COS/MOS INTEGRATED CIRCUITS

M 764
M 764A

ADVANCE DATA

TONE RINGER

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

The M764 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 M764 utilizes COS/MOS technology and is available in 18 pin dual in-line plastic or ceramic package; the M764A is available in 16 pin dual in-line plastic or ceramic package.

ABSOLUTE MAXIMUM RATINGS*

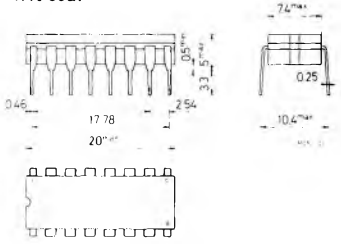
V_{DD}	Supply voltage	-0.5 to +20	V
V_I	Input voltage	-0.3 to V_{DD} + 0.5	V
P_{tot}	Power dissipation	400	mW
T_{op}	Operating temperature range	-25 to 80	°C
T_{stg}	Storage temperature range	-55 to 125	°C

* Stresses 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.

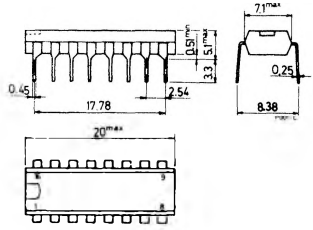
ORDERING NUMBERS:
M 764 B1 for dual in-line plastic package
M 764A B1 for dual in-line plastic package
M 764 F1 for dual in-line frit seal ceramic package
M 764A F1 for dual in-line frit seal ceramic package

MECHANICAL DATA (Dimensions in mm)

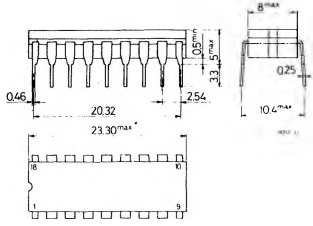
Dual in-line ceramic package (M764A)
frit seal



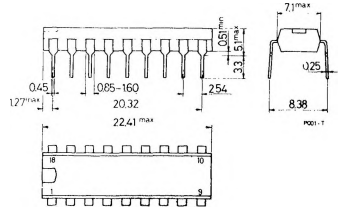
Dual in-line plastic package (M764A)



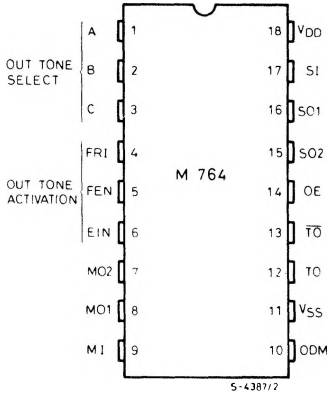
Dual in-line ceramic package (M764)
frit seal

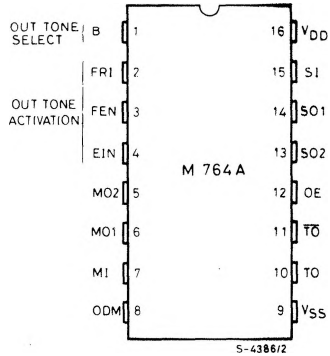


Dual in-line plastic package (M764)

