Pressure Sensor
HSPPAD038A
Data Sheet

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ALPS PRODUCT NO.

HSPPAD038A

OVERVIEW

The HSPPAD038A is a pressure sensor using effect of piezo resistive bridge circuit formed on silicon diaphragm, packaged in LGA package.
The HSPPAD038A consists of pressure and temperature sensor, 16bit analog to digital converter, a control unit with MTP ROM, and a I2C serial Interface.
The HSPPAD038A delivers the auto-compensated pressure value.

FEATURES

- Pressure Range 300 to 1100 hP (+9000 to -500m above sea level)
- Supply Voltage 1.7 to 3.6 V
- Operating Temperature -40 to +85℃
- 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	[deg]	-40	-	+125	-
ESD	HBM	[V]	-	-	2000	-

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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	-	Sleep State
Pressure Resolution		[hPa]	-	0.013	-	-
Pressure Absolute Accuracy		[hPa]	-	±2.0	-	0 to 85°C
Pressure Relative Accuracy		[hPa]	-	-0.2/+0.1	-	900-1000hPa 25°C, 1.8V
RMS Noise		[hPa]	-	0.02	-	-
Conversion time		[msec]	-	7	10	-
Solder drift		[hPa]	-4.0	0	+4.0	-
Long term drift		[hPa]	-1.0	0	+1.0	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	-	-	-

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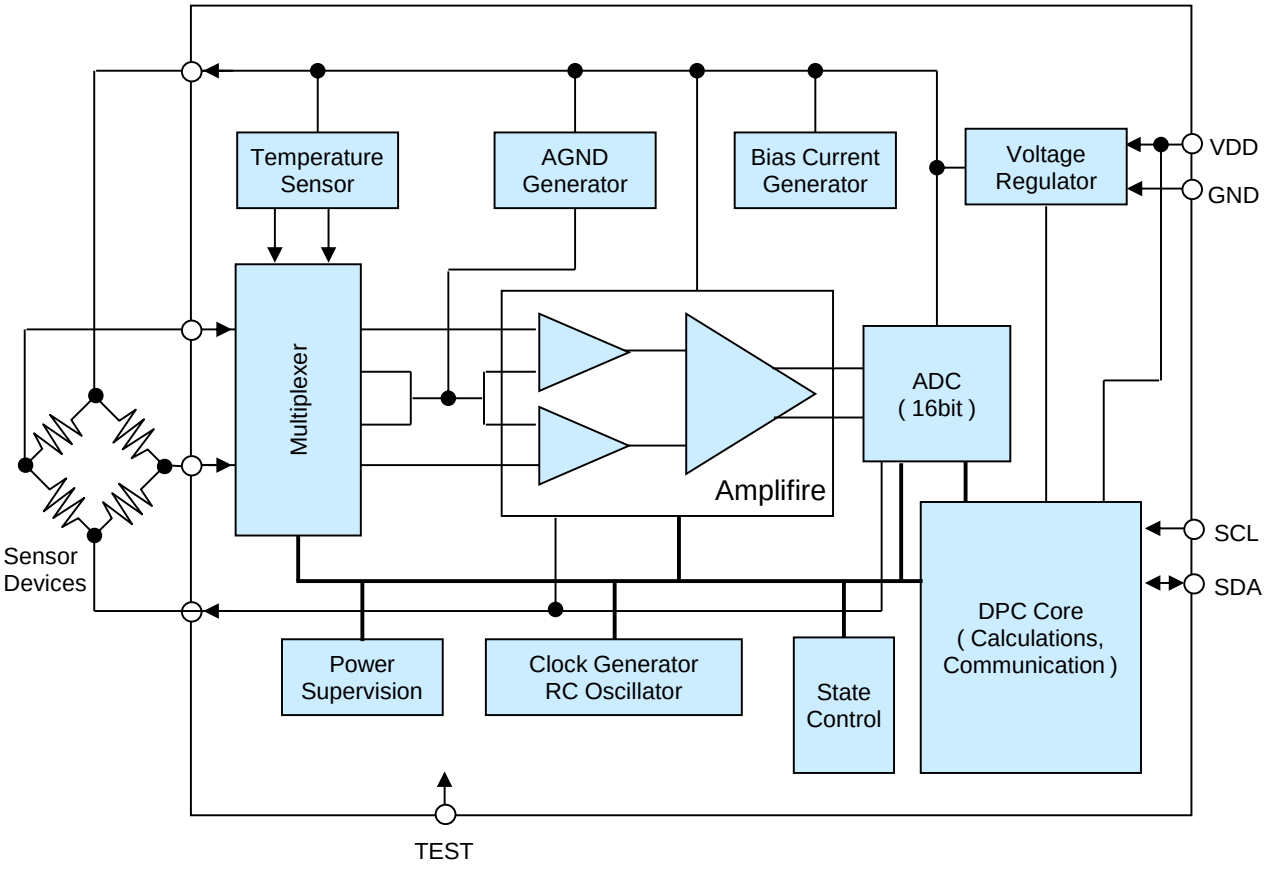
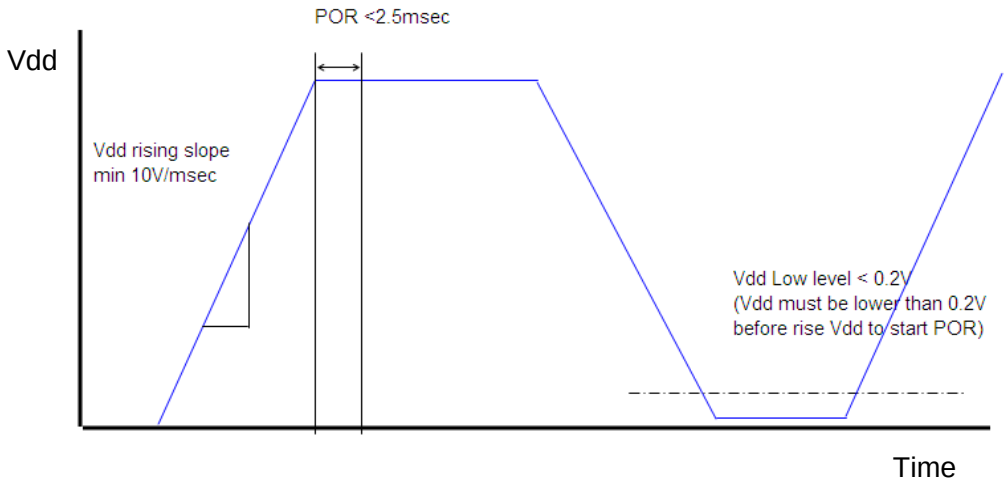
BLOCK DIAGRAM



