



Building and Home Automation Solutions



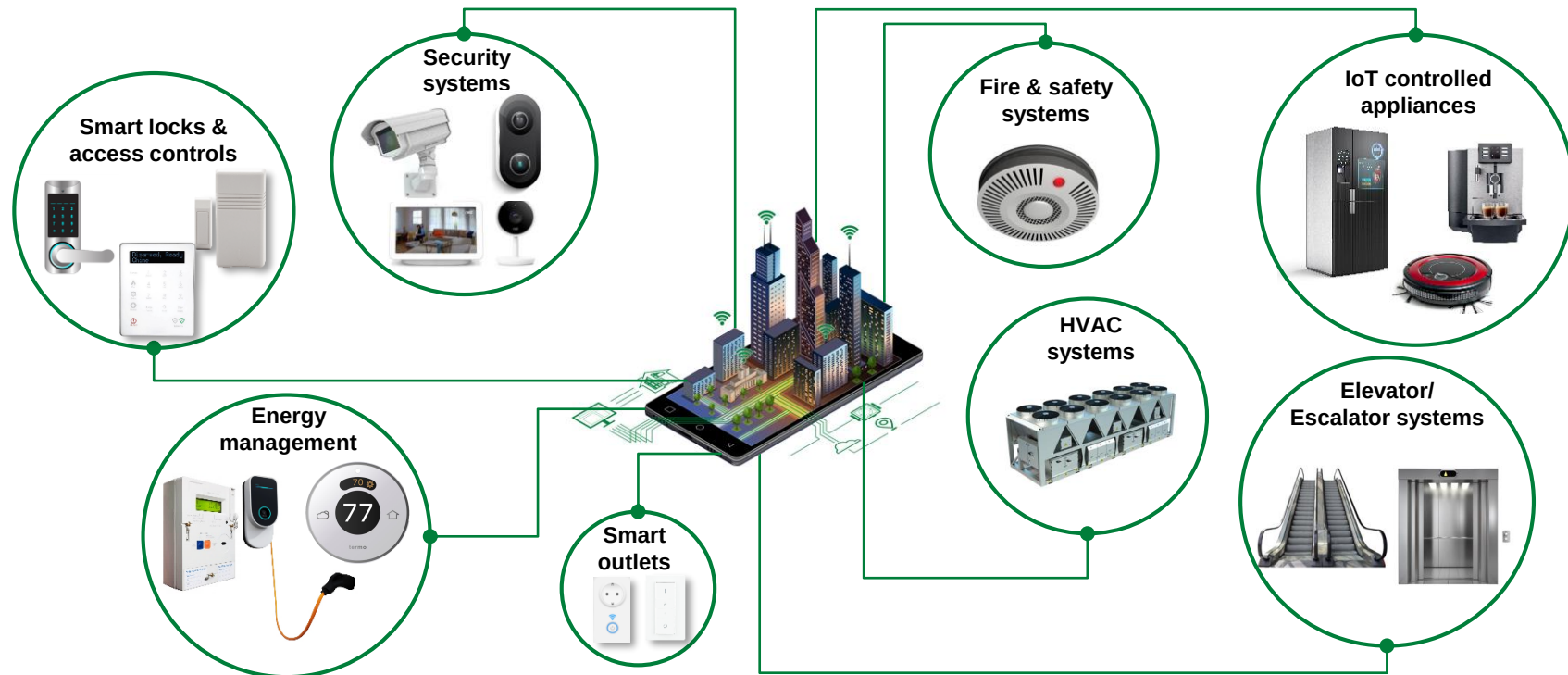
Building automation



Littelfuse®

Expertise Applied | Answers Delivered

Smart buildings & homes are equipped with intelligent technologies that make lives more convenient & energy efficient



Littelfuse offers protect, control, and sense technologies to improve safety, reliability, and energy efficiency of buildings

Littelfuse-recommended products for HVAC systems

Control unit



- Fuses
- SPD, SIDACTor® + MOV, TVS diode
- Current and voltage monitors
- Solid state relay
- Reed sensor

