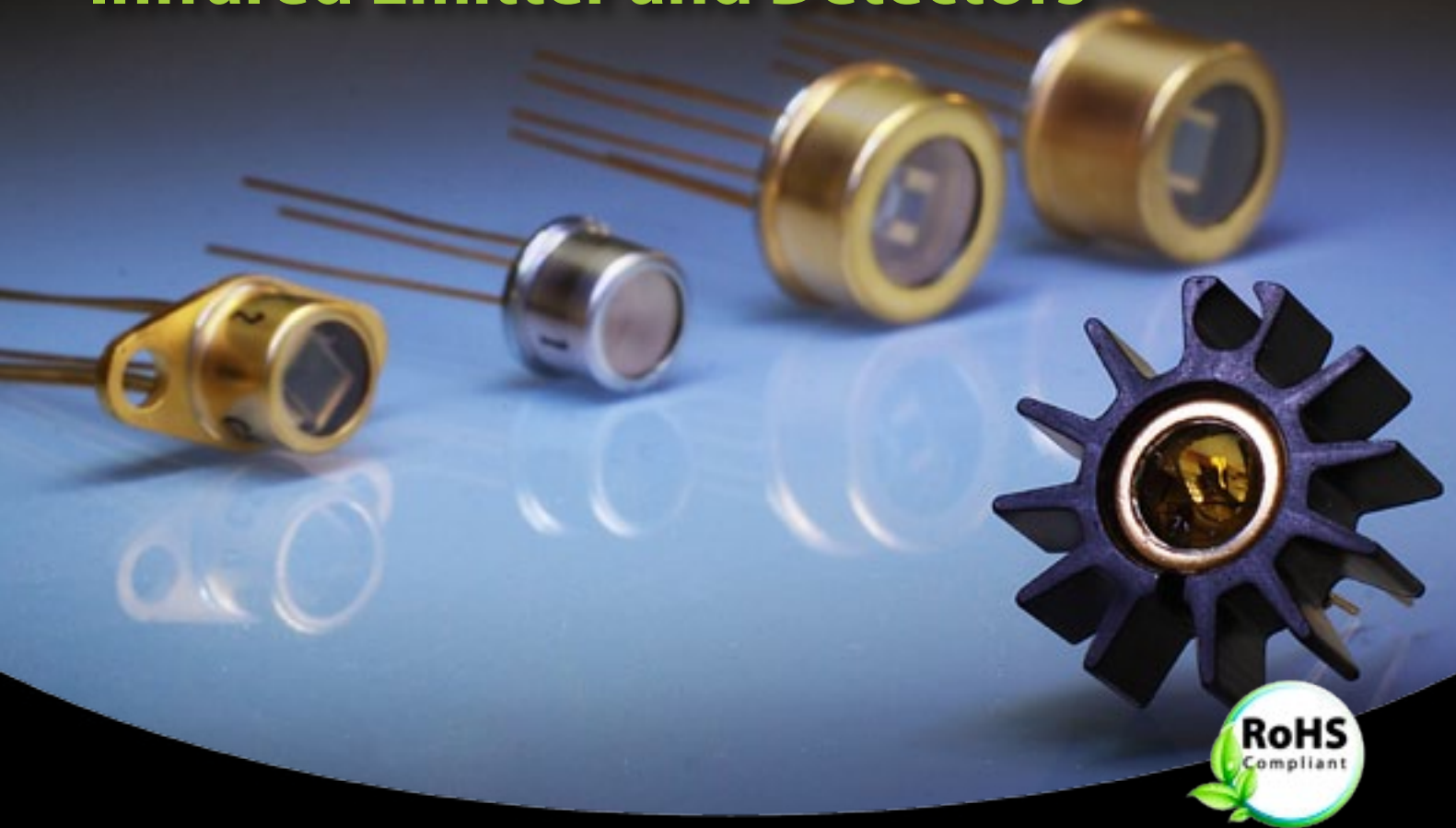


MicronSensIR™

Infrared Emitter and Detectors



New Technology Provides Industry-Leading Sensitivity, Reliability and Durability

In the detection and identification of gases in the 1.0 to 5.5 μm infrared region, PbS and PbSe detectors provide unparalleled sensitivity versus cost. In addition to their best-in-class performance statistics, Lumex's new MicronSensIR family of infrared emitter and detector products are ideal for a wide range of applications.

Features:

- Industry-leading sensitivity of 1.5×10^{10} Jones across the 1 to 5.5 micron infrared spectrum
- Available in off-the-shelf and customizable formats
- The MicronSensIR family of Detectors offers significant opportunities for cost reduction and design simplification reducing the need for multiple individual detectors and complex optics
- MicronSensIR Emitters high-speed infrared source combines a high-performance pulsable emitter with corresponding drive electronics. Designed to maximize output over 1 Hz to 200 Hz pulse rates, this source-driver combination optimizes system signal to noise performance while minimizing the overall footprint

Applications:

- Gas analysis and detection
- Greenhouse gas monitoring
- Fire and spark detection
- Flame monitoring
- Emission monitoring
- Process and quality control

Markets:

- Medical
- Environmental
- Industrial safety
- Rail Safety
- Automotive & Aviation
- Underground & Tunnel Safety

LUMEX®
Creating LED and LCD Solutions Together™

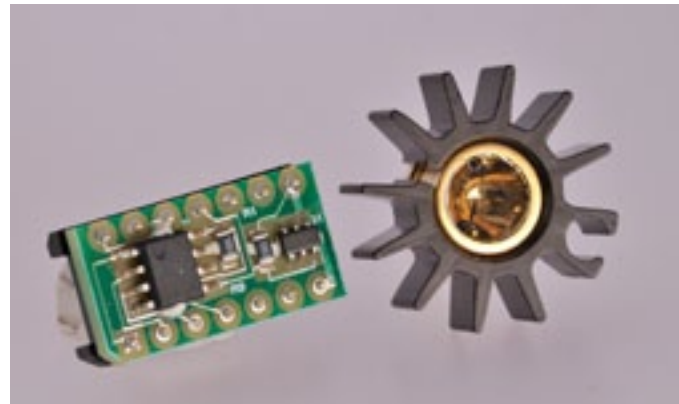
02/28/2011

MicronSensIR™ Infrared Emitters

Lumex's high-performance MicronSensIR Infrared Emitters, combine a high-speed pulsable emitter with its corresponding drive electronics on a compact 14 pin circuit board. Designed to maximize output over a 1 Hz to 200 Hz range of pulse speeds, these complementary assemblies enhance signal to noise performance, while minimizing the overall system footprint.

The construction and implementation of the emitter and control circuitry, optimize performance by matching the drive waveform for the desired operating frequency. This ensures peak output temperatures at all pulse frequencies and promotes the highest output for any application. With typical pulse speeds of 180 Hz and 50% modulation depth, even trace elements in low parts per million concentrations can be accurately detected.

The MicronSensIR Infrared Emitters sub-system is an ideal solution for a variety of applications. The control circuitry will exploit the capabilities of the high-speed source in any application, pulsed or steady state. With this emitter and controller set, designers can now focus on maximizing the overall system performance rather than interfacing with the source.



