TEMIC

TELEFUNKEN Semiconductors

U4074B

Tone Ringer Interface

Description

The U4074B is a monolithic integrated circuit that contains all integrable components of a ringing circuit for telephone sets used in conjunction with a microcomputer. The combination of a microcomputer and the U4074B permits flexible programming of the ringing sequence (melody), tone and volume control.

Ringing frequency detection takes place in the microcomputer. The U4074B is responsible for the interface to the line, driver stages for the piezoelectric sound transducer, volume adjustment, amplitude detection, voltage supply for the microcomputer and other auxiliary functions.

Features

- Suitable for specifications FTZ 1TR2 and ETR 2
- Rectifier bridge
- Z-diode
- Amplitude detection
- Supply voltage for microcomputer 3.5 @ $\leq$ 1.5 mA
- DC operation possible
- Bridge push-pull output stage
- CMOS-compatible microcomputer interface
- 2-bit log. volume adjustment
- High-voltage bipolar technology, 30 V

Benefits

- μC controlled melody and volume
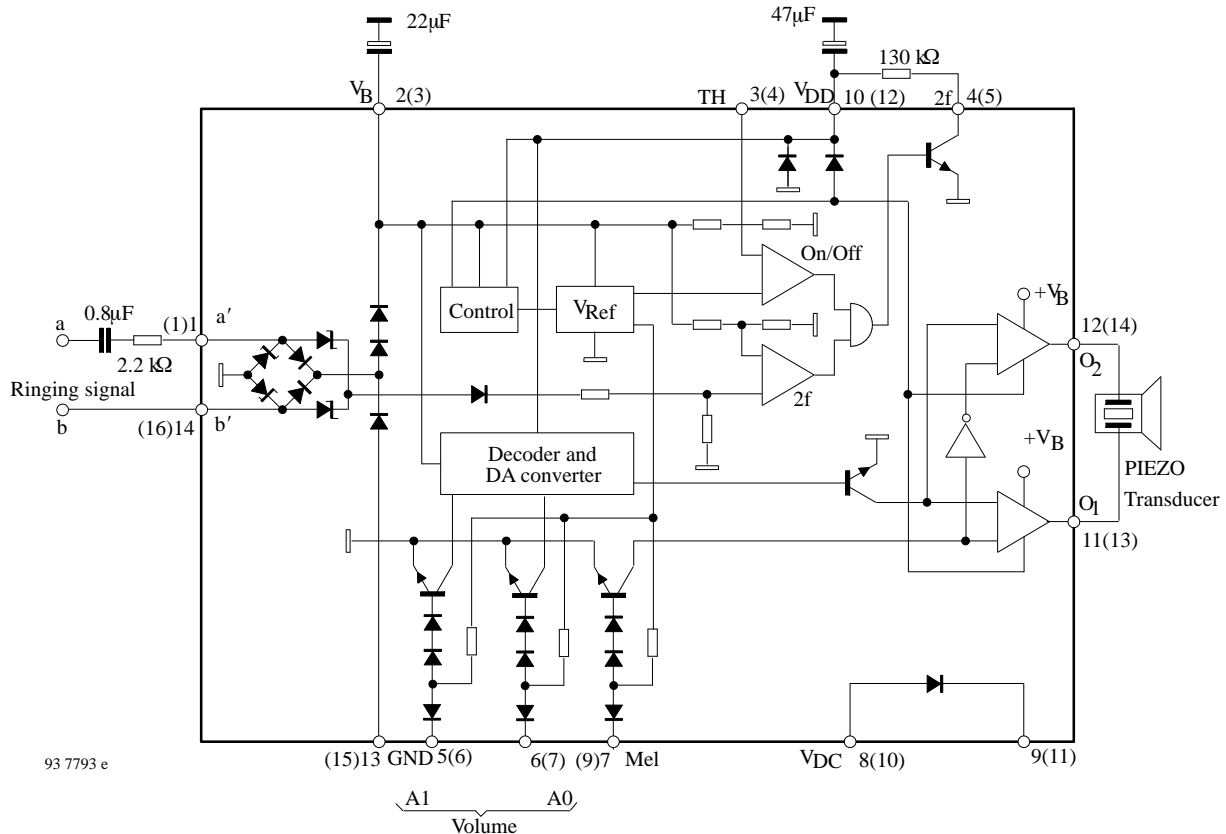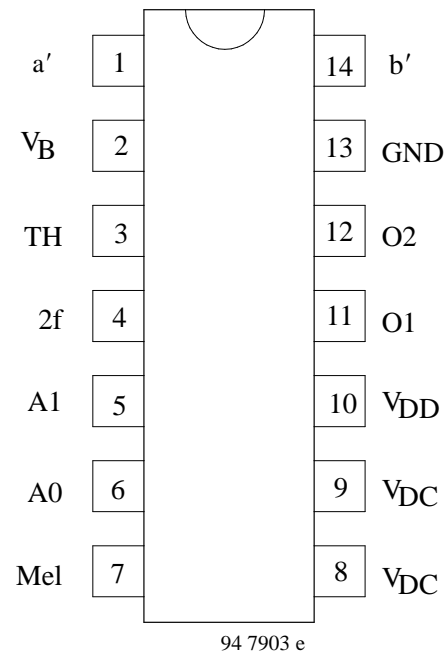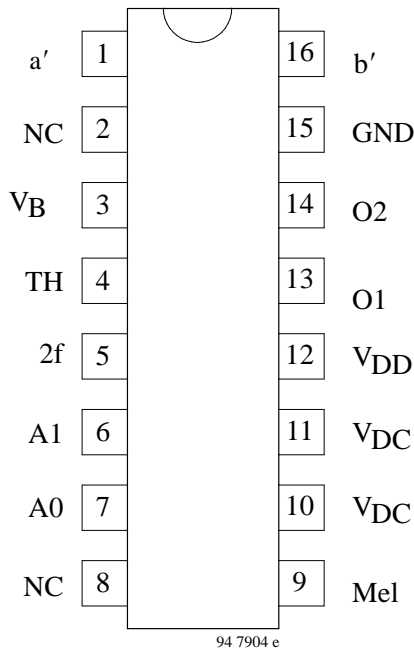- Low number of external components

