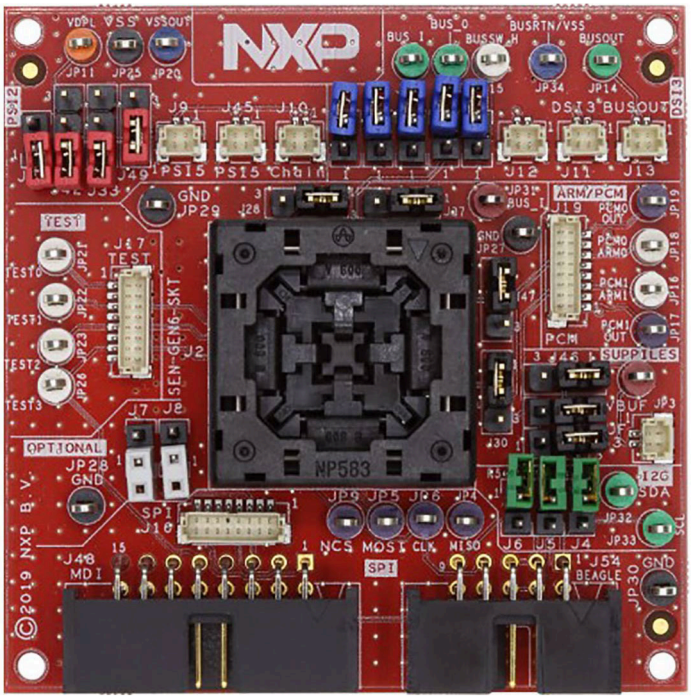
UM11559

SEN-GEN6-SKT user manual

Rev. 1 — 5 January 2021 User manual



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Document information

Info	Content
Keywords	SEN-GEN6-SKT, socket evaluation board
Abstract	User manual

1 Introduction

1.1 SEN-GEN6-SKT Kit

The SEN-GEN6-SKT board is a socket kit designed to evaluate the FXLS9xxxx, and FXPS7xxxx sensors.

The board supports different communication configurations such as SPI, I²C, DSI3 or PSI5. Before inserting a device into the socket, make sure you have properly configured the board to support the desired protocol.

This user manual describes the different options.

1.1.1 Kit contents

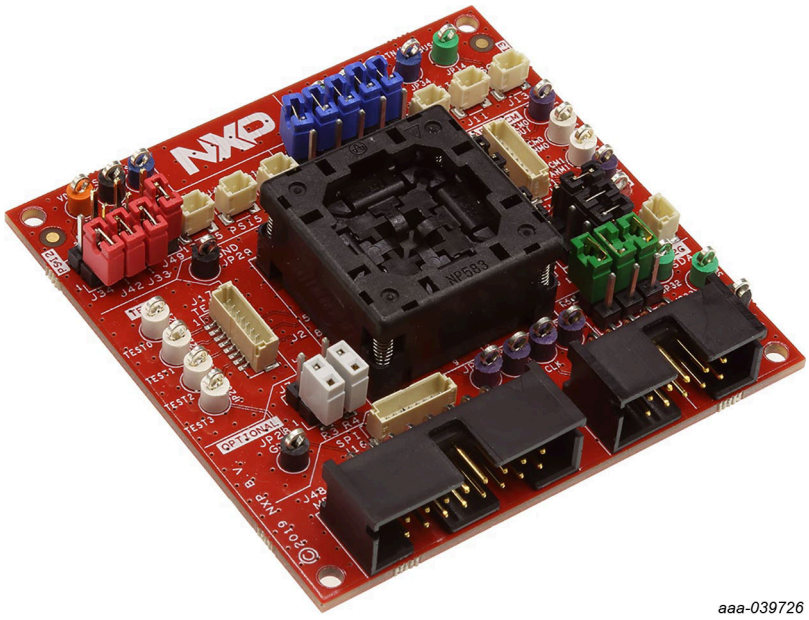

Figure 1. Sensor Socket board (SEN-GEN6-SKT)

Content of the Kit:

- One automotive Sensor Socket board (SEN-GEN6-SKT)
- Four red jumpers
- Two white jumpers
- Five blue jumpers
- Three green jumpers
- Seven purple jumpers

