



ARM® Cortex®-A8 SBC with CSI CMOS Camera Interface and NEON™ GPU

SBC5651



Features

- ✓ ARM Cortex-A8 processor, 800MHz
- ✓ 512MB SDRAM, 4GB Flash, 4MB SPI NOR Flash
- ✓ CSI camera port, 10-bit parallel with user programmable pinout
- ✓ LCD touchscreen support
- ✓ CAN bus interface
- ✓ Three (3) USB 2.0 ports, three (3) serial ports, and one (1) SD/MMC card slot
- ✓ 10/100 Ethernet
- ✓ Four power options: USB OTG, Li-Ion battery, StackableUSB, Terminal Block
- ✓ Pico-ITX form factor

The SBC5651 is ideal for applications requiring small, low-power SBCs typical in medical, data collection, and test and measurement systems. With Freescale's i.MX515 ARM Cortex-A8 multimedia processor at its core, the SBC5651 effortlessly interfaces to a CSI CMOS camera module to offer functions such as OCR, bar code scanning, edge detection, and real time video or video capture. Users can control the speed and power consumption by adjusting processor speeds up to 800 MHz.

On-board I/O features include an LCD touchscreen for LVDS and TFT, LED backlight

control, keypad interface, SD card slot, 4G NAND flash, audio, Ethernet, watchdog timer, two PWM outputs, 1-wire interface, and three serial ports. Analog expansion via USB, SPI, and I2C is available through StackableUSB™.

The Linux BSP for the SBC5651 is built through Yocto and installed on an SD card, making the board ready to program. Users can connect to their workstation via Ethernet to access their preferred Linux programming tools. Access to both OpenCV and GStreamer is available, as are sample programs for simple video applications.

Software Support

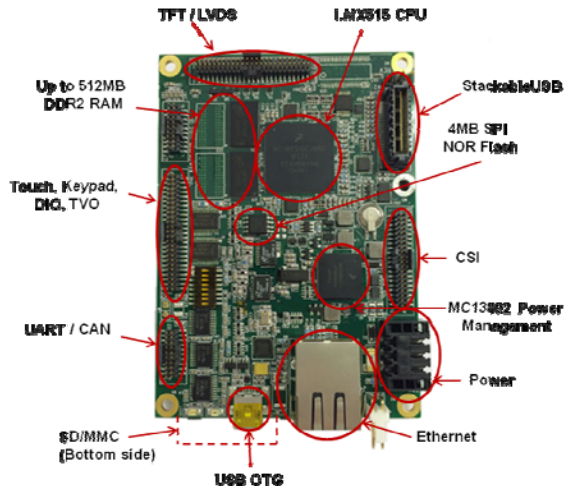


Features & Standards



Compatible Hardware





Technical Details:

At the heart of the SBC5651 is the Freescale i.MX515 multimedia applications processor, a System on Chip (SOC) offering high-performance processing optimized for the lowest power consumption. The core of i.MX515 is an 800MHz ARM Cortex-A8 CPU. The CPU is augmented by a floating-point coprocessor, ARM's NEON SIMD media accelerator, and OpenGL ES 2.0 and OpenVG 1.1 hardware accelerators for fast, power-efficient graphics operations.

Optimized for vision, the SBC5651 provides users a configurable CMOS camera port directly from the i.MX515 CPU. The 24-pin 10-bit parallel port is programmable via the JTAG connector. The programmable port allows users to test different CMOS cameras during development and switch cameras for production if delivery or obsolescence becomes an issue.

The i.MX515 SOC integrates many peripherals, including an interrupt controller, watchdog timer, SDRAM and flash memory controllers, three (3) High-Speed USB ports, one (1) Full-Speed On-The-Go USB port, one (1) 10/100 Ethernet MAC, three (3)

16C550 UARTs, 1-Wire interface, 24-bit flat panel display output, 4-wire resistive touchscreen interface, an 8-row x 6-column keypad controller, an audio port, and PWM and TV output.

In addition to the peripherals built into the i.MX515, the SBC5651 adds a CAN (Controller Area Network) controller and 16 bits of programmable parallel I/O.

The SBC5651 offers three boot options for users' runtime applications: a dedicated 4MB SPI NOR flash memory, a partition of the NAND flash, and a bootable SD/MMC card slot.

The SBC5651 memory subsystem provides up to 512MB of DDR2 SDRAM for application data. The 4MB SPI NOR flash memory holds the bootloader and operating system. 1-4GB NAND flash is available for operating system and non-volatile user storage.

Three (3) 16C550-compatible RS232/RS485 serial ports allow communication with low-speed devices.

The SBC5651 can be powered from an external 5 VDC source, a single cell Li-Ion battery, through an on-board mini-AB USB power connector, or through StackableUSB. If external power is supplied while a battery is plugged in, the battery will be recharged. Advanced power management is enabled by the new Freescale MC13892. Through user-programmable clock rates, the SBC5651 can attain sub 1W power requirements.

The SBC5651 becomes a powerful front-end processor for control applications with the standard StackableUSB expansion. This popular I/O channel accommodates multiple stacked I/O boards without requiring a hub.

