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Universal College of Engineering

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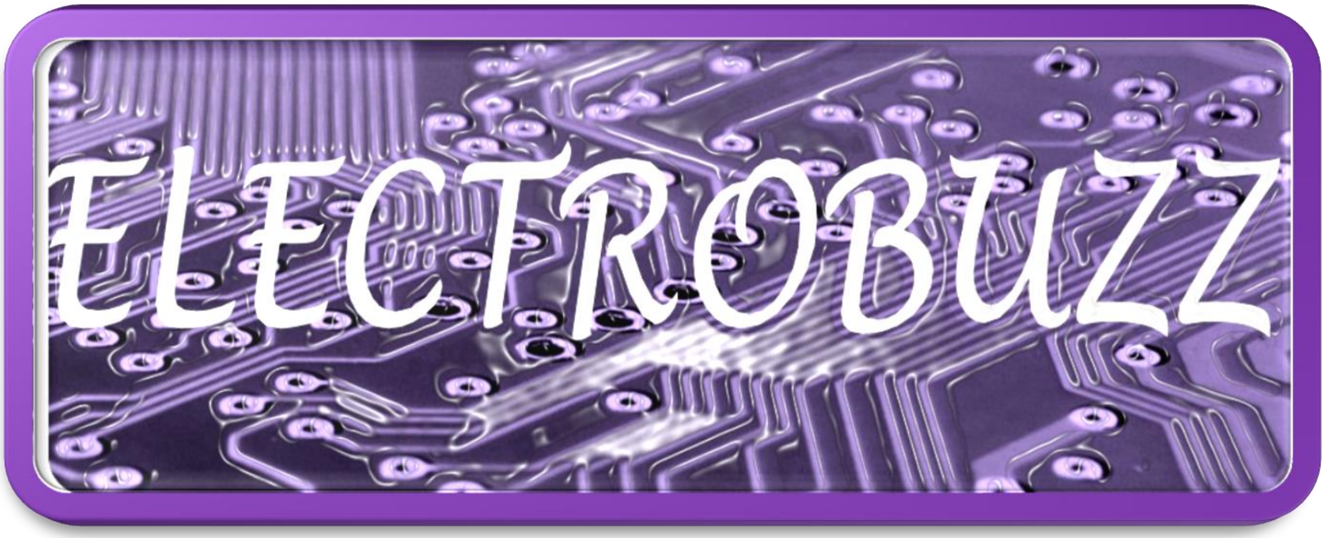

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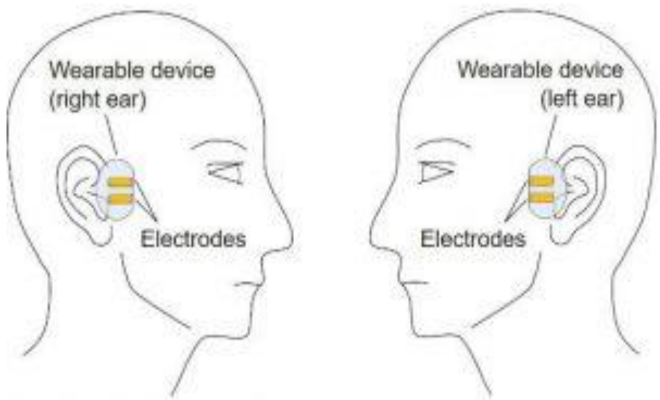
Department Vision:

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.

Tissue-based human body communications are OK



"For wearables to truly transcend portables, we will need to rethink the way in which devices communicate with each other," according to the university. "The usual approach of using an antenna to radiate signals into the surrounding area while hoping to reach a receiver won't cut it for wearables – this method of transmission not only demands a lot of energy but can also be unsafe from a cybersecurity standpoint. Moreover, the human body itself also constitutes a large obstacle because it absorbs electromagnetic radiation and blocks signals."

Human body communication (HBC) is one of the wireless body area network (WBAN) techniques.

