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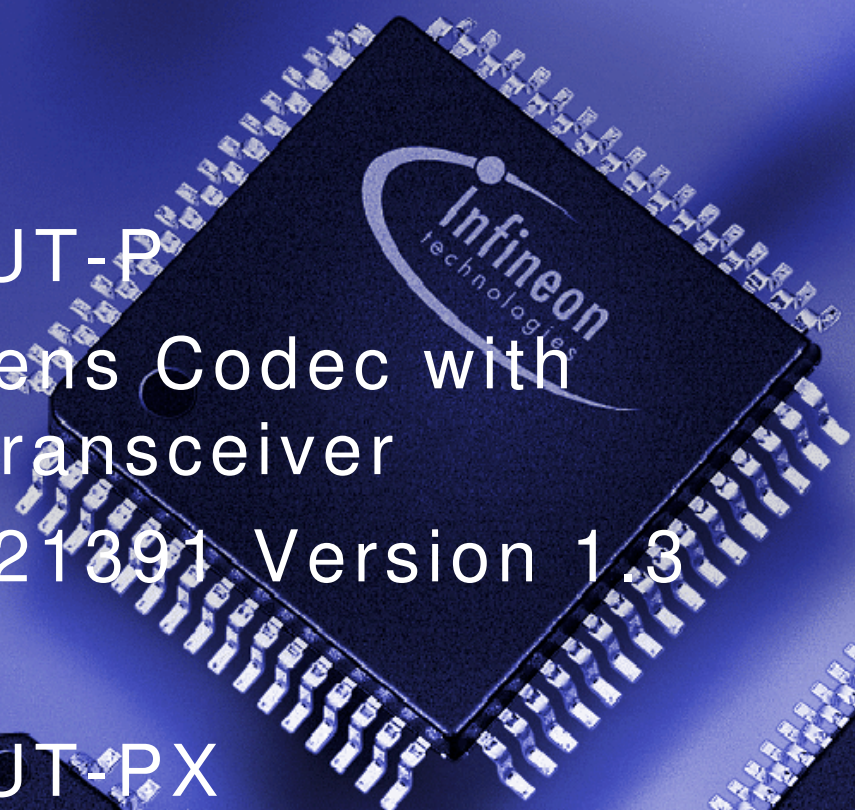
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SCOUT-P  
Siemens Codec with  
U<sub>PN</sub> Transceiver  
PSB 21391 Version 1.3



SCOUT-PX  
Siemens Codec with  
U<sub>PN</sub> Transceiver featuring  
Speakerphone functionality  
PSB 21393 Version 1.3

Wired  
Communications



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**PSB 21391**

**PSB 21393**

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Page	Subjects (major changes since last revision)
29	Figure with clock signals added
59	BCL=' 0' changed to BCL='1'
81	BCL changed from 'low' to 'high'
107	Note regarding AXI input added
143	Recommendation regarding CRAM programming modified
157 158	BCL is inverted compared to last description (DS1); figure added
163	' <i>Rising</i> ' BCL edge changed to ' <i>falling</i> ' edge
231	Figure 85 modified
233	Timings added
236	Power supply currents added

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## 1 Overview

The SCOUT-P or SCOUT-PX respectively integrates all necessary functions for the completion of a cost effective digital voice terminal solution.

**Please note: Throughout the whole document “SCOUT™” refers to “SCOUT™-P” and “SCOUT™-PX”**

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 SmartLink-P PSB 2197 (Subscriber Access Controller for U<sub>PN</sub> Terminals) or ISAC®-P TE PSB 2196 (ISDN Subscriber Access Controller for U<sub>PN</sub> Terminals in TE mode) respectively on a single chip.

The SCOUT-P is suited for the use in basic PBX 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-PX PSB 21393 is an extended SCOUT-P PSB 21391 which provides the speakerphone performance of the ARCOFI-SP PSB 2163.

The transceiver implements the subscriber access functions for a digital terminal to be connected to a two wire U<sub>PN</sub> 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, S/T-interface option, terminal repeater) by connecting other voice/data devices to the SCOUT.

A serial microcontroller interface (SCI) is supported. A clock signal and a reset input and output pin complete the microcontroller interface.

The SCOUT is a CMOS device offered in a P-MQFP-44 package and operates with a 3.3V or 5V supply.

