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Peripheral Sensor Interface for Automotive Applications

Substandard Powertrain

1 Introduction

One significant feature of the PSI5 V2.0 is the implementation of alternative PSI5 physical and Data Link Layer parameters motivated by extended application requirements. In addition to the base standard application specific frameworks and conditions are given in corresponding substandards, where recommended operation modes and system configurations are given, as well as forbidden configurations are excluded.

Please be aware, that not every feature can be combined among one other. Hence it is in responsibility of the system vendor to evaluate which feature is necessary to fulfill the system requirements and assure that the combination of features is compatible.

This substandard is effective with the PSI5 Base standard V2.0 and is valid for all powertrain components.

The document is structured similar to the PSI5 V2.0 Base Specification Standard: Chapter 2 gives recommended operation modes, whereas Chapter 3 and 4 define details of the Sensor to ECU, or the ECU to sensor communication, respectively. Chapter 5 describes Application Layer Implementations and in Chapter 6 specific system parameters for powertrain applications are given.

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2 Operation Modes

The following table shows the possible operation modes for use in powertrain applications.

Communication Modes	
A	Asynchronous Mode
P	Synchronous Parallel Bus Mode
V	Variable Synchronous Bus Mode
Error Detection	
CRC	Three Bits Cyclic Redundancy Check
Bit Rate	
L	125 kbps
Cycle time	
tttt	cycle time in µs (e.g. 500)
	or minimum allowed cycle time in µs for variable time triggered operation (e.g.. 228)

The above selected operation modes exclude the use of synchronous daisy chain bus mode (PSI5-D) and defines a 125kbps data rate and a maximum of six time slots per sync period.

3 Sensor to ECU communication

Basically the full data range as specified in PSI5 V2.0 Base Standard can be applied.
Unless otherwise defined by the application the recommended data frame comprises a 15bit payload data region with two start bits and three CRC bits for error detection. The payload data region is composed of a 12bit Data Region A, 2 messaging and one Status bit.

Bits	function	Number of bits
M0 … M1	Serial messaging channel	2
E0	status	1
A0 … A11	Sensor Data [Data region A]	12

4 ECU to Sensor (bidirectional) communication

The ECU to Sensor Communication is to be realized using the “Pulse Width” method as specified in PSI5 V2.0 Base Standard. Frame format for the ECU to sensor communication is Frame 4 "XXLong" according to the PSI5 V2.0 Base Document.
Synchronization pulses with a pulse width beyond the specified range (sync signal sustain time <16µs or >62µs) are ignored by the sensor.

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5 Application Layer Implementations

5.1 Sensor start up an identification

Sensor start up and identification is executed in Serial Channel Method according to PSI5 V2.0 Base Standard. During initialization phase I the only data transmitted is the meta information header. Furthermore the ECU can perform a connectivity test or a sensor self test is executed.

	Initialisation Phase I	Run Mode
Duration of initialization phases	<10ms	Parallel transmission of measurement and initialization data

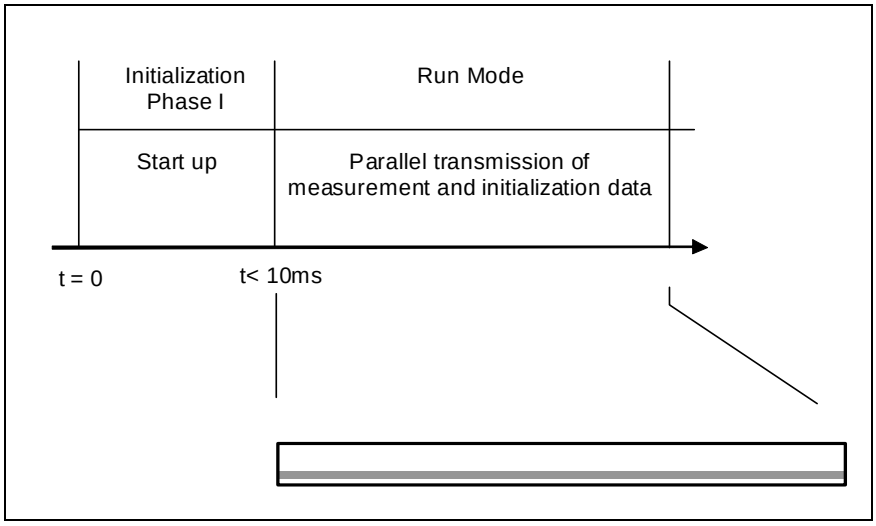

Figure 1 Initialization of the sensor

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6 Physical Layer - Parameter Specification

The PSI5 implementation can be made with hereafter listed selected parameters by either applying the "Common Mode" or the "Low Power Mode" as specified in PSI5 V2.0 Base Standard.

Common Mode

- Supply Voltage: $V_{CE, min}$ = 4.2V; $V_{SS, min}$ = 4.0V
- Sync signal sustain voltage V_{t2} = 2.5V
- Internal ECU Resistance $R_{E, max}$ = 9.5Ω

Due to standard sensor sink signal current in combination with low supply voltage, special attention needs to be taken concerning sensor power dissipation and supply voltage ripples.

Low power mode

- Supply Voltage: $V_{CE, min}$ = 4.2V; $V_{SS, min}$ = 4.0V
- Sync signal sustain voltage V_{t2} = 2.5V
- Internal ECU Resistance $R_{E, max}$ = 9.5Ω

7 Document History & Modifications

Rev.N°	Chapter	Description / Changes	Date
2.0	all	First Release of Powertrain Substandard; Revision Number of corresponding PSI5 Base Document adopted	01.06.2011

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