Kinetis K Series

Freescale Communicator

Introducing the world's most secure MCUs

Kinetis K8x: K80, K81and K82

Advanced security microcontrollers with Cortex®-M4 processors

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Global Full Market Launch Date: November 17, 2015

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The Importance of Security for Embedded Designers

Along with the explosive growth of edge node devices comes an ever growing need for protecting data, reducing fraud and securing networks. With new and expanding uses of embedded technology, the full threat from the expansion of smart things is just now being realized. The Kinetis K8x MCU family leverages proven security technology to deliver the most secure MCU platform; enhancing Trust, Cryptographic acceleration and Tamper features in the form of a multi-function microcontroller. Security is no longer a problem that can be set aside to a future design or pushed up network infrastructure. Whether designing a connected chicken coop door or a mobile payment application, K8x family has the capability to allow designers to build with confidence for the IoT today.

Product Summary

The Kinetis K8x MCU family extends the Kinetis MCU portfolio with advanced security capabilities including:

- Boot ROM to support encrypted firmware updates
- Support for public key cryptography
- Hardware AES acceleration with side band attack protection
- Automatic decrypt and execute from external NOR flash memory

These advancements are done while maintaining a **high level of compatibility** with previous Kinetis devices. K8x MCUs are performance-efficient and offer industry-leading low-power while providing significant BOM savings through smart on-chip integration. The Kinetis K series is supported by a **comprehensive set of development tools, software and enablement.**

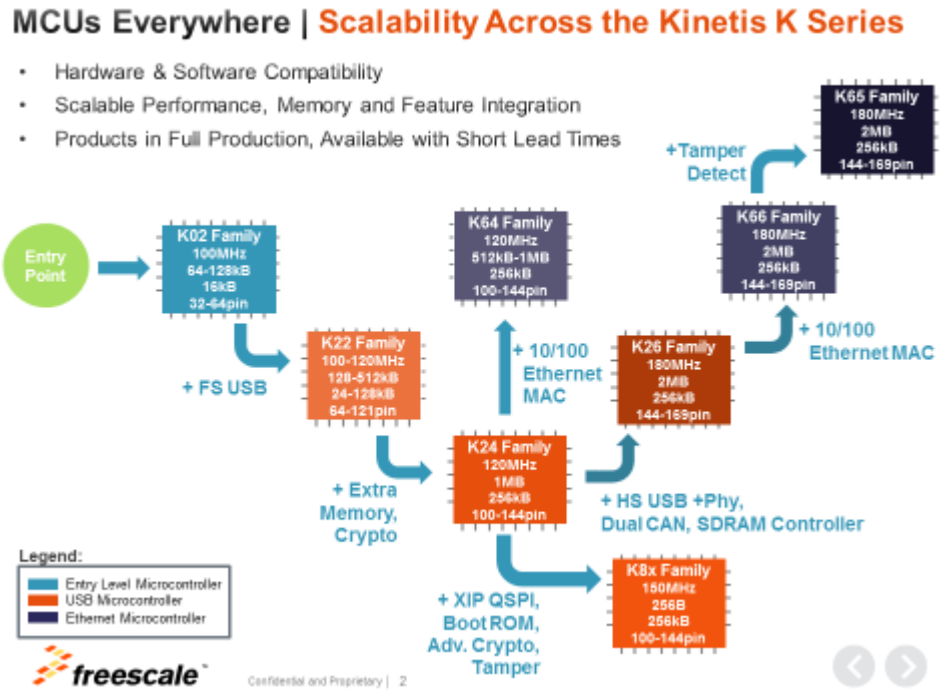
Highlights

In addition to advanced security, this latest member of the Kinetis portfolio contains the following:

- **Execute in place (XIP)** from external serial NOR flash memory for nearly limitless scalability
- **CPU and system cache** reduce latency of memory resources lowering power consumption and improving performance
- **Separate I/O power domain** for up to 14 pins allow operations without the need for external level translators
- **FlexIO peripheral** expands MCU capabilities by emulating serial, parallel, or custom interfaces using software drivers provided by the Kinetis SDK
- **Low-power operation** with dynamic currents down to 220 uA/MHz, state retention stop mode down to 5.5 uA with fast wake-up time and lowest power mode with only 340 nA

- **Faster time to market** with comprehensive enablement solutions, including SDK (drivers, libraries, stacks), IDE, ROM bootloader, RTOS, online community, and more