1.1.2 Schematic

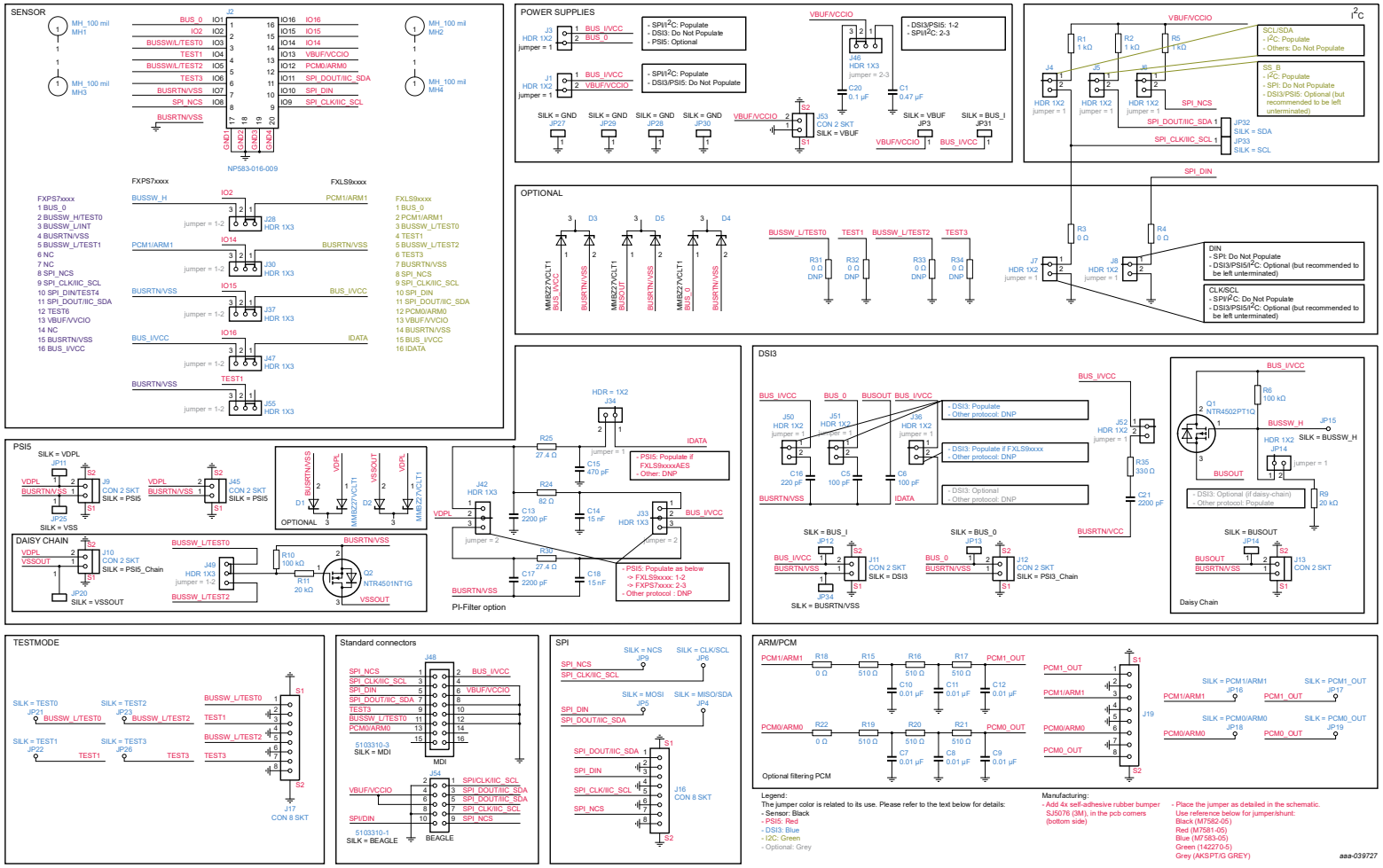

Figure 2. Schematic

1.1.3 Component mapping

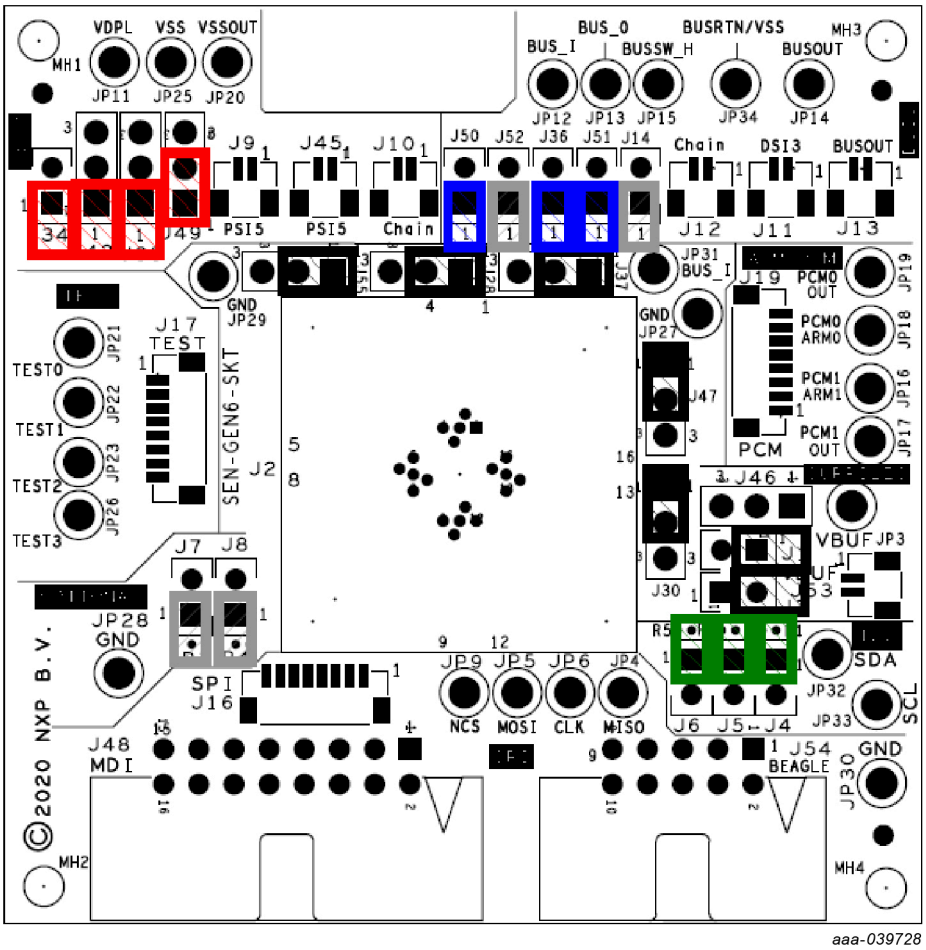

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Figure 3. Component mapping

2 Getting started with the SEN-GEN6-SKT board

2.1 Order an FXLSxxxx sensor

Order any FXLSxxxxx sensors from www.nxp.com or through our distributors.

Table 1. FXLSxxxxx parts list

Device	Variation	Protocol
FXLS90322	XY – MM	SPI, DSI3
FXLS90422	XZ – MM	SPI, DSI3
FXLS90333	XY – HH	SPI, DSI3
FXLS90433	XZ – HH	SPI, DSI3
FXLS93322	XY – MM	PSI5
FXLS93422	XZ – MM	PSI5
FXLS93333	XY – HH	PSI5
FXLS93433	XZ – HH	PSI5
FXLS90220	X – M	SPI, DSI3
FXLS90230	X – H	SPI, DSI3
FXLS90120	Z – M	SPI, DSI3
FXLS90130	Z – H	SPI, DSI3
FXLS93220	X – M	PSI5
FXLS93230	X – H	PSI5
FXLS93120	Z – M	PSI5
FXLS93130	Z – H	PSI5
FXPS7115D4	40 – 115 kPa	SPI
FSPS7115DS4T1	40 – 115 kPa	SPI
FSPS7115DI4T1	40 – 115 kPa	I^2C
FXPS7140D4	40 – 140 kPa	DSI3
FXPS7140P4	50 – 126 kPa	PSI5
FXPS7165DS4T1	60 – 165 kPa	SPI
FXPS7165DI4T1	60 – 165 kPa	I^2C
FXPS7250DS4T1	20 – 250 kPa	SPI
FXPS7250DI4T1	20 – 250 kPa	I^2C
FXPS7400DS4T1	20 – 400 kPa	SPI
FXPS7400DI4T1	20 – 400 kPa	I^2C
FXPS7550DS4T1	20 – 550 kPa	SPI
FXPS7550DI4T1	20 – 550 kPa	I^2C

2.2 Order a kit

To order a socket board, visit http://www.nxp.com/SEN-GEN6-SKT.

