Desarrollo de un sistema completo del automóvil (Airbag)

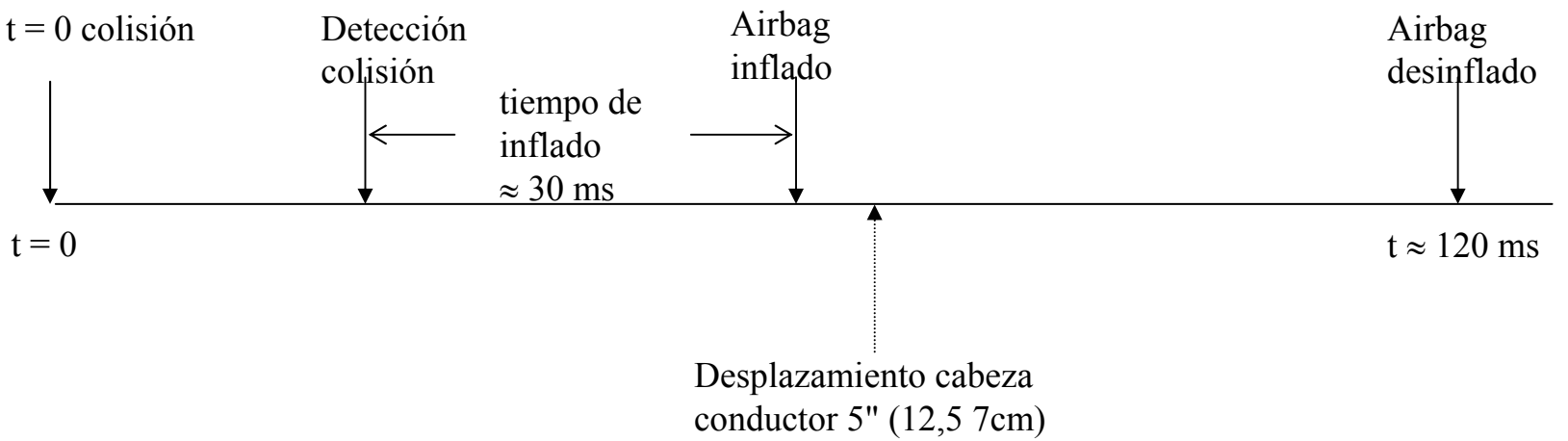
Descripción de los sistemas comerciales

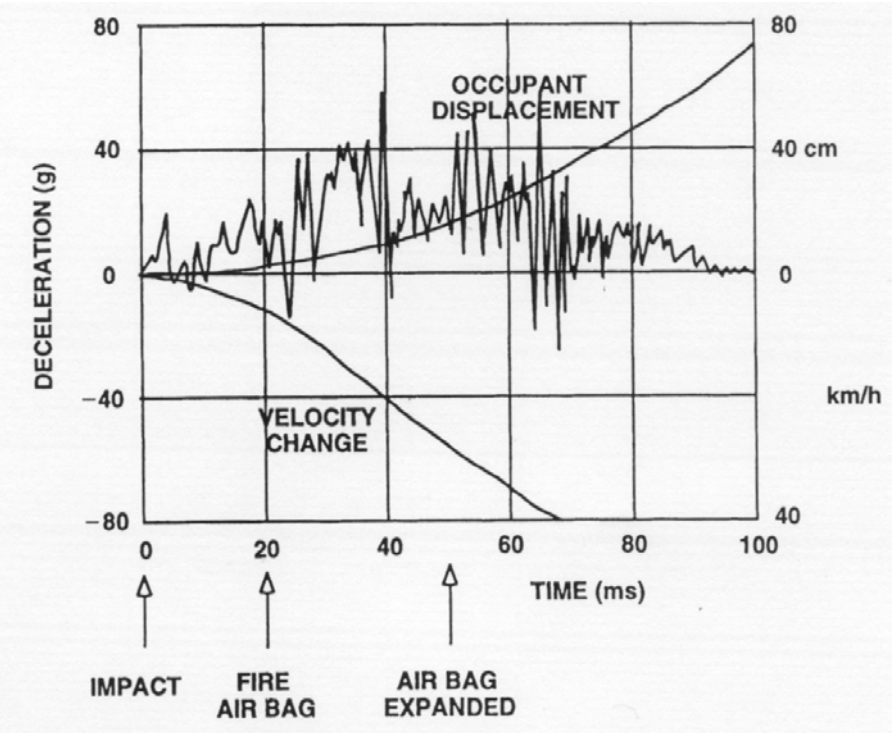
Detección de colisión:

Deceleración decenas de g's (1 g = 9,8 m/s^2)

Características:

Tipo vehículo, velociad, tipo colisión (barrera, poste, etc...)





