

# M-980-02 3V/5V General Purpose Call Progress Tone Detector

Covers the 315 to 640 Hz range (common call progress)

Sensitivity to -38 dBm

Dynamic range over 38 dB

40 ms minimum detect

8-pin DIP or 16-pin SOIC

Single supply CMOS (low power)

Supply range 2.8 to 5.5 VDC

Inexpensive 3.58 MHz time base

Low power consumption ( 15 mW at 3V)

Applications include: automatic dialers, dialing modems, traffic measurement equipment, test equipment, service evaluation, billing systems

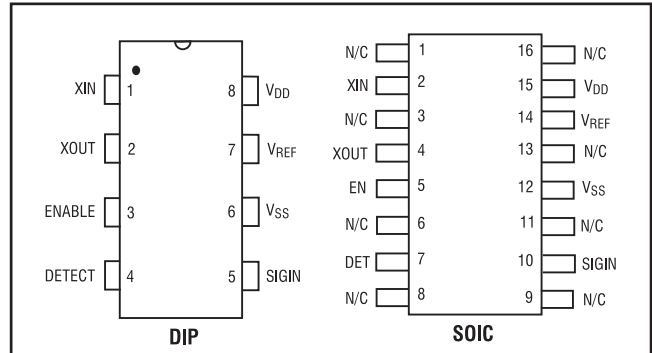


Figure 1 Pin Diagram

The M-980-02 is an integrated circuit tone detector for general purpose use in automatic following of switched telephone calls. The circuit uses low-power CMOS techniques to provide the complete filtering and control required for this function. The basic timing of the M-980-02 is designed to permit operation with almost any progress tone system.

The use of integrated circuit techniques allows the M-980-02 to pack the complete frequency and amplitude portion of call progress following into a single 8-pin DIP or 16-pin SOIC. A 3.58 MHz crystal-controlled time base guarantees accuracy and repeatability. 3V/5V operation increases customer flexibility, improves reliability, and minimizes power consumption.

## Call Progress Tone Detection

Call progress tones are audible tones sent from switching systems to calling parties to show the status of calls. Calling parties can identify the success of a call placed by what is heard after di-

aling. The type of tone used and its timing vary from system to system, and though intended for human ears these signals can provide valuable information for automated calling systems.

The M-980-02 is a signal detector sensitive to the frequencies most often used for these progress tones. Electronic equipment monitoring the DETECT output of the M-980-02 can determine the nature of signals present by measuring their duty cycle. See Figure 4 for a diagram of a circuit that could be used to permit a microcomputer to directly monitor tones on the telephone line. Much of the character of the progress tones is in their duty cycle or cadence (sometimes referred to as interruption rate). This information, coupled with level and frequency indication from the M-980-02, can be used to decide what progress tones have been encountered.

Table 5 shows some call progress tones with on/off times; 0.25/0.25 being 250 ms on, 250 ms off on a repeating basis. For example, dial tones as shown in the table are usually "on" con-

