

Features

- Supply Voltage: 4.5V to 36V
- Offset Voltage: $\pm 300\mu\text{V}$ Maximum
- Gain Error: 0.05% Maximum
- Bandwidth: 3MHz, Slew Rate: 5V/ μs
- EMI Enhancement
- Over-Temperature Protection
- -40°C to 125°C Operation Temperature Range

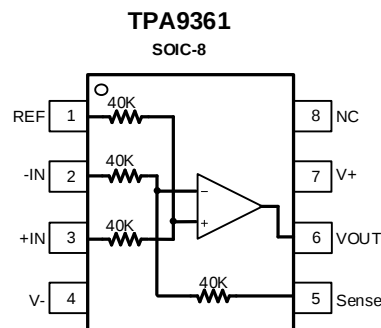
Applications

- Instrumentation
- Industrial control
- Audio
- Building block for precision amplifier circuit

Description

The TPA9361 is general-purpose, unity-gain difference amplifiers intended for precision signal conditioning. The on-chip resistors are trimmed for excellent gain accuracy and high CMRR. It has extremely low gain drift at operated temperature range. It also provides exceptional common-mode rejection ratio (100 dB typical) and high bandwidth while amplifying signals well beyond the supply rails. The common-mode range of the amplifiers extends to almost double the supply voltage, making these amplifiers ideal for single-supply applications that require a high common-mode voltage range.

Pin Configuration and Description



Pin No. of TSSOP	Pin Name	Description
1	REF	Reference input.
2	-IN	Inverting input.
3	+IN	Noninverting input.
4	V-	Negative power supply ^{Note 1}
5	Sense	Sense input.
6	VOUT	Output
7	V+	Positive power supply ^{Note 1}
8	NC	Not Connect.

Note 1: In this document, (V+) – (V-) is referred to as V_s .

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Revision History

Date	Revision	Notes
2020/5/5	Rev.Pre	Pre-release Version
2020/10/10	Rev.Pre.1	Update Spec
2021/2/9	Rev.Pre.2	Update Feature, Application and Description
2021/3/20	Rev.A.0	Initial Version

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity
TPA9361-SO1R	-40 to 125°C	8-Pin SOIC	A9361	3	Tape and Reel, 4000

Absolute Maximum Ratings ^{Note 1}

Parameters	Rating
Supply Voltage	36 V
Input Voltage Range	2*(Supply Voltage)
Input Current ^{Note 2}	±10mA
Maximum Operating Junction Temperature	150°C
Operating Temperature Range	−40 to 125°C
Storage Temperature Range	−65 to 150°C
Lead Temperature (Soldering, 10 sec)	260°C

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: The inputs are protected by ESD protection diodes to each power supply. If the input extends more than 300mV beyond the power supply, the input current should be limited to less than 10mA.

ESD Rating / Latch Up

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001	1	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002	1.5	kV

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
8-Pin SOIC	158	43	°C/W

Electrical Characteristics

All test condition is $V_+ = +15V$ and $V_- = -15V$, $R_L = 10k\Omega$ to ground, reference pin connected to ground, sense pin connected to VOUT pin, $T_A = 25^\circ C$, unless otherwise noted.

