Arm® Core-Based Embedded Microprocessors
High Performance, Power Efficient, Secure, Easy to Use

www.microchip.com/MPU
## SAMAX® Cortex®-A5 MPUs

**Product** | **Core** | **VPU/NEON/Trizone** | **Clock Speed (MHz)** | **Core Operating Voltage** | **DDR2 SDRAM (MB)** | **LPDDR2 SDRAM (MB)** | **SRAM (KB)** | **L1 Cache Memory (KB)** (Instruction/Data) | **L2 Cache (KB)** | **GSPI Interface** | **IDPR2/IDPR1/IDPR0** | **IDPR3** | **NAND** | **SLC ECC (Bi)** | **MLC ECC (Bi)** | **UART** | **SPI** | **TWI (FC)** | **SSC and I²S** | **CAN** | **Device Only** |
SAMAXD21 | Cortex-A5 | 1/1 | 500 | 1.2V | – | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 9 | 6 | 6 | 4 | – | – |
SAMAXD22 | Cortex-A5 | 1/1 | 500 | 1.2V | – | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 9 | 6 | 6 | 4 | – | – |
SAMAXD25C-D1M | Cortex-A5 | 1/1 | 500 | 1.2V | 16 | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 9 | 7 | 7 | 4 | – | – |
SAMAXD23 | Cortex-A5 | 1/1 | 500 | 1.2V | – | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 9 | 6 | 6 | 4 | – | – |
SAMAXD24 | Cortex-A5 | 1/1 | 500 | 1.2V | – | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 9 | 6 | 6 | 4 | – | – |
SAMAXD26 | Cortex-A5 | 1/1 | 500 | 1.2V | – | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 10 | 7 | 7 | 4 | – | – |
SAMAXD27 | Cortex-A5 | 1/1 | 500 | 1.2V | – | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 10 | 7 | 7 | 4 | – | – |
SAMAXD27C-D5M | Cortex-A5 | 1/1 | 500 | 1.2V | 64 | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 10 | 7 | 7 | 4 | – | – |
SAMAXD27C-D1G | Cortex-A5 | 1/1 | 500 | 1.2V | 128 | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 10 | 7 | 7 | 4 | – | – |
SAMAXD27C-LD1G | Cortex-A5 | 1/1 | 500 | 1.2V | – | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 10 | 7 | 7 | 4 | – | – |
SAMAXD28 | Cortex-A5 | 1/1 | 500 | 1.2V | – | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 10 | 7 | 7 | 4 | – | – |
SAMAXD26C-D1G | Cortex-A5 | 1/1 | 500 | 1.2V | 128 | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 10 | 7 | 7 | 4 | – | – |
SAMAXD26C-LD1G | Cortex-A5 | 1/1 | 500 | 1.2V | – | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 1/1 | 32 | 32 | 10 | 7 | 7 | 4 | – | – |
SAMAXD28C-LD2G | Cortex-A5 | 1/1 | 500 | 1.2V | – | 256 | 128 | 2 x 32 | 128 | 2 | 1/1 | 1/1 | 1/1 | 32 | 32 | 10 | 7 | 7 | 4 | – | – |
SAMAXD31 | Cortex-A5 | 1/1 | 536 | 1.2V | – | 128 | 2 x 32 | – | – | 1/1 | 1/1 | – | 24 | 24 | 7 | 6 | 3 | 2 | – | – |
SAMAXD33 | Cortex-A5 | 1/1 | 536 | 1.2V | – | 128 | 2 x 32 | – | – | 1/1 | 1/1 | – | 24 | 24 | 5 | 6 | 3 | 2 | – | – |
SAMAXD34 | Cortex-A5 | 1/1 | 536 | 1.2V | – | 128 | 2 x 32 | – | – | 1/1 | 1/1 | – | 24 | 24 | 5 | 6 | 3 | 2 | – | – |
SAMAXD35 | Cortex-A5 | 1/1 | 536 | 1.2V | – | 128 | 2 x 32 | – | – | 1/1 | 1/1 | – | 24 | 24 | 7 | 6 | 3 | 2 | – | – |
SAMAXD36 | Cortex-A5 | 1/1 | 536 | 1.2V | – | 128 | 2 x 32 | – | – | 1/1 | 1/1 | – | 24 | 24 | 7 | 6 | 3 | 2 | – | – |
SAMAXD41 | Cortex-A5 | 1/1 | 600 | 1.8V | – | 128 | 2 x 32 | 128 | – | 1/1 | 1/1 | – | 24 | 24 | 8 | 8 | 4 | 2 | – | – |
SAMAXD42 | Cortex-A5 | 1/1 | 600 | 1.8V | – | 128 | 2 x 32 | 128 | – | 1/1 | 1/1 | – | 24 | 24 | 8 | 8 | 4 | 2 | – | – |
SAMAXD43 | Cortex-A5 | 1/1 | 600 | 1.8V | – | 128 | 2 x 32 | 128 | – | 1/1 | 1/1 | – | 24 | 24 | 8 | 8 | 4 | 2 | – | – |
SAMAXD44 | Cortex-A5 | 1/1 | 600 | 1.8V | – | 128 | 2 x 32 | 128 | – | 1/1 | 1/1 | – | 24 | 24 | 8 | 8 | 4 | 2 | – | – |

**Temperature Range:** –40°C to +85°C (ambient), except where indicated

**UART:** Support for RS485, ISO7816, I²C, LIN, modern control lines and SPI on selected UARTs.

**TWI:** Two-Wire Interface, interconnects components on a two-wire bus.

**SSC:** Serial Synchronous Controller, supports many serial synchronous communications protocols used in audio and telecom applications such as I2S, short or long frame sync.

