Next Generation Kinetis K Series – K2, and L Series MCUs

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M A Y . 2 0 1 4
Agenda

• Kinetis Microcontroller Solutions Introduction
• General Purpose Kinetis K Product Lines
  − Kinetis K-Series
  − Kinetis K2

• General Purpose Kinetis L Product Lines

• Additional Resources
  − Enablement
  − Kinetis Minis support (CSP)
K2 the Next Generation of Kinetis K Solutions

Leadership in Cortex-M

World’s Broadest, Most Scalable Portfolio…

…with Best-in-Class Tools and Software support!
Kinetis Microcontroller Solutions Introduction
ARM SOC Portfolio’s

How to Choose an ARM® Core & Supplier

Who is the Most Comprehensive ARM® Supplier?**

**Number of active product SKUs listed on website as of November 2013

1st to Market with Cortex M4
1st to Market with Cortex M0+

Freescale

Five Years Out
Unbound Scalability from lowest-power to higher performances

1. Higher Performances **up to 180MHz** with FPU – 50% faster than previous generation with double of RAM memory

2. Product breadth **ARM® Cortex®-M0+ to M4** with 900+ code compatible product offerings, 60+ pin for pin compatible devices that span multiple families

3. Lowest power to highest functionality Energy efficient battery powered products to analog intensive sensing products.
General Purpose Kinetis K Product Lines
# Kinetis General Purpose Product Lines

<table>
<thead>
<tr>
<th></th>
<th>Kinetis L Series</th>
<th>Kinetis E Series</th>
<th>Kinetis K Series</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Processor</strong></td>
<td>ARM® Cortex™-M0+</td>
<td>ARM® Cortex™-M0+</td>
<td>ARM® Cortex™-M4</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>Up to 48MHz</td>
<td>Up to 48MHz</td>
<td>Up to 50 / 72 / 100 / 120 / 150 / 180MHz</td>
</tr>
<tr>
<td><strong>Ultra Low Power</strong></td>
<td>Typical ~50uA/MHz ( VLPR Mode )</td>
<td>na</td>
<td>Typical ~130uA/MHz ( VLPR Mode )</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>8kB – 256kB Flash 1kB – 32kB SRAM</td>
<td>8kB – 128kB Flash 1kB – 16kB SRAM</td>
<td>32kB – 2MB Flash 8kB – 256kB SRAM</td>
</tr>
<tr>
<td><strong>Pin-Count</strong></td>
<td>16 – 121 Pin</td>
<td>16 – 80 Pin</td>
<td>32 – 256 Pin</td>
</tr>
<tr>
<td><strong>Features</strong></td>
<td>Baseline / Mixed-Signal and optional Segment LCD, USB</td>
<td>5V / EMC / Safety (CRC) Control (Flextimer) and optional Segment LCD, CAN</td>
<td>Baseline / Mixed-Signal and optional FlexMemory, USB, Segment LCD, CAN, Ethernet, Graphic LCD, DRAM-CTRL, NAND-Flash-CTRL, Crypto, Anti-Tamper</td>
</tr>
<tr>
<td><strong>Price</strong></td>
<td>From $0.49 ( MKL02x, 8KB, 16QFN )</td>
<td>From $0.78 ( MKE02x, 16KB, 32LQFP )</td>
<td>From $0.79 ( MK02, 64KB, 32QFN )</td>
</tr>
<tr>
<td><strong>Demo Board</strong></td>
<td><img src="image1.png" alt="Image" /></td>
<td><a href="http://www.freescale.com/FREEDOM">www.freescale.com/FREEDOM</a></td>
<td><a href="http://www.freescale.com/TOWER">www.freescale.com/TOWER</a></td>
</tr>
</tbody>
</table>

Freescale free RTOS called MQX [www.freescale.com/MQX](http://www.freescale.com/MQX) including USB / Ethernet / MS File System / Peripherals Driver

MQX-Lite +USB and Peripherals Drivers (also within Processor Expert – Code Generator)

**Note:** Availability device dependent
Kinetis K Series MCU Portfolio

**First Generation Key Differentiators**

<table>
<thead>
<tr>
<th>Feature Rich MCUs</th>
<th>Next Generation Key Differentiators</th>
</tr>
</thead>
<tbody>
<tr>
<td>K70 Family + Graphics LCD</td>
<td><strong>Graphic Controller</strong></td>
</tr>
<tr>
<td>K60/K61 Family Ethernet, USB</td>
<td></td>
</tr>
<tr>
<td>K5x Family (Measurement) Analog, USB, SLCD, Ethernet, Encryption</td>
<td><strong>Measurement</strong></td>
</tr>
<tr>
<td>K40 Family Segment LCD + USB</td>
<td></td>
</tr>
<tr>
<td>K30 Family Segment LCD</td>
<td><strong>Segment LCD</strong></td>
</tr>
<tr>
<td>K20 Family USB</td>
<td></td>
</tr>
<tr>
<td>K10 Family Mixed-Signal</td>
<td><strong>USB</strong></td>
</tr>
<tr>
<td><strong>Baseline</strong></td>
<td><strong>Ethernet</strong></td>
</tr>
</tbody>
</table>

**Power / Processing Efficiency**
- Excel in Power Efficiency
- Cortex-M4 w/ FPU >100MHz from 64KB to 2MB of Flash
- Power conscious peripherals

**Streamline Feature Set**
- Smart Integration: right features at the right price.
- Save BOM cost with Crystal-less USB device functionality

**Introduction of New Tools**
- Kinetis Software Development Library (SDK)
- Kinetis Development Studio
- Embed support
- Expansion of low-cost Freescale Freedom development platform

**FlexMemory**
- EEPROM
- Read-While-Write

**HMI:**
- Touch Sensing
- Segment LCD
- Graphic LCD

**Comprehensive Enablement - Hardware and Software Scalability**
Introducing ... K2

K2 The next generation of Kinetis

freescale

freescale.com/Kinetis
The next generation of Kinetis solutions builds on its strong history of scalability and innovation paired with an even more expansive set of enablement solutions:

- **Speed application development** with a comprehensive set of new tools built upon the already strong Kinetis Enablement.

