PLCcore-5484

IEC 61131-3 AND C/C++ PROGRAMMABLE SINGLE BOARD COMPUTER

SYS TEC ELECTRONIC

High-performance, Linux-based insert-ready PLC core module

Where Embedded meets IEC 61131-3

The PLCcore-5484 is an insert-ready OEM-able single board computer running Linux and a ready-to-use IEC 61131-3 runtime kernel together with a CANopen manager pre-installed. This makes the PLCcore-5484 an ideal solution for own control applications without suffering from high cost caused by IEC 61131-3 development or resale licenses.

The design advantage: Measuring just 40 x 70mm, the PLCcore-5484 incorporates the CPU kernel, SDRAM, Flash memory and communication interfaces. Furthermore, this small module also provides voltage regulation and supervision, programmable logic as well as other commonly-used peripherals - all in a compact form factor, multi-layer PCB with enhanced EMI protection.

Linux pre-installed: The PLCcore-5484 comes with a performance-optimized Linux pre-installed. It includes all drivers, standard network services and a Flash file system. About 4MB flash space is available to the user for own Linux and/or PLC applications.
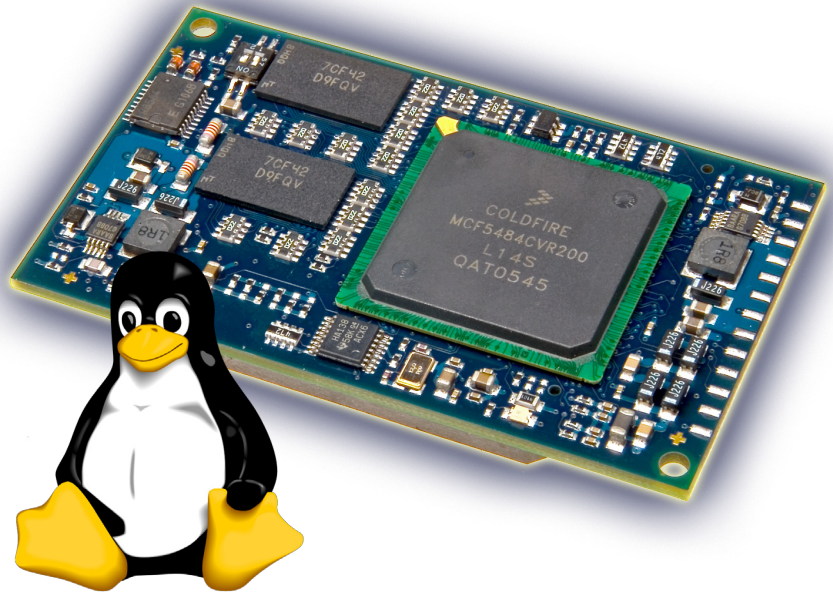
Built-in IEC 61131-3 runtime kernel with CANopen manager: The PLCcore-5484 features an IEC 61131-3 runtime kernel which allows the user to execute and debug applications written in an IEC 61131-3 compliant language. The PLC runtime kernel already includes a fully functional CANopen manager and function blocks for accessing on-board peripherals. The board also supports simultaneous execution of PLC programs and Linux applications. It is possible to share data between the PLC program and other native Linux applications e.g. written in C/C++. A comprehensive function block library provides access to all communication interfaces and to higher-layer protocols such as CANopen including CANopen manager services.

Flexible I/O configuration: The PLCcore-5484 allows for flexible adaptation of the I/O configuration according to customer requirements. This does not only include the on-board CPLD but also allows for using the I2C, SPI or FlexBus to access application-specific I/O peripherals. With our Driver Development Kit (DDK) we provide all board-related information, source code and demos required to write your own application-specific I/O driver.

PLCcore-5484 Starter Kit

The PLCcore-5484 was designed to be plugged onto a carrier board. Both, the module and a development board as a reference carrier board, are included in the PLCcore-5484 Starter Kit. The carrier board contains the I/O connectors required for immediate start-up of the module as well as other interface circuitry not provided on the SBC module itself. The Starter Kit provides an excellent platform to evaluate controllers, develop software as well as specify and determine the feasibility of new embedded designs based on the PLCcore-5484.

Additionally, an I/O Extension board is available for the PLCcore-5484 and adapts all digital in- and outputs via pushbuttons and LEDs.

Designed For:

Motion control

High-speed measurement and monitoring devices

Embedded machine controls

Performance without Compromise

The PLCcore-5484 is an in-application programmable, high-performance single board computer subassembly module, supporting textual and graphical programming methods according to IEC 61131-3. The various industry-proven on-board communication interfaces are accessible through intuitive function blocks. The PLCcore-5484 combines an extra-ordinary I/O flexibility with high-performance program execution. Therefore, the module has various I/O extension interfaces to connect custom peripherals easily, e.g. memory mapped I/O ports, SPI, I2C et cetera. The module comes pre-programmed with a performance optimized Linux operating system including the fully featured IEC 61131-3 runtime kernel and ready-to-use software drivers – no need to suffer extra resale licenses or even expensive development licenses.

