The Embedded I/O Company

TEWS TECHNOLOGIES

TPCE275

PCI Express XMC Carrier

Version 1.0

User Manual

Issue 1.0.2

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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

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

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: - Modification of power supply voltages on connectors X5 and X6: o VPWR no longer available, is now always +12V o Additionally, +5V are now also available on X6 in TPCE275-x1 variants o 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.

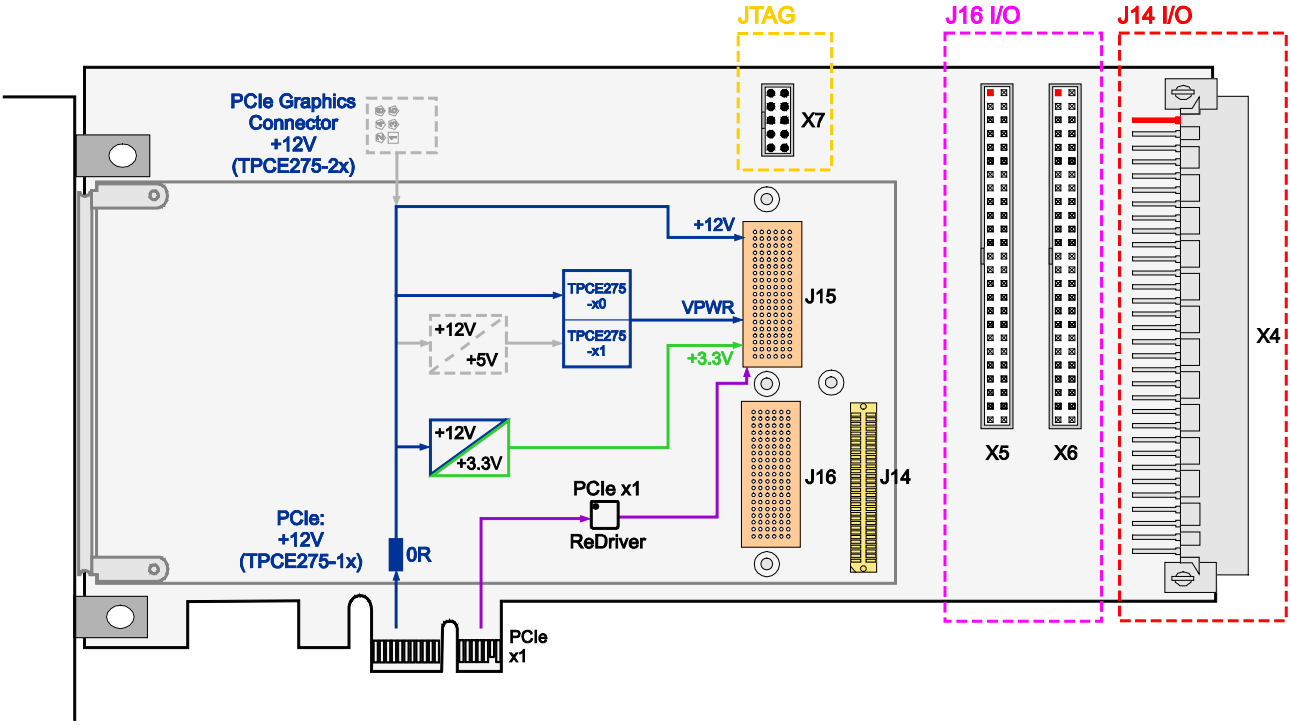


Figure 1-1 : TPCE275 Block Diagram

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 Storage	0°C to +70°C 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 ±8%, whereas the XMC specification allows only for ±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.

