Integrated Connections: The FPGA Guide
The FPGA and SoC Hardware Guide

FPGA technology has come a long way from its roots as a flexible logic-circuit replacement based on programmable-memory technology in the 1980s. Xilinx, the pioneer of FPGA technology, has continued innovating and transforming itself from its programmable logic heritage to an ‘All Programmable’ company. Recent innovations include new heterogeneous multi-processing SoCs (MPSoCs), new ASIC-class FPGAs and 3D ICs, and C-based synthesis design tools that power a new class of software defined development environments. FPGA technology is widely used as the primary or sole processor for small and large systems in applications spanning basic appliances to Hyperscale machine learning. New programmable SoC technology integrates the software programmability of a processor with the hardware programmability of an FPGA, providing an unrivaled level of system performance, flexibility and scalability.

JUMP START YOUR NEXT FPGA OR SOC DESIGN

At Avnet we have partnered Xilinx for FPGA and All Programmable SoC devices along with some of the top suppliers providing complementary data converters, interconnect, memory, thermal, power and timing devices for FPGA/SoC based designs. To support the research phase of your next FPGA based design we have assembled a library of product information, development kits and reference designs/kits to jump start your next project.

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Xilinx’s product portfolio combines All Programmable devices in the categories of FPGAs, SoCs, and 3D ICs, as well as All Programming models, including software-defined development environments. Xilinx technology enables smart, connected, and differentiated applications driven by 5G Wireless, Embedded Vision, Industrial IoT and Cloud Computing.

**XILINX MULTI-NODE FPGA PRODUCT PORTFOLIO**

The comprehensive multi-node FPGA portfolio addresses requirements across a wide set of applications. Whether you are designing a state-of-the-art, high-performance networking application requiring the highest capacity and performance, or looking for a low-cost, small footprint FPGA, Xilinx All Programmable devices provide you with system integration while optimizing for performance/watt.

![All Programmable Multi-Node FPGA Portfolio](image)

**XILINX ALL PROGRAMMABLE SOC AND MPSOC PRODUCT PORTFOLIO**

The Zynq® All Programmable SoC and MPSoC product portfolio redefines the possibilities for embedded systems, giving system architects and software developers a flexible platform to launch their new solutions, while providing traditional ASIC and SoC users a fully hardware and software programmable alternative. The Zynq product line integrates the software programmability of a processor with the hardware programmability of an FPGA, providing unrivaled levels of system performance, flexibility, and scalability. Unlike traditional SoCs, the flexible programmable logic provides the user the ability to hardware optimize the silicon and to differentiate the solution by easily allowing connectivity of peripherals and accelerators.

![Xilinx All Programmable SoC and MPSoC Product Portfolio](image)
BROADEST COST-OPTIMIZED ALL PROGRAMMABLE PRODUCT PORTFOLIO

Whether designing an HDMI interface for 4k2k display, an RX beamformer for portable ultrasound, or next generation embedded vision systems, applications demanding low cost, low density programmable solutions have come to expect a broad feature set for varying levels of integration, performance and power.

The Xilinx All Programmable Cost-Optimized Portfolio delivers the broadest cost effective solution for such requirements. Composed of FPGA, SoC and MPSoC devices, each product family delivers the best value for its target applications.

I/O Optimized  Transceiver Optimized  System Optimized

<table>
<thead>
<tr>
<th>SPARTAN</th>
<th>SPARTAN</th>
<th>ARTIX</th>
<th>ZYNQ</th>
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<tr>
<td>I/O Optimized</td>
<td>Transceiver Optimized</td>
<td>System Optimized</td>
<td>Xilinx Cost-Optimized Product Portfolio</td>
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</table>

DESIGN ENABLEMENT

Design enablement offerings by Xilinx and its ecosystem improves hardware designer productivity and empowers systems and software developers to directly leverage All Programmable FPGA, SoCs and 3D ICs. Xilinx and ecosystem members support a combination of hardware, software, model, platform and IP-based design environments.

