HIGH-SPEED FAKRA-MINI (HFM®) INTERCONNECT SYSTEM

NEW: HFM connectors deliver high-speed connectivity in a compact, robust and modular package ideal for automotive applications including camera, display, autonomous driving and telematics systems.

NPI INNOVATION

DECEMBER 2024

HFM® is a registered trademark of Rosenberger

creating connections for life

High-Speed FAKRA-Mini (HFM) Interconnect System

Designed to provide high-speed data connectivity for advanced automotive systems including cameras and telematics, High-Speed FAKRA-Mini (HFM) connectors deliver data rates of up to 28Gbps at frequencies up to 20 GHz in a compact, lightweight form factor optimized for rugged reliability and space efficiency.

Key Product Information

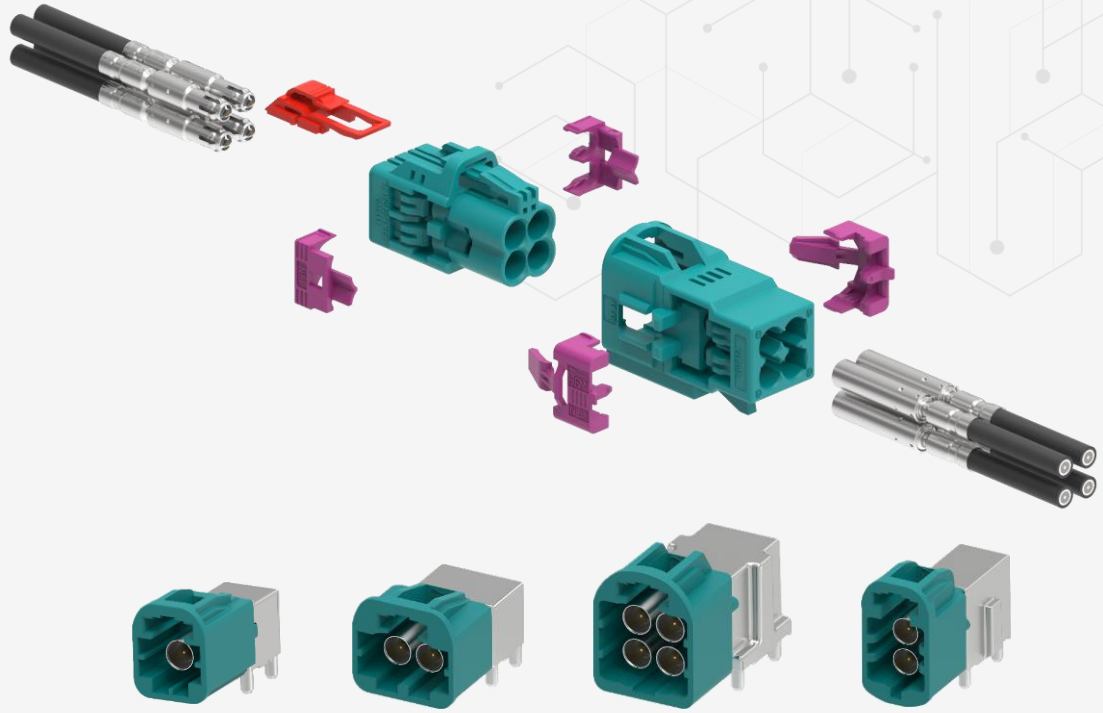
Category: Automotive PCB/Wire Connectors

Protocols: APIX, ASA-ML, Ethernet, FPD-Link III/IV, GMSL 2/3, GVIF, HDBase-T, MIPI A-PHY, PCIe

Frequencies: Up to 20 GHz

Data Rates: Up to 28Gbps

Impedance: 50 Ohms



View Product Landing Page

Download Datasheet

New Series

207911	**HFM Jack Housings and Terminals**
207912	**HFM Plug Housings and Terminals**
208241	**HFM Single Right-Angle Headers**
208242	**HFM Dual Right-Angle Headers**
208244	**HFM Quad-Stack Right-Angle Headers**
208246	**HFM Dual-Stack Right-Angle Headers**

Vital Product Information

High-Speed FAKRA-Mini (HFM) Interconnect System

What makes this product different from alternatives?

