EVB2130

SSI2130 EVALUATION BOARD USER GUIDE

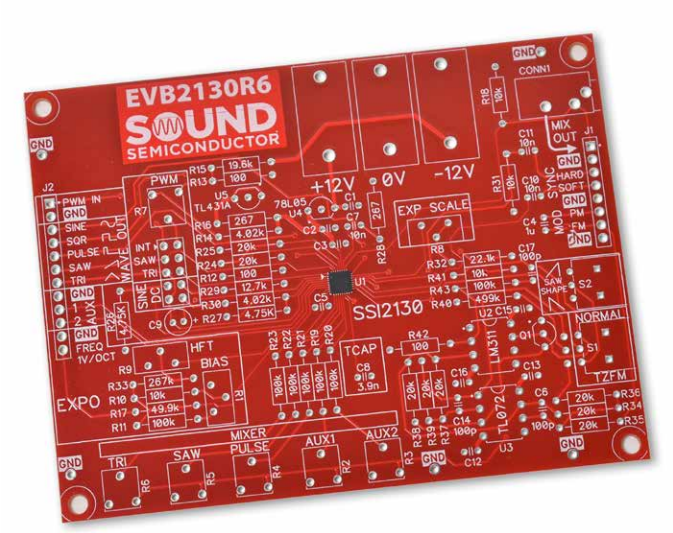
Support Products

EVB2130R6

The SSI2130 offers unprecedented performance and features, but its ultra-compact QFN package can present prototyping challenges. The EVB2130 eases evaluation by providing a PCB that allows comprehensive exploration of capabilities. Two versions are available: the EVB2130-B blank board with only a SSI2130 attached, and the EVB2130-P which is fully populated and ready for the bench. With exception of the SSI2130, all components are through-hole for easy construction and experimentation.

A on-board +5V regulator and 2.5V reference simplify external power connections, and pots are provided for mixer control, PWM, and VCO setup. Switches ease selection of saw ramp direction plus Through-Zero and Pulse Modulation.

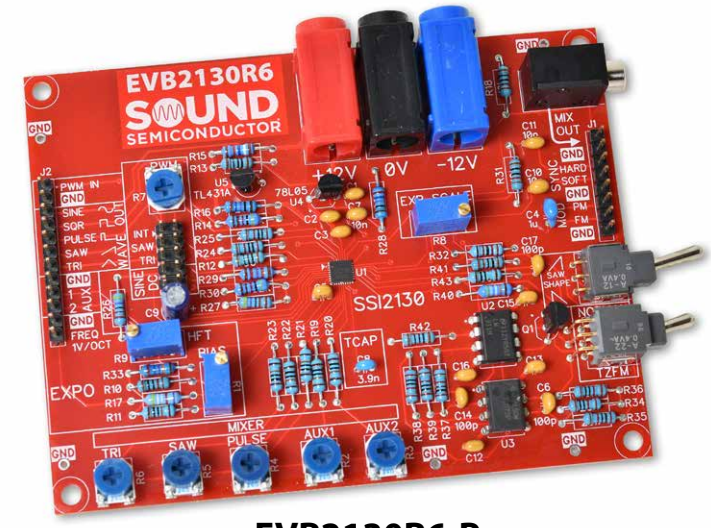
The schematic, bill of materials, and a user guide follow; refer to the SSI2130 data sheet for detailed information on use of the IC.



EVB2130R6-B

SPECIFICATIONS

- **PCB size: 108 x 82mm**
- **External Power: ±12V**
- **Inputs:** Expo Freq 1V/Oct
  PWM In
  Aux 1 and 2 In
  FM In
  PM In
  Hard Sync
  Soft Sync
- **Outputs:** Sine
  Saw
  Triangle
  Pulse
  Square
  Mix Out



EVB2130R6-P

The EVB2130 is available exclusively from Sound Semiconductor and its authorized resellers

PO Box 222, Standard, CA 95373 USA Phone 209-536-0492, www.soundsemiconductor.com

