

# Aviation Platforms

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Aerospace and Defense



# Commercial aircraft & eVTOL\* subsystems overview

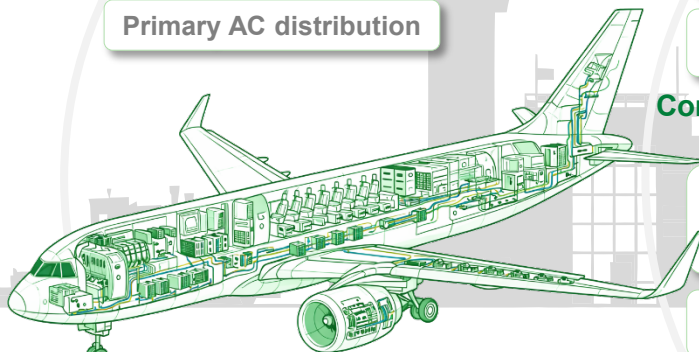
Shared electrical subsystems with diverging power architecture: AC centralized vs. HVDC distributed

## Commercial aircraft

### Power sources

- 115/200 VAC 3 $\Phi$
- Engine/APU generator

### Primary AC distribution



### Power conversion

- TRU AC  $\rightarrow$  28 VDC
- Inverter
- DC-DC

### Avionics

(Flight control systems, Autopilot, Radar, etc.)

### DC distribution

## Commonly shared subsystems

### Cabin & lighting systems

### Thermal management

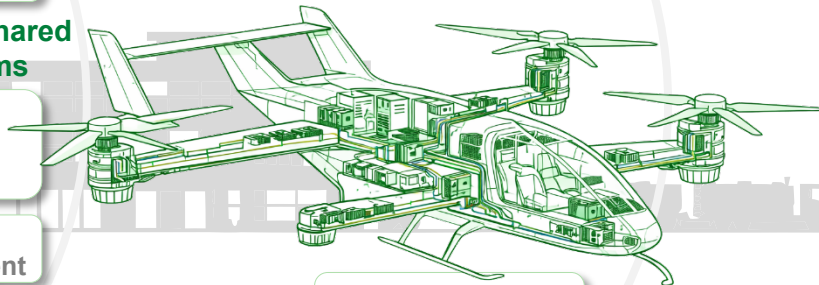
### LV Battery + emergency power

## eVTOL

### HV battery pack

- 400-800 VDC

### HVDC junction box



### Inverter + electric motor

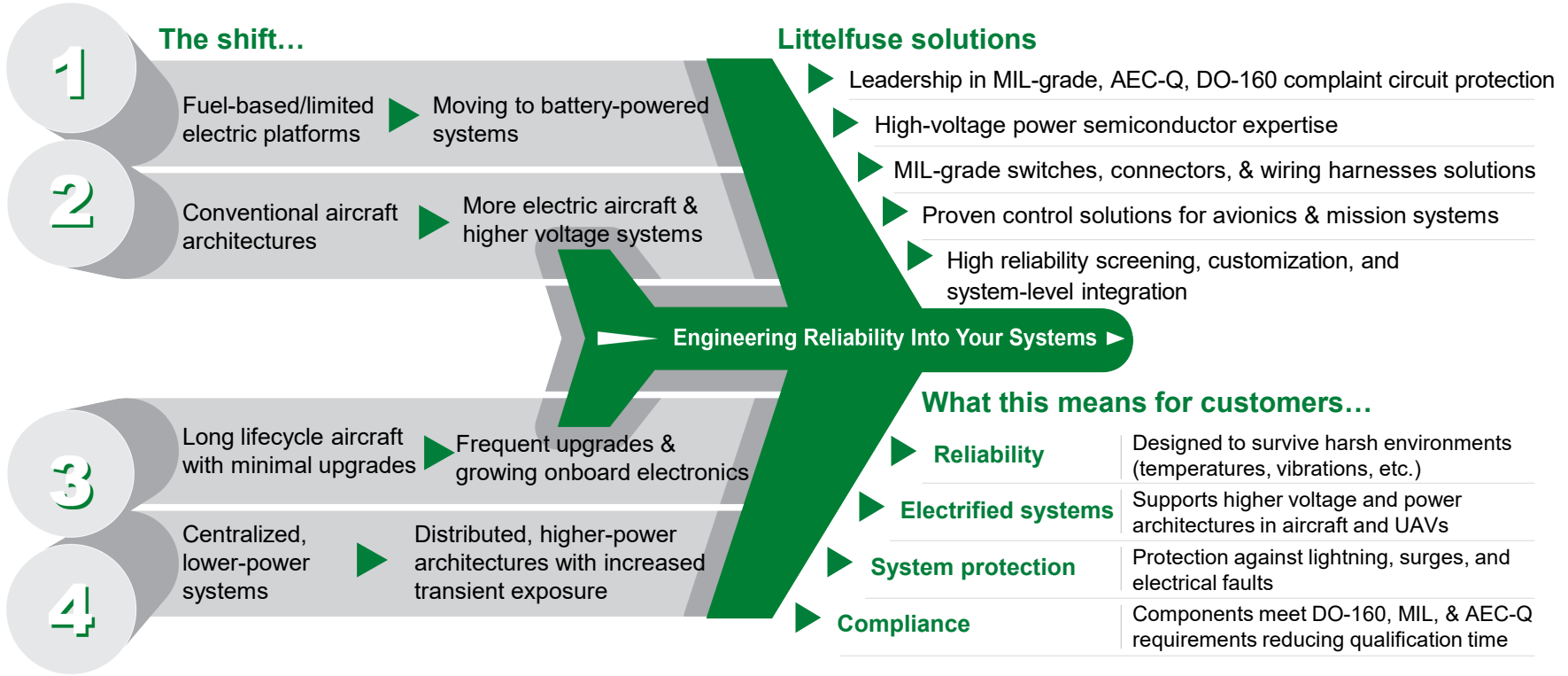
### Power conversion

- HV to LV conversion
- LDO

\* Electric Vertical Take-off and Landing Aircraft

# Powering the evolution of aviation systems

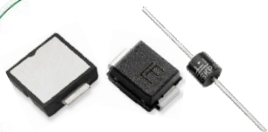
MIL-grade, DO-160, AEC-Q expertise | Power & protection devices | MIL-grade interconnect & control



