The Latest Computer on Modules Form Factor – SMARC

An ADLINK Technical White Paper

Module Computing Product Segment

ADLINK Technology, Inc.

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Contents

- Why SMARC® 3
- SMARC® vs COM Express® 4
- Applications 5
- Pin Group Summary 5
- ADLINK SMARC Products 6
- Technical Leadership 7
- About ADLINK 8

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Why SMARC®

SMARC® (“Smart Mobility Architecture”) is a versatile small form factor computer module definition targeting applications that require low power and high performance. SMARC modules will typically use ARM SOCs such as those found in popular consumer devices such as tablet computers and smart phones. Alternatively, low power x86 SOCs and CPUs or other RISC CPUs may as also be used. The SMARC module power envelope is typically under 6W.

SMARC modules are used as building blocks for portable and stationary embedded systems. The core CPU and support circuitry, including memory, boot flash, power sequencing, CPU power supplies, Ethernet and graphics are located on the module. SMARC modules are used in conjunction with carrier boards that implement application specific features such as audio codecs, touch controllers, wireless devices, etc. This modular approach allows scalability, faster time to market and upgradability while maintaining lower costs, low power and small physical size.

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SMARC® vs COM Express®

COM Express® is a very successful computer-on-module (COM) standard that is optimized for PC architecture based embedded systems. The COM Express feature set exploits contemporary PC chipsets very well. There is support for numerous USB ports and PCI Express lanes, PCI Express graphics, LPC bus and PCI bus, as well as power pins supporting over 100 watts.

The SMARC specification targets lower power, small form factor systems. The SMARC pin out is optimized for features common to ARM CPUs rather than those of the PC architecture. Some of these features include parallel LCD display interfaces; provisions for serial and parallel camera input; multiple I2C, I2S, SPI and serial port options; USB client/host mode and OTG (on the go) operation and SD/eMMC card operation. The SMARC specification also includes some of the features found in COM Express, such as a limited number of PCIe, SATA and USB ports, but provides a combination of interfaces that allows many features of interest not supported by COM Express to be made available for contemporary mobile applications.

Two module sizes

- 82mm x 50mm
- 82mm x 80mm

Carrier board connector: 314 pin MXM pin-out

- Low cost
- Low profile
- Excellent signal integrity
- Robust, vibration resistant connector

Module input voltage range: 3.0V to 5.25V

- Allows operation using 3.6V nominal Lithium-ion battery packs
- Allows operation using 3.3V fixed DC supply
- Allows operation using 5.0V fixed DC supply
- Single power supply (no separate standby voltage)
- Module power pins allow 5A max, or 15W max input power at 3.0V

Low power designs

- 1W to 6W typical module power draw during active operation
- Fanless
- Passive cooling
- Lowest standby power
- Designed for battery operation
- 1.8V default I/O voltage

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Applications

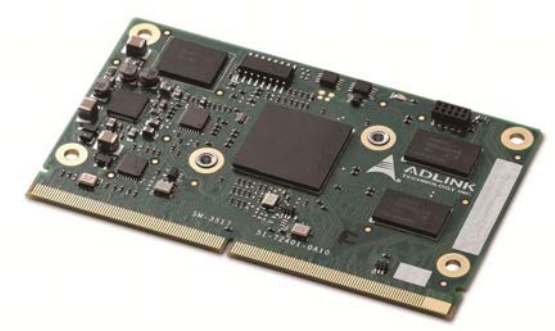


Pin Group Summary

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
CSI0 / PCAM Hi	7	Camera Input: CSI 2 lane / Parallel Camera Input D10:15	
CSI1 / PCAM Lo	10	Camera Input: CSI 4 lane / Parallel Camera Input D0:9	
PCAM Support	6	Parallel Camera support signals	
GBE	12	Gigabit Ethernet	
PCIe	28	3 PCIe x 1 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	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)	AFBs
RSVD / EDP_HPD	1	Reserved / Future use for eDP HPD	
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		

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ADLINK SMARC Product



ADLINK SMARC Module LEC-3517

Processor

- TI Sitara AM3517 Cortex-A8 600MHz
- NEON™ SIMD coprocessor and vector floating point coprocessor
- PowerVR™ SGX530 graphics accelerator

Memory

- Up to 2GB DDR2 SDRAM
- Up to 2GB NAND Flash
- 64K-Byte SRAM

Video

- Video Processing Front End (VPFE) 16-bit
- Supports REC656/CCIR656 standard
- Supports YCbCr422 format

Display

- Parallel digital output
- Up to 24-bit RGB , up to 2 LCD panels
- Two 10-bit digital-to-analog converters (DACs)

Audio

- I2S, codec on carrier board

Network

- 10/100 Base-T Ethernet controller

GPIO

- 10 signals

Media Interface

- 2 x High-Speed eMMC/SD/SDIO
- eMMC 8-bit , SDIO 4-bit

SDIO Interfaces

- 4-bit SDIO card interface with support lines
- 8-bit eMMC interface with support lines

Camera Interfaces

- Serial configuration: CSI (2 lane) + CSI (2 or 4 lane)
- Parallel configuration: 10, 12, 16 bit or dual 8 bit input motion video or still images

