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NOVEMBER/DECEMBER 2022

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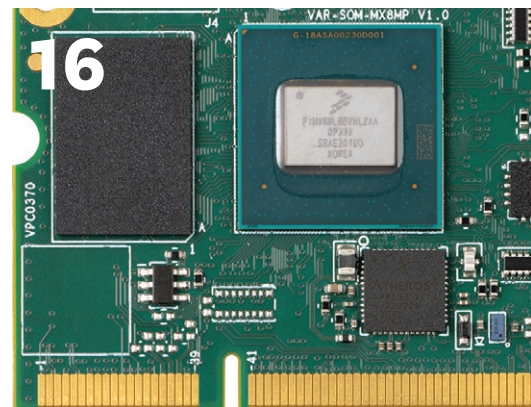
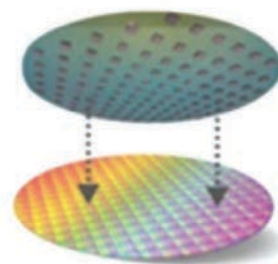
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SOM OR CHIP DOWN DESIGN?

System on modules or chip-down design? SoM makers offer enough features and interfaces to meet most market needs.

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Medical wearables go hand-in-hand



As consumers, we are acutely aware that new and more advanced tech devices continue to be spawned in the wearable design category each year. Often, the goal of these new products is to simplify our daily activities. Interestingly, wearable electronics are no longer represented by just smartwatches and fitness trackers that can measure your heart rate. The past two years of wrestling with a global pandemic has fast-tracked a lot of design activity in the medical space - expediting wearable tech adoption and heightened the role it plays in healthcare.

Consumer acceptance of these products continues to skyrocket, as these devices not only help keep their owners fit, they also notify them of potential medical emergencies

Mind you, the use of wearables was already on the rise, as Canadians gravitate to the idea of monitoring their own health. Today, consumer acceptance of these products continues to skyrocket, as these devices not only help keep their owners fit, they also notify them of potential medical emergencies and offer valuable physiological insights to help prevent disease.

They can estimate blood pressure, body temperature, heart rate and respiration of the aged and indicate risks such as declining health, worsening diseases and other threatening situations like- increased blood pressure or problem with respiration, etc.

Fitness vs medical

As designers know, medical wearables are not defined by the same

parameters as fitness products like FitBit or Apple Watch. Medical devices are represented by a more regulated industry. Some of these devices may even be prescribed by a medical physician - such as glucose monitors, heart monitors, or on-body infusion pumps. These units deliver fluids, such as nutrients and medications, into a patient's body in controlled amounts. Infusion pumps are widely used in clinical settings such as hospitals, nursing homes, and in the home.

Most importantly, these devices are being designed for the patient's safety, comfort and quality of life. Lest we forget that the engineering teams behind the development of these types of specialized medical devices are

faced with some unique challenges. Atop the list of considerations is 'environment of use' - recognizing that the device will be exposed to heat, sun, sweat, along with the cold of winter. Designers must also be aware of what other products that medical device interacting with? Is it a standalone unit, or used in conjunction with three or four different products? Where is it stored when it is not in use? How is it charged if it is a wearable? How is it filled - if it is dispensing medication? How will the device user-interface work? Essentially, this boils down to a long list of questions that needs to be answered through direct consideration of the user, or open dialogue with a group of end-users (i.e. patients or caregivers).

Other considerations

It is important to determine in advance if the device should be completely disposable or reusable. Will it have consumable parts? Should it be refurbished? If so, what is the protocol for collecting the used devices? It's important to note that designers connect with adhesives suppliers early in the design process to source the right product. There is no such thing as a 'miracle go-to adhesive' suitable for all skin-worn devices. Different adhesives (such as acrylic, silicone, hydro-colloid, or synthetic base rubber) have different characteristics appropriate for different uses. Design teams must also be sure that all components that have direct or indirect contact with skin are biocompatible.

Incorporating conductive materials into wearable technology is a simple concept. However, it has led to a vast variety of wearables sensors including wet electrodes stuck on the skin to measure the heart, dry electrodes in headphones to analyze brain signals, and microneedles within skin patches to quantify muscle movements. As such, this also creates a broad application space for electrodes ranging from vital sign monitoring and sleep analysis for healthcare.

The good news is, Canada continues to make strides in this segment, as illustrated by ventureLAB, which announced its plans to establish a MedTech-specific stream within its Hardware Catalyst Initiative (HCI), an Ontario-based lab and incubator for hardware and semiconductor companies. Besides, in order to be ready for the next health emergency, we need to start building the foundation now. **EP&T**

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NEWSWATCH

FLEXIBLE ELECTRONICS

VOLTERA UNVEILS PRINTER FOR SOFT, STRETCHABLE ELECTRONICS

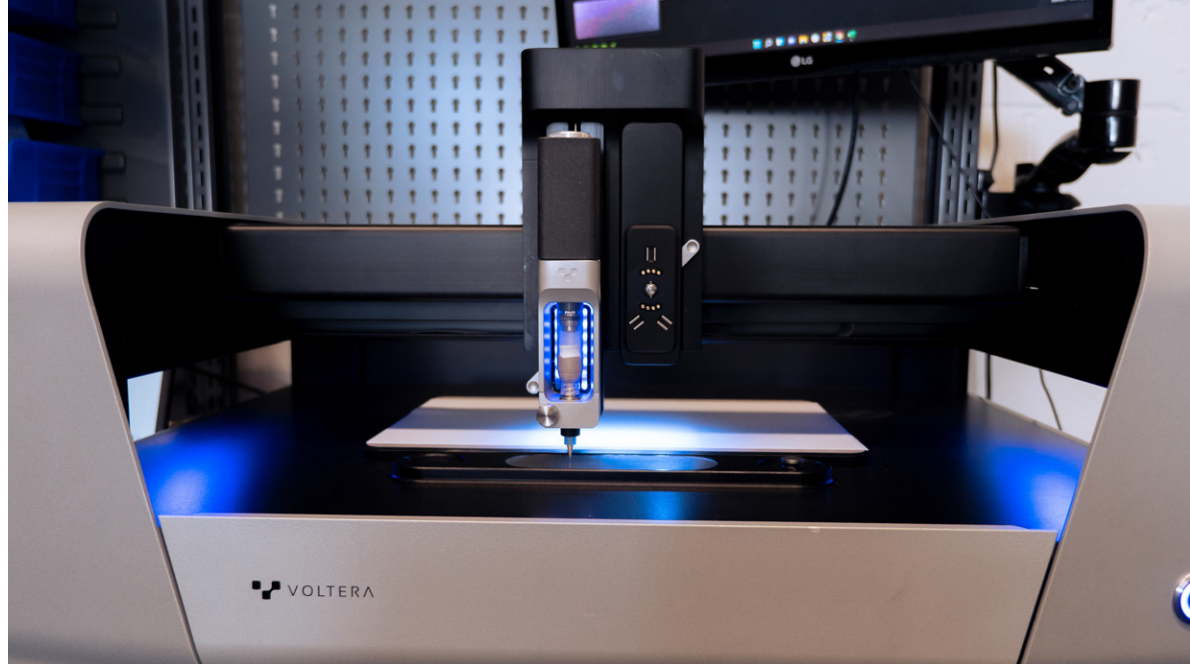
Voltera, a Kitchener-based manufacturer of additive and printed electronics technology, has launched NOVA, a ground-breaking manufacturing platform for printing flexible hybrid electronics. NOVA uses direct-write technology to print circuits on soft, stretchable surfaces.

"This first-of-its-kind benchtop machine unlocks rapid flexible hybrid electronics prototyping and the ability to experiment with custom inks and a wide variety of substrates," said Alroy Almeida, CEO and co-founder of Voltera.

NOVA's precision extrusion technology makes it easier and faster to conduct research and develop the products of the future by enabling rapid benchtop iteration, leading to more reliable results, faster development times, and lower costs.

"With NOVA, we can make devices and align them to sub 10-micron precision, which is essential to everything that we do," said Alex Kashkin, graduate researcher, Velasquez Group at MIT, who is using NOVA to develop printed electron sources for neutralizing ionic thruster plumes in low-earth orbit. "If we have a 20-micron deviation, our devices explode. We need a lot of precision, we need to have tuned materials, and NOVA enables both."

As a direct-write, digital printer, NOVA enables innovation without



Voltera recently launched NOVA, a manufacturing platform for printing flexible hybrid electronics.

requiring the tooling and high costs associated with screen printing. This allows for rapid design iteration while offering higher performance than other additive prototyping options, such as inkjet. It is also environmentally friendly, as there is significantly less waste and material contamination, and NOVA can print circuits on eco-friendly materials, such as biodegradable substrates.

WIRELESS

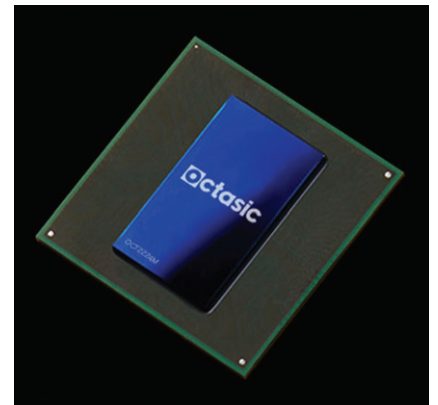
OCTASIC SET TO GROW IN CUSTOM 5G/4G WIRELESS SPACE

Octasic, a Montreal-based manufacturer of programmable silicon for mission-critical custom wireless applications, has unveiled its new corporate branding that better reflects the company's 24-years of industry expertise and its vision to become a leader in the creation of

the most advanced custom wireless solutions across the commercial, government, and defence markets.

