

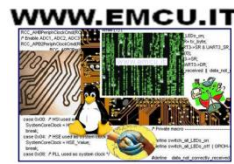


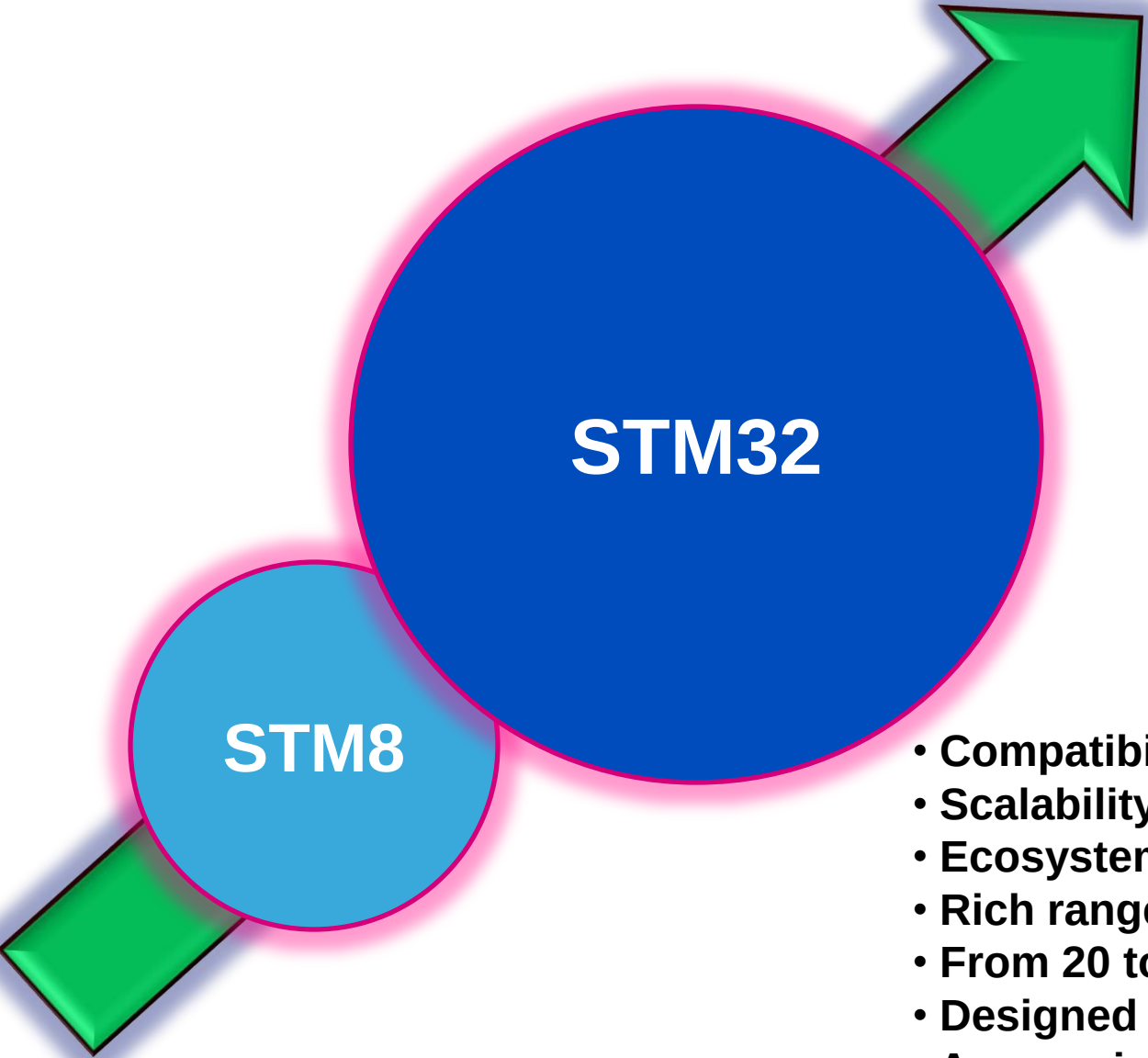
STM MCU Presentation

Apr. 2013



www.emcu.it



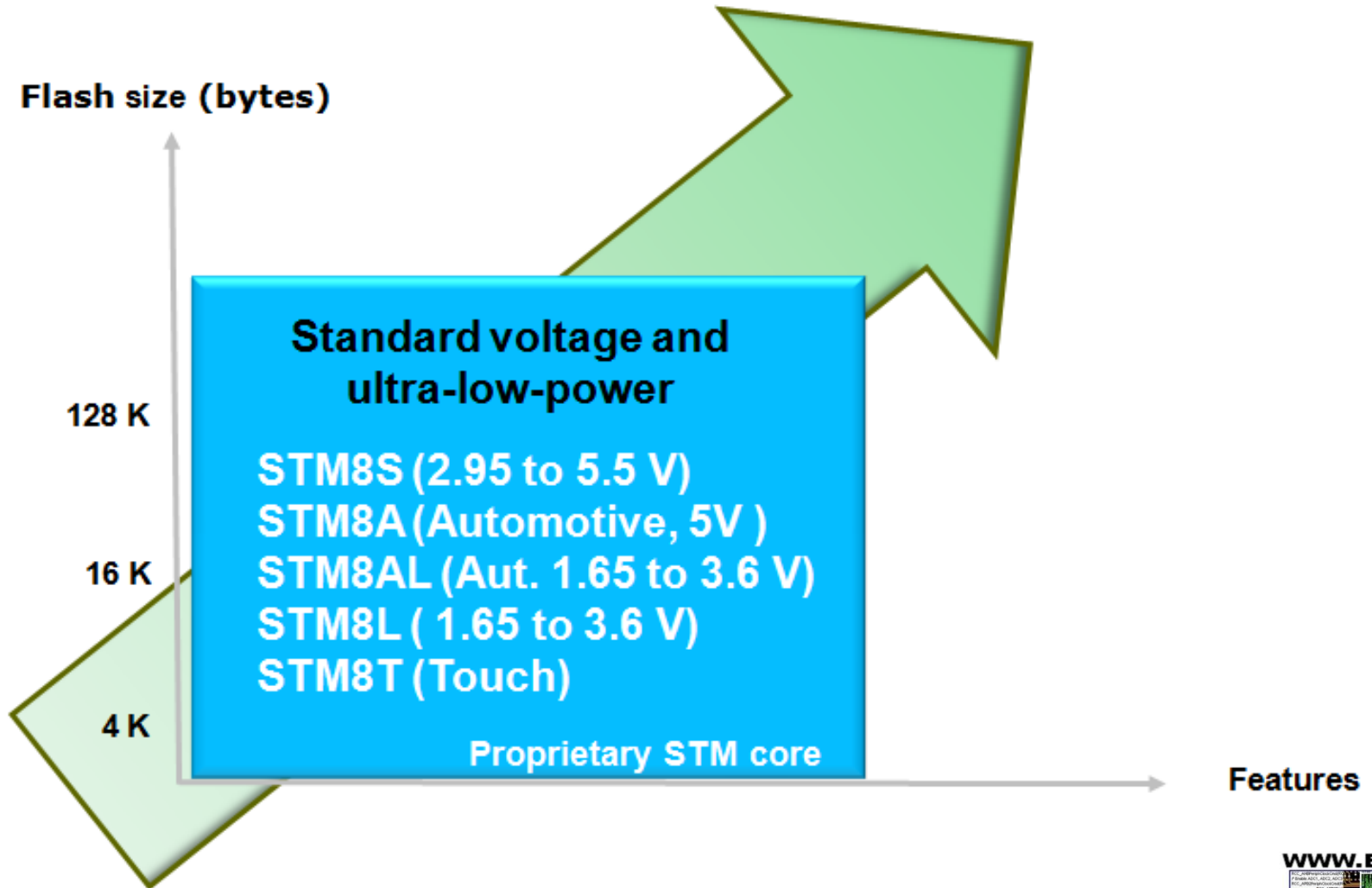


STM32

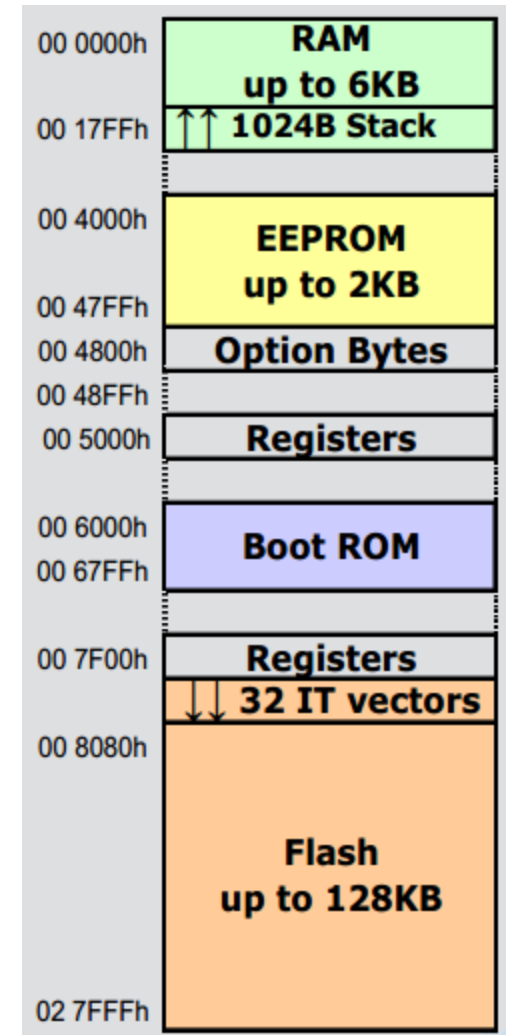
STM8

- Compatibility
- Scalability
- Ecosystem
- Rich range of peripherals
- From 20 to 208 pins
- Designed for industrial applications
- Aggressive pricing

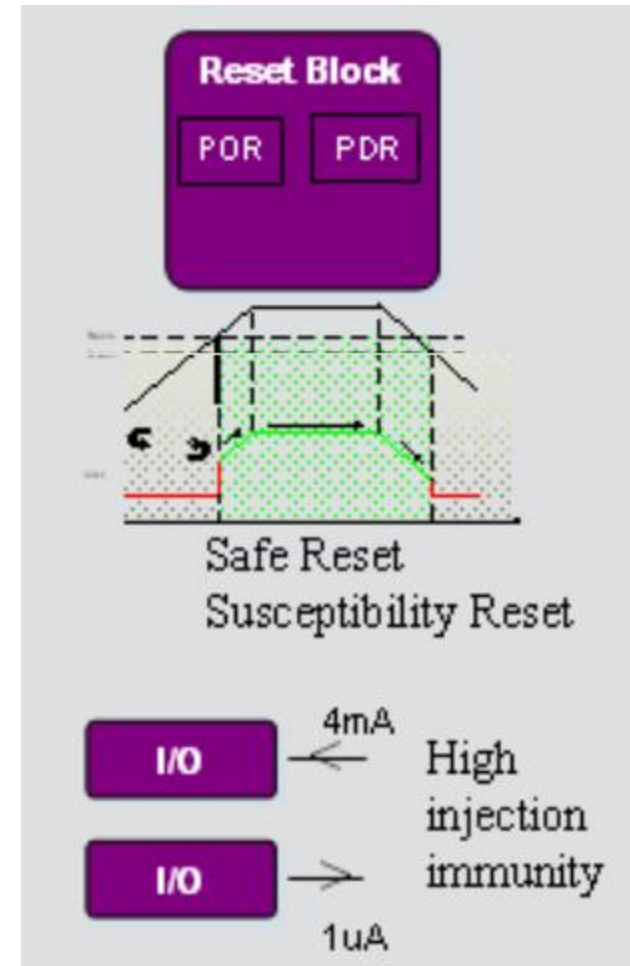
STM8



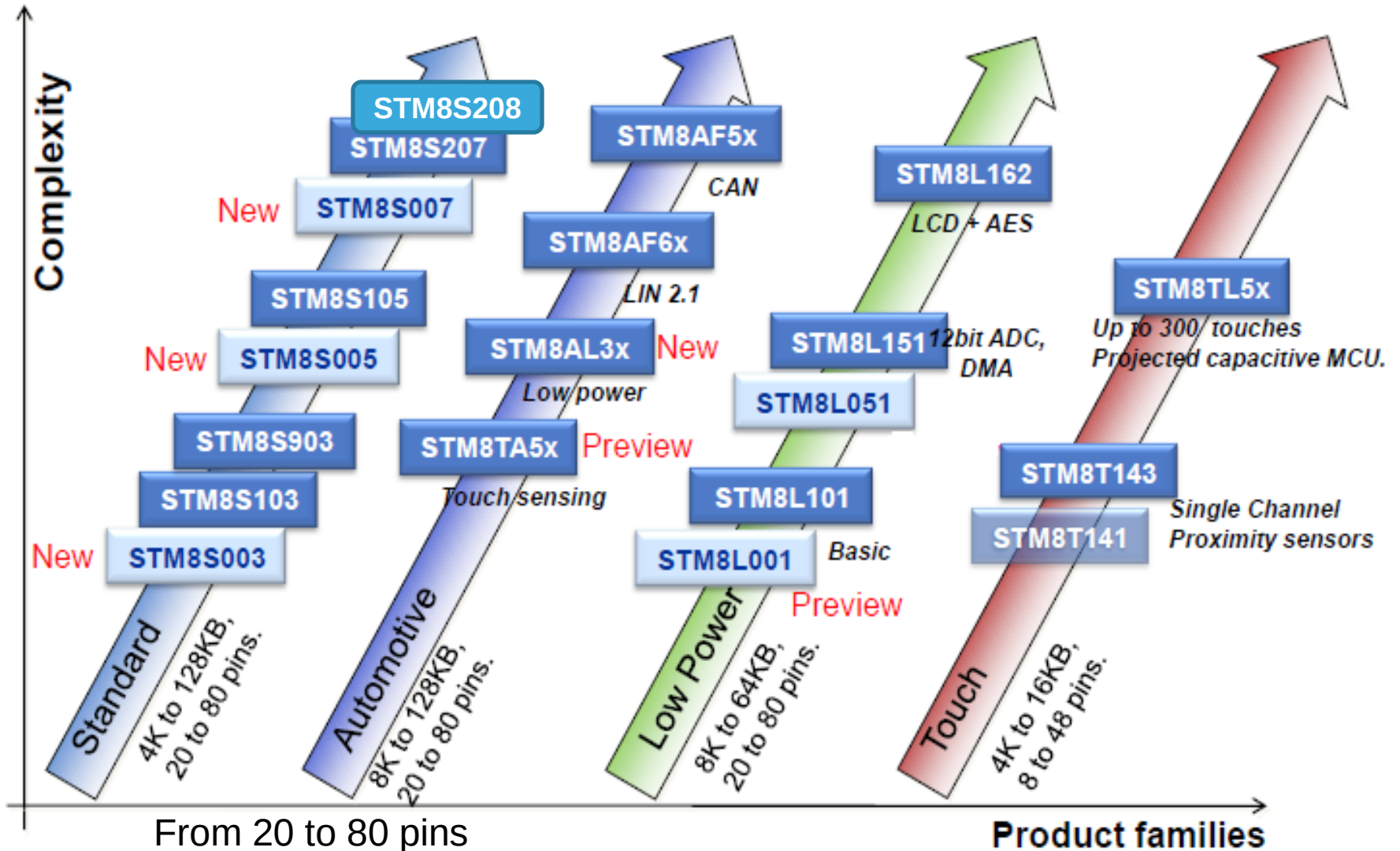
- **Harvard Architecture** - CISC
- **0,25 DMips/Mhz** – similar to some well known 16-bit CPU performance – 6DMips at 24MHz
- **Embedded single wire interface module SWIM** for fast on chip **programming** and **non intrusive debugging** (programming 128K in < 6sec)
- **Boot Loader** from **USART** and **CAN**
- **FLASH** up to 128KB, 10K write/erase cycle
- **RAM** up to 6KB
- **EEPROM** up to 2KB
- In-application programming IAP and in-circuit programming ICP
- **6 bits ECC for 32 data bits** (single error correction)
- **Illegal opcode reset**
- **Signed arithmetic operation** support, 16-bit arithmetic instructions, Division 16/8 and 16/16
- **3 Stage Pipeline**
- **4 DMA** (on STM8L)
- **RTC** (on STM8L)



- **ADC 10bit** on STM8A/S and **12bit** on STM8L
- **DAC 12bit** (on STM8L)
- **LCD 4x28** (on STM8L)
- **2 x WatchDog**
- **Clock & Clock security** system with clock monitor
 - 1...24Mhz Xtal
 - 32,768MHz Xtal(on STM8L)
 - 28KHz Internal RC (on STM8L)
 - 16Mhz Internal RC 1% (trim.)
 - 128KHZ Internal RC
 - External clock input
- Integrated **Power On Reset (POR)**
- **Power Down Reset (PDR)**
- **Low voltage detector (LVD)**
- Interrupt management
 - Nested interrupt controller with 32 interrupts
 - Up to 37 external interrupts on 6 vectors



STM8 Product Lines



From 20 to 80 pins

From 4K to 128KFlash

From 512byte to 2KEEPROM

STM8 development tools

A wide choice of solutions.

starter kits Numerous boards



STM8L101-EVAL
STM8L1526-EVAL



STM8/128-EVAL



STM8-SK/RAIS



ST-ICE

STM8 promotion kits



STM8L-PRIMER



STM8S-DISCOVERY
STM8L-DISCOVERY
STM8SVLDiscovery



STM8/128_MCKIT



ST-LINK

IDE solutions



STVD



EWSTM8



RIDE (*)



