

The Embedded I/O Company



TPCE275

PCI Express XMC Carrier

Version 1.0

User Manual

Issue 1.0.2

April 2013

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TPCE275-10R

PCI Express x1 Carrier for one XMC module, +12V Power Supply from PCIe Connector, 12V VPWR, J14 I/O, J16 I/O, JTAG connections to XMC module via 10-pin header

TPCE275-11R

PCI Express x1 Carrier for one XMC module, +12V Power Supply from PCIe Connector, 5V VPWR, J14 I/O, J16 I/O, JTAG connections to XMC module via 10-pin header

TPCE275-20R

PCI Express x1 Carrier for one XMC module, +12V power supply from external PCIe graphics power connector used (cable adapter enclosed in order), 12V VPWR, J14 I/O, J16 I/O, JTAG connections to XMC module via 10-pin header

TPCE275-21R

PCI Express x1 Carrier for one XMC module, +12V power supply from external PCIe graphics power connector used (cable adapter enclosed in order), 5V VPWR, J14 I/O, J16 I/O, JTAG connections to XMC module via 10-pin header

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Style Conventions

Hexadecimal characters are specified with prefix 0x, i.e. 0x029E (that means hexadecimal value 029E).

For signals on hardware products, an 'Active Low' is represented by the signal name with # following, i.e. IP_RESET#.

Access terms are described as:

| | |
|-----|------------|
| W | Write Only |
| R | Read Only |
| R/W | Read/Write |
| R/C | Read/Clear |
| R/S | Read/Set |

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| Issue | Description | Date |
|--------------|--|----------------|
| 1.0.0 | Initial Issue | September 2012 |
| 1.0.1 | Added information about the stable time for the XMC slot power supply | October 2012 |
| 1.0.2 | New board revision: <ul style="list-style-type: none">- Modification of power supply voltages on connectors X5 and X6:<ul style="list-style-type: none">o VPWR no longer available, is now always +12Vo Additionally, +5V are now also available on X6 in TPCE275-x1 variantso All voltages are now fuse protected | April 2013 |

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1 Product Description

The TPCE275 is a standard height PCI Express, Revision 1.1 compatible module that provides one slot for a single-width XMC module used to build modular, flexible and cost effective I/O solutions for all kinds of applications like process control, medical systems, telecommunication and traffic control.

The TPCE275 supports XMC front-panel I/O, and also XMC P14 and P16 Rear-I/O.

XMC P14 Rear-I/O is offered through a VME P2 style connector (IEC 60603-2, Type C). The I/O mapping of P14 complies with VITA-35 (“PMC P4 to VME-P2, Rows A-C mapping”).

XMC P16 Rear-I/O is implemented through two 50 pin, 0.1 inch flat ribbon cable connectors providing access to all P16 I/O lines. The single-ended signals of P16 are all routed to one flat cable connector, while the differential signals are routed to the second connector.

The operating temperature range is 0°C to +70°C.

