

德州仪器推出最新 **Stellaris® ARM® Cortex™-M4F** 微控制器 可提供领先的模拟集成、业界一流的低功耗及浮点性能

业界首例 65 nm Cortex-M 微控制器现已面市，从而可提供更低功耗及更高性能水平，为整个 Stellaris 系列产品的发展计划打下了坚实基础



Loyal Bao 鲍震

德州仪器单片机产品线

Stellaris® 微控制器产品线

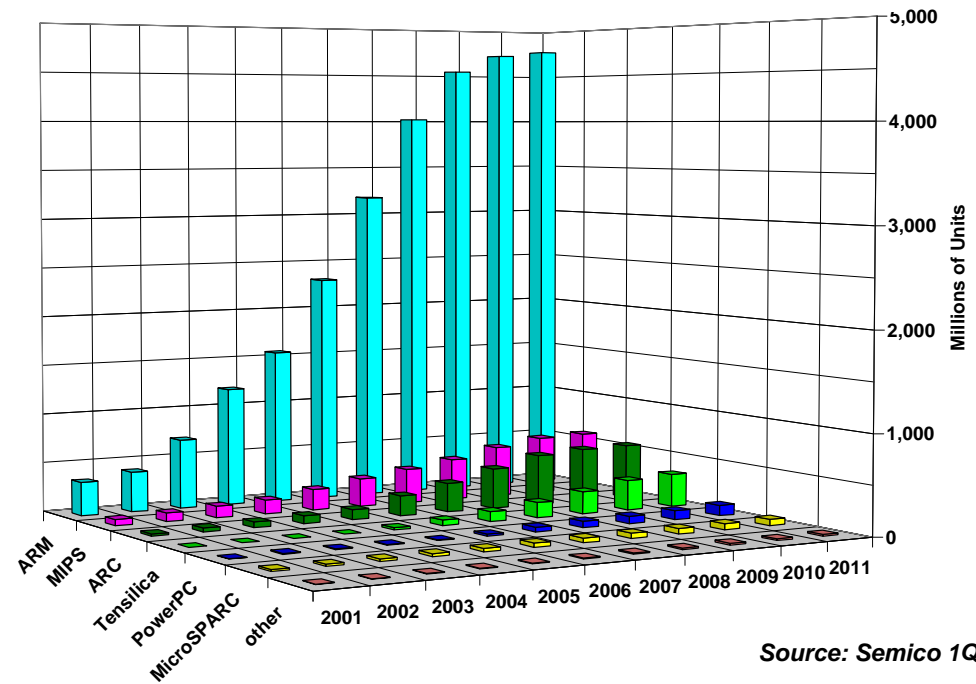
中国区业务拓展经理

TI Information – Selective Disclosure

ARM The Embedded Industry's Standard Architecture

- Chart reports and forecasts 'unit' growth
- Demonstrates ARM overall growth in consumer, industrial, automotive, and networking.
- ARM is the market share leader for licensable Core IP
- Why?
 - Result of ARM's R&D spend of nearly 500% more than the closest licensable competitor over the past 4 years.

Worldwide Unit Production and Forecast



ARM's extensive ecosystem



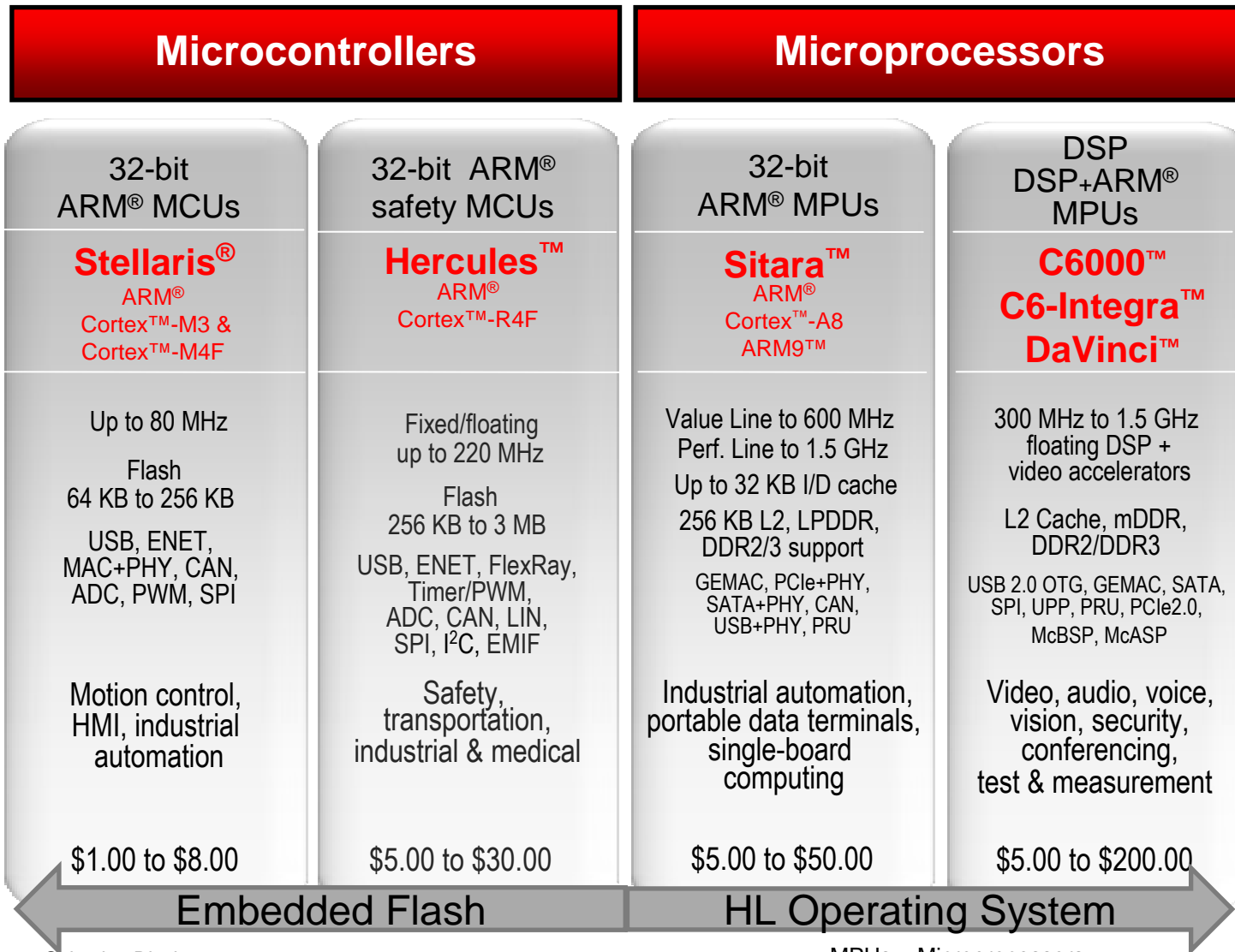
The ARM Ecosystem—the companies that provide:

- Development tools
- Training and support
- Design tools
- Operating systems
- Systems support
- Silicon

Do You Know?

- Semicast forecasted the 2010 ARM-based market at...
20 Billion USD
- Semicast reported that 2010 results show that TI's ranking is...
TI is the leading supplier of ARM-based MCUs/MPUs
- The number of ARM cores shipped to date is
25 Billion units
- TI's total shipped ARM cores exceeds
6 Billion units
- 70% of engineers consider the #1 processor selection criteria to be...
Software as their #1 processor selection criteria

TI tailors its ARM® portfolio to address market demands

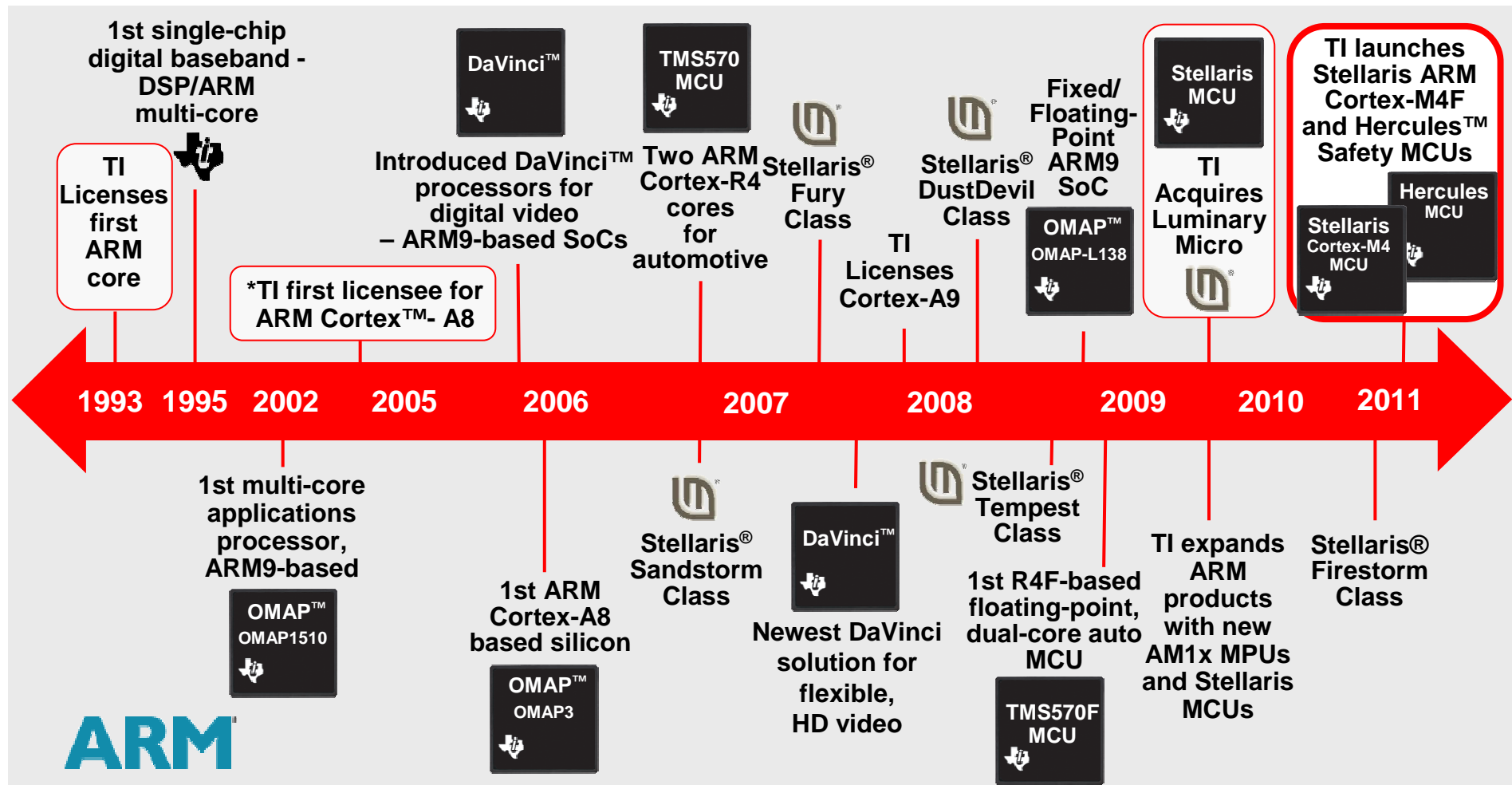


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MPUs – Microprocessors



