X1600 MPU

This article introduces Lumissil's Microprocessor (MPU) portfolio: the X1600 family. This family utilizes XBurst 1, a 1GHz MIPS processor featuring an IEEE 754 compliant single/double precision FPU (floating point unit) and 32/64MB LPDDR2 (Low Power) and 128MB DDR2 options to support mobile power sensitive applications and performance applications. The X1600 is aimed at commercial, industrial white goods, IoT and general-purpose applications.

MPUs are utilized in a wide variety of commercial/industrial white goods applications. They are commonly found in home appliances such as refrigerators, microwave ovens and stove tops to name a few. With modern white goods applications, MPUs are often used to drive displays, speakers and sensor communications while receiving up layer commands through an external application control processor.

In Figure 1, an application control process is communicating with a X1600 in an HMI refrigerator application. The control processor is used to provide upper-level control commands to the X1600 and process X1600 data. The X1600 on the other hand, is used to provide lower-level control of a 720p/480p display, drive a speaker and read sensors.

DESIGN EASE

Lumissil's X1600 eases design through its XBurst processor, integrated memory and provides support for external SIP memory as well as for higher performance systems. For flexibility, the X1600 features a wide range of interfaces, analog/digital blocks and configurable GPIO pins which can be used in a variety of applications.

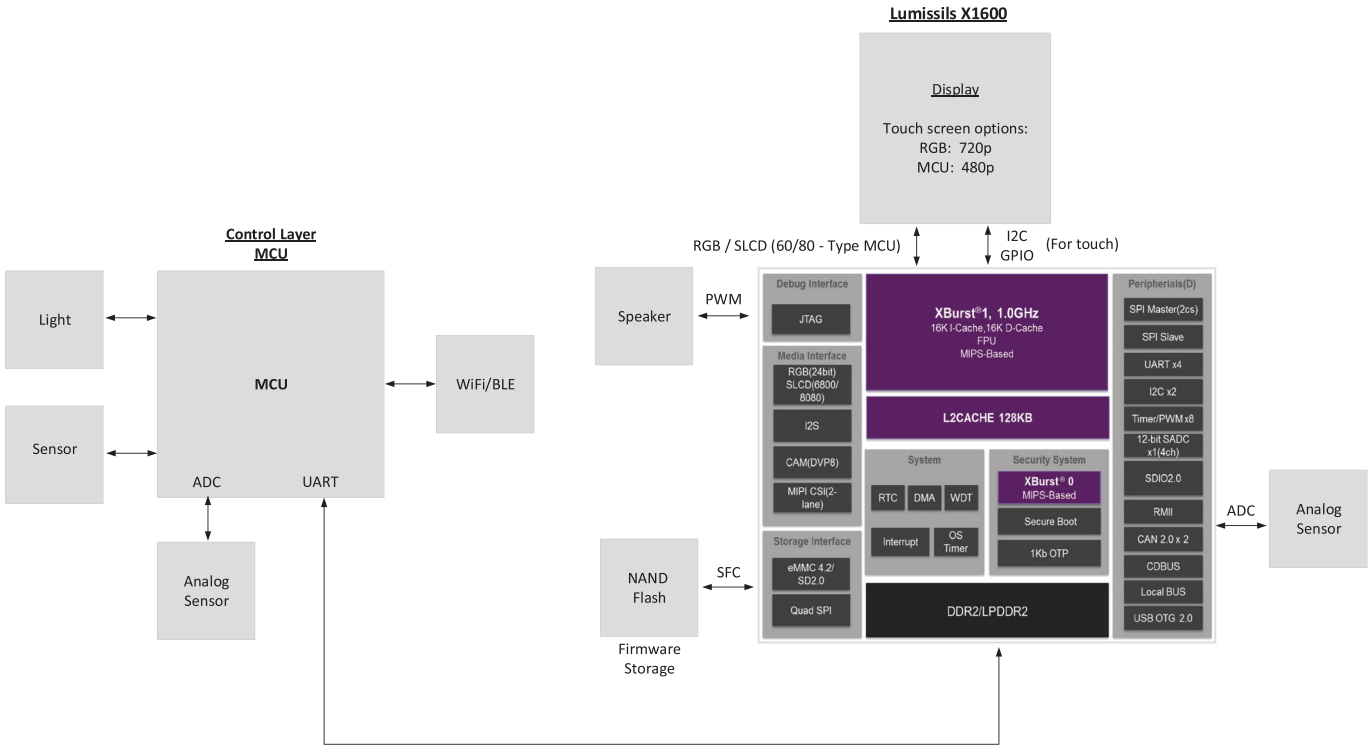

Figure 1: Refrigerator with Display Panel

To reduce time to market, the X1600 provides a complete array of tools to replicate its OS on applications for complete OS compatibility using Buildroot and Kernel. The X1600 also makes development easy through its toolchain by abstracting a developer's OS environment. This means that no matter which version of Linux is being used, development is transparent through the use of the toolchain. And to ease concerns for security, UBoot is included to facilitate secure boot at runtime. In summary, the X1600 enables engineers to quickly develop applications through its hardware features and software tools.

