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STM32助力万物互联3.0 - 无线

意法半导体
区域产品市场经理

罗少贤
Shaoxian.LUO@st.com

We are creators and makers of technology



One of the world's largest semiconductor companies



48,000 employees of which
8,400 in R&D



\$12.8 billion revenues
in 2021



Over **80** sales & marketing
offices serving over **200,000**
customers across the globe

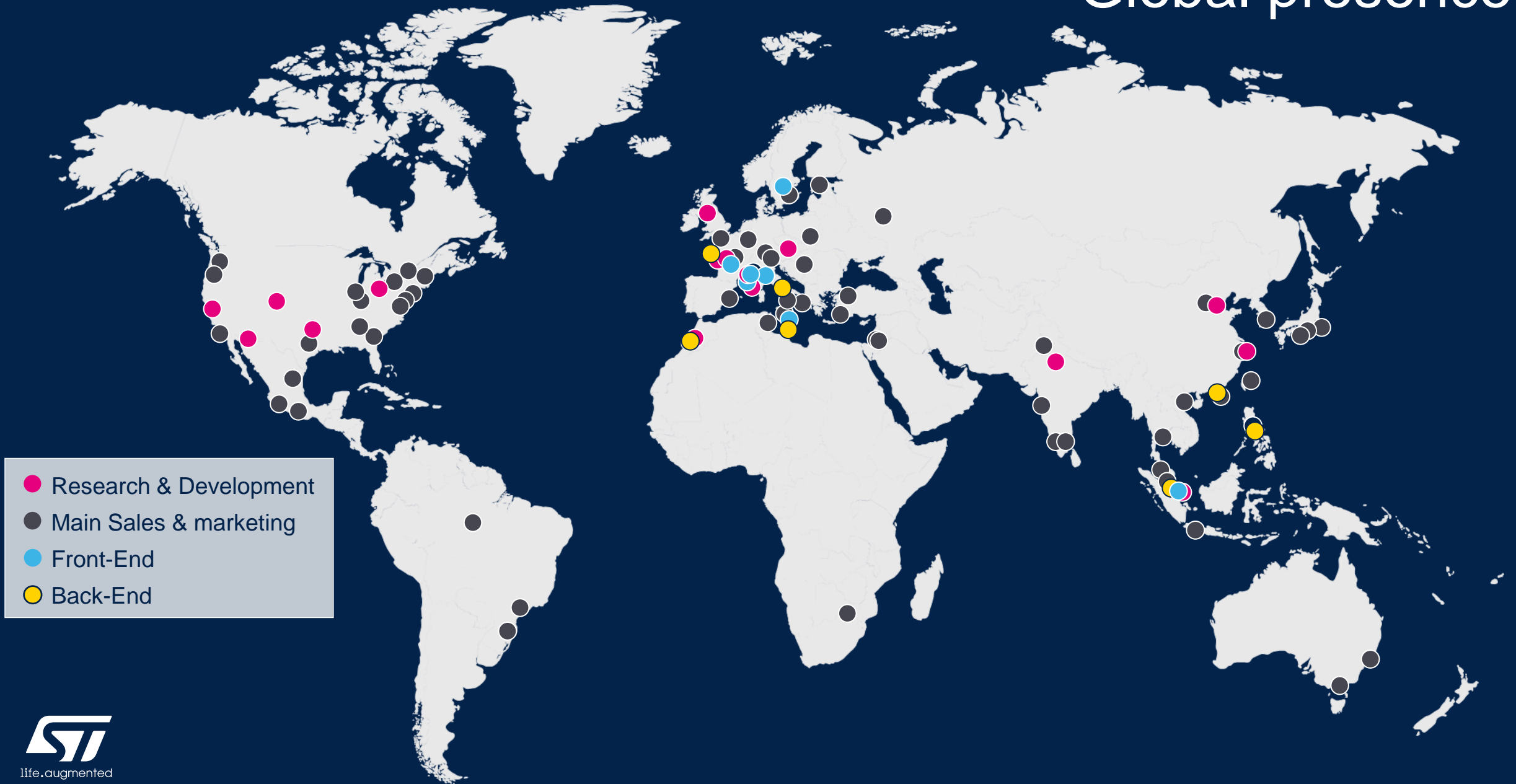


14 manufacturing sites



Signatory of the United Nations Global Compact (UNGC)
Member of the Responsible Business Alliance (RBA)

Global presence



Internet of things & Connectivity

ST provides sensors, embedded processing, connectivity, security and power management, as well tools and ecosystems

