

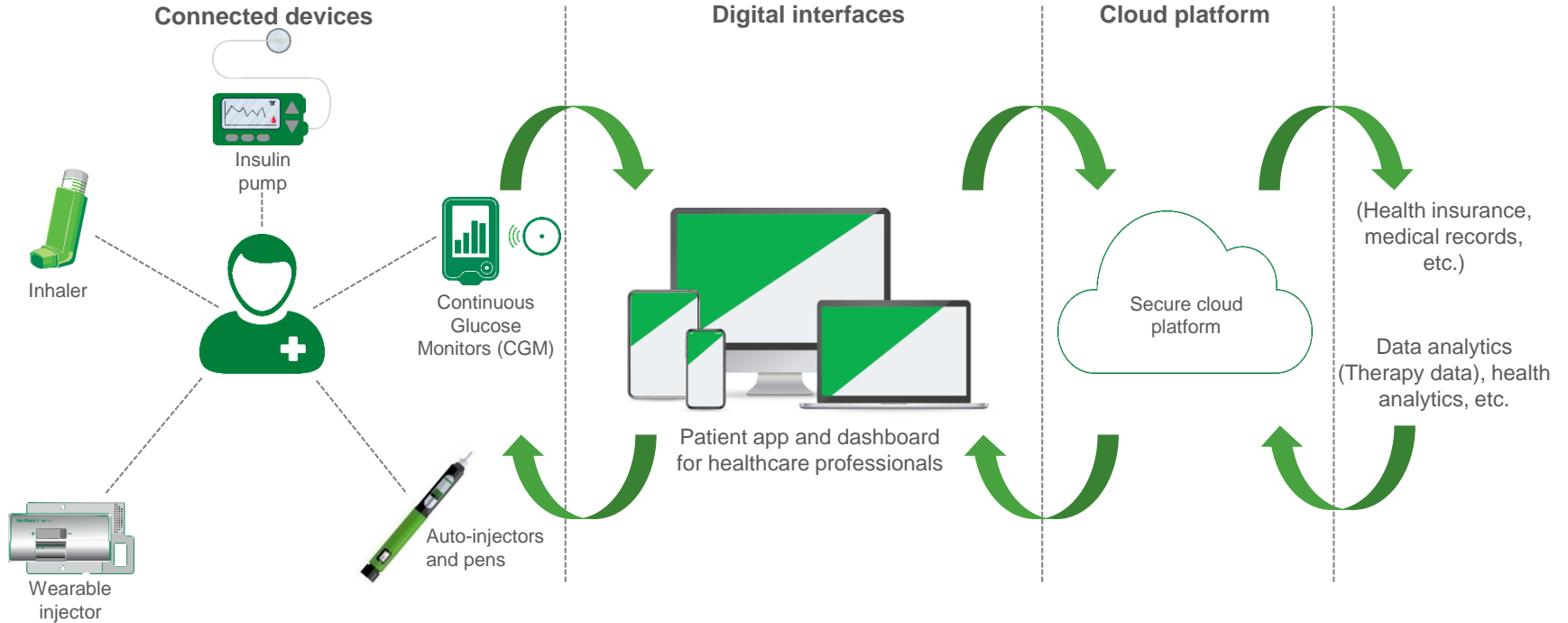


C&K[®] Switches for Drug Delivery Device Ecosystem

 Healthcare Solutions

 **Littelfuse[®]**
Expertise Applied | Answers Delivered

Connected drug delivery systems are radically changing how services are being delivered to patients



Connected healthcare helps achieve lower healthcare costs, improves efficiency, and empowers patients.

Drug delivery device ecosystem is growing at ~25% CAGR

Market trends and drivers

The market size growth for connected medical devices is projected to reach \$251.57 billion by 2030, with CAGR estimated at 25.3% from 2021-'28.

Personal, portable, connected medical devices with CE* mark, FDA** approval, and NMPA*** certifications allow healthcare professionals to receive and act on data.

Connected auto-injectors and pens are new emerging tech in a mature conservative fast-growing drug market (Titrated Pens: 80% @ 10% CAGR; One-dose Auto Injectors: 20% @ 35% CAGR).

Decentralized healthcare relies on personal, wearable, and connected devices for patients to self-administer tests and medicines, necessitating precise data and high-performance Littelfuse parts like TMR, temperature sensing, switching, and ESD protection are used to generate precise data in robust environments.

