electronicsForYou
EXPRESS
AUGUST 2022 • ₹50
Vol. 2 Issue No. 10 • Pages: 84

MUST READ

STATRUP:
Astrome For Telecom Infrastructure

STATRUP:
SimYog Technology

STATRUP:
SixSense AI Platform

INNOVATION:
How We Can Innovate Better

"INQUISITIVENESS TO EXPLORE MAKES A BIG DIFFERENCE..."

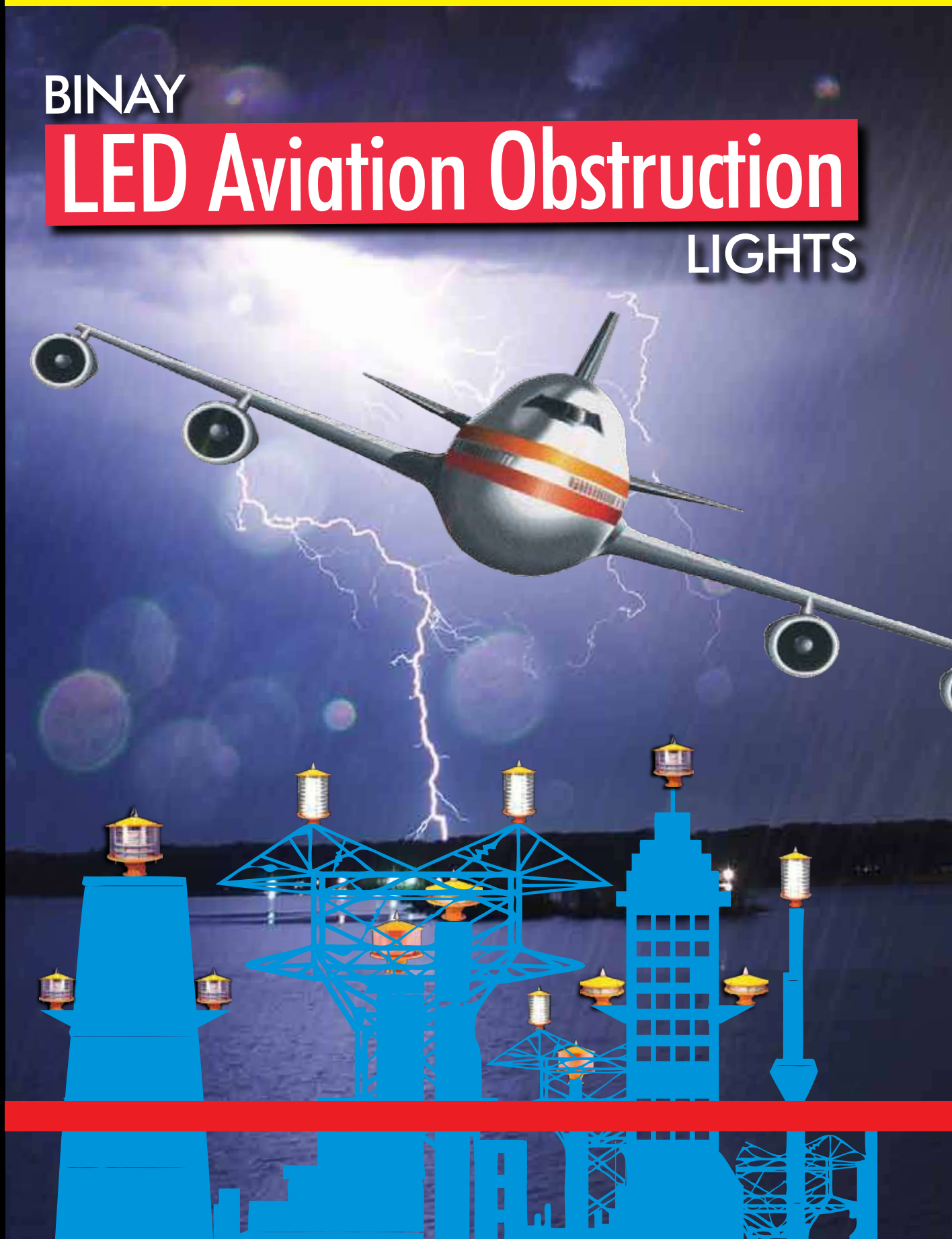
—Dr Aloknath De, Samsung

INDUSTRY REPORT

INDIA'S ELECTORNICS INDUSTRY

How's It Doing?

PROVIDING LED POWERED



BINAY

LED Aviation Obstruction LIGHTS

TECHNOLOGIES SINCE 1983

BINAY LED-based HIGH, MEDIUM and LOW Intensity Aviation Obstruction Light Beacons

As per International Civil Aviation Organisation (ICAO) requirements
Available in Low Intensity, Medium Intensity and High Intensity versions (as per International Civil Aviation Organization guidelines), BINAY's patented LED Aviation Lights come with 5-year/3-year warranties

High Intensity
200,000 candela
(Flashing White LEDs)

Medium Intensity
20,000 candela
(Flashing White LEDs)

Medium Intensity
2,000 candela
(Flashing Red OR Fixed Red LEDs)

All BINAY Aviation Lights are based on Non-switching passive type circuitry (NO SMPS)

The circuitry incorporated inside the LED Aviation Obstruction Lights is passive electronic (solid-state) in nature, and does not use internal SMPS driver switching units to control the light unit. Internal LED current control is by non-switching electronic means only. No electrolytic capacitors are used inside the Aviation Obstruction Light unit.

The above is necessary to ensure reliability of the LED Aviation Obstruction Light. This system design effectively eliminates any active components and circuits inside the aviation light itself, and enhances the solid-state passive reliability of the LEDs (mounted in relatively inaccessible locations at the height of tall structures). This drastically reduces the possibility of component failure - and hence possibility of any maintenance requirement – in the LED Aviation Obstruction Lights themselves (which are mounted at extreme heights in the system).

The BINAY LED Aviation Obstruction Light offers the following advantages:

- Fit-and-forget maintenance-free operation
- A long life of 100,000 hours (20 years at 12 hours daily burning)
- Pays for itself within a short period of operation in the form of reduced installation, maintenance and servicing costs
- Quick Installation; Reliable operation 365 days per year
- Shock-proof and vibration-resistant
- Over-Designed Intensity to allow for natural LED intensity degradation over its operating lifetime

LED Obstruction Lighting for:

- Industrial chimneys and smokestacks
- Transmission, microwave and cellular towers
- Radio, TV and similar structural towers
- High-rise buildings and structures
- Airports and airfields

THE BINAY LED OBSTRUCTION LIGHT IS UNDER ACCEPTED PATENT, AND AS SUCH IS A PROPRIETARY PRODUCT

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Email: info@binayLED.com
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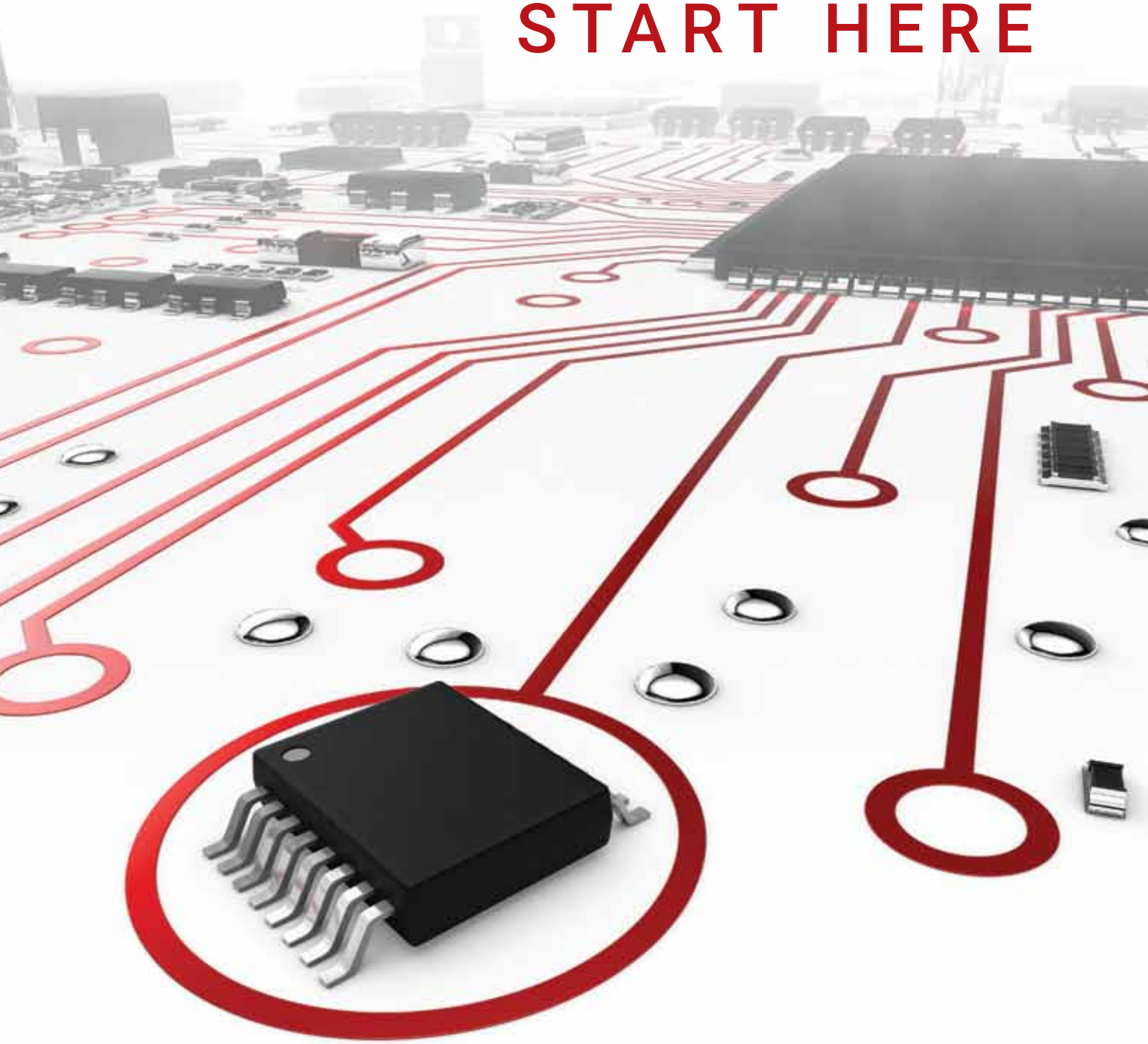

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Digi-Key ELECTRONICS

WHAT IF EXPLORING SPACE WAS VITAL TO PRESERVING EARTH?

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ANALOG DEVICES

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FROM YOU

YOUR SUGGESTIONS AND THINGS YOU WANTED TO KNOW!

WIRELESS SECURITY SYSTEM

This is regarding the 'Wireless Security System Using PIR Sensors' DIY article published in June 2018 issue. I tried it using a 433MHz transmitter-receiver pair and a Raspberry Pi at the central receiver circuit instead of a microcontroller and it worked perfectly.

Lengushuru Charles

EFY. Thanks for interfacing this circuit with Raspberry Pi! It will motivate the other readers also to experiment.

• • •

VIBRATION BASED HEATING NECKBAND

This is regarding the 'Wireless Security System Using PIR Sensors' DIY article I found online at *https://www.electronicsforu.com/market-verticals/medical/vibration-based-heating-neckband-for-cervical-spondylosis*. I want to know whether the team at Anant National University has started producing these vibration neckbands yet? If so, how can I reach them?

Niladri

EFY. The team has not started production and perhaps never will. They just created the prototype of the belt which can be used to resolve the issue.

• • •

PROTECTION CIRCUIT ERROR

This is regarding the 'Protect Appliances From High/Low Voltages' DIY article published in EFY February 2022 issue. Is there an error in D3 diode connection? A relay does not respond that fast and, sometimes, by the time a surge comes in it turns everything off—only after your circuit has burnt. I suggest using an optocoupler.

Nazmi and Chris

EFY. Thanks Nazmi and Chris for pointing out the error! Yes, this is a mistake. Cathode of diode D3 should connect to 12V and the anode to collector of transistor T2. In brief, please reverse the polarity of diode D3.

• • •

MICROCONTROLLER BASED PRODUCTS

This is regarding the 'Developing Microcontroller Based Products—A Case Study' article at *https://www.electronicsforu.com/electronics-projects/developing-microcontroller-based-product-case-study*. I do not know who the author is but he has written a beautiful book! It explains something I have been searching for for over 15 years. I started programming with Arduino, but never came across anything except this book that led me down the path of product development using a microcontroller in an understandable way.

Now, I have a roadmap that can be used to create all kinds of neat stuff that I have dreamed up over the years. Yes, I can now blink LEDs, put letters and numbers on an a 4 × 16 LCD array, and even put photos on a TFT LCD. In lighter vein, can also make some noise and smoke (blue type) by connecting power backwards. Best of all, can now think of putting an electronic device on the shelves of Amazon. Wow! Thank you very much. Please do send a copy of this article to Instructable's.

Walter Hynson

EFY. Thank you for your valuable feedback!

• • •

THINGS YOU WANTED TO KNOW

I am designing the wireless power bank published in previous issue of EFY. How do I calculate its battery time, if I use a 4400mAh battery and use it with a device that consumes 900mA continuously?

Kumar

EFY. If you are designing any battery packs, power banks, battery based IoT, or need to calculate EV battery life in your design, you can do it quickly using your battery time calculator that is now available at *https://www.electronicsforu.com/special/battery-life-calculator*

You can also use the formula below for calculating the battery runtime for any device:

Time (H) = Capacity (Ah)/ Current(A)

❑ I want to share my electronics project for publication. How can I do so and how do I know when my project is published?

Rathor

EFY. You can share your project with us either by mailing it to us at *onedit@efy.in* or you can share it using the Submit Project section at *https://www.electronicsforu.com/submit-your-project*. We will inform you once we have received your project and reviewed it.

❑ Can we see the videos of the projects and circuits published by EFY to see how they work and how these can be constructed?

Sharad

EFY. Yes, the video of every project or circuit tested by EFY Lab is available on *electronicsforu.com* website and YouTube channels. You can also ask us via e-mail for the same.

• • •

SOURCE CODES OF THE PROJECTS

I want to make a project from Electronics For You magazine. How can I get its source code?

Mukul

EFY. The source codes of recently published as well as previous articles are available for free download at *source.efymag.com*

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Tiny artificial luminescent muscles developed that let flying bots to also converse

Taking inspiration from nature, MIT researchers have created electro-luminescent soft artificial muscles that enable flying, insect-scale robots. When the robots fly, these tiny artificial muscles that drive their wings generate a coloured light. The robots can also converse with one another because of this electro-luminescence. For example, robots may use lights to signal others and call for assistance if they were deployed on a search and rescue operation inside a collapsed building. The artificial muscles that these robots have are durable actuators that are made by alternating ultra-thin layers of elastomer and carbon nanotube electrodes in a stack and then rolling it into a squishy cylinder.

Inspired by fireflies, MIT researchers have created soft actuators that can emit light in different colours or patterns (Credit: MIT)

Prof. Paul E. Sokol, Department of Physics, The College of Arts & Sciences, Indiana University, Bloomington (Credit: Indiana University)

Researchers are exploring behaviour of particles in shrinking microchip leads

The wires that transport electricity to microchips must advance in size, speed, and functionality at the same rate as the microchips do. But under newly designed systems, shrinking wires is like confining the electrons in a one-dimensional tube, and that behaviour is quite different from that of a regular wire. Researchers at Indiana University and the University of Tennessee have now built a model system of electronics packed inside a one-dimensional tube to explore the behaviour of particles in these conditions, with the help of an unusual element—helium. Helium was chosen as a model system for their research because of its well-known interactions with electrons and the ease with which it can be made incredibly pure.

An electronic tongue that can identify chemical makeup of any liquid

IBM research scientists have developed an electronic tongue with AI assistance that can identify the complicated chemical makeup of any liquid. The 'tongue,' known as

Hypertaste (Credit: IBM Research)

Hypertaste, is a reasonably tiny and affordable device. The final product employs an array of sixteen conductive polymeric sensors. To use Hypertaste, one has to submerge the array of sensors in the liquid. The sensors generate a series of voltage signals in response to the liquid's compounds, which are referred to as the liquid's chemical fingerprint. These are then transmitted to the user's mobile device, where they are compared by a trained ML algorithm to a database of chemical compositions.

The new mechanism would help robots see in dark and carry out tasks

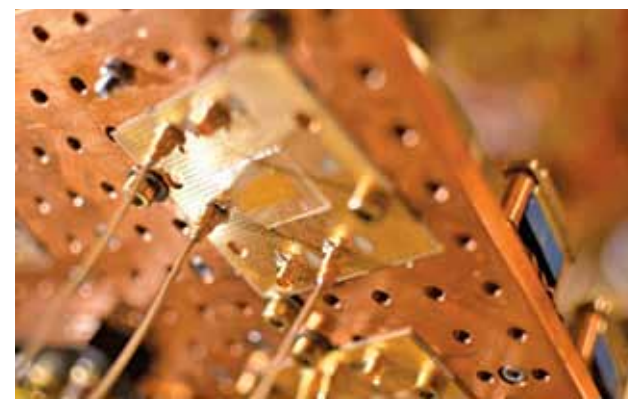
Rice University engineers have devised a mechanism for people to assist robots in 'seeing' their surroundings and

The task set for this Fetch robot by Rice University computer scientists is made easier by their BLIND software, which allows for human intervention when the robot's path is blocked by an obstacle (Credit: Kavraki Lab)

carrying out tasks. This technique is called the Bayesian Learning IN the Dark (BLIND). The goal was achieved by integrating Bayesian inverse reinforcement learning with well-established motion planning approaches. When obstructions obscure a machine's 'view' of its destination, BLIND inserts a human mid-process to modify the choreographic possibilities—or best guesses—offered by the robot's algorithm, rather than setting a trajectory up front. This means that this technique simplifies human-robot relationships by incorporating human preferences.

Sound waves can now be controlled and modulated with a chip

For the first time ever, scientists from Harvard's John A. Paulson School of Engineering and Applied Sciences (SEAS) have successfully controlled and modulated sonic

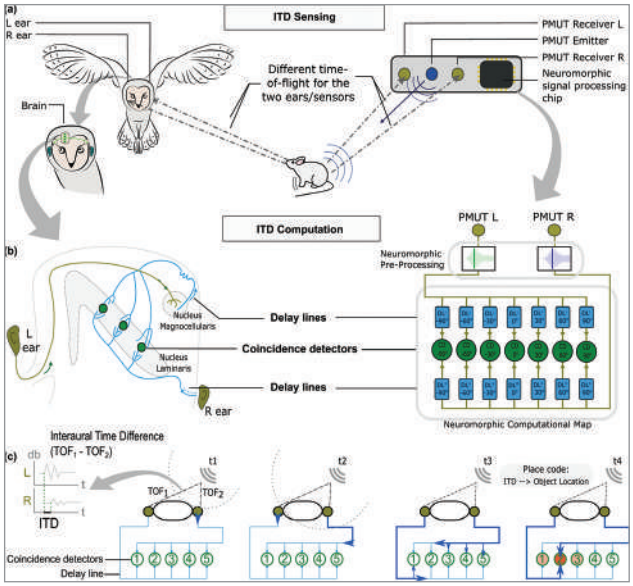


A chip that can control and modulate acoustic waves (Credit: Linbo Shao/ Harvard SEAS)

waves using an electric field on chip. They showed that we can control acoustic waves on an integrated lithium niobate platform, bringing us one step closer to an acoustic integrated circuit. This chip is also called an on-chip electro-acoustic modulator. The modulator can alter the acoustic waves' phase, amplitude, and frequency by imposing an electric field. The researchers are currently striving to construct more intricate, large-scale acoustic-wave circuits and links with more quantum systems.

This setup can calculate azimuth and elevation of sound source like an owl

An owl processes the difference in the arrival of a sound in each ear to calculate the azimuth and the elevation of the sound source. Scientists in France have incorporated these two aspects of computation into hardware that mim-

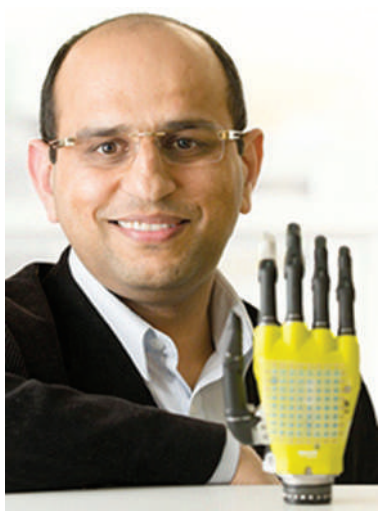


Object localisation system in barn owls and the proposed bio-inspired technology (Credit: www.nature.com)

ics this process. Mainly, it focuses on the acoustic based, object-localisation task. The setup emulates a particular type of neuron and delivers a spike-like pulse once specific time and amplitude dependencies have been met from the envelope detector. If the reflecting object is within earshot distance, the pipeline delivers a spike on a channel whose time difference is related to the target azimuth angle.

Biodegradable crop sensors and organic PVs being developed

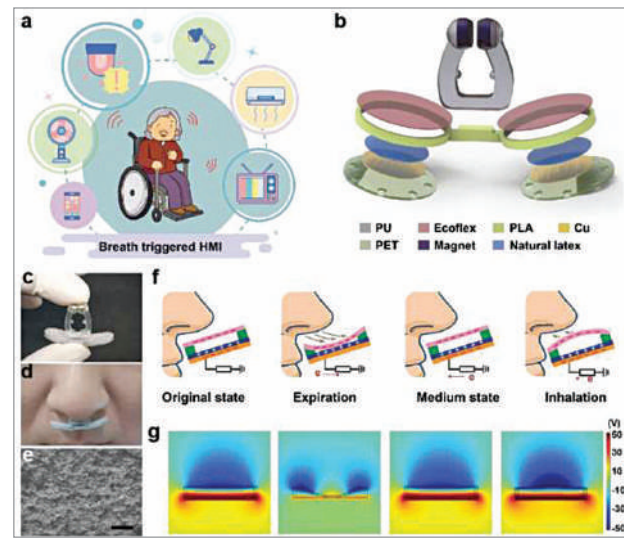
Under the direction of Glasgow University researchers, green electronics for linked farming, such as biodegradable crop sensors and organic photovoltaics (PVs), are being developed. A modular sensor system for crop monitoring is being investigated and its two component pieces will either decompose into the soil at the end of their useful lives or can be recovered and utilised again in other systems. The biodegradable element will be the sensor patch itself. The sensors will be able to perform tasks like monitoring pH, temperature, and bioimpedance. They will also have an electrical module with wireless communication capabilities. Reusability and repairability are top priorities in this module's design, which aims to reduce system waste as much as possible.



Prof. Ravinder Dahiya, James Watt School of Engineering, University of Glasgow with the prototype (Credit: University of Glasgow)

A device that fits into nostrils can manage smart devices by altering breathing patterns

A simple prototype gadget developed by Case Western Reserve University researchers allows users to manage 'smart home' devices by altering their breathing patterns.



Structural design and working mechanism of the breathing-driven triboelectric sensor (Credit: Advanced Materials Interfaces)

People with limited mobility or who have trouble speaking effectively may benefit from the self-powered device, which fits into the nostrils. Additionally, it can be set up to automatically notify medical staff when someone has a respiratory problem. It was created via a process called triboelectrification, and the tech is known as triboelectric nanogenerators (TENGs). TENGs can convert mechanical energy gathered from the environment into electricity for recharging consumer electronics or powering tiny devices like sensors.

