μC-Controlled Speech and Ringer Circuit

Description

The μC-controlled telephone circuit U4037B-N is a linear integrated circuit for use in telephone sets. It contains the speech circuit, tone-ringer interface, sidetone equivalent and ear-protection rectifiers. The circuit is line powered and contains all components necessary for amplification of signals and adaptation to the line.

Features

- DC characteristic adjustable
- Receive gain adjustable
- Symmetrical input of microphone amplifier
- Anti-clipping in transmit direction
- Automatic line-loss compensation
- Symmetrical output of earpiece amplifier
- Built-in ear protection
- DTMF and MUTE input
- Adjustable sidetone suppression independent of sending and receiving amplification
- Power down
- Tone-ringer interface
- 2-bit D/A for volume control
- Supply voltages for all functional blocks of a subscriber set
- Operation possible from 8-mA line currents

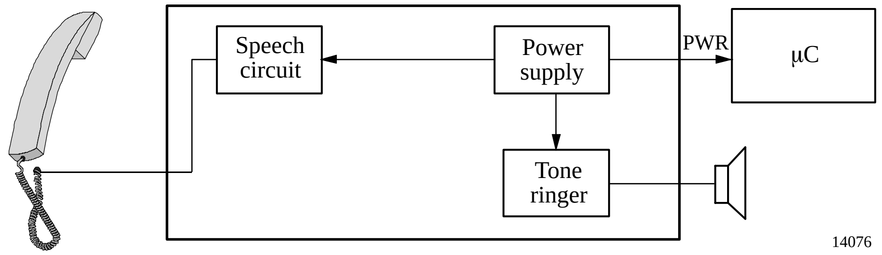
Benefits

- Complete system integration of analog signal processing on one chip
- Very few external components

