

DS4321 CAN Monitor

# Hardware Reference

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

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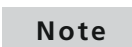





# About This Reference

**Content** This reference introduces you to the features of the DS4321 CAN Monitor and explains how to connect it to dSPACE real-time hardware.

**Required knowledge** Knowledge about the specific dSPACE real-time hardware you want to connect with the DS4321 is assumed.

**Symbols** dSPACE user documentation uses the following symbols:

Symbol	Description
	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
	Indicates a hazard that, if not avoided, could result in property damage.
	Indicates important information that you should take into account to avoid malfunctions.
	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.

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## 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>`

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## 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](http://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 DS4321

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## Using the DS4321

Waking a device up or sending it to sleep on the detection of CAN bus traffic

The DS4321 monitors a connected CAN bus. If CAN bus traffic is detected, the DS4321 can wake up a connected device or send it to sleep.

**Example use case** Suppose you work with MicroAutoBox II installed in a vehicle. Using the DS4321, you can wake up MicroAutoBox II or send it to sleep depending on whether there is traffic on the vehicle's CAN bus.

Detection of signal edges

The DS4321 CAN Monitor is a passive CAN bus device. It cannot react to specific CAN messages. It can only detect traffic (signal edges) on a CAN bus.

Function principle

Waking up a connected device or sending it to sleep is controlled by the following DS4321 signals as long as the REMOTE\_IN signal of the DS4321 is high:

- SLEEP\_IN
- AWAKE\_OUT

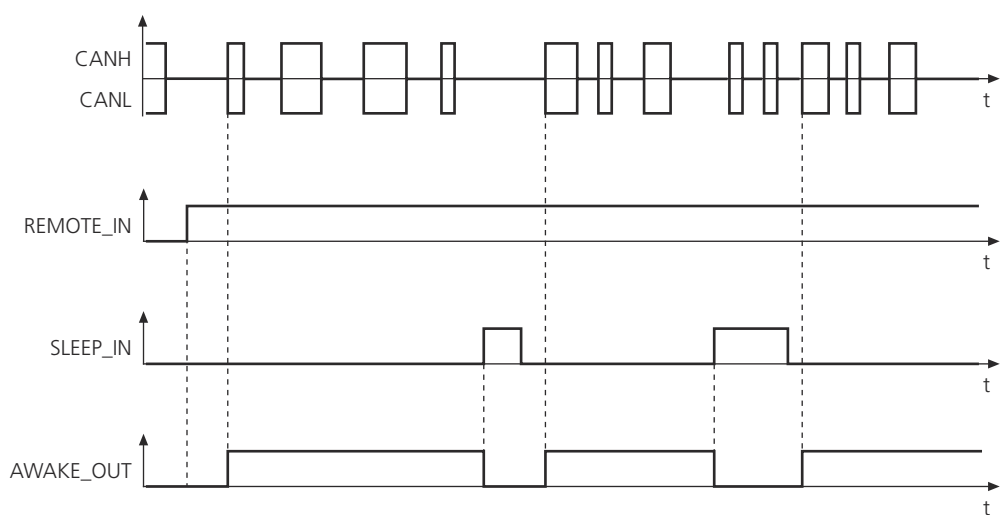
**Waking up a device** If SLEEP\_IN is low and if the DS4321 detects CAN bus traffic (CANH/CANL), the DS4321 sets the AWAKE\_OUT signal to high. You can use this signal to wake up the connected device and keep it awake as long as the AWAKE\_OUT signal remains high.

**Sending a device to sleep** If SLEEP\_IN is high for at least 2 ms, the DS4321 sets the AWAKE\_OUT signal to low. You can use this signal to send the connected device to sleep and keep it asleep as long as no CAN bus traffic is detected. The DS4321 sets the AWAKE\_OUT signal to high again the next time it detects CAN bus traffic.

#### Note

When you use the DS4321 to send a device such as MicroAutoBox II to sleep, you should ensure that the real-time application of MicroAutoBox II checks that there is no more CAN bus traffic until the application sets the SLEEP\_IN signal to high. Otherwise, the DS4321 will wake up MicroAutoBox II again.

