EIU

ELECTRONICS INFORMATION UPDATE

A Mouser Magazine

EUROPE | JUNE 2022

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LIVING AT THE EDGE

FEATURES

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EIU
ELECTRONICS INFORMATION UPDATE

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In this issue...

To paraphrase Aerosmith, 'We're seeing things in a different way... living at the Edge'. Our theme in June is ML/AI at the Edge and includes articles on: machine learning and embedded systems; democratizing AI development; using ML to help cancer diagnosis; and Edge intelligence to boost productivity.

Students continue to amaze with new tech and Adam Taylor advises on MCU selection. Martin Hill is turning us into motor experts; Stuart Cording looks at cable test and David Pike is still unashamedly the 'Connector Geek'. Tech Tips considers security enablers for the IoT. Plus a news round-up, Dev Kit Pick and, of course, a review of the most innovative products now in stock at Mouser. Now read on...

Published by Mouser Electronics.
For Editorial contact Nick Foot at
nick.foot@bwwcomms.com.

For Advertising, contact
Claudia Bertaccini at
claudia.bertaccini@mouser.com.

Renesas invests in 300mm power semis fab

Renesas Electronics has announced that it will invest 90 billion yen in its Kofu Factory, located in Kai City, Yamanashi Prefecture, Japan. Closed in October 2014, Renesas intends to reopen the fab in 2024 as a 300-mm wafer fab capable of manufacturing power semiconductors. Once the Kofu Factory reaches its mass production, the total production capacity of Renesas' power semiconductors will double.

The Kofu Factory of Renesas Semiconductor Manufacturing, a wholly-owned subsidiary of Renesas, previously operated both 150mm and 200mm wafer fabrication lines.

Hidetoshi Shibata, President and CEO of Renesas said, "this investment enables us to have our largest wafer fabrication line dedicated to power semiconductors, which are key to realizing decarbonization. We will continue to conduct necessary investments to enhance our in-house production capability while further strengthening ties with outsource partners."

www.renesas.com

Würth and Luminovo to transform PCB prototyping

PCB manufacturer Würth Elektronik Circuit Board Technology and software provider Luminovo are connecting their products to enable their customers to adapt a much simpler, faster and more accurate PCB prototype costing and quoting process.

The PCB shop is connected to Luminovo's RfQ software LumiQuote to automatically extract all relevant technical parameters of required PCBs using the modern PCB engine.

Luminovo is working on a software suite that aims to transform processes within and between the different companies in the electronics value chain in a modern way. In addition to Stackrate, Luminovo's software solution for PCB manufacturers, LumiQuote focuses on connecting, digitizing and automating quoting and procurement processes for EMS, including material and manufacturing calculations.

https://www.we-online.com
https://luminovo.ai

TDK and VueReal aim for highest resolution displays

Addressing technical challenges plaguing microLED development using a multi-printhead approach, TDK Ventures and microLED developer VueReal intend to print the highest resolution displays in the industry at scalable speeds and throughput, at a low capital expenditure. TDK's investment in VueReal will accelerate the development of their microprinting manufacturing process, enabling cost savings and increased performance.

MicroLED offers the same refresh rates, viewing angles, and material flexibility (for curved screens) that OLED provides, but with reduced power consumption, improved contrast, improved resolution (micron-size pixels), and a two-to-three-times longer lifespan. VueReal's proprietary microprinting process transfers and inspects hundreds of thousands of small-pitch microLED chips on an individual printhead, quickly, with high precision, at up to several square meters of surface per hour. The tech boasts resolutions over 30,000 pixels per inch with one micron precision.

