

# UM10856

User manual for dI2C demo board

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User manual

## Document information

Info	Content
<b>Keywords</b>	dI2C-bus, differential I <sup>2</sup> C-bus buffer, PCA9614, PCA9615, PCA9616
<b>Abstract</b>	User manual for the dI2C demo board OM13523. This demo board will make it easy to test and design with PCA9614, PCA9615 and PCA9616, a differential I <sup>2</sup> C-bus buffer.



**Revision history**

Rev	Date	Description
1.1	20170710	Corrected demo board name to OM13523.
1	20150713	Initial version.

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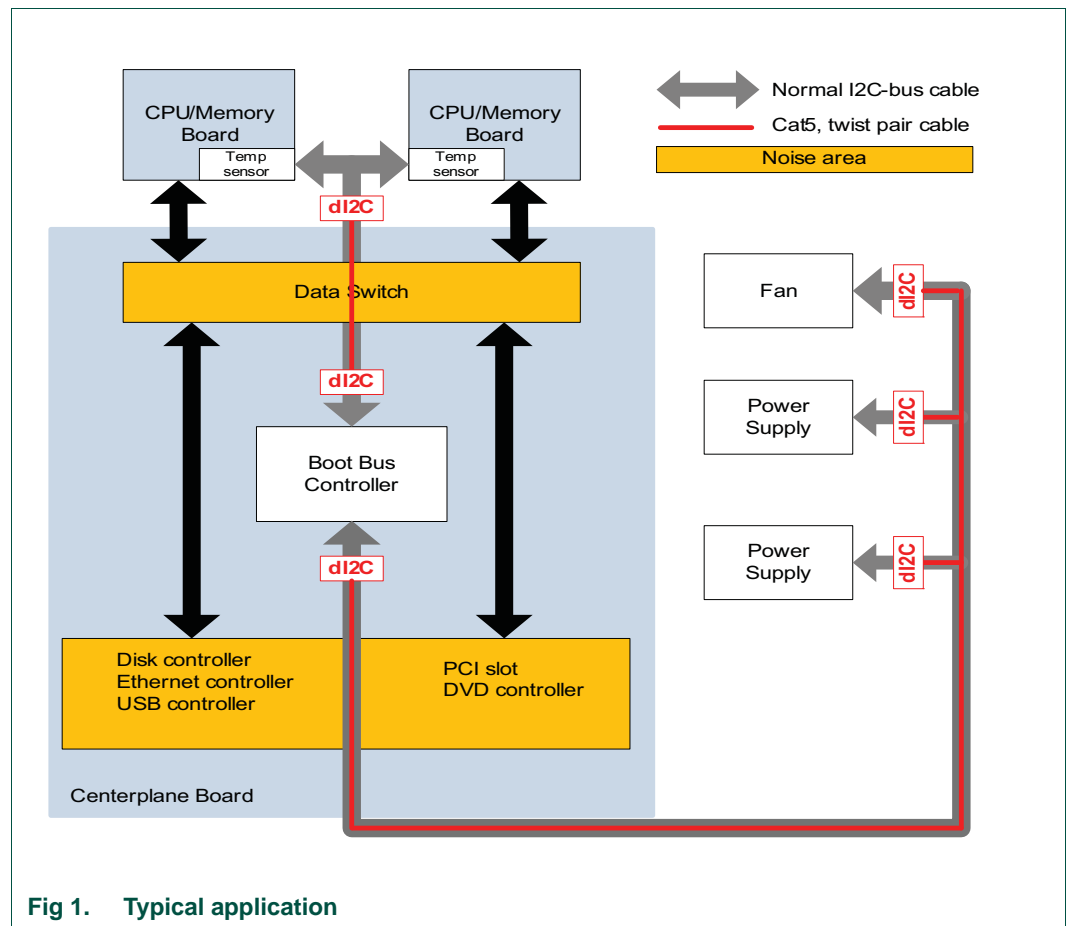
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## 1. Introduction

The dI2C demo board OM13523 is for demonstration of the differential I<sup>2</sup>C-bus working better in noise and ground offset environment than standard I<sup>2</sup>C-bus. The two dI2C demo boards can be used to see the improvement of signal integrity in a noisy environment or a system that has many different power sources creating different ground offset.

In the system block diagram (Figure 1), the I<sup>2</sup>C-bus between the Boot Bus Controller and the CPU/Memory board has a lot of high speed data transmission; therefore the I<sup>2</sup>C-bus may pick up some noise. The fan and power supply modules may have different power sources; they may have a different ground offset level. To make a better I<sup>2</sup>C-bus system, install dI2C devices to isolate noise and ground offset in a system.

This user manual shows how to use a dI2C demo board on an existing system.