Applications

Telephone sets

Block Diagram



Ordering Information

Type	Package	Remarks
U4037B-NFL	SO24	
U4037B-NFLG3	SO24	Taped and reeled

Pin Description

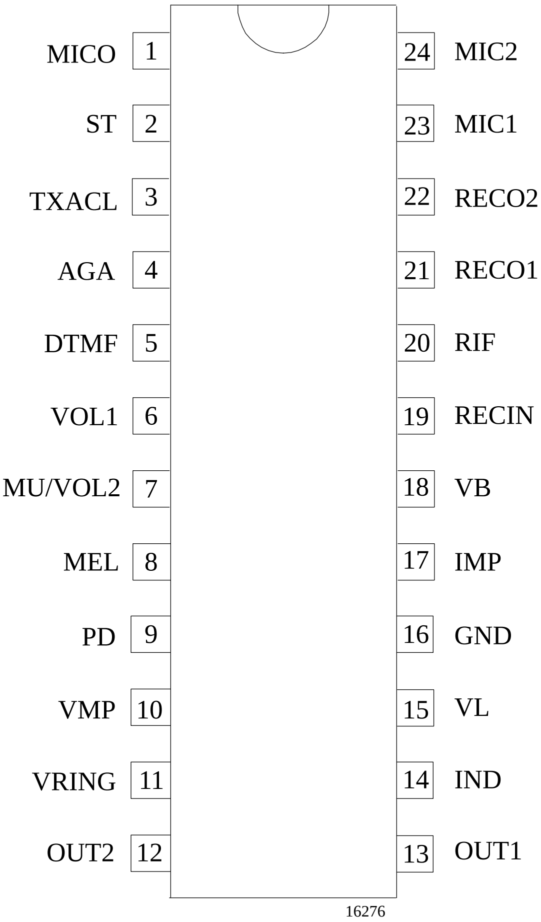


Figure 1. Pinning

Pin	Symbol	Function
1	MICO	Output of microphone preamplifier
2	ST	Sidetone reduction input input resistance is approx. 25 kΩ.
3	TXACL	Time constant of anti-clipping in transmit path
4	AGA	Automatic gain adjustment with line current, a resistor connected from this pin to GND sets the starting point maximum gain change: 6 dB.
5	DTMF	Input for DTMF signals
6	VOL1	2-bit volume adjustment for tone ringer
7	MU/ VOL2	1. 2-bit volume adjustment for tone ringer 2. Mute of microphone amplifier: – Speech condition, input MU/VOL2 low – DTMF condition input MU/VOL2 high DTMF signal at Pin 5 is fed to the line. A part of the DTMF-signal is passed to the receiving amplifier as a confidence signal during dialing.
8	MEL	Input for melody
9	PD	Active high input for reducing the current consumption of the circuit, simultaneously V_L is shorted by an internal switch
10	VMP	Regulated supply voltage 3.4 V for peripheral circuits (esp. micropro-cessors), minimum output current: 2 mA (ringing) 4 mA (speech mode)
11	VRING	Input for ringersupply voltage
12	OUT2	Differential output for tone ringer
13	OUT1	
14	IND	The internal equivalent inductance of the circuit is proportional to the value of the capacitor at this pin, a resistor connected to ground may be used to reduce the DC line voltage
15	VL	Line voltage
16	GND	Reference point for DC- and AC-output signals
17	IMP	Impedance adjustment
18	VB	Unregulated supply voltage for peripheral circuits (voice switch), limited to typically 7 V
19	RECIN	Receiver input
20	RIF	Pin for adjustment of frequency response and gain of receiver
21	RECO1	Output of receiving amplifier
22	RECO2	Inverting output of receiving ampl.
23	MIC1	Inverting input of microphone ampl.
24	MIC2	Non-inverting input of microphone amplifier

