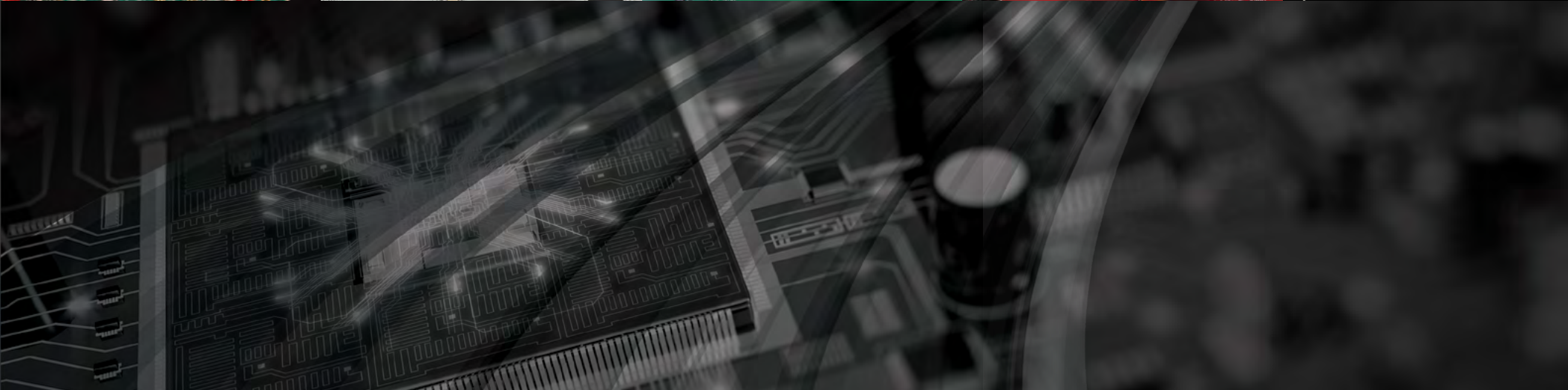
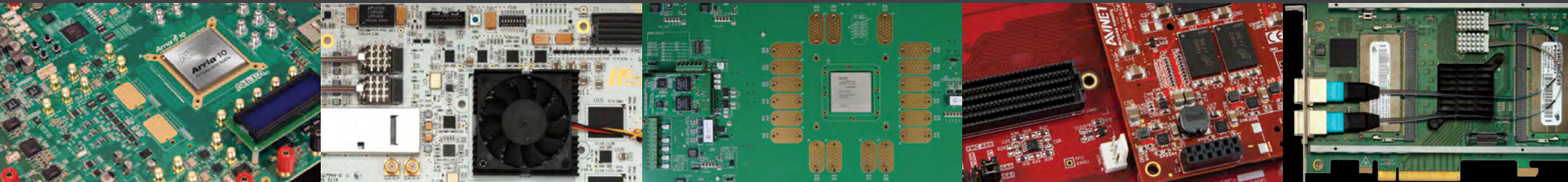


SILICON DEVELOPMENT INTERCONNECT SOLUTIONS GUIDE



SILICON DEVELOPMENT SOLUTIONS

Developers are well aware of the ever-evolving demands of designing silicon-based platforms, facing the challenge of balancing increasing data throughput and expandability requirements with concerns such as power consumption, time-to-market and cost.

Samtec has the high speed interconnect expertise and signal integrity leadership that can help take your silicon application designs to the next level. Our unique in-house expertise and support includes:

- **Samtec Optical Group:** engineering and design support of micro optical engines, active optical assemblies, and high density ganged passive optical panel solutions
- **High Data Rate Cables Group:** sophisticated design, engineering and development support for micro coax and twinax cable assemblies, including modeling, simulation, testing and manufacturing capabilities
- **Advanced Interconnect Design:** design and development of all levels of end-to-end interconnect solutions designed to make systems faster, thinner and lighter, across longer distances and with lower overall cost
- **Samtec Microelectronics Group:** advanced package and substrate design, flip chip, die attach, wirebond and sealing, as well as thermal management, wafer dicing, lid attach and marking capabilities
- **Worldwide Signal Integrity Group:** unparalleled end-to-end signal integrity support at a local level, along with access to free online data and engineer-to-engineer support for more complex applications
- **Teraspeed® Consulting,** A Division of Samtec: Tier 1 level signal integrity expertise and capabilities, including complex system design, signal integrity analysis and engineering, and in-depth training

Contact sig@samtec.com to discuss your silicon application needs.