www.tdk-ventures.com

Germany offers chip makers €14B

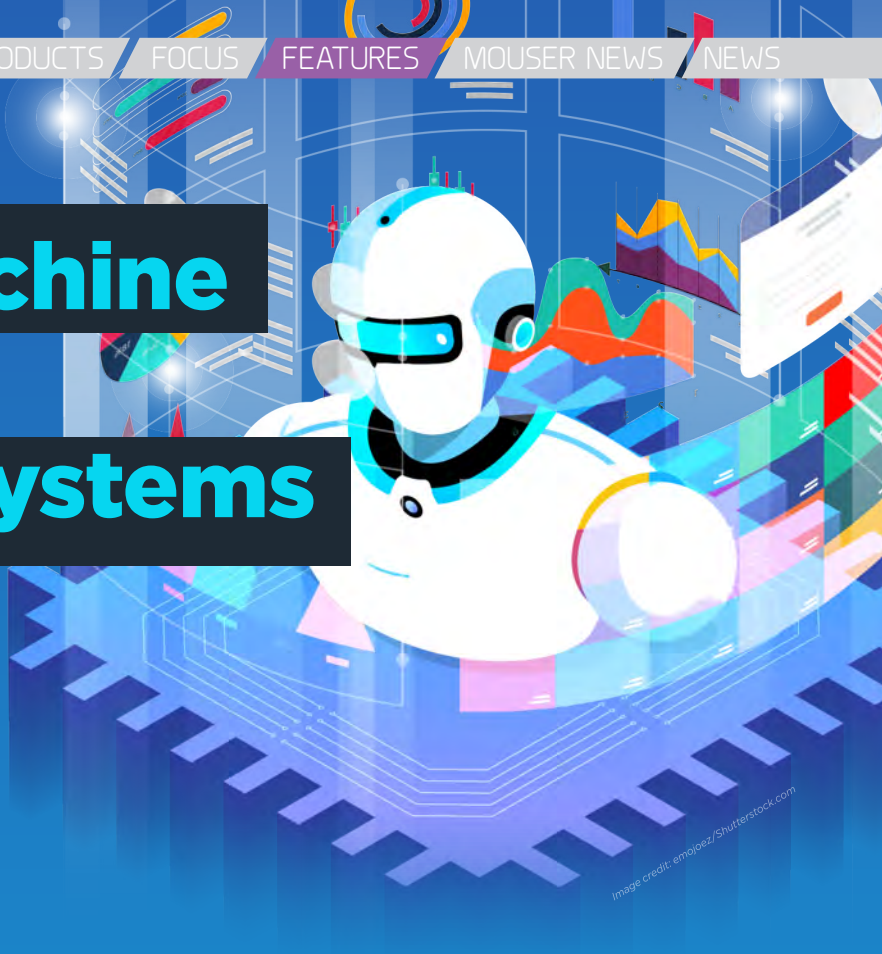
Germany's government wants to attract chip makers with 14 billion euros ($14.71 billion) in support, according to the country's Economy Minister Robert Habeck, adding that the lack of semiconductors is a massive problem.

The European Commission has plans to encourage chip manufacturing in the European Union, with proposed new legislation to ease state aid rules for chip factories.

In March, U.S. chipmaker Intel announced it had picked the German town of Magdeburg as the site for a huge new 17 billion euro chipmaking complex. Habeck said there would be further examples like Magdeburg even though companies in Germany would remain dependent on producers elsewhere for components like batteries.

"We must develop our own strategy to secure primary materials," he said. The German Economy and Climate Protection Minister delivered his speech during a ceremony for a planned floating LNG terminal in the harbor in Wilhelmshaven, Germany.

Bringing machine learning to embedded systems



By Mark Nadeski, Texas Instruments

It is hard to understate the promise of machine learning, the latest evolution of which, deep learning, has been called a foundational technology that will impact the world to the same degree as the internet, or the transistor before that.

Brought on by great advancements in computing power and the availability of enormous labeled data sets, deep learning has already brought major improvements to image classification, virtual assistants and game playing, and will likely do the same for countless industries. Compared to traditional machine learning, deep learning can provide improved accuracy, greater versatility and better utilization of big data – all with less required domain expertise.

In order for machine learning to fulfill its promise in many industries, it is necessary to be able to deploy the inference (the part that executes the trained machine learning algorithm) into an embedded system. This deployment has its own unique set of challenges and requirements.

