MLX90807/90808

Integrated Relative and Absolute Pressure Sensors

Features and Benefits

- ❑ Compact monolithic (single die) solution
- ❑ Absolute and Relative pressure sensors for different ranges
- ❑ Fully programmable through the connector with OTP memory
- ❑ Fully automotive compliant (overvoltage, reverse voltage, broken tracks and broken membrane diagnostics)
- ❑ Fully automotive qualified beyond AEC-Q100 requirements
- ❑ Rail-to-Rail ratiometric analog output proportional to the applied pressure

Application Examples

- ❑ Automotive applications:
  - Engine management: MAP/TMAP, Barometers
  - Fuel management: Fuel vapour, Fuel delivery, CNG/LPG
  - Braking systems: brake boosters
  - Oil pressure: engine, transmission
  - Filter control
  - HVAC systems
- ❑ Home appliance applications:
  - Washing machines, Dish washers, Boilers
  - Home HVAC systems
- ❑ Medical applications
  - Respirators
  - Blood pressure monitoring

Ordering Code

Product Code	Temperature Code	Package Code	Option Code	Packing Form Code
MLX90807	L	UF	AAA-000	WB
MLX90807	L	UF	CAA-001	WB
MLX90807	L	UF	CBA-002	WB
MLX90807	L	UF	CCA-003	WB
MLX90807	L	UF	CDA-004	WB
MLX90808	L	UF	CAA-001	WB
MLX90808	L	UF	CBA-002	WB
MLX90808	L	UF	CCA-003	WB
MLX90808	L	UF	CDA-004	WB

Legend:

Product Code: MLX90808=>absolute pressure sensor,
MLX90807=>relative pressure sensor

Temperature Code: L for Temperature Range -40°C to 150°C

Package Code: UF for Die on Foil

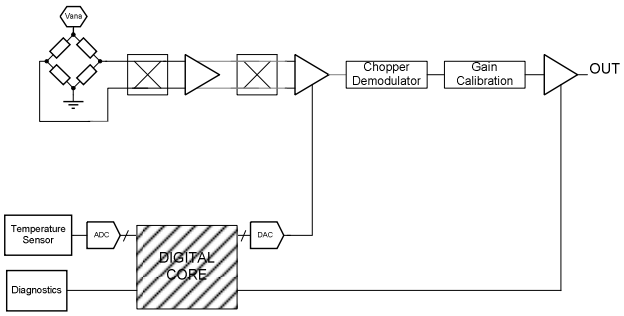
Option Code:
MLX90807LUF-AAA-000 = 0.06 – 0.14 Bar Full Span
MLX90807LUF-CAA-001 = 0.4 – 2 Bar Full Span
MLX90807LUF-CBA-002 = 2 – 8 Bar Full Span
MLX90807LUF-CCA-003 = 8 – 15 Bar Full Span
MLX90807LUF-CDA-004 = 15 – 45 Bar Full Span

MLX90808LUF-CAA-001 = 0.6 – 3 Bar Full Span
MLX90808LUF-CBA-002 = 3 – 8 Bar Full Span
MLX90808LUF-CCA-003 = 8 – 15 Bar Full Span
MLX90808LUF-CDA-004 = 15 – 45 Bar Full Span

Packing Form: WB for Waferbox

Ordering example: MLX90320LFR-BBA-000-RE

1 Functional Diagram



General Description

The MLX90807 and MLX90808 are fully integrated relative and absolute pressure sensors respectively. They are realized with state of the art compatible CMOS and MEMS technologies. Piezoresistors in a wheatstone bridge configuration are implanted on the edges of a silicon membrane and transform the stress induced by the pressure on the membrane into an electrical signal. An analog chain interacting with a digital core performs the conditioning of the piezoresistors electrical signal. By writing calibration settings in the chip memory an uniform transfer function is obtained over pressure and temperature