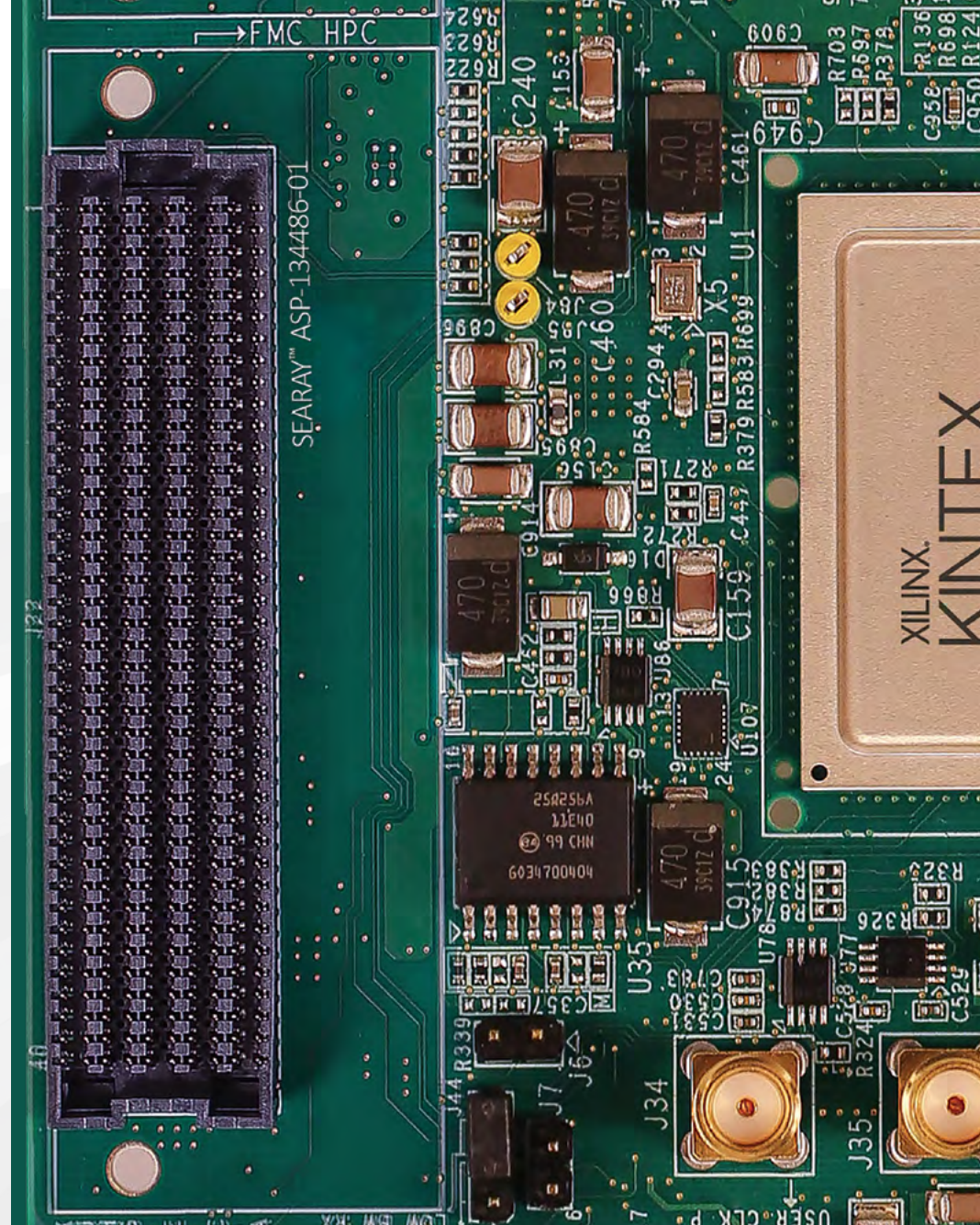


Photo courtesy of Xilinx®, featuring Samtec FMC (HPC) SEARAY™ ASP-134486-01.

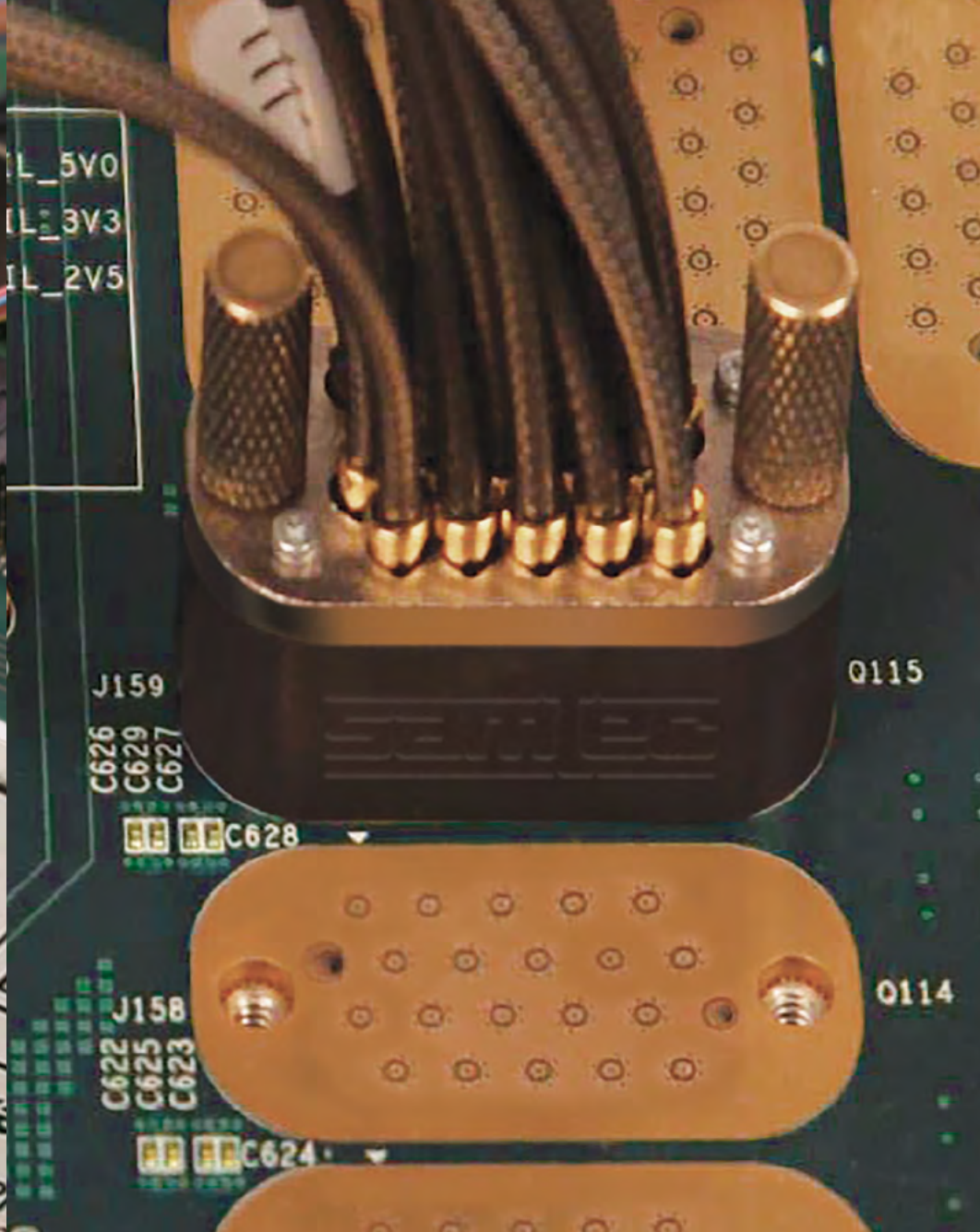
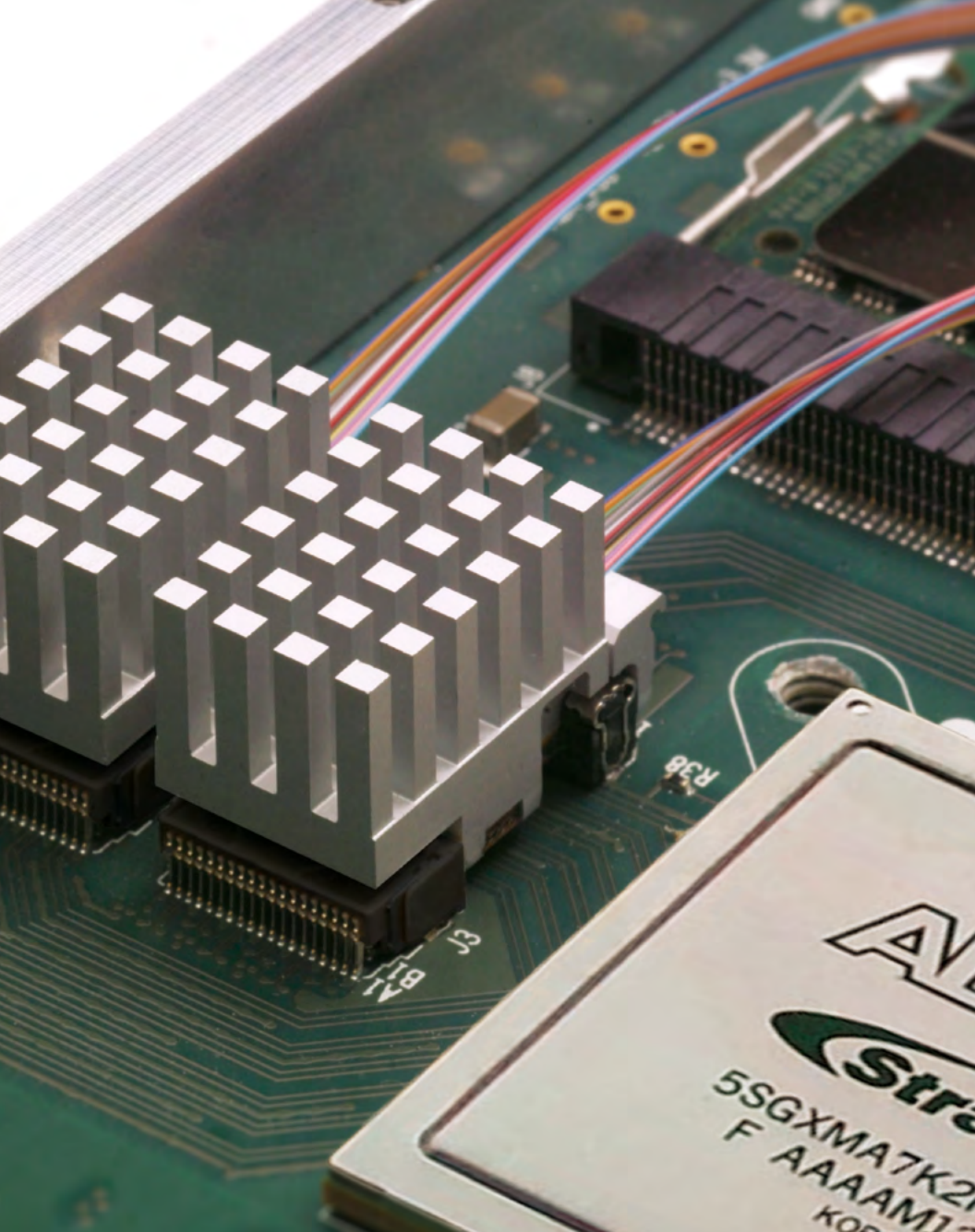


