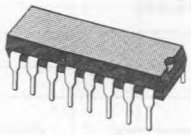
SGS-THOMSON MICROELECTRONICS

M764A

THREE TONE RINGER

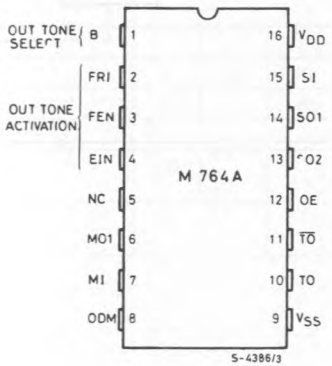
- WIDE OUTPUT TONE SELECTION
- DIRECT DRIVE FOR PIEZOCERAMIC OR DYNAMIC TRANSDUCERS
- BUILT IN BAND PASS FILTER (20 TO 60 Hz)
- µP CONTROL INPUT
- CMOS TECHNOLOGY



DIP16
(Plastic Package 0.25)

ORDER CODE : M764A B1

PIN CONNECTION



DESCRIPTION

The M764A is a high performance electronic ringer suitable for application in standard and parallel connection telephones ; it can also be used as an alarm indicator. An incorporated bandpass filter prevents spurious ringing caused by transients and dialling pulses. Pin-selectable options permit three, two and single tone sequences.

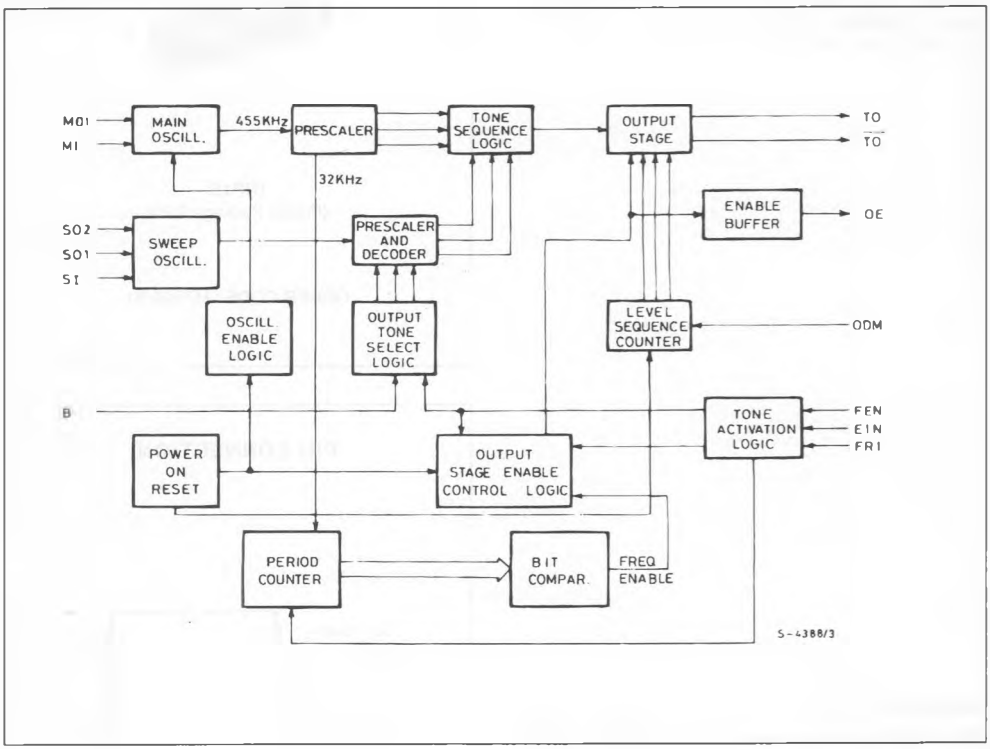
The output stage allows direct drive of both piezoceramic and dynamic transducers. The output tone level can be externally programmed to increase gradually during the first three bursts. Output tone stability and the bandpass filter corner frequencies are guaranteed by a crystal controlled oscillator.

