1 General description

The SCA60*: accelerometer consists of a silicon bulk micro machined sensing element chip and a signal conditioning ASIC. The chips are mounted on a lead-frame and wire bonded to appropriate contacts. The encapsulation process is a standard semiconductor transfer molding process. The sensor has 8 SMD legs (Gull-wing type).

1.1 Block diagram

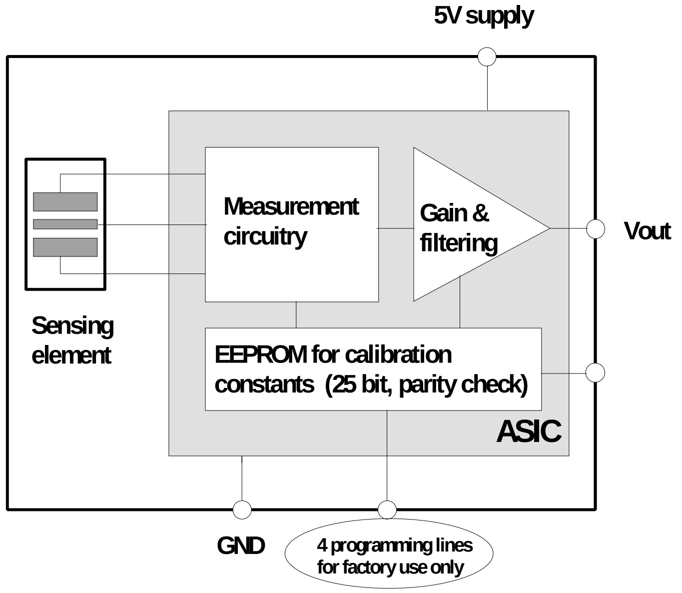


Figure 1. Block diagram of the N1000060

1.2 SCA60*: Features

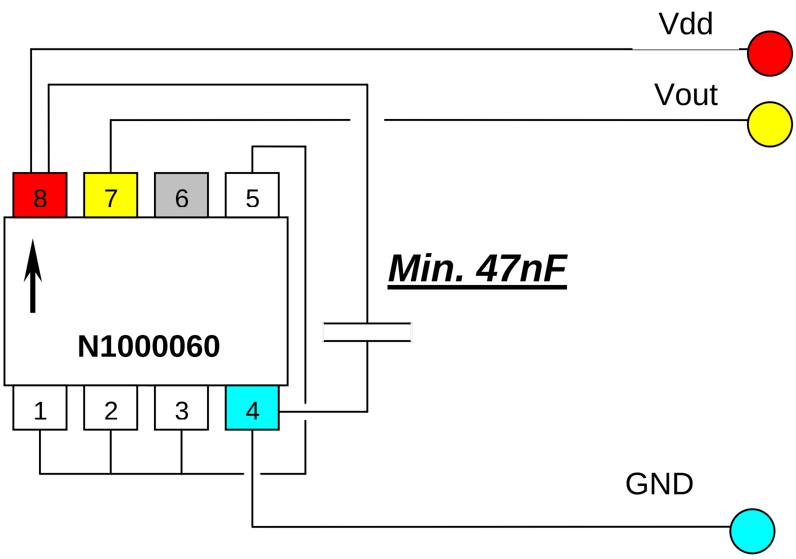
- Single +5V supply
- Low current consumption (2mA typ.)
- Ratiometric output in relation to supply voltage (Vdd = 4.75....5.25V)
- Enhanced failure detection features
    - Memory parity check during power up, and self-test cycle.
    - Built in connection failure detection.
- Wide load drive capability (≥20 kOhm, ≤20 nF)
- True DC response.

1 Electrical specifications

1.1 Electrical Connection

The following is minimum requirement for electrical interface to the N1000060. If over-voltage or reverse polarity protection is needed, please contact lamshine Technologies Oy for application information.

Pins 1, 2, 3 and 5 are connected together.



Pin #	Pin Name	Function
1	CLK	Data shift clock (Factory only)
2	C1	(Factory only)
3	MODE	Mode control input (Factory only)
4	GND	Negative supply voltage (V_{SS})
5	PGM	Programming voltage (Factory only)
6	ST	(Factory only)
7	VOUT	Sensor output voltage
8	VDD	Positive supply voltage (V_{DD})

1.2 Absolute maximum ratings

Supply voltage (V_{DD})	-0.3 V to +7.0V
Voltage at input / output pins	-0.3V to (V_{DD} + 0.3V)
Voltage at PGM and MODE pin	-0.3V to + 0.3V
Storage temperature	-55°C to +125°C
Operating temperature	-40°C to +125°C
Mechanical shock	Drop from 2 meters on a concrete surface. Powered or non-powered. Must be in the final product or in the shipping package.

1.3 Electrical Specification

Vdd = 5.00V and ambient temperature unless otherwise specified.

