

External PCI Express (PCIe)

x1, x4, x8, x16

I/O Products





Molex interconnects extend PCI Express outside the box

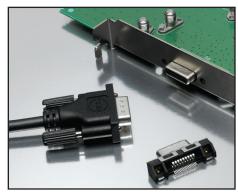
External PCI Express is a new, multi-purpose, hotpluggable input/output (I/O) interface that can be used across the computing industry, from mobile equipment through high-end servers as well as communication equipment. These connectors were designed to fit all popular mechanical architectures without special or custom versions.

Molex technology provides future scalability and flexibility by supporting Generation 1 PCle data rates at 2.5Gbps through Generation 2 data rates of 5.0 Gbps.

The broad usage and versatility of this technology allows for cabled-system extensions to external I/O subsystems, meeting the needs for specific applications which include:

- Split systems or disaggregate PCs, desktop consoles that contain removable media drives, memory modules, I/O ports and audio jacks
- 1/0 expansion to extend the I/O card capabilities of the main system for support of different form factors, including legacy systems for test and measurement and for instrumentation
- Server expansion I/O to support conventional PCI Express add-in cards and express modules
- Graphic subsystems (controller and memory) located external to the main system

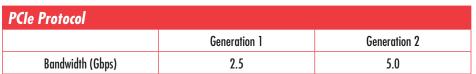
PCIe connectors and cables from Molex are available in multiple configurations including a high durability x1 configuration (rated for 1500 mating cycles) and x4, x8 and x16 configurations (rated for 250 mating cycles). In addition, test boards are available to meet customer evaluation and development requirements.



x1 18-Circuit TDP™



x4 38-Circuit iPass™



For more detailed product information visit the following Molex sites:

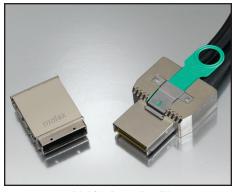
- http://www.molex.com/product/iPass.html
- http://www.molex.com/product/pciexpress.html

For more information on the specification:

http://www.pcisig.com/specifications/pciexpress



x8 68-Circuit iPass™



x16 136-Circuit iPass™



nolex® External PCI Express (PCIe)

0.64mm (.025") Pitch PCle x1

x1 Receptacle (Series 74150)

Reference Information

Packaging: Tape and reel UL File No.: Pending CSA File No.: Pendina Mates With: Series 74155 Plug **Designed In: Millimeters**

Electrical

Voltage: 40V

Current: 1.5A per contact

Contact Resistance: 20 milliohm max. (20 milliohms max. at initial, and only 10 milliohm max. change from initial)

Dielectric Withstanding Voltage: 500V Insulation Resistance: 100 Megohms min. Impedence: 100 +/-10 Ohms differential

Mechanical

Contact Insertion Force: 0.60N (0.13 lbf) per circuit Insertion Force to PCB: 44.50N (10.00 lbf) total Mating Force: 11.17N (2.51 lbf) per circuit Unmating Force: 6.7N (1.5 lbf) per circuit

Durability: Meets the PCIe durability requirements for 1,500 cycles

Housing: Black LCP UL 94V-0 Contact: Copper (Cu) Alloy Plating: Contact Area — 15µ" (0.38µm) Gold (Au) Solder Tail Area — Matte Tin (Sn)

Underplating — Nickel (Ni) RoHS Compliant: Yes

Operating Temperature: -20 to +85°C

x1 Plug (Series 74155)

Reference Information

Packaging: Tube UL File No.: Pending CSA File No.: Pending Mates With: Series 74150 Receptacle

Designed In: Millimeters

Electrical

Voltage: 40V

Current: 1.5A per contact

Contact Resistance: 20 milliohms max. (20 milliohms max. at initial, and only 10 milliohm max. change from initial)

Dielectric Withstanding Voltage: 500V Insulation Resistance: 100 Megohms min. Impedence: 100 +/-10 Ohms differential

Mechanical

Contact Insertion Force: 0.60N (0.13 lbf) per circuit Insertion Force to PCB: 44.50N (10.00 lbf) total Mating Force: 11.17N (2.51 lbf) per circuit Unmating Force: 6.7N (1.5 lbf) per circuit

