

How to Select the Right Microcontrollers for an Application

DAY 4 : Microcontroller Selection Use Cases

Sponsored by



Webinar Logistics

- Turn on your system sound to hear the streaming presentation.
- If you have technical problems, click “Help” or submit a question asking for assistance.
- Participate in ‘Group Chat’ by maximizing the chat widget in your dock.
- Submit questions for the lecturer using the Q&A widget. They will follow-up after the lecture portion concludes.

Course Sessions

- The Microcontroller Industry Today
- MCU Selection Criteria
- The Modern MCU Selection Process
- **Microcontroller Selection Use Cases**
- Microcontroller Selection Best Practices

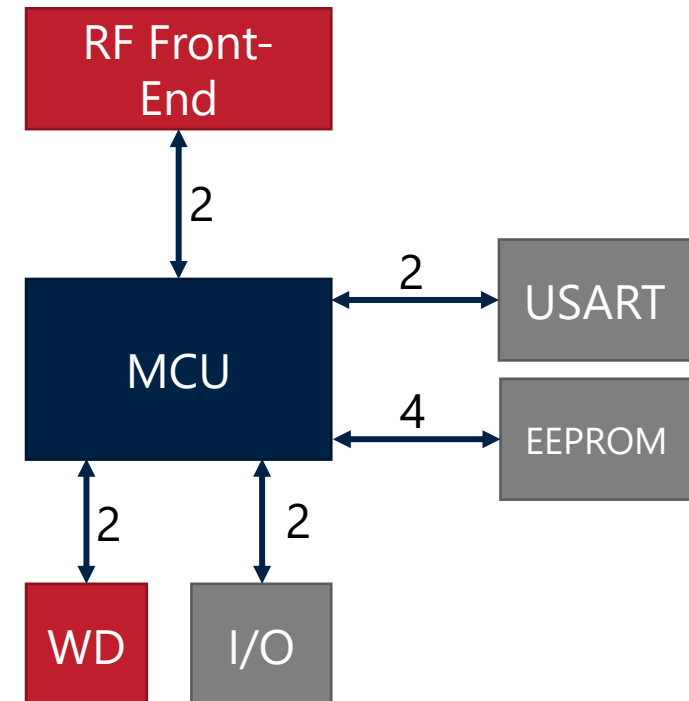


Real-time Communication MCU Selection

Example Project Requirements

Key Requirements

- Low Power
- Low Volume
- 12 I/O (minimum)
- Encryption
- Cost not a major concern



Options in STM32CubeMx

MCU/MPU Selector	Board Selector	Example
Peripheral		
<input checked="" type="checkbox"/> ADC 12-bit	0	42
<input type="checkbox"/> ADC 16-bit	0	0
<input checked="" type="checkbox"/> AES	1	2
<input checked="" type="checkbox"/> CAN	0	2
<input checked="" type="checkbox"/> COMP	0	7
<input checked="" type="checkbox"/> CORDIC	<input type="checkbox"/>	
<input type="checkbox"/> CRYP	0	0
<input checked="" type="checkbox"/> DAC 12-bit	0	3
<input checked="" type="checkbox"/> DCM1	<input type="checkbox"/>	
<input type="checkbox"/> DDR		
<input checked="" type="checkbox"/> DEBUG	<input type="checkbox"/>	
<input checked="" type="checkbox"/> DFSDM	0	1
<input checked="" type="checkbox"/> DSIHOST	<input type="checkbox"/>	
<input type="checkbox"/> Ethernet		
<input checked="" type="checkbox"/> FDCAN	0	3
<input checked="" type="checkbox"/> FMAC	<input type="checkbox"/>	
<input checked="" type="checkbox"/> FMC	<input type="checkbox"/>	
<input type="checkbox"/> FMPI2C		
<input type="checkbox"/> FSMC		
<input checked="" type="checkbox"/> GFXMMU	<input type="checkbox"/>	
<input checked="" type="checkbox"/> HASH	0	1
<input checked="" type="checkbox"/> HDMI CEC	<input type="checkbox"/>	

