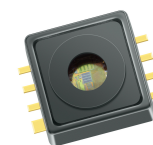# KP200

Technical product description

PRO-SIL™ pressure sensor for side crash detection

This document is only an extract of the technical datasheet which can be provided by Infineon in its full version under NDA only.

Features

- Synchronous data transmission based on PSI5-P10P-500/3L and PSI5-P10P-250/1L mode
- Asynchronous data transmission based on PSI5-A10P-250/1L[1] mode
- AK-LV 29 compatible
- 2-wire interface with on chip current modulator for Manchester communication
- E^2PROM for ID number, calibration and mode selection
- On chip voltage regulator
- Relative pressure signal ($\Delta p/p_0$-signal)

PG-DSOF-8-16

ISO 26262 ready

RoHS

AEC Qualified

Potential applications

The KP200 is used to detect the pressure change inside a door during a side crash.

Product validation

Qualified for automotive applications.
Product validation according to AEC-Q100.

Description

The KP200 is a pressure sensor for the detection of side crashes in passenger cars. In this application the pressure sensor is assembled in a door module located within the car's side door. When the door is compressed due to a side impact, the KP200 provides a signal pulse which is proportional to the pressure change inside the door $\Delta p/p_0$). The height of signal pulse is independent of the ambient pressure but is dependent on the relative pressure change. This is achieved by dividing the absolute pressure change by the ambient pressure. The division is performed on-chip. The ambient pressure is calculated with a low pass filter from the absolute pressure.

The sensor provides the relative pressure as a digital Manchester encoded output signal.

This cost optimized configuration allows autonomous operation of the sensor without any further logic ICs in the pressure satellite.

During the normal operation mode there is a continuous internal range check.

Product name	Product type	Ordering code	Package
KP200	Pressure sensor for side crash detection	SP000849342	PG-DSOF-8-16

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[1]   In the asynchronous mode, the sensor sends every 228 µs ± clock variation a Manchester frame.
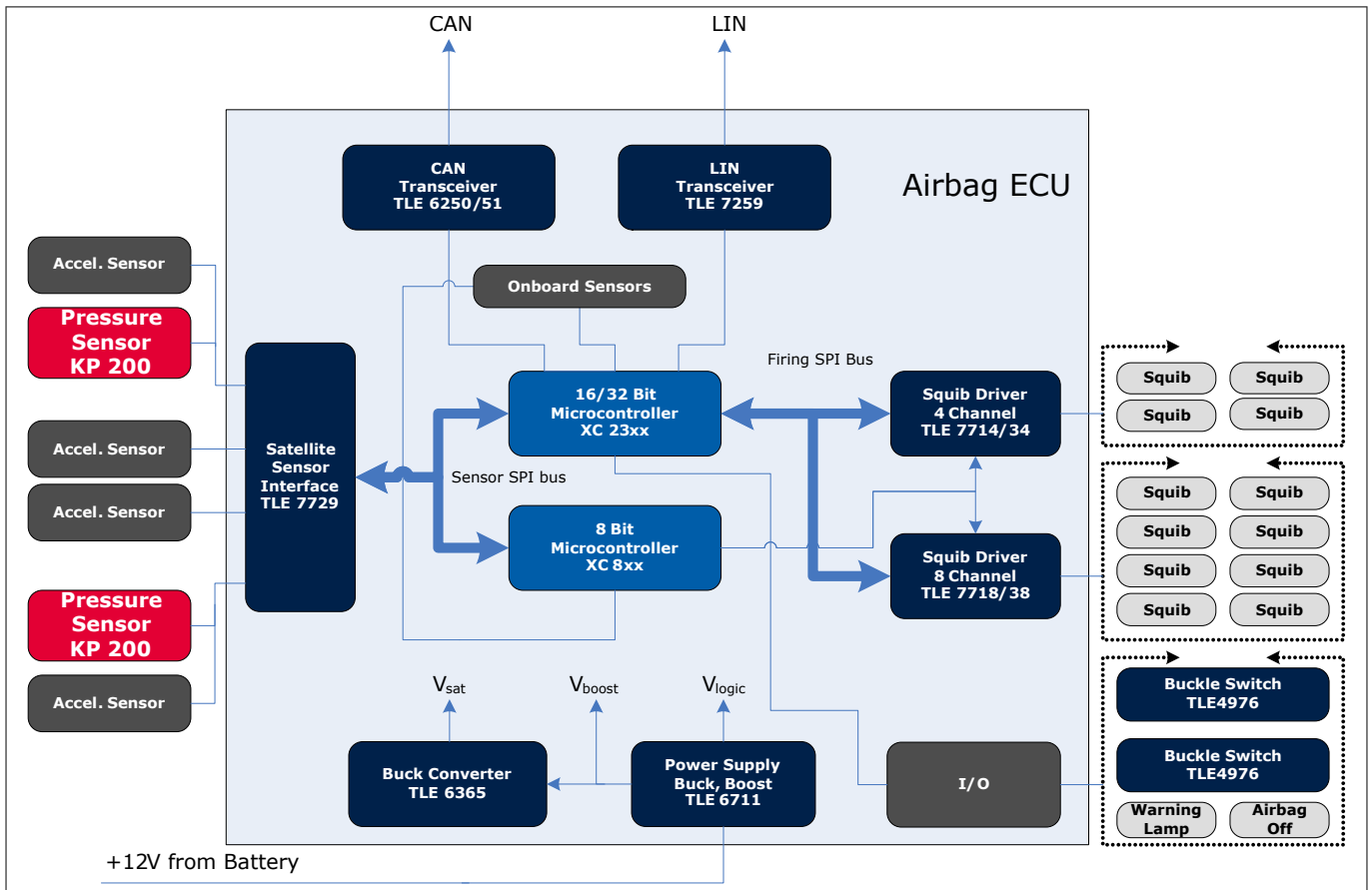
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1 Application example

