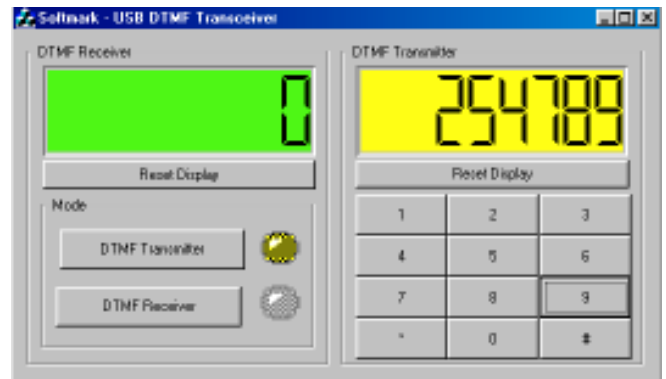


SOFTMARK



USB DTMF Transceiver



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The USB DTMF Transceiver is able to generate and receive DTMF tones from various sources. The card is controlled by the USB port. Windows automatically finds the card and the project is ready to be used immediately. Software for this card works on Windows 98 and XP

USB DTMF Transceiver Kit description

The DTMF signal consists of a mixture of two sine tones:

		High Group				
		Frequencies (Hz)				
		1209	1336	1477	1633	
Low Group Frequencies (Hz)	697	1	2	3	A] NOT USED
	770	4	5	6	B	
	852	7	8	9	C	
	941	*	0	#	D	

Figure 1. The DTMF tone is generated when you press a button which consists of a mixture of row and column frequencies. DTMF tones can represent one of 16 different states or symbols.

Applications

Paging systems
 Repeater systems
 Mobile radio
 PABX systems
 Computer systems
 Fax machines
 Robotics

Input configurations for MT8880

MT8880, which is used in this kit, is manufactured using state of the art CMOS technology. There are two input configurations, single ended and differential input configurations.

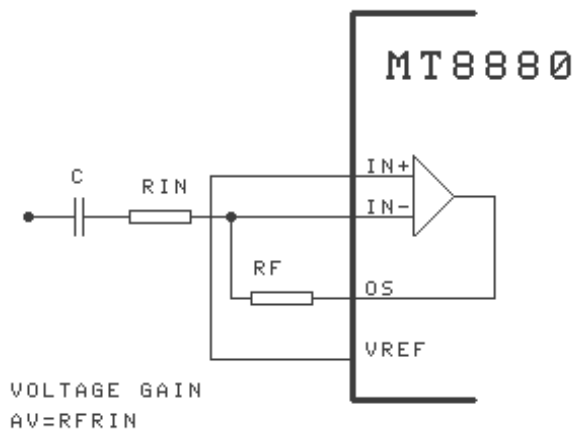
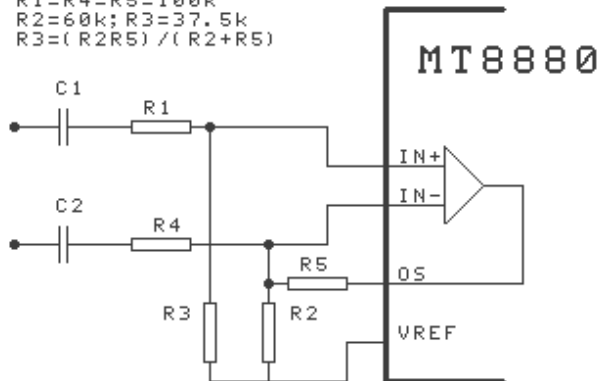


Figure 2. Single ended input configuration

Differential Input
 $C1=C2=10\text{nF}$
 $R1=R4=R5=100\text{k}$
 $R2=60\text{k}; R3=37.5\text{k}$
 $R3=(R2R5)/(R2+R5)$



VOLTAGE GAIN
 $A_V=R5/R1$
 INPUT IMPEDANCE
 $Z_{in}=\sqrt{2R1^2+(1/\omega C)^2}$

Figure 3. Differential input configuration

To find out more about settings, refer to the technical data sheet for MT8880.

How it works

Communication with MT8880 takes place over a 4-bit bus consisting of D0 to D3 and additional bits which select modes of operation. These additional bits are chip select (CS), read/write (RW) and register select (RS). MT8880 is active only when CS is zero. RW determines the data directions: 1 = Read (data from MT8880 by USB controller) and 0 = write (data from USB controller to MT8880). RS determines whether the transactions involve data (DTMF tones) or internal MT 8880 functions (instructions or status): 1 = instructions/status and 0 = data. Once the MT8880 is set up, the USB controller writes 000 to CS, RW and RS. This is done in order to send DTMF tones. The USB controller can also write 010 to read the DTMF tones.

Before you use MT8880, you have to set it up. You have to initialize both modes separately. For receiver mode, initializing takes place after the “DTMF Receiver” button is pressed (Figure 4). After that, the receiver is ready to read DTMF signals supplied to the audio input pin. Audio input is configured to be a single ended input amplifier built inside MT8880. Amplifier gain can be changed as per the description for the single input amplifier (Figure 2).

