Vidya Vikas Education Trust's

Universal College of Engineering

Approved by AICTE, DTE, Maharashtra State Goverment and Affiliated to Mumbai University

Accredited with B+ Grade by NAAC | Recognised as Linguistic (Gujarati) Minority Institution

COMPILED AND DESIGNED BY:

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Department Vision:

To be recognized for practicing the best teaching-learning methods to create highly competent, resourceful and self-motivated young electronics engineers for benefit of society.

Department Mission:

- To nurture engineers who can serve needs of society using new and innovative techniques in electronics.
- To improve and apply knowledge of electronics subjects through participation in different technical events.
- To enhance carrier opportunities of electronic students through industry interactions and in plant training.
- To install the passion and spirit among students to pursue higher education in electronics and entrepreneurship.

Researchers Design World's Fastest Information-Fueled Engine

The development of this engine, which converts the random jiggling of a microscopic particle into stored energy, is outlined in research published in the *Proceedings of the National Academy of Sciences* (PNAS) and could lead to significant advances in the speed and cost of computers and bio-nanotechnologies.

SFU physics professor and senior author John Bechhoefer says researchers' understanding of how to rapidly and efficiently convert information into "work" may inform the design and creation of real-world information engines.

"We wanted to find out how fast an information engine can go and how much energy it can extract, so we made one," says Bechhoefer, whose experimental group collaborated with theorists led by SFU physics professor David Sivak.

Engines of this type were first proposed over 150 years ago but actually making them has only recently become possible.

"By systematically studying this engine, and choosing the right system characteristics, we have pushed its capabilities over ten times farther than other similar implementations, thus making it the current best-in-class," says Sivak.

The information engine designed by SFU researchers consists of a microscopic particle immersed in water and attached to a spring which, itself, is fixed to a movable stage. Researchers then observe the particle bouncing up and down due to thermal motion.

“When we see an upward bounce, we move the stage up in response,” explains lead author and PhD student Tushar Saha. “When we see a downward bounce, we wait. This ends up lifting the entire system using only information about the particle’s position.”

Repeating this procedure, they raise the particle “a great height, and thus store a significant amount of gravitational energy,” without having to directly pull on the particle.

Saha further explains that, “in the lab, we implement this engine with an instrument known as an optical trap, which uses a laser to create a force on the particle that mimics that of the spring and stage.”

Joseph Lucero, a Master of Science student adds, “in our theoretical analysis, we find an interesting trade-off between the particle mass and the average time for the particle to bounce up. While heavier particles can store more gravitational energy, they generally also take longer to move up.”

“Guided by this insight, we picked the particle mass and other engine properties to maximize how fast the engine extracts energy, outperforming previous designs and achieving power comparable to molecular machinery in living cells, and speeds comparable to fast-swimming bacteria,” says postdoctoral fellow Jannik Ehrich.

Reference: “Maximizing power and velocity of an information engine” by Tushar K. Saha, Joseph N. E. Lucero, Jannik Ehrich, David A. Sivak and John Bechhoefer, 18 May 2021, *Proceedings of the National Academy of Sciences*.

Source: https://scitechdaily.com/researchers-design-worlds-fastest-information-fueled-engine/

ON adds SiC MOSFET modules for EV chargers

EC charging stations require power levels in excess of 350 kW with efficiencies of 95% becoming the norm.

The 1200V M1 full SiC MOSFET 2 pack modules, based upon planar technology and suited to a drive voltage in the range of 18-20 V, are simple to drive with negative gate voltages. The larger die reduces thermal resistance compared to trench MOSFETs, thereby reducing die temperature at the same operating temperature.

Configured as a 2-PACK half bridge, the NXH010P120MNF is a 10 mohm device housed in an F1 package while the NXH006P120MNF2 is a 6 mohm device in an F2 package. The packages feature press-fit pins making them suitable for industrial applications and an embedded negative temperature coefficient (NTC) thermistor facilitates temperature monitoring.

As part of the ON Semiconductor EV charging ecosystem, the new SiC MOSFET modules have been designed to work alongside driver solutions such as the NCD5700x devices. The recently introduced NCD57252 dual channel isolated IGBT/MOSFET gate driver offers 5 kV of galvanic isolation and can be configured for dual low-side, dual high-side or half-bridge operation.

