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April 28, 2021

MAX1000 IoT Maker Board

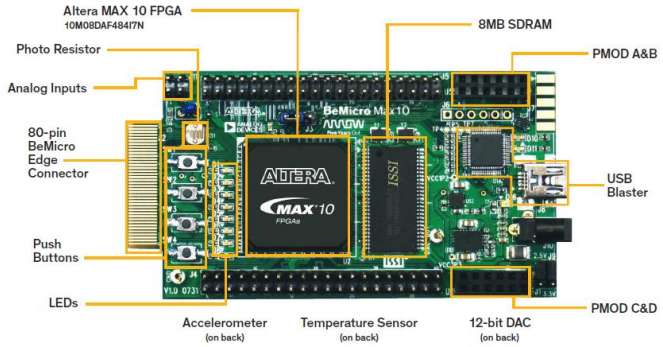
and what you can do with it ?

Five Years Out

MAX1000 Board

… and why we made it

BeMicro MAX10



Pros:

> Very attractive price ~~30$~~ 22€ (29$)

> Customer like simple starter applications

> Arrow has won many customers

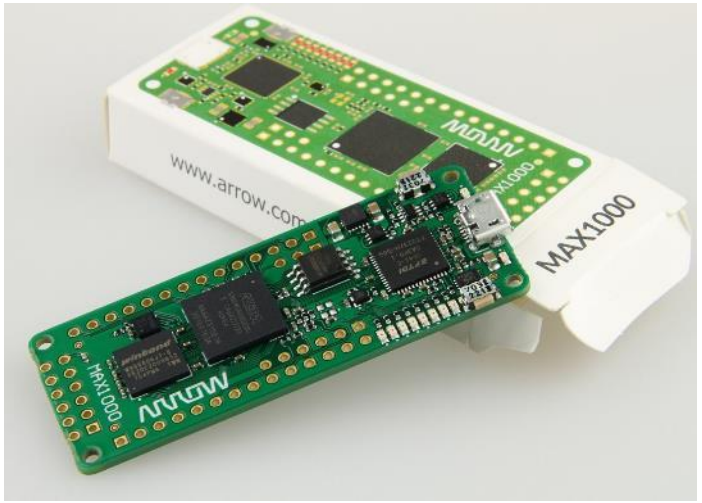
~~Challenge / Cons:~~ → Pros

> ~~ONLY~~ a “promotion” board

> ~~NOT~~ qualified to use in an end product

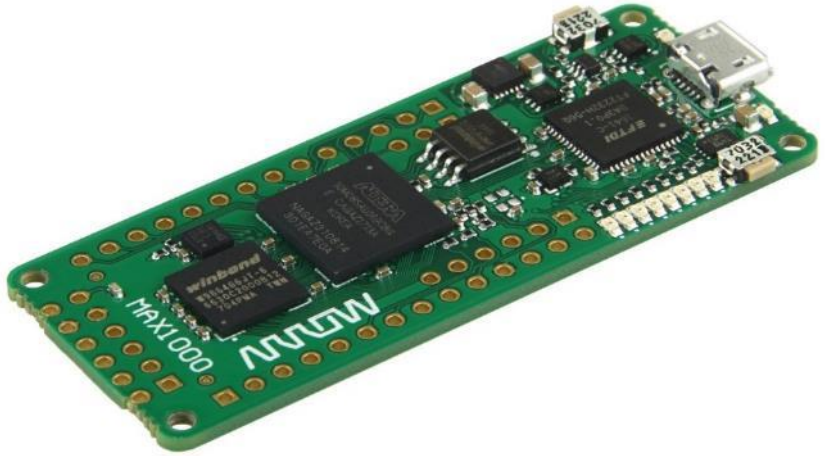
> ~~NOT~~ available in high quantity

MAX1000



MAX1000

... the IoT Maker Solution!

