



Integrated Device Technology

# PCI Express® Solutions

Comprehensive Portfolio from the Leader in PCI Express Solutions

POWER MANAGEMENT | ANALOG & RF | INTERFACE & CONNECTIVITY | CLOCKS & TIMING | MEMORY & LOGIC | TOUCH & USER INTERFACE | VIDEO & DISPLAY | AUDIO

## PCI Express Switches

Industry's most comprehensive family of high-performance, scalable PCIe switching solutions

- Extensive Portfolio
- Up to 64 lane and 24 port devices
- Highly flexible port configurations
- Unprecedented 8 non-transparent bridging (NTB) functions to enable multi-root applications

## PCI Express Bridges

High performance PCIe bridging to legacy PCI and PCI-X protocols

- Ultra low power version for consumer applications
- Forward mode buffer optimization
- The only PCI Express bridges with Short Term Caching for significant improvement in PCI Read performance
- Pin compatible with competitive offerings for dual source solution

## PCI Express Signal Repeaters and Retimers

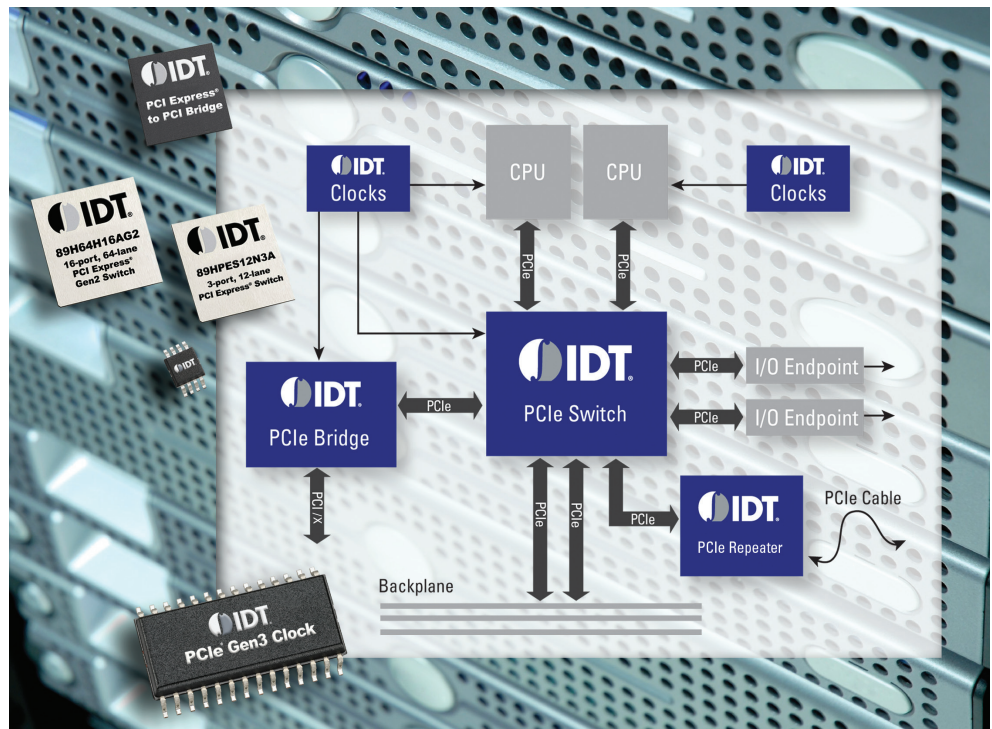
Active signal conditioning for applications up to 8Gbps PCIe Gen 3

- Four, eight and sixteen channels
- Compensates for cable and PCB trace attenuation and ISI jitter
- Configurable receiver equalization
- Configurable transmitter de-emphasis
- On-chip diagnostics support
- Leading edge power minimization in active and shutdown modes
- Mux / Demux modes provided

## PCI Express Timing Solutions

Industry's broadest offering of PCIe Gen1, Gen2 and Gen3 clock generation and buffering solutions

- World's first PCI Express Gen3 family of timing devices
- Industry's most accurate all-silicon CMOS oscillator
- Clock Generators and Synthesizers
- Spread Spectrum Clock Generators
- Fanout Buffers and Muxes
- Jitter Attenuators
- Frequency Translators
- Zero Delay Buffers



PCI Express (PCIe) is globally recognized as the general purpose I/O that unifies the component interconnect across many applications including desktop computing, servers, workstations, storage, networking, enterprise router, industrial test and control equipment, defense, aerospace and many more.