Durability: Meets the PCIe durability requirements for 1,500 cycles

Housing: Black LCP UL 94V-0 Contact: Phosphor Bronze Alloy Contact Area — 15µ" (0.38µm) Gold (Au) Solder Tail Area — Matte Tin (Sn) Underplating — Nickel (Ni) RoHS Compliant: Yes

Operating Temperature: -20 to +85°C

x1 Cables (Series 74576)

Reference Information

Mates With: Series 74150 Receptacle, use with series 74155 Plug **Designed In: Millimeters**

Electrical

Voltage: 40V

Current: 1.5A per contact

Impedence: 100 +/-10 Ohms differential

Mechanical

Durability: Meets the PCIe durability requirements for 1,500 cycles Bend radius: 24AWG = 29.25mm (1.151")

28AWG = 26.10mm (1.028")Bend cycle: 100 cycles

Physical

Standard Overmold Cable Color: Black

RoHS Compliant: Yes

Operating Temperature: -40 to +85°C

0.80mm (.031") Pitch PCle x4, x8

x4 and x8 Receptacle (Series 75586)

Reference Information

Packaging: Tape and Reel **UL File No.: Pending** CSA File No.: Pending

Mates With: Series 74546 Cable Assembly Use With: Series 74540 Guide Frame **Designed In: Millimeters**

Electrical

Voltage: 30V Current: 0.5A max.

Contact Resistance: 30 milliohms Dielectric Withstanding Voltage: 500V AC Insulation Resistance: 1000 Megohms min.

Mechanical

Contact Retention to Housing: 4.45N (1 lbf) Mating Force: 1.25N (0.28 lbf) per circuit Unmating Force: 0.25N (0.06 lbf) per circuit Durability: 250 cycles

Physical

Housing: High-Temperature Thermoplastic Glass Filled , UL 94V-O, Black Contact: Copper (Cu) Alloy

Contact Area — 15µ" (0.38µm) or 30µ" (0.76µm) Gold (Au)

Solder Tail Area — Tin (Sn) Under Plating — Nickel (Ni) RoHS Compliant: Yes

Operating Temperature: -40 to +85°C

x4 and x8 Guide Frame (Series 74540)

Reference Information

Packaging: Tray

Mates With: Series 74546 Cable Assembly

Designed In: Millimeters

Mechanical

Retention to PCB: Threaded Screw (M2)

Physical

Housing: Zinc (Zn) diecast Plating: Nickel (Ni) over Tin (Sn) RoHS compliant: Yes

Operating Temperature: -20 to +85°C

x4 and x8 Cable Assembly (Series 74546)

Reference Information

Packaging: Box UL File No.: Pending CSA File No.: Pending Mates With: Series 75586 Use With: Series 74540 **Designed In: Millimeters**

Electrical

Voltage: 30V Current: 1.0A

Contact Resistance: 30 milliohms Dielectric Withstanding Voltage: 240V Insulation Resistance: 40 Meaohms

Mechanical

Latch to Cage Retention Force: 88.96N (20 lbf) min. x4 Mating Force: 40N (9 lbf) max. x4 Unmating Force: 21N (4.72 lbf) max. x8 Mating Force: 62.2 (13.98 lbf) max. x8 Unmating Force: 34.3N (7.71 lbf) max. Durability: 250 cycles

Physical:

Cable Housing: Zinc (Zn)die cast PCB Contact: Gold (Au) over Nickel (Ni) Housing Plating: Nickel (Ni) over Zinc (Zn) RoHS Compliant: Yes Operating Temperature: -40 to +85°C

0.80mm (.031") Pitch PCle x 16

x16 Integrated Stacked Connector and Cable Assembly (Series 75581)

Reference Information

Packagina: Travs UL File No.: Pending CSA File No.: Pending

Mates With: Series 74546 Cable Assembly

Designed In: Millimeters

Electrical

Voltage: 30V Current: 0.5A

Remove Contact Resistance

Dielectric Withstanding Voltage: 500V AC Insulation Resistance: 1000 Megohms min.

Mechanical

Matina Force: 1.17N per circuit Unmating Force: 0.78 N per circuit Durability: 250 cycles

Physical

Housina: LCP

Contact: Copper (Cu) Alloy

Contact Area — 15µ" (0.38µm) or 30µ" (0.76µm) Gold (Au) Solder Tail Area — 100µ" (0.25µm) Tin (Sn) min. Under plating — 50µ" (0.13µm) Nickel (Ni)

PCB Thickness: 1.77mm (.070") min.

