

Voice Dialer 364

Speech Recognition Dialing IC

Speaker Dependent IC for Voice Dialing Applications

GENERAL DESCRIPTION

The Voice Dialer 364, from the Interactive Speech™ family of products, is an application specific standard product (ASSP) designed for cost-sensitive telephony applications. This IC features speech recognition technology that is ideally suited for dialing phone numbers by saying the name of the person you want to call. With Voice Dialer 364, a complete dialing system can be built with minimal components.

The Voice Dialer 364 is designed for use as a slave chip controlled by an external host processor. The external host sends commands to perform dialing and directory functions, such as adding names to the directory, dialing a name, and playing back a phone number. The Voice Dialer 364 manages a full telephone directory of names, speech recognition templates and telephone numbers.

The Voice Dialer 364 employs a sophisticated neural network to recognize trained names with high accuracy. Its advanced technology delivers fast response and accurate recognition in difficult noise environments, such as automobiles, and adjusts for recognition over different distances - ideal for speakerphone applications.

Voice Dialer 364 can be integrated into existing products or used to develop innovative new applications. A highly flexible development kit is available, including a removable *Rapid Prototyping Module* to drop into your product prototype to get you up and running quickly!

FEATURES

Complete Dialing Solution

- 60 name telephone directory
- Speaker dependent speech recognition for name dialing
- User-friendly speech prompts
- Digital recording and playback of directory entries
- DTMF generation

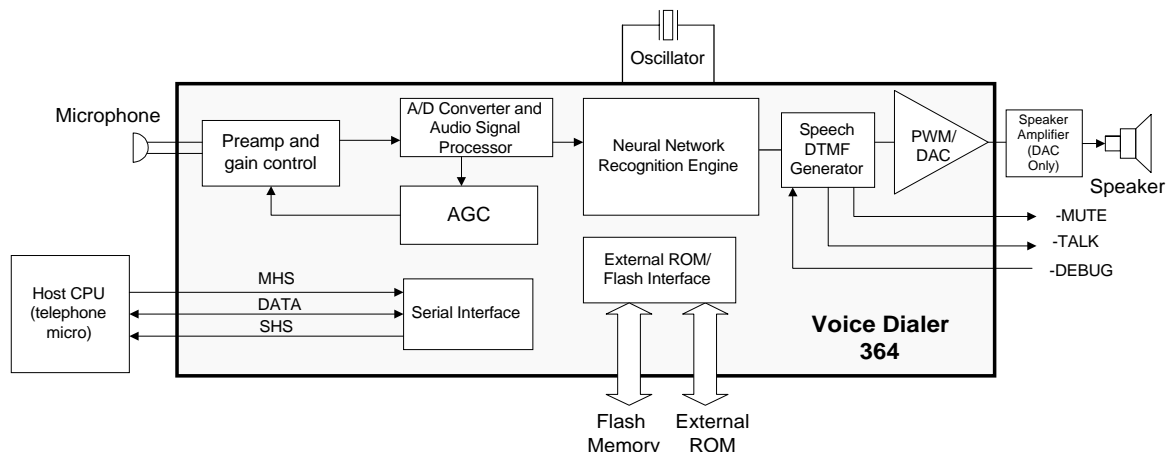
Powerful Functionality

- Add, modify, delete directory commands
- Multiple directory support for more than one user
- Multiple telephone numbers per name
- Language localization and custom synthesis options
- On chip A/D and D/A converters and pre-amplifier

Easy to Implement

- Simple serial interfaces with both 3-wire synchronous or 2-wire asynchronous support.
- 1 & 2 Mbit Flash memory interfaces
- High level commands
- Minimal external components required
- 3 volt operation for 2 or 3 battery applications

VOICE DIALER 364 BLOCK DIAGRAM



FEATURE OVERVIEW

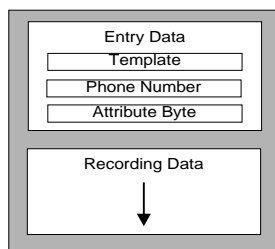
The Voice Dialer 364 is a single-chip CMOS device that uses sophisticated speech recognition technology to map spoken names to phone numbers. Using easy-to-learn, intuitive techniques, end-users train the Voice Dialer 364, which performs speaker-dependent (SD) speech recognition, audio record and playback of names, speech prompting, and DTMF (Dual Tone Multi-Frequency) synthesis. The Voice Dialer 364 is available as an IC, or as a module along with a development kit.