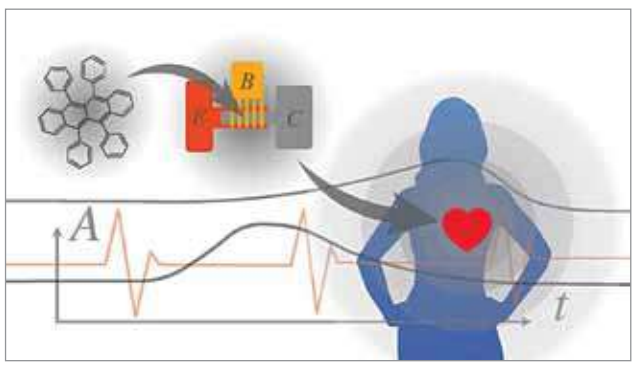
A mathematical model that can solve next-generation battery issues

Stanford researchers have developed a new mathematical model that combines the physics and chemistry of very promising lithium-metal batteries. These batteries have a higher energy capacity, charge faster, and are lighter than

lithium-ion batteries, but their commercial use has been limited due to concerns over their potential for overheating and catching fire. This happens due to the production of dendrites—metallic structures that sprout as lithium accumulates on electrodes inside the battery. The mathematical model revealed that changing the electrolytes to ones with anisotropic qualities could reduce or even stop dendrite growth. Battery separators were another solution that was a huge aspect of the study.

Organic bipolar transistor much quicker than earlier organic transistors demonstrated

Transistors made of organic materials have gained attention recently for flexible applications. Now, the first extremely effective organic bipolar transistor has been demonstrated



Organic bipolar transistors can also handle demanding data processing and transmission tasks on flexible electronic elements, for example, here for electrocardiogram (ECG) data (Credit: TU Dresden)

by a research team at the Technical University of Dresden. The utilisation of highly organised thin organic layers was essential for this research. The working frequencies of the components have finally reached the gigahertz range, or more than a billion switching operations per second, making this new technology several times quicker than earlier organic transistors. Future applications such as intelligent patches with built-in sensors that process the data locally and wirelessly connect with the outside are envisaged.

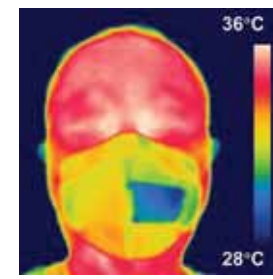
This ink coating could replace batteries in wearable devices

Researchers at Sweden's KTH Royal Institute of Technology have developed a thermoelectric ink coating that can transform low-grade heat emitted by electronics into electrical power. When one end of a thermoelectric material is heated up, charge carriers (electrons and holes) travel away from the hot end and towards the cold end, resulting in an electric current. The team leveraged this phenomenon and

Hybrid thermoelectric material (Credit: KTH Royal Institute of Technology)

concentrated on the design and development of hybrid thermoelectric materials for room-temperature operations, which combine solid-state semiconductors with flexible materials like polymers to create inks. This technology could replace batteries by being integrated as a coating in wearable devices.

Bioelectronic face mask that could also monitor user's physiological state



An infrared image of a person wearing a smart mask concept (Credit: University of Missouri)

The idea of putting bioelectronics into a breathable face mask has been put into practice by a research team at the University of Missouri College of Engineering. These masks can monitor a user's physiological state depending on the features of their cough. A technique called laser-assisted manufacturing that has been employed by researchers for about ten years has proved to be useful in the production of wearable bioelectronics. Laser-assisted fabrication is simple, scalable, cost-effective, and easily customisable. Also, the team looked at the viability of using the metallic conductor known as MoO2, which exhibits properties that make it suitable for construction of various bioelectronic sensors.

Micro-supercapacitors on marble flooring could provide excellent power supply

Eco-friendly construction materials, like marble and granite, are often used in construction and refurbishing. Now a group of scientists from the American Chemical Society (ACS), in a step toward integrating energy storage with these materials, have fabricated micro-supercapacitors onto the surface of stone tiles. However, these materials often have microscopic bumps and divots, making it difficult to adhere electrical components to them. Researchers have recently figured out how to place micro-supercapacitors, which have fast charging and discharging rates and excellent power supply storage, onto irregular surfaces with lasers. Scientists are adopting this approach to build micro-supercapacitors on marble.

TRULY INNOVATIVE ELECTRONICS

INNOVATION UPDATES

Amongst numerous press releases of new products received by us, these are the ones we found worthy of the title *Truly Innovative Electronics*

Image sensor with industry's smallest 0.5µm pixel

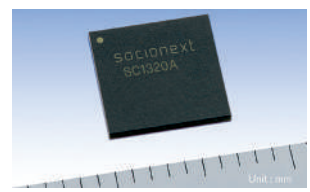
The ISOCELL HP3 from Samsung is a 200MP camera sensor with the world's smallest sensor measuring only 0.5µm. The sensor packs 200 million pixels in a 1/3.6cm optical format. ISOCELL HP3 is capable of capturing HDR images with 14-bit RAW output and employs a pixel

binning technique called Tetra2pixel technology, which joins up to 16 pixels to capture a 12MP image with much bigger pixels in an ultra-low light condition. All the pixels are equipped with AF capabilities, which allow for sharper and more vibrant images. Furthermore, it allows more accurate and quicker auto-focus. The sensor is capable of shooting 8K videos @ 30fps and 4K videos @ 120fps. The smaller pixels have resulted in a 20% reduction in sensor size compared to its predecessor, thus making it desirable for high-end smartphones.

Samsung
https://semiconductor.samsung.com

World's first HD-PLC LSI compliant with IEEE 1901-2020

The SC1320A HD-PLC communication LSI from Socionext is the world's first semiconductor design using an IEEE 1901-2020 compliant IP core. The High-Definition Power Line Communication (HD-PLC) superimposes high frequency signals over existing power lines, telephone lines, etc, to enable communication. The SC1320A uses only a single 3.3V power supply and comes in a compact 7 × 7mm package. This solution has multiple I/O interfaces,

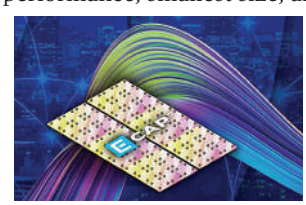


such as SPI/UART and Ethernet MAC (RMII), allowing SC1320A to be easily embedded into designs. The compact and low-power solution is suitable for a wide variety of applications, which include home automation and smart metering.

Socionext
https://www.socionext.com

World's smallest and most configurable capacitor

The latest addition to E-Cap series of capacitor solution from Empower Semiconductor is the industry's highest performance, smallest size, and



most configurable capacitor. E-CAP solutions offer densities of 1.1µF/mm^2, which is over twice the density of alternative silicon capacitor technologies. E-Cap provides a superior high-frequency de-coupling solution with a much smaller footprint and component count than traditional MLCC based solutions. It is suitable for use in demanding applications, such as IoT, wearables, mobile, and processors where size, performance, and flexibility are essential.

Empower
https://www.empowersemi.com

Energy-efficient Bluetooth location service device

BG22 from Silicon Labs is an energy-efficient Bluetooth location service solution. It incorporates advanced software, which is designed to maximise the location-finding capabilities of the BG22 series of SoCs and

SiP modules. The device features an accurate, low-power Bluetooth device to simplify angle of arrival (AoA) and angle of departure (AoD) location services. This product family combines ultra-low transmit and receive power (4.1mA TX at 0dBm, 3.6mA RX) with a high-performance Arm Cortex-M33 core (27µA/MHz active, 1.2µA sleep). It can operate for up to ten years on a single coin cell battery and can be used in applications such as asset tracking, warehouse management, IoT for healthcare products, and more through real-time location services (RTLS).

Silicon Labs
https://www.silabs.com

Ultra-accurate GNSS module to cover all major bands

The ORG4600 from Origin GPS is a dual-frequency L1 + L5 GNSS for ultra-accurate positioning. The highly

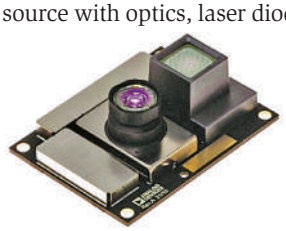
precise system covers almost all the major bands, including GPS, GLO, GAL, QZSS, and IRNSS. The compact GPS

module weighs only 0.4gm and comes in a small package measuring only 10 × 10 × 1.95mm. The ORG4600 is capable of providing up to a centimetre-level accuracy with RTKLIB and NMEA with raw data in parallel. It has a frequency of -167dBm and a refresh rate of 1Hz.

Origin GPS
https://origingps.com

Industry's first high-resolution module for 3D depth sensing

ADTF3175 from Analog Devices is industry's first high-resolution module for 3D depth sensing applications. The ADTF3175 uses indirect time-of-flight tech module for 3D depth sensing and vision systems. It features an infrared light source with optics, laser diode,



and driver, and a receiver path with a lens and an optical band-pass filter that makes integrating the module into a product cheaper and faster. It offers high accuracy of ±3mm and is intended for a wide variety of applications that cover healthcare, industrial automation, logistics, and augmented reality.

Analog Devices Inc.
http://www.analog.com

Tiny energy harvesting IC with microwatts to milliwatts power input

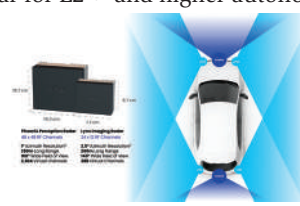
The NH16D3045 from Nowi is a high-performing energy harvesting PMIC with power input ranging from microwatts to milliwatts. It comes in an ultra-compact size measuring 4 × 4mm and offers a fast and efficient MPPT algorithm. The PMIC can be used to

charge rechargeable batteries as well as supercapacitors. The NH16D3045 combines integrated energy harvesting and power management into one single product to serve as a complete power offering, boasting features such as regulated output over-voltage protection and USB charging.

Nowi
https://www.nowi-energy.com

Surround radar enhancing perception and sensor fusion

Arbe Robotics has announced Lynx, the world's first long-range, high-resolution, 360°-sensing imaging radar processing 24 × 12 channels. Lynx is designed to be a corner and a back radar for L2+ and higher autonomous



vehicles, which can also be used as a front radar for driver assist system (ADAS). Lynx delivers effective sensing in all environmental conditions and gathers the data that optical sensors lack, like velocity, long range, depth perception, and more. The radar's small form factor and affordable price make it a highly suitable sensor and industry-first surround radar capable of enhancing perception and sensor fusion.

Arbe Robotics
https://www.prnewswire.com

First battery-powered AI/ML based smart alarm system

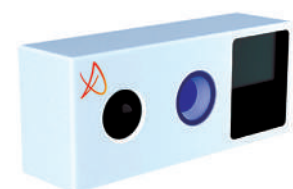
Infineon Technologies has released a battery-powered smart alarm system (SAS). The tech platform is the industry's first battery-powered AI/ML based acoustic event detection system with sensor fusion. The solution incorporates Infineon's analogue XENSIV MEMS microphone IM73A135V01, XENSIV digital pressure sensor DPS310, and PSoC 62 microcontroller. It features a low-power wake-on acous-

tic event detector that improves the battery life of the device. The compact design provides a high level of accuracy in detection and better battery life compared to that of any acoustic-only alarm system. The SAS is suitable for security and monitoring applications in smart buildings, homes, warehouses, and can also be employed in various other IoT applications.

Infineon Technologies
https://www.infineon.com

Fastest-ever flash lidar for accurate detection and tracking

T30P from PreAct Technologies is said to be the fastest flash lidar available in the market. The sensor is capable of accurately detecting and tracking objects in all environmental condi-



tions. PreAct's flash lidar architecture is based on modulated waveforms that can be optimised for different applications via over-the-air updates, along with an application stack that resides on the edge. The radar employs an Espros EPC660 sensor and has a maximum viewing angle of 36° × 102°. The device is suitable for application in autonomous vehicles, drones, autonomous robots, etc.

PreAct Technologies
https://www.preact-tech.com

NEW PRODUCTS

MAKE IN INDIA

COMPONENTS

Inductive position sensor

LX34070 inductive position sensor from Microchip has been specifically designed for EV motor control applications. The sensor enables lighter, smaller, more reliable motor control solutions that meet stringent safety requirements, reduced overall system costs, and can operate seamlessly and precisely in the noisy environment of an automobile's DC motors, high currents, and solenoids. It includes a fast sample rate and differential outputs, and incorporates features that make it functional-safety-ready for ISO 26262 compliance in the Automotive Safety Integrity Level-C (ASIL-C) classification.

Microchip
https://www.microchip.com

Position sensor for ADAS

A33115 is a position sensor for ADAS applications from Allegro MicroSystems. The A33115 features a TMR and vertical Hall elements to achieve high accuracy and has built-in redundancy for safety-critical systems. The angle sensors are said to be the first commercial sensors to offer both the Vertical Hall Technology (VHT) and the Advanced Tunnelling Magnetoresistance (TMR) technology in a single package. The TMR-on-silicon technology used in this sensor offers up to eight times greater sensitivity, which results in an improved resolution and better accuracy. The A33115 also includes a turn counter that tracks motion in 90-degree increments and a low-power mode with a user-programmable duty cycle that reduces power consumption when the IC is in a key-off position.

Allegro MicroSystems
www.allegromicro.com

SoC for secure car access

STSAFE-VJ100-CCC from STMicroelectronics is a ready-to-use system-on-chip (SoC) for secure car access. The SoC combines as ST secure element based on certified ST33K-A secure IC and Java Card platform with G + D digital key. The new platform is believed to accelerate the introduction of digital car keys, giving consumers keyless access to vehicles via their mobile device. The product supports the latest Car Connectivity Consortium (CCC) Digital Key Release 3.0 standard, ensuring high level of security and protection.

STMicroelectronics
www.st.com

MOSFET in DFN package

Nexperia's DFN0603 is the first 20V and 30V MOSFET in the DFN package. The MOSFET offers great ESD performance and comes in a compact package measuring only 0.63 x 0.33 x 0.25mm and requiring 13% lesser space than the next smallest package available in the market. It offers up to 74% lower RDS(on) than other competing products, thus achieving higher efficiency and lower heat dissipation. The DFN0603 is suitable for use in space-constrained operations, such as smart watches and wireless earphones.

Nexperia
https://www.nexperia.com

HF ultrasonic transceivers

CUI Devices has added a new ultrasonic transceiver to its ultrasonic sensor product line. The new transceivers feature IP67-IP68 ratings and have a higher frequency range of up to 400kHz. The transceivers offer a wide beam angle from 7 to 80 degrees. They have suitable working distance range of 0.03 to 15 metres and are suitable for application in a wide temperature range from -40 to 85°C. The product is suitable for use in such applications as distance measurement, object detection, proximity sensing, etc.

CUI Devices
www.cuidevices.com

Synthesizer for data converters

ADF4377 from Analog Devices, Inc. (ADI) is a synthesizer for high-performance ultra-wideband data converter and synchronisation applications. The high-performance PLL has a figure of merit of -239dBc/Hz, ultra-low 1/f noise, and a high PFD frequency that can achieve ultra-low in-band noise and integrated jitter. The ADF4377's fundamental VCO and output divider generate frequencies from 800MHz to 12.8GHz. The ADF4377 is suitable for operation in applications such as radar, instrumentation, and wideband receivers requiring multiple data converters.

Analog Devices Inc
http://www.analog.com

SoC with ARM Cortex-M4

Infineon Technologies has announced AIROC CYW20820, a Bluetooth &

Bluetooth LE (low energy) system on chip (SoC). It features an Arm Cortex-M4 microcontroller unit with

a floating-point unit. The SoC is designed to be employed for a wide variety of applications, such as home automation and sensors, which also add IoT functionality to the healthcare industry, home, security, etc. It is supported by ModusToolbox software and tool, which also have code examples to simplify the process of development and integration of AIROC modules to other systems.

Infineon Technologies
https://www.infineon.com

5G smartphone SoC

MediaTek's Dimensity 9000+ system-on-chip (SoC) is an addition to the company's top-of-the-line 5G

smartphone chipset. The Dimensity 9000+ can deliver faster gameplay, seamless streaming, and an all-around better user experience in smartphones. The SoC features an Arm v9 CPU with 4nm octa-core processor along with an integrated LPDDR5X that supports 8MB L3 CPU cache and 6MB system cache. The chip also features MediaTek's fifth-gen Application Processor Unit (APU 5.0), which enables it to perform powerful AI computing. The SoC can do 18-bit HDR video recording simultaneously from three cameras, and record 4K videos. It is capable of running a 144Hz WQHD+ displays, and can add latest Wi-Fi, Bluetooth, and GNSS standards to a device.

MediaTek
www.mediatek.com

Wireless microcontrollers

Texas Instruments CC2340 is a series of wireless microcontrollers (MCUs) that enable high-quality Bluetooth Low Energy (LE) at a lower price than any

of its existing competitors. The MCUs offer flash memory of up to 512kB and 36kB RAM with over-the-air download support. The device also includes a low standby current and can work for over a decade with a single coin cell. The CC2340 devices feature an integrated RF balun to enable a simpler design with fewer external components, leading to cost savings and shorter time for product designing and development. The MCUs can be employed in multiple applications, such as EV chargers, electronic shelf labels, and tyre-pressure monitoring systems.

Texas Instruments
https://www.ti.com

T&M SOLUTIONS

Viscometer for solder paste

Malcom PCU-285 from Seika Machinery is a CE-certified viscometer

for testing solder paste viscosity. It has a measurement range of 5Pa.s to 800Pa.s with a speed range of 1 to 50rpm and an accuracy of ±5% of indicated value. The viscometer features an onboard PC, highly stable temperature control, and a 17.8cm (7-inch) LCD touchscreen display capable of displaying graphs. The Malcom PCU-285 offers an automatic measurement feature with an option to save data and also comes with an option to add a printer. It features multiple interfaces that include two USB type A, which can be used for interfacing a mouse, keyboard, or a flash drive and one USB type B for connecting it with a PC. It also features a LAN port. The device has a low power consumption of 130W and weighs about 13kg.

Seika Machinery
www.seikausa.com

Vector network analyser

Rohde & Schwarz has added R&S ZNB26 and R&S ZNB43 to its R&S ZNB vector network analyser family. The

new model addresses applications in the mmWave range, such as 5G at FR2 frequencies and applications in aerospace and defense in the Ka-band. The ZNB26 variant is capable of analysing up to 26.5GHz whereas the ZNB43 extends the upper frequency of the midrange VNA family to 43.5GHz. The models have a second internal source and offer an extended power range. Both models are suitable for the characterisation of passive devices, such as filters, couplers, and switches. The R&S ZNB43 is available in two connector types measuring 2.4mm or 2.92mm and comes with 2-port amd 4-port options.

Rohde & Schwarz
www.rohde-schwarz.com

BOARDS & MODULES

Isolated DC/DC converters

The TMR 12WI from Traco Power is a series of isolated 12W DC/DC converter modules. The modules provide a regulated output featuring wide 4:1 input voltage range with high efficiency of up to 90% within an operating tem-

perature range of -40°C to +65°C. The modules offer continuous short-circuit protection and pack high power density of 4.73W/cm³ in compact SIP-8 metal packages. The series is suitable for a wide variety of operations that include application in communication equipment, instrumentation, and industrial electronics.

Traco Power
http://www.tracopower.com

Wireless Raspberry Pi Pico

Raspberry Pi has added wireless connectivity to its Pi Pico, the company's smallest development board for IoT applications, The Raspberry Pi Pico W features an RP2040 microcontroller powered by 133MHz Arm Cortex-M0+ CPU cores. The newer Pico W also features an Infineon CYW43439 chip, which enables the wireless connectivity. The CYW43439 chip supports both Bluetooth Classic and Bluetooth Low-Energy along with the Wi-Fi 2.4GHz 802.11n. The board only comes with the Wi-Fi connectivity. The company is expected to add the Bluetooth connectivity through a firmware update in the near future. Like the original Pico, the newer model has 26 multi-function GPIO pins, an accurate clock, and timer on-chip and an on-board temperature sensor.

Raspberry Pi Foundation
https://www.raspberrypi.org

Low-power GNSS module

u-Blox has released SAM-M10Q GNSS, a low-power Global Navigation Satellite System (GNSS) with a built-in antenna. The SAM-M10Q GNSS antenna module offers a best-in-class low-power positioning solution. The wide band antenna along with the SAW filter and low-noise amplifier (LNA) architecture offers out-of-band jamming immunity. The M10Q can offer superior position availability with concurrent reception of all four GNSS constellations, including GPS, GLONASS, Galileo, and BeiDou. Typical applications include industrial tracking and telematics, automation and monitoring, and small UAVs.

u-Blox
www.u blox.com

Single-board computer

IB956 from IBASE Technology Inc. is a high-performance single-board computer in a 8.9cm (3.5-inch) form factor. Powered by an 11th Gen Intel Core processor, the module can support up to four displays and is suitable for both fan and fan-less systems operating 24/7. The compact module can fit up to 32GB of DDR4 memory and features multiple I/O ports, such as Gigabit LAN ports, USB 3.1, USB 2.0, and SATA III, to meet the data and transmission requirements of a multitude of IoT applications. The module can run at wide operating voltages from 12V DC to 24V DC and can work with both Windows 10 and Linux Ubuntu operating systems.

IBASE
www.ibase.com.tw

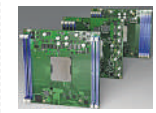
Module driving AI at edge

Adlink's new AIOT SMARC 2.1 module is capable of driving AI at the edge. The AIoT SMARC module is powered by MediaTek's 8-core MT8395 CPU, which features four power cores of Arm Cortex-A78 and four cores of Arm Cortex-A55. It is capable of handling up to 8GB of LPDDR4 RAM. The module has one onboard UFS, up to 256GBs, and features 3x MIPI CSI interfaces. It also features an integrated AI processor unit for on-device AI processing, such as deep learning, neural network acceleration, and computer vision. The module can support up to three MIPI camera inputs and extended IO connectivity.

ADLINK
https://www.adlinktech.com

Servers on modules

Congatec has introduced five new modules to its Xeon D-2700 processor based server-on-module portfolio. The modules will satisfy the industry demands for edge server performance in a small form factor. The rugged and outdoor capable modules come in a compact 160 × 160 COM-HPC Server Size D performance class. The modules feature processors with up to 20 cores, making them suitable for tasks such as hosting multiple real-time applications simultaneously. The modules provide double throughput per PCIe lane to Gen 4 speeds, as well as up to 100GbE connectivity and TCC/TSN support. Target applications of the new Intel Xeon D-2700 processor based COM-HPC modules are deeply embedded, space-constrained edge server deployments with high data throughput but less memory-intensive workloads.



Congatec
https://www.congatec.com/en

ENTERPRISE CLASS

Waterproof asset tracker

The AS500 LTE-M/NB-IoT is a waterproof asset tracker with a long standby from ATrack Technology Inc. The asset tracker is suitable for both indoor and outdoor unpowered asset tracking applications and can operate for up to ten years on a single charge. It utilises Wi-Fi and Bluetooth for asset tracking. The module can help business owners quickly realise cloud management and play a key role in driving customers into 'Connecting the Future.'

ATrack Technology Inc.
https://www.atrack.com.tw/en

Conveyor belt lidar scanner

Contour2D from Pepperl+Fuchs can ensure that packages on a conveyor belt are distributed evenly to downstream stations. Contour2D sensor system employs a single lidar sensor with a combina-

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tion of an intelligent algorithm that can analyse the number of objects and can correct the shadow effect. It can achieve a high angular resolution of 0.042° at a scan rate of up to 50Hz. The lidar scanner detects the contour of packages on the conveyor belt and uses that information to calculate the conveyor belt utilisation. The product is easy to install and commission, making the Contour2D a fast and simple solution to employ.

Pepperl + Fuchs
https://pepperl-fuchs.com

DisplayPort KVM over IP Extender

ATEN Advanced KX9970 is a 5K DisplayPort KVM over IP Extender. The KX9970 transmitter and receiver

is capable of enabling real-time KVM over IP with resolutions up to 5120 × 1440@60 (4:4:4) and 5120 × 2880@30 (4:4:4) lossless video compression over long distances. It provides a zero-latency transmission and colour depth up to 12 bits. The extenders also provide USB isochronous transfer that enables USB camera and USB speaker usage between transmitter and receiver. The KX9970 is suitable for various applications, which include diverse control room applications such as air-traffic control, eSports applications, and more.

