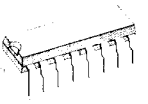
M764A

TONE RINGER

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



B
DIP-16 Plastic (0.25)

ORDERING NUMBER: M764A B1

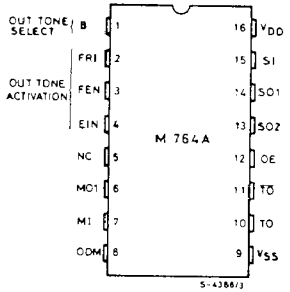
DESCRIPTION

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 indicador. 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.

PIN CONFIGURATION

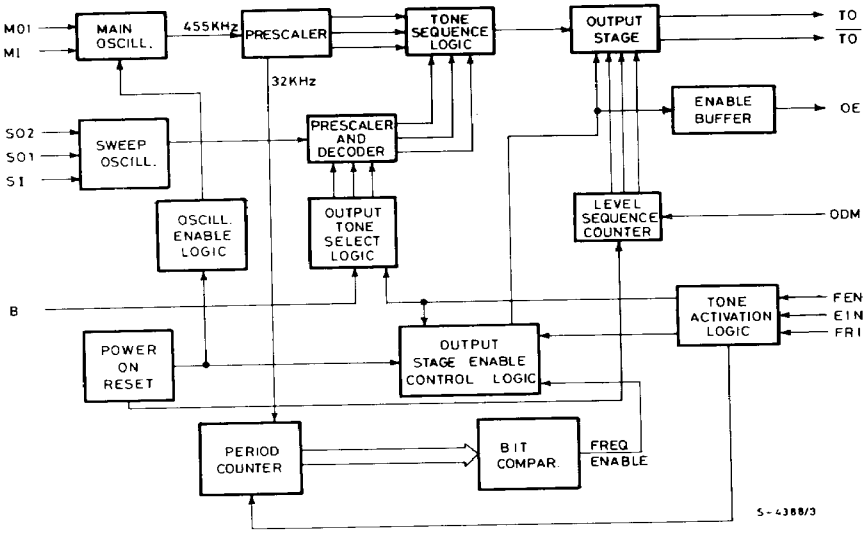


ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}	Supply voltage	-0.5V 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

Stress above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

BLOCK DIAGRAM



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

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}= 15V OE = 1				0.75	mA
	I_{DDO}	Stand-by supply current	V_{DD}= 15V				0.15	mA
Main oscillator	MI	Main oscillator input	I_{IH} V_{IH}= 15V	V_{DD}= 15V			+5	µA
			I_{IL} V_{IL}= 0V				-1	
	MO1	Main oscillator output 1	I_{OH} V_{OH}= 13V	V_{DD}= 15V	-250			µA
			I_{OL} V_{OL}= 1V		+250			

ELECTRICAL CHARACTERISTICS (continued)

		Parameter	Test conditions		Min.	Typ.	Max.	Unit
Sweep oscillator	SI	Sweep oscillator input	I_{IH} V_{IH}= 15V	V_{DD}=15V			+1	µA
			I_{IL} V_{IL}= 0V				-1	
	SO1	Sweep oscillator output 1	I_{OH} V_{OH}= V_{DD}-1V	V_{DD}=15V	- 90			µA
			I_{OL} V_{OL} V_{DD}13V		+ 90			
	SO2	Sweep oscillator output 2	I_{OH} V_{OH}= V_{DD}-1V	V_{DD}=15V	-90			µA
			I_{OL} V_{OL} V_{DD}13V		+ 90			
Control pins	EIN FEN ODM	Enable input Filter enable input Output drive mode	I_{IH} V_{IH} = 15V			0.1	+ 1	µA
			I_{IL} V_{IL} = 0V			-0.1	- 1	
	A B C *	Output sequence selection pins	I_{IH} V_{IH} = 15V			0.1	5	µA
			I_{IL} V_{IL} = 2V			1		mA
Freq. input	FRI	Frequency input	I_{IL} V_{IL}= 0V				1	µA
			I_{IH} V_{IH}= 4V		4	20	40	
			V_{TH}		2		4	V
Output enable	OE		I_{OH} V_{DD}= 15V V_O = 13V		10			mA
			I_{OL} V_{DD}= 15V V_O = 1V		1			
Tone outputs	TO	Output	I_{OH} V_{DD} 15V V_O 13V		10			mA
			I_{OL} V_{DD} = 15V V_O 1V		10			
	$\overline{TO}$	Inverted output	I_{OH} V_{DD} 15V V_O 13V		10			mA
			I_{OL} V_{DD} 15V V_O 1V		10			