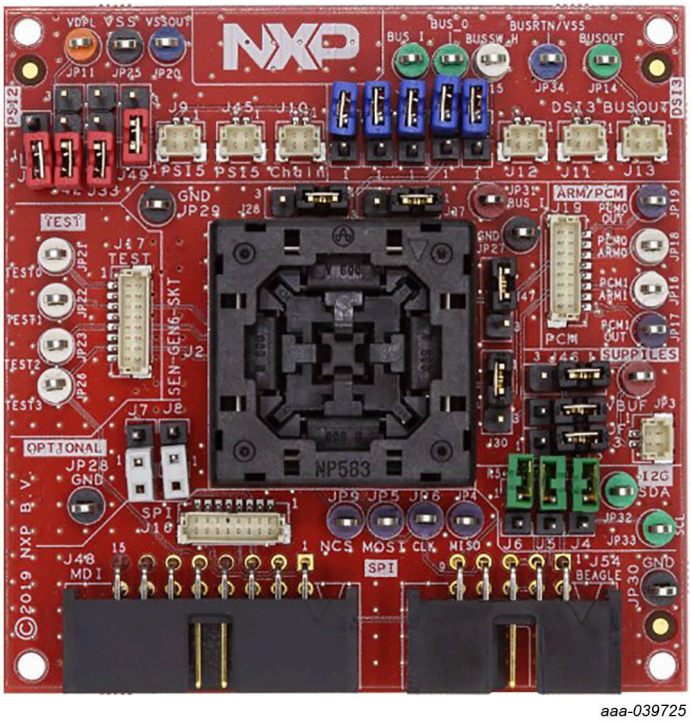

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Figure 4. SEN-GEN6-SKT board

2.3 Configure the board

The board supports the FXLS9xxxx, and FXPS7xxxx sensor families.

For easier board configuration, the jumpers have been colored per category/protocol. They are listed below:

- Sensor compatibility or power supply related: **black**
- I²C: **green**
- DSI3: **blue**
- PSI5: **red**
- SPI: N/A

By default, the board is configured for FXLS9xxxx devices in SPI mode. However, the configuration can easily be modified using the jumpers.

By default, most jumpers are floating. Floating means they are attached to their proper connector but remain unconnected. The reference to "DNP" means “Do not populate”, meaning it can be removed or unshorted.

2.3.1 FXLS9xxxx (default) or FXPS7xxxx

Table 2 identifies the proper jumper settings for family compatibility.

Table 2. Family compatibility

Jumper reference	Jumper position	
	FXLS9xxxx compatibility	FXPS7xxxx compatibility
J28	1-2	2-3
J30	1-2	2-3
J37	1-2	2-3
J47	1-2	2-3
J55	1-2	2-3

There are four possible configurations depending on the bus communication protocol needs of the user.

2.3.2 SPI (default)

By default, the board is configured to support SPI communication. NXP recommends configuring J1, J3, and J36 as non-floating potentials on the sensor supply pins. Refer to the product data sheet.

Ensure that J4, J5, and J6 are not populated (pull-up resistors). J7 and J8 must remain floating for SPI mode.

Table 3. SPI mode jumper configuration

Jumper reference	Jumper position	Description
J3	1-2	Connect BUS_I/VCC to VBUF_VCCIO
J1	(1-2)	Connect BUS_I/VCC to BUS_O (optional)
J36	(1-2)	Connect BUS_I/VCC to IDATA (Optional)
J46	2-3	VCC with 1 µF capacitor
J4	1 or DNP	Floating
J5	1 or DNP	Floating
J6	1 or DNP	Floating
J7	1 or DNP	Floating
J8	1 or DNP	Floating

2.3.3 I²C

In order to configure I²C mode, begin with the SPI mode configuration and add pull-up resistors on SDA, SCL, and the CS pins.

If the I²C lines are already driven by the MCU (shared pull-up), NXP recommends leaving J4 and J6 unpopulated.

Table 4. I²C mode jumper configuration

Jumper reference	Jumper position	Description
J3	1-2	Connect BUS_I/VCC to VBUF_VCCIO
J1	(1-2)	Connect BUS_I/VCC to BUS_O (optional)

Table 4. I²C mode jumper configuration*...continued*

Jumper reference	Jumper position	Description
J36	(1-2)	Connect BUS_I/VCC to IDATA (Optional)
J46	2-3	VCC with 1 µF capacitor
J4	1-2	Add pull-up resistor on I²C SLC signal
J5	1-2	Add pull-up resistor on I²C SDA signal
J6	1-2	Add pull-up resistor on SS_B signal
J7	1 or DNP	Floating
J8	1 or DNP	Floating

2.3.4 DSI3

The communication interface between an ECU device (such as MC33SA0528AC) and the sensor device in DSI3 mode is established via a DSI3 compatible two-wire interface, with parallel or serial (daisy-chain) connections to the satellite modules.

