

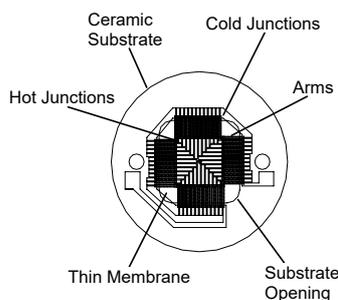
# Introduction to Thermopile Detectors

## Thermopile Detector Overview

Dexter Research Center is a leader in the manufacture of stable, high quality, high output radiation sensing thermopile detectors with a linear dynamic range from the UV to long wave IR. Thermopile detectors are passive radiation sensing voltage-generating devices, that require no bias or cooling and do not emit any radiation. Our detector's spectral absorption is flat from the ultraviolet to the far infrared. Spectral sensitivity is defined by the selection of optical band-pass filters. Thermopile output is generally in the micro-Volt to milli-Volt range depending on target size, temperature and radiance.

## What are Thermopile Detectors?

Thermopile detectors can be thought of as a series array of miniature thermocouple junctions connected in series as differential pairs. These differential pairs make up the cold junctions and the hot junctions (see figure 1). In fact, the hot and cold junctions are connected by alternating n-type and p-type materials, called "Arms", creating a Seebeck effect between the junctions. A voltage is



**Figure 1:**  
Key features of the Model 2M  
Thin Film thermopile detector

produced, proportional to the temperature gradient between the hot and cold junctions. For Thin Film based thermopiles, the arm materials are antimony (Sb) and bismuth (Bi). For Silicon thermopiles, the arm materials can be alternating n-type and p-type Poly-Silicon or n-type with gold (Au) or aluminum (Al). The cold junctions are typically thermally connected to the detector package and are located around the perimeter of the substrate opening. The hot junctions are located in the center of the detector pattern and are coated with an energy absorber. The hot junctions define the active area of the detector and are suspended on a thin membrane, thermally isolating them from the rest of the package.

Our detectors are designed in small TO-18, TO-5, or TO-8 transistor type packages. Before the detector package is hermetically sealed (encapsulated), the package is evacuated of ambient air and back-filled with one of four gases. The backfill gas provides one of the key thermal paths for dissipation of energy from the active area. Please reference Application Brief #7: "Effects of Encapsulation Gas on Thermopile Detectors" for a discussion of these effects on detector performance.

The unique energy absorbing materials used by Dexter Research Center enable our thermopile detectors to have a spectral response that is essentially flat from the ultraviolet to the far infrared. Depending on the detector application, spectral sensitivity is limited by the choice of optical band-pass filters. We have a wide range of optical filters and window materials in stock and available for customization of your detector for your application. Dexter Research also offers optional internal apertures, internal heatsinks, and several choices of package aperture sizes to meet your design requirements.

Thermopile detectors are very low noise detectors and have the same amount of noise as a resistor of equal resistance. Unlike Pyroelectric detectors, thermopile detectors generate no  $1/f$  or microphonic noise, but only the Johnson noise of their resistance. Thermopile detectors provide a stable output for DC radiation up to a frequency limited by the time constant. Unlike Pyroelectric detectors, no chopper is required.

8585 Rev B

Update: 5/17/06

Information subject to change without notice

## Types of Thermopile Detectors

Dexter Research Center offers two distinct types of thermopile detectors, the Bismuth-Antimony Thin Film based and the Silicon based. There are several performance differences between the two types of detectors as follows. Thin Film based thermopiles have lower resistance and lower noise voltage than a Silicon based thermopile, therefore Thin Film detectors provide a higher Signal-to-Noise ratio. A Thin Film thermopile with equal output to that of a Silicon based thermopile will have a slower time constant. In general, Thin Film thermopiles are available with larger active areas. Please see the table below for a comparison of these two types of thermopiles.

Several Thin Film thermopile models are designed with an internal compensating element. The compensating element is blinded and is typically connected in opposition to the active element, thus minimizing the effect of a sudden change in ambient package temperature. This temperature compensation is effective for no more than 5 seconds. Dexter Research Center has also created compensated Silicon thermopiles (the models starting with "ST"). Please ask our sales representative for more information.

## Examples of Thermopile Detector Applications

- Hand-Held Non-Contact Temperature Measurements
- Non-Contact Temperature Measurements in industrial applications and process control
- Infrared Radiometry
- Tympanic Thermometers
- Automotive Exhaust Gas Analysis and Emissions Control
- Refrigerant Leak Detection
- Medical Gas Analysis including Anesthetic monitoring, incubator CO and CO<sub>2</sub>, Blood Alcohol Breathalyzers
- Horizon sensors for Aircraft, Satellites, and hobbyist applications
- Thermal Imaging
- Thermal Positioning and Targeting
- Automotive Climate Control
- Automotive Occupancy Sensing
- Household Appliance Temperature Measurement
- Aircraft Flame and Fire Detection
- Hazard Control including Flame and explosion Detection
- Fire Detection in transportation tunnels
- Black ice detection and warning
- Blood Glucose monitoring
- Security Human Presence and Detection
- Humidity measurement

Thin Film based vs. Silicon based thermopiles

Parameter	Thin Film	Silicon
Output Voltage	Higher	Lower
Signal-to-Noise Ratio	Higher	Lower
Temperature Coefficient of $R$	-0.36%/°C	-0.01%/°C
Noise Voltage	Lower	Higher
Time Constant	Slower	Faster
Cost	Higher	Lower
Operating Temperature	100°C	125°C