Photo courtesy of Guzik, featuring Samtec FireFly™ mid-board optical assemblies (shown with custom heat sink).

Photo courtesy of Xilinx®, featuring Samtec Bull's Eye® landing pads and cable.

SILICON DEVELOPMENT & EVALUATION

Based on Samtec's line of SEARAY™ High Density Arrays, the VITA 57.1 FPGA Mezzanine Card (FMC) Connector is an important technology for hardware and FPGA developers.

The FMC standard helps streamline the way FPGAs and mezzanine cards communicate with the host board, eliminating common challenges such as high-cost field-replaceable devices, and increasing data throughput and expandability .

FMC connectors provide design simplicity and reuse, adaptable high bandwidth performance, as well as reduced power consumption, latency and engineering time.

In addition to FMC solutions, Samtec offers a full line of high speed interconnect systems designed to support the challenges of Power Measurement, Wafer-level Testing and Chip Validation, with features such as:

- Best-in-class LLCR performance with flexibility to route signal & power in the same connector
- Stack height flexibility & pin counts to 720 I/Os
- High temperature testing for HTOL applications
- Wide variety of standard and customizable mating high data rate coax and twinax cables and shielded micro coax cables

These high speed interconnect solutions are available directly from Samtec and include:

- SEARAY™ High Density Arrays
- Z-Ray® Ultra Micro Interposers
- Q Series® High Speed Interconnects
- Q Rate® and Edge Rate® Rugged High Speed Interconnect Systems

Contact sig@samtec.com to learn more.

Contact Xilinx® and Altera® for information related to development kits and programmable devices. PCIe® is a registered trademark of PCI-SIG®.

XILINX® KINTEX® ULTRASCALE™ FPGA KCU105 EVALUATION KIT

DESCRIPTION

FPGA development environment optimized for quickly prototyping applications requiring PCIe® Gen3, DDR4 and FMC-based solutions like JESD204b using Xilinx® Kintex® UltraScale™ All Programmable FPGAs.

FEATURES

- (1) VITA 57.1 FMC (HPC) 400 I/O Female Connector (SEARAY™ ASP-134486-01)
- (1) VITA 57.1 FMC (LPC) 160 I/O Female Connector (SEARAY™ ASP-134603-01)



ALTERA® ARRIA® 10 FPGA DEVELOPMENT BOARD

DESCRIPTION

A full-featured hardware development platform for prototyping and testing high speed serial interfaces to Altera® Arria® 10 GX FPGAs.

