



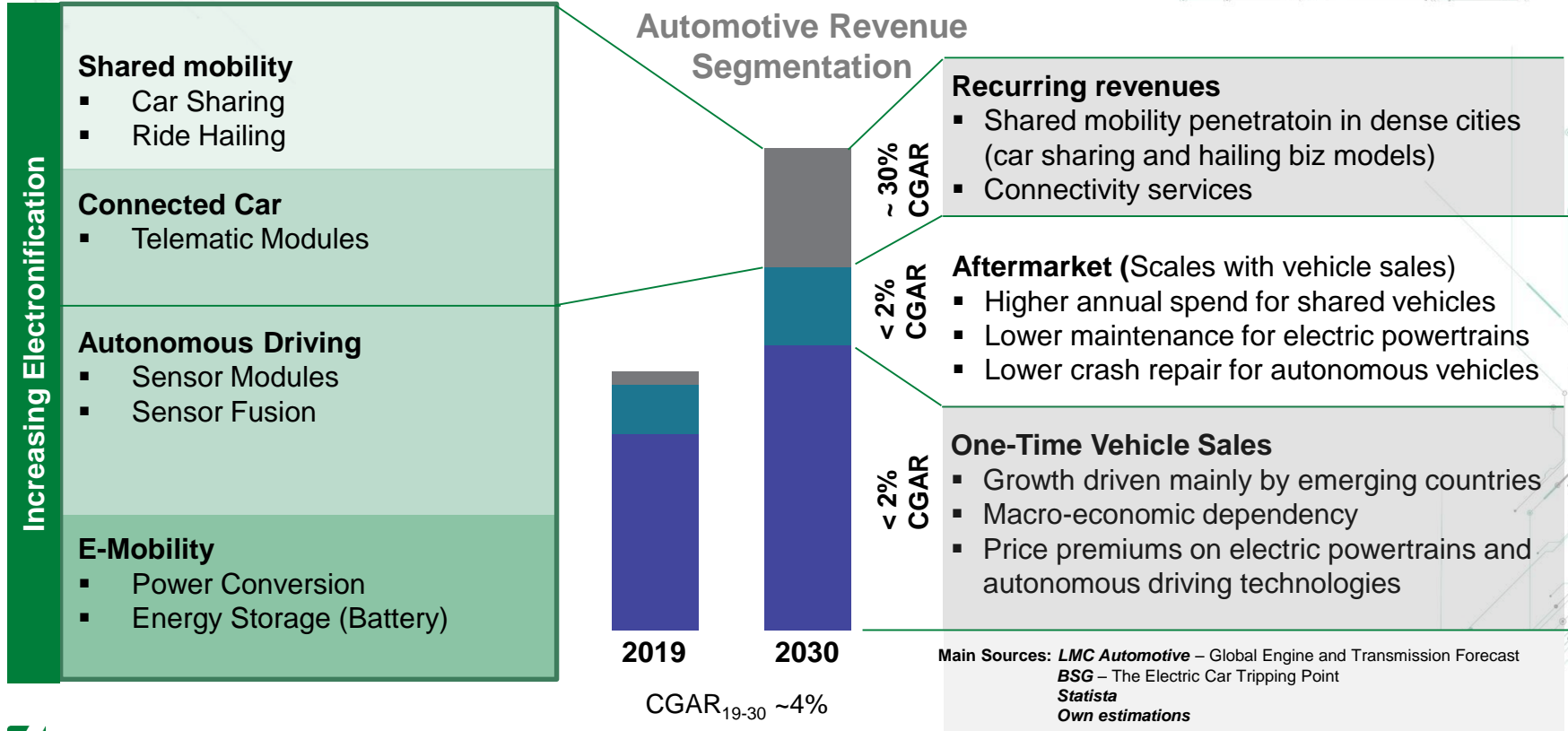
Expertise Applied | Answers Delivered

# ESD Protection Solutions Connectivity and Autonomous Driving

May 2019

# Automotive mega trends and market drivers

- Connectivity is essential to Autonomous driving will change the driving experience radically