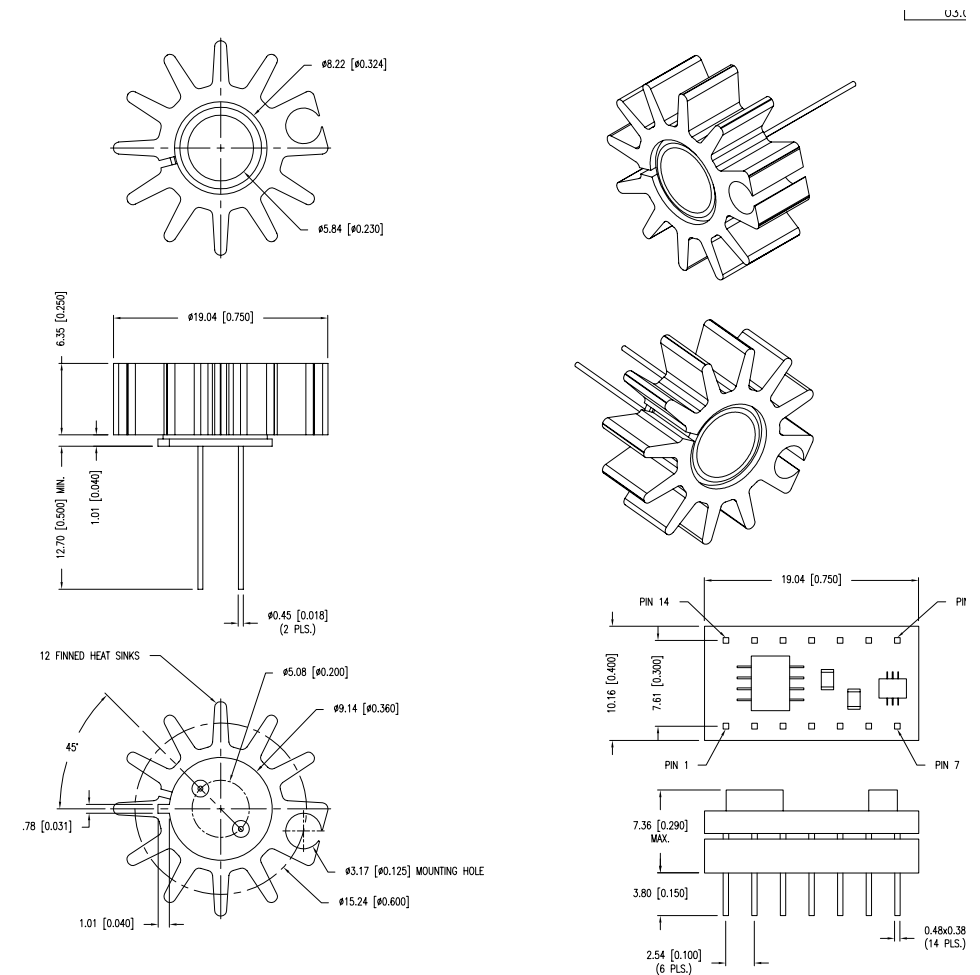
Key Features:

- Fast pulse rates, up to 180 Hz with 50% modulation depth
- Adjustable pulse rates with 0 to 5V control circuitry
- High output emitter, .04 watts/cm² at one inch from filament compact, reduced footprint solution
- Software support of custom pulse configurations
- Broadband output with 88% emissivity
- Lower overall system costs
- Typ. MTTF of >26,000 hrs at max rated power

Applications:

- Gas analysis
- Environmental monitoring
- Spectroscopy
- Process control systems
- Plastics sorting

MicronSensIR™ Infrared Emitters Lumex P/N: SNR-40636 Product Specifications



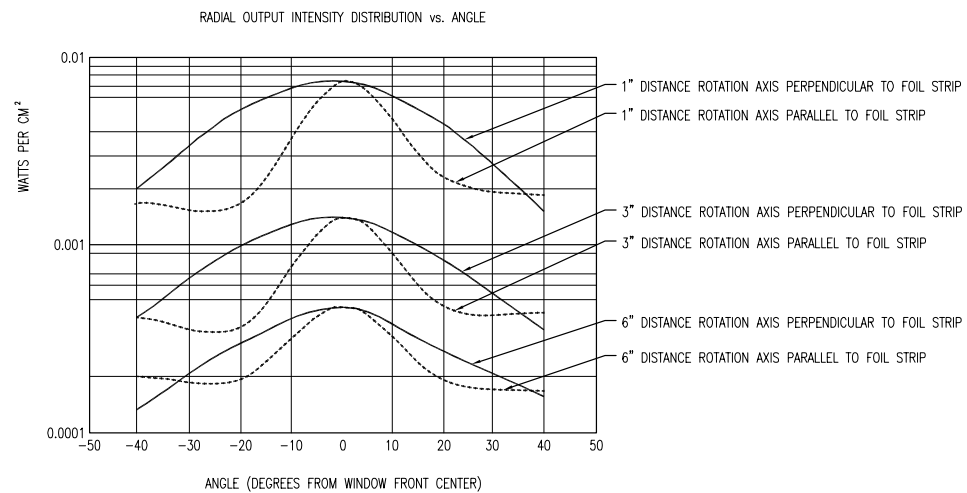
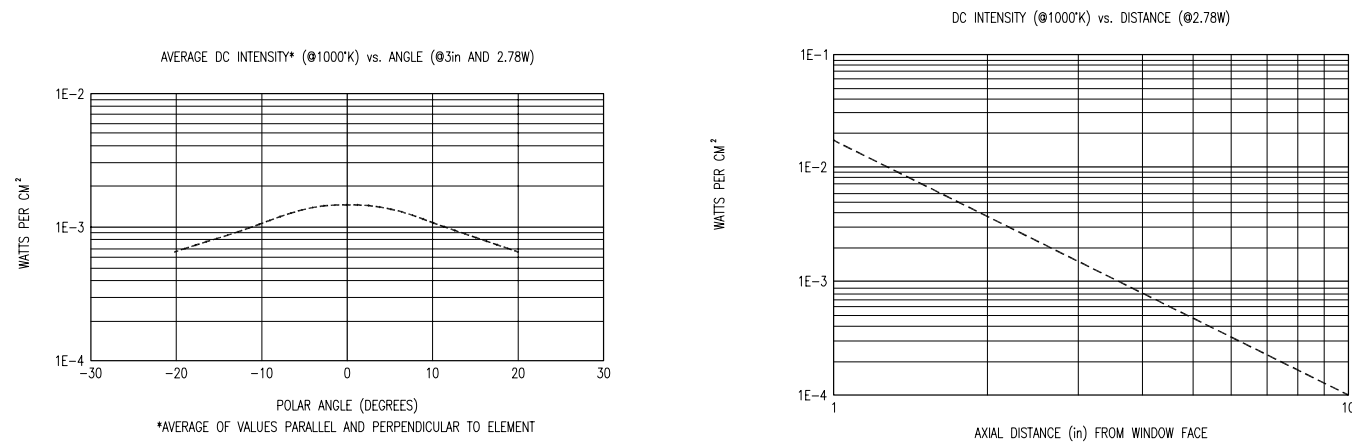
PEAK EMITTER CURRENT (12V)		5A
AVERAGE EMITTER CURRENT (12V)	10mA	220mA
OUTPUT ENABLE VOLTAGE	0V (DISABLE)	5V (ENABLE)
FILAMENT TEMPERATURE (12V)		1000°K
FILAMENT EMISSIVITY		88%
OPERATING TEMPERATURE	-30°C	+100°C
LIFETIME (MTTF)	26,000 Hrs	
SPECIAL OUTPUT (WITH SAPPHIRE WINDOW)	0.35mm	6um

PIN	NET LIST
1	+5V
2	NC
3	NC
4	NC
5	NC
6	NC
7	EMITTER
8	GND
9	NC
10	NC
11	PULSE REF
12	ENABLE (GND TO DISABLE)
13	FREQUENCY CONTROL (0 TO +5V)
14	GND



MicronSensIR™ Infrared Emitters

Lumex P/N: SNR-40636 Product Specifications



MicronSensIR™ Infrared Detectors

Lumex's MicronSensIR Infrared PbSe and PbS detectors are available in single element and multi-element formats and provide industry-leading sensitivity of 1.5E10 Jones across the 1 to 5.5 micron infrared spectrum.