The Vivado® Design Suite HLx Editions enable a new ultra-high productivity approach for designing All Programmable SoCs, FPGAs and the creation of reusable platforms. All HLx Editions include Vivado High-Level Synthesis (HLS) including C/C++ libraries, Vivado IP Integrator (IPI), LogicCORE™ IP subsystems, and the full Vivado implementation tool suite to enable mainstream users to readily adopt the most productive and advanced C and IP-based design flows. When coupled with the UltraFast™ High-Level Productivity Design Methodology Guide, users can realize a 10-15X productivity gain over traditional approaches.

The SDSoC™ development environment enables the Zynq SoCs and MPSoCs broad user base of systems and software engineers. The SDSoC development environment, a member of the SDx™ family, includes expanded library, board and design services ecosystem support, enabling embedded C/C++ application development. This public access release also features enhancements to the integrated design environment (IDE) for ease of programming and platform development.

Xilinx with Avnet and a broad ecosystem offer a wide array of Zynq SoC and MPSoC-based evaluation kits and components that enable rapid development for highly differentiated embedded applications.
Supporting All Programming Models, from RTL-Based Design to Software-Defined Programming
HIGH SPEED BOARD-TO-BOARD CONNECTORS

Samtec offers a comprehensive portfolio of high speed board-to-board connectors that complement FPGA/SoC-based systems. Samtec’s board-to-board connector solutions support various high speed, high density, rugged and isolation applications. Samtec’s Mezzanine Strips feature integral ground planes, ruggedized contact systems, slim bodies and a number of low profile stacking heights. Samtec Rugged High Speed Strips offer increased insertion depths and rugged designs for contact protection during mating and unmating.

High density arrays offer a variety of pitches, stack heights and configurations allowing for maximum routing, grounding and design flexibility. Newer backplane solutions enable FPGA/SoC designers to optimize signal density in line card applications while providing a path to 28 Gbps and beyond. Whether conforming to industry standards or providing application specific solutions, a growing number of Samtec board-to-board connector solutions are found in modern FPGA/SoC systems.

<table>
<thead>
<tr>
<th>Samtec High Speed Board-to-Board Connectors</th>
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</thead>
<tbody>
<tr>
<td><strong>FMC Standard Connectors</strong></td>
</tr>
<tr>
<td>The VITA 57 Field Programmable Mezzanine Card (FMC) standard specifies Samtec’s SEARAY™ connector set. The VITA 57 SEAM/SEAF Series system provides two options: High Pin Count (HPC) or Low Pin Count (LPC).</td>
</tr>
<tr>
<td>- HPC offers 400 I/Os in a 40 x 10 configuration</td>
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<tr>
<td>- LPC offers 160 I/Os in a selectively loaded 40 x 10 configuration</td>
</tr>
<tr>
<td>- Both LPC and HPC options cope in 8.5 mm and 10 mm stack heights</td>
</tr>
<tr>
<td><strong>Q STRIP® High Speed Ground Plane Terminal and Socket Strips (QTE/QSE series)</strong></td>
</tr>
<tr>
<td>Samtec Q Strip® connectors are designed for high speed board-to-board applications where signal integrity is essential. They have surface mount signal contacts and ground planes for improved electrical performance.</td>
</tr>
<tr>
<td><strong>Edge Rate® Rugged High Speed Terminal and Socket Strips (ERM8/ERF8 series)</strong></td>
</tr>
<tr>
<td>Rugged Edge Rate® contact systems optimized for signal integrity performance in high speed, high cycle applications. The smooth, milled surface of the Edge Rate® contact reduces wear tracks while increasing durability and cycle count. It also lowers insertion and withdrawal forces allowing the connectors to be zippered when unmating.</td>
</tr>
</tbody>
</table>
HIGH SPEED EDGE CARD CONNECTORS
Samtec's high speed edge card interconnects features rugged Edge Rate™ contacts as well as a variety of orientations. They are designed for high speed, high cycle applications. The surface of the Edge Rate® contact is milled creating a smooth mating surface area instead of a stamped contact that mates on a cut edge. This smooth mating surface reduces the wear tracks on the contact increasing the durability and cycle life of the contact system. It also lowers insertion and withdrawal forces allowing the connectors to be zippered when unmating.

