INTERNATIONAL STANDARD

ISO 11898-6

First edition
2013-11-01

Road vehicles — Controller area network (CAN) —

Part 6: High-speed medium access unit with selective wake-up functionality

Véhicules routiers — Gestionnaire de réseau de communication CAN — Partie 6: Unité d'accès au médium haute vitesse avec fonctionnalité de réveil sélectif

Reference number
ISO 11898-6:2013(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO 11898 consists of the following parts, under the general title *Road vehicles — Controller area network (CAN)*:

— *Part 1: Data link layer and physical signalling*

— *Part 2: High-speed medium access unit*

— *Part 3: Low-speed, fault-tolerant, medium-dependent interface*

— *Part 4: Time-triggered communication*

— *Part 5: High-speed medium access unit with low-power mode*

— *Part 6: High-speed medium access unit with selective wake-up functionality*

Introduction

This International Standard was first published as one document in 1993. It covered the controller area network (CAN) data link layer, as well as the high-speed physical layer.

In the reviewed and restructured ISO 11898 series:

— ISO 11898-1 describes the data link layer including the logical link control (LLC) sublayer and the medium access control (MAC) sublayer as well as the physical signalling (PHS) sublayer;

— ISO 11898-2 defines the high-speed medium access unit (MAU);

— ISO 11898-3 defines the low-speed fault-tolerant medium access unit (MAU);

— ISO 11898-4 defines the time-triggered communication;

— ISO 11898-5 defines the power modes of the high-speed medium access unit (MAU);

— ISO 11898-6 defines the selective wake-up functionality of the high-speed medium access unit (MAU).

Road vehicles — Controller area network (CAN) —

Part 6: High-speed medium access unit with selective wake-up functionality

1 Scope

This part of ISO 11898 specifies the controller area network (CAN) physical layer for transmission rates up to 1 Mbit/s. It describes the medium access unit (MAU) functions.

This part of ISO 11898 represents an extension of ISO 11898-2 and ISO 11898-5, specifying a selective wake-up mechanism using configurable CAN frames.

Physical layer implementations according to this part of ISO 11898 are compliant with all parameters of ISO 11898-2 and ISO 11898-5. Implementations according to this part of ISO 11898, ISO 11898-2, and ISO 11898-5 are interoperable and can be used at the same time within one network.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7637-3, *Road vehicles — Electrical disturbances from conduction and coupling — Part 3: Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines*

ISO 11898-1, *Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signalling*

ISO 11898-2:2003, *Road vehicles — Controller area network (CAN) — Part 2: High-speed medium access unit*

ISO 11898-5:2007, *Road vehicles — Controller area network (CAN) — Part 5: High-speed medium access unit with low-power mode*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11898-1, ISO 11898-2, and ISO 11898-5 and the following apply.

3.1
bias unit
subpart of the transceiver which provides the biasing voltage

Note 1 to entry: Figure 1 depicts the subparts of a transceiver.

3.2
bit rate
number of bits per time during transmission, independent of bit representation

3.3
CAN node
communication participant of the CAN system which contains typically a transceiver, a CAN controller, and a processing unit

3.4
CAN controller
subpart of a CAN node which implements the data link layer protocol and the physical signalling as defined in ISO 11898-1

3.5
data mask bit
optional configuration bit to disable the data length code (DLC) and data field judgment for the wake-up frame validation

3.6
decoding unit
subpart of the control unit with selective wake-up function which analyses the CAN communication to detect wake-up frames

Note 1 to entry: Figure 1 depicts the subparts of a transceiver.

3.7
mode control unit
subpart of the transceiver with selective wake-up function which controls all functions and other subparts of a transceiver

Note 1 to entry: Figure 1 depicts the subparts of a transceiver.

3.8
selective wake-up
functionality of a transceiver to make the operation of a CAN system with partial networking possible

3.9
receiver
subpart of the transceiver which is responsible to transform physical bus signals to logical signals and provides them to the CAN controller

Note 1 to entry: Figure 1 depicts the subparts of a transceiver.

3.10
transceiver
component that adapts logical signals to the physical layer and vice versa

Note 1 to entry: Figure 1 depicts the subparts of a transceiver.

3.11
transmitter
subpart of a transceiver which is responsible to transform logical signals to physical bus signals and sets them on the bus

Note 1 to entry: Figure 1 depicts the subparts of a transceiver.

3.12
CAN activity filter time (of a CAN node)
t_{Filter}
duration of dominant and recessive bus-levels on the bus lines CAN_H and CAN_L for detecting activity on the CAN bus

3.13
wake-up frame
CAN frame which causes a wake-up of one or more CAN nodes after being analysed