**Comparison of the SCOUT with the two chip solution SmartLink -P and ARCOFI-BA; -SP**

	<b>SCOUT</b>	<b>SmartLink -P / ARCOFI</b>
Operating modes	TE	TE, TR, HDLC Cont.
Supply voltage	3.3V $\pm$ 5 % or 5V $\pm$ 5 %	5V $\pm$ 5 %
Technology	CMOS	CMOS, BICMOS
Package	P-MQFP-44	P-DSO-28 / P-DSO-28
Transceiver		
Transformer ratio for receiver and transmitter	1:1 (3.3V) or 2:1 (5V)	2:1 (5V)
Transceiver Output Driver	Slower slew rate compared with SmartLink by slowed down output drivers	
Test loops	Test loop2, 3	Test loop2, 3
Microcontroller Interface	Serial (SCI)	Serial (SCI)
Microcontroller clock	Provided ( 7.68, 3.84, 0.96MHz, disabled or 15.36, 7.68, 1.92 MHz, disabled if double clock rate selected)	Provided ( 7.68, 3.84, 1.92, 0.96MHz)
Register address space	256 byte (32 byte FIFO, 96 byte configuration, 128 byte CRAM)	4 controlreg., 2 statusreg., 4 byte FIFO / 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	SmartLink specific full duplex structure
Controller data access to IOM-2 timeslots	All timeslots; various possibilities of data access	Not provided
Data control and manipulation	Various possibilities of data control and data manipulation (enable/disable, shifting, looping, switching)	B-channel mute and loop back

	<b>SCOUT</b>	<b>SmartLink -P / ARCOFI</b>
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 or 1 or 2)	Not provided
C/I channels	CI0 (4bit), CI1 (4/6bit)	CI0 (4bit), CI1 (Status of 3bit)
Layer 1 state machine	Equivalent to SmartLink	
State machine 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- channel protocol
FIFO size	64 bytes per direction with programmable FIFO thresholds	2x4 bytes per direction
Undervoltage detection	Provided	Provided
Reset Sources	$\overline{\text{RST}}$ Input $\overline{\text{VDDDET}}$ Watchdog C/I Code Change $\overline{\text{EAW}}$ Pin Software Reset	$\overline{\text{RST}}$ Input $\overline{\text{VDDDET}}$ Watchdog
Pulse width output LCD contrast	Not provided	Provided
Codec		
Analog inputs	1 single ended, 2 differential	1 single ended, 2 differential
Band gap reference	Externally buffered	Internally buffered
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

	<b>SCOUT</b>	<b>SmartLink -P / ARCOFI</b>
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

# Siemens Codec with U<sub>PN</sub> Transceiver SCOUT-P, SCOUT-PX

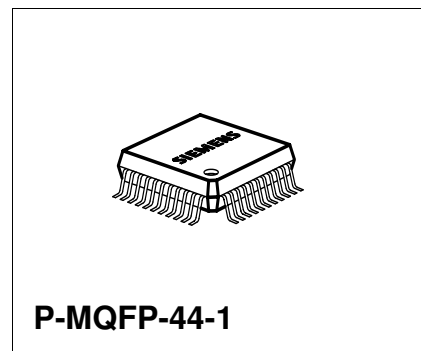
PSB 21391  
PSB 21393

Version 1.3

CMOS

## 1.1 Features

- 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 3.3 V or 5 V
- Monitor channel handler (master/slave)



- Sophisticated power management for restricted power mode
- Programmable microcontroller clock output and reset (input/output) pins
- Undervoltage detection and power-on reset generation
- Advanced CMOS technology

## Transceiver part

- Two wire U<sub>PN</sub> transceiver with 2B+D channels in half-bauded AMI coding. Fully compatible to U<sub>P0</sub> but for reduced loop length
- Conversion of the frame structure between the U<sub>PN</sub> interface and IOM-2
- Receive timing recovery
- Continuously adapted receive thresholds
- 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)

