DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

e-SRUSHTI

An Innovative Bucket...

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CONTENTS

NARAYANA ENGINEERING COLLEGE :: NELLORE

AUTONOMOUS

Vision of the Institute

To be one of the nation's premier Institutions for Technical and Management Education and a key contributor for technological and Socio-economic development of the nation.

Mission of the Institute

- To produce technically competent Engineers and Managers by maintaining high academic standards, world class infrastructure and core instructions.
- To enhance innovative skills and multi disciplinary approach of students through well experienced faculty and industry interactions.
- To inculcate global perspective and attitude of students to face real world challenges by developing leadership qualities, lifelong learning abilities and ethical values.

Vision of the Department

To produce technically competent and creative engineers who can cater to the industry and societal requirements in the field of Electronics & Communication Engineering.

Mission of the Department

- To impart quality engineering education to students to enhance ability to pursue knowledge by providing core competency and state of the art infrastructure.
- To provide industry oriented learning for empowering and facilitating the learner through industry institute interaction and leadership qualities.
- To promote participation in research and extension activities for addressing the social needs by providing value based education along with life-long learning abilities.

Program Educational Objectives (PEOs)

PEO_1: Attain professional excellence or gain higher degree to face challenges posed by industry and society.

PEO_2: Address complex problems in a responsive and innovative manner.

PEO_3: Gain reputation by functioning effectively to address social and ethical responsibilities.

Program Specific Outcomes (PSOs)

PSO_1: Domain Specific Knowledge: Implement electronic systems related to Electronics Devices & Circuits, VLSI, Signal processing, Microcomputers, Embedded and Communication Systems to fulfill the solutions to real world challenges

PSO_2: Hardware Product Development: Apply the software and hardware tools in Analog and Digital Electronic circuit design to address complex Electronics and Communication engineering problems.

Program Outcomes(POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal & environmental contexts, and demonstrate the knowledge of,and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Professor Desk

It gives me immense pleasure to know that the Department of Electronics & Communication Engineering is releasing its student technical magazine E-SRUSHTI.

This will help the student community to show their talent in technology and innovations. This is a platform where students can excel and project innovative ideas.

Congratulations to the editorial team for their determined efforts in bringing out this third edition of technical magazine. On this occasion, I convey my good wishes to the Students of the College in their endeavors.

Dr. K. Selvakumarasamy
Professor,
Dept. of ECE.

Hyper spectral Imaging Technology

Hyperspectral imaging (HSI) is a technique that analyzes a wide spectrum of light instead of just assigning primary colors (red, green, blue) to each pixel.

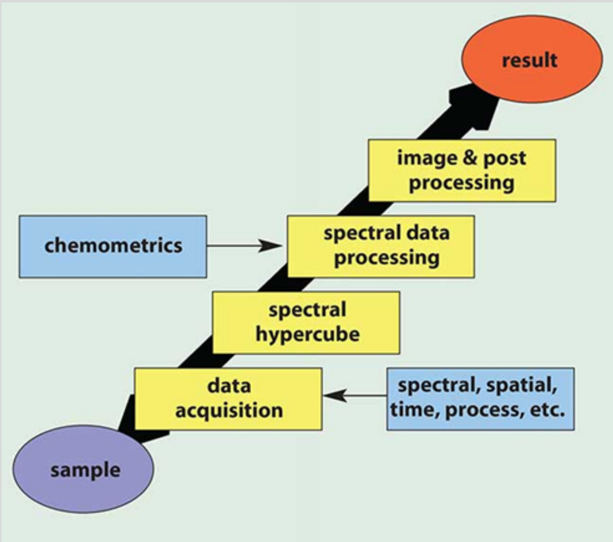
The light striking each pixel is broken down into many different spectral bands in order to provide more information on what is imaged.

The algorithms and the image processing methodologies associated with HSI are a product of military research, and were primarily used to identify targets and other objects against background clutter. In the past, HSI has seen civil applications, and has particularly been useful in satellite technology.

Hyper spectral imaging spectroscopy has developed dramatically from a large, complex, remote-sensing satellite- or aircraft-based system into a rugged, compact, economically priced imaging and spectroscopic tool for a range of process control, monitoring, diagnostic and inspection applications. Applications include colorimetry and color matching, spectral radiometry, industrial process control and quality assurance, pharmaceuticals preparation and packaging, forensic analysis, bio-agents detection, camouflage detection, live cell microscopy, genomics and proteomics research and precancerous cell detection in the life sciences.

The use of imaging techniques for scene evaluation has become a key method for nondestructive, remote evaluation. Conventional imaging, whether monochrome or color, depends upon the spatial resolution of the image.

Spectral imaging work flow:



Hyper spectral Imaging Technology

If the image is blurred or too fuzzy then the viewer cannot determine exactly where or what the object under view is. Hyper spectral imaging adds significant additional information to the brightness analysis of a scene by adding the light intensity as a function of wavelength, its spectrum, from each image's spatial position.