Table 5. DSI3 mode jumper configuration

Jumper reference	Jumper position	Description
J1	1 or DNP	Floating
J3	1 or DNP	Floating
J46	2-3	BUS_I/VCC with 0.47 µF capacitor
J36	1-2	Connect BUS_I/VCC to IDATA
J50	1-2	Add 100 pF cap between BUS_O and BUSRTN
J51	1-2	Add 200 pF cap between BUS_I/VSS and BUSRTN
J52	(1-2)	Optional EMC filter
J8	1 or DNP	Floating

2.3.5 PSI5

The communication interface between an ECU device and this sensor device in PSI5 mode is established via a PSI5 compatible two-wire interface, with universal or daisy-chain connections to the satellite modules.

Table 6. PSI5 mode jumper configuration

Jumper reference	Jumper position	Description
J1	1 or DNP	Floating
J3	1 or DNP	Floating
J46	2-3	BUS_I/VCC with 0.47 µF capacitor
J42	1-2	Filtering (FXLS9xxxx)
	2-3	Filtering (FXPS7xxxx)
J34	1-2	Connect the filter to IDATA

Table 6. PSI5 mode jumper configuration...*continued*

Jumper reference	Jumper position	Description
J33	1-2	Connect the filter to BUS_I/VCC (FXLS9xxxx only)
	2-3	Connect the filter to BUS_I/VCC (FXLS9xxxx only)
J49	1-2 or 2-3	If using PSI5 daisy chain

2.4 Insert the sensor into the socket

Figure 5 illustrates the proper way to insert the sensor into the socket. For proper connection, align the circle on the IC to the arrowhead (identified in yellow in Figure 5) on the mounting socket.

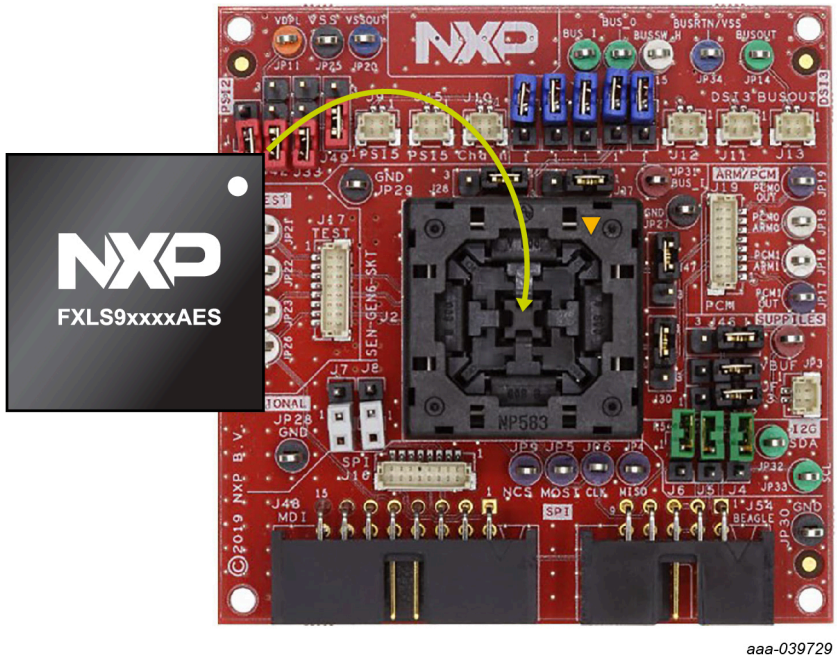

Figure 5. Insert sensor in to SEN-GEN6-SKT socket

2.5 Connect the board to a compatible ECU

The SEN-SPI-BOX has two dedicated interfaces suitable for SPI and I²C communications, an MDI connector and a Beagle connector. The NXP MDI connector supports the SEN-SPI-BOX kit. The Beagle connector is an industrial standard and may be coupled to any Beagle compatible analyzer.