## 2. Key features

- A complete evaluation platform for PCA9616, (or PCA9614 and PCA9615)
- Easy to connect to an existing system
- Convenient test point for easy scope measurement and signal access

### 3. Getting started

#### 3.1 Assumptions

Familiarity with the I<sup>2</sup>C-bus is recommended.

##### 3.1.1 Static handling requirements

This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling. You must use a ground strap or touch the PC case or other grounded source before unpacking or handling the hardware.

##### 3.1.2 System requirement

The OM13523 demo card can be used with Fm+ Development Board (OM13260), or customer's application system.

##### 3.1.3 Schematic of dI2C demo board

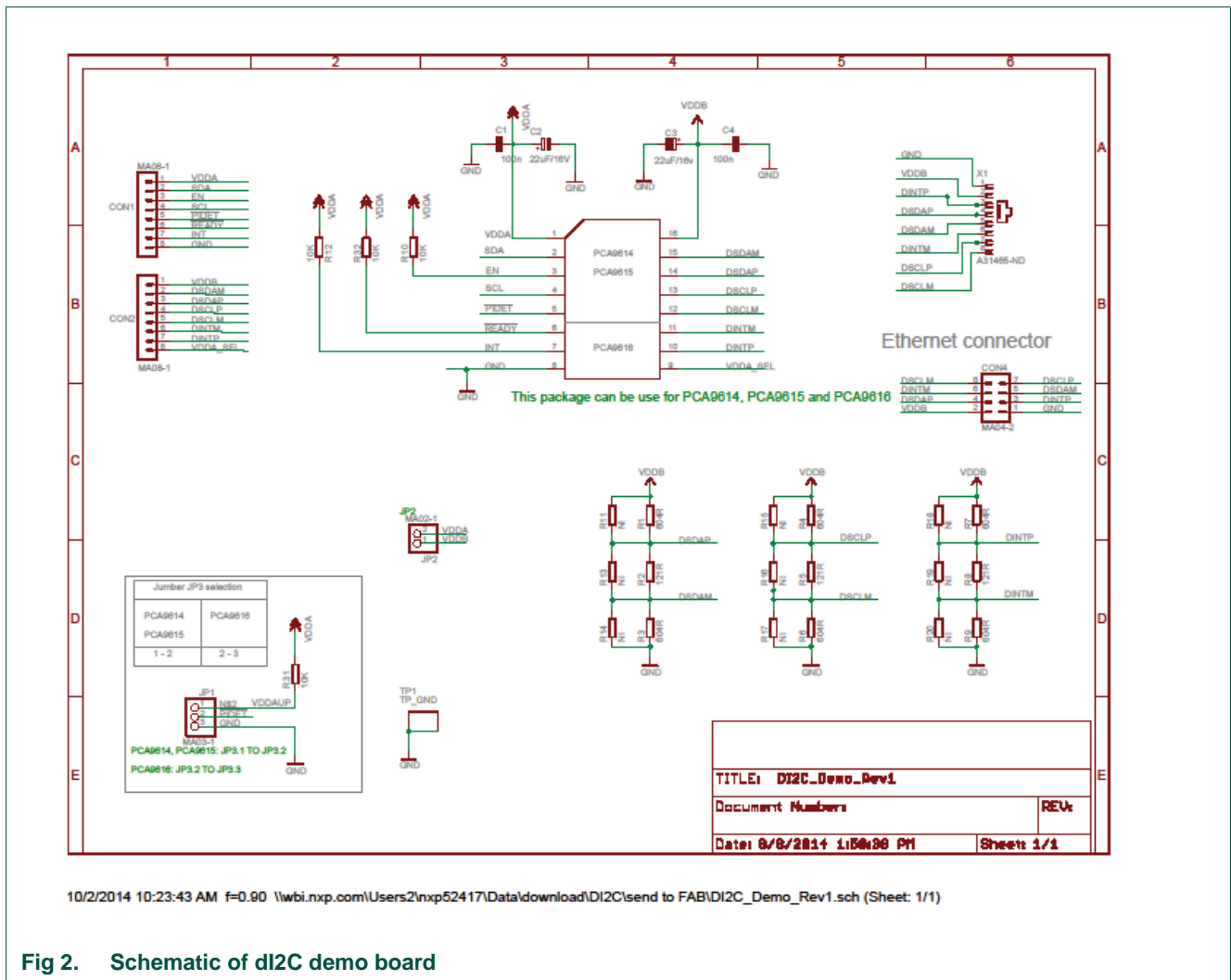


Fig 2. Schematic of dI2C demo board