Cloud connected and data-enabled services

Two billion industrial IoT & utility connected devices by 2022

Digital security for all data

IoT security services market over **\$10 billion** in 2021

5G accelerating the connection of objects to the IoT

Over **90 million** new 5G IoT connections in 2026

ST product portfolio enabling strategic trends

Dedicated Automotive ICs



Discrete & Power Transistors



Analog, Industrial & Power Conversion ICs



GP, Connected MCU, MPU
Secure MCU, EEPROM



MEMS & Optical sensing solutions



ASICs based on ST proprietary technologies



Smart Mobility

Power & Energy

Internet of Things & Connectivity



STM32 MCUs and MPUs portfolio



 MPU

STM32MP1
4158 CoreMark
Up to 800 MHz Cortex-A7
209 MHz Cortex-M4

 High Perf MCUs

STM32F2
Up to 398 CoreMark
120 MHz Cortex-M3

STM32F4
Up to 608 CoreMark
180 MHz Cortex-M4

STM32F7
1082 CoreMark
216 MHz Cortex-M7

STM32H7
Up to 3224 CoreMark
Up to 550 MHz Cortex -M7
240 MHz Cortex -M4

 Mainstream MCUs

STM32F3
245 CoreMark
72 MHz Cortex-M4

STM32G4
569 CoreMark
170 MHz Cortex-M4

Mixed-signal MCUs

STM32F0
106 CoreMark
48 MHz Cortex-M0

STM32G0
142 CoreMark
64 MHz Cortex-M0+

STM32F1
177 CoreMark
72 MHz Cortex-M3

 Ultra-low Power MCUs

STM32L0
75 CoreMark
32 MHz Cortex-M0+

STM32L1
93 CoreMark
32 MHz Cortex-M3

STM32L4
273 CoreMark
80 MHz Cortex-M4

STM32L4+
409 CoreMark
120 MHz Cortex-M4

STM32L5
443 CoreMark
110 MHz Cortex-M33

STM32U5
651 CoreMark
160 MHz Cortex-M33

 Wireless MCUs

STM32WL
162 CoreMark
48 MHz Cortex-M4
48 MHz Cortex-M0+

STM32WB
216 CoreMark
64 MHz Cortex-M4
32 MHz Cortex-M0+ 

 Latest product generation

 Radio co-processor only



STM32 助力万物互联3.0 – 无线

 3.0 无线 MCU

STM32-WB



STM32-WL



 2.0 高安全 MCU

STM32-L5



STM32-U5



 1.0 超低功耗 MCU

STM32-L0



STM32-L1



STM32-L4



STM32-L4+



STM32出货量逾**60亿**颗



2.4GHz 产品系列

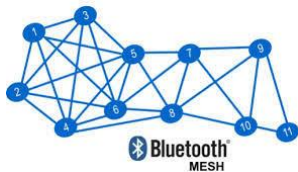
市面上最具有强竞争力的2.4GHz产品组合

PERFORMANCE

<p>STM32WBA5 Bluetooth LE 5.3 802.15.4, Zigbee 3.0, Thread Matter Application processor Cortex-M33 @ 100MHz Advanced Security - TZone Rich periph (LCD, Comp ...) Flash: 1MB / RAM: 128K Up to 35 GPIOs, UFBGA59, QFN48, UQFN32, Module</p> <p>Q1'23</p>	<p>STM32WB55/35 Bluetooth LE 5.3 802.15.4, Zigbee 3.0 Thread Application processor Dual core Cortex-M4 @ 64MHz M0+ @ 32MHz Advanced Security, Rich Analog Rich peripherals (USB, LCD ...) Flash: 256K - 1MB / RAM: 48K - 256K Up to 72 GPIOs, UFBGA129, WLCSP100, VQFN68, UQFN48, Module</p>	<p>STM32WB15 Bluetooth LE 5.3 Application processor Dual core Cortex-M4 @ 64MHz M0+ @ 32MHz Advanced Security, Rich Analog Flash: 320KB / RAM: 48KB UQFN48, WLCSP49, Module</p>	<p>New Bluetooth LE 5.3 Cortex-M0+ 64MHz security features Flash 512KB / RAM 64KB up to 20 GPIOs QFN32, WLCSP36</p> <p>Q2'23</p>	<p>BlueNRG-LP Bluetooth LE 5.2 Cortex-M0+ 64MHz security features Flash 256KB / RAM: 64KB up to 32 GPIOs QFN48/32, WLCSP49</p>	<p>BlueNRG-2 Cortex-M0 32MHz Flash 256KB / RAM 24KB QFN32, QFN48, WLCSP34</p>	<p>BlueNRG-2N Bluetooth LE 5 Network processor QFN32, WLCSP34</p>
<p>STM32WB50/30 Bluetooth LE 5.3 802.15.4, Zigbee 3.0 Thread Application processor Cortex-M4 @ 64MHz Cortex-M0+ @ 32MHz Flash: 1MB / RAM: 128K UQFN48</p>	<p>STM32WB10 Bluetooth LE 5.3 Application processor Cortex-M4 @ 64MHz Cortex-M0+ @ 32MHz Flash: 320KB / RAM: 48KB UQFN48</p>	<p>BlueNRG-LPS Bluetooth LE 5.3 Cortex-M0+ 64MHz security features Flash 192KB / RAM 24KB up to 20 GPIOs QFN32, WLCSP36</p>	<p>BlueNRG-1 Cortex-M0 32MHz Flash 160KB / RAM 24KB QFN32, WLCSP34</p>	<p>BlueNRG-MS Bluetooth LE 4.2 Network processor QFN32, WLCSP34</p>		

ULTRA-LOW-POWER

LOW-POWER



BlueNRG 单核低功耗蓝牙产品系列

网络协处理器

应用处理器

可扩展性

BlueNRG-MS

BT4.2 认证
BLE基本功能

BlueNRG-2N

BT5.2 认证
LE Privacy 1.2
LE Secure Conn
LE Data Len ext

BlueNRG-1

BT5.2 认证
LE Privacy 1.2
LE Secure Conn

Cortex-M0, 32MHz
内存: 160KB/24KB

BlueNRG-2

BT5.2 认证
LE Privacy 1.2
LE Secure Conn
LE Data Len ext

Cortex-M0, 32MHz
内存: 256KB/24KB

BlueNRG-LP

BT5.2 认证
Advertisement ext
High speed (2 Mbps)
Long range
GATT Caching

Cortex-M0+, 64MHz
内存: 256KB/64KB

BlueNRG-LPS

BT5.3 认证
AoA/AoD
Advertisement ext
High speed (2 Mbps)
Long range
GATT Caching

New
Bluetooth LE 5.3
Cortex-M0+ 64MHz
security features
Flash 512KB / RAM 64KB
up to 20 GPIOs
QFN32, WLCSP36