The M764A is available in 16 pin dual in-line plastic.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	– 0.5 V to + 17	V
V_I	Input Voltage	– 0.3 to V_{DD} + 0.5	V
P_{tot}	Power Dissipation	400	mW
T_{op}	Operating Temperature Range	– 25 to 70	°C
T_{stg}	Storage Temperature Range	– 55 to 125	°C

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS (all parameters are tested at T_{amb} = 25 °C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
DC CHARACTERISTICS						
Supply						
V_{DD}	Voltage Supply		6		17	V
V_{TH}	Power on/off Reset Threshold		4.5		5.5	V
V_{TH}	Sequence Logic Power on/off Reset		1.8		2.8	V
I_{DD}	Operating Supply Current	V_{DD} = 15 V OE = 1			0.75	mA
I_{DDO}	Stand-by Supply Current	V_{DD} = 15 V			0.15	mA
Main Oscillator						
MI	Main Oscillator Input	I_{IH} V_{IH} = 15 V, V_{DD} = 15 V			+ 5	µA
		I_{IL} V_{IL} = 0 V, V_{DD} = 15 V			− 1	µA
MO1	Main Oscillator Output 1	I_{OH} V_{OH} = 13 V, V_{DD} = 15 V	− 250			µA
		I_{OL} V_{OL} = 1 V, V_{DD} = 15 V	+ 250			µA
Sweep Oscillator						
SI	Sweep Oscillator Input	I_{IH} V_{IH} = 15 V, VDD = 15 V			+ 1	µA
		I_{IL} V_{IL} = 0 V, VDD = 15 V			− 1	µA
SO1	Sweep Oscillator Output 1	I_{OH} V_{OH} = V_{DD} − 1 V, V_{DD} = 15 V	− 90			µA
		I_{OL} V_{OL} = V_{DD} 13 V, V_{DD} = 15 V	+ 90			µA
SO2	Sweep Oscillator Output 2	I_{OH} V_{OH} = V_{DD} − 1 V, V_{DD} = 15 V	− 90			µA
		I_{OL} V_{OL} = V_{DD} 13 V, V_{DD} = 15 V	+ 90			µA
Control Pins						
EIN FEN ODM	Enable Input Filter Enable Input Output Drive Mode	I_{IH} V_{IH} = 15 V		0.1	+ 1	µA
		I_{IL} V_{IL} = 0 V		− 0.1	− 1	µA
A B C*	Output Sequence Selection Pins	I_{IH} V_{IH} = 15 V		0.1	5	µA
		I_{IL} V_{IL} = 2 V		1		mA
Frequency Input						
FRI	Frequency Input	I_{IL} V_{IL} = 0 V			1	µA
		I_{IH} V_{IH} = 4 V	4	20	40	µA
		V_{TH}	2		4	V
Output Enable						
OE		I_{OH} V_{DD} = 15 V, V_O = 13 V	10			mA
		I_{OL} V_{DD} = 15 V, V_O = 1 V	1			mA

* Input resistor of 1.5 KΩ is active until V_{TH} of input inverter is reached.

ELECTRICAL CHARACTERISTIC (continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Tone Outputs						
TO	Output	I_{OH} V_{DD} = 15 V V_O = 13 V	10			mA
		I_{OL} V_{DD} = 15 V V_O = 1 V	10			
$\overline{TO}$	Inverted Output	I_{OH} V_{DD} = 15 V V_O = 13 V	10			mA
		I_{OL} V_{DD} = 15 V V_O = 1 V	10			

* Input resistor of 1.5 KΩ is active until V_{TR} of input inverter is reached.

