Littelfuse®

Expertise Applied | Answers Delivered

# Small appliances

Appliances

*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.*

REV0124

# Small appliances: continued evolution with more electronic content and sensors


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# Market trends of small appliances

## Market trends and drivers

There's a growing consumer demand for energy-efficient and environmentally friendly appliances, leading to innovations in power-saving features and sustainable materials.

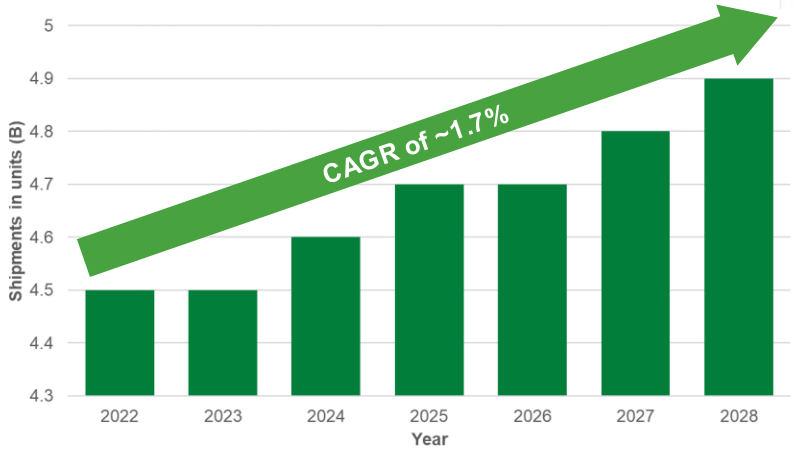
Global small appliances shipments in 2022 numbered ~4.5 B units. Growth is expected at a CAGR of ~1.7% from 2022 to 2028.

The integration of IoT (Internet of Things) technology in small appliances enables remote control and data collection to improve user experience and device performance.

The demand for cordless and portable small appliances is increasing, supported by advancements in battery technology and wireless charging.

Much of the growth in this market is being driven by emerging economies amid rising income levels, changing lifestyles, and growing urbanization.

## Small appliance shipments (2022–2028)

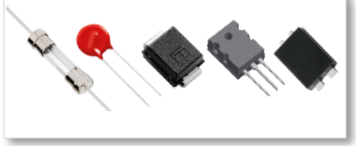



***Small appliances include:***
*Vacuum cleaners, toasters, irons, grills, roasters, coffee machines, microwave ovens, air fryers, and electric kettles*

