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# **Kinetis KE1xZ256 Highly Robust General-Purpose MCUs**

256 KB internal flash, 32 KB SRAM, Serial Communication Ports, robust Touch Sense Input

#### 1. Introduction

The Kinetis E family provides a highly scalable portfolio of robust 5-V MCUs, with cores ranging from 20-MHz ARM® Cortex®-M0+ to 160-MHz ARM Cortex-M4. With a power supply of 2.7~5.5 V and the focus on exceptional EMC/ESD robustness, the Kinetis E family is well-suited for a wide range of applications in harsh electrical environments, and is optimized for cost-sensitive applications. The Kinetis E family of MCUs offers a broad range of memory, peripheral, and package options.

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### 2. Kinetis KE1xZ256 Family Overview

The Kinetis KE1xZ256 MCUs are the most powerful MCUs from the KE1xZ family, based on the ARM Cortex-M0+ core. With up to 256 KB flash, 32 KB RAM, and a complete set of analog/digital features, the KE1xZ256 MCUs extend the Kinetis E family to a higher performance and a broader scalability. The robust TSI provides a high level of stability and accuracy to your HMI system. The 1-Msps ADC and FlexTimer modules provide a perfect solution for BLDC motor-control systems.

- KE14Z—a broad offering with mixed-signal integration, ADCs, DAC, ACMPs, and FlexTimers
- KE15Z—an expansion from the KE14Z family with an additional TSI module

## 3. Kinetis KE1xZ256 Family Key Features

- 72-MHz ARM Cortex-M0+ core for a broad range of processing bandwidth requirements, while
  maintaining excellent cost-effectiveness, easy-to-use packages, and a wide range of memory
  densities.
- Enhanced and robust I/Os for high performance, even in noisy environments.
- Robust TSI supports both the mutual-cap mode and the self-cap mode, providing flexibility for up to 36 touch keys.
- FlexTimer-featured 8-channel PWM for 3-phase motor control with dead-time insertion and fault detection.
- 1-Msps 12-bit ADC with up to a 16-channel input per module with a fast sampling rate for prompt data conversion and storage.
- Analog comparator for a fast response to external analog changes.
- Programmable delay block with a flexible trigger system providing various interconnections for on-chip modules (ADC, DAC, Flextimers, ACMP, and so on).
- FlexIO for a flexible serial communication interface implementation.
- Boot ROM for on-chip boot code and serial port drivers which saves flash space and provides flexible boot options and in-system programming support.
- Faster time to market with comprehensive enablement solutions, including SDK (drivers, libraries, stacks), IDE, bootloader, RTOS, online community, and more.

# 4. Kinetis KE1xZ256 Family Feature Summary

Table 1. Kinetis KE1xZ256 family feature summary

Kinetis KE1xZ256 sub-family	KE14Z	KE15Z
CPU performance	72 MHz	72 MHz
Flash	128–256 KB	128–256 KB
SRAM	16–32 KB	16–32 KB
	2x 12-bit ADC	2x 12-bit ADC
Analog	2x 12-bit ADC 2x ACMP	2× ACMP
	ZX ACIVIF	36-channel TSI
Other Features	FlexTimers	FlexTimers
Other Features	FlexIO	FlexIO
Dookogo ontiono	100LQFP (14 x 14),	100LQFP (14 x 14),
Package options	64LQFP (10 x 10)	64LQFP (10 x 10)