AC CHARACTERISTICS

Main Oscillator						
t_{SM}	Start up Time	V_{DD} = 6 V fo = 455 KHz R_F = 1 MΩ $C_I = C_O$ = 100 pF	See Tables 1-2	10		ms
Sweep Oscillator						
t_{SS}	Start up Time	V_{DD} = 6 V f = 1140 to 11400 Hz (*)		5		ms

(*) R > 50 kΩ
C > 100 pF

FUNCTIONAL DESCRIPTION

MAIN OSCILLATOR

The main oscillator has been designed to be driven either by an external RC network or by a ceramic resonator (see fig. 1) :

The accuracy of the output tones and of the bandpass filter characteristics are determined by the accuracy of the main oscillator frequency.

The crystal guarantees good performance over the whole temperature range with no external trimmer. The main oscillator as well as the sweep oscillator are maintained in a stand-by condition or forced to run according to table 1.

SWEEP OSCILLATOR

The sweep oscillator (fig. 2) controls the repetition rate of the output tone sequence. The output repetition period is given by

$$T_{rep} = \frac{384}{F_{sweep\ oscill.}}$$

OUTPUT TONE ACTIVATION (pins FEN, EIN, FRI)

The output stage is enabled by the signal OE (output enable) under control of pins FEN, EIN, FRI as shown in table 1, and fig. 3.

Pin FEN and EIN are standard C-MOS inputs.

Pin FRI has a pull-down resistor of approximately 300 KΩ.

OUTPUT ENABLE (OE)

The output enable pin (OE) can be used in special application to drive a LED or any external circuit to indicate that an incoming ringing signal has been detected by the tone ringer as in automatic responders.

OE timing diagrams are shown in table 1.

The OE output stage configuration is shown in fig.4.

Figure 1 : a) Crystal Controlled Oscillator.

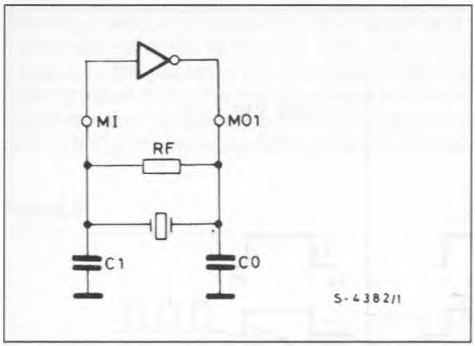


Figure 2.

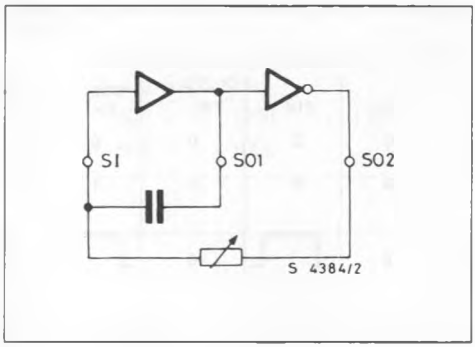


Figure 3 : Timing Diagram.

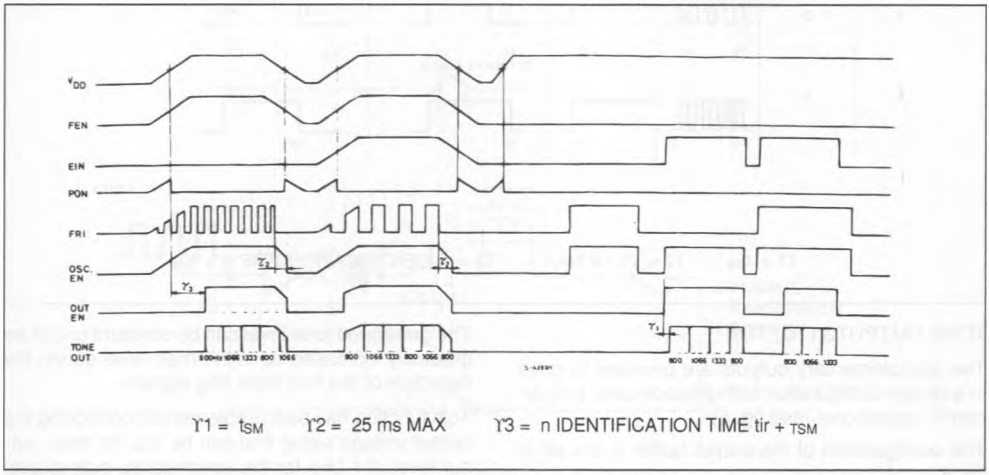


Figure 4.

