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Data Sheet, DS 1, March 2001

SCOUT-S

Siemens Codec with S/T Transceiver

PSB 21381/2 Version 1.3

SCOUT-SX

Siemens Codec with S/T Transceiver Featuring Speakerphone Functionality

PSB 21383/4 Version 1.3

Wired Communications

Never stop thinking.

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PSB 21381/2
PSB 21383/4

Revision History: **2001-03-12** DS 1

Previous Version: 09.99

Page	Subjects (major changes since last revision)
35	Figure with clock signals added
67	BCL=’ 0’ changed to BCL=’1’
90	BCL changed from ’low’ to ’high’
118	Note regarding AXI input added
169 170	BCL is inverted compared to last description (DS1); figure added
173	’*Rising*’ BCL edge changed to ’*falling*’ edge
245	Figure 95 modified
250 251	Timings added
251	Power supply currents added

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1 Overview

The SCOUT-S or SCOUT-SX respectively integrates all necessary functions for the completion of a cost effective ISDN voice terminal solution.

Please note: Throughout the whole document “SCOUT™“ refers to “SCOUT™-S“ and “SCOUT™-SX“

The SCOUT combines the functionality of the ARCOFI®-BA PSB 2161 (Audio Ringing Codec Filter Basic Function) or ARCOFI®-SP PSB 2163 (Audio Ringing Codec Filter with Speakerphone) respectively and the ISAC®-S TE PSB 2186 (ISDN Subscriber Access Controller for Terminals) on a single chip.

The SCOUT-S is suited for the use in basic ISDN voice terminals just as it is, and in combination with an additional device on the modular IOM®-2 interface, in high end featurephones e.g. with acoustic echo cancellation.

The SCOUT-SX PSB 21383 is an extended SCOUT-S PSB 21381 which provides the speakerphone performance of the ARCOFI-SP PSB 2163.

The transceiver implements the subscriber access functions for an ISDN terminal to be connected to a four wire S/T interface. It covers complete layer-1 and basic layer-2 functions for digital terminals.

The codec performs encoding, decoding, filtering functions and tone generation (ringing, audible feedback tones and DTMF signal). An analog front end offers three analog inputs and two analog outputs with programmable amplifiers.

The IOM-2 interface allows a modular design with functional extensions (e.g. acoustic echo cancellation, tip/ring extension, modem extension, answering machine, video or data terminal) by connecting other voice/data devices to the SCOUT.

In the P-MQFP-44 package (PSB21381/3) only a serial microcontroller interface (SCI) is supported.
In the P-MQFP-64 package (PSB21382/4) a serial and parallel microcontroller interface are supported. A clock signal and a reset input and output pin complete the microcontroller interface.

The SCOUT is a CMOS device and operates with a 3.3 V or 5 V supply.

Comparison of the SCOUT with the two chip solution ISAC-S TE and ARCOFI-BA; -SP

	SCOUT	ISAC-S TE / ARCOFI
Operating modes	TE	TE
Supply voltage	3.3V ± 5 % or 5V ± 5 %	5V ± 5 %
Technology	CMOS	CMOS, BICMOS
Package	P-MQFP-44, P-MQFP-64	P-MQFP-64 / P-DSO-28
Transceiver		
Transformer ratio for receiver and transmitter	1:1	2:1
Test Functions	- Dig. loop via Layer-2 (TLP) - Layer-1 disable (DIS_TR) - Analog loop (LP_A- bit EXLP- bit, ARL)	- Dig. loop via Layer-2 (TLP) - Layer-1 disable (TEM) - Analog loop (ARL)
Microcontroller Interface	Serial (SCI) 8-bit parallel (MQFP-64): Motorola Mux Siemens/Intel Mux Siemens/Intel Non-Mux direct/ indirect Addressing	Not provided 8-bit parallel: Motorola Mux Siemens/Intel Mux Siemens/Intel Non-Mux
Microcontroller clock	Provided (7.68, 3.84, 0.96MHz, disabled)	Not provided
Register address space	256 byte (32 byte FIFO, 96 byte configuration, 128 byte CRAM)	204 byte (32 byte FIFO, 32+12 byte configuration, 128 byte CRAM)
Codec CRAM access (128 byte)	Indirect and direct addressing (general purpose RAM)	Indirect addressing
Command structure of the register access	Header/ address(command)/data	Address (command)/data
Controller data access to IOM-2 timeslots	All timeslots; various possibilities of data access	Restricted access to B- and IC-channel