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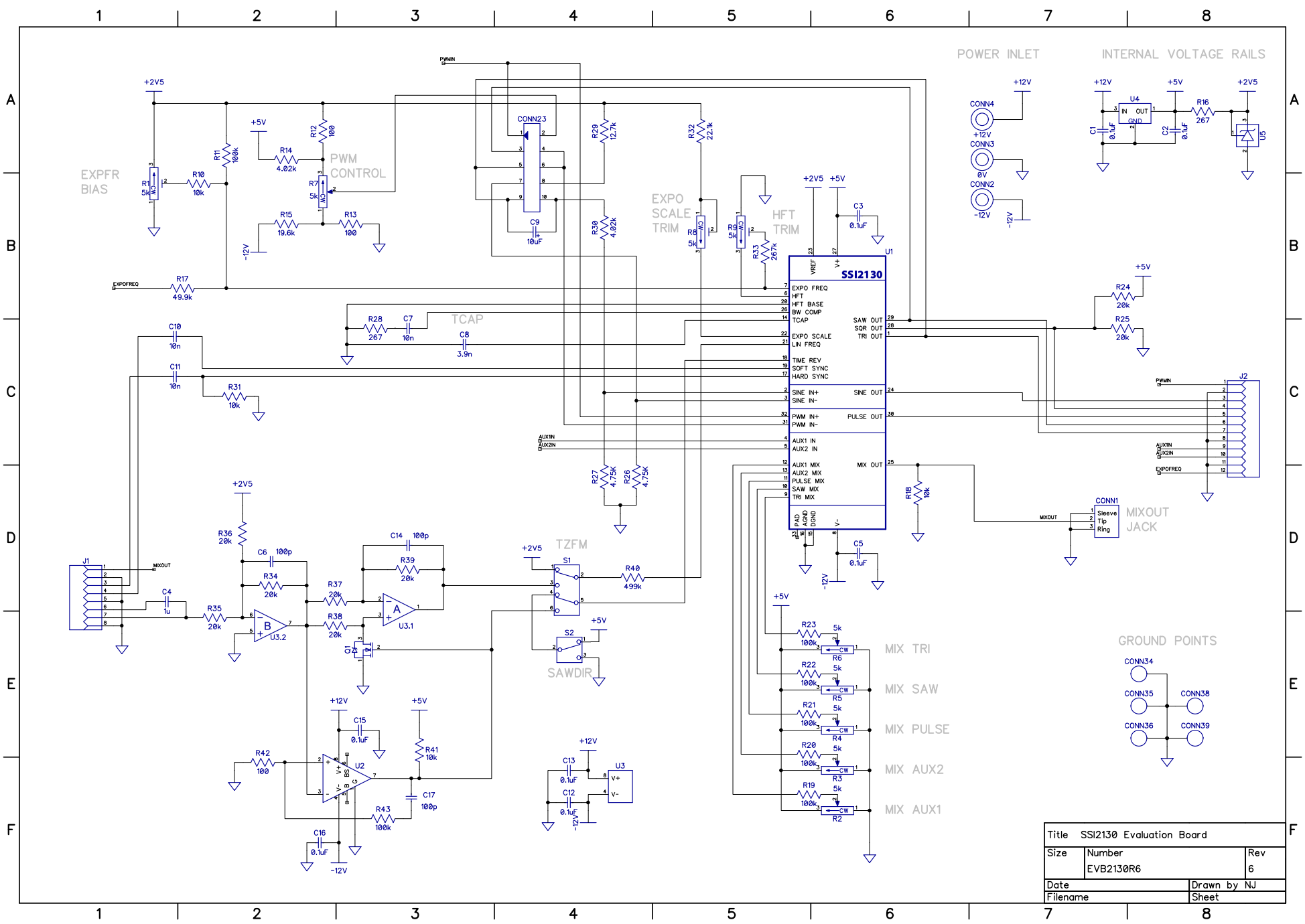

POWER INLET
INTERNAL VOLTAGE RAILS
EXPFR BIAS
PWM CONTROL
EXPO SCALE TRIM
HFT TRIM
TCAP
TZFM
SAWDIR
MIXOUT JACK
GROUND POINTS
MIX TRI
MIX SAW
MIX PULSE
MIX AUX2
MIX AUX1
SSI2130
EXPO FREQ
HFT
HFT BASE
BW COMP
TCAP
EXPO SCALE
LIN FREQ
TIME REV
SOFT SYNC
HARD SYNC
SINE IN+
SINE IN-
PWM IN+
PWM IN-
AUX1 IN
AUX2 IN
AUX1 MIX
AUX2 MIX
PULSE MIX
SAW MIX
TRI MIX
VREF
V+
SAW OUT
SQR OUT
TRI OUT
SINE OUT
PULSE OUT
MIX OUT
PWMIN
AUX1IN
AUX2IN
EXPOFREQ
MIXOUT
Title SSI2130 Evaluation Board
Size
Number EVB2130R6
Rev 6
Date
Drawn by NJ
Filename
Sheet

