

MANUAL

ANAGATE

SPI

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Revision History

| Version | Date | Changes |
|---------|------------|-----------------------------------|
| 1.01 | 02.09.2009 | Error in PIN description SPI jack |
| 1.00 | 01.05.2006 | Initial version |
| | | |

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1 Introduction

1.1 Description

The AnaGate SPI connects a PC or other general device to a SPI bus via the TCP/IP network protocol. The AnaGate SPI basically works as a SPI Master on the bus.

1.2 Features

- Supports SPI read and write commands for all SPI devices
- Variable SPI bus speed (100 to 6250 kbps)
- Separate plug for voltage supply
- Supports 3.3 V or 2.5V and 5 V voltage to allow SPI devices to be operated on application boards
- System is addressed using a proprietary TCP/IP protocol
- Static or dynamic assignment (DHCP) of IP addresses

1.3 Specification

Measurements:

| | |
|---------|----------------|
| Length: | approx. 155 mm |
| Width: | approx. 105 mm |
| Height: | approx. 40 mm |
| Weight: | approx. 250 g |

SPI Bus:

| | |
|--------------------------|---|
| Baud rate: | 100 to 6250 kbps, software configuration |
| High-level CLL/MOSI/-SS: | 2.5 / 3.3 / 5.0 V, software configuration |
| High Level MISO: | Min: 2.0V, Max: 5.5V |
| System mode: | SPI master Mode |
| Interface: | 1x DB9 plug incl. MISO, MOSI, CLK, -SS, GND, 3.3 V and 5 V |

Digital IO:

| | |
|----------|----------------------------------|
| Inputs: | 4, galvanic decoupled |
| Outputs: | 4, galvanic decoupled (max. 5mA) |

LAN Interface:

| | |
|------------|-------------------------------------|
| Baud rate: | 10/100 Mbps |
| TCP/IP: | Static or dynamic (DHCP) IP address |
| Interface: | RJ45 socket |

Voltage Supply:

| | |
|---------------------|--|
| Voltage: | 9V direct current |
| Current consumption | max. 750 mA, approx. 350 mA in idle state |
| Current load: | max. 200 mA for both 3.3 V and 5 V connections |

Ambient Temperature:

| | |
|---------------|------------|
| Storage: | 0 .. 85° C |
| In operation: | 0 .. 55° C |

1.4 Application

Product Development:

1. Test phase with new SPI devices.
2. Debugging of new electronic switches.
3. Programming of SPI serial EEPROM devices during development of electronic switches.

Assembly:

1. Programming of SPI devices during assembly.
2. Subassembly tests, especially if SPI master is mounted on a separate board.

Repairs and Maintenance:

1. Test
2. Reprogramming of EEPROM data or security codes

1.5 Order information

| Order no. | Designation |
|---------------|---|
| GT-SPI-HW-EU | AnaGate SPI incl. plug-in power supply unit for Europe |
| GT-SPI-HW-UK | AnaGate SPI plug-in power supply unit for the UK |
| GT-SPI-HW-US | AnaGate SPI incl. plug-in power supply unit for the USA |
| GT-SPI-AH | Fastening element for DIN rails |
| GT-SPI-EP-WIN | SPI EEPROM programmer for Windows 2000/XP |

Table 1-1: Order information

2 Hardware

2.1 Packing list

The AnaGate SPI is delivered together with the following components:

- 1 x AnaGate SPI
- 1 x set of rubber pads
- 1 x plug-in power supply unit (compatible with country of delivery)
- 1 x CD incl. manual and DLL
- 1 x 2 m Cat. 5 LAN cable