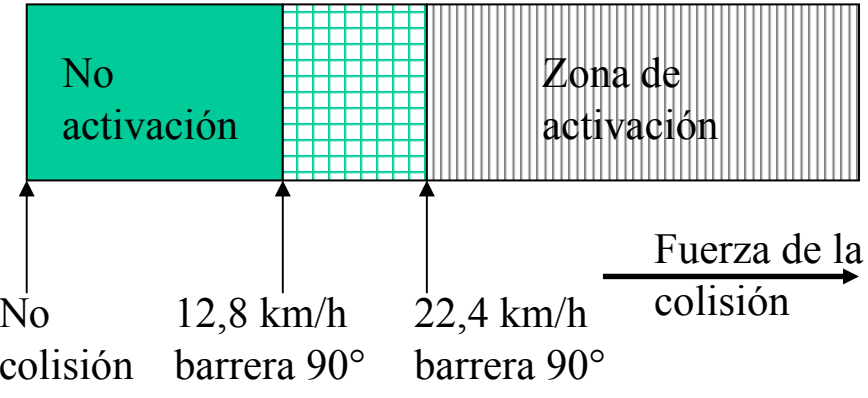
Señal de deceleración registrada en un impacto frontal

Secuencia de inflado del airbag

Descripción de los sistemas comerciales

Detección de colisión:

Características:



Test Library Event	Required Deployment T (msec)
9 mph frontal barrier	ND
9 mph frontal barrier	ND
15 mph frontal barrier	50.0
30 mph frontal barrier	24.0
35 mph frontal barrier	18.0
12 mph left angle barrier	ND
30 mph right angle barrier	36.0
30 mph left angle barrier	36.0
10 mph center high pole	ND
14 mph center high pole	ND
18 mph center high pole	ND
30 mph center high pole	43.0
25 mph offset low pole	56.0
25 mph car-to-car	50.0
30 mph car-to-car	50.0
30 mph 550 hop road, panic stop	ND
30 mph 629 hop road, panic stop	ND
30 mph 550 tramp road, panic stop	ND
30 mph 629 tramp road, panic stop	ND
30 mph square block road, panic stop	ND
40 mph washboard road, medium braking	ND
25 mph left-side pothole	ND
25 mph right-side pothole	ND
60 mph chatter bumps, panic stop	ND
45 mph massoit bump	ND
5 mph curb impact	ND
20 mph curb dropoff	ND
35 mph belgian blocks	ND

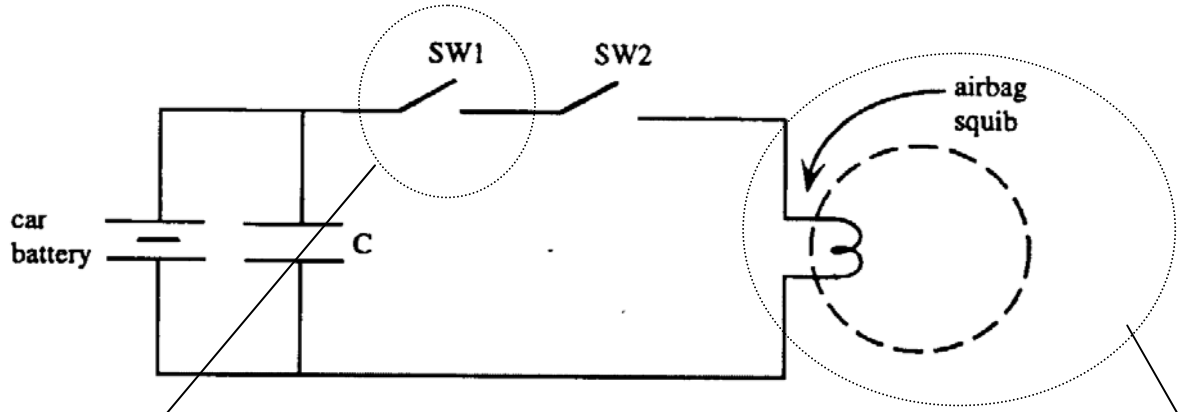
Descripción de los sistemas comerciales

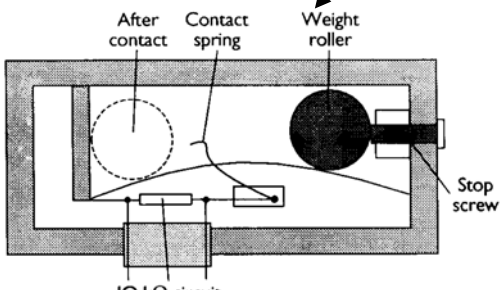
Tipos de dispositivos: Electromecánicos

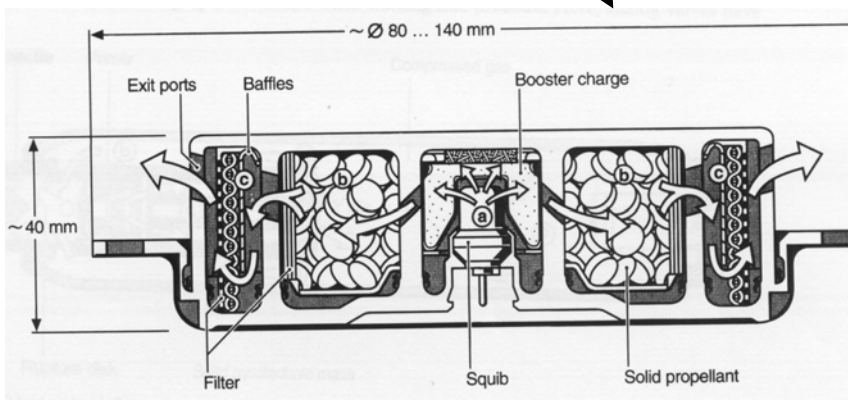
Interruptor inercial

Circuito de disparo

Airbag







Descripción de los sistemas comerciales

Tipos de dispositivos: Electrónicos

Acelerómetro:

