Altera High Speed Mezzanine Card, AHSMC, breakout adapter

ZX106x, ZX107x Breakout adapter in Cyclone development systems

Altera's Cyclone development systems using AHSMC bus standard, incorporating Q series® Samtec High Speed Connectors, QTH/QSH. Zebax offers high quality breakout adaptors tailored for testing, bringup, software development and emulation applications. This document lists the AHSMC requirements and outlines benefits of ZX106x and ZX107x in FPGA applications.

This document identifies:
1. Samtec Q series® connector
2. Altera HSMC , AHSMC, requirements- ASP-122952-01 – ASP-122953-01
3. Application of ZX106x,ZX107x w/ Cyclone development or any designs using AHSMC standards

Revision History

Version	Date	Description
v01	Jan 27, 2017	Updated

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1   Samtec Q Series

Samtec Q-Strip® hi-speed connectors are 0.5mm pitch high speed connectors with performance exceeding 8GHz/9.5GHz bandwidth due to their contacts, surface mount, ground shielding that exists between two rows of signals for improved electrical performance.

QTH, and QSH connectors are one of the Q-Strip connector types offered by Samtec with wide industry acceptance due to their high performance and ground shielding. QTH is considered the HEADER (Male) whereas the QSH is defined as Socket (Female). The Header / Socket terminology is due to the ground plating that is located at mid section of the connector, rather the legacy contact pins terminology.

QSH/QTH is offered in single ended and differential configuration. The single ended, SE, connectors are commonly used and it is offered in 60 (30 pins per row) , 120(60) , 180(90), 240(120) pins whereas the differential pair signaling is by pair, maintaining the 50 Ω impedance at each 2 pins where the 3rd signal is left empty. Differential pair , DP, connectors are offered in 40(20 pins per row), 40(80), 60(120), 80(160). Zebax offers several products accommodating different applications utilizing AHSMC standards.

QSH/QTH is offered in multiple **Bank segments** where each bank contains 60 (30 pins per row), and 40(20 pins per row) pins for single ended and differential pairs types respectively. Rule of thumb is that All lower banks QTH connectors mate with higher bank segment Sockets. Example: One can use Zebax ZX101 Samtec Breakout adapter offers 60 (30 pins per row) header and socket that can be used for 40(20 pins per row)differential pair as well as single ended 120(60 pins per row) QSH060, 180(90) QSH090, or 240(120) pins as well as QSH020, QSH040, QSH060, QSH080 differential pairs sockets.

Figure 1 – Samtec QTH Header

QTH HI-SPEED HEADER

(0.5mm) 0.0197" pitch

Integral metal Plane for power or ground. Typically used for Ground.

Standard Stack Heights from 5mm to 25mm

Polarized
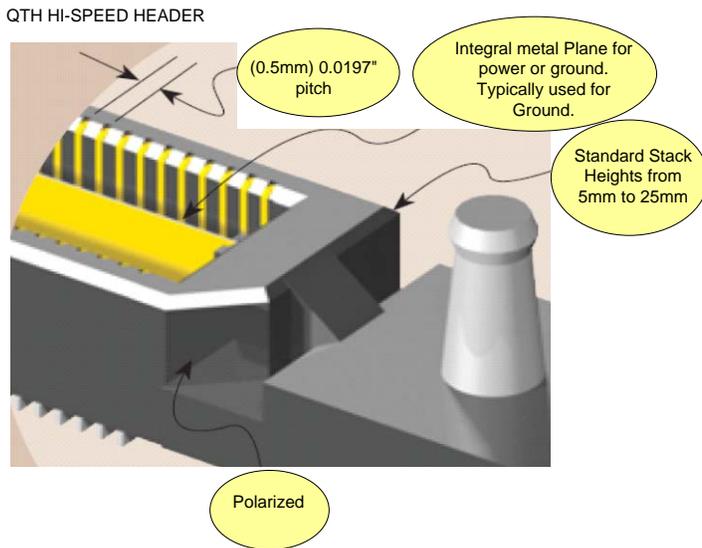
Figure 2 – Samtec QSH Socket

QSH HI-SPEED SOCKET

Blade & Beam Design process of Samtec

Integral metal Plane for power or ground. Typically used for Ground.