- A New standard of Cortex M3/M4 power efficiency with an unbeatable low dynamic power consumption from 100 to 180MHz while delivering 7x lower static power compared with the closest competitor.

- **New Lower price points** with better enablement, power/performance efficiency and smart integration. Kinetis K2 starting at $0.79 (10ku RSL) with Cortex-M4, 100MHz, FPU and 64KB of Flash Memory.
A New High of Cortex M3/M4 power efficiency with New Lows in Prices

- **Second Generation** of Kinetis K devices
  - A New standard of Cortex M3/M4 power efficiency
    - 125uA/MHz in VLPR mode (4MHz)
    - 160uA/MHz in Run Compute (100MHz)
    - 170uA/MHz in Run
    - 2.6uA low power mode with full state retention, wake-up time of 6uS
    - 150nA in the Lowest mode

- Full Series of Cost-Effective Devices

- Total of 65 Part Number already in production, 21 more to be launch further in 2014
K2 – Break thought investment in Software Development

• **A comprehensive set of new tools** built upon the already strong Kinetis Enablement
  - Kinetis Software Development Kit (SDK)
  - Kinetis Design Studio (KDS)
  - Kinetis Bootloader
  - Addition of mbed support to the Kinetis K-Series
  - Expansion of ultra-low-cost Freedom Boards for K-Series

• New tools being launched with K2, initially based on the second generation of K-Series devices as a starting point. Will cover the full Kinetis Series with updated releases
Broad Scalability at New Price Points

- Next-generation Kinetis K series devices add to the existing large Kinetis MCU portfolio, adding new combinations of memory sizes, packaging and integration, allowing customers and even broader selection of products at even lower price points.

- Preserve engineering investment
  - Broad and fast-growing portfolio of more than 900 Kinetis MCU solutions with software and hardware compatibility

- Lowest-priced ARM® Cortex®-M4-based device
  - Next-generation devices start at 100 MHz with floating point unit, 64 KB Flash at just $.79 (USD)

- Streamlined Feature Set
  - Optimized on-chip integration with BOM-saving features such as crystal-less USB device functionality
Kinetis K Series Portfolio

ARM Cortex-M4 solutions for a wide range of embedded applications

1st Gen Kinetis K-Series Families

- K1x – Baseline
- K2x – USB
- K30 – SLCD
- K40 – SLCD + USB
- K5x – Measurement (Medical)
- K60/K61 – Ethernet w/optional Tamper
- K70 – Graphics

2nd Gen Kinetis K-Series Families

- K10D / K20D
- K10F / K20F
- K12D / K22D
- K11D / K21D
- K24F
- K21F / K22F
- K30D / K40D
- K30D / K40D
- K30D / K40D
- K60D
- K5xD
- K64F
- K63F / K64F
- K65F / K66F

Performance

- 32KB
- 64KB
- 128KB
- 256KB
- 512KB

Memory Density
• Market Trends
Smarter Consumer and Industrial Devices with:
- Increased functionality
- Highly connected
- More advanced HMIs (for things like smart thermostats)
- Small form factor

• Applications

Consumer
- Gaming systems
- Wearables
- Smart Phone / Tablets Accessories

Metering
- Connected Meters
- Smart-Grid Concentrators

Building & Home Automation
- Connected Security & access control
- Smart Thermostats

Point of Sale & Secure Applications
Factory Automation
Portable Instrumentation
**Key Features:**

- **Core/System**
  - Cortex-M4 @ 180 MHz with 8KB I-Cache and FPU
- **Memory**
  - Up to 2MB Flash
  - Up to 256KB SRAM
- **Communications**
  - USB OTG FS/LS w/ PHY and USB Vreg
  - USB OTG LS/FS/HS w/PHY
  - Crystal-less USB device capability
  - Ethernet
  - Multiple serial ports including dual CAN
- **Analog**
  - 4 x ACMP
  - 2x 16-bit ADC, Up to 2 x 12-bit DAC
  - Analog Vref
- **Others**
  - 1.71V-3.6V; -40 to 105oC
  - Up to 105 x I/Os (3V)
  - Tamper and Crypto acceleration
  - 144LQFP, 144BGA, 169MBGA 169WCSP
- **Availability**
  - Samples: 1Q2014
  - Qual/Production: early 3Q2014
**K22F/K02F – 64KB to 512KB -100/120MHz:**

**What is Available Now?!**  
http://compass.freescale.net/go/K22F_Alpha

- MCU samples in inventory:

<table>
<thead>
<tr>
<th>Partnumber</th>
<th>Max. Freq.</th>
<th>Pin Count</th>
<th>Package</th>
<th>Flash</th>
<th>SRAM</th>
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<tbody>
<tr>
<td>PK22FN512VDC12</td>
<td>120MHz</td>
<td>121</td>
<td>XFBGA</td>
<td>512K</td>
<td>128KB</td>
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<tr>
<td>PK22FN512VLL12</td>
<td>120MHz</td>
<td>100</td>
<td>LQFP</td>
<td>512K</td>
<td>128KB</td>
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<tr>
<td>PK22FN512VLH12</td>
<td>120MHz</td>
<td>64</td>
<td>LQFP</td>
<td>512K</td>
<td>128KB</td>
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<tr>
<td>PK22FN256VDC12</td>
<td>120MHz</td>
<td>121</td>
<td>XFBGA</td>
<td>256K</td>
<td>48KB</td>
</tr>
<tr>
<td>PK22FN256VMP12</td>
<td>120MHz</td>
<td>64</td>
<td>BGA</td>
<td>256K</td>
<td>48KB</td>
</tr>
</tbody>
</table>

- MCU offer update in the KPUR
  - including 10ku/y pricing
  - volume quotes contact Tactical Marketing or Business Development Team.

