Editorial

Cars Full of I&M!

Wendy Van Moer

First of all, I wish you all a very happy and prosperous 2019!

When you read this, we will have already enjoyed one month of 2019. However, when I wrote this editorial, we just lost our good friend and colleague Prof. Domenico Grimaldi (known as Mimmo to our friends). He was a dedicated reviewer and author for our I&M Magazine. But, most of all, he was the happiest man I ever knew. He always looked happy and was always laughing. I will miss his smile!

I am sure that Mimmo would have enjoyed this issue… full of cars! So Mimmo, this issue is for you!

Ladies and cars… it seems to be a good match! Your EIC has been crazy about cars from the age of… well, since she was born. And our Guest Editor is even worse, I think…

Silvia Cutrufelli knows everything about cars, and she is the most perfect Guest Editor for this issue. It was a pleasure and a great honor to work with her. We received many interesting papers on various topics within the automotive world.

I hope you enjoy it as much as I did!

Groetjes,

Wendy

Guest Editorial

I&M in the Automotive Sector

Sylvia Cutrufelli
I am very pleased to introduce this issue of I&M Magazine about I&M in the automotive sector.

In the last 50 years, the automotive market has become more competitive every day. It forces the manufacturers to continuously evolve and to introduce a lot of new instrumentation and consequently measuring techniques. In the past, automobiles were seen only as mechanical machines, but now, it is evident that electronics play a fundamental role in the evolution of cars, and not only on a safety side.

Today's cars have more than 50 electronic control units (ECU) on board for the continuous monitoring and control of many systems and functions of the car. The first use of an ECU computer was for engine control and specifically to perform electronic fuel injection. Due to the increase of production and sale volumes of cars, the industry has demanded more of safety and security systems. Active and passive safety mandates are by now fully regulated by international agreements and tested with instrumented dummies in order to guarantee the safety of all of the drivers and passengers.

The fast automotive technological process also pushes the manufacturers to guarantee safer vehicles by assisting and alerting the driver by designing Advanced Driver Assistance Systems (ADAS) which aim to prevent the possibility of collision with people or other vehicles and to automate/ improve driving maneuvers. In this way, ADAS should be considered as a first step in the direction of autonomous driving vehicles.

Even if not regulated by norms in terms of maintenance and replacement, suspensions are very important components for the stability of the vehicle; together with brakes and tires, they should be considered before any other component for ensuring safety while driving.

Nowadays, many manufacturers produce vehicles, and what can help the customers choose one brand instead of another are quality and personalization. For example, external and internal lighting can differentiate a brand from another in terms of user perception. Also, the Human Machine Interface (HMI) can condition the customer in the choice of the brand and of the vehicle in terms of suitability to habits and attitudes. On this side, virtual and augmented reality play an important role in the design of new vehicles and allow the manufacturers to reduce design time and cost while they focus on the occupants, for example drivers' ergonomics and perceived quality.

And what about the future? For sure one possible direction will be the continued development of electric vehicles, with the improvement of the dynamic wireless recharge capabilities and the possibility that the driver becomes a passenger of the car.

I hope that the readers will enjoy all of the interesting papers and consider ways to stay connected with innovation in the automotive industry. It is a sector that amazes continuously! Finally, I would like to thank Eng. Luca Russotti for his kind cooperation and professionalism: a technical precious help.
Memoriam

