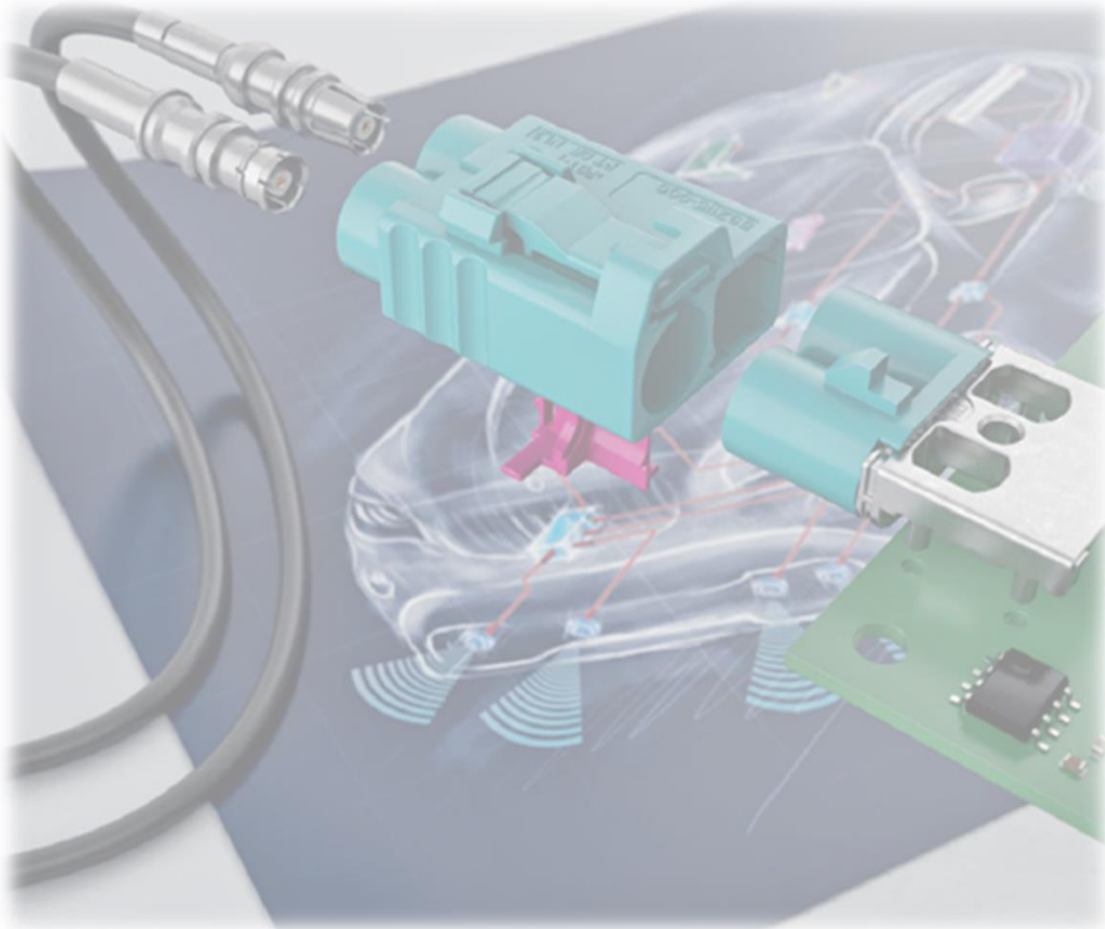


罗森伯格车载高速连接器方案与标准

胡天宇 高速连接器产品经理 2022-11-11

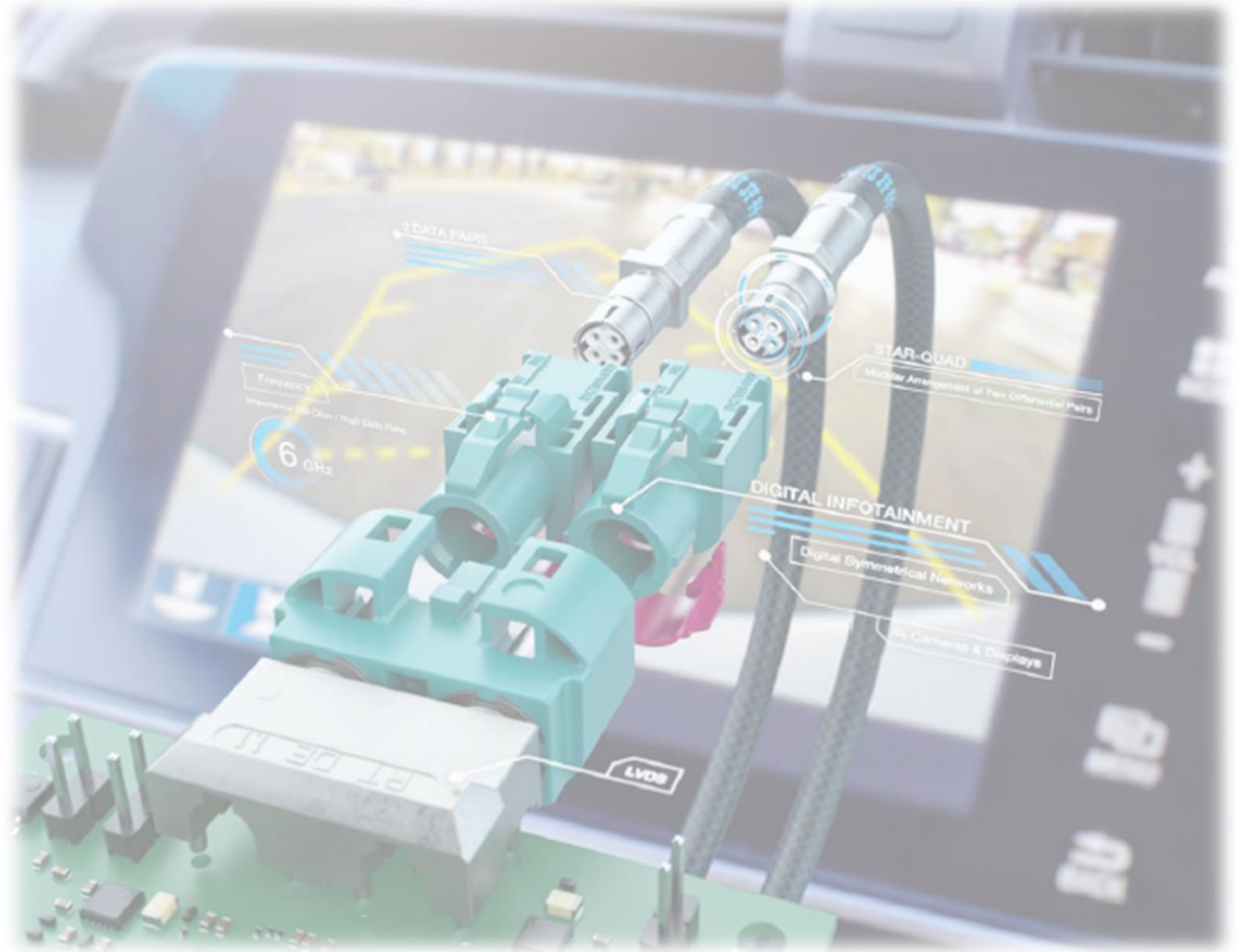


罗森伯格FAKRA



DIN 72594 ISO 20860 USCAR 17&18

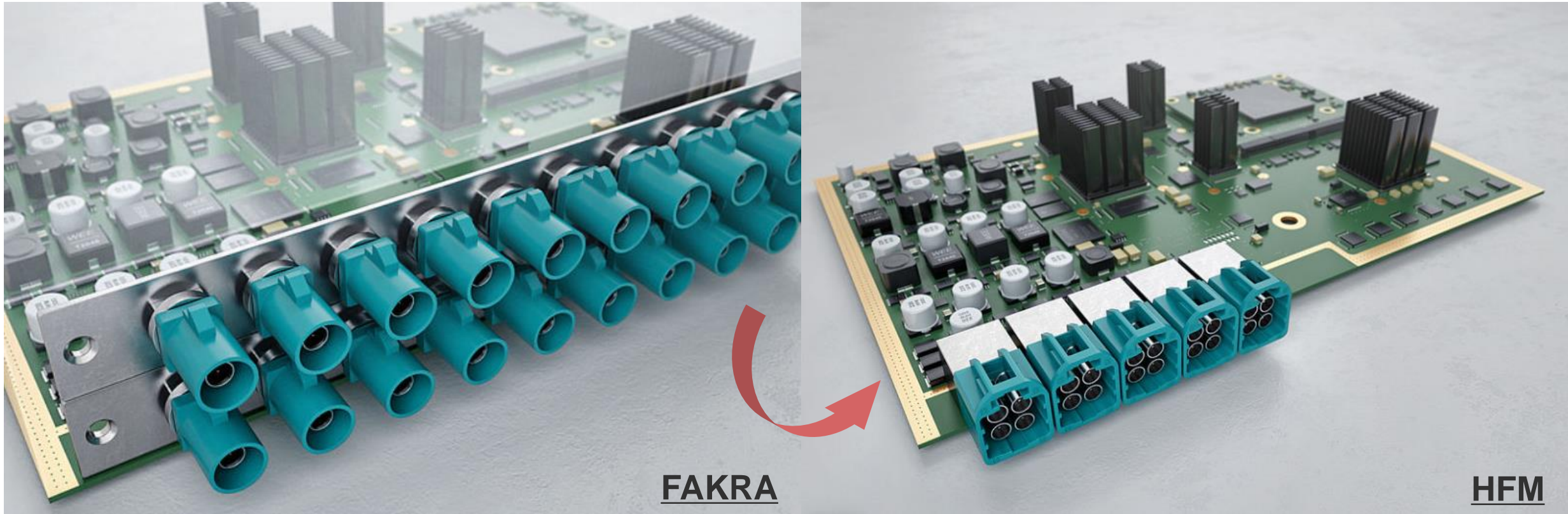
罗森伯格HSD



RN 059 RN 061

HFM[®] High-Speed FAKRA-Mini

Why HFM[®] ?



HFM 对于空间的节省 最多可达80%

HFM[®] 特性

“迷你同轴”系统

- 特性阻抗 : 50Ω
- 传输频率 : 最高可达 **20 GHz**
- 温度范围: -40°C to +105 °C
- 对插次数 25次 (防水型号 5次)