**Timing diagram** The timing diagram below shows the relation between input signals and output signals of the DS4321.

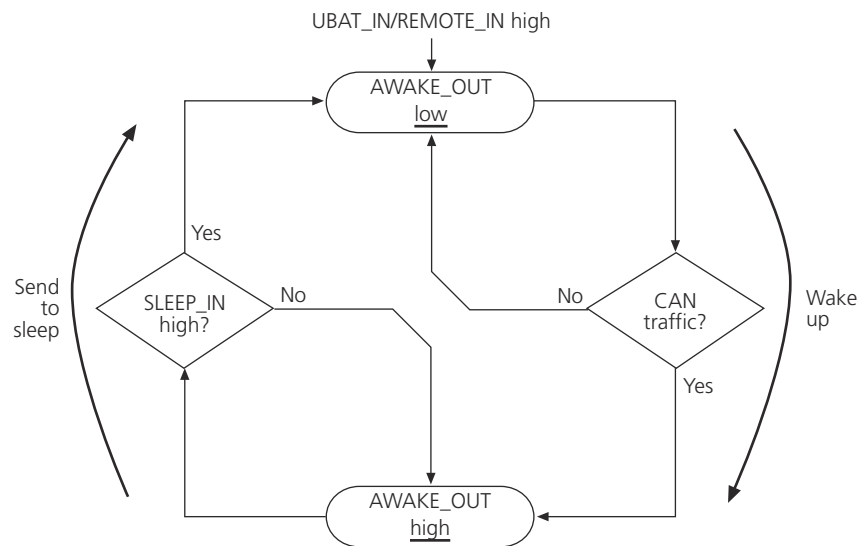


As long as the AWAKE\_OUT signal or the SLEEP\_IN signal is high, the DS4321 ignores any CAN bus traffic.



**State diagram**

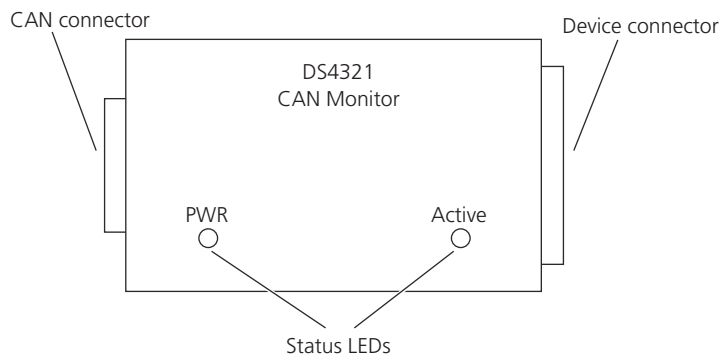
The state diagram below shows the states and the state transitions.



## DS4321 Hardware Overview

**Enclosure**

The illustration shows the enclosure of the DS4321.

**Connectors**

The DS4321 has two connectors:

- A CAN connector for connecting the DS4321 to the CAN bus to be monitored. For the connector pinout, refer to [CAN Connector](#) on page 15.
- A device connector for connecting the DS4321 to a device to be switched on/off. For the connector pinout, refer to [Device Connector](#) on page 16.

For information on connecting the DS4321, refer to [Example: Connecting the DS4321 to MicroAutoBox II](#) on page 11.

## Status LEDs

The DS4321 has two status LEDs.

PWR LED:

- Off:  
REMOTE\_IN pin is LOW
- Lit (red):  
REMOTE\_IN pin is HIGH, SLEEP\_IN pin is LOW and CAN bus traffic was detected
- Flashing (red):
  - REMOTE\_IN pin and SLEEP\_IN pin are HIGH
  - REMOTE\_IN pin is HIGH and SLEEP\_IN pin is LOW (waiting for CAN bus traffic)

Active LED:

- Off:  
AWAKE\_OUT pin is LOW
- Lit (green):  
AWAKE\_OUT pin is HIGH

# Connecting the DS4321

Where to go from here

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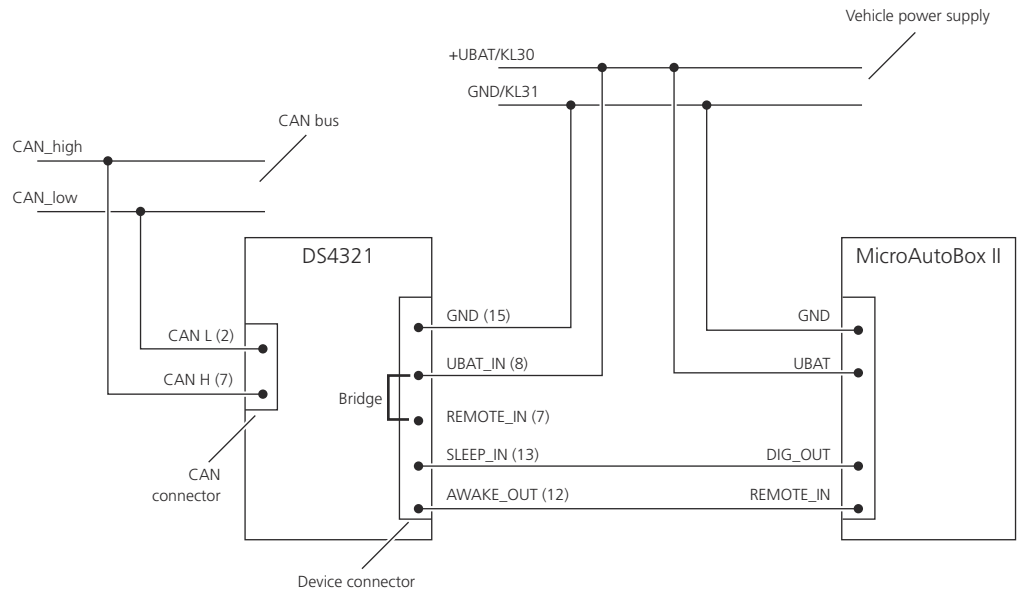
<a href="#">Example: Connecting the DS4321 to MicroAutoBox II.....</a>	<a href="#">11</a>
An example that shows how to connect the DS4321 to MicroAutoBox II.	
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## Example: Connecting the DS4321 to MicroAutoBox II

Introduction

As an example, the following illustration shows how to connect the DS4321:

- To the vehicle power supply
- To the CAN bus
- To MicroAutoBox II



## Note

Do not connect the REMOTE\_IN pin of MicroAutoBox II to the UBAT or REMOTE\_PULL\_UP pin of MicroAutoBox II.

For information on the MicroAutoBox II pinouts and the pin characteristics, refer to the MicroAutoBox II documentation.

## Related topics

## References

<a href="#">CAN Connector.....</a>	<a href="#">15</a>
<a href="#">Device Connector.....</a>	<a href="#">16</a>

## How to Connect Termination Resistors

### Objective

If you connect the DS4321 at the end of a CAN bus, you have to terminate the bus on the DS4321. This is not necessary if you connect the DS4321 to a CAN bus that is already terminated.

**Preconditions**

You need four 120  $\Omega$  0805 SMD resistors.

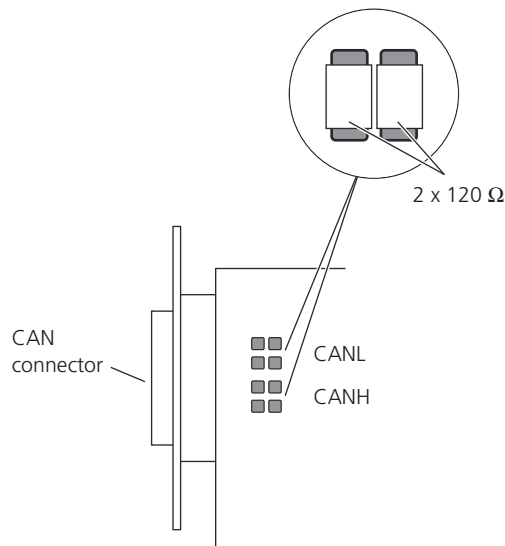
**⚠ WARNING**

Before opening the DS4321, to avoid damage caused by high electrostatic voltage, take the following precautions:

- Make sure that you and all material the DS4321 comes in contact with are properly grounded.
- During storage or handling, place the DS4321 on conductive foam or in a protective bag.