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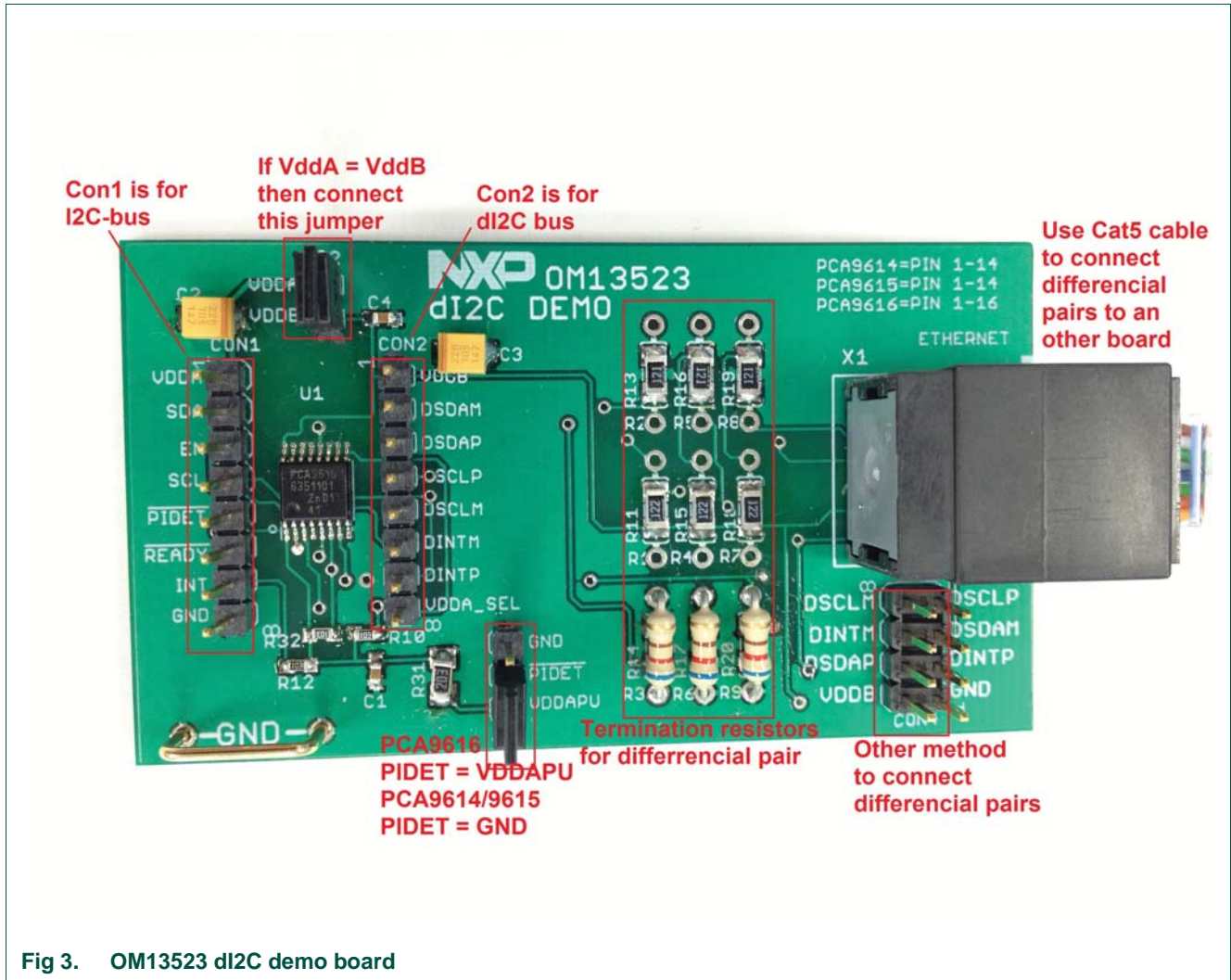


Fig 3. OM13523 dI2C demo board

### 3.1.4 Bill of materials

Table 1. Bill of materials

Part	Value	Package	Part #	Description
C1	100n	C0603	399-1095-1-ND	SMD capacitor
C2	22uF/16V	A/3216-18R	1276-2728-1-ND	SMD capacitor
C3	22uF/16v	A/3216-18R	1276-2728-1-ND	SMD capacitor
C4	100n	C0603	399-1095-1-ND	SMD capacitor
CON1	MA08-1	MA08-1	609-3235-ND	dI2C part connector 1
CON2	MA08-1	MA08-1	609-3235-ND	dI2C part connector 2
CON4	MA04-2	MA04-2	609-3203-ND	Cable connector
JP1	MA03-1	1X03	WM8073-ND	Part selector header
JP2	MA02-1	1X02	WM8072-ND	VDDDB power selector header
R1	604R	M1206	541-604FCT-ND	Terminator resistor
R10	10K	R0603	1276-5930-2-ND	EN, pull-up resistor

