



Physical Logic

# MAXL-CL-3050 Datasheet

**Part Number:** 32010155-10/ 32010155-15/ 32010155-20

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MAXL-CL-3050 is a high performance accelerometer based on a unique MEMS device and ASIC designed for tactical navigation applications, providing a digital acceleration output.

A highly advanced device, the MAXL-CL-3050 features an input range of  $\pm 50g$  and operates from a single power supply voltage of 5 V with  $< 85$  mA current consumption. The sensor's system is composed of an LCC44 hermetically sealed package mounted on an interface board for customer evaluation and prototype testing. According to specified ICD, Physical Logic offers its customers assembly and testing of accelerometers on customer integration boards.

## Features

- ❖ Sensing range  $\pm 50$  g
- ❖ Single-axis sensing
- ❖ Temperature output for thermal compensation
- ❖ High resolution
- ❖ High bias and scale factor stability
- ❖ Hermetic packaging
- ❖ Low profile, small form factor, LCC44 package
- ❖ Low weight





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## Table of Contents

1	Accelerometer Functional Characteristics .....	3
2	Accelerometer Environmental Characteristics .....	5
3	Absolute Maximum Ratings .....	6
4	Physical specifications.....	6
5	Operational Principles.....	7
6	Electrical Interface .....	8
7	Pin configuration and function description .....	8
8	Temperature Sensor .....	9
9	Quality.....	9

## List of figures

Figure 1	Simplified view of sensor interface.....	7
Figure 2	Connector pin-out (Top View) .....	8

## List of tables

Table 1	Accelerometer Functional characteristics.....	3
Table 2	Accelerometer Environmental characteristics .....	5
Table 3	Absolute maximum ratings .....	6
Table 4	Physical specifications .....	6
Table 5	Pin description.....	8
Table 6	Temperature Sensor Specifications .....	9

## 1 Accelerometer Functional Characteristics

Table 1 Accelerometer Functional Characteristics

Parameter	Units	MAXL-CL-3050-10	MAXL-CL-3050-15	MAXL-CL-3050-20
Input Range	g	±50	±50	±50
<b>Bias</b>				
Null Bias @25°C	mg (max)	30	30	30
Short Term Stability 5h	µg (max)	220	200	180
One-year Repeatability	µg (1σ)	4000	2000	1200
Temperature Sensitivity	µg/°C (max)	600	300	300
Temperature Residual Error	µg (max)	900	750	500
<b>Scale Factor</b>				
Scale Factor @25°C	mbit/g	7.2±0.01	7.2±0.01	7.2±0.01
Short Term Stability 5h	ppm (max)	150	150	150
One-year Repeatability	ppm (max)	800	600	400
Temperature Sensitivity	ppm/°C (max)	200	150	150
Temperature Residual Error	ppm (max)	300	200	200
<b>Misalignment</b>				

Parameter	Units	MAXL-CL-3050-10	MAXL-CL-3050-15	MAXL-CL-3050-20
Misalignment @25°C	mrad (max)	10	10	10
Temperature Residual Error	μrad (max)	100	50	50
<b>Other</b>				
Turn On to Turn On Repeatability @25°C	μg (max)	250	200	200
SF Linearity Error	ppm of input acceleration over full range (max)	450	450	300
Resolution/Threshold	μg (max)	50	50	50
Bandwidth	Hz	>300	>300	>300
Equivalent Noise Density over Bandwidth	μg/√Hz (max)	150	120	100
Vibration Rectification Error (20-2000 Hz)	μg/g <sup>2</sup> <sub>RMS</sub> (max)	30	25	25

## 2 Accelerometer Environmental Characteristics

The accelerometer is qualified according to the Table 2

**Table 2 Accelerometer Environmental Characteristics**

Operating temperature range	-40°C to +85°C
Storage temperature range	-54°C to +90°C
Operational vibration	5 g RMS, 20-2000 Hz, 2 h each axis
Non-operational vibration (Transportation by track)	MIL-STD-810G METHOD 514.6, 1 h each axis
Operational shock	40 g 11 msec., saw tooth, 2 shocks each axis
Non-operational shock	75 g 6 msec., saw tooth, 2 shocks each axis
Non-operational high shock	500 g 1 msec., half sine, 2 shocks each axis
ESD sensitivity	Class 2 (MIL-STD-883-G), HBM 2 kV