KEY ADVANTAGES AND BENEFITS INCLUDE:

- **XBurst®:** The MPU features a XBurst® MIPS based core, which supports both single and double floating-point formats and is IEEE754 compatible. This ensures high computational accuracy and efficiency.
- **Integrated DDR:** Supports LPDDR2, DDR2, LVDDR2 with a 16-bit bus width, providing flexibility in memory configurations.
- **SIP LPDDR2 and DDR2:** Offers options for up to 128MB DDR2 to support different memory requirements.
- **Security:** Includes encryption engine, true random number generator, and secure boot, ensuring data security.
- **Display Controller:** Supports various input and output formats, with display sizes up to 1280 x 720 @ 60Hz, making it ideal for high-resolution displays.
- **SFC (SPI) Controller:** Supports multiple transfer modes including standard SPI, dual-output/dual-input SPI, quad-output/quad-input SPI, and more, enhancing data transfer capabilities.
- **Interfaces:** CAN2.0B, USB 2.0 OTG, I2C, SPI and UART supports standard, fast, and high-speed modes, ensuring compatibility and reliable data transfer and communications for commercial/industrial and automotive applications.
- **IPI-CSI2 Interface:** Supports resolutions up to 1280 x 1080 @ 60fps, making it suitable for high-quality video applications.
- **Camera Interface:** Supports various data formats and resolutions up to 640 x 480 @ 60fps, providing flexibility for different camera applications.
- **AIC Controller:** Supports multiple audio sample data sizes and channels, ensuring high-quality audio processing.
- **MMC/SD/SDIO Controllers:** Compatible with multiple specifications and supports high data rates, enhancing storage capabilities.
- **MAC Controller:** Supports 10/100 Mbps operation, providing reliable network connectivity.
- **GPIO:** Configurable input/output/function pins, providing flexibility for various applications.
- **Software Tools:** Buildroot, Kernel and Toolchain. These tools provide rapid configuration and minimize concerns for OS environment.

OTHER COMMON USE CASES INCLUDE:

- **IoT Applications:** The X1600 can control, receive and process Wi-Fi/BLE data packets as well as receive and process sensor data.
- **Automation Controllers:** The X1600 can read data from various sensors like temperature sensors then perform calculations based on the data. The X1600 can also send commands to control applications using its GPIO programmable pins.
- **Gaming Devices:** The X1600 can be used to control game controllers and consoles as well as handheld devices.
- **Single Board Computer:** The X1600 can be utilized as a small size computer like a Raspberry PI.

DEVELOPMENT KIT

Lumissil makes developing MPU applications easy with Halley 6, an X1600 development kit. As a bonus, the development kit is designed around an X1600 module which includes a 2.4GHz Wi-Fi and BLE 5.1 communications. In terms of software support, the development kit comes equipped with Buildroot, Linux Kernel, UBoot and Tool Chain.

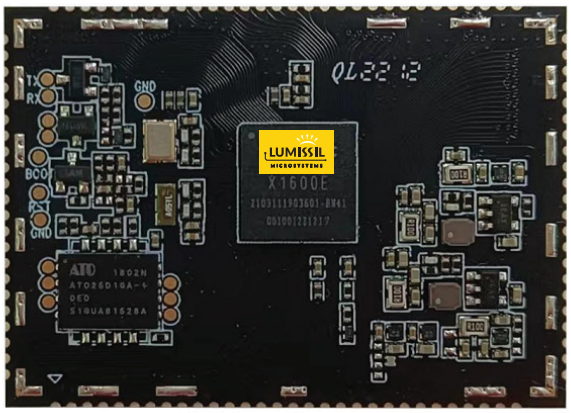

Figure 2: X1600 Module

Figure 3: Halley 6 Development Board

PART NUMBERS

Part	Description
X1600	1.2V Multi-Core MPU with 32MB LPDDR2
X1600E	1.2V Multi-Core MPU with 64MB LPDDR2
X1600HN	1.8V Multi-Core MPU with 128MB DDR2

MPU FAMILY KEY FEATURES

Features	X1600	X2000	X2600
Technology	40nm	28nm	22nm
Main CPU Co-Processor	Xburst 1 @ 1GHz -	Xburst 2 @ 1.2GHz -	Xburst 2 @ 1.2GHz RISC-V @ 600MHz
Singe Instrution Multiple Data (SIMD)	-	Yes	Yes
Security CPU	Xburst 0 @ 300MHz	Xburst 0 @ 240MHz	Xburst 0 @ 300MHz
SIP (MB)	32/64/128	128/256/512	128/256/512
Flash EMMC/SFC/SD	Yes	Yes	Yes
Display Interface			
High End			
MIPI-DSI (up to 1080p)	-	Yes	Yes
LVDS	-		Yes
Low End			
RGB (800x480 to 1024x600)	Yes	Yes	Yes
SLCD (320x240 to 480x272)	Yes	Yes	Yes
Camera Interface	Yes	Yes	Yes
Audio Interface	No	Yes	Yes
Printer Controller	No	No	Yes
Package	BGA159, 9x9 mm	BGA270, 12x12 mm	BGA209, 11x11 mm