IDEA

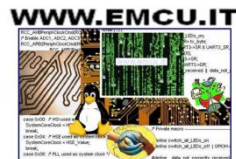
(*) up to 32 KB C compiler free of charge

Software/Hardware solution providers



STM32® Series Presentation

April 2013



For those unfamiliar with the family CORTEX we give some preliminary clarifications. In general, the main features of ARM core are:

- Core 32bit
- RISC architecture
- Excellent relations DMips/Watt

Some years ago, ARM has launched a new generation of its core identified by the name: **CORTEX**

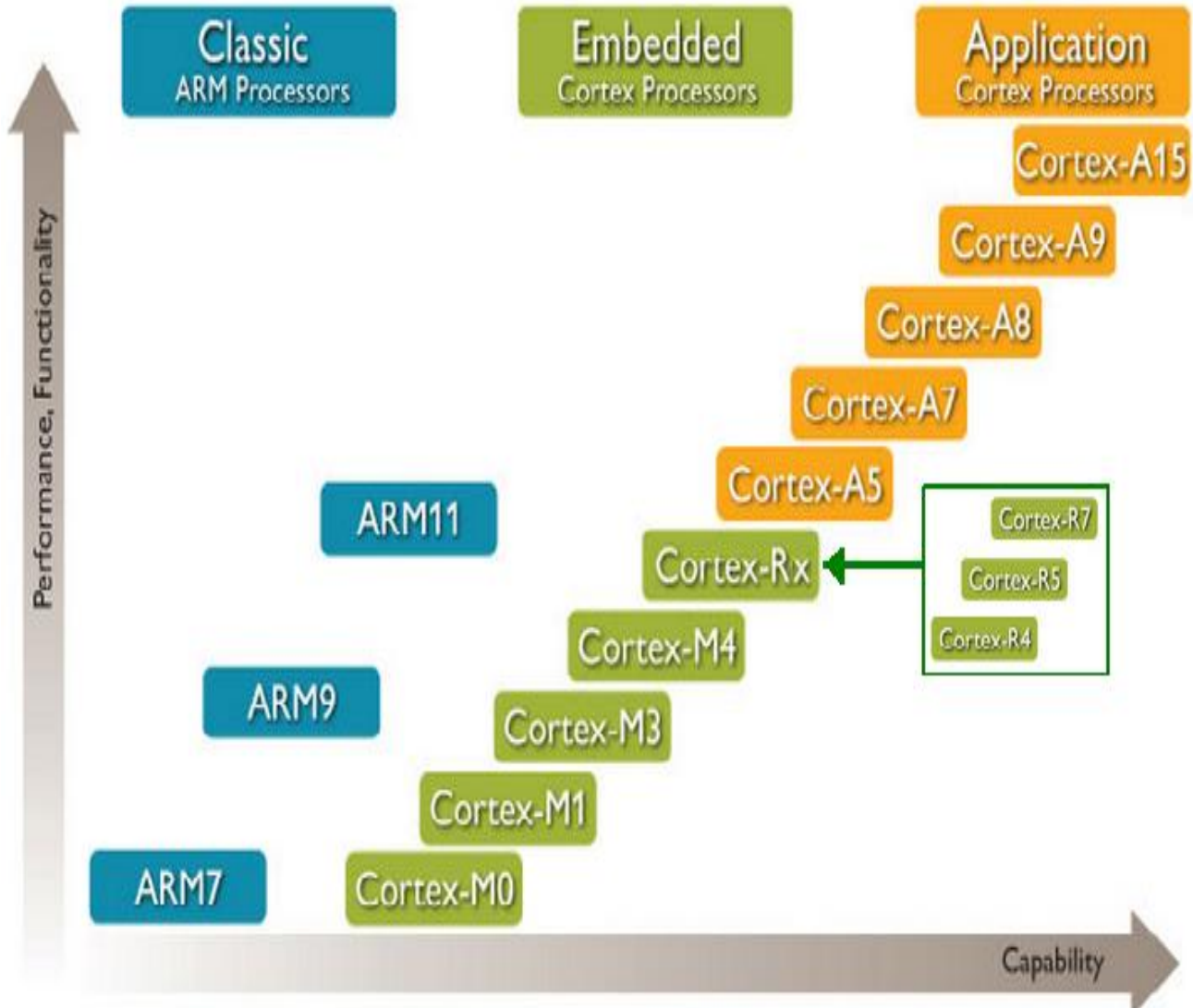
The family is divided into three subfamilies:

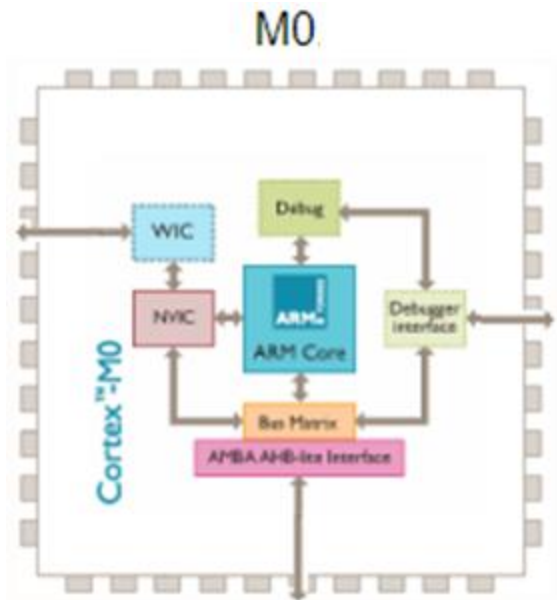
CORTEX Ax
CORTEX Rx
CORTEX Mx

The **x** identifies in detail the core.

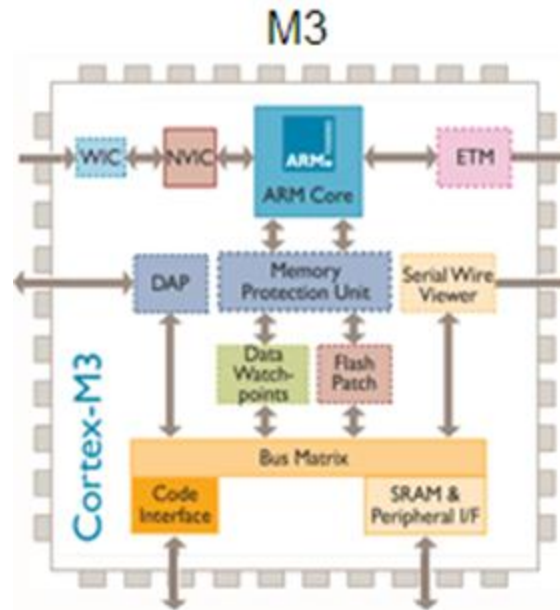


WWW.EMCU.IT

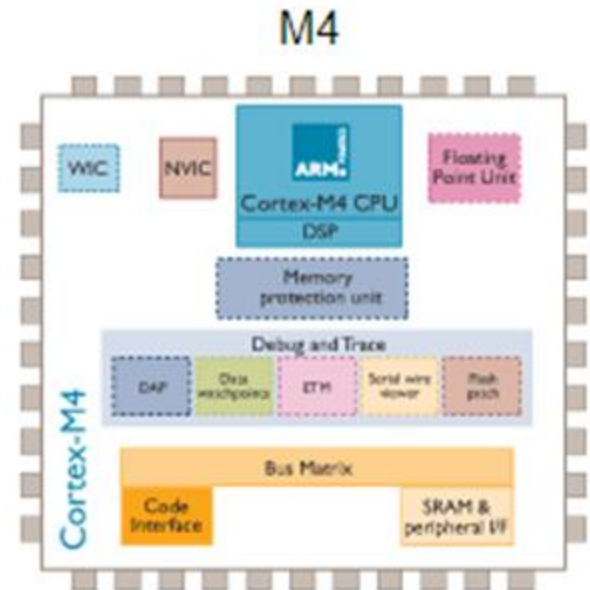




Von Neumann Architecture
0,9 DMIPS



Harvard Architecture
1,25 DMIPS



Harvard Architecture
1,25 DMIPS + DSP + FP

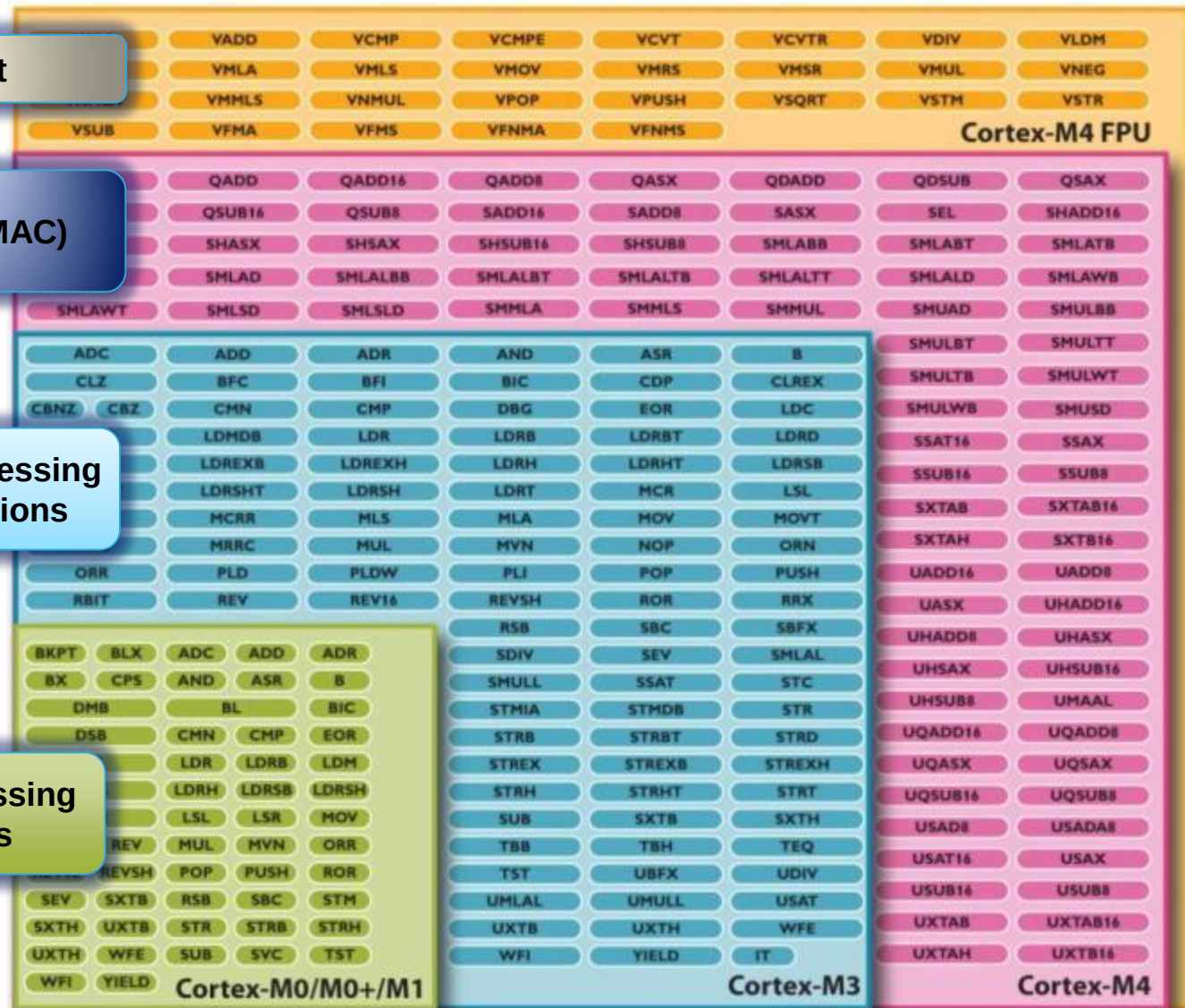
Powerful & scalable instruction set

Floating Point

DSP (SIMD, fast MAC)

Advanced data processing
Bit field manipulations

General data processing
I/O control tasks



Cortex-M feature set comparison

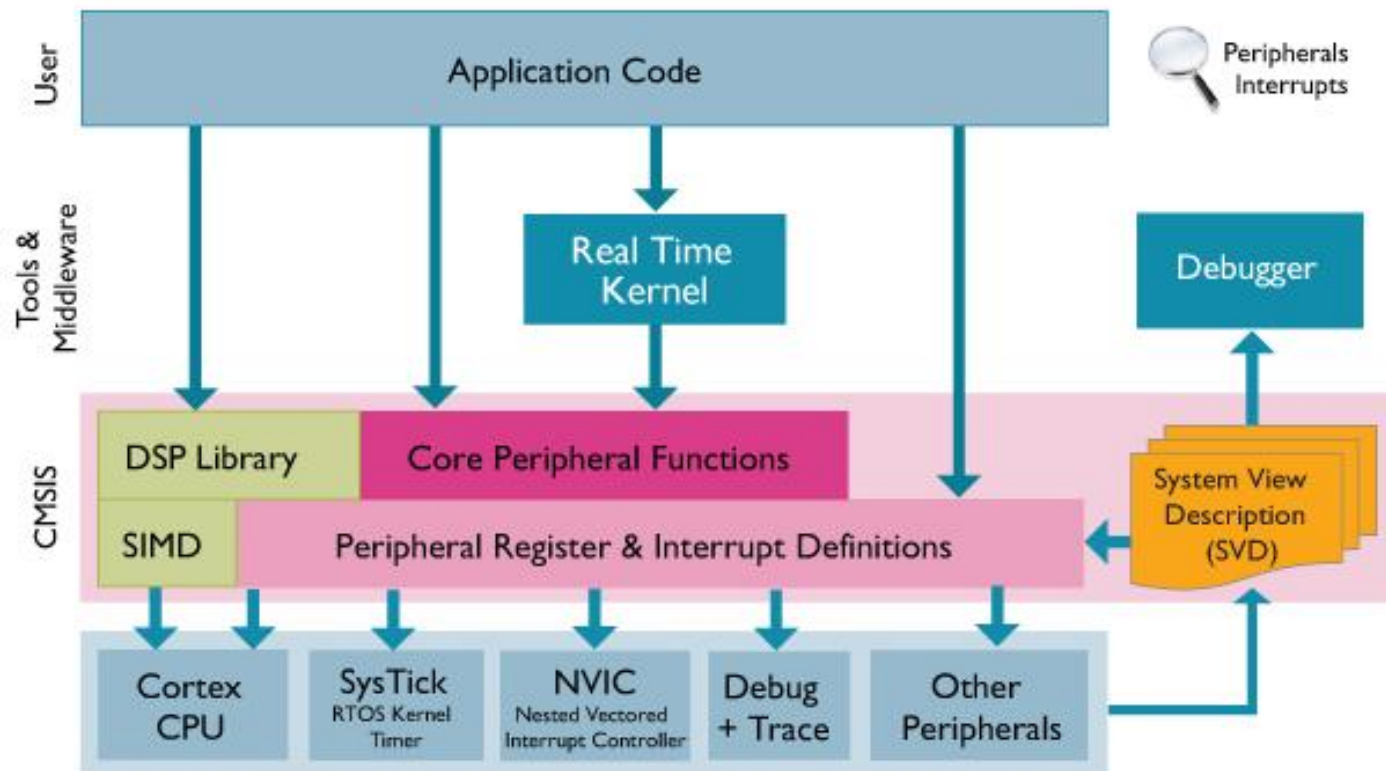
 Low-Power Leadership from ARM	Cortex-M0	Cortex-M3	Cortex-M4
Architecture Version	V6M	v7M	v7ME
Instruction set architecture	Thumb, Thumb-2 System Instructions	Thumb + Thumb-2	Thumb + Thumb-2, DSP, SIMD, FP
DMIPS/MHz	0.9	1.25	1.25
Bus interfaces	1	3	3
Integrated NVIC	Yes	Yes	Yes
Number interrupts	1-32 + NMI	1-240 + NMI	1-240 + NMI
Interrupt priorities	4	8-256	8-256
Breakpoints, Watchpoints	4/2/0, 2/1/0	8/4/0, 2/1/0	8/4/0, 2/1/0
Memory Protection Unit (MPU)	No	Yes (Option)	Yes (Option)
Integrated trace option (ETM)	No	Yes (Option)	Yes (Option)
Fault Robust Interface	No	Yes (Option)	No
Single Cycle Multiply	Yes (Option)	Yes	Yes
Hardware Divide	No	Yes	Yes
WIC Support	Yes	Yes	Yes
Bit banding support	No	Yes	Yes
Single cycle DSP/SIMD	No	No	Yes
Floating point hardware	No	No	Yes
Bus protocol	AHB Lite	AHB Lite, APB	AHB Lite, APB
CMSIS Support	Yes	Yes	Yes

CMSIS means: **Cortex Microcontroller Software Interface Standard**
CMSIS is a vendor-independent hardware abstraction layer
for the Cortex-M processor series.

CMSIS

The CMSIS enables consistent and simple software **interfaces** to the **processor** and the **peripherals**, **simplifying software re-use**, reducing the learning curve for new microcontroller developers and reducing the time to market for new devices.

Creation of software is acknowledged as a major cost factor by the embedded industry. By standardizing the software interfaces across all Cortex-M silicon vendor products, this cost is significantly reduced, especially when creating new projects or migrating existing software to a new device.



