μA1458 • μA1458C • μA1558

DUAL INTERNALLY-COMPENSATED OPERATIONAL AMPLIFIER

FAIRCHILD LINEAR INTEGRATED CIRCUITS

GENERAL DESCRIPTION — The μA1458/μA1558 are a monolithic pair of Internally Compensated High Performance 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 μA1458/μA1558 ideal for use as voltage followers. The high gain and wide range of operating voltage provides superior performance in integrator, summing amplifier and general feedback applications.

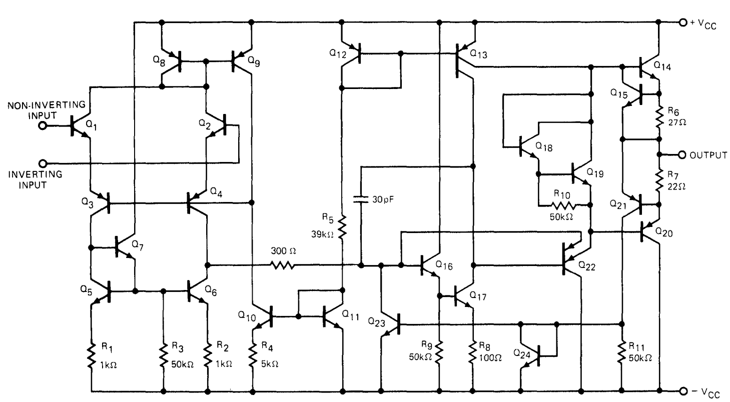
The μA1458/μA1558 are short-circuit protected and require no external components for frequency compensation. The internal 6 dB/octave roll-off insures stability in closed loop applications. For single amplifier performance, see the μA741 data sheet.

- **NO FREQUENCY COMPENSATION REQUIRED**
- **SHORT-CIRCUIT PROTECTION**
- **LARGE COMMON-MODE AND DIFFERENTIAL VOLTAGE RANGES**
- **LOW POWER CONSUMPTION**
- **NO LATCH-UP**
- **MINI DIP PACKAGE**

ABSOLUTE MAXIMUM RATINGS

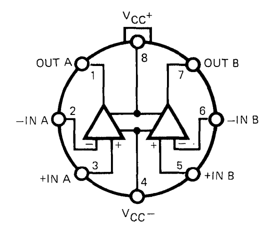
Supply Voltage	
Military (μA1558)	±22 V
Commercial (μA1458 and μA1458C)	±18 V
Internal Power Dissipation (Note 1)	
Metal Can	500 mW
Mini DIP	310 mW
Differential Input Voltage (Note 2)	±30 V
Common-Mode Input Swing (Note 2)	±15 V
Output Short Circuit Duration (Note 3)	Indefinite
Storage Temperature Range	-65°C to +150°C
Operating Temperature Range	
Military (μA1558)	−55°C to +125°C
Commercial (μA1458 and μA1458C)	0°C to 70°C
Pin Temperature	
Metal Can (Soldering, 60 s)	300°C
Mini DIP (Soldering, 10 s)	260°C

EQUIVALENT CIRCUIT
(EACH SIDE)



Notes on following page.

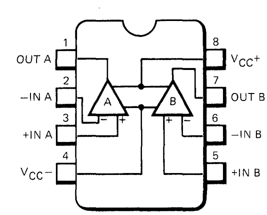
CONNECTION DIAGRAMS
8-PIN METAL CAN
(TOP VIEW)
PACKAGE OUTLINE 5S
PACKAGE CODE H



ORDER INFORMATION

TYPE	PART NO.
μA1458	μA1458HC
μA1458C	μA1458CHC
μA1558	μA1558HM

8-PIN MINI DIP
(TOP VIEW)
PACKAGE OUTLINE 9T 6T
PACKAGE CODE T R



ORDER INFORMATION

TYPE	PART NO.
μA1458	μA1458TC
μA1458C	μA1458CTC
μA1458	μA1458RC
μA1458C	μA1458CRC
μA1558	μA1558RM

*Planar is a patented Fairchild process.

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μA1458

ELECTRICAL CHARACTERISTICS: V_S = ±15 V, T_A = 25°C unless otherwise specified.