BILL OF MATERIALS

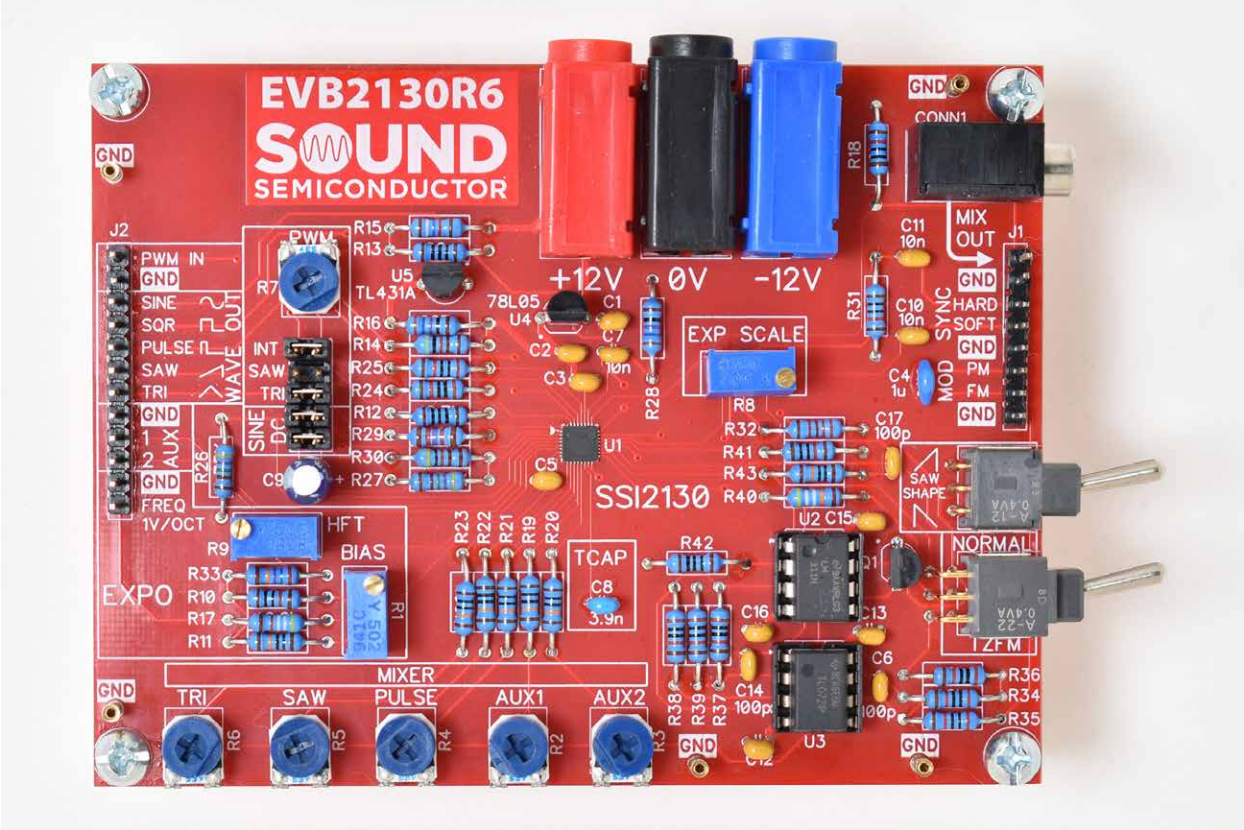
Type	Reference	Value	Digikey P/N	Note
Resistors	R1	5k	490-2926-ND	Bourns Trim Pot PV36Y
	R2	5k	3306F-502-ND	Bourns Trim Pot 3306
	R3	5k	3306F-502-ND	Bourns Trim Pot 3306
	R4	5k	3306F-502-ND	Bourns Trim Pot 3306
	R5	5k	3306F-502-ND	Bourns Trim Pot 3306
	R6	5k	3306F-502-ND	Bourns Trim Pot 3306
	R7	5k	3306F-502-ND	Bourns Trim Pot 3306
	R8	5k	490-2926-ND	Bourns Trim Pot PV36Y
	R9	5k	490-2926-ND	Bourns Trim Pot PV36Y
	R10	10k	10.0KXBK-ND	
	R11	100k	100KXBK-ND	
	R12	100	100XBK-ND	
	R13	100	100XBK-ND	
	R14	4.02k	4.02KXBK-ND	
	R15	19.6k	19.6KXBK-ND	
	R16	267	267XBK-ND	
	R17	49.9k	49.9KXBK-ND	
	R18	10k	10.0KXBK-ND	
	R19	100k	100KXBK-ND	
	R20	100k	100KXBK-ND	
	R21	100k	100KXBK-ND	
	R22	100k	100KXBK-ND	
	R23	100k	100KXBK-ND	
	R24	20k	20.0KXBK-ND	
	R25	20k	20.0KXBK-ND	
	R26	4.75k	4.75KXBK-ND	
	R27	4.75k	4.75KXBK-ND	
	R28	267	267XBK-ND	
	R29	12.7k	12.7KXBK-ND	
	R30	4.02k	4.02KXBK-ND	
	R31	10k	10.0KXBK-ND	
	R32	22.1k	22.1KXBK-ND	
	R33	267k	267KXBK-ND	
	R34	20k	20.0KXBK-ND	
	R35	20k	20.0KXBK-ND	
	R36	20k	20.0KXBK-ND	
	R37	20k	20.0KXBK-ND	
	R38	20k	20.0KXBK-ND	
	R39	20k	20.0KXBK-ND	
	R40	499k	499KXBK-ND	
	R41	10k	10.0KXBK-ND	
	R42	100	100XBK-ND	
	R43	100k	100KXBK-ND	

