JUNE/JULY 2021

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Nextiles

NRC remains flexible in new age of materials



Seeing as the theme for this particular issue happens to be flexible electronics, I thought it might be necessary to shed

some more light on it in this space.

Flexible electronics isn't a new technology, but it has achieved remarkable progress over the past years and has become increasingly important to many sectors, such as consumer electronics, automotive, retail and healthcare.

NRC Mississauga

Aiming to help lead the way in materials R&D in Canada, the National Research Council (NRC) opened a new facility in Mississauga this spring with the intents to become a catalyst in accelerating the development of advanced materials technologies and their commercialization in disruptive new products.

Working in lockstep with industry, academia, and other government department (OGD) partners, the facility establishes and operates a national innovation platform, supporting and undertaking foundational research and development (R&D) to develop new materials, scaling up their production, and de-risking and demonstrating their application.

During a recent Zoom conversation with Andrew Johnston, who leads the new advanced materials manufacturing centre, with space to accommodate approximately 100 researchers, he expressed excitement in the work being done on materials acceleration.

"From this facility we will applying a core platform technology with competencies that we can apply to a wide range of different sectors. One of these includes technology called materials

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acceleration platforms or MAP," says Johnston, who previously held the title of director of research. "Effectively it is a concept for autonomous experiments, where you have robots which would autonomously conduct high throughput experiments."

Johnston says that the concept is not necessarily unique, but what is different is that the experiment involves adding on a component of "high-end artificial intelligence" to create a closed loop model. This allows researchers to instruct the sophisticated AI component to create a material with certain material properties. The AI model then uses a combination of past history - of what worked, along with modeling tools to then mix and match a lot of different materials to produce an outcome that the researchers targeted.

"This can be applied in microelectronics, says Johnston. "Initially we are looking for catalysts in energy – including conversion of carbon dioxide to fuel sources. This technology can be applied to huge ranges of different types of applications, which are only limited by the model itself."

Partnering with XRCC

As direct neighbours to the Xerox Research Centre of Canada (XRCC), NRC is continuing its relationship with the specialty materials research organization. Both groups have recently collaborated on the development of a printable, biodegradable and non-toxic battery that can simply be thrown in the compost after use, without detrimental effects to the environment. It must also be produced at low cost using high-throughput printing technologies such as the ones mastered by XRCC.

These one-time use 'green

in /ept-magazine

batteries' can be applied to many low-power designs, such as packaging, lending itself to support ongoing efforts in reducing e-waste, according to Johnston. Leveraging the XRCC's experience in microelectronics and smart materials for 3D printing, the NRC now shares patents on this technology.

"Some of the other research we are working on with them (XRCC) is investigating printed piezoelectric materials, which is still at the very early stage," Johnston adds.

Further research must be done in the areas of biodegradable alternatives to electrode materials, biodegradable substrate layers impervious to gases or humidity, optimization and scale-up the printing capabilities, long term device compostability and ecotoxicity assessments, as well as technology transfer and product benchmarking.

Education input

Other future initiatives for the centre include serving as headquarters for the Collaboration Centre with the University of Toronto for green energy materials, as well as hosting students and equipment from the University of Waterloo to support additive manufacturing materials and processes.

Underscoring the promise and intent behind this facility, plans to expand with a third floor addition is already underway, something that was originally slated for much later down the road. This is clearly a reason to have optimism and expectation for much more to come.

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NEWSWATCH

SEMICONDUCTORS

TECH LEADERS LAUNCH CANADA'S SEMICONDUCTOR COUNCIL



A select group of globally recognized Canadian founders, business leaders, chip manufacturers, and investors have formed Canada's Semiconductor Council, with a mandate to build and lead Canada's national semiconductor strategy and action plan.

The coalition will work towards advancing Canadian competitiveness, strengthening trade partnerships, bolstering supply chain resilience, and propelling Canada to the forefront of the US\$7 trillion global semiconductor industry.

The Council will focus on short-term and long-term actions across key pillars to transform Canada into a global hub for semiconductor research, design, and manufacturing. To unite and integrate our national ecosystem of organizations, the Council will focus in the following core areas: (1) Activating a critical mass of IP-rich anchor companies designing and manufacturing semiconductor and related products who choose to start, scale and invest in Canada to meet demand for the domestic and global market; (2) Attract, retain and galvanize Canadian skills and talent; (3) Scale Canadian pools of investment capital; (4) Expand strategic investment opportunities to Canada.

5N PLUS TO ACQUIRE AZUR SPACE

5N Plus Inc., a Montreal-based producer of specialty semiconductors and performance materials, has entered into an agreement with Azur Space Solar Power GmbH pursuant to which 5N Plus would acquire all of the issued and outstanding shares of Azur. The Transaction is subject to the customary closing conditions, including regulatory approvals. 5N Plus will fully integrate AZUR's workforce and will appoint Jürgen Heizmann, managing director of Azur, as a member of 5N Plus's executive committee.

Located in Heilbronn, Germany with a workforce of 240 employees, Azur is a global leader in developing and manufacturing multi-junction solar cells for space and terrestrial concentrated photovoltaic (PV) applications. 5N Plus operates R&D, manufacturing and commercial centers in several locations in North America, Asia and Europe, including three in Germany and one in Belgium. The firm is a leading supplier to the thin-film PV renewable energy industry and a notable supplier within the U.S. satellite supply chain.



EMS

DSM ACHIEVES SMART FACTORY AUTOMATION MILESTONE

Dynamic Source Manufacturing Inc. (DSM) took another step in its journey towards Industry 4.0 with the support of Cogiscan, a solution provider for the EMS industry leading in connectivity and analytics.

Headquartered in Calgary, with production facilities in Canada and the United States, DSM's journey to-date has included complete automation and digitalization of a major portion of material flow and factory value chain. This includes having successfully implemented cutting-edge hardware solutions



from leading suppliers, for processes such as intelligent material receiving, smart shop-floor and point-of-use material storage and retrieval, high-volume connected placement, and post-teardown x-ray counting of parts.

To connect and manage all of these solutions, DSM has utilized Cogiscan's best-of-breed Track, Trace and Control (TTC) and electronics IIoT platform, including for features such as traceability, material control, and machine-to-machine communication and synchronization between all of the various equipment sets involved.

"When digital transformation is done right, we as a team transform as well, for the better," says Duane Macauley, president and CEO of DSM.

AI

DEEPLITE UNVEILS FREE VERSION OF NEUTRINO

Deeplite, a Montreal-based provider of AI software designed to make other AI models faster, more compact and energy-efficient, has rolled out its free Neutrino Community version. This edition provides a hands-on introduction while also enabling new connections and knowledge exchange among community members from different commercial, research and academic environments.

Community users will benefit from sharing feedback and ideas using Deeplite Neutrino on Github, while optimizing their deep learning models for memory, compute, power and other resource constraints on cameras, drones, smartphones and other network edge devices.

As organizations look to include more edge devices in their AI and deep learning strategies, they are faced with the challenge of making AI models run on devices that often have very limited hardware resources. Deeplite created Neutrino, an intelligent optimization engine for Deep Neural Networks (DNNs) deployed on cloud servers, where increased throughput can save money, and edge devices where size, speed and power are often major challenges.

With Neutrino, AI experts automatically optimize high-performance DNN models for these resource constraints. Neutrino inputs large, initial DNN models that have been trained for a specific use case and understands the edge device constraints to deliver smaller, more efficient, and accurate models.

Neutrino Community is designed for deep learning engineers and teams at both startups and larger corporations, as well as industry researchers and academics – anyone looking to test the benefits of optimization on their AI models.

