Pressure Sensor
HSPPAD032A

Data Sheet

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ALPS PRODUCT NO.

HSPPAD032A

OVERVIEW

The HSPPAD032A is a pressure sensor using effect of piezo resistive bridge circuit formed on silicon diaphragm.
The HSPPAD032A consists of pressure and temperature sensor, 16bit analog to digital converter, a control unit with MTP ROM, and a I2C serial Interface.
The HSPPAD032A delivers the auto-compensated pressure value.

FEATURES

- Pressure Range 50 to 110 kPa (+5000 to -500m above sea level)
- Supply Voltage 1.7 to 3.6 V
- Operating Temperature -40 to +85°C
- Digital interface I2C slave interface (High Speed Mode) is supported.
- Lead free, RoHS instruction, Halogen free conforming

Absolute Maximum Rating

Item	Symbol	Unit.	Specification			Notes
			min.	Typ.	max.	
Max supply voltage	VDD	[V]	-0.4	-	3.63	
Max load pressure	Pmax	[kPa]	26	-	3000	
Storage temperature	Tstg	[deg]	-40	-	+125	
ESD	HBM	[V]			2000	

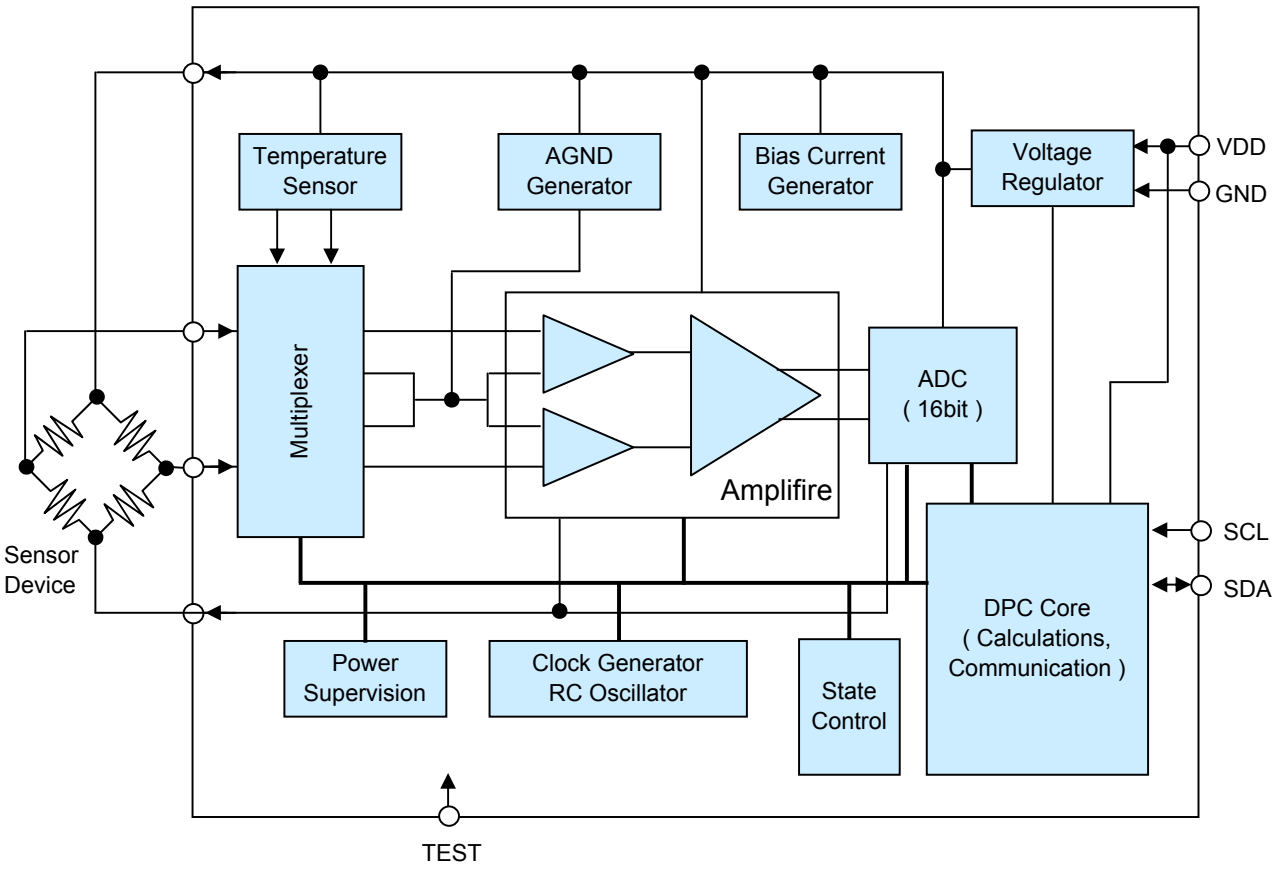
Operating Conditions

Item	Symbol	Unit.	Specification			Notes
			min.	Typ.	max.	
Classify of Pressure		[-]		Absolute		
Supply voltage	VDD	[V]	1.7	-	3.6	