**16-bit and 32-bit Timers:** Capture/compare, waveform generation and PWM modes.

**ECC:** Error Corrected Code controller.

**Security level:** Adv. = hardware encryption engine + on the fly DDR encryption/decryption + secure storage + tamper pin Med. = hardware encryption engine only

### System on Module (SoM)

<table>
<thead>
<tr>
<th>Product</th>
<th>MPU</th>
<th>Microchip Components</th>
</tr>
</thead>
</table>
| **SAMAXD27-SOM1** | System-In-Package (SAMAXD27C-D1G) including 500 MHz Arm® Cortex®-A5 Processor and 128 MByte DDR2 SDRAM | **Power Management Unit (MIC2800-G1JYML):**
2 Kb Serial EEPROM with EU-48® Node Identity (24AA02E48TI/OT)
64 Mb Serial Quad I/O Flash Memory (SST26VF064BT-104/MF)
10Base-T/100Base-TX Ethernet PHY (KSZ8081RN1C)
Integrated Crystals and Internal Voltage Regulators |
| **SAMAXD27-WLSOM1** | System-In-Package (SAMAXD27C-LD2G) including 500 MHz Arm Cortex-A5 Processor and 256 MByte LPDDR2 SDRAM | **Power Management Unit (MCP16502AC-E/S8B):**
IEEE 802.11 n/g/b Link Controller with integrated Bluetooth® 4.0 (ATWLC3000-MR110UA)
CryptoAuthentication™ Device (ATCC939-TNGTLSU)
64 Mb Serial Quad I/O Flash Memory (SST26VF064BEUI-1014/MF)
10Base-T/100Base-TX Ethernet PHY (KSZ8081RN1A)
Analog Comparator (MIC842NYMT)
Clock Oscillators and Internal Voltage Regulators |
SAM5 Arm Cortex-A5 MPUs

### USB

<table>
<thead>
<tr>
<th>Device and Host</th>
<th>Host Only</th>
<th>10/100 Ethernet MAC</th>
<th>10/100/1000 MII MAC</th>
<th>10/100/1000 MII Support</th>
<th>SD/MMC</th>
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### Ethernet

<table>
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<tr>
<th>Graphics LCD</th>
<th>LCD Overlay</th>
<th>Relative (R) and/or CAP (G) Touch</th>
<th>Hardware Video Decoder</th>
<th>Class D/DPWM/Audio PLL</th>
<th>Security Level</th>
<th>Secure Boot</th>
<th>Anti-Tamper Pins</th>
<th>Environmental Monitors</th>
<th>PWM Channels</th>
<th>16-bit ADC Channels</th>
<th>Max I/O Pins</th>
<th>Expansion/Emb. Temperature Range</th>
<th>E-340°C to +105°C</th>
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<td>5</td>
<td>5</td>
<td>12</td>
<td>12</td>
<td>128</td>
<td>BGA 196, 11 x 11, 0.75 mm pitch</td>
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</table>

### Camera Interface

For CMOS-type image sensor, ITU-R BT. 601/656 external interface, programmable frame capture rate, up to 12-bit data interface, SAV and EAV synchronization, preview path with scaling, output is in YCbCr format; Raw Bayer is supported on the ATSAMA5D52 series.

### Graphics LCD

24-bit parallel interface; supports STN and TFT displays, up to 16-bits per pixel in STN color mode, up to 16M colors in TFT mode.

### Video Decoder

Hardware video decoding and image post processing: H.264, MPEG4, H.263, MPEG2, JPEG, VP8.

### eMMC™

V4.3 – MLC NandFlash supported through eMMC interface; V4.5 support for ATSAMA5D2 series.

### USB

High speed (HS) or Full Speed (FS), High Speed Inter-Chip (HSIC)

Peripheral implementation varies among products. Consult individual product datasheets for a detailed description.

### FLEXCOM

Flexible Serial Communication Controller that can be configured as USART, SPI or TWI.

### PTC

Peripheral Touch Controller, built-in hardware for capacitive touch buttons, sliders and wheels.

