MANUAL

ANAGATE

I²C

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Revision History

Version	Date	Changes
1.0	17.06.2004	Initial version
1.1	06.08.2004	AnaGate I^2C fully integrated
1.2	21.10.2004	Integration of hardware layout version 1.0A
1.3	01.04.2006	Integration of hardware layout version 1.1A

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1 Introduction

1.1 Description

The AnaGate I2C connects a PC or other general device to a I2C bus via the TCP/IP network protocol. The AnaGate I2C basically works as a I2C Master on the bus, whereby it can be run in both single-master and multi-master modes. When being used in multi-master mode, all the other masters on the bus must also be compatible with the multi-master operating mode.

1.2 Features

- Supports I2C read and write commands for all I2C devices (both 7 and 10-bit format)
- Variable I2C bus speed (100 or 400 kbps)
- Separate plug for voltage supply
- Supports 3.3 V and 5 V voltage to allow I2C 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

I2C Bus:

Baud rate:	100 resp. 400 kbps, software configuration
High-level SCL/SCA:	2.7—5.0 V
System mode:	Single and multi-master Mode
Interface:	1x DB9 plug incl. SCL, SDA, 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 I2C devices.
2. Debugging of new electronic switches.
3. Programming of I2C serial EEPROM devices during development of electronic switches.

Assembly:

1. Programming of I2C devices during assembly.
2. Subassembly tests, especially if I2C 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-I2C-HW-EU	AnaGate I2C incl. plug-in power supply unit for Europe
GT-I2C-HW-UK	AnaGate I2C plug-in power supply unit for the UK
GT-I2C-HW-US	AnaGate I2C incl. plug-in power supply unit for the USA
GT-I2C-AH	Fastening element for DIN rails
GT-I2C-EP-WIN	I2C EEPROM programmer for Windows 2000/XP
GT-I2C-LAB	LabVIEW™ Software API for AnaGate I2C

Table 1-1: Order information

2 Hardware

2.1 Packing list

The AnaGate I2C is delivered together with the following components:

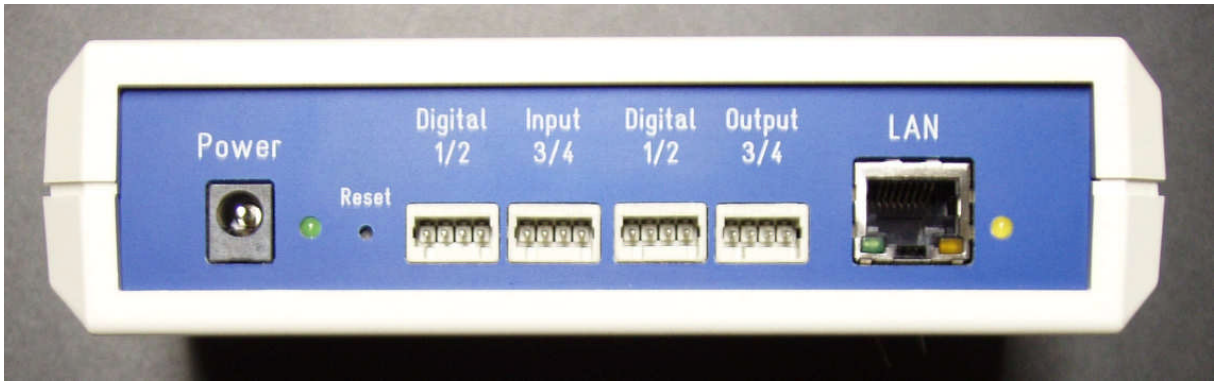
- 1 x AnaGate I^2C
- 1 x set of rubber pads
- 1 x plug-in power supply unit (compatible with country of delivery)
- 1 x CD incl. manual and DLL
- 1 x 2 m Cat. 5 LAN cable

2.2 Layout

2.2.1 AnaGate I2C - front view

The I2C bus connector is located on the front of the AnaGate. Please refer to 2.3 “Connections” for further details.

2.2.2 AnaGate I2C – 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
8. Please refer to 2.3 “Connections” for further details.
9. LAN port

   Please refer to 2.3 “Connections” for further details.

10. AnaGate I2C activity LED (yellow)

    This LED lights up when the AnaGate I2C is processing messages from a PC.