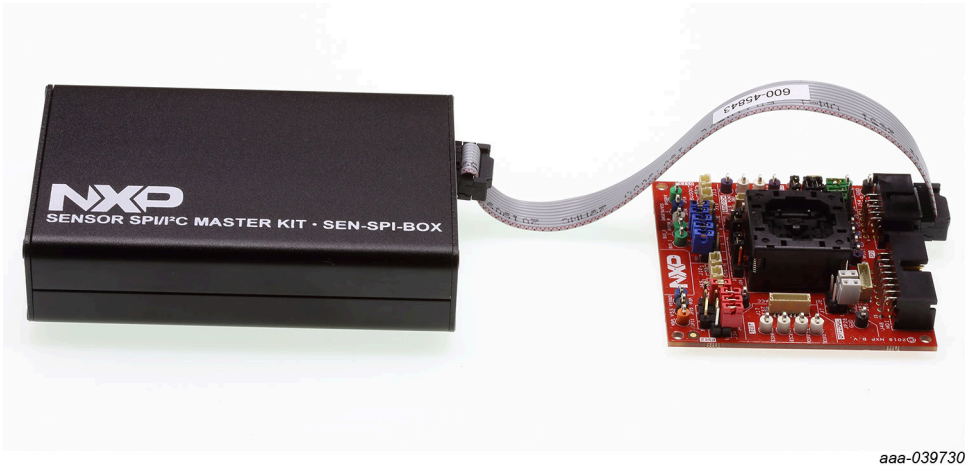

Figure 6. SEN-SPI-BOX coupled with a SEN-GEN6-SKT board (SPI protocol)

For DSI3 and PSI5 support, the SEN-SPI-BOX can be used with a dedicated NXP adapter (SEN-DSI3-ADAPTER and SEN-PSI5-ADAPTER).

Refer to Section 2.5.1 for board connections.

2.5.1 NXP MDI and Beagle

Figure 7 illustrates the MDI and Beagle connectors while Figure 8 identifies the individual connectors.

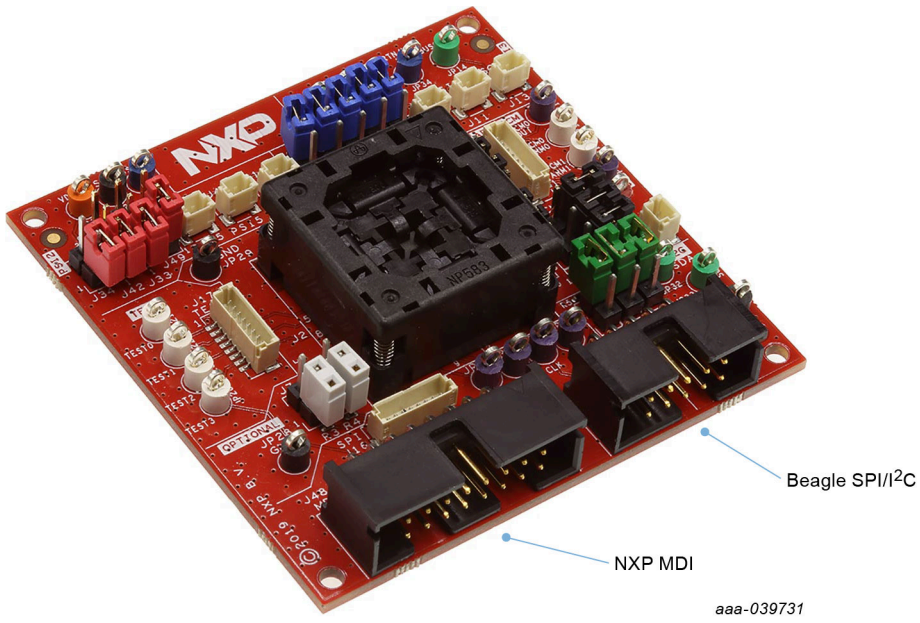

Figure 7. NXP MDI and Beagle

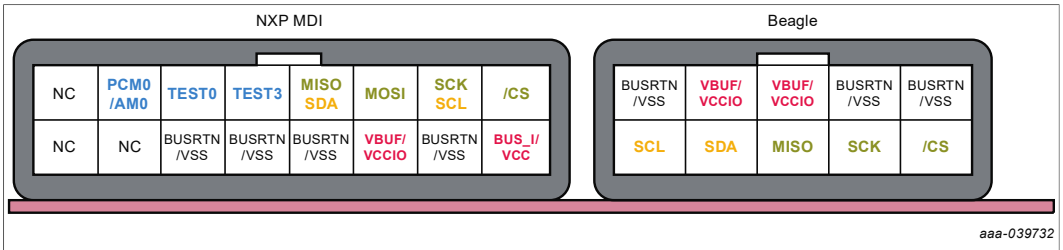

Figure 8. NXP MDI and Beagle connections

2.5.2 SPI

Connect the SEN-GEN6-SKT board to any MCU with SPI compatibility using the 4-pin SPI signals and a power supply.

