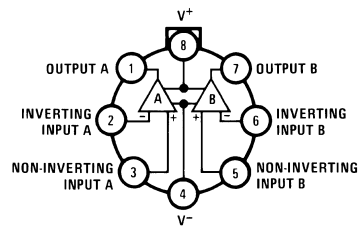
Typical Connection



00915501

Connection Diagrams

Metal Can Package



00915502

Pin 4 connected to case

Top View

Order Number LF442AMH or LF442MH/883
See NS Package Number H08A

Ordering Information

LF442XYZ

X indicates electrical grade

Y indicates temperature range

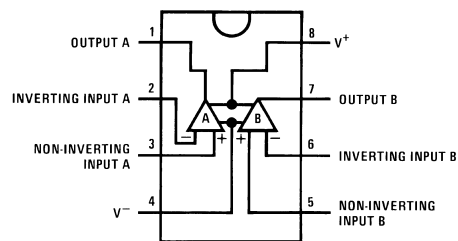
“M” for military

“C” for commercial

Z indicates package type

“H” or “N”

Dual-In-Line Package



00915504

Top View

Order Number LF442ACN or LF442CN
See NS Package Number N08E

Absolute Maximum Ratings (Note 1)

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

	LF442A	LF442		H Package	N Package
Supply Voltage	±22V	±18V	θ_{JA} (Typical) (Note 4)	65°C/W	114°C/W
Differential Input Voltage	±38V	±30V	(Note 5)	165°C/W	152°C/W
Input Voltage Range (Note 2)	±19V	±15V	θ_{JC} (Typical)	21°C/W	
Output Short Circuit Duration (Note 3)	Continuous	Continuous	Operating Temperature Range	(Note 5)	(Note 5)
			Storage Temperature Range	-65°C ≤ T _A ≤ 150°C - 65°C ≤ T _A ≤ 150°C	
			Lead Temperature (Soldering, 10 sec.)	260°C	260°C
			ESD Tolerance	Rating to be determined	
T _j max	H Package 150°C	N Package 115°C			

DC Electrical Characteristics (Note 7)

Symbol	Parameter	Conditions	LF442A			LF442			Units	
			Min	Typ	Max	Min	Typ	Max		
V _{OS}	Input Offset Voltage	R _S = 10 kΩ, T _A = 25°C		0.5	1.0		1.0	5.0	mV	
		Over Temperature						7.5	mV	
ΔV _{OS} /ΔT	Average TC of Input Offset Voltage	R _S = 10 kΩ		7	10		7		μV/°C	
I _{OS}	Input Offset Current	V _S = ±15V (Notes 7, 8)	T _j = 25°C		5	25		5	50	pA
			T _j = 70°C			1.5			1.5	nA
			T _j = 125°C			10				nA
I _B	Input Bias Current	V _S = ±15V (Notes 7, 8)	T _j = 25°C		10	50		10	100	pA
			T _j = 70°C			3			3	nA
			T _j = 125°C			20				nA
R _{IN}	Input Resistance	T _j = 25°C		10 ¹²			10 ¹²		Ω	
A _{VOL}	Large Signal Voltage Gain	V _S = ±15V, V _O = ±10V, R _L = 10 kΩ, T _A = 25°C	50	200		25	200		V/mV	
		Over Temperature	25	200		15	200		V/mV	
V _O	Output Voltage Swing	V _S = ±15V, R _L = 10 kΩ	±12	±13		±12	±13		V	
V _{CM}	Input Common-Mode Voltage Range		±16	+18 -17		±11	+14 -12		V V	
CMRR	Common-Mode Rejection Ratio	R _S ≤ 10 kΩ	80	100		70	95		dB	
PSRR	Supply Voltage Rejection Ratio	(Note 9)	80	100		70	90		dB	
I _S	Supply Current			300	400		400	500	μA	

AC Electrical Characteristics (Note 7)

Symbol	Parameter	Conditions	LF442A			LF442			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	$V_S = \pm 15\text{V}$, $T_A = 25^\circ\text{C}$	0.8	1		0.6	1		V/ μs
GBW	Gain-Bandwidth Product	$V_S = \pm 15\text{V}$, $T_A = 25^\circ\text{C}$	0.8	1		0.6	1		MHz
e_n	Equivalent Input Noise Voltage	$T_A = 25^\circ\text{C}$, $R_S = 100\Omega$, $f = 1\text{ kHz}$		35			35		nV/ $\sqrt{\text{Hz}}$
i_n	Equivalent Input Noise Current	$T_A = 25^\circ\text{C}$, $f = 1\text{ kHz}$		0.01			0.01		pA/ $\sqrt{\text{Hz}}$

Note 1: "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.

Note 2: Unless otherwise specified the absolute maximum negative input voltage is equal to the negative power supply voltage.

Note 3: Any of the amplifier outputs can be shorted to ground indefinitely, however, more than one should not be simultaneously shorted as the maximum junction temperature will be exceeded.

Note 4: The value given is in 400 linear feet/min air flow.

Note 5: The value given is in static air.

