DS2103 Multi-Channel D/A Board

Features

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dSPACE

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How to Contact dSPACE Support

If you encounter a problem when using dSPACE products, contact your local dSPACE representative:

- Local dSPACE companies and distributors: http://www.dspace.com/go/locations
- For countries not listed, contact dSPACE GmbH in Paderborn, Germany.
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You can also use the support request form: http://www.dspace.com/go/supportrequest. If you are logged on to mydSPACE, you are automatically identified and do not need to add your contact details manually.

If possible, always provide the relevant dSPACE License ID or the serial number of the CmContainer in your support request.

Software Updates and Patches

dSPACE strongly recommends that you download and install the most recent patches for your current dSPACE installation. Visit http://www.dspace.com/go/patches for software updates and patches.

Important Notice

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About This Document

Content

This document provides feature-oriented access to the information you need to implement the functions of the DS2103 board.

Symbols

dSPACE user documentation uses the following symbols:

Symbol	Description
⚠ DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a hazard that, if not avoided, could result in property damage.
Note	Indicates important information that you should take into account to avoid malfunctions.
Tip	Indicates tips that can make your work easier.
⁇	Indicates a link that refers to a definition in the glossary, which you can find at the end of the document unless stated otherwise.
📖	Precedes the document title in a link that refers to another document.

Naming conventions

dSPACE user documentation uses the following naming conventions:

%name%   Names enclosed in percent signs refer to environment variables for file and path names.

< >   Angle brackets contain wildcard characters or placeholders for variable file and path names, etc.

Special folders

Some software products use the following special folders:

Common Program Data folder   A standard folder for application-specific configuration data that is used by all users.

`%PROGRAMDATA%\dSPACE\<InstallationGUID>\<ProductName>`

or

`%PROGRAMDATA%\dSPACE\<ProductName>\<VersionNumber>`

Documents folder   A standard folder for user-specific documents.

`%USERPROFILE%\Documents\dSPACE\<ProductName>\`
`<VersionNumber>`

Local Program Data folder   A standard folder for application-specific configuration data that is used by the current, non-roaming user.

`%USERPROFILE%\AppData\Local\dSPACE\<InstallationGUID>\`
`<ProductName>`

Accessing dSPACE Help and PDF Files

After you install and decrypt dSPACE software, the documentation for the installed products is available in dSPACE Help and as PDF files.

dSPACE Help (local)   You can open your local installation of dSPACE Help:
- On its home page via Windows Start Menu
- On specific content using context-sensitive help via **F1**

dSPACE Help (Web)   You can access the Web version of dSPACE Help at www.dspace.com.
To access the Web version, you must have a *mydSPACE* account.

PDF files   You can access PDF files via the 📄 icon in dSPACE Help. The PDF opens on the first page.

Introduction to the Features of the DS2103

Objective

D/A conversion is required by many control applications to provide the control signals for actuators. In hardware-in-the-loop applications, sensors that provide analog signals have to be simulated.

Where to go from here

Information in this section

Information in other sections

Data Sheets (PHS Bus System Hardware Reference 📖)
Summarizes the technical specifications of the hardware components.
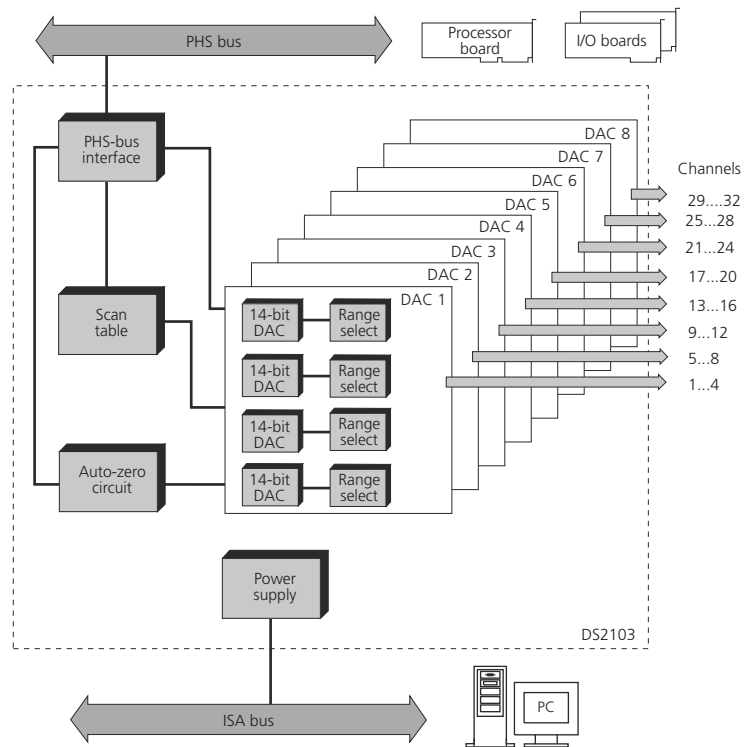
Board Architecture

Board architecture

The DS2103 Multi-Channel D/A Board provides 32 parallel D/A channels that you can use for D/A conversion.

The following illustration gives an overview of the functional units and architecture of the DS2103:

Integration Into a PHS-Bus-Based System

Introduction

To be used, the DS2103 must be integrated into a PHS-bus-based system. While the DS2103 performs the required output tasks, the processor board takes over the calculation of the real-time model. That is, applications using DS2103 I/O features are implemented on the processor board.

Communication between processor board and I/O board is performed via the peripheral high speed bus: That is the PHS bus for connection to a dSPACE processor board.

Partitioning the PHS bus with the DS802   With the DS802 PHS Link Board you can spatially partition the PHS bus by arranging the I/O boards in several expansion boxes.

