



APIX AShell



August 11, 2008

Product Specification



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### Features

- Direct interface to sideband I/O's of APIX INAP125T12/R12/T24/R24 link device family
- Transmission of application data ensuring data integrity
- Reception of application data ensuring data integrity
- Supply of information about transmission link status as well as simple error statistics
- Error control (optional)
  - AShell implements a window based ACK protocol to manage bit errors occurring during serial transmission over the wire-based APIX link.
- Available under the SignOnce IP Licensing agreement
- Supports Spartan-3E™ and Virtex-5™ Xilinx FPGA's

AllianceCORE Facts	
Provided with Core	
Documentation	User Guide
Design File Formats	Encrypted NGC netlist
Constraints Files	APIX_AShell.ucf
Verification	Test Bench, Test Vectors
Instantiation Templates	VHDL
Reference Designs & Application Notes	none
Additional Items	none
Simulation Tool Used	
ModelTech's Modelsim	
Support	
Support provided by INOVA Semiconductors GmbH	

### Applications

- Central Infotainment Displays (CID)
- Automotive Dashboards
- Rear-Seat Entertainment Systems
- Head-Up Displays
- Automotive Driver Assistance
- Diagnostic Systems
- Camera Systems
- Medical Equipment

Table 1: Example Implementation Statistics for Xilinx® FPGAs

Family	Example Device	Fmax (MHz)	Slices <sup>1</sup>	IOB <sup>2</sup>	GCLK	BRAM	MULT/DSP48/E	DCM / CMT	MGT	Design Tools
Spartan®-3Ex	XC3S1200E-5	100	1493	146	3	0	0	0	N/A	ISE® 10.1.00i
Virtex®-5	XC5VLX50T	125	1341	146	3	0	0	0	0	ISE® 10.1.00i

Notes:

- 1) Actual slice count dependent on percentage of unrelated logic – see Mapping Report File for details
- 2) Assuming all core I/Os and clocks are routed off-chip

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## General Description

APIX Automotive Shell is a communication protocol defined by INOVA Semiconductors to ensure secure data transaction over the full duplex serial APIX link.

An application and a APIX interface device with AShell form a stacked bidirectional wire-based communication system with a corresponding AShell on the Receiver side (Figure 1). As part of this communication stack, AShell provides two interfaces for the exchange of messages from local to a remote island or vice versa. This encapsulation provides for higher levels of abstraction and supports a functional layered architecture of the communication system.

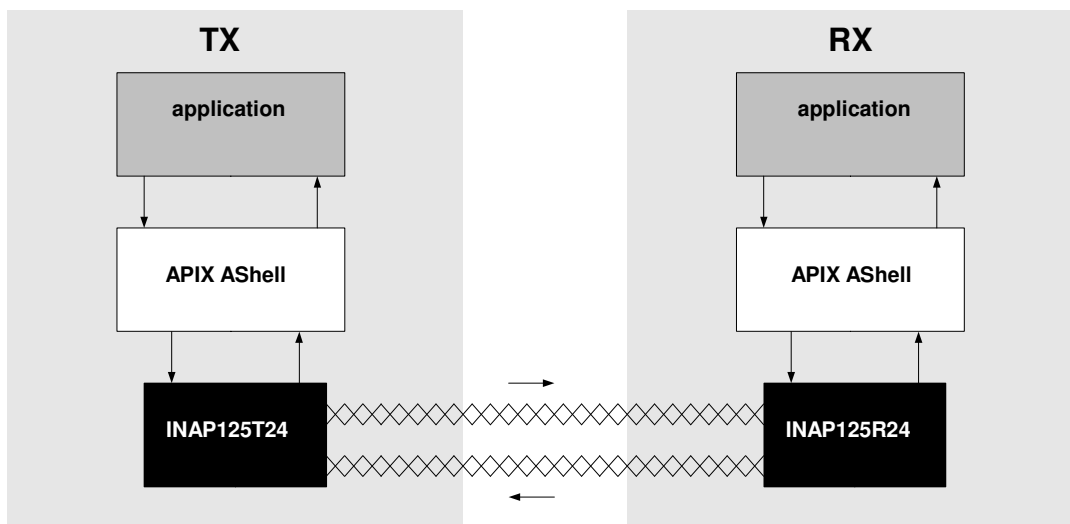


Figure 1 : APIX based communication system

## Functional Description

- Transaction framing and de-framing  
Payload data sinked to or sourced by an application is compiled to or extracted from PDUs (transactions) exchanged as protocol entities between local and remote AShell.
- Data exchange through APIX INAP125 devices  
AShell handles sideband interface signals from INAP125 devices such that data is sent and received via INAP125
- Data integrity control  
AShell implements a CRC-24 polynomial to detect most transmission errors. Only valid transactions are offered to the application.
- Error control (optional)  
AShell implements a window based ACK protocol to manage bit errors occurring during serial transmission over the wire-based INAP125 link.

## APIX AShell

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- Status report  
Information about the transmission status as well as error statistics are collected and presented to the application at the interface.

## Core I/O Signals

The core signal I/O have not been fixed to specific device pins to provide flexibility for interfacing with user logic. Descriptions of all signal I/O are provided in Table 2.

Signal	Signal Direction	Description
ashell_clk	Input	AShell system clock input
ap_clk	Input	Application clock
ap_reset_n	Input	Application reset request
ap_restart	Input	AShell is reinitialized and alignment restarts
ap_data_in[55:0]	Input	Application outbound transaction data
ap_data_in_valid	Input	Signalizes new transaction request to AShell
config	Input	Forces reconfiguration of APIX AShell
config_byte_shell_1[7:0]	Input	AShell configuration vector
config_byte_shell_2[7:0]	Input	AShell configuration vector
config_byte_shell_3[7:0]	Input	AShell configuration vector
config_byte_shell_4[7:0]	Input	AShell configuration vector
sbdown_data_gpio_in [1:0]	Input	Interface to external APIX device
sbup_data_gpio_in [1:0]	Input	Interface to external APIX device
ap_data_out[55:0]	Output	Application inbound transaction data
ap_data_out_valid	Output	Flags 'ap_data_out' as valid
ap_strobe	Output	Handshake signal. Indicates that AShell reads applications data
fatal_error	Output	Status output signal
crc_error	Output	Status output signal. Indicates CRC error in inbound data
crc_error_cnt[7:0]	Output	Status output signal
operational	Output	Status output signal
ready_for_data	Output	Status output signal
outbound_handshake	Output	Status output signal
inbound_handshake	Output	Status output signal
crc_timeout	Output	Status output signal
protocol_error	Output	Status output signal
remote_ashell_restarted	Output	Status output signal
sbdow_data_gpio_out [1:0]	Output	Interface to external APIX device
sbup_data_gpio_out [1:0]	Output	Interface to external APIX device

**Table 2: Core I/O Signals.**

## Verification Methods

The APIX AShell core has been verified through extensive simulation and rigorous code coverage measurements.

The encrypted IP is shipped with compiled simulation libraries for ModelSim.

The simulation and the implementation of the core do not require any particular skills beyond general XILINX tools knowledge.

## Recommended Design Experience

The users should have experience in the following areas:

- Synchronous digital circuit design
- XILINX ISE tools
- Model Sim

The user must be familiar with HDL design methodology as well as instantiation of XILINX netlists in a hierarchical design environment.

## Ordering Information

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