Polarized

(0.5mm) 0.0197" pitch
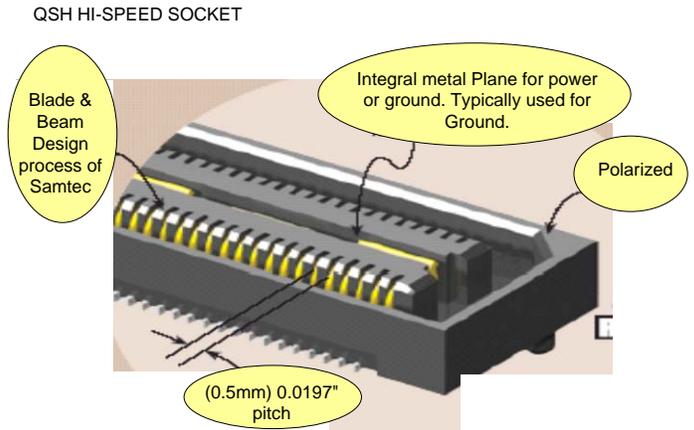
Q-Series Height QSH QTH

Traditionally Socket connectors are placed on PCBoard or the main board whereas the Header connector is adapted on the Device Under Test, DUT, board.

Figure 3 – Header Socket board configuration

QTH HI-SPEED HEADER

QSH HI-SPEED SOCKET
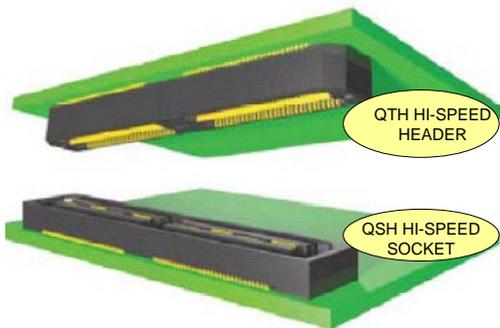
Standard QSH connector height is 0.125" (3.05mm) and it is NOT offered in any other height. QTH, Header is offered in various height enabling designs with height restrictions. QTH LEAD STYLE provides QTH height ordering options as listed in Table 1. ALL QTH lead style connectors mate with the QSH connector.

Table 1 – QTH Samtec Header

QTH LEAD STYLE	A	HEIGHT WITH QSH
−01	(4,27) .168	(5,00) .198
−02	(7,26) .286	(8,00) .316
−03	(10,27) .404	(11,00) .433
−04	(15,25) .600	(16,00) .630
−05	(18,24) .718	(19,00) .748
−07	(24,24) .954	(25,00) .984

2   Altera HSMC requirements

The Altera High Speed Mezzanine Card specification defines the electrical and mechanical properties of high speed mezzanine card adapter interface for FPGA-based motherboards utilizing Samtec QSH series adopting ASP-122952-01 ASP-122953-01 and where Zebax Zx106x ZX107x breakout adapters may facilitate DUT interface solutions. The AHSMC specification allows for the design of interoperable motherboards and add-on cards by different manufacturers that can interoperate and utilize high-performance I/O features found in today's FPGA devices. Figure 4 outlines simplified block diagram of the HSMC connector using Samtec QSH/QTH connector bank segment allocation.

Figure 4- AHSMC QSH/QTH connector Bank segment allocation using Zebax ZX106x, ZX107x breakout adapter
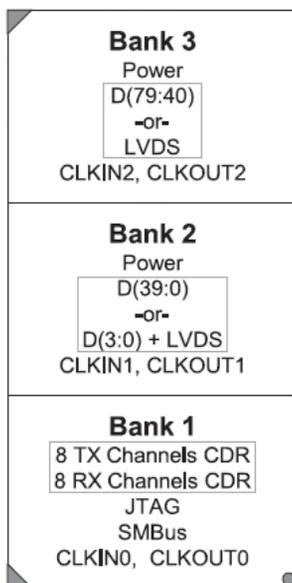
The AHSMC interface provides a mechanism to extend the peripheral-set of an FPGA host by means of a mezzanine card. Zebax Samtec breakout adapters provide full interface enabling DUT to the FPGA method both in single ended as well as differential pair configuration.