<input type="checkbox"/> HDP		
<input type="checkbox"/> HMAC		
<input checked="" type="checkbox"/> HRTIM	<input type="checkbox"/>	
<input checked="" type="checkbox"/> I2C	0	4
<input checked="" type="checkbox"/> I2S	0	2
<input checked="" type="checkbox"/> IPCC	<input type="checkbox"/>	
<input checked="" type="checkbox"/> IRTIM	<input type="checkbox"/>	
<input type="checkbox"/> JPEG		
<input checked="" type="checkbox"/> LPTIM	0	3
<input checked="" type="checkbox"/> LPUART	1	2
<input type="checkbox"/> MD5		
<input type="checkbox"/> MDIOS		
<input checked="" type="checkbox"/> OCTOSPI	0	2
<input checked="" type="checkbox"/> OPAMP	0	6
<input checked="" type="checkbox"/> OTFDEC	0	1
<input checked="" type="checkbox"/> PKA	<input type="checkbox"/>	
<input checked="" type="checkbox"/> PSSI	<input type="checkbox"/>	
<input checked="" type="checkbox"/> PWR	<input type="checkbox"/>	
<input checked="" type="checkbox"/> QUADSPI	<input type="checkbox"/>	
<input checked="" type="checkbox"/> RF	<input type="checkbox"/>	
<input checked="" type="checkbox"/> RNG	0	1
<input checked="" type="checkbox"/> RTC	<input type="checkbox"/>	
<input checked="" type="checkbox"/> SAI	0	2
<input type="checkbox"/> SDIO		
<input checked="" type="checkbox"/> SDMMC	0	2

<input type="checkbox"/> SHA		
<input type="checkbox"/> SPI		
<input checked="" type="checkbox"/> SPI	1	
<input checked="" type="checkbox"/> SUBGHZ	<input type="checkbox"/>	
<input checked="" type="checkbox"/> SWPMI	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Security Area	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Segment LCD	<input type="checkbox"/>	
<input checked="" type="checkbox"/> TAMP	<input type="checkbox"/>	
<input checked="" type="checkbox"/> TFT LCD	<input type="checkbox"/>	
<input checked="" type="checkbox"/> TRNG	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Timer 16-bit	0	10
<input checked="" type="checkbox"/> Timer 32-bit	0	2
<input checked="" type="checkbox"/> Touch Sensing	<input type="checkbox"/>	
<input checked="" type="checkbox"/> TrustZone	0	3
<input checked="" type="checkbox"/> UART	0	2
<input checked="" type="checkbox"/> UCPD	0	2
<input checked="" type="checkbox"/> USART	1	6
<input checked="" type="checkbox"/> USB DRD_FS	<input type="checkbox"/>	
<input checked="" type="checkbox"/> USB Device	<input type="checkbox"/>	
<input checked="" type="checkbox"/> USB OTG_FS	<input type="checkbox"/>	
<input type="checkbox"/> USB OTG_HS		
<input type="checkbox"/> USBH_HS	0	0
<input checked="" type="checkbox"/> VREFBUF	<input type="checkbox"/>	

Options in STM32CubeMx

MCUs/MPUs List: 265 items

+ Display similar items

Export

*	Part No	Reference	Marketing St...	Unit Price for 10kU...	Board	Package	Flash	RAM	IO	Freq.
☆	STM32G041C6	STM32...	Active	1.26		LQFP48	32 kBytes	8 kBytes	44	64 MHz
☆		STM32...	NA	NA		UFQFPN...	32 kBytes	8 kBytes	44	64 MHz
☆	STM32G041C8	STM32...	Active	1.293		LQFP48	64 kBytes	8 kBytes	44	64 MHz
☆		STM32...	Active	1.293		UFQFPN...	64 kBytes	8 kBytes	44	64 MHz
☆	STM32G041F6	STM32...	Active	1.036		TSSOP20	32 kBytes	8 kBytes	18	64 MHz
☆	STM32G041F8	STM32...	Active	1.09		TSSOP20	64 kBytes	8 kBytes	18	64 MHz
☆	STM32G041G6	STM32...	Active	1.08		UFQFPN...	32 kBytes	8 kBytes	26	64 MHz
☆	STM32G041G8	STM32...	Active	1.137		UFQFPN...	64 kBytes	8 kBytes	26	64 MHz
☆	STM32G041J6	STM32...	Active	0.816		SO8N	32 kBytes	8 kBytes	6	64 MHz
☆	STM32G041K6	STM32...	Active	1.124		LQFP32	32 kBytes	8 kBytes	30	64 MHz
☆		STM32...	NA	NA		UFQFPN...	32 kBytes	8 kBytes	30	64 MHz

