



Precision Low noise CMOS Rail-to-Rail Input/Output Operational Amplifiers

Preliminary Technical Data

AD8605ACB*

FEATURES

Low Offset Voltage: 65 mV max
Low Offset Variation: 300 mV max for any CMV and V_{sy}
Low Input Bias Currents: 1pA max
Low Noise: 8 nV/√Hz
Wide Bandwidth: 10 MHz
Unity Gain Stable
Single-Supply Operation: 2.7 to 6 Volts

APPLICATIONS

Photodiode amplification
 Battery Powered Instrumentation
 Medical Instruments
 Multi-pole Filters
 Sensors
 Portable Audio Devices

GENERAL DESCRIPTION

The AD8605ACB is a rail-to-rail input and output single supply amplifier featuring very low offset voltage, very low input bias current, low voltage and current noise and wide signal bandwidth. AD8605 utilizes patented DigiTrim® technology to achieve superior precision without laser trimming.

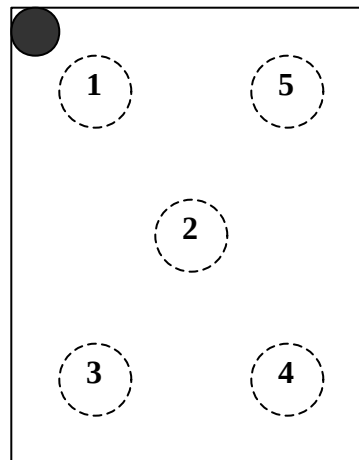
The combination of very high performance features makes these amplifiers useful in a wide variety of applications. Filters, integrators, photo-diode amplifiers and high impedance sensors all benefit from the performance of the AD8605. Audio and other AC applications benefit from the wide bandwidth and low distortion.

Applications for these amplifiers include laser diode control loops and optical sensing, portable and loop-powered instrumentation, audio amplification for portable devices and ASIC input/output amplifiers. The AD8605ACB is specified over the extended industrial (-40° to +125°C) temperature range. The AD8605ACB is available in the tiny 5-bump MicroCSP package and offers the smallest available footprint for any surface-mountable operational amplifier. MicroCSP versions are available in tape and reel only. Refer to the AD8605/AD8606/AD8608 family datasheet for the released AD8605 version in SOT package and for dual/quad versions.

Pin Configurations

AD8605 MicroCSP Topview
(Bump Side Down)

Pin 1 →
Identifier



Pin No.	Functionality
1	OUT
2	V-
3	+IN
4	-IN
5	V+

*Protected by US patent No. 5,969,657; other patents pending

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PRELIMINARY TECHNICAL DATA

AD8605

ELECTRICAL CHARACTERISTICS ($V_S=+2.7V$, $V_{CM} = V_S/2$, $T_A=+25^\circ C$ unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V _{OS}	V _S =3.5V, V _{CM} = 1V, V _{CM} = 3V		20	65	μV
		V _S =2.7V, V _{CM} = 0V to 2.7V		80	300	μV
		-40°C < T _A < +125°C			750	μV
Input Bias Current	I _B			0.2	1	pA
		-40°C < T _A < +85°C			50	pA
		-40°C < T _A < +125°C			250	pA
Input Offset Current	I _{OS}			0.1	0.5	pA
		-40°C < T _A < +85°C			20	pA
		-40°C < T _A < +125°C			75	pA
Input Voltage Range			0		2.7	V
Common-Mode Rejection Ratio	CMRR	V _{CM} = 0V to 2.7V	80	95		dB
		-40°C < T _A < +125°C	70	85		dB
Large Signal Voltage Gain	A _{VO}	R _L = 2 kΩ V _O = 0.5V to 2.2V	110	350		V/mV
Offset Voltage Drift	ΔV _{OS} /ΔT			1	4.5	μV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V _{OH}	I _L = 1mA	2.6	2.66		V
		-40°C < T _A < +125°C	2.6			V
Output Voltage Low	V _{OL}	I _L = 1mA		25	40	mV
		-40°C < T _A < +125°C			50	mV
Output Current	I _{OUT}			±30		mA
Closed Loop Output Impedance	Z _{OUT}	f=1 MHz, A _V = 1		12		Ω
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V _S = 2.7 V to 5.5 V	80	95		dB
		-40°C < T _A < +125°C	70	90		dB
Supply Current/Amplifier	I _{SY}	V _O = 0V		1.15	1.4	mA
		-40°C < T _A < +125°C			1.5	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R _L =2 kΩ		5		V/μs
Settling Time	t _s	To 0.01%		<0.5		μs
Gain Bandwidth Product	GBP			9		MHz
Phase Margin	∅ _o			50		degrees
NOISE PERFORMANCE						
Voltage Noise	e _{n p-p}	f = 0.1Hz to 10Hz		2.3	3.5	μV p-p
Voltage Noise Density	e _n	f = 1kHz		8	12	nV/√Hz
Voltage Noise Density	e _n	f = 10kHz		6.5		nV/√Hz
Current Noise Density	i _n	f = 1kHz		0.01		pA/√Hz