空间优化的设计

- 尺寸小 - 优化的空间利用
- 模块化系统 - 节省安装空间高达80%

符合全球汽车标准

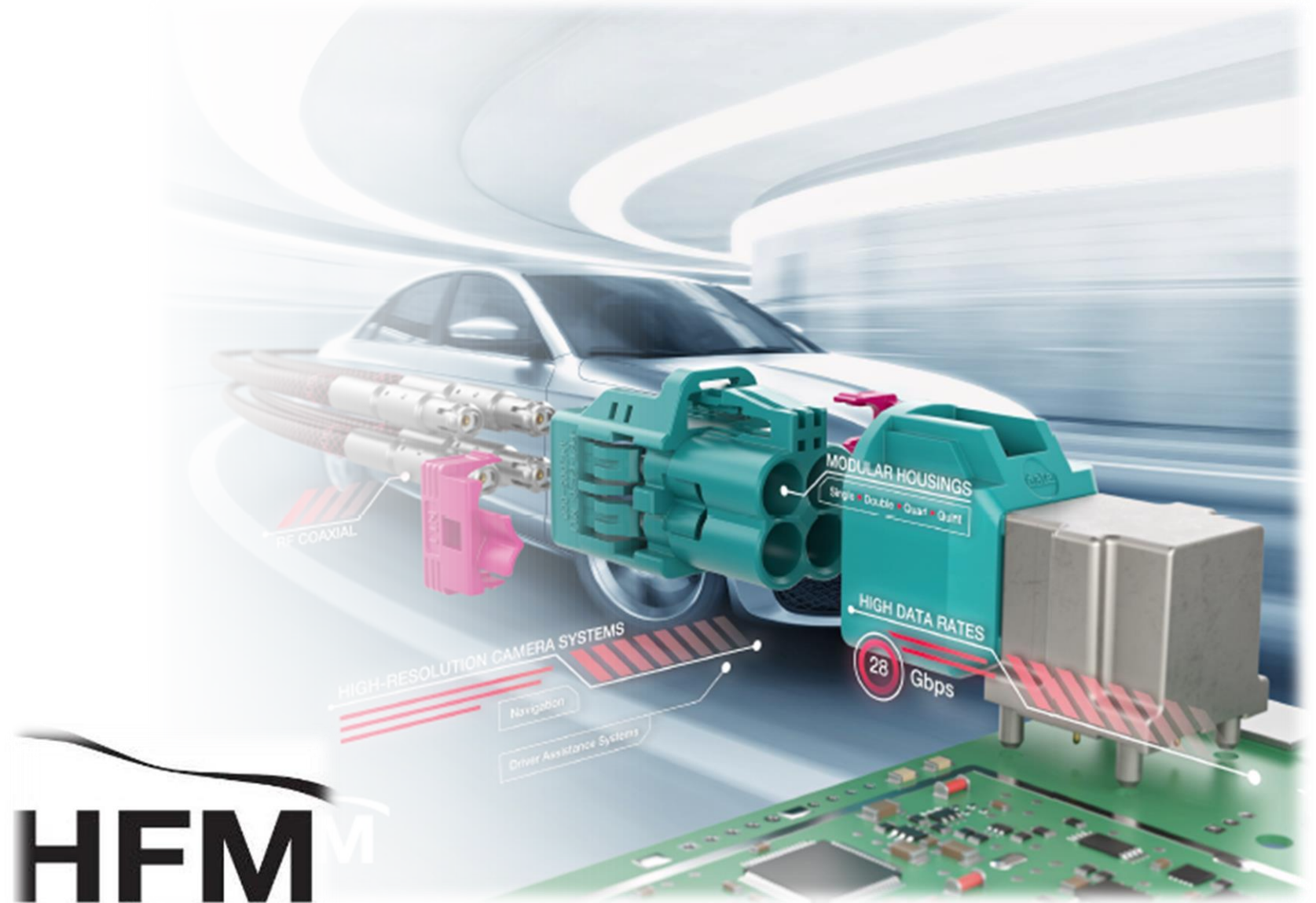
- 高机械强度
- 符合人体工程学

多种型号可选择

- 单腔、多腔的非防水型号及防水型号
- 线端塑壳可选装CPA

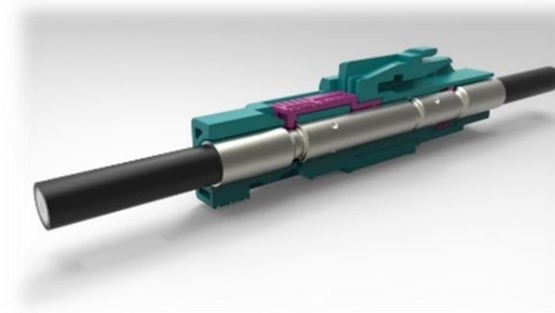
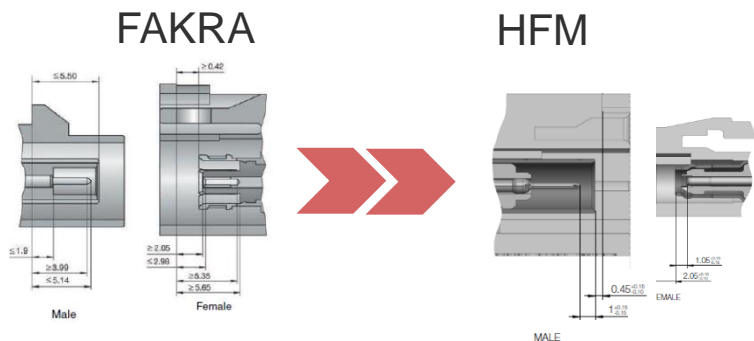
适配多种线缆

- RG 174, Dacar 462
- RTK 031 (Dacar 302-3/ 4)
- **RTK 044**



HFM[®] 的优秀电气性能

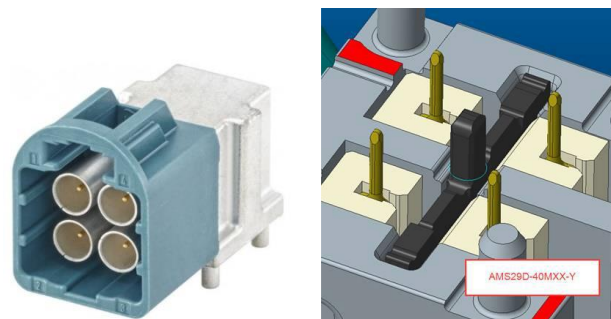
- 回波损耗



回波损耗 Return Loss	Rosenberger HFM
DC to 1 GHz	≤ -25 dB
> 1 to 2 GHz	
> 2 to 3 GHz	
> 3 to 6 GHz	≤ -20 dB
> 6 to 9 GHz	≤ -15 dB
> 9 to 12 GHz	
> 12 to 15 GHz	≤ -12 dB
> 15 to 20 GHz	≤ -10 dB