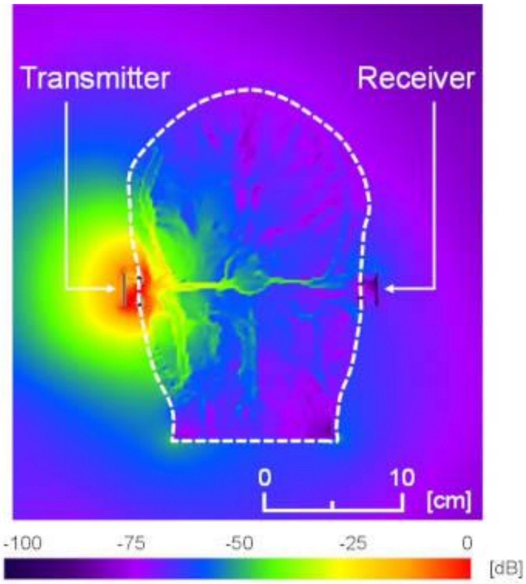
Instead of Bluetooth, Zigbee or similar antenna-based electro-magnetic technique, HBC interfaces to the skin with electrodes. "Some electric fields can propagate inside the body very efficiently without leaking to the surrounding area," said the university. "By interfacing skin-worn devices with electrodes, we can enable them to communicate with each other using relatively lower frequencies than those used in conventional wireless protocols like Bluetooth."

Binaural hearing aids were picked as a subject for the project because they work in pairs, have to be synchronised, and are naturally in contact with the skin. 10, 20 and 30MHz were selected as potential operating frequencies, plus 2.45GHz to compare results with Bluetooth.

The researchers had previously studied HBC on real people, and have now used numerical simulation to determine how the electric fields emitted from an electrode in one ear travel through the head to reach the opposite ear.

They first tested various human-body models to find one that was sufficiently representative, then explored the effects of various system parameters.

"We calculated the input impedance characteristics of the transceiver electrodes, the transmission characteristics between transceivers, and the electric field distributions in and around the head. In this way, we clarified the transmission mechanisms of the proposed HBC system," said researcher Dairoku Muramatsu.



With the model calibrated, they could weed out less effective electrode structures and "they also calculated the levels of electromagnetic exposure caused by their system and found that it would be completely safe for humans, according to modern safety standards", said the university.

Findings included that reactive impedance matching makes a big difference to communication effectiveness, and that signals outside the body attenuate sufficiently quickly to allow devices on separate people to operate at similar frequencies in the same space without interference.

"With our results, we have made progress towards reliable low-power communication systems that are not limited to hearing aids but also applicable to other head-mounted wearable devices," said Muramatsu. "Not just this, accessories such as earrings and piercings could also be used to create new communication systems."

Much more detail, including safety-related SAR (specific absorption rate), can be found in the paper 'Transmission Analysis in Human Body Communication for Head-Mounted Wearable Devices', published in Electronics by MDPI. This can be read in full without payment, and is worth at least browsing as it is clearly written, easily understood and informative.

Source: https://www.electronicsweekly.com/news/research-news/tissue-based-human-body-communications-ok-2021-08/

ASFETs for hot-swap and soft-start

Nexperia has brought out 80V and 100V ASFETs with enhanced SOA performance, targeting hot-swap & soft-start applications in 5G telecom systems & 48 V server environments and industrial equipment needing e-fuse and battery protection.

ASFETs are a new breed of MOSFET optimized for use in particular design scenarios. By focusing on specific parameters critical to an application, sometimes at the expense of others that are less important in the same design, new levels of performance can be achieved.

The ASFETs use a combination of Nexperia's latest silicon technology and copper-clip package construction to significantly strengthen the Safe Operating Area (SOA) and minimize PCB area. Previously, MOSFETs have suffered from the Spirito effect, whereby the SOA performance drops off rapidly due to thermal instability at higher voltages. Nexperia's rugged, enhanced SOA technology eliminates the 'Spirito-knee', increasing SOA by 166 % at 50 V when compared to previous generations in D2PAK.

