Device Applications for Automotive IEEE 1394 Networks
Application Overview

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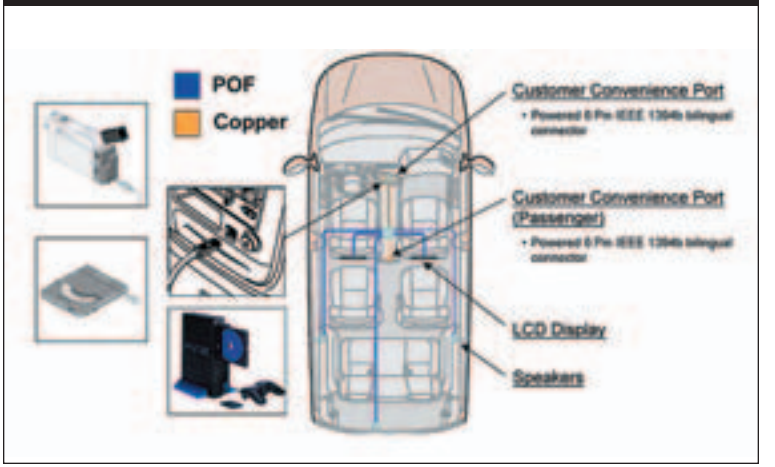
Connecting lifestyles from the home to the vehicle is an emerging trend in the automotive industry. The ability to interface consumer electronic devices and allow for quick installation in vehicles is now being facilitated through a standard global interface developed by the Automotive Multimedia Interface Collaboration (AMI-C). Designed for delivery of multimedia content, the network is known in the consumer electronics industry as the IEEE 1394 bus. The automotive supplement is titled IDB-1394 and is being developed by the 1394 Joint Automotive Working Group.

IDB-1394 is designed for high-speed multimedia applications that require large amounts of information to be moved quickly in a vehicle. This open standard bridges the gap between automotive electronics and consumer electronics by enabling the connection and interoperability of portable consumer electronic devices over the embedded network in the car.

Powered ports require overcurrent protection, and established standards for power sources that are used with existing bus systems have been in effect for many years. Because the customer convenience port, or CCP, transfers signal and power it must be protected from damage when a shorted or damaged downstream device, such as a bad cable or connector, is plugged into the port. This can be a fairly common occurrence, so CCP port short-circuit protection must be effective and reliable.

Figure 1. The automotive multimedia network includes a Customer Convenience Port (CCP) that lets passengers connect their CD players, games, and other 1394-equipped devices and peripherals to the network with a cable that can be used in both the home and the vehicle.



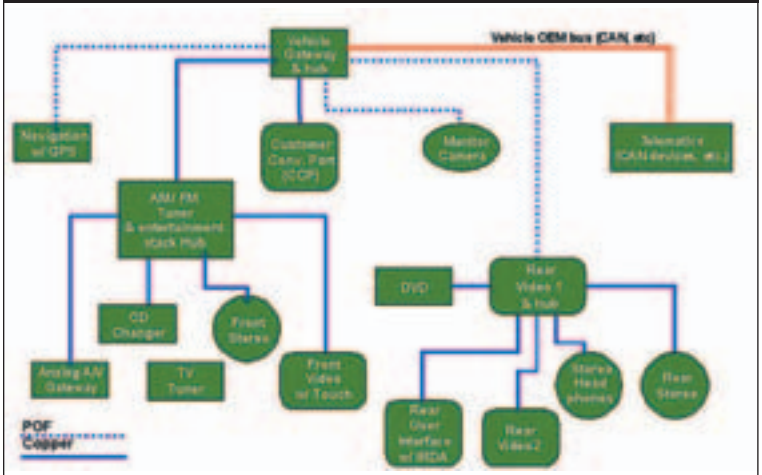
The automotive architecture is divided into an embedded network and a CCP, as shown in Figure 1. The current specification defines an embedded plastic optical fiber (POF) vehicle network similar to the existing MOST specification. It is, however, more robust, offers higher data rates, and is easier to implement. Connected by the network are various electronic components such as DVD players, video displays, navigation systems, radio head units, communications equipment such as cell phones or automatic telematics for emergency functions, and other multimedia applications.

Circuit Protection Requirements

In the hot-pluggable automotive environment, where the consumer is connecting and disconnecting peripherals on a powered port, the potential for short circuit damage is clearly present. Powered ports require overcurrent protection. Because the CCP transfers signal and power it must be protected from damage when a shorted or damaged downstream device, such as a bad cable or connector, is plugged into the port. This can be a fairly common occurrence, so CCP short-circuit protection must be effective, reliable, and preferably resettable.

Current limiting can be accomplished by using a resistor, fuse, switch, or polymeric positive temperature coefficient (PPTC) device. Resistors are rarely an acceptable solution because of

Figure 2. PolySwitch devices help circuit designers meet safety requirements and protect powered ports, telematics, and portable components that may be connected to the automotive network.



the excessive voltage drop these generate with nominal currents. One-shot fuses may be used, but they may fatigue, and must be replaced after a fault event. The limitations of bimetallic switches include cycling and the potential for contacts to weld shut. In many automotive applications the preferred solution is the PPTC device, which has low resistance in normal operation and high resistance when exposed to a fault.

PolySwitch PPTC devices are widely used for IEEE 1394 applications, providing resettable circuit protection on computers, peripherals, and portable electronics. In automotive multimedia applications the device is frequently used to help protect the I/O ports of GPS components, CD changers, stereos, and other electronic peripherals. (Figure 2)

Like traditional fuses, PolySwitch devices limit the flow of dangerously high current during fault conditions. Unlike traditional fuses, PolySwitch devices reset after the fault is cleared and power to the circuit is removed. Another advantage is their small form factor, which allows them to be mounted directly on the circuit board and located inside electronic modules, junction boxes, and power distribution centers.

Designing products built to a common electronics standard helps consumers upgrade their vehicles with new aftermarket products. A common bus also can help vehicle manufacturers facing technology obsolescence issues as technology continues to outpace automotive design cycles. In the hot-pluggable automotive environment, the potential for short circuit damage is clearly present. PPTC devices provide an effective overcurrent protection solution to this problem. These resettable circuit protection devices also help manufacturers provide a safe and reliable product, comply with regulatory agency requirements, and reduce their warranty and repair costs.

The IDB-1394 standard interface allows consumers to hot-plug portable devices. Overcurrent protection of powered ports and portable components on the multimedia network must be reliable and cost-effective. The low resistance, fast time-to-trip, low profile, and resettable functionality of the PolySwitch device helps circuit designers provide a safe and dependable product, comply with regulatory agency requirements, and reduce warranty repair costs. Other PolySwitch benefits include manufacturing compatibility with high-volume electronics assembly techniques, and greater design flexibility through a wide range of product options.

Device Selection

SMD150/24
miniSMDC150/24