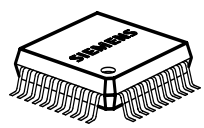
	SCOUT	ISAC-S TE / ARCOFI
Data control and manipulation	Various possibilities of data control and data manipulation (enable/ disable, shifting, looping, switching)	B- and IC-channel looping
IOM-2		
IOM-2 Interface	Double clock (DCL), bit clock pin (BCL), serial data strobe 1 (SDS1) serial data strobe 2 (SDS2/ $\overline{\text{RSTO}}$)	Double clock (DCL), bit clock (BCL), serial data strobe (SDS)
Monitor channel programming	Provided (MON0, 1 or 2)	Provided (MON0 or 1)
C/I channels	CI0 (4bits), CI1 (4/6bits)	CI0 (4bits), CI1 (6bits)
Layer-1 statemachine	With changes in ISAC-S for correspondence with the actual ITU Specification	
Statemachine in software	Possible	Not possible
IDSL (144kBit/s)	Provided (HDLC, SDS)	Not provided
HDLC support	D- and B- channels; Non-auto mode, transparent mode 0-2, extended transparent mode	D-channels; auto mode, non-auto mode, transparent mode 1-3
FIFO size	64 bytes per direction with programmable FIFO thresholds	2x32 bytes per direction
Reset Sources	$\overline{\text{RST}}$ Input Watchdog C/I Code Change $\overline{\text{EAW}}$ Pin Software Reset	$\overline{\text{RST}}$ Input Watchdog C/I Code Change EAW Pin
Codec		
Analog inputs	1 single ended, 2 differential	1 single ended, 2 differential
Band gap reference	Externally buffered	Internally buffered

	SCOUT	ISAC-S TE / ARCOFI
Max. AFE gain transmit (guaranteed transmission characteristics)	36 dB differential inputs 24 dB single ended input	42 dB differential inputs 24 dB single ended input
Analog gain steps earpiece	3 dB	6 dB
Speakerphone		
Status indication	Register status bits	Piezo pins
AGC initialization	Initial value	Maximum gain
Voice data manipulation	Three party conferencing (adding receive and transmit data) Voice monitoring on IOM-2	Three party conferencing (adding receive data) Voice monitoring on piezo output
Voice data formats	A-/µ-Law, 8 or 16 bit linear	A-/µ-Law, 16 bit linear
Mask register for voice data	Provided	Not provided
Tone Generator Output	Loudspeaker, earpiece	Loudspeaker, earpiece, piezo pins
Direct tone generator output to loudspeaker	Provided Tone generator signal is attenuated by -6dB compared to the ARCOFI; extended gain range (-24.5, -27.5dB) in the loudspeaker amplifier control setting	Provided
Saturation amplification of tone filter, i.e. CRAM Parameter GE	As specified	Adjusted to fix value

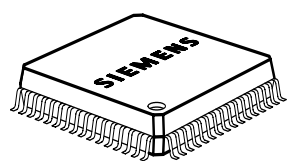
Version 1.3 **CMOS**

1.1 Features

- 8-bit parallel microcontroller interface (only PSB 21382/4 in P-MQFP-64 package), Motorola, Siemens/Intel bus type multiplexed or non-multiplexed, direct-/indirect register addressing
- Serial control interface (SCI)
- IOM-2 interface in TE mode, single/double clock, two serial data strobe signals
- Various possibilities of microcontroller data access, data control and data manipulation to all IOM-2 timeslots
- Power supply 3.3V or 5V
- Monitor channel handler (master/slave)
- Sophisticated power management for restricted power mode
- Programmable microcontroller clock output and reset (input/output) pins
- Advanced CMOS technology



P-MQFP-44-1



P-MQFP-64-1

Transceiver part

- Full duplex 2B+D S/T interface transceiver according to ITU-T I.430
- Conversion of the frame structure between the S/T interface and IOM-2
- Receive timing recovery
- Continuously adapted receive thresholds
- D-channel access control
- Access to S and Q bits of S/T interface