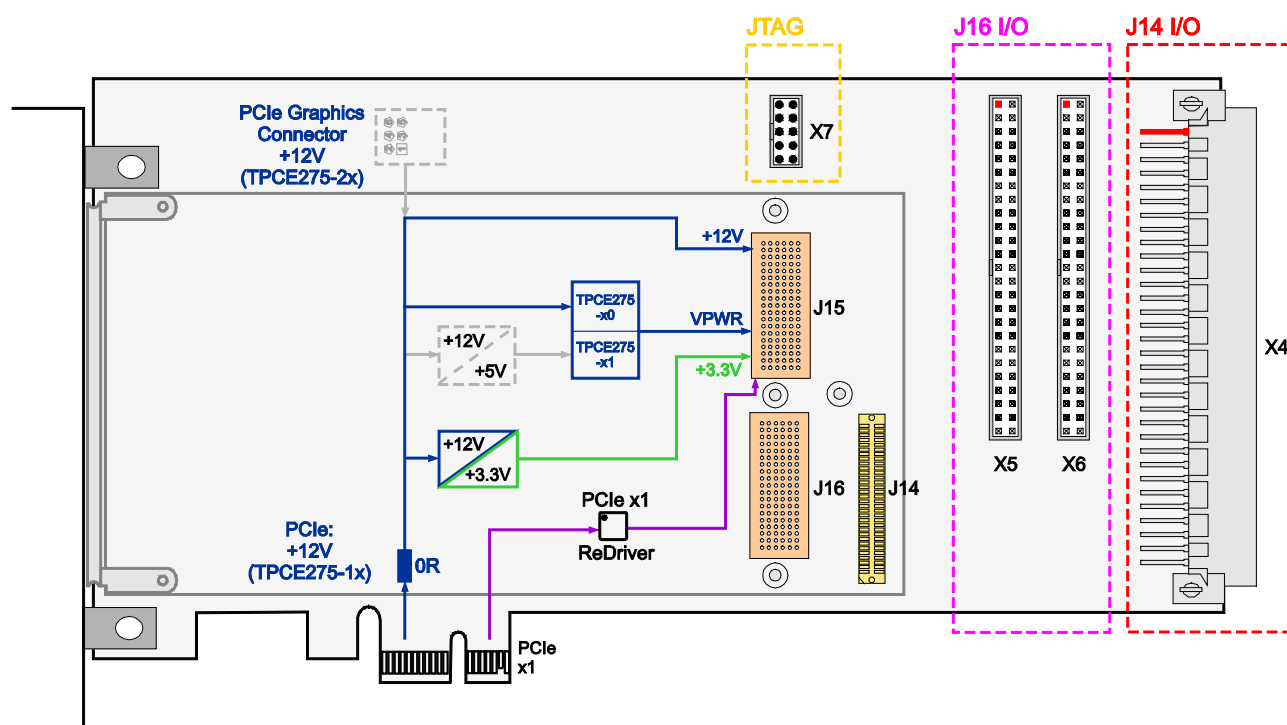


Figure 1-1 : TPCE275 Block Diagram

2 Technical Specification

| Mechanical and Electrical Interfaces | |
|--------------------------------------|---|
| PCI Express | PCI Express x1, Revision 1.1 Standard Height Full Length |
| XMC Slot | ANSI/VITA 42.0 (R2008) ANSI/VITA 42.3 Single-Width |
| XMC Interface | |
| Number of XMC Slots | 1 |
| XMC I/O Access | XMC Front Panel I/O XMC P14 Rear I/O through VG64 Right Angle Male Connector XMC P16 Rear I/O through 2x50-pin Flat Cable Connectors Maximum Current for all Rear I/O Lines is 0.5A! |
| I/O Power Supply Access | +12V, +3.3V and +5V (TPCE275-x1 variants) are available on X5 and X6. All voltages are fuse protected. The maximum current for each voltage is 0.5A! |
| On Board Devices | |
| PCI Express ReDriver | PI2EQX4401D (Pericom) |
| Physical Data | |
| Power Requirements | 125mA maximum @ +3.3V DC 75mA maximum @ +12V DC Additional power is required by the XMC Module! |
| Power Stable for XMC Slot | The power supply for the XMC slot is stable approximately 20ms after the system power supply is stable. |
| Maximum Power for XMC Slot | The maximum power available for an XMC module is variant dependent. Please see chapter "Power Limits for XMC Modules" for detailed information. |
| Temperature Range | Operating 0°C to +70°C Storage 0°C to +70°C |
| MTBF | TPCE275-1xR: 664000 h TPCE275-2xR: 637000 h MTBF values shown are based on calculation according to MIL-HDBK-217F and MIL-HDBK-217F Notice 2; Environment: G _B 20°C. The MTBF calculation is based on component FIT rates provided by the component suppliers. If FIT rates are not available, MIL-HDBK-217F and MIL-HDBK-217F Notice 2 formulas are used for FIT rate calculation. |
| Humidity | 5 – 95 % non-condensing |
| Weight | TPCE275-10R: 114 g TPCE275-11R: 120 g TPCE275-20R: 116 g TPCE275-21R: 122 g |

Table 2-1 : Technical Specification

3 Handling and Operating Instructions

3.1 ESD Protection



The TPCE275 is sensitive to static electricity. Packing, unpacking and all other handling of the TPCE275 has to be done in an ESD/EOS protected Area.