Power Up and Power Donw-Up Sequence



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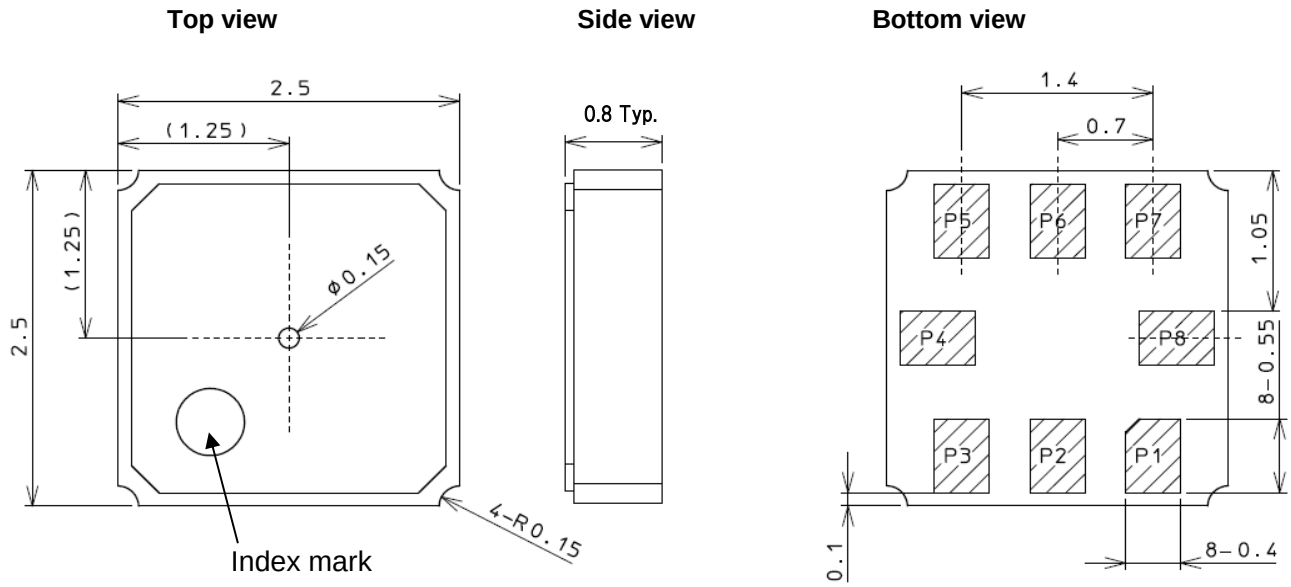
Full view