Type		Package
PSB 21381	SCOUT-S	P-MQFP-44-1
PSB 21383	SCOUT-SX	P-MQFP-44-1
PSB 21382	SCOUT-S	P-MQFP-64-1
PSB 21384	SCOUT-SX	P-MQFP-64-1

- Activation and deactivation procedures with automatic activation from power down state
- HDLC controller. Operating in non-auto mode, transparent mode 0-2 or extended transparent mode. Access to B1, B2 or D channels or the combination of them e.g. for 144 kbit/s data transmission (2B+D)
- FIFO buffer with 64 bytes per direction and programmable FIFO thresholds for efficient transfer of data packets
- Implementation of IOM-2 MONITOR and C/I-channel protocol to control peripheral devices
- Realization of layer-1 statemachine in software possible
- Watchdog timer
- Programmable reset sources
- Test loops and functions

Codec part

- Applications in digital terminal equipment featuring voice functions
- Digital signal processing performs all CODEC functions
- Fully compatible with the ITU-T G.712 and ETSI (NET33) specification
- PCM A-Law/μ-Law (ITU-T G.711) and 8/16-bit linear data; maskable codec data
- Flexible configuration of all internal functions
- Three analog inputs for the handset microphone, the speakerphone and the headset
- Two differential outputs for a handset earpiece (200 Ω) and a loudspeaker (50 Ω for 5V power supply, 25 Ω for 3.3V power supply)
- Flexible test and maintenance loopbacks in the analog front end and the digital signal processor
- Independent gain programmable amplifiers for all analog inputs and outputs
- Full digital speakerphone (SCOUT-SX only) and loudhearing support without any external components (speakerphone test and optimization function is available)
- Enhanced voice data manipulation for features like:
  - Three-party conferencing
  - Voice monitoring
- Two transducer correction filters
- Side tone gain adjustment
- Flexible DTMF, tone and ringing generator
- Direct and indirect CRAM access