NOVACENEAI AND CMC DELIVER QUANTUM COMPUTING

Novacene and CMC Microsystems, manager of Canada's National Design Network (CNDN), launched a quantum-enhanced artificial intelligence (AI) application for business users. The two firms partnered to incorporate quantum AI algorithms into the NovaceneAI Platform.

Ottawa-based Novacene's platform uses AI and machine learning (ML) technology to automate business processes, allowing teams to focus on higher-value activities while using data to support decision making. By using quantum technology, Novacene aims to make its platform reach performance levels that were previously impossible.

True to its mission of lowering barrier to technology adoption, CMC has made quantum technology more accessible for researchers and business. As a member of the IBM Q Hub at the Université de Sherbrooke Institut quantique (IQ), CMC has exclusive cloudbased access to IBM's most advanced quantum computer systems and software, and has a world class, in-house quantum team.

For Marcelo Bursztein, founder and CEO of NovaceneAI, partnering with CMC was a great opportunity to use



quantum technology to take his business to the next level. "This is a great example of organizations coming together to democratize quantum technology. Integrating quantum technology into the NovaceneAI Platform has the potential to give our customers unprecedented data analysis capabilities. We see this effort as the starting point of an exciting collaboration ahead."

TEST

KEYSIGHT ACQUIRES QUANTUM BENCHMARK

Keysight Technologies Inc., a global provider of advanced design and validation test solutions, has acquired Kitchener ON-based Quantum Benchmark, a leader in error diagnostics, error suppression and performance validation software for quantum computing.

Quantum Benchmark's technology is based on years of research by several of the world's leading experts in quantum computing at the University of Waterloo's Institute for Quantum Computing. The acquisition of Quantum Benchmark supports Keysight's goal to deliver a comprehensive quantum portfolio addressing customer needs across the physical, protocol, and application layers.

"Joining forces with Keysight is a strategic and timely opportunity to accelerate the development and delivery of our industry-leading solutions," says Joseph Emerson, Ph.D., Quantum Benchmark CEO, founder and chief scientist. "Together, we bring the world closer to achieving the break-through applications of quantum computing including the design of energy-efficient materials, the acceleration of drug discovery, the promise of quantum machine learning, and so much more."

As quantum computing technology evolves, the ability of quantum computers to perform meaningful computations is determined by the number of qubits, as well as by the quality of qubits.

Quantum Benchmark's technology improves the quality of the qubits across all quantum hardware platforms and delivers solutions at both ends of the quantum market. It helps quantum hardware makers design better qubits and helps quantum end-users stabilize the performance of those qubits for their specific use-cases.

PCB MAKERS

CCI TAKES NEXT STEP TOWARDS SMART MANUFACTURING

CCI Canadian Circuits Inc., the Surrey BC-based manufacturer of printed circuit boards (pcbs), has taken a significant step towards smart manufacturing with some recent upgrades to its machinery line-up.

The pcb maker has added MODUL, a Schmoll Maschinen drilling/routing system that features an automated high-precision camera alignment system. With the new machine, the company has gained some advanced capabilities to fabricate a broad range of HDI pcbs. The machinery enhances CCI's capabilities to deliver a fast turn-around for blind and buried via jobs and control depth drilling.

The added equipment will assist CCI achieve: high-speed drilling; non-conductive surface precision depth control and back drilling; advanced Inner layer registration; and smart Auto loader for 24/7production time

"This equipment addition takes us into the next phase of pcb technology. Over the past few years, our team has worked extremely hard to improve our quality, technology, and capabilities," says CCI president Praveen Arya.

"MODUL supports Industry 4.0, and it is easy to integrate the machine data into the CCI Canadian Circuits ERP system. The data can be fetched and analyzed to increase the efficiency of the existing pcb manufacturing processes and enhance overall capabilities," adds Tamendra Thapa, CCI operations manager.

BITTELE ADVANCES COMPONENT SOURCING STRATEGY



Bittele Electronics Inc., a Toronto-based printed circuit board (pcb) shop specializing in prototype and low-to-mid volume fabrication and assembly, announced its new strategy to benefit customers in need of sourcing components during a global shortage.

While the COVID19 pandemic has affected many industries over the past year, it has caused particular disruptions within the electronics component supply chain. To respond to these limitations, Bittele has advanced a new component sourcing strategy.

"While our policy is to purchase only from authorized North American vendors, we can either source parts locally in China or recommend an alternative part if a specified part is not available after a customer approves their pcb assembly order," says Bittele CEO Ben Yang.

For items with very long lead times, Bittele also recommends placing a 'parts only' order and then proceed with the turnkey pcb assembly once the parts arrive.

Bittele is advising its clients to consider placing their volume and prototype orders as soon as possible to reduce delays in production.

CEM

AUGUST WELCOMES NEW CEO

Calgary-based electronics manufacturing services (EMS) provider August Electronics has appointed Paul Crawford to the position of chief executive officer (CEO). August's outgoing CEO, Tanya Korenda, will remain a key strategic leader within the organization. She will be stepping over to a newly-formed chief operations officer (COO) position.

The firm's ownership team remains unchanged and includes Korenda as COO, Jack Francis as president and co-founder and PeterWilson as co-founder.

Hailing from Calgary, Crawford brings more than 30-years of executive leadership, engineering and EMS experience. Most recently, he served as CEO of Northpoint Technical Services. He holds a mechanical engineering degree from the University of Calgary and previously trained as a journeyman machinist and welder.

WEARABLES

BORÉAS PIEZO CHIP TOUCHES WEARABLES



Boréas Technologies, Bromont QC, unveiled its Boréas Piezo Haptic Engine (Boréas PHE), a module that harnesses the high performance of piezo actuators solving wearable devices' most significant challenge—achieving true high-definition (HD) haptic feedback in a broad range of low-power space-constrained devices.

Boréas PHE is an advancement over the two legacy technologies that have dominated haptics in wearables and other small devices: linear resonant actuators (LRAs) and eccentric rotating mass (ERM) motors, in which the quality of haptic performance is tied directly to the LRA's or ERM's volume and mass. This architectural approach makes these platforms too large to achieve a satisfying user experience in wearables.

VR tech to revolutionize commercial driver training

Serious Labs harnesses the power of virtual reality

BY SOHAIL KAMAL

Serious Labs has taken us from tragedy to triumph? The Edmonton-based firm designs and manufactures virtual reality simulators to standardize training programs for operators of heavy equipment such as aerial lifts, cranes, forklifts, and commercial transport trucks. These simulators enable operators to acquire and practice operational skills for the job safety and efficiency in a risk-free virtual environment so they can work more safely and efficiently.

The 2018 Humboldt bus catastrophe sent shock waves across the industry. The tragedy highlighted the need for standardized commercial driver training and testing. It also contributed to the acceleration of the federal government implementing a Mandatory Entry-Level Training (MELT) program for Class 1 & 2 drivers currently being adopted across Canada. MELT is a much more rigorous standard that promotes safety and in-depth practice for new drivers.

Enter Serious Labs. By proposing to harness the power of virtual reality (VR), the firm has earned considerable funding to develop a VR commercial truck driving simulator.

Commerical deployment

The Alberta Governemnt has awarded \$1 million, and Emissions Reduction Alberta (ERA) is contributing an additional \$2 million for the simulator development. Commercial deployment is estimated to begin in 2024, with the simulator to be made available across Canada and USA, with the Alberta Motor Transport Association (AMTA) helping to provide simulator tests on driver standards certification.

West Tech Report recently took the opportunity to chat with Serious Labs CEO, Jim Colvin, about the environmental and labour benefits of VR Driver Training, as well as the unique way that Colvin went from angel investor to CEO.



