

Tone Ringer Interface

Description

The U4074B is a monolithic integrated circuit that contains all integral 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 piezo-electric 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 @ ≤ 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

- μ C-controlled melody and volume
- Low number of external components

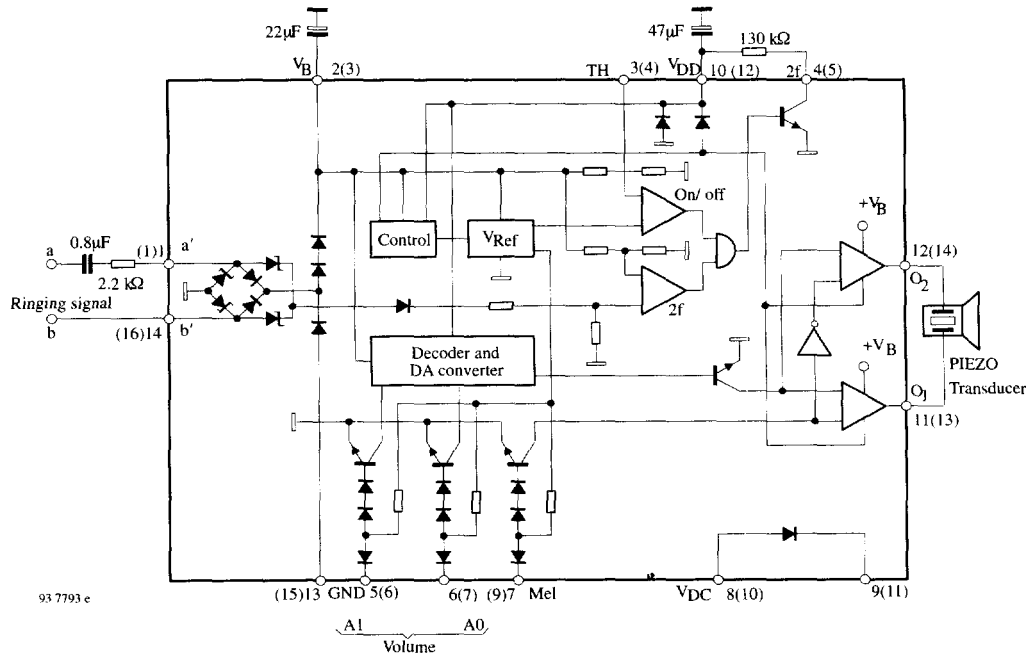


Figure 1. Block diagram and application circuit (pin connections for SO16 in brackets)

Ordering Information

Extended Type Number	Package	Remarks
U4074B-FP	SO16	
U4074B	DIP14	

Pin Configuration

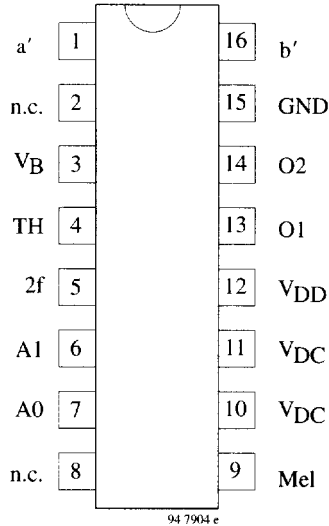


Figure 2. Pinning SO16

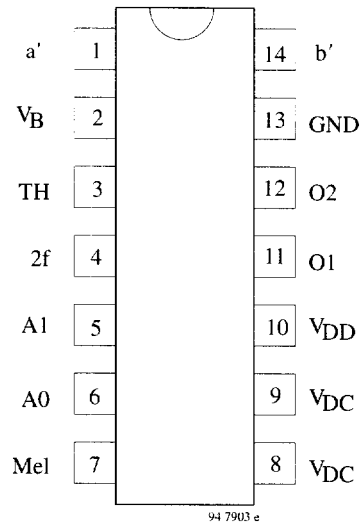


Figure 3. Pinning DIP14

Pin SO16	Pin DIP14	Symbol	Function
1	1	a'	AC ringing signal input
3	2	V _B	Output to charging capacitor
4	3	TH	Comparator threshold adjustment input
5	4	2f	Output for frequency detection
6	5	A1	Digital volume adjustment input
7	6	A0	Digital volume adjustment input
9	7	Mel	Input for melody signal
10	8	V _{DC}	DC supply diode connections
11	9	V _{DC}	DC supply diode connections
12	10	V _{DD}	Microcomputer supply voltage
13	11	O ₁	Outputs to the transducer
14	12	O ₂	Outputs to the transducer
15	13	GND	Ground
16	14	b'	AC ringing signal input
2, 8		n.c.	Not connected

Pin Description

Power Supply a' and b'

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-k Ω resistor.