Aten
www.aten.com

Cellular-to-cloud IoT kits

CK-RA6M5 and CK-RX65N from Renesas are two new cellular-to-cloud IoT development platforms. The kits are powered by RA and RX families of

32-bit microcontrollers (MCUs) and feature a RYZ014A Cat-M1 Pmod module—a certified LTE cellular module that offers the ability to establish a wireless connection between MCUs and cloud services quickly and securely without a gateway. These kits incorporate multiple sensors, hardware based security, and a reliable software stack. In addition, the cloud kits can utilise the global cloud service platforms such as AWS Cloud and other IoT services. Both kits are designed to run on Amazon Web Services, Free RTOS for CK-RA6M5 using flexible software package, and CK-RX65N using RX driver package.

Renesas
https://www.renesas.com

EMBEDDED

OS-independent hypervisor

Real-Time Systems (RTS) has announced RTS Safe Hypervisor, an OS-independent functional safety certified Type 1 hypervisor to target mixed-critical workloads based on x86

multicore processor technologies. RTS Safe Hypervisor is planned to be delivered as a complete OEM package, bundling the certified real-time hypervisor with functionally safe and non-safe virtual machines and a certified safe OS, such as the Linux based Zephyr or QNX. The Hypervisor allows users to combine any operating system with any available processor from Intel. It enables you to virtualise devices and their IoT connectivity individually.

RTS
https://www.real-time-systems.com

New Embedded R2000 SoC

AMD 2nd generation of Ryzen Embedded R2000 processor is specially designed for embedded and industrial platforms. The mid-range system-on-chip (SoC) is optimised for a wide

range of applications, such as ML, IoT, industrial, and robotics systems. It is capable of powering up to four 4K displays simultaneously and supports OS from both Microsoft and Linux. The module is scalable up to four Zen + CPU cores with eight threads, 2MB of L2 cache, and 4MB of shared L3 cache. The R2000 series processor supports up to 3200MT/s DDR4 dual-channel memory and features enterprise-class security features, which include AMD Secure Processor to help protect sensitive data and validate code before it is executed and offers AMD Memory Guard for real-time DRAM memory encryption.

AMD
https://www.amd.com

MISCELLANEOUS

Halogen-free flux

SMEF-Z52 flux from SHENMAO America, Inc. is an enhanced solder-joint encapsulation material, which provides higher bonding strength and joint protection. The SJEM flux com-

bines the ability of conventional flux and underfill, thus providing greater joint protection along with an excellent bonding strength as the epoxy cures after the reflow process. This flux can be used for a wide variety of soldering processes, which include jetting, dipping, stencil printing, dispensing, and pin-transfer processes. It is suitable for multiple IC packages, such as wafer-level-package, system-in-package, and flip-chip. The halogen-free (REL0) flux complies with RoHS, RoHS 2.0, and REACH.

SHENMAO America, Inc.
www.shenmao.com

Syringe with NFC tag

NP Plastibell has revealed a truly innovative syringe with near-field communication (NFC) tag embedded in it. The NFC tag used in this syringe

is from STMicroelectronics, which is directly moulded into the syringe. The tag enables doctors, patients, and staff to access important medicine-related information stored in it. The syringe is safe for medical use as it is sterilised at a temperature above 130°C by autoclave without damaging the electronics.

NP Plastibell
https://www.clayens-np.com

How MOBILE PHONES HAVE EVOLVED And Lead To NEWER INNOVATIONS

It's a pretty exciting time for mobile architecture since the world is currently struggling with the gradual decline of Moore's Law. In his keynote address at the VLSI Design Conference 2022, Ken Wiseman (VP - Technology, Qualcomm) talked about mobile architecture, the existing challenges, and how the mobile architecture has led to newer innovations

KEN WISEMAN is VP - Technology at Qualcomm

Cellphones have influenced the world more than any other electronic device. Just ask yourself: How many times do you check your phone in a day? In the beginning, mobile phones were used for making calls only while moving around. The ability to text other mobile phones was introduced shortly thereafter. Nowadays, you can do practically anything on a mobile device.

"In 1992, I actually worked on my first phone ever in Japan. It was a system called PHS (Personal Handy-phone System), which was a microcellular technology. It was just a basic version only for calls, and there was no data," says Ken Wiseman, VP - Technology, Qualcomm. Today, we have true mobility and performance in our phones.

On December 3, 1992, Neil Papworth—a test engineer for Sema Group—sent the first text message to a mobile phone. It just said, "Merry Christmas"

You have now got a computer in your hand—there is multimedia, 4K Ultra HD video player, recorder, navigation, broadband, and much more. You can download files, interact on Facebook or other types of platforms, and share experiences. There is interconnectivity anywhere, whether you have Wi-Fi or cellular—there is always a connected device in your hand today. At first, battery life was just about a few hours. Now, we can keep our devices powered for a very long time. The architecture and complexity have also evolved. So how did this happen?

How did the capabilities of these handheld devices evolve so quickly?

Moore's Law has been a big piece of that enablement. Today, Moore's Law has definitely slowed down. In his paper titled *What's Next? (The end of Moore's Law)*, R. Stanley Williams, research scientist for HP Labs writes, "The end of Moore's Law may be the best thing that has happened in computing since the beginning of Moore's Law. Confronting the end of an epoch should enable a new era of creativity…"

"In 1999, I was working on the PHS handset," says Wiseman. "My company

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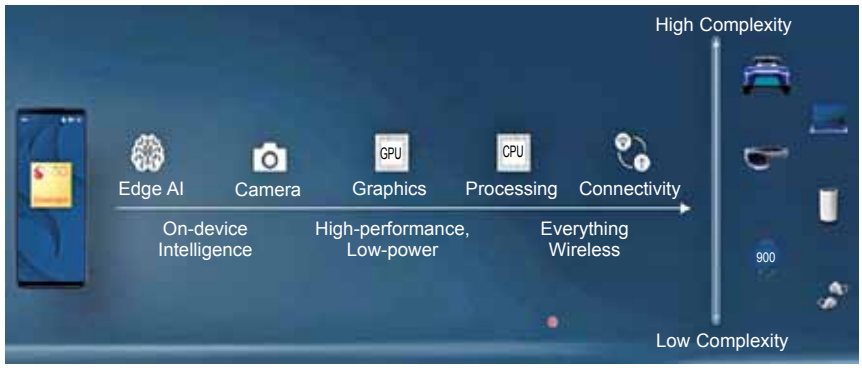

Handsets: One technology roadmap that scales to address all growth vectors (Credit: Ken Wiseman, Qualcomm)

had this strategy that they would reuse technology from their different businesses. So, I was in the wireless business when the people from the CMOS Sensor group came to me and said, "Hey, why don't we put a camera on the phone?" I thought it was a crazy idea," he adds. Today, cameras are a huge part of handsets. In terms of the percentage of our silicon, everything revolves around video and camera processing. Without applying Moore's Law, we would not have the handsets that we have today.

"The end of Moore's law may be the best thing that has happened in computing since the beginning of Moore's Law. Confronting the end of an epoch should enable a new era of creativity..."

In terms of mobile technologies, we have modems of various generations of 5G today. We have 802.11, Bluetooth, RF, and many other connectivity technologies. There are so many types of processors—DSPs, GPUs, CPUs, and even neural processors! In multimedia, there is video processing, display, etc. When you think of mobile devices, they have every interaction that you could possibly think of happening on them with a small, compact form factor. And we are constantly adding new features to handsets!

The mobile SoC world: then and now

Previously, in the mobile SoC (silicon-on-chip) world, the focus was on low-power design and keeping up with the rapid evolution of mobile phone features. Engineers were also focused on the RTL design of IPs. These IPs were largely the CPUs, GPUs, DSPs, and dedicated hardware accelerator IPs that were necessary to save power. Chip architecture was somewhat a newer concept, except in more well-established companies like Intel.

"But overall, Moore's Law was alive and well with each new tech node. We would get a lot of power and cost savings, and the die would stay the same, or sometimes get a little smaller. Performance would improve significantly with each new tech node," recalls Wiseman

In the last few years, however, the features of mobile phones have grown exponentially. These features and IPs are more demanding on power and performance. There is artificial intelligence (AI), machine learning (ML) accelerators, heterogeneous compute, and much more. The features are growing, but Moore's Law is slowing down. Power, performance, and cost improvements are not improving as fast as they did in the past. Moreover, the die area and package area are increasing due to less scaling.

> We now need creative architectural system solutions to get better power, performance, and cost savings.

Today, many phones and their chips have also reached their thermal limits. "If I operate everything on my phone today, all at once, there are going to be difficulties," Wiseman says. There are a lot of challenges around thermal throttling, and around other design or architecture changes that we have to make to accommodate the thermal capacity of the handset. We are also constrained on bandwidth, since it has increased dramatically with more cameras, 5G, and ML hardware.

Architecture has actually been a big catalyst to solving some of these problems to get better power performance and cost savings. So, we now need creative architectural system solutions to get better power, performance, and cost savings. We can no longer count on the process node to save us. We actually need to work harder with the process nodes to get what we can out of them. And then, we have to work harder on the architecture too, using compression and some software algorithms to manage the system better. We also need to focus on hardware-software trade-offs and try to reduce the silicon footprint. So, that's today's mobile SoC world.

Connecting mobile architecture to newer innovations

XR glasses. Augmented reality (AR), virtual reality (VR), mixed reality (MR), and everything in between is all included under extended reality (XR). Although AR and VR offer a variety of ground-breaking experiences, XR is powered by the same underlying technologies as AR and VR. XR glasses have all sorts of features—displays, cameras, sensors, speakers! "The dream here is that XR glasses will have 5G connectivity too, and maybe be able to replace the handsets. It's a big dream," Wiseman says.

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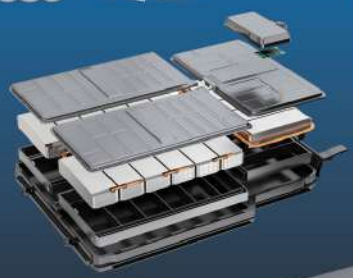

Battery Cell Insulation Tester 11210

Battery Reliability Test System 17010 & 17010H

Battery Cell Simulator 87001

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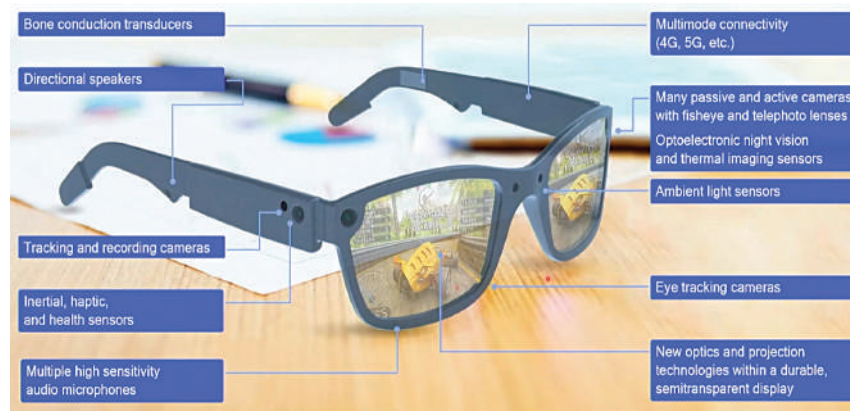


Features of XR glasses (Credit: Ken Wiseman, Qualcomm)

So, how do we keep pushing the form factor and what architecture do we use? These glasses necessarily have one chip, as we have in our handsets. According to Wiseman, we have to start distributing some chips throughout the XR glass. This way, we can make it not just thermally capable of processing what is needed but also ensure that the industrial design of the glass won't be compromised by thermal issues.

Smart cars. "The cockpits in newer cars are actually digital," explains Wiseman. A supersized version of the features present in mobile handsets is also present in smart cars. Although they have certain features that are not present in mobile phones—like multiple displays and ADAS—the core technology is similar. AI accelerators that are there in our handsets are again scaled with respect to the target market—automobiles.

"We can't just copy the architecture of mobiles and move it into the automobile space. There are other pieces of IP that are specific to some of these different applications," he adds. However, he believes that mobile architecture can be extended to add the features that we need for these target markets.

PCs, wearables, and consumer electronics. It is all about scaling. Some PC applications, like computing, are much superior to mobile ones, but some applications, like cameras, may not be. It is possible to converge mobile architecture into these devices—after scaling, or even directly.

"I have a drone that has a Qualcomm chipset with Wi-Fi, and it has all the capabilities that are needed to enable multiple cameras," says Wiseman. Even exercise machines like Pelotons have tablet displays. The technology is not far off from what we have in a mobile phone today.

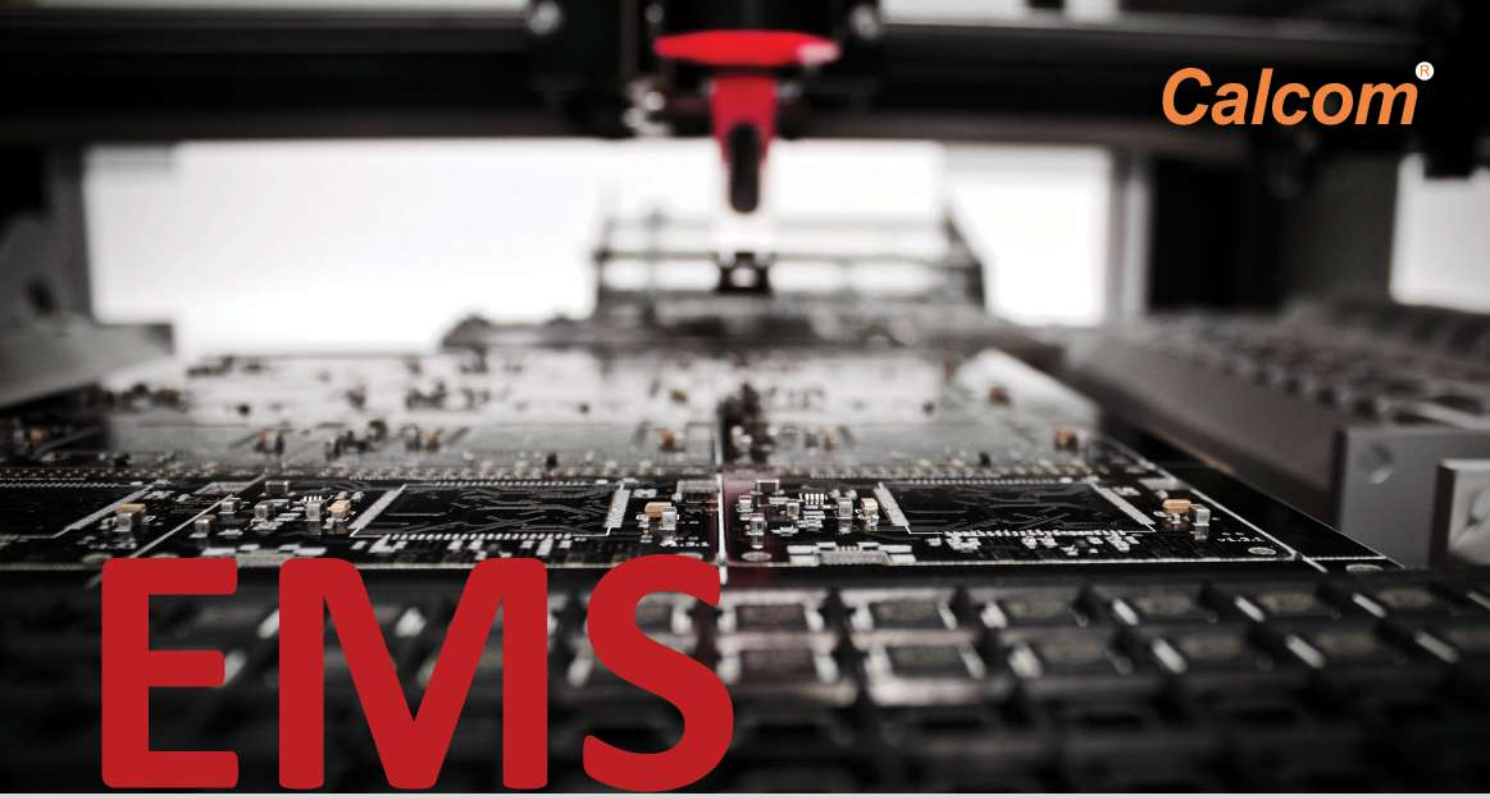
Some important components of Smart Car Infrastructure

- AI
- Heterogeneous Computing
- Computer Vision
- Precise Positioning
- Audio
- Sensor Fusion
- Multi-node 4G/5G

What next?

"The handset today has gotten limited in terms of volume and thermal capability. Moore's Law is slowing down, but we're going to keep milking it for as long as we can, but it's definitely becoming a challenge," says Wiseman. "So, there is going to be some transformation very soon!" EFY

This article has been transcribed and curated by EFY's Aaryaa Padhyegurjar from Ken Wiseman's keynote address at the VLSI Design Conference 2022.



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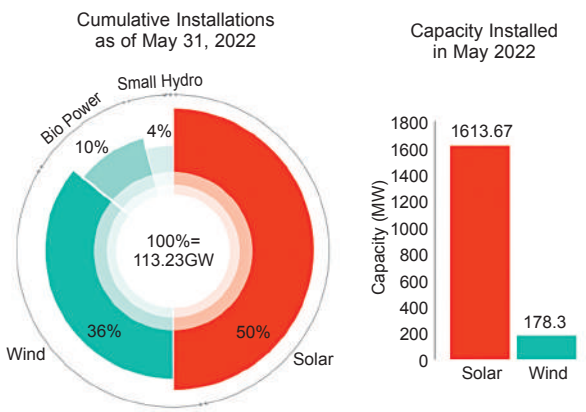
THE DASHBOARD

Solar Contributes 50% to Total RE Installations

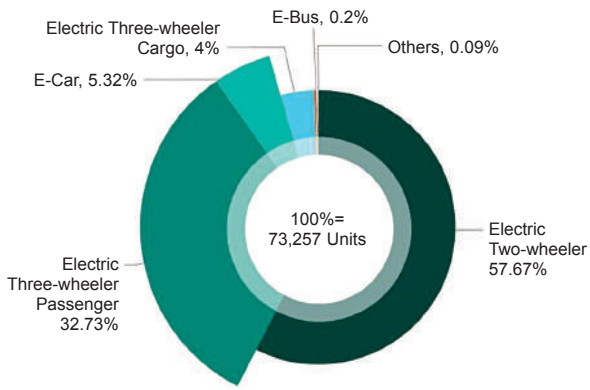
The month of May 2022, saw 1791.17MW of solar and wind capacity being installed in India. 1115.53MW of solar capacity was added in Rajasthan only, followed by Tamil Nadu with 193.99MW and Gujarat (163.32MW). Gujarat and Karnataka installed the second and third highest wind capacity as well, of 58.5MW and 40.5MW respectively.



(Source: JMK Research)

Overall EV Sales Driven by Electric Two-Wheelers

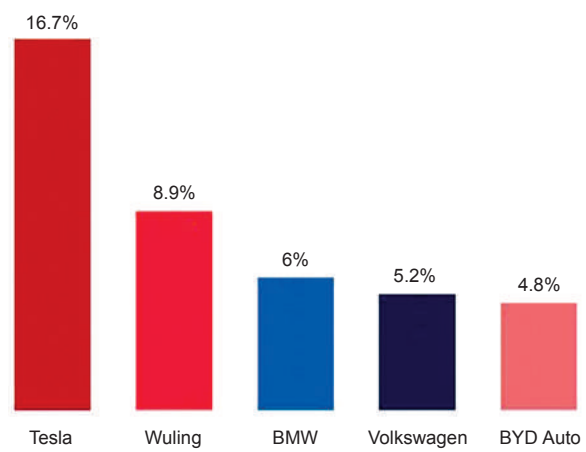
June 2022 saw a leap of more than 5 times in EV sales MoM resulting in a total of 73,257 units. E2Vs account for more than 50% of the total units sold. Adding passenger-type electric three-wheelers, the total accounts to 90.4% of total registrations in the month. Uttar Pradesh tops the market with a 17% of overall sales, followed by 13% in Maharashtra. Karnataka retains the third spot with 10% share, followed by Gujarat, Rajasthan, Tamil Nadu and Delhi.



(Source: JMK Research)

EV Shipments Expected to Cross 10 Million Units by 2022

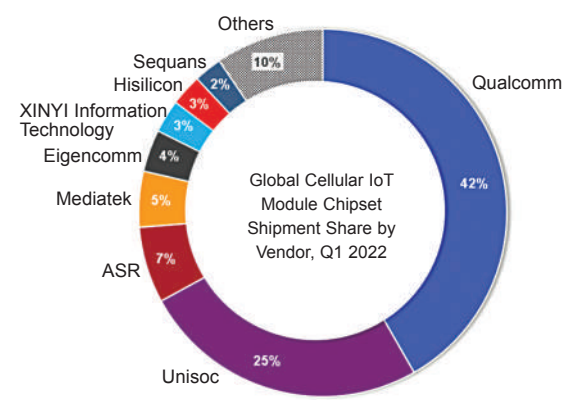
Global EV shipments exceeded 1.95 million units, showing a 79% increase YoY. China remains the market leader, followed by Europe and the US. Post operations of Shanghai Gigafactory in 2019, Tesla's shipments grew 68% YoY and are expected to cross 1.3 million units by the end of 2022. The Europe sales are also likely to increase with the Berlin Gigafactory becoming operational in March.



(Source: Counterpoint Research)

IoT Module Chipset Market Led by Qualcomm

As per reports, the global cellular IoT module chipset shipments grew 35% YoY in Q1 2022. 75% of the volume was accounted for by China, North America and Western Europe. Leading with a 30% YoY growth, Qualcomm topped with its IoT chipset portfolio, followed by UNISOC with a 26% share. ASR Microelectronics maintains its third rank, as China continues to be its key market. MediaTek takes the fourth position in the market, while Eigencomm registered the highest growth of 869% YoY during Q1 2022.

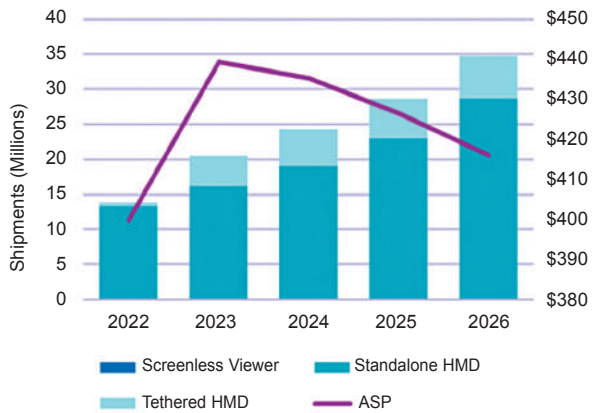


(Source: Counterpoint Research)

At-a-glance view of key industry trends that can shape the future of your business…

VR Headset Sales Jump 241.6% in Q1 2022

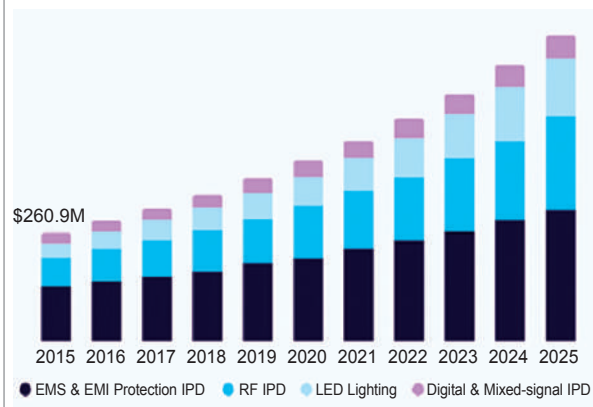
Forecast to grow further in the year, the VR shipments are expected to reach 13.9 million units (up by 26.6%). With Meta, Pico, Sony and Apple entering in 2023, the VR industry (and by extension, augmented reality as well) is projected to face a huge challenge that may drop its shipments considering the exclusive content with subsidised hardware being offered by the former.



