Multi-purpose Voltage Controlled Analog Building Module

patent pending

The EDR82536 is a universal analog building block intended for low frequency applications requiring high accuracy high-pass filtering, adjustable cutoff and automatic gain control. The unique design provides the user with the ability to design an IDEAL differentiator or integrator. The EDR82536 is housed a 1.8"x1"x.2, 20-pin SIP package, and operates from +/- 12V dc.

FEATURES

- compact size
- voltage controllable high- or low- pass filters
- multiple devices in one module
- low noise amplifier that can be configured as a second order low-pass filter
- low noise amplifier with 100x gain
- unity gain for a voltage controllable low-pass filter application
- +/- 15V Supply
- high dynamic range 70db, typ
- low signal distortion, -55db, typ
- wide bandwidth: 500 KHz typ
- easy to use, SIP design
- low cost

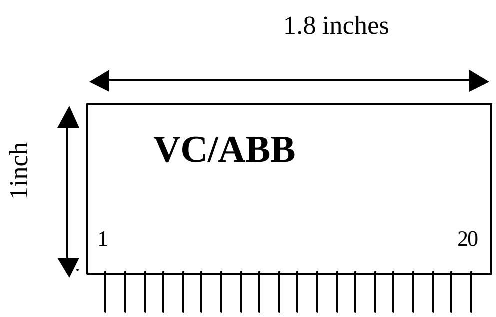
APPLICATIONS

- **Voltage Controlled Filters:**
  ***Lowpass**
  ***Ripple-Free Highpass**
  ***Bandpass**
- **Second Order Lowpass filter**
- **Automatic Gain Control**
- **Parametric Equalizer**
- **Tracking Filter**
- **Ideal differentiator**
- **Electronic Musical applications**
- **Compressor/Limiters**
- **Low Distortion Sinusoidal VCO's**

ORDERING INFORMATION

PACKAGE	- 20-pins 1.8"x1.0", SIP MODULE
Operation temperature range	- -10^{0}C to 50^{0}C
Part number	- **EDR82536**

PIN CONNECTIONS



Pin 1	Capacitor Cx	Pin 11	Ground
Pin 2	Capacitor Cx	Pin 12	-12VDC
Pin 3	Capacitor Cy	Pin 13	+12VDC
Pin 4	Transconductance amp gain ctrl	Pin 14	Feedback in
Pin 5	LNA output/HP Output	Pin 15	Feedback out
Pin 6	Input of HPF/LPF	Pin 16	- LN Amplifier input
Pin 7	Cutoff frequency adjust	Pin 17	- LPF output
Pin 8	Capacitor Cz1	Pin18	-Input transconductance amp
Pin 9	Capacitor Cz2	Pin 19	+Input transconductance amp
Pin 10	Slope adjust	Pin 20	Output transconductance amp

Figure 1. Pin-outs and descriptions of the EDR-82536

GENERAL DESCRIPTION

The EDR-82536 consists of three independent circuits—A Voltage Controlled Low-Pass Filter with a Voltage Controlled Feedback circuitry, a current-controlled transconductance amplifier, and Low Noise Amplifier with a gain set to 100. The module was designed to satisfy modern demanding signal processing requirements -- creating the optimum bandwidth to enhance signal-to-noise ratio (SNR). The module can be configured as a low-pass filter, a high-pass filter, a low-noise amplifier and as a gain controlled amplifier.

Below are a few configurations of the module to demonstrate the versatility of its applications using the analog building block - EDR-82536.

