

PR2301 Single-Chip 48 V True Phantom® Power Supply



Features

- supplies 48 V of phantom power with an 0.8 mA to 10 mA supply current
- reduces third harmonic distortion by between 3.6 dB and 14 dB
- minimizes fifth harmonic distortion
- complies with standard IEC 61938, P48

Applications

- mixing consoles
- microphone preamplifiers
- standalone digital recorders
- replaces a phantom power supply

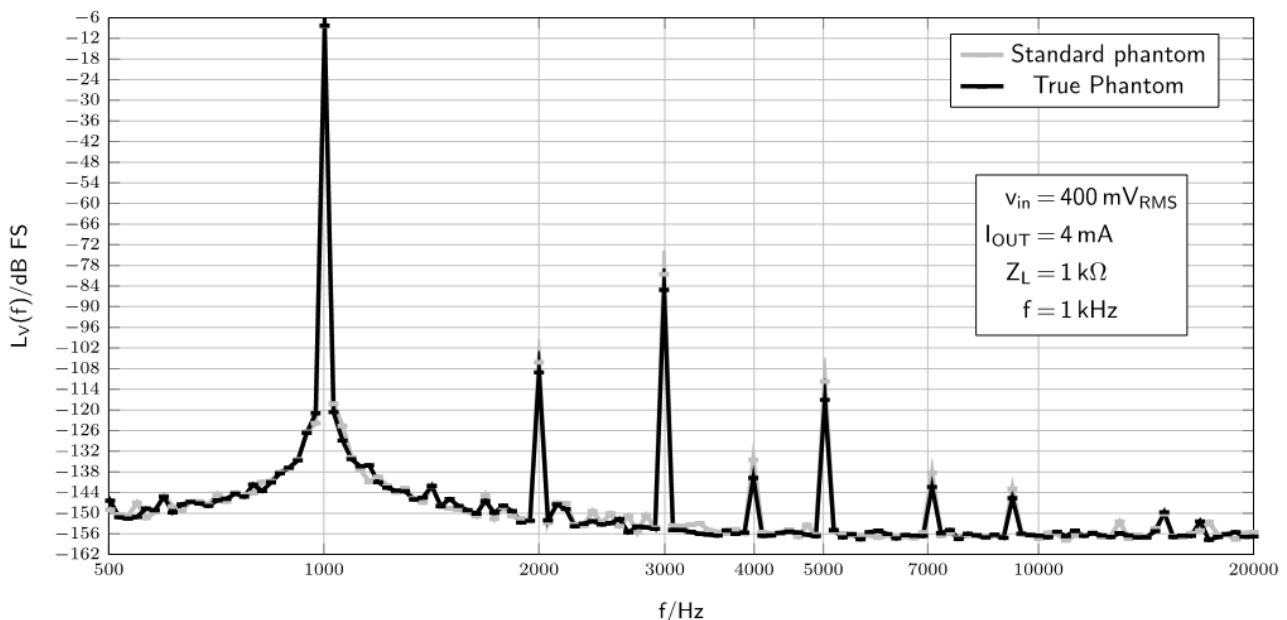
Introduction

The PR2301 replaces a phantom power source and reduces distortion from a condenser microphone output.

A condenser microphone needs an external power supply. IEC 61938 defines an 48 V phantom power source as a voltage source that is connected to the microphone through two 6.8 k Ω resistors.

A standard phantom power circuit shunts the output signal of a condenser microphone and loads the microphone output stage. Harmonic distortion increases.

The PR2301 integrated circuit cancels this effect and minimizes distortion.



FFT of measurements: Condenser microphone harmonic distortion with standard phantom and True Phantom® power for a 1 kHz signal. The microphone output stage consists of two PNP emitter followers. 0 dB FS = 1 V.

With the PR2301 all distortion products are reduced. Distortion is mainly third order.

PR2301 Single-Chip 48 V True Phantom® Power Supply



The PR2301 causes no additional loading of the microphone. Load impedance consists solely of the input impedance of the microphone preamplifier. Output harmonic distortion is reduced to the minimum achievable with a given microphone preamplifier.

For a typical microphone with 4 mA supply current with a PR2301, harmonic distortion decreases by 3.6 dB with a 1 kΩ load and by 14 dB with a 5 kΩ load.