Octasic enables both enterprise and government clients to go beyond commercial applications and build a myriad of customized base station, user-equipment (UE), and software-defined radio (SDR)-based systems deployed for numerous private network environments, including

Octasic OCT2224M System-on-Chip (SoC) is built to perform high-density media processing at a fraction of the power of competing parts.

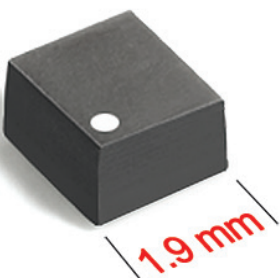


Photos: Voltera; Octasic



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NEWSWATCH

Industrial IoT, Non-Terrestrial Networks, tactical, automated warehouses, and autonomous mobile robots.

Octasic works with global technology innovators such as Capgemini and Radisys. Cambridge Consultants, part of Capgemini Group, has developed custom full-scale systems delivering breakthrough performance, tailored for specific mission critical communication and IIOT (Industrial Internet of Things) applications.



MIOVISION ACQUIRES RAPID FLOW

Miovision, a Kitchener-based firm that helps cities modernize their approach to traffic management using artificial intelligence and advanced analytics, has acquired Pittsburgh-based Rapid Flow Technologies.

Rapid Flow is the market's technology leader in adaptive traffic signal control, which uses real-time traffic data to optimize signal timing, adapting to real-world conditions. The firm's Surtrac adaptive traffic signal control system can support all traffic signal controller types to optimize traffic signal timing, second by second, while accounting for all modes of travel, keeping vehicles, cyclists, pedestrians, and transit moving and safe.

"Not only does this add an industry-leading adaptive control product to our existing platform capabilities, but also adds the passionate team of people who developed it to Miovision's world-class engineering team," said Miovision CEO Kurtis McBride.

ERICSSON PARTNERS WITH MONTREAL UNIVERSITIES ON 5G & AI

Ericsson Canada has achieved a strategic research program led by École de technologie supérieure (ÉTS), in partnership with Concordia University, Polytechnique Montréal and Environment and Climate Change

Ericsson has partnered on 5G and AI with École de technologie supérieure in partnership with Concordia University in Montreal.

Miovision Scout is a portable video-based data collector that collects verifiable, multimodal traffic data.



Canada (ECCC), to explore how Artificial Intelligence (AI) can help the telecommunications sector minimize the energy consumption of 5G networks. The project aims to help communication service providers shrink their carbon footprint and reduce operational costs by saving on energy, which will, in turn, help lower costs for consumers and decrease harmful emissions.

"5G networks are the technological backbone of our society and they represent an opportunity to digitalize industries and significantly reduce global CO2 emissions," Erik Ekudén, senior VP & chief technology officer at Ericsson. "Under the focused guidance of our partners and with the help of Ericsson experts in Montreal, our researchers will test and refine solutions to make 5G & beyond technologies smarter, more energy-efficient."

NOKIA TRANSFORMING OTTAWA FACILITY INTO TECH HUB

Backed by \$72-million in funding by three levels of government, Nokia Canada, plans to turn the company's Ottawa facility into a research and development technology centre.

Nokia says the \$340 million project will transform its 26-acre campus at the Kanata North Business Park into a mixed-use corporate, residential and commercial hub. Nokia says the tech hub will significantly expand its capacity in 5G, cyber security, artificial intelligence and machine learning.

The federal government says the announcement is a step toward strengthening Canada's wireless network and will help pave the way for new opportunities in the areas of clean energy, smart cities, precision agriculture, autonomous vehicles, and advanced telemedicine.

Nokia says it plans to begin site construction in 2023 and expects to open the new facility in 2026.

PRODUCTION

ARBELL TO REPRESENT KURTZ ERSA STENCIL PRINTERS IN CANADA

Kurtz Ersa Inc., a leading supplier of electronics production equipment,

has appointed Arbell Electronics as manufacturers' representative in Canada for its line of VersaPrint stencil printers.

The stencil printers provide fully integrated 100% 3D SPI, while delivering error detection before they appear through stencil inspection, zero reference measurement of the unprinted pcb and the inspection of complex pcbs directly after the printing process.

"VersaPrint devices have long since outgrown the status of being only a simple printer and have transformed themselves into full-fledged multifunctional systems," says Lee Wise, president of Arbell Electronics.



Ersa's VersaPrint stencil printers provide fully integrated 100% 3D SPI.

ENGINEERING

WÜRTH ELEKTRONIK JOINS CELUS ENGINEERING PLATFORM

Global manufacturer of electronic and electromechanical components Würth Elektronik has signed up to become a component partner to the CELUS Engineering Platform - a leading provider of cloud-based electronics engineering automation software.

The two companies will collaborate to integrate Würth Elektronik components into the CELUS component database.


CELUS' digital ecosystem provides business advantages to component manufacturers like Würth, enabling the part maker to reach the end-customers by sharing application knowledge and enriched product information. **EP&T**

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Navigating a global chip shortage

Firms must be more vigilant than ever when securing the parts they need

BY AARON NURSEY, FOUNDER, CEO & PRESIDENT, DIRECT COMPONENTS INC.

 The past two years have brought a unique set of challenges to businesses of all shapes and sizes. Supply chain issues have plagued industries around the globe, and manufacturers and suppliers have had to struggle to keep goods flowing. The microchip industry has been no exception to the recent turmoil, and with a worldwide shortage of integrated circuits (ICs), manufacturers have had to scramble to keep assembly lines moving.

While the phrase 'chip shortage' may seem daunting, there has always been shortages of chips and electronic components. This does not take away from the severity of the current shortage, but the fact is that there has never been a free flow of parts. The reason why certified Independent Stocking Distributors (ISDs) exist is because they help firms secure hard-to-find parts - not readily available.

It's times like these when companies must be more vigilant than ever when securing the parts they need. As the supply chain has staggered over the past

couple years and OCMs have been unable to fulfill just-in-time orders, many OEMs are turning to the open market for the first time to purchase valuable parts. While the open market is a great alternative to OCMs and franchise distributors, buyers should always proceed with caution.

There have always been fake parts on the open market, but it has nearly tripled in the past year, as counterfeiters have seized this opportunity. The problem with counterfeit parts is that they sometimes work. When these parts don't work, designers have wasted money. But, when counterfeit parts work, OEMs run the risk of selling a product that will malfunction soon after it is purchased. When dealing with mission critical or life-saving equipment, the consequences can be catastrophic.

As companies venture into the open market to find the parts they need, there are several things they must keep in mind to ensure they minimize risk:

1) Know your options: When buying from the open market, you will have plenty of

options, but not all are created equal. Open market options range from ebay, to brokers, or to certified ISDs.

2) Know your certifications: Just because an ISD can point to a certification on the wall, your vetting work is not necessarily done. Seek out ISDs who are certified by respected auditors like NQA which have rigorous and high standards for the companies that they certify. You want to make sure that the parts you buy have undergone a rigorous testing process to ensure fit, form and function.

3) Know your price: Price isn't everything, but price matters. Know your purchase price variance and how much you can afford to pay for your parts. In this market, it is not uncommon to pay 10 or even 100 times the standard price for chips. Depending on your application, this may or may not be possible.

People ask me all the time when I think the current chip crisis will be over. While I cannot tell the future, I will say I am hopeful. This shortage will not last forever, but it will most likely



not get better all at once. Some things will get better, but some things may still get worse. While there will be relief in sight for some, it will most likely be at the commodity level, for example, DRAM ICs may start to come out of the factory quicker than they are now. That said, there are always unknown factors around the corner. Most recently, the war in Ukraine ignited a neon gas shortage, which threatens chip production due to the use of neon in a chip production process known as lithography. **EP&T** <https://www.directics.com/>

Aaron Nursey is founder & CEO/president of Direct Components Inc., an obsolete components distributor.



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Wearable robot aims to free patients from wheelchairs

BC-based Human in Motion Robotics awarded \$663K contract by ISC

BY SOHAIL KAMAL, WEST COAST CORRESPONDENT

Human in Motion Robotics Inc. (HMR) is a Vancouver-based developer of a next generation wearable lower-limb exoskeleton called XoMotion. Designed to revolutionize robotic rehabilitation, the medical unit supports physical therapy in order to get people out of wheelchairs and walking again with full mobility and independence.

XoMotion also provides advanced articulation and superior joint range of motion, allowing for natural walking, self-balancing and independent use.

West Tech Report recently had the opportunity to chat with company co-founder and CEO Siamak Arzanpour about the firm's recent contract with the Canadian Federal Government - why they started the company, and how their solutions will help people get out of wheelchairs.

HMR was also recently awarded a \$663,000 contract by Innovative Solutions Canada (ISC) for the Department of National Defence Canada (DND). The contract is for the Canadian government to purchase two XoMotion units.

"HMR's patented and disruptive medical technology offers a dramatic improvement in mobility challenged persons' rehabilitation in clinics or daily living at home with a host of distinguishing and innovative features," explains Arzanpour.

"It is essentially a self-balancing bipedal robot capable of hands-free dynamic walking and other complex maneuvers for daily use for mobility-impaired people. For people with motion disabilities, it is not their destiny to sit in a chair for the rest of their lives. It's almost a social justice issue."