LGA package

Pin-layout

PIN	Name	Function
1	VDD	Positive supply voltage
2	GND	Ground reference voltage
3	TEST	Do not connect
4	SCL	Serial clock
5	SDA	Serial data
6	NC	Do not connect
7	NC	Do not connect
8	EOC	End of conversion

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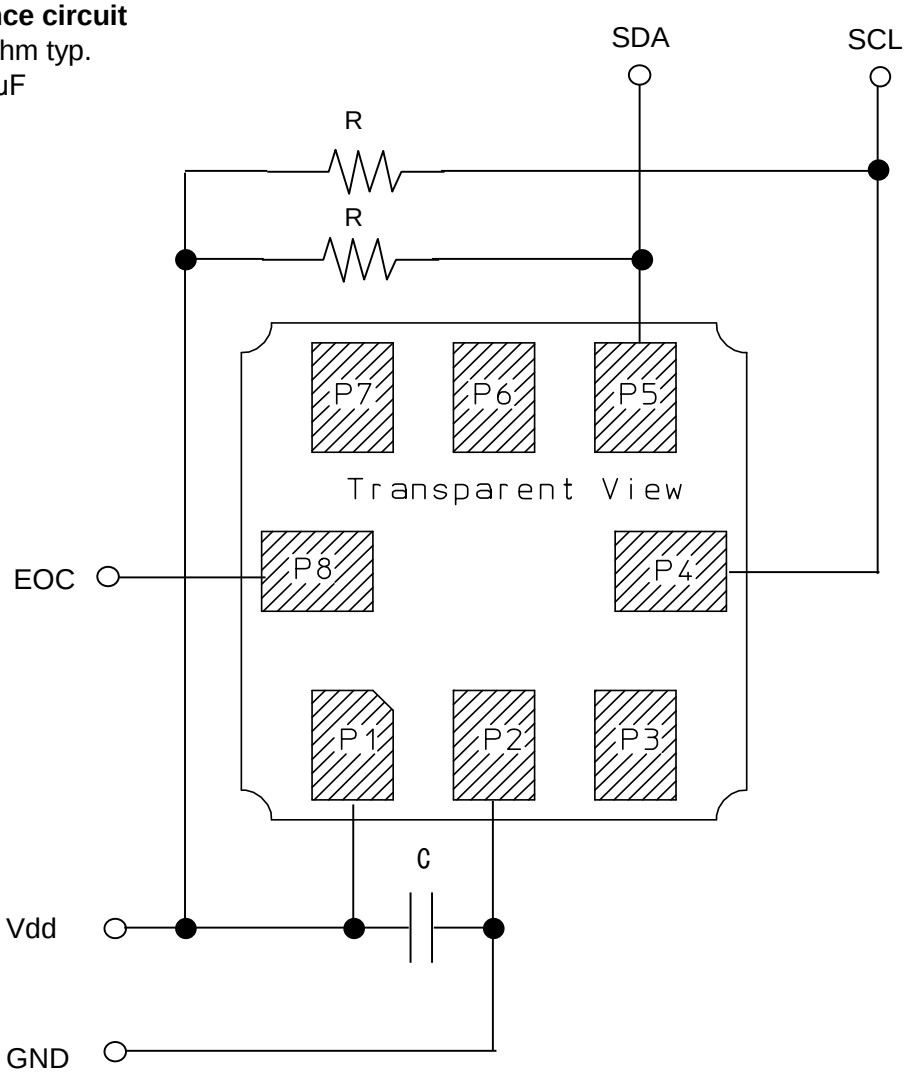
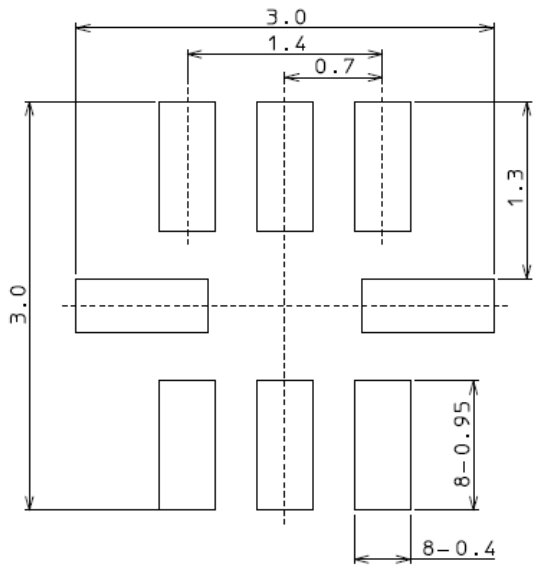
I2C Reference circuit