# Automotive electronics system protection

- ESD Protection is mandatory to cover ISO 10605 system requirements

## Multipurpose Camera: ■

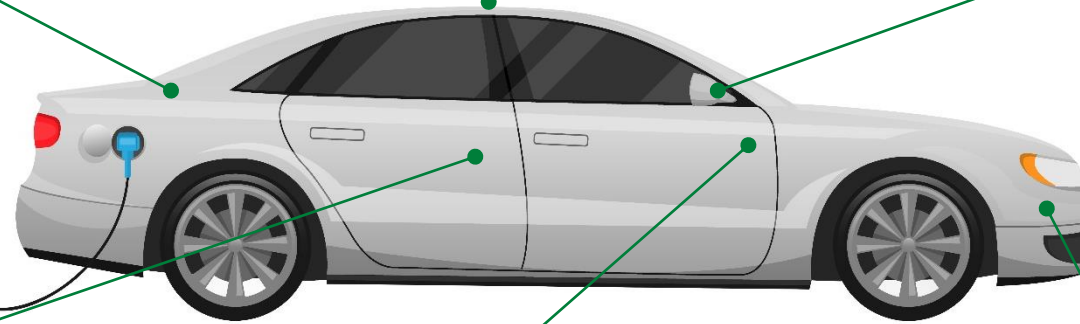
- High Speed ESD Protection
- ESD Diodes CAN Bus Protection
- Coil Overcurrent Protection
- Feedback-Loop Protection

## Ecall: ■

- Antenna ESD Protection
- TVS Load dump Protection
- Backup Battery Overcurrent Protection
- Reverse Polarity Protection

## Smart Infotainment: ■ ■

- ESD Diodes CAN Bus Protection
- Multi-Channel ESD Protection
- Resettable Overcurrent Protection
- DC/DC Converter Output Rectification



## V2X Communication: ■

- Antenna ESD Protection
- TVS Load dump Protection
- Input Overcurrent Protection
- Reverse Polarity Protection

## Sensor Fusion: ■

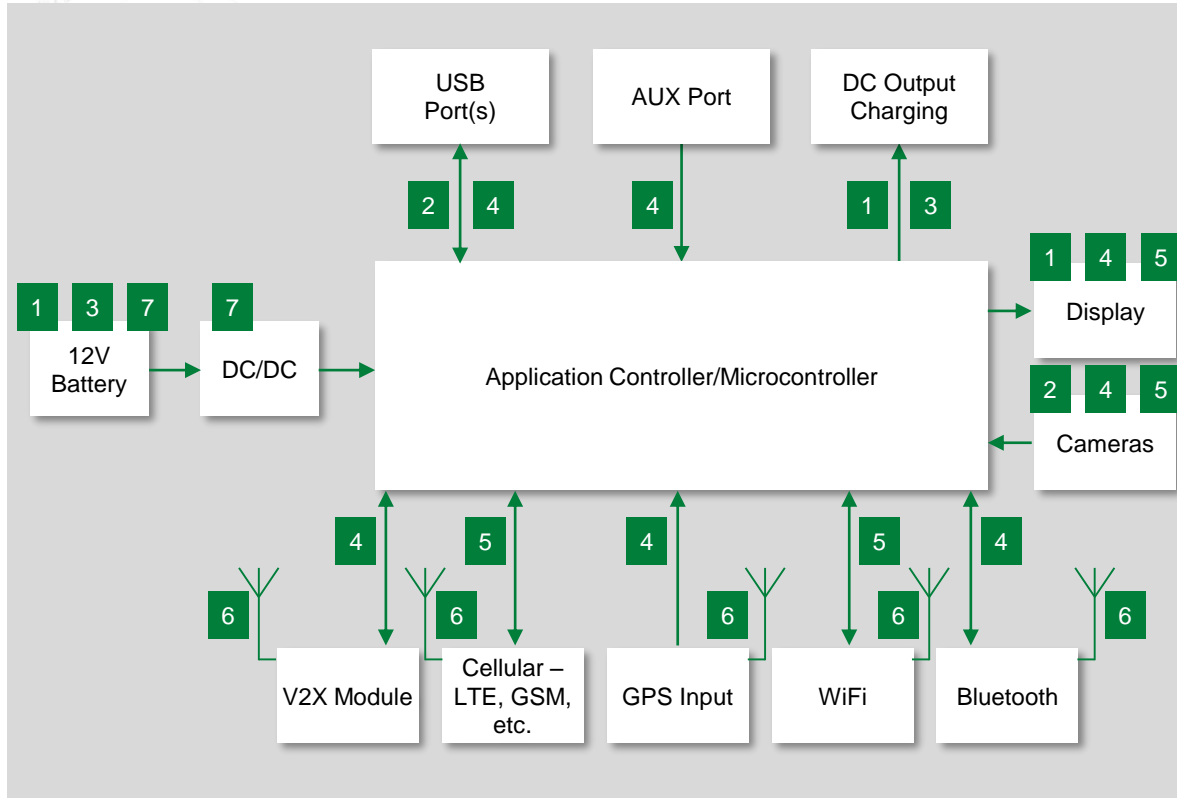
- Multi-Protocol ESD Protection
- TVS Load dump Protection
- Freewheeling Diode