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<table>
<thead>
<tr>
<th>SoM Interfaces</th>
<th>Dimensions (mm)</th>
<th>Number of Pins</th>
<th>IO Pins</th>
<th>Main Supply Voltage</th>
<th>Temperature Range</th>
<th>Connector Style</th>
<th>Metal Shield Ready</th>
<th>Optional Voltage Supplies</th>
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<tbody>
<tr>
<td>4 UARTS, 4 FLEXCOMs, 2 SPI, TWI, QSPI, SSC, F$^<em>$S, 6 PTC Buttons, 4 ADC, 2 CAN-FD, 3 HS-USB Host/Device and HSIC, 10 Base-$^</em>$100Base-TX Ethernet, 2 SD/MMC/eMMC/SDDIO, 24-bit RGB, Camera - ISC, Mono PDMIC, Class D Stereo, 6 Tamper Pins, Shutdown and Reset control pins</td>
<td>38 x 40</td>
<td>176</td>
<td>103</td>
<td>3.3V</td>
<td>-40°C to +85°C</td>
<td>Single-sided, hand-solderable board</td>
<td>Yes</td>
<td>VDDBU, VDDSDHC, VDDSDC</td>
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<tr>
<td>5 UARTS, 4 FLEXCOMs, 2 SPI, TWI, 2 QSPI, SSC, F$^<em>$S, Full PTC, 6 ADC, CAN-FD, 2 HS-USB Host/Device and HSIC, 10 Base-$^</em>$100Base-TX Ethernet, SD/MMC/eMMC, 16-bit RGB, Camera - ISC, Mono PDMIC, Class D Mono, 7 Tamper Pins, Start, Shutdown, Wake-Up and Reset control pins</td>
<td>40.8 x 40.8</td>
<td>188</td>
<td>94</td>
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<td>Memory</td>
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<td>DDR2 SDRAM (MB)</td>
<td>DDR3 SDRAM (MB)</td>
<td>DDR4 SDRAM (MB)</td>
<td>L1 Cache Memory (KB)</td>
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<td>1</td>
<td>–</td>
<td>7</td>
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</tbody>
</table>

**Temperature Range:** −40°C to +85°C (ambient)

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ATSAM9 Arm9-Based MPUs

<table>
<thead>
<tr>
<th>Camera Interface</th>
<th>Graphics LCD</th>
<th>Security Level</th>
<th>Secure Boot Pins</th>
<th>Anti-Tamper Pins</th>
<th>16-bit Timers</th>
<th>32-bit Timers</th>
<th>PWM Channels</th>
<th>10-bit ADC Channels</th>
<th>12-bit ADC Channels</th>
<th>Max I/O Pins</th>
<th>Extended Temperature Range (-40 to 105°C Ambient)</th>
<th>Packages</th>
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<tbody>
<tr>
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</table>

Camera Interface: For CMOS-type image sensor, ITU-R BT. 601/656 external interface, programmable frame capture rate, up to 12-bit data interface, SAV and EAV synchronization, preview path with scaler, YCbCr format ; Raw Bayer support with ATSAMA5D2 series

Graphics LCD: 24-bit parallel interface; supports STN and TFT displays, up to 16-bits per pixel in STN color mode, up to 16M colors in TFT mode.

Hardware Video Decoder: Hardware video decoding and image post processing : H.264, MPEG4, H.263, MPEGl, JPEG, VP8.

2D Graphics: 2D Graphics Engine supporting fill BLT, copy BLT, transparent BLT, blend/alpha BLT, ROP4 BLT (Raster Operations) and command ring buffer.

eMMC: V4.3 – 4G NAND Flash supported through MMC interface; V4.5 support for ATSAMA5D2 series.

USB: High speed (HS) or Full Speed (FS).
## Evaluation Kits

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<tr>
<th>Ordering Code</th>
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<th>Image</th>
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<td>SAM9X60-EK</td>
<td>SAM9X60</td>
<td></td>
</tr>
<tr>
<td>ATSAMA5D27-WLSOM1-EK1</td>
<td>SAM5D2-Series LPDDR2 SiP and Wireless SOM included</td>
<td></td>
</tr>
<tr>
<td>ATSAMA5D27-SOM1-EK1</td>
<td>SAM5D2-Series DDR2 SiP and SOM included</td>
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<td>DM320108-BNDL</td>
<td>Bundle ATSAMA5D2-PTC-EK + QT1-XPRO</td>
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<tr>
<td>ATSAMA5D2C-XULT</td>
<td>SAM5D2 Series</td>
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# Evaluation Kits

<table>
<thead>
<tr>
<th>Ordering Code</th>
<th>Supported Devices</th>
<th>Image</th>
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<tbody>
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<td>AT91SAM9G15-EK</td>
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<td>DV164232</td>
<td>J-32 Debug Probe supporting all MPU products</td>
<td><img src="image" alt="J-32 Debug Probe" /></td>
</tr>
</tbody>
</table>

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  - [www.freertos.org](http://www.freertos.org)

### Bare Metal
- MPLAB® Harmony v3
- Softpacks
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- IAR Embedded Workbench for Arm® processors (EWARM)
- GNU Toolchain Bare Metal and RTOS-Based Systems Learning
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