The NCD57252 is housed in a small SOIC-16 wide body package and accepts logic level inputs (3.3 V, 5 V & 15 V). The high current device (source 4.0 A / sink 6.0 A at Miller plateau voltage) is suitable for high-speed operation as typical propagation delays are 60ns.

Complementing the new modules and gate driver are the ON Semiconductor SiC MOSFETs that provide superior switching performance and enhanced thermals when compared to similar silicon devices. This results in improved efficiency, greater power density, improved electromagnetic interference (EMI) and reduced system size and weight.

The recently-announced 650 V SiC MOSFETs employ a novel active cell design combined with advanced thin wafer technology enabling a best-in-class figure of merit (FoM) for (RDS(on)*area). Devices in the series such as the NVBG015N065SC1, NTBG015N065SC1, NVH4L015N065SC1 and NTH4L015N065SC offer the lowest RDS(on) in the market for D2PAK7L / TO247 packaged MOSFETs.

The 1200 V and 900 V N-channel SiC MOSFETs feature a small chip size that reduces device capacitance and gate charge (Qg – as low as 220 nC), reducing switching losses when operating at the high frequencies demanded by EV chargers.

Source: https://www.electronicsweekly.com/news/business/adds-sic-mosfets-2-2021-06/

Digi-Key supplies Startups Survival Guide

The startup site contains resources, tools and knowledge Digi-Key has built from its own experience of working with thousands of startups.

The manual, called the *Startups Survival Guide*, is the second edition based on Digi-Key's partnership with *Startups Magazine*.

The website and manual follow a 10-step journey – the Startup Roadmap – going from initial ideas and prototyping through production and support. The company says it will "provide expertly curated success factors to help mitigate the complexities and navigate towards success".

"Being the engineer's choice for early-stage prototyping through design and production, Digi-Key is uniquely positioned to share knowledge back to the startup community helping them navigate the particular challenges they face on their journey to success," said David Sandys, director of technical marketing at Digi-Key.

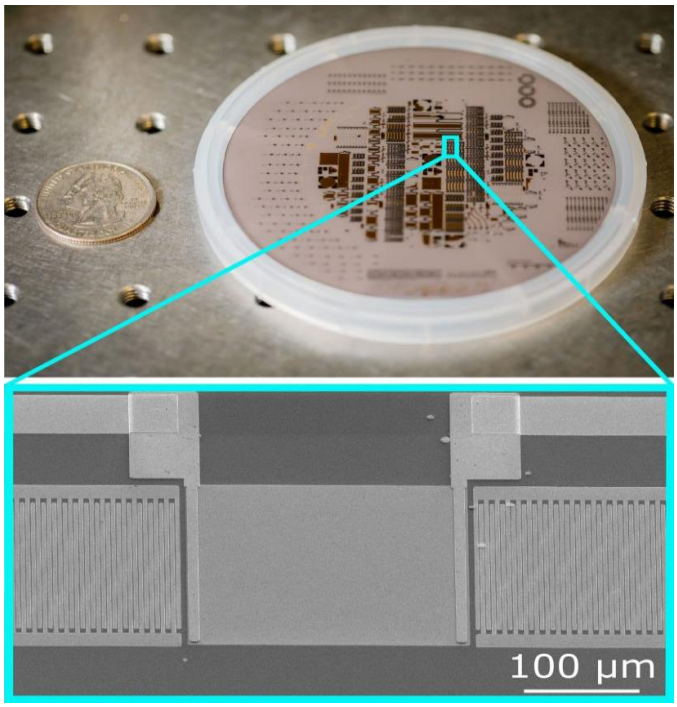
"Our engagement with tens of thousands of startups has enabled Digi-Key to learn ways around both common and more obscure pitfalls that hamper startups' desires and aspirations. The new microsite

and guide are two of the best resources to steer through those obstacles."
The website also includes a dozen "startup success" tools, from Scheme-it, Digi-key's back-of-the-napkin ideation tool to bill of materials (BOM) management, reference platforms, bare PCB ordering with PCB Builder and DKRed through to its Marketplace offerings on its main website.
The Roadmap Dashboard, previously mentioned, is an interactive tool with steps, sub-steps and resources for each of the 10 stages as well as a tracking system to help startups complete all the steps necessary.