Options in STM32CubeMx

Other

Price From 0.0 to 9.314



IO From 6 to 136



Eeprom From 0 to 6144 (Bytes)



Flash From 16 to 2048 (kBytes)



Ram From 2 to 640 (kBytes)



Freq. From 0 to 170 (MHz)

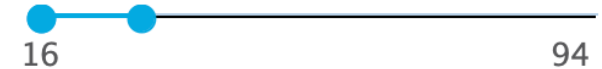


Other

Price From 0.0 to 4.312



IO From 16 to 30



Eeprom From 0 to 6144 (Bytes)



Flash From 64 to 512 (kBytes)



Ram From 8 to 256 (kBytes)



Freq. From 32 to 80 (MHz)



Options in STM32CubeMx

MCUs/MPUs List: 51 items

+ Display similar items

Export

*	Part No	Reference	Marketing St...	Unit Price for 10kU...	Board	Package	Flash	RAM	IO	Freq.
☆	STM32G041F8	STM32...	Active	1.09		TSSOP20	64 kBytes	8 kBytes	18	64 MHz
☆	STM32G041G8	STM32...	Active	1.137		UFQFPN...	64 kBytes	8 kBytes	26	64 MHz
☆	STM32G041K8	STM32...	Active	1.152		LQFP32	64 kBytes	8 kBytes	30	64 MHz
☆		STM32...	Active	1.152		UFQFPN...	64 kBytes	8 kBytes	30	64 MHz
☆	STM32G041Y8	STM32...	Active	1.09		WLCSP18	64 kBytes	8 kBytes	16	64 MHz
☆	STM32G061F8	STM32...	Active	1.148		TSSOP20	64 kBytes	18 kBytes	18	64 MHz
☆		STM32...	Active	1.148		WLCSP20	64 kBytes	18 kBytes	18	64 MHz
☆	STM32G061G8	STM32...	Active	1.176		UFQFPN...	64 kBytes	18 kBytes	26	64 MHz
☆	STM32G061K8	STM32...	Active	1.204		LQFP32	64 kBytes	18 kBytes	30	64 MHz
☆		STM32...	Active	1.204		UFQFPN...	64 kBytes	18 kBytes	30	64 MHz
☆	STM32G081EB	STM32...	Active	1.621		WLCSP25	128 kByt...	36 kBytes	23	64 MHz
☆	STM32G081GB	STM32...	Active	1.605		UFQFPN...	128 kByt...	36 kBytes	26	64 MHz
☆		STM32...	NA	NA		UFQFPN...	128 kByt...	36 kBytes	26	64 MHz
☆	STM32G081KB	STM32...	Active	1.621		LQFP32	128 kByt...	36 kBytes	30	64 MHz
☆		STM32...	NA	NA		LQFP32	128 kByt...	36 kBytes	30	64 MHz
☆		STM32...	Active	1.621		UFQFPN...	128 kByt...	36 kBytes	30	64 MHz
☆		STM32...	NA	NA		UFQFPN...	128 kByt...	36 kBytes	30	64 MHz

Cross Check

Mfr Part #	Quantity Available	Price	Series	Package	Product Status	Core Processor	Core Size	Speed	Connectivity	Peripherals	Number of I/O	Program Memory Size
^	^	^	^	^	^	^	^	^	^	^	^	^
 STM32G031F8P6 IC MCU 32BIT 64KB FLASH 20TSSOP <i>STMicroelectronics</i>	30 In Stock	1 : \$3.54000 Tube	STM32G0	Tube	Active	ARM® Cortex®-M0+	32-Bit Single- Core	64MHz	I²C, IrDA, LINbus, SPI, UART/USART	Brown-out Detect/Reset, DMA, I²S, POR, PWM, WDT	18	64KB (64K x 8)
 STM32G041J6M6 IC MCU 32BIT 32KB FLASH 8SO <i>STMicroelectronics</i>	30 In Stock	1 : \$3.04000 Tube	STM32G0	Tube	Active	ARM® Cortex®-M0+	32-Bit Single- Core	64MHz	I²C, IrDA, LINbus, SPI, UART/USART	Brown-out Detect/Reset, DMA, I²S, POR, PWM, WDT	6	32KB (32K x 8)
 STM32G031J6M6 IC MCU 32BIT 32KB FLASH 8SO <i>STMicroelectronics</i>	100 In Stock	1 : \$2.52000 Tube	STM32G0	Tube	Active	ARM® Cortex®-M0+	32-Bit Single- Core	64MHz	I²C, IrDA, LINbus, SPI, UART/USART	Brown-out Detect/Reset, DMA, I²S, POR, PWM, WDT	6	32KB (32K x 8)
 STM32G050K8T6 MAINSTREAM VALUE LINE, ARM CORTE <i>STMicroelectronics</i>	10 In Stock	1 : \$2.69000 Tray	STM32G0	Tray	Active	ARM® Cortex®-M0+	32-Bit Single- Core	64MHz	I²C, IrDA, LINbus, SPI, UART/USART	Brown-out Detect/Reset, DMA, I²S, POR, PWM, WDT	-	64KB (64K x 8)
 STM32G0B1CEU6 MAINSTREAM ARM CORTEX-M0+ 32-BIT <i>STMicroelectronics</i>	10 In Stock	1 : \$7.18000 Tray	STM32G0	Tray	Active	ARM® Cortex®-M0+	32-Bit Single- Core	64MHz	CANbus, HDMI-CEC, I²C, IrDA, LINbus, SPI, UART/USART, USB	Brown-out Detect/Reset, DMA, I²S, POR, PWM, WDT	42	512KB (512K x 8)

