FPGA with Breakthrough Capabilities in Security, Reliability and Low Power

Microsemi Corporation, a leading provider of semiconductor solutions differentiated by power, security, reliability and performance, today unveiled its new SmartFusion®2 system-on-chip (SoC) field programmable gate array (FPGA) family. Microsemi's next-generation SmartFusion2 SoC FPGAs are designed to address fundamental requirements for advanced security, high reliability and low power in critical industrial, defense, aviation, communications and medical applications. SmartFusion2 integrates inherently reliable flash-based FPGA fabric, a 166 megahertz (MHz) ARM® Cortex™-M3 processor, advanced security processing accelerators, DSP blocks, SRAM, eNVM and industry-required high-performance communication interfaces all on a single chip.

"Several years ago we implemented a strategy to drive growth in high-value markets by strengthening our product portfolio, increasing our focus on R&D, and the strategic addition of key products and technologies for high-value, high-barrier-to-entry markets," said James J. Peterson, president and CEO of Microsemi. "Our new SmartFusion2 product family is one of the industry-leading products we are developing to broaden our overall system solutions portfolio and further solidify our leadership position in applications where security is vital, reliability is non-negotiable and power is an essential factor."

"Our new SmartFusion2 SoC FPGAs are designed for challenging safety-critical applications in industrial, defense, aviation, communications and medical applications where it is imperative for devices to operate reliably and flawlessly,"

said Esam Elashmawi, vice president and general manager at Microsemi. “Our SmartFusion2 devices have the differentiated features required to ensure secure and reliable operation with extremely low-power consumption. These next-generation devices also feature higher densities and industry standard interfaces that allow us to address a much wider range of mainstream applications.”

Microsemi has already engaged with lead customers who plan to use SmartFusion2 in a broad range of applications including flight data recorders, weapons systems, defibrillators, handheld radios, communications management systems and industrial motor control.

SmartFusion2: Design and Data Security

Recent attacks on industrial, defense, aviation, communications and medical systems have highlighted the need for security and anti-tamper safeguards within electronic systems. SmartFusion2 includes breakthrough security capabilities that make it easy to protect classified and highly-valuable designs against tampering, cloning, overbuilding, reverse engineering and counterfeiting with state-of-the-art design protection based on non-volatile flash technology.

SmartFusion2 provides the most advanced design and data security capabilities starting with a robust root-of-trust device with secure key storage capability using the SoC FPGA industry’s only physically unclonable function (PUF) key enrollment and regeneration capability. SmartFusion2 is also the only SoC FPGA protected from differential power analysis (DPA) attacks using technology from the Cryptographic Research Incorporated (CRI) portfolio. Users may also leverage built-in cryptographic processing accelerators including: advanced encryption standard (AES) AES-256, secure hash algorithm (SHA) SHA-256, 384 bit elliptical curve cryptographic (ECC) engine and a non-deterministic random bit generator (NRBG).

The combination of these features, as well as the flash-based fabric, makes SmartFusion2 the most secure FPGA available in the market.

SmartFusion2: High-reliability

Microsemi’s programmable logic solutions are used extensively in defense and aviation applications due to their high reliability and immunity to single event upset (SEU) occurrences, which can cause binary bits to change state and corrupt data and cause hardware malfunction. The need for SEU protection is also extending into industrial and medical applications.

Smartfusion2 devices are designed to meet many industry standards including IEC 61508, DO254 and DO178B, and feature SEU immunity of zero failures in time (FIT). As an additional benefit, SmartFusion2 flash FPGA fabric does not require external configuration, which provides an added level of security since the SoC FPGA retains its configuration when powered off and enables device “instant-on” performance.

SmartFusion2 is the only SoC FPGA that protects all its SoC embedded SRAM memories from SEU errors. This is accomplished through the use of single error correction, double error detection (SECDED) protection on embedded memories such as the Cortex-M3 embedded scratch pad memory, Ethernet, CAN and USB

buffers, and is optional on the DDR memory controllers.

These product attributes, as well as the flash-based device architecture, make SmartFusion2 the ideal solution for demanding applications such as aviation that require protection from damaging SEU occurrences.

SmartFusion2: Lowest Power

SmartFusion2 SoC FPGAs offer designers 100x lower standby power compared to equivalent SRAM-based FPGAs without sacrificing performance. The Flash*Freeze standby power mode can be initiated with a simple command. In this mode all registers and SRAM retain state, I/O state can be set, the microprocessor sub-system (MSS) can be operational while low frequency clock and I/Os associated with MSS peripherals can be operational. The device can enter and exit Flash*Freeze mode in approximately 100 micro seconds. This is ideal for low duty cycle applications where short bursts of activity are required, such as defense radio where size, weight and power are critical.

SmartFusion2: Technical Information

Microsemi’s flash-based SoC FPGA redefines low power with 10 milliwatts (mW) of static power for 50K LUT (look-up table) device, including the processor and without sacrificing performance. With the Flash*Freeze standby mode, power drops to 1mW. This is about 100 times lower standby power than similar SoC FPGAs or FPGAs.

SmartFusion2 devices are available with a range of density from 5K LUT to 120K LUT plus embedded memory and multiple accumulate blocks for digital signal processing (DSP). High bandwidth interfaces include PCI Express (PCIe) with flexible 5G SERDES along with high-speed double data rate DDR2/DDR3 memory controllers. The device also includes a microprocessor sub-system (MSS) with a 166 MHz ARM Cortex-M3 processor, on chip 64KB eSRAM and 512KB eNVM to minimize total system cost. The MSS is enhanced with an embedded trace macrocell (ETM), 8 Kbyte instruction cache, and peripherals including controller area network (CAN), Gigabit Ethernet and high speed USB 2.0. Optional security accelerators can be used for data security applications.

Designing with SmartFusion2

System designers can leverage the newly released, easy-to-use Libero® SoC software toolset for designing SmartFusion2 devices. Libero SoC integrates industry leading synthesis, debug and DSP support from Synopsys, and simulation from Mentor Graphics with power analysis, timing analysis and push button design flow. Firmware development is fully integrated into Libero SoC with compile and debug available from GNU, IAR and Keil, and all device drivers and peripheral initialization is auto generated based on System Builder selections. The ARM Cortex-M3 processor includes operating system support for embedded Linux from EmCraft Systems, FreeRTOS, SAFERTOS and uc/OS-III from Micrium.

Microsemi Corporation

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