Q2'23

QFN48

QFN32

WLCSP

BlueNRG-MSQTR

BlueNRG-232N

BlueNRG-132

BlueNRG-248

BlueNRG-232

BlueNRG-355MT(*)

BlueNRG-355AT(*)

BlueNRG-332AT(#)

BlueNRG-MSCSP

BlueNRG-234N

BlueNRG-134

BlueNRG-234

BlueNRG-355VT(*)

BlueNRG-332VT(#)

BlueNRG-M2SA/SP

性价比



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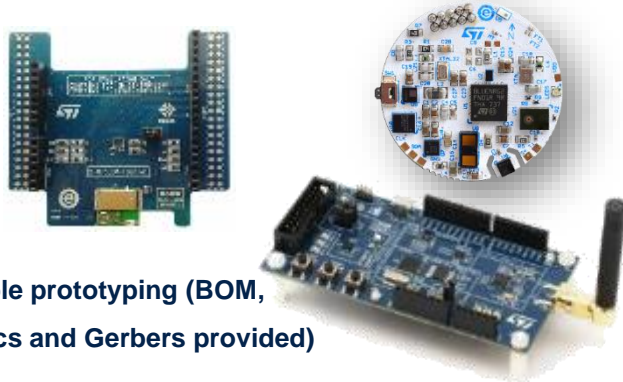
(*) RAM大小可选(32 kB and 64 kB), 以及温度范围可选(最高 +85 °C 以及最高 +105 °C)

(#)温度范围可选(最高 +85 °C 以及最高 +105 °C). 目前只有332AT量产状态; 332VT工程样品状态; + 85 °C 2023年量产 11

Complete Bluetooth Low Energy flexible ecosystem



Please contact your nearest ST Sales Office for more information



Flexible prototyping (BOM, Schematics and Gerbers provided)



Starter Kits and Ref. Designs

PC and Mobile GUIs

SDKs and Libraries

*NP

X-NUCLEO-IDB05A2
X-NUCLEO-BNRG2A1
SensorTile.box

Any GP MCU IDE

ST BLE Sensor App
ST BLE Mesh App

X-CUBE-BLE1/2
X-CUBE-BLEMESH1
FP-ATR-BLE1
FP-SNS-BLEMESH1



SoC

Chip-down
Modules

STEVAL-IDB011V1
STEVAL-IDB008V2
BlueNRG-Tile
STEVAL-IDB008V1M
BlueNRG-Plug

BlueNRG Navigator
BlueNRG Power Estimator
BlueNRG Init. Wizard

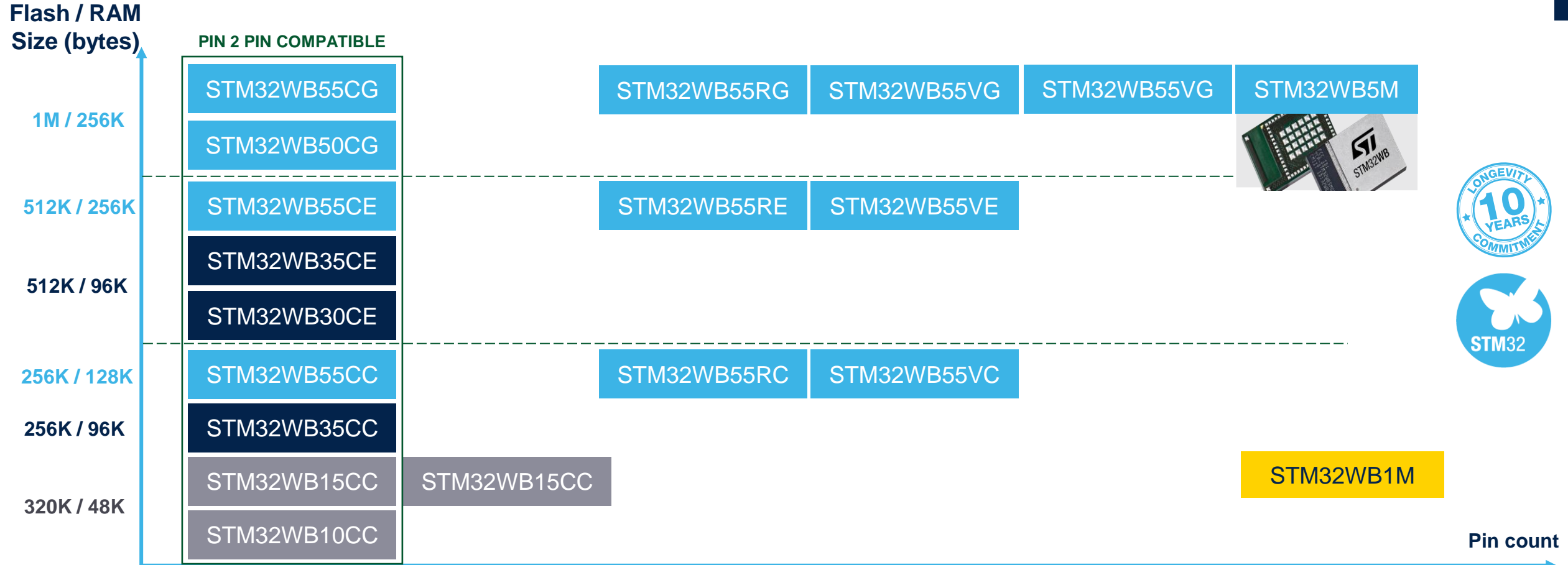
BlueNRG DK
BlueNRG Profiles
BlueNRG-Mesh



