

# GEMnet MULTI-GIGABIT DIFFERENTIAL CONNECTOR SYSTEM

Enabling 15 GHz and up to 56 Gbps Performance for the Automotive Industry



Automotive manufacturers are increasingly utilizing multi-gigabit (10Gbps+) data links to design applications and architectures. Designed to meet these requirements, TE Connectivity's (TE) GEMnet connector family supports Multigigabit Ethernet and SerDes applications; provides bandwidth up to 15GHz and able to support data transmission up to 56Gbps.

The GEMnet connector system offers the flexibility to support a wide range of Ethernet applications and industry protocols including 4K displays, radar/lidar and safety critical applications.

The GEMnet connector system features 90° and 180° terminals and offers sealed and unsealed product types. Compatible with USCAR interface, the GEMnet connector system can be used with variety of different cables including Shielded Twisted Pair, Unshielded Twisted Pair and new high-performance cables. The GEMnet connector system provides automotive manufacturers with a high-performance connector system that supports current and future vehicle requirements with automotive grade robustness.

### Automotive-Grade Design

The GEMnet connector family has been designed specifically for automotive applications and includes. a primary and secondary lock, crimp connection, high cable retention force, high coding efficiency, anti-stubbing, anti-scooping, connector position assurance (CPA) protection and Poke-yoke with terminal polarization. In addition, The GEMnet connector family offers specific advantages in terms of automotive robustness, which include the robust ground contact design and integrated lead-in features and stub protection. The multiple contact points allow the GEMnet connector system to offer sufficient EMI performance. Featuring USCAR interface, GEMnet is an automotive grade connector system that can be used in a broad array of automotive applications.

#### Terminal

- 90 and 180 degree
- Shielded and Unshielded
  Variants available

### Header

- 90 and 180 degree header (sealed and unsealed)
- 1, 2, 4, 6 port
- Hybrid Versions



### Housing

- 180° male and female housing, 90° female (sealed and unsealed)
- 1, 2, 4, 6 port
- Hybrid Versions

## **PRODUCT OVERVIEW**

#### Performance

Performance	Standards Conformance
Up to 56 Gbps* 15 GHz 100 Ohm impedance	TC9, IEEE802.3ch, APIX 3, PCIe Gen 4, GMSL2/3, FPD-Link III/IV

#### Protocols

Protocols Sup	ported	Functional Applications
Ethernet	100BASE-T1 1000BASE-T1 2.5/5/10/25GBASE-T1	
SerDes	APIX® FPD-Link GMSL™ MIPI® A-PHY™ PCIe® USB GVIF HDBase-T™ ASA Motion Link	<ul> <li>Camera systems (4K and beyond)</li> <li>Driver assistance systems</li> <li>Automated driving functions</li> <li>High resolution displays</li> <li>Rear seat entertainment</li> <li>Compliant to USCAR</li> </ul>
Other	USB PCIe®	

#### **Mechanical Features**

- Primary and secondary locking
- Robust crimp design
- High cable retention force
- Anti-stubbing pin protection

- Scoop proof
- Optional Connector Position Assurance (CPA)
- Up to 25 mating cycles