Figure 1   **Application example for a restraint system**

2 Specification

2.1 Absolute maximum ratings

Attention: *Stresses above the max. values listed in the table below may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.*

Table 1 Absolute maximum ratings

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
Voltage on *VDD*[2]	V_{DD}	-16.5	–	16.5	V	$|V_{DD} - V_{iout}| < 16.5V$	1.1
Voltage on *I_OUT*	V_{iout}	-16.5	–	16.5	V	$|V_{DD} - V_{iout}| < 16.5V$	1.2
Voltage on *CAP*	V_{CAP}	-16.5	–	16.5	V		1.3
Voltage on digital pins	V_{dig_pin}	-0.3	–	3.5	V		1.4
Voltage on *DAT_IN*/ V_{PROG} during programming	V_{dig_prog}	-0.3	–	20.0	V		1.5
Current on serial pin	I_{dig_out}	–	–	0.1	mA		1.6
Latch-up robustness for each pin	$I_{latchup}$	100	–	–	mA	according to EIA/ JESD78	1.7
Ambient storage temperature	T_{st}	-55	–	125	C		1.8
Mechanical shock survival	g_{st}	-2000	–	2000	g	unpowered, 0.5 ms	1.9
Input pressure range	p_{range}	10	–	200	kPa		1.10
				600	kPa	limited time: max. 300 s	
ESD robustness at pins (HBM: 1.5 k, 100 pF)	V_{ESD}	–	–			according to EIA/ JESD22-A114-B	1.11
VDD, *GND*, *I_OUT*, *CAP*				4	kV		
CLK, *CS*, *DAT_IN*, *DAT_OUT*				2	kV		
Lid pull-off force	$F_{pull\_off\_lid}$	1	–	–	N		1.12
Lid push-in force	$F_{push\_in\_lid}$	–	–	10	N	max. allowed force on top of the lid without damaging the sensor	1.13

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2 Outside the normal operation supply voltage range the over voltage detection disables the Manchester communication; as long as the over voltage detection has not detected an over voltage, the sensor operates inside the specified operating range.

2.2 Operating range

Table 2 **Operating conditions**

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
Supply voltage at pin *VDD*	V_{DD}	4.5	–	11.0	V		2.1
Voltage at pin *I_OUT*	V_{iout}	3.5	–	11.0	V		2.2
Voltage at pin *CAP*	V_{CAP}	4.5	–	11.0	V	connector only defined to connect with a capacitor; connection with a constant voltage source not allowed	2.3
Voltage during sync pulse at pin *VDD* & pin *I_OUT*	V_{sync}	–	–	16.5	V		2.4
Supply voltage power up/down gradient	V_{grad}	1E-5	–	1E4	V/ms		2.5
Input voltage for low level at pins *DAT_IN*, *CLK* & *CS*	V_{low_in}	0.0	–	1.0	V	not valid for programming pulse (see parameter 3.84: programming pulse voltage level in [1])	2.6
Input voltage for high level at pins *DAT_IN*, *CLK* & *CS*	V_{high_in}	2.3	–	3.3	V	not valid for programming pulse (see parameter 3.84: programming pulse voltage level in [1])	2.7
Output voltage for low level at pin *DAT_OUT*	V_{low_out}	0.0	–	1.0	V		2.8
Output voltage for high level at pin *DAT_OUT*	V_{high_out}	2.3	–	3.4	V		2.9
Current on pin *DAT_OUT*	I_{DAT_OUT}	–	–	0.1	mA		2.10
Ambient operating temperature	T_{Op}	-40	–	85	C		2.11
Thermal resistance	$R_{thj\text{-}pin}$	–	180	–	K/Ω	describes the thermal resistance between the die and the pins	2.12
Absolute operating pressure range	p_{abs}	50.9	–	126.5	kPa	range for pressure pulses during a crash	2.13
Ambient operating pressure range	p_{amb}	53.6	–	110.0	kPa	range for p_0 value	2.14
Lifetime	t_{live}	15	–	–	years		2.15

(table continues…)

Table 2   (continued) Operating conditions

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
No. of programming cycles	n_{prog}	–	–	20	–	• inside programming temperature • a programming cycle is defined as applying the programming pulse once in order to change the state of at least one E^2PROM cell	2.16
Programming temperature	T_{prog}	10	–	30	C		2.17
External buffer capacitor	C_{buf}	0	–	4.7	µF	no capacitor needed to avoid oscillation of regulator	2.18
Autarky time	$t_{\mu b}$	–	–	2	ms	the autarky time defined with C_{buf} must not exceed 2 ms	2.19

In addition to the lifetime (ambient operation temperature), the temperature profile over lifetime is given as follows.

