32-bit Controller Solutions

Vybrid VF6xx Family

Dual heterogeneous core solution with XGA display, dual USB, dual Ethernet and L2 switch
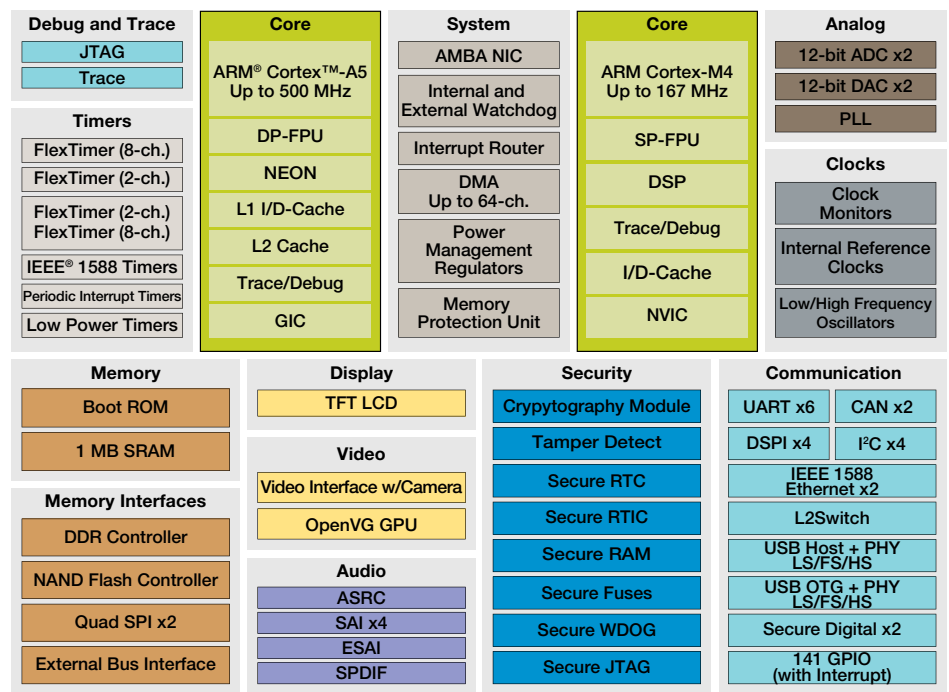
Typical Applications

- Building/home automation
- Industrial automation
  - Applications requiring displays (HMI) and real-time control
- Medical
  - Patient monitors
  - Portable medical devices such as monitors, ventilators and respirators
- Consumer
  - Printers
  - Portable media players
  - Portable navigation systems
  - Networked audio and video systems
- Metering
  - Data concentrator
- Appliances
- Point-of-sale
- IP cameras
- Digital signage

Overview

The Vybrid VF6xx family features a heterogeneous dual-core solution that combines the ARM® Cortex™-A5 and Cortex™-M4 cores. The family also features dual USB 2.0 OTG controllers with integrated PHY, dual 10/100 Ethernet controllers with L2 switch, 1.5 MB of on-chip SRAM and a rich suite of communication, connectivity and human-machine interfaces (HMI). The VF6xx family is pin and software compatible with the VF[4,5,7]xx families.

Vybrid VF6xx devices include multiple serial interfaces including UARTs with support for ISO7816 SIM/smart cards, SPI and I²C and dual CAN modules. VF6xx devices can interface to a variety of external peripherals and memories for system expansion and data storage.

Vybrid VF6xx Block Diagram

Debug and Trace	Core	System	Core	Analog
JTAG	ARM® Cortex™-A5 Up to 500 MHz	AMBA NIC	ARM Cortex-M4 Up to 167 MHz	12-bit ADC x2
Trace		Internal and External Watchdog		12-bit DAC x2
Timers	DP-FPU	Interrupt Router	SP-FPU	PLL
FlexTimer (8-ch.)	NEON	DMA Up to 64-ch.	DSP	**Clocks**
FlexTimer (2-ch.)	L1 I/D-Cache	Power Management Regulators	Trace/Debug	Clock Monitors
FlexTimer (2-ch.) FlexTimer (8-ch.)	L2 Cache	Memory Protection Unit	I/D-Cache	Internal Reference Clocks
IEEE® 1588 Timers	Trace/Debug		NVIC	Low/High Frequency Oscillators
Periodic Interrupt Timers	GIC			
Low Power Timers				

Memory	Display	Security	Communication	
Boot ROM	TFT LCD	Crypytography Module	UART x6	CAN x2
1 MB SRAM	**Video**	Tamper Detect	DSPI x4	I²C x4
Memory Interfaces	Video Interface w/Camera	Secure RTC	IEEE 1588 Ethernet x2	
DDR Controller	OpenVG GPU	Secure RTIC	L2Switch	
NAND Flash Controller	**Audio**	Secure RAM	USB Host + PHY LS/FS/HS	
Quad SPI x2	ASRC	Secure Fuses	USB OTG + PHY LS/FS/HS	
External Bus Interface	SAI x4	Secure WDOG	Secure Digital x2	
	ESAI	Secure JTAG	141 GPIO (with Interrupt)	
	SPDIF			

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Vybrid

Dual Quad SPI interfaces with Execute-in-Place, dual secure digital host controller, NAND flash and DRAM controllers with ECC support allow connection to a wide variety of memory types for critical applications.