- The circuit possesses overload resistance at terminals a and b. It can withstand a voltage of 110 V with a frequency of 50 Hz at terminals a and b for a maximum of 15 s.
- Testing the circuit with the configuration shown in figure 4 does not destroy the circuit under the following conditions:

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

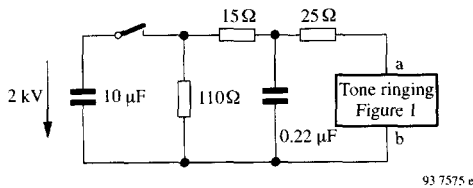


Figure 4. Test circuit

Smoothing Capacitors

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- μF external capacitor will smooth the regulated supply, V_{DD} , at Pin 10 (12).

Outputs O₁, O₂

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 $2 \times (V_B - V_{DD} - 3.5 \text{ V})$

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

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

Volume Adjustment A1, A0

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

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}

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

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

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}

Decoupling diode for DC supply.

Absolute Maximum Ratings

Reference point, Pin 13 (15), unless otherwise specified, $T_{amb} = 25^{\circ}\text{C}$

Parameters		Symbol	Value	Unit	
Supply current	Pin 1, 14 (1, 16)	I_s	50	mA	
Output current	Pin 11, 12 (13, 14)	I_o	50	mA	
Junction Temperature		T_j	125	$^{\circ}\text{C}$	
Ambient temperature		T_{amb}	-25 to +60	$^{\circ}\text{C}$	
Storage temperature		T_{stg}	-40 to +125	$^{\circ}\text{C}$	
Power dissipation	$T_{amb} = 60^{\circ}\text{C}$	DIP14	P_{tot}	860	mW
		SO16	P_{tot}	400	mW

Thermal Resistances

Parameters		Symbol	Value	Unit
Junction ambient	DIP14	R_{thJA}	75	K/W
	SO16		160	K/W

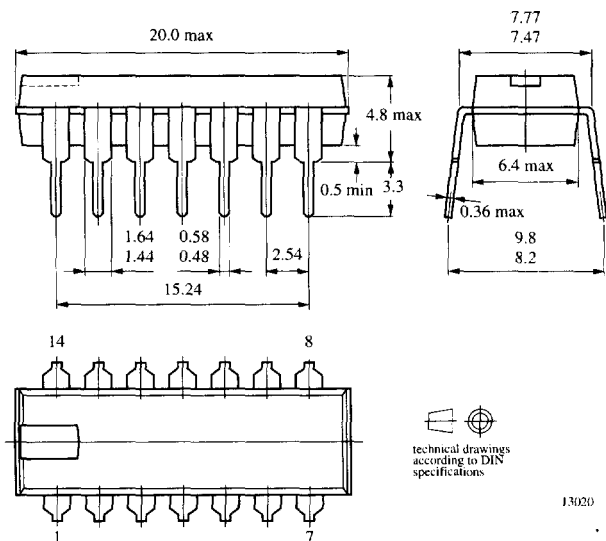
Electrical Characteristics

$T_{amb} = -10$ 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) $O_1 = O_2 = \text{open}$ $A_1 = A_0 = 0, V_B = 15\text{ V}$ $I_{DD} = -300\ \mu\text{A}$, Pin 2 (3) open	I		1.1	1.4	mA
Input voltage	Pin 1, 14 (1, 16) on threshold off threshold	V	9.5	10.5	11.5	V
			4.5	5.5	6.5	V
Audio frequency impedance	$f = 300$ to 3400 Hz , $V_{a,b} = 1.5\text{ V}_{rms}$	R	200			$k\Omega$
Output on resistance	$I_{(O_1, O_2)} = \pm 20\text{ mA}$	R_{on}			400	Ω
Internal voltage limitation	$I_Z = 1\text{ mA}$ (Pin 2)	V_Z	25	27	30	V
Supply voltage for microcomputer	$0.5\text{ mA} > I_{DD} < 1.5\text{ mA}$		3.15	3.5	3.85	V
Leakage current	$V_a', V_b', V_B \leq 3.5\text{ V}$ $V_{A1}, V_{A0}, V_{Melody} \leq 6\text{ V}$ $5.5\text{ V} \leq V_{DD} \leq 6\text{ V}$ $0\text{ V} \leq V_{DD} \leq 5.5\text{ V}$	I_{2f} I_{A0} I_{A1} I			10	μA
					100 10	μA
Diode load current		I_D			80	mA

Package Information

Package DIP14
Dimensions in mm



Package SO16
Dimensions in mm