Symbol	Parameter	Conditions	T _A	Min	Typ	Max	Unit
Power Supply							
V _S	Supply Voltage Range			±2.25		±18	V
I _Q	Quiescent Current per Amplifier	No Load			1.5	2	mA
			-40°C to 125°C			2.5	mA
Gain							
	Initial	V _{OUT} = ±10V			1		V/V
	Gain Error	V _{OUT} = ±10V			0.02	0.05	%FSR
			-40°C to 125°C			0.1	%FSR
	Gain Drift		-40°C to 125°C		5		PPM/°C
	Nonlinearity				0.0005		%FSR
Offset Voltage							
V _{OS}	Input Offset Voltage	V _{CM} = 0V			150	300	μV
			-40°C to 125°C			800	μV
V _{OS} TC	Offset Voltage Drift		-40°C to 125°C		2		μV/°C
PSRR	Power Supply Rejection Ratio	V _S = ±2.25V to ±18V, V _{CM} = 0V		100	120		dB
			-40°C to 125°C	95			dB
Input							
	Impedance	Differential			80		kΩ
		Common-mode			40		kΩ
	Input Voltage range	Differential		-2*(V-)		2*[(V+)-1.5]	V
CMRR	Common-mode rejection	V _{CM} = -30V to 27V		80	100		dB
			-40°C to 125°C	78			dB
Output							
	Output Swing from Supply Rail	R _{LOAD} = 10kΩ to V _S /2			50	200	mV
		R _{LOAD} = 2kΩ to V _S /2			400	500	mV
I _{SC}	Output Short-Circuit Current				100		mA
AC Specifications							
GBW	Gain-Bandwidth Product				3		MHz
SR	Slew Rate	10V step			5		V/μs
t _S	Settling Time, 0.1%	G = -1, 10V step			0.8		μs
Noise Performance							
E _N	Input Voltage Noise	f = 0.1Hz to 10Hz			0.2		μV _{RMS}
e _N	Input Voltage Noise Density	f = 1kHz			30		nV/√Hz

Typical Performance Characteristics

$V_S = \pm 15V$, $V_{CM} = 0V$, $R_L = 10k\Omega$, unless otherwise specified.

