Wireless ZigBee® and Sub-GHz Solution SoC/SiP Supporting Internet of Things (IoT)

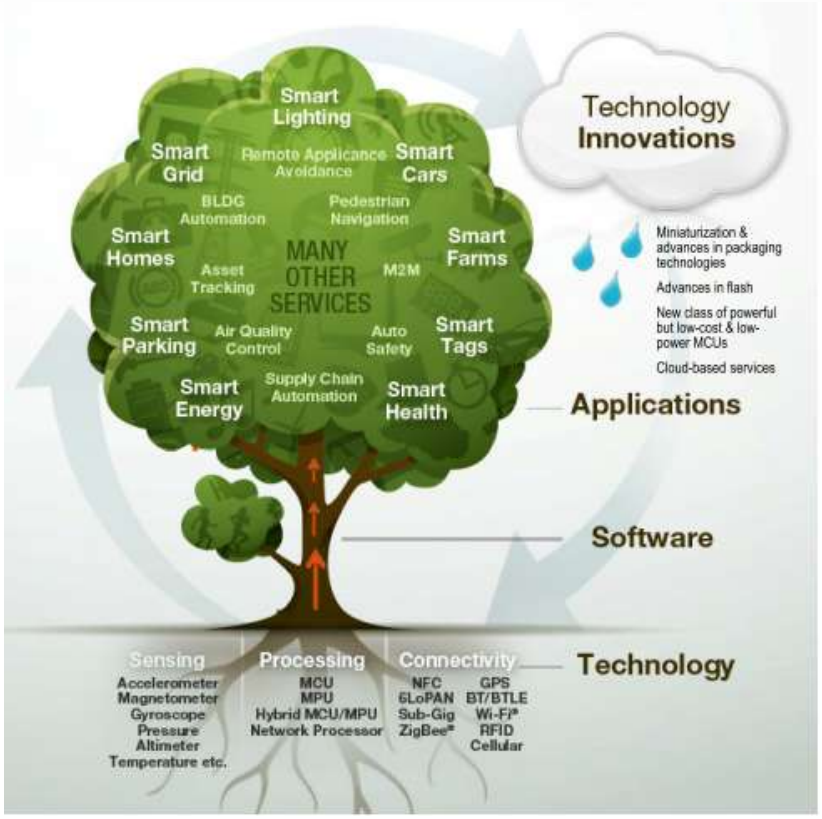
AMF-IND-T0274

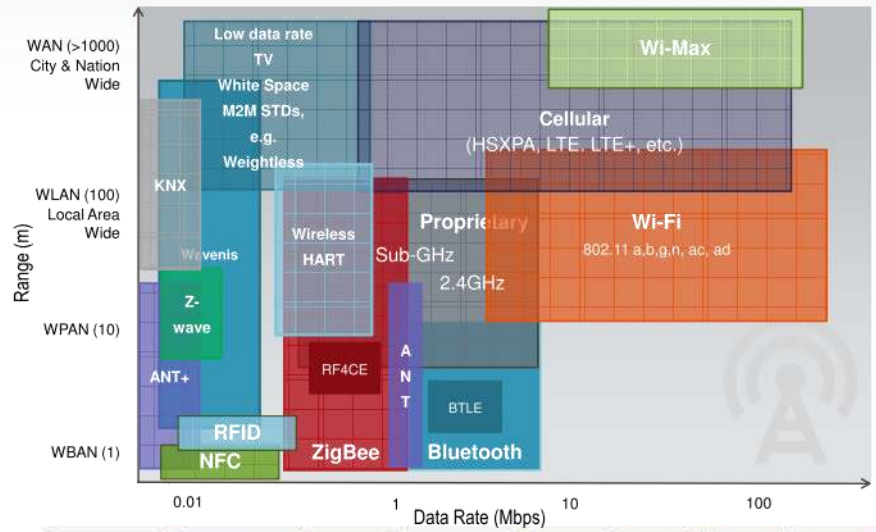
Derrick Klotz

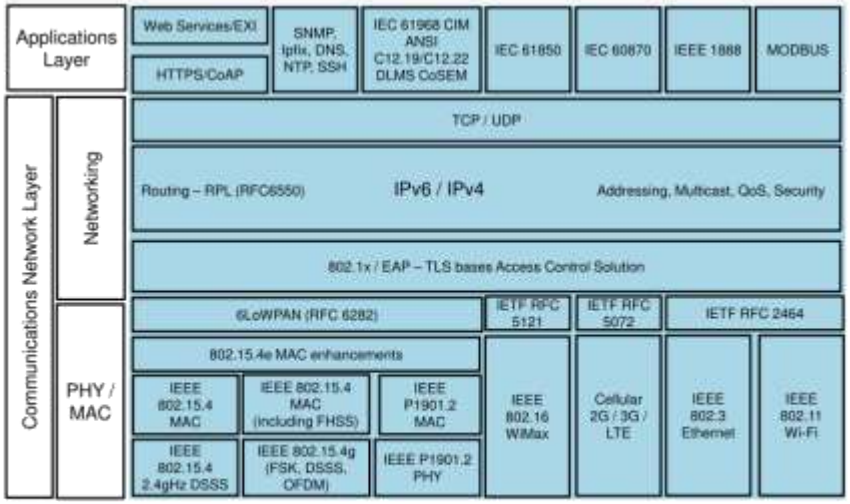
October 2013

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, Magnéti, MXC, Platform in a Package, QorIQ Qonverga, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Wireless connectivity for the IoT



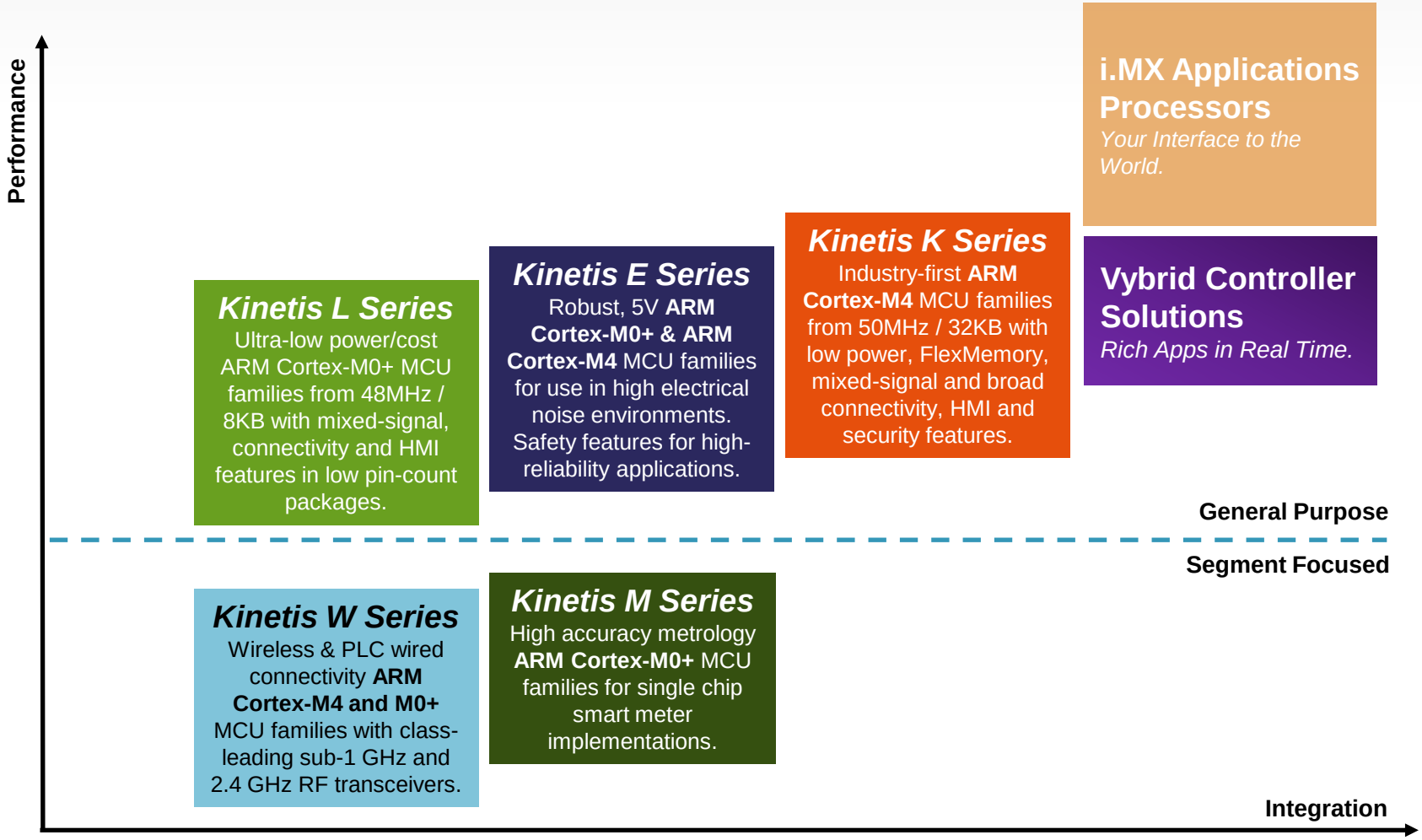




Professor David E. Culler
University of California, Berkeley
CWSN Keynote, Sept. 26, 2011

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ConfiPa, CoreFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

MCU/MPU Portfolio - Current & Future



Freescale Solutions Enabling the Smart Grid

Power Generation, Transmission, Monitoring & Control, Renewable Sources

MPC8xxx, QorIQ, Kinetis

Distribution & Sub-station Automation, Protection, Control and Monitoring

MSC9130 , MPC8xxx, QorIQ, Kinetis

Data Concentrator

P102x, MPC8308, i.MX28

Neighborhood Area Network (NAN)

RF: Sub Gig 802.15.4g Kinetis KW01

PLC: G3/ PRIME OFDM - Kinetis

Smart Electricity Meters

1-ph, 2-ph, 3-ph, Sub-Metering

Kinetis, Vybrid

Home Area Network (HAN)

ZigBee
Kinetis KW2x

Home Energy Management (HEM)

i.MX283
Vybrid

freescale™

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

KW2x – 2.4 GHz Smart Energy & Home Automation Solution from Freescale

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, Magnéti, MXC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

What is Kinetis KW2x?

