



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.

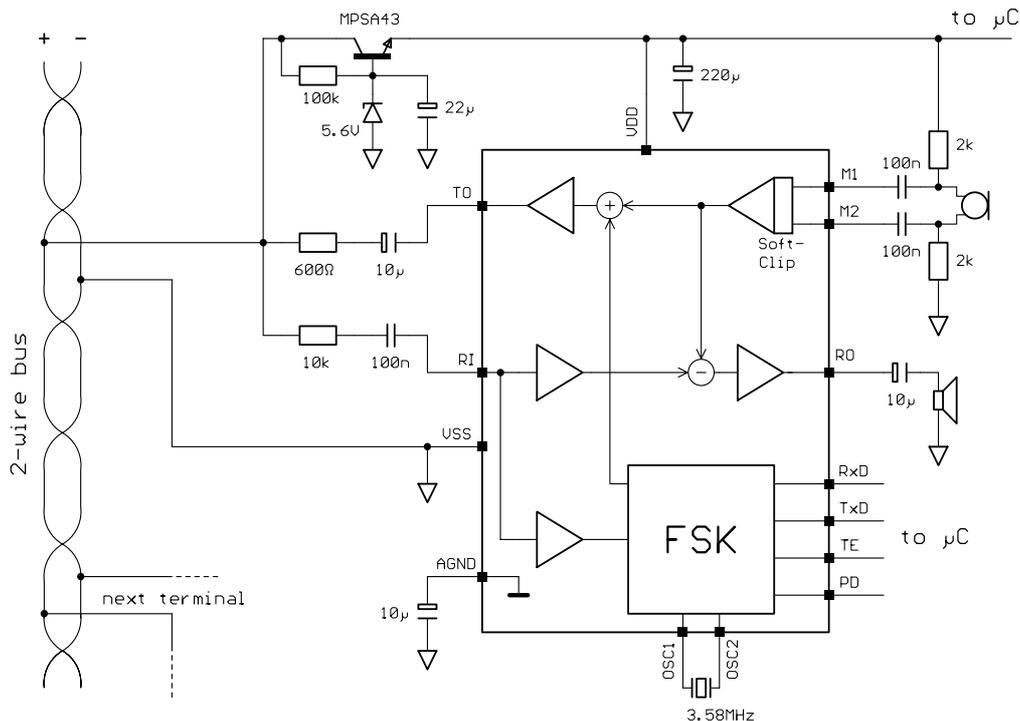
The low standby current (typ. 2 mA) allows several devices to listen to the 2-wire line.

The speech circuit is designed for compatibility with commonly used handset (150 Ω 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 ecieve I ntput Input for ac-separated receive signal
4	4	RO	R ecieve 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 ecieve 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 AGND 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

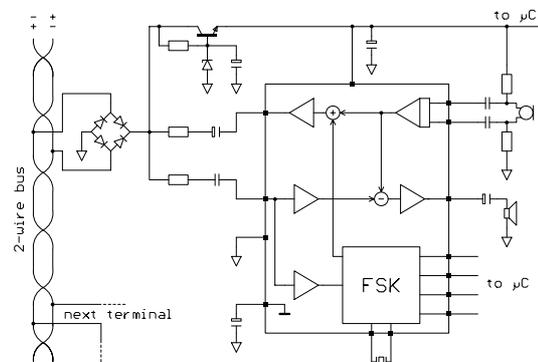
The demodulator consists out of a bandpass filter to attenuate interfering speech signals and a period counter. The RXD output is updated after each valid period or a counter overflow.

