Anybus® CompactCom™ M40

HARDWARE DESIGN GUIDE

HMSI-216–126 2.1 ENGLISH

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Anybus® CompactCom™ M40 Hardware Design Guide

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1 Preface

1.1 About this Document

This document is intended to provide a good understanding of the mechanical and electrical properties of the Anybus CompactCom platform. It does not cover any of the network specific features offered by the Anybus CompactCom 40 products; this information is available in the appropriate Network Guide.

The reader of this document is expected to be familiar with hardware design and communication systems in general. For additional information, documentation, support etc., please visit the support website at www.anybus.com/support.

1.2 Related Documents

Related documents

Document	Author
Anybus CompactCom 40 Software Design Guide	HMS
Anybus CompactCom B40–1 Design Guide	HMS
Anybus CompactCom Host Application Implementation Guide	HMS
Anybus CompactCom Network Guides (separate document for each supported fieldbus or network system)	HMS
Low-Cost, Low-Power Level Shifting in Mixed-Voltage (5V, 3.3V) Systems (SCBA002A)	Texas Instruments
LT1767 Data Sheet	Linear Technology
EN 60950	IEC
EN 61000	IEC
EN 55011	IEC

1.3 Document History

Summary of changes to this version

Change	Where (section no.)
Updated DIP switch settings for EtherCAT when using stand alone shift register mode.	*3.5.2*
UL logo updated	*C.4*
Added information on VIH and LEDs 1 and 2 to table on differences between 40– and 30–series.	*B.1*
Updated table for power supply considerations with PROFINET FO	*A.7*
Added text to reset circuit example	*3.5.5*
Corrected table for pin usage in 16 bit parallel mode	*3.3.3*
Corrected LED interface table	*3.2.3*
Added DIP1 and DIP2 to UART and SPI modes	*3.2* *3.6.2* *3.4.2*

Revision list

Version	Date	Author	Description
1.40	2015–09–22	KeL	Last FM version.
2.0	2016–02–24	KeL	Moved from FM to XML Misc. updates
2.1	2016–08–23	KeL	Misc. updates and corrections

1.4 Conventions

Unordered (bulleted) lists are used for:

- Itemized information
- Instructions that can be carried out in any order

Ordered (numbered or alphabetized) lists are used for instructions that must be carried out in sequence:

1. First do this,
2. Then open this dialog, and
   a. set this option...
   b. ...and then this one.

Bold typeface indicates interactive parts such as connectors and switches on the hardware, or menus and buttons in a graphical user interface.

```
Monospaced text is used to indicate program code and other
kinds of data input/output such as configuration scripts.
```

This is a cross-reference within this document: *Conventions, p. 4*

This is an external link (URL): www.hms-networks.com

This is additional information which may facilitate installation and/or operation.

This instruction must be followed to avoid a risk of reduced functionality and/or damage to the equipment, or to avoid a network security risk.

Caution
This instruction must be followed to avoid a risk of personal injury.

WARNING
This instruction must be followed to avoid a risk of death or serious injury.

1.5 Document Specific Conventions

- The terms “Anybus” or “module” refers to the Anybus CompactCom module.
- The terms “host” or “host application” refer to the device that hosts the Anybus.
- Hexadecimal values are written in the format NNNNh or 0xNNNN, where NNNN is the hexadecimal value.
- A byte always consists of 8 bits.
- All measurements in this document have a tolerance of ±0.20mm unless otherwise stated.
- Outputs are TTL compliant unless otherwise stated.
- Signals which are “pulled to GND” are connected to GND via a resistor.
- Signals which are “pulled to 3V3” are connected to 3V3 via a resistor.

- Signals which are “tied to GND” are directly connect GND,
- Signals which are “tied to 3V3” are directly connected to 3V3.

2 Introduction

2.1 General Description

All Anybus CompactCom module implementations share the same footprint and electrical interface, allowing the host application to support all major networking systems using the same hardware platform. In the same way all Anybus CompactCom B40-1 share footprint and electrical interface. This document describes the hardware details of the Anybus CompactCom M40 modules, both with and without housing. Please consult the Anybus CompactCom B40–1 Design Guide for specific information about the Anybus CompactCom B40–1 brick solution.

> **!** This a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.
>
> This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product.

2.2 Features

• Hardware support for triple buffered process data, which increases performance

• Supports synchronization for selected industrial networks

• Black channel interface, offering a transparent channel for safety communication for selected networks

• Low latency

• Integrated protocol stack handling (where applicable)

• Galvanically isolated network interface (where applicable)

• On-board network status indications according to each network standard (where applicable)

• On-board network connectors according to each network standard

• Compact size (52 x 50 mm, 2” x 1.97”)

• Firmware upgradable (FLASH technology)

• 3.3 V design

• 8-bit and 16-bit parallel modes

• SPI mode

• Shift register mode

• Precompliance tested for network conformance (where applicable). Not finalized. All Anybus CompactCom versions will be precertified for network conformance. While this is done to ensure that the final product *can* be certified, it does not necessarily mean that the final product does not require recertification. Contact HMS for further information.

• Precompliance tested for CE & UL. Not finalized. Contact HMS for further information.

3 Host Interface

This chapter describes the low level properties of the Anybus CompactCom itnerface

3.1 Overview

The Anybus CompactCom has five different host communication interfaces, corresponding to different operating modes. The figure below illustrates the basic properties of these interfaces as well as various I/O and control signals, and how they relate to the host application.

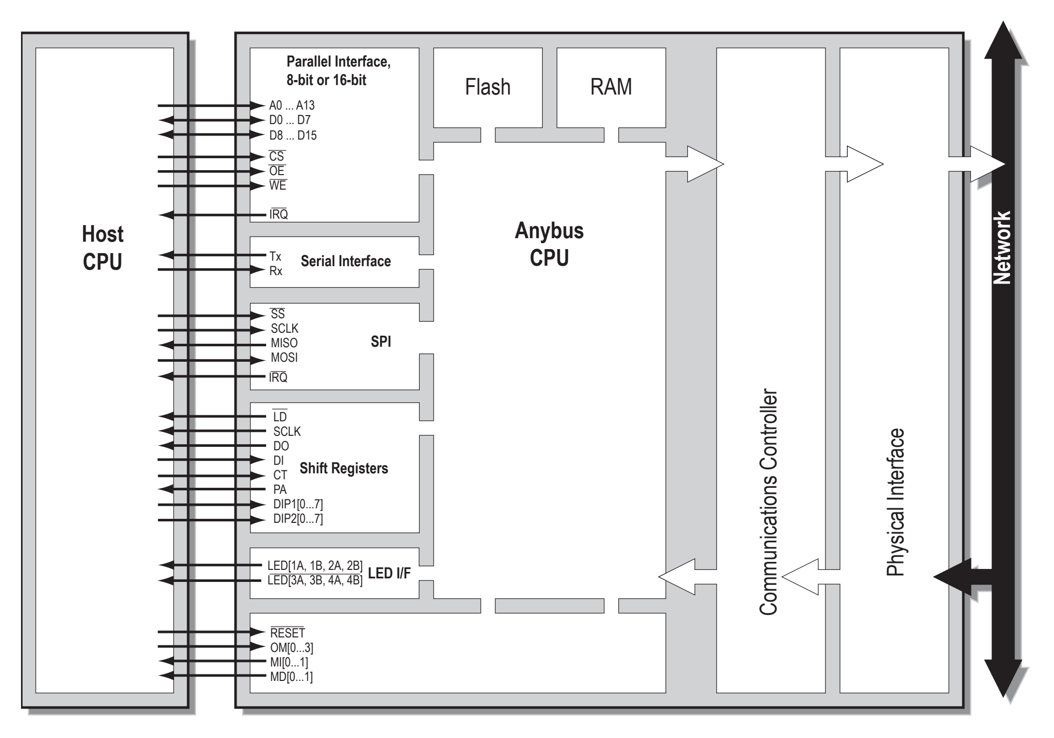


Fig. 1

Please note that only one communication interface at a time is available. Which one is decided at startup.

3.1.1 Parallel Interface, 8–bit or 16–bit

From an external point of view, the parallel interface is a common 8-bit or 16-bit parallel slave port interface, which can easily be incorporated into any microprocessor based system that has an external address/data bus. Generally, implementing this type of interface is comparable to implementing an 8-bit or 16-bit wide SRAM. Additionally, the parallel interface features an interrupt request line, allowing the host application to service the module only when actually needed.

3.1.2 SPI

The Serial Peripheral Interface (SPI) is a synchronous serial link. It operates in full duplex mode and devices communicate in master/slave mode where the Anybus CompactCom modules always act as slaves. The interface can provide much higher performance than the serial interface, but not as high as the parallel interface.

3.1.3 Stand-Alone Shift Register Interface

In this mode the Anybus CompactCom M40 operates stand-alone, with no host processor. Process data is communicated to the shift registers on the host.

3.1.4 Serial Interface (UART)

The serial interface is provided for backward compatibility with the Anybus CompactCom 30. The interface is event based, and it is not recommended to use it with an Anybus CompactCom M40 module as it can not take advantage of the greater performance of the 40-series. For more information about the serial interface, see the Anybus CompactCom Hardware Design Guide for the 30 series.

3.1.5 LED Interface

Network status LED output signals are available in all operating modes except 16-bit parallel mode. The status of the network LEDs is always available in the LED status register for all modes, see Anybus CompactCom 40 Software Design guide for more information.

3.2 Connector

The Anybus CompactCom uses a 50–pin CompactFlash™ style connector. The pinning is seen form the host application side of the CompactCom module

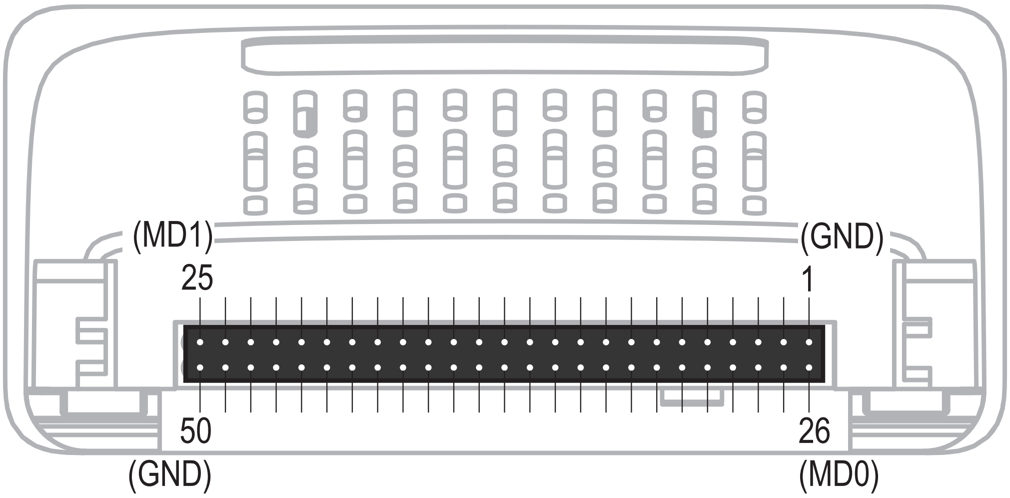


Fig. 2

See .*Application Connector Pin Overview, p. 10* for information on how each pin is used in the different modes.

> **!** The host interface is not pin compatible with the CompactFlash™ standard. Also, prior to exchanging a module, power should be turned off or the MD (module detection signals should be used to shut down communication and power when the module is removed. Failure to observe this may cause damage to the host product and/or the Anybus CompactCom module.

The pin types of the host interface connector are defined in the table below. The pin type may be different depending on which mode is used.

Pin type	Definition
I	Input
O	Output
I/O	Input/Output (bidirectional)
OD	Open Drain
Power	Pin connected directly to module power supply, GND or 3V3

3.2.1 Application Connector Pin Overview

Depending on operating mode, the pins have different names and different functionality. Presented below is an overview of all pins except GND and 3V3.

The ASM signals are used by a safety module to connect to the safety module interface of an Anybus CompactCom M40 series module.

Pin	Signal Name					Type	Notes
	Serial Mode	SPI Mode	8-bit Mode	16-bit Mode	Shift Register Mode		
49	DIP1_0	DIP1_0	A0	WEH	DIP1_0	I	-
24	DIP1_1	DIP1_1	A1	A1	DIP1_1	I	-
48	DIP1_2	DIP1_2	A2	A2	DIP1_2	I	-
23	DIP1_3	DIP1_3	A3	A3	DIP1_3	I	-
47	DIP1_4	DIP1_4	A4	A4	DIP1_4	I	-
22	DIP1_5	DIP1_5	A5	A5	DIP1_5	I	-
46	DIP1_6	DIP1_6	A6	A6	DIP1_6	I	-
21	DIP1_7	DIP1_7	A7	A7	DIP1_7	I	-
45		SS	A8	A8	LD	I	-
20		SCLK	A9	A9	SCLK	O, I	-
44		MISO	A10	A10	DO	O, I	-
19		MOSI	A11	A11	DI	I	-
43	ASM RX		A12	A12		I	-
18	ASM TX		A13	A13		O, I	-
14	DIP2_0	DIP2_0	D0	D0	DIP2_0	I, I/O	-
39	DIP2_1	DIP2_1	D1	D1	DIP2_1	I, I/O	-
15	DIP2_2	DIP2_2	D2	D2	DIP2_2	I, I/O	-
40	DIP2_3	DIP2_3	D3	D3	DIP2_3	I, I/O	-
16	DIP2_4	DIP2_4	D4	D4	DIP2_4	I, I/O	-
41	DIP2_5	DIP2_5	D5	D5	DIP2_5	I, I/O	-
17	DIP2_6	DIP2_6	D6	D6	DIP2_6	I, I/O	-
42	DIP2_7	DIP2_7	D7	D7	DIP2_7	I, I/O	-
4	LED1B	LED1B	LED1B	D8	LED1B	O, I/O	In modules supporting RMII, these pins are used for the RMII interface, see *RMII — Reduced Media-Independent Interface, p. 14*.
29	LED1A	LED1A	LED1A	D9	LED1A	O, I/O	
5	LED2B	LED2B	LED2B	D10	LED2B	O, I/O	
30	LED2A	LED2A	LED2A	D11	LED2A	O, I/O	
6	LED3B	LED3B	LED3B	D12	LED3B	OD, I/O	
31	LED3A	LED3A	LED3A	D13	LED3A	OD, I/O	
7	LED4B	LED4B	LED4B	D14	LED4B	O, I/O	
32	LED4A	LED4A	LED4A	D15	LED4A	O, I/O	
34			WE	WEL	CT	I	-
33			OE	OE		I	-
10			CS	CS		I	-
9		IRQ	IRQ	IRQ	PA	O	-
28	RX	ASM RX	ASM RX	ASM RX	ASM RX	I	Connect to 3V3 if not used.
3	TX / OM3	ASM TX / OM3	ASM TX / OM3	ASM TX / OM3	ASM TX / OM3	O	Strapping input with internal weak pull-up during powerup. To configure OM3, use an external pull-up/pull-down of 1.0 to 2.2 kΩ). The pin changes to output after powerup.
36	OM0	OM0	OM0	OM0	OM0	I	-
11	OM1	OM1	OM1	OM1	OM1	I	-

Pin	Signal Name					Type	Notes
	Serial Mode	**SPI Mode**	**8-bit Mode**	**16-bit Mode**	**Shift Register Mode**		
35	OM2	OM2	OM2	OM2	OM2	I	-
27	MI0	MI0/ SYNC	MI0/ SYNC	MI0/ SYNC	MI0	O	Low at powerup and before reset release.
2	MI1	MI1	MI1	MI1	MI1	O	Connected to 3V3
26	MD0	MD0	MD0	MD0	MD0	O	Connected to GND
25	MD1	MD1	MD1	MD1	MD1	O	Connected to GND
8	RESET	RESET	RESET	RESET	RESET	I	-

3.2.2 Power Supply Pins

Signal Name	Type	Pin	Description
GND	Power	50 37 12 1	Power and signal ground reference.
3V3	Power	38 13	3.3 V power supply.

3.2.3 LED Interface / D8–D15 (Data Bus)

Signal Name	Pin Type	Pin	Description, LED Interface	Description, Data Bus
LED1A / D9	O / I/O	29	LED 1 Indication A • Green	D9 Data Bus • "D9" in 16-bit data bus mode.
LED1B / D8	O / I/O	4	LED 1 Indication B • Red	D8 Data Bus • "D8" in 16-bit data bus mode.
LED2A / D11	O / I/O	30	LED 2 Indication A • Green	D11 Data Bus • "D11" in 16-bit data bus mode.
LED2B / D10	O / I/O	5	LED 2 Indication B • Red	D10 Data Bus • "D10" in 16-bit data bus mode.
$\overline{\text{LED3A}}$ / D13	OD / I/O	31	LED 3 Indication A • Green • Mainly used for link/activity on network port 1 on the Ethernet modules. Pin is open-drain to maintain backward compatibility with existing applications, where this pin may be tied to GND. Also for compatibility with passive modules where this pin is as driver enable input	D13 Data Bus • "D13" in 16-bit data bus mode.
$\overline{\text{LED3B}}$ / D12	OD / I/O	6	LED 3 Indication B • Yellow or red, depending on network	D12 Data Bus • "D12" in 16-bit data bus mode.

Signal Name	Pin Type	Pin	Description, LED Interface	Description, Data Bus
			• Mainly used for link/activity on network port 1 on the Ethernet modules (yellow). Pin is open-drain to maintain backward compatibility with existing applications, where this pin may be tied to GND. Also for compatibility with passive modules where this pin is as driver enable input	
$\overline{\text{LED4A}}$ / D15	O / I/O	32	LED 4 Indication A • Green • Mainly used for link/activity on network port 2 on the Ethernet modules.	D15 Data Bus • "D15" in 16-bit data bus mode.
$\overline{\text{LED4B}}$ / D14	O / I/O	7	LED 4 Indication B • Yellow or red, depending on network • Mainly used for link/activity on network port 2 on the EThernet modules (yellow)	D14 Data Bus • "D14" in 16-bit data bus mode.

3.2.4 Settings / Sync

Signal Name	Type	Pin	Description
OM0 OM1 OM2 OM3 (ASM TX) (TX)	I I I I (Used as OM3 during power up)	36 11 35 3	**Operating Mode** Used to select interface and baud rate, see below.
MI0 / SYNC MI1	O O	27 2	**Module Identification** MI0 and MI1 can be used by the host application to determine what type of Anybus CompactCom that is connected. **SYNC** On networks that support synchronous communication, a periodic synchronization pulse is provided on the SYNC output. The SYNC pulse is also available as a maskable interrupt using the IRQ signal.
MD0 MD1	O O	26 25	**Module Detection** These signals can be used by the host application to determine that an Anybus CompactCom is inserted into the slot, see *Module Detection, p. 13*. The signals are connected directly to GND on the CompactCom.
ASM RX ASM TX	I O	28 3	**Black Channel Communication** These signals can be connected to a safety module, e.g. to IXXAT Safe T100 to provide a safe channel for black channel communication If not used, pin 28 should be connected to 3V3.
RX TX	I O	28 3	**Serial Communications Signals**

Operating Modes

These inputs select the interface that should be used to exchange data (SPI, stand-alone shift register, parallel or serial) and, if the serial interface option is used, the operating baud rate. The state of these signals is sampled once during startup, i.e. any changes require a reset in order to have effect.

OM3	OM2	OM1	OM0	Operating Mode
0	0	0	0	Reserved
0	0	0	1	SPI
0	0	1	0	Stand-alone shift register
0	0	1	1	Reserved
0	1	0	0	Reserved
0	1	0	1	Reserved
0	1	1	0	Reserved
0	1	1	1	16-bit parallel
1	0	0	0	8-bit parallel
1	0	0	1	Serial 19.2 kbps
1	0	1	0	Serial 57.6 kbps
1	0	1	1	Serial 115.2 kbps
1	1	0	0	Serial 625 kbps
1	1	0	1	Reserved
1	1	1	0	Reserved
1	1	1	1	Service Mode

These signals must be stable prior to releasing the RESET signal. Failure to observe this may result in faulty behavior.

In an application, where it has to be possible to change an M30 module for an M40 module, there should be an external pull-up on the OM3 pin to ensure correct and stable behavior. The reason is that during startup the OM3 will indicate an M30 mode if it is high. The signal will change to an output signal after startup, and will then be used either for the serial interface towards the host application or for black channel communication using an external safety module.

Module Detection

These signals are internally connected to GND, and can be used by the host application to detect whether a module is present or not.

State		Indication
MD0	**MD1**	
HIGH	HIGH	Module not present
LOW	HIGH	
HIGH	LOW	
LOW	LOW	Module present

LOW = V_{OL}

HIGH = V_{OH}

If unused, leave these signals unconnected.

Module Identification

These signals indicate which type of module that is connected. It is recommended to check the state of these signals before accessing the module.

MI1	MI0	Module Type
LOW	LOW	Active Anybus CompactCom 30
LOW	HIGH	Passive Anybus CompactCom
HIGH	LOW	Active Anybus CompactCom 40
HIGH	HIGH	Customer specific

LOW = V_{OL}

HIGH = V_{OH}

On modules supporting “SYNC”, MI0 is used as a SYNC signal during operation. MI0 should only be sampled by the application during the time period from power up to the end of SETUP state.

3.2.5 RMII — Reduced Media-Independent Interface

In RMII enabled modules, the pins described in the table below are used for the RMII communication. They are set to tristate during startup, making it impossilbe to indicate e.g. exception during setup. When setup is complete, they are set to inputs/outputs according to the selected mode. See Anybus CompactCom 40 Software Design Guide for more information on mode selection.

! The 16–bit parallel mode can not be used when RMII is enabled

LED status will not be available when RMII is enabled.

Pin	Signal Name	Type	Notes
4	RXD0	O	-
29	RXD1	O	-
5	RXDV	O	-
30		I	Not used (connect to external pull-down)
6	TXD0	I	-
31	TXD1	I	-
7	TXEN	I	-
32	CLK	I	-

3.2.6 RESET (Reset Input)

Signal Name	Pin Type	Pin	Description
$\overline{\text{Reset}}$	I	8	**Reset** Used to reset the module.

The reset input is active low. It must be connected to a host application controllable output pin in order to handle the power up sequence, voltage deviations and to be able to support network reset requests.

The module does not feature any internal reset regulation. To establish a reliable interface, the host application is solely responsible for resetting the module when the supply voltage is outside the specified range.

There is no Schmitt trigger circuitry on this input, which means that the module requires a fast rise time of the reset signal, preferably equal to the slew rate of typical logical circuits. A simple

RC circuit is for example not sufficient to guarantee stable operation, as the slew rate from logic 0 to logic 1 is too slow.

> **!** The rise time of the reset signal should be as fast as possible, and must not exceed 30 ns. The signal is not under any circumstances allowed to be left floating. Use a pull-down to prevent this.

The following requirements must be met by the reset regulator connected to the reset input signal.