- Tower Boards: X-TWR-K22F120M
  - with User Manual
  - Design files (schematic, BOM,…)

- IDE Support:
  - IAR 7.10.1
  - Keil

- Sample Code
  - With Quick Start Guide

- MQX support - release 4.1

- NDA Documentation
  - Customer Presentation
  - Product Brief
  - Preliminary Datasheet’s
  - Preliminary Reference Manual
  - Preliminary Errata

- Questions: Paulo.K@freescale.com
Conclusion

K2 – The Next Generation of Kinetis Solutions
- Extend Kinetis Enablement with further easy-of-use
- Introduce next level of performance, feature, and cost-effective K-Series devices

Kinetis K2 becomes the new Low-Power Reference for ARM Cortex-M3/4 “beyond 100DMIPS with FPU” for both dynamic and static modes

‘K2’ priced aggressively for Market Share gain having a 10-20% discount over K-Series 1st generation

Samples and TWR boards available now, announcement at FTF and production ramp-up through summer of 2014.
General Purpose Kinetis L Product Lines
Kinetis L Series

• Ultra Low Power, Ultra Small Scale, Super Easy to Use, Leading Scalability and Integration as an ideal solution for Internet of Things edge nodes

World’s Most Energy Efficient ARM based Microcontroller
Architected for power efficiency, the Kinetis L series takes advantage of ARM’s ultra low power Cortex-M0+ processor and features peripherals that help you optimize power consumption. Kinetis L series provide ultra low dynamic consumption, ultra low static consumption, rich low power modes and innovative low power peripherals.

World’s Smallest ARM based Microcontroller
Built on Freescale leading technology, Kinetis L series provide rich package options from 8x8mm2 121XFBGA, 10x10mm2 100LQFP all the way down to world’s smallest KL03 20WLCSP with 1.6x2mm2 ultra small scale device.

World’s Leading Scalability and Integration with Super Ease of Use
Built on the ARM Cortex-M0+ core, the Kinetis L series simplifies development with an upward migration path to Kinetis K and X series. With a comprehensive enablement bundle including low cost Tower System and Freedom Tools, Kinetis Design Studio IDE, Kinetis Software Development Kit, MQX RTOS and the ARM support ecosystem, development is super simple. Expanding on well-known features of the Kinetis platform with leading scalability, best-in-class integration with rich analog features and low-power connectivity, the Kinetis L series redefines entry-level.
# Implications for Entry-Level MCUs

<table>
<thead>
<tr>
<th>Connectivity</th>
<th>8/16-bit MCUs</th>
<th>32-bit MCUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Interface</td>
<td><img src="#" alt="USB" /></td>
<td><img src="#" alt="Bluetooth" /></td>
</tr>
<tr>
<td>Power Consumption</td>
<td><img src="#" alt="Ultra-low sleep/power-down currents" /></td>
<td><img src="#" alt="Maximum Energy efficiency (CoreMark®/mW)" /></td>
</tr>
</tbody>
</table>
| Computation | \(\sqrt{\int_{x}^{n} \sin \log_{n}}\) | |}
| Software/Cost of Ownership | Unique platforms, MCU dependent/$$\$$ | Scalable, reusable platforms with modern software techniques/$$

| Scalability | Limited choice, single source | Broad MCU portfolios, multi-source |
Kinetis L Series MCUs: Enabling Differentiation in Entry-Level Products

Energy efficiency
Class-leading CoreMark/mW

Scalability and integration
Kinetis L to K Series MCUs (ARM Cortex-M0+ to Coretex-M4)

Enablement
Freescale bundle + ARM ecosystem

32-bit

Kinetis L Series MCUs
The evolution of the entry-level MCU

Ultra-low static
<1uA

Low cost
From <$0.50

Ease of use
Freedom Platform, Processor Expert and MCU Solution Advisor

Going Green
Health & Safety
Net Effect

External Use | 41
Kinetis L Series MCUs: Target Applications

Banking
- OTP
- Cash Registers

Building Control
- Smoke Detector
- Thermostat

Instrumentation & Medical
- Joy Sticks
- Remote Controller
- Aero Model
- Shaver
- Mouse
- GPS Watch

Mass Market
- ETC
- Electronic Label
- Fiber Module
- RFID
- ETC

Energy Efficiency
- Scale
- Shaver
- Mouse
- GPS Watch

Kinetis L Series
# Kinetics L Series MCUs Feature Overview

<table>
<thead>
<tr>
<th>Common Features</th>
<th>Optional Features</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cortex-M0+ Core, 48/72 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-Low-Power Modes and Peripherals, Low-Power Boot, Clock Gating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.71-3.6 V, –40 °C to 105 °C [1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 nm TFS Flash, SRAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Memory Security/Protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Analog Peripherals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/16-bit ADC, 12-bit DAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Serial Interfaces</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UART (Including 1 LPUART)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPI, I²C</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Timers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Real-Time Clock</strong> [2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-bit Low-Power TPMS (GP Timer/PWM)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Low-Power Timers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32-bit Periodic Interrupt Timer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Family</th>
<th>Flash</th>
<th>SRAM</th>
<th>Pin Count</th>
<th>USB</th>
<th>SLCD</th>
<th>DMA</th>
<th>RTC</th>
<th>ADC</th>
<th>DAC</th>
<th>I2S</th>
<th>TSI</th>
<th>ROM</th>
<th>Vref</th>
<th>Security</th>
</tr>
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<tbody>
<tr>
<td>KL46</td>
<td>128-256 KB</td>
<td>16-32 KB</td>
<td>64-121</td>
<td>OTG</td>
<td>Y</td>
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<td>KL43</td>
<td>128-256 KB</td>
<td>16-32 KB</td>
<td>48-64</td>
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<td>KL36</td>
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<td>KL34</td>
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<td>KL33</td>
<td>32-256 KB</td>
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<td>64</td>
<td>Y</td>
<td>Y</td>
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<td>KL28</td>
<td>256-512 KB</td>
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<td>KL27</td>
<td>32-256 KB</td>
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</tr>
<tr>
<td>KL04</td>
<td>8-32 KB</td>
<td>1-4 KB</td>
<td>24-48</td>
<td>Y</td>
<td>Y</td>
<td>12-bit</td>
<td></td>
<td></td>
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<tr>
<td>KL03</td>
<td>8-32 KB</td>
<td>2 KB</td>
<td>16-24</td>
<td>Y</td>
<td>12-bit</td>
<td></td>
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<tr>
<td>KL02</td>
<td>8-32 KB</td>
<td>1-4 KB</td>
<td>16-32</td>
<td>12-bit</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