RoHS Compliant: Yes

Operating Temperature: -40 to +85°C

x16 Cable (Series 74546)

Reference Information

Packaging: Box UL File No.: Pending CSA File No.: Pending

Mates With: Series 75581 Integrated Connector and Cage Assembly

Designed In: Millimeters

Electrical

Voltage: 30V Current: 1.0A

Contact Resistance: 30 milliohms Dielectric Withstanding Voltage: 240V Insulation Resistance: 40 Megohms

Mechanical

Latch to Cage Retention Force: 88.96N (20 lbf) min. Mating Force: 109.4N (24.59 lbf) max. Unmating Force: 62.6 (14.07 lbf) max. Durability: 250 cycles

Cable Housing: Zinc (Zn) die cast PCB Contact: Gold (Au) over Nickel (Ni) Housing Plating: Nickel (Ni) over Zinc (Zn) RoHS Compliant: Yes

Operating Temperature: -40 to +85°C

APPLICATIONS



0.64mm (.025") Pitch PCle x1, 18 Circuit

74150 Receptacle **74155** Plug

74962 Hex Jack Post

74576 Cable Assembly

Computers

- Modular I/O hubs

- High-speed peripheral devices

- Notebooks

- Express Card

Consumer devices

- HDTV consol stations and devices

- TV tuners

- High-end device interconnection

- CAD stations

Industrial

Test equipment

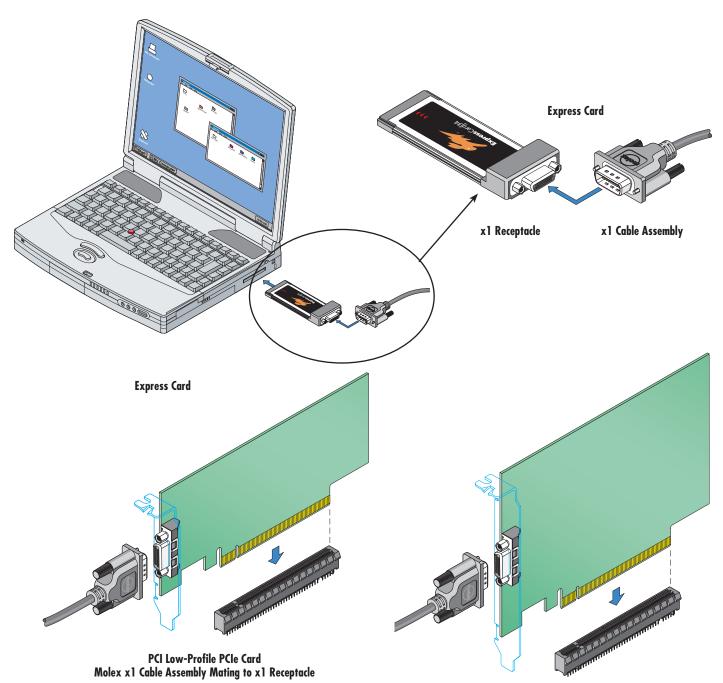
- High-end digital cameras

Instrumentation equipment

- Document cameras

- High-end printers

■ Medical imaging



PCI Standard PCIe Card
Molex x1 Cable Assembly Mating to x1 Receptacle



molex® 0.64mm (.025") Pitch PCle x1, 18 Circuit

74150 Receptacle **74155** Plug 74962 Hex Jack Post 74576 Cable Assembly

			7 7 7 Cubic Assembly
Receptacle			
	Order No.	Component	Features and Benefits
	74150-0001	Receptacle	Shielded, dual-row cable-to-board, input/output system for high speed and controlled impedance
• •	74962-0001	Jackpost	Tape-and-reel packaging for receptacle allows high-volume PCB processing
Plug			■ 1,500 mating cycles with 15µ" Gold for high reliability
	Order No.	Tail Plating	
		Tin	Split-beam receptacle contact provides 2 points of contact, assuring optimal signal integrity