Rectifier



- Rectifier module

Inverter



- IGBT module
- NTC
- TVS diode
- Semiconductor fuses



Communication interface



- Diode array *

User interface



- Polymer ESD suppressor

Analog front end

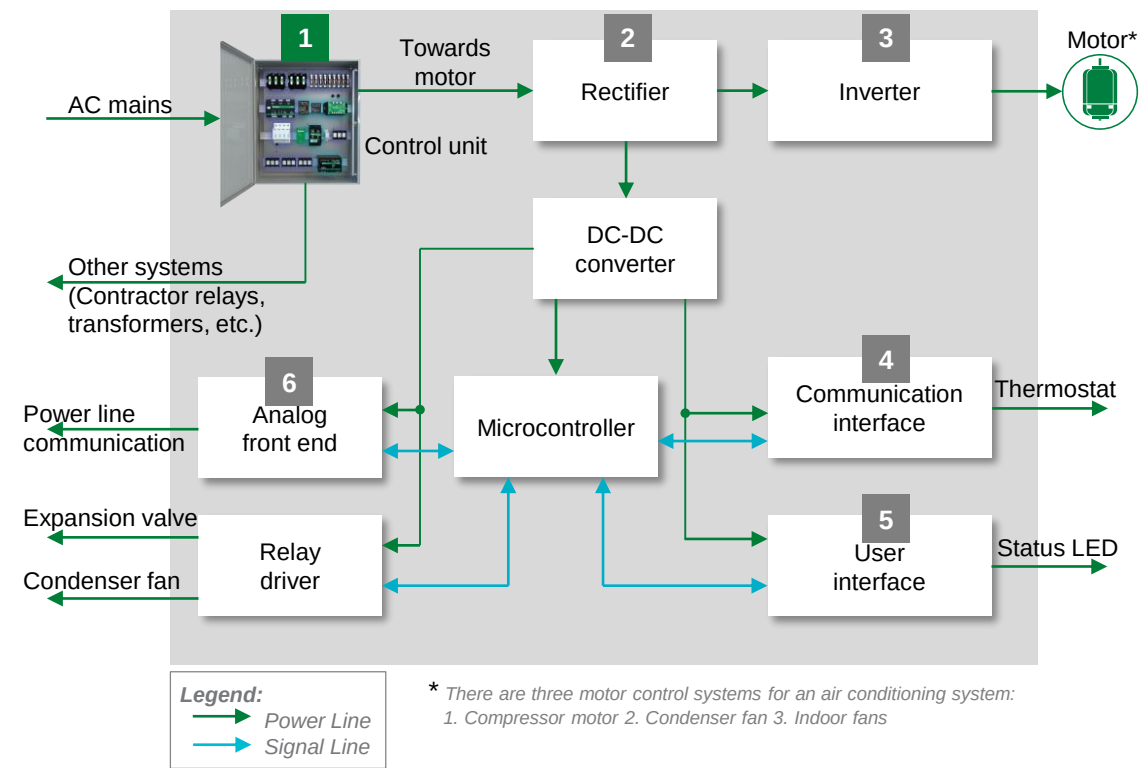


- TVS diode

** This is recommended for compact designs where clearance between the antenna and the casing is < 2 mm*



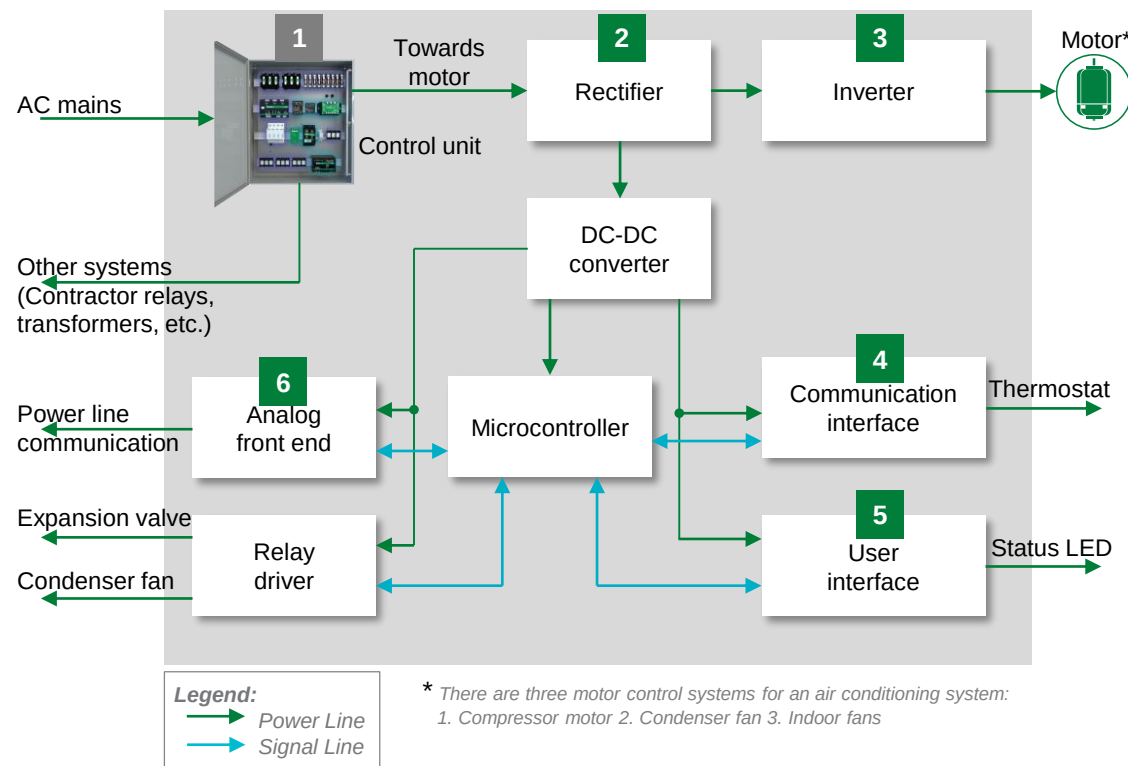
HVAC system block diagram



* There are three motor control systems for an air conditioning system:
1. Compressor motor 2. Condenser fan 3. Indoor fans

	Technology	Product series
1	UL class fuses	CCMR , KLDR , KLKR , KLKD , FLNR , FLSR , JLLN , JLLS , JTD
	Type 2 surge protection devices	SPD2
	SIDACtor® + MOV	Pxxx0FNL , Pxxx0ME + UltraMOV
	TVS diode	High Voltage AK , LTKAK
	Three-phase voltage monitors	460 , 201A , 250A , 455
	AC current transducers & sensors	TCSA20 , LSRX-C , LSRX
	Time delay relays	TMV , CT1 , TRU1 , TS1 , TH1 , TDUH , TDUB
	Solid state relay	CPC40055ST , CPC1998J
	Reed sensor	59140 , 57140

HVAC system block diagram



* There are three motor control systems for an air conditioning system:
 1. Compressor motor 2. Condenser fan 3. Indoor fans

	Technology	Product series
2	Rectifier module	MDD , VUO , MDMA
	IGBT module	MIXA , MIXG
3	TVS diode	SMBJ , SMCJ
	High-speed fuses	QS , PSR
	NTC	USUR1000 , SM
4	Diode array **	SP3213
5	Polymer ESD suppressor	PGB10603 , PGB10402
6	TVS diode	15KPA

** This is recommended for compact designs where clearance between the antenna and the casing is < 2 mm

Littelfuse solutions for wired security cameras

Memory

- Diode array



Motor drive

- Solid state relay



DC power input

- Fuse, PPTC
- TVS diode



Power over ethernet

- Fuse, PPTC
- Diode array



Power adapter

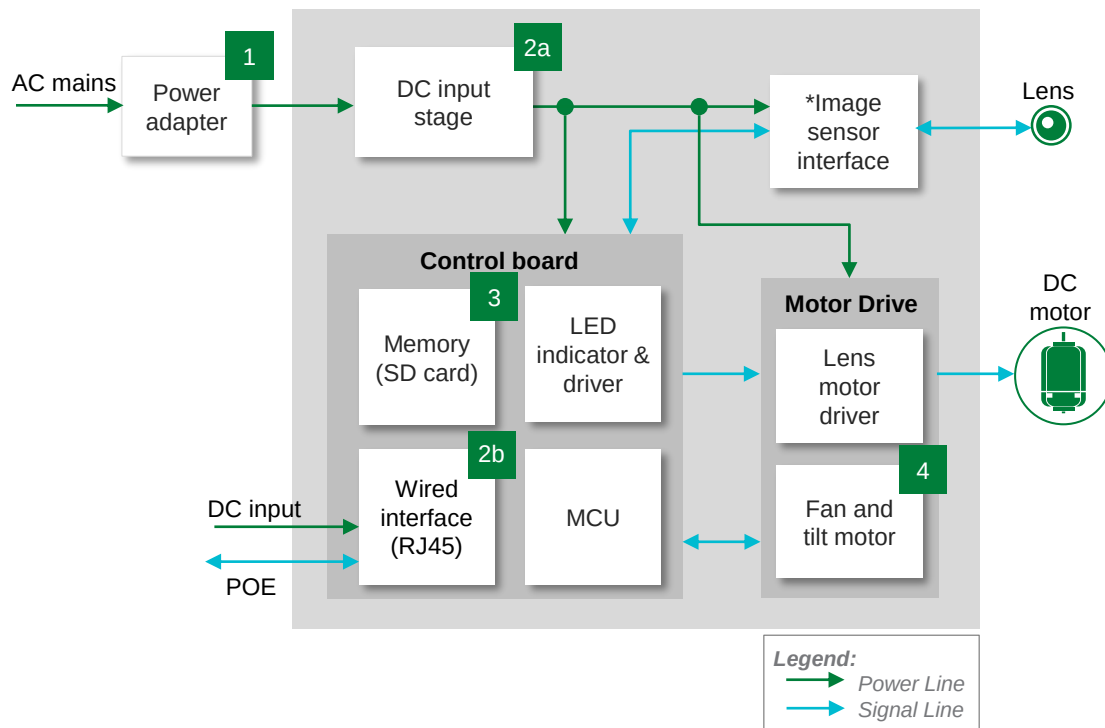
- Fuse
- MOV
- TVS diode





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

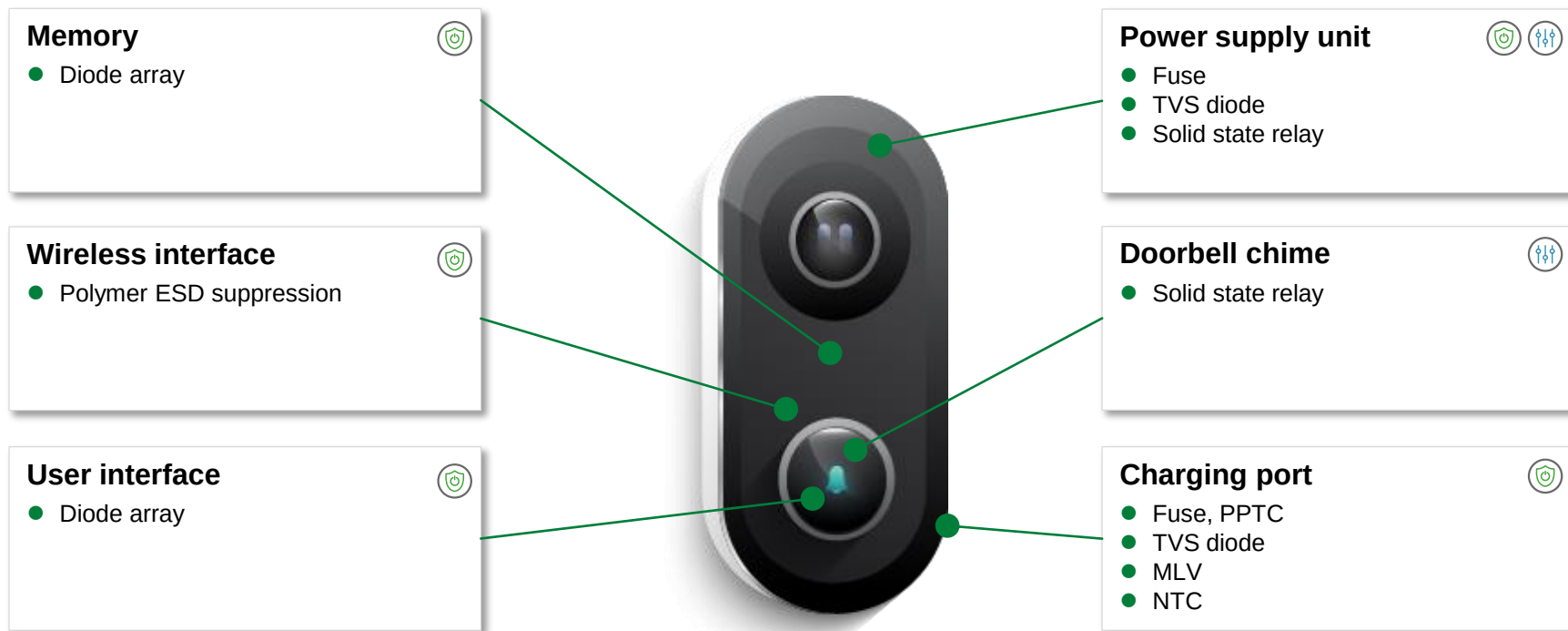
Wired security camera functional block diagram



