Austria Mikro Systeme International AG

Single Chip 2-Wire Intercom CMOS Integrated Circuit

Key Features

- Line/speech circuit and signalling on one 14 pin CMOS chip
- Only 2 wires needed for power supply, signalling and speech
- Soft clipping to avoid harsh distortion
- Fully integrated 2/4 wire conversion
- Side tone cancellation
- Low noise
- Signalling with FSK modem
- Low standby power consumption allows parallel operation of up to 25 terminals on a bus pair with central supply
- Parallel operation of up to 70 terminals if supplied locally
- Controllable via simple µC interface
- Very few external components

Application

Entrance telephone system, intercom and data transmission, alarm systems, toy phone

General Description

The AS2507 is a CMOS integrated circuit that contains all the functions needed to build a 2-wire intercom network.

The device incorporates 2/4-wire conversion (hybrid), soft clipping for high speech quality, FSK modem and a simple interface to a microcontroller.

The signalling mode is selectable between FSK modulation and burst mode.

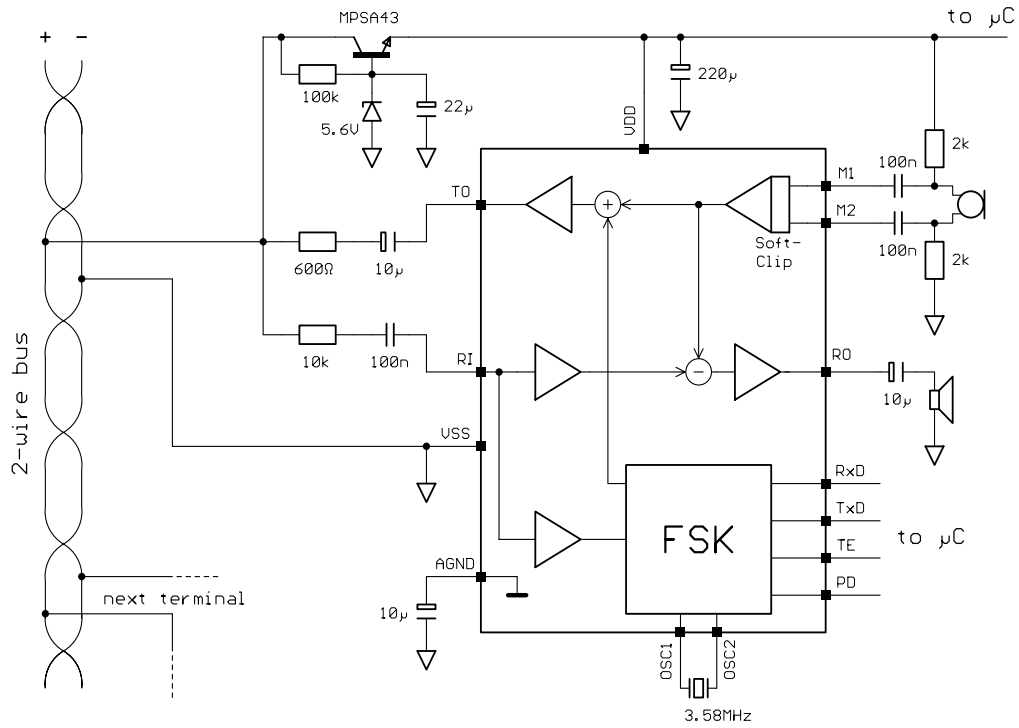
The low standby current (typ. 2 mA) allows several devices to listen to the 2-wire line.

The speech circuit is designed for compatibility with commonly used handset (150Ω earpiece and electret microphone) with receive gain of -6 dB and transmit gain of 32 dB (relative to line).

