TR-AD8436-01
Testing Report
Customer Applications Center (CAC)

Frequency Performance of AD8436

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INTRODUCTION

AD8436 is translinear precision, low power, true rms-to-dc converter loaded with options. It computes a precise dc equivalent of the rms value of ac wave-forms, including complex patterns such as those generated by switch mode power supplies and triacs. Its accuracy spans a wide range of input levels and temperatures.
The ensured accuracy of ≤±0.5% and ≤10 μV output offset result from the latest Analog Devices, Inc., technology. The crest factor error is <0.5% for CF values between 1 and 10.

TESTING CONDITIONS

Indoor laboratory environment

TESTING SETUP

Supply the AD8436 evaluation board with 5V and -5V power. The signal generator output different frequency and different waveform and voltage range into AD8436 via a coaxial cable. The RMS output is connected to the digital multimeter.

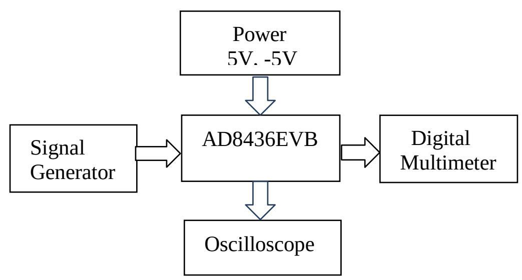

Figure 1. Testing System Frameworks

EQUIPMENTS

Equipment	Model	Manufacturer	Quantity
Oscilloscope	DS1204B	RIGOL	1
Digital Multimeter	2400 Sourse Meter	Tektronix	1
Signal Generator	DG5151	RIGOL	1
Power supply	DH1718G	Dahua	1

Table 1. Testing Equipments

TR-AD8436-01

SCHEMATICS

The schematic of AD8436 can be downloaded from www.analog.com, which is partially shown as below.

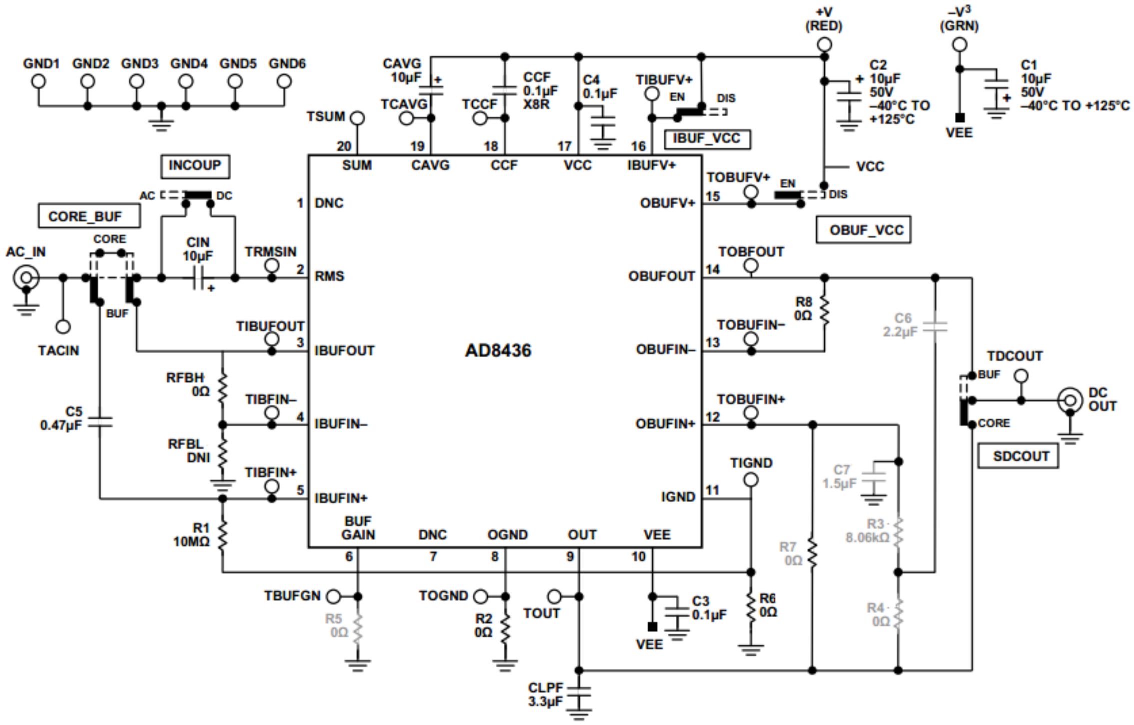

Figure 2. Testing Schematic

PROCEDURES

1) Open the package of AD8436 and read the instructions carefully.