Power Up

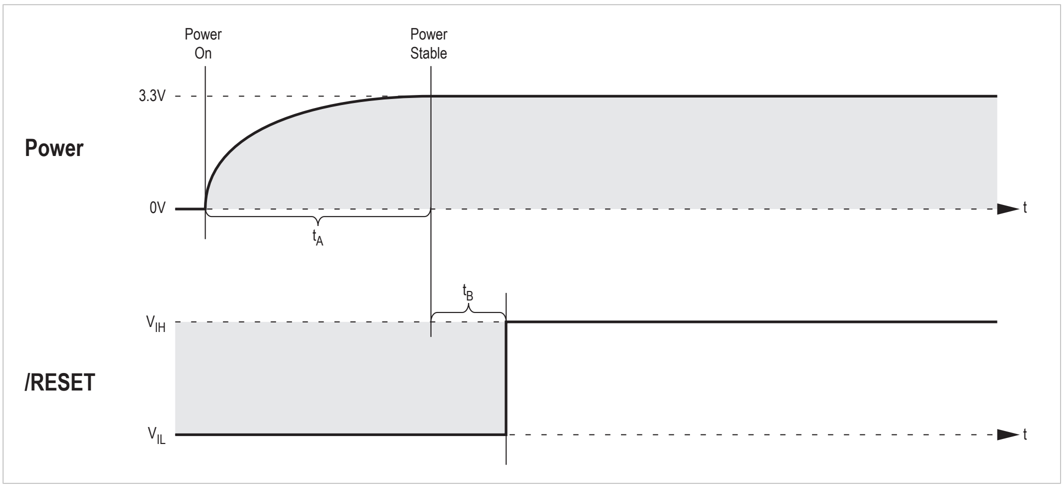


Fig. 3

Power up time limits are given in the table below:

Symbol	Min.	Max.	Definition
t_A	-	-	Time until the power supply is stable after power-on; the duration depends on the power supply design of the host application and is thus beyond the scope of this document.
t_B	1ms	-	Safety margin.

Restart

The reset pulse duration must be at least 10 µs in order for the NP40 to properly recognize a reset.

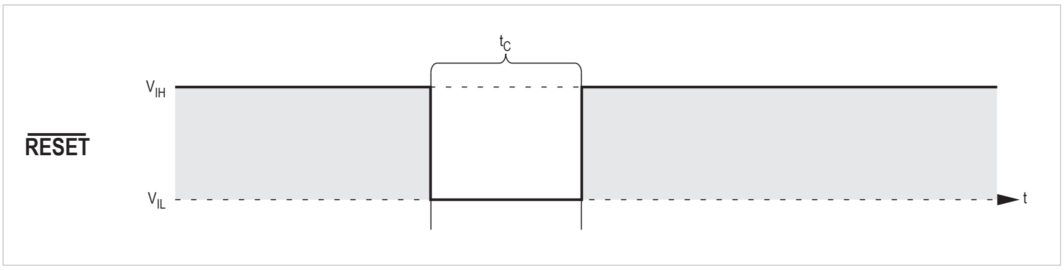


Fig. 4

Symbol	Min.	Max.	Definition
t_C	10 µs	-	Reset pulse width.

3.3 Parallel Interface Operation

3.3.1 General Description

The parallel interface is based on an internal memory architecture, that allows the Anybus CompactCom module to be interfaced directly as a memory mapped peripheral. The M40 modules can be configured for 8-bit or 16-bit parallel operation. The access time is 30 ns.

Polled operation is possible, but at the cost of an overhead. For increased efficiency, an optional interrupt request signal (IRQ) can relieve the host application from polling for new information, thus increasing the performance.

The parallel interface must be enabled using OM[0... 3].

3.3.2 Pin Usage in 8–bit Parallel Mode

The parallel 8-bit interface uses the following signals:

Pin	Signal Name	Pin Type	Description/Comments
49 24 48 23 47 22 46 21 45 20 44 19 43 18	A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13	I	A[0...13]: Mandatory address input signals.
14 39 15 40 16 41 17 42	D0 D1 D2 D3 D4 D5 D6 D7	I/O	Standard bidirectional data bus.
4 29 5 30 6 31 7 32	LED1B LED1A LED2B LED2A $\overline{\text{LED3B}}$ $\overline{\text{LED3A}}$ $\overline{\text{LED4B}}$ $\overline{\text{LED4A}}$	O O O O OD OD O O	8-bit mode: LED functionality, see *LED Interface, p. 8*".
34	$\overline{\text{WE}}$	I	Active low write signal or combined read/write signal.
33	$\overline{\text{OE}}$	I	Bus output enable; enables output on the data bus when low.
10	$\overline{\text{CS}}$	I	Bus chip select enable; enables parallel access to the module when low.
9	$\overline{\text{IRQ}}$	O	Active low Interrupt Request signal. Asserted by the Anybus CompactCom module. The use of this signal is optional but highly recommended. Even if the host application lacks interrupt capabilities, it is recommended to connect this signal to an input port to simplify software design. This signal must be pulled to 3V3 on the host application side to prevent spurious interrupts during startup.
36 11 35	OM0 OM1 OM2	I	Operating mode. Connect all three to GND for 8-bit parallel operating mode. For more information see *Operating Modes, p. 13*".
3	OM3 / ASM TX	O, I	Black channel output.

Pin	Signal Name	Pin Type	Description/Comments
			See *Black Channel/Safety Module, p. 35*. During startup the pin (with OM[0..2]) is used to define the operating mode of the module. Connect to external pull-up for 8-bit parallel operating mode, see *Application Connector Pin Overview, p. 10*.
28	ASM RX	I	Black channel input. Connect to 3V3 if not used. See *Black Channel/Safety Module, p. 35*
27 2	MI0/SYNC MI1	O	See *Module Identification, p. 14*".
26 25	MD0 MD1	O	See *Module Detection, p. 13*".
8	$\overline{\text{RESET}}$	I	See *RESET (Reset Input), p. 14*.

Applications with limited number of address lines may connect A[0..10] of the Anybus CompactCom module to their CPU, and pull signals A[11..13] high. This will allow communication with the module using the smaller message format of the Anybus CompactCom 30 series, with a reduced set of address lines, allowing access to only 256 byte process data, see the Anybus CompactCom 30 Software Design Guide for more information.

There are no internal pull-up resistors on any of the signals above, except for OM3, which has an internal weak pull-up.

Function Table (CS, WE, OE, D[0...7])

$\overline{\text{CS}}$	WE	OE	D[0...7] State	Comment
HIGH	X	X	High impedance	Module not selected.
LOW	LOW	X	Data Input (Write)	Data on D[0...7] is written to location selected by address bus.
LOW	HIGH	LOW	Data Output (Read)	Data from location selected by address bus is available on D[0...7].
LOW	HIGH	HIGH	High impedance	Module is selected, but D[0...7] is in a high impedance state.

X = don’t care

LOW = V_{IL}

HIGH = V_{IH}

3.3.3 Pin Usage in 16–bit Parallel Mode

The parallel 16-bit interface uses the following signals:

Pin	Signal Name	Pin Type	Description/Comments
24 48 23 47 22 46 21 45 20 44 19 43 18	A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13	I	A[1...13]: Mandatory address input signals. Selects source/target location.
14 39 15 40 16 41 17 42 4 29 5 30 6 31 7 32	D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15	I/O	Standard bidirectional data bus.
49	$\overline{WEH}$	I	Write enable high byte.
34	$\overline{WEL}$	I	Write enable low byte.
33	$\overline{OE}$	I	Bus output enable; enables output on the data bus when low.
10	$\overline{CS}$	I	Bus chip select enable; enables parallel access to the module when low.
9	$\overline{IRQ}$	O	Active low Interrupt Request signal. Asserted by the Anybus CompactCom module. The use of this signal is optional but highly recommended. Even if the host application lacks interrupt capabilities, it is recommended to connect this signal to an input port to simplify software design. This signal must be pulled to 3V3 on the host application side to prevent spurious interrupts during startup.
36 11 35	OM0 OM1 OM2	I	Operating mode. Connect all three to 3V3 for 16-bit parallel operating mode. For more information see *Operating Modes, p. 13*".
27 2	MI0/SYNC MI1	O	See *Module Identification, p. 14*".
3	OM3 / ASM TX	O, Strap	Black channel output. See *Black Channel/Safety Module, p. 35* During startup the pin (with OM[0..2]) is used to define the operating mode of the module. Connect to pull-down for 16-bit parallel operating mode, see *Application Connector Pin Overview, p. 10*.
28	ASM RX	I	Black channel input. Connect to 3V3 if not used. See *Black Channel/Safety Module, p. 35*
26 25	MD0 MD1	O	See *Module Detection, p. 13*.
8	$\overline{RESET}$	I	See *RESET (Reset Input), p. 14*".

Applications with limited number of address lines may connect A[0..10] of the Anybus Compact-Com module to their CPU, and pull signals A[11..13] high. This will allow communication with the module using the smaller message format of the Anybus CompactCom 30 series, with a reduced set of address lines, allowing access to only 256 byte process data, see the Anybus CompactCom 30 Software Design Guide for more information.

The A0 signal is not needed in 16-bit parallel operating mode, as 16 bits are addressed instead of 8 bits. If there is need for writing one byte at the time signals WEH and WEL can be used to enable writing to the high or low byte respectively. If both are enabled both bytes are written.

Function Table (CS, WEL, WEH, OE, D[0...15])

$\overline{CS}$	$\overline{WEL}$	$\overline{WEH}$	$\overline{OE}$	D[0...15] State	Comment
HIGH	X	X	X	High impedance	Module not selected.
LOW	LOW	HIGH	X	Data Input (Write)	Data on D[0...7] is written to low byte of location selected by address bus.
LOW	HIGH	LOW	X	Data Input (Write)	Data on D[8...15] is written to high byte of location selected by address bus.
LOW	LOW	LOW	X	Data Input (Write)	Data on D[0 ...15] is written to location selected by address bus.
LOW	HIGH	HIGH	LOW	Data Output (Read)	Data from location selected by address bus is available on D[0...15].
LOW	HIGH	HIGH	HIGH	High impedance	Module is selected, but D[0...15] is in a high impedance state.

X = don’t care

LOW = V_{IL}

HIGH = V_{IH}

3.3.4 Memory Access Read Timing

The $\overline{WE}$ input signal must remain high during a read access. The timing diagram shows a burst read, but the timing applies for a single read as well. The Anybus CompactCom M40 has no set-up or hold timing requirements on the address bus relative to $\overline{CS}$ during read operations. The only limitation on read setup and hold times is that the pingpong and powerup interrupt will be acknowledged if all address lines are high for 10-15 ns or more while $\overline{CS}$ is low.

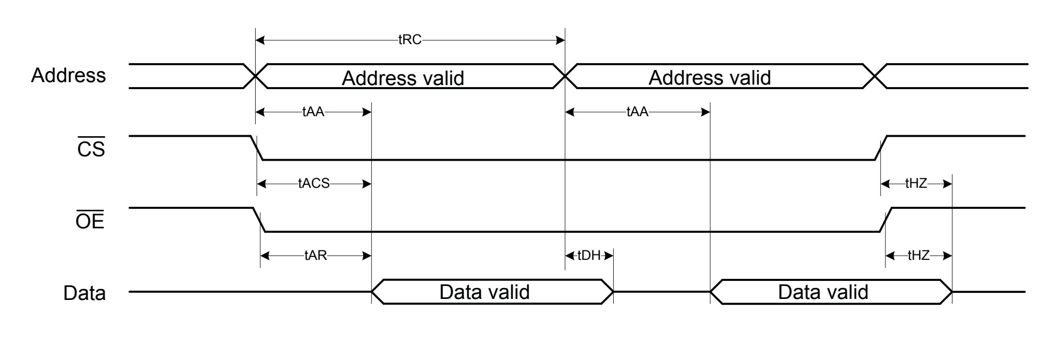


Fig. 5

Symbol	Parameter	Min (ns)	Max (ns)
tRC	Read cycle time	30	-
tAA	Address valid to Data valid	-	30
tACS	$\overline{CS}$ low to Data valid	-	30
tAR	**OE** low to Data valid	-	15
tHZ	$\overline{CS}$ or $\overline{OE}$ high to output reached tristate	-	15
tDH	Data hold time	0	-

3.3.5 Memory Access Write Timing

It doesn't matter if the $\overline{\text{OE}}$ signal is low or high as long as $\overline{\text{WE}}$ is active (low). In 16 bit mode, the timing requirements of $\overline{\text{WE}}$ applies to both $\overline{\text{WEL}}$ and $\overline{\text{WEH}}$. The timing diagrams show a burst write but the timing applies for a single write as well. The first diagram shows write enable controlled write timing and the second shows chip select controlled write timing.

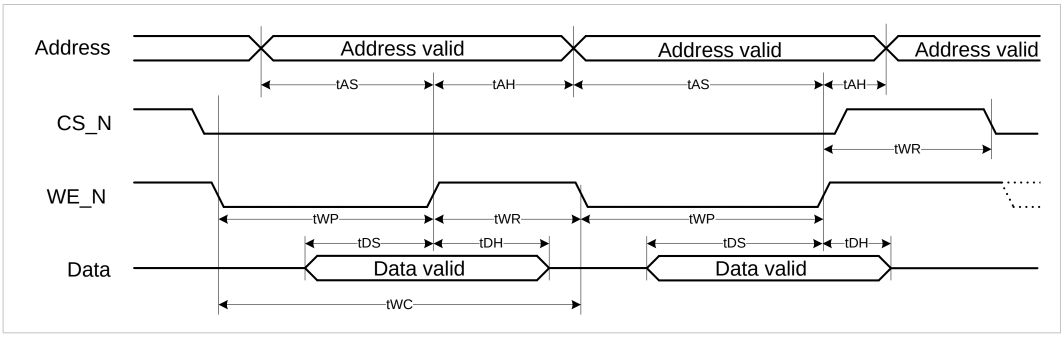


Fig. 6

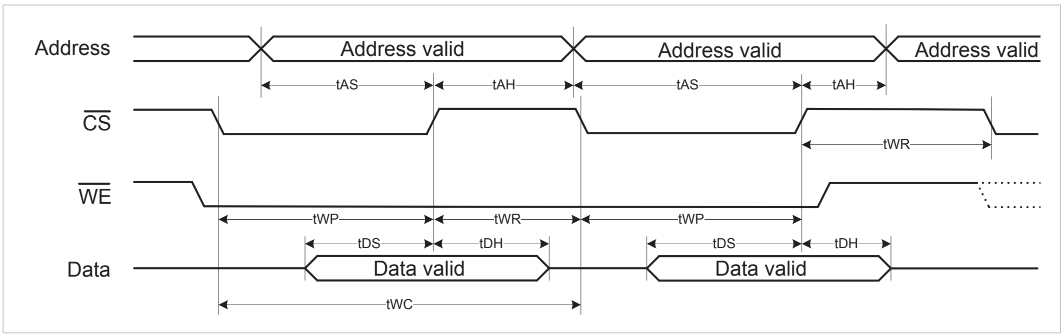


Fig. 7

Symbol	Parameter	Min (ns)	Max (ns)
tWC	Write cycle time	30	-
tAS	Address valid before End-of-Write	15	-
tAH	Address valid after End-of-Write	0	-
tWP	$\overline{\text{CS}}$ and $\overline{\text{WE}}$ low pulse width	15	-
tDS	Data valid before End-of-Write	15	-
tDH	Data valid after End-of-Write	0	-
tWR	Write recovery time	10	-

3.4 SPI Operation

3.4.1 General Description

The SPI (Serial Peripheral Interface) bus is a synchronous serial data link standard which operates in full duplex mode.

The SPI interface is activated using the OM[0...3] inputs. See *Operating Modes, p. 13*.

3.4.2 Pin Usage in SPI Mode

Presented below is an overview of all pins except GND and 3V3.

Pin	Signal Name	Type	Description/Comments
49 24 48 23 47 22 46 21	DIP1_0 DIP1_1 DIP1_2 DIP1_3 DIP1_4 DIP1_5 DIP1_6 DIP1_7	I I I I I I I I	DIP switch. Usage defined by application. Connect to GND if not used.
45	$\overline{\text{SS}}$	I	Slave select. Active low.
20	SCLK	I	Serial Clock Input
44	MISO	O	Master input, slave output. Input to the master's shift register, and output from the slave's shift register.
19	MOSI	I	Master output, slave input. Output from the master's shift register, and input to the slave's shift register.
43 18	(not used)	I O, I	Connect to 3V3.
14 39 15 40 16 41 17 42	DIP2_0 DIP2_1 DIP2_2 DIP2_3 DIP2_4 DIP2_5 DIP2_6 DIP2_7	I I I I I I I I	DIP switch. Usage defined by application. Connect to GND if not used.
4 29 5 30 6 31 7 32	LED1B LED1A LED2B LED2A $\overline{\text{LED3B}}$ $\overline{\text{LED3A}}$ $\overline{\text{LED4B}}$ $\overline{\text{LED4A}}$	O O O O OD OD O O	LED interface. Gives access to LED indications. For more information, see *LED Interface / D8–D15 (Data Bus), p. 11*".
34 33 10	(not used)	I	Connect to 3V3.
9	$\overline{\text{IRQ}}$	O	Active low Interrupt Request signal. Asserted by the Anybus CompactCom module. The use of this signal is optional but highly recommended. Even if the host application lacks interrupt capabilities, it is recommended to connect this signal to an input port to simplify software design. This signal must be pulled to 3V3 on the host application side to prevent spurious interrupts during startup.
36 11 35	OM0 OM1 OM2	I	Operating mode [OM2, OM1, OM0]: 0,0,1 for SPI operating mode. For more information see *Operating Modes, p. 13*".
3	OM3 / ASM TX	O, Strap	Black channel output. See *Black Channel/Safety Module, p. 35* During startup the pin (with OM[0..2]) is used to define the operating mode of the module. Connect to external pull-down for SPI operating mode,see *Application Connector Pin Overview, p. 10*.
28	ASM RX	I	Black channel input. Connect to 3V3 if not used. See *Black Channel/Safety Module, p. 35*
27 2	MI0/SYNC MI1	O	See *Module Identification, p. 14*".
26 25	MD0 MD1	O	See *Module Detection, p. 13*".
8	$\overline{\text{RESET}}$	I	See *RESET (Reset Input), p. 14*".

3.4.3 SPI Interface Signals

The SPI interface option uses three (optionally four) signals:

Signal	Description
SCLK	Serial Clock Input
MOSI	Master output, slave input. Output from the master’s shift register, and input to the slave’s shift register.
MISO	Master input, slave output. Input to the master’s shift register, and output from the slave’s shift register.
$\overline{SS}$	Slave Select (optional)

For increased efficiency, the interrupt request signal ($\overline{IRQ}$) is also available, allowing the host application to service the Anybus CompactCom module only when necessary.

4–Wire Mode

In 4-wire mode the $\overline{\text{SS}}$ signal is used to indicate the start and stop of an SPI transfer. In this mode the SCLK signal is allowed to be either idle high or idle low. This mode also allows multiple SPI slaves on the same SPI bus, since Anybus CompactCom MISO is tri-stated when $\overline{\text{SS}}$ is high.

A 4-wire diagram example:

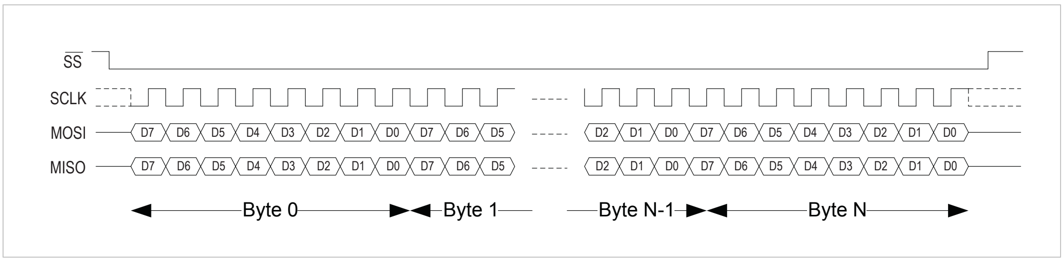


Fig. 8

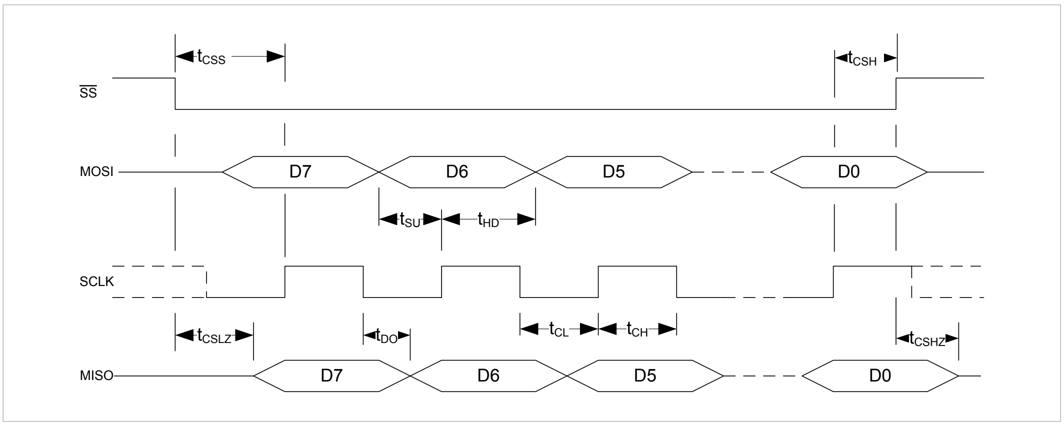


Fig. 9

Item	Description	Min Value	Max Value
tSU	MOSI setup before SCK rising edge	10 ns	-
tHD	MOSI hold after SCK rising edge	10 ns	-
tDO	MISO change after SCK falling edge	0 ns	20 ns
tCL	SCK low period	20 ns	-
tCH	SCK high period	20 ns	-
tCL+tCH	SCLK period. Max. frequency supported is 20 MHz.	50 ns	-
tCSS	$\overline{\text{SS}}$ setup before first SCLK rising edge.	20ns	-
tCSH	$\overline{\text{SS}}$ hold after last SCLK rising edge.	20ns	-
tCSLZ	MISO valid after falling edge of $\overline{\text{SS}}$.	-	20ns
tCSHZ	MISO high-Z after rising edge of $\overline{\text{SS}}$.	-	20ns

3–Wire Mode

In 3-wire mode the $\overline{SS}$ signal must be tied low permanently, and the SCLK signal must be idle high. Multiple SPI slaves on the same bus are not possible in this mode. The module detects start and stop of a transfer by monitoring SCLK activity.

There must be an idle period of at least 10 µs between two transfers in this mode, and the SCLK signal must never remain high for more than 5 µs during a transfer.

A 3-wire diagram example.

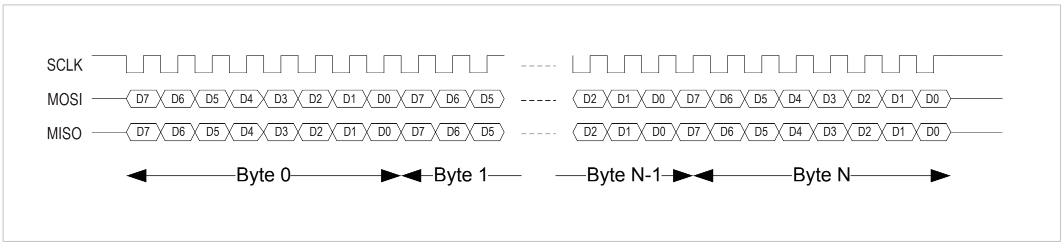


Fig. 10

SPI diagram and bit timing for 3-wire mode.