# Littelfuse portfolio for aviation systems

Enabling protection, power conversion, and robust interconnects

## Circuit protection solutions



TVS Diodes



Fuses



MOVs

## C&K® switches



Pushbutton Switch



Tactile Switch

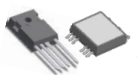


Toggle Switch

## Power Semiconductors



Si/SiC Diodes



Silicon Carbide MOSFETs



Silicon MOSFETs



IGBTs



Power Modules



Gate Drivers

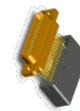
## Connectors and wire harnesses



AeroSplice® Wire-to-wire



D-Sub Connectors



Micro-D Connectors



Accessories



Wire Harnesses

Portfolio complies with MIL-grade, DO-160, & AEC-Q



End-to-end system solutions from power entry to signal I/Os



HV power solutions enabling next-gen electrification (eVTOL)



Rugged HMI solutions and high reliability interconnects



# New and featured products for aviation systems

## High reliability TVS Diodes



- 15 kW & 30 kW peak pulse capability
- DO-160 5a Level 5 protection in low-profile SMT SPD4-1 high-thermal package
- Excellent clamping capability
- Protects I/O interfaces,  $V_{CC}$  bus & other vulnerable circuits in avionics/aviation & eVTOL

## AeroSplice® Wire-to-Wire Solutions



- Exceeds MIL-DTL-24308 specifications
- Eliminates traditional manual splicing
- Withstands high vibration, extreme temperatures, and harsh conditions
- Supports a wide range of standard wire gauges

## Toggle Switches (MIL-DTL-83731F)



MIL-DTL-83731F

- Fully certified according to MIL-DTL-83731F
- Special Au plating on contact area: 50 min
- Approved by DLA on specific versions: /9, /10, /15, /16
- Sealed and non-sealed level or panel designs
- Wide range of configurations

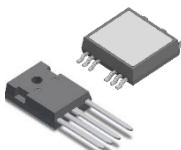
## Custom Wire Harnesses



Custom

- Custom cable harnesses based on customer requirements
- Applications include lavatories, overhead compartments, etc.
- Capability to build sealed and shielded harnesses
- On-site support

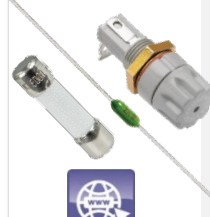
## SiC MOSFETs



650–1700 V SiC MOSFETs

- 650~1700 V MOSFETs 13~750 mΩ
- Discrete packages: TO-247-4L, TO263-7L, TOLL
- Multi-chip, isolated packages (SOT227, SMPD)
- SiC MOSFETs Half Bridges in SMPD package: 1200 V

## Fuse + Fuseholder



Fuse

- Midget Fuse/5AG: 250–500 VAC; high interrupt rating suitable for feeder and branch protection
- Fast-acting and time-delay
- Micro & PICO® Fuses up to 120 VDC suitable for PCBs

# Littelfuse solutions for commercial aircraft



1

## AC power sources

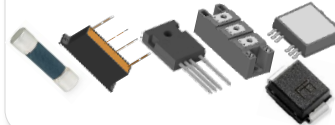
AC Fuse, Fuseholder, MOV



2

## Power conversion box

Fuse, AC Bridge, MOSFET, Diode Module, Power Module, TVS Diode



3

## DC distribution & control

Fuse, TVS Diode



4

## Avionics

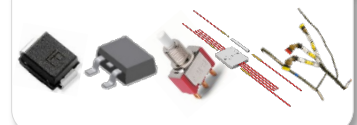
Fuse, TVS Diode, C&K® switch, IGBT, Module, Si/SiC MOSFET, Gate Driver