This additional spectral dimension can be rapidly and straightforwardly analyzed to provide an image-contrast capability that is not present in a normal scene-brightness approach.

In any system, a clear understanding of the application's requirements for the system, the illumination conditions and the signal processing work flow are required. Such an end-to-end approach to the instrument hardware and software design seeks to analyze the individual components' performance so as to eliminate any performance bottlenecks. The key to good performance is simplicity and stability

19711A0431 - GARIKA ARAVIND, II ECE-A

"NeuRRAM" Neuromorphic Chip

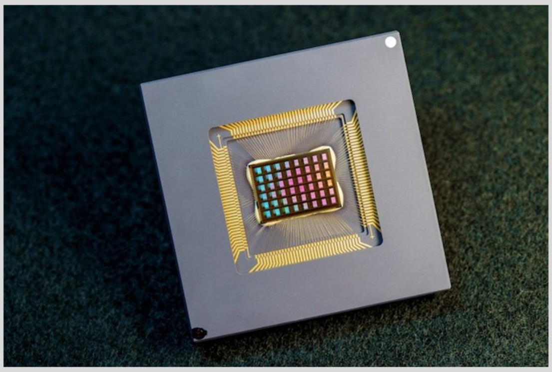
The teams have developed the first compute-in-memory chip to tackle a range of AI applications at lower energy and higher accuracy than other platforms.

The holy grail of edge AI computing is a chip that offers high efficiency, performance, and versatility simultaneously. Obtaining all three has historically posed a significant challenge for designers, and as such, many have started considering new computing architectures altogether.

One of these new architectures is in-memory computing, which aims to eliminate the data movement bottleneck to achieve higher efficiency and better performance than conventional digital processing units.

This week, a group of international researchers published a paper describing a new compute-in-memory chip based on resistive random-access memory (RRAM).
Resistive RAM for Compute in Memory. Within the past 30 years, designers have been investigating the idea of compute in memory—and more recently, compute in memory based on resistive RAM.

RRAM CIM removes the von Neumann bottleneck, a result of separate memory and compute, and instead merges them together.



Neuromorphic IC

In this architecture, resistive RAM elements are used for memory storage, where binary digits are stored based on the resistive state of the RRAM material in each cell. Here, applying a voltage may cause the RRAM to become a highly resistant material, representing a digital 1 and vice versa. Reading out bits in memory is achieved by applying a voltage to the RRAM cell and reading out the resulting current, which will vary based on the state of the RRAM.

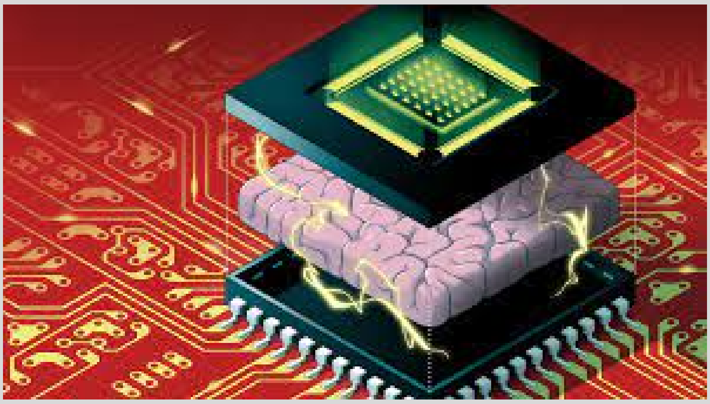
RRAM is an extremely power-efficient, small, and non-volatile form of memory.

This architecture also fits very well in the context of artificial intelligence computation since machine learning computation relies heavily on multiply and accumulate functions that can be easily implemented with RRAM. Since sensing currents enable RRAM results to be read out, one can easily add and multiply RRAM values by summing currents in a junction or a series of junctions.

NeuRRAM Hits on Efficiency, Accuracy, Flexibility. The NeuRRAM neuromorphic chip is said to achieve a combination of efficiency, accuracy, and flexibility thanks to an output sensing method it employs. Compared to conventional techniques that read out current for an output, NeuRRAM uses a neuron circuit that senses voltages and performs efficient analog-to-digital conversion all on-chip.

The architecture includes CMOS neuron circuits that coexist with the RRAM bit cells. A neuromorphic AI chip, NeuRRAM consists of 48 neurosynaptic cores, 256 CMOS neurons, and 65,536 RRAM cells that perform parallel processing and can support data and model parallelism. This allows different model layers to be mapped to different cores for maximum versatility.

Altogether, the study suggests that this chip matches the accuracy of conventional digital chips but with significantly less energy expenditure and higher density. The researchers, who designed this chip with edge computing in mind, claim that the low power and high performance of NeuRRAM may enable a new class of devices that are currently not feasible with existing technology.