IDT provides an extensive product portfolio that tackles design requirements needed to build an entire PCI Express network, including switches, bridges, signal integrity and timing solutions.

### Switches

- I/O Expansion Switches
- System Interconnect Switches

### Bridges

- PCIe to PCI / PCI-X Bridges
- PCI-X to PCI-X Bridges
- PCI to PCI Bridges

### Signal Integrity Products

- Repeaters
- Retimers

### Timing

- Clock synthesizers & Spread spectrum clock generators
- PLL zero-delay buffers (ZDB)
- Non-PLL fanout buffers and muxes
- Jitter Attenuators
- All-silicon CMOS Oscillators

**PCI Express switches** provide the switching capacity for the entire PCI Express network.

**PCI Express bridges** provide connectivity between PCI Express and a different interconnect protocol.

**PCI Express signal integrity** is signal conditioning to remove signal noise and correct for trace/cable attenuation.

**PCI Express timing** provides the reference-clock while maintaining tight jitter specifications for all components.



Learn more:

[www.idt.com/go/PCIe](http://www.idt.com/go/PCIe)

## PCI Express® Switches

Featuring Dual DMA, Multiple NTB, Multicast; Configurations 3 to 64 Lanes and 3 to 24 Ports

IDT provides the industry's most comprehensive family of high performance, scalable PCI Express switching solutions. PCIe® Gen1 and Gen2 switching solutions are optimized by application to maximize performance per watt for the most demanding applications.

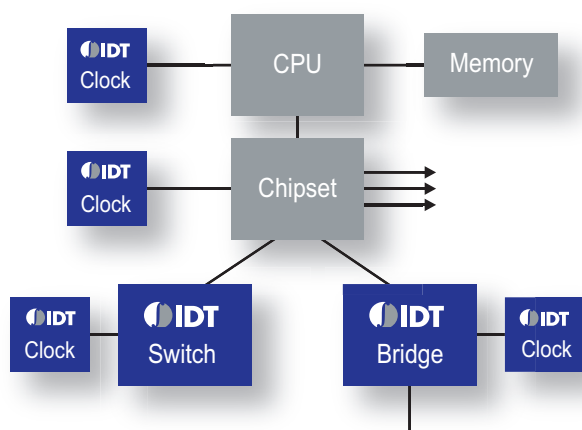
IDT "I/O Expansion PCIe Switches" are commonly used to connect a single Root Complex to I/O devices and add-in cards. In this usage

model, the majority of traffic flows between the Root Complex and the I/O devices.

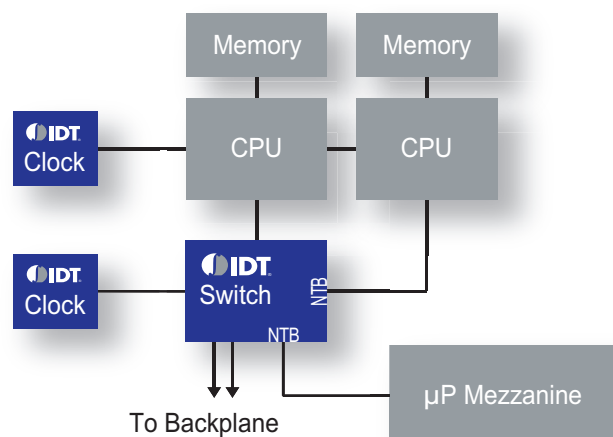
The other primary usage model is using a PCIe switch as an embedded system fabric referred to as "System Interconnect Switch," which utilizes a high degree of peer-to-peer traffic. The System Interconnect Switch is capable of PCIe domain isolation, which may involve connecting multiple processing endpoints or simply providing a redundant backplane architecture.

### FEATURES

- Most advanced switching architecture available
  - Switch partitioning
  - Adaptive cut-through latency
  - Request metering
  - Large flow control credits and buffers
- Enables multi-domain communication in multi-root applications
  - Multiple Non-Transparent Bridge functions
  - Multi-port timing domain and Spread Spectrum Clock support
  - Multicast
  - Dual DMA controllers



