

P883

Medium and High Pressure MEMS Pressure Sensor Die

Description

The NovaSensor P883 die products utilize four piezoresistors combined in Wheatstone bridge circuit. When excited by either constant voltage or constant current, the P883 die produces a differential millivolt output signal directly proportional to the applied pressure. Available as gage (differential) or absolute, the P883 sensor die also features high sensitivity, excellent overload capability and small temperature hysteresis over a wide temperature range. The product is 100% visually inspected and electrically probed. Samples from each wafer are tested for resistance, sensitivity, linearity, offset, temperature coefficients and hysteresis. The products are available in standard configuration with 63 mil (1.60 mm) and 93 mil (2.36 mm) thick glass support and low-profile configuration with 22 mil (0.56 mm) thick glass support and no glass support.

Applications

- Process Control
- Automotive Systems
- Pneumatic Controls
- Hydraulic Systems
- Level Sensing

Features

- High Reliability MEMS sensor
- · Available as absolute or gauge (differential)
- Available with different glass thickness or no glass at all (consult NovaSensor for more information)
- Designed to be temperature compensated using constant current or voltage
- NovaSensor's proprietary SenStable[®] process produces excellent long-term stability
- Pressure ranges available from 5 to 15,000 psi
- Media Compatibility clean dry air, noncorrosive gases and liquids, other fluids compatible with silicon and borosilicate glass

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P883 Specifications - Standard Configuration