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

AC CHARACTERISTICS

Main oscillator	t_{SM}	Start up time	V_{DD}= 6V f_o= 455 KHz		10		ms
			R_F= 1 MΩ C_I= C_O= 100 pF	see tables 1-2			
Sweep oscill.	t_{SS}	Start up time	V_{DD}= 6V f = 1140 to 11400 Hz (*)		5		ms

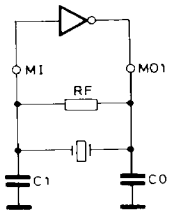
(*) R > 50 KΩ
C > 100 pF

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):

Fig. 1 - a) Crystal controlled oscillator



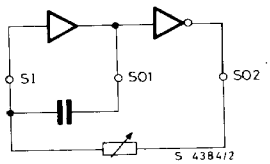
The accuracy of the output tones and of the band-pass filter characteristics are determined by the accuracy of the main oscillator frequency.
The crystal guarantees good performance over the whole temperature range with no external trimmer.
The main oscillator as well as the sweep oscillator are maintained 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

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

Fig. 2



Output Tone Activation (pins FEN, EIN, FRI)

The output stage is enabled by the signal OE (output enable) under control of pins FEN, EIN, FR 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.

FUNCTIONAL DESCRIPTION (continued)

Table 1

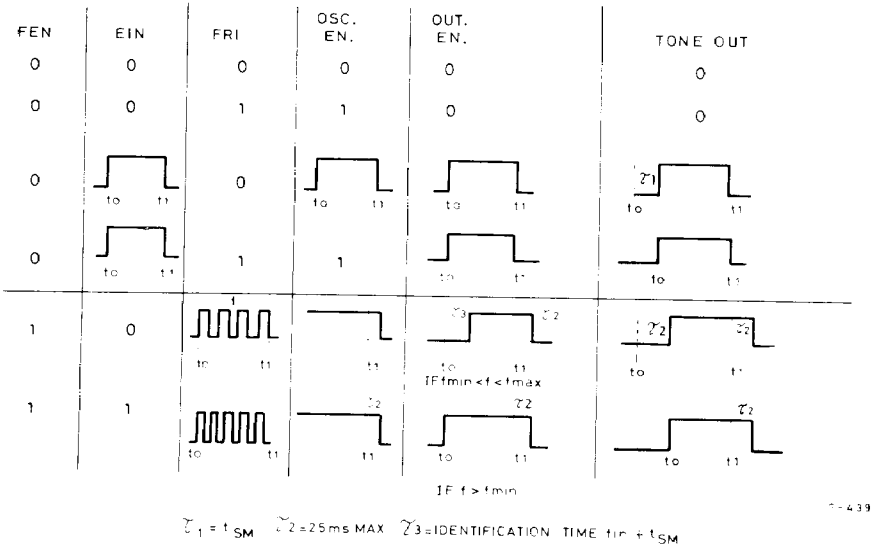
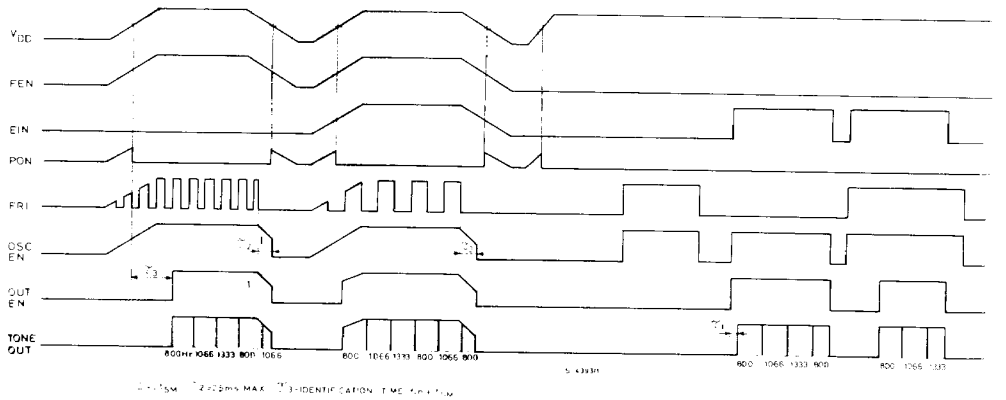