93 7793 e

Figure 1. Block diagram and application circuit (pin connections for SO 16 in brackets)

U4074B

Pin Configuration

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94 7903 e

Pin	Symbol	Function
1, 14 (1,16)	a′, b′	AC ringing signal input
2 (3)	V_B	Output to charging capacitor
3 (4)	TH	Comparator threshold adjustment input
4 (5)	2f	Output for frequency detection
5, 6 (6, 7)	A1, A0	Digital volume adjustment input
7 (9)	Mel	Input for melody signal
8, 9 (10, 11)	V_{DC}	DC supply diode connections
10 (12)	V_{DD}	Microcomputer supply voltage
11, 12 (13, 14)	O_1, O_2	Outputs to the transducer
13 (15)	GND	Ground
(2, 8)	NC	Not connected

Pin Description

Power supply a′ and b′, Pin 1, 14

An ac ringing voltage is supplied to the inputs a′ and b′

via a 0.8 μF decoupling capacitor connected in series with a 2.2 kΩ resistor

1. The circuit possesses the following overload resistance at terminals a and b. The circuit can withstand a voltage of 110 V with a frequency of 50 Hz at terminals a and b for a maximum of 15 s.

2. Testing the circuit with the configuration shown in figure 2 does not destroy the circuit under the following conditions.

Charging voltage of surge capacitance: $V_{cs} = 2$ kV
Pulse shape: 10/700 μs
Pulse sequence: 30 s
Number of surges: 10
Polarity change after 5 surges

See figure 2.

