

## ESS319-IIC Digital Pressure Sensor



■ Range: -100kPa...0kPa~10kPa...100MPa 
 ■ Output: I2C 
 ■ Accuracy:  $\pm 0.5\%$ /FS (pressure);  $\pm 0.5^\circ\text{C}$  (temperature) 
 ■ Pressure Type: Gauge/Absolute 
 ■ Power Supply: 3.3V

### Description

ESS319-IIC Digital Pressure Sensor can transfer the measurement signals of pressure and liquid level to IC digital output. With the fast and accurate interface, the ESS319-IIC is used to build an Internet of Things using a microcontroller. It can read data and control power on and off to reduce power consumption through microprocessor operation.

ESS319-IIC Digital Pressure Sensor is available ranges from -100KPa to 100MPa.

### Key Features & Benefits

- Digital compensation for sensor offset, sensitivity, temperature drift and nonlinearity
- 32-bit customer ID field for module traceability
- Digital output of temperature and pressure in I2C bus mode
- Fast power-on to data output response: 3ms
- Low power consumption, sleep mode operation, as low as 5  $\mu\text{A}$ , current consumption depends on the programmed sampling rate
- Operating temperature:  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$
- Wide supply voltage capability: 3.3V

### Standard Range

Range	Overload	Output/F.S (mV)	Typical Value(mV)	Pressure
0~10KPa	300%	35~60	45	G
0~20KPa	300%	70~110	90	G/A
0~35KPa	300%	55~80	70	G/A/D
0~70KPa	300%	55~80	60	G/A/D
0~100KPa	300%	60~85	75	G/A/D
0~200KPa	300%	60~85	75	G/A/D
0~400KPa	300%	60~80	70	G/A/D
0~600KPa	200%	90~120	100	G/A/D

### Technical Parameters

Parameters	Typ.	Max.	Unit
Nonlinearity	0.2	0.5	%FS
Hysteresis	0.05	0.1	%FS
Repeatability	0.05	0.1	%FS
Zero Output	$\pm 1$	$\pm 2$	mV DC
FS Output	100		mV DC
Input/ Output	2.6	3.8	k $\Omega$
Zero Temp. Drift*	$\pm 0.15$	$\pm 0.8$	%FS, @25 $^\circ\text{C}$
Sensitivity Temp. Drift*	$\pm 0.2$	$\pm 0.7$	%FS, @25 $^\circ\text{C}$

## ESS319-IIC GID-3-EV03.3.1.1

0~1.0 MPa	200%	125~185	150	G/A/D
0~1.6 MPa	200%	80~120	100	G/A/D
0~2.0 MPa	200%	50~70	60	G/A/D
0~3.5 MPa	200%	100~120	110	G/A/D
0~7.0 MPa	200%	120~150	135	G/A
0~10 MPa	200%	180~230	200	G/A
0~25 MPa	150%	140~170	150	S
0~40 MPa	150%	230~280	250	S
0~60 MPa	150%	100~160	130	S
0~100 MPa	150%	100~150	120	S

**Notes:** G for Gauge pressure; A for Absolute pressure; D for Differential pressure; S for Sealed gauge.

Long-term Stability	0.1	%FS/year
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Range -100kPa~100MPa

\*The typical value of 0~10kPa and 0~20kPa's zero temperature drift and sensitivity temperature drift is 0.4%FS@25°C, max value is 1.6%FS@25°C




## Construction Performance

**Diaphragm:** Stainless Steel 316L  
**Housing:** Stainless Steel 316L  
**Pressure leading tube:** Stainless Steel 316L  
**O Ring:** Φ16\*1.8mm (nitrile rubber or viton)  
**Measuring Medium:** Which is compatible with SS316L, viton, nitrile rubber  
**Packing Medium:** Silicon Oil  
**Net weight:** 20~30g

## Electric & Environment Performance

**Power supply:** 3.3±0.1Vdc;  
**Insulation Resistance:** 500MΩ@500VDC  
**Overpressure:** 1.5~3 times FS  
**Vibration (20~500Hz):** 20G  
**Storage Temp.:** -40~+125°C  
**Operating Temp.:** -40~+85°C  
**Compensation Temp.:** 0~50°C; -10~80°C  
 @ 0~70 (7kPa, 20 kPa, 35 kPa)



