μA741

FREQUENCY-COMPENSATED OPERATIONAL AMPLIFIER

FAIRCHILD LINEAR INTEGRATED CIRCUIT

GENERAL DESCRIPTION – The μA741 is a high performance monolithic Operational Amplifier constructed using the Fairchild Planar* epitaxial process. It is intended for a wide range of analog applications. High common mode voltage range and absence of latch-up tendencies make the μA741 ideal for use as a voltage follower. The high gain and wide range of operating voltage provides superior performance in integrator, summing amplifier, and general feedback applications. Electrical characteristics of the μA741A and E are identical to MIL-M-38510/10101.

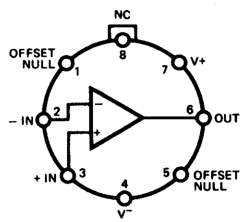
- **NO FREQUENCY COMPENSATION REQUIRED**
- **SHORT CIRCUIT PROTECTION**
- **OFFSET VOLTAGE NULL CAPABILITY**
- **LARGE COMMON MODE AND DIFFERENTIAL VOLTAGE RANGES**
- **LOW POWER CONSUMPTION**
- **NO LATCH-UP**

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	
μA741A, μA741, μA741E	±22 V
μA741C	±18 V
Internal Power Dissipation (Note 1)	
Metal Can	500 mW
Molded and Hermetic DIP	670 mW
Mini DIP	310 mW
Flatpak	570 mW
Differential Input Voltage	±30 V
Input Voltage (Note 2)	±15 V
Storage Temperature Range	
Metal Can, Hermetic DIP, and Flatpak	–65°C to +150°C
Mini DIP, Molded DIP	–55°C to +125°C
Operating Temperature Range	
Military (μA741A, μA741)	–55°C to +125°C
Commercial (μA741E, μA741C)	0°C to +70°C
Lead Temperature (Soldering)	
Metal Can, Hermetic DIPs, and Flatpak (60 s)	300°C
Molded DIPs (10 s)	260°C
Output Short Circuit Duration (Note 3)	Indefinite

CONNECTION DIAGRAMS

8-LEAD METAL CAN
(TOP VIEW)
PACKAGE OUTLINE 5B

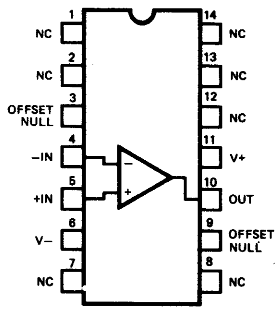


Note: Pin 4 connected to case

ORDER INFORMATION

TYPE	PART NO.
μA741A	μA741AHM
μA741	μA741HM
μA741E	μA741EHC
μA741C	μA741HC

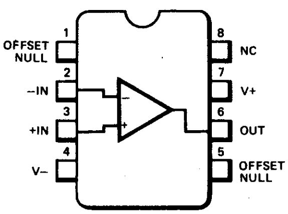
14-LEAD DIP
(TOP VIEW)
PACKAGE OUTLINE 6A, 9A



ORDER INFORMATION

TYPE	PART NO.
μA741A	μA741ADM
μA741	μA741DM
μA741E	μA741EDC
μA741C	μA741DC
μA741C	μA741PC

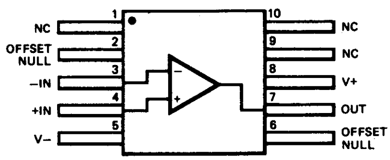
8-LEAD MINIDIP
(TOP VIEW)
PACKAGE OUTLINES 6T 9T
PACKAGE CODES T R



ORDER INFORMATION

TYPE	PART NO.
μA741C	μA741TC
μA741C	μA741RC

10-LEAD FLATPAK
(TOP VIEW)
PACKAGE OUTLINE 3F



ORDER INFORMATION

TYPE	PART NO.
μA741A	μA741AFM
μA741	μA741FM

Notes on following pages.

*Planar is a patented Fairchild process.

μA741A

ELECTRICAL CHARACTERISTICS (V_S = ±15V, T_A = 25°C unless otherwise specified)

PARAMETERS (see definitions)	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 50\Omega$		0.8	3.0	mV
Average Input Offset Voltage Drift				15	μV/°C
Input Offset Current			3.0	30	nA
Average Input Offset Current Drift				0.5	nA/°C
Input Bias Current			30	80	nA
Power Supply Rejection Ratio	V_S = +10, −20; V_S = +20, −10V, R_S = 50Ω		15	50	μV/V
Output Short Circuit Current		10	25	35	mA
Power Dissipation	V_S = ±20V		80	150	mW
Input Impedance	V_S = ±20V	1.0	6.0		MΩ
Large Signal Voltage Gain	V_S = ±20V, R_L = 2kΩ, V_{OUT} = ±15V	50			V/mV
Transient Response (Unity Gain) — Rise Time			0.25	0.8	μs
Transient Response (Unity Gain) — Overshoot			6.0	20	%
Bandwidth (Note 4)		.437	1.5		MHz
Slew Rate (Unity Gain)	V_{IN} = ±10V	0.3	0.7		V/μs
The following specifications apply for −55°C ≤ T_A ≤ +125°C					
Input Offset Voltage				4.0	mV
Input Offset Current				70	nA
Input Bias Current				210	nA
Common Mode Rejection Ratio	V_S = ±20V, V_{IN} = ±15V, R_S = 50Ω	80	95		dB
Adjustment For Input Offset Voltage	V_S = ±20V	10			mV
Output Short Circuit Current		10		40	mA
Power Dissipation	V_S = ±20V, −55°C			165	mW
Power Dissipation	V_S = ±20V, +125°C			135	mW
Input Impedance	V_S = ±20V	0.5			MΩ
Output Voltage Swing	V_S = ±20V, R_L = 10kΩ	±16			V
Output Voltage Swing	V_S = ±20V, R_L = 2kΩ	±15			V
Large Signal Voltage Gain	V_S = ±20V, R_L = 2kΩ, V_{OUT} = ±15V	32			V/mV
Large Signal Voltage Gain	V_S = ±5V, R_L = 2kΩ, V_{OUT} = ±2 V	10			V/mV

NOTES

1. Rating applies to ambient temperatures up to 70°C. Above 70°C ambient derate linearly at 6.3mW/°C for the metal can, 8.3mW/°C for the DIP and 7.1mW/°C for the Flatpak.
2. For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
3. Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or 75°C ambient temperature.
4. Calculated value from: $BW(MHz) = \frac{0.35}{\text{Rise Time } (\mu s)}$

μA741

ELECTRICAL CHARACTERISTICS (V_S = ±15 V, T_A = 25°C unless otherwise specified)

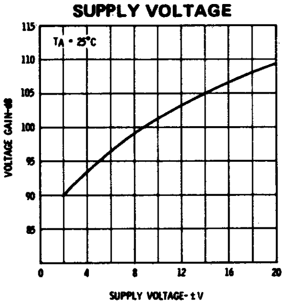
PARAMETERS (see definitions)	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	5.0	mV
Input Offset Current			20	200	nA
Input Bias Current			80	500	nA
Input Resistance		0.3	2.0		MΩ
Input Capacitance			1.4		pF
Offset Voltage Adjustment Range			±15		mV
Large Signal Voltage Gain	$R_L \geq 2$ kΩ, V_{OUT} = ±10 V	50,000	200,000		
Output Resistance			75		Ω
Output Short Circuit Current			25		mA
Supply Current			1.7	2.8	mA
Power Consumption			50	85	mW
Transient Response (Unity Gain) — Rise time	V_{IN} = 20 mV, R_L = 2 kΩ, $C_L \leq 100$ pF		0.3		μs
Transient Response (Unity Gain) — Overshoot			5.0		%
Slew Rate	$R_L \geq 2$ kΩ		0.5		V/μs

The following specifications apply for $-55°C \leq T_A \leq +125°C$:

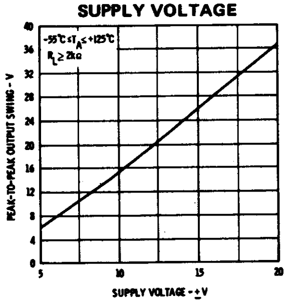
PARAMETERS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	6.0	mV
Input Offset Current	T_A = +125°C		7.0	200	nA
	T_A = −55°C		85	500	nA
Input Bias Current	T_A = +125°C		0.03	0.5	μA
	T_A = −55°C		0.3	1.5	μA
Input Voltage Range		±12	±13		V
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ		30	150	μV/V
Large Signal Voltage Gain	$R_L \geq 2$ kΩ, V_{OUT} = ±10 V	25,000			
Output Voltage Swing	$R_L \geq 10$ kΩ	±12	±14		V
	$R_L \geq 2$ kΩ	±10	±13		V
Supply Current	T_A = +125°C		1.5	2.5	mA
	T_A = −55°C		2.0	3.3	mA
Power Consumption	T_A = +125°C		45	75	mW
	T_A = −55°C		60	100	mW

TYPICAL PERFORMANCE CURVES FOR μA741A AND μA741

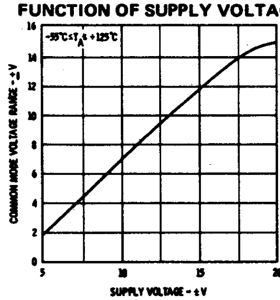
OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF SUPPLY VOLTAGE



OUTPUT VOLTAGE SWING AS A FUNCTION OF SUPPLY VOLTAGE



INPUT COMMON MODE VOLTAGE RANGE AS A FUNCTION OF SUPPLY VOLTAGE

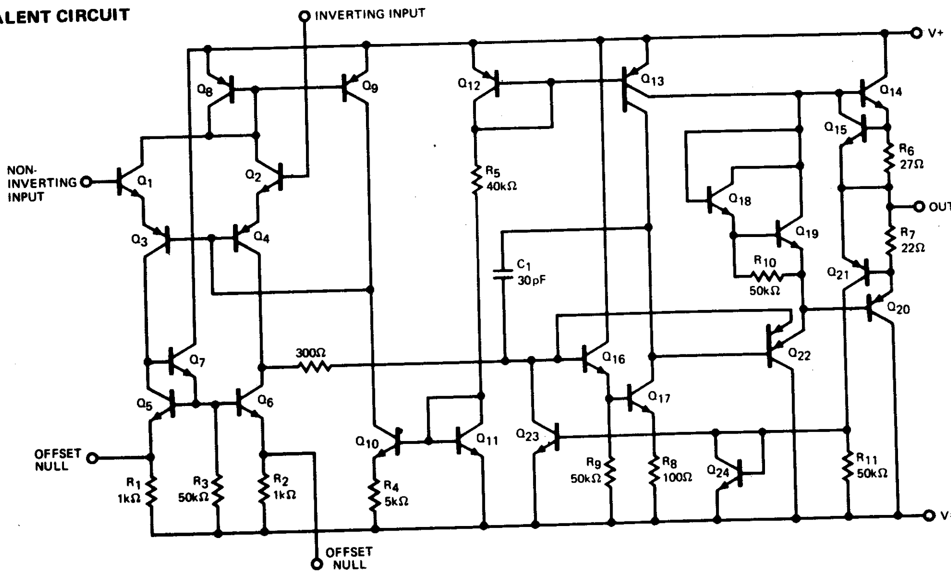


μA741E

ELECTRICAL CHARACTERISTICS (V_S = ±15V, T_A = 25°C unless otherwise specified)