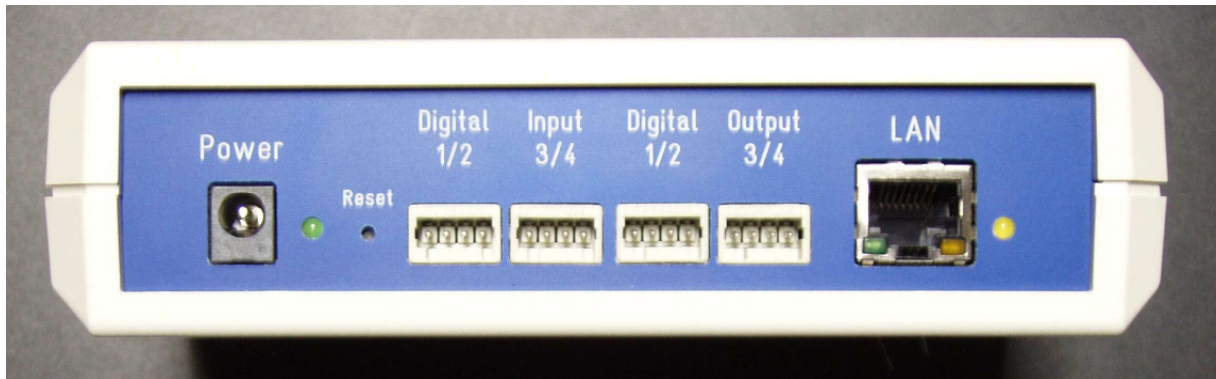
2.2 Layout

2.2.1 AnaGate SPI - front view



The SPI bus connector is located on the front of the AnaGate. Please refer to 2.3 "Connections" for further details.

2.2.2 AnaGate SPI – rear view



The rear of the AnaGate features the following connectors and LEDs (from left to right):

1. Power supply
Please refer to 2.3 “Connections” for further details.
2. Power LED (green)
This LED lights up when 9 V DC voltage is being supplied.
3. Reset button
The AnaGate can be reset to the factory settings using this button. Please refer to 2.7 “Factory reset” for further details.
4. Digital input 1/2
Please refer to 2.3 “Connections” for further details.
5. Digital input 3/4
Please refer to 2.3 “Connections” for further details.
6. Digital output 1/2
Please refer to 2.3 “Connections” for further details.
7. Digital output 3/4
Please refer to 2.3 “Connections” for further details.
8. Please refer to 2.3 “Connections” for further details.
9. LAN port
Please refer to 2.3 “Connections” for further details.
10. AnaGate SPI activity LED (yellow)
This LED lights up when the AnaGate SPI is processing messages from a PC.

2.3 Connections

The AnaGate SPI features the following connections:

1. SPI jack

The SPI bus is fed out of the device via a DB9 socket. The pins are assigned as follows:

| Pin | Application |
|-------|--------------------------------------|
| 1 | SPI Clock (clock output AnaGate) |
| 2 | SPI MOSI (data output AnaGate) |
| 3 | SPI -SS (Chip Select output AnaGate) |
| 4 | SPI MISO (data input AnaGate) |
| 5 | 5,0 V (max. 200 mA) |
| 6 - 8 | GND |
| 9 | 3,3 V (max. 200 mA) |

Table 2-1: SPI jack assignment

2. LAN connection

The LAN is fed out of the device via a RJ45 socket. The pins are assigned as follows:

| Pin | Application |
|-------|---------------|
| 1 | TX + |
| 2 | TX - |
| 3 | RX + |
| 4 / 5 | Not connected |
| 6 | RX - |
| 7 / 8 | Not connected |

Table 2-2: LAN jack assignment

3. Digital input 1/2

The digital inputs 1 and 2 (galvanic decoupled) are fed out via a Wago clamping socket. The pins (arranged from left to right) are assigned as follows:

| Pin | Application |
|-----|------------------|
| 1 | Input 1 GND |
| 2 | Input 1 U_{in} |
| 3 | Input 2 GND |
| 4 | Input 2 U_{in} |

Table 2-3: Digital inputs 1/2

4. Digital input 3/4

The digital inputs 3 and 4 (galvanic decoupled) are fed out via a Wago clamping socket. The pins (arranged from left to right) are assigned as follows:

| Pin | Application |
|-----|------------------|
| 1 | Input 3 GND |
| 2 | Input 3 U_{in} |
| 3 | Input 4 GND |
| 4 | Input 4 U_{in} |