Smoothing capacitors, Pin 2, 10

After rectification of the ac ringing voltage via the integrated rectifier bridge, the pulsating DC voltage is smoothed by the external capacitor (22 μF to 47 μF) at Pin 2 (3). The charging voltage is restricted to a maximum of 30 V by an integrated Z-diode. A 47 F external capacitor of will smooth the regulated supply, V_{DD}, at pin 10 (12).

Preliminary Information
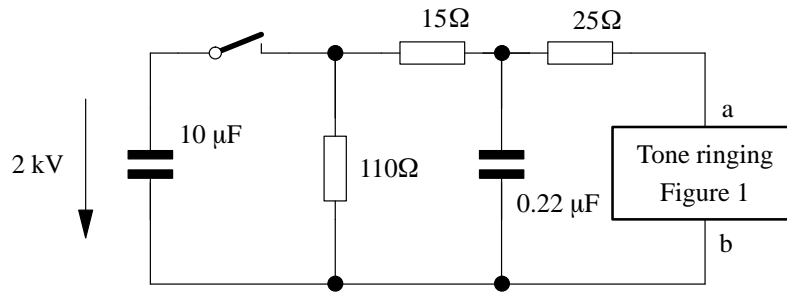
Figure 2. Test circuit

Outputs O_1, O_2 Pin 11, 12

The bridge push-pull outputs are used for direct connection of a piezo electric sound transducer with a typical value of 80 nF. The output stage transistors can process up to 20 mA in both directions.

The output signal without load is $2 \cdot (V_B - V_{DD} - 3.5 \text{ V})$

$$R_i = \left(\frac{V_{(12,11)} \text{ open}}{V_{(12,11)} \text{ load}} - 1 \right) \cdot R_{load}$$

where $R_{load} = 400 \ \Omega$

Volume Adjustment A1, A0 Pin 5 (6), 6 (7)

The ringing volume is adjusted by means of a 2-bit D/A converter. The maximum volume is achieved with the bit combination A1 (MSB) = 1 and A0 (LSB) = 1. The volume can be reduced by approximately 35 dB (A) if a bit combination of A1 = 0, A0 = 0 is supplied. The volume is programmed by supplying a ground potential to these inputs.

Melody, Pin 7 (9)

The melody input inverts the activation phase of the bridge push-pull output stage. The input is CMOS-compatible and suitable for processing ringing frequencies.

Supply Voltage V_{DD}, Pin 10 (12)

An external load, such as a microcomputer, can be connected to V_{DD}. This value of V_{DD} is 3.5 V for a maximum load current of 1.5 mA. V_{DD} is highly resistive and can block up to 6 V in call and idle states. The typical value of the back-up capacitor is 47 µF.

Frequency Detection 2f, Pin 4 (5)

Frequency detection takes place in the microcomputer. For this purpose, the output 2f supplies a square wave signal with double ringing frequency to the microcomputer. The output signal is CMOS-compatible. This terminal is highly resistive in idle and call states.

Comparator Threshold Adjustment TH Pin 3 (4)

The on/off threshold of the 2f comparator can be adjusted (terminal against ground respectively V_{DD}). To fulfill the Bundespost specification this terminal should be open.

V_{DC}, Pin 8, 9

Decoupling diode for dc supply.

Absolute Maximum Ratings

Reference point, Pin 13 (15), unless otherwise specified, $T_{amb} = 25°C$.

