Dual 125MHz Video Current Feedback Amplifier

The HA5023 is a wide bandwidth high slew rate dual amplifier optimized for video applications and gains between 1 and 10. It is a current feedback amplifier and thus yields less bandwidth degradation at high closed loop gains than voltage feedback amplifiers.

The low differential gain and phase, 0.1dB gain flatness, and ability to drive two back terminated 75Ω cables, make this amplifier ideal for demanding video applications.

The current feedback design allows the user to take advantage of the amplifier's bandwidth dependency on the feedback resistor. By reducing R_F, the bandwidth can be increased to compensate for decreases at higher closed loop gains or heavy output loads.

The performance of the HA5023 is very similar to the popular Intersil HA-5020.

Ordering Information

PART NUMBER	PART MARKING	TEMP. RANGE (°C)	PACKAGE	PKG. DWG. #
HA5023IP	HA5023IP	-40 to 85	8 Ld PDIP	E8.3
HA5023IPZ (Note)	HA5023IPZ	-40 to 85	8 Ld PDIP* (Pb-free)	E8.3
HA5023IB	5023I	-40 to 85	8 Ld SOIC	M8.15
HA5023IB96	5023I	-40 to 85	8 Ld SOIC Tape and Reel	M8.15
HA5023IBZ (Note)	5023IBZ	-40 to 85	8 Ld SOIC (Pb-free)	M8.15
HA5023IBZ96 (Note)	5023IBZ	-40 to 85	8 Ld SOIC Tape and Reel (Pb-free)	M8.15
HA5023EVAL	High Speed Op Amp DIP Evaluation Board			

*Pb-free PDIPs can be used for through hole wave solder processing only. They are not intended for use in Reflow solder processing applications.

NOTE: Intersil Pb-free plus anneal products employ special Pb-free material sets; molding compounds/die attach materials and 100% matte tin plate termination finish, which are RoHS compliant and compatible with both SnPb and Pb-free soldering operations. Intersil Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J STD-020.

Features

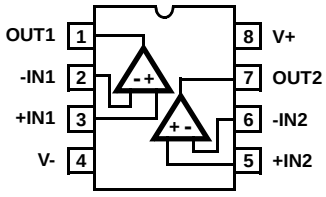
- Wide Unity Gain Bandwidth 125MHz
- Slew Rate 475V/µs
- Input Offset Voltage 800µV
- Differential Gain 0.03%
- Differential Phase . . . . . 0.03°
- Supply Current (per Amplifier) 7.5mA
- ESD Protection 4000V
- Guaranteed Specifications at ±5V Supplies
- Pb-Free Plus Anneal Available (RoHS Compliant)

Applications

- Video Gain Block
- Video Distribution Amplifier/RGB Amplifier
- Flash A/D Driver
- Current to Voltage Converter
- Medical Imaging
- Radar and Imaging Systems
- Video Switching and Routing

Pinout

HA5023
(PDIP, SOIC)
TOP VIEW



Absolute Maximum Ratings

Voltage Between V+ and V- Terminals 36V
DC Input Voltage (Note 3) . . . . . $\pm V_{SUPPLY}$
Differential Input Voltage 10V
Output Current (Note 4) . . . . . .Short Circuit Protected
ESD Rating (Note 3)
Human Body Model (Per MIL-STD-883 Method 3015.7). . . 2000V

Operating Conditions

Temperature Range . . . . . .-40°C to 85°C
Supply Voltage Range (Typical) . . . . . $\pm$4.5V to $\pm$15V

Thermal Information

Thermal Resistance (Typical, Note 2)	θ_{JA} (°C/W)
PDIP Package*	130
SOIC Package	160

Maximum Junction Temperature (Note 1) . . . . . .175°C
Maximum Junction Temperature (Plastic Package, Note 1) . . 150°C
Maximum Storage Temperature Range . . . . . -65°C to 150°C
Maximum Lead Temperature (Soldering 10s) . . . . . 300°C
(SOIC - Lead Tips Only)

*Pb-free PDIPs can be used for through hole wave solder processing only. They are not intended for use in Reflow solder processing applications.

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTES:

1. Maximum power dissipation, including output load, must be designed to maintain junction temperature below 175°C for die, and below 150°C for plastic packages. See Application Information section for safe operating area information.
2. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.
3. The non-inverting input of unused amplifiers must be connected to GND.
4. Output is protected for short circuits to ground. Brief short circuits to ground will not degrade reliability, however, continuous (100% duty cycle) output current should not exceed 15mA for maximum reliability.