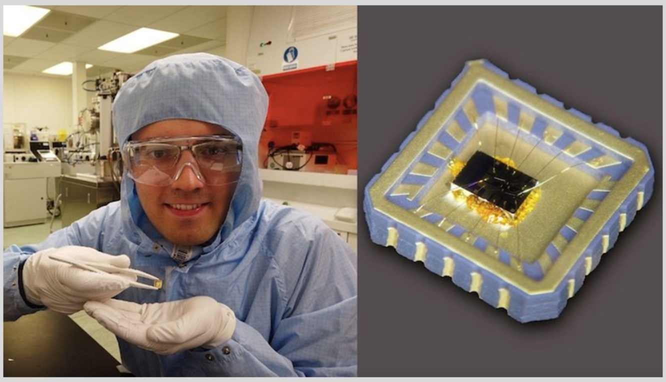


Neuromorphic Chip on PCB

18711A0431, D. Jyothsna, III ECE-A

Highly-sensitive Terahertz Detector

Recently, a team of scientists from Cambridge University, the University of Augsburg, and the University of Lancaster published their findings on a new type of terahertz detector using two-dimensional (2D) electron gas. An electron gas is free to move in two axes but is tightly constrained in the third, thus appearing to exist as a 2D plane in a 3D environment.



Terahertz Detector

The terahertz detector developed by Cambridge researchers. Image used courtesy of Wladislaw Michailow and the University of Cambridge

By exposing their sensor to terahertz radiation, the researchers were able to read out a much stronger signal than previously theorized. They attributed these findings to the way that electromagnetic waves interact with matter at different frequencies.

Discovered by the German physicist Heinrich Rudolf Hertz, the photoelectric effect occurs when the light above a certain energy threshold hits the surface of select materials. Electrons that were previously bound to that material are then released. This is the basis of many vital modern technologies like solar power generation and optical imaging sensors.

Up until now, the photoelectric effect hasn't been observed to work in the terahertz range. While this team of scientists still doesn't fully understand how and why their discovery works, their experimental proof carries a lot of benefits for the future of terahertz technologies. This new property is named the "in-plane" photoelectric effect, derived from the 2D electron gas plane.
When it detects terahertz radiation, the team's sensor generates a magnitude of response much stronger than other methods. This gives the new detector a considerably higher sensitivity, thus mitigating path loss of depreciating signals.

Lithium Improves Terahertz Photonic Sources:

Another recent development in terahertz technologies, this time in the area of signal generation, comes from a team of researchers from the Nankai University in China and their colleagues at the INRS-ENT in Canada. Led by professors Jiayi Wang, Shiqi Xia, and Ride Wang, a group of scientists developed a single lithium niobate photonic chip for use in a novel terahertz source module.

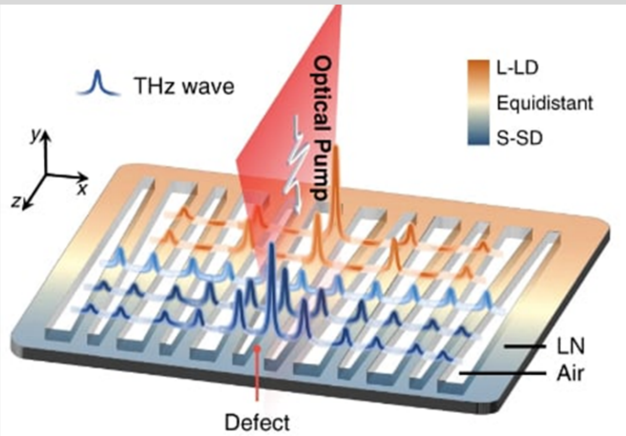
The material in question is a type of non-naturally occurring crystal with the chemical composition of lithium, niobium, and oxygen. This material is commonly used in engineering, which here particularly in telecommunications and nonlinear optics.

The team manufactured their sensor using a photonic microstructure that contained lithium niobate waveguide strips. These strips were capable of topically trivial and nontrivial transitions. Next, using a femtosecond laser writing method, they inserted a topological defect at the central interface of their photonic chip. The team directly mapped a terahertz field, demonstrating tunable confinement along their chip. Using this method, the scientists achieved wave confinement as a consequence of topological protection.

This research gives engineers a new platform to tune the confinement and topological properties of terahertz radiation, opening new possibilities for photonic circuits to be used for signal generation of in the advanced telecommunications and imaging applications

Adopting Terahertz for 6G:

One major obstacle to terahertz adoption is the challenge of designing and implementing transmitter and receiver modules that are efficient, affordable, and operable in a real-world environment. Solving these problems doesn't only carry the weight of advanced medical and security terahertz sensors but also the development of other emerging technologies that are indirectly dependent on faster wireless protocols.



Terahertz for 6G

Current wireless technologies don't support holographics, artificial intelligence, and even 4K video streaming on a large-enough scale—even with the theoretical limits of the 5G standard. These two new discoveries by Cambridge University and Nankai University open up the possibility of electronics that use terahertz frequencies, pushing the future of a sixth-generation wireless network forward.