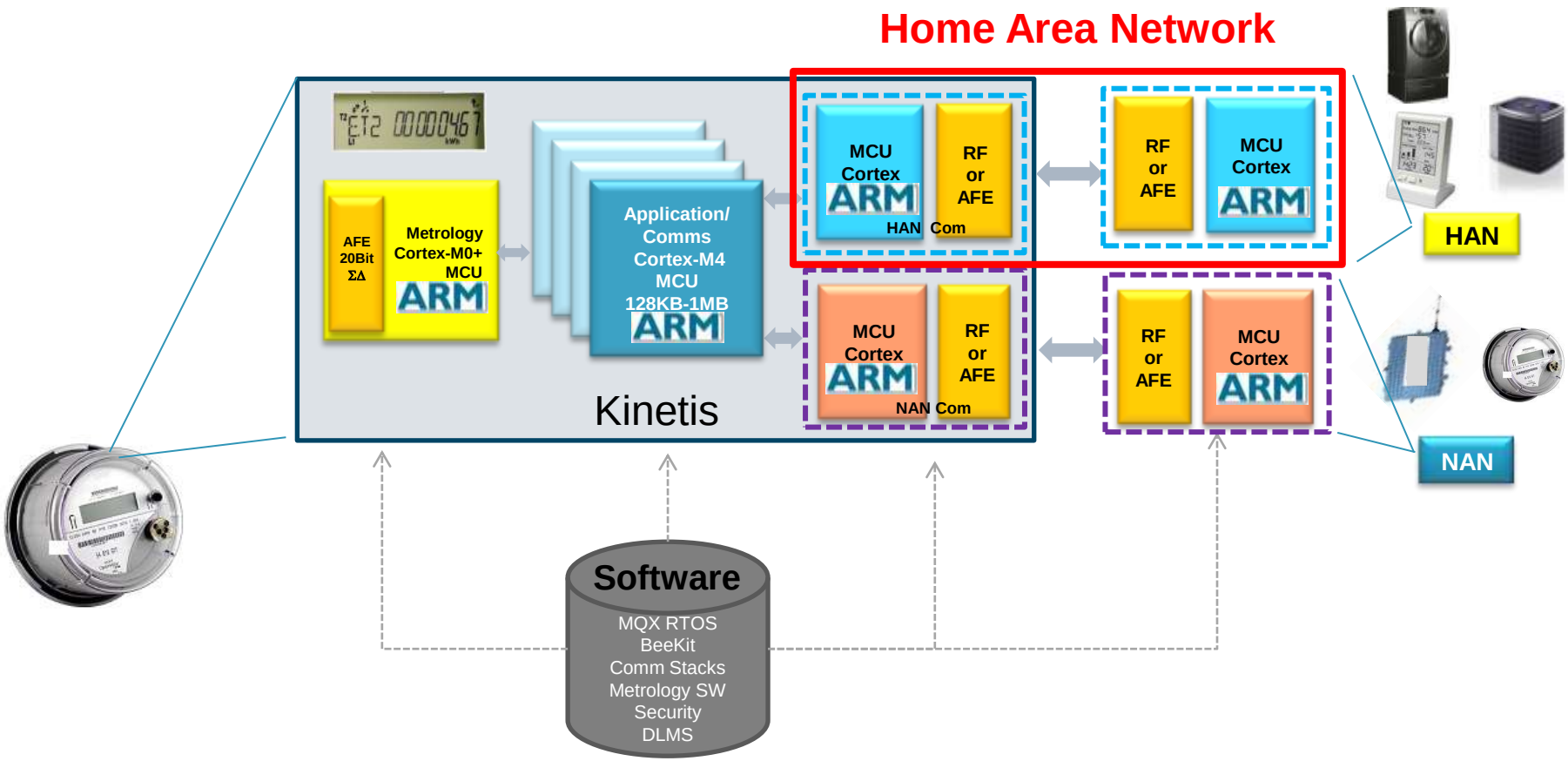
- The new Kinetis KW2x is Freescale next generation 2.4 GHz 802.15.4 platform

- The Kinetis KW2x platform integrates a class leading RF transceiver, ARM Cortex-M4 core and a robust feature set for a reliable, secure and low-power IEEE® 802.15.4 wireless solution.

- Wireless protocol software is seamlessly integrated into Kinetis software development tools for rapid creation of embedded systems.

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Freescale Smart Metering Solutions – Home Are Network



Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Kinetis MKW2x Wireless MCU

- **CPU**
  - 50 MHz Cortex M4 CPU core
  - Up to 512KB Flash & up to 64KB SRAM
  - Optional (MKW21D256): 64 KB FlexNVM & 4 KB FlexRAM
  - Typical current: 250 uA/Mhz run, 1.7uA RTC standby
- **Radio Transceiver, 2.4GHz**
  - IEEE-802.15.4 compliant
  - -102 dBm Rx sensitivity and +10dBm Tx output power
  - Peak typical current: 17mA Tx and 19mA Rx
  - Dual Personal Area Network (PAN) support in hardware
  - Run two RF networks simultaneously
  - Antenna diversity with automatic antenna selection
- **Security**
  - Active and passive tamper detection with RTC timestamp
  - Crypto engine: DES, 3DES, AES 128-256, SHA-1, SHA-256, MD5, RNG
- **Software**
  - 812.15.4 2006 MAC
  - RF4CE, ZigBee Pro, ZigBee IP
  - ZigBee Profiles: ZSE, ZHA, ZHC, ZRC
  - Freescale IPv6 Mote Stack
  - MQX Lite RTOS
- **System**
  - UART, SPI, I2C, optional USB 2.0 FS/LS H/D/OTG
  - 16-bit ADC
  - Operating range: 1.8 V to 3.6 V, -40C to +105C

Core
- ARM Cortex™-M4 50 MHz
- DSP
- Debug Interfaces
- Interrupt Controller

Communications
- I²C
- SPI
- UART (ISO 7816)
- USB On-The-Go (H)
- USB Charger Detect
- USB Voltage Regulator

System
- Internal and External Watchdogs
- DMA
- Low Leakage Wake-Up Unit

Analog
- 16-bit ADC
- High Speed Comparator with 6-bit DAC

Security
- Cyclic Redundancy Check (CRC)
- Tamper Detect
- Cryptography Authentication Unit
- Random Number Generator

Memories
- Program Flash (Up to 512 KB)
- FlexMemory Option 64 KB FlexNVM 4 KB FlexRAM (MKW21D256 only)
- SRAM (Up to 64 KB)

Timers
- Flex Timer
- Programmable Delay Block
- Periodic Interrupt Timers
- Low Power Timer
- Independent Real Time Clock

RF Transceiver
- IEEE 802.15.4 2006 2.4 GHz
- Fast Antenna Diversity
- Dual PAN ID
- 32 MHz Osc
- SPI Interface

Clocks
- Phase-Locked Loop
- Frequency Locked Loop
- Low / High Frequency Osc.
- Internal Reference Clocks

Device	Flash	RAM	Feature	Package
MKW21D256VHA5	256 KB	32 KB	No USB	8x8 63-pin LGA
MKW21D512VHA5	512 KB	64 KB	No USB	8x8 63-pin LGA
MKW22D512VHA5	512 KB	64 KB	USB	8x8 63-pin LGA
MKW24D512VHA5	512 KB	64 KB	USB and Smart Energy 2.0	8x8 63-pin LGA

Cortex-M4 MCU

- ARM Cortex M4 with DSP
- Supports up to 50Mhz (1.25 DMIPS/MHz)
- 16-channel DMA
  - Supports up to 128-bit data values
  - Programmable
- Configurable nested vector interupt controller (NVIC)
- Wake-up Interrupt Controller (WIC)
- Advanced debug and trace
- Hardware CRC
- Independent-clocked COP
- External watchdog
- 10 low power modes
  - Low-leakage wake-up, low power timer and low power RTC
  - Fast wakeup times
- FlexTimers
  - Programmable Interrupt Timer (PIT)
  - PWM support
- Carrier Modulator Timer

Core
- ARM Cortex™-M4 50 MHz
- DSP
- Debug Interfaces
- Interrupt Controller

Communications
- I²C
- SPI
- UART (ISO 7816)
- USB On-The-Go (H)
- USB Charger Detect
- USB Voltage Regulator

System
- Internal and External Watchdogs
- DMA
- Low Leakage Wake-Up Unit

Analog
- 16-bit ADC
- High Speed Comparator with 6-bit DAC

Security
- Cyclic Redundancy Check (CRC)
- Tamper Detect
- Cryptography Authentication Unit
- Random Number Generator

Memories
- Program Flash (Up to 512 KB)
- FlexMemory Option 64 KB FlexNVM 4 KB FlexRAM (MKW21D256 only)
- SRAM (Up to 64 KB)