Type	Reference	Value	Digikey P/N	Note
Capacitors	C1	0.1µF	BC3324-ND	
	C2	0.1µF	BC3324-ND	
	C3	0.1µF	BC3324-ND	
	C4	1µF	445-173257-1-ND	
	C5	0.1µF	BC3324-ND	
	C6	100pF	BC5129-ND	
	C7	10nF	BC5134-ND	
	C8	3.9nF	490-9019-1-ND	TCAP
	C9	10µF	399-6598-ND	Electrolytic
	C10	10nF	BC5134-ND	
	C11	10nF	BC5134-ND	
	C12	0.1µF	BC3324-ND	
	C13	0.1µF	BC3324-ND	
	C14	100pF	BC5129-ND	
	C15	0.1µF	BC3324-ND	
	C16	0.1µF	BC3324-ND	
	C17	100pF	BC5129-ND	
Switches	S1		360-2702-ND	NKK A22AH (DPDT)
	S2		360-2975-ND	NKK A12AH (SPDT)
Connectors	CONN1		CP1-3533N-ND	1/8” Audio Jack
	CONN2	–12V		**Newark** – Multicomp 80P3614 (blue)
	CONN3	0V		**Newark** – Multicomp 80P3613 (black)
	CONN4	+12V		**Newark** – Multicomp 80P3616 (red)
	CONN23		609-3212-ND	2 x 5 Header
			S9337-ND	Shunts for 2 x 5 Header
	CONN34 –CONN39		ED90074-ND	Mill-Max Pin Recepticle **(optional)**
	J1		2057-PH1-12-UA-ND	1 x 8 Header
	J2		2057-PH1-08-UA-ND	1 x 12 Header
			3M541-ND6	8L DIP Socket **(optional)**
Transistor	Q1		2N7000TACT-ND	
IC’s	U1		SSI2130	
	U2		LM311NNS/NOPB-ND	LM311N
	U3		296-14997-5-ND	TL072IP
	U4		497-15783-1-ND	L78L05ABZ-AP
	U5		TL431ACLPRAGOSCT-ND	TL432ACLPRA
Misc.	EVB2130R5			PCB
	Standoffs			1” Nylon, Threaded **(optional)**
	Screws			6/32” - 40 (4) **(optional)**

USER NOTES

INTRODUCTION

Welcome to the SSI2130 Evaluation Board User Guide! This short document will get you started with this evaluation board designed to harness the awesome capabilities of the SSI2130 Voltage-Controlled Oscillator.



SETTING UP

Power Supplies

The EVB2130 needs very little additional support to get it going. With an onboard regulator and reference, the only power needed is a dual (bipolar) ±12V bench power supply. +12V goes into the red (left) banana socket, GND/COM/0V goes to the black (middle) socket, and -12V goes to the blue (right) socket.

Signal Connections

All connections to the EVB2130 are brought out to the sides of the board. Ground terminals are positioned around the board as well as within headers for convenience. Almost all of the signal connections to the EVB2130 are suitable for oscilloscope probes or small crocodile clips. Header strips allow easy connection to other circuit boards or test leads.