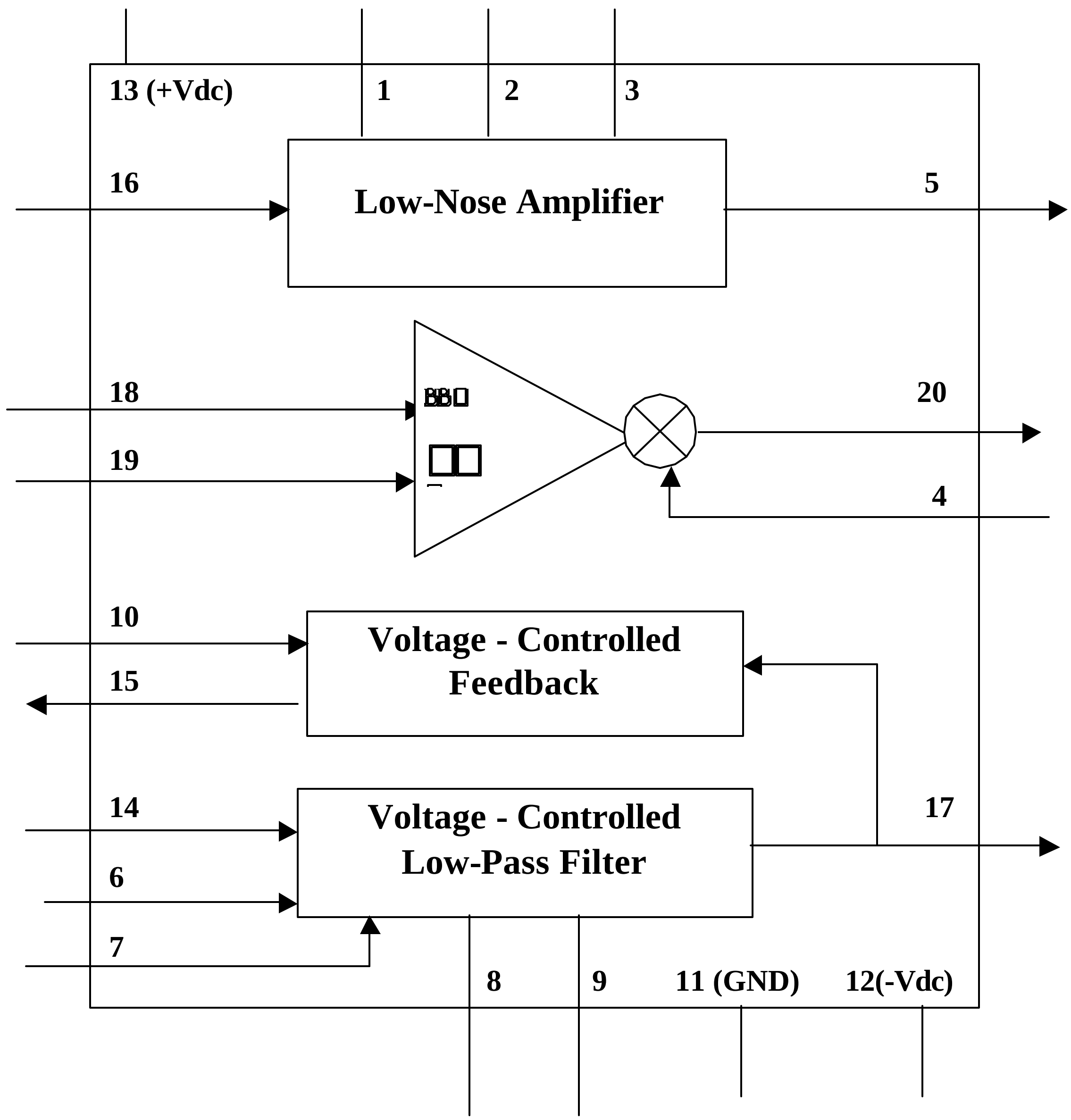


Figure 2. A block-diagram of the EDR-82536 - Analog Building Block

Application of the EDR-82536 as a High-Pass Ripple-Free Filter

Originally the module was designed to be configured as an ideal, ripple-free high-pass filter to detect small signals generated by the conduction system of the heart and Ventricular muscles. Both signals, the Bundle His and the Late Potential, which are extremely small amplitude high-frequency pulses, are located on a trail of the P-wave and the falling slope of the QRS-wave respectfully.