The impetus for starting the company came from an 'Abilities Expo', which showcased mobility products. The founder witnessed the excitement of wheelchair users, especially



B.C. fashion designer Chloe Angus (left) helped advise Human in Motion Robotics Inc. co-founder & CEO Siamak Arzanpour in the design of XoMotion next gen exoskeleton.

"when they saw one of their own stand up and walk," says Arzanpour. HMR today is the result of more than a decade of research and development in the area of robotic systems and design of related sophisticated mechanisms by the HMR co-founders.

"I began to take note of the significant limitations of the existing technology, most specifically the single motion of walking forward that it supports and the requirement for arm support including walkers, canes, and crutches," says Arzanpour.

He was convinced there was a better approach and subsequently contacted a colleague, Dr. Edward Park, who had recently

published a scientific journal article about self-balancing exoskeletons.

Together, with support from Simon Fraser University (SFU), they incorporated HMR to develop the next-generation exoskeleton that would remove the need for arm supports, remove the need for a person to be alongside or behind the exoskeleton user, and provide a natural human gait.

One early example of product success came by way of a local fashion designer, Chloe Angus, who was told in 2015 that she would never walk again. Refusing to accept this answer, Angus met with HMR first at SFU.

When it was explained to her that they were developing the next-generation exoskeleton that would overcome the limitations of prior iterations she had tested, she agreed to join as an advisor to HMR. Her goal was to ensure that what was being developed would be directly applicable to those with lower-limb paralysis similar to her situation.

At present HMR is focused on two new product lines: XoMotion-R for rehabilitation and XoMotion-P adapted for personal and home use.

The target customers for the XoMotion-R will be institutions like hospitals and rehabilitation centres whereas the XoMotion-P will be marketed to consumers and end users. The engineering behind these products is complex.

"It has 12 motors that are working synchronously together to generate stable and natural gaits. The brain of the robot should generate commands for the motors and the motors should execute them in milliseconds, otherwise, the robot will not walk smoothly and it may fall," says Arzanpour.

All the components of this robot including the motors are designed by the HMR team, which resulted in a sleek product, appealing to end-users. HMR also custom designs its batteries and chargers for the robots, and worked with manufacturers to cut weight on the device and minimize charging time.

The contract with the federal government will lead to the delivery of the XoMotion-R to a clinical testing site at the Queen Elizabeth Hospital in Charlottetown, Prince Edward Island. **EP&T** www.humaninmotion.ca



Sohail Kamal is EP&T's West Coast correspondent. sohail@nextgear.ca

Photo source: Human in Motion Robotics Inc.

Is graphene green? There's no simple answer

Questions raised as the industry enters next phase of commercial journey

BY IDTECHEX, CAMBRIDGE, UK



Is Graphene Green? This question comes up an increasing amount.

Green drivers and ESG investments are an obvious focus across the supply chain, but where does graphene fit into this discussion? The short answer - no. As assessed by IDTechEx in a recent report, the capacity for graphene easily exceeds 12,000 tpa. Nearly all of this comes from a graphite feedstock and uses a top-down approach, with liquid phase exfoliation and oxidation-reduction being dominant. Each process will have a different impact, given the energy efficiency, water requirements, and chemicals used, but given the feedstock and general approach, IDTechEx does not think it is possible to call graphene a 'green material'. The long answer might be no, BUT... Despite the above, there are several arguments to be made for graphene's green credentials.

1. A lower carbon footprint and lower loading than incumbent additives. This has been claimed by some companies, in which they state that against their petrochemical counterparts, such as carbon black, they have a lower CO₂ footprint per tonne, and the higher performance results in lower loading.

2. Can alternative feedstocks be used? This is a growing trend with several companies emerging to utilize waste, by-products, or renewable materials, and in several cases, coupling this with hydrogen production. Most of these are at an early stage in their commercial journey and will face challenges with the business model and product consistency, but it is certainly an area to watch as they promote their green solution.

3. Can graphene be an enabling solution for sustainability? Sustainability is a key driver across many sectors and as pressure increases so will the need, this has presented an opportunity for graphene adoption.

Graphene is just one option

Firstly, and most obviously, lithium-ion batteries are the major part of a booming energy storage market. Graphene plays a minimal role in this



CO₂

Some firms state they have a lower carbon footprint than their petrochemical counterparts - such as carbon black, they have a lower CO₂ footprint per tonne, and the higher performance results in lower loading.

sector to date, but looking to the next generation of LiBs, silicon anodes will see significant adoption, and graphene is demonstrating itself as a potential enabling solution; before everyone gets too excited, it should be noted that graphene is just one option in an exceptionally competitive and well-funded field.

There are lots of other energy storage areas graphene is active in, but none with the same potential, this includes Li-S (struggling technology), lead acid batteries (limited growth), Al-ion (early stage), and supercapacitors (growing niche). Green polymers are a key topic that ranges from packaging to pipelines. Both recycled plastics and bioplastics have a consistent challenge with their mechanical performance vs the virgin incumbent material.

Graphene has been explored as an additive here, and if adopted gives the potential for very high volumes, this is being explored by many in the field, but it is not straightforward with the production process and price of the upmost priority. The current graphene hype is all about concrete, which is under pressure to reduce their well-documented emission problem.


The potential for nanocarbons to improve the performance and crucially reduce the cement requirement has been known for a long time but has

recently gained significant traction with more studies and demonstrations.

Many graphene manufacturers see this as the industry's killer application and are positioning their business accordingly. The potential sales volume is, of course, enormous but this is a very conservative industry with very fine margins to contend with. If the orders do arrive, they will initially be for very specific use-cases, and if this expands, another question is who will have sufficient capacity, many talk of easily scaling their process, but that does not happen overnight. There are several other applications for graphene with environmental drivers, including filtration membranes, sustainable electronics, and replacing toxic additives. Each market landscape is different and at various stages of graphene commercialization.

As seen, the answer to whether graphene is green is more nuanced than it may appear. It is a question that will continue to circulate for many years as the graphene industry enters the next phase of its commercial journey. **EP&T**

<https://www.idtechex.com/en/research-report/graphene-market-and-2d-materials-assessment-2023-2033/878>

 Click here to see a copy of IDTechEx's report: Graphene Market & 2D Materials

Alive & ticking

Wearables go beyond fitness

BY THOMAS SODERHOLM, NORDIC SEMICONDUCTOR



When 45-year-old Florida resident Jason Saucier woke up feeling unwell he did as many of us did before the pandemic, brushed it off as nothing serious and went to work. When he later put on his Apple Watch it started making a sound he had never heard before. On looking at his smartwatch it told him he was in ‘aFib’ or atrial fibrillation, a type of heart condition that can increase your risk of stroke and other serious heart complications. Saucier wisely decided to head to the emergency room at his local hospital where the doctors confirmed what his smartwatch had been urgently trying to tell him – he was close to going into cardiac arrest.

Saucier is not alone. With an estimated 325-million people using wearables worldwide, you don’t have to look far to find other examples of wearable technology that has saved lives. Be it smartwatches notifying emergency services when their fall detection sensor is triggered, or electrocardiogram (ECG) functionality detecting an irregular heart rhythm, increasingly powerful wearables have evolved from the activity trackers and calorie counters of a decade ago. Today, these devices not only help keep their owners fit, they also notify them of potential medical emergencies and offer valuable physiological insights to help prevent disease.

Live long and prosper

Beyond consumer demand, other factors have also converged to drive the development and uptake of increasingly sophisticated wearables, not least COVID-19. The pandemic and the stress it placed on global healthcare systems saw the fast-tracking of countless IoT-based devices and ‘ehealth’ wearables. The U.S. Food and Drug Administration (FDA)—responsible for ensuring

the safety and efficacy of medical devices in the country grappled with how to regulate the new technology that blurred the lines between consumer gadget and medical device, but at the same time had the potential to reshape how the healthcare system managed the COVID-19 crisis. Ultimately the pandemic forced a rethink.

In March 2020 the FDA issued a new policy allowing manufacturers of certain FDA-cleared, non-invasive, vital sign-measuring devices to expand their use so health care providers could use them to monitor patients remotely, including wearables that measure body temperature, respiratory rate, heart rate and blood pressure.

Used remotely at home, these devices can help health care providers access information about a patient’s vital signs, reducing the need for hospital visits. Such devices provided a key early warning system about the likelihood of COVID-19 infection by monitoring an individual’s physiological data such as blood oxygen saturation, respiratory rate, heart rate and temperature. At the same time the devices used AI and deep learning for infection surveillance in different scenarios from screening to contact tracing. The FDA’s seal of approval, while welcome, came too late for some.

“If health systems had accelerated the adoption of [wearable] technology available over the past few years, the magnitude of the current pandemic would likely have been much less severe,” said Asma Channa, an early stage researcher from the Polytechnic University of Bucharest, in a paper titled *The Rise of Wearable Devices during the COVID-19 Pandemic*. “The potential of wearables in healthcare is enormous ... [but] wearables must have multifunctional capabilities and be easily configurable.”



Warmie Sensor’s wireless system provides continuous body monitoring.

Transforming healthcare

While the SARS-CoV-2 virus has helped accelerate the development of multifunction wearables, they are now equally playing a vital role in the prevention and management of a host of other diseases from the physiological—diabetes, hypertension and sleep apnea, for example—to neuro-cognitive disorders such as Parkinson’s disease and Alzheimer’s. They are also proving their worth for drug delivery applications.

