FAIRCHILD

A Schlumberger Company

μA798 Dual Operational Amplifier

Linear Division Operational Amplifiers

Description

The μA798 consists of a monolithic pair of independent, high gain, internally frequency compensated operational amplifiers designed to operate from a single power supply or dual power supplies over a wide range of voltages. The common mode input range includes the negative supply, thereby eliminating the necessity for external biasing components in many applications. The output voltage range also includes the negative power supply voltage. The μA798 is constructed using the Fairchild Planar Epitaxial process.

- **Input Common Mode Voltage Range Includes Ground Or Negative Supply**
- **Output Voltage Can Swing Near Ground Or Negative Supply**
- **Internally Compensated**
- **Wide Power Supply Range Single Supply Of 3.0 V To 36 V Dual Supply of ± 1.5 V To ± 18 V**
- **Class AB Output Stage For Minimal Crossover Distortion**
- **Short Circuit Protected Output**
- **High Open Loop Gain — 200 k Typ**
- **Exceeds μA1458 Type Performance**
- **Operation Specified At ± 15 V And +5.0 V Power Supplies**
- **High Output Current Sink Capability 0.8 mA At V_O = 400 mV Typ**

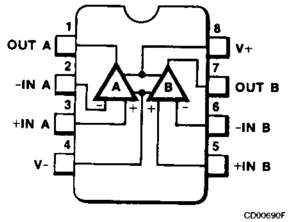
Absolute Maximum Ratings

Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	0°C to +70°C
Lead Temperature (soldering, 10 s)	265°C
Internal Power Dissipation[1, 2]	
8L-Molded DIP	0.93 W
SO-8	0.81 W
Supply Voltage Between V+ and V−	36 V
Differential Input Voltage	± 30 V
Input Voltage[3]	−0.3 V (V−) to V+
Output Short Circuit Duration[4]	Indefinite

Notes

1. $T_{J\ Max}$ = 150°C.
2. Ratings apply to ambient temperature at 25°C. Above this temperature, derate the Molded DIP at 7.5 mW/°C, and the SO-8 at 6.5 mW/°C.
3. For supply voltage less than 30 V between V+ and V−, the absolute maximum input voltage is equal to the supply voltage.
4. Indefinite on shorts to ground or V− supply. Shorts to V+ supply may result in power dissipation exceeding the absolute maximum rating.

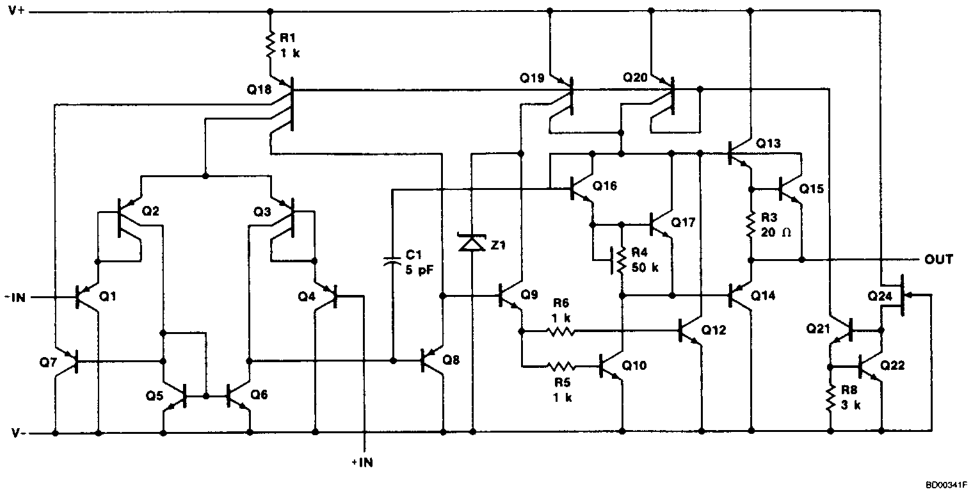
Connection Diagram 8-Lead DIP and SO-8 Package (Top View)



Order Information

Device Code	Package Code	Package Description
μA798SC	KC	Molded Surface Mount
μA798TC	9T	Molded DIP

Equivalent Circuit (1/2 of circuit shown)



Note

1. All resistor values in ohm.

μA798
Electrical Characteristics $T_A = 25°C$, $V_{CC} = \pm 15$ V, unless otherwise specified.