(Source: www.idc.com)

Global IPDs Market to be Valued at US$2.64 Billion by 2025

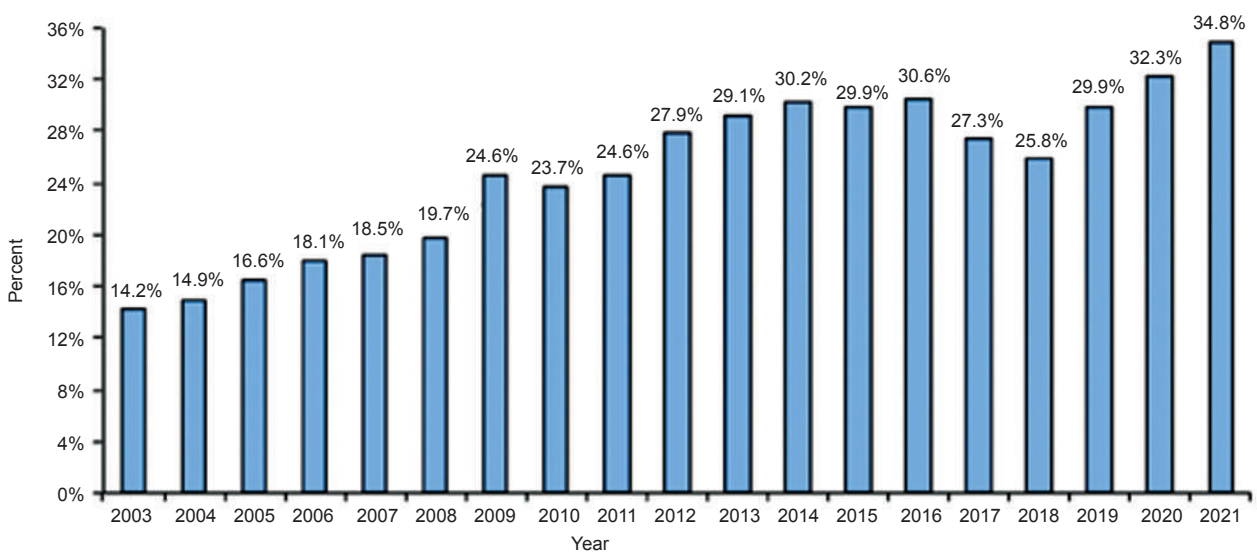
Expected to grow at a compound annual growth rate (CAGR) of 11.7%, till 2025, the integrated passive devices market is valued at US$2.64 billion. LED products have accelerated its usage in various electronic devices. Miniaturisation of such devices is the demand for the IPD market. Previously at US$260.9 million in 2015, the extensive use of products from this market are expected to promote its growth.



(Source: www.grandviewresearch.com)

34.8% Share of Global IC Sales Held by Fabless Suppliers

Back in 2010, IDM IC sales grew 35% while the fabless IC company grew only 29%. However in 2021 sales surged 36% while IDM sales went up by only 21%. Accounting for 14% of the IC market in 2003, the total sales for fabless IC companies went up from US$66.4 billion to US$177.7 billion. The surge has enabled the fabless companies set a new all-time record of having a 34.8% share in the overall IC market.



(Source: www.icinsights.com)

"INQUISITIVENESS TO EXPLORE Makes A Big Difference..."

There are many who aspire to hold prestigious positions at big corporate houses, but very few are willing to work hard enough for it. Such positions can be achieved by only those who love what they do. Dr Aloknath De is one of them. He calls himself a 'missionpreneur.' He refuses to box himself and loves to think out of the box. He does not become comfortable in a setting as he likes to do things outside his comfort zone. He has been Samsung India's first CTO besides many more achievements to his credit. This is Dr Aloknath De's story, as told to EFY's Siddha Dhar

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FNAE, EXECUTIVE CONSULTING DIRECTOR, SAMSUNG


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Born in the spiritual town of Nabadwip Dham in West Bengal, Aloknath had the influence of holy men on him from a very young age. Even though his family migrated to Kolkata soon after he turned a year old, Aloknath credits his birthplace for teaching him the lessons of renunciation, finding fulfillment in life, and cherishing it.

Aloknath's father picked up his LLB degree out of passion while working as a gazetted officer at the Food Corporation of India. Under his tutelage, Aloknath was home-schooled till the age of six. A rigorous man, it was he who built the strong foundation of science and mathematics for Aloknath.

Aloknath recalls, "He was a very disciplined person, and he influenced my love for science. So, taking up science after 10th standard was a very natural choice." Aloknath went to a proper school only when he was in the 2nd standard. While home-schooling provided him with the basic skills, he gained 'interactive intelligence' only after he went to school.

Aloknath says, "I realised that natural intelligence, or the ability to react in a situation, comes only when you interact and talk with more and more people. The more you converse, the more you grow."

Aloknath's mother, a homemaker, has always been soft-natured. She is an epitome of love and affection. This fusion of hard and soft behaviour of parents is what Aloknath tries to maintain in his own life as well, even today. In fact, his leadership mantra is: "Be Hard on Goal, Be Soft on Soul."

Diligent from childhood, it was quite natural for Aloknath to be a topper in his school. But by the time he was in 6th standard, a sense of restlessness loomed over him. "It gave me a feeling of accomplishment in the beginning, but then it made me feel as if I was not being challenged enough." This notion of not ever getting too comfortable in something was a lesson that has driven Aloknath all through his life.

On the lookout for more competition to raise his accomplishment bar, Aloknath decided to appear for a Central government merit scholarship programme, which allowed him to study in a residential school of his choice. And he got admission in Ramakrishna Mission (RKM) Residential School in Purulia—a district 250km away from Kolkata.

Though he had the option to choose a school in Kolkata and stay near his family, Aloknath decided not to base his choice on emotions, and rather grab the opportunity to live and operate independently. The pangs of separation from his parents and siblings struck him in the initial phase. But Aloknath knew that he was accountable for the decision that he had taken and that he had to stick to it—a lesson that he would recall again, years later.

Although his father was a strong influence in his life, it was his monk headmaster at RKM whom Aloknath regards as his role model. "He was a man of such purity. He had mastery over multiple languages. Once I was writing an essay about the river Ganges. I showed him the first draft and he helped me make it better—his knowledge was profound. I would say it was the best piece in Bengali that I have ever written."

It is not surprising that science and math were his favourite subjects. But Aloknath was not excellent in academics alone, he also took active part in school debates, elocutions, recitation competitions, and so on. He even appeared on numerous TV debate shows broadcast by Doordarshan.

A rational thinker since childhood, Aloknath quickly figured out that his heart lay in engineering. When he was in the 11th standard, he decided to share this with his father, who was then disappointed with his decision. "My father wanted to be a doctor, but it was not possible due to financial constraints. He was hoping that I would become a physician, but I chose engineering. I remember it was a long-drawn evening discussion with my father and uncle. They tried very hard to change my mind."

Aloknath did not budge from his goal and readied himself to prepare for the next chapter in his life.

IIT and finding his calling

A large chunk of Aloknath's future plans began taking shape in his undergraduate years that he spent at IIT Kharagpur. While studying Electronics and Communication Engineering (ECE), he remained a high-achiever here too. Having done his secondary education in a Bengali-medium school, the fluency with which some students at IIT spoke English alarmed him. But he did not let it intimidate him. He

A Few Lessons from Dr Aloknath De's Story

- ABC of Achievement—Align (your thoughts), Beam (your energy), Collaborate (your ecosystem)
- Infuse lateral thinking, when needed, before making decisions rationally
- Keep your mind open to learning new things; continuous learning is of essence
- Get out of your comfort zone; perturb a bit when too comfortable. Bring stability from comfort zone and growth from outside the comfort zone
- Building zero-to-one has different challenge than scaling one-to-infinity
- What is interesting about life is that sometimes taking an apparent step back can help you leap forward by ten steps
- Your unique way of doing and supporting will always be valued by the community

Thought Leadership presentation by Dr Aloknath De

remained headstrong and mastered the language pretty soon.

At an institute of IIT's stature—where the brightest minds of the country came to make their dreams come true—Aloknath found there were many who were just as meritorious as him. But he took it as a blessing in disguise, as he was always looking for a more competitive space where his limits could be tested, and his mind could expand.

Aloknath says, "It's important to accept that some people are better than you at something and it's absolutely okay to be not as good as them. But what is important is to bring yourself to a minimum threshold level on attributes that matter in life and excel in a few dimensions."

As his world-view expanded and he met more people, Aloknath found his calling—telecommunications—at IIT Kharagpur a fascinating field indeed! "I saw the power of communications and how it helped people stay connected remotely. I saw how it could compete with transportation and thought it was revolutionary."

The realisation didn't occur overnight, though. He spent months and months reading books and magazines, listening to radio, and talking to people to soak in as much information as possible and then come to this conclusion. "Inquisitiveness to explore makes a big difference. When you keep your queries alive, one fine morning you'll come across some information that makes you pause. And you take a moment to think about it and ask further questions. It is in this process of asking and answering these questions that you realise what you are drawn to."

A three-step process Aloknath likes to follow for his goal is ABC of Achievement: Align (your thoughts), Beam (your energy), and Collaborate (your ecosystem). As he began the seeding for his future roles, he realised how telecommunication systems could be built with hardware and then-new software elements. He also started appreciating how engineering deployment could complement technological innovations.

Dream job and memories at IISc

The unpredictability of life is enthralling. It makes you do things you never intended to, and gives you results you never expected. Although Aloknath had planned to pursue his master's degree after IIT and even got admission to a US university, a financial crisis forced him to start working right after his graduation in 1985. Yet, he did not let this setback derail him from his plans.

Thankfully for Aloknath, he found his way to Bharat Electronics Ltd (BEL). In an era when MNCs did not rule the subcontinent, PSUs were the dream job of many, and Aloknath was no different.

But, while joining BEL, he knew what his ultimate goal was—to learn telecommunication systems as much as he could.

At BEL, he was part of a team that built a low-flying target detection radar, which was the first indigenously built radar system: INDRA 1. Till date, INDRA series of radars are deployed on the borders of India.

His role in BEL, Sahibabad needed him to travel a lot to the headquarters in Bangalore (now Bengaluru). He made it a rule to take a different route during each of his trips. This was his way of having fun and exploring the country while working. As he travelled the length and breadth of India, Aloknath's mantra to always go out of his comfort zone found more strength. "Even today, whenever I see that I'm getting too comfortable, I try to find new things to do that make me uncomfortable for a while."

But going out of your comfort zone can be scary besides being uncomfortable. How did he tackle that? He says, "The trick is to keep yourself anchored 50% in comfort and unsettle the rest. Going completely out of your comfort zone makes it probably very risky. Bring stability from the comfort zone, and growth from outside the comfort zone."

After a two-year stint at BEL, Aloknath went on to pursue his master's degree from another premier institute of India—IISc Bangalore. A fond memory of IISc that he holds close to his heart, beyond studies, is how he would save some money from his scholarship grant to buy cassettes of classical music. An avid lover of classical music since a young age, Aloknath had even tried learning the stringed musical instrument sitar. Although he could not sing well, his affinity for classical music drove him

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to find solace in it, irrespective of his prevailing mood.

At IISc, Aloknath further broadened his knowledge about telecommunications and realised how every aspect uniquely complemented each other. It was this fascination that took him from India to Canada, where he pursued his PhD and also started another phase of his life.

Flight to Canada and international exposure

Like many middle-class Indians at that time, Aloknath's flight to Canada was the first one he had ever taken in his life. While he was working hard to revolutionise telecommunications, calling from a foreign country was a luxury that he could not afford then. And that would also make his parents anxious at times.

"When I first landed there, I sent them a telegram but it took ten days to reach. In the meantime, my father would go to the Air India office every now and then to enquire if my flight had landed. The people there assured him that many flights had gone and come back since my flight, so I was probably already well-settled in Canada," he laughs.

Aloknath did his PhD in 'communication with signal processing' from McGill University on a full scholarship. After 'communication with control' in IIT and 'communication with computing' in IISc, he wanted to fathom this combination as well. Aloknath knew that it would eventually bring him to a more holistic view of telecommunications.

Surviving in Canada was no easy feat. Aloknath had to adjust to the limited food choices and the cold climate. However, he liked the cosmopolitan culture of Montreal and saw himself living there for a long time, and hence took up learning French language.

Aloknath's PhD thesis was supported by Canadian Institute for Telecommunication Research; he also bagged the Alexander Graham Bell prize in Canada for his doctoral research. His PhD mentor was a wonderful man who made the whole learning process at McGill very enjoyable for Aloknath. "He was an immigrant himself; so he knew what challenges I was facing and he helped me navigate through them."

Dr Aloknath De with former IT Minister of Karnataka at Innovate Karnataka Launch

It was through this mentor that Aloknath got his first break in Canada. He bagged an opportunity to work in Nortel Networks, which was then called Bell Northern Research. His first assignment had ample scope for innovation. He just needed to find the meaningful business gap. This, he credits to being curious and looking for means to go above and beyond to find a pain point he ought to fix.

But as he kept getting better at making these discoveries, he missed the excitement of implementing them and seeing them in their realised form. He knew it was time to get out of his comfort zone and soak deeply into practical implementations and field issues to grow in industry. "I told my manager that I wanted to do the dirtiest work. The most mundane things that nobody wanted to do."

In the summer of 1999, Aloknath made a decision that would change the trajectory of his life—leaving Canada after a decade and coming back to India. "It was one of the toughest decisions I had to make in my life," Aloknath remarks. He was eligible for a Canadian PR. His son was three years old and had access to better education there; and he himself had a thriving career.

In his true spirit to think through and make a call, Aloknath mulled over the situation for an entire year. He thought rationally yet infused elements of lateral thinking before taking decision. After all, he couldn't look back and regret his decision. "I decided to come back to India. Although it seems unbelievable now, I did envision something along the lines of how India would look like in 2020, and wanted to see if I could be part of that vision coming true."

His reasoning to come back was based on two things. First, he had built a broad international perspective that expanded his mind and made him understand what makes a country developed. Second, he understood deeply what was needed to be a subject matter expert on communication with controls, computing, and signal processing elements, and build global innovative products.

He recalls, "With all that knowledge in my bag, I felt complete and thought it was the right time to come back. Many around me felt that I was taking a step backwards. But what is interesting about life is that sometimes taking an apparent step back can help you leap forward by ten steps."

Return to India and re-building from zero

Back in India, Aloknath had uprooted his life in Canada by taking the risk of applying to only two companies. Fortunately, he received offers

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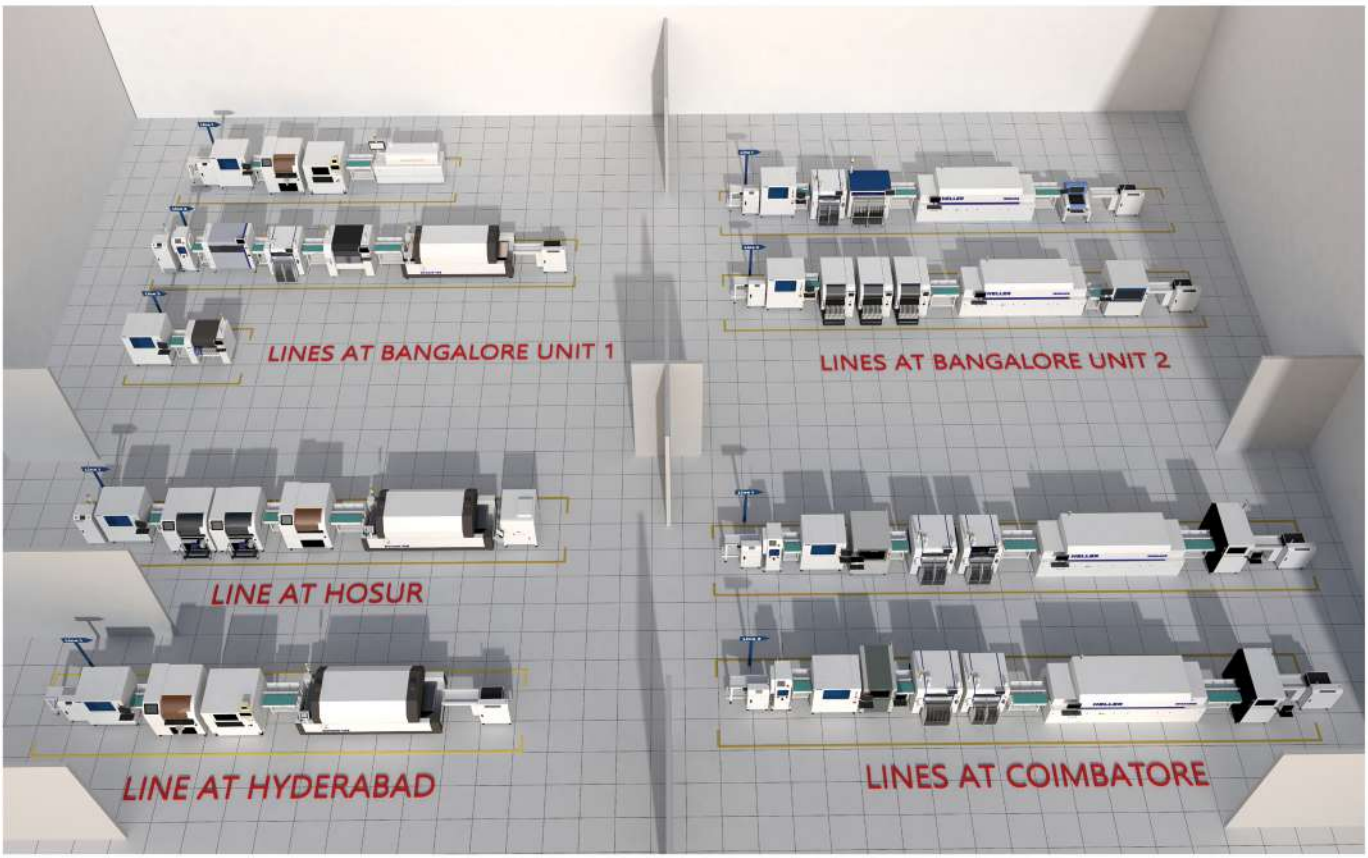

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Dr Aloknath De practising for fitness

from both the companies. "The same postman brought the two offer letters on the same day. I found the phrase so true: God helps those who help themselves. The power of hope and ambition beats everything," he remembers.

He went with one of these companies—Hughes Software Systems in Gurgaon. His interview with the Director of Hughes India had happened while he was still in Canada. Incidentally, the Director had made it a point to highlight how different his life would be once Aloknath was back in India.

In such a case, one might take a moment to reconsider the decision. But Aloknath knew exactly what he wanted. "I told the executive that I am cognizant of all of that, and I was making the decision while being fully aware. I am ready to face challenges as they come."

This director who also became his manager and is now a good friend, was a source of inspiration for Aloknath as he made his switch so seamless; he never felt like he had left home. At Hughes too, Aloknath's vision for joining a company did not alter—he wanted to do something that nobody else was doing or was willing to do.

He recalls, "During that time, digital signal processing in the base layer was effectively not there in Hughes communication stack. Many prospective clients said that they could have a service agreement with Hughes if that solution could be included in service delivery. That was truly a defining statement for me."

He was entrusted with building a team for the same. Here came a moment to take something from zero to one, an opportunity of intrapreneurship. "Taking something from level one and scaling it to infinity is relatively easy because you have done it once. Building something from zero to one is the real challenge."

Aloknath had to build a team of twenty people with strong DSP expertise and also start securing the DSP business beyond Hughes. It gave him joy that, due to this twenty-member team, Hughes could garner indirectly about eighty other people in higher-level stack areas. And this continued scaling up.

After a four-year stint at Hughes, he had a new itch. Even though the chip was never his core, he realised that semiconductors and VLSI design were a part of telecommunications and had a tremendous potential. So, he decided to join ST-Microelectronics, which was looking to start telecom business *ab initio* in 2003. He joined them as the head of this division.

In 2008, when a joint venture between STMicroelectronics and Ericsson was signed, Aloknath was appointed as the MD of the group in India. He was handling the teams of both Noida and Bengaluru. He built an enviable team by internal transfer, external hiring as well as company acquisitions. By the time he left, he had 1000 team members.

To understand the full stack better, he became a 'student' of chip design. Even though he was the MD, he would often join the freshers during their training sessions to learn more about frontend and backend chip design, the processes and nuances. "In order to make decisions as an MD and interact as a global leader, I needed to know the subject to a great extent. I thought it was an integral part of decision making and I had to learn it to do my job well."

After eight good years at ST-Ericsson, a world giant was waiting for Aloknath to knock on their door.

Samsung and a missed opportunity

Aloknath had the good taste of administrative life for a long time at ST-Ericsson where he was also a Board Director of the company, and he now craved for a more technical role. He wanted to lead with technology. But before that, he wanted to pause and take time to contemplate—much like he used to do in his childhood days.

He took a sabbatical of about six months and decided to experiment with a few things during the period. He taught at IIT Delhi as an Adjunct Professor, served as a consultant to Accenture, and mentored a location-technology based startup during this phase. While mentoring the startup, he got down to interacting with the ground-level customers to understand things from their perspective. "If you can take a month or even a few days to interact with the people on the ground, there is no better learning than this. I would not trade this for anything else."