8585 Rev B

Update: 5/17/06

Information subject to change without notice

<b>Multi-Channel Thin-Film by Specification</b>	<b>DR26</b>	<b>DR34</b>	<b>DR46</b>	<b>TM34</b>	<b>T34 Comp</b>	<b>2M Quad</b>	<b>10 Channel</b>
Active Area Size (mm)	2 x .6	3.16 x.4	4 x .6	3.16 x.4	3.16 x.4	2 x 2	3.16 x.4
Element Area (mm <sup>2</sup> )	1.2	1.264	2.4	1.264	1.264	4	1.264
Number of Junctions	26	40	50	40	40	48	40
Number of Channels	2	2	2	3	3 Compensated	4	10
Output Voltage (μV)	54	115	210	115	115	250	115
Signal-to-Noise Ratio	5,684	10,088	16,406	10,088	7,099	19,531	10,088
Responsivity $\mathcal{R}$ (V/W)	13.6	27.6	26.5	27.6	27.6	18.9	27.6
Resistance (kΩ)	5.5	8	10	8	16	10	8
Temp. Coefficient of $\mathcal{R}$ (%/°C)	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36
Temp. Coefficient of Resistance (%/°C)	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20
Noise Voltage (nV/√Hz)	9.5	11.4	12.8	11.4	16.2	12.8	11.4
Noise Equivalent Power (nW/√Hz)	0.70	0.42	0.48	0.42	0.59	0.68	0.42
Detectivity (10 <sup>8</sup> √Hz/W)	1.6	2.7	3.2	2.7	1.9	3.0	2.7
Time Constant (ms)	38	38	40	38	38	85	38
Field of View (Degrees)	NA	NA	NA	NA	NA	NA	NA
Package Type	TO-5	TO-5w/5 pins	TO-8 w/5 pins	TO-8 w/12 pins	TO-8 w/12 pins	TO-8 w/12 pins	TO-5
Operating Temperature (°C)	-50 to 100	-50 to 100	-50 to 100	-50 to 100	-50 to 100	-50 to 100	-50 to 100
Element Matching (%)	5	5	5	5	5	5	10
Element Separation (mm)	1.10	1.80	2.00	See DWG	See DWG	4.57	1.82 & 4.28

Multi-Channel Silicon by Specification	ST60 Dual	ST120 Dual	ST150 Dual	ST60 Quad	ST120 Quad	ST150 Quad	SLA32	SA32x32
Active Area Size (mm)	.61 x .61	1.2 x 1.2	1.5 x 1.5	.61 x .61	1.2 x 1.2	1.5 x 1.5	.05 x .65	.3 x .3
Element Area (mm <sup>2</sup> )	.037	1.44	2.25	.037	1.44	2.25	0.0325	0.09
Number of Junctions	80	80	120	80	80	120	74	28
Number of Channels	2	2	2	4	4	4	2 x 16 Staggered	1024
Output Voltage (μV)	62	165	230	62	140	230	14.8	27
Signal-to-Noise Ratio	1,981	4,301	6,571	1,981	3,649	6,571	423	614
Responsivity $\mathcal{R}$ (V/W)	50.5	34.7	31.0	50.5	29.5	31.0	138.0	90.0
Resistance (kΩ)	60	90	75	60	90	75	76	120
Temp. Coefficient of $\mathcal{R}$ (%/°C)	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.01	-0.01
Temp. Coefficient of Resistance (%/°C)	0.11	0.02	0.11	0.11	0.02	0.11	0.11	0.11
Noise Voltage (nV/√Hz)	31.3	38.4	35.0	31.3	38.4	35.0	35.0	44.0
Noise Equivalent Power (nW/√Hz)	0.62	1.10	1.13	0.62	1.30	1.13	0.26	0.49
Detectivity (10 <sup>8</sup> √Hz/W)	1.0	1.09	1.3	1.0	0.92	1.3	0.7	0.6
Time Constant (ms)	18	25	38	18	25	38	7	6
Field of View (Degrees)	15°/47°	27°/77°	27°/99°	15°/47°	9°/63°	22°/85°	NA	NA
Package Type	TO-5	TO-5	TO-5	TO-5	TO-5	TO-8	flat pack .97" x 1.27"	Kyocera PB87700-A .95" x .95"
Operating Temperature (°C)	-50 to 100	-50 to 125	-50 to 100	-50 to 100	-50 to 125	-50 to 100	-50 to 100	-50 to 100
Element Matching (%)	5	25	5	15	25	15	15	15
Element Separation (mm)	2.08	3.30	3.30	2.08	2.08	3.30	0.31	0.36

# DR26

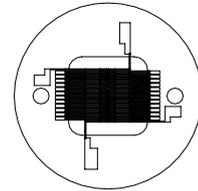
## Thin Film Based Thermopile Detector

**Features:** A two-channel thin-film thermopile that offers low noise in a TO-5 package. Each small active area is 2mm x 0.6mm. This is our lowest noise-voltage two-channel detector.

**Options:** See [Standard Windows and Filters](#) for list of optical filter options. See [Thermopile Configuration Table](#) for more options.

**Applications:** Security, intrusion detection and human presence monitoring, including identifying direction of travel. Other potential applications include non-contact temperature measurement.

**Benefits:** Two-channel output and low noise with small active area size and no internal aperture.



Detector circuit overlay



DR26

## Technical Specifications

Specifications apply at 23°C with KBr Window and Argon encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size	2 x .6			AA	mm	Hot junction size, per element.
Element Area	1.2			A	mm <sup>2</sup>	
Number of Junctions	26					Per element.
Number of Channels	2					Per detector package.
Output Voltage	45	54	62	V <sub>s</sub>	μV	DC, H=330μW/cm <sup>2</sup> (3)
Signal-to-Noise Ratio	4,206	5,684	7,209	SNR	√Hz	DC, SNR=V <sub>s</sub> /V <sub>n</sub>
Responsivity	11.4	13.6	15.7	R	V/W	DC, R=V <sub>s</sub> /HA (2)
Resistance	4.5	5.5	7.0	R	kΩ	Detector element
Temperature Coefficient of R		-36			%/°C	Best linear fit, 0° to 85°C (1)
Temperature Coefficient of V <sub>s</sub>		-2			%/°C	Best fit, 0° to 85°C (1)
Noise Voltage	8.6	9.5	10.7	V <sub>n</sub>	nV/√Hz	V <sub>n</sub> <sup>2</sup> =4kTR
Noise Equivalent Power	.55	.71	.94	NEP	nW/√Hz	DC, NEP= V <sub>n</sub> HA/V <sub>s</sub> (2)
Detectivity	1.2	1.6	2.0	D*	10 <sup>8</sup> cm√Hz/W	DC, D*=V <sub>s</sub> /V <sub>n</sub> H√A (2)
Time Constant		38		T	ms	Chopped, -3dB point (1)
Field of View	NA			FOV	Degrees	Not Applicable
Package Type	TO-5					Standard package hole size: ∅.150"
Element Matching		5	10	M	%	M= V <sub>A</sub> -V <sub>B</sub>  /V <sub>B</sub> (2)
Element Separation		1.10			mm	Center to Center
Operating Temperature	-50		100	T <sub>a</sub>	°C	