1.2 Pin Configuration

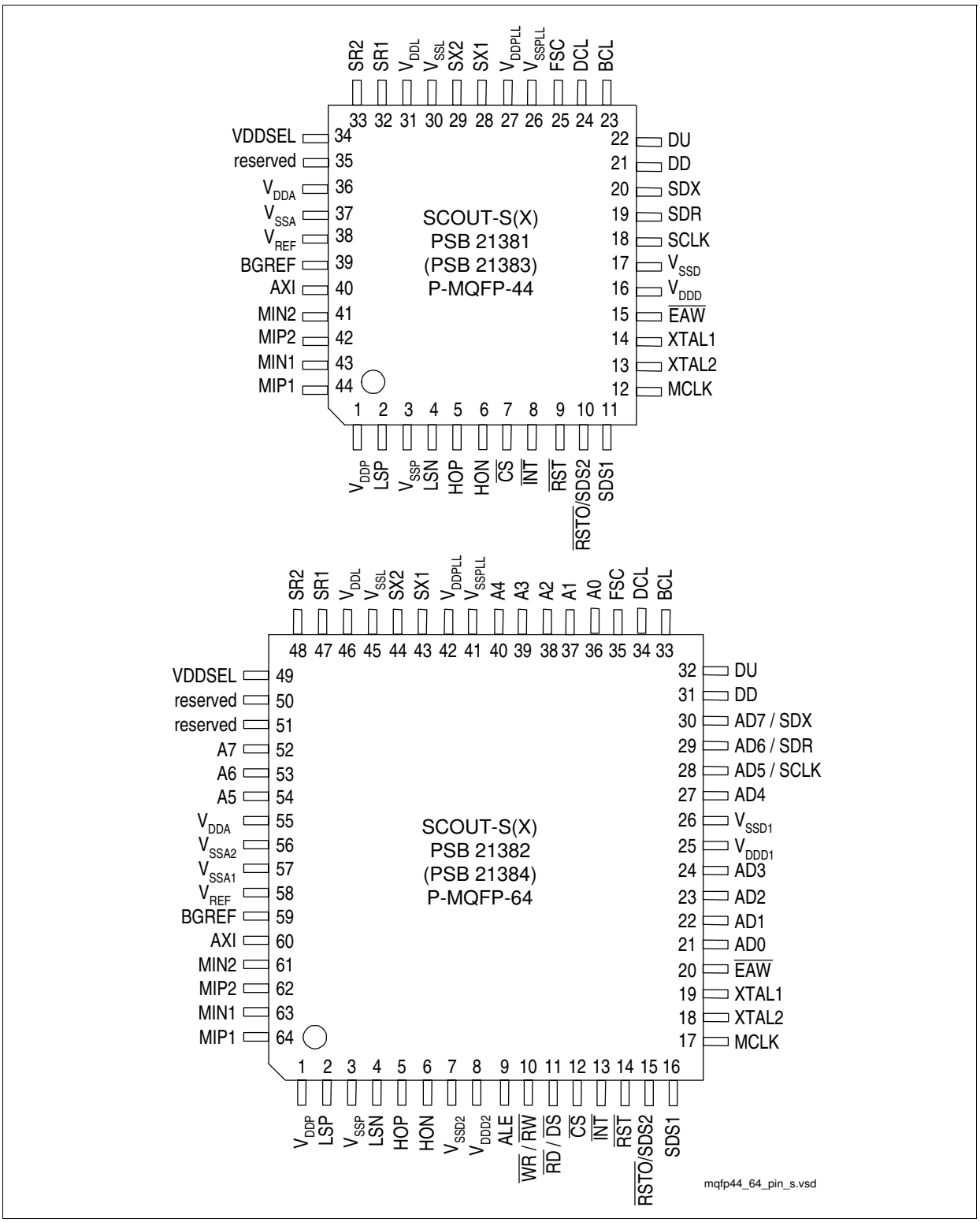


Figure 1
Pin Configuration

1.3 Logic Symbol

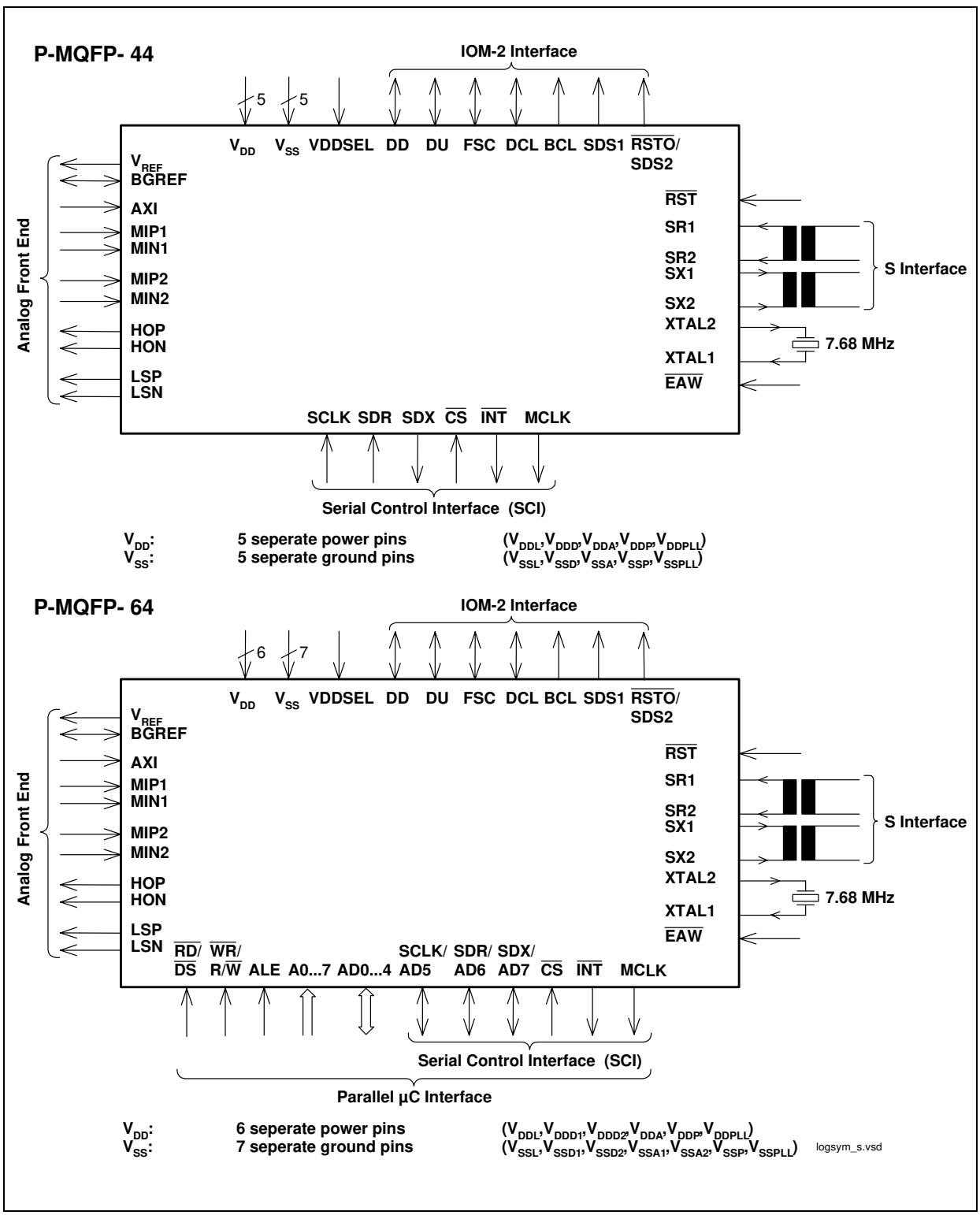


Figure 2
Logic Symbol of the SCOUT in P-MQFP-44 and P-MQFP-64

1.4 Pin Definitions and Function

Table 1

Pin No. MQFP-44	Pin No. MQFP-64	Symbol	Input (I) Output (O) Open Drain (OD)	Function
				Power supply (3.3 V or 5 V ± 5 %)
31	46	V_{DDL}	–	Supply voltage for line driver
16		V_{DDD}	–	Supply voltage for digital parts
	25	V_{DDD1}		
	8	V_{DDD2}		
36	55	V_{DDA}	–	Supply voltage for analog parts
1	1	V_{DDP}	–	Supply voltage for loudspeaker
27	42	V_{DDPLL}	–	Supply voltage for internal PLL
30	45	V_{SSL}	–	Ground for line driver
17		V_{SSD}	–	Ground for digital parts
	26	V_{SSD1}		
	7	V_{SSD2}		
37		V_{SSA}	–	Ground for analog parts
	57	V_{SSA2}		
	56	V_{SSA1}		
3	3	V_{SSP}	–	Ground for loudspeaker
26	41	V_{SSPLL}	–	Ground for internal PLL
34	49	VDDSEL	I	VDD Selection '0': 3.3 V supply voltage '1': 5 V supply voltage
				IOM-2 Interface
21	31	DD	I/OD/O	Data Downstream
22	32	DU	I/OD/O	Data Upstream
25	35	FSC	I/O	Frame Synchronization Clock (8 kHz)
24	34	DCL	I/O	Data Clock I: single or double clock (programmable) O: double clock, 1.536 MHz
23	33	BCL	O	Bit Clock (768kHz)

Table 1 (cont'd)

