Precision 20 MHz CMOS Rail-to-Rail Input/Output Operational Amplifiers

Preliminary Technical Data AD8615/AD8616/AD8618

FEATURES
Low Offset Voltage: 80mV typ. 300 mV max
Single-Supply Operation: 2.7 to 6 Volts
Low Noise: 8 nV/ÖHz
Wide Bandwidth: 20 MHz
Slew Rate: 12 V/ms
Low Distortion
No Phase Reversal
Low Input Bias Currents
Unity Gain Stable

APPLICATIONS
Barcode Scanners
Battery Powered Instrumentation
Multi-pole Filters
Sensors
ASIC Input or Output Amplifier
Audio
Photodiode amplification

GENERAL DESCRIPTION

The AD8615, AD8616 and AD8618 are single, dual and quad rail-to-rail input and output single supply amplifiers featuring very low offset voltage, wide signal bandwidth, and low input voltage and current noise. These amplifiers use a patented trimming technique that achieves superior precision without laser trimming. All are fully specified to operate from +3V to +5V single supply.

The combination of low offsets, low noise, very low input bias currents, and high speed make these amplifiers useful in a wide variety of applications. Filters, integrators, photo-diode amplifiers and high impedance sensors all benefit from the combination of performance features. Audio and other AC applications benefit from the wide bandwidth and low distortion.

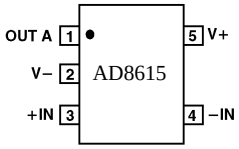
Applications for these amplifiers include Portable and loop-powered instrumentation, audio amplification for portable devices, portable phone headsets, bar code scanners, and multi-pole filters. The ability to swing rail-to-rail at both the input and output enables designers to buffer CMOS ADCs, DACs, ASICs and other wide output swing devices in single supply systems.

The AD8615, AD8616 and AD8618 are specified over the extended industrial (-40° to +125°C) temperature range. The AD8615, single, is available in the tiny 5-lead SOT-23 package. The AD8616, dual, is available in the 8-lead micro-SOIC and narrow SOIC surface mount packages. The AD8618, quad, is available in 14-lead TSSOP and narrow 14-pin SOIC packages.

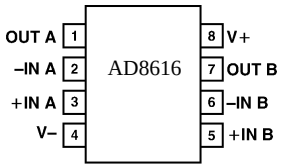
SOT, MSOP and TSSOP versions are available in tape and reel only.

PIN CONFIGURATIONS

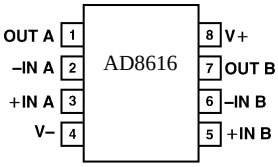
5-Lead SOT (RJ-5)



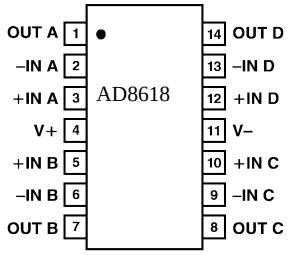
8-Lead MSOP (RM-8)



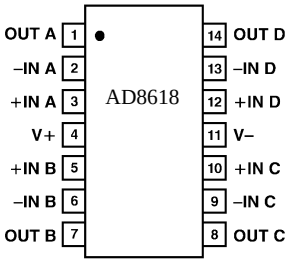
8-Lead SO (R-8)



14-Lead TSSOP (RU-14)



14-Lead SO (R-14)



