32-bit Microcontrollers

Kinetis K20 Family

Low-power MCUs with USB On-The-Go

Energy Efficient Solutions
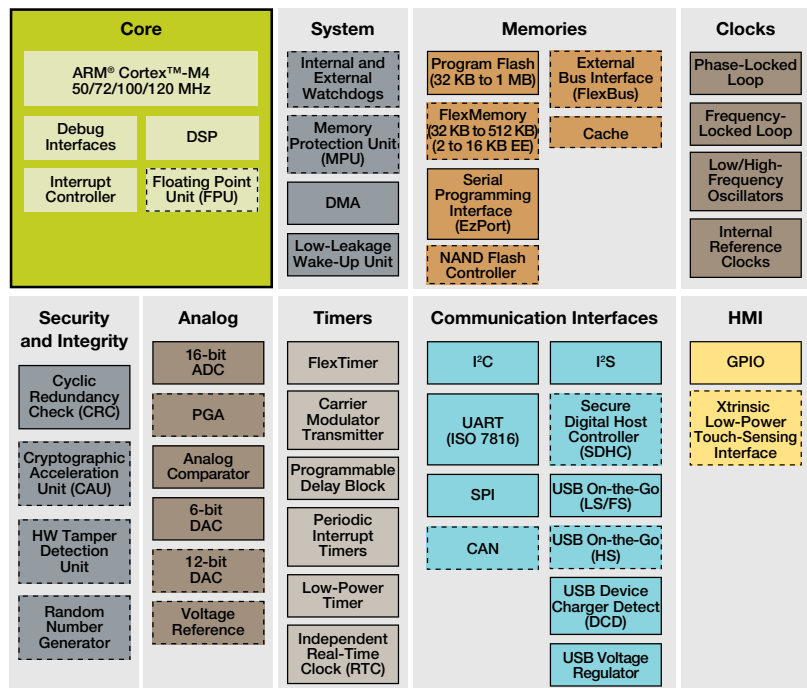optimized for low power

Target Applications

- Barcode scanners
- Portable media players
- Printers
- Programmable logic controllers

Overview

The Kinetis MCU portfolio consists of multiple pin-, peripheral- and software-compatible MCU families based on the ARM® Cortex™-M4 core. Families are built from innovative 90 nm thin-film storage (TFS) flash technology with unique FlexMemory (EEPROM) capability, and offer industry-leading low-power and mixed-signal analog integration.

The K20 MCU family is pin-, peripheral- and software-compatible with the K10 MCU family and adds Full- and High-speed USB 2.0 On-The-Go with device charger detect capability. Devices start from 32 KB of flash in 5x5 mm 32 QFN packages extending up to 1 MB in a 144 MAPBGA package with a rich suite of analog, communication, timing and control peripherals. High memory density K20 family devices include a single precision floating point unit and NAND flash controller.

Kinetis K20 Family

Core	System	Memories	Clocks
ARM® Cortex™-M4 50/72/100/120 MHz	Internal and External Watchdogs	Program Flash (32 KB to 1 MB) / External Bus Interface (FlexBus)	Phase-Locked Loop
Debug Interfaces / DSP	Memory Protection Unit (MPU)	FlexMemory (32 KB to 512 KB) (2 to 16 KB EE) / Cache	Frequency-Locked Loop
Interrupt Controller / Floating Point Unit (FPU)	DMA	Serial Programming Interface (EzPort)	Low/High-Frequency Oscillators
	Low-Leakage Wake-Up Unit	NAND Flash Controller	Internal Reference Clocks

Security and Integrity	Analog	Timers	Communication Interfaces	HMI
Cyclic Redundancy Check (CRC)	16-bit ADC	FlexTimer	I²C / I²S	GPIO
Cryptographic Acceleration Unit (CAU)	PGA	Carrier Modulator Transmitter	UART (ISO 7816) / Secure Digital Host Controller (SDHC)	Xtrinsic Low-Power Touch-Sensing Interface
HW Tamper Detection Unit	Analog Comparator	Programmable Delay Block	SPI / USB On-the-Go (LS/FS)	
Random Number Generator	6-bit DAC	Periodic Interrupt Timers	CAN / USB On-the-Go (HS)	
	12-bit DAC	Low-Power Timer	USB Device Charger Detect (DCD)	
	Voltage Reference	Independent Real-Time Clock (RTC)	USB Voltage Regulator	

☐ Standard Feature ⬚ Optional Feature

freescale™
Kinetis

One-Stop Enablement Offering—MCU + IDE + RTOS

Freescale Tower System hardware development environment:

- Integrated development environments
  - Eclipse-based CodeWarrior V10.x IDE and Processor Expert
  - IAR Embedded Workbench
  - Keil MDK
  - CodeSourcery Sourcery G++ (GNU)
- Runtime software and RTOS
  - Math, DSP and encryption libraries
  - Motor control libraries
  - Complimentary bootloaders (USB, Ethernet, RF, serial)
  - Complimentary Freescale embedded GUI
  - Complimentary Freescale MQX™
  - Cost-effective Nano™ SSL/Nano™ SSH for Freescale MQX RTOS
  - Micrium uC/OS-III
  - Express Logic ThreadX
  - SEGGER embOS
  - freeRTOS
  - Mocana (security)
- Full ARM ecosystem

Features

- ARM® Cortex™-M4 core with DSP instruction support and optional single precision floating point unit
- Up to 32-channel DMA. Up to 16 KB of cache. Cross bar switch