In so doing they are driving a transition in healthcare from a conventional doctor-patient relationship, where diagnosis and treatment was previously based on a fragmented medical history and medical records, to a digitally mediated consumer-led model. That latter model makes it possible to generate rich data sets that enable health providers to offer more personalized health decisions, make earlier diagnoses, perform remote patient tracking and ensure prescription adherence.

The medical profession is largely in favour of the potential of wearables for patient care but advise caution, particularly if the onus will be on physicians to sort through the massive amount of data the devices collect.

“The engineers have been able to give us all this data and create all these sensors for us,” Dr Mohamed Elshazly, a cardiac electrophysiologist at the Cleveland Clinic told *The Verge*. “Now it’s up to us to analyse that data and figure out how to make clinical sense of it.” To do so, Dr Eric Topol and Lionel Tarrasenko, a biomedical engineer known for developing early-warning systems



Warmie produces medical grade wearable wireless temperature sensors.

in critical care, said medicine needed to take a lesson from the aviation industry.

Writing in the international peer-reviewed medical journal, *JAMA*, the pair said jet engines with 100,000 individual parts are monitored constantly with readings taken on temperature, pressures, shaft speeds and vibrations. Machine learning (ML) is used to detect when readings veer from established patterns and produce early warnings that unscheduled maintenance is needed.

“The full potential of health monitoring for people will only be realized when individualized models underpin the monitoring algorithms,” the authors wrote. “Prospective validation that it promotes health, rather than exacerbates false alarms, will be vital.”

Wearable AI & ML

While they may not be able to supervise a modern jet engine, the SoCs and SiPs that power the latest generation of advanced wearables are well equipped to

oversee the requirements of even the most sophisticated medical wearables. This includes support for the ML algorithms that will be needed to sift huge volumes of data for signs that things are going wrong.

“Computing on edge devices such as wearables is getting progressively more energy efficient and powerful while algorithms are more streamlined and energy optimized,” says Petter Myhre, Nordic’s head of product marketing. Myhre says that in the future these developments will allow high-end SoCs and SiPs running ML routines to rapidly establish data anomalies that could indicate underlying health issues. In so doing, the chips have the potential to allow wearable developers to explore ways to selectively provide doctors with just the information they need to make rapid clinical decisions.

Making sense of big data

Developers are already taking heed. In response to the pandemic, Polish medical start-up Warmie developed a battery-powered, medical grade wearable wireless temperature sensor. The device is designed to rapidly detect changes in body temperature, providing localized continuous temperature and infection monitoring of post-operative surgical wounds in and out of hospital. It is designed to be easily integrated into other telemedicine systems so the body temperature of many patients can be reviewed simultaneously from a single web-based dashboard, without having to attend to the patient in person.

“Because temperature measurements are traditionally taken manually several times a day, they often miss critical changes that can signify an infection,” says Warmie’s Professor Tomasz Banasiewicz, M.D. PhD. “And, infections left untreated can quickly become more widespread within the body and thus much harder to treat.”

The Warmie Sensor is powered by Nordic Semiconductor’s nRF52810 SoC and its 64 MHz, 32-bit Arm Cortex-M4 processor that enables the device to not only record single-point temperature measurements but also evaluate patterns of temperature

changes that can be spread over several parts of the body, and alert clinicians or users of potential health risks.

“Body temperature changes throughout the day ... so it is more accurate to assess many time series measurements and perform pattern recognition in comparison to an individual patient’s baseline,” continues Banasiewicz.

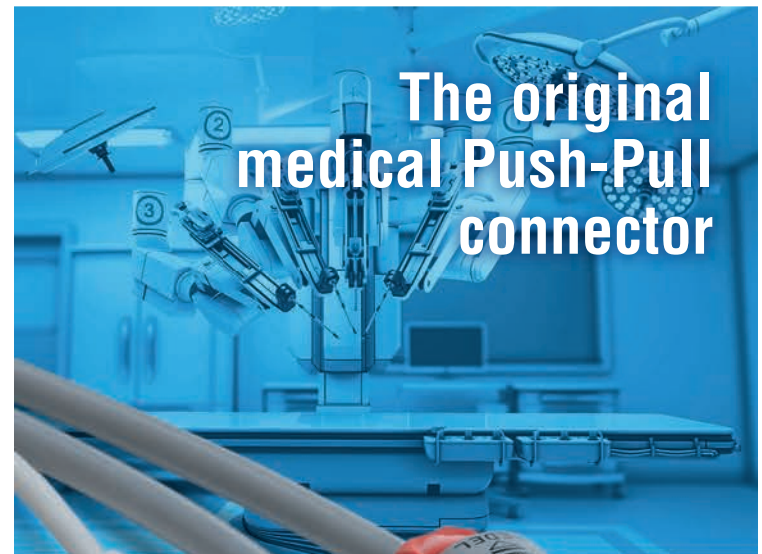
Another company developing wearable products that offer benefits to both the medical sector and consumers is Norwegian tech manufacturer, AppSens. The company’s ECG247 Smart Heart Sensor is a wearable ECG heart monitor designed to detect atrial fibrillation and other cardiac arrhythmias. Medical professionals can use the platform to remotely monitor and screen people who are at increased risk of stroke due to heart rhythm disorders or who have symptoms of rhythm disorders such as palpitations or fast heart rate. The solution can also be used by patients to self-test their own heart health, including during exercise or activity.

The device consists of a disposable electrode-patch to fasten the sensor to the patient’s chest and a reusable electronic component to achieve reliable electrical connection for the measurement of ECG signals. The integrated SoC’s processor not only supervises the wearable’s integrated sensors but also supports the complex computations necessary to run the proprietary algorithms for measuring and analysing the heart’s electrical activity.

As wireless wearables transition to multifunction medical solutions, their ability to further disrupt healthcare will in part depend on the AI, ML, augmented reality and big data capabilities of the tiny chips inside, as well as the FDA’s willingness to accept their role in a highly regulated sector. When this happens, researchers claim, the next step for wearables will be to provide the healthcare system with a value-added emphasis on diagnosis, treatment, tracking and prevention. **EP&T**

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Professor Tomasz Banasiewicz, M.D. PhD provides technical supervision to Warmie.



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MedTech Check-up

Design safe and reliable electronic personal care products

BY PRASAD TAWADE, STRATEGIC MARKETING MANAGER, LITTELFUSE INC.

Global health and well-being awareness drive the strong market growth of devices such as electric toothbrushes, electric shavers, epilators, and other innovative products. Electronics, sensors, and battery technology advancements have allowed personal care products to become more intelligent, smaller, and battery-powered. As a result, the personal care electrical appliances market is projected to double in relevancy by 2031 with a compound annual growth rate of 7%. The latest innovations will incorporate AI technologies, real-time monitoring, data storage, and connectivity for information transfer to mobile devices.

The challenge for designers will be adding advanced features to their new products while minimizing product size and power consumption. In addition, the latest rechargeable Li-ion batteries and fast wireless recharging technologies add to the list of essential design criteria.

Furthermore, designers must ensure the safety and reliability of their products. This article provides designers with solutions for making their new products robust to electrical hazards and more efficient for reducing power consumption while enabling them to minimize product size. The article also helps designers reduce the time to market by informing them of the applicable safety standards to which their products must conform to avoid time-consuming, expensive compliance re-testing.

Protection design example: Electric toothbrush

While these recommendations can apply to any personal care and healthcare product, the electric toothbrush will be the product used to illustrate



Diversity of personal care and healthcare products with similar electronic architecture.

solutions for making a safe, reliable, and efficient design. Figure 2 presents an electric toothbrush showing the main electrical and electronic components. This example uses wireless charging to recharge the battery behind the printed circuit board (PCB).

Protecting from current overloads, voltage transients, battery failure

Wireless Charger protection
The Wireless Charger interfaces with the AC power line, which has the capacity to deliver a large amount of current. A short in the primary coil inside the charger can cause a significant current overload. A time delay fuse with an appropriate current rating

will protect the coil while avoiding nuisance interruptions due to inrush coil current. Ensure the fuse's voltage rating equals or exceeds the peak line voltage. The fuse should have an interrupting rating exceeding the maximum possible short circuit current so that the fuse will open under the worst-case current overload condition. A small fuse will help to minimize the size of the wireless charger. Of most importance for components connected to the AC line, use a fuse certified to UL/CSA 248, Standard for Low Voltage Fuses.

Battery protection

Ensuring battery safety is critical for designers of personal care

products. Protecting the battery from a short circuit or another overload condition requires either a fuse or a polymer positive temperature coefficient (PPTC) resettable fuse. Consider a fast-acting, surface-mount fuse for use in space-constrained personal care healthcare devices when choosing a fuse. Packaging can be as small as an 0603 size. The PPTC fuse option avoids fuse replacement requirements after a short circuit or other overcurrent events.

Keeping any voltage transient away from the battery will reduce the risk of battery breakdown due to an overvoltage. Lithium batteries are susceptible to punch-through from a high voltage strike. A transient voltage suppressor (TVS) diode can provide transient protection for the battery. Look for models of TVS diodes with safe absorption of:

- Electrostatic discharge (ESD) strikes as high as 30 kV, either from human contact or through the air (reference IEC 61000-4-2, Electromagnetic compatibility (EMC) testing and measurement techniques),
- Up to 400W from a peak pulse 10/1000 μ s waveform, and
- Up to 60 A of peak surge current.