[1] Feature not available on CSP packages
[2] For KL02, use software to support

---

---
### Kinetis L Series MCUs Availability

Pricing from <$0.49 SRP @ 10,000 units

<table>
<thead>
<tr>
<th>Product Family</th>
<th>Flash Memory</th>
<th>10K # Suggested Resale Price</th>
<th>General Market Availability</th>
<th>Volume Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>KL46/36/34</td>
<td>64-256 KB</td>
<td>$1.71 - $2.73</td>
<td>Now</td>
<td>Now</td>
</tr>
<tr>
<td>KL43/33</td>
<td>64-256 KB</td>
<td>$1.77 - $2.69</td>
<td>Q3 '14</td>
<td>Q3'14</td>
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<tr>
<td>KL28</td>
<td>256-512 KB</td>
<td>$2.85 - $3.47</td>
<td>Q2'15</td>
<td>Q2'15</td>
</tr>
<tr>
<td>KL27/17</td>
<td>128-256 KB</td>
<td>$0.96 - $2.27</td>
<td>Q3 '14</td>
<td>Q3'14</td>
</tr>
<tr>
<td>KL26/16</td>
<td>32-256 KB</td>
<td>$0.96 - $2.29</td>
<td>Now</td>
<td>Now</td>
</tr>
<tr>
<td>KL25/24</td>
<td>32-128 KB</td>
<td>$1.30 - $2.01</td>
<td>Now</td>
<td>Now</td>
</tr>
<tr>
<td>KL15/14</td>
<td>32-128 KB</td>
<td>$0.97 - $1.79</td>
<td>Now</td>
<td>Now</td>
</tr>
<tr>
<td>KL05/04</td>
<td>8-32 KB</td>
<td>$0.62 - $1.03</td>
<td>Now</td>
<td>Now</td>
</tr>
<tr>
<td>KL03</td>
<td>8-32 KB</td>
<td>$0.49 - $0.93</td>
<td>Q2'14</td>
<td>Q2'14</td>
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<tr>
<td>KL02</td>
<td>8-32 KB</td>
<td>$0.49 - $0.86</td>
<td>Now</td>
<td>Now</td>
</tr>
</tbody>
</table>

**Qualification status**

- **MK L 46 Z 256 V LL 4**
- **Kinetis**
- **L Series**
- **Family/Sub-Family**
- **Cortex-M0+**
- **Flash Size**
- **Temp**
- **Package**
- **Speed**
Kinetis KL03

Packages
- 24QFN 4x4x0.65/0.5mm
- 16QFN 3x3x0.65/0.5mm
- 20WLCSP 1.6x2.0x0.56/0.4mm

Features Highlight
- ROM boot loader for easy flash upgrade
- High Speed I2C up to 1Mbps
- Embedded 1.2V voltage reference for ADC
- 35uA/MHz VLPR and 1uA sleep
- (50uA/MHz, 2uA)

Availability
- Sample: Mar’14
- Production: Jul’14
KL03 New Family Summary

• Packages
  – 24QFN, 16QFN, 20WLCSP

• New Features
  – ROM with Boot Loader
  – 1.2V Internal Voltage Reference
  – High Speed I2C

• Availability
  – PK samples of all packages available NOW!
  – X-FRDM-KL03Z available NOW!
  – Market launch and production (24QFN) on 25-July!
Kinetis KL43/33

**Packages**
- 64LQFP 10x10x1/0.5mm
- 64MAPBGA 5x5x1/0.5mm

**Features Highlight**
- ROM boot loader for easy flash upgrade
- Crystal-less USB Slave
- High Speed IIC up to 1Mbps
- Embedded 1.2V voltage reference for ADC
- FlexIO module
- 60uA/MHz VLPR and 1.5uA sleep

**Availability**
- Sample: NOW
- Production: July’14
KL43/33 New Family Summary

• Packages
  - 64LQFP, 64MAPBGA

• New Features
  - ROM with Boot Loader
  - 1.2V Internal Voltage Reference
  - High Speed I2C
  - Crystal-less USB
  - FlexIO

• Availability
  - PK samples (64LQFP) available NOW!
  - X-FRDM-KL43Z and X-TWR-KL43Z48M available on 25-May!
  - Market launch and production (64LQFP) on 1-July!
# Kinetis KL27/17

## Packages
- 64LQFP 10x10x1/0.5mm
- 64MAPBGA 5x5x1/0.5mm
- 48QFN 7x7x0.65/0.5mm
- 32QFN 5x5x0.65/0.5mm

## Features Highlight
- ROM boot loader for easy flash upgrade
- Crystal-less USB Slave
- High Speed IIC up to 1Mbps
- Embedded 1.2V voltage reference for ADC
- FlexIO module
- 60uA/MHz VLPR and 1.5uA sleep

## Availability
- Sample: NOW
- Production: July’14

## Security and Integrity
- Unique ID
- 16ch 16-bit SAR ADC
- High Speed Analog Comparator
- 12-bit DAC
- Internal Voltage Reference

## Analog
- 6ch Timer/PWM
- 2ch Timer/PWM
- Low Power Timer
- Internal Voltage Reference
- Periodic Interrupt Timers
- RTC

## Timers
- Communication Interfaces
- Low Power UART x2
- UART x1
- SPI x2
- I2S x1
- I2C x2
- USB Slave
- USB Voltage Regulator
- FlexIO
- KL27 only

## System
- Core
  - ARM Cortex-M0+ 48MHz
- Interface
  - SWD
- MTB
- Interrupt Controller

## Memories
- Program Flash 128-256KB
- 32-Byte Register File
- SRAM 32KB
- ROM 16KB

## Clocks
- Low & High Frequency Oscillators
- High Accuracy Internal Reference Clocks
- 48M/8MHz
- 1KHz LPO
KL27/17 New Family Summary

- **Packages**
  - 64LQFP, 64MAPBGA, 48QFN, 32QFN

- **New Features**
  - ROM with Boot Loader
  - 1.2V Internal Voltage Reference
  - High Speed I2C
  - Crystal-less USB
  - FlexIO

- **Availability**
  - PK samples (64LQFP) available NOW!
  - X-FRDM-KL43Z and X-TWR-KL43Z48M available on 25-May!
  - Market launch and production (64LQFP) on 1-July!
**Kinetis KL27/17**