±50 g (-40°C a 70 °C)

BW≈ 750 Hz, sensibilidad cruzada<3%

Tecnologías: piezoeléctrico, piezoresistivo, capacitivo

Microcontrolador

Circuito de disparo

Airbag

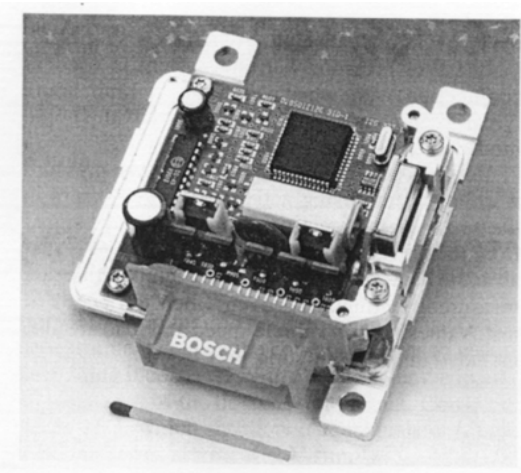
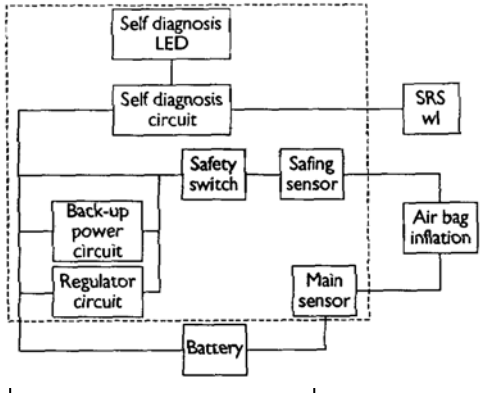
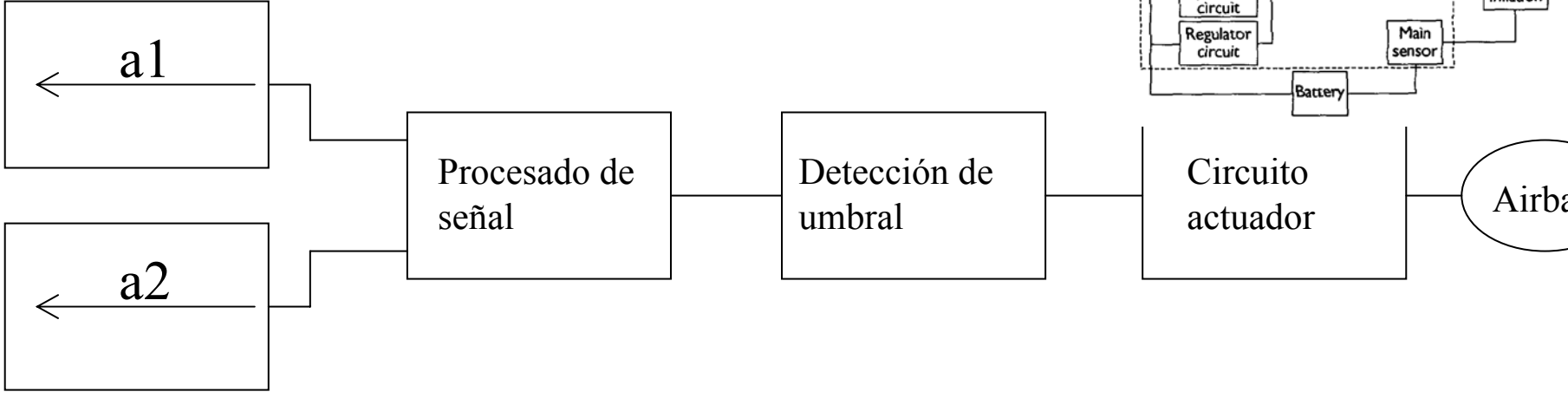


Figure 15.31 Air bag triggering unit (Robert Bosch UK Ltd.)