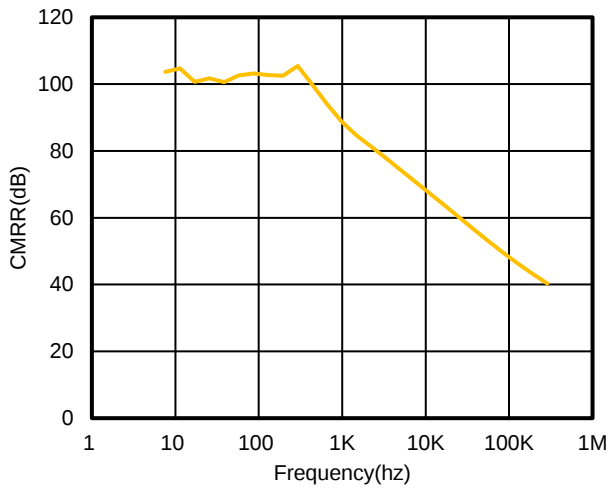


Figure 1. CMRR vs. Frequency

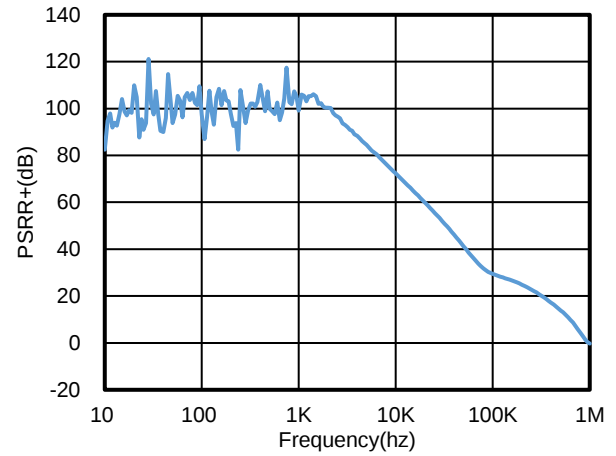


Figure 2. PSRR+ vs. Frequency

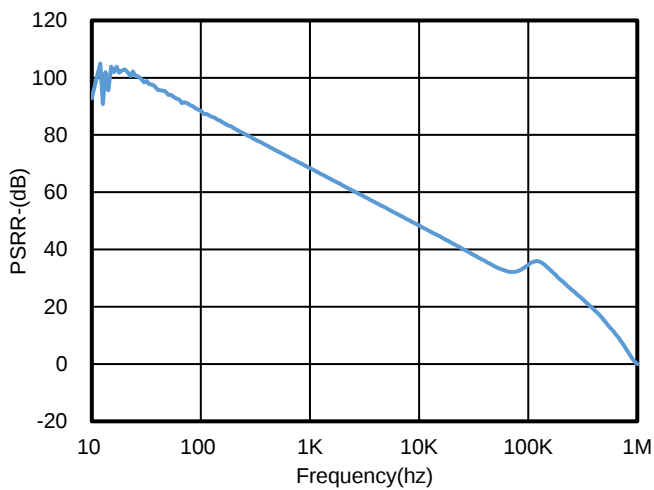


Figure 3. PSRR- vs. Frequency

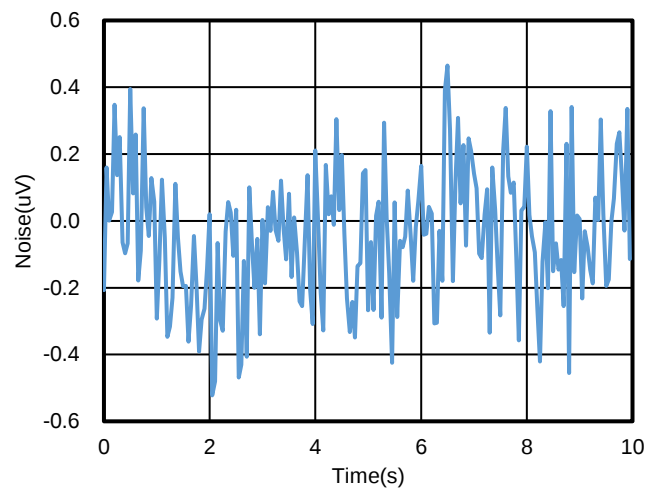
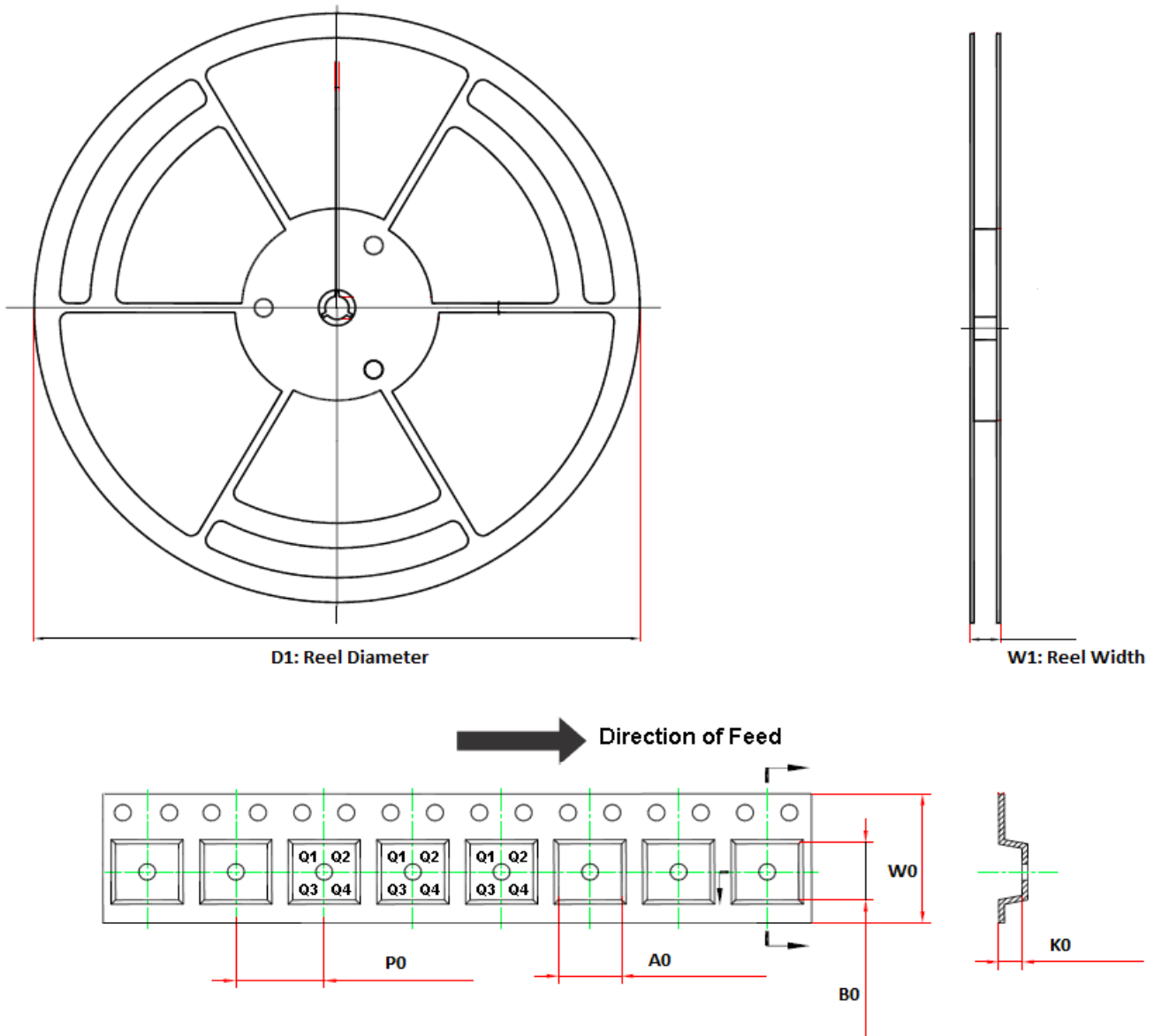