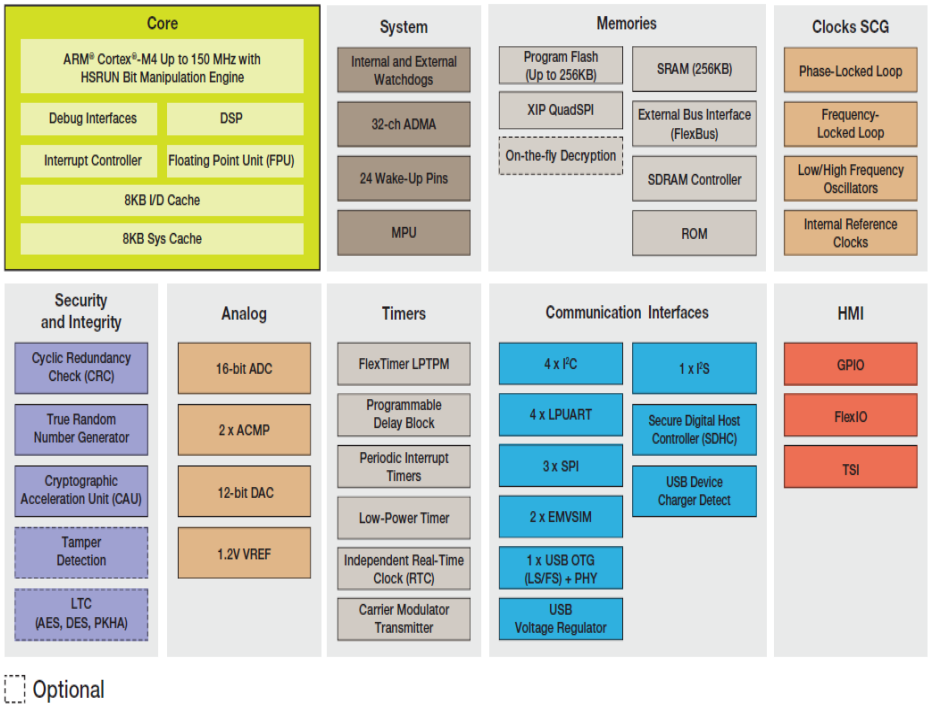
From a feature and price standpoint, the K8x brings greater capabilites to the Kinetis K2x sub-family at comparable prices



Target Applications

- Smart Wearable Devices
- Portable Health & Fitness
- Gaming Controllers
- Smart Home Automation and Security
- Building Control
- Point-of-Sale
- Activity and wellness monitor

Product Overview



Advanced Security

Flash and chip security settings

Memory protection unit provides memory protection for all masters on the cross bar switch, increasing software reliability

Hardware implementation of security operations Symmetrical crypto. Supports DES, 3DES, AES, MD5, SHA-1 and SHA-256 algorithms

Ability to disable JTAG and chip unique ID

ROM support for encrypted firmware updates

Flash Access controller to create execute only regions of embedded flash

K81 and K82: Hardware crypto co-processor with support for DES, AES and Public key cryptography

K81 and K82: On-the-fly AES decryption and execution from external serial NOR flash

K81: Tamper detect module with detection for temperature, voltage, clock or pin tampers with the ability to create active tamper meshes

K81: 2KB of secure session RAM linked to the tamper detect module

Memory and Scalability
256KB of Flash
256KB of SRAM
CPU cache consisting of separate 8KB I/D and 8KB system cache
QSPI controller optimized for XIP from external serial NOR flash memories with support for quad and octal data interfaces
SDRAM and external memory bus interfaces
eMMC/SDIO interface through eSDHC peripheral

Performance
ARM® Cortex®-M4 core + DSP up to 150 MHz, single-cycle MAC, single instruction multiple data (SIMD) extensions, single precision floating point unit
Up to 32-channel DMA for peripheral and memory servicing with reduced CPU loading and faster system throughput
CPU cache consisting of separate 8KB I/D and 8KB system cache

Cross bar switch enables concurrent multi-master bus accesses, increasing bus bandwidth

HMI (Human Machine Interface)
32-Pin FlexIO block capable of interfacing to camera or displays
External memory bus for connection to smart display modules
Touch Sense interface supported by Kinetis SDK software library
GPIO pins with support for digital filtering

Mixed Signal Capability
16-bit analog-to-digital converter (ADC) with configurable resolution. Single or differential output mode operation for improved noise rejection
12-bit digital-to-analog converters (DACs) for analog waveform generation for audio applications
Two high-speed comparators providing fast and accurate motor over-current protection by driving PWMs to a safe state
Analog voltage reference provides an accurate reference to analog blocks, ADC and DAC, and replaces external voltage references to reduce system cost