SILICA
An Arm Company



6 product series

- Compatibility
- Scalability – Pin to Pin from F0 to F4
- Ecosystem
- Rich range of peripherals
- From 20 to 208 pins
- Designed for industrial applications
- Aggressive pricing

M4 +
TFT controller
High Performances

M4 +
rich analog
peripherals



@180 MHz
225 DMIPS



@ 72 MHz
63 DMIPS
94 DMIPS from CCM-SRAM



@120 MHz
150 DMIPS

M3 High Performances



@24 MHz
30 DMIPS @72 MHz
61 DMIPS

M3



@33 MHz
33 DMIPS

M3 Ultra Low Power



@48MHz
38 DMIPS

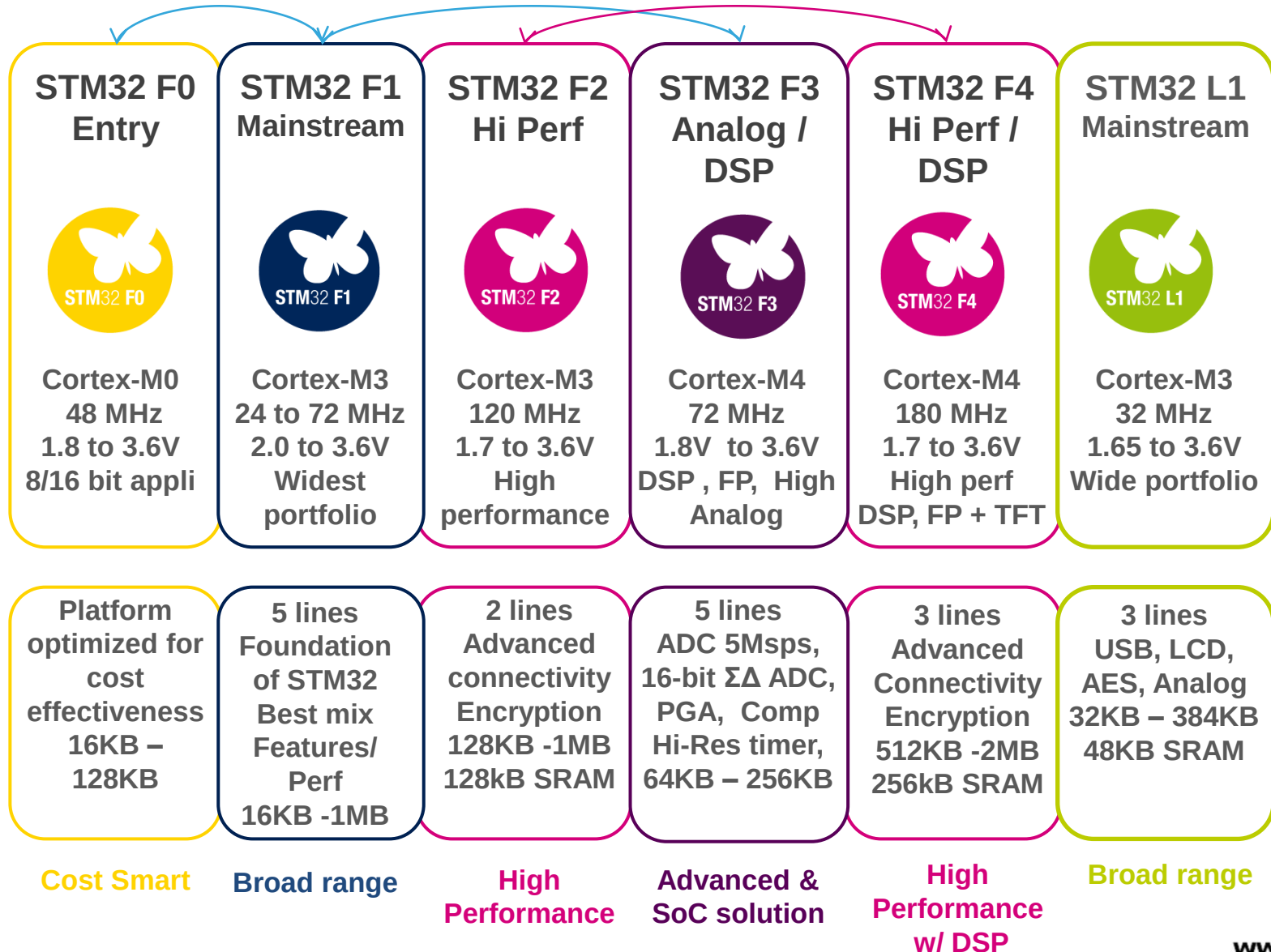
@24MHz
22 DMIPS

M0 Ultra Low Cost

@24MHz
6 DMIPS



STM32F Complete offer



STM32 – 6 product series

Common core peripherals and architecture:

Communication peripherals: USART, SPI, I ² C
Multiple general-purpose timers
Integrated reset and brown-out warning
Multiple DMA
2x watchdogs
Real-time clock
Integrated regulator PLL and clock circuit
External memory interface (FSMC)
Up to 3x 12-bit DAC
Up to 4x 12-bit ADC (Up to 5 MSPS)
Main oscillator and 32 kHz oscillator
Low-speed and high-speed internal RC oscillators
-40 to +85 °C and up to 105 °C operating temperature range
Low voltage 2.0 to 3.6 V or 1.65/1.7 to 3.6 V (depending on series)
Temperature sensor

STM32 F4 series - High performance with DSP (STM32F405/415/407/417)

168 MHz Cortex-M4 with DSP and FPU	Up to 192-Kbyte SRAM	Up to 1-Mbyte Flash	2x USB 2.0 OTG FS/HS	3-phase MC timer	2x CAN 2.0B	SDIO 2x I ² S audio Camera IF	Ethernet IEEE 1588	Crypto/ hash processor and RNG
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**+ STM32F4-TFT
STM32F42x/43x**

STM32 F3 series - Mixed-signal with DSP (STM32F302/303/313/372/373/383)

72 MHz Cortex-M4 with DSP and FPU	Up to 48-Kbyte SRAM & CCM-SRAM	Up to 256-Kbyte Flash	USB 2.0 FS	2x 3-phase MC timer (144 MHz)	CAN 2.0B	Up to 7x comparator	3x 16-bit $\Sigma\Delta$ ADC	4x PGA
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STM32 F2 series - High performance (STM32F205/215/207/217)

120 MHz Cortex-M3 CPU	Up to 128-Kbyte SRAM	Up to 1-Mbyte Flash	2x USB 2.0 OTG FS/HS	3-phase MC timer	2x CAN 2.0B	SDIO 2x I ² S audio Camera IF	Ethernet IEEE 1588	Crypto/ hash processor and RNG
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STM32 F1 series - Mainstream - 5 product lines (STM32F100/101/102/103 and 105/107)

Up to 72 MHz Cortex-M3 CPU	Up to 96-Kbyte SRAM	Up to 1-Mbyte Flash	USB 2.0 OTG FS	3-phase MC timer	Up to 2x CAN 2.0B	SDIO 2x I ² S audio	Ethernet IEEE 1588	STM32 F1
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STM32 F0 series – Entry level (STM32F050/051)

48 MHz Cortex-M0 CPU	Up to 12-Kbyte SRAM	Up to 128-Kbyte Flash	3-phase MC timer	Comparator	CEC
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F052 USB dev. & CAN

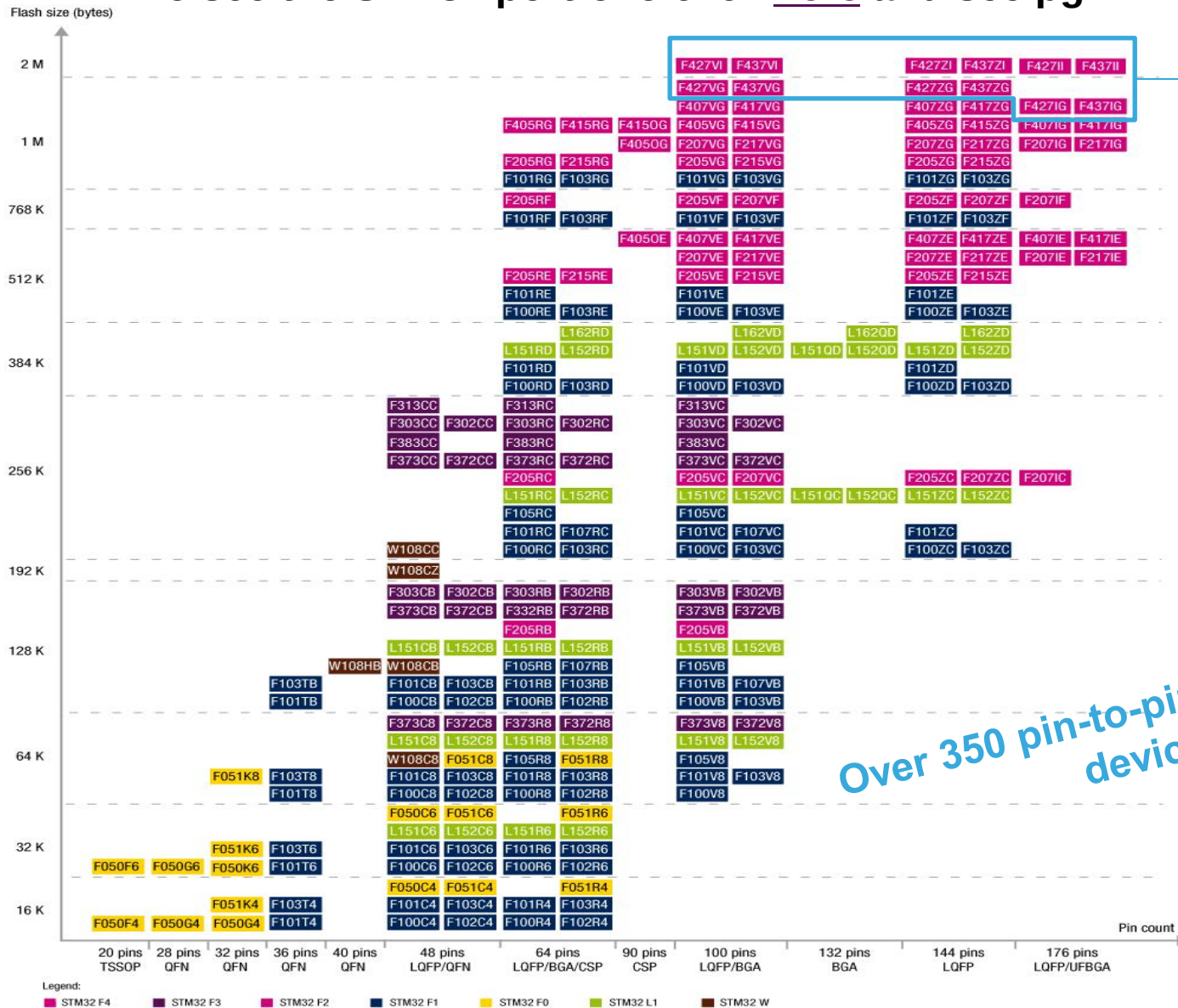
STM32 L1 series - Ultra-low-power (STM32L151/152/162)

32 MHz Cortex-M3 CPU	Up to 48-Kbyte SRAM	Up to 384-Kbyte Flash	USB FS device	Up to 12-Kbyte EEPROM	LCD 8x40 4x44	Comparator	BOR MSI VScal	AES 128-bit
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STM32 – leading portfolio *in production*

To see the STM32 portfolio click [here](#) and see pg2.



NEW 2 MB

Over 350 pin-to-pin compatible devices



WWW.EMCU.IT



What should I use to develop on STM32 ? - [See here](#)

STM32 tools

Starter and promotion kits Numerous boards



Motor control kit



Evaluation boards:
STM320518-EVAL, STM3240G-EVAL,
STM32L152D-EVAL and
STM32373C-EVAL



STM32 W evaluation kit
STM32W-SK

STM32 promotion kits



EvoPrimer



STM32-ComStick



5 Discovery kits

More than 15 different development IDE solutions



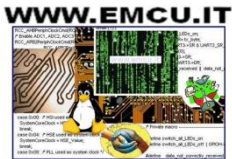
ST-LINK-v2
for STM8
and STM32



More than 25 different RTOS and stack solution providers



STM32 EcoSystem

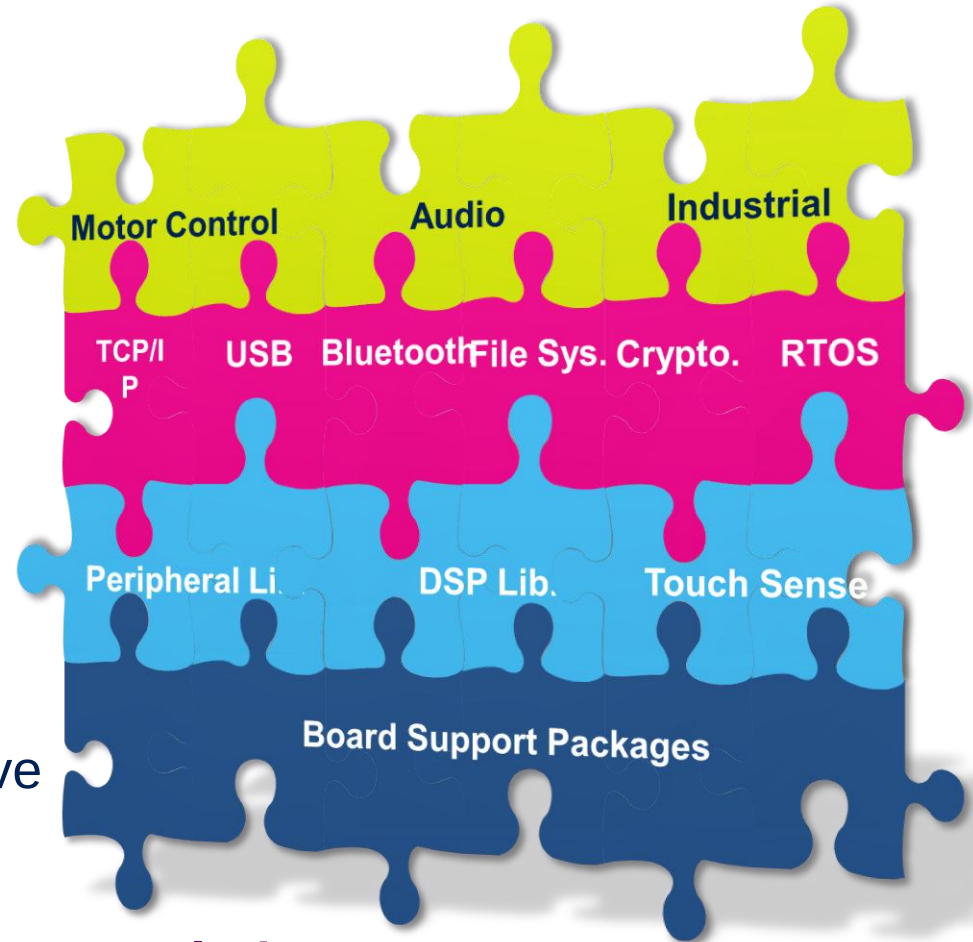


SW Libraries Speed Time-to-Market

- Free STM32 Standard peripheral libraries
 - C source code for easy implementation of all STM32 peripherals and **Class B-ready** compliant



- Free STM32 Infra-red software
- Free STM32 CEC software
- Free RTOS
- USB (Dev./OTG)
- File System (FatFS)
- STM every day works to improve the STM32 EcoSystem
- STM32-STM8 embedded software solutions