3.2 Power Limits for XMC Modules



The PCIe specification limits the power for PCIe add-in cards. These limitations have implications for the use of XMC modules. Refer to the chapter “Power Limits for XMC Modules” for details.

3.3 Installation of XMC Modules



Before mounting XMC Modules on the TPCE275, be sure that the system is powered off. Also, follow the installation instructions in the “XMC Interface” chapter.

3.4 Installation of TPCE275-2xR



For the TPCE275-2xR variants, it is imperative to always connect a PCI Express VGA power connector to the TPCE275, even if no PMC is mounted.

3.5 Installation of TPCE275-x0R



For the TPCE275-x0R variants, VPWR is +12V. This voltage is directly connected from the PCIe connector. The PCIe specification allows for tolerances of $\pm 8\%$, whereas the XMC specification allows only for $\pm 5\%$.

This has to be taken into consideration before plugging the XMC module onto the TPCE275-x0R.

4 XMC Interface

4.1 Power Limits for XMC Modules

The following current limits have to be taken into account when choosing the appropriate TPCE275 for the power requirements of the XMC module.

| TPCE275 | Voltage | | Current Limits |
|-------------|---------|-------------------|----------------|
| TPCE275-1xR | 3.3V | | 2.0 A |
| | VPWR | 5V (TPCE275-11R) | 1.2 A |
| | | 12V (TPCE275-10R) | 0.5 A |
| | +12V | | 200 mA |
| | | | |
| TPCE275-2xR | 3.3V | | 7.5 A |
| | VPWR | 5V (TPCE275-21R) | 5.0 A |
| | | 12V (TPCE275-20R) | 2.1 A |
| | +12V | | 200 mA |
| | | | |

Table 4-1 : Current Limits for the XMC Modules

4.2 Stable Power Supply

The power supply for the XMC slot is stable approximately 20ms after the system power supply is stable.

4.3 Installation of an XMC Module

The XMC modules are mounted to the TPCE275 prior to installation into the system.

If the XMC has a front panel, first remove the cover from the XMC front panel cut-out of the TPCE275. Install the XMC at an angle so that the XMC front panel penetrates the XMC front panel cut-out. Then rotate down to mate with the XMC connectors on the TPCE275. If the XMC has no front panel, simply plug in the XMC, and leave the cover in the XMC front panel cut-out of the TPCE275.

After the XMC module has been installed, it can be mounted on the TPCE275 using the mounting screws that come with the XMC module. There are four screw mounting locations, two at the XMC front panel and two at the standoffs near the XMC bus connectors.

Before installing an XMC module, be sure that the power supply for the TPCE275 is turned off.

The components are Electrostatic Sensitive Devices (ESD). Use an anti-static mat connected to a wristband when handling or installing the components.

5 Indicators

5.1 LED Indicators

The TPCE275 provides a couple of board-status LEDs as shown below.

