μAF771 SINGLE • μAF772 DUAL
μAF774 QUAD BIFET
OPERATIONAL AMPLIFIER FAMILY
FAIRCHILD LINEAR INTEGRATED CIRCUITS

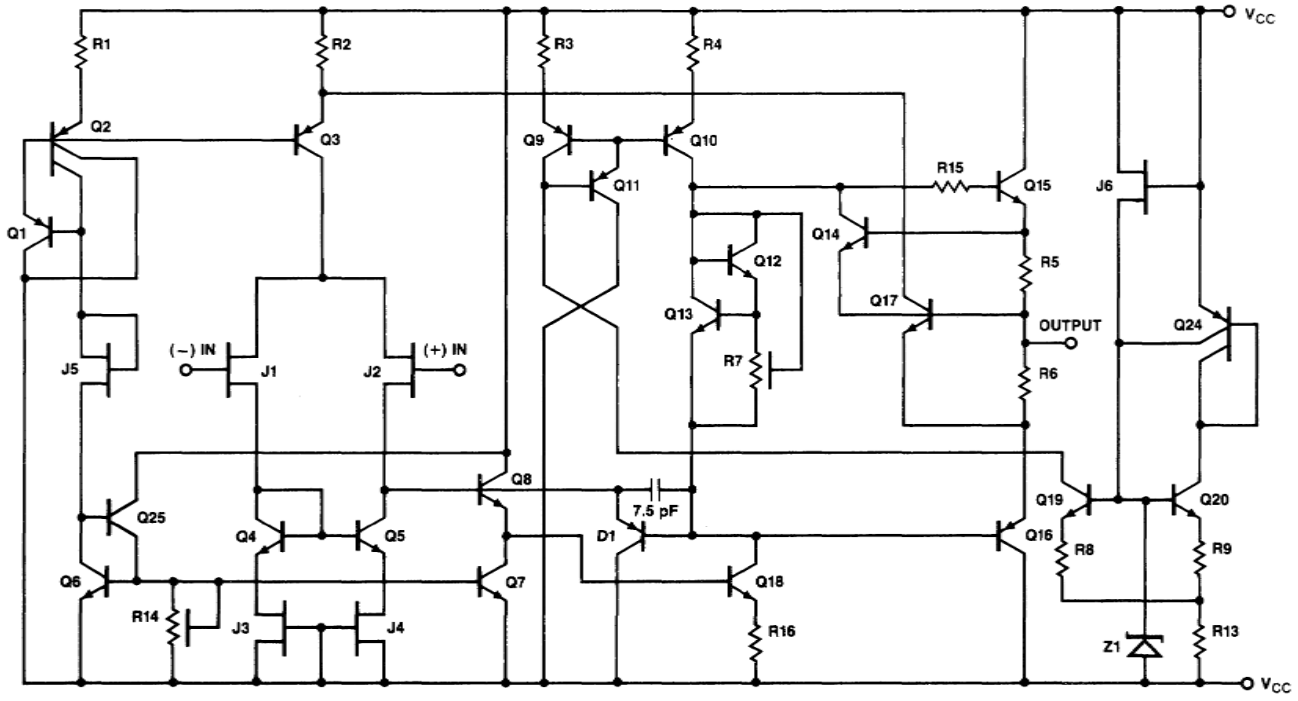
GENERAL DESCRIPTION — These monolithic JFET input operational amplifiers incorporate well matched ion implanted JFETS on the same chip with standard bipolar transistors. The key features of these op amps are low input bias currents in the sub nanoamp range plus high slew rate (13 V/μs typically) and wide bandwidth (3.0 MHz typically).

- **LOW INPUT BIAS CURRENT – 200 pA FOR μAF77X**
- **LOW INPUT OFFSET CURRENT – 100 pA FOR μAF77X**
- **HIGH SLEW RATE – 13 V/μs TYPICALLY**
- **WIDE BANDWIDTH – 3.0 MHz TYPICALLY**

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	±18 V
Internal Power Dissipation (Note 1)	
DIP Package (9A) (6A)	670 mW
Molded Mini DIP Package (6T) (9T)	310 mW
Hermetic Package (5S)	500 mW
Differential Input Voltage	±30 V
Input Voltage Range (Note 2)	±16 V
Output Short Circuit Duration	continuous
Storage Temperature Range	
(5S) (6A)	−65°C to +150°C
(9A) (9T)	−55°C to +125°C
Operating Temperature Range	
Commercial (μAF77XA, μAF77XB, μAF77X, μAF77XL)	0°C to +70°C
Military (μAF77XAM, μAF77XBM)	−55°C to +125°C
Pin Temperature	
Molded Package (9T, 9A) Soldering 10 s	260°C
Hermetic Package (5S, 6A, 6T) Soldering 60 s	300°C

