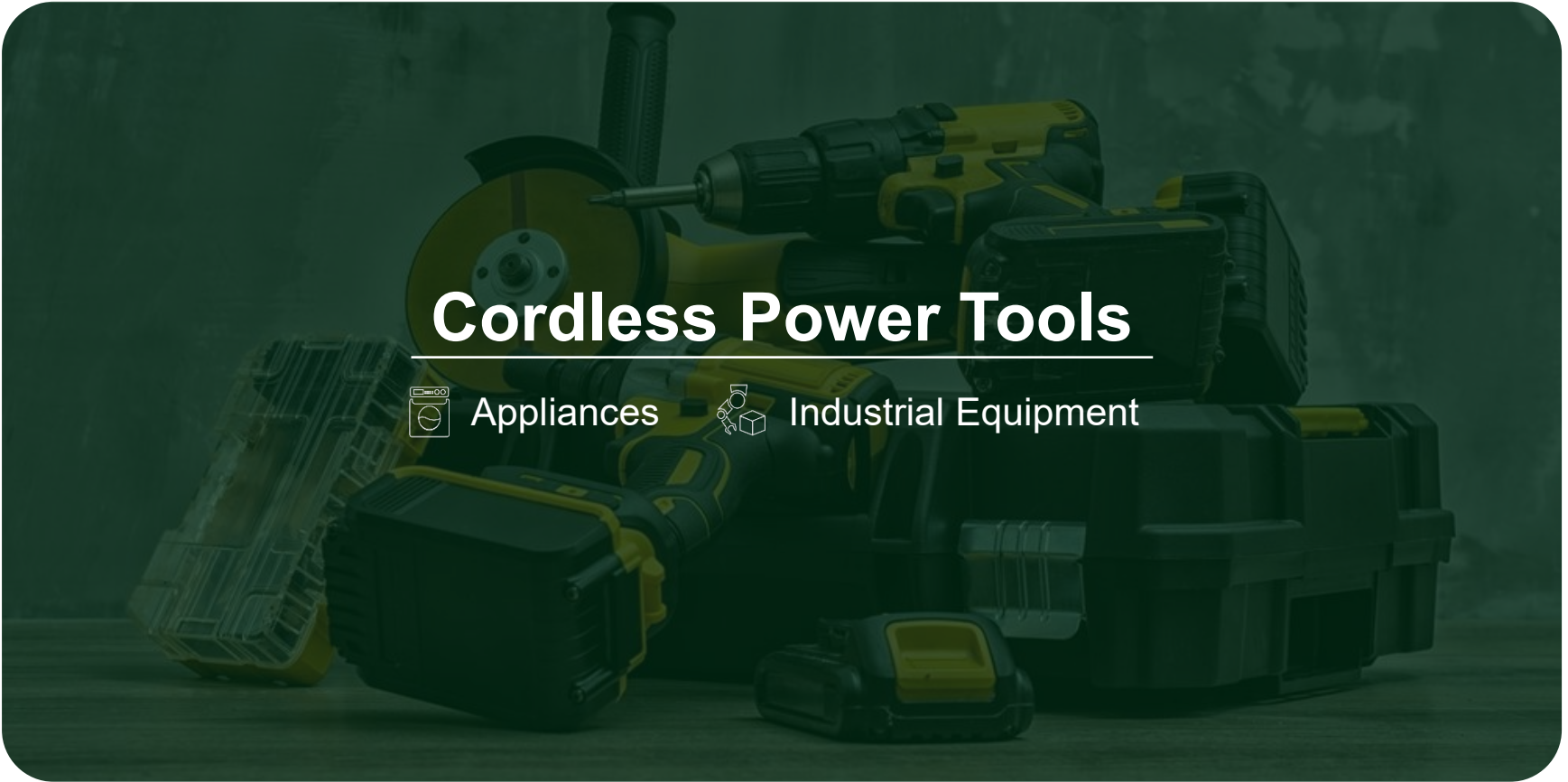




Cordless Power Tools



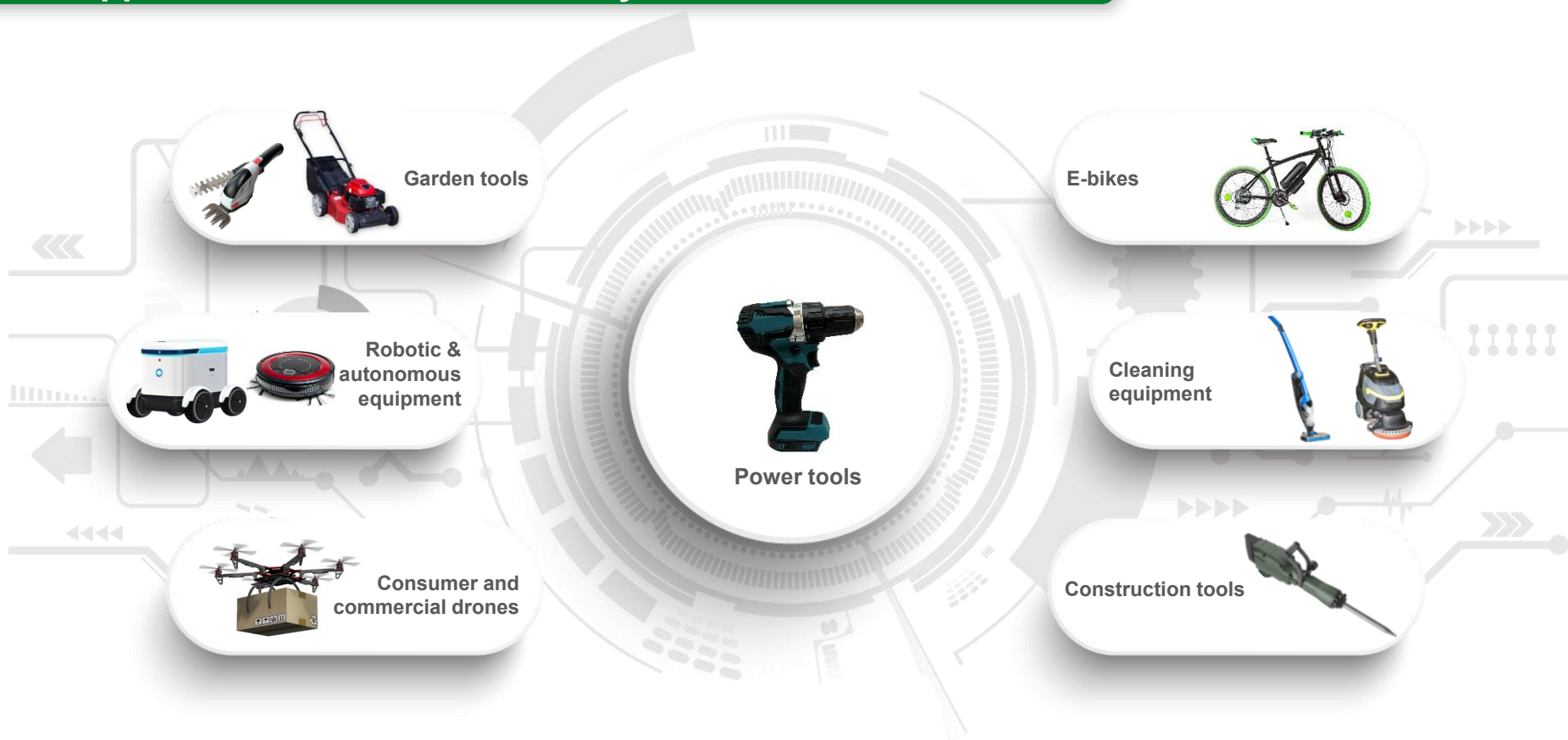
Appliances



Industrial Equipment

Users must independently evaluate the suitability of and test each product selected for their own specific applications. It is the User's sole responsibility to determine fitness for a particular system or use based on their own performance criteria, conditions, specific application, compatibility with other parts, and environmental conditions. Users must independently provide appropriate design and operating safeguards to minimize any risks associated with their applications and products. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at littelfuse.com/disclaimer-electronics.

Many battery-powered devices in very different applications share similar safety and control elements



Global power tool market statistics and drivers

Market trends and drivers

Strong market growth: Forecast to rise from \$15.7 billion in 2026 to \$31.8 billion by 2033, at 10.6% CAGR.