Pinout

Pin Number	Pin Name	Function
1	VEE	negative supply
2	SUB	connect to negative supply
3	COMP	filter
4	OUT1	current output
5	OUT2	current output
6	VCC	positive supply
7	NC	leave unconnected
8	NC	leave unconnected

Application Circuit

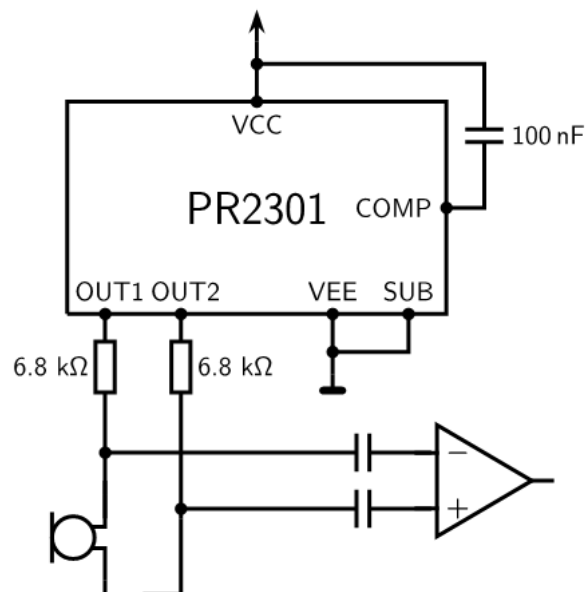


Figure 2: Application circuit

The circuit produces two voltages $V(OUT1) = V(OUT2) = 48 V$

$$V(OUT1) = V(OUT2) = 48 V$$

to supply a condenser microphone with current. The PR2301 uses a supply voltage between 60 V and 70 V and an external 100 nF capacitor.

PR2301 Single-Chip 48 V True Phantom[®] Power Supply



Electrical Characteristics

Absolute Maximum Ratings

Parameter	min	typ	max	Unit
VCC			80	V
I(OUT1), I(OUT2) ¹	9			mA
T _j (junction temperature)			125	°C

with two 6.8 kΩ resistors the circuit will be protected against short circuits.

Parameters

@ VCC = 65 V, T = 21 °C, I_{load} = 4 mA²

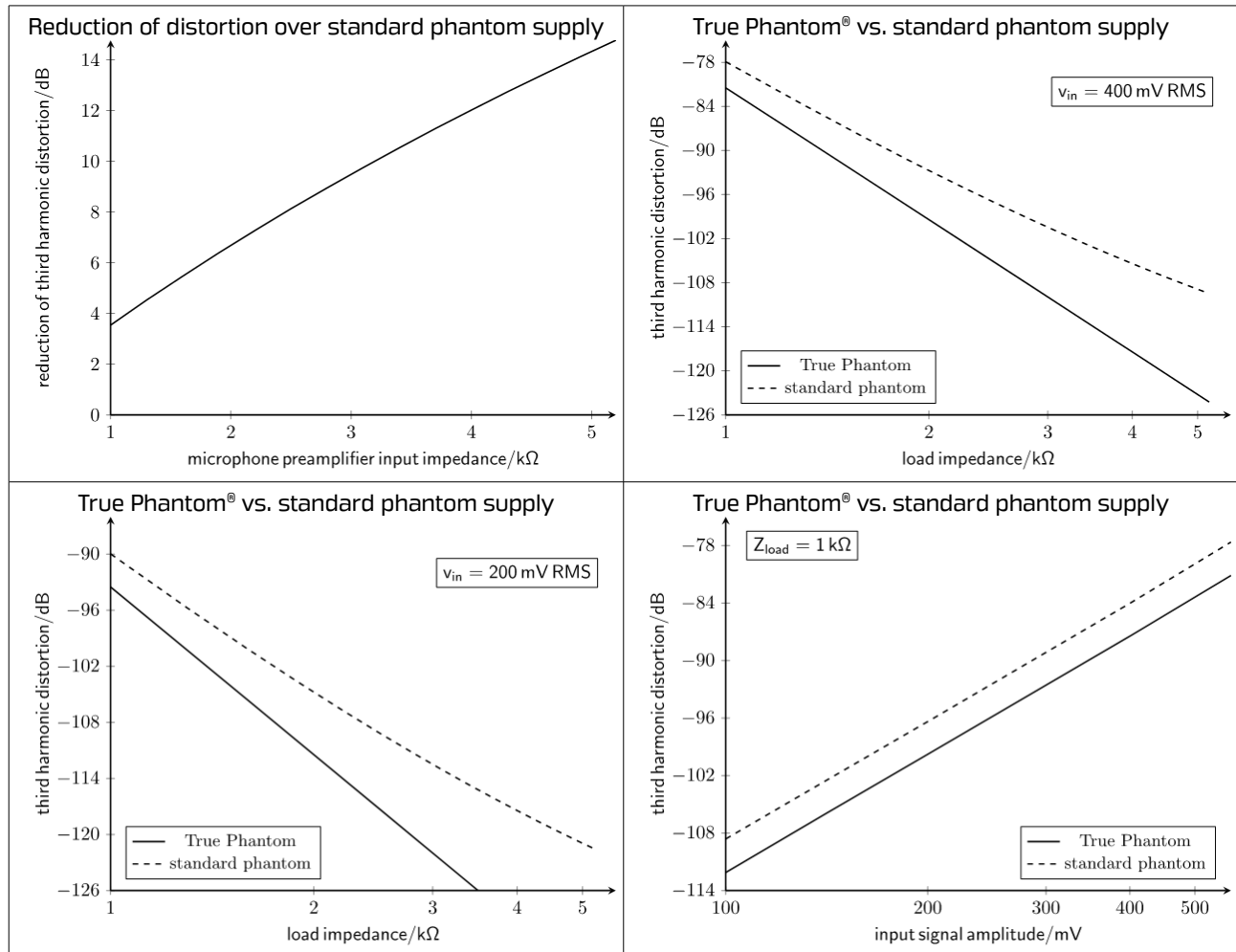
Parameter	min	typ	max	Unit
operating temperature	0		65	°C
T _j (junction temperature)			100	°C
V _{cc}	60	65	70	V
I(V _{cc})		5		mA
I _{load}	0.8		10	mA
(V(OUT1) + V(OUT2)) / 2	46	48	50	V
I(OUT1) vs. I(OUT2) mismatch			0.4	%
Z _{OUT} f3dB _{low} f3dB _{high}	1 100 (200)		1 (0.1)	MOhm Hz kHz