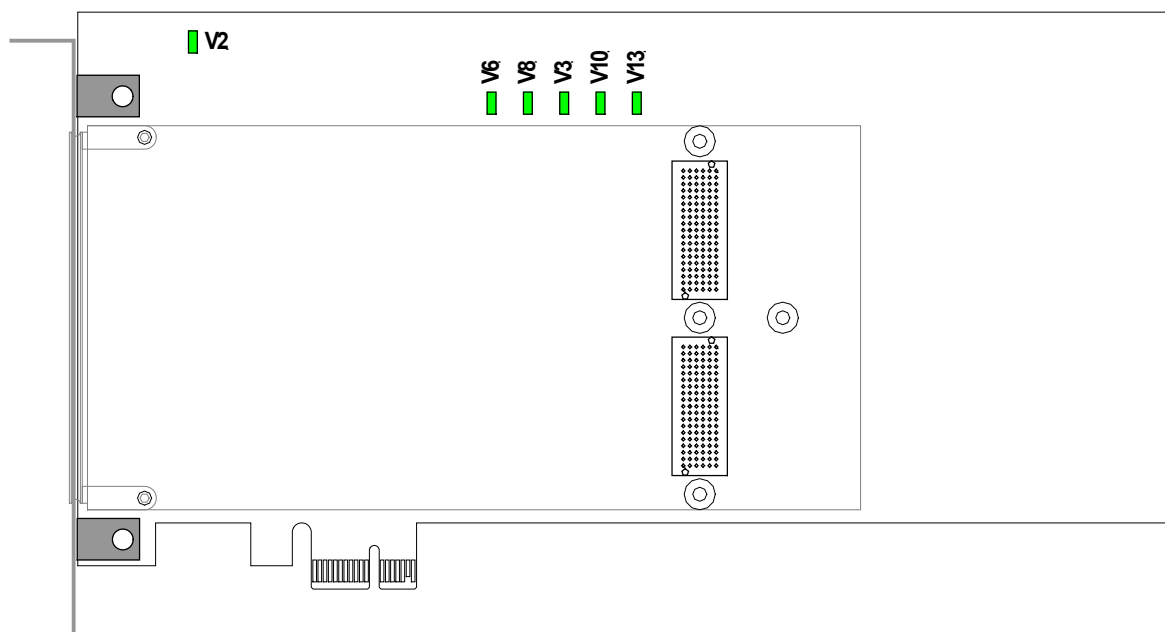


Figure 5-1 : Onboard LED Placement

| LED | | Color | State | Description |
|-------------------|-----------------|-------|-------|-----------------------------|
| V6 | SIG_A | Green | Off | PCIe TX link is down |
| | | | On | PCIe TX link is up |
| V8 | SIG_B | Green | Off | PCIe RX link is down |
| | | | On | PCIe RX link is up |
| V2 | 3.3V Power Good | Green | Off | 3.3V Power Supply is not OK |
| | | | On | 3.3V Power Supply is OK |
| V3 | 1.8V Power Good | Green | Off | 1.8V Power Supply is not OK |
| | | | On | 1.8V Power Supply is OK |
| Dependent on VPWR | | | | |
| V10 | VPWR Power Good | Green | Off | 5V Power Supply is not OK |
| | | | On | 5V Power Supply is OK |
| V13 | VPWR Power Good | Green | Off | 12V Power Supply is not OK |
| | | | On | 12V Power Supply is OK |

Table 5-1 : Onboard LED Description

6 Pin Assignments

6.1 XMC J15

| | A | B | C | D | E | F |
|----|----------|----------|------------------------|---------------------|----------------------|---------------------|
| 01 | PET0p0 | PET0n0 | 3,3V | | | VPWR |
| 02 | GND | GND | TRST ¹⁾ | GND | GND | PERST# |
| 03 | | | 3,3V | | | VPWR |
| 04 | GND | GND | TCK ¹⁾ | GND | GND | |
| 05 | | | 3,3V | | | VPWR |
| 06 | GND | GND | TMS ¹⁾ | GND | GND | +12V |
| 07 | | | 3,3V | | | VPWR |
| 08 | GND | GND | TDI ¹⁾ | GND | GND | -12V |
| 09 | | | | | | VPWR |
| 10 | GND | GND | TDO ¹⁾ | GND | GND | GA0 |
| 11 | PER0p0 | PER0n0 | | | | VPWR |
| 12 | GND | GND | GA1 | GND | GND | |
| 13 | | | 3,3V_AUX ²⁾ | | | VPWR |
| 14 | GND | GND | GA2 | GND | GND | SMCLK ⁶⁾ |
| 15 | | | | | | VPWR |
| 16 | GND | GND | MVMRO ³⁾ | GND | GND | SMDAT ⁶⁾ |
| 17 | | | | | | |
| 18 | GND | GND | | GND | GND | |
| 19 | REFCLK+0 | REFCLK-0 | | WAKE# ⁴⁾ | ROOT0# ⁵⁾ | |