<table>
<thead>
<tr>
<th>Samtec High Speed Edge Card Connectors</th>
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<tbody>
<tr>
<td><strong>0.80 mm Edge Rate® High Speed</strong> Edge Card Connector; Vertical, Edge Mount &amp; Right Angle (HSEC8 Series)</td>
</tr>
</tbody>
</table>

HIGH SPEED CABLE ASSEMBLIES
As a vertically integrated cable assembly manufacturer, Samtec offers FPGA/SoC designers standard or custom copper and optical cable assembles that complement their designs. The combination of Samtec’s in-house design capabilities and customer service enables predictable lead times, high quality product, optimized performance and unparalleled pricing and delivery. Samtec now provides several cable assembly solutions used extensively in FPGAs/SoC systems.

<table>
<thead>
<tr>
<th>Samtec High Speed Cable Assemblies</th>
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</thead>
<tbody>
<tr>
<td><strong>Bulls Eye®</strong> High Performance Test Solutions</td>
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<table>
<thead>
<tr>
<th>FMC Cable Assemblies</th>
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<tbody>
<tr>
<td>In addition to FMC Standard Connectors, cables assemblies are becoming a popular option for connecting FMC-enabled solutions together. Several options supporting both HPC and LPC versions are available from Samtec.</td>
</tr>
</tbody>
</table>
Increased data transfer rates between boards in a system or system to system in a network require advanced high-speed interconnect technologies. The TE Connectivity (TE) portfolio of connectors and packaging products fit the requirements of these applications in support of the FPGA or SoC that drives the overall system performance for the telecommunications, video and data transmission, test and measurement or defense and security markets.

### PLUGGABLE CONNECTORS & CAGES

Speed, density, flexibility, efficiency, and standardization. These are the five words that best describe TE’s rich portfolio of pluggable I/O interconnects. TE products are continuously improved to move data faster while also keeping system thermal management in mind. TE products are designed to industry standards specifications to ensure compatibility with complimentary FPGA and SoC devices.

<table>
<thead>
<tr>
<th>TE Pluggable Connectors &amp; Cages</th>
<th></th>
</tr>
</thead>
</table>
| **ZFP+ (SFP28) Connectors & Cages** | - Next generation 25 Gbps SFP interface, backwards compatible to SFP+  
- Broad portfolio including 1x8 and 2x12 configurations  
- Quick turn for custom Cage/H5/LP configurations  
- Thermally enhanced versions available |
| **ZQSF+ (QSFP28) Connectors & Cages** | - Next generation 25 Gbps QSFP interface, backwards compatible to QSFP/QSFP+  
- 0.8 mm pitch, 38 position interface  
- 4 channels x 25 Gbps data rates  
- Supports 100G Ethernet, 100G Infiniband, 128G Fibre Channel and 25G/50G Consortium |

### HIGH SPEED BOARD-TO-BOARD POWER CONNECTORS

TE Connectivity high speed power board-to-board connectors are optimized for any application where signal transfer is required. With a wide range of options, these products are ideal for industrial control and medical devices.

### MULTI-BEAM Power Connectors

<table>
<thead>
<tr>
<th>MULTI-BEAM XLE Power Connectors</th>
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</thead>
<tbody>
<tr>
<td>MULTI-BEAM XLE connectors feature a 3-beam contact, made from a thicker/higher conductivity material than the original single or 4-beam designs. The new 3-beam design allows for a greater angular mis-alignment between mating connectors and a lower mating force. In addition, MULTI-BEAM XLE connector’s slimmer housing design reduces the overall PCB footprint and has the option of using a low power Universal Power Module (UPM) contact.</td>
<td></td>
</tr>
</tbody>
</table>
HIGH SPEED BACKPLANE CONNECTORS
Designers of electronic products are continually challenged to evolve those products, which requires incorporating the newest features while addressing trends toward higher density, greater speed, expanded connectivity, and improved power management. High speed backplane connectors are the backbone of data center architectures. TE’s solutions can provide high speed and scalability for what’s next. Increasing bandwidth demands require better-performing high speed connectors. TE’s assortment of 6.25 – 56 Gbps backplane interconnects provides the connections needed to keep data flowing.