2) Setup the test system according to the framework.

3) Power on the EVB board with 5V and -5V.

4) Use signal generator to give Sinusoidal wave input to AD8436 and tune the frequency.

5) Measure the output with oscilloscope to get the waveform and use digital multimeter to get the value of the output voltage level.

6) Use signal generator to give Triangular wave input to AD8436 and tune the frequency and repeat step 5 to measure the output.

7) Use signal generator to give Square wave input to AD8436 and tune the frequency and repeat step 5 to measure the output.

RESULTS

Below are the detailed testing results under different conditions.

Sinusoidal wave input with different frequency

With 10Vpp sine input, tune the frequency from 50Hz to 1MHz.

Theoretical value should be $10/2\sqrt{2}$. That is 3.535V.

The testing result is shown as figure 3.

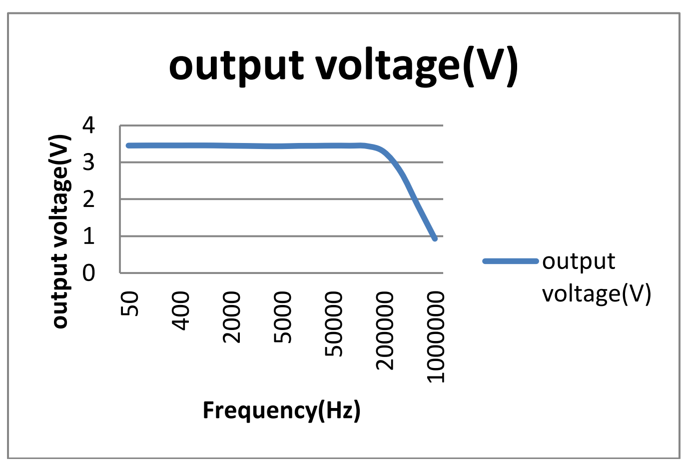

Figure 3. output voltage vs. input frequency

When input frequency is close to DC, output seems not converted to RMS DC voltage. Figure 4 shows when input voltage is 1Vrms sine wave, the output is just like the input. But when input frequency increases, the output tends to stable RMS value. Please refer to the figure 5 and 6.The blue line stands for the output and the yellow line stands for the input.