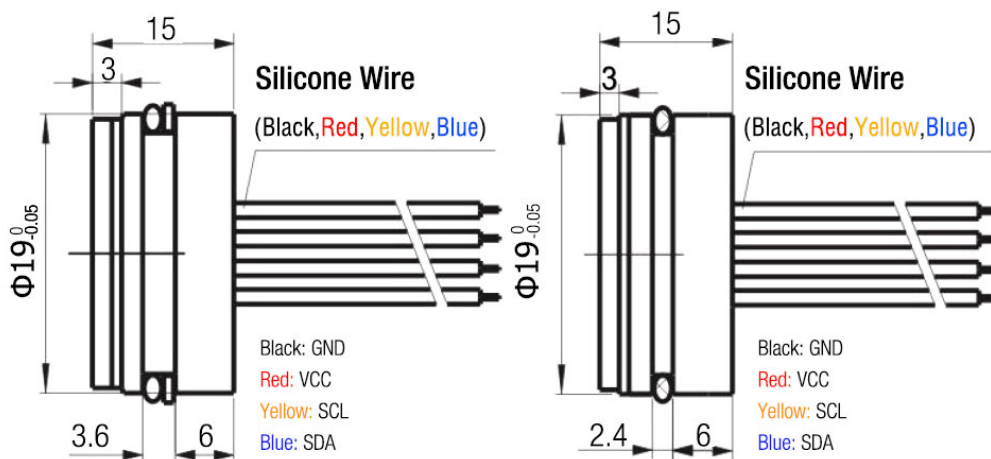
**ESS319-IIC**  
**Digital Output Pressure Sensor**

◇ Range -100kPa~10kPa...100MPa ◇ Stability: ±0.3%-0.5%FS/year ◇ MOC: Stainless Steel 316L ◇ Output: IIC

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## Drawing

ESS319-I2C Digital Pressure Sensor Range: -100kPa...0kPa~10kPa...100MPa



Drawing of pressure range > 40Mpa

Drawing of pressure range < 40Mpa

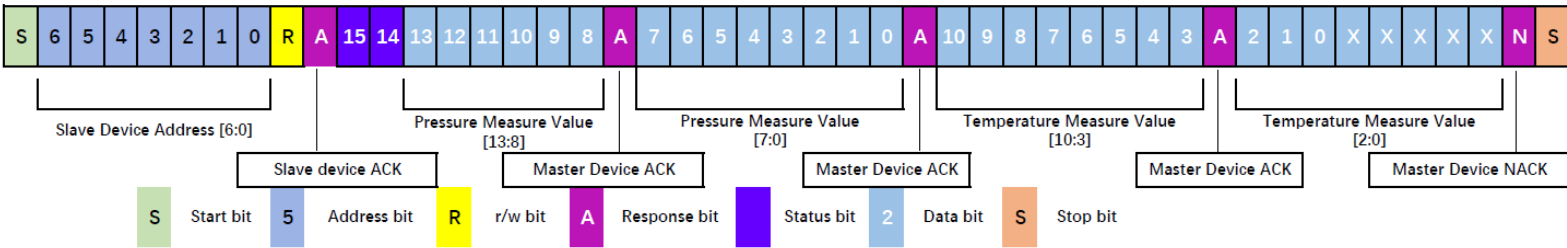
## Ordering Procedure

ESS3	High Stable OEM Piezoresistive Sensor						
	Code	Model					
	19-IIC	Digital Pressure Sensor					
		Cod	Span	Code	Span	Code	Span
		R01	0~10KPa	R07	0~1.0MPa	R13	0~40 MPa
		R02	0~35KPa	R08	0~2.0Mpa	R14	0~60 MPa
		R03	0~70KPa	R09	0~3.5 MPa	R15	0~100 MPa
		R04	0~100KPa	R10	0~7.0 MPa		
		R05	0~200KPa	R11	0~10.0 MPa		
		R06	0~400KPa	R12	0~25 MPa		
		Code	Pressure Type				
		G	Gauge				
		A	Absolute				
		S	Sealed Gauge				
		Code	Power Supply				
		C	3.3V				
		E					
		Code	Pressure connection				
		0	O-ring -NBR				
		1	O-ring -Viton				
		Code	Electric connection				
		1	Kovar pin				
		2	Rubber flexible silicon wires (10cm)				
ESS3	19-IIC	R10	G	C	0	2	