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19711A0474 - M.SUVARNA, II ECE-B

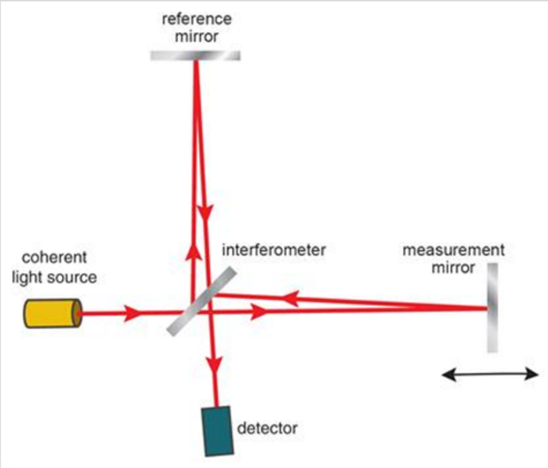
New Technique Side-steps Shot Noise for Precision Optics in a Photonic IC

A new technique eliminates the limitations of shot noise on laser interferometry. When it comes to applications requiring very precise measurements, such as detecting gravitational waves or environmental sensing, we need specialized measuring techniques. One of the most accurate methods of measurement available to us is known as optical interferometry.

While highly precise, optical interferometry comes with limitations. Specifically, the maximum achievable sensitivity of this technique is limited by a naturally occurring phenomenon called shot noise. Seeking to solve this issue, researchers at the University of Rochester recently published a paper that introduces a new way to achieve increased sensitivity of optical interferometry on an integrated circuit without being limited by shot noise.

Brief Overview of Optical Interferometry:

Optical interferometry is a precision measurement technique widely used in scientific applications to achieve very granular measurements. These tools work by merging at least two light sources to create an interference pattern. Since the wavelength of the light is so small, users can detect very minute differences in the distance traveled by each light source in the interference pattern.



Optical Interfero Metry

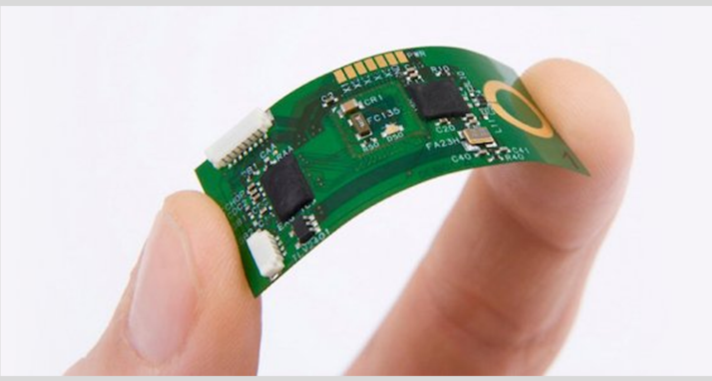
These tools work by merging at least two light sources to create an interference pattern. Since the wavelength of the light is so small, users can detect very minute differences in the distance traveled by each light source in the interference pattern. In this way, interferometers can make very small measurements, detecting distances as small as 1/10,000 the width of a proton.

The Challenge of Shot Noise:

As mentioned earlier, shot noise, in general, is a form of noise that occurs due to the discrete nature of charge carriers and photons.

Light and electrical current is defined by the discrete movement of particles, photons, and electrons. Due to their discrete and random nature, if you measured the number of photons or electrons in a given area, that measurement would never be the same for multiple trials.

This variation of charge carriers, and its impact on the signal, is known as shot noise and is modeled by a Poisson distribution.



Optical Interfero Metry IC

Generally, the effects of shot noise are negligible because the amplitude of most signals is so large that these small variations in charge carriers are of no consequence.

However, when working at ultra-small amplitudes, like in the case of interferometry, shot noise can become the limiting factor on sensitivity.

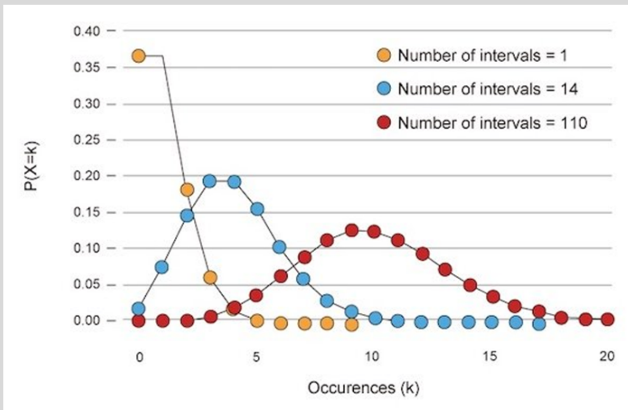
19711A0491 - S.Uday Kumar,
II ECE-B

Stretchable Electronics

Printed circuit board (PCB) design has come a long way from the tape and cut methods of the past. Advanced capabilities have allowed designers to use ECAD software to develop FR-4 rigid PCBs with little difficulty.Flexible PCBs and interconnects are common today and often used for interfacing hardware like laptop ‘motherboards’ to display screens or allow for foldable electronic systems.