Table 2-4: Digital inputs 3/4

5. Digital output 1/2

The digital outputs 1 and 2 (galvanic decoupled) are fed out via a Wago clamping socket. The pins (arranged from left to right) are assigned as follows:

| Pin | Bedeutung |
|-----|--|
| 1 | Output 1 emitter of the opto coupler (npn) |
| 2 | Output 1 collector of the opto coupler (npn) |
| 3 | Output 2 emitter of the opto coupler (npn) |
| 4 | Output 2 collector of the opto coupler (npn) |

Table 2-5: Digital output 1/2

6. Digital output 3/4

Die digital outputs 3 and 4 (galvanic decoupled) are fed out via a Wago clamping socket. The pins (arranged from left to right) are assigned as follows:

| Pin | Bedeutung |
|-----|--|
| 1 | Output 1 emitter of the opto coupler (npn) |
| 2 | Output 1 collector of the opto coupler (npn) |
| 3 | Output 2 emitter of the opto coupler (npn) |
| 4 | Output 2 collector of the opto coupler (npn) |

Table 2-6: Digital output 3/4

7. Voltage supply

9V DC voltage is supplied using the accompanying power supply unit.

2.4 Initial installation

Please ensure that the AnaGate SPI is positioned on an even surface. Also keep it away from direct sunlight.

Insert the round plug into the casing socket labelled 9V. Then plug the power supply unit into the wall socket.

Insert the LAN cable into the plug labelled LAN and connect it either to a hub or switch, or directly to the PC using a crossover cable.

The AnaGate is delivered with the following settings:

- Type of address: Static
- IP address: 192.168.1.254
- Network mask: 255.255.255.0
- Gateway: 0.0.0.0

The AnaGate can now be configured using a standard browser (Internet Explorer, Mozilla, etc.) by using <http://192.168.1.254>.

2.5 TCP/IP parameters

Proceed as follows to configure the TCP/IP parameters:

1. Switching the dynamic/static IP address

Here you can switch between static IP and dynamic (via DHCP) addresses. If DHCP is being used, the remaining fields cannot be edited as this information is retrieved from the DHCP server. In this case, a DHCP server must be available and accessible in the network.

2. IP address (not DHCP)

The IP address is entered in a.b.c.d format (e.g. 192.168.1.1) and is permanently stored in the AnaGate.

3. Subnet mask (not DHCP)

The subnet mask is entered in a.b.c.d format (e.g. 255.255.255.0) and is permanently stored in the AnaGate

4. Default gateway (not DHCP)

The default gateway is entered in a.b.c.d format (e.g. 192.168.1.200) and is permanently stored in the AnaGate. Enter "0.0.0.0" if a default gateway is not required.

2.6 Firmware update

Please visit our Web site <http://www.anagate.de> for further information.

2.7 Factory reset

Proceed as follows to restore the default factory settings (IP address/subnet mask: 192.168.1.254/255.255.255.0):

1. Disconnect the AnaGate SPI from the power supply.
2. Press the reset button using a pointed instrument (do not release it).
3. Reconnect the power supply.
4. Release the reset button when the yellow AnaGate SPI activity LED lights up.
5. The device restarts and now operates again with the default factory settings.