Domenico (Mimmo) Grimaldi

Alessandro Ferrero

In Italy, everybody active in the I&M field could say that they’ve known Domenico (Mimmo) Grimaldi forever, even if they lived hundreds of kilometers apart, they studied at different universities and worked in different universities. We all shared the same interest and passion: I&M. In Italy, there were very few professors teaching I&M when Mimmo, and those like us, started careers, many years ago as young assistant professors. Our professors, who triggered and nurtured our passion for I&M, were so wise to understand not only the importance of this subject in a world that is more and more relying on measured quantities and data, but also that the I&M culture could be developed and disseminated by people who were deeply engaged in this field and in finding common solutions to the different I&M problems. They organized, on a regular basis, several scientific meetings where these issues could be discussed among all of us. Their wisdom was so great that they also understood that good friends could be much more “efficient” rather than only colleagues. So those meetings – let’s not forget that we live in Italy! – always ended with a good dinner, with all of us sitting at the same table and sharing the same good food and good wine. No wonder that the generation to whom Mimmo belonged developed such a strong friendship, and the awareness that we had not only good colleagues, but also good friends. Mimmo was one of the quietest of us, always respectful of everybody else’s ideas but also very determined in expressing his own ones. His competences in the ADC field and, more recently, in biomedical measurements represented a reference for all of us.

His contribution to our Instrumentation and Measurement Society was as significant and silent as he was. He was one of the best Associate Editors for our Transactions on Instrumentation and Measurement, and he was one of the founders of our MeMeA symposium. The 2009 edition he organized in Cetraro, a wonderful little town on the Southern Italy coast not far from his home town Cosenza, was memorable from both the scientific and social point of view, filled with the natural warmth with which he could infuse everything he did.

He was also a wonderful father for his daughter and his son. He loved to talk of them, and there was always a glance of pride in his eyes, even when he was somehow worried (and which father is not?) about their future.

Now that a terrible, silent and sudden illness stole him from us on October 24, 2018, at the age of 66, we are dearly missing all of this: a colleague, a friend, and the companion with whom we shared all our professional lives as well as many wonderful moments. We’ll miss you, Mimmo. Our deep sorrow is mitigated only by the awareness that your warm smile will remain with us forever. Ciao! Rest in peace.

The print magazine includes a photograph.

Article Summaries
**The Evolution of Passive Safety in ILM**

*(Summary)*

Agata Maria Di Natale

This article presents the general concepts of passenger safety design in automobiles and discusses the evolution of passive safety systems over the past decades. A detailed comparison of the EuroSID II re and the WorldSID safety testing programs and crash dummy instrumentation design are presented.

*This summary is a brief overview of the article.*

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**History and Future of Driver Assistance**

*(Summary)*

Marco Galvani

A simplified distinction between passive and active safety systems in the automotive industry is that while the former mitigate the consequences of an accident, the latter prevent its occurrence. In this overview, the reader can find a survey on the main active safety systems which can be classified as Driver Assistance Systems, although only Advanced DAS are the focus.

*This text is from the introduction of the article.*

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**Vehicle Suspension**

*(Summary)*

Andrea Secondi

Conventional vehicles must have suspension parts made by molding or casting technology with limited regulation of the geometry so the vehicle dynamics performance remains constant during the operational time. Racing vehicles must control the ground clearance to optimize aerodynamic behavior. Regardless of their application, no type of suspension can manage in a perfect way the geometric constraints: all types of suspensions have some fault in their driving accuracy, due to their kinematics and to their structural flexibility. These faults often give the particular behavior to each suspension type, and so an optimal design of a suspension is the best trade-off between these various features.

*This text is from the introduction of the article.*
Automotive Design: At the Beginning Only Was Light

(Summary)

Antonio Leone

This paper presents the evolution of automotive lighting design for both the exterior and interiors of vehicles and the future technology of lighting instrumentation and measurement. As the author discusses, “automotive brands bet on the “wow effect” when customers drive their cars. There are so many specialists and working hours spent on engineering lighting contents… If cars will not fly in a few years, they will certainly be full of brilliant technological contents.”

This summary includes text from the article.

Human-Machine Interaction, Methods and International Standards

(Summary)

Dora Serritiello

Researchers in the field of HMI observe the ways in which humans interact with vehicles and design technologies that let humans interact with it, accessing all of the relevant information at the right time in the correct manner. The advantages provided by incorporating HMI include error reduction, increased system and user efficiency, improved reliability and maintainability, increased user acceptance and user comfort, reduction in training and skill requirements, reduction in physical or mental stress for users, reduction in task saturation, etc.