**Method****To connect termination resistors**

- 1 Unplug the DS4321 from all connected devices.
- 2 Unscrew the 4 bolts of the enclosure with a Phillips screwdriver and open it.
- 3 Find the solder pads near the CAN connector on the bottom of the board shown in the illustration below.



- 4 Solder two 120  $\Omega$  resistors to the upper solder pad pair to terminate the CANL line and the other two 120  $\Omega$  resistors to the lower solder pad pair to terminate the CANH line.
- 5 Close the enclosure of the DS4321.

**Result**

The CAN bus is terminated on the DS4321.



# DS4321 Data Sheet

## Where to go from here

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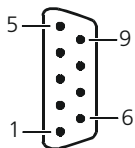
## CAN Connector

### Introduction

The CAN connector of the DS4321 is a 9-pin, male Sub-D connector. It meets ISO11898. CAN specifications 2.0A and 2.0B are supported.

### Pinout and signal description

Because the pin numbering used for Sub-D connectors is not standardized, the following figure shows the numbering scheme used (front view).



#### **⚠ WARNING**

Do not rely on the numbers written on Sub-D connectors.

The following table shows the pin assignment of the CAN connector, and a description of the signals.

Pin	Signal	Description	Specification
1	Not used	–	–
2	CANL	CAN bus low	Dominant LOW
3	GND	CAN ground	–
4	Not used	–	–
5	SHIELD	Optional CAN shield	–
6	GND	CAN ground	–
7	CANH	CAN bus high	Dominant HIGH
8	Not used	–	–
9	CV+	Input for an optional external power supply for the PHILIPS CAN controller TJA 1041.	+ 6 ... 40 V
<div><b>Note</b></div> <p>If the DS4321 is not powered by the device connector (UBAT), connect CV+ to avoid effects on the CAN bus.</p>			

#### Note

By default, the CAN bus lines (CANH, CANL) are not terminated on the DS4321. For instructions on terminating the CAN bus on the DS4321, refer to [How to Connect Termination Resistors](#) on page 12.

## Device Connector

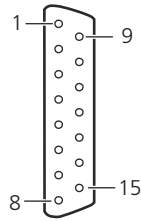
### Introduction

The device connector of the DS4321 is a 15-pin, female Sub-D connector for waking up devices such as MicroAutoBox II and AutoBox or sending them to sleep.



**Pinout and signal description**

Because the pin numbering used for Sub-D connectors is not standardized, the following illustration shows the numbering scheme used (front view).

**⚠ WARNING**

Do not rely on the numbers written on Sub-D connectors.

The following table shows the pin assignment of the device connector, and a description of the signals.