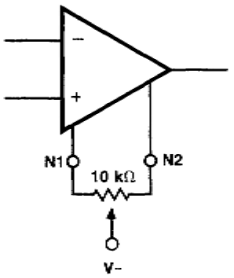
SCHEMATIC DIAGRAM (Typical Channel)



DC ELECTRICAL CHARACTERISTICS – COMMERCIAL GRADE DEVICES

SYMBOL	CHARACTERISTICS	CONDITIONS	μAF77XA			μAF77XB			μAF77X			μAF77XL			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
The Following Specifications Apply for V_S = ±15 V, T_A = 25°C															
V_{OS}	Input Offset Voltage	Note 3 R_S = 10 kΩ	–	–	2.0	–	–	5.0	–	–	10.0	–	–	15.0	mV
I_{OS}	Input Offset Current	Notes 3, 4 T_j = 25°C	–	–	50	–	–	50	–	–	100	–	–	100	pA
I_B	Input Bias Current	Notes 3, 4 T_j = 25°C	–	50	100	–	50	100	–	50	200	–	50	200	pA
R_{IN}	Input Resistance		–	10^{12}	–	–	10^{12}	–	–	10^{12}	–	–	10^{12}	–	Ω
A_{VOL}	Large Signal Voltage Gain	V_O = ± 10 V R_L = 2 kΩ	50	100	–	50	100	–	50	100	–	50	100	–	V/mV
I_{SC}	Short Circuit Current		–	25	–	–	25	–	–	25	–	–	25	–	mA
I_S	Supply Current	Per Amplifier	–	–	2.8	–	–	2.8	–	–	2.8	–	–	2.8	mA
The Following Specifications Apply for V_S = ±15 V, 0°C ≤ T_A ≤ 70°C															
V_{OS}	Input Offset Voltage	Note 3 R_S = 10 kΩ	–	–	4.0	–	–	7.0	–	–	13	–	–	20	mV
$\Delta V_{OS}/\Delta T$	Average TC of Input Offset Voltage	R_S = 10 kΩ	–	10	–	–	10	–	–	10	–	–	10	–	μV/°C
I_{OS}	Input Offset Current	Notes 3, 4	–	–	2.0	–	–	2.0	–	–	4.0	–	–	4.0	nA
I_B	Input Bias Current	Notes 3, 4	–	–	4.0	–	–	4.0	–	–	8.0	–	–	8.0	nA
A_{VOL}	Large Signal Voltage Gain	V_O = ± 10 V R_L = 2 kΩ	25	–	–	25	–	–	25	–	–	25	–	–	V/mV
V_O	Output Voltage Swing	R_L = 10 kΩ R_L = 2 kΩ	±12 ±10	–	–	±12 ±10	–	–	±12 ±10	–	–	±12 ±10	–	–	V V
V_{CM}	Input Common Mode Voltage Range		±11	+15 −12	–	±11	+15 −12	–	±11	+15 −12	–	±11	+15 −12	–	V
CMRR	Common Mode Rejection Ratio	R_S = 10 kΩ	80	–	–	80	–	–	70	–	–	70	–	–	dB
PSRR	Supply Voltage Rejection Ratio	R_S = 10 kΩ	80	–	–	80	–	–	70	–	–	70	–	–	dB
I_S	Supply Current	Per Amplifier	–	–	3.0	–	–	3.0	–	–	3.0	–	–	3.0	mA

INPUT OFFSET VOLTAGE NULL CIRCUITS



(μAF771 and μAF772 — 14 pin)