Detailed Block Diagram with External Components

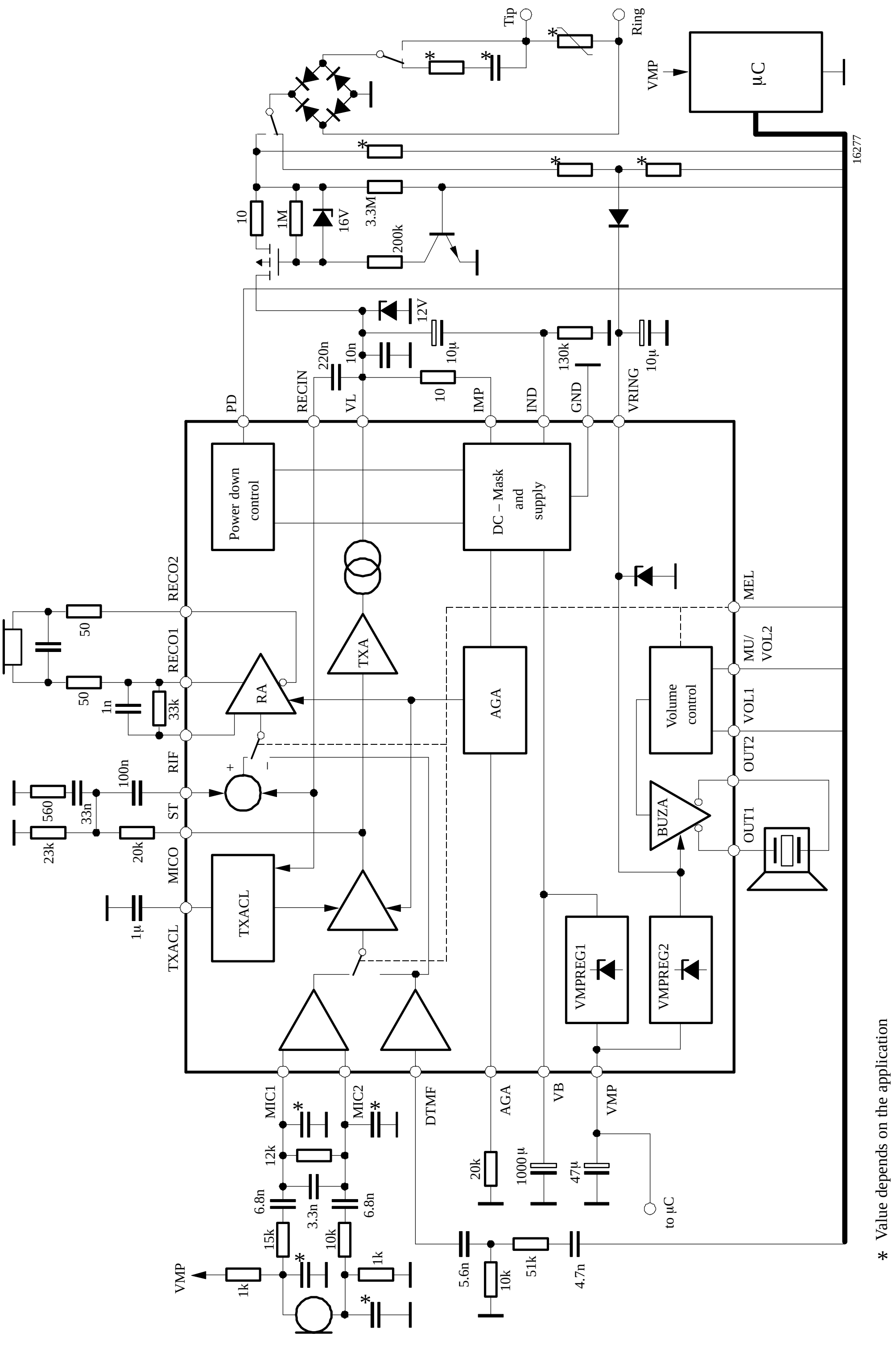


Figure 2. Application circuit

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Line current	I_L	140	mA
DC line voltage	V_L	12	V
Maximum input current	I_{RING}	15	mA
Junction temperature	T_j	125	°C
Ambient temperature	T_{amb}	–25 to +75	°C
Storage temperature	T_{stg}	–55 to +150	°C
Total power dissipation, T_{amb} = 60°C	P_{tot}	520	W

Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient SO24	R_{thJA}	75	K/W

Electrical Characteristics

f = 1 kHz, 0 dBm = 775 mV_{rms}, I_{MP} = 2 mA, T_{amb} = 25°C, Z_{ear} = 68 nF + 100 Ω, Z_M = 68 nF, unless otherwise specified

Parameters	Test Conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
DC characteristics						
DC voltage drop over circuit	I_L = 2 mA I_L = 14 mA I_L = 60 mA I_L = 100 mA	V_L	4.6 8.8	2.4 5.0 7.5 9.4	5.4 10.0	V
Transmission amplifier, I_L = 14 mA, V_{MIC} = 2 mV, unless otherwise specified						
Transmitting amplification		G_T	47	48	49	dB
Frequency response	$I_L \geq$ 14 mA, f = 300 to 3400 Hz	ΔG_T			± 0.5	dB
Gain change with current	I_L = 14 to 100 mA	ΔG_T			± 0.5	dB
Gain deviation	T_{amb} = –10 to +60 °C	ΔG_T			± 0.5	dB
CMRR of microphone amplifier		CMRR	60	80		dB
Input resistance of MIC amplifier		R_i		50		kΩ
Distortion at line	I_L > 14 mA V_L = 700 mV_{rms}	d_t			2	%
Maximum output voltage	I_L > 19 mA, d < 5% V_{mic} = 10 mV CTXA = 1 µF	V_{Lmax}	1.8	3	4.2	dBm
Noise at line psophometrically weighted	I_L > 14 mA G_T = 48 dB	no		–80	–72	dBmp
Anti-clipping attack time release time	CTXA = 1 µF each 3 dB overdrive			0.5 9		ms
Line-loss compensation	I_L = 100 mA, RAGA = 20 kΩ	ΔG_{TI}	–6.4	–5.8	–5.2	dB
Mute suppression	$I_L \geq$ 14 mA	G_{TM}	60	80		dB