5

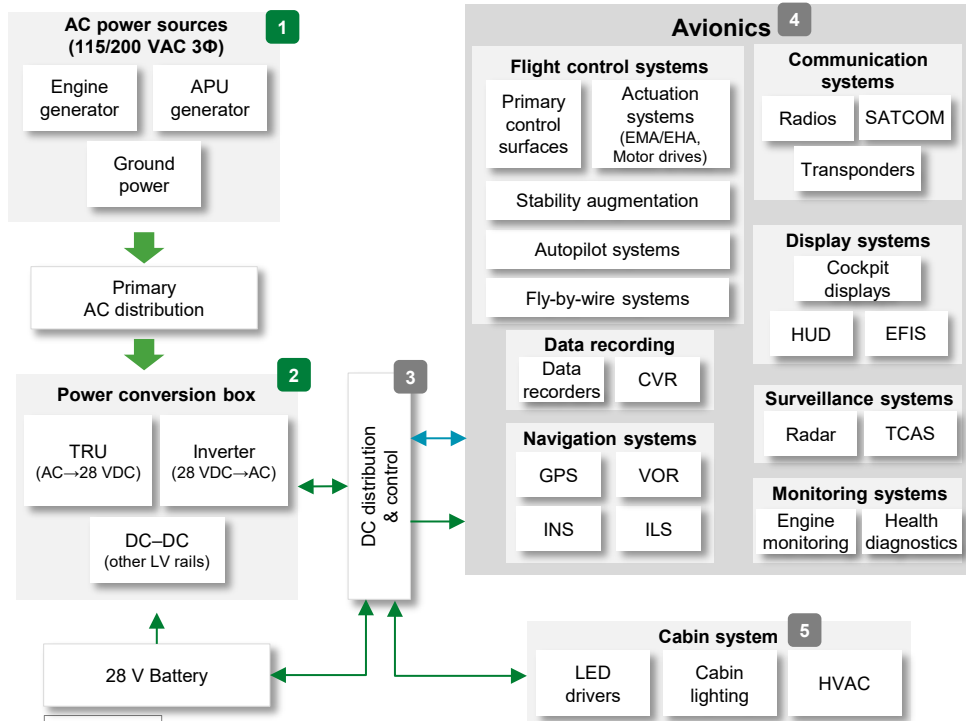
## Cabin system

TVS Diode, MOSFET, Switch, Connectors, Wire Harness



# Commercial aircraft block diagram & Littelfuse solutions

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



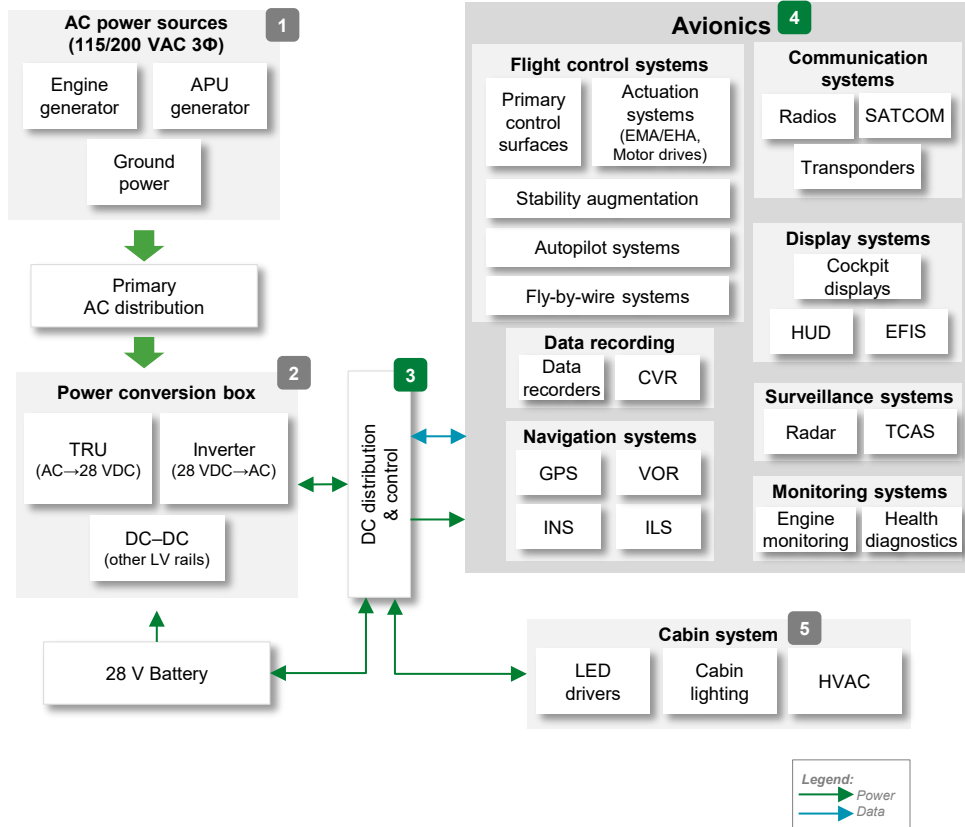
**Acronyms:**  
 APU: Auxiliary Power Unit  
 TRU: Transformer Rectifier Unit  
 CVR: Cockpit Voice Recorder  
 GPS: Global Positioning System  
 VOR: VHF Omnidirectional Range  
 INS: Inertial Navigation System

ILS: Inertial Landing System  
 SATCOM: Satellite Communication  
 HUD: Head-Up Display  
 EFIS: Electronic Flight Instrument System  
 TCAS: Traffic Collision Avoidance System  
 HVAC: Heating, Ventilation, & Air Conditioning

	Technology	Function in application	Product series
1	Fuse	AC feeder (250–500 VAC) branches overcurrent protection; time delay only for inrush (transformers, motor loads)	<a href="#">592/594</a> (fast), <a href="#">593</a> (time delay) (MIL-grade Fuses)
	MOV	AC distribution hubs to absorb high-energy lightning/inductive surges before they propagate	<a href="#">AUMOV</a> , <a href="#">SM10</a> (AEC-Q qualified) <a href="#">QPL</a> , <a href="#">TX Hi-Rel</a> (DSCC Qualified)
2	Rectifier Diode	Converts AC line voltage to DC	<a href="#">AC Bridges</a> , <a href="#">Diode Modules</a> , <a href="#">Rectifier</a>
	Power Diode	Rectification	<a href="#">Power Diode</a>
	IGBT Discrete	AC–DC and DC–AC power conversion	<a href="#">IGBT</a>
	IGBT Module OR SMPD		<a href="#">IGBT Module</a> OR <a href="#">SMPD</a>
	Si MOSFET		<a href="#">Si MOSFET</a>
	SiC MOSFET	High power switching with efficiency, thermal capability, and reliability	<a href="#">SiC MOSFET</a>
	Gate Driver	Controls SiC and IGBTs switching safely and efficiently	<a href="#">IX4352NEAU</a>
	Fuse	Isolates TRU faults from 28 V bus	<a href="#">263 PICO® Fuse</a> , <a href="#">MICRO™</a> <a href="#">262/268/269</a> (MIL-grade Fuses)
	TVS Diode	Clamps fast-switching spikes from DC–DC converters	<a href="#">SMBJ-HR/HRA</a> , <a href="#">SMDJ-HR/HRA</a> (DO-160 compliant)