Connectivity and Communications
USB 2.0 On-The-Go (full-speed) with USB transceiver. Intelligent design with embedded 48 MHz oscillator allowing for USB crystal-less system design. Device charge detect optimizes charging current/time for portable USB devices enabling longer battery life. Low-voltage regulator supplies up to 120 mA off chip at 3.3 volts to power external components from 5 volts input
Up to four UARTs with IrDA support
EMVSIM module with ISO7816 smart card support
Inter-IC Sound (I2S) serial interface for audio system interfacing
Three DSPI and four I2C

Reliability and Safety
Memory protection unit provides memory protection for all masters on the cross bar switch, increasing software reliability
Cyclic redundancy check engine validates memory contents and communication data, increasing system reliability
Independent-clocked COP guards against clock skew or code runaway for fail-safe applications such as the IEC 60730 safety standard for household appliances
External watchdog monitor drives output pin to safe state external components if watchdog event occurs

Cost saving integration
48MHz internal reference clock capable of supporting Full-Speed USB device without external crystal
Integrated USB regulator to allow direct connection to 5V from USB cables
Separate I/O power domain for several pins allowing interfaces without external level translators
Analog voltage reference provides an accurate reference to analog blocks, ADC and DAC, and replaces external voltage references to reduce system cost

Ultra-Low Power
Flexible low-power modes with power and clock gating for optimal peripheral activity and recovery times. Stop currents of <340 nA, run currents of 200 µA/MHz, 5.8 µs wake-up from Stop mode
Full memory and analog operation down to 1.71 volts for extended battery life
Low-leakage wake-up unit with up to seven internal modules and 24 pins as wake-up sources in low-leakage stop (LLS)/very low-leakage stop (VLLS) modes
Low-power peripherals and DMA for continual system operation in reduced power state

All devices in the Kinetis K8x family operate at 150MHz and contain 256KB of embedded Flash and 256KB of embedded SRAM. In addition to internal memory resources the K8x MCUs support execute in place from external serial NOR flash. The below table details the variations of the K8x devices.

Part Number	Pin Count	Package Type	Package Size (mm)	Boot ROM	FS USB	Crystal-less FS USB Operation	Hardware Encryption	LP Trusted Crypto (LTC)	OTF AES128 Decrypt (QSPI)	Tamper Detection
MK80FN256CAx15R*	121	WLCSP	4.6x4.5x0.6	Yes	Yes	Yes	Yes	-	-	-
MK80FN256VDC15	121	XFBGA	8x8x0.5	Yes	Yes	Yes	Yes	-	-	-
MK80FN256VLL15	100	LQFP	14x14x1.7	Yes	Yes	Yes	Yes	-	-	-
MK80FN256VLQ15*	144	LQFP	20x20x1.6	Yes	Yes	Yes	Yes	-	-	-
MK81FN256CAx15R*	121	WLCSP	4.6x4.5x0.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MK81FN256VDC15	121	XFBGA	8x8x0.5	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MK81FN256VLL15	100	LQFP	14x14x1.7	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MK81FN256VLQ15*	144	LQFP	20x20x1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MK82FN256CAx15R*	121	WLCSP	4.6x4.5x0.6	Yes	Yes	Yes	Yes	Yes	Yes	-
MK82FN256VDC15	121	XFBGA	8x8x0.5	Yes	Yes	Yes	Yes	Yes	Yes	-
MK82FN256VLL15	100	LQFP	14x14x1.7	Yes	Yes	Yes	Yes	Yes	Yes	-
MK82FN256VLQ15*	144	LQFP	20x20x1.6	Yes	Yes	Yes	Yes	Yes	Yes	-

** The WLCSP and 144 LQFP package for this product is not yet available; however, it is included in a Package Your Way program for Kinetis MCUs.*
Please visit Freescale.com/KPYW for more details.

Suggested Stocking

Those devices highlighted below in green are highest priority for stocking based on anticipated popularity. The item marked in red can not be stocked by the distributor, but will be available for particular customers under NDA from Freescale.com. Those items marked in yellow and orange can be stocked at the distributors' discretion. Devices in green will be the high runners and should definitely be stocked for launch. Devices in the LQFP package are ready for immediate shipment. Devices in the XFBGA package are orderable now, but will ship out following the launch (targeting late Q4/early Q1).