Electrical Characteristics (continued)

Parameters	Test Conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Receiving amplifier, I_L = 14 mA, unless otherwise specified, V_{GEN} = 300 mV						
Receiving amplification		G_R			12	dB
Adjustment range		G_R	–8		12	dB
Amplification of DTMF signal from DTMF IN to RECO 1, 2	$I_L \geq$ 14 mA, V_{DTMF} = 8 mV	G_{RM}	14		20	dB
Frequency response	I_L > 14 mA, f = 300 to 3400 Hz	ΔG_{RF}			± 0.5	dB
Gain change with current	I_L = 14 to 100 mA	ΔG_R			± 0.5	dB
Gain deviation	T_{amb} = –10 to +60°C	ΔG_R			± 0.5	dB
Ear protection differential	$I_L \geq$ 14 mA V_{GEN} = 11 V_{rms}	EP			2.2	V_{rms}
MUTE suppression	$I_L \geq$ 14 mA	ΔG_R	60			dB
Output voltage d ≤ 2% differential	I_L = 14 mA Z_{ear} = 68 nF + 100 Ω		0.775			V_{rms}
Output voltage d ≤ 5% differential	I_L = 14 mA Z_{ear} = 68 nF + 100 Ω RDC = infinite		1.2			V_{rms}
Receiving noise psophometrically weighted	Z_{ear} = 68 nF + 100 Ω $I_L \geq$ 14 mA	ni			–64	dBmp
Output resistance	each output against GND	Ro			40	Ω
Line-loss compensation	RAGA = 20 kΩ, I_L = 100 mA	ΔG_{RI}	–7.0	–6.0	–5.0	dB
Gain at low operating current	I_L = 8 mA, I_{MP} = 1 mA I_M = 300 µA V_{GEN} = 100 mV RDC = 68 kΩ	G_R	10.5	12	13.5	dB
DTMF-amplifier test conditions: IMP = 2 mA						
DTMF amplification	I_L = 15 mA, VDTMF = 8 mV Mute active	G_D	40.7	41.7	42.7	dB
Gain deviaton	I_L = 15 mA T_{amb} = –10 to +60 °C	G_D			± 0.5	dB
Input resistance	RGT = 15 kΩ	R_i	15	20	25	kΩ
Distortion of DTMF signal	$I_L \geq$ 15 mA, V_L = 0 dBm	d_D			2	%
Gain deviation with current	I_L = 15 to 100 mA	ΔGD			± 0.5	dB
Supply voltages, V_{mic} = 10 mV, T_{amb} = – 10 to + 60°C						
V_{MP}	I_L = 8 mA, RDC = 130 kΩ I_{MP} = 1 mA	V_{MP}	3.1	3.4	3.6	V
Ringing part, I_{VMP} = 1 mA						
Maximum output voltage	V_{RING} = 20 V	V_{out}		25		V_{pp}
Input impedance in speech mode	f = 300 Hz to 3400 Hz I_L > 15 mA, $V_{TIP/RING}$ = 1.5 V_{rms}	R_i	50			kΩ

