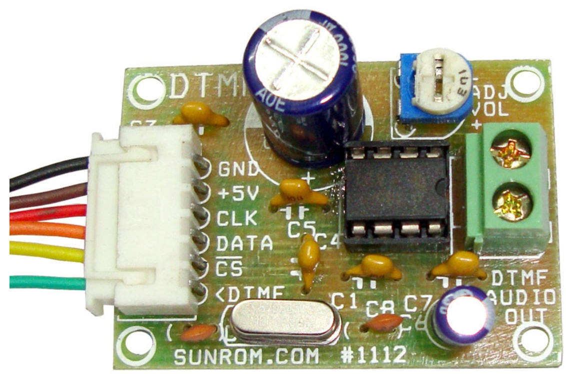
Document: Datasheet Date: 9-Feb-12 Model #: 1112 Product's Page: www.sunrom.com/p-1105.html

DTMF Generator/Dialer/Encoder

This board can generate DTMF tones as per input from microcontroller. The output is DTMF audio which can be fed to variety of sources like Landline Telephone, FM transmitter, Mobile Phones or custom devices which needs DTMF transmission. At receiver side the DTMF can be decoded using popular MT8870 board or any such device.



Features

- Full 16 DTMF tones generated
- Digitally controlled
- Simple to use and Low Cost
- Onboard LM386 based amplifier
- Adjustable 1W DTMF audio output
- Can drive speaker directly

Applications

- Phone Auto Dialer
- Remote Control
- Data Transfer
- Security

Specification

Working voltage	+5V DC	Regulated power supply required
Idle Current	20 mA	
Active Current	100 mA	Tone Generation (Depend on audio volume)
Audio Output	1 watts	Adjustable using onboard volume preset
DTMF Tones	Total 16	All 16 tones can be generated

