ALPS
ALPS ELECTRIC CO., LTD.

Pressure Sensor
HSPPAD132A

Data Sheet

ALPS ELECTRIC CO., LTD.

This specification is subject to change without notice.

ALPS ®
ALPS ELECTRIC CO., LTD.

Digital Pressure Sensor

HSPPAD132A Data Sheet

2/7
Rev.1
Apr/23/2015

ALPS PRODUCT NO.
  HSPPAD132A

OVERVIEW
   The device is a pressure sensor using effect of piezo resistive bridge circuit
   formed on silicon diaphragm.
   The device consists pressure and temperature sensor, 16bit analog to digital
   converter, control unit with MTP ROM, and I2C serial Interface.
   The device delivers temperature compensated pressure value.
   Small size and waterproof(Class IPX7) LCP package.

FEATURES
   - Pressure Range   300 to 1100 hP (+9000 to -500m in altitude)

   - 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	[hPa]	260	-	30000	
Storage temperature	Tstg	[°C]	-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	[hPa]	300	-	1100	
Current consumption	IDDpeak	[uA]	-	1350	1900	Active State
			-	0.07	0.25	Sleep State
Pressure Resolution		[hPa]	-	0.013	-	
Pressure Absolute Accuracy		[hPa]	-2	-	2	-10 to 60°C
Temperature Resolution		[°C]	-	0.002	-	
Temperature Accuracy		[°C]	-2	-	2	-10 to 60°C
Conversion time		[msec]	-	7	10	

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	-	-	

ALPS
ALPS ELECTRIC CO., LTD.

Digital Pressure Sensor

HSPPAD132A Data Sheet

4/7
Rev.1
Apr/23/2015

BLOCK DIAGRAM

Power Up and Power Donw-Up Sequence

POR <2.5msec

Vdd

Vdd rising slope min 1V/msec

Vdd Low level < 0.2V
(Vdd must be lower than 0.2V before rise Vdd to start POR)
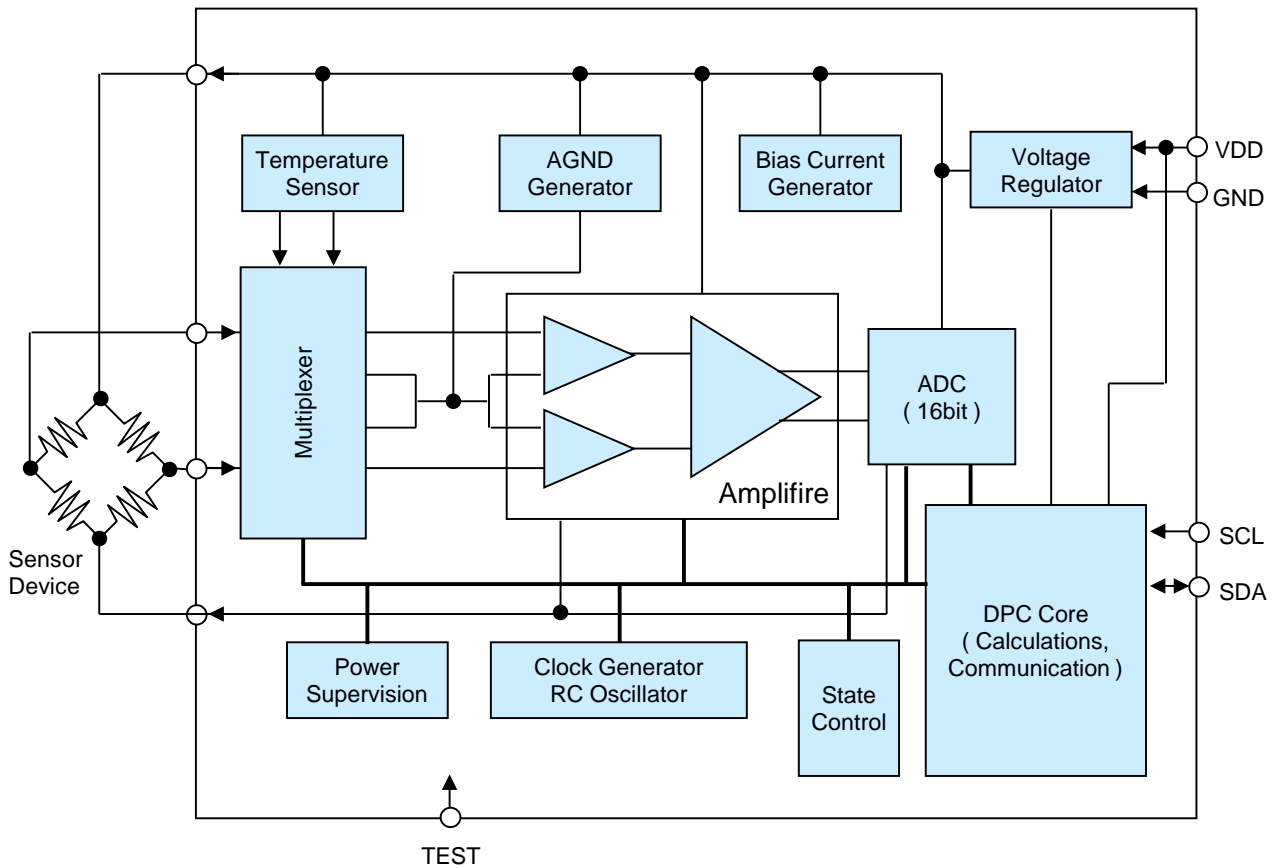
Time
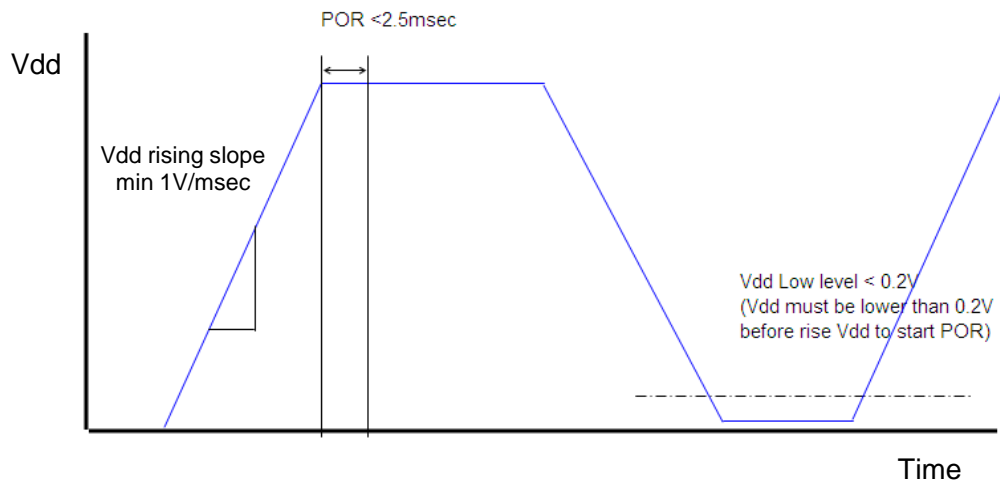
COMMUNICATION INTERFACE

