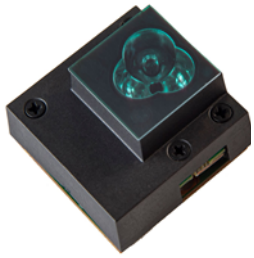
NeoSpectra-Micro – SWS62231 – Spectral Sensor

General Description

The NeoSpectra-Micro is an integrated spectral sensor that can be used in a wide variety of material sensing applications for qualification and quantification. The sensor offers performance comparable to laboratory based spectrometers, but at a dramatically smaller size and lower cost.



The sensors are based on Fourier Transform InfraRed (FT-IR) technology, which is a standard technique used in laboratory based spectrometers that offers a wide spectral range for the best qualification and quantification of materials. The sensors used patented Micro Electro Mechanical Systems (MEMS) technology, which allows for a Michelson interferometer to be created monolithically on a MEMS chip.

The NeoSpectra-Micro sensor determines the spectral content of the input light in the Near InfraRed (NIR) range between 1,350 – 2,500 nm.

Features

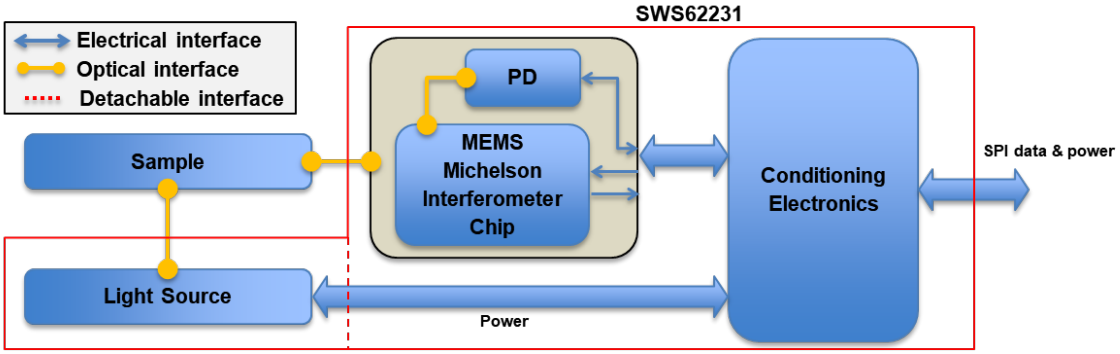
- Miniature, low cost, fully integrated NIR spectral sensor
- Smallest FT-IR solution with a single photodetector
- Wide spectral range at the higher wavelengths end of NIR (λ: 1,350 – 2,500 nm)
- Free-space optics
- Different modes to optimize power consumption
- Designed for high volume production
- Minimum amount of external components

Applications

Enabling a broad range of applications and use cases across multiple industries:

- Smart Farming
- Smart Food
- Smart Healthcare
- Smart Industry
- Smart Consumer

Block Diagram



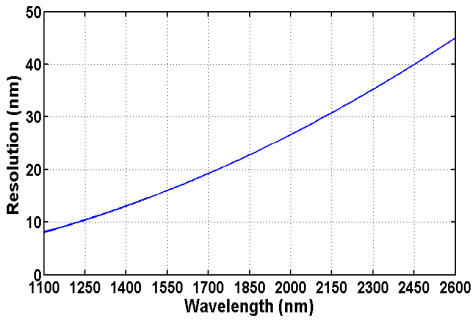
Specifications

Parameter	Conditions	Value	Units
Wavelength Range	Upper and lower limits guarantee SNR>170:1 across spectral range	1,350 - 2,550	nm
Resolution	At λ=1,550 nm, FWHM criterion	16	nm
		66.6	cm^{-1}
Number of bulbs	Standard optical head	3 lamps Number of lamps to illuminate can be selected by software	-
Typical SNR (rms)	2 s scan time, @λ = 2,350 nm, 2 light bulbs ON, PTFE sample in direct contact with optical window.	1,500:1	-
	2 s scan time, @λ = 2,350 nm, 3 light bulbs ON, PTFE sample in direct contact with optical window.	2,000:1	-
Temperature	Operation	-5 : 40	°C
Wavelength Accuracy	@λ = 1,681.5 nm; absorbance level = 0.8 A.U., temperature < 40°C, reference material: polystyrene	± 1.9	nm
Wavelength Repeatability	@λ = 1,681.5 nm; absorbance level = 0.8 A.U., temperature < 40°C, reference material: polystyrene	± 0.35	nm
Dimensions	With standard optical head	32 × 32 × 22	mm^3
Weight	With standard optical head	17	g
Voltage	Power supply	3.3	V
	Communication pins	3.3	V
Bulb lifetime	Standard optical head	> 10,000 (continuous operation)	hrs
Diameter of collected light beam	Standard optical head. Sample in direct contact with optical window.	2.5	mm
Typical power consumption	Power-off mode	0.0033	mW
	Sleep mode	102	mW
	Stand-by mode	230	mW
	Active mode, 2 lamps ON	3,175	mW
	Active mode, 3 lamps ON	4,125	mW
Peak transient current	Transition from Stand-by mode to Active mode with 2 lamps ON	1,350	mA
	Transition from Stand-by mode to Active mode with 3 lamps ON	1,800	mA