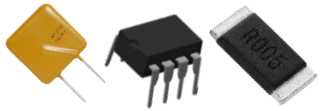
*Source: Statista*

# Recommended Littelfuse components for small appliances

**Power supply unit**
Fuse, MOV,
TVS Diode, Schottky Diode, TRIAC



**Motor drive**
PPTC, Gate Driver, Current Sensor



**User interface & display**
Load Switch, PESD,
TVS Diode Array

**Mechanical sub-systems**
TMR Sensor, Reed Switch,
Reed Sensor

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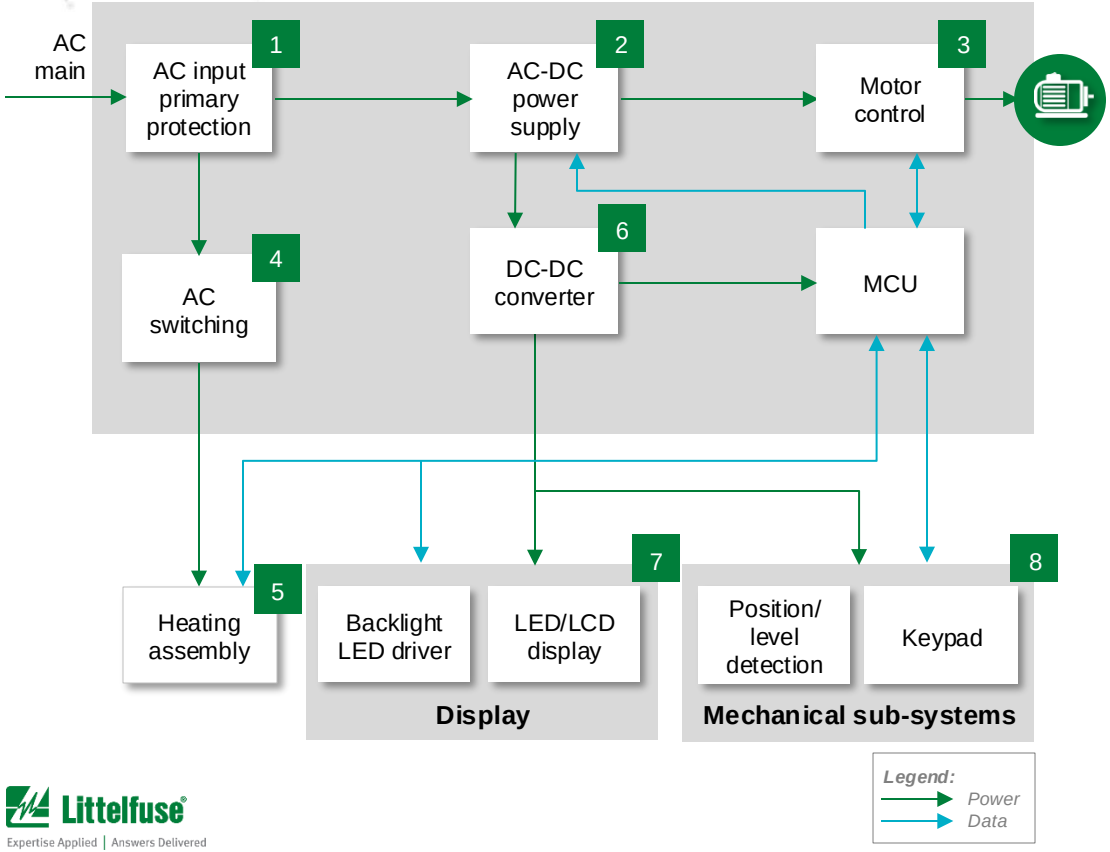
Click the product series in the table below for more info

# Functional block diagram for typical small appliances




| | Technology | Series |
|---|---|---|
| 1 | Fuse | 5X20mm Fuse |
| | MOV | M3, Xtreme |
| 2 | MOSFET | X2-class |
| | TVS Diode | P6SMB |
| | Schottky Diode | MBR, DST |
| 3 | PPTC | LVR |
| | Gate Driver | IX3120, IX3180 |
| | Current Sense Resistor | WPB |
| 4 | TRIAC | QJxx16xHx |
| 5 | NTC | H6246 |
| 6 | Load Switch | LQ05021QCS4<br>LQ05021RCS4<br>LQ05041RCS6 |
| 7 | TVS Diode | SMF, SMF4L |
| | TVS Diode Array | SP3423, SP1064 |
| 8 | TMR Sensor | 54140 |
| | Reed Switch | Flex-14, 59177, 59141 |
| | Snap Switch | ZMA |

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Click the product series in the table below for more info

# Potential Littelfuse products for small appliances

| | Technology | Function in Application | Series | Benefits | Features |
|---|---|---|---|---|---|
| 1 | Fuse | Helps protect user and the power stage from overcurrent fault events | 5X20mm Fuse | Reduces customer qualification time by complying with third-party safety standards such as UL/IEC | Third-party compliance with UL/IEC; low internal resistance; shock-safe; vibration-resistant |
| | MOV | Helps protect unit from damage from voltage surges (eg. power transients) | M3, Xtreme | Capable of withstanding high surge energy/current absorption, allowing smaller device selection | Peak current up to 15000 A; maximum operating temperature of 125 °C |
| 2 | MOSFET | Offers high switching speed in power supply units | X2-class | Offers fast response time and lower heat signature | Low $R_{ds(on)}$; dv/dt ruggedness |
| | TVS Diode | Secondary protection from voltage transient events | P6SMB | Improves system reliability by protecting downstream components from transients on power lines | Excellent clamping capability; optimized for minimal impact on PCB space |
| | Schottky Diode | Performs 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 |
| 3 | PPTC | Protects electric motors from damage caused by mechanical overloads, overheating, etc. | LVR | Fast time to trip; offers board space saving; reduces customer quality time by complying with UL/IEC | Line voltage ratings of 120 VAC and 240 VAC; low resistance; holds current up to 2 A; compact size |
| | Gate Driver | Provides required drive current to power MOSFETs | IX3120, IX3180 | Efficient and fast MOSFET switching | Capable of sourcing and sinking up to 2 A; wide operating voltage range; 3750 $V_{rm}$ input−output isolation |
| | Current Sensing Resistor | Part of current measurement circuitry | WPB | Cost-effective solution compared to competing technologies; Low profile | Tolerance down to 0.5%; power rating up to 3 W |
| 4 | TRIAC | AC switching for heater or motor control loads | QJxx16xHx | Solid-state (non-mechanical) switching and no audible noise during operation; enables power efficient, compact design | High voltage withstand capability (1 kA), high surge capability up to 200 A; mechanically and thermally robust TO-220 |