Production
Development started

STM32WB5x
STM32WB3x
STM32WB1x

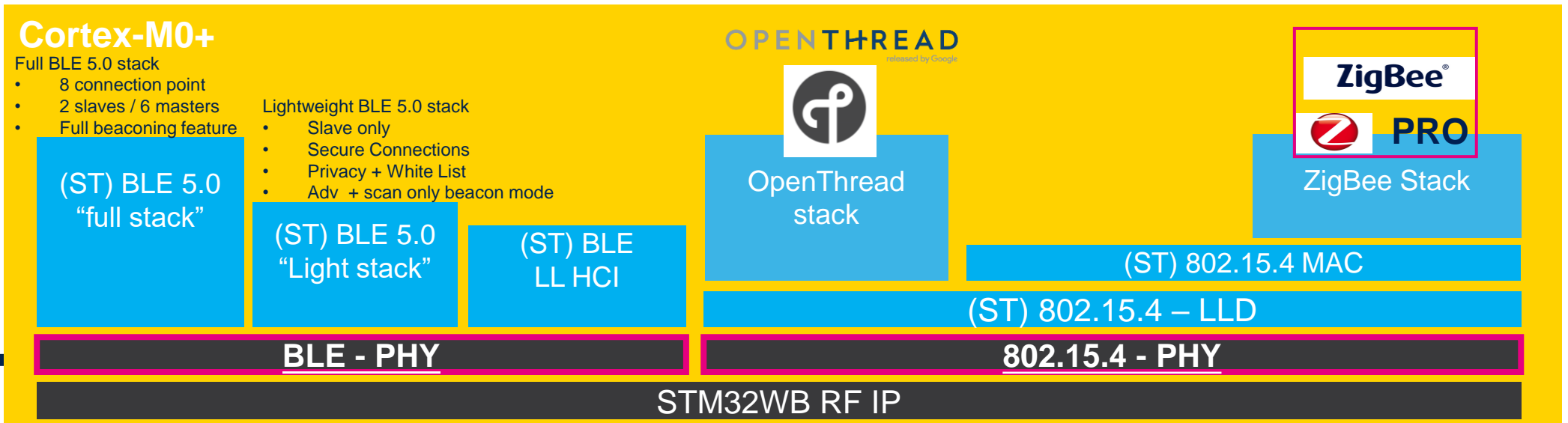
STM32WB 系列 組合



from 1.7 V to 3.6 V
from -40°C to +105°C 13

免费的各种协议栈和参考源码

Binary
源码
私有代码
硬件IP



STM32WB55	STM32WB35	STM32WB15
BLE 5.2/Zigbee 3.0 Open Thread/Matter proprietary (HCI, MAC, LLD) /802.15.4 Multi-protocols (BLE/Zigbee, BLE/Thread)	BLE 5.2 Zigbee 3.0 Open Thread proprietary (HCI, MAC, LLD) /802.15.4	BLE 5.2 proprietary (HCI, LLD) /802.15.4





Sub1GHz 产品系列



市面上最具有竞争力的Sub-GHz 产品组合

PERFORMANCE

STM32WL5x

Application processor
Cortex-M4 / M0+ @ 48MHz

Build-in PA with 2x output power
Up to +15 dBm and up to +22 dBm
170 dB Link budget

Advanced Security, Hardware
Isolation, Rich Analog

Flash: up to 256KB / RAM: up to 64KB

Up to 72 GPIOs,
UFQFPN48,, BGA73

STM32WLEx

Application processor
Cortex-M4 @ 48MHz

Build-in PA with 2x output power
Up to +15 dBm and up to +22 dBm
170 dB Link budget

Advanced Security, Rich Analog
Flash: up to 256KB / RAM: up to 64KB

Up to 72 GPIOs,
UFQFPN48, BGA73

STM32WL3

Application processor
Cortex-M0+ @ 64Mhz

Build-in PA with 2x output power
Up to +14 dBm and up to +20 dBm
152dB Link budget

LCD Driver, LP analog sensing
FLASH up to 256KB / RAM 32KB

Up to 32 GPIOs
QFN32/48

Coming soon

SPIRIT2 (S2-LP)

Ultra-Low-Power
Transceiver

Up to +16dBm output power
146 dB Link budget
QFN24

SPIRIT1

Transceiver

Up to +16dBm output power
136 dB Link budget
QFN20

Application Processor (SoC)

Transceiver





SPIRIT 系列射频收发器 Sub1GHz 专用射频芯片



150-174 MHz
300-348 MHz
387-470 MHz
779-956 MHz

SPIRIT1

- RX: **9.2 mA** / TX: **19.5 mA** @ +11 dBm
- Sleep/Stby: **850 nA** / **600 nA**
- Max.Out: **+16 dBm**
- Sensitivity: **-120dBm**
- Mod: 2(G)FSK, OOK
- QFN20 4x4