MK Part Number	10Ku S/R *Check Web latest Price	Product Family	Pin Count	Package	Dimensions (xyz)(mm)	Pitch (mm)	MOQ	Suggested Stocking	Order Priority and Comments
MK82FN256VDC15	$5.02	K82	121	XFBGA	8x8x0.5	0.65	384	348	#1 – True superset device for broad market
MK82FN256VLL15	$4.88	K82	100	LQFP	14x14x1.7	0.5	90	180	#1- True superset device for broad market
MK80FN256VDC15	$4.44	K80	121	XFBGA	8x8x0.5	0.65	384	348	#2 – K82 devices can be used as superset if needed
MK80FN256VLL15	$4.29	K80	100	LQFP	14x14x1.7	0.5	90	90	#2 – K82 devices can be used as superset if needed
MK81FN256VDC15	$5.25	K81	121	XFBGA	8x8x0.5	0.65	384	348	#3 – Docs and SW for this part are under NDA only, POS-focused
MK81FN256VLL15	$5.10	K81	100	LQFP	14x14x1.7	0.5	90	90	#3 – Docs and SW for this part are under NDA only, POS-focused
FRDM-K82F	$50.00	K82					1	50	Ideal launch board
TWR-K80F150M	$189.00	K80					1	5	Tower System Mofule
TWR-POS-K81							1	0	This board will be sold only through Freescale directly due to NDA requirement

Enablement

To accelerate time to market and enable a wide range of applications, the K8x MCUs are enabled by hardware options summarized below.

TWR-K80F150M Tower System Development Platform

The TWR-K80F150M development board is designed to work in standalone mode or as part of the Freescale Tower System, a modular development board platform that enables rapid prototyping and tool re-use through reconfigurable hardware. Begin constructing your Tower System evaluation board platform today and find additional Tower System boards and compatible peripherals at **freescale.com/Tower**.

FRDM-K82F Freescale Freedom Development Platform

The Freescale Freedom development boards are small, low-power, cost-effective evaluation and development platforms perfect for quick application prototyping and demonstration of Kinetis MCU families and Freescale sensors. These evaluation boards offer an easy-to-use mass-storage device mode flash programmer, a virtual serial port and classic programming and run-control capabilities.

TWR-PoS-K81 Tower System Development Platform

The TWR-POS-K81 development platform is a reference platform for a payment pin entry device. This board includes Cirque SecureSense AFE for secure pin entry. The design files and associated software show an example pin pad application that has been submitted for Payment Card Industry certification. The board is designed to work standalone or as part of the Freescale Tower System.

Hardware Tool Features

Feature Description		TWR-K80F150M	FRDM-K82F	TWR-PoS-K81
Memory Expansion	2x 32 MB (4 MB) Dual On-board Serial Flash	X	X	
	512 MB (64 MB) Dual QuadIO Serial Flash			X
	64 MB (8 MB) SDRAM	X		
	MicroSD Card Slot	X		
Security	Anti Tamper			X
	Symmetric Cryptography Acceleration	X	X	X
	Public Key Cryptography Acceleration		X	X
	On-The-Fly AES Decrypt		X	X
Power Options	Independent Voltage Domains: VDD and VDDIO_E	X	X	
	Board Power Select with 3.3 V or 1.8 V MCU Operation	X	X	
	Independent, Battery-operated Power Supply for Real-Time Clock (RTC) Module	X		X
Sensors	3-Axis Gyroscope	X		
	Digital Pressure Sensor	X		
	Accelerometer + 3D Magnetometer	X	X	
	Cirque SecureSense AFE			X
Interfaces	Socket for Touch Keypad Plug-in (TWRPI-TOUCH-STR)	X		
	EMVSIM Card Interface	X		
	Standalone Full-speed USB Host and Device Function	X	X	X
	Onboard Debug Circuit: K20DX128VFM5 OpenSDA with Virtual Serial Port	X	X	

Freescale Board Support Packages

The Kinetis software development kit (SDK) provides comprehensive software support for Kinetis MCUs. It includes a hardware abstraction layer (HAL) and drivers for each MCU peripheral, USB and connectivity stacks, middleware, real-time operating systems and example applications designed to simplify and accelerate application development on Kinetis MCUs. The Kinetis SDK is complimentary and includes full source code under a permissive open-source license for all hardware abstraction and peripheral driver software.

The Kinetis SDK is offered for free, and support for it is provided through the Kinetis Software Development Kit (SDK) Community Forum.

www.freescale.com/ksdk

Third Party Support Ecosystem

For a list of partners please visit us at Freescale.com/kinetis/kseries under each product page or click here.

Available Documentation

Documentation is posted to web at http://www.freescale.com/products/arm-processors/kinetis-cortex-m/k-series/k8x-scalable-secure-mcus:K8X-SCALABLE-SECURE-MCU

Updated presentation on CIA at: https://www.freescale.com/livelink/livelink?func=ll&objId=234529113&objAction=browse&viewType=1

Updated Kinetis Master PUR at: http:www.freescale.com/go/KinetisMasterPUR

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