BS ISO 21806-8:2020

BSI Standards Publication

Road vehicles — Media Oriented Systems Transport (MOST)

Part 8: 150-Mbit/s optical physical layer

Documents
Document Sharing Hub

Full document details: BS ISO 21806-8:2020

National foreword

This British Standard is the UK implementation of ISO 21806-8:2020.

The UK participation in its preparation was entrusted to Technical Committee AUE/16, Data Communication (Road Vehicles).

A list of organizations represented on this committee can be obtained on request to its committee manager.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 539 03048 8

ICS 43.040.15

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2020.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS ISO 21806-8:2020

INTERNATIONAL STANDARD

ISO 21806-8

First edition
2020-10

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

Reference number
ISO 21806-8:2020(E)

Documents
Document Sharing Hub
© ISO 2020

Full document details: BS ISO 21806-8:2020

COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub

Full document details: BS ISO 21806-8:2020

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Symbols and abbreviated terms **2**
4.1 Symbols 2
4.2 Abbreviated terms 3
5 Conventions **4**
6 Physical layer service interface to OSI data link layer **4**
6.1 Overview 4
6.2 Data type definitions 4
6.3 Event indications and action requests 4
6.3.1 P_EVENT.INDICATE 4
6.3.2 P_ACTION.REQUEST 4
6.4 Parameters 4
6.4.1 PHY_Event 4
6.4.2 PHY_Request 5
7 Basic physical layer requirements **5**
7.1 Logic terminology 5
7.1.1 Single-ended low-voltage digital signals 5
7.1.2 Differential LVDS signals 6
7.2 Specification points (SPs) 6
7.3 Phase variation 7
7.3.1 General 7
7.3.2 Wander 7
7.3.3 Jitter 7
7.3.4 Clock recovery and reference clock 8
7.3.5 Link quality 9
7.3.6 MOST network quality 10
8 MOST150 oPHY requirements **14**
8.1 General MOST network parameters 14
8.1.1 MOST network coding 14
8.1.2 Specification Point details 15
8.2 Models and measurement methods 16
8.2.1 Golden PLL 16
8.2.2 Jitter filter 17
8.2.3 Retimed bypass mode and stress pattern 18
8.2.4 Optical signal level detection 18
8.2.5 Region of optical signal level detection 18
9 Link specifications **19**
9.1 General 19
9.2 Specification Point 1 (SP1) 19
9.3 Specification Point 2 (SP2) 21
9.3.1 Link quality parameters 21
9.3.2 Optical overshoot and undershoot 23
9.4 Specification Point 3 (SP3) 26
9.5 Specification Point 4 (SP4) 27
10 Power-on and power-off **28**
10.1 Frequency reference and power supply 28

AVA Documents
Document Sharing Hub

© ISO 2020 – All rights reserved

Full document details: BS ISO 21806-8:2020

10.2 Power supply monitoring circuitry 29
10.3 Optical and electrical signal power state 29
10.3.1 General 29
10.3.2 EOC requirements 29
10.3.3 EOC power-on and power-off sequence 31
10.3.4 OEC requirements 32
10.3.5 OEC power-on and power-off sequence 34

11 MOST network requirements 35
11.1 SP4 receiver tolerance 35
11.2 TimingMaster delay tolerance 36
11.3 Optical fibre link length requirement 36
11.4 Environmental requirements and considerations 36

12 Electrical interfaces 36
12.1 LVDS 36
12.2 Bit rate and frequency tolerance 37

13 FOT packaging 37
13.1 SMD package 37
13.1.1 SMD FOT package reference drawings 37
13.1.2 SMD FOT pinout 37
13.1.3 SMD OEC signal definitions 38
13.1.4 SMD EOC signal definitions 39
13.2 Through-hole mount (THM) package 39
13.2.1 THM FOT package reference drawings 39
13.2.2 THM FOT pinout 40
13.2.3 THM OEC signal definitions 40
13.2.4 THM EOC signal definitions 40
13.3 Small form connector 2+0 SMD 7-Pin-package 41
13.3.1 2+0 Small form connector SMD 7-Pin-package reference drawings 41
13.3.2 Small form connector 2+0 SMD 7-Pin-package FOT pinout 41
13.3.3 7-Pin OEC signal definitions 42
13.3.4 7-Pin EOC signal definitions 42
13.4 MOST150 FO-Transceiver THM 180° 43
13.4.1 MOST150 FO-Transceiver THM 180° reference drawings 43
13.4.2 MOST150 FO-Transceiver THM 180° FOT pinout 43
13.4.3 MOST150 FO-Transceiver THM 180° OEC signal definitions 43
13.4.4 MOST150 FO-Transceiver THM 180° EOC signal definitions 43
13.5 MOST150 FO-Transceiver SMD 90° 43
13.5.1 MOST150 FO-Transceiver SMD 90° reference drawings 43
13.5.2 MOST150 FO-Transceiver SMD 90° FOT pinout 43
13.5.3 MOST150 FO-Transceiver SMD 90° OEC signal definitions 44
13.5.4 MOST150 FO-Transceiver SMD 90° EOC signal definitions 44

14 Device connectors 45
14.1 Connector interfaces 45
14.2 Connector interface loss 45

Bibliography 47

© ISO 2020 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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.