Development								
Parameter								
General		Value			Units	Notes		
Pressure	ential and absolute		0, 70, 150, 300, 5		psig / psia			
	ute only	1000, 1500	1000, 1500, 3000, 5000, 10000, 15000			Products may be qualified		
Maximum Pressure		6X pressu	re 5-150 psi		a higher maximum pressure			
		3X pressu	3X pressure 300-3000 psi			after additional testing		
		2X pressu	re 5000-150	00 psi				
Environmental								
Electrostatic damage (ESD) Class 1						MIL-STD 883 method 3015		
Temperature Range)							
Operating		-40 to 140)		°C	-40°F to 284°F, note 1		
Storage		–55 to 150)		°C	–67°F to 302°F		
Nechanical								
	With Glass	1.99 mm x	1.99 mm x 1.99 mm. Options for glass thickness: 0.56 mm, 1.60 mm, 2.36 mm					
Die Dimensions (L >	(W)	Die thickne	Die thickness: 0.96 mm, 2.0 mm, 2.75 mm					
	Without Glass	2.17 mm x	2.17 mm x 2.17 mm x 0.40 mm					
Veight		With 0.56	With 0.56 mm thick Glass - 0.007 grams, with 1.60 mm thick Glass - 0.016 grams					
voigin		With 2.36	With 2.36 mm thick Glass - 0.022 grams, without Glass - 0.002 grams					
Metalization		Pure alum	Pure aluminum					
Media Compatibility	/	Clean, dry	air, and noncorro	osive gases				
Electrical Perform	ance @ 25°C (72°F), 1	.0 mA						
Parameter	Range	Min	Typical	Max	Units	Notes		
Recommended					•			
Recommended	Current		1.0	1.6	mA	-		
	Current Voltage	5.0	1.0 10	1.6 V	mA	-		
excitation	Voltage	5.0			Ohm	2		
excitation	Voltage		10	V		- - 2		
excitation Input and Output Ir	Voltage npedance	4000	10 5300	V 6000		- - 2 2,3		
excitation Input and Output Ir	Voltage npedance 5 to 7 psi	4000 -10	10 5300 within ±5	V 6000 +10	Ohm			
excitation Input and Output Ir Zero Offset	Voltage npedance 5 to 7 psi 15 to 70 psi	4000 -10 -7.5	10 5300 within ±5 within ±2.5	V 6000 +10 +7.5	Ohm			
excitation Input and Output Ir Zero Offset Full Scale Output	Voltage mpedance 5 to 7 psi 15 to 70 psi 150 to 15000 psi	4000 -10 -7.5 -5.0	10 5300 within ±5 within ±2.5 -0.3	V 6000 +10 +7.5 +5.0	Ohm			
excitation Input and Output Ir Zero Offset Full Scale Output	Voltage mpedance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi	4000 -10 -7.5 -5.0 100	10 5300 within ±5 within ±2.5 -0.3 130	V 6000 +10 +7.5 +5.0 166	Ohm mV/V	2, 3		
excitation Input and Output Ir Zero Offset Full Scale Output	Voltage mpedance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi	4000 -10 -7.5 -5.0 100 120	10 5300 within ±5 within ±2.5 -0.3 130 140	V 6000 +10 +7.5 +5.0 166 180	Ohm mV/V	2, 3		
excitation Input and Output Ir Zero Offset Full Scale Output (FSO or Span)	Voltage npedance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi 15000 psi	4000 -10 -7.5 -5.0 100 120 215	10 5300 within ±5 within ±2.5 -0.3 130 140 250	V 6000 +10 +7.5 +5.0 166 180 275	Ohm mV/V mV	2, 3 2, 4		
excitation Input and Output Ir Zero Offset Full Scale Output (FSO or Span)	Voltage mpeJance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi 15000 psi 5 psi	4000 -10 -7.5 -5.0 100 120 215 -0.30	10 5300 within ±5 within ±2.5 -0.3 130 140 250 -0.14	V 6000 +10 +7.5 +5.0 166 180 275 +0.30	Ohm mV/V	2, 3 2, 4 2, 5, 10		
excitation Input and Output Ir Zero Offset Full Scale Output (FSO or Span)	Voltage mpedance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi 150 psi 5 psi 7 psi	4000 -10 -7.5 -5.0 100 120 215 -0.30 -0.20	10 5300 within ±5 within ±2.5 -0.3 130 140 250 -0.14 -0.10	V 6000 +10 +7.5 +5.0 166 180 275 +0.30 +0.20	Ohm mV/V mV	2, 3 2, 4 2, 5, 10 2, 5, 6		
excitation Input and Output Ir Zero Offset Full Scale Output (FSO or Span) Linearity	Voltage mpeJance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi 150 psi 7 psi 15 to 5000 psi 15 to 5000 psi	4000 -10 -7.5 -5.0 100 120 215 -0.30 -0.20 -0.15	10 5300 within ±5 within ±2.5 -0.3 130 140 250 -0.14 -0.10 within ±0.1	V 6000 +10 +7.5 +5.0 166 180 275 +0.30 +0.20 +0.15	Ohm mV/V mV	2, 3 2, 4 2, 5, 10 2, 5, 6 2, 5, 10		
