CCM6

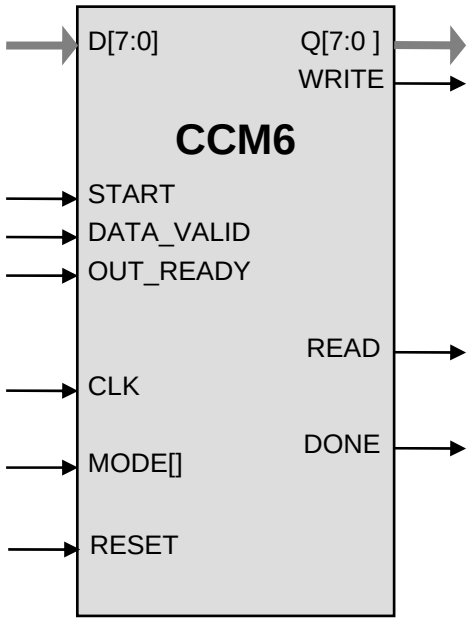
802.16e WiMAX AES Core

General Description

Implementation of the new WLAN security standard (802.16e) requires the NIST standard AES cipher in CTR and CBC modes (a.k.a. CCM) for encryption and message authentication. The CCM6 AES core is tuned for 802.16e applications. The core contains the base AES core AES1 and is available for immediate licensing.

The design is fully synchronous and available in both source and netlist form.

Symbol



Key Features

Small size:
From 8,900 ASIC gates at 802.16 data speeds

Completely self-contained: does not require external memory

Supports encryption and decryption,

Includes key expansion (scheduling)

Support for Counter Mode Encryption (CTR) operation and CCM extensions (Counter Mode with CBC MAC)

Support for CMAC and MBS-CTR

Flow-through design

Test bench provided

Applications

- IEEE 802.16e

Pin Description

Name	Type	Description
CLK	Input	Core clock signal
RESET	Input	Core reset signal
MODE	Input	Operation mode of the core
START	Input	HIGH starting input data processing
READ	Output	Read request for the input data byte
DATA_VALID	Input	HIGH when valid data byte present on the input
WRITE	Output	Write to the output interface
OUT_READY	Input	HIGH when output interface is ready to accept data byte
D[7:0]	Input	Input Data
Q[7:0]	Output	Output Data
DONE	Output	Data processing completed

Function Description

The Advanced Encryption Standard (AES) algorithm is a NIST data encryption standard as defined in the http://csrc.nist.gov/publications/fips/fips197/fips-197.pdf .

The CCM6 implementation fully supports the AES algorithm for 128 bit keys in Counter Mode (CTR) method of encryption with CBC message integrity check as required by the CCM protocol of the 802.16e standard, as well as MBS-CTR and CMAC modes as required by the WiMAX standard..

The core is designed for flow-through operation, with byte-wide input and output interfaces. CCM key precedes the frame in the flow of data. CCM6 supports encrypt/decrypt modes and include on-the-fly key expansion (scheduling).

Implementation Results

Area Utilization and Performance

Representative area/resources figures are shown below.

Technology	Area / Resources	Frequency	Max Throughput
TSMC 0.13 µ	11,861 gates	250 MHz	800 Mbps
TSMC 0.13 µ	24,763 gates	150 MHz	960 Mbps

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Export Permits

US Bureau of Industry and Security has assigned the export control classification number 5E002 to the core. The core is eligible for the license exception ENC under section 740.17(A) and (B)(1) of the export administration regulations. See the site of US Department of Commerce http://www.bxa.doc.gov/Encryption/ for details.

Deliverables

HDL Source Licenses

- Synthesizable Verilog RTL source code
- Testbench (self-checking)
- Vectors for testbenches
- Expected results
- User Documentation

Netlist Licenses

- Post-synthesis EDIF
- Testbench (self-checking)
- Vectors for testbenches
- Expected results

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