This text is from the introduction of the article.

Implantable Autonomous Device for Wireless Force Measurement in Total Knee Prosthesis

(Summary)

Muhammad Ahmed Khan, Michela Borghetti, Mauro Serpelloni, and Emilio Sardini

In this paper, the design and test of a self-powered force measuring device has been presented. This system allows continuous monitoring of a knee prosthesis after total knee arthroplasty. The complete device has been tested to validate the performance of the power harvesting system and efficient wireless transmission of measured force. The implemented power harvesting module eliminates the need for batteries or any external power source and will derive energy from human walking.
Estimating Gravity Component from Accelerometers

(Summary)

Manuel Gil-Martin, Rubén San-Segundo, Syaheerah Lebai Lutfi, and Alejandro Coucheiro-Limeres

This paper presents an analysis of acceleration signals to propose a method to compute the gravity orientation using an accelerometer. After this computation, the authors subtract the gravity from the total acceleration to extract the human movement acceleration. All of the analyses have been done using a public available dataset. The main contribution of this paper is the proposal of an accelerometer-specific solution to calculate the gravitational component from acceleration recordings.

Columns

Life After Graduation

Brief Thoughts about the I&M in Cars

(Summary)

Vincenzo Marletta

In less than thirty years the auto seems to have passed from the stone age to the future era of some movies. If we think of the new hybrid or electric cars, without necessarily having to think about supercars, and to the attempts to create autonomous vehicles, the industry seems to have landed on another planet. Technology evolution is changing at least three aspects of the car: the engines, the safety and finally the way we live during the time we spend in the car. In all of these three aspects, instrumentation and measurements play a central role.

Basic Metrology

Solar Time versus Time on our Mobile Phones

(Summary)

Richard Davis
The author discovers why the time read from a very large sundial was almost 100 minutes behind the time displayed on his mobile phone. Could both be correct? Some basic features of sundials and time zones are discussed.

This summary was provided by the author.

**Departments**

**New Products**

Robert Goldberg

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5G Base Station Manufacturing Test Solution
Keysight Technologies announces the Keysight S9100A 5G multi-band vector transceiver (S9100A). The S9100A is a compact and scalable 5G base station manufacturing test solution that enables network equipment manufacturers (NEMs) to streamline high volume test of 5G New Radio (NR) infrastructure equipment, accelerating deployment of 5G networks.

Keysight's 5G base station manufacturing test solution leverages common hardware and software platforms (including Keysight's PathWave) which support the latest 3GPP 5G NR Rel. 15.2.0 standards. This enables wireless equipment manufacturers to easily transition from R&D design validation, to integration and verification, to volume manufacturing. It also delivers the scalability NEMs need to cost-effectively and quickly validate complex 5G designs across both sub-6GHz (FR1) and mmWave (FR2) frequency bands in over-the-air (OTA) and conducted test environments.

The S9100A uses Keysight's new PXIe vector transceiver (VXT) (Keysight M9410A) to provide high RF performance in a compact modular design, for improved efficiency and scalability in manufacturing test. Keysight's VXT offers wide bandwidth support of up to 1.2 GHz, combined with high-performance mmWave transceiver heads, to deliver best-in-class Error Vector Magnitude (EVM) and Adjacent Channel Leakage Ratio (ACLR) performance across FR1 and FR2 in a small footprint.

Keysight's 5G end-to-end design and test solutions enable the mobile industry to accelerate 5G product design development from the physical layer to the application layer and across the entire workflow from simulation, design, and verification to manufacturing, deployment, and
optimization. Keysight offers common software and hardware platforms compliant to the latest 3GPP standards, enabling the ecosystem to quickly and accurately validate 5G chipsets, devices, base stations and networks, as well as emulate subscriber behavior scenarios.

