



Timing in Modern Vehicles

Automotive technology has made significant advances since the 1970s in terms of safety, reliability, performance, and fuel efficiency. Today, automobiles require more than 60 processors and electronic controllers to manage all the system functions that require varying degrees of timing accuracy. Some of these will need simple crystals and others will require low jitter and high stability clocks. The demand for AEC-Q200 qualified timing products is at an all-time high with no end in sight.

What are the technologies that are driving this increased need for precision timing products in automobiles?

Consumers are wanting smarter automobiles every day. As advances are made in systems technologies, the use of ECU (Electric Control Units) is vital to manage individual functions like Ethernet for a wired central data link and safety features like ADAS (Advanced Driving Assistance Systems). These systems will continue to make the driving experience more enjoyable and infinitely safer.

What technologies can we expect to see in future vehicles?

Demand for performance, comfort, and connectivity are the primary functions driving the increasing use of electronics in vehicles. In-Vehicle Infotainment (IVI) and In-Car Entertainment (ICE) systems deliver convenience, information, and entertainment seamlessly to the driver and passengers. The growing requirements for media and connectivity increases the complexity of systems. This requires us to increase the performance requirements on the individual clocks. ECS Inc. International's automotive grade crystals and oscillators provide high level performance and reliability.

When can we expect vehicles to drive themselves?

We predict that as more electronic parts are used to provide in car connectivity, there will be fundamental changes in the auto industry. The days when the radio in the dashboard was the only connection to the outside world are long gone. Consumers have come to expect the ability to stay connected via cell phone with 4G, 5G, and the Intranet. Entertainment continues to be one of the main reasons people want technology in their vehicles. At the top of consumers wish lists are voice-activated wireless communications and a dashboard display featuring real-time local information. The radio is still the primary entertainment, but communications and information functions, like navigation, are considered must haves when designing and integrating these connectivity functions.

What is ahead?

The use of electronics to optimize performance, safety, and entertainment will continue to grow for the foreseeable future. It is estimated that the number of processors needed will increase fivefold over the next three to five years to satisfy the need for performance and personal connectivity. This will require vehicle-to-vehicle (V2V) communication that reduces the chance of collisions and eventually vehicle to everything (V2X) communications to achieve the goal of autonomous machines.

To meet the expectations of high performance and cutting-edge automotive grade timing products, these are the following technologies that will need to improve exponentially:

- ADAS – Advanced Driving Assistance Systems
- V2X – Vehicle to everything communications
- ECU – Electronic Control Units
- Battery Management Systems
- Navigation, Maps, and GPS
- Cellular, Bluetooth, and WiFi
- ABS – Anti-Lock Braking
- RADAR and Lidar Active Safety Systems
- Blind Spot and Lane Departure Detection
- Electronic Stability and Traction Control
- Adaptive Cruise Control
- TPMS – Tire Pressure Monitoring Systems
- Drivetrain Management

IATF 16949 and AEC-Q200 Qualifications for Automotive Grade Products

IATF 16949 is a global manufacturing quality management system standard for the automotive industry. It is a process-oriented quality management system that focuses on continual improvement, defect prevention, and reduction of variation and waste in the supply chain. The goal is to meet customer requirements efficiently and effectively.

The AEC-Q200 qualification is the global standard for stress resistance that all passive electronic components must meet if they are intended for use within the automotive industry. Parts are deemed to be AEC-Q200 qualified if they have passed the stringent testing as outlined within the standards. All the automotive standards can be found and downloaded using the link below. Including qualifications that apply to passive electronic components [AEC-Q100](#) and [AEC-Q101](#).

All component suppliers will have slightly different test procedures, but at ECS Inc. International the automotive qualified parts we supply are tested to ensure they are within strict limits. Our testing process includes subjecting a sample of the parts to rigorous rounds of testing. Below are some examples of the types of testing these parts undergo before they are deemed AEC-Q200 qualified:

- A round of stringent electrical testing, followed by a stress test, and then a further round of testing to ensure the electrical integrity of the component.
- The temperature resistance of the part is tested by exposing the samples to the maximum temperature within the required testing range for a prolonged period.
- Moisture resistance is tested by exposing the part to a high degree of humidity for a prolonged period.
- The operational life of the component is checked to ensure it passes the required benchmark.
- The resistance of the component to solvents is tested.



- Mechanical shock and vibration resistance are checked by exposing the components to high levels of g-force for prolonged periods of time and by cycling the parts through periods of vibration.
- The solderability of the parts and their resistance to soldering heat is also checked to ensure they are fully operable which involves exposing the components to extremely high temperatures.
- The board flex and terminal strength of the components are also checked to ensure compliance with the standard.
- Finally, the parts undergo a strict visual inspection and a check to ensure their physical characteristics meet the required specifications.

There's a lot of testing that goes into qualifying a part to AEC-Q200 specifications which adds peace of mind about the integrity of the part which ultimately makes for a safer product.

The future of AEC-Q200 products looks dynamic. As more modern cars incorporate ever increasing amounts of electronic technology, the need for standards to be applied to the components they require is ever greater.

For an in-depth look at the IATF 16949 standards, there is a book available for purchase [here](#).

For a full list of ECS Inc. International's automotive grade crystals, click [here](#).

For a full list of ECS Inc. International's automotive grade oscillators, click [here](#).

For a full list of ECS Inc. International's automotive grade power inductors, click [here](#).

To see the full ECS Inc. International product catalog, click [here](#).