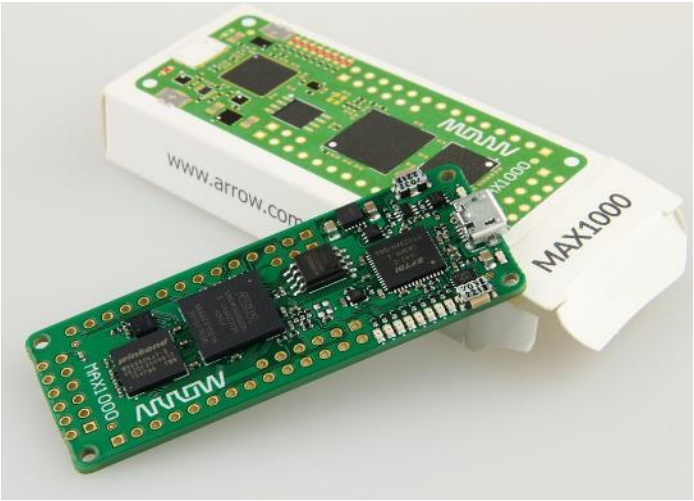


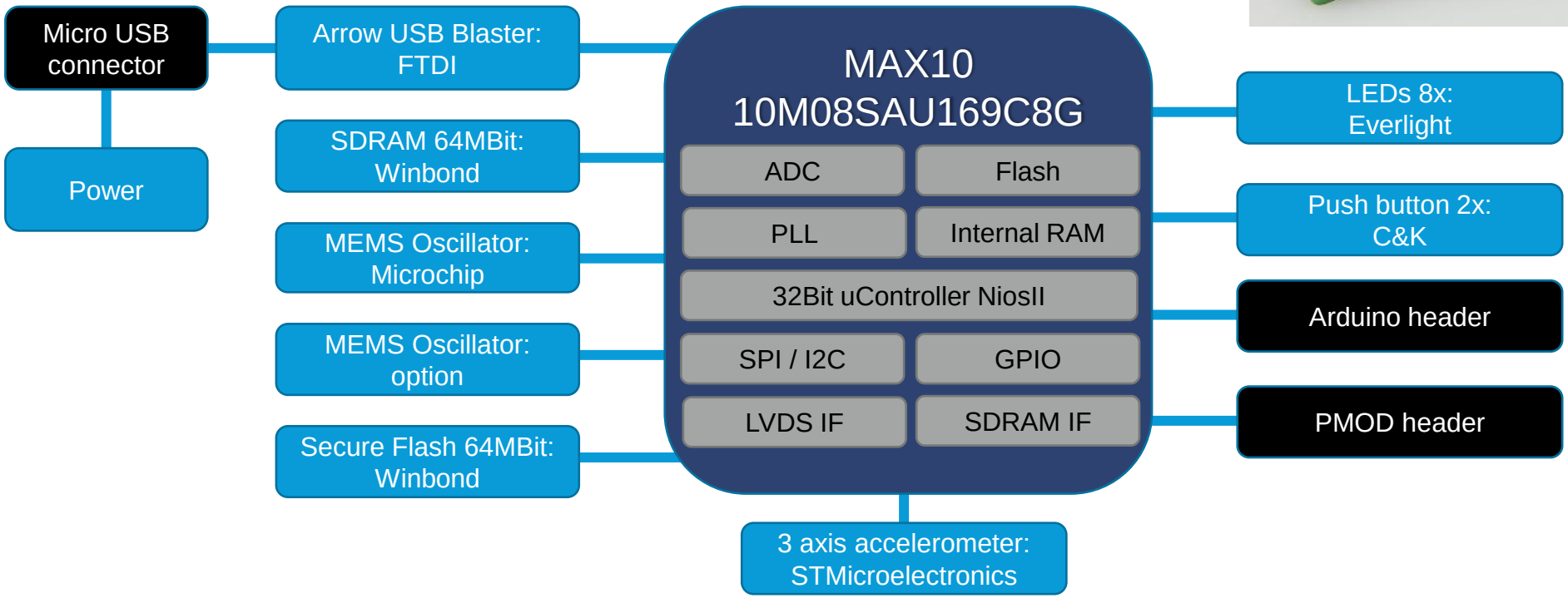
Feature Set:

- > Lowest cost MAX10 solution on the market
- > Intel MAX10 with 8kLE
- > Arduino MKR standard 25x61.5mm²
- > Integrated Arrow USB Blaster
- > Preprogrammed Demo Application
- > Plug&play full featured FPGA kit
- > PMOD connector to adapt various solutions
- > Comes in an attractive box
- > **Qualified hardware also for real end products in a customized version!!!**

MAX1000

... Block diagram

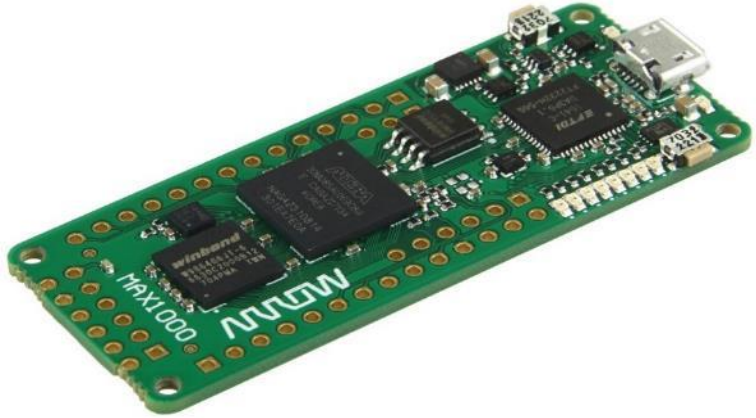




MAX1000

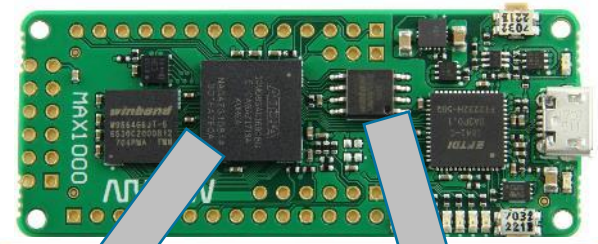
... full customized solution

		Standard	
MAX10	2	8 kLE	16
Flash	single	dual inside	dual
ADC	0	8Ch. 12Bit	8x
Temperature Tj.	-40	0…85°C	125
SDRAM	0	64 MBit	256
USB Programmer2	no	onboard	onboard / JTAG
MEMs Oscillator		12 MHz	all frequencies
Switch / LEDs	0 / 0	2x / 8x	
PMOD / Headers		no	mounted
PCB	customized	25x61.5mm²	customized



MAX1000 – Security 2/2

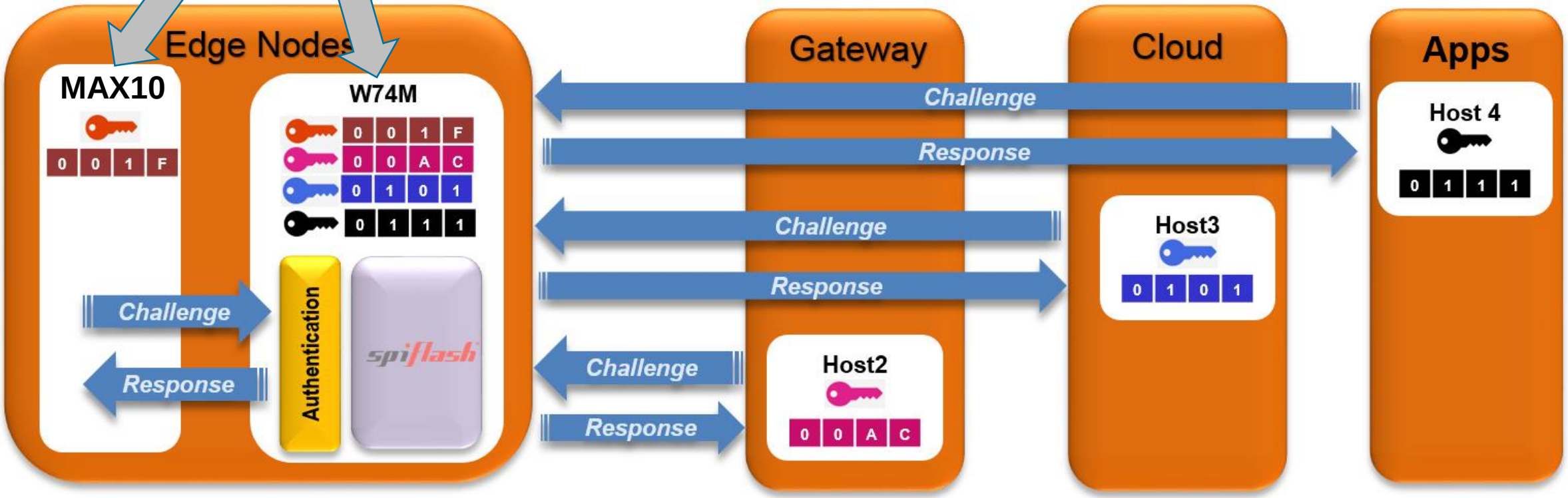
... bring Authentification and Security to your end note / device