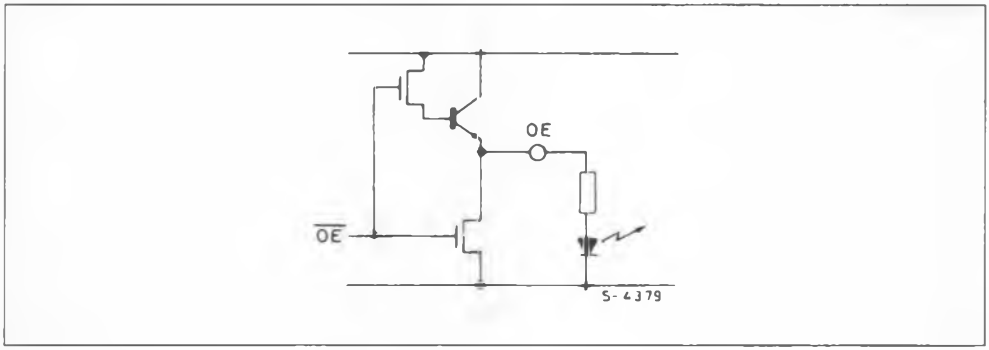
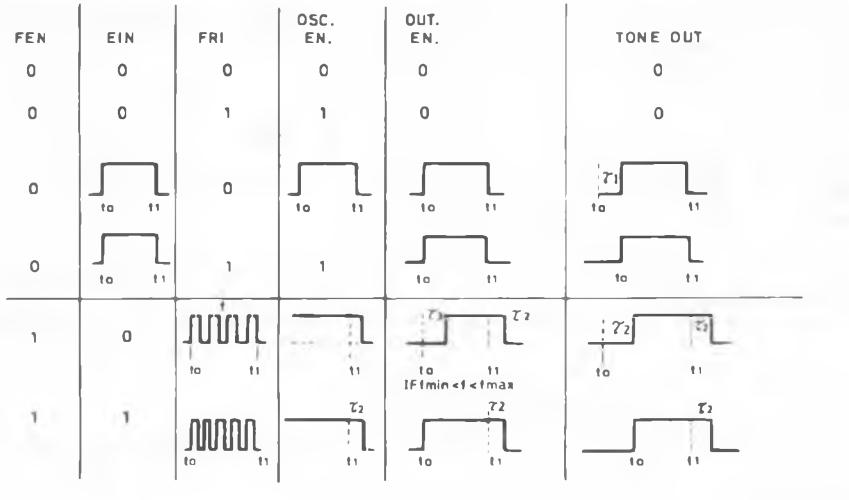


Table 1.



TONE OUTPUTS (TO, TO)

Two complementary outputs are provided to drive in a bridge configuration both piezoceramic and dynamic transducers (see fig. 5).

The configuration of the output buffer is shown in fig. 6.

The output waveform is a square wave with 50 % duty cycle.

The generated tone level can be constant or can be gradually increased up to the max. level during the detection of the first three ring signals.

This function has been implemented controlling the output voltage swing that can be V_{DD} for max. output level, 0.4 V_{DD} for the intermediate output level and 0.1 V_{DD} for the lowest output level.

OUTPUT DRIVE MODE (ODM)

The output level is constant if this pin is a logical 0 : it gradually increases to the max. level if this pin is a logical 1 : the sequence can take place if after the first ring signal during the ring tone pause period the supply does not fail below the power on reset threshold (5.5 V) and always starts from the lowest level.