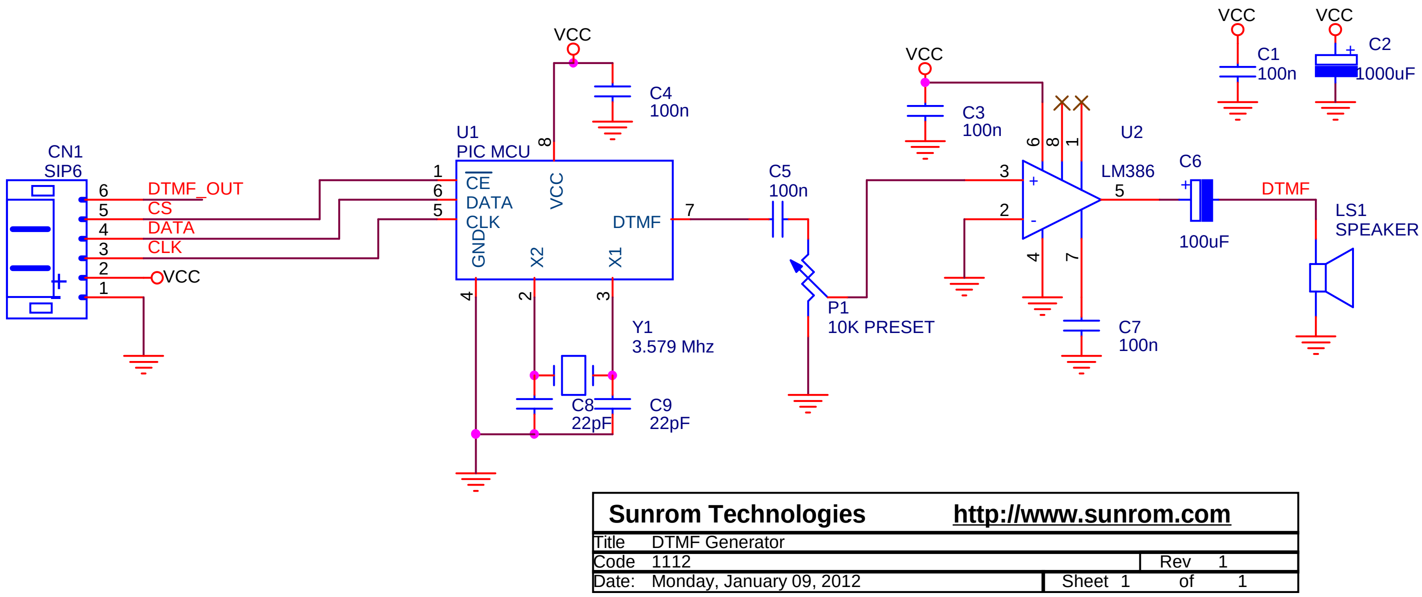
Board Schematic

On the board you can see two main sections.

The first is PIC MCU IC which takes digital data and generates DTMF tones.

Section IC is LM386 which is audio amplifier which can generate up to 1 watt of output which can also drive speakers directly.

The Preset P1 can be used to adjust output volume.

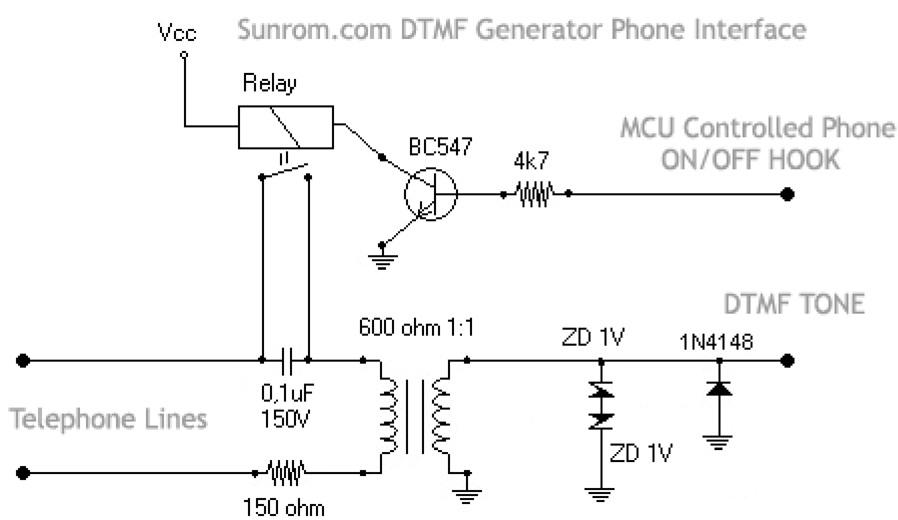


How to connect to Landline Phone

If you are making audio dialer you need to feed the audio from DTMF board to phone lines.

Here is the schematic for interfacing. The relay can be controlled by MCU which put the phone ON or OFF hook just like you pickup the phone and then dial number.

The DTMF is fed to the telecom transformer and so phone line.



