



## AUTOMOTIVE GRADE

### Overview of Automotive Grade Products

## AUTOMOTIVE GRADE PRODUCTS



### DISCRETE SEMICONDUCTORS

- MOSFETs
- Optoelectronics

### PASSIVE COMPONENTS

- Capacitors
  - Aluminum
  - Tantalum
  - Ceramic
  - Film
- Resistors
  - Film
  - Wirewound
  - Power Metal Strip®
  - Thick Film Power
- Inductors
  - IHLP®
  - IHTH





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## Program Description

Vishay has incorporated key automotive industry quality initiatives into an Automotive Grade Product line. The goal is zero defects. The requirements cover design, qualification, and manufacturing, and are used to continuously improve Vishay products and processes. Products fulfilling the Vishay Automotive Grade requirements, described below, earn our Automotive Grade stamp on their datasheets.

### Design

- **Robust Design Policy:** New and modified products are designed using design rules, DFMEA, and lessons learned. The design rules ensure Automotive Grade Products are robust through manufacturing and assembly. Testing to failure confirms that design margins meet the demands of automotive use.
- **Safe Launch:** Vishay's Safe Launch Policy ensures that everything from design through production roll-out happens according to plan. Process corner evaluation, yield analysis, process capability review, and reliability testing are all incorporated.

### Qualification

- **AEC-Q100-, AEC-Q101-, AEC-Q200-Qualified:** Automotive Grade Products are qualified to the latest AEC qualification standards and presented for approval using PPAP.

### Manufacturing

- **TS16949 Facility:** All Automotive Grade Products are produced in facilities certified to TS16949.
- **Maverick Lot Program:** The Maverick Lot Program employs Part Average Testing (PAT), Statistical Yield Limit (SYL), and Statistical Bin Limit (SBL) according to AEC-Q001 and AEC-Q002 to identify statistically different parts and lots.
- **Periodic Verification to AEC Requirements:** Product families are verified to AEC Stress Test Qualification standards every two years.

### Continuous Improvement

- **Error Proofing:** Error proofing is performed during the entire process to identify and eliminate potential causes of defects.
- **Lessons Learned/Look Across:** All continual improvement actions are linked to lessons learned and look across programs to ensure improvement everywhere in the company.





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Discrete Semiconductors AEC-Q101 Qualified	Description / Families	Packages
<b>MOSFETs</b>	<ul style="list-style-type: none"> <li>N-channel and p-channel TrenchFET® power MOSFETs (avalanche-rated cell density process, very low on-resistance, optimized logic-level and standard-level types)</li> </ul>	PowerPAK® 1212-8, PowerPAK SO-8L, DPAK (TO-252), TO-262, TO-263, TO-220, reverse DPAK, bare die, SO-8, TSOP-6, SOT-23, SC-70, SQ
<b>Optoelectronics</b>	<ul style="list-style-type: none"> <li>LED - full color palette including white</li> <li>Infrared emitters: – 830 nm, 850 nm, 870 nm, 890 nm, and 940 nm</li> <li>Photodiodes, phototransistors – peak sensitivity matches emitters: 400 nm to 1100 nm, 790 nm to 970 nm</li> <li>Ambient light sensors: – peak sensitivity of 540 nm</li> <li>Optical sensors: – reflective sensors, slotted interrupters</li> </ul>	PLCC-2, PLCC-4, Little Star®, TELUX, 1206, 0805, 0603, 1.8 mm gullwing, reverse gullwing, PLCC-4 multicolor, MiniLED, custom packages



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Passive Components AEC-Q200 Qualified		Description / Families		Packages
<b>CAPACITORS</b>				
Aluminum Electrolytic		<ul style="list-style-type: none"> <li>Very high lifetime, high ripple current, low ESR, high temperature up to 150 °C, low impedance</li> </ul>		
		- Radial		146 RTI, 140 RTM, 150 RMI, 152 RMH
		- SMD		160 CLA, 146 CTI, 140 CRH, 150 CRZ
Tantalum		TP3	High performance, low ESR	Cases A, B, C, D, and E
		TH3	High temperature: 150 °C	Cases A, B, C, D, and E
		TH4	High temperature: 175 °C	Cases B, C, and D
		TP8	Small case sizes, maximum capacitance	Cases: 0603, 0805, low-profile A & B
Ceramic	Surface-Mount MLCC	<ul style="list-style-type: none"> <li>Matte tin terminations incl. Polymer layer (Soft-/Flex-) option</li> <li>AgPd terminations for conductive epoxy assembly</li> <li>COG (NP0), X7R and X8R</li> <li>Size 0402 up to 1812 with ranges from 16 V to 3000 V</li> <li>Excellent ESD performance: 100 V (0805, 10 nF) up to 22 kV ESD, 200 V (0805, 10 nF) up to 25 kV ESD</li> </ul>		SMD (VJ...31X ROHS Automotive series) SMD (VJ...31 and VJ...34 Automotive series)
	Leaded MLC	A...R Series, K...R Series <ul style="list-style-type: none"> <li>Axial, radial crimped or straight leads</li> <li>Tin plated copper-clad steel wire, 0.5 mm</li> </ul>		<ul style="list-style-type: none"> <li>50 V<sub>DC</sub>, 100 V<sub>DC</sub>, 200 V<sub>DC</sub></li> <li>Class 1 and Class 2 ceramic</li> <li>Lead spacing of 2.5 mm and 5.0 mm</li> </ul>
		HOTCap® (K... H series) <ul style="list-style-type: none"> <li>Radial crimped or straight leads</li> <li>Tin plated copper</li> <li>Maximum operating temperature: 175 °C</li> </ul>		50 V <sub>DC</sub> , 100 V <sub>DC</sub> , 200 V <sub>DC</sub> Class 1 and class 2 ceramic Lead spacing of 2,5 mm and 5,0 mm
Ceramic Singlelayer	AY2 Series X1/Y2 safety capacitor <ul style="list-style-type: none"> <li>Radial leaded, straight leads</li> <li>Tin-plated, copper-clad steel wire, 0.6 mm</li> <li>Temperature cycle: 3000 cycles (-55 °C to +125 °C)</li> </ul>		<ul style="list-style-type: none"> <li>Safety Class X1, 440 V<sub>AC</sub>, Y2, 300 V<sub>AC</sub> (IEC 60384-14.3)</li> <li>Lead spacing of 5 mm, 7.5 mm and 10.0 mm</li> </ul>	
Film Capacitor		<ul style="list-style-type: none"> <li>MKT DC lacquered radial</li> <li>MKT DC potted radial</li> <li>MKP RFI Y2 potted radial</li> <li>MKT RFI X2 potted radial</li> <li>MKP DC-Link potted radial</li> </ul>		5 mm - 27.5 mm : BFC2 365-366-367-368-369-467-468-469 10 mm - 27.5 mm: MKT 1820 7.5 mm - 27.5 mm: BFC2 338 6 15 mm - 27.5 mm: F1772-2 310V X2 (<= 470 nF) 27.5 mm - 52.5 mm: MKP 1848 DC-Link