REV. PrA

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ELECTRICAL CHARACTERISTICS (V_S=+3.0V, V_{CM} = V_S/2, T_A=+25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	V_{CM} = 0V to 3V		80	300	µV
		-40°< T_A < +125°C			750	µV
Input Bias Current	I_B			0.2	60	pA
		-40°< T_A < +85°C			100	pA
		-40°< T_A < +125°C			100	pA
Input Offset Current	I_{OS}			0.1	30	pA
		-40°< T_A < +85°C			50	pA
		-40°< T_A < +125°C			500	pA
Input Voltage Range			0		3	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = 0V to 3V	68	83		dB
Large Signal Voltage Gain	A_{VO}	R_L = 2 kΩ V_O= 0.5V to 2.5V	30	100		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			2		µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L = 1mA	2.92	2.95		V
		-40°C < T_A < +125°C	2.88			V
Output Voltage Low	V_{OL}	I_L = 1mA		20	35	mV
		-40°C < T_A < +125°C			50	mV
Output Current	I_{OUT}			±150		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	67	80		dB
Supply Current/Amplifier	I_{SY}	V_O = 0V		1.6	2.0	mA
		-40°< T_A < +125°C			TBD	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L =2 kΩ		12		V/µs
Settling Time	t_s	To 0.01%		<0.25		µs
Gain Bandwidth Product	GBP			20		MHz
Phase Margin	Øo			40		degrees
NOISE PERFORMANCE						
Voltage Noise Density	e_n	f=1kHz		8		nV/√Hz
Voltage Noise Density	e_n	f=10kHz		6		nV/√Hz
Current Noise Density	i_n	f=1kHz		0.05		pA/√Hz

ELECTRICAL CHARACTERISTICS (@ V_S=+5.0V, V_{CM} = V_s/2, T_A=+25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	V_{CM} = 0V to 5V		80	300	µV
		-40°< T_A < +125°C			750	µV
Input Bias Current	I_B			0.2	60	pA
		-40°< T_A < +85°C			100	pA
		-40°< T_A < +125°C			1000	pA
Input Offset Current	I_{OS}			0.1	30	pA
		-40°< T_A < +85°C			50	pA
		-40°< T_A < +125°C			500	pA
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = 0V to 5V	74	89		dB
Large Signal Voltage Gain	A_{VO}	V_O= 0.5V to 4.5V, R_L = 2 kΩ , V_{CM}= 0V	30	70		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			2		µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L = 1mA	4.925	4.975		V
		I_L = 10mA	4.7	4.77		V
		-40°C to +125°C	4.6			V
Output Voltage Low	V_{OL}	I_L = 1mA		15	30	mV
Output Voltage High	V_{OL}	I_L = 10mA		125	175	mV
		-40°C to +125°C			250	mV
Output Current	I_{OUT}			±50		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	67	80		dB
Supply Current/Amplifier	I_{SY}	V_O = 0V		1.3	2.0	mA
		-40°< T_A < +125°C			TBD	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L =2 kΩ		12		V/µs
Settling Time	t_s	To 0.01%		<.5		µs
Full Power Bandwidth	BWp	<1% Distortion		TBD		kHz
Gain Bandwidth Product	GBP			20		MHz
Phase Margin	Øo			40		degrees
NOISE PERFORMANCE						
Voltage Noise Density	e_n	f=1kHz		8		nV/√Hz
Voltage Noise Density	e_n	f=10kHz		6		nV/√Hz
Current Noise Density	i_n	f=1kHz		0.05		pA/√Hz

ABSOLUTE MAXIMUM RATINGS[1]

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
R, RT, RM, RU Package ..... -65°C to +150°C
Operating Temperature Range
AD8615/AD8616/AD8618 ..... -40°C to +125°C
Junction Temperature Range
R, RT, RM, RU Package ..... -65°C to +150°C
Lead Temperature Range (Soldering, 60 Sec) ..... +300°C

Package Type	qJA	qJC	Units
5-Pin SOT-23 (RT)	230	--	°C/W
8-Pin microSOIC (RM)	210	45	°C/W
8-Pin SOIC (R)	158	43	°C/W
14-Pin SOIC (R)	120	36	°C/W
14-Pin TSSOP (RU)	180	35	°C/W