But as they say, you cannot hide exceptional talent anywhere. This time, Aloknath's talent was found by South Korean electronics giant Sam-

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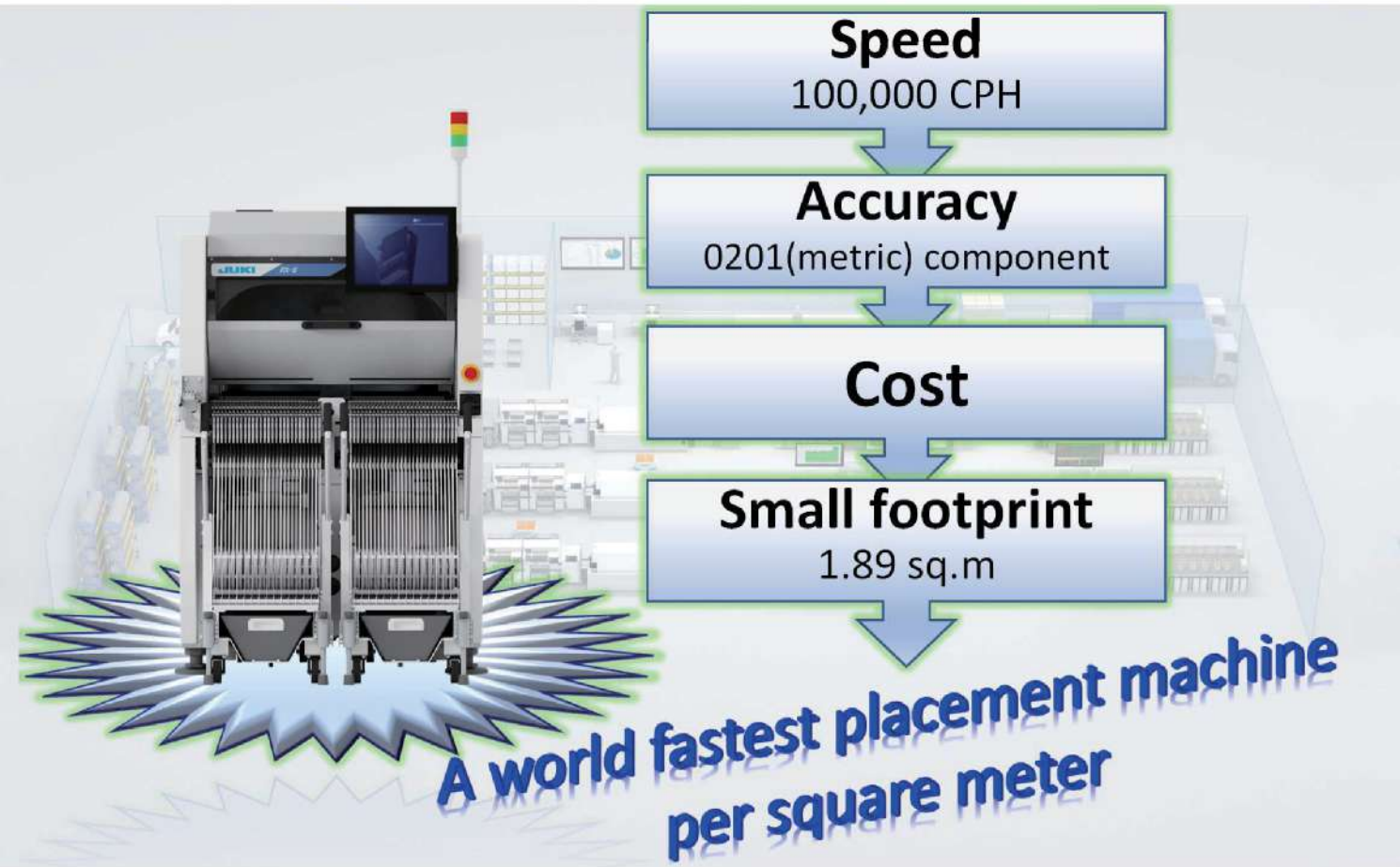

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Some Unknown Facts about Dr Aloknath De

- **Favourite cuisine** : Hyderabadi Biryani
- **Favourite book(s)** : Isaac Asimov (Robot Dreams, Fantastic Voyage)
- **Favourite leader** : Swami Vivekananda
- **Favourite film** : Three Idiots
- **Favourite actor** : Nasiruddin Shah
- **Favourite actress** : Smita Patil
- **Favourite sports** : Volleyball
- **Favourite music genre** : Classical
- **Car and bike** : Black Car

sung. Although the folks at Samsung wanted Aloknath to come over to Korea and work with them from their headquarters, Aloknath's priority was now sorted out; he could not leave his family in India and the family was not in a position to relocate at that juncture.

So, Aloknath was almost ready to decline the offer but his destiny, however, had other plans. The very next day after this interview, he received a call from Samsung HQ. "They were willing to interview me again to create a position especially for me if I only wanted to work in India."

This is how Aloknath became the first CTO of the Indian unit of the conglomerate with his base in Bangalore. His mantra, again, was simple—he didn't want to work on something that was going well. He wanted something that was aspirational, but they couldn't seem to make it work.

At Samsung, he had to create an innovation layer onto the flagship products by building new intellectual properties (IPs) without jeopardising base engineering deliveries. In the first fifteen years of Samsung's journey in India, it had about 2000 patents, which increased to 7500+ patents under his leadership by their silver jubilee celebrations time.

He became the Corporate VP for Samsung Electronics, Korea and contributed to the internet of things (IoT) on SmartThings platform. Despite these accomplishments, he felt like something was missing. The earlier-missed opportunity to join the team in Korea kept gnawing at him. He asked them if he could join them in HQ and the team in Korea happily agreed. He got an IoT lab to work in Korea where he spent 7-8 days every month for thirty months or so. This made him a very effective global leader.

The data platform that Aloknath built in Korea is now connecting 200 million home appliances and mobility devices globally. With his global role and expertise in AI and Blockchain, he has built an impactful AIoT Centre-of-Excellence in India. Now, with this background and experience behind him, he has set a personal mission of researching and nurturing activities around Cyber-Physical Systems.

Finding love, fitness goals, and his mission

While the accomplishments of Aloknath are innumerable, his story of finding his love is like a romantic film. Aloknath and his wife knew each other since long, but never knew that they would be cojoined by destiny in an everlasting bond.

They got married towards the end of Aloknath's PhD, that is, six months before he would graduate. His wife had to stay back in Kolkata for some time. "She had to go to a neighbour's place to call me and had to request them to go out," he laughs. She soon joined him in Canada, where she also pursued a postgraduate degree at Concordia University.

Upon returning to India, she has been working as a Math teacher. She is a big fitness junkie.

"She is also my personal trainer. I was never into fitness that much, but since the pandemic, I started taking care of my physique. And would it not be a waste if I didn't utilise my opportunity despite having a trainer at home!" he says with a smile.

The couple has a son who was born in Canada, studied in India, and went on to pursue Economics and Physics at the University of Chicago. After his stint at an investment bank, he currently works with a global new-gen ride-sharing company.

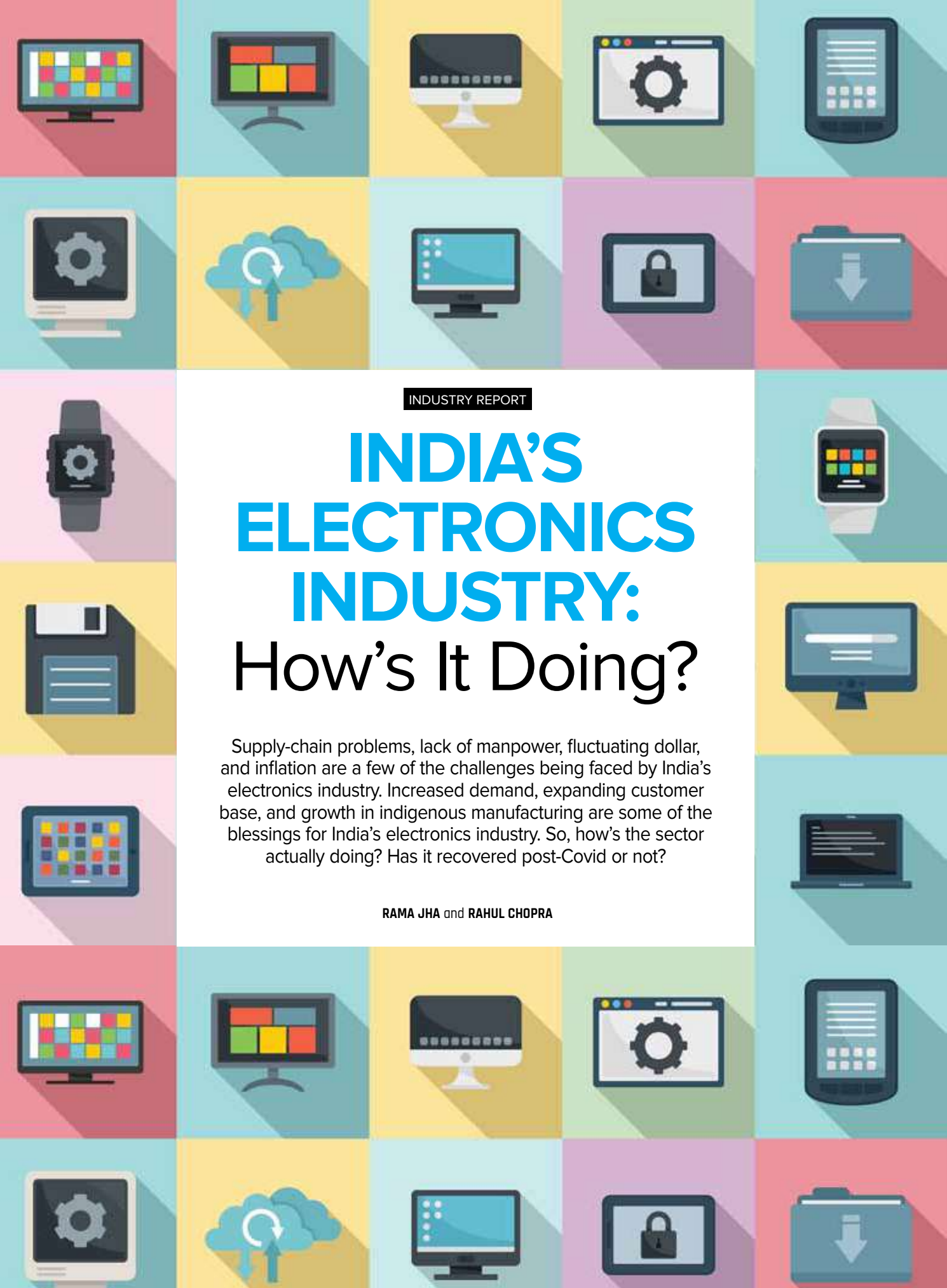
Aloknath's love for music is still intact, thanks to his mother who continues to practice music till date. She is the inspiration behind his love for classical music.

In December 2021, Aloknath took superannuation from Samsung formally. However, he is still associated with them as an Executive Consulting Director and wishes to continue as long as it makes sense for both. He calls it his Corporate Home.

Aloknath has increased his efforts to mentor deep-tech startups and has also become an angel investor. He is now an Adjunct Professor with IISc (ECE) and IIT Jodhpur (CS). Aloknath also has a venture of his own in the works.

Talking of his future plans, Aloknath says, "During India's 75th Independence Day celebration, it is solemn for me to rededicate to the service of the nation. R&D serves as an impetus for business growth. If we can hone India's talent for R&D and can excite business to spend greater on R&D and innovation, we can do wonders as a country."

In fact, he revealed that the unveiling of his singular mission could happen soon; but he is in no hurry. Because if there's anything he has learnt, it is to make 'the rest of his life, the best of his life!' EFY



INDUSTRY REPORT

INDIA'S ELECTRONICS INDUSTRY: How's It Doing?

Supply-chain problems, lack of manpower, fluctuating dollar, and inflation are a few of the challenges being faced by India's electronics industry. Increased demand, expanding customer base, and growth in indigenous manufacturing are some of the blessings for India's electronics industry. So, how's the sector actually doing? Has it recovered post-Covid or not?

RAMA JHA and **RAHUL CHOPRA**

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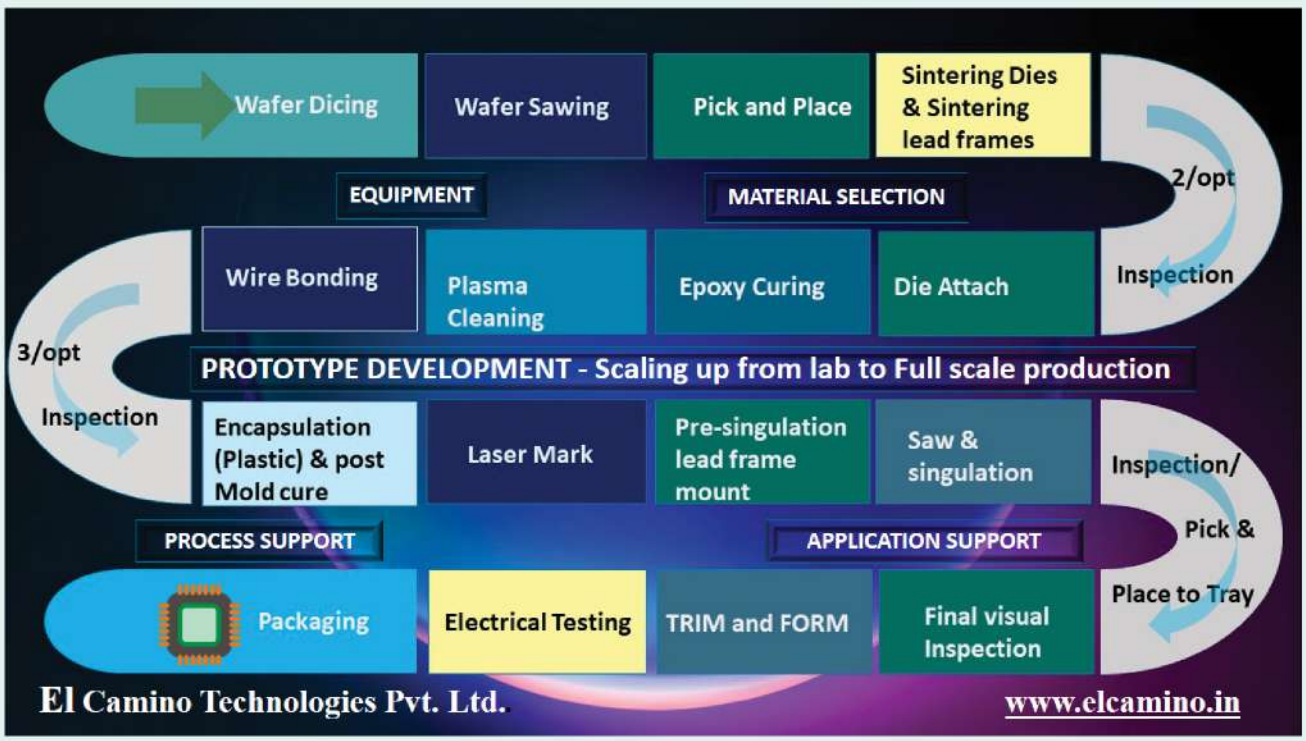

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"How was the last financial year for India's Electronics Industry?"

That's the question our team attempted to find an answer to by speaking to 350-plus top-shots and business executives spread across different segments of the industry, and geographies. What we uncovered is pretty exciting.

BUSINESS TRENDS

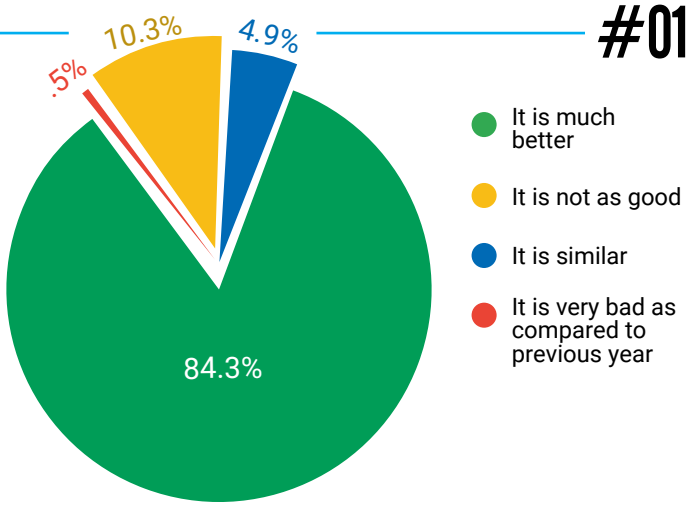
Since we got an opportunity to speak to key executives, we not only asked about business trends but some other related issues too. But, first let's look at the key business trends uncovered...

#01

Was FY 21-22 a growth FY?

Have the businesses grown in the latest financial year (Apr 21-Mar 22) over the previous year (Apr 20-Mar 21)? That's the first question we posed. And, we have good news to share...

A whopping 84.3% reported that it's much better than the previous FY. And, only 10.3% reported that it's not as good, with 4.9% reporting it as "similar to the previous FY." For very few it was very bad.



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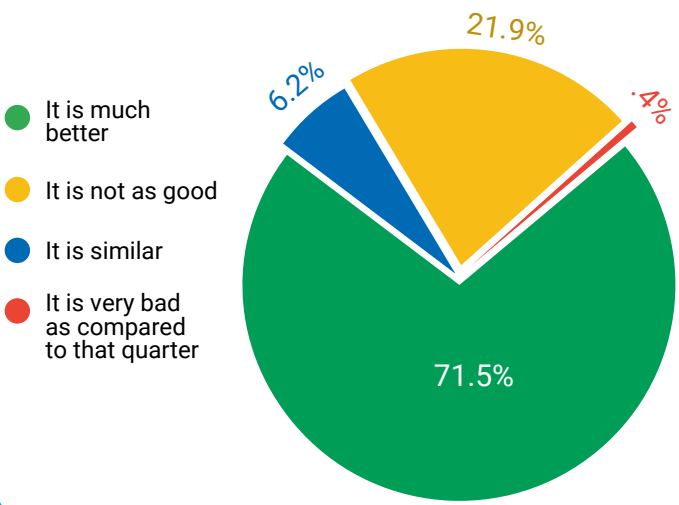


How was FY 21-22 as compared to the pre-Covid FY?

In other words, have you grown over the FY which had little impact of Covid? That's what we posed next.

We were surprised by the findings here. For a very large majority (71.5%) the previous FY was even better than FY 19-20. That means India's electronics industry has recovered from the ills of Covid, and is striding towards a fast growth.

Result. 71.5%: It's much better | 21.9%: It is not good | 6.2%: It is similar| Rest: It is very bad (0.4%)

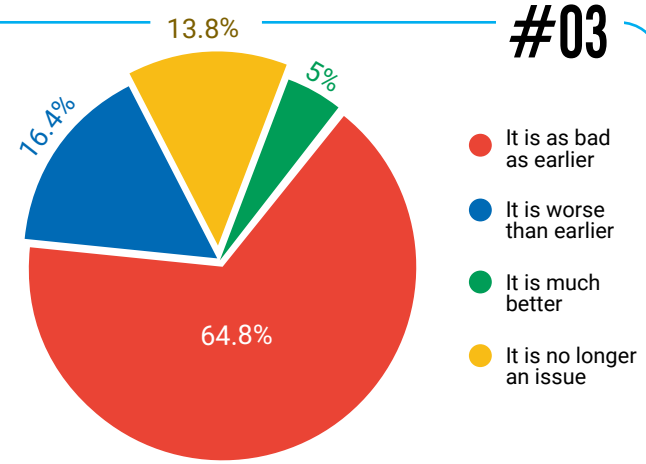
#03

How's the supply-chain crisis?

You cannot produce a meaningful survey on the electronics industry without exploring this pressing issue—the severe supply-chain crisis that's affecting production all across the globe, including India.

Given the positive results shared earlier, we felt that the supply-chain crisis would have reduced. But, we were wrong! A majority (64.8%) stated that it's as bad as earlier. Additionally, 16.4% stated that it's gotten worse.

Result. 64.8%: It is bad as earlier | 16.4%: It's worse than earlier | 13.8%: It is no longer an issue | Rest: It is much better (??%)



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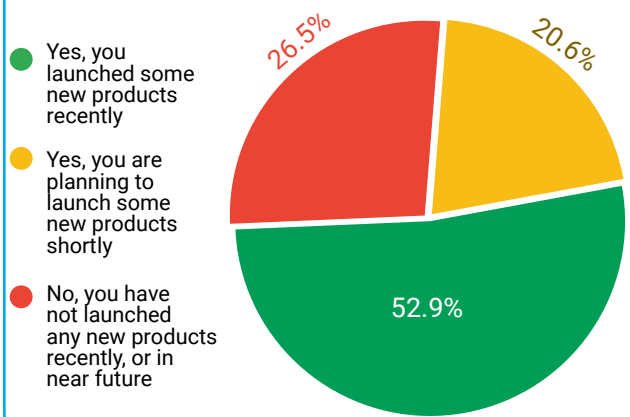


Launching new products?

This question was focused on the OEMs. Given the unique combination of challenges and opportunities, were they launching new products? Had they launched any product recently or were planning to launch one soon?

It was encouraging to see that 52% of them have launched new products recently. And, an additional 20% are planning to launch one shortly.

In other words, there's clear evidence of investment in their businesses, and hence setting the stage for long-term growth.

Result. 52.9%: Have launched new products recently | 20.6%: Planning to launch new products shortly | 26.5%: Not launched and have no plan to launch in near future

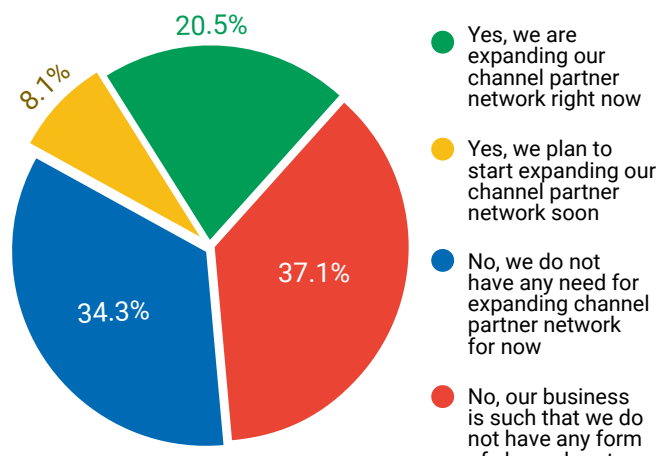
#05

Expanding channel partner network?

Typically, when a market is expanding, the need for partnerships increases—especially between OEMs and their channel partners or system integrators.

37% turned out to be businesses that don't need channel partners. Barring them, the majority polled (34%) seem to be happy with their existing channel partners and hence were not keen on expanding or inviting new partners. About 20% are actively seeking new partners—and could be an opportunity for like minded firms to partner,

Result. 37.1%: Our business does not require channel partners | 34.3%: No need for expanding channel partner network for now | 20.5%: Yes, we are expanding our channel partner network | 8.1%: Yes, we plan to start expanding our channel partner network.



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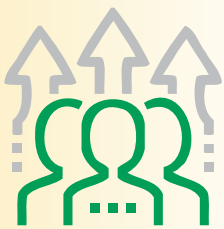
HR TRENDS

Besides the business trends, our survey managed to capture some valuable insights with respect to hiring trends of the industry. However, since we were speaking to business decision makers and influencers, some were not sure about their hiring practices and hence could not answer these questions.



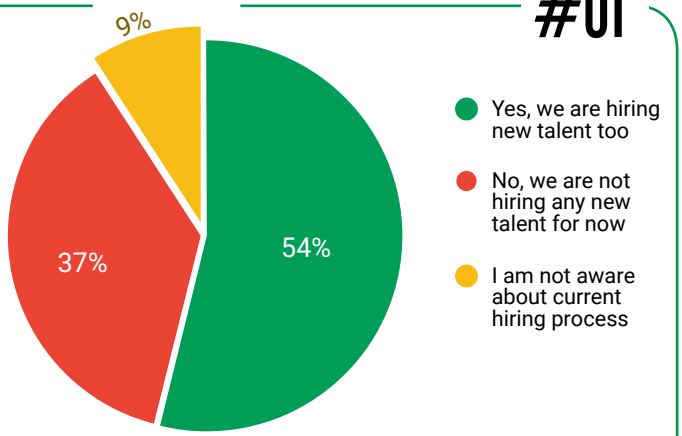
#01

Are you hiring now?

One of the first casualties of Covid was job cuts. Is that dark period over? Has hiring started? That's what we sought to find out.

Happy to report that there's good news here too: a large majority (54%) confirmed that they are actively hiring!

Result. 54.1%: Hiring new talent | 37.0%: No, we are not hiring | 9%: Not aware about current hiring needs.



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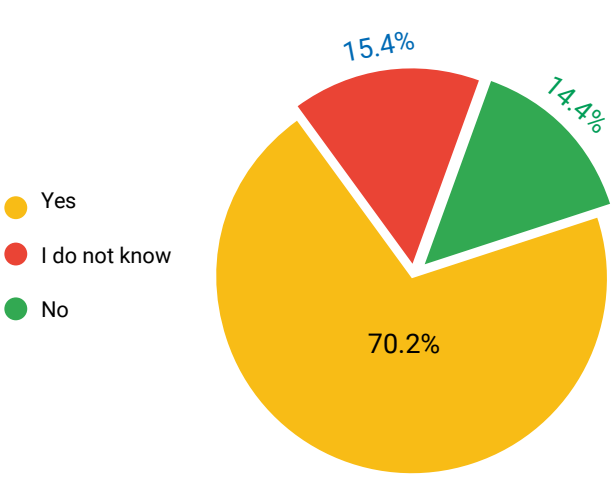

Is hiring tech talent a challenge?

Post-Covid, there's been a lot of talk around 'mass resignation,' especially in the tech sector. Some firms have seen their attrition touch 30% on a quarterly basis! Since tech talent forms the core of the electronics industry, it was important to understand if hiring tech talent was posing a challenge to Indian businesses.