- 多腔连接器串扰

≤ -60 dB to 10 GHz
 ≤ -50 dB to 15 GHz



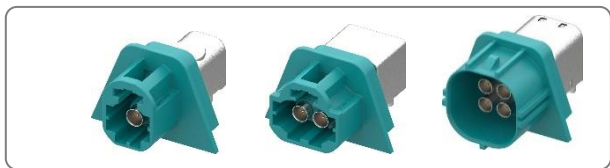
HFM[®] High-Speed FAKRA-Mini

高集成度 & 多种型式

■ HFM



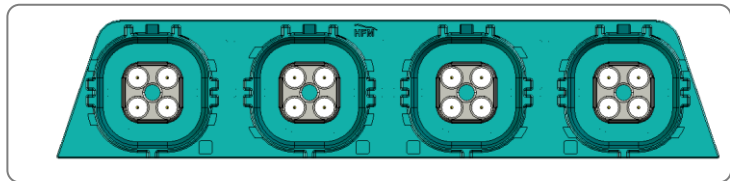
■ 防水HFM
➢ 防水等级 IPX7 & IPX9K



■ HFM + Power pin

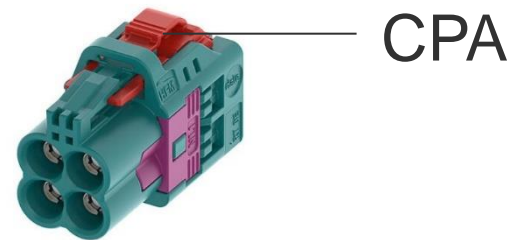


■ 防水16合1 HFM



板端连接器

线端连接器



CPA

更多型号开发中

应用

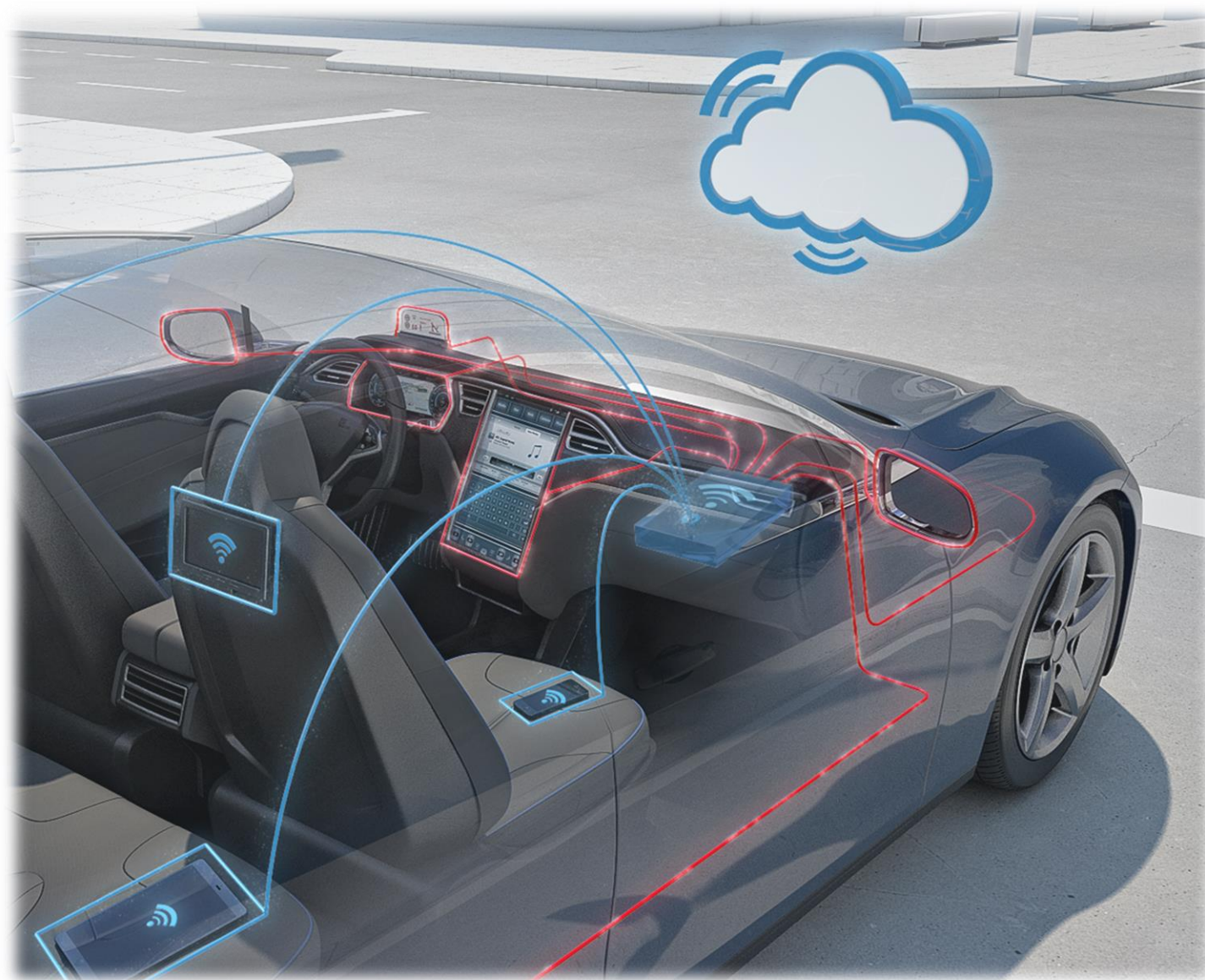
■ 天线端

- AM/ FM
- 数字广播/电视 (DAB/TV)
- Bluetooth
- GPS
- 远程控制、无钥匙进入
- 3G/4G/5G移动通信 & Wi-Fi
- V2X