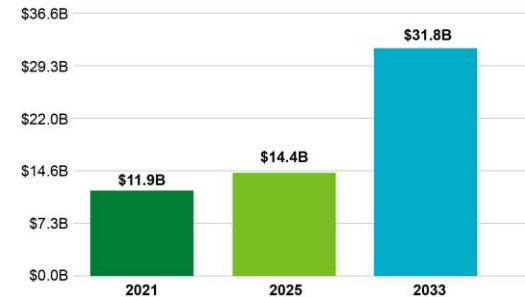
Longer runtime and faster charging: Advances in lithium-ion batteries are accelerating the shift from corded to cordless tools

Brushless motors and compact designs: Manufacturers are improving efficiency and power output while reducing tool weight and user fatigue

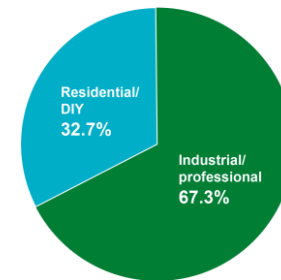
Shared battery platforms: Interchangeable batteries across multiple tools improve convenience and reduce ownership costs

Connected tools: Bluetooth and digital monitoring enable tool tracking, usage monitoring, and maintenance alerts

Cordless power tool market growing at 10.6% CAGR



Professional applications drive cordless tool demand



Source: Littelfuse Estimates, [Grandviewresearch](#)