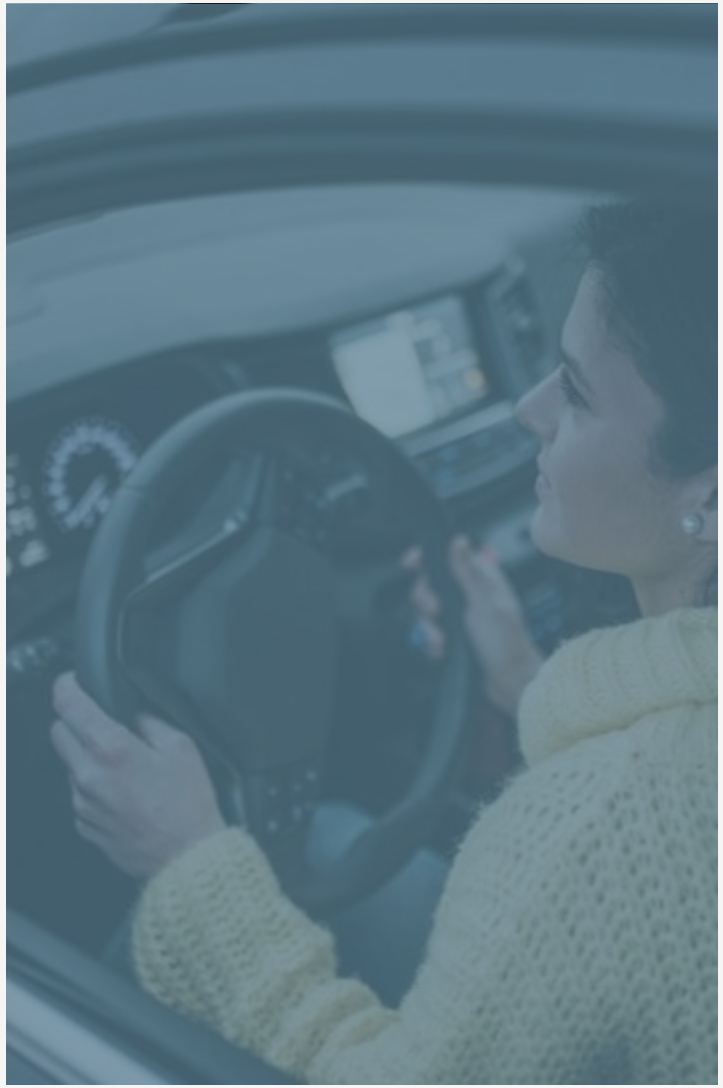
HFM connectors offer significant space savings compared with traditional FAKRA connectors, optimizing space within crowded vehicle architectures. The miniaturized design and dual/quad connector configurations help save weight by reducing component package size and simplifying the wiring harness, which improves vehicle efficiency.

How does this solution create value for our customers?

By providing a compact and reliable high-speed data connection, the HFM system lowers the barriers to adding sensors and cameras needed for advanced driver assistance systems (ADAS). HFM connectors require less space and add less weight, enabling designers to add connections for more devices within limited package sizes and PCB space. This increases the functionality of the vehicle while minimizing wiring harness complexity and maintaining high system reliability.

What is the Molex advantage?

Global manufacturing capability, robust engineering support and a collaborative mindset focused on finding innovative solutions to industry challenges make Molex a unique partner in optimizing connectivity.



Product Overview

High-Speed FAKRA-Mini (HFM) Interconnect System

High-Speed Data Transmission for Advanced Applications

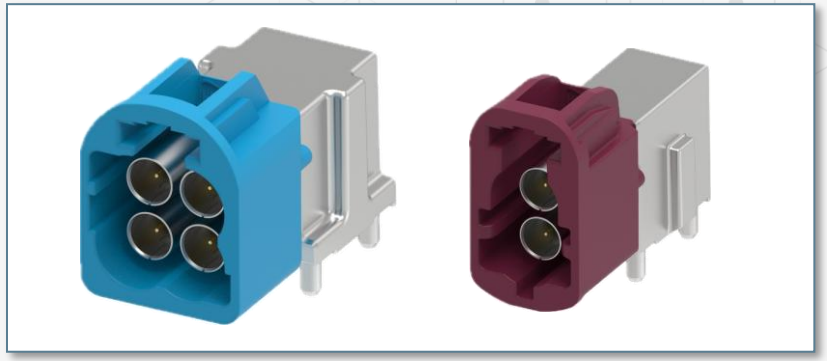
The HFM system supports data speeds up to 28Gbps and frequencies up to 20 GHz, making it suitable for advanced driver assistance systems (ADAS) and other advanced, data-rich applications such as cameras, vehicle-to-everything (V2X) communication and infotainment systems.