PARAMETERS (see definitions)		CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage		$R_S \leq 50\Omega$		0.8	3.0	mV
Average Input Offset Voltage Drift					15	μV/°C
Input Offset Current				3.0	30	nA
Average Input Offset Current Drift					0.5	nA/°C
Input Bias Current				30	80	nA
Power Supply Rejection Ratio		V_S = +10, −20; V_S = +20, −10V, R_S = 50Ω		15	50	μV/V
Output Short Circuit Current			10	25	35	mA
Power Dissipation		V_S = ±20V		80	150	mW
Input Impedance		V_S = ±20V	1.0	6.0		MΩ
Large Signal Voltage Gain		V_S = ±20V, R_L = 2kΩ, V_{OUT} = ±15V	50			V/mV
Transient Response (Unity Gain)	Rise Time			0.25	0.8	μs
	Overshoot			6.0	20	%
Bandwidth (Note 4)			.437	1.5		MHz
Slew Rate (Unity Gain)		V_{IN} = ±10V	0.3	0.7		V/μs
The following specifications apply for 0°C ≤ T_A ≤ 70°C						
Input Offset Voltage					4.0	mV
Input Offset Current					70	nA
Input Bias Current					210	nA
Common Mode Rejection Ratio		V_S = ±20V, V_{IN} = ±15V, R_S = 50Ω	80	95		dB
Adjustment For Input Offset Voltage		V_S = ±20V	10			mV
Output Short Circuit Current			10		40	mA
Power Dissipation		V_S = ±20V			150	mW
Input Impedance		V_S = ±20V	0.5			MΩ
Output Voltage Swing		V_S = ±20V, R_L = 10kΩ	±16			V
		V_S = ±20V, R_L = 2kΩ	±15			V
Large Signal Voltage Gain		V_S = ±20V, R_L = 2kΩ, V_{OUT} = ±15V	32			V/mV
		V_S = ±5V, R_L = 2kΩ, V_{OUT} = ±2 V	10			V/mV

EQUIVALENT CIRCUIT



μA741C

ELECTRICAL CHARACTERISTICS (V_S = ±15 V, T_A = 25°C unless otherwise specified)

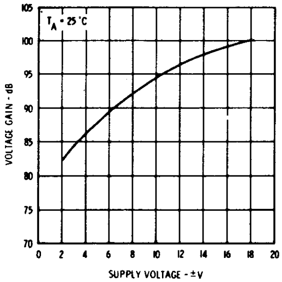
PARAMETERS (see definitions)	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10\ k\Omega$		2.0	6.0	mV
Input Offset Current			20	200	nA
Input Bias Current			80	500	nA
Input Resistance		0.3	2.0		MΩ
Input Capacitance			1.4		pF
Offset Voltage Adjustment Range			±15		mV
Input Voltage Range		±12	±13		V
Common Mode Rejection Ratio	$R_S \leq 10\ k\Omega$	70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10\ k\Omega$		30	150	μV/V
Large Signal Voltage Gain	$R_L \geq 2\ k\Omega$, V_{OUT} = ±10 V	20,000	200,000		
Output Voltage Swing	$R_L \geq 10\ k\Omega$	±12	±14		V
	$R_L \geq 2\ k\Omega$	±10	±13		V
Output Resistance			75		Ω
Output Short Circuit Current			25		mA
Supply Current			1.7	2.8	mA
Power Consumption			50	85	mW
Transient Response (Unity Gain) — Rise time	V_{IN} = 20 mV, R_L = 2 kΩ, $C_L \leq 100$ pF		0.3		μs
Transient Response (Unity Gain) — Overshoot			5.0		%
Slew Rate	$R_L \geq 2\ k\Omega$		0.5		V/μs

The following specifications apply for $0°C \leq T_A \leq +70°C$:

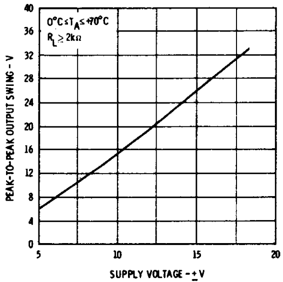
PARAMETERS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage				7.5	mV
Input Offset Current				300	nA
Input Bias Current				800	nA
Large Signal Voltage Gain	$R_L \geq 2\ k\Omega$, V_{OUT} = ±10 V	15,000			
Output Voltage Swing	$R_L \geq 2\ k\Omega$	±10	±13		V

TYPICAL PERFORMANCE CURVES FOR μA741E AND μA741C

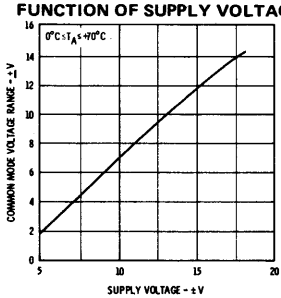
OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF SUPPLY VOLTAGE



OUTPUT VOLTAGE SWING AS A FUNCTION OF SUPPLY VOLTAGE

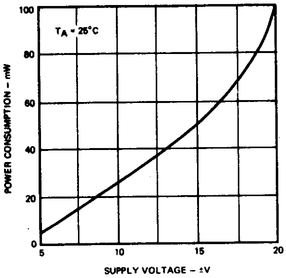


INPUT COMMON MODE VOLTAGE RANGE AS A FUNCTION OF SUPPLY VOLTAGE

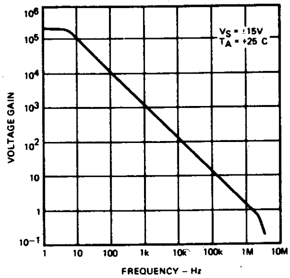


TYPICAL PERFORMANCE CURVES FOR μA741A, μA741, μA741E AND μA741C

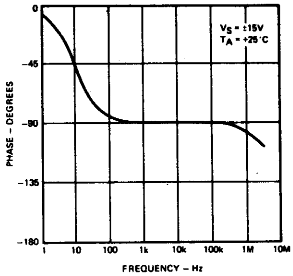
POWER CONSUMPTION AS A FUNCTION OF SUPPLY VOLTAGE



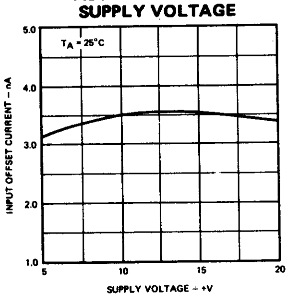
OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF FREQUENCY



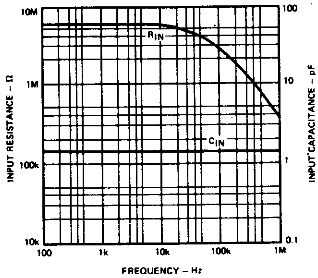
OPEN LOOP PHASE RESPONSE AS A FUNCTION OF FREQUENCY



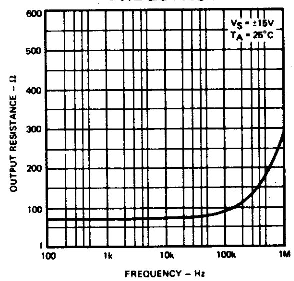
INPUT OFFSET CURRENT AS A FUNCTION OF SUPPLY VOLTAGE



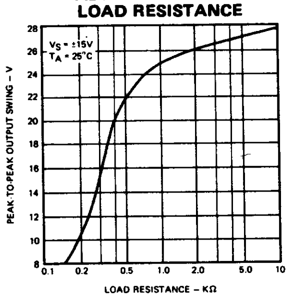
INPUT RESISTANCE AND INPUT CAPACITANCE AS A FUNCTION OF FREQUENCY



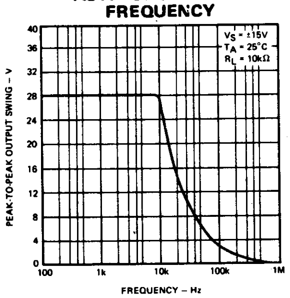
OUTPUT RESISTANCE AS A FUNCTION OF FREQUENCY



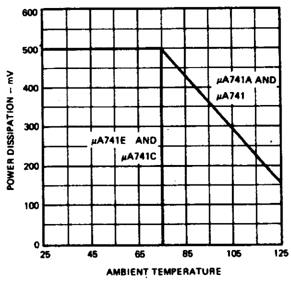
OUTPUT VOLTAGE SWING AS A FUNCTION OF LOAD RESISTANCE



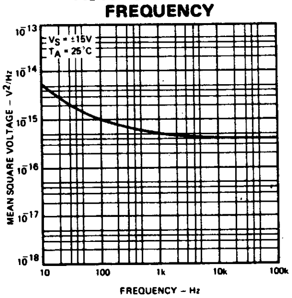
OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY



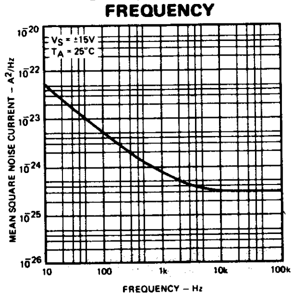
ABSOLUTE MAXIMUM POWER DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE



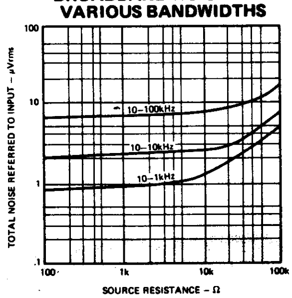
INPUT NOISE VOLTAGE AS A FUNCTION OF FREQUENCY



INPUT NOISE CURRENT AS A FUNCTION OF FREQUENCY

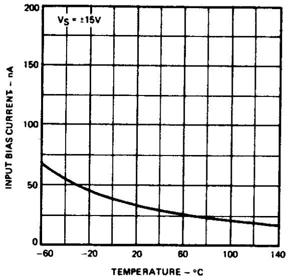


BROADBAND NOISE FOR VARIOUS BANDWIDTHS

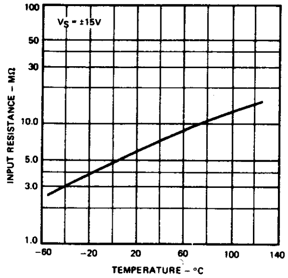


TYPICAL PERFORMANCE CURVES FOR μA741A AND μA741

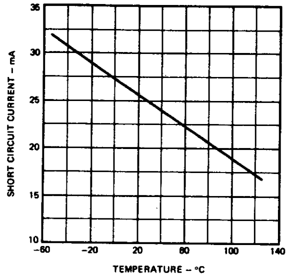
INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



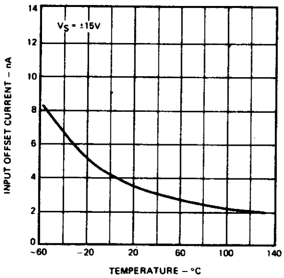
INPUT RESISTANCE AS A FUNCTION OF AMBIENT TEMPERATURE



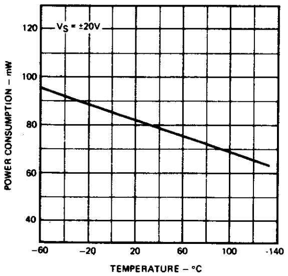
OUTPUT SHORT-CIRCUIT CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



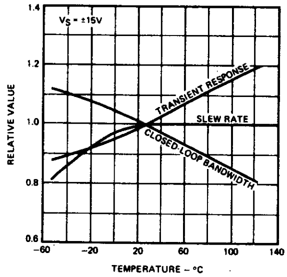
INPUT OFFSET CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE

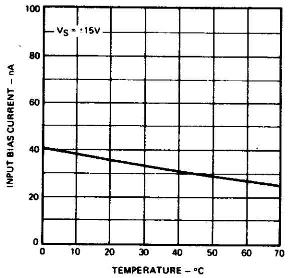


FREQUENCY CHARACTERISTICS AS A FUNCTION OF AMBIENT TEMPERATURE

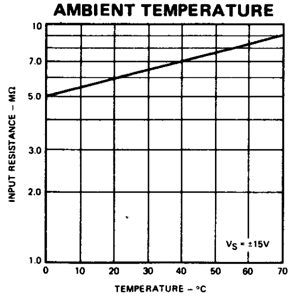


TYPICAL PERFORMANCE CURVES FOR μA741E AND μA741C

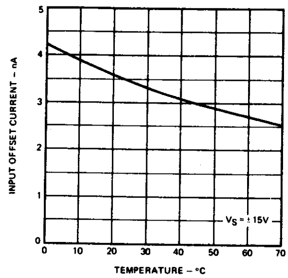
INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



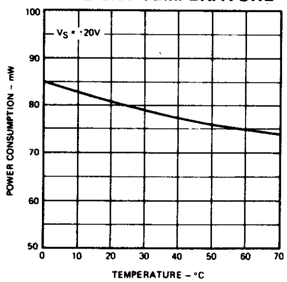
INPUT RESISTANCE AS A FUNCTION OF AMBIENT TEMPERATURE



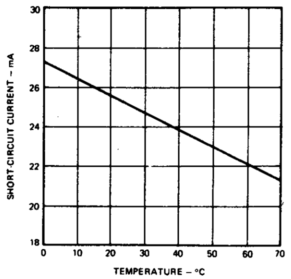
INPUT OFFSET CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



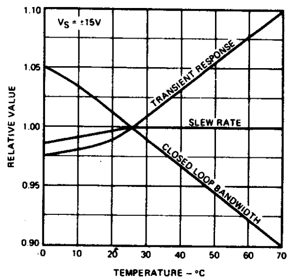
POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE



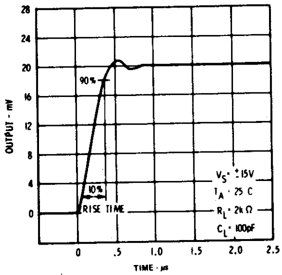
OUTPUT SHORT CIRCUIT CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



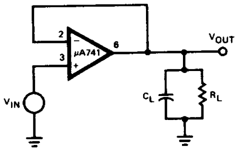
FREQUENCY CHARACTERISTICS AS A FUNCTION OF AMBIENT TEMPERATURE



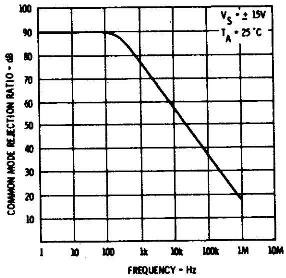
TRANSIENT RESPONSE



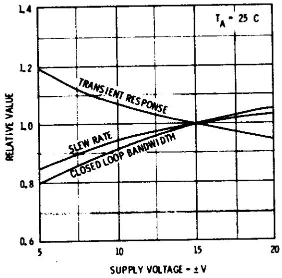
TRANSIENT RESPONSE TEST CIRCUIT



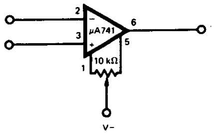
COMMON MODE REJECTION RATIO AS A FUNCTION OF FREQUENCY



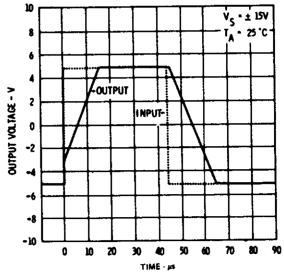
FREQUENCY CHARACTERISTICS AS A FUNCTION OF SUPPLY VOLTAGE



VOLTAGE OFFSET NULL CIRCUIT

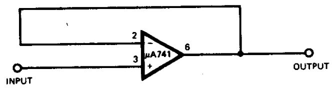


VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



TYPICAL APPLICATIONS

UNITY-GAIN VOLTAGE FOLLOWER



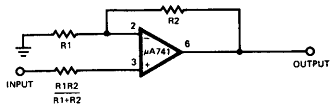
R_{IN} = 400 MΩ

C_{IN} = 1 pF

R_{OUT} << 1 Ω

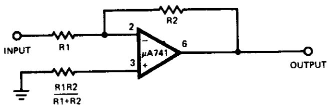
B.W. = 1 MHz

NON-INVERTING AMPLIFIER



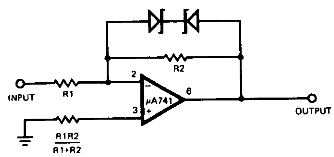
GAIN	R1	R2	B W	R_{IN}
10	1 kΩ	9 kΩ	100 kHz	400 MΩ
100	100 Ω	9.9 kΩ	10 kHz	280 MΩ
1000	100 Ω	99.9 kΩ	1 kHz	80 MΩ

INVERTING AMPLIFIER



GAIN	R1	R2	B W	R_{IN}
1	10 kΩ	10 kΩ	1 MHz	10 kΩ
10	1 kΩ	10 kΩ	100 kHz	1 kΩ
100	1 kΩ	100 kΩ	10 kHz	1 kΩ
1000	100 Ω	100 kΩ	1 kHz	100 Ω

CLIPPING AMPLIFIER



$$\frac{E_{OUT}}{E_{IN}} = \frac{R2}{R1} \text{ if } |E_{OUT}| \leq V_Z + 0.7\text{ V}$$

where V_Z = Zener breakdown voltage

μA747

DUAL FREQUENCY-COMPENSATED OPERATIONAL AMPLIFIER

FAIRCHILD LINEAR INTEGRATED CIRCUITS

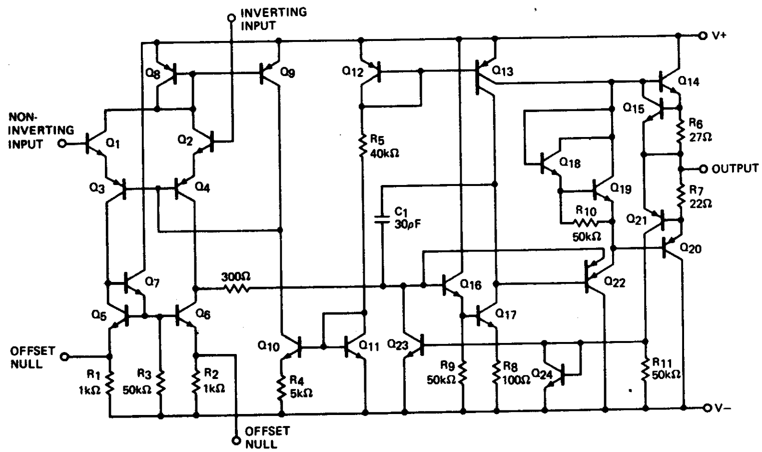
GENERAL DESCRIPTION – The μA747 is a pair of high performance monolithic Operational Amplifiers constructed using the Fairchild Planar* epitaxial process. They are intended for a wide range of analog applications where board space or weight are important. High common mode voltage range and absence of latch-up make the μA747 ideal for use as a voltage follower. The high gain and wide range of operating voltage provides superior performance in integrator, summing amplifier, and general feedback applications. The μA747 is short circuit protected and requires no external components for frequency compensation. The internal 6 dB/octave roll-off insures stability in closed loop applications. For single amplifier performance, see μA741 data sheet. Electrical characteristics are identical to MIL-M-38510/10102.

- **NO FREQUENCY COMPENSATION REQUIRED**
- **SHORT CIRCUIT PROTECTION**
- **OFFSET VOLTAGE NULL CAPABILITY**
- **LARGE COMMON MODE AND DIFFERENTIAL VOLTAGE RANGES**
- **LOW POWER CONSUMPTION**
- **NO LATCH-UP**

ABSOLUTE MAXIMUM RATINGS

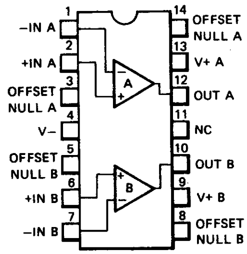
Supply Voltage	
Military (μA747A, μA747, μA747E)	±22 V
Commercial (μA747C)	±18 V
Internal Power Dissipation (Note 1)	
Metal Can	500 mW
DIP	670 mW
Differential Input Voltage	±30 V
Input Voltage (Note 2)	±15 V
Voltage betweeen Offset Null and V–	±0.5 V
Storage Temperature Range	–65°C to +150°C
Operating Temperature Range	
Military (μA747A, μA747)	–55° C to +125°C
Commercial (μA747E, μA747C)	0°C to 70°C
Lead Temperature (Soldering 60s)	300°C
Output Short Circuit Duration (Note 3)	Indefinite

EQUIVALENT CIRCUIT (1/2 μA747)



Notes on following pages.

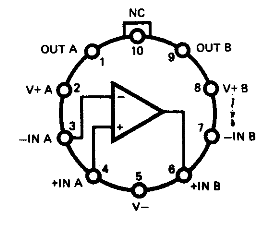
CONNECTION DIAGRAMS
14-LEAD DIP
(TOP VIEW)
PACKAGE OUTLINE 7A 9A
PACKAGE CODE D P



ORDER INFORMATION

TYPE	PART NO.
μA747A	μA747ADM
μA747	μA747DM
μA747E	μA747EDC
μA747C	μA747DC
μA747C	μA747PC
μA747–I	μA747–IDM
μA747–IC	μA747–IDC

10-LEAD METAL CAN
(TOP VIEW)
PACKAGE OUTLINE 5F



ORDER INFORMATION

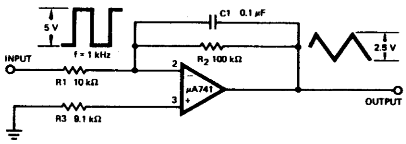
TYPE	PART NO.
μA747A	μA747AHM
μA747	μA747HM
μA747E	μA747EHC
μA747C	μA747HC
μA747–I	μA747–IHM
μA747–IC	μA747–IHC

NOTE:
V+A is internally connected to V+B for μA747A, μA747, μA747E, and μA747C. They are not internally connected for μA747-I and μA747-IC.

*Planar is a patented Fairchild process.