Table 1. Bill of materials ...continued

Part	Value	Package	Part #	Description
R11	NI	0204/7	NONE	Terminator resistor op
R12	10K	R0603	1276-5930-2-ND	INT, pull-up resistor
R13	NI	0204/7	NONE	Terminator resistor op
R14	NI	0204/7	NONE	Terminator resistor op
R15	NI	0204/7	NONE	Terminator resistor op
R16	NI	0204/7	NONE	Terminator resistor op
R17	NI	0204/7	NONE	Terminator resistor op
R18	NI	0204/7	NONE	Terminator resistor op
R19	NI	0204/7	NONE	Terminator resistor op
R2	121R	M1206	541-131FCT-ND	Terminator resistor
R20	NI	0204/7	NONE	Terminator resistor op
R3	604R	M1206	541-604FCT-ND	Terminator resistor
R31	10K	M1206	1276-5930-2-ND	Pull-up resistor
R32	10K	R0603	1276-5930-2-ND	!Ready, pull-up resistor
R4	604R	M1206	541-604FCT-ND	Terminator resistor
R5	121R	M1206	541-131FCT-ND	Terminator resistor
R6	604R	M1206	541-604FCT-ND	Terminator resistor
R7	604R	M1206	541-604FCT-ND	Terminator resistor
R8	121R	M1206	541-131FCT-ND	Terminator resistor
R9	604R	M1206	541-604FCT-ND	Terminator resistor
TP1	TP_GND	TP_GND	952-1873	GND
U1	PCA9410	TSSOP16_4X4MM	PCA9616	dI2C part
X1	A31465-ND	RJ45-NO-SHIELD	A31465-ND	Internet connector

### 3.1.5 Power supply

The dI2C demo board needs two power supplies for I<sup>2</sup>C-bus (VDDA) and dI2C-bus (VDDDB).

- Using Fm+ Development Board (Fm+ DB): There is no direct connector to the Fm+ DB. The dI2C demo board can draw the power from an Fm+ DB using either 3.3 V headers (CN21) or 5 V headers (CN22) to the VDDA of CON1 on the dI2C demo board. VDDDB can use the same power as VDDA by connecting JP2, or using jumper wire from CN21 or CN22 of Fm+ DB (see [Figure 4](#)).