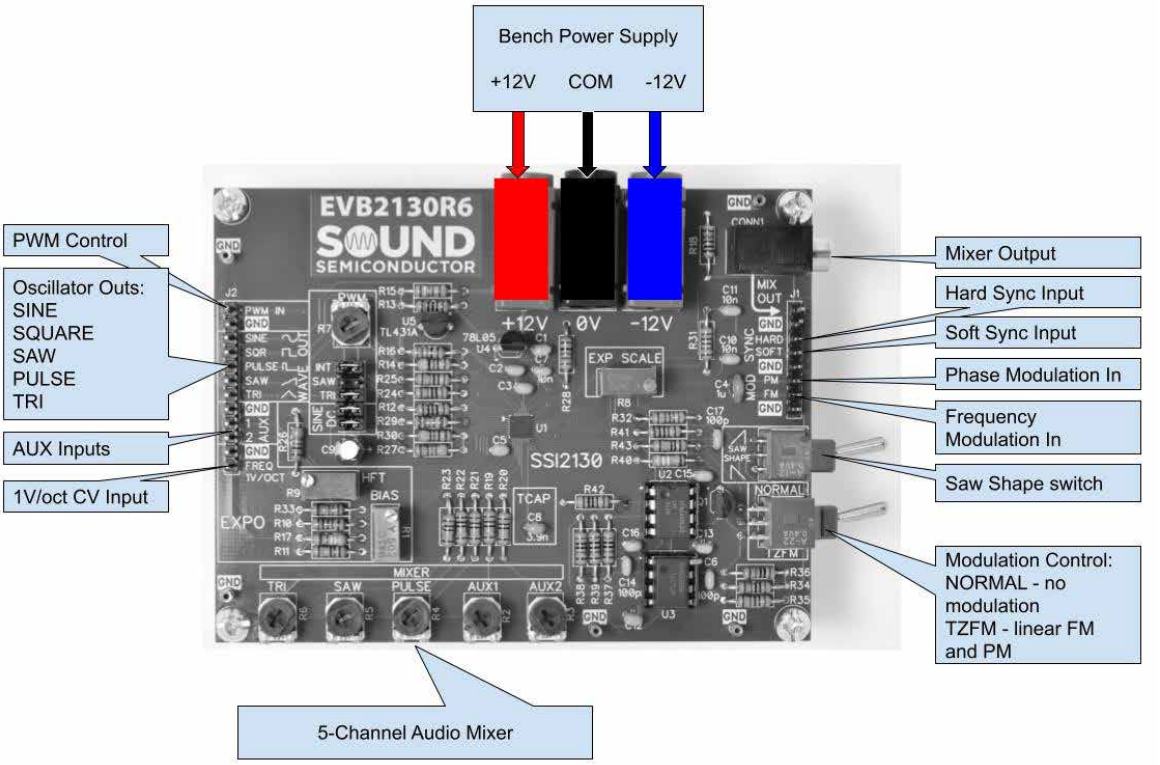
Initial Jumper "Shunt" Setup *(see photo above)*

INT Fitted; connects the on-board PWM control R7 to the PWM input

SAW Not connected

TRI Fitted; PWM is generated by the triangle wafeform

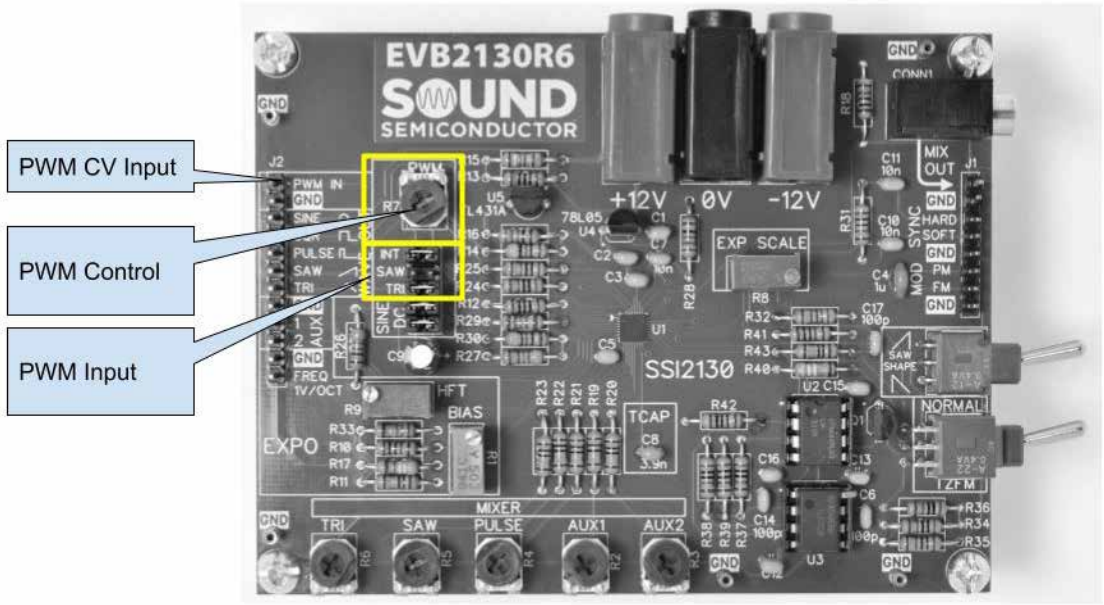
SINE DC Both fitted; sine converter is DC-coupled for best low-frequency performance



PWM

The EVB2130 supports both on-board PWM control as well as an external PWM Control Voltage. The PWM control can be set using pot R7 with the INT header fitted, or an external control voltage can be applied with the INT header removed.