\*depending on chipset modulation, cable type & cable length

#### **APPLICATIONS**

#### **Autonomous Driving**

- LIDAR
- Radar

#### Connected vehicle

- High performance computer
- Domain ECU (ADAS, infotainment)
- Zonal controller

#### Infotainment

- 4K Displays; 8K/High-resolution displays
- USB



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# **PRODUCT OVERVIEW**

Mechanical Performance	9	Electrical Performance	
Mating Cycles	≥ 25	Impedance	100 ±10 Ohms
	1 Port ≤ 20 N	Isolation Resistance	≥ 100 mOhm
Connector         2 Port ≤ 35 N           Engagement Force         4 Port ≤ 50 N           6 Port ≤ 75 N	Working Voltage	≤ 60 V D C	
Connector Disengage Force (Lock Enabled)		Power Current	≤2ADC
	≥ 110 N	Signal Contact Resistance	≤ 40 mOhm
Connector Disengage Force (Lock Disabled)	$\ge 5$ N and $\ge 75$ N	Outer Contact Resistance	Initial ≤ 25 mOhms Final ≤ 40 mOhms
Polarization Feature Effectiveness	$1 \text{ Port} \le 20 \text{ N}$ 2 Port $\le 35 \text{ N}$ 4 Port $\le 50 \text{ N}$	Return Loss Single component, gated **	Initial ≤ 15 mOhms Final ≤ 25 mOhms
Connector to Connector Audible Click	6 Port ≤ 75N 65dB	Return Loss – Mated Pair compliant with future standards (including Open Alliance TC9, IEEE 802.3cy)	≥ 25 dB up to 1.5 GHz ≥ 20 dB up to 4 GHz ≥ tbd. up to 9 GHz

**Environment Performance\*** 

Temperature Range	-40°C to +105°C	Dry Heat	DIN IEC 60068 2-2 Test B Temperature +105°C SAE/ USCAR-2 Rev 7 (cable dependent)
Vibration	DIN IEC 60068-2-2 Test B Severity 1 SAE/USCAR-2 Rev 7, V1 (cable dependent)	Humidity	DIN IEC 60068-2-30 @ +40°C
Mechanical Shock	DIN-EN-60068-2-27 Severity 1 SAE/USCAR-2 Rev 7, V1	Temperature/Humidity Cycling	SAE/USCAR-2 Rev 7 V2
Thermal Shock	DIN-EN-60068-2-14 SAE/USCAR-2 Rev 7 -40°C to +105°C (cable dependent)	Soldering Profile	acc. to IEC 60068-2-58; Group 3 (+250°C/ 30 sec)



\* OEM-specific validations to be completed as required

\*\* Results dependent on maximum frequency of cable and mated precision adapter

# **GEMnet CONNECTOR SYSTEM**

<b>STP</b> TERMINALS 180°		Components	Components Part Number	Applicator Part Number
3		Female Outer Contact	2368036-1	3-2837986-2
	2	Female Center Contact	2368012-1	3-2837971-2
	3	Ferrule	2368028-3	3-2837986-2
3	1	Male Outer Contact	2368037-1	3-2837976-2
	2	Male Center Contact	2368031-1	3-2837970-2
	3	Ferrule	2368028-3	3-2837976-2
80° Female terminal set	PN 2394484 PN 2394485			

180° Male terminal set PN 2394485

UTP TERMINALS 180°			Components	Components Part Number
3	1	1	Fixation Element	2461621-1
2	2	and the second se	Female Dielectric	2461620-1
C.	3		Female Center Contact	2368012-1
3	1	UT-	Fixation Element	2461621-1
	2	State -	Male Dielectric	2476729-1
	3		Male UTP Center Contact	2203260

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90° stamp and formed terminal is under development

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# **GEMnet CONNECTOR SYSTEM UNSEALED HOUSINGS**

FEMALE HOUSINGS	Ports	Orientatio	n CP/	A Part Number	r Key Codes
	1	180°	Yes	s 2368022-X	A, B, C, D, E, F, Z
	1	180°	No	5-2368022-X	( A, B, C, D, E, F, Z
	2	180°	Yes	2386612-X	A, B, C, D, E, F
	2	180°	No	5-2386612-X	A, B, C, Z
	4	180°	Yes	2386629-X	A, B, C, D, E, F, Z
	4	180°	No	5-2386629-X	( A, B, C, D, E, F, Z
	6	180°	Yes	5 2428482-X	A, B, C, Z
	6	180°	No	5-2428482-X	ά Α, Β, C, Ζ
	1	90°	Yes	s 2406070-X	A, B, C, D, F,Z
Key Codes A	В	с	D	E F	Z