■ 视频传输

- 摄像头: 360环视, 周视等
- 屏幕: 仪表盘, 中控屏, 后座娱乐等

- ★ 可支持FPD-Link IV, GMSL III等同轴传输视频方案

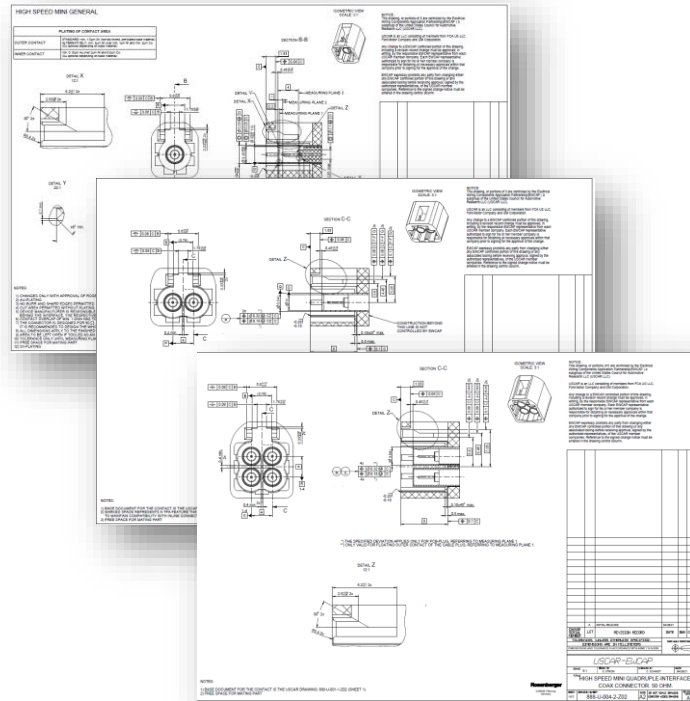


HFM[®] High-Speed FAKRA-Mini

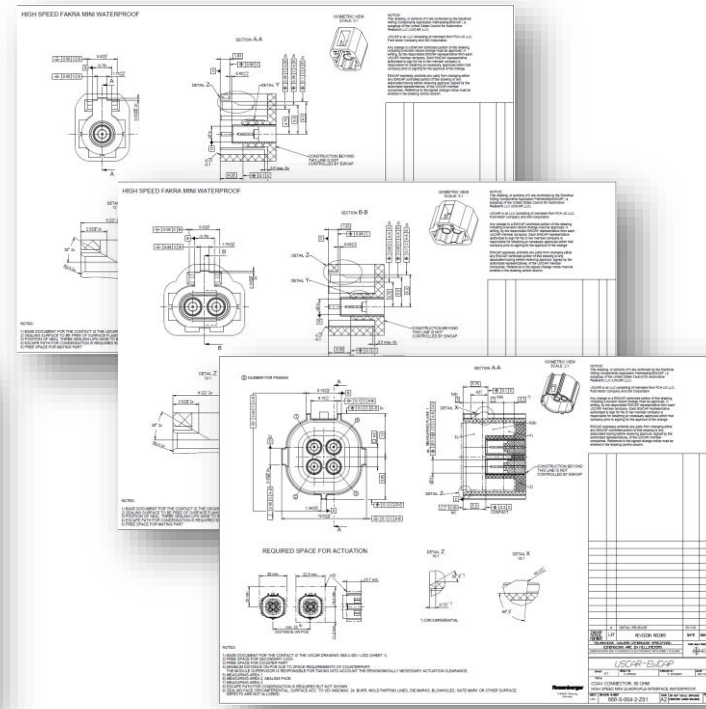
USCAR & ISO 标准



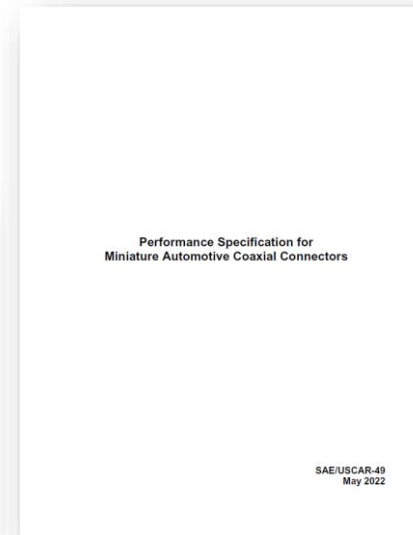
Unsealed HFM interface



Sealed HFM interface



Test standard
for Mini Coax connector systems
USCAR 49



ISO 8092-7
Mini-Coaxial
Connector Interface
and Test procedures

H-MTD[®] 特性

- 车规级非屏蔽H-MTDe / 360°屏蔽H-MTD差分连接器

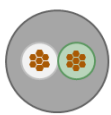
- 特性阻抗 : 100Ω
- 传输频率 : 最高可达 **20 GHz** (屏蔽系统)
- 温度范围: -40°C to +105 °C
- 对插次数 25次 (防水型号 5次)

- 高机械强度

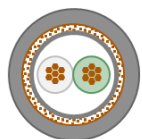
- 符合LV214 / USCAR 和 Open联盟TC2/TC9标准

- 可支持多种线缆

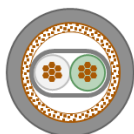
- UTP – **U**nshielded **T**wisted **P**air
非屏蔽双绞线
- STP – **S**hielded **T**wisted **P**air
屏蔽双绞线
- SPP – **S**hielded **P**arallel **P**air
屏蔽平行线



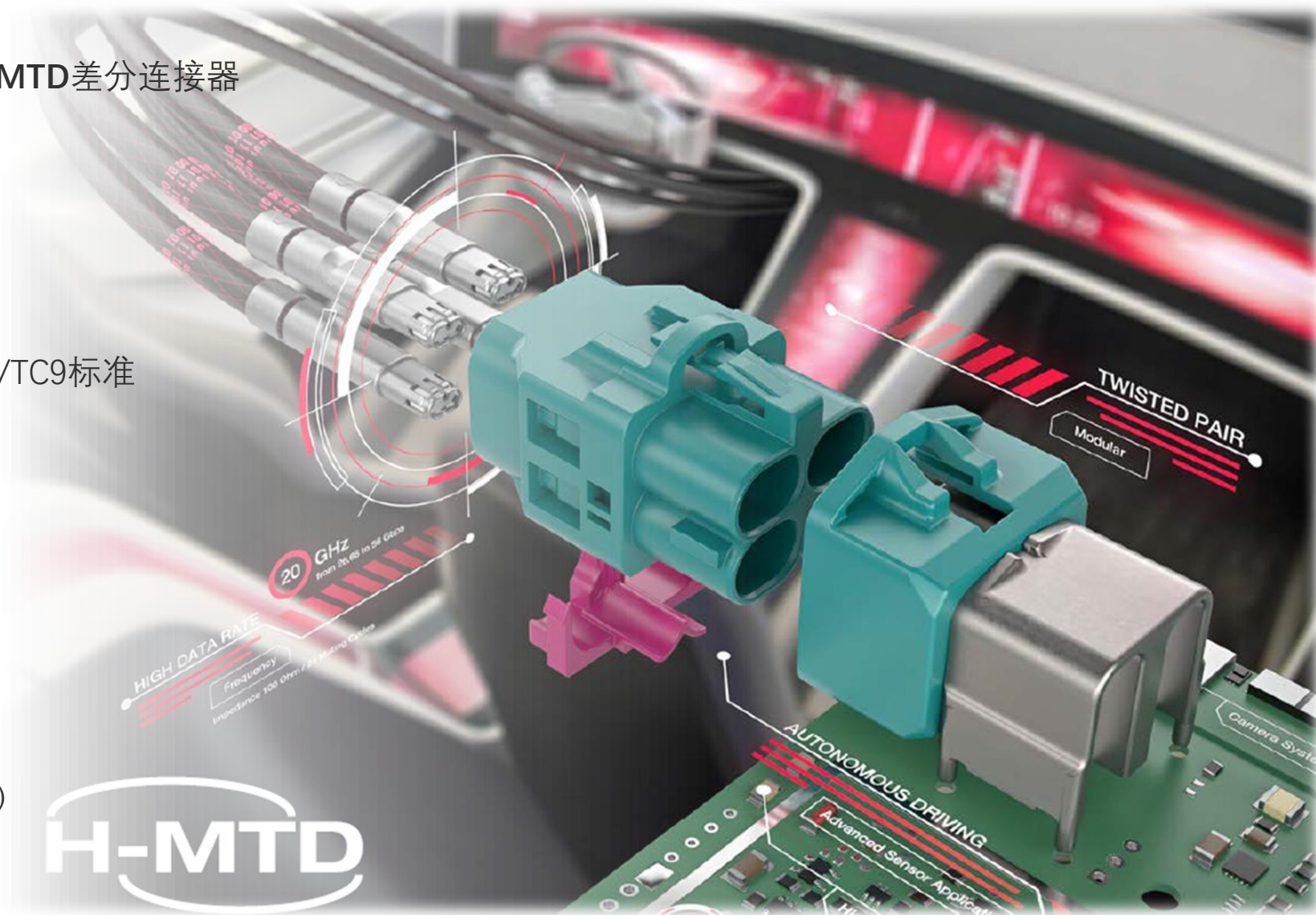
UTP (1 GHz)



STP (7.5 GHz)



SPP (20 GHz)