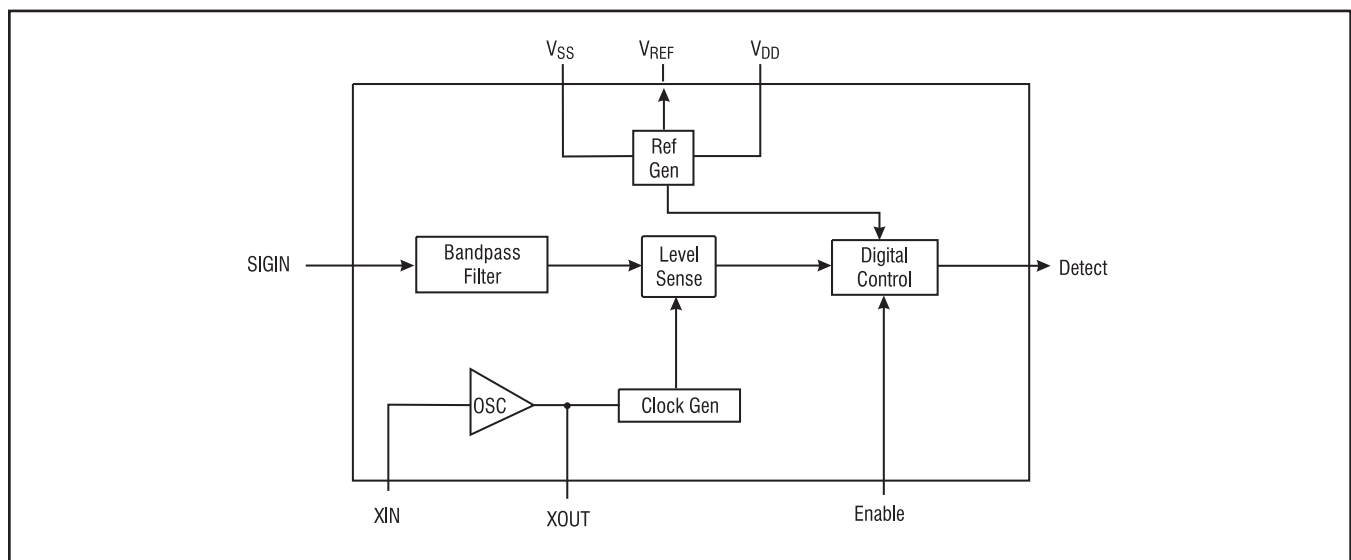


Figure 2 Block Diagram

Table 1 Pin Descriptions

PIN	Description
SIGIN	Signal input, AC or DC coupled (see level limitations elsewhere).
DETECT	Active output indicating signal detection. Activated by ENABLE.
ENABLE	Enables DETECT output. Used to mask signal activity.
V <sub>DD</sub>	Most positive power supply pin.
V <sub>REF</sub>	Internally generated reference voltage. $(V_{SS} + V_{DD}) / 2$ volts.
V <sub>SS</sub>	Most negative power supply pin.
XIN, XOUT	Crystal attachment pins. XIN may be used as the input for an external 3.58 MHz clock.

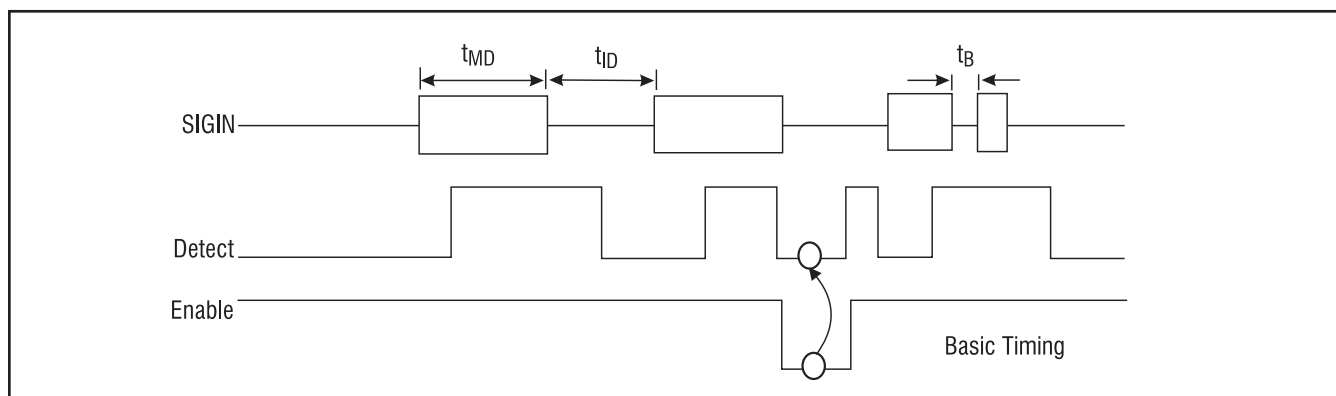


Figure 3 Signal Timing (See Table 2)

tinuously and last until the first dial digit is received by the switching system. Line Busy, on the other hand, is turned off and on at a rate of 1 Hz with a 50% duty cycle, or an interruption rate of 60 times per minute (60 IPM). The tones can be distinguished in this way.