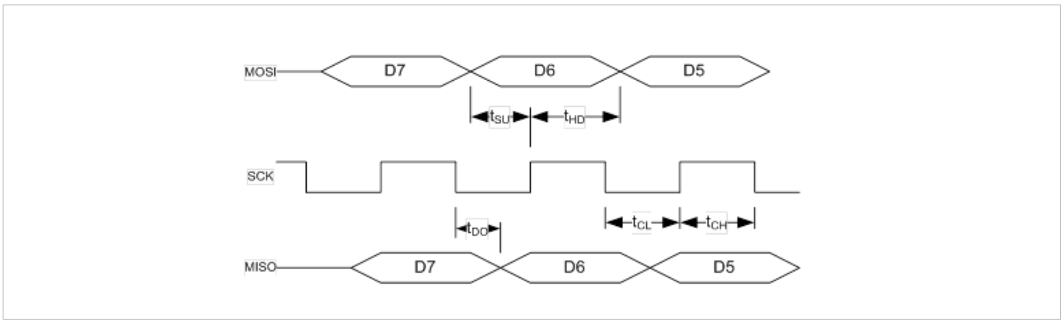


Fig. 11

Item	Description	Min Value	Max Value
tSU	MOSI setup before SCK rising edge	10 ns	-
tHD	MOSI hold after SCK rising edge	10 ns	-
tDO	MISO change after SCK falling edge	0 ns	20 ns
tCL	SCK low period	20 ns	-
tCH	SCK high period	20 ns	-
tCL+tCH	SCK period Max. frequency supported is 20 MHz.	50 ns	-

SPI Frame Format

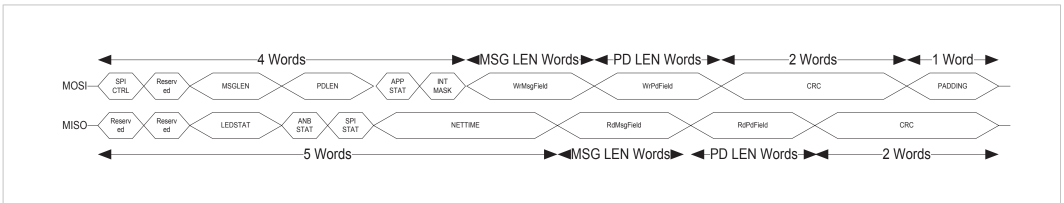


Fig. 12

Each byte is transmitted with the most significant bit first, but the byte order is little endian. The least significant byte is transmitted first.

3.5 Stand-alone Shift Register

3.5.1 General Information

In this mode the Anybus CompactCom M40 operates stand-alone, with no host processor. Process data is communicated to shift registers on the host. The Anybus CompactCom M40 supports up to 32 registers in each direction, for a total of 256 bits of data. SYNC functionality is not supported.

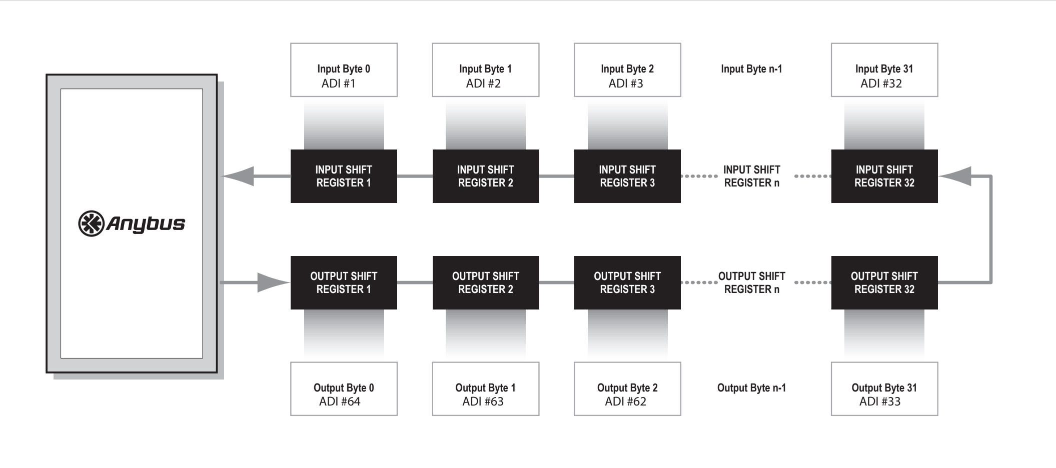


Fig. 13

Even though the Anybus CompactCom M40 operates stand-alone, it is still possible to set host application attributes, via the use of the virtual attributes list. Some attributes are mandatory to implement in order to pass conformance tests

See the Virtual Attributes section in the Anybus CompactCom 40 Software Design Guide for more information.

The Anybus CompactCom M40 will automatically detect the number of connected input and output shift registers. Every shift register will be represented by one UINT8 ADI. The input ADIs will be named “Input 0”, “Input 1”, etc. The output ADIs will be named “Output 0”, “Output 1”, etc.

Bits are clocked out/in MSB first, on the positive side of CLK. An active low load signal ($\overline{LD}$) loads all shift registers before and after a transfer.

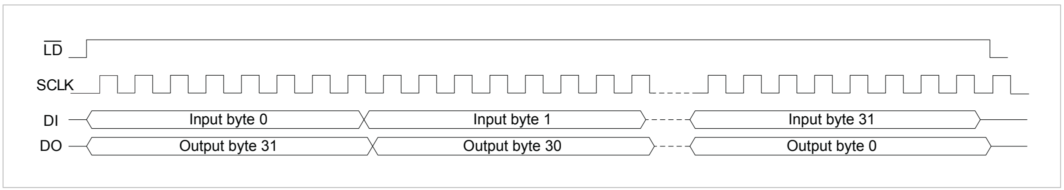


Fig. 14

A fifth signal, PA, is high when the module is in active state, and low when the module is not. This signal can be used by the application to clear/set the output shift registers to default values when the module is not in active state.

3.5.2 Pin Usage in Stand-Alone Shift Register Mode

Presented below is an overview of all pins except GND and V_{DD}.

Pin	Signal Name	Type	Description/Comments
49 24 48 23 47 22 46 21	DIP1_0 DIP1_1 DIP1_2 DIP1_3 DIP1_4 DIP1_5 DIP1_6 DIP1_7	I I I I I I I I	DIP switch node address / IP address. See *DIP1 and DIP2 Pins Usage, p. 28*.
45	$\overline{\text{LD}}$	O	Shift register load.
20	SCLK	O	Clock output.
44	DO	O	Serial data output from shift registers.
19	DI	I	Serial data input from shift registers.
43	(not used)	-	Leave unconnected
18	(not used)	-	Leave unconnected
14 39 15 40 16 41 17 42	DIP2_0 DIP2_1 DIP2_2 DIP2_3 DIP2_4 DIP2_5 DIP2_6 DIP2_7	I I I I I I I I	DIP switch baud rate / Device ID / station name. See *DIP1 and DIP2 Pins Usage, p. 28*.
4 29 5 30 6 31 7 32	LED1B LED1A LED2B LED2A $\overline{\text{LED3B}}$ $\overline{\text{LED3A}}$ $\overline{\text{LED4B}}$ $\overline{\text{LED4A}}$	O O O O OD OD O O	LED interface. Gives access to LED indications. For more information, see *LED Interface / D8–D15 (Data Bus), p. 11*.
34	CT	I	Center tap signal for shift register mode. The number of connected input and output shift registers will be detected using this signal.
9	PA	O	Process active signal for shift register mode. In a PROFINET shift register stand-alone application, the PA signal must be used to clear outputs, when the Anybus CompactCom M40 is not in state PROCESS ACTIVE. Otherwise it will not be possible to certify the final product. See the Anybus CompactCom 40 PROFINET IRT Network Guide for more information.
33	(not used)	-	Leave unconnected.
10	(not used)	-	Leave unconnected.
28	ASM RX	I	Black channel input. Connect to 3V3 if not used. See *Black Channel/Safety Module, p. 35*
3	ASM TX / OM3	O, Strap	Black channel output. See *Black Channel/Safety Module, p. 35* During startup the pin (with OM[0..2]) is used to define the operating mode of the module. Connect to external pull-down for shift register operating mode, see *Application Connector Pin Overview, p. 10*.
36 11 35	OM0 OM1 OM2	I	Operating mode [OM2, OM1, OM0]: 0,1,0 for shift register operating mode. For more information see *Operating Modes, p. 13*.
27 2	MI0 MI1	O	See *Module Identification, p. 14*.
26 25	MD0 MD1	O	See *Module Detection, p. 13*.
8	$\overline{\text{RESET}}$	I	See *RESET (Reset Input), p. 14*

DIP1 and DIP2 Pins Usage

The use of the DIP1 and DIP2 pins is network specific. If used, they will be read during SETUP state. Thereafter, DIP switch changes will be sampled and written to the Network Configuration Object every 0.5 seconds.

DIP1 is linked to the Network Configuration Object, instance 1 (node address) or instance 3 (IP address). DIP2 is linked to the Network Configuration Object, instance 2 (baud rate) or instance 1 (Device ID, EtherCAT), or, in the case of PROFINET, linked to the PROFINET IO Object , instance 1, attribute 24.

See Network Configuration Object (04h) in the Anybus CompactCom 40 Software Design Guide for more information.

Network	DIP1 (linked to Network Configuration Object)	DIP2	Notes
DeviceNet	0 - 63 (Instance 1: Node address)	Value: 0 - 3 (Network Configuration Object, Instance 2: Baud Rate)	DIP2: Network Configuration Object, Instance 2: Baud Rate (125 kbps, 250 kbps, 500 kbps, Auto)
EtherCAT	1 - 254 (Instance 3: IP address)	0 - 255 (Network Configuration Object, Instance 1: Device ID)	If DIP1 is set to 0, saved values from instances 3 - 6 are used. If DIP1 is set to 255, DHCP is used for all settings. The DIP switches set the last byte of the IP address. Virtual attributes are used to configure the remaining part the IP address, as well as the subnetmask (Network Configuration Object, instance 4) and the gateway (instance 5).
EtherNet/IP	1 - 254 (Instance 3: IP address)	Not used	
Modbus-TCP	1 - 254 (Instance 3: IP address)	Not used	
Common Ethernet	1 - 254 (Instance 3: IP address)	Not used	
POWERLINK	1 - 239 (Instance 1: Node address)	Not used	-
PROFIBUS	0 - 126 (Instance 1: Node address)	Not used	-
PROFINET	1 - 254 (Instance 3: IP address)	Value: 1 — 255 (PROFINET IO object, Instance 1, attribute 24)	If DIP1 is set to 0, saved values from instances 3 - 6 are used. If DIP1 is set to 255, DHCP is used for all settings. The DIP1 to switches set the last byte of the IP address. Virtual attributes are used to configure the remaining part the IP address, as well as the subnetmask (Network Configuration Object, instance 4) and the gateway (instance 5). If DIP2 is set to 0, the value saved in the non volatile memory will be used. The DIP2 switches set the last three digits of the station name. see the Anybus CompactCom 40 PROFINET IRT Network Guide.
CC-Link	1 - 64 (Instance 1: Node address).	Value: 0 - 4 (Network Configuration Object, Instance 2: Baud Rate)	DIP1: Depending on number of stations used. An invalid value will generate a NACK on Setup Complete. DIP2: Network Configuration Object, Instance 2: Baud Rate (156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps)

Unused DIP pins should be connected to ground (GND).

External pull-down resistors are needed if DIP switches are connected to the DIP1 and DIP2 pins, see *DIP Switches Example, p. 31*.

3.5.3 Timing

The Anybus CompactCom M40 operates in 12.5 MHz in shift register mode.

Timing Diagram

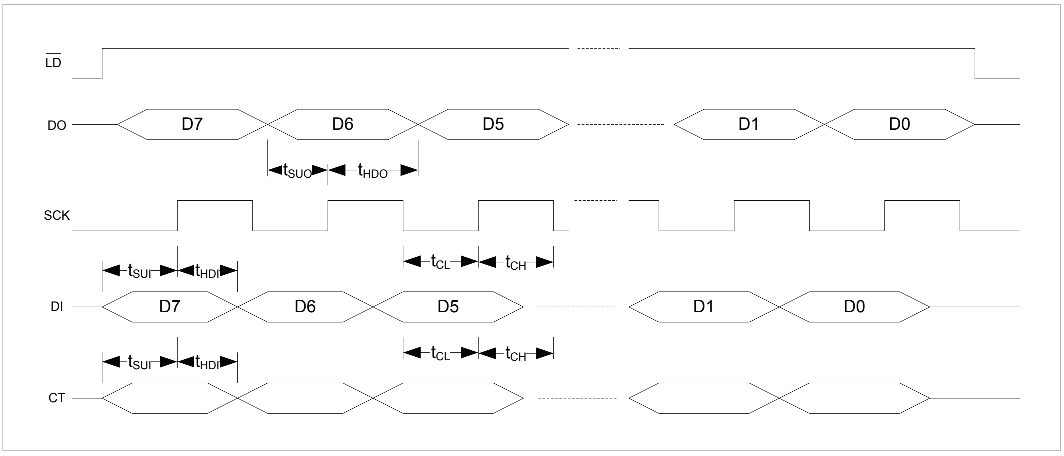


Fig. 15

Abbreviations from the diagram above, explained, and timing details:

Item	Description	Min Value
tSUO	DO setup before SCK rising edge	20 ns
tHDO	DO hold after SCK rising edge	20 ns
tSUI	DI/CT setup before SCK rising edge	10 ns
tHDI	DI/CT hold after SCK rising edge	0 ns
tCH	SCK high period	35 ns
tCL	SCK low period	35 ns
tCH + tCL	SCK period	78 ns

The idle time between two transfers, i.e. when the $\overline{\text{LD}}$ signal is low, is at least 1 µs.

The cycle time range is typically 160 µs to 200 µs. However it is highly module and network dependent, and may differ from the defined range.

3.5.4 Basic Shift Register Circuit

The schematic below illustrates a basic shift register circuit.

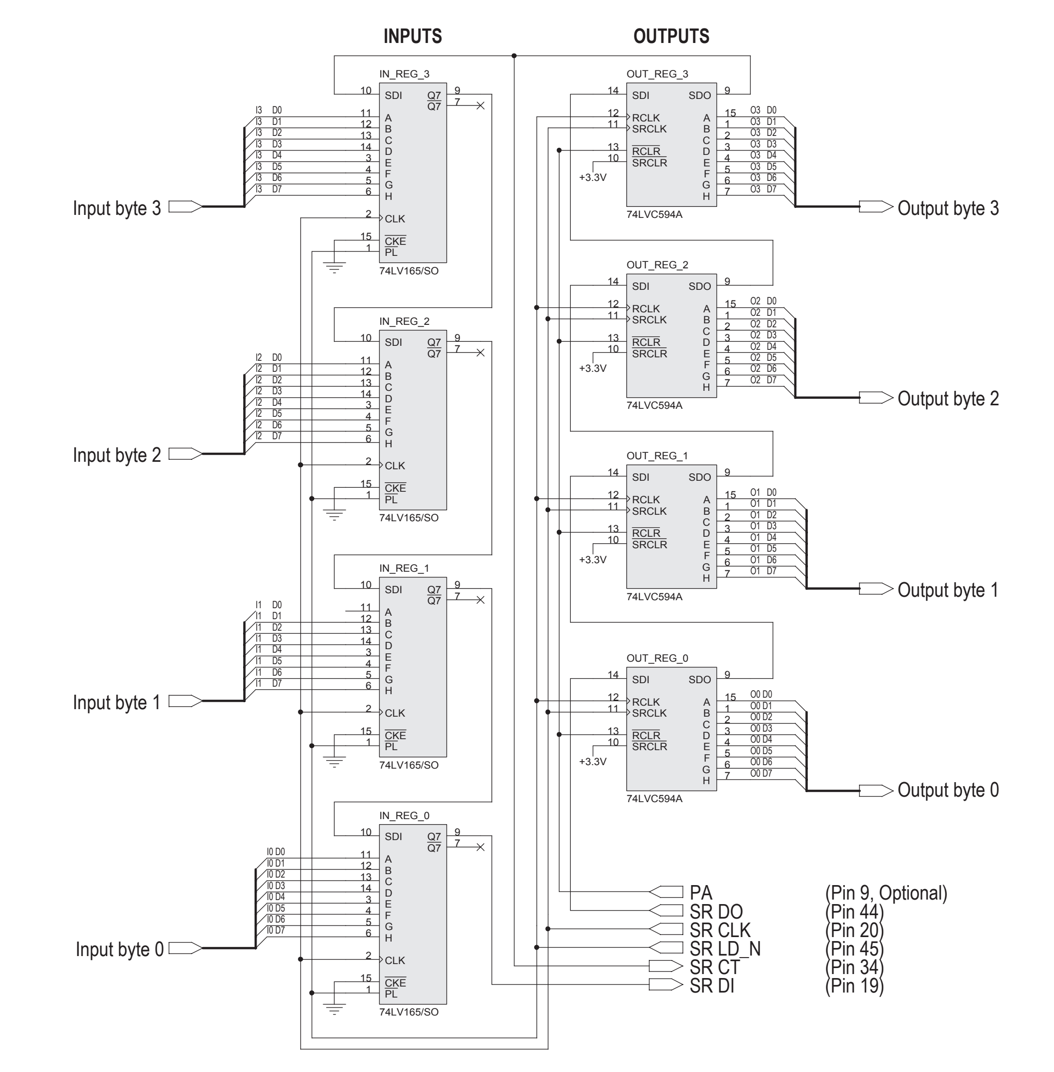


Fig. 16

3.5.5 Reset Circuit Example

The reset circuit example in the figure, is a common 3.3 V supervisor. The main usage is to obtain a defined reset release delay after the voltage is switched on. The power supply has to provide a stable voltage within the interval 3.15–3.45 V

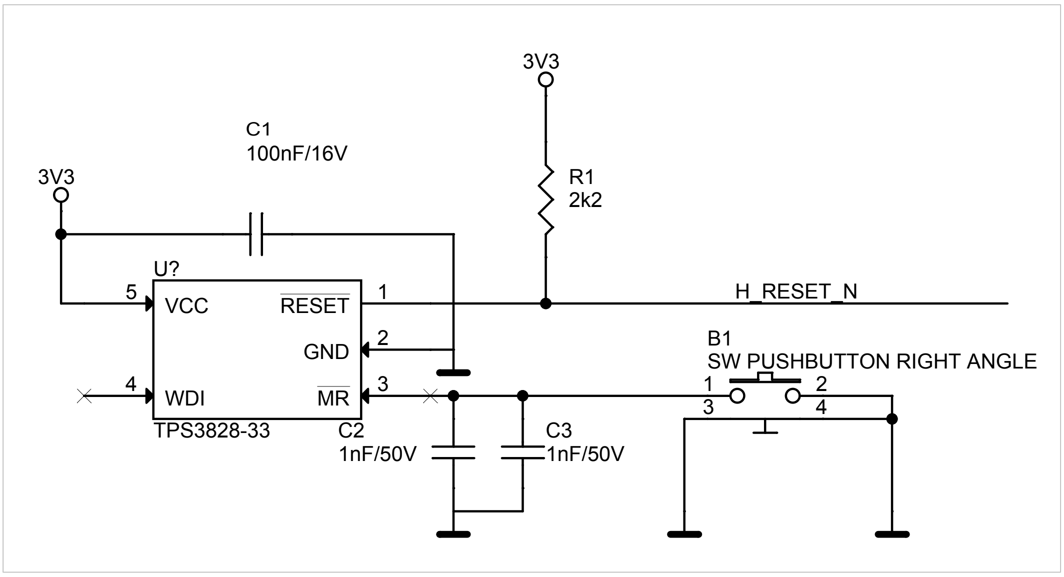


Fig. 17

3.5.6 DIP Switches Example

Pull-down resistors are necessary if DIP switches are connected to the DIP inputs.

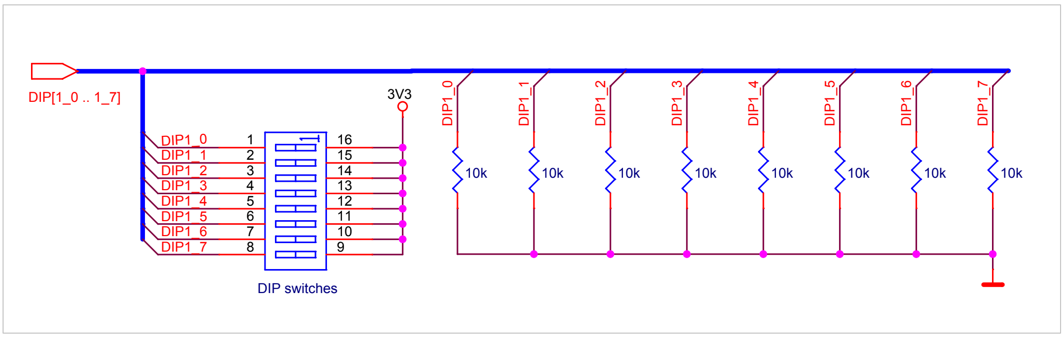


Fig. 18

3.6 UART Operation

3.6.1 General Description

The serial interface is a common asynchronous serial interface, which can easily be interfaced directly to a microcontroller or UART. It is provided for backwards compatibility with the Anybus CompactCom 30 series.

The serial interface is activated using the OM[0...3] inputs, which also are used to select the operating baud rate. See .

Other communication settings are fixed to the following values:

Data bits: 8

Parity: None

Stop bits: 1

Communication settings are fixed to asynchronous, 8-N-1, with bit order LSB first and without hardware flow control signals.

SYNC functionality is not supported in this mode

3.6.2 Pin Usage in Serial Mode

Presented below is an overview of all pins except GND and 3V3

Pin	Signal Name	Pin Type	Description/Comments
49 24 48 23 47 22 46 21	DIP1_0 DIP1_1 DIP1_2 DIP1_3 DIP1_4 DIP1_5 DIP1_6 DIP1_7	I I I I I I I I	DIP switch. Usage defined by application. Connect to GND if not used.
45 20 44	(not used)	I I O,I	Connect to GND
19	(not used)	I	Connect to 3V3.
43	ASM RX	I	See *Black Channel/ Safety Module, p. 35* If not used, connect to 3V3.
18	ASM TX	O	See *Black Channel/ Safety Module, p. 35* If not used, leave unconnected.
14 39 15 40 16 41 17 42	DIP2_0 DIP2_1 DIP2_2 DIP2_3 DIP2_4 DIP2_5 DIP2_6 DIP2_7	I I I I I I I I	DIP switch. Usage defined by application. Connect to GND if not used.
4 29 5 30 6 31 7 32	LED1B LED1A LED2B LED2A LED3B LED3A LED4B LED4A	O O O O OD OD O O	LED interface. Gives access to LED indications. For more information, *LED Interface / D8–D15 (Data Bus), p. 11*. When not used, LED1A, LED1B, LED2A, LED2B, LED4A and LED4B can be left unconnected. LED3A and LED3B are open-drain outputs and should, if not used, be pulled either to GND or to 3V3, depending on application.
34 33 10	(not used)	I I I	Connect to 3V3.
9	(not used)	O	Leave unconnected
28	RX	I	Receive Input • Direction: Host application -> CompactCom • Idle state = High Connect to 3V3 if not used.
3	TX / OM3	O, I	Transmit Output • Direction: CompactCom -> Host application

<table>
<tr><th>Pin</th><th>Signal Name</th><th>Pin Type</th><th colspan="2">Description/Comments</th></tr>
<tr><td></td><td></td><td></td><td colspan="2">• Idle state = High
This pin doubles as "OM3" strapping input on Anybus Compact-Com M40 modules. Connect a pull-up resistor on the application for this pin in serial mode.</td></tr>
<tr><td rowspan="6">36
11
35</td><td rowspan="6">OM0
OM1
OM2</td><td rowspan="6">I</td><td colspan="2">Operating mode [OM2, OM1, OM0]:</td></tr>
<tr><td>001</td><td>Serial 19.2 kbps</td></tr>
<tr><td>010</td><td>Serial 57.6 kbps</td></tr>
<tr><td>011</td><td>Serial 115.2 kbps</td></tr>
<tr><td>100</td><td>Serial 625 kbps</td></tr>
<tr><td colspan="2">For more information see Operating Modes, p. 13.</td></tr>
<tr><td>27
2</td><td>MI0
MI1</td><td>O</td><td colspan="2">See Module Identification, p. 14".</td></tr>
<tr><td>26
25</td><td>MD0
MD1</td><td>O</td><td colspan="2">See Module Detection, p. 13 .</td></tr>
<tr><td>8</td><td>$\overline{RESET}$</td><td>I</td><td colspan="2">See RESET (Reset Input), p. 14".</td></tr>
</table>

It is important to connect all signals correctly for proper functioning of the serial interface.