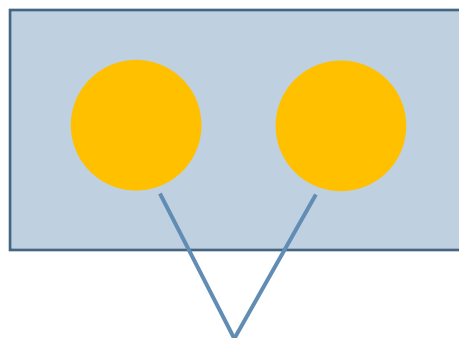
H-MTD

屏蔽形式的对比

- 按照OPEN 联盟 TC9分级连接器屏蔽界面

Unshielding

非屏蔽

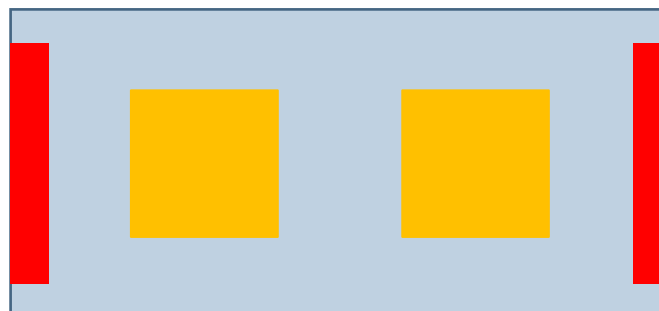


信号端子

H-MTDe非屏蔽

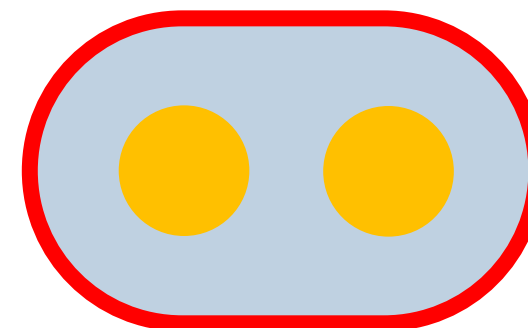
Shielding class 1

简单屏蔽



Shielding class 2

全屏蔽



H-MTD屏蔽

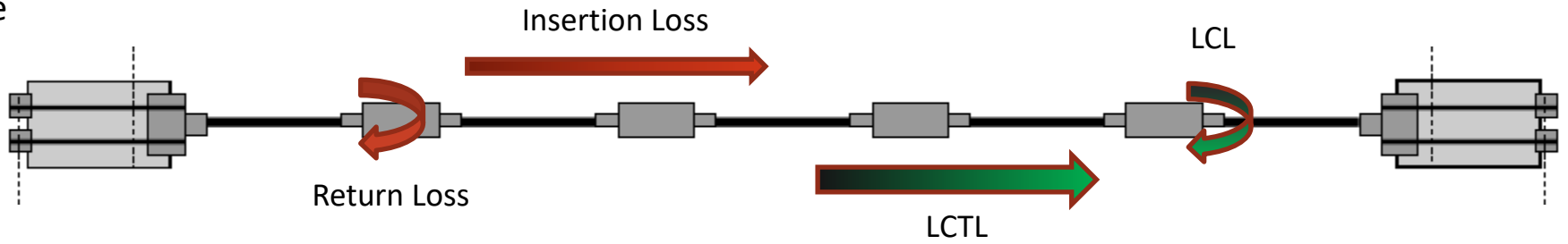
独立通道

■ 独立通道

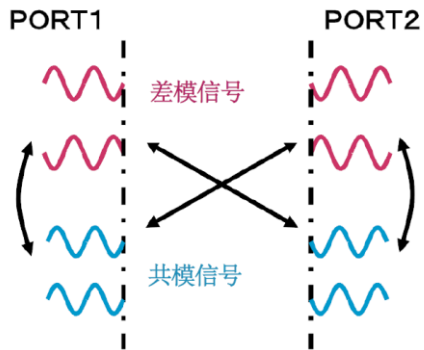
- Characteristic impedance
- Propagation Delay
- Return Loss
- Insertion Loss

- LCL
- LCTL

影响EMC性能



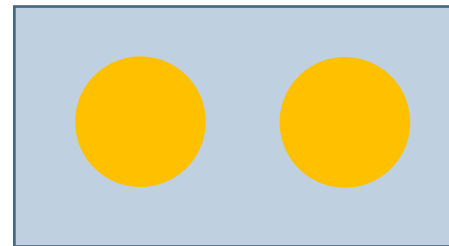
Mixed Mode S-parameter



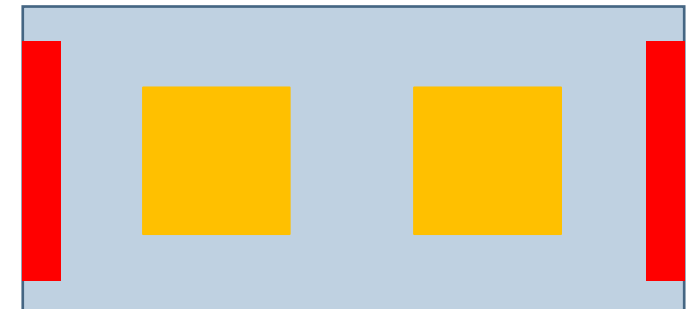
LCL($S_{dc_{11}}$)—纵向转换损耗

LCTL($S_{dc_{21}}$)—纵向转换传输损耗

非屏蔽



屏蔽Class 1

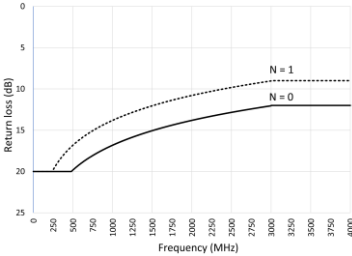
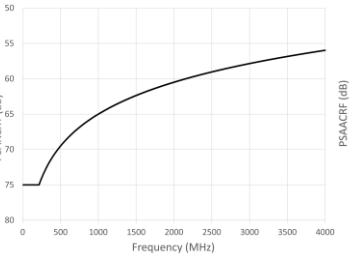
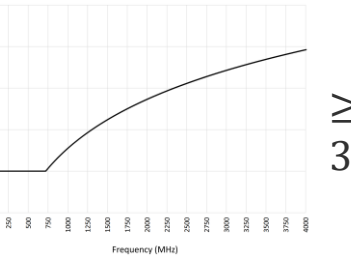






H-MTD[®] High-Speed Modular Twisted-Pair Data

IEEE 802.3ch 10G 车载以太网

- Rosenberger H-MTD[®] 符合IEEE 802.3ch 2.5G/5G/10BASE 链路要求。
- H-MTD连接器，总长15 m 链路，4处inline打断，采用STP AWG26线缆，室温。



Parameter	Return Loss	Insertion Loss	PS-ANEXT	PS-AACRF	Coupling Attenuation	Screening Attenuation
Requirement						$\geq 45dB$ 30 – 4000 MHz
Results						