Package

Available in 14 pin DIP and 16 pin SOIC

Block Diagram



Pin description

Pin # DIP 14	Pin # SO 16	Symbol	Function
7	7	M1	**M**icrophone Input **1** Differential input for the microphone (electret)
6	6	M2	**M**icrophone Input **2** Differential input for the microphone (electret)
2	2	RI	**R**eceive **I**nput Input for ac-separated receive signal
4	4	RO	**R**eceive **O**utput to Handset Output for driving a dynamic earpiece with an impedance from 150Ω to 300Ω
14	15 16	VDD	**V**oltage **D**rain **D**rain Positive Power Supply
9	9 10	VSS	**V**oltage **S**ource **S**ource Negative Power Supply
8	8	AGND	**A**nalogue **G**round Signal ground for the internal amplifiers
11	12	OSC1	**O**scillator Output **1** Output to ceramic resonator 3.58MHz.
12	13	OSC2	**O**scillator Input **2** Input for ceramic resonator 3.58MHz.
5	5	PD	**P**ower **D**own Input Active high, i.e. a high level on this pin will power down the analogue signal path.
10	11	RxD	**R**eceive **D**ata Output Output of the FSK demodulator
13	14	TxD	**T**ransmit **D**ata Input Input for the FSK modulator
1	1	TE	**T**ransmit **E**nable Input for enabling transmit data

Functional Description

The AS2507 is a CMOS integrated circuit that incorporates a speech circuit and a FSK modem. It is intended to be used as line-powered interface on a 2-wire intercom bus.

Standby Condition

During standby operation (PD=High) only the FSK demodulator is active to provide the companion microcontroller with all signalling information on the 2-wire bus. The low power consumption (typical 2mA) and a high input and output impedance in standby mode allow the parallel operation of many terminals on each bus pair.

2/4-Wire Conversion

The AS2507 has a built-in side tone cancellation circuit. The transmit signal is attenuated by 6 dB over the 600Ω resistor (ac impedance) and subtracted from the receive signal at the receive input (RI). This configuration allows the selection of the required ac impedance and yet maintaining a good side tone cancellation.

AC Impedance

The ac impedance is determined by an external resistor at the TO output (typical 600Ω).

Transmit Path

The gain of the transmit path from the microphone inputs (M1/M2) to the transmit output (TO) is set to 32 dB. The soft clip level is set to $0.5V_{PEAK}$ at TO. In standby the output impedance is 60kΩ.

Receive Path

The gain of the receive path from the receive input (RI) to the receive output (RO) is set to -6dB. The receive input is internally biased to A_{GND} with a 500kΩ resistor.

FSK Modulator

Two signalling modes are provided, namely FSK and burst mode. The signalling mode and the signalling can be controlled by a microcontroller using the TE and TXD inputs as follows:

TE	TXD	MODE
0	0	IDLE, no transmission
0	1	TEST, for testing only
1	0	SPACE ("0") 18.645 kHz
1	1	MARK ("1") 22.375 kHz

FSK Demodulator

Also the demodulator provides two modes for detection as follows:

Signal on line	RXD
IDLE, no transmission	1
SPACE ("0") 18.645 kHz	0
MARK ("1") 22.375 kHz	1

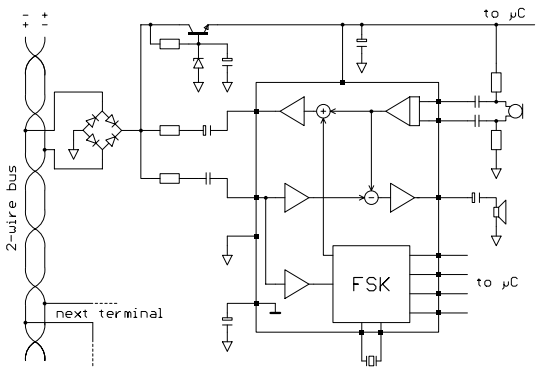
The demodulator consists out of a bandpass filter to attenuate interfering speech signals and a period counter. The RxD output is updated after each valid period or a counter overflow.