Fig. 3 - Timing diagram

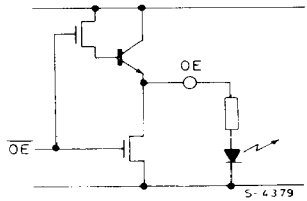


FUNCTIONAL DESCRIPTION (Continued)

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.

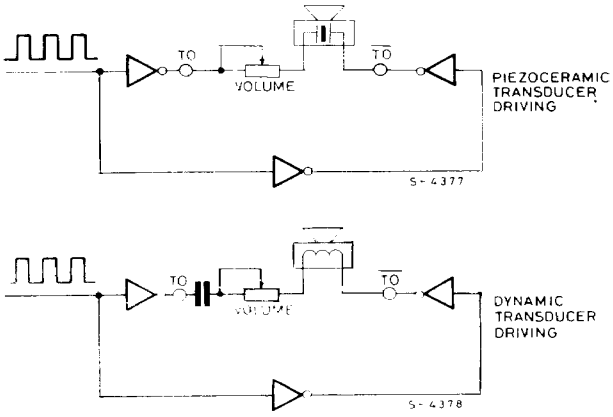
Fig. 4



Tone Outputs (TO, $\overline{TO}$)

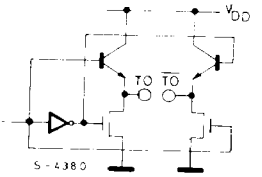
Two complementary outputs are provided to drive in a bridge configuration both piezoceramic and dynamic transducers (see fig. 5).

Fig. 5



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

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 (5.5V) and always starts from the lowest level.

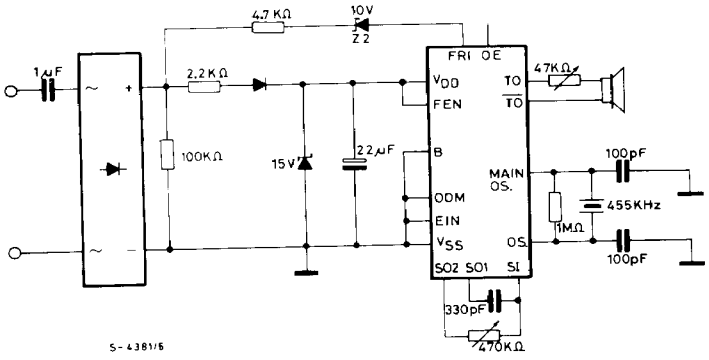
Output Tone Selection (B)

Table 2 **B** Output tone sequences and frequencies
$f_{max\ oscill.} = 455KHz$

0	800	1066	1333
1	800	1066	

TYPICAL APPLICATIONS

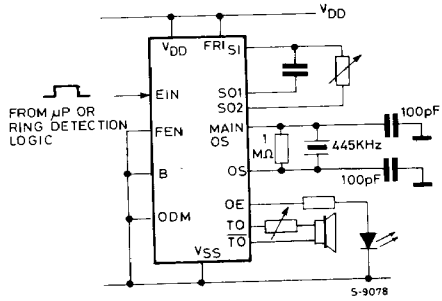
a) **Tone ringer for standard telephone applications**



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

- 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.

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.