	Technology	Series
1	Fuse	875 , 807 , 373
	MOV	TMOV* , LA , UltraMOV
	TVS diode	P6KE , P6SMB
2a	Fuse, PPTC	461 , 449 , picoSMD
	TVS diode	5.0SMDJ
2b	Fuse, PPTC	461 , 449 , picoSMD
	Diode array	SRV05-4HTG , SP0504SHTG
3	Diode array	SP1006
4	Solid state relay	CPC1560

* TMOV is the recommended solution to comply with the new IEC 62368-1 standard

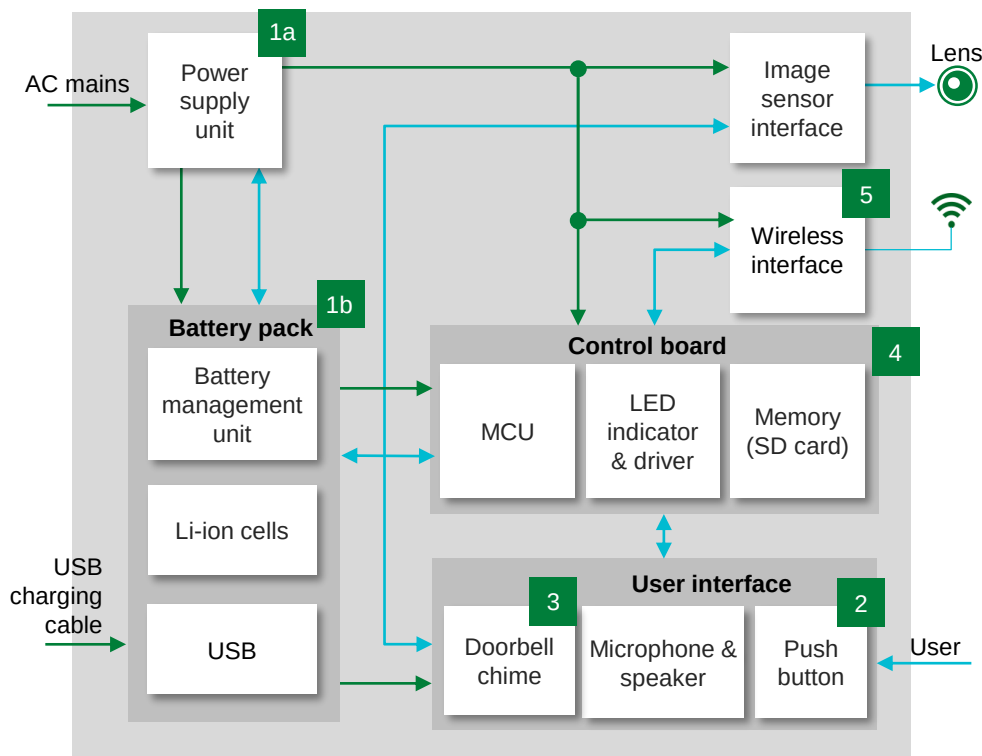
Littelfuse solutions for wired doorbell cameras





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

Wired doorbell camera functional block diagram



Legend:

→ Power Line
→ Signal Line

	Technology	Series
1a	Fuse	443, 449
	Solid state relay	PLB190
	TVS diode	4.0SMDJ24A
1b*	Fuse, PPTC	469, 449, 1206L450SL
	TVS diode	SMBJ
	MLV	MLA
	NTC	KC
2	Diode array	SP1006
3**	Solid state relay	LCB710
4	Diode array	SP1006
5***	Polymer ESD suppressor	PGB10603, PGB10402

* In some applications, micro-USB port is provided for charging removable Li-Ion batteries. The rechargeable battery is built in and gets power from the main power stage

** This is found in European markets where SSR is used to cut off vampire power and as an energy harvester switch to transfer power to the image sensor only a few times an hour, as per privacy regulations

