Low Voltage Speech Circuit with Tone Ringer Interface

Description

TELEFUNKEN microelectronic's low voltage speech and ringer interface circuit, U4037B performs all necessary speech, line interface functions and the tone ringer required in an electronic telephone set.

The circuit is line powered and contains all components necessary for amplification of signals and adaption to the line. The power supply of U4037B provides the MCU during the ringing and the speech mode.

Features

Speech Circuit

- Adjustable dc characteristic
- Symmetrical input of microphone amplifier
- Receiving amplifier for dynamic or piezo-electric earpieces
- Automatic line loss compensation
- MCU controlled earphone gain 8 dB
- Anti-clipping in transmit direction

Tone Ringer Interface

- Adjustable volume via 2 bit D/A converter
- Adjustable threshold
- MCU power supply

Benefits

- Low number of external components

Applications

Standard, telephones, fax machines

Block Diagram / Applications

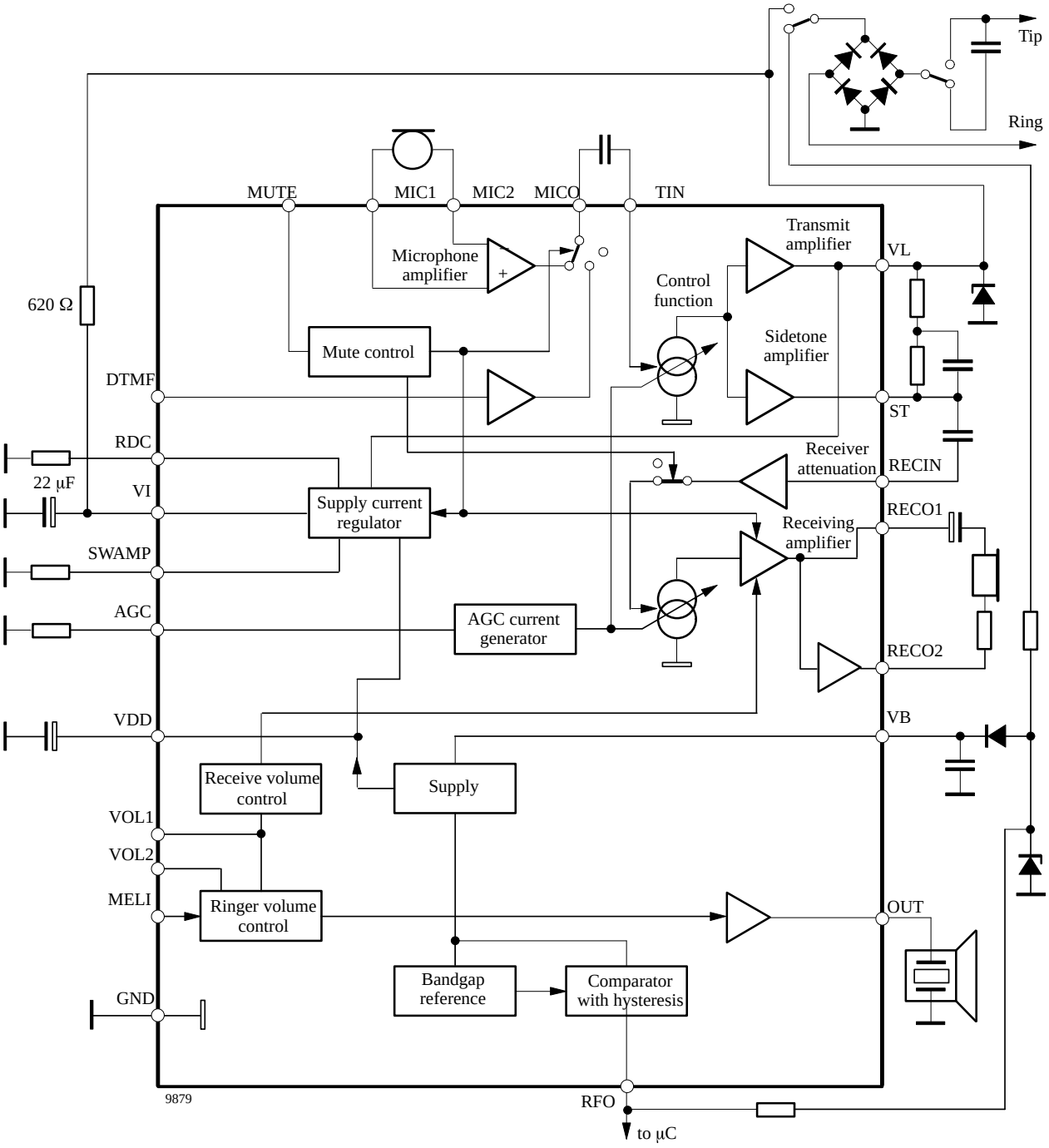


Figure 1. Block diagram

Pin Description

Pin	Symbol	Function
	OUT	Buzzer output
	MELI	Melody input
	RECO1 RECO2	Output of the receiver amplifier Suitable for dynamic or piezoelectronic transducers
	GND	Ground
	ST	The output of the sidetone cancellation signal, which requires a balanced impedance of 8 to 10 times the subscribers line impedance to be connected to Pin V_L.
	TIN	Input to the line output driver amplifier, transmit a.g.c. applied to this stage
	MICO	Transmit pre-amplifier output
	MIC 1, MIC 2	Inputs of symmetrical microphone amplifier with high common mode rejection ratio
	V_{DD}	Regulated output voltage of for biasing the MCU
	RECIN	Receive amplifier input The receiving amplification is regulated by an a.g.c.
	V_L	Positive supply voltage input to the device The current through this pin is modulated by the transmit signal.

Pin	Symbol	Function
	SWAMP	An external resistor (1 W) is required from this pin to GND to control the dc input impedance of the circuit. It has a nominal value of 56 Ω for low voltage operation.
	VOI1 VOI2	Volume adjustment of ringer and earphone amplifier
	RFO	Output for ringing frequency detection