CHARACTERISTICS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10\,k\Omega$		2.0	6.0	mV
Input Offset Current			.03	0.2	μA
Input Bias Current			0.2	0.5	μA
Differential Input Impedance					
Parallel Input Resistance	f = 20 Hz, Open Loop	0.3	1.0		MΩ
Parallel Input Capacitance	f = 20 Hz, Open Loop		6.0		pF
Common-Mode Input Impedance	f = 20 Hz		200		MΩ
Common-Mode Input Voltage Swing		±12	±13		V
Equivalent Input Noise Voltage	A_V = 100, R_S = 10 kΩ, f = 1.0 kHz, BW = 1.0 Hz		45		nV/√Hz
Common-Mode Rejection Ratio	f = 100 Hz	70	90		dB
Open-Loop Voltage Gain	V_{OUT} = ±10 V, R_L = 2.0 kΩ	20k	100k		V/V
Power Bandwidth	A_V = 1, R_L = 2.0 kΩ, THD ≤ 5%, V_{OUT} = 20 V_{pk-pk}		14		kHz
Unity Gain Crossover Frequency (Open-Loop)			1.1		MHz
Phase Margin (Open Loop)			65		Degrees
Gain Margin			11		dB
Slew Rate	A_V = 1		0.8		V/μs
Output Impedance	f = 20 Hz		75		Ω
Short-Circuit Output Current			20		mA
Output Voltage Swing	R_L = 10 kΩ	±12	±14		V
Power Supply Sensitivity					
V_{CC-} = Constant	$R_S \leq 10$ kΩ		30	150	μV/V
V_{CC+} = Constant	$R_S \leq 10$ kΩ		30	150	μV/V
Power Supply Current	I_+		2.3	5.6	mA
	I_-		2.3	5.6	mA
Power Dissipation	V_{OUT} = 0		70	170	mW

The Following Specifications Apply For 0°C ≤ T_A ≤ 70°C

CHARACTERISTICS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10$ kΩ			7.5	mV
Input Offset Current				0.3	μA
Input Bias Current				0.8	μA
Open Loop Voltage Gain	V_{OUT} = ±10 V, R_L = 2.0 kΩ	15k			V/V
Output Voltage Swing	R_L = 2.0 kΩ	±10	±13		V
Average Temperature Coefficient of Input Offset Voltage	R_S = 50 Ω		15		μV/°C

μA1458C

ELECTRICAL CHARACTERISTICS: $V_S = \pm15$ V, $T_A = 25°C$ unless otherwise specified.

CHARACTERISTICS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10$ kΩ		2.0	10	mV
Input Offset Current			.03	0.3	μA
Input Bias Current			0.2	0.7	μA
Differential Input Impedance					
Parallel Input Resistance	f = 20 Hz, Open Loop		1.0		MΩ
Parallel Input Capacitance	f = 20 Hz, Open Loop		6.0		pF
Common-Mode Input Impedance	f = 20 Hz		200		MΩ
Common-Mode Input Voltage Swing		±11	±13		V
Equivalent Input Noise Voltage	$A_V = 100$, $R_S = 10$ kΩ, f = 1.0 kHz, BW = 1.0 Hz		45		nV/√Hz
Common-Mode Rejection Ratio	f = 100 Hz	60	90		dB
Open-Loop Voltage Gain	$V_{OUT} = \pm10$ V, $R_L = 10$ kΩ	20k	100k		V/V
Power Bandwidth	$A_V = 1$, $R_L = 2.0$ kΩ, THD ≤ 5%, $V_{OUT} = 20$ V_{pk-pk}		14		kHz
Unity Gain Crossover Frequency (Open-Loop)			1.1		MHz
Phase Margin (Open Loop)			65		Degrees
Gain Margin			11		dB
Slew Rate	$A_V = 1$		0.8		V/μs
Output Impedance	f = 20 Hz		75		Ω
Short-Circuit Output Current			20		mA
Output Voltage Swing	$R_L = 10$ kΩ	±11	±14		V
Power Supply Sensitivity					
V_{CC-} = Constant	$R_S \leq 10$ kΩ		30		μV/V
V_{CC+} = Constant	$R_S \leq 10$ kΩ		30		μV/V
Power Supply Current	I_+		2.3	8.0	mA
	I_-		2.3	8.0	mA
Power Dissipation	$V_{OUT} = 0$		70	240	mW

The Following Specifications Apply For $0°C \leq T_A \leq +70°C$

CHARACTERISTICS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S = 10$ kΩ			12	mV
Input Offset Current				0.4	μA
Input Bias Current				1.0	μA
Open Loop Voltage Gain	$V_{OUT} = \pm10$ V, $R_L = 10$ kΩ	15k			V/V
Output Voltage Swing	$R_L = 2.0$ kΩ	±9.0	±13		V
Average Temperature Coefficient of Input Offset Voltage	$R_S = 50$ Ω		15		μV/°C

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μA1558

ELECTRICAL CHARACTERISTICS: $V_S = \pm15$ V, $T_A = 25°C$ unless otherwise specified.

