Automotive Ethernet
PCIe
DDR/LPDDR
SERDES
MIPI
Power/signal integrity
EMI debugging

Automotive test solution

DOMAIN CONTROLLERS AND HIGH-PERFORMANCE ECUs

ROHDE & SCHWARZ

Make ideas real

YOUR CHALLENGE

Domain/zone controllers are expected to replace functionality that is currently performed by a vast number of ECUs. These controllers must be reliable, robust, able to handle massive amounts of data fast and communicate with various other components (sensors, actuators, ECUs, gateways) using different communication protocols (automotive Ethernet, CAN-FD, SERDES, etc.) within the same unit.

In-vehicle signals
Testing and debugging of communication protocols between domain controller and in-vehicle networks.
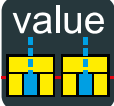
Automotive Ethernet

10M	100M	1000M

CAN/CAN-FD
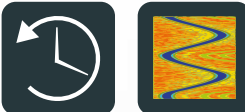
CAN	LIN

Performance and debugging
Trigger and decode, EMI debugging, boot-up time measurements and bus timing analysis.
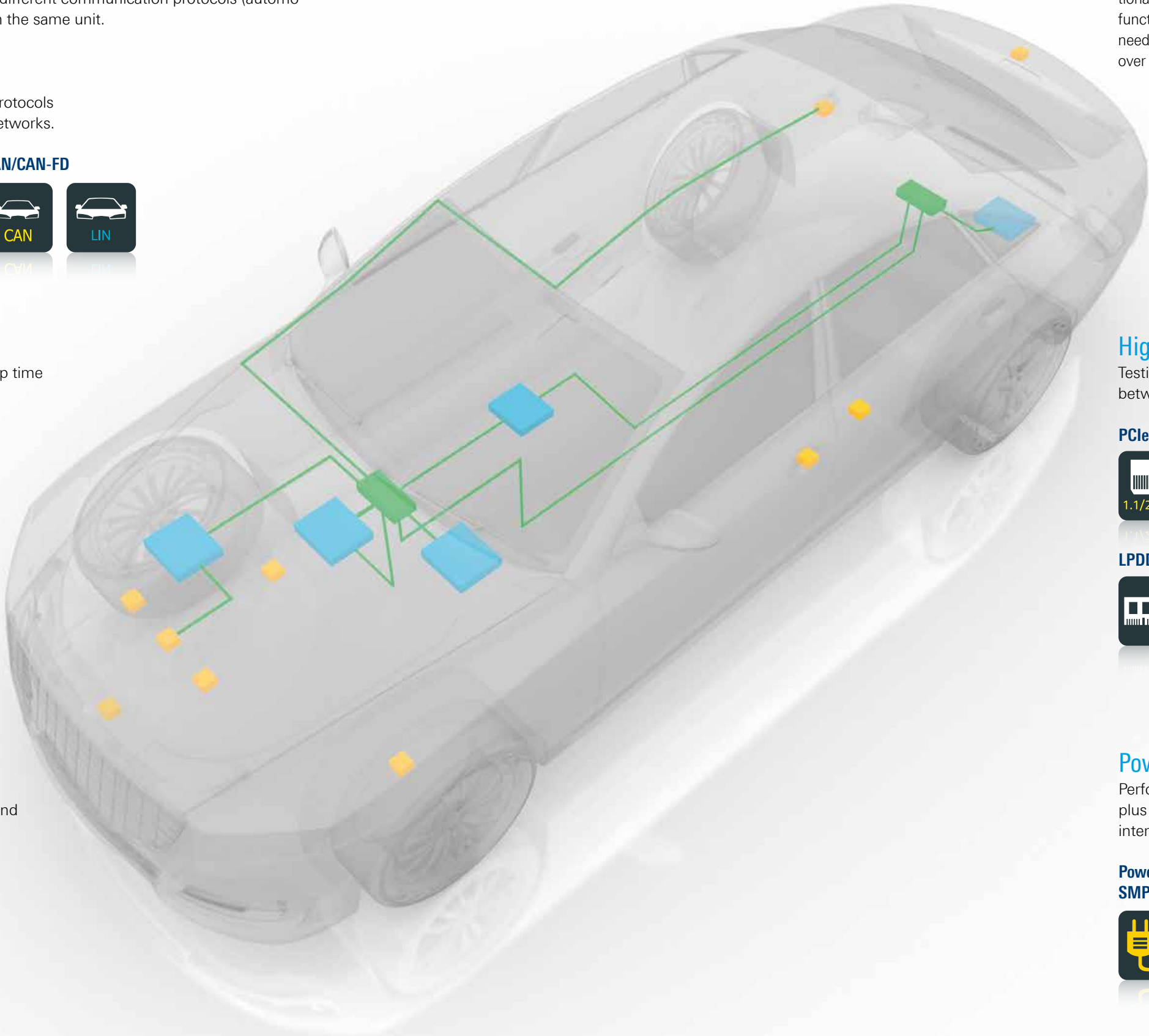
Boot-up time
Redundancy switchover time

value

Trigger and decode
EMI debugging

TDR/TDT
Accurately measure impedance mismatch and microreflections between any components throughout the in-vehicle networks.