Source: https://www.electronicsweekly.com/news/business/distribution/digi-key-supplies-startups-survival-guide-2021-06/

Smallest acoustic amplifier made by Sandia Labs

Amplifiers can potentially be made smaller and better as acoustic devices by using sound waves instead of electrons to process radio signals.



Sandia's acoustic, 276-megahertz amplifier, measuring 0.0008 in.^{2} (0.5 mm^2), demonstrates the potential for making radios smaller through acoustics.
To amplify 2 gigahertz frequencies, which carry much of modern cell phone traffic, the device would be even smaller, 0.00003 in.^{2} (0.02 mm^2).
"We are the first to show that it's practical to make the functions that are normally being done in the electronic domain in the acoustic domain," says researcher Matt Eichenfield.

The device can boost a signal by a factor of 100 in 0.008 inch (0.2 mm) using 36V and 20mW.

Fusing an ultrathin semiconducting layer onto a dissimilar acoustic device took an intricate process of growing crystals on top of other crystals, bonding them to other crystals and then chemically removing 99.99% of the materials to produce a perfectly smooth contact surface.

Source: https://www.electronicsweekly.com/news/business/smallest-acoustic-amplifier-made-sandia-labs-2021-06/

Motor controller programmes through Arduino IDE

It handles up to four axes of step-and-direction motion control (500kHz max step rate), and provides 13 software-configurable protected 24V-compatible I/Os.

"You can download the optional ClearCore Arduino Wrapper Library. This allows you to write code within the easy-to-use Arduino IDE and using Arduino command syntax. This library includes dozens of Arduino sketch examples," according to its maker, New York-based Teknic.

For a more comprehensive programming environment, there is a C++ library which includes example projects compatible with Atmel Studio 7 development environment., and the optional Atmel-ICE debug tool adds debug techniques like single-stepping through code and setting complex breakpoints.

ClearCore can be used stand-alone to control smaller systems, or multiple units can be networked to a master – a Raspberry Pi, for example. Communication can be through Ethernet, serial port or USB, or there is a wireless option through an XBee module for WiFi, Bluetooth, ZigBee, DigiMesh or 802.15.4.

For up to 64 more IO lines, up to eight of the company's CCIO-8 expansion modules can be added.

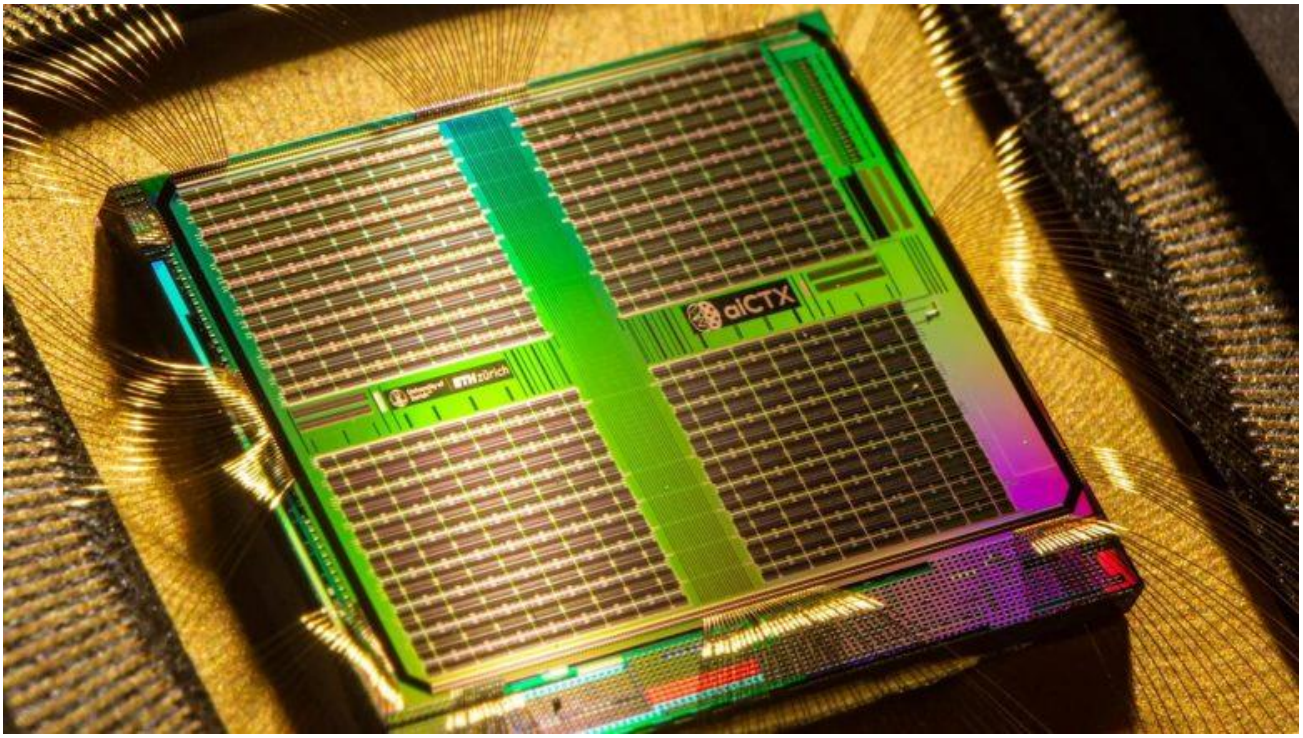
The unit is 127mm x 88.9mm x 25.4mm and needs 12V or 24V power, drawing 300mA (400mA with an XBee) from 24V. Operation is across -20 to 50°C and 0-90% non-condensing humidity.