CHARACTERISTICS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10$ kΩ		1.0	5.0	mV
Input Offset Current			0.03	0.2	μA
Input Bias Current			0.2	0.5	μA
Differential Input Impedance					
Parallel Input Resistance	f = 20 Hz, Open Loop	0.3	1.0		MΩ
Parallel Input Capacitance	f = 20 Hz, Open Loop		6.0		pF
Common-Mode Input Impedance	f = 20 Hz		200		MΩ
Common-Mode Input Voltage Swing		±12	±13		V
Equivalent Input Noise Voltage	$A_V = 100$, $R_S = 10$ kΩ, f = 1.0 kHz, BW = 1.0 Hz		45		nV/√Hz
Common-Mode Rejection Ratio	f = 100 Hz	70	90		dB
Open-Loop Voltage Gain	$V_{OUT} = \pm10$ V, $R_L = 2.0$ kΩ	50k	200k		V/V
Power Bandwidth	$A_V = 1$, $R_L = 2.0$ kΩ, THD ≤ 5%, $V_{OUT} = 20\ V_{pk-pk}$		14		kHz
Unity Gain Crossover Frequency (Open Loop)			1.1		MHz
Phase Margin (Open Loop)			65		Degrees
Gain Margin			11		dB
Slew Rate	$A_V = 1$		0.8		V/μs
Output Impedance	f = 20 Hz		75		Ω
Short-Circuit Output Current			20		mA
Output Voltage Swing	$R_L = 10$ kΩ	±12	±14		V
Power Supply Sensitivity					
$V_{CC}-$ = Constant	$R_S \leq 10$ kΩ		30	150	μV/V
$V_{CC}+$ = Constant	$R_S \leq 10$ kΩ		30	150	μV/V
Power Supply Current	I_+		2.3	5.0	mA
	I_-		2.3	5.0	mA
Power Dissipation	$V_{OUT} = 0$		70	150	mW

The Following Specifications Apply For $-55°C \leq T_A \leq +125°C$

CHARACTERISTICS	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10$ kΩ			6.0	mV
Input Offset Current				0.5	μA
Input Bias Current				1.5	μA
Open-Loop Voltage Gain	$V_{OUT} = \pm10$ V, $R_L = 2.0$ kΩ	25k			V/V
Output Voltage Swing	$R_L = 2$ kΩ	±10	±13		V
Average Temperature Coefficient of Input Offset Voltage	$R_S = 50$ Ω		15		μV/°C

NOTES:
1. Rating applies to ambient temperatures up to 70°C. Above 70°C ambient derate linearly at 6.3 mW/°C for the metal can and 5.6 mW/°C for the mini 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 70°C ambient temperature.

TYPICAL PERFORMANCE CURVES FOR μA1458, μA1458C AND μA1558

($V_{CC}+ = +15$ V, $V_{CC}- = -15$ V, $T_A = 25°C$ unless otherwise noted)

OPEN-LOOP VOLTAGE GAIN AS A FUNCTION OF POWER SUPPLY VOLTAGES

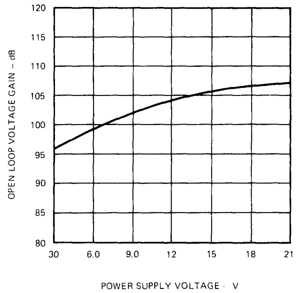

Fig. 1

OPEN-LOOP FREQUENCY RESPONSE

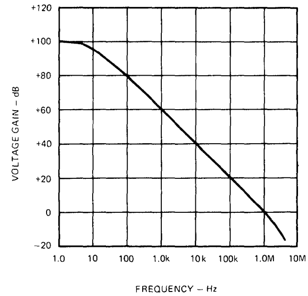

Fig. 2

POWER BANDWIDTH (LARGE SIGNAL SWING AS A FUNCTION OF FREQUENCY)