Host Boards are defined as any board with an FPGA connected to one or more HSMC interfaces utilizing ASP-122953-01 (gender: female or socket). Since FPGA are configurable devices, the interconnect I/Os available on the HSMC connector can have all possible I/O standard and logic features the can be supported by the host FPGA. Zebax ZX106, Zx107 Samtec breakout adapters are designed in **4 6 and 8 layers PCB** and **50 Ω** trace impedance. They are designed to meet both analog as well as digital worlds requirements in signal quality, reduced crosstalk targeting full Samtec connector signal bandwidth performance.

Zebax Technologies Santa Cruz, CA U.S.A (8 3 1) 2 2 2 – 0 7 1 7 www.Zebax.com

DOCUMENT : AHSMC Breakout Adapter   SUBJECT: ZX106x ZX107x Breakout Adapter

Mezzanine Cards are daughter cards which feature electrical components and interfaces using ASP-12295-01 (gender: male or header) on both. One can easily interface their evaluation / prototype board to the Host board using Zebax ZX106x, ZX107x breakout adapters.

AHSMC Connectors

AHSMC connectors provide the interface between a host & mezzanine card. The AHSMC connector has total of 172 pins (ASP-122952-01 ASP-122953-01) where Zebax ZX106 ZX107 Samtec Breakout Adapter offers hardware interface.

The connector is based on the 0.5mm-ptich QWSH/QTH series from Samtec offering 3 banks where Bank 1 has every third pin removed (similar to the differential pair) as one in QSH-DP/QTP-DP connector series. Bank 2 and Bank3 have all of the pins populated similar to the single ended connectors.

Figure 5 – AHSMC connector configuration – Zebax ZX106x ZX107x Samtec breakout adapter
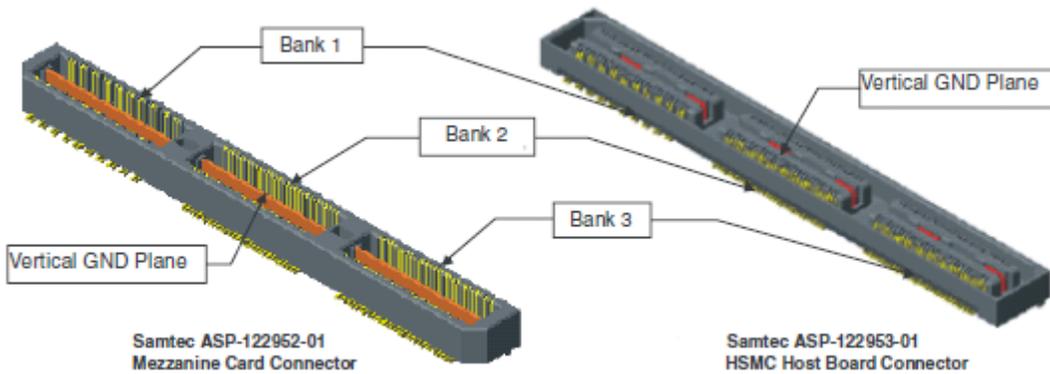
Figure 6 – AHSMC board interface
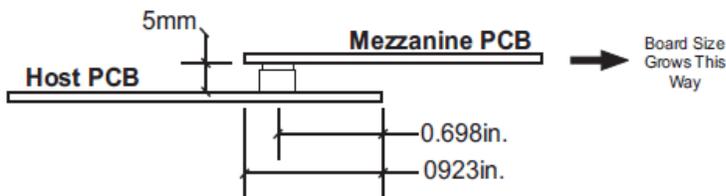
Figure 7 – Zebax ZX107x application as AHSMC breakout adapter