2 Absolute Maximum Ratings

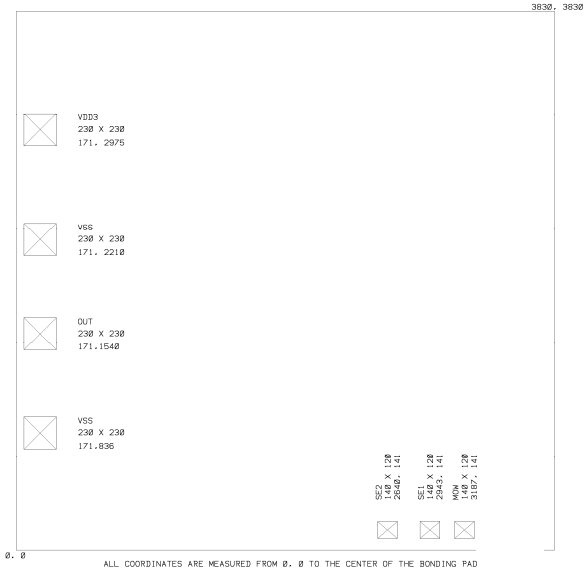
Parameter	Symbol	Min Value	Max Value	Units
Supply Voltage (overvoltage)	V_{DD}	-14	16	V
Supply Voltage (operating)	V_{DD}	4.5	5.5	V
Supply Current, I_{DD} with V_{DD} = 16 V	I_{DD}		25	mA
Output Voltage, V_{out}	V_{out}	-0.5	16	V
Supply current with output shorted to 0V .. 16V	I_{DD}		100	mA
Supply Current limit, reverse polarity	I_{DD}		160	mA
Programming Temperature Range (ZAP cells)	T_P	-20	100	°C
Operating Temperature Range	T_A	-40	150	°C
Storage Temperature Range	T_S	- 50	150	°C
Burst Pressure (versions AA-0 CA-1, CB-2, CC-3) Front side exposed			5x the maximum full scale of that version	
Burst Pressure (versions CD-4) Front side exposed			3x the maximum full scale of that version	
ESD Sensitivity (AEC Q100 002)		-2	2	kV

Table 1: Absolute maximum ratings

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

3 Die Information

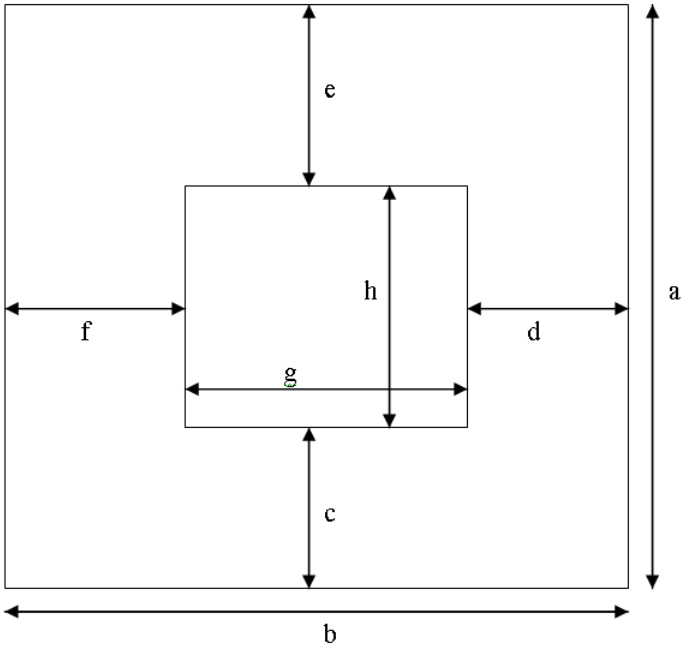
Die front side description.



Pad Name	Pad Function / Description
Vdd3	Supply pad
SE1, SE2, MOW	Test pads
OUT	Analog output pad
Vss	Ground pad, 2 pads are available but only one has to be connected

Table 2: Pad definitions and descriptions

Die back side description (only valid for the 90807, there is no opening at the back side of the 90808).



The internal square represents the back side opening of the 90807. The dimensions c,d,e, f show the space available for the die attach.

Dimensions in um	a	b	c	d	e	f	g	h	thickness
MLX90807-0	3830	3830	900	900	900	900	2000	2000	550
MLX90807-1 -2 -3 -4	3830	3830	1150	1150	1150	1150	1500	1500	550
MLX90808-1	3830	3830	NA	NA	NA	NA	NA	NA	570
MLX90808 -2 -3 -4	3830	3830	NA	NA	NA	NA	NA	NA	580

For more information on how the product is delivered, how to perform the assembly of the product and how the product has been qualified to meet the most stringent automotive quality requirements consult your local sales representative and ask for access to the following documents:
Pressure Sensors Assembly guidelines
Pressure Sensors Shipping information
Qualifying MEMS based Pressure Sensors

