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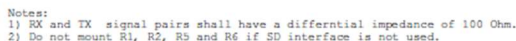
Using SFP/SFF Fiber Optic Transceivers with Anybus CompactCom B40 PROFINET

Application Note

The standard fiber optic transceiver used with the Anybus CompactCom 40 PROFINET fiber optic modules is the POF transceiver QFBR-5978AZ from Broadcom/Avago [1]. However, it will also be possible to use SFP/SFF fiber optic transceivers when designing with the Anybus CompactCom B40 [2] form factor. This application note will give hints about what to think about when using SFP/SFF transceivers.

2 Example Schematics

Design Example Ethernet Fibre Optics Network Interface



Example FO interface schematics from the B40 hardware design guide [3]

3 RXP/RXN and TXP/TXN

The differential signals RXP/RXN and TXP/TXN should be routed as differential pairs with a characteristic impedance of 100Ω differentially.

4 Signal Detect(SD)

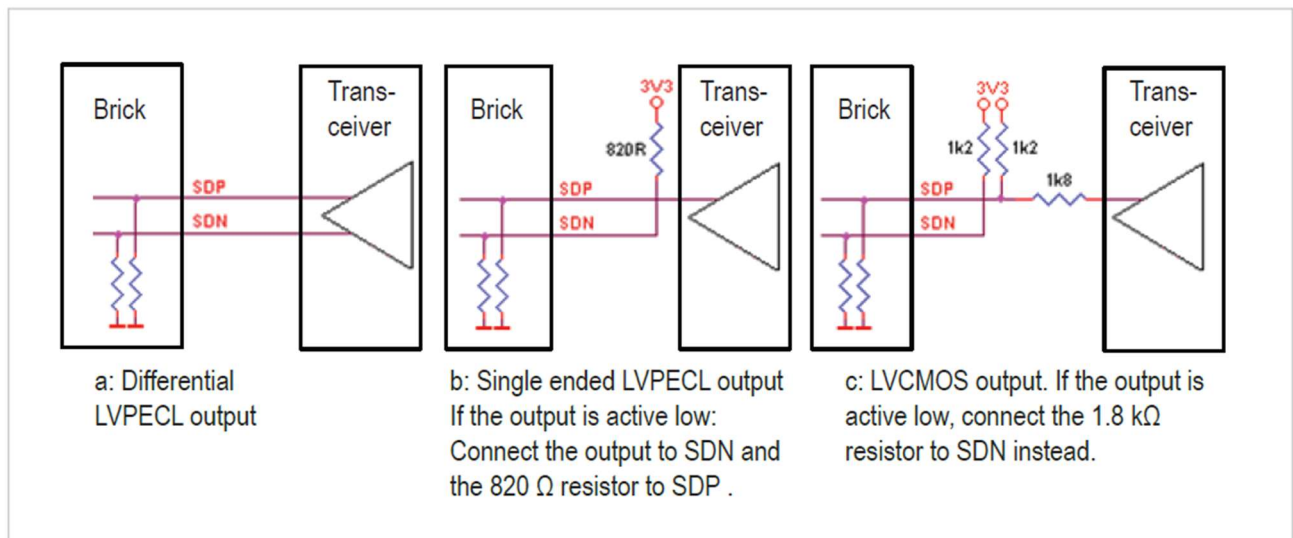
The SD channel is designed for a transceiver output that has a DC coupled differential output with 100-1000mV amplitude. If a transceiver with LVTTTL/LVCMOS output is used, the signal needs to be conditioned using a few resistors, to obtain desired signal levels for the brick.

Each line is pulled to GND by a 1.27kΩ resistor on the brick.

Even if the transceiver has a single ended output and the other line is at a fixed reference potential, it is recommended to route SDN and SDP side by side all the way to the signal conditioning resistors. This will give the interference, collected by the transmission line, common mode characteristics, and it can thus be ignored by the differential input, instead of becoming a differential mode interference that would corrupt the signal.

The QFBR-5978AZ transceiver has a Signal Detect output (connected to the SDP signal). Almost all other transceivers have a Loss Of Signal output instead (to be connected to the SDN signal), i.e. the opposite polarity.

Below is a figure describing three different ways to connect a transceiver output to an SD channel of the brick:



In case a and case b, additional pull-down resistors will be required if the LVPECL outputs require a certain bias current (> 1 mA) to function.