# Commercial aircraft block diagram & Littelfuse solutions

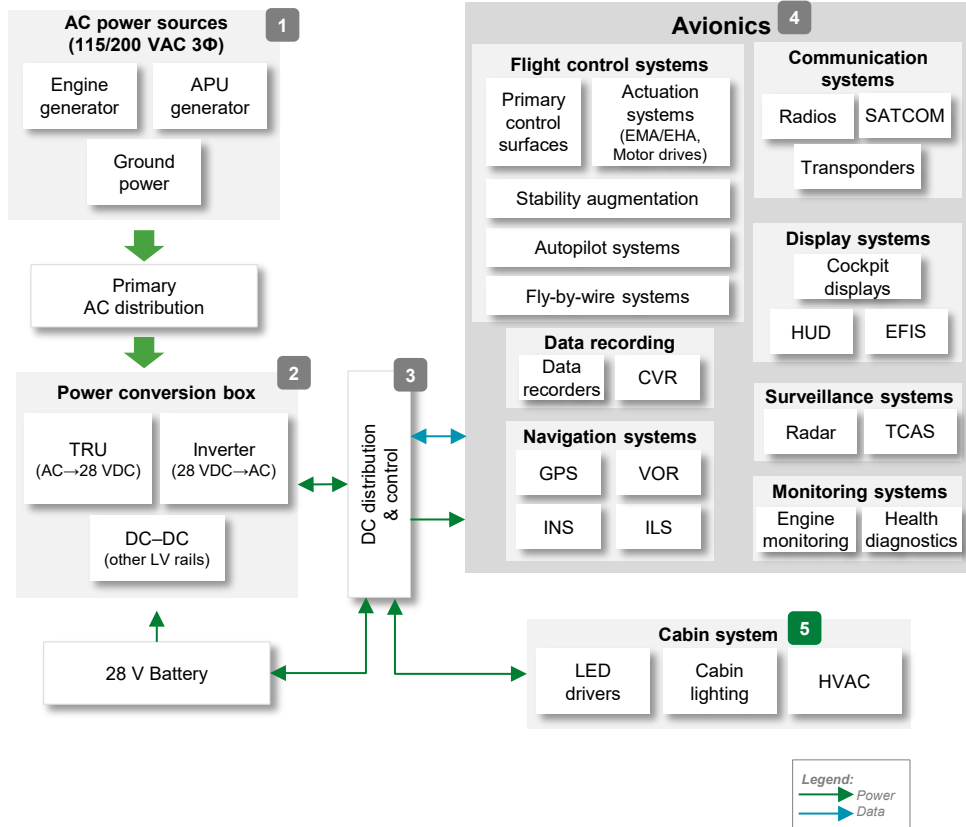
Click on the product series in the table below for more info



	Technology	Function in application	Product series
3	Fuse (Branch)	Source-end branch fusing protects wiring and isolates LRU faults	<a href="#">441A, 501A</a> (AEC-Q compliant) <a href="#">263 PICO® Fuse, MICRO™</a> (MIL-grade Fuses)
	TVS Diode	Fast transient protection on feeders and control I/O	<a href="#">SMBJ/SMDJ-HR/HRA</a> (DO-160 compliant)
	MOSFET	Semiconductor switch	<a href="#">Si/SiC MOSFET</a>
4	Fuse	PCB-level, low-amp electronics protection	<a href="#">441A, 501A</a> (AEC-Q compliant) <a href="#">263 PICO® Fuse, MICRO™</a> (MIL-grade Fuses)
	TVS Diode	ESD protection on power rails, sensor inputs, & I/O interfaces	<a href="#">SMBJ-HR, SMDJ-HR</a> (DO-160 compliant)
	TVS Diode	High-energy transient separation on avionics power and I/Os	<a href="#">SM15KPA-HR/HRA, SM30KPA-HR/HRA, SMLCE/SMCLCE-HR/HRA</a> (DO-160 compliant)
	C&K® Switch	Controls for avionics & cockpit interfaces	<a href="#">MIL-DTL-83731F (Toggle)</a> <a href="#">8020, PBA (Pushbutton)</a>
	IGBT Discrete	AC-DC and DC-AC power conversion	<a href="#">IGBT</a>
	IGBT Module OR SMPD		<a href="#">IGBT Module</a> <b>OR</b> <a href="#">SMPD</a>
	Si MOSFET		<a href="#">Si MOSFET</a>
SiC MOSFET	High-power switching with efficiency, thermal capability, and reliability	<a href="#">SiC MOSFET</a>	
Gate Driver	Controls SiC and IGBTs switching safely and efficiently	<a href="#">IX4352NEAU</a>	

# Commercial aircraft block diagram & Littelfuse solutions

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



	Technology	Function in application	Product series
5	TVS Diode	LED drivers and lighting power transient protection	<a href="#">SMBJ-HR/SMDJ-HR</a> (DO-160 compliant)
	Power Diode	Rectification	<a href="#">Power Diode</a>
	C&K® switch	User interface for cabin systems (lighting, HVAC, etc.)	<a href="#">MIL-DTL-83731F</a> (Toggle) <a href="#">8020, PBA</a> (Pushbutton)
	Connectors	MIL-Grade wire-to-wire interconnects	<a href="#">AeroSplice®</a> (MIL-grade)
	Si MOSFET	Semiconductor switch	<a href="#">P-Channel</a>
	EIS Wiring Harness	Custom aircraft wiring system	<a href="#">Custom Wiring Harness</a>

