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Road vehicles — Media Oriented Systems Transport (MOST) —

Part 8: 150-Mbit/s optical physical layer

Véhicules routiers — Système de transport axé sur les médias —

Partie 8: Couche optique physique à150-Mbit/s

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Contents

Page

Foreword

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This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

A list of all parts in the ISO 21806 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The Media Oriented Systems Transport (MOST) communication technology was initially developed at the end of the 1990s in order to support complex audio applications in cars. The MOST Cooperation was founded in 1998 with the goal to develop and enable the technology for the automotive industry. Today, MOST[1)] enables the transport of high quality of service (QoS) audio and video together with packet data and real-time control to support modern automotive multimedia and similar applications. MOST is a function-oriented communication technology to network a variety of multimedia devices comprising one or more MOST nodes.

Figure 1 shows a MOST network example.

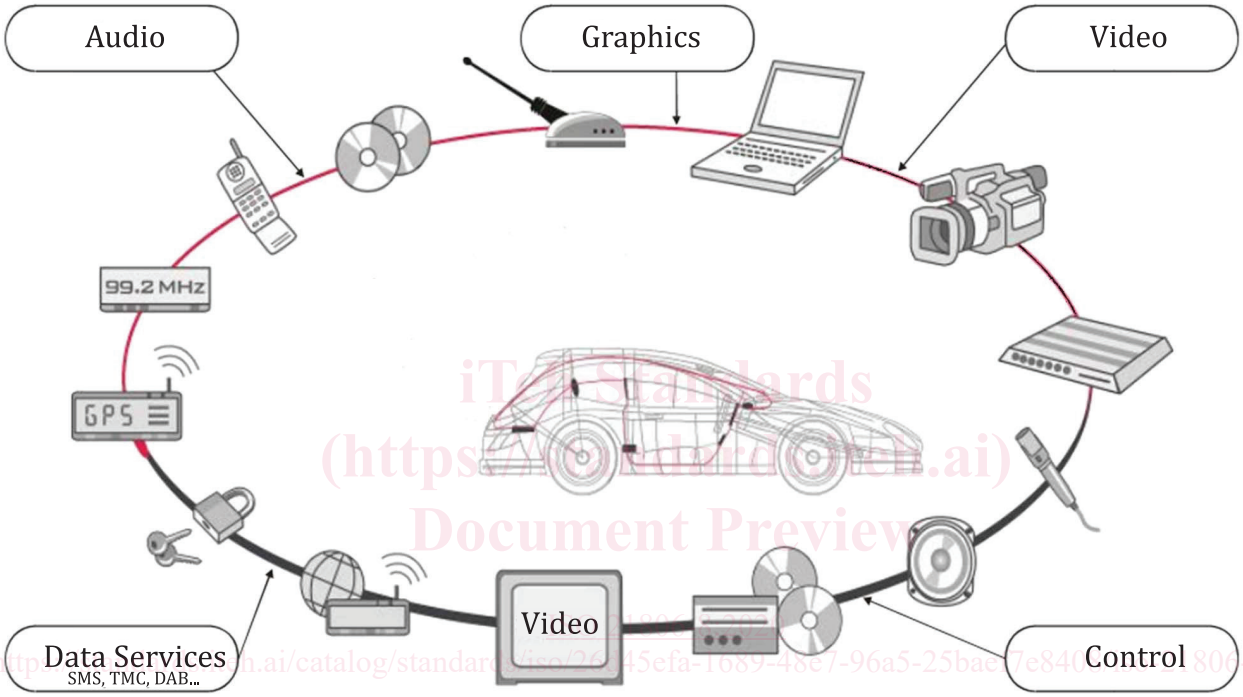

Figure 1 — MOST network example

The MOST communication technology provides:

— synchronous and isochronous streaming,

— small overhead for administrative communication control,

— a functional and hierarchical system model,

— API standardization through a function block (FBlock) framework,

— free partitioning of functionality to real devices,

— service discovery and notification, and

— flexibly scalable automotive-ready Ethernet communication according to ISO/IEC/IEEE 8802-3[4].

MOST is a synchronous time-division-multiplexing (TDM) network that transports different data types on separate channels at low latency. MOST supports different bit rates and physical layers. The network clock is provided with a continuous data signal.

1) MOST® is the registered trademark of Microchip Technology Inc. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO.