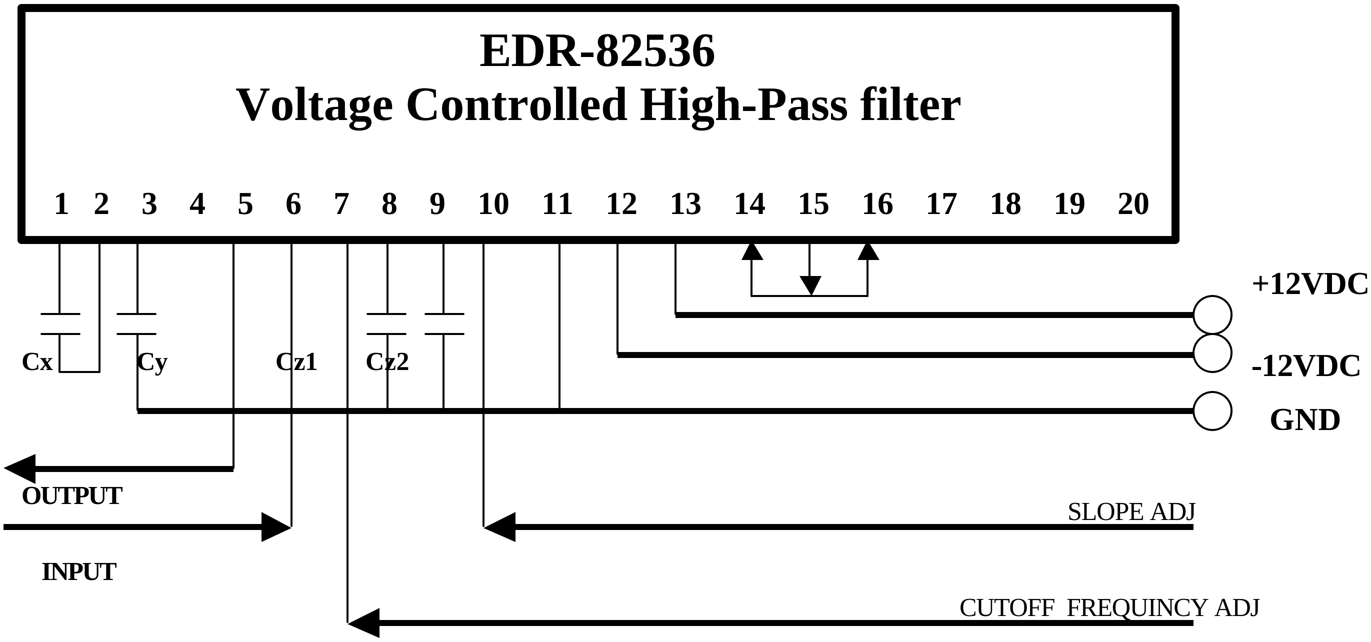
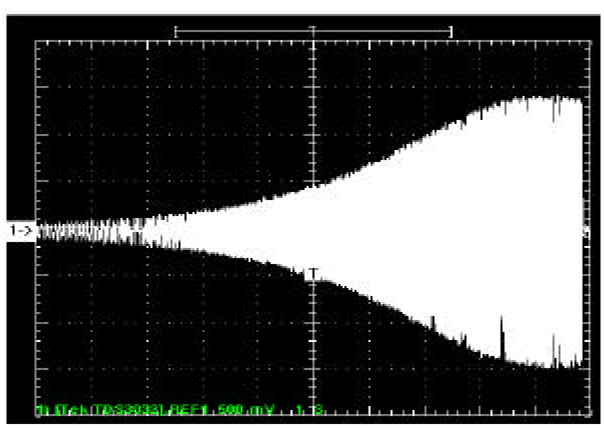


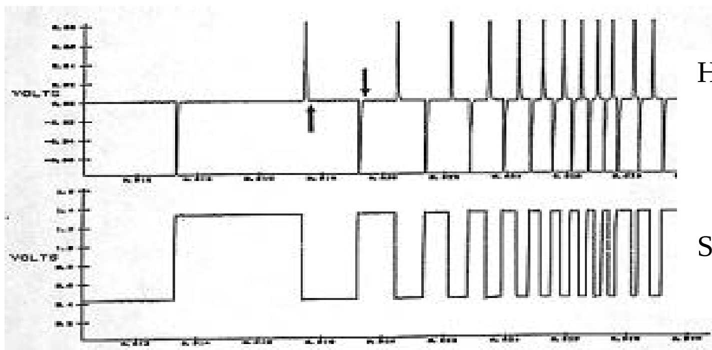
Figure 3. A module configured as a Voltage-Controlled Ripple-free, High-Pass filter

Only four capacitors are required to build a high-pass filter to fit your application. Capacitors Cx and Cy should be selected to construct a low-pass VCVS second-order Butterworth filter. Internal resistors have the following values R1=2K, R2=12K, R3=15K and R4=135K. Capacitors Cz1 and Cz2 are setting the high frequency cutoff. Control voltages applied onto Pin 7 and Pin 10 adjust the cutoff frequency and the slope respectfully.

