



Xensor Integration
Designing, prototyping, manufacturing

Distributieweg 28
2643 EJ Delfgauw
The Netherlands

XEN-393 Series

Fast Scanning Calorimetry Chips

The XEN-393 is a series of micro-machined thin-film calorimeter sensors designed for measurements on small samples with high temperature scanning rates. The XEN-393 series are made with aluminium interconnections, limiting them to a lower temperature range than the XEN-394 series, which has gold interconnections.

The sensors have single ultra-thin silicon-nitride membrane, which are characterized by a high thermal resistance to the ambient and a very small time constant. This makes these sensors particularly suited for measurements in gaseous environments and for fast measurements, such as Fast Scanning Calorimetry.



Features

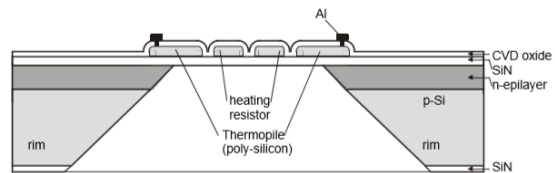
- High heating and cooling rates up to 1 MK/s
- Wide sample temperature range from -273 °C up to 500 °C

Applications

Study of thermally induced physical transitions and chemical processes like crystallization and reorganization of polymer, pharmaceuticals and explosive materials.

Principle of operation

The calorimeter chip consists of a thin membrane, suspended in a thick frame of silicon. Integrated heaters heat-up the middle of the membrane: the sample area of the chip, and a thermopile measures the sample area temperature. In this way the sample can be subjected to a predetermined temperature profile so that the behaviour of the sample with temperature changes can be observed.



Example of calorimeter chip fabrication; SiN membrane with poly-Si heater and thermopile

Design Considerations & Differences

XEN-39390	This is a smaller sized sample area calorimeter chip, with a sample area of about 30x30 μm, featuring a 6-couple thermopile within two 4-wire heaters (bias and guard heater).
XEN-39391	These are medium sized sample area calorimeter chip, with a hot spot area of about 60x60 μm
XEN-39395	and 60x70 μm, featuring a 6-couple thermopile within two 4-wire heaters.
XEN-39392	These are larger sized sample area calorimeter chips, with a sample area of about 100x100 μm,
XEN-39399	featuring a 6-couple thermopile within two 4-wire heaters. The XEN-39399 has a poly-silicon-covered sample area for improved temperature homogeneity.
XEN-39397	These are the largest sized sample area calorimeter chips. The XEN-39398 has double, 4-wire heaters, with a sample area of about 250x250 μm, featuring a 6-couple thermopile within two 4-wire heaters. The sample area is covered with polysilicon for improved temperature homogeneity. The XEN-39397 has a single, 4-wire heater and a 20-couple thermopile, the sample area is 1000x1000 μm and is aluminum-covered for improved temperature homogeneity.
XEN-39398	



Xensor Integration
 Designing, prototyping, manufacturing

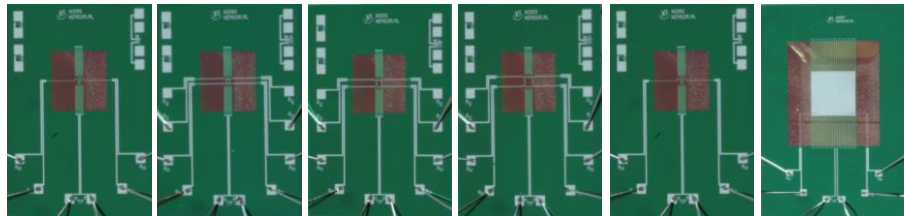
Distributieweg 28
 2643 EJ Delfgauw
 The Netherlands

Typical Specifications

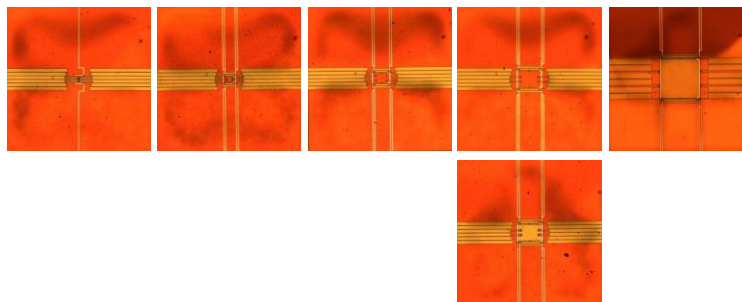
Ambient temperature 22 °C, air, 1013 mbar

	XEN-39395	XEN-39390	XEN-39391	XEN-39392	XEN-39398	XEN-39397
General parameters						
output (V/W)	75	55	46	40	23	23
time constant (ms)	0.7	0.9	1.6	2	3.4	17
noise-equivalent power (μW)	2	2	2	2	2	2
@ heating rate (MK/s)	1.5	1	0.5	0.5	0.5	0.1
membrane + gas (kK/W)	38	28	29	20	11	3.3
addenda (nJ/K)	17	31	54	100	300	5100
Dimensions						
chip dimensions (mm ²)	3.3x2.5	3.3x2.5	3.3x2.5	3.3x2.5	3.3x2.5	5.0x3.3
membrane size (mm ²)	0.9x0.9	0.9x0.9	0.9x0.9	0.9x0.9	0.9x0.9	2.4x2.0
membrane thickness (μm)	1	1	1	1	1	1
sample area (μm x μm)	60x70	86x86	116x116	156x156	296x246	1020x974

Design Overview

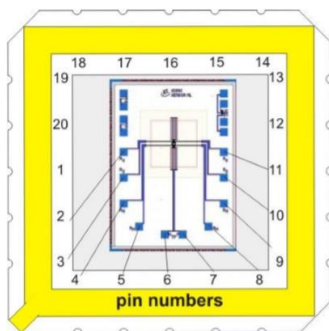


Close up of sample area

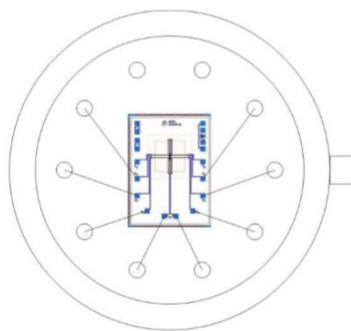


Housing

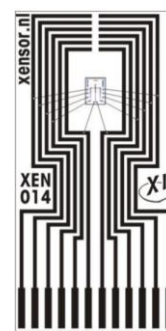
The XEN-393 series are available on various housings.



LCC-20nn



TO-5



XEN-40014