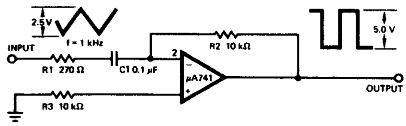
TYPICAL APPLICATIONS (Cont'd)

SIMPLE INTEGRATOR



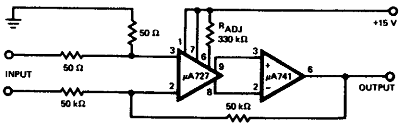
$$E_{OUT} = -\frac{1}{R_1C_1}\int E_{IN}dt$$

SIMPLE DIFFERENTIATOR



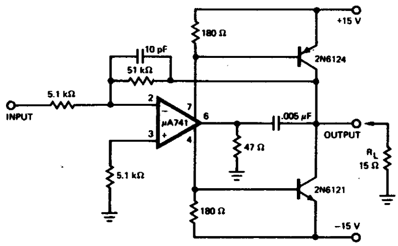
$$E_{OUT} = -R2C1\frac{dE_{IN}}{dt}$$

LOW DRIFT LOW NOISE AMPLIFIER

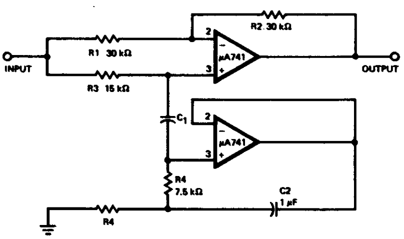


Voltage Gain = 10^3
Input Offset Voltage Drift = 0.6 μV/°C
Input Offset Current Drift = 2.0 pA/°C

HIGH SLEW RATE POWER AMPLIFIER



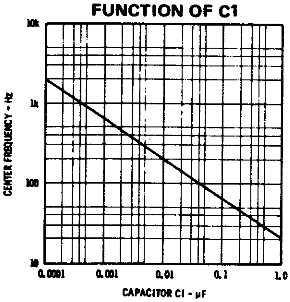
NOTCH FILTER USING THE μA741 AS A GYRATOR



Trim R3 such that

$$\frac{R1}{R2} = \frac{R3}{2\ R4}$$

NOTCH FREQUENCY AS A FUNCTION OF C1



μA747A

ELECTRICAL CHARACTERISTICS ±5 V ≤ V_S ≤ ±20 V, T_A = 25°C unless otherwise specified)

PARAMETERS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	R_S ≤ 50Ω		0.8	3.0	mV
Average Input Offset Voltage Drift				15	μV/°C
Input Offset Current			3.0	30	nA
Average Input Offset Current Drift	T_A = 25°C to +125°C T_A = −55°C to +25°C			0.2 0.5	nA/°C nA/°C
Input Bias Current			30	80	nA
Power Supply Rejection Ratio	V_S = +10, −20; V_S = +20 V, −10 V 0.2 R_S = 50 Ω		15	50	μV/V
Common Mode Rejection Ratio	V_S = ±20 V, V_{IN} = ±15 V R_S = 50 Ω	80	95		dB
Adjustment for Input Offset Voltage	V_S = ±20 V	10			mV
Output Short Circuit Current		10	25	35	mA
Power Dissipation	V_S = ±20 V per Channel		80	150	mW
Input Impedance	V_S = ±20 V	1.0	6		MΩ
Large Signal Voltage Gain	V_S = ±20 V, R_L = 2 kΩ V_{OUT} = ±15 V	50			V/mV
Transient Response (Unity Gain) — Rise Time			0.25	0.8	μs
Transient Response (Unity Gain) — Overshoot			6.0	20	%
Bandwidth (Note 4)		0.437	1.5		MHz
Slew Rate (Unity Gain)	V_{IN} = ±10 V	0.3	0.7		V/μs
The following specifications apply for −55°C ≤ T_A ≤ +125°C					
Input Offset Voltage				4.0	mV
Input Offset Current				70	nA
Input Bias Current				210	nA
Output Short Circuit Current		10		40	mA
Power Dissipation	V_S = ±20 V, −55°C			165	mW
	V_S = ±20 V, +125°C			135	mW
Input Impedance	V_S = ±20 V	0.5			MΩ
Output Voltage Swing	V_S = ±20 V, R_L = 10 kΩ	±16			V
	R_L = 2 kΩ	±15			V
Large Signal Voltage Gain	V_S = ±20 V, R_L = 2 kΩ, V_{OUT} = ±15 V	32			V/mV
	V_S = ± 5 V, R_L = 2 kΩ, V_{OUT} = ± 2 V	10			V/mV
Channel Separation	V_S = ±20 V	100			dB

NOTES:

1. Rating applies to ambient temperatures uo to 70°C. Above 70°C ambient derate linearly at 6.3 mW/°C for the Metal Can, 8.3 mW/°C for the DIP.
2. For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.
3. Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or 75°C ambient temperature.
4. Calculated value from: $BW\ (MHz) = \frac{0.35}{\text{RISE TIME}\ (\mu s)}$

μA747

ELECTRICAL CHARACTERISTICS – Each Amplifier (V_S = ±15 V, T_A = 25°C unless otherwise specified)

PARAMETERS (see definitions)		CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Offset Voltage		$R_S \leq 10$ kΩ		1.0	5.0	mV
Input Offset Current				20	200	nA
Input Bias Current				80	500	nA
Input Resistance			0.3	2.0		MΩ
Input Capacitance				1.4		pF
Offset Voltage Adjustment Range				±15		mV
Large Signal Voltage Gain		$R_L \geq 2$ kΩ, V_{OUT} = ±10 V	50,000	200,000		V/V
Output Resistance				75		Ω
Output Short-Circuit Current				25		mA
Supply Current				1.7	2.8	mA
Power Consumption				50	85	mW
Transient Response (Unity Gain)	Rise time	V_{IN} = 20 mV, R_L = 2 kΩ, $C_L \leq 100$ pF		0.3		μs
	Overshoot			5.0		%
Slew Rate		$R_L \geq 2$ kΩ		0.5		V/μs
Channel Separation				120		dB

The following specifications apply for $-55°C \leq T_A \leq +125°C$.

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	6.0	mV
Input Offset Current	T_A = +125°C		7.0	200	nA
	T_A = −55°C		85	500	nA
Input Bias Current	T_A = +125°C		0.03	0.5	μA
	T_A = −55°C		0.3	1.5	μA
Input Voltage Range		±12	±13		V
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ		30	150	μV/V
Large Signal Voltage Gain	$R_L \geq 2$ kΩ, V_{OUT} = ±10 V	25,000			V/V
Output Voltage Swing	$R_L \geq 10$ kΩ	±12	±14		V
	$R_L \geq 2$ kΩ	±10	±13		V
Supply Current	T_A = +125°C		1.5	2.5	mA
	T_A = −55°C		2.0	3.3	mA
Power Consumption	T_A = +125°C		45	75	mW
	T_A = −55°C		60	100	mW

μA747C

ELECTRICAL CHARACTERISTICS – Each Amplifier (V_S = ±15 V, T_A = 25°C unless otherwise specified)

PARAMETERS (see definitions)		CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage		$R_S \leq 10$ kΩ		1.0	6.0	mV
Input Offset Current				20	200	nA
Input Bias Current				80	500	nA
Input Resistance			0.3	2.0		MΩ
Input Capacitance				1.4		pF
Offset Voltage Adjustment Range				±15		mV
Large Signal Voltage Gain		$R_L \geq 2$ kΩ, V_{OUT} = ±10 V	25,000	200,000		V/V
Output Resistance				75		Ω
Output Short-Circuit Current				25		mA
Supply Current				1.7	2.8	mA
Power Consumption				50	85	mW
Transient Response (Unity Gain)	Rise time	V_{IN} = 20 mV, R_L = 2 kΩ, $C_L \leq 100$ pF		0.3		μs
	Overshoot			5.0		%
Slew Rate		$R_L \geq 2$ kΩ		0.5		V/μs
Channel Separation				120		dB

The following specifications apply for 0°C < T_A < +70°C.

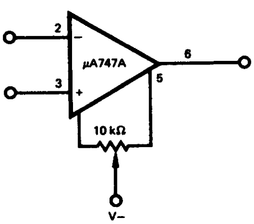
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	7.5	mV
Input Offset Current			7.0	300	nA
Input Bias Current			0.03	0.8	μA
Input Voltage Range		±12	±13		V
Common Mode Rejection Ratio	$R_S \leq 10$ kΩ	70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10$ kΩ		30	150	μV/V
Large Signal Voltage Gain	$R_L \geq 2$ kΩ, V_{OUT} = ±10 V	15,000			V/V
Output Voltage Swing	$R_L \geq 10$ kΩ	±12	±14		V
	$R_L \geq 2$ kΩ	±10	±13		V
Supply Current			2.0	3.3	mA
Power Consumption			60	100	mW

μA747E

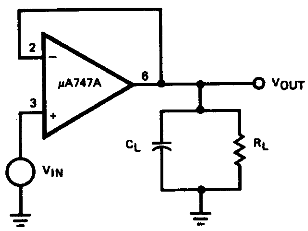
ELECTRICAL CHARACTERISTICS ($\pm 5\text{ V} < V_S < \pm 20\text{ V}$, $T_A = 25°C$ unless otherwise specified)

PARAMETERS (see definitions)	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S < 50\Omega$		0.8	3.0	mV
Average Input Offset Voltage Drift				15	μV/°C
Input Offset Current			3	30	nA
Average Input Offset Current Drift	$T_A = 25°C$ to $70°C$ $T_A = 0°C$ to $25°C$			0.2 0.5	nA/°C nA/°C
Input Bias Current			30	80	nA
Power Supply Rejection Ratio	$V_S = +10, -20$; $V_S = +20\text{ V}, -10\text{ V}$ $R_S = 50\ \Omega$		15	50	μV/V
Common Mode Rejection Ratio	$V_S = \pm 20\text{ V}$, $V_{IN} = \pm 15\text{ V}$ $R_S = 50\ \Omega$	80	95		dB
Adjustment for Input Offset Voltage	$V_S = \pm 20\text{ V}$	10			mV
Output Short Circuit Current		10	25	35	mA
Power Dissipation	$V_S = \pm 20\text{ V}$		80	150	mW
Input Impedance	$V_S = \pm 20\text{ V}$	1.0	6		MΩ
Large Signal Voltage Gain	$V_S = \pm 20\text{ V}$, $R_L = 2\text{ k}\Omega$, $V_{OUT} = \pm 15\text{ V}$	50			V/mV
Transient Response (Unity Gain) — Rise Time			0.25	0.8	μs
Transient Response (Unity Gain) — Overshoot			6	20	%
Bandwidth (Note 4)		0.437	1.5		MHz
Slew Rate (Unity Gain)	$V_{IN} = \pm 10\text{ V}$	0.3	0.7		V/μs
The following specifications apply for $0°C < T_A < 70°C$					
Input Offset Voltage				4.0	mV
Input Offset Current				70	nA
Input Bias Current				210	nA
Output Short Circuit Current		10		40	mA
Power Dissipation	$V_S = \pm 20\text{ V}$			165	mW
Input Impedance	$V_S = \pm 20\text{ V}$	0.5			MΩ
Output Voltage Swing	$V_S = \pm 20\text{ V}$, $R_L = 10\text{ k}\Omega$ $R_L = 2\text{ k}\Omega$	±16 ±15			V V
Large Signal Voltage Gain	$V_S = \pm 20\text{ V}$, $R_L = 2\text{ k}\Omega$, $V_{OUT} = \pm 15\text{ V}$	32			V/mV
	$V_S = \pm 5\text{ V}$, $R_L = 2\text{ k}\Omega$, $V_{OUT} = \pm 2\text{ V}$	10			V/mV
Channel Separation	$V_S = \pm 20\text{ V}$	100			dB

VOLTAGE OFFSET NULL CIRCUIT

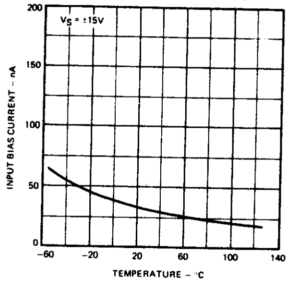


TRANSIENT RESPONSE TEST CIRCUIT

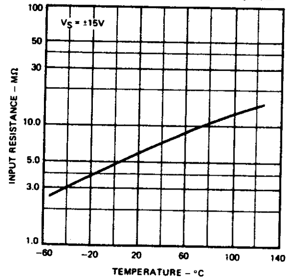


TYPICAL PERFORMANCE CURVES FOR μA747A AND μA747

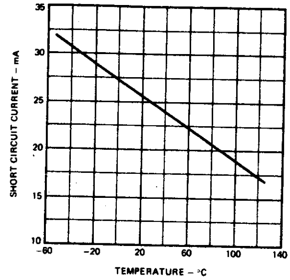
INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