Another important advancement is the inclusion of 125 °C SOA characteristics on the datasheet. Comments Mike Becker, Senior International Product Marketing Manager at Nexperia: "SOA is traditionally only specified at 25 °C, meaning designers have to derate for operation in hot environments. Our new hot-swap ASFETs include a 125 °C SOA specification, eliminating this time-consuming task and confirming Nexperia's excellent performance even at elevated temperatures".

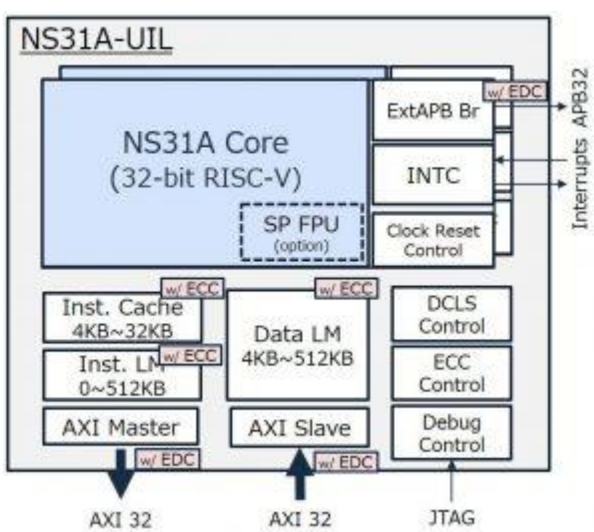
The new PSMN4R2-80YSE (80 V, 4.2 mΩ) and PSMN4R8-100YSE (100 V, 4.8 mΩ) hot-swap ASFETs are packaged in the Power-SO8 compatible LFPAK56E.

The internal copper-clip construction of the package improves thermal and electrical performance whilst substantially reducing footprint size. The new LFPAK56E products are just 5 mm x 6 mm x 1.1 mm, offering reductions of 80 % and 75 % for PCB footprint and device height respectively, compared to the D2PAK of previous generations. The devices also feature a maximum junction temperature of 175 °C, meeting IPC9592 regulations for telecoms and industrial applications.

Adds Becker: "A further benefit is improved current sharing in high power applications that demand multiple hot-swap MOSFETs to be used in parallel, improving reliability and reducing system cost. Nexperia is widely recognized as the market leader for hot-swap MOSFETs. With these latest ASFETs, we have again raised the bar."

Source: https://www.electronicsweekly.com/news/business/asfets-hot-swap-soft-start-2021-08/

Functional safety development support for automotive Risc-V



"Functional safety is a constant growing requirement for embedded systems, with automotive applications, industrial automation and medical devices as three of the major driving forces," according to IAR Systems. "With the rise of Risc-V, functional safety for Risc-V is becoming more and more important."

Nsitexe's recently-announced Risc-V core is NS31A, a general-purpose single-issue four-stage in-order pipeline CPU implementing the RV32IMAF instruction set and supporting an ISO 26262 ASIL D functional safety mechanism for automotive applications as well as a privileged mode for Autosar.

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Its integrated hardware safety features include ECC (error correction codes) on the memories, dual-core lockstep architecture and bus protocol violations detection. “These enable this processor to meet ASIL D safety requirements without the need to add any external special safety mechanism,” claimed Nsitexe.

NS31A-HSK (hardware safety kit) provides FMEDA (failure modes effects and diagnostics analysis), a safety manual, safety case reports and ISO 26262-related documentation.

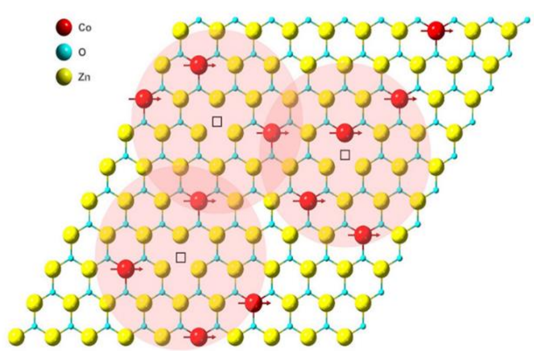
“NS31A is for users who want to control embedded systems easily, reasonably and safely,” said Nsitexe CTO Hideki Sugimoto. “IAR Embedded Workbench for Risc-V will be the must-use software development tools in the market of Risc-V, and IAR Embedded Workbench for Risc-V and NS31A will be a leading solution for customers who develop safety-related applications.”