Vybrid VF6xx devices offer a host of multimedia options for rich applications with real-time control. Audio interfaces include synchronous audio interface for full-duplex audio transfer, enhanced serial audio interface for interfacing with the Sony/Philips Digital Interface for digital audio support. Display controller units interface with TFT LCD displays for resolutions up to XGA (1024 x 768). A video interface unit provides image and vision capture, and an OpenVG GPU powers user interface acceleration.

Vybrid VF6xx devices include a variety of data integrity and security hardware features for safeguarding memory, communication and system data. A cyclic redundancy check module is available for validating memory contents and communication data. An optional hardware encryption unit supports several encryption and hashing algorithms for program validation as well as authentication and securing data for transfer and storage. The optional tamper detection system has integrated sensors for voltage, frequency and temperature, and external sensing for physical attack detection.

One-Stop Enablement Offering: MPU + IDE + OS

- Freescale Tower System hardware development environment
- Integrated development environments

- Reference Linux® BSP
- Reference MQX™ BSP
- ARM DS5 MDK
- CodeWarrior V10.x (Eclipse) IDE with Processor Expert software modeling tool
- Math and encryption libraries
- Media framework
- Complimentary bootloaders (USB, Ethernet, RF, serial)
- Complimentary Freescale embedded GUI software driver for graphics LCD panels
- Complimentary Freescale MQX RTOS
- Cost-effective Nano™ SSL/Nano™ SSH for Freescale MQX RTOS
- Full ARM ecosystem

Features and Benefits

	Feature	Application Benefit
Core and System	ARM® Cortex™-A5	Power-efficient applications processor with full ARM Cortex application compatibility
	NEON media processing engine	Advanced SIMD instruction set for acceleration of media and signal processing functions
	Double Precision floating point with IEEE® 754 compliance	Algorithm acceleration and improved signal processing
	Level 1 and 2 caches	Increased code throughput and reduced processor stalls
	TrustZone technology	Ensures reliable implementation of security applications ranging from digital rights management to electronic payment
	ARM Cortex™-M4	High-performance real-time core
	DSP instruction support	Enhanced signal processing capabilities with single cycle 32-bit MAC
	Single precision floating point, IEEE 754 compliant	Facilitates algorithm development and improved analog signal processing
	16 KB Instruction and data caches	Maximum code execution performance and reduced power consumption
	64 KB tightly coupled memory	No-wait state memory access
	64-bit AXI bus	Increases concurrent data transfer capabilities from several bus masters
	Up to 64-channel DMA	Peripheral and memory servicing with reduced CPU loading
	Address space controllers	Provides memory protection for all cross bar switch masters, increasing software reliability
Memory and Memory Interfaces	Up to 1.5 MB of on-chip SRAM with ECC	High reliability, fast access non-blocking RAM
	FlexBus external bus interface	Enables the connection of external memories and peripherals (e.g., graphics displays)
	NAND flash controller	Supports up to 32-bit ECC current and future NAND types with minimal software overhead
	Secure digital controller	For in-application software upgrades, media files or adding Wi-Fi® support
	Dual quad-SPI with Execute-in-Place (XiP)	Supports up to 80 MHz external SPI flash
	DRAM controller	Support for DDR3 and LPDDR2 memories up to 800 MHz data rate • ECC support • DFI interface to PHY
Communications Interface	USB On-The-Go (High-, Full- and Low-Speed) with integrated PHY	High-speed I/O required for demanding diagnosis and monitoring tasks including dynamic machine condition, plug-and-play ease for monitoring human machine interfaces (HMIs) or connect to industrial compute. Lower BOM cost with integrated PHY
	10/100 Ethernet MAC with IEEE 1588 hardware time stamping	Precision clock synchronization for real-time, networked industrial automation and control
	Serial interfaces	Multiple communication interfaces for simple and efficient data exchange, industrial network bridging and audio system interfacing Variety of data size, format and transmission/reception settings supported for multiple industrial communication protocols
	CAN	Enable industrial network bridging by connecting to sensors, actuators and control devices
Security	Hardware encryption accelerator	Secure data transfer and storage. Faster than software implementations with minimal CPU loading. Supports a wide variety of algorithms: DES, 3DES, AES, MD5, SHA-1, SHA-256
	Hardware tamper detection	Secure real-time clock with independent battery supply and secure key storage with internal/external tamper detect for temperature/clock/supply voltage variations and physical attack
	High assurance boot	Supports encrypted boot with code signing, peripheral access policy control and public key infrastructure RSA 2048/ECC-512
	Hardware cyclic redundancy check engine	Validates memory contents and communication data, increasing system reliability
	Independent-clocked COP, external watchdog monitor	Prevents code runaway in fail-safe applications and drives output pin to safe state external components if watchdog event occurs
HMI	Display controller	Support for up to XVGA resolution TFT displays
	2D GPU	Enables user interface acceleration
	Video interface unit	24-bit parallel interface for image and vision capture
Audio	Synchronous audio interface	Supports full-duplex serial interfaces with frame synchronization such as I²S, AC97 and CODEC/DSP interfaces
	Enhanced serial audio interface	Full-duplex serial port for communication with a variety of serial audio devices, including industry-standard codecs, SPDIF transceivers and other processors
	Sony Philips Digital Interface	Receive and transmit digital audio using the IEC60958 standard consumer format
	Asynchronous sample rate converter	Sample rate conversion between input and output audio streams

For more information, visit freescale.com/Vybrid