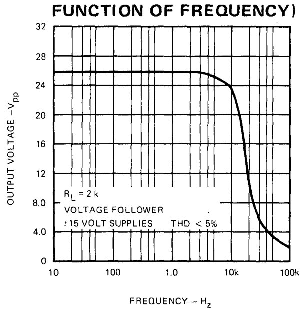

Fig. 3

POWER DISSIPATION AS A FUNCTION OF POWER SUPPLY VOLTAGE

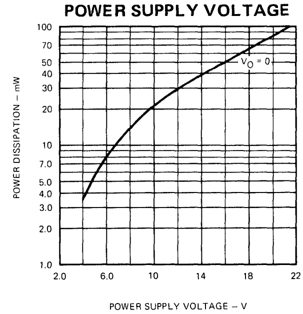

Fig. 4

OUTPUT VOLTAGE SWING AS A FUNCTION OF LOAD RESISTANCE

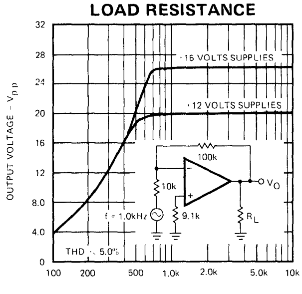

Fig. 5

OUTPUT NOISE AS A FUNCTION OF SOURCE RESISTANCE

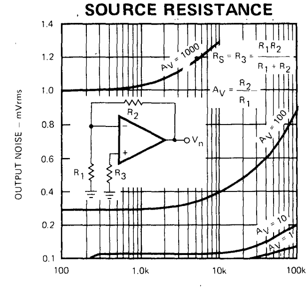

Fig. 6

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HIGH-IMPEDANCE, HIGH-GAIN INVERTING AMPLIFIER

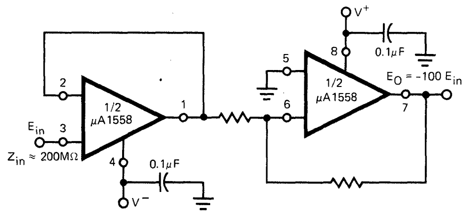
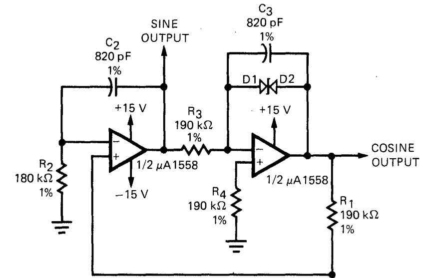


Fig. 7

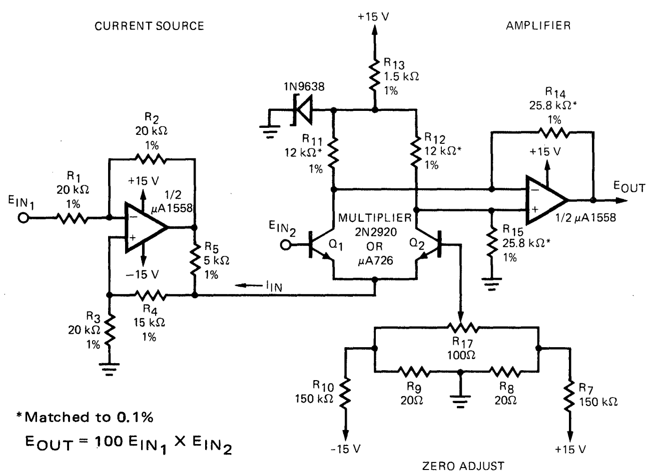
QUADRATURE OSCILLATOR



$$*f = \frac{1}{2\pi\sqrt{C_2R_2C_3R_3}} \quad (R_1C_1 = R_2C_2)$$

Fig. 8

ANALOG MULTIPLIER

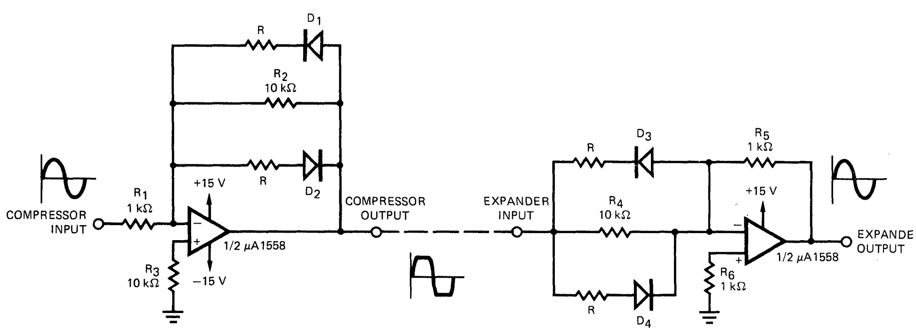


*Matched to 0.1%

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

Fig. 9

COMPRESSOR/EXPANDER AMPLIFIERS



MAXIMUM COMPRESSION EXPANSION RATIO = R_1/R $(10\,k\Omega > R \geqslant 0)$

NOTE: DIODES D_1 THROUGH D_4 ARE MATCHED FD6666 OR EQUIVALENT.

Fig.10