In the detection and identification of gases and materials in the 1.0 to 5.5 μm infrared region, PbSe and PbS detectors provide unparalleled sensitivity versus cost.



MicronSensIR PbS High Sensitivity Infrared Single Element Detectors

MicronSense™ PbS high-sensitivity infrared detectors (single-channel detector) integrate recognized PbS technology with proven manufacturing processes to provide the highest sensitivity detectors across the 1 to 3 micron spectrum. In addition, these products minimize maintenance cost and assure dependable operation with industry-leading reliability.

Available in several configurations, customers can choose element size, cooling alternatives and package size to suit a variety of system and application requirements. Cooled units provide additional sensitivity for very low level signal detection and enhance stability for environments where temperatures are in constant flux.



SNR-40147



SNR-40013



SNR-40029

Key Features:

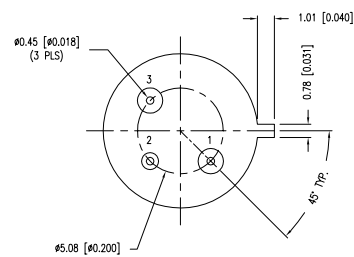
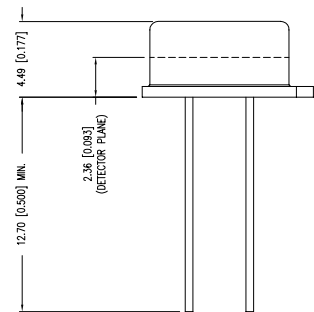
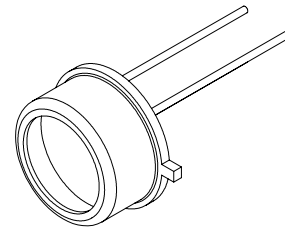
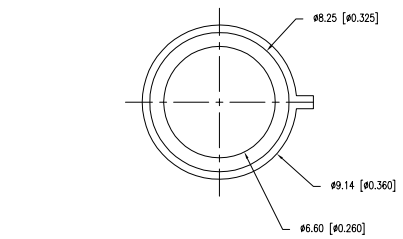
- Highest sensitivity detectors operating in the 1-3 micron region. Provides high signal to noise performance for wide measurement dynamic range
- High durability ensures long operation in the field. Minimizes maintenance and repair.
- Repeatable performance, promotes high manufacturing yields. Consistent results from batch to batch

Applications:

- Gas analysis
- Emissions monitoring
- Spectroscopy
- Process control systems
- Thermal imaging
- Flame Monitoring and Detection



Lumex P/N: SNR-40013 Product Specifications



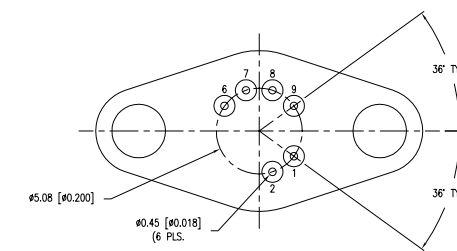
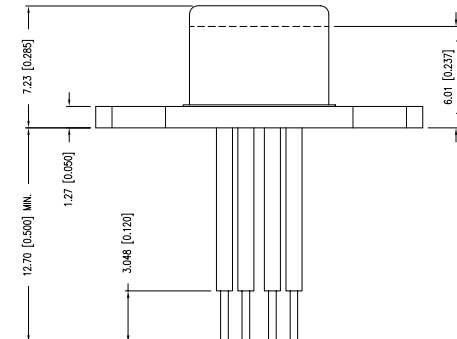
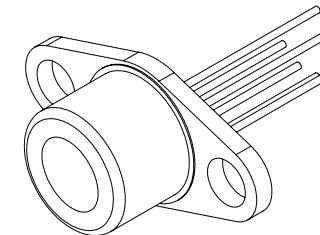
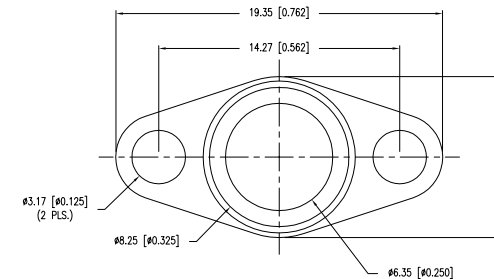
SPECIFICATIONS
STANDARD SPECIFICATIONS: ELECTRICAL
DETECTORS TESTED USING 50V/mm ACROSS THE DETECTOR AND A 0.5MΩ LOAD RESISTOR IN SERIES.

	MIN.	TYP.	MAX.	UNITS
WAVELENGTH OF MAX. RESPONSE	2.2	2.4		μm
D*(500K, 650Hz, 1Hz)	7.5x10 ⁹	9.4x10 ⁹		cm Hz ^{1/2} W ⁻¹
D*(pk, 650Hz, 1Hz)	8.0x10 ¹⁰	1.0x10 ¹¹		cm Hz ^{1/2} W ⁻¹
ELEMENT RESISTANCE (DARK)	0.5	1	2	MΩ/sq.
TIME CONSTANT (NOT MEASURED)		200	400	μs
RATED ELEMENT TEMP.			65	°C
ELEMENT SIZE		1x1		mm
RESPONSIVITY (pk, 650) vw-1	5.3x10 ⁵	8.0x10 ⁵		
AMBIENT TEMP./DETECTOR OPER. TEMP.		23		°C

PIN FUNCTION TABLE

PIN NO.	FUNCTION	COLOR
1	DETECTOR	BARE
2	CASE GND	BARE
3	DETECTOR	BARE

Lumex P/N: SNR-40147 Product Specifications



SPECIFICATIONS
STANDARD SPECIFICATIONS: ELECTRICAL
ALL DETECTOR SPECIFICATIONS ARE AT A BIAS VOLTAGE OF 50V/mm DISTANCE BETWEEN ELECTRODES APPLIED ACROSS THE DETECTOR AND WITH A 1MΩ LOAD RESISTOR IN SERIES. ALL SPECIFICATIONS APPLY AT OR NEAR MAXIMUM COOLING W/HEAT SINK AT +25°C. TYPICAL COOLER POWER AT MAX. COOLING 0.8W AT 2A.

	MIN.	TYP.	MAX.	UNITS
WAVELENGTH OF MAX. RESPONSE	2.4	2.5		μm
D*(500K, 650Hz, 1Hz)	1.0x10 ⁹	1.5x10 ⁹		cm Hz ^{1/2} W ⁻¹
D*(pk, 650Hz, 1Hz)	1.0x10 ¹¹	1.5x10 ¹¹		cm Hz ^{1/2} W ⁻¹
ELEMENT RESISTANCE (DARK)	1.5	3	10	MΩ/sq.
TIME CONSTANT (NOT MEASURED)		800	1600	μs
RATED ELEMENT TEMP.			65	°C
DT Ø/OR NEAR MAX. COOLING	45	50		°C
ELEMENT SIZE		3x3		mm
RESPONSIVITY (pk, 650) vw-1	4.2x10 ⁵	6.3x10 ⁵		
AMBIENT TEMP.		25		°C
DETECTOR OPER. TEMP.		-25		°C

PIN FUNCTION TABLE

PIN NO.	FUNCTION	COLOR
1	THERMISTOR	YELLOW
2	THERMISTOR	YELLOW
6	DETECTOR	WHITE
7	DETECTOR	WHITE
8	COOLER (-)	BLACK
9	COOLER (+)	RED

