DS2302 Direct Digital Synthesis Board

DS2302 Modules Hardware Reference

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dSPACE

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About This Reference

Contents

This reference gives you an overview of the DAC and ADC modules for the DS2302, their registers, and their data sheets.

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.

DAC Module

Where to go from here

Information in this section

DAC Module Overview

Objective

The DAC analog output module for the DS2302 is a plug-on module. It is specifically designed for high-speed signal generation.

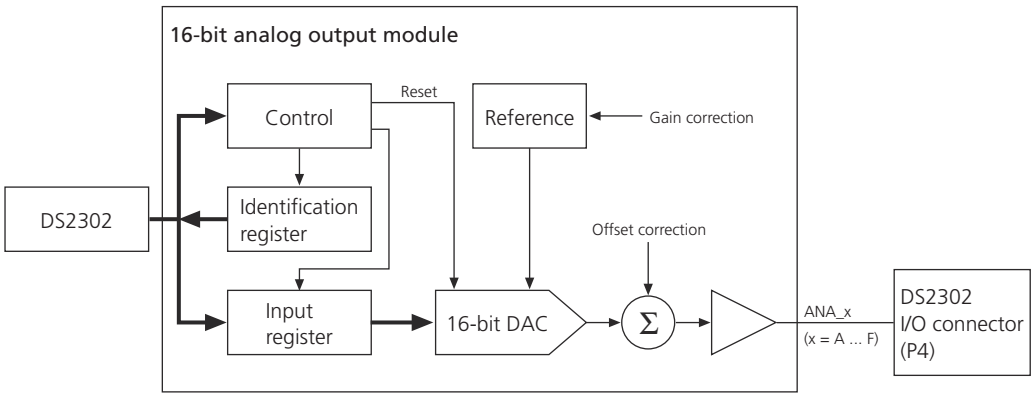
Features

The features of the DAC module are:

- 16-bit low glitch DA converter
- Parallel interface
- ±10 V output range
- 0.8 µs settling time
- Auto-zero function for critical applications
- Module identification register

Block diagram

The block diagram shows the functional units and their interrelations.



The 16-bit input register (DAD) of the DAC module is connected to the upper 16 bits of the DSP data bus. A high-speed DAC converts the digital data of the input register into a corresponding output voltage. A module identification register (MIR) allows the presence of the module to be checked. Each analog output module also contains an offset- and gain-correction circuit and an output buffer.

Module Identification Register (MIR)

Objective

The DAC module for the DS2302 contains a module identification register (MIR).

Description

This register is used by the monitor program to check the hardware and software integrity. The MIR is a read-only register and contains a 6-bit module-specific ID number in the data bits D26 to D31. All other bits of the MIR are not used. The DAC module's identification number is 1.

Note

Only the upper 6 bits (D26 to D31) of the 32-bit word are relevant.

DAC Data Register (DAD)

Description

Each of the analog output modules consists of a 16-bit write-only data register. The DAC accepts left-aligned two's complement input code and has a single-ended voltage output with a ±10 V output span. The tables below show the DAC data register and the DAC input format.

Register	Peripheral Address	D31..16
DAD	500000H	Left aligned DAC data

Output Voltage Range [V]	32-bit Data Range	Code
+10	7FFF0000H	2's complement
…	…	
0	00000000H	
…	…	
-10	80000000H	

Note

Only the upper 16 bits (D16 to D31) of the 32-bit word are relevant.

If an I/O error occurs on the PHS bus, the DAC output is forced to zero if resetting is enabled with the `ds2302_module_reset_on_ioer()` function of the processor board. Under this condition, further write operations to the DAC are ignored as long as the I/O error line is active. If the error is removed, the DAC output remains zero until a new value is written to the DAD. If a DSP of the DS2302 is reset and the DAC reset is disabled, the corresponding DAC output voltage keeps its current value.

Resetting is by default disabled.

DAC Module Data Sheet

Technical data

The following table shows the data sheet of the DAC module:

Parameter	Specification [1)]
General	▪ One D/A converter per channel

Parameter		Specification [1]
		▪ 16-bit resolution
Analog output (typical values at 25 °C)	Voltage output range	±10 V
	Output current	Max. ±5 mA
	Initial offset error	±1 mV
	Offset drift	±10 ppm of FSR/K (FSR: full scale range)
	Initial gain error	±0.5%
	Gain drift	±20 ppm of FSR/K
	Settling time to ±0.012% of FSR	0.8 µs typ.
	Slew rate	Approx. 25 V/µs
	Differential linearity error	±1 LSB (least significant bit)
	Monotonicity	14 bit
	Total harmonic distortion	–90 dB (at 10 kHz)
Physical size		92 x 18 x 10 mm (3.6 x 0.7 x 0.4 in)
Ambient temperature		0 … 70 °C (32 … 158 °F)
Power consumption		1.45 W

[1] Unless stated otherwise, the specifications are valid only if the dSPACE hardware is correctly powered, switched on, and ready for operation.

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