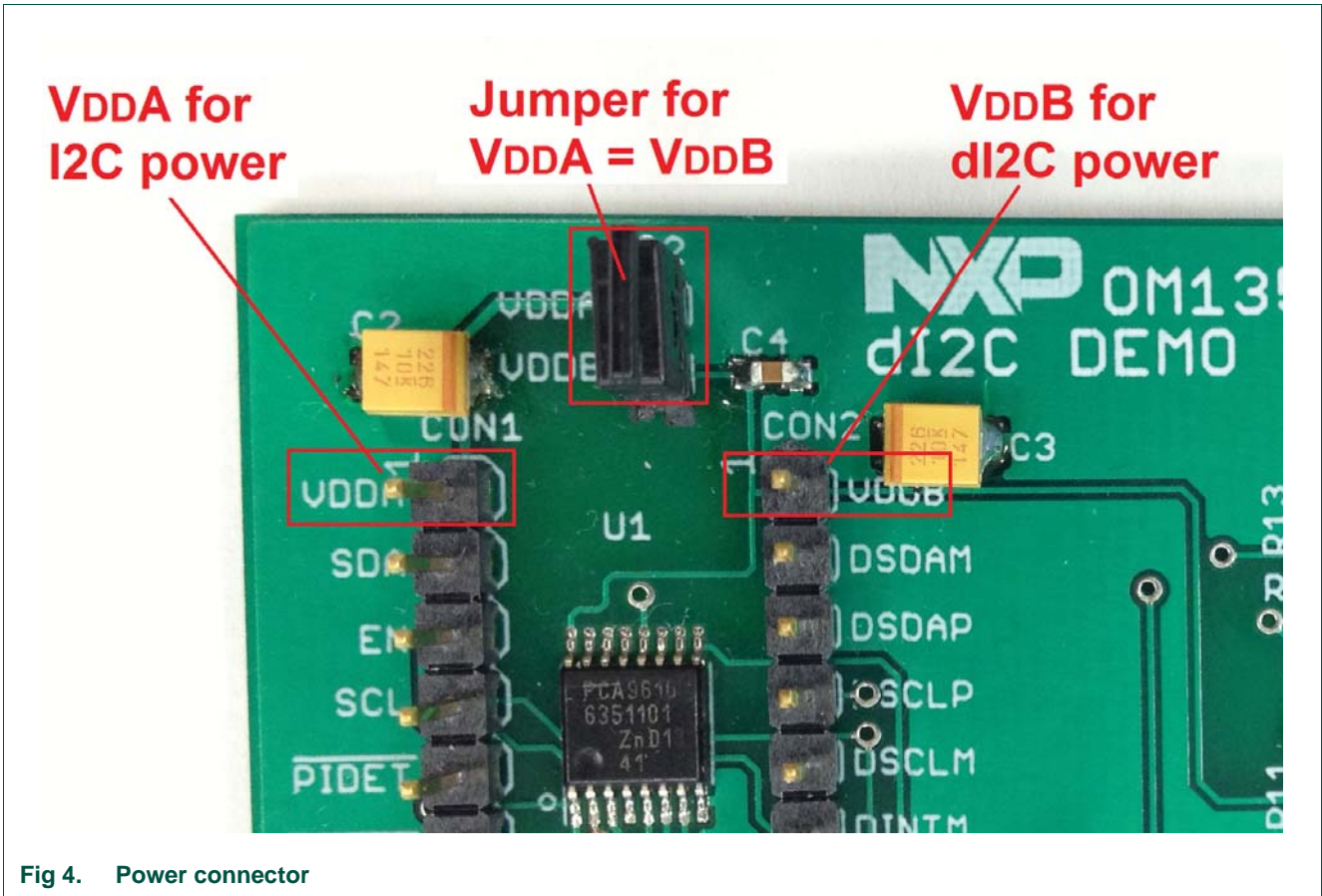


Fig 4. Power connector

- User application board: CON1 pin VDDA is for the I<sup>2</sup>C-bus power and CON2 pin VDDB is for dI2C-bus power. On an application board, the I<sup>2</sup>C-bus pull-up power should connect to the VDDA power. VDDB is the power for PCA9616 and differential bus signals. VDDB can be set the same as VDDA by adding a jumper header on JP2, if VDDA is between 3.0 V and 5.0 V.

**3.1.6 I<sup>2</sup>C-bus side**

The I<sup>2</sup>C-bus on the dI2C demo board does not have the pull up resistors on SLC and SDA signals. The pull-up resistors should be taken care of by the I<sup>2</sup>C master board (Fm+ DB or application board).

INT signal can be used as an interrupt signal to the microcontroller or a reset signal to the slave devices. The INT signal has a 10K pull-up to VDDB on the dI2C demo board.