Type		Package
PSB 21391	SCOUT-P	P-MQFP-44-1
PSB 21393	SCOUT-PX	P-MQFP-44-1

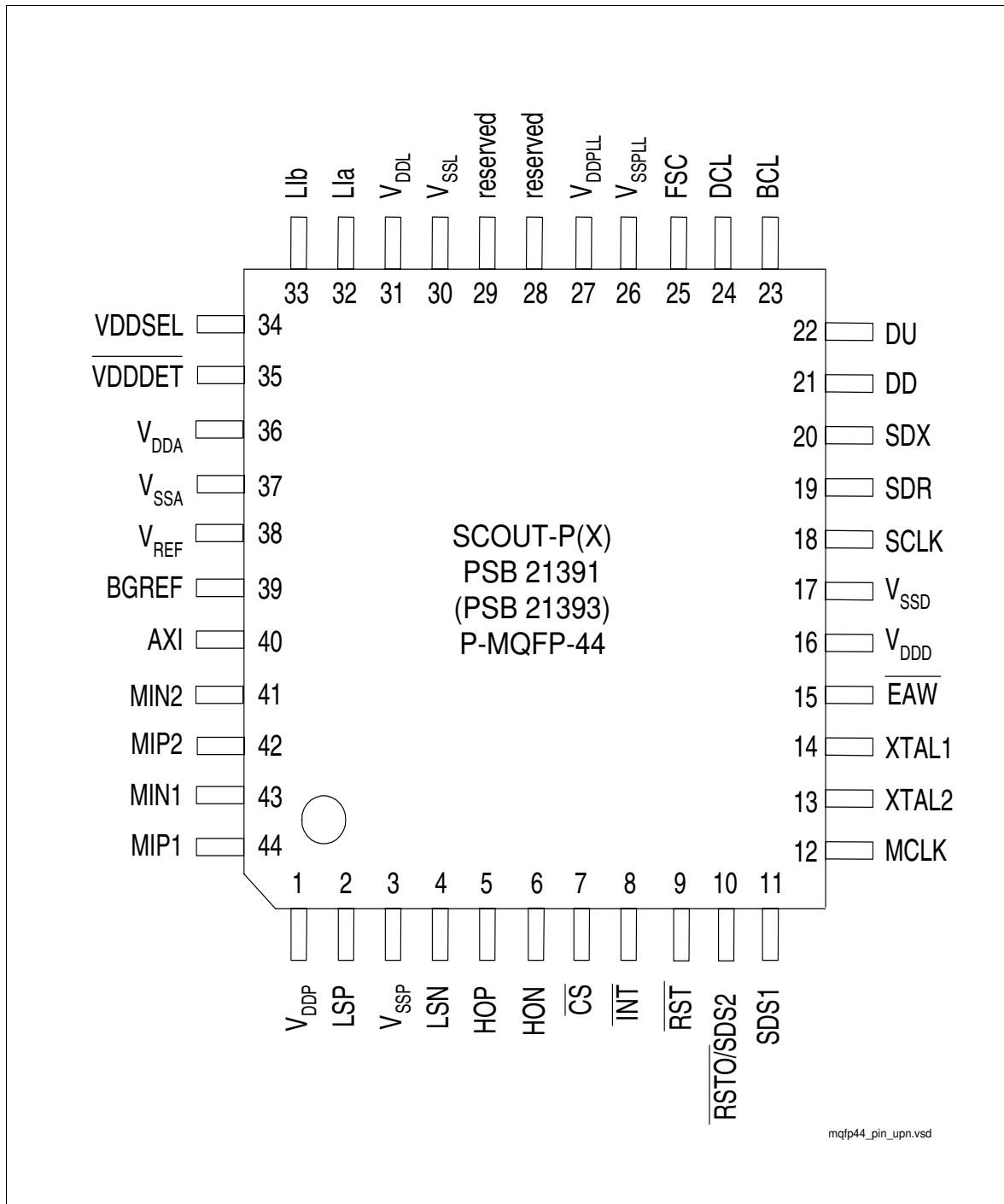


- FIFO buffer with 64 bytes per direction and programmable FIFO thresholds for efficient transfer of data packets
- D-channel access control
- Implementation of IOM-2 MONITOR and C/I-channel protocol to control peripheral devices
- Realization of layer 1 state machine in software possible
- Watchdog 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/ $\mu$ -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  $\Omega$ ) and a loudspeaker (50  $\Omega$  for 5V power supply, 25  $\Omega$  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-PX PSB 21393 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