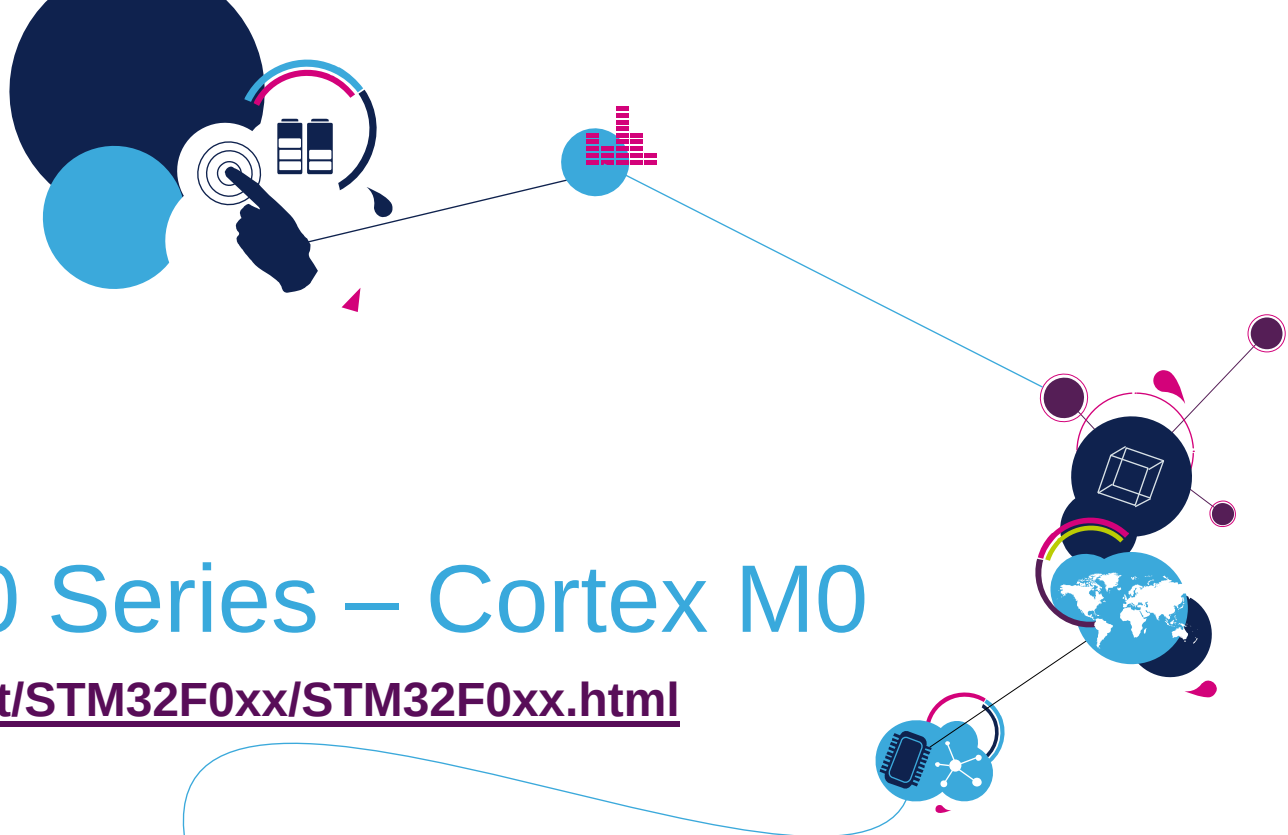


Java platform



Microsoft .NET Micro Framework platform





STM32 F0 Series – Cortex M0

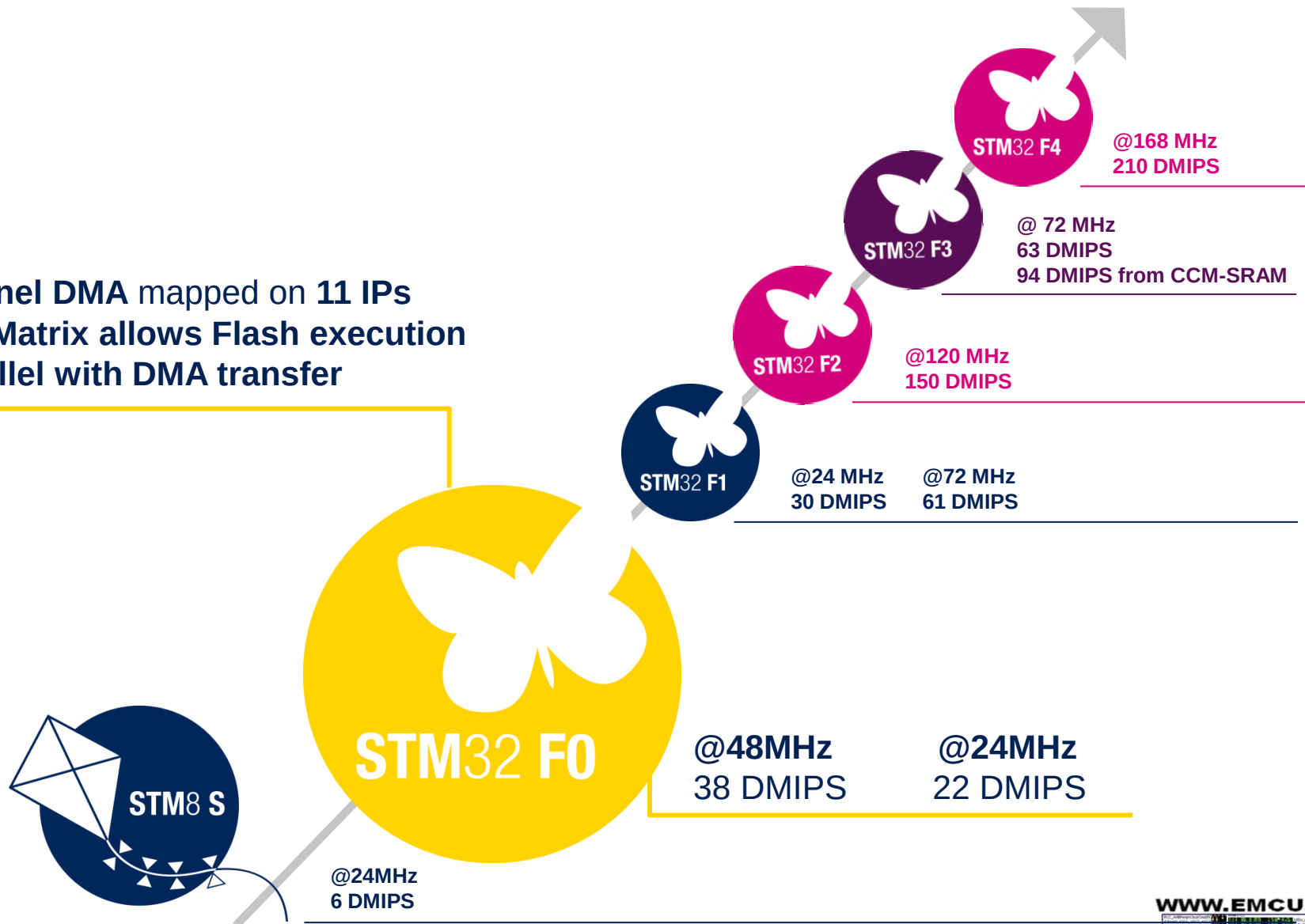
<http://www.emcu.it/STM32F0xx/STM32F0xx.html>



Real-Time Performance



5 channel DMA mapped on 11 IPs
+ Bus Matrix allows Flash execution
in parallel with DMA transfer



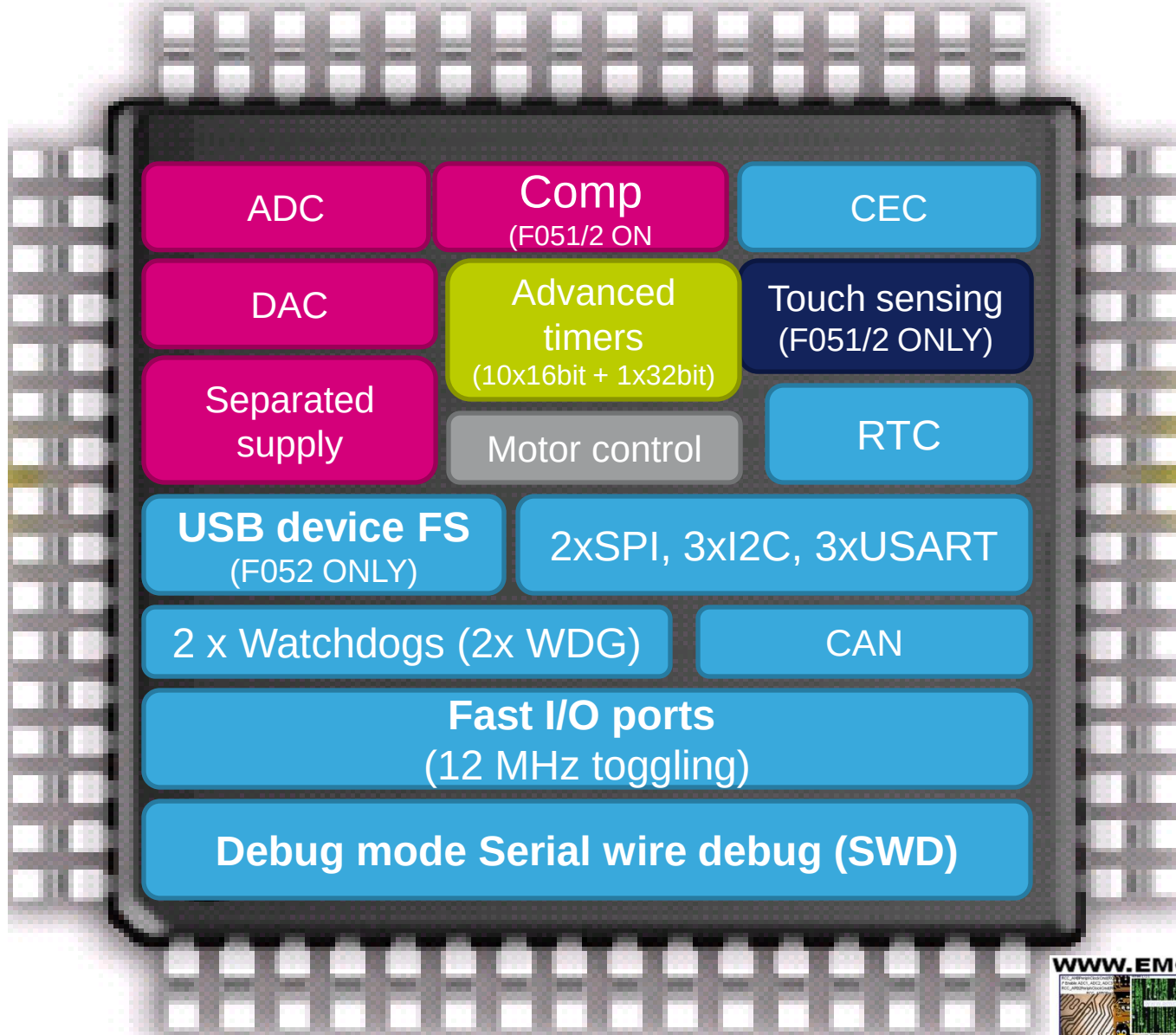
STM32F050/1/2

- **Core**
 - Low cost-low power ARM® Cortex™-M0 0.9 DMIPS/MHz at 48 MHz max
- **Enhanced features for appliances, consumer and industrial**
 - **10 x 16-bit timers (IC/OC/PWM)** including **Motor Control Timer**, fast 1.0 μ s
 - **1 x 32-bit timer** each with **4 IC/OC/PWM**
 - **Fast GPIO (12MHz toggling) + programmable slew rate**
 - **12-bit ADC, 12-bit DAC, Comparators**
 - **HDMI Consumer Electronic Control (CEC)** hardware function
 - **5-channel DMA** controller
 - **VBAT** supply for **RTC** and backup registers - with alarm and periodic wakeup from Stop/Standby
 - **1 x CAN** (H2/2013)
- **Comm**
 - **4 x USART** (6Mbit) with **wakeup from STOP** and baud rate programming independently from CPU frequency
 - **2 x SPI** with 4-16 bit programmable data frame and baud rate up to 24Mbps
 - **3 x I²C** Fast mode + **up to 1Mbps** with **wake-up from STOP** mode on **address match** and **programmable analog and digital noise filtering**
 - **USD device** (H2/2013)
- **Touch-sensing**
 - Up to 18 keys - Key, slider and wheel

Innovative Peripheral



- From **8**-Kup to 64-Kbyte Flash with extension up to 128/256 KFlash
- From **20**-pin to 64-pin packages with extension to **100**-pin packages



Extensive Tools and SW



- Evaluation board for full product feature evaluation
 - Hardware evaluation platform for all interfaces
 - Possible connection to all I/Os and all peripherals
- Discovery kit for cost-effective evaluation and fast prototyping



STM320518-EVAL



STM32F0DISCOVERY

More than **15** different development IDE solutions

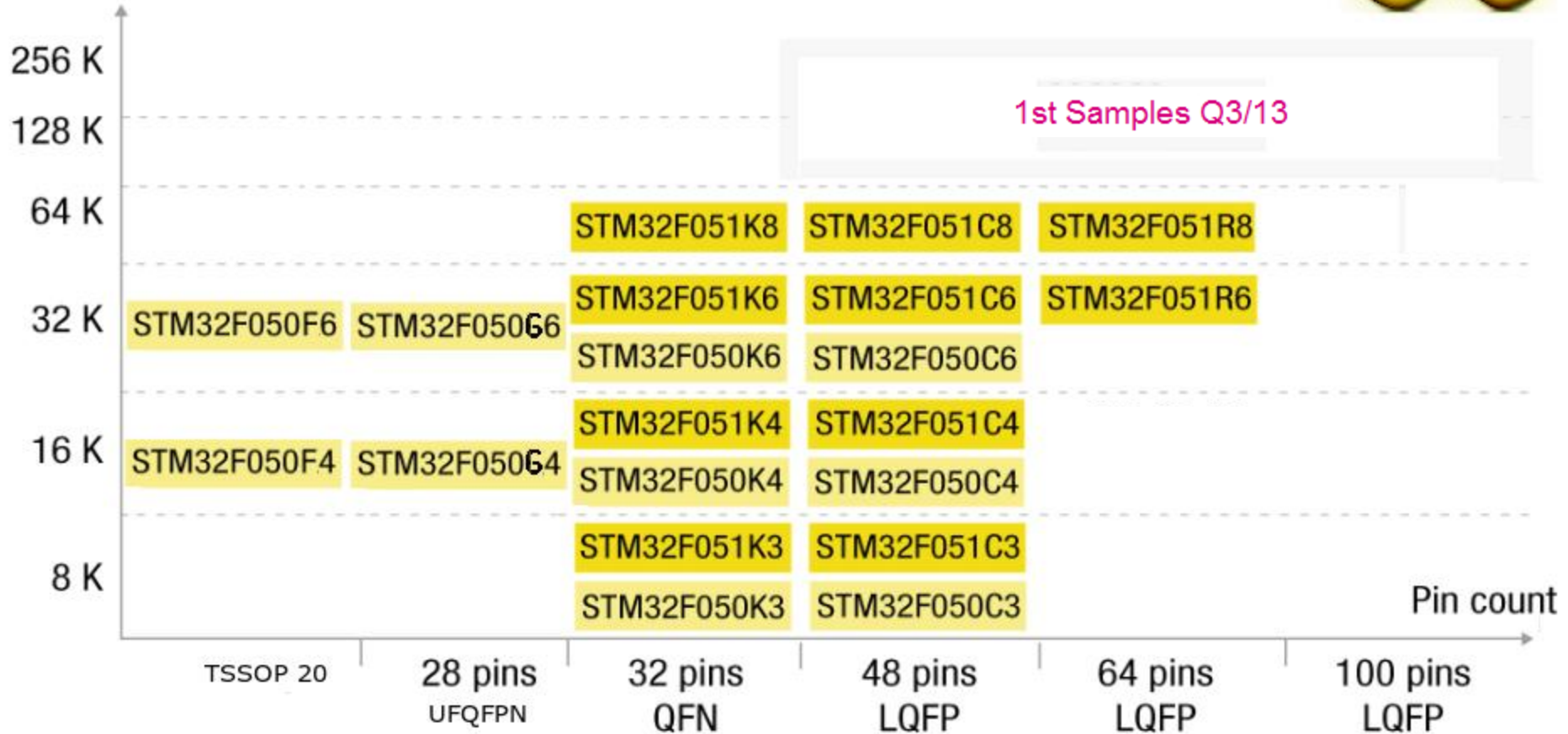
More than **25** different RTOS and stack solution providers



STM32 F0 Portfolio

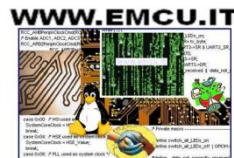


Flash size (bytes)



STM32 F1 Series – Cortex M3

<http://www.emcu.it/STM32.html>



STM32F1 series Product Lines

All lines include:

Multiple communication peripherals
Up to 5 x USART, 3xSPI, 2xI²C

ETM*

FSMC**

Dual 12-bit DAC***

Multiple 16-bit Timers

Main Osc 4-16MHz (25MHz on 105/107)

Internal 8 MHz RC
and 40 kHz RC

Real Time Clock with Battery
domain & 32KHz ext osc

2 x Watchdogs

Reset circuitry and
Brown Out Warning

Up to 12 DMA cnls



Connectivity Line: STM32F107

72MHz
CPU

Up to 256 KB
Flash /
64KB SRAM

2x12-bit ADC
(1µs)
TempSensor

USB 2.0
OTG (FS)

2 x Audio
Class I2S

2 x CAN

PWM
timer

Ethernet
IEEE158
8

Connectivity Line: STM32F105

72MHz
CPU

Up to 256 KB
Flash /
64KB SRAM

2x12-bit ADC
(1µs)
TempSensor

USB 2.0
OTG (FS)

2 x Audio
Class I2S

2 x CAN

PWM
timer

Performance Line: STM32F103

72MHz
CPU

Up to 1MB
Flash /
96KB SRAM

2/3x12-bit ADC
(1µs)
TempSensor

USB-FS
Device

SDIO*

I2S*

CAN

PWM
timer

USB Access Line: STM32F102

48MHz
CPU

Up to 128KB
Flash / 16KB
SRAM

1x12-bit ADC
(1µs)
Temp sensor

USB-FS
Device

Access Line: STM32F101

36MHz
CPU

Up to 1MB
Flash / 80KB
SRAM

1x12-bit ADC
(1µs)
Temp sensor

Value Line: STM32F100

24MHz
CPU

Up to 512KB
Flash / 32KB
SRAM

1x12-bit ADC
(1.2µs)
Temp sensor

HDMI-
CEC

PWM
timer

* Performance/Access Lines 256KB, 384KB, or 512KB devices and ALL Connectivity devices