excitation Input and Output Ir Zero Offset Full Scale Output (FSO or Span) Linearity Zero Pressure Rep	Voltage mpeJance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi 15000 psi 5 psi 7 psi 15 to 5000 psi 15 to 5000 psi	4000 -10 -7.5 -5.0 100 120 215 -0.30 -0.20 -0.15 -0.25	$ \begin{array}{r} 10 \\ 5300 \\ within \pm 5 \\ within \pm 2.5 \\ -0.3 \\ 130 \\ 140 \\ 250 \\ -0.14 \\ -0.10 \\ within \pm 0.1 \\ -0.07 \\ \end{array} $	V 6000 +10 +7.5 +5.0 166 180 275 +0.30 +0.20 +0.15 +0.25	Ohm mV/V mV %FSO %FSO	2, 3 2, 4 2, 5, 10 2, 5, 6 2, 5, 10 2, 5, 7 2		
excitation Input and Output Ir Zero Offset Full Scale Output (FSO or Span) Linearity Zero Pressure Rep Thermal Coefficien	Voltage mpeJance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi 15000 psi 5 psi 7 psi 15 to 5000 psi 15 to 5000 psi	4000 -10 -7.5 -5.0 100 120 215 -0.30 -0.20 -0.20 -0.15 -0.25 -0.1	$ \begin{array}{r} 10 \\ 5300 \\ within \pm 5 \\ within \pm 2.5 \\ -0.3 \\ 130 \\ 140 \\ 250 \\ -0.14 \\ -0.10 \\ within \pm 0.1 \\ -0.07 \\ \pm 0.01 \\ \end{array} $	V 6000 +10 +7.5 +5.0 166 180 275 +0.30 +0.20 +0.20 +0.15 +0.25 +0.1	Ohm mV/V mV %FSO	2, 3 2, 4 2, 5, 10 2, 5, 6 2, 5, 10 2, 5, 7		
excitation Input and Output Ir Zero Offset Full Scale Output (FSO or Span) Linearity Zero Pressure Rep Thermal Coefficien of Zero (TCO)	Voltage mpeJance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi 15000 psi 5 psi 7 psi 15 to 5000 psi 15 to 5000 psi 15 to 5000 psi 5 psi 7 psi 15 to 5000 psi 5 to 70 psi	4000 -10 -7.5 -5.0 100 120 215 -0.30 -0.20 -0.15 -0.25 -0.1 -15	$ \begin{array}{r} 10 \\ 5300 \\ within \pm 5 \\ within \pm 2.5 \\ -0.3 \\ 130 \\ 140 \\ 250 \\ -0.14 \\ -0.10 \\ within \pm 0.1 \\ -0.07 \\ \pm 0.01 \\ within \pm 5 \\ \end{array} $	V 6000 +10 +7.5 +5.0 166 180 275 +0.30 +0.20 +0.15 +0.25 +0.1 +15	Ohm mV/V mV %FSO %FSO	2, 3 2, 4 2, 5, 10 2, 5, 6 2, 5, 10 2, 5, 7 2		
excitation Input and Output Ir Zero Offset Full Scale Output (FSO or Span) Linearity Zero Pressure Rep Thermal Coefficien of Zero (TCO) Thermal Coefficien	Voltage mpeJance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi 15000 psi 5 psi 7 psi 15 to 5000 psi 15 to 5000 psi 5 psi 7 psi 15 to 5000 psi 15 to 70 psi 150 to 15000 psi 150 to 15000 psi	4000 -10 -7.5 -5.0 100 120 215 -0.30 -0.20 -0.15 -0.25 -0.1 -15 -10	$ \begin{array}{r} 10\\ 5300\\ within \pm 5\\ within \pm 2.5\\ -0.3\\ 130\\ 140\\ 250\\ -0.14\\ -0.10\\ within \pm 0.1\\ -0.07\\ \pm 0.01\\ within \pm 5\\ within \pm 5\\ within \pm 2.5\\ 0.380.40\\ \end{array} $	V 6000 +10 +7.5 +5.0 166 180 275 +0.30 +0.20 +0.15 +0.25 +0.1 +15 +10 0.48	Ohm mV/V mV %FSO %FSO μV/V/°C %/°C	2, 3 2, 4 2, 5, 10 2, 5, 6 2, 5, 10 2, 5, 7 2 8, 9, 10 8, 9		
excitation Input and Output Ir Zero Offset Full Scale Output (FSO or Span) Linearity Zero Pressure Rep Thermal Coefficien of Zero (TCO) Thermal Coefficien	Voltage mpeJance 5 to 7 psi 15 to 70 psi 150 to 15000 psi 5 to 800 psi 1000 to 5000 psi 15000 psi 5 psi 7 psi 15 to 5000 psi 15 to 70 psi 150 to 15000 psi 150 to 15000 psi 150 to 15000 psi 150 to 15000 psi	4000 -10 -7.5 -5.0 100 120 215 -0.30 -0.20 -0.15 -0.25 -0.1 -15 -10 0.32	$ \begin{array}{r} 10 \\ 5300 \\ within \pm 5 \\ within \pm 2.5 \\ -0.3 \\ 130 \\ 140 \\ 250 \\ -0.14 \\ -0.10 \\ within \pm 0.1 \\ -0.07 \\ \pm 0.01 \\ within \pm 5 \\ within \pm 2.5 \\ \end{array} $	V 6000 +10 +7.5 +5.0 166 180 275 +0.30 +0.20 +0.15 +0.25 +0.1 +15 +10	Ohm mV/V mV %FSO %FSO	2, 3 2, 4 2, 5, 10 2, 5, 6 2, 5, 10 2, 5, 7 2 8, 9, 10		

