

Musical Gloves

Wireless Design Challenge Entry FZ1625

1. Abstract

A. The Musical Gloves are a virtual musical instrument which allow the user to 'play' a variety of types of music on any available surface, from a table top to the top of their head. As implemented and described here, the Musical Gloves are a fully functional demonstration prototype of a consumer product.

B. The wireless, battery powered, 'Musical Gloves' are instrumented with fingertip switches and 3 axis accelerometers, so the system can track finger presses and overall hand motion. Finger presses start and stop notes, while hand motion determines the loudness and octave of each note played.

C. The Musical Gloves may be used as a musical toy for children, allowing them to experiment with musical notes without restricting them to playing on a keyboard. They may also be used by older children or adults as part of a music act or stage act, using any available surface from their head, to the floor, to a drainpipe or stairs, as an instrument.

D. The Musical Gloves were built using Freescale demonstration boards, containing:

- a) Freescale microcontroller MC9S08GT60
- b) Freescale accelerometers MMA6261Q (X and Y axis), MMA1260D (Z axis)
- c) Freescale RF transceiver MC13192

E. The Musical Gloves are connected to a host PC via a wireless RF connection. The wireless connection is based on the IEEE 802.15.4 PHY layer, as provided by the Freescale MC13192 transceiver. The MC13192 is driven by a substantially modified and extended version the Freescale SMAC protocol stack. The SMAC software has been modified to allow the use of multiple interrupt sources, and to provide debugging and status information. It has been extended to support a synchronous, multiple node, star network configuration.

F. The star network configuration allows the Musical Gloves system to support up to 4 pairs of gloves simultaneously, without any loss of data integrity or throughput. Gloves may enter or leave the network automatically, without the user having to provide any initialization or set addresses.

G. The Host PC processes the finger presses and accelerometer readings from each glove to control the musical output. Vertical acceleration of the hand, as if pressing down on a keyboard, is measured to determine the note 'velocity' or loudness. Sideways (horizontal) motion is measured to determine the change of octave for a note, as if moving up and down a keyboard.