The SSI2130 supports two modes of PWM operation based on whether the PWM block is driven by SAW or TRI waveform.



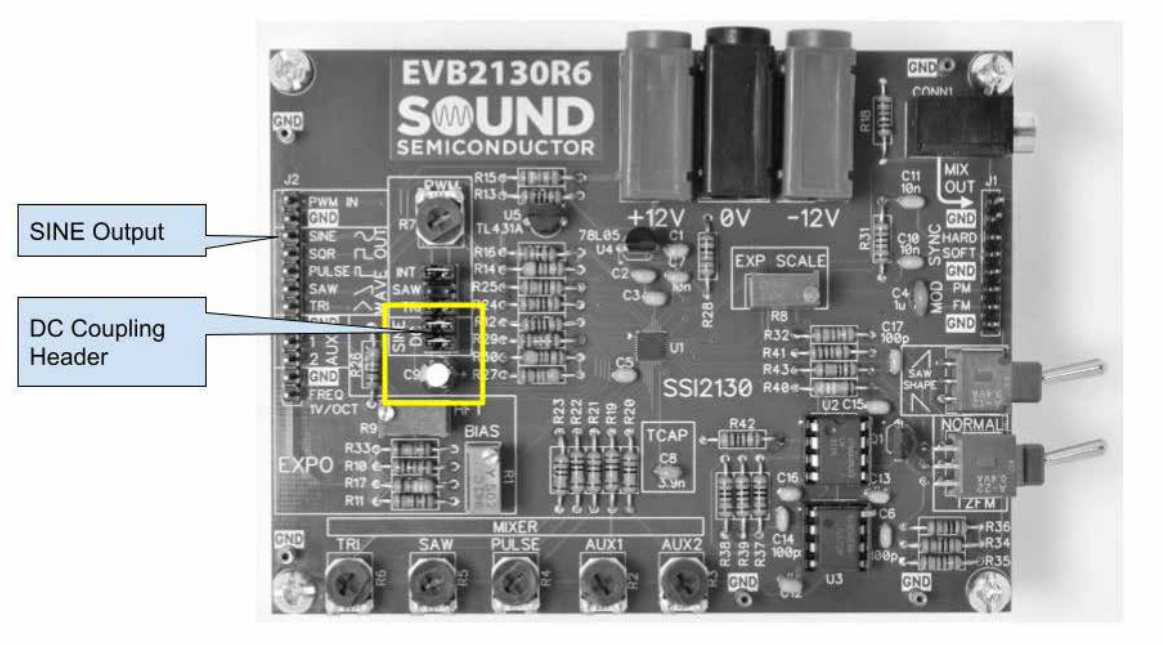
When driven by the SAW wave the PWM output falling edge corresponds to the falling edge of the SAW. The rising edge occurs at a point determined by the PWM reference (internal or external). If the modulation signal varies at audio rates the effect is to introduce a subtle frequency modulation of the VCO output.

When driven by the TRI wave both PWM edges change position with changes in the modulation signal. This is called "Phase Correct PWM" and retains the correct frequency of the VCO.

SINE SHAPER

The SSI2130 includes a low-distortion and temperature-compensated sine wave shaping circuit. On the EVB2130 it is driven by the triangle wave output.

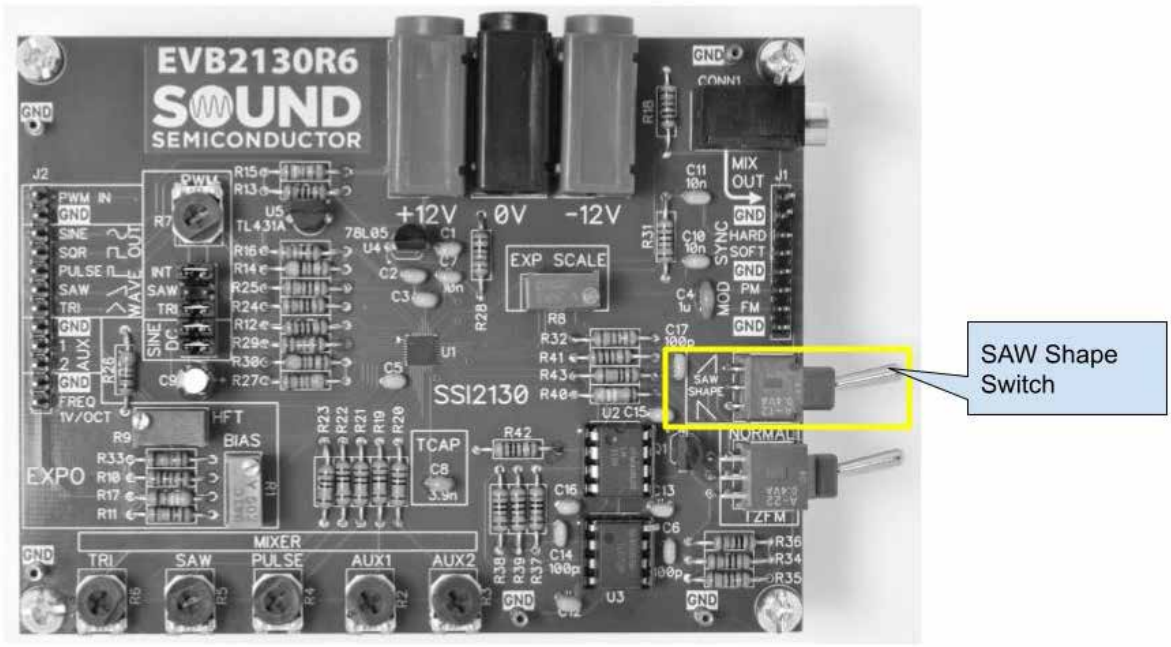
The sine shaper can be driven in two ways: AC-coupled and DC-coupled. The EVB2130 can be configured in both ways. To AC-couple, remove both of the headers in the SINE section. For DC-coupling, insert both headers: one removes the DC-blocking capacitor, the other adds a DC bias to correct for the bias in the TRI output.