Additional information about Keysight's 5G solutions is available at www.keysight.com/find/5G.

**Handheld Microwave Spectrum Analyzer**

Rohde & Schwarz has expanded its R&S Spectrum Rider FPH family with three new base models providing frequency ranges from 5 kHz to 6 GHz, 13.6 GHz and 26.5 GHz. R&S claims the Spectrum Rider FPH to be the industry's first handheld spectrum analyzer to offer a capacitive touchscreen and a unique frequency upgrade concept via keycodes. Since upgrades require neither downtime nor recalibration, users can effortlessly upgrade their base models, e.g., from 26.5 GHz to 31 GHz.

New higher-frequency models enable the rugged R&S Spectrum Rider FPH to perform a vast range of measurement tasks in the field and lab. In combination with several useful options, the R&S Spectrum Rider FPH is a handy tool for diverse applications, such as verifying signal transmission over 5G, broadcast, radar and satellite communications links. The instrument will appeal to field technicians and lab engineers alike, as it supports everyday measurement tasks in aerospace and defense, mobile network testing and broadcasting, as well as tasks to be performed by regulatory authorities and tasks in education.

Weighing just 2.5 kg, the R&S Spectrum Rider FPH is ideal for mobile use. Its battery lasts more than six hours, making the instrument capable of working a full day without recharging.

The analyzer can be remotely controlled via USB or LAN. For even more convenience, the R&S MobileView app for iOS and Android provides wireless remote control of the R&S Spectrum Rider FPH from a mobile device.

For more information, visit www.rohde-schwarz.com/spectrum-rider.

**Arbitrary Function Generator**

Tektronix, Inc. has announced a redefined arbitrary/function generator (AFG) with the introduction of the AFG31000 series. A completely new design, the AFG31000 features many key firsts including a large touchscreen and new user interface that will be useful to engineers and researchers who need to generate increasingly complex test cases for debugging, troubleshooting, characterizing and validating devices under test.

Despite their importance in electronics test and wide adoption, AFGs have lagged behind other test instrumentation in terms of usability, making do with small displays and other shortcomings that make them hard to learn and operate. Moreover, traditional AFGs lack the deep memory and programming capability needed to compose a series of test cases with complex timing – critical for optimum test efficiency. By addressing these issues, the AFG31000 represents the next generation of AFGs with features and capabilities not available elsewhere today.
The AFG31000 series features a 9-inch capacitive touchscreen, the largest available on an AFG, that allows users to see all related settings and parameters on a single screen within a shallow menu tree. Like the modern touch-enabled smart devices, users can tap or swipe to easily select, browse, locate and change settings. The intuitive user interface saves users time in both learning and operating the instrument for major gains in productivity and efficiency.

Traditional AFGs assume they are driving a 50 Ω impedance. However, most devices under test (DUTs) do not have a 50 Ω impedance. This mismatch results in an inconsistency between the waveform as set on the AFG and the signal at the DUT. The new patented InstaView feature on the AFG31000 series addresses this problem by monitoring and displaying the waveform at the DUT without the need for additional cables or instruments.

In addition to traditional AFG operation modes, the AFG31000 series offers an Advanced or waveform sequencer mode. In the Advanced mode, the instrument's up-to 128 Mpts of waveform memory can be segmented into up to 256 entries, and users can drag and drop long waveforms, or multiple waveforms in the sequencer and define how they are output.

Taking advantage of the large capacitive touch screen, the new ArbBuilder tool built in the AFG31000 series enables users to create and edit arbitrary waveforms directly on the instrument without needing to create the waveforms on a PC and transferring them to the instrument. ArbBuilder improves test efficiency especially for arbitrary waveforms that need to change frequently. For users who want to replicate waveforms captured by an oscilloscope, they can save waveforms as .csv files and use ArbBuilder to load them directly into the AFG31000.

Find more information at www.TEK.COM.