Interfaces

Optical interface	Free-space illumination and collection via optical head for diffuse reflectance measurements. Ceramic optical window for direct contact with sample.
Electrical interface	SPI via Ball Grid Array (BGA)

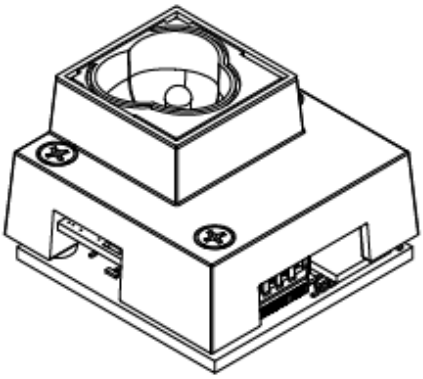
Definitions

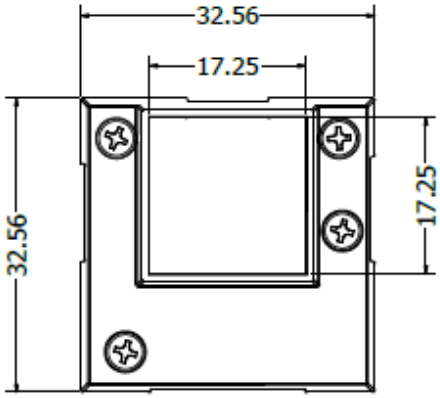
Parameter	Definition
Wavelength range	The wavelength range is defined as the range where the spectral data is useful. The upper and lower wavelength limits are determined by the wavelength points where the SNR reaches the value 170:1. Spectral range is then truncated to maintain specified lower and upper limits.
Typical SNR	SNR is calculated from the average of the ratio of Power Spectral Density to the noise of 10 consecutive measurements at each point across the spectral range.$SNR(\lambda) = Avg[PSD(\lambda)/Noise\ RMS]$. Maximum value across the spectral range is reported
Resolution	Resolution is defined as the minimum spacing between two consecutive wavelength (Δλ) / wavenumber (Δv) points that can be fully resolved by the module. Two consecutive lines are fully resolved if separation > Full Width Half Maximum (FWHM) power density of either line. The resolution in wavenumber is constant across the spectral range. The relationship between the resolution in wavelength Δλ, and the resolution in wavenumber Δv is governed by $\Delta\lambda = \Delta v\ \lambda^2$. 
Wavelength accuracy	Wavelength accuracy is the difference between the measured wavelength of a wavelength standard (e.g. polystyrene), and the nominal wavelength reported for that wavelength standard.

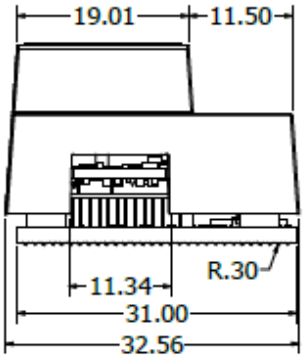
Power Modes

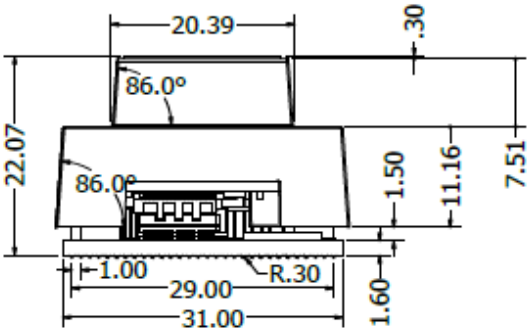
Modes	Definition
Active	During illumination and acquisition of spectrum. All system components are turned on.
Stand-by	Default power mode. All system components except the light source are ready. System is waiting for command to initiate the measurement and switch to Active mode.
Sleep	Low power mode. Most of system components are turned off, but data are preserved.
Power-off	Extremely low power mode to be used when NeoSpectra-Micro is not operational for extended periods of time. Data are not preserved when switching to this mode.

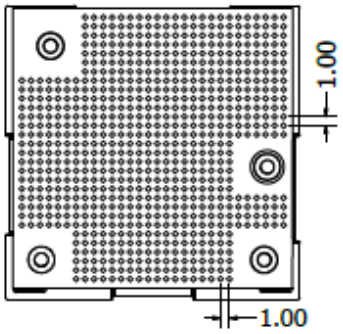
Mechanical drawings











Revision History

Revision	Date	Description
1.0	12/11/2017	Initial version
2.0	1/03/2019	Updates for production version
2.1	1/31/2019	Mechanical drawings added
2.2	5/22/2019	Additional information in specifications' conditions

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