This article will address the challenges of deploying machine learning in embedded systems and the primary considerations when choosing an embedded processor for machine learning.

Training and inference

In the subset of machine learning that is deep learning, there are two main pieces: training and inference, which can be executed on completely different processing platforms, as shown in Figure 1, below. The training side of deep learning usually occurs offline on desktops or in the cloud and entails feeding large labeled data sets into a deep neural network (DNN). Real-time performance or power is not an issue during this phase.

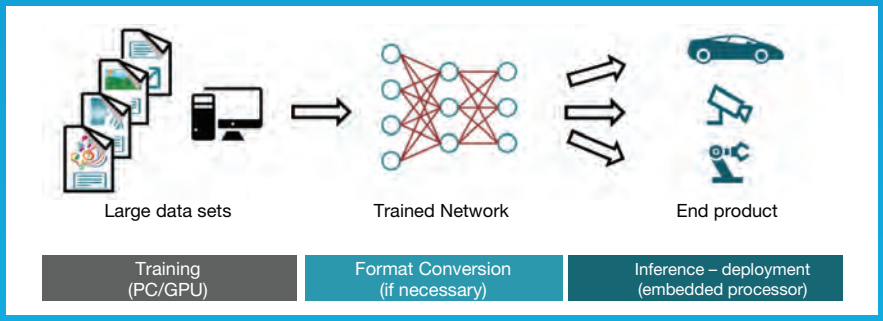


Figure 1: Traditional deep learning development flow.

The result of the training phase is a trained neural network that when deployed can perform a specific task, such as inspecting a bottle on an assembly line, counting and tracking people within a room, or determining whether a bill is counterfeit. The deployment of the trained neural network on a device that executes the algorithm is known as the inference.

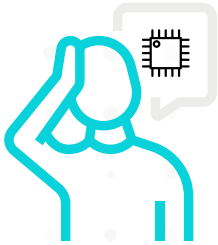
Given the constraints imposed by an embedded system, the neural network will often be trained on a different processing platform than the one running the inference. This article focuses on processor selection for the inference part of deep learning. The terms "deep learning" and "machine learning" in the rest of this paper refer to the inference.

Micro matters

By Adam Taylor

Microcontrollers - spanning a huge capability from 4-bit to 64-bit and beyond - are to be found everywhere. Therefore, we thought it was high time that Mouser's Electronics Information Update presented a series of articles looking at the MCU in detail, considering architectures, operation, selection, OS and tools. In the opening chapter, Adam Taylor, Founder and Principal Consultant at Adiuvo Engineering and visiting professor of embedded systems at the University of Lincoln, reminds us of MCU history.

Considerations when selecting MCUs



One of the most challenging aspects of an embedded system is how to weigh the different parameters associated with a MCU and to select the most appropriate one for the application at hand. Of course, the selection of the most appropriate processor depends on many factors which are defined in customer requirements, environmental conditions, architectural solutions, and company constraints.

Selection of the MCU must show compliance with regard to these factors in order for the customer to accept and sign off on the solution.

Performance

Of all the features that must be considered, the first and most critical is the required performance. Selecting the correct performance will enable the MCU to complete its task within the allocated deadlines. Firstly, determine whether the application can be achieved using a single MCU core or does the design need several MCU cores to split the software tasks.

Determining if a single or multiple core MCU is sufficient will depend upon several factors including the use of an operating system, whether or not the software architecture contains several layers, and consideration of any frameworks and libraries that might be used.

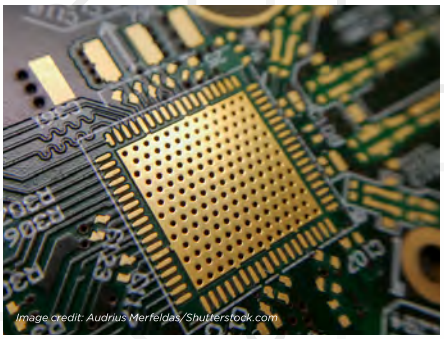


Image credit: Audrius Merfeldas/Shutterstock.com

The developer must also have a deep understanding of the algorithms which are being implemented and their expected performance. The algorithms needed for an operating system will be defined within the software architecture. Understanding these enables the developer to estimate the performance required for the MCU.