** 256KB, 384KB, or 512KB Performance and Access devices

*** 256KB, 384KB, or 512KB devices except Value line where present on all memory range

STM32F1 series Product Lines

- **Core**
 - Power ARM® Cortex™-M3 1,25 DMIPS/MHz at 72 MHz max
- Enhanced features for appliances, consumer and industrial
 - **17 x 16-bit timers (IC/OC/PWM)** including **Motor Control Timer**
 - **Fast GPIO (18MHz toggling) + programmable slew rate**
 - 12-bit **ADC** (21ch), 12-bit **DAC** (2ch)
 - **HDMI Consumer Electronic Control (CEC)** hardware function
 - 12-channel **DMA** controller
 - VBAT supply for **RTC** and backup registers - with alarm and periodic wakeup from Stop/Standby
- **Comm**
 - **5 x USART** (6Mbit - (ISO 7816 interface, LIN, IrDA capability, modem control) and **2 x UART**
 - **3 x SPI** up to 18Mbps
 - **3 x I²C** interfaces (SMBus/PMBus)
 - **2 x I²S**
 - **1 x Ethernet MAC** 10/100
 - **2 x CAN** – 2.0B Active

STM32 Discovery kit

- Development Toolchain support

- **Atollic TrueSTUDIO®**
- **IAR EWARM**
- **KEIL MDK-ARM**
- **GCC**



ST-LINK

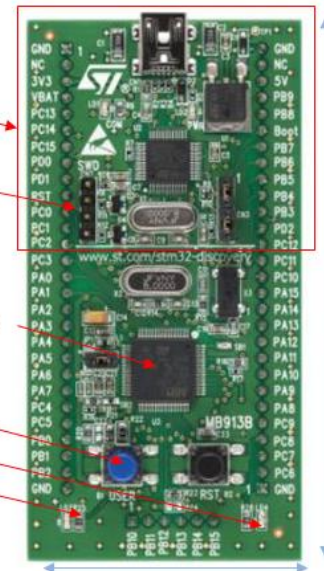
SWD connector

STM32F100RBT6B

User button

Led Blue

Led Green



84mm

42mm



- Eva Board are here:

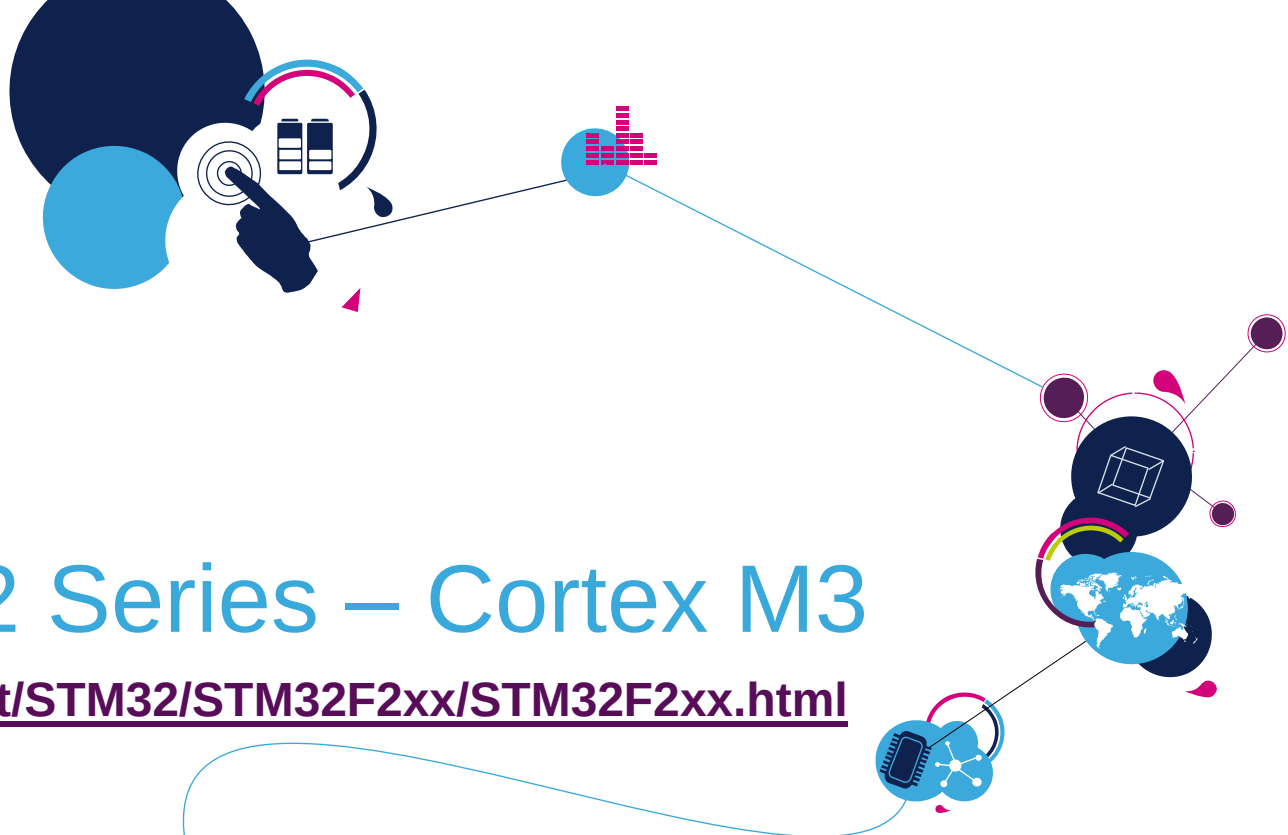
http://www.emcu.it/STM32.html#Evaluation_Boards

- **What should I use to develop on STM32 ?**

- Large number of software examples available at:

www.st.com/stm32-discovery

http://www.emcu.it/STM32.html#TUTORIAL_and_SW_examples



STM32 F2 Series – Cortex M3

<http://www.emcu.it/STM32/STM32F2xx/STM32F2xx.html>



STM32 F-2 Series highlights

- Advanced technology and process from ST:
 - Memory accelerator: **ART Accelerator™**
 - Multi AHB Bus Matrix
 - 90nm process
- Outstanding results:
 - 150DMIPS at 120MHz
 - **Execution from Flash equivalent to 0-wait state** performance
 - Outstanding dynamic power consumption: **188uA/MHz**, less than 23mA in run mode from flash at 120MHz with peripherals OFF (running CoreMark benchmark).



STM32 F-2 Series highlights 2/2

- More Memory
 - Up to 1MB Flash, up to 128kB SRAM
- New peripherals in the STM32 platform
 - USB OTG High speed **480Mbit/s**
 - **Camera interface**
 - **Crypto/hash processor**
 - 32-bit random number generator (**RNG**)
 - 32-bit RTC with calendar
 - **32bit Timers**

STM32 F-2 Series product lines

6x USART, 3x SPI, 3x I ² C
2x CAN
Multiple 16-bit and 32-bit timers
2x advanced timers
Dual DAC
EMI
2x PS
MPU
ETM with JTAG fuse security
Main 8-26 MHz oscillator
Internal 16 MHz (1 %) and 32 kHz RC oscillators
Real-time clock
4-Kbyte battery backed up SRAM
2x watchdogs
Reset circuitry
Up to 16-channel DMA
80 % GPIO ratio, up to 60 MHz
3x 12-bit ADC 2 MSPS
Temperature sensor
1.65 ³ to 3.6 V V _{DD}

+

STM32F207/217

120 MHz CPU	Up to 128-Kbyte SRAM	Up to 1-Mbyte Flash	USB 2.0 OTG FS/HS ¹	USB 2.0 OTG FS	Camera interface	SDIO	RNG	Crypto/hash processor ²	Ethernet IEEE 1588
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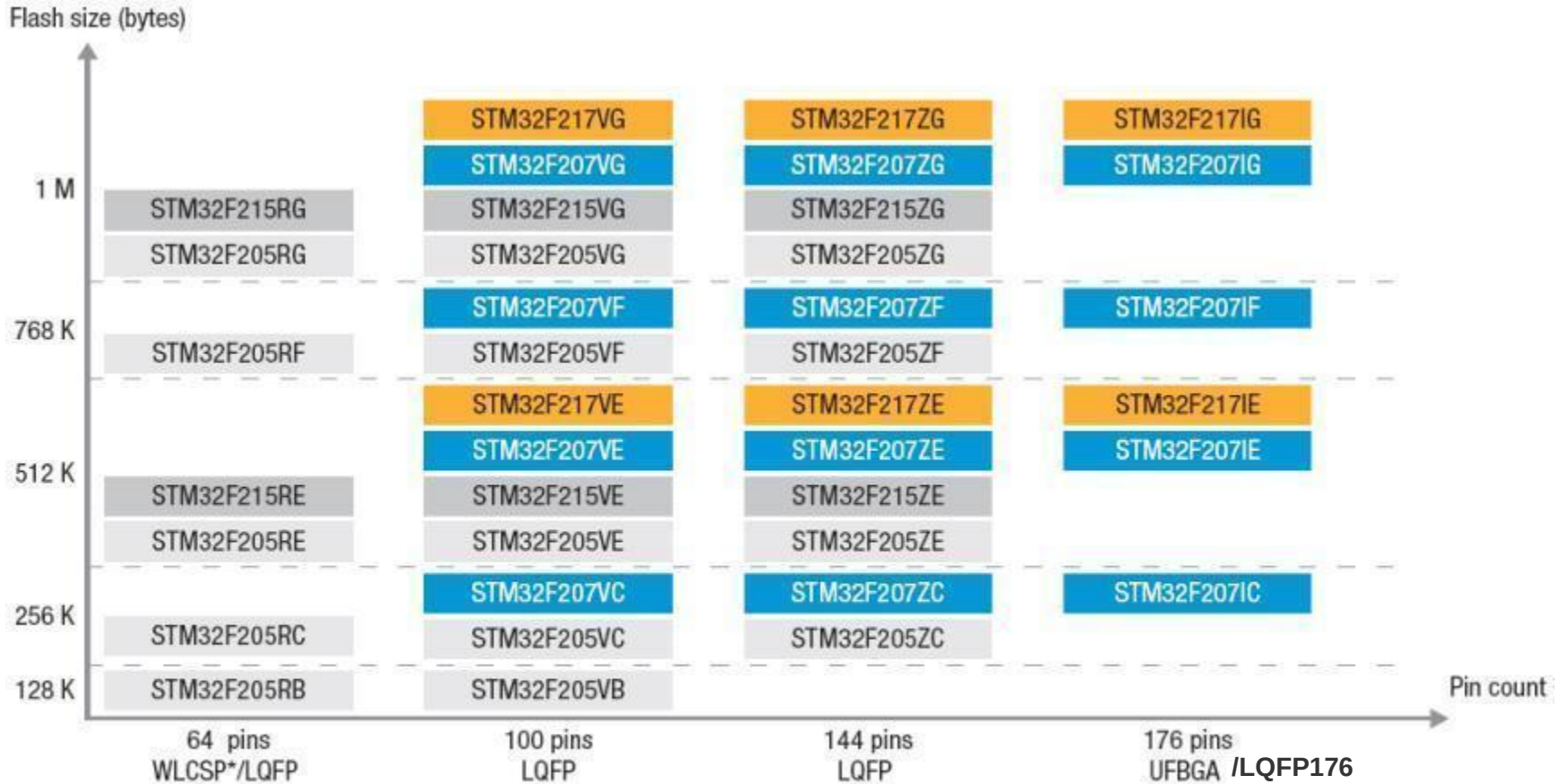
STM32F205/215

120 MHz CPU	Up to 128-Kbyte SRAM	Up to 1-Mbyte Flash	1x USB 2.0 OTG FS/HS ¹	SDIO	RNG	Crypto/hash processor ²
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Notes:

1. HS requires an external PHY connected to ULPI interface
2. Crypto/hash processor on STM32F217x and STM32F215x
3. 1.65 V for WLCSP64 package only and 1.8 V for all other packages

STM32 F-2 series portfolio



Note:
For STM32F205RGY6 and
STM32F205REY6 only

Legend:

■ STM32F207

Ethernet, 2x USB OTG, camera interface

■ STM32F217

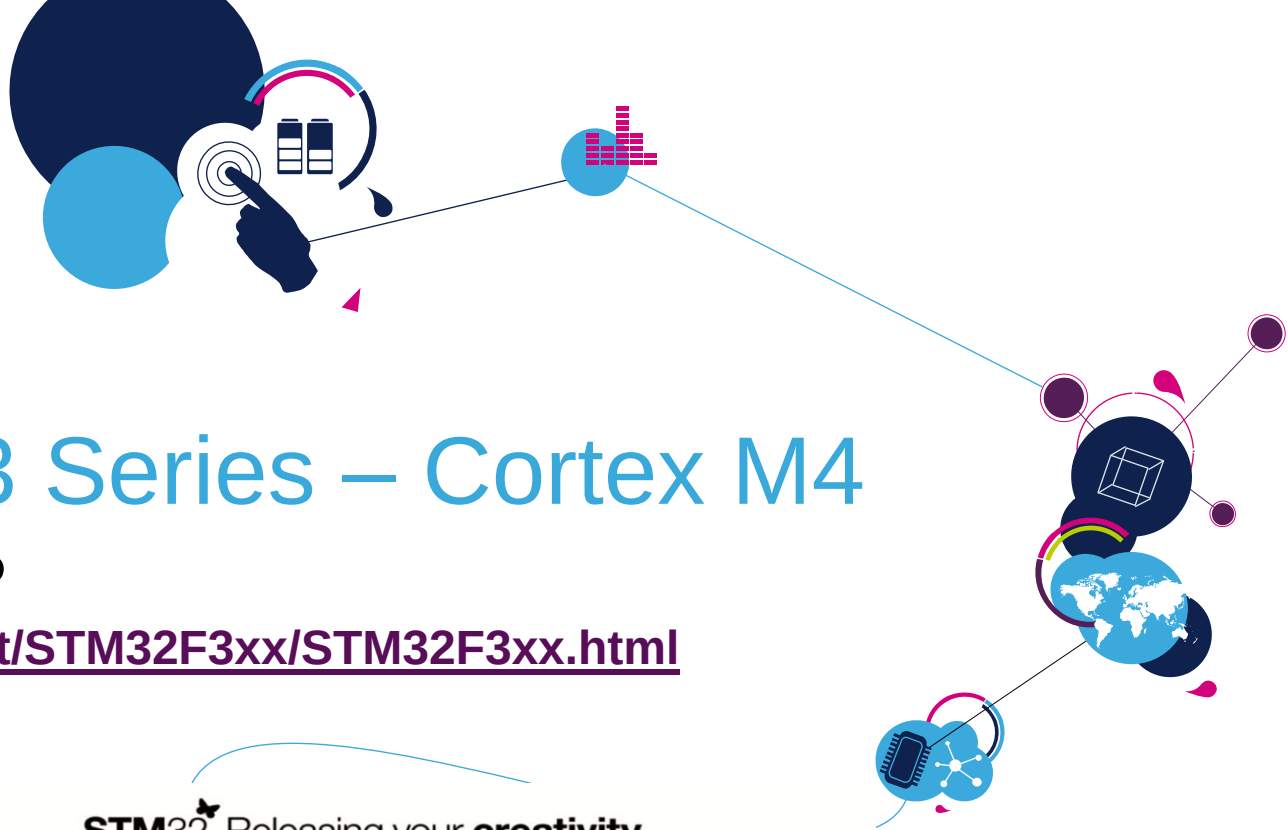
Ethernet, 2x USB OTG, camera interface,
crypto/hash processor

■ STM32F205

1x USB OTG FS/HS

■ STM32F215

1x USB OTG FS/HS,
crypto/hash processor



STM32 F3 Series – Cortex M4

Analog & DSP

<http://www.emcu.it/STM32F3xx/STM32F3xx.html>

STM32[✈] Releasing your **creativity**



STM32 F3 series: DSP/DSC applications

- STM32 F3 series complement the F-1 series with:
 - More performance (Cortex-M4F & more DMips)
 - Richer analog peripherals set
 - Renewed digital peripheral set
 - **Pin and SW compatibility w/ F1 series**
- Performance
 - Core Cortex M4 + FPU
 - Fmax = 72 MHz
 - **Core Coupled Memory** (CCM-SRAM) to execute critical loop at full speed (0 WS @ 72 MHz = 90 DMips)
- Safety
 - RAM with parity bit
 - **Memory Protection Unit (MPU)**
 - HW CRC
- Power supply
 - 2.0 to 3.6 V supply
 - Specific 1.8V +/-8% mode
- Rich analog peripherals
 - **Comparators**, **DAC**, **PGA**, **12-bit ADC 5Msps**, **16-bit ADC $\Sigma\Delta$** , **Hi-Resolution timer (<1ns)**
- Renewed digital peripherals
 - I²C, UART, SPI, CRC, RTC, faster I/Os, Capacitive **Touch sensing** (Charge Transfert)



Analog specification

- **Programmable Gain Amplifier (PGA)**
 - Analog supply voltage: $2.4 \leq VDDA \leq 3.6V$
 - 5 gains (1% accuracy): 1, 2, 4, 8, 16
 - Rail to rail input
 - Offset < 6mV max
 - Max output current: 500 μ A (sink and source)
 - Rail to rail output: $GNDA + 100mV < V_{out} < VDDA - 100mV$ (Max)
 - 20mV @ 100 μ A I out
 - Speed: GBW: 8 MHz, Slew rate 4.7V/ μ s
- **Comparator**
 - Propagation time: 50ns typ, 100ns max ($2.7 < VDDA < 3.6V$)
 - Input range: rail to rail
 - Input offset error: +/-4mV typ, +/-10mV max
- **ADC (4x independent ADCs)**
 - 12-bit, 10-bit, 8-bit or 6-bit configurable resolution
 - Can manage single ended or differential inputs (programmable per channels)
 - 39 channels :
 - 19 Fast Channels: 0.19 μ s for 12-bit resolution (5.1 Ms/s)
 - 20 Slow Channels: 0.21 μ s for 12-bit resolution (4.8 Ms/s)
 - Dual modes (simultaneous or interleaved)
 - DMA capability
 - 3 Analog watchdogs per ADC