IAR offers functional safety editions of Embedded Workbench, which run alongside a support and update agreement that guarantees support for the sold version for the duration of the contract.

The functional safety edition of ‘Embedded Workbench for Risc-V’ is certified by TÜV SÜD according to the requirements IEC 61508 and automotive standard ISO 26262. Certification also covers IEC 62304, EN 50128, EN 50657, IEC 60730, ISO 13849, IEC 62061, IEC 61511 and ISO 25119.

Source: https://www.newelectronics.co.uk/electronics-technology/addressing-safety-critical-fpga-designs/235317/

Berkeley team build world’s thinnest magnet



Baking in a conventional lab oven transformed the mixture into a single atomic layer of zinc-oxide with a smattering of cobalt atoms sandwiched between layers of graphene. In a final step, the graphene is burned away, leaving behind just a single atomic layer of cobalt-doped zinc-oxide.

“We’re the first to make a room-temperature 2D magnet that is chemically stable under ambient conditions,” said Jie Yao, a faculty scientist in Berkeley Lab’s Materials Sciences Division and associate professor of materials science and engineering at UC Berkeley.

“This discovery is exciting because it not only makes 2D magnetism possible at room temperature, but it also uncovers a new mechanism to realize 2D magnetic materials,” said Rui Chen, a UC Berkeley graduate student in the Yao Research Group. The new material can be bent into almost any shape without breaking, and is a million times thinner than a sheet of paper could help advance the application of spin electronics or spintronics that uses the orientation of an electron’s spin rather than its charge to encode data. “Our 2D magnet may enable the formation of ultra-compact spintronic devices to engineer the spins of the electrons,” said Chen.

There are many magnetic thin films but these are still 3D materials that are hundreds or thousands of atoms thick. “State-of-the-art 2D magnets need very low temperatures to function. But for practical reasons, a data centre needs to run at room temperature,” said Yao. “Our 2D magnet is not only the first that operates at room temperature or higher, but it is also the first magnet to reach the true 2D limit: It’s as thin as a single atom.”

The graphene-zinc-oxide system becomes weakly magnetic with a 6 percent concentration of cobalt atoms. Increasing the concentration of cobalt atoms to about 12 percent results in a very strong magnet. Exceeding a concentration of 15 percent cobalt atoms shifts the 2D magnet into an exotic quantum state where different magnetic states within the 2D system are in competition with each other. And unlike previous 2D magnets, which lose their magnetism at room temperature or above, the researchers found that the new 2D magnet not only works at room temperature but also at 100 degrees Celsius (212 degrees Fahrenheit).

“Our 2D magnetic system shows a distinct mechanism compared to previous 2D magnets,” said Chen. “And we think this unique mechanism is due to the free electrons in zinc oxide.” “With our material, there are no major obstacles for industry to adopt our solution-based method,” said Yao. “It’s potentially scalable for mass production at lower costs.”

To confirm that the resulting 2D film is just one atom thick, Yao and his team conducted scanning electron microscopy experiments at Berkeley Lab’s Molecular Foundry to identify the material’s morphology, and transmission electron microscopy (TEM) imaging to probe the material atom by atom.

Additional X-ray experiments at SLAC National Accelerator Laboratory’s Stanford Synchrotron Radiation Lightsource verified the electronic and crystal structures of the synthesized 2D magnets. And at Argonne National Laboratory’s Center for Nanoscale Materials, the researchers employed TEM to image the 2D material’s crystal structure and chemical composition.