MicronSensIR™ Infrared Detectors

Lumex P/N: SNR-40029 Product Specifications

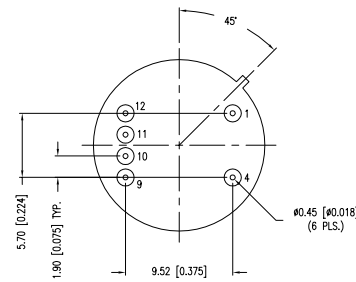
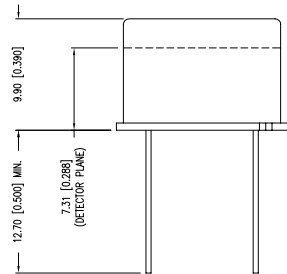
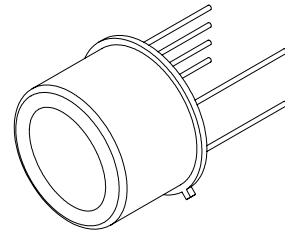
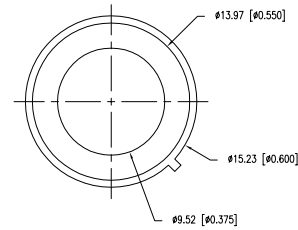
MicronSensIR™ Infrared Detectors

MicronSensIR PbSe Single Element Infrared Detectors

MicronSense™ PbSe Single Element Infrared Detectors (single-channel detector) family integrates recognized PbSe technology with proven manufacturing processes to provide the highest sensitivity detectors across the one to five micron spectrum. In addition, MicronSense™ PbSe Single Element Infrared Detectors products minimize maintenance cost and assure dependable operation with industry-leading reliability.

The high sensitivity maximizes measurement dynamic range for applications with trace elements. Real-time measurements are easily supported with the MicronSense™ PbSe Single Element Infrared Detector's fast response time. High durability and long life minimize repair and maintenance costs.

Available in several configurations, customers can choose element size, cooling alternatives and package size to suit a variety of system and application requirements. Cooled units provide additional sensitivity for very low level signal detection and enhance stability for environments where temperatures are in constant flux.



SPECIFICATIONS				
STANDARD SPECIFICATIONS: ELECTRICAL				
ALL DETECTOR SPECIFICATIONS ARE AT A BIAS VOLTAGE OF 50V/mm DISTANCE BETWEEN ELECTRODES APPLIED ACROSS THE DETECTOR AND WITH A 1MΩ LOAD RESISTOR IN SERIES. ALL SPECIFICATIONS APPLY AT OR NEAR MAXIMUM COOLING WITH THE HEAT SINK AT +25°C. TYPICAL COOLER POWER AT MAX. COOLING 1.9W AT 1.4A.				
	MIN.	TYP.	MAX.	UNITS
WAVELENGTH OF MAX. RESPONSE	2.6	2.7		μm
D* _(500K, 650Hz, 1Hz)	2.2x10 ⁹	3.3x10 ⁹		cm Hz ² W ⁻¹
D* _(1K, 650Hz, 1Hz)	2.0x10 ⁹	3.0x10 ⁹		cm Hz ² W ⁻¹
ELEMENT RESISTANCE (DARK)	3	6	20	MΩ/sq
TIME CONSTANT (NOT MEASURED)		1750	3500	μs
RATED ELEMENT TEMP.			65	°C
DT @/OR NEAR MAX. COOLING	70	75		°C
ELEMENT SIZE		3x3		mm
RESPONSIVITY (pk, 650) vV ⁻¹	4.3x10 ⁹	6.5x10 ⁹		
AMBIENT TEMP./DETECTOR OPER. TEMP.			25	°C
DETECTOR OPER. TEMP.			-25	°C
OPERATING TEMP.			45	°C

PIN FUNCTION TABLE		
PIN NO.	FUNCTION	COLOR
1	COOLER (-)	BLACK
4	COOLER (+)	RED
9	DETECTOR	WHITE
10	THERMISTOR	YELLOW
11	THERMISTOR	YELLOW
12	DETECTOR	WHITE



SNR-40135



SNR-40059



SNR-40186

Key Features:

- Highest sensitivity detectors operating in the 1-5 micron region. Provide high signal to noise performance for wide measurement dynamic range.
- Fastest response speed for mid-IR applications
- High reliability for long life
- Best overall performance for the 1-5 micron spectrum
- Consistent repeatable results minimize testing

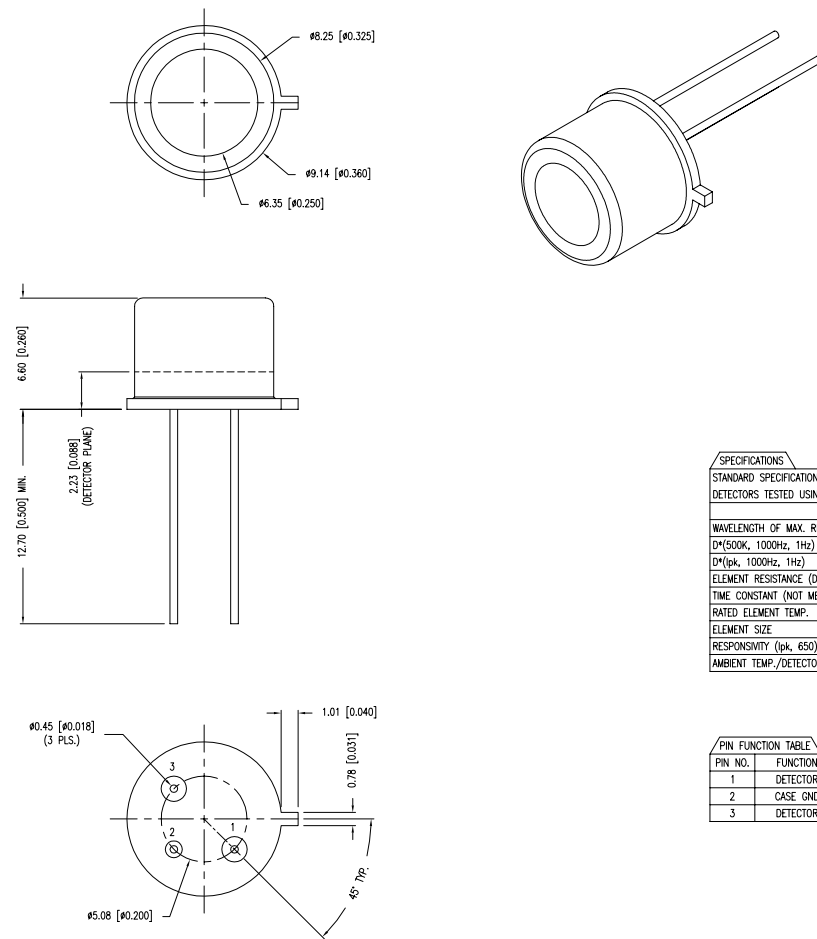
Applications:

- Gas analysis
- Emissions monitoring
- Spectroscopy
- Process control systems
- Thermal imaging
- Flame Monitoring and Detection