In recent years, a discussion has arisen about the third type of circuit board and electronics device: stretchable electronics. Stretchable electronics are on the rise in research arenas, and with the popularity of wearable technology, they may be becoming a commercial product in the near future. In this article, let's discuss what stretchable electronics are, the challenges and applications, and finally dive into recent research.

How Stretchable Electronics Differ From Flex & Rigid-Flex?



Stretchability of Electronics

There are several variations on the traditional PCB, including rigid-flex designs that incorporate interconnect copper on the flexible substrate between rigid PCB elements and full flexible PCBs with entire systems soldered onto the flex substrate.

The IPC-6013D (2017 edition) is the IPC standard related to the performance of flexible and rigid-flex PCBs. However, unlike flexible PCBs, which are typically bendable in a single axis, stretchable electronics are an in-development design class that is stretchable, twistable, and bendable.

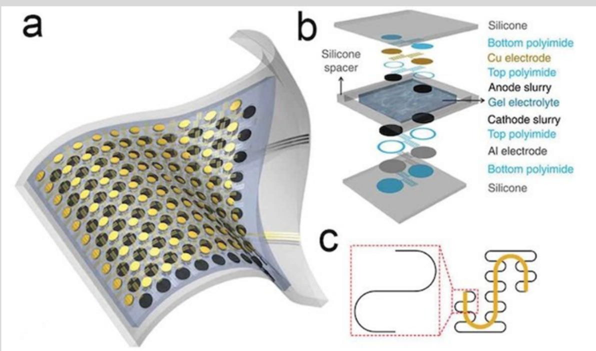
Structures like signal interconnects, substrates, sensor electrodes, and even energy storage surfaces can be stretched by various amounts of strain and still maintain their operational properties. Overall, there are various challenges to overcome to accomplish these attributes and specific applications they can be applied.

Challenges & Potential Applications of Stretchable Electronics

There are two principal methods for achieving elastic electronics, one of which is the use of inherently stretchable materials like predominant poly(dimethylsiloxane) (PDMS).

One way to achieve conductivity is by using metal nanowires, carbon nanomaterial, and polymers, which are embedded within the stretchable materials in various configurations, including "wavy structural configuration, island-interconnect, fractal design and traditional paper-cutting."

The three potential areas of stretchable electronics: conductors and electrodes, energy storage, and the development of printed electronics like transistors and sensors, which are stretchable and self-healing.



Flexible Lithium-ion battery device in a twisted state

The first recent news comes from the American Chemical Society (ACS), highlighting the development of a flexible supercapacitor made of wrinkled titanium carbide, an MXene nanomaterial.

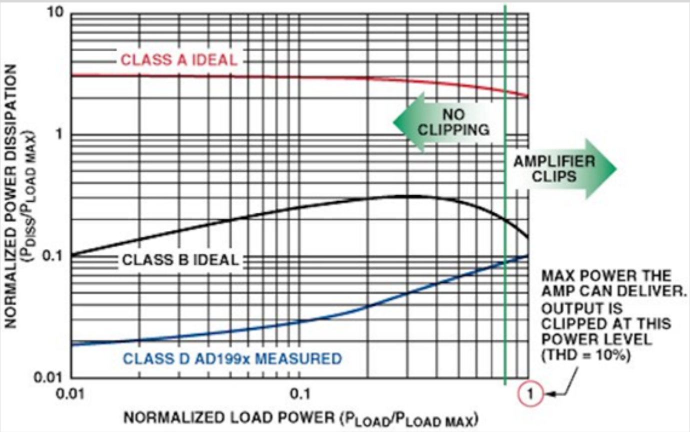
The supercapacitor electrodes were developed by disintegrating the MXene powder in hydrofluoric acid to retrieve pure layers of titanium carbide nanosheets. This material was placed on an 800% strained polymer, as seen below (in still-frame), and then crumpled when the polymer returned to rest.Two MXene crumpled electrodes and a polyvinyl(alcohol)-sulfuric acid gel electrolyte as a dielectric were used to form the supercapacitor. The resulting crumpling created an accordion-type structure on the surface of the electrode, which allowed for repeated stretchability. The researchers state that their supercapacitor maintained up to 90% of its energy storage capacity after 1000 stretches, bends, or twists.

MXene nanomaterials are shown to be very versatile. For instance, nanomaterials have also been used successfully as an EMI shielding material in fabrics.Moving on from MXene nanomaterials, let's take a look at research using a type of conductive film to push the limits of rigid PCBs.

19711A0497 - SHAIK ARSHIYA,
II ECE-B

The Class-D Amplifier Is the Star of Acoustic Vehicle Alerting Systems

ADAS and AVAS are known to add a number of speakers to an automotive audio system. Class-D amplifiers, however, may be a useful solution for cutting size, costs, heat, and power consumption. Automotive manufacturers are now pushing the conventional audio layout limits by adding more speakers. These additional speakers, such as midrange and woofer, provide over six speakers per vehicle, making it necessary to place an external amplifier in the trunk space.