Pin No. MQFP-44	Pin No. MQFP-64	Symbol	Input (I) Output (O) Open Drain (OD)	Function
11	16	SDS1	O	**Programmable strobe signal or bit clock**
10	15	$\overline{\text{RSTO}}$/ SDS2	OD O	**Reset Output (active low)** **Programmable strobe signal or bit clock**
				RESET
9	14	$\overline{\text{RST}}$	I	Reset (active low)
				Transceiver
32	47	SR1	I	S-Bus receiver input
33	48	SR2	I	S-Bus receiver input
28	43	SX1	O	S-Bus transmitter output (positive)
29	44	SX2	O	S-Bus transmitter output (negative)
13	18	XTAL2	OI	Oscillator output
14	19	XTAL1	I	Oscillator or 7.68 MHz input
15	20	$\overline{\text{EAW}}$	I	External Awake. A low level on this input starts the oscillator from the power down state and generates a reset pulse if enabled (see **chapter 7.2.12**) In addition an interrupt request is generated at pin $\overline{\text{INT}}$.
				Microcontroller Interface
8	13	$\overline{\text{INT}}$	OD	**Interrupt request** (active low)
12	17	MCLK	O	**Microcontroller Clock**
7	12	$\overline{\text{CS}}$	I	Chip Select (active low) During reset also used as interface selection pin (see **chapter 2.1**)
-	9	ALE	I	Multiplexed bus mode: Address Latch Enable Non-multiplexed bus and serial mode: Interface selection pin (see **chapter 2.1**)

Table 1 (cont'd)