Example: I/O Expansion Server Motherboard



Example: System Interconnect Embedded Blade

## PCI Express Gen 2 Switches

Part Number*	Lanes	Ports	Switch Partitions (Multi-Root)	NTB ports (Multi-Root ID)	DMA Controllers	Multicast	Adaptive Cut-through	Multi-Domain Clocking	Request Metering	Temperature Sensor	Package Size (mm)
89H64H16AG2	64	16	16	-	-	✓	✓	16	✓	-	35x35
89H48H12G2	48	12	12	-	-	✓	✓	12	✓	-	27x27
89H32NT24AG2	32	24	8	8	2	✓	✓	8	✓	✓	23x23
89H32NT8AG2	32	8	8	8	2	✓	✓	8	✓	✓	23x23
89H24NT6AG2	24	6	6	6	2	✓	✓	6	✓	✓	23x23
89H24NT24G2	24	24	8	8	2	✓	✓	2	✓	✓	23x23
89H16NT16G2	16	16	4	4	2	✓	✓	2	✓	✓	19x19
89H12NT12G2	12	12	3	3	2	✓	✓	2	✓	✓	19x19
89HPES6T6G2	6	6	-	-	-	-	-	-	-	-	19x19
89HPES4T4G2	4	4	-	-	-	-	-	-	-	-	19x19

## PCI Express Gen 1 Switches

Part Number*	Lanes	Ports	Package Size (mm)
89HPES64H16	64	16	35x35
89HPES48H12	48	12	35x35
89HPES34H16	34	16	35x35
89HPES32H8	32	8	31x31
89HPES16H16	16	16	23x23
89HPES8T5A	8	5	15x15
89HPES6T5	6	5	15x15
89HPES5T5	5	5	15x15
89HPES4T4	4	4	15x15
89HPES3T3	3	3	10x10

\* Additional products and information available — [www.idt.com/go/PCleSwitches](http://www.idt.com/go/PCleSwitches)

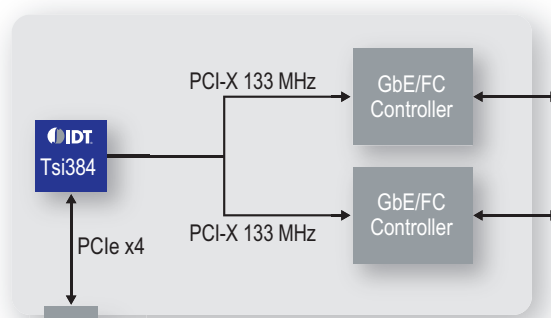
## PCI Express Bridges

### PCIe to PCI and PCI-X Bus Standards

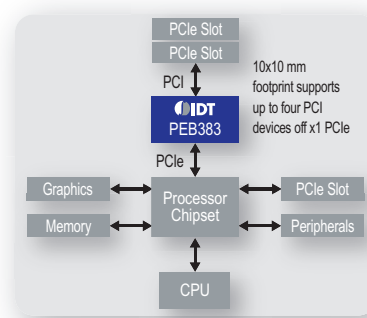
To complement the switch products, IDT offers bridges to connect PCIe to the PCI and PCI-X bus standards. A PCIe bridge is used for bridging devices that use the PCI/X interface to provide a PCIe connection to a host processor or root complex. Applications include PCIe adapter cards, embedded computing, and motherboards to provide connection to PCI/X devices or additional PCI/X expansion slots.

### FEATURES

- Compliant to PCIe 1.1 specification
- Low latency & high throughput features
- Proven interoperability
- Small footprint packages
- Simple power supply requirements
- Comprehensive design tools



Example: Storage HBA



Example: Motherboard Application

Bridge	Part Number*	PCIe	PCI	Short Term Caching	External Master Support	Non-Transparent Bridging	Power	Package Size (mm)
PCIe to PCI	PEB383	x1 Gen1	32/66	✓	4	✓	450 mW 130 mW standby	14x14 QFP 10x10 QFN
PCIe to PCI	Tsi382	x1 Gen1	32/66	✓	4	✓	700 mW	20x20 QFP 10x10 PBGA
PCIe to PCI	Tsi381	x1 Gen1	32/66	✓	4	✓	700 mW	13x13 PBGA
PCIe to PCI-X	Tsi384	x4 Gen1	64/133	✓	4	✓	1.3 W	17x17 PBGA
PCI-X to PCI-X	Tsi310		64/133	✓	6		3.0 W	31x31 BGA
PCI to PCI	Tsi352		32/66		4		0.5 W	32x32 QFP
PCI to PCI	Tsi350A		32/66		9		1.0 W	25x25 QFP 15x15 BGA
PCI to PCI	Tsi340		32/66		4		0.5 W	23x17 mm QFP

Contact an IDT representative for details on pin compatibility with comparable solutions.