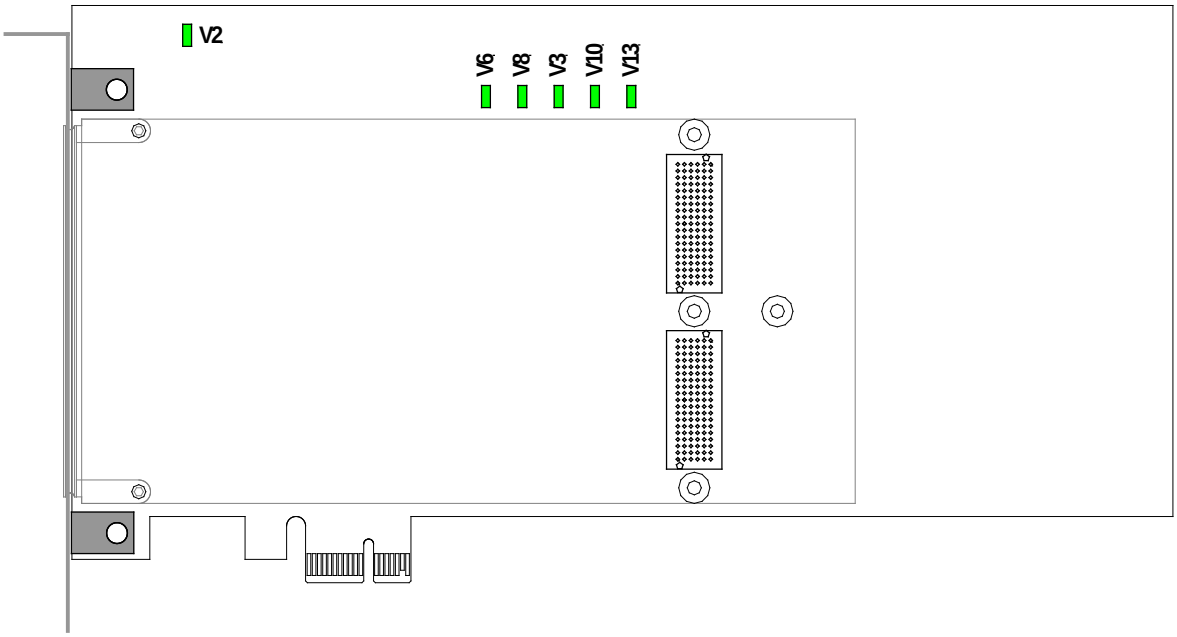


Figure 5-1 : Onboard LED Placement

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

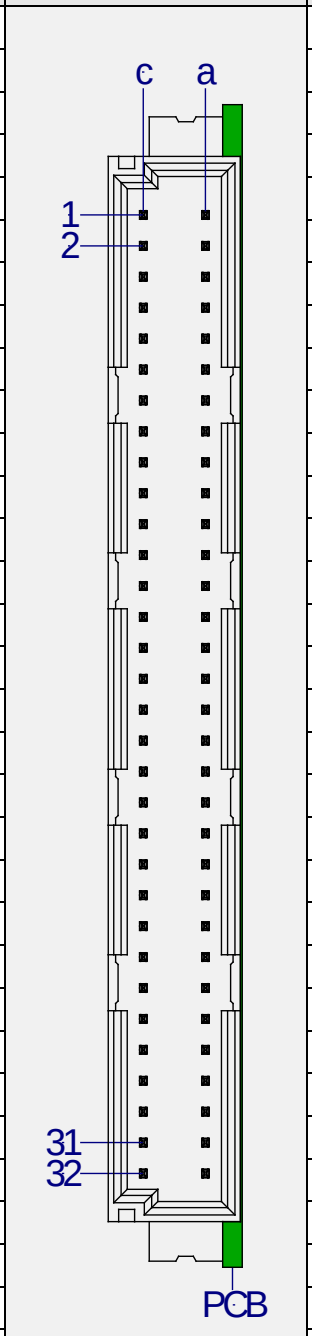
Signal	Pin	Connector view	Pin	Signal
I/O 1	**c1**		**a1**	I/O 2
I/O 3	**c2**		**a2**	I/O 4
I/O 5	**c3**		**a3**	I/O 6
I/O 7	**c4**		**a4**	I/O 8
I/O 9	**c5**		**a5**	I/O 10
I/O 11	**c6**		**a6**	I/O 12
I/O 13	**c7**		**a7**	I/O 14
I/O 15	**c8**		**a8**	I/O 16
I/O 17	**c9**		**a9**	I/O 18
I/O 19	**c10**		**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

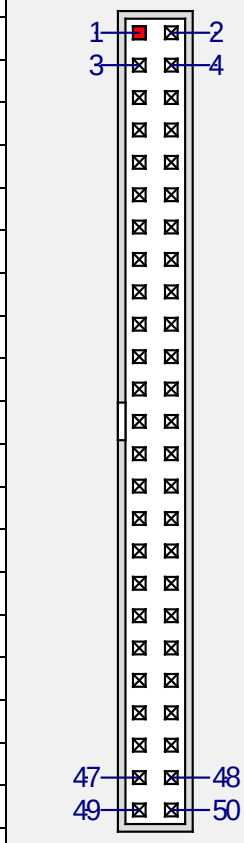
Pin Assignment				
Description	**Pin**	**Connector View**	**Pin**	**Description**
DP00-	**1**		**2**	DP00+
DP01-	**3**		**4**	DP01+
DP02-	**5**		**6**	DP02+
DP03-	**7**		**8**	DP03+
DP04-	**9**		**10**	DP04+
DP05-	**11**		**12**	DP05+
DP06-	**13**		**14**	DP06+
DP07-	**15**		**16**	DP07+
DP08-	**17**		**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

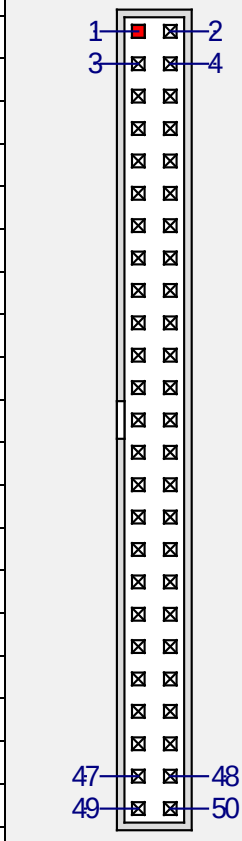
Pin Assignment				
Description	**Pin**	**Connector View**	**Pin**	**Description**
UD_F1	**1**		**2**	UD_C1
UD_F2	**3**		**4**	UD_C2
UD_F3	**5**		**6**	UD_C3
UD_F4	**7**		**8**	UD_C4
UD_F5	**9**		**10**	UD_C5
UD_F6	**11**		**12**	UD_C6
UD_F7	**13**		**14**	UD_C7
UD_F8	**15**		**16**	UD_C8
UD_F9	**17**		**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_PCIe [2)]	**47**		**48**	+12V_PCIe [2)]
+12V_PCIe [2)]	**49**		**50**	+12V_PCIe [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.

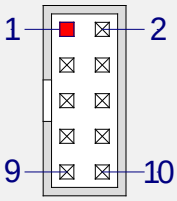
Signal	Pin	Connector View	Pin	Signal
TCK	**1** *)		**2**	GND
TMS	**3**		**4**	GND
TDO	**5**		**6**	GND
TDI	**7**		**8**	GND
TRST#	**9**		**10**	-

Table 6-5 : X7 - JTAG Header

Notes:

***)** Pin 1 has a squared pad for better recognition