Serious Labs' system replaces in-cab truck driving training hours with VR training hours.

Serious Labs was founded as 3D Interactive in 2005 by a group that included some former members of an AAA game developer, Bioware (now Electronic Arts). "They had what

was at the time quite a Serious Labs CEO, radical idea - using ... Jim Colvin video game technol-

ogy to rapidly develop training simulations and equipment simulators for real-world industrial applications," Colvin explains.

The idea gave the company exposure on how to engage with instructional designers to create realistic simulations of various kinds. Colvin saw the real-world applications for this in 2011, and he was immediately intrigued by this idea of using game technology to create equipment simulators and simulated training.

"While still in an early startup phase, the kernel of what was possible was emerging," Colvin adds. "I could see the kind of potential this would have in all kinds of industrial training situations building people's skills without tying up actual machines, letting people practice for challenging situations without risk, all while providing objective assessment."

Colvin and his partners invested in an early-stage round of equity financing and rebranded the company and Colvin stepped in as CEO. "Next, we went out and established some key anchor customers who were industry leaders and influencers. All of that started us down this road of developing game-based e-learning content and ultimately adopting VR for both experiential safety training as well as heavy equipment operation," he says.

"There is a strong entrepreneurial spirit here, and in Edmonton—there is also an established video game development community trained through the University of Alberta," Colvin states.

Building tech sector

The firm also garnered support from organizations such as Alberta Innovates and Edmonton Global to provide services and foster awareness of the challenges Serious Labs was solving. The \$3M in funding, announced recently, has been essential to the firm's growth trajectory, and it "reflects a commitment to building up our technology sector while addressing problems like road safety, the growing driver shortage, and global climate change," says Colvin.

Serious Labs' system will replace in-cab training hours with VR training hours, which is significant because the simulator runs on electricity. It also allows driver trainees to spend more time practicing safe maneuvers in labs, rather than driving to varied challenging terrains to practice those maneuvers. InVR, a driver can practice merging 10-times in 10-minutes without the 'empty' time in between.

In terms of labour, Canada's transportation industry is facing a shortage of more than 20,000 commercial drivers - projected to worsen in coming years. The new requirements, though excellent for increasing safety standards, creates added barriers for new entrants. Serious Labs' simulators help by bringing different landscapes to trainees. A driver in Saskatchewan will be able to drive in the coastal mountains of BC, and can train in multiple languages - breaking the barrier of entry for new immigrants interested in a trucking career.

Colvin's relationship with Serious Labs is unique in that he started out as an angel investor. In his case, he not only provided capital, but went on to lead the company from relative obscurity to prominence.

"I'm not original in anything – but, I know a good thing when I see it. Putting two and two together, putting video game tech into something other than entertainment, I was helpful in setting up the infrastructure to succeed," says Colvin. "I've never written a line of code in my life. Not a genius, more the parasite that stumbled along later."

"Companies get their size when they need infrastructure. I build the house around companies. You can do the wrong financing deal or give up your intellectual property," he says. "Almost like any professional service, you want your thoroughbreds not to be distracted by the money. That is for guys like me to do in the background. Get the talent pointed in the right direction." **EP&T** www.seriouslabs.com



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



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Get your head around it

Muse headband technology from Toronto tech firm is a mind scratcher by STEPHEN LAW, EDITOR EP&T



Among the growing number of wearable devices to reach consumer's hands these days, a headband created to

ease or simplify the process of meditating certainly quantifies as one-of-a-kind within electronic design circles.

Created by Toronto-based InteraXon Inc., the Muse meditation headband is a research-grade EEG device that passively senses the brain activity of the headband wearer and translates it into the guiding sounds of weather to help you stay calm & focused. The science behind Muse is pretty robust - the neurofeedback has been used in the mental health field for over a decade - and its tech has been used in neuroscience research.

The headband uses advanced signal processing to interpret mental activity to help guide those using the device. When the mind is calm and settled, you hear peaceful weather. Busy mind? As your focus drifts, you'll hear stormy weather that cues you to bring your attention back to your breath.

In this article, EP&T poses a few questions to InteraXon founder and chief evangelism officer Ariel Garten, who is also a psychotherapist trained in neuro-linguistic programming.



Ariel Garten, founder & chief evangelism officer, InteraXon Inc.

Here, she shares her thoughts on what sets this award-wining electronic gadget apart and one that likely will continue evolving as new technologies enter the wearable design sector.

How significantly has the technology inside Muse's original brain sensing headband changed since original launch in 2014?

Muse is an EEG system that uses advanced algorithms to train beginner and intermediate meditators to control their focus. Although the basic concept for the EEG sensing launched in 2014 is the same, we have improved performance on the electronic circuitry as well as the EEG sensors (electrodes). With each iteration, total size has changed and we have also improved power consumption / battery life.

In addition, new biosensors have been added in the headband models to offer more biofeedback experiences and data capture for users. For Muse 2 and Muse S, we introduced heart rate and breath sensors.

For the latest model, Muse S, the formfactor and accompanying electrodes are completely new—they are soft, flexible and washable since they are on fabric. With Muse S, new algorithms were also developed to detect and visualize sleep staging, body positions and deep sleep insights.

We're preparing to launch a revolutionary update to our responsive go-tosleep algorithms, coming soon. All sleep audio content will be able to fade-in and out in response to the user's brain state. Subscribers with a Muse device will have the added benefit of using this new feature with external audio content, such as their favourite podcast or audio book. If users wake up during the night and can't fall back asleep, this feature will detect if they have woken up and will auto play the content they fell asleep to at the beginning of the night.

2 Which components in the meditation headband design provide it with the ability to translate brain activity?

Muse detects a range of brain electrical activity and transforms it into easily understandable experiences to provide results such as calm, active and neutral states.

The electrodes of our headbands consist of 5 silver plated pads on the forehead of the band, as well as 2 parts along the ears. These EEG sensors on the headband pick up the electrical



activity of the brain at specific locations. This data is then sent to our Muse app where our algorithm analyzes the raw brain signals to identify the different brain waves (alpha, beta, gamma), as well as their power spectrum, and transforms them into many different components-noise, oscillations, non-periodic characteristics, and transient and event-related brain events. Signal processing and machine learning techniques are applied to the brain signal components to control the experience in real-time.

B How many sensors are a part of the product's design, and what types of sensors are used. Is there one sensor that plays a more important role than the rest?

The EEG sensors are the most important, the 3 center electrodes playing a pivotal role for signal quality as they provide the electronic reference for the others. For Muse 2 and Muse S, a gyroscope is used for movement and breath sensing and a PPG (photoplethysmography) for heart rate and breath sensing.

Describe the sourcing process or challenges faced when seeking for suitable sensors for the unique purposes of the Muse design.

The electrode design for the Muse S headband was a challenging process. We sought sourcing from wearable technology companies and iterated on a custom solution which we are constantly improving. We also sourced some of the sensors from our electronics component



suppliers and distribution partners who provide technical support and sales.

In the end, are there multiple component sources or did you discover a single source? We have a number of sources

covering our various component requirements.

5 Given the unique nature of Muse as a consumer product, was it important to receive very specific or specialized engineering support during the design process?

We have a wonderful team of neuroscientists, engineers and makers in-house. We have been able to produce most of the design and have protected these designs by filing over 90 design patents. Going from Muse 2 to Muse S, we moved to a softband form factor which presented the biggest challenge in terms of physical materials. We received a lot of support for the manufacturing of the fabric design, as well as for the integration of conductive electrodes on fabric.

How many different engineering disciplines are involved in bringing the Muse device to market?

