



» SMARC «

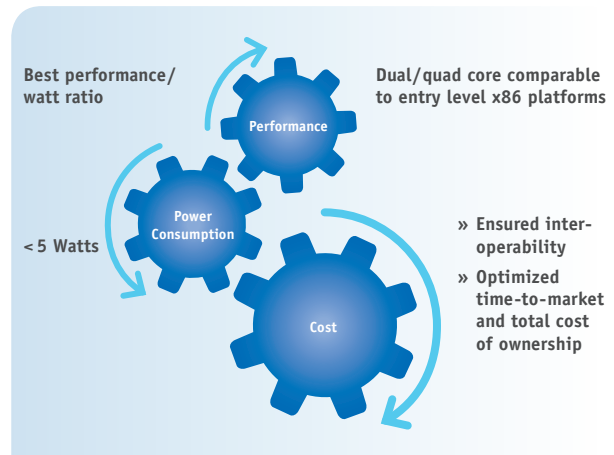
Ultra-low power ARM and SoC-based, Computer-on-Modules

- » Creating mobile, embedded, connected solutions
- » Scalable building blocks
- » Optimized pin-out definition for ARM technology
- » Ultra low-power, low-profile solutions
- » Constructed to withstand harsh industrial environments



» Why ARM solutions are so attractive «

ARM-based platforms are prevalent throughout low-power market segments (i.e. smartphones, tablets and HMI sub-systems). With performance comparable to dual/quad core x86 Intel® Atom™ processors and less than 5W low-power consumption, the latest ARM technology represents an optimal solution for an increasing number of small embedded form factor applications that have been underserved until now. ARM processor architecture has evolved to support a wider range of interfaces and functionality allowing a true open-systems approach which is key for embedded designers. Delivery of needed scalability for efficient development from one generation to the next from a growing ecosystem of providers is now possible. Couple these benefits with more than 10 year platform longevity and you've got a solid foundation for a promising solution.



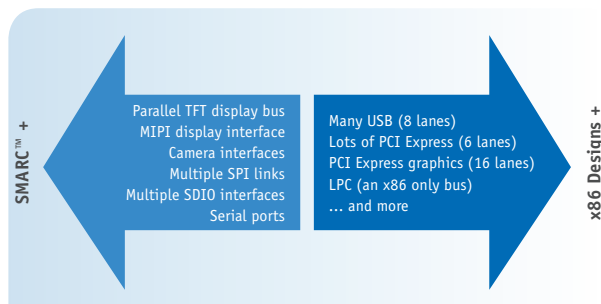
Kontron led the effort to create the SMARC™ standard to support the ARM/SoC market. SMARC™ is different to existing x86 COM standards:

SMARC™ adds features that are not typically found on x86 designs

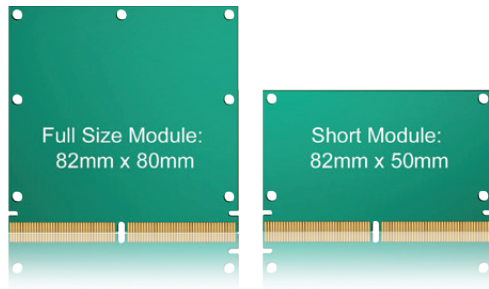
- » Parallel TFT display bus (lowest cost)
- » MIPI display interface (for small, low cost displays such as used on mobile phones)
- » Camera interfaces (serial and parallel)
- » Multiple SPI (Serial Peripheral Interface) links
- » Multiple SDIO (Secure Digital I/O) interfaces
- » These are useful for consumer memory cards, such as are found on cameras and phones
- » I²S

Mechanics

- » The application area for ARM based COM ask for low profile designs
- » The MXM 3.0 connector offer 314pin for a safe and broadbanded feature set
- » x86-based modules need more space for the power circuit than ARM designs



» SMARC™ and ARM go hand-in-hand «



- » Ultra low-power Computer-on-Module
- » Scalable performance and I/O feature set
- » Out-of-the-box solutions

Kontron's ultra-low power module standard bridges the gap between current proprietary industrial offerings and offerings from the consumer market – a far less suitable solution for demanding environments.

The SMARC™ standard was developed to encompass a new range of modules for ARM and SoC processors. Based on the 314-pin MXM 3.0 connector that is only 4.3 mm in height, it enables durable, slim, cost-efficient solution designs. The connector is also available in a shock and vibration proof construction suitable for harsh environments. The standard enables new interfaces specifically for the new ARM and SoC platforms including video outputs such as LVDS.

SMARC™ modules serve as building block solutions for very small portable handheld devices as well as for larger devices where consumption must not exceed a few watts. Additionally the SMARC™ modules provide computing power that rivals x86 technology and is expected to improve with future technical progress.