OUTPUT TONE SELECTION (B)

Table 2.

B	Output Tone Sequences and Frequencies $f_{max\ oscill.}$ = 455 KHz		
0	800	1066	1333
1	800	1066	

Figure 5.

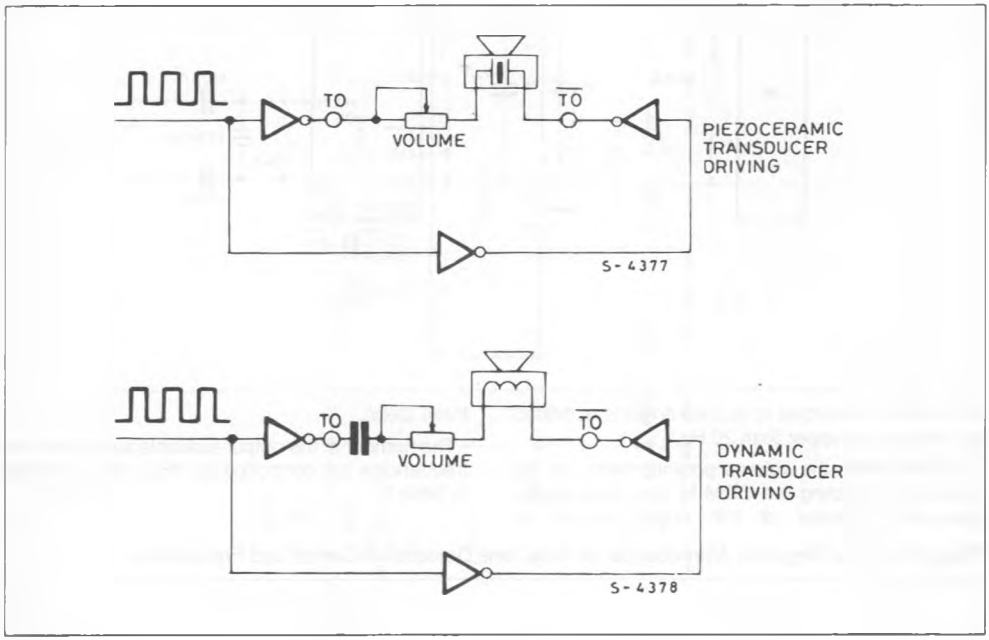
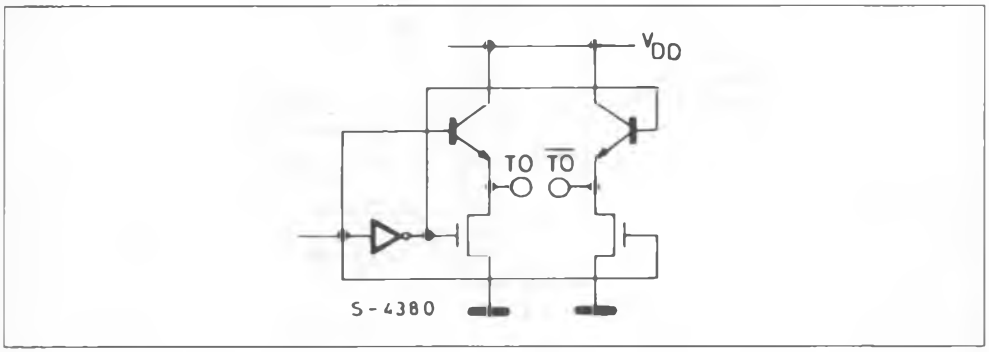
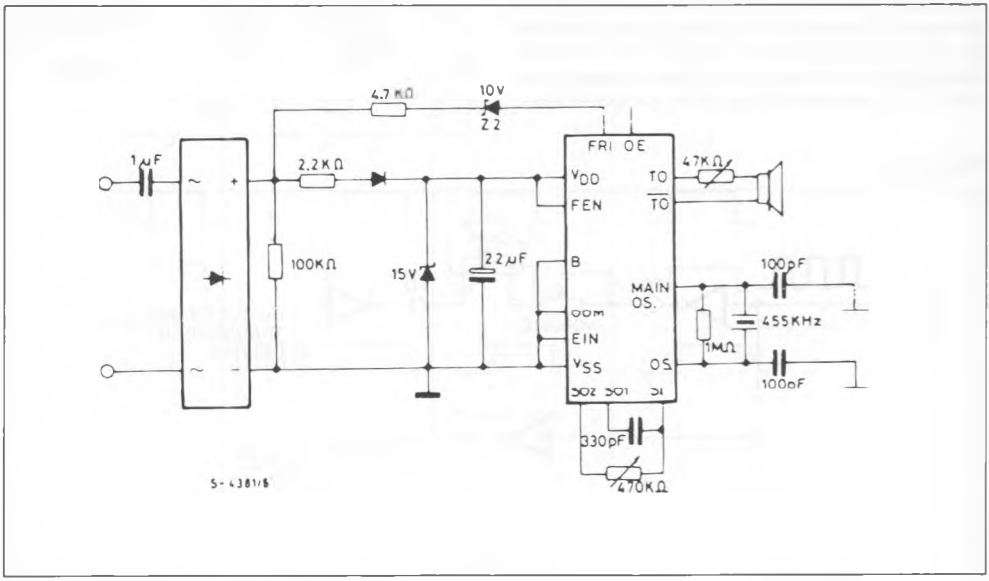