			■ 1.5A continuous power per pin allows for higher power throughput
	74155-0001*		Lead-free process compatible and RoHS compliant to meet future manufacturing requirements
			■ SMT solder tails meet current SMT process requirements
			Data rates up to 5 Gbps with 100 Ohm impedance designed for high-speed and high-performance applications
	74155-0002	Nickel	Low mating and un-mating force (42 grams per contact) for ease of mating and un-mating
			Two first-mate/last-break (FMLB) terminals on the plug prevent damage to electrical circuitry in the system by having the ground pin mate first
Cable Assembly			
•	Order No.	Cable Length	Features and Benefits
_	74576-0000	0.5m (1.64')	■ Standard and custom cable assembly product offering provides cable
	74576-0001	1.0m (3.28')	solutions for virtually any application
	74576-0003	3.0m (9.84')	■ 360° electromagnetic interference (EMI) shielding for EMI and radio frequency interference (RFI) protection
	74576-0004	4.0m (13.12')	 Overmold finish provides a firm-grip surface and an attractive finish at a competitive cost
	74576-0005	5.0m (16.40')	■ 4/40 jackscrews assure reliable mating retention
	74576-0006	6.0m (19.68')	Generation I and II PCIe compliant to ensure flexibility for system
	74576-0007	7.0m (22.96′)	upgrades

^{*}Denotes most popular and readily available version.

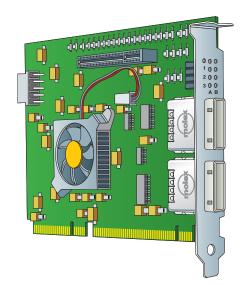
APPLICATIONS

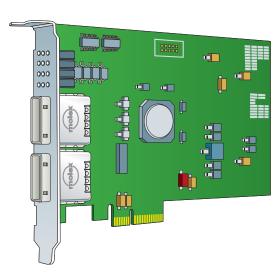
- - 0.80mm (.031") Pitch PCle x4 and x8
 - 38 (x4) and 68 (x8) Circuit
 - **75586 SMT Host Connector**
 - 74540 Guide Frame 74546 Cable Assembly

- Server storage
 - HBAs (Host Bus Adapters)
 - Servers and server expansion (add-in cards)
 - Storage racks
 - Switches and routers
 - RAIDs (Redundant Array of Individual Discs)
 - JBODs (Just a Bunch of Discs)
- Networking equipment

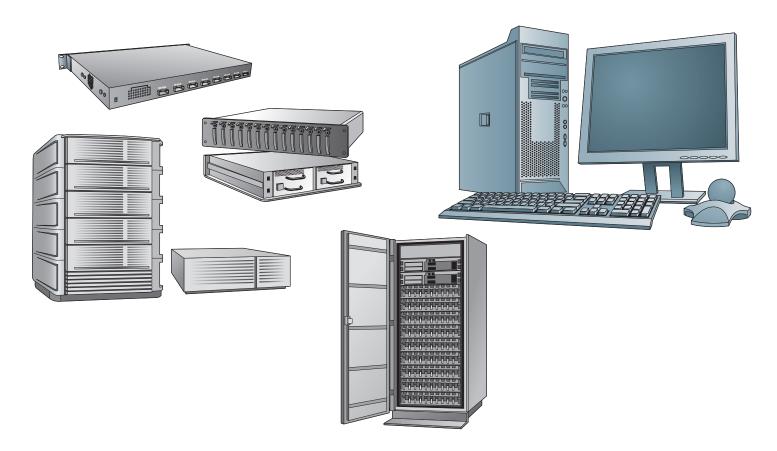
- Computer applications
 Industrial computers

 - Workstations
 - Split systems
 - Removable media drives
 - Memory modules
 - Graphic subsystems
 - Networking