Logic Analyzer
The SP209 series logic analyzers and protocol decoders from Ikalogic offer in-depth analysis of logic signals and protocols with 200 MHz (5ns) timing resolution. 9-channel operation allows 8-bit parallel data to be captured along with a clock or strobe signal.

The SP Series is composed of two devices, SP209 and SP209i. The SP209 (Standard) model has 9 logic channels supporting 1.8 V, 2.5 V, 3.3 V and 5 V logic levels. It features 200 MSPS@ 9 channels and a 2 Gb internal memory. The SP209i (Industrial) model has all of the features of the standard model with the addition that logic channels can be multiplexed with dedicated industrial inputs that can be directly connected to RS-232, RS-485, CAN and LIN buses. SP209 series logic analyzers rely on ScanaStudio software (runs Windows, Mac and Linux) to capture, display, analyze and decode signals.

Features include:
- 9 logic channels with adjustable thresholds (1.8 V, 2.5 V, 3.3 V, 5 V)
- State of the art input stage, with Schmitt triggers that eliminate glitches on slow signals
- 200 MHz sampling rate, with all 9 channels used
- External clock option (state mode), up to 50 MHz
- Precise trigger-In and trigger-Out signals on SMA ports
- Sample compression and streaming via USB
- 2 Gb DDR-3 memory kicks-in when USB is not fast enough
- Embedded receivers on industrial version: SP209i (RS-232, CAN, LIN, RS485)
- Guaranteed performances on all hosts
- Embedded 2 Gb sampling memory = performance assurance.

SP series logic analyzers compress and stream captured signals via USB 2.0 to a Windows, Linux or MacOS machine. USB bandwidth can be variable from one system to another, and is practically limited to 20 MB/s. That is why SP logic analyzers have an embedded 2Gb DDR-3 memory that buffers captured samples at 1.6 GB/s, overcoming USB limitations.

SP series logic analyzers are adapted for demanding applications, where it is needed to capture logic signals with maximum resolution on all 9 channels.

The SP series can capture very long sequences of logic signals (up to 2 Tera samples). Its software lets you view decoded signals in many different levels of abstractions (Packets or detailed bits and bytes). Thanks to a versatile multi-stage trigger system, users can target very specific events. Device performance does not depend on USB connection bandwidth.

Find more information at www.ikalogic.com.

**Counter Quantum Analyzer for Parallel Readout of 10 Qubits**

The Zurich Instruments UHFQA Quantum Analyzer represents the new standard for multi-qubit readout in ambitious quantum computing projects. The UHFQA measures the state of 10 qubits simultaneously with state-of-the-art speed, fidelity, and innovative signal crosstalk suppression techniques. In dual-sideband operation, a frequency span up to 1.2 GHz is covered. Now, the combination of UHFQA and the HDAWG Arbitrary Waveform Generator forms a complete solution for multi-qubit control and measurement in the baseband.

The UHFQA consists of a dual-channel 14-bit arbitrary waveform generator and a dual-channel signal acquisition and analysis unit, both running at a 1.8 GSa/s rate. The analysis unit contains 10 configurable digital filters, each 4 kSamples long, allowing for precise matching to a given qubit transient response. Such a matched filter can significantly improve SNR and readout time compared with unweighted signal integration. Crosstalk suppression by a fully configurable 10 x 10 matrix multiplication allows faithful readout, even as the system size increases. The UHFQA comes with LabOne software for configuration and measurement.

The UHFQA is used in demanding quantum computing applications with superconducting and spin qubits.

Find more information at www.zhinst.com.

**Four-Port Serial Communication Module**
Opto 22 announces the release of the groov serial I/O module, GRV-CSERI-4. This module plugs into a groov EPIC® chassis alongside Opto 22’s new groov Edge Programmable Industrial Controller (EPIC) and discrete and analog I/O modules, to provide the mix of analog, discrete, and serial signals you need at any location.