Explanation how it works:

http://www.eetimes.com/document.asp?doc_id=1332289

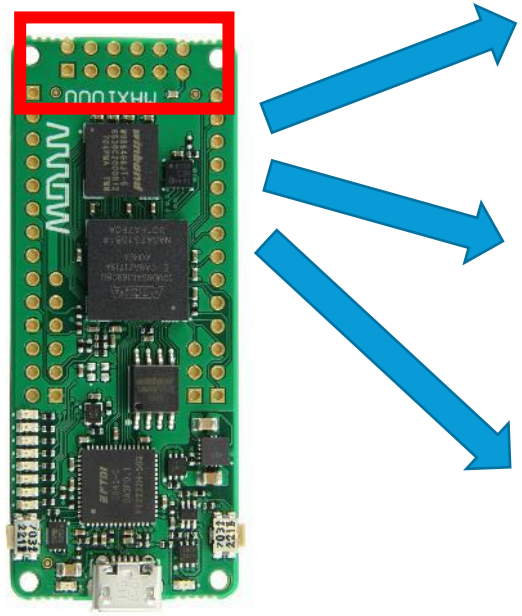
(not longer available on eetimes, but on archive.org)



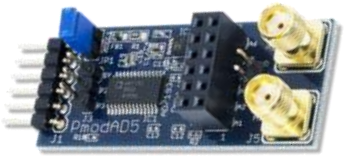
MAX1000 – Connectivity 1

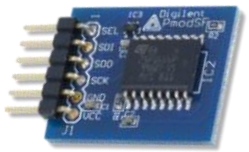
... PMOD connector... build easily more applications!

PMOD Standard Connector



PMOD Adapter Boards





Application

Wifi / BLE
RTC

24Bit ADC
3 axis sensor

9 axis sensor
Flash

....and many more!!!

Supplier Solution

MICROCHIP

ANALOG DEVICES

life.augmented

MAX1000 – Pmod Applications

... Measurement Communication, Controlling, Logging …

- Communication:
  - UART/RS485, I²C, SPI, CAN and other serial interfaces
  - Wireless communication via BlueTooth, BLE, WiFi, LoRa …
  - Alarm message via sound and any display (see next slide)

- Controlling Heater, Fans, Windows or Doors

- Environmental Data Logger
  - Using integrated SDRAM or none volatile QuadSPI NOR Flash
  - Adding external SD card, eMMC or USB stick

Pmod BLE

Pmod RS485

Pmod WiFi

Pmod CAN

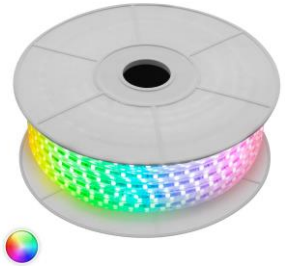
MAX1000 – Pmod Applications 2

... Visualisation

- LEDs and LED Strings
  - 8 LEDs directly available on the boards
  - many more LEDs can be controlled by free pins
  - it is easy to control intelligent LED strings (e.g. WS2811) or LED arrays