## Radar: ■

- Multi-Protocol ESD Protection
- TVS Load dump Protection
- Freewheeling Diode

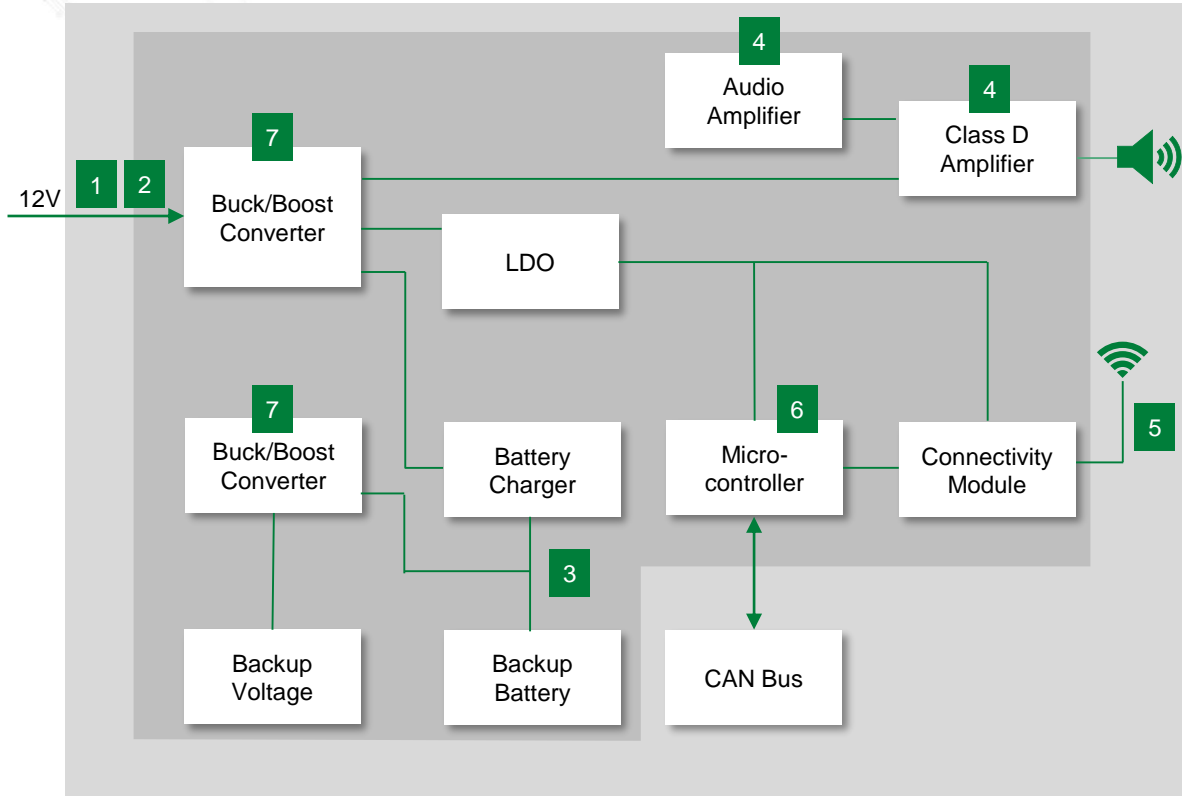
■ Protect ■ Control ■ Sense

# Smart infotainment



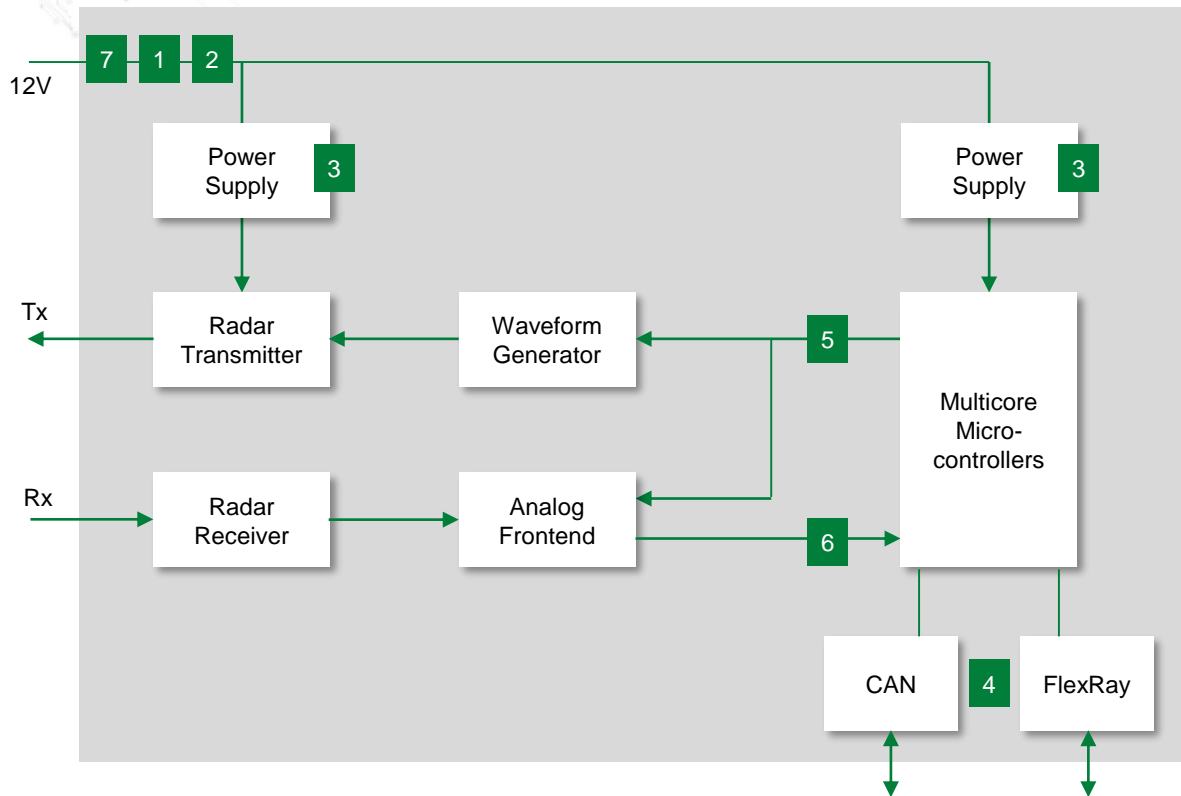
	Technology	Series
1	SMD Fuse	<a href="#">437A</a> , <a href="#">440A</a> , <a href="#">441A</a>
2	Resettable PTC	<a href="#">ASMD</a> , <a href="#">miniASMD</a>
3	TVS Diode	<a href="#">SZ1SMB</a> , <a href="#">SLD8S</a>
	Varistor	<a href="#">AUML</a> , <a href="#">MLA Auto</a>
4	Diode Arrays	<a href="#">AQ1005</a>
	Varistor	<a href="#">MLA Auto</a>
5	Diode Arrays	<a href="#">AQ3045</a>
6	Polymer and Silicon ESD Diode	<a href="#">AXGD</a> , <a href="#">AQ3130</a> , <a href="#">AQ3118</a>
7	Resettable PTC	<a href="#">ASMD</a> , <a href="#">miniASMD</a>
	Schottky Diode	<a href="#">DST</a>