As expected, the majority of the respondents (70%) shared that they were facing challenges in hiring tech talent. Seems like it's the best time for talented techies right now.

Result. 70.2%: Yes, hiring good people with technical background is a challenge | 14.4%: No, we do not find technical hiring a challenge | 15.4%: Not in a position to comment.

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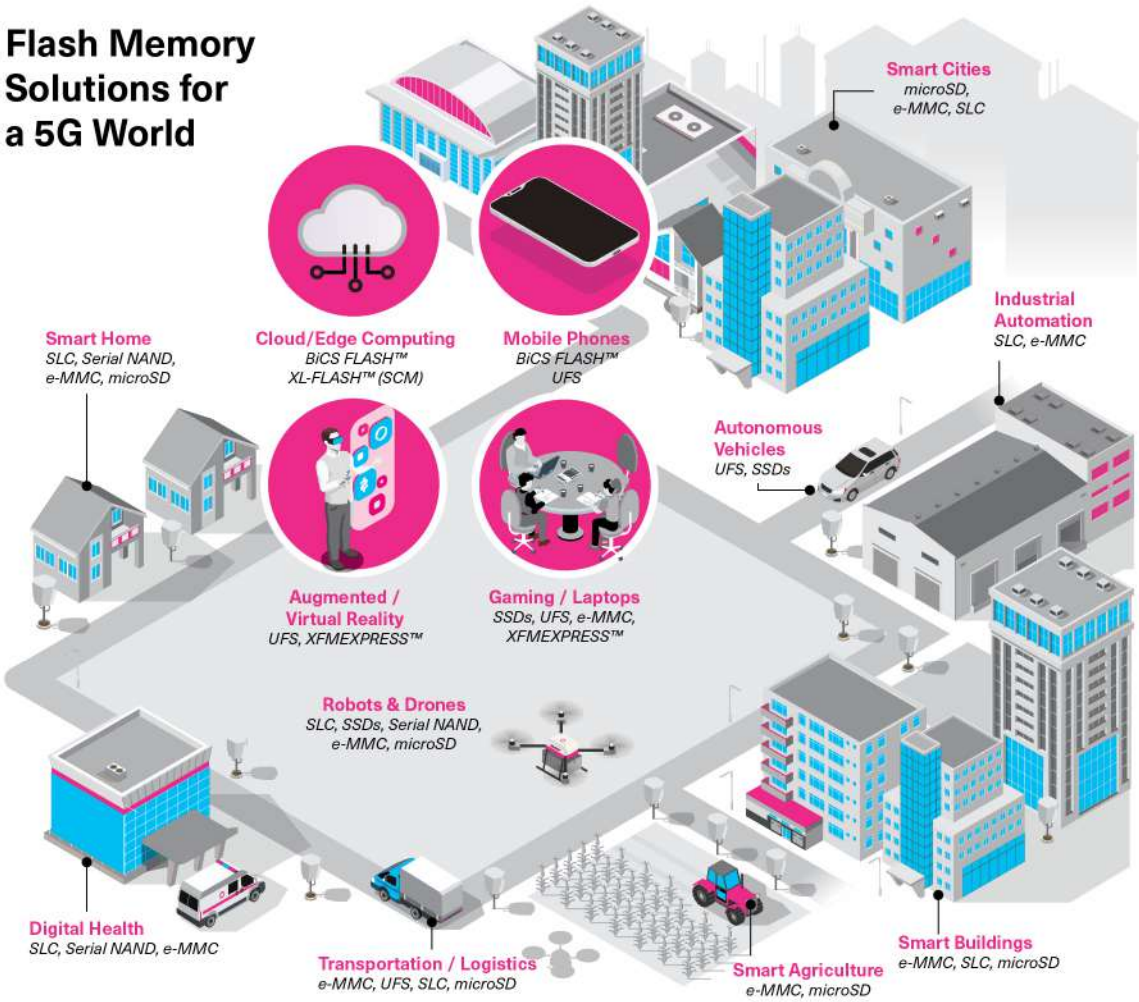

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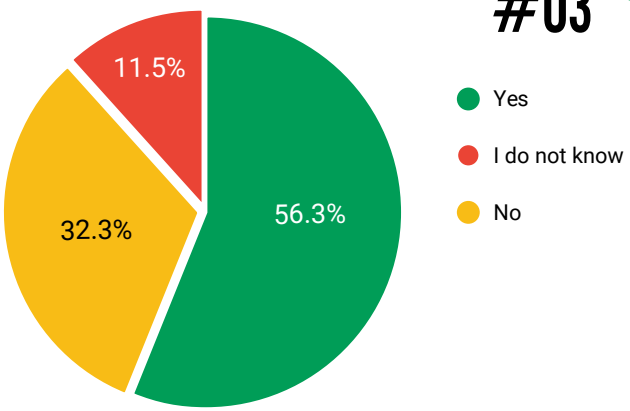
#03

Are the jobs visible on websites like LinkedIn or Naukri.com?

With so many firms hiring, where can the tech talent go to know about the opportunities available? Is it job websites like Naukri.com or LinkedIn? 56% promote their job openings on job-related websites. The others seem to be depending on traditional methods like references, agencies, etc.

Result. 56.3%: We use portals like Naukri.com & Linkedin for hiring | 32.3%: No, we don't | 11.5%: Not in a position to comment.



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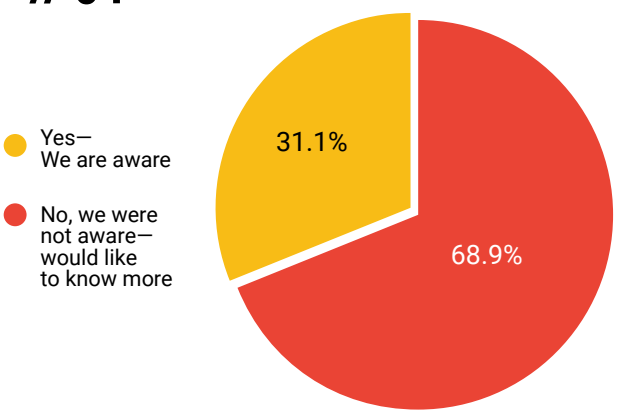

Can you list electronics jobs for free on ElectronicsForU.com?

That's a question we asked in the end to understand if the industry was aware about the platform we had developed for them to engage and attract the right talent. Unfortunately, a majority (68.9%) was unaware of it. Clearly, our marketing team will have to do a better job for promoting this platform.

Result. 68.9%: We were not aware | 31.1%: Yes, we are aware.

This report has been designed and prepared by EFY's Rama Jha and Rahul Chopra.

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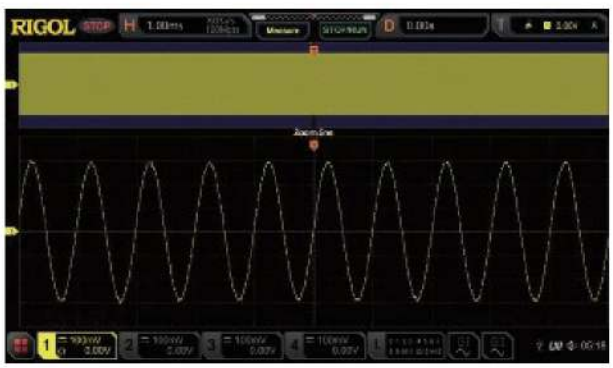

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How We Can INNOVATE BETTER

Real innovation is becoming scarce day by day. It is being replaced by fund-raising celebrations. There is no dearth of problems or issues to be tackled; instead, most of them spend a large portion of funds on rebranding, marketing, and serving unsustainable claims

ANAND TAMBOLI
is a serial entrepreneur, speaker, award-winning author, and an emerging-technology thought leader

One of the perennial questions I have been asking every startup I consulted in the past ten years is, "What is new in this product or business model?" But most of them—rather all of them—usually come up with one standard answer, which is, "It works in Silicon Valley."

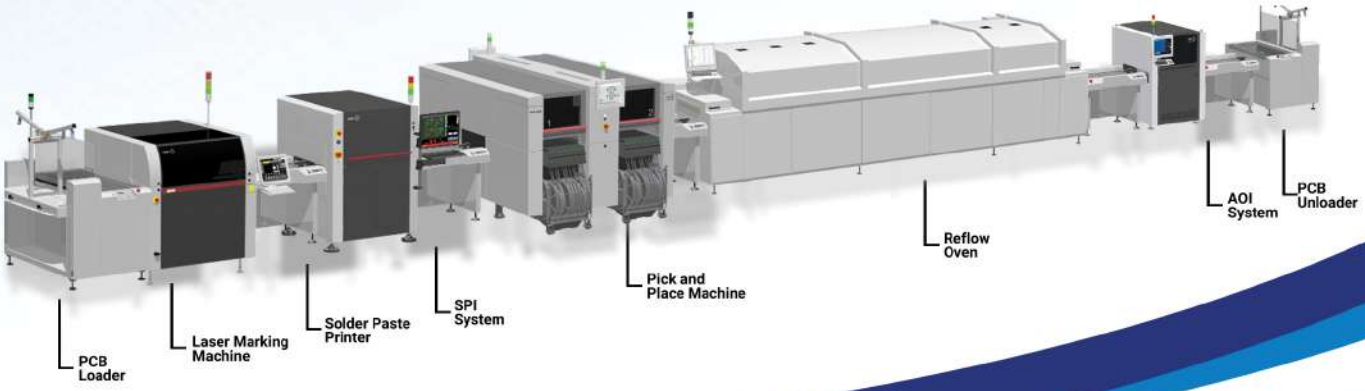
And that is one of the biggest issues in our innovation and entrepreneurship system. It suffers because it relies too much on Western business models and ideologies. But while it relies on those models and ideologies, it lacks the thought process, infrastructure, and, most importantly, the spirit in which everything is done.

So, what is the real problem here? Why can't we think independently and innovate better? I can think of at least three key issues. The good news is that if we can identify those issues, we can also fix them.

Issue # 1: The definition of innovation

The word disruption has been widely used and abused in the context of innova-

END TO END SOLUTIONS FOR ELECTRONICS MANUFACTURING



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tion. But why do we have to be disruptive when being constructive is better? The definition of innovation can sometimes be rather too broad. However, if you were to look at it from the customers' perspective, innovation is something that improves their condition.

Innovation is something that improves the human condition.

This means thousands of innovations that micro, small, and medium companies deploy regularly are equally valid and sometimes more important.

Issue # 2: The practicality of the innovation

Our innovative thinking has taken a serious hit with the educational system geared toward creating workers and followers. However, it doesn't stop there. So many startups I interact with do not show a good understanding of customer problems and intent. This shows up in the solutions they create. It results in a solution-heavy approach rather than a problem-centric approach.

Innovation is not about finding solutions. It is about finding problems that need to be solved and then solving them.

> FOR A STARTUP, PROFIT SHOULD BE MORE GLAMOROUS THAN THE (DEBT) FUNDS THEY RAISE.

We forget that innovation is not about finding solutions. It is about finding problems that need to be solved and then solving them. Most founders are good at building solutions but, unfortunately, they do not know how to identify the real problems. So, most founders follow Western ideas and make local versions of them. The result? Impractical innovations that fail to deliver at the local level.

Issue # 3: Debt focused thinking

This is perhaps the biggest reason why innovation takes a backseat. Nowadays, raising money, that is, taking debt, has become more glamorous than gaining customers and increasing revenue and profits. We somehow have managed to ignore fully-working solid business fundamentals, such as, equity is costly, the customer is like a God, and profit or cashflows are the bloodlines.

Most entrepreneurs you would see are doing exactly the opposite. They sell out equity to raise an enormous amount of unwanted money. They ignore customers' intent and real problems. And, unfortunately, give priority to burning (the raised) money in completely unnecessary or avoidable activities.

Result? Real innovation is becoming scarce day by day. It is being replaced by fund-raising celebrations. There is no dearth of problems or issues to be tackled; instead, most of them spend a large portion of funds on rebranding, marketing, and serving unsustainable claims.

In my view and experience, profit should be more glamorous for any startup than the (debt) funds they raise. We need to stop accepting and spending good money on bad activities. Instead, we must start questioning such business models. Then only we can see better innovations coming up.

The point is

I completely understand that many would like to see this article as a rant. But if we really believe and want to shine in the world as a better economy today, we must change our outlook. Instead of showcasing ourselves as the largest market (of consumers), we need to highlight ourselves as the origin of high-quality innovations.

The three issues I mentioned are easier to fix than you might think. Of course, some will take longer than usual. But none of them is impossible. And this is what we should start doing today to make it happen:

> DIRECTION OF INNOVATION IS DRIVEN BY HOW ECOSYSTEM RESPONDS TO IT.

1. Remember that innovation is not always about bigger things. Small yet important things matter. They matter to the end-users and customers. This is why we must start celebrating and highlighting them. This, in turn, will encourage other entrepreneurs to follow this path.

2. Focusing on customer problems and intent must be touted as the key to better innovation. Entrepreneurs must avoid copying business models and products from other markets—not from the IP point of view, which is still a big issue, but from a relevancy point of view, which is more important. Again, we need to celebrate appropriate behaviour and stop condoning inappropriate one.

3. Borrowing more money is not a badge of honour. Generating revenue, profits, and more customers are. Deep down, we know it. Now we need to make it known to the ecosystem.

A lot of times, the direction in which innovation goes in any ecosystem is driven by how that ecosystem responds to it in the first place. So, as an ecosystem, we must understand better innovation. And beyond that, we have to encourage it more and more. EFY

ams OSRAM is transferring its automotive expertise in forward lighting, rear lighting and projection to offer best-in-class products for the 2-wheeler (2W) market.

ams OSRAM is committed to driving high-value applications and innovation in the transportation sector, including motorbikes, E-bikes, E-scooters, and micro E-scooters. We are expanding our capabilities to offer best-in-class products that address the opportunities and needs of the 2-wheeler (2W) market. With our extensive experience in the automotive industry – notably in forward lighting, rear lighting, projection, logo projection – we are well equipped to take our 2W business to the next level and make a decisive step in the transportation sector.

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The Gigamesh 5G Edge is the next version of the Gigamesh Pathway. It will not only scale the markets that it addresses, but also its capacity per link

Astrome is a deep-tech startup from Bengaluru that uses its proprietary technology to accelerate the construction of 5G and rural telecommunication infrastructure. Founded by Dr Prasad Bhat and Dr Neha Satak in 2015, Astrome aims to help India and the world connect better. Apart from Bengaluru, the company has a presence in the USA as well.

During this pandemic, the world realised that connectivity is nothing less than a necessity—not just in cities but also in rural areas and in the defense sector. "If you look at the telecom infrastructure around you, there is great infrastructure whenever you have fibre. But when you move away from fibre, the kind of connectivity you get is not really adequate," says Dr Satak. "This problem is only going to intensify when you deploy 5G."

The Market Verticals of Astrome

- Defense Communication
- Rural Broadband
- 4G/5G Telecom Networks
- Enterprise and Private Networks

More about Gigamesh

Scalability in terms of range. It can work in urban areas where you need a shorter range and a higher capacity, and also in rural areas where you need a very large range of more than 10km.

Scalability in terms of capacity. It can deliver from 1Gbps to 100Gbps speeds in the future versions.

Completely software-driven. Since the system is controlled and managed through software, it reduces the overall cost.

The only solution is to have wireless equipment that can give gigabit speeds or higher, but at a good price point. To accomplish all of that, we have to develop really cool, cost-effective wireless technologies that can be deployed fast. These technologies need to complement fibre optics for us to get connected better and faster.

To solve these problems, Astrome has developed Gigamesh. This product has won several awards, one of them being "The most promising connectivity solution" from the International Telecommunication Union. It is a patented technology that happens to be the world's first multi-beam E-band radio. This means that it works at very high frequencies. It can do the job of multiple fibre strands to connect one tower, which is connected with fibre to multiple towers that are not connected with fibre.

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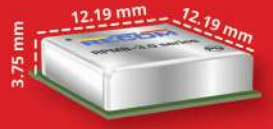
Wide operating temp: -40°C up to +140°C

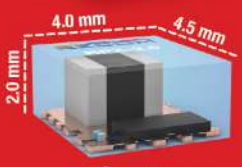
RPM, RPMB, RPMH, RBB Series

- DC Vin 4-65V ➔ DC Vout 5V (1-9V adj.), 12V (9-24V adj.) @ 0.5A -6A
- Power Density as high as 1324W/in³
- No external component needed, buck / buck & boost



RPX & RPY Series:

- DC Vin 3.8-36V ➔ DC Vout 0.8-34.8V (adj.) @ 1A - 4A
- Q series certified with:
  - AEC-Q100 Grade 1, in wettable flank package



RPL Series:

- DC Vin 4-18V ➔ DC Vout 0.8-5.2V (adj.) @ 3A

RxxCT(E) & RxxC05TE Series:

- 0.5W & 1W regulated Output
- Selectable or adj. Vout: 3.3V, 5V
- UL/IEC/EN62368-1, IEC/EN60601-1 with 2MOPP (RxxCT)
- Reinfoced isolation up to 5kVAC / 1 min.

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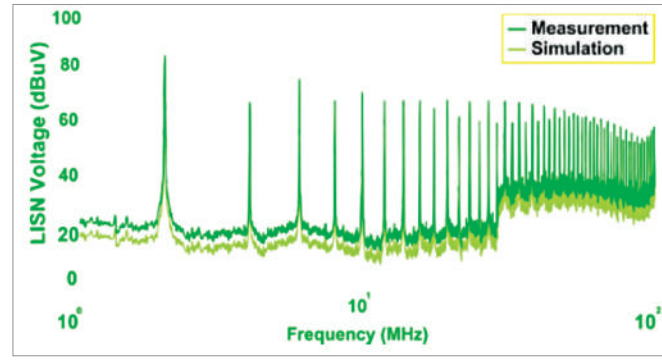
2 SimYog TECHNOLOGY

Every electronic device has a semiconductor chip that needs to have compliance certifications. But EMI/EMC contributes to a significant number of compliance failures in electronic devices. That's the problem SimYog aims to solve



Simulations in the virtual lab vs measurements in the physical lab. SimYog's simulation achieves accuracy with performance through a combination of physical and data science (Credit: SimYog Technologies)

SimYog Technology, a company based in Bengaluru and Austin (USA), is a spinoff from IISc. Founded in 2017, SimYog's mission is to be "Agile for Hardware." "We want to help startups and companies in electronic design," says Dr Dipanjan Gope, CEO of Simyog Technology and Associate Professor at IISc. "We provide design tools and simulation tools that would aid in hardware development."

Today, the number of electronic and electrical parts of most systems are growing faster than ever. A future-generation car or a drone is like a next-gen PCB! Hence, the way we design electronics is also changing. If you look at the automotive industry, a lot of electronics is packed together in close proximity. This increases the chances of their interfering with each other.

The noise generated by each one of these components can affect and hurt the performance of the others. It is therefore important to ensure electromagnetic compatibility. It is vital to make sure that these components pass electromagnetic compatibility (EMC) test the very first time.

The problem with EMC testing is that it is handled in the physical stage. Once you have the hardware, only then can you take it to a laboratory and test it. Since the hardware is available only during the final stages of the design cycle, it becomes very difficult and time-consuming to adjust the hardware in case the test fails.

Compliance-Scope, a tool designed by SimYog, enables a designer to test EMC in the early design stages. "When you test at an early stage, there are ways of fixing the problem and it will be much less expensive. There's no need to cancel projects or make huge changes in the design," explains Dr Gope.

Compliance-Scope is a virtual EMI/EMC laboratory that lets engineers do such tests with just the design files rather than the actual hardware. "It shows some diagnostics so the designer can use them to reduce emissions," says Dr Gope.

The company uses a specialised two-pronged approach—one is based on physical science (computations, circuits, and electromagnetics) and the other is based on data science. With these two pillars combined—data science and physical science—it is possible to predict how a device will behave in the lab.

"We are further offering our products on the cloud. Right now, we are in the automotive sector, but we want to make our tools available in the IT and aerospace sectors too," mentions Dr Gope. "The journey continues!"

3 SixSense AI PLATFORM

When you are into production, especially giga-scale and mega-scale production, you need sharp visuals and a lightning speed of screening to prevent damaged devices from reaching your customers

SixSense has developed a no-code platform for building, monitoring, and maintaining deep learning models for computer vision applications. Currently, production engineers utilise the platform to create AI models that can detect and classify defects in photos. They are shifting from a decade-old inspection process based on manual labour or rule based systems to a significantly more efficient and

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Delvitech designs, manufactures and supplies 3D automated optical inspection systems for Printed Circuit Board Assembly (PCBA) in both SMT and THT processes. R&D and innovation are at the heart of everything we do.

Thanks to our global team and exclusive partners, Delvitech aims to provide clients in diverse markets with revolutionary solutions based on AI that stand out in quality and performance.

Our technology is based on agnostic artificial intelligence software to offer self programming features and outstanding inspection capabilities according to IPC.

DelvitechAI Vision Systems India

No-43, Velankani Tech Park, B1, 3rd Floor, Block-1, Electronic City, Phase-1 Bangalore-560100 Karnataka.

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What happens when there are multiple inaccurate inspections

- Cost of labour increases
- Delays are introduced
- Increase in rejects and false alarms
- Certain defects are missed

scalable AI based solution using the SixSense AI platform.

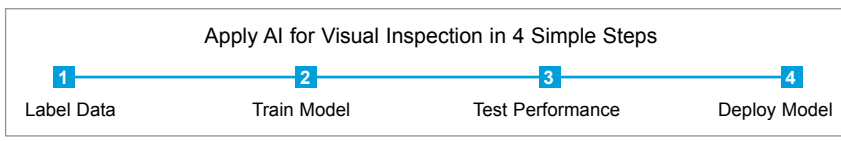
Visual quality inspection is one of the most critical processes in manufacturing and is used to control the cost of quality. In a 24/7 production line, visual checks that happen increase the cost of quality exponentially. Today, inspections have a very high error rate of up to 40%. Manufacturers generally have a team of operators, who might make mistakes due to factors such as fatigue or oversight.

Sometimes, engineers automate their processes using rule based algorithms. But they fail to scale and adapt to a broader catalogue with subtle variations between defect classes. This leads to defects getting missed or false alarms.

"We have identified this problem and have built an accurate AI-powered automatic defect classification software called ClassifAI," says Akanksha Jagwani, Co-Founder & CEO at SixSense.ai. "Our technology integrates with existing image capture tools, analyses at a very high speed, and classifies the defect into various categories. The AI monitors and maintains itself and ultimately writes back the class codes of the defects for decision making." This software is able to take any kind of image data—optical, SEM, X-Ray, etc—and analyse it for accurate defect classification.

How does ClassifAI work?

- You can upload and label large volumes of data in a matter of seconds
- You can also ask for AI suggestions and label data in just a few clicks
- The platform comes with pre-trained models specialised for defect identification
- The pre-trained models get automatically tuned to your dataset as you enter details about your data
- In many cases, AI takes multiple views of a defect into account to make a classification decision
- ClassifAI separates new defects and quickly adapts to them
- Once the model is trained, you look at its performance and can debug errors
- Models with high performance are instantly deployed to production



The processes behind ClassifAI (Credit: SixSense AI)

4 BoatLab DYNAMICS

Flying hundreds of drones simultaneously while controlling their flying patterns via a single software platform has always been a technical challenge, but not anymore

During the week-long Republic Day celebrations in January this year, 1000 drones made by BotLab Dynamics, a Delhi based startup, made different formations in the sky. Drones in the colours of the Indian national flag could be seen rising, gently building a globe, and rotating in the air—

BotLab Dynamics' custom hardware suite

- Motor Controller
- Flight Controller
- Precision GPS Module

BotLab Dynamics' drone show at the Rashtrapati Bhavan (Credit: BotLab Dynamics)

imitating the Earth's movements.

