ISO 11898-1:2024-05 (E)

Road vehicles - Controller area network (CAN) - Part 1: Data link layer and physical coding sublayer

Contents

Page

Foreword v

Introduction vi

1 Scope 1

2 Normative references 1

3 Termsanddefinitions 1

4 Symbols and abbreviated terms 6

5 Basic concepts of CAN 8
5.1 CAN properties 8
5.2 Frame transmissions 9
5.3 Bus access method 11
5.4 Information routing 11
5.5 Network flexibility 11
5.6 Remote data request 11
5.7 Error detection 11
5.8 Error signalling and recovery time 11
5.9 Fault confinement 12
5.10 Error-active 12
5.11 Error-passive 12
5.12 Bus-off 12
5.13 ACK 12
5.14 Repetition of transmission attempts 12
5.15 Network-wide data consistency 12
5.16 Switchable operating modes of the PMA 13
5.17 Bus states and MAC sub-layer phases 13

6 CANDLLspecification 14
6.1 General 14
6.2 Time stamping 14
6.3 DLL protocol 14
6.4 LLC sub-layer 15
6.4.1 Overview 15
6.4.2 Notifications 16
6.4.3 Structure of LLC frames 16
6.4.4 Limited LLC frames 17
6.4.5 Services of LLC sub-layer 17
6.5 Functions of the LLC sub-layer 21
6.5.1 General 21
6.5.2 Flow control on re-arbitration 21
6.5.3 Flow control on retransmission 21
6.5.4 Frame acceptance filtering 22
6.5.5 Overload notification 22
6.5.6 Recovery management 22
6.5.7 Time stamping 22
6.6 MAC sub-layer 23
6.6.1 Functions and rules 23
6.6.2 Services of the MAC sub-layer 23

6.6.3 Time reference points ... 23
6.6.4 Functional model of MAC sub-layer architecture ... 23
6.6.5 Specification of EF ... 27
6.6.6 Specification of OF ... 28
6.6.7 Inter-frame space specification ... 28
6.6.8 SOF ... 30
6.6.9 Elements of the MAC frame ... 30
6.6.10 MAC frame in CBFF and CEFF ... 31

6.6.11 MAC frame in FBFF and FEFF ... 33
6.6.12 MAC frame in XLFF ... 37
6.6.13 MAC frame coding ... 42
6.6.14 Data frame acknowledgement ... 43
6.6.15 Frame validation ... 43
6.6.16 Order of bit transmission ... 43
6.6.17 Medium access method ... 43
6.6.18 MAC data consistency ... 45
6.6.19 Restricted operation ... 45
6.6.20 Bus monitoring ... 45
6.6.21 Error handling and overload handling ... 45

7 PLspecifications ... 49
7.1 General and functional modelling ... 49
7.2 Services of the PCS interface ... 50
7.2.1 Requirements ... 50
7.2.2 PCS_Data.Request ... 50
7.2.3 PCS_Data.Indicate ... 50
7.2.4 PCS_Mode.Request ... 50
7.2.5 PCS_Status.Transmitter ... 51
7.2.6 PCS_Status.Receiver ... 51
7.3 PCS ... 51
7.3.1 Bit encoding/decoding ... 51
7.3.2 Bit time ... 51
7.3.3 Configuration of the bit time parameters ... 55
7.3.4 Transmitter delay compensation ... 56
7.3.5 Synchronization ... 58
7.3.6 Tolerance range of the oscillator frequencies ... 60
7.4 Attachment unit interface ... 61
7.4.1 General ... 61
7.4.2 PCS to PMA symbols ... 61
7.4.3 PMA to PCS symbol ... 62
7.5 PWM encoding ... 62
7.5.1 General function and definitions ... 62
7.5.2 PCS without PWM encoding ... 63
7.5.3 PCS sub-layer with PWM encoding ... 63

8 Description of supervisor FCE ... 66
8.1 Fault confinement ... 66
8.1.1 Objectives ... 66
8.1.2 Strategies ... 66
8.1.3 Fault confinement interface specification ... 66
8.1.4 Rules of fault confinement ... 69
8.1.5 Node start-up ... 71
8.2 Bus failure management ... 71

Annex A (normative) CAN FD light -- Data link layer and physical coding sub-layer requirements of responder nodes ... 72

Annex B (informative)Configurationinterface ... 80

Annex C (informative) Additional information ... 81

Bibliography ... 82