

TAIYO YUDEN Provides Reliable Filtering in Automotive Applications

As innovative technologies become more commonplace in the automotive industry, today's vehicles have transformed into powerful "computers on wheels." The rapid development of semiconductors and software has enabled a host of features ranging from GPS, infotainment, collision detection, advanced driver-assistance systems (ADAS), to self-driving. The number of electronics integrated into the latest vehicles, such as hybrid-electric (HEV) and electric vehicles (EVs), has increased significantly to enable the aforementioned new technologies. Consequently, automobiles are now becoming increasingly electrified with discrete power levels throughout the vehicle.

Communication Technologies for Today's "Computers on Wheels"

Electro-mobility (E-mobility) promises to enhance the ease, safety, and drivability of vehicles for owners. This system utilizes a unification of e-Powertrain, in-vehicle information (IVI), and wireless communication technologies. In relation, a key segment of modern automobiles is the Telematics Control Unit (TCU) which enables wireless tracking, cloud and in-vehicle communications, vehicle diagnostics for predictive maintenance, and obtaining telemetry data from the car during operation, such as speed, engine state, position, etc., by interfacing with various subsystems. It functions via various hosts of wireless standards, including Bluetooth, Wi-Fi, LTE, and 5G.

The Role of RF Filtering in Automotive TCUs

A well-designed TCU ensures reliable data connectivity and optimizes the antennas for more accurate sensing



and diagnostics. However, RF disturbances, also known as "noise," remains a common problem. Ceramic-type filters are ideal for minimizing RF interferences that can impair the performance of transmitters and receivers in automotive TCUs. These filters utilize the piezoelectric effect of the material to allow only signals within a specified frequency range to pass through while blocking signals that fall outside it. In addition, ceramic filters can also help improve the signal-to-noise ratio and sensitivity of wireless receivers. Some filters also contain diplexers that enable a shared antenna between two frequency bands. Widespread 5G implementation has led to an increased demand for LTCC filters, particularly in the automotive industry.

TAIYO YUDEN Solutions for Automotive Communications

TAIYO YUDEN's multilayer ceramic devices (LTCC) provide high-reliability filtering to prevent RF interference in automotive TCUs. They also fulfill requirements of smartphone devices. Designed using best-in-class materials, they offer a wide range of passband frequencies in small-footprint packages for board savings in compact applications. TAIYO YUDEN LTCC filters are RoHS and REACH compliant and offer stable performance over a wide range of temperatures under the hood of automobiles (-40 to +105 °C). Besides, these filters provide wide bandwidth support ideal for 5G NR sub-6GHz (TDD) and use multiplexers, effectively reducing the number of antennas required.