*** This is recommended for compact designs where clearance between the antenna and the casing is < 2 mm

Littelfuse solutions for wireless security cameras

Wireless interface

- Polymer ESD suppressor



Memory

- Diode array



Charging port

- PPTC
- MLV
- Temperature indicator

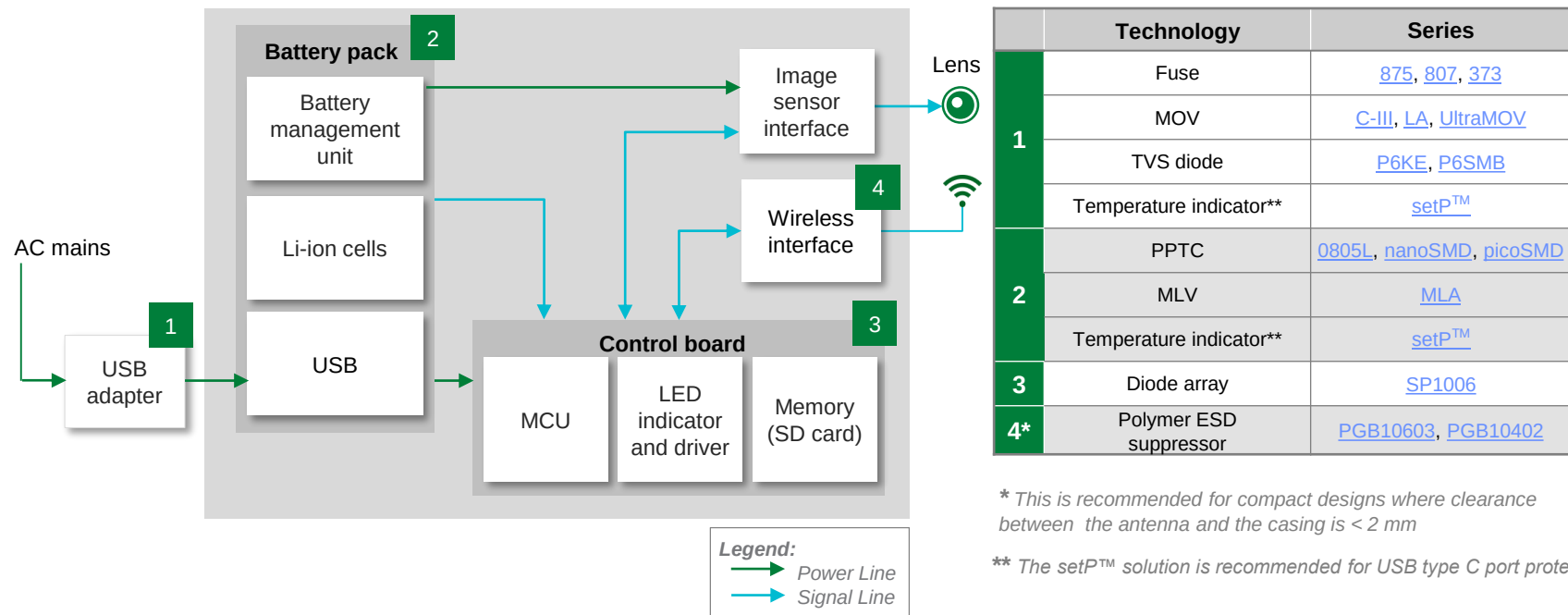


Power adapter

- Fuse
- MOV
- TVS diode
- Temperature indicator



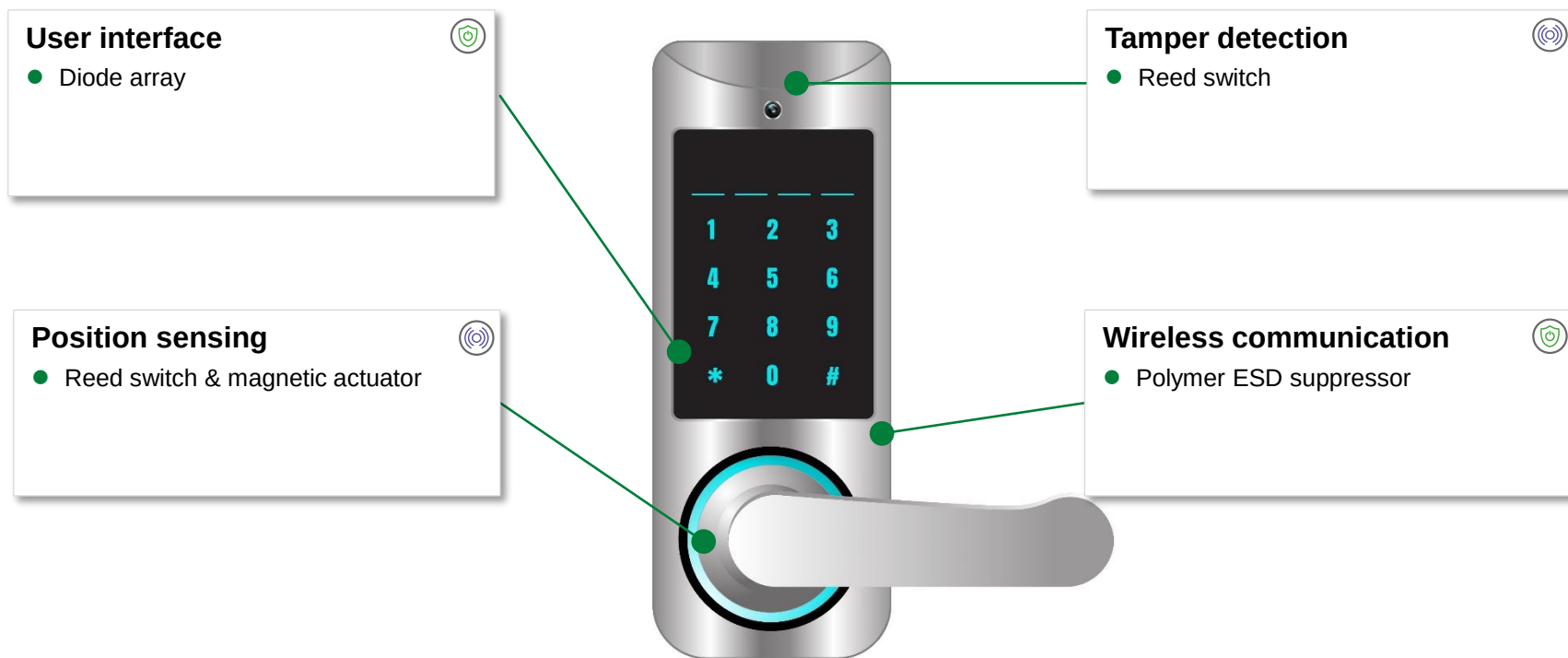
Wireless security camera functional block diagram



* This is recommended for compact designs where clearance between the antenna and the casing is < 2 mm

** The setP™ solution is recommended for USB type C port protection.

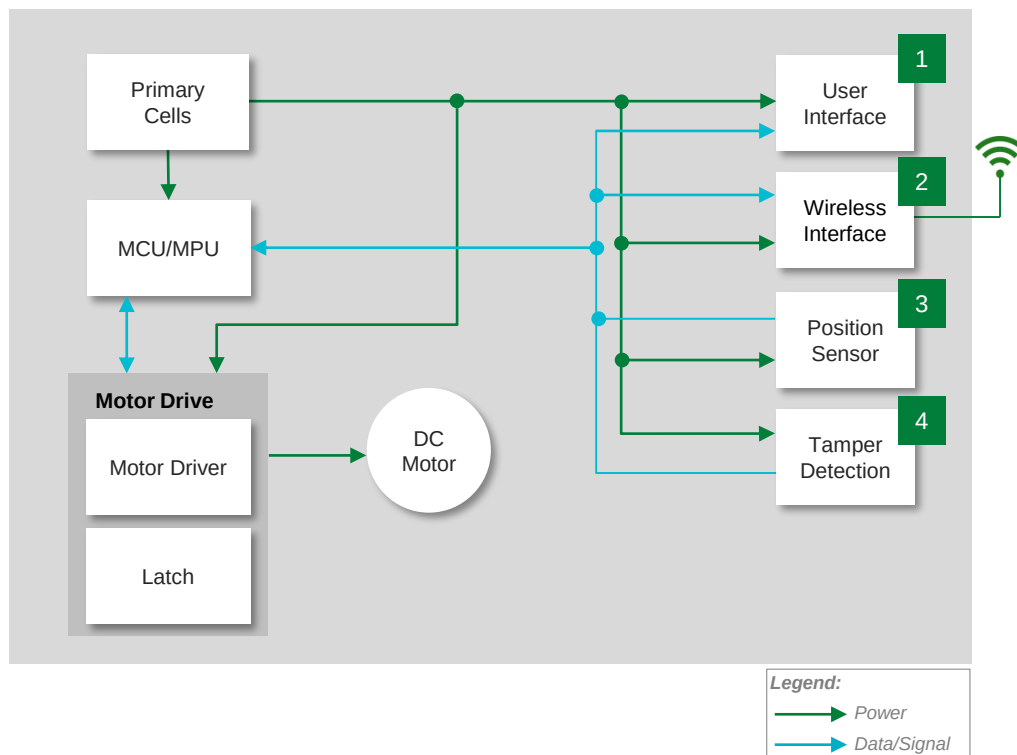
Protection and sensing solutions for smart locks





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

Smart lock block diagram



	Technology	Series
1	Diode array	SP1012 , SP1003
2*	Polymer ESD suppressor	PGB10603 , PGB10402
3	Reed switch Magnetic actuator	MDSM-10 , MDSR-10 , MITI-7 , H-36
4	Reed switch	59166

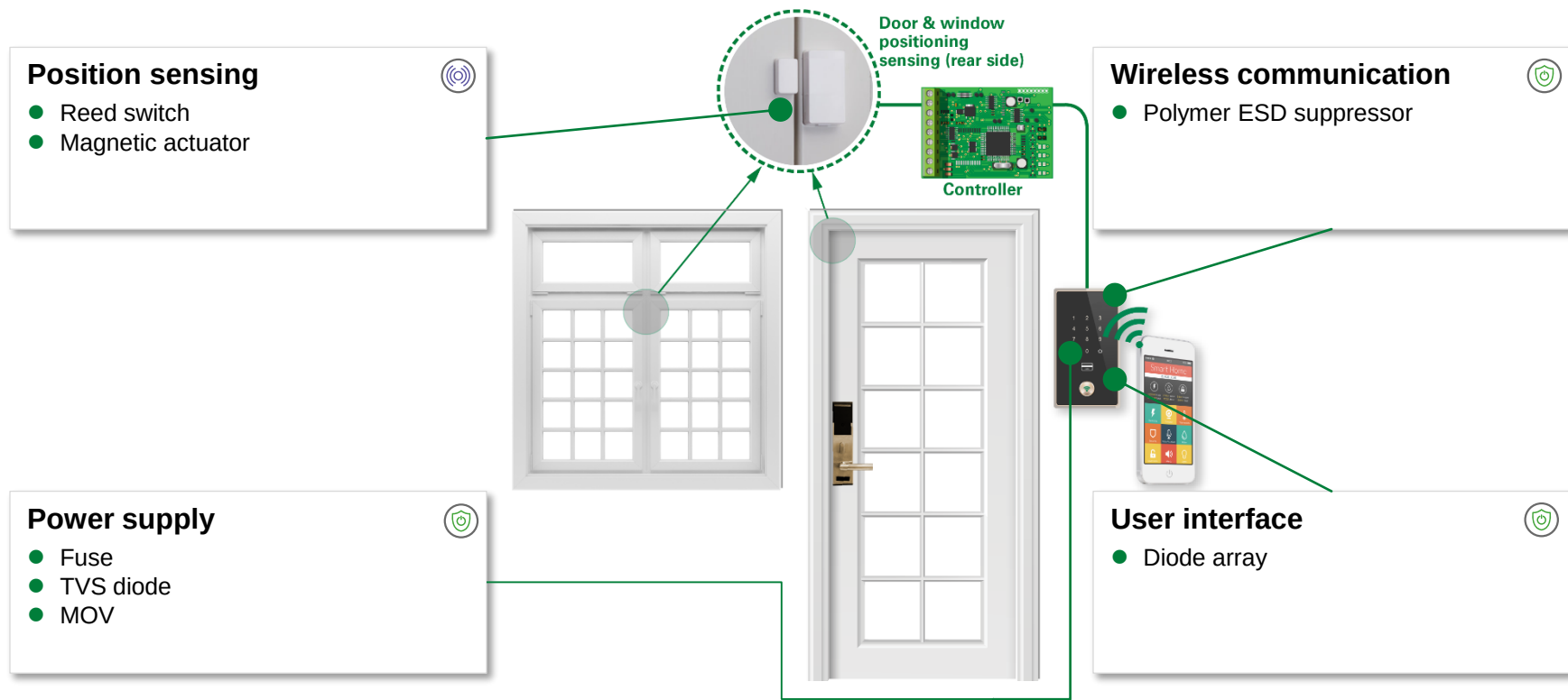
Acronyms:

TVS: transient voltage suppressor

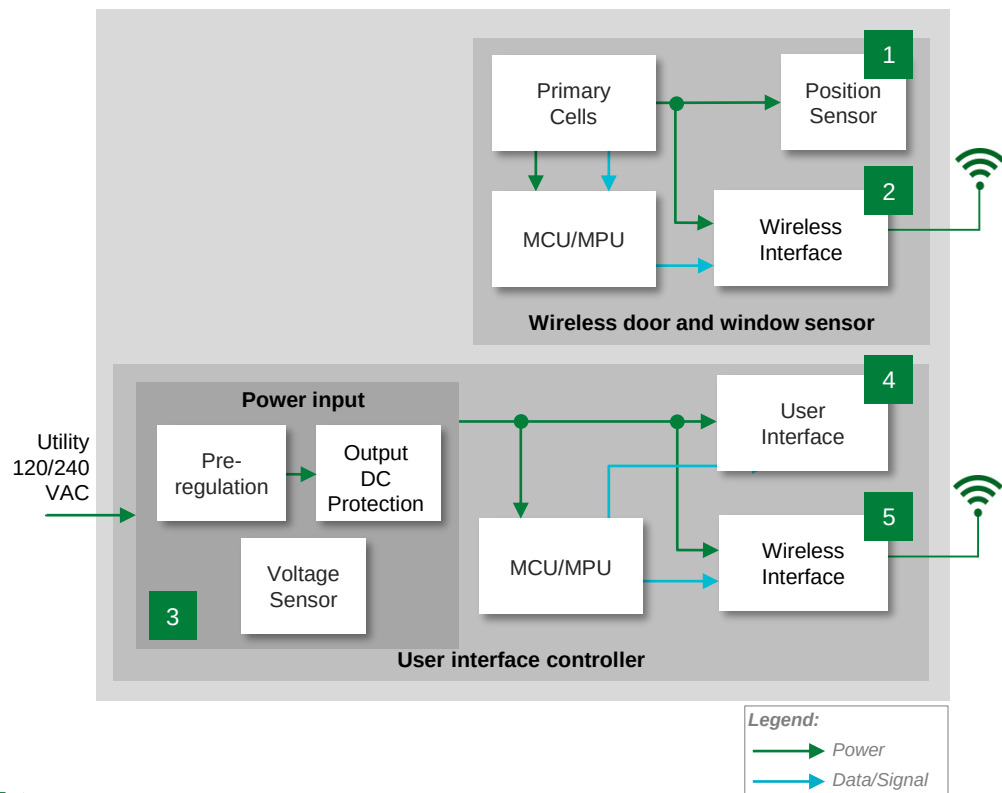
ESD: electrostatic discharge

*:Recommended for compact designs where clearance between the antenna and the casing is < 2 mm

Wireless door/window sensors with control panel



Wireless door/window sensors with control panel



	Technology	Series
1	Reed switch Magnetic actuator	MDSM-4 , MDSR-10 , MDCG-4 , MITI-7 , H-36
2*	Polymer ESD suppressor	PGB10603 , PGB10402
3**	Fuse	215 , 875 , 877
	MOV	LA , C-III
	TVS diode	SMCJ
4	Diode array	SP1012 , SP1003
5*	Polymer ESD suppressor	PGB10603 , PGB10402

Acronyms:

MOV: metal oxide varistor

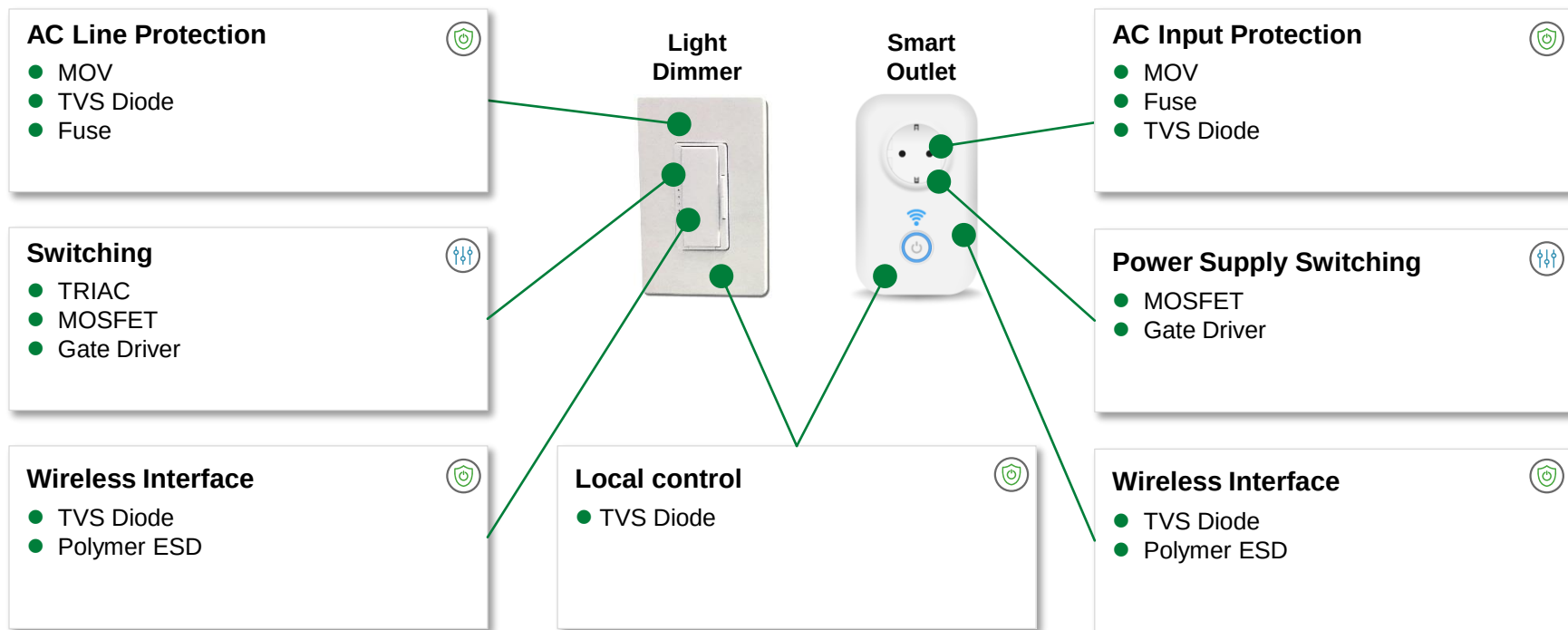
TVS: transient voltage suppressor

ESD: electrostatic discharge

*: Recommended for compact designs where clearance between the antenna and the casing is < 2 mm

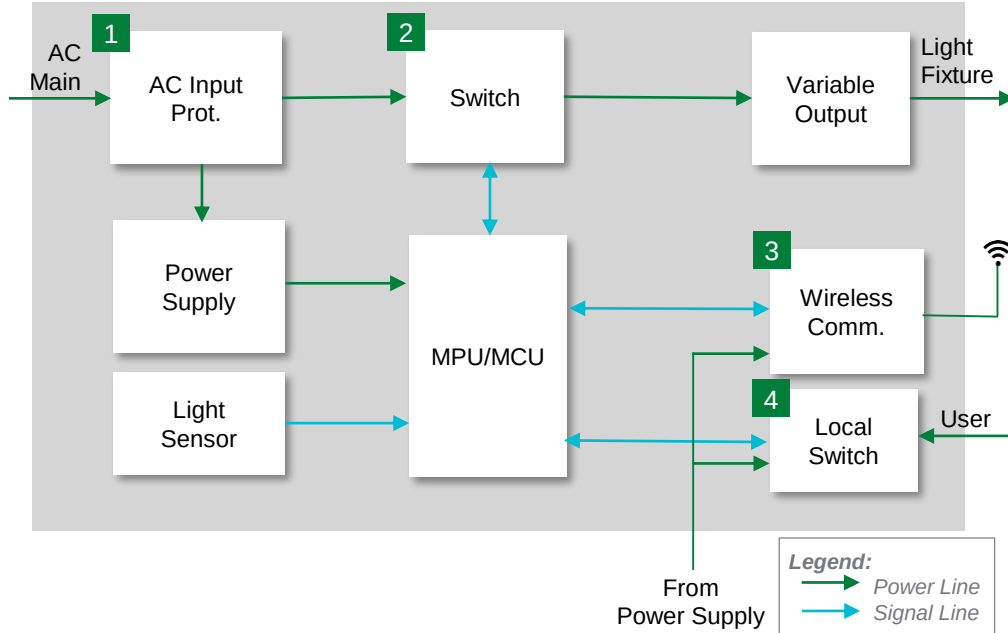
***: For commercial installations, the power input from AC mains is provided

Protection & control in light dimmers & smart outlets



TVS: Transient-Voltage Suppression
MOV: Metal Oxide Varistor
MOSFET: Metal Oxide Field Effect Transistor
TRIAC: Triode for Alternating Current