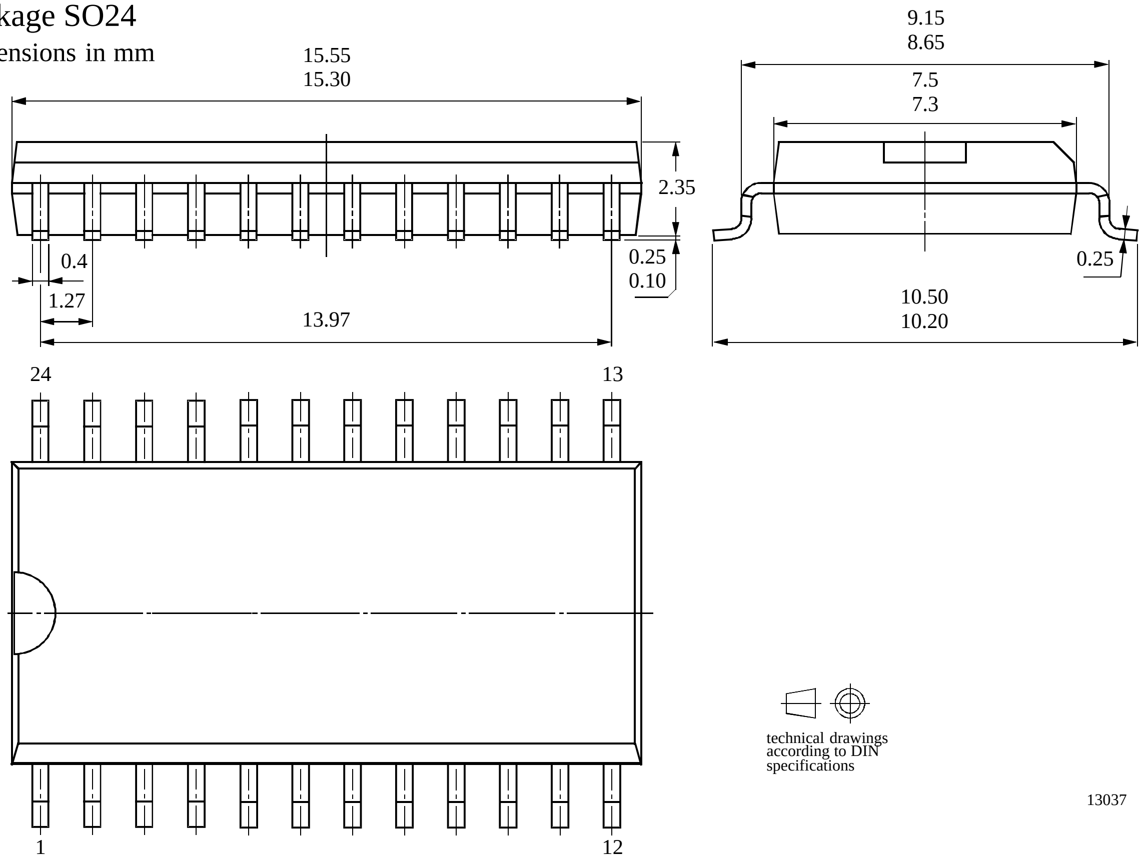
Electrical Characteristics (continued)

Parameters	Test Conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Ringing part: Ringer output voltage	f = 25 Hz, C_{BUZ} = 50 nF $V_{TIP/RING}$ = 63 V_{rms}	V_{out}	28			V_{pp}
	$V_{TIP/RING}$ = 45 V_{rms}	V_{out}		18		V_{pp}
	$V_{TIP/RING}$ = 25 V_{rms}	V_{out}	7			V_{pp}
Volume adjustment steps		11 10 01 00		0 –6 –12 –24		dB
Zener diode voltage	I_{RING} = 25 mA	$V_{RINGmax}$		28.5		V
PD Input						
PD input current	PD active, I_L > 14 mA V_{PD} = V_{MP}	Ipd		9		uA
Input voltage	PD = active PD = inactive	V_{pd} V_{pd}	2		0.3	V
Voltage drop at V_L	PD = active, I_L = 14 mA I_L = 100 mA,	V_L V_L		1.5 1.9		V
Internal current comsumption at V_B	V_B = 3.5 V, PD = active, I_L = 0 mA	I_B		300		µA

Package Information

Package SO24

Dimensions in mm



Preliminary Information

Ozone Depleting Substances Policy Statement

It is the policy of **Atmel Germany GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Atmel Germany GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Atmel Germany GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Data sheets can also be retrieved from the Internet: http://www.atmel–wm.com

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