DC ELECTRICAL CHARACTERISTICS – MILITARY GRADE DEVICES

SYMBOL	CHARACTERISTICS	CONDITIONS	μAF77XAM			μAF77XBM			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
The Following Specifications Apply for V_S = ±15 V, T_A = 25°C									
V_{OS}	Input Offset Voltage	R_S = 10 kΩ Note 3	–	–	2.0	–	–	5.0	mV
I_{OS}	Input Offset Current	Notes 3, 4 T_j = 25°C	–	–	50	–	–	50	pA
I_B	Input Bias Current	Notes 3, 4 T_j = 25°C	–	50	100	–	50	100	pA
R_{IN}	Input Resistance		–	10^{12}	–	–	10^{12}	–	Ω
A_{VOL}	Large Signal Voltage Gain	V_O = 10 V, R_L = 2 kΩ	50	–	–	50	–	–	V/mV
V_O	Output Voltage Swing	R_L = 10 kΩ	±12	–	–	±12	–	–	V
		R_L = 2 kΩ	±10	–	–	±10	–	–	V
V_{CM}	Input Common Mode Voltage Range		±11	+15 −12	–	±11	+15 −12		V
CMRR	Common Mode Rejection Ratio	R_S = 10 kΩ	80	–	–	80	–	–	dB
PSRR	Supply Voltage Rejection Ratio	R_S = 10 kΩ	80	–	–	80	–	–	dB
I_S	Supply Current	Per Amplifier	–	–	2.8	–	–	2.8	mA
The Following Specifications Apply for V_S = ±15 V, −55°C ≤ T_A ≤ 125°C									
V_{OS}	Input Offset Voltage	R_S = 10 kΩ Note 3	–	–	5.0	–	–	8.0	mV
$\Delta V_{OS}/\Delta T$	Average TC of Input Offset Voltage	R_S = 10 kΩ	–	10	–	–	10	–	μV/°C
I_{OS}	Input Offset Current	Notes 3, 4	–	–	20	–	–	20	nA
I_B	Input Bias Current	Notes 3, 4	–	–	50	–	–	50	nA
A_{VOL}	Large Signal Voltage Gain	V_O = ±10 V, R_L = 2kΩ	25	–	–	25	–	–	V/mV
V_O	Output Voltage Swing	R_L = 10 kΩ	±12	–	–	±12	–	–	V
		R_L = 2 kΩ	±10	–	–	±10	–	–	
CMRR	Common Mode Rejection Ratio	R_S = 10 kΩ	–	80	–	–	80	–	dB
PSRR	Supply Voltage Rejection Ratio	R_S = 10 kΩ	–	80	–	–	80	–	dB
I_S	Supply Current	Per Amplifier	–	–	3.4	–	–	3.4	mA

COMMERCIAL AND MILITARY
AC ELECTRICAL CHARACTERISTICS V_S = ±15 V, T_A = 25°C

SYMBOL	CHARACTERISTICS	CONDITIONS	μAF77XA/AM			μAF77XB/BM			μAF77X			μAF77XL			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew Rate	(Fig. 1)		13			13			13			13		V/μs
GBW	Gain Bandwidth Product	(Fig. 2)		3.0			3.0			3.0			3.0		MHz
e_n	Equivalent Input Noise Voltage	R_S = 100 Ω, f = 1000 Hz		16			16			16			16		nV/√Hz
i_n	Equivalent Input Noise Current	f = 1000 Hz		0.01			0.01			0.01			0.01		pA/√Hz

NOTES:
1. Rating applies to ambient temperatures up to 70°C above T_A = 70°C. Derate linearly 6.3 mW/°C for the metal can, 5.6 mW/°C for the mini DIP and 8.3 mW/°C for the DIP.
2. Unless otherwise specified the absolute maximum negative input voltage is equal to the negative power supply voltage.
3. I_B and I_{OS} are measured at V_{CM} = 0.
4. The input bias currents are junction leakage currents which approximately double for every 10°C inrease 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.
5. Supply voltage rejection ratio is measured for both supply magnitudes increasing or decreasing simultaneously in accordance with common practice.

5

AC CHARACTERISTICS MEASUREMENT INFORMATION

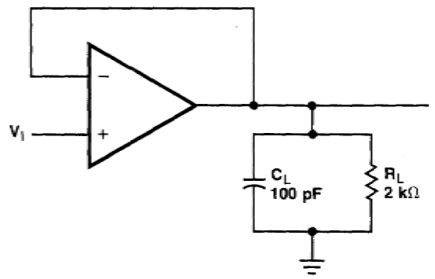


Fig. 1. Unity Gain Amplifier

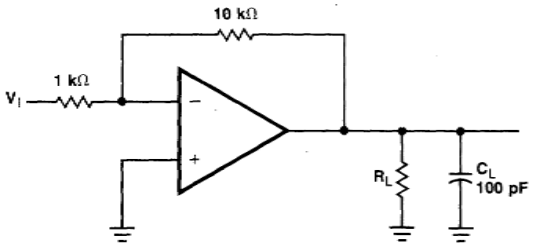


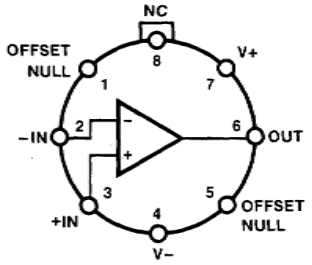
Fig. 2. Gain-of-10 Inverting Amplifier.

CONNECTION DIAGRAMS AND ORDERING INFORMATION

μAF771

8-PIN METAL CAN
(TOP VIEW)

PACKAGE OUTLINE	5B	5S
PACKAGE CODE	H	H



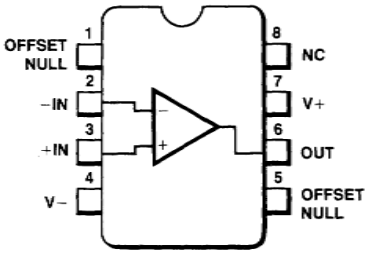
Note: Pin 4 connected to case.