# Littelfuse solutions for eVTOL



1

## HV battery pack

Fuse, TVS Diode, TTape™



2

## HVDC junction box

Fuse, Current Sensor, TVS Diode, HVDC Contactor



3

## Power management

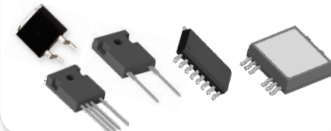
Fuse, TVS Diode, MOSFET, Gate Driver



4

## Inverter

IGBT, SiC MOSFET, SiC Diode, Gate Driver, SMPD



5

## Avionics

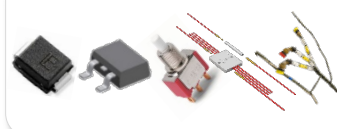
Fuse, TVS Diode, C&K® switch



6

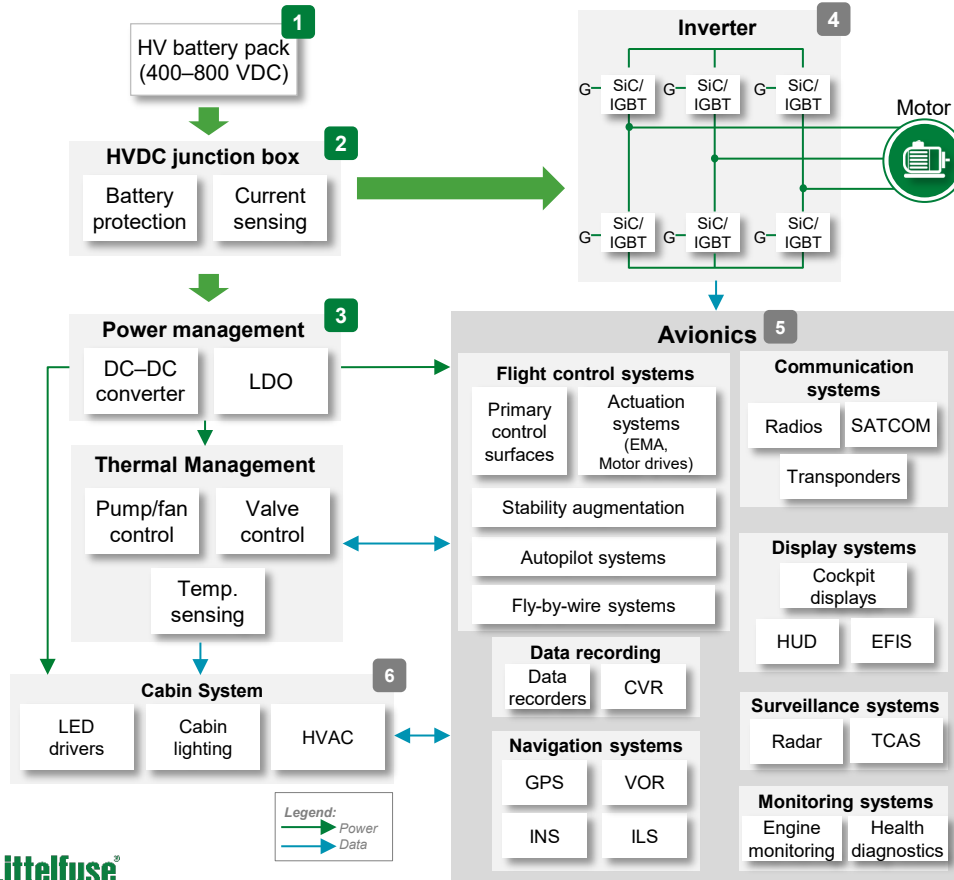
## Cabin system

TVS Diode, MOSFET, Switch, Connectors, Wire Harness



# eVTOL block diagram & Littelfuse solutions

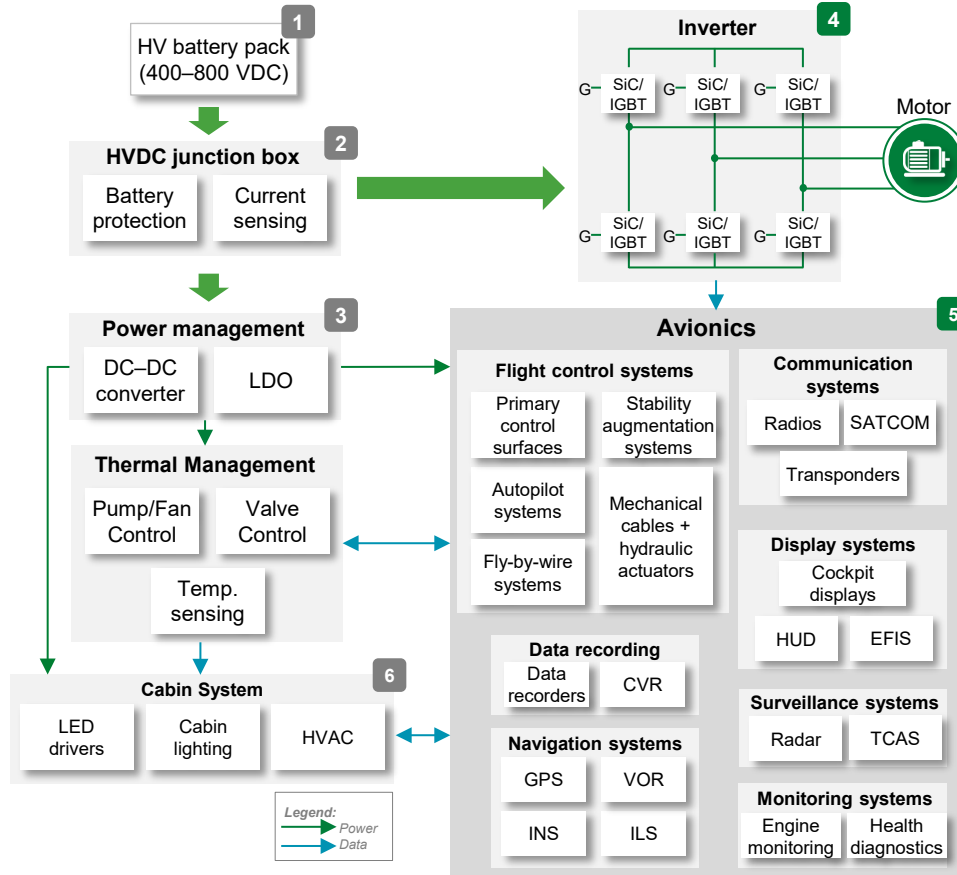
Click on the product series in the table below for more info