Timers
- Flex Timer
- Programmable Delay Block
- Periodic Interrupt Timers
- Low Power Timer
- Independent Real Time Clock

RF Transceiver
- IEEE 802.15.4 2006 2.4 GHz
- Fast Antenna Diversity
- Dual PAN ID
- 32 MHz Osc
- SPI Interface

Clocks
- Phase-Locked Loop
- Frequency Locked Loop
- Low / High Frequency Osc.
- Internal Reference Clocks

Freescale, the Freescale logo, AMNiro, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Connectivity and Communication

- SPI
  - Full-duplex
  - Master and slave mode
  - Buffered transmit and receive with FIFOs
  - DMA support for FIFOs
- Inter-Integrated Circuit (I2C)
- I2C SMBus version 2 compatible
- Up to 100 Kbps
- Multi-master operation
- DMA support
- UART
  - Full-duplex operation
  - Programmable TX/RX polarity
  - Idle line or address mark wakeup
  - Hardware parity
  - DMA request
- USB Interface - OTG
  - USB 2.0 compliant
  - On-chip FS and LS transceiver
  - USB host mode
  - USB device mode
  - Suspend mode /low power
  - Supports HS with off-chip transceiver

Core
- ARM Cortex™-M4 50 MHz
- DSP
- Debug Interfaces
- Interrupt Controller

Communications
- I²C
- SPI
- UART (ISO 7816)
- USB On-The-Go (H)
- USB Charger Detect
- USB Voltage Regulator

System
- Internal and External Watchdogs
- DMA
- Low Leakage Wake-Up Unit

Analog
- 16-bit ADC
- High Speed Comparator with 6-bit DAC

Security
- Cyclic Redundancy Check (CRC)
- Tamper Detect
- Cryptography Authentication Unit
- Random Number Generator

Memories
- Program Flash (Up to 512 KB)
- FlexMemory Option 64 KB FlexNVM 4 KB FlexRAM (MKW21D256 only)
- SRAM (Up to 64 KB)

Timers
- Flex Timer
- Programmable Delay Block
- Periodic Interrupt Timers
- Low Power Timer
- Independent Real Time Clock

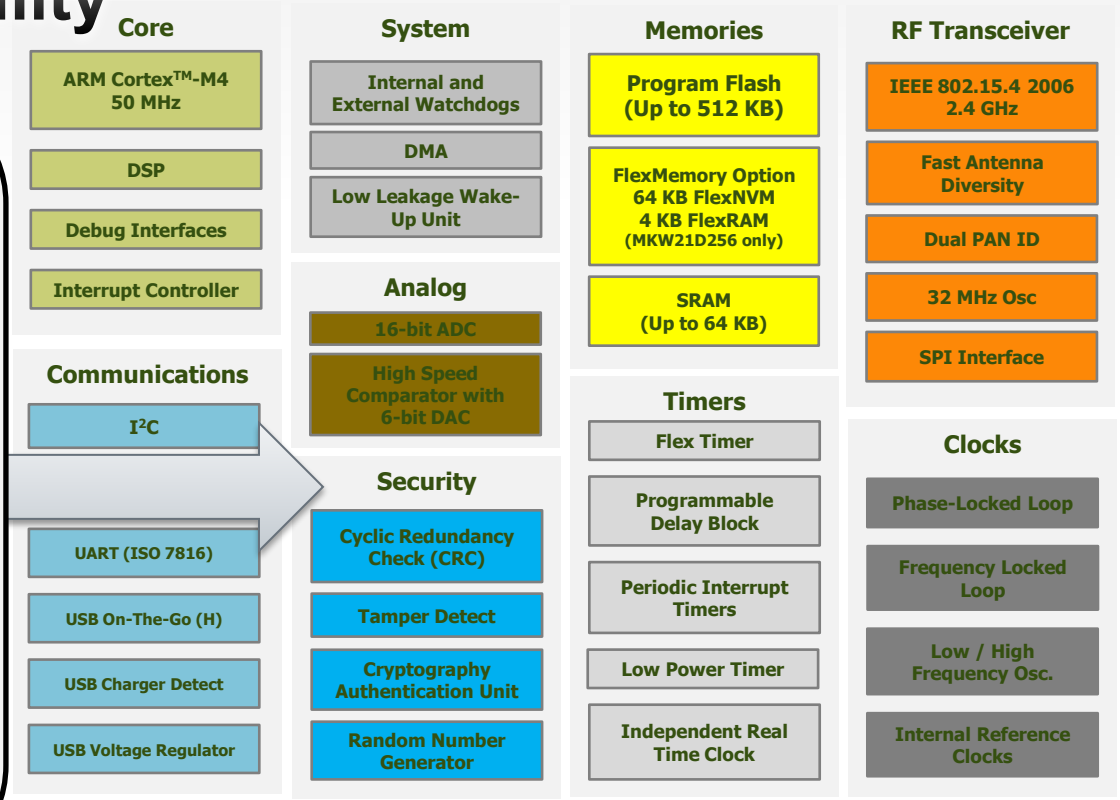
RF Transceiver
- IEEE 802.15.4 2006 2.4 GHz
- Fast Antenna Diversity
- Dual PAN ID
- 32 MHz Osc
- SPI Interface

Clocks
- Phase-Locked Loop
- Frequency Locked Loop
- Low / High Frequency Osc.
- Internal Reference Clocks

Freescale, the Freescale logo, AMWiz, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Security and Reliability

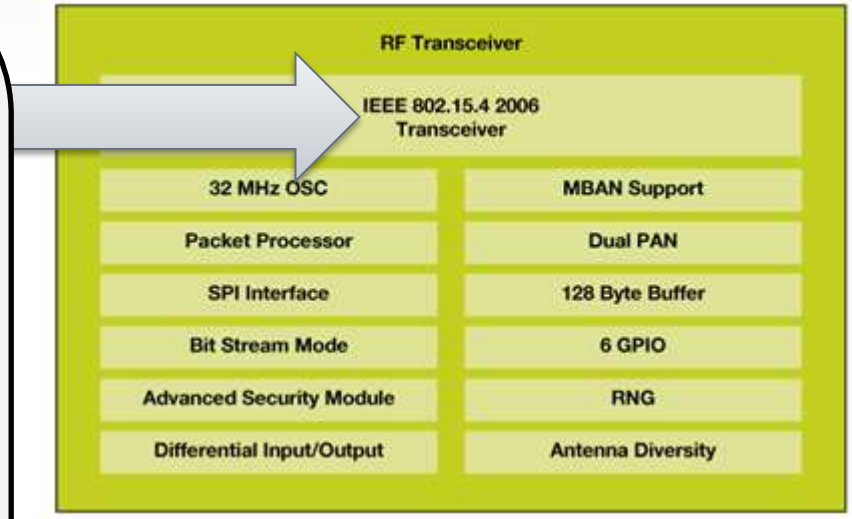
- Tamper detect
  - External tamper detect
  - 256-bit secure storage (erased on tamper)
- CRC
- Hardware encryption
- Cryptography Acceleration Unit (CAU)
- Random Number Generator (RNG)
  - FIPS compliant



Transceiver Features

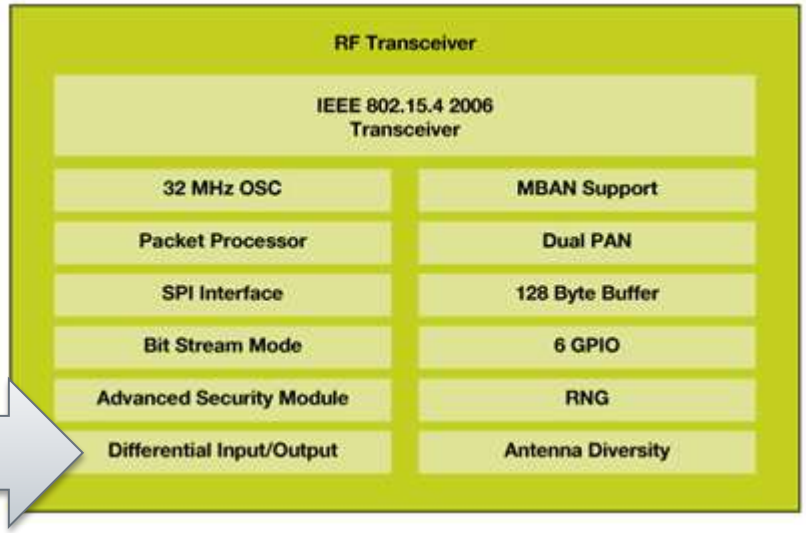
Transceiver Features

- 2.4 GHz frequency band
  - Supports 2.36 to 2.4 GHz Medical Band
- 802.15.4 compliant
  - 250 kbps data rate
  - O-QPSK modulation
  - DSSS with 5 MHz channels
  - 16 selectable channels
- Supports packet and bit stream mode
- 802.15.4 Packet Processor
- Output power varience +/- 2 dBm
- Programmable output power from -30 to +10 dBm
  - 2dB steps
- Low power receive mode
- 32 Mhz crystal oscillator with on board trim capability