This involved a wide variety of teams with specialties in industrial design, electrical and electronic engineering, embedded software development process and manufacturing engineering, mechanical engineering, quality engineering, research and neuroscience. Muse headbands work in tandem with a companion Muse app. This also involves software development and data engineering for the app, cloud, and infrastructure.

Given the stresses related to the ongoing pandemic, such as increased anxiety and panic experience by the general populace, has Muse seen an uptick in consumer demand for these products?

Our users logged over 5 million meditation sessions 2020 and we saw interesting shifts in their meditation behavior. For instance, many who had dropped off their meditation practice returned to meditate during the pandemic, especially during the first lockdown. You can read more about the trends we uncovered here.

7 Is the Muse headband regarded as a wellness or medical device?

If wellness, what design alterations would be required to make it a medical device?

Currently, Muse is marketed and sold as a general wellness device for the meditation and sleep markets. To become a medical device, design alterations wouldn't be required but an FDA or equivalent submission by country/region would be needed to attain medical device status.

With the rise in awareness and even misuse of data privacy, what steps did Muse engineers have to take to ensure its compliance with provincial/state laws?

At Muse, device and data security and personal privacy are a top priority in the design of our product. Since the beginning, Muse co-founder Ariel Garten along with board members like Anne Cavoukian who created the Privacy By Design framework, created The Center for Responsible Brainwave Technology to ensure that the highest standards around privacy and security were maintained. We try to keep abreast of the changing privacy framework in our primary markets around the world and continually update our transparent privacy policy (see: https://choosemuse.com/legal) to address changes in the law. We also focus on implementing

We also focus on implementing physical, technical, and administrative safeguards to protect the security and privacy of personal information.

What are the next biggest design alterations planned for Muse in the coming months, years?

We are constantly working on iterative product improvements to meet current customer pain points, one notable one being offering solutions for an even wider range of head sizes.

We are currently working with the National Research Council of Canada to develop a new version of our soft band that is compatible with all head mounted commercial VR/AR displays. Currently, numerous companies offer components of the required technology, including EEG, traditional physiological monitoring and VR/AR headsets. However, seamless integration that considers user-friendliness for a range of users remains lacking. Additionally, many of these components systems remain limited for use by clinical researchers. The overall outcome goal of the project is to increase effectiveness, convenience and affordability so as to deploy for home care use. This would be made available for remote monitoring by clinicians and for players in the VR/AR commercial space as a compatible hardware accessory.

When it comes to other larger functional changes, we have a few exciting plans for later this year that we can't talk about publicly just yet—stay tuned! **EP**&**T**

In-mold electronics gets human touch

Montreal smart surface solution specialists work with NRC on 5G tech

BY RON HAAG, VP OF TECHNOLOGY & JULIE FERRIGNO, **R&D ENGINEER, E2IP TECHNOLOGIES**

As printed electronics become integrated into industrial and commercial products and solutions, the term 'print-

ed electronics' is now mainstream. While leveraging printed electronics, e2ip technologies, has been working in partnership with the National Research Council of Canada (NRC) to advance the material science and manufacturing of In-Mold Electronics and with the Communication Research Center of Canada (CRC) to develop it's 5G smart surface technologies. This article offers an overview of these technologies.

What is in-mold electronics?

In Mold Electronics is becoming a common buzzword in the human machine interface (HMI) industry. Understanding the intricacies between the design and the process of producing a finished IME product is not that common, therefore a simplified explanation will help to understand the benefits of the technology.

Industrial design

The IME design begins with the creation of a 3D surface via industrial design experts that have vision and intuition as to how a user interacts with a device. From touch, to lighting, to material selection and integration into its surrounding environment, all these attributes go into creating the desired look and feel. This makes surfaces smarter to simplify our everyday lives.

Engineering

Once the part is designed in a CAD model stage, the design is recreated in a 2D format. This is the point where the engineer(s) will step in and utilize electronic skills, printed electronic expertise, connector methods, and lighting techniques combined with printing techniques to create a sophisticated version of a circuit board on a thin plastic film substrate utilizing specialized formable conductive and non-conductive inks.

final process. where resin is injected between the films to encapsulate all of the components.





Molding is the

Manufacturing

When the circuit and graphic designs are completed the actual manufacturing processing steps begin. The first process step is the printing phase which requires understanding the ink chemistries and print layer stack-ups. In some cases, the overall print stackup is completed on a single film and in others two films are used.

The second process step includes the pick-and-place of components required to add LED's, passive components and in some cases microprocessor capabilities. It should be noted that depending on the types of ink used, the pick-and-place step could move to a later point in the process.

The third process step converts the flat printed sheet to its intended 3D user interface shape. All inks along with the components on the film end up being positioned exactly where intended in the final shape of the part.

Typical thermoforming methods include high pressure forming and in some cases vacuum forming. The films are trimmed, sometimes before molding and sometimes after molding, and the circuits are function checked. Molding is the final process consisting of placing the formed films in a mold, where the resin is injected between the films to encapsulate all the components.



From ideation to

human-machine

smart surface

based e2ip

fabrication, Montreal-

Technologies delivers

interface (HMI) and

solutions to global

market leaders. The

firm specializes in

material science,

printed electronics,







This also provides the part with its rigid structure and a means for attachment via screw bosses or clips.

Finished product

IME represents the future of HMI in several industries including but not limited to aerospace, automotive, medical, white goods and industrial. IME offers industrial designers the freedom to create a truly innovative user interface with a smooth curved surface that integrates seamlessly into its surroundings.

Finished parts are thin, lightweight, durable, cost efficient and highly reliable. Additionally, they are easy to assemble with a streamlined manufacturing process, lower cost of assembly, and a lower carbon footprint.

e2ip technologies extended IME offering is called 'smart molded parts' and can include capacitive touch switches, various illumination techniques, proximity sensors, printed heaters, antennas, and shielding techniques. advanced manufacturing processes and embedded system development. https://ezip.com This technology is unique among esip's printed electronics product offering in that it does not have a human machine interface (HMI) application.

To look at, this technology could not be simpler. An e₂ip 5G smart surface is a fine line pattern printed on a thin, flexible substrate. The design of the pattern predicates the functionality.

Signal redirection applications

To start we must recognize the basic properties of millimeter-wave propagation. Due to the short nature of the wavelengths, these signals cannot cover large areas or pass through, buildings, walls, trees or solid structures. Due to this, millimeter-wave 5G networks will always have 'dead zones', particularly in dense city configurations. In order to extend coverage to these 'dead zones' providers deploy small cell antennas.

These antennas require power to operate and considerable resources for installation. 5G smart surfaces are a passive, require no power, and are low cost alternative to replace a proportion of the overall number of small cell antennas required in a 5G network, depending on the network design and requirements.

Because this technology is passive, installation is relatively simple. An e2ip 5G Smart Surface is applied to a surface and positioned in line of sight of a 5G signal to redirect the signal in a pre-set direction. The surface could be a wall, window, billboard, a painting or a custom panel. The dimensions vary based on design and network requirements.

Different patterns provide different functionality. For signal redirection, the 5G smart surface (reflector) can act as a mirror for a selected frequency and redirect the signal at a specific angle. While the 5G smart surface (diffuser) re-directs the signal in multiple directions. The diffuser technology is used to cover dead zones inside buildings or to enhance the coverage of the 5G Network outdoors in dense cities.

Signal blocking applications

 e_2ip 's 5G Smart Surfaces can block certain frequencies and ignore all others. This technology can be leveraged to protect the data transmission at a certain frequency from one space to another or act as a shield, preventing certain millimeter-waves from propagating.