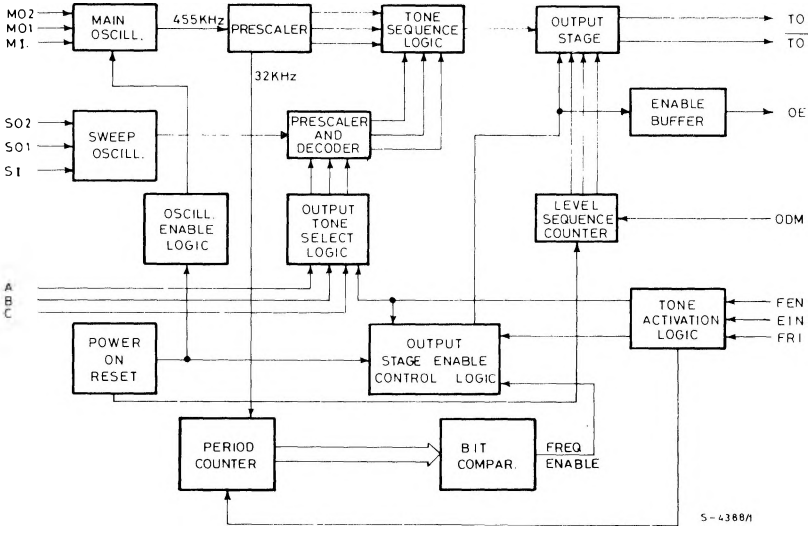


PIN CONNECTIONS





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		18	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				0.5	mA
	I_{DDO} Stand-by supply current	V_{DD} = 15V				0.15	mA
Main oscillator	M_I Main oscillator input	I_{IH} V_{IH} = 15V	V_{DD} = 15V			+5	µA
		I_{IL} V_{IL} = 0V				-1	
	M_{O1} Main oscillator output 1	I_{OH} V_{OH} = 14V	V_{DD} = 15V			-250	µA
		I_{OL} V_{OL} = 1V				+250	
	M_{O2} Main oscillator output 2	I_{OH} V_{OH} = 14V	V_{DD} = 15V			-200	µA
		I_{OL} V_{OL} = 1V				+200	

ELECTRICAL CHARACTERISTICS (continued)

Parameter			Test conditions		Min.	Typ.	Max.	Unit
Sweep oscillator	S_I	Sweep oscillator input	I_{IH} V_{IH}= 15V	V_{DD}=15V			+1	μA
			I_{IL} V_{IL}= 0V				-1	
	S_{O1}	Sweep oscillator output 1	I_{OH} V_{OH}= V_{DD}-1V	V_{DD}=15V		-200		μA
			I_{OL} V_{OL}= V_{DD}-3V			+200		
	S_{O2}	Sweep oscillator output 2	I_{OH} V_{OH}= V_{DD}-1V	V_{DD}=15V		-200		μA
			I_{OL} V_{OL}= V_{DD}-3V			+200		
Control pins	EIN FEN ODM	Enable input Filter enable input Output drive mode			Standard C/MOS inputs			
	A B C	Output sequence selection pins			C/MOS inputs with active pull-down			
Freq. input	FRI	Frequency input	I_{IL} V_{IL}= 0V				1	μA
			I_{IH} V_{IH}= 4V		8		16	
			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 = 14V		10			mA
			I_{OL} V_{DD}= 15V V_O = 0.7V		10			
	$\overline{TO}$	Inverted output	I_{OH} V_{DD}= 15V V_O = 14V		10			mA
			I_{OL} V_{DD}= 15V V_O = 0.7V		10			

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 oscil.	t_{SS}	Start up time	V_{DD}= 6V f = 1140 to 11400 Hz (*)			5		ms

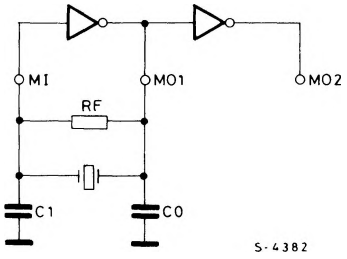
(*) R > 50 KΩ
C > 100 pF

FUNCTIONAL DESCRIPTION

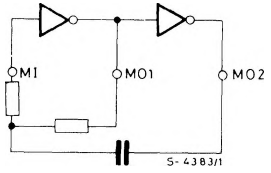
Main oscillator

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



b) RC oscillator



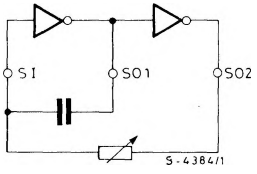
The accuracy of the output tones and of the band-pass filter characteristics are determined by the accuracy of the main oscillator frequency.
The crystal guarantees good performance over the whole temperature range with no external trimmer.
The main oscillator as well as the sweep oscillator are maintained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

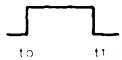
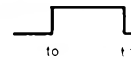
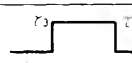
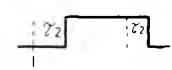
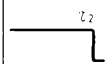
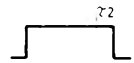
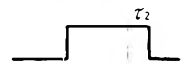


Output tone activation (pins FEN, EIN, FRI)

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

FUNCTIONAL DESCRIPTION (continued)

Table 1

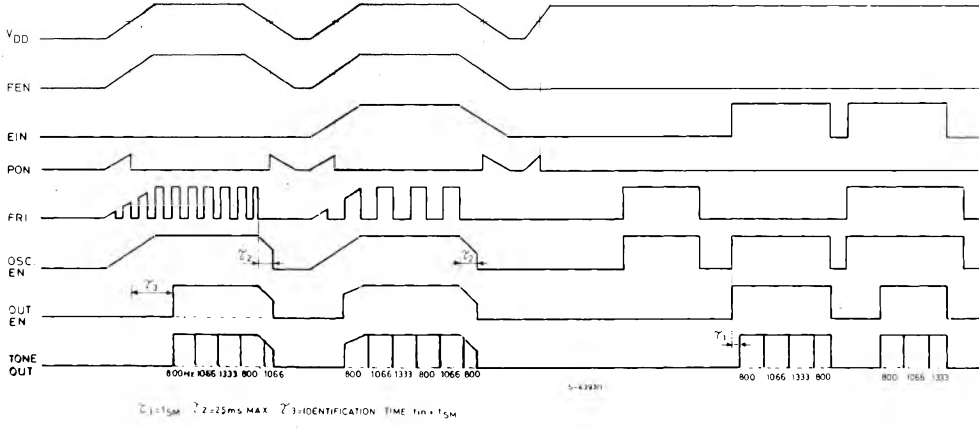
FEN	EIN	FRI	OSC. EN.	OUT. EN.	TONE OUT
0	0	0	0	0	0
0	0	1	1	0	0
0		0			
0		1			
1	0				
1	1				