P883 Specifications - Low-Profile Configuration

Parameter									
General			Value			Units	Notes		
Pressure Differenti	Pressure Differential and absolute			5, 15, 30, 70, 150, 300					
Maximum Pressure		6X pressure 5-150 psi 3X pressure 300 psi				Products may be qualified to a higher maximum pressure after additional testing			
Environmental									
Electrostatic damage	(ESD) CI	ass 1					MIL-STD 883 method 3015		
Tempera- Operating	g		–40 to 14	0		°C	–40°F to 284°F, note 1		
ture Range Storage			–55 to 15	0		°C	–67°F to 302°F		
Mechanical									
Die Dimensions: With	glass (L	x W x H)	1.99 mm	x 1.99 mm x 0.96	6 mm				
Wi	thout gla	ass (L x W x H)	2.17 mm	x 2.17 mm x 0.40) mm				
Weight			With 0.56	With 0.56 mm thick Glass - 0.007 grams, without Glass - 0.002 grams					
Metallization			Pure alum	ninum					
Media Compatibility			Clean, dry air, and noncorrosive gases						
Electrical Performan	се								
Parameter	Range		Min	Typical	Мах	Units	Notes		
Recommended	Cur	rent	-	1.0	1.6	mA			
excitation	Volt	tage	-	5.0	10	V			
Input and Output Imp	edance		4000	48005300	6000	Ohm	2		
	5 psi	5 psi		within ±5	+10	mV/V	2, 3		
Zero Offset	15 to 70 psi 150 to 300 psi		-7.5	within ±2.5	+7.5				
			-5.0	-0.3	+5.0				
Full Scale Output	5 psi		100	115	166	mV	2, 4		
(FSO or Span)	15 to 3	800 psi	100	130	166	IIIV	<u>د</u> , ד		
Linearity	5 psi 15 to 300 psi		-0.30	-0.120.20	+0.30	%FSO	2, 5, 10		
Lineanty			-0.15	within ±0.1	+0.15		2, 5, 10		
Zero Pressure Repeatability		-0.1	±0.01	+0.1	%FSO	2			
Thermal Coefficient of Zero (TCO)		-15	within ±5	+15	µV/V/°C	8, 9, 10			
Thermal Coefficient of	Thermal Coefficient of Resistance (TCR)		0.32	0.40	0.48	%/°C	8, 9		
Thermal Coefficient of Sensitivity (TCS)			-0.23	-0.19	-0.15	%/°C	8, 9		
Zaua Thannad Libertaur	-!-	With glass	-0.2	within ±0.02	+0.2	0/ 500	0.0.10		
Zero Thermal Hystere	SIS	Without glass	-0.25	within ±0.05	+0.25	%FSO	8, 9, 10		
ESO Thormal Unitered	cic	With glass	-0.2	within ±0.03	+0.2	%FSO	8 0 10		
FSO Thermal Hysteresis		Without glass	-0.25	within ±0.05	+0.25	70-30	8, 9, 10		

- The die passed qualification testing in -40°C...150°C temperature range. Additional testing in this temperature range may be required for some applications. 1.
- 2. Tested using 1.0 mA excitation at 25°C.
- 0 kPaA for absolute sensors, 0 kPaG for differential or 3. gage sensors.
- Part for 5000 psi can be used for 7500 psi and 10,000 psi. Part for 15,000 can be used for 10,000 psi. 4. 5.
- Best fit straight line.
- Part for 7 psi can be used for 5 psi for pressure non-linearity within ± 0.20 . 6. 7.
- Typical pressure non-linearity is provided based on testing at 10,000 psi. Parameter is evaluated between 86°F and 176°F (30°C 8.
- and 80°C) by testing samples from each wafer, typical range.
- Between -40°F and 284°F (-40°C and 140°C) with respect to 25 °C, typical range.
- Die mounting may have a large impact of sensor hys-teresis, linearity, and TCO when low profile die is used.