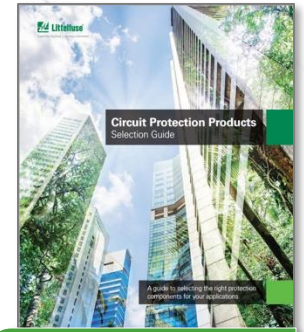
Click the product series in the table below for more info

# Potential Littelfuse products for small appliances

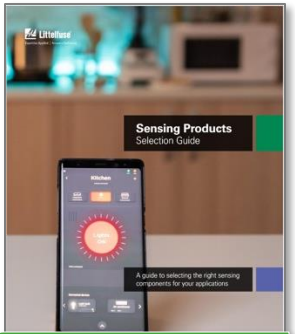
| | Technology | Function in Application | Series | Benefits | Features |
|---|---|---|---|---|---|
| 5 | NTC | Measures water/liquid temperature | H6246 | Customized probes and assemblies to meet individual customer requirements | Wide range of requirements for customer-specific applications; various precision levels available |
| 6 | Load Switch | Controls the flow of power to subsystems | LQ05021QCS4<br>LQ05021RCS4<br>LQ05041RCS6 | Slew rate control, integrated output discharge switch, and internal EN pull-down resistor | Ultra-low $I_Q$: 7 nA Typ @ 5.5 $V_{IN}$; low $R_{ON}$ = 31 mΩ Typ @ 5.5 $V_{IN}$ |
| 7 | TVS Diode | Protects ICs from ESD induced through display | SMF, SMF4L | Improves system reliability by protecting downstream components from transients on power lines | 400 W peak pulse power capability; fast response time (<1 nS); low inductance |
| | TVS Diode Array | Protects ICs from ESD induced on signal line through display | SP3423, SP1064 | Smaller form-factor and multi-line protection enables ease of design | Low leakage current; low capacitance per I/O |
| 8 | TMR Sensor | Lid position detection or water level detection | 54140 | Ultra-low power consumption at 1.5 uA; longevity of up to 20 billion operations | IP67 rated; 17 Gauss sensitivity |
| | Reed Switch | Provides open or close control signal of functional blocks to protect from physical harm or equipment damage | Flex-14, 59177, 59141 | Hermetically sealed; suitable for humid, wet, or contaminated environments | Application-specific customization available; wide range of sensitivities available |
| | Snap Switch | Position detection for safety mechanism | ZMA | Reliable snap-acting mechanism; compact size; ideal when space is limited | Contact rating up to 3 A; electrical life up to 300,000 cycles |

# Additional information can be found on Littelfuse.com

Explore the world of Littelfuse with the electronics eCatalogs (ecatalogs.littelfuse.com)

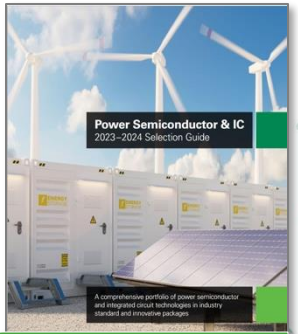



Circuit Protection Selection Guide



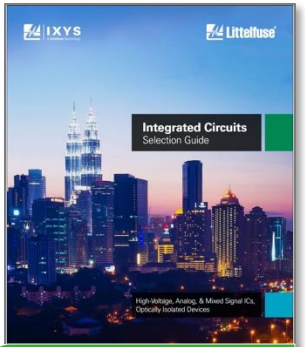

Sensor Selection Guide


C&K Switches Selection Guide




Power Semiconductor Guide

Click the images for more information




Integrated Circuit Selection Guide


Building Automation Guide

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# Local resources supporting our global customers


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An industrial technology manufacturing company empowering a sustainable, connected, and safer world

**Application expertise**

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

**Global customer service**

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


**Compliance & regulatory expertise**

We help customers in the design process to account for requirements set by global regulatory authorities

**Testing capabilities**

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

**Global manufacturing**

High-volume manufacturing that is committed to the highest quality standards

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