Cirius 3

Miniature High Range Infrared Gas Sensor for Carbon Dioxide

Patented GB2449433

Features

- Latest technology MEMS detectors
- Typical Sensing ranges: 0-30% volume Carbon Dioxide to 0-100% volume Carbon Dioxide
- Absolute limit ranges: 0-10%volume Carbon Dioxide to 0-100%volume Carbon Dioxide
- All metal construction
- Patented sensor design
- Small internal volume
- Low power
- Active and Reference signal outputs
- Embedded thermistor temperature sensor output
- Wide operating temperature range
- Fast response
- Immunity from 'poisoning'
- Fail safe operation
- Electrically isolated housing

Description and Operation

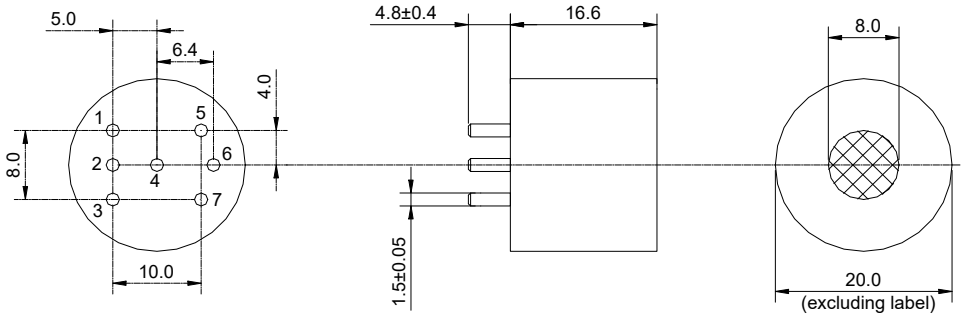
The Cirius range of sensors use the non-dispersive infrared method to detect the presence of gases. The sensors contain an infrared radiation source, a dual element infrared detector and a unique optical waveguide into which gas diffuses. The dual element infrared detector responds to changes in incident radiation and to operate the sensor the infrared source should be pulsed with a duty cycle of 50% at a frequency typically between 2Hz and 4Hz. The sensor produces outputs for active wavelengths, which are modified by the presence of target gas, and for reference wavelengths, which are not modified by the presence of target gas. These outputs consist of a small AC signal in sympathy with the source pulse that is superimposed on a DC voltage pedestal. The sensor also provides a measure of internal temperature via an embedded thermistor. The sensor requires a voltage supply to operate the infrared detector and the connections to the sensor follow the industry standard 7 pin format.

To operate the sensor it must be connected to a suitable circuit that provides the source drive and extracts the small AC signals from the DC voltage pedestal. The circuit must amplify the small AC signals, extract a value from them and treat the results to provide a linear output related to gas concentration. The temperature output from the sensor should be used to apply temperature compensation in order to achieve the full performance specification. Technical support on implementation and application notes are available from Clairair Limited.