Figure 6.



TYPICAL APPLICATIONS

Figure a : Tone Ringer for Standard telephone Applications.

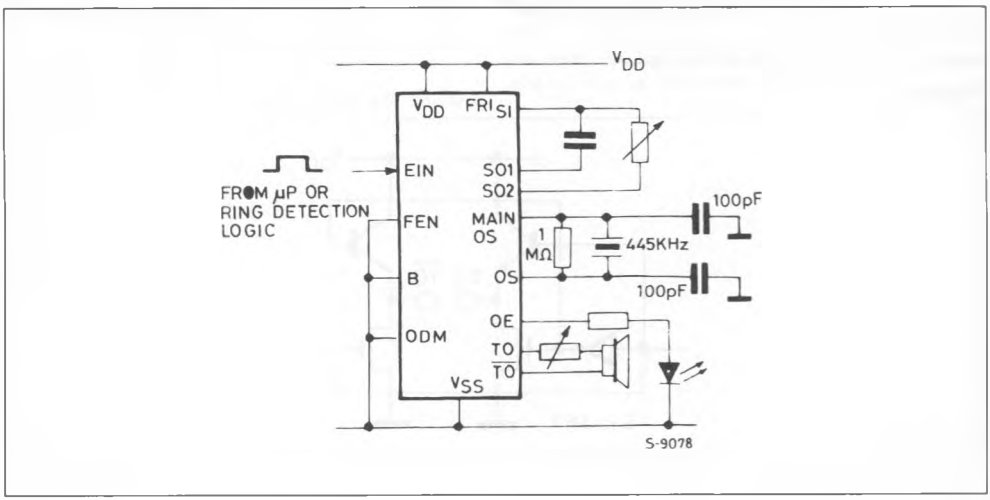


If pin EIN is connected to V_{DD} the ringer is activated by frequencies upper than 20 Hz.

- In both cases the volume potentiometer can be avoided connecting the ODM to V_{DD} allowing the gradually increase of the ringer volume in three steps.

- The number of the output available tones and their frequencies are controlled by ABC pins according to table 2.

Figure b : Tone Ringer for Alarm,Buzzer or Ring Tone Detection in Centralized Equipments.



ANTI TAPPING APPLICATION

In the anti-tapping application an input current threshold is established.