TVS diodes respond to a transient in an extremely fast time of under 1 ps. They are also available in uni-directional or bi-directional models. Also, surface mount models are available. Figure 4 shows schematics of the bi-directional and uni-directional models and illustrates how a

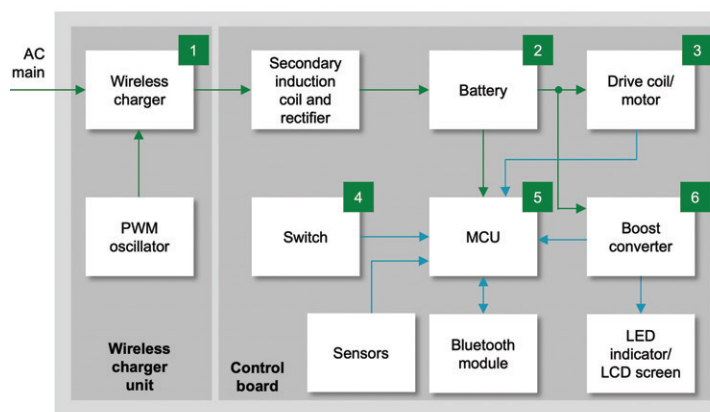


Figure 2: Electric toothbrush's block diagram and the recommended components for protection and efficiency. The adjacent table lists the component types recommended for protecting the product (and the user) while maximizing product efficiency.

	Technology	Series
1	UL, IEC listed AC fuse	Axial/Radial (875) TR/TE (389)
	PPTC	0805L, 1210L
2	Fuse	494
	TVS Diode	P4SMA12A
3	NTC	KR
	PPTC	0805L, 1210L
4	Switch	PTS815, KMS
	MCU	S3F8S15, S3F8S19, S3F8S24, S3F8S28, S3F8S35, Z8F1625
6	PPTC	0805L, 1210L

TVS diode responds to a voltage transient by clamping the peak voltage. Select a TVS diode with a version whose clamping voltage is sufficiently low to avoid damage to the battery.

Monitoring battery temperature is another critical function for ensuring a safe device. A negative temperature coefficient element, a thermistor, with a temperature measurement range of -40 to +125°C, can monitor battery temperature. Miniature surface mount versions facilitate contact with the battery to ensure battery-effective heat transfer to the thermistor. The microcontroller unit (MCU) can monitor the battery temperature and shut down operation if the thermistor detects a fast temperature rise.

Boost converter protection

The Drive Coil/Motor circuit powers the spinning brushes, and the Boost Converter increases the voltage to drive the LED power-on indicator and the LCD screen. Consider

using a resettable, surface-mount PPTC fuse for these two circuits. In the Drive Coil/Motor circuit, the fuse will protect the power MOSFETs from a short in the motor windings. In the Boost Converter, the fuse will protect the circuit and the LCD screen from potential startup inrush current damage. PPTC fuses will enhance the reliability of both these circuits.

Efficient control

The Switch controls the power to the electric toothbrush, chooses the operating function, and selects the brush speed. Look for long-life switches with ratings of at least 50,000 and preferably 100,000 operations. Space-saving surface mount versions are available with reliable and repeatable haptic performance.

The MCU controls the operation of the electric toothbrush. Select a low-power microcontroller to maximize the length of the battery discharge cycle. Models that operate at voltages as low

as 1.8 V and at low speeds, such as 0.5 MHz to minimize power consumption are available. Typically, 8-bit or 16-bit microcontrollers provide acceptable performance for a product like an electric toothbrush. Look for an MCU with ESD resistance and a low power idle mode, like the ZILOG S3 family of microcontrollers. Since a battery powers the MCU, consider models with a low voltage detection mode for safe, controlled shutdown of the toothbrush when the battery voltage reaches a low voltage threshold level. Selecting a small MCU is essential for achieving product size objectives.

Safety standards

Since personal care and health-care products interface with human beings, the product will require compliance to appropriate safety standards. Table 1 lists the applicable standards and describes their scope and the region where the standard applies. Designers should include

compliance standards in their project design goals. Not adhering to the requirements of the standards can result in late-stage re-design and multiple re-test cycles for compliance certification, resulting in unplanned increases in development costs and delays in product introduction.

Protection and efficiency

Designers can provide product protection and optimize their product's efficiency with a small number of components. Furthermore, designers can save development time and reduce the time to market by taking advantage of the component manufacturer's expertise. Component manufacturers can assist with:

- Cost-effective part selection
- Safety standard compliance
- Pre-compliance testing.
- Familiarizing with and using recommended components and techniques to enable the design of a robust, small, low-power product. **EP&T**

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AR display systems are the new reality

MICLEDI seeks to satisfy technical challenges in augmented reality technology



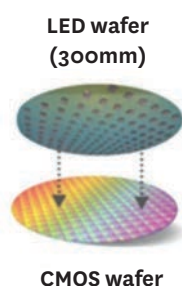
New tech start-up MICLEDI Microdisplays (from IMEC in Belgium) was founded in response to the growing interest in display systems for augmented reality (AR) eyeglasses. With the objective to satisfy technical challenges in the emerging technology, MICLEDI remains focused on the microdisplay module, one of the mission-critical components of AR.

As has occurred with OLEDs for mobile computing and television displays, merging the light source and pixel together into a simplified display subsystem results in a solution for AR glasses that can address the form-factor, design and wearability problems of currently available systems.

One of the most significant values of μ LED solutions is brightness. Brightness of other methods (OLED, LCOS, DLP, others) is too low for transparent lens displays for outdoor use in natural sunlight. μ LED displays can produce between 1 million nits and 10 million nits which can create a vibrant and clearly visible full color image on clear lenses in bright sunlight.

Consumers don't want to look like Darth Vader wearing the digital display "headset" of the future. They demand stylish, attractive and comfortable eyeglasses that can be worn all day, inside and outside. They desire AR glasses that can serve as a combined digital display for the myriad mobile consumer computing, communication, and image capture devices including cell phones, watches, tablets, cameras, drones, and other portable devices. Augmented reality glasses are gradually moving from the bulky and expensive products used in industrial, enterprise and military markets to lightweight, low-power, and price sensitive consumer products.

For this evolution to take place, visual performance is key. Significant progress has been made by industry leaders on the front-end and back-end of the AR glasses system topology. The



Hybrid W2W bonding. LED integration with CMOS.

front-end includes the power/wireless/video-pipeline part of the AR glasses ecosystem. The back-end includes the optical part of the system which receives the light from the display module and projects the images from the emitter onto the retina by way of optical combiner/waveguide technology. The piece in the middle is where remaining challenges exist.

Many companies are betting on microLED displays to solve this middle challenge. Impressive microLED prototypes have been shown in recent years. Some target specifications as well as volume manufacturing still pose challenges. MICLEDI has introduced a μ LED process-flow with backplane integration that is realized in a 300mm CMOS line using standard volume manufacturing equipment. Proof-of-concept validation is achieved with a similar integration scheme as is done for 3D-stacked backside illuminated imager in volume production today.

The main differentiation of μ LED display modules, when compared to other microdisplay technologies, are resolution and brightness. Other parameters, such as power budget, image quality, yield and cost will also influence the integration methodology.

Brightness targets for μ LED display modules for AR glasses based on waveguides, derive from the fact that only 3% or less of photons generated by the display module will reach the eye either being attenuated by projection optics and combiners/waveguides, or wasted to accommodate human factors such as interocular distance differences. This means for outdoor usage in transparent, or clear-lens glasses, 1-10 million nits 'white light' needs to be generated with a similar power budget to a mobile phone display (<1W). The brightness limits of non- μ LED light sources are insufficient for true clear-lens consumer AR.

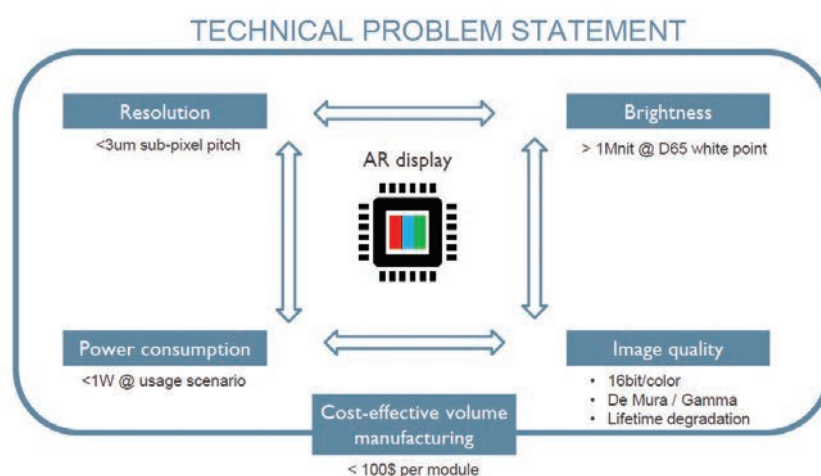
Manufacturability

One of the most significant barriers to adopting μ LED-based microdisplays has been the manufacturability of the display modules. 300mm wafer manufacturing is an enabling part of the solution. This graph illustrates the display size for different pixel pitches including driver and interface circuitry that extends beyond the pixelated active area applying basic assumptions about the backplane ASIC performance in an advanced node (<45nm).

For just a 5 μ m pitch FHD display, the practical limits of reticles size of the exposure tool in an advanced foundry are being approached. This will strongly impact manufacturability and yield. To strike an appropriate compromise, MICLEDI has designed and optimized a μ LED panel for each color: red, green, and blue.