Table 6-1 : XMC J15 Pin Assignment

Notes:

- 1) JTAG lines are routed to a 10pin header onboard, not to the PCIe edge card connector
- 2) 3.3V_AUX is connected to the PCIe edge card connector, so it is up to the mainboard to deliver this power supply. If a mainboard does not provide this power supply, it can be changed to 3.3V on the TPCE275 with a resistor.
- 3) MVMRO is set to logic high by default, prohibiting write access. It can be changed via a resistor.
- 4) WAKE# is connected to the PCIe edge card connector, so it is up to the mainboard to provide for this signal. If this is not the case, WAKE# may be separated from the mainboard via a resistor.
- 5) ROOT# is not supported; this pin is not connected on the TPCE275 by default. It can be pulled high via a resistor.
- 6) SMCLK and SMDAT are not connected to the PCIe edge card connector by default. Both signals can be connected via series resistors.

6.2 XMC J14 Rear-I/O (X4 - VG64 Connector)

The TPCE275 routes the XMC I/O lines to the VG64 connector compliant to VITA-35 (“PMC P4 to VME-P2, Rows A-C mapping”). The actual signal assignment of the XMC P14 connector is XMC specific.

| | |
|--------------------------------|--|
| Connector Type | DIN 41612 2.54mm - Right Angle Male Connector - Type C |
| Source & Order Info | ERNI 384047 |

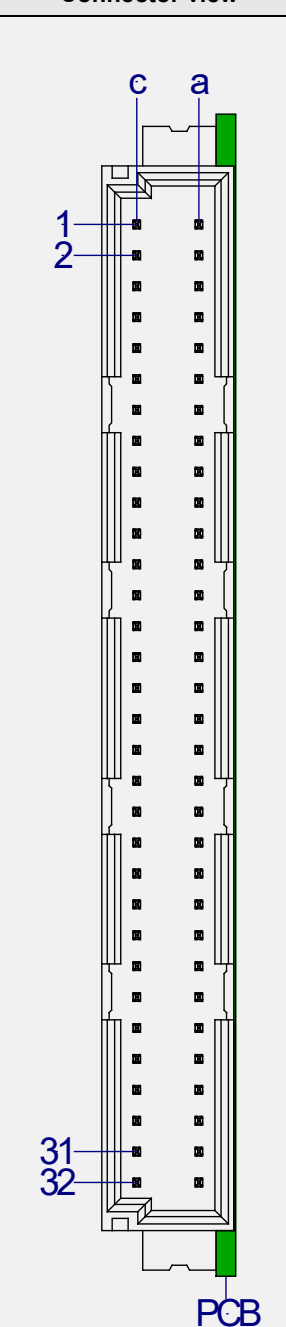
| Signal | Pin | Connector view | Pin | Signal |
|--------|-----|--|-----|--------|
| I/O 1 | c1 |  | a1 | I/O 2 |
| I/O 3 | c2 | | a2 | I/O 4 |
| I/O 5 | c3 | | a3 | I/O 6 |
| I/O 7 | c4 | | a4 | I/O 8 |
| I/O 9 | c5 | | a5 | I/O 10 |
| I/O 11 | c6 | | a6 | I/O 12 |
| I/O 13 | c7 | | a7 | I/O 14 |
| I/O 15 | c8 | | a8 | I/O 16 |
| I/O 17 | c9 | | a9 | I/O 18 |
| I/O 19 | c10 | | a10 | I/O 20 |
| I/O 21 | c11 | | a11 | I/O 22 |
| I/O 23 | c12 | | a12 | I/O 24 |
| I/O 25 | c13 | | a13 | I/O 26 |
| I/O 27 | c14 | | a14 | I/O 28 |
| I/O 29 | c15 | | a15 | I/O 30 |
| I/O 31 | c16 | | a16 | I/O 32 |
| I/O 33 | c17 | | a17 | I/O 34 |
| I/O 35 | c18 | | a18 | I/O 36 |
| I/O 37 | c19 | | a19 | I/O 38 |
| I/O 39 | c20 | | a20 | I/O 40 |
| I/O 41 | c21 | | a21 | I/O 42 |
| I/O 43 | c22 | | a22 | I/O 44 |
| I/O 45 | c23 | | a23 | I/O 46 |
| I/O 47 | c24 | | a24 | I/O 48 |
| I/O 49 | c25 | | a25 | I/O 50 |
| I/O 51 | c26 | | a26 | I/O 52 |
| I/O 53 | c27 | | a27 | I/O 54 |
| I/O 55 | c28 | | a28 | I/O 56 |
| I/O 57 | c29 | | a29 | I/O 58 |
| I/O 59 | c30 | | a30 | I/O 60 |
| I/O 61 | c31 | | a31 | I/O 62 |
| I/O 63 | c32 | | a32 | I/O 64 |