The usual measurement for defining the performance of a MCU is Dhrystone Millions of Instructions Per Second or DMIPS. DMIPS are normally specified as DMIPS/MHz which enables the developer to determine the performance that can be expected for the processor at the intended clock frequency.

DMIPS therefore allows the developer to compare different MCUs in order to select the most appropriate. The DMIPS requirement will also inform the developer if a single-core MCU can be used or multiple MCU cores might be better suited.

For more advanced algorithms, the processor may require a floating-point unit (FPU) which enables the developer to implement floating-point operations. The performance of a FPU is defined in floating point operations per second (FLOPS).

These compliment the DMIPS number and enable the developer to correctly determine the MCU performance required.

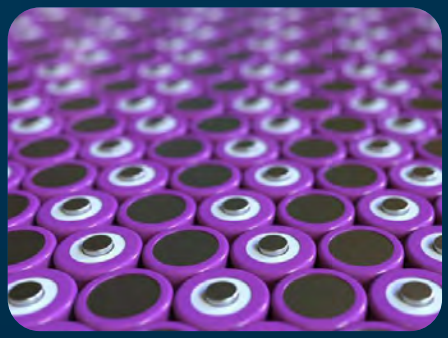
University TECHNOLOGY EXPOSURE

This year, Mouser began a sponsorship of a University Technology Exposure Program with the Wevolver Community. Wevolver aims to empower people to create and innovate by providing access to engineering knowledge. The community provides inspiring, informative content to millions of engineers every month through a number of web and social channels. The University Technology Exposure Program enables students to share their work with the global engineering community and industry.

Mouser has a long history of supporting the University sector (which is detailed here). The Wevolver program will last six months and we will detail submissions in a regular blog in EIU. Readers can vote for their favourite project.

Life on Mars?

This month's articles included three submissions related to renewable energy, two about transportation tech and one each related to space tech, additive manufacturing and drones.



#1. Surface engineered nickel-rich cathode material enabling high power discharge for Li-ion battery applications By Anish Raj Kathribail

Electric Vehicles require high-performance batteries to function in a desirable way. Nickel-rich materials like LiNixMnyCozO2 (NMC) are a popular choice for making the cathode due to their high specific capacity but undergo a drastic capacity loss, especially at high voltages due to a side reaction.

The article explains a surface-coating technique for NMC particles that improves the Lithium-ion battery's total available capacity and high-power performance. The technology can be applied in vehicles, drones, power tools, military, grid storage, electronics, and more.

Read the submission here.

#2. Swissloop Tunneling: Revolutionizing the Tunneling Industry By Swissloop Tunneling

Hyperloop is a futuristic transportation system that aims to overcome the drawbacks of presently available facilities. It includes a pod-like capsule levitating inside vacuum tubes, accelerating across the country at high speeds, being inexpensive for goods and people.

The article presents a list of challenges faced during the implementation, and a technical description of the project and its subsystems. Delft hyperloop by TU Delft students made it to the list of winners of Wevolver Engineering Student & Researcher Communication Program 2021.

Check out the details by visiting this link.

#3. Bringing circularity to the solar panel industry by Sujith Vishwanathreddy

The lifespan of a typical solar panel is roughly 25-30 years. While it may seem like a long period, the panels installed near the beginning of the solar energy boom are almost at the end of their life. Solar panels are currently made in a way that makes them impossible to be repaired, recycled or reused.

In this article, the authors present the concept of bringing circularity to the solar panel industry. With the help of a modular solar panel design, the students are making solar cells replaceable when required, and upgradable when newer technology becomes available. It is projected that by adopting the novel design, the lifespan of solar panels can be extended by 5-10 years.

Access the full article here.