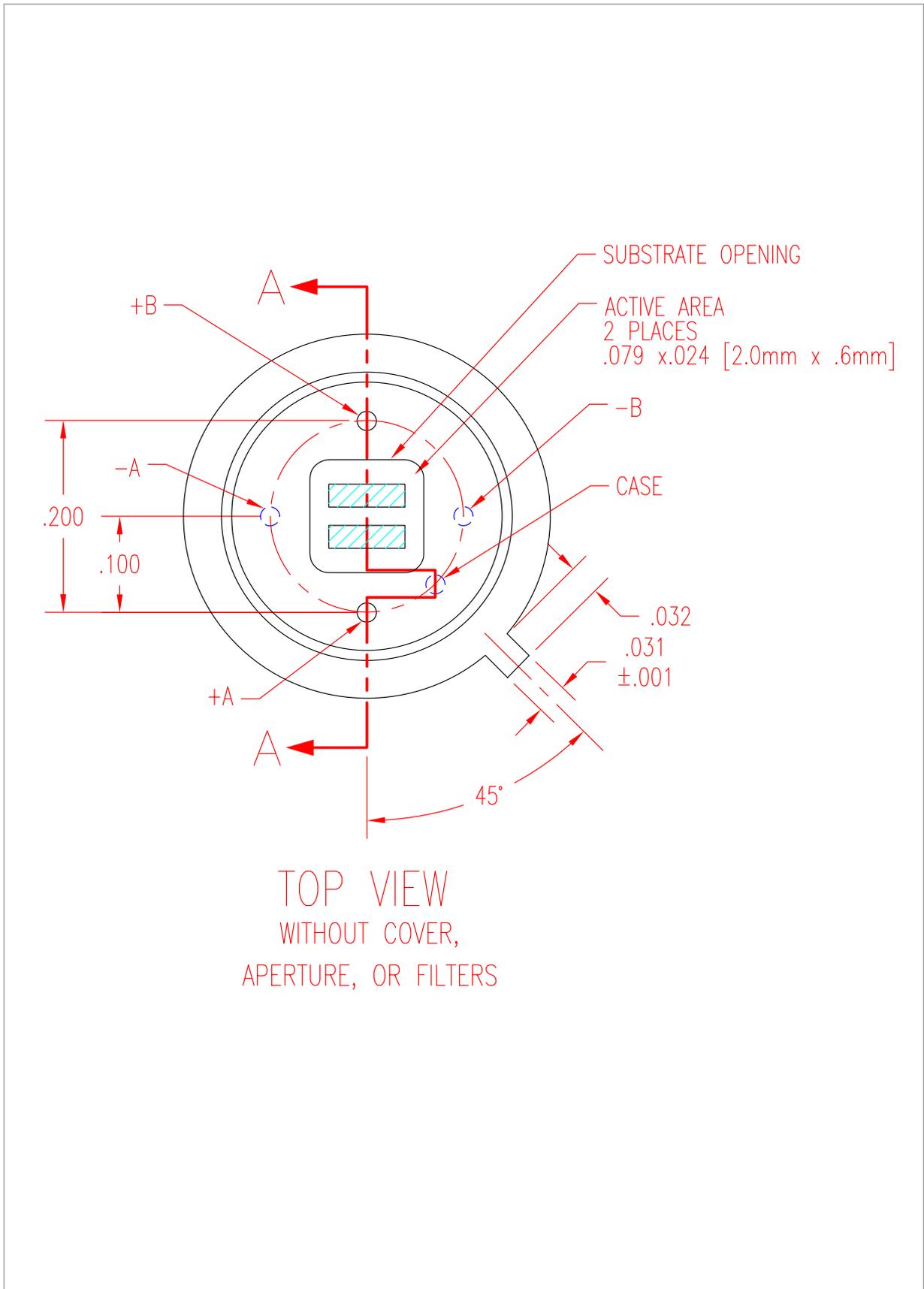
**General Specifications:** Flat spectral response from 100nm to > 100μm. Linear signal output from 10<sup>-6</sup> to 0.1W/cm<sup>2</sup>. Maximum incident radiance 0.1W/cm<sup>2</sup>, damage threshold ≥ .5W/cm<sup>2</sup>