ORDER INFORMATION

TYPE	PART NO.
μAF771AM	μAF771AHM
μAF771BM	μAF771BHM
μAF771A	μAF771AHC
μAF771B	μAF771BHC
μAF771	μAF771HC
μAF771L	μAF771LHC

8-PIN MINI DIP
(TOP VIEW)

PACKAGE OUTLINES	6T	9T
PACKAGE CODES	R	T



ORDER INFORMATION

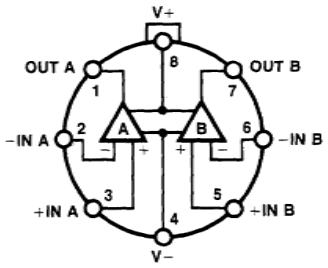
TYPE	PART NO.
μAF771AM	μAF771ARM
μAF771BM	μAF771BRM
μAF771A	μAF771ARC
μAF771B	μAF771BRC
μAF771	μAF771RC
μAF771L	μAF771LRC
μAF771A	μAF771ATC
μAF771B	μAF771BTC
μAF771	μAF771TC
μAF771L	μAF771LTC

CONNECTION DIAGRAMS AND ORDERING INFORMATION (Cont.)

μAF772

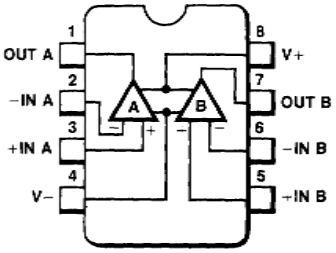
8-PIN METAL CAN
(TOP VIEW)

PACKAGE OUTLINE 5S 5B
PACKAGE CODE H H



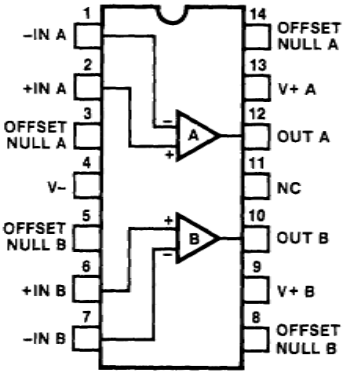
8-PIN MINI DIP
(TOP VIEW)

PACKAGE OUTLINES 6T 9T
PACKAGE CODES R T



14-PIN DIP
(TOP VIEW)

PACKAGE OUTLINE 6A 9A
PACKAGE CODE D P



ORDER INFORMATION

TYPE	PART NO.
μAF772AM	μAF772AHM
μAF772BM	μAF772BHM
μAF772A	μAF772AHC
μAF772B	μAF772BHC
μAF772	μAF772HC
μAF772L	μAF772LHC

ORDER INFORMATION

TYPE	PART NO.
μAF772AM	μAF772ARM
μAF772BM	μAF772BRM
μAF772A	μAF772ARC
μAF772B	μAF772BRC
μAF772	μAF772RC
μAF772L	μAF772LRC
μAF772A	μAF772ATC
μAF772B	μAF772BTC
μAF772	μAF772TC
μAF772L	μAF772LTC

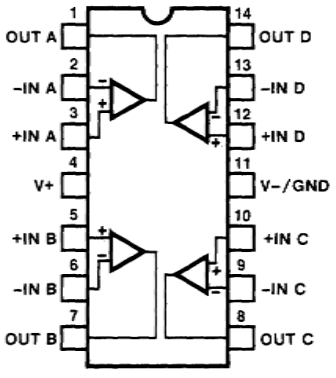
ORDER INFORMATION

TYPE	PART NO.
μAF772AM	μAF772ADM
μAF772BM	μAF772BDM
μAF772A	μAF772ADC
μAF772B	μAF772BDC
μAF772	μAF772DC
μAF772L	μAF772LDC
μAF772A	μAF772APC
μAF772B	μAF772BPC
μAF772	μAF772PC
μAF772L	μAF772LPC

μAF774

14-PIN DIP
(TOP VIEW)

PACKAGE OUTLINE 6A 9A
PACKAGE CODE D P



ORDER INFORMATION

TYPE	PART NO.
μAF774AM	μAF774ADM
μAF774BM	μAF774BDM
μAF774A	μAF774ADC
μAF774B	μAF774BDC
μAF774	μAF774DC
μAF774L	μAF774LDC
μAF774A	μAF774APC
μAF774B	μAF774BPC
μAF774	μAF774PC
μAF774L	μAF774LPC