Battery packs used in power tools and appliances



Secondary protection

Fuse, Battery Protector



Primary protection

TVS Diode



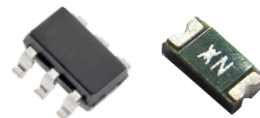
Battery management unit

Fuse, PolySwitch® Resettable Device,
Current Sensing Resistors



Battery identification & communication

TVS Diode Array, PPTC



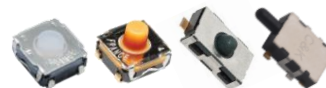
Thermal cell protection

NTC



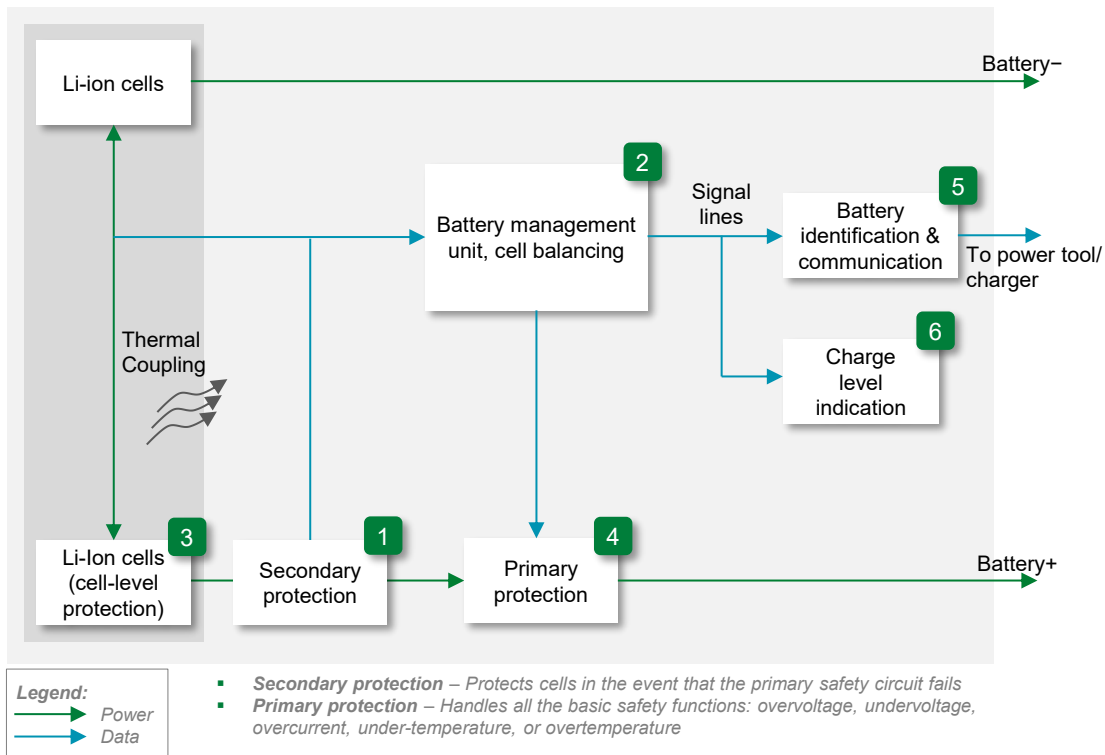
Charge level indication

Tactile, Detect



Cordless tool battery pack block diagram

Click on the product series in the table below for more info



	Technology	Product series
1	Fuse OR Battery Protector	MIDI, 871 OR ITV
2	PolySwitch® Resettable Device OR Fuse	0805L OR 438
	Current Sensing Resistor	SSA
3	NTC	KC
4	TVS Diode	SME, SMF4L
5	PolySwitch® Resettable Device	nanoSMD
	TVS Diode Array	SP3021, SP1007
6	Tactile Switch	KSC441J, PTS645V, KSC2, KSC DCT

Typical products for tools and appliances battery packs

 Click on the product series in the table below for more info

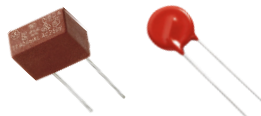
	Technology	Function in application	Product series	Benefits	Features
1	Fuse OR Battery Protector	Non-resettable overcurrent protection	MIDI, 871 OR ITV	Space-saving solutions. SMD-type fuses improve reliability in environments with significant mechanical vibrations	Supports higher power requirements with a single fuse design; current ratings up to 200 A
		Non-resettable overcurrent and overcharge protection (on demand activated)		Overcurrent and overcharge protection; controlled disconnection, can be activated by BMS	Surface mountable; UL and TUV certified; 3-pin device; controlled fusible element
2	Fuse OR PolySwitch® Resettable Device	Non-resettable protection for BMS from high currents due to external shorts	438 OR Q805L	Saves board space; excellent temperature stability and performance reliability; high I _{ft} values ensures high inrush current withstand capability	Operating temperature from –55 °C to +150 °C
		Resettable protection for BMS from high currents due to external shorts		SMD form factor allows for compact design, resets after fault clearance	Surface mountable; compatible with lead-free solder processes per IEC standards
	Current Sensing Resistor	Part of current measurement circuitry	SSA	Cost-effective solution compared to competing technologies; compact size	Tolerance down to 1%; high power ratings up to 15 W
3	NTC	Analog temperature monitoring of battery packs during charging and discharging cycles	KC	Provides accurate temperature readings for enabling safe device operation	Insulated lead wires; small form factor; fast thermal response
4	TVS Diode	Protects battery packs from overvoltage conditions due to abnormal charging conditions	SMF, SMF4L	Improves system reliability by protecting downstream components from transients on power lines	Excellent clamping capability
5	PolySwitch® Resettable Device	Overcurrent protection for TVS or Zener Diode	nanoSMD	Resets to normal operation after fault is cleared; smaller footprint saves space	Maximum electrical rating: 13 VDC; short circuit current: 82–200 mA; small footprint 0201 size
	TVS Diode Array	ESD protection of I ² C input	SP3021, SP1007	Small, space-saving design; low capacitance to prevent signal disruption	µDFN-2 (0201) footprint; ±30 kV ESD withstand voltage
6	Tactile Switch	Indication of battery status	KSC441J, PTS645V, KSC2, KSC DCT	Saves space; reliable and repeatable haptic performance elevates end users' experience	Microminiature, short travel, PCB mount tactile with a minimum of 100K operations