Healthcare is ready for disruption, and 5G, AI, and ML are essential for connected care. Accurate data are crucial, and Littelfuse's high-performance parts meet these demands.

High-performance and accurate Littelfuse products are for all medical device designs. The global market for decentralized connected health and wellness solutions is expanding rapidly, with no sub-segment is being left behind. Diagnosis and treatment (includes connected pharmaceutical delivery), wellness and prevention, monitoring, and others are all experiencing accelerated growth.

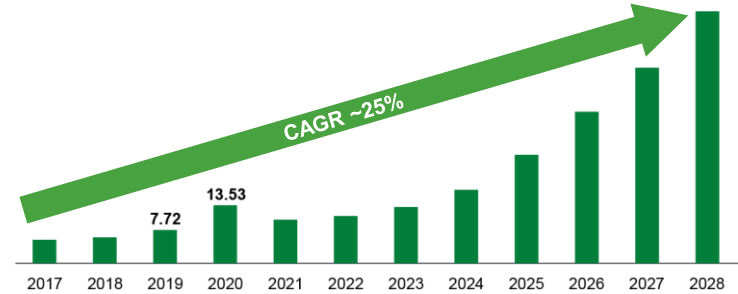
Country Oversight and Compliance to standards:

* CE Mark: Europe

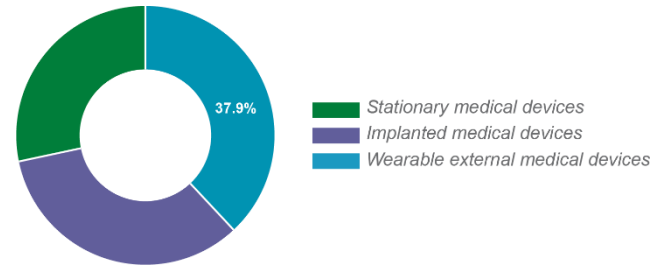
** FDA Food and Drug Administration: USA

*** NMPA National Medical Products Administration: China

North America IoMT* market size, 2017 to 2028 (\$B)



Global IoMT market share by product, 2020



Sources: Littelfuse estimates, [Fortune Business Insights](#)

Acronyms:

CAGR – Compound Annual Growth Rate

TMR – Tunnel Magnetoresistance Effect

ESD – Electro-Static Discharge

AI – Artificial Intelligence

ML – Machine Learning

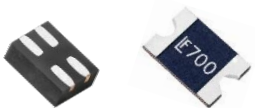
IoMT – Internet of Medical Things

Littelfuse solutions for wearable injectors, auto-injectors, and drug delivery pens

1

Power management

Protection IC (eFuse), PPTC



2

USB

TVS Diode Array



3

Dose dialing

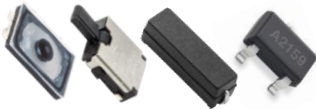
Detect Switch



4

Activity detection

Tactile Switch, Detect Switch, Reed Switch, TMR Switch



5

Plunger position measurement

TMR Sensor

Under development

6

Control unit

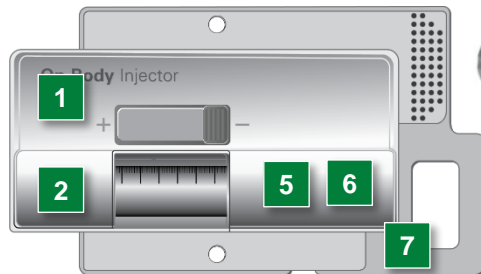
Microcontroller



7

Motor control

TVS Diode, Gate Driver



[Click on the link to learn more about Littelfuse solutions for 'Drug Delivery Device Ecosystem'](#)




C&K® Switches features & benefits for wearable injectors, auto-injectors, & drug delivery pens