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

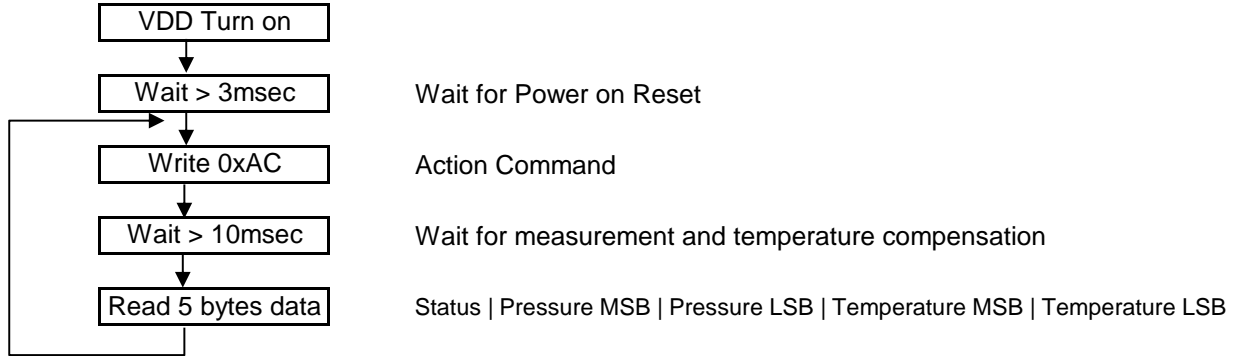- To convert it into the unit converted value, it calculates as follows.

Unit conversion

Pressure [hPa] = PRESS. DATA × 860 / 65535 + 250

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

- Temperature accuracy is not guaranteed.

ALPS
ALPS ELECTRIC CO., LTD.