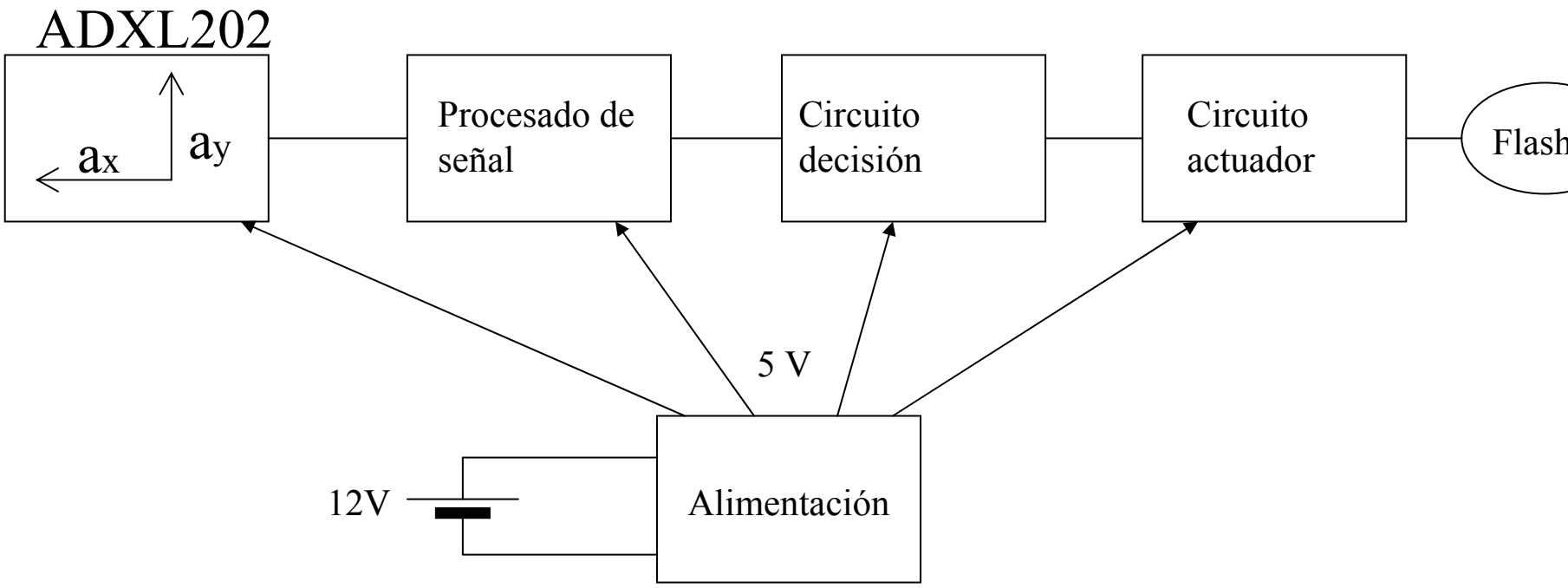


olución propuesta

Acelerómetro dos ejes

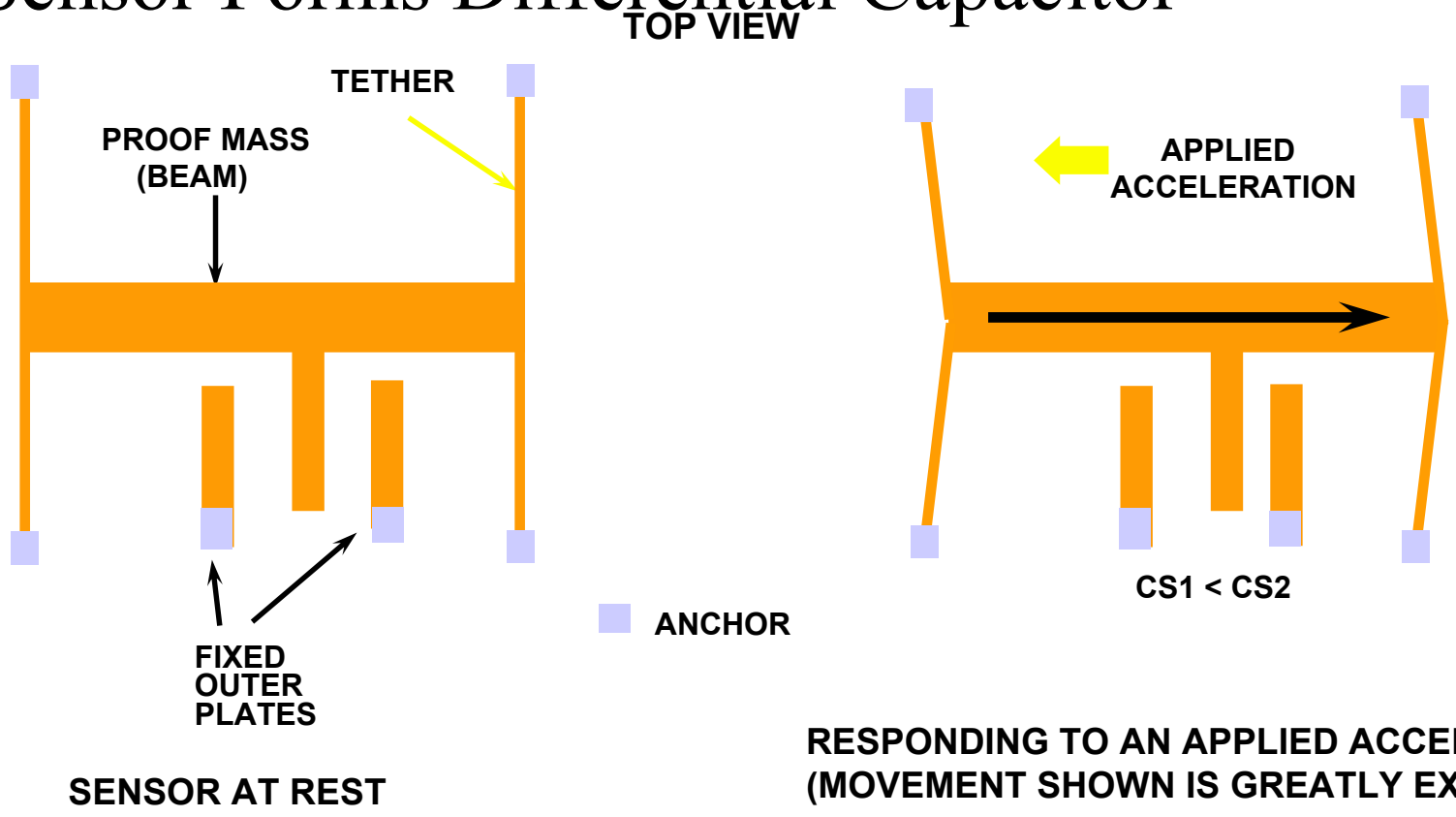
Procesado de señal analógico

Simulación de airbag mediante flash



