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 (Rl = 600 Ohm Cl = 330 pF):
  0,00015 % at 20 kHz
  0,00036 % at 40 kHz
- unity-gain stable at Rl=600 Ohm Cl=1000 pF
- phase margin at G=+1 & Rl = 600 Ohm without external correction:
  125° at Cl=100 pF
  60° at Cl=330 pF
- slew rate G=+1 30 V/µS & Rl = 600 Ohm Cl = 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% Rl=600 Ohm, Rsl=0 Ohm, Cl=100 pF;
  10% Rl=600 Ohm, Rsl=0 Ohm, Cl=250 pF;
  30% Rl=600 Ohm, Rsl=0 Ohm, Cl=1000 pF;
  15% Rl=600 Ohm, Rsl=25 Ohm, Cl=1000 pF
- no phase reversal
- peak-to-peak output voltage swing 32V typ. with Vcc= ±18V and Rl=600 Ohm

DIP-8 hybrid module

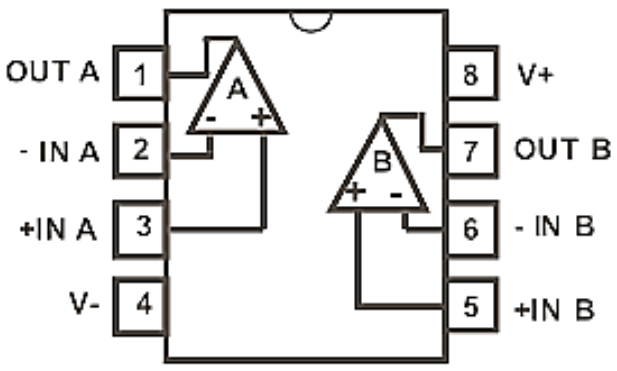
Description

AS402 is two channel bipolar-input Hi-End audio operational amplifier and provide ultra-low THD+Noise level -130dB (1Khz) and -110dB (40kHz) for Rl= 600 Ohm & Cl=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, Vs= (V+) – V(-)		40	V
	Input Voltage	(V-) -1.0	(V+) + 1.0	
	Input differential voltage		±5	
Current	Output short - circuit	Continuous		mA
Temperature	Operating, Ta	-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 Ta = +25°C, Vs = ±15 V Rl= 600 Ohm and Cl=100 pF unless otherwise noted.

Parameter	Test conditions	Min	Typ	Max	Unit
THD+N , Total Harmonic Distortion + Noise	80-kHz measurement bandwidth G=+1, f=1kHz, Vout=3V(RMS) Rl=600 Ohm Cl=330pF G=+1, f=20kHz, Vout=3V(RMS) Rl=600 Ohm Cl=330pF G=+1, f=40kHz, Vout=3V(RMS) Rl=600 Ohm Cl=330pF G=+1, f=1kHz, Vout=7V(RMS) Rl=600 Ohm Cl=330pF G=+1, f=20kHz, Vout=7V(RMS) Rl=600 Ohm Cl=330pF G=+1, f=40kHz, Vout=7V(RMS) Rl=600 Ohm Cl=330pF G=+1, f=1kHz, Pout=50mW Rl=128 Ohm G=+1, f=1kHz, Pout=10mW Rl=32 Ohm		0.000015 0.00018 0.00036 0.000024 0.00024 0.00053 0.000055 0.00021		%
GBW Gain-bandwith product	G=+1	35			MHz
SR , Slew rate	G=+1		30		V/µS
Full-Power Bandwith	G=+1, Vo=1 Vpp		4.5		MHz
	G=+1, Vo=26 Vp-p		0.35		
Phase Margin	G=+1 Rl=600 Ohm Cl=330 pF	60			Degrees
Input voltage noise	G=+1		2		nV/√Hz
Vos Input Offset Voltage	Vs= ±15 V			250	µV
	Vs= ±5 V			350	
Ib Input Bias Current	Vs= ±15 V			± 1	µA
	Vs= ±5 V			± 1.5	
Aol Open-Loop Gain	V out = ±10 V RL= 2 kOhm		82		V/mV
Vout Output Voltage Swing	Output signal - SIN 10kHz Rl=600 Ohm Vs= ±15 V	± 13			V
Short circuit current	Vs= ±15 V	25			mA
Small-Signal Overshoot	Rl=600 Ohm, Rsl= 0 Ohm Cl= 100 pF			8	%
	Rl=600 Ohm, Rsl= 0 Ohm Cl= 300 pF			10	
	Rl=600 Ohm, Rsl= 0 Ohm Cl=1000 pF			30	
	Rl=600 Ohm, Rsl=25 Ohm Cl=1000 pF			15	
Vs		±4.5		±18	V
Quiescent current (channel)			8	10	mA
Operation temperature range		-40		+85	°C