Electronic dimmer block diagram



	Technology	Series
1	Fuse	Nano, Pico
	MOV	UltraMOV
	TVS Diode	SMCJ
2	TRIAC	Q6008xH1LED
	Gate Driver	IX4340
	MOSFET	650V X2 Series
	MOV	TMOV
3	Diode Array	SP3213
	Polymer ESD	PESD
4	Diode Array, Polymer ESD	SP3213, PESD

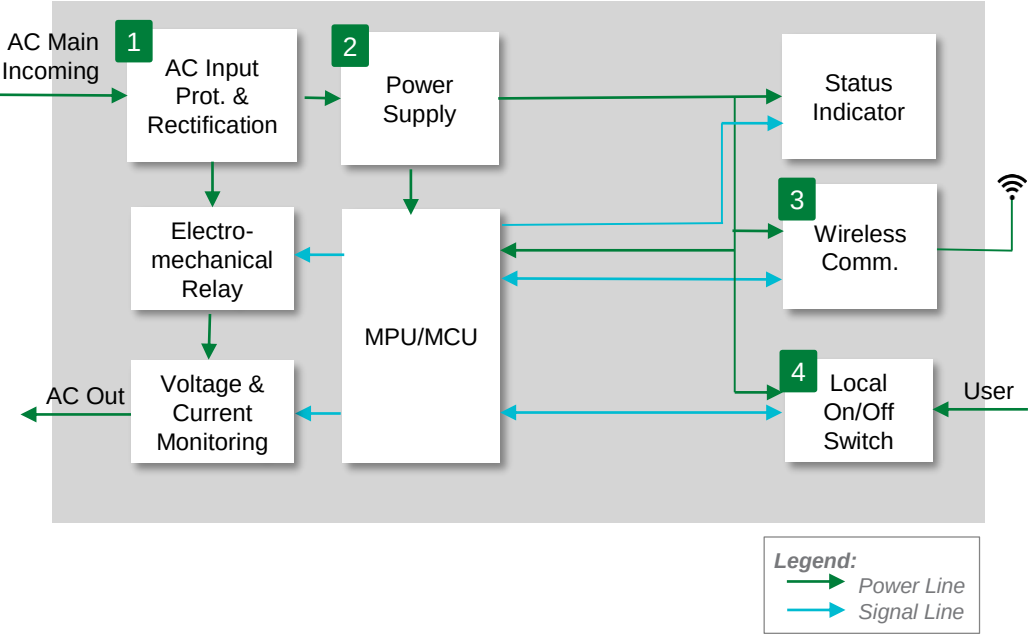
Notes:

- Typically 250 V or 300 V for 120 VAC applications and 650 V for 230 VAC applications
- tMOV used with MOSFET and will be across switch
- MOV used with TRIAC

Dimmer types:

- Smart (IoT) dimmer that can be remotely controlled
- Intelligent dimmers that can control dimmer timing and range
- Basic dimmer with no intelligence such as adjustable dimming rates, delays, or indicators have minimum protection requirements

Smart outlet block diagram

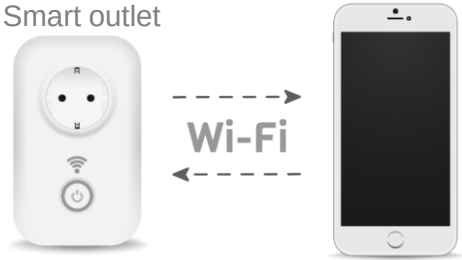


	Technology	Series
1	Fuse	Nano, Pico
	MOV	UltraMOV
	TVS Diode	SMCJ
2	Schottky Rectifier	DST
3	TVS Array	SP3213
	Polymer ESD	PESD
4	TVS Array, Polymer ESD	SP3213, PESD

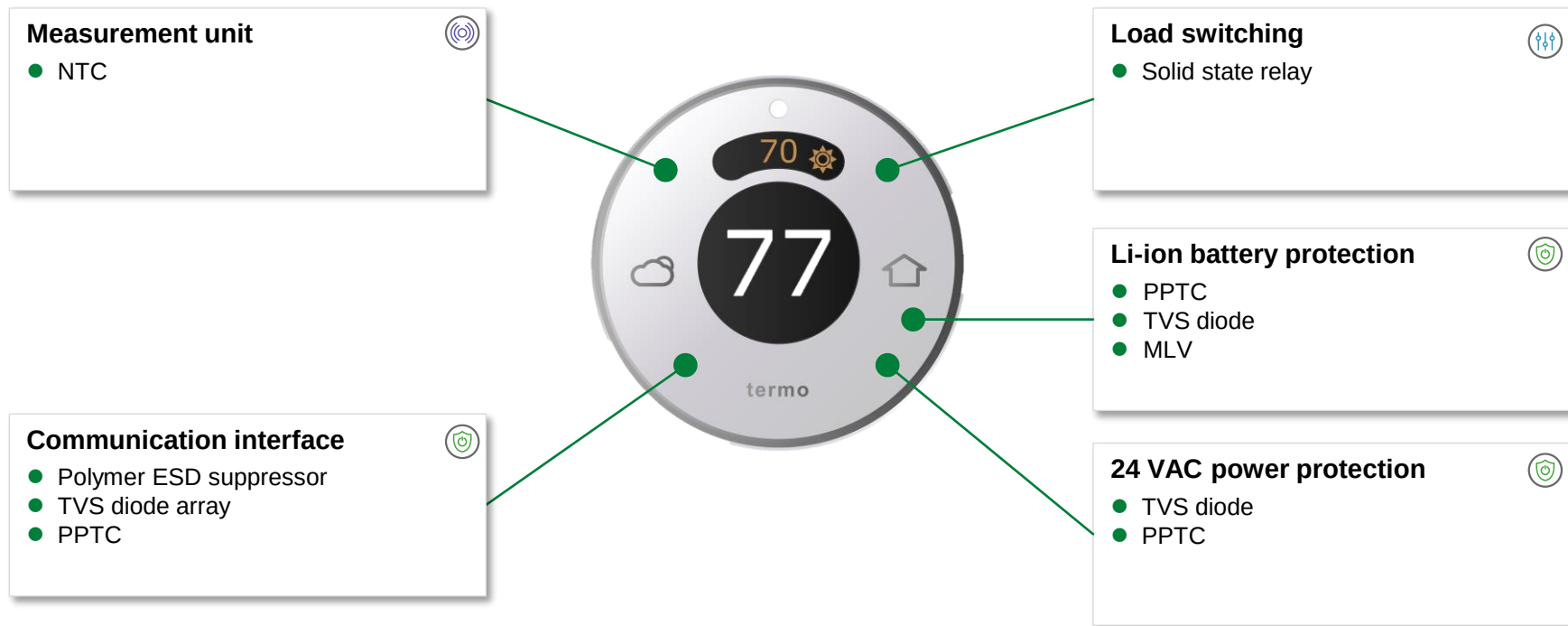
Notes:

- Some smart outlets have USB power outlet. See Slide 13 for additional protection.
- Some designers choose to use large caps and transformer which reduces protection requirements