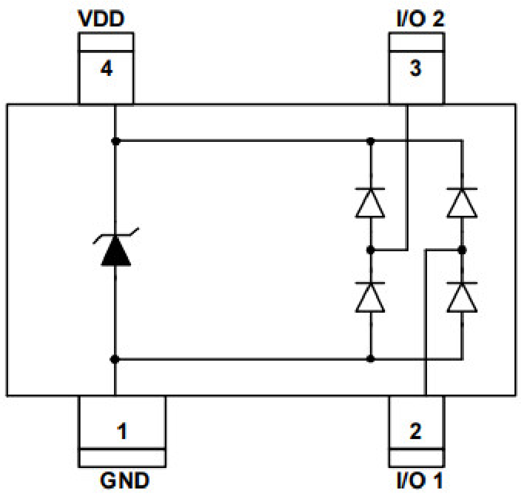
“I believe that the discovery of this new, robust, truly two-dimensional magnet at room temperature is a genuine breakthrough,” said co-author Robert Birgeneau, a faculty senior scientist in Berkeley Lab’s Materials Sciences Division and professor of physics at UC Berkeley who co-led the study.

“Our results are even better than what we expected, which is really exciting. Most of the time in science, experiments can be very challenging,” Yao said. “But when you finally realize something new, it’s always very fulfilling.”

Source:electronicsweekly.com/news/design/eda-and-ip/functional-safety-development-support-automotive-risc-v-2021-08/

ESD protection array for data and audio

“The multifaceted AZ1015-02N maintains low surge clamping voltage for ESD/EOS protection and low capacitance to keep signal integrity,” according to New Yorker Electronics, which is stocking the part. “The device is used for audio interface, monitor and flat panel display, USB2.0 and SIM ports.” The device protects two data lines or audio lines, and includes a clamping cell transient voltage suppressor which connects to the circuit power rails, and four low-capacitance surge-rated diodes – a pair to each input.

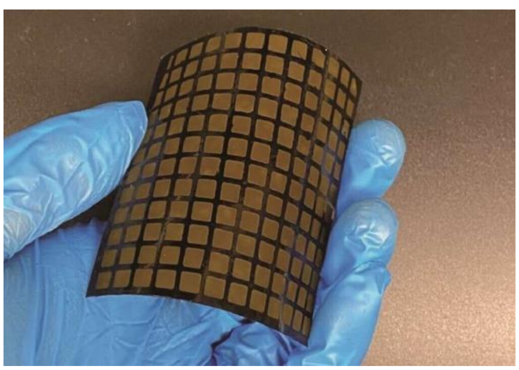


"During transient conditions, the steering diodes direct the transient to either the power supply line or to the ground line," said New Yorker. "The internal unique design of clamping cell prevents overvoltage on the power line, protecting any downstream components." With USB it will work "even when the pulse appears on the VBUS of the USB port. Therefore, the data lines and VBUS of the two ports are completely protected with this device."

It is designed to protect circuits up to 5V (6V abs max) with 5µA max leakage (25°C) from the power rail and 1µA through the signal pins. Typically, clamping voltage is 8V (9V max) and input capacitance is 2pF (3pF max). Channel to channel capacitance is 80fF (1MHz 25°C, 150fF max). The data sheet is clearly written and include discussion of the effect of inductance on clamping voltage. It recommends an optional 0.1µF capacitor across the power rail connections to reduce the amplitude of transients injected into the power rails.

Source: ***https://www.electronicsweekly.com/news/products/analogue-linear-mixed-signal-ics/esd-protection-array-data-audio-2021-08/***

Researchers Develop Wearable X-Ray Detector



Researchers developed a flexible, wearable X-ray detector that doesn't require toxic heavy metals. X-ray imaging is a very critical technique in the biomedical field. It is a very effective way to look inside the human body. But X-ray detectors which images the body parts contain harmful heavy metals, such as lead and cadmium. Moreover, most X-ray detectors are integrated into big, immobile instruments, such as computerized tomography. Researchers have earlier tried to use nontoxic metal-organic frameworks (MOFs) for flexible radiation detectors, but they consisted of lead, just like X-ray detectors that are currently in use. Researchers have now reported proof-of-concept wearable X-ray detectors implemented from nontoxic metal-organic frameworks (MOFs) layered between flexible plastic and gold electrodes for high-sensitivity sensing and imaging. Their work appeared in the ACS Nano Letters journal.