On-board processing is by a 120MHz SAME53N19A Cortex M4F.

Source: https://www.electronicsweekly.com/news/products/bus-systems-sbcs/motor-controller-programmes-arduino-ide-2021-06/

Neuromorphic Chip: Artificial Neurons Recognize Biosignals in Real Time

Researchers from Zurich have developed a compact, energy-efficient device made from artificial neurons that is capable of decoding brainwaves. The chip uses data recorded from the brainwaves of epilepsy patients to identify which regions of the brain cause epileptic seizures. This opens up new perspectives for treatment.



Current neural network algorithms produce impressive results that help solve an incredible number of problems. However, the electronic devices used to run these algorithms still require too much processing power. These artificial intelligence (AI) systems simply cannot compete with an actual brain when it comes to processing sensory information or interactions with the environment in real time.

Neuromorphic chip detects high-frequency oscillations

Neuromorphic engineering is a promising new approach that bridges the gap between artificial and natural intelligence. An interdisciplinary research team at the University of Zurich, the ETH Zurich, and the UniversityHospital Zurich has used this approach to develop a chip based on neuromorphic technology that reliably and accurately recognizes complex biosignals. The scientists were able to use this technology to successfully detect previously recorded high-frequency oscillations (HFOs). These specific waves, measured using an intracranial electroencephalogram (iEEG), have proven to be promising biomarkers for identifying the brain tissue that causes epileptic seizures.

Complex, compact, and energy efficient

The researchers first designed an algorithm that detects HFOs by simulating the brain's natural neural network: a tiny so-called spiking neural network (SNN). The second step involved implementing the SNN in a fingernail-sized piece of hardware that receives neural signals by means of electrodes and which, unlike conventional computers, is massively energy efficient. This makes calculations with a very high temporal resolution possible, without relying on the internet or cloud computing. "Our design allows us to recognize spatiotemporal patterns in biological signals in real time," says Giacomo Indiveri, professor at the Institute for Neuroinformatics of UZH and ETH Zurich.

Measuring HFOs in operating theaters and outside of hospitals

The researchers are now planning to use their findings to create an electronic system that reliably recognizes and monitors HFOs in real time. When used as an additional diagnostic tool in operating theaters, the system could improve the outcome of neurosurgical interventions.

However, this is not the only field where HFO recognition can play an important role. The team's long-term target is to develop a device for monitoring epilepsy that could be used outside of the hospital and that would make it possible to analyze signals from a large number of electrodes over several weeks or months. "We want to integrate low-energy, wireless data communications in the design – to connect it to a cellphone, for example," says Indiveri. Johannes Sarnthein, a neurophysiologist at UniversityHospital Zurich, elaborates: "A portable or implantable chip such as this could identify periods with a higher or lower rate of incidence of seizures, which would enable us to deliver personalized medicine." This research on epilepsy is being conducted at the Zurich Center of Epileptology and Epilepsy Surgery, which is run as part of a partnership between UniversityHospital Zurich, the Swiss Epilepsy Clinic and the University Children's Hospital Zurich.