Transmission Protocol

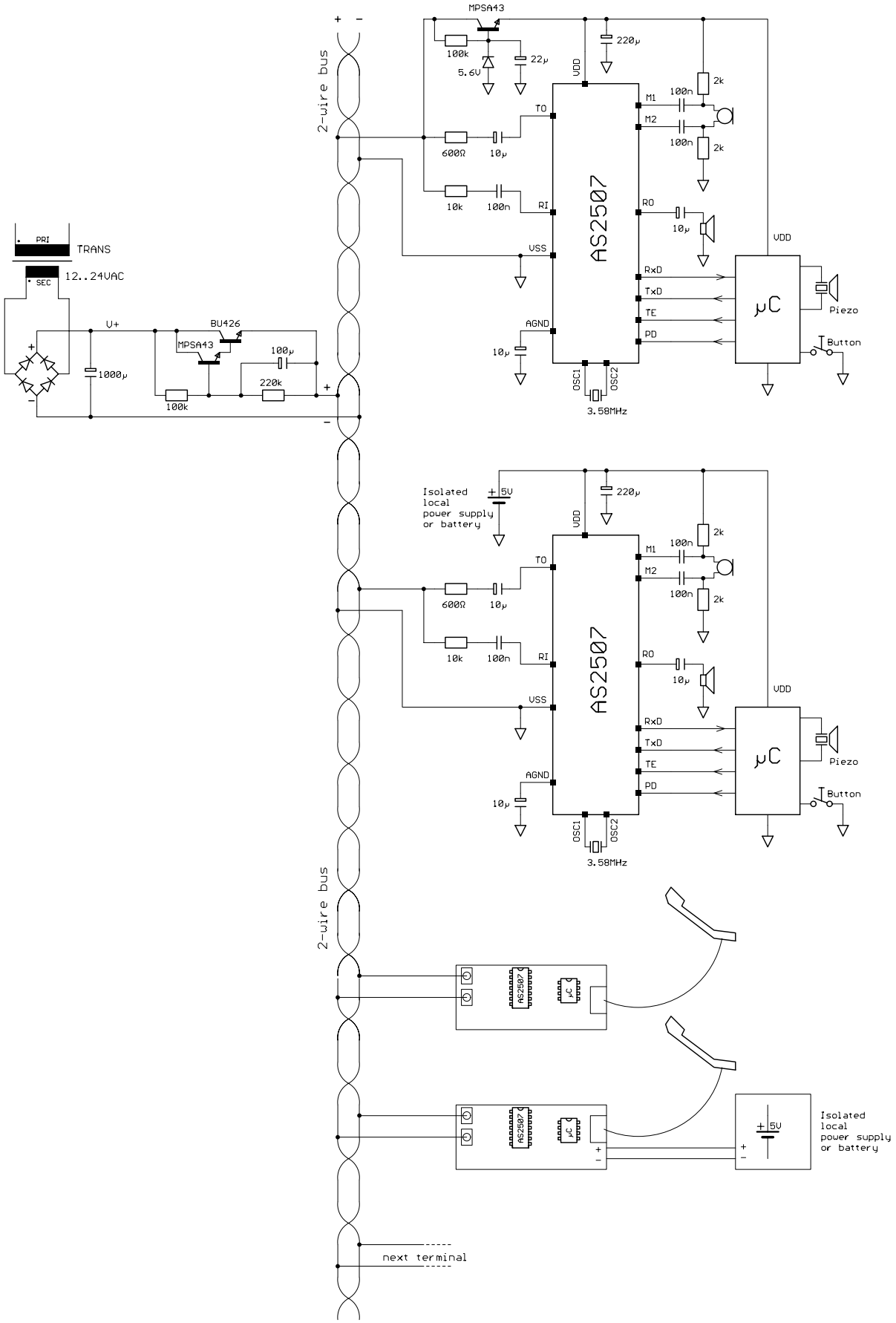
In order to assure a safe data transmission, data framing is recommended. Each frame should consist out of a preamble (e.g. FF_{hex}), a header (e.g. AA_{hex}), data bytes and checksum.

Independence of bus polarity

Centrally supplied terminals can be connected to the 2-wire bus independent from polarity. In this case a rectifier bridge, known from telephony, is recommended since the DC-supply current will bias the diodes.



Typical 2-Wire Intercom Application



Electrical characteristics

Electrical charateristics are measured with the Test Circuit application. Typical mean values will not be tested.