Another challenge is the integration of the μ LED display module to the ASIC backplane. There are many different methods for accomplishing this that are in current use for different types of displays – OLED, LCOS, others.

Diversity of personal care and healthcare products with similar electronic architecture.



This figure illustrates the different approaches. It is MICLEDI's contention that integration of the front and back planes can best be achieved in a self-contained 300mm manufacturing flow using a proven and proprietary hybrid wafer-to-wafer bonding method with devices available for demonstration today.

Since LED starting material is not available in 300mm wafers, and if it were there would be major challenges with wafer stress, bow, and planarity for wafer-to-wafer bonding with the backplane ASIC, it is necessary to reconstitute best-in-class epi material onto a 300mm silicon carrier wafer, which can then proceed through the manufacturing tools available in world-class CMOS fabs. This figure illustrates the re-sizing of GaN epi wafers by dicing and repopulating the epi chiplets of a 100 to 200mm wafer onto a 300mm Si wafer. Also shown is the subsequently manufactured μ LED wafer which is ready to be bonded to a CMOS ASIC backplane in a proprietary process. The spacing of the epi chiplets is a function of the spacing needed to align with the chosen backplane design and wafer map.

Business model

In the display module arena, integrated front and back planes can be designed, made, and sold as an integrated module by the μ LED maker. Another option, for larger OEMs with unique market requirements, is for the OEM to design the backplane ASIC and port the design into a compatible fab for integration with the front plane μ LED. A third option for especially large and capable OEMs might be to license to them the unique elements of μ LED manufacturing and enable them to produce the display modules themselves.

At the present time, with AR 'headsets' for military, industrial, and enterprise solutions priced between USD\$1,000 and \$5,000, and even higher, market adoption is limited to niche applications. As the cost, size, resolution and power of display modules based on μ LEDs drives into the realm to meet consumer specs, demand will skyrocket into volumes rivaling cell phones.

The business model for each of the three elements in the system topology for AR glasses is similar. At this stage of market development, specialists in front-end, back-end, and the middle supply highly specialized and optimized components which are bought by OEMs who integrate them into their unique AR glasses. Specialty suppliers design, make, and sell ICs to enable the front-end – wireless/GPU/power. Other specialty suppliers design,

make, and sell optical engines and waveguides to serve the back-end. A third group of specialty suppliers design, make and sell display modules. There are examples of certain OEMs trying to acquire specialty companies in the front, back and middle to become fully vertically integrated. The prevailing market dynamic is still disaggregated suppliers offering best-in-class solutions to all parts of AR glasses topologies.

As the market continues to

evolve, and as high-volume, low-cost methods mature, it is likely that all three business models described above will exist, adapted to the appropriate market conditions and commercial entities' needs. **EP&T**

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This article was written and submitted by MICLEDI Microdisplays, a fabless developer of microLED displays for the Augmented Reality (AR) market.

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System on modules or chip-down design? It's complicated

BY OHAD YANIV, CEO, VARISCITE



In the rush to put new electronic products on the market – edge/IoT devices, robotics, even specialty industrial or medical equipment – the choices manufacturers make early in the design process can have a large impact later.

The biggest choice in embedded computing design is, well, the computing subsystem that will perform the function the product is intended to do.

Given the explosion of devices, device developers, and applications, there's no one best practice or perfect choice. There are, however, two primary schools of thought: chip-down design or system on module/computer on module. Both have advantages and choosing the one that most suits your particular engineering effort may seem complicated.

Briefly: in chip-down design you're starting from the ground up. Your design is unique and completely designed to your requirements. You select the components: processor, RAM, flash, networking, connectivity, power supplies, temperature controls, security features, drivers, and miscellaneous micro-hardware. You build the operating software to run it all and you manage the integration. The more in-house process you can afford, the more control you gain. This level of customization and control may be tempting but this approach comes with many disadvantages.

Time is money

The time it takes to achieve greenfield chip-down design may be enormous – R&D, trial and error, quality control. Your organization may not even have the in-house technical and human resources for chip-down design.

The real impact of this choice is go-to-market delay. Chip-down is a largely manual, hands-on process to design, engineer, prototype, source,



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Today, top SoM manufacturers offer a dizzying array of interfaces and features, processor architectures, speeds and price points, enough to meet the requirements of 99.9 percent of the market.

and produce. Even a talented team may require many months and in some cases, even years, and that doesn't consider supply chain delays (the global components crisis is not over yet) for all those myriad components you need to order.

The System on Module (SoM) approach is like starting at square twelve instead of square one. The design starts with a module that's been pre-built with the core computing components accompanied by software. The device developer designs only the carrier board with the peripheral components and connectors the final product needs which can be outsourced as well. With this method, the R&D time and effort are focused on the specific IP of the company.

SoMs are off-the-shelf and ready for immediate implementation, obviously a very compelling option for compressed product development timelines but this isn't the only advantage.

What about the cost optimization angle? Production volumes do play a big role in the choice between chip-down and SoM. If you produce consumer devices and expect more than 100,000 units per year, economy of scale makes chip-down financially viable. However, if you produce industrial devices at a smaller scale, for example, there really is no cost advantage to using chip-down versus a SoM. In these volumes, a SoM is still more economically feasible because you don't need a large pool of engineers during development or a maintenance team during the product life-cycle.

Production quality?

Some developers are tempted to choose chip-down for self-sufficiency, to avoid reliance on any one supplier. Turnaround time and longevity are often an existential concern, and there are few things more frustrating than a delay caused by a third party or end-of-life of components. The reality is that chip-down means relying on multiple third parties, each of which can let you down and cause a bottleneck in production or lead to redesigning in the worst case.

SoM vendors typically purchase large volumes of components far in advance and can ship fully functional SoMs at small volumes within days – large volumes within weeks. Moreover, some SoM vendors have the privilege to get access to new technology, sometimes even before it is released to the market due to long-term partnership relations with the component vendors. Getting your hand on new technology can give you a significant competitive edge that couldn't be reached without a highly maintained partnership.

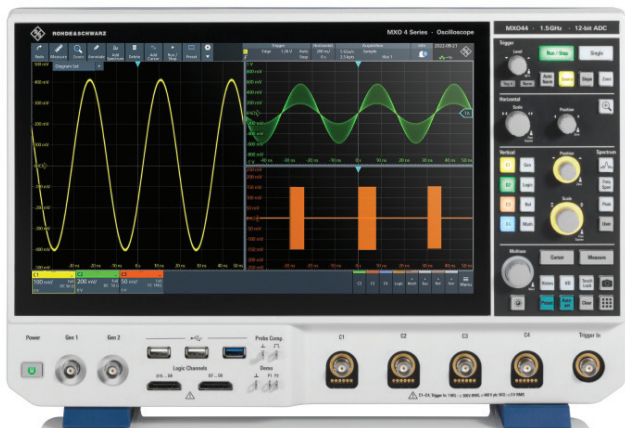
There is the question of production quality. What's ultimately higher quality, less error-prone, longer lasting? Bespoke chip-down products or those built on an off-the-shelf mass-produced SoM? The answer may surprise you. There is actually a greater probability of failures impacting product return rates in chip-down products because these are often first-time custom configurations that only been tested in a lab. On the other hand, SoMs are well tested in a vast number of different environments and configurations in the embedded market. Behind each SoM there is an engineering team that consistently work on updates.

Finally, when would a company still prefer a chip-down design? Today, top SoM manufacturers offer a dizzying array of interfaces and features, processor architectures, speeds and price points, enough to meet the requirements of 99.9 percent of the market. There are niche companies out there making niche devices that can't be built on a SoM due to the need for a special features and components that don't exist in a pre-built platform, so I won't claim 100%. **EP&T**
<https://www.variscite.com/>



Ohad Yaniv is chief executive officer of Variscite, Israel-based specialists in developing and manufacturing a range of System on Modules (SoM).

Photo credit: Variscite

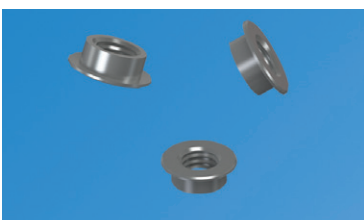


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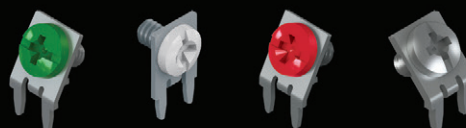
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The electricity meter measures the voltage (or potential energy) and amperage (current) in the electrical circuit at the connection of your house to the utility power source. One volt multiplied by one amp is one watt. An analog meter uses an electrical field effect to make a disc spin, counting the watts used. A digital meter puts the volt and amp input through a digital signal processor.

Electronic meters have just as many electronics in them as the mechanical devices used to precisely measure the electricity consumed. In fact, today's meters are so smart that many are sending the information via wi-fi so that you no longer have a person going and looking at the actual meter.