TI ARM® investment and innovation



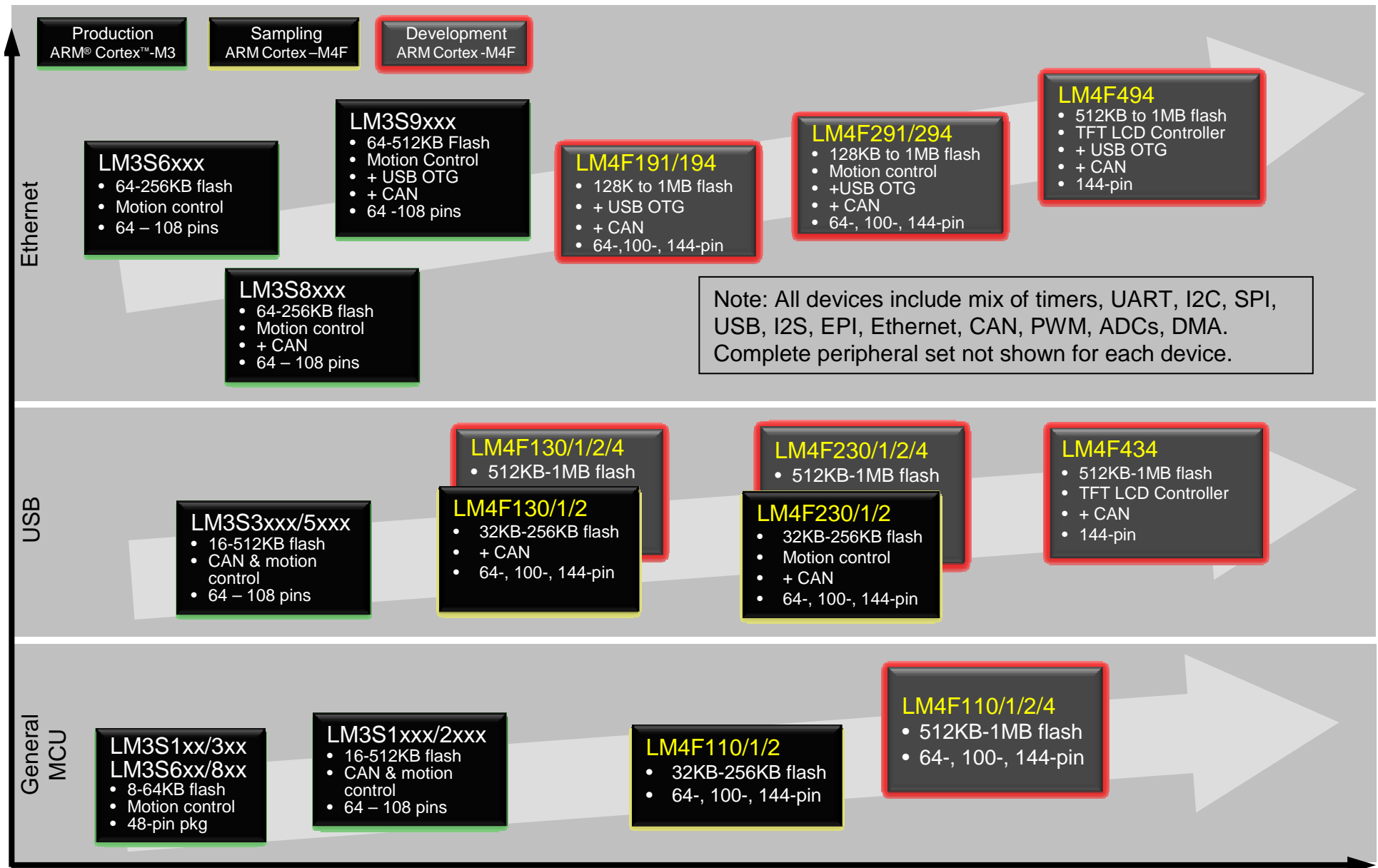
TI has shipped over 6 billion ARM-based products and continues to invest in a large portfolio of scalable platforms from \$1 to >1GHz

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* TI licensed in July 2003, but publicly announced Oct 2005.



Stellaris® Roadmap



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Product Preview – Subject to Change



德州仪器最新 **Stellaris® ARM® Cortex™-M4F** 微控制器, 可提供领先的模拟集成、业界一流的低功耗及浮点性能

凭借浮点性能及领先的集成度, 降低系统成本并提升性能

无需为获得高精确度而牺牲性能

- 用于实现高精确度的高性能的12位 ADC 和模拟比较器
- 所有的 Stellaris Cortex-M4F MCU 都提供浮点运算单元
- 高达 256KB 闪存和 32KB 的 SRAM
- 丰富的连接外设: 8个UART, 6个I2C, 4个SPI, 2个CAN、1个USB OTG