What is the most challenging part of MCU selection?

- Cost
- Availability
- Peripheral set
- Memory options
- Other

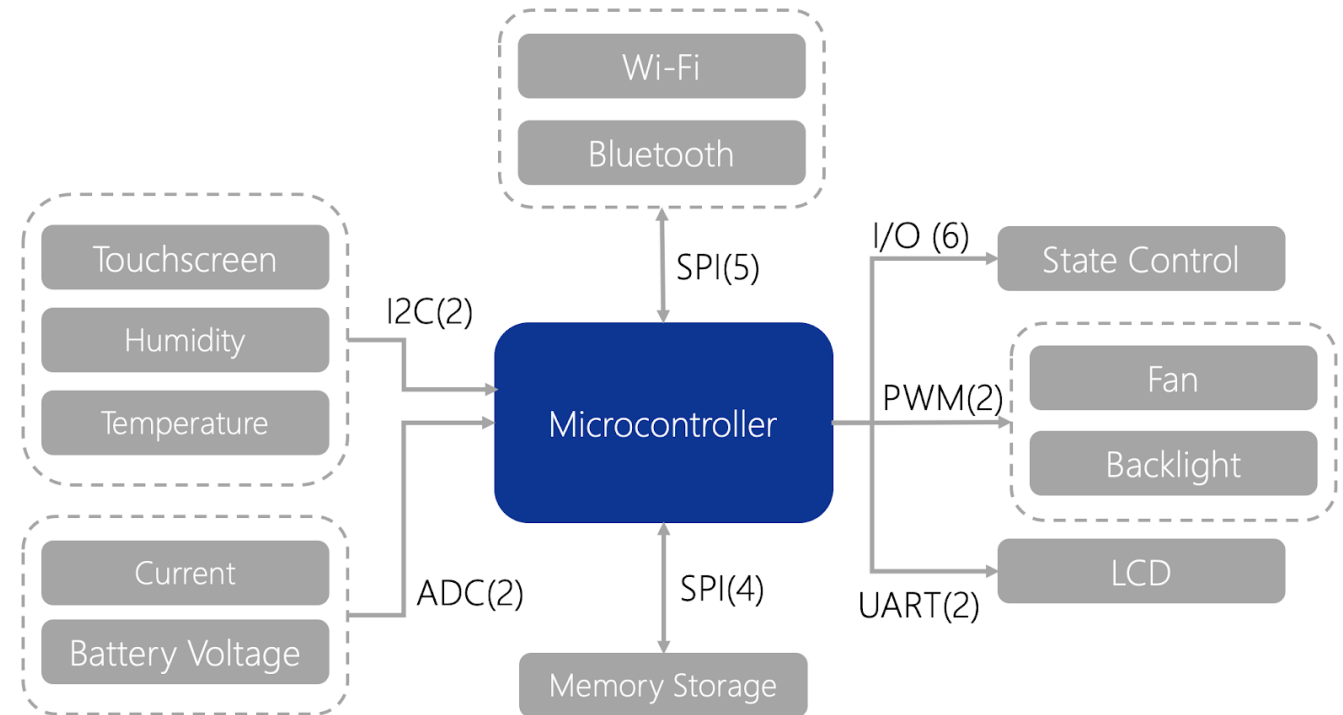
2

IoT Sensor Node MCU Selection

Example Project Requirements

Key Requirements

- Low Power
- High volume
- 23 I/O (minimum)
- Off loaded connectivity stack
- Cost constrained