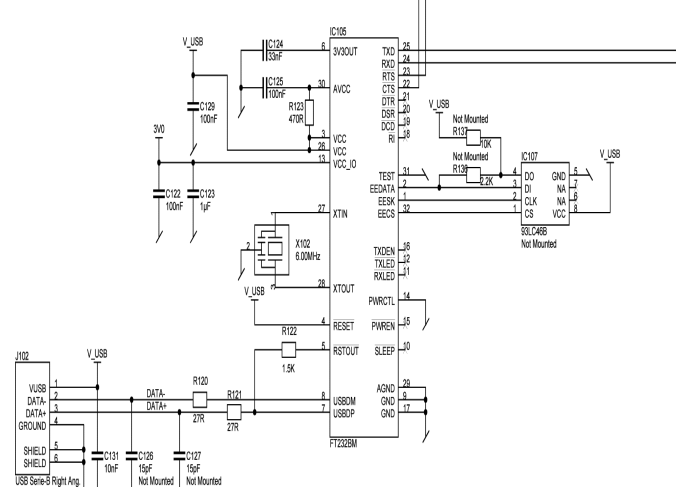
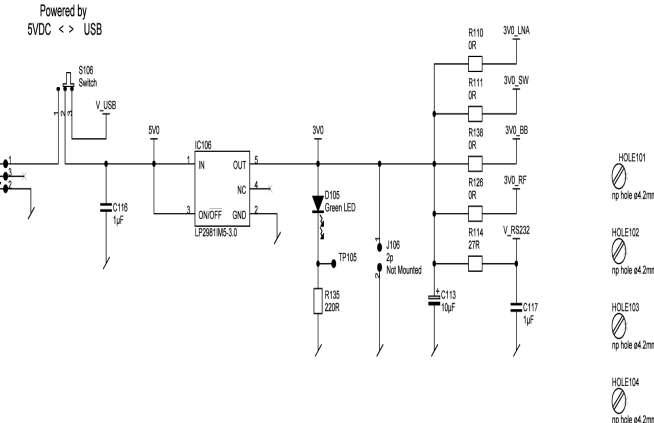
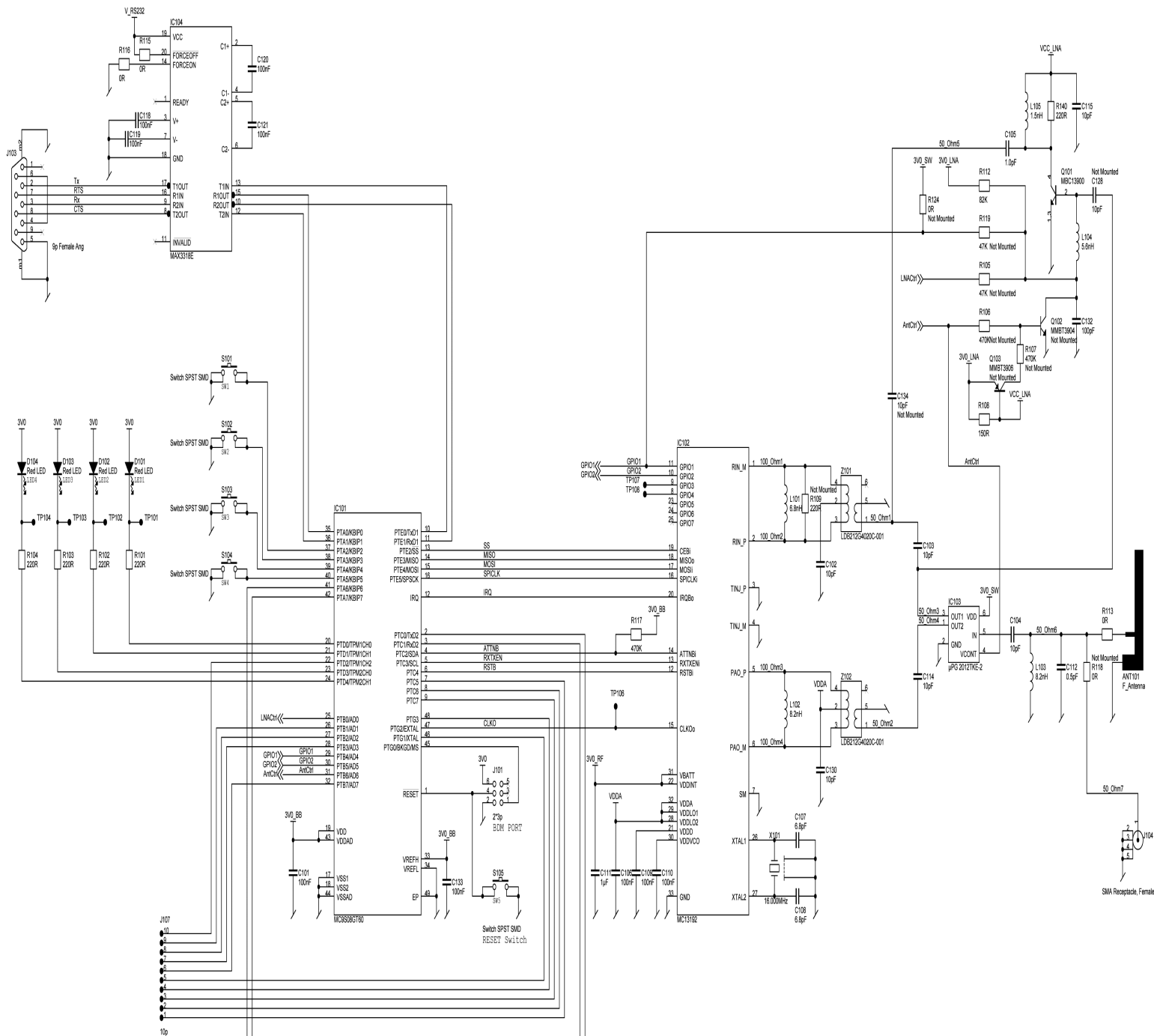
H. The Host PC provides the actual music output, using the Midi (Musical Instrument Digital Interface) software that is supplied with the Windows XP operating system. The Midi software supports a large variety of instrument voices, ranging from drums to wind instruments to keyboard instruments. The Musical Gloves can drive any of the supported instrument voices.



Software Architecture Drawing Legend

A01





Title: ZigBee Evaluation Kit (ZIG525-2); Main Schematic
 Size: Document Number: 80000528001_R0200_DS01
 Date: Wednesday, December 01, 2004
 Sheet 1 of 1

Freescale Semiconductor, Inc. 2004
 Skafhus 5
 DK-8240 Nibe, Denmark
 Telephone: +45 9871 0000
 Fax: +45 9830 0052
 www.freescale.com