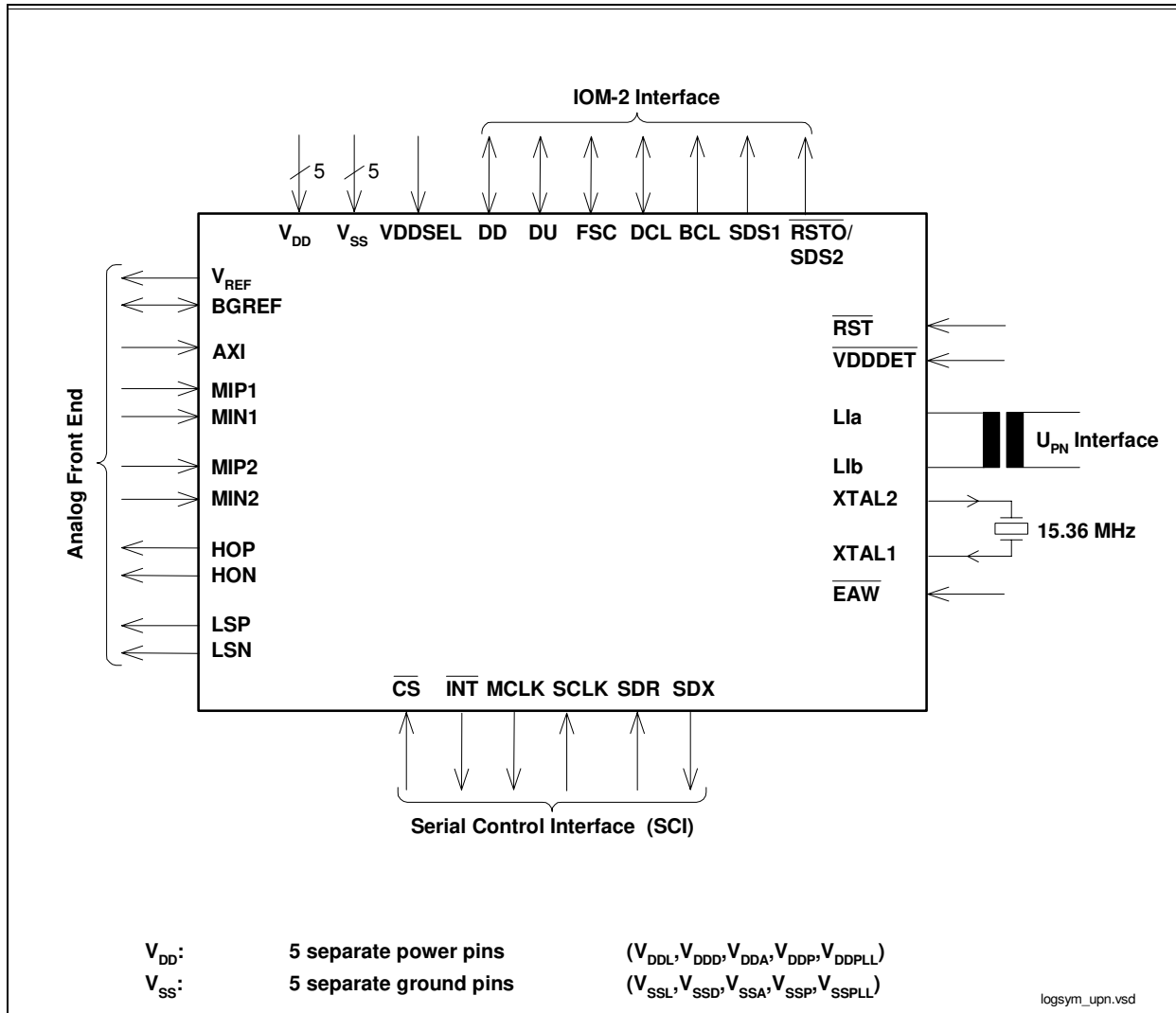
## 1.2 Pin Configuration



mfp44\_pin\_upn.vsd

**Figure 1**  
**Pin Configuration**

### 1.3 Logic Symbol



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

## 1.4 Pin Definitions and Function

Table 1

Pin No.	Symbol	Input (I) Output (O) Open Drain (OD)	Function
<b>Power supply (3.3 V or 5 V <math>\pm</math> 5 %)</b>			
31	$V_{DDL}$	–	Supply voltage for line driver
16	$V_{DDD}$	–	Supply voltage for digital parts
36	$V_{DDA}$	–	Supply voltage for analog parts
1	$V_{DDP}$	–	Supply voltage for loudspeaker
27	$V_{DDPLL}$	–	Supply voltage for internal PLL
30	$V_{SSL}$	–	Ground for line driver
17	$V_{SSD}$	–	Ground for digital parts
37	$V_{SSA}$	–	Ground for analog parts
3	$V_{SSP}$	–	Ground for loudspeaker
26	$V_{SSPLL}$	–	Ground for internal PLL
34	VDDSEL	I	VDD Selection '0': 3.3 V supply voltage '1': 5 V supply voltage
<b>IOM-2 Interface</b>			
21	DD	I/OD/O	Data Downstream
22	DU	I/OD/O	Data Upstream
25	FSC	I/O	Frame Synchronization Clock (8 kHz)
24	DCL	I/O	Data Clock (double clock, 1.536 MHz)
23	BCL	O	Bit Clock (768kHz)
11	SDS1	O	Programmable strobe signal or bit clock
10	$\overline{RSTO}$ / SDS2	OD O	Reset Output (active low) Strobe signal for each IOM <sup>®</sup> time slot and/or D channel indication (programmable)
<b>RESET</b>			
9	$\overline{RST}$	I	Reset (active low)
35	$\overline{VDDDET}$	I	VDD Detection enable (active low)