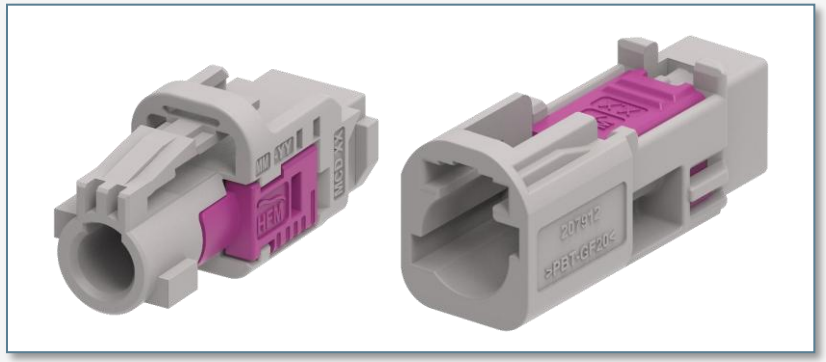
Compact, Rugged Design Optimized for Automotive Use

Compact, miniaturized HFM connectors save space compared with traditional FAKRA connectors, enabling more connections in a limited space. The rugged design and locking features enable consistent connectivity and long-term reliability in automotive environments subject to vibration and wide temperature swings.

Versatile and Scalable for Future-Proofed Architecture

With single, dual, dual stack, and quad connector and header options as well as next-generation functionality, the flexible HFM system is designed to accommodate future vehicle networks, applications and protocols.



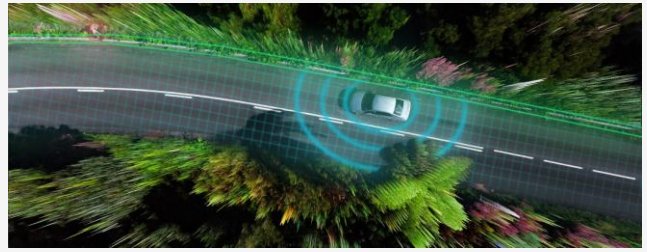


Markets and Applications

High-Speed FAKRA-Mini (HFM) Interconnect System

Advanced Driver Assistance Systems (ADAS)

Infotainment Systems



Telematics Solutions

AUTOMOTIVE

- Advanced driver assistance systems (ADAS)
- Autonomous driving systems
- Camera systems, including surround view, driver monitor, lane assist and others
- High-resolution (4K) displays
- High-speed cable networks

- Infotainment systems
- Internet connections
- Radar systems
- Rear-seat entertainment devices
- Sensor-to-device connections

- Telematics solutions, including:
  - 5G
  - Bluetooth
  - Global position satellite (GPS)
  - Satellite radio
  - Vehicle-to-everything (V2X)
  - Wi-Fi and WiGig

Frequently Asked Questions

High-Speed FAKRA-Mini (HFM) Interconnect System

What keying options are available for the HFM system?

HFM connectors are available in up to 12 different keying options, all molded in a unique color for easy identification. This makes assembly operations faster, easier and more reliable in applications utilizing multiple HFM connectors.

What wire types does the HFM system support?

Molex HFM connectors support RG174, RTK031 and RTK044 50-Ohm coaxial cables with crimp terminations.

Is HFM compatible with TE's Mate Ax connector line?

HFM and Mate-Ax connector solutions, while similar, are not intermateable. It is possible, however, to use HFM, Mate-Ax and/or standard FAKRA connectors on opposite ends of the same cable assembly.

What is the main difference between HFM and standard FAKRA connectors?

In general, HFM connectors are smaller and can handle higher speeds than standard FAKRA connectors. Other HFM differences include an improved terminal interface, enhanced electrical properties and a design optimized for automated mass production tooling.

Product Advantages and Features

High-Speed FAKRA-Mini (HFM) Interconnect System

Optimizes space and weight
The compact design reduces weight, saves installation space and maximizes limited PCB real estate, improving overall efficiency.

Enables real-time communication with high-performance devices
Data rates of up to 28Gbps and 20 GHz frequencies enable reliable, high-speed communication with high-resolution cameras, telematics and infotainment devices.

Prevents accidental disconnection in high-vibration applications
The integrated secondary lock (ISL) and available connector position assurance (CPA) provide robust terminal and connector retention.

Improves flexibility and supports future upgrades
The versatile, modular system helps future-proof vehicle architecture with single, dual, dual-stack and quad connectors for wire-to-wire, wire-to-module and wire-to-device solutions.

