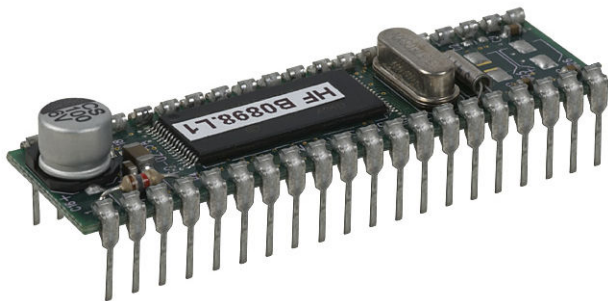**S E N S O R Y** ®

Description

Sensory's VR Stamp™ simplifies the design of speech recognition products by integrating all key components into a convenient 40-pin DIP footprint module. A low-noise audio channel and standardized footprint allow rapid prototyping, less debugging and shorter time to market.

Using the VR Stamp™ Toolkit, application programs can be downloaded into the VR Stamp. The VR Stamp can then be removed from the Module Programmer Board and plugged directly into the final product. In-circuit reprogramming is also supported.

The VR Stamp offers 24 I/O lines, as well as connections for a power, ground, microphone, speaker, and logic-level RS232 interface.

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
▸ Speaker Verification Word Spot (SVWS) - Noise robust voice biometric security
▸ 8 voice MIDI-compatible music synthesis
▸ Audio Wakeup from sleep
▸ Touch Tone (DTMF) output
▸ 0 wait state compatible

Integrated Solution

▸ RSC-4128 Speech processor & 1Mbit Flash
▸ 128Kb serial EEPROM 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} = 2.70V – 3.6V
▸ I_{ACT} = 26mA @ 3V (typ. for complete module)
▸ I_{SLEEP} = <20uA @ 3V (typ. for complete module)

VR Stamp Block Diagram
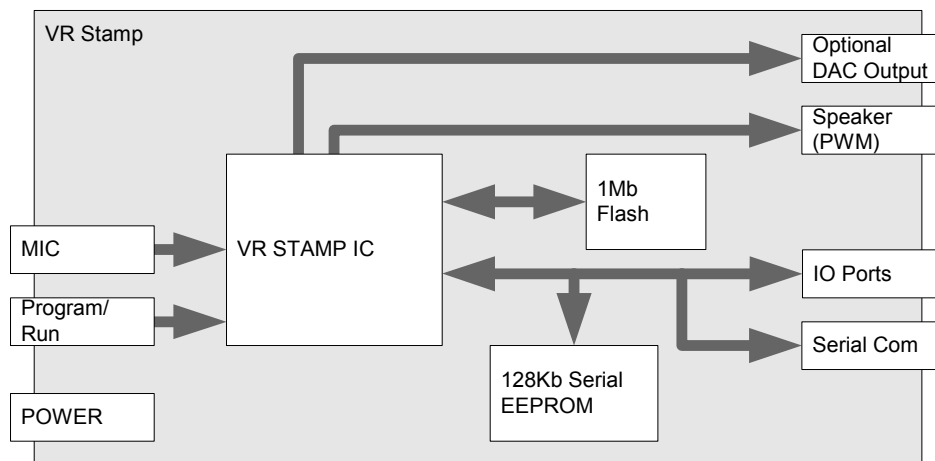
DC Specifications

For details, refer to RSC-4128 Data Sheet (80-0206).

Major Components

U3 RSC-4128 IC
The 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 1.2K on-board through-hole microphone source resistor is calibrated for use with a microphone with -44dB sensitivity with 2.2K. This satisfies the -49dB system gain.

U2 1M Bit Flash Memory
This 1Mb Flash memory stores the application binary code.

U4 128K Bit Serial EEPROM Memory
This 128K bit serial EEPROM is designed to store speech templates and application data.

VR Stamp Pin Specification

Pin	Description	Pin	Description
1	Microphone Return (Analog GND)	40	GND
2	Microphone VDD	39	VDD
3	Microphone Input	38	P0.7 (Serial EEPROM SDA)
4	Microphone Power	37	P0.6
5	DAC Output	36	P0.5
6	P2.0	35	P0.4 (Serial EEPROM SCL)
7	P2.1	34	P0.3
8	P2.2	33	P0.2 (Serial Com -Shutdown)
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: P0.4 and P0.7 should be reserved for accessing SD/SV recognition data stored in Serial EEPROM.

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 VR Stamp.

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 VR Stamp 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 Data Sheet (80-0206).

Microphone Ports

Input: The VR Stamp 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. Refer to page 4 of the Module Programmer Board Schematic (70-0069).

VR Stamp Schematic

Refer to: (70-0066).

Developing VR Stamp Applications

What you can develop with the VR Stamp:
  ‣ Speaker Independent Recognition
  ‣ Speaker Dependent Recognition
  ‣ Speaker Verification

What you can not develop with the VR Stamp:
  ‣ Record and Playback feature

Sample Programs

Sample programs in the FluentChip™ Technology Library are a great place to start. Please refer to the RSC-4x 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™-Lite (Pat. Pending)"
For creating speech files, use "QuickSynthesis 4™"

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. The Interactive Speech Product Line 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 line 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 record/playback. The family is supported by a complete suite of evaluation tools and development kits.

Speech Recognition Modules and Tools

The *VR Stamp™* is a complete voice recognition module based around 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 line 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 processor and control functions. Members of the SC-6x line can store as much as 37 minutes of speech on chip and include as much as 64 I/O pins for external interfacing. Integrating this broad range of features onto 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 Animated Speech technology offers animated avatars with advanced speech recognition and synthesis capabilities for use in Smart Phones, Language Trainers, and Kiosk applications. Facial expressions can be configured for different emotions and lip synchronization can be automatically driven from voice or text data. Visit www.3Dmsg.com for more information.

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