VS1053 to VS1063 Migration Guide

Description

This document describes how to migrate from VS1053 to VS1063. It lists hardware and software differences and other considerations.

This document applies to all versions of VS1053 and VS1063.

Revision History			
Rev	**Date**	**Author**	**Description**
1.11	2019-02-04	POj	MP3 patents expired in 2017.
1.1	2016-04-01	POj	Sine test through SDI requires more zero bytes.
1.03	2012-11-28	HH	Minor modifications.
1.02	2012-11-21	HH	Changed how the VS1063a Patches plugin is mentioned.
1.01	2011-05-24	HH	Corrected incorrect PDF title.
1.00	2011-05-04	HH	Initial revision.

Contents

1 General

VS1063 is pin-compatible with the VS1053 which makes migration from VS1053 to VS1063 very simple from a hardware point of view.

Major updates in VS1063 are:

- Added MP3, Ogg Vorbis, μ-law, A-law and G.722 encoding.
- Added codec mode (both encoder and decoder work at the same time) that works with μ-law, A-law G.722, IMA ADPCM and PCM WAV.
- Removed MIDI and MPEG layer I (MP1) decoders.
- MPEG layers II (MP2) and III (MP3): new, more robust and accurate decoding. MP3 is now full accuracy compliant. Highest MP3 bitrates and samplerates require 2.5$\times$ clock.
- CRC checking added for MP3 files that contain CRC. CRC checking can be disabled.
- Keeps track of the valid data in bit MP3 reservoir, which allows noiseless start of decoding in the middle of an MP3 file.
- The highest allowed internal clock speed for VS1053 was 55.3 MHz. VS1063 can run at up to 67.6 MHz.
- Samplerate finetuning in parametric_x.rateTune.
- SCI_WRAMADDR 0xc0c0..0xc0ff is mapped to parametric_x structure.
- Support reading u_int32's (almost) atomically through WRAM.
- Reading of stream and audio buffer fill states possible.
- Proportional and fixed-width font in data ROM for standalone applications.
- WAV decoding supports 24-bit and 32-bit and floating-point formats.
- RIFF-WAV header is generated automatically in WAV encoding (and codec) modes. The user still needs to fix the RIFF size and data size fields to make them valid WAV files.
- Sample-exact samplerate and volume change.
- Added mono mode and pause mode for player (parametric_x.playMode).
- Added FLAC decoding up to 2 channels.
- Added 5-channel equalizer.
- Added VU meter.
- Added AD mixer.
- Added PCM mixer.
- Added Speed shifter.
- Added I2C memory boot option.
- AAC, WMA, MP3 and FLAC decoding can be individually disabled using bits in parametric_x.config1.

Some of these new features have required for the register interface to be changed accordingly.

2 Hardware

VS1053 and VS1063 share the same hardware, so there is no need to update PCBs for VS1063.

3 Application Considerations

This chapter gives general info on applications using VS1063.

3.1 Hardware Design

From a hardware point of view, VS1063 is a drop-in replacement for the VS1053.

Nevertheless, VS1063 has an option to boot from external I2C memory. If this functionality is required, GPIO0, GPIO4 and GPIO6 need to be connected accordingly. Read the *VS1063 Datasheet* Chapter *I2C boot* for details.

3.2 Software Considerations

Basic operation of VS1053 and VS1063 similar: playing back audio files doesn't usually require any changes to the controller software, except for replacing loading of the *VS1053b Patches w/ FLAC Decoder* package with the *VS1063a Patches* package, available at
`http://www.vlsi.fi/en/support/software/vs10xxpatches.html`
Using the *VS1063a Patches* package is highly recommended.

Major changes to microcontroller software is only needed when the features new to the VS1063 are required, or if audio encoding is used.

Note: VS1053 Applications will not run on VS1063 without porting them first.

4 SCI Registers

VS1053 and VS1063 have a few differencies in registers. The following chapters list these differencies. See more info from VS1053 and VS1063 datasheets.

4.1 Changed: SCI_MODE

SM_EARSPEAKER_LO and SM_EARSPEAKER_HI register bits are removed from VS1063. A much more fine-grained 16-bit EarSpeaker tuning register is offered in the earSpeakerLevel field of the Extra Parameters structure. To port from old register values, see the following table:

VS1053		VS1063
SM_EARSPEAKER_HI	**RF_EARSPEAKER_LO**	**earSpeakerLevel**
0	0	0
0	1	12000
1	0	38000
1	1	50000

SM_STREAM has been removed from VS1063. The option was limited in VS1053 so it was decided it could be dropped from VS1063. To stream using VS1063, use samplerate finetuning.

SM_ADPCM has been renamed SM_ENCODE because VS1063 can encode also in many other formats than only IMA ADPCM.

4.2 Changed: SCI_STATUS

SS_VER is 4 for VS1053, and 6 for VS1063.

SS_REFERENCE_SEL was inconvenient to use on VS1053 due to a firmware bug. With VS1063 the higher reference voltage 1.65 V can be used as described in the VS1063 datasheet (AVDD$\geq$3.3 V).

4.3 Changed: SCI_WRAMADDR

More memory areas can now be accessed with this register. See the *VS1063 Datasheet* Chapter *SCI_WRAMADDR* for details.

5 Sine and Memory Tests

In vs1063a sine test and other tests started through SDI require additional 7-8 zero bytes to be sent to SDI for them to start.

6 User Applications

Because memory addresses have changed the user applications, plugins and patches are different between VS1053 and VS1063. Many of them are not needed anyway because VS1063 directly supports the functionality of many of VS1053's plugins and applications.

7 Audio Encoding

Audio encoding has changed considerably between VS1053 and VS1063. While the basic interface, namely reading data through registers SCI_HDAT0 and SCI_HDAT1 remains, both initializing and finalizing recording has changed significantly. Read Chapter *Audio Encoding* of the *VS1063 Datasheet* for details.

8 Extra Parameters parametric_x

The Extra Parameters parametric_x data structure has many new fields and effects, ranging from a fine-tuned playback speed shifter to a 5-channel equalizer. Read Chapter *Extra Parameters* of the *VS1063 Datasheet* for details.

9 Licenses

If the end product plays formats that require licenses, refer to the *Licenses* chapter of the VS1063 Datasheet. As of year 2017 patents related to MP3 have expired and MP3 does not require licenses.

10 Microcontroller Examples

Examples on how to control VS1063 using a microcontroller are available at
http://www.vlsi.fi/en/support/software/microcontrollersoftware.html

11 Latest Document Version Changes

This chapter describes the most important changes to this document.

Version 1.11, 2019-02-04

- MP3 patents have expired in 2017.

Version 1.03, 2012-11-28

- Added Chapter 10, *Microcontroller Examples*.
- Other minor modifications.

Version 1.02, 2012-11-21

- Changed how VS1063a Patches plugin is mentioned.

Version 1.01, 2011-05-24

- Corrected incorrect PDF title.

Version 1.00, 2011-05-04

- Initial revision.

12 Contact Information

VLSI Solution Oy
Entrance G, 2nd floor
Hermiankatu 8
FI-33720 Tampere
FINLAND

URL: http://www.vlsi.fi/
Phone: +358-50-462-3200
Commercial e-mail: sales@vlsi.fi

For technical support or suggestions regarding this document, please participate at
http://www.vsdsp-forum.com/
For confidential technical discussions, contact
support@vlsi.fi