TDR/TDT

YOUR TASK

Engineers working on domain controllers need to verify signal integrity on high-speed digital interfaces such as PCIe, SERDES and automotive Ethernet while ensuring that traditional communications such as CAN-FD, LIN and MIPI also function as expected. Furthermore, domain controllers will need to have low levels of EMI and be able to rapidly switch over to a redundant system in case of a malfunction or failure.

High-speed serial interface debugging
Testing and debugging of communication protocols between domain controller and in-vehicle networks.

PCIe Gen 2/3

1.1/2.0/3.0

SERDES

8
10

LPDDR4

MIPI D-PHY

D-PHY

Power and signal integrity
Perform accurate power analysis across your designs, plus detailed signal integrity testing on high-speed digital interfaces with the fastest acquisition rate.

Power integrity
SMPS power measurements
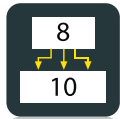
Jitter
separation

INTRODUCTION

Developments in advanced driver assistance systems (ADAS) are triggering new approaches to in-vehicle network (IVN) architecture design. With today's vehicles deploying at least a hundred electronic control units (ECUs), the current network architecture has reached its limits. The automotive industry is now focusing on a domain or zonal controller architecture to simplify network design and maximize performance. A domain controller can potentially replace the functions of many ECUs, providing capabilities for high-speed communications, sensor fusion and decision-making, and supporting high-speed interfaces for cameras, radar and LiDAR.

DOMAIN CONTROLLERS AND HIGH-PERFORMANCE ECUs

1.1/2.0/3.0

PCIe Gen 3.0 compliance tests with the R&S®RTP-K122 software option; PCIe supports speeds up to 8 GT/s.

8 → 10

SERDES serial decoding with the R&S®RTP-K52 software option for buses up to 6.25 Gbit/s.
The R&S®RTP is the optimal solution, with realtime deembedding, extremely fast update rate, clock data recovery (CDR) and advanced jitter analysis capability.
The R&S®RTP-K140/-K141 software options additionally deliver a high-speed serial pattern trigger with a maximum nominal data rate of 8 Gbps/16 Gbps.

D-PHY

MIPI D-PHY triggering and decoding for up to 4-lane designs with the R&S®RTP-K42 software option. Decoding uses fixed clock speed or direct clock measurement; results are displayed as color-coded telegrams and in tabular form.

DDR4 and LPDDR4 automated compliance tests with the R&S®RTP-K93 software option. Other supported functions include signal integrity debugging (with eye diagram analysis) and decoding of read and write cycles.

