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GB/T 42691.4-2023

Road vehicles - Local Interconnect Network(LIN) - Part 4: Electrical physical layer (EPL) specification 12 V/24 V

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Foreword

This document was drafted in accordance with the rules provided in GB/T 1.1-2020 Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents.

This document is Part 4 of GB/T 42691 Road vehicles - Local Interconnect Network (LIN). The following parts have been issued for GB/T 42691:

-- Part 1: General information and use case definition;

-- Part 2: Transport protocol and network layer services;

-- Part 3: Protocol specification;

-- Part 4: Electrical physical layer (EPL) specification 12 V/24 V;

-- Part 5: Application programmers interface (API);

-- Part 6: Protocol conformance test specification;

-- Part 7: Electrical Physical Layer (EPL) conformance test specification;

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-- Part 8: Electrical physical layer (EPL) specification: LIN over DC powerline (DC-LIN).

This document is identical to ISO 17987-4:2016, Road vehicles - Local Interconnect Network (LIN) - Part 4: Electrical physical layer (EPL) specification 12 V/24 V.

1 Scope

This document specifies the 12 V and 24 V electrical physical layers (EPL) of the LIN communications system.

The electrical physical layer for LIN is designed for low-cost networks with bit rates up to 20 kbit/s to connect automotive electronic control units (ECUs). The medium that is used is a single wire for each receiver and transmitter with reference to ground. This document includes the definition of electrical characteristics of the transmission itself and also the documentation of basic functionality for bus driver devices.

All parameters in this document are defined for the ambient temperature range from -

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

IEC 61000-4-2, Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test

Note: GB/T 17626.2-2018, Electromagnetic compatibility (EMC) - Testing and measurement techniques - Electrostatic discharge immunity test (IEC 61000-4-2:2008, IDT)

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1

BR_Range_20K

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LIN systems which operate at speeds up to 20 kbit/s.

CMASTER and CSLAVE are defining the total node capacitance at the connector of an ECU

including the physical bus driver (transceiver) and all other components applied to the LIN bus pin such as capacitors or protection circuitry. The number of nodes in a LIN cluster shall not exceed 16. The network impedance may prohibit a fault-free communication under worst case conditions with more than 16 nodes. Every additional node lowers the network resistance by approximately 3 % (30 kohm || ~1 kohm).

5.3.7 12 V LIN systems: performance in non-operation supply voltage range

For VBAT > 18 V or VBAT < 8 V, the ECU may still operate, but communication is not guaranteed. If an ECU is not intending to transmit on the LIN bus (e.g., transmit input of a LIN transceiver is recessive), the LIN driver shall not drive the LIN bus to dominant state. If the LIN bus is in recessive state, the LIN receiver output shall provide a recessive state.

5.3.8 24 V LIN systems: performance in non-operation supply voltage range

For VBAT > 36 V or VBAT < 16 V for a BR_Range_20K system or for VBAT > 36 V or VBAT < 8 V for a BR_Range_10K system, the ECU may still operate, but communication is not guaranteed. If an ECU is not intending to transmit on the LIN bus (e.g., transmit input of a LIN transceiver is recessive), the LIN driver shall not drive the LIN bus to dominant state. If the LIN bus is in recessive state, the LIN receiver output shall provide a recessive state.

5.3.9.1 General requirements

All LIN device state changes on conditional events (e.g., temperature shutdown) shall be specified in the LIN device data sheet.

5.3.9.2 Loss of supply voltage connection or ground connection

ECUs with loss of connection to either supply voltage or ground shall not interfere with normal communication among the remaining LIN participants. Upon return of connection, normal operation shall resume without any intervention on the LIN bus line.

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5.3.9.3 12 V LIN systems: LIN systems bus wiring short to battery or ground

The network data communication may be interrupted but there shall be no damage to any ECU when the LIN bus line is shorted to either positive battery with less than 26.5 V or GND. Upon removal of the fault, normal operation shall resume without any intervention on the LIN bus line.

Note: The 26.5 V is specified to stay within the non-conducting range of the commonly used 27 V Zener stacks.

5.3.9.4 24 V LIN systems: LIN systems bus wiring short to battery or ground

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