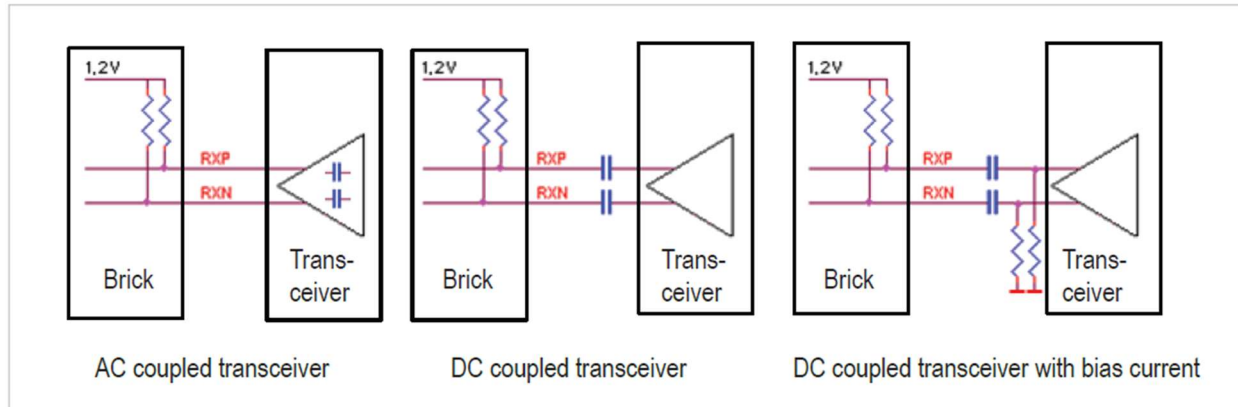
5 2-wire serial interface SDA/SCL

Some transceivers have the possibility to report diagnostic data via the 2-wire serial interface. If diagnostics are needed, a transceiver with this functionality must be selected. However, the SDA/SCL interface is also connected to the internal EEPROM in the transceiver, so it must always be connected.

6 Rx Channel Design Requirements

The Rx channel is designed for an optical transceiver output that has an AC coupled 100Ω differential signal with 100-1000mV amplitude, e.g. LVPECL (low voltage positive emitter coupled logic). Each line is terminated with 50Ω to a common point with a potential of 1.2V on the brick.

If a transceiver with a DC coupled output is used, series capacitors are needed to obtain desired signal levels for the brick. Below is a figure describing three different options to connect a transceiver output to an Rx channel on the brick:



The AC coupling capacitors typically have a value of 100nF. Resistors draining bias current typically have a value of 150Ω .

7 SFP electrical pin-out

Pad	Name	Function	Connect to B40
1	VeeT	Transmitter ground	
2	Tx_Fault	Transmitter fault indication	Not used by B40. 4k7 pull-up.
3	Tx_Disable	Optical output disabled when high	Port 1: A_TXDIS Port 2: B_TXDIS
4	SDA	2-wire serial interface data line	Port 1: A_SDA Port 2: B_SDA
5	SCL	2-wire serial interface clock	Port 1: A_SCL Port 2: B_SCL
6	Mod_ABS	Module absent, connection to VeeT or VeeR in the module indicates module presence to host	
7	RS0	Rate select 0	Not used by B40.
8	Rx_LOS	Receiver loss of signal indication	Port 1: A_SDN Port 2: B_SDN
9	RS1	Rate select 1	Not used by B40.
10	VeeR	Receiver ground	
11	VeeR	Receiver ground	
12	RD-	Inverted received data	Port 1: A_RXN Port 2: B_RXN
13	RD+	Received data	Port 1: A_RXP Port 2: B_RXP
14	VeeR	Receiver ground	
15	VccR	Receiver power (3.3 V, max. 300 mA)	
16	VccT	Transmitter power (3.3 V, max. 300 mA)	
17	VeeT	Transmitter ground	
18	TD+	Transmit data	Port 1: A_TXP Port 2: B_TXP
19	TD-	Inverted transmit data	Port 1: A_TXN Port 2: B_TXN
20	VeeT	Transmitter ground	

8 References

- [1] *Broadcom/Avago fiber optic transceiver, QFBR-5978AZ.*
- [2] *Anybus CompactCom B40 PROFINET, AB6676.*
- [3] B40 Hardware Design Guide, HMSI-27-230.