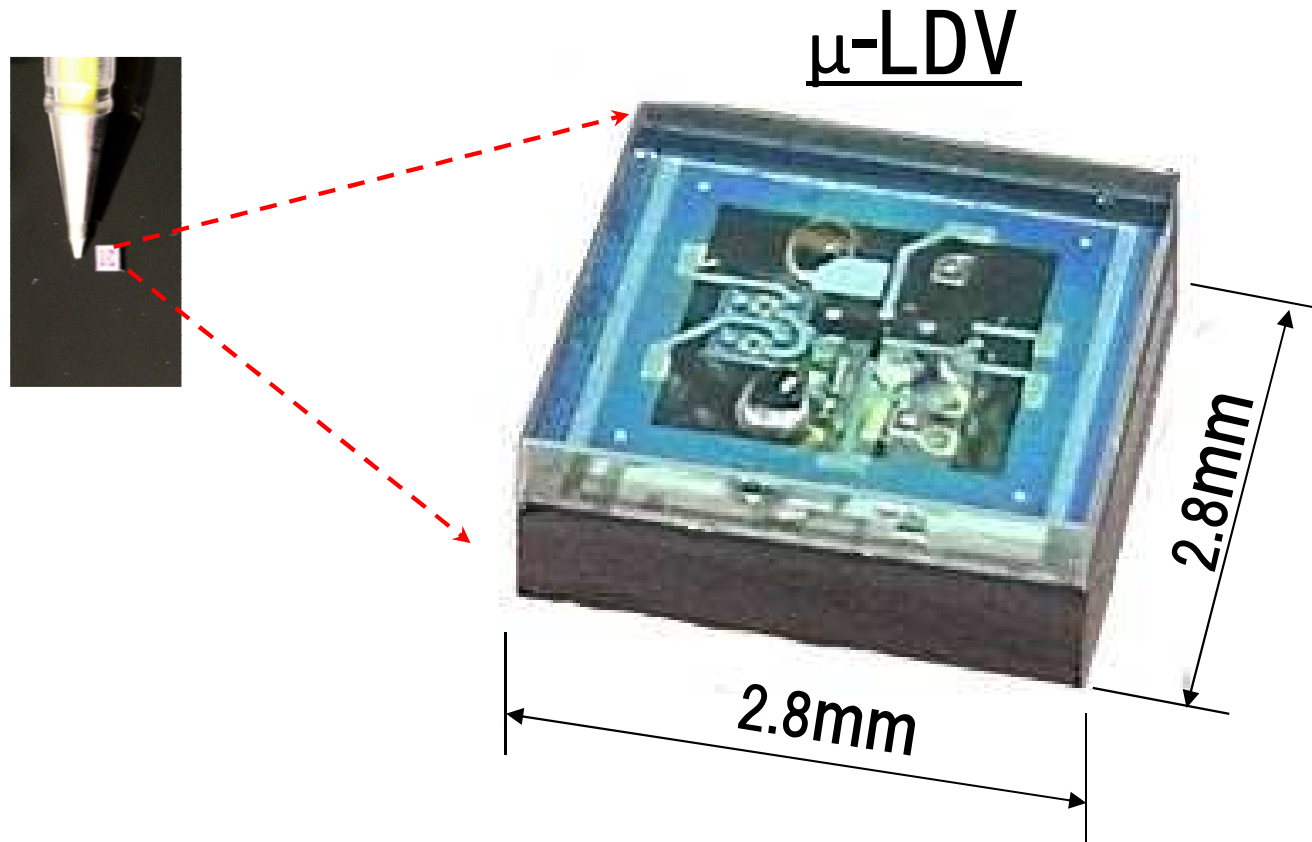


ここで紹介するセンサは絶対速度を測定できるマイクロレーザードップラーセンサーです。。このセンサーは、移動する物体の速度を測定できます。移動物体に回折格子を使用すると、速度と変位を超高精度で測定できます。散乱体を移動物体として使用し、ドップラーシフトビート信号のスペクトルのピークを検出することで速度を測定できます。散乱体、たとえば着色された液体は、絶対速度を測定できます。目下、このセンサーを大量生産できる会社を探しています。