3.6.3 Baud Rate Accuracy

As with most asynchronous communication devices, the actual baud rate used on the Anybus CompactCom may differ slightly from the ideal baud rate.

The baud rate error of the module is less than ±1.5%. For proper operation, it is recommended that the baud rate accuracy in the host application lies within ±1.5% from the ideal value.

4 Black Channel/Safety Module

The black channel is a transportation mechanism for safety related protocol extensions over a nonsafe communication media. The safety layer performs safety related transmission functions and checks on the communication to ensure that the integrity of the link meets the requirement for SIL 3, cat4/PL e. The black channel can be seen as a virtual link between the safety layers of the devices.

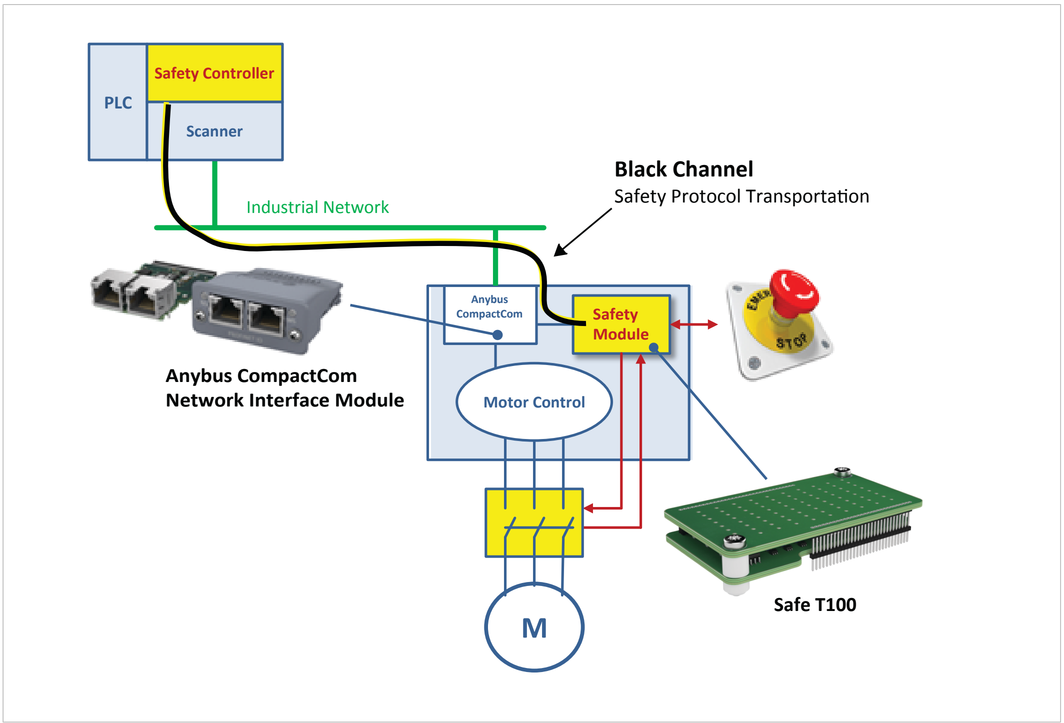


Fig. 19

The IXXAT Safe T100 is a precertified embedded safety option module which provides device manufacturers with an easy and cost efficient way to integrate conformant safe I/O signals into standard automation devices. It connects via its serial black channel interface to the Anybus CompactCom module. The safety module provides digital safe I/O signals that can be controlled via the network and that can be directly connected to the safety functions of an automation device. Other standard safety modules can also be used to provide a safety communication interface for the Anybus CompactCom 40 series.

If it is planned to use serial download to the module, please take this in account when implementing the use of a safety module or Black Channel.

A Implementation Examples

A.1 General

In this appendix HMS provides examples of possible implementations for the Anybus CompactCom M40 series. Some of the examples can also be used for the Anybus CompactCom 30 series, showing that the modules from the two product families in some contexts are interchangeable.

There are many different processors with different functionality available on the market today. The implementations in this appendix are to be regarded as examples that are designed for one single type of processor. Other hardware interfaces may require adjustments for timing, different functionality etc. It is important to fully understand the interface to take correct design decisions in order to obtain a stable and reliable design.

A.2 Serial and 16–bit Parallel

The example in the figure below shows an implementation with serial communication and firmware update (via UART). An Anybus CompactCom 30, connected as shown, can thus be used in serial mode and is prepared for firmware update via the UART. Exchanging the M30 for the M40 will also give access to 16-bit parallel mode.

Firmware update for an M40 series module is preferably done using the File System Interface Object, see Anybus CompactCom 40 Software Design Guide.

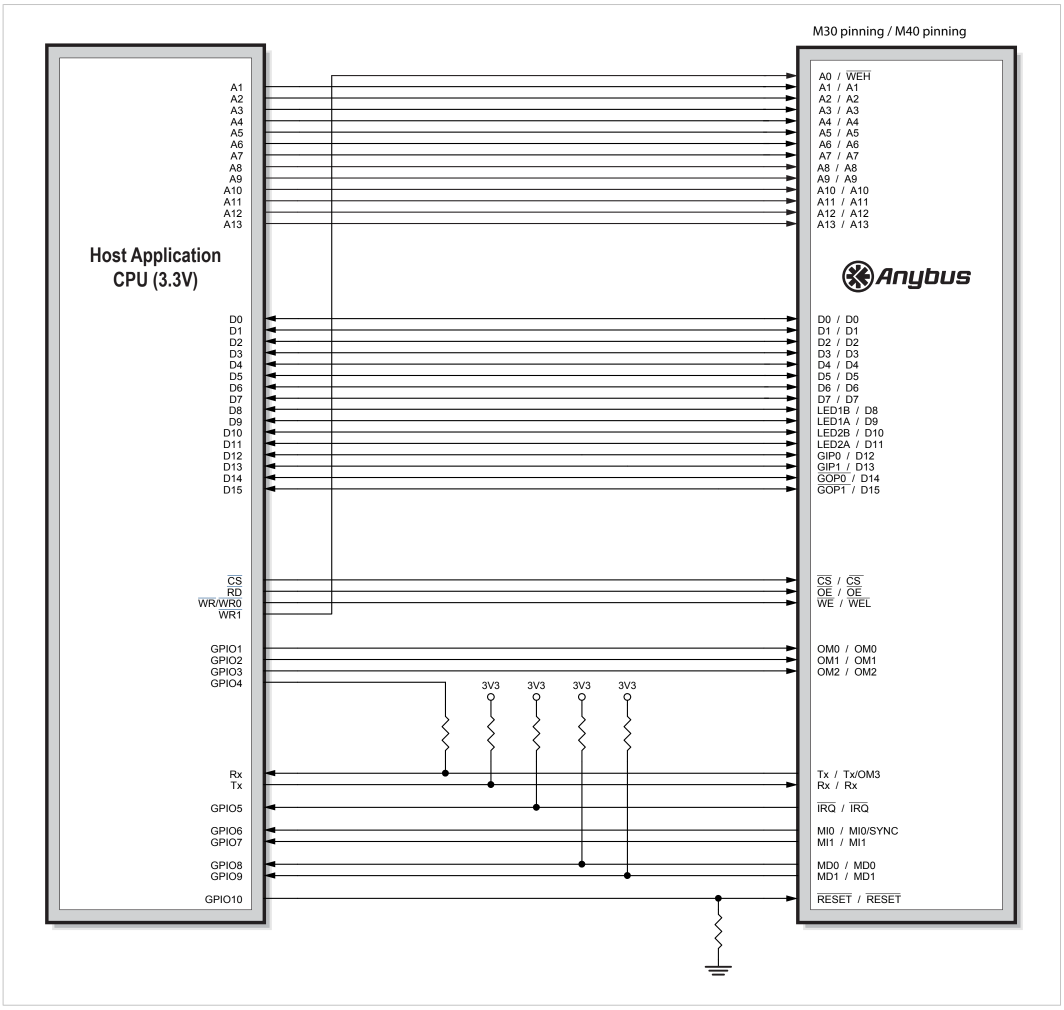


Fig. 20

> **!** To prevent damage to the host processor, as well as the Anybus CompactCom M30 LED outputs, the host processor must disable data inputs/outputs D8 - D15, i. e. these pins must be set to high impedance state, if MI indicates that some other module than an Anybus CompactCom M40 is inserted. If a CompactCom M30 is connected, and if the host processor cannot shut off this part of the data bus, the CompactCom M30 will have to be protected by external circuitry. See example on next page.
>
> If the host application uses the data bus lines D8 - D15 for any other purpose, e.g. toward other circuitry, this implementation may cause damage to other components connected to the data bus.

This implementation does not support Anybus CompactCom passive modules.

A.3 8–bit/16–bit Parallel

This example shows a design for 8-bit and 16-bit parallel mode. Using M30 you have access to 8-bit parallel and serial modes. With M40 you can also use the 16-bit parallel mode.

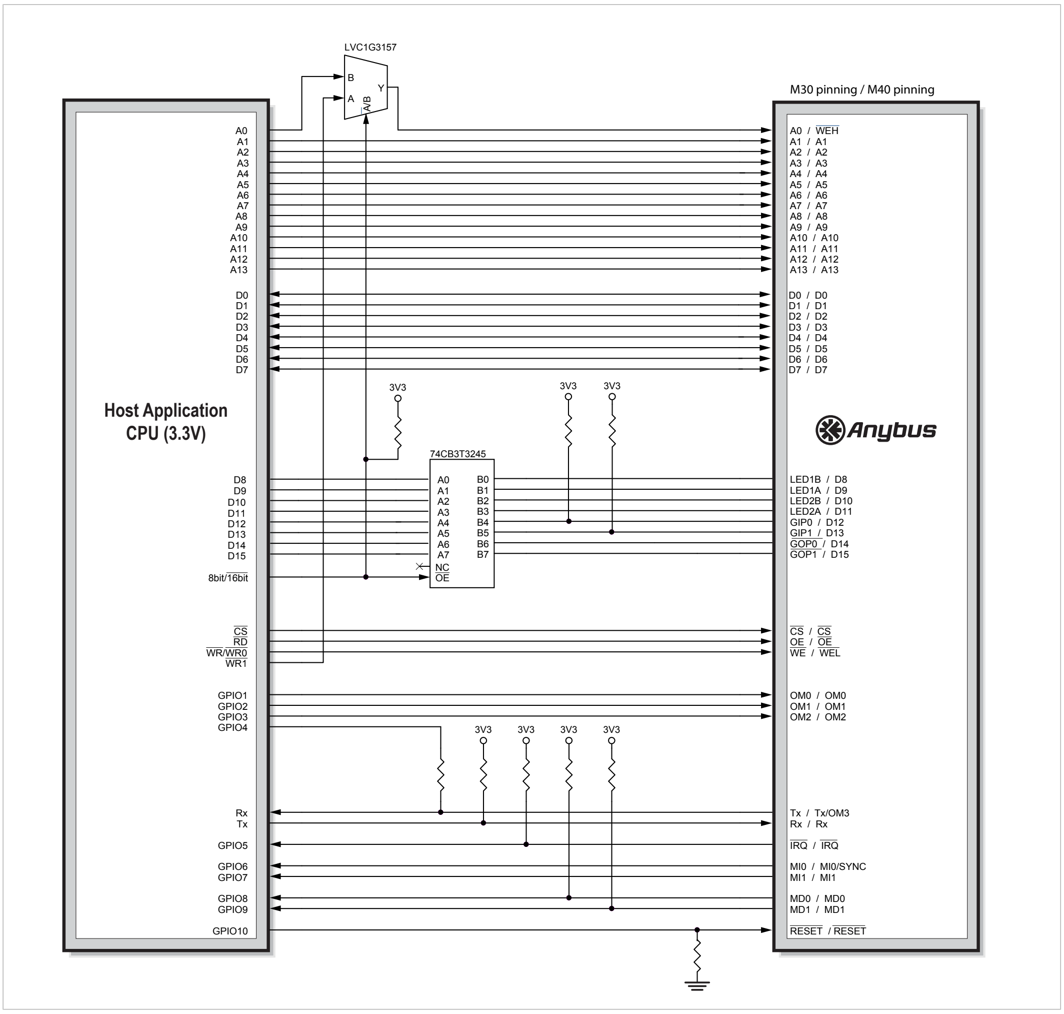


Fig. 21

If LEDs are to be used in the host application, please refer to *Network Status LED Outputs (LED[1A...4B]), p. 42*, for guidelines on how to connect the LED outputs. In 16-bit parallel mode it is not possible to use these outputs for LEDs.

In this implementation, the LED outputs on the Anybus CompactCom M30 module are protected by external circuitry (74B3T3245, a SN74CB3T3245, 8-BIT FET BUS SWITCH is suggested). This circuit is fast, and only lets the signal from the driving circuit pass through.

A.4 8–bit Parallel

This design for 8-bit parallel mode, including firmware update (via UART), can be used for both M30 and M40.

Firmware update for a M40 series module is preferably done using the File System Interface Object, see Anybus CompactCom 40 Software Design Guide.

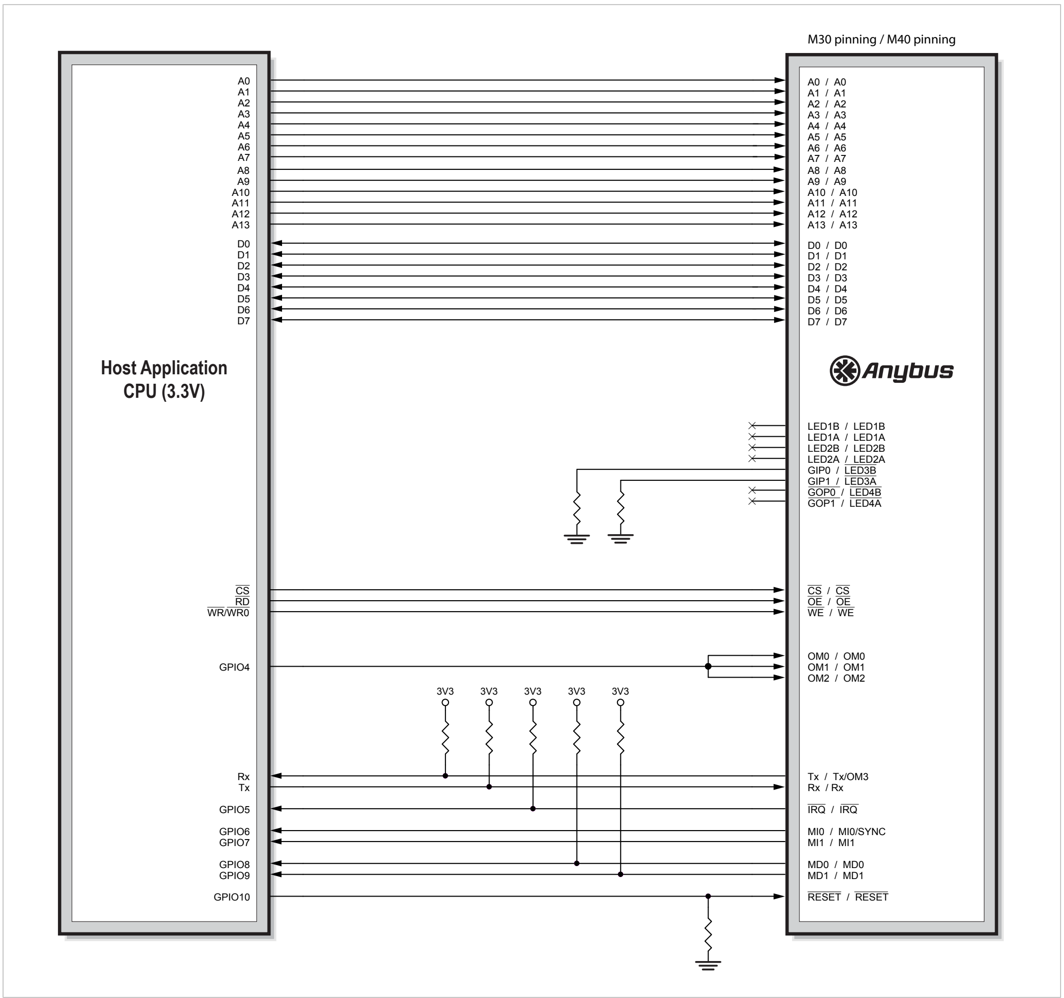


Fig. 22

If LEDs are to be used in the host application, please refer to *Network Status LED Outputs (LED[1A...4B]), p. 42*, for guidelines on how to connect the LED outputs.

The pull-down resistors on LED3A and LED3B make it possible to support Anybus Compact-Com passive modules.

A.5 SPI and Serial

When using M30, the serial interface will be available with this design, as well as firmware update (using a UART). If the M30 is exchanged for a M40 the SPI interface will also be available.

Firmware update for a M40 series module is preferably done using the File System Interface Object, see Anybus CompactCom 40 Software Design Guide.

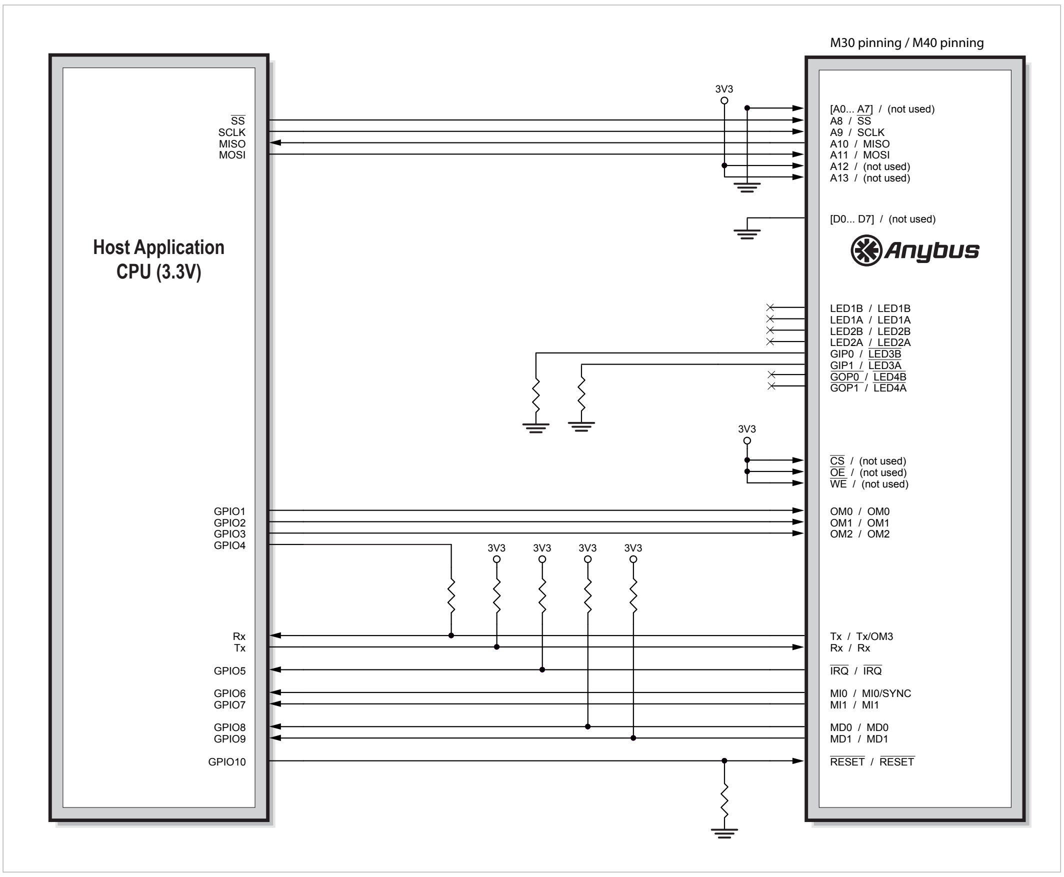


Fig. 23

If LEDs are to be used in the host application, please refer to *Network Status LED Outputs (LED[1A...4B]), p. 42*, for guidelines on how to connect the LED outputs.

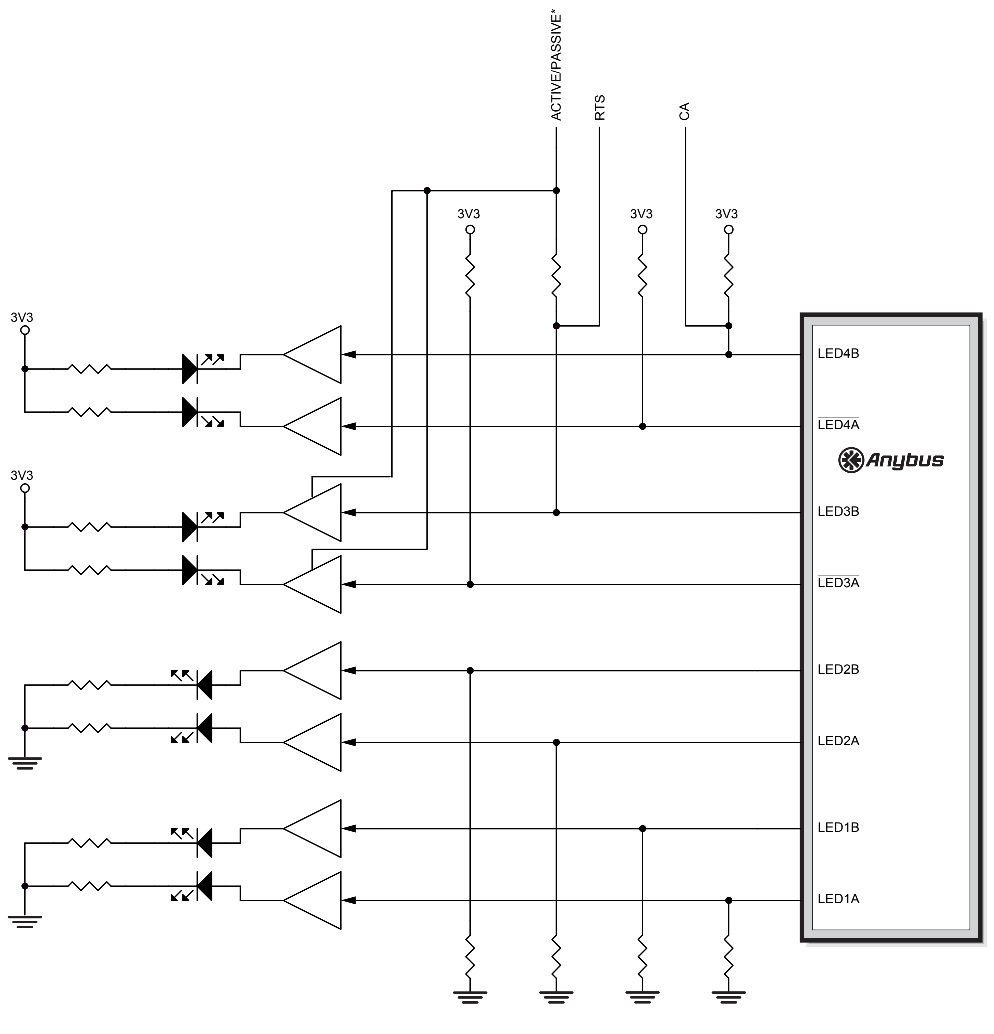
In serial mode, The pull-down resistors on LED3A and LED3B make it possible to support Anybus CompactCom passive modules.