FEATURES

- (2) VITA 57.1 FMC (HPC) 400 I/O Female Connectors (SEARAY™ ASP-134486-01)



ALTERA® ARRIA® V GX FPGA DEVELOPMENT BOARD

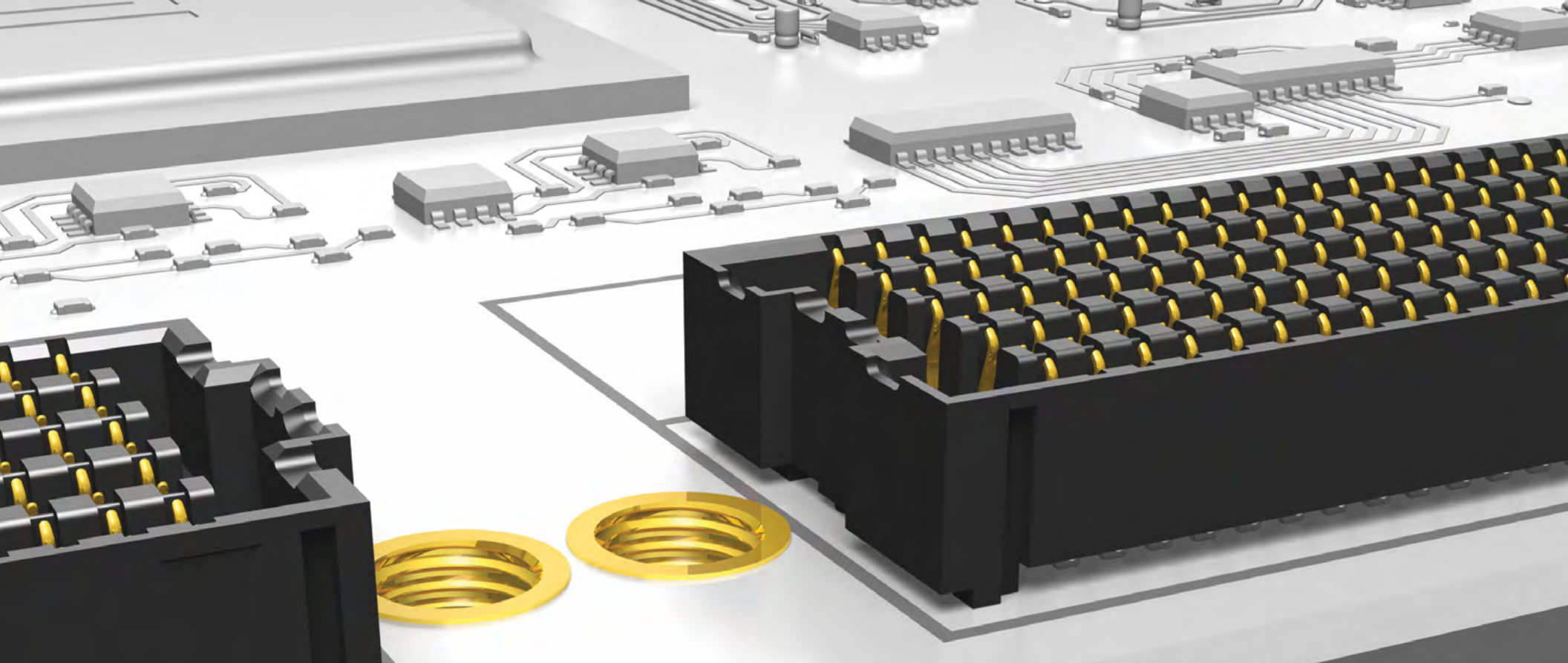
DESCRIPTION

This development kit includes all the hardware and software needed to develop full Arria® V GX FPGA designs and test them within a system environment.

FEATURES

- (1) VITA 57.1 FMC (HPC) 400 I/O Female Connector (SEARAY™ ASP-134486-01)
- (1) High Density RF Test Point Receptacle and Cable (Bull's Eye® BAR-J-22 & BE25S-01SP1-01.0-02-0152)
- (2) High Speed Mezzanine Card (HSMC) Connectors (Q-Strip® ASP-122953-01, mates with Q-Strip® ASP-122952-01)





ANSI / VITA 57.1 FMC SOLUTIONS

VITA 57.1 FPGA Mezzanine Card (FMC) interconnects are application specific versions of Samtec's SEARAY™ high speed array system. They are available directly from Samtec and are scalable to higher performance applications as development efforts demand.

SEARAY™

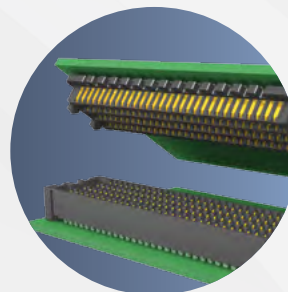
FEATURES

- 0.50" (1.27 mm) pitch Open Pin Field Array for configurable I/O functionality
- Rugged Edge Rate® contact system
- Low insertion / withdrawal forces
- Solder charge termination
- Extended Life Product™ testing (10 Year Mixed Flowing Gas (MFG) and High Mating Cycles (250 to 2,500))

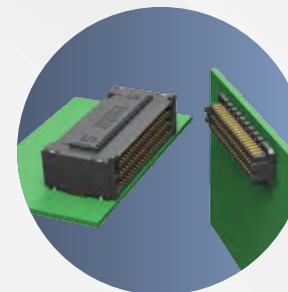
BENEFITS

- Fast data rates - up to 28 Gbps
- Design simplicity - supports a wide range of protocol standards
- Design reuse - FMC modules can target different baseboards
- Best-in-class LLCR performance
- Ideal for HTOL applications

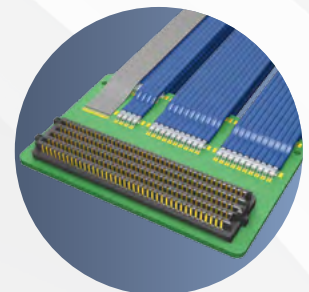
SEARAY™ HIGH DENSITY
HIGH SPEED ARRAYS



SEARAY™ HIGH DENSITY
MICRO BACKPLANE ARRAYS



SEARAY™ HIGH SPEED
CABLE ASSEMBLIES



THE EXPANDING FMC ECOSYSTEM

As FMC leverages open platforms and standards, developers today are working to further the adaptation of programmable device technologies in the marketplace. Many of these developers are working closely with Samtec to support a variety of applications, including:

- FMC daughter cards / modules
- FPGA-based development boards with provisions for FMC expansion
- FPGA-based networking cards with provisions for FMC expansion, along with optical interfaces
- FPGA-based characterization platforms with provisions for FMC expansion
- Embedded systems such as networking development bridge cards

Available directly from Samtec, some of the key interconnect solutions being used to support these technologies include:

- VITA 57.1 FMC Interconnects (SEARAY™) for I/O mezzanine connection (see pgs 4-5 & right)
- FireFly™ Micro Flyover System™ x12 unidirectional or bidirectional system and x4 bidirectional systems, launched as a mid-board optical flyover solution (see pgs 8-9)
- Bull's Eye® Test Point System for cost-effective transceiver characterization (see pgs 10-11)
- True75™ 75Ω High Density BNC for 12G-SDI (see Fidus Systems 12G-SDI Card, right)

Contact sig@samtec.com to learn more.

Contact [Fidus Systems](#), [inrevium](#), [Avnet](#), [TechwaY](#) and [Praesum](#) for information related to their respective Mezzanine Card Systems.

12G-SDI FPGA CONNECTIVITY MEZZANINE CARD (FMC)

DESCRIPTION

Fidus Systems and inrevium's next generation Xilinx® targeted FPGA Mezzanine Card (FMC) utilizes MACOM's 12G-SDI Chipset to enable 4K60p video.

FEATURES

- (6) High Density BNC Connectors (True75™ 75Ω 3G-SDI optimized HDBNC Series)
- (1) VITA 57.1 FMC (HPC) 400 I/O Male Connector (SEARAY™ ASP-134488-01)



MicroZed™ FMC CARRIER CARD WITH MicroZed™

DESCRIPTION

Avnet's MicroZed™ provides easy access to the full 108 user I/O available from the MicroZed™ SOM while connecting 75 of the MicroZed™ Programmable Logic (PL) I/O to a LPC VITA 57 FMC expansion slot.

FEATURES

- (1) VITA 57.1 FMC (LPC) 160 I/O Female Connector (SEARAY™ ASP-134603-01)



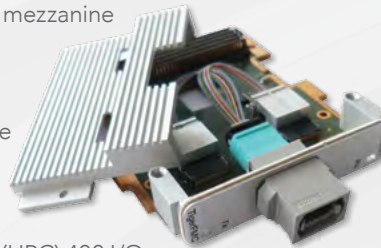
TechwaY TigerFMC

DESCRIPTION

VITA 57.1 compliant mezzanine card integrates 10 full duplex 10 Gbps optical links for 200 Gbps aggregate bandwidth.

FEATURES

- (1) VITA 57.1 FMC (HPC) 400 I/O Male Connector (SEARAY™ ASP-134488-01)
- (2) High Speed Edge Card Connector Sets (FireFly™ Connector System UEC5 / UCC8 Series)
- (1) x12 Bidirectional (12 Tx / 12 Rx) Optical MT Driver (FireFly™ Optical Micro Flyover System™ ECUO Series)



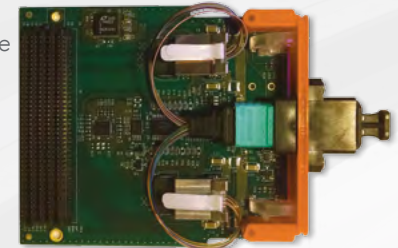
PRAESUM OPTICAL FMC ADAPTOR CARD

DESCRIPTION

VITA 57.1 form factor mezzanine card integrates 12 full duplex 14 Gbps optical I/Os for 168 Gbps aggregate bandwidth.

FEATURES

- (1) VITA 57.1 FMC (HPC) 400 I/O Male Connector (SEARAY™ ASP-134488-01)
- (2) High Speed Edge Card Connector Sets (FireFly™ Connector System UEC5 / UCC8 Series)
- (1) x12 Bidirectional (12 Tx / 12 Rx) Optical MT Driver (FireFly™ Optical Micro Flyover System™ ECUO Series)



See pages 8-9 for additional FireFly™ Optical Micro Flyover solutions.

FMC CONNECTOR OPTIONS

FPGA Baseboard Side Connector Options		Mezzanine Card Side Connector Options		
SAMTEC P/N	DESCRIPTION	SAMTEC P/N	DESCRIPTION	MATED STACK HEIGHT
ASP-134486-01	FMC Connector, lead free, (HPC), 400 I/O, female	ASP-134488-01	FMC Connector, lead free, (HPC), 400 I/O, male	10 mm
ASP-134603-01	FMC Connector, lead free, (LPC), 160 I/O, female	ASP-134602-01	FMC Connector, lead free, (HPC), 400 I/O, male	8.50 mm
		ASP-134604-01	FMC Connector, lead free, (LPC), 160 I/O, male	10 mm
		ASP-134606-01	FMC Connector, lead free, (LPC), 160 I/O, male	8.50 mm

The (LPC) connectors provide 68 user-defined, single ended signals (or 34 user-defined, differential pairs); (HPC) connectors provide 160 user-defined, single ended signals (or 80 user-defined, differential pairs), 10 serial transceiver pairs and additional clocks; (HPC) and (LPC) use the same mechanical connector body - the only difference is which signals are actually populated. Thus, cards with (LPC) connectors can be plugged into (HPC) sites, and if properly designed, (HPC) cards can offer a subset of functionality when plugged into an (LPC) site.

FMC HDR CABLE ASSEMBLY OPTIONS

Mezzanine Card Side Connector Options					
SAMTEC P/N	DESCRIPTION	END 1 FMC CONNECTOR ON CABLE	END 2 FMC CONNECTOR ON CABLE	CONNECTOR MOUNTING ON CABLE	END-TO-END CABLE LENGTH
HDR-153514-01	High Data Rate Cable, (HPC) female to (HPC) male	ASP-134486-01	ASP-134488-01	Same Side	300 mm*
HDR-169468-01	High Data Rate Cable, (HPC) female to (HPC) male			Opposite Side	
HDR-169470-01	High Data Rate Cable, (HPC) male to (HPC) male	ASP-134488-01	ASP-134488-01	Same Side	
HDR-169472-01	High Data Rate Cable, (LPC) female to (LPC) male	ASP-134603-01	ASP-134604-01	Same Side	
HDR-169473-01	High Data Rate Cable, (LPC) female to (LPC) male			Opposite Side	
HDR-169475-01	High Data Rate Cable, (LPC) male to (LPC) male	ASP-134604-01	ASP-134604-01	Same Side	

* Other cable lengths available; contact HDR@samtec.com.

