

AMP03

FEATURES

High CMRR: 100 dB Typ
Low Nonlinearity: 0.001% Max
Low Distortion: 0.001% Typ
Wide Bandwidth: 3 MHz Typ
Fast Slew Rate: 9.5 V/ μ s Typ
Fast Settling (0.01%): 1 μ s Typ
Low Cost

APPLICATIONS

Summing Amplifiers
Instrumentation Amplifiers
Balanced Line Receivers
Current-Voltage Conversion
Absolute Value Amplifier
4 to 20 mA Current Transmitter
Precision Voltage Reference Applications
Lower Cost and Higher Speed Version of INA105

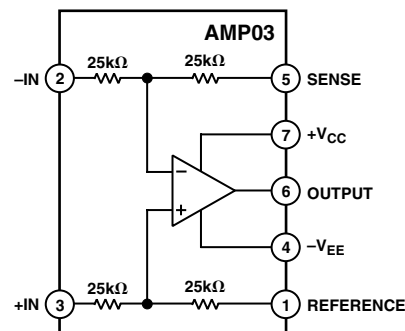
GENERAL DESCRIPTION

The AMP03 is a monolithic unity-gain, high speed differential amplifier. Incorporating a matched thin film resistor network, the AMP03 features stable operation over temperature without requiring expensive external matched components. The AMP03 is a basic analog building block for differential amplifier and instrumentation applications.

The differential amplifier topology of the AMP03 both amplifies the difference between two signals and provides extremely high rejection of the common-mode input voltage. By providing common-mode rejection (CMR) of 100 dB typical, the AMP03 solves common problems encountered in instrumentation design. As an example, the AMP03 is ideal for performing either addition or subtraction of two signals without using expensive externally matched precision resistors. The large common-mode rejection is made possible by matching the internal resistors to better than 0.002% and maintaining a thermally symmetric layout. Additionally, due to high CMR over frequency, the AMP03 is an ideal general amplifier for buffering signals in a noisy environment into data acquisition systems.

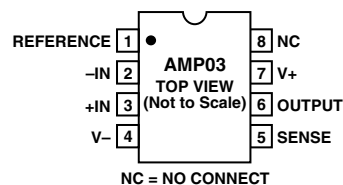
The AMP03 is a higher speed alternative to the INA105. Featuring slew rates of 9.5 V/ μ s and a bandwidth of 3 MHz, the AMP03 offers superior performance to the INA105 for high speed current sources, absolute value amplifiers, and summing amplifiers.

FUNCTIONAL BLOCK DIAGRAM

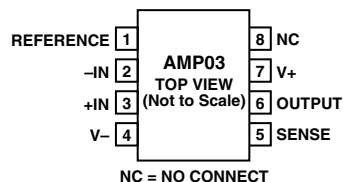


PIN CONNECTIONS

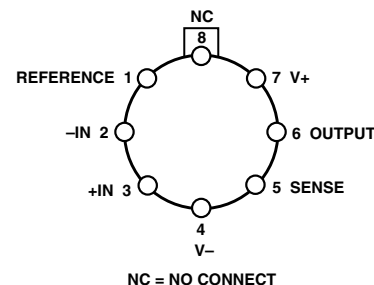
8-Lead PDIP (P Suffix)



8-Lead SOIC (S Suffix)



Header (J Suffix)



REV. F

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AMP03—SPECIFICATIONS

ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 15\text{ V}$, $T_A = +25^\circ\text{C}$, unless otherwise noted.)