You'll find many of our products in all phases of electricity meters such as our featured Slim Line Screw Terminals, as well as • Standoffs and Spacers • Battery Clips, Contacts & Holders • Multi-Purpose Hardware • Fuse Clips & Holders

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See our Blog

HALF BRICK DC-DC CONVERTERS DELIVER 43V TO 160V INPUT

TDK-LAMBDA AMERICAS

CN-B110 series 200W and 300W rated half brick dc-dc converters are capable of operating from a wide input voltage of 43 to 160Vdc. Units

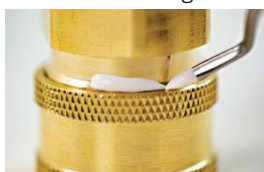


are compatible with 72Vdc or 110Vdc nominal railway systems. The second-generation devices are available with 12V, 13.8V, 15V and 24V outputs. Using the trim function, units can be adjusted to using a resistor or an external voltage to compensate for voltage drops, or to accommodate non-standard system voltages. Standard models have non-latching (self-recovering) over current and overvoltage protection, with an option for latching with manual reset. <https://www.us.lambda.tdk.com>

THERMALLY CONDUCTIVE, NON-CONDUCTIVE SILICONE MEETS NASA SPECS

MASTER BOND

MasterSil 323AO-LO two component silicone elastomer with a self-priming feature is designed for bonding,



sealing and gap filling applications. The electrically insulating

and thermally conductive compound meets NASA low outgassing specifications and can be used in the aerospace, electronic, opto-electronic and specialty OEM industries. System has a thermal conductivity of 1.15-1.30W/(m·K).

<https://www.masterbond.com>

ULTRA-HIGH PRECISION COULOMETRY CYCLERS LOWER NOISE

TMETRIX

Novonix Battery Technology Solutions (BTS) CMA-HDX-99-56 Ultra-high precision coulometry cyclers provide industry-leading low noise and high accuracy source and measurement electronics catered to making precision measurements, including

Coulombic Efficiency (CE). Units cater to making precision measurements, while systems allow for comparison measurements of cell performance in only a few weeks instead of months or years of long-term cycling. Used with a properly controlled temperature, product is capable of measuring coulombic efficiency with a precision of 20ppm and accuracy of 50ppm.

<https://tmetrix.com/product/novonix-ultra-high-precision-coulometry-cyclers-uhpc-2a/>

EXTREME TEMPERATURE SOCKET BOOSTS ELECTRICAL PERFORMANCE



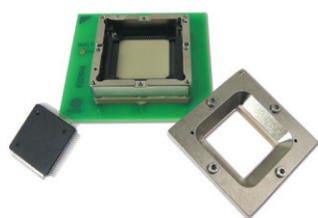
IRONWOOD

SBT-QFE-3035 socket addresses high performance requirements for burn-in and test applications. The contactor is a stamped spring pin with 14 gram actuation force per ball and cycle life of 125,000 insertions. The self-inductance of the contactor is 0.88nH, insertion loss of <1 dB at 20.5GHz and capacitance 0.097pF. The current capacity of each contactor is 2.9 amps. Socket temperature range is -55°C to +180°C. Product features a floating guide for precise lead to pin alignment. Device includes additional floating compression plate that has a cavity to accommodate mold case.

<https://www.ironwoodelectronics.com/>

EDGE COMPUTER PROCESSES IN REAL-TIME WITH AI DEVICES

NVIDIA



Jetson Orin Nano rugged Edge Computer targets the growing demand for real-time processing capabilities in artificial intelligence (AI) devices such as smart cameras, handheld's, smart meters, and

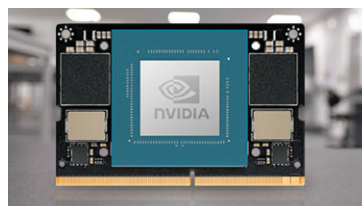
service robots, where integrators often require a lower power and a more cost-effective solution. Product provides up to 80x the AI performance of its predecessor, boosting on-device, low-latency processing without increasing power consumption or cost. Series will be available in two versions, a 4GB and an 8GB model, each denoting the amount of LPDDR5 respectively. The 4GB version features a 512-core NVIDIA Ampere GPU with 16 Tensor cores, and 8GB version delivers 1024-core NVIDIA Ampere GPU with 32 Tensor cores.

<https://www.nvidia.com/en-us/autonomous-machines/embedded-systems/jetson-orin/>

WIDE INPUT RANGE DC-DC CONVERTER SERVES INDUSTRIAL APPLICATIONS

ABSOPULSE ELECTRONICS

HVT 5K-1200/24-4U7 high input voltage industrial quality dc-dc converter is designed for driving low voltage 24Vdc equipment in 5kW applications. Unit converts 1200Vdc



(1000Vdc to 1400Vdc range) to 24Vdc/208A. The input and output can be customized for other voltages. Conversion efficiency is typically 85% at 1200Vdc nominal input, at full load. Several units can be parallel connected for 10kW, 20kW and higher output power. Unit is designed for compliance with EN62368-1 and equivalent safety standards.

<https://absopulse.com>

SIGNAL QUALITY ANALYZER SUPPORTS PCI EXPRESS BASE SPEC

ANRITSU

MP1900A Signal Quality Analyzer-R now supports the PCI Express 6.0 (PCIe 6.0) Base Specification Receiver Test (Rx Test) and has been further enhanced



with an SKP function to filter SKP packets to support separate clock architecture (SRNS). As a result, one MP1900A supports PCIe 3.0 to PCIe 6.0 and can calibrate stressed test signals and measure jitter tolerance using a real-time oscilloscope to provide engineers with an efficient solution to verify their high-speed interconnect designs for 5G data centers and services.

<https://www.anritsu.com/en-us/test-measurement/products/mp1900a>

PIEZO HAPTIC DRIVER SHRINKS BOM COST, HARDWARE FOOTPRINT

BOREAS TECHNOLOGIES

BOS1921 tiny piezo driver delivers autonomous operation and sensing for piezo haptic trackpads in a single chip - freeing PC OEMs from the



dedicated electronics that other piezo drivers require for force sensing. This advancement reduces BOM costs by up to 2x, keeps piezo haptic trackpads thin, improves responsiveness and provides 15x greater sensing resolution than firm's first-generation piezo haptic driver BOS1901. Device provides integrated digital front end with 13C/12C and a waveform synthesizer (WFS).

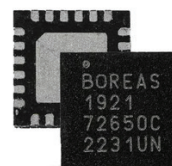
<https://www.boreas.ca>

TERMINAL BLOCKS ARE 9MM WIDE WITH 1-6 DISTRIBUTION

WAGO

TOPJOB S Distribution Terminal Blocks are open tool slot and push-button,

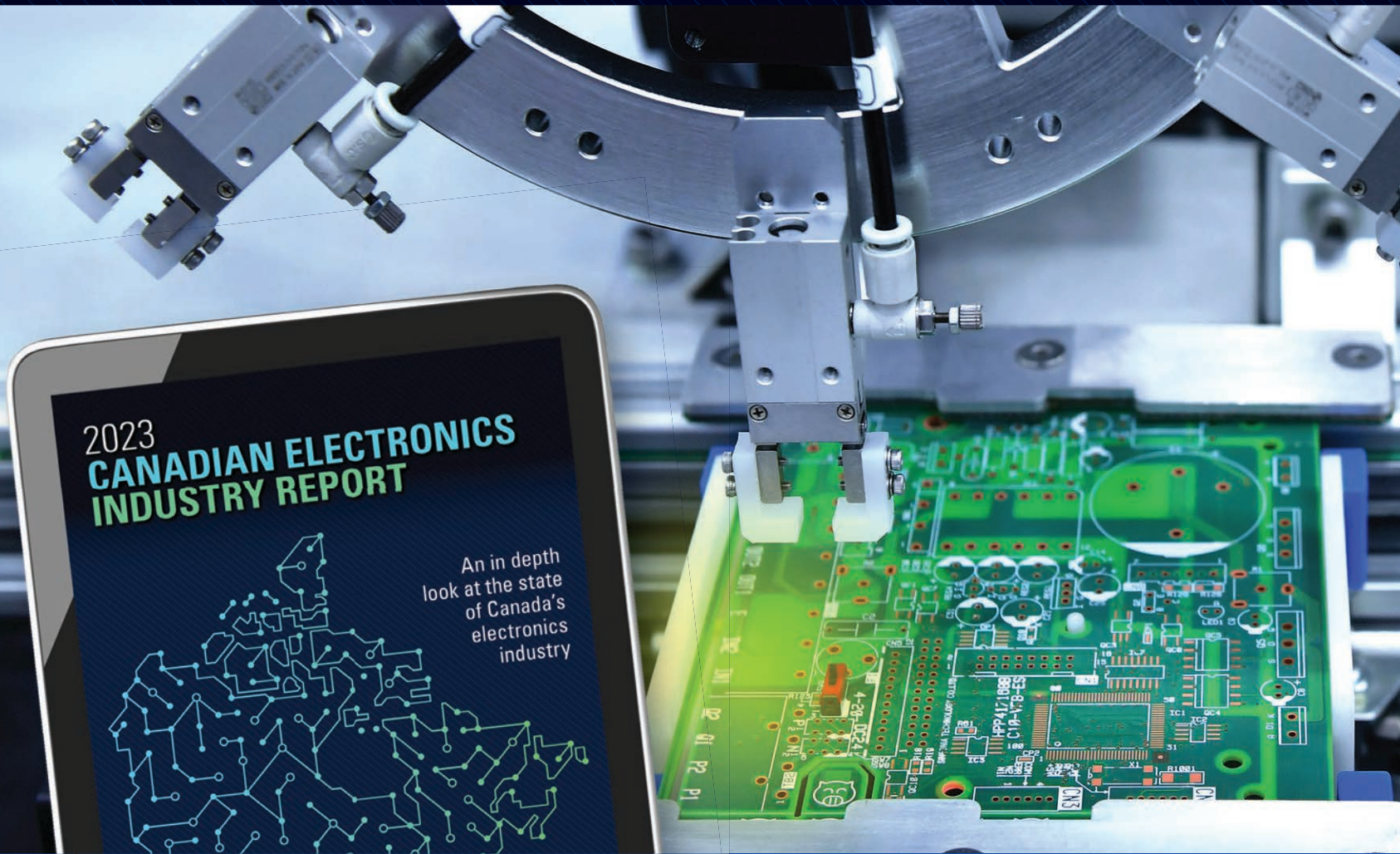
measuring 9mm wide with 1 to 6 distribution. Blocks allow power feed-in up to



a nominal cross-section of 8 AWG (10 AWG with ferrule) connecting 6- 14 AWG outputs. Both options also feature dual row jumper slots for parallel configuration.