- USB On-The-Go (Full- and High-Speed) with device charger detect

- Memory protection unit
- Hardware cyclic redundancy check engine
- Independent-clocked COP. External watchdog monitor
- Cryptographic acceleration unit (CAU)
- Hardware tamper detection Unit
- Random number generator

- Up to four FlexTimers with up to 20 channels
- Carrier modulator transmitter
- 4-channel, 32-bit periodic interrupt

- FlexBus external bus interface
- Secure digital host controller
- NAND flash controller

- 32 KB–1 MB flash. Up to 128 KB of SRAM
- 32 KB–512 KB FlexMemory

Benefits

- Up to 120 MHz core supporting a broad range of processing bandwidth needs
- Peripheral and memory servicing with reduced CPU loading. Optimized bus bandwidth and flash execution performance. Concurrent multi-master bus accesses for increased bus bandwidth

- Optimized charging current/time for portable USB devices, enabling longer battery life. USB low-voltage regulator supplies up to 120 mA off chip at 3.3V to power external components from 5V input

- Provides memory protection for all cross bar switch masters, increasing software reliability
- Validates memory contents and communication data, increasing system reliability
- Prevents code runaway in fail-safe applications. Drives output pin to safe state external components if watchdog event occurs
- Secure data transfer and storage. Faster than software implementations and with minimal CPU loading. Supports a wide variety of algorithms: DES, 3DES, AES, MDS, SHA-1,SHA-256
- Secure key storage with internal/external tamper detect for unsecured flash, temperature/clock/supply voltage variations and physical attack

- General-purpose timers with hardware dead-time insertion and quadrature decoding for motor control
- Infrared waveform generation for remote control applications
- Time base generation for RTOS task scheduler or trigger source for ADC conversion and programmable delay block

- Enables the connection of external memories and peripherals (e.g., graphics displays)
- Connection to SD, SDIO, MMC or CE-ATA cards for in-application software upgrades, file systems or adding Wi-Fi® or Bluetooth® support
- Supports up to 32-bit ECC current and future NAND types with minimal software overhead

- High reliability, fast access program memory with 4-level security protection. Independent flash banks allow concurrent code execution and firmware updating
- FlexMemory provides 32 byte–16 KB of user-segmentable byte write/erase EEPROM. In addition, FlexNVM from 32 KB–512 KB for extra program code, data or EEPROM backup

K20 Family Options

Part Number	CPU (MHz)	Flash (KB)	Flex NVM (KB)	SRAM (KB)	Cache (KB)	Single Precision Floating Point Unit	Memory Protection Unit	CAN	Secure Digital Host Controller	NAND Flash	External Bus	12-bit DAC	Prog. Gain Amplifier	5V Tolerant I/O	Other	FM 32QFN (5x5)	FT 48QFN (7X7)	LF 48LQFP (7X7)	MP 64MAPBGA	LH 64LQFP	LK 80LQFP	MB 81BGA (8X8)	LL 100LQFP	ML 104BGA	MC 121BGA (8x8)	LQ 144LQFP	MD 144BGA
MK20DN32Vyy5	50	32		8		ww									USB OTG (FS)	√	√	√	√	√							
MK20DN64Vyy5	50	64		16											USB OTG (FS)	√	√	√	√	√							
MK20DN128Vyy5	50	128		16											USB OTG (FS)	√	√	√	√	√							
MK20DN512Vyy10	100	512		128			√	√	√		√	√	√	√	USB OTG (FS)							√	√	√		√	√	√
MK20FN1M0Vyy12	120	1 MB		128	16	√	√	√	√	√	√	√	√	√	USB OTG (FS/HS)											√	√
MK20DX32Vyy5	50	32	32	8											USB OTG (FS)	√	√	√	√	√							
MK20DX64Vyy5	50	64	32	16											USB OTG (FS)	√	√	√	√	√							
MK20DX128Vyy5	50	128	32	16											USB OTG (FS)	√	√	√	√	√							
MK20DX64Vyy7	72	64	32	16			√			√	√	√	√		USB OTG (FS)							√	√	√			
MK20DX128Vyy7	72	128	32	32			√			√	√	√	√		USB OTG (FS)							√	√	√	√	√	
MK20DX256Vyy7	72	256	32	64			√			√	√	√	√		USB OTG (FS)							√	√	√	√	√	
MK20DX128Vyy10	100	128	128	32			√	√	√		√	√	√	√	USB OTG (FS)											√	√
MK20DX256Vyy10	100	256	256	64			√	√	√		√	√	√	√	USB OTG (FS)							√	√	√		√	√	√
MK20FX512Vyy12	120	512	512	128	16	√	√	√	√	√	√	√	√	√	USB OTG (FS/HS)											√	√
MK21DX128Vyy5(R)	50	128	64	32											HW Encryption and Tamper Detec							√	√				
MK21DX256Vyy5(R)	50	256	64	32											HW Encryption and Tamper Detec							√	√				
MK21DN512VLK5(R)	50	512		64											HW Encryption and Tamper Detec							√	√				
MK22DX128Vyy5(R)	50	128	64	32					√						USB OTG (FS)					√		√	√	√			
MK22DX256Vyy5(R)	50	256	64	32					√						USB OTG (FS)					√		√	√	√			
MK22DN512VLH5(R)	50	512		64					√						USB OTG (FS)					√		√	√				

yy = package designator

For current information about Kinetis products and documentation, please visit freescale.com/Kinetis