Table 6-2 : X4 - J14 I/O Pin Assignment

6.3 XMC J16 Rear-I/O (50-Pin Flat Cable Connectors)

6.3.1 X5 - J16 Differential I/O Lines

| | |
|---------------------|----------------------|
| Pin-Count | 50 |
| Connector Type | Flat Cable Connector |
| Source & Order Info | AMP 104340 |

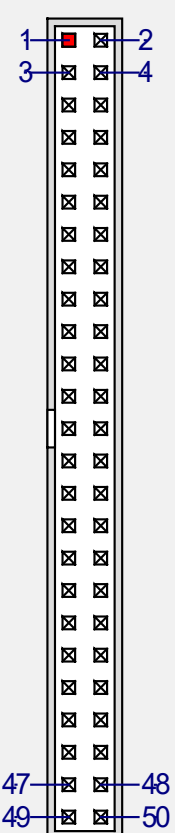
| Pin Assignment | | | | |
|--------------------|-----|--|--------------------|-------------|
| Description | Pin | Connector View | Pin | Description |
| DP00- | 1 |  | 2 | DP00+ |
| DP01- | 3 | | 4 | DP01+ |
| DP02- | 5 | | 6 | DP02+ |
| DP03- | 7 | | 8 | DP03+ |
| DP04- | 9 | | 10 | DP04+ |
| DP05- | 11 | | 12 | DP05+ |
| DP06- | 13 | | 14 | DP06+ |
| DP07- | 15 | | 16 | DP07+ |
| DP08- | 17 | | 18 | DP08+ |
| DP09- | 19 | | 20 | DP09+ |
| DP10- | 21 | | 22 | DP10+ |
| DP11- | 23 | | 24 | DP11+ |
| DP12- | 25 | | 26 | DP12+ |
| DP13- | 27 | | 28 | DP13+ |
| DP14- | 29 | | 30 | DP14+ |
| DP15- | 31 | | 32 | DP15+ |
| DP16- | 33 | | 34 | DP16+ |
| DP17- | 35 | | 36 | DP17+ |
| DP18- | 37 | | 38 | DP18+ |
| DP19- | 39 | | 40 | DP19+ |
| - | 41 | 42 | - | |
| GND | 43 | 44 | GND | |
| GND | 45 | 46 | GND | |
| 3.3V ¹⁾ | 47 | 48 | 3.3V ¹⁾ | |
| 3.3V ¹⁾ | 49 | 50 | 3.3V ¹⁾ | |

Table 6-3 : X5 - J16 Differential I/O Lines Pin Assignment

1) All voltages are fuse protected. The maximum current for each voltage is 0.5A!