Symbol	Characteristic		Condition	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage				2.0	6.0	mV
I_{IO}	Input Offset Current				10	50	nA
I_{IB}	Input Bias Current				50	250	nA
Z_I	Input Impedance			0.3	1.0		MΩ
R_O	Output Resistance				800		Ω
I_{CC}	Supply Current		$V_O = 0$, $R_L = \infty$		2.0	4.0	mA
CMR	Common Mode Rejection		$R_S \leq 10$ kΩ	70	90		dB
V_{IR}	Input Voltage Range			+13 to V−	+13.5 to V−		V
PSRR	Power Supply Rejection Ratio		Positive		30	150	μV/V
			Negative		30	150	
I_{OS}	Output Short Circuit Current[1,2]		$V_O = -15$ V, $V_{ID} = 1.0$ V	10	30	45	mA
	(Per Amplifier)		$V_O = $ Gnd, $V_{ID} = -1.0$ V	10	70	85	
A_{VS}	Large Signal Voltage Gain		$V_O = \pm 10$ V, $R_L = 2.0$ kΩ	20	200		V/mV
V_{OP}	Output Voltage Swing		$R_L = 10$ kΩ	±13	±14		V
			$R_L = 2.0$ kΩ	±12	±13.5		
TR	Transient Response	Rise Time	$V_O = 50$ mV, $A_V = 1.0$, $R_L = 10$ kΩ		0.3		μs
		Fall Time	$V_O = 50$ mV, $A_V = 1.0$, $R_L = 10$ kΩ		0.3		
		Overshoot	$V_O = 50$ mV $A_V = 1.0$, $R_L = 10$ kΩ		20		%
BW	Bandwidth		$V_O = 50$ mV, $A_V = 1.0$, $R_L = 10$ kΩ		1.0		MHz
SR	Slew Rate		$V_I = -10$ V to +10 V, $A_V = 1.0$		0.6		V/μs
CS	Channel Separation		f = 1.0 kHz to 20 kHz (Input Referenced)		−120		dB

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

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage				7.5	mV
$\Delta V_{IO}/\Delta T$	Input Offset Voltage Temperature Sensitivity			10		μV/°C
I_{IO}	Input Offset Current				200	nA
$\Delta I_{IO}/\Delta T$	Input Offset Current Temperature Sensitivity			50		pA/°C
I_{IB}	Input Bias Current				400	nA

μA798 (Cont.)
Electrical Characteristics $T_A = 25°C$, $V_{CC} = \pm 15$ V, unless otherwise specified.

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
A_{VS}	Large Signal Voltage Gain	$R_L = 2.0$ kΩ, $V_O = \pm 10$ V	15			V/mV
V_{OP}	Output Voltage Swing	$R_L = 2.0$ kΩ	±10			V

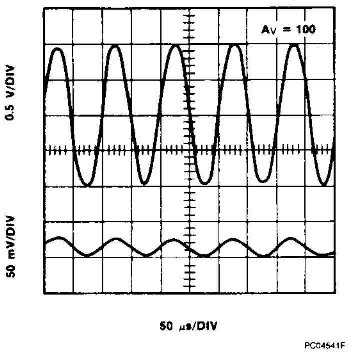
The following specifications apply for $T_A = 25°C$, V+ = 5.0 V, V−=GND

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage			2.0	7.5	mV
I_{IO}	Input Offset Current			10	50	nA
I_{IB}	Input Bias Current			80	250	nA
A_{VS}	Large Signal Voltage Gain	$R_L \geq 2.0$ kΩ	20	200		V/mV
PSRR	Power Supply Rejection Ratio				150	μV/V
V_{OP}	Output Voltage Swing[3]	$R_L = 10$ kΩ	4.0			V_{p-p}
		5.0 V ≤ V+ ≤ 30 V $R_L = 10$ kΩ	(V+) −1.5			
I_{O-}	Output Sink Current	$V_O = 200$ mV, $V_{ID} = 1.0$ V	0.35			mA
I_{CC}	Supply Current			2.0	4.0	mA