Covered under the standard are two module foot-prints to offer flexibility for different mechanical requirements: a short module measuring 82 x 50 mm and a full size module measuring 82 x 80 mm.

SMARC™ port overview

| Pin Group | Pin Count | Description / Primary Function | Alternate Function |
|----------------|-----------|---|--------------------|
| Parallel LCD | 28 | Primary Display: 24 bit parallel RGB data | - |
| LVDS LCD | 10 | Primary Display: Single channel 18/24 bit LVDS data | eDP |
| LCD Support | 4 | Panel and backlight enable, PWM, dual pixel clock | - |
| HDMI | 12 | Secondary Display: HDMI | DP |
| CAM0 | 7 | Camera Input: CSI 2 lane/Parallel Camera Input | - |
| CAM1 | 10 | Camera Input: CSI 4 lane/Parallel Camera Input | - |
| PCAM Support | 6 | Parallel Camera supports signals | - |
| GBE | 12 | Gigabit Ethernet | - |
| PCIe | 28 | 3 PCIe x1 ports with supporting signals | - |
| USB | 11 | 3 ports, one is OTG (client or host), other 2 host only | - |
| SATA | 5 | 1 port (may be boot device) | - |
| SDIO | 9 | 1 port 4 bit | - |
| eMMC | 11 | 1 port 8 bit (may be boot device) | - |
| SPI | 10 | 2 ports (one of the two may be a boot device) | - |
| I2S | 13 | 3 ports plus Audio Master Clock | - |
| SPDIF | 2 | 1 port | - |
| I2C | 8 | 4 ports | - |
| Serial | 12 | 4 ports (two 2 wire and two 4 wire) | - |
| CAN Interface | 4 | 2 ports | - |
| GPIO | 12 | General Purpose I/O (4 additional GPIO via Strap pins) | - |
| Boot Sel | 3 | Boot device select pins | - |
| Force Recovery | 1 | Allow boot media recovery, with Module as USB client | - |
| WDT | 1 | Watch Dog Timer output | - |
| MISC | 12 | Power management pins | - |
| RSVD/AFB | 20 | Reserved/Alternate Function Blocks (AFB) | AFB |
| RSVD/EDP_HPDP | 1 | Reserved/Future use for eDP HPDP | - |
| Type Pins | 3 | Pin straps used to distinguish Camera Use and I/O Voltage | - |
| Power | 11 | 10 pins for Module input power; 1 for RTC | - |
| GND | 48 | Grounds - circa 15% of total pins | - |

Pin Total 314

» Why choose Kontron as your ARM partner? «

Kontron is the expert in embedded module computing technology. Along with the long track record of innovation and reputation for delivering the highest quality solutions, Kontron knows that working with the right industry-leading partners is the key to success. These well established partnerships are extended to

our customers through the Kontron offering of end-to-end solutions and services. Kontron has a global reach and in-region technical support where our customers are and where their applications are installed. Kontron delivers the most complete solution for smart, secure, connected, managed devices globally.

Hardware

- » Best performance / watt ratio, lowest power consumption portfolio
- » Kontron can validate component / peripheral interaction
- » Electrical and mechanical integration

Firmware

- » Tested and validated
- » Adjustments to address hardware variances

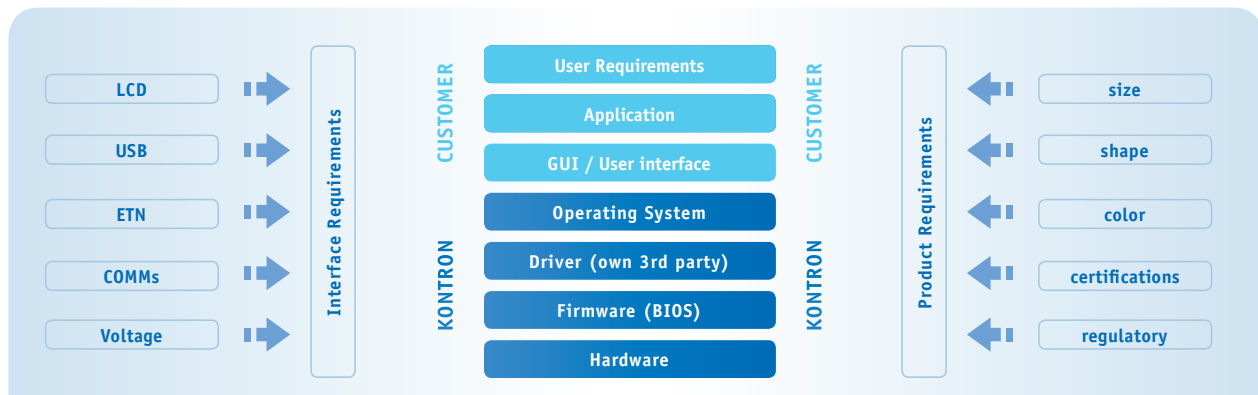
Drivers

- » All drivers developed and/or tested by Kontron to enable a more seamless development experience
- » Kontron is a source for Microsoft, Linux and Android BSP
- » Additional application-specific drivers support available to address unique project requirements

