S E N S O R Y ®

Data Sheet

Description

Sensory's **RSC-4x Rapid Prototyping Module** (RSC-4x RPM) simplifies prototyping of products featuring speech technologies by integrating key components into a convenient 40-pin DIP footprint module. With the RSC-4x RPM's 32Mbit Flash

memory, Sensory's entire FluentChip™ library can be utilized including Record and Playback, along with lots of extended speech. The RPM is a prototyping tool designed for developers who will be creating product system designs that feature RSC-4x processor chips.

Using the Module Programming Board (MPB), developers can download application programs into the RSC-4x RPM. The module can then be removed from the MPB and plugged directly into the prototype for real world testing. In-circuit reprogramming is also supported.

Features

FluentChip™ Capabilities

‣ Noise-robust Speaker Independent (SI) and Speaker Dependent (SD) recognition
‣ Many language models now available for international use
‣ High quality, 2.4-7.8 kbps speech synthesis & sound effects with Sensory "SX" synthesis technology
‣ Speech with "SXL" compression
‣ Speaker Verification Word Spot (SVWS) - Noise robust voice biometric security
‣ 8 voice MIDI-compatible music synthesis
‣ Audio Wakeup from sleep
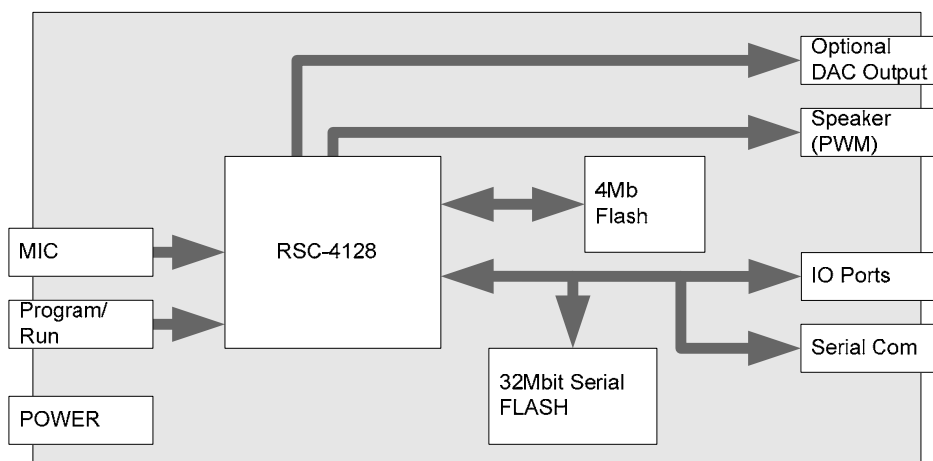‣ Touch Tone (DTMF) output
‣ Record and Playback (RP)

Integrated Solution

‣ RSC-4128 Speech processor & 4Mbit Flash
‣ 32Mbit serial Flash for data
‣ 14MHz (main) & 32kHz (time keeping) clocks
‣ 24 I/O lines
‣ Microphone preamplifier
‣ Pulse Width Modulator (PWM) for Speaker and optional DAC output

Low Power Requirements

‣ V_{DD} = 3.0V – 3.6V
‣ I_{ACT} = 26mA @ 3V (typ. for complete module)
‣ I_{SLEEP} = <20uA @ 3V (typ. for complete module)

RSC-4x RPM Block Diagram

DC Specifications

For details, refer to <u>RSC-4128 Datasheet</u> (80-0206).

Major Components

U3 RSC-4128 IC
An RSC-4128 Integrated Circuit is the central speech processor.

Y1 Crystal
A 3.57 MHz crystal drives a 14.3MHz phase lock loop (PLL) in the RSC-4128 to create the system clock. Timer 1 is used for all speech recognition functions, and should only be used by the application programmer who is not using speech recognition. Timer 3 is reserved for the application programmer.

Y2 Crystal
A 32.768 KHz crystal establishes the frequency of Timer 2 on the RSC-4128 IC. Timer 2 is useful for timekeeping applications since it is not interrupted, unlike Timer 1.

R4 Microphone Source (gain) Resistor
A 1.8K on-board through-hole microphone source resistor is calibrated for use with a microphone with -44dB sensitivity with 2.2K. This satisfies the -46dB system gain.

U2 4M Bit Flash Memory
This 4Mb Flash memory stores the application binary code.

U4 32M Bit Serial Flash Memory
This 32M bit Serial Flash is designed to store speech templates, Record and Playback data, and application data.

RSC-4x RPM Pin Specification

Pin	Description	Pin	Description
1	Microphone Return (Analog GND)	40	GND
2	Microphone VDD	39	VDD
3	Microphone Input	38	P0.7
4	Microphone Power	37	P0.6 (Serial Flash SO)
5	DAC Output	36	P0.5 (Serial Flash SI)
6	P2.0	35	P0.4 (Serial Flash Clock)
7	P2.1	34	P0.3 (Serial Flash -CE)
8	P2.2	33	P0.2
9	P2.3	32	P0.1 (Serial Com TXD)
10	P2.4	31	P0.0 (Serial Com RXD)
11	P2.5	30	P1.7
12	P2.6	29	P1.6
13	P2.7	28	P1.5
14	P1.0	27	Power Down (PDN)
15	P1.1	26	-Reset
16	P1.2	25	Program/-Run (-XM)
17	P1.3	24	PWM 1 (Speaker Output)
18	P1.4	23	PWM 0 (Speaker Output)
19	VDD	22	VDD
20	GND	21	GND

Note: P0.3, P0.4, P0.5 and P0.6 should be reserved for accessing SD/SV recognition and RP data stored in Serial Flash memory.