Within the synchronous base data signal, the content of multiple streaming connections and control data is transported. For streaming data connections, bandwidth is reserved to avoid interruptions, collisions, or delays in the transport of the data stream.

MOST specifies mechanisms for sending anisochronous, packet-based data in addition to control data and streaming data. The transmission of packet-based data is separated from the transmission of control data and streaming data. None of them interfere with each other.

A MOST network consists of devices that are connected to one common control channel and packet channel.

In summary, MOST is a network that has mechanisms to transport the various signals and data streams that occur in multimedia and infotainment systems.

The ISO standards maintenance portal (https://standards.iso.org/iso/) provides references to MOST specifications implemented in today's road vehicles because easy access via hyperlinks to these specifications is necessary. It references documents that are normative or informative for the MOST versions 4V0, 3V1, 3V0, and 2V5.

The ISO 21806 series has been established in order to specify requirements and recommendations for implementing the MOST communication technology into multimedia devices and to provide conformance test plans for implementing related test tools and test procedures.

To achieve this, the ISO 21806 series is based on the open systems interconnection (OSI) basic reference model in accordance with ISO/IEC 7498-1[2] and ISO/IEC 10731[3], which structures communication systems into seven layers as shown in Figure 2. Stream transmission applications use a direct stream data interface (transparent) to the data link layer.