IF f > fmin

IF fmin < f < fmax

$\tau_1 = t_{SM}$ $\tau_2 = 25\,ms\ MAX$ τ_3 = IDENTIFICATION TIME $f_{in} + t_{SM}$

Fig. 3 - Timing diagram

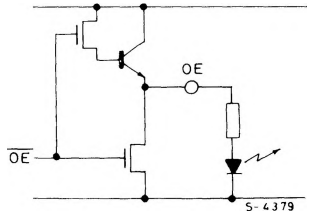


FUNCTIONAL DESCRIPTION (Continued)

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.

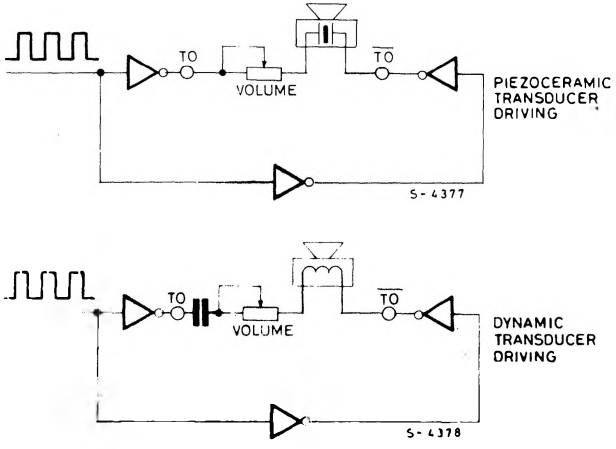
Fig. 4



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

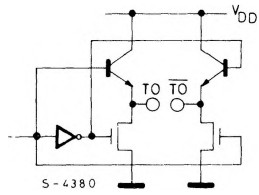
Two complementary outputs are provided to drive in a bridge configuration both piezoceramic and dynamic transducers (see fig. 5).

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 signal.
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 (2.8V) and starts always from the lowest level.

Output tone selection (A B C)

Table 2

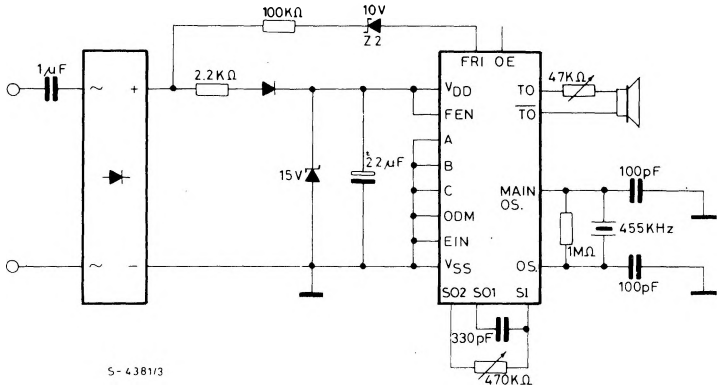
A	B	Output tone sequences and frequencies $f_{main\ oscill.}$ = 455 KHz and pin C = 0		
0	0	800	1066	1333
0	1	800	1066	
1	1	800	d.c. 50%	
1	0	800		

All the above mentioned frequencies are divided by 2 when pin C is taken to V_{DD}.

In the M764A pins A and C are not available and are internally pulled down.

TYPICAL APPLICATIONS

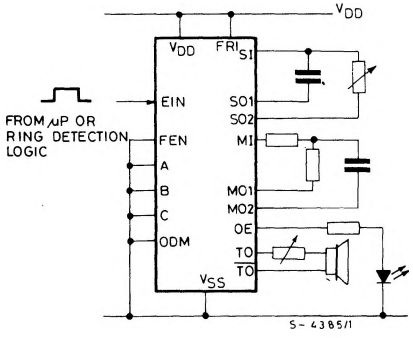
a) **Tone ringer for standard telephone applications**



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.**



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