SAW SHAPE

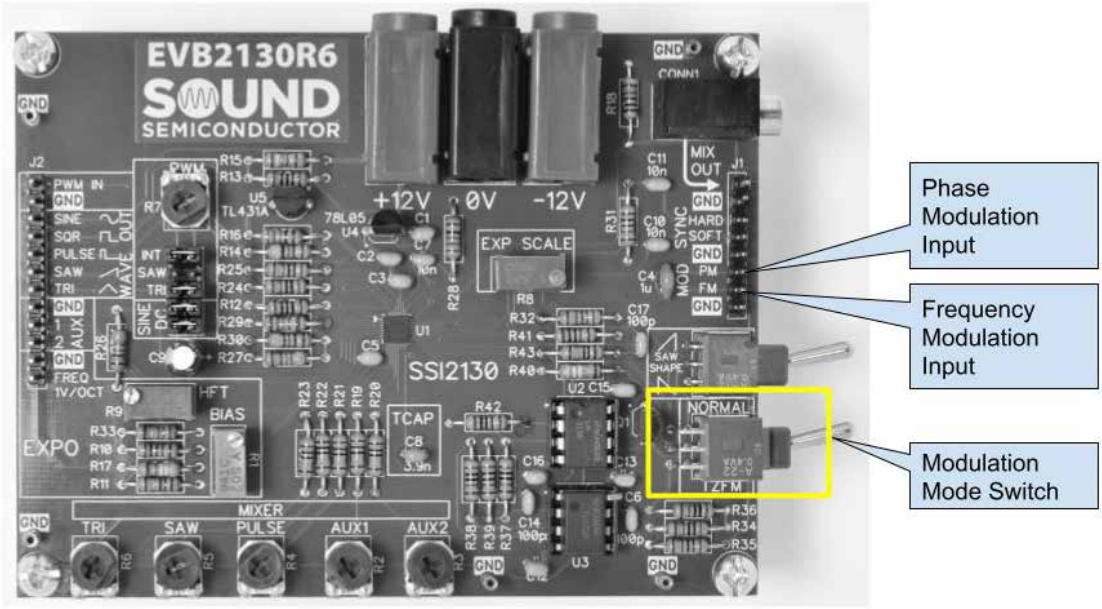
The SSI2130 supports both rising and falling sawtooth waves when in non-TZFM mode.

With the switch in the upper position the SAW output produces a rising slope, and with the switch in the lower position the SAW output produces a falling slope. Note that in TZFM mode (see below) the SAW SHAPE switch is not used.



TZFM MODULATION

The SSI2130 is easily set to operate as a Through-Zero Frequency Modulated Voltage-Controlled Oscillator.



Put the mode switch into the TZFM position. Without any modulation signal the result is unchanged. However, with a modulation signal things get interesting.

The FM pin allows introduction of a DC-coupled modulating signal into the VCO. This is added to the normal expo current so that it keeps the original center frequency. As the modulation signal increases, frequency of the VCO also increases. As the modulation signal falls so too does the VCO frequency.

Once the VCO frequency falls to DC (zero frequency) it continues through zero to produce negative frequencies, giving the name "Through-Zero FM." What this really means is that the oscillator reverses direction: if the triangle was previously going up, it now goes down, and so on.

The result is the classic "FM" sound: rich, complex waveforms that can be used to produce a wide range of timbres, from piano and organ, to brass and more experimental sci-fi sounds.