Absolute maximum ratings

Positive Supply Voltage	-0.3V <= V_{DD} <= 7V
Input Current	± 25mA
Analogue Input Voltage	-0.3V <= V_{in} <= V_{DD}+0.3V
Digital Input Voltage	-0.3V <= V_{in} <= V_{DD}+0.3V
Electrostatic Discharge (HBM 1.5kΩ-100pF)	± 1000V
Storage Temperature	-65°C to +125°C

Recommended operating conditions

Supply Voltage (V_{DD})	5V ±10%
Oscillator Frequency	3.58 MHz
Operating Temperature	-10°C to +60°C

DC characteristics

V_{DD}=5V, f=1kHz, unless other specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
I_{DDS}	Supply Current	Standby Mode PD=High, V_{DD}=2.5V		2	3	mA
I_{DDO}	Supply Current	Operating Mode PD=Low, V_{DD}=2.5V		5	6	mA
V_{IL}	Digital Input Voltage LOW		V_{SS}		0.1 V_{DD}	V
V_{IH}	Digital Input Voltage HIGH		0.9 V_{DD}		V_{DD}	V

Transmit characteristics

V_{DD}=5V, f=1kHz, unless other specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
A_{TX}	Transmit Gain M1/M2 —> TO	V_{TO}=0.25V_{RMS}	+30.0	+32.0	+34.0	dB
THD	Distortion	V_{TO}=0.25V_{RMS}			2	%
V_{NO}	Noise Output Voltage TO	T_{AMP}=25°C			-60	dBmp
V_{AGC1}	Soft Clip Level M1/M2 —> TO at TO			0.5		V_P
Z_{out-TO}	Output Impedance with PD=High at TO	PD=High T_{AMP}=25°C	60			kΩ

Receive characteristics

V_{DD}=5V, f=1kHz, unless other specified

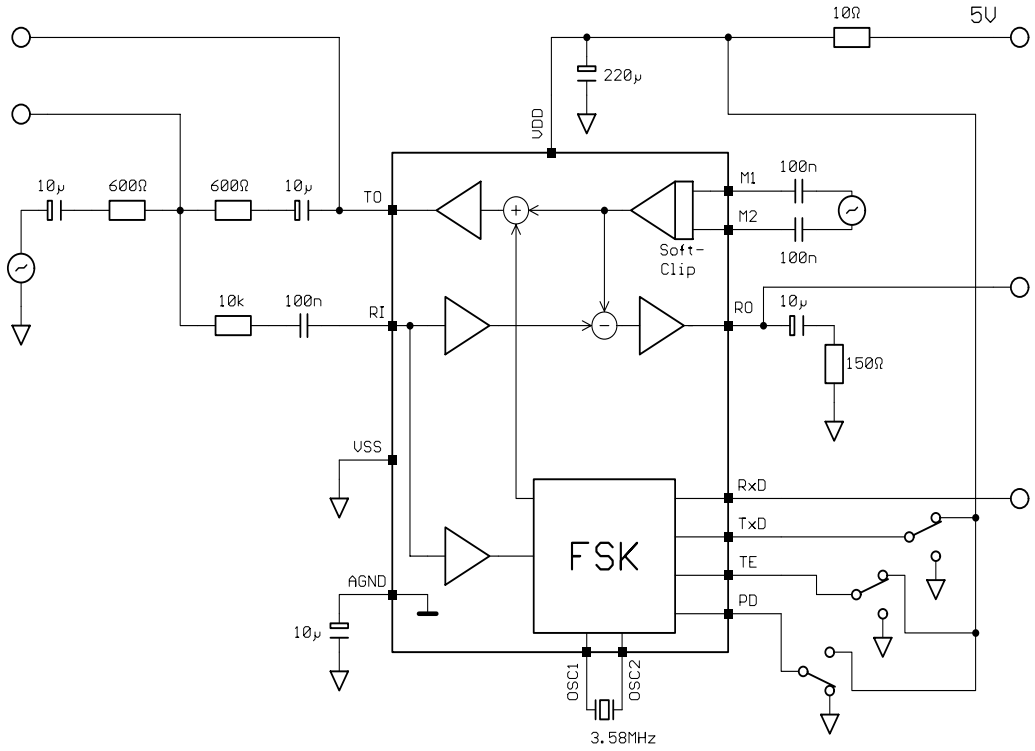
Symbol	Parameter	Conditions	Min	Typ	Max	Units
A_{RX}	Receive Gain RI —> RO	V_{RI}=0.25V_{RMS}	-8.0	-6.0	-4.0	dB
THD	Distortion	V_{RI}=0.25V_{RMS}			2	%
V_{NO}	Noise Output Voltage RO	T_{AMP}=25°C			-60	dBmp
ST	Sidetone	V_{RI}=0.25V_{RMS}		24		dB
Z_{In-RI}	Input Impedance RI			500		kΩ