<table>
<thead>
<tr>
<th>TE High Speed Backplane Connectors</th>
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</table>
| STRADA Whisper Backplane Connector | - 25 to 56 Gb/s speeds  
- Design flexibility: mid-plane orthogonal, traditional, cabled-backplane and embedded cap  
- Power Sum FEXT lower than -50 dB for system implementation at 12.5 GHz  
- Insertion loss < 1 dB and linear up to 20 GHz  
- Individual shielded pairs for excellent signal integrity / EMI performance  
- Little to no skew through high-speed differential pairs  
- Common mode impedance controlled throughout the connector, footprint and mating interface  
- Electrical performance maintained in a 1.5 mm unmated condition |
| Z-PACK HM-e Zd+ Connector for ATCA Applications | - Designed for data rates of 20 to 25+ Gbps  
- Backwards compatible mating interface; inter-matable with HM-Zd family  
- 4 Pair, 10 Column version available  
- New footprint for the receptacle and header  
- Ideal for 100G ATCA – Next generation standard |
| Z-PACK Slim UHD Backplane Connector | - 10% denser than similar products on the market  
- Low-profile design for space savings and design flexibility  
- Accompanying 5-position power connector available  
- Complement to TE’s 25G STRADA Whisper backplane connector for lower signal speeds |
| IMPACT Connectors | - Data rates up to 25 Gbps  
- High differential pair density (up to 80 pairs per linear inch)  
- Reduced crosstalk with broad-edge-coupled, differential-pair systems running higher data rates  
- Application with compliant, press fit tails  
- Excellent mating performance with inline staggered, bifurcated contact beams in a daughter card interface |
Silicon Labs offers the industry’s broadest portfolio of crystal oscillator, clock generator and clock buffer products and PCI Express (PCIe) clock generators and PCI Express buffers. Silicon Labs’ patented technology reduces system jitter and the number of expensive discrete components, while improving flexibility, customization and performance.

**COMPREHENSIVE PORTFOLIO**

Silicon Labs offers a portfolio of frequency flexible jitter attenuating clocks, clock generators, clock buffers and oscillators that enable hardware designers to simplify clock synthesis and distribution. Silicon Labs clocks use proprietary DSPLL and MultiSynth technologies to generate any combination of frequencies/formats with low jitter. Clock buffers provide integrated format/voltage level translation and are PCIe compliant.

**DATA CENTER**

Silicon Labs’ PCIe zero delay buffers meet PCIe Gen 1/2/3 specifications and feature low-power push-pull output driver technology that minimizes power consumption while simplifying PCB design. Silicon Labs’ clock generators are highly frequency flexible, generating any combination of frequencies from any input frequency with unparalleled performance and enabling “clock-tree-on-a-chip” BOM consolidation. Silicon Labs also offers ultra-low jitter programmable oscillators customizable to any frequency, with samples available in less than two weeks.

**NETWORKING**

Silicon Labs offers industry leading jitter performance for 10/40/100 G OTN and Ethernet Applications (100 fs RMS). Silicon Labs’ clock products are highly frequency flexible, generating any combination of frequencies from any input frequency with unparalleled performance and enabling “clock-tree-on-a-chip” BOM consolidation. Silicon Labs also offers ultra-low jitter programmable oscillators customizable to any frequency, with samples available in less than two weeks. Silicon Labs’ PCIe PCI Express timing products provide fully compliant PCIe Gen 1/2/3 clock generation and distribution.
WIRELESS

Silicon Labs presents a comprehensive clock and oscillator portfolio for wireless infrastructure applications. These devices eliminate the need for discrete VCXO and loop filter components, simplifying design, and minimizing overall solution costs. Silicon Labs’ clock products are highly frequency flexible, generating any combination of frequencies from any input frequency with unparalleled performance and enabling “clock-tree-on-a-chip” BOM consolidation.

