MEMS Gear Drive

Courtesy: Sandia
Complex Gear System
Sandia MEMS 6-Gear Drive Train
Importance of Cleanliness During Microfabrication

Photo of a dust mite on a MEMS gear drive

Device needs to be debugged!

Courtesy: Sandia
MEMS Rotary Motor
Aphid on a Micromotor Drive

Courtesy: Sandia
Clutched MEMS Actuator
Movable Micromirror
Bulk Micromachined Vibration Isolation Platform

Device Photograph

Vibration sensitive MEMS device

A MEMS spring-mass-damper mechanical low pass filter

Typical Frequency Response

Measured Filter Response vs. Frequency

Magnitude, dB

Frequency, Hz
Micromachined Micro-Bolometer

Courtesy: LETI
MEMS Capacitive Accelerometer

Spring

Proof mass

Gap for capacitively measuring displacement

Courtesy: Litton G&C
MEMS Accelerometer Packaged on Tiny Ceramic Cube
Hygrometrix HMX2000 MEMS Humidity Sensor

Front side

Back side

Courtesy: Hygrometrix, Inc/
Micromachined Si Fuel Atomizer

Courtesy: Surface Technology Systems, Ltd
Microfluidics Flow Channels in Si
MEMS Micromirror chip

An Array of over 300 parallel plate micromirror actuators

Designed for distortion correction in optical systems

Courtesy: SY Technology, Inc.
MEMS Gas Flow Sensor in LTCC

Courtesy Gongora-Rubio et al
LIGA Micro-Gears

Courtesy: Karlsruhe Nuclear Research Center
LIGA Micro-Gear on Ant’s Leg

Courtesy: Karlsruhe Nuclear Research Center
Working Micromachined Electric Car

World’s smallest working car

Powered by a remote magnetic field

Courtesy: Denso Corp
Chip Scale Micromachined Helical Antenna

Courtesy: SY Technology, Inc.
Micromachined RF Switch Array

- Laminated micromachined polyimide layers
- Electrostatic actuators turn switches on and off
Precision Laser Cutting

- Cutting into or through materials with a high-precision, computer controlled laser
A High-G Accelerometer Made in Printed Circuit Board Laminate

Top Layer Removed

Integrated with Electronics

Spring

Proof mass

Capacitive position detection
Micromachined H$_2$-O$_2$ Fuel Cell in Laminate

Courtesy: Stanford
Micro Optics Devices

Positive and negative microlens arrays

Array of micro corner cube reflectors

Arbitrary surfaces to generate various optical effects

Courtesy: MEMS Optical