Transmission Protocol

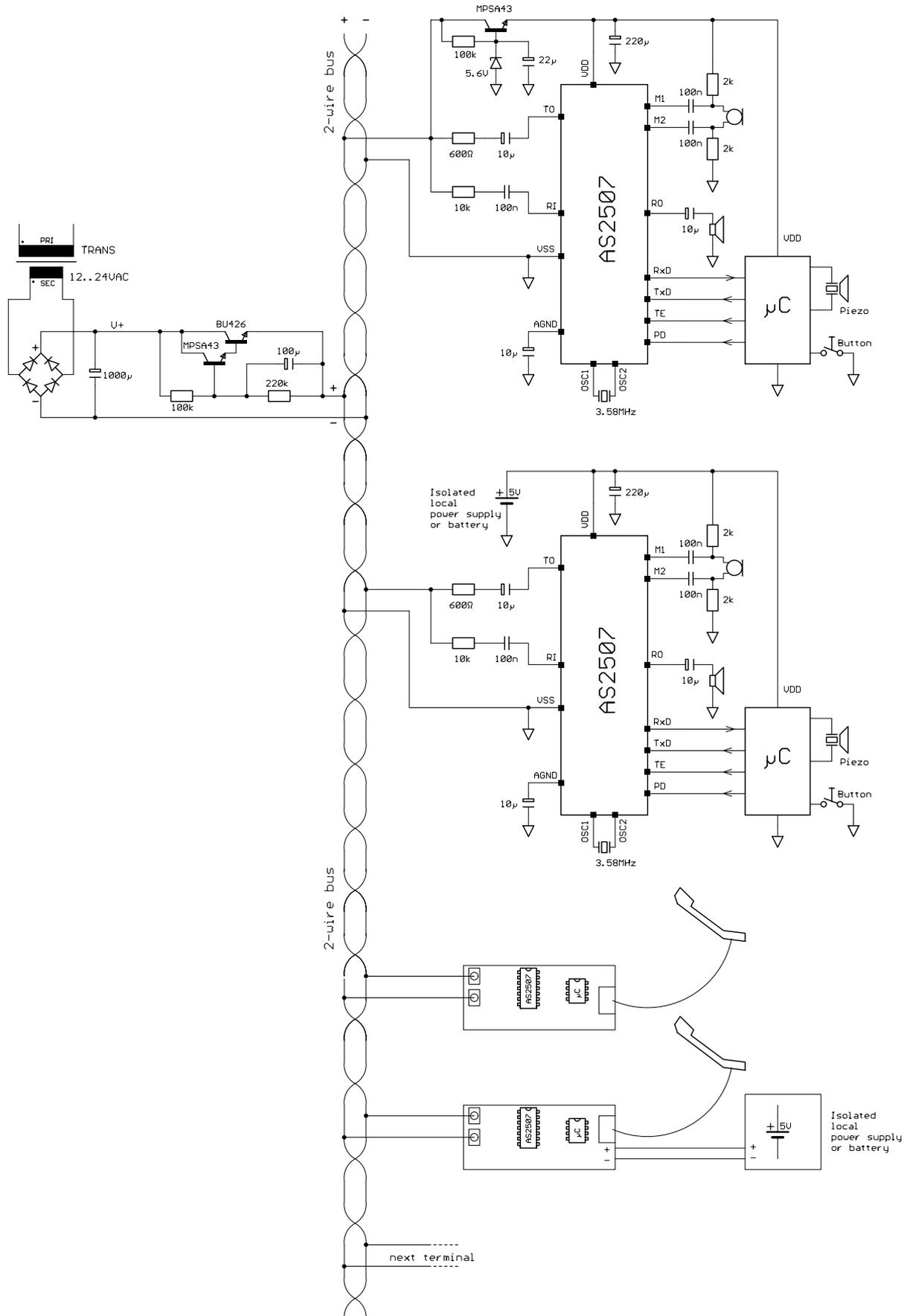
In order to assure a safe data transmission, data framing is recommended. Each frame should consist out of a preamble (e.g. FF_{hex}), a header (e.g. AA_{hex}), data bytes and checksum.

