50 MHz, Precision, Low Distortion, Low Noise CMOS Amplifiers

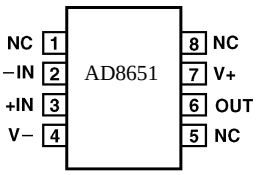
Preliminary Technical Data — AD8651/AD8652

FEATURES
Single Supply Operation: 2.7 V to 5.5 V
Space-Saving MSOP and TSSOP Packaging
Bandwidth: 50 MHz @ 5 V
Offset Voltage: 100uV typ
41 V/us Slew Rate
Rail-to-Rail Input and Output Swing
Input Bias Current: 1 pA
Supply Current: 8 mA/op amp

APPLICATIONS
Optical Communications
Laser Source Drivers / Controllers
Broadband Communications
High speed ADC and DAC
Microwave link interface
Cellphone PA control
Video line driver
Audio

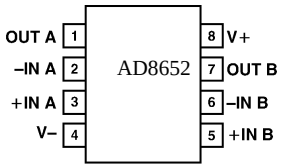
PIN CONFIGURATIONS

8-Lead MSOP (RM-8)



NC = NO CONNECT

8-Lead SO (R-8)



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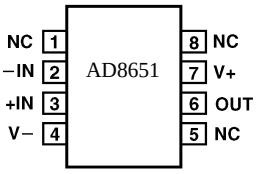

NC = NO CONNECT

GENERAL DESCRIPTION

The AD8651 and AD8652 are high precision low noise low Distortion Rail-to-Rail CMOS operational amplifiers running at single supply voltage from 2.7V to 5V.

The single and dual amplifiers are both offered in the 8-Lead SOIC package and the single is also offered in the 8- Lead MSOP package.

The AD8651/2 features high speed, high bandwidth, low noise and high precision. They are rail-to-rail output amplifiers with a gain bandwidth of 50 MHz and typical voltage offset of 150uV from a 5V supply. It also features low noise of 5nV per square root Hertz.

The AD8651/2 can be used in communication areas, such as cell phone transmission power control, fiber optics networking, wireless networking and video line drivers.

The AD86512 are specified over the extended industrial (-40°C to +125C°) temperature range.

REV. PrB

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ELECTRICAL CHARACTERISTICS (V_+=+2.7V, V_-=+0V, $V_{CM} = V_+/2$, T_A=+25°C unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}			100	300	uV
		-40°C ≤ T_A ≤ +85°C			tbd	uV
		-40°C ≤ T_A ≤ +125°C			tbd	uV
Offset Voltage Drift				4		uV/°C
Input Bias Current	I_B			1	10	pA
		-40°C ≤ T_A ≤ +85°C				
		-40°C ≤ T_A ≤ +125°C				
Input Offset Current	I_{OS}			1	20	pA
		-40°C ≤ T_A ≤ +85°C				
		-40°C ≤ T_A ≤ +125°C				
Input Voltage Range	V_{CM}		0		V_+	V
Common-Mode Rejection Ratio	CMRR	V_+ = 2.7V, 0V<V_{CM} <2.7V	75	90		dB
		-40°C ≤ T_A ≤ +85°C	70			dB
		-40°C ≤ T_A ≤ +125°C	70			dB
		V_+ = 2.7V, 0V<V_{CM} <2.7V	66	85		
Large Signal Voltage Gain	A_{VO}	R_L = 10 kΩ , 50mV<Vo<2.65V		120		dB
		R_L = 1 kΩ, 200mV<Vo<2.5V	100	125		dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L = 250uA	2.68			V
Output Voltage Low	V_{OL}	I_L = 250uA			20	mV
Short Circuit Limit	I_{SC}	Sourcing		80		mA
		-40°C ≤ T_A ≤ +125°C				mA
		Sinking				mA
		-40°C ≤ T_A ≤ +125°C				mA
Output Current	I_O			+40		mA
Capacitive Load Drive	C_{load}	See Performance Curve				
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = 2.7V to 5.5V, V_{CM}=0V	76	85		dB
		-40°C ≤ T_A ≤ +125°C	75			dB
Supply Current/Amplifier	I_{SY}	I_O = 0		8	10	mA
		-40°C ≤ T_A ≤ +125°C			12	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	G=1, R_L =10 kΩ, C_L=100pF,		41		V/µs
Gain Bandwidth Product	GBP	G=1, C_L=100pF		50		MHz
Setting Time, 0.1%		G=±1, 2V Step		0.2		uS
Overload Recovery Time		V_{IN} • G =V_+		0.1		uS
Total Harmonic Distortion + Noise	THD+N	G = 1, R_L =600 Ω, f = 1 kHz		0.0006		%
NOISE PERFORMANCE						
Voltage Noise Density	e_n	f = 10 kHz		7		nV/√Hz
		f = 100 kHz		5.6		nV/√Hz
Current Noise Density	i_n	f=10 KHz		4		fA/√Hz