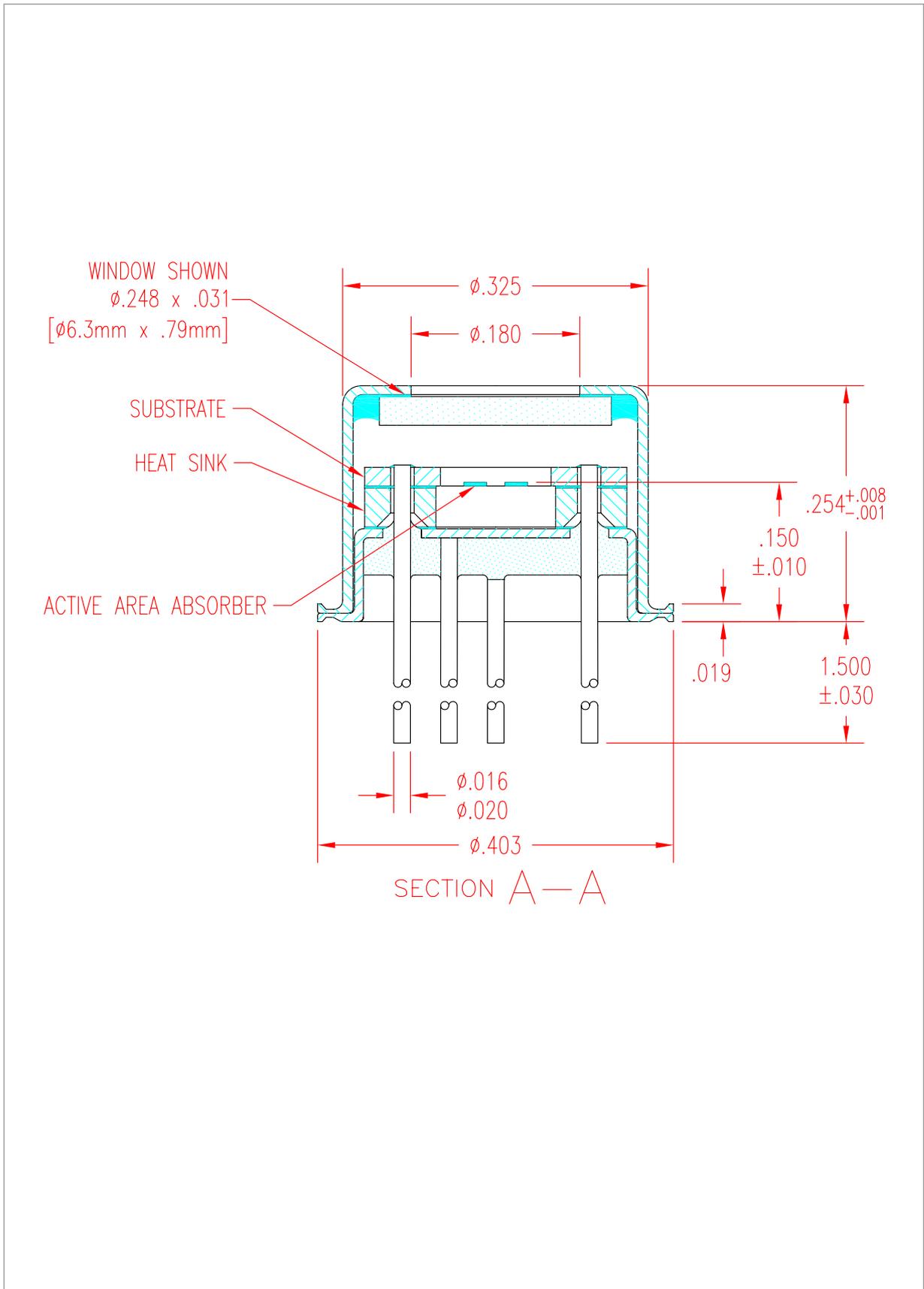
**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in cm<sup>2</sup>. (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

8509 Rev J

Update: 2/5/07

Information subject to change without notice





# DR34

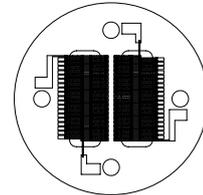
## Thin Film Based Thermopile Detector

**Features:** A two-channel or a one-channel compensated thin-film thermopile in a TO-5 package. Each active area is 3.16mm x 0.4mm and offers low noise output. Internal aperture minimizes channel-to-channel crosstalk and thus increasing sensitivity.

**Options:** See [Standard Windows and Filters](#) for list of optical filter options. See [Thermopile Configuration Table](#) for more options.

**Applications:** Gas analysis for automotive, environmental air quality including greenhouses, industrial and medical monitoring including infant incubators.

**Benefit:** Low noise and dual channel in a TO-5 package with moderate output.



Detector circuit overlay



DR34

## Technical Specifications

Specifications apply at 23°C with KBr Window and Argon encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size	3.16 x .4			AA	mm	Hot junction size, per element.
Element Area	1.264			A	mm <sup>2</sup>	
Number of Junctions	40					Per element.
Number of Channels	2					Per detector package.
Output Voltage	90	115	130	V <sub>s</sub>	μV	DC, H=330μW/cm <sup>2</sup> (3)
Signal-to-Noise Ratio	6,429	10,088	16,049	SNR	√Hz	DC, SNR=V <sub>s</sub> /V <sub>n</sub>
Responsivity	21.6	27.6	31.2	ℳ	V/W	DC, ℳ=V <sub>s</sub> /HA (2)
Resistance	4.0	8.0	12	R	kΩ	Detector element
Temperature Coefficient of ℳ	-36				%/°C	Best linear fit, 0° to 85°C (1)
Temperature Coefficient of R	-2				%/°C	Best fit, 0° to 85°C (1)
Noise Voltage	8.1	11.4	14.0	V <sub>n</sub>	nV/√Hz	V <sub>n</sub> <sup>2</sup> =4kTR
Noise Equivalent Power	.26	.42	.65	NEP	nW/√Hz	DC, NEP= V <sub>n</sub> HA/V <sub>s</sub> (2)
Detectivity	1.7	2.7	4.3	D*	10 <sup>8</sup> cm√Hz/W	DC, D*=V <sub>s</sub> /V <sub>n</sub> H√A (2)
Time Constant	38			T	ms	Chopped, -3dB point (1)
Field of View	NA			FOV	Degrees	Not Applicable
Package Type	TO-5 with 5 Pins					Standard package hole size: ∅.180"
Element Matching	5		10	ℳ	%	ℳ = V <sub>A</sub> -V <sub>B</sub>  /V <sub>B</sub> (2)
Element Separation	1.8				mm	Center to Center
Operating Temperature	-50		100	T <sub>a</sub>	°C	