SELECT TIMING SOLUTION FOUND ON EVERY XILINX EVALUATION BOARD:

<table>
<thead>
<tr>
<th>Chipset</th>
<th>Target Market</th>
<th>Application</th>
<th>Oscillator</th>
<th>Buffer</th>
<th>Clock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtex® - 7</td>
<td>Highest Performance and Density</td>
<td>Wired Communications and Data Center</td>
<td>Si570</td>
<td>Si533xx</td>
<td>Si532X, Si534x</td>
</tr>
<tr>
<td>Kintex® - 7</td>
<td>Highest signal processing and low power</td>
<td>Wireless Communications and Industrial</td>
<td>Si570</td>
<td>Si533xx</td>
<td>Si532X, Si534x</td>
</tr>
<tr>
<td>Artix® - 7</td>
<td>Lowest cost, High volume applications</td>
<td>General Purpose, Industrial (Ultrasound, Camera), Backhaul, Multi-Protocol machine</td>
<td>Si570</td>
<td>Si533xx</td>
<td>Si532X, Si534x</td>
</tr>
<tr>
<td>Zynq®</td>
<td>Programmable SOCs</td>
<td>General Purpose, Automotive, Consumer, Industrial</td>
<td>Si570</td>
<td>Si533xx</td>
<td>Si532X, Si534x</td>
</tr>
<tr>
<td>Virtex® UltraScale™</td>
<td>ASIC – All programmable architecture</td>
<td>Wired Communications, High Performance Computing, ASIC Prototyping &amp; Emulation</td>
<td>Si570</td>
<td>Si533xx</td>
<td>Si532X, Si5335, Si534x</td>
</tr>
<tr>
<td>Kintex® UltraScale™</td>
<td>ASIC – All programmable architecture</td>
<td>General Purpose, Digital Video, OTN Networking, Wireless Communications, Industrial</td>
<td>Si570</td>
<td>Si533xx</td>
<td>Si532X, Si5335, Si534x</td>
</tr>
</tbody>
</table>

[pages.silabs.com/clockbuilder-pro-software]
Aavid is a one-stop-shop for all thermal needs from interface materials and attachments to custom integrated solutions. Aavid Engineers consistently collaborate with manufacturers and customer engineering teams to develop a full understanding of the product and industry requirements.

**Aavid thermal management solutions for FPGAs and SoCs include:**

- **FPGA/BGA Heat Sinks:** High Fin Density Heat Sinks provide increased efficiency for high power applications under forced convection by creating greater volumetric surface area and are classified into two types: High Aspect Ratio Extrusions and Fabricated Fin Assemblies. Although both types offer considerable performance gains over standard extrusions.

- **FPGA/BGA Heat Sink & Fan Combinations:** Fan Heat Sinks provide significant component cooling benefits over system level fans. They incorporate a dedicated fan with a heat sink base to increase localized airflow while improving thermal efficiency. These active fan heat sinks allow for greater thermal performance than can be achieved with an equivalent size passive solution.

- **Heat Pipe Assemblies:** Small Diameter Heat Pipe Assemblies provide greater thermal efficiency by embedding heat pipes into an assembly to transport heat away from a concentrated source. Heat pipes passively facilitate this transfer by employing an evaporator and condenser in a closed loop mechanism, spreading heat evenly within a base or transporting it to peripheral fins.

- **Liquid Cooling:** Liquid Cold Plate Heat Sinks provide the best thermal performance per unit volume and counter nearly every drawback associated with air cooling by dissipating more heat with considerably less flow volume, better temperature consistency, and less local acoustic noise. Cold plates take advantage of the increased thermal conduction properties of liquid by actively circulating fluids past a heat source through a closed loop system.

**CLIP ATTACH E-SERIES FOR BALL GRID ARRAYS:**

- Heat sink for BGA with easy to mount plastic frame along with flexible wire springs. The wire springs are resistant to breakage and allow for easy installation. They provide pressure to improve thermal contact. Customization is possible with different interface materials, finishes, and expanded heat sink size for smaller Rca. The standard finish is black anodize.

Aavid cooling offerings will work with any type or brand of FPGA as long as you match the correct system requirements with the thermal technology. Due to the number of options and combinations, Aavid recommends that you fill out the FPGA Solution Questionnaire as thoroughly as possible to be able to match solutions to your needs.