	Technology	Function in application	Product series
1	Main Fuse	Main traction protection at the battery output (400–1000 VDC)	<a href="#">30EV1K, 25EV1K</a> (AEC-Q compliant)
	Sense-line Fuse	Protects cells and BMS components from overcurrent	<a href="#">437A, 483A, 438A</a> (AEC-Q compliant)
	TTape™ Platform	Overtemperature monitoring	<a href="#">TTP</a>
	TVS Diode	Transient suppression to protect BMS electronics and sensor I/O	<a href="#">TPSMA6L/SD05</a> (AEC-Q compliant) <a href="#">SMBJ-HR/SMCJ-HR</a> (DO-160 compliant)
	TVS Diode Array	Protects from ESD, EFT, and voltage transient	<a href="#">AQ05C/AQ1205, AQ24COM-02, AQ24COM-01</a> (AEC-Q compliant)
2	Main Fuse	Short circuit and overload circuit protection	<a href="#">30EV1K, 25EV1K, 38EV</a> (AEC-Q compliant)
	Auxiliary Fuse	HV Fuse (branch to inverters/auxiliary HV loads)	<a href="#">827, 828</a> (AEC-Q compliant)
	Current Sensor	Measure the overall current in the system	<a href="#">CH1S01xB, CH1B02xB, CH1B03xB, CH1B04xB</a>
	HVDC Contactor	Protects main contactors from excess inrush current	<a href="#">DCNHExx</a>
	TVS Diode	Surge and transient protection	<a href="#">TP5_0SMDJ</a> (AEC-Q compliant) <a href="#">441A, 501A</a> (AEC-Q compliant)
3	Fuse	Protects LV feeder (avionics and flight control)	<a href="#">263 PiCO® Fuse, MICRO™</a> (MIL-grade Fuses)
	TVS Diode	Clamps fast switching spikes from DC–DC converters	<a href="#">SMBJ-HR/HRA, SMDJ-HR/HRA</a> (DO-160 compliant)
	MOSFET	High-efficiency switching for DC–DC converter	<a href="#">Si/SiC MOSFET</a>
	Power Diode	Rectification	<a href="#">Power Diode</a>
	Gate Driver	Controls MOSFETs switching safely & efficiently	<a href="#">IXD 6xxSI, IX4352NEAU</a> (AEC-Q compliant)

# eVTOL block diagram & Littelfuse solutions

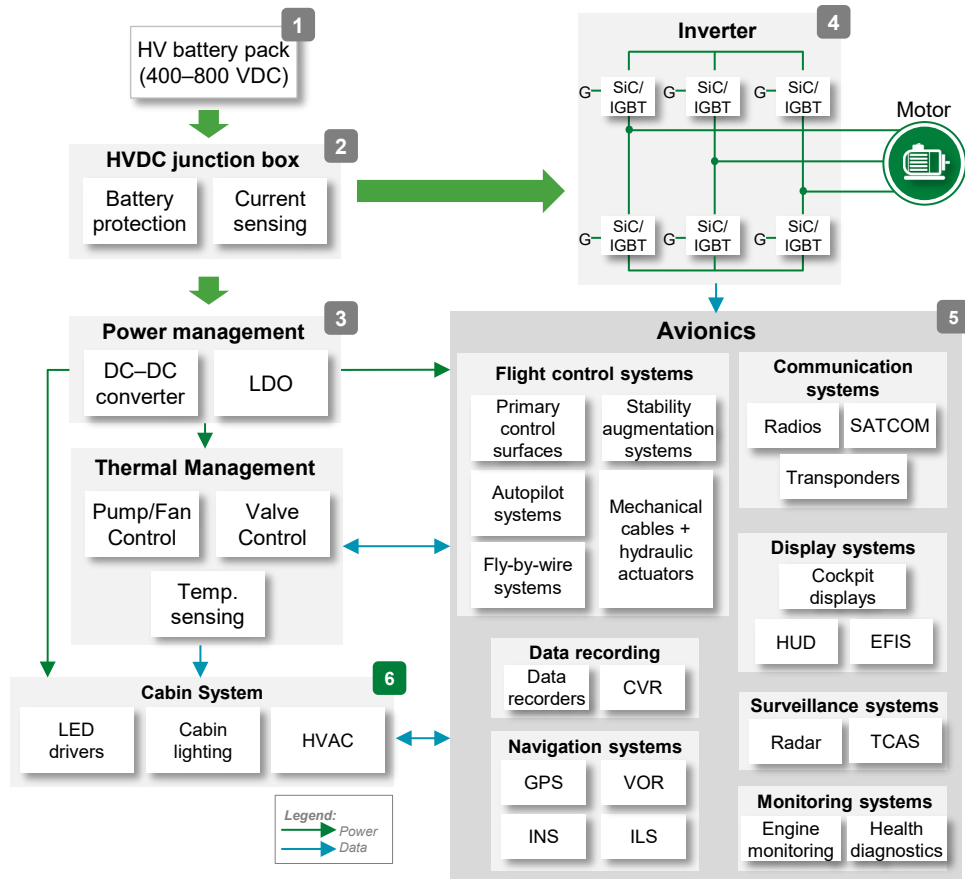
Click on the product series in the table below for more info