2.8 Connecting the digital inputs

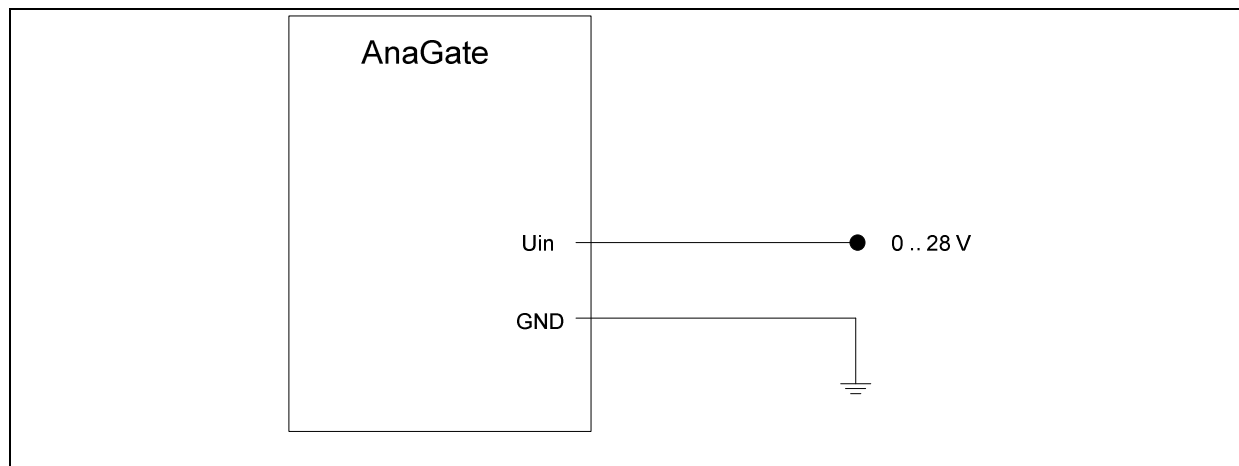


Chart 2-1: Example for connecting the digital inputs

Input U_{in} of the digital input can be connected to an external voltage between 0 and 28V. If the input voltage at U_{in} is greater than 2.0 V the AnaGate device interpretes the input as a logical 1, otherwise 0.

2.9 Connecting the digital outputs

In principle there are two different kinds of connecting the digital outputs:

- Variant A (positive logic)
If the output of the AnaGate is set to a logical 1, the internal transistor shortens the output to VCC, otherwise the pull down resistor hold the output LOW.
- Variant B (negative logic)
If the output of the AnaGate is set to a logical 1, the interanal transistor shortens to GND, otherwise the pull up resistor hold the output to VCC.

It is to be noted in both variants that the maximum current is 5 mA.

The voltage drop at the internal transistor is typically 0,5V under the indicated operating conditions.