The development tools you need

Top 5 Development Tools

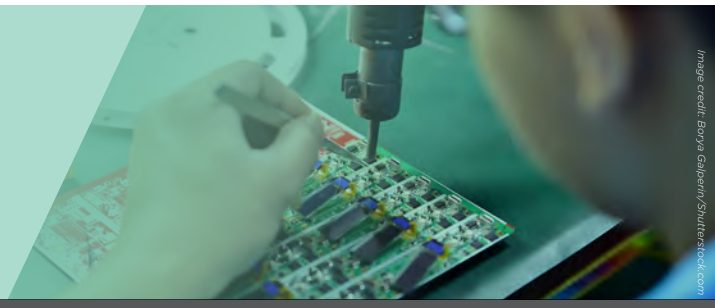


Image credit: Borya Galperin/Shutterstock.com

Mouser offers one of the widest ranges of development kits immediately available off-the-shelf to help designers get started. Here, Mouser's Technical Marketing Manager, EMEA, Mark Patrick, presents his 'Top 5 Pick' of recently-released dev kits.

www.mouser.com/Development-Tools-Center

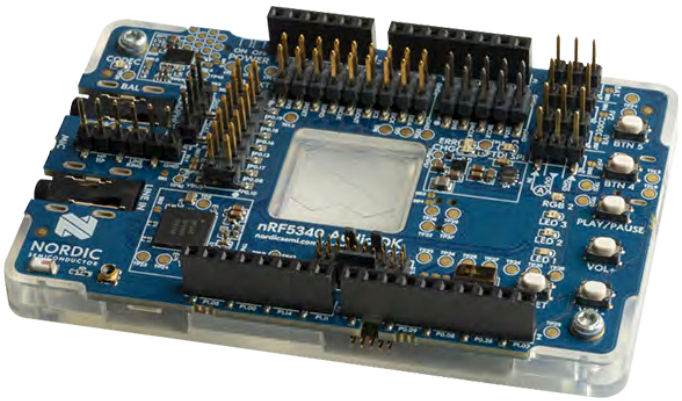
Are you listening?

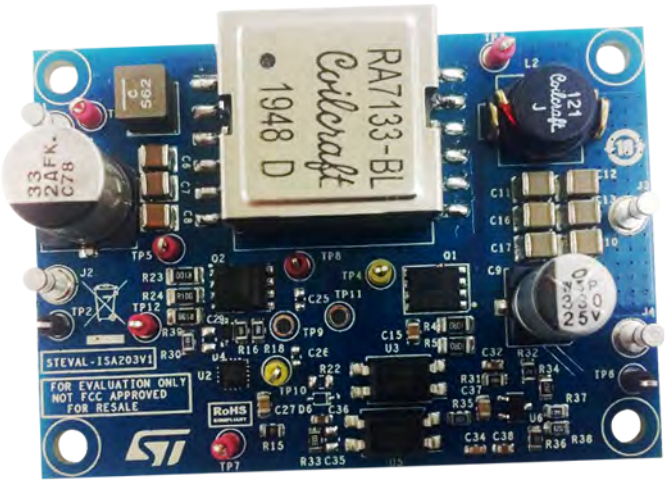
Nordic Semiconductor nRF5340 audio devkit

The configurable nRF5340 Audio Kit is a development platform designed for BLUETOOTH® "LE Audio". It functions as a USB dongle allowing audio data to be sent or received from a PC, or it can serve as a business headset, a broadcast receiver, or a True Wireless Stereo (TWS) earbud. Two or more kits are recommended for most use cases.

The kit contains three primary devices - an nRF5340 SoC, an nPM1100 PMIC, and Cirrus Logic's CS47L63 Audio DSP. The CS47L63 high-performance DAC and differential output driver are intended for direct connection to an external headphone load. The CS47L63 is ideal for earbuds with mono-only and direct speaker output. The nRF5340 Audio DK is typically powered via USB and has a battery connector for a Li-Ion/Li-Po battery. The Power Profiler Kit II uses the dedicated current measurement pins to allow current consumption measurement.