It should be noted that while such techniques will usually be effective, there are some circumstances in which the M-980-02 cannot be accurately used. Examples include situations where ringback tone may be short or not even encountered. Ringback may be provided at ringing voltage frequency (20 or 30 Hz) with some harmonics and may not fall in the detect range, and speech or other strong noise may obscure tones making cadence measurement difficult.

Detection of "answer" is most difficult for many reasons. One way to determine if a called party has answered is by looking for a short burst of DETECT indications without a cadence match (produced by a click and "hello" at the far end). Some applications will require special methods like speech detection, but

most can be reliably handled with the M-980-02 and simple cadence measurement.

As can be seen, the tones used for the same purposes in different systems may not be the same. Standards do exist and should be consulted for your particular application. In North America AT&T's "Notes on the Network" or EIA's RS-464 PBX standard should be reviewed. In Europe tone plans may vary with locale, in which case the CEPT administration in each country must be consulted. Outside these areas, national PTT organizations can provide information on the systems within their borders.

#### Ordering Information

M-980-02P	8-pin plastic DIP
M-980-02S	16-pin SOIC
M-980-02T	16-pin SOIC, Tape and Reel

Table 2 Device Timing

Time	Value	Significance
t <sub>MD</sub>	40 ms	A valid tone will always be detected if it is at least 40 ms long.
t <sub>ID</sub>	40 ms @ -38 dBm	Inter-tone gaps must be detected if greater than this duration.
	85 ms @ -10 dBm	
t <sub>B</sub>	18 ms	Drop-outs of valid tone of up to 18 ms will be ignored.
<b>Note:</b> Application or removal of high level signals outside the must detect range may cause momentary detection, which may be filtered by time guarding the output.		

Table 3 Absolute Maximum Ratings

DC Supply Voltage ( $V_{DD} - V_{SS}$ )	6.0V
Voltage on SIGNAL IN	( $V_{DD} + 0.5V$ ) to ( $V_{SS} - 12V$ )
Voltage on Any Pin Except SIGNAL IN	( $V_{DD} + 0.5V$ ) to $V_{SS} - 0.5V$
Storage Temperature Range	-65° to 150°C
Operating Temperature	-40°C to 85°C
Lead Soldering Temperature	260° for 5 seconds
<b>Note:</b> Exceeding these ratings may permanently damage the M-980-02.	

Table 4 Specifications

Parameter		Min	Max	Units	Notes	
Supply Current		–	5	mA	10-	
Signal Detection	Level (5V)	-38	0	dBm	1,2	
	Level (3V)	-40	0	dBm	–	
	Duration	40	–	ms	–	
Signal Rejection	Level	Inband (5V)	–	-50	dBm	1,2
		Inband (3V)	–	-55	dBm	–
		Outband	–	0	dBm	1,3
Quiet Interval Detect	Duration	40	–	ms	8	
		85	–	ms	9	
“Detect” Output Pin	Logic 0	–	0.5	V	4	
	Logic 1	$V_{DD} - 0.5$	–	V	4	
“Enable”, “XIN” Input Pin	Logic 0	$V_{SS}$	$V_{SS} + 0.2$	V	5	
	Logic 1	$V_{DD} - 0.2$	$V_{DD}$	V	5	
“XIN” Duty Cycle		40	60	%	6	
“XOUT” Loading		–	10	pF	–	
“VREF” Output Pin	Deviation	-2	+2	%	7	
	Resistance	3.25	6.75	k $\Omega$	–	
“SIGIN” Input Pin	AC + DC level	$V_{SS} - 5V$	$V_{DD}$	V	–	
	Impedance (500 Hz)	80	–	k $\Omega$	–	
Power Consumption	3V operation	–	15	mW	–	
	5V operation	–	25	mW	–	
Unless otherwise noted, $V_{DD} - V_{SS} = 2.8$ to $5.5$ V and $T_a = 25^\circ\text{C}$						
<b>Notes:</b>						
1. 0 dBm = 0.775 Vrms.		6. External clock.				
2. F = 315 to 640 Hz.		7. Nominal = ( $V_{DD} + V_{SS}$ )/2.				
3. F > 1025 Hz, < 190 Hz.		8. Signal dropping from -38 to -65 dBm.				
4. Output current = 1 mA, $V_{SS} - V_{DD} - 3.0V$ .		9. Signal dropping from -10 to -65 dBm.				
5. Input current - 10 $\mu\text{A}$ max.		10. Typical supply current 4 mA.				