 Click the product series in the table below for more info

	Switch type	Function in application	Product series	Benefits	Features
1	Detect Switch	Detects position of the dose dial	HDT	Easy to integrate into a variety of device designs; offers sensitive and reliable performance, especially in compact devices and is safer and more environmentally friendly	SPST circuit; momentary actuation; low profile package; top actuation; low actuation force 35-gram maximum
			SDS	Features a low actuation force and a low-profile package; i2 mm overtravel which making them ideal for detector applications and with ultra low current options	SPST circuit; side actuated detect switches; low profile package sits just 2 mm off PCB; 2 mm overtravel ideal for detector applications; low actuation force (75 grams max.)
			KSU	Ensures high reliability and consistent performance in critical applications with its robust and long-lasting design that offers high performance; compact size making it easy to integrate into various device designs	SPST circuit; momentary detect; top actuated; new multi contact construction; metal actuator with low actuating force; high temperature resistance
			FDSE	Allows for applications requiring angled detection; with its long travel and compact size, it is ideal for detector applications and easy to integrate into various device designs	SPST circuit; J bend and Gullwing type terminals for SMT; angled actuation; extremely small package size; with long travel 3.14 mm or 60 °C

C&K® Switches features & benefits for wearable injectors, auto-injectors, & drug delivery pens

 Click the product series in the table below for more info

	Switch type	Function in application	Product series	Benefits	Features
2	Tactile Switch	For various activity detection (for example, reliable navigation, dose dialing, dose counting, cap on/off detection, activation, detection of vial in correct position, contact with patient body/skin contact)	NanoT	Offers board space saving and design flexibility, making it an ideal choice for compact applications. NanoT reduces cost and integration difficulties compared to designing a full interface button	Ultra-compact size ; up to 300,000 life cycles; IP67 for sealed switch compatibility with PCB coatings
			KXT	Ultra-low profile top-actuated tactile switch, designed to be reliable and durable, catering specifically to the needs of engineers developing next-generation devices	Ultra-compact size, 3.0 x 2.0 mm footprint, 0.6 mm thickness; high number of cycles up to 500,000 cycles
			KMT0, KMT0 D	Ultra-miniature SMT top-actuated switch with an extended life cycle, making it perfect for applications that require space-saving, long-lasting performance	Ultra-compact size, 3.6 x 2.6 mm footprint; IP rating 68, compatible with harsh environment; long life up to 1 million cycles; response to touch and feel; detect version available
	Detect Switch		PTS847	Compact tactile switch designed to meet the demand for smaller and reliable switches in designs with limited PCB space	Ultra-compact size 4.6 x 2.2 x 2.6 mm package; Side actuation; SMT termination with or without L-shape shield; hard and soft actuator options
			HDT	Easy to integrate into a variety of device designs, offer sensitive and reliable performance, especially in compact devices	SPST circuit. Momentary actuation; low profile package; top actuation; low actuation force, 35 grams max.
			FDSE	Allows for applications requiring angled detection. With its long travel and compact size, it is ideal for detector applications and easy to integrate into various device designs	SPST circuit; J bend & Gullwing type terminals for SMT; angled actuation; extremely small package size; with long travel 3.14 mm or 60 °C
			HDS	Switches are micro-mini, side-actuated, with a compact size, making them easy to integrate into various device designs; offers right and left options and have a low actuation force	SPST circuit ;Low profile package sits just 1.4mm off PCB; side actuation; right and left options available; low actuation force, 30 grams max.

Littelfuse solutions for insulin pump

1

Power management

Protection IC (eFuse), PPTC



2

USB

TVS Diode Array



3

Keypad

Tactile Switch, Detect Switch



4

Plunger position measurement

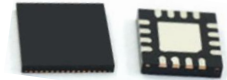
TMR Sensor

Under development

5

Control unit

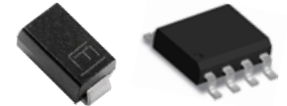
Microcontroller



6

Motor control

TVS Diode, Gate Driver



Click on the link to learn more about Littelfuse solutions for 'Drug Delivery Device Ecosystem'

