

Description

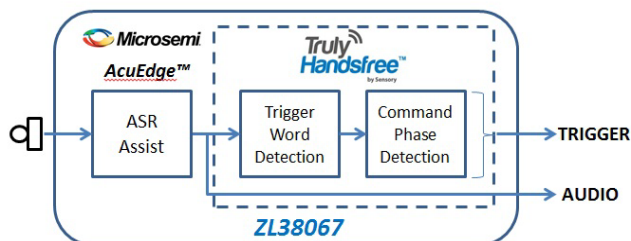
The ZL38067 is part of Microsemi's Timberwolf audio processor family of products that combines the company's innovative *AcuEdge™* acoustic technology with Sensory's Truly Handsfree™ Voice Control. Microsemi ZL38067 improves Automatic Speech Recognition (ASR) performance at extended distances with barge-in capability and optimize for detecting voice commands.

The Microsemi *AcuEdge* Technology ZL38067 device is ideal for Connected Home applications. The device is capable of both voice control and 2-way full duplex audio with voice enhancements such as Acoustic Echo Cancellation (AEC), Noise Reduction (NR) to improve both the intelligibility and subjective quality of voice in harsh acoustic environments.

Microsemi offers additional tools to speed up the product development cycle. The MiTuner™ ZLS38508 or ZLS38508LITE GUI software packages allow a user to interactively configure the ZL38067 device. The optional ZLE38470BADA Automatic Tuning Kit provides automatic tuning and easy control for manual fine tuning adjustments.

Applications

- Integrated smart home gateways
- Connected home devices:
 - Thermostats
 - Smart Speakers
 - Security Systems
 - Digital Assistants
 - Alarm Clock/Radio Units



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Ordering Information

Device OPN	Package	Packing
ZL38067LDF1	64-pin QFN (9x9)	Tape & Reel
ZL38067LDG1	64-pin QFN (9x9)	Tray
ZL38067UGB2	56-ball WLCSP (3.1x3.1)	Tape & Reel

These packages meet RoHS 2 Directive 2011/65/EU of the European Council to minimize the environmental impact of electrical equipment.

Microsemi *AcuEdge* Technology ZLS38067 Firmware

There are three Firmware images that may be selected to provide the desired operating mode. Firmware images can be swapped during normal operation to switch modes dynamically. Firmware image size varies with firmware load.

ZLS38067.1 (Stand-alone ASR)

- Detection of a fixed trigger in 'spotting' mode (ability to detect trigger even in continuous speech).
- Detection of up to 20 command phrases after the trigger detection.
- Generation of a wake-on-trigger signal to wake up another device to enable full-duplex voice communication.

ZLS38067.2 (ASR with Barge-In)

- All of the features of the ZLS38067.1 for a trigger and up to 10 command phrases, PLUS:
- Support for Barge-in, or incoming trigger 'spotting' in the presence of DAC audio output
- Enhanced far field support for distances up to 16 feet from the microphone.
- Command framing triggers to assist with cloud-ASR streaming.

ZLS38067.0 (Full Duplex Communication)

- Full Narrowband and Wideband Acoustic Echo cancellation operation
 - Supports long tail AEC (up to 256 ms)
 - Non-Linear AEC provides higher tolerance for speaker distortions
 - Non-Linear processor
- G.168 Line Echo Canceller
- Howling detection/cancellation

- Prevents oscillation in AEC audio path
- Advanced noise reduction reduces background noise from the near-end speech signal using Psychoacoustic techniques
- Provisions for stereo audio mixing (sample rate of 44.1 or 48 kHz) and stereo music record and playback (sample rate of 48 kHz) with 8 kHz or 16 kHz voice processing
- Various encoding/decoding options:
 - 16-bit linear, G.722, G.711 A/μlaw
- Send and receive path equalizers
- Caller ID Type 1 & 2
- Programmable tone generation
- DTMF detection
- Dual $\Delta\Sigma$ 16-bit digital-to-analog converters (DAC)
 - Sampling up to 48 kHz and internal output drivers
 - Headphone amps capable of 4 single-ended or 2 differential outputs
 - 32 mW output drive power into 16 ohms
 - Impulse pop/click protection
- 1 Digital Microphone input supporting 1 or 2 Microphones
- 2 TDM ports shared between PCM and Inter-IC Sound (I²S)
 - Each port can be a clock master or a slave
 - Each port supports delayed and non-delayed (GCI) timing and I²S normal and left justified modes
 - Each port provides sample rate conversion and synchronous TDM bus operation

ZLS38067 Hardware Features

- DSP with Voice Hardware Accelerators
- SPI or I²C Slave port for host processor interface
- General purpose UART port for debug
- Master SPI port for serial Flash interface
- Boots from SPI or Flash
 - Flash firmware can be updated from SPI Slave
- 14 General Purpose Input/Output (GPIO) pins (11 with the 56 pin WLCSP)
- 2 low power modes controlled by reset

The *MiTuner*™ Automatic Tuning Kit and ZLS38508 MiTuner GUI

Microsemi's Automatic Tuning Kit option includes:

- Audio Interface Box hardware
- Microphone and Speaker
- ZLS38508 *MiTuner* GUI software
 - Allows tuning of Microsemi's *AcuEdge* Technology Audio Processor

The ZLS38508 software features:

- Auto Tuning and Subjective Tuning support
- Provides visual representations of the audio paths with drop-down menus to program parameters, allowing:
 - Control of the audio routing configuration
 - Programming of key blocks in the transmit (Tx) and receive (Rx) audio paths
 - Setting analog and digital gains
- Configuration parameters allow users to “fine tune” the overall performance

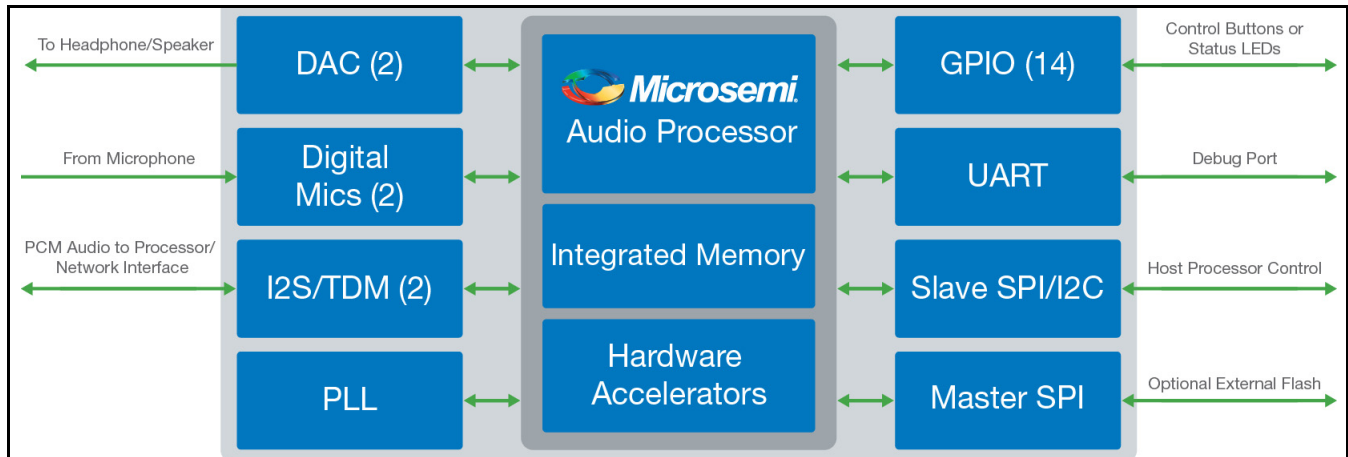


Tools

- ZLK38000 Evaluation Kit
- *MiTuner*™ ZLS38508 and ZLS38508LITE GUI
- *MiTuner*™ ZLE38470BADA Automatic Tuning Kit

Device Block Diagram

Figure 1 - ZL38067 Automatic Speech Recognition Audio Processor shown with Full Duplex Communication Firmware



Applications

The ZL38067 integrates the Sensory Truly Hands Free™ Automatic Speech Recognition which provides systems with the capability to recognize a trigger word and up to 20 command phrases. Recognition is speaker independent and does not require any end user training. The Truly Hands Free™ also allows for trigger-to-command phase detection without the need of a pause. This provides a user friendly experience. Microsemi's AcuEdge™ ASR assist enhances the performance by providing barge-in support, noise reduction, and far field processing which extends the detection range.

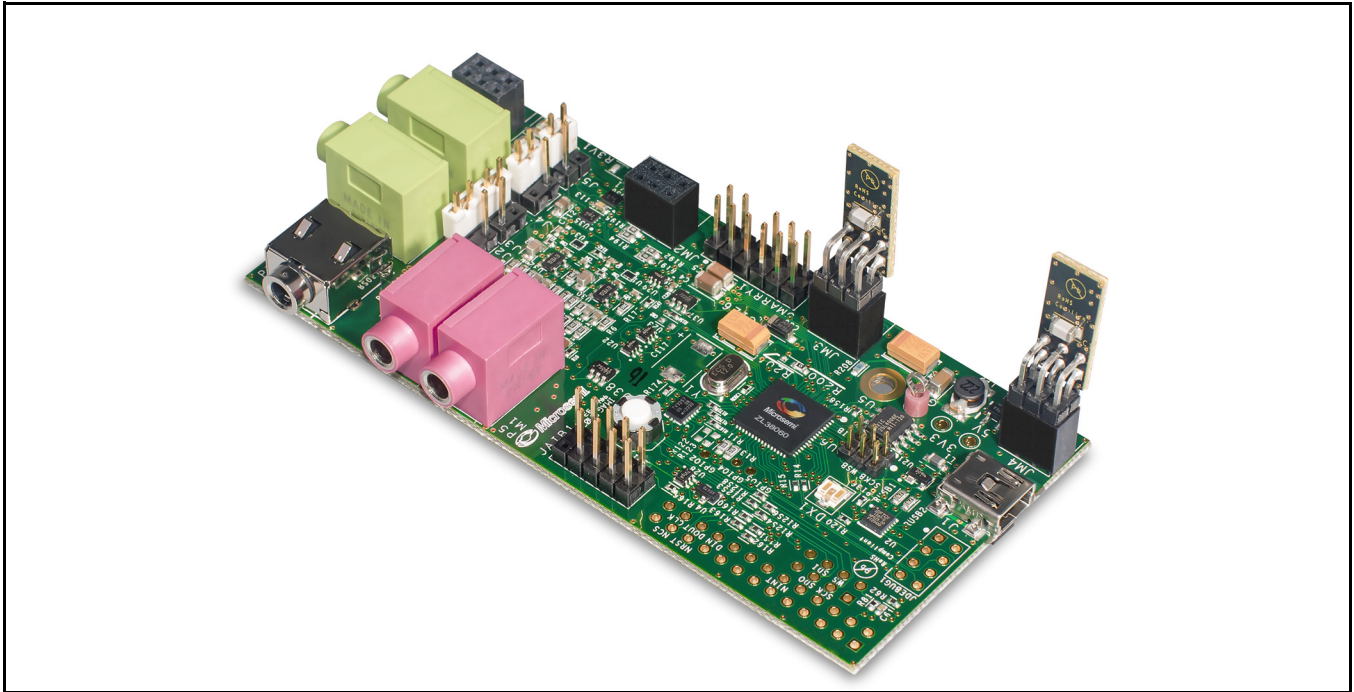
The ZL38067 has three primary modes of operation: Automatic Speech Recognition (ASR) with extended vocabulary, Automatic Speech Recognition with ASR Assist, and Full Duplex Communications mode. The ZLS38067.0 firmware provides the Full Duplex communications mode, while the other firmware variants (ZLS38067.1, ZLS38067.2) provide the ASR with extended memory and ASR with ASR assist respectively.

Evaluation Kit

The ZLK38000 Evaluation Kit includes all the hardware necessary to operate the ZL38067 device on the ZLE38000 Evaluation Board. The Evaluation Board provides a flexible platform to evaluate the Sound Classifier device with AcuEdge™ Technology Firmware.

The ZLE38000 Evaluation Board provides a simple analog interface that can be connected to microphones and speakers to allow for subjective testing. The small size allows for easy mounting in an existing plastic enclosure.

The Firmware for the ZL38067 device and a Configuration Record can be downloaded into the Evaluation Board using the ZLS38000 Firmware Loader software. The ZLE38000 Evaluation Board can then be controlled using the *MiTuner*™ GUI Lite Software (ZLS38508LITE) or the full *MiTuner* GUI Software package (ZLS38508). Microsemi has developed automatic tuning capability into the full *MiTuner* GUI Software to further facilitate and shorten the design process. The ZLS38508 Software package consists of the *MiTuner* GUI Software and the Audio Interface Box (AIB) Evaluation Kit (ZLE38470BADA) hardware, together performing automatic tuning of the ZL38067 device on the Evaluation Board or in a system design.

Figure 2 - ZLE38000 Evaluation Board**ZLK38000 Evaluation Kit Contents**

- ZLE38000 Evaluation Board
- ZLS38000 Firmware Loader Software
- USB to Serial (UART) interface cable
- Headset (32 Ω), with microphone/headphone splitter adapter
- 25 foot Headset Extension Cable
- Speaker (un-powered, 4 Ω , 2.5 W)

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