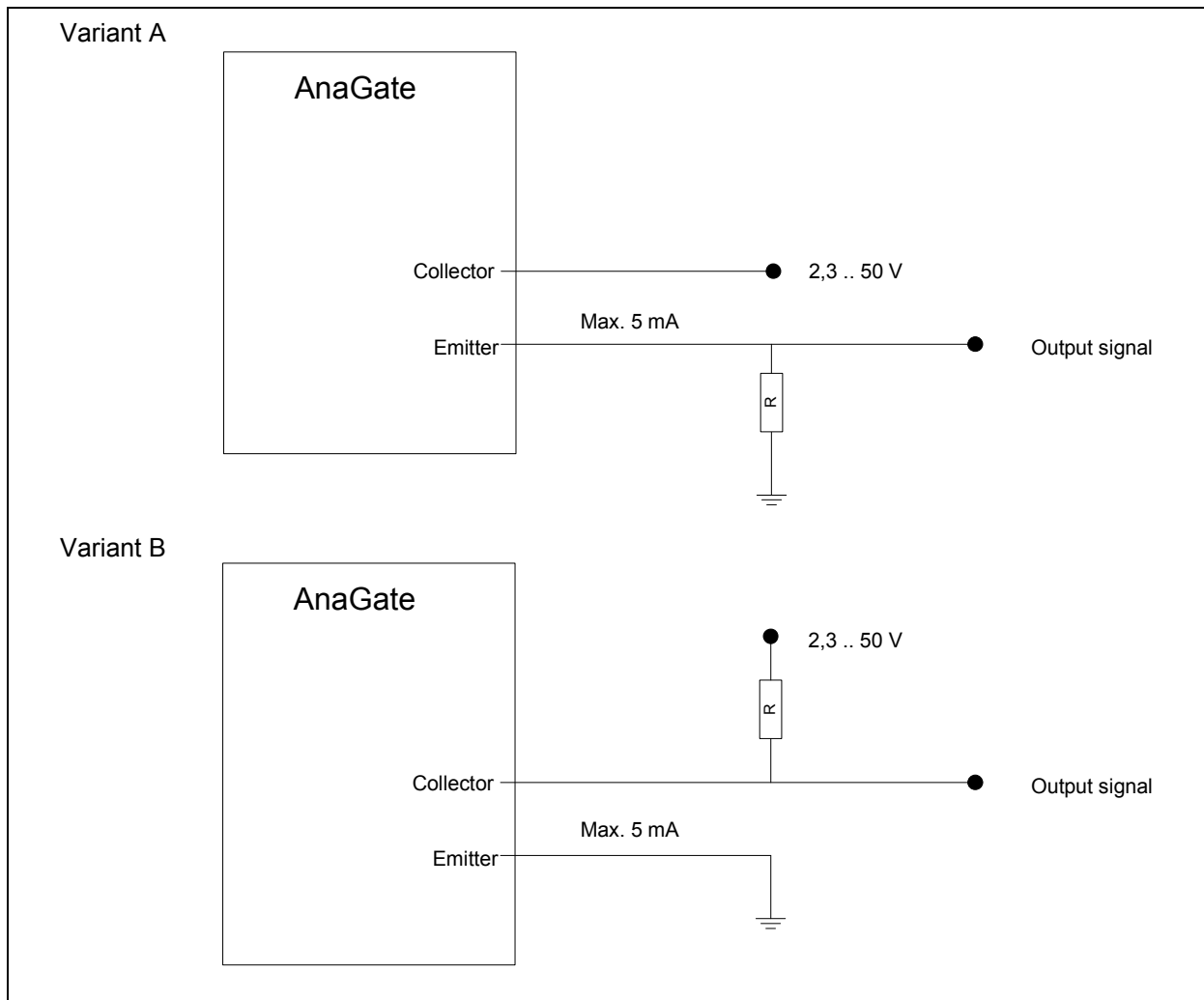


Chart 2-2: Example for connecting the digital outputs

3 Application Scenarios

3.1 AnaGate SPI directly switched to an SPI device

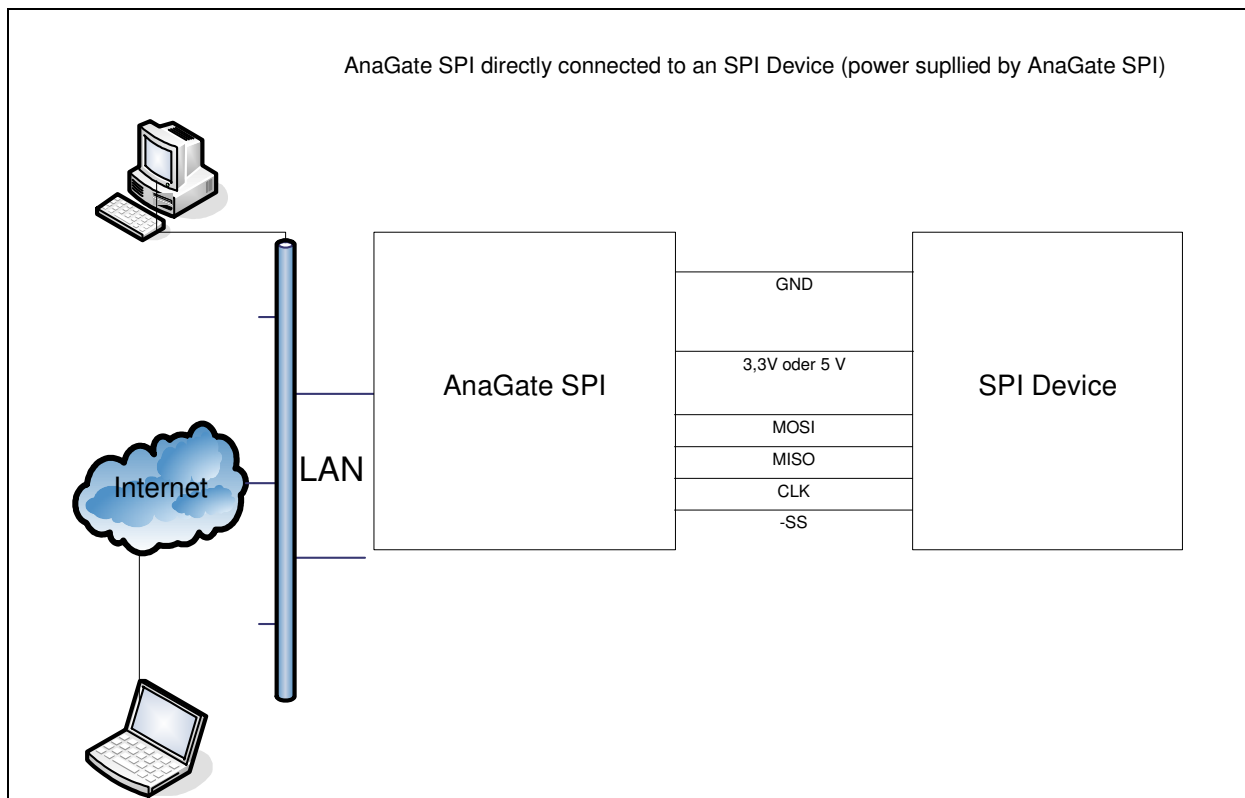


Chart 3-1: AnaGate SPI directly switched to an SPI device

If an SPI device is directly connected to the AnaGate SPI, the following must be considered:

- MOSI
This line has to be connected to the data input of the SPI device (frequently marked as DI or SI)
- MISO
This line has to be connected to the data output of the SPI device (frequently marked as DO or SO)

- CLK

This line has to be connected to the clock input of the SPI device (frequently marked as CLK or SCK)

- -SS

This line has to be connected to the chip select input of the SPI device (frequently marked as -SS or -CS)

3,3 V / 5,0 V / GND have to be provided with power or GND.