FSK characteristics

V_{DD}=5V, f=1kHz, unless other specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
f_{MARK}	MARK Frequency	TE=High TxD=High f_{OSC}=3.579545MHz		22375		Hz
f_{SPACE}	SPACE Frequency	TE=High TxD=Low f_{OSC}=3.579545MHz		18645		Hz
$f_{\Delta MARK}$	Valid input frequency range MARK	TE=Low		22375 ±447		Hz
$f_{\Delta SPACE}$	Valid input frequency range SPACE	TE=Low		18645 ±372		Hz
V_{RImin}	Minimum Receive Input Voltage Detection Level	TE=Low			100	mVp
V_{TO}	Tone Output Level	TE=High	600			mVp
A_{VB}	Attenuation at 4kHz Input Bandpass Filter			35		dB

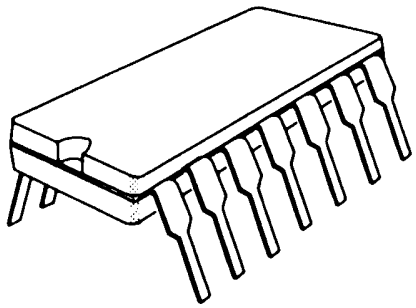
Test circuit



Packaging

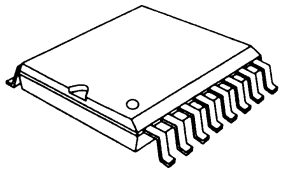
The device is available in the packages outlined below (not to scale). For exact mechanical package dimensions please see AMSAG packaging information.

14-pin plastic DIP (suffix P)



Max. Body Length 20.19mm / 795mil
Max. Body Width 7.11mm / 280mil
Pitch 2.54mm / 100mil

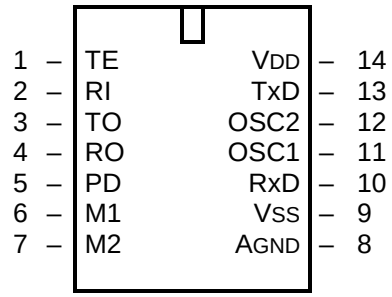
16-pin plastic SOICw (suffix T)



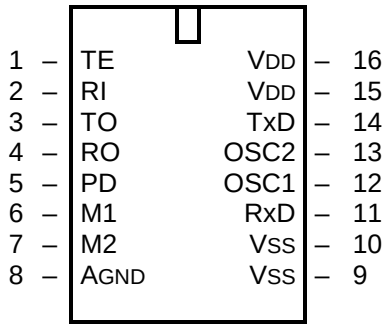
Max. Body Length 10.5mm / 414mil
Max. Body Width 7.6mm / 300mil
Pitch 1.27mm / 50mil

Pin-out

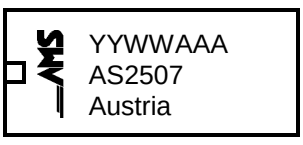
DIP14 (suffix P)



SO16w (suffix T)



Marking



YY year of production
WW calendar week of production
AAA AMSAG assembly ID

Ordering information

Number	Package	Description
AS2507 P	DIP14	plastic dual inline package - 14 leads (suffix P)
AS2507 T	SO16w	plastic small outline package - 16 leads (suffix T)

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