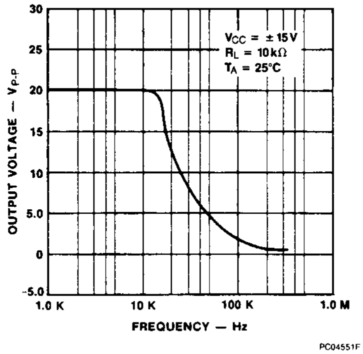
Notes
1. Not to exceed maximum package power dissipation.
2. Indefinite on shorts to ground or V− supply. Shorts to V+ supply may result in power dissipation exceeding the absolute maximum rating.
3. Output will swing to ground.

Typical Performance Curves

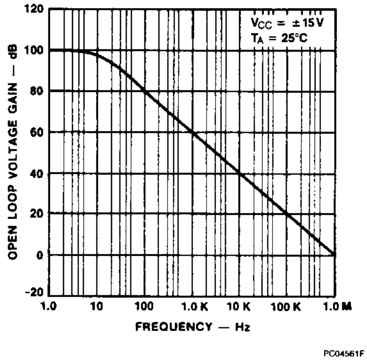
Sinewave Response



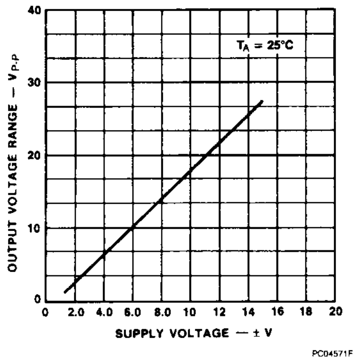
Output Voltage vs Frequency



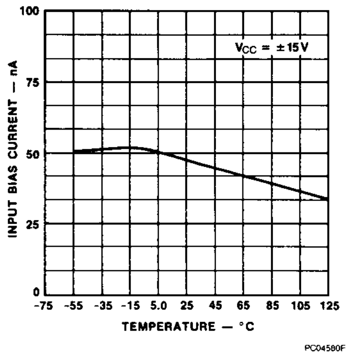
Open Loop Frequency Response



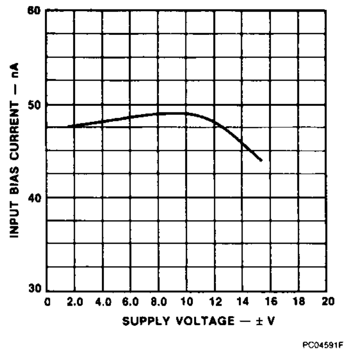
Output Swing vs Supply Voltage



Input Bias Current vs Temperature

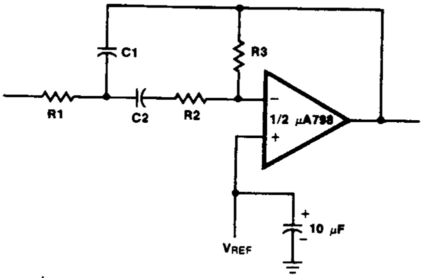


Input Bias Current vs Supply Voltage



Typical Applications

Multiple Feedback Bandpass Filter



$f_o \overset{\Delta}{=}$ center frequency

$BW \overset{\Delta}{=}$ Bandwidth

R in kΩ

C in μF

$$Q = \frac{f_o}{BW} < 10$$

$$C1 = C2 = \frac{Q}{3}$$

$\left.\begin{matrix} R1 = R2 = 1 \\ R3 = 9Q^2 - 1 \end{matrix}\right\}$ Use scaling factors in these expressions.

If source impedance is high or varies, filter may be preceded with voltage follower buffer to stabilize filter parameters.