The researchers tested their MOF-based X-ray detector was more sensitive than recently reported detectors when irradiated with 20 keV X-rays, equivalent to the energy released during medical diagnostic imaging. To make the device flexible, the team sandwiched the nickel-containing MOF between gold film electrodes, one of which was on a flexible plastic surface. They used copper wires to transmit current from each pixel of a 12×12 array and covered the whole device with a silicone-based flexible polymer. Researchers believe that their proof-of-concept will pave the road for the next generation of radiology imaging equipment and radiation detection when wearable or flexible devices are needed.

Source: ***https://www.electronicsforu.com/technology-trends/research-papers/researchers-develop-wearable-x-ray-detector***

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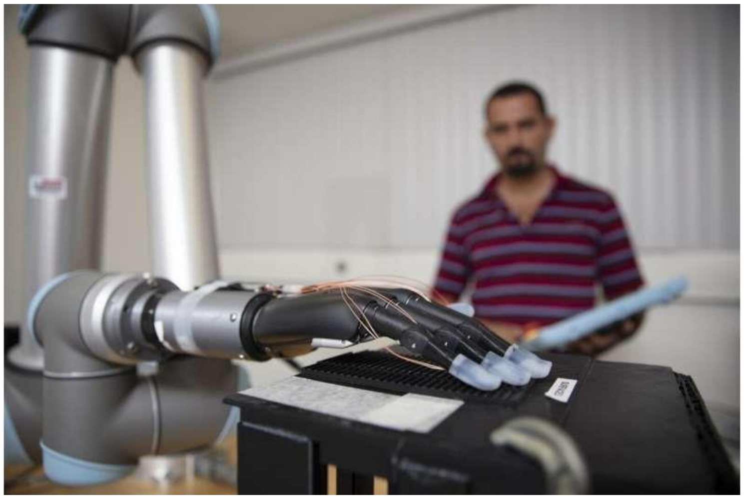
Liquid metal Sensors for Prosthetic Arms



Researchers realized liquid metal sensors along with AI for more natural prosthetic arms. Humans rely on the touch receptors very much, and the lack of this sensation presents various challenges. Each human fingertip has more than 3000 touch receptors. Researchers are trying to fill the absence of these receptors with prosthetic limbs. Researchers from Florida Atlantic University's College of Engineering and Computer Science have recently incorporated stretchable tactile sensors using liquid metal on the fingertips of a prosthetic hand. They are aiming towards realizing a more natural feeling prosthetic hand interface. The study has been published in the journal Sensors. The developed sensors are encapsulated within silicone-based elastomers. This approach provides significant advantages over traditional sensors, including high conductivity, compliance, flexibility and stretchability. The researchers used individual fingertips on the prosthesis to distinguish between different speeds of a sliding motion along different textured surfaces. For each of the ten surfaces, 20 trials were collected to test the ability of the machine learning algorithms to distinguish between the ten different complex surfaces composed of randomly generated permutations of four different textures. Liquid metal sensors showed sensitivity among every surface and performed better overall by simultaneous reception.

"Significant research has been done on tactile sensors for artificial hands, but there is still a need for advances in lightweight, low-cost, robust multimodal tactile sensors," said Erik Engeberg, Ph.D., senior author, an associate professor in the Department of Ocean and Mechanical Engineering and a member of the FAU Stiles-Nicholson Brain Institute and the FAU Institute for Sensing and Embedded Network Systems Engineering (I-SENSE), who conducted the study with first author and Ph.D. student Moaed A. Abd. "The tactile information from all the individual fingertips in our study provided the foundation for a higher hand-level of perception enabling the distinction between ten complex, multi-textured surfaces that would not have been possible using purely local information from an individual fingertip.

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