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

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.

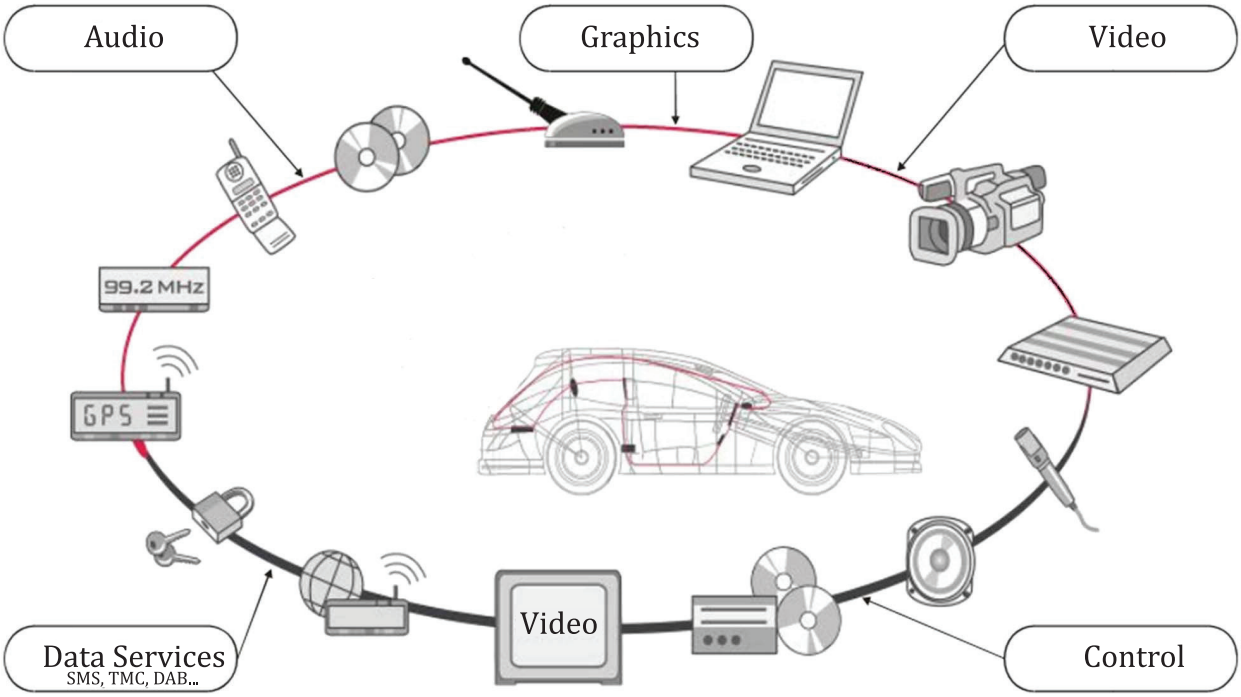


Figure 1 — MOST network example

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.

© ISO 2020 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

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.