Pin No. MQFP-44	Pin No. MQFP-64	Symbol	Input (I) Output (O) Open Drain (OD)	Function
-	10	$\overline{WR}$	I	Write access in Intel bus mode (active low)
		R/$\overline{W}$	I	Read/write access in Motorola bus mode During reset also used as interface selection pin (see **chapter 2.1**)
	11	$\overline{RD}$	I	Read access in Intel bus mode (active low)
		$\overline{DS}$	I	Data strobe in Motorola bus mode (active low) During reset also used as interface selection pin (see **chapter 2.1**)
18		SCLK	I	Clock for the serial control interface
	28	SCLK	I	Serial control interface: Clock
		AD5	I/O	Multiplexed bus mode: Address/data line bit 5 Non-multiplexed bus mode: Data line bit 5
19		SDR	I	Serial Data Receive
	29	SDR	I	Serial control interface: Data receive
		AD6	I/O	Multiplexed bus mode: Address/data line bit 6 Non-multiplexed bus mode: Data line bit 6
20	30	SDX	OD/O	Serial Data Transmit
		SDX	OD/O	Serial control interface: Data transmit
		AD7		Multiplexed bus mode: Address/data line bit 7 Non-multiplexed bus mode: Data line bit 7
-	21	AD0	I/O	Multiplexed bus mode: Address/data lines Non-multiplexed bus mode: Data lines
	22	AD1	I/O	
	23	AD2	I/O	
	24	AD3	I/O	
	27	AD4	I/O	

Table 1 (cont'd)

Pin No. MQFP-44	Pin No. MQFP-64	Symbol	Input (I) Output (O) Open Drain (OD)	Function
-	36	A0	I	Multiplexed bus mode: Not used, has to be connected to V_{DD}
	37	A1	I	
	38	A2	I	Non-multiplexed bus mode: Address bus. For indirect address mode only A0 is valid
	39	A3	I	
	40	A4	I	
	54	A5	I	
	53	A6	I	
	52	A7	I	

Table 1 (cont'd)

Pin No. MQFP-44	Pin No. MQFP-64	Symbol	Input (I) Output (O) Open Drain (OD)	Function
				Analog Frontend
38	58	V_{REF}	O	2.4V Reference voltage for biasing external circuitry An external capacity of ≥ 100nF has to be connected
39	59	BGREF	I/O	Reference Bandgap voltage for internal references An external capacity of ≥ 22nF has to be connected
40	60	AXI	I	Single-ended Auxiliary Input
44 43	64 63	MIP1 MIN1	I I	Symmetrical differential Microphone Input 1
42 41	62 61	MIP2 MIN2	I I	Symmetrical differential Microphone Input 2
5 6	5 6	HOP HON	O O	Differential Handset earpiece output for 200 Ω transducers
2 4	2 4	LSP LSN	O O	Differential Loudspeaker output for 50 Ω or 25 Ω loudspeaker using a power supply of 5 V or 3.3 V respectively
				Reserved Pins
35	50	$\overline{\text{reserved}}$	I	This input is not used for normal operation and must be connected to *VDD*.
	51	$\overline{\text{reserved}}$	I	This input is not used for normal operation and must be connected to *VSS*.

1.5 Typical Applications

The SCOUT can be used in a variety of applications like

- ISDN voice terminal (**Figure 3**)
- ISDN voice terminal with speakerphone (**Figure 4**)
- ISDN voice terminal as featurephone with acoustic echo cancellation (**Figure 5**)
- ISDN voice terminal with tip/ring extension (**Figure 6**)
- ISDN voice terminal with answering machine (**Figure 7**)
- ISDN voice terminal with full duplex speakerphone and answering machine (**Figure 8**)
- ISDN videophone with speakerphone (**Figure 9**)
- ISDN videophone with full duplex speakerphone (**Figure 10**)
- ISDN voice/data terminal on a PC card (**Figure 11**)
- ISDN voice/data terminal with tip/ring extension (**Figure 12**)
- Terminal Adapter with dual tip/ring (**Figure 13**)