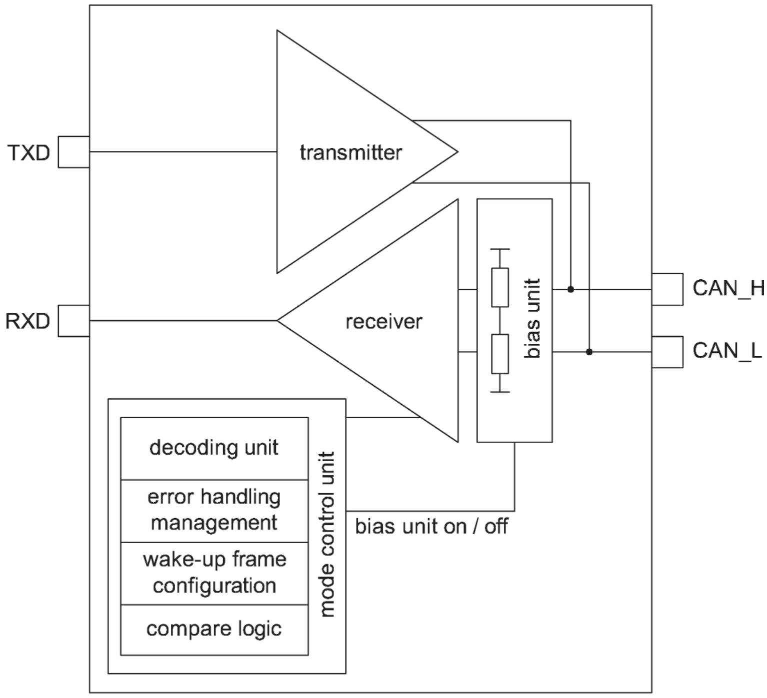

Figure 1 — Subparts of a transceiver

3.14
wake-up pattern
two periods of dominant bus-levels, separated by a period of recessive bus-level each of at least t_{Filter}

4 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms given in ISO 11898-1, ISO 11898-2, and ISO 11898-5 and the following apply.

ID	Identifier field
PHS	Physical signalling
R_{IN}	Internal receiver input resistors
V_{CAN_H}	Voltage on CAN_H bus line
V_{CAN_L}	Voltage on CAN_L bus line
V_{diff}	Differential CAN voltage (= $V_{CAN\_H} - V_{CAN\_L}$)
WUF	Wake-up frame
WUP	Wake-up pattern

5 Functional description of medium access unit (MAU) with selective wake-up functionality

5.1 General

This specification discloses the respective hardware functionalities for CAN high-speed transceivers with selective wake-up capability. The transceivers with this capability shall be interoperable with CAN transceivers according to ISO 11898-2 and ISO 11898-5 (for details, see Clause 7).

If CAN transceivers with selective wake-up function are used, it is possible to define sub-networks of nodes, which only change to active state if they receive a configured wake-up frame.

The node state is changed from inactive to active only if the transceiver has received a frame and accepted it as a wake-up event. Acceptance of a CAN frame as a wake-up event is done by the mode control unit of the transceiver by comparing configured and received ID and, if not disabled, DLC and data. Configuration is done via implementation specific interfaces (e.g. host interface). In case of erroneous communication, the transceiver shall wake-up upon or after an overflow of the internal error counter.

CAN transceivers with selective wake-up function are able to recognize and decode CAN frames by the decoding unit. An automatic voltage biasing function at CAN_H and CAN_L is used in CAN transceivers with selective wake-up function.

5.2 Compliance classes

The following compliance classes are defined.

— Compliant to ISO 11898-6:

The CAN transceiver fulfils all requirements of this part of ISO 11898.

— Compliant to automatic voltage biasing as defined in ISO 11898-6:

The CAN transceiver fulfils only the requirements of the automatic voltage biasing at the CAN pins (see 5.4.3.2).

5.3 Configuration and status data

5.3.1 General

The transceiver shall support read access to all its configuration data.

5.3.2 List of configuration data

The following configuration data are given.

— ID (mandatory)

— ID mask (mandatory)

— DLC (mandatory)

— Data field bits (mandatory)

— Bit rate (mandatory)

— Data mask bit (optional)

— Frame error counter overflow threshold value (optional)

5.3.3 List of status data

Furthermore, the following status data are defined.

— Frame error counter value (optional)

5.3.4 Optional support of data mask bit

Optionally, a data mask bit can be implemented to indicate if the DLC and data field bits shall be part of the WUF validation (data mask bit set) or if only the ID field shall be considered for the WUF validation (data mask bit not set).

If the data mask bit is not implemented, the DLC and data field bits shall be part of the WUF validation.

5.4 Physical medium attachment sublayer specification

5.4.1 General

Two different termination models are recommended for the high-speed medium access unit according to Figure 2:

— termination with single resistor between CAN_H and CAN_L;

— split termination dividing the single resistor into two resistors with same value in series connection, while the centre tap is connected to a grounding capacitor and optionally to a dedicated split supply.

Figure 2 — Termination variants, single-resistor termination, and split termination

In order to support low-power functionality, two different modes of operation are defined as follows.

— Normal mode: (as defined in ISO 11898-2)

— Low-power mode, which is split into the two following sub-states:

  — without selective wake-up function: (as defined in this part of ISO 11898 and in ISO 11898-5)

  — with selective wake-up function: (as defined in this part of ISO 11898)

5.4.2 Bus levels during normal mode

The CAN bus lines have one of the two logical states: recessive or dominant (see Figure 3).

The bus lines are in recessive state if the transmitters of all CAN nodes are switched off. In this case, the mean bus voltage is generated by the termination and by the internal resistance of each CAN node's receiver. In the recessive state, V_{CAN_H} and V_{CAN_L} are fixed to a mean voltage level determined by the bus termination. V_{diff} is less than a maximum threshold. The recessive state is transmitted during bus idle (see ISO 11898-1) or a recessive bit. Figure 3 illustrates the maximum allowed differential recessive bus voltage. Typically, the differential voltage is about 0 V.