2.3 Connections

The AnaGate I2C features the following connections:

1. I2C jack

   The I2C bus is fed out of the device via a DB9 socket. The pins are assigned as follows:

Pin	Application
1	SDA data for I2C communication
2	SCL clock for I2C communication
3	3.3 V (max. 200 mA)
4	5.0 V (max. 200 mA)
5 .. 9	GND

Table 2-1: I2C 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

Pin	Application
4	Input 4 U_{in}

Table 2-4: Digital inputs 3/4

5. Digital output 1/2

   Die 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 I2C 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 I2C 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 I2C activity LED lights up.
5. The device restarts and now operates again with the default factory settings.

2.8 Connecting the digital inputs

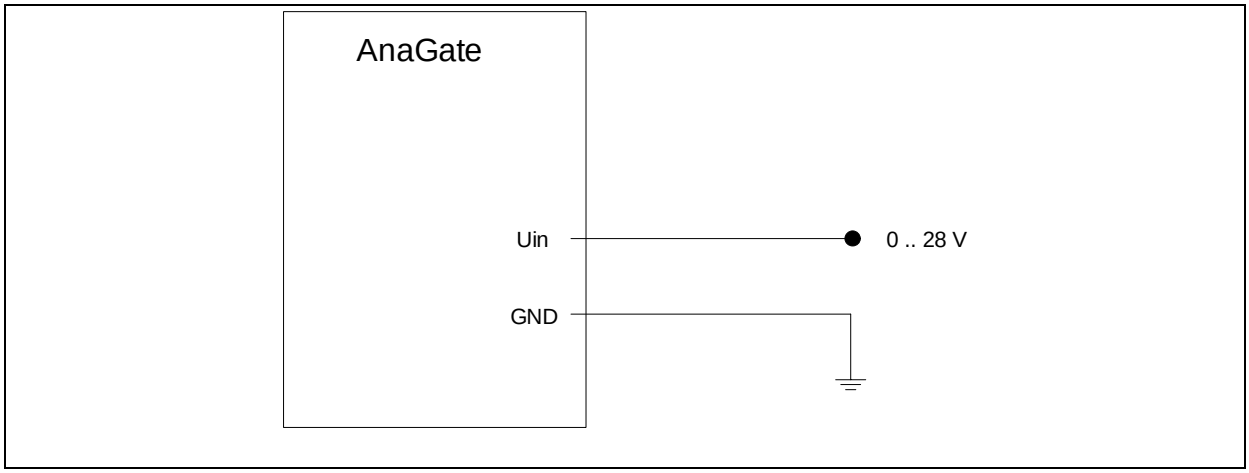


Chart 2-1: Example for connecting the digital inputs

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.