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

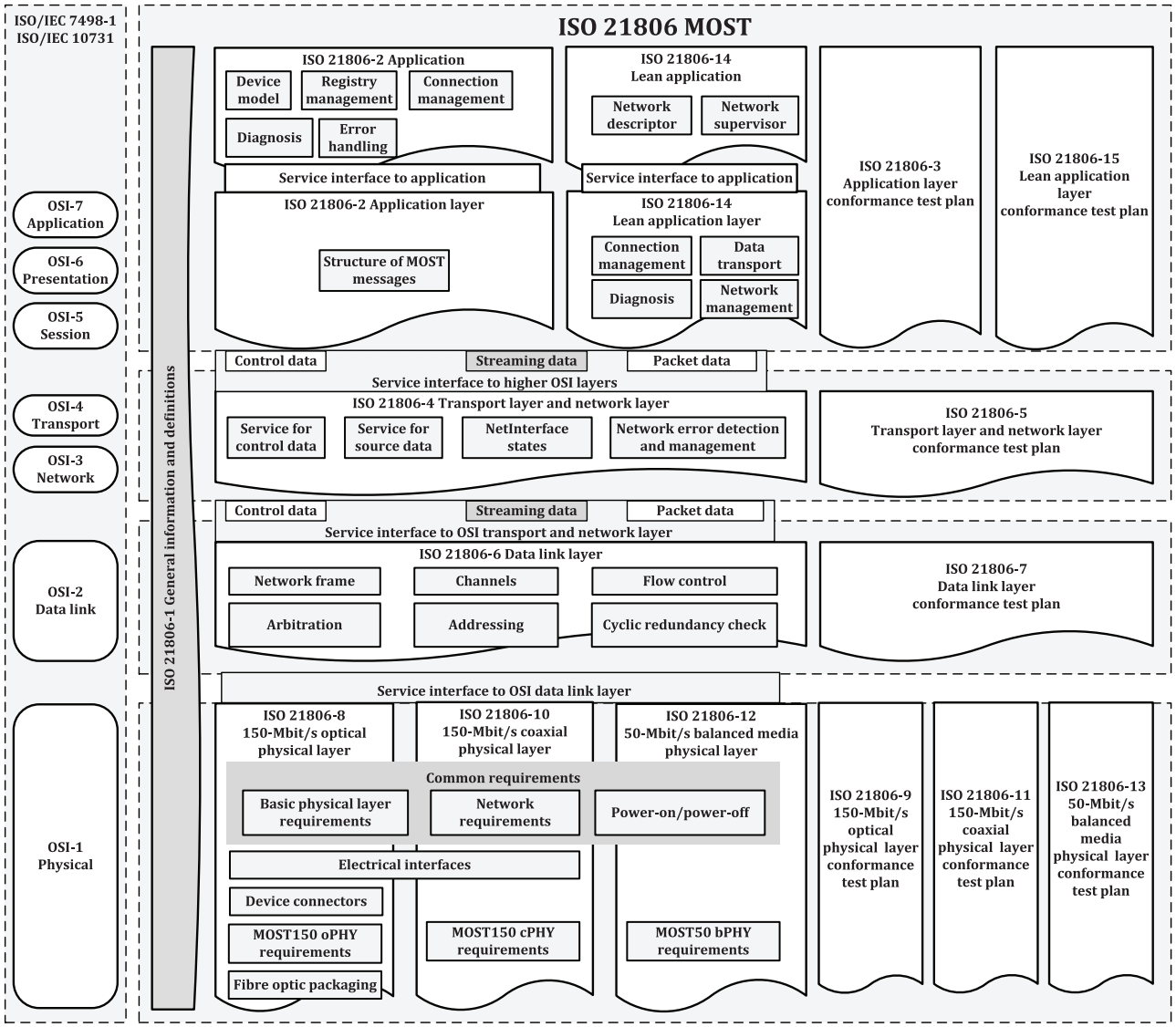


Figure 2 — The ISO 21806 series reference according to the OSI model

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent.

ISO takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO that he/she is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO. Information may be obtained from the patent database available at www.iso.org/patents.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those in the patent database. ISO shall not be held responsible for identifying any or all such patent rights.

© ISO 2020 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

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/.

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

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

© ISO 2020 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

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

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

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.

© ISO 2020 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

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.

© ISO 2020 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020

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.

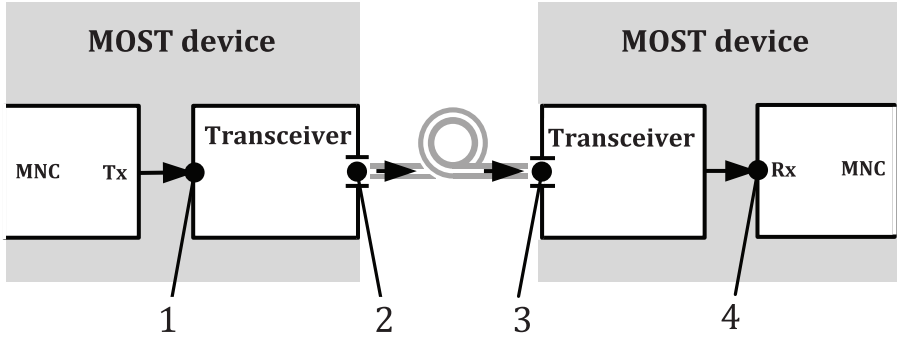
Table 7 — Terms for LVDS bus states

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.

© ISO 2020 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020



Key

1 specification point 1
2 specification point 2
3 specification point 3
4 specification point 4

Figure 3 — Location of SPs along a link

SPs define interfaces that are boundaries between a transmitting and a receiving MOST component. For each of those interfaces, a set of requirements and properties is defined (e.g. signal timing, signal amplitude, connector interface drawings). SP1 and SP4 are located between a MOST network controller (MNC) and the corresponding transceiver. SP2 and SP3 are located between transceivers and a wiring harness.