Parameter	Symbol	Conditions	AMP03F			AMP03B			AMP03G			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Offset Voltage	V_{OS}	$V_{CM} = 0\text{ V}$	−400	+10	+400	−700	+20	+700	−750	+25	+750	μV
Gain Error		No Load, $V_{IN} = \pm 10\text{ V}$, $R_S = 0\ \Omega$		0.00004	0.008		0.00004	0.008		0.001	0.008	%
Input Voltage Range	IVR	(Note 1)	± 20			± 20			± 20			V
Common-Mode Rejection	CMR	$V_{CM} = \pm 10\text{ V}$	85	100		80	95		80	95		dB
Power Supply Rejection Ratio	PSRR	$V_S = \pm 6\text{ V}$ to $\pm 18\text{ V}$		0.6	10		0.6	10		0.7	10	$\mu\text{V/V}$
Output Swing	V_O	$R_L = 2\text{ k}\Omega$	± 12	± 13.7		± 12	± 13.7		± 12	± 13.7		V
Short-Circuit Current Limit	I_{SC}	Output Shorted to Ground	+45/−15			+45/−15			+45/−15			mA
Small-Signal Bandwidth (−3 dB)	BW	$R_L = 2\text{ k}\Omega$		3			3			3		MHz
Slew Rate	SR	$R_L = 2\text{ k}\Omega$	6	9.5		6	9.5		6	9.5		V/ μs
Capacitive Load Drive Capability	C_L	No Oscillation		300			300			300		pF
Supply Current	I_{SY}	No Load		2.5	3.5		2.5	3.5		2.5	3.5	mA

NOTES

¹Input voltage range guaranteed by CMR test.

Specifications subject to change without notice.

ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 15\text{ V}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ for B Grade)

Parameter	Symbol	Conditions	AMP03B			Unit
			Min	Typ	Max	
Offset Voltage	V_{OS}	$V_{CM} = 0\text{ V}$	−1500	+150	+1500	μV
Gain Error		No Load, $V_{IN} = \pm 10\text{ V}$, $R_S = 0\ \Omega$		0.0014	0.02	%
Input Voltage Range	IVR		± 20			V
Common-Mode Rejection	CMR	$V_{CM} = \pm 10\text{ V}$	75	95		dB
Power Supply Rejection Ratio	PSRR	$V_S = \pm 6\text{ V}$ to $\pm 18\text{ V}$		0.7	20	$\mu\text{V/V}$
Output Swing	V_O	$R_L = 2\text{ k}\Omega$	± 12	± 13.7		V
Slew Rate	SR	$R_L = 2\text{ k}\Omega$		9.5		V/ μs
Supply Current	I_{SY}	No Load		3.0	4.0	mA

Specifications subject to change without notice.

ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 15\text{ V}$, $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ for F and G Grades)

Parameter	Symbol	Conditions	AMP03F			AMP03G			Unit
			Min	Typ	Max	Min	Typ	Max	
Offset Voltage	V_{OS}	$V_{CM} = 0\text{ V}$	−1000	+100	+1000	−2000	+200	+2000	μV
Gain Error		No Load, $V_{IN} = \pm 10\text{ V}$, $R_S = 0\ \Omega$		0.0008	0.015		0.002	0.02	%
Input Voltage Range	IVR		± 20			± 20			V
Common-Mode Rejection	CMR	$V_{CM} = \pm 10\text{ V}$	80	95		75	90		dB
Power Supply Rejection Ratio	PSRR	$V_S = \pm 6\text{ V}$ to $\pm 18\text{ V}$		0.7	15		1.0	15	$\mu\text{V/V}$
Output Swing	V_O	$R_L = 2\text{ k}\Omega$	± 12	± 13.7		± 12	± 13.7		V
Slew Rate	SR	$R_L = 2\text{ k}\Omega$		9.5			9.5		V/ μs
Supply Current	I_{SY}	No Load		2.6	4.0		2.6	4.0	mA

Specifications subject to change without notice.

WAFER TEST LIMITS (@ $V_S = \pm 15\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.)*

Parameter	Symbol	Conditions	AMP03GBC Limit	Unit
Offset Voltage	V_{OS}	$V_S = \pm 18\text{ V}$	0.5	mV max
Gain Error		No Load, $V_{IN} = \pm 10\text{ V}$, $R_S = 0\ \Omega$	0.008	% max
Input Voltage Range	IVR		± 10	V min
Common-Mode Rejection	CMR	$V_{CM} = \pm 10\text{ V}$	80	dB min
Power Supply Rejection Ratio	PSRR	$V_S = \pm 6\text{ V}$ to $\pm 18\text{ V}$	8	$\mu\text{V/V}$ max
Output Swing	V_O	$R_L = 2\text{ k}\Omega$	± 12	V max
Short-Circuit Current Limit	I_{SC}	Output Shorted to Ground	+45/-15	mA min
Supply Current	I_{SY}	No Load	3.5	mA max

*Electrical tests are performed at wafer probe to the limits shown. Due to variations in assembly methods and normal yield loss, yield after packaging is not guaranteed for standard product dice. Consult factory to negotiate specifications based on dice lot qualifications through sample lot assembly and testing.