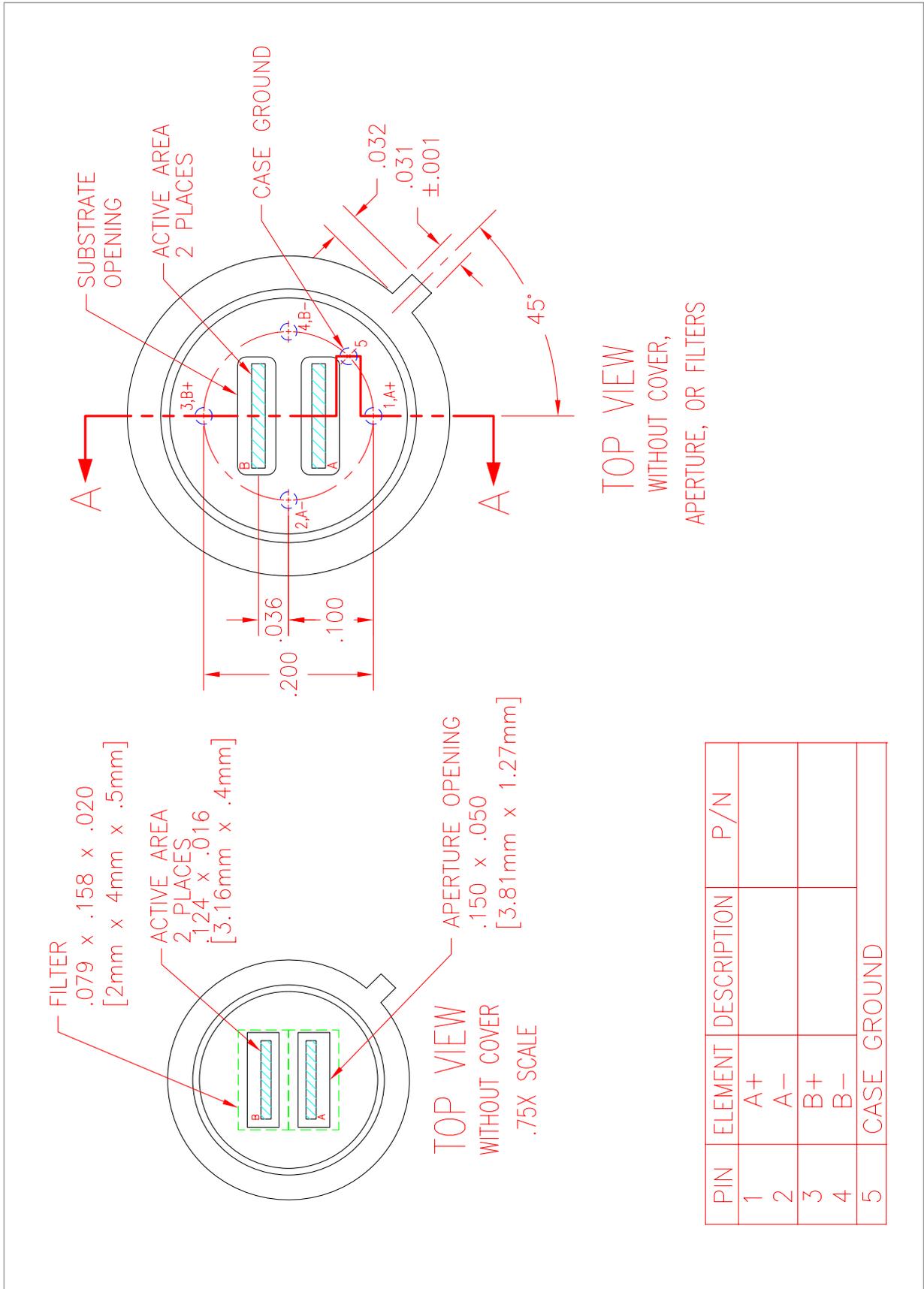
**General Specifications:** Flat spectral response from 100nm to > 100μm. Linear signal output from 10<sup>-8</sup> to 0.1W/cm<sup>2</sup>. Maximum incident radiance 0.1W/cm<sup>2</sup>, damage threshold ≥ .5W/cm<sup>2</sup>

**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in cm<sup>2</sup>. (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