RF Front End

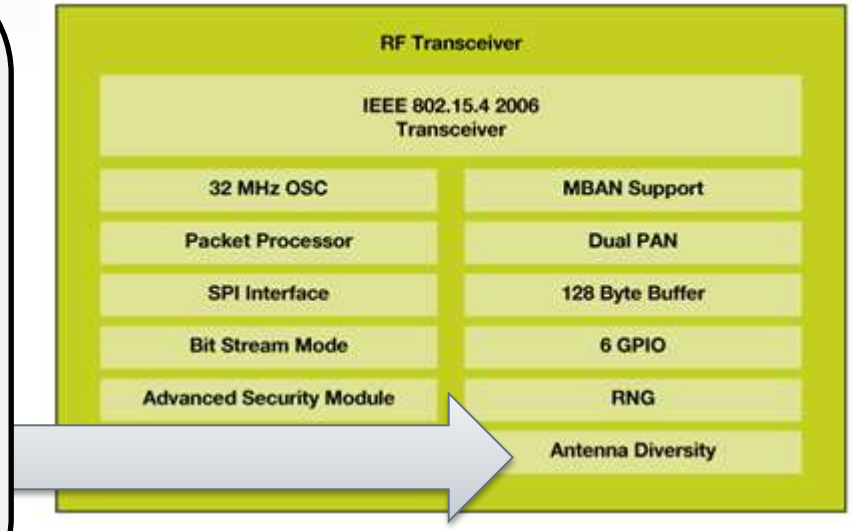
- **Differential input/output port**
  - Supports external PA/LNA
- **Single ended antenna option**
  - Integrated transmit/receive switch
- **Antenna diversity option**
- Automatic Gain Control (AGC)
- Receive Strength Signal Indicator (RSSI)
- Temperature compensation



Antenna Diversity

Diversity

- GPIO for Antenna Diversity control
- FAD (Fast Antenna Diversity)
  - Off
  - Preamble detect

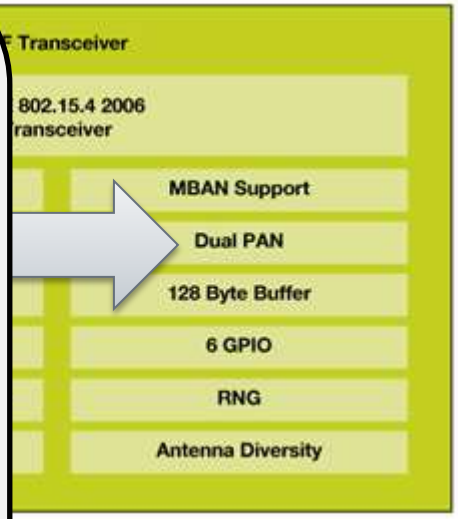


Dual PAN

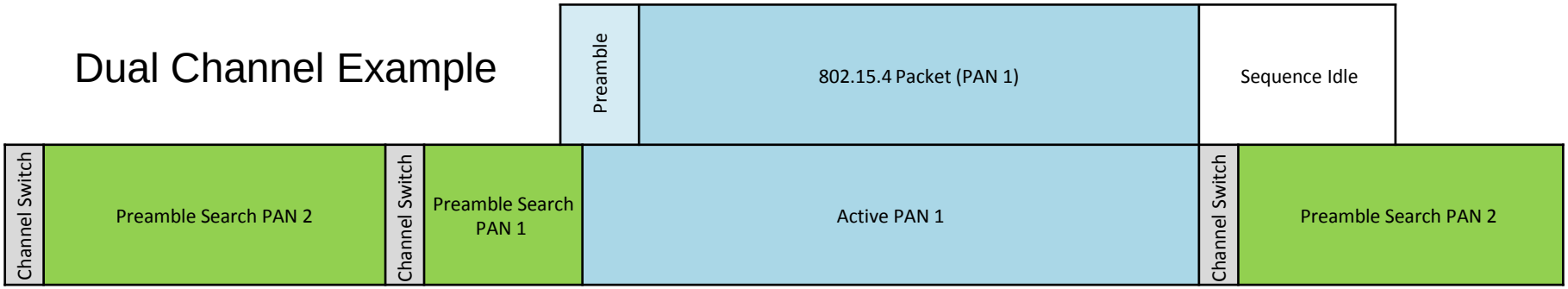
Ability to participate in two networks simultaneously
- Maintains two sets of network parameters
  - PAN, MAC address (short and long), Channel

2 channels, 2 PANs
- Manual mode – software controls which PAN is active
- Automatic mode – hardware controls which PAN is active
  - Time to dwell on channel can be set from .5 mS to 3.2 seconds
  - If PAN is active when timer expired, sequence will complete before channel switch occurs
- Channel switch is 56 uS
  - Time to switch, poll, receive packet and switch back is <10mS

1 channel, 2 PANs
- Address filtering is done simultaneously
- No channel switch is necessary

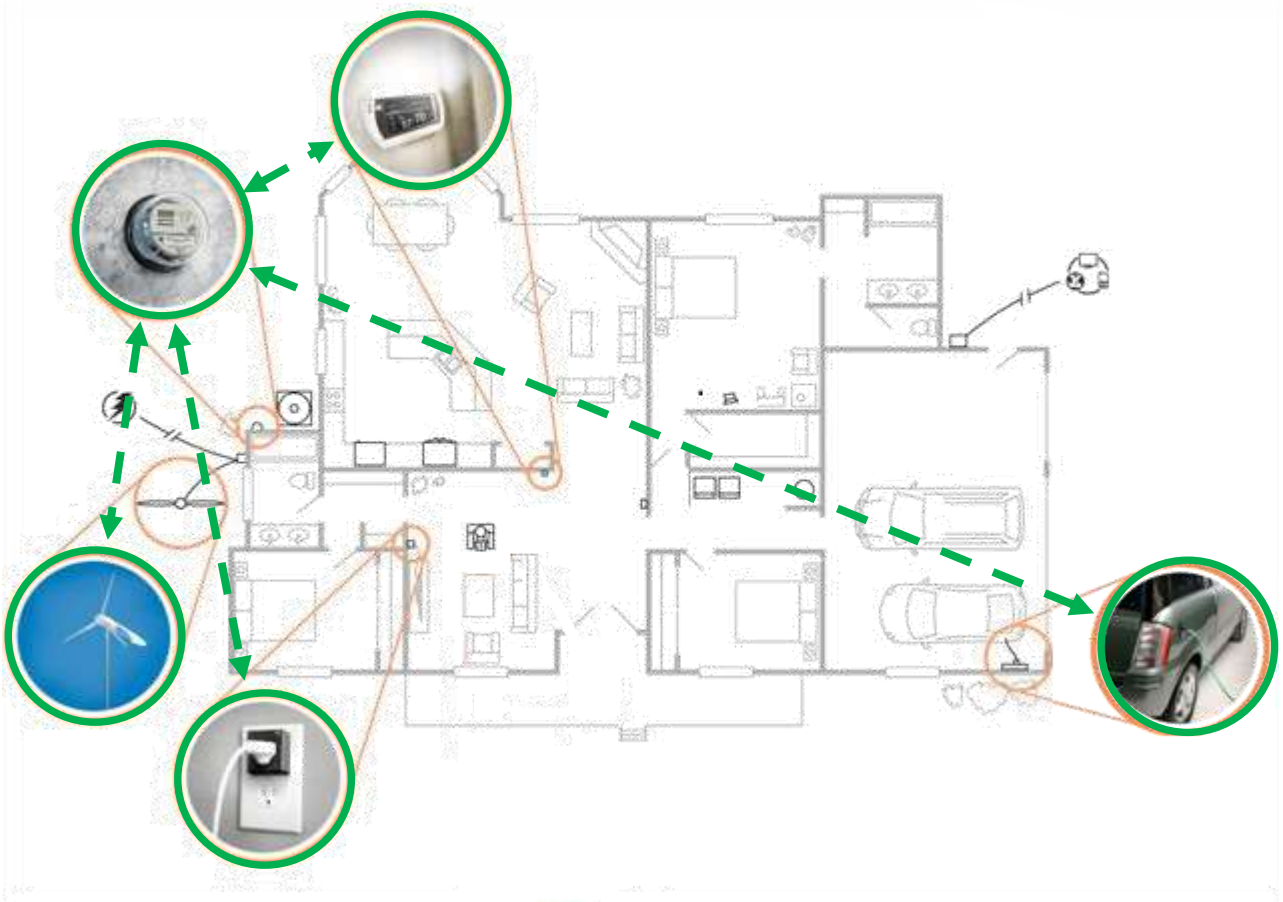


Dual Channel Example



Dual PAN Use Case

- Smart Energy Network (Utility)