VCC must not exceed 5.25 V.

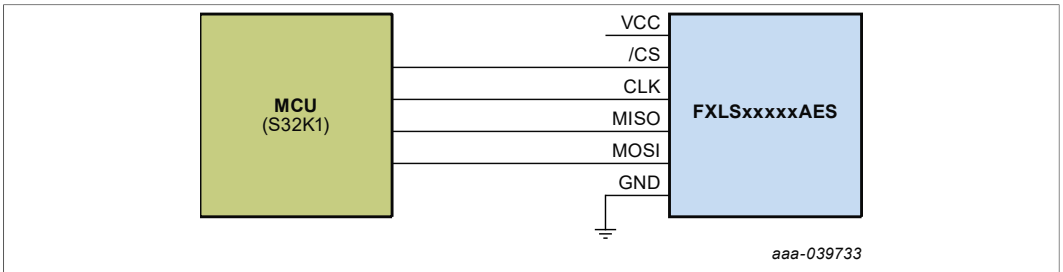

Figure 9. SPI application diagram

Table 7 identifies the various accessible interfaces that can connect to the MCU board.

Table 7. SPI connector reference

Signal name	Connector reference	Description
VCC	JP31	Power supply
GND	JP29	Ground
SS_B	JP9	Chip select
SCLK	JP6	Serial Clock
MISO	JP4	MCU In Sensor out
MOSI	JP5	MCU out Sensor in
SPI	J16	4-pin SPI connector
NXP MDI	J48	General-purpose connector
Beagle	J54	General-purpose connector

2.5.3 I²C

Connect the SEN-GEN6-SKT board to any I²C MCU board using the two-pin I²C signals and a power supply.

VCC must not exceed 5.25 V.

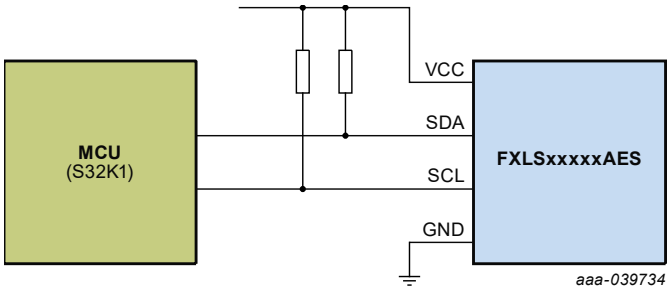

Figure 10. I²C application diagram

Table 8. I²C connector reference

Signal name	Connector reference	Description
VCC	JP31	Power supply
GND	JP29	Ground
SDA	JP32	I²C Serial Data
SCL	JP33	I²C Serial Clock
I²C	J16	two-pin I²C connector
NXP MDI	J48	General-purpose connector
Beagle	J54	General-purpose connector

The board is equipped with two dedicated interfaces suitable for SPI and I²C communications. The NXP MDI connector supports the SEN-SPI-BOX board. The Beagle connector, an industrial standard, can be interfaced with any Beagle compatible analyzer.

2.5.4 DSI3

The DSI3 protocol, an automotive protocol, provides power supply and bidirectional communication using only two wires. This protocol is suitable for all satellite-based applications (such as airbag) requiring safety and EMC robustness.

Table 9. DSI3 connector reference

Signal name	Connector reference	Description	Mode
BUSIN	JP12	DSI3 Bus In	Discovery mode / Parallel mode
BUSRTN	JP34	DSI3 bus return	
DSI3	J11	two-pin DSI3 connector	
BUS_O	JP13	Daisy chain out	Daisy chain mode
BUSRTN	JP34	DSI3 bus return	
DSI3_Chain	J12	two-pin DSI3 daisy chain connector	
BUSOUT	JP14	Daisy chain out	Daisy chain mode (FXPS7xxxx only)
BUSRTN	JP34	DSI3 bus return	
DSI3_Chain	J13	two-pin DSI3 daisy chain connector	