ADVANCED & EMBEDDED SYSTEMS

Samtec offers co-development and co-marketing opportunities for a variety of systems, working closely with semiconductor manufacturers and companies developing FPGA or ASIC-based systems, to address their interconnectivity needs.

This type of collaboration has led to the incorporation of some of Samtec's latest, most innovative products and technologies into Silicon development solutions. For example, the new ultra micro **x12 FireFly™ Optical System** with 14 Gbps per channel over optical fiber, can be launched as a mid-board optics flyover solution, and as a fast-path I/O via MPT® to go outside of the box.

High speed interconnect expertise, in-house microelectronics capabilities, and leading-edge innovations make Samtec the ideal partner to help take your designs to the next level.

All Samtec connectors and cables noted are available directly from Samtec.

Contact sig@samtec.com to discuss your system.

Contact **HiTech Global**, **Pentek** and **Guzik** for information related to their networking cards.
PCI Express® is a registered trademark of PCI-SIG®.
MTP is a registered trademark of US Conec Ltd.

HITECH GLOBAL HTG-712 VIRTEX®-7 HIGH-END NETWORKING CARD

DESCRIPTION

Xilinx® Virtex®-7 powered card is ideal for high-end networking applications requiring 120+ Gbps data rates, high-performance computing, high-end image processing, PCI Express® Gen 2 & 3 development and FPGA development.

FEATURES

- (1) VITA 57.1 FMC (HPC) 400 I/O (SEARAY™ ASP-134486-01)
- (2) High Speed Edge Card Connector Sets (FireFly™ Connector System UEC5 / UCC8 Series)
- (1) x12 Unidirectional (Tx) Optical MT Driver and (1) x12 Unidirectional (Rx) Optical MT Receiver (FireFly™ Optical Micro Flyover System™ ECUO Series)



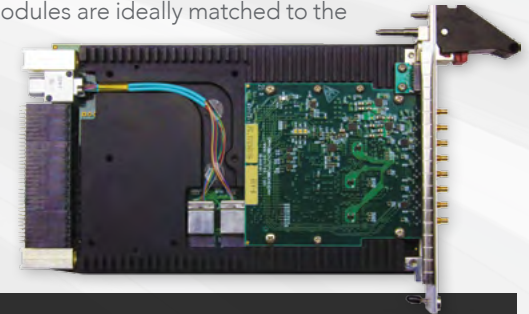
PENTEK FLEXOR® 5973 VIRTEX®-7 PROCESSOR & FMC CARRIER BOARD (3U OpenVPX)

DESCRIPTION

Flexor® 5973 uses the VITA 66.4 standard for half size MT optical interconnects, providing 12 optical duplex lanes to the backplane, and enables gigabit backplane communications between boards, independent of the PCIe® interface. The high pin count FMC connection of the Flexor 3312 FMC & 3316 Modules are ideally matched to the 5973 Carrier for boosting performance levels and adding flexibility.

FEATURES

- (1) VITA 57.1 FMC (HPC) 400 I/O (SEARAY™ ASP-134486-01)
- (2) High Speed Edge Card Connector Sets (FireFly™ Connector System UEC5 / UCC8 Series)
- (2) x12 Bidirectional (12 Tx and 12 Rx) Optical MT Drivers (FireFly™ Optical Micro Flyover System™ ECUO Series)



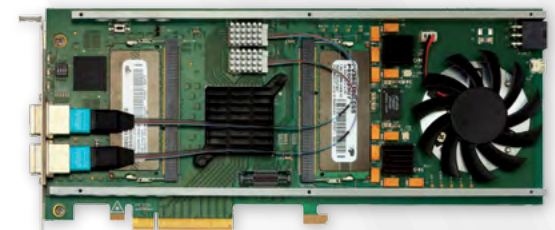
GUZIK FIBER OPTICS-TO-PCIe® BRIDGE CARD

DESCRIPTION

Powered by Altera® Stratix® V GS FPGA, the Guzik Fiber Optics-to-PCIe® Bridge Card enables evolving markets such as high speed data acquisition systems, HPC and networking, to take advantage of the latest optical technology. The card provides 12 bidirectional optical links with total user data bandwidth greater than 20 GBps (160 Gbps).

FEATURES

- (2) High Speed Edge Card Connector Sets (FireFly™ Connector System UEC5 / UCC8 Series)
- (1) x12 Unidirectional (Tx) Optical MT Driver and (1) x12 Unidirectional (Rx) Optical MT Receiver (FireFly™ Optical Micro Flyover System™ ECUO Series)





HIGH PERFORMANCE / HIGH DENSITY SOLUTIONS

The FireFly™ Micro Flyover System™ is a future-proof, high density technology that helps simplify the board routing challenges of chip-to-chip, board-to-board and system-to-system connectivity at data rates up to 28 Gbps.



FEATURES

- Electrical system: performance to 28 Gbps
- Mid-board optical transceivers:
 - 14 Gbps x12 unidirectional or bidirectional
 - 28 Gbps x12 unidirectional or bidirectional
 - 14 Gbps x4 bidirectional
 - 28 Gbps x4 bidirectional
- Micro rugged two-piece connector set
- Proven 850 nm VCSEL technology

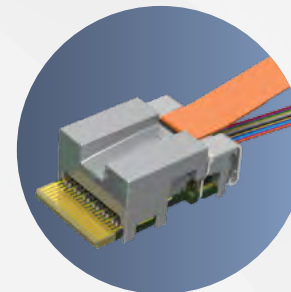
BENEFITS

- Future-proof system easily upgrades from copper to optical
- Enables chip-to-chip, board-to-board and system-to-system connectivity at data rates up to 28 Gbps
- Data connectivity is taken off-board, resulting in improved electrical performance and significantly easier signal integrity design