All: -40 °C to +105 °C



413-479 MHz ●
826-958 MHz ●
452-527 MHz ●
904-1055 MHz ●

S2-LP ● / S2-LPCB ●

- RX: **7 mA** / TX: **10 mA** @ +10 dBm
- Sleep/Stby: **700 nA** / **500 nA**
- Max.Out: **+16 dBm**
- Sensitivity: **-130 dBm**
- Mod: 2(G)FSK, 4(G)FSK, OOK/ASK
- QFN24 4x4



S2-LPTX ●

- S2-LP Based Radio Transmitter
- -40 °C to +105 °C



远程抄表



智慧生活



资产跟踪



智能监测与报警



智能家居



智慧农业



智慧公共事业



医疗保健与救助



智慧停车

家居和楼宇自动化

智能抄表

报警系统

工业监控和控制



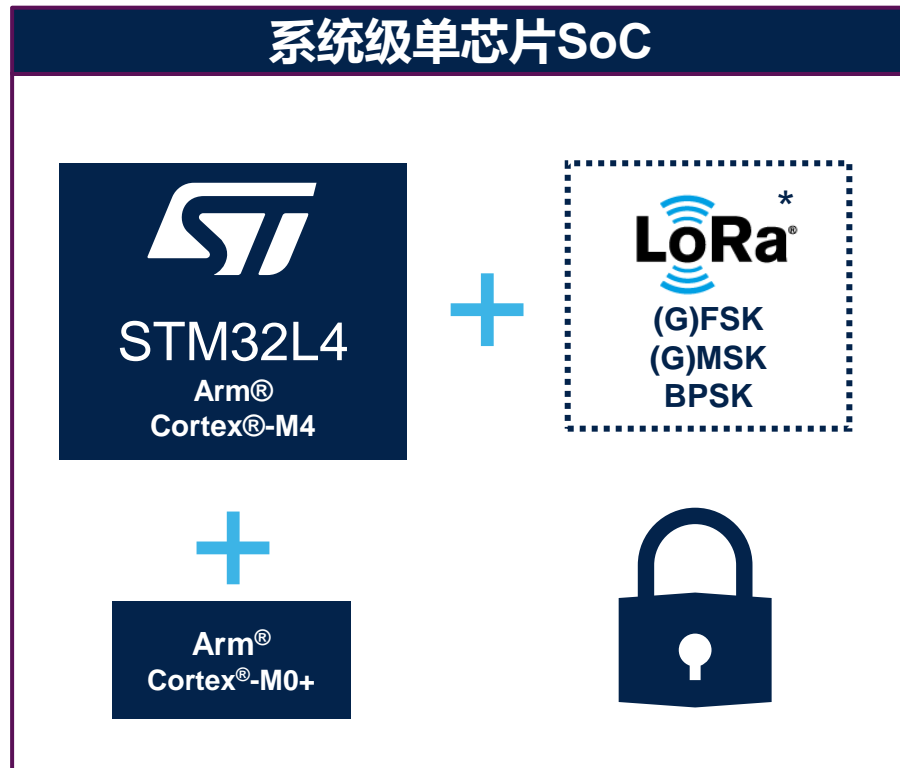
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STM32WL SoC释放无限创造力

长距离无线微控制器：释放无限IoT应用可能

全球首款
支持LoRa®的系统级单芯片
SoC!



=



* ST acquired LoRa® IP (white box) license from Semtech in 2019.

STM32WL Sub-GHz 产品组合

单核丰富的产品特性集

STM32WLE5

- Arm® Cortex®-M4 & DSP, 频率高达48 MHz
- 高达256 KB闪存和64 KB SRAM

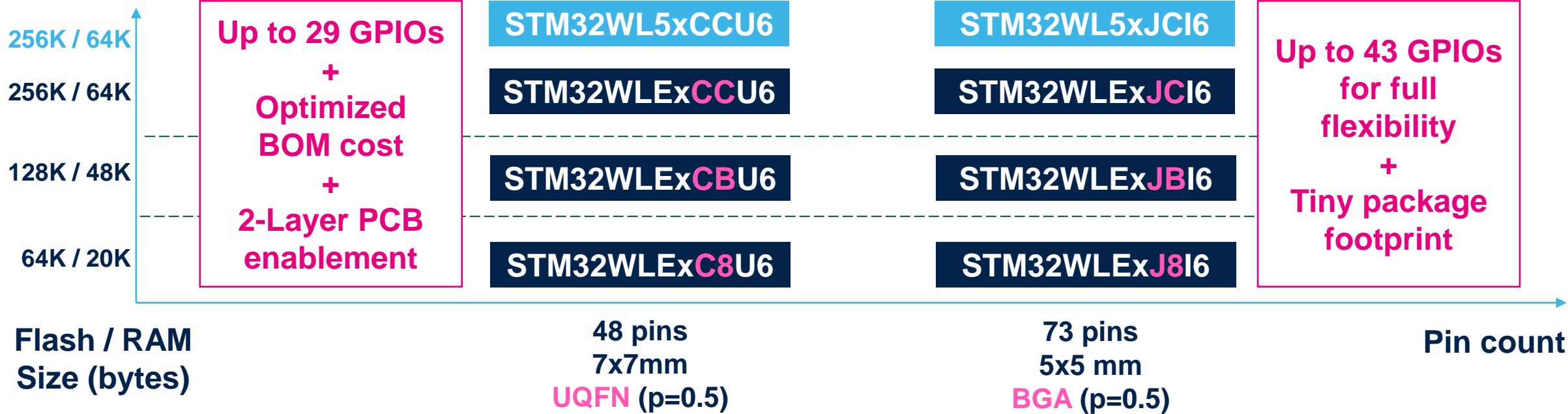
双核及更先进的安全性

STM32WL55

- Arm® Cortex® -M4 & DSP, 频率高达48 MHz
- 高达256 KB闪存和64 KB SRAM
- **Arm® Cortex®-M0+**, 频率高达48 MHz
- 先进的安全特性