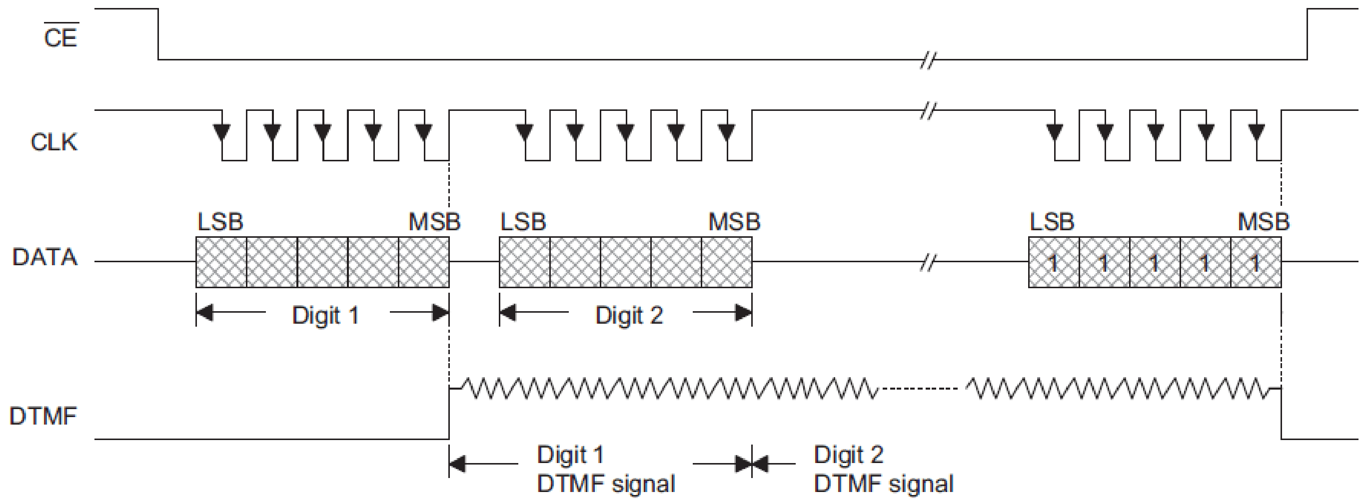
Serial Data format

There are three wires CS, DATA, CLK that can be used to control the board.
For each digit a byte is written. Only five bits are written from the byte.

So first CS is chip select made low, and DATA pin is clocked at CLK pin with 5 bits as per DTMF tone required from table below.

DTMF Digit	Hex Value to be sent	DTMF Tone (Hz)
1	0x01	697+1209
2	0x02	697+1336
3	0x03	697+1477
4	0x04	770+1209
5	0x05	770+1336
6	0x06	770+1477
7	0x07	852+1209
8	0x08	852+1336
9	0x09	852+1477
0	0x0A	941+1336
*	0x0B	941+1209
#	0x0C	941+1477
A	0x0D	697+1633
B	0x0E	770+1633
C	0x0F	852+1633
D	0x00	941+1633

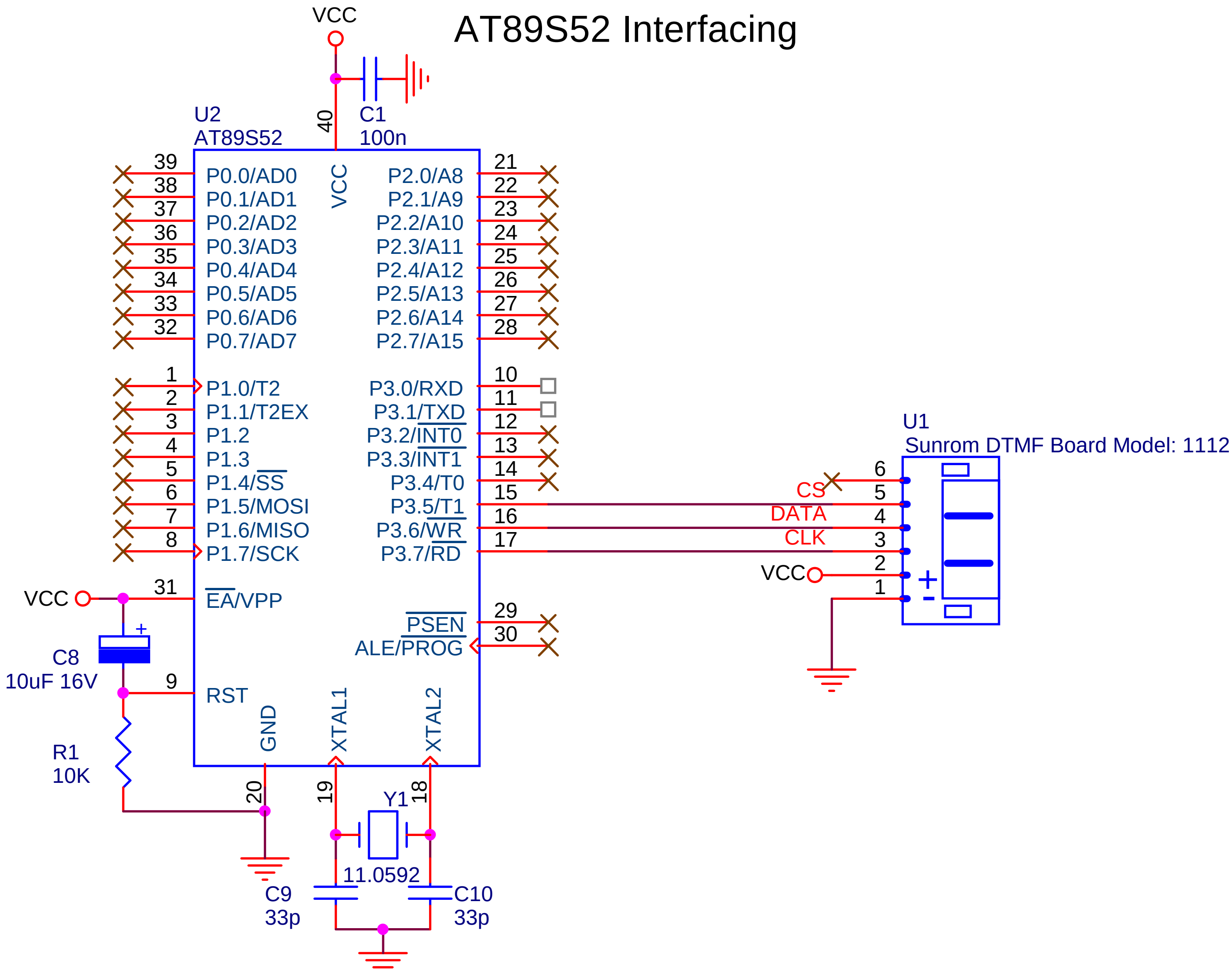
Waveform during controlling will be as below.
As you can see a tone is generated as long as CS/CE line is made high or new code is not sent.