**Key factors to choosing or creating the proper solution:**

- **Power Levels/Watts**
- **Available Space/Solution Size Requirements**
- **Attachment Type**
- **Forced or Natural Convection**
FINDING YOUR FPGA THERMAL SOLUTION – REQUIREMENTS QUESTIONNAIRE

1. Provide a data sheet, if possible. At a minimum, provide the footprint.

2. What are the size (L x W x H) constraints for the heat sink (Maximum in mm)?

3. Where will the device be located on the heat sink base? Please provide a sketch.

4. How much power (Watts) will be dissipated from the device?

5. Describe the ambient conditions:
   a. Are you open to use a fan for cooling? If so, what is the air velocity (CFM)?
   b. Will the heat sink be fully ducted (no extra space between the heat sink edges and the duct)? If not, please describe.
   c. If you do not plan on using a fan, what will the orientation of the heat sink be with respect to gravity?
   d. What is the temperature of the surrounding environment (ambient temp)?

6. What is the maximum allowable case temperature of the device?
   Note: If you do not specify a max case temp, then the heat sink will be designed around the max junction temp listed on the data sheet.

7. Does the device need to be electrically isolated from the heat sink? If so, what dielectric strength is required?

8. What will be used as the interface material between the device and heat sink?
   Note: Aavid can recommend and include an interface material as part of the completed assembly.

9. What is the preferred method of mounting the device to the heat sink?
   Examples: double sided tape, PCB attach, attach to device etc.

10. What finish do you need on the heat sink?

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Thermal Interface Materials, High Pressure Die Casting and High Density Die Casting vary in thermal efficiency and power based upon application
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Avnet development and evaluation products help engineers accelerate the design cycle and get to market faster. Avnet specializes in creating products for industry leading FPGAs.

**XILINX ARTIX®-7 35T “ARTY” FPGA EVALUATION KIT**
The Artix-7 35T FPGA evaluation board is the perfect solution for designers interested in exploring the MicroBlaze soft processor or Artix-7 FPGAs in general. Experienced FPGA users will find the Artix-7 35T FPGA evaluation board a valuable tool for general purpose prototyping and testing. Utilizes the Xilinx XC7A35T-L1CSG324I device.

**XILINX KINTEX® ULTRASCALE™ DEVELOPMENT KIT**
Available with the Kintex UltraScale XCKU040-1FBVA676 device, the Kintex UltraScale kit provides expandability and customization through the FMC HPC expansion slot and PMOD headers.

**MICROZED™ ZYNQ®-7000 ALL PROGRAMMABLE SOC SYSTEM-ON-MODULES**
MicroZed™ is a low-cost development board based on the Xilinx Zynq®-7000 All Programmable SoC. Its unique design allows it to be used as both a stand-alone evaluation board for basic SoC experimentation, or combined with a carrier card as an embeddable system-on-module (SOM). Utilizes the Xilinx XC7Z010-1CLG400C or XC7Z020-1CLG400C.

**PICOZED™ ZYNQ®-7000 ALL PROGRAMMABLE SOC SYSTEM-ON-MODULES**
PicoZed™ is a highly flexible, rugged, SOM that is based on the Xilinx Zynq®-7000 All Programmable SoC. It offers designers the flexibility to migrate between the 7010/15/20/30 Zynq-7000 AP SoC devices in a pin-compatible footprint. The PicoZed module contains the common functions required to support the core of most SoC designs, including memory, configuration, Ethernet, USB, and clocks.

**MATLAB AND SIMULINK FOR FPGA AND ZYNQ SOC DEVELOPMENT**
Use Model-Based Design with MATLAB® and Simulink® to significantly reduce hardware-software codesign development time for systems based on the Xilinx® Zynq®-7000 All Programmable SoC. Move from concept, to code, to production using MathWorks hardware support, which offers a complete solution for system modeling and simulation, HDL IP core generation using HDL Coder™, Linux executable generation using Embedded Coder® and Support options that span development, evaluation, or application-focused Zynq development kits.
REFERENCE DESIGNS AND TOOLS

To accelerate your FGPGA and SoC based designs, the following are some of the reference designs and tools available from our partners for determining the right set of complimentary products.

AAVID THERMALLOY

HEAT PIPE EXPLORATION KIT
Aavid’s Heat Pipe Exploration Kit is for you to get your hands onto heat pipes and get a feel for how they work, what they do, and try them out in your own application.

