Application Brief

How the AM625SIP Processor Accelerates Development by Integrating LPDDR4

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Processors and microcontrollers are everywhere and used in almost every smart device imaginable. As technology has progressed, end devices and applications have become more sophisticated and smarter to address the needs of our ever-connected world. Indeed, this has also caused processors and embedded systems to become more complicated and larger, leading to increased hardware complexity to address design challenges in applications for smart homes, connected grids factories, and beyond.

This application brief explores common design challenges when designing with a processor. Some of the most common design challenges include:

- Increased hardware and software design time
- Support and robustness of the processor life cycle
- Balancing power consumption with performance needs

Processor Development: Getting to Market Faster

Currently, processors are becoming increasingly larger in size and higher in layer count to address the requirements of new applications with higher performance. For example, a smart home device such as a doorbell camera can require more performance to connect to many accessory devices through local communication and also run processing at the edge to do facial recognition or object detection. A processor in this application can require memory, IOs and significant DMIPs of performance to facilitate these processes. Ultimately, this can lead to a larger processor which can increase the complexity of the hardware design.

Due to this, there is an increased need for scalability and compatibility between processors. There is also a growing demand for increased computational performance while maintaining compatibility with existing software and hardware. This often leads to more complex tradeoffs and compatibility challenges in processor design when moving from different applications. A doorbell can require 1.4 GHz of performance while an Internet of Things Gateway can require less performance. Instead of redesigning and coming up with a new platform, most designers prefer the scaling of the current processor to several applications. Scalable hardware and software allows ease of reuse of development resources on one processor to another reducing development time and resources in both hardware and software.

Enabling Robustness in Processor Board Design

There are several components including the processor that goes into board design. This includes the processor, memory, peripherals, and many other components. Robustness is a key design consideration in processor selection but extends beyond just hardware and software. There are additional design challenges in the board design process including security, testing, validation, error handling with booting up board, layout or layer count, and thermal or power management.

Making sure an end product is reliable, secure, and more resistance to vulnerabilities is crucial. Memory or DDR layout is critical in board design as well as, the memory or DDR layout is the most common reason a board cannot boot up the first time. SoCs need to be able to detect and recover from errors easily. This is critical but requires extensive testing and validation under various conditions using complex simulation tools. This is not easily feasible to a vast majority of engineers, especially those who are using a processor for the first time. Successfully meeting the robustness challenge makes sure that an SoC can perform reliably, is more secure, and durable in a wide range of appliances.

Balancing Power Consumption with Performance

Processors often need to balance their power consumption with the need for performance in various applications. We often see processors in battery powered devices, where efficient power management is crucial to enable longer battery lives. Power consumption can also lead to overheating which can cause performance degradation and even permanent damage to the chipset's longevity.

Increased performance in processors is posing a significant challenge to board design for both energy efficiency and thermal management. Typically, higher-end processors can require effective thermal management which can include heat sinks, thermal sensors or even throttling mechanisms. For example, a laptop has these same thermal management systems such as throttling and a fan to prevent overheating. However, these additional components can lead to larger designs and increased development time and resources to design the board. Power consumption and thermal management is a very serious design challenge met by every designer, and effective methods to mitigate this on a SoC can streamline the design process.

AM625SIP Processor

TI system-in-package (SIP) processors with integrated LPDDR4 like the AM625SIP help solve common processor design challenges. These processors addresses the hardware, software, robustness, power. and many more challenges that engineers face today. AM625SIP enables the ability to have a simpler and faster development flow through the integrated LPDDR4.

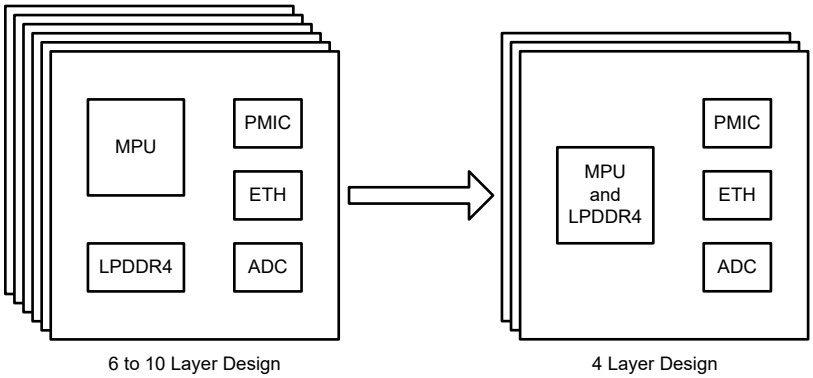

Figure 1. AM62x System-In-Package

The SiP can reduce time and resources needed to layout the DDR, bringing the layout to market faster with lesser effort on PCB layout, simulation, verification and failure analysis. There are also additional benefits to using a System in Package such as simplified hardware design, increased robustness, optimized size or system BOM, power consumption savings all enabling faster development.

Conclusion

Designing a processor SoC involves addressing and balancing a multitude of design challenges related to power, thermals, scalability, software or hardware design, security, error handling, and testing. This is not an easy feat for any designer, but successfully meeting these challenges can enable faster development and cost savings. The System in Package is a valuable choice for designing the system and can be pivotal in shaping various general-purpose applications or devices, as well as, compact and high-performance devices.

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