	V_I	This internal voltage bias line must be connected to V_L via an external resistor, R_B, which dominates the ac input impedance of the circuit and should be 620 Ω for an 600 Ω input impedance or 910 Ω for a 900 Ω input impedance.
	R_{AGC}	The range of transmit and receive gain variations between short and long loops may be adjusted by connecting a resistor R_{AGC} from this pin to (GND). This pin can be left open to set a.g.c. out of action.
	DTMF	DTMF input
	MUTE	Control input for DTMF operation
	VB	Ringer supply
	RDC	Input for setting the DC characteristic

Electrical Characteristics speech circuit

Reference point Pin GND, f = 1000 Hz, 0 dBm = 775 mV_{rms}, R_{DC} = 60 kΩ, T_{amb} = 25°C, unless otherwise specified

Parameters	Test Conditions / Pin	Symbol	Min	Typ	Max	Unit
Line voltage	I_L = 8 mA I_L = 20 mA I_L = 30 mA I_L = 73 mA	V_L	1.8 3.0 3.6 7.7	2.1 3.3	2.6 3.6 4.5 9.7	V V V V
Transmit and sidetone						
Input resistance	R_i	R_i	30	50	75	kΩ
Gain	I_L = 30 mA	G_s	47	48	49	dB
Line loss compensation	R_{AGC} = 0 Ω, I_L = 73 mA	ΔG_s	–5	–6	–7	dB
Distortion at line	I_L > 15 mA, V_L = 775 mVrms	d_s			2	%
Maximum output voltage	I_L > 19 mA, d < 5 %, V_{mic} = 10 mV, RDC = 100 kΩ	V_{1max}	1.8	3	4.2	dBm
Anti-clipping attack time	V_{mic} = 20 mV, C = 470 nF			0.5		ms
Release time	Each 3 dB overdrive			9		ms
Noise at line weighted psophometrically	I_L > 30 mA, G_S = 48 dB	n_o			– 72	dBmp
Sidetone reduction	$I_L \geqq$ 20 mA	G_{STA}	10	15	20	dB
DTMF-amplifier						
Volume range d ≧ 5%		V_0	1			V_{RMS}
Receiving amplifier						
Gain	IL ≥ 20 mA	G_R		4		dB
Amplification of DTMF signal from DTMF IN to RECO1/2	$I_F \geq$ 15 mA, mute active	G_{RM}	–15	–12	–9	dB
Frequency response	I_L> 15 mA, C_L = 4.7 nF, f =300 to 3400 Hz	ΔG_{RF}			± 0.5	dB
Gain change with current	I_L = 15 to 100 mA	Δ_{GR}			± 0.5	dB
Gain deviation	T_{amb} = –10 to +60°C, I_L = 15 mA	Δ_{GR}			± 0.5	dB
Ear protection differential	$I_L \geq$ 15 mA, V_{gen} = 11 V_{rms}				2.2	V_{rms}
Line loss compensation	I_L = 73 mA	ΔG_R	–5	–6	–7	dB
Receiving noise at earphone psophometrially weighted	I_L = 73 mA	n_i		–80	–71	dBm
Gain change when muted	$I_L \geqq$ 20 mA	G_{RM}		40		dB
Output voltage push pull	$I_L \geqq$ 20 mA	V_0	0.8	0.9	1	V_{rms}
Supply voltage						
Output voltage	$I_L \geqq$ 20 mA speech mode	V_{DDS}		3		V V
Mute suppression	$I_L \geq$ 20 mA	G_{SM}	60			dB