HEAT PIPE DISCOVERY KIT
Aavid’s Heat Pipe Discovery Kit is for you to get your hands onto heat pipes and get a feel for how they work, what they do, and try them out in your own application.

GAP FILLING THERMAL INTERFACE MATERIAL DEMONSTRATION KIT
Aavid’s Gap Filler Demonstration Kit allows you to feel and test our new high thermal conductivity gap filling interface materials. Kit includes all three product lines.
FINAL INCH® - PRE-OPTIMIZED BREAK OUT REGION REFERENCE DESIGNS

In an effort to simplify high speed connector selection for FPGAs/SoCs, Samtec has extended the concept of manufacturer supplied PCB layouts and connector electrical models to include one of the most difficult design issues on the PCB: the break out region (BOR) around a high speed connector. Samtec’s Final Inch® reference designs:

- Save design, development and validation time and resources
- Balance performance with manufacturability and cost
- Predict real-world performance expectations
  - Physical Models
  - Electrical Models
  - Empirical Data
  - Test and Evaluation Boards
  - Are based on standard PCB material and manufacturing processes
  - Minimize signal degradation

The following products have Final Inch® data available.
- ERM8/ERF8
- HSEC8
- OTE/OSE
- SEAM/SEAF (FMC Standard Connectors series)

SILICON LABS

Silicon Labs programmable oscillators, clocks generators, jitter attenuators and clock fan-out buffers are featured on evaluation boards and reference designs showcasing the latest FPGA and SoC technologies from Xilinx.

- Virtex®-7: VC707 Evaluation Board
- Kintex®-7: KC705 Evaluation Board
- Artix®-7: AC701 Evaluation Board
- Zynq®-7000: ZC702 and ZC706 Reference Designs
- Kintex®-Ultrascale™: KCU105 Evaluation Board

CLOCKBUILDER PRO SOFTWARE

This software solution is provided in executable format to support Silicon Labs’ Si534x and Si538x clock generators and jitter attenuators.

QUICK–TURN XOS

Need an XO on your next design? Enter your requirements using Silicon Labs’ web utility and request samples from Avnet. Silicon Labs ships samples of any Si5xx XO/VCXO with short 2 week lead times.
FPGA Services & Support

**DESIGN CHAIN SERVICES®**
Avnet offers engineers a host of services from any point in the design cycle from concept to architectural design to new product introduction and on through next generation modification or end-of-life. Avnet has the technical products, services and tools to accelerate design cycles — including ASIC and programmable logic engineering services, IP cores and more. With offerings that run the gamut from Web seminars to connector assembly, Avnet offers it all.

**Assembly and Programming**
- Commercial and military interconnect assembly
- Custom cable assembly
- Device programming
- Motor modification
- ElectroAir™ avionic components
- Power supply modification
- Thermal management

**Design Tools**
- Design Resource Center
- Development and evaluation kits
- Embedded OS solutions
- IP cores

**Engineering Services**
- ASIC design/FPGA design
- Systems design
- Design service partners

**Technical Education**
- SpeedWay Design Workshops™
- On-Ramp Technical Sessions™
- Seminars/Webinars

**SUPPLY CHAIN SERVICES®**
Avnet optimizes supply chains by providing end-to-end supply chain services to electronic original equipment manufacturers (EOEMs), Electronic Manufacturing Services (EMS) providers and electronic component manufacturers. By combining internal competencies of global warehousing and logistics, finance, information technology and asset management with objective, external industry-wide data, Avnet’s supply chain services allow customers to increase their overall business knowledge — enabling more informed decisions.

**Component Intelligence**
- Bill of material (BOM) analysis
- Inventory optimization services
- Green initiative programs

**Supply Chain Assessment**
- Discovery and logistical analysis
- Financial analysis
- Project implementation

**Inventory Management Solutions**
- Bonded inventory programs
- EDI Point-of-Use Replenishment Systems (POURS)
- Vendor-managed inventory
- In-plant stores
- New product introduction (NPI) program support
- Pipeline inventory from forecasts
- Inventory ownership programs