AN-CS014

# BLUETOOTH® and NUVOTON CODECS

## Introduction

Bluetooth® was designed to carry short distance wireless data and voice traffic. Naturally, the voice must be digitized before being sent over the digital radio link. Then it is decoded back into voice at the receiving end. This is an excellent place to use a CODEC such as the Nuvoton W681360 or W681310. **[Note this Application Note should be read with AN-CS003 for all the details.]**

## The Application

One application that has been noted is using the W681360 with the CSR BlueCore™ chips to create a voice link. The BlueCore™ series of chips provide a complete RF and baseband for a BT link. Most of the BC chips have a PCM interface to allow adding voice to the link. This interface is very flexible. However, it has many potential settings to consider when interfacing to a CODEC. One common application problem is that the BC4 registers, or the CODEC, can be set incorrectly for this interface. This results in distortion at best; noise and dead silence at worst.

## Details

The table below lists some of the interface functions available on the BC4 chip and which of those are available on two different Nuvoton CODECs.

| BlueCore™4-ROM | W681360 | W681310 |
|---|---|---|
| **Option** | | |
| 13-bit Linear PCM | ✓ | |
| 16-bit Sign Extended | ✓ | |
| Receive Gain Adjust | ✓ | |
| 8-bit Mu-Law PCM | | ✓ |
| 8-bit A-Law PCM | | ✓ |
| Long Frame Sync | ✓ | ✓ |
| Short Frame Sync | ✓ | ✓ |
| GCI Mode | | ✓ |
| 256/512 KHz MCLK | ✓ | ✓ |

The BlueCore™ 4-ROM Plug-n-Go (BC41B143A) data sheet, in section 11.8.9, explains which bits to set in the PSKEY_PCM_CONFIG32 register to get the 16-bit sign-extended mode which will mate with the W681360. Specifically, Bit 4 (SIGN_EXTEND_EN) must be set to a 1, also bits 11 (48M_PCM_CLK_GEN_EN) and 12 (LONG_LENGTH_SYNC_EN) must be set to 1. That should put the BlueCore™ in the 16-bit Sign-Extended Mode to match the W681360 operation.

Another alternative, of course, is to run the BC4 in the 13-bit linear mode to match the W681360 default mode. (Remember that when we say "linear" the data is actually output in twos complement data format.)

As can be seen from the table above, there are actually two Nuvoton CODECs that will interface nicely to the BlueCore™ chip. The choice is mostly between 13-bit linear (W681360) and 8-bit companded (W681310) formats. There are also selections to be made for the Frame Synchronization and whether to use the Receive Gain Control (W681360.) Once these decisions are made, the system can be setup to operate through the registers and the pins of the two devices.

**Conclusion**

It can be seen that combining a Nuvoton CODEC with a CSR BlueCore™ Bluetooth System will add an inexpensive and simple voice link to the Bluetooth operation.