**Table 1**

Pin No.	Symbol	Input (I) Output (O) Open Drain (OD)	Function
			<b>Transceiver</b>
32	L1a	I/O	U <sub>PN</sub> transceiver Line Interface
33	L1b	I/O	
13	XTAL2	O/I	Oscillator output
14	XTAL1	I	Oscillator or 15.36 MHz input
15	$\overline{\text{EAW}}$	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 <b>chapter 7.1.10</b> ) In addition an interrupt request is generated at pin $\overline{\text{INT}}$ .
			<b>Microcontroller Interface</b>
7	$\overline{\text{CS}}$	I	Chip Select (active low)
8	$\overline{\text{INT}}$	OD	Interrupt request (active low)
12	MCLK	O	Microcontroller Clock
18	SCLK	I	Clock for the serial control interface
19	SDR	I	Serial Data Receive
20	SDX	OD/O	Serial Data Transmit

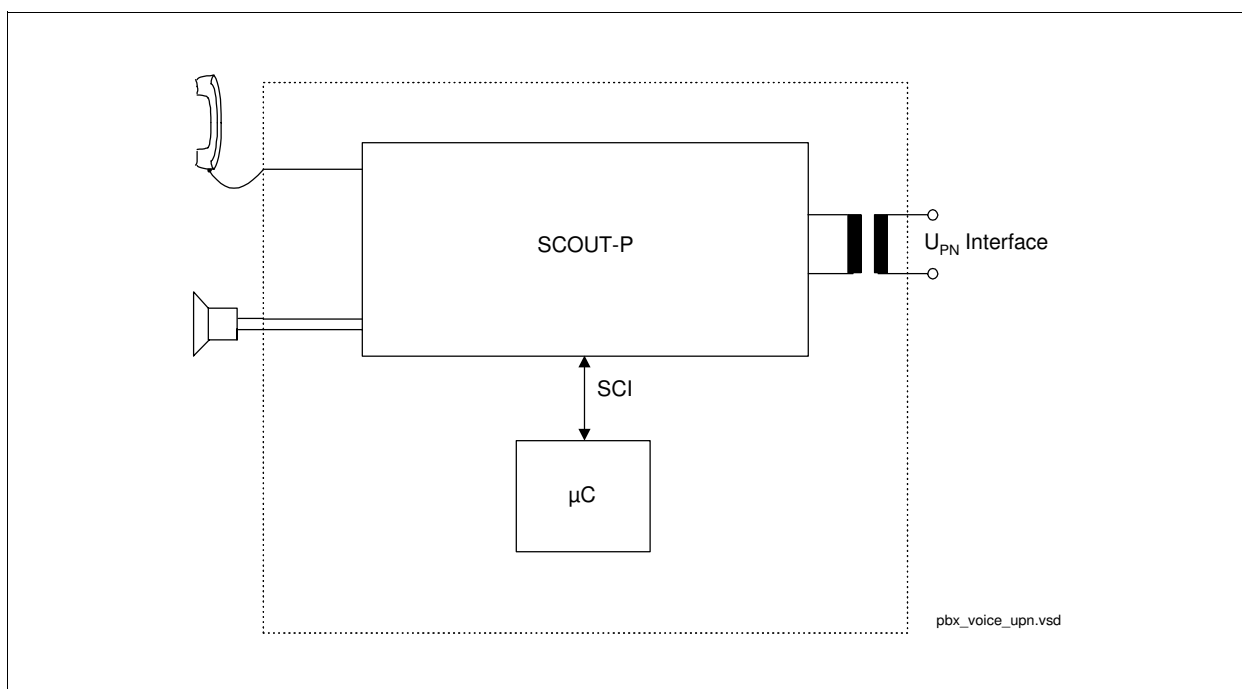
**Table 1**

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

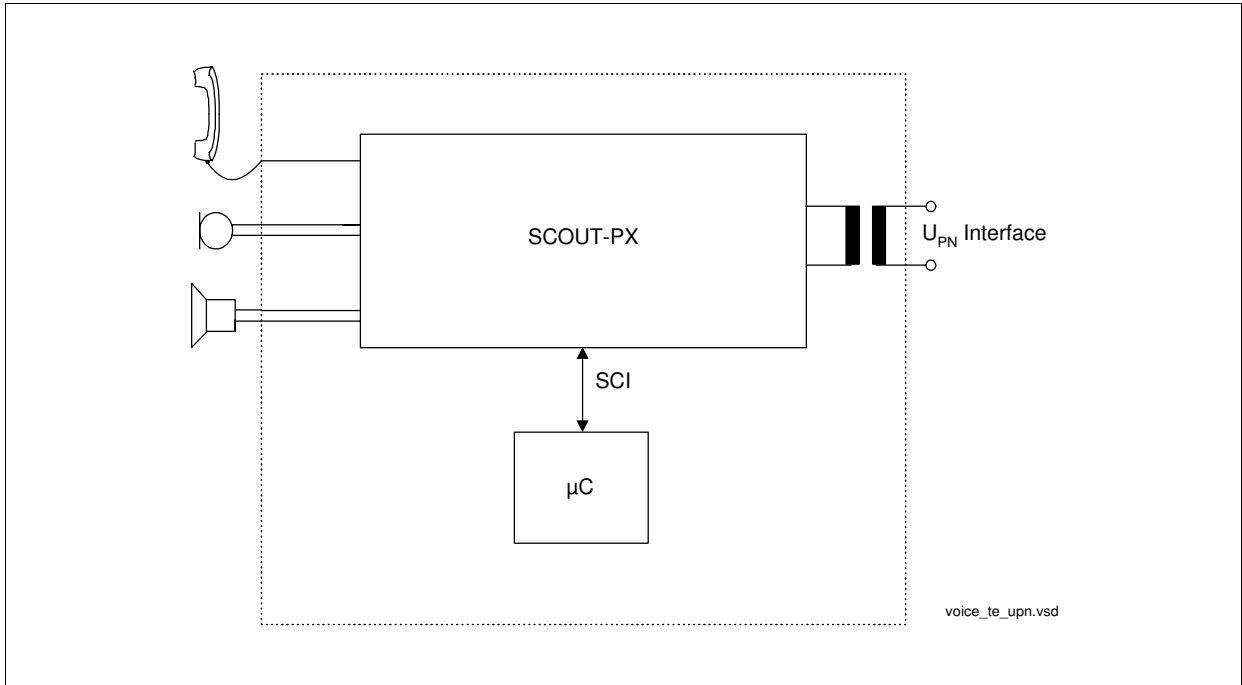
## 1.5 Typical Applications

The SCOUT can be used in a variety of applications like

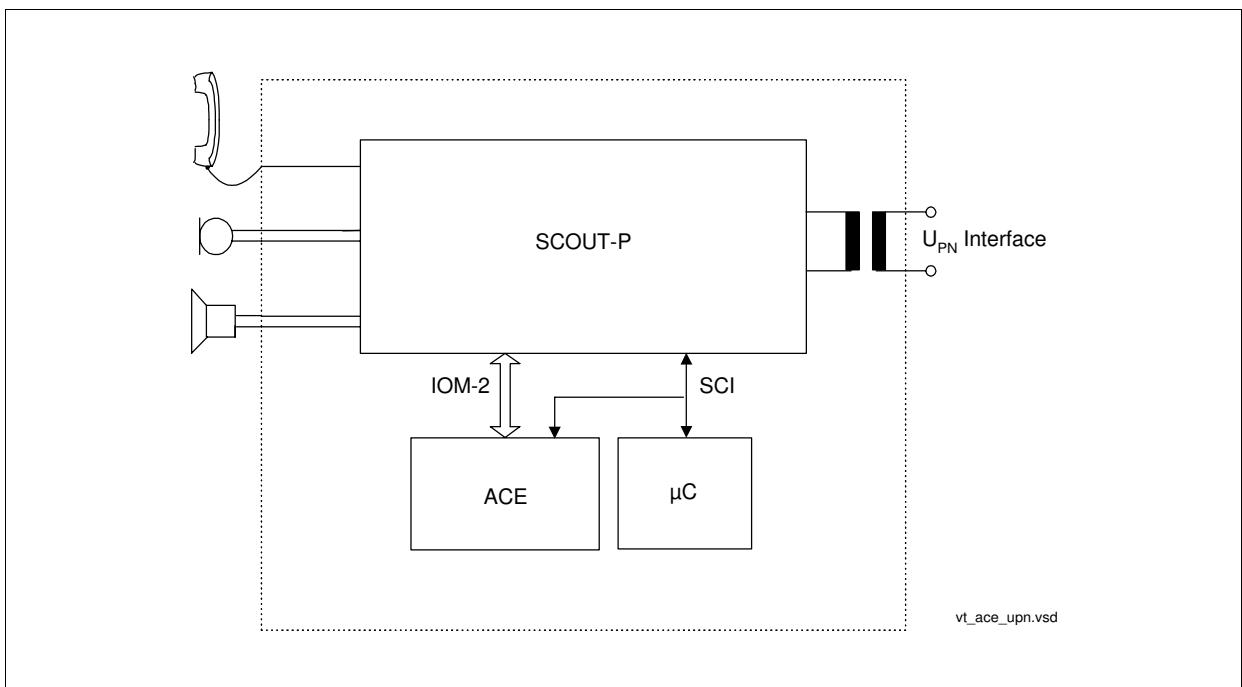
- PBX voice terminal (**Figure 3**)
- PBX voice terminal with speakerphone (**Figure 4**)
- PBX voice terminal as featurephone with acoustic echo cancellation (**Figure 5**)
- PBX voice terminal with tip/ring extension (**Figure 6**)
- U<sub>PN</sub>-terminal repeater (**Figure 7**)
- U<sub>PN</sub>-terminal with S/T-interface option (**Figure 8**)