提高便携性并满足功率预算

业界一流的
低功耗

- 待机电流低至 1.6 μ A
- 运用先进的TI 模拟技术提升额外的系统效率

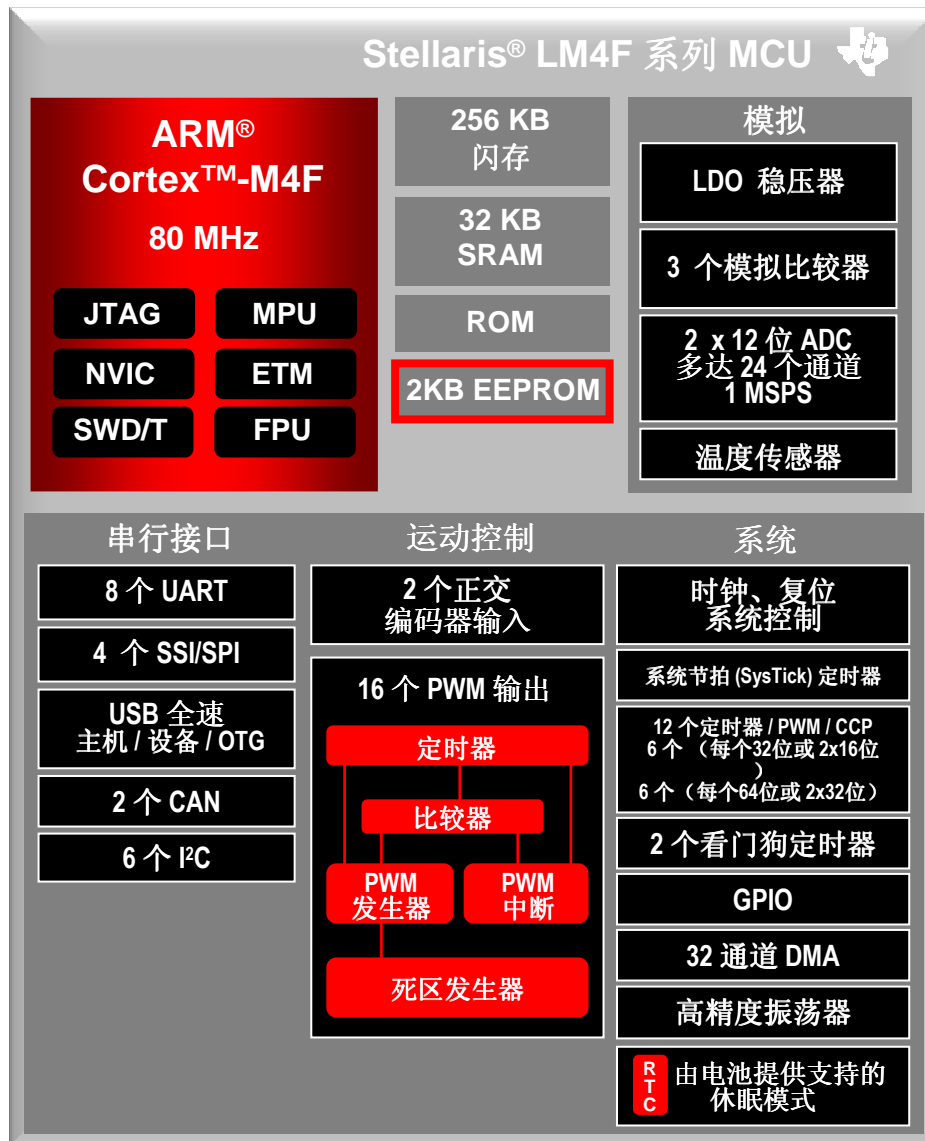
可借助 270+ 多款 Stellaris MCU 轻松实现设计调整, 并利用稳健的 StellarisWare 软件及工具加速产品的上市进程

- TI 独有的StellarisWare® 软件实现了轻松迁移至新型 Cortex-M4F 的能力, 旨在最大限度地提高代码复用率
- 预载软件库到片内独有的ROM区, 预载软件库包括外设驱动程序库、启动加载程序及校验和
- 简单易用型评估套件可实现在 10 分钟或更短的时间里跨越式启动设计
- 基于 65 nm 工艺来实现更高速度、更大内存及超低功耗的发展路标图

