

# Scanning MEMS Mirror – 0.6, 1.5, 2.0 mm Diameter

(Single and Dual-Axis, Up To 7 Degree, High Precision, High Repeatability)



The SMEM series of scanning two axis (tip-tilt) and one axis tilt MEMS mirror provide 2D and 1D optical beam-steering functions. The SMEMS features faster scanning, very low power consumption, high precision, and high repeatability. The MEMS is made of single-crystal silicon with flat and smooth mirror coated with a highly refractive gold thin film. The SMEM is hermetically packaged with an optical window designed for 25 years continuously operation. Driving PCB is also offered for convenient evaluations. For volume application contact sales

## Features

- Compact
- High Reliability
- Low Power Consumption
- High Repeatability

## Specifications

| Parameter                   | Min                     | Typical           | Max   | Unit                 |        |
|-----------------------------|-------------------------|-------------------|-------|----------------------|--------|
| Mirror Diameter             | 0.6                     | 1.5               | 2     | mm                   |        |
| Operation Wavelength        | 450                     |                   | 2600  | nm                   |        |
| Reflectivity (@1260-1660nm) | 95                      |                   | 96    | %                    |        |
| Tilt Angle                  | 0.6mm@60V               | ± 2.2             | ± 2.5 | ± 2.7                | degree |
|                             | 1.0mm @58V              | ± 2.7             | ± 2.8 | ± 3.0                |        |
|                             | 1.5mm@67V               | ± 6.8             | ± 7   | ± 7.6                |        |
|                             | 2.0mm@200V              | ± 5.9             | ± 6   | ± 6.2                |        |
| Damage Voltage              | 0.6mm                   |                   | 70    | V                    |        |
|                             | 1.0mm                   |                   | 65    |                      |        |
|                             | 1.5mm                   |                   | 70    |                      |        |
|                             | 2mm X-axis              |                   | 220   |                      |        |
| Resonance Frequency         | 2mm Y-axis              |                   | 100   | Hz                   |        |
|                             | 0.6mm                   |                   | 600   |                      |        |
|                             | 1.0mm                   |                   | 550   |                      |        |
|                             | 1.5mm                   |                   | 750   |                      |        |
|                             | 2mm X-axis              |                   | 500   |                      |        |
| 2mm Y-axis                  |                         | 1000              |       |                      |        |
| Resolution/Repeatability    |                         | ± 0.0003 - 0.001  |       | °                    |        |
| Response Time               |                         | 5                 | 10    | ms                   |        |
| Optical Power Handling      |                         | 500               |       | mW                   |        |
| Durability                  | 10 <sup>10</sup>        |                   |       | Cycle                |        |
| Device Resistance           | 2                       |                   |       | MOhm                 |        |
| Power Consumption           |                         |                   | 0.5   | mW                   |        |
| Operating Temperature       | -40                     |                   | 75    | °C                   |        |
| Storage Temperature         | -40                     |                   | 85    | °C                   |        |
| Reliability                 | Telcordia 1209 and 1221 |                   |       |                      |        |
| Package Leak Rate           |                         | <10 <sup>-9</sup> |       | Pa.m <sup>3</sup> /s |        |

## Applications

- Optical Devices
- Sensors
- Instrumentation



**Note:** The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link](#):

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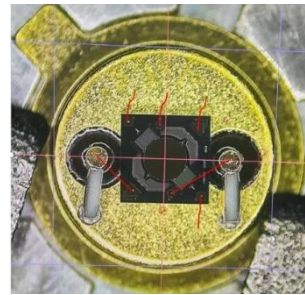
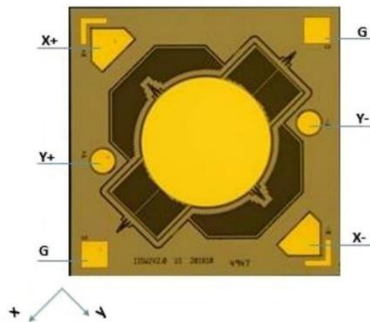
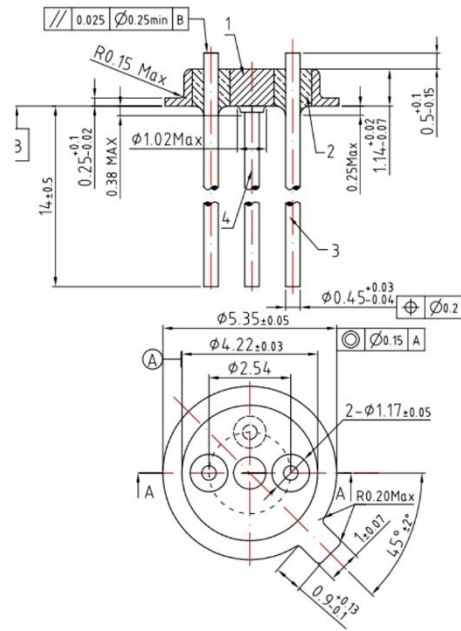
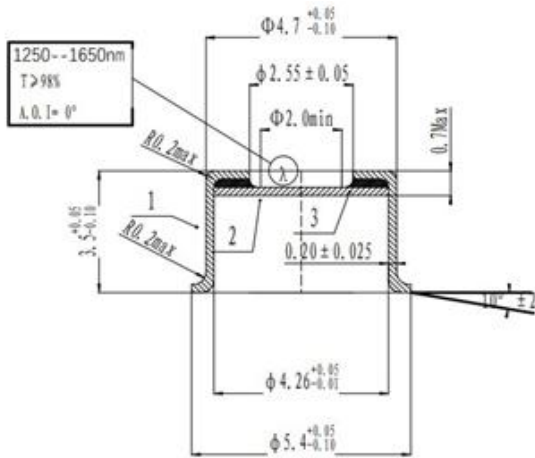
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## DATASHEET