### Packages
- 64LQFP 10x10x1/0.5mm
- 36XFBGA 3.5x3.5x0.5/0.5mm
- 64MAPBGA 5x5x0.5/0.5mm
- 36WLCSP 2.3x2.3x0.5/0.35mm
- 48QFN 7x7x0.65/0.5mm
- 32QFN 5x5x0.65/0.5mm

### Features Highlight
- ROM boot loader for easy flash upgrade
- Crystal-less USB Slave
- High-speed I2C up to 1Mbps
- FlexIO module
- CRC for data correction
- 40uA/MHz in VLPR and 1uA in sleep (with RTC and RAM retention)
- USB connection keep alive in sleep mode

### Availability
- Sample: 30-Aug’14 (64LQFP), 18-Sept’14 (36XFBGA)
- Production: 31-Oct’14 (64LQFP), 30-Dec’14 (36XFBGA)
Kinetics KL28/28S

Packages
- 121XFBGA 8x8x1/0.65mm
- 100LQFP 14x14x1/0.5mm
- 64MAPBGA 5x5x0.65/0.5mm
- 64LQFP 10x10x1/0.5mm
- WLCSP - TBD

Features Highlight
- 72MHz core speed with large memory size
- ROM boot loader for easy flash upgrade
- Black Box
- Crystal-less USB Slave
- High-speed I2C up to 1Mbps
- Embedded 1.2V voltage reference for ADC
- FlexIO module
- 75uA/MHz run and 4uA sleep

Availability
- Sample: Q4’14
- Production: Q2’15
L Series Technical Differentiators
Kinetis L Series MCUs: Energy Efficiency

Ultra-efficient processing
- Cortex-M0+ processor
- 90 nm low-power flash technology
- Bit manipulation engine
- <40 uA/MHz, 4.8 CM/mW
- Peripheral bridge crossbar
- Zero wait state Flash memory controller

Ultra-low-power modes
- 90nm low-leakage flash technology
- Multiple run, wait and stop modes
- 4 us wake-up from deep sleep modes
- Clock & power gating, low-power boot options
- 2 uA deep sleep Idd with register retention, LVD active and 4.3 us wake-up

Energy-saving peripherals
- Smart peripherals function in deep sleep modes and can make intelligent decisions and process data without waking up the core—ADMA, UART, timers, ADC, segment LCD, touch sensing...

Most Innovative Process Technology
Kinetis ARM Cortex-M4 MCUs
Kinetis L Series

Peripherals: Asynchronous DMA (ADMA)

**Inter-module-connection with aDMA**

<table>
<thead>
<tr>
<th>Peripheral</th>
<th>Wakeup source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch Sense Interface</td>
<td>End of scan</td>
</tr>
<tr>
<td></td>
<td>Scan out of range</td>
</tr>
<tr>
<td>CMP</td>
<td>Compare detected</td>
</tr>
<tr>
<td>I2S</td>
<td>Receive data ready</td>
</tr>
<tr>
<td></td>
<td>Transmit data needed</td>
</tr>
<tr>
<td>LPUART</td>
<td>Receive data ready</td>
</tr>
<tr>
<td></td>
<td>Transmit data needed</td>
</tr>
<tr>
<td>LPTPM</td>
<td>Compare/capture detected</td>
</tr>
<tr>
<td></td>
<td>Counter overflow</td>
</tr>
<tr>
<td>Port Control and Interrupts</td>
<td>External edge detected</td>
</tr>
<tr>
<td>ADC</td>
<td>Conversion complete</td>
</tr>
</tbody>
</table>

- Kinetis L-Series devices support DMA operation in low power modes
- Stop modes can be entered with the System Clock enabled
- Allows peripherals with STOP mode functionality to trigger asynchronous DMA request
- The MCU will wake from STOP mode to WAIT, process the DMA request and then re-enter the STOP mode with no CPU intervention
- The MCU can be placed in a Compute mode with peripherals configured for STOP. In this mode, the CPU can continue to process data at very low dynamic power. Peripherals with STOP mode functionality can continue to operate and trigger DMA transfers

**Use Case:** ADC performing conversions, DMA transferring conversion results into RAM buffer and CPU processing/filtering the data all done with minimal power ~ 300uA at 4MHz Core speed
“Given that ultra-low-power devices spend 99.9 percent of the time in standby mode, leakage current has become a key factor in determining power efficiency in smaller process geometries.”

**Use Case Details:**
- 99.9% of time in standby with RTC active
  - Kinetis L—VLLS1+RTC
  - Wolverine—LPM3 + RTC

**Conclusions:**
- Running at same frequency, Kinetis L consumes 15–20% less average current.
- However, Kinetis L delivers nearly 2x the work or can do the same work at roughly half the frequency.
- In this case, **Kinetis delivers on the “typical use case” at nearly 40% less average current.**
## Kinetis L Series MCUs: Entry-Level Enablement

### Hardware

**Freescale Freedom Development Platform**
- FRDM-KL02Z
- FRDM-KL05Z
- FRDM-KL25Z
- FRDM-KL26Z
- FRDM-KL46Z
  - Low-cost/power platform for entry-level developers ($12.95/€10 SRP)
  - Integrates a fully featured debugger that works with all featured tool chains

**Freescale Tower System**
- TWR-KL46Z48M
- TWR-KL25Z48M
  - Modular, open source development platform with reusable peripheral modules offering connectivity, analog, graphics LCD and motor control functionality

### IDE & Code Generation

**Freescale & Third-Party IDEs**
- Freescale CodeWarrior v10.3: **free** 64KB
- Keil MDK: free 32 KB
- IAR EWARM: free 32 KB
- Atollc TrueStudio: free 8 KB
- GCC ARM Embedded via Launchpad.net
  - Additional tool support from Code Red and others in Q412

**Freescale Processor Expert Code Generator**
- **Free** software generation tool for device drivers/start-up code
- Seven steps from project creation to debug – dramatically reduces development time
- Available within CodeWarrior or as a standalone plug-in for IAR/Keil/GNU IDEs

### Run-Time Software & Product Selector

**Freescale MQX Lite RTOS**
- [www.freescale.com/mqx](http://www.freescale.com/mqx)
  - **Free**, lightweight MQX kernel customised for small resource MCUs
  - Packaged as a Processor Expert component
  - Upwards compatible with MQX RTOS