Preliminary Search

Number of I/O

23

Max

2

3

4

5

6

7

8

9

Clear

Program Memory Size

Search Filter

256B (256 x 8)

384B (256 x 12)

448B (256 x 14)

512B (256 x 16)

512B (512 x 8)

768B (512 x 12)

896B (512 x 14)

1KB (1K x 8 + 128B)

1KB (1K x 8 + 256B)

1KB (1K x 8)

Apply All

64,250 of 92,182 Results

SEARCH ENTRY

embedded microcontrollers

APPLIED FILTERS

Remove All

Core Processor

Number of I/O

4,985 In Stock	1 : \$2.70000 Cut Tape (CT) 5,000 : \$2.26500 Tape & Reel (TR)	SAM L11	Tape & Reel (TR) ? Cut Tape (CT) ? Digi-Reel® ?	Active	ARM® Cortex®-M23	32-Bit Single-Core	32MHz	IPC, LINbus, SPI, UART/USART	Brown-out Detect/Reset, DMA, POR, PWM, WDT	25	16KB (16K x 8)
4,000 In Stock	Active	PIC® 32CM	Tape & Reel (TR) ? Cut Tape (CT) ? Digi-Reel® ?	Active	ARM® Cortex®-M23	32-Bit	48MHz	IPC, IrDA, LINbus, SPI, UART/USART, USB	Brown-out Detect/Reset, POR, PWM, WDT	34	512KB (256K x 16)

Availability and Memory Size Issues

Continue Research

Stocking Options

☐ In Stock

☐ Normally Stocking

☐ New Product

Environmental Options

☐ RoHS Compliant

☐ Non-RoHS Compliant

Media

☐ Datasheet

☐ Photo

☐ EDA/CAD Models

Marketplace Product

☐ Exclude

Apply All

16,639 Results

SEARCH ENTRY

embedded microcontrollers

APPLIED FILTERS

Program Memory Size

Product Status

Number of I/O

Remove All

24,956 Marketplace	97 : \$3.12000 Bulk	SAM G51	Bulk ⓘ	Active	ARM® Cortex®-M4	32-Bit Single- Core	48MHz
22,175 Marketplace	26 : \$11.86000 Bulk	MCF5222x	Bulk ⓘ	Active	Coldfire V2	32-Bit Single- Core	80MHz

7,460 Marketplace	53 : \$5.67000 Bulk	SAM4L	Bulk ⓘ	Active	ARM® Cortex®-M4	32-Bit Single- Core	48MHz
7,328 Marketplace	28 : \$11.04000 Bulk	R8C/Lx/38B	Bulk ⓘ	Active	R8C	16-Bit	20MHz
7,282 In Stock	1 : \$7.10000 Tray	PIC® XLP™ 24F	Tray ⓘ	Active	PIC	16-Bit	32MHz