MicronSensIR™ Infrared Detectors

Lumex P/N: SNR-40135 Product Specifications



SPECIFICATIONS

STANDARD SPECIFICATIONS: ELECTRICAL
DETECTORS TESTED USING 35W/mm ACROSS THE DETECTOR AND A 1MΩ LOAD RESISTOR IN SERIES

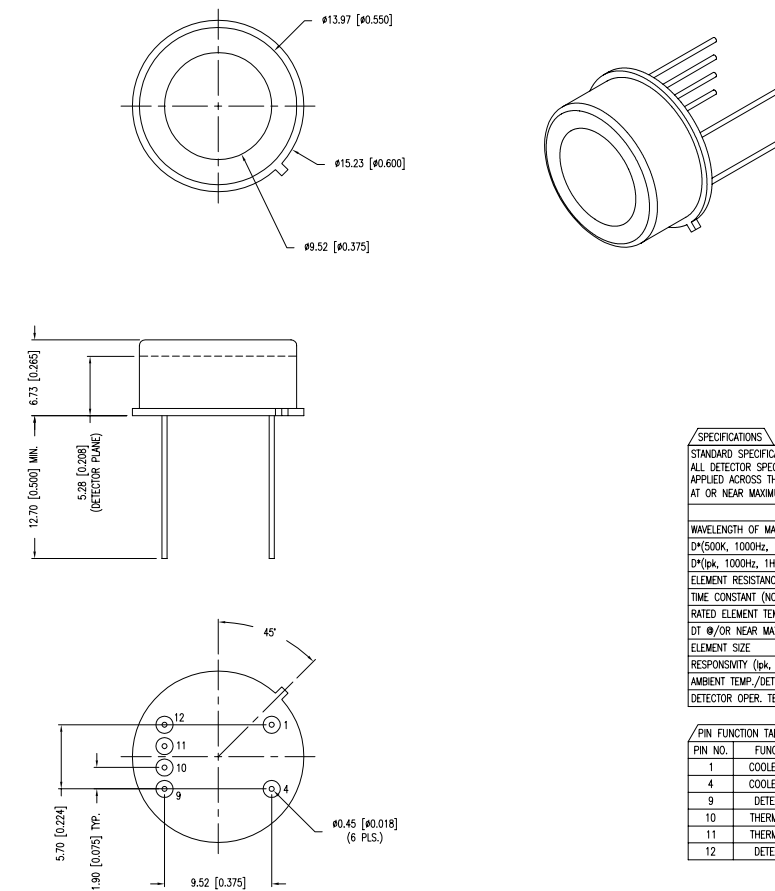
	MIN.	TYP.	MAX.	UNITS
WAVELENGTH OF MAX. RESPONSE	3.6	3.8		μm
D*(500K, 1000Hz, 1Hz)	1.0x10 ⁸	1.5x10 ⁹		cm Hz ^{1/2} W ⁻¹
D*(pk, 1000Hz, 1Hz)	1.0x10 ⁹	1.5x10 ¹⁰		cm Hz ^{1/2} W ⁻¹
ELEMENT RESISTANCE (DARK)	0.1	0.8	2.5	MΩ/sq.
TIME CONSTANT (NOT MEASURED)		2	5	μs
RATED ELEMENT TEMP.			85	°C
ELEMENT SIZE		2x2		mm
RESPONSIVITY (pk, 650) vV-1	7.5x10 ³	1.5x10 ⁴		
AMBIENT TEMP./DETECTOR OPER. TEMP.		23		°C

PIN FUNCTION TABLE

PIN NO.	FUNCTION	COLOR
1	DETECTOR	BARE
2	CASE GND	BARE
3	DETECTOR	BARE

MicronSensIR™ Infrared Detectors

Lumex P/N: SNR-40059 Product Specifications



SPECIFICATIONS

STANDARD SPECIFICATIONS: ELECTRICAL
ALL DETECTOR SPECIFICATIONS ARE AT A BIAS VOLTAGE OF 25V/mm DISTANCE BETWEEN ELECTRODES APPLIED ACROSS THE DETECTOR AND WITH A LOAD RESISTOR IN SERIES. ALL SPECIFICATIONS APPLY AT OR NEAR MAXIMUM COOLING W/HEAT SINK AT +25°C.

	MIN.	TYP.	MAX.	UNITS
WAVELENGTH OF MAX. RESPONSE	4	4.2		μm
D*(500K, 1000Hz, 1Hz)	1.9x10 ⁸	3.9x10 ⁹		cm Hz ^{1/2} W ⁻¹
D*(pk, 1000Hz, 1Hz)	1.4x10 ⁹	2.8x10 ⁹		cm Hz ^{1/2} W ⁻¹
ELEMENT RESISTANCE (DARK)	0.5	4	10	MΩ/sq.
TIME CONSTANT (NOT MEASURED)		6	12	μs
RATED ELEMENT TEMP.			85	°C
DT @/OR NEAR MAX. COOLING	45	50		°C
ELEMENT SIZE		2x2		mm
RESPONSIVITY (pk, 650) vV-1	2.0x10 ⁴	3.0x10 ⁴		
AMBIENT TEMP./DETECTOR OPER. TEMP.		25		°C
DETECTOR OPER. TEMP.		-25		°C

PIN FUNCTION TABLE

PIN NO.	FUNCTION	COLOR
1	COOLER (-)	BLACK
4	COOLER (+)	RED
9	DETECTOR	WHITE
10	THERMISTOR	YELLOW
11	THERMISTOR	YELLOW
12	DETECTOR	WHITE

MicronSensIR™ Infrared Detectors

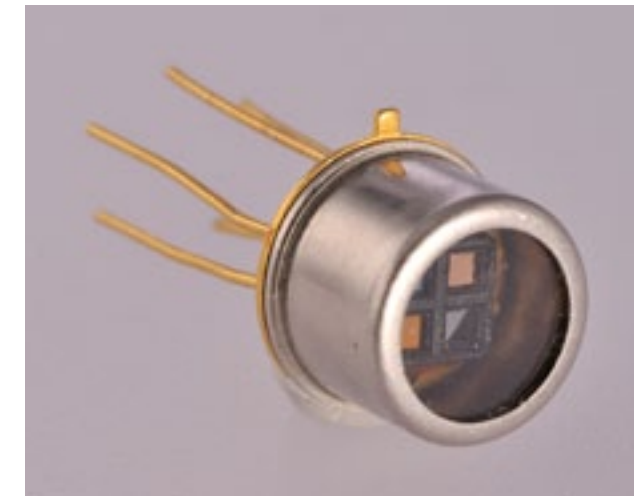
Lumex P/N: SNR-40186 Product Specifications

MicronSensIR™ Infrared Detectors

Lumex P/N: SNR-40642 Product Specifications

MicronSensIR High Performance Multi-Channel Infrared Detectors

New application demands are driving instrument manufacturers to measure more elements in smaller devices without sacrificing performance. To meet these challenges, Lumex's MicronSensIR High Performance Multi-Channel Infrared Detectors product family provides four discrete optical channels in a compact TO-5 package. Offering long-life, high-sensitivity PbSe detectors, MicronSensIR products cover the 1-5.5 micron spectrum for near- and mid-infrared applications.



These multi-channel detectors are designed in a quadrant configuration. Four isolated optical bandpass filters are mounted on four discrete elements. Well suited for a variety of applications, including air quality monitoring and emissions analysis, the filters have peak wavelengths of 4.62, 4.60, and 3.34 microns to cover for CO₂, CO and HC test requirements.

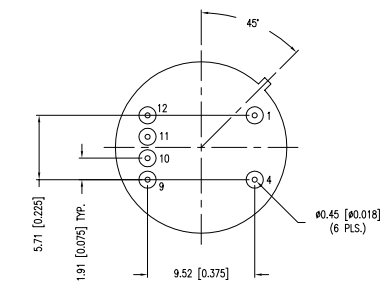
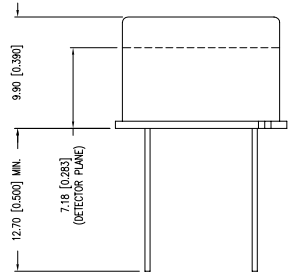
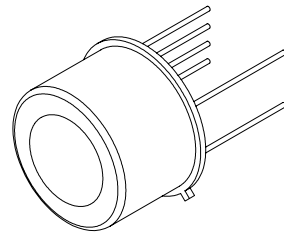
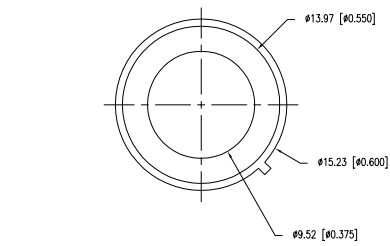
MicronSensIR High Performance Multi-Channel Infrared Detectors provides industry-leading sensitivity in the detection of up to four distinct gases in the 1.0 to 5.5 μm infrared region. Combining the superior sensitivity, high quality and exceptional reliability of the MicronSensIR™ products, these detectors offer the four channels with unmatched channel isolation and a compact TO-5 footprint. In addition, they provide optical filtering CO, CO₂ and CH₄ (methane). The fourth channel is typically used as an optical reference (filtered at 3.8 μm) to minimize measurement degradation from obstacles in the optical path.