Table 5 Call Progress Tones

Frequency 1	Frequency 2	On/Off	Use
350	+440	Continuous	Dial tones
425	—		
600	X 120		
400	—		
480	+620	0.5/0.5s	Line Busy Tones
600	X 120		
480	+620	0.25/0.25s	Reorder Tones
600	X 120		
440	+ 480	2.0/4.0s	Audible Ringing
500	X 40		
440		0.5s burst	Various

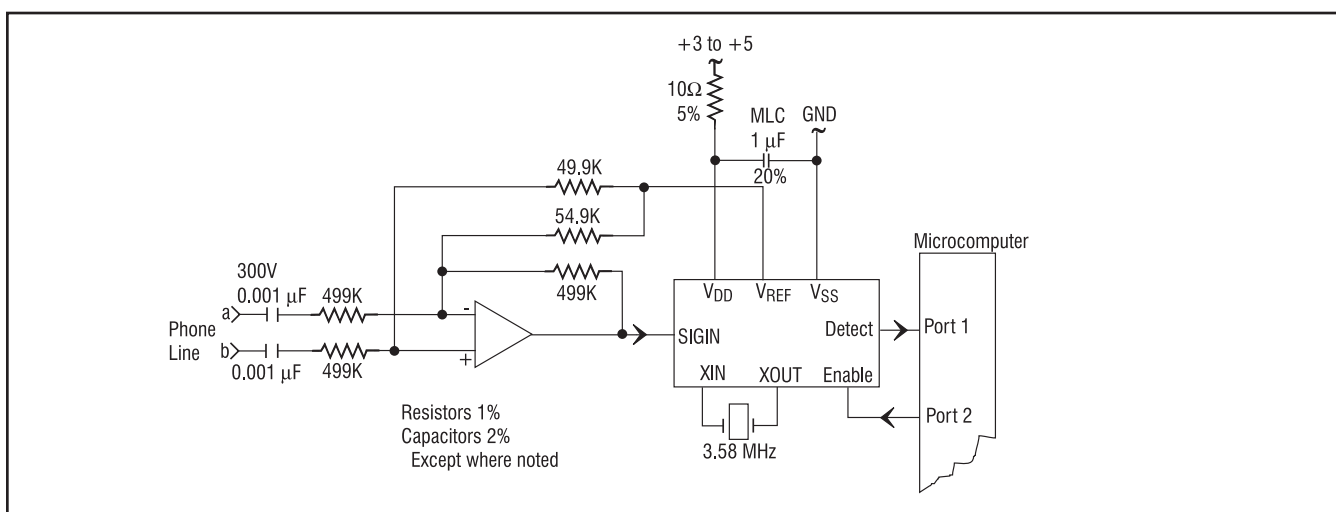


Figure 4 Telephone Line Circuit Application

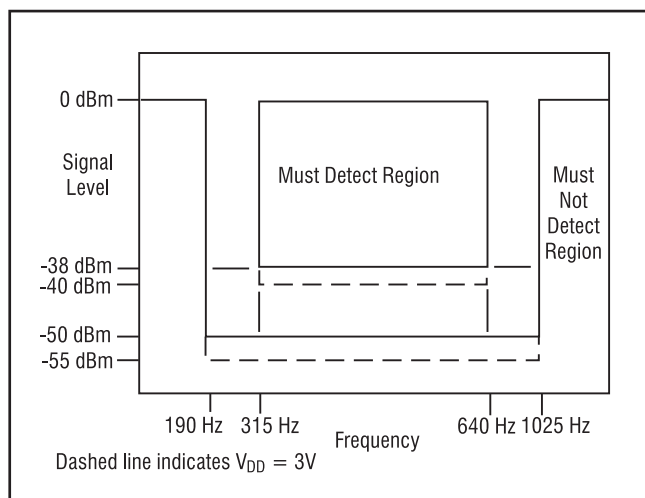


Figure 5 Detect Range

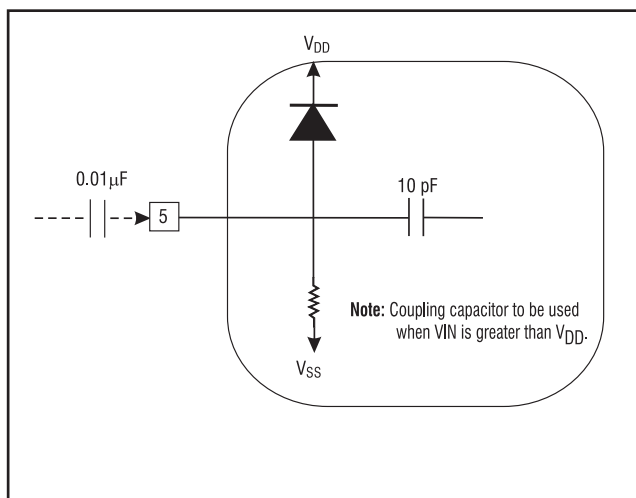
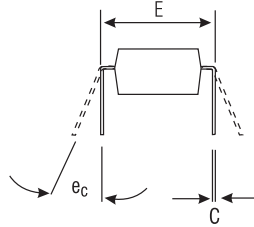
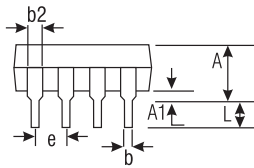
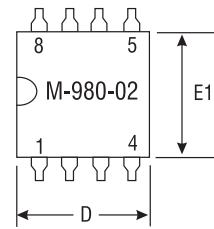


Figure 6 Input Signal Configuration

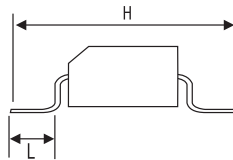
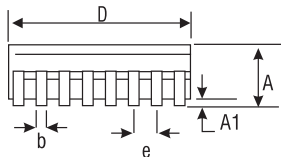