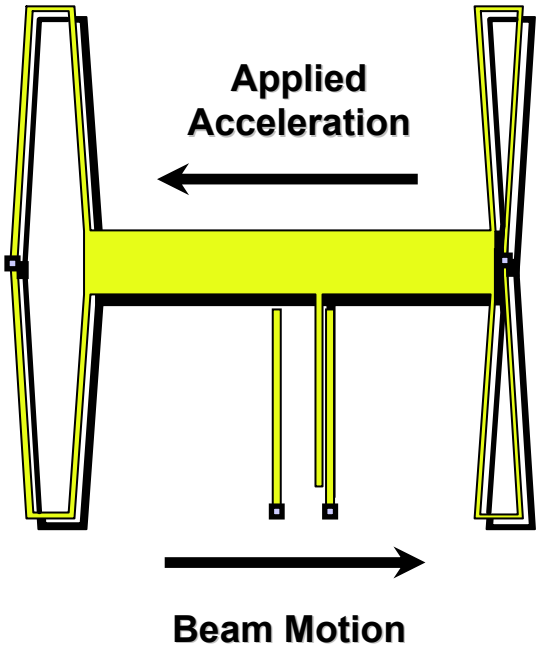
How does it work

- Sensor Forms Differential Capacitor



Sensor Operation

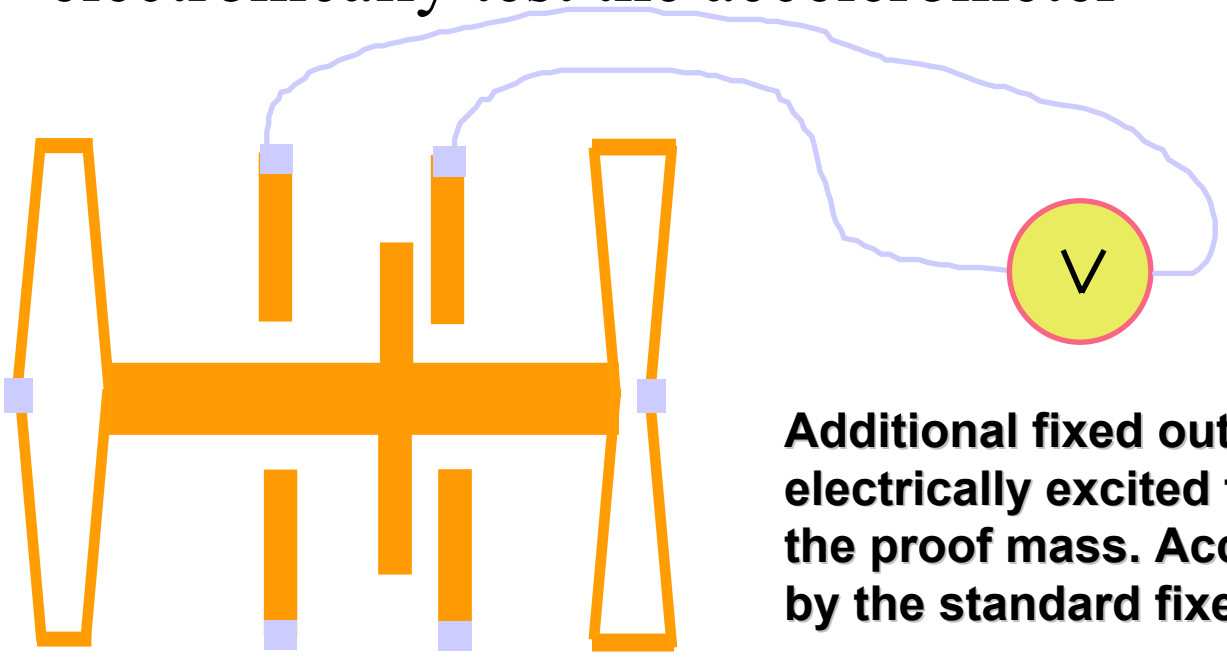
Using folded tethers improves performance and yield



