

# ARM® 180nm Ultra Low Power Platform

Targeting ARM Cortex™-M Series Processors and optimized for the TSMC CE018FG (180nm ULL) Process

The ARM® Ultra Low Power Platform enables best-in-class, energy efficient 32-bit MCU processor implementations.

The 180nm Ultra Low Power Platform, optimized for the TSMC 180nm CE018FG Ultra Low Leakage (ULL) process, is designed for consumer and industrial applications that require low cost manufacturing and ultra-low power consumption. Comprised of a power efficient processor with low power logic and memory libraries, the 180nm Ultra Low Power Platform provides a dynamic suite of energy efficient solutions that minimize System-on-Chip (SoC) dynamic and leakage power and extend battery life. ARM leadership in microprocessor architectures, coupled with its Physical IP, delivers low cost, flexible and low power implementations for cost-effective embedded solutions.

The ARM logo, consisting of the letters "ARM" in a bold, blue, sans-serif font.

The Architecture for the Digital World®

### ARM Cortex-M0 Processor Highlights

- The smallest, lowest power ARM processor
- 85  $\mu\text{W}/\text{MHz}$  in an area of under 12K gates
- Architected for ultra low power deep sleep modes, using ARM Physical IP Logic and Memories
- Low active and standby power extends life of battery-powered applications

## ARM Cortex-M0 Processor

The ARM® Cortex™-M0 processor is the smallest, lowest power and most energy-efficient ARM processor available. This exceptionally small gate count and low power processor consumes as little as 85 microwatts/MHz (0.085 mW/MHz) in an area of under 12K gates when using the ARM 180nm ULL Physical IP. This exceptionally power-efficient MCU makes it ideal for ultra-low power applications such as medical devices, e-metering, lighting, smart control, gaming accessories, compact power supply, power and motor control, precision analog and IEEE 802.15.4 (ZigBee)

### Logic Highlights

- SC9 High Density 9-track Standard Cell libraries for speed, area and power balanced designs
- SC7 Ultra-High Density 7-track Standard Cell libraries for very low power and high gate densities
- SC7 Ultra-High Density Standard Cell Power Management Kits for active dynamic and leakage power reduction

## ARM Logic IP Family

The ARM 180nm ULL Logic family consists of High Density and Ultra-High Density libraries, complemented with an Ultra-High Density Power Management Kit for added power reduction. The High Density libraries, targeted at mainstream applications, provide a balance between speed, area and power. The Ultra-High Density cells, optimized for low power and low cost, offer reduced area and extremely power efficient cells. Dramatically low density is achieved from a tapless cell design that enables smaller transistor area. Available in multiple, very fine granularity drive strengths, ARM Logic Libraries also facilitate very dense, low power

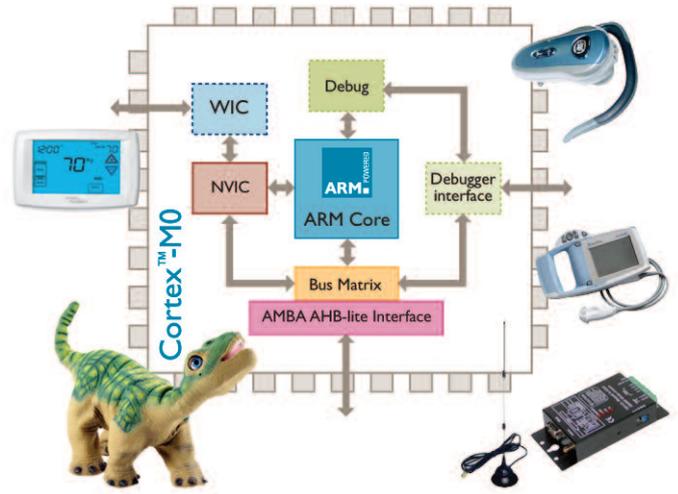
### Memory Highlights

- Memory compilers are optimized for High Speed/High Density or Low Power
- Memory retention mode offers up to 68% lower leakage than regular standby mode
- Low active power and leakage only standby current through external power gating
- Usage of up to Metal3 in register files and Metal4 in SRAMs minimize mask costs
- Byte write capability and multiple form factor implementation support

## ARM Memory IP Family

ARM 180nm ULL Memory IP is designed to meet the density and power requirements of ultra low-power and long battery life implementations. As energy consumption increases from sub-threshold and gate leakage, SoCs demand improved power management techniques. The ARM 180 ULL memories have been designed for ultra low power consumption through a combination of techniques to lower active power and leakage power dissipation. These low power memories support multiple power management modes such as active retention and shutdown modes. During retention