Operating System

- » Kontron offer to manage the integration and test of the Operating system
- » Kontron is a source for Microsoft, Wind River, QNX OS licenses
- » Service of OS re-validation in case of revision changes, etc.

Layer Model

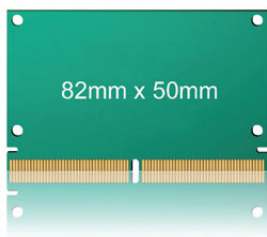


Summary

- » Scalable Computer-on-Modules
- » Exceptional performance / watt ratio – reduces total cost of ownership
- » ARM provides ultra low-power alternative to x86 low-power apps
- » SMARC™ serves new market spaces underserved by legacy and proprietary solutions
- » The optimized combination of Kontron ARM building blocks (i.e. module with carrier & firmware & drivers & OS) – reduce time-to-market
- » Kontron provides multiple layers of added value enabling OEMs to focus on their application-specific requirements
- » A complete ARM ultra low-power solution delivers the best benefit to Kontron customers – improved ROI

CONCEPT to REALITY

Small size SMARC™ module



I/O Features 314-pin MXM 3.0 Connector



Operating Systems



ARM Ecosystem

With pre-validated building blocks, customers are assured of compatibility, interoperability and high reliability so designers

can fully focus on application development rather than dealing with the challenges of hardware integration.

Software & Services for ARM

Support & Services

- » Getting Started Support
- » ARM Baseboard & Software Training
- » Enhanced Software Support
- » Customization, Software Development and Migration Services

OS/Licenses

- » Evaluation Images
- » Image Building
- » Microsoft Embedded Licenses



Board Support Package

- » For WEC7, Linux, Android available
- » VxWorks on request
- » Customization and Driver Development Services

Bootloader

- » Configuration Services
- » Customer specific bootloader development and variant handling



About SMARC™

SMARC™ is the brand name of the first form factor specification of the SGET. The SMARC™ specification describes extremely flat ARM/SoC-based ultra-low-power Computer-on-Modules in miniature format. The module specification is aimed at manufacturers of Computer-on-Modules as well as carrier board and system developers. OEMs and VARs profit from the new specification due to the resulting comprehensive ecosystem for ultra-flat ARM/SoC-based Computer-on-Modules in miniature format. The specification is available free of charge on the SGET website.

The application areas for the new SMARC™ modules range from solutions in the automation market up to graphics and image-centric devices which also require extremely low energy consumption and have to withstand extreme environmental conditions. The new modules serve as a building block solution for very small portable handheld devices as well as for all larger devices in which consumption must not exceed a few watts and the computing power has to be particularly high. Moreover, it is expected that the performance will further increase with future technical progress.

About Kontron

Kontron is a global leader in embedded computing technology. With more than 40% of its employees in research and development, Kontron creates many of the standards that drive the world's embedded computing platforms. Kontron's product longevity, local engineering and support, and value-added services, helps create a sustainable and viable embedded solution for OEMs and system integrators.

Kontron works closely with its customers on their embedded application-ready platforms and custom solutions, enabling them to focus on their core competencies. The result is an accelerated time-to-market, reduced total-cost-of-ownership and an improved overall application with leading-edge, highly-reliable embedded technology.

Kontron is listed on the German TecDAX stock exchanges under the symbol "KBC". For more information, please visit: www.kontron.com

CORPORATE OFFICES

Europe, Middle East & Africa

Oskar-von-Miller-Str. 1
85386 Eching / Munich
Germany
Tel.: +49 (0) 8165 / 77 777
Fax: +49 (0) 8165 / 77 219
info@kontron.com

North America

14118 Stowe Drive
Poway, CA 92064-7147
USA
Tel.: +1 888 294 4558
Fax: +1 858 677 0898
info@us.kontron.com

Asia Pacific

17 Building, Block #1, ABP.
188 Southern West 4th Ring Road
Beijing 100070, P.R.China
Tel.: +86 10 63751188
Fax: +86 10 83682438
info@kontron.cn

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kontron.com/smarc