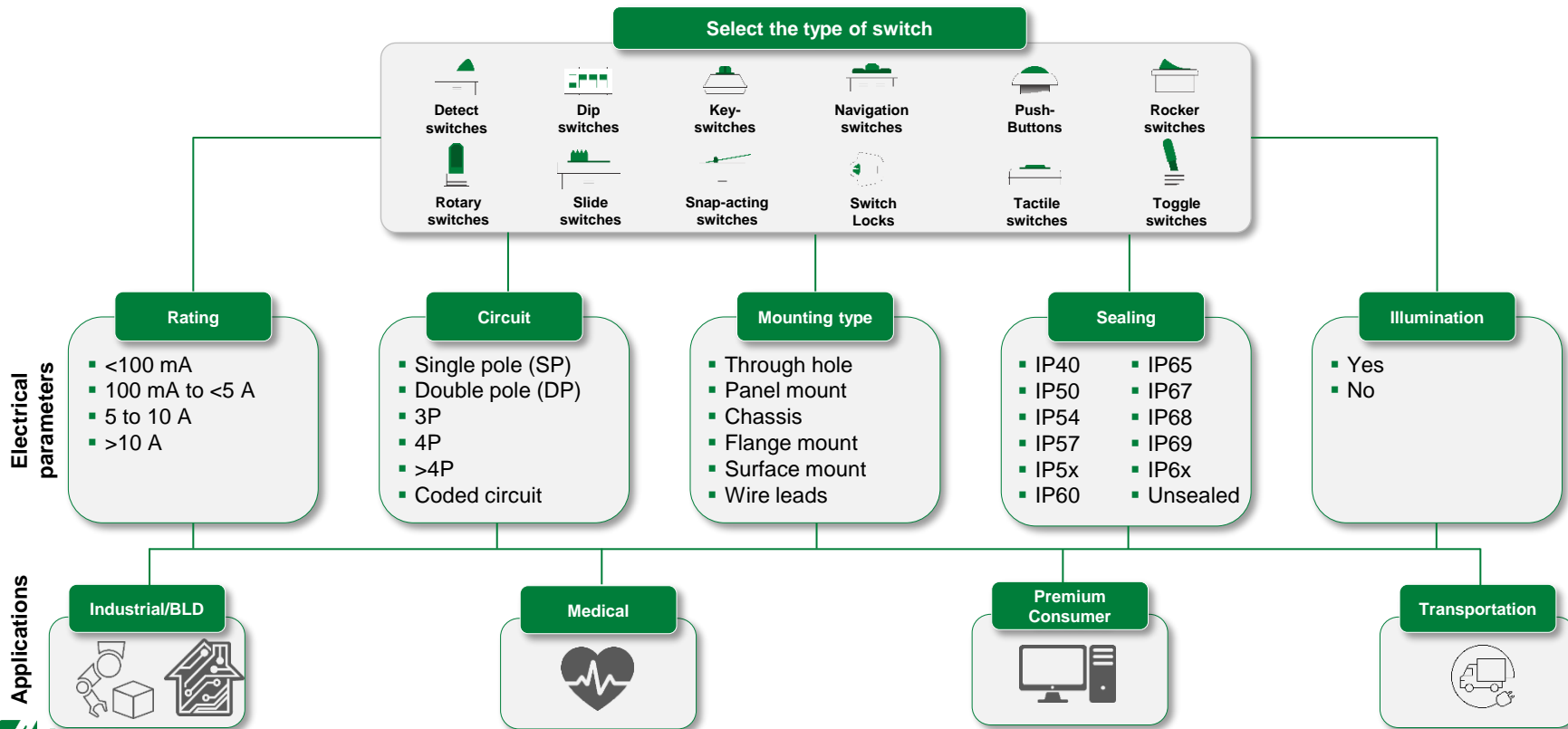


C&K® Switches features and benefits for insulin pump

 Click the product series in the table below for more info

	Switch type	Function in application	Product series	Benefits	Features
1	Tactile Switch	Reliable navigation; dose dialing and activation	NanoT	Offers board space saving and design flexibility, making it an ideal choice for compact applications; reduces cost and integration difficulties compared to designing a full interface button	Ultra-compact size; up to 300,000 life cycles; IP67 for sealed switch compatibility with PCB coatings
			KXT	Ultra-low-profile top-actuated tactile switch, designed to be reliable and durable, catering specifically to the needs of engineers developing next-generation devices	Ultra-compact size 3.0 x 2.0 mm footprint; 0.6 mm thickness; high number of cycles up to 500,000 cycles
			KMT0 , KMT0 D	Ultra-miniature SMT top-actuated switch with an extended life cycle; making it perfect for applications that require space-saving; long-lasting performance	Ultra-compact size, 3.6 x 2.6 mm footprint; IP rating 68, compatible with harsh environment; long life up to 1 million cycles; response to touch and feel; detect version available
			PTS847	Compact tactile switch designed to meet the demand for smaller, reliable switches in designs with limited PCB space	Ultra-compact size 4.6 x 2.2 x 2.6 mm package; side actuation; SMT termination with or without L-shape shield; hard and soft actuator options
	Detect Switch		HDT	Easy to integrate into a variety of device designs, offer sensitive and reliable performance, especially in compact devices	SPST circuit; momentary actuation; low profile package; top actuation; low actuation force, 35 gram max.
	FDSE		Allows for applications requiring angled detection. With its long travel and compact size; it is ideal for detector applications and easy to integrate into various device designs	SPST circuit; J bend & Gullwing type terminals for SMT; angled actuation; extremely small package size; with long travel 3.14 mm or 60 °C	
	HDS		Micro-mini, side-actuated, with a compact size, making them easy to integrate into various device designs; they offer right and left options and have a low actuation force	SPST circuit; low profile package sits just 1.4 mm off PCB; side actuation; right and left options available; low actuation force, 30 grams max.	