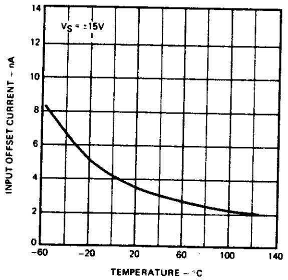
INPUT RESISTANCE AS A FUNCTION OF AMBIENT TEMPERATURE



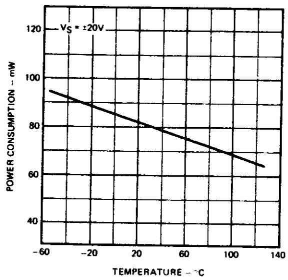
OUTPUT SHORT-CIRCUIT CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



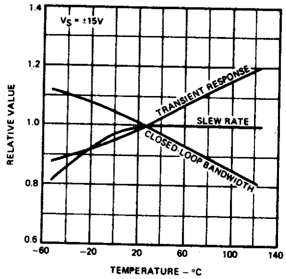
INPUT OFFSET CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE

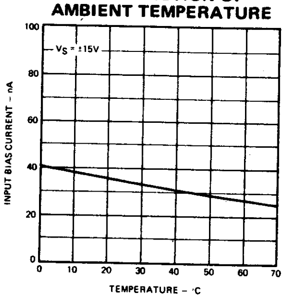


FREQUENCY CHARACTERISTICS AS A FUNCTION OF AMBIENT TEMPERATURE

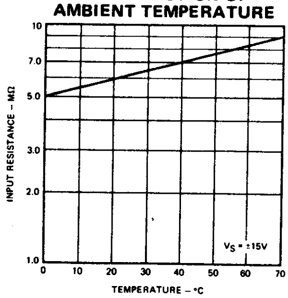


TYPICAL PERFORMANCE CURVES FOR μA747E AND μA747C

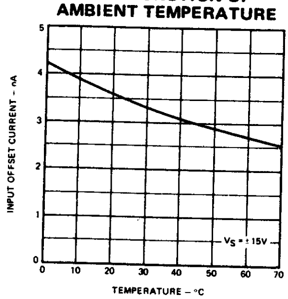
INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



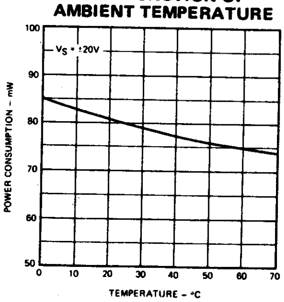
INPUT RESISTANCE AS A FUNCTION OF AMBIENT TEMPERATURE



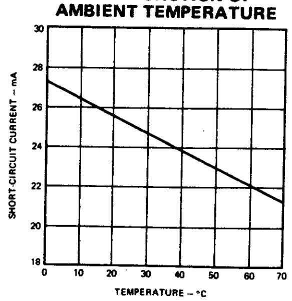
INPUT OFFSET CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



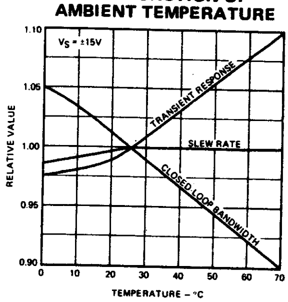
POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE



OUTPUT SHORT CIRCUIT CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE

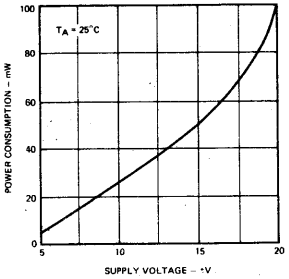


FREQUENCY CHARACTERISTICS AS A FUNCTION OF AMBIENT TEMPERATURE

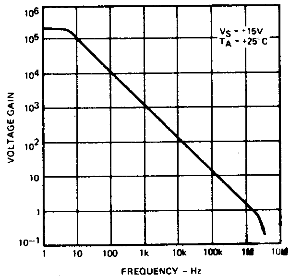


TYPICAL PERFORMANCE CURVES FOR μA747A, μA747C, μA747 AND μA747E

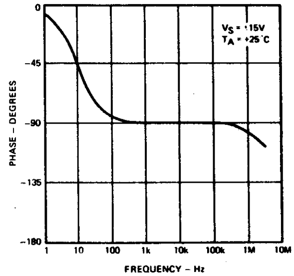
POWER CONSUMPTION AS A FUNCTION OF SUPPLY VOLTAGE



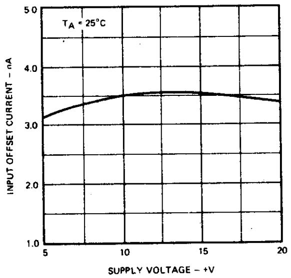
OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF FREQUENCY



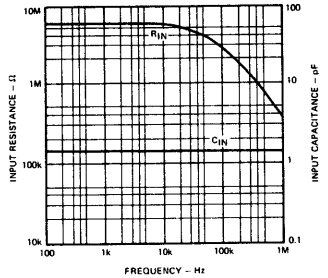
OPEN LOOP PHASE RESPONSE AS A FUNCTION OF FREQUENCY



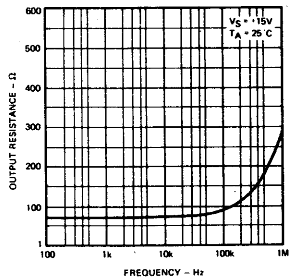
INPUT OFFSET CURRENT AS A FUNCTION OF SUPPLY VOLTAGE



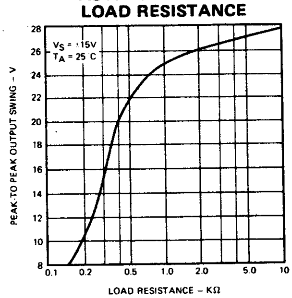
INPUT RESISTANCE AND INPUT CAPACITANCE AS A FUNCTION OF FREQUENCY



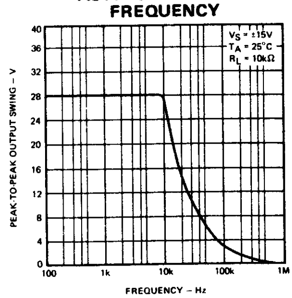
OUTPUT RESISTANCE AS A FUNCTION OF FREQUENCY



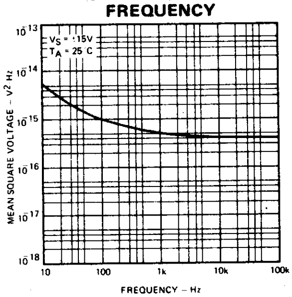
OUTPUT VOLTAGE SWING AS A FUNCTION OF LOAD RESISTANCE



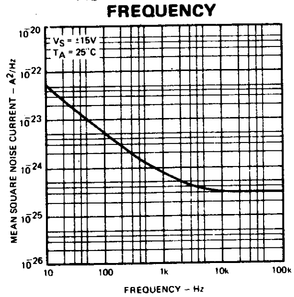
OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY



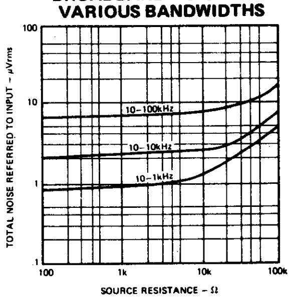
INPUT NOISE VOLTAGE AS A FUNCTION OF FREQUENCY



INPUT NOISE CURRENT AS A FUNCTION OF FREQUENCY

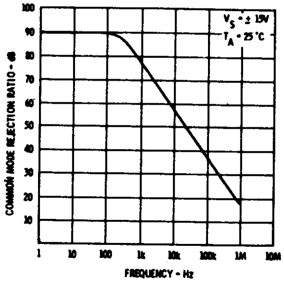


BROADBAND NOISE FOR VARIOUS BANDWIDTHS

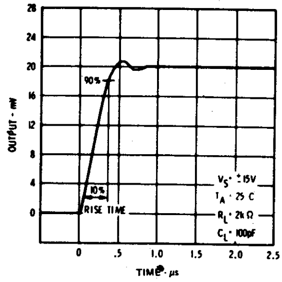


TYPICAL PERFORMANCE CURVES (Each Anplifier) FOR μA747 AND μA747C

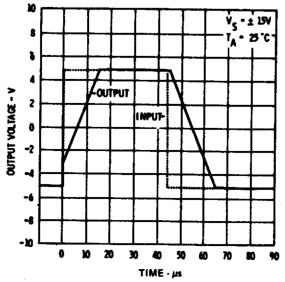
COMMON MODE REJECTION RATIO AS A FUNCTION OF FREQUENCY



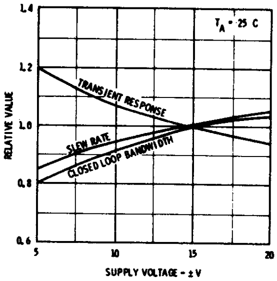
TRANSIENT RESPONSE



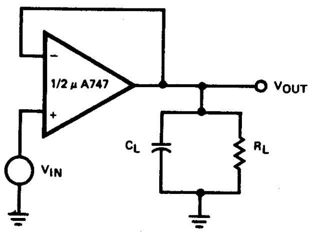
VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



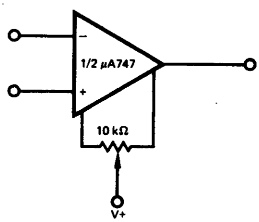
FREQUENCY CHARACTERISTICS AS A FUNCTION OF SUPPLY VOLTAGE



TRANSIENT RESPONSE TEST CIRCUIT



VOLTAGE OFFSET NULL CIRCUIT



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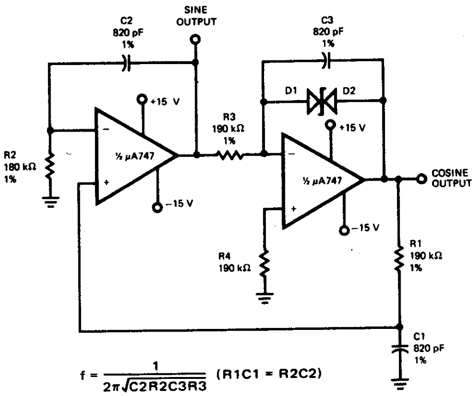
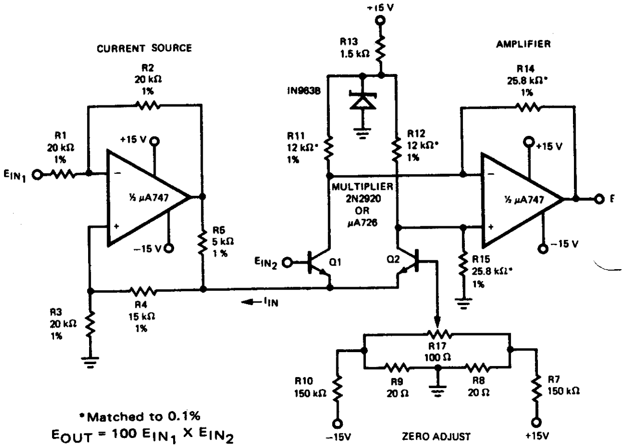
TYPICAL APPLICATIONS