Parameter	Condition	Min.	Typ	Max.	Units
Measuring range (1	Nominal	-1.0		+1.0	g (2
Supply voltage Vdd		4.5	5.0	5.5	V
Current consumption	Vdd = 5 V; No load		2.0	4.0	mA
Operating temperature	Performance specified at temperatures	- 40		+ 85	°C
Resistive output load	Vout to Vdd or Vss	20			kohm
Capacitive load	Vout to Vdd or Vss			20	nF
Min. output voltage; Vdd = 5V	20k from Vout to Vdd	0		0.25	V
Max. output voltage; Vdd = 5V	20k from Vout to Vss	4.75		5.00	V
Offset (Output at 0g) (3, 12	@ room temperature @ Vdd = 5V		0.5 x Vdd 2.5		V V
Sensitivity (4, 12	@ room temperature @ Vdd = 5V		0.4 x Vdd 2		V/g V/g
Offset Error (Output at 0g) (5, 12	- 40 ... + 85°C	-200	0	+200	mg
Sensitivity error (6, 12	- 40 ... + 85°C	-5	0	+5	%
Typical non-linearity (7	Range = -1g...+1g	-20		+20	mg
Frequency response -3dB (8		20		80	Hz
Ratiometric error (9	Vdd = 4.75...5.25V	-2		2	%
Cross-axis sensitivity (10	@ room temperature			5	%
Output noise	Density at 20 Hz(11		20		ug/sqrt(Hz)
Start-up delay	Reset and parity check			10	ms

Note 1. The measuring range is limited only by the sensitivity, offset and supply voltage rails of the device

Note 2. $1g=9.82m/S^2$

Note 3. Offset specified as Voffset = Vout(0g) [V]. See note 12

Note 4. Sensitivity specified as Vsens = {Vout(+1g) - Vout(-1g)}/2 [V/g]. See note 12

Note 5. Offset error specified as Offset Error = {Vout(0g)-Vdd/2} / Vsens [g]
Vsens = Nominal sensitivity
Vdd/2= Nominal offset
See note 12

Note 6. Sensitivity error specified as Sensitivity Error = { [Vout(+1g)-Vout(-1g)] / 2-Vsens} / Vsens x 100% [%]
Vsens = Nominal sensitivity
See note 12

Note 7. From straight line through -1g and +1g

Note 8. The frequency response is determined by the sensing element's internal gas damping. The output has true DC (0Hz) response.

Note 9. The ratiometric error is specified as

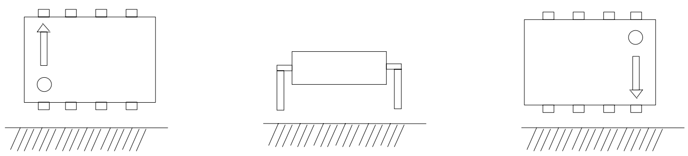
$$RE = 100\% \times \left(1 - \frac{Vout(@Vx) \times \frac{5.00V}{Vx}}{Vout(@5V)} \right)$$

Note 10. The cross-axis sensitivity determines how much acceleration, perpendicular to the measuring axis, couples to the output. The total cross-axis sensitivity is the geometric sum of the sensitivities of the two axes, which are perpendicular to the measuring axis.

Note 11. In addition, supply voltage noise couples to the output due to the ratiometric nature of the accelerometer.
DC..4kHz < 5mVrms

Note 12. Measuring positions

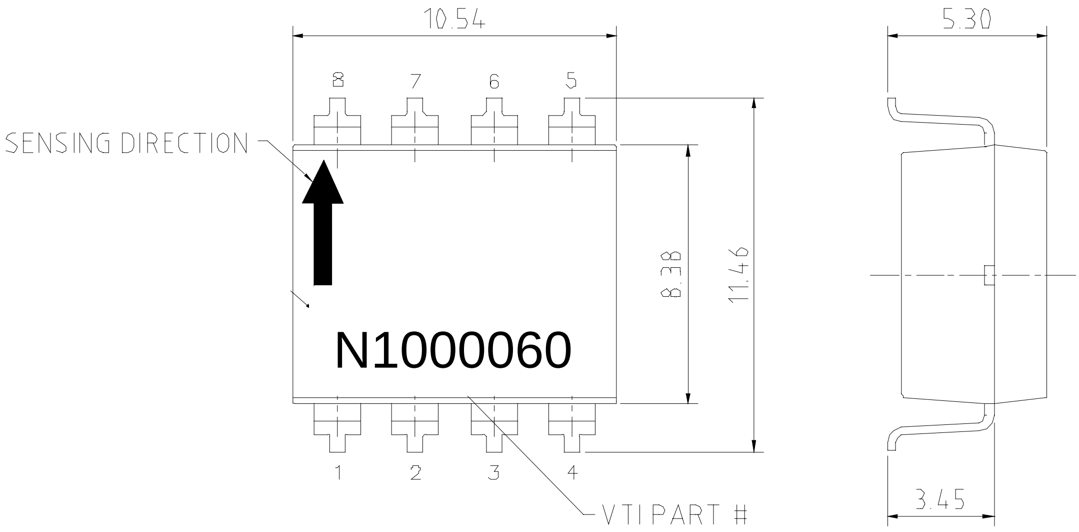
+1g position **0g** position **-1g** position