x4 External Application PCIe Expansion Link Card





nolex 0.80mm (.031") Pitch PCle x4 and x8 38 (x4) and 68 (x8) Circuit

> **75586 SMT Host Connector** 74540 Guide Frame 74546 Cable Assembly

SMT External Host Con					
	Order No.	Lane	Circuits	Plating	Features and Benefits
	75586-0010	х4	38	15μ" Gold	 0.80mm (.031") pitch SMT host connector designed for placement beneath guide frame is ideal for external applications
	75586-0011	х4	38	30μ" Gold	■ High-temperature thermoplastic housing withstands lead-free processing
	75586-0002	x8	68	15µ" Gold	Alignment posts provide stability for placement on the PCB
	75586-0007	x8	68	30μ" Gold	■ SMT design allows for ease of routing and provides the option for placement on both sides of the PCB
Guide Frame					
- Charles	Order No.	Lane	Degree	Application	Features and Benefits
Circles /	74540-0401	x4	1	PCIe add-in cards	Diecast guide frame provides robust cable-to-chassis interface
					■ Guide frame panel-mount gaskets povide improved EMI
	74540-0501	x4	0	Standard host boards	performance Screw attachment for the guide frame to the PCB provides a
	74540 0101	•	,	nci II. I	durable Input/Output connection for large cable bundles during the cable management process
	74540-0101	x8	1	PCIe add-in cards	■ Multiple guide frame configurations provide board design
	74540-0201	х8	0	Standard host boards	flexibility Alignment posts provide stability for placement on the PCB
Cable Assembly					
	Order No.	Lane		Length	Features and Benefits
	74546-0401		1.0m (3.28') 2.0m (6.56') 3.0m (9.84') 4.0m (13.12')		 Reduced plug width allows customers to populate 2, x4 ports and 2, x8 ports on a standard PCI Express card Streamlined, narrow, latch-pull design allows for more dense cab management applications
	74546-0402				
	74546-0403				
	74546-0404	x4			
	74546-0405		5.0m (16.40')		Flexible color-coded latch-pull provides an intuitive latch and unlatch mechanism and identifies PCIe applications
	74546-0406		6.0m (19.68')		
	74546-0407		7.	Om (22.96')	■ Lower external-plug profile reduces cable bend radius versus standard 4x LaneLink™ cable assemblies
	74546-0801		1.	.0m (3.28')	
	74546-0802		2.0m (6.56')		Integrated EMI gaskets in the back shell assembly and mating snout provide EMI seal to case interface and reduces emissions from the back shell seams
	74546-0803		3.0m (9.84')		
	74546-0804	x8	4.0m (13.12')		■ High-performance paddle card design provides improved
	74546-0805		5.0	Om (16.40')	impedance control and minimizes crosstalk
	74546-0806		6.0	Om (19.68')	
	74546-0807		7.0m (22.96')		

1 Lane = 1 transmit pair plus 1 receive pair, per the PCIe specification.

Note: PCIe transition cables are available in x4 to x1 and x8 to x4 configurations. Contact Molex for availability.

APPLICATIONS

- Switches

- Routers

0.80mm (.031") Pitch

PCle x16, 136 Circuit

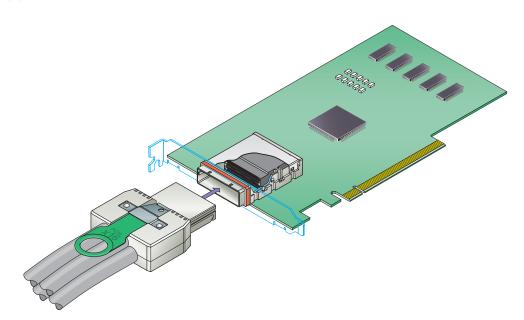
75581 Integrated Stacked Connector and Cage Assembly 74546 Cable Assembly

- High-end graphic cards (gaming)
- PCIe add-in cards
- Industrial computer systems
- Datacommunication equipment

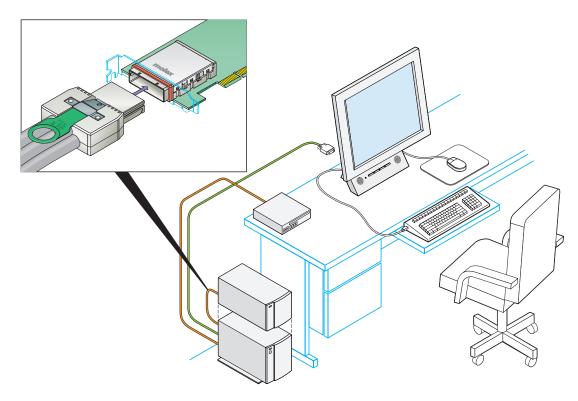
■ Networking and storage equipment

- High-end and mid-range servers
- Workstations

- Storage racks



Graphic Card with Integrated Stacked Connector and Cage Assembly Mounted



External Graphic Box with Cable Assembly Mating to Integrated Stacked Connector and Cage Assembly