Performance of Class A, B & D Amplifiers

To avoid this, hardware designers must develop smaller audio amplifier solutions with low power and heat dissipation for advanced automotive audio systems. As a recent example, ST Microelectronics recently announced its plans to improve safety alerts during the driving experience with its HFDA801A Class-D amplifier.

Design Considerations for Amplifiers in Modern Automotive Audio:

When engineers are determining the size of a new audio amplifier system, some crucial considerations include:

·Efficiency
·Thermal performance
·Switching frequency
·Inductor size
·Package design

Each amplifier differs greatly in specifications, making each one fit for different design goals and applications.

New Class-D Amplifier from ST:

Cueing into the efficacy of Class-D in automotive audio applications, ST recently announced the HFDA801A, a 2 MHz pulse width modulation (PWM) Class-D amplifier with a quad-bridge configuration.

The amplifier has a 124-bit digital-to-analog converter (DAC) to ensure higher sound quality. It also includes a noiseless turn-on/off with a signal-to-noise ratio (SNR) of 120 dB range to help with unwanted distortion.

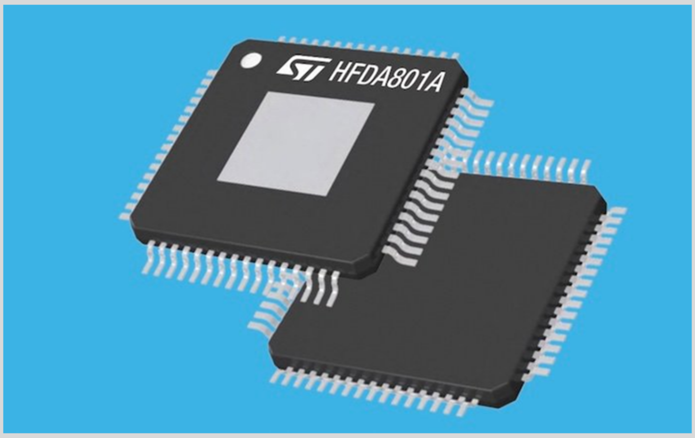
While a standard Class-D amplifier achieves linearity and minimal distortion, the trade-off is that it requires more components. However, ST says its embedded solution adds depth to traditional Class-D-based hardware by including a digital impedance meter and real-time load-current monitors. This amplifier solution can also draw its supply from the vehicle's battery without additional power converters.

Class-D Amplifiers for AVAS and ADAS

Acoustic vehicle alerting systems (AVAS) emit warning sounds to alert pedestrians of the presence of electric vehicles. These systems, forecasted to be of use in smart cities, can also open doors for more sophisticated sound algorithms in semi- and fully-autonomous vehicles.

Meanwhile, ADAS adds to the number of speakers needed within each vehicle—unless a well-equipped Class-D audio system is used. A challenge to overcome in these systems is shoot-through current, which occurs during long periods of operation. Shoot-through current can be addressed with current-sensing output-transistor protection circuitry. This circuitry will set a safety threshold, and should the current surpass it, the device shuts off.

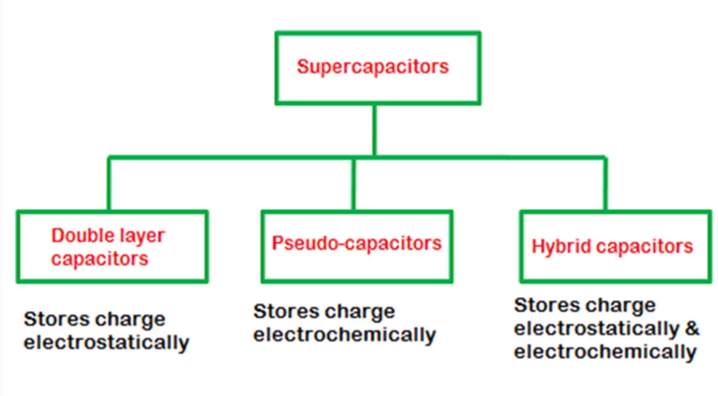
Even with low heat dissipation output by Class-D designs, overheating can still occur during long periods of operation. Temperature monitoring is necessary to avoid overheating—a feature built into ST's HFD801A.



HFD801A IC

19711A0453 -(KONDURU SHIVASAI)
II ECE-A

Super capacitors or ultra capacitors



Types of Super Capacitors

They differ from conventional capacitors due to their fast charge–discharge rates, longer life cycle, high power, and high energy density. There are two types of super capacitors depending on the charge storage. The first type is a double-layer electrical capacitor (EDLC) that stores electrical energy by intercalating charges at the electrode–electrolyte interface forming the double layer of charges. The charges are physically deposited by electrostatic attraction, resulting in rapid charge–discharge kinetics, high-power density, and long-life cycle (as no chemical reaction is involved) . Carbonaceous materials (graphene, carbon nanotubes, activated carbon, graphite, etc.) are mostly used as the electrode material to store charges. The second type of supercapacitor is known as a pseudocapacitor as it uses faradaic reactions to store electric energy. RuO and MnO are well-known pseudocapacitive materials with specific capacitance closer to their theoretical limit.