Both mechanically and functionally the surfaces can be customized to meet each customer's specific needs. This technology has been designed and is qualified to perform in harsh outdoor conditions.

Considerations when planning your printed electronic circuit

Creating a custom HMI solution for your application

BY MEMTRONIK, SAINT-HUBERT OC



There are many innovative ways to create a custom human-machine interface (HMI) for your application. That is why

it is important to have a good sense of what you are looking to accomplish - weighing aesthetics, feel, functionality and cost. To help guide your decisions, here are some considerations when developing your solution.

Determining what you want to achieve is a great starting point. Do you want a custom interface, an optimized version of an existing circuit, or simply want an update of a current design? It is preferable to be able to explain your objectives to your supplier's designers at the outset.

If they know your goals, they can offer options, explaining associated pros and cons and help you determine how to best use the available space for your keypad. Ultimately this permits you to optimize the user experience within the budget you are working with. Their expertise can be leveraged by you. Each supplier's strengths and process will differ and, when engaged in the engineering early enough, they can help you achieve the ideal result based on your priorities and preferences.

UV protection

Your new HMI should be an upgrade. Your perspectives regarding any current solution you have can be shared with your design partner, giving them a sense of what improvements are sought and which features and capabilities you wish to retain. This will guide the development plan.

Knowing how and where your circuit will be used is important because the physical environment the product will be in and who will be using it is very relevant. These circumstances will guide decisions on



FIG 1 Depending on the material, your membrane switch keypad's lifespan can range from thousands to millions of interactions.



FIG 2 Membrane switch technology can adapt to almost any application.



The aesthetic of a custom graphic overlay permits a wide variety of design options, creating an unique experience when interacting with the HMI.

applicable regulations and standards - MIL, Medical, FDA, UL, Automotive or other, influences how the HMI is constructed. Protecting a sensitive circuit from ESD or preventing EMI/ RFI emissions determines the type of shielding required in the interface and affects the ability to get required approvals.

Optimizing yields

The interpretation of colour can be very subjective, while generally being important to the customer. The use of colour swatches or a spectrophotometer or industry standard colours is highly recommended to avoid any disappointment.

The space for your interface is typically already defined. For a perfect fit, exact measurements of the area available for your HMI must be provided to your supplier. Singulation can be extremely precise with the use of the latest laser technology.

In high-volume applications a die-cut approach can be justified as well. Modern 3D modelling techniques allow engineers to preview spaces with the design of your solution to make sure

FIG 4

Memtronik's automated and highly-controlled factory can manage prototyping to large scale manufacturing.

material selection. Is UV resistance required for exterior use? Is resistance to aggressive materials needed? What force and wear will the cover layer need to withstand? Is sunlight viewing or backlighting of keys required? How many operational cycles do you want the keypad to be rated for? What temperatures will the membrane be exposed to, and what operating range is expected? What moisture levels can be anticipated? Will users be wearing gloves? The choice of smooth or textured surfaces - including embossing (braille/rim/pillow/

dome options) for improved tactile feedback, will be determined by this. The recommendation for use of LEDs, other backlighting, or 7-segment displays for visible communication will be based on these parameters.

Regulatory needs play a key role in the construction of your design. In many instances, manufacturers must follow requirements outlined under UL94 concerning the flammability of plastic components installed in appliances, IP standards that apply to product sealing, and applicable NEMA standards. Awareness of everything is as it should be. The engineering charges) related to more detailed information you can provide - including tolerances, the more helpful it is!

The earlier you consult with your supplier the better, as the location of cable slots in the substrate, positioning of openings, the length and location of the cable can be managed easily during the initial stages, while optimizing yields.

Costing the solution

Share your budget information at the outset. The finished product can be targeted to meet your financial objectives. Your supplier will be able to guide you in terms of what options you may entertain, and which ones would force you outside of your price range. This approach supports meeting the highest standards possible within your price range.

Consider the volume factor when costing your solution. There are initial NRE costs (non-recurring options and the appearance of

the generation of the drawings for customer sign-off and production purposes, as well as the patterns that need to be generated for the screens used for the printing steps.

Production considerations

Those are one-time expenses providing that the design is not changed. In addition to that, there is the cost of setting up the equipment and pastes for a printing sequence. That set-up cost is amortized over the number of units built.

For one unit, the whole set-up cost is added to the production cost of the one unit. For 10,000 units, each unit has 1/10,000 of the set-up cost added. Asking for the quotation of finished product in the usage volume expected will give you a realistic sense of ongoing prices.

To help you get a sense of your

your unit, a 3D model or prototype of your design gives you an advanced idea at the development stage and permits you to spot anything that needs to be changed prior to production. In short, it helps you identify issues up front and minimizes costs.

Product evolutions

When you are ready to order, CAD or 3D files, as well as Vector files for your illustrations are usually needed to proceed. Your manufacturer might be able to offer a vector image creation and 3D modelling service. Your timeline will influence the type of HMI that suits you best. All providers work differently, so choosing the right manufacturer is essential to guarantee a streamlined process from start to finish. Raw material supply can be unpredictable, so using the standard materials typically stocked by your supplier mitigates delivery risks.

There is no harm in planning for the future. Add-ons, updates and optimizations, product evolutions are only a few things that you can begin to consider.

Sharing these thoughts with your supplier can save you money and provide you with an understanding of what is achievable going forward. Do not hesitate to draw upon the expertise and know-how of your supplier's designers.

Designing and manufacturing high-quality circuits and sensors for the printed electronics, industrial and consumer industries is no easy feat. With state-of-theart equipment and engineering, these challenges are easily managed. **EP**&T

This article was written and submitted by Memtronik, Saint-Hubert QC-based design and engineering specialists in printed electronics and user interfaces. https://memtronik.com

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Smart fabric allows users to track data directly through clothing

Nextiles blends traditional sewing techniques with pcbs

Nextiles, a New York-based textiles manufacturing startup backed by the National Science Foundation (NSF) and Massachusetts Institute of Technology (MIT), is launching into the sports and performance market to provide smart thread technology that captures biometric and biomechanics data. Spun out of academia, Nextiles was founded in 2018 while George Sun, a trained biological and electrical engineer, was finalizing his PhD in biomaterials at MIT.

While attending MIT's Media Lab, Sun was recruited to lead the embedded engineering team at PUMA, with a focus on incorporating sensors into footwear. Through his work, he was inspired to recreate the sensor industry and provide a superior form factor by developing a now-patented technique to sew sensors directly into fabric. In its early stages of development, Nextiles was recognized and awarded by MIT to fund further optimization of the smart fabric technology and was also selected to go through MIT's accelerator program, Delta-V and finally joining the Newlab community in Brooklyn.

Threads are semi-conductive

Behind the science, Nextiles blends traditional sewing techniques with printed circuit boards to make flexible material with sensors embedded within fabrics, such as your everyday sportswear. Through its patent-protected manufacturing process, Nextiles' fabrics allow for complete biomechanic and biometric sensing captured on one platform – no straps, rings, wraps or clunky attachments that only capture partial data. Nextiles leverages the use of traditional sewing machines and commonly found threads, such as nylon or spandex.

The threads used are semi-conductive, which measure mechanical changes from multiple data points. Nextiles differentiates its suite of data analytics by providing Newtonian measurements through its fabrics (force, bending, stretching, velocity, pressure) to offer athletes and teams data such as torque, power, fatigue, strain, and much more. The fabric captures traditional measurements, as well by combining force data with IMU technology (direction, speed, distance). Nextiles provides clients with APIs and SDKs to stream data via Bluetooth in real-time and offers the ability for data to be stored locally and in the cloud.