STM32 F3 product lines

All product lines include:

Cortex-M4 + FPU Fmax = 72 MHz
MPU*
PLL
ETM*
Reset + BOR PVD
Low and high speed internal oscillators
2x watchdogs + RTC (real-time clock)
HW CRC
Reset circuitry POR/PDR
Multiple DMA
Communication peripherals USART, SPI, I ² C
IR transmitter
Multiple 16-bit timers
1x 32-bit timer
Temperature sensor
Backup registers
Touch-sensing controller

STM32F302/303/313 lines

Up to 256-Kbyte Flash	Up to 40-Kbyte SRAM	Up to 8-Kbyte CCM- SRAM	2x DAC 12-bit	7x comparator	4x 12-bit ADC 5 MSPS SAR	4x PGA	CAN 2.0B	USB 2.0 FS	2x16-bit AMC timer
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STM32F372/373/383 lines

Up to 256-Kbyte Flash	Up to 32-Kbyte SRAM	3x 16-bit $\Sigma\Delta$ ADC	3x DAC 12-bit	2x comparator	1x 12-bit ADC 1 MSPS SAR	CEC	CAN 2.0B	USB 2.0 FS
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+

STM32F333 line

Up to 256-Kbyte Flash	Up to 32-Kbyte SRAM	Up to 8-Kbyte CCM- SRAM	3x DAC 12-bit	3x comparator	2x 12-bit ADC 5 MSPS SAR	1x PGA	CAN 2.0B	High resolution timer < 300 ps	1x16-bit AMC timer
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STM32F301 Access line

Up to 64-Kbyte Flash	Up to 16-Kbyte SRAM	1x DAC 12-bit	3x comparator	1x 12-bit ADC 5 MSPS SAR	1x PGA	CAN 2.0B	USB 2.0 FS	1x16-bit AMC timer
----------------------------	---------------------------	------------------	------------------	-----------------------------------	--------	-------------	---------------	--------------------------

Note: * Except STM32F301 and STM32F333

STM32 F3 series – Main differences

Unit parameters	STM32F303	STM32F302	STM32F373	STM32F372
Core	Cortex-M4F + FPU	Cortex-M4F + FPU	Cortex-M4F + FPU	Cortex-M4F + FPU
Freq max	72 MHz	72 MHz	72 MHz	72 MHz
Flash max	256 Kbytes	256 Kbytes	256 Kbytes	256 Kbytes
Ram (up to)	40 Kbytes	32 Kbytes	32 Kbytes	32 Kbytes
CCM (Code-SRAM)	8 Kbytes	8 Kbytes	-	-
ADC SAR	4x 12-bit 5 Msps	2x 12-bit 5 Msps	1x 12-bit 1 Msps	1x 12-bit 1 Msps
ADC $\Sigma\Delta$	-	-	3x 16-bit	1x 16-bit
Other Analog	7x Comp 4x PGA 2x DAC	4x Comp 2x PGA 1x DAC	2x Comp - 3x DAC	1x Comp - 1x DAC
MC timer	2x (144 MHz)	1x (144 MHz)	-	-
Other Digital (except SPI, UASRT, I ² C)	1x USB FS device 1x CAN, CT Touch sense	1x USB FS device 1x CAN, CT Touch sense	1x USB FS device 1x CAN, CT Touch sense	1x USB FS device 1x CAN, CT Touch sense

Large tools offer STM32F3- series

- **Evaluation board** for full product feature evaluation

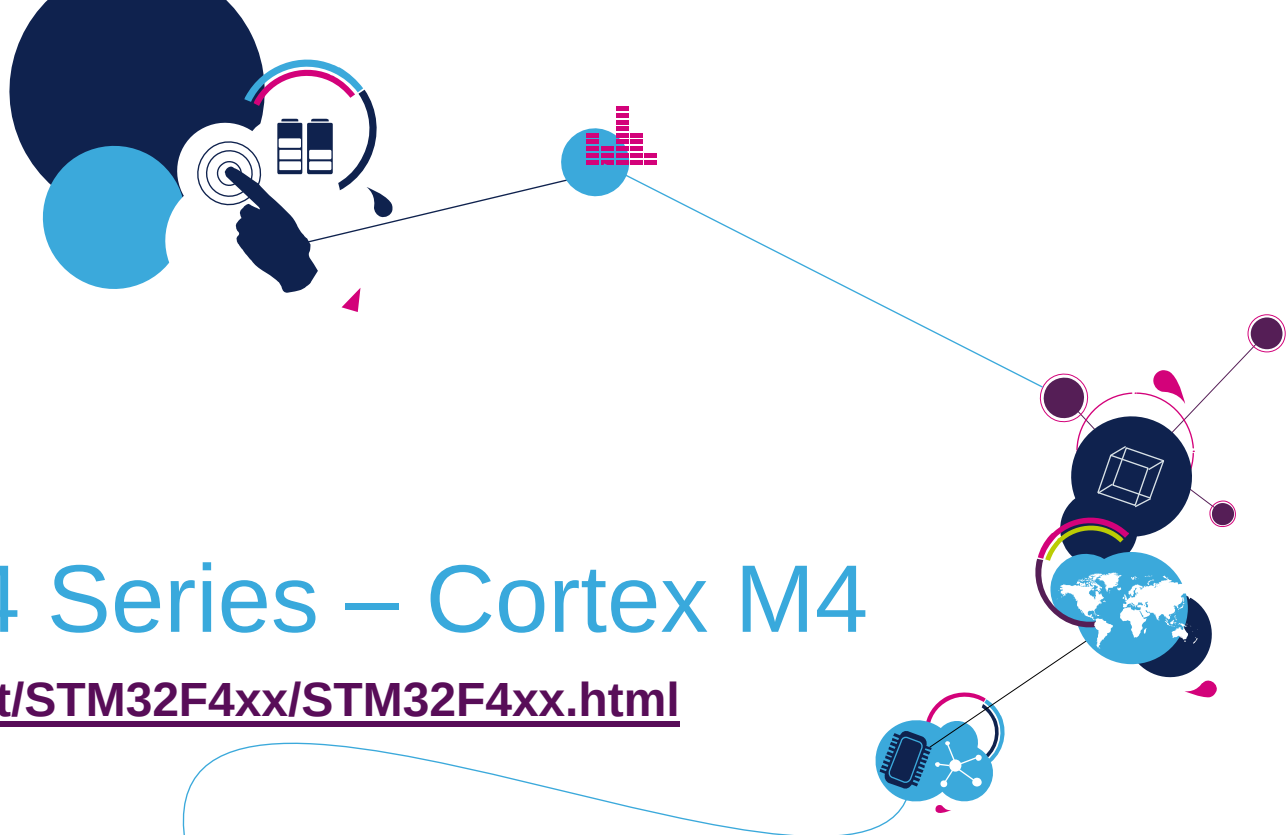
Sales types : **STM32303C-EVAL**
 STM32373C-EVAL

- **STM32F3 discovery kit** : low-cost evaluation kit is the cheapest and quickest way to discover the STM32F3 series



- Large choice of development IDE solutions





STM32 F4 Series – Cortex M4

<http://www.emcu.it/STM32F4xx/STM32F4xx.html>



STM32 F4 series

High-performance digital signal controller

168/180 MHz F_{CPU} **210/225** DMIPS – **363-606** Coremark score



FPU

Single precision
Ease of use
Better code efficiency
Faster time to market
Eliminate scaling and saturation
Easier support for meta-language tools
(Matlab...)

MCU

Ease of use of C
programming
Interrupt handling
Ultra-low power

Cortex-M4

DSP

Harvard architecture
Single-cycle MAC
Barrel shifter



STM32 F4

Main common features

Cortex™-M4
(DSP + FPU)
up to 180 MHz

- 2x USB 2.0 OTG FS/HS
- 2x CAN 2.0B
- SDIO, FSMC
- USART, SPI, I²C
- 2x I²S + audio PLL
- 16- and 32-bit timers

- 3x 12-bit ADC (0.41 μ s)
- Dual 12-bit DAC

- Low voltage
1.7* to 3.6 V

STM32F429/439

1 to 2-MB Flash
256-KB SRAM

Same features
as
STM32F427/437

TFT LCD
with
Chrom-ART™
Accelerator

SDRAM
interface

Serial
audio
interface
(SAI)

STM32F427/437

1 to 2-MB Flash
256-KB SRAM

Ethernet
IEEE 1588

Camera
interface

Hardware
Crypto/Hash
RNG

STM32F407/417

512-KB to 1-MB
Flash
192-KB SRAM

Ethernet
IEEE 1588

Camera
interface

Hardware
Crypto/Hash
RNG

STM32F405/415

512-KB to 1-MB
Flash
192-KB SRAM

Hardware
Crypto/Hash
RNG



Note: *1.7 V min on WLCSP90, LQFP144, LQFP176 and UFBGA176 packages only and 1.8 min for all other packages

STM32 F4 Series highlights

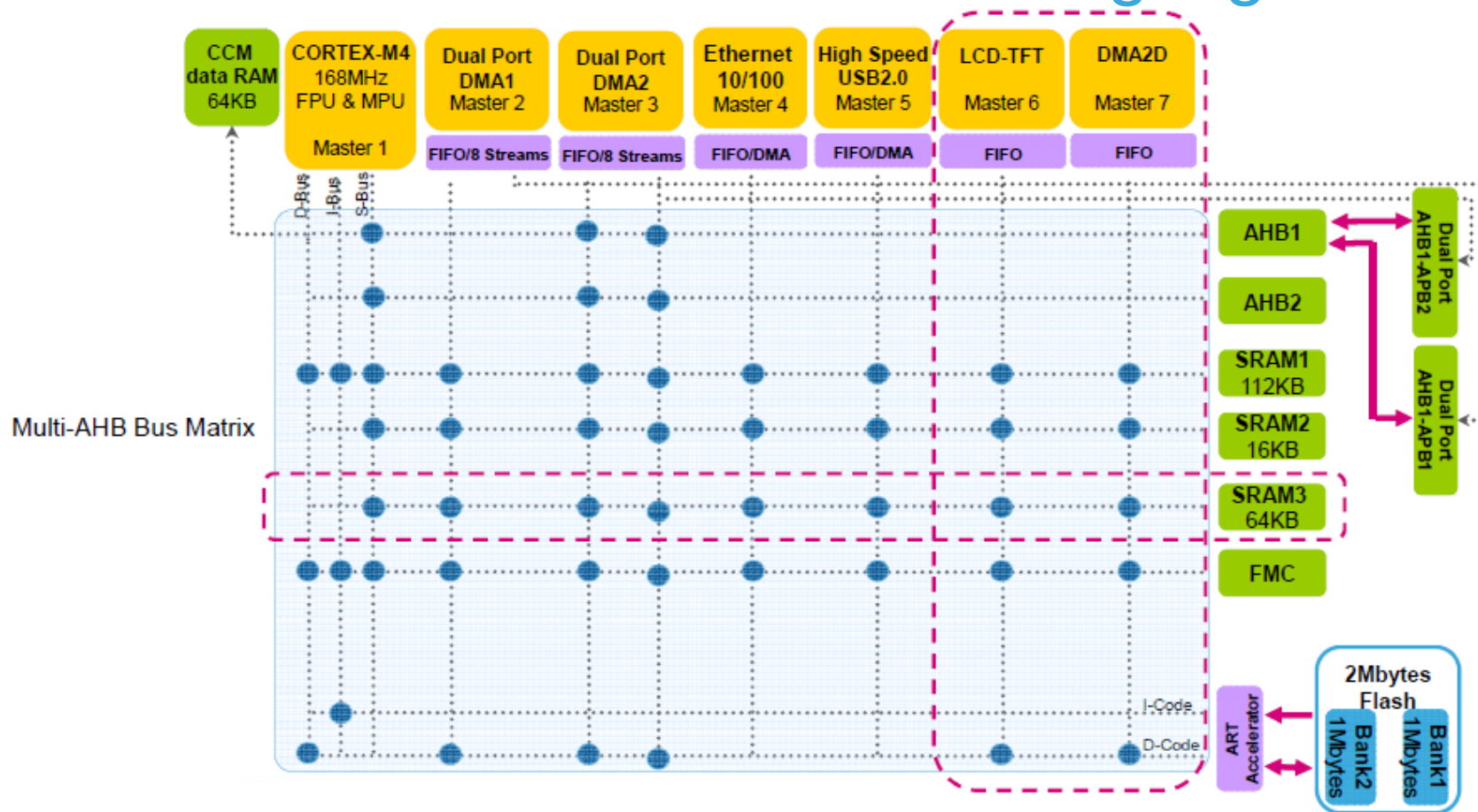
More Memory

- Up to **1MB Flash**,
- **192KRAM**: 128kB on bus matrix + 64kB on data bus dedicated to the CPU usage
- **2MB Flash** on STM32F43x/42x
- **256KRAM** on STM32F43x/42x

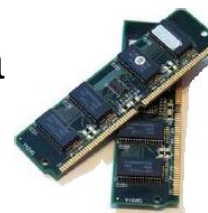
Advanced peripherals shared with STM32 F2 Series

- **USB OTG** High speed **480Mbit/s**
- **Ethernet** MAC 10/100 with IEEE1588
- PWM High speed timers: **Now 168Mhz max frequency!**
- **Crypto/hash processor** + 32-bit **random number generator** (RNG)
- 32-bit RTC with calendar: **Now with sub 1 second accuracy, and <1uA typ.**

STM32 F42x/43x Series highlights



- **TFT Controller** (800x600 – QVGA-WQVGA-VGA-SVGA) 60fps
- **Chrom ART Accelerator**
- **FMC** (90Mhz) with SDRAM + Support and 32-bit data
- Dual Bank 2 x 1MB Flash



ART Accelerator

Feature	Renesas	NXP	Freescall	Microchip	STM32
Rectangle filling (solid color)	Partial (with DMA)	Partial (with GPDMA)	Yes (with DMA)	Yes	Yes
Rectangle copy	Partial (with DMA)	Partial (with GPDMA)	Yes (with DMA)	Yes	Yes
Rectangle copy with Pixel Format Conversion	No	No	No	No	Yes
Image composition (blending of 2 sources)	No	No	No	No	Yes

- Some of the competitors can use their system DMA to accelerate few features but none of them can do more than simple data copy
- **DMA2D** is totally independent from system DMA and has been **designed for graphical operations**
- Thanks to its integrated pixel format converter and blender it **accelerates the most CPU consuming tasks**

STM32 F4 Series highlights

Further improvements

- Low voltage: 1.8V to 3.6V VDD , down to 1.7*V on most packages
- **Full duplex I2S** peripherals
- **12-bit ADC: 0.41µs conversion/2.4Msps (7.2Msps in interleaved mode)**
- High speed **USART** up to **11.25 Mbits/s**
- High speed **SPI** up to **37.5 Mbits/s**
- **Camera interface up to 54 MBytes/s**

*external reset circuitry required to support 1.7V

Large tools offer STM32F4- series

- **Evaluation board** for full product feature evaluation

Sales types : STM3240G-EVAL
STM3241G-EVAL
STM32437I-EVAL

- **STM32F4 discovery kit** : low-cost evaluation kit is the cheapest and quickest way to discover the STM32F4 series

STM32F4-Discovery
STM32F429-Discovery

- Large choice of development IDE solutions

RAISONANCE
Embedded Systems Development Tools

aiji SYSTEM
아이지시스템

hitex
DEVELOPMENT TOOLS

IAR
SYSTEMS

atollic

SEGGER

KEIL
An ARM® Company

LAUTERBACH

SIGNUM
SYSTEMS

TASKING
Embedded software development tool

expresslogic

CooCox

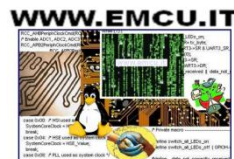
iSYSTEM

Green Hills
SOFTWARE, INC.