- OLEDs and Small TFT
  - Using Pmod interface for OLED
  - realizing serial or parallel interface to small TFT (cheap in Arduino format)

- Standard Monitors
  - Using integrated SDRAM (8MByte) and VGA-Interface
  - Using 3*6 or 3*8 pin parallel interface to control a bigger display



WS2811 String

LCD Matrix

Pmod OLED 128x32

Pmod OLED 96x64

Pmod VGA

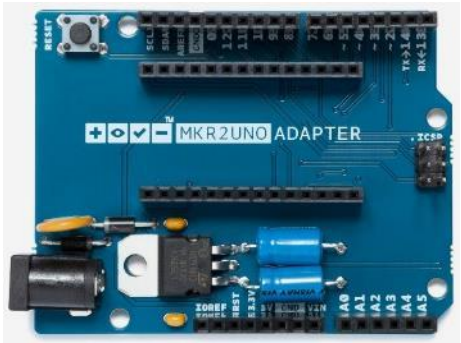
MAX1000 – Connectivity 2

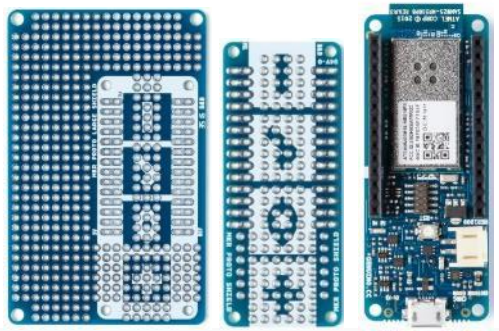
... Arduino features... build easily various applications

Arduino
MKR Standard

Arduino
MKR2UNO Adapter

Arduino
Shields





Ideas for Applications and Expansions

Using other Processors, Languages and IDE‘s

- Arduino
  - Direct update of software over serial interface possible
  - Normally you need an AVR (MegaAVR) core to use the original software framework
  - A lot of adaption are made to use the same framework under “normal” C environment
  - Maybe an adapter from MKR to Arduino is helpful

- Other processor cores are possible
  - ARM Cortex-M can be critical because of licences
  - RISC V are available in different flavors fitting in 8kLE (even multicore)
  - 8051, 6502, Z80, PIC, AVR and 6808 are often used in old projects so adaption of these software is easier
  - A lot of old video games using cores like 1802 or 6502 adaptable to this board (e.g. Pong)
  - Some programming language like JAVA or Python can be accelerated with own cores

- Own Cores and Language
  - FORTH (K1 and SmallForth – need only a terminal and editor to develop a program)
  - BASIC (also now seldom used)
  - MicroPython (actual in focus but no free version available)

Information about MAX1000 and Extensions

Links to diffent web sides

- Arrow web sites:
  https://www.arrow.com/en/products/max1000/arrow-development-tools (MAX1000)
  https://www.arrow.com/en/products/tsx00005/arduino-corporation (MKR to Arduino Adapter Board)
- Trenz electronics web site:
  https://shop.trenz-electronic.de/en/Products/Trenz-Electronic/MAX1000-Intel-MAX-10/ (MAX1000 and MAXCO2)
- Article about MAX1000 (and MAX10):
  https://github.com/vpecanins/max1000-tutorial (some projects with MAX1000)
  https://www.mikrocontroller.net/topic/434791 (MAX1000 Erfahrungen)
  https://www.mikrocontroller.net/topic/446007 (MAX1000 allererste Schritte)
  https://hackaday.com/2018/10/05/easy-fpga-cpu-with-max1000/ (Framework for other CPU‘s or Arduino like SW)
  https://www.intel.com/content/www/us/en/products/programmable/fpga/max-10.html (Intel MAX10 page)
  https://www.intel.com/content/dam/www/programmable/us/en/pdfs/literature/hb/max-10/10_step_to_max10.pdf (Intro)
  https://www.intel.com/content/www/us/en/programmable/solutions/partners/partner-profile/system-level-solutions--inc-/ip/usb-2-0-device-with-fifo-interface--usb20hf-.html (MAX10 USB 2.0 IP for ULPI Interface)
- Other Links:
  https://opencores.org/ (A lot of open cores and interfaces for FPGA; e.g. https://opencores.org/projects/avr_core)
  https://store.digilentinc.com/pmod-modules-connectors/ (Digilent Pmod Modules)
  https://www.adafruit.com/category/17 (Adafruit Arduino products like TFT-, LED-, and Servo Motor shields)