RECOMMENDED SEQUENCE

```
┌──────────────────┐
│   VDD Turn on    │
└──────────────────┘
         │
         ▼
┌──────────────────┐
│  Wait > 3msec    │      Wait for Power on Reset
└──────────────────┘
         │
  ┌──────▼───────────┐
  │   Write 0xAC     │      Action Command
  │ └────────────────┘
  │      │
  │      ▼
  │ ┌────────────────┐
  │ │ Wait > 10msec  │      Wait for measurement and temperature compensation
  │ └────────────────┘
  │      │
  │      ▼
  │ ┌──────────────────┐
  │ │ Read 5 bytes data│    Status | Pressure MSB | Pressure LSB | Temperature MSB | Temperature LSB
  │ └──────────────────┘
  │      │
  └──────┘
```
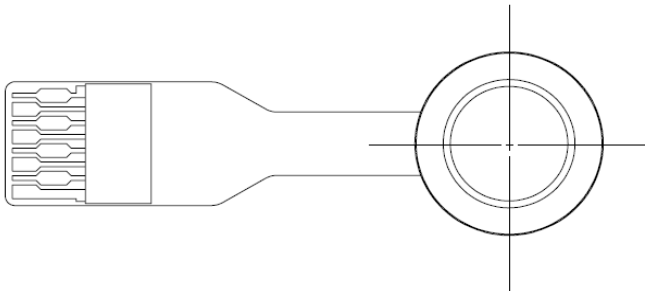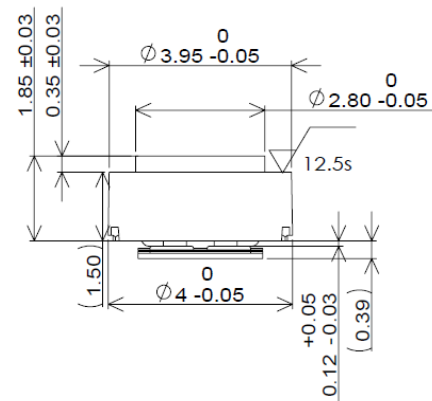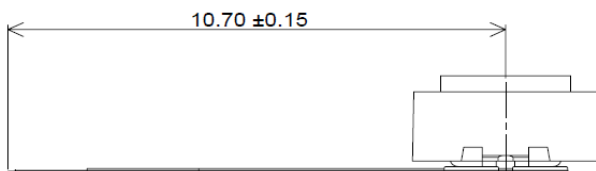
STATUS

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

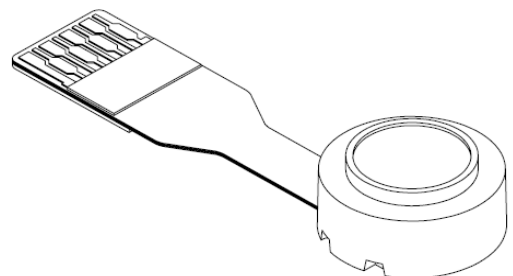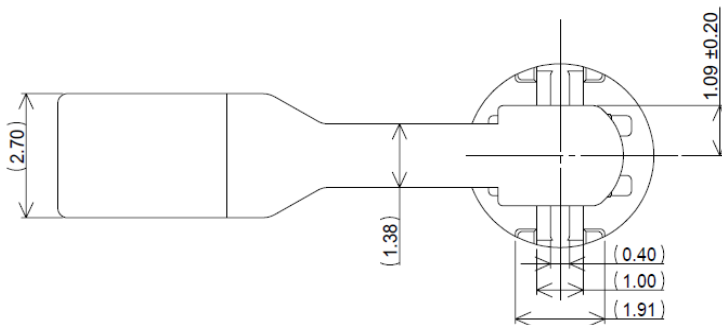| Bit	Name	Description
7	Not Used	0 = default
6	Power?	Power indication 0 = Power Off , 1 = Power On (VDD On)
5	Busy?	Busy indication 0 = Normal , 1 = Busy
4:3	Mode	Current mode 00 = Normal Mode , 01 / 10 / 11 = Adjustment Mode
2	Memory Error?	Memory integrity / error flag 0 = Test Passed , 1 = Test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

Confidential

ALPS
ALPS ELECTRIC CO., LTD.

Digital Pressure Sensor

HSPPAD132A Data Sheet

7/7
Rev.1
Apr/23/2015

※上面図　Top view

正面図　Front view

10.70 ±0.15

1.85 ±0.03
0.35 ±0.03
∅ 3.95 −0.05 / 0
∅ 2.80 −0.05 / 0
12.5s
(1.50)
∅ 4 −0.05 / 0
0.12 −0.03 / +0.05
(0.39)

底面図　Bottom view

(2.70)
(1.38)
1.09 ±0.20
(0.40)
(1.00)
(1.91)

Pin Assign

①	GND
②	VDD
③	N/C
④	N/C
⑤	N/C
⑥	SDA
⑦	SCL
⑧	N/C

Connector top view

⑧ ⑦ ⑥ ⑤ ④ ③ ② ①