This sensor can measure the absolute velocity of moving objects. When a diffraction grating is used for a moving object, velocity and displacement can be measured with ultra-high accuracy. Using a scatterer as a moving object, the velocity can be measured by detecting the peak of the spectrum of the Doppler shift beat signal. Scatterers, for example colored liquids, can be measured for their absolute velocity. Currently, we are looking for a company that can mass-produce this sensor.

Micro-laser Doppler velocimeter (μ -LDV)

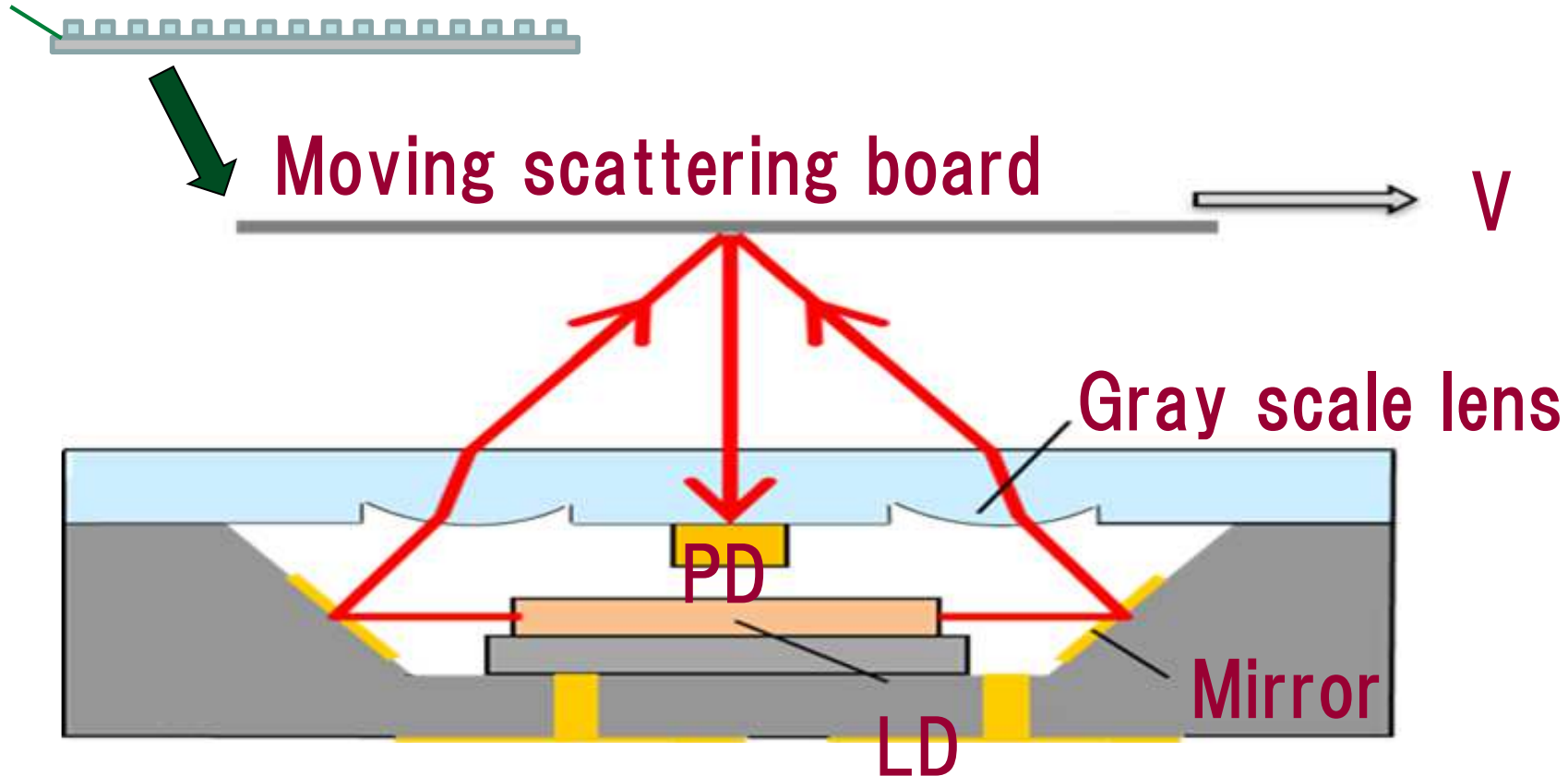
Size: $2.8 \times 2.8 \times 1.0$ mm (1/ 10,000 vol.)