A.6 Network Status LED Outputs (LED[1A...4B])

The LED[1A....4B] outputs can be used to relay the network status LEDs to elsewhere on the host application. This is possible in all modes except 16-bit parallel mode, where these pins are used for data (D8...D15).

Note that it is the responsibility of the host application to ensure that each LED output is connected to a LED of the correct color (on active modules, it is possible to retrieve this information from the LED status register or from the Anybus Object (01h); consult the Anybus CompactCom Software Design Guide for more information). For more information, see *LED Interface / D8–D15 (Data Bus), p. 11*.

The outputs are unbuffered, and are not recommended for driving LEDs directly. Please consult the image below for guidelines on how to connect the LED outputs.



*By connecting this signal to Ground, this design can be used to support Anybus CompactCom passive modules.

Fig. 24

These pins can not be used for LEDs in 16-bit parallel mode, as the pins in that case are used for data.

This solution can be used to support Anybus CompactCom passive modules. Please verify that the rest of the application is correctly designed for passive modules.

A.7 Power Supply Considerations

A.7.1 General

The Anybus CompactCom 40 platform in itself is designed to be extremely power efficient. The exact power requirements for a particular networking systems will however vary a lot depending on to the components used in the actual bus circuitry.

While some systems usually require less than 250 mA of supply current, some high performance networks, or networks which require the use of legacy ASIC technology, will consume up to 500 mA, or in rare cases even as much as 1000 mA.

As an aid when designing the power supply electronics, the networks have been divided into classes based on their power consumption as follows.

- Class A

  This class includes systems which consume less than 250 mA of supply current.

- Class B

  This class includes systems which consume up to 500 mA of supply current.

- Class C

  This class includes systems which consume up to 1000 mA of supply current.

  The following table lists the currently supported networking systems and their corresponding class.

The following table lists the currently supported networking systems and their corresponding class.

Network	Class A	Class B	Class C
DeviceNet	X		
PROFIBUS	X		
EtherCAT		X	
PROFINET 2-Port		X	
PROFINET FO 2-Port			x
Ethernet/IP 2-Port		X	
EtherNet POWERLINK		X	
Common Ethernet		X	
CC-Link		X	
Modbus-TCP 2-Port		X	

A power supply designed to fulfill Class A requirements (250 mA), will be able to support all networks belonging to class A, but none of the networks in Class B and C.

A power supply designed to fulfill Class C requirements, will be able to support all networks.

A.7.2 Bypass Capacitance

The power supply inputs must have adequate bypass capacitance for high-frequency noise suppression. It is therefore recommended to add extra bulk capacitors near the power supply inputs:

Reference	Value (Ceramic)
C1	22 µF / 6.3 V
C2	100 nF / 16 V

An example is shown in the picture below.

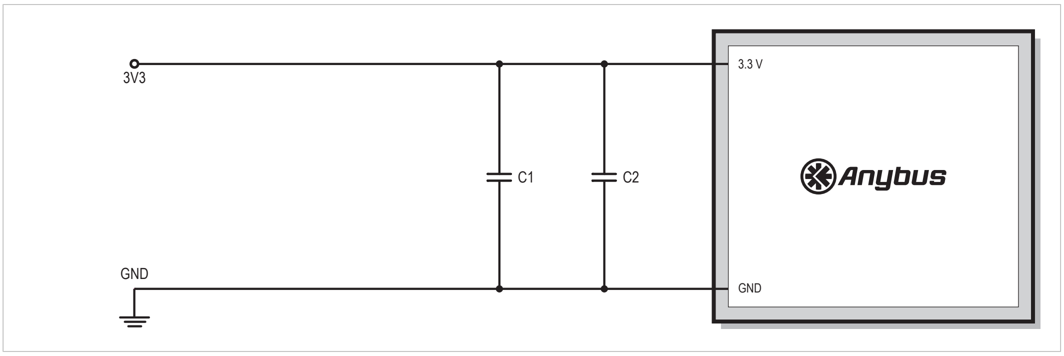


Fig. 25

A.7.3 3.3 V Regulation

The following example uses the LT1767 from Linear Technology to provide a stable 3.3 V power source for the module. Note that all capacitors in this example are of ceramic type.

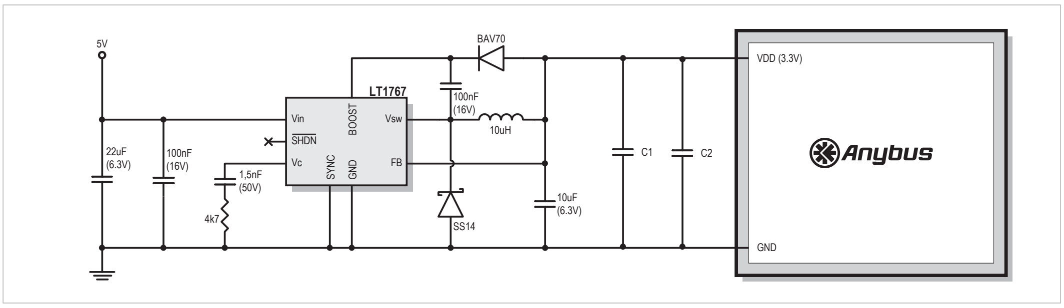


Fig. 26

For detailed information regarding this example, consult the data sheet for the LT1767 (Linear Technology).

B Backwards Compatibility

The Anybus CompactCom M40 series of industrial network modules have significantly better performance and include more functionality than the modules in the Anybus CompactCom 30 series. The 40 series is backward compatible with the 30 series in that an application developed for the 30 series should be possible to use with the 40 series, without any major changes. Also it is possible to mix 30 and 40 series modules in the same application.

This appendix presents the backwards compatibility issues that have to be considered, when designing with both series in one application, or when adapting a 30 series application for the 40 series.

B.1 General

Item	Description
Ping-pong protocol Serial host communication Half duplex communication	The half duplex protocol is the only way to communicate with an Anybus CompactCom 30. To support backward compatibility, this protocol has been hardware implemented in the Anybus CompactCom 40 series, available when using 8-bit parallel or serial mode. An Anybus CompactCom M30 typically responds to a "ping" within 10 - 100 μs. Due to the hardware implemented ping-pong protocol, Anybus CompactCom M40 typically responds to a "ping" within 2 μs. Interrupt driven applications, designed for CompactCom M30, may see increased CPU load due to the increased speed. For more information, see Anybus CompactCom 40 Software Design Guide chapter 6.
Message size	The message size is significantly larger in the 40-series (1524 bytes) than in the 30-series (256).
Burst access	The Anybus CompactCom 40 series allows burst parallel access in 8-bit and 16-bit parallel modes. The 30 series does not.
Questions from module to application at startup	An Anybus CompactCom module (M30 or M40)sends a series of requests to the host application at startup. e.g. to find out which objects are implemented in the application. These requests have to be handled correctly by the application, e.g. by returning a "not supported". Please note, that the set of objects that can be implemented by the application differs from the M30 series to the M40 series, but modules from both series have to be able to handle requests to all objects.
Network Configuration Object, Instance Numbers	The instance numbers have changed in the latest version of the Network Configuration Object. This may require changes in the application. Also, there is one Ethernet version of the object to be used for all 40 series Ethernet modules.
Module Type Attribute	Anybus CompactCom 30 returns 0401h for standard modules and 0402h for drive profile modules. The Anybus CompactCom 40 returns 0403h. (Present HMS example drivers does not use this attribute)
Simpler timing requirements	The Anybus CompactCom 40 has simpler timing requirements in parallel mode than the Anybus CompactCom 30. An application which fulfills the timing requirements of the 30 series modules, also fulfills the timing requirements of the 40 series modules.
LED 1 and LED 2 pins	The LED1 and LED2 pins on the 30 series modules are connected to the on board LEDs. A pull down should be added to the pins for backward compatibility.
LED 3 and LED 4 pins	The LED 3 pins on a 40 series device correspond to the GIP pins on a 30 series device. A pull down should be added to the pins for backward compatibility. The pins are implemented as open-drain. The LED 4 pins on a 40 series device correspond to the GOP pins on a 30 series device. A pull up should be added to the pins for backward compatibility.
Anybus CompactCom M40 Hardware Design Guide, Appendix A, Examples	Appendix A in the Anybus CompactCom M40 Hardware Design Guide give examples that show how to design for Anybus CompactCom M40, but still be able to use an Anybus CompactCom M30.
GPIO	On some Anybus CompactCom 30 modules, there is an attribute, that when set allows the configuration of the GPIO pins as LED outputs. This attribute value can be used on 40 series modules to enable RMII functionality. If you configure a 40 series module to support RMII, and replace it with a 30 series module, it will result in an electrical short circuit. Otherwise the GPIO pins are LED outputs by default on 40 series modules..

Item	Description
Module Identification Pins, MI[0..1]	On Anybus CompactCom 30, these pins can be used by applications to detect active "00" and passive "01" modules. The Anybus CompactCom 40 returns the value "10", indicating that it is a 40-series module. Applications expecting the value "00" may need a small software change. These pins are driven by logic, which means they have less drive strength, than when they are permanently tied to GND as they are in the M30 modules. No passive modules are planned in the M40 series. See *Module Identification, p. 14* for more information.
TX Pin	This pin is in tristate during power-up on Anybus CompactCom 30 and driven high by the Anybus CompactCom's UART after power-up. On Anybus CompactCom 40 this pin has double functionality since it is also an OM3 strapping pin with built-in weak pull-up during power-up.
Input signal level maximum (V_{IH})	Input signal level maximum for the 30 series modules is V_{DD} + 0.2 V. Input signal level maximum for the 40 series modules is 3.45 V.
Address Pins [11 .. 13]	If not used to address a larger memory area, these pins must be high during access to Anybus CompactCom 40.
Control Register AUX bit	Anybus CompactCom 30 ignores process data when AUX = 0, if enabled. Anybus CompactCom 40 always ignores the value of the AUX bit and always accepts process data.
Status Register AUX bit	On Anybus CompactCom M30 this indicates changed data, if enabled. On Anybus CompactCom M40 this indicates updated (refreshed) data regardless of if it has been enabled or not.
Control Register R bit	In Anybus CompactCom 30, the application may change this bit at any time, but for Anybus CompactCom40 the bit is only allowed transition from '1' to '0' when 'M' is set in the status register. Existing CompactCom example drivers from HMS comply with this requirement.
Modifications of Status Register, RdPD and RdMSG:	In the CompactCom 40 the status register, RdPD and RdMSG are write protected in hardware.
Extended memory areas	Previously reserved memory areas have been released in the 40 series for use by the application. The Anybus CompactCom 40 implements new functionality in some of these previously reserved memory areas, but it also e.g. allows the application to use a transparent mode where an application can create any user-defined drive profile. 30 series applications do not have to be changed because of this, but if 30 and 40 series modules are mixed in an application, please take care. For a memory map, see Anybus CompactCom 40 Software Design Guide

B.2 Fieldbus/Industrial Network Specific

EtherCAT

Item	Description
Network Configuration Object	Instance number three is moved to number one in Anybus CompactCom 40

PROFIBUS DP-V1

Item	Description
HMS Ident Number	The default HMS Ident Number differs between the 40 series and the 30 series. If a user specific number has been provided by implementing the Ident number attribute, this requires no customer change in the application.
Additional Diagnostic Object	Removed. Any Anybus CompactCom 30 series implementation including this object must be changed.
Network PROFIBUS DP-V1 Object	Removed. Any Anybus CompactCom 30 series implementation including this object must be changed.
Parameterization data in PROFIBUS DP-V1 Object	In the first 10 bytes only the parameter struct bit (bit 3) is copied. All other bits are set to 0.
Buffer mode	Buffer mode exists in the Anybus CompactCom 30 series, but not in the Anybus CompactCom 40 series, as the message size is considerably larger. Max lengths are supported.

Item	Description
CheckCfg	How to calculate default expected configuration is changed in the Anybus CompactCom 40 series. Cfg data handling depends on CheckCfgMode in default mode. In the Anybus CompactCom 30 series it only uses CheckCfgMode if the CheckCfgBehavior attribute is used. This attribute is removed in the Anybus CompactCom 40 series.
I&M	I&M 1 - 4 are only writable from the network. I&M0 Version and Supported parameters are removed from the PROFIBUS DP-V1 Host Object.

PROFINET

Item	Description
HMS Ident Number	The default HMS Ident Number differs between the 40 series and the 30 series. If a user specific number has been provided by implementing the Ident number attribute, this requires no customer change in the application.
Additional Diagnostic Object	Removed. Any 30 implementation including this object must be changed.
I&M	I&M 1 - 4 are only writable from the network. The I&M Record data Transparent mode (PROFINET IO Host Object, attribute #7, bit 1) is replaced by the command IM_Options. I&M0 parameters IM Version and IM Supported are removed from the PROFINET IO Host Object and set to constant values.
PROFIenergy	PROFIenergy command PE_Identify no longer uses the PROFIenergy functionality attribute of the PROFINET IO Object to gather the supported functionality. Instead a static list is used, as all the supported commands are also mandatory for PROFIenergy v1.1. PROFIenergy is now enabled by the application having implemented the Energy Control Object.
Diagnostic Object	The structure of network specific event information has changed. Instead of including diagnostic source information such as API, Slot and Subslot in the data field it is extracted from the extended diagnostic fields in the create command. API, Slot and Subslot are determined with the help of Slot and aDI given by the extended diagnostic mode.
Network Configuration Object	Network specific instances are moved from instance number 15 onwards to instance number 20 onwards. Network specific instances that handled IM data have been removed, as they only can be set from the network.
PROFINET IO Object	PROFIenergy functionality attribute reserved as it holds no functionality in the Anybus CompactCom 40 series
LED indications	Major internal error is now indicated by both module and network status LEDs being solid red (FATAL event). Previously 4 red flashes on the module status LED.

EtherNet/IP

Item	Description
Object F8h	Attributes 27 and 28 not implemented in 40-series
Network Configuration Object	This object now has one version that is equal to all Ethernet based industrial networks.

C Technical Specification

The properties specified in this chapter apply to all Anybus CompactCom M40 modules unless otherwise stated. Any deviations from what is stated in this chapter is specified separately in each network appendix.

C.1 Environmental

Operating temperature

Modules with plastic housing:	-40 to 70°C (-40 to 158°F)
Modules without plastic housing:	-40 to 85°C (-40 to 185°F)

(Tests performed according to SS-EN 60068-2-1:2007 and SS-EN 60068-2-2:2008)

Storage temperature

Active and passive modules: -40 to 85°C (-40 to 185°F)

(Tests performed according to SS-EN 60068-2-1:2007 and SS-EN 60068-2-2:2008)

Humidity

Active modules: 5 to 95% noncondensing

(Tests performed according to SS-EN 60068-2-30:2006 and SS-EN 60068-2-78:2001)

C.2 Shock and Vibration

- Shock test, operating IEC 68-2-27 half-sine 30g, 11 ms, 3 positive and 3 negative shocks in each of three mutually perpendicular directions.
- Shock test, operating IEC 68-2-27 half-sine 50g, 11 ms, 3 positive and 3 negative shocks in each of three mutually perpendicular directions.
- Sinusoidal vibration, operating IEC 68-2-6 10-500 Hz, 0.35 mm, 5g, 1oct/min., 10 double-sweep in each of three mutually perpendicular directions.

C.3 Electrical Characteristics

C.3.1 Operating Conditions

Symbol	Parameter	Pin Types	Conditions	Min.	Typ.	Max.	Unit
3V3	Supply Voltage (DC)			3.15	3.30	3.45	V
	Ripple (AC)			-	-	± 100	mV
GND	Ground reference		-	0.00	0.00	0.00	V
I_{IN}	Current consumption	PWR	Class A	-	-	250	mA
			Class B	-	-	500	mA
			Class C	-	-	1000	mA
V_{IH}	Input High Voltage	I, BI	-	2.0	-	3.45	V
V_{IL}	Input Low Voltage			-0.3	-	0.8	V
I_{OH}	Current, Output High	O, BI	-	-8.0	-	8.0	mA
I_{OL}	Current, Output Low						
V_{OH}	Output High Voltage		I_{OH} = -4mA	2.4	-	-	V
V_{OL}	Output Low Voltage		I_{OL} = 4mA	-	-	0.4	V

I= Input, CMOS (3.3V)

O= Output, CMOS (3.3V)

BI= Bidirectional, Tristate

PWR= Power supply inputs

C.3.2 Isolation (Host to Network)

Functional isolation of 500 V AC (1 minute)

C.3.3 Functional Earth & Shielding

All Anybus CompactCom modules features a cable shield filter designed according to each network standard. To be able to support this, the host application *must* have a conductive area connected to functional earth as described in *Mechanical Specification, p. 51* (FE Connection Pad).

HMS cannot guarantee proper EMC behavior unless this requirement is fulfilled.

C.4 Regulatory Compliance

C.4.1 EMC Compliance (CE)

Since the Anybus CompactCom is considered a component for embedded applications, it cannot be CE-marked as an end product. However, the CompactCom family is precompliance tested in a typical installation providing that all modules conforms to the EMC directive in that installation.

Once the end product has successfully passed the EMC test using any of the CompactCom modules, the precompliance test concept allows any other interface of the same type in the CompactCom family to be embedded in that product without further EMC tests.

To be compliant to the EMC directive 2004/108/EC, the precompliance testing has been conducted according to the following standards:

- Emission: EN61000-6-4

  EN55016-2-3 Radiated emission

  EN55022 Conducted emission

- Immunity: EN61000-6-2

  EN61000-4-2 Electrostatic discharge

  EN61000-4-3 Radiated immunity

  EN61000-4-4 Fast transients/burst

  EN61000-4-5 Surge immunity

  EN61000-4-6 Conducted immunity

Since all CompactCom modules have been evaluated according to the EMC directive through the above standards, this serves as a base for our customers when certifying CompactCom based products.

C.4.2 UL/c-UL Compliance

E214107

The certification has been documented by UL in file E214107.

D Mechanical Specification

> **!** This a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.
>
> This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product.

D.1 Overview

The measurements below are given in millimeters and include a tolerance of ±0.20 mm.

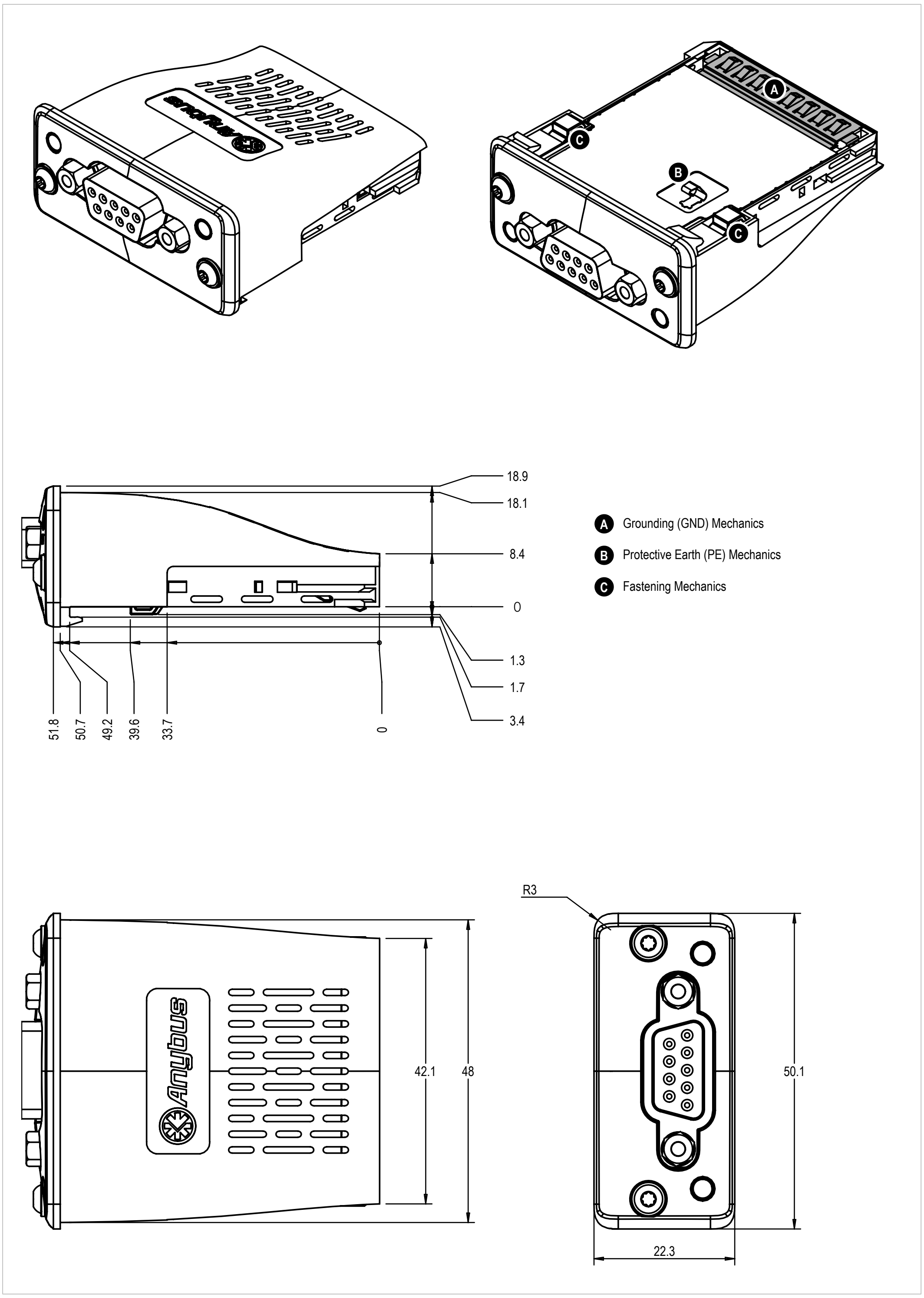


Fig. 27

D.2 Footprint

The measurements below are given in millimeters and include a tolerance of ±0.10 mm.