TI Information – Selective Disclosure



40 多款 超低价格 Stellaris Cortex™-M4F 的 MCU



高性能模拟集成

- 两个 1 MSPS 12 位 ADC
 - 无需硬件平均
- 三个模拟比较器

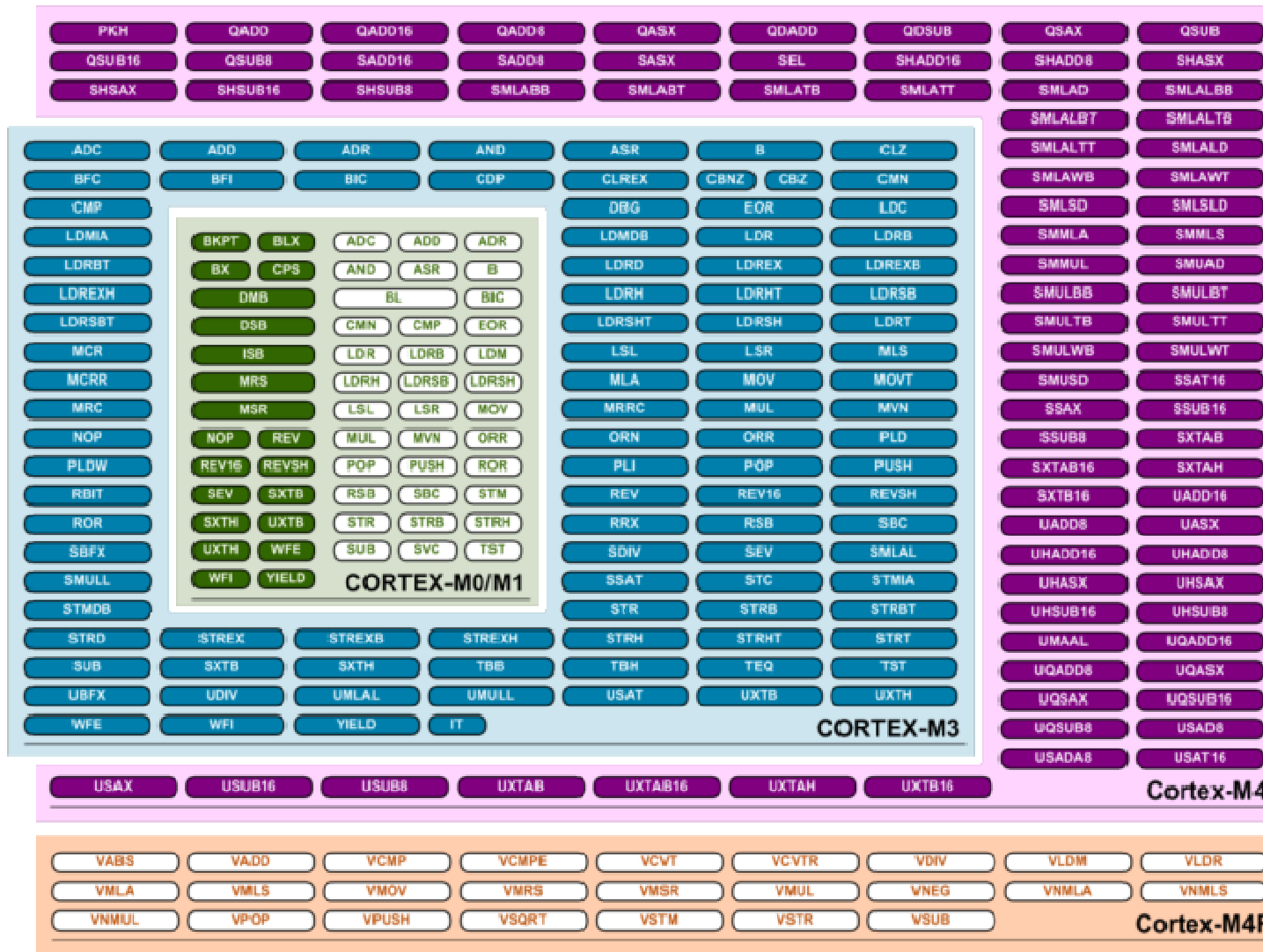
丰富的连接功能:

丰富的连接外设: 8个UART, 6个I2C, 4个SPI, 2个CAN、1个USB OTG

最低功耗的 Stellaris MCU

- 待机电流低至 1.6 μ A
- 运行 RTC 模式低至 1.7 μ A
- 唤醒时间: 500 μ s 或更短
- 基于 TI 专有的 65nm 工艺技术

Stellaris LM4Fx is ISA-compatible with LM3Sx



Cortex-M4F Benefits (wrt M3)



Cortex M4F Enhances Audio

Application	Cortex-M4F vs. Cortex-M3
Audio – window overlap & add	1.8-2.6x Faster
FIR Filter	2x Faster
IIR Filter	2x-3x Faster
MP3 Decode	2x Faster, 15% code reduction
WMA Decode	1.6x Faster, 9% code reduction
Audio Post Processing	2x Faster, 20% code reduction

Cortex M4F Enhances Motor Control

Application	Cortex M4F vs. Cortex M3
Motor Control – Clarke Transform	5x Faster
Motor Control – Park's Transform	7x Faster
PID	4x Faster

Cortex M4F Enhances DSP

Application	Cortex M4F vs Cortex M3
FFT	2x Faster
Matrix Multiplication	4x Faster
Correlation (Floating Point)	10x Faster

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Single-Cycle MAC Benefit – IIR Filter Example

	<u>Cortex-M3</u>	<u>Cortex-M4</u>
	<u>cycle count</u>	<u>cycle count</u>
xN = *x++;	2	2
yN = xN * b0;	3-7	1
yN += xNm1 * b1;	3-7	1
yN += xNm2 * b2;	3-7	1
yN -= yNm1 * a1;	3-7	1
yN -= yNm2 * a2;	3-7	1
*y++ = yN;	2	2
xNm2 = xNm1;	1	1
xNm1 = xN;	1	1
yNm2 = yNm1;	1	1
yNm1 = yN;	1	1
Decrement loop counter	1	1
Branch	2	2