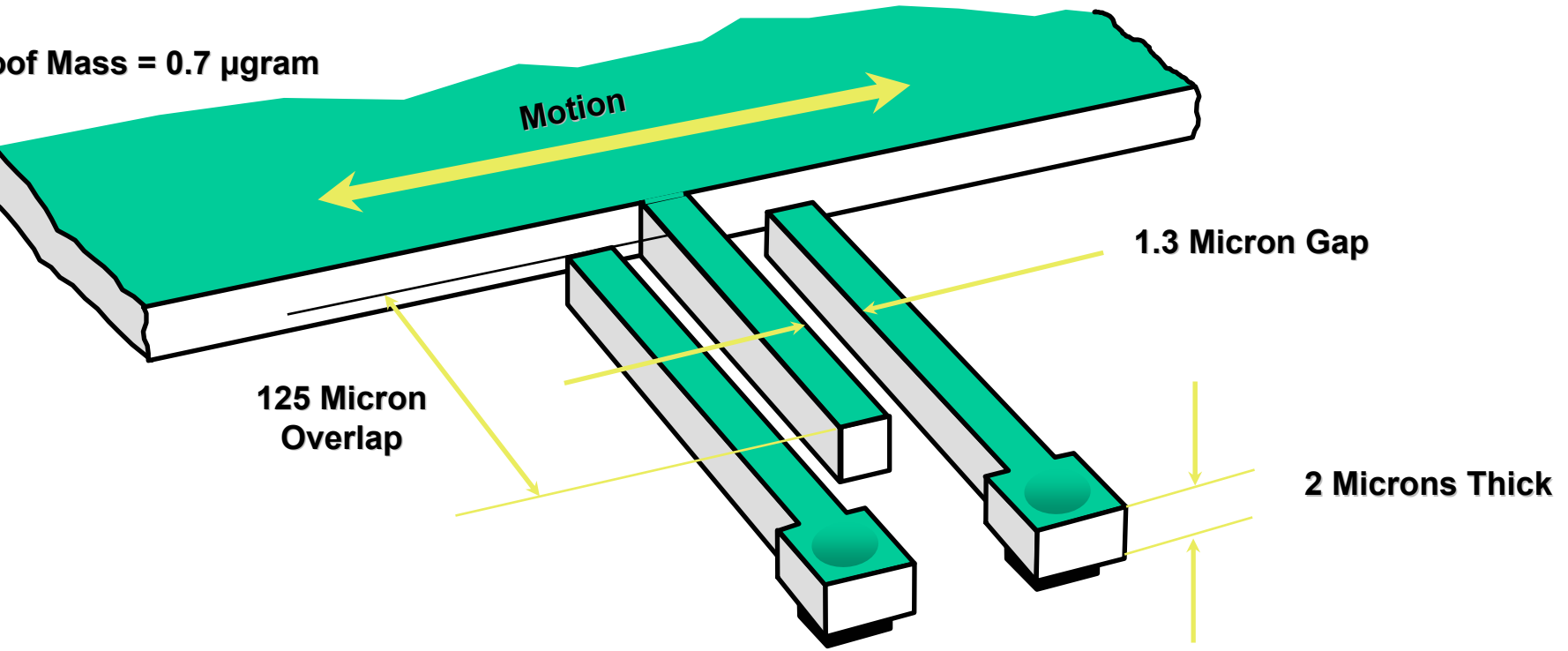
Responding to an Applied Acceleration

Self Test Operation

- Extra fixed outer plates may be added which when exited, force the proof mass to move. So you can electronically test the accelerometer