ABSOLUTE MAXIMUM RATINGS¹

Supply Voltage	$\pm 18\text{ V}$
Input Voltage ²	Supply Voltage
Output Short-Circuit Duration	Continuous
Storage Temperature Range	
P, J Package	-65°C to $+150^\circ\text{C}$
Lead Temperature (Soldering, 60 sec)	300°C
Junction Temperature	150°C
Operating Temperature Range	
AMP03B	-55°C to $+125^\circ\text{C}$
AMP03F, AMP03G	-40°C to $+85^\circ\text{C}$

Package Type	θ_{JA} ³	θ_{JC}	Unit
Header (J)	150	18	$^\circ\text{C/W}$
8-Lead PDIP (P)	103	43	$^\circ\text{C/W}$
8-Lead SOIC (S)	155	40	$^\circ\text{C/W}$

NOTES

¹Absolute maximum ratings apply to both DICE and packaged parts, unless otherwise noted.

²For supply voltages less than $\pm 18\text{ V}$, the absolute maximum input voltage is equal to the supply voltage.

³ θ_{JA} is specified for worst-case mounting conditions, i.e., θ_{JA} is specified for device in socket for header and PDIP packages and for device soldered to printed circuit board for SOIC package.

ORDERING GUIDE

Model ¹	Temperature Range	Package Description	Package Option ²
AMP03GP	-40°C to $+85^\circ\text{C}$	8-Lead PDIP	P-8
AMP03BJ	-40°C to $+85^\circ\text{C}$	Header	H-08B
AMP03FJ	-40°C to $+85^\circ\text{C}$	Header	H-08B
AMP03BJ/883C	-55°C to $+125^\circ\text{C}$	Header	H-08B
AMP03GS	-40°C to $+85^\circ\text{C}$	8-Lead SOIC	S-8
AMP03GS-REEL	-40°C to $+85^\circ\text{C}$	8-Lead SOIC	S-8
5962-9563901MGA	-55°C to $+125^\circ\text{C}$	Header	H-08B
AMP03GBC		Die	

NOTES

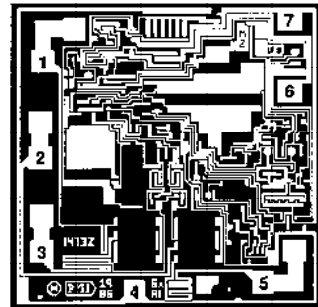
¹Burn-in is available on commercial and industrial temperature range parts in PDIP and header packages.

²Consult factory for /883 data sheet.

CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the AMP03 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

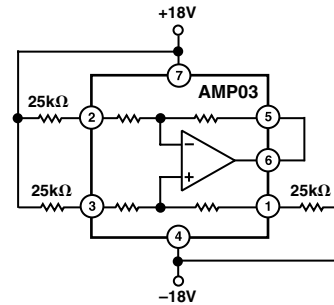
DICE CHARACTERISTICS



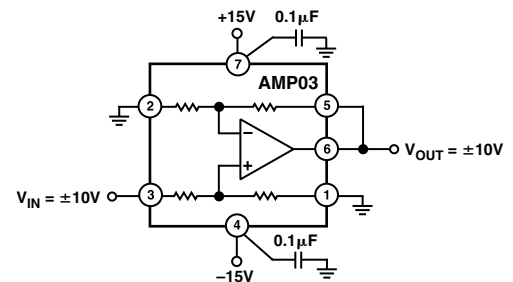
DIE SIZE 0.076 inch $\times$ 0.076 inch, 5,776 sq. mm
(1.93 mm $\times$ 1.93 mm, 3.73 sq. mm)