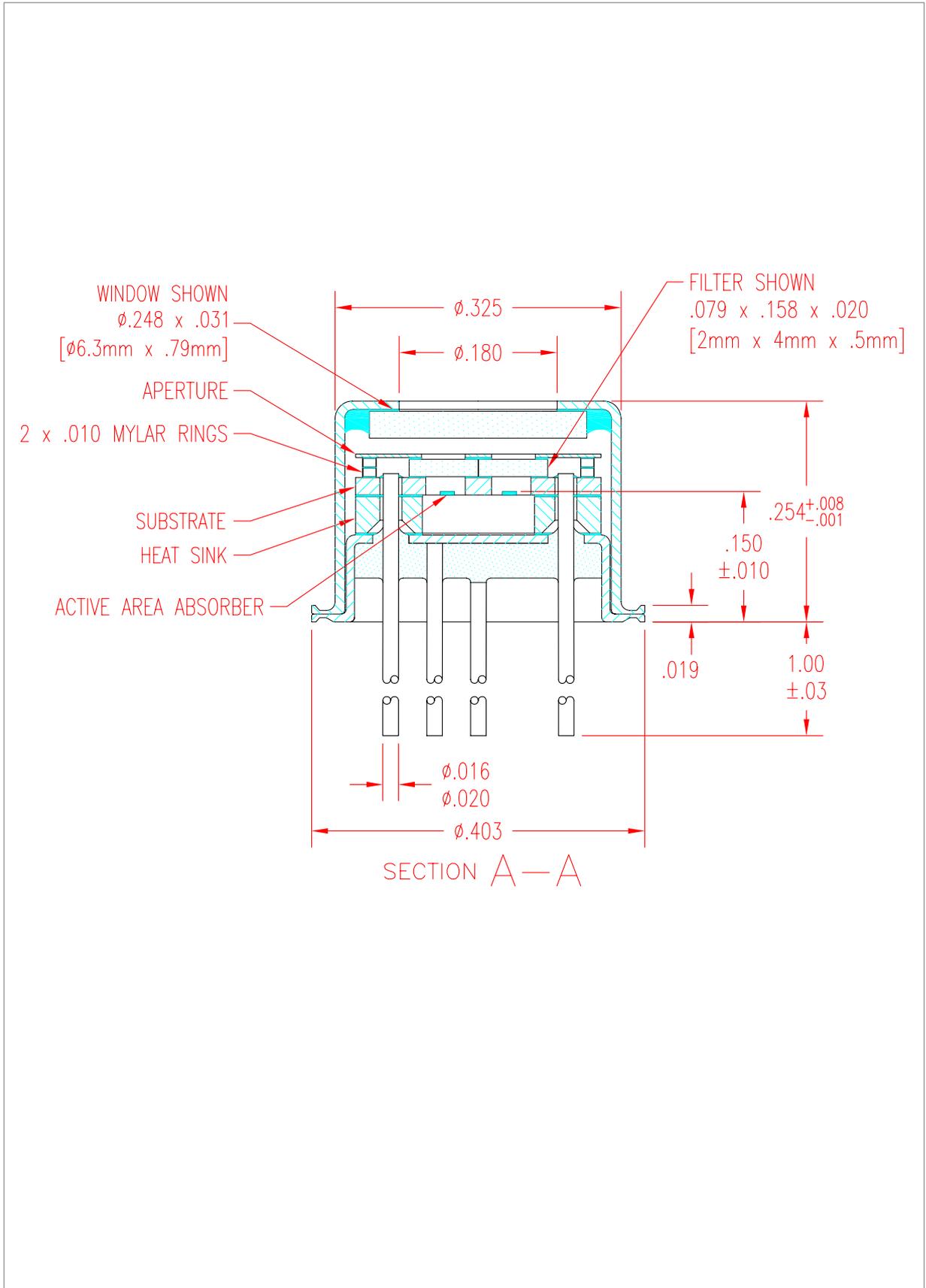
8510 Rev H

Update: 6/16/05

Information subject to change without notice



PIN	ELEMENT	DESCRIPTION	P/N
1	A+		
2	A-		
3	B+		
4	B-		
5	CASE GROUND		



# DR46

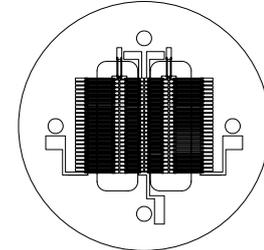
## Thin Film Based Thermopile Detector

**Features:** A two-channel or a one-channel compensated thin-film thermopile in a TO-8 package. Each active area is 4mm x 0.6mm. Offers high output with excellent signal-to-noise ratio. An internal aperture minimizes channel-to-channel crosstalk increasing sensitivity.

**Options:** See [Standard Windows and Filters](#) for list of optical filter options. See [Thermopile Configuration Table](#) for more options.

**Applications:** Gas analysis, non-contact temperature measurement, fire detection / suppression.

**Benefit:** High output, low noise and dual channel in a TO-8 package size.



Detector circuit overlay



DR46

## Technical Specifications

Specifications apply at 23°C with KBr Window and Argon encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size	4 x .6			AA	mm	Hot junction size, per element.
Element Area	2.4			A	mm <sup>2</sup>	
Number of Junctions	50					Per element.
Number of Channels	2					Per detector package.
Output Voltage	170	210	250	V <sub>s</sub>	μV	DC, H=330μW/cm <sup>2</sup> (3)
Signal-to-Noise Ratio	10,828	16,406	23,364	SNR	√Hz	DC, SNR=V <sub>s</sub> /V <sub>n</sub>
Responsivity	21.5	26.5	31.6	$\mathcal{R}$	V/W	DC, $\mathcal{R}=V_s/HA$ (2)
Resistance	7	10	15	R	kΩ	Detector element
Temperature Coefficient of $\mathcal{R}$		-36			%/°C	Best linear fit, 0° to 85°C (1)
Temperature Coefficient of R		-2			%/°C	Best fit, 0° to 85°C (1)
Noise Voltage	10.7	12.8	15.7	V <sub>n</sub>	nV/√Hz	V <sub>n</sub> <sup>2</sup> =4kTR
Noise Equivalent Power	.34	.48	.73	NEP	nW/√Hz	DC, NEP= V <sub>n</sub> HA/V <sub>s</sub> (2)
Detectivity	2.1	3.2	4.6	D*	10 <sup>8</sup> cm√Hz/W	DC, D*=V <sub>s</sub> /V <sub>n</sub> H√A (2)
Time Constant		40		$\mathcal{T}$	ms	Chopped, -3dB point (1)
Field of View	NA			FOV	Degrees	Not Applicable
Package Type	TO-8 with 5 Pins					Standard package hole size: ∅.437"
Element Matching		5	10	$\mathcal{M}$	%	$\mathcal{M} =  V_A - V_B /V_B$ (2)
Element Separation		2.0			mm	Center to Center
Operating Temperature	-50		100	T <sub>a</sub>	°C	

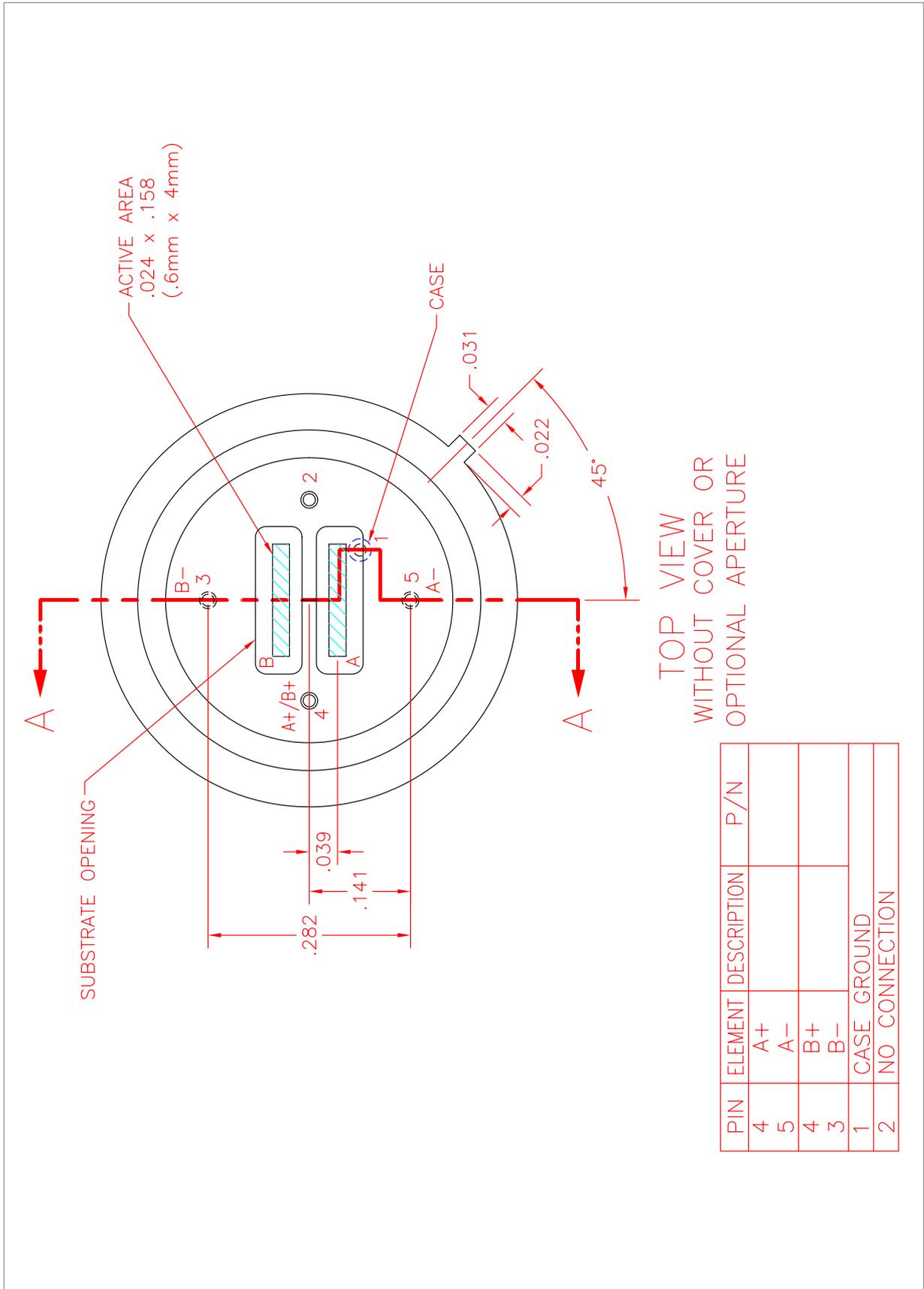
**General Specifications:** Flat spectral response from 100nm to > 100μm. Linear signal output from 10<sup>-6</sup> to 0.1W/cm<sup>2</sup>. Maximum incident radiance 0.1W/cm<sup>2</sup>, damage threshold ≥ .5W/cm<sup>2</sup>