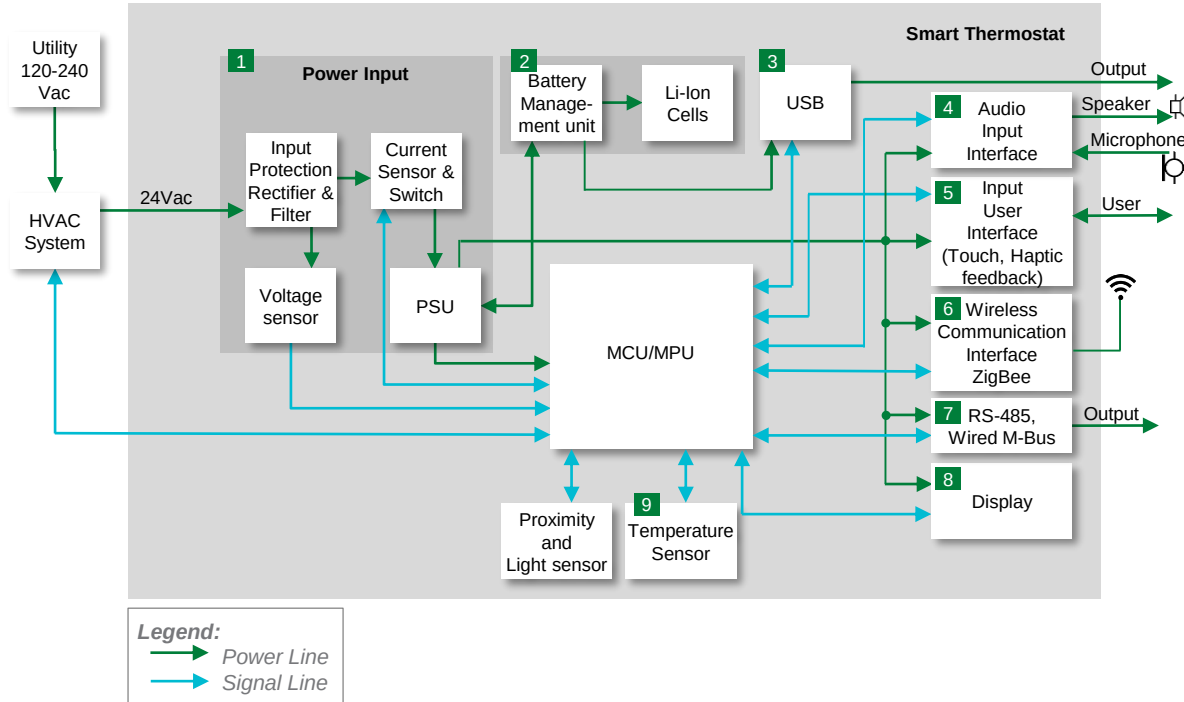
Smart outlet



Smart thermostat



Smart thermostat block diagram



	Technology	Series
1	Chip Fuse (24V AC)	437 , 468
	PPTC	2920L , SMDC
	TVS Diode	SACB , SMAJ , SMF3.3
	Latching Relay Driver	CPC1600
2	TVS Diode, MLV	MLA , SMF
	PPTC	femtoSMD , nanoSMD , picoSMD
	Strap PPTC	MXP , SL
3	TVS Array	SESD , SPXX
	PPTC	0402L , femtoSMD
4	TVS Array	SACB , SMAJ , SMBJ
5	TVS Array	PESD , SP3213-01UTG
6	TVS Array	SP3213-01UTG
	Polymer ESD	PESD
7	TVS Array	SM712
8	TVS diode, MLV	MLA , PLED , SMF
9	NTC	SM Series , RB , DO-35

Smart electricity meter

Anti-tamper

- Reed switch



Metrology System Unit

- MOV
- Fuse
- TVS diode
- MOSFET/SiC MOSFET
- PPTC
- NTC



Communication Interface

- RF
- SIDactor
- Opto-isolator



I/O Protection and Control

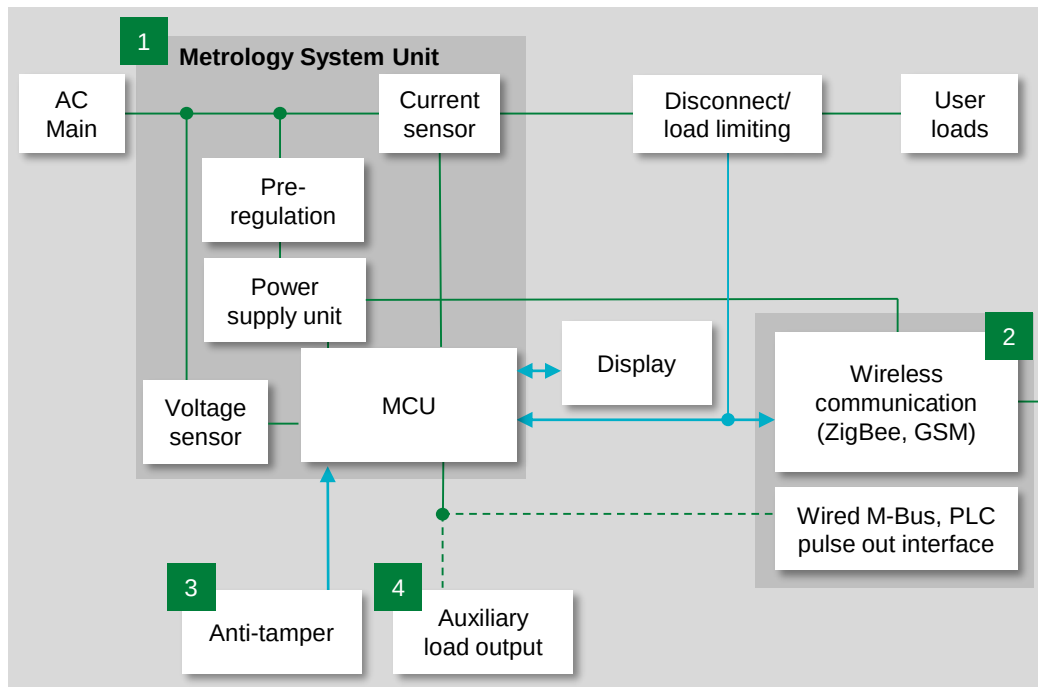
- SSR
- Fuse
- TVS, MOV
- SSR





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

E-metering high-level block diagram



	Technology	Series
1	MOV	Ultra MOV , CIII , TMOV
	Cartridge fuse	215 , 514 , 835
	TVS diode	SMAJ , SMBJ
	NTC	ST , End-banded Chip
	MOSFET/SiC MOSFET	Polar™ , X2-class , LSICMO170E1000
	PPTC	TRF600-150
	MOSFET	X2-class
2	Diode array	AQxx-02HTG , LC03-3.3
	SIDActor®	SEP0xx
	Solid state relay	PLA192 , CPC1394 , PLA193 , PLA194
3	Reed switch/TMR	MDSR-10 , TMR
4	Solid state relay	PLA192 , CPC1394 , CPC1983YE , PLA193 , PLA194
	TVS diode/MOV	SMCJ , SM7

Smart water and gas meter

Battery & Interface Panel

- PPTC
- Fuse
- ATEX fuse
- TVS diode



Anti-tamper

- Reed Switch
- Hall Effect sensor



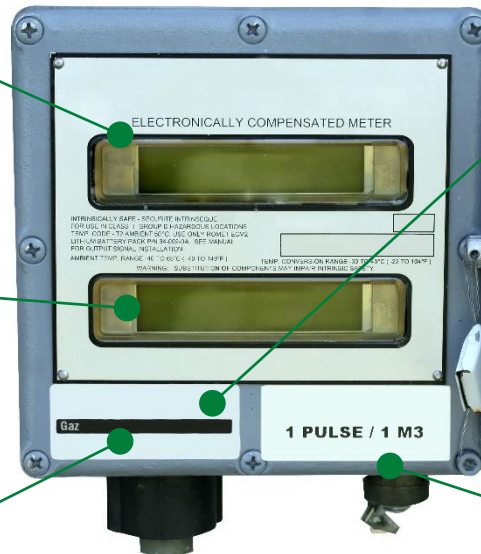
Communication Interface

- RF
- SIDACtor
- Opto-isolator
- SSR



Safety Valve

- SSR



Flow Measurement

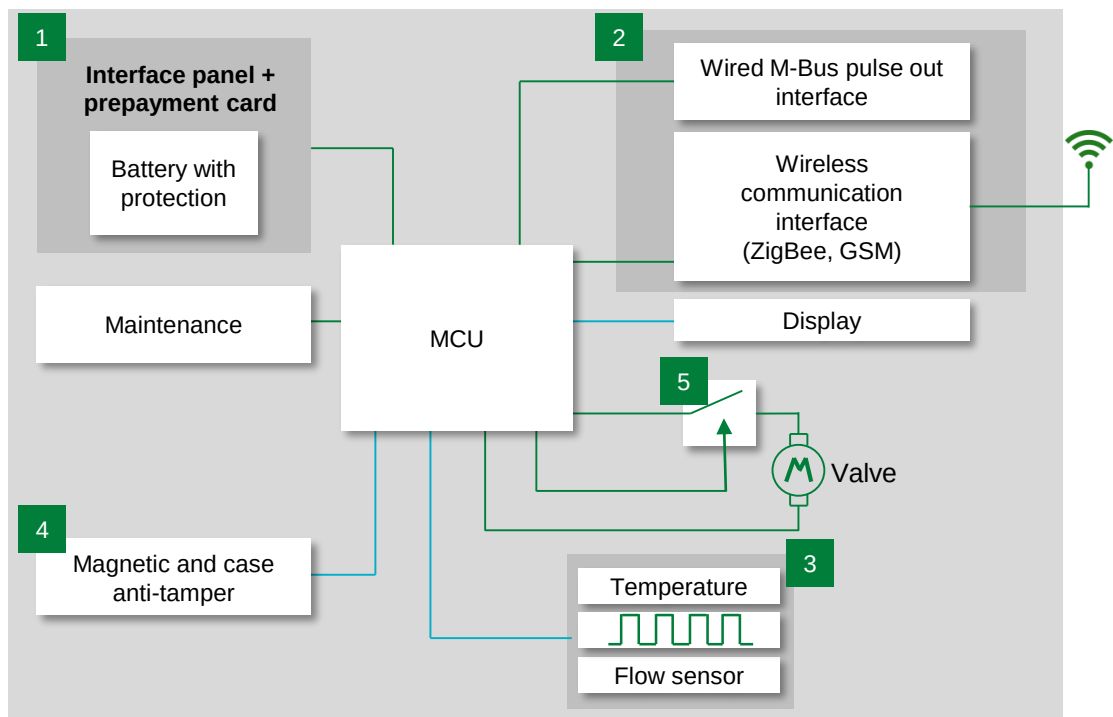
- NTC Thermistor
- Reed switch





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

Gas and water meters share many functional blocks



	Technology	Series
1	Fuse PPTC	Atex 259/304 , 437 Femto , Nano
	TVS diode	SMBJ , SMCJ
2	Diode array	AQxx-02HTG
	SIDACtor	SEP0xx
	Solid state relay	PLA192 , CPC1394 , PLA193 , PLA194
3	NTC	MELF style , End-banded Chip , Thermistor assembly
	Reed switch	MDSR-10
4	Reed switch	59166 , MDSM-4
5	Solid state relay	PLA192 , CPC1394 , CPC1983YE , PLA193 , PLA194