Many industrial automation applications require communication between the controller and multiple serial devices. This new module provides four independent and isolated serial ports for this purpose, communicating with RS-232 or RS-485 serial devices. Up to 4 modules can be installed in one groov EPIC chassis, providing a total of 16 serial ports to support these communication requirements.

Each port is selectable for RS-232 or RS-485 mode, with programmable termination and bias as well as half- or full-duplex options in RS-485 mode. Baud rates of up to 1 Mbps are supported. For serial devices communicating via standard protocols, the included PAC Control flowchart-based programming software offers communication handles to serial devices. Or use groov EPIC’s Ignition Edge® from Inductive Automation®, which provides support for hundreds of communication drivers. For serial devices requiring the development of custom drivers, groov EPIC supports secure shell access, SDKs and a cross-compiler for custom user-written applications.


Data Manager Supports Industrial Internet of Things
Endress+Hauser has released the Memograph M RSG45 Advanced Data Manager DIN rail version, an intelligent remote device with extensive communication capabilities, making it ideal for IIoT (Industrial Internet of Things) applications and use as an edge device for getting data to cloud-based servers.

The RSG45 can acquire data from up to 20 HART or universal analog input channels and 14 digital inputs. It has two analog outputs and up to 12 relay outputs and makes its data available to IIoT systems and all major automation system architectures via multiple communication interfaces and protocols.

With all these interfaces, the Memograph M easily communicates with new and existing PLCs, SCADA systems, distributed control systems, historians and cloud-based data structures. It also has an embedded web server that can be accessed by any web browser via the internet once proper security procedures are followed.

The Memograph M can generate e-mail or SMS messages to alert users of alarm conditions or process events. Messages can be sent to several recipients simultaneously or automatically forwarded to a recipient/destination. Messages can be confirmed, relays can be controlled remotely, and current values queried by any web browser.

For more information, visit www.us.endress.com/RSG45.
**Precision Power Analyzer**  
The WT5000 is the Next Generation in precision of Yokogawa’s Power Analyzer product line. It is a versatile platform that delivers precision and exceptional performance for the most demanding applications. Equipped with 7 user swappable and reconfigurable input elements plus 4 motor channels, the WT5000 is an ideal instrument for both electrical and mechanical power and efficiency measurements. It features a highly responsive touchscreen, intuitive menu operations, and out of the box software solution to support your testing needs.

As renewable energy, electric vehicles and energy efficient technologies gain wider adoption, the need for reliability in testing efficiency, performance and safety has never been greater. Changing application needs and evolving international standards call for custom measurements and consistent accuracy.

The WT5000 delivers:
- **Reliability** – With a guaranteed accuracy of ±0.03%, harmonic comparisons up to the 500\textsuperscript{th} order and custom computations, the WT5000 delivers multichannel measurements that you can trust.
- **Versatility** – 7 slots for user swappable power elements and diverse options enable you to expand or reconfigure the WT5000 as your applications and their needs change. Additionally, the speed and torque from 4 separate motors are measurable.
- **Simplicity** – With a full touchscreen experience, supported by hardware hotkeys and powerful software for remote measurements, connecting, configuring and measuring power has never been easier.

Its accuracy specifications are guaranteed from 1\% to 130\% of the selected voltage and current ranges. With minimum influence of low power factor (0.02\% of apparent power) the unit is also accurate at large phase shifts and frequencies.

Find more information at [www.yokogawa.com](http://www.yokogawa.com).

**Modular Bed of Nails Tester**  
Seica introduces the Compact Slim Next> series, a very small (only 300 mm width) yet modular bed of nails tester especially suitable for deployment in as a series of equivalent systems, loaded either manually or via a COBOT solution.

The system features a 180×300 mm test area with an automated receiver specifically conceived for robotized loading. There are 14 slots available for the ATE instrumentation, up to 6 user power supply units and an integrated control and management unit.