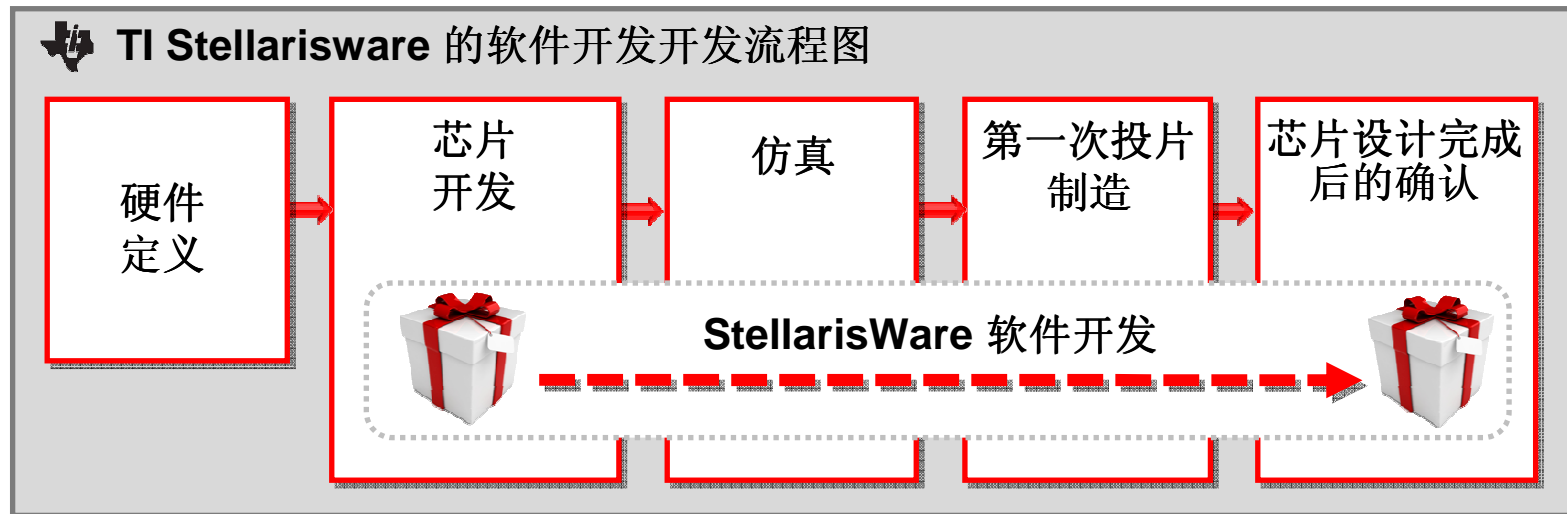
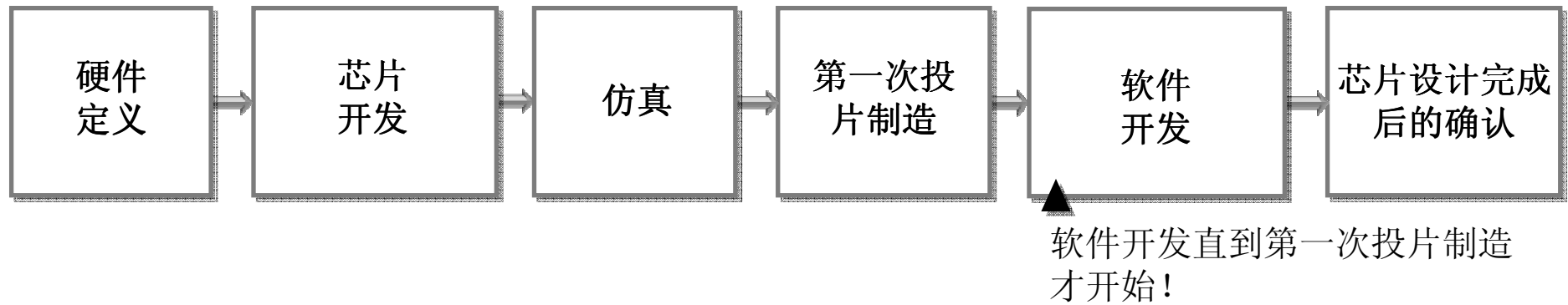
$$y[n] = b_0x[n] + b_1x[n-1] + b_2x[n-2] - a_1y[n-1] - a_2y[n-2]$$

- Only looking at the inner loop, making these assumptions
 - Function operates on a block of samples
 - Coefficients b0, b1, b2, a1, and a2 are in registers
 - Previous states, x[n-1], x[n-2], y[n-1], and y[n-2] are in registers
- Inner loop on Cortex-M3 takes 27-47 cycles per sample
- Inner loop on Cortex-M4 takes 16 cycles per sample **(40 to 65% cycle reduction!!!)**