Nextiles is headquartered out of where the Garment District once thrived in New York City. Inspired to fuel further innovation





"One of the reasons we value fabrics over traditional printed circuit board technologies is our philosophy of building from the bottom up thread by thread"

within fabric and sewing, Sun moved the headquarters to Brooklyn's Navy Yard after being recruited by Newlab – home to over 150 companies focused on frontier technology and 800+ entrepreneurs, inventors and engineers. Newlab approached Sun to join and reinvigorate the textile industry by innovating locally. The factory, which was a Navy Yard building during WWI and WWII, now hosts Nextiles' core engineering team. Nextiles also maintains a cut and sew studio in New Jersey, as well as an industrial design team based in Manhattan.

"Modern sewing technology is almost 2,000 years old, but the industry in recent decades has been overlooked because our society believes we maximized its utility," said Nextiles CEO George Sun. "However, at Nextiles, we are rekindling textile innovation, and more importantly doing it in what was once the sewing capital of the world. One of the reasons we value fabrics over traditional circuit board technologies is our philosophy of building from the bottom-up – thread by thread. Our industry has coveted smartphones so much that we have grown to become content in wearing them as watches and straps. Rather, we should instead endow such powers to what we are most familiar with. Revolutionize our clothes, instead of miniaturizing computer chips, by building on top of generation and time-tested fabric materials."

While Nextiles is leveraging apparel as its first platform, the company sees broad technological applications and is working with several OEMs in various business verticals, such as automotive, military, and fitness.

Camera vision or accelerometers

"We've seen our technology become incorporated into more than just garments, but as solutions for a variety of inter-related industries," Sun continued.

"If it can be sewn, it can be smart. To date, we have several ongoing projects and collaborations in sports performance quantifying movement which would otherwise be impossible with camera vision or accelerometers, because we literally form around the 3D complexities of human movement. With that, we've also seen interest from OEMs in augmenting their current product offerings by taking their soft-good products and pushing them into the IoT world. I am excited to share this technology with our manufacturers and athletic partners because there is an internal gratification among our team when someone can own their own data through their own clothes."

In 2020, Nextiles completed its seed round, which was led by its first investor, MIT. The remainder includes a diverse group of strategic individual investors who are senior executives ranging from multiple industries such as sports, media, retail, medicine, technology, finance and professional athletes.

"We are extremely grateful to have welcomed several individual investors from diverse backgrounds with incredible experience and networks who all share our vision of a more connected future. The diversity of our cap table reflects the diversity of our technology and we look forward to innovating alongside current and future partners in a variety of business verticals," said John Peters, chief business officer of Nextiles. **EP**&**T**

NRC unveils advanced materials research centre

Mississauga facility represents NRC's first physical **R&D** presence in the Greater Toronto Area



The national Research Council (NRC), Canada's largest federal research and development organization, recently opened the doors

its brand-new advanced materials research facility in Mississauga. Located in Sheridan Research Park, the facility represents the NRC's first physical R&D presence in the Greater Toronto Area.

The facility acts as a catalyst to accelerate the development of advanced materials technologies and their commercialization in disruptive new products. Together with industry, academia, and other government department (OGD) partners, the facility establishes and operates a national innovation platform, supporting and undertaking foundational research and development (R&D) to develop new materials, scaling up their production, and de-risking and demonstrating their application.

Capabilities

The facility aims to support materials development and commercialization in numerous industrial sectors by establishing a technology platform and enabling infrastructure relevant to a broad range of materials and partners. The NRC team of research professionals and experts in chemistry, materials science, engineering, AI



NRC's advanced materials research facility in Mississauga Photo: Phil De Luna, NRC

(artificial intelligence), robotics and technology transfer addresses common challenges in advanced materials development and commercialization through research and technology development (R&TD) spanning three core platform technologies:

Accelerated materials discovery and process development, including:

- computational materials discovery, design and process simulation
- high-throughput materials characterization and processing experiments
- structured materials and process databases

Production scale-up, demonstration and standardization, including:

- materials and process standards development
- materials synthesis and scale-up design and demonstration of
- multifunctional materials and devices

Materials and process sustainability and safety, including:

- cradle-to-grave materials and product life cycle assessment
- health and environmental impacts and mitigation methods
- accelerated aging of materials and devices

These platforms are applied to printed electronics, clean energy materials, smart and multi-functional materials and structures, and novel feedstock materials for additive manufacturing.

CCAMM

The NRC's Mississauga facility also represents a major stepping stone in a longterm vision supporting the creation of the Canadian Campus for Advanced Materials Manufacturing (CCAMM), a joint initiative between the NRC and the Xerox Research Centre of Canada. CCAMM aims to offer unique shared facilities where new kinds of 'public-academia-private' partnerships representing high-value advanced materials expertise will be created and fostered.

CCAMM will act as a catalyst for development, manufacturing, and integration to aid in more quickly accessing markets for new advanced materials. As CCAMM grows, and by working together, the organizations will share the goal of accelerating research results, improving commercialization impacts, and helping to build an ecosystem where new relations with stakeholders and industrial partners are established. **EP**&T

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750W rated i7A non-isolated dc-dc converters are capable of operating from an input voltage of 18V to 32V. The step-down converters deliver an output voltage that can be adjusted from 3.3 to 18V with an output current of up to 45A. Product series has been optimized for a 24V nominal input and weighs 25g, intended for use in a wide range of applications. Models utilize the industry standard 1/16th "brick" pinout, potentially offering cost reduction and efficiency improvements over isolated converters. https://www.us.lambda.tdk.com

OPTICALLY CLEAR EPOXY IS NON-CYTOTOXIC MASTER BOND



EP30-4Med two part epoxy system has a fast set up time that

cures at room temperature, or even more rapidly with a bit of heat. The low viscosity system meets the requirements of ISO 10993-5 testing and is therefore considered to be non-cytotoxic. Product can be used for bonding, sealing, and small encapsulation applications. It can also be utilized as a coating, especially when optical clarity is needed. Product resists EtO sterilization, and withstands most detergents, disinfectants, bleaches and liquid sterilants.

k https://www.masterbond.com/ properties/biocompatible-adhesive

POWER SUPPLIES SERVE VARIOUS BENCH APPLICATIONS ROHDE & SCHWARZ



NGA100 power supplies deliver intuitive manual control and simple computer-controlled operation, and can be used as a bench supply. Easy-to-use entry-level units are feature rich and are based on a stable output, low noise, linear topology housed in a compact footprint and is quiet in operation. Products provide improved readback accuracy and deliver a low current range with multiple sleep modes for completing demanding measurements required by IoT devices. The channel fusion feature extends voltage and current ranges by allowing the isolated outputs to be connected in series for higher voltages or in parallel for higher output currents.

★ https://www.rohde-schwarz.com

HIGH-TEMPERATURE WIRE STRIPPER STATION BOOSTS PRECISION



JBC TOOLS WSS precision high-temperature wire stripper station is specially designed for

stripping high-temperature wire insulations made of thermostable materials such as teflon, kapton, silicone rubber, etc, from 14 to 40 AWG (1.63 to 0.079mm) up to 800°C / 1470°F. Unit incorporates predetermined power levels for each type of material. Product features a customized working mode. Station comes with comfortable WS140 Precision Tweezers and is compatible with W140 Blade Cartridge Range. Cartridge customization is available to satisfy any special requirement. ► https://www.jbctools.com/ ws-thermal-wire-stripperproduct-1912.html

REGULATORY TEST SOLUTION ACCELERATES CERTIFICATION OF WIRELESS DEVICES KEYSIGHT TECHNOLOGIES



IOT0047A regulatory test solution accelerates the certification of wireless devices that use the unlicensed bands at 2.4 and 5GHz and achieve time-tomarket goals. Flexible test software is continuously updated according to the latest ETSI and FCC standard releases. Product increases throughput and asset utilization with a system that can easily scale into separate test stations and used in parallel to address different standards and test cases. Upgrade as needs evolve with an expandable system - add additional channels, software capabilities or standards coverage.

