ALM OFS

OEVICE ROT PECONINIEN

- High Quality 20-bit Audio Processing
- High Power/High Gain Capability
- SOUNDFIT Fitting Software
- Configurable Low Battery Indicator
- Eight Biquadratic Filters
- 16 kHz or 8 kHz Bandwidth
- Four Fully Configurable Memories with Audible Memory Change Indicator
- 96 dB Input Dynamic Range with Headroom Extension
- 128-bit Fingerprint Security System and Other Security Features to Protect against Device Cloning and Software Piracy
- High Fidelity Audio CODEC
- Soft Acoustic Fade between Memory Changes
- Drives Zero-Bias Two-Terminal Receivers
- E1 RoHS-compliant Hybrid
- Hybrid Typical Dimensions: 0.220 x 0.125 x 0.060 in (5.59 x 3.18 x 1.52 mm)

### **BLOCK DIAGRAM**

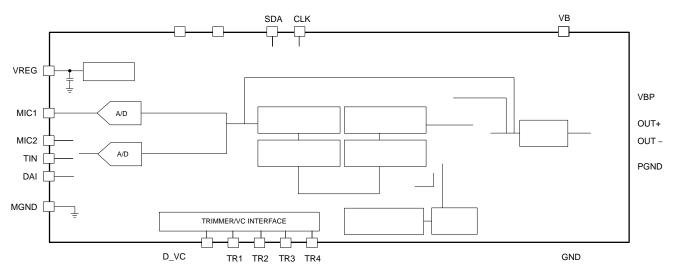
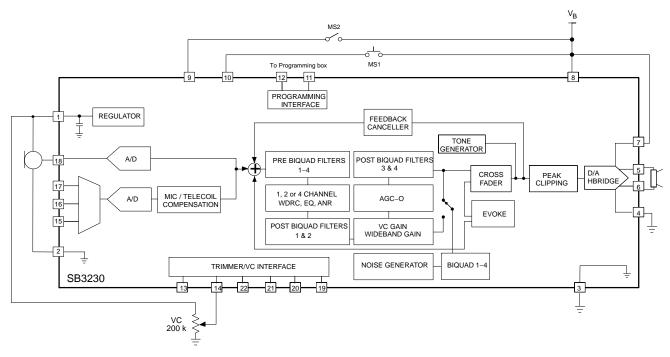


Figure 1. Hybrid Block Diagram

**SPECIFICATIONS** 

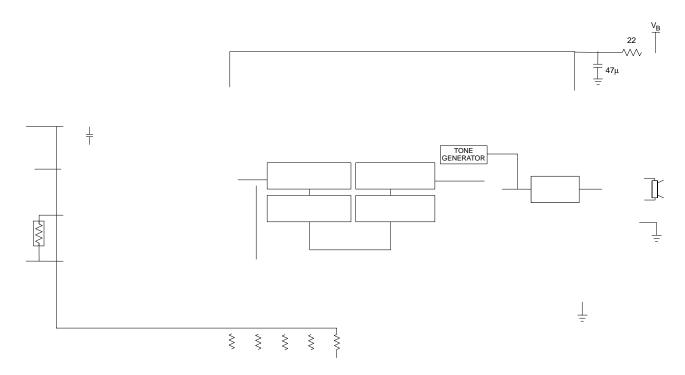
Table 3. I <sup>2</sup> C TIMING		

## **TYPICAL APPLICATIONS (continued)**



Note: All resistors in ohms and all capacitors in farads, unless otherwise stated.

Figure 3. Typical Programmable Application Circuit



Note: All resistors in ohms and all capacitors in farads, unless otherwise stated.

**Figure 4. Typical Trimmer Application Circuit** 

## **SB3230 OVERVIEW**

SB3230 is a DSP system implemented on ON Semiconductor's Wolverine hardware platform. Wolverine is the hearing industry's first 90 nm Silicon-on-Chip platform enabling design of highly-

 The compression region of the I/O curve pivots about the lower threshold. Low-level gain remains constant as the compression ratio trimmer is adjusted.

The squelch region within each channel implements a low level noise reduction scheme (1:3 expansion) for listener comfort. This scheme operates in quiet listening environments (programmable threshold) to reduce the gain at very low levels.

#### **Automatic Telecoil**

The automatic telecoil feature in SB3230 is to be used with memory D programmed with the telecoil or MIC + TCOIL front end configuration. The feature enables the part to transition to memory D upon the closing of a switch connected to MS2. With the feature enabled and a reed switch connected to MS2, the static magnetic field of a telephone handset will close the switch whenever the handset is brought close to the device, causing the hybrid to change to memory D. The part will transition back to the initial memory once the switch is deemed opened after proper debouncing.

A debounce algorithm with a programmable debounce period is used to prevent needless switching in and out of memory D due to physical switch bounces when MS2 is configured for automatic telecoil. Upon detecting a close to open switch transition, the debounce algorithm monitors the switch status. The debounce algorithm switches the device out of memory D only once the switch signal has been continuously sampled open over the specified debounce period.