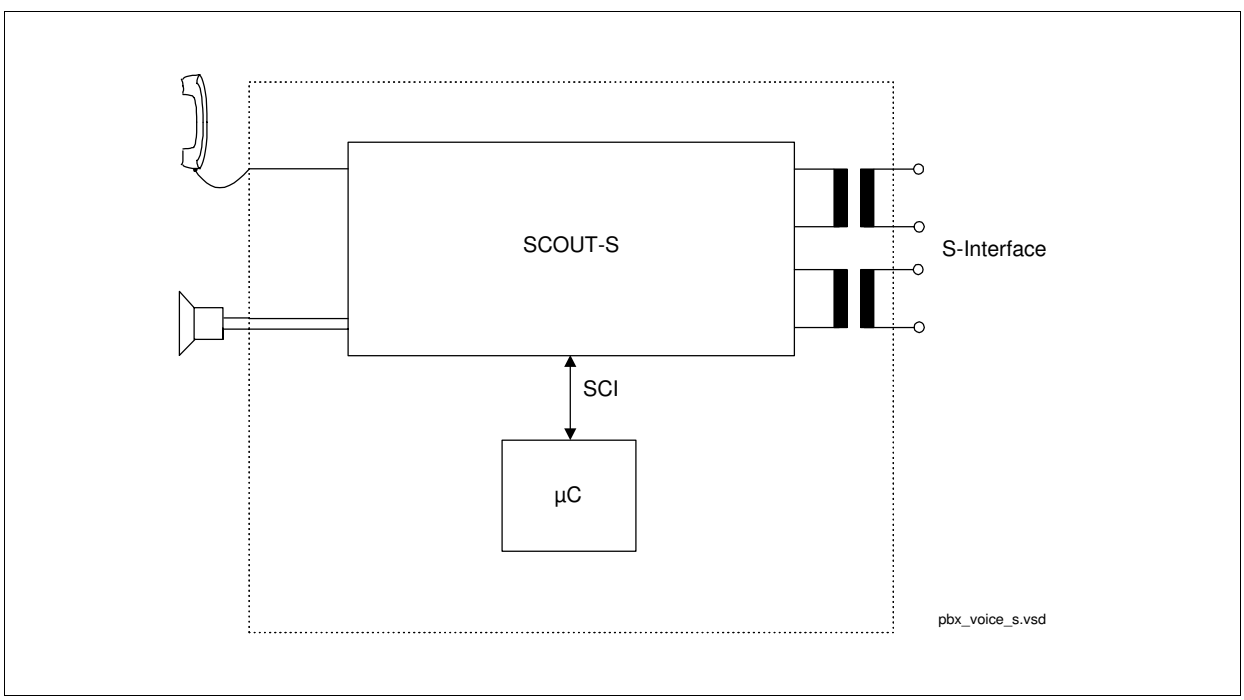


Figure 3
ISDN Voice Terminal

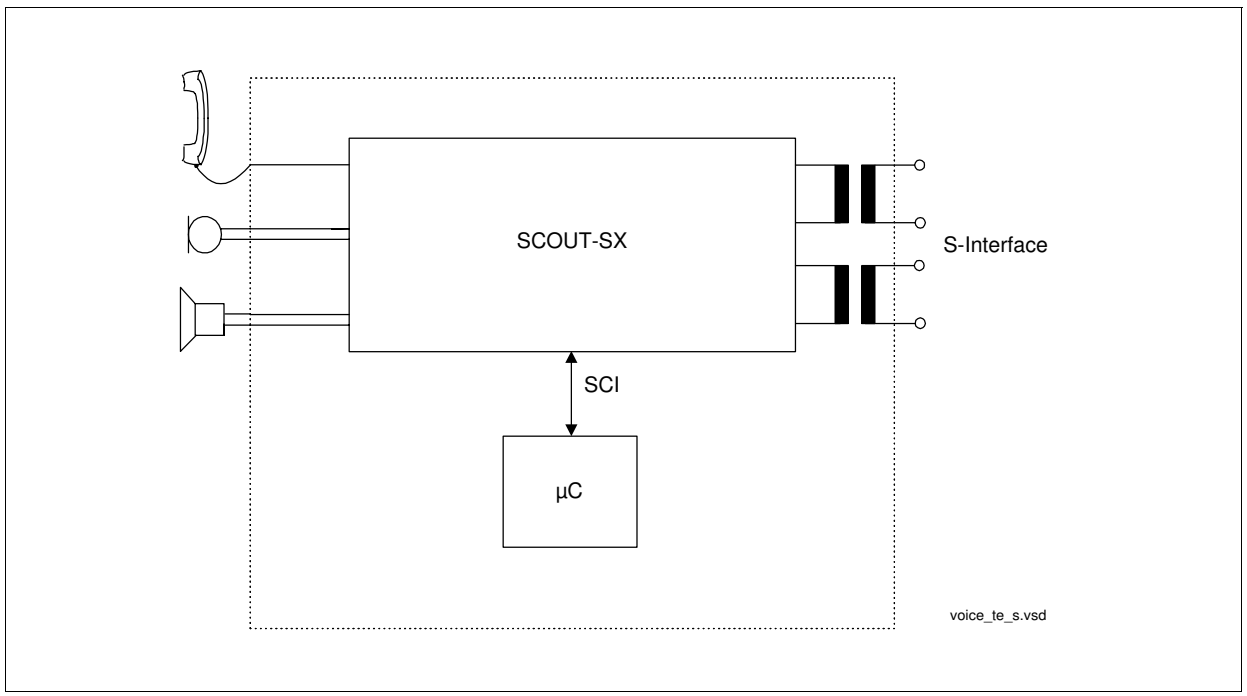


Figure 4