### 3 Absolute Maximum Ratings

Stresses above those listed as “absolute maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

**Table 3 Absolute maximum ratings**

Ratings	Unit	Maximum value
Supply Voltage (VIN)	V	4 - 6
Operating Temperature Range	°C	-54 to 90

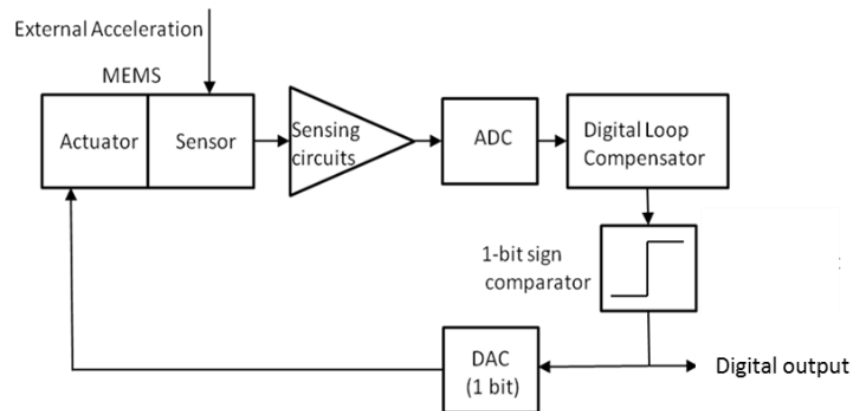
### 4 Physical specifications

**Table 4 Physical specifications**

Packaging	LCC, 44 pin
Sealing	Hermetically sealed. Sealing process is qualified at $5 \cdot 10^{-8}$ atm·cm <sup>3</sup> /s (requirements MIL-STD-883-E)
Weight	< 3 gram (Package Only)
Package size	16.5X16.5X3.4 mm

## 5 Operational Principles

The MAXL-CL-3050 is a complete one axis acceleration measurement system with a measurement range of  $\pm 15$  g.



**Figure 1 Simplified view of sensor interface**

Figure 1 illustrates a block diagram of a Sigma-Delta servo accelerometer, MAXL-CL-3050 represents. The proof mass position of the sensor is captured through sensing circuits. The signal is then digitalized in a low resolution A/D converter before being processed in a digital loop compensator. The output of the compensator is put through a 1-bit sign comparator to get a single bit stream. This bit stream carries the acceleration signal information in a 1-bit format at highly oversampled ratio. The signed 1-bit data coming out of the comparator is then fed back in a 1-bit D/A converter to generate an actuation force pulse on the MEMS sensor.

## 6 Electrical Interface

Connector type: Samtec TFM-105-02-L-D-WT

N.C.	9	10	GND
CLK_OUT	7	8	N.C.
DATA_OUT	5	6	N.C.
N.C.	3	4	N.C.
Vin	1	2	TEMP

Figure 2 Connector pin-out (Top View)

## 7 Pin configuration and function description

Table 5 Pin description

Pin #	Name	Description
1	Vin	Supply Voltage. 5 V (< 85 mA)
2	TEMP	Temperature sensor reading. Analog output.
3	N.C.	Not connected
4	N.C.	Not connected
5	DATA_OUT	Single bit Output data. Digital out, ~780 kHz, 3.3 V.
6	N.C.	Not connected
7	CLK_OUT	Single Bit Output clock (rising edge). Digital out, ~780 kHz, 3.3 V.
8	N.C.	Not connected
9	N.C.	Not connected
10	GND	Ground



## 8 Temperature Sensor

The temperature sensor in the MAXL-CL-3050 accelerometer reflects the sensor's junction temperature and provides a convenient temperature measurement for system-level characterization and calibration feedback.

**Table 6 Temperature Sensor Specifications**

Parameter	Units	Value
Range	°C	- 45 to + 85
Output at 20 °C	V	1.0 ± 0.1
Typical sensitivity	mV/ °C	8.2 ± 0.5
Short term stability	°C	0.01
Accuracy	°C	± 2

## 9 Quality

- Physical Logic is ISO 9001 and AS9100D certified
- MAXL-CL-3050 is qualified according to Mil-STD-810G

Physical Logic reserves the right to update the content of this datasheet without notice.