Functional elements in power tool charger



AC input primary protection

Fuse, MOV



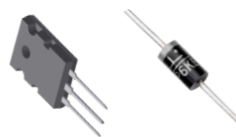
DC output protection

TVS Diode



Rectification, high-frequency converter

MOSFET, TVS Diode



Wireless communication

TVS Diode Array



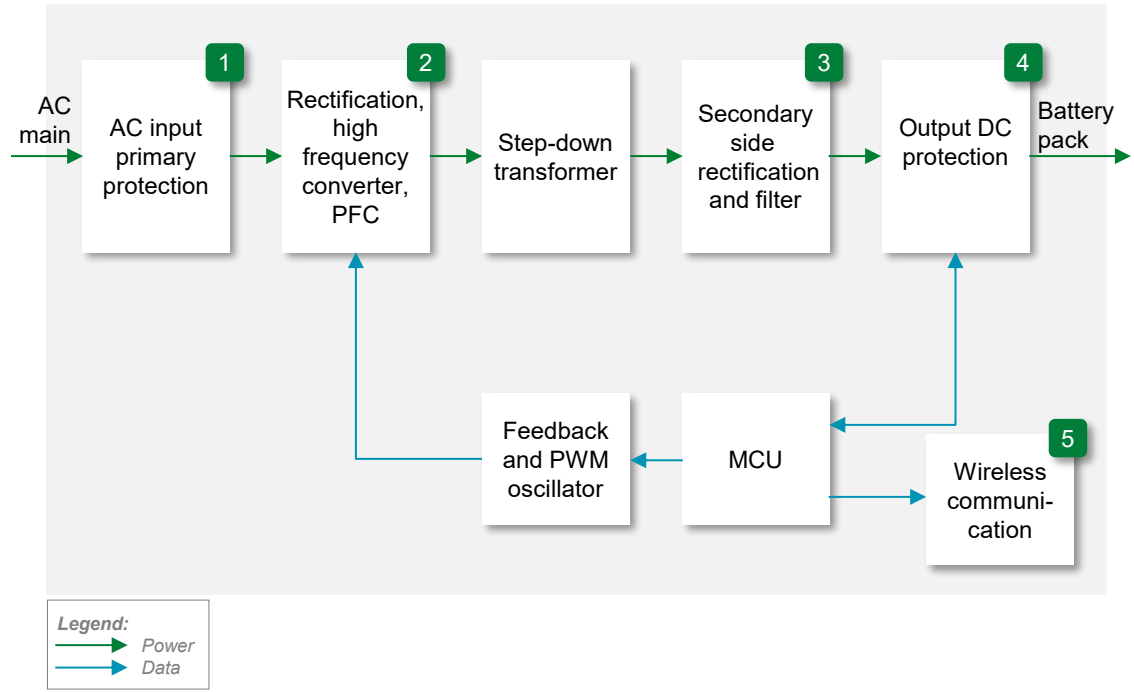
Secondary side rectification

Schottky Diode



Power tool charger protection architecture

Click on the product series in the table below for more info



	Technology	Product series
1	Fuse	5X20mm Fuse , TR , TE
	MOV	Xtreme , TMOV
2	MOSFET	X2-Class
	TVS Diode	P6KE , P6SMB
3	Schottky Diode	MBR , DST
4	TVS Diode	SMBJ
5	TVS Diode Array	SP3021 , SP1007

Potential Littelfuse products for power tool charger

 Click on the product series in the table below for more info

	Technology	Function in application	Product series	Benefits	Features
1	Fuse	Protects the power stage from overcurrent	5X20mm Fuse , TR , TE	Compact protection against high fault currents; approved components help simplify end-product certification and reduce qualification effort	Applicable UL/IEC approvals; low internal resistance; shock-safe; vibration-resistant
	MOV	Protects power unit from voltage surges such as lightning and transients	Xtreme , TMOV	Provides quick protection against voltage spikes, handles high energy surges, and is easy to install in various designs	Thermally protected (TMOV); best-in-class high-energy absorption with compact size
2	MOSFET	High switching speed in power supply units	X2-Class	Fast response time and low heat signature	Low $R_{ds(on)}$, dv/dt ruggedness
	TVS Diode	Protects the power unit from voltage transients	P6KE , P6SMB	Improves system reliability by protecting downstream components from transients on power lines	Excellent clamping capability
3	Schottky Diode	Rectification and blocking in power supply units	MBR , DST	Enables the design of high-efficiency power supplies	Ultra-low forward voltage drop; high-frequency operation
4	TVS Diode	Surge protection	SMBJ	Improves system reliability by protecting downstream components from transients on power lines	Excellent clamping capability
5	TVS Diode Array	ESD protection of wireless communication	SP3021 , SP100Z	Small, space-saving design; low capacitance to prevent signal disruption	μ DFN-2 (0201) footprint; ± 30 kV ESD withstand voltage

