SMARC

ADLINK SMARC Solution Optimizes your Uptime

- Low Power Consumption
- Cost Effective Solution
- Smaller Form Factor with higher performance
- Robust, Vibration Resistant Connector

Why SMARC®

SMARC® is a versatile small form factor computer module definition targeting applications that require ultra low power, low cost 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 performance diversification while maintaining lower costs, low power and small physical size.

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, typical x86 interfaces such as LPC bus and PCI bus, as well as a large number of power input pins supporting module power consumption of over 100 watts.

The SMARC® computer-on-module specification targets ultra lower power, small form factor systems. The SMARC pin-out is optimized for features common to ARM and SOCs rather than those of the current x86 architecture. Some of these ARM/SOC features include parallel LCD display interfaces; provisions for serial and parallel camera input; multiple I2C, I2S and serial port options; USB client/host mode operation; and SD/eMMC card operation. The SMARC specification, with its 314-pin board to board connector, is future proof by offering additional space for modern interfaces found on today's devices such as LVDS, PCIe, SATA, HDMI and DisplayPort.

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

- 2W to 6W typical module power draw during active operation
- Fanless
- Passive cooling
- Low standby power
- Designed for battery operation
- 1.8V default I/O voltage

Supported Operating Systems

Microsoft Windows

- Windows Embedded Compact7.0
- Windows CE 6.0

Linux

- Android
- Ubuntu

RTOS

- VxWorks
- QNX

314-pin Board-to-Board Connector Summary

Pin Group	Pin Count	Description / Primary Function
Parallel LCD	28	Primary Display: 24 bit parallel RGB data
LVDS LCD	10	Primary Display: Single channel 18 / 24 bit LVDS data
LCD Support	4	Panel and backlight enable, PWM, dual pixel clock
HDMI	12	Secondary Display: HDMI
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)
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

SMARC Applications

LEC-3517

SMARC Module with TI Sitara AM3517 + TI PMIC

EXTREME RUGGED

Features

- SMARC Short form factor module for low cost and high performance applications
- TI ARM Cortex-A8 processor
- Low profile form factor and low power consumption
- Robust, vibration resistant 314 pin MXM connector
- Optimized for features common to ARM CPUs, including LCD display interfaces; serial and parallel camera input; multiple I²C, I²S and serial port options; and USB client/host mode operation

Specifications

Core System

TI Sitara AM3517 Cortex-A8 600MHz
NEONTM SIMD co-processor and vector floating point co-processor
PowerVR SGX™ 530 Graphics Accelerator

Memory

256MB DDR2 SDRAM (166 MHz 16/32- bit mDDR/DDR2 Interface)
512MB NAND flash
64K-Byte SRAM

Video

Video Processing Front End (VPFE) 16-bit
Supports REC656/CCIR656 standard
Supports YCbCr422 format (8-bit or 16-bit with discrete horizontal and vertical sync)

Audio

I²S, codec on carrier board

Display

Parallel Digital Output
Up to 24-bit RGB , up to 2 LCD panels
Two 10-bit digital-to-analog converters (DACs) supporting:
- Composite NTSC/PAL video
- S-Video

Ethernet

10/100 Base-T Ethernet controller (SMSC LAN PHY)

Media Interface

3 x High-Speed MMC/SD/SDIO
MMC 8-bit , SDIO 4-bit

GPIO

12 signals

Timer

12x 32-bit general purpose timers
1x 32-bit watchdog timer
1x 32-bit 32-kHz sync timer

Power

PMIC TPS65023

Operation Temperature

Extended: -40˚C to +85˚C

Dimensions

82 mm x 55 mm (L x W)