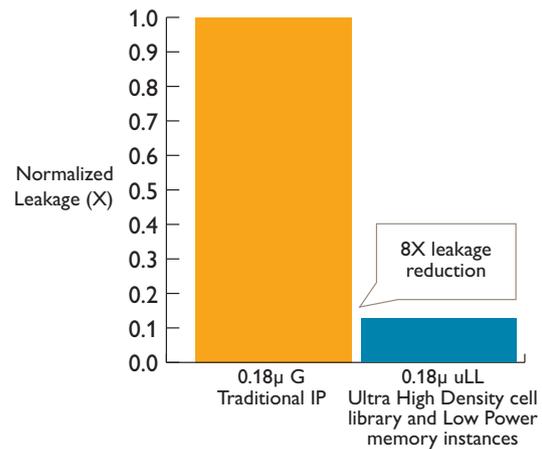
and Z-Wave systems. The low-power operation of the ARM Cortex-M0 processor is enhanced by the Ultra High Density Logic Library, the Power Management Kit (PMK), and the low power Memory IP, all built expressly targeting the ARM Cortex-M0 and ARM Cortex-M3 processors.



designs. The Power Management Kit goes further to enable the active management of dynamic and leakage power by supporting the latest low power flows with voltage islands and on-chip power gating. This specialized power management system uses level shifters and retention flip flops to maximize power savings while facilitating fast wake-up from sleep modes.

### Leakage Improvement in Cortex-M0 Implementation

Using 0.18 $\mu$  uLL Embedded Flash process, ARM Ultra High Density and Low Power IP



mode, users can shutdown the periphery, powering only the core, to retain data and minimize power dissipation. By incorporating standby retention modes and power gating, ARM Low Power memories provide a leakage power savings of up to 68%. The aggressive power saving techniques in ARM memories enable power-efficient active and standby operation and extended battery life in embedded applications.

### Low Power Memory 180ULL Implementation



## Support of Leading EDA Design Flows

Each ARM product is delivered with an extensive and accurate set of models, supporting industry-leading formats, and validated with tools provided by ARM EDA partners including Cadence, Magma, Mentor Graphics and Synopsys. The products are designed to support leading EDA solutions, such as those featured in TSMC Reference Flows.



### EDA Deliverables Highlights

- EDA Deliverables Highlights
- Simulation models (Verilog)
- Timing and power models
- Advanced power formats support
- Place-and-route abstracts
- LVS netlists and GDSII files

## ARM Physical IP Platform Overview



ARM is the industry's leading provider of 32-bit embedded RISC microprocessors, offering a wide range of processors based on a common architecture that deliver high performance, industry leading power efficiency and reduced system cost.

To enable our partners to choose a processor which is ideal for their specific needs and application, ARM has developed a processor portfolio of over 20 processors that range from the latest Cortex family through to the foundation ARM7 and ARM9 families. This exceptional range ensures that whether it is outright performance, minimal power consumption, or device cost, or all three that is required, one of our processors will fit the application.

The Cortex family of processors stretches from the ultra-small low power ARM Cortex-M0 processor through to the multi-core capable ARM Cortex-A9 processor to deliver scalability from less than \$1 to GHz performance. The family delivers unrivalled compatibility while enabling developers to target vastly differing requirements across the embedded spectrum.



ARM Memories are optimized to deliver fast processor performance while minimizing power consumption and die size. The High Speed mem-

ories include advanced power management features, providing dynamic and leakage power savings, resulting in reduced packaging costs, while maintaining performance. High Density memories maximize the performance/area tradeoff for dense SRAM arrays with reduced die size requirements. These innovative architectures combined with processor-specific power management modes, enable superior ARM processor implementations, not available in generic solutions.



ARM Logic libraries deliver next-generation standard cells for high performance, main-stream and power-optimized configurations. High Performance libraries unleash the frequency of high speed ARM processors, while High Density libraries offer a balance between speed and area targets. Used in the combination, these libraries allow for independent performance, area and power optimization across all regions of the SoC. The PMK and ECO kit reduce power consumption and lower overall design risk.

ARM also offers Support and Maintenance that provides documentation, support, training and onsite assistance for faster and more effective design projects. These services ease integration and minimize costly rework, reducing design effort and enabling faster time-to-market.



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