	Technology	Function in application	Product Series
4	IGBT Discrete	High-efficiency switching for inverter stage driving eVTOL propulsion motor; SiC technology allows for smaller die size per voltage or current rating and better efficiency	<a href="#">IGBT</a>
	IGBT Module Or SMPD		<a href="#">IGBT Module</a> <b>OR</b> <a href="#">SMPD</a>
	SiC MOSFET		<a href="#">SiC MOSFET</a> , <a href="#">SMPD</a>
	Si/SiC Diode	Output rectification	<a href="#">Si/SiC Diode</a>
	Gate Driver	Controls SiC switching safely & efficiently	<a href="#">IXD 6xxSI</a> , <a href="#">IX4352NEAU</a> (AEC-Q compliant)
5	TVS Diode	Active clamping for IGBT; gate protect for SiC MOSFET	<a href="#">TPSMB</a> , <a href="#">SZ1SMB</a> , <a href="#">SZP6SMB</a> , <a href="#">TPSMBASY</a>
	Fuse	PCB-level, low-amp electronics protection	<a href="#">253</a> or <a href="#">262/268/269</a> (MIL-grade Fuses) <a href="#">437A</a> , <a href="#">483A</a> , <a href="#">438A</a> (AEC-Q compliant)
	TVS Diode	ESD protection on power rails, sensor inputs, & I/O interfaces	<a href="#">SMBJ-HR/SMDJ-HR</a> (DO-160 compliant) <a href="#">SM15KPA-HR/HRA</a> , <a href="#">SM30KPA-HR/HRA</a> , <a href="#">SMBLCE/SMCLCE-HR/HRA</a> (DO-160 compliant)
	TVS Diode	High-energy transient separation on avionics power & I/Os	<a href="#">MIL-DTL-83731F</a> (Toggle) <a href="#">8020</a> , <a href="#">PBA</a> (Pushbutton)
	C&K® switch	Controls for avionics & cockpit interfaces	
	IGBT Discrete	AC-DC and DC-AC power conversion	<a href="#">IGBT</a>
	IGBT Module OR SMPD		<a href="#">IGBT Module</a> <b>OR</b> <a href="#">SMPD</a>
	Si MOSFET		<a href="#">Si MOSFET</a>
	SiC MOSFET	High-power switching with efficiency, thermal capability, and reliability	<a href="#">SiC MOSFET</a>
	Gate Driver	Controls SiC and IGBTs switching safely and efficiently	<a href="#">IX4352NEAU</a>

# eVTOL block diagram & Littelfuse solutions

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



	Technology	Function in application	Product series
6	TVS Diode	LED drivers and lighting power transient protection	<a href="#">SMBJ-HR/SMDJ-HR</a> (DO-160 compliant)
	Power Diode	Rectification	<a href="#">Power Diode</a>
	C&K® switch	User interface for cabin systems (lighting, HVAC, etc.)	<a href="#">MIL-DTL-83731F</a> (Toggle) <a href="#">8020, PBA</a> (Pushbutton)
	Connectors	MIL-Grade wire-to-wire interconnects	<a href="#">AeroSplice®</a> (MIL-grade)
	Si MOSFET	Semiconductor switch	<a href="#">P-Channel</a>
	EIS Wiring Harness	Custom aircraft wiring system	<a href="#">Custom Wiring Harness</a>

# Manufacturing capabilities for aerospace and defense

## Bremerhaven, Germany



- EWIS and electronics products for aviation and defense systems
- Production, QA, and testing
- **Quality certifications:**
  - ISO 14001
  - **EN 9100**
  - EASA/LBA

## Dole, France



- Switches and connectors for aerospace and defense
- Production, QA & testing, and logistics
- **Quality certifications:**
  - ISO 9001, ISO 14001,
  - **EN9100/AS9100D/JISQ 9100**
  - ESA, MIL, and NASA

## Wuxi, China

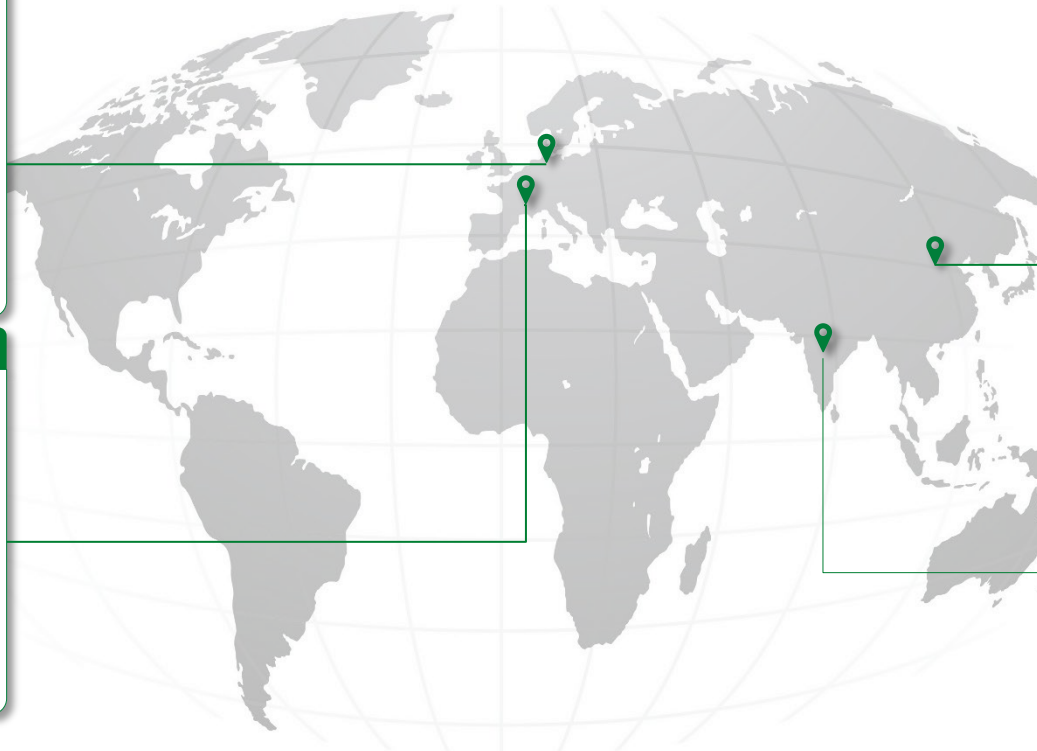


- **Quality certifications:**
  - RTCA/DO-160 Standard (Environmental conditions and test procedures for airborne equipment)
  - MILSTD-704
  - MIL-PRF-19500
  - **AS9100**