### 2D 0.6mm Diameter Mirror Mechanical Footprint Dimensions and MEMS Structure (mm)



| Rotation | DC +   | DC -             |
|----------|--------|------------------|
| X+       | Pad X+ | Pads G, X-,Y+,Y- |
| X-       | Pad X- | Pads G, X+,Y+,Y- |
| Y+       | Pad Y+ | Pads G, X+,X-,Y- |
| Y-       | Pad Y- | Pads G, X+,X-,Y+ |

**Note:**

- The pins coated with 0.4 $\mu$ m thick Gold

\*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

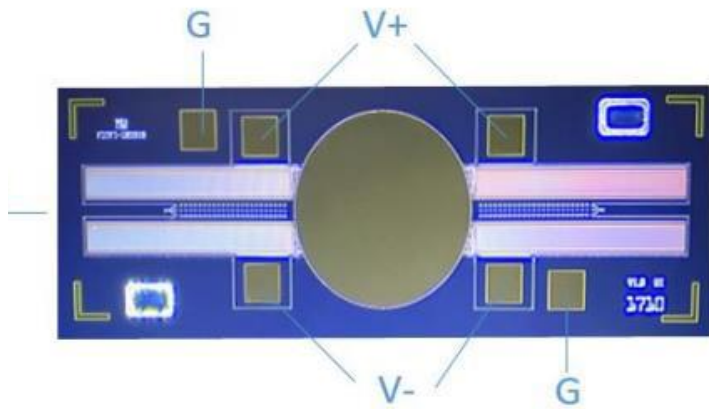
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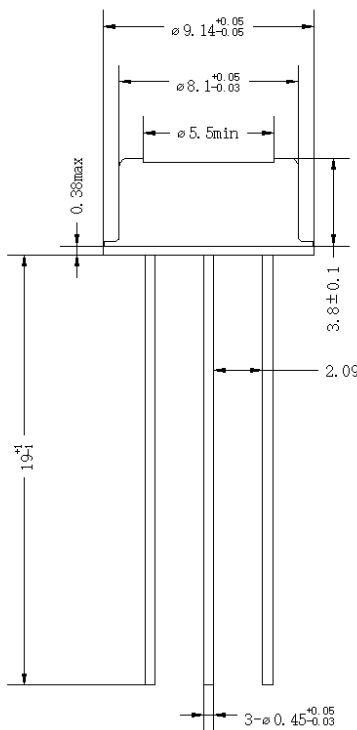


## DATASHEET

### 1D 1.5 mm Diameter Mirror Mechanical Footprint Dimensions and MEMS Structure (mm)



| Rotation | DC +   | DC -           |
|----------|--------|----------------|
| X+       | Pad V+ | Pads G, Pad V- |
| X-       | Pad V- | Pads G, Pad V+ |