Figure 4
This is a typical frequency response curve for a high pass filter and has a slope of 20DB per decade and a maximum cutoff frequency of 300Hz



A module, configured as a High-Pass filter exhibits the property of an ideal differentiator. Figure 4 shows the test performed with a square-wave signal applied to the input resulting in no ripples at the output.



High Pass Filter Square Wave Response

Square Wave Input Signal

Figure 5. Square Wave Response of High Pass Filter *

Notice there is no ripple characteristics in the square wave response which is otherwise typical for a conventional High Pass Filter.

Application of the EDR-82536 as a Voltage-Controlled Low-Pass filter

In many process control type applications it is necessary to change the cut-off frequency. The module requires only two external capacitors (Cz1 and Cz2) to build a voltage controllable filter.

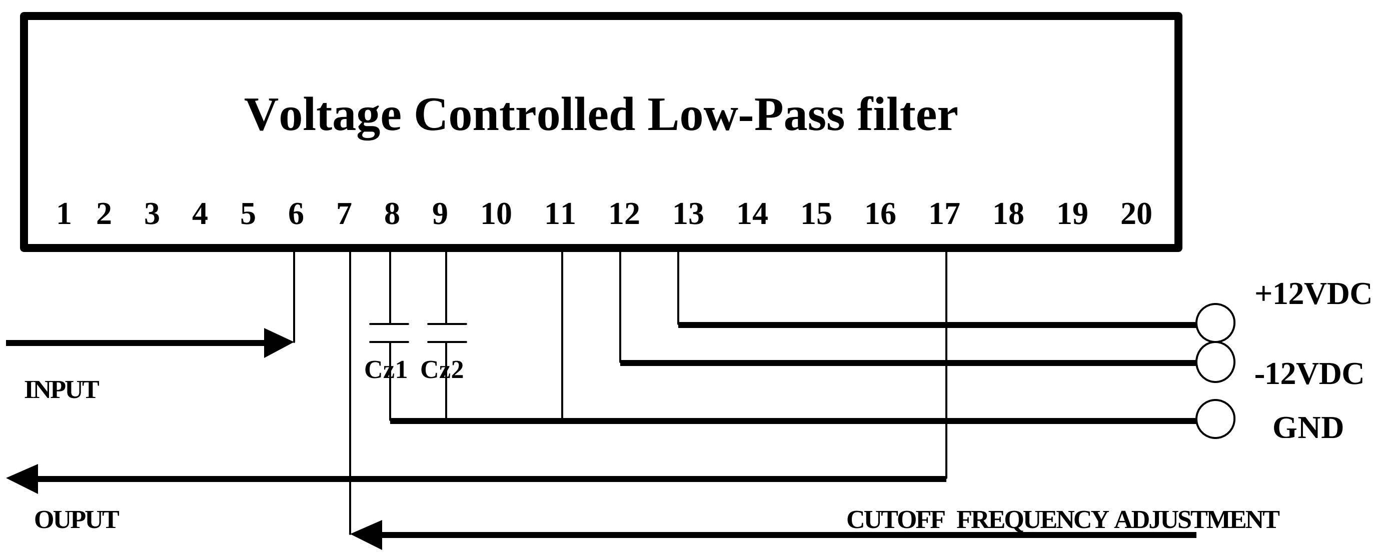


Figure 6. The module configured as a Voltage Controlled Low-Pass Filter

A low-pass filter behaves like an ideal integrator as can be seen in Figure 7.