For MOST components that are located between two adjacent SPs, requirements and properties can be derived. The definitions of the second SP of the pair specify the component's output performance to be achieved, considering input conditions as defined in the first SP. For example, a transmit converter component specification can be derived from SP1 and SP2. Receive converter component requirements are covered by SP3 and SP4. Wiring harness requirements can be derived from SP2 and SP3.

In addition to the definitions of the SPs for a point-to-point link, this document defines requirements covering the stability of the MOST network. Examples are requirements regarding jitter transfer through MOST devices, jitter accumulation through the MOST network, and power state transitions.

The specified parameters in this document are minimum values to ensure functionality of the MOST network in a wide range of environmental conditions.

7.3 Phase variation

7.3.1 General

Phase variation is caused by data stream timing noise and distortion.

7.3.2 Wander

Wander is made up of any phase variation from 0 Hz to 10 Hz. All active MOST components in the MOST network create wander. Wander is a function of the temperature drift and propagates from node to node. Typically, wander does not affect alignment jitter eye masks.

NOTE It is possible that the wander impacts the TimingMaster.

7.3.3 Jitter

Jitter is any phase variation of frequencies above 10 Hz. Every MOST component and the transmission medium create jitter in the MOST network. Jitter is correlated or uncorrelated. The dominant jitter

© ISO 2020 – All rights reserved

AVA Documents Document Sharing Hub
Full document details: BS ISO 21806-8:2020

sources in the MOST network consist of PLL noise, link-induced DDJ, sensitivity-induced OEC noise, crosstalk, or phenomena such as power supply coupling. Data scrambling is used to eliminate DDJ correlation between nodes.

There are two jitter categories as shown in Figure 4:

— Alignment jitter: jitter that affects the reception of data by degrading the receiver eye diagram with horizontal closure (influences eye diagram measurement); it has impact only on a link as data recovery is performed by the MNC.

— Transferred jitter: jitter that is accumulated over all links (does not influence eye diagram measurement); the TimingMaster jitter tolerance shall be determined accordingly.

As the jitter on the measured signal increases, the eye closes more and more. A keep-out mask is specified to detect possible error traces. If the eye does not hit the mask then data recovery is ensured. Mask design depends on the required receiver margin and the characteristics of the channel.

Figure 4 shows the phase variation measurements.

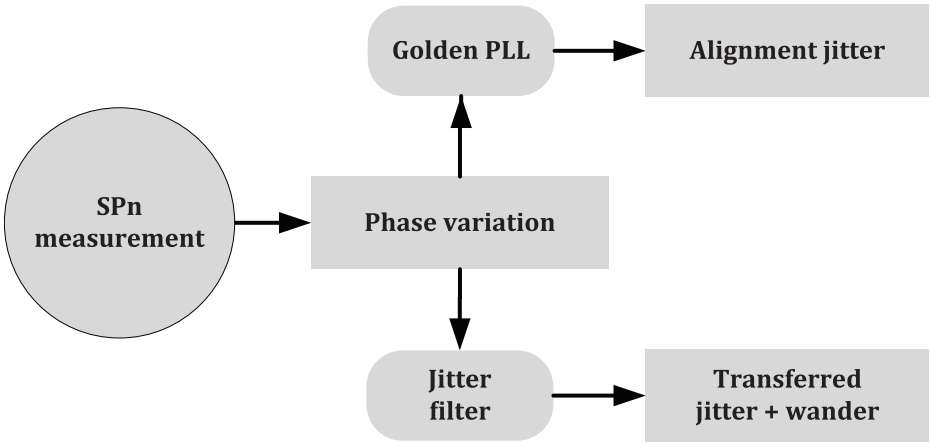


Figure 4 — Phase variation measurements

7.3.4 Clock recovery and reference clock

7.3.4.1 General

Phase variation can be measured directly on a data stream. To view alignment jitter and transferred jitter independently, special tools are required.

All MOST networks contain one device that implements the TimingMaster, which creates the reference clock. This clock is embedded within the data stream. All other MOST devices contain TimingSlaves that recover the clock from the data stream. Therefore, clock recovery is a basic functionality of an MNC. MOST components add a phase variation to the data stream. This degrades the reference clock.

Receiver jitter tolerance and jitter transfer are basic operation properties of any MNC. Alignment jitter is measured by means of an eye diagram formed with a Golden PLL. Transferred jitter is measured with a jitter filter.

Figure 5 illustrates clock recovery and data recovery in an MNC. Therefore, there is a need for a Golden PLL model and a jitter filter model. Together they reflect the required jitter behaviour of an MNC.

© ISO 2020 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 21806-8:2020