★ www.keysight.com

WIRE-TO-BOARD CONNECTOR COMES WITH INTEGRATED ISL



Molex Micro-One Wire-to-Board Connectors with integrated ISL ensures proper

terminal insertion and prevents accidental back-outs. This allows users to achieve a secure electrical contact and have improved mating retention in high-vibration applications. Devices feature 2mm pitch low-profile design and come with UL/CSA certification. Products are compatible with existing MicroClasp Terminals. Devices are available as 2- to 8- circuit vertical and right-angle header assembly.

★ https://www.tti.com

SENSING PLATFORM PUTS HAPTIC-RICH TAP, SWIPE, CLICK AT FINGERTIPS

BORÉAS TECHNOLOGIES



NexusTouch sensing and localized haptic platform allows designers to expand touch-based user interfaces on the sides of smartphones and gaming phones. Platform enables seamless context-sensitive swipes, taps and clicks-all while delivering rich haptic feedback. Blending advanced gesture sensing with localized haptics, platform supports a range of new use cases, from finger-clicks that makes a smartphone feel like a DSLR camera to customizable trigger effects that replace mechanical toggles on a premium gaming phone.

k https://www.boreas.ca/pages/ nexustouch

CONDUCTIVE INKS DELIVER CONDUCTIVITY OPTIONS IN PRINTED ELECTRONICS NOVA CENTRIX



Metalon conductive inks capitalize on advanced materials and formulation to provide conductivity options for additive manufacturing of printed electronics like photovoltaic devices, RFID, smart cards/labels, displays, and advanced packaging. Inks with solderable, resistive, magnetic and stretchable conductive properties are also offered. Utilizing nanoparticles and flakes, inks are available in off-the-shelf formulations as well as custom formulations for specific applications and print methods. Variants already developed include silver inks suitable for application by inkjet, screen, flexographic printing, and gravure.

khttps://www.novacentrix.com/ products/metalon-conductive-inks



PCB BOARD CONVERTS SPEAKERS INTO NETWORK COMPATIBLE DEVICES TOA CANADA

N-SP8oSB a SIP compliant hands-free Voice over IP (VoIP) pcb board has the capability to transform already mounted or to be installed analog speakers into network compatible devices. Utilizing standard SIP protocols, the board can integrate with external SIP compatible systems through a SIP server and Peer-to-Peer configuration when a server is not present. Achieve installation by mounting the SIP board behind the speaker and with that, the device morphs into a key cog of any network audio system assembly.

ĸ www.toacanada.com

SMALL TO LARGE I/O TEST SOCKET SERVES BGA DEVELOPMENT IRONWOOD ELECTRONICS



Grypper G80 LIF test sockets (part number GR1005-XXXX) are suitable for any BGA device, including large array ASIC's and the smallest I/O and down to 0.35mm pitch. Device can be designed to any I/O count specific to most custom BGA requirements. Products allow testing of an 896 I/O -31.0 x 31.0 pitch BGA package. The 109092-XXXX Grypper socket is a 12 ball socket at 0.40 pitch. Device measures 1.2 X 1.6mm, and also incorporates built in alignment corners making it easy to position the small BGA to the socket prior to insertion. ★ https://www.ironwoodelectronics. com/products/grypper/grypper-G80-G80-LIF.html

BIO-BASED HOT MELT ADHESIVE SUPPORTS STRUCTURAL BONDING APPLICATIONS HENKEL

LOCTITE HHD 3544F bio-based polyurethane reactive (PUR) hot melt adhesive is suitable for

consumer electronics assembly. Approximately two-thirds of the product's content is sourced from renewable, plant-based feedstocks. A one-part, moisture-cure material, product delivers a sustainable production alternative that provides many market-leading advantages. The bio-based formulation is compatible with a variety of substrates including plastics, metals and glass; aligns with high-volume production objectives, enabling deposition of narrow bond lines via jetting or needle dispensing; and integrates fluorescence for in-line AOI. ▶ https://www.henkel-adhesives.com

IP67 RATED TACT SWITCH DELIVERS 5,000,000 LIFE CYCLE E-SWITCH



TL6150 series surface mount tact switch provides up to 5,000,000 cycle life expectancy in a 6.2mm square footprint. Product series features a soft silicon actuator available in two heights - 3.50mm and 5.20mm; provides termination options - Gull Wing or J Lead; and multiple force options indicated by actuator color - Brown - 160gf ± 50gf (5,000,000 cycles); Red - 200gf ± 50gf (500,000 cycles); Orange -

350gf ± 100gf (300,000 cycles). Devices are rated IP67 for moisture and dust protection. Additional features include SPST Off-(On) function; 12Vdc, 50mA contact rating, dielectric strength of 250Vac for 1 minute; operating temperature ranges from -40°C to 85°C. Travel varies with force - 0.3mm (160gf), 0.35mm (200gf), 0.5mm (350gf). ★ www.e-switch.com

ADAPTIVE SOM ACCELERATES AI APPLICATIONS AT THE EDGE XILINX



Kria portfolio of adaptive system-on-modules (SOMs) are production-ready

small form factor embedded boards that enable rapid deployment in edge-based applications. Coupled with a complete software stack and pre-built, production-grade accelerated applications, Kria adaptive SOMs bring adaptive computing to AI and software developers. Kria K26 SOM specifically targets vision AI applications in smart cities and smart factories. Firm's SOM roadmap includes a full range of products, from cost-optimized SOMs for size and cost-constrained applications to higher performance modules that will offer developers more real-time compute capability per watt.

★ https://www.xilinx.com

HIGH CURRENT CHOKE WITH VERTICAL DESIGN **MOUNTS TO PCB** SCHURTER



DKIV-1 current-compensated chokes for pcb mounting, includes a vertical design for 1-phase high current applications. Device sports a compact design and smaller footprint due to its vertical orientation. Product series is available with a ferrite or nanocrystalline core for a wide range of rated currents from 10A to 50A. Product series is suitable for use in any application requiring EMC asymmetrical inductance. Devices deliver max. rating of 50A, and require a small footprint to accommodate its THT terminals on the pcb, thus saving valuable board space without compromising performance. ★ https://us.schurter.com/en/ datasheet/DKIV-1

BROADENING ULTRA-COMPACT, HIGH-EFFICIENCY DC-DC CONVERTERS MURATA



UltraBK, MonoBK and PicoBK series non-isolated dc-dc converters are suitable for distributed power architecture applications. Products provide small size, high efficiency, decreased noise, low EMI, and take up less board space. Devices address the design challenges impacting today's communication, storage, and server applications along with the exacting demands of the emerging 5G market. Devices were developed for distributed power architecture applications. Each version features small size, high efficiency, decreased noise and low EMI.

★ https://www.murata.com

SINTER PASTE BOOSTS THERMAL CONDUCTIVITY HERAEUS



mAgic DA295A sinter paste improves thermal conductivity

and enables power electronics to operate at elevated temperature and extends device lifetime. Product is a low temperature, non-pressure sintering solution designed to achieve improved die-attach properties for high power, high reliability applications. The improved micro-Ag formulation further widens processing window to reduce overall cost of ownership. Product is lead-free and contains zero halogen, while improving dispensing performance - no cleaning required.

khttps://www.heraeus.com

SUPPLY SIDE



SEMICONDUCTORS

IBM UNVEILS 'WORLD'S FIRST' 2NM CHIP

IBM, Albany NY, unveiled a breakthrough in semiconductor design and process with the development of what it's calling the 'world's first' chip with 2 nanometer (nm) nanosheet technology.