The IEC 61131-3 runtime kernel supports users with a broad range of high-performance program development functionalities. The on-target debug functionality supports breakpoints, single stepping, power flow as well as changing and forcing variables. Program download is either possible via Ethernet, CAN-bus or RS232. The PLC program can be updated anytime during runtime, even if the module is placed deeply embedded into the target application. The user application is stored persistent to enable an instant restart after recovering from power-fail.

Its broad variety of communication interfaces makes the PLCcore-5484 best suitable, wherever networked applications are required. Dedicated communication function blocks make it easy to implement proprietary gateway applications or protocol converters. The comprehensive CANopen library, including the CiA 302-compliant CANopen manager allows for a flexible expandability via CAN-bus; just as easy as Plug & Play. Furthermore, the PLCcore-5484 supports the CiA 314 (former CiA 405) CANopen Interface profile for IEC 61131-3 programmable devices. This allows for a very simple data exchange with other CANopen devices.

An implementation based on our insert-ready PLC subassembly as the "core" of your embedded hardware design allows you to concentrate on hardware peripherals and your application software. This is possible without expending resources to "re-invent" the microcontroller circuitry, I/O drivers or even communication protocols. We provide you with a most convenient environment to accelerate your design – an insert-ready solution in hardware and software.

Designed to performance, the core module incorporates all high-speed components on an extremely compact, low-EMI multilayer PCB. The target-specific base board holds the slower clocked peripheral components and thus, can be kept "simple" and less critical in PCB design. The module has a digital I/O expansion interface to connect custom peripherals.

The PLCcore-5484 has a powerful on-board CPLD (Complex PLD). It allows for implementation of basic digital input and output lines as well as highly complex peripheral units. Apart from basic I/Os, the standard version of the CPLD also contains one freely configurable high-speed counter and a powerful PWM/PTO unit. Both, the VHDL sources of the CPLD and the C source code of the I/O driver, are available with our Driver Development Kit (DDK). The on-board CPLD provides the most flexible way to adapt the I/O configuration to specific needs. Thus, proprietary algorithms for pre-processing of process data could be "outsourced" to the hardware level. In addition to memory mapped interfaces, the DDK also supports the usage of standard I/O extension busses like I2C and SPI. Hence, the user is able to adapt the I/O configuration freely and easily to various application requirements.

A reliable and performance-optimized Linux operating system supports simultaneous execution of one or more C-code user-applications besides the PLC runtime kernel. A special API provides functions to share the process image between the C-code user-application and the PLC program. Dedicated tasks could be assigned to external hardware interrupts or system events with least latency. This provides a new degree of freedom for combining PLC applications with high-speed processing low-level OS functions and turns the PLCcore-5484 into a flexible platform for embedded control applications.

The CPU of the PLCcore-5484 includes a real hardware MMU. The Linux operating system allows that single tasks are running in separate Virtual Machines. Those are independent and isolated from each other. That means, each task is protected and shielded from the rest of the system. A crash of one of those tasks cannot impair the integrity of the overall system.

Module Features

- **Hardware:**

  32-bit Freescale MCF5484, 200MHz, MMU

  4 MiB user application memory

  32 kiB non-volatile process data memory

  CPLD (Complex PLD) or FPGA

  RTC and Temperature sensor on-board

  3.3 VDC Single-voltage power supply

- **Software:**

  Linux including preinstalled Telnet, FTP and HTTP Server

  IEC 61131-3 runtime kernel preinstalled

  Programmable in IEC 61131 as well as in C/C++

  IEC 61131/PLC and Linux application simultaneously

  Data exchange via shared memory

  Download: Ethernet, CAN-bus and serial port

  Fully featured CANopen Manager with automatic node configuration (CiA 302 and CiA 314)

- **I/O configuration (standard driver, fully customizable via DDK):**

  24 digital inputs and 22 digital outputs on-board

  1 high-speed counter (Pulse/Dir or A/B)

  1 PWM-/PTO output (Pulse/Dir)

  Modifiable via DDK (using memory-mapped I/O, I2C and SPI)

- **Communication interfaces:**

  2x 10/100 Mbps Fast Ethernet, 1 on–board PHY

  2x High-speed CAN2.0B

  4x Serial

- **Dedicated function blocks for:**

  CANopen master and slave services

  Ethernet (UDP) communication

  Serial interfaces

  Real time clock (RTC)

  Hardware counter and PWM/PTO

  Non-volatile memory

- **HMI units (target-specific, mounted on baseboard):**

  Run/Stop-Switch and Run-/Error-LED

  DIP- and HEX-Encoding Switches

- **Operating temperature range:**

  Industrial: -40°C to +85°C