ARM® Cortex®-A8 SBC with NTSC/PAL and Spartan®-6 FPGA SBC1655

Features

- ✓ ARM Cortex-A8 processor, 800MHz
- ✓ Xilinx Spartan-6 FPGA expands vision processing capabilities
- ✓ One NTSC/PAL camera port
- ✓ Develop with OpenCV and GStreamer
- ✓ TFT/LVDS 24-bit display interface with backlight and touchscreen
- ✓ 512MB SDRAM, 4GB Flash, 2 SD/MMC
- ✓ Dual CAN bus interface
- ✓ Up to 64 differential DIO from FPGA
- ✓ Dual 10/100 Ethernet / Web Server

The SBC1655 is ideal for mid-range embedded vision applications in a rugged, harsh, environment with limited access to power. Freescale's i.MX515 ARM Cortex-A8 CPU provides a NEON™ GPU that processes video input from the onboard NTSC/PAL interface, while the Xilinx Spartan-6 FPGA provides additional heavy video processing computations for this multimedia-rich board.

The SBC1655 ships with a factory-installed Linux image in NAND flash plus an SD card with a full build of Linux, including a broad suite of development tools. There is a vision development layer included with the Development Kit that provides access to OpenCV. Users can program the board directly from the command line and use multiple formats of Eclipse for debug.

The SBC1655 includes the features listed above plus dual CAN, real-time clock, watchdog timer, audio, SATA HDD, and 1-Wire interface. Industrial I/O includes up to 64 differential DIO, two PWM, DAC and/or ADC available through StackableUSB™. The SBC1655 uses minimal power and operates at extended temperatures (-40 to +85) on a 3.5" x 3.5" (PC/104) footprint.

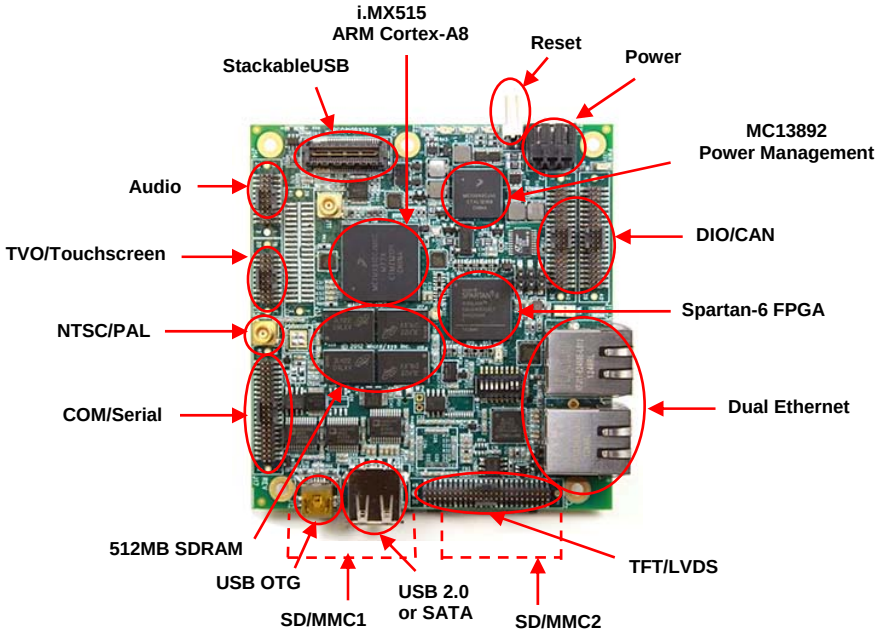
Software Support

GNU/Linux · Microsoft® Windows® Embedded Partner · yocto PROJECT PARTICIPANT · gstreamer · OpenCV

Features & Standards

ARM CONNECTED · USB 2.0 · RoHS COMPLIANT · IPC

Compatible Hardware



Technical Details:

At the heart of the SBC1655 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 enhanced by a floating-point coprocessor, ARM's NEON SIMD media accelerator, AGP Video with 64MB Video memory, and OpenGL ES 2.0 and OpenVG 1.1 hardware accelerators for fast, power-efficient graphics operations.

The heart of vision processing for the SBC1655 is a Xilinx Spartan-6 FPGA. The FPGA can either be programmed using Xilinx ISE tools or programmed with Micro/sys IP cores, third party cores or the user's own IP. Either way, the FPGA supports the i.MX515 by offloading repetitive, computational tasks, leaving the i.MX515 free for system level functions such as networking, application programs and general housekeeping. Other applications such as digital I/O, serial ports, and SPI ports can be implemented in the FPGA.

The FPGA communicates to the i.MX515 via a memory bus configuration using the Freescale-defined WEIM bus. The SBC1655 ships with the FPGA 95% available for the users' IP. If the optional digital I/O, SPI and COM ports are ordered, 80% of the FPGA remains available for the user.