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 characteristics 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 _{DD} S	Supply Current	Standby Mode PD=High, V _{DD} =2.5V		2	3	mA
I _{DD} O	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

VDD=5V, f=1kHz, unless other specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
ATX	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	%
VNO	Noise Output Voltage TO	T _{AMP} =25°C			-60	dBmp
VAGC1	Soft Clip Level M1/M2 → TO at TO			0.5		VP
Z _{out-TO}	Output Impedance with PD=High at TO	PD=High T _{AMP} =25°C	60			kΩ

Receive characteristics

VDD=5V, f=1kHz, unless other specified

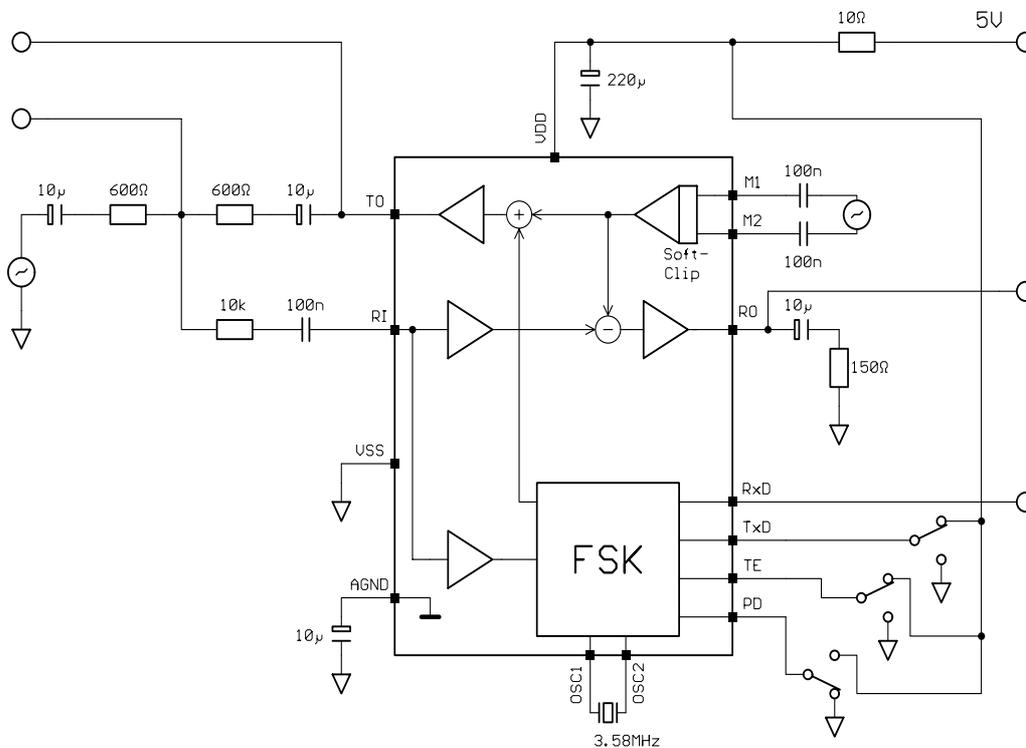
Symbol	Parameter	Conditions	Min	Typ	Max	Units
ARX	Receive Gain RI → RO	V _{RI} =0.25V _{RMS}	-8.0	-6.0	-4.0	dB
THD	Distortion	V _{RI} =0.25V _{RMS}			2	%
VNO	Noise Output Voltage RO	T _{AMP} =25°C			-60	dBmp
ST	Sidetone	V _{RI} =0.25V _{RMS}		24		dB
Z _{In-RI}	Input Impedance RI			500		kΩ

FSK characteristics

VDD=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 _{ΔMARK}	Valid input frequency range MARK	TE=Low		22375 ±447		Hz
f _{ΔSPACE}	Valid input frequency range SPACE	TE=Low		18645 ±372		Hz
VR _{Imin}	Minimum Receive Input Voltage Detection Level	TE=Low			100	mVp
V _{TO}	Tone Output Level	TE=High	600			mVp
AVB	Attenuation at 4kHz Input Bandpass Filter			35		dB