NOTES

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

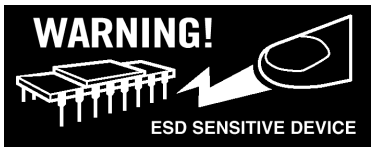
[2] θ_{JA} is specified for the worst-case conditions, i.e., θ_{JA} is specified for device soldered in circuit board for surface mount packages.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Branding Information
AD8615ARJ	-40°C to +125°C	5-Pin SOT-23	RT-5	
AD8616ARM	-40°C to +125°C	8-Pin micro-SOIC	RM-8	
AD8616AR	-40°C to +125°C	8-Pin SOIC	R-8	
AD8618AR	-40°C to +125°C	16-Pin SOIC	R-16	
AD8618ARU	-40°C to +125°C	16-Pin TSSOP	RU-16	

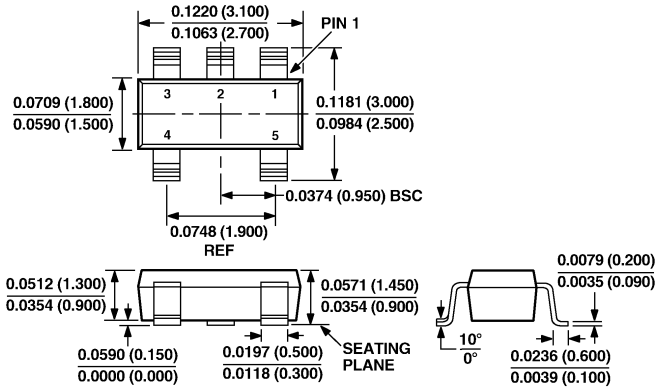
CAUTION

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 this device 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.



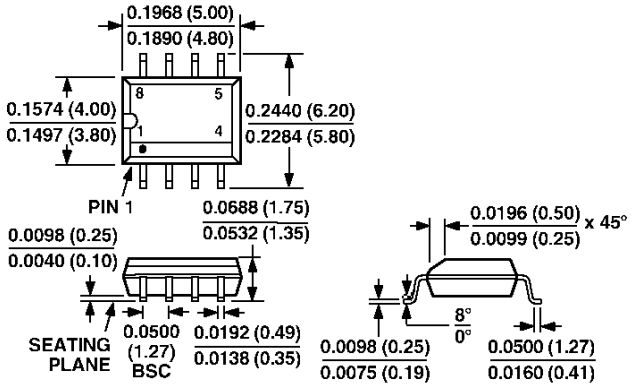
OUTLINE DIMENSIONS

5-Lead SOT-23
(RJ Suffix)

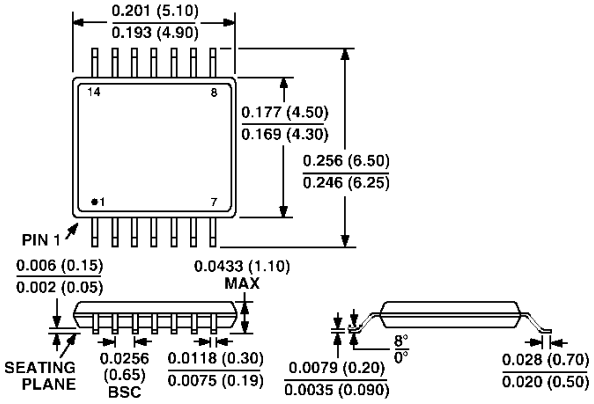


NOTE:
PACKAGE OUTLINE INCLUSIVE AS SOLDER PLATING.

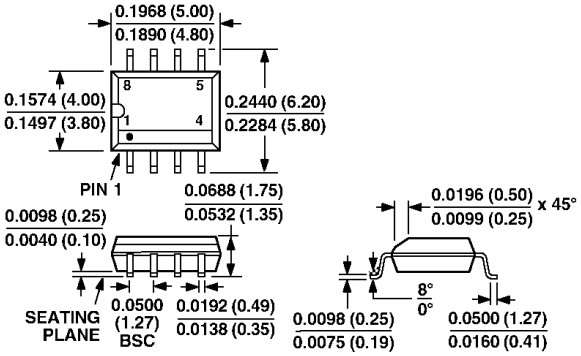
8-Lead ?SOIC
(RM-8)



14-Lead TSSOP
(RU-14)



8-Lead SO
(R-8)



14-Lead SO
(R-14)