2.5.4.1 DSI3 parallel or discovery mode

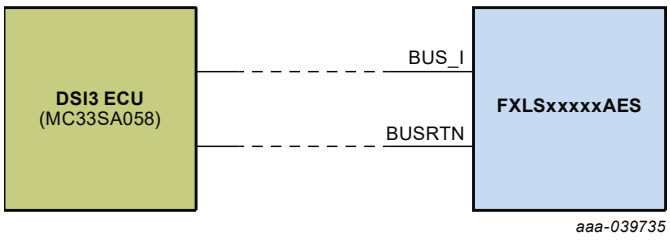

Figure 11. DSI3 parallel application diagram

2.5.4.2 DSI3 daisy chain

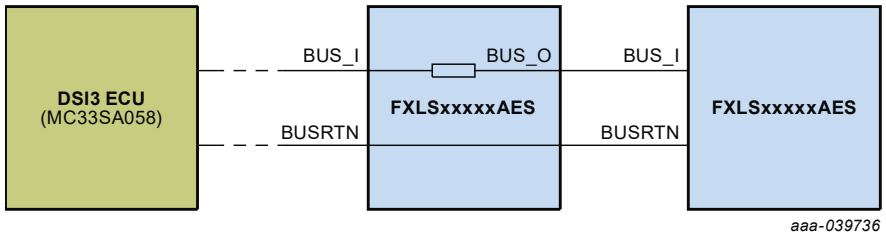

Figure 12. DSI3 daisy chain application diagram

2.5.4.3 DSI3 daisy chain mode (FXPS7xxxx only)

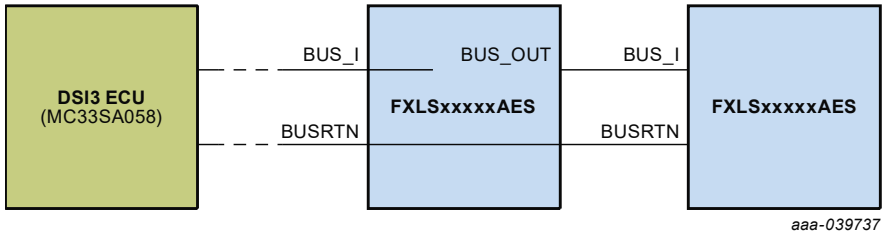

Figure 13. DSI3 daisy chain mode application diagram (FXPS7xxxx only)

2.5.5 PSI5

The PSI protocol, an automotive protocol, provides power supply and bidirectional communication using only two wires. This protocol is suitable for all satellite-based applications.

Table 10. PSI5 connector reference

Signal name	Connector reference	Description	Mode
VDPL	JP11	PSI5 BUS IN	Universal mode / Parallel mode
VSS	JP25	PSI5 VSS	
PSI5	J9, J45	two-pin PSI5 connector	
VDPL	JP11	PSI5 BUS IN	Daisy chain mode
VSSOUT	JP20	PSI5 VSS daisy chain	
PSI5_Chain	J10	two-pin PSI5 daisy chain out	

2.5.5.1 PSI5 parallel or universal mode

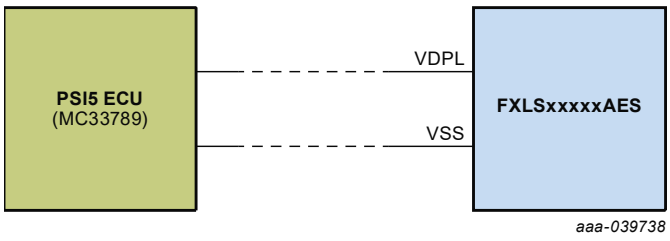

Figure 14. PSI5 parallel application diagram

2.5.5.2 PSI5 daisy chain mode

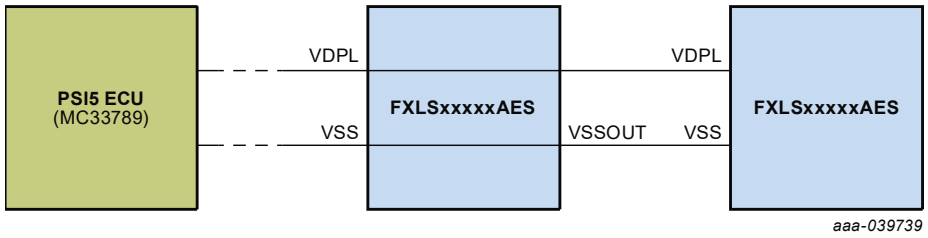

Figure 15. PSI5 daisy chain mode application diagram

3 Revision history

Table 11. Revision history

Rev	Date	Description
v.1	20210105	Initial release

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