QUADRATURE OSCILLATOR



$$f = \frac{1}{2\pi\sqrt{C2R2C3R3}} \quad (R1C1 = R2C2)$$

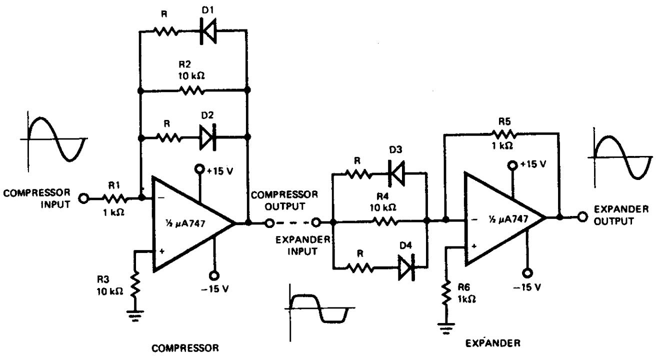
ANALOG MULTIPLIER



*Matched to 0.1%

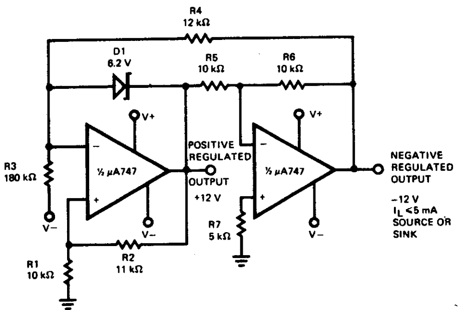
$E_{OUT} = 100\ E_{IN_1} \times E_{IN_2}$

COMPRESSOR/EXPANDER AMPLIFIERS



MUXIMUM COMPRESSION EXPANSION TATIO = R1/R (10 kΩ >R >0)
NOTE: DIODES D1 THROUGH D4 ARE MATCHED FD666 OR EQUIVALENT

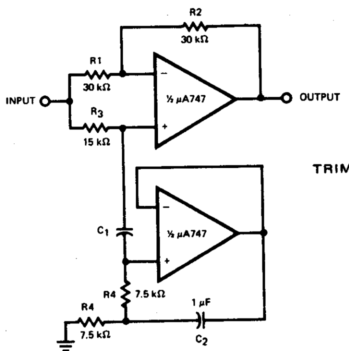
TRACKING POSITIVE AND NEGATIVE VOLTAGE REFERENCES



$\text{POSITIVE OUTPUT} = V_{D1} \times \frac{R1 + R2}{R2}$

$\text{NEGATIVE OUTPUT} = -\text{POSITIVE OUTPUT} \times \frac{R6}{R5}$

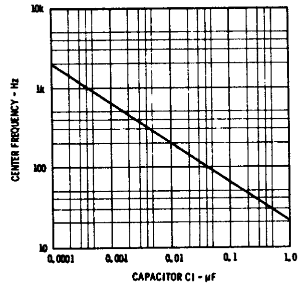
NOTCH FILTER USING THE μA747 AS A GYRATOR



TRIM R3 SUCH THAT

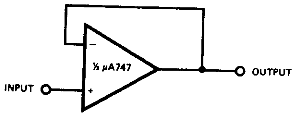
$$\frac{R1}{R2} = \frac{R3}{2\ R4}$$

NOTCH FREQUENCY AS A FUNCTION OF C1



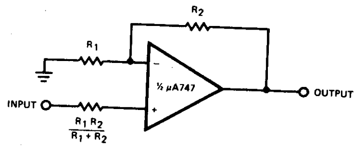
TYPICAL APPLICATIONS

UNITY-GAIN VOLTAGE FOLLOWER



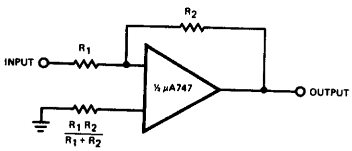
R_{IN} = 400 MΩ
C_{IN} = 1 pF
R_{OUT} << 1 Ω
B W = 1 MHz

NON-INVERTING AMPLIFIER



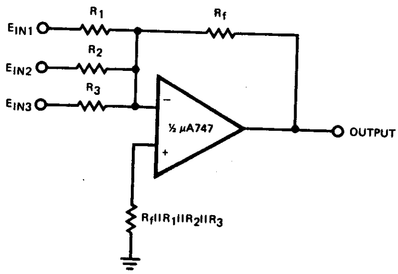
GAIN	R_1	R_2	B.W.	R_{IN}
10	1 kΩ	9 kΩ	100 kHz	400 MΩ
100	100 Ω	9.9 kΩ	10 kHz	280 MΩ
1000	100 Ω	99.9 kΩ	1 kHz	80 MΩ

INVERTING AMPLIFIER



GAIN	R_1	R_2	B W	R_{IN}
1	10 kΩ	10 kΩ	1 MHz	10 kΩ
10	1 kΩ	10 kΩ	100 kHz	1 kΩ
100	1 kΩ	100 kΩ	10 kHz	1 kΩ
1000	100 Ω	100 kΩ	1 kHz	100 Ω

WEIGHTED AVERAGING AMPLIFIER



$$-E_{OUT} = E_{IN1}\left(\frac{R_f}{R_1}\right) + E_{IN2}\left(\frac{R_f}{R_2}\right) + E_{IN3}\left(\frac{R_f}{R_3}\right)$$

μA748

OPERATIONAL AMPLIFIER

FAIRCHILD LINEAR INTEGRATED CIRCUITS

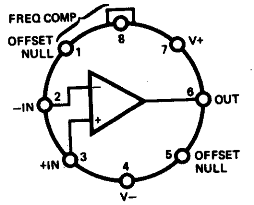
GENERAL DESCRIPTION – The μA748 is a High Performance Monolithic Operational Amplifier constructed using the Fairchild Planar* epitaxial process. It is intended for a high wide range of analog applications where tailoring of frequency characteristics is desirable. High common mode voltage range and absence of latch-up make the μA748 ideal for use as a voltage follower. The high gain and wide range of operating voltages provide superior performance in integrator, summing amplifier, and general feedback applications. The μA748 is short-circuit protected and has the same pin configuration as the popular μA741 operational amplifier. Unity gain frequency compensation is achieved by means of a single 30 pF capacitor. For superior performance, see μA777 data sheet.

- **SHORT-CIRCUIT PROTECTION**
- **OFFSET VOLTAGE NULL CAPABILITY**
- **LARGE COMMON-MODE AND DIFFERENTIAL VOLTAGE RANGES**
- **LOW POWER CONSUMPTION**
- **NO LATCH UP**

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	±22 V
Internal Power Dissipation (Note 1)	
Metal Can	500 mW
DIP	670 mW
Mini DIP	310 mW
Flatpak	570 mW
Differential Input Voltage	±30 V
Input Voltage (Note 2)	±15 V
Storage Temperature Range	
Metal Can, DIP, and Flatpak	−65°C to +150°C
Mini DIP	−55°C to +125°C
Operating Temperature Range	
Military (μA748)	−55°C to +125°C
Commercial (μA748C)	0°C to +70°C
Lead Temperature (Soldering, 60 Seconds)	
Metal Can, Flatpak, and Hermetic DIPs	300°C
Molded Mini DIP	260°C
Output Short Circuit Duration (Note 3)	Indefinite

CONNECTION DIAGRAMS
8-LEAD METAL CAN
(TOP VIEW)
PACKAGE OUTLINE 5S
PACKAGE CODE H

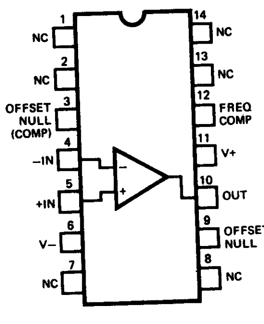


NOTE: Pin 4 connected to case

ORDER INFORMATION

TYPE	PART NO.
μA748	μA748HM
μA748A	μA748AHM
μA748C	μA748HC

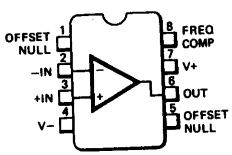
14-LEAD DIP
(TOP VIEW)
PACKAGE OUTLINE 6A
PACKAGE CODE D



ORDER INFORMATION

TYPE	PART NO.
μA748	μA748DM
μA748A	μA748ADM
μA748C	μA748DC

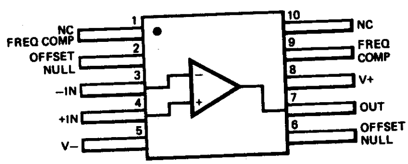
CONNECTION DIAGRAMS
8-LEAD MINI DIP
(TOP VIEW)
PACKAGE OUTLINE 9T
PACKAGE CODE T



ORDER INFORMATION

TYPE	PART NO.
μA748C	μA748TC

10-LEAD FLATPAK‡
(TOP VIEW)
PACKAGE OUTLINE 3F
PACKAGE CODE F



‡Available on special request

ORDER INFORMATION

TYPE	PART NO.
μA748	μA748FM
μA748A	μA748AFM

*Planar is a patented Fairchild process.

μA748A

ELECTRICAL CHARACTERISTICS (V_S = ±15 V, T_A = 25°C, C_C = 30 pF unless otherwise specified)

PARAMETERS		CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage		$R_S \leq 50$ kΩ		0.5	2.0	mV
Input Offset Current				2.0	10	nA
Input Bias Current				20	75	nA
Input Resistance			2.0	10.0		MΩ
Input Capacitance				3.0		pF
Offset Voltage Adjustment Range				±25		mV
Large Signal Voltage Gain		$R_L \geq 2$ kΩ, V_{OUT} = ±10V	50,000	250,000		V/V
Output Resistance				100		Ω
Output Short Circuit Current				±25		mA
Supply Current				1.9	2.8	mA
Power Consumption				60	85	mW
Transient Response (Voltage Follower, Gain of 1)	Rise Time	V_{IN} = 20 mV, C_C = 30 pF, R_L = 2 kΩ, $C_L \leq 100$ pF		0.3		μs
	Overshoot			5.0		%
Slew Rate (Voltage Follower, Gain of 1)		$R_L \geq 2$kΩ		0.5		V/μs
Transient Response (Voltage Follower, Gain of 10)	Rise Time	V_{IN} = 20 mV, C_C = 3.5 pF, R_L = 2 kΩ, $C_L \leq 100$ pF		0.2		μs
	Overshoot			5.0		%
Slew Rate (Voltage Follower, Gain of 10)		$R_L \geq 2$ kΩ, C_C = 3.5 pF		5.5		V/μs
The following specifications apply for -55°C ≤ T_A ≤ +125°C:						
Input Offset Voltage		$R_S \leq 50$ kΩ		0.5	3.0	mV
Average Input Offset Voltage Drift		$R_S \leq 50$ kΩ		2.5	15	μV/°C
Input Offset Current					25	nA
Average Input Offset Current Drift		25°C ≤ T_A ≤ +125°C		2.5	30	pA/°C
		-55°C ≤ T_A ≤ 25°C		6.5	150	pA/°C
Input Bias Current					100	nA
Input Voltage Range			±12	±13		V
Common Mode Rejection Ratio		$R_S \leq 50$ kΩ	80	95		dB
Supply Voltage Rejection Ratio		$R_S \leq 50$ kΩ		13	100	μV/V
Large Signal Voltage Gain		$R_L \geq 2$ kΩ, V_{OUT} = ±10 V	25,000			V/V
Output Voltage Swing		$R_L \geq 10$ kΩ	±12	±14		V
		$R_L \geq 2$ kΩ	±10	±13		V
Supply Current		T_A = +125°C		1.5	2.5	mA
		T_A = -55°C		2.0	3.3	mA
Power Consumption		T_A = +125°C		40	75	mW
		T_A = -55°C		60	100	mW

NOTES

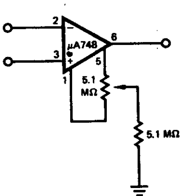
1. Rating applies to ambient temperatures up to 70°C. Above 70°C ambient derate linearly at 6.3 mW/°C for metal can, 8.3 mW/°C for the DIP 5.6 mW/°C for the mini DIP and 7.1 mW/°C for the flatpak.
2. For supply voltages less than ± 15 V, the absolute maximum input voltage is equal to the supply voltage.
3. Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or +75°C ambient temperature.