# eCall



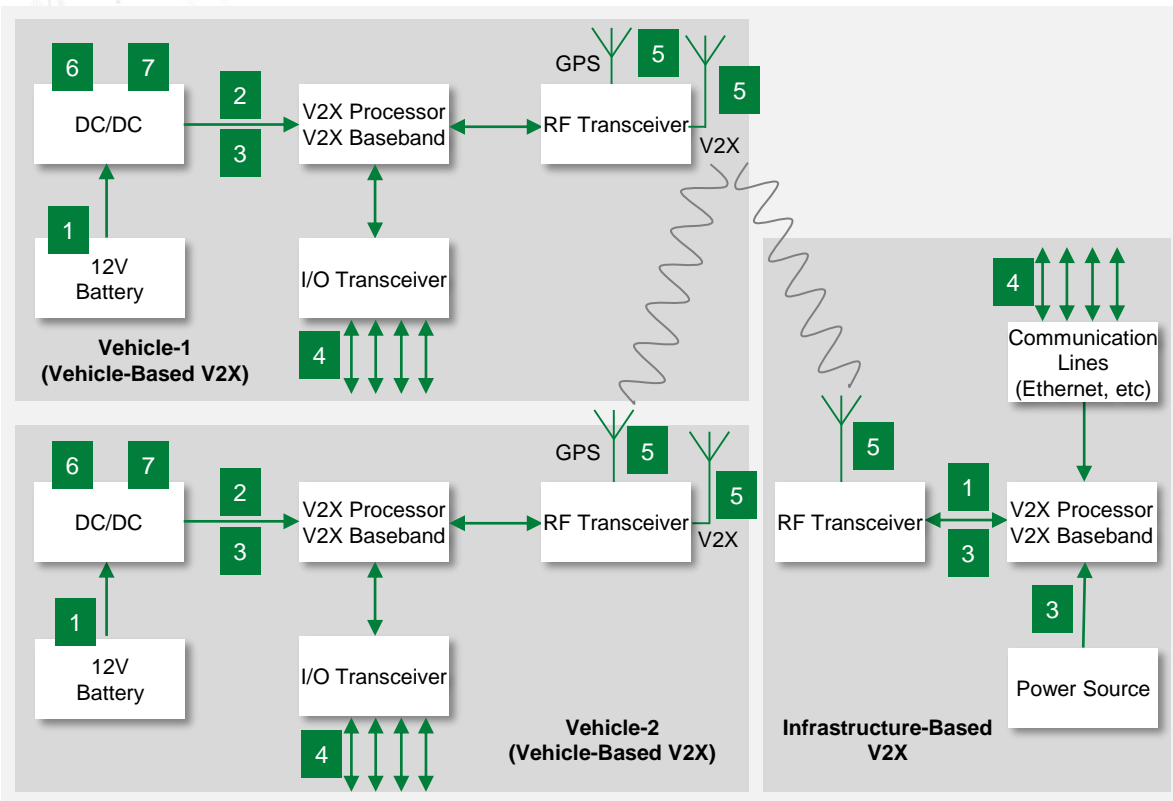
	Technology	Series
1	TVS Diode	<a href="#">SLD8S</a> , <a href="#">SZ1SMA</a> , <a href="#">SZ1SMB</a>
2	Varistor	<a href="#">AUML</a> , <a href="#">MLA Auto</a>
3	Resettable PTC	<a href="#">ASMD</a> , <a href="#">miniASMD</a> , <a href="#">Battery Strap</a>
4	Diode Arrays	<a href="#">AQ1005</a>
5	Polymer and Silicon ESD Diode	<a href="#">AXGD</a> , <a href="#">AQ3130</a> , <a href="#">AQ3118</a>
6	Diode Arrays	<a href="#">AQ24CANA</a> , <a href="#">AQ24CANFD</a>
7	Schottky Diode	<a href="#">DST</a>

