

PHYTEC



phyCORE[®] Vybrid Cortex[™]-A5/M4

HIGHLIGHTS

- Combination of ARM[®] Cortex[™]-A5 (500 MHz) and Cortex[™]-M4 (166 MHz)
- Scalable Processor Family
- Safety- and Security Functions
- Extreme cost optimization through alternative design approaches

Modern embedded systems increasingly require a graphical user-interface in addition to real-time capabilities for deeper control processes.

Graphics and Real-time, Combined

The Vybrid family's heterogeneous Cortex-A5 and Cortex-M4 dual core architecture enables easy integration of complex HMI with the deterministic behavior of deeper control applications. The Cortex-A5 provides for extensive visualizations or process-supporting calculations simultaneous to time-critical tasks with defined response times on the Cortex-M4.

Well Suited for Safety Critical Applications

The Vybrid controller offer a variety of integrated features for ensuring data integrity and maintaining the security of memory, interfaces and system data.

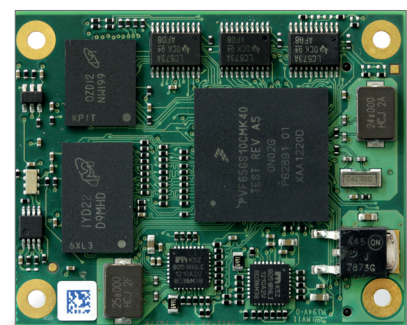
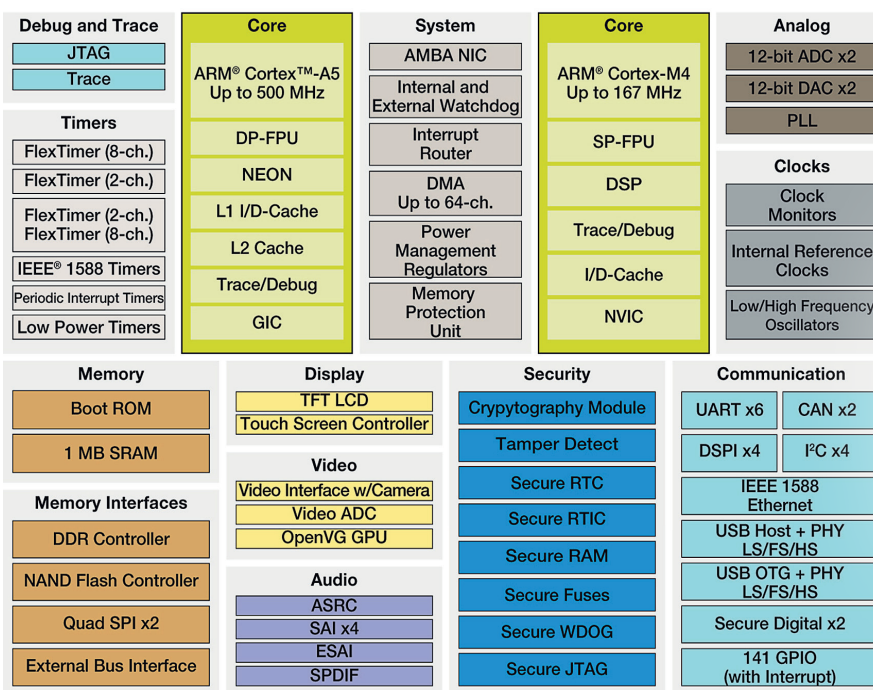
The on-chip CRC module offers memory and communication data validation, while a Memory Protection Units allows for increased data security as well as improved software reliability.

An independent watchdog can be used for code monitoring for safety critical applications. Other processor features include secure booting, cryptographic keys as well as sabotage detection.

Energy efficient Design

In addition to a combination of efficient chip design, power management and custom software support, Vybrid processors offer low power consumption. This eliminates the need for cooling measures, thereby reducing system cost.

Freescale Vybrid Block Diagram



The phyCORE Vybrid combines the scalability of the Vybrid processor family with a flexible SOM design.

Even though the phyCORE Vybrid offers complex circuitry, it boasts a very cost-efficient design. The various and scalable Vybrid variants in particular allow for custom and cost-optimized SOM configuration according to the required functionalities of the end user.

The combination of a cost-efficient NAND Flash mass storage and a secure SPI NOR Flash boot device offers excellent reliability at a favorable price. The separation of Kernel and Root file systems is possible due to use of NAND Flash.

Industrial temperature range grade parts as well as 3.3 V I/O voltage levels and mechanically robust phyCORE connectors make the phyCORE Vybrid well suited for harsh application environments.

The diagram illustrates the Vybrid Processor's architecture and its connections to various external components. The processor is shown on the left, with a central block labeled "Vybrid Processor" containing "VF6xx (Multicore A5 + M4)" and "VF5xx (Singlecore A5)".

Internal Components and Connections:

- QSPI Flash (x2):** Connected to the processor via QSPI with XIP (x2).
- NAND Flash:** 256 / 512 / 1024 / 2048 MByte, connected via FlexBus 16 bit.
- ETH0 PHY:** Connected via RMIIO and RMII0.
- ETH1 PHY:** Connected via RMIIO and RMII1.
- Dual RS232 Transceiver:** Connected via SCI (x6).
- CAN Transceiver (x2):** Connected via CAN (x2).
- Camera VIU:** Connected to the processor.
- 2x 10 channel 12 bit ADC:** Connected to the processor.
- 2x 12 bit DAC:** Connected to the processor.
- USB OTG (x2):** Connected to the processor.
- GPIO, IRQ:** Connected to the processor.
- DSPI (x4):** Connected to the processor.
- I2C with SMBUS support (x4):** Connected to the processor.
- EEPROM:** Connected via I2C.
- RTC:** Connected via I2C.
- Switch:** Connected to the processor and the Supervisor.
- Supervisor:** Connected to the processor and the 3V3 Volt POWER.
- DDR3 Memory:** 128 / 256 / 512 / MByte (32 bit), connected to the processor and the 1.5 Volt regulator.
- DDR3 Voltage Regulator:** Connected to the processor and the 1.5 Volt power source.
- Driver:** Connected to the processor and the 1.5 Volt power source.