**Figure 3**  
**PBX Voice Terminal**

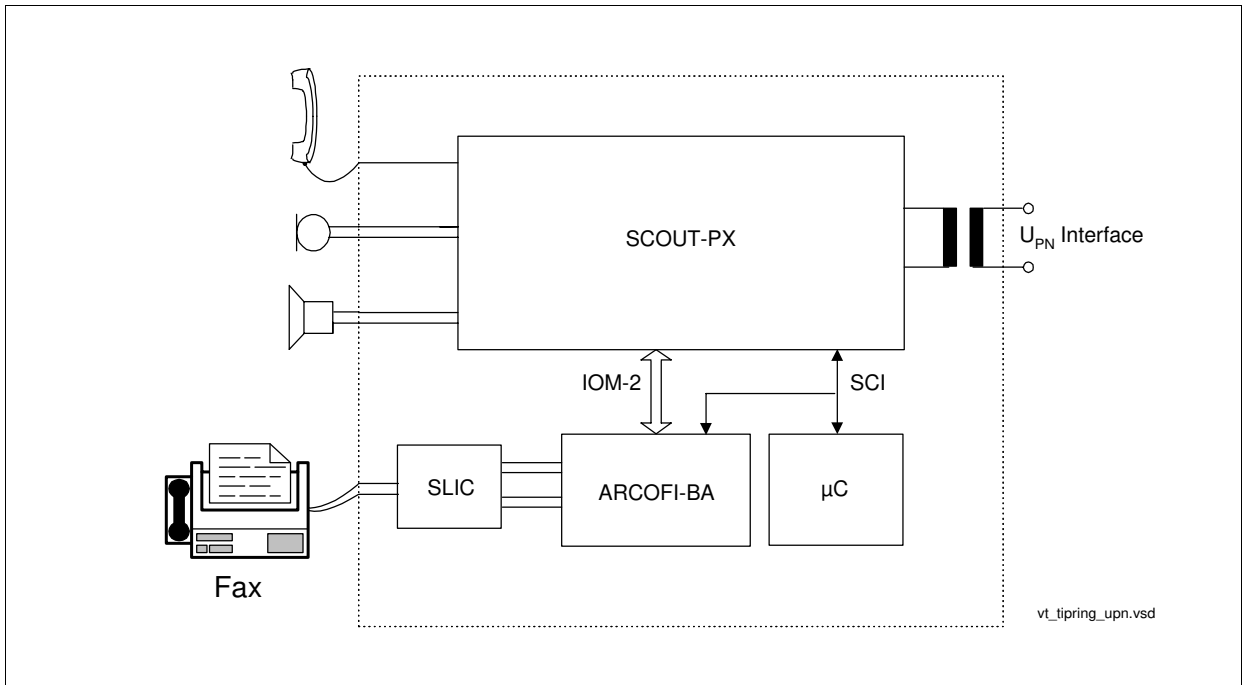


**Figure 4**  
**PBX Voice Terminal with Speakerphone**

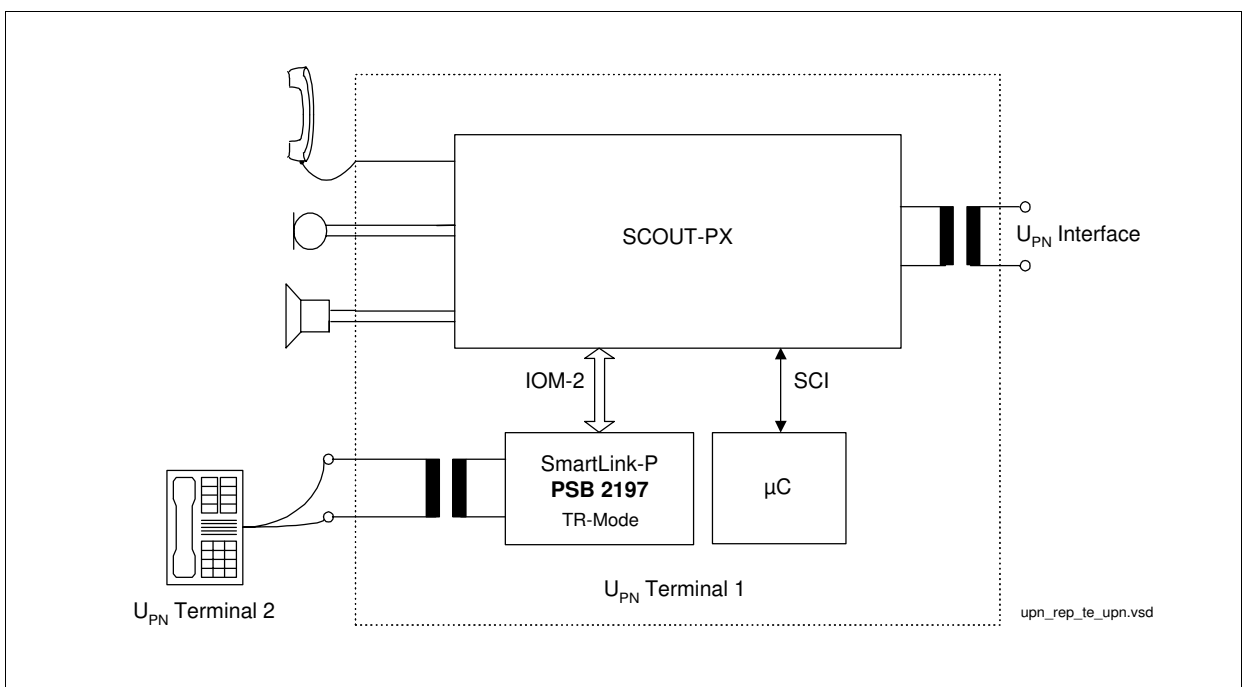


**Figure 5**  
**PBX Voice Terminal as Featurephone with Acoustic Echo