Key Codes	A	В	с	D	E	F	Z
Suffix (tray)	-1	-2	-3	-4	-5	-6	1 - / - 4

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MALE HOUSINGS	Ports	Orientation	СРА	Clip	Part Number	Key Codes
	1	180°	No	No	2368003-X	Α, Β
	1	180°	No	Yes	2-2368033-X	Α, Β
	1	180°	No	Yes	2368033-X	А, В, С
No.	2	180°	No	No	2386606-X	A, B, C
State of the second sec	2	180°	No	Yes	2-2386608-X	А, В, С
See .	2	180°	No	Yes	2386608-X	A, B, C

Key Codes	А	В	С	D	E	Z
Suffix (tray)	-1	-2	-3	-4	-5	1 - / - 4

Hybrid options with MQS terminals are under development

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## **GEMnet CONNECTOR SYSTEM SEALED HOUSINGS**

1 PORT FEMALE AND MALE SEALED HOUSING	Component	Part Number	СРА	Key Codes
	Female Housing	1802794-X	Yes	A, B, C, Z
5	Male Housing	2441123-X	Yes	A, B, C, Z
	Wire Seal	1802792-1	-	-
C.	TPA	1802802-1	-	-
C.	Rear Cover	1802803-1	-	-

4 PORTS FEMALE SEALED HOUSING	Component	Part Number	СРА	Key Codes
	Housing	2420615-X	Yes	A, B, C, D, E, F, G, H, J
	Wire Seal	2420614-1	-	-
	Cover	2420612-1	-	-
	Cavity Plug	2452913-1	-	-

1 GEMnet + 6 MQS SEALED HOUSING	Compo	nents	Part Number	СРА		Key Codes	
<b></b>	Hous	ing	2472975-X	Yes		A, B, C, Z	
	Wire	Seal	2472966-1	-		-	
<b>Š</b>	Cov	er	2472973-1	-		-	
Key Codes	A	В	с	D	E	z	
Suffix (tray)	-1	-2	-3	-4	-5	1 - / - 4	

All specifications subject to change. Consult TE Connectivity for latest specifications.

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# **GEMnet CONNECTOR SYSTEM PCB HEADERS**

UNSEALED	Ports	Orientation	Protection CAP	Part Number	Key Codes
	1	90°	No	2374901-X	A, B, C, D, E, Z
8	1	90°	No	2475960-X	A, B, C
<b>S</b>	1	180°	Yes	2421271-X	A,B,C,D,E,Z
<b>E</b>	1	180°	No	2-2397137-X	A,B,C,D,E,Z
<b>BC</b>	2	90°	No	2374902-X	A, B, C, D, E, Z
Co	2	180°	Yes	2464105-X	A,B,C,D,E,Z
ČC .	2	180°	No	2-2464105-X	A,B,C,D,E,Z
<b>X</b>	4	90°	No	2374900-X	A, B, C, D, E, Z
8	4	90°	No	2443956-X	A, B, C
ăa	4	180°	Yes	2463437-X	A,B,C,D,E,Z
800	6	90°	No	2397129-X	A, B, C, Z
0000	6	180°	Yes	2463460-X	A,B,C,D,E,Z
0000	6	180°	No	2-2463460-X	A,B,C,D,E,Z
Key Codes	A	В	C D	E	Z

-3

1 - / - 4

-5

-4

Suffix (tray)

-1

-2

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SEALED	Ports	Orientation	PN
õ	1	90°	2397320
	1	180°	2397248
	1	180°	2477126-1
88	4	90°	2397322
	1+6	180°	2472964-1

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# **GEMnet CONNECTOR SYSTEM CABLE ASSEMBLY**

1 port 180deg female / 1 port 180deg female
1 port 180deg male / 1 port 180deg female
1 port 180deg female pigtail
1 port 180deg male pigtail

Available cable types: UTP 100Mbps /STP 25Gbps

# **GEMnet CONNECTOR SYSTEM APPLICATION TOOLING**



Applicator PN	Platform	Terminal PN
3-2837976-2	OCEAN	2368028-1
3-2837970-2	OCEAN	2368031-1
3-2837971-2	OCEAN	2368012-1
3-2837968-2	OCEAN	2368028-1 (2368036 female outer jacket)





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