¹ for 5 seconds

² I_{load} = I(OUT1) + I(OUT2)

Performance

Performance for a condenser microphone with $I_{load} = 4\text{ mA}$



Functional Description

A microphone output stage consists generally of two emitter followers.

Standard Phantom Power

PR2301 Single-Chip 48 V True Phantom[®] Power Supply

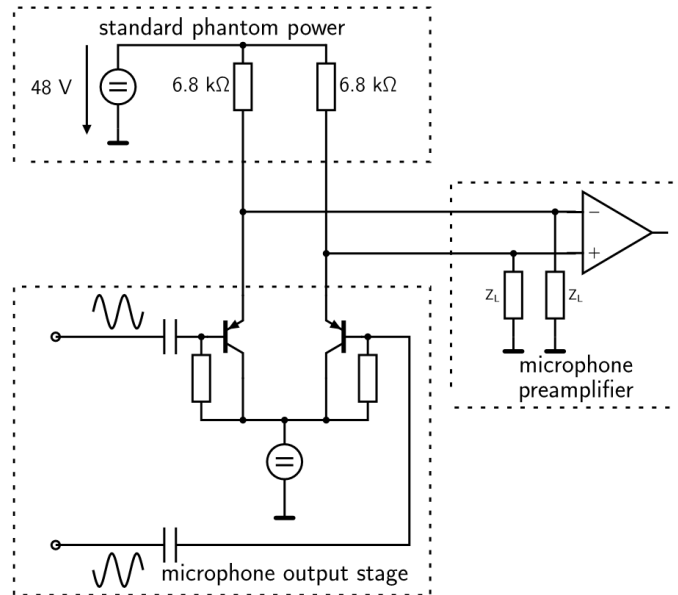


Figure 3: Typical condenser microphone output stage with standard phantom power supply and load (simplified circuit)

With a standard phantom power supply, the two 6.8 kΩ resistors load the emitter followers and distortion increases. Due to the symmetrical nature, even order harmonics are attenuated but not suppressed completely. Distortion is mainly third order.

True Phantom[®] Power

The voltage source is replaced by a dual current source. Currents are regulated so the output voltage is 48 V as described in IEC 61938.