P883 Schematic and wire bonding diagram



P883-CB (closed bridge) Schematic and wire bonding diagram

Shipping and Handling

The standard products are available on tape with metal frame and are shipped in protective plastic containers. Electrical rejects and visual rejects are inked. Each wafer will have the following information: Lot #, Wafer #, Part #, and the number of good (yielded) die.

Warranty

NovaSensor warrants its products against defects in material and workmanship for 12 months from date of shipment. Products not subject to misuse will be repaired or replaced. THE FOREGOING IS IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTIES. NovaSensor reserves the right to make changes without further notice to any products herein. NovaSensor makes no warranty, representation or guarantee regarding the suitability of its products for any particular application, nor does NovaSensor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims and all liability, including without limitation consequential or incidental damages.

Ordering Information

Standard Configuration

63 mil (1.60 mm) Glass – Standard				
Part Gage /		Pressure range		
No.	Abs.	Psi	Bar	
71322	G	5	0.34	
71837	G	7	0.48	
71323	G	15	1.03	
71324	G	30	2.06	
71325	G	70	4.82	
71326	G	150	10.3	
71327	G	300	20.6	
71405	G	500	34.5	
71744	G	800	55.2	
71346	А	5	0.34	
71838	А	7	0.48	
71328	А	15	1.03	
71329	А	30	2.06	
71330	А	70	4.82	
71331	А	150	10.3	
71332	А	300	20.6	
71776	А	500	34.5	
71821	А	800	55.2	
71588	А	1000	68.9	
71589	А	1500	103	
71590	А	3000	206	
71591	А	5000	345	
/1391	~	10000	689	
71621	А	15000	1034	

93 mil (2.36 mm) Glass – Optional					
Part	Gage /	Pressure Range			
No.	Abs.	Psi	Bar		
71333	G	5	0.34		
71334	G	15	1.03		
71335	G	30	2.06		
71336	G	70	4.82		
71337	G	150	10.3		
71338	G	300	20.6		
71347	А	5	0.34		
71339	А	15	1.03		
71340	А	30	2.06		
71341	А	70	4.82		
71342	А	150	10.3		
71343	А	300	20.6		

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Sensors

Low Profile Configuration

22 mil (0.56 mm) Glass – Low profile				
Part Gage /		Pressure Range		
No.	Abs.	Psi	Bar	
51632	G	5	0.34	
51634	G	15	1.03	
51636	G	30	2.06	
51638	G	70	4.82	
51640	G	150	10.3	
51642	G	300	20.6	
51839	А	5	0.34	
51633	А	15	1.03	
51635	А	30	2.06	
51637	А	70	4.82	
51639	А	150	10.3	
51641	А	300	20.6	
١	lo glass	– Low Pr	ofile	
Part			ire Range	
No.	Abs.	Psi	Bar	
51643	G	5	0.34	
51644	G	15	1.03	
51645	G	30	2.06	
51646	G	70	4.82	
51647	G	150	10.3	
51648	G	300	20.6	
No G	lass with	Au Meta	allization	
71625	G	5	0.34	
71610	G	15	1.03	

The code number to be ordered may be specified as follows:

Code 7XXXX	Glass Type Standard / optional glass No glass in case of Au metalization			
5XXXX	Low profile / no glass			
	Code Not specified	Circuit Configuration Wheatstone bridge open at Ground		
	СВ	Closed Wheatstone bridge		
P883 ·				

Note:

All products are supplied on 6" wafers. Minimum release quantity: 2500 die.

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