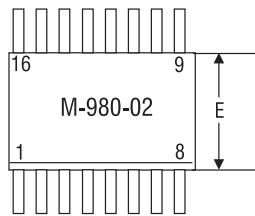
Drawing not to scale.  
Does not reflect actual part marking.

8-Pin DIP



	Tolerances		Tolerances	
	(Inches)		Metric (mm)	
	Min	Max	Min	Max
A		.210		5.33
A1	.015		.38	
b	.014	.022	.36	.56
b2	.045	.070	1.1	1.8
C	.008	.014	.20	.36
D	.355	.400	9.02	10.16
E	.300	.325	7.6	8.3
E1	.240	.280	6.1	7.1
e	.100 BSC		2.54 BSC	
ec	0°	15°	0°	15°
L	.115	.150	2.9	4.1

16-Pin SOIC



	Tolerances		Tolerances	
	(Inches)		Metric (mm)	
	Min	Max	Min	Max
A	.0926	.1043	2.35	2.65
A1	.0040	.0118	.10	.30
b	.013	.020	.33	.51
D	.3977	.4133	10.10	10.50
E	.2914	.2992	7.4	7.6
e	.050 BSC		1.27 BSC	
H	.394	.419	10.00	10.65
L	.016	.050	.40	1.27

Figure 7 Package Dimensions



**CLARE**

MICRO CHIPS.  
MACRO SOLUTIONS.