For a footprint for the Anybus CompactCom host connector, see *Host Connector, p. 56*

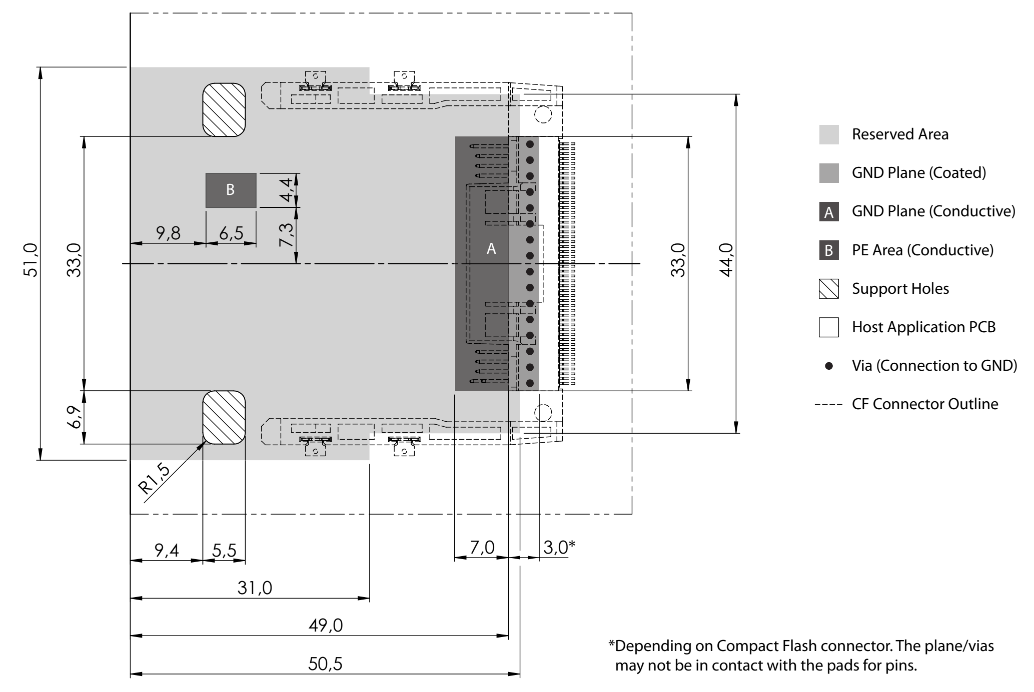


Fig. 28

Area	Description
Reserved Area	To ensure isolation and mechanical compatibility, it is strongly advised that this area is kept completely free from components and signal lines. Under no circumstances may components, via holes, or signal lines, be placed on the PCB-layer facing the Anybus module. Failure to comply with this requirement may induce EMC/EMI problems, mechanical compatibility issues, or even short circuit.
FE Area (Conductive)	To achieve proper EMC behavior and to provide support for different cable shielding standards, this area must be tin plated (preferably using Hot Air Levelling technology) and have a stable, low impedance connection to functional earth.
GND Plane (Coated)	The exact shape of this area depends on the properties of the CompactFlash connector. It is however important to follow these basic design rules:
GND Plane (Conductive)	• The plane must be continuous and have a stable, low impedance connection to GND (preferably through at least 16 vias as illustrated in the figure) • The connection to GND should be placed beneath the CompactFlash connector as illustrated above (see figure) • The plane must follow the signal path through the connector • The conductive part must be tin plated, preferably using Hot Air Levelling technology
Support Holes	These holes are used by the fastening mechanics to secure the module onto the host application.

D.3 Housing Preparations

The measurements below are given in millimeters and include a tolerance of ±0.10 mm.

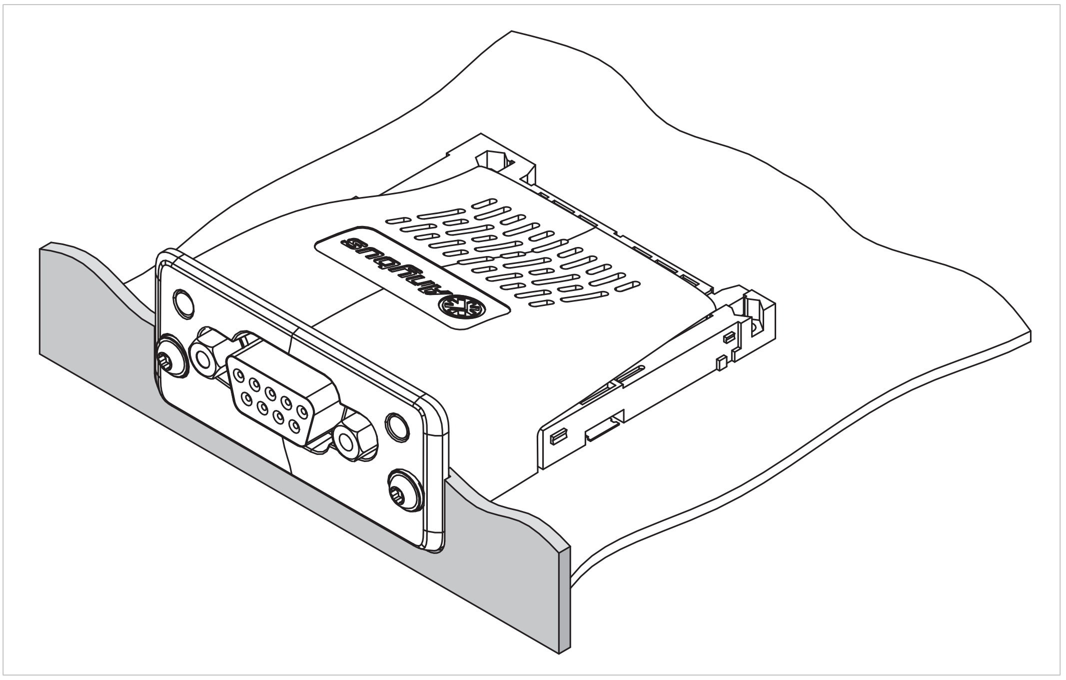


Fig. 29

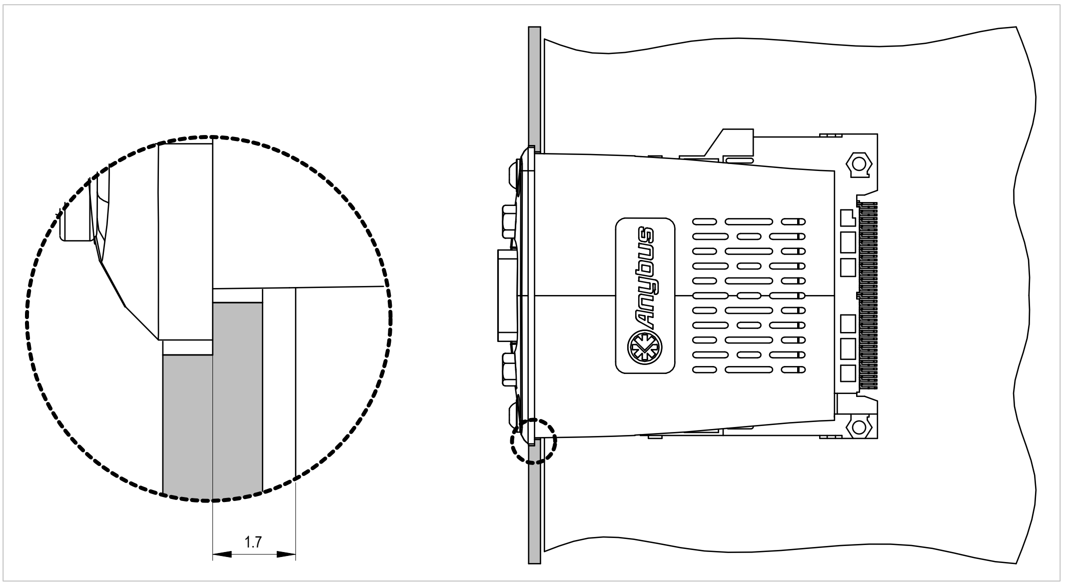


Fig. 30

D.3.1 Front

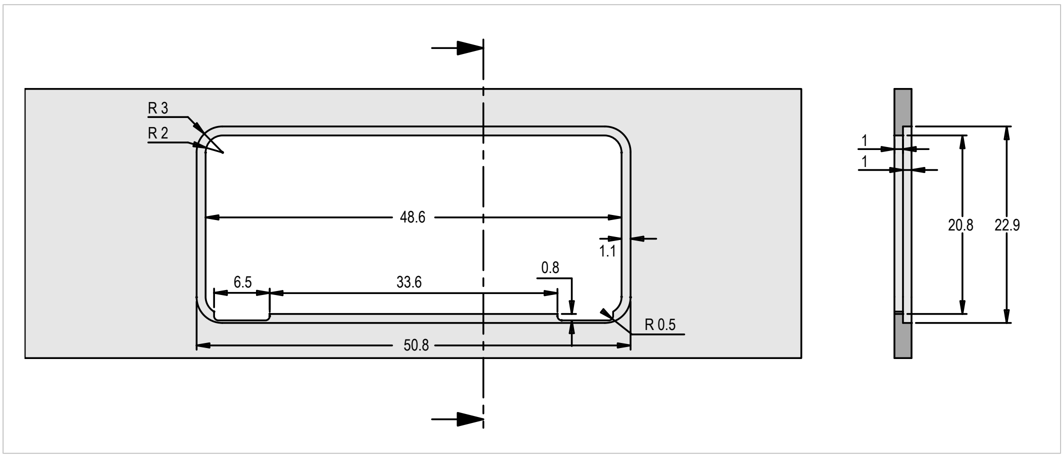


Fig. 31

D.4 Slot Cover

HMS can supply a “blind” slot-cover, which may be used to cover the Anybus CompactCom slot when not in use, allowing the Anybus CompactCom module to be supplied as an end-user option instead of being mounted during manufacturing.

The measurements below are given in millimeters and include a tolerance of ±0.10 mm.

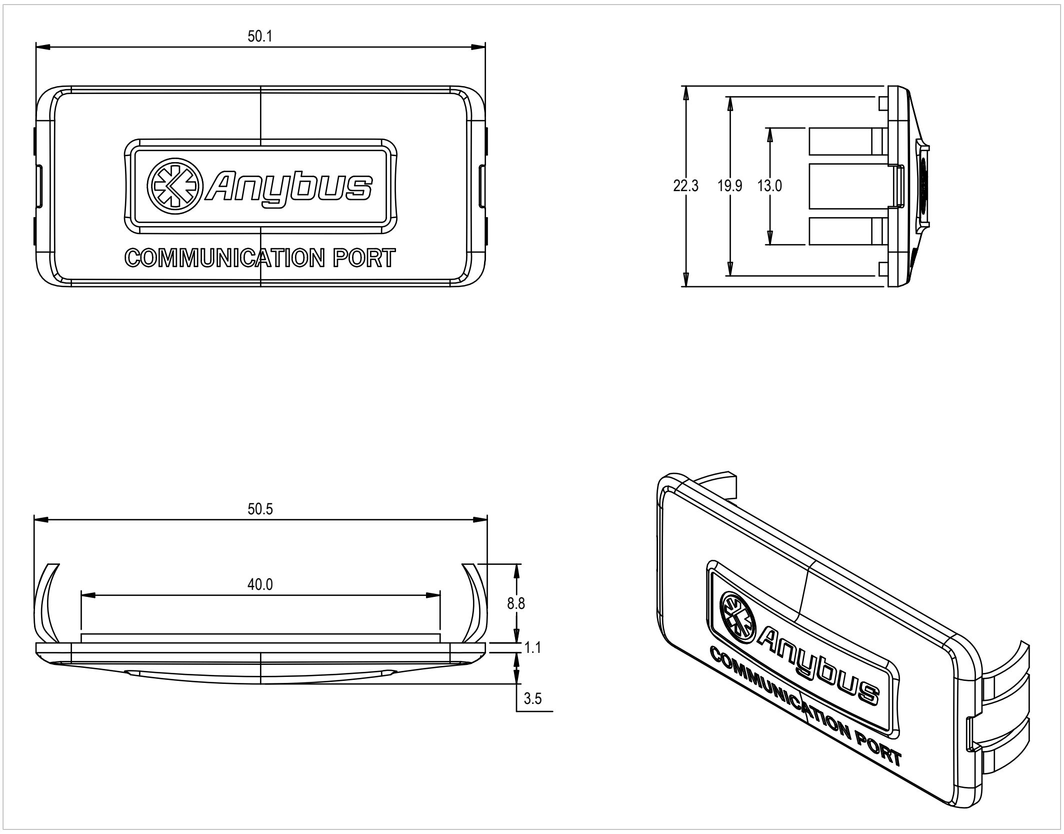


Fig. 32

D.5 Host Connector

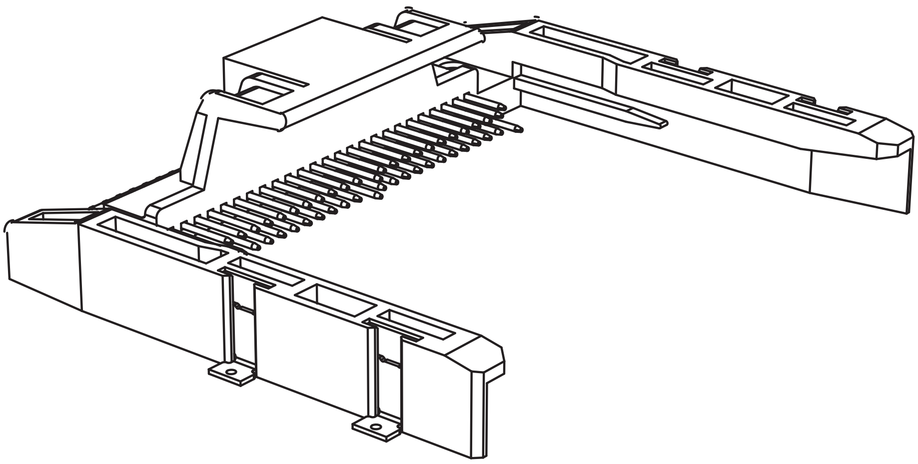


Fig. 33

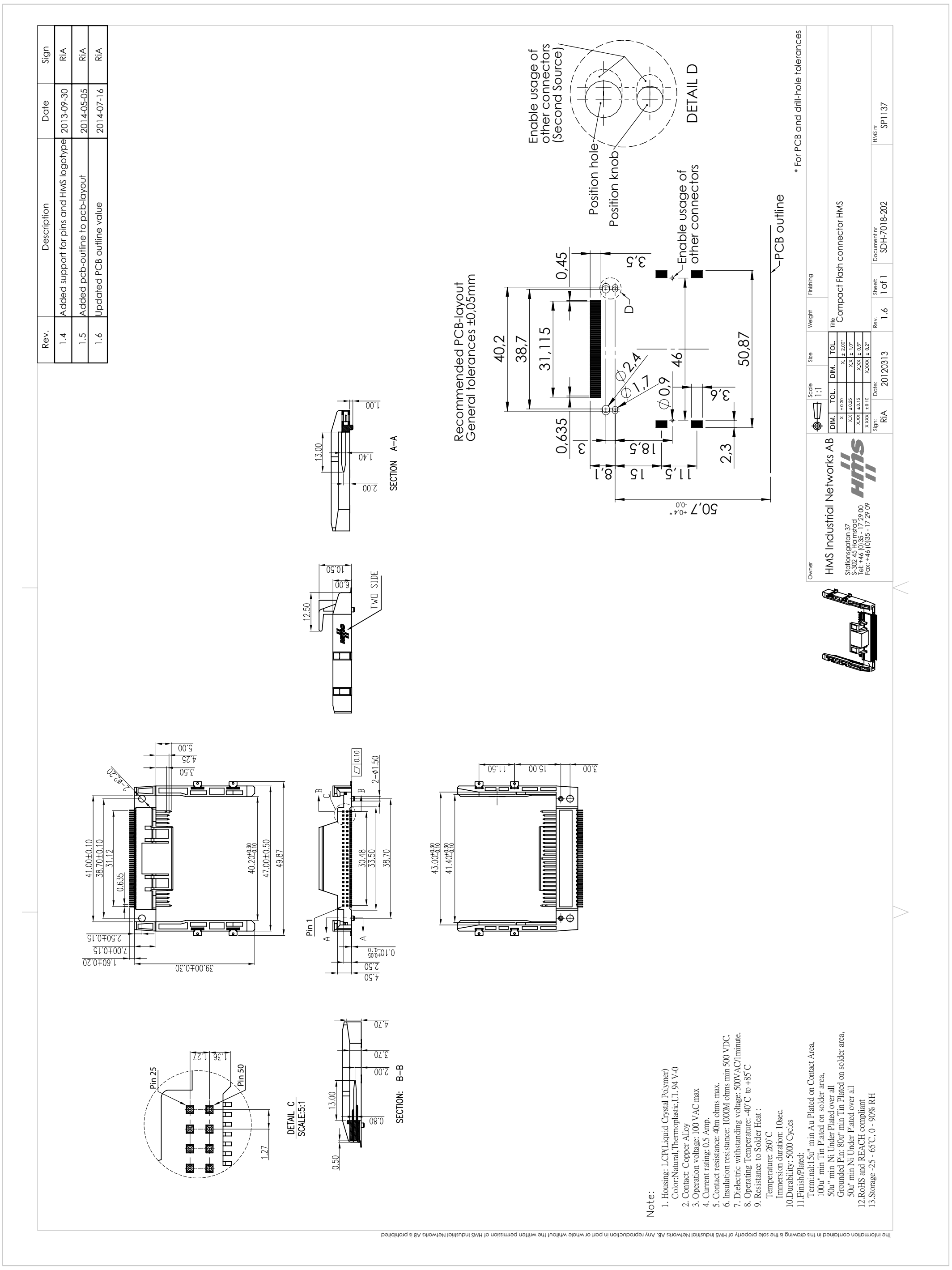
The Anybus CompactCom is designed to use a compact flash connector as application connector. HMS offers a host connector, that is designed to simplify the mounting and to meet the demands for a secure and stable connection of the Anybus CompactCom modules. The measurements of the connector and the information needed for the PCB layout are presented in the figure on the next page.

Please note that it is recommended to mill oval holes in the PCB, to enable usage of other connectors.

> **!** **Warning:** Always verify that the dimensions of another connector is compatible with this design.

Manufacturer	Part No.	Web
HMS Industrial Networks	SP1137	For more information visit the support pages for Anybus CompactCom at www.anybus.com

> ℹ ***Note**: To ensure that you receive the correct measurements for the latest version of the contact, please consult the support pages at www.anybus.com/support, where you will find all the latest available information for the connector.*



Rev. Description Date Sign
1.4 Added support for pins and HMS logotype 2013-09-30 R/A
1.5 Added pcb-outline to pcb-layout 2014-05-05 R/A
1.6 Updated PCB outline value 2014-07-16 R/A
Recommended PCB-layout
General tolerances ±0,05mm
Enable usage of other connectors (Second Source)
Position hole
Position knob
DETAIL D
Enable usage of other connectors
PCB outline
* For PCB and drill-hole tolerances
SECTION A-A
TWO SIDE
SECTION: B-B
DETAIL C SCALE:5:1
Pin 25
Pin 50
Pin 1
HMS Industrial Networks AB
Compact Flash connector HMS
SDH-7018-202
SP1137

Fig. 34

D.5.1 Host Connector Considerations

When using other connectors, the following needs to be considered:

To prevent incorrect insertion and to ensure that the grounding mechanics work as intended, use connectors with guiding rails of sufficient length (preferably longer than 19 mm), or provide an equivalent mechanical solution.

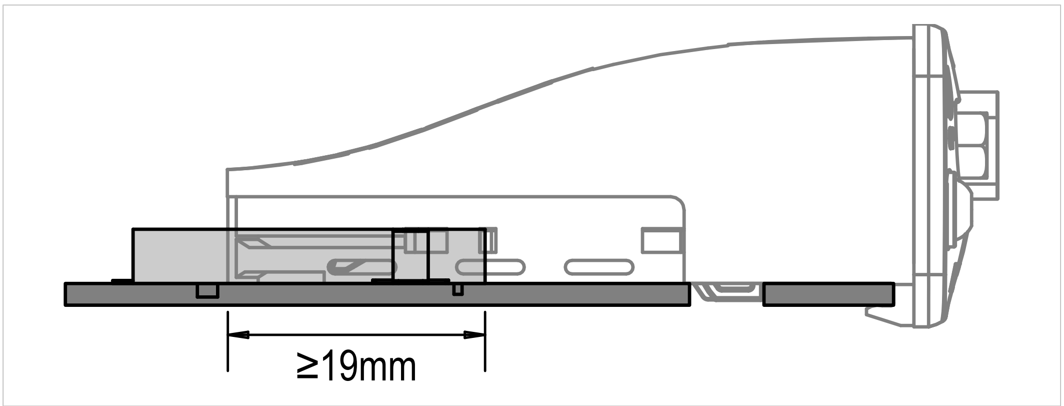


Fig. 35

The distance of the connectors to the PCB has to conform to the picture below:

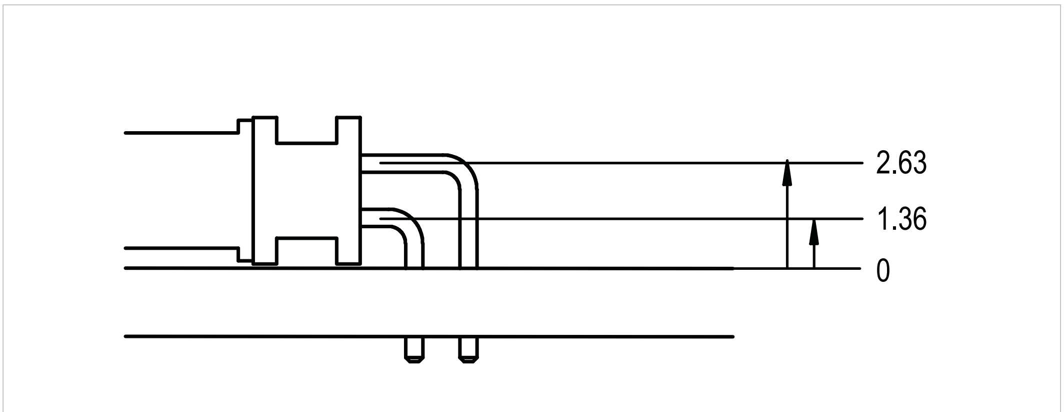


Fig. 36

It is recommended to use connectors which can be screwed into the host application board, to minimize mechanical strain on solder joints etc.

The following connectors have been verified for use with the Anybus CompactCom:

Manufacturer	Part No.	Web
Tyco	1734451-1	www.tycoelectronics.com
AllConnectors	101D-TAAB-R	www.allconnectors.de
Suyin	127531MB050XX04NA	www.suyin.com, www.suyin-europe.com, www.suyinusa.com
Harwin	M504-8815042 M504-88 25042	www.harwin.com ***Note**: The dimensions of the holes for the fixing pins of this connector are 1.8 mm, i.e. slightly larger than the dimensions given in the figure above.*

D.5.2 Host Connector Pin Numbering

The surface mounted pins of the HMS compact flash connector are numbered from left to right (see figure below), corresponding to pin numbers 1, 26, 2, 27...... 25, 50 of the host interface connector, see *Connector, p. 9*.