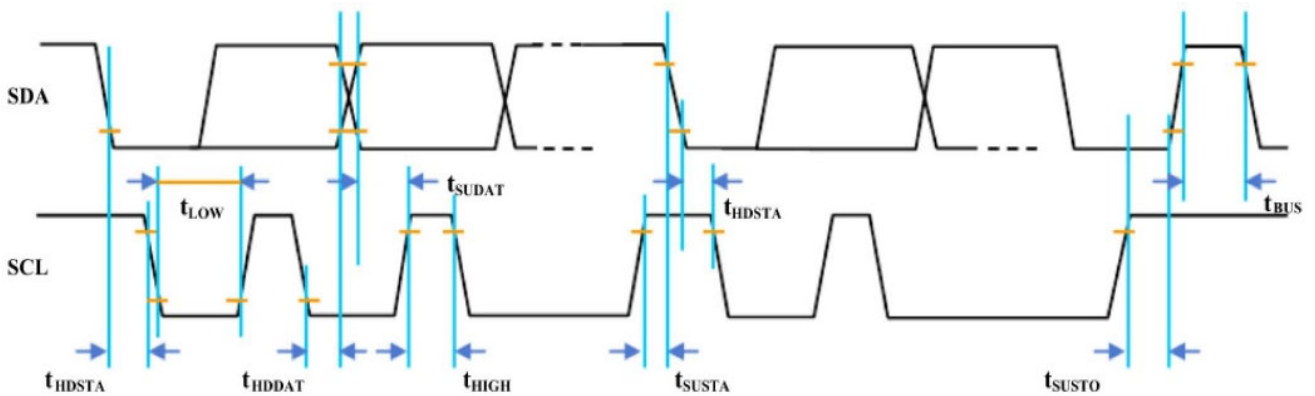
**Note:** ① Extremely attention must be paid to sensor installation process to avoid any miss conduction that affect the sensor performance, ② please protect the diaphragm and the compensated board carefully to prevent any damage. ③ Please contact us if your requested working temperature lower than -20 °C

## Address 0x28 & Data Reading for IIC Communication

For read and write operations, the master device commands to start, and sends an ACK (acknowledgement) as a slave device to indicate success. The factory address of the slave device is 0x28, and the communication sequence is shown as below.

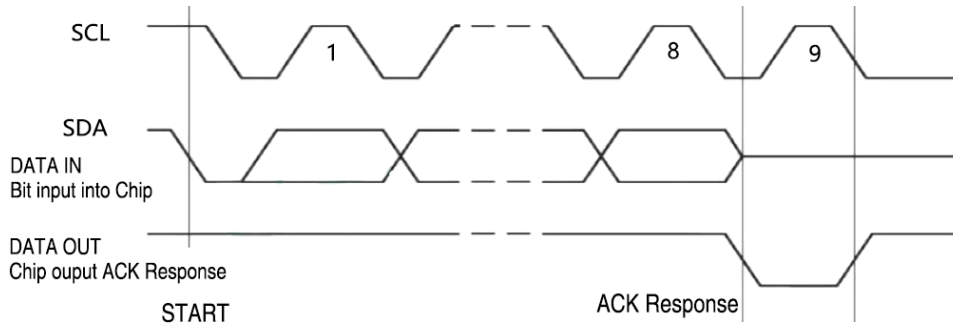


## Data Reading Sequence



Parameters	Code	MIN	TYP	MAX	UNITS
SCL Time Frequency	$f_{SCL}$	100		400	kHz
Time of Starting Condition Protection to SCL	$t_{HDSTA}$	0.1			us
Width of Minimal SCL Time at Low Level	$t_{LOW}$	0.6			us
Hight of Minimal SCL Edge Time	$t_{HIGH}$	0.6			us
Start Terms Setting to SCL Edge Time	$t_{SUSTA}$	0.1			us
Time of Data Projection SDA to SCL Edge Time	$t_{HDDAT}$	0			us
Time of Data Establish SDA to SCL Edge Time	$t_{SUDAT}$	0.1			us
Time of Stop Terms Setting SCL	$t_{SUSTO}$	0.1			us
Bus Idle Time Between Stop & Start Terms	$t_{BUS}$	2			us

*The Lower Level/Height/Width should no less than Minimal SCL Cycle*



## Reference Value of Output

Parameters	Typ	Unit
Zero pressure output (5%)	333	Hexadecimal
Zero pressure output (10%)	666	Hexadecimal
Full-scale pressure output (90%)	399A	Hexadecimal
Full-scale pressure output (95%)	3CCB	Hexadecimal

## Formula of Temperature Calculation

- $T=200 \times T_v / 2047 - 50$ 
  - ✓  $T_v$ : IIC Temperature Output (Decimalism)
  - ✓  $T$ : Real Temperature

## Formula of Pressure Calculation

- $P=(P_v - 1638) \times P_r / 13110$ 
  - ✓  $P_v$ : IIC Pressure Output (Decimalism)
  - ✓  $P_r$ : Pressure Range
  - ✓  $P$ : Real Pressure
  - ✓  $P_r$  share the same unit with  $P$

**FOR EXAMPLE:** If the range  $P_r$  is 4Mpa, the value of 4916 which obtained from IIC, so the real pressure  $P=(4916 - 1638) \times 4 / 13110 = 1.00015\text{Mpa}$