CMX
SYSTEMS

ST
life.augmented

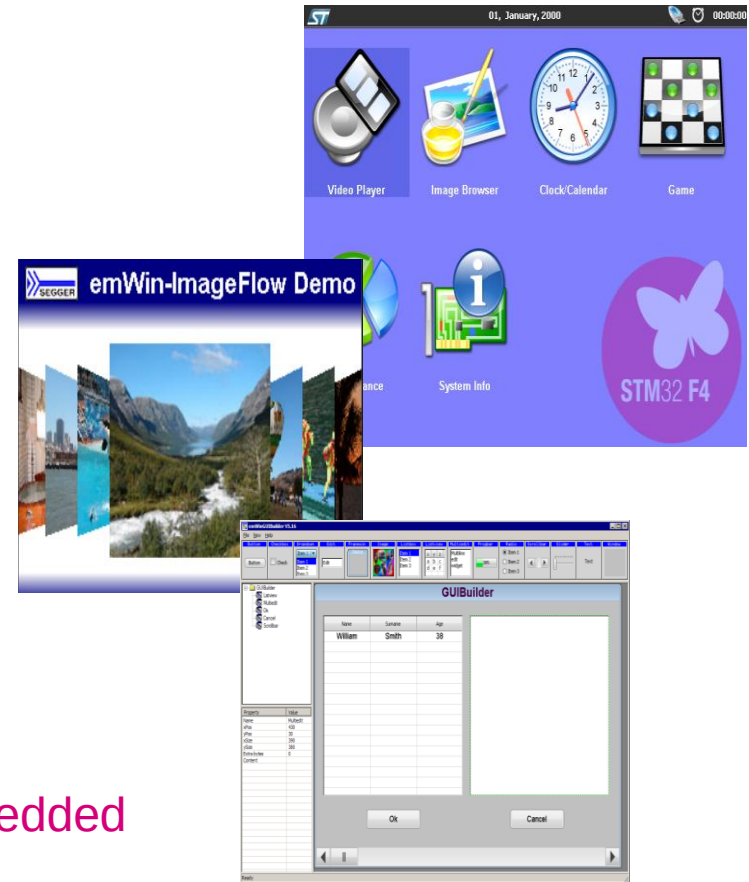
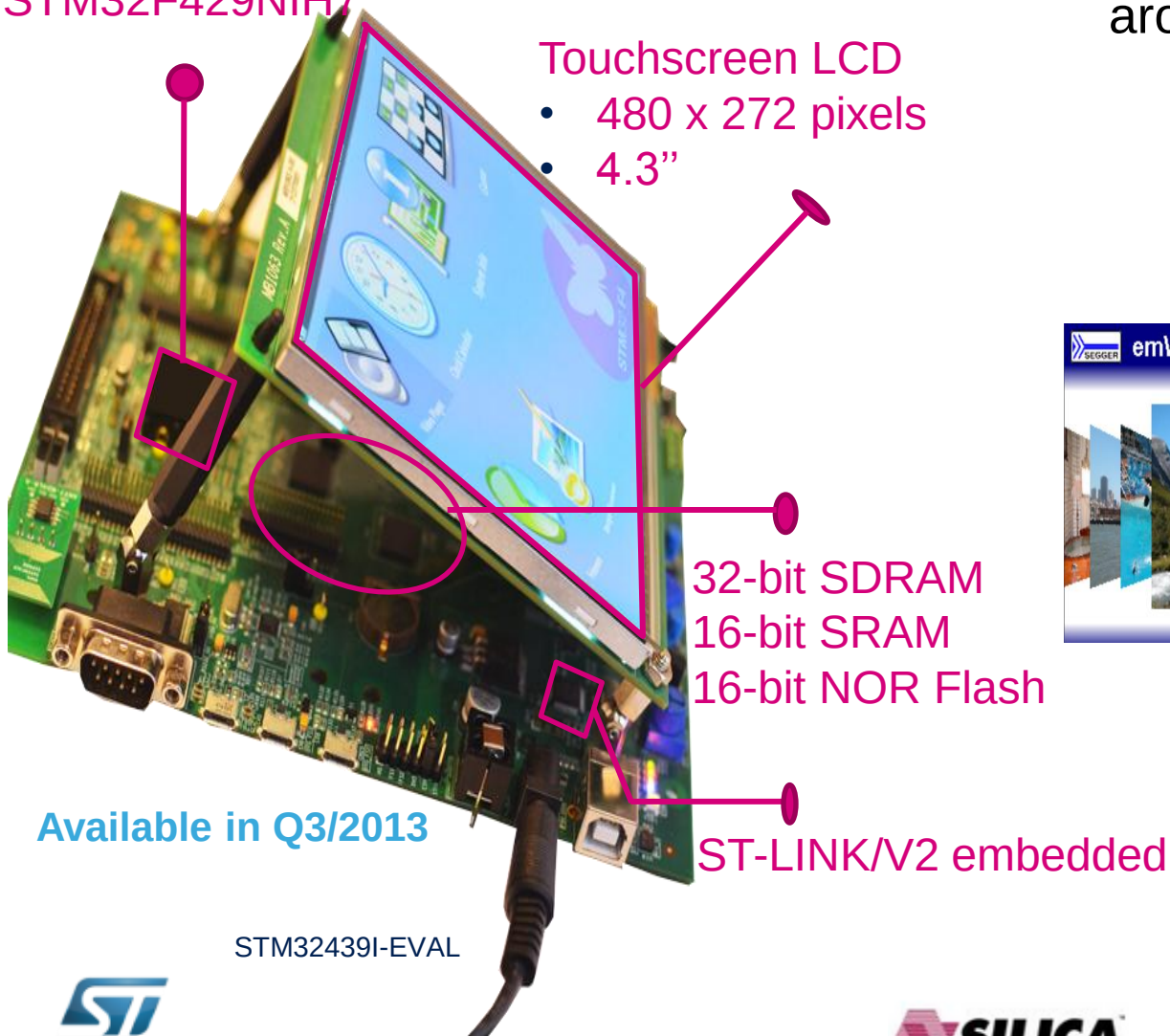
SILICA
An Avnet Company



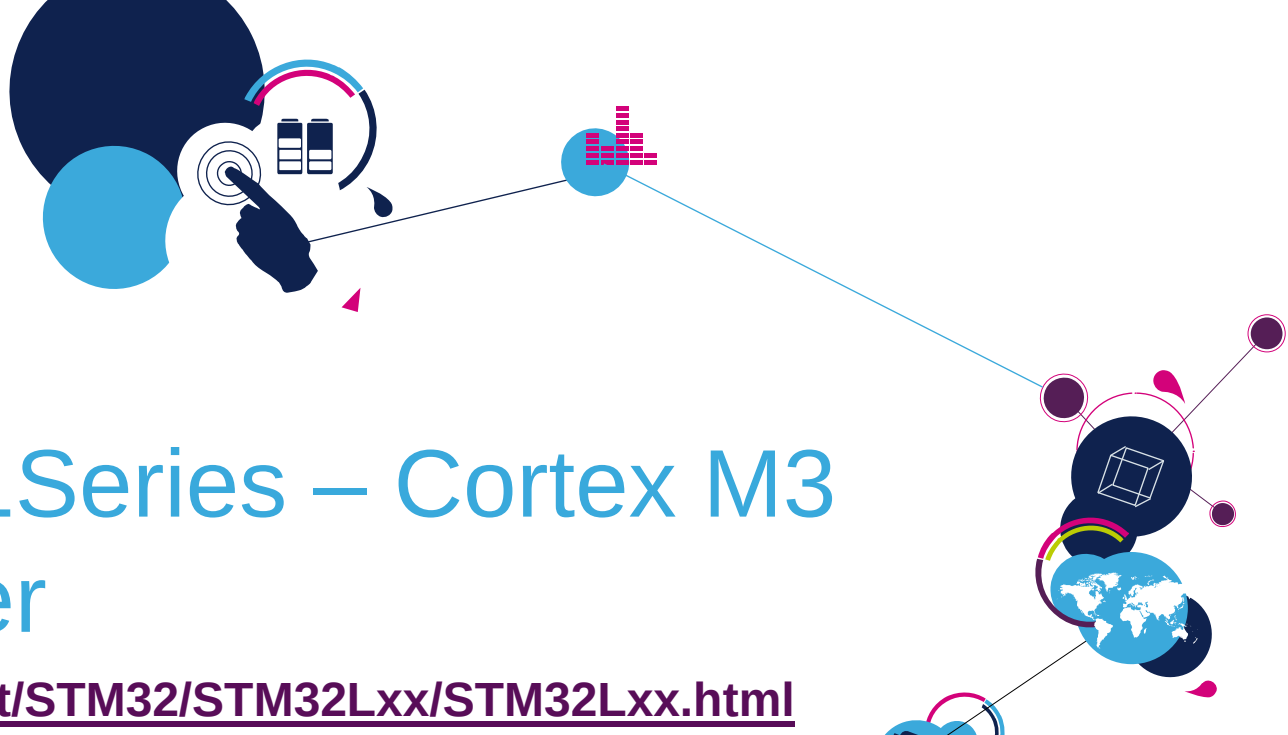
STM32F42x9 HW/SW Tools

Full-featured demonstration and evaluation board with STM32F429NIH7

SEGGER and **ST** signed an agreement
around **emWin** graphical stack

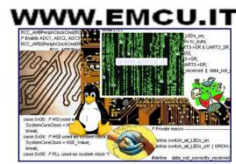


STM32439I-EVAL



STM32 L1Series – Cortex M3 Low Power

<http://www.emcu.it/STM32/STM32Lxx/STM32Lxx.html>





STM32 L1 series

Wide range of application

Consumer



Digital cameras



Bar-code
scanners



GPS



Gaming

Industrial



Home automation



Water meters



Electricity meters

Healthcare and fitness



Glucose meters, insulin pumps,
ECG, sports watches

STM32Lxxx

Main common features

**Cortex™-M3 (32 MHz)
with MPU**

- 5 clock sources
- Advanced RTC w/ calibration
- USB 2.0 FS
- USART, SPI, I²C
- 16- and 32-bit timers
- 12-bit ADC 1 MSPS
- 12-bit DAC
- Comparators

STM32L162

Up to 384-KB Flash
Up to 48-KB SRAM
Up to 12-KB EEPROM

SDIO
FSMC

Op-Amp
Comparators
Temp. sensor

LCD
8x40

Capacitive
Touch

AES
128-bit

STM32L151/152

Up to 384-KB Flash
Up to 48-KB SRAM
Up to 12-KB EEPROM

SDIO
FSMC

Op-Amp
Comparators
Temp. sensor

LCD
8x40

Capacitive
Touch

STM32L100 Value line

Up to 256-KB Flash
Up to 32-KB SRAM
Up to 8-KB EEPROM

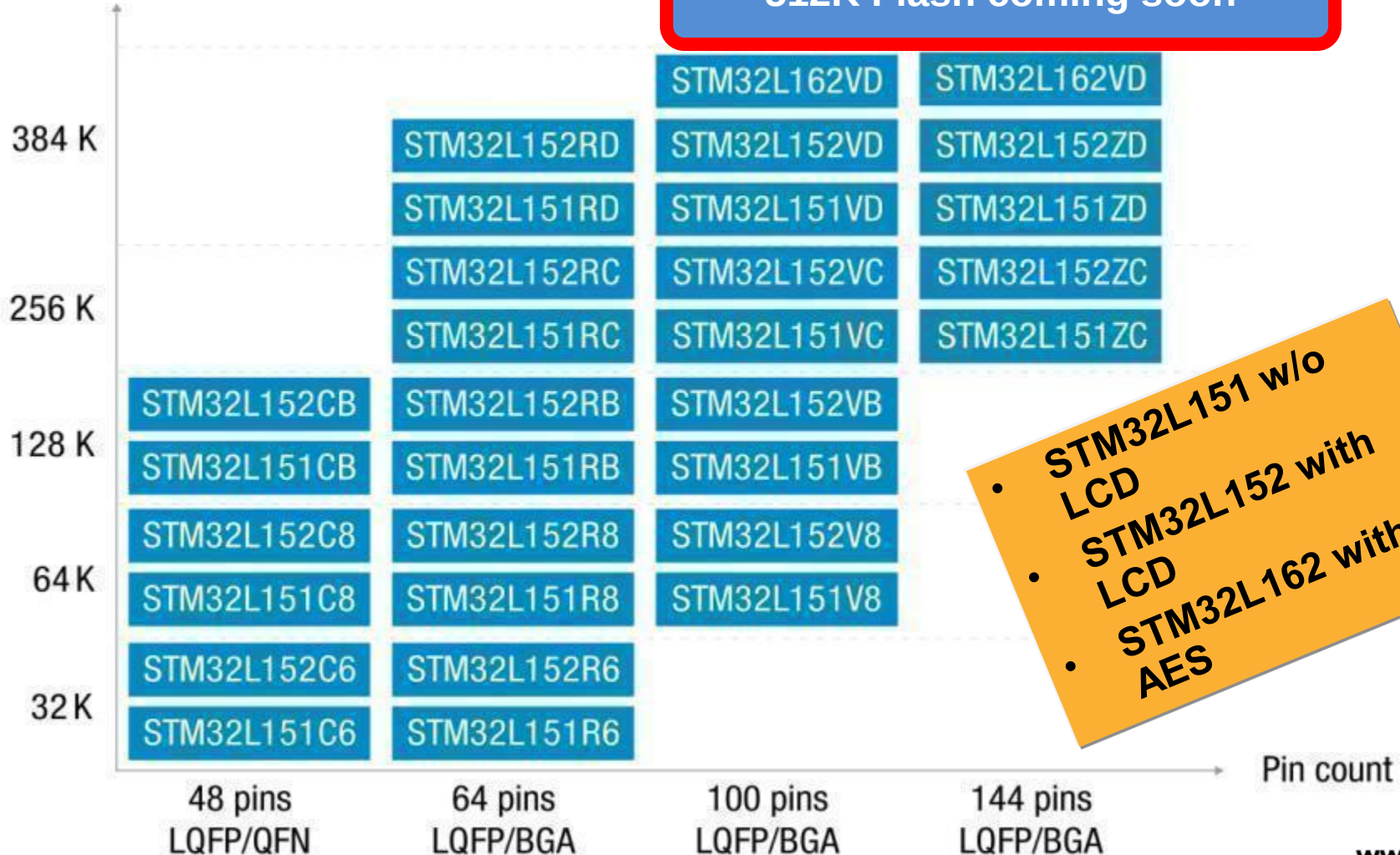
LCD
8x40



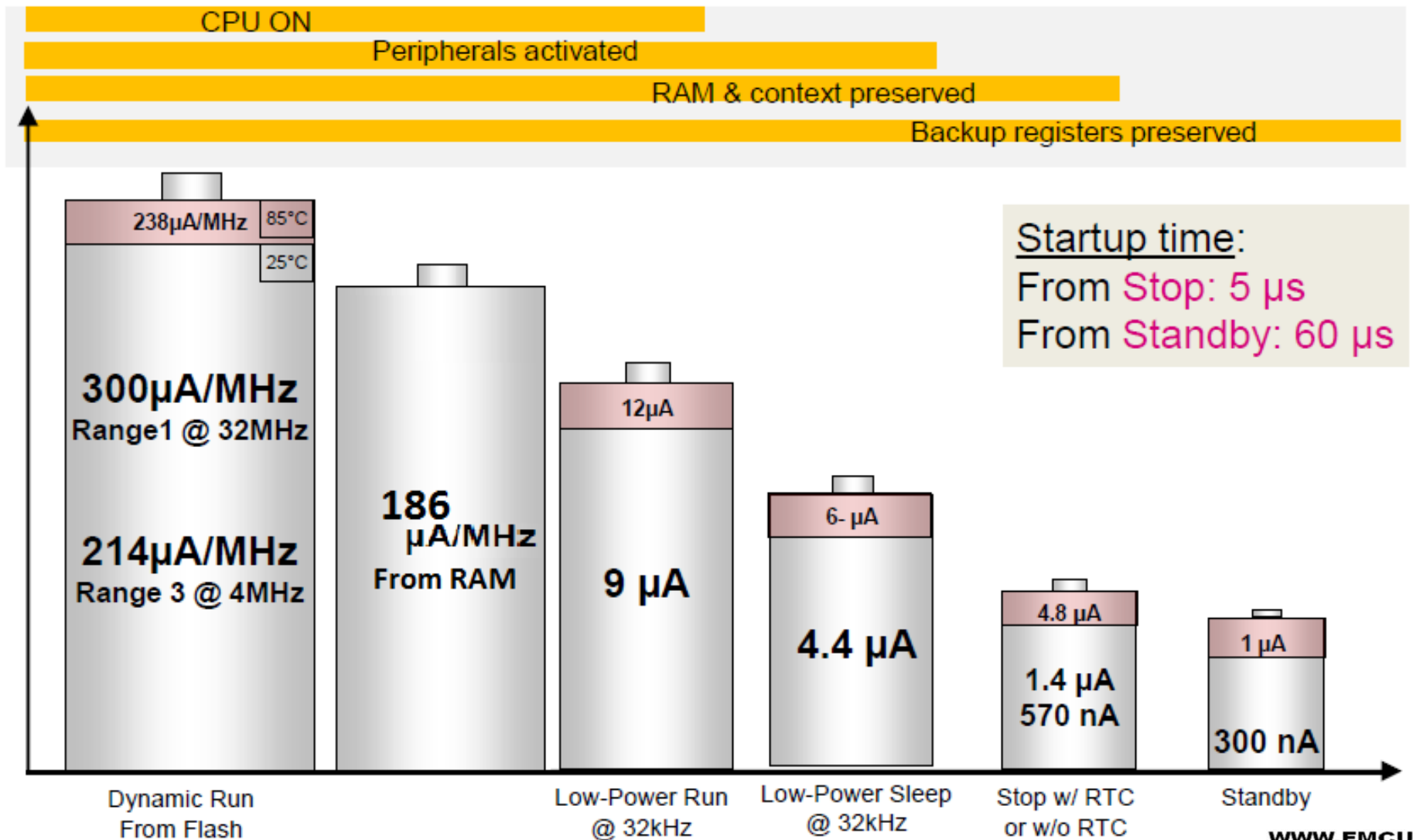
- Memory
 - 64 to 384-Kbyte Flash
 - 10 to 48-Kbyte SRAM
 - **4-Kbyte data EEPROM**

STM32L portfolio

Flash size (bytes)

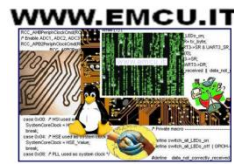


STM32L152 ultra-low-power consumption



Large tools offer STM32L- series

- **Evaluation board** for full product feature evaluation
**Sales types : STM32L152D-EVAL
STM32L152-EVAL**
- **STM32L-DISCOVERY** : low-cost evaluation board
cheapest and quickest way to discover the capabilities of the STM32L152
STM32L-Discovery
- Large choice of development IDE solutions