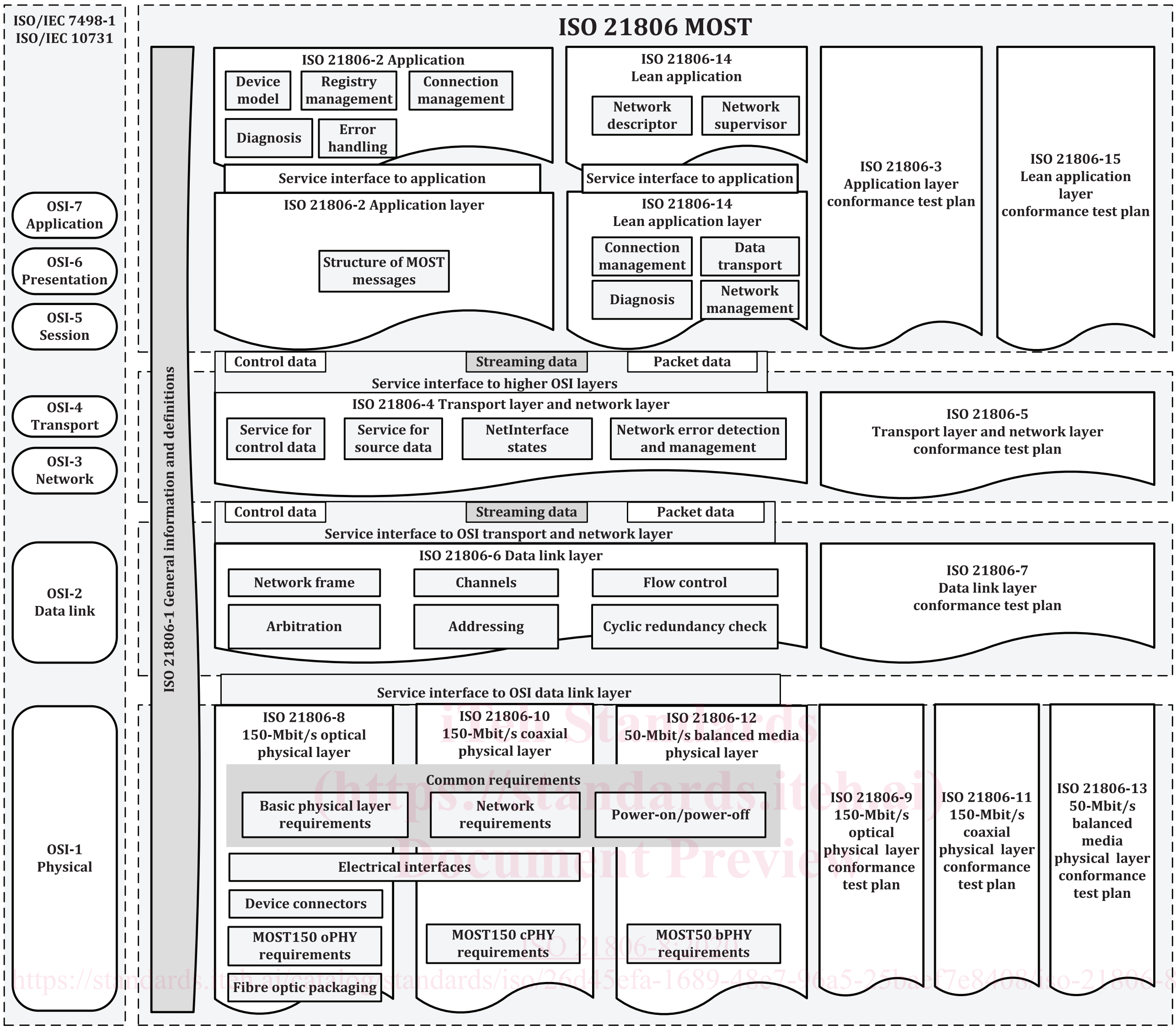

Figure 2 — The ISO 21806 series reference according to the OSI model

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Road vehicles — Media Oriented Systems Transport (MOST) —

Part 8:
150-Mbit/s optical physical layer

1 Scope

This document specifies the 150-Mbit/s optical physical layer for MOST (MOST150 oPHY), a synchronous time-division-multiplexing network.

This document specifies the applicable constraints and defines interfaces and parameters, suitable for the development of products based on MOST150 oPHY. Such products include fibre optical links and connectors, fibre optic receivers, fibre optic transmitters, electrical to optical converters, and optical to electrical converters.

This document also establishes basic measurement techniques and actual parameter values for MOST150 oPHY.

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 edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 21806-1, *Road vehicles — Media Oriented Systems Transport (MOST) — Part 1: General information and definitions*

IEC 60825-2, *Safety of laser products — Part 2: Safety of optical fibre communication systems (OFCS)*

JEDEC MS-013E[2], *Standard — Very Thick Profile, Plastic Small Outline (SO) Family, 1,27 mm pitch, 7,50 mm (.300 inch) Body Width*. B1R-PDSO/SOP/SOIC

JEDEC No. JESD8C.01[3], *Interface Standard for Nominal 3 V/3,3 V Supply Digital Integrated Circuits*

TIA/EIA-644-A[4], *Electrical Characteristics of Low Voltage Differential Signaling (LVDS) Interface Circuits*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21806-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

2) Available at https://www.jedec.org/.

3) Available at https://www.jedec.org/.

4) Available at https://www.tiaonline.org/standards/.

3.1
electrical to optical converter
EOC
MOST component that converts an electrical signal into an optical signal

3.2
MOST150 oPHY
150-Mbit/s optical physical layer

3.3
numerical aperture
NA
sine of the vertex angle of the largest cone of meridional rays that can enter or leave an optical system or element, multiplied by the refractive index of the medium in which the vertex of the cone is located

[SOURCE: IEC Electropedia, 731-03-85]

3.4
optical to electrical converter
OEC
MOST component that converts an optical signal into an electrical signal

3.5
pigtail
short length of optical fibre, permanently attached to a component and intended to facilitate jointing between that component and another optical fibre or component

[SOURCE: IEC Electropedia, 731-05-08, modified — The term was originally "optical fibre pigtail" and the Note 1 to entry has been deleted.]

4 Symbols and abbreviated terms

4.1 Symbols

---	empty cell/undefined
b_0	the optical signal level when a logic 0 is transmitted
b_1	the optical signal level when a logic 1 is transmitted
N_{BPF}	bits per frame
ρ_{Fs}	network frame rate
ρ_{BR}	bit rate
T_A	ambient temperature
t_{MDT}	TimingMaster delay tolerance
t_{UI}	unit interval
V_{OH}	output high voltage
V_{OL}	output low voltage

4.2 Abbreviated terms

BER	bit error rate
BPF	bits per frame
Cd[n]	condition
DC	direct current
DCA	DC adaptive
DDJ	data-dependant jitter
DLL	data link layer
DSV	digital sum value
ECU	electronic control unit
EOC	electrical to optical converter
EMC	electromagnetic compatibility
EMI	electromagnetic interference
FOR	fibre optic receiver
FOT	fibre optic transceiver
FOX	fibre optic transmitter
LS	low sensitivity
LVDS	Low Voltage Differential Signaling
NA	numerical aperture
N/A	not applicable
MNC	MOST network controller
OEC	optical to electrical converter
oPHY	optical physical layer
PCB	printed circuit board
PDF	probability density function
PHY	physical layer
PLL	phase locked loop
POF	polymer (plastic) optical fibre
RMS	root mean square
Rx data	MOST150 oPHY automotive encoded digital bit stream being received
SDA	serial data analyser

SP[n]	Specification Point
TDM	time-division-multiplexing
Tx data	MOST150 oPHY automotive encoded digital bit stream being transmitted
UI	unit interval

5 Conventions

This document is based on OSI service conventions as specified in ISO/IEC 10731[3].