# Radar



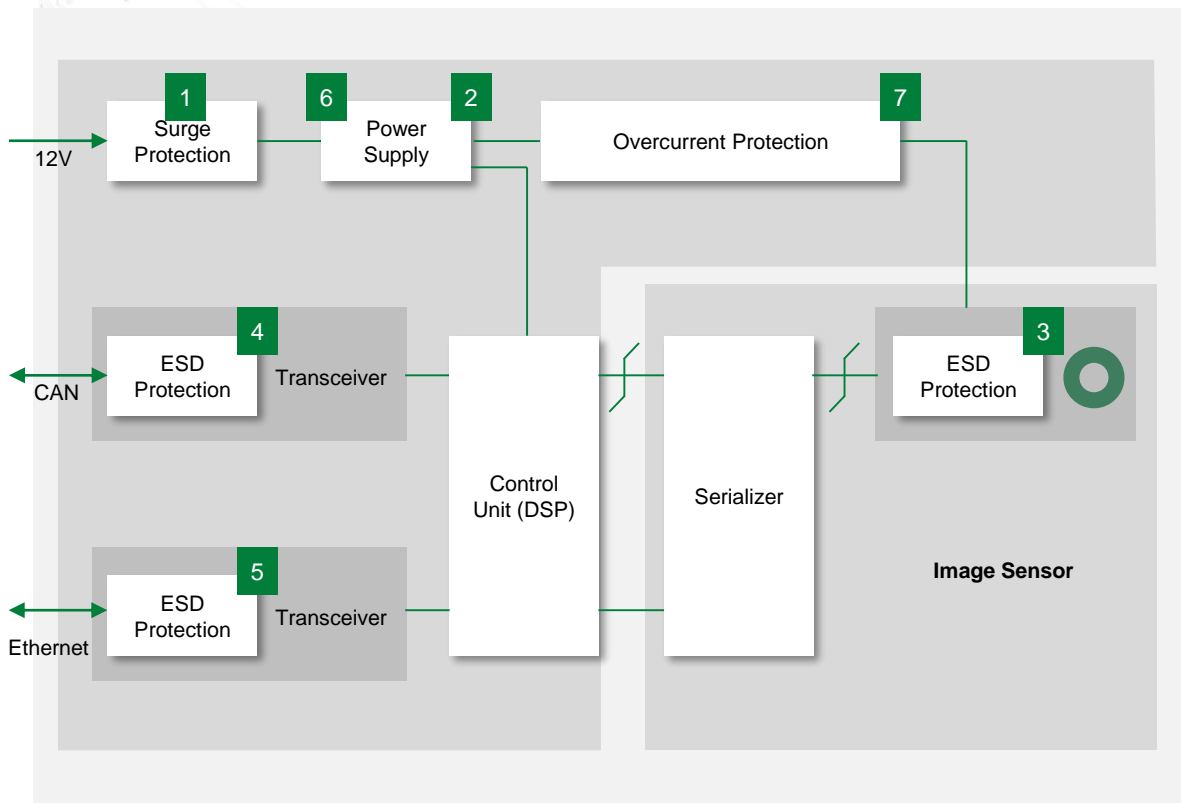
	Technology	Series
1	SMD Fuse	<a href="#">437A</a> , <a href="#">440A</a> , <a href="#">441A</a>
2	Resettable PTC	<a href="#">ASMD</a> , <a href="#">miniASMD</a>
3	TVS Diode	<a href="#">SZ1SMB</a> , <a href="#">SLD8S</a>
4	Diode Arrays	<a href="#">AQ24CANA</a> , <a href="#">AQ24CANFD</a>
5	Diode Arrays	<a href="#">AQ3045</a>
6	Polymer and Silicon ESD Diode	<a href="#">AXGD</a> , <a href="#">SESD</a>
7	Schottky Diode	<a href="#">DST</a>

# V2X communication



	Technology	Series
1	SMD Fuse	<a href="#">437A, 438A, 440A</a>
2	Resettable PTC	<a href="#">ASMD, miniASMD</a>
3	TVS Diode	<a href="#">SZ1SMA, SZ1SMB</a>
4	Diode Arrays	AQ3400, <a href="#">AQ2555</a>
5	Polymer ESD	<a href="#">AXGD</a>
6	TVS Diode	<a href="#">SZ1SMB, SLD8S</a>
7	SMD PTC	<a href="#">ASMD, miniASMD</a>
	Schottky Diode	<a href="#">DST</a>