Key Features:

- Four discrete high sensitivity optical channels allow for simultaneous measurement of multiple materials including
 - CO₂, CO and HC at 4.62, 4.60 and 3.34 microns respectively
 - Optical reference at 3.85 microns
- Covers 1- 5 microns for near- and mid-IR applications
- Compact, TO5 package maximizes potential applications
 - Ideal for portable instruments where size is critical
 - Hermetically sealed for use in harsh environments
- Designed for reliability to promote long life in the field

Applications:

- Medical gas analysis
- Industrial gas analysis
- Auto and aviation emissions monitoring
- Air quality monitoring or analysis
 - Environmental
 - In tunnels
 - Underground

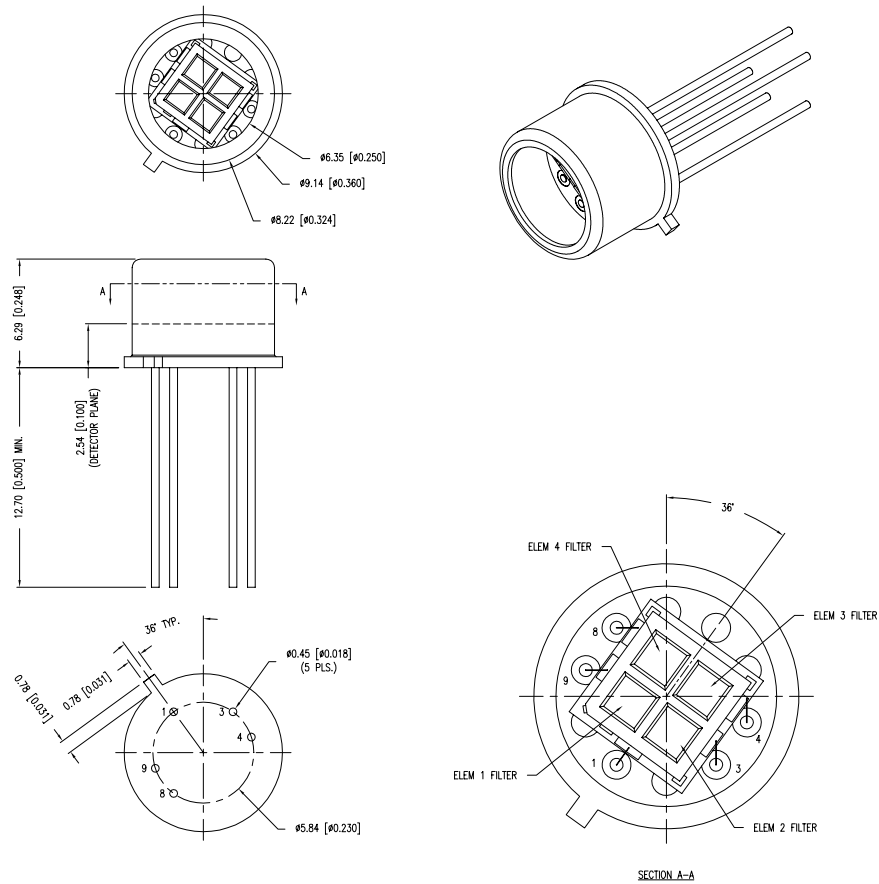


SPECIFICATIONS				
STANDARD SPECIFICATIONS: ELECTRICAL				
ALL DETECTOR SPECIFICATIONS ARE AT A BIAS VOLTAGE OF 25V/mm DISTANCE BETWEEN ELECTRODES APPLIED ACROSS THE DETECTOR AND WITH A LOAD RESISTOR IN SERIES. ALL SPECIFICATIONS APPLY AT OR NEAR MAXIMUM COOLING W/HEAT SINK AT +25°C. TYPICAL COOLER POWER AT MAX. COOLING 1.9W AT 1.4A.				
	MIN.	TYP.	MAX.	UNITS
WAVELENGTH OF MAX. RESPONSE	4.3	4.5		μm
DP(500K, 1000Hz, 1Hz)	2.9x10 ⁶	5.2x10 ⁶		cm Hz ^{1/2} W ⁻¹
DP(1pk, 1000Hz, 1Hz)	2.0x10 ⁶	3.5x10 ⁶		cm Hz ^{1/2} W ⁻¹
ELEMENT RESISTANCE (DARK)	1	6	20	MO/sq.
TIME CONSTANT (NOT MEASURED)		12	25	μs
RATED ELEMENT TEMP.			55	°C
ELEMENT SIZE		2x2		mm
RESPONSIVITY (1pk, 650) vw-1	5.0x10 ⁴	7.5x10 ⁴		
AMBIENT TEMP.		25		°C
DETECTOR OPER. TEMP.		-25		°C
OPERATING TEMP.		-50		°C

PIN FUNCTION TABLE		
PIN NO.	FUNCTION	COLOR
1	COOLER (-)	BLACK
4	COOLER (+)	RED
9	DETECTOR	WHITE
10	THERMISTOR	YELLOW
11	THERMISTOR	YELLOW
12	DETECTOR	WHITE

MicronSensIR™ Infrared Detectors

Lumex P/N: SNR-40633 Product Specifications



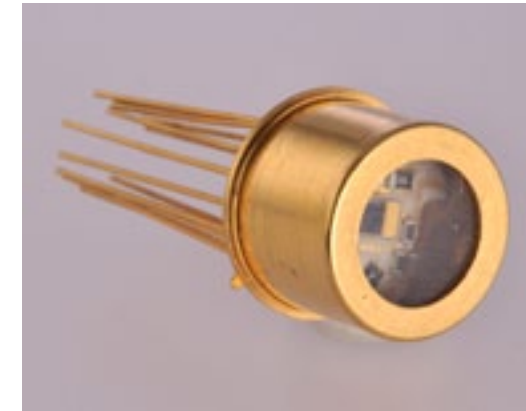
PIN NO.	FUNCTION	FILTER
1	COMMON	---
3	ELEM 2	3.85µm
4	ELEM 3	4.26µm
8	ELEM 4	4.60µm
9	ELEM 1	3.34µm

	CWL (µm)	HBW (µm)	TRANSMISSION AT CWL (%)	BW AT 75% TRANSMISSION (µm)
CO2	4.62±.04	±.07 ±.007	>85	>.75 x HBW
CO	4.60±.05	±.07 ±.007	>85	>.75 x HBW
HC	3.34±.03	±.07 ±.007	>55	>.75 x HBW
REF	3.85±.04	±.10 ±.01	>85	>.75 x HBW

	MIN.	TYP.	MAX.	UNITS
WAVELENGTH OF MAX. RESPONSE		3.8		µm
DM (500K, 1000Hz, 1Hz)	1.0x10 ⁸	1.5x10 ⁸		cm Hz ² W ⁻¹
DM (pk, 1000Hz, 1Hz)	7.0x10 ⁸	1.5x10 ¹⁰		cm Hz ² W ⁻¹
RESPONSIVITY (pk, 650Hz)	1.5x10 ⁴	3.0x10 ⁴		V/W
TIME CONSTANT (NOT MEASURED)		2	5	µs
RATED ELEMENT TEMP.			85	°C
ELEMENT SIZE		1x1		mm
DARK RESISTANCE	0.1	0.8	2.5	MO/eq.
OPER. TEMP.		23		°C

MicronSensIR Integrated Detector Assembly

Lumex's MicronSensIR Integrated Detector Assembly incorporates electronics while still providing the exceptional sensitivity of the 2 mm square PbSe detector (2.8 x x 1010 cm Hz^{1/2} w-1 peak D*) across the 1 to 5.5 micron spectrum. Ideal for portable instruments, where size, durability and costs are so important, this compact detector provides a 10 dB gain amplifier, a cooler and a thermistor all within a hermetically shielded package. This configuration helps minimize system noise, optimizing the measurement dynamic range, while reducing the system footprint and costs.