The on-board NTSC/PAL interface automatically detects and converts incoming analog baseband television signals to 4:2:2 component video data compatible with the BT.656 interface standard via the MCX7 connector. This in turns provides users seamless access to a wide range of encoders, codecs, and video processing tools. The analog input channel accepts standard composite video signals. Accurate 10-bit analog-to-digital conversion provides

professional quality video performance for industrial application with true 8-bit data resolution.

The SBC1655 memory subsystem provides 512MB of DDR2 SDRAM for application data. The 4MB SPI NOR flash memory holds the bootloader and operating system. Up to 4GB NAND flash is also available for operating system and non-volatile user storage.

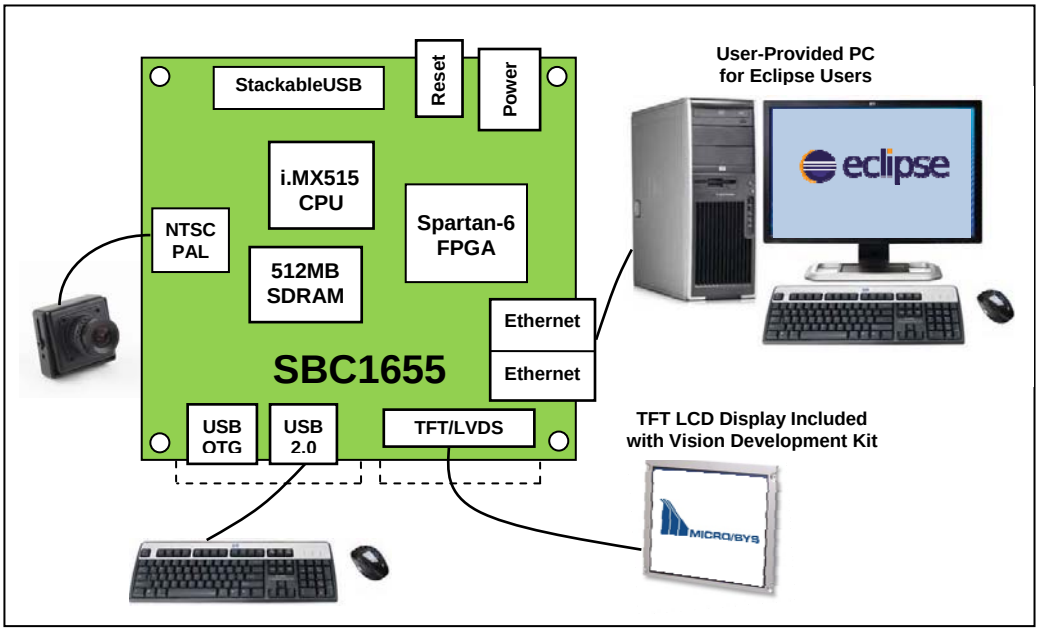
The SBC1655 integrates many additional features including an interrupt controller, watchdog timer, SDRAM and flash memory controllers, three High-Speed USB ports, one Full-Speed On-The-Go USB port, a 10/100 Ethernet MAC, three 16C550 UARTs, 1-Wire interface, 24-bit flat panel display output, 4-wire resistive touchscreen interface, an audio port, and two PWM. Additional peripherals include a second 10/100 Ethernet port and dual Controller Area Network controllers (CAN).

Large application programs, data storage and/or portability of either of these items is available via one of two SD card slots or connecting to the SATA HDD connector to attach an external hard drive.

The SBC1655 becomes a powerful front-end processor for control applications when mated with a StackableUSB I/O board offering DAC and ACD via an easily programmable PIC32 microcontroller.

The SBC1655 has both a Linux and a WindowsCE BSP. The SBC1655 comes standard with a factory installed Linux runtime image. The Linux BSP (included with the Development Kit) is supplied on SD card and includes integrated Linux support layers, including OpenCV and GStreamer.

Micro/sys can provide OEMs with customized versions of the SBC1655 and a single part number for ordering.



Specifications:

Mechanical:
- ❑ PC/104 footprint
- ❑ 3.55” (plus I/O region) x 3.775” x .6”
- ❑ Installed Secure Digital (SD) card extends past edge of board
- ❑ Max height .535” (Ethernet connector)

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

Power Requirements:
- ❑ +5v ±5% at 500mA typical, 850mA max

Power Connector	
Pin	Signal
1	+5V
2	Reserved
3	GND

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)
- ❑ JTAG (IEEE 1149.1) debug interface

On-board Memory
- ❑ 512MB DDR2 Synchronous DRAM
- ❑ 4MB SPI NOR flash
- ❑ 4GB NAND flash (option)

Memory Expansion
- ❑ Two SD/MMC card slots
- ❑ SATA HDD connector (option)

NTSC/PAL Camera Interface:
- ❑ CVBS (composite, Y/C, S-video) input
- ❑ YPrPb (component) input
- ❑ BT.656 Video Decoder, SD/HD TV