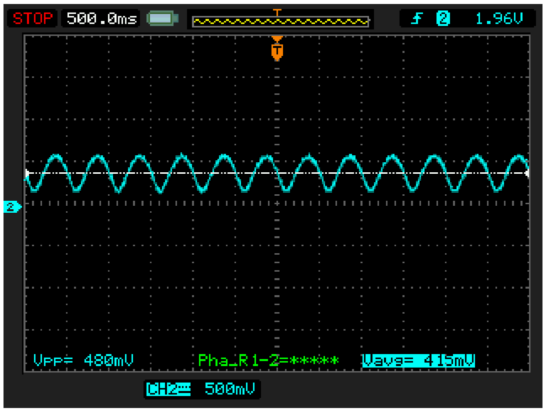

Figure 4. Iutput frequency is 1Hz

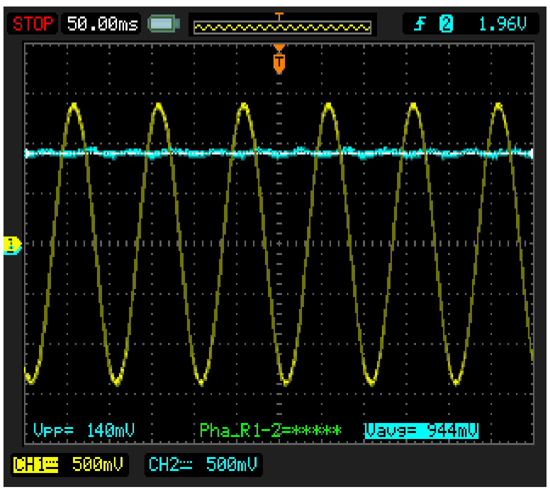

Figure 5. Input frequency is 10Hz

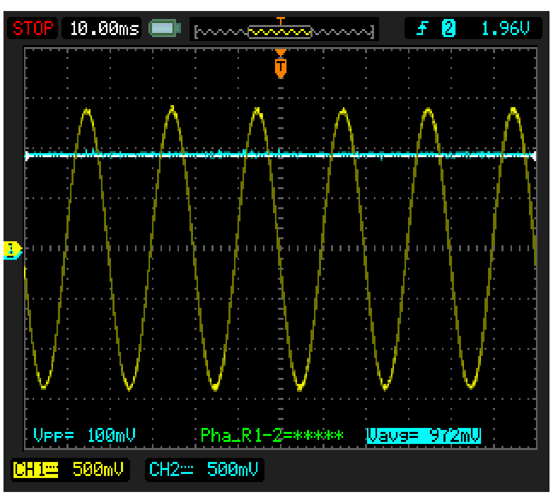

Figure 6. Input frequency is 50Hz

Triangular wave input with different frequency

With 5Vpp triangular input, tune the frequency from 50Hz to 1MHz. Theoretical value should be $5/2\sqrt{3}$. That is 1.4434V.

The testing result is shown as figure 7.

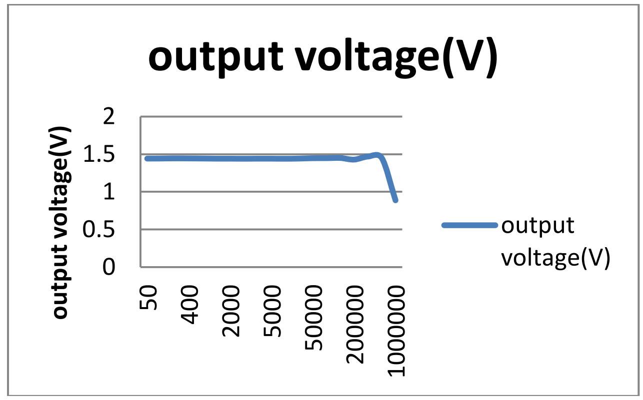

Figure 7. output voltage vs. input frequency

When input frequency is close to DC, output seems not converted to RMS DC voltage. Figure 8 shows when input voltage is 5Vpp triangular wave and frequency is 1Hz. But when input frequency increases, the output tends to stable RMS value. See figure 9.
The blue line stands for the output and the yellow line stands for the input.

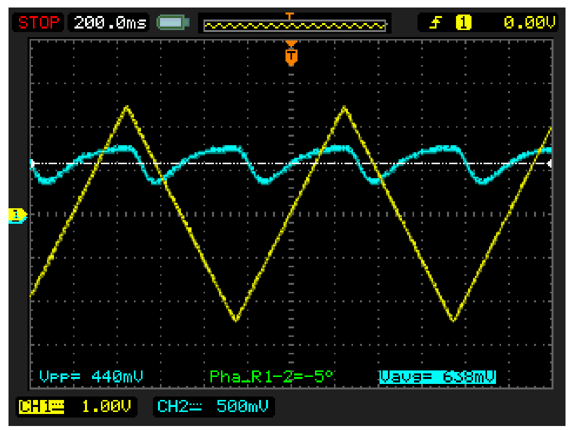

Figure 8. Input frequency is 1Hz

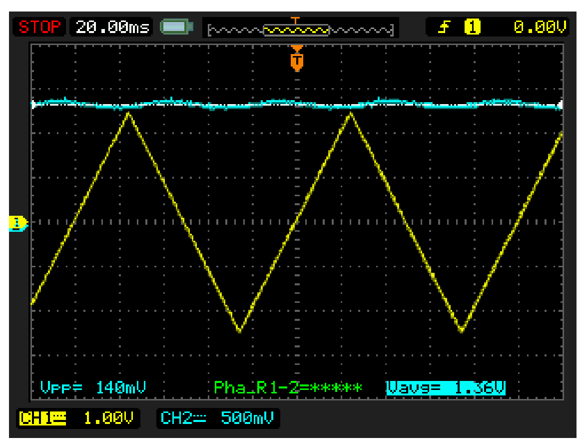

Figure 9. Input frequency is 10Hz

Square wave input with different frequency

With 2Vpp triangular input, tune the frequency from 50Hz to 1MHz.