PRELIMINARY TECHNICAL DATA

AD8605

ELECTRICAL CHARACTERISTICS (@ $V_S=+5.0V$, $V_{CM} = V_S/2$, $T_A=+25^\circ C$ unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V _{OS}	V _S =3.5V, V _{CM} = 1V, V _{CM} = 3V		20	65	μV
		V _S =5V, V _{CM} = 0V to 5V		80	300	μV
		-40°< T _A < +125°C			750	μV
Input Bias Current	I _B		0.2	1	pA	
		-40°< T _A < +85°C			50	pA
		-40°< T _A < +125°C			200	pA
Input Offset Current	I _{OS}		0.1	0.5	pA	
		-40°< T _A < +85°C			20	pA
		-40°< T _A < +125°C			75	pA
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	V _{CM} = 0V to 5V	85	100		dB
		-40°< T _A < +125°C	75	90		dB
Large Signal Voltage Gain	A _{VO}	V _O = 0.5V to 4.5V, R _L = 2 kΩ	300	1000		V/mV
Offset Voltage Drift	ΔV _{OS} /ΔT			1	4.5	μV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V _{OH}	I _L = 1mA	4.96	4.98		V
		I _L = 10mA	4.7	4.79		V
		-40°< T _A < +125°C	4.6			V
Output Voltage Low	V _{OL}	I _L = 1mA		20	40	mV
Output Voltage High	V _{OL}	I _L = 10mA		170	210	mV
		-40°< T _A < +125°C			290	mV
Output Current	I _{OUT}			±80		mA
Closed Loop Output Impedance	Z _{OUT}	f=1 MHz, A _V = 1		10		Ω
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V _S = 2.7 V to 5.5 V	80	95		dB
			70	90		dB
Supply Current/Amplifier	I _{SY}	V _O = 0V -40°< T _A < +125°C		1	1.2	mA
					1.4	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R _L =2 kΩ		5		V/μs
Settling Time	t _s	To 0.01%		<1		μs
Full Power Bandwidth	BW _p	<1% Distortion		360		kHz
Gain Bandwidth Product	GBP			10		MHz
Phase Margin	∅ _o			65		degrees
NOISE PERFORMANCE						
Voltage Noise	e _{n p-p}	f = 0.1Hz to 10Hz		2.3	3.5	μV p-p
Voltage Noise Density	e _n	f=1kHz		8	12	nV/√Hz
Voltage Noise Density	e _n	f=10kHz		6.5		nV/√Hz
Current Noise Density	i _n	f=1kHz		0.01		pA/√Hz

PRELIMINARY TECHNICAL DATA

AD8605

ABSOLUTE MAXIMUM RATINGS¹

Supply voltage	+6V
Input Voltage.....	Gnd to Vs
Differential Input Voltage	±6V
Output Short-Circuit Duration to Gnd ² ... Observe Derating Curves	
Storage Temperature Range	
CB Package.....	-65°C to +150°C
Operating Temperature Range	
AD8605.....	-40°C to +125°C
Junction Temperature Range	
CB Package.....	-65°C to +150°C
Lead Temperature Range (Soldering, 60 Sec).....	+300°C

Package Type	θ_{JA}	θ_{JC}	Units
5-Bump MicroCSP (CB)	125 ³	--	°C/W

NOTES

¹ Absolute maximum ratings apply at 25°C, unless otherwise noted.

² θ_{JA} is specified for the worst-case conditions, i.e., θ_{JA} is specified for device soldered in circuit board for surface mount packages.

³ Estimated value. Full study in process

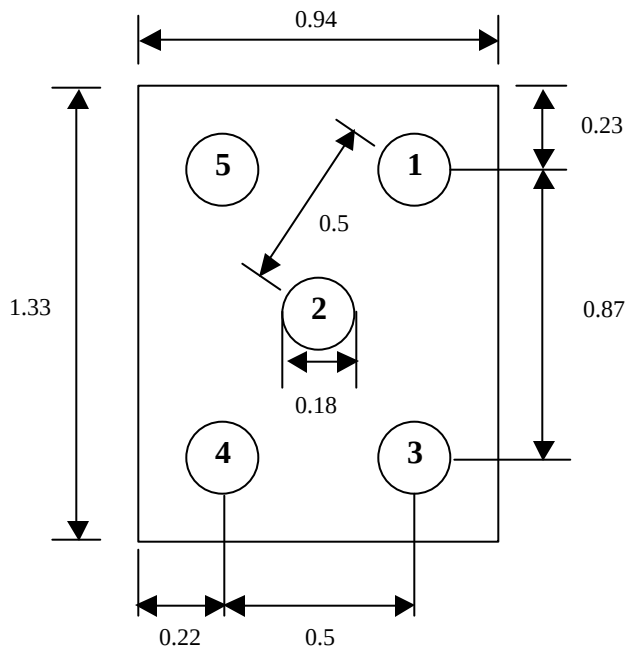
ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
AD8605ACB	-40°C to +125°C	5 bump-MicroCSP	CB-5

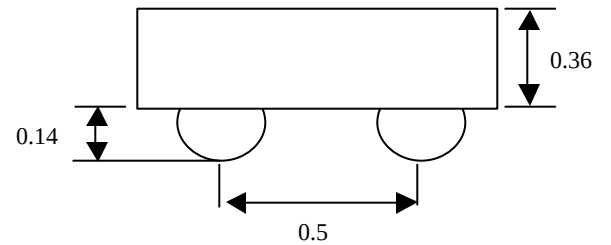
AD8605 MicroCSP Package Dimension Drawing

Top View

(Bump Side Up, all dimensions in mm)



AD8605 MicroCSP Side View (all dimensions in mm)



Bump Locations referenced to die center

Pin No.	X (um)	Y (um)
1	250	433
2	0	0
3	250	-433
4	-250	-433
5	-250	433