**Solution Advisor**
- [www.freescale.com/sa](http://www.freescale.com/sa)
  - Web-based interactive MCU selector
  - Filters for operating characteristics, packaging, memory configuration and peripherals. Verifies muxing compatibility.
  - Save, download and print summary reports and pin muxing configurations.
Additional Resources / Information
Kinetis Solution Overview

**Kinetis MCU**

- **ARM Cortex-M0+ Core**
  - 48MHz, 1.77 CoreMark/MHz, 2-Stage Pipeline, 1-Cycle GPIO, Micro Trace Buffer

- **ARM Cortex-M4 Core**
  - 50-150MHz, 3.40 CoreMark/MHz, HW-divide, MAC, DSP-commands, FPU option

- **Differentiators**
  - Low-power, Performance, Flex-Memory, Mixed-Signal, Security, HMI Features

- **Special Functions**
  - Analog Pre-Processing, 24b-Sigma Delta ADC, sub -1GHz & 2.4 GHz Transceiver

**Enablement**

- **Freescale Bundle**
  - **Hardware**
    - Freedom board, Tower Platform
  - **Software**
    - CodeWarrior, Processor Expert, Driver Suite, eGUI, PEG, FreeMASTER
  - **RTOS**
    - MQX, MQX Lite

**ARM Eco System**
The Growing Importance of Software

Average MCU Flash size grew x8 in the last decade

Software now accounts for 60+% of embedded project costs*

57% of projects are late, primarily due to software*

Firmware is our customers’ BIGGEST pain point

60% SW cost

57% late

*2013 Embedded Market Study, UBM Tech
# Freescale’s Microcontroller Enablement Bundle

<table>
<thead>
<tr>
<th>Solution Advisor</th>
<th>Development Platforms</th>
<th>Development Tools</th>
<th>Development Software</th>
<th>Online Enablement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Selector</td>
<td>Partner Ecosystem &amp; Kinetis Design Studio</td>
<td>Visual and automated framework to accelerate development time, deliver software components</td>
<td>Complimentary MQX RTOS</td>
<td>Cloud enablement through freely available online design tools, communities, part selectors</td>
</tr>
<tr>
<td>Solution Advisor</td>
<td>Freedom Development Platform</td>
<td>Processor Expert</td>
<td>MQX/MQX-Lite Software Stacks and Libraries</td>
<td></td>
</tr>
<tr>
<td>Visual and automated framework to accelerate development time, deliver software components</td>
<td>Visual and automated framework to accelerate development time, deliver software components</td>
<td>Processor Expert</td>
<td>MQX/MQX-Lite Software Stacks and Libraries</td>
<td>Cloud enablement through freely available online design tools, communities, part selectors</td>
</tr>
<tr>
<td>Find best-fit processors and tools with web-based interactive product selector</td>
<td>Freedom Development Platform</td>
<td>Processor Expert</td>
<td>Complimentary MQX RTOS</td>
<td></td>
</tr>
<tr>
<td>Tower System</td>
<td>Freedom Development Platform</td>
<td>Processor Expert</td>
<td>MQX/MQX-Lite Software Stacks and Libraries</td>
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<tr>
<td>Low cost hardware platforms for prototyping application development</td>
<td>Freedom Development Platform</td>
<td>Processor Expert</td>
<td>MQX/MQX-Lite Software Stacks and Libraries</td>
<td></td>
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<td>Processor Expert</td>
<td>MQX/MQX-Lite Software Stacks and Libraries</td>
<td></td>
</tr>
</tbody>
</table>
Robust Software & Development Ecosystem

Applications

Tools, OS, Middleware

Architectures

>800 Embedded Software Engineers

Key Software Acquisitions & Investments

1999: Metrowerks
2002: AMC, Lineo
2008: Intoto
2009: MQX Runtime Platform
2010: Processor Expert, Chipwerks, Swell
Kinetis Software Development Kit (SDK)

A complete software framework for developing applications across all Kinetis MCUs

HAL, peripheral drivers, libraries, middleware, utilities, and usage examples.

**Product Features**

- Open source Hardware Abstraction Layer (HAL) provides APIs for all Kinetis hardware resources
- BSD-licensed set of peripheral drivers with easy-to-use C-language APIs
- Comprehensive HAL and driver usage examples and sample applications for RTOS and bare-metal.
- CMSIS-CORE compatible startup and drivers plus CMSIS-DSP library and examples
- RTOS Abstraction Layer (OSA) with support for Freescale MQX, FreeRTOS, Micrium uC/OS, bare-metal and more
- Integrates USB and TCP/IP stacks, touch sensing software, encryption and math/DSP libraries, and more
- Support for multiple toolchains including GNU GCC, IAR, Keil, and Kinetis Design Studio

Learn more at: www.freescale.com/KSDK (coming April 2014)
Kinetis Design Studio

Product Features
- A free of charge and unlimited IDE for Kinetis MCUs
- A basic IDE that offers robust editing, compiling and debugging
- Based on Eclipse, GCC, GDB and other open-source technologies
- Includes Processor Expert with Kinetis Platform SDK integration
- Host operating systems:
  - Windows 7/8
  - Linux (Ubuntu, Redhat, Centos)
  - Mac OS X
- Support for SEGGER, P&E and Open SDA/CMSIS-DAP debugger targets
- Support for Eclipse plug-ins including RTOS-awareness (i.e. MQX, FreeRTOS)
- CodeWarrior project importer

No-cost integrated development environment (IDE) for Kinetis MCUs

Eclipse and GCC-based IDE for C/C++ editing, compiling and debugging

Learn more at: www.freescale.com/KDS (coming April 2014)
Kinetis Bootloader

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.