Outline Details

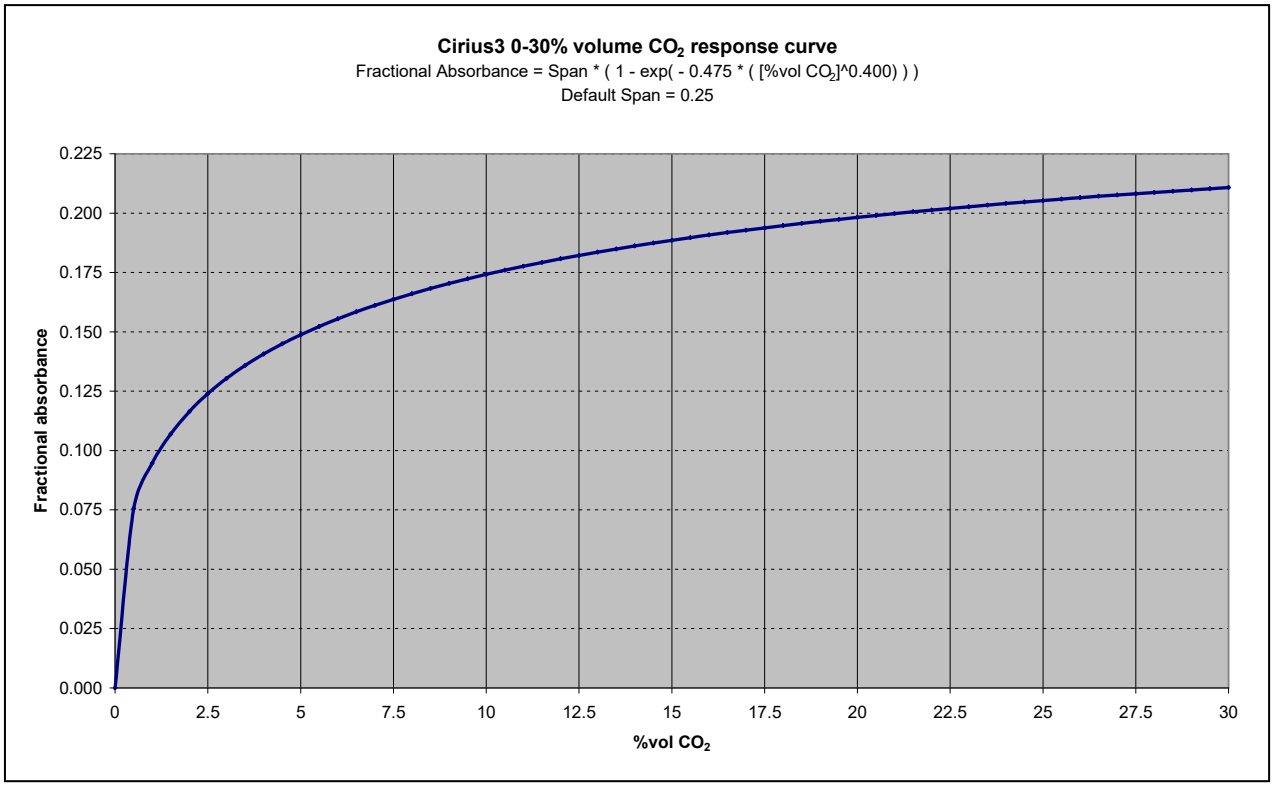
All dimensions in millimetres (±0.1mm unless noted)