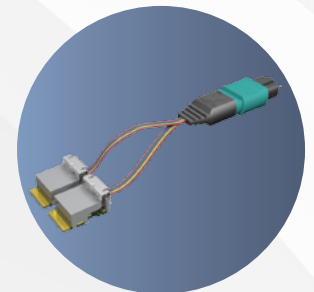
FIREFLY™ 28 Gbps FUTURE-PROOF ELECTRICAL MICRO FLYOVER SYSTEM™



FIREFLY™ 14 Gbps OPTICAL MICRO FLYOVER SYSTEM™



FIREFLY™ x12 BIDIRECTIONAL OPTICAL MICRO FLYOVER SYSTEM™



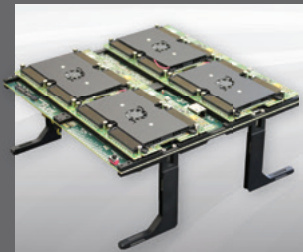
IC TEST & CHARACTERIZATION

Samtec offers a variety of high speed test products, including an array of high performance, cost-effective **Bull's Eye® Test Points**, along with a variety of high speed cable systems designed to meet demanding emulation requirements.

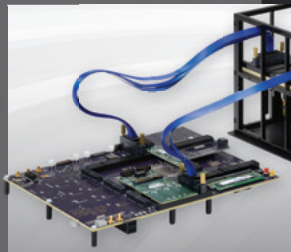
FPGA-BASED ASIC DEVELOPMENT SYSTEMS

Samtec's interconnect solutions have been chosen by a number of developers for use in their FPGA-based ASIC development systems.

These solutions are an integral part of the companies' interconnect strategies to manage the high speed serial transceiver I/Os over mezzanine connections (SEARAY™) and high speed cable assemblies.



PRODESIGN | PROFPGA Quad V7 2000T
Prototyping System



Synopsys | HAPS-DX & HAPS-70
Series Prototyping System

Contact **Xilinx®** and **Altera®** for information related to development kits and programmable devices.

Contact **PRODESIGN Electronic GmbH** and **Synopsys®** directly for information related to their FPGA-based ASIC development systems and related Samtec interconnect solutions specific to their designs.

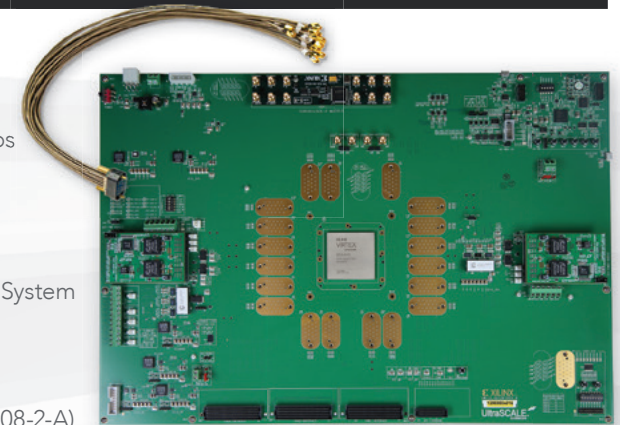
XILINX® VIRTEX® ULTRASCALE™ FPGA VCU1287 CHARACTERIZATION KIT

DESCRIPTION

The Xilinx® Virtex® UltraScale™ VCU1287 Characterization Kit with the Virtex® UltraScale™ VU095 device features GTY transceivers capable of 32.75 Gbps short reach and 28.21 Gbps backplane operation, ideal for implementing next generation 400 Gbps and 500 Gbps wired networking systems.

FEATURES

- (20) Landing Pads for Bull's Eye® High Density RF Test Point System (Bull's Eye® HDR-155805-XX-BEYE)
- (3) VITA 57.1 FMC (HPC) 400 I/O Female Connectors (SEARAY™ ASP-134486-01)
- (1) SEARAY™ Female Connector (SEARAY™ SEAF-30-05.0-S-08-2-A)



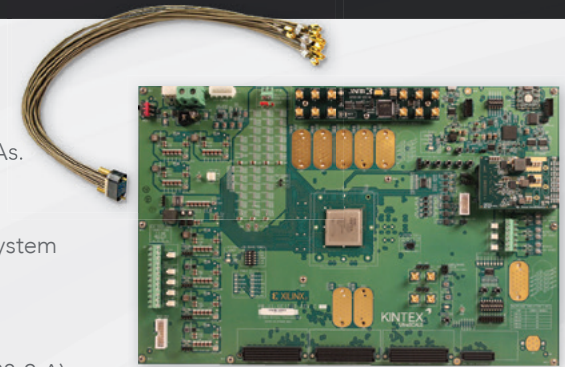
XILINX® KINTEX® ULTRASCALE™ FPGA KCU1250 CHARACTERIZATION KIT

DESCRIPTION

The Xilinx® Kintex® UltraScale™ KCU1250 Characterization Kit provides everything needed to evaluate the 16.3 Gbps GTH transceivers available on Xilinx® 20nm Kintex® UltraScale™ FPGAs.

FEATURES

- (8) Landing Pads for Bull's Eye® High Density RF Test Point System (Bull's Eye® HDR-155805-XX-BEYE)
- (3) VITA 57.1 FMC (HPC) 400 I/O Female Connectors (SEARAY™ ASP-134486-01)
- (1) SEARAY™ Female Connector (SEARAY™ SEAF-30-05.0-S-08-2-A)



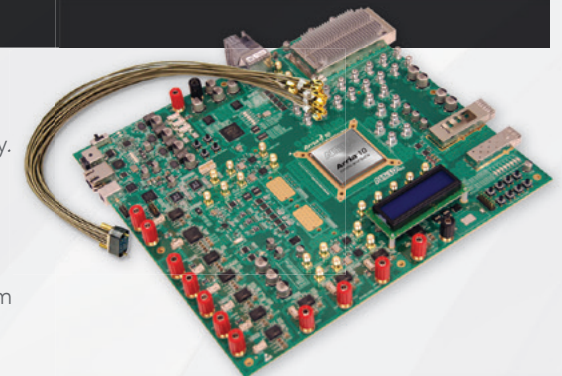
ALTERA® ARRIA® 10 FPGA SIGNAL INTEGRITY KIT