How to receive and send DTMF codes

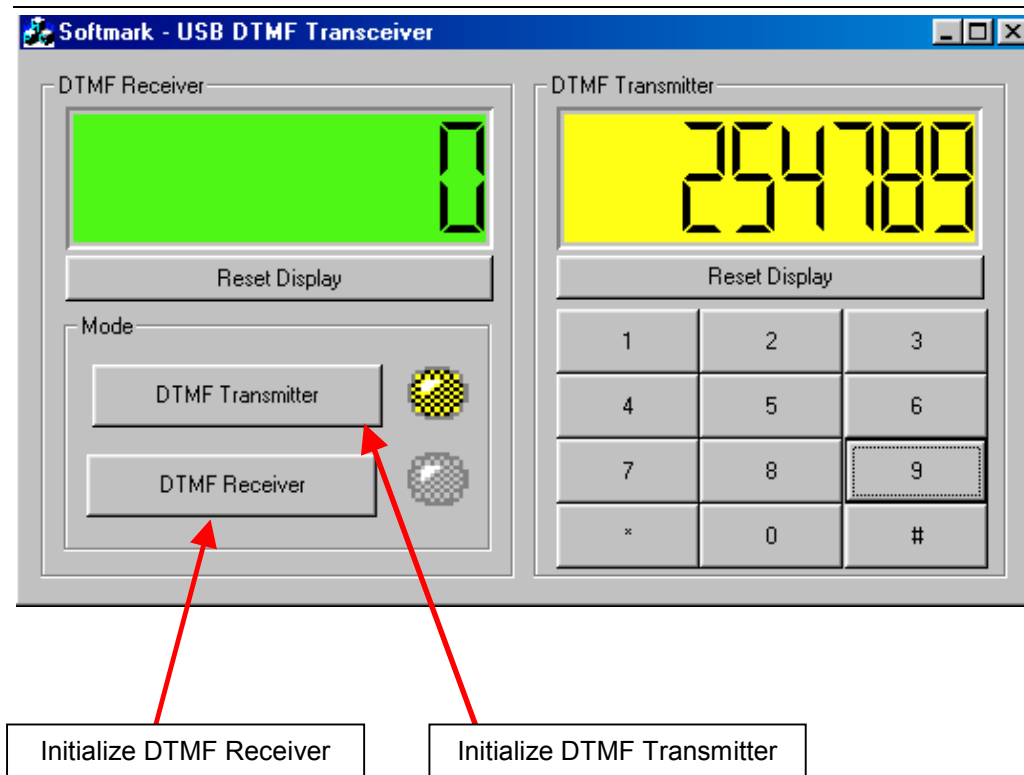


Figure 4. Virtual panel of the DTMF Transceiver

Pressing the “DTMF Receiver” button will set registers CRA and CRB for receiving mode and you will be able to receive DTMF signals from inputs. Each DTMF signal will be appended to the value currently displayed. The displayed value can be reset at any time by pressing the “Reset Display” button.

If you would like to transmit DTMF tones, you must firstly press the “DTMF Transmitter” button (Figure 4). After that, any numerical button pressed will generate DTMF tones. DTMF output will be amplified by IC2. The audio level can be changed by setting the potentiometer built directly on the PC board (VR1). LM386’s amplifier can generate around 1W of audio power and it can be connected to a small speaker (speaker is not included in the kit). Each received tone is displayed on the DTMF Receiver display. The next received DTMF tone is appended to the value on the display. This display can be cleared by pressing the “Reset Display” button.

How to connect the DTMF Receiver directly to the phone line

This will require differential input configuration for MT8880 (Figure 3). Please find more information regarding this in the technical data sheet for MT8880.

Building the card

The PCB top view (element side) is shown in Figure 5 below.



Figure 5. The PCB top view

Firstly, fit resistors, then all LEDs, IC sockets, the USB connector and then plug the ICs into the sockets. Remember to check the soldering once you finish.

Note that the kit is also available assembled.

Testing the card and installation

Connect the USB DTMF Transceiver card with the USB port in your PC. Use a USB cable (A-B type) to do this. The red LED, LD1, should be on. This diode only shows that voltage from the USB bus is being applied to your board. If LD1 is off, check the voltage (using a voltmeter) on the USB connector's pin 1 or IC1's pin 12. LD1 could be off because of incorrect polarity or over-soldering. In this case, you should examine the polarity of the diode and PCB soldering. If the VCC line was soldered to ground then the USB controller (Host) in your PC will automatically disconnect voltage to the USB bus and to your kit. If the problem was rectified, reconnect the USB cable to your kit. If LD1 (VCC) is on, that means your board is receiving 5V.

Next, the Windows operating system will try to find, and talk to, the USB controller (IC1). After a few seconds (usually 1-2 seconds), you will get a message on your screen that a new device was found. Following this, Windows will start installing the driver for this kit. This will only take a minute and does not have to be done again.

Note that information about installing drivers can be found on the CD ROM/disks supplied with the kit.

After the driver is installed, the next time you use the card the Windows operating system will automatically find the driver for your card. No other setup will be required.

Important

On the PCB there is a VCC connector which can be used to supply 5V and a maximum of 50mA for your other applications. Do not supply voltage to this connector. The USB DTMF Transceiver card does not need a power supply as voltage is supplied from the USB bus in your PC.

Power supply not required

The card has a connector which supplies 5V (+5V and GND line). This voltage is taken from the USB bus. The maximum current is about 50mA.

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