μ -Laser Doppler velocimeter (μ -LDV)

Detect movement and measure the Velocity of an object *the same as micro encoder*

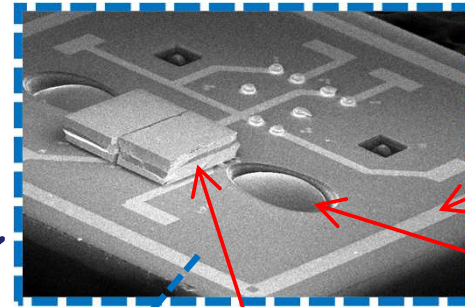
Traveling grating scale



Structure of μ -Encoder or LDV

Wafer level packaging

- **Cover glass with lens**
- **Si substrate with cavity**
- **Through Si Via**
- **Mass Productivity**



Gray scale lens

Glass substrate

Si substrate

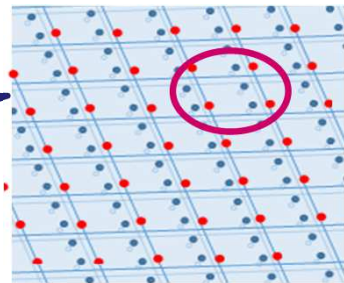
Laser diode

Through Silicon via

Au mirror

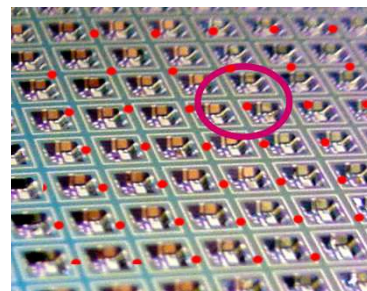


Bonded

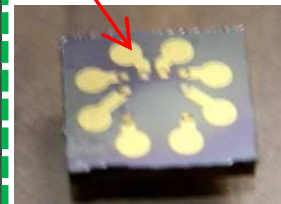
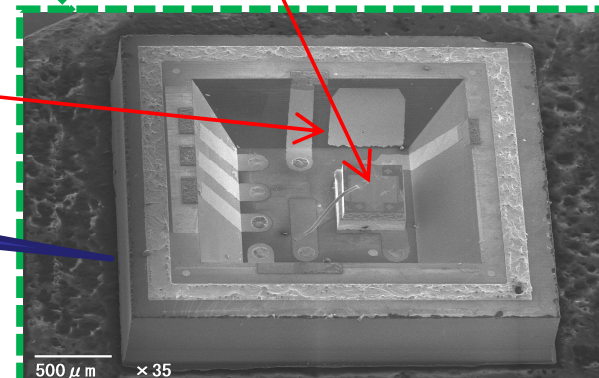
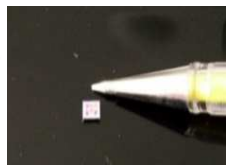


Glass layers
(Glass substrate)

Si layers
(Si substrate)

