FAIRCHILD

A Schlumberger Company

μA148 • μA248 • μA348 Quad Operational Amplifiers

Description

The μA148 series is a true quad μA741. It consists of four independent, high gain, internally frequency compensated, low power operational amplifiers which have been designed to provide functional characteristics identical to those of the familiar μA741 operational amplifier. In addition, the total supply current for all four amplifiers is comparable to the supply current of a single μA741 type operational amplifier.

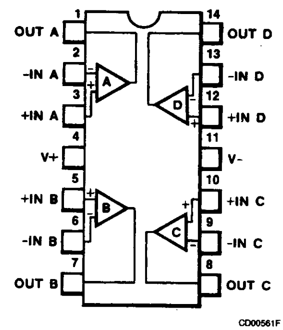
Other features include input offset currents and input bias currents which are much less than those of a standard μA741. Also, excellent isolation between amplifiers has been achieved by independently biasing each amplifier and using layout techniques which minimize thermal coupling.

- **μA741 Op Amp Operating Characteristics**
- **Low Supply Current Drain**
- **Class AB Output Stage — No Crossover Distortion**
- **Lead Compatible With The μA324 & μA3403**
- **Low Input Offset Voltage — 1.0 mV Typically**
- **Low Input Offset Current — 4.0 nA Typically**
- **Low Input Bias Current — 30 nA Typically**
- **Gain Bandwidth Product For μA148 (Unity Gain) — 1.0 MHz Typically**
- **High Degree Of Isolation Between Amplifiers — 120 dB Typically**
- **Overload Protection For Inputs And Outputs**

Absolute Maximum Ratings

Storage Temperature Range	
Ceramic DIP	-65°C to +175°C
Molded DIP	-65°C to +150°C
Operating Temperature Range	
Extended (μA148M)	-55°C to +125°C
Industrial (μA248V)	-25°C to +85°C
Commercial (μA348C)	0°C to +70°C
Lead Temperature	
Ceramic DIP (soldering, 60 s)	300°C
Molded DIP (soldering, 10 s)	265°C
Internal Power Dissipation[1,2]	
14L-Molded DIP	1.04 W
14L-Ceramic DIP	1.36 W
Supply Voltage	
μA148	±22 V
μA248, μA348	±18 V
Differential Input Voltage	
μA148	±44 V
μA248, μA348	±36 V
Input Voltage	
μA148	±22 V
μA248, μA348	±18 V
Output Short Circuit Duration[3]	Indefinite

Connection Diagram
14-Lead DIP
(Top View)



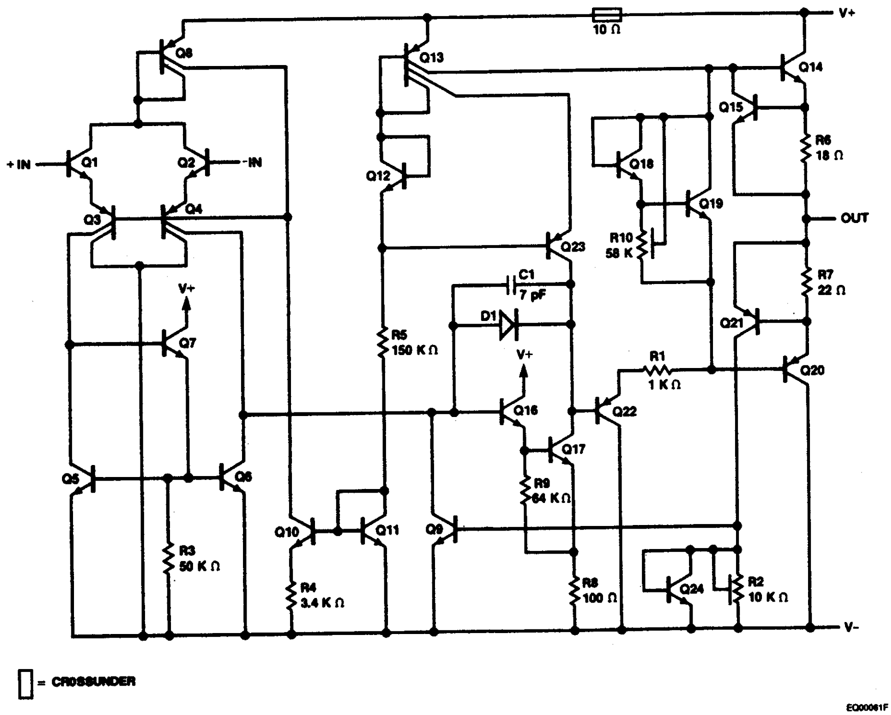
Order Information

Device Code	Package Code	Package Description
μA148DM	6A	Ceramic DIP
μA248DV	6A	Ceramic DIP
μA248PV	9A	Molded DIP
μA348DC	6A	Ceramic DIP
μA348PC	9A	Molded DIP