Key Specifications	
Frequencies	Up to 20 GHz
Data Rate	Up to 28Gbps
Impedance	50 Ohms
Operating Temperatures	-40 to +105°C

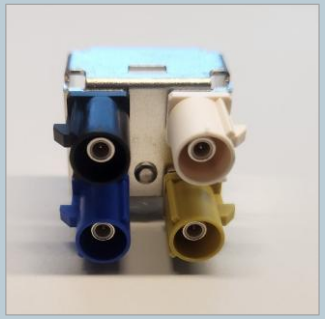
Solving Industry Challenges

High-Speed FAKRA-Mini (HFM) Interconnect System

Industry Need	Industry Challenge	Industry Solution	Anticipated Results
Miniaturized connectors	**More functionality in less space** To meet consumer demands for more devices and enhanced functionality, manufacturers need to fit wiring for more devices into the same compact spaces.	**Compact, lightweight HFM system** HFM connectors are designed to be compact and lightweight, saving space and weight while enabling more devices to be integrated into ADAS and other advanced systems.	**Better integration with multiple devices** Manufacturers can incorporate more—and more complex—devices and systems into confined spaces in vehicles, enhancing functionality.
High-speed data connectivity	**Real-time data transmission** To meet the demands of ADAS and autonomous driving systems, manufacturers need real-time data processing to enable reliable connectivity with high-resolution cameras and other sensor systems.	**High-speed 28Gbps connectors** Offering 28Gbps/20 GHz high-speed connectivity, HFM connectors enable the seamless integration of multiple devices. This helps ensure the proper functioning of critical safety and telematics systems.	**Reliability for high-performance systems** The proper functioning of critical safety and telematics systems, including the integration of data from multiple sources in real time, will lead to enhanced vehicle safety and a better user experience.
Reliability in harsh conditions	**Rugged, dependable construction** Manufacturers need interconnect solutions to function reliably in harsh conditions subject to temperature extremes, water and fluid exposure, and the potential of electromagnetic interference (EMI).	**Robust design with positive locking** The HFM system is ruggedized for consistent performance, with a robust housing design, ISL, and available CPA to ensure connectivity in high-vibration environments. The connector is also shielded for EMI protection.	**Exceptional reliability and reduced costs** Increasing the reliability and durability of electronic systems reduces maintenance costs and downtime, improving long-term performance and enhancing customer satisfaction.

Unique and Useful Differentiation vs. Similar Molex Product

High-Speed FAKRA-Mini (HFM) Interconnect System

	Molex | High-Speed FAKRA Mini (HFM) Connectors	Molex | FAKRA Connectors
Frequency	Up to 20 GHz	Up to 6 GHz
Size	Up to 80% smaller than FAKRA	Standard FAKRA
Validation	USCAR-49, USCAR-2	USCAR-17
Cable Type	Coaxial	Coaxial
Combined Connectors	Single, dual, dual stack, quad	Single, dual, multi-port
Product Image		

Product Specifications

High-Speed FAKRA-Mini (HFM) Interconnect System

Reference Information

Packaging: Bag, reel, or tape and reel
Designed in: Millimeters
RoHS: Yes

Electrical

Impedance: 50 Ohms
Frequency: DC to 20 GHz
Center Contact Resistance: <15 milliohms
Outer Contact Resistance: <5 milliohms
Power Current (max.): 1.0A DC
Return Loss (max.): 12 to 25 dB, depending on frequency
Crosstalk (max.): -60 dB up to 10 GHz

Mechanical

Engagement Force (max.): 15N (single), 30N (dual and dual stack), 45N (quad)
Disengagement Force (min.): 2N (single, dual and dual stack), 5N (quad)
Durability (max.): 25 mating cycles

Physical

Housing: HTN or PBT
Center Contact: Phosphor bronze
Outer Contact:
Interface—Bronze
Solder or Crimp Area—Zinc alloy or stainless steel
Plating:
Interface—Gold
Solder or Crimp Area—Tin
Dielectric: Nylon or LCP
Cable Type: RG174, RTK031 or RTK044* coaxial cable
Operating Temperatures: -40 to +105°C

**RTK044 not yet available*

Additional Resources	
Web Overview Page	**https://www.molex.com/en-us/products/automotive-connectivity/automotive-pcb-wire-connectors/high-speed-fakra-mini-hfm-coaxial-cable**
Datasheet	987651-8942.pdf (molex.com)
Global Product Manager	Celery He/Mark Machin, CMBU, TIS
Group Product Manager	Tiffany Vandervelde-Peralta, CMBU, TIS

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