Standing out from other single-element detectors, MicronSensIR Integrated Detector Assembly was created to minimize size and simplify system implementation, without sacrificing performance. The standard MicronSensIR Integrated Detector Assembly includes a 2x2 mm PbSe detector and supports single or bipolar bias supplies. It is configured with an AC coupled 10 dB gain amplifier.

The compact size significantly reduces the footprint as compared to traditional detector schemes and provides a hermetically sealed assembly for harsh environments. MicronSensIR Integrated Detector Assembly is ideal for manufacturers of portable equipment where size, durability and costs are so important.

The MicronSensIR Integrated Detector Assembly design takes advantage of a shielded, high impedance detector node to minimize noise. With the integrated thermistor and thermoelectric cooler (TEC), MicronSensIR Integrated Detector

Assembly can manage temperature fluctuations reliably. These complementary features combine to optimize the signal to noise ratio. Thus Lumex's MicronSensIR Integrated Detector Assembly is prepared to meet the challenges of today's and tomorrow's demanding applications.

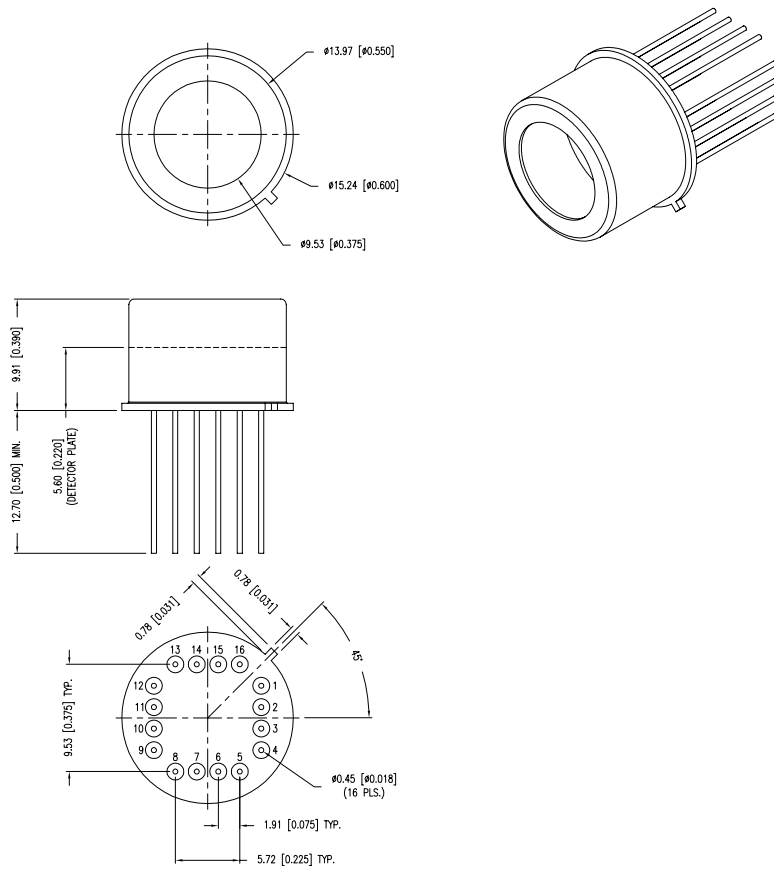
Key Features:

- High sensitivity detector with integrated electronics including:
 - Single stage TEC and thermistor for temperature control
 - Hermetic sealing for use in harsh environments
 - A compact TO-8 package
- Ideal for portable instruments where small size is critical
- Less susceptible to noise than external circuitry configurations
- External interface required to control TEC

Applications:

- Gas analysis, medical and industrial
- Emissions monitoring
- Spectroscopy
- Process control systems
- Thermal imaging
- Flame detection





BIAS VOLTAGE (Vb+ AND Vb-) TABLE*

DETECTOR SIZE	PbSe CHEMISTRY
2mm x 2mm	Vb+ = 50V Vb- = 0V

*RECOMMENDED FOR BEST PERFORMANCE

SPECIFICATION TABLE

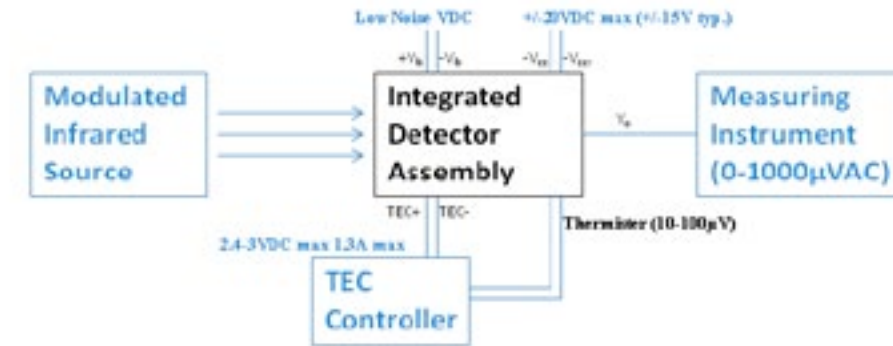
SPECIFICATION	MIN	TYP	MAX
DETECTOR SIZE		2 x 2mm	
DETECTOR LOAD RESISTOR		1M Ω	
GAIN		10	
INPUT TIME CONSTANT		150ms	
RADIATION INTENSITY: PbSe	10 ⁴ W/cm ²		10 ⁶ W/cm ²
SOURCE MODULATION FREQUENCY	10Hz	100Hz, 500Hz	825Hz
Vb+ - Vb- PbSe		50-70VDC	100VDC
THERMISTOR (25°C)(10 μ V-100 μ V INPUT)		10K Ω	
TEC VOLTAGE			2.4-3VDC
TEC CURRENT			1.3A
OPERATING TEMPERATURE	-20°C		+65°C
OP AMP SUPPLY VOLTAGE +Vcc,-Vcc		±15V	±20V
OP AMP SUPPLY CURRENT		2 μ A	20 μ A
OUTPUT TO INSTRUMENT Vo		10-1000 μ V	