The DS802 can be used in combination with many types of available dSPACE I/O boards. However, some I/O boards and some functionalities of specific I/O boards are not supported.

The I/O board support depends on the dSPACE software release which you use. For a list of supported I/O boards, refer to DS802 Data Sheet (PHS Bus System Hardware Reference 📖).

Connection to External Devices

Connection methods

There are two different ways to connect external devices to the DS2103. To access the I/O unit of the DS2103, connect external devices:

- to the 50-pin DAC connector P1 of the DS2103
- to the optional connector panel CP2103, equipped with BNC connectors CP1 … CP33

DAC Unit

DAC Unit

Introduction

The DS2103 provides a DAC unit featuring 8 parallel D/A converters with 4 D/A channels each. They have the following characteristics:

- 14-bit resolution
- ±5 V or ±10 V output voltage range (selectable for each of the 32 D/A channels individually)
- Transparent and latched mode (selectable for each group individually)

Transparent and latched mode

The DAC unit consists of 8 groups, each containing 4 D/A channels. For each group the output mode can be programmed separately. Each group can be driven in two operating modes:

- In the *transparent mode*, the converted value is output immediately.
- In the *latched mode*, the converted value is output after a strobe command by the application from the processor board. This allows you to write output values to more than one channel, and output the values simultaneously.

  To generate the strobe command, use the ds2103_strobe function. This mode is not supported by RTI.

Reaction to I/O errors

If another I/O board activates the I/O error signal of the PHS bus, the DS2103 provides two different modes:

- If the *I/O error mode* is enabled, the output is reset to zero as long as the error is active. When the error line is no longer set, the DS2103 outputs the voltage according to the previous value which was present after the last update of the DAC.
- If the *I/O error mode* is disabled, an I/O error has no influence on the output value.

You can set the *I/O error mode* of the D/A converters for each group individually with RTI and RTLib.

> ⚠ **WARNING**
>
> On power-up of the DS2103, each output channel of the DAC unit is set to a random value that does not provide any specified information.
> The firmware is used to clear the output registers of the DS2103 after power-up.

RTI/RTLib support

You can access the DAC unit via DS2103 Blockset and RTLib. For details, see
- DAC Unit in the *DS2103 RTI Reference*
- DAC Unit in the *DS2103 RTLib Reference*

Execution times

For details on the execution times and the corresponding measurement setup, refer to Function Execution Times (DS2103 RTLib Reference 📖).

Connecting external devices

For an excerpt from the circuit diagram that shows the I/O circuit and for information on the electrical characteristics and signal conditioning of the DAC unit, refer to Signal Connection to External Devices (PHS Bus System Hardware Reference 📖).

I/O mapping

The following table shows the mapping between the RTI block and RTLib functions and the corresponding pins used by the DAC unit:

Related RTI Block	Ch (RTI)	Related RTLib Functions	Ch (RTLib)	Conn. Pin	Pin on CP	Signal
DS2103_Bx	Ch 1	DAC Unit	Ch 1 (group 1)	P2 17	P1	VOUT1
	Ch 2		Ch 2 (group 1)	P2 50	P2	VOUT2
	Ch 3		Ch 3 (group 1)	P2 16	P3	VOUT3
	Ch 4		Ch 4 (group 1)	P2 49	P4	VOUT4
	Ch 5		Ch 5 (group 2)	P2 15	P5	VOUT5
	Ch 6		Ch 6 (group 2)	P2 48	P6	VOUT6
	Ch 7		Ch 7 (group 2)	P2 14	P7	VOUT7
	Ch 8		Ch 8 (group 2)	P2 47	P8	VOUT8
	Ch 9		Ch 9 (group 3)	P2 13	P9	VOUT9
	Ch 10		Ch 10 (group 3)	P2 46	P10	VOUT10
	Ch 11		Ch 11 (group 3)	P2 12	P11	VOUT11
	Ch 12		Ch 12 (group 3)	P2 45	P12	VOUT12
	Ch 13		Ch 13 (group 4)	P2 11	P13	VOUT13
	Ch 14		Ch 14 (group 4)	P2 44	P14	VOUT14
	Ch 15		Ch 15 (group 4)	P2 10	P15	VOUT15
	Ch 16		Ch 16 (group 4)	P2 43	P16	VOUT16
	Ch 17		Ch 17 (group 5)	P2 9	P17	VOUT17
	Ch 18		Ch 18 (group 5)	P2 42	P18	VOUT18
	Ch 19		Ch 19 (group 5)	P2 8	P19	VOUT19
	Ch 20		Ch 20 (group 5)	P2 41	P20	VOUT20
	Ch 21		Ch 21 (group 6)	P2 7	P21	VOUT21
	Ch 22		Ch 22 (group 6)	P2 40	P22	VOUT22
	Ch 23		Ch 23 (group 6)	P2 6	P23	VOUT23
	Ch 24		Ch 24 (group 6)	P2 39	P24	VOUT24
	Ch 25		Ch 25 (group 7)	P2 5	P25	VOUT25
	Ch 26		Ch 26 (group 7)	P2 38	P26	VOUT26
	Ch 27		Ch 27 (group 7)	P2 4	P27	VOUT27
	Ch 28		Ch 28 (group 7)	P2 37	P28	VOUT28
	Ch 29		Ch 29 (group 8)	P2 3	P29	VOUT29
	Ch 30		Ch 30 (group 8)	P2 36	P30	VOUT30
	Ch 31		Ch 31 (group 8)	P2 2	P31	VOUT31
	Ch 32		Ch 32 (group 8)	P2 35	P32	VOUT32

Related topics

References

DAC Connector (P2) (PHS Bus System Hardware Reference 📖)