ISDN Voice Terminal with Speakerphone

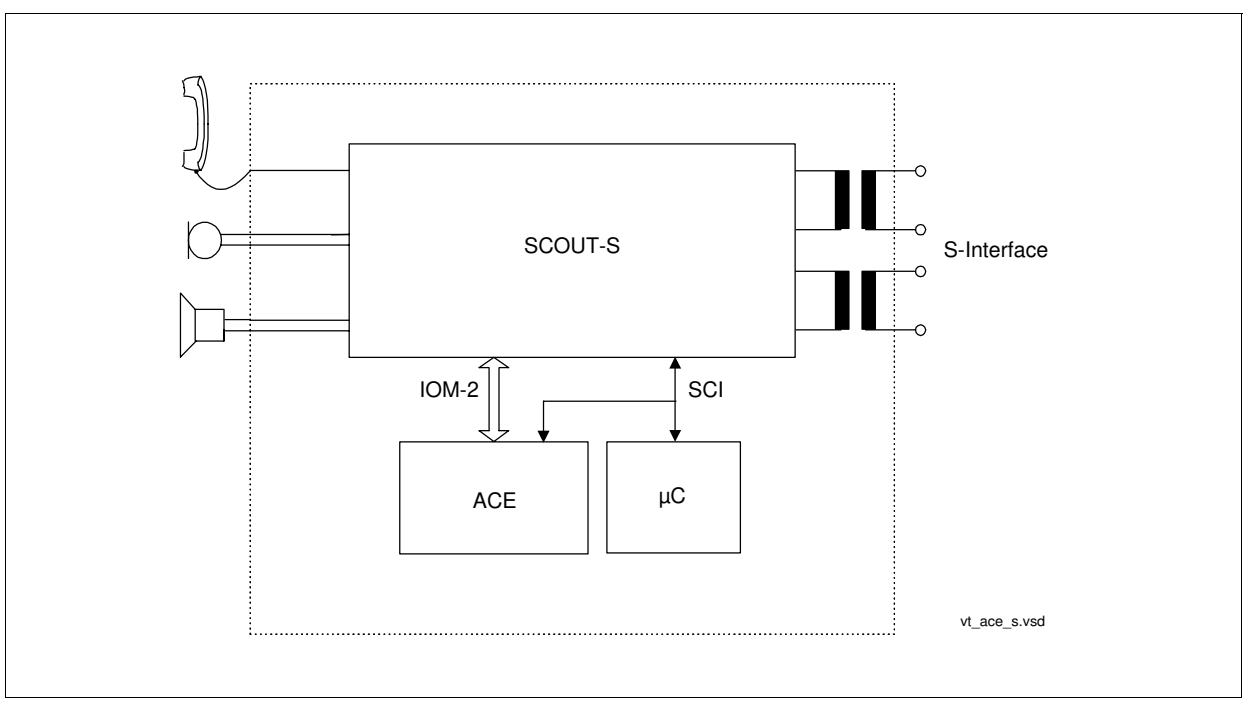


Figure 5
ISDN Voice Terminal as Featurephone with Acoustic Echo Cancellation