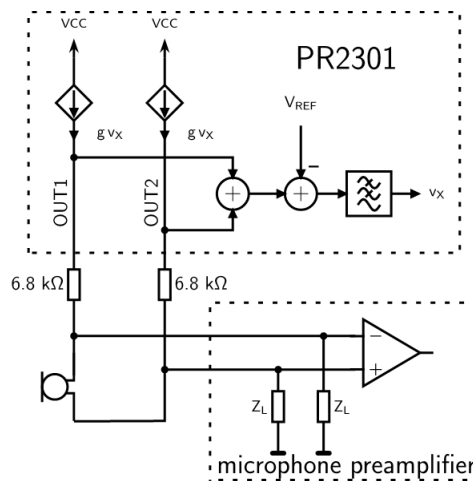


Figure 4: Functional diagram of PR2301 connected to a microphone.

The PR2301 uses two controlled current sources instead of the voltage source to provide two 48 V output voltages at terminals OUT1 and OUT2. For audio frequencies, OUT1 and OUT2 are high impedance nodes so the 6.8 kΩ resistors don't load the microphone output circuit. Distortion stays at the smallest possible level.

PR2301 Single-Chip 48 V True Phantom[®] Power Supply



Safety Precautions

- The device must be protected against electrostatic discharge.
- It is advisable to protect the chip terminals against transient voltages.

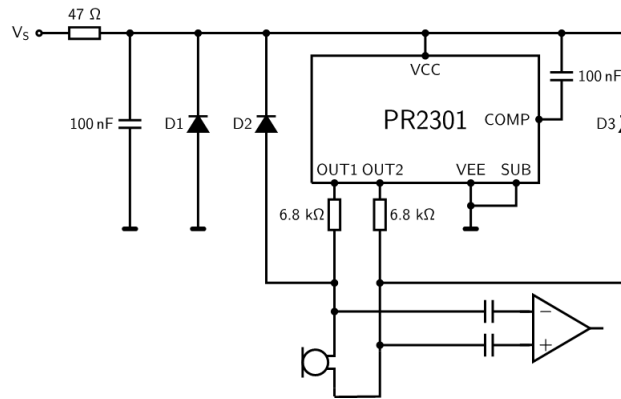


Figure 5: PR2301 with protective circuitry.

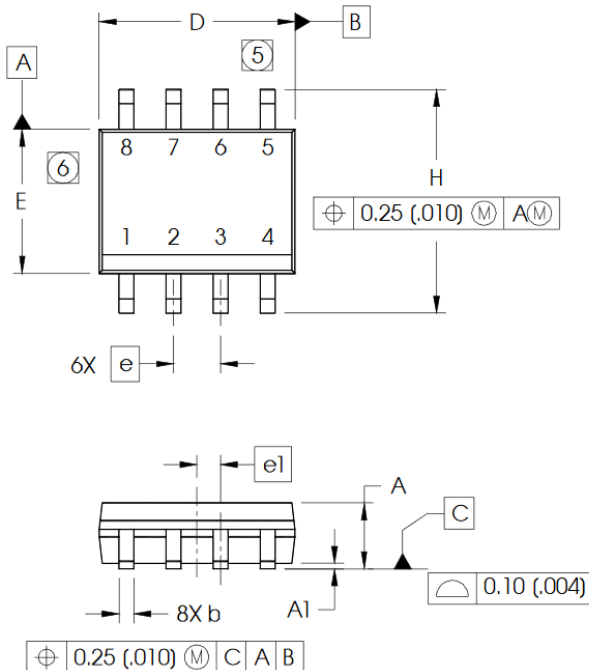
D1 fast switching diode, e. g. 1N4936

D2, D3 low capacitance diodes.

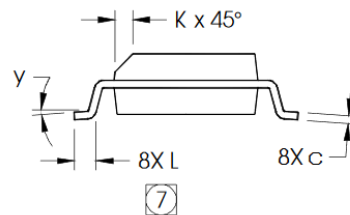
Capacitances should be close to chip terminals.

Package Dimensions

SO-08 package dimensions



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
y	0°	8°	0°	8°



True Phantom[®] is a registered trademark of Phantom Sound B. V. Amsterdam The Netherlands

PR2301 Single-Chip 48 V True Phantom[®] Power Supply



Disclaimer

Information provided by PREMA is believed to be accurate and correct. However, no responsibility is assumed by PREMA for its use, nor for any infringements of patents or other rights of third parties which may result from its use. PREMA reserves the right at any time without notice to change circuitry and specifications.

Life Support Policy

PREMA Semiconductors products are not authorized for use as critical components in life support devices or systems without the express written approval of PREMA Semiconductor. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PREMA Semiconductor GmbH

Robert-Bosch-Str. 6

55129 Mainz Germany

Phone: +49-6131-5062-0

Fax: +49-6131-5062-220

Email: prema@prema.com · Website: www.prema.com