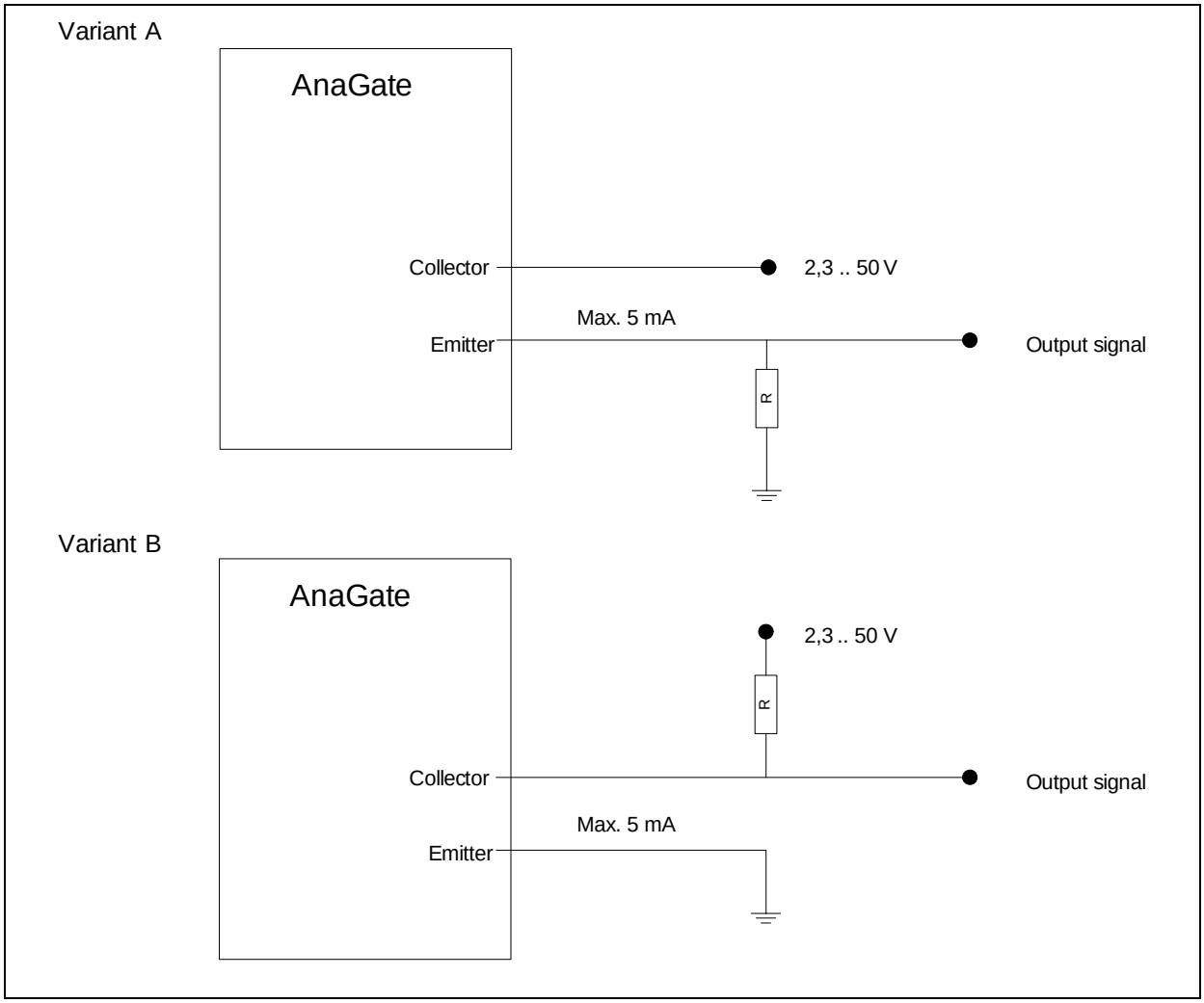


Chart 2-2: Example for connecting the digital outputs

3 Application Scenarios

3.1 AnaGate I2C directly switched to an I2C device

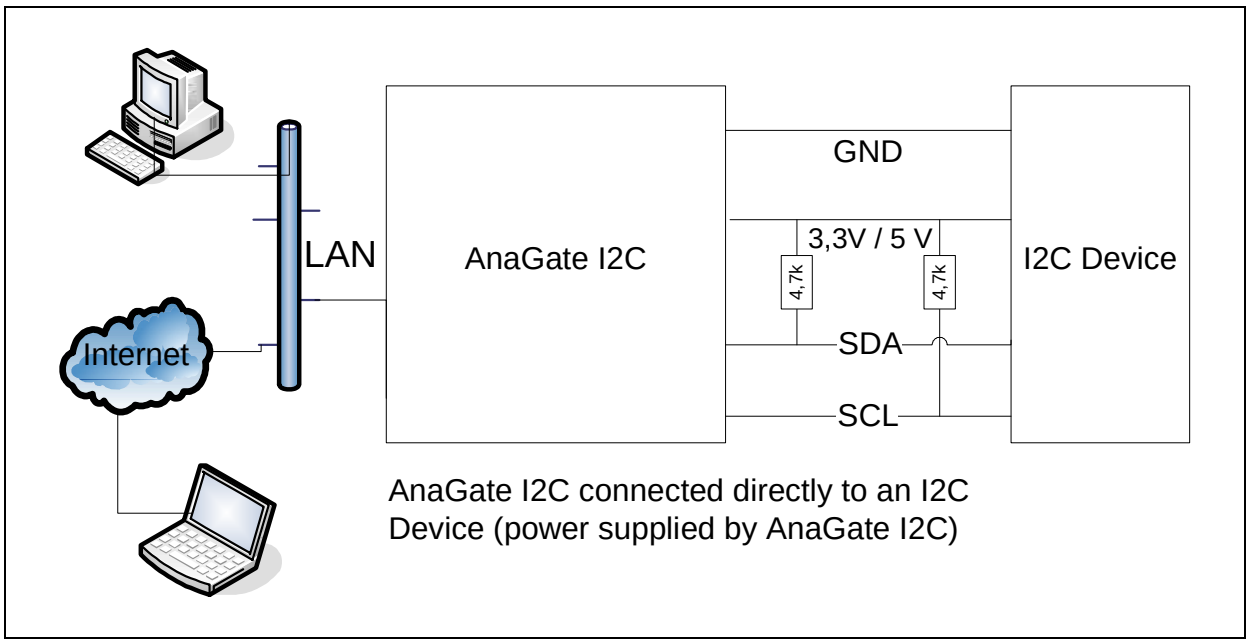


Chart 3-1: AnaGate I2C directly switched to an I2C device

If an I2C device is directly connected to the AnaGate I2C, two 4.7 kOhm pull-up resistors have to be switched between the voltage supply and the SDA or SCL circuit.