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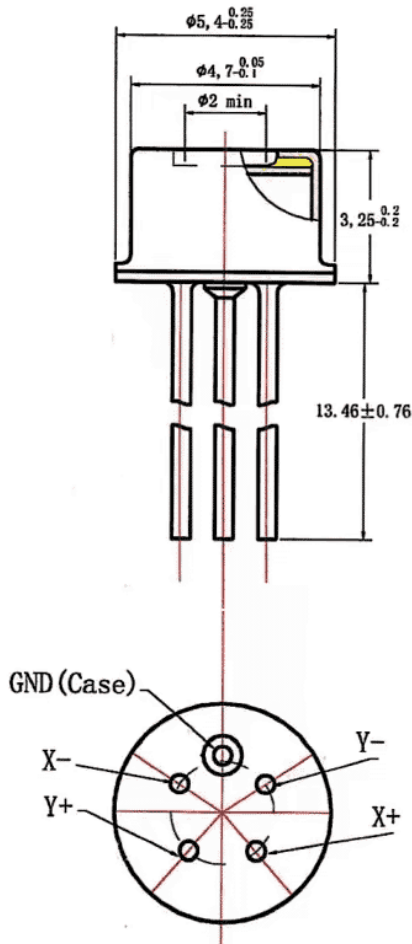
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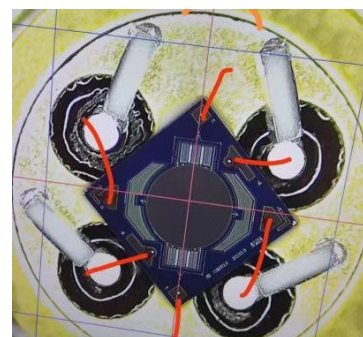
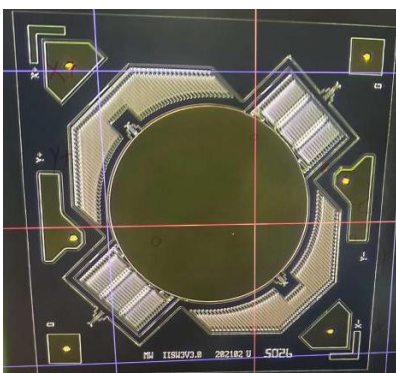
### 2D 0.6mm Diameter Mirror Mechanical Footprint Dimensions and MEMS Structure (mm)



#### Note:

- The pins coated with  $0.4\mu\text{m}$  thick Gold

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# Scanning MEMS Mirror – 0.6, 1.5, 2.0 mm Diameter

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## DATASHEET

### 2D 2mm Diameter Mirror Mechanical Footprint Dimensions and MEMS Structure (mm)



### Electronic Driving Instruction

| Rotation | DC     | GND |
|----------|--------|-----|
| X+       | Pad X+ |     |
| X-       | Pad X- |     |
| Y+       | Pad Y+ |     |
| Y-       | Pad Y- |     |

**Note:**

- The pins coated with 0.4µm thick Gold

# Scanning MEMS Mirror – 0.6, 1.5, 2.0 mm Diameter

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## DATASHEET

### Ordering Information (Part Number)

| Prefix | Mirror Size | Window Coating                 | Axis   | Surface  | Chip Package               | Tilting Angle °   | USB Electric Driver |   |
|--------|-------------|--------------------------------|--------|----------|----------------------------|-------------------|---------------------|---|
| SMEM-  | ∅0.8mm = 8  | 1230-1650nm = 1<br>Special = 0 | 2D = 2 | Gold = 1 | TOCAN = 1<br>Bare Chip = 2 | X±2.2: Y± 2.7= 23 | None = 1<br>Yes = 2 | 1 |

| Prefix | Mirror Size | Window Coating                 | Axis   | Surface  | Chip Package               | Tilting Angle ° | USB Electric Driver |   |
|--------|-------------|--------------------------------|--------|----------|----------------------------|-----------------|---------------------|---|
| SMEM-  | ∅1mm = 1    | 1230-1650nm = 1<br>Special = 0 | 2D = 2 | Gold = 1 | TOCAN = 1<br>Bare Chip = 2 | ± 3 = 03        | None = 1<br>Yes = 2 | 1 |

| Prefix | Mirror Size | Window Coating                                    | Axis   | Surface  | Chip Package               | Tilting Angle ° | USB Electric Driver |   |
|--------|-------------|---------------------------------------------------|--------|----------|----------------------------|-----------------|---------------------|---|
| SMEM-  | ∅1.5mm = 5  | 1230-1650nm = 1<br>300 -2400nm = 2<br>Special = 0 | 1D = 1 | Gold = 1 | TOCAN = 1<br>Bare Chip = 2 | ± 10 = 10       | None = 1<br>Yes = 2 | 1 |

| Prefix | Mirror Size | Window Coating                                    | Axis   | Surface  | Chip Package               | Tilting Angle ° | USB Electric Driver |   |
|--------|-------------|---------------------------------------------------|--------|----------|----------------------------|-----------------|---------------------|---|
| SMEM-  | ∅2mm = 2    | 1230-1650nm = 1<br>300 -2400nm = 2<br>Special = 0 | 2D = 2 | Gold = 1 | TOCAN = 1<br>Bare Chip = 2 | X±6: Y± 15= 15  | None = 1<br>Yes = 2 | 1 |

