

# VS10XX AppNote: VS1033 to VS1053 migration checklist

## Description

This document describes how to migrate from VS1033 to VS1053. This document lists hardware and software differences and other considerations.

This document applies to all versions of VS1033 and VS1053.

<b>Revision History</b>			
<b>Rev</b>	<b>Date</b>	<b>Author</b>	<b>Description</b>
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## 1 Hardware

VS1033 and VS1053 have a few differences in hardware. Normally the same circuit board can be used.

### Core Voltage

The nominal core voltage of VS1033 is 2.5 V, VS1053 uses 1.8 V.

### GPIO pins

Pins used for I2S output have been changed to allow SPI Boot and I2S in the same application.

VS1053 also has the ability to read the states of XCS, XDSC, SCLK, and SI from GPIO\_IDATA. This may be useful in standalone applications that don't use the SCI and SDI interfaces.

### Internal PLL

The PLL control through SCI\_CLOCKF allows higher clocks by leaving out 1.5× multiplier and 0.5× addition.

See more info on PLL and the CLOCKF register from VS1053 datasheet.

### Audio Inputs

In VS1053 the SM\_LINE1 bit in SCI\_MODE is set after reset, so LINE1 is selected by default and the MIC amplifier is off. This is different than in VS1033 or VS1003.

In VS1053 the MIC input can be used simultaneously with the LINE2 input. MICP can also act as a LINE1 input to get stereo line input.

VS1053 has a stereo ADC and an improved audio path. Samplerate selection is more accurate, IMA ADPCM can be encoded in mono or stereo, or read out as uncompressed linear data. Automatic gain control can work in stereo or dual-channel mode. Read the ADPCM recording chapter in the VS1053 datasheet.

Ogg Vorbis Encoding with different encoding profiles is available as a plugin.

## 2 Application Considerations

This chapter gives general info on applications using VS1053.

### 2.1 Hardware Design

RC-snubbers described in the “ESD protection and line-out” application note (see application note pages at <http://www.vlsi.fi/>), must be connected to LEFT, RIGHT and GBUF even if GBUF is not used. RC-pairs should be connected right after the output jack. If line-out connection is used RC-pairs must be connected right after VS1053 analog outputs with no components between RC-pairs and VS1053.

PCB traces from analog connections (including mic and line) should be kept as short as possible.

Each voltage input pin should be bypassed with 100 nF capacitor for best performance.

Ground plane should be used under the VS1053. Each ground pin should be connected to this plane as close to the chip as possible.

Also see the PCB layout application note for best practices in how to connect RCAP.

### 2.2 Software Considerations

Ogg Vorbis and HE-AAC decoders have been added.

Sending of zeros after file data and using the SM\_CANCEL (was SM\_OUTOFWAV) bit to end decoding is encouraged instead of using software reset.

The parametric structure has changed and allows for example fast-play mode with all codecs.

Resynchronization to bad stream data is enabled by default.

SCLSTATUS bit DO\_NOT\_JUMP tells that a jump in a file (rewind, repeat) is not allowed.

See the full list of firmware changes in the Version Changes chapter at the end of the VS1053 datasheet.

The larger instruction RAM of VS1053 (4096 words) allows more complex custom applications to be run.

## 3 SCI Registers

VS1053 and VS1033 have some differences in SCI registers. See more info from VS1053 and VS1033 datasheets.

### 3.1 MODE

SM.LINE1, was SM.LINE\_IN, switches between MICP/MICN and LINE1 operation. Is set after reset, clear it to select differential mic input and mic amplifier instead of line1 input for the left channel.

SM.CANCEL, was SM.OUTOFWAV, cancels the decoding of the current file format. Now used by all decoders.

SM.ADPCM\_HP, not used in VS1053.

### 3.2 STATUS

SS.DO\_NOT\_JUMP indicates when it is not safe to jump in the file data. User should clear it after software reset and cancel to make certain it is not left set accidentally.

SS.VER is 4 for VS1053

Due to a hardware volume control that is new in VS1053, there are no longer digital filter scaling (AVOL) bits in SCL\_STATUS.

Other new bits in SCL\_STATUS can be ignored, set them to 0.

### 3.3 CLOCKF

SCL\_CLOCKF allows higher clocks to be configured by leaving out  $1.5\times$  multiplier and  $0.5\times$  addition. This means that the SCL\_CLOCKF values are not strictly compatible with VS1033.

### 3.4 DECODE\_TIME

DECODE\_TIME is not reset when file ends, it is only cleared at hardware or software reset. A write to DECODE\_TIME resets bitrate calculation (See VS1053 datasheet).

### **3.5 HDAT0 and HDAT1**

These registers give info on the supported audio formats. With the new codecs supported in VS1053 these registers contain new info.

### **3.6 VOL**

Operation of volume control register SCI\_VOL has not changed, but VS1053 contains hardware volume control that changes volume when zero-crossing is detected in the data (or after a timeout). This minimizes the audible disturbance when volume is changed.

## 4 Plugins, Patches, User Applications

Because the memory addresses have changed the User Applications written for VS1053 must be ported to VS1053. See new memory map and other info on VS1053 registers and functions from VS1053 datasheet. With applications provided by VLSI Solution it is normally enough to just switch to a VS1053 version.

## 5 Document Version Changes

This chapter describes the most important changes to this document.

### Version 1.00, 2009-04-01

- Preliminary version.



## 6 Contact Information

VLSI Solution Oy  
Hermiankatu 6-8 C  
FIN-33720 Tampere  
FINLAND

Fax: +358-3-316 5220  
Phone: +358-3-316 5230  
Email: [support@vlsi.fi](mailto:support@vlsi.fi)  
URL: <http://www.vlsi.fi/>

Note: If you have questions, first see support pages at  
<http://www.vlsi.fi/>