Key elements of cordless power tool



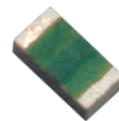
DC input protection

Fuse, TVS Diode



Temperature sensing

NTC



Power bridge protection

NTC, setP™



Mode control switch

Tactile, Snap-Acting, Slide



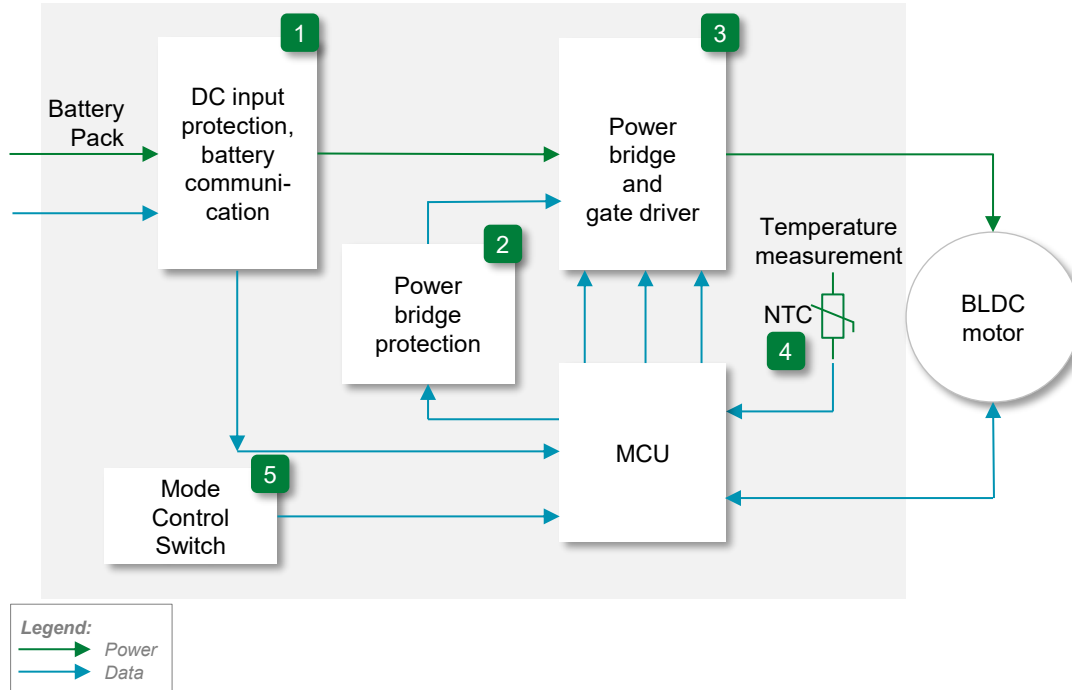
Power bridge & gate driver

MOSFET



BLDC motor protection architecture

Click on the product series in the table below for more info



	Technology	Product series
1	Fuse	501
	TVS Diode	SMAJ , SMBJ , 5KP
	Reed Switch	MDSR-10 , 59166
2	NTC	KC
	Digital Temperature Indicator	setP™
3	MOSFET	Gen2/Gen4
4	NTC	RB
5	Snap Acting	LCS , TF , TM , ZMS , ZMA
	Tactile Switch	KSC OF , KSC2 , KSC3 , KSC4 , KSC7
	Slide Switch	OS , JS , L , AYZ