1. REFERENCE
2. -IN
3. +IN
4. -VEE
5. SENSE
6. OUTPUT
7. +V_{CC}
8. NC

BURN-IN CIRCUIT



SLEW RATE TEST CIRCUIT



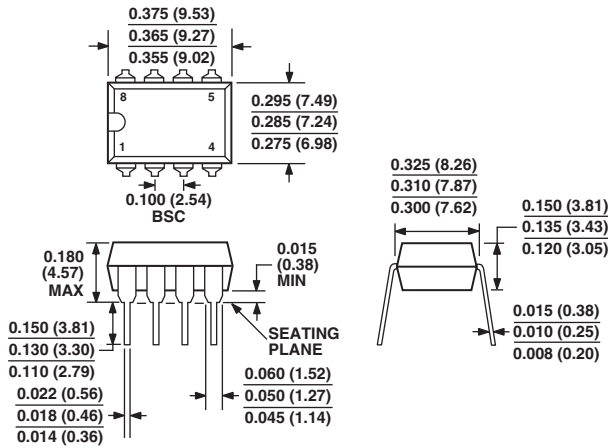
OUTLINE DIMENSIONS

8-Lead Plastic Dual In-Line Package [PDIP]

[P Suffix]

(N-8)

Dimensions shown in inches and (millimeters)



COMPLIANT TO JEDEC STANDARDS MO-095AA

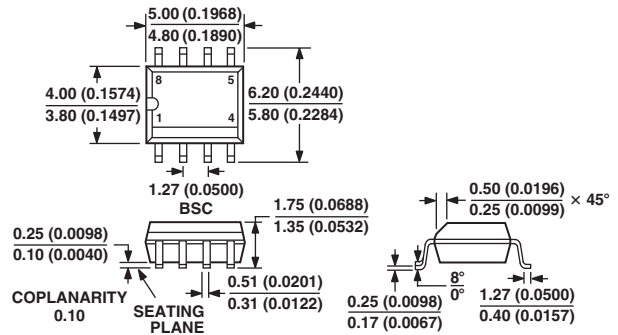
CONTROLLING DIMENSIONS ARE IN INCHES; MILLIMETER DIMENSIONS (IN PARENTHESES) ARE ROUNDED-OFF INCH EQUIVALENTS FOR REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN

8-Lead Small Outline Package [SOIC]

[S Suffix]

(R-8)

Dimensions shown in millimeters and (inches)



COMPLIANT TO JEDEC STANDARDS MS-012AA

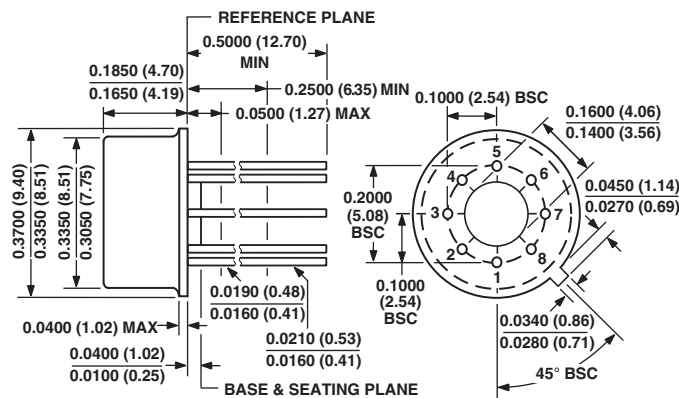
CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN

8-Lead Metal Can [TO-99]

[J Suffix]

(H-08B)

Dimensions shown in inches and (millimeters)



COMPLIANT TO JEDEC STANDARDS MO-002AK

CONTROLLING DIMENSIONS ARE IN INCHES; MILLIMETERS DIMENSIONS (IN PARENTHESES) ARE ROUNDED-OFF INCH EQUIVALENTS FOR REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN