The RSC-464 is the newest member of Sensory's RSC-4x family of speech microcontrollers. The RSC-464 has many features of the RSC-4128, but costs less due to reduced integrated memory.

The RSC-464 is designed to bring high performance speech I/O features to the most cost-sensitive embedded consumer products. The RSC-464 operates in tandem with the radically new FluentChip™ technology, offering the best embedded speech recognition technologies in the industry. FluentChip is capable of accurate speech recognition; voice password; high quality, low data-rate compressed speech; and music synthesis. One or more technologies may be used in an application. Revolutionary Text-to-Speaker-Independent (T2SI™) technology is derived from a Hidden Markov Model-Neural Net hybrid, allowing the creation of SI recognition sets in minutes by simply entering text.

The RSC-464 is based on an 8-bit microcontroller and integrates speech-optimized digital and analog blocks into a single chip solution. The RSC-464 can store technology code, data sets, and application code on-chip as a single chip solution. The RSC-464 acts as a general purpose controller, providing the option of replacing an existing microcontroller for cost optimal solutions, or by alternatively acting as a speech recognition slave.

In addition to best-in-class embedded speech recognition performance, the RSC-464 provides further on-chip integration of features. A complete speech I/O application can be built with as few additional parts as a clock crystal, speaker, microphone, and few resistors and capacitors.

FEATURES

WIDE RANGE OF FLUENTCHIP TECHNOLOGY CAPABILITIES

‣ Noise-robust Speaker Independent and Speaker Dependent recognition
‣ Over 7 language models now available for international use
‣ Speaker Verification – voice password biometric security
‣ Word Spotting and Continuous Listening recognition options
‣ High quality, 2.4-10.8 kbps speech synthesis & sound effects, with Sensory SX™ synthesis technology
‣ Music synthesis – MIDI-compatible, with up to 8 voices and drum tracks
‣ Voice Record & Playback (voice memo)
‣ Audio Wake Up from sleep – whistles or claps wake the processor

INTEGRATED SINGLE-CHIP SOLUTION

‣ 8-bit microcontroller; fully nested interrupt structure with up to 8 sources
‣ On-chip microphone pre-amp, 16 bit ADC, 10 bit DAC & PWM (30% louder than previously available)
‣ Independent, programmable Digital Filter engine
‣ Twin-DMA, vector math accelerator, and multiplier
‣ Uses low cost 3.58MHz crystal (internal PLL); optional 32KHz crystal input for real time clock
‣ 2.8 KB total RAM (256Bytes user-RAM); includes on-chip storage for SD or SV template
‣ Five timers - 3 General Purpose (GP), 1 Watchdog & 1 Multi-Tasking (MT)
‣ Code security - no ROM dump capability
‣ 16 configurable I/O lines with 10 mA (typical) outputs; includes 4 analog comparator inputs
‣ Low EMI design for FCC and CE requirements

LONG BATTERY LIFE

‣ 2.4 – 3.6V operation
‣ 10mA (typical) operating current at 3V
‣ 2 low power modes; 1 μA typical sleep current

FULL SUITE OF QUICK & POWERFUL TOOLS

‣ Quick Text-to-SI (T2SI) text entry to build noise robust SI recognition sets – low cost & push-button – no recording!
‣ Quick Synthesis for push-button speech compression
‣ Integrated Development Environment, C Compiler, Debugger & In Circuit Emulator from Phyton, Inc.

RSC-464 Block Diagram
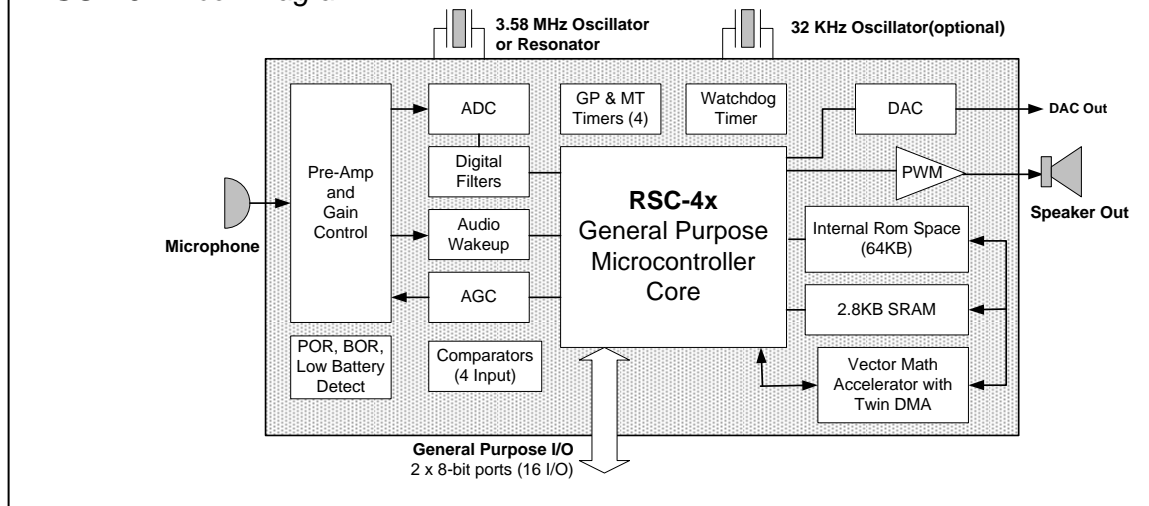
The RSC-464 is designed to operate in tandem with the FluentChip™ technology library, including speaker independent (SI), speaker dependent (SD), and speaker verification (SV) speech recognition. Combinations of these technologies may used to create applications that are rich in features. These are described below:

- ‣ **Speaker Independent** recognition requires no user training. The RSC-464 can recognize up to 10 words in an active set (number of sets is limited only by internal ROM size). Text-to-SI (T2SI), based on a hybrid of Hidden Markov Modeling and Neural Net technologies, allows creation of accurate SI recognition sets in seconds. SI requires on-chip ROM to store the words to be recognized.
- ‣ **Speaker Dependent** recognition allows the user to create names for products or customize recognition sets. SD is implemented with DTW (dynamic time warping) pattern matching technology. SD requires programmable memory to store the personalized speech templates that may be on-chip SRAM or off-chip Serial EEPROM, serial Flash Memory, or serial SRAM. Up to 30 words can be recognized in an active set (the number of unique sets is limited only by programmable memory capacity). The RSC-464 can store up to 2 SD templates (trained patterns) in on-chip SRAM.
- ‣ **Speaker Verification** enables the RSC-464 to authenticate when a previously trained password is spoken by the target user. SV is also implemented with DTW technology. Two SV templates can be stored in on-chip SRAM, or more with external programmable serial memory.
- ‣ **Word Spotting** enables the RSC-464 to spot a specific word surrounded by other speech within a phrase. This can be quite effective when the users response may vary (e.g. spotting "telephone" in the phrases "ummm telephone", or "telephone call"). This option is available for SI and SD.
- ‣ **Continuous Listening** allows the chip to continuously listen for a specific word. This may be used as a trigger word to request a device to listen for a command. This option is available for SI and SD.

SPEECH AND MUSIC

The RSC-464 provides high-quality speech compression using Sensory SX™ technology. Data rates vary from 2400 – 7800 bits per second. The RSC-464 uses a MIDI-like system to generate up to eight voices of wave table music synthesis. Speech and Music data may be stored in on-chip ROM. Speech data may alternatively be stored in off-chip serial ROM or serial Flash for extended durations.

RECORD AND PLAYBACK

The RSC-464 can perform voice record and playback. This is useful in adding a voice memo function to product or for speaker dependent confirmation of choice selected. External serial Flash or serial SRAM is required to store the compressed speech.

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