Notes

1. $T_{J\ Max}$ = 150°C for the Molded DIP, and 175°C for the Ceramic DIP.
2. Ratings apply to ambient temperature at 25°C. Above this temperature, derate the 14-Lead Molded DIP at 8.3 mW/°C, and the 14-Lead Ceramic DIP at 9.1 mW/°C.
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.

Equivalent Circuit (1/4 of Circuit)



μA148

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

DC Characteristics

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	5.0	mV
I_{IO}	Input Offset Current			4	25	nA
I_{IB}	Input Bias Current			30	100	nA
Z_I	Input Impedance		0.8	2.5		MΩ
I_{CC}	Supply Current (Total)			2.4	3.6	mA
I_{OS}	Output Short Circuit Current			25		mA
A_{VS}	Large Signal Voltage Gain	$V_O = \pm 10$ V, $R_L \geq 2.0$ kΩ	50	160		V/mV
CS	Channel Separation	1.0 Hz $\leq f \leq$ 20 kHz (Input Referred)		−120		dB

The following specifications apply over the range of $-55°C \leq T_A \leq +125°C$.

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage	$R_S \leq 10$ kΩ			6.0	mV
I_{IO}	Input Offset Current				75	nA
I_{IB}	Input Bias Current				325	nA
CMR	Common Mode Rejection	$R_S \leq 10$ kΩ	70	90		dB
V_{IR}	Input Voltage Range		±12			V
PSRR	Power Supply Rejection Ratio	$R_S \leq 10$ kΩ	77	96		dB
A_{VS}	Large Signal Voltage Gain	$V_O = \pm 10$ V, $R_L \geq 2.0$ kΩ	25			V/mV
V_{OP}	Output Voltage Swing	$R_L = 10$ kΩ	±12	±13		V
		$R_L = 2.0$ kΩ	±10	±12		

AC Characteristics

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
BW	Bandwidth			1.0		MHz
ϕ	Phase Margin	$A_V = 1.0$		60		degrees
SR	Slew Rate	$A_V = 1.0$		0.5		V/μs

μA248
Electrical Characteristics $T_A = 25°C$, $V_{CC} = \pm 15$ V, unless otherwise specified.

DC Characteristics

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	6.0	mV
I_{IO}	Input Offset Current			4	50	nA
I_{IB}	Input Bias Current			30	200	nA
Z_I	Input Impedance		0.8	2.5		MΩ
I_{CC}	Supply Current (Total)			2.4	4.5	mA
I_{OS}	Output Short Circuit Current			25		mA
A_{VS}	Large Signal Voltage Gain	$V_O = \pm 10$ V, $R_L \geq 2.0$ kΩ	25	160		V/mV
CS	Channel Separation	1.0 Hz $\leq f \leq$ 20 kHz (Input Referred)		−120		dB

The following specifications apply over the range of $-25°C \leq T_A \leq +85°C$.

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage	$R_S \leq 10$ kΩ			7.5	mV
I_{IO}	Input Offset Current				125	nA
I_{IB}	Input Bias Current				500	nA
CMR	Common Mode Rejection	$R_S \leq 10$ kΩ	70	90		dB
V_{IR}	Input Voltage Range		±12			V
PSRR	Power Supply Rejection Ratio	$R_S \leq 10$ kΩ	77	96		dB
A_{VS}	Large Signal Voltage Gain	$V_O = \pm 10$ V, $R_L \geq 2.0$ kΩ	15			V/mV
V_{OP}	Output Voltage Swing	$R_L = 10$ kΩ	±12	±13		V
		$R_L = 2.0$ kΩ	±10	±12		

AC Characteristics

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
BW	Bandwidth			1.0		MHz
ϕ	Phase Margin	$A_V = 1.0$		60		degrees
SR	Slew Rate	$A_V = 1.0$		0.5		V/μs