Parameters		Symbol	Value	Unit
Supply current	Pin 1, 14 (1, 16)	I_s	50	mA
Output current	Pin 11, 12 (13, 14)	I_0	50	mA
Junction Temperature		T_j	125	°C
Ambient temperature		T_{amb}	−25 to +60	°C
Storage temperature		T_{stg}	−40 to +125	°C
Power dissipation $T_{amb} = 60 °C$	DIP 14	P_{tot}	860	mW
	SO 16	P_{tot}	400	mW

Thermal Resistances

Parameters		Symbol	Value	Unit
Junction ambient	DIP	R_{thJA}	75	K/W
	15O 16		160	K/W

Electrical Characteristics

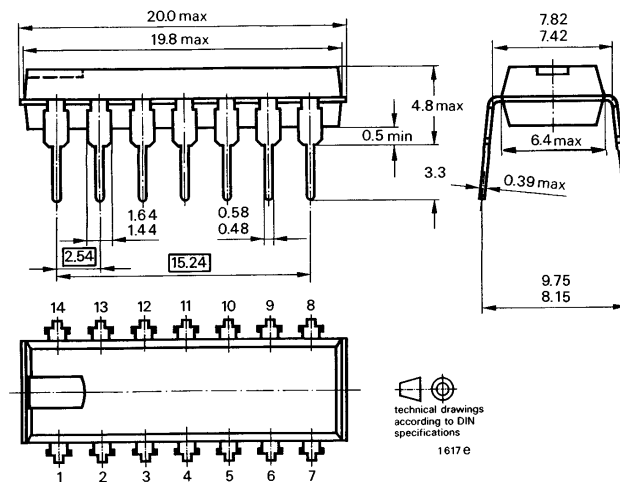$T_{amb} = −10$ to 60°C, reference point is Pin 13 (15), unless otherwise specified

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Current consumption	Pin 1, 14 (1, 16) $O_1 = O_2 = $ open $A1 = A0 = 0$, $V_B = 15$ V $I_{DD} = −300$ µA, Pin 2 (3) open	I		1.1	1.4	mA
Input voltage	Pin 1, 14 (1, 16) on threshold off threshold	V	9.5 4.5	10.5 5.5	11.5 6.5	V V
Audio frequency impedance	f = 300 to 3400 Hz, $V_{a,b} = 1.5\ V_{rms}$	R	200			kΩ
Output on resistance	$I_{(O1, O2)} = \pm 20$ mA	R_{on}			400	Ω
Internal voltage limitation	$I_Z = 1$ mA (Pin 2)	V_Z	25	27	30	V
Supply voltage for microcomputer	0.5 mA > I_{DD} < 1.5 mA		3.15	3.5	3.85	V
Leakage current	$V_{a'}, V_{b'}, V_B \leq 3.5$ V	I_{2f} I_{A0} I_{A1} I			10	µA
	$V_{A1}, V_{A0}, V_{Melody} \leq 6$ V 5.5 V $\leq V_{DD} \leq 6$ V 0 V $\leq V_{DD} \leq 5.5$ V	I_{DD}			100 10	µA
Diode load current					80	mA

Preliminary Information

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Order Information

Extended Type Number	Package	Remarks
U4070B-FP	SO 16	
U4074B	DIP 14	

Dimensions in mm

Package: DIP 14

technical drawings
according to DIN
specifications

1617 e

Package: SO 16

technical drawings
according to DIN
specifications

2 695 e

Preliminary Information
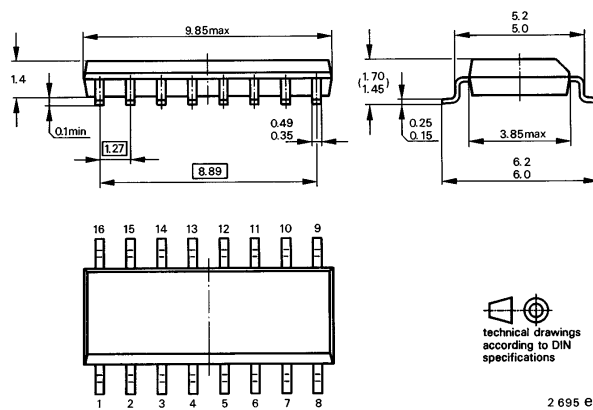
Ozone Depleting Substances Policy Statement

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.