H-MTD[®] High-Speed Modular Twisted-Pair Data

高集成度& 多种型式

■ H-MTD

■ 防水H-MTD

➢ 防水等级 IPX7M / IPX9

■ H-MTD + Power pin



线端连接器



更多型号开发中

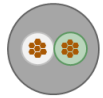


车载以太网以及多G车载以太网解决方案

- 速率 / 调制: 100 Mbps / PAM3
- 特性阻抗 / 带宽: 100 Ω / 66 MHz



H-MTD^{®e}



UTP

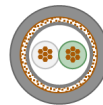
100 M

- 速率 / 调制: 1 Gbps / PAM3
- 特性阻抗 / 带宽: 100 Ω / 600 MHz

1 G



H-MTD[®]



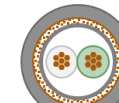
STP

- 速率 / 调制: 2.5 Gbps / 5 Gbps / 10 Gbps / PAM4
- 特性阻抗 / 带宽: 100 Ω / 1/2/4 GHz

Multi-Gigabits
及以上



H-MTD[®]



STP



SPP

应用

■ 视频传输

- 可支持4K摄像头及以上
- 高分辨率显示器
- 后座娱乐系统

■ 支持多种协议，如

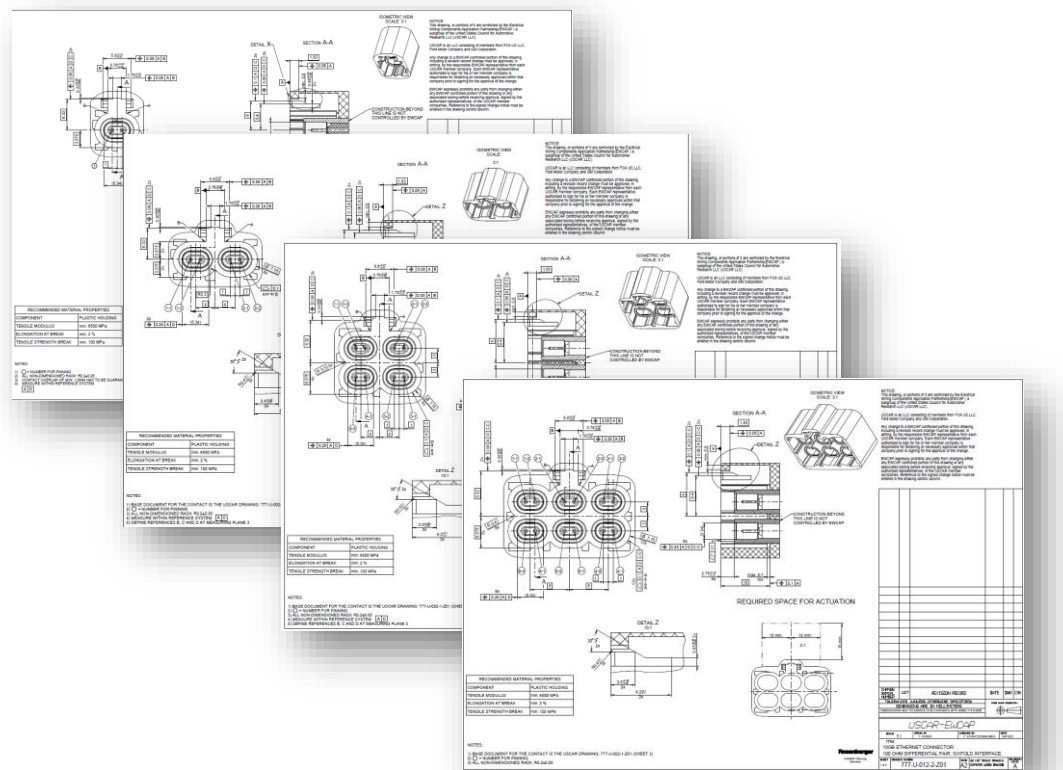
- – LVDS
- – APIX 3
- – PCIe Gen3
- – GMSL 3
- – FPD-Link 4



