

General Description

HM9220E call progress tone detector is built on the 3.5 micron CMOS process and implemented with switched capacitors techniques. It detects the input signal in the range of 305 to 640 Hz and then outputs relative envelopes to allow automatic equipment to monitor tones in dial telephone systems. The HM9220E is sensitive to signals from 0 dBm to -27 dBm.

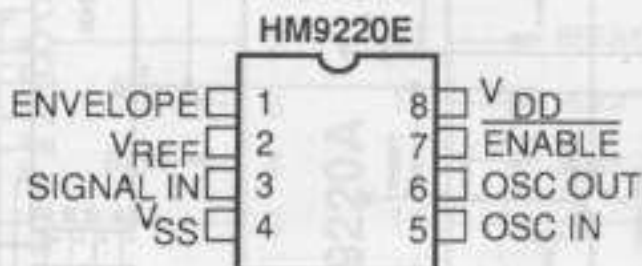
Features

- Low cost 32768 Hz crystal or clock.
- Low power consumption.
- Detects tones throughout the telephone progress band (305 ~ 640 Hz).
- Sensitivity to -8 ~ -39 dBm ($V_{DD}=2.5V$) or 0 ~ -27 dBm ($V_{DD}=5V$).
- Supply voltage: 2.5 to 5.5V.
- 8 pins DIP package.

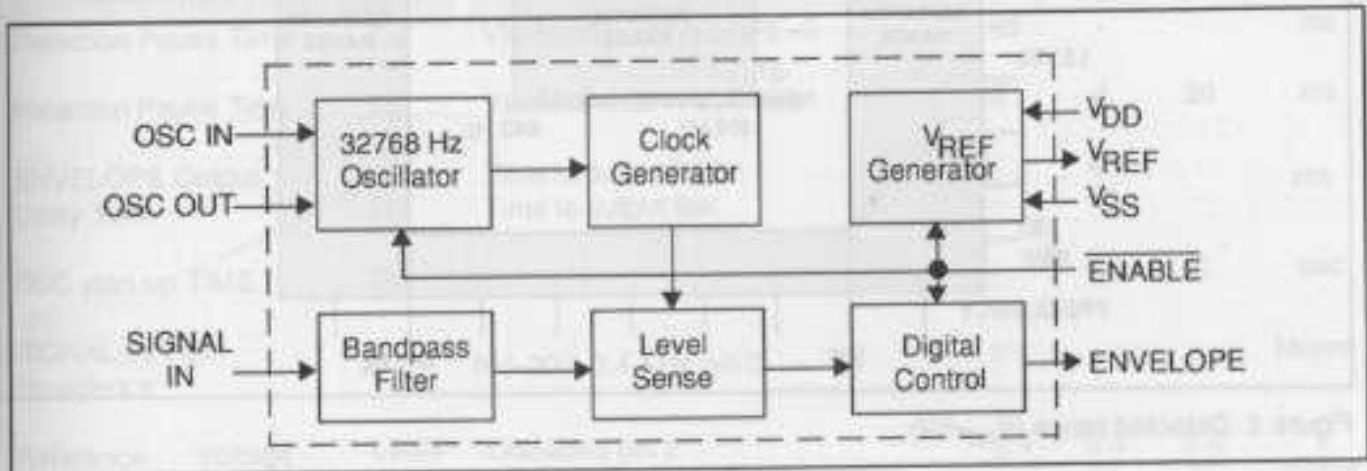
Application

- Service supervision.
- Modems.
- Feature telephones.
- Answering machines.
- Billing systems.
- Test equipment.
- Traffic measurement equipment.

Pin Configurations



Functional Block Diagram



Pin Descriptions

Pin No	Sym.	Function
8	V_{DD}	Supply Voltage: 2.5 to 5.5V. While $\overline{ENABLE}=1$, chip are disabled, the V_{REF} will be turned off and outputs will be pulled low to decrease the consumption of power.
4	V_{SS}	
2	V_{REF}	Provide voltage at half VDD for voltage reference.
3	SIGNAL IN	Accept the analog input. This pin is internally biased at V_{REF} so that the input signal should be AC coupled.
7	\overline{ENABLE}	$\overline{ENABLE}=0$, this chip in normal state, then all of the functions can be operated. $\overline{ENABLE}=1$, this chip is disabled. oscillator stops and ENVELOPE is pulled low.
5	OSC IN	Crystal Oscillator input and output. A 32768 Hz crystal is connected between these pins in parallel with a builtin inverter and R, C feedback & loading components. While $\overline{ENABLE}=1$, the oscillator will be disabled to decrease the consumption of power.
6	OSC OUT	
1	ENVELOPE	If the input signal is within specifications ($V_{in}=-27$ to 0 dBm, frequency within 305 to 640 Hz, and lasts longer than 40 ms), this pin will output relative envelope with delay time=40ms typically. The detected timing diagram and range are shown in figure 1 and 2.