享有TI 独有的StellarisWare[®] 软件库的软件开发方法

— 软件开发并不是事后的补救

一般的软件开发流程图

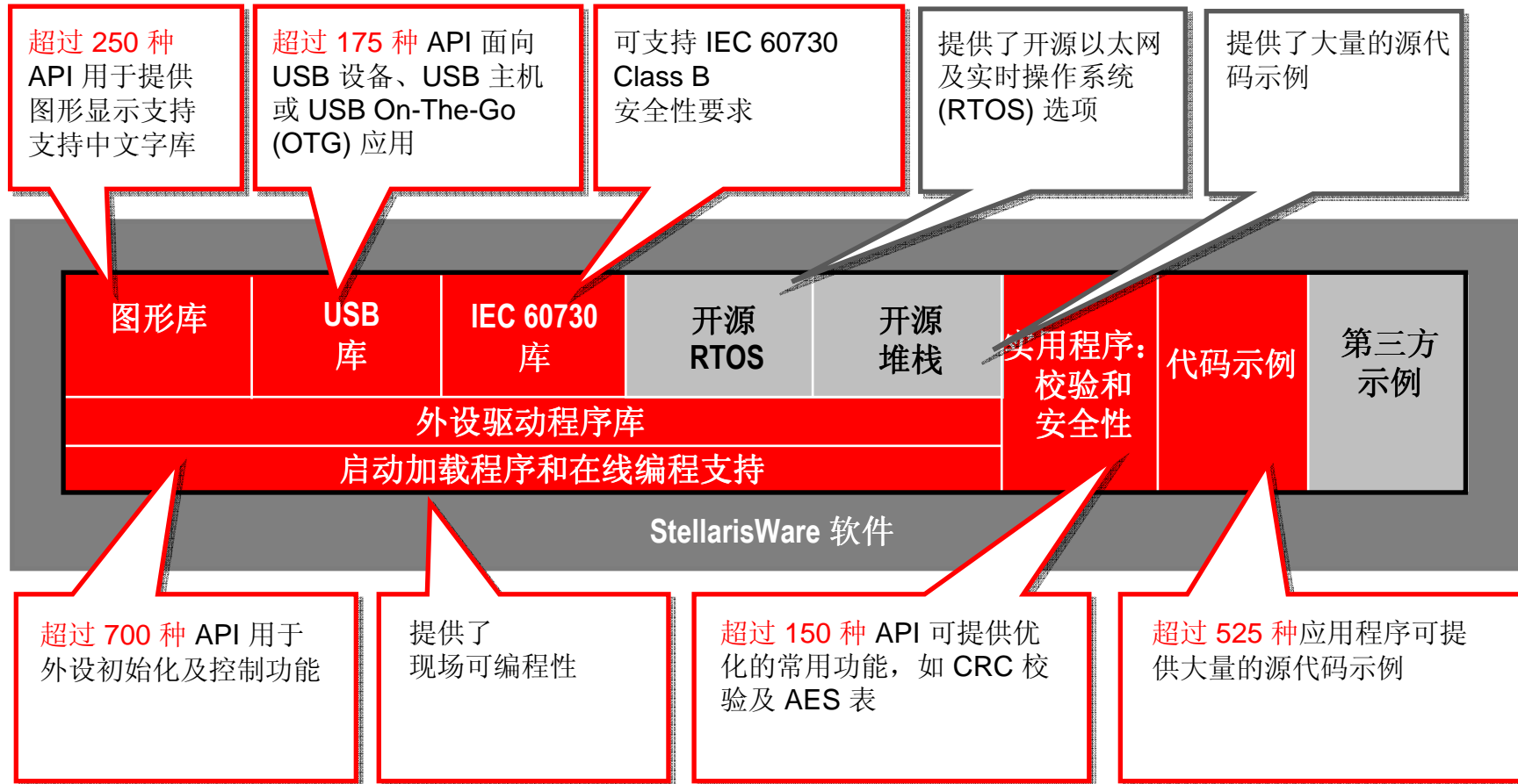


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TI 独有的StellarisWare® 软件库



- 所有的程序设计均可采用 C/C++ 语言，甚至包括中断服务例程及启动代码
- 包含代码和免版税的程序库，用于提供应用支持



TI Information – Selective Disclosure

StellarisWare® USB Library

- **Free license & royalty-free** drivers plus example applications to accelerate USB implementation on Stellaris MCUs

- Examples available:

- **Device Examples:**

- HID Keyboard
 - HID Mouse
 - CDC Serial
 - Mass Storage
 - Generic Bulk
 - Audio
 - Device Firmware Upgrade
 - Oscilloscope

- **Host Examples:**

- Mass Storage
 - HID Keyboard
 - HID Mouse
 - Isochronous Audio Input

- **OTG Examples:**

- SRP (Session Request Protocol)
 - HNP (Host Negotiation Protocol)*

- **Windows INF for supported classes**

- Points to base Windows drivers
 - Sets config string
 - Sets PID/VID
 - Precompiled DLL saves development time

- **Device framework integrated into USBLib**



- **USB Device Firmware Update (DFU) now available in ROM; just plug-in and reprogram your firmware!**

- TI sub-licenses Stellaris VID & PIDs for customer use

StellarisWare Graphics Library Examples



Primitives



Radio Buttons



Checkbox



Security Keypad



Canvas

TI Information – Selective Disclosure



Push Buttons



Container



BLDC Touchscreen Motor Controller

10 分钟之内即可启动开发工作



简单易用型评估套件

- 所有的硬件及软件开发均可在 10 分钟或更短时间内启动
- 完整的外设功能
- 96 x 64 色 OLED 显示器凸显了 StellarisWare™ 免费许可图形库的优势
- 工程示例

在您中意的环境中进行设计：

- 得到了 5 种常用 IDE 的支持



Code Composer Studio™ IDE

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Stellaris Evaluation Kits: “Zero-to-32bits” in 10 minutes

- **Everything a developer needs to get up and running in 10 minutes or less**
 - Each kit includes: evaluation board(s), all required cables, a choice of evaluation tools suites for popular development tools, documentation, StellarisWare® software, and applications notes