μA348

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

DC Characterisitcs

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage	$R_S \leqslant 10$ kΩ		1.0	6.0	mV
I_{IO}	Input Offset Current			4	50	nA
I_{IB}	Input Bias Current			30	200	nA
Z_I	Input Impedance		0.8	2.5		MΩ
I_{CC}	Supply Current (Total)			2.4	4.5	mA
I_{OS}	Output Short Circuit Current			25		mA
A_{VS}	Large Signal Voltage Gain	$V_O = \pm 10$ V, $R_L \geqslant 2.0$ kΩ	25	160		V/mV
CS	Channel Separation	1.0 Hz $\leqslant f \leqslant$ 20 kHz (Input Referred)		−120		dB
The following specifications apply over the range of $0°C \leqslant T_A \leqslant +70°C$.						
V_{IO}	Input Offset Voltage	$R_S \leqslant 10$ kΩ			7.5	mV
I_{IO}	Input Offset Current				100	nA
I_{IB}	Input Bias Current				400	nA
CMR	Common Mode Rejection	$R_S \leqslant 10$ kΩ	70	90		dB
V_{IR}	Input Voltage Range		±12			V
PSRR	Power Supply Rejection Ratio	$R_S \leqslant 10$ kΩ	77	96		dB
A_{VS}	Large Signal Voltage Gain	$V_O = \pm 10$ V, $R_L \geqslant 2.0$ kΩ	15			V/mV
V_{OP}	Output Voltage Swing	$R_L = 10$ kΩ	±12	±13		V
		$R_L = 2.0$ kΩ	±10	±12		

AC Characteristics

BW	Bandwidth			1.0		MHz
ϕ	Phase Margin	$A_V = 1.0$		60		degrees
SR	Slew Rate	$A_V = 1.0$		0.5		V/μs

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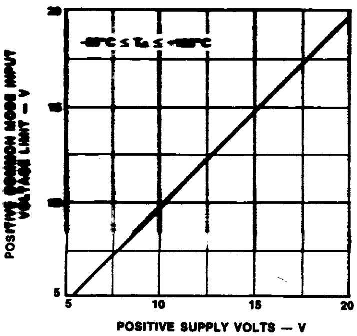
Typical Performance Curves

Positive Common Mode Input Voltage Limit vs Supply Voltage



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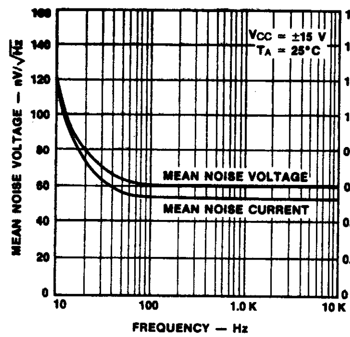
Input Noise Voltage and Noise Current vs Frequency



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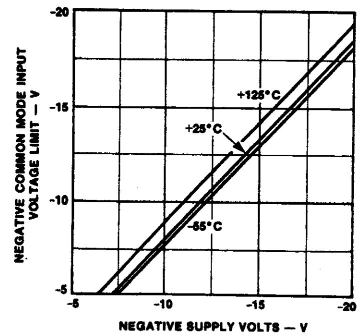
Negative Common Mode Input Voltage Limit vs Supply Voltage



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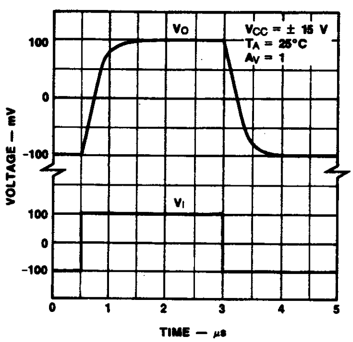
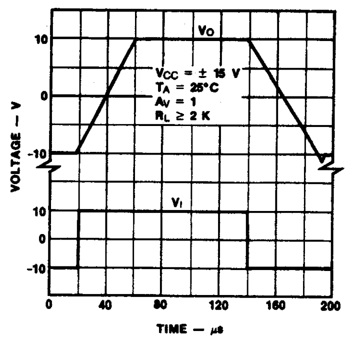
Small Signal Pulse Response



PC02971F

Large Signal Pulse Response



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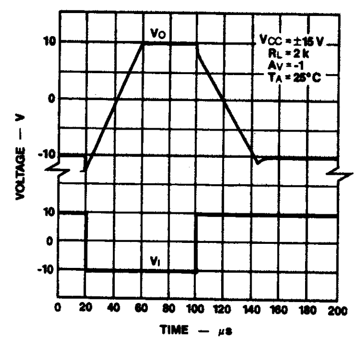
Inverting Large Signal Pulse Response