QTH

Mezzanine Cards, daughter cards, DUT

QSH

Headers

Zebax ZX107x Samtec
Breakout Adapter

QTH

QSH

HOST PCB
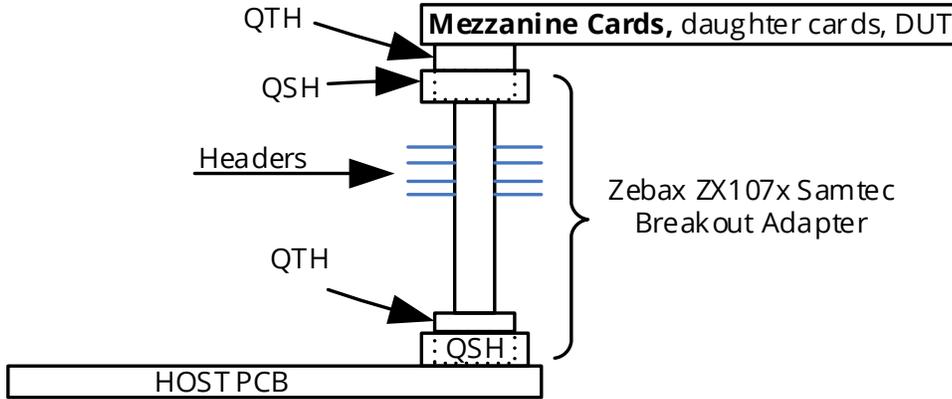
Figure 8 – Zebax ZX106 application as HSMC breakout adapter

Headers or Pads,
interface accessible
test points

Wire

Mezzanine Cards, daughter cards, DUT

Headers

Zebax ZX106x Samtec
Breakout Adapter

QTH

QSH

HOST PCB
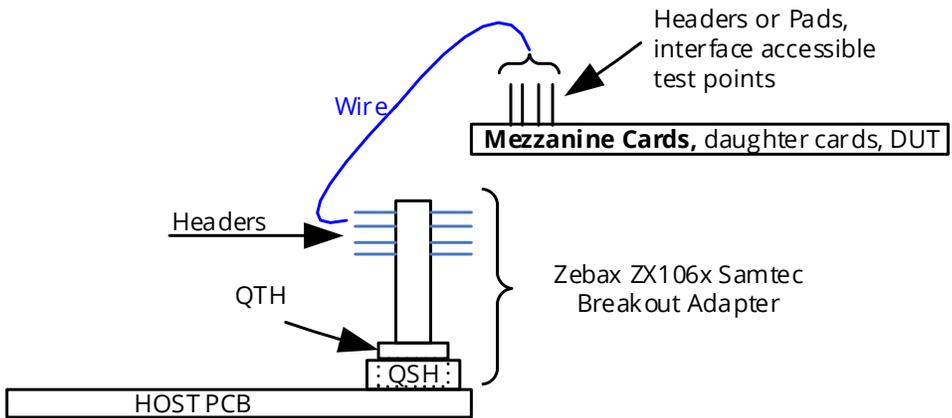
3   Application of ZX106x, ZX107x with Altera development system

Zebax ZX106x, Zx107x AHMC breakout adapters are designed in 4 6 and 8 PCB layers with 50 Ω trace impedance meeting both analog as well as digital worlds requirements with both internal layers as GND plane with precision GND stitching design enabling full Samtec connector signal bandwidth performance.

Zebax offers several AHSMC modules. – Below is summary of few AHSMC modules . Please refer to www.zebax.com for the latest updates in AHSMC offerings.

ZX106-QSH-90-ST

Samtec breakout adapter using onboard QSH090 connector, 2 rows x 90 pins → 180 pins. All signals
 are accessible via onboard headers.
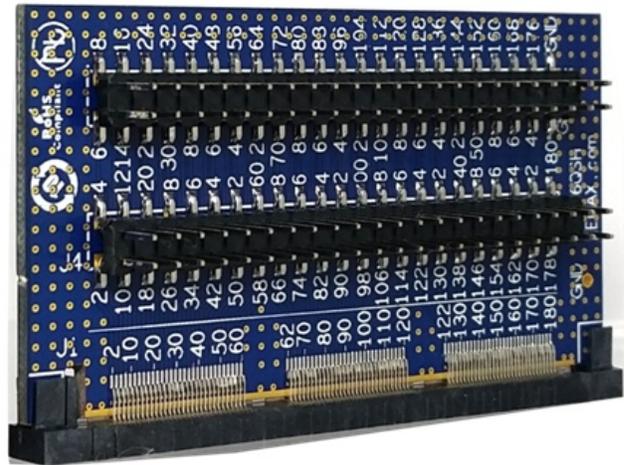
ZX106-ZX106-QTH-90-ST