Select Littelfuse products for BLDC motor protection

 Click on the product series in the table below for more info

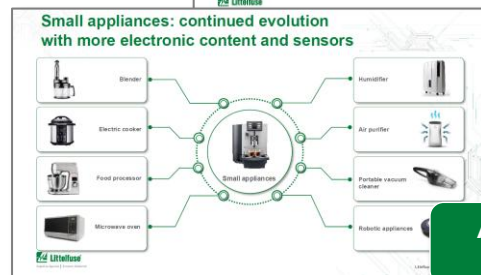
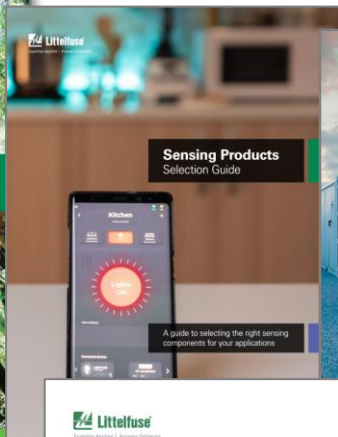
	Technology	Function in application	Product series	Benefits	Features
1	Fuse	Protects the battery and downstream controller from damage due to inrush current, motor shorting or external shorts at contacts	501	Provides quick protection for circuits with minimal space requirements and reduces risk of damage from short circuits	Third-party compliance with UL/IEC; low internal resistance; shock safe; vibration resistant
	TVS Diode	Protect battery pack from voltage transients	SMAJ , SMBJ , 5KP	Improves system reliability by protecting downstream components from transients on power lines	Excellent clamping capability
	Reed Switch	Provides control signal to turn the motor on or off	MDSR-10 , 59166	Contamination resistant, compact design	Switch up to 200 VDC or 0.5 A at up to 10 W; 10 ¹² Ohms insulation resistance
2	NTC	Temperature sensing of Power MOSFET	KC	Provides accurate temperature (component/ ambient) for enabling safe device operation	High reliability; small form factor; fast thermal response
	Digital Temperature Indicator	FET overheating indication	setP™	Reliable overheating indication regardless of power being delivered	Compact footprint 0805; multipoint measurement (device configuration in series)
3	MOSFET	Part of the inverter of brushless DC motor for high-frequency switching	Gen2/Gen4 (from 36 V)	Improves system efficiency and enables compact design	Very low R _{ds(on)} ; high current capability
4	NTC	Temperature sensing to prevent motor damage due to overheating	RB	Provides accurate temperature (component/ ambient) for enabling safe device operation	High reliability; small form factor; fast thermal response
5	Snap Acting OR Tactile Switch	Actuation of the device (on/off control)	LCS , TF , TM , ZMS , ZMA	Reliable snap-acting mechanism ensures consistent performance; wide variety of actuator and terminal styles available	Reliable snap-acting mechanism; compact size; IP67 rating (ZMS)
			KSC OF , KSC2 , KSC3 , KSC4 , KSC7	Long electrical and mechanical life; reliable Snap Acting mechanism ensures consistent performance, making these switches suitable for critical applications	IP67 rated; ensuring protection against dust and water; wide variety of actuator and terminal styles
	Slide Switch	Mode control	QS , JS , L , AYZ	Reliable performance in high-vibration and high-load scenarios	Miniature and compact designs for space-saving applications; surface-mount options for modern PCB integration

Standards for power tool equipment

Standard	Title	General Scope	Region
IEC/UL 62841-1	Safety standards for Transportable Hand-Held Motor Operated Electric Power Tools	IEC 62841-1 compliance testing deals with the hazards presented by tools. The standard covers tools with rated voltage is not more than 250 V for single-phase AC or DC and 480 V for three-phase AC The rated input is not more than 700 W.	Global/ North America
IEC 62133-2/UL 62133	Safety standards for Li-Ion Secondary Cells and Batteries	Evaluating protection during various battery fault scenarios.	Global/ North America
UL 2595	General Requirements for Battery-Powered Appliance	The standard covers the safe functioning of lithium-ion battery systems and lithium-ion cells employed in battery systems. The maximum rated voltage for appliances and battery packs is 75 VDC.	North America
UL 1642	Lithium Batteries	Both are Safety standard that deal with cells and small portable batteries. UL1642 deals with individual cells while UL2054 is for small rechargeable battery packs.	North America
UL 2054	Household and Commercial batteries		North America
IEC 62281	Safety of Primary and Secondary Lithium Cells and Batteries during transport	This standard specifies test methods and requirements for primary and secondary (rechargeable) lithium cells and batteries to ensure their safety during transport other than for recycling or disposal.	Global
JIS C8714	Safety Tests for Portable Li-Ion secondary cells and Batteries	Covers safety testing of Li-ion storage batteries (single cell and multiple cell) for portable electronic devices.	Japan
ANSI C18.2M	Portable Rechargeable Cells and Batteries	Defines safety standards for portable cells and batteries. It is specific to two distinct chemistry systems: lithium ion and nickel.	North America