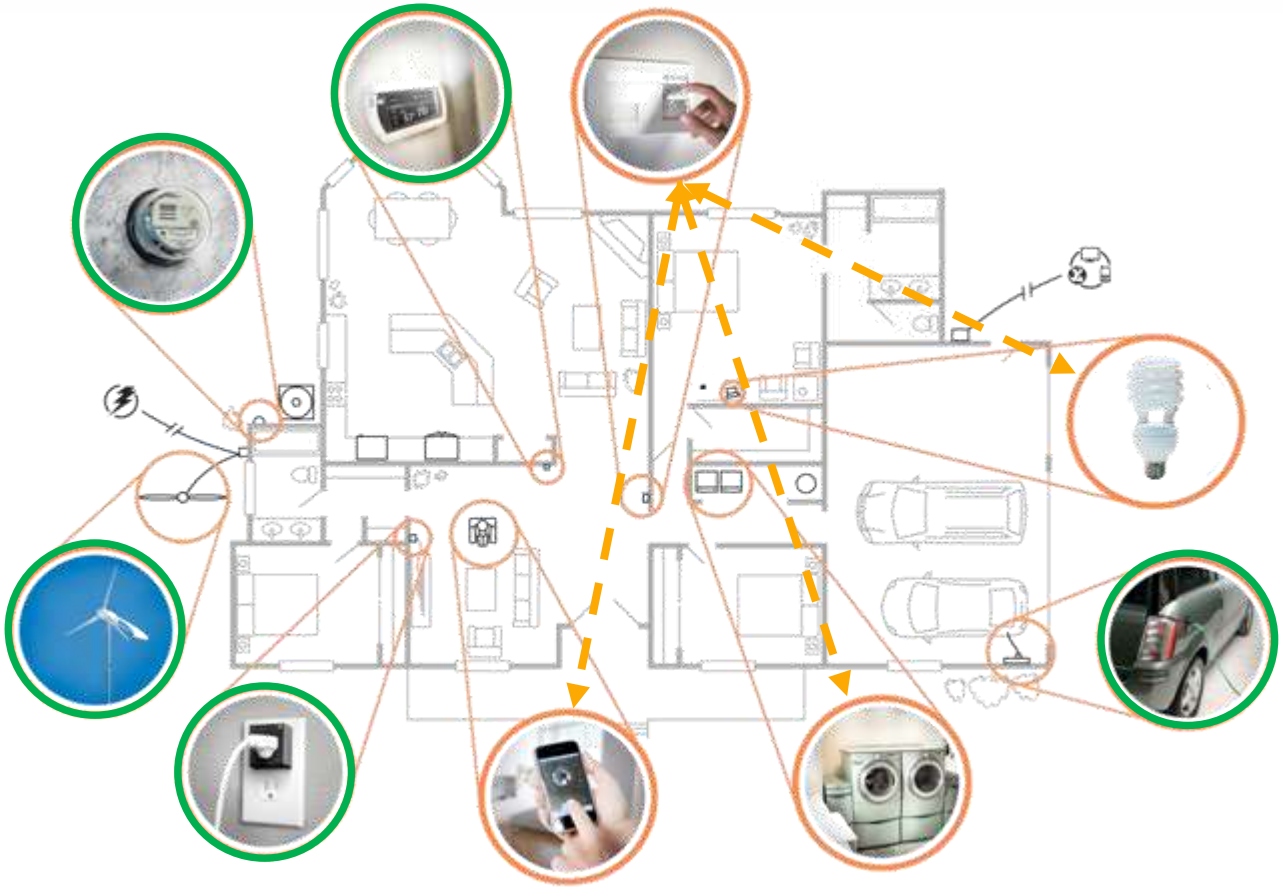


Smart Energy

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Dual PAN Use Case

- Smart Energy Network (Utility)
- Home Automation Network (Home Owner)



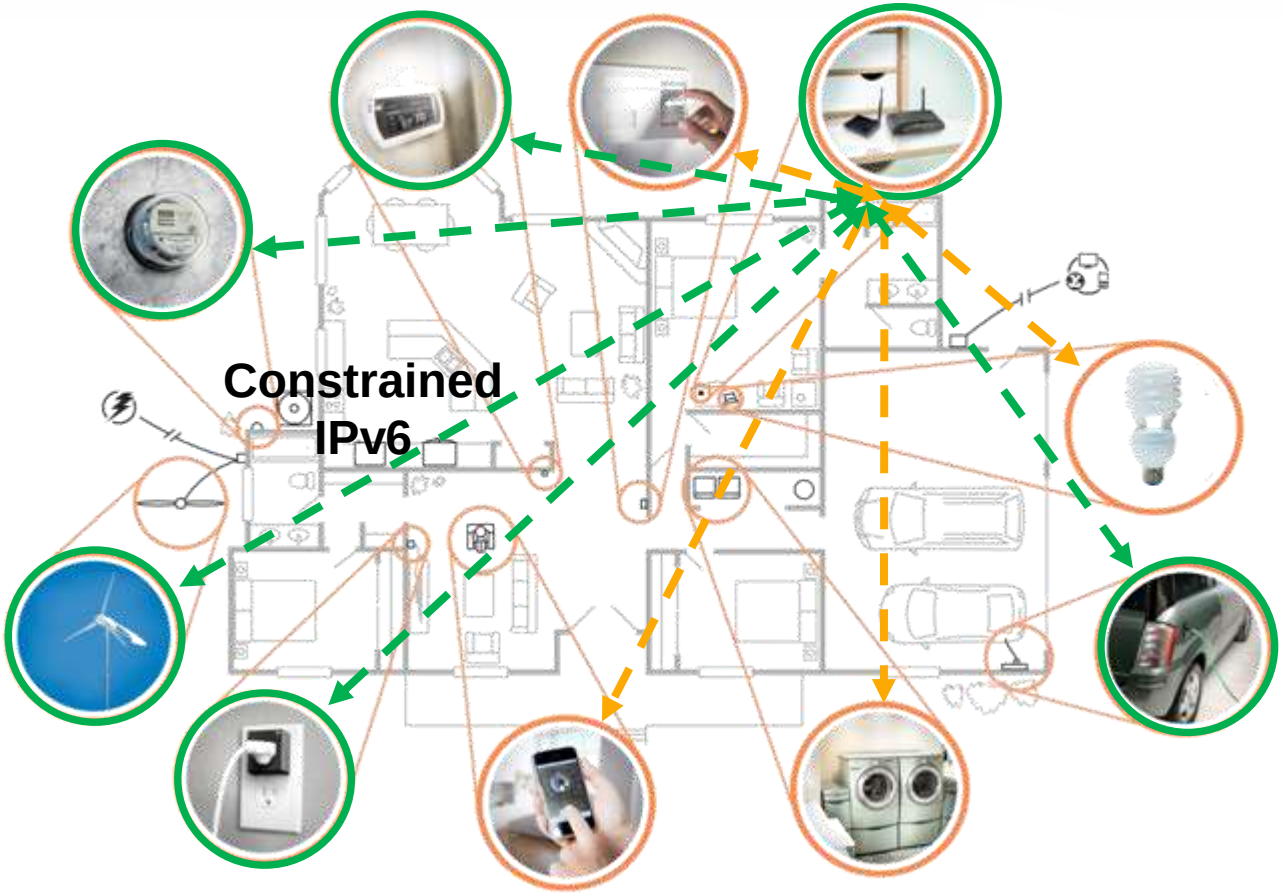
Smart Energy

Home Automation

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Dual PAN Use Case

- Smart Energy Network (Utility)
- Home Automation Network (Home Owner)
- Dual PAN
  - Smart Energy & Home Automation



Smart Energy

Home Automation

Dual PAN – SE/HA

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Features and Benefits

Features	Benefits
RF	
• Class-leading link budget	• 112 dB link budget provides greater range, reducing the need for external power amplifiers and lowering cost.
• Low power consumption	• 17mA TX / 19 mA RX power consumption extends battery life
• Dual PAN support	• System can actively participate in 2 networks, eliminating the need for multiple radios.
• Diversity Support	• Freescale's FAD (Fast Antenna Diversity) allows the hardware to automatically select between 2 antennas, improving reliability in high interference environments.

Features and Benefits

Features	Benefits
MCU	
• ARM® Cortex™-M4 core with DSP	• Up to 50 Mhz core provides a broad range of application support
• Up to 512 KB of Flash and 64 KB of RAM	• Provides enough memory to run complicated protocols or dual stacks and user applications on a single IC
• 256 KB of FlexMemory (MKW21 only)	• Allows user to define configuration of memory between Flash and EEPROM
• Secure Flash	• Protects the code and data from unauthorized access or modification
• Tamper detect	• Protects critical IP by detecting tamper events (NDA required)
• Cryptography Acceleration Unit	• Reduces code size and execution time through hardware support for advanced security protocols
• 128-bit Random Number Generator	• Meets the FIPS 140 Security Requirements for Cryptographic Modules

MKW2x Enablement

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, Magnéti, MXC, Platform in a Package, QorIQ Qonverga, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

KW2x Development Kit

Kit Features

- Can use PCB “F” antenna or bypass for external antenna via RF connector
- Open-SDA debugging
- USB port to interface with PC
- Configurable I/O access
- LEDs and switches for demonstration, monitoring and control
- BeeKit Tool with stacks and applications
  - ZigBeePro R20 with SE 1.1.x, HA 1.1, HC 1.0 profiles
  - Simple MAC and RF Test Tool
  - Dual-PAN example
  - Over-The-Air programming example
  - **Coming: ZigBeeIP and SE 2.0 profile**
- Quick Start Guide

Tower Form Factor

- *Use standalone or in Tower System*
- *Boards sold individually*
- *Combine as many boards as needed*

Part Numbers:

TWR-KW21D256
TWR-KW24D512

Freescale, the Freescale logo, AMWiz, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Freescale ZigBee Stacks