Cancellation**

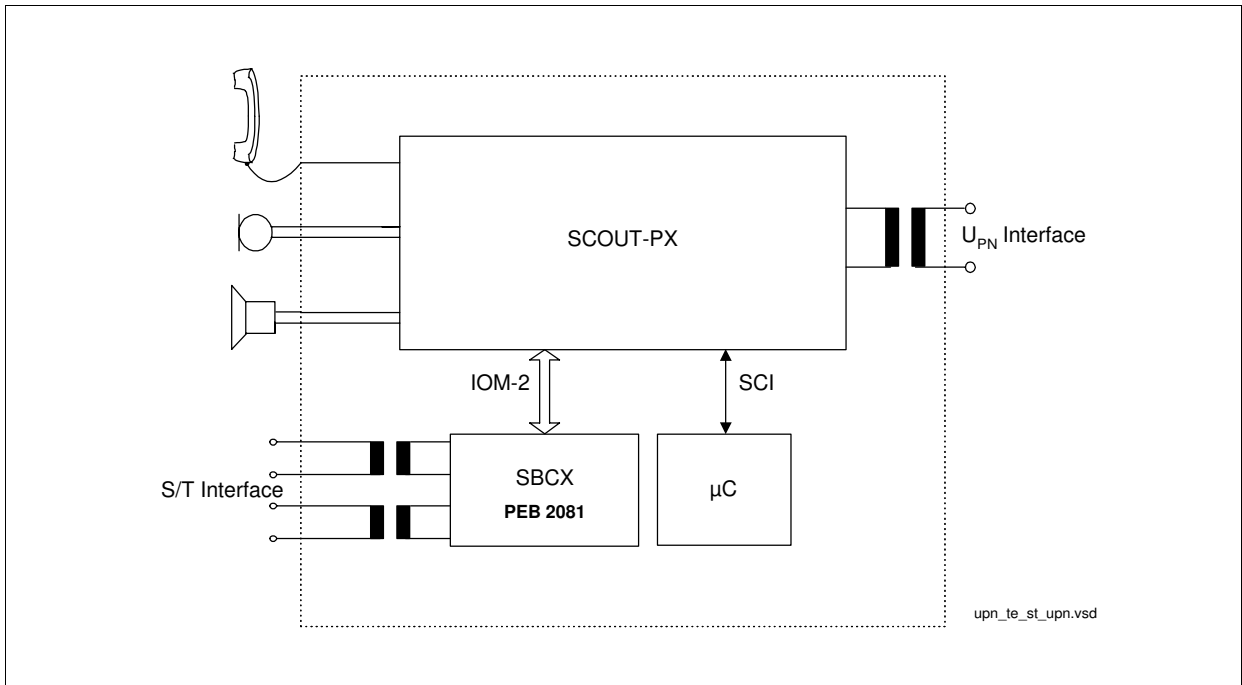




**Figure 6**  
**PBX Voice Terminal with Tip/Ring Extension**



**Figure 7**  
**U<sub>PN</sub>-Terminal Repeater**



**Figure 8**  
**U<sub>PN</sub>-Terminal with S/T- Interface Option**