6 Physical layer service interface to OSI data link layer

6.1 Overview

The physical layer (PHY) service interface specifies the abstract interface to the OSI data link layer (DLL), see ISO 21806-6[1].

6.2 Data type definitions

The data type `Enum` is defined as an 8-bit enumeration.

6.3 Event indications and action requests

6.3.1 P_EVENT.INDICATE

The PHY shall use `P_EVENT.INDICATE` to indicate the occurrence of an event to the DLL.

```
P_EVENT.INDICATE{
    PHY_Event
}
```

6.3.2 P_ACTION.REQUEST

`P_ACTION.REQUEST` shall trigger the execution of a request.

```
P_ACTION.REQUEST {
    PHY_Request
}
```

6.4 Parameters

6.4.1 PHY_Event

Table 1 specifies the `PHY_Event` parameter, which notifies the DLL about events.

Table 1 — Parameter passed from PHY to DLL

Parameter	Data type	Description

PHY_Event	Enum {
	PHY_Output_Off,
	PHY_Network_Activity
	}
		An event that is reported to the DLL.

Table 2 specifies the parameter values for the PHY_Event Enum.

Table 2 — PHY_Event Enum values

Enum value	Description
PHY_Output_Off	MNC transmit terminal switched off.
PHY_Network_Activity	Network activity detected at the MNC receive terminal.

6.4.2 PHY_Request

Table 3 specifies the PHY_Request parameter, which is passed from DLL to PHY.

Table 3 — Parameter passed from DLL to PHY

Parameter	Data type	Description

PHY_Request	Enum {
	cmd_Output_Off,
	cmd_Output_On,
	cmd_Open_Bypass,
	}
		A request from the DLL

Table 4 specifies the parameter values for the PHY_Request Enum.

Table 4 — PHY_Request Enum values

Enum value	Description
cmd_Output_Off	Switching off the MNC transmit terminal requested. By default, it is off.
cmd_Output_On	Switching on the MNC transmit terminal requested. By default, it is off.
cmd_Open_Bypass	Opening the bypass requested. By default, the bypass is closed.

7 Basic physical layer requirements

7.1 Logic terminology

7.1.1 Single-ended low-voltage digital signals

For the parameters provided in JEDEC No. JESD8C.01, Table 5 defines the corresponding terms for single-ended signals used in this document. These terms are used to describe the logic states of signals /RST and STATUS.

Table 5 — Terms for single-ended signals

Term	Corresponding JEDEC parameter
Low	V_{OL} (output low voltage)
Logic 0	
High	V_{OH} (output high voltage)
Logic 1	

7.1.2 Differential LVDS signals

TIA/EIA-644-A uses the labels A and B for the device output terminals; this document uses P and an N, respectively. Table 6 specifies the terms for LVDS signals. The terms correspond to the TIA/EIA-644-A specification.

Table 6 — Terms for LVDS signals

Term	Corresponding JEDEC parameter
Low	The P terminal shall be negative with respect to the N terminal for a binary 0 state.
Logic 0	
High	The P terminal shall be positive with respect to the N terminal for a binary 1 state.
Logic 1	

Since some of the MOST devices specified in this document use a tri-state LVDS interface, Table 7 specifies the terms for LVDS bus states.

Table 7 — Terms for LVDS bus states

Term	Corresponding TIA/EIA description
Disabled	The P and N terminals are in a high impedance state. If small leakage currents exist, they might cause an indeterminate voltage on the line/load.
Off	
Enabled	The P and the N terminals are driving the line/load. The outputs are at valid LVDS logic levels provided the input data is valid.
On	
Valid LVDS signal	Data or LVDS 0, according to LVDS voltage levels.

7.2 Specification points (SPs)

A physical connection of two MOST devices is called a link. Measurements are taken at specific locations along a link. These locations are called SPs. The location of the SPs is shown in Figure 3.