R=1kohm typ.
C=0.1µF



Recommendation footprint

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



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

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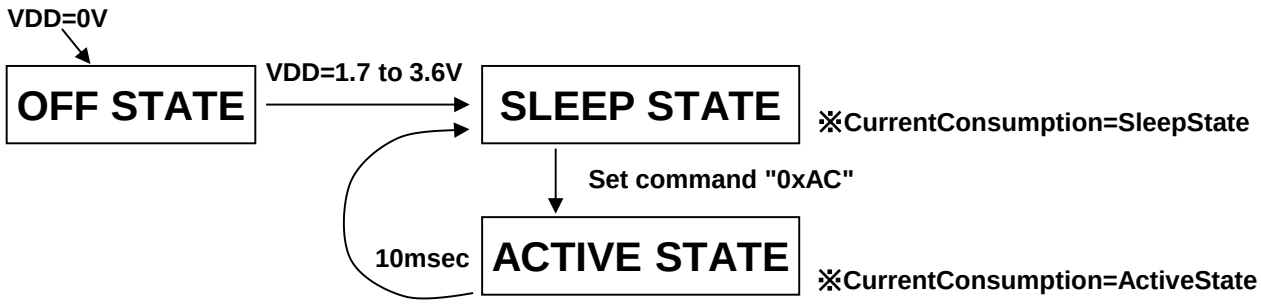
COMMUNICATION INTERFACE (Continued)

STATUS

- The status byte contains the following bits
- The status is "0x40" at the time of 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

Modes



OFF STATE・・・The sensor is not active when VDD is disabled.
SLEEP STATE・・・Waiting for command "0xAC".
ACTIVE STATE・・・Measurement and data transmission.

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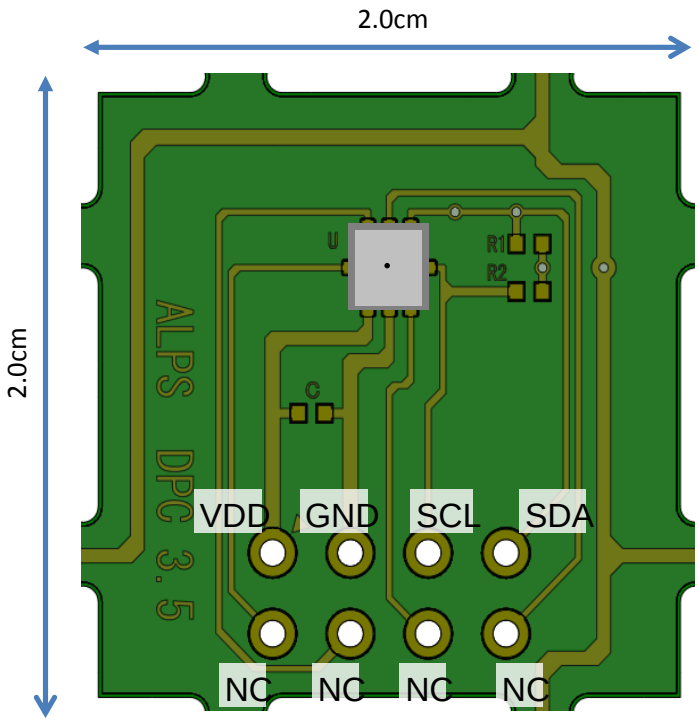
Eval Board Pin layout



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