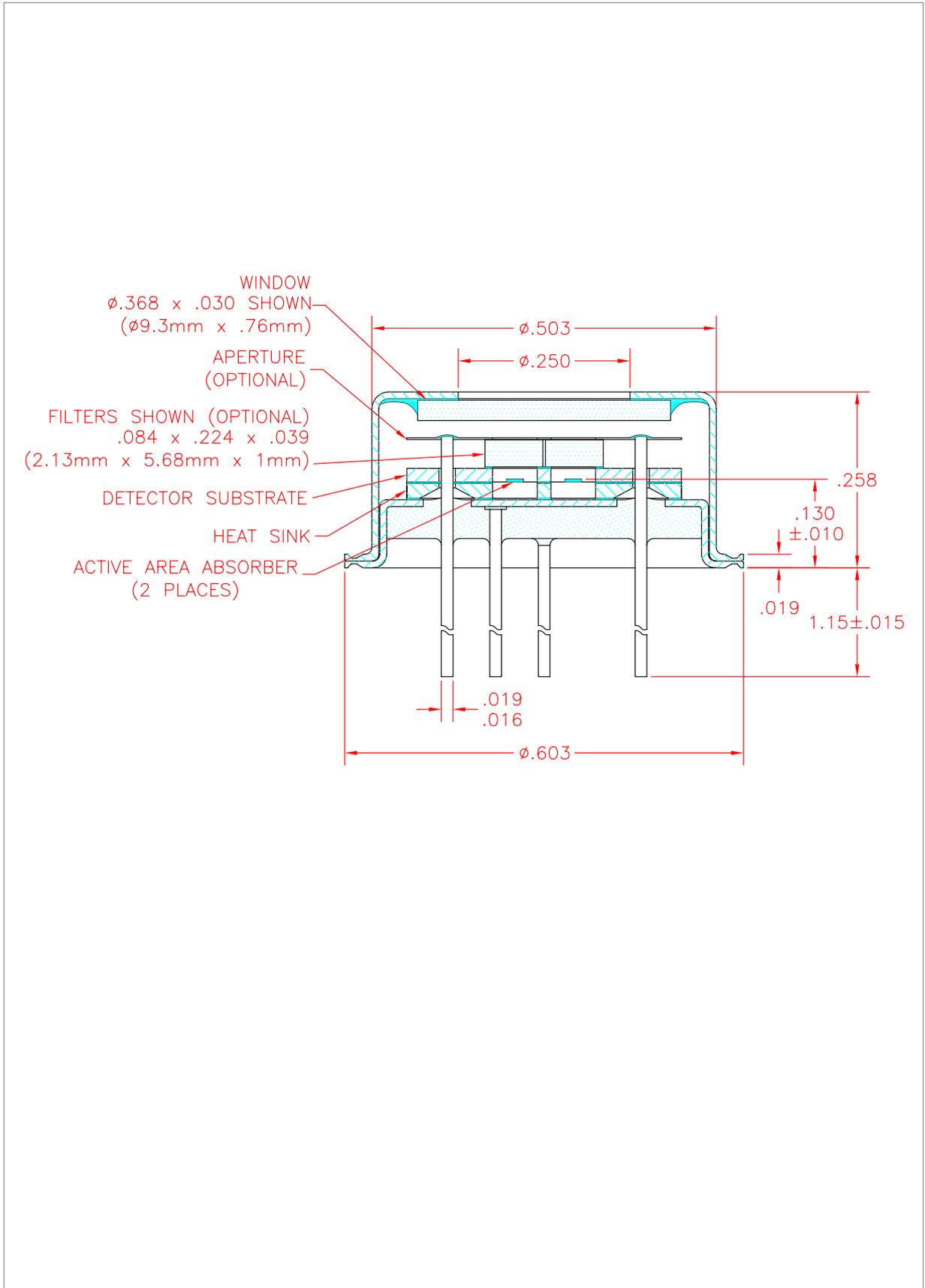
**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in cm<sup>2</sup>. (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

8512 Rev k

Update: 11/14/06

Information subject to change without notice





# TM34

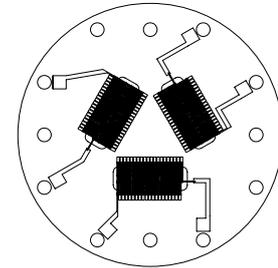
## Thin Film Based Thermopile Detector

**Features:** A three-channel thin-film thermopile in a TO-8 package. Each symmetrically positioned active area is 3.16mm x 0.4mm. Offers low noise output and internal aperture minimizing channel-to-channel crosstalk while increasing sensitivity.

**Options:** 1) See [Standard Windows and Filters](#) for list of optical filter options. 2) Internal 30kΩ 5% NTC chip thermistor provides ambient package temperature measurement. See [Thermistor Options](#) p/n: MT04. See [Thermopile Configuration Table](#) for more options.