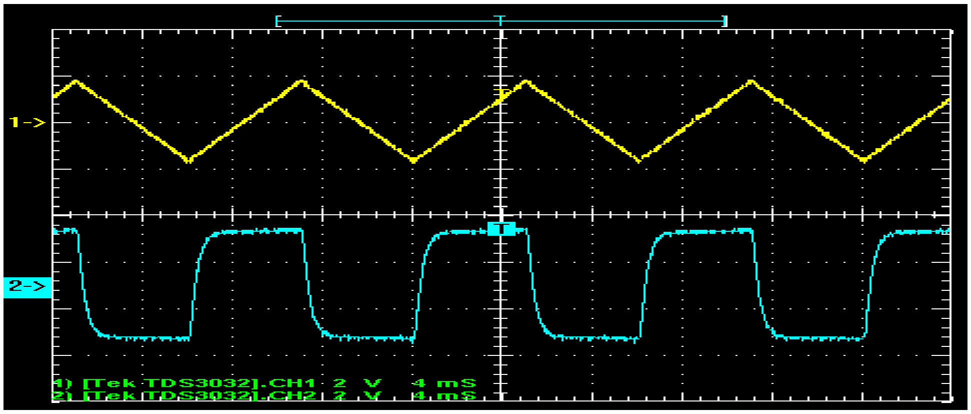
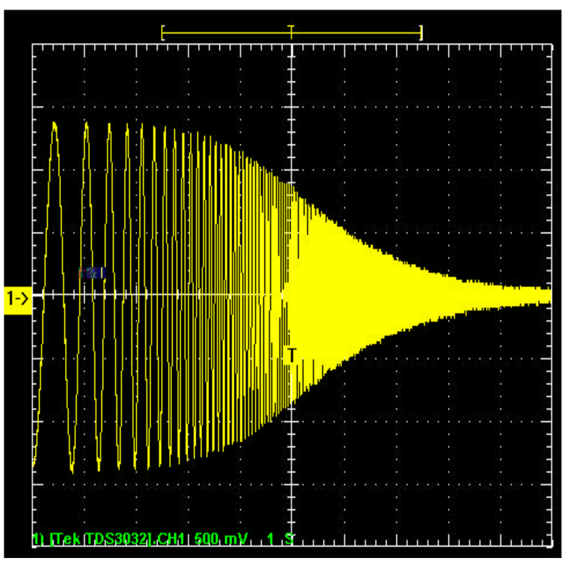


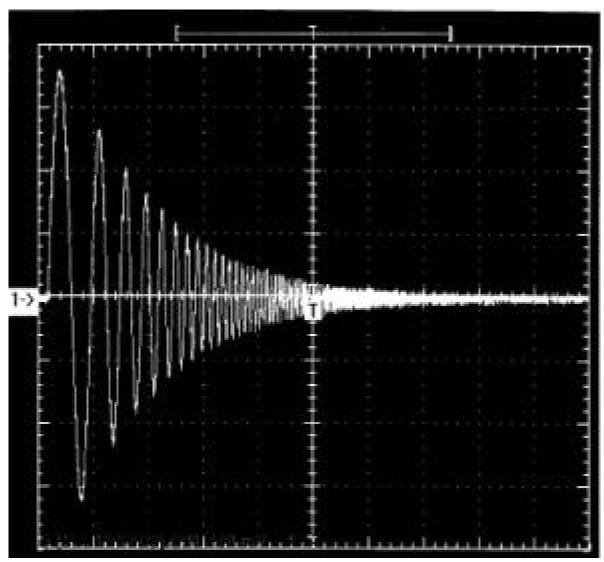
Figure 7
Response of a low-pass filter on a triangle-waveform signal

Figures 8 and 9 shows two typical frequency response curves for the Low Pass Filter. The input signal has a frequency range from DC to 600 Hz using a Cz1 = .1 uF and Cz2 = 2 uF,and control voltages applied to Pin 7 with values of Vcv=+10 VDC and Vcv= -9 VDC respectfully.



DC 600Hz

Figure 8



DC 600Hz

Figure 9

The above Figures show the effect of changing the control voltage. Figure 8 has a 3dB cutoff frequency of 19Hz and Figure 9 has a 3dB cutoff frequency of 2Hz.