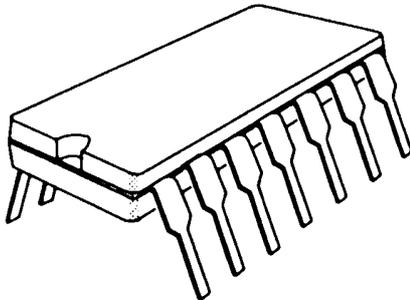
Test circuit



Packaging

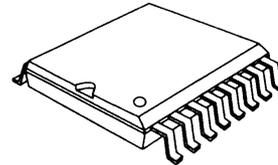
The device is available in the packages outlined below (not to scale). For exact mechanical package dimensions please see AMS_{AG} packaging information.

14-pin plastic DIP (suffix P)



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

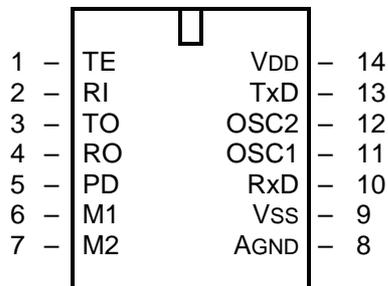
16-pin plastic SOICw (suffix T)



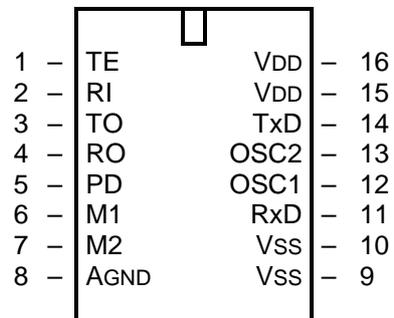
Max. Body Length 10.5mm / 414mil
 Max. Body Width 7.6mm / 300mil
 Pitch 1.27mm / 50mil

Pin-out

DIP14 (suffix P)



SO16w (suffix T)



Marking



YY year of production
 WW calendar week of production
 AAA AMS_{AG} 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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Headquarters

Austria Mikro Systeme International Int. AG

Schloß Premstätten
8141 Unterpremstätten, Austria-Europe
Tel: +43 (0)3136 500-0
Fax: +43 (0)3136 52501, 53650
email: info@vertical-global.com
<http://www.vertical-global.com>

France

124 Avenue de Paris
F-94300 Vincennes
Tel: +33 (0)1 4374 0090
Fax: +33 (0)1 4374 2098

Germany (south)

Stefan-George-Ring 19
D-81929 München
Tel: +49 (0)89 993 558-0
Fax: +49 (0)89 993 558-66

Germany (nord)

Am Seestern 8
D-40547 Düsseldorf
Tel: +49 (0)211 536 02-0
Fax: +49 (0)211 536 02-50

Hong Kong

21/F., 1 Des Voeux Road West
Sheung Wan, Hong Kong
Tel: +852 2524 2738
Fax: +852 2868 4155

Italy

Piazzale Lugano 9
I-20158 Milano
Tel: +39 (0)2 3932 1022
Fax: +39 (0)2 3932 3087

Spain

Parc Tecnològic del Vallès
E-08290 Cerdanyola/Barcelona
Tel: +34 (0)93 582 4470
Fax: +34 (0)93 582 4471

Sweden (Scandinavia)

Sjöängsvägen 7
S-19272 Sollentuna
Stockholm
Tel: +46 (0)8 7549 395
Fax: +46 (0)8 7544 544

United Kingdom

Coliseum Business Centre
Watchmoor Park
Camberley, Surrey
England GU15 3YL
Tel: +44 (0)1276 233 99
Fax: +44 (0)1276 293 53

USA

Suite 460
20863 Stevens Creek Blvd.
Cupertino, CA 95014
Tel: +1 408 865 1217
Fax: +1 408 865 1219

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