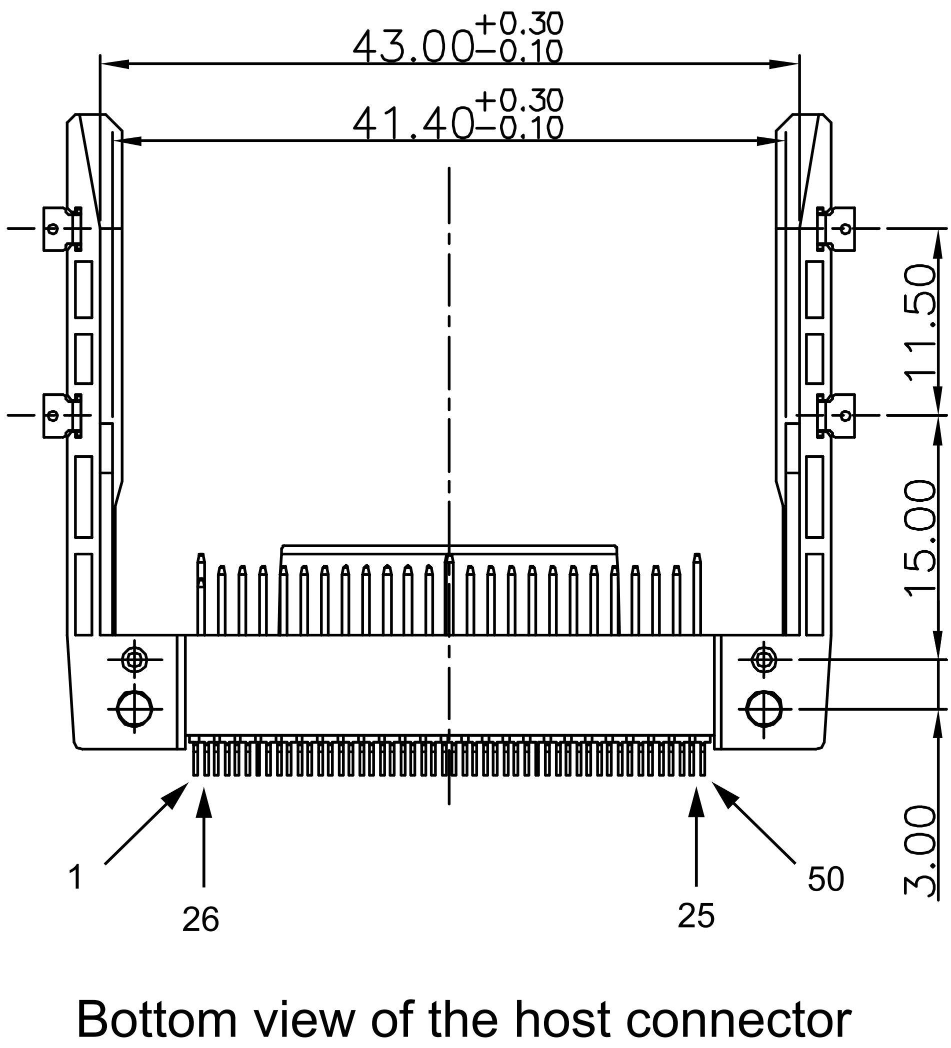


Fig. 37

D.6 Fastening Mechanics

To support the fastening mechanism, the host application PCB thickness must be 1.60 (±10%) mm.

Recommended screw tightening torque is 0.25 Nm.

When fastening the module into the end product, make sure that the Anybus module is properly aligned into the CompactFlash socket prior to applying any force. Rough handling and/or excessive force in combination with misalignment may cause mechanical damage to the Anybus CompactCom module and/or the end product.

D.6.1 Fastening

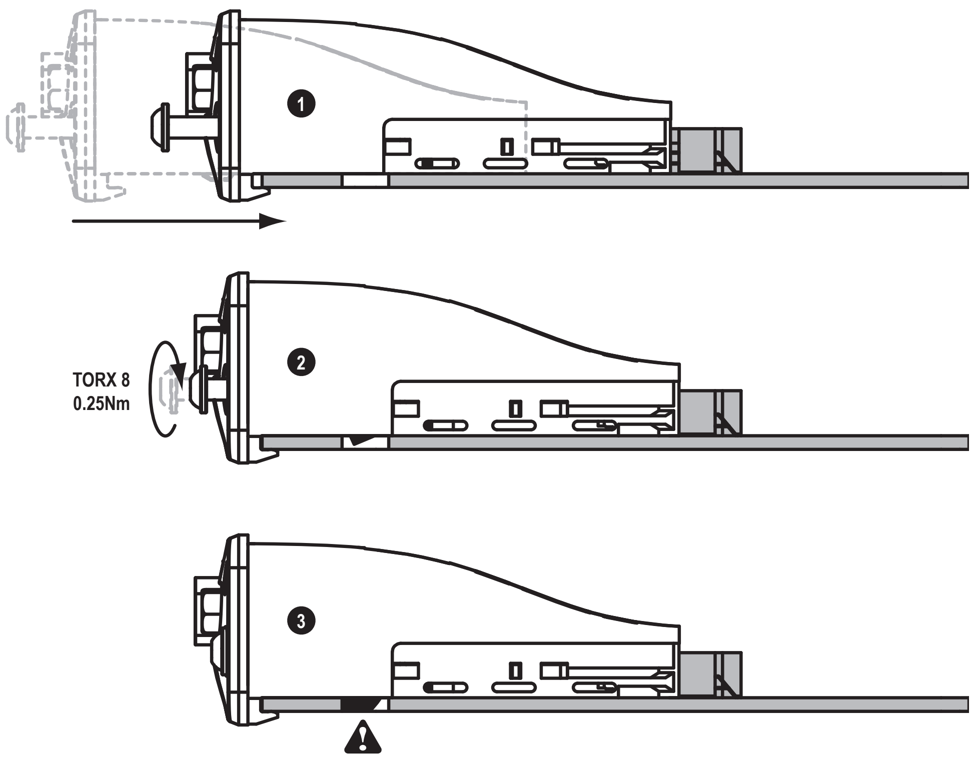


Fig. 38

D.6.2 Removal

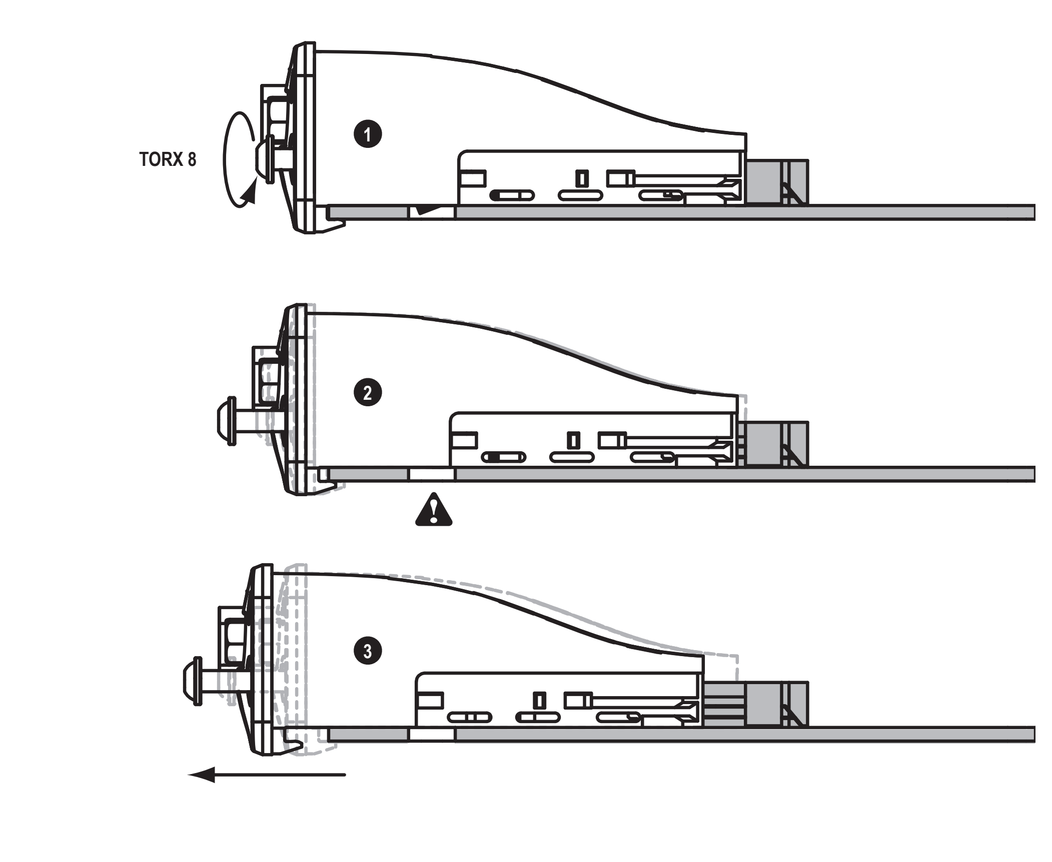


Fig. 39

E Anybus CompactCom 40 without Housing

> **!** This a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.
>
> This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product.

E.1 General Information

In some applications the standard Anybus CompactCom plug-in housing concept cannot be used. Instead an Anybus CompactCom 40 module without housing is mounted on the PCB, using a specially designed Anybus CompactCom Mounting Kit. This enables full Anybus CompactCom functionality for all applications without loss of network compatibility or environmental characteristics.

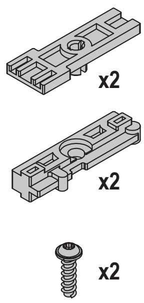


Fig. 40

The kit is easy to assemble, and is based on a few plastic parts which when assembled secures the Anybus module firmly onto the host application.

To support this concept in the host application, the PCB must be designed according to the footprint specification in this document.

To guarantee proper EMC behavior, it is also important that the application supports the FE (functional earth) and grounding mechanisms found on all Anybus CompactCom modules.

Anybus CompactCom modules without housing exist in two different versions:

- with the usual fieldbus or industrial network connector
- as brick, with a pin connector directly to the carrier board instead of a fieldbus or a network connector mounted on the Anybus CompactCom board, for more information see the Anybus CompactCom B40 Design Guide.

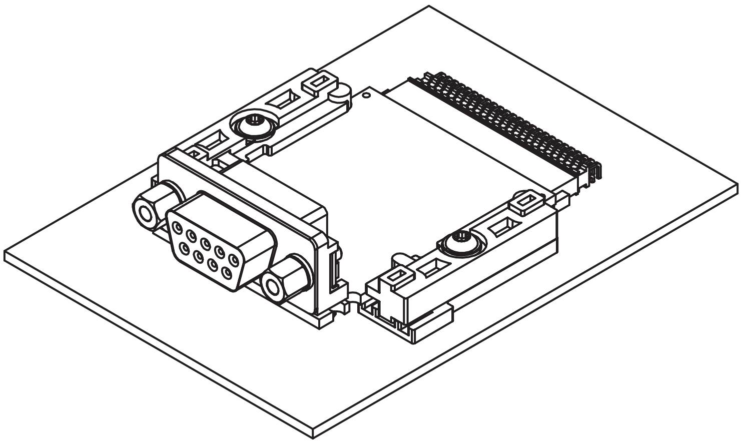


Fig. 41

All dimensions expressed in this document are stated in millimeters and have a tolerance of ±0.10mm unless stated otherwise.

E.2 Ordering Information

Part No.	Name	Contents
019180	ABCC Mounting Kit	100 x Bottom Part 100 x Top Part 100 x Screw

E.3 Footprint

E.3.1 Without Housing

Footprint for modules without housing.

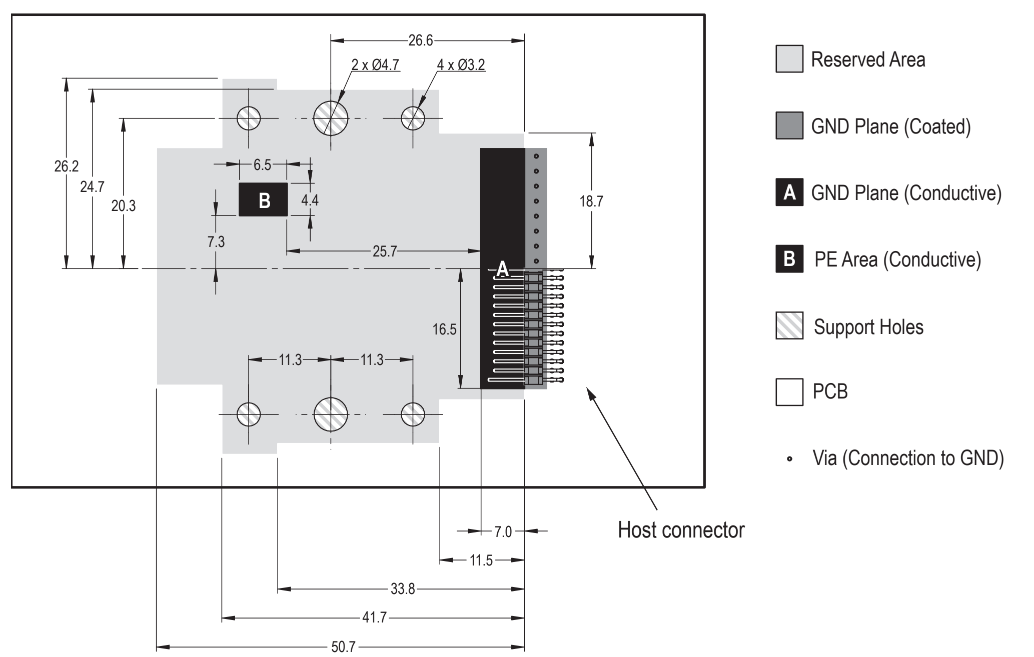


Fig. 42

Area	Description
Reserved Area	To ensure isolation and mechanical compatibility, it is strongly advised that this area is kept completely free from components and signal lines. Under no circumstances may components, vias, or signal lines, be placed on the PCB-layer facing the Anybus module. Failure to comply with this requirement may induce EMC/EMI problems, mechanical compatibility issues, or even short circuit.
FE Area (Conductive)	To achieve proper EMC behaviour and to provide support for different cable shielding standards, this area must be tin plated (preferably using Hot Air Levelling technology) and have a stable, low impedance connection to functional earth.
GND Plane (Coated) GND Plane (Conductive)	The exact shape of this area depends on the properties of the CompactFlash connector. It is however important to follow these basic design rules: • The plane must be continuous and have a stable, low impedance connection to GND (preferably through at least 16 vias as illustrated in the figure) • The connection to GND should be placed beneath the CompactFlash connector as illustrated above (see figure) • The plane must follow the signal path through the connector • The conductive part must be tin plated, preferably using Hot Air Levelling technology
Support Holes	These holes are used by the mounting kit mechanics to secure the module onto the host application.
PCB	The host application PCB should be 1.6mm thick to be able to support the fastening mechanics.

E.4 Host Connectors

The following connectors have been found to be compatible with the mounting kit.

Manufacturer	Part No.	Comment	Web
Samtec	HPT-125-01-L-D-RA (recommended)	Through hole mounted	www. samtec. com
3M	N7E50-D516PG-30	Surface mounted	www.3m. com

E.5 Height Restrictions

All dimensions are in millimeters

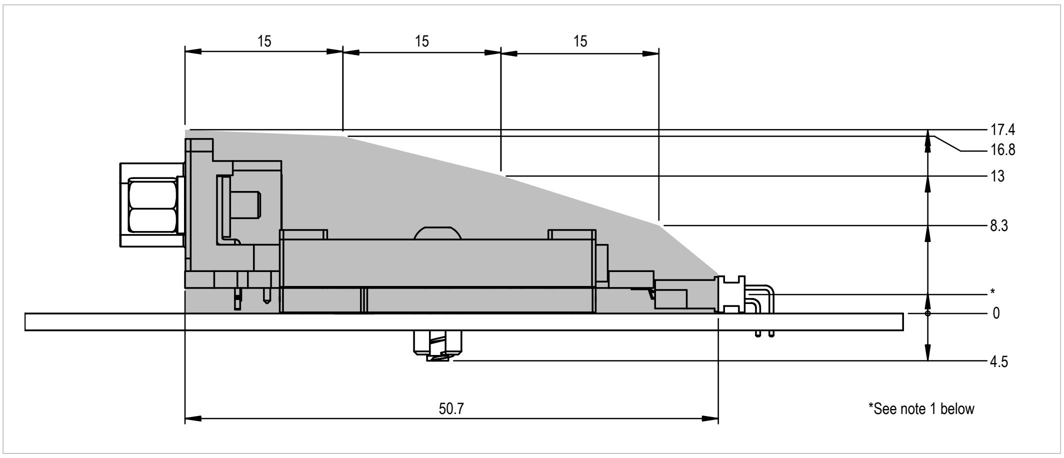


Fig. 43

To ensure stable connection to FE, use a connector that conforms to the distances from the PCB to the pins of the host connector, that are recommended in the picture. Tolerance (0.35 mm, -0.05 mm).

The gray area in the figure above specifies the maximum height occupied by onboard components of the Anybus module. To ensure isolation, it is recommended to add an additional 2.5 mm on top of these dimensions.

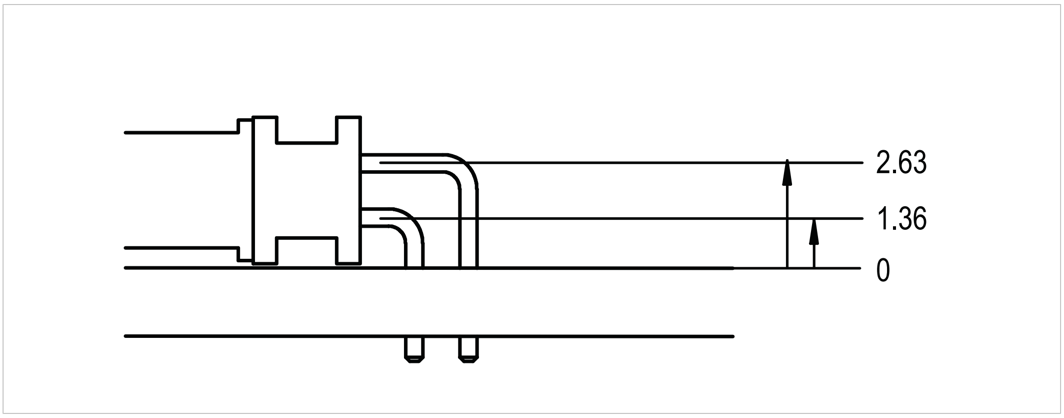


Fig. 44

E.6 Assembly

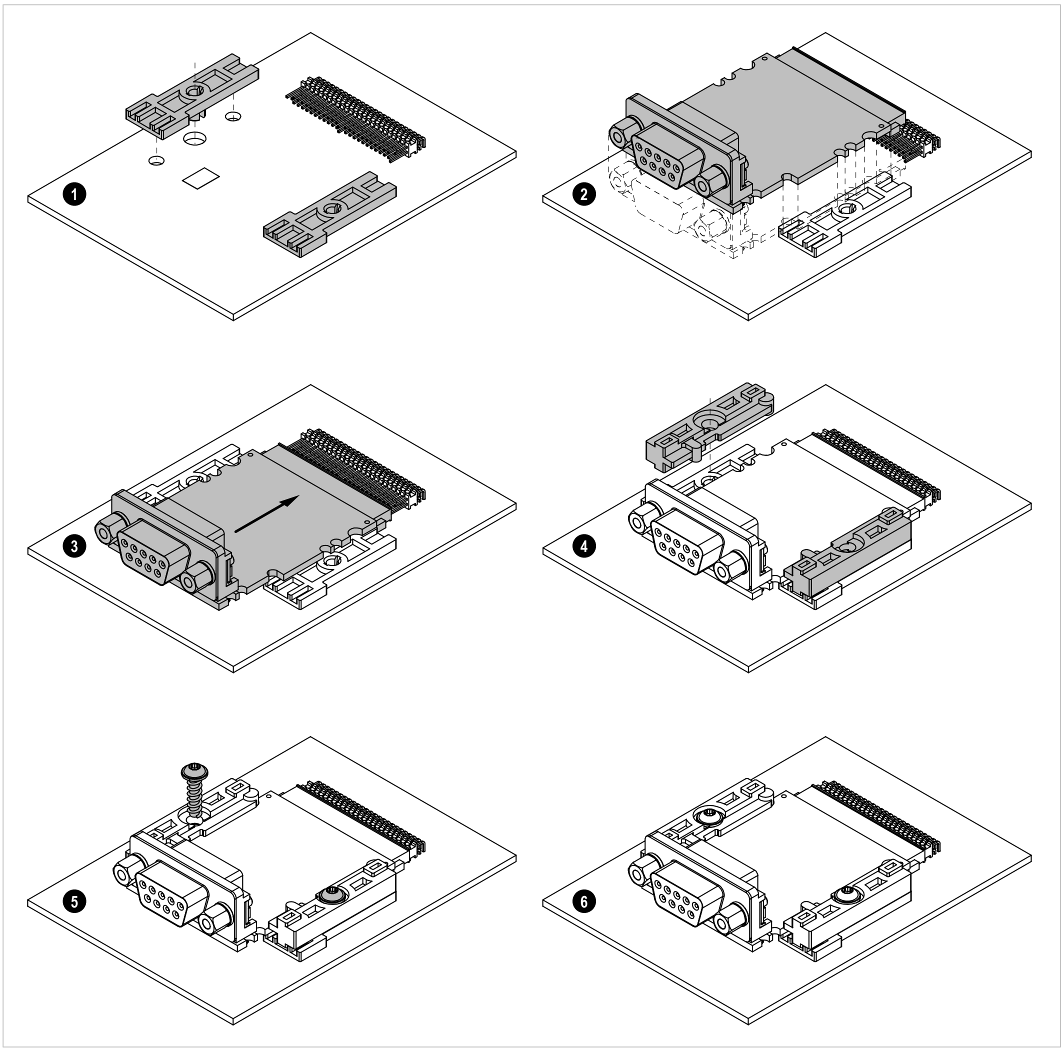


Fig. 45

E.7 Dimensions

All dimensions are in millimeters.