Note: P0.0 and P0.1 are used for serial download of the binary. P0.1 is also the default pin for output of diagnostic information. Another input pin needs to be assigned as a DiagEnable pin; at reset, diagnostic output is enabled if the pin is low and disabled if the pin is high. After reset, the pin can be used for other purposes.

Reset (-Reset)
Input: A negative going pulse resets the RSC-4x RPM.

Program/-Run (-XM)
Input: To run the application, leave this pin unconnected. To download application binary, pull this pin high with a 100 Ohms resistor.

Power Down (PDN)
Output: The Power Down pin is an active high output, and it is controlled by the application firmware.

General Purpose I/O
Bidirectional: The RSC-4x RPM has 24 general purpose I/O pins. Each line can be programmed as an input with a weak pull-up resistor, input with a strong pull-up resistor, input without pull-ups, or as an output. For more details, refer to the RSC-4128 Datasheet (80-0206).

Microphone Ports
Input: The RSC-4x RPM is designed so that you can use the on-board 1.2K microphone source resistor or external custom microphone source resistor. Use the on-board microphone resistor if the microphone sensitivity provides -49dB system gain with 1.2K. Use the external microphone source resistor otherwise. For more information on microphones, refer to Design Note - Selecting a Microphone (80-0259).

NOTE: Sleep Current is 100uA (typ.) with a microphone.

Speaker Output (PWM0, PWM1)
Output: PWM ports can be directly connected to the speaker.

DAC Output
Output: An optional DAC output for the speaker is provided. To use DAC output, you need to provide the external audio amplifier.

RSC-4x RPM Schematic
Refer to: RSC-4x RPM Schematic (70-0068).

Developing RSC-4x RPM Applications

What you can develop with the RSC-4x RPM:
- Speaker Independent Recognition
- Speaker Dependent Recognition
- Speaker Verification
- Record and Playback
- Speech with SXL compression

Sample Programs
Sample programs in the FluentChip™ Technology Library are a great place to start. Please refer to the Module Programmer Board Manual (80-0294) for the complete list of supported samples.

Creating SI Recognition Sets and Speech Files
For creating Speaker Independent recognition sets, use "Quick T2SI™ (Pat. Pending)"
For creating speech files, use "QuickSynthesis™ 4"

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The Interactive Speech™ Product Line

The Interactive Speech line of ICs and software was developed to "bring life to products" through advanced speech recognition and audio technologies. It is designed for cost-sensitive consumer-electronic applications such as home electronics, home automation, toys, and personal communication. The product line includes the award-winning RSC-4x general-purpose microcontrollers and tools, the *VR Stamp™* 40 pin DIP module and tools, the SC series of speech and music synthesis microcontrollers. Our suite of software development kits are designed to run on non-Sensory processors and DSP's, and support most popular operating systems.

RSC Microcontrollers and Tools
The RSC product family contains low-cost 8-bit speech-optimized microcontrollers designed for use in consumer electronics. All members of the RSC family are fully integrated and include A/D, pre-amplifier, D/A, ROM, and RAM circuitry. The RSC family can perform a full range of speech/audio functions including speech recognition, speaker verification, speech and music synthesis, and voice recording/playback. The family is supported by a complete suite of evaluation and development toolkits.

Speech Recognition Modules and Tools
The VR Stamp™ is a complete speech recognition module based on the RSC-4x and is ideal for fast design and easy production. A low-noise audio channel and standardized 40-pin DIP footprint allow rapid prototyping, less debugging, and shorter time to market. The *VR Stamp Toolkit* includes everything needed to get started today, including VR Stamps, Module Programming Board, sample applications, and a complete set of development tools featuring the Phyton IDE and limited-life C compiler, QuickSynthesis™ 4 and Quick T2SI-Lite™ speech tools.

SC Microcontrollers and Tools
The SC-6x product family features the highest quality speech synthesis ICs at the lowest data rate in the industry. The line includes a 12.32 MIPS processor for high-quality, low data-rate speech compression and MIDI music synthesis, with plenty of power left over for other processing and control functions. Members of the SC-6x line can store as much as 37 minutes of speech on-chip and include as many as 64 I/O pins for external interfacing. Integrating this broad range of features into a single chip enables developers to create products with high quality, long duration speech at very competitive price points.

FluentSoft™ Technology
FluentSoft™ Recognizer is the engine powering the FluentSoft**™** SDK. It provides a noise-robust, large-vocabulary, speaker-independent solution with continuous digit recognition and word-spotting capabilities. This small-footprint software recognizes up to 5,000 words; runs on non-Sensory processors including Intel XScale, TI OMAP, and ARM9 platforms; and supports operating systems such as MS Windows, Linux, and Symbian.

3Dmsg™ Technology
3Dmsg's (www.3Dmsg.com) Animated Speech technology offers animated avatars with advanced speech recognition and synthesis capabilities for use in smartphones, language trainers, and kiosk applications. Facial expressions can be configured to show emotions and lip synchronization can be automatically driven from voice or text data.

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