STM32WLE4*

STM32WL54*



Dual core

Single core

Note:

x = 5 支持所有的调制解调方式 (e.g. STM32WLE55CCU6)

x = 4 支持除了LoRa外的所有调制解调方式 LoRa(e.g. STM32WLE4CCU6)

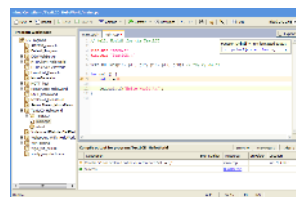


STM32WL – 生态系统概述

完全集成到丰富且经过市场验证的STM32生态系统中



NUCLEO-WL55JC



sigfox



ZETA



硬件开发板 STM32 Nucleo-64

开发非常容易的原型灵活硬件开发板:
NUCLEO-WL55JC1(High Band)
NUCLEO-WL55JC2(Low Band)

软件开发工具

STM32CubeMX
STM32CubeWL
STM32CubeMonitor
STM32CubeProg
STM32CubeIDE + 合作伙伴IDE

协议栈

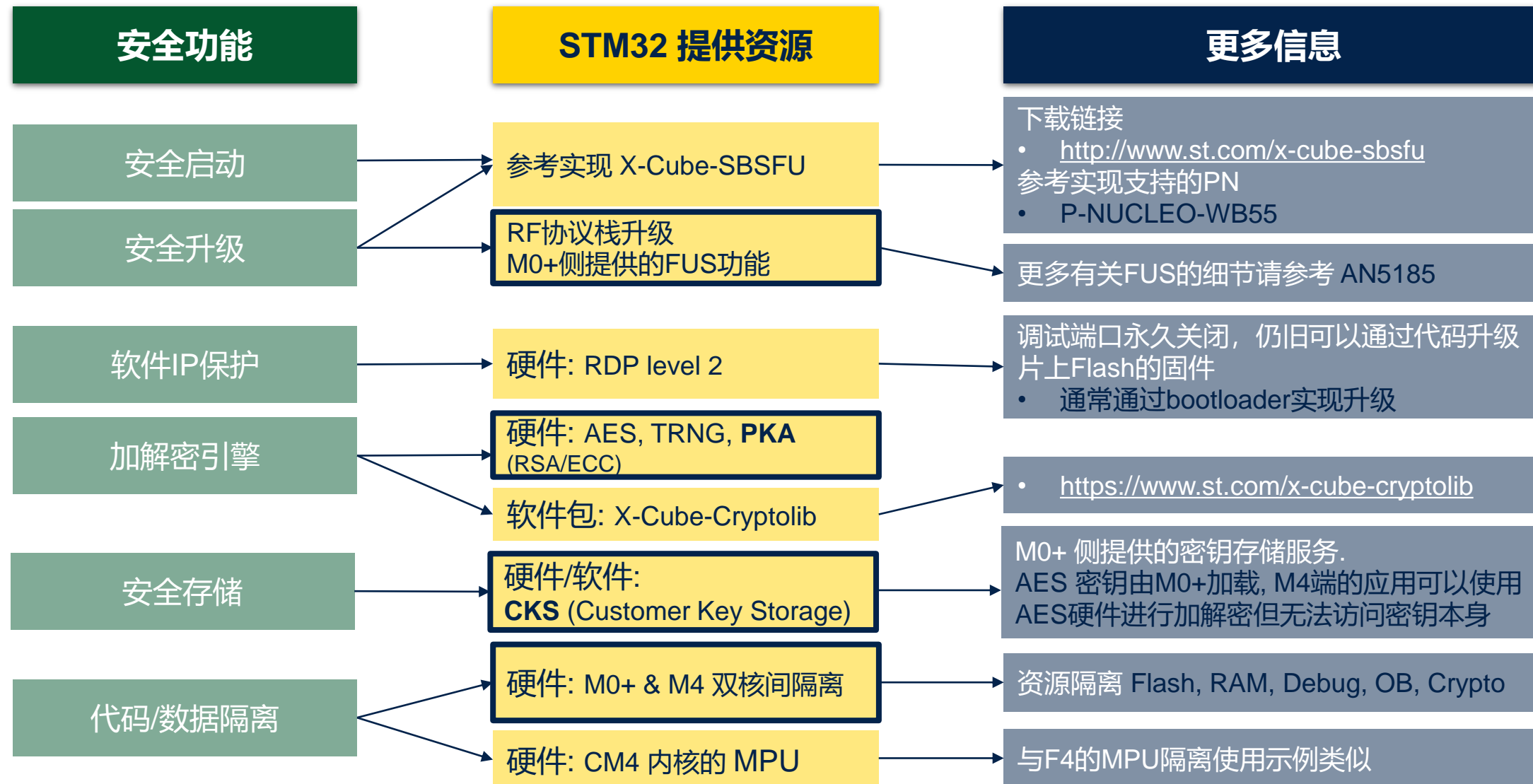
LoRaWAN® (ST)
Sigfox (ST)
无线MBUS (Stackforce)
ZETA (Zifisense)
Mioty (Stackforce)