If the I2C device is fitted with chip-enable address inputs (usually designated A0/E0, A1/E1 and A2/E2), these also have to be provided with GND or power.

3.2 AnaGate I2C and application board with integral power supply

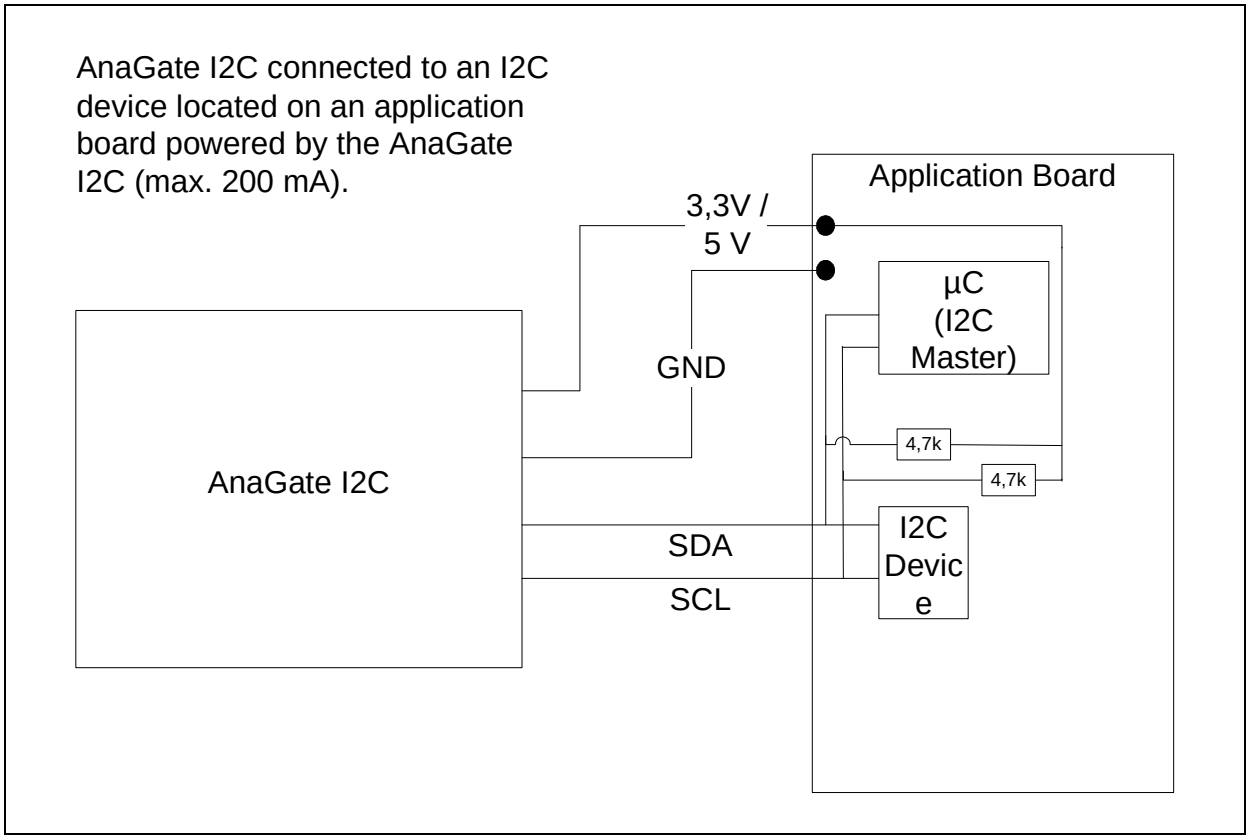


Chart 3-2: AnaGate I2C with an application board and integral power supply

If the AnaGate I2C is connected to an application board on which an I2C device has been mounted, the AnaGate I2C 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 I2C SDA and SCL outputs can be connected directly to the application board.