NTSC/PAL Camera Interface (cont’d):
- ❑ 1Vpp to Video Decoder
- ❑ NTSC or PAL format (30 fps)
- ❑ Digital ITU-R BT.656 Format to i.MX515

User Programmable FPGA
- ❑ Xilinx Spartan-6 XC6SLX16
- ❑ Configurable with Micro/sys FPGA options (see Ordering Info)
- ❑ Program using FPGA Development Kit

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

Serial Interfaces:
- ❑ Three RS232 asynchronous serial ports
- ❑ Four optional serial ports in FPGA
- ❑ 16C550-compatible
- ❑ RTS and CTS modem controls
- ❑ Four RS485 half-duplex ports (option)
- ❑ SPI
- ❑ I2C

Ethernet Ports:
- ❑ Two 10/100BASE-T Ethernet ports
- ❑ Standard RJ45 connectors

USB:
- ❑ One Full-Speed USB 2.0 On-The-Go port providing device and limited Host functions, Mini-AB connector
- ❑ Three High-Speed USB 2.0 Host ports
- ❑ StackableUSB connector (option)
- ❑ Transfers at High-Speed 480Mbit/sec, Full-Speed 12Mbit/sec, or 1.5Mbit/sec

Real Time Clock:
- ❑ RTC with onboard battery, 10 year life

Controller Area Network:
- ❑ Dual CAN 2.0B, 1Mbit/sec (option)
- ❑ Standard and extended data and remote frames
- ❑ Two receive buffers and three transmit buffers with prioritized message storage

Digital I/O:
- ❑ Up to 64 TTL programmable bi-directional signals from FPGA
- ❑ 1-Wire interface
- ❑ Two PWM outputs

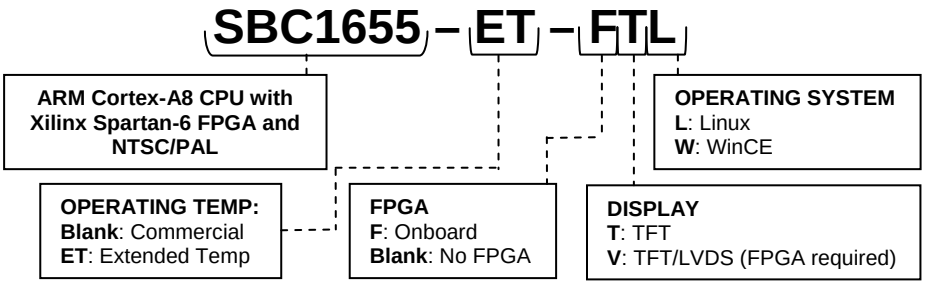
Audio/Video I/O:
- ❑ Microphone/headphone, line in/line out (option)
- ❑ 24-bit LVDS (option) /TFT LCD interface
- ❑ 4-wire resistive touchscreen interface

External Connections:
- ❑ Three 40-pin headers for COM1-COM7, RS485, DIO, and CAN
- ❑ One 50-pin header for LVDS/TFT
- ❑ One NTSC/PAL MCX7 plug
- ❑ Two 20-pin headers for Audio and TVOut/Touchscreen

External Connections (cont'd):
- ❑ Two 8-pin modular RJ45 Ethernet jacks
- ❑ Two SD/MMC card slots
- ❑ SATA HDD connector (option)
- ❑ StackableUSB connector (option)
- ❑ USB 2.0, Type A (option)
- ❑ USB On-The-Go, Mini-AB
- ❑ 2-pin locking header for reset
- ❑ 3-pin removable terminal strip for power input

Development Kits Available:
- ❑ DK1655 with complete cable set
- ❑ DKV1655 for vision development
- ❑ DKF1655 for FPGA development
- ❑ DKC1655 for both vision & FPGA development

Ordering Information:



SBC1655 Options:

1655OPT7	Upgrade to 4GB flash
1655OPT8-2	Configurable RS485
1655OPT8-4	Configurable RS485
1655OPT22	CAN Bus Interface
1655OPT22-1	Dual CAN Bus Interface
1655OPT24[+]	SATA Interface
1655OPT45	Audio Interface
1655OPT60	StackableUSB Host
1655OPT63[++]	Type A USB Header

** Add "-ET" to 1655OPTxx for Extended Temp*

[+] Not available in Extended Temp.

[++] 1655OPT24 & 1655OPT63 not available together

Related Products:

CS1655**	Complete Cable Set
BA2020	20-pin high density to 20-pin screw terminal
BA4040	40-pin high density to 40-pin screw terminal
BA4052	50-pin high density to 50-pin screw terminal
CA4133	RJ45 Ethernet Cable
CA4136	Mini B to Type A USB
DKV1655	Vision Development Kit
DKF1655	FPGA Development Kit

*** Cables nominally 15"*