75581 Integrated Stacked Connector and Cage Assembly 74546 Cable Assembly

	Order No.	Circuits	Plating	Features and Benefits
	75581-0001	136	15µ" Gold	Integrated press-fit connector assembly with cage provides one-step placement to PCB
				Four integral screw-mount hold downs applied from bottom of PCB provide optimal retention of die-cast assembly to PCI without taking up additional board real estate
				Low-profile height [13.13mm (.517")] accomodates standard and low-profile PCIe add-in cards
				Two robust guide pins located on each side ensure assembly alignment to PCB
	75581-0002	136	30µ" Gold	■ Front elastomeric gasket provides improved EMI protection to face plate
				■ Eight ground-pad alleys are located at the rear of the die- cast assembly providing ease of routing off top layers of PC
Cable Assembly				
-				
	Order No.	Le	ngth	Features and Benefits
	Order No. 74546-1601		(3.28')	■ Streamlined, narrow, latch-pull design allows for more dens
		1.0m	-	 Streamlined, narrow, latch-pull design allows for more dens cable management applications Flexible latch-pull provides an intuitive latch and unlatch
	74546-1601	1.0m 2.0m	(3.28′)	 Streamlined, narrow, latch-pull design allows for more dens cable management applications Flexible latch-pull provides an intuitive latch and unlatch mechanism
	74546-1601 74546-1602	1.0m 2.0m 3.0m	(3.28')	 Streamlined, narrow, latch-pull design allows for more dens cable management applications Flexible latch-pull provides an intuitive latch and unlatch
	74546-1601 74546-1602 74546-1603	1.0m 2.0m 3.0m 4.0m	(3.28') (6.56') (9.84')	 Streamlined, narrow, latch-pull design allows for more dens cable management applications Flexible latch-pull provides an intuitive latch and unlatch mechanism Reduced plug width using dual paddle card design allows 32 differential pair on a standard card (PCI standard, half
	74546-1601 74546-1602 74546-1603 74546-1604	1.0m 2.0m 3.0m 4.0m ((3.28') (6.56') (9.84') (13.12')	 Streamlined, narrow, latch-pull design allows for more dens cable management applications Flexible latch-pull provides an intuitive latch and unlatch mechanism Reduced plug width using dual paddle card design allows 32 differential pair on a standard card (PCI standard, half height, AMC) Integrated EMI gaskets in the back shell assembly and

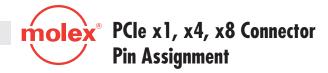
 $1 \; \text{Lane} = 1 \; \text{transmit} \; \text{pair} \; \text{plus} \; 1 \; \text{receive} \; \text{pair}, \; \text{per} \; \text{the PCle specification}.$

Note: PCIe transition cables are available in x16 to x8 configurations. Contact Molex for availability.



x1, x4, x8, x16

Test Boards x 1				
	Order No.	Lane	Circuits	Features and Benefits
	73931-2752	хl	18	 High-speed, low-loss material (Nelco) Compression contact SMAs Electrical length and impedance matched traces Cal traces (short, open and load) so the effects of the board can be minimized x1 includes provisions for connector housings and brackets
Test Boards x4, x8, x16				Supports creation of s-parameter models for PCIe cable assemblies
y - y - y - y - y - y - y - y - y - y -	73931-2642	x4	38	
	73931-2652	х8	68	
o distribution of the second o	73931-2662	x16	136	



x1 Connector Pin Assignment			
Pin Numbers	Signals	Description	
A1-A2	PERO	Differential PCI Express Receiver Lanes	
A3	RSVD	Reserved	
Α4	SB_RTN	Signal Return for Single-Ended Sideband Signals	
A5-A6	CREFCLK	Differential 100 MHz Cable Reference Clock	
A7	PWR_RTN	Return for +3.3V Power (Optional)	
A8	CPERST#	Cable PERST#	
А9	GND	Ground Reference for PCI Express Transmitter Lane	
B1	GND	Ground Reference for PCI Express Receiver Lane	
B2	RSVD	Reserved	
B3	CWAKE#	Power Management Signal for Wakeup Events (Optional)	
B4	CPRSNT#	Cable Installed / Downstream Subsystem Powered-up	
B5	GND	Ground Reference for Cable Reference Clock	
B6	PWR	+3.3V Power (Optional)	
B7	CPWRON	Upstream Subsystem's Power Valid Notification	
B8-B9	PETO PETO	Differential PCI Express Transmitter Lanes	