Operating temperature	Topr	[°C]	-40	-	+85	
Range of measurement pressure	Popr	[kPa]	50	-	110	
Current consumption	IDDpeak	[uA]	-	1270	1900	Active State
			-	0.07		Sleep State
Pressure Resolution		[kPa]	-	0.001	-	
Pressure Absolute Accuracy		[kPa]	-	±0.2	-	0 to 85°C
Pressure Relative Accuracy		[kPa]		±0.01		95-105kPa 25°C, 1.8V
RMS Noise		[kPa]		0.003		25°C, 1.8V No averaging
Conversion time		[msec]		7.8	10	
Short term drift		[kPa]		±0.02		24 hours
Long term drift		[kPa]		±0.1		12 months

I/O Characteristics

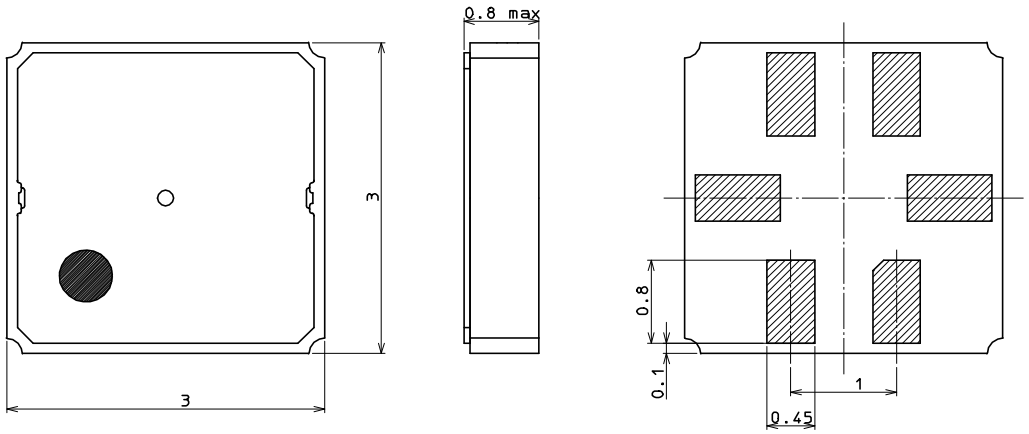
Item	Symbol	Unit.	Specification			Notes
			min.	Typ.	max.	
I2C Clock Frequency	fscl	[kHz]	-	-	3400	High Speed mode
Low Level Input Voltage	VIL	[V]	-	-	0.3×VDD	
High Level Input Voltage	VIH	[V]	0.7×VDD	-	-	
Low Level Output Voltage	VOL	[V]	-	-	0.2×VDD	
High Level Output Voltage	VOH	[V]	0.8×VDD	-	-	

BLOCK DIAGRAM



Full view

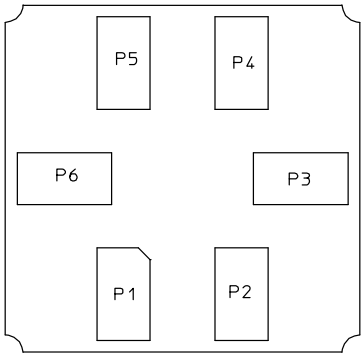
Top view **Side view** **Bottom view**



Pin-layout

PIN	Name	Function
1	VDD	Positive supply voltage
2	GND	Ground reference voltage
3	TEST	Do not connect
4	SCL	Serial clock input
5	SDA	Serial data input / output
6	NC	Do not connect