IPv6

HID

802.15.4	ZigBee PRO	ZigBee IP	SynkroRF	RF4CE
Customer Defined & Developed	Customer Developed	Customer Developed	Customer Defined	Customer Developed
	ZigBee Profiles	ZigBee Profiles		RF4CE Profiles
	ZigBee NWK	ZigBee IP NWK	SynkroRF NWK	RF4CE NWK
802.15.4 MAC	802.15.4 MAC	802.15.4-2006 MAC	802.15.4 MAC	802.15.4 MAC
802.15.4 PHY	802.15.4 PHY	802.15.4 PHY	802.15.4 PHY	802.15.4 PHY
Hardware	Hardware	Hardware	Hardware	Hardware

freescale™

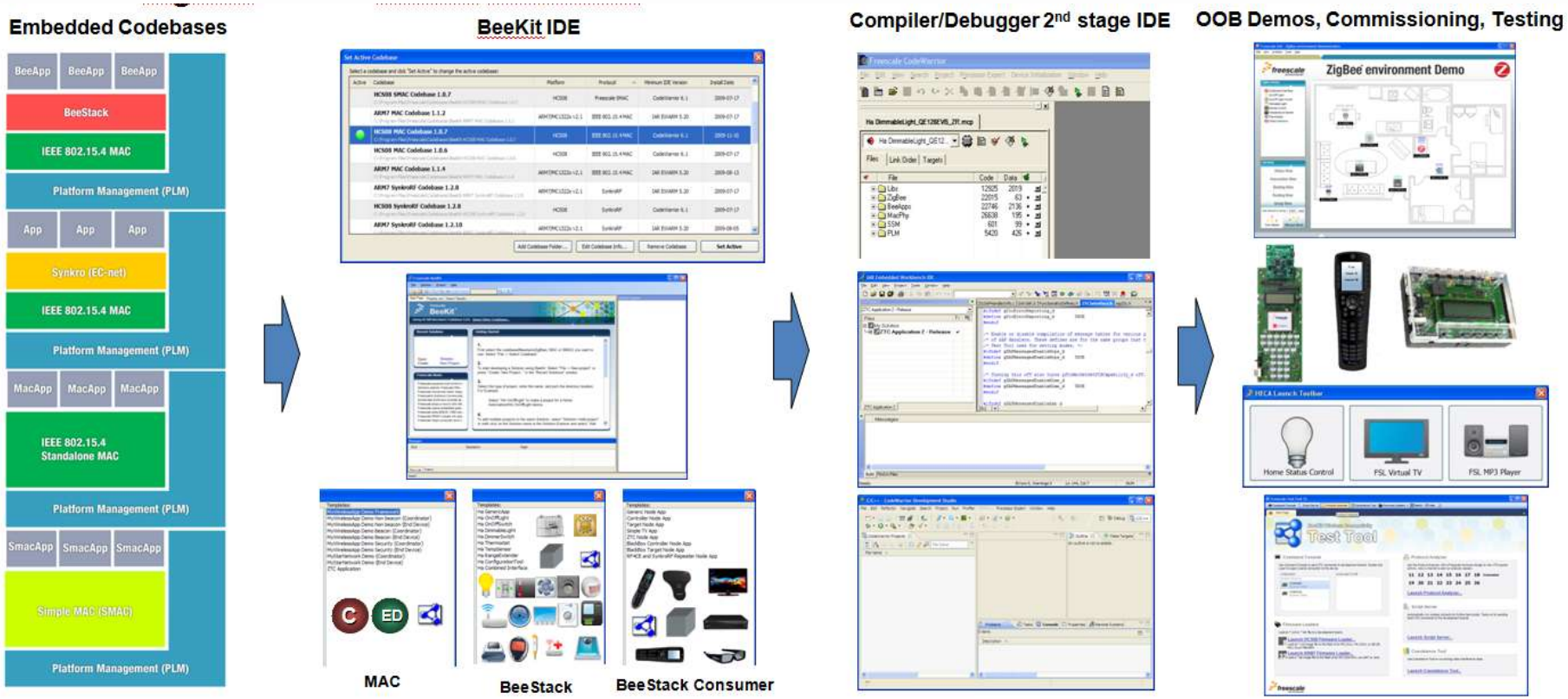
Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

802.15.4 Protocol Stack Comparison

Feature	SMAC	802.15.4 MAC	SynkroRF®	ZigBee® RF4CE	ZigBee® Pro	ZigBee® IP
Applications						
Cable Replacement	✓	✓	✓		✓	
Remote Control	✓	✓	✓	✓	✓	
Home Control			✓	✓	✓	
Home Automation					✓	
Health Care					✓	
Building Automation						
Smart Energy					✓	✓
Network Stack	No	No	Yes	Yes	Yes	Yes
Application Profiles	No	No	No	Yes	Yes	Yes
Memory Requirements	4-8K	32K	<40K	<40K	128-160K	256K
Network Topology	Point-to-Point	Peer-to-Peer	Co-existing Star	Co-existing Star	Tree	Mesh
	Star	Tree			Mesh	
Typical # of Nodes	2-100	2-1000	32 per Controlled Device	32 per Target Device	2-1000 ZigBee Pro	2-32
Typical Data Throughput	50-115K	90-115K	70-100K	70-100K	30-70K	<50K

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Freescale BeeKit Toolchain



Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Leveraging the Kinetis Ecosystem for KW2x

HW BDM Debugger/Emulators

IDE: Tools Compliers, Debuggers

MQX RTOS

Security

Tower EVBs & System Design

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

KW2x – Summary

- **ARM Cortex-M4**
  - Up to 50 Mhz core provides a broad range of application support
- **Dual PAN Capability**
  - System can simultaneously participate in 2 ZigBee networks, eliminating the need for multiple radios
- **Fast Antenna Diversity**
  - Fast Antenna Diversity allows the hardware to automatically select between 2 antennas
- **Integrated 64K SRAM**
  - Provides enough memory to run complicated protocols stacks and user applications on a single IC
- **USB Connectivity**
  - Additional Connectivity

KW01 – Sub GHz Smart Radio Solution from Freescale

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, Magnéti, MXC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

What is KW01?

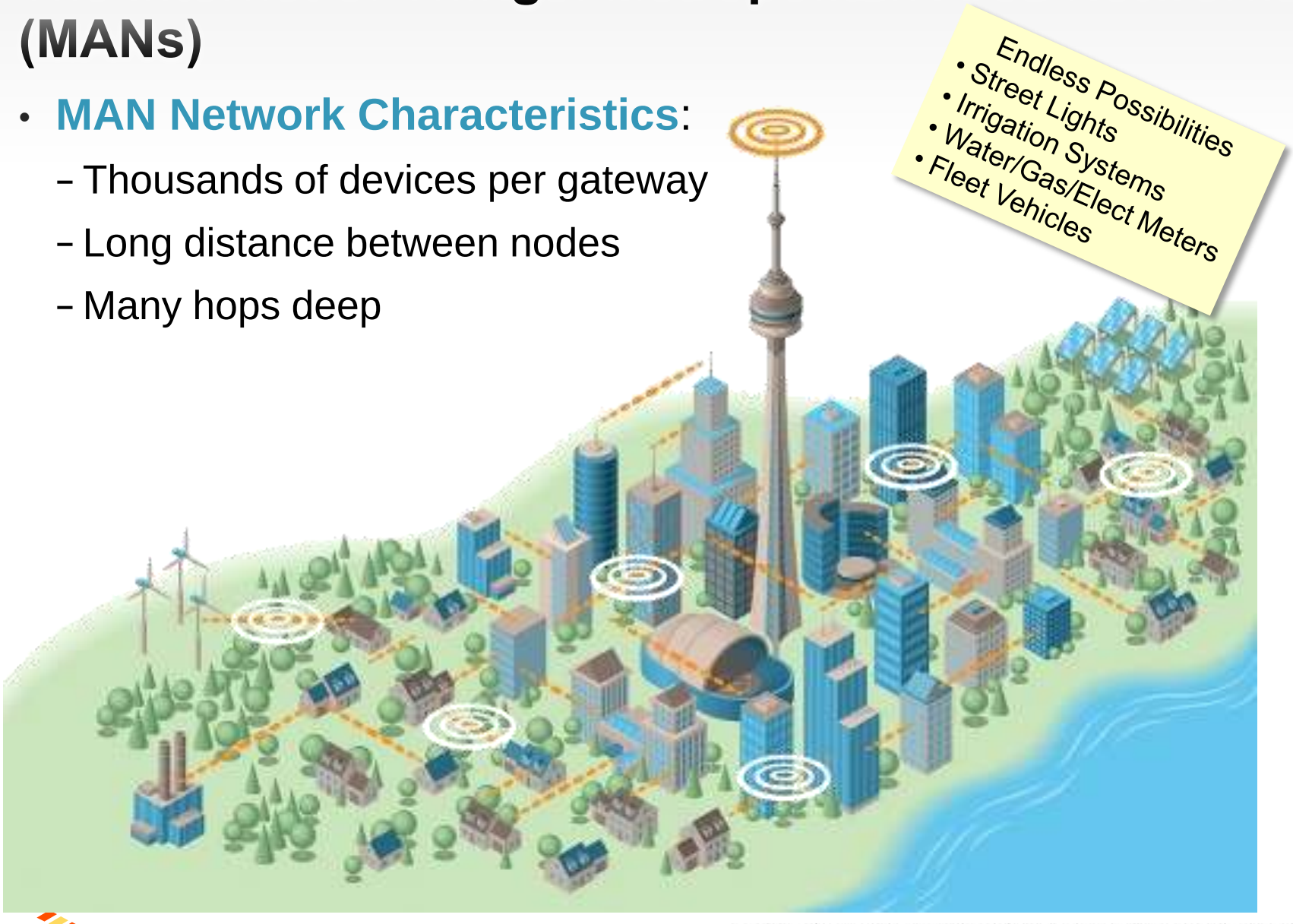
- World's first integrated ARM Cortex-M0+ based sub-1 GHz smart radio
  - Integrates Kinetis MCU (ARM Cortex M0+ 128KFlash/16K RAM) with a sub 1 GHz transceiver

- Targeted for Automated Meter Reading and mesh-networked smart sensors applications

Freescale, the Freescale logo, AMWiz, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