4.General Electrical Specifications

DC Operating Parameters T_A = -40 °C to 150 °C, V_{DD} = 5V (unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Units
Supply Voltage	V_{dd}	4.5	5	5.5	V
Supply Current	I_{dd}	4	7	10	mA
Output Load Resistance	Rload	4.47		100	kOhm
Output Capacitive Load	CLoad	2	47	100	nF
Low Clamping level (versions CA-1, CB-2, CC-3, CD-4)		5		7	% V_{dd}
High Clamping level(versions CA-1, CB-2, CC-3, CD-4)		93		95	% V_{dd}
Low Clamping level (version AA-0)		6.5		8.5	% V_{dd}
High Clamping level (version AA-0)		91		93.5	% V_{dd}
Linearity error	V_{out}	-0.3	0.1	0.3	% FSO
Ratiometricity error		-0.3		0.3	% FSO
Output hysteresis vs temperature		-0.3	0.1	0.3	% FSO
Noise (versions CA-1, CB-2, CC-3, CD-4)				2	mVrms
Power-up time				5	ms
Response time 10% / 90%	$T_{rp\ 10-90}$			1.5	ms

Table 3: Electrical specifications

Parameter	Min	Typ	Max	Units
Output when sensor is broken			2	% V_{dd}
Output when V_{dd} is broken			4	% V_{dd}
Output when V_{ss} is broken	96			% V_{dd}

Table 4: Diagnostic features

For more information on the electrical specifications please contact your local sales representative and ask for the document *Pressure Sensors Error Budget*.

5. General Description

This chip integrates a pressure sensor and the associated signal conditioning on the same die. The supply voltage V_{DD} directly supplies the pressure sensor.

The pressure sensing element consists of a square diaphragm realized in the silicon chip by backside etching. Due to its small thickness this diaphragm reacts to a pressure difference at both of its side by cambering. The internal strain increases, in particular at the border of the diaphragm. Here, the piezo-resistive elements have been implanted into the silicon diaphragm, which act as transducer.
Four resistors are placed in a Wheatstone-bridge configuration at the four borders of the square diaphragm.

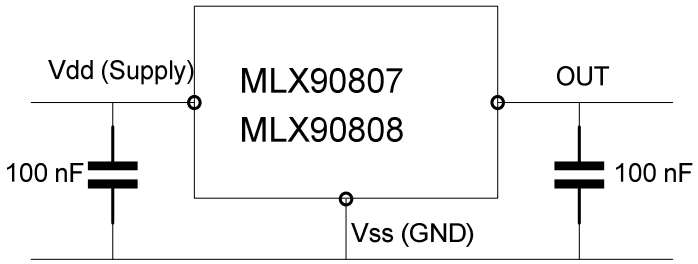
A chopped instrumentation stage amplifies the differential output signal of the sensor. The gain of this amplifier can be adjusted with 3 bits. After the input stage, there is a 3 bit programmable coarse offset which is followed by a differential to single-ended conversion. The reference voltage for this stage is generated by a 10 bit DAC and varies linearly with temperature in order to perform the offset and offset drift compensation. A digital hardware multiplier calculates this compensation. The temperature signal, serving as input for this multiplier, is generated from the ADC of the output signal of the internal temperature sensor.
The chopped signal is demodulated with a switched capacitor stage. The buffered output serves as reference for a 10 bit DAC to perform the span and span drift compensation. The DAC is controlled by the digital part.
Finally the signal is given out by a class AB rail-to-rail amplifier capable of sourcing and sinking large currents.

A calibration of the transfer function using 3 temperature points and 2-point pressure points per temperature can be performed to achieve an error less than ±1% over the complete pressure and temperature range (the output error is referred to the output span).

PTC (Programming Through Connector) protocol is used to perform calibration.
The programming of the sensor chip is carried out via the analog connections (i.e. supply, ground, signal out). No additional pins are necessary for calibration. Melexis delivers all required hardware and software to perform the calibration of the MLX90807 and MLX90808.

For more information on how to perform the calibration of the MLX90807/90808 consult the following documents:
AN PTC 90807
Multi Sensor Calibration Board
AN Advanced Calibration 90807 90808
Software User Manual MLX90807 PTC04

6. Application Information



Only 3 pins are used in the application (Vdd, Vss, Out).
Calibration and Programming is made through the application pins.
Only a capacitor on the supply and output lines are necessary.

7. Disclaimer

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