Red for special order

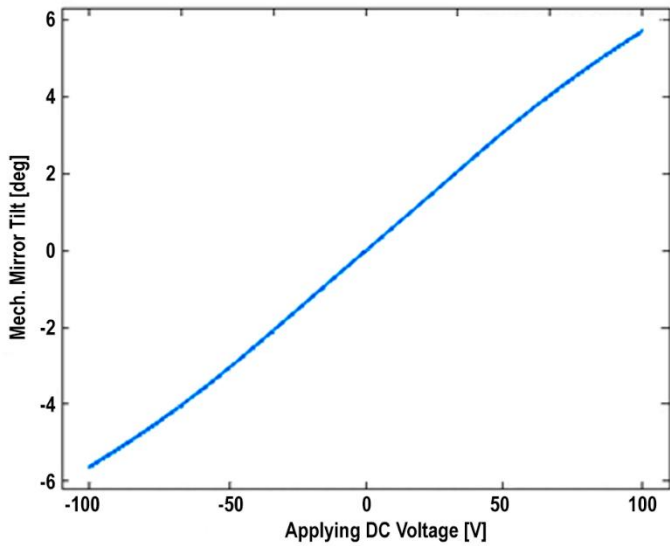
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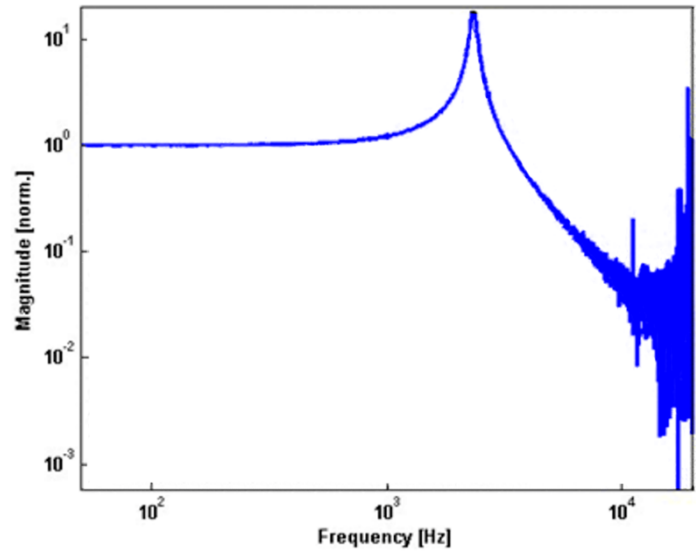


## DATASHEET

### Tilting Performance (Typical)



### Frequency Response (Typical)



| XYZ            | Chip Size (mm)                                                                  | Mirror Diameter (μm) | Rotating Angle      | Drive Voltage      |
|----------------|---------------------------------------------------------------------------------|----------------------|---------------------|--------------------|
| X-, X+, Y-, Y+ | Typical: 1.7 x 1.7 x 0.61                                                       | 800                  | 2.2 ~ 2.7 °         | < 60               |
| X-, X+         | MIN: 5.48 x 1.88 x 0.55<br>Typical: 5.5 x 1.9 x 0.575<br>MAX: 5.52 x 1.92 x 0.6 | 1500                 | 7.5 °               | < 70               |
| X-, X+         | Typical: 5.5 x 1.9 x 0.62                                                       | 1500                 | ±10 °               | < 110              |
| X-, X+, Y-, Y+ | Typical: 7 x 5 x 0.8                                                            | 2000                 | X: ±6 °<br>Y: ±15 ° | X < 220<br>Y < 100 |
| X-, X+, Y-, Y+ | Typical: 1.7 x 1.7 x 0.61                                                       | 800                  | 2.2 ~ 2.7 °         | < 60               |
| X-, X+, Y-, Y+ | Typical: 1.8 x 1.8 x 0.61                                                       | 1000                 | ±3.0 °              | < 60               |
| X-, X+         | Typical: 1.0 x 1.0 x 0.57                                                       | 595                  | 0.23 ~ 0.33 °       | < 6                |
| X+             | Typical: 1.7 x 1.7 x 0.57                                                       | 860                  | 0.28 ° @5V          | < 8                |
| X-, X+, Y-, Y+ | Typical: 1.9 x 3.2 x 0.62                                                       | 1000                 | X: ±2 °<br>Y: ±4 °  | < 60               |