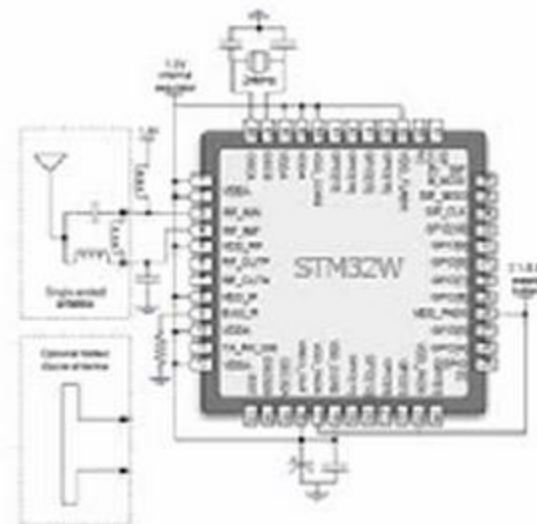
STM32 W

<http://www.emcu.it/STM32/STM32Wxx/STM32Wxx.html>



STM32W architecture overview

- 32-bit ARM Cortex-M3 core running @ 24 MHz
- 64- to 128-Kbyte Flash, 8-Kbyte RAM
- Fully IEEE 802.15.4 compliant radio @ 2.4 GHz
- Power management
 - Deep sleep mode <1 μ A with RAM retention
- On-chip debug support
 - ARM JTAG/SWD
 - Packet trace interface enables remote monitoring of radio messages
- ARM memory protection unit
 - To detect erroneous software accesses
- Sleep timer, watchdog timer and GP timers
- AES-128 encryption acceleration
- Serial communication (UART/SPI/I²C)
- GPIO
- ADC (6 channels, first order 12-bit sigma delta)

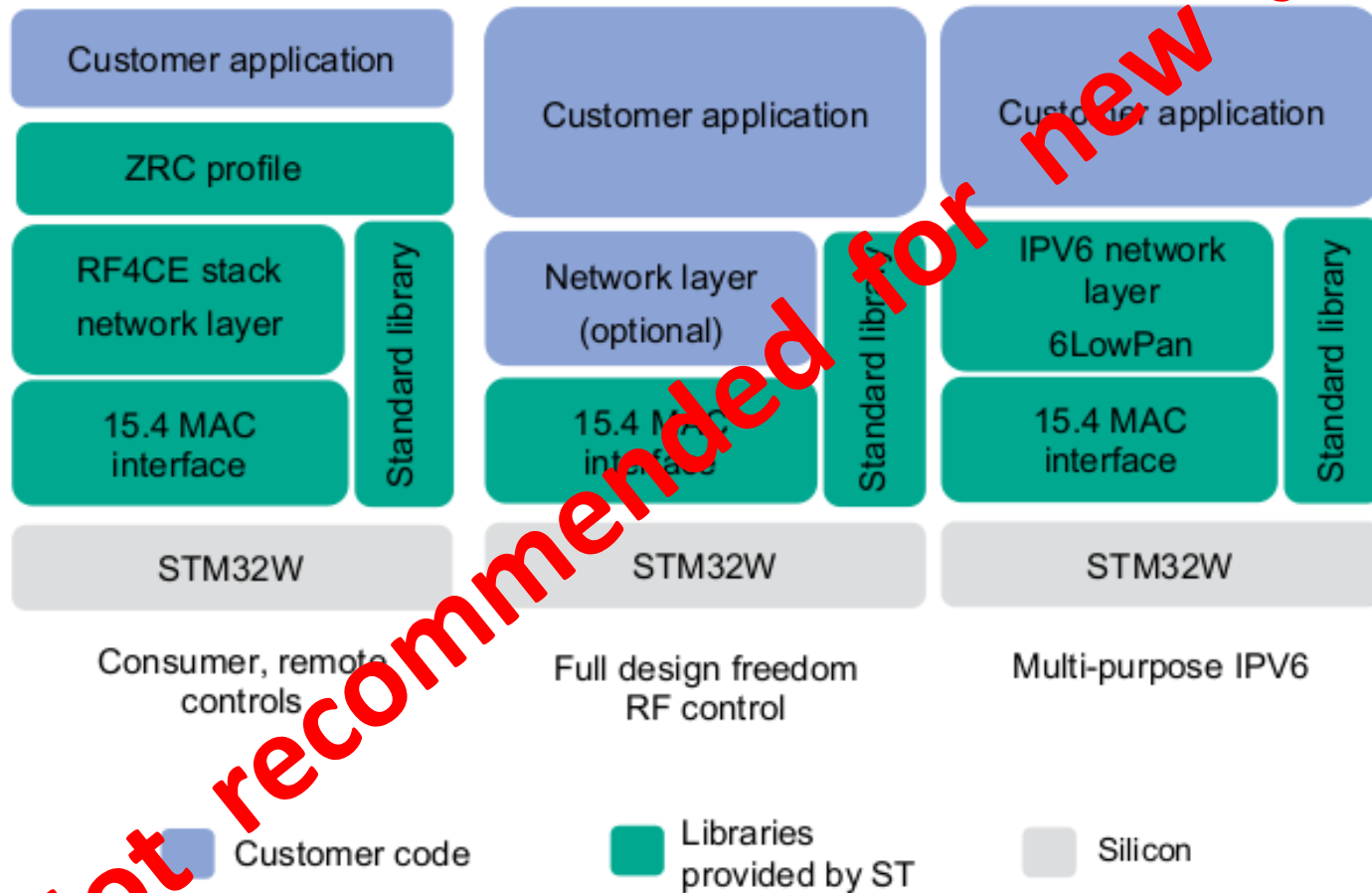


STM32W is Open Flexible Reconfigurable Platform



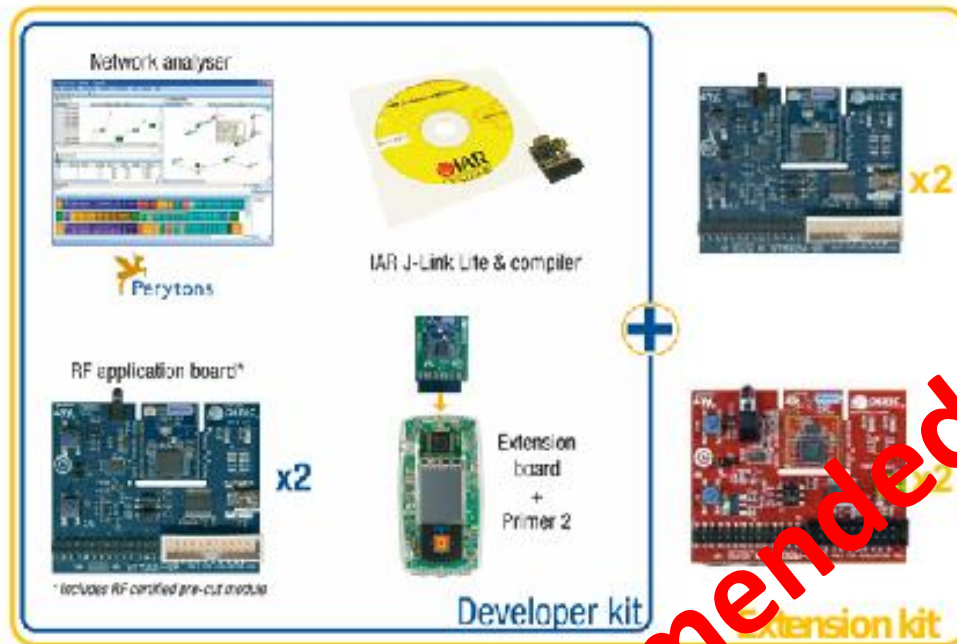
STM32W software libraries

802.15.4



Not recommended for new design

STM32W development tools



RF application board

RF extension

Sniffer

Infrared

Analyzer

USB

Not recommended for new design

STM32W RF Control kit

STM32W RF Control kit



The advertisement features a yellow background with a green butterfly and a white butterfly with 'STM32' written on it. Below this is a green circuit board with various components and a USB dongle. The text 'STMicroelectronics' is at the bottom left, and 'DIZIC' is at the bottom right. A large red diagonal watermark reads 'Not recommended for new design'.

STMicroelectronics

RF control made easy with STM32W

STM32W Control/Receive board
Upgradable platform with STM32W tools family
RF control ready
IEEE 802.15.4 protocol ready
Numerous applications available at www.st.com/stm32w_rfcontrol

www.st.com/stm32w_rfcontrol

- Entry-level RF evaluation and development tool
- Low cost
- Plug-and-play RF control
- Fully compatible with STM32W standard tools series

STM32 Motor control offers

<http://www.emcu.it/STM32/STM32-MotorControl/STM32-MotorControl.html>

Features set, MCU support

STM32F103x HD/XL, STM32F2xx, STM32F4xx, STM32F3xx

STM32F103x LD/MD

STM32F100x, STM32F0xx

1shunt	Flux Weakening	IPMSM MTPA
Feed Forward	Sensor-less (STO + PLL)	Sensor-less (STO + Cordic)
Encoder	Hall sensors	Debug & Tuning
ST MC Workbench support	USART based com protocol add-on	Max FOC F100 ~11kHz F0xx T.B.D.

3shunt

FreeRTOS

F103, F2xx

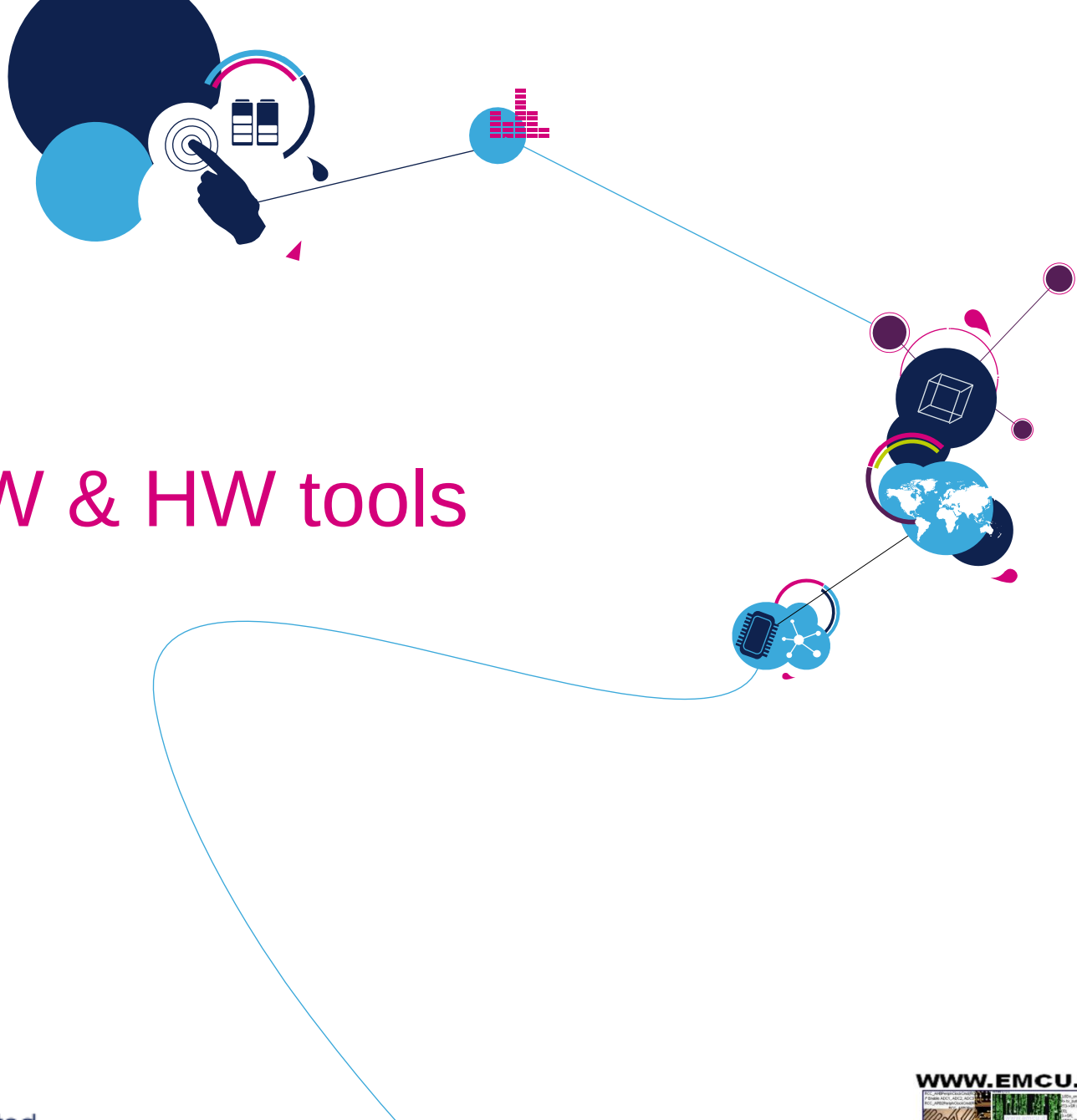
ICS

Max FOC
~25kHz

Dual FOC

Max FOC
F103 ~25kHz
F2xx ~40kHz
F2xx ~50kHz
F3xx T.B.D.

Max FOC dual
F103 ~20kHz
F2xx ~36kHz
F4xx ~45kHz
F3xx T.B.D.



STM32® SW & HW tools

ST-LINK-v2

- **Compatible with STM8 and STM32**
- **STM8 – SWIM**
- **STM32 – JTAG, SWD and SWV**
- **Basic cables for SWIM and JTAG**



<http://www.emcu.it/ST-LINKv2/ST-LINKv2.html>



STM's MCU MicroXplorer

• MCU configuration tool

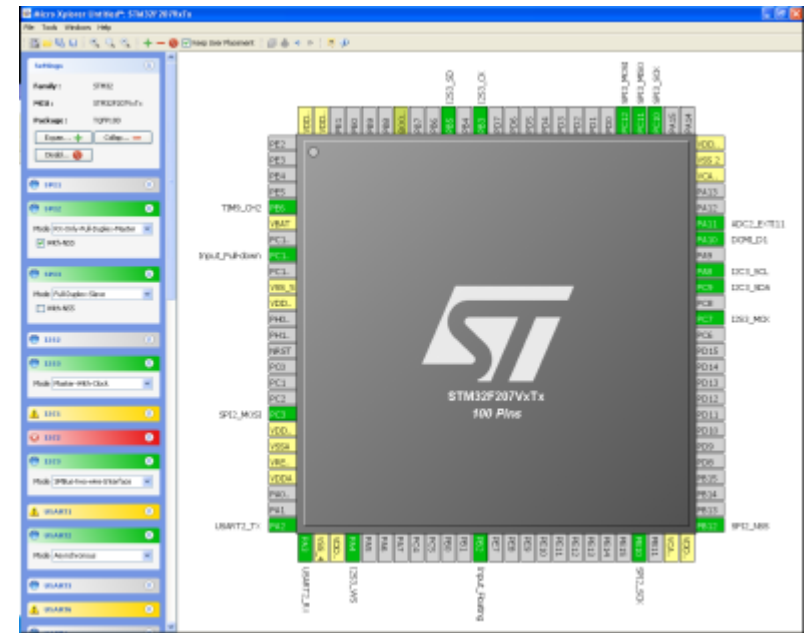
- Peripherals pinout setup wizard
 - Quickly define your pin configuration
 - Efficient constraint solver to match your application request
- Clock configuration
- Code generation*

• MCU product selector

- Quickly identify the best fitting MCU for your application
- STM8/STM32** portfolio

**Under development*

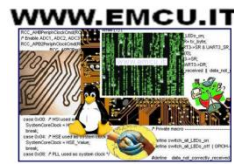
***All references not available yet*



<http://www.emcu.it/MicroXplorer/MicroXplorer.html>



-
- The screenshot shows the STWorX software interface. The main window is titled 'VarViewer4'. It features a menu bar (File, Edit, View, Options, Help) and a toolbar. Below the toolbar is a 'VarViewer settings' section. The 'General' tab is selected, showing 'VarViewer as BarGraph' and 'List of Variables'. The 'List of Variables' section contains a table with 10 rows, each representing a variable (V1 to V10) and its type (e.g., signed 16-bit, unsigned 16-bit, signed 32-bit, unsigned 32-bit). The 'Value Range' section shows 'Lower Value: 0.00' and 'Upper Value: 1.00'. The main display area shows a bar chart with 10 bars of different colors, each labeled with a value. The y-axis is labeled 'Value' and ranges from 0.00 to 1.00. The x-axis is labeled 'Variables' and lists variables V1 through V10.
- | Name | Address | Type | Color |
|------|---------|-----------------|------------|
| V1 | 0x00 | signed 16-bit | Red |
| V2 | 0x04 | signed 16-bit | Green |
| V3 | 0x08 | unsigned 16-bit | Blue |
| V4 | 0x0C | unsigned 16-bit | Yellow |
| V5 | 0x10 | unsigned 16-bit | Purple |
| V6 | 0x14 | unsigned 16-bit | Orange |
| V7 | 0x18 | unsigned 16-bit | Teal |
| V8 | 0x1C | unsigned 16-bit | Pink |
| V9 | 0x20 | unsigned 16-bit | Dark Blue |
| V10 | 0x24 | unsigned 16-bit | Light Blue |
- VarViewer4
- Value
- Variables
- V1 V2 V3 V4 V5 V6 V7 V8 V9 V10
- 0.00 0.20 0.40 0.60 0.80 1.00
- 0.60 0.70 0.80 0.70 0.70 0.70 0.70 0.70 0.70 0.70



For more info contact:
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roberto.rossetti@silica.com BDM