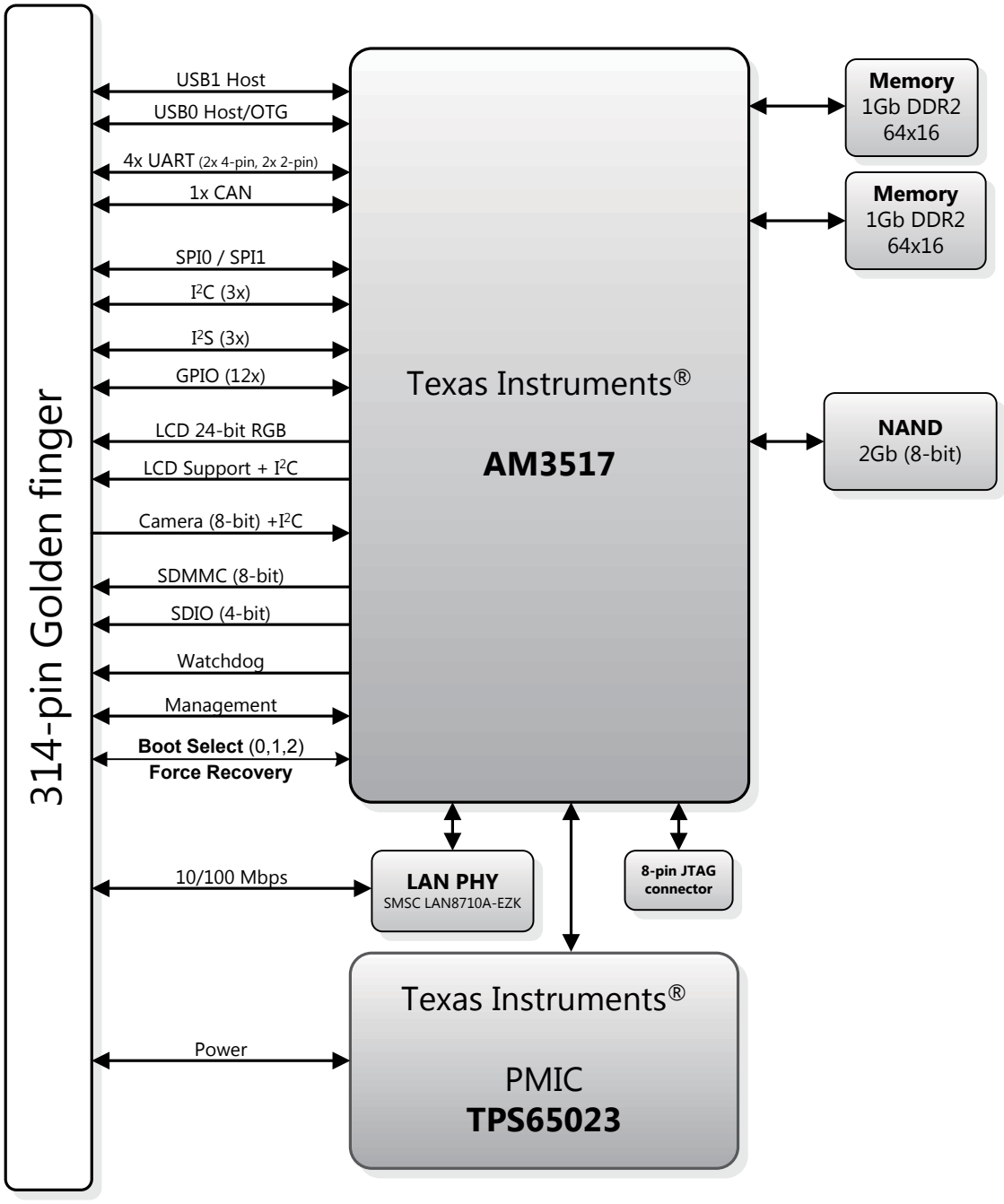
Board connector

MXM3 314 pins

Operating System

Standard Support Linux, Android, Windows CE, VxWorks 6.x

Functional Diagram



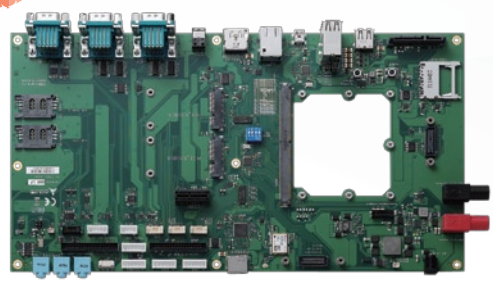
Ordering Information

Modules

Model Number	Description/Configuration
LEC-3517	SMARC, TI AM3517 Cotex-A8 600MHz, 256MB DDR2 SDRAM, 512MB NAND Flash, 82mm x 55mm

LEC-BASE

SMARC Reference Carrier Board



Features

- For SMARC form factor modules
- GPS u-blox NEO-6 module and G Sensor
- Supports keypad (TI TCA8418) and touchscreen (TSC204061PW)
- Wi-Fi & Bluetooth USB dongle
- USB hub
- RGB to HDMI

Specifications

Display Interfaces

24 bit parallel RGB LCD data and control signals

Single channel LVDS 18 or 24 bit (derived from parallel RGB data)
- Panel support signals (I²C, power enable, PWM)
- 2nd LVDS output may be implemented on carrier board
- Support for dual channel implementations

Future migration to eDP defined by pin-sharing with LVDS

HDMI/DP port

Camera Interfaces

Serial configuration: CSI (2 lane) + CSI (2 or 4 lane)

Parallel configuration: Parallel 10, 12, 16 bit or dual 8 bit input motion video or still images

SDIO Interfaces

4 bit SDIO card interface with support lines

8 bit eMMC interface with support lines
- Off-module boot from eMMC (optional)

SPI Interfaces

2x SPI interfaces
- Off module boot use (optional)
- G sensor ADXL345 BCCZ

I²S Interfaces

3x I²S interfaces
- Audio codec TLV320AIC23BPW
- Line-in, Line-out, Mic
- Optional with HDA

I²C Interface

4x I²C
- Power Management
- General Purpose
- Camera
- LVDS Display ID

Asynchronous Serial Port Interfaces

4x asynchronous serial ports
- Two with 2 wire handshake (RXD, TXD, RTS#, CTS#)
- Two with data only (RXD, TXD)
- Logic level interface

CAN Bus Interfaces

2x CAN bus interfaces
- Logic level signals from Module based CAN bus protocol controllers
- RXD, TXD only