Interfacing with AT89S52

Here is application on how to interface with 89S52 microcontroller and generate DTMF as per your application.

Source Code is given on next page.



```c
// Author: Sunrom Technologies 9/2/2012
// Board: DTMF Encoder/Generator Demo Model: 1112 at Sunrom.com
// The program can generate DTMF audio for dialing or remote control
// Compiler: Keil C51 MCU: AT89S52

#include <REGX51.H> // Standard 8051 defines
#include<intrins.h> // for nop()

#define delay_5us() _nop_();_nop_();_nop_();_nop_()

#define CS        P3_5 // Define which MCU pins are connected to DTMF board
#define DATA      P3_6
#define CLK       P3_7

// -=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=
// -=-=-=-=- Delay x ms -=-=-=-=-=-=-=-=
// -=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=
void delay_ms(int x) // delays x msec (at fosc=11.0592MHz)
{
      int y=0;
      while(x>=0)
      {
            for (y=0; y<100; y++);
                  x--;
      }
}
// -=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=
// -=-=-=-=- Send 5 Bits -=-=-=-=-=-=-=-=
// -=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=
void Write5Bits(unsigned char dtmfByte)
{
      unsigned char count=5;
      if(dtmfByte==0)dtmfByte=10;
      CS=0;
      delay_ms(10);
      while(count--)
      {
            if(dtmfByte&0x01)
            {
                  DATA=1;
            }
            else
            {
                  DATA=0;
            }
            CLK=0;
            delay_5us();
            CLK=1;
            dtmfByte>>=1;
      }
      delay_ms(100); // Important, This time decide how long DTMF tone is generated.
      CS=1; // Deselecting CS stops current DTMF tone.
}
```

```c
void sendDTMF(unsigned char *s,unsigned char l)
{
      while(l--)
      {
            Write5Bits(*s);
            delay_ms(100); //Important, This time decides after how much time
                              //    next tone is sent.
            s++;
      }
}

// -=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=
// -=-=-=-=- Main Program -=-=-=-=-=-=-=-=
// -=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=
void main()
{
unsigned char data test_number[]={1,3,4,7,4,4,6,9,8,0,6};//test number to dial
      while(1) // Loop Forever
      {
            // Dial the whole string, function needs string
            // & its length as parameters
            sendDTMF(test_number,11);

            delay_ms(1000); // After what time again function is called again
      }
}
```