Electrical Specifications

$V_{SUPPLY} = \pm 5V$, $R_F = 1k\Omega$, $A_V = +1$, $R_L = 400\Omega$, $C_L \leq 10pF$, Unless Otherwise Specified

PARAMETER	TEST CONDITIONS	(NOTE 9) TEST LEVEL	TEMP. (°C)	MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS							
Input Offset Voltage (V_{IO})		A	25	-	0.8	3	mV
		A	Full	-	-	5	mV
Delta V_{IO} Between Channels		A	Full	-	1.2	3.5	mV
Average Input Offset Voltage Drift		B	Full	-	5	-	µV/°C
V_{IO} Common Mode Rejection Ratio	Note 5	A	25	53	-	-	dB
		A	Full	50	-	-	dB
V_{IO} Power Supply Rejection Ratio	$\pm 3.5V \leq V_S \leq \pm 6.5V$	A	25	60	-	-	dB
		A	Full	55	-	-	dB
Input Common Mode Range	Note 5	A	Full	$\pm$2.5	-	-	V
Non-Inverting Input (+IN) Current		A	25	-	3	8	µA
		A	Full	-	-	20	µA
+IN Common Mode Rejection ($+I_{BCMR} = \frac{1}{+R_{IN}}$)	Note 5	A	25	-	-	0.15	µA/V
		A	Full	-	-	0.5	µA/V
+IN Power Supply Rejection	$\pm 3.5V \leq V_S \leq \pm 6.5V$	A	25	-	-	0.1	µA/V
		A	Full	-	-	0.3	µA/V
Inverting Input (-IN) Current		A	25, 85	-	4	12	µA
		A	-40	-	10	30	µA
Delta -IN BIAS Current Between Channels		A	25, 85	-	6	15	µA
		A	-40	-	10	30	µA

Electrical Specifications $V_{SUPPLY} = \pm5V$, $R_F = 1k\Omega$, $A_V = +1$, $R_L = 400\Omega$, $C_L \leq 10pF$, Unless Otherwise Specified **(Continued)**

PARAMETER	TEST CONDITIONS	(NOTE 9) TEST LEVEL	TEMP. (°C)	MIN	TYP	MAX	UNITS
-IN Common Mode Rejection	Note 5	A	25	-	-	0.4	µA/V
		A	Full	-	-	1.0	µA/V
-IN Power Supply Rejection	$\pm3.5V \leq V_S \leq \pm6.5V$	A	25	-	-	0.2	µA/V
		A	Full	-	-	0.5	µA/V
Input Noise Voltage	f = 1kHz	B	25	-	4.5	-	$nV/\sqrt{Hz}$
+Input Noise Current	f = 1kHz	B	25	-	2.5	-	$pA/\sqrt{Hz}$
-Input Noise Current	f = 1kHz	B	25	-	25.0	-	$pA/\sqrt{Hz}$
TRANSFER CHARACTERISTICS							
Transimpedence	Note 11	A	25	1.0	-	-	MΩ
		A	Full	0.85	-	-	MΩ
Open Loop DC Voltage Gain	$R_L = 400\Omega$, $V_{OUT} = \pm2.5V$	A	25	70	-	-	dB
		A	Full	65	-	-	dB
Open Loop DC Voltage Gain	$R_L = 100\Omega$, $V_{OUT} = \pm2.5V$	A	25	50	-	-	dB
		A	Full	45	-	-	dB
OUTPUT CHARACTERISTICS							
Output Voltage Swing	$R_L = 150\Omega$	A	25	±2.5	±3.0	-	V
		A	Full	±2.5	±3.0	-	V
Output Current	$R_L = 150\Omega$	B	Full	±16.6	±20.0	-	mA
Output Current, Short Circuit	$V_{IN} = \pm2.5V$, $V_{OUT} = 0V$	A	Full	±40	±60	-	mA
POWER SUPPLY CHARACTERISTICS							
Supply Voltage Range		A	25	5	-	15	V
Quiescent Supply Current		A	Full	-	7.5	10	mA/Op Amp
AC CHARACTERISTICS ($A_V = +1$)							
Slew Rate	Note 6	B	25	275	350	-	V/µs
Full Power Bandwidth	Note 7	B	25	22	28	-	MHz
Rise Time	Note 8	B	25	-	6	-	ns
Fall Time	Note 8	B	25	-	6	-	ns
Propagation Delay	Note 8	B	25	-	6	-	ns
Overshoot		B	25	-	4.5	-	%
-3dB Bandwidth	$V_{OUT} = 100mV$	B	25	-	125	-	MHz
Settling Time to 1%	2V Output Step	B	25	-	50	-	ns
Settling Time to 0.25%	2V Output Step	B	25	-	75	-	ns

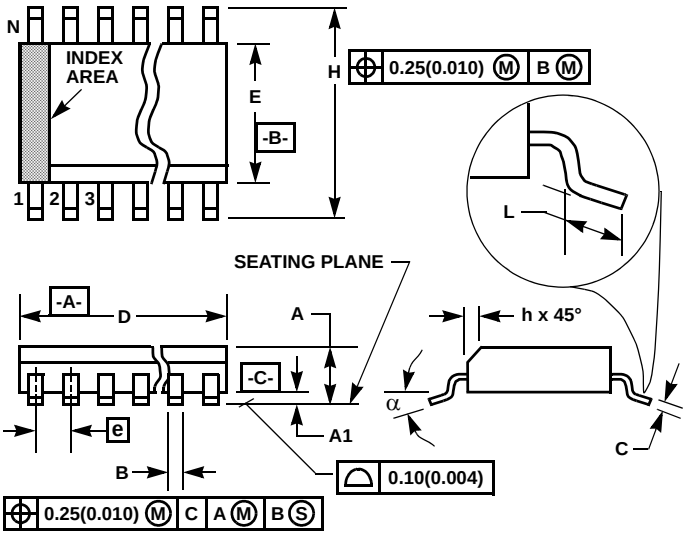
Electrical Specifications V_{SUPPLY} = ±5V, R_F = 1kΩ, A_V = +1, R_L = 400Ω, C_L ≤ 10pF, Unless Otherwise Specified **(Continued)**