External Interfaces and Connections:

- JTAG and BDM / Nexus / Trace 16 Bit:** Connected to the processor.
- ETHERNET0:** Connected via ETH0 PHY.
- ETHERNET1:** Connected via ETH1 PHY.
- RS232 (x2):** Connected via Dual RS232 Transceiver.
- CAN (x2):** Connected via CAN Transceiver.
- enable:** Connected to the Supervisor.
- 3V3 Volt POWER:** Connected to the Supervisor and the 1.5 Volt regulator.
- 1.5 Volt:** Connected to the DDR3 Voltage Regulator and the Driver.

The diagram also shows a "Module Connector: 2x120 pins" on the right side, which is connected to the processor and the Supervisor.



Accelerated Design

Rapid Development Kits

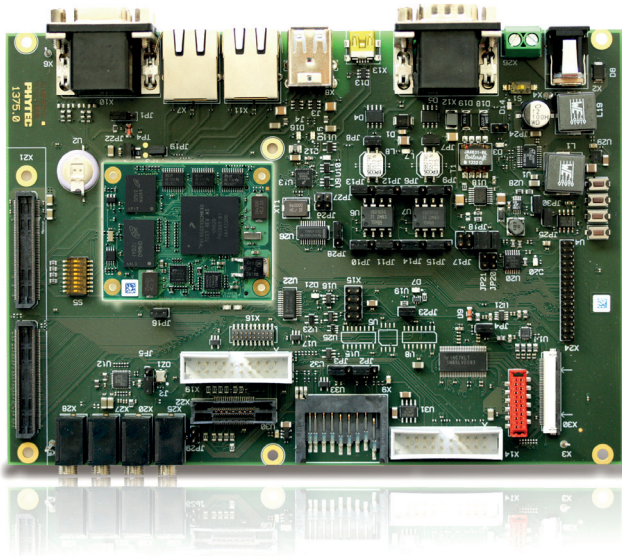
Phytect's development kits provide a fast and easy platform to jump start design with the phyCORE Vybrid.

The kits include a SOM, Carried Board as well as software BSPs needed for start-up. Embedded Linux supports the Cortex-A5 core while MQX operates on the Cortex-M4. The operating systems are always pre-installed.

The kit includes Embedded Linux for the A5 core as well as MQX for the M4 core.

Phytect offers two development kit versions. The economical entry-level kit is well suited for evaluating processor performance and graphics capabilities (via DVI). An additional kit variant offers a 7" display.

Phytect's start-up guarantee, in addition to the QuickStart Instructions, offers an efficient jump start for development.



phyCORE [®] Vybrid Kit	with Display	without Display
Processor	Freescale Vybrid VF6xx	Freescale Vybrid VF6xx
DDR3 RAM	256 MB	256 MB
NAND Flash	512 MB	512 MB
NOR Flash	32 MB SPI	32 MB SPI
EEPROM	4 kB	4 kB
Carrier Board Vybrid		
Ethernet	2 x 10/100 MBit	2 x 10/100 MBit
RS232 (SUB-D9)	1	1
USB OTG (Mini-AB jack)	1	1
USB Host (A jack)	1	1
MMC / SDIO card slot	2	2
ADC	4	4
SP-Dif	in / out	in / out
SPI	4	4
I ² C	4	4
CAN	2	2
Display / Touch Interface connector (LVDS / 4Wire)	1 x ZIF LVDS	1 x ZIF LVDS
Audio Line-In / Out (3,5 mm jack)	1 x Stereo	1 x Stereo
Audio Mic-In / AUX (3,5 mm jack)	1 x Stereo	1 x Stereo
Display	7" / 800 x 480	-
Touch	resistive (opt. capacitive)	-
Linux Kit	KPCM-052-LIN-D € 375,00	KPCM-052-Linux € 195,00

We offer a large number of workshops for our new products.
For more information please go to: <http://www.phytect.eu/europe/news>

Vybrid Software

phyCORE® Vybrid Roadmap

	Q1/13	Q2/13	Q3/13	Q4/13	
MQX		PD 13.0.0 ●	PD 13.1.0 ●		
Linux		PD 13.0.0 ●	PD 13.1.0 ●		

● actual release date PD yy.0.x = Alpha program ● anticipated release date PD yy.1.x = Serial production | Maintenance cycle: semi annually

Custom BSPs for Embedded Linux

Phytec provides BSPs that are specifically tailored to meet the requirements of industrial use.

The emphasis in software development for e software for the phyCORE® Vybrid was to provide operating systems that are specifically suited for both cores. MQX supports the Cortex™-M4 core while Linux runs on the Cortex-A5 core. A Multi Core-Communication (MCC) protocol enables interoperability between both cores.

A Linux Board Support Package offered in cooperation with TimeSys enables user adaptation of Linux. The ARM DS5 tool chain provides a build environment for both Linux and MQX. The Carrier Board provides circuitry that, in connection with DS5, supports debugging of both cores via JTAG.

Features	Linux
Timesys LinuxLink Pro subscription	PD13.0.0
MQX	PD13.1.0
ARM DS5	PD13.1.0
NAND	PD13.0.0
CAN	PD13.1.0
Ethernet	PD13.0.0
USB	PD13.0.0
LCD	PD13.0.0
MMC / SD	PD13.1.0
SPI	PD13.1.0
I²C	PD13.1.0

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