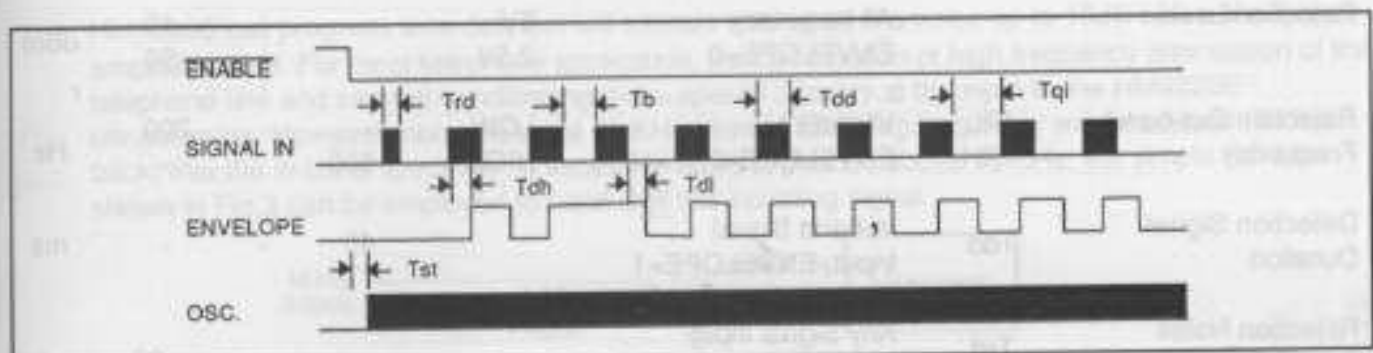
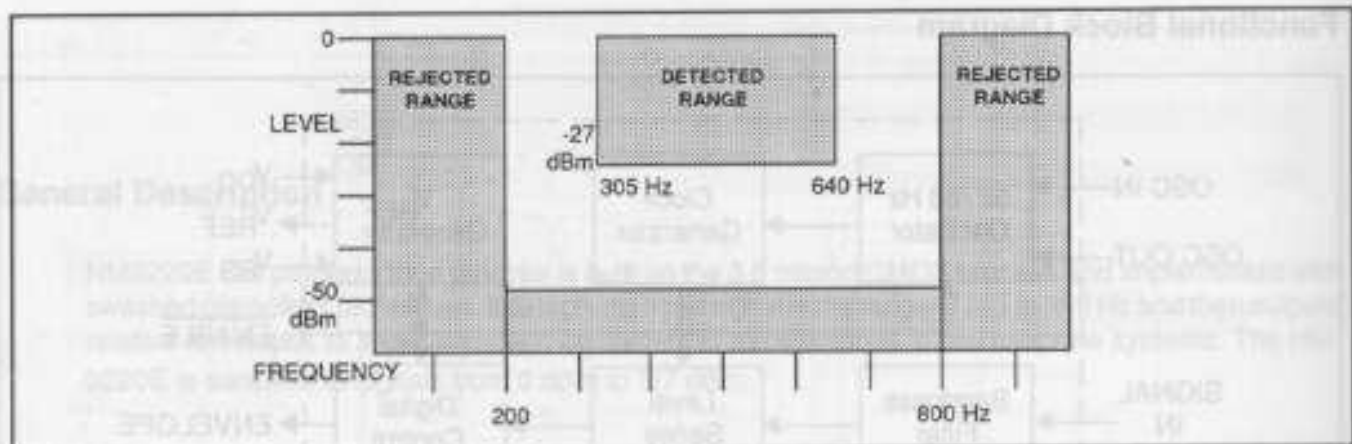


Figure 1. Decoded Timing Diagram


 Figure 2. Detected range ($V_{DD}=5V$).