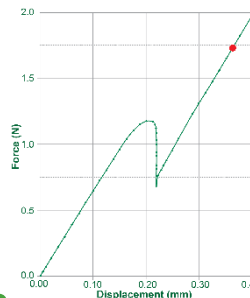
Selecting a Switch



C&K customization expertise

Enhance user experience

- Customized Haptic Switches
 - Desirable appearance, feel & sound
- Decorative solutions
 - Custom graphics, logos, & textures
- Lighting
 - Backlight accenting & light piping to enhance your product appearance

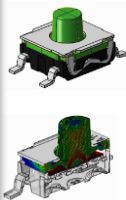


Design & manufacturing tools

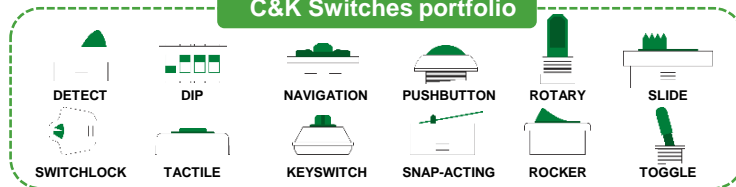
- 3-D CAD modeling
- Mold flow analysis
- FEA
- Dynamic motion analysis
- High-speed photography
- Fixed & dynamic X-ray
- Thermal imaging
- SEM/FTIR
- Sound chamber and force/displacement tester

Value added services

- Designing switches into modules & assemblies
- Multi-function & multi-axis switching
- Integrating switches and electronics
- Provides wire harnesses, terminated wires, integrated connectors, or header pins



C&K Switches portfolio



Quality & reliability

- Develop & manufacture sealed switches to meet either IP67 or IP68 standard
- Harsh environmental compatibility
- Sweat resistance testing
- SO2 and SO4 gas testing



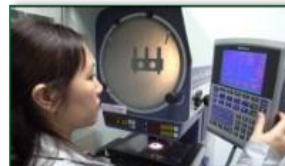
Design products to meet customer requirements for haptic touch, look, sound, & other unique features



C&K manufacturing excellence

Dole, France

- Vertically integrated, R&D (400 employees, defect rate < 0.5ppm)
- Proprietary equipment & methods
- Custom molds, dies & assembly machines
- Quality certifications (ISO 9001:2008, ISO 14001:2004, ISO 50001, TS 16949:2009, ESCC - MIL-NASA)



Huizhou, China

- Vertically-integrated, R&D capabilities (800 employees, 60 lines, defects rate < 2ppm)
- Auto-assembly & Auto-inspection machines (80 sets, 90% In-house designed, cycle time 0.8s to 2s)
- Quality certifications (ISO 9001:2008, ISO 14001:2004, TS 16949:2009)

Workshops

- 90% tooling designed and manufactured internally
- Stamping Workshops (Dole and Huizhou)
- Molding Workshops (Dole and Huizhou)
- Plating Workshops (Dole)
- Assembly Workshops (Dole and Huizhou)