3 Mechanical specification (Reference only)

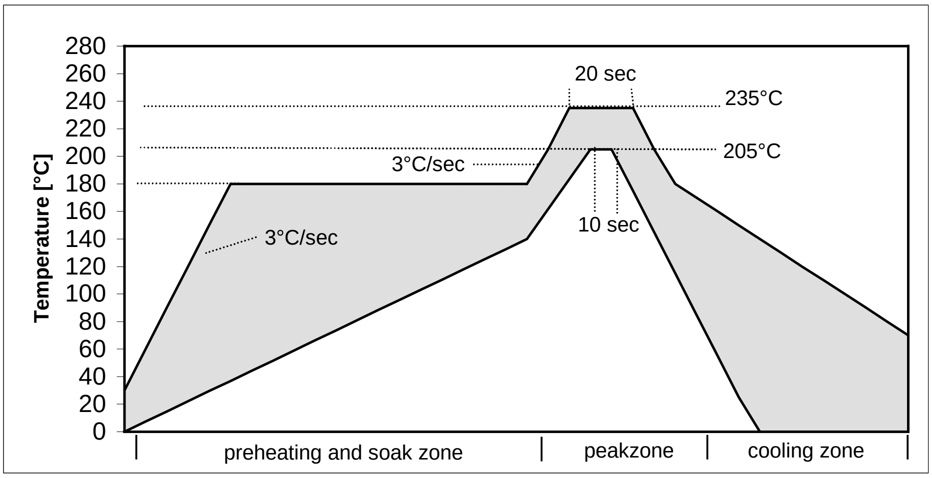
Lead frame material:	Copper per Olin C-194
Plating:	Sulfamate Nickel per QQ-N-290 followed by Palladium
Solderability:	Per MIL-STD_202F, Method 208G

3.1 Dimensions (Reference only)



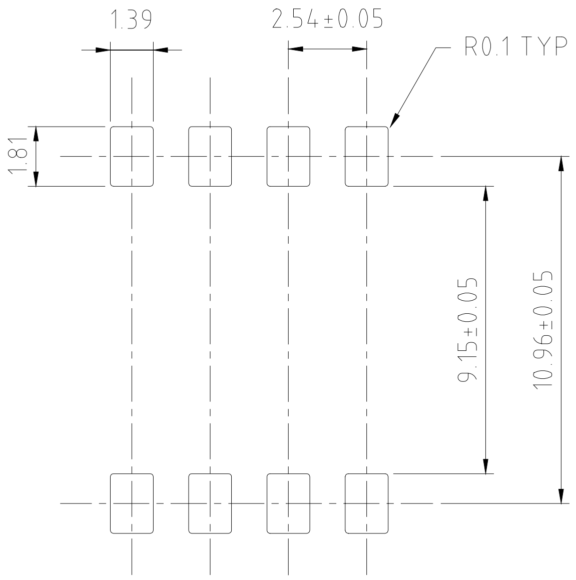
4 Mounting

The SCA60C:N1000060 is suitable for mounting with normal SMD pick-and-place equipment. Recommended body temperature profile during reflow soldering:



Note. Preheating time and temperatures according to solder paste manufacturer. Component body temperature during the soldering should be measured from the top of the part.

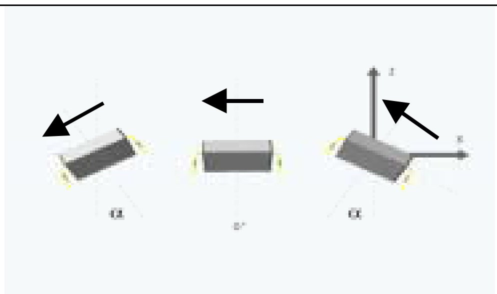
Maximum soldering temperature is 235°C/20sec.



Recommended PCB lay-out

Notes:

- It is important that the part is parallel to the PCB plane and that there is no angular alignment error from intended measuring direction during assembly process.
  - 1° mounting alignment error will increase the cross-axis sensitivity by 1.7%
  - 1° mounting alignment error will change the output by 17mg
- To achieve the highest accuracy and to minimize resonances it is recommended to glue the accelerometer to the PCB before soldering
- Wave soldering is not recommended.
- A supply voltage by-pass capacitor (>47nF) is recommended
- Please note the picture below, which provides information on how the output of the accelerometer behaves in different circumstances, when assembled in a different position in earth's gravity field.

Output voltage polarity vs. position		
	V1 < V2=2.5V @ 0g < V3	