SPI Interfaces

- 2x SPI interface

I^2S Interfaces

- 3x I2S interfaces

I^2C Interface

- 3x I2C

Asynchronous Serial Port Interfaces

- 4x asynchronous serial ports

CAN Bus Interfaces

- 1x CAN bus interfaces

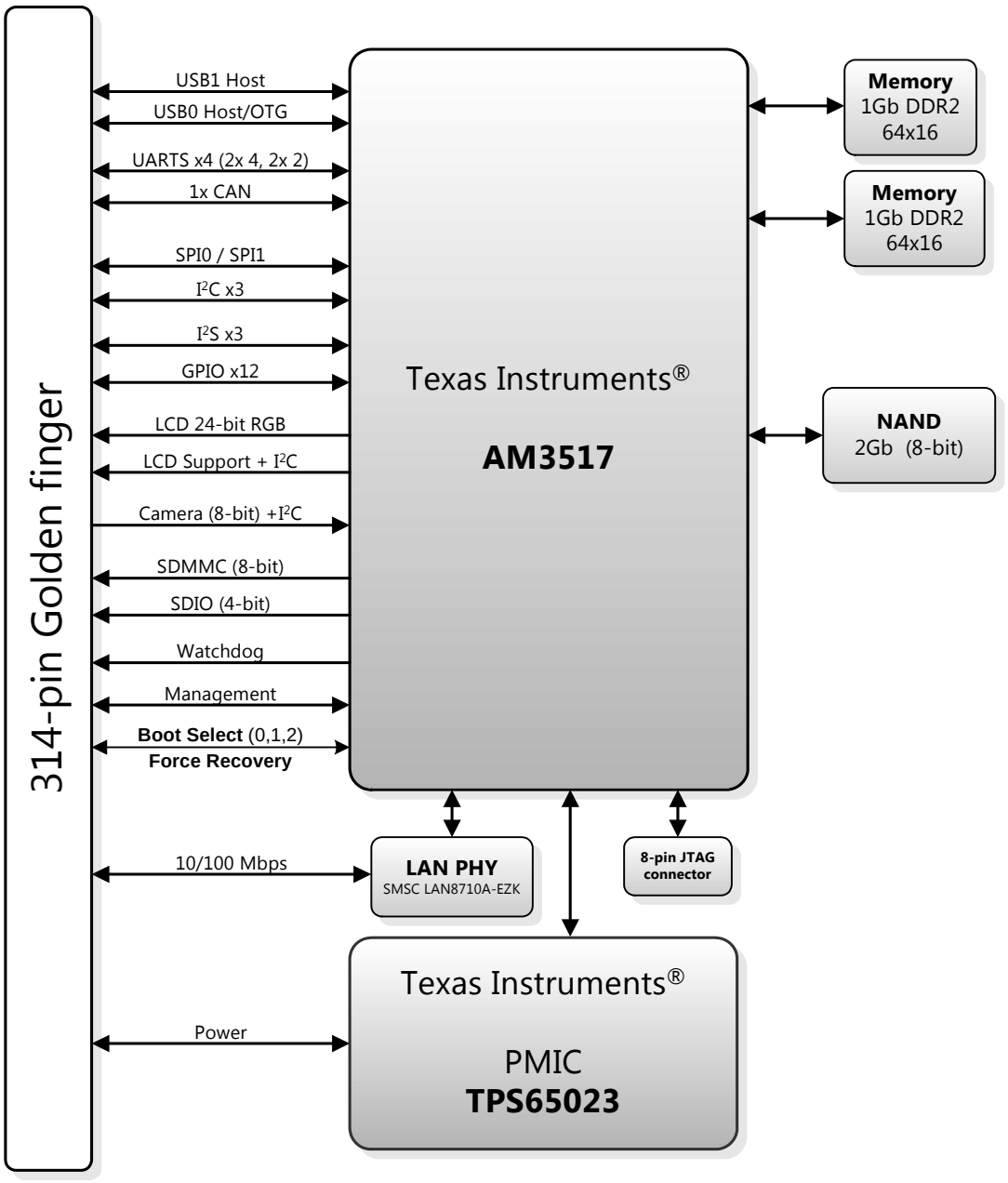
USB Interfaces

- 2x ports

Supported Operating Systems

- **Microsoft Windows**
  Windows Embedded Compact7.0 (WEC7)
  Windows CE 6.0
- **Linux**
  Android, Fedora/Ubuntu
- **RTOS**
  VxWorks, QNX

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Technical Leadership

- Intel Intelligent Systems Alliance Associate Member
- PICMG Executive Member
- SGET Voting Member
- PC/104 Embedded Consortium Affiliate Member
- SFF-SIG Voting Member
- PXISA Sponsor Member
- AXIe Consortium Strategic Member
- Montavista Partner
- Wind River Hardware Partner
- Automation Imaging Association Member
- Microsoft Windows Embedded Partner

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About ADLINK

ADLINK is a leading manufacturer of high-performance, high-quality PC based add-on cards and platform provider, has been developing the full line of embedded systems for a wide range of applications in Test & Measurement, Automation and Computer & Communication. ADLINK endeavors to improve quality continuously and have applied 6 Sigma in its product line and service flow. ADLINK is also quickly emerging as a leader in industrial computing products, with innovative Passive Backplane and CompactPCI platforms. ADLINK products are marketed globally through direct sales offices and an extensive network of worldwide sales channels.

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