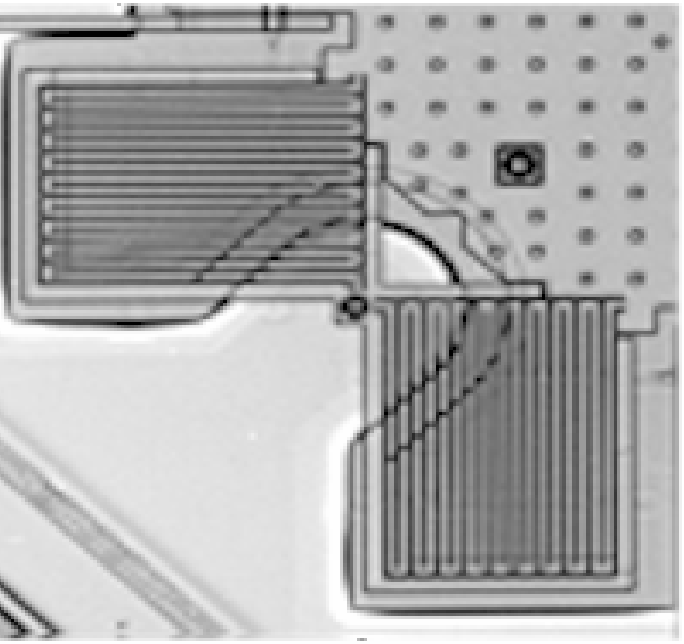


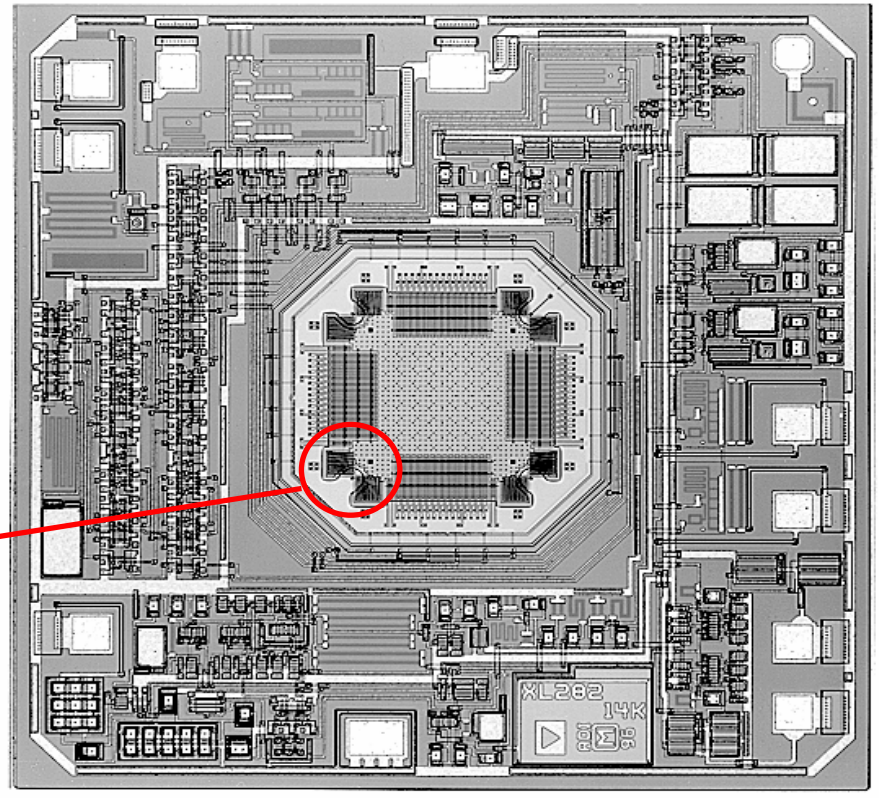
Additional fixed outer plates are electrically excited to induce movement o the proof mass. Acceleration is measured by the standard fixed plates as usual.



- This is a single finger set. There are 30 sets per axis.
- The total capacitance from the center member to each side is 64 fF.

ADXL202





ADXL202 Dual-Axis Accelerometer Chip

0.1 pF per Side for the Differential Capacitor

20 zF (10^{-21} f) Smallest Detectable Capacitance Change (2.5 ´pm of movement)