EXTERNAL HOST CONTROLLER

Sensory's Voice Dialer 364 operates as a slave chip, receiving and processing commands from a host controller or Master CPU (Host) and returning status information and data. The Voice Dialer 364 has private access to its own control program, to an optional language/extended speech ROM, and to a non-volatile external read/write Flash memory. Either 1 or 2 megabits of flash memory are supported – the size reflects application-specific requirements for the phone directory. Communication with the Host is through a serial bus, either 3-wire synchronous or 2-wire asynchronous.

The Voice Dialer 364 includes a rich command set allowing the programmer to implement complex voice recognition functions with a minimum of Host overhead. This allows the application software to focus on providing an intuitive and efficient user interface.

DIALING DIRECTORY MANAGEMENT



The Voice Dialer 364 maintains a dialing directory with the following information for each entry:

- A speaker-dependent speech template - a stored pattern of the trained name
- A voice recording of the name – the system plays the recording for confirmation
- Four 0-30 digit strings – the telephone numbers associated with name
- An attribute byte – to identify the kind or type of entry during searches

IC PIN DESCRIPTIONS

Depending on the memory selected Voice Dialer 364 can store either 30 or 60 names. Using attribute bytes, applications can also create multiple directories.

Users can access all data associated with a name entry either by voice recognition or sequentially. Users can also organize multiple directories or categories.

SPEECH PROMPTS

Voice Dialer 364 provides an internal English vocabulary with more than 100 phrases of general-purpose Standard English, developed for telephony applications.

The onboard standard word list can be replaced with a customized word list for English or foreign languages via an external ROM chip. Speech prompts can also be muted entirely.

INPUT AUDIO AMPLIFIER AND FILTER

The Voice Dialer 364 includes an on chip pre-amplifier to condition the input signal. It has been optimized to interface directly to an inexpensive omni-directional electret microphone, requiring very few external components (for biasing).

AUDIO OUTPUT

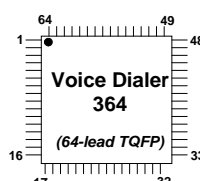
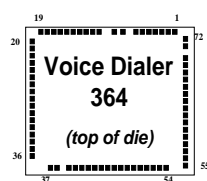
Voice Dialer 364 offers two separate options for analog output. The DAC (Digital to Analog Converter) output provides a 10-bit analog output that may be used for speech and DTMF output (with the inclusion of an audio amplifier). For applications that require driving a small speaker, the PWM (Pulse-Width-Modulator) output can be used instead of the DAC output. This output is intended to drive a 32-ohm speaker directly.

FLASH MEMORY

The Voice Dialer 364 is designed to work with external non-volatile memory (Atmel AT29C010/ SST29EE010-1Mbit or SST29EE020-2 Mbit) to store speech templates and phone numbers.

RAPID PROTOTYPING MODULE 364

The Voice Dialer 364 solution is also available as a complete module. The module is a single 2" x 2" PCB that includes all additional memory components and circuitry required except for the microphone and speaker. This module is ideal for prototype development or small production runs. A complete development kit is also available that allows the module to interface directly to a PC for evaluation purposes, as well as an upgrade kit for owners of Sensory's Demo Unit 264T/364.



Name	Die Pad	QFP Pin	Description	I/O
A[15:0]	20-27, 30-37	1-8, 11-18	External ROM / Flash Memory Address Bus	O
AIN0	5	52	Analog In, low gain. (Range: Vss to Vdd/2)	I
AIN1	4	51	Analog In, hi gain (8X input amplitude of AIN0, same range)	I
AOFE1	72	49	Output of 1 st stage of preamplifier	O
AOFE2	6	53	Output of 2 nd stage of preamplifier (AGC stage)	O
AOFE3	3	51	Output of 3 rd stage of preamplifier	O
AIFE1	71	48	Input to 1 st stage of preamplifier (Microphone input)	I
AIFE2	1	49	Input to 2 nd stage of preamplifier (Analog input pin to preamplifier)	I
PWM0	8	55	Pulse Width Modulator Output 0	O
DACOUT	2	50	Analog Output (unbuffered)	O
D[7:0]	12-19	57-64	External ROM / Flash Data Bus	I/O
Vss	7, 28, 62	9, 39, 54	Ground	-
PDN	67	44	Power Down. Active high when powered down.	O
NC	10, 11, 38, 39, 43-51, 53	22-28, 30, 33, 34	Not Connected	-
DEBUG	52	29	Enable debug diagnostic speech	I
/MUTE	57	34	Audio Mute Signal. Active low during DTMF output.	O
/TALK	56	33	Audio Talk Signal. Active low during speech synthesis.	O
A16	55	32	External ROM / Flash address line 16, ROM A15	O
A17	54	31	External ROM / Flash address line 17	O
DATA /ASYNC	58	35	Serial Data between Master and Slave. Bi-directional (synchr. mode).	I/O
SHS, TXD	59	36	Slave Handshake, Received Data. Driven by Voice Dialer 364.	O
MHS, RXD	60	37	Master Handshake, Received Data. Driven by Host.	I
/RDC	63	40	External Code Read Strobe	O
/RDD	65	42	External Data Read Strobe	O
/RESET	42	21	Reset	I
/TE1 or PWM1	9	56	Test Mode <i>or</i> Pulse Width Modulator Output1 (multiplexed)	I <i>or</i> O
VREF	70	47	Reference Voltage = Vdd/2 or Vdd/4. Depends on software	-
VDD	29, 61	10, 38	Supply Voltage	-
/WRC	64	41	External Code Write Strobe	O
/WRD	66	43	External Data Write Strobe	O
/XMH	68	45	Default / Custom speech select (active low)	I
/XML	69	46	Unused (must be tied high)	I
XO1	40	19	Oscillator 1 output (14.1318 MHz)	O
XI1	41	20	Oscillator 1 input	I