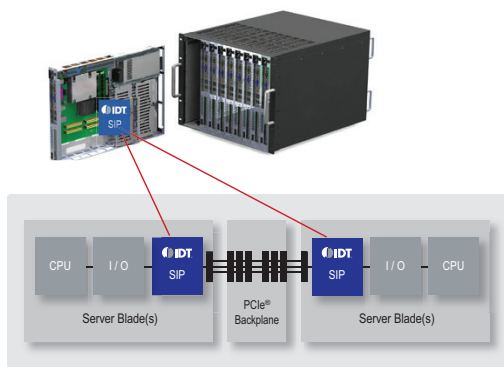
\* Additional products and information available — [www.idt.com/go/PCIEBridges](http://www.idt.com/go/PCIEBridges)

## PCI Express Signal Integrity Products

### PCIe Gen 3 and Gen2 Standards

With the increase of signal speeds in the computing, storage and communications applications, system designers increasingly face signal integrity challenges. Signal Integrity Product (SIP) components provide signal conditioning for applications up to 8Gbps, PCI Express 3.0, delivering signal quality over extended distances while offering simplified design by alleviating board layout constraints.

These devices incorporate advanced receive equalization and transmit de-emphasis capabilities, as well as diagnostic features that help IDT customers achieve a simplified design with faster time-to-market. Specifically, the devices drive long on-board traces, backplane traces and cables to external devices to ensure optimum system performance. The devices all offer power savings modes for the lowest-possible power consumption.



Example: Signal Conditioner Use

### FEATURES

- Extends trace over 60 inches, and cable over 10 meters
- Eliminates Deterministic Jitter (Dj), Random Jitter (Rj) and ISI (Inter-Symbol Interference)
- Optimizes system performance by reducing lost packets
- Better system reliability with increased signal voltage and timing margins
- Simplifies system design and time-to-market

Part Number*	Channels	Pin config.	I <sup>2</sup> C config.	Package	Pins
PCIe 3.0 Retimers					
89HT0808PZAAB	8	N	Y	BGA	100
89HT0816PZABC	16	N	Y	BGA	196
PCIe 2.1 Repeaters					
89HP0504PZBNR	4	N	Y	QFN	36
89HP0504PZBAB	4	Y	Y	BGA	100
89HP0504PBZBNR	4	Y	N	QFN	36
89HP0508PZBAB	8	N	Y	BGA	100

\* Additional products and information available — [www.idt.com/go/PCIESIP](http://www.idt.com/go/PCIESIP)



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## PCI Express® Timing Solutions

### Highly Integrated Clocks for PCIe-based Systems

The IDT PCI Express timing products meet or exceed the stringent PCIe SIG specification and include all the devices needed to design and manufacture top-of-the-line PCIe-based products requiring ultra-high-speed serial data transfer.

## SOLUTIONS

### Clock Synthesizers and Spread Spectrum Clock Generators

- Single-ended clock input to differential output
- Meets PCIe jitter specs at 100MHz
- Spread Spectrum feature reduces EMI

### PLL Zero-Delay Buffers (ZDB)

- Up to 19 outputs per device

### Non-PLL Fanout Buffers and Muxes

- PCIe specification compliant outputs
- 2 to 21 outputs per device
- Frequencies > 500MHz

### Jitter Attenuators

- Special purpose PLL reduces PCIe clock jitter
- 2 to 6 outputs per device

## All Silicon CMOS Oscillators

Eliminate Quartz with the World's Most Accurate CMOS Oscillators. For more information visit <http://www.idt.com/go/cmos-oscillators>

## High Performance PCIe Clock Synthesizers

Additional products and information available — [www.idt.com/go/PCIEClocks](http://www.idt.com/go/PCIEClocks)

Part Number	Description	Inputs	Outputs	Input Frequency	Output Frequency	Pins & Package
5V41064/5/6	PCIe Gen2 Clock Synthesizer. Spread Capable	1	1 / 2 / 4	25 MHz	100 MHz	16-MLF, 16/20 TSSOP
9FG104D/108D	PCIe Gen2 Clock Synthesizer. Spread Capable	1	4 / 8	14.318/ 25 MHz	100-400 MHz	28/48 SSOP, 28/48 TSSOP
9DS400/800	PCIe Gen2 Spread Generator	1	4 / 8	100 MHz	100 MHz	28/48 SSOP, 28/48 TSSOP
9FG430/830	PCIe Gen3 Clock Synthesizer. Spread Capable	1	4 / 8	14.318 MHz, 25 MHz	100-400 MHz	28/48 SSOP, 28/48 TSSOP