E.7.1 General

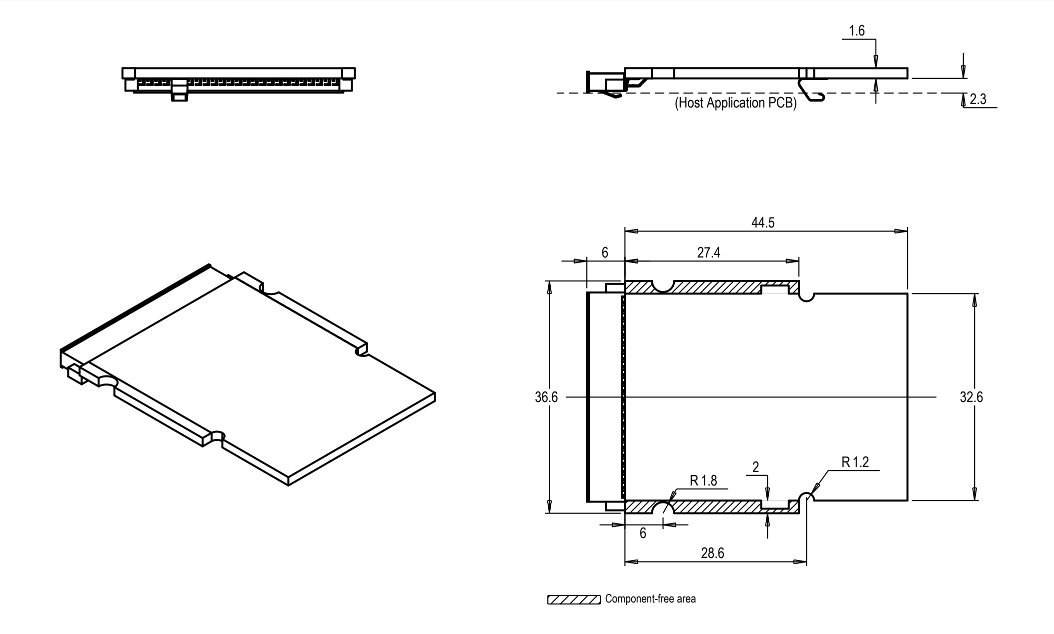


Fig. 46

E.7.2 Standard LED Positions

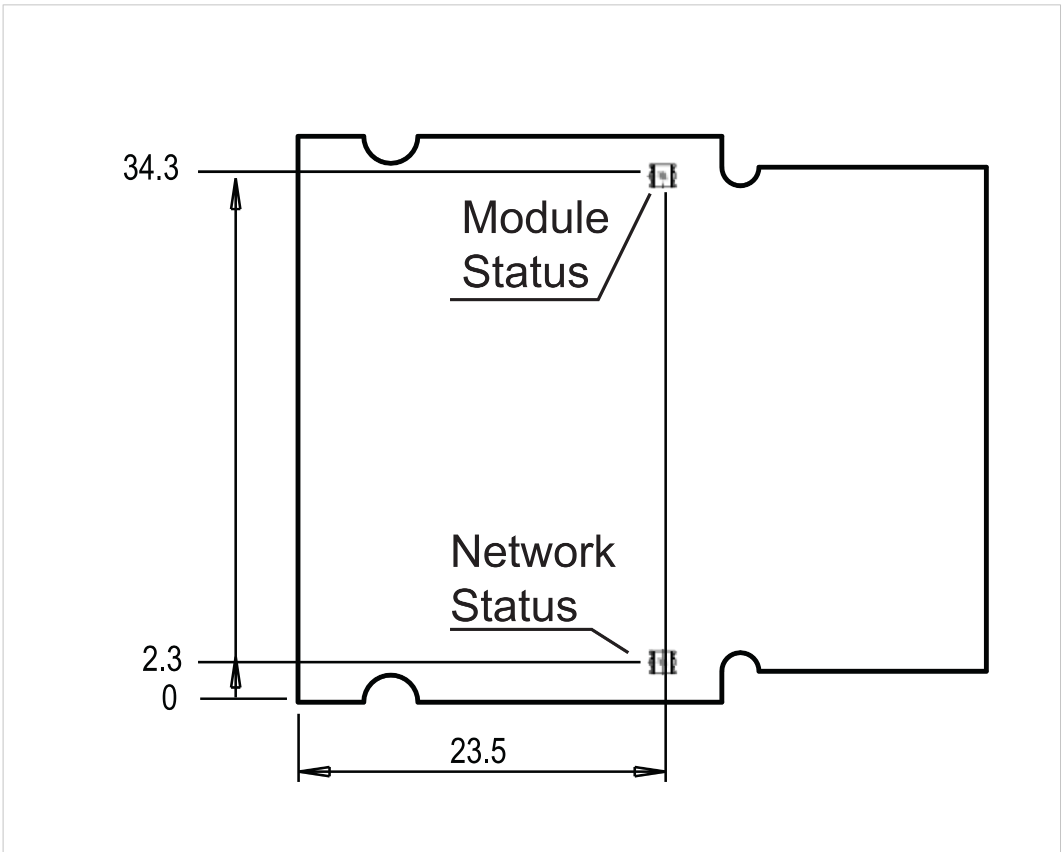


Fig. 47

Standard CompactCom

E.7.3 Mounting Kit Parts

Unless specified otherwise all dimensions are in millimeters, tolerance ± 0.1 mm.

Bottom Part

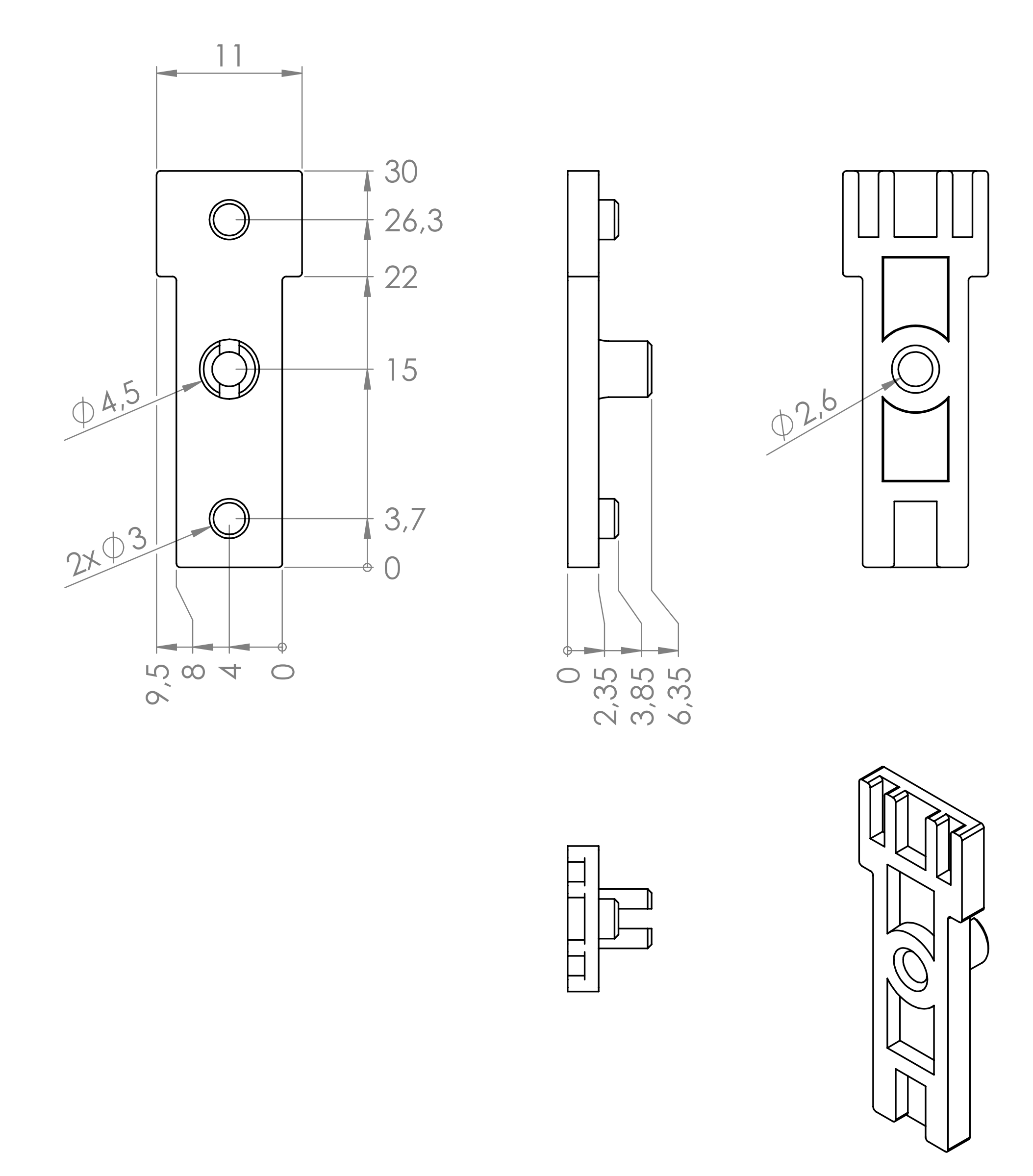


Fig. 48

Top Part

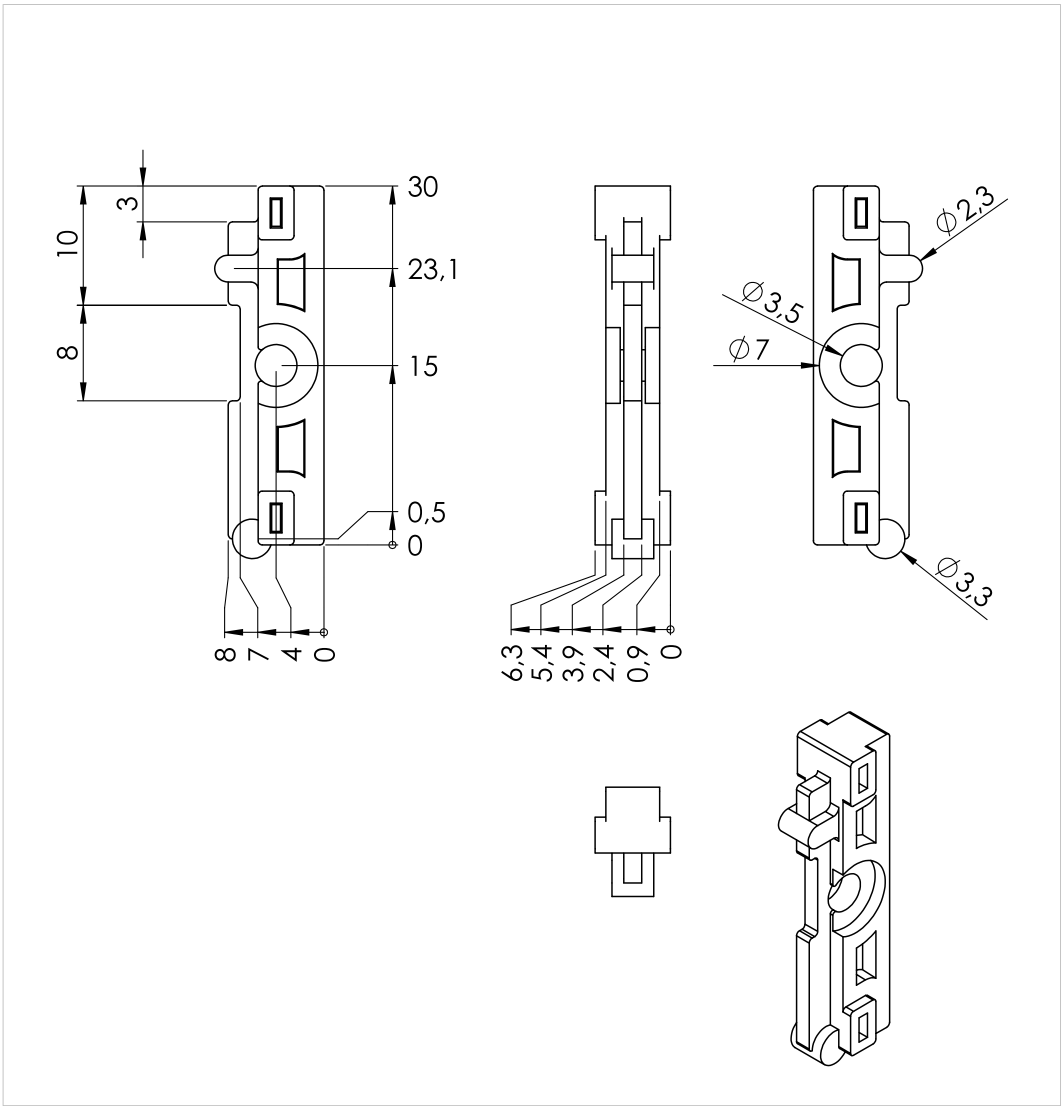


Fig. 49

Fastening Screw

Recommended screw tightening torque is 0.3 Nm.

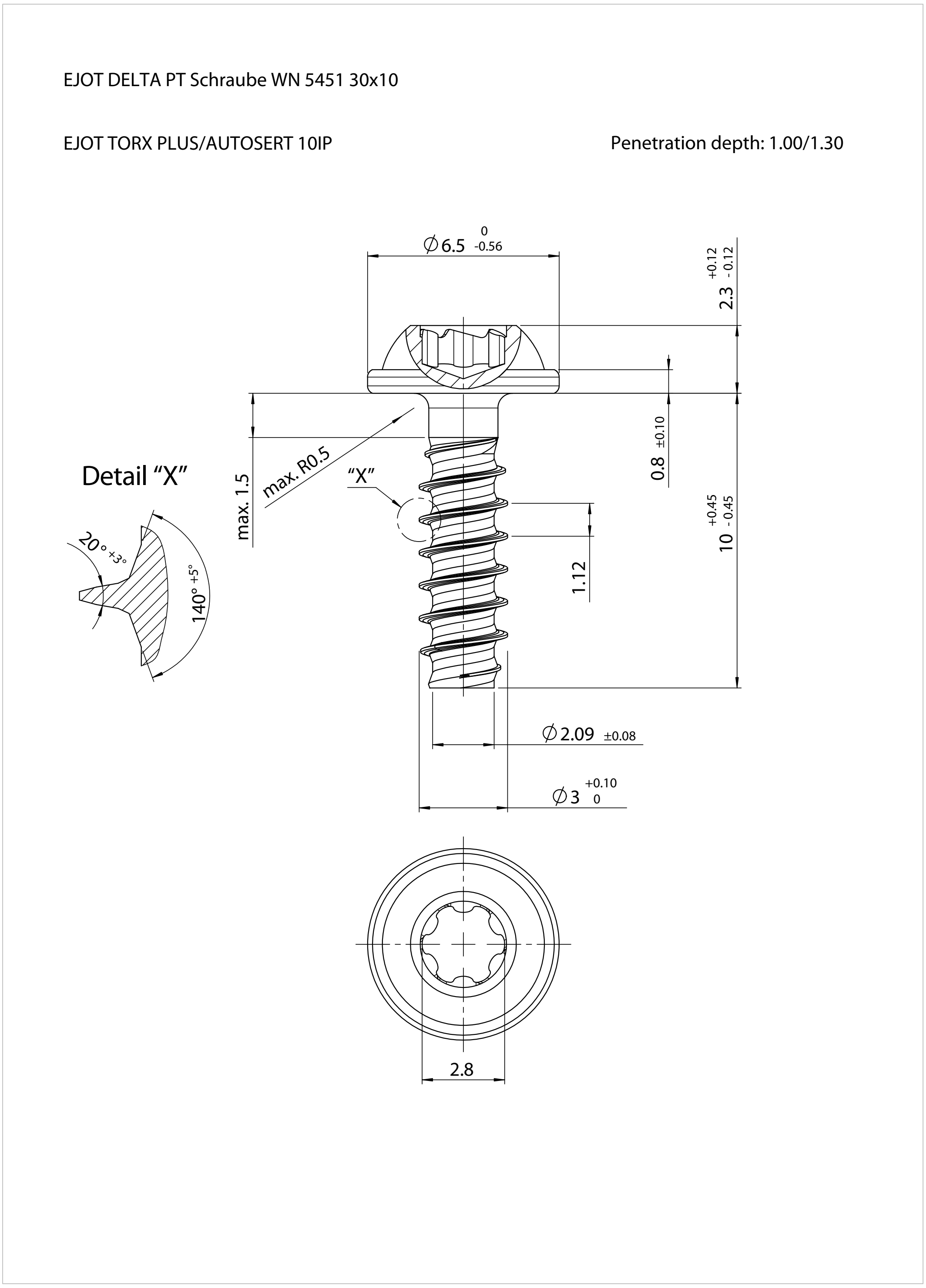


Fig. 50

E.7.4 D-sub

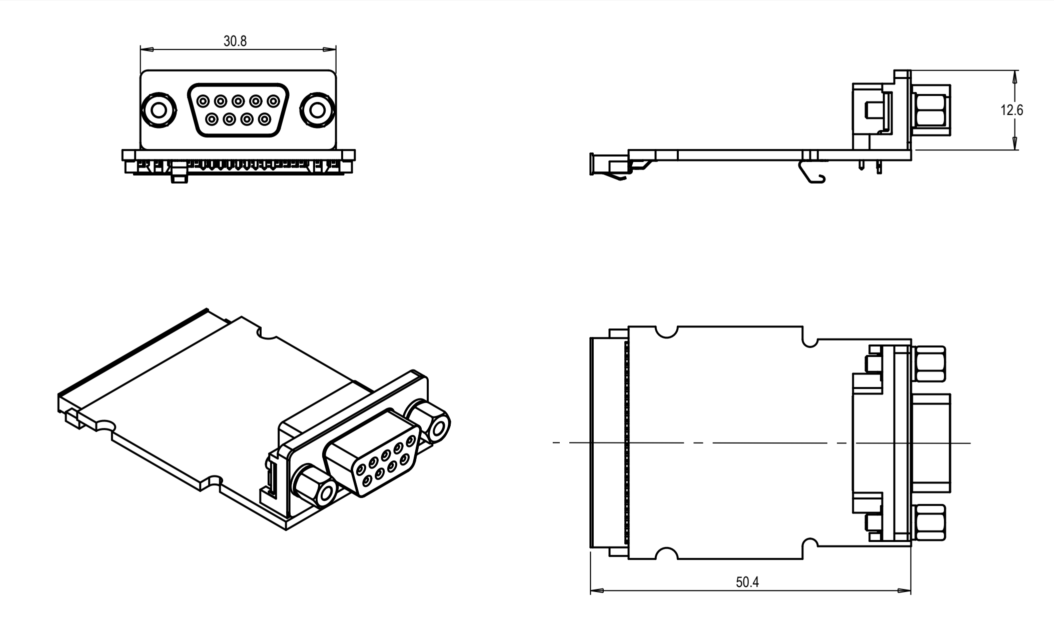


Fig. 51

E.7.5 RJ45, 2–port

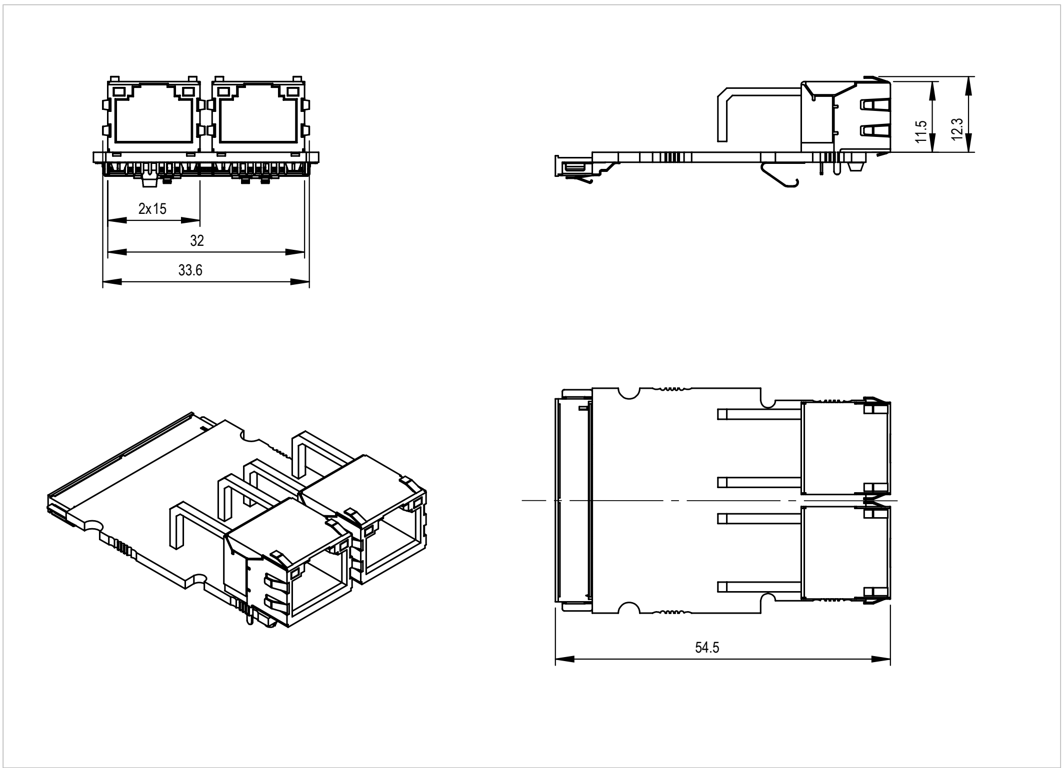


Fig. 52

E.7.6 Fiber Optics, 2–port

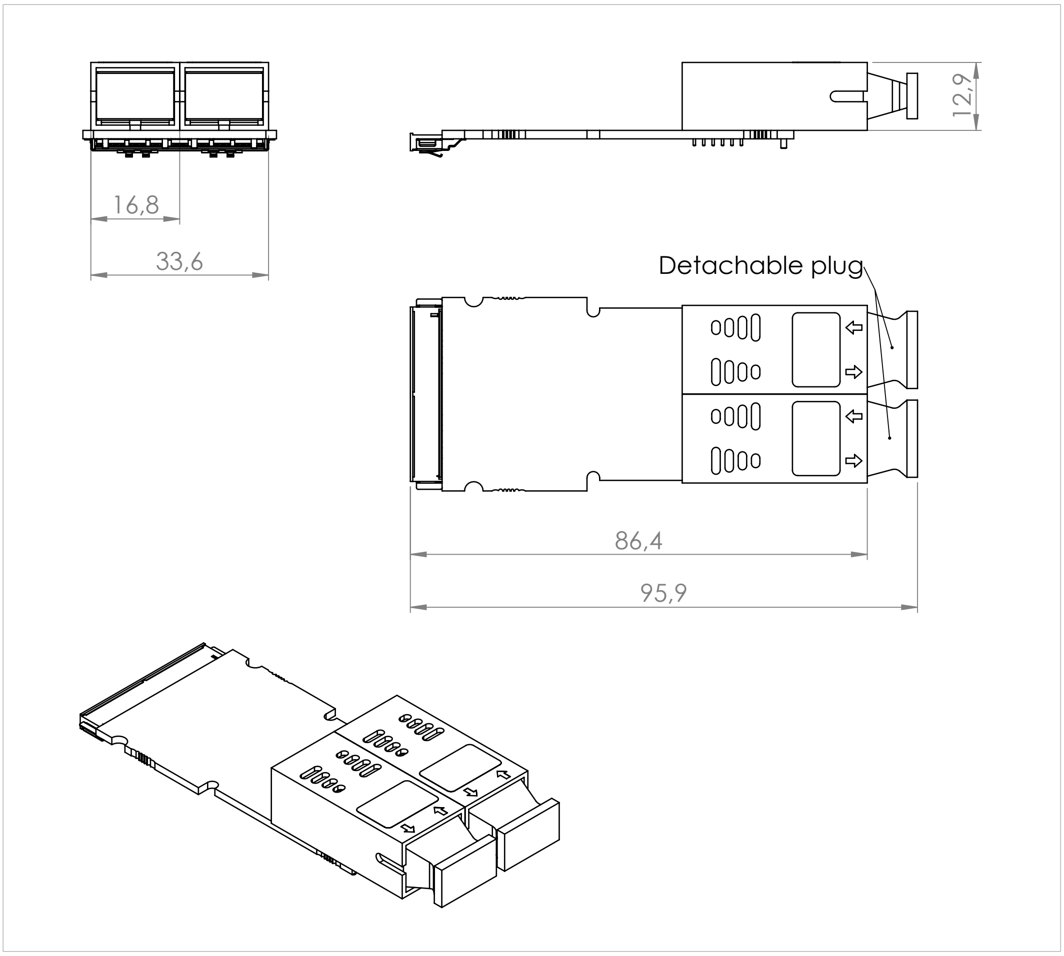


Fig. 53

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