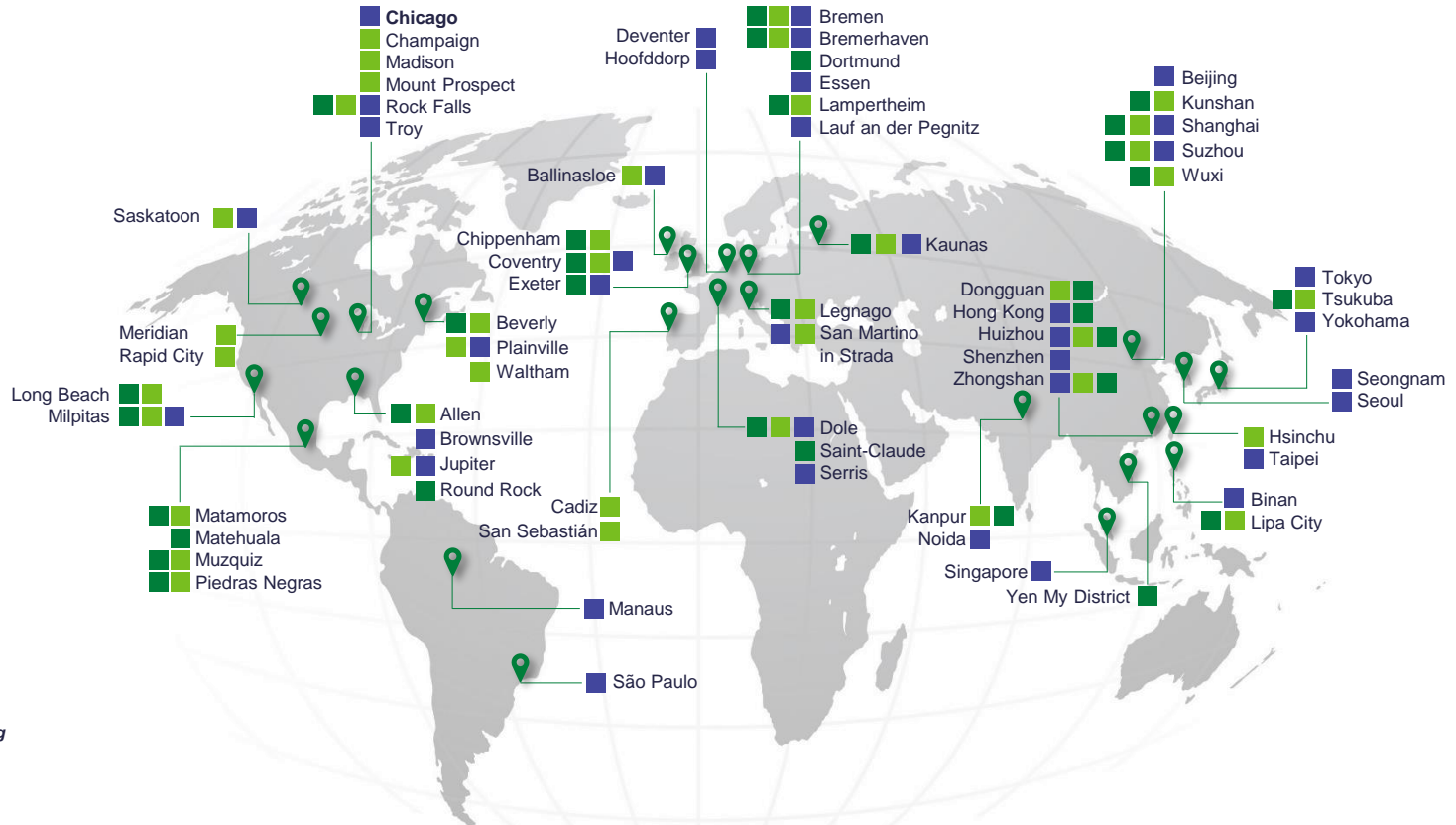
Hung Yen, Vietnam

- Built in 2019 (47 lines, 250 employees, and defects rate < 2ppm)
- Manual assembly lines with semi-automated machines and tools (Cycle time 2s, lean work cells, in-line QA processes)
- Quality certifications (ISO 9001:2015)

Striving for complete customer satisfaction through state of art manufacturing facility & defect free performance



Local resources supporting our global customers



Legend

- Sales
- R&D
- Manufacturing

Partner for tomorrow's electronic systems

Broad Product Portfolio

We are an industrial technology manufacturing company empowering a sustainable, connected, and safer world.

Testing Capabilities

We help customers get products to market faster, and we offer certification testing to global regulatory standards.

Application Expertise

Our engineers partner directly with customers to help speed up product design and meet their unique needs.

Compliance and Regulation

We help customers during the design process to consider requirements set by global regulatory authorities.

Global Customer Service

Our global customer service team is with you to anticipate your needs and ensure a seamless experience.

Global Manufacturing

Our high-volume manufacturing is committed to the highest quality standards.





Expertise Applied | Answers Delivered

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