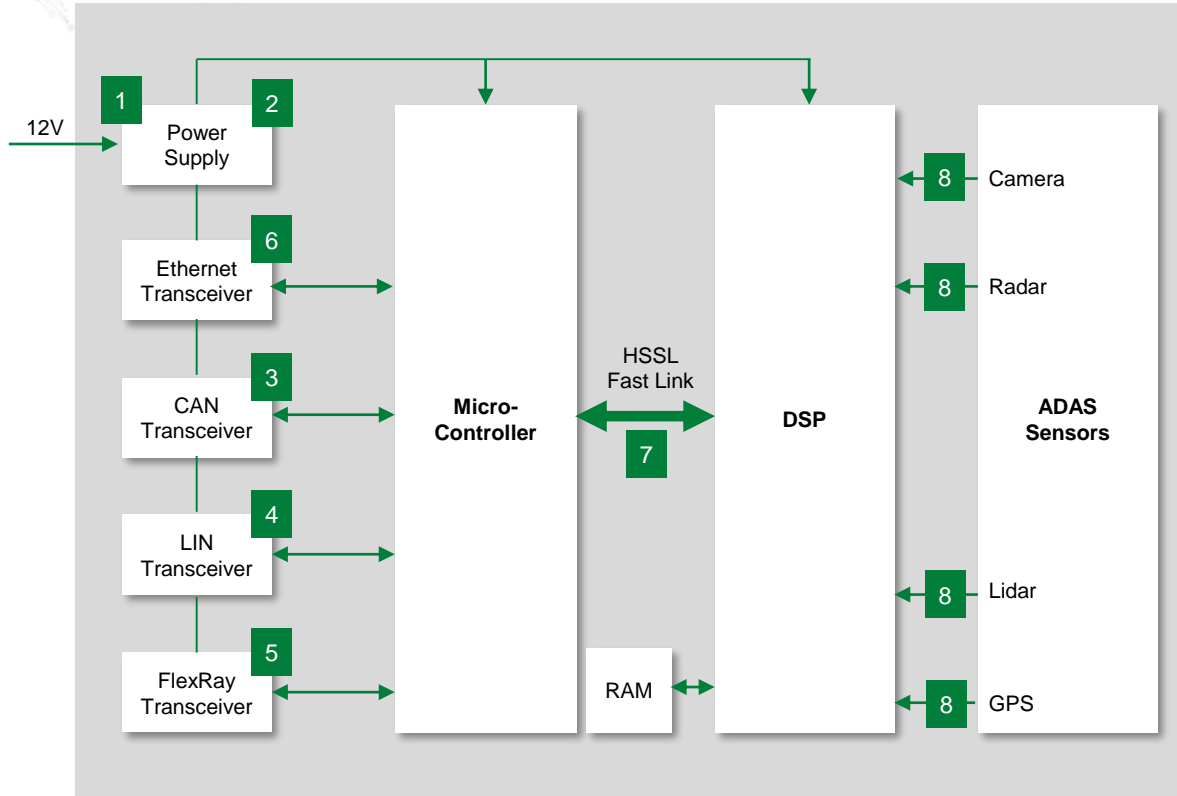
# Multi-purpose camera



	Technology	Series
1	TVS Diode	<a href="#">SZ1SMB</a> , <a href="#">SLD8S</a>
	Varistor	<a href="#">AUML</a> , <a href="#">MLA Auto</a>
2	SMD Fuse	<a href="#">437A</a> , <a href="#">438A</a> , <a href="#">440A</a>
3	Diode Arrays	<a href="#">AQ3045</a>
4	Diode Arrays	<a href="#">AQ24CANA</a> , <a href="#">AQ24CANFD</a>
5	Polymer and Silicon ESD Diode	<a href="#">AXGD</a> , <a href="#">AQ3400</a> , <a href="#">AQ2555</a>
6	Schottky Diode	<a href="#">DST</a>
7	SMD PTC	<a href="#">ASMD</a> , <a href="#">miniASMD</a>