10M 100M 1000M CAN LIN
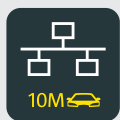
Automotive Ethernet compliance tests: future-ready solutions for speeds up to 10GBASE-T1 with the R&S®RTP-K57, R&S®RTP-K89 and R&S®RTP-K87 software options. CAN/CAN-FD, LIN and other common automotive bus standards are also supported.
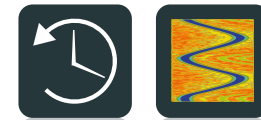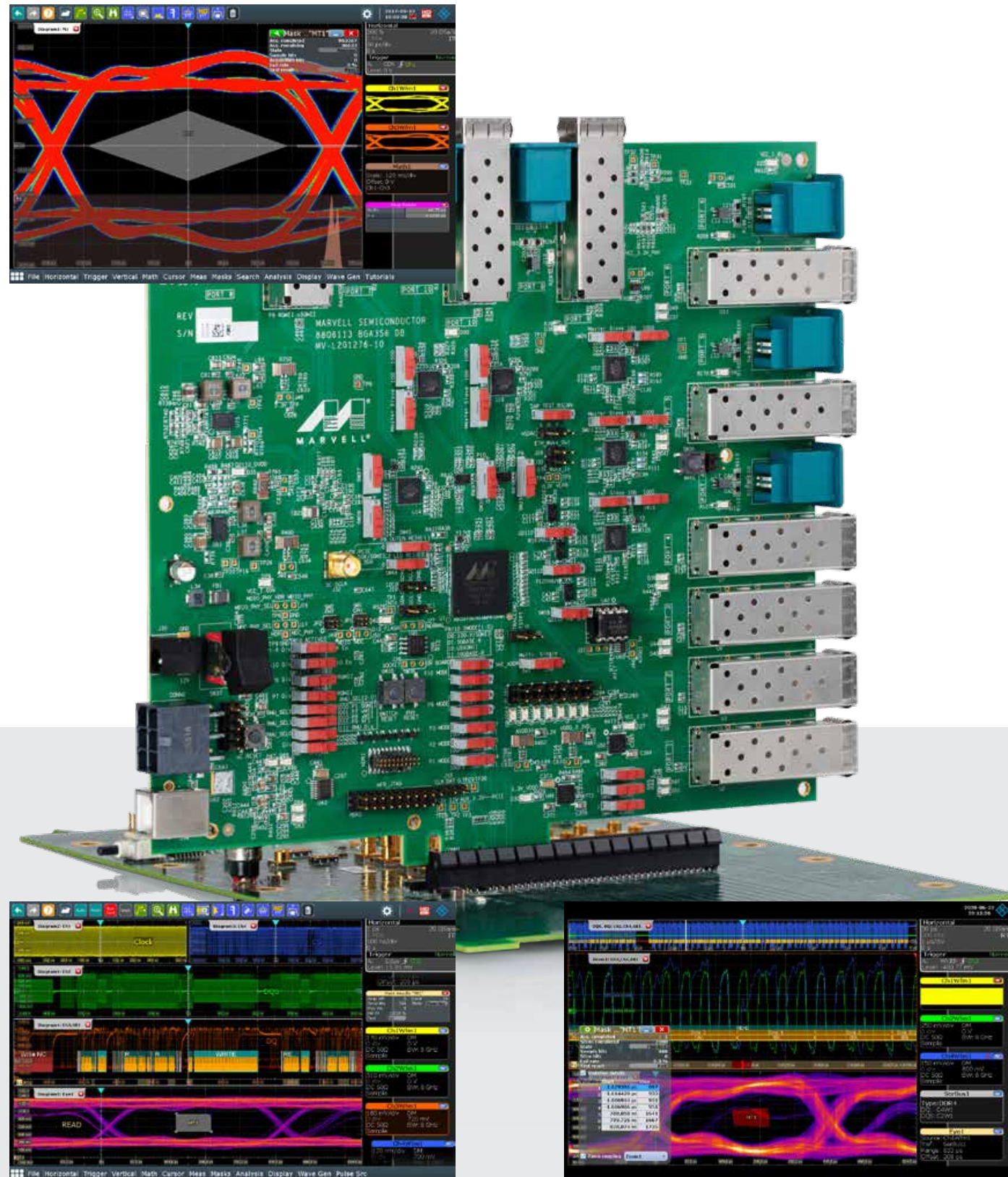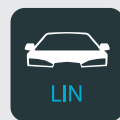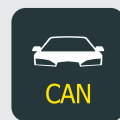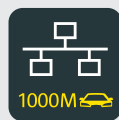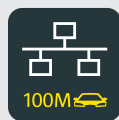
High-speed serial pattern trigger up to 16 Gbps with the R&S®RTP-K140/R&S®RTP-K141 software options features clock data recovery (CDR). Perfect for debugging embedded clock signals (line coding, PCIe interrupts, histogram, data eye mask tests).
In addition, the R&S®RTP provides spectrum analysis capability for detailed EMI debugging.

Jitter measurements with the R&S®RTP-K133 software option measuring deterministic jitter (DJ) and total jitter (TJ) are now mandatory requirements for DDR4/LPDDR4 applications.

TDR/TDT analysis with the R&S®RTP-K130 software option and the R&S®RTP-B7 hardware option, which delivers a 16 GHz differential pulse signal. Perfect solution for PCB debugging.

Power analysis with the R&S®RTP-K31 software option. It provides all essential measurement functions for analyzing power electronics and supports automated test configuration and customizable test reports for all power measurements.

value

Bus timing measurements with the R&S®RTP-K35 software option allows you to measure frame-to-frame time. Get the full bus error statistics including total frame errors, percentage of erroneous frames in relation to total frames, and the rate of consecutive frame errors.

ALL-IN-ONE R&S®RTP OSCILLOSCOPE

Signal integrity in realtime

The R&S®RTP high-performance oscilloscope combines high-class signal integrity with a fast acquisition rate. Customized frontend ASICs and realtime processing hardware enable highly accurate measurements at unprecedented speed in a compact form factor.

▸ Quickly find signal faults with 750,000 waveforms/s
▸ High-precision digital trigger without bandwidth limitations
▸ Realtime deembedding for triggering and fast acquisition
▸ Compact design and silent operation for best fit to any lab
▸ Precise measurements due to flat frequency response of ±0.25 dB

Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

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► Environmental compatibility and eco-footprint
► Energy efficiency and low emissions
► Longevity and optimized total cost of ownership

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