# 5. Kinetis KE1xZ256 Family Block Diagram

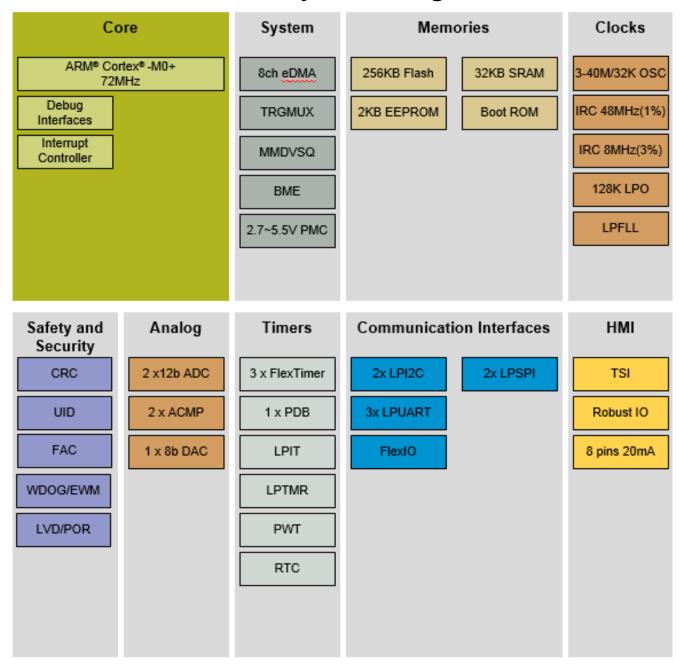


Figure 1. Kinetis KE1xZ256 family block diagram

# 6. Kinetis KE1xZ256 Family Features

Table 2. Kinetis KE1xZ256 family features

Sub-family	KE14Z	KE15Z		
Core	ARM Cortex-M0+	ARM Cortex-M0+		
Frequency	72 MHz	72 MHz		
Flash	256–512 KB	256–512 KB		
SRAM	16–32 KB	16–32 KB		
EEPROM/data flash	2 KB	2 KB		
Clock	48 MHz FIRC (1 %), 8 MHz SIRC (3 %), XOSC (3–40 MHz, 30–40 KHz), 128 KHz LPO, LPFLL	48 MHz FIRC (1 %), 8 MHz SIRC (3 %), XOSC (3–40 MHz, 30–40 KHz), 128 KHz LPO, LPFLL		
BootROM (UART, SPI, I <sup>2</sup> C)	Yes	Yes		
DMA	8 channels	8 channels		
WDT/POR/LVD	Yes	Yes		
ADC	2x 12-bit, 1 μs	2x 12 bit, 1 μs		
ACMP	2	2		
DAC	8-bit (in ACMP)	8-bit (in ACMP)		
Timer	3× FlexTimer, 1× LPTMR	3x FlexTimer, 1x LPTMR		
PDB	1	1		
PIT	1	1		
RTC	1	1		
CAN	_	_		
UART	3	3		
SPI	2	2		
I <sup>2</sup> C	2	2		
FlexIO	4 timers, 4 shifters, 8 pins	4 timers, 4 shifters, 8 pins		
TSI	_	36-channel TSI		
VDD	2.7~5.5 V	2.7~5.5 V		
Temperature (Ta)	-40~105 °C	-40~105 °C		
Package (GPIOs)	100LQFP (14 × 14), 64LQFP (10 × 10)	100LQFP (14 × 14), 64LQFP (10 × 10)		

## 7. Comprehensive Enablement Solutions

#### 7.1. Kinetis Software Development Kit (KSDK)

- Extensive suite of robust peripheral drivers, stacks, and middleware
- Includes software examples demonstrating the usage of HAL, peripheral drivers, middleware, and RTOSes
- Operating System Abstraction (OSA) for Freescale MQX<sup>TM</sup> Lite RTOS, FreeRTOS OS, Micrium μC/OS<sup>®</sup> kernels, and bare-metal (no RTOS) applications

#### 7.2. Processor Expert

- Free software-generation tool for device drivers/start-up code
- Seven steps from project creation to debug—dramatically reducing the development time
- Available within Kinetis Design Studio (KDS) or as a standalone plug-in for IAR/Keil/GNU IDEs

#### 7.3. Integrated development environments (IDEs)

- IAR Embedded Workbench® IDE www.iar.com
- ARM Keil® Microcontroller Development Kit IDE www2.keil.com/nxp
- Kinetis Design Studio IDE
  - No-cost (IDE) for Kinetis MCUs
  - Eclipse and GCC-based IDE for C/C++ editing, compiling, and debugging
- Broad ARM ecosystem support through NXP Partner Program

#### 7.4. Online enablement with ARM mbed™ development platform

- Rapid and easy Kinetis MCU prototyping and development
- Online ARM mbed SDK, developer community
- Free software libraries

#### 7.5. Bootloader

- Common bootloader for all Kinetis MCUs
- In-system flash programming over a serial connection: erase, program, verify
- ROM- or flash-based bootloader with open-source software and host-side programming utilities

#### 7.6. Development hardware

- NXP Freedom development platform
  - **–** Low cost (< \$20)
  - Designed in an industry-standard compact form factor
  - Integrated open-standard serial and debug interface (OpenSDA)
  - Compatible with a rich set of third-party expansion boards

## 8. Part Identification

#### 8.1. Description

The chip part numbers contain fields that identify the specific part. Use the values of these fields to determine the specific part you've got.

#### 8.2. Format

The part numbers for these MCUs have this format: Q KE## A FFF T PP CC (N)

#### 8.3. Fields

This table lists the possible values for each field in the part number (not all combinations are valid):

Table 3. Part number field descriptions

Field	Description	Values	
Q	Qualification status	M = fully-qualified, general market flow P = prequalification	
KE##	Kinetis family	KE14Z KE15Z	
Α	Key attribute	Z = ARM Cortex-M0+	
FFF	Program flash memory size 256 = 256 KB 128 = 128 KB		
R	Silicon revision	(Blank) = main A = revision after main	
Т	Temperature range	V = -40–105 °C	
PP	Package identifier	LL = 100LQFP (14 mm × 14 mm) LH = 64LQFP (10 mm × 10 mm)	
CC	Maximum CPU frequency (MHz)	7 = 72 MHz	
N	Packaging type	R = tape and reel (Blank) = trays	

## 9. Orderable Part Numbers

Table 4. Ordering information

Product	Product Memory		Package		IO and ADC channels		
MC part number	Flash	SRAM	Pin count	Package	GPIOs	GPIOs (INT/HD) <sup>1</sup>	ADC <sup>2</sup> channels (SE/DP)
MKE15Z256VLL7	256 KB	32 KB	100	LQFP	89	89/8	28/0
MKE15Z256VLH7	256 KB	32 KB	64	LQFP	58	58/8	27/0
MKE15Z128VLL7	128 KB	16 KB	100	LQFP	89	89/8	28/0
MKE15Z128VLH7	128 KB	16 KB	64	LQFP	58	58/8	27/0
MKE14Z256VLL7	256 KB	32 KB	100	LQFP	89	89/8	28/0
MKE14Z256VLH7	256 KB	32 KB	64	LQFP	58	58/8	27/0
MKE14Z128VLL7	128 KB	16 KB	100	LQFP	89	89/8	28/0
MKE14Z128VLH7	128 KB	16 KB	64	LQFP	58	58/8	27/0

<sup>1.</sup> INT: interrupt pin numbers; HD: high drive pin numbers

# 10. Revision History

Table 5. Revision history

Revision number	Date	Substantive changes
0	05/2016	Initial release.

<sup>2.</sup> ADC0 + ADC1



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