<https://www.wago.com/ca-en/>

AN IN-DEPTH LOOK AT THE STATE OF CANADA'S ELECTRONICS INDUSTRY



Be sure to download your own copy of the Industry Report here.



EP&T presents the 2023 Canadian Electronics Industry Report.

This 28-page special supplement contains the results of our readership survey conducted during this past summer. We asked you, our readers, which issues are most impacting the electronics ecosystem. Our goal was to determine a baseline on how engineers are continuing to transform with the times amid this era of disruption. The results reveal component allocation, and supply chain challenges atop the list, along with staffing and retention difficulties.

In order to bring objective analysis to the results of our survey, EP&T Editor Stephen Law hosted a panel of industry representatives, who shared their thoughts and insights with us. The Industry Report dives deep with commentary from the panelists, supported by statistical results derived from the survey.

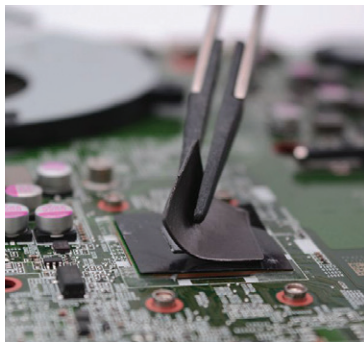
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SUPPLY SIDE



ACQUISITIONS

HENKEL ACQUIRES THERMEXIT MATERIALS

Henkel has completed its acquisition of the thermal management materials business of Nanoramic Laboratories, Boston, MA, marketed under the brand Thermexit. Nanoramic, until 2018 known as FastCAP Systems Corp., is an R&D company focused on developing high-end energy storage and thermal management technologies based on carbon composites.

With this acquisition Henkel aims to strengthen the position

of its adhesive technologies business unit in the growing markets for thermal interface materials (TIM) by expanding its capabilities in high-performance segments.

The Thermexit portfolio includes patented, high-performance thermal interface gap pads based on an innovative nano-filler technology. This technology provides unique materials with extremely high thermal conductivity and excellent stability.

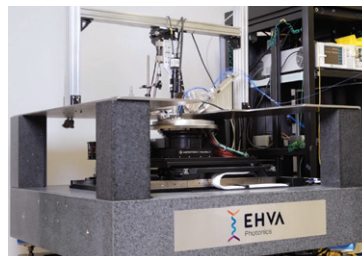
EXFO ACQUIRES EVHA

EXFO, the Quebec City-based test, monitoring and analytics specialists for the communications industry, has acquired EHVA, a Photonics Integrated Circuits (PICs) and system automation company also based in Quebec City. The deal will accelerate EXFO's advanced capabilities in PIC testing, enabling delivery of automated, turnkey end-to-end

testing of optical components from lab applications to high-volume and high-speed manufacturing.

EHVA combines manufacturing intelligence with wafer-to-single device capabilities to deliver scalable solutions for PIC testing and manufacturing. The company has worked with world-class photonics industry leaders as well as with the Center for Optics, Photonics, and Lasers (COPL) at Laval University.

EHVA's process software suite seamlessly integrates EXFO's advanced swept continuous laser scanning technology into customer manufacturing settings.



SEMICONDUCTORS

TI'S BEGINS 300MM WAFER PRODUCTION

Texas Instruments (TI) has commenced initial production at its newest 300-millimeter wafer fab in Richardson Texas, and will ramp over the coming months to support the future growth of semiconductors in electronics.

The latest fab is now connected to the original, which opened in 2009 as the world's first 300mm analog wafer fab, and represents one of six 300mm wafer fabs TI is adding to its operations.

The new fab is more than 30% larger than the original, offering over 630,000-square-feet of total clean room space between the two fabs. The facility boasts 15 miles of automated, overhead delivery systems that will seamlessly move wafers between the two fabs once fully built out. At full production, the fabs will make more than 100-million analog chips every day. **EP&T**

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TEARDOWN

Apple TV 4K 2021

BY IFIXIT



These findings are from iFixit, the open source repair guide. The popular online site teaches people how to fix just about any electronic device, and sells the parts and tools to make it possible. For this teardown, engineers at iFixit tackle the Apple TV 4K 2021.

This teardown will briefly explain how it can be done, while also showing what some of the parts are inside the device for reference. Let's open it up and see what's on TV.

→ Step 1

With the black box, we know exactly where to prod and pry. Our tried-and-tested methods still work fine on this updated hardware, so we go right ahead and remove the bottom cover.

Underneath we are greeted by the full metal fan unit seen in the Apple TV 4K, not the heatsinks of previous generations.

- Apple A12 Bionic chip for that high-frame-rate 4K HDR viewing pleasure
- Colour balance and Thread support
- HDMI 2.1, Ethernet, 802.11ax WiFi 6, and Bluetooth 5.0

→ Step 2

Disassembling the cooling unit is a breeze, and unsurprisingly no different from the previous 4K model.

So far things are looking pretty familiar, so we'll fast forward a bit. Suffice to say, with a good set of tools (not pictured), the blower comes out like magic.

→ Step 3

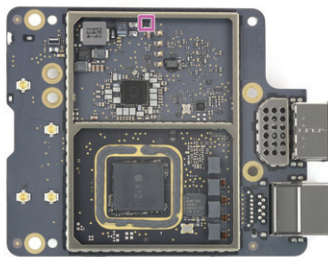
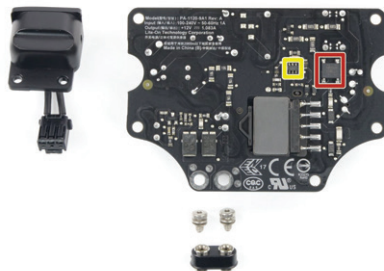
A few Torx screws later, the logic board is free and exposes these chips on the top:

- Apple A12 Bionic SoC
- Apple APL1091 338S00673 power management IC
- Broadcom BCM57762AoKMLG Gigabit Ethernet controller
- Alpha & Omega Semiconductor AONE36196 MOSFET
- T245 MrHP crystal oscillator
- Lattice Semiconductor iCE5LP4K iCE field programmable gate array (FPGA)
- Macronix MX25U8035F 8 Mb serial NOR flash memory

→ Step 4

Lots of individual components revealed here:

- Too many to list, but here are some notables found underneath:
- Kinetic Technologies MCDP2920A4 DisplayPort 1.4 to HDMI 2.0 converter
 - SK Hynix H230EG8126ADO-BC 32 GB NAND flash memory
 - Murata 339S00763 Wi-Fi/Bluetooth module



- Lattice Semiconductor SiL9437CNUC audio return channel receiver/transmitter
- ON Semiconductor LC89091JA digital audio interface receiver
- Infrared receiver Nordic Semiconductor nRF52833 Bluetooth 5.2 SoC w/ NFC and Zigbee

→ Step 5

The power supply board still lies buried under a hefty metal body for heat dissipation. We find the same conductive posts and modular C7 socket as in the past. If you ever wondered: the cable used for the Apple TV may also fit in the power brick of your MacBook, or older iPad and iPhone chargers.

Some more silicon ID, while we're here:

- Diodes Incorporated ABS20MH bridge rectifier
- Infineon IPD65R1K4C6 N-channel



These findings are from iFixit, the open source repair guide. The popular site teaches people how to fix just about any electronic device, and sells the parts and tools to make it possible. Anyone can create a repair manual for a device or edit the existing guides to improve them. iFixit empowers individuals to share their technical knowledge and teach the rest of the world how to fix their stuff. <https://canada.ifixit.com>



MOSFET

- NXP Semiconductor TEA1833LTS switched mode power supply controller

We'll end on a high note, which is to say: This is still pretty repairable for a streaming box.

→ Final Thoughts

Modular construction and only a few major components simplifies repair. The remote's battery and Lightning cable are soldered together—but not to anything else, so they should be inexpensive to replace.

The power supply AC-in jack is modular. The remote itself can be fussy to service and it's guarded by pentalobe screws, but it's not glued together.

Most of the I/O ports on the streaming box are soldered to the logic board.

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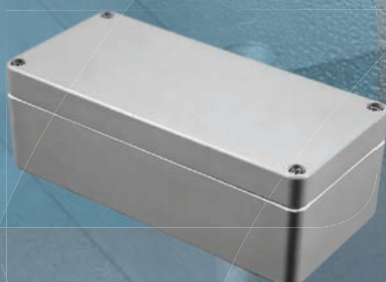


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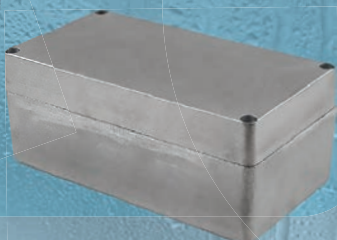
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