With a small size of 300 mm width and 762 mm height, it is scalable and suitable for serial installation of equivalent systems with a test area of 180 x 300 mm, and 14 slots are also available for ATE instruments.
All the Next> series solutions have Seica’s Industrial Monitoring Solution on board, with the potential for remote monitoring of current and voltage consumption, mains supply, temperature, light indicators and other parameters useful to indicate correct operation, to provide information enabling predictive maintenance and in general to render the systems compatible with today’s Industry 4.0 standards.

For more information, visit www.seica.com. You can also view a video describing the product at www.youtube.com/watch?v=G9eX-jwBnyU.

**Portable Measurement Arm**

Hexagon’s Manufacturing Intelligence division has unveiled its new Absolute Arm range. It is a redesign from the ground up that has been modernized to meet the needs of today’s metrology users, with a key focus on improved usability and versatility without compromising on speed and accuracy.

A standout feature of the new Absolute Arm is its modular wrist design. This allows both the RS5 Laser Scanner and the pistol grip to be completely removed, facilitating easy probing in tight spaces. When reattached for laser scanning applications, a variety of grip sizes are available to ensure a perfect fit for every user. The new wrist also now features a display screen that allows for measurement result oversight, profile switching and calibration right at the point of measurement, reducing time spent switching attention between the arm and its control computer.

The new Absolute Arm models are also available in a 6-axis version designed for dedicated probing applications. Within this category is the new Absolute Arm Compact, which assumes position of the previous ROMER Absolute Arm Compact as the most accurate portable measuring arm in the world, with accuracy now to within just 6 microns. The full Absolute Arm range is available across seven sizes, with measurement radiuses from 1.2 to 4.5 meters, and three levels of accuracy, resulting in 36 unique arm configurations – an arm for every application.

Find more information at www.hexagon.com.

**Ultra-Low Power Clock Generator**

The CDCI6214 device is an ultra-low power clock generator that selects between two independent reference inputs to a phase-locked loop and generates up to four different frequencies on configurable differential output channels and a copy of the reference clock on a LVCMOS output channel.

Each of the four output channels has a configurable integer / fractional output divider and a dedicated integer divider. Together with the output multiplexers, this allows up to five different frequencies. Clock distribution dividers are reset in a deterministic way for clean clock gating and glitch-less update capability. Flexible power-down options allow to optimize the device for
lowest power consumption in active and standby operation. Typically, four 156.25 MHz LVDS outputs consume 150 mW at 1.8 V.

The CDCI6214 enables high-performance clock trees from a single reference at ultra-low power with a small footprint. The factory- and user-programmable EEPROM make the CDCI6214 ideal as easy-to-use, instant-on clocking solution with low power consumption.

Find more information at [www.ti.com](http://www.ti.com).

**Temperature Indicator for USB Type-C Connectors**
Littelfuse, Inc. has introduced the PolySwitch® setP™ Series Temperature Indicator, which protects the users of USB Type-C and USB Power Delivery charging cables from dangerous overheating.

When dust, dirt or other debris becomes trapped in a USB Type-C cable connector, it can create a resistive fault from the power line to ground, which can cause a dangerous temperature rise without increasing the current. The power-independent setP senses the temperature increase, alerting the charging port to shut down the power flow. Once the user disconnects the cable and removes the debris, the cable can resume normal operation. The compact 0805 (mils) footprint of the setP Temperature Indicator makes it at least 50 percent smaller than other solutions that require placing a device on the power line.

The setP Series Temperature Indicator offers these key benefits:

- The compact size and sensitivity to temperature helps to simplify keeping the cable surface temperatures safe for users.
- The rigid structure is compatible with conventional assembly and molding operations used in cable and connector manufacturing.
- Being independent of USB power delivery allows for a smaller footprint and greater energy efficiency and simplifies part selection.
- No disruption of the communication channel makes the setP an easy drop-in solution to existing designs.

Additional information is available on the setP Series Temperature Indicator product page at [www.littelfuse.com](http://www.littelfuse.com).