



AS402 Hi-End audio two-channel operational amplifier

Features

- Hi-End sound quality
- less then 2 nV/√Hz low input voltage noise
- ultra-low total harmonic distortion+ noise (RI = 600 Ohm CI = 330 pF):
 0,00015 % at 20 kHz
 0,00036 % at 40 kHz
- unity-gain stable at RI=600 Ohm CI=1000 pF
- phase margin at G=+1 & RI = 600 Ohm without external correction:
 125° at CI=100 pF
 60° at CI=330 pF
- slew rate G=+1 30 V/μS & RI = 600 Ohm CI = 330 pF
- low input offset voltage 250μV (max)
- bandwidth > 35MHz
- wide supply range +9 V to +36 V (±4,5 V -±18 V)) - input current < 1uA
- linear output stage class A
- low small-signal overshoot with capacitive load (100mV output step):
 8% RI=600 Ohm, Rsl=0 Ohm, CI=100 pF;
 10% RI=600 Ohm, Rsl=0 Ohm, CI=250 pF;
 30% RI=600 Ohm, Rsl=0 Ohm, CI=1000 pF;
 15% RI=600 Ohm, Rsl=25 Ohm, CI=1000 pF
- no phase reversal
- peak-to-peak output voltage swing 32V typ. with Vcc= ±18V and RI=600 Ohm



DIP-8 hybrid module

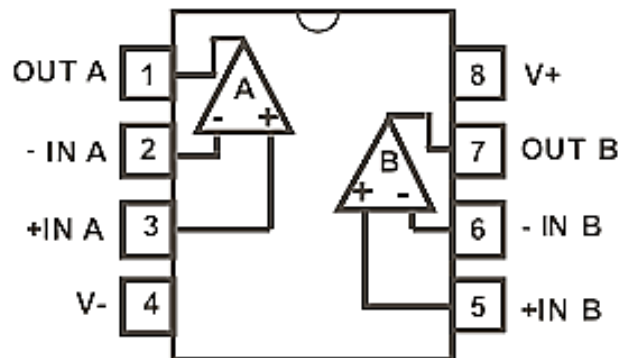
Description

AS402 is two channel bipolar-input Hi-End audio operational amplifier and provide ultra-low THD+Noise level -130dB (1Khz) and -110dB (40kHz) for RI= 600 Ohm & CI=100 pF. Amplifier drives a 32 Ohm load at 10 mW and 600 Ohm load at 70 mW. AS401 is unity-gain stable and provides excellent dynamic behavior over a wide range gain and load conditions at a wide supply range of ±4.5 to ±18 V.

AS402 is a hybrid module with DIP8 footprint.

Pin information

Pin name	Pin number	Description
OUT A	1	Output_A
-IN A	2	Inverting input_A
+IN A	3	Non-inverting input_A
V-	4	Negative power supply
+IN B	5	Non-inverting input_B
-IN B	6	Inverting input_B
OUT B	7	Output_A
V+	8	Positive power supply





Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) (1)

Parameter	Description	Min	Max	Unit
Voltage	Supply voltage, $V_s = (V+) - V(-)$		40	V
	Input Voltage	(V-) -1.0	(V+) + 1.0	
	Input differential voltage		±5	
Current	Output short - circuit	Continuous		mA
Temperature	Operating, T_a	-40	+85	°C

(1) Stresses beyond those listed under *Absolute – Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Electrical Characteristic: at $T_a = +25^\circ\text{C}$, $V_s = \pm 15\text{ V}$ $R_l = 600\text{ Ohm}$ and $C_l = 100\text{ pF}$ unless otherwise noted.