Since electrochemical signature of pseudocapacitor is like EDLC, it is called a pseudocapacitor. The energy density of this supercapacitor is higher compared to EDLC, but the involvement of chemical reactions decreases its power density as well as life cycle.

In electrochemical energy storage device, both type of capacitor materials are combined in a single device to harvest of the advantages of both capacitive materials. A hybrid energy storage device can deliver high energy and power density compared to EDLC and pseudocapacitive material alone. Overall, supercapacitors are capable to deliver high-power density compared to batteries, but their energy density is still far behind batteries.

18711A0419 - PAPPU BHANUPRAKASH, III ECE-A

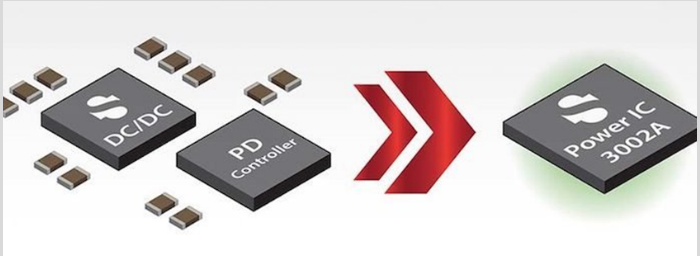
World's First" Buck Converter IC with Intelligent Power Sharing [SZPL3002A]

Silanna Semiconductor unveiled a high-efficiency, single-chip USB port power supply solution that claims to reduce component count and simplify the power-sharing design in multi-port fast chargers.

Thanks to newer semiconductor technologies like gallium nitride (GaN), fast chargers' power density, efficiency, and compactness have increased significantly. A standard charger delivers around 5 W to the connected device, while modern fast chargers can give up to 100 W power. With that in mind, many major flagship phones in the market offer fast charging, which delivers high power to your smartphone for quick charging.

The continued demand for more powerful smartphones with better displays and 5G features has created a demand for next-generation AC adapters to charge larger lithium-ion batteries quickly. Moreover, consumers need more power but don't need bulky adapters. Therefore, charger manufacturers are trying to make faster chargers with a higher power density and smaller, lightweight form factor.

A fast charger usually consists of a highly efficient DC-DC buck converter and a power delivery (PD) controller that manages the power sent to the devices. Hoping to take on the challenge of fast charger designs, Silanna Semiconductor announced a new power IC, SZPL3002A, which combines a high-efficiency synchronous buck converter and an advanced power delivery controller in a single QFN packaging measuring only 5 mm x 5 mm. The new IC claims to significantly reduce the components needed to implement a 65 W charger with up to 4 ports. In this article, we'll look at the importance of PD controllers concerning fast charging and then look a bit more into Silanna's power IC.



SZPL3002A IC

18711A0424 - CHOPPARAPU RAMYA SREE, III ECE-A

Nordic Semiconductor Rolls Out Its First Wi-Fi IC

Complementing its existing wireless IoT offerings, Nordic Semiconductor has unveiled a dual-band Wi-Fi 6 companion chip.For years, the name Nordic Semiconductor has been synonymous with wireless connectivity chipsets. Indeed, the company's line of cellular and Bluetooth ICs have been staples in the industry, especially in embedded and the Internet-of-Things (IoT) applications.That said, the company lacked any offerings for Wi-Fi connectivity.

Different but tangential, Wi-Fi is the final leg of the wireless trio that connects almost every connected device worldwide. Last week, Nordic changed that narrative with the release of its first Wi-Fi chip.In this article, we'll talk about Nordic's foray into Wi-Fi as well as the new product offering just brought to market.

A Dual-band Wi-Fi 6 Companion IC:

Now, over two years since that acquisition, Nordic's work has finally come to fruition with the introduction of their first-ever Wi-Fi IC, a dual-band Wi-Fi 6 device. The product, called the nRF7002, is described as a Wi-Fi companion IC, meaning it is designed to provide the Wi-Fi connectivity and related functionality to existing Nordic products. Essentially, unlike other Nordic solutions, which incorporate compute and connectivity into a single SoC, the nRF7002 is strictly for connectivity.Currently, the list of ICs that are compatible with the nRF7002 includes the nRF52 and nRF53 Bluetooth SoCs and the nRF91 cellular SiP, although Nordic claims that the device can also be used with non-Nordic host devices.

Wi - Fi IC

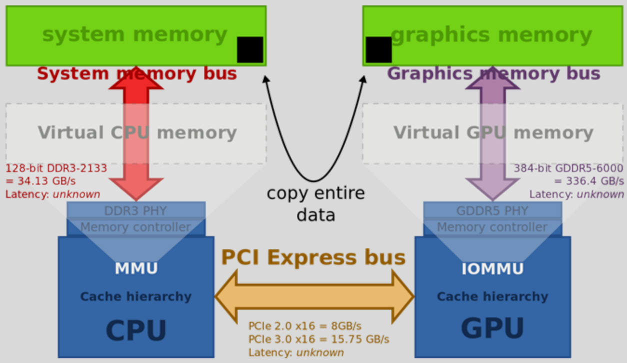
The device, which comes in a 6 mm x 6 mm QFN package, is said to be optimized for low power operation, security, and coexistence with Bluetooth LE.