Product Features

• A common bootloader for all Kinetis MCUs
• Source code provided under a permissive BSD open source license
• ROM based on select Kinetis devices
• Pre-programmed into flash (on devices without a dedicated ROM) for built-in factory programming capabilities
• Fully customizable for use in customer applications providing reliable field updates
• Serial communications with a host via UART, SPI, I2C, USB HID, or CAN
  – Active peripheral detection
  – Common command protocol for all peripherals.
• Command-line and GUI tools provided for Windows, Linux and Mac hosts

Learn more at: www.freescale.com (coming April 2014)
Kinetis K2 Tools Solutions (Addition to existing Kinetis Enablement)

- **mbed Support – Expanding to Kinetis K-Series Families**
  - Rapid and easy Kinetis prototyping and development through the global **mbed Developer Community** providing free software libraries

- **Expand Offer of K-Series Freedom Boards**
  - Ultra low-cost/low-power development platform
  - Enables quick application prototyping and demonstration of **Kinetis MCU families**

---

**Software**

- C/C++ Programs
- mbed Components Database
  - Accelerometer, GPS, 802.15.4/6LoWPAN, Cellular, Compass, ...
- mbed SDK
  - Runtime, Memory Model, Peripheral APIs, STDIO, RTOS, Networking, Platform features
- Low Level Driver Libraries
- Toolchain C library
- RTOS
- CMSIS-CORE
Freescale Kinetis Minis
Freescale Kinetis L combined with WLCSP packing brings the next World’s Smallest ARM® Powered MCU

**Microscopic Package. Massive Potential.**

- 1.6 mm x 2.0 mm x 0.56 mm
- Advanced wafer-level chip scale package for the ultimate in PCB area reduction
- 35% less PCB area, yet delivers 60% more GPIO than the next competing solution
- 32-bit ARM® Cortex™-M0+ core with high density feature integration: 32 KB flash, precision analog, ultra low power and more
- Start developing with the Kinetis L series Freescale Freedom development platform
- Sampling in April 2014!

For more information, visit freescale.com/Kinetis/KL03CSP
Freescale CSP Packaging Overview for 32-bit Kinetis MCUs

• What is Wafer Level CSP?
  - Wafer Level Chip Scale Package refers to the technology of packaging an integrated circuit at the wafer level, instead of the traditional process of assembling individual units in packages after dicing them from a wafer.

• What will it mean for me as a customer buying and mounting CSP package into my system
  - The cost will be higher. Handling is more complex and thus cost of both handling and soldering process more expensive
  - More information on Freescale recommended handling is available in an Application Note see AN3846

• **CSPs are not targeted at low volume customers.** For 2014, only High Touch accounts backed by Business Development Marketing will be supported.
Alternative to CSPs

• With the higher cost of CSP and difficult handling, customers should consider some alternative options before selecting a CSP.

• If the customer requirement is only for a very thin package, and area is not a major concern, customers should consider the new 121 pin Ultra Fine BGA packages being supported on new products.
  - The use of the ultra fine BGA will lead to a lower cost PCB than that which utilizes a CSP.

• Other alternatives to CSP:
  - 24, 32 or 48 QFN
  - 64, 121 & 144MAPBGA
Kinetis WLCSP Portfolio
The World’s Smallest ARM Powered MCUs – From ultra low power to high performance
## CSP options on Kinetis – Qualified

<table>
<thead>
<tr>
<th>Device</th>
<th>Part #</th>
<th>Flash</th>
<th>Speed Grade</th>
<th>Temp range</th>
<th>Package</th>
<th>Dimensions (mm)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>KL02</td>
<td>MKL02Z32CAF4R KKL02Z32CAF4R</td>
<td>32KB</td>
<td>48MHz</td>
<td></td>
<td>20WLCSP</td>
<td>1.994 x 1.94 x 0.563*</td>
<td></td>
</tr>
<tr>
<td>KL15</td>
<td>MKL15Z128CAD4R KKL15Z128CAD4R</td>
<td>128kB</td>
<td>48MHz</td>
<td></td>
<td>35WLCSP</td>
<td>2.37 x 2.46*</td>
<td>18wk lead-time for Production</td>
</tr>
<tr>
<td>KL16</td>
<td>MKL16Z128CAL4 KKL16Z128CAL4</td>
<td>128kB</td>
<td>48MHz</td>
<td></td>
<td>36WLCSP</td>
<td>2.5 x 3 x 0.528**</td>
<td>0.35mm ball pitch</td>
</tr>
<tr>
<td>KL26</td>
<td>MKL26Z128CAL4 KKL26Z128CAL4</td>
<td>128kB</td>
<td>48MHz</td>
<td></td>
<td>36WLCSP</td>
<td>2.5 x 3 x 0.528**</td>
<td>0.35mm ball pitch</td>
</tr>
<tr>
<td>K60</td>
<td>MK60DN512ZCAB10R KKL60DN512ZCAB10R</td>
<td>512KB</td>
<td>100MHz</td>
<td>Max Ambient = - 40 to 85oC</td>
<td>120WLCSP</td>
<td>5.29 x 5.28 x 0.563*</td>
<td></td>
</tr>
<tr>
<td>K20</td>
<td>MK60DN512ZCAB10R KKL60DN512ZCAB10R</td>
<td>512KB</td>
<td>100MHz</td>
<td></td>
<td>120WLCSP</td>
<td>5.29 x 5.28 x 0.563*</td>
<td></td>
</tr>
<tr>
<td>K60</td>
<td>SCK60FN1MGCAA12R</td>
<td>1MB</td>
<td>120MHz</td>
<td></td>
<td>143WLCSP</td>
<td>6.44 x 5.55 x 0.563*</td>
<td></td>
</tr>
<tr>
<td>K61</td>
<td>MK61FN1M0CAA12R KKL61FN1M0CAA12R</td>
<td>1MB</td>
<td>120MHz</td>
<td></td>
<td>143WLCSP</td>
<td>6.44 x 5.55 x 0.563*</td>
<td></td>
</tr>
<tr>
<td>K10</td>
<td>MK10DN512ZAB10R</td>
<td>512KB</td>
<td>100MHz</td>
<td>Max Ambient = 0 to 70oC</td>
<td>120WLCSP</td>
<td>5.29 x 5.28 x 0.563*</td>
<td></td>
</tr>
</tbody>
</table>