Parameter	Test conditions	Min	Typ	Max	Unit
THD+N , Total Harmonic Distortion + Noise	80-kHz measurement bandwidth				%
	$G=+1, f=1\text{kHz}, V_{out}=3\text{V(RMS)} R_l=600\text{ Ohm } C_l=330\text{pF}$		0.000015		
	$G=+1, f=20\text{kHz}, V_{out}=3\text{V(RMS)} R_l=600\text{ Ohm } C_l=330\text{pF}$		0.00018		
	$G=+1, f=40\text{kHz}, V_{out}=3\text{V(RMS)} R_l=600\text{ Ohm } C_l=330\text{pF}$		0.00036		
	$G=+1, f=1\text{kHz}, V_{out}=7\text{V(RMS)} R_l=600\text{ Ohm } C_l=330\text{pF}$		0.000024		
	$G=+1, f=20\text{kHz}, V_{out}=7\text{V(RMS)} R_l=600\text{ Ohm } C_l=330\text{pF}$		0.00024		
	$G=+1, f=40\text{kHz}, V_{out}=7\text{V(RMS)} R_l=600\text{ Ohm } C_l=330\text{pF}$		0.00053		
	$G=+1, f=1\text{kHz}, P_{out}=50\text{mW } R_l=128\text{ Ohm}$		0.000055		
	$G=+1, f=1\text{kHz}, P_{out}=10\text{mW } R_l=32\text{ Ohm}$		0.00021		
GBW Gain-bandwidth product	$G=+1$	35			MHz
SR , Slew rate	$G=+1$		30		V/μS
Full-Power Bandwidth	$G=+1, V_o=1\text{ Vpp}$		4.5		MHz
	$G=+1, V_o=26\text{ Vp-p}$		0.35		
Phase Margin	$G=+1 R_l=600\text{ Ohm } C_l=330\text{ pF}$	60			Degrees
Input voltage noise	$G=+1$		2		nV/√Hz
V_{os} Input Offset Voltage	$V_s = \pm 15\text{ V}$			250	μV
	$V_s = \pm 5\text{ V}$			350	
I_b Input Bias Current	$V_s = \pm 15\text{ V}$			± 1	μA
	$V_s = \pm 5\text{ V}$			± 1.5	
A_{ol} Open-Loop Gain	$V_{out} = \pm 10\text{ V } R_L = 2\text{ kOhm}$		82		V/mV
V_{out} Output Voltage Swing	Output signal - SIN 10kHz $R_l=600\text{ Ohm } V_s = \pm 15\text{ V}$	± 13			V
Short circuit current	$V_s = \pm 15\text{ V}$	25			mA
Small-Signal Overshoot	$R_l=600\text{ Ohm}, R_{sl}=0\text{ Ohm } C_l=100\text{ pF}$			8	%
	$R_l=600\text{ Ohm}, R_{sl}=0\text{ Ohm } C_l=300\text{ pF}$			10	
	$R_l=600\text{ Ohm}, R_{sl}=0\text{ Ohm } C_l=1000\text{ pF}$			30	
	$R_l=600\text{ Ohm}, R_{sl}=25\text{ Ohm } C_l=1000\text{ pF}$			15	
V_s		±4.5		±18	V
Quiescent current (channel)			8	10	mA
Operation temperature range		-40		+85	°C