ELECTRICAL CHARACTERISTICS (V_+=+5V, V_-=+0V, V_{CM} = V_+/2, T_A=+25°C unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}			100	300	uV
		-40°C ≤ T_A ≤ +85°C			tbd	uV
		-40°C ≤ T_A ≤ +125°C			tbd	uV
Offset Voltage Drift				4		uV/°C
Input Bias Current	I_B			1	10	pA
		-40°C ≤ T_A ≤ +85°C				
		-40°C ≤ T_A ≤ +125°C				
Input Offset Current	I_{OS}			1	20	pA
		-40°C ≤ T_A ≤ +85°C				
		-40°C ≤ T_A ≤ +125°C				
Input Voltage Range	V_{CM}		0		V_+	V
Common-Mode Rejection Ratio	CMRR	V_+ =5V, 0V<V_{CM} <5V	75	90		dB
		-40°C ≤ T_A ≤ +85°C	70			dB
		-40°C ≤ T_A ≤ +125°C	70			dB
		V_+ = 5V, 0V<V_{CM} <5V	66	85		
Large Signal Voltage Gain	A_{VO}	R_L = 10 kΩ , 50mV<Vo<4.95V		120		dB
		R_L = 1 kΩ, 200mV<Vo<4.8V	100	125		dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L = 250uA	4.98			V
Output Voltage Low	V_{OL}	I_L = 250uA			20	mV
Short Circuit Limit	I_{SC}	Sourcing		80		mA
		-40°C ≤ T_A ≤ +125°C				mA
		Sinking				mA
		-40°C ≤ T_A ≤ +125°C				mA
Output Current	I_O			+40		mA
Capacitive Load Drive	C_{load}	See Performance Curve				
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = 2.7V to 5.5V, V_{CM}=0V	76	85		dB
		-40°C ≤ T_A ≤ +125°C	75			dB
Supply Current/Amplifier	I_{SY}	I_O = 0		8	10	mA
		-40°C ≤ T_A ≤ +125°C			12	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	G=1, R_L =10 kΩ, C_L=100pF,		41		V/µs
Gain Bandwidth Product	GBP	G=1, C_L=100pF		50		MHz
Setting Time, 0.1%		G=±1, 2V Step		0.2		uS
Overload Recovery Time		V_{IN} • G =V_+		0.1		uS
Total Harmonic Distortion + Noise	THD+N	G = 1, R_L =600 Ω, f = 1 kHz		0.0006		%
NOISE PERFORMANCE						
Voltage Noise Density	e_n	f = 10 kHz		7		nV/√Hz
		f = 100 kHz		5.6		nV/√Hz
Current Noise Density	i_n	f=10 KHz		4		fA/√Hz

ABSOLUTE MAXIMUM RATINGS[1]

Supply Voltage ..... +5.5V
Input Voltage ..... GND to Vs + 0.3V
Differential Input Voltage[1] ..... ±5.5V
Output Short-Circuit Duration to Gnd ..... Indefinite
Storage Temperature Range
N, R Package..... -65°C to +150°C
Operating Temperature Range
..... -40°C to +125°C
Junction Temperature Range
N, R Package..... -65°C to +150°C
Lead Temperature Range (Soldering, 10 sec)..... +300°C

Package Type	θ_{JA}	θ_{JC}	Units
8-Pin MSOP (RM)	210	45	°C/W
8-Pin SOIC (R)	158	43	°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.

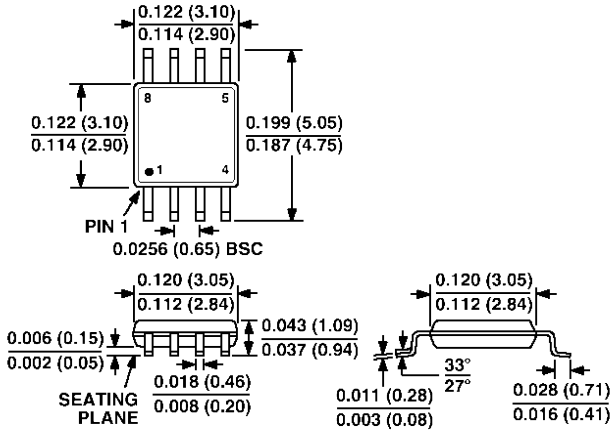
ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Branding Information
AD8651ARM-Reel	-40°C to +125°C	8-Pin MSOP	RM-8	XXX
AD8651AR	-40°C to +125°C	8-Pin SOIC	R-8	
AD8651AR-Reel	-40°C to +125°C	8-Pin SOIC	R-8	
AD8651AR-Reel7	-40°C to +125°C	8-Pin SOIC	R-8	
AD8652AR	-40°C to +125°C	8-Pin SOIC	R-8	
AD8652AR-Reel	-40°C to +125°C	8-Pin SOIC	R-8	
AD8652AR-Reel7	-40°C to +125°C	8-Pin SOIC	R-8	

CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 2000 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.

8-Lead mSOIC
(RM-8)



8-Lead SO
(R-8)