Additional information can be found at [Littelfuse.com](https://www.littelfuse.com)

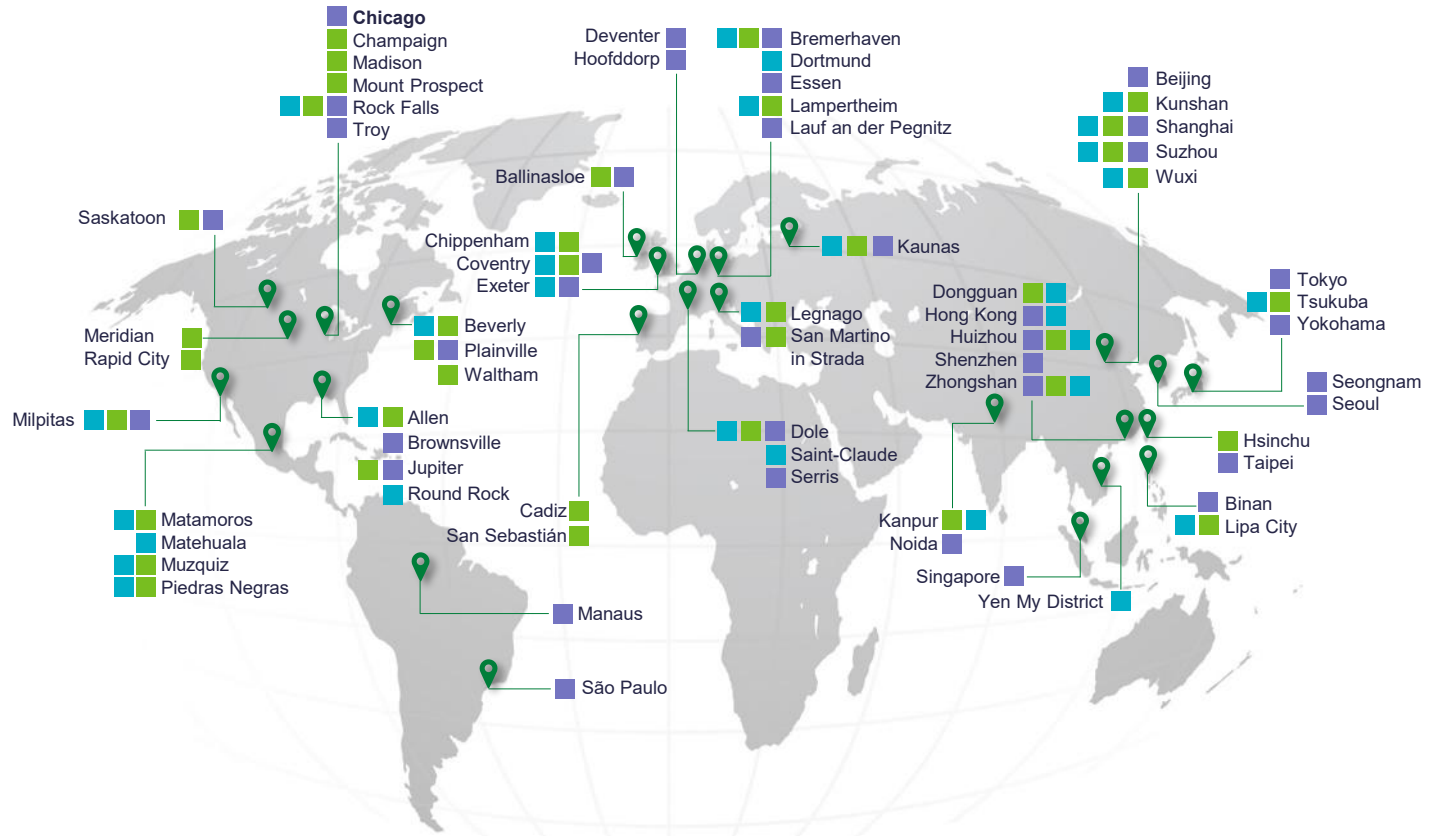
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Application
Spotlights



Local resources supporting our global customers



Shaping solutions for the safe and efficient transfer of electrical energy

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 Regulatory

We help customers in the design process to account for 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

We offer high-volume manufacturing that is committed to the highest quality standards.



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