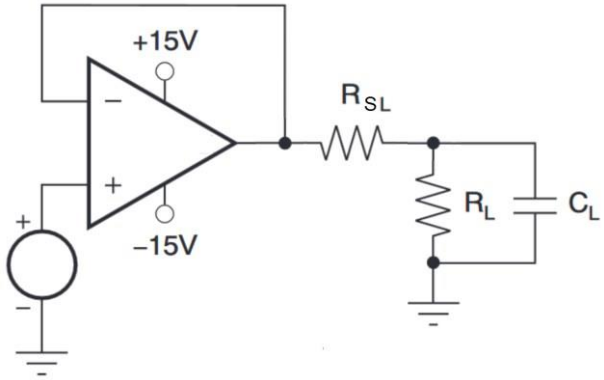
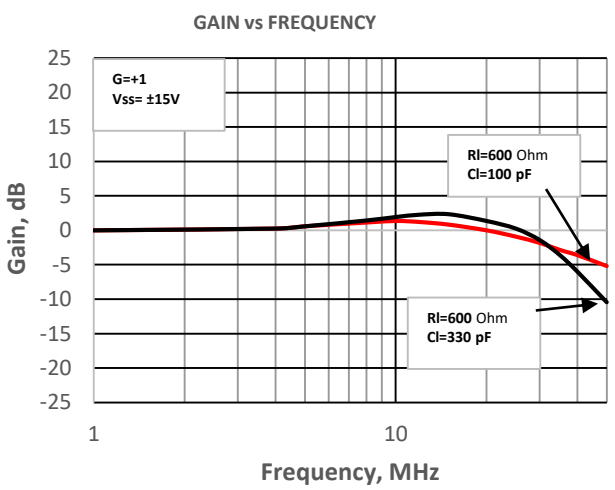
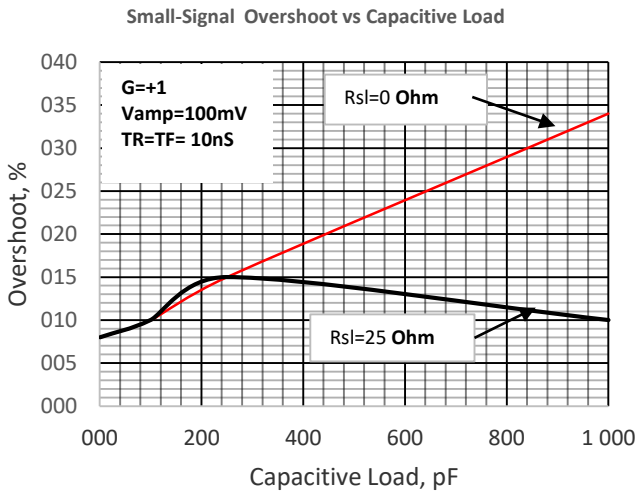
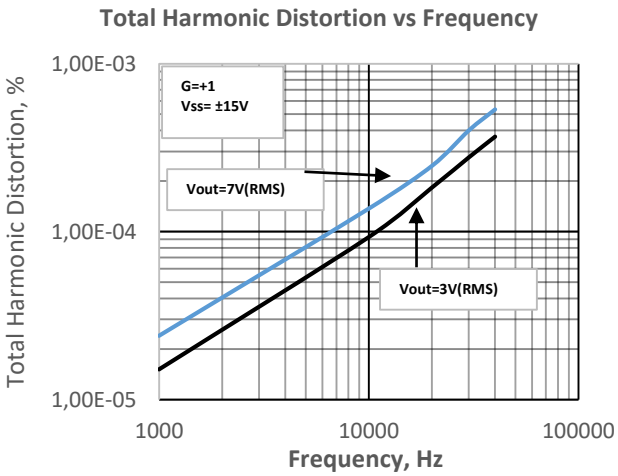


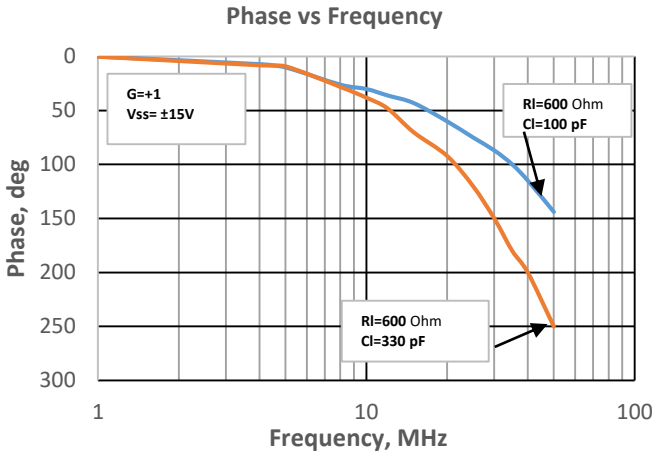
Fig. 1 Measurement schematic (if Rsl not noted, then Rsl=0)

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



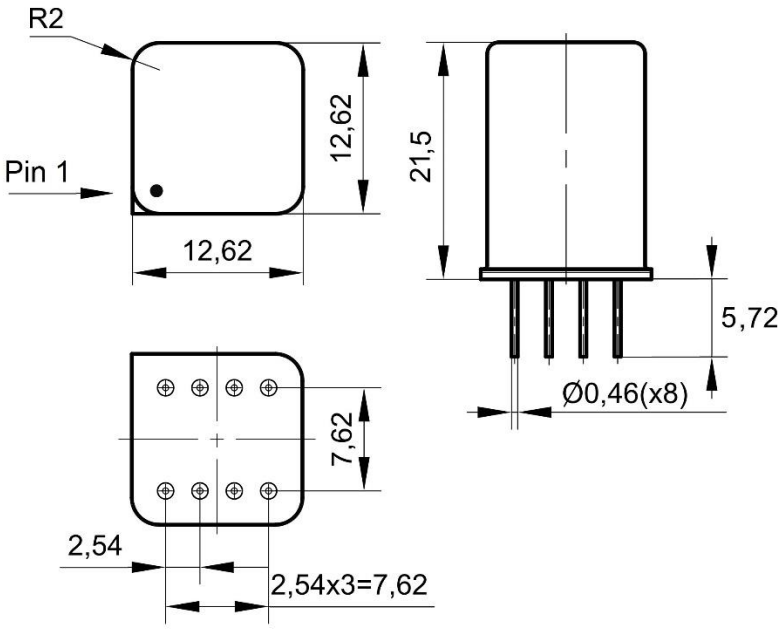






Package information

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