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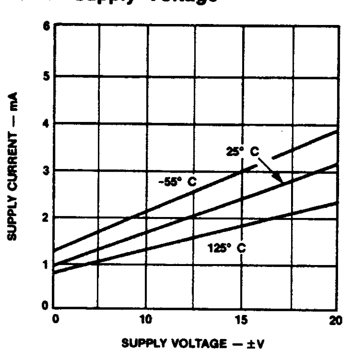
Supply Current vs Power Supply Voltage



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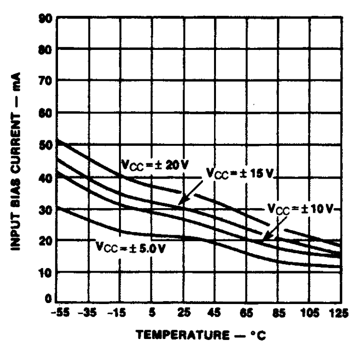
Input Bias Current vs Ambient Temperature



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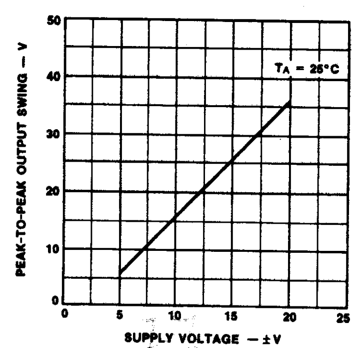
Output Voltage Swing vs Supply Voltage



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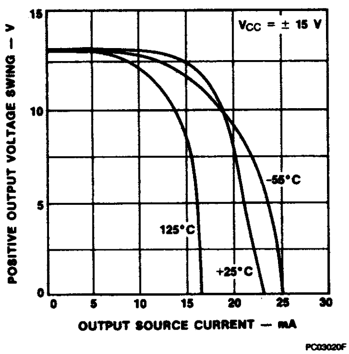
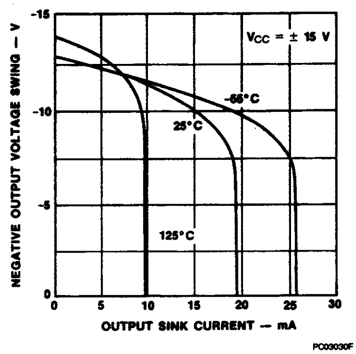
Typical Performance Curves (Cont.)

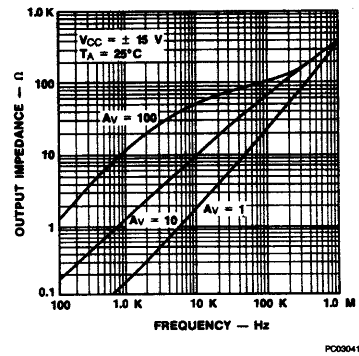
Output Voltage vs Source Current



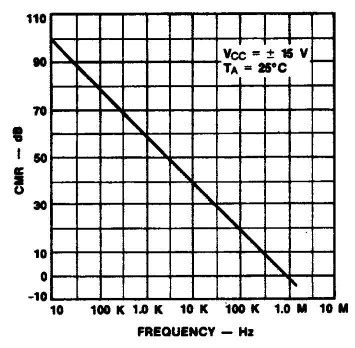
Output Voltage vs Sink Current



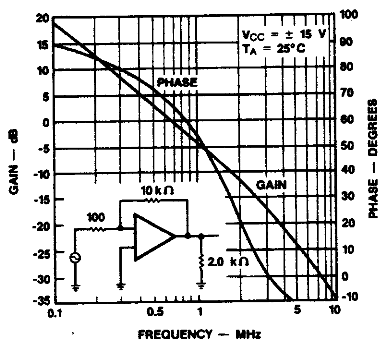
Output Impedance vs Frequency



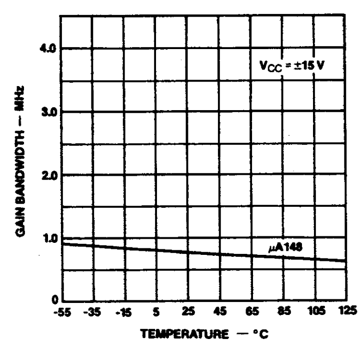
CMR vs Frequency



Gain and Phase vs Frequency



Gain Bandwidth vs Temperature



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