□ 这里仅列出主要功能, 其他未列出的部分请参考 MUC产品相关手册文档以及www.st.com/stm32trust

□ X-Cube-SBSFU 目前最新版本v2.4.0

□ **加粗框**: WB 增加的或特有的安全特性

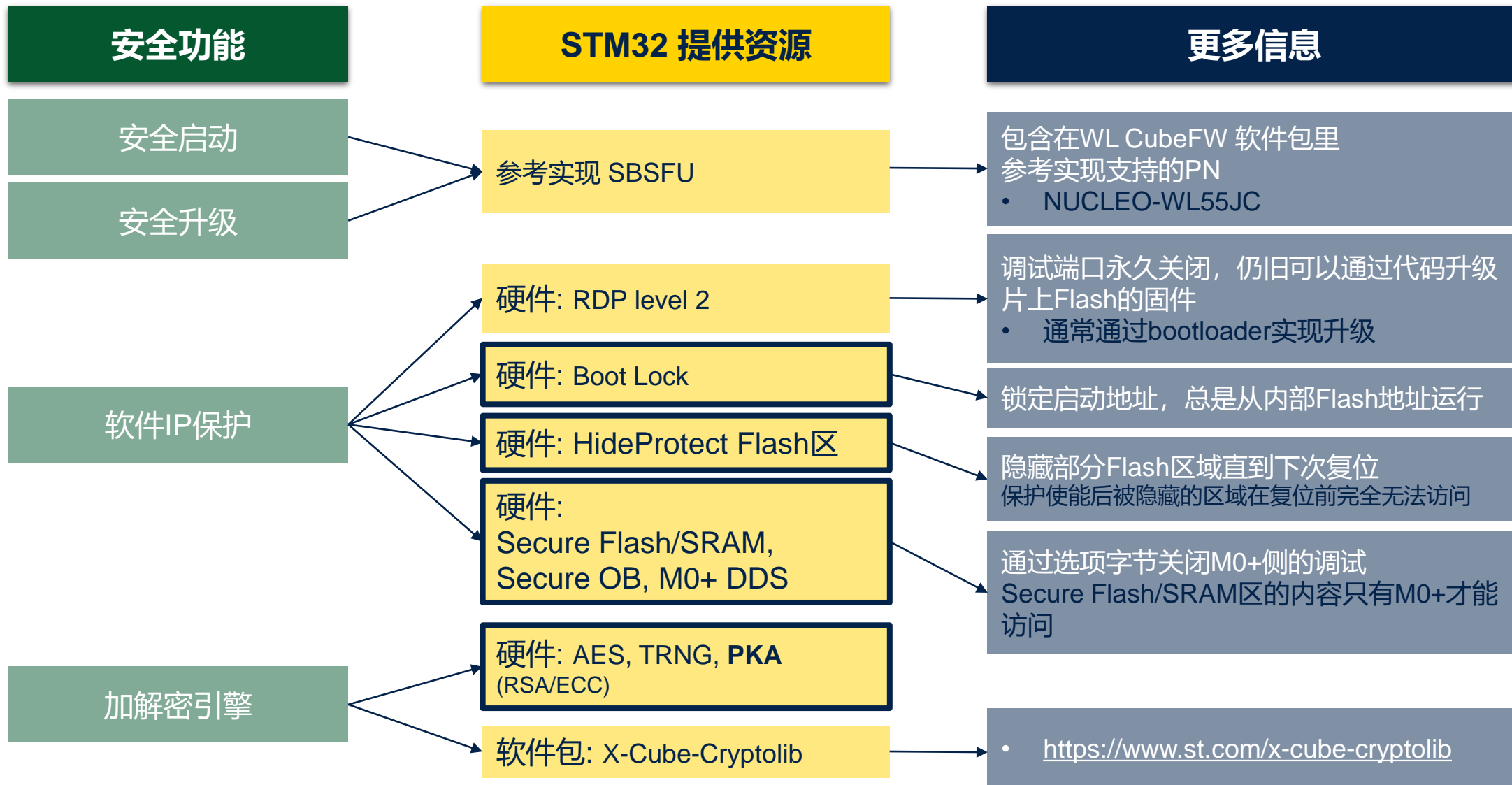
STM32WB提供的主要安全能力



□ 这里仅列出主要功能, 其他未列出的部分请参考 MUC产品相关手册文档以及 www.st.com/stm32trust

□ **加粗框**: WL 增加的或特有的安全特性

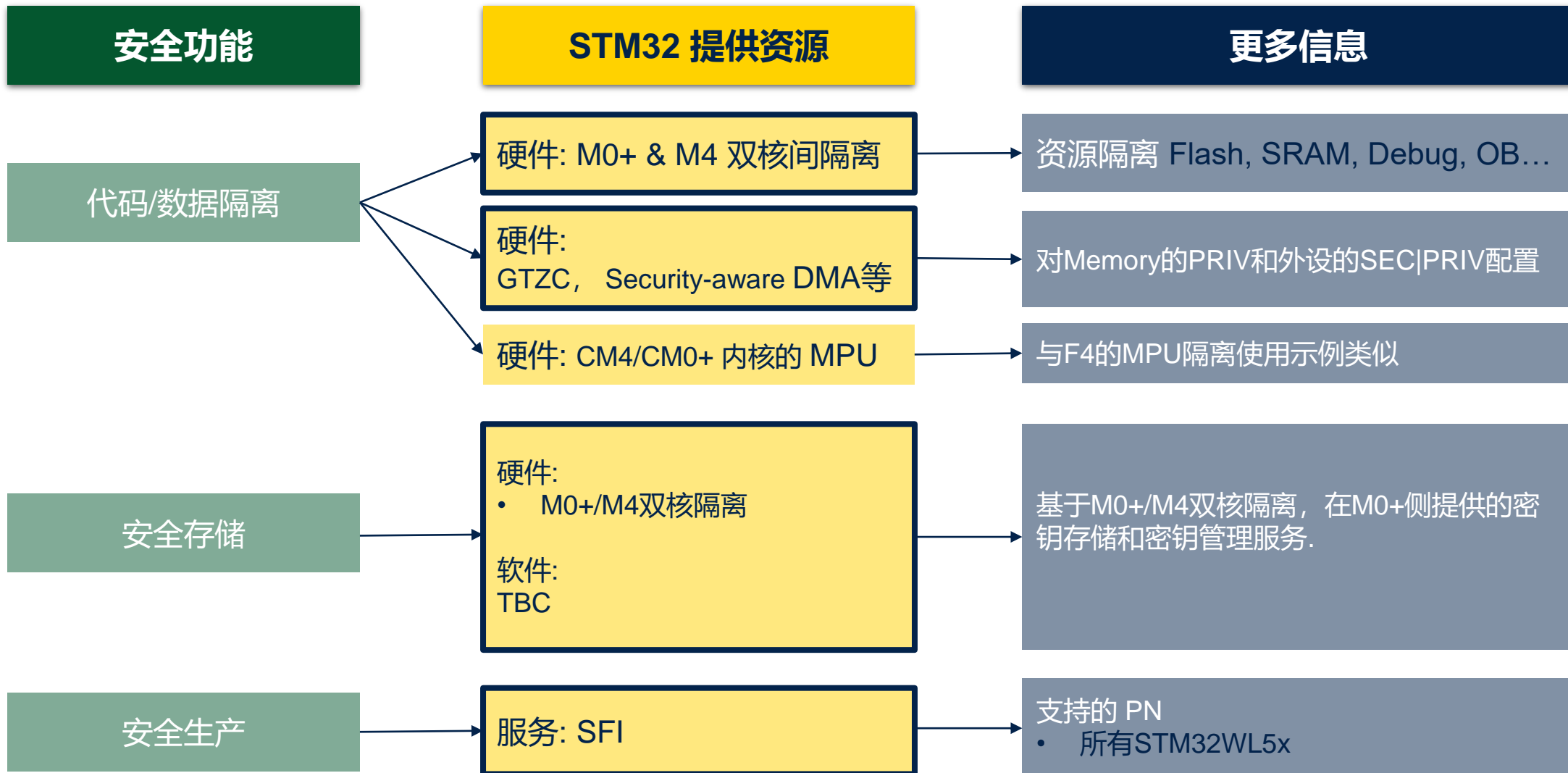
STM32WL提供的主要安全能力(1)



□ 这里仅列出主要功能, 其他未列出的部分请参考 MUC产品相关手册文档以及www.st.com/stm32trust

□  加粗框: WL 增加的或特有的安全特性

STM32WL提供的主要安全能力(2)



STM32 向无线进击



STM32 Wireless Line 中文视频培训

网址:

<https://c.51diantang.com/>



课程名:

STM32WB 新一代无线芯片BLE应用开发和设计

STM32WB设计资料汇总

<https://www.stmcu.com.cn/ecosystem/chip/chipfamily-stm32wb>

《STM32WB 新一代无线芯片BLE应用开发和设计》课程大纲	
上篇	
01. STM32WB 简介	
02. STM32WB 硬件简介	
03. STM32WB 软件简介	
04. GATT 与服务介绍	
05. 使用 STM32CubeMX创建BLE应用	
06. 如何设计BLE应用	

- 全球首款LoRa SOC芯片: STM32WL全新发布
 - <https://www.stmcu.com.cn/video/1519>
- STM32WL单片机的LoRa无线技术
 - <https://www.stmcu.com.cn/video/1472>
- STM32WL在线研讨会和Q&A
 - <https://www.stmcu.com.cn/video/1584>
- 使用STM32WL实现LoRaWAN与多路广播
 - <https://www.stmcu.com.cn/video/1574>

• 更多培训视频正在筹备中.....



STM32 本地化资源

STM32本地化线上平台提供海量信息，各类技术支持服务与多样的技术文档、原厂工程师录制的培训视频等。其中STMCU本地官网与全球官网内容保持同步更新，组织架构更加完善，分类更加清晰。



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edu.china@st.com



STM32 中文官网

[STM32 中文社区](#)

[STM32 21ic论坛](#)



STM32 天猫旗舰店



**STM32
Finder
APP**



从App Store
下载



从应用汇下载



从360手机助手
下载



STM32微信订阅号



STM32微信服务号



STM32视频号



STM32线上视频课程



STM32 Bilibili

Our technology starts with You

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