3.2 AnaGate SPI and application board with integral power supply

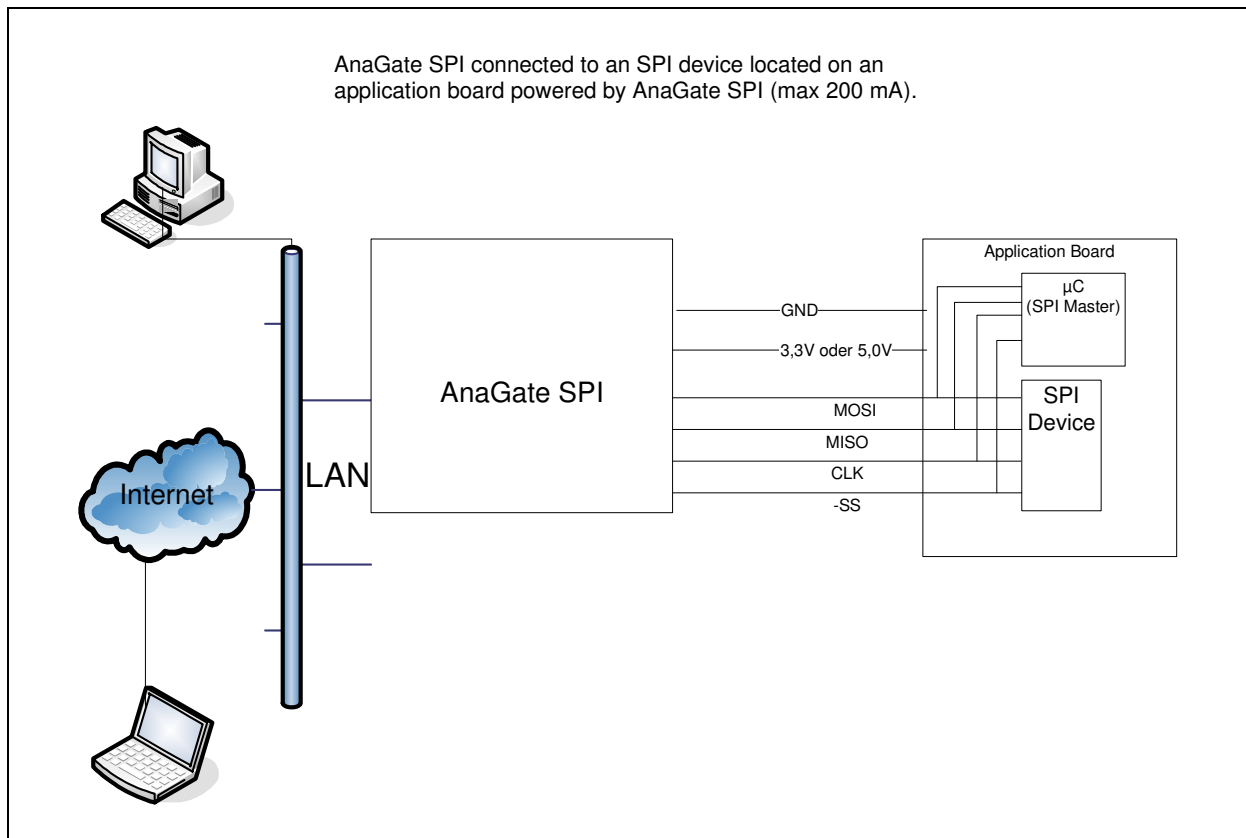


Chart 3-2: AnaGate SPI with an application board and integral power supply

If the AnaGate SPI is connected to an application board on which an SPI device has been mounted, the AnaGate SPI is also capable of supplying power to the board. Please ensure that the power consumption of the application board does not exceed 200mA.

If the two pull-up resistors on the application board are switched between the voltage supply and the SDA or SCL circuit as shown in Chart 3-2, both the AnaGate SPI SDA and SCL outputs can be connected directly to the application board.

The MISO/MOSI/CLK/-SS lines are connected as in “3.1 AnaGate SPI directly switched to an SPI device” already described.

An SPI master installed on the application board may not address the SPI bus at the same time as the AnaGate is accessing the SPI device. The SPI master can be set to RESET mode, for example, to prevent this.