"We were asked to place all drones and recover them in less than an hour," says Tanmay Bunkar Co-founder at BotLab Dynamics. "When we were approached by the Department of Defence, we only had 50 systems, but the demonstration required 1000!" The company took up this challenge and learned how to scale its technology quickly. They soon realised that scaling up would become less and less of a technological problem and more and more of a logistics problem.

BotLab Dynamics has demonstrated its technology for almost every military base in India—the first one being in 2019—for the Indian Army. They were the first group in India to demonstrate a fleet of ten drones from a single ground control station. What's interesting is that these drones can talk to each other. If one of them malfunctions, it can assign its task to any other one.

Drone swarms are the new fireworks! Since defense hardware takes time to mature, the company also started working on drone shows. They had to come up with indigenous solutions to control the cost and build the associated software that would enable the drone show to happen. "We started with off-the-shelf components," says Bunkar. "We knew how the controls would work—we just needed inexpensive hardware to run our logic. So, we decided to make our own systems."

Using an RTK system and a base station on the ground, they enhanced the accuracy of their GPS by collecting data and using the data to correct the positions of the drones. "Normal GPS on a good day can get you 2m to 5m of accuracy. Our GPS can place itself within 10cm of the designated spot," explains Bunkar.

For every site, they had deployed spectrum analysers. Then they moved on to the software part. They used animation software and wrote code that translated an image into a point lump, which was then used to generate flight trajectories. Consequently, they used simulation software to keep all the drones together. This was done to avoid collisions and to profile velocities.

BotLab Dynamics is currently working on a RISC V controller. They have a soft core working on an FPGA. In the near future, the company hopes to make its own silicon! Bunkar believes that having the necessary technical knowhow in-house is extremely important. This knowhow was exactly what helped the company grow and scale at a meteoric rate. EFY

A drone from BotLab Dynamics (Credit: BotLab Dynamics)

This article was put together by EFY's Aaryaa Padhyegurjar from the Startup Showcase session at VLSI 2022. The session was hosted by Dhanapathy Krishnamoorthy, Principal Engineer at Intel Corporation.

AI defence products launched by Rajnath Singh

Ranging from AI platform automation to simulators/test equipment and speech/voice analysis using natural language processing, Union Defence Minister Rajnath Singh launched 75 new defence products that use artificial intelligence (AI) at the first-ever 'AI in Defence' (AIDef) symposium and exhibition organised by the Ministry of Defence at New Delhi. These products are expected to open new business avenues for the Defence public sector units. An exhibition for innovators to display their capabilities, products, and state-of-the-art technologies was also organised.

Representational image

Government approves 314 proposals under M-SIPS scheme

A total of 314 applications worth ₹868.24 billion have been approved by the Electronics and IT Ministry. M-SIPS was one of the first schemes launched by the government to attract electronics manufacturers to invest in India. Domestic companies whose proposals have been approved include Lava, Bhagwati (Micromax), Padget Electronics (Dixon Technologies), UTL Neolyncs, and Optiemus.

PEOPLE (on the move)

Amrit Manwani takes over as Chairman of ESSCI

The Electronics Sector Skills Council of India (ESSCI) has announced Amrit Manwani as its new Chairman, replacing Dr Ajai Chowdhry. Manwani is the Chairman & Managing Director of Sahasra Electronics Pvt Ltd and Infopower Technologies Limited, and also a veteran in the electronics industry. He is also associated with ELCINA as President and ELCINA EMC Pvt Ltd as Chairman. He has been MD at TEGNA Electronics Pvt Ltd, Director at QCI, and is an active member of ICTE Committee at CII.

Ivan Saha joins Vikram Solar as CEO

Holding a master's degree in Technology and Materials Science from IIT Kanpur, Ivan has experience working in technology and operational roles across organisations, such as the IIT Kanpur, ISRO, and Moser Baer Photo Voltaic Limited. He succeeds Saibaba Vutukuri at Vikram Solar as CEO.

Tom McClelland appointed CEO of Frequency Electronics

Holding a PhD in physics from Columbia University, Tom McClelland has been appointed as the CEO of Frequency Electronics Inc., replacing Stanton Sloane who retired recently. He has been with the company for almost forty years and has led the company's research and scientific efforts for ten years as Chief Scientist.

Matt Hicks is now IBM Red Hat's President & CEO

Matt Hicks has been named new President and CEO of IBM Red Hat, carrying over from Paul Cormier. Matt first joined Red Hat in 2006 as a developer and has carried on in several roles at the company over his 22-year career there. Most recently, he was Vice President for product and technologies, where he took responsibility for the entirety of Red Hat's product strategy and engineering function.

Mike Slater joins as VP of global business at Digi-Key

With more than 25 years in sales, management, and business experience, Mike Slater has joined Digi-Key as its new Vice President of global business development. He previously served as the President of E-Switch Inc. and as a General Manager at Arrow Electronics.

CORPORATE news

Intel India opens engineering centre in Bengaluru

With about 42,085 square metres (nearly 453,000sqft) of space spread across two towers at Ecospace Business Park, with a capacity to accommodate 2000 employees, Intel is expanding its R&D presence in

India. Inaugurated by Rajeev Chandrasekhar, Union Minister of State for Electronics and IT, Skill Development and Entrepreneurship, in the presence of Nivruti Rai, Country Head, Intel India & Vice President, Intel Foundry Services, and some others from the government and industry. One floor (6503sqm) in this facility is dedicated to high-tech R&D labs for silicon design and validation purposes. This is Intel's largest design and engineering centre outside the US.

*astTECS looking to explore BPO opportunities from its new office in Kerala

Along with I-FI Global Info Pvt Ltd, *astTECS is looking to further explore a few BPO opportunities in this market. With its expertise in unified communication projects, the new office set up by the company in collaboration with I-FI Global Info Pvt Ltd is in Changanassery, Kerala. It aims to primarily address the growing customer demand and service delivery capabilities while engaging new opportunities.

HARTING sets up a new production unit in Chennai

HARTING has unveiled their new production plant located in Thirumazhisai, Chennai. Inaugurated on 30th June 2022, it was graced by Bernd Fischer (General Manager Corporate Regional Management HARTING), Andreas Conrad (Member of the Board for Operations) along with customers, partners and distributors. A customer and distributor meeting at the plant along with a plant tour was also done. With over 2970sqm (about 32,000sqft) in India, this plant alone would be able to produce close to 74,000 units per month coping with the business strategy and the tremendous growth in the Asia market.

Redinent and Al-Futtaim sign MoU to protect CCTV networks in UAE

With an increasing rate of cyber-attacks and rapid deployments of CCTV cameras with IoT devices, the urgency for an automated enterprise-grade CCTV camera threat scanning tool is seen. The MoU between Redinent and Al-Futtaim focuses on the enablement of managed security services along with a shared objective of serving organisations that aim to increase security, privacy, and compliance between both the companies. This partnership aims to facilitate future alliances for protecting the CCTV networks across the UAE.

VerdeMobility installing smart EV charging stattions

A subsidiary of System Level Solutions, VerdeMobility India Pvt Ltd intends to revolutionise EV charging by focusing on smart solutions to create the most innovative and affordable range of products while maximising RoI and minimising cost. It aims to be a pan India CPO with a target of 20,000+ charge points by March 2023. Initial charge point installations at key locations in Delhi, Bengaluru, Mumbai, Hyderabad, and Kolkata have already been set up. There are also phased launches of physical experience centres.

SNIPPETS

- CEA, Soitec, GlobalFoundries, and STMicroelectronics collaborate for fully depleted silicon-on-insulator
- Infineon Technologies AG and Oxford Ionics come together to build fully integrated quantum processing units
- Solectrac has decided to partner with Nolan Manufacturing to ramp up the production of electric tractors
- STMicroelectronics has created a new AWS FreeRTOS-qualified TF-M based reference implementation with Amazon Web Services
- TT Electronics partners with Honeywell Aerospace to design a new power supply for next-generation inertial navigation units
- VW Group held ground-breaking ceremony at the site of its upcoming EV battery cell plant in Salzgitter, Germany and announced the formation of a new company, PowerCo, which will be responsible for handling the company's burgeoning battery business
- TSMC forecasts its revenue growth could be the highest in ten quarters for 3Q22. The net profit for April-June rose to a record T$237.0 billion ($7.94 billion), above the T$219.13 billion average
- Fujifilm to invest $350 million into its electronic materials. Apart from the capital investment, the company plans to add at least 120 new positions by the end of 2024
- Both Cyient and Honeywell have partnered to manufacture the aviation industry's first cloud-connected cockpit system. Named the Honeywell Anthem, Cyient has signed a multi-year agreement with Honeywell for this project

BESCOM to organise EV expos in tier-two cities

With the success of the three-day EV Expo in Bengaluru, the Bangalore Electricity Supply Company Limited (BESCOM) has decided to organise similar events in tier-two cities in the state in future. The department is in talks with the residents' welfare associations to further increase the network of charging stations by setting them up in apartments and residential areas in Bengaluru. The recent EV Expo in Bengaluru was to further promote green energy and the use of EVs in Karnataka.

Mahindra on a hiring spree for EVs

By 2027, Mahindra plans to have five electric SUVs in its lineup. M&M Electric's R&D base in Bengaluru was the hub of EV engineering, and while expanding the MRV it has reportedly hired 900 engineers The Bengaluru R&D centre will continue to play a supporting role in developing EVs. Despite the expansion of the MRV, Mahindra is still looking to cooperate with other EV makers to source components.

Repos Energy launches mobile EV chargers

Tata-backed mobile energy distribution startup Repos Energy announced the launch of an organic waste-powered mobile electric charging vehicle solution. For this, Repos has signed an MoU with Urja Biosystem Pvt Ltd and Batx Energy Pvt Ltd for mobile distribution of clean electrical power to EVs through second-life batteries. Repos proposes to create an ecosystem that facilitates the delivery of all forms of energy at the doorstep of end consumers with the help of technology.

Hindalco to develop aluminium-air batteries for EVs

To develop aluminium-air batteries for EVs, Hindalco has joined hands with Israel based battery manufacturer Phinergy and IOP, a joint venture between Indian Oil Corporation and Phinergy. As per contract, Phinergy and IOP will partner with Hindalco on R&D and

pilot manufacturing of aluminium plates for aluminium-air batteries, and recycling of aluminium, after usage in these batteries. Hindalco enunciated that these batteries will enable rapid 'refuelling' and will eliminate the need for expensive EV charging stations.

EV startup Bounce begins sales while collaborating with CSC

Bengaluru EV startup Bounce announced its partnership with the central government's e-governance service delivery network CSC to strengthen its presence across rural markets. Under the collaboration, Bounce will sell its product offerings through the Common Service Centre (CSC) network. CSC rural e-Mobility promotes the use of EVs and charging infrastructure across the country through a strong and vibrant network of VLEs. This is an effort to bring Bounce's smart mobility offerings to rural customers across the country.

Bharat Alt Fuel to set up an EV facility in Tamil Nadu

An investment of ₹2.5 billion is planned to set up a Greenfield facility in the Krishnagiri district of Tamil Nadu to manufacture EVs, batteries, and motors by Bharat Alt Fuel. Built over a land area of 40,000 square metres and expected to commence production in the second half of 2023, this project would span over three years and help localise the manufacturing process as part of the 100% Made-in-India pitch of the brand.

BEL signs MoU to supply ADS for IAF helicopters

Amidst the presence of Joint Secretary (DIP) and senior Indian Air Force officials, Navratna Defence PSU Bharat Electronics Limited (BEL) signed an MoU with Defense Initiatives (DI), Belarus, and Defense Initiatives Aero Pvt Ltd, India (a subsidiary of DI Belarus). It aims for co-operation between the three companies for supply of airborne defence suite (ADS) for the helicopters of the Indian Air Force. Under the 'Make in India' category, BEL will be the prime contractor and will be supported by DI with supply of advanced EW suites for helicopters.

Skye offering payload for drones as a service in Himachal

Skye Air Mobility has agreed with HP State Electronics Development Corporation Ltd (HPSEDC) to lend its support by offering payload as a service throughout the state of Himachal Pradesh. The company has already made two successful drone delivery projects in the past in Himachal and showcased its capability and products at the Drone Mela, Dharamshala, which was organised by Himachal government in December 2021. It has successfully operated more than 1500 flights so far.

Garuda Aerospace reiterates commitment to defence sector

The Tamil Nadu Industrial Development Corporation Limited (TIDCO) along with Garuda Aerospace signed an MoU at the Tamil Nadu Investment Conclave 2022, highlighting the investments that Garuda has made in the sector and reiterating the latter's commitment to the defence sector. This partnership benefits TIDCO which is the nodal agency for the Tamil Nadu defence corridor.

Altair and LG Electronics to build a simulation platform

By integrating LG's product development technology with Altair's simulation and AI technology the two companies plan to build a more advanced digital transformation development environment. The new digital simulation platform involves sharing of information in key areas, including CAE, data analytics, automation, and digital twin technology.

TEKNOFEET offers 3D foot-scanning at its store

After the enormous success of its business model through kiosk operations, TEKNOFEET, a Gurugram based startup, has established its first flagship store in Gurugram. With its 360-degree approach, the company has developed India's first revolutionary 3D foot scanning technology, that empowers footwear brands to know their customers better apart from a seamless shopping experience. The company plans to open more outlets soon.

Karnataka invites investors to boost semiconductor sector

Minister for Electronics, Dr C.N. Ashwath Narayan, at the event 'Semiconductor Industry Connect 2022: Roadmap for 2025—Semiconductor Ecosystem in Karnataka,' called upon investors to make use of the Open Land Reforms Policy of the state government to promote growth of the semiconductor industry. He asserted that the government would consider installing a semiconductor park and a testing lab to promote the Electronics System Design & Manufacturing (ESDM) Skill Development sector.

Coimbatore to attract huge investments

An investors' meet recently organised by the state government of Tamil Nadu saw the launch, laying of foundation, and signing of MoU for several projects across the state. Coimbatore district is all set to attract investments in IT and ITES, engineering, and textile sectors from companies that took part in the meet. From the companies that signed MoU with the state government or facilities at least four were related to IT and ITES sectors.

Odisha state establishes skill development centre

An EV, Drone Manufacturing and Training Centre will be set up in Odisha state with the help of the Directorate of Technical Education & Training through the Government Polytechnic Bhubaneswar. The institute has signed a pact with Skyy Rider to deliver more than 80 different skill development programs to generate over 10,000 jobs annually. Aero Rovers has also collaborated with the government to set up a drone manufacturing and pilot training unit, and also provide hands-on technical understanding to students of the polytechnic.

Neyveli welcomes an Atal Tinkering Lab

Rakesh Kumar, Chairman-cum-Managing Director of NLC India Ltd, recently inaugurated the Atal Tinkering Lab (ATL) in Neyveli, Tamil Nadu. The ATL being promoted under the Atal Innovation Mission (AIM) by the Union government aims at cultivating one million children in the country as neoteric innovators. Atal Tinkering Lab is a workspace where young children will get a chance to work with tools and equipment to understand the concepts of STEM (Science, Technology, Engineering, and Mathematics).

Two cities in West Bengal get internet exchange points

The launch of these internet exchange points (IXP) of NIXI is under the Digital India vision to connect every Indian with an open, safe, trusted, and accountable internet.

INTERNATIONAL news

World's first 3nm chips from Samsung

The 3-nanometer (nm) manufacturing node using the gate-all-around (GAA) transistor architecture by Samsung Electronics has begun. This production, when matched to its 5nm process, consumes 45% less power, offers improved performance by 23%, and has 16% smaller surface area. The company is also working on a second-generation 3nm process node that would be better in terms of power use, performance, and surface area.

Renesas and Cyberon to deliver integrated voice UI solutions

While Renesas makes a voice reference hardware platform available for rapid prototyping and development of voice interfaces, Cyberon's DSpotter solution eliminates the need for massive voice data collection while supporting over 40 global languages, empowering customers to adopt voice technology on embedded applications worldwide. Both companies have partnered to deliver voice user interface (VUI) solutions for Renesas' entire RA MCU line. It is a complimentary access being given to Renesas RA customers.

Bosch expanding facility to manufacture SiC semiconductors

Reutlingen is Bosch's silicon-on-chip (SiC) production facility. With increase in demand the company is expanding this facility between now and 2025. Bosch is looking to invest €3 billion by 2026, with around €400 million in the expansion of manufacturing capacity and the conversion of existing factory space. €250 million will be spent on adding 3000 square metres to the cleanroom at the €1 billion Dresden fab it opened last year.

Delta Electronics sets up an R&D and manufacturing facility in Texas

Delta Electronics has acquired a nearly 30-acre complex in Plano, Texas, for R&D and manufacturing, that accommodates facilities of over 37,150sqm (400,000 square feet). The Plano complex is expected to facilitate Delta's expansion whilst creating hundreds of jobs. The new site is expected to operate 100% on renewable electricity by 2030 as the company hopes to potentially invest substantial resources in partnership with Texas universities and local colleges, to attract skilled talent in the region.

ST and GlobalFoundries to manufacture 300mm wafers

STMicroelectronics with GlobalFoundries Inc. have signed an MoU for a new jointly-operated 300mm semiconductor manufacturing facility in Crolles, France. The facility is targeted to ramp up to full capacity by 2026, with up to 620,000 300mm wafers per year whilst generating 1000 onsite additional staff. Significant financial support from France has been shown towards the companies for the new facility, which will strongly contribute to the objectives of the European Chips Act, including the goal of Europe reaching 20% of worldwide semiconductor production by 2030.

Europe's most powerful EV charging hub opened in Oxford

Oxford City Council, Pivot Power, Fastned, Tesla Superchargers and Wenea have officially launched Europe's most powerful EV charging hub that will offer fast and ultra-rapid charging for 42 vehicles at once at Oxford's Redbridge Park and Ride. This charging hub will be powered entirely by renewable energy. The project is part of a national network of Energy Superhubs developed by Pivot Power, which combines transmission-connected batteries and power infrastructure for EV charging to enable more renewables and accelerate the decarbonisation of transport.

Hyundai to set up first Korean EV factory

After 1996, Hyundai looks forward to opening its first factory in its origin country, South Korea, which will be solely dedicated to EVs. It is set to expand its sales by dedicated electric production. Hyundai has invested $48 billion for this new plant apart from the EV production factory in Georgia, US. The production in Georgia will also include battery manufacturing and start in early 2023. The South Korean automobile manufacturing company is set to enter the electric vehicle market.

Panasonic to build second lithium-ion battery plant for EVs in US

The lithium-ion battery plant in Kansas could create up to 4000 new jobs as the Tesla supplier drives to expand its presence. The factory will be Panasonic´s second electric car battery operation in the United States, joining its facility in Nevada. The new factory is expected to be located in De Soto, Kansas. The Kansas Department of Commerce said the state would reimburse Panasonic with estimated subsidies of $829 million after the company has completed investment and hiring.

Volkswagen and Redwood collaborate to recycle EV batteries

Volkswagen and Redwood have joined hands for recycling EV batteries. Redwood would recycle EV batteries from Volkswagen and Audi in the United States by re-manufacturing battery electrode components from materials such as cobalt, nickel, lithium, and copper. It looks to work with more than 1000 Volkswagen and Audi dealers in the US to recover and recycle EV battery packs at its Nevada facilities. Volkswagen feels this partnership will help increase EV adoption such that 55% of its US vehicle sales will be fully electric by 2030.

Skyrora commences rocket production in the UK

By 2030, Skyrora plans to conduct sixteen launches per year from the Saxavord launch complex in the Shetland Islands alone. With the production of two Skyrora vehicles, which feature 3D-printed engine components that are already underway at the Cumbernauld site, the company plans to increase the total to sixteen per year once mass production begins. The company is also expected to generate new job opportunities, both in the North Lanarkshire area and in the rest of Scotland, with up to 100 highly-skilled technical and business roles.

It is in sync with the MeitY's vision of 1000 days. It was inaugurated by Union Minister of State, Electronics and Information Technology, Skill Development & Entrepreneurship, Rajeev Chandrasekhar, at Durgapur and Vardhman in West Bengal.

Chhattisgarh government introduces EV policy

The EV policy in Chhattisgarh exempts road tax on all EVs purchased during the first two years. Registration fee waivers are also being provisioned to encourage the use of EVs, thereby ensuring relief to people bearing the brunt of rising fuel prices. A waiver in the registration fees on the sale of EVs along with the charging stations being built in government and private buildings will also be seen.

Step-By Step Guide To Select POWER MOSFETs

Metal oxide semiconducting field effect transistor, commonly known as MOSFET, is a voltage-controlled device that is normally used as a switch or amplifier. It is considered one of the most crucial electronic devices in bringing about the modern electronics revolution. This semiconducting switch finds application in a wide variety of operations, especially where power conversion takes place. However, a power MOSFET remains one of the most common causes of failure of high-power circuits like converters and inverters. Failure of a power MOSFET can be due to various reasons, but the most frequent is selection of a wrong power MOSFET for the application. This article covers the different types of MOSFETs and factors to consider while selecting a power MOSFET

SHARAD BHOWMICK

MOSFET is a voltage-controlled 3-terminal device with source, drain, and gate as the three terminals. The basic idea of the 3-terminal device is to control the flow of current through one of its terminals by accurately controlling the voltage between the other two terminals.

MOSFETs can be categorised based on the type of doping, whether N-channel or P-channel. Both types can further be classified on the basis of operation, that is, whether it is an enhancement type MOSFET (E-MOSFET) or depletion type MOSFET. Thus, there are following four types of MOSFETs:

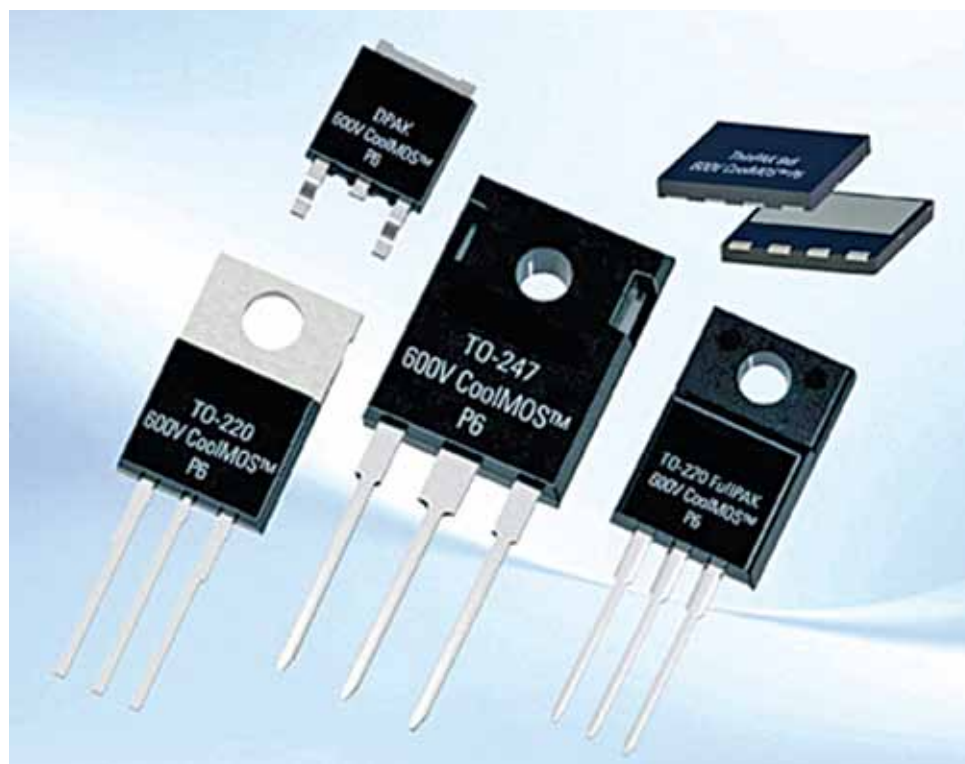


Fig. 1: The image represents different types of MOSFET packages

• N-channel enhancement mode MOSFET
• P-channel enhancement mode MOSFET
• N-channel depletion mode MOSFET
• P-channel depletion mode MOSFET

Depletion mode MOSFETs are normally on, and applying VGS voltage turns them off. Enhancement mode MOSFETs are normally off, and applying VGS voltage turns them on. The flow chart in Fig. 2 shows how different types of MOSFETs work.