Focus on Wireless Connectivity for IoT:
With the introduction of its Wi-Fi chip, Nordic has become one of the only companies in the world that offers Wi-Fi, Bluetooth, and cellular connectivity offerings with a focus on IoT use cases. So far, the product is available for samples with plans for production availability in the near future.

18711A0443 - KAKOLLU ASWINI, III ECE-A

Graphics Processing Unit

There are various applications that require a 3D world to be simulated as realistically as possible on a computer screen.

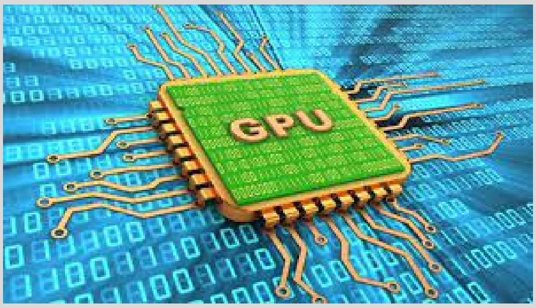


Graphics Processing Unit

In this situation, the processing time and bandwidth are at a premium due to large amounts of both computation and data.

The functional purpose of a GPU then, is to provide a separate dedicated graphics resources, including a graphics processor and memory, to relieve some of the burden off of the main system resources, namely the Central Processing Unit, Main Memory, and the System Bus, which would otherwise get saturated with graphical operations and I/O requests. The abstract goal of a GPU, however, is to enable a representation of a 3D world as realistically as possible. So these GPUs are designed to provide additional computational power that is customized specifically to perform these 3D tasks.

A Graphics Processing Unit (GPU) is a microprocessor that has been designed specifically for the processing of 3D graphics. The processor is built with integrated transform, lighting, triangle setup/clipping, and rendering engines, capable of handling millions of math-intensive processes per second. GPUs form the heart of modern graphics cards, relieving the CPU (central processing units) of much of the graphics processing load. GPUs allow products such as desktop PCs, portable computers, and game consoles to process real-time 3D graphics that only a few years ago were only available on high-end workstations.
Used primarily for 3-D applications, a graphics processing unit is a single- chip processor that creates lighting effects and transforms objects every time a 3D scene is redrawn. These are mathematically-intensive tasks, which otherwise, would put quite a strain on the CPU. Lifting this burden from the CPU frees up cycles that can be used for other jobs.



GPU IC

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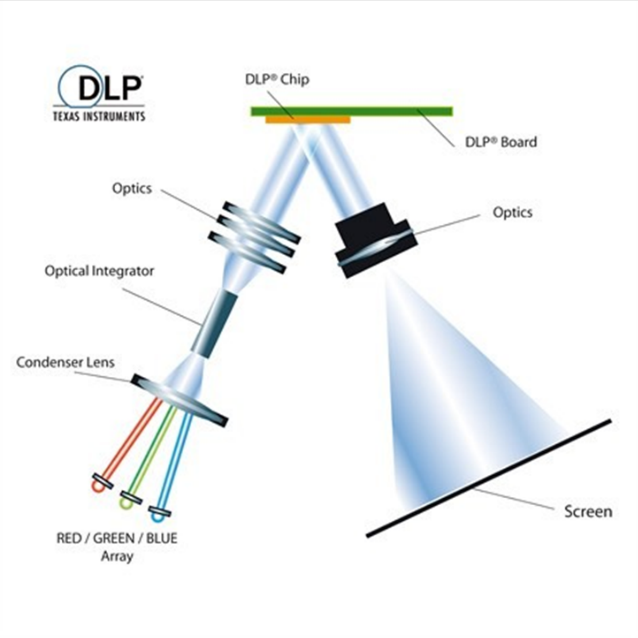
Digital Light Processing

Digital Light Processing is the one of primary display technologies driving this rapid growth and maturation .it is a revolutionary way to project and display information based on the Digital Micro Mirror Device (DMD) Digital Light processing was invented in 1987 by Texas Instruments it creates the final link to display digital visual information.
Digital Light Processing creates deeper blacks, conveys fast moving images very well and uses a single, replaceable, white -light bulb . it is available in both front-and rear-projection models DLP is an excellent choice for people who watch a lot of sports or fast-action movies because of the speed at which it creates an image.
DLP Structure:
A Digital Micro Mirror Divice chip is the heart of Digital Light Processing projector, DMD can be described simply as a semiconductor light switch. The micro mirrors are mounted on the DMD chip and it tilts in response to an electrical signal. Other elements of a DLP projector include a light source, a colour filter system, a cooling system, illumination and projection optics.
The signal goes through DLP video processing and becomes progressive Red (R), Green (G) and Blue (B) data. The progressive RGB data is then formatted into entire binary bit planes of data.



Digital Light Processor

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