USB Interfaces

2x ports
- One with USB 2.0 OTG
- Two with USB 2.0 host operation (Full Speed and High Speed)

PCI Express

Three PCIe x1 links

PCIe Gen1 or Gen 2 (module dependent)

Reference clock pair for each PCIe link

Full set of PCIe support signals for each link

May be configured as PCIe target if module chipset allows

Common PCIe wake signal

SATA Interface

One SATA with power interface

Gigabit Ethernet

RJ-45 10/100/1000 (by LAN transformer)

One analog GBE MDI interface

SPDIF Interfaces

SPDIF out for audio

Boot Source Select

Module SPI/eMMC/NOR/NAND

Carrier SPI/eMMC/SD Card/SATA

DIP Switch (4)

GPIO

12 pins header (including fan control and HDA reset)

Alternate Function Blocks (AFB)

Standard Module: AFB pins are reserved

MOST Bus AFB

Dual GBE AFB

FieldBus AFB

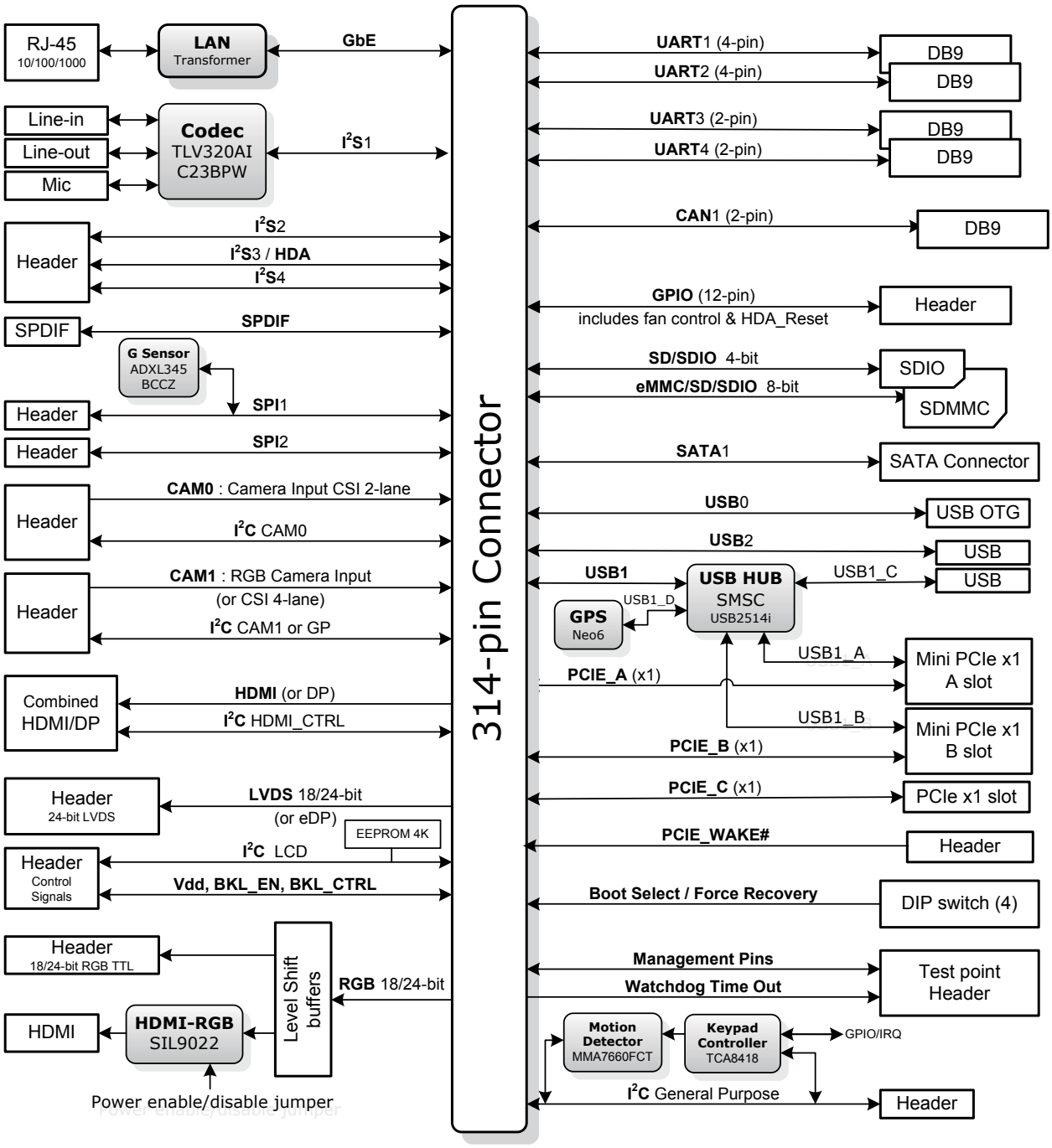
Dimensions

330 mm x 175 mm (L x W)

Board connector

MXM3 314 pins

Functional Diagram



Ordering Information

Modules

Model Number	Description/Configuration
LEC-BASE	SMARC, Baseboard for LEC-3517 module, MXM 314 pins, 330 mm x175 mm