EK-LM3S811
Low pin count
49 USD



EK-LM3S1968
High pin count
59 USD



EK-LM3S2965
CAN Functionality
79 USD



EK-LM3S3748
USB Host/Device
109 USD



EK-LM3S6965
Ethernet MAC+PHY
69 USD



EK-LM3S8962
Ethernet+CAN
89 USD



EK-LM3S9D90
Ethernet+USB OTG
99 USD



EK-LM3S9D92
Ethernet+OTG+MC
99 USD



EK-LM4F232
USB + CAN
149 USD

- **Five versions of each kit:**



EKK-LM3Sx

- ARM RealView Microcontroller Development Kit tools with 32KB address Limit



EKI-LM3Sx

- IAR Embedded Workbench KickStart with 32KB address limit



EKC-LM3Sx

- Sourcery CodeBench G++ GNU with 30-day evaluation license



EKT-LM3Sx

- Code Red Technologies Red Suite with 90-day evaluation license



EKS-LM3Sx

- TI Code Composer Studio with full evaluation license locked to board



Blizzard Applications

TI Information – Selective Disclosure



Stellaris® MCUs – Versatile, Connected, Compact

Connectivity



Data Acquisition



Home Automation



Medical Connectivity



Serial-to-Ethernet
Bridge

Automation



Automated Motor Control



Home Automation

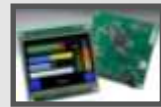
Human Machine Interface



Advanced
Remotes



Touch Interface



Graphics Displays

Point of Sale



Security Monitoring



Biometric
Scanning



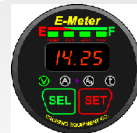
Networked
Access Control



Exercise
Equipment



HVAC
Pump inverter
Compressor motor



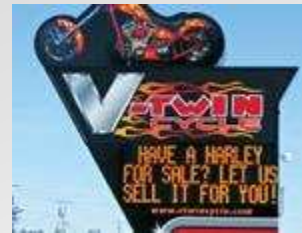
Electricity and
Flow metering



White goods

Energy

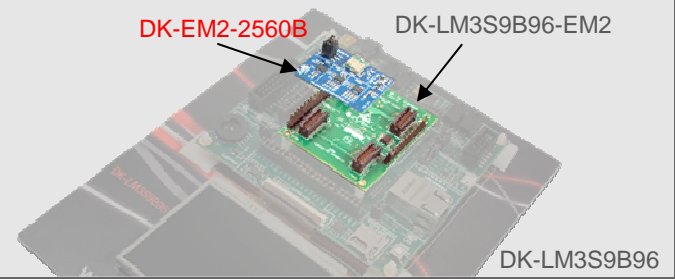
LED signage



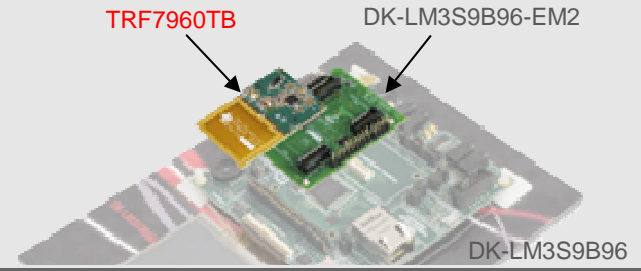
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Complete, modular wireless solutions

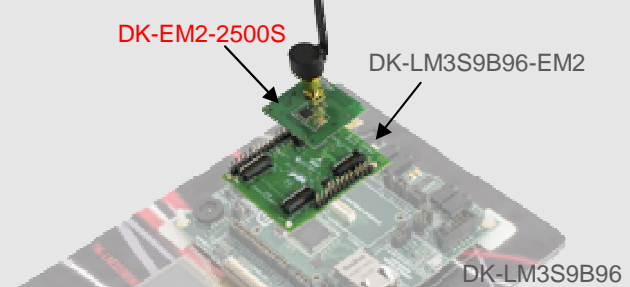
**Stellaris®
2.4 GHz CC2560
Bluetooth® Kit**



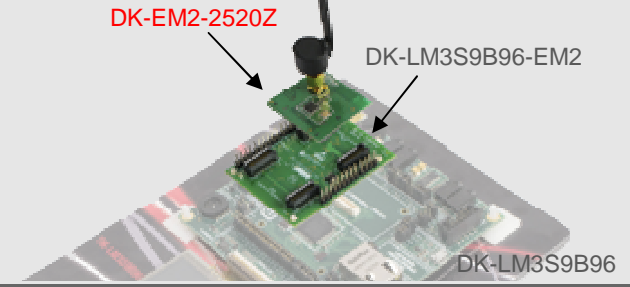
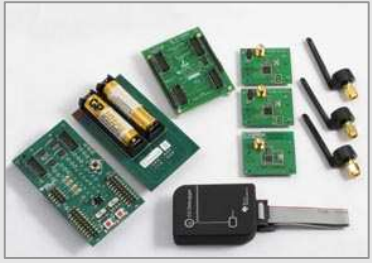
**Stellaris
13.56MHz RFID
Wireless Kit**



**Stellaris
2.4 GHz SimpliciTI™
Wireless Kit**



**Stellaris
ZigBee®
Networking Kit**



Stellaris[®] Bluetooth[®] Networking Kit

DK-EM2-2560B

Key features

- Proven protocol software, example applications, and StellarisWare[®] support for Bluetooth v2.1+EDR
- Advanced Audio Distribution Profile (A2DP) with Example Application
 - Connect and stream audio from your Android[™], Blackberry[®], or iPhone[®]
- Serial Port Profile (SPP) Wire Replacement Example Application
 - Transmits accelerometer position data enabling drawing on DK-LM3S9B96 LCD screen
- Pairs with best-in-class performance Bluetooth transceiver
 - CC2560-PAN1325 module by Panasonic

Applications



- Cell phone accessories
- Mobile device accessories (iPod[®], iPad[®], etc.)
- Medical data aggregator
- Short-range serial communication replacement

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\$199 USD



Blizzard Opportunities in China

- Existing Opportunities

- AC Induction motor control
 - Fast, accurate ADC; ARM Cortex-M core; Support
- Permanent magnet motor control (for refrigerator compressor)
- Industrial circuit breakers
- Lighting control
 - Wired/wireless Communication Support, # of timers
- Uninterruptible Power Systems
 - Fast, accurate ADC
- Human machine interface
 - Graphics Library, Time to market
- Fitness watches
 - Low Power Performance, Bluetooth enablement
- RF networking
- System Management Control applications
- Etc...

- Can you think of others?

- Tell us!

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Thank You !