ABSOLUTE MAXIMUM RATINGS (IC ONLY)

Any pin to GND	-0.1V to +6.5V
Operating temperature (T _O)	0°C to +70°C
Soldering temperature	260°C for 10 sec
Power dissipation	1 W
Operating Conditions	0°C to +70°C
	V _{DD} =2.4 - 5.25V
	V _{SS} =0V

WARNING:

Stressing the Voice Dialer 364 beyond the “Absolute Maximum Ratings” may cause permanent damage. These are stress ratings only. Operation beyond the “Operating Conditions” is not recommended and extended exposure beyond the “Operating Conditions” may affect device reliability.

ORDERING INFORMATION

Part	Marketing P/N	Description
Voice Dialer 364 Die	CVD3XS1P	Tested, Singulated Voice Dialer 364 die in waffle pack
Voice Dialer 364 QFP	CVD3XV1T	Voice Dialer 364 64 pin 10 x 10 x 1.0 mm TQFP
Voice Dialer 364 Development Kit	EDKVD3GSX	Voice Dialer 364 Development Kit
RSC-364 Demo Unit Upgrade	EDKVD3GUX	RSC-364 Demo Unit to Voice Dialer 364 Dev. Kit Upgrade
Rapid Prototyping Module 364 (RPM)	EPMRP3GSX	Rapid Prototyping Module 364 (w/ bootloader SW, manual)
RPM 364 (module only)	EPMRP3GUX	Rapid Prototyping Module 364 (module only)

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 technology. The Interactive Speech Product Line was designed for consumer telephony products and cost-sensitive consumer electronic applications such as home electronics, personal security, and personal communication. The product line includes award-winning RSC-series general-purpose microcontrollers and tools plus a line of easy-to-implement chips that can be pin-configured or controlled by an external host microcontroller. Sensory's software technologies run on a variety of microcontrollers and DSPs.

RSC Microcontrollers and Tools

The RSC family of microcontrollers (RSC-300/364) are low-cost 8-bit 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 (RSC-364), 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 with a complete suite of tools and development kits.



Application Specific Standard Products (ASSPs)

Voice Direct™ 364 provides inexpensive speaker-dependent speech recognition and speech synthesis. This easy-to-use, pin-configurable chip requires no custom programming and can recognize up to 60 trained words in slave mode, and 15 words in stand-alone mode. Ideal for speaker-dependent command and control of household consumer products, Voice Direct™ 364 is part of a complete product line that includes the IC, module, and Voice Direct 364 Speech Recognition Kit.

Voice Dialer™ 364 delivers speech recognition technology that allows users to dial phone numbers by saying the name of the person they wish to call. Voice dialing and phone directory management through speech recognition can be easily integrated into existing products. This IC is designed for use as a slave chip controlled by an external host processor.

Voice Extreme™ simplifies the creation of fully custom speech-enabled products by offering developers the capability of programming the chip in a high-level C-like language. Program code, speech data, and even record and playback information can be stored on a single off-chip Flash memory. Based on Sensory's RSC-364 speech processor, Voice Extreme includes a highly efficient on-chip code interpreter, and is supported by a comprehensive suite of low-cost development tools..

Software and Technology

Voice Activation™ micro footprint software provides advanced speech technology on a variety of microcontroller and DSP platforms. A flexible design with a broad range of technologies allows manufacturers to easily integrate speech functionality into consumer electronic products.

Fluent Speech™ small footprint software recognizes up to 50,000 words; offers Animated Speech with the ability to automate enunciation and articulation; performs text-to-speech synthesis in either male or female voices; provides noise and echo cancellation, performs wordspotting for natural language usage; offers telephone barge-in; and provides continuous digit recognition.

IMPORTANT NOTICES

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