The PM pin operates in a slightly different way to the FM pin. Although it appears to vary VCO frequency, note this pin is AC-coupled which produces PHASE modulation (the CZ series of synthesizers from a certain Japanese calculator company used this to great effect). This is a subtle distinction but brings a different sonic palette to the SSI2130's capabilities. Try feeding in a 10Hz square wave into the FM and PM pins to hear the difference.

EXPO CONVERSION

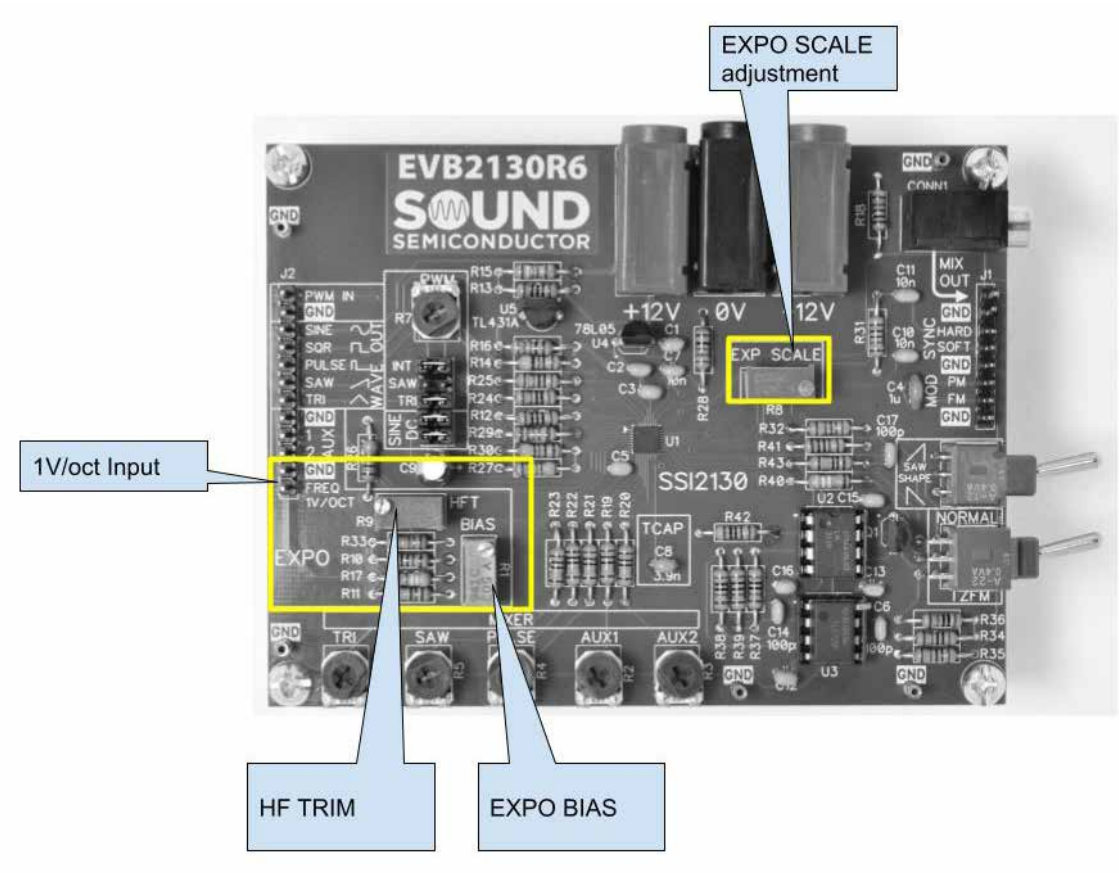
The SSI2130 has a fully temperature-compensated exponential converter, necessary for musical oscillators to track in volts-per-octave.

The following diagram shows all the accessible components of the exponential converter. The FREQ pin is where the external (e.g., keyboard) control voltage is connected. EXP SCALE sets sensitivity of the VCO (typically +1V/octave). The HFT provides compensation at the upper end of the control voltage range. Finally, the BIAS trimmer sets the VCO's operating frequency for 0V control voltage input. Once tuned all you need to do is to connect a +1V/octave control voltage to the FREQ pin.

For setting this all up see "Tuning Process" in the SSI2130 data sheet.

MIXER

The SSI2130's internal 5-channel mixer brings together the three main waveforms (triangle, sawtooth and pulse/PWM) together with two additional auxiliary inputs (AUX1 and AUX2).



For example, one of the auxiliary inputs could be connected to the sine wave shaper output. The output of the mixer is on the MIX OUT pin. A 3.5mm mono audio jack is also provided for easy connection to a mixer or Eurorack modular synthesizer.