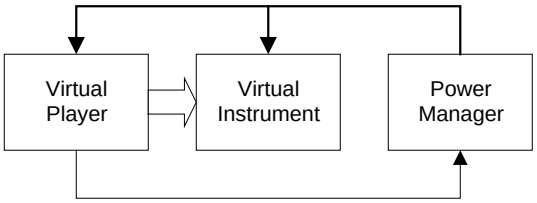
HTC750 Operation.

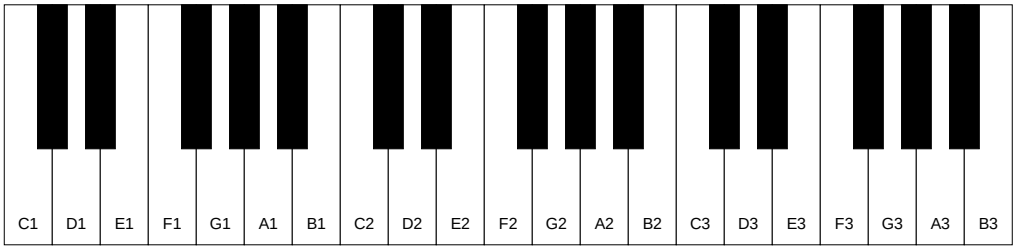
HTC750 is general-purpose melody generator. It could be used in musical toys, doorbells, alarm clocks and musical gifts. HTC750 was build using a microprocessor. Our approach in creating this melody generator involves several functional blocks illustrated below. There are three major functional blocks and we will discuss them separately.



Virtual Instrument.

This software module is generating sounds per given input note. This virtual instrument is capable of generating any notes in three-octave range see Figure 2 below. Each octave consists of twelve notes. Note that frequency of A1 is 440Hz, A2 is 880Hz and A3 is 1760Hz. Note that letter assignment in Figure 2 is not associated with musical notation and it is used for reference only. Frequency for other notes are easily found by multiplying each note from left to right by $2^{(1/12)}$. This number is derived from notion that frequency is doubled after each twelve notes and frequency distribution is linear. Note that frequency is only electrical definition of notes. Of course this is very simplified definition of notes and does not explain difference between instruments. For example A note plaid on guitar or violin will have same frequency, but we can never mistaken one for another. This is complex matter and we will not discuss it in this article. We will just say that sound generated by HTC750 resembles electric piano sound.

Figure 2



Virtual Player.

This module is responsible for playing our virtual instrument. At power up this module will choose melody to be plaid by reading melody selection inputs. It plays each note one after another until last note. After playing last note player notifies power manager that it is done playing.

Power Manager.

This module is responsible for keeping power alive during playing melody and managing power control pin. This electrical output is used to control external power switch. This output will go high at power up. As soon as player is done power manager turns of all power and puts HTC750 into sleep mode. "Sleep mode" is just an expression for this part entering low power consumption mode. We'll discuss usage of this pin and module in more detail during building of actual doorbell project.

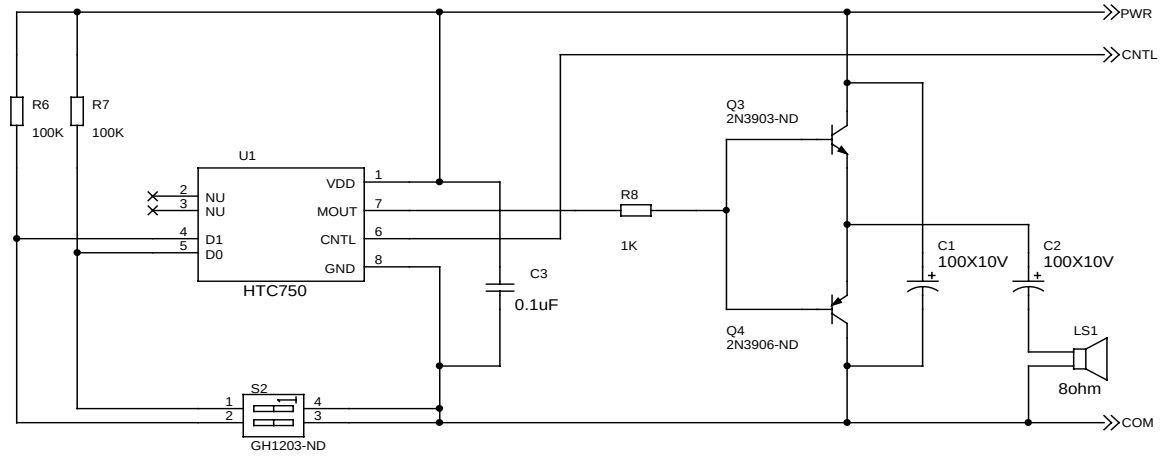
Constricting doorbell with HTC750.

We will divide this project into two sections. First section describes electrical connections of HTC750 and amplifier. Second section describes usage of different power sources.

Melody generator.

See Figure 3 during discussion of this section. Dip switch selects melody to be played. Since output of HTC750 is digital, requirement for output amplifier stage is limited to just current amplification. We used current amplifier build with two transistors configured as emitter followers. Output stage could be build using any other amplifier configuration. Output amplifier drives speaker generating audio signal. Note that output waveform of HTC750 is squire wave. Waveform is partially adjusted by speaker inertia. Also note that amplifier used will create additional sound distortion.