Design example:

given: $Q = 5$, $f_o = 1.0$ kHz

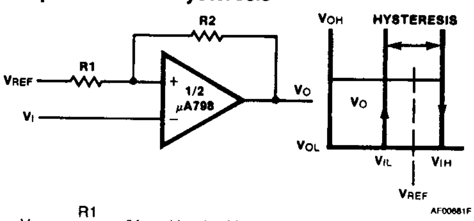
Let R1 = R2 = 10 kΩ

then $R3 = 9(5)^2 - 10$

R3 = 215 kΩ

$$C = \frac{5}{3} = 1.6\ \mu F$$

Comparator With Hysteresis



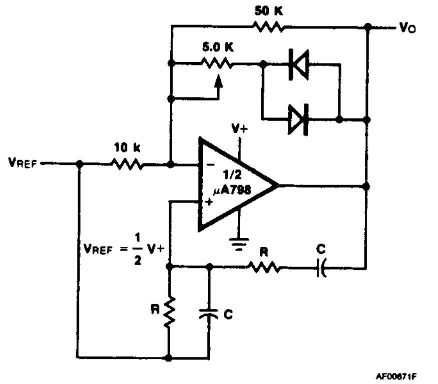
$$V_{IL} = \frac{R1}{R1 + R2}(V_{OL} - V_{REF}) + V_{REF}$$

$$V_{IH} = \frac{R1}{R1 + R2}(V_{OH} - V_{REF}) + V_{REF}$$

$$H = \frac{R1}{R1 + R2}(V_{OH}\ V_{OL})$$

$$f = \frac{R1 + R2}{4CR_fR1} \text{ if } R3 = \frac{R2R1}{R2 + R1}$$

Wein Bridge Oscillator

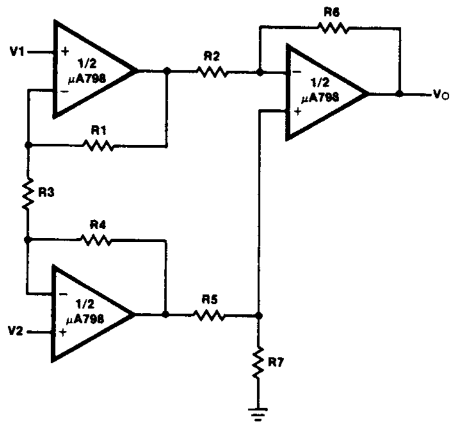


$$f_o = \frac{1}{2\pi RC} \quad \text{for } f_o = 1.0 \text{ kHz}$$

R = 16 kΩ

C = 0.01 μF

High Impedance Differential Amplifier



$$V_O = C\ (1 + a + b)(V2 - V1)$$

$$\frac{R2}{R5} \equiv \frac{R6}{R7} \text{ for best CMRR}$$

R1 = R4

R2 = R5

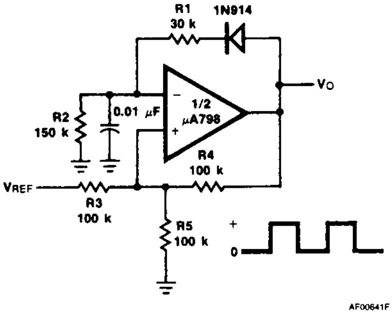
$$\text{Gain} = \frac{R6}{R2}\left(1 + \frac{2R1}{R3}\right) = C\ (1 + a + b)$$

Note

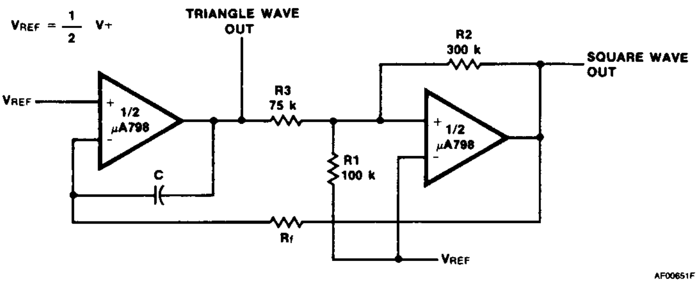
1. All resistor values in ohms.

Typical Applications (Cont.)

Pulse Generator



Function Generator



Note
1. All resistor values are in ohms.