μA748

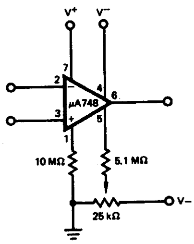
ELECTRICAL CHARACTERISTICS (V_S = ±15 V, T_A = 25°C, C_C = 30 pF unless otherwise specified)

PARAMETERS (see definitions)		CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage		R_S≤10 kΩ		1.0	5.0	mV
Input Offset Current				20	200	nA
Input Bias Current				80	500	nA
Input Resistance			0.3	2.0		MΩ
Input Capacitance				2.0		pF
Offset Voltage Adjustment Range				±15		mV
Large Signal Voltage Gain		R_L ≥2 kΩ, V_{OUT} = ±10 V	50,000	150,000		V/V
Output Resistance				75		Ω
Output Short-Circuit Current				25		mA
Supply Current				1.9	2.8	mA
Power Consumption				60	85	mW
Transient Response (Voltage Follower, Gain of 1)	Rise Time	V_{IN} = 20 mV, C_C = 30 pF, R_L = 2 kΩ, C_L ≤100 pF		0.3		μs
	Overshoot			5.0		%
Slew Rate (Voltage Follower, Gain of 1)		R_L ≥2 kΩ		0.5		V/μs
Transient Response (Voltage Follower, Gain of 10)	Rise Time	V_{IN} = 20 mV, C_C = 3.5 pF, R_L = 2 kΩ, C_L ≤100 pF		0.2		μs
	Overshoot			5.0		%
Slew Rate (Voltage Follower, Gain of 10)		R_L ≥2 kΩ, C_C = 3.5 pF		5.5		V/μs
The following specifications apply for −55°C ≤T_A≤ +125°C:						
Input Offset Voltage		R_S ≤10 kΩ		1.0	6.0	mV
Input Offset Current		T_A = +125°C		10	200	nA
		T_A = −55°C		50	500	nA
Input Bias Current		T_A = +125°C		0.03	0.5	μA
		T_A = −55°C		0.3	1.5	μA
Input Voltage Range			±12	±13		V
Common Mode Rejection Ratio		R_S ≤10 kΩ	70	90		dB
Supply Voltage Rejection Ratio		R_S ≤10 kΩ		30	150	μV/V
Large Signal Voltage Gain		R_L ≥2 kΩ, V_{OUT} = ±10 V	25,000			V/V
Output Voltage Swing		R_L ≥10 kΩ	±12	±14		V
		R_L ≥2 kΩ	±10	±13		V
Supply Current		T_A = +125°C		1.5	2.5	mA
		T_A = −55°C		2.0	3.3	mA
Power Consumption		T_A = +125°C		45	75	mW
		T_A = −55°C		60	100	mW

VOLTAGE OFFSET NULL CIRCUIT

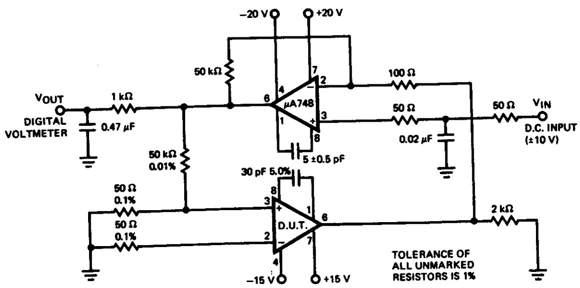


SUGGESTED



ALTERNATE

GAIN TEST CIRCUIT



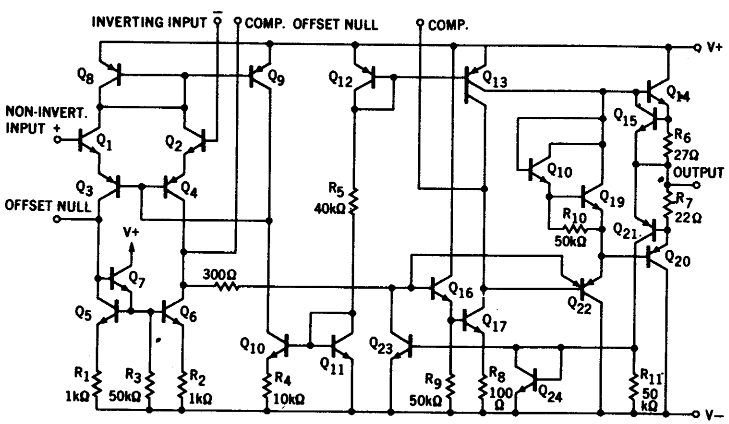
$$A_{VO} = \frac{V_{IN} \times 10^3}{V_{OUT}} = \frac{10 \times 10^3}{V_{OUT}} \text{ FOR } V_{IN} \text{ SPECIFIED}$$

μA748C

ELECTRICAL CHARACTERISTICS (V_S = ±15 V, T_A = 25°C, C_C = 30 pF unless otherwise specified)

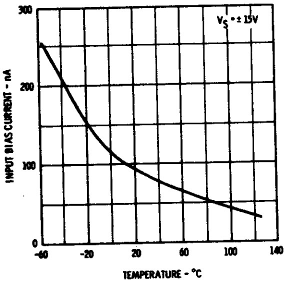
PARAMETERS		CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage		R_S <10 kΩ		2.0	6.0	mV
Input Offset Current				20	200	nA
Input Bias Current				80	500	nA
Input Resistance			0.3	2.0		MΩ
Input Capacitance				2.0		pF
Offset Voltage Adjustment Range				±15		mV
Large Signal Voltage Gain		R_L >2 kΩ, V_{OUT} = ±10 V	20,000	150,000		V/V
Output Resistance				75		Ω
Output Short-Circuit Current				25		mA
Supply Current				1.9	2.8	mA
Power Consumption				60	85	mW
Transient Response (Voltage Follower, Gain of 1)	Rise Time	V_{IN} = 20 mV, C_C = 30 pF, R_L = 2 kΩ, C_L <100 pF		0.3		μs
	Overshoot			5.0		%
Slew Rate (Voltage Follower, Gain of 1)		R_L >2 kΩ		0.5		V/μs
Transient Response (Voltage Follower, Gain of 10)	Rise Time	V_{IN} = 20 mV, C_C = 3.5 pF, R_L = 2 kΩ, C_L <100 pF		0.2		μs
	Overshoot			5.0		%
Slew Rate (Voltage Follower, Gain of 10)		R_L >2 kΩ, C_C = 3.5 pF		5.5		V/μs
The following specifications apply for 0°C < T_A < +70°C:						
Input Offset Voltage		R_S < 10 kΩ			7.5	mV
Input Offset Current					300	nA
Input Bias Current					800	nA
Input Voltage Range			±12	±13		V
Common Mode Rejection Ratio		R_S < 10 kΩ	70	90		dB
Supply Voltage Rejection Ratio		R_S < 10 kΩ		30	150	μV/V
Large Signal Voltage Gain		R_L >2 kΩ, V_{OUT} = ±10 V	15,000			V/V
Output Voltage Swing		R_L >10 kΩ	±12	±14		V
		R_L >2 kΩ	±10	±13		V
Power Consumption				60	100	mW

EQUIVALENT CIRCUIT

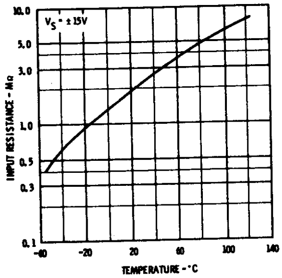


TYPICAL PERFORMANCE CURVES FOR μA748

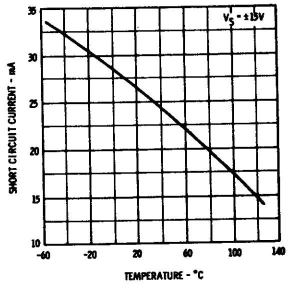
INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



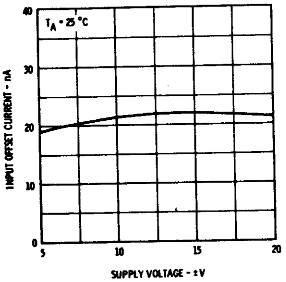
INPUT RESISTANCE AS A FUNCTION OF AMBIENT TEMPERATURE



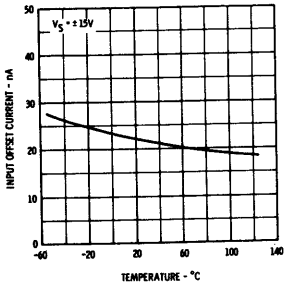
OUTPUT SHORT-CIRCUIT CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



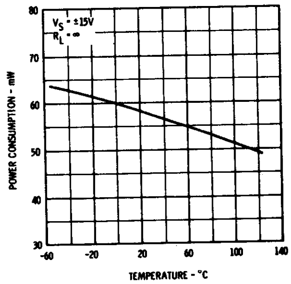
INPUT OFFSET CURRENT AS A FUNCTION OF SUPPLY VOLTAGE



INPUT OFFSET CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE

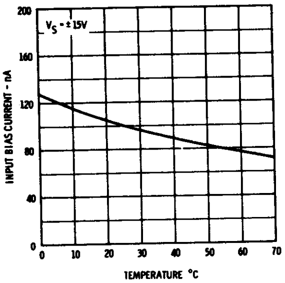


POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE

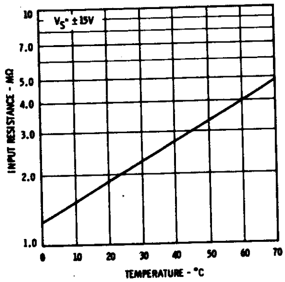


TYPICAL PERFORMANCE CURVES FOR μA748C

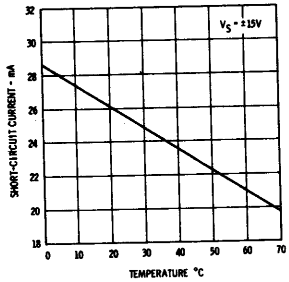
INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



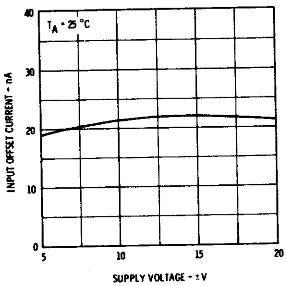
INPUT RESISTANCE AS A FUNCTION OF AMBIENT TEMPERATURE



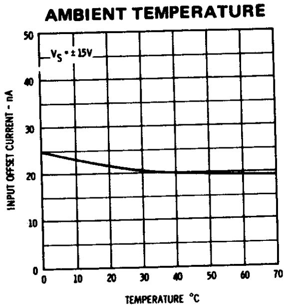
OUTPUT SHORT-CIRCUIT CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



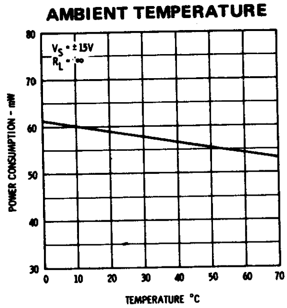
INPUT OFFSET CURRENT AS A FUNCTION OF SUPPLY VOLTAGE



INPUT OFFSET CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE

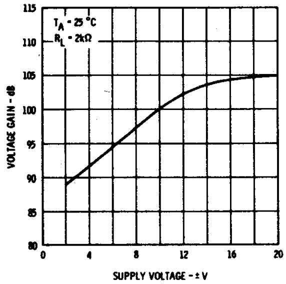


POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE

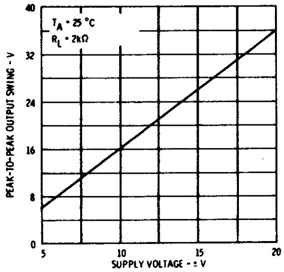


TYPICAL PERFORMANCE CURVES FOR μA748 AND μA748C

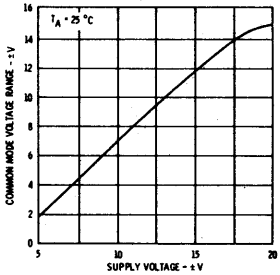
OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF SUPPLY VOLTAGE