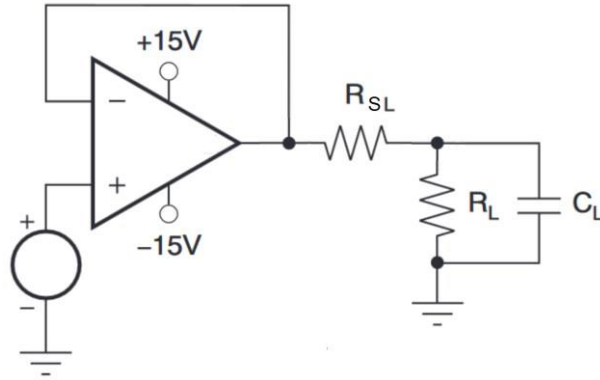
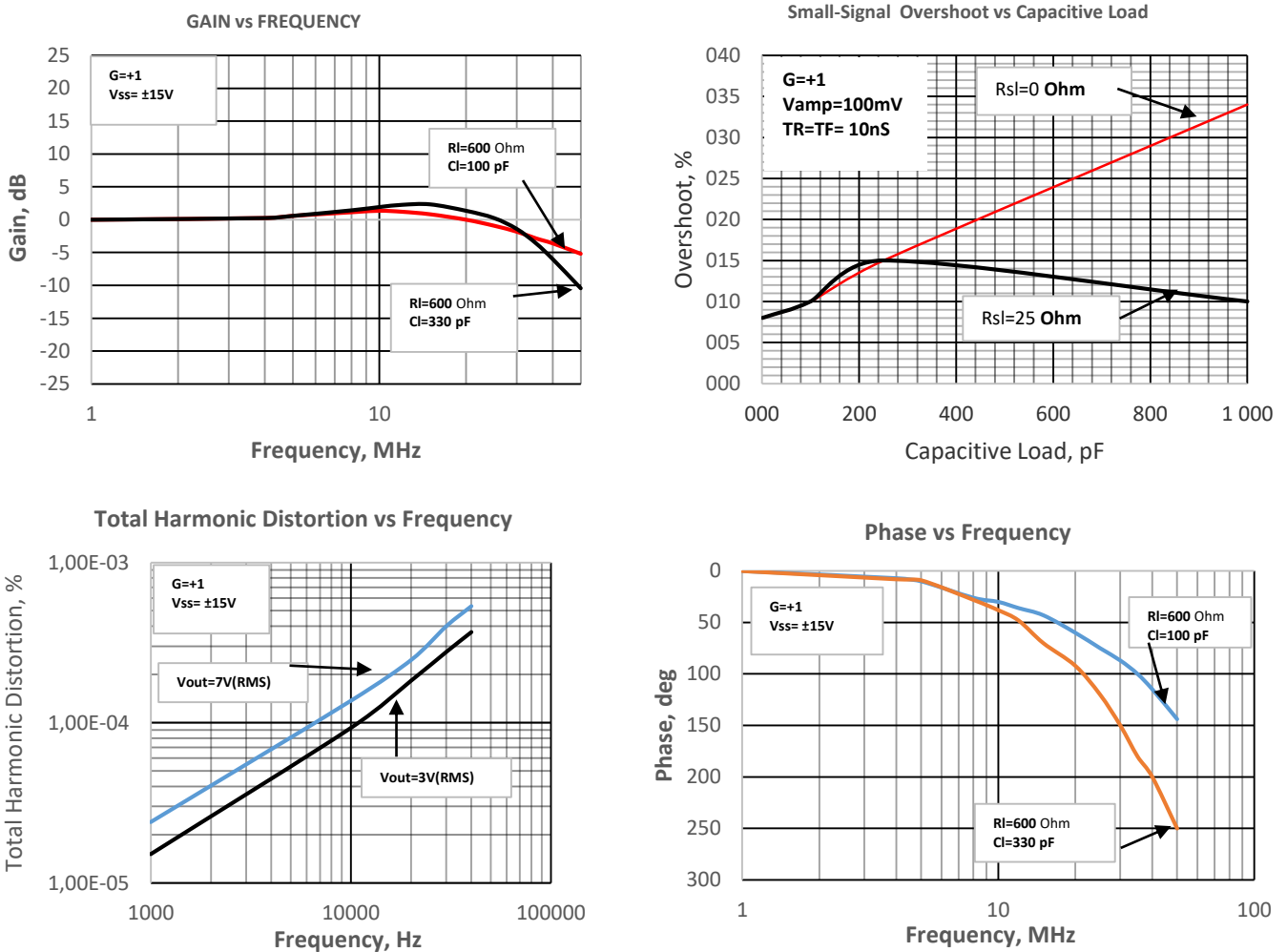


Fig. 1 Measurement schematic (if Rsl not noted, then Rsl=0)

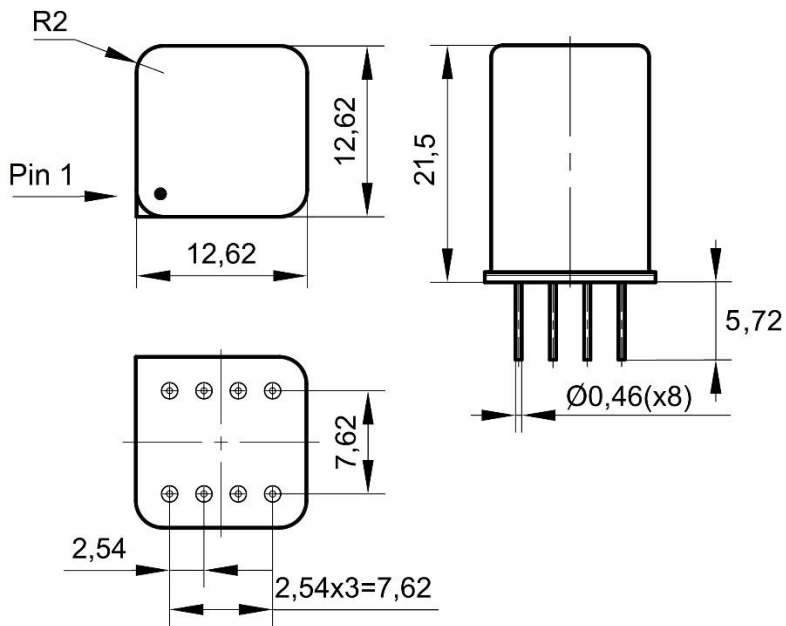
Typical Characteristics at Ta = +25°C, Vs = ±15V RI= 600 Ohm and CI=100 pF (unless otherwise noted)





Package information

Part number	Package
AS402	DIP8 hybrid module



Revision history

Date	Revision	Changes
20-Jun-2019	1	Preliminary version 1
21-Oct-2019	2	Minor changes:
18-Apr-2020	3	Package drawing