## Kanpur, India



- EWIS for aviation and defense systems
- Production, QA & testing, and logistics
- **Quality certifications:**
  - ISO 14001
  - **AS 9100D**

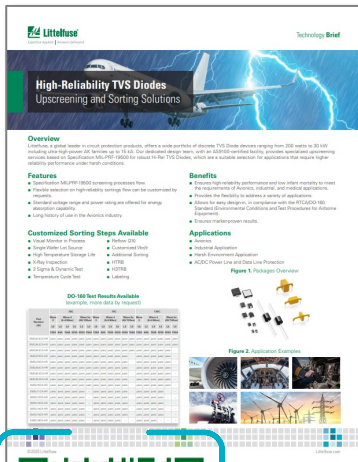


# Additional information can be found at [Littelfuse.com](http://Littelfuse.com)

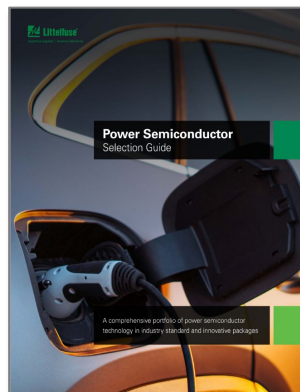
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Aerospace Application Guide

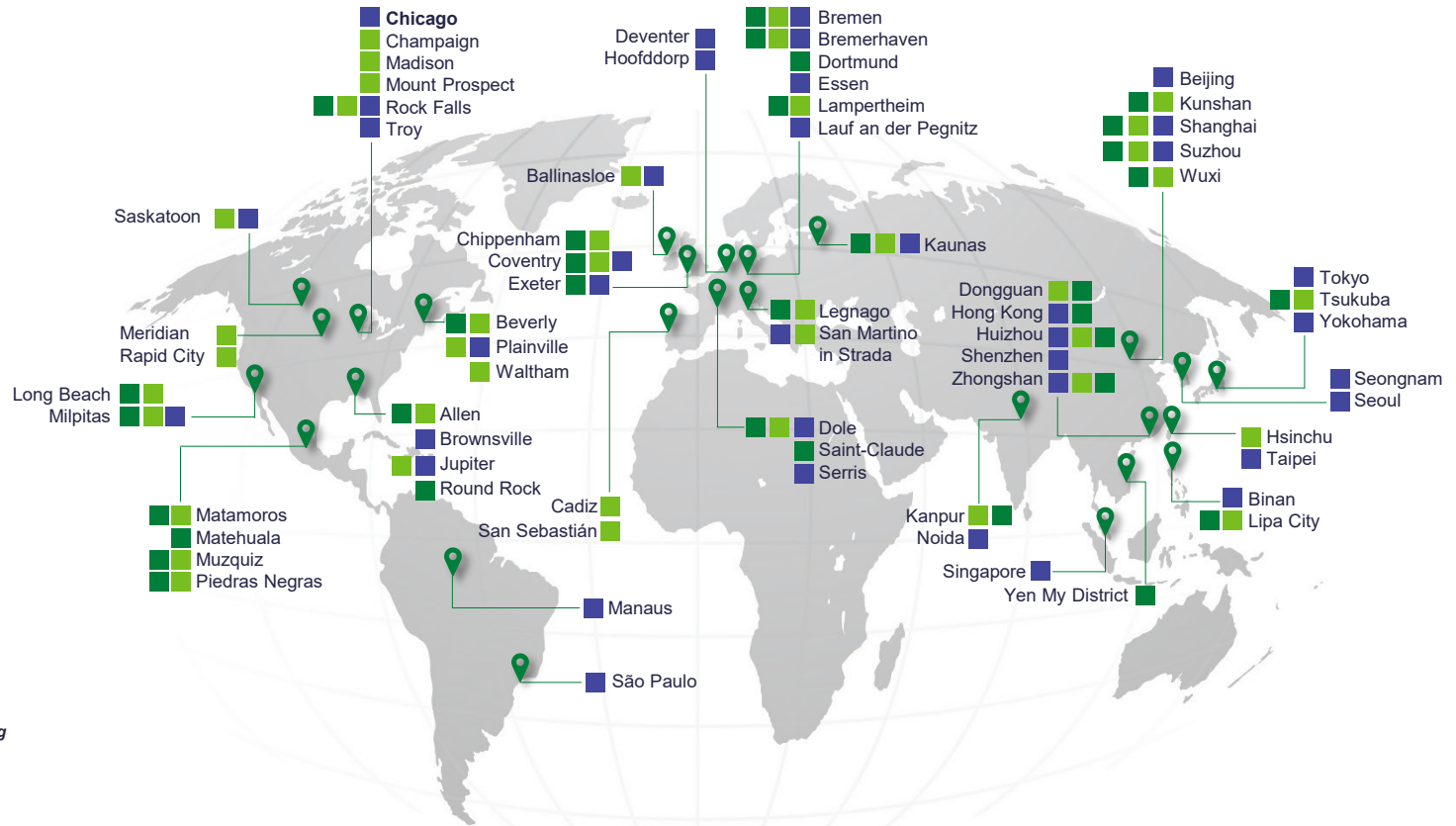


High-Reliability TVS Diode Guide



eCatalogs

# 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, 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 accelerate product design and to 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

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



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