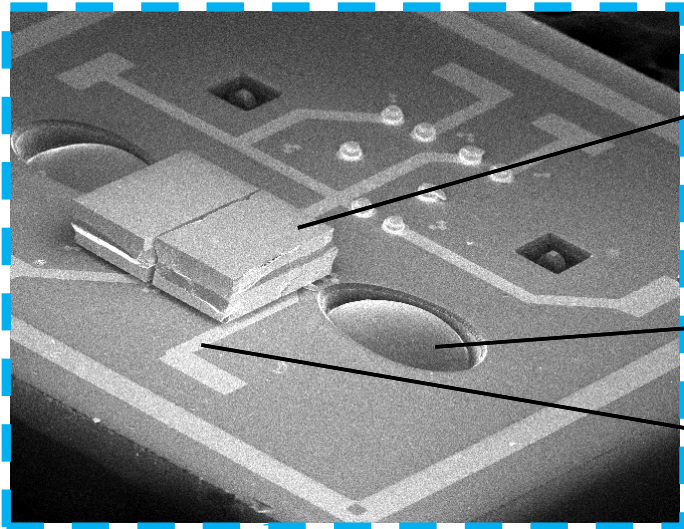


Separated



Design & Fabrication: LDV design for wafer level packaging

Glass layer



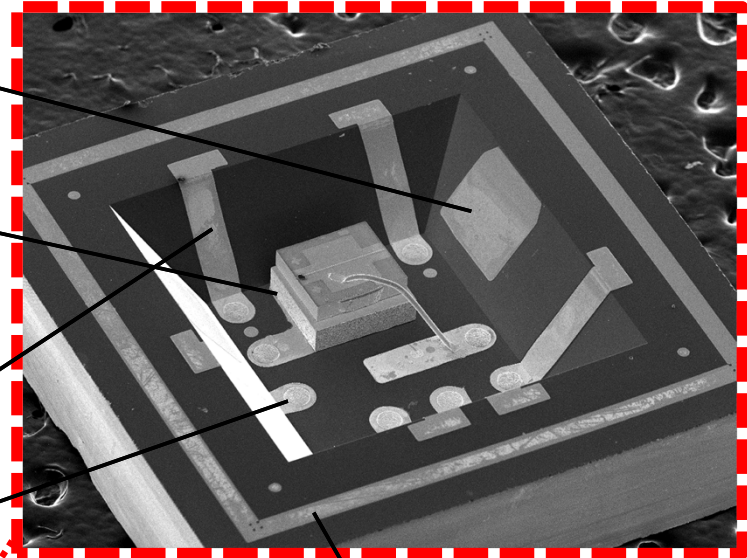
Mirror
Photo diode(PD)

Laser diode(LD)
Lens(gray scale lithography)

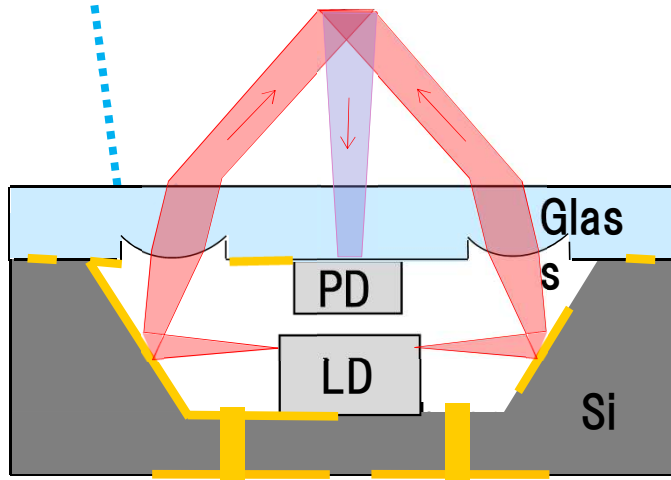
Electrodes

Through hole via

Si cavity (anisotropic etching)



Pattern for layers bonding



- Low temperature, Au-Au Surface-Activated Bonding (150°C, in Air) for protecting diodes performance
- Passive alignment with Au alignment pattern