## Very High Performance PCIe Clock Synthesizers

Additional products and information available — [www.idt.com/go/PCIEClocks](http://www.idt.com/go/PCIEClocks)

Part Number	Description	Inputs	Outputs	Input Frequency	Output Frequency	Pins & Package
841S101 / 102 / 104	PCIe Clock Synthesizer. Gen3 jitter performance	1	1, 2 or 4	25MHz (xtal)	100MHz	16, 20, 24 TSSOP
841602 / 604 / 608	PCIe Clock Synthesizer. Gen2 jitter performance	2	2, 4, or 8	25MHz (xtal)	100, 125MHz	32 VFQFN (841608), 28 TSSOP
841N4830	PCIe Gen2 Clock Synthesizer. Low phase noise outputs.	2	6 (HCSL, CMOS, Ref_Out)	25MHz	25, 50, 100MHz	32 VFQFN
871S1022	PCIe Gen2 jitter attenuator and selectable frequency synthesizer. Low phase noise outputs. SSC capable	2 (XTAL or Diff)	4	25MHz (xtal) or 100MHz	100, 125, 250, 500MHz	32 VFQFN

## PLL Zero Delay Buffers w/Fanout Mode

Additional products and information available — [www.idt.com/go/PCIEClocks](http://www.idt.com/go/PCIEClocks)

Part Number	Description	Inputs	Outputs	Max Prop. delay	Max Output Skew	Pins & Package
9DB102/106	2/6 output PCIe Gen2 buffer	1	2/6	4.2 ns	25 ps	20 QSOP, 20/28 SSOP, 28 TSSOP
9DB403/803	4/8 output PCIe Gen2 buffer	1	4/8	4.5 ns	50 ps	28/48 SSOP, 28, 48 TSSOP
9DB423/823	4/8 output PCIe Gen2, QPI 6.4GB/s buffer	1	4/8	4.5 ns	50 ps	48 SSOP, 48 TSSOP
9DBx33	2-19 output PCIe Gen3 Buffers	1	2 / 4 / 6 8 / 12 / 19	4.5 ns	100 ps	20 / 28 / 48 / 64 / 72 QSOP / TSSOP / SSOP / MLF
9ZX21x01	PCIe Gen3, QPI 9.6GB/s buffer, low drift	1	12/15/19	4.5 ns	100 ps	56/64/72 MLF

## Non-PLL Fanout Buffers and Muxes

Additional products and information available — [www.idt.com/go/PCIEClocks](http://www.idt.com/go/PCIEClocks)

Part Number	Description	Inputs	Outputs	Max Prop Delay	Max Output Skew	Pins & Package
557-08	2 to 1 HCSL output PCIe Gen1 clock multiplexing buffer	2	1	4 ns	50 ps	16 TSSOP
557-06	2 to 4 HCSL output PCIe Gen1 clock multiplexing buffer	2	4	3 ns	50 ps	20 TSSOP
9DBL411	4 output PCIe Gen2 low power fanout buffer	1	4	3.5 ns	50 ps	20 TSSOP, 20 MLF

## PCIe Jitter Attenuators

Additional products and information available — [www.idt.com/go/PCIEClocks](http://www.idt.com/go/PCIEClocks)

Part Number	Description	Inputs	Outputs	Input Frequency	Output Frequency	Pins & Package
874003-02	PCIe. Part of Virtex5 ref. design	1	3	100MHz	100, 125, 250MHz	20 TSSOP
874003-05	PCIe Gen2. Part of Virtex6 ref. design	1	3	100MHz	100, 125, 250MHz	20 TSSOP
874001-05	PCIe Gen2. Part of Virtex6 ref. design	1	1	100MHz	100, 125, 250, 500MHz	20 TSSOP
8714004	PCIe Gen2. External feedback, low phase noise, individual output divides, MLVDS output.	1	4	19.6 - 165MHz	98 - 165MHz, individual output divides	40 VFQFN
8743004	PCIe Gen2. External feedback, low phase noise, individual output divides, MLVDS output.	1	4	19.6 - 165MHz	98 - 165MHz, individual output divides	40 VFQFN
871S1022*	PCIe Gen2. Selectable frequency synthesizer, low phase noise outputs, SSC capable	2 (XTAL or Diff)	4	25MHz (xtal) or 100MHz	100, 125, 250, 500MHz	32 VFQFN

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