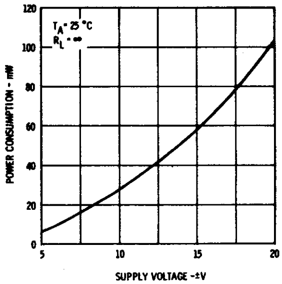
OUTPUT VOLTAGE SWING AS A FUNCTION OF SUPPLY VOLTAGE



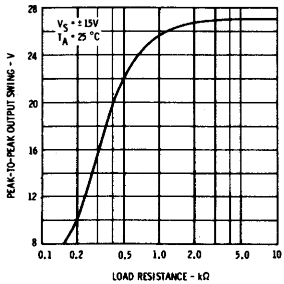
INPUT COMMON MODE VOLTAGE RANGE AS A FUNCTION OF SUPPLY VOLTAGE



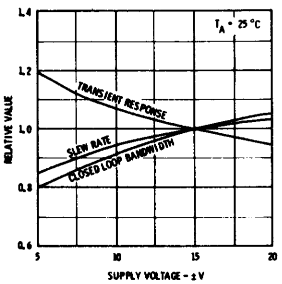
POWER CONSUMPTION AS A FUNCTION OF SUPPLY VOLTAGE



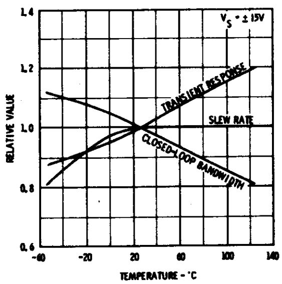
OUTPUT VOLTAGE SWING AS A FUNCTION OF LOAD RESISTANCE



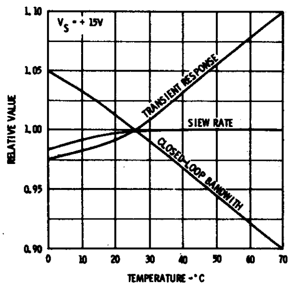
FREQUENCY CHARACTERISTICS AS A FUNCTION OF SUPPLY VOLTAGE



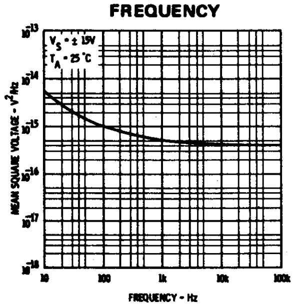
μA748 FREQUENCY CHARACTERISTICS AS A FUNCTION OF AMBIENT TEMPERATURE



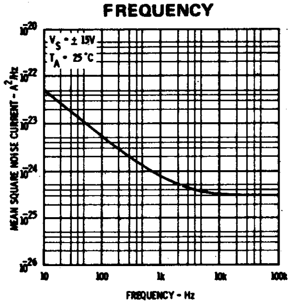
748C FREQUENCY CHARACTERISTICS AS A FUNCTION OF AMBIENT TEMPERATURE



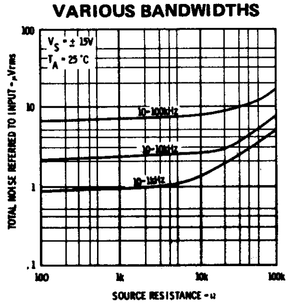
INPUT NOISE VOLTAGE AS A FUNCTION OF FREQUENCY



INPUT NOISE CURRENT AS A FUNCTION OF FREQUENCY

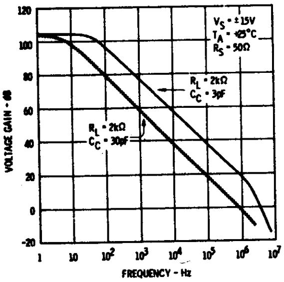


BROAD BAND NOISE FOR VARIOUS BANDWIDTHS

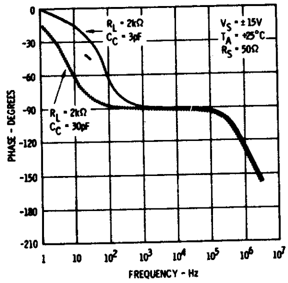


TYPICAL PERFORMANCE CURVES FOR μA748 AND μA748C

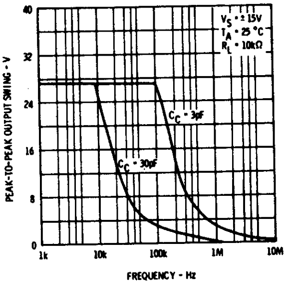
OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF FREQUENCY



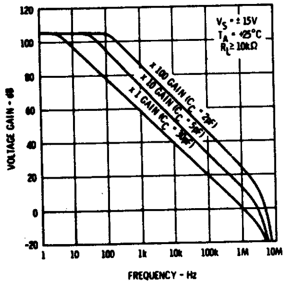
OPEN LOOP PHASE RESPONSE AS A FUNCTION OF FREQUENCY



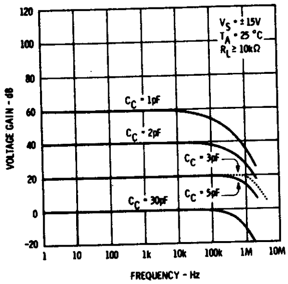
OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY



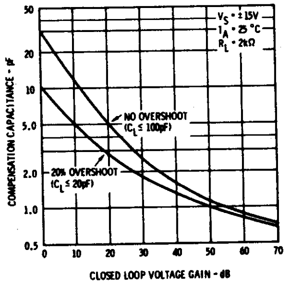
OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF FREQUENCY FOR VARIOUS GAIN/COMPENSATION OPTIONS



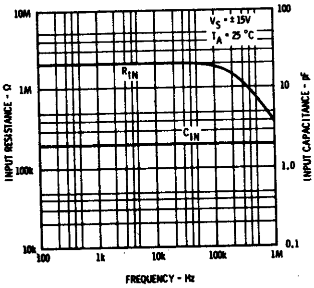
FREQUENCY RESPONSE FOR VARIOUS CLOSED LOOP GAINS



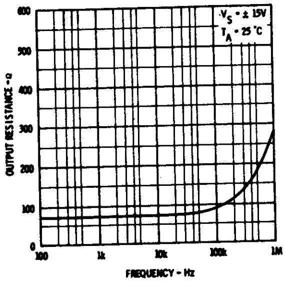
COMPENSATION CAPACITANCE AS A FUNCTION OF CLOSED LOOP VOLTAGE GAIN



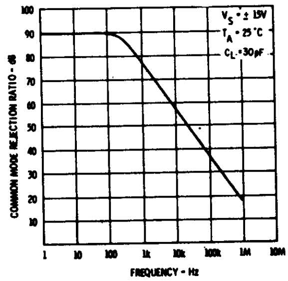
INPUT RESISTANCE AND INPUT CAPACITANCE AS A FUNCTION OF FREQUENCY



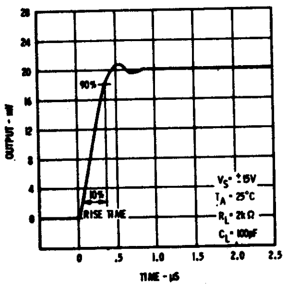
OUTPUT RESISTANCE AS A FUNCTION OF FREQUENCY



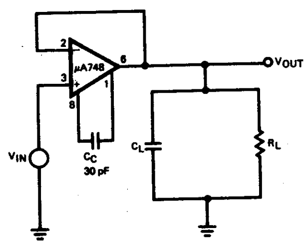
COMMON MODE REJECTION RATIO AS A FUNCTION OF FREQUENCY



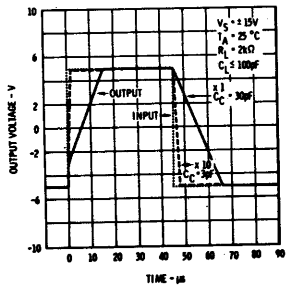
VOLTAGE FOLLOWER TRANSIENT RESPONSE (GAIN OF 1)



TRANSIENT RESPONSE TEST CIRCUIT

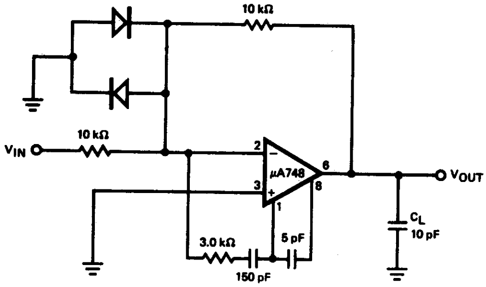


VOLTAGE FOLLOWER LARGE-SIGNAL PULSE RESPONSE

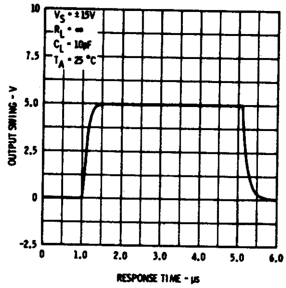


TYPICAL PERFORMANCE CURVES FOR μA748 AND μA748C

FEED FORWARD COMPENSATION

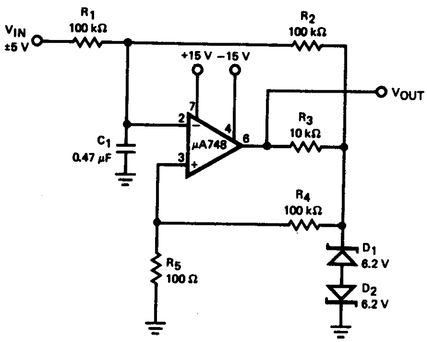


LARGE SIGNAL FEED FORWARD TRANSIENT RESPONSE



TYPICAL APPLICATIONS

PULSE WIDTH MODULATOR



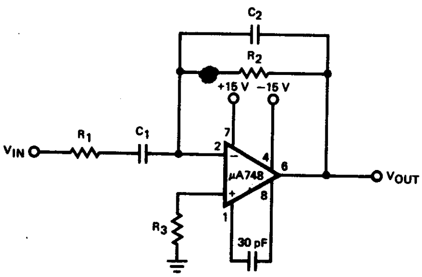
$$f_c = \frac{1}{2\pi\ R2\ C1}$$

$$f_n = \frac{1}{2\pi\ R1\ C1}$$

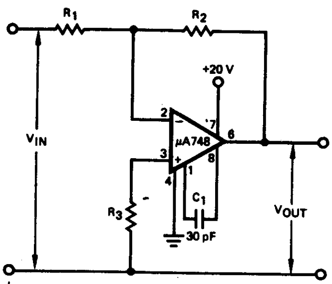
$$= \frac{1}{2\pi\ R2\ C2}$$

$$f_c < f_n < f_{unity\ gain}$$

PRACTICAL DIFFERENTIATOR



CIRCUIT FOR OPERATING THE μA748 WITHOUT A NEGATIVE SUPPLY



NOTES

1. Rating applies to ambient temperature up to 70°C. Above 70°C ambient derate linearly at 6.3 mW/°C for the metal can, 8.3 mW/°C for the DIP, 5.6 mW/°C for the mini DIP and 7.1 mW/°C for the flatpak.
2. For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.
3. Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or +75°C case temperature or +75°C ambient temperature.