Design and Verification of AHB Protocol Using System Verilog and Universal Verification Methodology (UVM)

Dilip K*, Vijaya Prakash A M*

* M.Tech, Department of ECE, Bangalore Institute of Technology, Karnataka, India
* Professor Department of ECE, Bangalore Institute of Technology, Karnataka, India

ABSTRACT :
Recently, VLSI technology has improved significantly and more transistors can be incorporated in a chip. A System on-Chip (SOC) Configuration have number of blocks are integrated on a single chip. Numerous blocks are integrated in single IC, but to access their function, they requires a powerful communication architecture. This can only be achieved by using on–chip bus architecture to meet their requirements. Different Companies has various on–Chip Bus architectures but one of the most suitable architecture is AMBA by ARM. AMBA consist of three buses, namely, Advanced Systems Bus (ASB), Advanced Peripheral Bus (APB) and Advanced High Performance Bus (AHB). when compared to other two buses AHB is high performance, high bandwidth and for high clock frequency system modules the System designers select AHB as their primary choice. The AHB (Advanced High-performance Bus) is a superior bus in AMBA (Advanced Microcontroller Bus Architecture) family. It is a norm for intercommunication of modules in a framework. The AHB (Advance High performance) bus Standards are characterized by ARM which supports for the communication of on–chip memories, processors and interfaces of external off-chip memory. Here the basic blocks such as master, slave, decoder, and arbiter are used to design and verify an AHB that supports multiples master and multiples slave. The conventional way of verification is simulation based. As the Technology improves the complexity of IC's has been increased. Thus, time spent on verification has also been increased. The main focus is to design of AHB protocol in Verilog and verify using Hardware verification language such as System Verilog and standard Methodology such as Universal Verification Methodology (UVM). QuestaSim (Advanced verification tool from Mentor Graphics) is an EDA tool used to simulate and verify the design and obtain Coverage report.

Keywords — AMBA, AHB, APB, ASB, OCB, SOC, UVM

I. INTRODUCTION

1.1 About AMBA bus

The AMBA is an Advanced Microcontroller Bus Architecture defined by ARM, it is an open standard widely used for an on-chip bus system. The standard is intends to simplify component design by allowing the use of interchangeable parts the within the SoC style. It promotes the use of holding parts, so that a minimum of a neighborhood of the SoC can be reconstructed, instead of having to rewrite it entirely each time. AHB (Advanced High-performance Bus), ASB (Advanced System Bus), and APB (Advanced Peripheral Bus) are the bus groups defined in the AMBA. AHB. The AHB is employed for high-performance, high frequency architecture. These applications includes are ARM cores and high-speed RAM inside the system, Nand Flash, DMA and Bridge links. [1] The APB is used for connecting external devices such as UART, keypad and timer, and has low performance requirements, while it is used for optimizing power consumption. AMBA is the Standard bus-based microcontroller typical feature a high-performance system hub bus (AHB or ASB) that supports for external memory bandwidth, including CPUs, on-chip memories, and other direct data access (DMA) devices. For most of the transmission between various units, such as CPUs, on-chip memories, and DMA, the bus serves as a high bandwidth interface.

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