Note 6: These devices are available in both the commercial temperature range $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$ and the military temperature range $-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$. The temperature range is designated by the position just before the package type in the device number. A "C" indicates the commercial temperature range and an "M" indicates the military temperature range. The military temperature range is available in "H" package only.

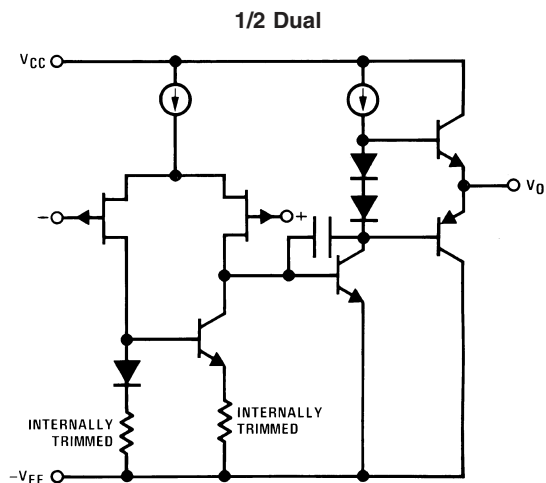
Note 7: Unless otherwise specified, the specifications apply over the full temperature range and for $V_S = \pm 20\text{V}$ for the LF442A and for $V_S = \pm 15\text{V}$ for the LF442. V_{OS} , I_B , and I_{OS} are measured at $V_{CM} = 0$.

Note 8: The input bias currents are junction leakage currents which approximately double for every 10°C increase in the junction temperature, T_j . Due to limited production test time, the input bias currents measured are correlated to junction temperature. In normal operation the junction temperature rises above the ambient temperature as a result of internal power dissipation, P_D . $T_j = T_A + \theta_{jA}P_D$ where θ_{jA} is the thermal resistance from junction to ambient. Use of a heat sink is recommended if input bias current is to be kept to a minimum.

Note 9: Supply voltage rejection ratio is measured for both supply magnitudes increasing or decreasing simultaneously in accordance with common practice from $\pm 15\text{V}$ to $\pm 5\text{V}$ for the LF442 and $\pm 20\text{V}$ to $\pm 5\text{V}$ for the LF442A.

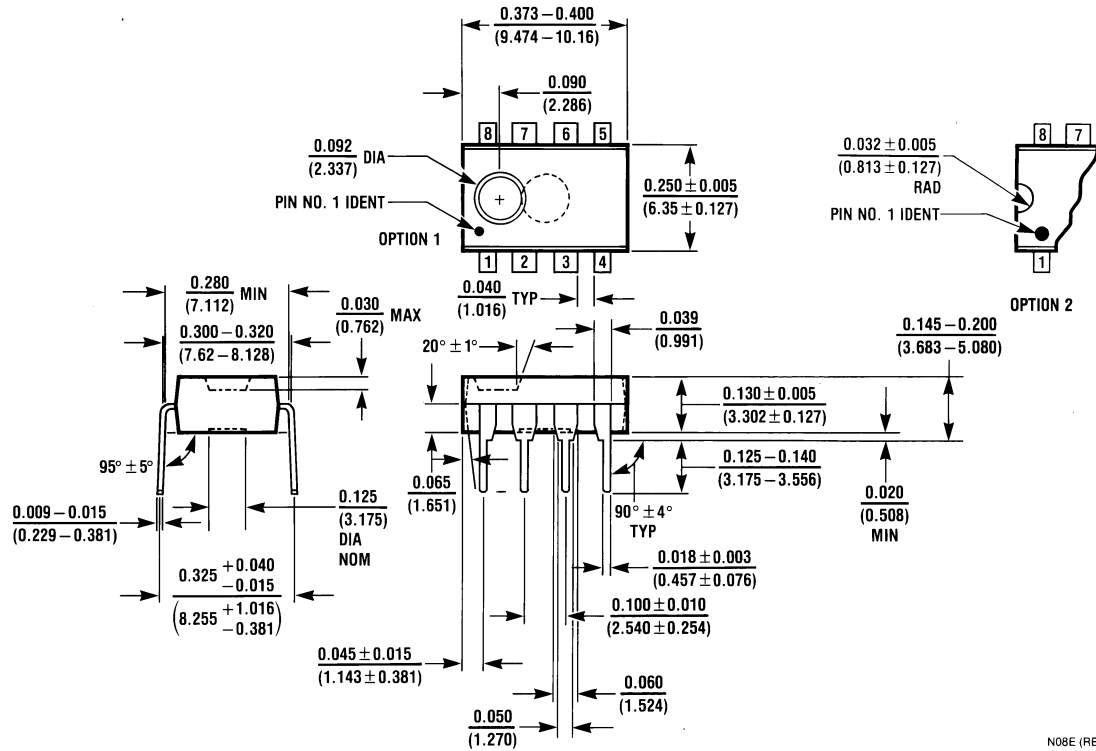
Note 10: Refer to RETS442X for LF442MH military specifications.

Simplified Schematic



00915503

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Molded Dual-In-Line Package (N)
Order Number LF442ACN or LF442CN
NS Package Number N08E

N08E (REV F)

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