Theoretical value should be $2/2\sqrt{1}$. That is 1V.

The testing result is shown as figure 10.

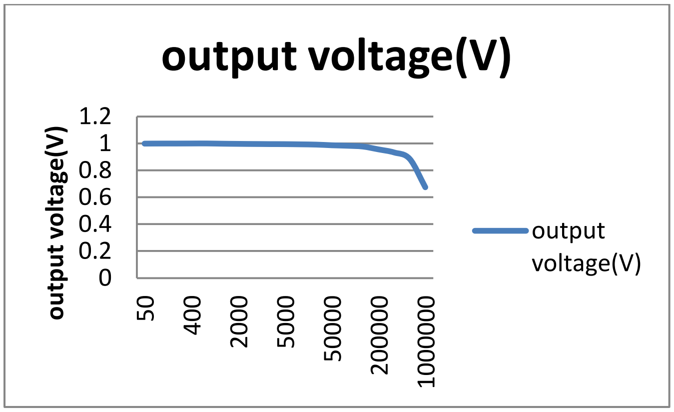

Figure 10. output voltage vs. input frequency

When input frequency is close to DC, output seems not converted to RMS DC voltage. Figure 11 shows when input voltage is 2Vpp square wave and frequency is 1Hz. But when input frequency increases, the output tends to stable RMS value. See figure 12.

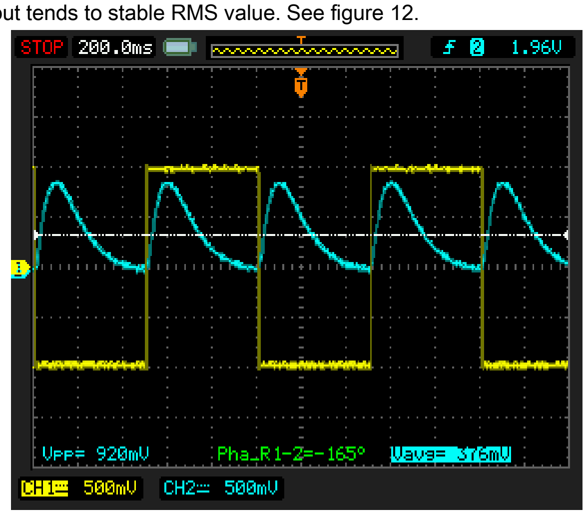

Figure 11. Input frequency is 1Hz

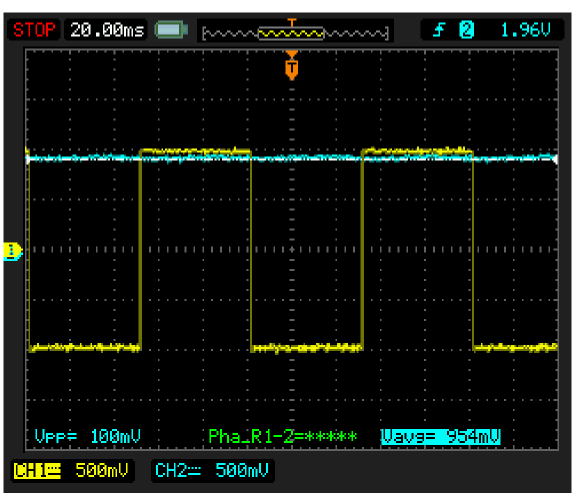

Figure 12. Input frequency is 10Hz

ANALYSIS

When we use RMS to DC converters, input frequency affects output accuracy, just as figure 3,7,10 in this testing report and figure 5 to 8 in datasheet. In very low frequency, just as figure 4,8,11 in this report, RMS output has larger error. For all tests, CAVG is 10uF, according to the integration theory, at lowest frequency, 10uF is not large enough to average enough periods to yield required rms accuracy.

CONCLUSION

When we use AD8436, if the input frequency is known, the chosen of CAVG value is important just as figure 28 in datasheet. In this report, for different input waveforms, the testing results meet the theoretical value. Larger CAVG could make better accuracy at very low frequency.

REFERENCE

1. AD8436 datasheet, Low Cost, Low Power, True RMS-to -DC Converter, Analog Devices.

2. MT-081 Tutorial, RMS-to-DC Converters, Analog Devices.

3. AN-268 Application Note, RMS-to-DC Converters Ease Measurement Tasks, Analog Devices.

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