3.3 AnaGate SPI and application board with external power supply

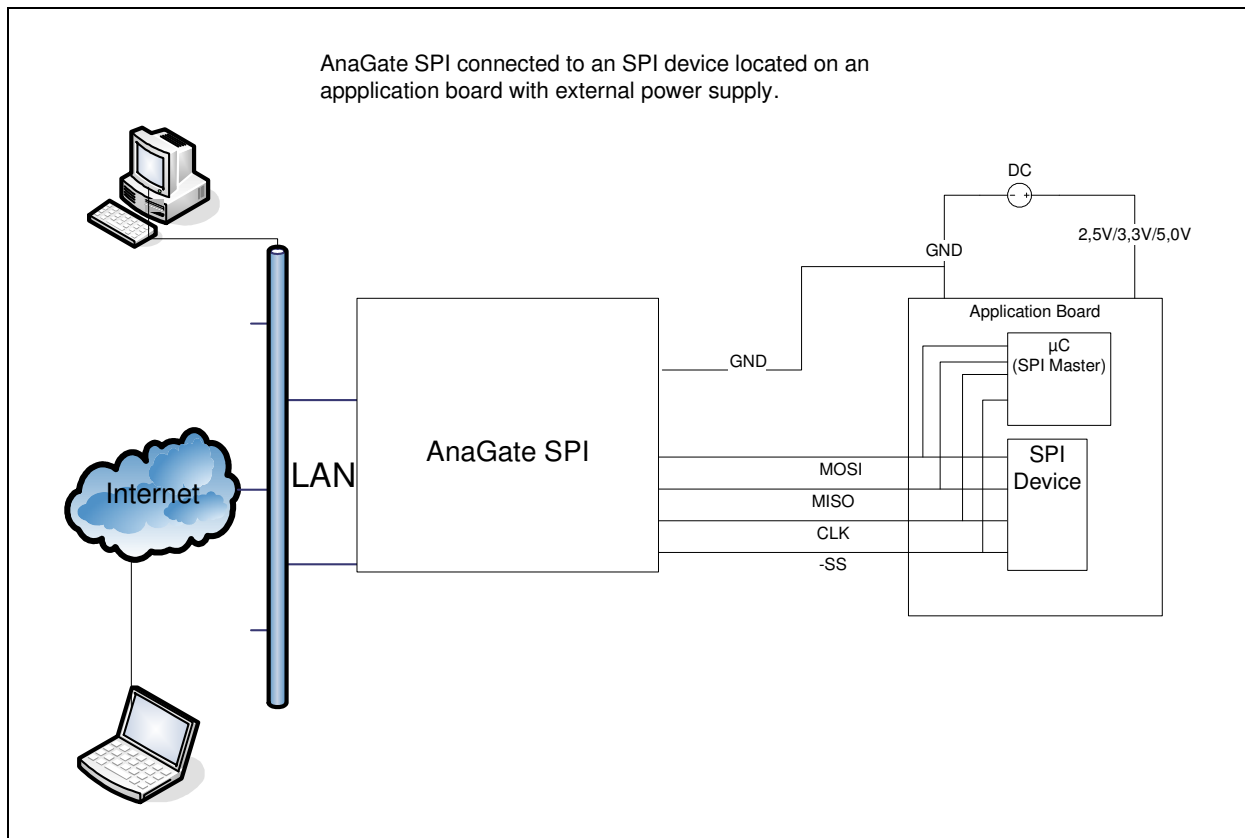


Chart 3-3: AnaGate SPI with an application board and external power supply

The same conditions as described previously in 3.2 “AnaGate SPI and application board with integral power supply” apply here, as well.

Where the external power supply is concerned, however, it must be ensured that the MISO/MOSI/CLK and –SS circuits between the AnaGate SPI and the application board are not connected before the two GND circuits have been connected.

4 Questions and Troubleshooting

4.1 No LAN connection

If no LAN connection is registered (the link LED next to the RJ45 socket does not light up), please check the wiring between the AnaGate SPI and the hub or switch. You need a crossover cable to connect the device to a PC.

Check that the AnaGate SPI is connected to the power supply.

4.2 No TCP/IP connection

If you cannot set up a TCP/IP connection to the AnaGate, please proceed as follows:

1. Check for an existing LAN connection (see also 4.1).
2. Check if you can address the device with a ping.

To do this, open the MS Windows command prompt and enter the command “ping a.b.c.d” (replace a.b.c.d with the IP address of the AnaGate). If there is no response, check whether the RX LED next to the RJ45 socket lights up while executing the ping command.

If you still cannot address the device, perform a factory reset (see 2.7 for details), configure your PC using the IP address 192.168.1.253/255.255.255.0, and repeat the aforementioned procedure using the IP address 192.168.1.254.

3. Check whether you can open a TCP connection at port 5000.

To do this, open the MS Windows command prompt and enter the command “telnet a.b.c.d 5000” (replace a.b.c.d with the IP address of the AnaGate). If you do not get a connection immediately check whether there is a firewall or packet filter installed between your PC and the AnaGate.

4.3 No SPI communication

If SPI communication with your SPI device fails, please proceed as follows:

1. Check that the SPI device is connected to the power supply.
2. Check that no other devices/ μ C are active on the SPI bus.
3. Ensure that the SDA and SCL circuits are provided with an adequate pull-up resistance (e.g. 4.7 kOhm) to the voltage supply (3.3 V resp. 5 V).
4. Ensure that no other electrical components can interfere with communication on the SPI bus between the AnaGate SPI and the SPI device.
5. Ensure that the chip-enable address of the SPI device and the software are identical.

4.4 Firewall

When working with a firewall, the TCP port 5002 has to be opened for communication with the AnaGate SPI.

Literature

- [1] SPI Bus <http://www.mct.net/faq/spi.html>
<http://www.embedded.com/story/OEG20020124S0116>

Abbreviations

| | |
|------|---|
| DHCP | <u>D</u> ynamic <u>H</u> ost <u>C</u> onfiguration <u>P</u> rotocol |
| SPI | <u>S</u> erial <u>P</u> eripheral <u>I</u> nterface |
| LSB | <u>L</u> east <u>S</u> ignificant <u>B</u> yte |
| MSB | <u>M</u> ost <u>S</u> ignificant <u>B</u> yte |
| SCL | <u>S</u> erial <u>C</u> lock |
| SDA | <u>S</u> erial <u>D</u> ata |