### **Adaptive Feedback Canceller**

The Adaptive Feedback Canceller (AFC) reduces acoustic feedback by forming an estimate of the hearing aid feedback signal and then subtracting this estimate from the hearing aid input. The forward path of the hearing aid is not affected. Unlike adaptive notch filter approaches, SB3230's AFC does not reduce the hearing aid's gain. The AFC is

Based on this approach, only enough attenuation is applied to bring the energy in each 'noisy' band to just below the masking threshold. This prevents excessive amounts of attenuation from being applied and thereby reduces unwanted artifacts and audio distortion. The Noise Reduction algorithm efficiently removes a wide variety of types of noise, while retaining natural speech quality and level. The level of noise reduction (aggressiveness) is configurable to 3, 6, 9 and 12 dB of reduction.

### **Volume Control, Trimmers and Switches**

#### **External Volume Control**

The volume of the device can either be set statically via software or controlled externally via a physical interface.

SB3230 supports both analog and digital volume control functionality, although only one can be enabled at a time. Digital control is supported with either a momentary switch or a rocker switch. In the latter case, the rocker switch can also be used to control memory selects.

### **Analog Volume Control**

Both the external (analog) volume control and trimmers work with a three–terminal 100 k $\Omega$  – 360 k $\Omega$  variable resistor. The volume control can have either a log or linear taper, which is selectable via software. It is possible to use a VC with up to 1 M $\Omega$  of resistance, but this could result in a slight decrease in the resolution of the taper.

### **Trimmers**

The trimmer interface provides the ability to control up to 19 hearing aid parameters through up to four trimmers. A single trimmer parameter can have up to 16 values and a single trimmer can control multiple parameters (e.g., Trimmer 1 can control compression ratio in all four channels simultaneously). The trimmer must be three–terminal 100 k $\Omega$  to 360 k $\Omega$  variable resistors and have a linear taper.

Parameters that can be assigned to trimmers include Noise Reduction, Low Cut, High Cut, Compression Ratio, Wideband Gain, Tinnitus Noise Level, Crossover Frequency, Lower Threshold, Upper Threshold, EQ Gain, Squelch Threshold, High Level Gain, Low Level Gain,

Case 1. Pull-up/Pull-down Resistors set to Pull-down If the static switch on MS2 is LOW, the part starts in	

switch closures indicates a program retreat to the next *lower* numbered memory. In this mode, volume control is only available through software control.

In Mixed Mode, operation of the switch as a volume control or memory select is governed by the time duration of the switch closure: either short or long. The discrimination of short and long pulses is set by a programmable, time—threshold value, from 1 s to 5 s in 1 s increments. An additional programmable parameter determines whether the short pulses refer to volume—control operation or memory—select operation.

If long pulses control memory select operation, the memory change is initiated once the switch is held for the long pulse period without requiring the switch to be released. In Digital VC mode or Momentary Memory Select mode, the action takes place after the switch is released.

AGC-O

fade-out transition time. The duration of an Acoustic Indicator is configurable, with a maximum value of 6.35 seconds.

EVOKE Acoustic Indicators can be programmed as output referred or input referred (prior to the filter bank).

## **Power Management**

SB3230 has three user-selectable power management schemes

## **PAD LOCATIONS**

## **Table 8. PAD POSITION AND DIMENSIONS**

	Pad Position	Pad DimensionsP a	d
Pad No			

**Table 8. PAD POSITION AND DIMENSIONS** 

Pad No.	Х	Υ	Xdim (mm)	Ydim (mm)
1	0	0	0.508	0.838
2	-0.686	0	0.508	0.838
3	-1.372	-0.127	0.508	0.584
4	-2.057	-0.127	0.508	0.584
5	-2.743	-0.127	0.508	0.584
6	-3.429	-0.127	0.508	0.584
7	-4.115	-0.127	0.508	0.584
8	-4.801	0	0.508	0.838
9	-4.801	1.067	0.508	0.584
10	-4.801	2.159	0.508	0.584
11	-4.115	2.159	0.508	0.584
12	-3.429	2.159	0.508	0.584
13	-2.743	2.159	0.508	0.584
14	-2.057	2.159	0.508	0.584
15	-1.372	2.159	0.508	0.584
16	-0.686	2.159	0.508	0.584
17	0	2.159	0.508	0.584
18	0	1.067	0.508	0.584
19	-0.686	1.067	0.508	0.584
20	-1.372	1.067	0.508	0.584
21	-2.057	1.067	0.508	0.584
22	-2.743	1.067	0.508	0.584
23	-3.429	1.067	0.508	0.584
24	-4.115	0.673	0.457	0.305
25	-4.115	1.359	0.457	0.305

SCALE 2:1 DATE 21 JUL 2020

ARITY A