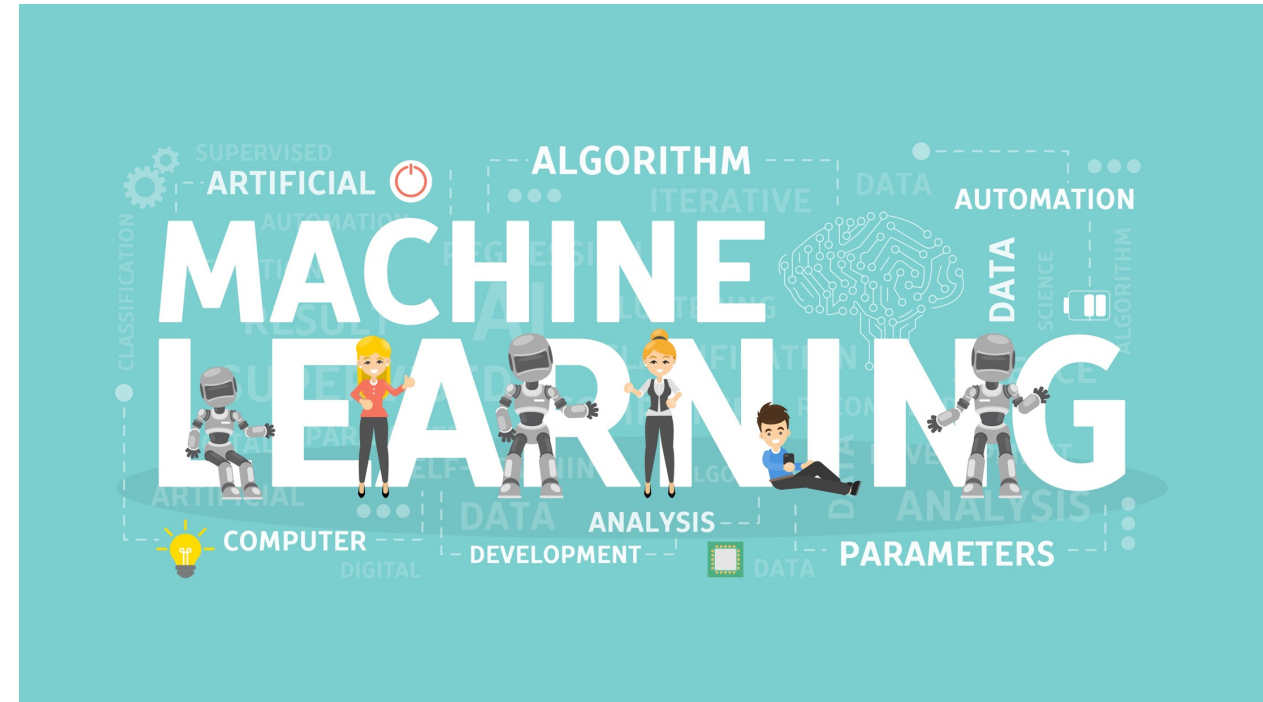
3

Machine Learning Device Microcontroller Selection

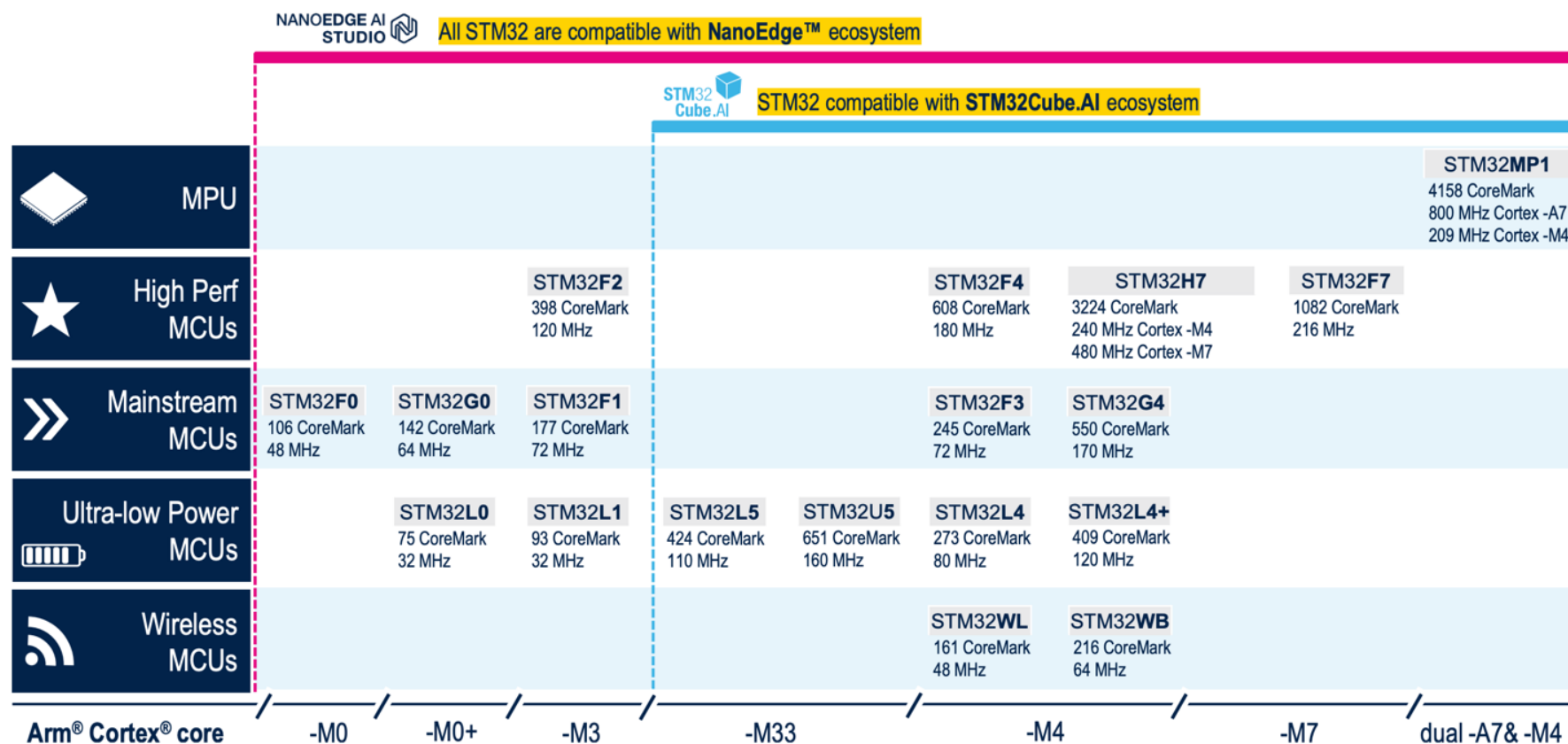
Example Project Requirements

Key Requirements


- Mid Power
- Low volume
- 30 I/O (minimum)
- Must run gesture recognition
- Cost not a concern