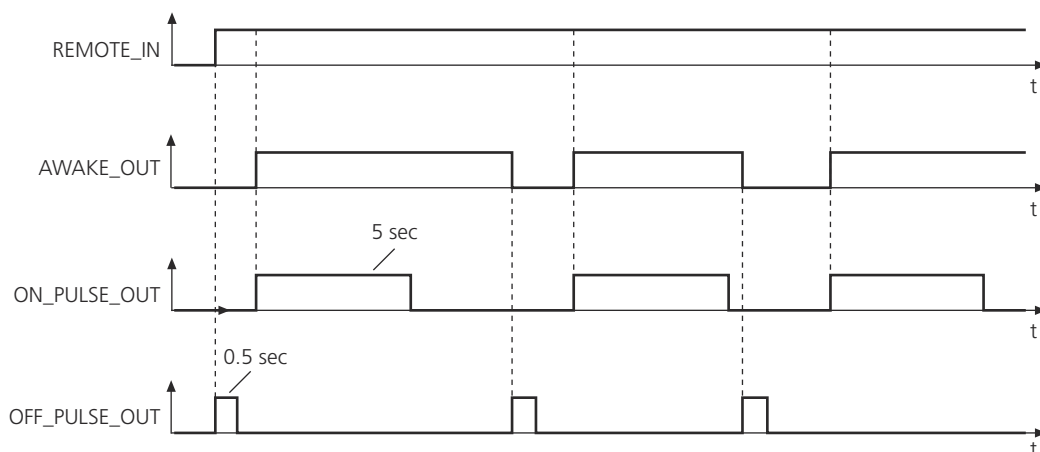
Pin	Signal	Description	Specification
1	/ERR_OUT	Error and power-up indication of the PHILIPS CAN controller TJA 1041; active LOW. For details, refer to the PHILIPS TJA 1041 data sheet.	0 ... +5 V
2	Not used	–	–
3	Not used	–	–
4	Not used	–	–
5	ON_PULSE_OUT	Indication of the awake state: When the AWAKE_OUT signal is set to high, the ON_PULSE_OUT signal is high for 5 s. See below for a timing diagram.	0 ... +5 V
6	OFF_PULSE_OUT	Indication of the asleep state: ▪ When the REMOTE_IN signal is set to high, the OFF_PULSE_OUT signal is high for 0.5 s. ▪ When the AWAKE_OUT signal is set to low, the OFF_PULSE_OUT signal is high for 0.5 s. See below for a timing diagram.	0 ... +5 V
7	REMOTE_IN	Signal enabling the monitor function of the DS4321	UBAT
8	UBAT_IN	External power supply input	+ 6 ... 40 V
9	INH_OUT	Signal of the PHILIPS CAN controller TJA 1041 (permanently HIGH). For details, refer to the PHILIPS TJA 1041 data sheet.	UBAT
10	GND	Power supply ground	–
11	Not used	–	–
12	AWAKE_OUT	Indication of the awake state	0 ... +5 V
13	SLEEP_IN	When the SLEEP_IN signal is set to high for at least 2 ms, the DS4321 sets the AWAKE_OUT signal to low and the DS4321 is reset to its monitor function.	0 ... +5 V
14	Not used	–	–
15	GND	Power supply ground	–

**Note**

Connect the power supply pin (UBAT) and ground pin (GND) of the device connector to a power supply.

**Timing diagram for  
ON\_PULSE\_OUT and  
OFF\_PULSE\_OUT**

Below is a timing diagram for the signals ON\_PULSE\_OUT and OFF\_PULSE\_OUT.



## Technical Specifications

**Technical data**

The following table summarizes the technical data of the DS4321 CAN Monitor.

Parameter		Specification
General		<ul style="list-style-type: none"> <li>PHILIPS CAN controller TJA 1041</li> <li>Support of CAN specification 2.0A and 2.0B (11- and 29-bit identifiers)</li> </ul>
Electrical characteristics	Supply voltage	+ 6 ... 40 V
	Power consumption	70 mW
Mechanical characteristics	Chassis	Plastic box
	Connectors	<ul style="list-style-type: none"> <li>9-pin, male Sub-D connector for connection to CAN</li> <li>15-pin, female Sub-D connector for device connection</li> </ul>
	Status LEDs	PWR LED: <ul style="list-style-type: none"> <li>Off: REMOTE_IN pin is LOW</li> <li>Lit (red):</li> </ul>

Parameter		Specification
		<p>REMOTE_IN pin is HIGH, SLEEP_IN pin is LOW and CAN bus traffic was detected</p> <ul style="list-style-type: none"> <li>▪ Flashing (red): <ul style="list-style-type: none"> <li>▪ REMOTE_IN pin and SLEEP_IN pin are HIGH</li> <li>▪ REMOTE_IN pin is HIGH and SLEEP_IN pin is LOW (waiting for CAN bus traffic)</li> </ul> </li> </ul>
		<p>Active LED:</p> <ul style="list-style-type: none"> <li>▪ Off: AWAKE_OUT pin is LOW</li> <li>▪ Lit (green): AWAKE_OUT pin is HIGH</li> </ul>
	Physical size (height x width x depth)	50 mm x 86 mm x 21 mm (1.97 in. x 3.39 in. x 0.83 in.)
	Weight	Approx. 40 g (0.088 lb.)
Environmental	Ambient and storage temperature	−40 ... +85 °C (−40 ... +185 °F)



**C**

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  - pinout 15
- Common Program Data folder 6

**D**

- device connector
  - pinout 17
- Documents folder 6

**L**

- Local Program Data folder 6

**P**

- pinout
  - CAN connector 15
  - device connector 17

**S**

- Status LEDs 10