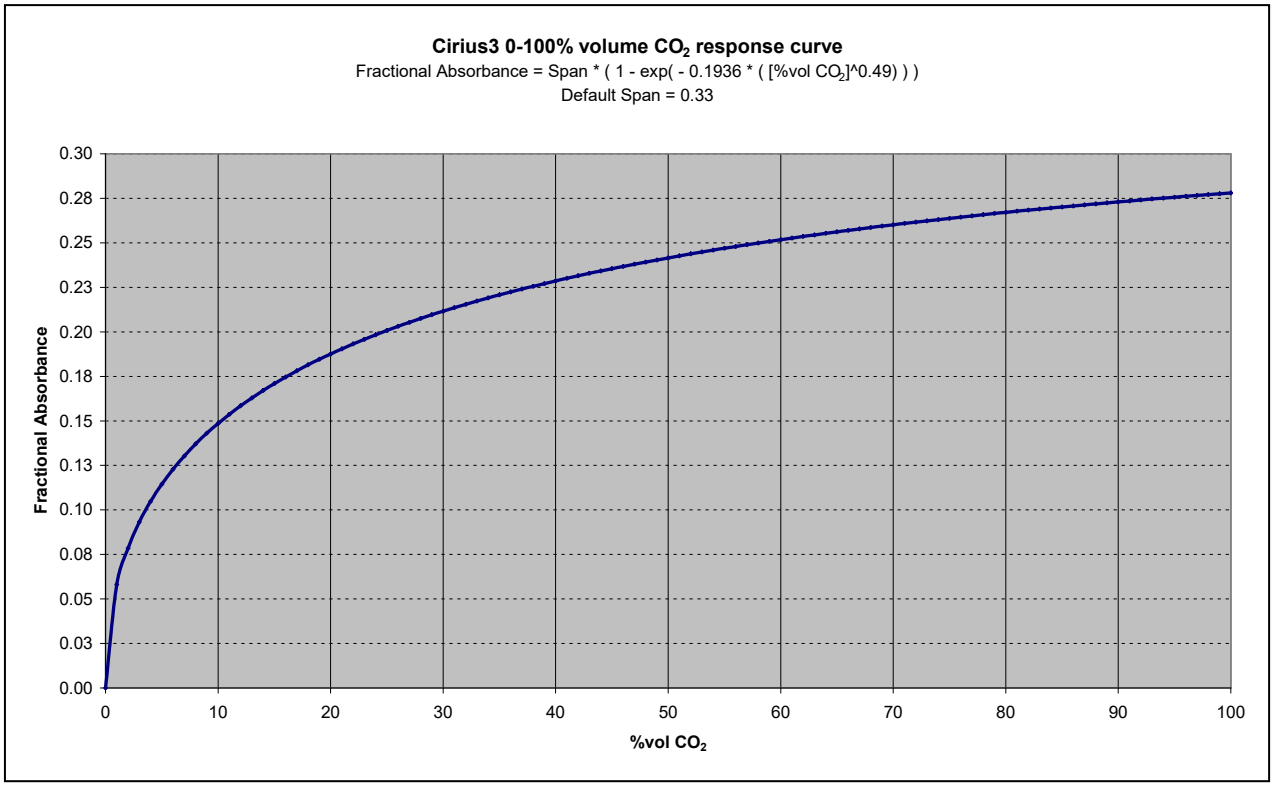
Pin Allocation:
1: Lamp Return
2: Lamp
3: +V DC Supply
4: Active Output
5: Reference Output
6: Temperature Output
7: 0V DC Supply



Response Characteristics

These plots illustrate the sensitivity versus concentration before linearisation. For further explanation, refer to the Infrared Sensor Application Notes available from Clairair Ltd.





Absolute Maximum Ratings

Ambient temperature range: -40°C to +80°C
Supply voltage to source (measured between pins 1 and 2): 5.1V
Supply voltage to detector (measured between pins 3 and 7): 5.5V

Handling Precautions

Electrostatic Sensitive Devices

The Cirius range of sensors contain electrostatic sensitive components. Anti-static handling precautions should be observed when handling these products.

Soldering to pins may seriously damage the sensor

Connections should be made via PCB sockets only.
Suggested socket: Wearnes Cambion reference 450-3326-01-06-00

Performance

Unless otherwise stated all data was taken using: Supply voltage of 5.0V. Lamp modulation of 0V – 5.0V, 50% duty cycle, 3.0Hz. Ambient temperature (between 20°C and 25°C). Ambient pressure (between 995 hPa and 1020 hPa). Gases diluted in nitrogen. Gas Flowrate 1litre/min across sensor face.

Power consumption:	150mW typical
Typical active signal in nitrogen:	2.3mV RMS (6.5mV p-p sinewave equivalent)
Typical reference signal in nitrogen:	3.5mV RMS (10mV p-p sinewave equivalent)
Temperature output:	3kΩ ± 5% NTC thermistor internally connected to 0V. Beta value 3450K
Typical % drop in active signal: At 100% volume carbon dioxide	35%
Response time (T_{90})	< 30s
Warm up time: To operation To specification	 < 30s < 30 minutes
Nominal ranges:	0 – 10%volume carbon dioxide minimum 0 – 100% volume carbon dioxide maximum
Minimum resolution: At zero At range	 < 0.5% of range <2% of range
MTBF	> 5 years
Weight:	17.6 grams
Vibration:	Complies with EN61779-1
Relative humidity:	0 – 95% RH non-condensing
Operating temperature range:	-30°C to +60°C
Operating pressure range:	700 – 1300 hPa
Storage temperature range:	-40°C to +80°C
Supply voltage range:	2.8V – 5.5V
Lamp drive voltage range:	2.8V – 5.0V (50% duty cycle)

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