# Sensor fusion



	Technology	Series
1	TVS Diode	<a href="#">SZ1SMB</a> , <a href="#">SLD8S</a>
2	Schottky Diode	<a href="#">DST</a>
3	Diode Arrays	<a href="#">AQ24CANA</a>
4	Diode Arrays	<a href="#">AQ24-01FTG</a>
5	Diode Arrays	<a href="#">AQ24CANFD</a>
6	Diode Arrays	<a href="#">AQ3400</a> , <a href="#">AQ2555</a>
7	Diode Arrays	<a href="#">AQ3045</a>
8	Diode Arrays	AQ3400

# Littelfuse solution for ESD protection

- Each communication interface has a unique set of requirements
  - Voltage Rating
  - ESD Rating
  - Number of channels
  - Polarity
  - Capacitance
- We can offer a large portfolio of automotive qualified ESD protection devices
- Our FAEs can help to find the best fit product for your application

Protocol	Bit Rate/Frequency	Best Fit Product
LIN	<20 kbps	AQ24C-01FTG
Classic CAN	<1 Mbps	AQ24CANA-02HTG
CANFD	<10 Mbps	AQ24CANFD-02HTG
Automotive Audio Bus (A <sup>2</sup> B)	50 Mbps	AQ3045-01ETG, AQ3400-02UTG
Broad R-Reach	100 Mbps	AQ3400-02UTG
Automotive Ethernet	100 Mbps, 1 Gbps	AQ3045-01ETG, AQ3400-02UTG
Automotive HDBaseT	~1 Gbps	AQ2555NUTG
USB 2.0	Data-480 Mbps	AQ305-01ETG, AQ3400-02UTG
	V <sub>BUS</sub> – DC Bus	AQ1003-01ETG
USD 3.2 Gen1	Data -5 Gbps	SESD1004Q4UG-0020-090
	V <sub>BUS</sub> – DC Bus	AQ1003-01ETG
USB 3.2 Gen1	V <sub>BUS</sub> – 15W Options (5V)	AQ1003-01ETG
	V <sub>BUS</sub> – 27W Options (9V)	AQH12-01ETG
	V <sub>BUS</sub> – 45W Options (15V)	AQH15-01ETG
	V <sub>BUS</sub> – 60W Options (20V)	AQH24-01ETG
Automotive AHD	100 MHz	AQ3045-01ETG, AXGD10402
GPS Antenna	1.5 GHz	AQ3045-01ETG
Bluetooth	2.4 GHz	AQ3045-01ETG
WiFi	2.4 GHz – 5.0 GHz	AXGD10402
4G/LTE	1.8 GHz – 8.0 GHz	AXGD10402

# Key links

TVS Diode Catalog and Design Guide:

<http://electronicscatalogs.littelfuse.com/tvsdiode/TVS-Diode-Catalog-and-Design-Guide/1/>

TVS Diode Array Catalogue:

[https://www.littelfuse.com/~media/electronics/product\\_catalogs/littelfuse\\_tvs\\_diode\\_array\\_catalog.pdf.pdf](https://www.littelfuse.com/~media/electronics/product_catalogs/littelfuse_tvs_diode_array_catalog.pdf.pdf)

ESD Suppression Design Guide:

[https://www.littelfuse.com/~media/electronics/design\\_guides/esd/littelfuse\\_esd\\_suppression\\_design\\_guide.pdf.pdf](https://www.littelfuse.com/~media/electronics/design_guides/esd/littelfuse_esd_suppression_design_guide.pdf.pdf)

Varistor Catalogue

[https://www.littelfuse.com/~media/electronics/product\\_catalogs/littelfuse\\_varistor\\_catalog.pdf.pdf](https://www.littelfuse.com/~media/electronics/product_catalogs/littelfuse_varistor_catalog.pdf.pdf)

Automotive Electronics Application Guide:

[https://www.littelfuse.com/~media/electronics/application\\_guides/littelfuse\\_automotive\\_electronics\\_applications\\_guide.pdf.pdf](https://www.littelfuse.com/~media/electronics/application_guides/littelfuse_automotive_electronics_applications_guide.pdf.pdf)

General

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