Power MOSFET is the most used power semiconductor device in the world. It is an enhanced version of a regular MOSFET that is capable of handling significantly higher power levels compared to any other semiconductor device, such as an insulated-gate bipolar transistor (IGBT) and a thyristor.

A power MOSFET has significant advantages, which include high low-voltage efficiency and a high switching speed. It also has a good paralleling capability, that is, multiple MOSFETs of similar type can be connected parallelly to allow a much higher amount of current to flow through the setup.

Double-diffused MOSFET, commonly known as DMOS, is one of the most commonly used power MOSFETs. It is commonly used in high-voltage, high-frequency switching applications. The double diffusion process is used to form the source and a channel region of this MOSFET. Fig. 3 shows the cross-section of a power MOSFET.

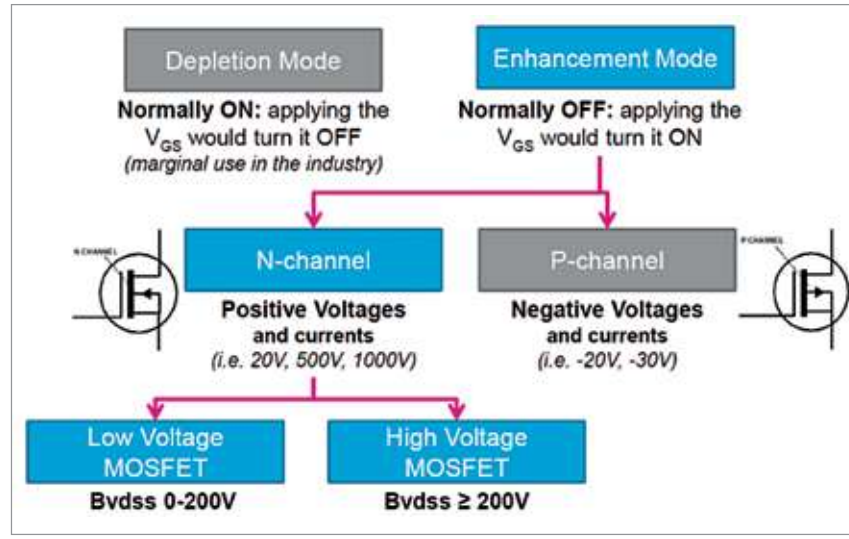


Fig. 2: Flow chart showing classification of MOSFETs (Source: STMicroelectronics)

Important MOSFET parameters

Two important parameters of a MOSFET that are crucial while selecting a MOSFET are the on-resistance, Rds(on), and the gate charge, Qg. These two parameters are interrelated and are responsible for the efficiency of the system.

Some other important parameters that determine the performance of a MOSFET are the breakdown voltage, BV_{DSS}, and the body drain diode, which is essential to take into account when the device is used as a power diode, like in synchronous free-wheeling operation mode, and intrinsic capacitances that can affect the switching times and voltage spikes.

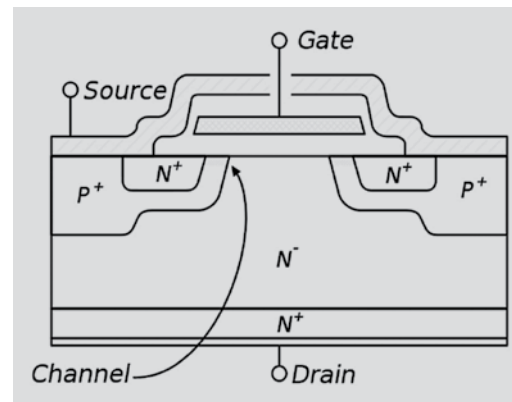


Fig. 3: Cross-section of a power MOSFET (Source: Link)

On-state resistance, $R_{DS(on)}$. It denotes the resistance between the drain and source terminals when the MOSFET is in on state. The conduction loss depends on it; the lower the value of the $R_{DS(on)}$, lower is the conduction loss.

Total gate charge, Q_G. It denotes the electric charge required by the gate driver to turn the device on/off.

Figure of Merit, FoM. It is the product of $R_{DS(on)}$ and Q_G, which accounts for the conduction losses and switching losses of a MOSFET. Therefore, the efficiency of a MOSFET depends on both, the $R_{DS(on)}$ and the Q_G.

Breakdown voltage, BV_{DSS}. It denotes the maximum drain-to-source voltage a MOSFET is capable of sustaining in off state.

An example of a MOSFET's datasheet parameters is given in Fig. 4.

Selecting a power MOSFET

Selecting the right power MOSFET with correct characteristics and appropriate ratings is important for designing a great circuit. The device should have operating conditions or working range that tells us the safe conditions for its working. The absolute maximum ratings are the limiting values, exceeding which might cause permanent damage or failure of the circuit.

"Selection of a MOSFET is very crucial for the stability of a sys-

SPECIFICATIONS (T_J = 25°C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0V, I_D = 250µA	100	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to 25°C, I_D = 1mA	-	0.12	-	V/°C
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250µA	2.0	-	4.0	V
Gate-source leakage	I_{GSS}	V_{GS} = ±20V	-	-	±100	nA
Zero gate voltage drain current	I_{DSS}	V_{DS} = 100V, V_{GS} = 0V	-	-	25	µA
		V_{DS} = 80V, V_{GS} = 0V, T_J = 150°C	-	-	250	
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS} = 10V, I_D = 3.4A[b]	-	-	0.54	Ω
Forward transconductance	g_{fs}	V_{DS} = 50V, I_D = 3.4A[b]	1.3	-	-	S

Fig. 4: Example of a MOSFET's specifications (Source: Vishay IRF510 datasheet)

tem," says Mrinjal Upadhayay, R&D engineer at Statcon Energia. He continues, "While selecting a MOSFET for any operation we always consider the peak current and voltage and not the operational current."

The drain-to-source voltage ratings (V_{DS}) should be at least 20% higher than the supply voltage, while the motor load should be higher than the peak load condition. For some cases with high currents, large torque steps, poorly controlled power supplies, etc, a higher margin is required.

The MOSFET should be rated at least for the maximum voltage and the maximum current for the power required. For the motor applications, its current rating should be higher than the peak current. Besides, thermal consideration also plays a vital role in the selection of a MOSFET.

The MOSFETs generate heat due to the drain-source resistance. Thermal constraints tell us about the maximum power that can be dissipated, and the maximum allowable power dissipation drives the selection of the MOSFETs based on the $R_{DS(ON)}$ value.

After determining the necessary voltage rating and $R_{DS(ON)}$, the gate charge (Q_G) value is considered. It determines the speed of the switching and efficiency of the MOSFET. It will switch faster with a device having lower gate drive current than one with a high Q_G.

An example for selection

As an example, let us see how to select a MOSFET for a 12V inverter for a residential application. Let us say the parameters known to us are:

Input - 12V DC (lead-acid battery)

Output - 230V AC

Load - 1000W

Peak load - 2000W

Losses in inverter - 20%

Step 1. Consider the maximum power output at peak load. (While calculating we only consider the maximum output power.)

P_max = 2000W

Total loss is 20% of 2000W, so the total loss is 400W

Step 2. Find out the total load

Total load = Maximum load + Load due to losses

= 2000W + 400W

= 2400W

Step 3. Calculate peak current and peak load

The input side of the inverter has a lead-acid battery, which will usually have a charge anywhere between 10V and 14V. Therefore, keeping 20% to 40% margin, the input will be approximately 6V to 8V.

Current = P/V = 2400/6 = 400A

Step 4. Calculating the voltage

A minimum of 2x voltage is selected to keep the system stable, because during a short-circuit or peak current a voltage spike is also observed. It is safer to select a higher voltage.

COMPARISON OF Si VS GaN VS SiC MOSFETs

Material	Band gap $E_g(eV)$	Electron saturation velocity $V_s(cm/s)$	Dielectric constant ε_r	Critical electric field $E_c(V/cm)$	Thermal conductivity $K(W/cm\,K)$
Si	1.1	$1 * 10^7$	11.8	$3 * 10^5$	1.5
GaN	3.4	$2.2 * 10^7$	10	$2.2 * 10^6$	1.7
4H-SiC	3.3	$2 * 10^7$	9.7	$2.5 * 10^6$	5

Steps to select a power MOSFET

1. Find out all the parameters of application, such as maximum voltage, maximum current, and operating temperature.
2. Find out the total load of the circuit.
3. Calculate peak current and peak load required for the MOSFET.
4. Find out the efficiency of the system.
5. Now calculate the load with losses.
6. Add a safety factor (depending on the temperature of operation).
7. Check if the device will operate as a bi-directional device or not.

Maximum battery voltage (V_Bmax) = 14V
MOSFET rating = 2 × 14V = 28V

Step 5. Adding safety factor to the current

The safe operation area of MOSFET is temperature dependent. So, in order to make the system more secure, we may take 50% to 80% higher current rating than the calculated current.

Let us take a safety factor of 50%.

I_S.F. = 400A + 200A = 600A

So, the MOSFET we require should be rated for 600A. Therefore, the suitable MOSFET for our operation should be rated for at least 600A and 28V.

SiC vs GaN vs Si MOSFET

For higher powered applications, the silicon carbide (SiC) and gallium nitride (GaN) MOSFETs are replacing the silicon MOSFET. Both SiC and GaN MOSFETs are capable of sustaining higher frequencies and higher voltages compared to the silicon MOSFETs. Higher switching frequency corresponds to lower passive components.

Both SiC and GaN MOSFETs have higher bandgap compared to their silicon counterparts. Furthermore, SiC and GaN MOSFETs have better thermal conductivity and higher electron conductivity, which makes them more suitable for higher power operations. Compared to the silicon MOSFET, the other two devices eliminate tail current during switching, thus reducing switching loss and providing a faster operation.

The table on previous page compares the Si, GaN, and SiC MOSFETs.

In power electronics systems, where a motor needs to be driven, employing a pre-driver or a gate driver circuit is essential for improving the efficiency and stability of the system. The gate driver circuit is mostly used with an N-channel power MOSFET in order to deliver high current to the motor. The design of gate driver circuit and selection of driver IC depends on the parameters of motor.

MOSFETs are the main building blocks of power electronics circuits. Power MOSFETs can be found in high-power applications, such as:

- Switch mode power supplies (SMPS)
- Automotive applications
- Residential, commercial, architectural, and street lighting
- DC-DC converters
- Motor control EFY

The author Sharad Bhowmick works as a Technology Advisor at EFY. He is passionate about power electronics and energy storage technologies. Through his work, he wants to help achieve the goal of a carbon-neutral world.

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A REMOTE WITHOUT BATTERY
That Can Work For Years

ASHWINI KUMAR SINHA

There is huge chemical waste being generated by billions of batteries used in remote controllers for electronic devices like TV sets, set-top boxes, air-conditioners, and even some ceiling fans now-a-days. The waste produced by their spent batteries keeps increasing annually.

This DIY project harvests energy from the environment to power the remote controller and does not require any battery. Since low power is needed for a remote's circuit, the battery can be eliminated altogether and thus save tons of chemical waste each year. The author's prototype is shown in Fig. 1.

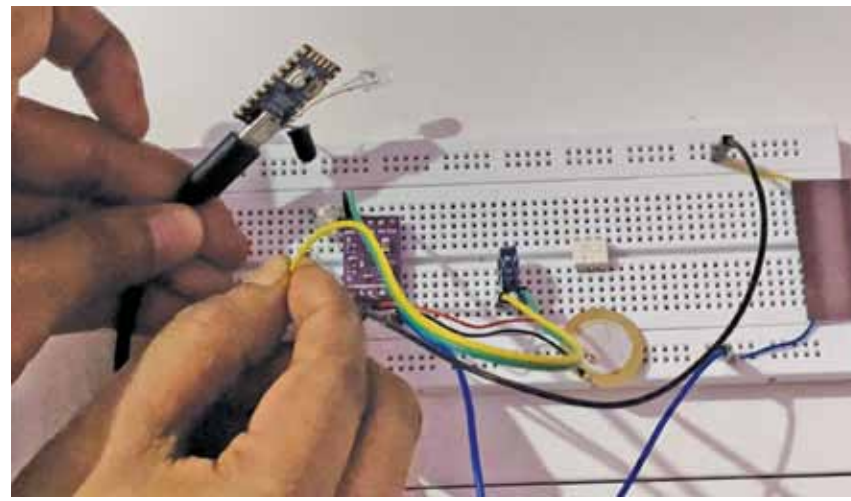

Fig. 1: Author's prototype on a breadboard

Circuit and working

The circuit diagram of this remote controller can be divided into two sections—the transmitter and the receiver. Circuit diagram of the transmitter section is shown in Fig. 2.

The transmitter is built around energy-harvesting module LTC3588 (MOD1), two 5.5V, 1F super capacitos (C1 and C2), small 2.2V, 50mA solar cell (SC1), piezoelectric crystal (PZ1), and transmitting LED (IR1). The piezoelectric crystal is connected to input pins PZ1 and PZ2 of LTC3588. The solar cell is connected to Vin and GND pins. At the output the IR LED is connected between D0 and the ground pins of MOD1.

Circuit diagram of the receiver is shown in Fig. 3, which also includes circuit diagram of the transmitter for convenience. It is built mainly around MOD2, receiving LED/ TSOP4538 (IR2), and 5mm LED

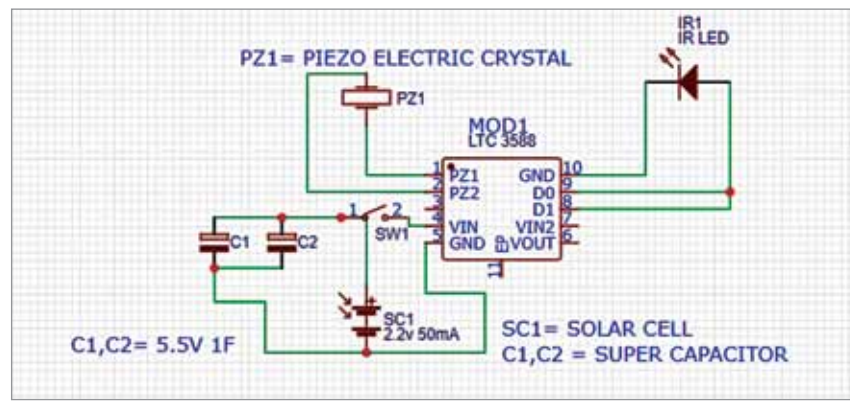

Fig. 2: Remote transmitter circuit

BILL OF MATERIAL

Component	Quantity	Description	Abbreviation
Solar Cell	1	2.2V, 50mA	SC1
Super Capacitor	2	5.5V, 1F	C1, C2
Piezoelectric Crystal	1	Piezoelectric generator	PZ1
IR LED	1	2.2V, 20mA	IR1
Energy Harvesting Module	1	LTC3588	MOD1
IR Receiver	1	TSOP4538/IR Receiver LED	IR2
RP2040 Zero Module	1	Microcontroller used for receiver testing	MOD2
5mm LED	1	LED to transmit signal	LED1

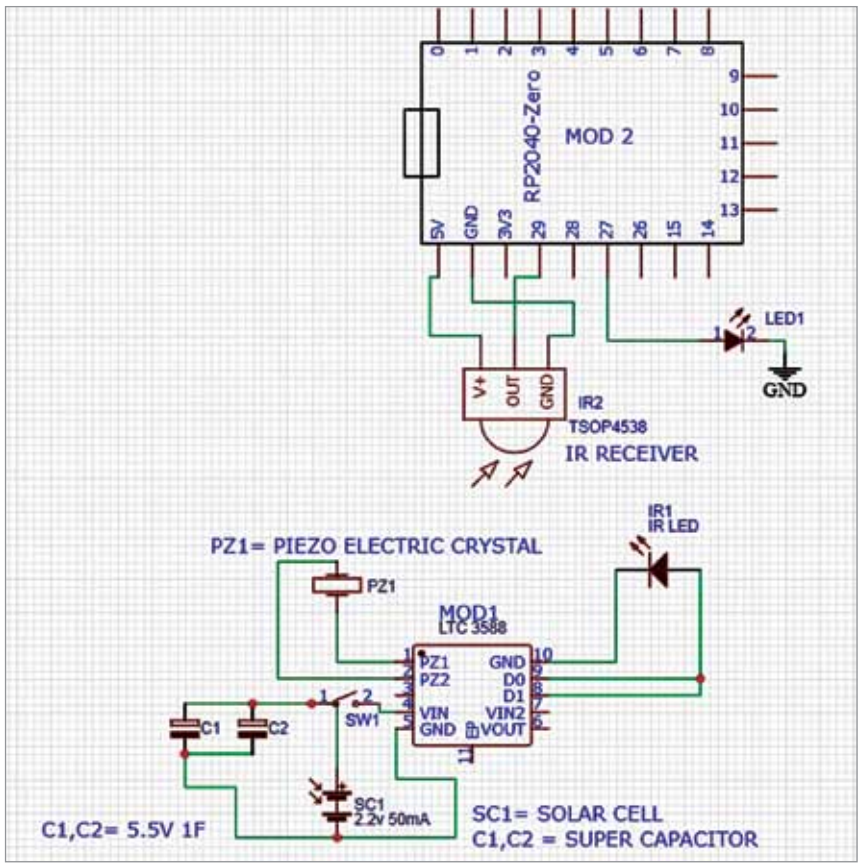

Fig. 3: The receiver section, including transmitter

```
void setup() {
  // initialize the LED pin as an output:
  pinMode(29, 0);
  // initialize the pushbutton pin as an input:
  pinMode(27, 1);
}
void loop() {
  if (analogRead(29)>= 10) {//// you can cahnage the
  //funcrtion or even read the hex value and set
  //the function to be perform when the signal is recived
    digitalWrite(27, HIGH);
  } else {
    digitalWrite(29, LOW);
  }
}
```

Fig. 4: Code for the receiver

(LED1). When the transmitter send the signal through IR1, it is received by IR2 in the receiver. It is necessary to ensure aligment of LED1 and LED2.

The V+, OUT, and GND pins of TSOP4538 are connected to the 5V supply, pin 29, and GND pins of MOD2, respectively. The program in source code, which is shown in Fig. 4, controls the LED. Any other function can also be included in the program for the IR signal received from the IR remote.

The components needed for this project are listed under the Bill of Material table.

The beauty of this project is that the kinetic energy used for pressing a key on the remote is harvested and used to charge the capacitors. This mechanical energy is converted to electric energy by the circuit. A small solar cell is also used to harvest photonic energy from the ambient light in the room.

All of the energy harvested is stored in the super capacitors and the remote uses this stored energy to work. Thus, whenever a switch on the remote is pressed, the electric energy is used to light the IR LED and a signal is given to the receiver to perform the desired function.

Software

The operation of remote receiver circuit can be tested by using the software program, which is written in Arduino programming language Sketch and saved as batteryless.ino. The latest Arduino IDE should be used to compile and upload the program.

During uploading, you need to select the the RP2040 as board in Arduino IDE for compiling and uploading the code shown in Fig. 4.

Construction and testing

After uploading the source code batteryless.ino into MOD1 and assembling the complete circuit of transmitter and recceiver, align the circuit in such a way that IR1 light falls on IR2 (refer Fig. 3) when the piezoelectric crystal is pressed. Please ensure that the solar cell is also connected to the super capacitors to keep them charged.

Working of the circuit is simple. When the piezoelectric crystal is pressed, the generated energy makes the IR LED (IR1) glow, thus sending a signal to the receiver circuit. This signal is received by IR2 in the receiver to perform the function as per the program. Thus, the remote can work for years without any battery.

The remote can be used even in the dark, with a slight press on the piezo element. EFY

EFY Note
The source code of this project is available for free download at *source.efymag.com*

Ashwini Kumar Sinha is a technology enthusiast at EFY

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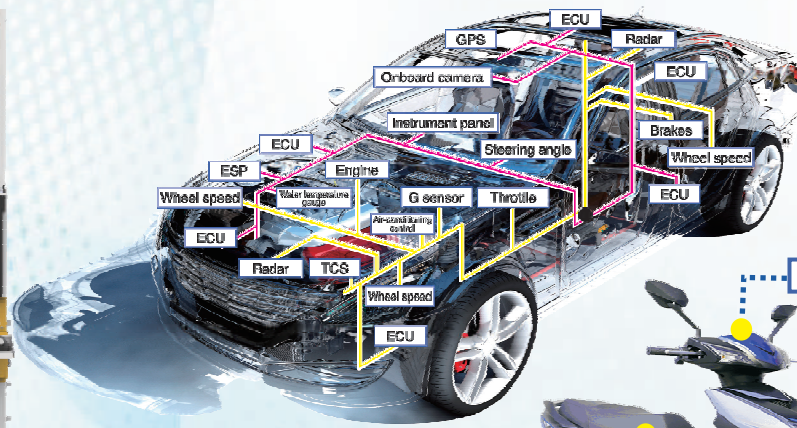

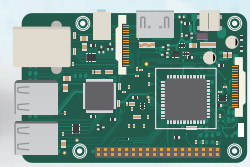

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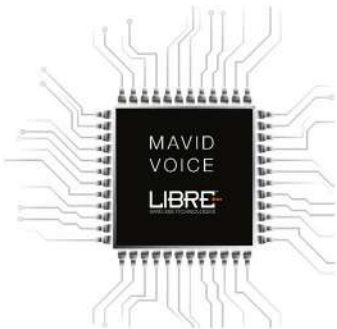

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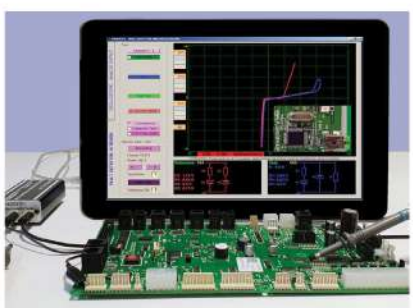

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The products are provided with a hardware interlock feature that can prevent switch operation until the interlock signal is present or return all functional switches to the open position when the signal is removed. The interlock signal can also be connected between modules allowing independent or ganged operation. Uses include but are not limited to disabling relay operation if the test system cabinet door is open.

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The particles may also differ in character – while combustion engines typically encounter hard and abrasive metallic particles, electronic engines can be susceptible to low- and high-conductivity particles. Most particles are generated during the processing of components and assemblies (approx. 80%) and only a fraction (approx. 20%) are due to environmental influences.

When it comes to PCBs, any metallic particles that measure > 200 µm or more present a potential risk of electrical short circuit. If the metallic particles are of a certain length, angle and position, and they land on the PCB in a particular way, they can cause a short circuit. This is what makes it important to find these critical particles and detach them from the PCBs..

Particle contamination has been a growing problem for the automotive industry since the early 1990s, when systems started becoming increasingly complex and installation spaces ever

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https://docs.wiznet.io/Product/Open-Source-Hardware/wizfi360-evb-pico

SDK • C/C++ • MicroPython • CircuitPython

WIZnet will be holding a design contest in June and offer free samples to our participants to encourage the advancement of IoT ecosystem and to coexist with other vendors. While the focus of the last contest was ethernet functionality, this upcoming contest will primarily focus on Wi-Fi functionality featuring our WizFi360 products. WizFi360 is registered as Arm's official shield for Open-CMSIS-Pack and is officially registered and used on various platforms such as Azure Certified. WizFi360 supports AWS AT Command as well as AWS SDK, and also supports various development environments, such as Arduino, C/C++, Python, Free-RTOS, and more.

More details at:
maker.wiznet.io

Contact:
muralidharan@wiznet.io

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