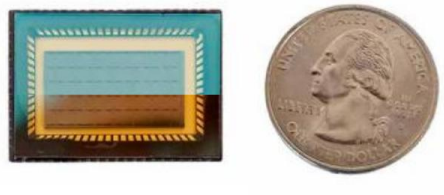
Large Aperture MEMS Scanning Mirror Array

1D MEMS Scanning Mirror A150-F2K-1D
2D Hybrid Scanning Mirror A150-F2K-2D
Customized Scanning Mirror

Features

- Large optical aperture (150 mm^2)
- Highly durable, high shock-resistance (1500 G)
- Built-in angle sensing with external read-out circuit



Applications

- Automotive LiDAR
- Custimized aperture for further applications in E-Vehicle/ARVR/HUD etc.

Outline

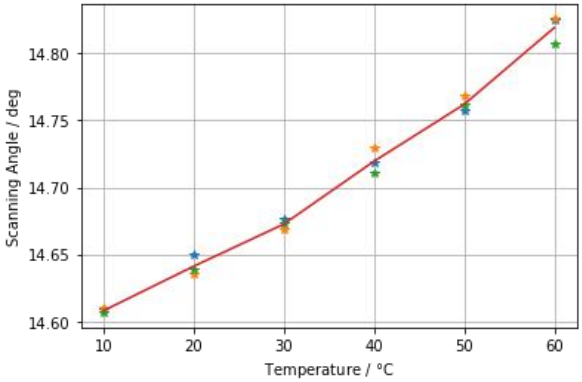
The 1D MEMS scanning mirror A150-F2K-1D, with a die size of 18mm x 9mm, is packed inside a standard LCC ceramic package, and sealed under an optical glass window with anti-reflection coating (wavelength customizable). The 2D hybrid scanning mirror A150-F2K-2D is composed of the 1D mirror A150-F2K-1D mounted on an electromagnetic scanner which can follow arbitrary control waveform.

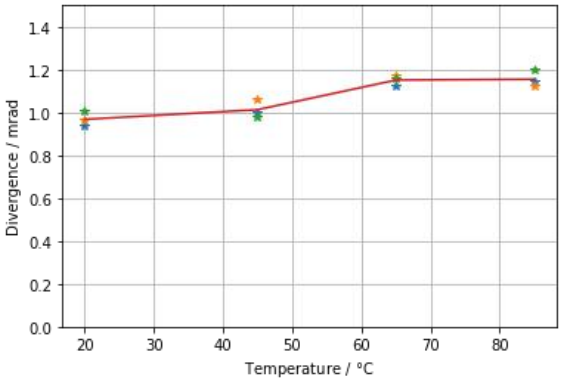
Specification

Parameter	Condition	Value			Unit
		Min.	Typ.	Max.	
1D MEMS scanning mirror					
Optical aperture	Aperture can be custimized (<2000mm^2)		150		mm^2
Optical scanning angle	Angle can be custimized (<±20°)	–	±12.5	±15	°
Optical divergence	The reflected beam divergence, assuming collimated beam incident on the entire aperture	–	1	2	mrad
Operation frequency	Resonance scanning	1900	2000	2100	Hz
Power consumption	±7.5° optical scanning angle	0.6	0.75	0.9	mW
Driving voltage	Sinusoidal wave, peak-to-peak voltage, ±7.5° optical scanning angle	65	70	75	V
Driving current	±7.5° optical scanning angle	340	350	380	µA
Mechanical Q-factor		55	60	65	–
Angle detection noise	Optical angle, RMS noise	–	0.001	–	°
Angle detection accuracy	Temperature oscillation 10 – 60 °C	–	0.02	0.05	°
Mirror reflectivity	Wavelength 905 nm ~ 1550 nm	96	97.5	–	%
G-Shock resistance	Half sine wave, 0.5 ms, 3 axis, 3 shocks each (AEC-Q100 automotive standard)	1500	–	–	G (9.8 m/s^2)
2D hybrid scanning mirror, slow-axis					
Optical scanning angle	Can be custimized (<±90°)	–	±30	±60	°
Angle detection accuracy	Using Hall-effect angle sensor, can be improved	–	0.024	–	°
Angle control accuracy	Scanning 60° optical angle, and following 5Hz triangular control waveform	–	0.05	–	°
Power consumption	Averaged over time	–	1.3	–	W
Max. driving voltage		–	12	–	V
Max. driving current	Stall current at max. driving voltage	–	2.2	–	A

Temperature Stability Test

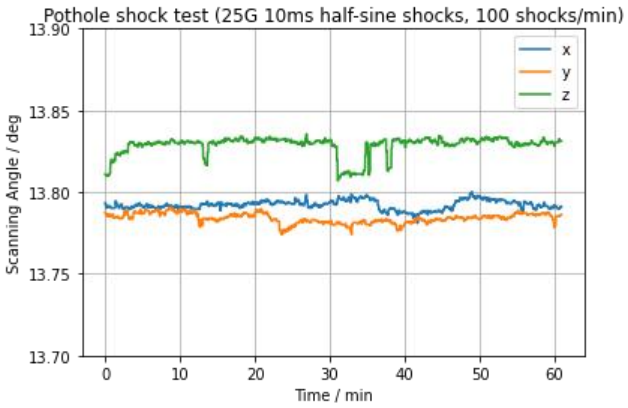
- 1D MEMS scanning mirror driven in open-loop mode (i.e. drift compensable in close-loop mode)

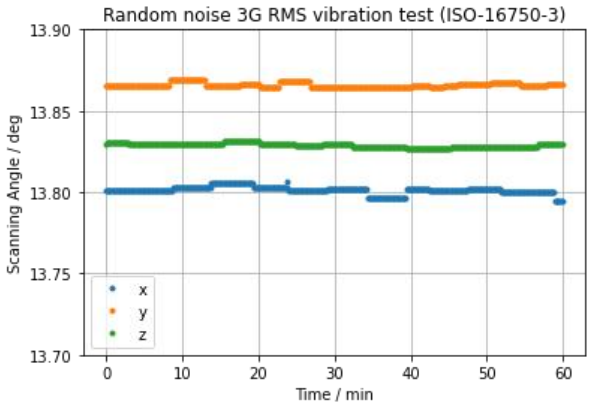




Vibration/Pothole Stability Test

- 1D MEMS scanning mirror driven in open-loop mode (i.e. drift compensable in close-loop mode)
- Pothole shock profile: 25G 10ms half-sine wave (GMW3172)
- Vibration profile: Random 3G RMS (ISO-16750-3)





Customized Scanning Mirror

The scanning mirror can be made according to customers' specification. A non-recurring engineering (NRE) fee will be charged. The customizable parameters are listed below.

Parameter	Customization Range	Risk	Potential Challenges
Aperture size	5~1000 mm^2	None (5~150 mm^2) Low (150~500 mm^2) Mid (500~1000 mm^2)	• Cost increases with aperture • Difficult to find off-the-shelf packages for large apertures
Aperture shape	Rectangle, customizable aspect ratio	None	• None
Maximum scanning angle	0~30° optical	None (0~20°) Low (20°~30°)	• Beam divergence scales linearly with scanning angle
Operation frequency	500 ~ 15kHz	None (1.6k~7kHz) Low (1k~1.6kHz, 7k~15kHz) Mid (500~1kHz)	• High operation frequency (>7kHz) may require increased driving voltage • Low operation frequency (<1.6kHz) reduces the device durability (e.g., the device may fail shock tests)