Examine the Marketing Materials




STM32CubeMX MCU Selector


Artificial Intelligence 

☒ Enable

Model

TFLite 

Runtime


STM32Cube.AI 

Model

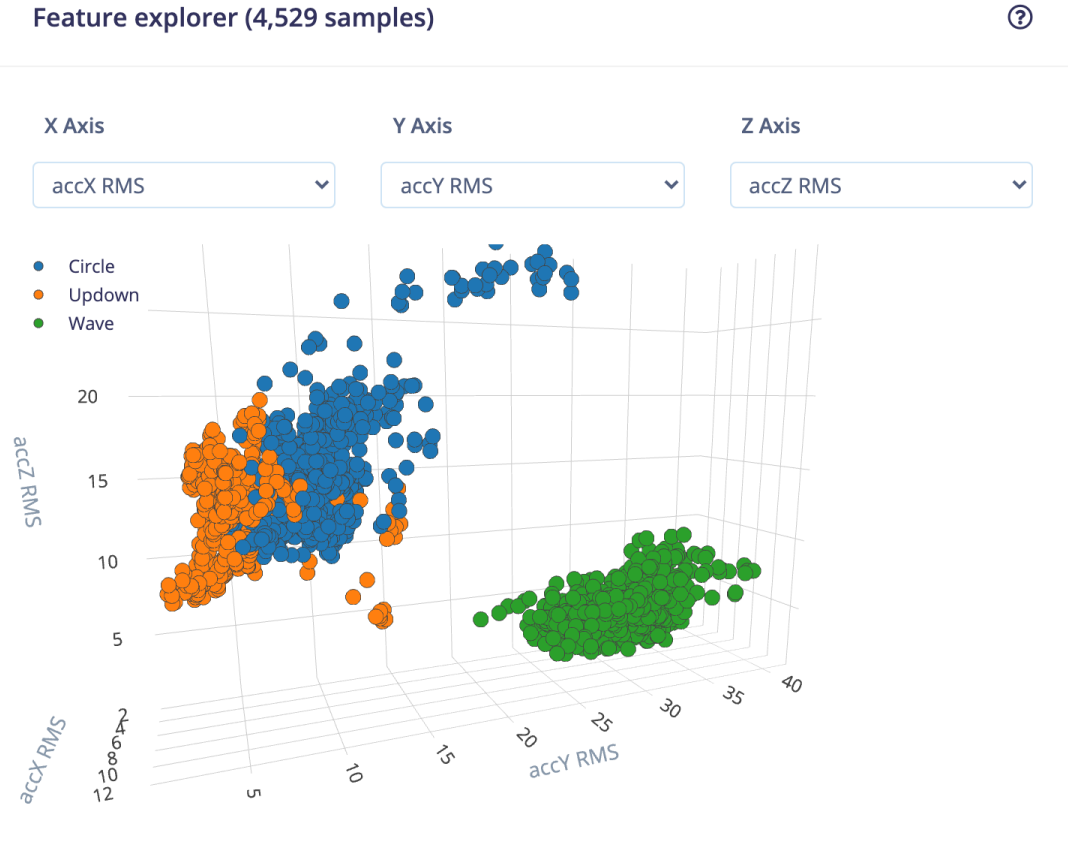
Browse

Browse

Compression

4 

Analyze



Identifying Potential Parts

MCUs/MPUs List: 166 items

+

Display similar items

Export

*	Part No	Reference	Marketing Status	Unit Price for 10kU (US\$)	Board	Package	Flash	RAM	IO	Freq.
☆	STM32H723VE	STM32H723VE...	Active	5.429		TFBGA100	512 kBytes	564 kBytes	82	550 MHz
☆		STM32H723VETx	Active	5.429		LQFP100	512 kBytes	564 kBytes	82	550 MHz
☆	STM32H723VG	STM32H723VG...	Active	5.815		TFBGA100	1024 kBytes	564 kBytes	82	550 MHz
☆		STM32H723VG...	Active	5.815		LQFP100	1024 kBytes	564 kBytes	82	550 MHz
☆	STM32H723ZE	STM32H723ZEIx	Active	5.815		UFBGA144	512 kBytes	564 kBytes	114	550 MHz
☆		STM32H723ZETx	Active	5.815		LQFP144	512 kBytes	564 kBytes	114	550 MHz
☆	STM32H723ZG	STM32H723ZGIX	Active	6.201		UFBGA144	1024 kBytes	564 kBytes	114	550 MHz
☆		STM32H723ZG...	Active	6.201	NUCLEO-H723ZG	LQFP144	1024 kBytes	564 kBytes	114	550 MHz
☆	STM32H725AE	STM32H725AEIx	Active	6.124		UFBGA169	512 kBytes	564 kBytes	125	550 MHz
☆	STM32H725AG	STM32H725AGIx	Active	6.511		UFBGA169	1024 kBytes	564 kBytes	125	550 MHz
☆	STM32H725IE	STM32H725IEKx	Active	6.33		UFBGA176	512 kBytes	564 kBytes	132	550 MHz
☆		STM32H725IETx	Active	6.33		LQFP176	512 kBytes	564 kBytes	121	550 MHz