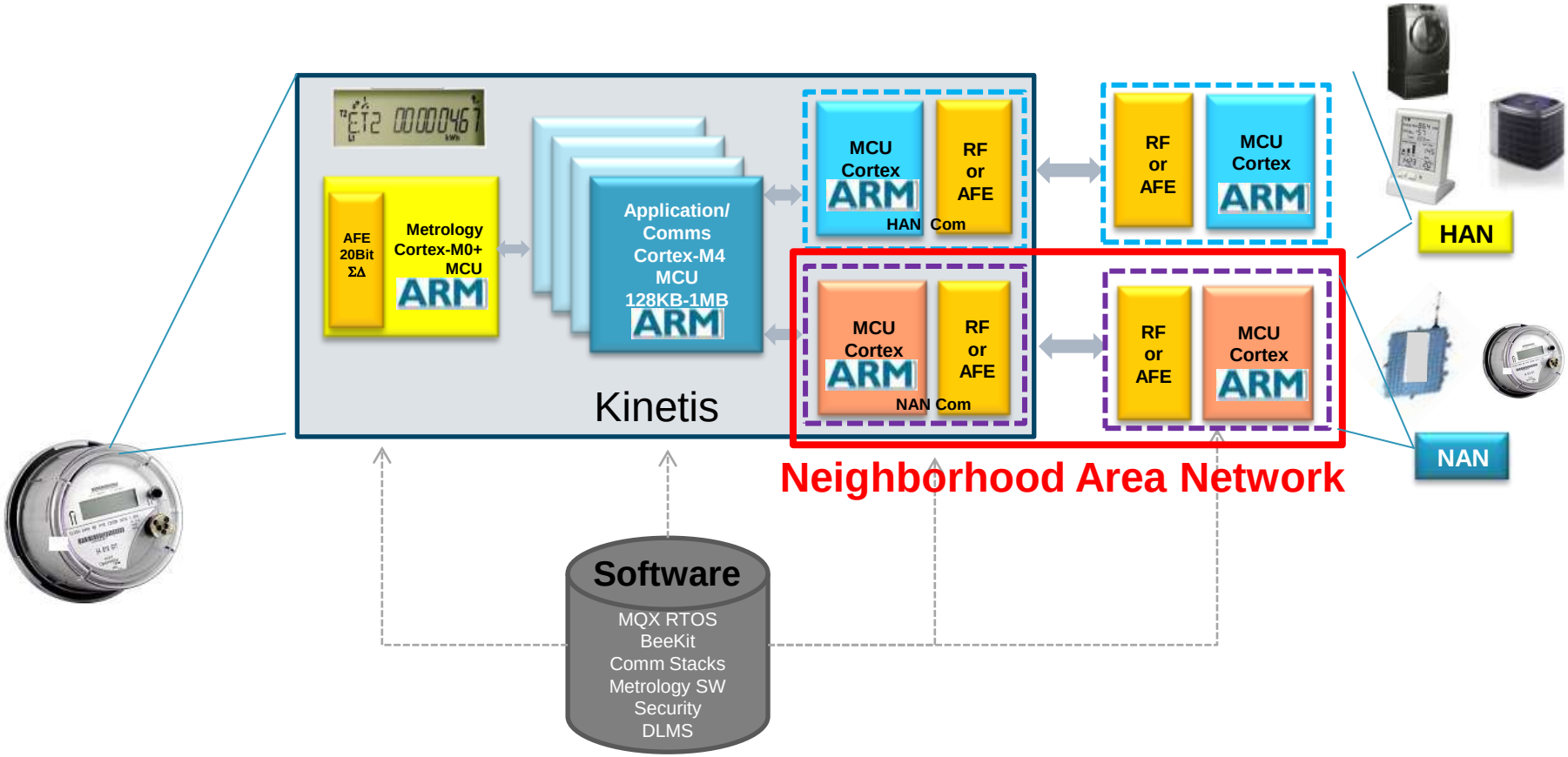
The Internet of Things: Metropolitan Area Networks (MANs)

- **MAN Network Characteristics**:
  - Thousands of devices per gateway
  - Long distance between nodes
  - Many hops deep



Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Freescale Smart Metering Solutions – Neighborhood Area Network



Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Kinetis KW0x Sub-1 GHz Smart Radio

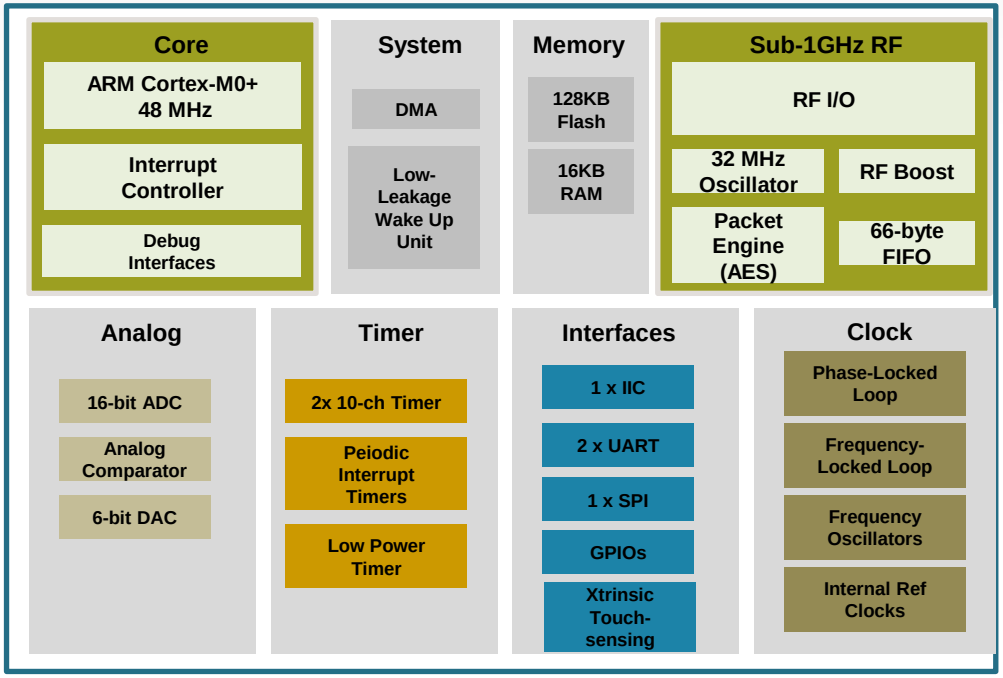
Freescale offers the world's first Kinetis ARM Cortex-M0+ based sub-1 GHz smart radio for automated meter reading and mesh-networked smart sensor applications in building/home control.

Ultra Low Power	Performance & Flexibility	Ease-of-Use
Market leading supplier provides best in class RF performance with 32-bit ARM Cortex-M0 for low-power, speed, MCU capability.	Flexibility to adapt to multiple communication protocols covering a wide range of frequencies worldwide.	Variety of development tools, software and documentation to accelerate the design cycle.

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Kinetis KW01 Wireless MCU (Sub 1-GHz)

- **CPU**
  - 32-bit ARM Cortex M0+ 48MHz Core
  - 128KB Flash and 16KB SRAM
- **Radio transceiver, Sub 1-GHz**
  - Supports 290-344MHz, 424-510MHz, and 862-1020MHz frequency bands
  - FSK, GFSK, MSK, GMSK and OOK modulations up to 600kbps
  - Up to -120dBm Rx sensitivity @ 1.2kbps
  - -18 to +17dBm Tx output power in steps of 1dBm
- **Ultra low power for battery operated devices**
  - Typical consumption
  - 1.7µA standby with 4.3µs wake-up time
  - <50 uA/MHz CPU system run mode
  - 16 mA Rx peak
  - 20 mA Tx peak at 0 dBm, 33 mA at +10 dBm
- **Software**
  - Simple-MAC, user modifies for their proprietary protocols
- **System**
  - 16-bit ADC, Cap Touch Sensors, I2C, UART, SPI, Timers
  - Operating Range: 1.8V to 3.6V, -40C to +85C



Device	Flash / Flex	RAM	Package
MKW01Z128CHN	128 KB	16 KB	8x8 56-pin LGA

Sub-1 GHz Target Applications

Metering and Building Control
Metering
Thermostats
Lighting control
HVAC unit monitors
Water heaters
Window coverings
Ceiling fan

Fire/Security
Smoke/heat sensing and monitor
Fire alarm
Room occupancy
Intruder alarms
Motion detectors
Access control

Medical/Healthcare/Wellness
Glucose monitors
Cardiac rhythm tracking
Hearing appliance remotes
Infusion pumps
Blood pressure monitoring
Pulse oximetry monitoring
Weight management monitoring

Wireless Sensors Networks
Liquid or gas flow detect and alarm
Usage data collection
Asset control (acceleration/theft)
Maintenance monitoring
Measurement data collection
Humidity monitor and control
Hazardous environment monitor
Vibration alerts

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

KW01 – Transceiver Features

- Frequency bands (61 Hz steps):
  - 290 to 340 MHz
  - 424 to 510 MHz
  - 862 to 1020 MHz
- Bitrate to 300 (MC12311) or 600 (MKW01) kbps
- -120 dBm @ 1.2kbps sensitivity
- IIP3 = -18 dBm, IIP2 = +35 dBm
- 16mA RX current
- AGC, AFC
- -18 to +17 dBm TX Pout
- FSK, GFSK, MSK, GMSK, OOK Modulation
- Built-in Bit Synchronizer, Packet Engine, AES128 encryption, FIFO.
- Built-in temperature sensor, low battery indicator
- Configurable for single TX/RX input/output for low parts count or separate TX out/RX in allowing off chip LNA, PA, switch, filter etc.