Figure 4. 0.1 to 10Hz Voltage Noise

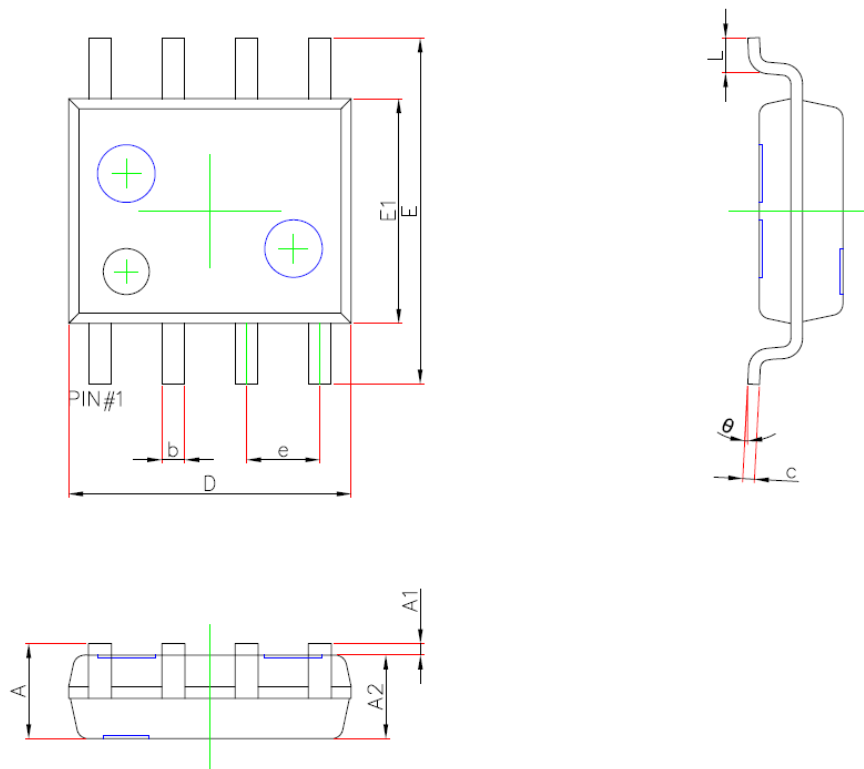
Tape and Reel Information



Order Number	Package	D1	W1	A0	B0	K0	P0	W0	Pin1 Quadrant
TPA9361-SO1R	8-Pin SOIC	330.0	17.6	6.4	5.4	2.1	8.0	12.0	Q1

Package Outline Dimensions

SOIC-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270(BSC)		0.050(BSC)	
L	0.400	0.800	0.016	0.031
θ	0°	8°	0°	8°

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