Absolute Maximum Ratings

Parameter	Sym.	Ratings	Unit
DC Supply Voltage	V_{DD}	7.0	V
Input Voltage Range	V_{IN}	-0.5 to $V_{DD} + 0.5$	V
Power Dissipation Per Package	P_D	500 ($T_A = -25 \sim +60^\circ C$)	mW
Operating Temperature	T_A	-25 to 85	$^\circ C$
Storage Temperature	T_{STG}	-65 to 165	$^\circ C$

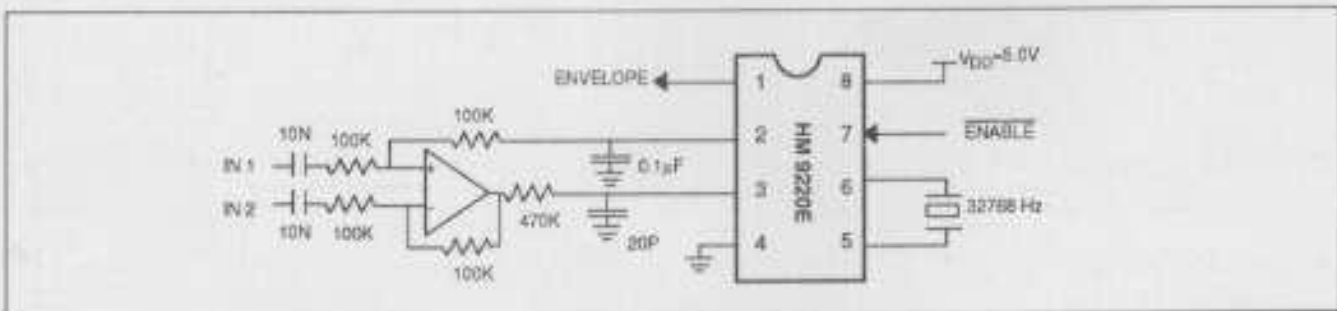
Electrical Characteristics

 Unless otherwise stated $V_{DD}=5.0V$, $f_{OSC}=32768$ Hz, $T_A=25^\circ C$

Characteristics	Sym.	Conditions	Min.	Typ.	Max.	Unit
Operating Voltage	V_{DD}	Functional	2.5V	-	5.5V	V
Operating Current	IOP	Functions enable	5V	-	2	mA
		Output unloaded	2.5V	-	0.8	mA
Quiescent Current	IQS	Functions disabled, $\overline{ENABLE}=1$	-	-	1	μA
Detection Level		$f_{IN}=305$ to 640 Hz	5V	-27	0	dBm
		ENVELOPE=1	2.5V	-39	-8	dBm
Rejection Level		All frequency	5V	-	-40	dBm
		ENVELOPE=0	2.5V	-	-50	dBm
Rejection Out-band Frequency	f_{RL}	$V_I \leq 0$ dBm	LOW	-	200	Hz
	f_{RH}	ENVELOPE=0	HIGH	800	-	-
Detection Signal Duration	T_{dd}	In-band Signal Input, ENVELOPE=1	40	-	-	ms
Rejection Noise Duration	T_{rd}	Any Signal input ENVELOPE=0	-	-	20	ms

Characteristics	Sym.	Conditions	Min.	Typ.	Max.	Unit
Detection Pause Time	Tqi	V _i < -50dBm, ENVELOPE=0	40	-	-	ms
Rejection Pause Time	Tb	V _i < -50dBm, ENVELOPE=1	0	0	20	ms
ENVELOPE Output Delay Time	Tdh	Time to output high	-	40	-	ms
	Tdl	Time to output low	-	40	-	ms
OSC start up TIME	Tst		-	0.8	2	sec
SIGNAL IN input Impedance	ZI	IIN=200 -3.4 KHz pin 3	1.0	-	-	Mohm
Reference Voltage	VREF	Unloaded pin 2	2.4	2.5	2.6	V
Output Impedance	ZREF	Unloaded pin 2	-	10	20	Kohm
Logic Input Voltage	VIH	pin 7	3.5	-	-	V
	VIL		-	-	1.5	V
Logic Input Current	I _{IH}	VIH=5.0V pin 7	-	-	0.1	μA
	I _{IL}	VIL=0V pin 7	-0.1	-	-	μA
Logic High Output Current	IOH	VOH=4.5V pin 1	-	-	-0.5	mA
			2.0	-	-	mA
Logic Low Output Current	IOL	VOL=0.5V pin 1				

Application Circuit



Application Note :

HM9220E call progress tone detector will tolerate total input rms noise up to 10dB below the lowest amplitude tone. For most telephone application, the combination of high frequency attenuation of the telephone line and internal bandlimiting make special circuitry at the input to the HM9220E unnecessary. However, noise near the 32 KHz internal sampling frequency will be aliased (folded back) into the in-band spectrum ; if excessive noise is present above 16 KHz, the simple RC filter shown in Fig.3 can be employed to band limit the incoming signal.

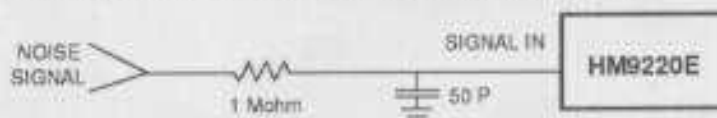


Fig.3 For use in extreme high frequency input noise environment.