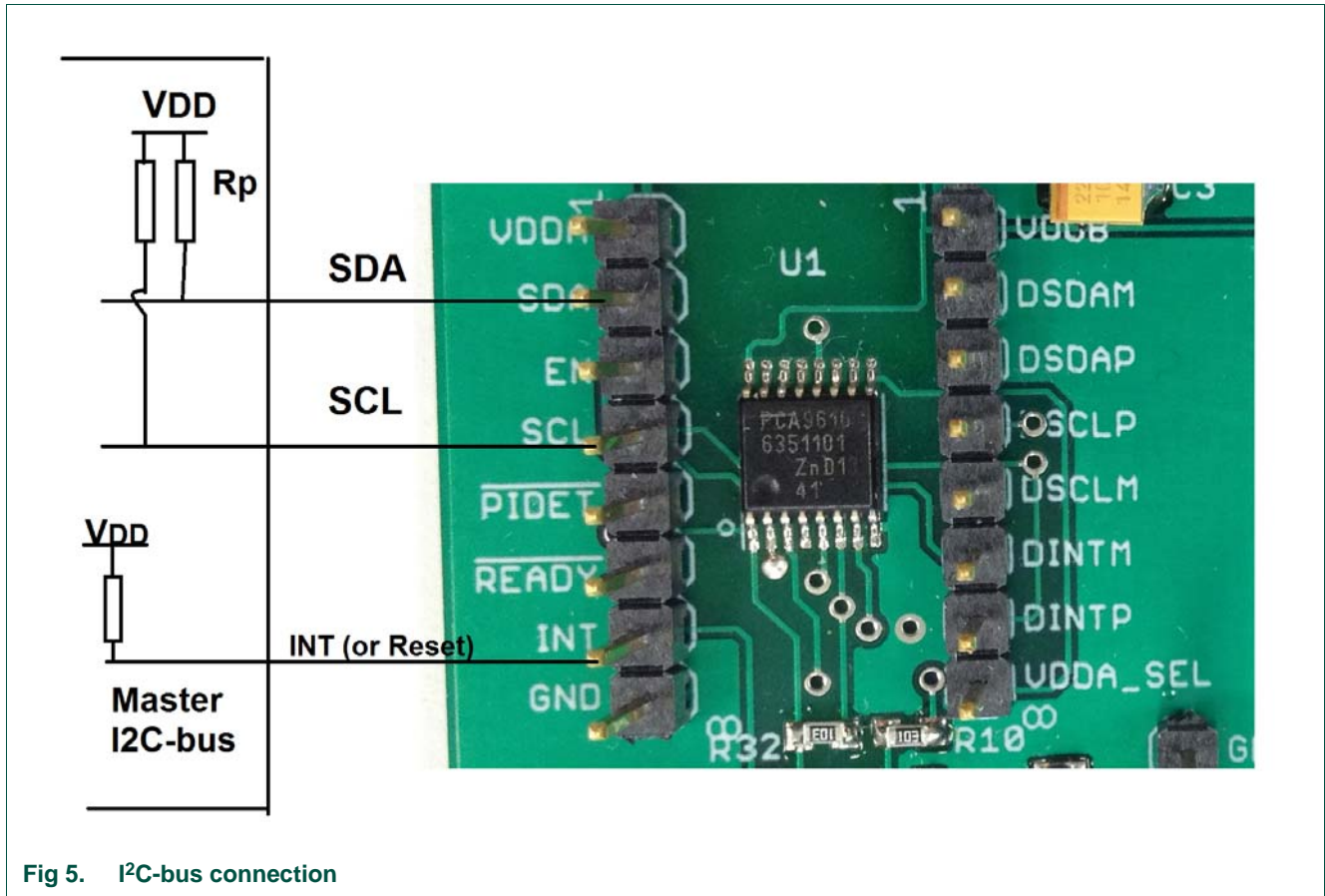


Fig 5. I2C-bus connection

### 3.1.7 dI2C-bus side

dI2C-bus has three pairs of differential signals on the dI2C demo board. All of the pairs are connected to RJ45 through the termination resistors. Please see schematic (Figure 6) for more detail. RJ45 is internet connector; it can use cat5/6 cable to connect to the other dI2C board. A user can have his or her own cable and it can be connected to CON4.