**Worldwide Sales Offices**

## CLARE LOCATIONS

Clare Headquarters  
78 Cherry Hill Drive  
Beverly, MA 01915  
Tel: 1-978-524-6700  
Fax: 1-978-524-4900  
Toll Free: 1-800-27-CLARE

Clare Micronix Division  
145 Columbia  
Aliso Viejo, CA 92656-1490  
Tel: 1-949-831-4622  
Fax: 1-949-831-4628

## SALES OFFICES

### AMERICAS

#### Americas Headquarters

Clare  
78 Cherry Hill Drive  
Beverly, MA 01915  
Tel: 1-978-524-6700  
Fax: 1-978-524-4900  
Toll Free: 1-800-27-CLARE

#### Eastern Region

Clare  
P.O. Box 856  
Mahwah, NJ 07430  
Tel: 1-201-236-0101  
Fax: 1-201-236-8685  
Toll Free: 1-800-27-CLARE

#### Central Region

Clare Canada Ltd.  
3425 Harvester Road, Suite 202  
Burlington, Ontario L7N 3N1  
Tel: 1-905-333-9066  
Fax: 1-905-333-1824

#### Northwestern Region

Clare  
1852 West 11th Street, #348  
Tracy, CA 95376  
Tel: 1-209-832-4367  
Fax: 1-209-832-4732  
Toll Free: 1-800-27-CLARE

#### Southwestern Region

Clare  
2816 Nevis Circle  
Costa Mesa, CA 92626  
Tel: 1-714-556-3661  
Fax: 1-714-546-4254  
Toll Free: 1-800-27-CLARE

#### Canada

Clare Canada Ltd.  
3425 Harvester Road, Suite 202  
Burlington, Ontario L7N 3N1  
Tel: 1-905-333-9066  
Fax: 1-905-333-1824

## EUROPE

#### European Headquarters

CP Clare nv  
Bampslaan 17  
B-3500 Hasselt (Belgium)  
Tel: 32-11-300868  
Fax: 32-11-300890

#### France

Clare France Sales  
Lead Rep  
99 route de Versailles  
91160 Champlan  
France  
Tel: 33 1 69 79 93 50  
Fax: 33 1 69 79 93 59

#### Germany

Clare Germany Sales  
ActiveComp Electronic GmbH  
Mitterstrasse 12  
85077 Manching  
Germany  
Tel: 49 8459 3214 10  
Fax: 49 8459 3214 29

#### Italy

C.L.A.R.E.s.a.s.  
Via C. Colombo 10/A  
I-20066 Melzo (Milano)  
Tel: 39-02-95737160  
Fax: 39-02-95738829

#### Sweden

Clare Sales  
Comptronic AB  
Box 167  
S-16329 Spånga  
Tel: 46-862-10370  
Fax: 46-862-10371

#### United Kingdom

Clare UK Sales  
Marco Polo House  
Cook Way  
Bindon Road  
Taunton  
UK-Somerset TA2 6BG  
Tel: 44-1-823 352541  
Fax: 44-1-823 352797

## ASIA PACIFIC

#### Asian Headquarters

Clare  
Room N1016, Chia-Hsin, Bldg II,  
10F, No. 96, Sec. 2  
Chung Shan North Road  
Taipei, Taiwan R.O.C.  
Tel: 886-2-2523-6368  
Fax: 886-2-2523-6369

<http://www.clare.com>

---

*Clare cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in this Clare product. No circuit patent licenses nor indemnity are expressed or implied. Clare reserves the right to change the specification and circuitry, without notice at any time. The products described in this document are not intended for use in medical implantation or other direct life support applications where malfunction may result in direct physical harm, injury or death to a person.*

---

Specification: 40-406-00018, Rev. B  
© Copyright 2000, CP Clare Corporation d/b/a Clare  
All rights reserved. Printed in USA.  
07/28/00