Table 3   Lifetime profile (biased device)

Ambient temperature T_a [°C]	Lifetime [%]	Lifetime [h]
-40	6	720
+23	20	2400
+52	65	7800
+80	8	960
+85	1	120

3 Package information

For passivation the sensor die is covered with a transparent silicone gel. Bubbles adjacent to the bond wires are not allowed (delivery status). The bond wires have to be completely covered by gel. The surface of the gel must be smooth.
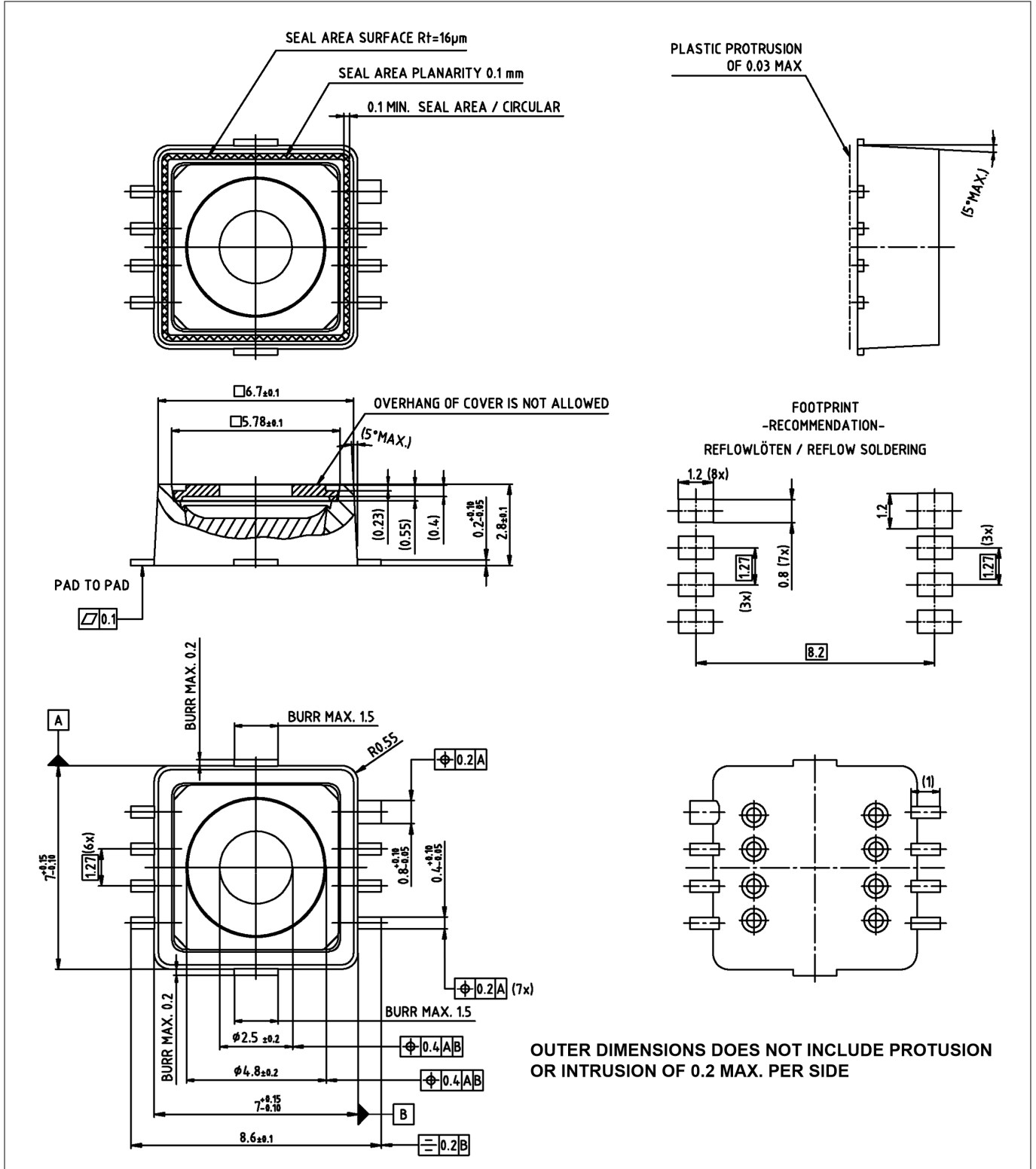

Figure 2   **PG-DSOF-8-16 package outline (all dimensions in mm)**

References

[1] Infineon Technologies AG: *Datasheet KP200* (Revision 1.2), 2011-02-11

Revision history

Document version	Date of release	Description of changes
V1.00	2020-12-01	• Extracted from *Datasheet KP200* [1]
V1.01	2022-02-14	• Editorial changes

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