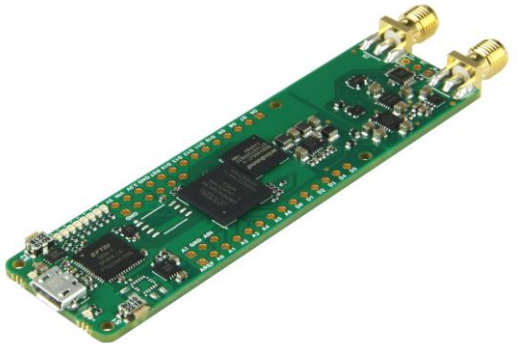
Digilent and Adafruit boards also available from arrow.com

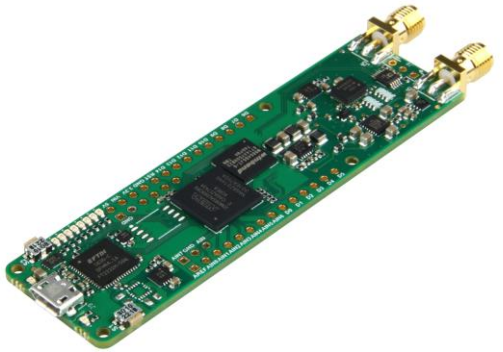
Other Arrow FPGA Boards

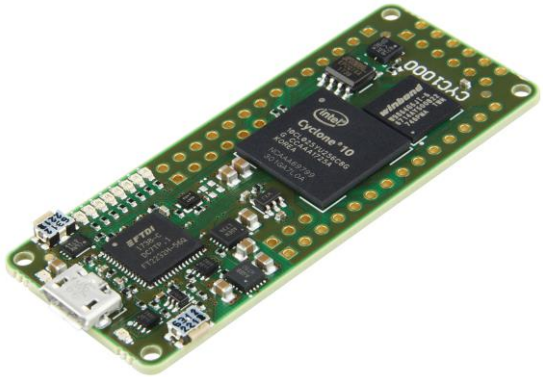
Same form factor – different applications

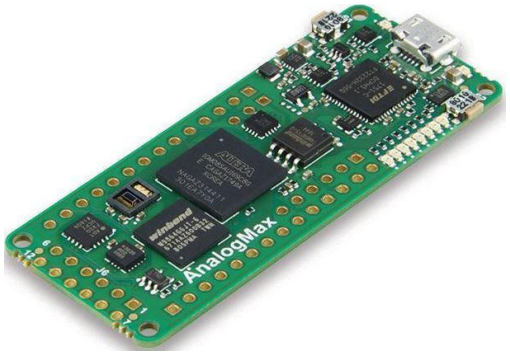
- Modified MAX1000 Boards
  - AnalogMax-01 – Full-featured Programmable Sensor Fusion Development Platform
  - AnalogMax-DAQ1 - with AD4003 (18-bit, 1MSPS)
  - AnalogMax-DAQ2 - with ADAQ7980 (16-bit, 1MSPS)
  - AnalogMax-DAQ2-500k - with ADAQ7988 (16-bit, 500kSPS)
  - AnalogMax-DAQ3 - with ADAQ4003 (18-bit, 2MSPS)

- CYC1000 with Intel Cyclone 10 LP (25kLE)
  - 8MByte SDRAM and 2MByte Flash
  - 3 axis accelerometer









Thank you

Questions?

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