☆	STM32H725IG	STM32H725IGKx	Active	6.717		UFBGA176	1024 kBytes	564 kBytes	132	550 MHz
☆		STM32H725IGTx	Active	6.717		LQFP176	1024 kBytes	564 kBytes	121	550 MHz
☆	STM32H725RE	STM32H725REVx	Active	5.326		VFQFPN68	512 kBytes	564 kBytes	46	550 MHz
☆	STM32H725RG	STM32H725RG...	Active	5.712		VFQFPN68	1024 kBytes	564 kBytes	46	550 MHz
☆	STM32H725VE	STM32H725VE...	Active	5.429		TFBGA100	512 kBytes	564 kBytes	77	550 MHz
☆		STM32H725VETx	Active	5.429		LQFP100	512 kBytes	564 kBytes	69	550 MHz
☆	STM32H725VG	STM32H725VG...	Active	5.558		TFBGA100	1024 kBytes	564 kBytes	77	550 MHz
☆		STM32H725VG...	Active	5.558		LQFP100	1024 kBytes	564 kBytes	69	550 MHz
☆		STM32H725VG...	Active	5.558		WLCSP115	1024 kBytes	564 kBytes	67	550 MHz
☆	STM32H725ZE	STM32H725ZETx	Active	5.944		LQFP144	512 kBytes	564 kBytes	99	550 MHz
☆	STM32H725ZG	STM32H725ZG...	Active	6.459		LQFP144	1024 kBytes	564 kBytes	99	550 MHz

What tools do you use to find microcontrollers?

- Digikey Website
- Vendor Tools
- Google Search
- Other



Going Further

Thank you for attending

Please consider the resources below:

- www.beningo.com
 - Blog, White Papers, Courses
 - Embedded Bytes Newsletter
 - <http://bit.ly/1BAHYXm>
 - Embedded Software Design
 - <https://bit.ly/3PZCtNO>



From www.beningo.com under

- Blog > CEC – How to Select the Right Microcontroller for an Application



DesignNews

Thank You

Sponsored by



© 2022Beningo Embedded Group, LLC. All Rights Reserved.