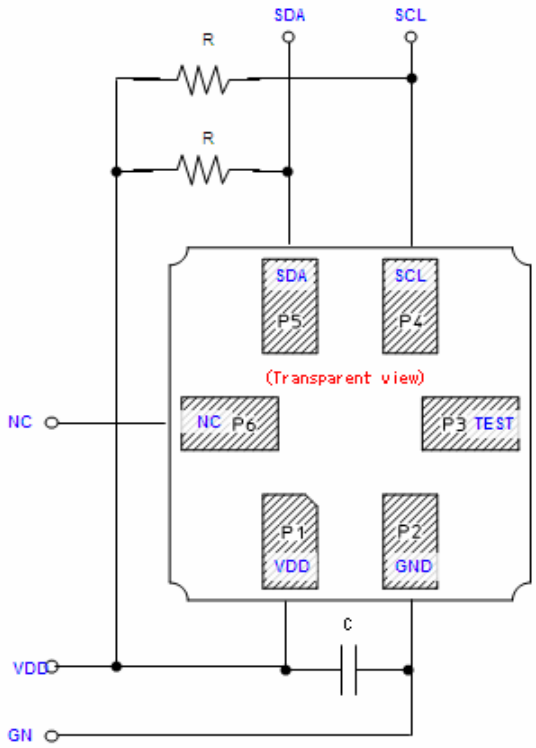
Transparent view



P1 is under the index mark

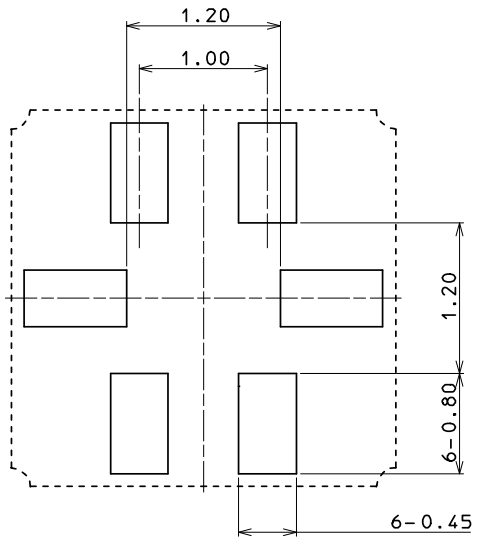
I2C Reference circuit

R=1kohm typ.
C=0.1µF



Recommendation footprint

Solder resist between circuit patterns is recommended to prevent solder bridge.



COMMUNICATION INTERFACE

I2C SLAVE INTERFACE & MEASUREMENT METHOD OF PRESSURE AND TEMPERATURE

- Slave device
- 7-bit addressing, Combined format
- Support Fast-mode, Hs-mode
- It does not support 10-bit addressing
- The device address can be changed and the standard setup is "1001000"
- Data transfers follow the combined format with 7-bit addressing of I2C interface.
- Data is transferred with the most significant bit (MSB) first and big endian.

Symbol	Description
S	START condition
P	STOP condition
A	acknowledge (SDA LOW)
N	not acknowledge (SDA HIGH
W	write ('0')
R	read ('1')

Write Format

MASTER	S	DEVICE ADDRESS	W		COMMAND		P
SLAVE				A		A	

- For starting full measurement, Set command "0xAC" .

Read Format

MASTER	S	DEVICE ADDRESS	R			A		A
SLAVE				A	STATUS		PRESS. DATA (MSB)	

	A		A		N	P
PRESS. DATA (LSB)		TEMP. DATA (MSB)		TEMP. DATA (LSB)		

- After active measurement time (MAX.10ms), the Acquired data stored to output register
- These data are compensated, but unit conversion is not carried out

- Unit convertion is as follows.

Compensated Pressure and Temperature

Pressure [kPa] = PRESS. DATA × 60 / 65535 + 50

Temperature [degC] = TEMP. DATA × 125 / 65535 - 40

- Temperature accuracy is not guaranteed.

COMMUNICATION INTERFACE (Continued)

STATUS

- The status byte contains the following bits
- The status should be "0x40" in normal operation

Bit	Name	Description
7	Not Used	0 = default
6	Power?	Power indication 0 = Power Off , 1 = Power On (VDD On)
5	Busy?	Busy indication 0 = Normal , 1 = Busy
4:3	Mode	Current mode 00 = Normal Mode , 01 / 10 / 11 = Adjustment Mode
2	Memory Error?	Memory integrity / error flag 0 = Test Passed , 1 = Test Failed
1	Data Corrected?	Data transfer / correction 0 = Normal , 1 = Data Transfer / Correction Error
0	Reserved	Reserve domain for extension 0 = default