Electrical Characteristics of Tone Ringer Interface

Parameters	Test Conditions / Pin	Symbol	Min	Typ	Max	Unit
Supply current, outputs open	V_{RING} = 14 V	I_S	1.5	2.0	2.5	mA
Switch-on threshold				11		V
Switch-off threshold				6.5		V
Volume adjustment range		VOI1 VOI2		40		dB(A)
Supply voltage for MCU	I_{DD} < 1 mA			3.2		V

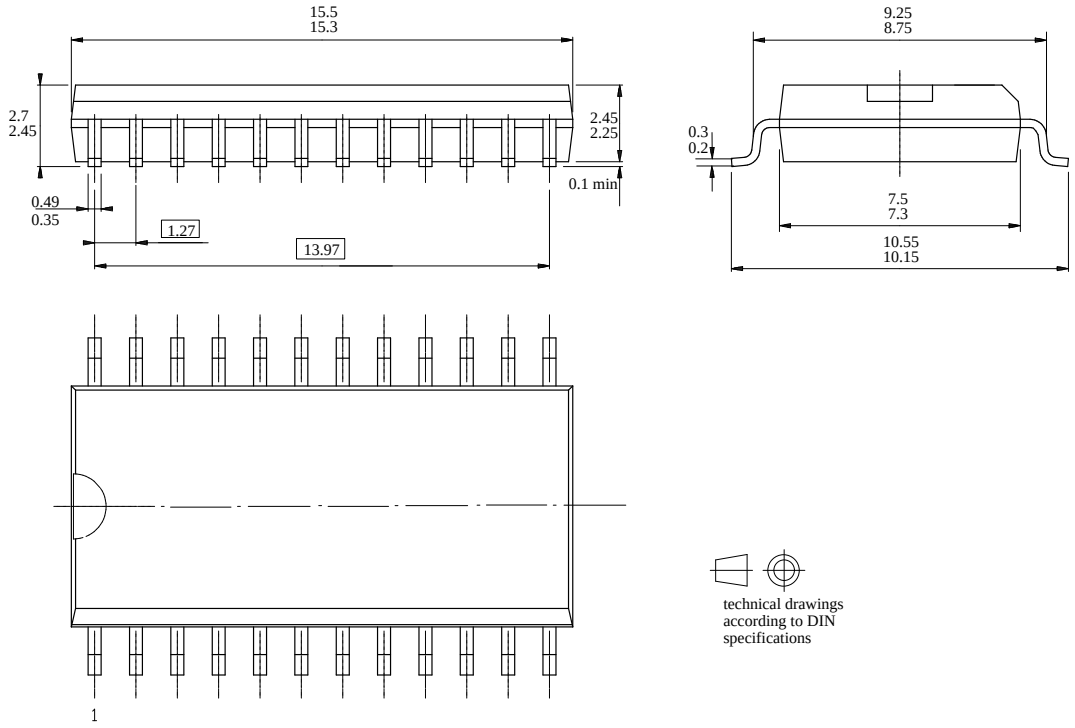
Ordering Information

Type	Package
U4037B	SO24

Package Information

Package SO24

Dimensions in mm



Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic 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.

TEMIC TELEFUNKEN microelectronic GmbH semiconductor division 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.

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

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