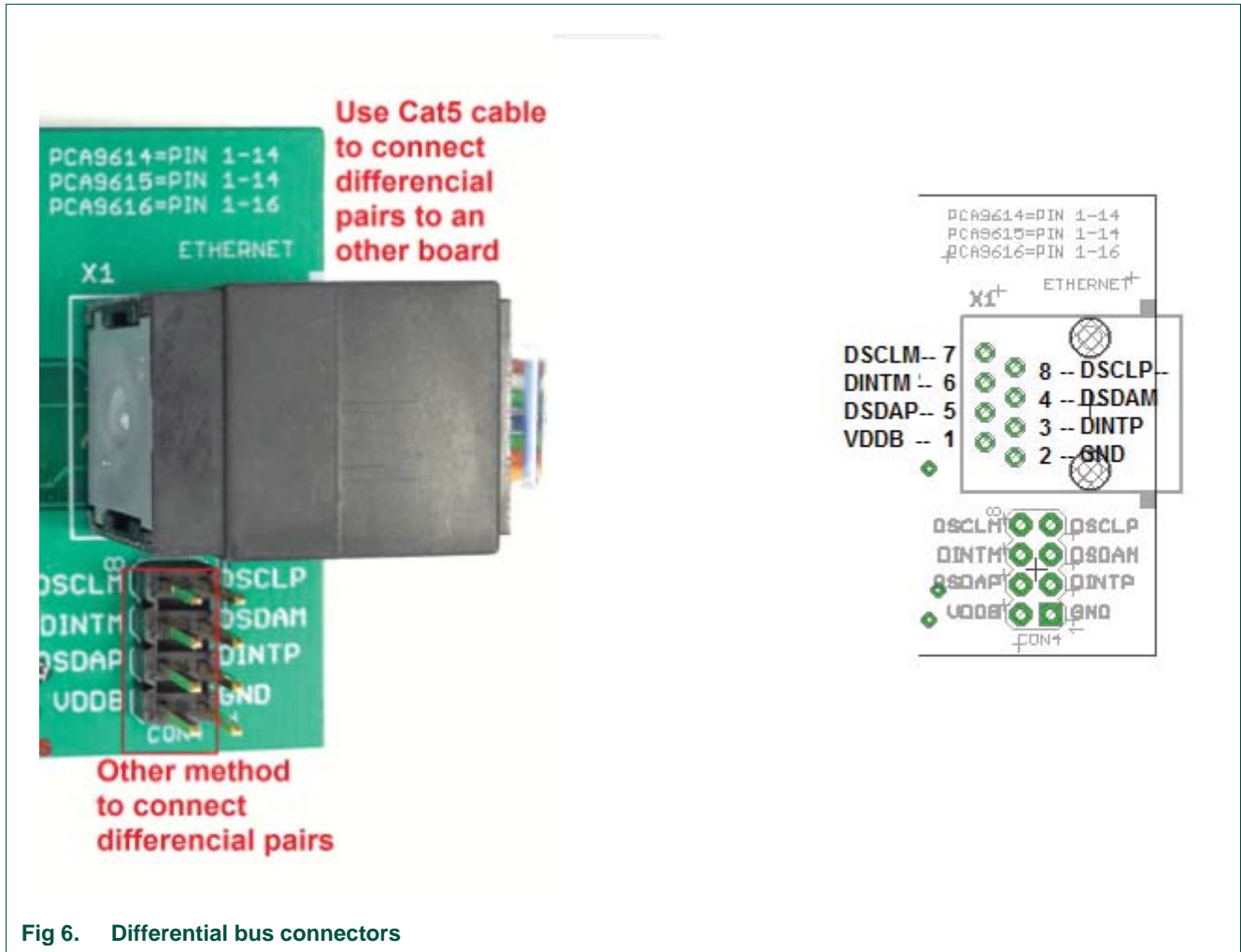


Fig 6. Differential bus connectors

### 3.1.8 Other signals

The dl2C demo board is designed ready to use; therefore, all other signals have been set to running mode. Please see the schematic in [Figure 2](#) for more detail.

## 4. How to run a demo on Fm+ board with dl2C demo board

### 4.1 How to connect dl2C to Fm+ DM

1. dl2C demo board #1: connect SCL, SDA, VDDA and GND to SCL1, SDA1, 3.3V and GND of Fm+ DM #1 respectively.
2. dl2C demo board #2: connect SCL, SDA, VDDA and GND to SCL2, SDA2, 3.3V and GND of Fm+ DM #2 respectively.
3. Use a CAT6 cable to connect the two dl2C DMs together
4. Install jumpers on both dl2C demo boards JP2 and JP1 (PIDET - VDDAPU)
5. Connect GPIO target board: the first GPIO target board connects to CN10 of Fm+ board #1 and the second one connects to CN20 of Fm+ board #2

## 4.2 Fm+ DM source code for expert mode

```
Expert Mode Data File
//Hardware setup: Two Fm+ boards OM13260, two dI2C demo boards OM13523, CAT6 cable,
    and two GPIO Target boards OM13303
//Fm+ DB#1, install jumper on JP10 = GND; no jumper on CN12; connect OM13303 board to
    CN10 on Fm+ DM#1
//Fm+ DB#2, install jumper on JP20 = GND; no jumper on CN12; connect OM13303 board to
    CN20 on Fm+ DM#2
//dI2C DB OM13523, JP2 =1&2; JP1=1&2
44,Write,Yes,200,FE,Comments: Please open this file in text editor for boards setup
44,Write,Yes,200,FE,Comments: Write to PCA9672 addr 0x44 on bus #1; set bit0=0
44,Write,Yes,200,FD,Comments: Write to PCA9672 addr 0x44 on bus #1; set bit1=0
44,Write,Yes,200,FB,Comments: Write to PCA9672 addr 0x44 on bus #1; set bit2=0
44,Write,Yes,200,F7,Comments: Write to PCA9672 addr 0x44 on bus #1; set bit3=0
44,Write,Yes,200,EF,Comments: Write to PCA9672 addr 0x44 on bus #1; set bit4=0
44,Write,Yes,200,DF,Comments: Write to PCA9672 addr 0x44 on bus #1; set bit5=0
44,Write,Yes,200,BF,Comments: Write to PCA9672 addr 0x44 on bus #1; set bit6=0
44,Write,Yes,200,7F,Comments: Write to PCA9672 addr 0x44 on bus #1; set bit7=0

//The data below are sent from bus1 through dI2C buffer to bus2 to drive PCA9672
46,Write,Yes,200,7F,Comments: Write to PCA9672 addr 0x46 on bus #2; set bit7=0
46,Write,Yes,200,BF,Comments: Write to PCA9672 addr 0x46 on bus #2; set bit6=0
46,Write,Yes,200,DF,Comments: Write to PCA9672 addr 0x46 on bus #2; set bit5=0
46,Write,Yes,200,EF,Comments: Write to PCA9672 addr 0x46 on bus #2; set bit4=0
46,Write,Yes,200,F7,Comments: Write to PCA9672 addr 0x46 on bus #2; set bit3=0
46,Write,Yes,200,FB,Comments: Write to PCA9672 addr 0x46 on bus #2; set bit2=0
46,Write,Yes,200,FD,Comments: Write to PCA9672 addr 0x46 on bus #2; set bit1=0
46,Write,Yes,200,FE,Comments: Write to PCA9672 addr 0x46 on bus #2; set bit0=0

Sequence:01,02,03,04,05,06,07,08,09,10,11,12,13,14,15,16,17

//;results: LED GPIO target board on JP10 runs from LED7 to LED0, other LED board runs
    form LED0 to LED7
```

## 4.3 Open source code in expert mode

Copy the source code in [Section 4.2](#) above in a text file and save it with “name.txt”, then open name.txt in expert mode of NXP's Fm+ board GUI software by selecting Device and Expert Mode.