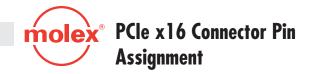
Reference: PCI Express External Cabling Specification, Section 5.2.1, Table 5-1

x4 Connector Pin Assignment			
Pin Numbers	Signals	Description	
A1-A13	PETO-PET3	Differential PCI Express Transmitter Lanes	
A14-A16	CREFCLK	Differential 100 MHz Cable Reference Clock	
A17	SB_RTN	Signal Return for Single-Ended Sideband Signals	
A18	CPRSNT#	Cable Installed / Downstream Subsystem Powered-up	
A19	CPWRON Upstream Subsystem's Power Valid Notification		
B1-B13	PERO-PER3	Differential PCI Express Receiver Lanes	
B14-B15	PWR	+3.3V Power (Optional)	
B16-B17	PWR_RTN	Return for +3.3V Power (Optional)	
B18	CWAKE#	Power Management Signal for Wakeup Events (Optional)	
B19	CPERST#	Cable PERST#	

Reference: PCI Express External Cabling Specification, Section 5.3.1, Table 5-9

x8 Connector Pin Assignment			
Pin Numbers	Signals	Description	
A1-A13	PETO-PET3	Differential PCI Express Transmitter Lanes	
A14-A16	CREFCLK	Differential 100 MHz Cable Reference Clock	
A17-A18	RSVD	Reserved	
A19	SB_RTN	Signal Return for Single-Ended Sideband Signals	
A20	CPRSNT#	Cable Installed / Downstream Subsystem Powered-up	
A21	CPWRON	Upstream Subsystem's Power Valid Notification	
A22-A34	PET4-PET7	Differential PCI Express Transmitter Lanes	
B1-B13	PERO-PER3	Differential PCI Express Receiver Lanes	
B14-B16	PWR	+3.3V Power (Optional)	
B17-B19	PWR_RTN	Return for 3.3V Power (Optional)	
B20	CWAKE#	Power Managment Signal for Wakeup Events (Optional)	
B21	CPERST#	Cable PERST#	
B-22-B34	PER4-PER7	Differential PCI Express Receiver Lanes	

Reference: PCI Express External Cabling Specification, Section 5.4.1, Table 5-16.



x16 Connector Pin Assignment			
Pin Numbers	Signals	Description	
A1-A13	PER1-PER7	Differential PCI Express Receiver Lanes (odd # lanes)	
A14-A16	PWR	+3.3V Power (Optional)	
A17	SB_RTN	Signal Return for Single-Ended Sideband Signals	
A18-A20	CREFCLK	Differential 100 MHz Cable Reference Clock	
A21-A33	PER9-PER15	Differential PCI Express Receiver Lanes (odd # lanes)	
A34	RSVD	Reserved	
B1-B13	PERO-PER6	Differential PCI Express Receiver Lanes (even # lanes)	
B14-B16	PWR_RTN	Return for 3.3V Power (Optional)	
B17	CPWRON	Upstream Subsystem's Power Valid Notification	
B18	CWAKE#	Power Management Signal for Wakeup Events (Optional)	
B19	CPRSNT#	Cable Installed / Downstream Subsystem Powered-up	
B20	CPERST#	Cable PERST#	
B21-B33	PER8-PER14	Differential PCI Express Receiver Lanes (even # lanes)	
B34	RSVD	Reserved	
C1-C13	PET1-PET7	Differential PCI Express Transmitter Lanes (odd # lanes)	
C14-C16	PWR	+3.3V Power (Optional)	
C17-C20	RSVD	Reserved	
C21-C33	PET9-PET15	Differential PCI Express Transmitter Lanes (odd # lanes)	
C34	RSVD	Reserved	
D1-D13	PETO-PET6	Differential PCI Express Transmitter Lanes (even # lanes)	
D14-D16	PWR_RTN	Return for +3.3V Power (Optional)	
D17-D20	RSVD	Reserved	
D21-D33	PET8-PET14	Differential PCI Express Transmitter Lanes (even # lanes)	
D34	RSVD	Reserved	

Reference: PCI Express External Cabling Specification, Section 5.5.1, Table 5-23

Note: Above pin outs are based on PCI Express™ External Cabling Specification Revision 0.7 dated 2/06