If the I2C device is fitted with chip-enable address inputs (usually designated A0/E0, A1/E1 and A2/E2), these also have to be switched accordingly on the application board.

An I2C master installed on the application board may not address the I2C bus at the same time as the AnaGate is accessing the I2C device. The I2C master can be set to RESET mode, for example, to prevent this. This rule does not apply to I2C masters which support multi-master mode.

3.3 AnaGate I2C and application board with external power supply

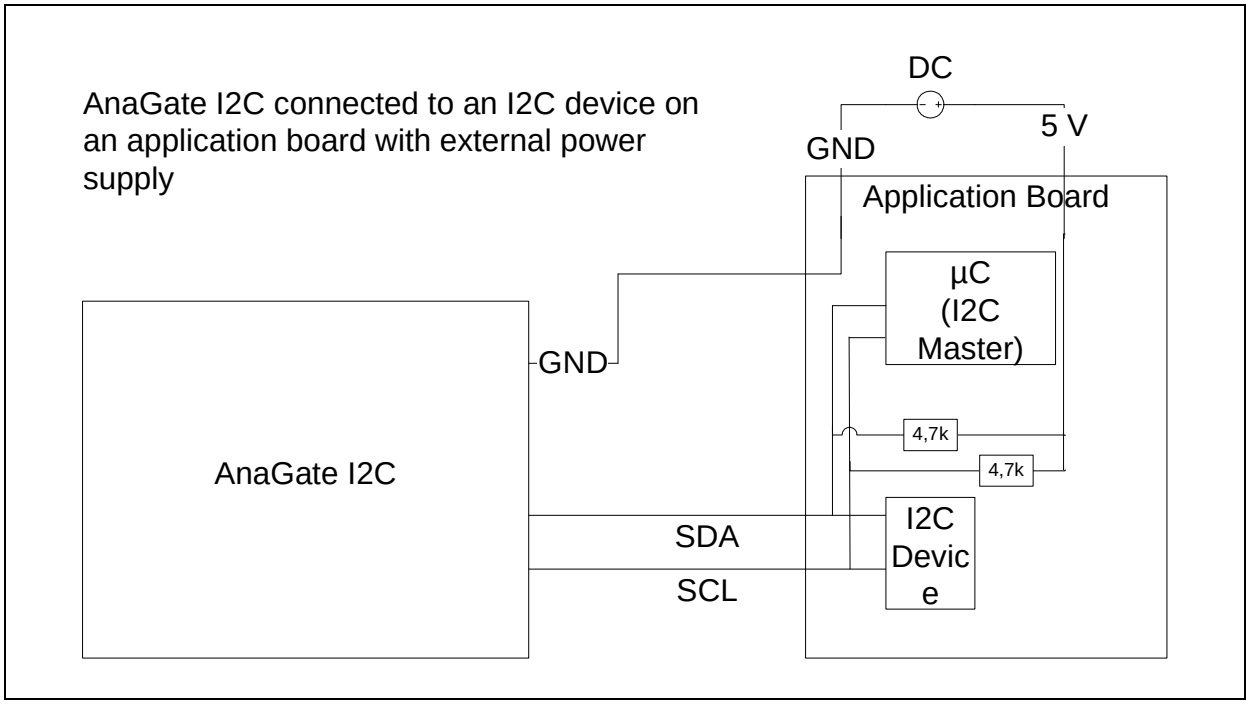


Chart 3-3: AnaGate I2C with an application board and external power supply

The same conditions as described previously in 3.2 “AnaGate I2C 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 SDA and SCL circuits between the AnaGate I2C 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 I2C and the hub or switch. You need a crossover cable to connect the device to a PC.

Check that the AnaGate I2C 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 I2C communication

If I2C communication with your I2C device fails, please proceed as follows:

1. Check that the I2C device is connected to the power supply.
2. Check that no other devices/µC are active on the I2C 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 I2C bus between the AnaGate I2C and the I2C device.
5. Ensure that the chip-enable address of the I2C device and the software are identical.

4.4 Firewall

When working with a firewall, the TCP port 5000 has to be opened for communication with the AnaGate I2C.

Literature

[1] I2C Bus http://www.semiconductors.philips.com/buses/i2c/

Abbreviations

DHCP	Dynamic Host Configuration Protocol
I2C / I^2C Bus	Inter IC Bus
LSB	Least Significant Byte
MSB	Most Significant Byte
SCL	Serial Clock
SDA	Serial Data