PIN FUNCTION TABLE

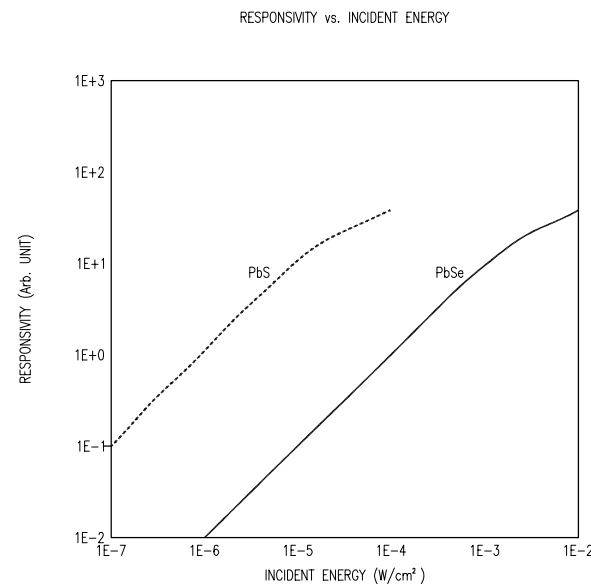
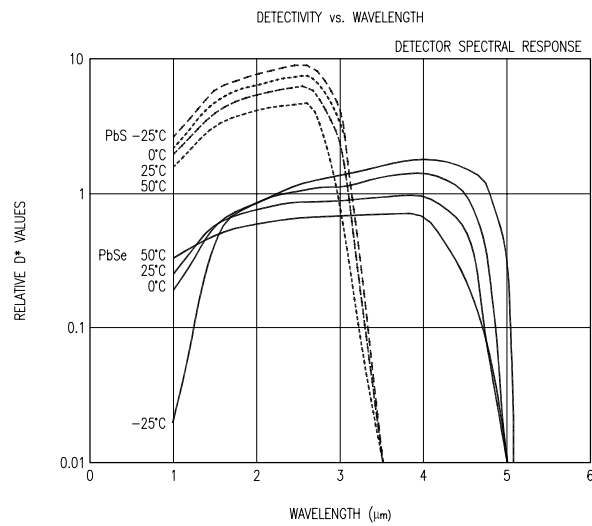
PIN NO.	FUNCTION	COLOR
1	TE COOLER (-)	BLACK
2	NC	
3	CASE	WHITE
4	TE COOLER (+)	RED
5	Vo	BLUE
6	GND	GREEN
7	Vb-	BLACK
8	NC	
9	THERMISTOR	YELLOW
10	NC	
11	NC	
12	THERMISTOR	YELLOW
13	NC	
14	Vb+	BROWN
15	-Vcc	BLACK
16	+Vcc	RED

MicronSensIR Integrated Detector Assembly - Operating Instructions

The MicronSensIR Integrated Detector Assembly consists of a PbSe 2x2mm detector with an integrated low-noise 10 gain buffer/amplifier, thermistor, and Thermoelectric Cooler (TEC). The Thermoelectric Cooler is typically configured with a temperature control circuit using the thermistor to provide feedback to the controller. Additionally, a low noise voltage source is required along with a measuring instrument, such as a wave analyzer or A/D converter and a software package, such as Labview. A modulated or “chopped” infrared source between 50-500Hz is needed to obtain Vo output between 0-1000 μ VAC. It is important to follow the guidelines provided in this document to achieve the optimal performance.



Typical System Diagram



Installing Cooled Detector Assembly

Thermoelectric coolers are often used to cool devices for increased sensitivity or stability. Packages involving the use of thermoelectric coolers require some careful consideration to insure maximum life and performance.

A Thermoelectric Cooler uses the Peltier effect to convert DC current into a differential temperature (ΔT) and is sometimes referred to as a Solid State Heat Pump. As the name implies, the device “pumps” heat from one place to another. Heat (Q) is typically pumped from the object that is being cooled to the atmosphere. It is very important that the thermal resistance in this path be low enough to dissipate both the heat being pumped and the heat generated by the cooler itself. If it is not, the cooler and the device will overheat, damaging both components.

When designing and using a thermoelectrically cooled package, some important items to consider are the heat sink selection, the mounting method, and the current limit of the control electronics.

1. Heat Sink Selection

A proper heat sink must be used. Heat can be generated by the device being cooled and also by the thermoelectric cooler itself, totaling several watts. The selected heat sink must be adequate to dissipate all of the heat being generated and pumped by the cooler. The heat sink represents the final thermal resistance to the atmosphere, so its design is critical to the performance and longevity of the device. Inadequate heat sink design, mounting or size will reduce detector performance and could lead to early failure of the device and cooler.

2. Mounting

As shown below, the optimal thermal path is out of the pin side of the package.

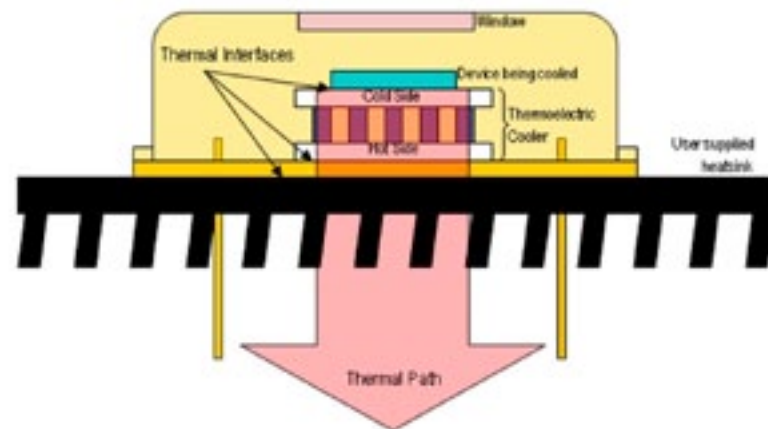


Figure 1 – Typical TO Style Package

The package material is designed to provide a hermetic seal, not necessarily low thermal resistance. Since the goal of heat sinking is to minimize the thermal resistance in the thermal path, it is important that it be mounted directly to the side of the package where the pins protrude. Mounting to any other surface on the package increases the thermal resistance, compromises thermal performance and reduces reliability.

To reduce the thermal resistance at the heat sink/package thermal interface, the mounting surfaces must be flat and free of any burrs or protrusions on any “casting” surface. Reducing the thermal resistance at this interface is aided by the use of thermally conductive interface materials between the back of the package and the heat sink. Thermal compounds are provided by companies such as Wakefield Engineering. To maintain a consistent thermal path beyond five (5) years, a thermal pad must be used in place of the thermal compound. This will increase the thermal resistance and thereby reduce the cooler delta T by as much as ten (10) percent but can increase the device lifetime if properly assembled and tightened when installed into the heat sink assembly. The assembly and torque are always very critical, but even more so when using a thermal pad in place of the compound.

The connecting pins or leads that protrude from the back of the package are hermetically sealed with a glass-filled feed through. Complete the assembly of the heat sink, including the final torque of the mounting screws, prior to soldering these pins into place. Failure to mount the heat sink before soldering the pins can put stress on the glass joint as the heat sink is tightened and can lead to a hermetic seal failure. Hermetic seal failure can cause device failure.

Avoid bending the pins. If they must be bent, use a pair of bending pliers or tweezers to isolate the bend area from the glass-filled seal. Multiple bends of these pins will lead to pin failure.

3. Control Electronics

External electronics are responsible for controlling the temperature and protecting the package from overheating. ΔT increases with increasing current (I) up to the point that the internal heating is greater than the heat pumping capacity. Increasing the current beyond that point will heat the device, possibly to destruction. The thermistor should be used to provide feedback to controller/power supply circuitry, which regulates the input power and maintains the appropriate set point temperature. A current limit must be set on the cooler power supply which is less than I_{max} and also prevents overheating for the cooler in use. Note that the point at which a cooler overheats depends directly on the thermal resistance to the atmosphere and the ambient temperature.

The TEC can be run in open-loop mode with a fixed voltage. This will increase the sensitivity and spectral response of the detector but does not reduce temperature-induced sensitivity fluctuations.

4. Summary

The performance of detector packages with thermoelectric coolers is directly related to the adequate heat sinking of the package. Thermal resistance is minimized by proper heat sink selection and mounting using a thermal interface material. Overall control and protection is the responsibility of the system cooler control electronics. Proper thermal and electronic design will prevent damage and optimize the performance of the detector.

Failure to use proper handling, heat sinking, thermal path, mounting methods, and/or power limits will void any expressed or implied warranty by Lumex.