KW01 – Microcontroller Features

- 48 MHz CPU clock frequency/24 MHz bus frequency.
  - External crystal options 32 to 40 KHz or 3 to 32 MHz.
  - FLL, PLL & internal oscillator options.
- Vectored interrupt, Wake up & non-maskable Interrupts.
- DMA, SWD debug
- 128KB P-flash, 64 byte flash, 16 KB RAM
- Low leakage modes & standby memories.
- 16-bit ADC, 12-bit DAC
- High Speed Comparator with 6-bit DAC
- Several Timers
- SPI, IIC, UART (SPI MCU to XCVR interface on chip)
- GPIO, Touch Screen Sensor
- 1.8 to 3.6V Supply, -40 to +85 C temp range.
- 56 pin 8x8mm (+4) PLGA Package.

Freescale, the Freescale logo, AMNiro, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

KW01 MCU: Ultra-low Power Modes

	Mode	CPU/Bus Freq.	Details	Peripheral Clocks	Typical Idd @ 3V, 25C	Recovery Time
RUN	RUN	48/24 MHz	MAXIMUM CPU/Bus frequency. Compute clocking option SUPPORTED	ENABLED	6.38mA (133uA/MHz)	-
		48/24 MHz		DISABLED	4.44mA (93uA/MHz)	-
		48/- MHz		Compute Operation*	3.98mA (83uA/MHz)	-
	VLPR	4/1 MHz	RESTRICTED CPU/Bus frequency. Compute clocking option SUPPORTED LVD OFF. Flash programming NOT supported	ENABLED	219uA (55uA/MHz)	-
		4/1 MHz		DISABLED	170uA (43uA/MHz)	-
		4/- MHz		Compute Operation*	156uA (39uA/MHz)	-
WAIT (SLEEP)	WAIT	48/24 MHz	MAXIMUM CPU/Bus frequency. CPU in SLEEP, peripherals functional. Compute clocking option NOT supported	DISABLED	3.88mA	-
	VLPW	4/1 MHz	RESTRICTED CPU/Bus frequency. CPU in SLEEP, peripherals functional. Compute clocking option NOT supported. LVD OFF. Flash programming NOT supported	DISABLED	112uA	4us
STOP (DEEP SLEEP)	STOP	-	MCU in static state, LVD ON. Energy-saving peripherals functional with ADMA. AWIC detects wake-up source for CPU.	-	309uA	4.3us
	VLPS	-	Same as STOP mode. LVD OFF.	-	2379nA	4.3us
	LLS	-	MCU in low-leakage state retention power mode. LLWU detects wake-up source for CPU including LPTMR, RTC, TSI, CMP, and select pin interrupts. Fast wake-up.	-	1738nA	4.6us
	VLLS3	-	MCU in low-leakage mode, most internal logic OFF. All RAM contents retained and I/O states held. LLWU controls wake-up source for CPU similar to LLS mode.	-	1344nA	53us
	VLLS1	-	Similar to VLLS3	-	713nA	115us
	VLLS0	-	Pin wakeup supported. LPTMR, RTC, TSI and CMP wake-up supported with external clock. Optional POR brown-out detection circuitry.	-	411nA (POR) / 205nA (no POR)	115us

*Compute Operation shuts off bus and system clock for lowest power core processing.
Peripherals with an alternate asynchronous clock source can continue to operate.

MKW01 Product Differentiator

- Very low power suitable for battery operated equipments
  - Cortex M0+ Breakthrough power efficiency
  - Low-power features such as 100nA with radio configuration retention.

- High Integration Level
  - Includes the exclusive ARM Cortex M0+ core with up to 48MHz performance, embedded 128KB Flash and 16KB of RAM supporting wireless communication protocol + application in one chip

- Demonstrates exceptional RF performance with a budget link up to +137dB

- Flexibility and Compliancy with Multiple Standards

- Full set of peripherals
  - Offers multiple 16-bit timers,. 13-bit port keyboard interrupt and Touch Sensing Interface, 16-bit ADC, SCI, I2C, SPI

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Features and Benefits

Features	Benefits
ARM Cortex M0+ CPU core	Lowest power industry core
Single-chip with MCU + Radio + Memory	Save size and cost versus a 2 to 3 chip solution
High radio link budget	Very long point to point wireless range without the need for repeaters or costly amplifying devices.
Flexible RF configuration	Adapt to global standard requirements and local (regional) regulations

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

MKW01 Enablement

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, Magnéti, MXC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

KW01 – Development System

- Modular Reference Board (MRB).
- Can run stand-alone with on-board mini-USB.
- Can plug into TWR-RF.
- SMA for Antenna or cable.
- Available with 30 or 32 MHz XTAL for frequency/spurious management.
- Available for 868/915 MHz, 434 MHz bands, can be tuned to 315 MHz.

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

Leveraging the Kinetis Ecosystem for KW01

HW BDM Debugger/Emulators

IAR SYSTEMS

SEGGER

IDE: Tools Compliers, Debuggers

IAR SYSTEMS

Radio Test Tool SMAC

freescale™

IEEE 802.15.4g IPv6

IPv6/6loWPAN
(Q4 ‘13)

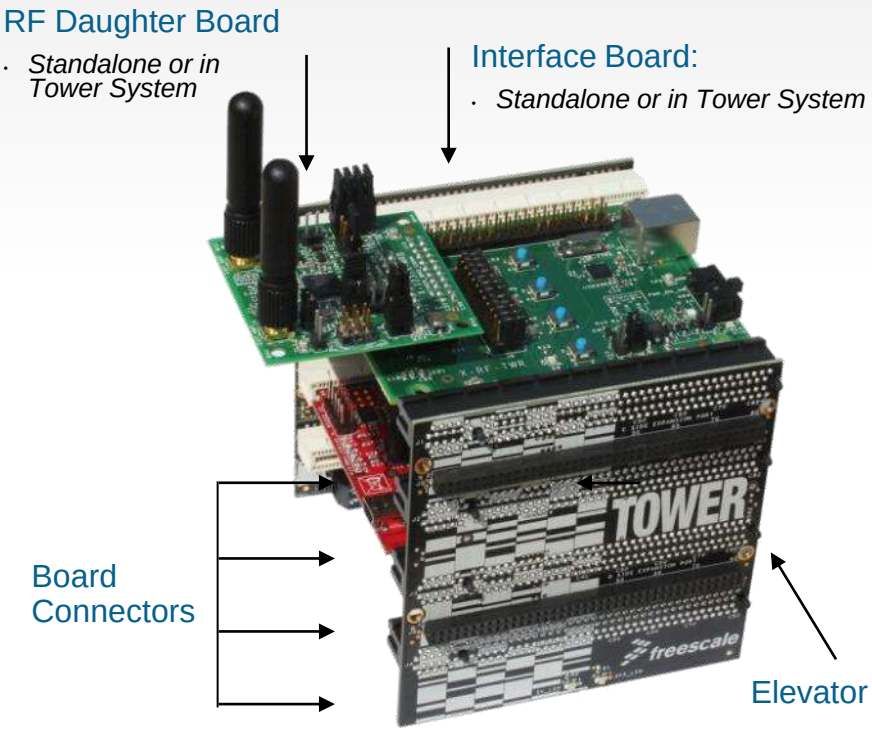
Tower EVBs & System Design

freescale™

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

KW01 Development Kits

- **Leverages the Tower system**
  - Quickly combine Tower Modules to build a prototype of your application
  - Software support from Freescale and Third Parties
  - Growing community of Third Party hardware support
  - On-line community: www.towergeeks.org
- **Kit Features**
  - Flash reprogramming and in-circuit hardware debugging
  - USB port to interface with PC
  - Configurable I/O access
  - LEDs and switches for demonstration, monitoring and control
  - Out-of-box application
  - Quick Start Guide



Part Numbers:

MRB-KW019032NA

MRB-KW019032EU

MRB-KW019030JA

An antenna needs to be purchased before using this kit. In addition, customer requiring Tower integration need the RF kit (TWR-RF)

KW01 Software

- Simple Proprietary MAC (SMAC)
  - Wireless UART

- Sub-GHz MAC/PHY
  - IEEE 802.15.4e/g MAC/PHY Layer
  - CSL (Coordinated Sample Listening) is supported
  - Compatible with the TTC JJ-300.10 spec

- Wireless MBUS
  - **Base EN13757-4** – a generic 868 MHz layer 1 & 2 Wireless Meter-Bus stack (EN13757-4: 2005 and EN13757-4:2013 mode C, when released) for modes R, S and T
  - **Evaluation version** – a cut-down implementation of the Full version designed as a free-to-download simplified stack to allow users to evaluate the Freescale Wireless Meter-Bus solution.
  - **Full version** – a comprehensive implementation of EN13757-4: 2005 and EN13757-4:2013 mode C, when released. Available through preferred partner.

Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, Qorivva, SafeAssure, the SafeAssure logo, StarCore, Symphony and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, CoreNet, Flexis, Layerscape, MagniV, MRC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SMARTMOS, Tower, TurboLink, Vybrid and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2013 Freescale Semiconductor, Inc.

KW01 - Summary

KW01 is World's first Cortex M0+ based wireless MCU

- Very low power suitable for battery operated equipments

KW01 is Flexible and Compliant with Multiple Standards (including IEEE 802.15.4 for Smart Utility Networks)

KW01 is a Modem-in-a-chip for easily adding connectivity to many applications

- Smart Metering Last Mile connectivity
- Sub-Metering
- Building Control and Automation

freescale™

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург, Промышленная ул, дом № 19, литера Н, помещение 100-Н Офис 331