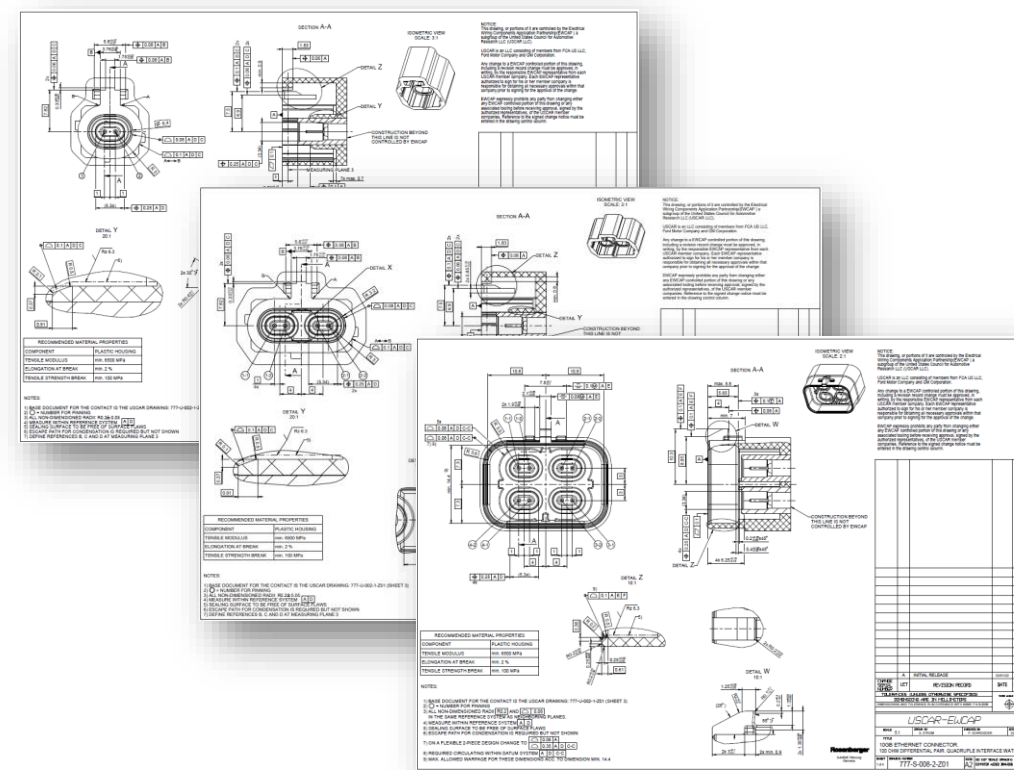
USCAR 标准



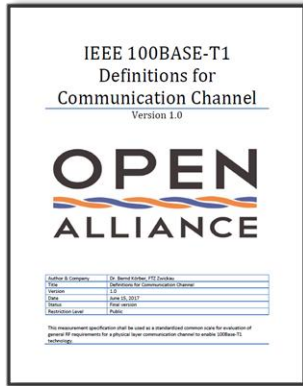
Unsealed H-MTD interface



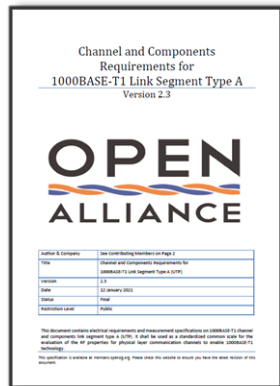
Sealed H-MTD interface



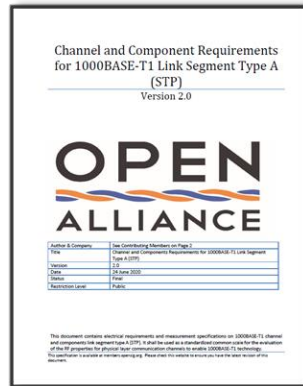
Open Alliance 标准 & ISO 标准



TC2



TC9 UTP



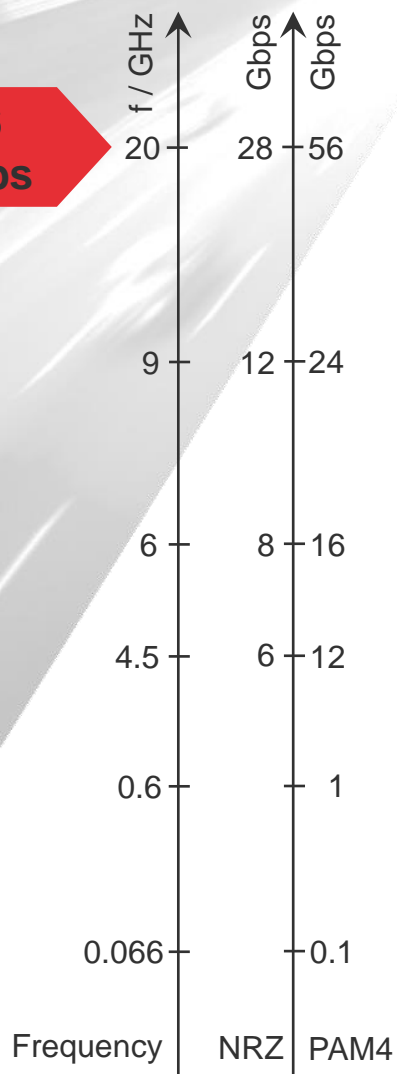
TC9 STP



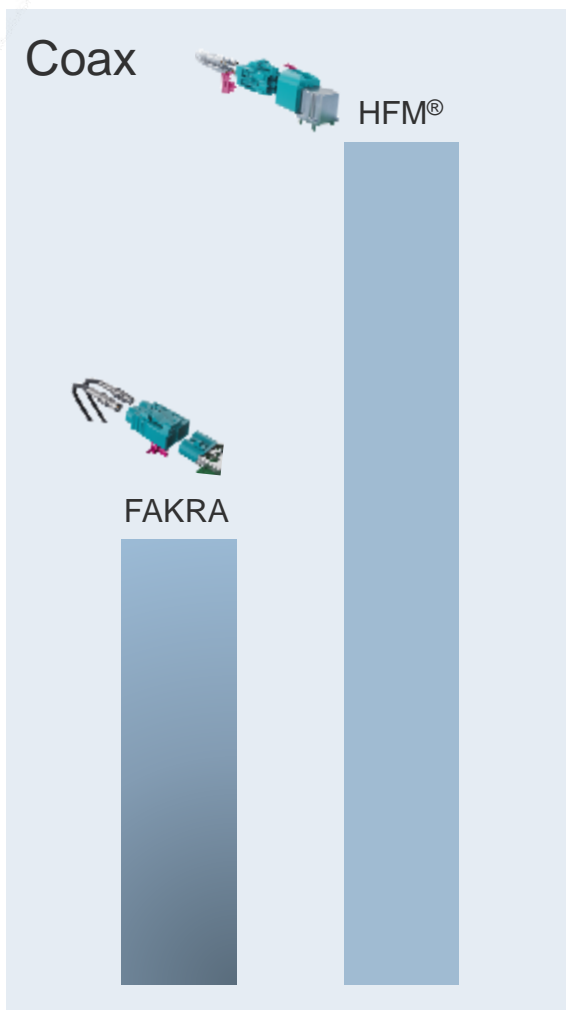
ISO 8092-6

Road vehicles — Connections for on-board electrical wiring harnesses — Part 6: In-vehicle Ethernet, general performance requirements and interface definitions.

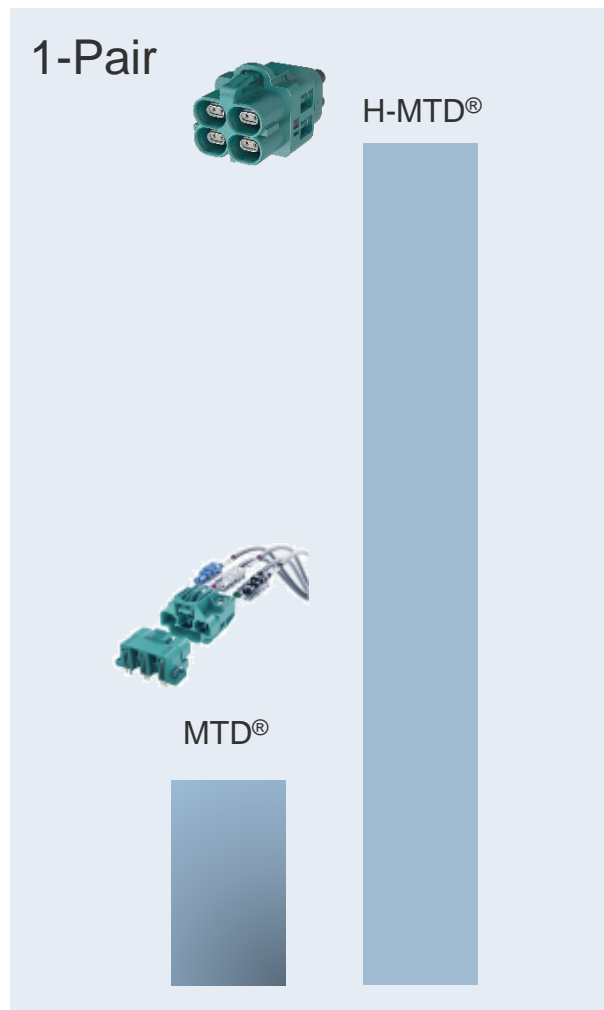
56 Gbps



Single-ended



Differential



Differential





罗森伯格汽车电子

Rosenberger - Wiring the future of mobility

Your global development partner for high-speed and high-voltage mobility connections