Samtec breakout adapter using onboard QTH090
 connector, 2 rows x 90 pins → 180 pins. All signals
 are accessible via onboard headers.
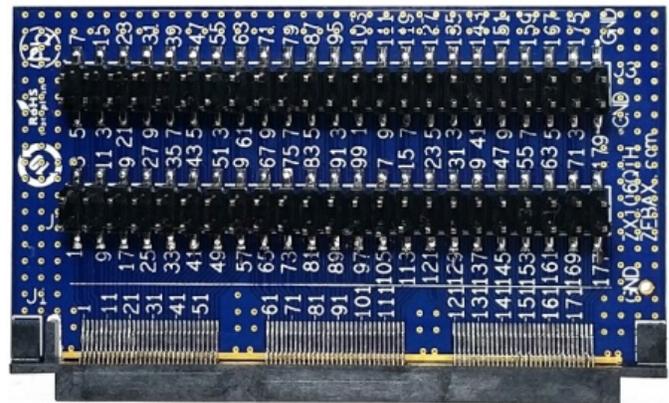
ZX106QTH090-HSMC

Samtec breakout adapter specifically designed
for AHSMC applications.

1- Using onboard QTH090 connector, 2 rows x 90 pins
2- All single & differential signals accessible at header.
3- 6 layers PCB design for improved signal integrity.
4- 50 Ohms trace impedance
5- All Clocks are accessible via onboard IPEX connectors.
6- Accessible supply rails for external interface/measurement
7- Accessible JTASG, D0.. D3 PRSNTn signals

ZX107HSMC

Samtec breakout adapter specifically designed for
AHSMC applications.

1- Using both QTH090 and QSH090 connectors
2- All single & differential signals accessible.
3- 6 layers PCB design for improved signal integrity.
4- 50 Ohms trace impedance
5- All Clocks are accessible via onboard IPEX connectors.
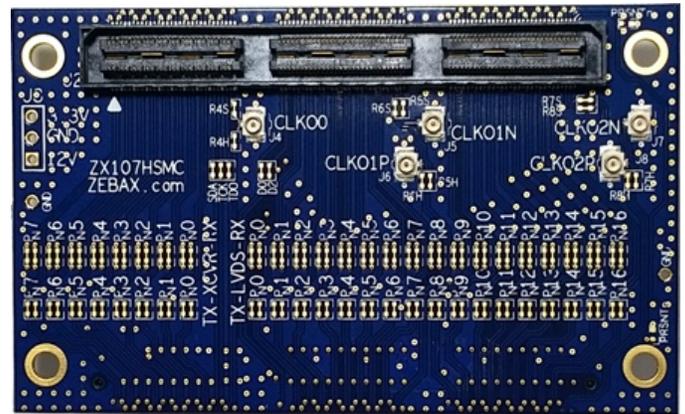
ZX107HSMC-S

Designed for testing using Logic Analyzer (Keysight)
breakout adapter specifically designed for AHSMC
applications.
1- Using both QTH090 and QSH090 connectors
2- All single & differential signals accessible.
3- 6 layers PCB design for improved signal integrity.
4- 50 Ohms trace impedance
5- All Clocks are accessible via onboard IPEX connectors.
6- Compatible with ZX132 breakout module

Compatible with Keysight Logic Analyzer probes:
E5378A E5379A E5381A E5382A E5385A

See ZX132x series for accessing the Logic Analyzer connectors using flying wire probes, ZX132x breakout adapters

ZX107-QTH090-QSH090

Samtec breakout adapter using onboard QSH and
 QTH 090 connector, 2 rows x 90 pins → 180 pins.
All signals are accessible via onboard headers.

Zebax offers best in class   Samtec   Mictor   FMC VITA 57.1   PCISIG M.2   PCIe/104 PCI/104-Express and more breakout test modules extension boards. ZX100 products are widely used in test, debug, validation and characterization of engineering efforts in R&D as well as automation test environment and manufacturing test areas.

Zebax is dedicated in providing best in class solutions supporting engineering and technical communities in test and measurements disciplines.

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