Demand for increased chip performance and energy efficiency continues to rise, especially in the era of hybrid cloud, AI, and the Internet of Things. IBM's new 2nm chip technology helps advance the state-of-the-art in the semiconductor industry, addressing this growing demand. It is projected to achieve 45% higher performance, or 75% lower energy use, than today's most advanced 7nm node chipsi.

The potential benefits of these advanced 2nm chips could include:

- Quadrupling cell phone battery life, only requiring users to charge their devices every four days.
- Slashing the carbon footprint of data centers, which account for one percent of global energy use. Changing all of their servers to 2nm-based processors could potentially reduce that number significantly.
- Drastically speeding up a laptop's functions, ranging from quicker processing in applications, to assisting in language translation more easily, to faster internet access.
- Contributing to faster object detection and reaction time in autonomous vehicles like self-driving cars.

Increasing the number of transistors per chip can make them smaller, faster, more reliable, and more efficient. The 2nm design demonstrates the advanced scaling of semiconductors using IBM's nanosheet technology. Its architecture is an industry first. Developed less than four years after IBM announced its milestone 5nm design, this latest breakthrough will allow the 2nm chip to fit up to 50-billion transistors on a chip the size of a fingernail.

More transistors on a chip also means processor designers have more options to infuse core-level innovations to improve capabilities for leading edge workloads like AI and cloud computing, as well as new pathways for hardware-enforced security and encryption.

BRANDING

KYOCERA, AVX TO ESTABLISH FRESH BRAND



Kyocera Corp. and AVX Corp. will establish a new integrated brand - Kyocera AVX - to be used for the Kyocera group's electronic components business starting in October, 2021. The move will follow the integration of Kyocera's Corporate Electronic Components Group and AVX into a new segment, effective now. The new brand structure will accelerate and strengthen the growth of Kyocera's electronic components business worldwide. The consolidation aims to enhance the global sales capabilities, and maximize synergy by combining the companies' resources of manufacture and development for further expansion of its global business.

AVX, a wholly-owned subsidiary of Kyocera, is a leading global supplier of a wide range of products, including electronic components, connectors, and sensors.

In its key markets, Kyocera expects demand for electronic components to accelerate due to the widespread use of IoT, 5G and Advanced Driver Assistance System, and rapid technological innovation and business opportunities are brought about by the progression of the so-called "the 4th Industrial Revolution."

INJECTION MOULDING

LBE SOURCES RESIN FOR INJECTION MOULDING NEEDS

While semiconductors have stolen the headlines with its global supply chain related challenges of late, other critical pieces to the electronic design process have also been tripped up. Leister Blake Enterprises Ltd. (LBE), Port Coquitlam BC, providers of custom electronic packaging solutions to the designer community in Canada, recently helped source plastic resin for a handful of its customer's injection moulding units - helping to save the day, according to company president Rob Blake.

"One of our major customers was having trouble finding plastic resin for their injection moulder here in Canada. We managed to find 13 metric tonnes of that product," Blake enthused. "Another customer was facing a shut down for lack of printed circuit boards (pcbs) and we found a supplier that can produce them in 18 days - at least as of now."

LBE supplies ABS, PC, fire retardant, and nylon resins among others at present. In addition, LBE has added FR4 material to its portfolio. FR4 is a type of high-quality PCB, which requires the use of copper and resins, both of which are becoming scarce and expensive due to demand – driven by factory disasters, such as fires.

"We can source some FR4 material if we have the customer's Gerber files showing us what they need," Blake states.

EDUCATION

EXFO PARTNERS WITH ALGONQUIN COLLEGE

EXFO Inc., Quebec City-based telecom test, monitoring and analytics experts, is collaborating with polytechnic institute Algonquin College in Ottawa, for the college's Optical Systems and Sensors (OSS) program.

EXFO will support the program's upgrade of its Optophotonics Lab by donating advanced testing technology equipment (100G), in the form of FTB portable test modules.

"This testing equipment will enhance students' work in the program's state-of-the-art Lab and will give them invaluable hands-on, practical experience in operating and managing 200Gb/s optical transport networks and optical switches in the Lab," says Dr. Wahab Almuhtadi, professor and coordinator of optical systems and sensors program, an Algonquin College-Carleton University bachelor's degree joint program.

ACQUISITION

STANDEX ACQUIRES AMERICAN RELAYS

Standex Electronics, a global electronics component manufacturer, has acquired American Relays, Inc., manufacturer of reed switch-based relays.

"This move further strengthens Standex' position in the T&M market, and will allow the firm to provide more products and options to customers of both companies," says Standex president John Meeks.

"This acquisition will also help strengthen our position in the North American relay market, as we will now be able to provide American Relay customers with a wider array of relay products and deeper application knowledge."

PRODUCT SOURCE GUIDE



Current-compensated choke

- Compact and lightweight for 1-phase applications - Vertical THT package with small PCB footprint - Ferrite or nanocrystalline core

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Apple AirPods Max

BY IFIXIT



With a name like AirPods, we had to know: will the AirPods Max be serviceable to any degree? Or did Apple spend a good chunk of the \$550 price on over-engineering them into knots?

What's inside?

- Two 40 mm Apple-designed dynamic drivers
- Two color-matched magnetic ear cushions
- Two Apple H1 chips
- Eight microphones for active noise cancellation
- Bluetooth 5.0 with support for the Apple-
- friendly AAC codec
- A soft-touch Smart Case and a Lightning-to-USB-C cable for charging

With the screws removed, the drivers flip right out, revealing a pair of repair-friendly spring contacts directly underneath. That provides enough clearance to remove our next target: the battery. As shown in the X-ray, both battery cells live in the right ear cup, tethered together by a single cable. Both cells are fastened with screws, not adhesive. Even better, they provide power via a single, iPhone-style pop connector—no solder here.

Upon extraction of the logic board, it provided an interesting display of silicon.

- STMicroelectronics STM32L496QG 32-bit Arm microcontroller
- Apple 343S00404, likely a Bluetooth SoC (rumoured to be the H1 chip).
 - Winbond W25Q256JW 256 Mb serial flash memory
 - Cirrus Logic CS46L10A0, likely an audio codecCirrus Logic CS44L22, likely a 1-Ch.
 - audio amplifier
 - Texas Instruments SN2501, likely a battery charger IC

Apple's electromechanical hinge hardware is both intricate and overbuilt - providing a sturdy but comfortable connection for the headband, while also reliably passing a power connection through from the battery.

Net result

Despite the slightly confusing and over-complicated (read: sticky) opening process, these things are actually fairly serviceable. Not fun to service, but serviceable.

FIG 1

To begin the teardown, it turns out, you're not supposed to remove the screws—just rotate them each a quarter turn or so, to release a locking wedge on the other side.





Fig 2

There's a unique logic board in each side of the headphone set.



Fig 3

While challenging to remove, this port's modularity is critical for repairs.





This hinge needs to provide a sturdy but comfortable connection for the headband, while also reliably passing a power connection through from the battery.

It was rumored that Apple wanted to design AirPods Max to be easily-swappable like its magnetic ear cups.

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**

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KANUFACTURING

On May 13th, Annex Business Media's Manufacturing Group teamed up to host Women in Manufacturing, a one-day virtual summit that brought together industry experts and thought leaders to promote gender equity, diversity and inclusion in Canadian manufacturing.

Visit womenincanadianmanufacturing.com to view on-demand content.

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