Legend:

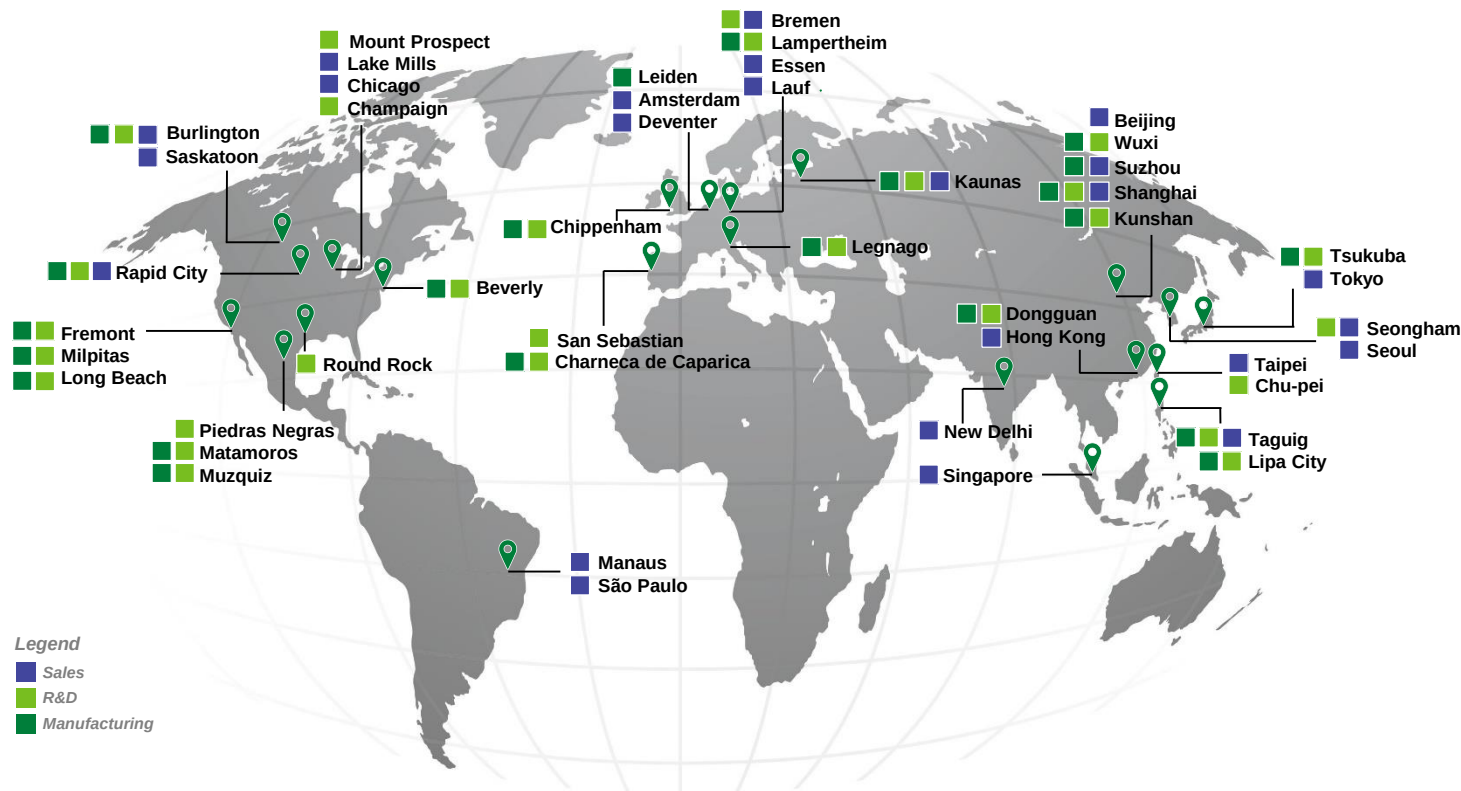
— Power

— Data/Signal

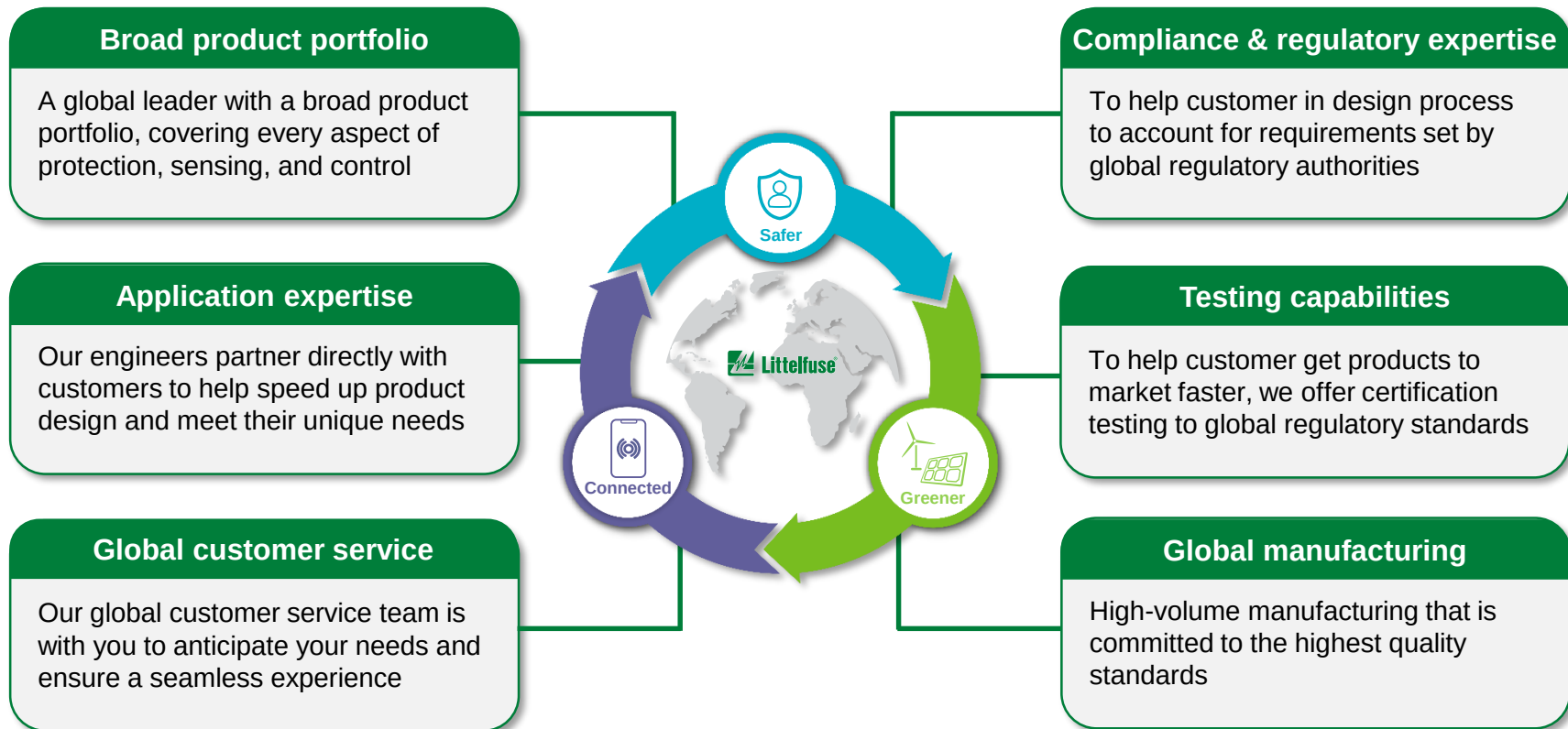


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