For true 32-bit application development, the SBC5651 supports 32-bit operating systems such as Linux, Windows CE, VxWorks, and Android. All have full tool suites available, including compilers and debuggers. Plus, Linux users can build their own custom version of a Linux distribution with Yocto.

Specifications:

Mechanical:

- Pico-ITX mounting holes
- 3.9" (plus I/O region) x 2.8" x .6"
- Installed Secure Digital (SD) card extends past edge of board
- Max height .535" (Ethernet connector)

Power Requirement Options:

- +5v \pm 5% at 250mA typical, 350mA max at Pin1, or
- +4.8v single cell Li-Ion battery at Pin2, or
- Mini-AB USB OTG port, or
- +5v through StackableUSB connector

Power Connector	
Pin	Signal
1	+5V
2	Battery Input
3	GND

Environmental:

- Operating range 0° to +70°C, with 800MHz processor
- ET-version operating range -40° to +85°C, with 600MHz processor
- 40° to +85°C storage
- 5%-95% relative humidity, non-condensing

Processor Core Section:

- Freescale i.MX515 multimedia applications processor
- 800MHz or 600MHz clock rate
- ARM Cortex-A8 CPU core
- Hardware graphics accelerators (video, OpenGL ES 2.0 and OpenVG 1.1)

On-board Memory:

- 256-512MB DDR2 Synchronous DRAM
- 4MB SPI NOR flash
- 1-4GB NAND flash (option)

Memory Expansion:

- One (1) SD/MMC card slot

CSI Camera Port:

- 10-bit parallel
- 24-pin connector
- Firmware configurable pinout

Watchdog Timer:

- Program must refresh watchdog timer periodically, or system will be reset
- Enabled through software

COM1-COM3 Serial Ports:

- Three (3) asynchronous serial ports
- 16C550-compatible
- RTS and CTS modem controls (COM1)
- RS232 on all channels
- Optional RS485/RS232 configurations

Ethernet Port:

- 10/100BASE-T Ethernet port
- Standard RJ45 connector

USB:

- One (1) Full-Speed On-The-Go USB 2.0 port providing device and limited Host functions, Mini-AB connector

USB (cont'd):

- ❑ Three (3) High-Speed USB 2.0 Host ports, StackableUSB connector
- ❑ Transfers at High-Speed 480Mbit/sec, Full-Speed 12Mbit/sec, or 1.5Mbit/sec

Real Time Clock:

- ❑ RTC with on-board battery

Controller Area Network (CAN Bus):

- ❑ CAN version 2.0B, 1Mbit/sec
- ❑ Standard and extended data and remote frames
- ❑ Two (2) receive buffers and three (3) transmit buffers with prioritized message storage

Digital I/O:

- ❑ 4-wire touchscreen interface
- ❑ I²C (on StackableUSB connector)
- ❑ SPI (on StackableUSB connector)
- ❑ 1-Wire interface
- ❑ Two (2) PWM outputs
- ❑ 8-row x 6-column keypad

Audio/Video I/O:

- ❑ Microphone input, stereo line in/line out, headphone out
- ❑ 24-bit TFT flat panel display output
- ❑ 24-bit LVDS flat panel display output option
- ❑ TV-out

External Connections:

- ❑ 50-pin header for TFT/LVDS LCD display out
- ❑ 50-pin header for touch, DIO, keypad, PWM, one-wire, and TVO
- ❑ 20-pin header for audio
- ❑ 20-pin header for CAN and Uart
- ❑ One (1) SD/MMC card slot
- ❑ One (1) USB Mini-AB USB connector
- ❑ 2-pin locking header for reset
- ❑ 2.1mm barrel power input
- ❑ One (1) RJ45 jack for Ethernet
- ❑ One (1) 24-pin CSI port

Development Kit:

- ❑ Single Board Computer
- ❑ Complete cable set and power supply
- ❑ BSP, documentation, sample software

Ordering Information:

OEM Single Board Computers:

SBC5651	i.MX515 ARM Cortex-A8 CPU, 800MHz, 256MB SDRAM, 4MB NOR Flash, Ethernet, Pico-ITX
SBC5651-ET	i.MX515 ARM Cortex-A8 CPU, 600MHz, 256MB SDRAM, 4MB NOR Flash, Ethernet, Pico-ITX, -40°C to +85°C operating temp
CS5651*	Complete Cable Set
5651OPT1**	Upgrade to 512MB SDRAM
5651OPT6	Upgrade to 2GB flash
5651OPT7	Upgrade to 4GB flash
5651OPT8-x	Configurable RS485
5651OPT22	CAN Bus Interface
5651OPT28	LVDS Panel Support
5651OPT45	Audio Interface
5651OPT50	Linux Installed
5651OPT55	WinCE Installed
5651OPT60-x	StackableUSB
5651OPT70	CSI Port

* Cables nominally 15", other lengths available

** Add "-ET" to 5651OPTxx for -40° to +85°C operating temp

Related Products:

BA4052	50-pin high density to 50-pin screw terminal
BA2020	20-pin high density to 20-pin screw terminal
CA4133	RJ45 Ethernet Cable
CA4136	Mini B to Type A USB Cable
DK5651	Development Kit (see DK datasheet for options)
OV5640	OmniVision CMOS camera