Total Capacitance Change for Full-scale is 0.1 fF

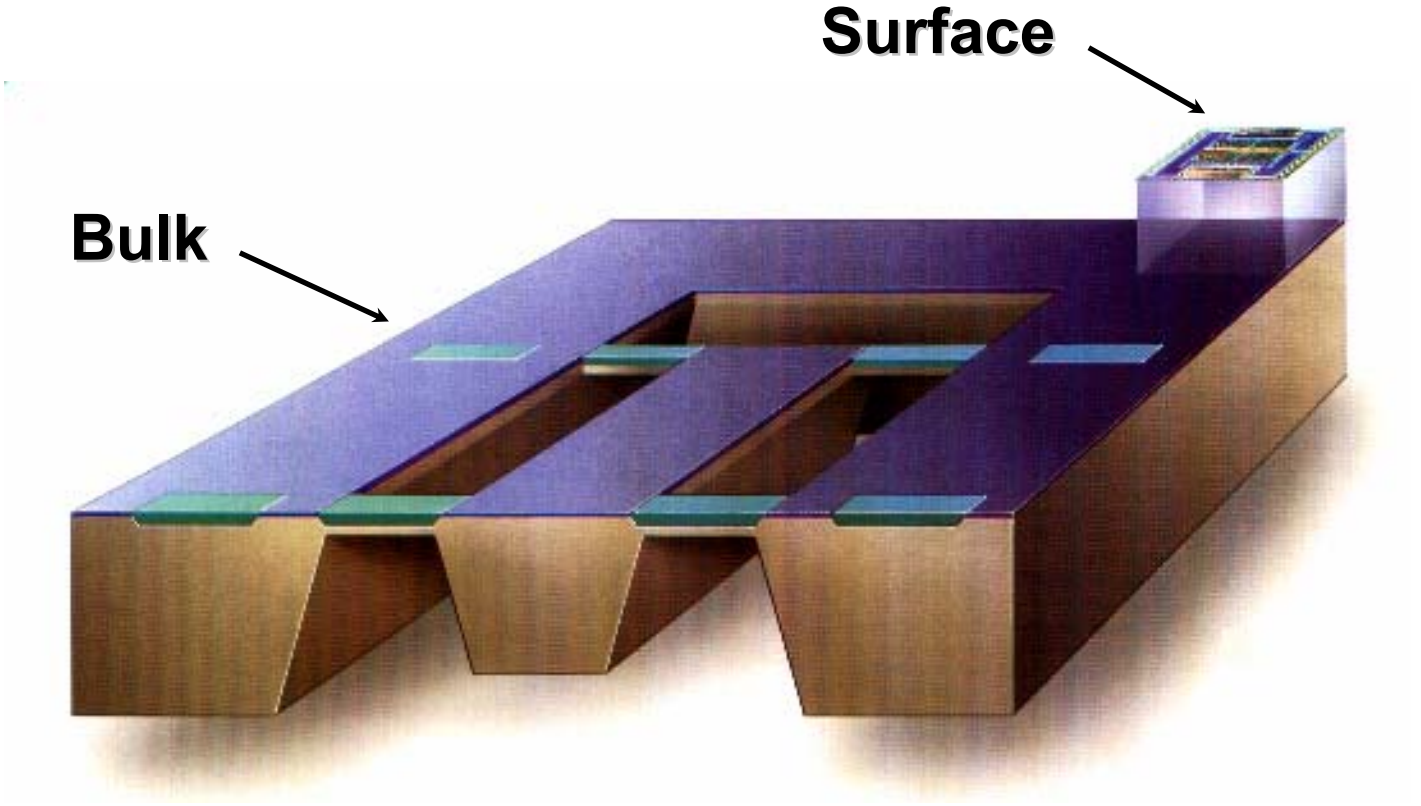
1.3 μm Gaps Between Capacitor Plates

2.5 pm Minimum Detectable Beam Deflection (one tenth of an Atomic diameter)

1.6 μm Between the Suspended Beam and Substrate

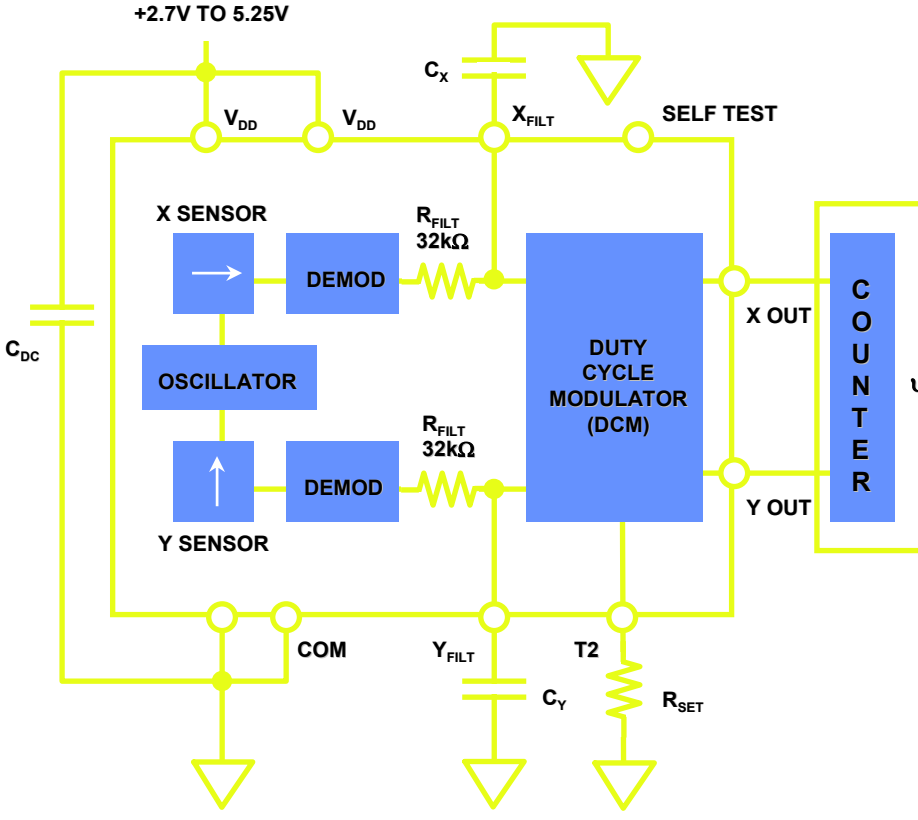
10 to 22 kHz Resonant Frequency of Beam

Bulk vs. Surface micromachining



Low Cost, 2 Axis, +/- 2 g: ADXL202

- Features
  - 5 mg Resolution
  - Duty Cycle Output
  - 0.6 mA Current Consumption
  - +3 V to +5.25 V Single Supply
  - BW Adjustment with Single Capacitor



Design Focus; Tilt

What specifications do we care about

- Zero g bias variation (part to part)
- Zero g drift over temperature
- Sensitivity variation (part to part)
- Sensitivity drift over temperature
- Resolution
- Noise
- PSRR