* +/- 0.035mm
** +/- 0.03mm
## CSP options on Kinetis – Pipeline

<table>
<thead>
<tr>
<th>Device</th>
<th>Part #</th>
<th>Flash</th>
<th>RAM</th>
<th>Speed</th>
<th>Number of balls (pitch)</th>
<th>Temp range</th>
<th>Size (mm)</th>
<th>PK Samples</th>
<th>Qual</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>K24 / K64</td>
<td>MK24FN1M0CAJ12R MK64FN1M0CAJ12R</td>
<td>1MB</td>
<td>256Kb</td>
<td>120MHz</td>
<td>142 (0.4mm)</td>
<td></td>
<td>4.8 x 5.6 x 0.563*</td>
<td>Now</td>
<td>TBD</td>
<td>18wk lead-time</td>
</tr>
<tr>
<td>K65</td>
<td>MK65FN2M0CAC18R MK65FX1M0CAC18R</td>
<td>2MB</td>
<td>256Kb</td>
<td>180MHz</td>
<td>169 (0.4mm)</td>
<td></td>
<td>5.6 x 5.5 x 0.563*</td>
<td>Now</td>
<td>May’14</td>
<td>July ‘14</td>
</tr>
<tr>
<td>KL03</td>
<td>MKL03Z32xxx4</td>
<td>32kB</td>
<td>4Kb</td>
<td>48MHz</td>
<td>20 (0.4mm)</td>
<td></td>
<td>2.0 x 1.6 x 0.563*</td>
<td>April ’14</td>
<td>June’14</td>
<td>July’14</td>
</tr>
<tr>
<td>K22F</td>
<td>MK22FN56CAH12 MK22FN128CAH12</td>
<td>256kb or 128Kb</td>
<td>48Kb</td>
<td>120MHz</td>
<td>64 (0.4mm)</td>
<td>Max Ambient = -40 to 85oC</td>
<td>3.4 x 3.2 x 0.563*</td>
<td>Now</td>
<td>TBD</td>
<td>18wk lead-time</td>
</tr>
<tr>
<td>K22F</td>
<td>MK22FN512CAP12 MK22FN256CAP12</td>
<td>512kb or 256Kb</td>
<td>128Kb</td>
<td>120MHz</td>
<td>80 (0.4mm)</td>
<td></td>
<td>4.12 x 3.56 x 0.563*</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>K22F</td>
<td>MK22FN128CAK10</td>
<td>128Kb</td>
<td>24Kb</td>
<td>100MHz</td>
<td>49 (0.4mm)</td>
<td></td>
<td>TBD x 0.563*</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>K02</td>
<td>K02FN128Cxx10 K02FN64Cxx10</td>
<td>12Kb or 64kB</td>
<td>16Kb</td>
<td>100MHz</td>
<td>TBD</td>
<td></td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

* Dates subject to change
Typical WLCSP Milestones - TBC

- **Mechanical samples: 4 - 6 weeks after silicon validation (confidence)**
  - Mechanical Samples – WLCSP samples are not tested. Part configurations and IP trims not programmed. Parts can be used to validate the RDL (re-distribution layer) and the case outline.

- **Pre-bump probe only, limited test samples: + 6 weeks after CSP mask design**
  - Probe-only (Limited Test) Samples – WLCSP sample are tested with appropriate part configurations, IP trims, and NVM initialized. However, parts are not tested or validated after bump processing. These can be shipped to customers for development purposes, but there is risk without validating the functionality of the parts after bump processing prior to shipment.

- **Ball map must be agreed by customer and RDL feasibility is complete**
  - Ball map probe only, limited test samples: + 6 weeks after CSP mask design
  - WLCSP sample are tested with appropriate part configurations, IP trims, and NVM initialized. Parts can be used to validate the RDL (re-distribution layer) and the case outline.

- **Full test samples (@room temp): + 5 weeks (Post Bump)**
  - Room-Temp Samples – WLCSP sample are tested with appropriate part configurations, IP trims, and NVM initialized. Parts are 100% tested after bump processing. These can be shipped to customers for development purposes, with low risk of failure for yield issues.

- **Qualification: + 6 weeks**
  - Qualification – generally, die itself is already qualified in standard package, additional testing and stressing to confirm WLCSP package qualification.

- **Production ramp: + 12 weeks after official design WIN (+6 weeks after qual)**
  - Production ramp – high volume customer orders can be filled (pending appropriate lead times). Range in schedule dependent on production hardware availability or creation.
Wafer Level Chip Scale Packaging

- Packaging of microcontroller assembled at the wafer level
- The package is of the same size as the die
- Interconnections from the die to the PCB are accomplished by solder balls
- No bond wires or interposer connections are required

Key Advantages:
- It allows the miniaturization of embedded applications
- The die to PCB inductance is minimized
- Enhanced thermal conduction characteristic

PCB Layout Application Note: AN3846, Wafer Level Chip Scale Package
Kinetis Chip Scale Package Portfolio
The World’s Smallest ARM Powered MCUs – From ultra low power to high performance

- World’s smallest ARM powered MCU (1.9x2.0mm²)
  - Kinetis L-series, KL02 20pin CSP
    - 25% less area, 60% more GPIO than next nearest competitor
    - Ultra low power Cortex-M0+

- World’s smallest 128KB Flash MCU (2.4x2.5mm²)
  - Kinetis L-series, KL16 36pin CSP
  - Ultra low power Cortex-M0+

- 512KB Flash, 128KB RAM, USB, ENET (5.3x5.3mm²)
  - Kinetis K-series, K60 120pin CSP
  - High performance Cortex-M4

- 1MB Flash, 128KB RAM, USB, ENET (6.5x5.6mm²)
  - Kinetis K-series, K61 143pin CSP
  - High performance Cortex-M4
Freescale Product Longevity Program

• The embedded market needs **long-term product support**

• Freescale has a longstanding track record of **providing long-term production support** for our products

• Freescale is pleased to introduce a formal **product longevity program** for the market segments we serve
  
  - For the automotive and medical segments, Freescale will make a broad range of program devices available for a minimum of **15 years**
  
  - For all other market segments in which Freescale participates, Freescale will make a broad range of devices available for a minimum of **10 years**

  - Life cycles begin at the time of launch

• For terms and conditions and to see a list of participating **Freescale products** available under this program: [www.freescale.com/productlongevity](http://www.freescale.com/productlongevity)
Designing with Freescale

Tailored live, hands-on training in a city near you

2014 seminar topics include

• QorIQ product family update
• Kinetis K, L, E, V series MCU product training

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