### 4.4 Board connectivity

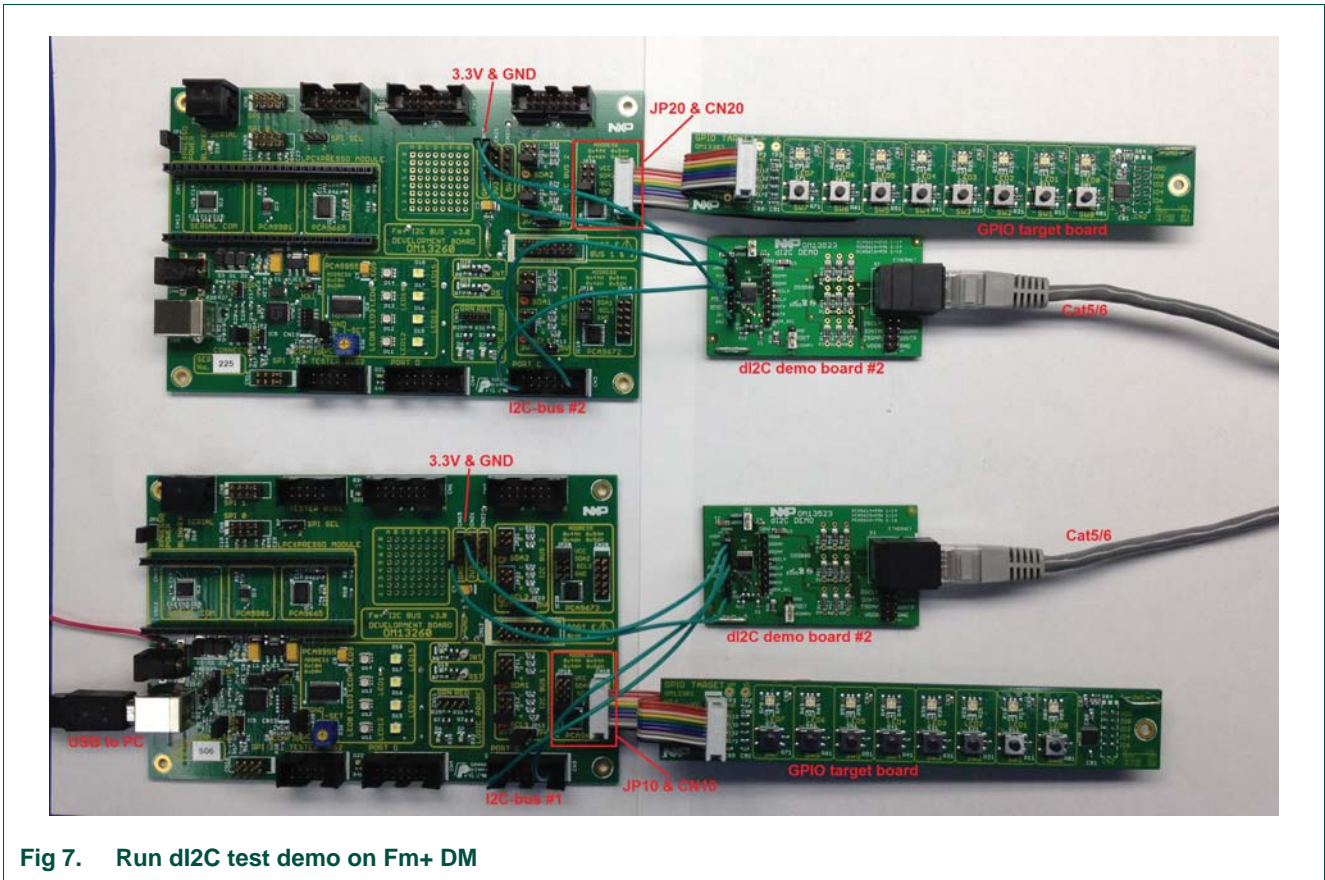


Fig 7. Run di2C test demo on Fm+ DM

### 4.5 How it works

Fm+ DM #1 has an I<sup>2</sup>C master and it sends commands on bus #1 to control two GPIO target boards on both Fm+ DMs. When the LEDs on GPIO target board #2 is toggling, that means the data has been transferred from Fm+ DM #1 to Fm+ DM #2 through di2C demo boards.

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