6.3.2 X6 - J16 Single-Ended I/O Lines

| | |
|--------------------------------|----------------------|
| Pin-Count | 50 |
| Connector Type | Flat Cable Connector |
| Source & Order Info | AMP 104340 |

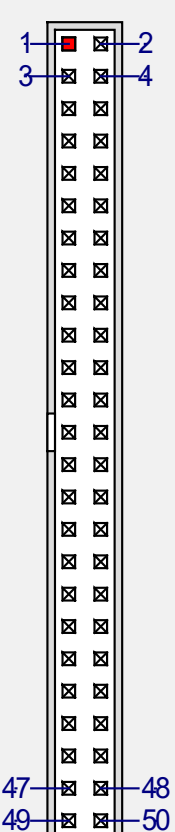
| Pin Assignment | | | | |
|--------------------------|-----|--|--------------------------|----------------------|
| Description | Pin | Connector View | Pin | Description |
| UD_F1 | 1 |  | 2 | UD_C1 |
| UD_F2 | 3 | | 4 | UD_C2 |
| UD_F3 | 5 | | 6 | UD_C3 |
| UD_F4 | 7 | | 8 | UD_C4 |
| UD_F5 | 9 | | 10 | UD_C5 |
| UD_F6 | 11 | | 12 | UD_C6 |
| UD_F7 | 13 | | 14 | UD_C7 |
| UD_F8 | 15 | | 16 | UD_C8 |
| UD_F9 | 17 | | 18 | UD_C9 |
| UD_F10 | 19 | | 20 | UD_C10 |
| UD_F11 | 21 | | 22 | UD_C11 |
| UD_F12 | 23 | | 24 | UD_C12 |
| UD_F13 | 25 | | 26 | UD_C13 |
| UD_F14 | 27 | | 28 | UD_C14 |
| UD_F15 | 29 | | 30 | UD_C15 |
| UD_F16 | 31 | | 32 | UD_C16 |
| UD_F17 | 33 | | 34 | UD_C17 |
| UD_F18 | 35 | | 36 | UD_C18 |
| UD_F19 | 37 | | 38 | UD_C19 |
| +5V ^{1) 2)} | 39 | | 40 | +5V ^{1) 2)} |
| +5V ^{1) 2)} | 41 | 42 | +5V ^{1) 2)} | |
| GND | 43 | 44 | GND | |
| GND | 45 | 46 | GND | |
| +12V_PCl_e ²⁾ | 47 | 48 | +12V_PCl_e ²⁾ | |
| +12V_PCl_e ²⁾ | 49 | 50 | +12V_PCl_e ²⁾ | |

Table 6-4 : X6 - J16 Single-Ended I/O Lines Pin Assignment

- 1) +5V are only available in TPCE275-x1 variants
- 2) All voltages are fuse protected. The maximum current for each voltage is 0.5A!

6.4 10-Pin JTAG Header (X7)

The 10-Pin JTAG Header (Connector X7) is connected to the XMC J15 connector with the following pin assignment.

All pins are described from the perspective of the XMC module.

| Signal | Pin | Connector View | Pin | Signal |
|--------|-----------------|----------------|-----|--------|
| TCK | 1 ^{*)} | | 2 | GND |
| TMS | 3 | | 4 | GND |
| TDO | 5 | | 6 | GND |
| TDI | 7 | | 8 | GND |
| TRST# | 9 | | 10 | - |

Table 6-5 : X7 - JTAG Header

Notes:

*) Pin 1 has a squared pad for better recognition