PARAMETER	TEST CONDITIONS	(NOTE 9) TEST LEVEL	TEMP. (°C)	MIN	TYP	MAX	UNITS
AC CHARACTERISTICS (A_V = +2, R_F = 681Ω)							
Slew Rate	Note 6	B	25	-	475	-	V/µs
Full Power Bandwidth	Note 7	B	25	-	26	-	MHz
Rise Time	Note 8	B	25	-	6	-	ns
Fall Time	Note 8	B	25	-	6	-	ns
Propagation Delay	Note 8	B	25	-	6	-	ns
Overshoot		B	25	-	12	-	%
-3dB Bandwidth	V_{OUT} = 100mV	B	25	-	95	-	MHz
Settling Time to 1%	2V Output Step	B	25	-	50	-	ns
Settling Time to 0.25%	2V Output Step	B	25	-	100	-	ns
Gain Flatness	5MHz	B	25	-	0.02	-	dB
	20MHz	B	25	-	0.07	-	dB
AC CHARACTERISTICS (A_V = +10, R_F = 383Ω)							
Slew Rate	Note 6	B	25	350	475	-	V/µs
Full Power Bandwidth	Note 7	B	25	28	38	-	MHz
Rise Time	Note 8	B	25	-	8	-	ns
Fall Time	Note 8	B	25	-	9	-	ns
Propagation Delay	Note 8	B	25	-	9	-	ns
Overshoot		B	25	-	1.8	-	%
-3dB Bandwidth	V_{OUT} = 100mV	B	25	-	65	-	MHz
Settling Time to 1%	2V Output Step	B	25	-	75	-	ns
Settling Time to 0.1%	2V Output Step	B	25	-	130	-	ns
VIDEO CHARACTERISTICS							
Differential Gain (Note 10)	R_L = 150Ω	B	25	-	0.03	-	%
Differential Phase (Note 10)	R_L = 150Ω	B	25	-	0.03	-	°

NOTES:

5. V_{CM} = ±2.5V. At -40°C Product is tested at V_{CM} = ±2.25V because Short Test Duration does not allow self heating.
6. V_{OUT} switches from -2V to +2V, or from +2V to -2V. Specification is from the 25% to 75% points.
7. $FPBW = \frac{\text{Slew Rate}}{2\pi V_{PEAK}}$; V_{PEAK} = 2V .
8. R_L = 100Ω, V_{OUT} = 1V. Measured from 10% to 90% points for rise/fall times; from 50% points of input and output for propagation delay.
9. A. Production Tested; B. Typical or Guaranteed Limit based on characterization; C. Design Typical for information only.
10. Measured with a VM700A video tester using an NTC-7 composite VITS.
11. V_{OUT} = ±2.5V. At -40°C Product is tested at V_{OUT} = ±2.25V because Short Test Duration does not allow self heating.

Small Outline Plastic Packages (SOIC)



NOTES:

1. Symbols are defined in the “MO Series Symbol List” in Section 2.2 of Publication Number 95.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Dimension “D” does not include mold flash, protrusions or gate burrs. Mold flash, protrusion and gate burrs shall not exceed 0.15mm (0.006 inch) per side.
4. Dimension “E” does not include interlead flash or protrusions. Interlead flash and protrusions shall not exceed 0.25mm (0.010 inch) per side.
5. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the crosshatched area.
6. “L” is the length of terminal for soldering to a substrate.
7. “N” is the number of terminal positions.
8. Terminal numbers are shown for reference only.
9. The lead width “B”, as measured 0.36mm (0.014 inch) or greater above the seating plane, shall not exceed a maximum value of 0.61mm (0.024 inch).
10. Controlling dimension: MILLIMETER. Converted inch dimensions are not necessarily exact.

M8.15 (JEDEC MS-012-AA ISSUE C)
8 LEAD NARROW BODY SMALL OUTLINE PLASTIC PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.0532	0.0688	1.35	1.75	-
A1	0.0040	0.0098	0.10	0.25	-
B	0.013	0.020	0.33	0.51	9
C	0.0075	0.0098	0.19	0.25	-
D	0.1890	0.1968	4.80	5.00	3
E	0.1497	0.1574	3.80	4.00	4
e	0.050 BSC		1.27 BSC		-
H	0.2284	0.2440	5.80	6.20	-
h	0.0099	0.0196	0.25	0.50	5
L	0.016	0.050	0.40	1.27	6
N	8		8		7
α	0°	8°	0°	8°	-

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