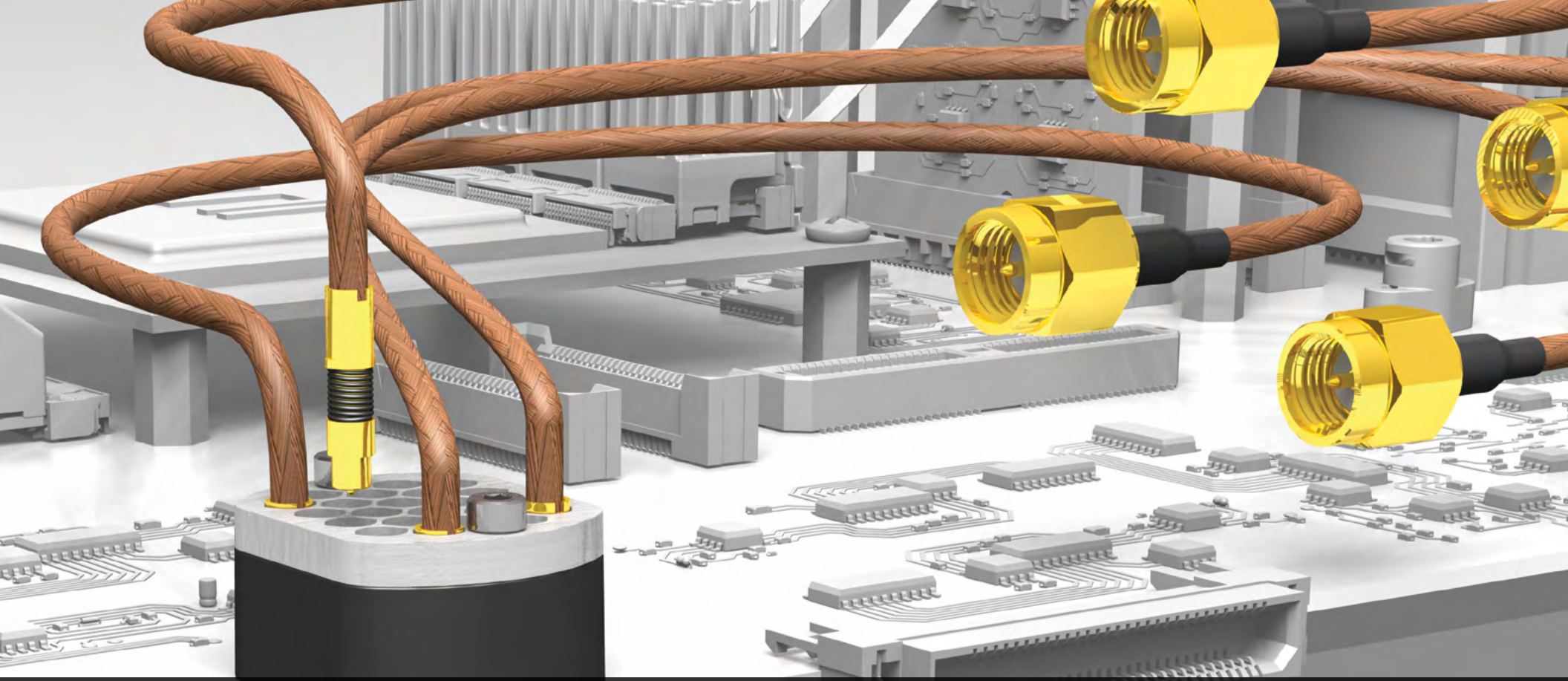
DESCRIPTION

The Altera® Arria® 10 FPGA Signal Integrity Kit enables a thorough evaluation of transceiver signal integrity and device interoperability. Features include five full-duplex 28 Gbps transceiver channels and ten full-duplex 12.5 Gbps transceiver channels.

FEATURES

- (2) Landing Pads for Bull's Eye® High Density RF Test Point System (Bull's Eye® HDR-187150-01-BEYE)





HIGH PERFORMANCE TEST SOLUTIONS

Bull's Eye® Test Points eliminate costly high performance SMA connectors with a high density array design that provides 4x the high bandwidth signals in the same real estate, allowing for a smaller board and fewer layers.



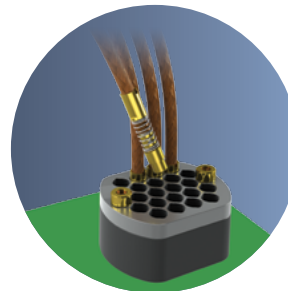
FEATURES

- V.S.W.R. 1.3 max, 20 GHz rated, 50Ω impedance
- 2.0, 5.0 and 10.0 pico-second phase matching
- Compression interface to board
- Bayonet mechanical latch for quick press-and-twist locking
- Single or multiport array configurations
- 23 or 25 AWG microwave cable
- 2.4 mm (50 GHz) and 1.85 mm (65 GHz) SMA terminations in development

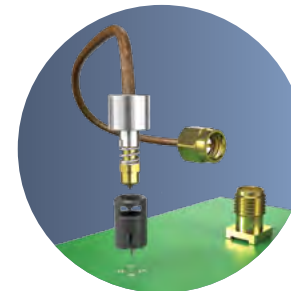
BENEFITS

- Rapid, simple connectivity of multiple signal channels to the board
- SMA performance with a board connector that is 10% of the cost
- Variety of configuration options help significantly reduce board size
- Probe cable adaptor connects to existing instrument cables via SMA, SMA 2.92 or SMP terminations
- Field reconfigurable or replaceable

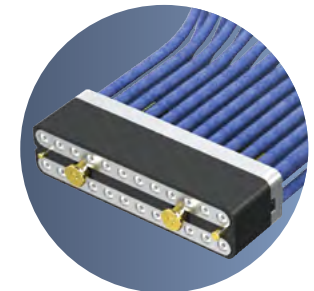
BULL'S EYE® TEST POINT ARRAY & 25 AWG MICROWAVE CABLES



BULL'S EYE® SINGLE TEST POINT & 25 AWG MICROWAVE CABLE



BULL'S EYE® MULTIPOINT TEST POINTS





GLOBAL OPERATIONS NETWORK



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JUNE 2015