FIND OUT MORE >>





Demonstrate the power

STMicroelectronics STEVAL ISA203V1 eval board

The STEVAL-ISA203V1 evaluation board demonstrates a compact and efficient continuous conduction mode flyback converter design especially suitable for server and telecommunications equipment. This eval board provides high-efficiency DC-DC conversion with 60W output (12V/5A), from 42 to 56VDC input (48V nom.). The PM8804 controller features all the integrated circuitry necessary for a compact and efficient 48V converter. It manages the flyback topology and includes a programmable oscillator for switching frequency regulation up to 1MHz, adjustable slope compensation, dual complementary low-side drivers with programmable dead time, programmable soft start, soft turn off, and a programmable current sense blanking time.

FIND OUT MORE >>

24-bit ADCs in stock

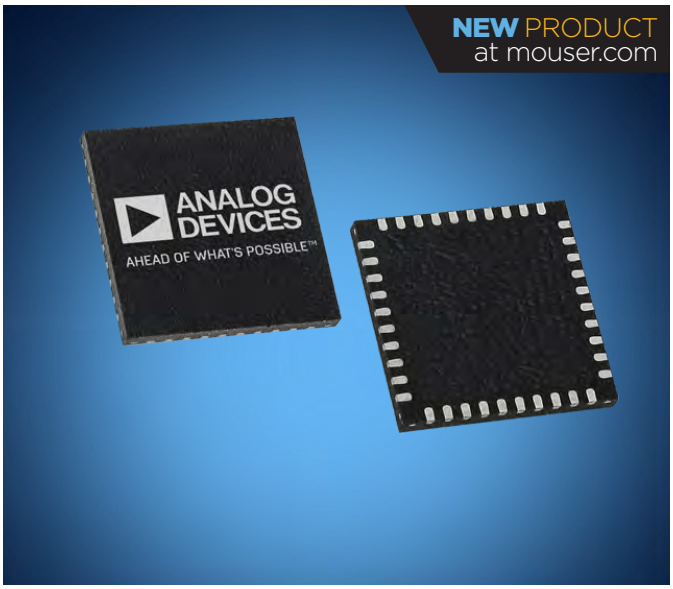
Mouser is now stocking the AD4116 analogue-to-digital converters (ADCs) from Analog Devices Inc.

Mouser is now stocking the AD4116 analogue-to-digital converters (ADCs) from Analog Devices Inc.

The AD4116 ADCs are low power, low noise, and 24-bit sigma-delta (Σ-Δ) ADCs that integrate ADI's proprietary iPassives® technology for precision performance.

These ADCs also feature an Analog Front End (AFE) for six fully differential or eleven single-ended, high-impedance (≥10MΩ) bipolar, and ±10V voltage inputs. The additional two differential or four single-ended/pseudo differential direct ADC inputs provide excellent performance at lower input ranges.

The AD4116 ADCs feature a maximum-channel scan rate of 12,422SPS (80µs) using a sinc5 + sinc1 filter and 20,618SPS per channel (48µs) using a sinc3 filter. The AD4116 converters operate with a single power supply and make it easy to use in galvanically isolated applications.



These AD4116 ADCs are housed in a 40-lead, 6mm x 6mm LFCSP package. Applications include programmable logic controller (PLC) modules, distributed control system (DCS) modules, and instrumentation and measurement.

Click for More Information

Mini-Cam for endoscopy

The NanEyeM miniature camera module from ams OSRAM is the world's smallest single-use digital camera module with a digital output for medical endoscopes, helping to ensure high levels of sterility and reduce the likelihood of cross-contamination.

In stock at Mouser, the NanEyeM has a footprint of just 1.0mm², yet delivers high-quality, high-frame-rate images using a 2.4µ rolling shutter pixel at a resolution of 320×320 without requiring coax or shielded cable.

The module offers variable frame rates from 4fps to 49fps for smooth imaging across a variety of standard interfaces, while the lens combines a wide field of view with an extended depth of field, reducing distortions and delivering a sharp and accurate image.

The module's LVDS serial interface provides a high signal-to-noise ratio digital output, enabling signals over a cable length up to 3m.

Click for More Information