Figure 3

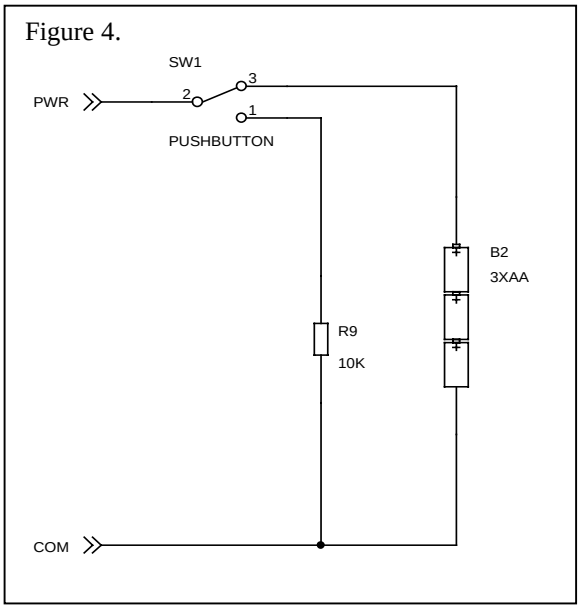


Power source.

We will discuss three methods of powering our project.

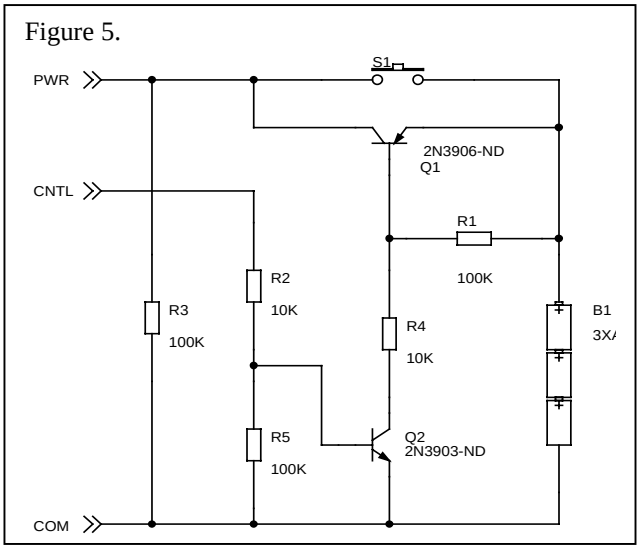
Method 1:
Simplest of all is just using switch with normally closed contacts and three AA size batteries. See Figure 4. This method works because HTC750 enters into sleep mode after finishing playing selected melody. In this mode power consumption is very low. R9 is used for discharging C1(figure 3) to allow reliable startup of HTC750.

Figure 4.



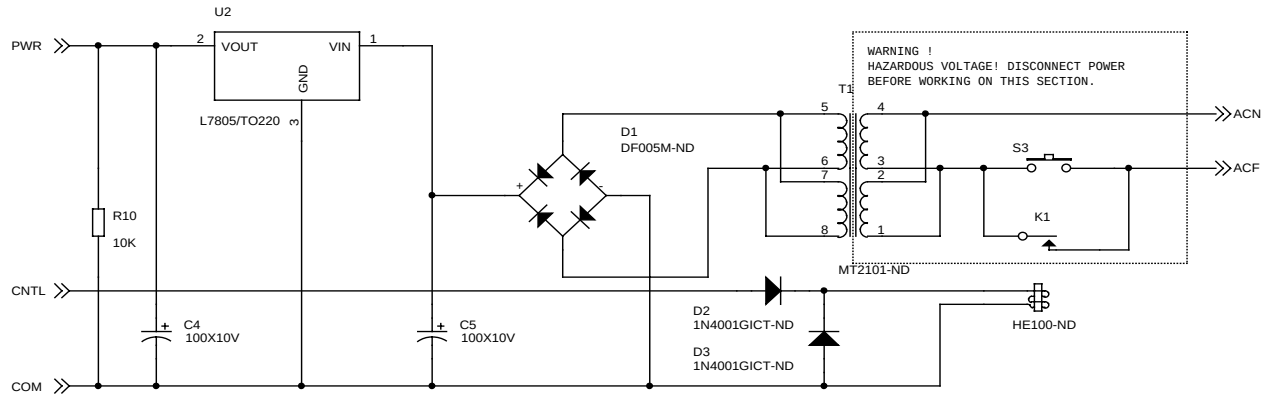
Method 2:
This method involves using "electronic switch" to shut down power using power control pin and three AA size batteries. See Figure 5. When S1 switch is activated HTC750 drives CNTL pin high and forcing Q2 into Saturation State. Q2 supplies Q1 base current and Q1 opens, entering into Saturation State. Q1 is connected parallel to S1 switch and when S1 is released, PWR current is supplied by Q1. After finishing melody HTC750 turns off CNTL pin and shuts down Q2 and Q1 effectively turning power off. This method improves power consumption of HTS750 in sleep mode and prolongs battery life.

Figure 5.



Method 3:
Involves using external relay to control AC power supply. See Figure 6. When we push S3 power supply generates plus 5V and HTC750 turns on K1 relay closing relay contact connected parallel to S3. This will keep our melody generator operational until melody is finished.

Figure 6.



All parts listed are available from Digikey (www.digikey.com) and HTC750 is available from High Tech Chips, Inc. ((www.hightechips.com)).