**Applications:** Gas analysis for automotive, environmental air quality, industrial sensors and medical monitoring.

**Benefit:** Low noise and 3-channels in a TO-8 package with moderate output.



Detector circuit overlay

## Technical Specifications

TM34

Specifications apply at 23°C with KBr Window and Argon encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size	3.16 x .4			AA	mm	Hot junction size, per element.
Element Area	1.264			A	mm <sup>2</sup>	
Number of Junctions	40					Per element.
Number of Channels	1					Per detector package.
Output Voltage	90	115	130	V <sub>s</sub>	μV	DC, H=330μW/cm <sup>2</sup> (3)
Signal-to-Noise Ratio	6,429	10,088	16,049	SNR	√Hz	DC, SNR=V <sub>s</sub> /V <sub>n</sub>
Responsivity	21.6	27.6	31.2	ℳ	V/W	DC, ℳ=V <sub>s</sub> /HA (2)
Resistance	4.0	8.0	12.0	R	kΩ	Detector element
Temperature Coefficient of ℳ		-36			%/°C	Best linear fit, 0° to 85°C (1)
Temperature Coefficient of R		-2			%/°C	Best fit, 0° to 85°C (1)
Noise Voltage	8.1	11.4	14.0	V <sub>n</sub>	nV/√Hz	V <sub>n</sub> <sup>2</sup> =4kTR
Noise Equivalent Power	.26	.42	.65	NEP	nW/√Hz	DC, NEP= V <sub>n</sub> HA/V <sub>s</sub> (2)
Detectivity	1.7	2.7	4.3	D*	10 <sup>6</sup> cm√Hz/W	DC, D*=V <sub>s</sub> /V <sub>n</sub> H√A (2)
Time Constant		38		T	ms	Chopped, -3dB point (1)
Field of View	NA			FOV	Degrees	Not Applicable
Package Type	TO-8 with 3 Pins					Standard package hole size: ∅.150"
Operating Temperature	-50		100	T <sub>a</sub>	°C	

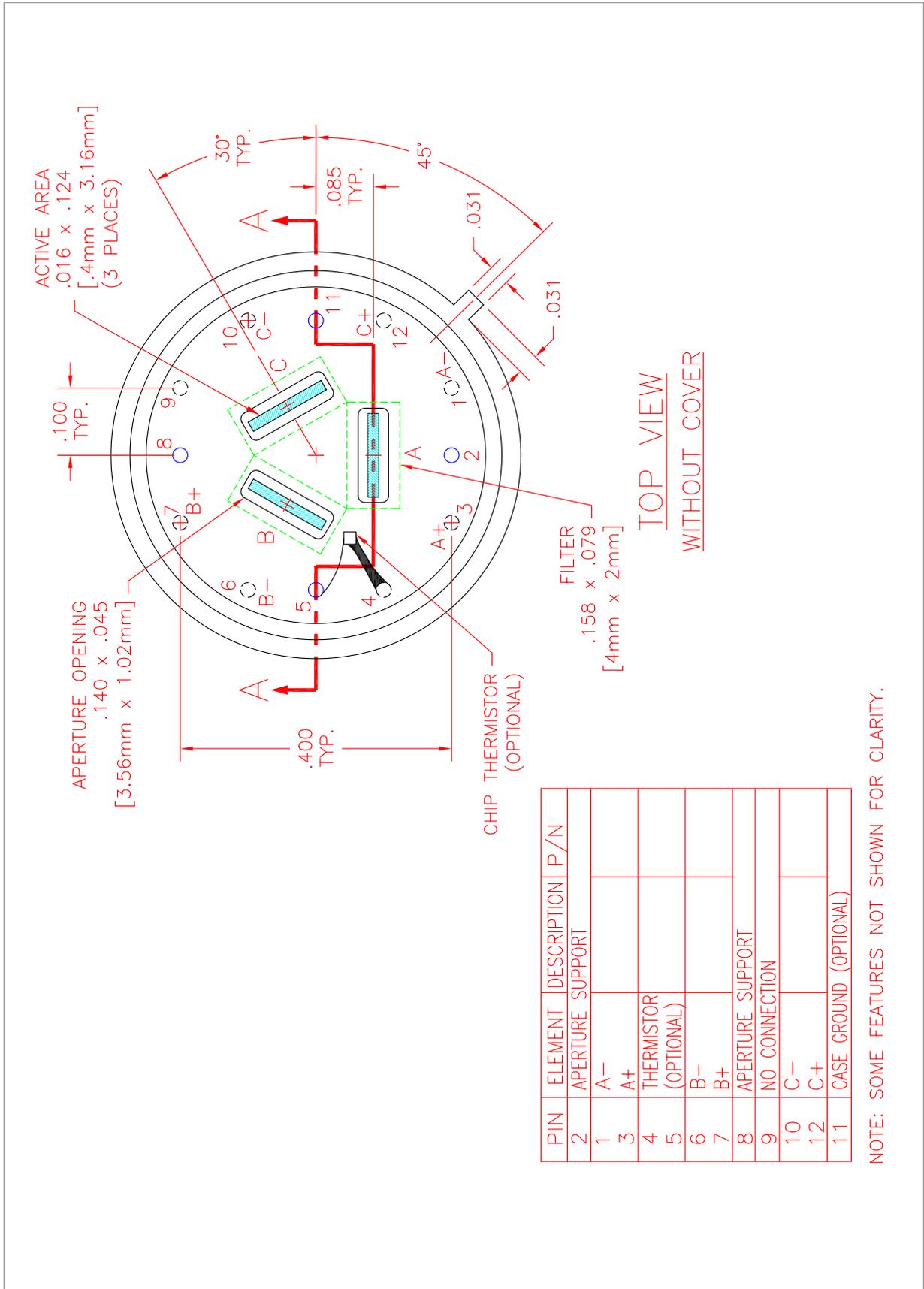
**General Specifications:** Flat spectral response from 100nm to > 100μm. Linear signal output from 10<sup>-6</sup> to 0.1W/cm<sup>2</sup>. Maximum incident radiance 0.1W/cm<sup>2</sup>, damage threshold ≥ .5W/cm<sup>2</sup>

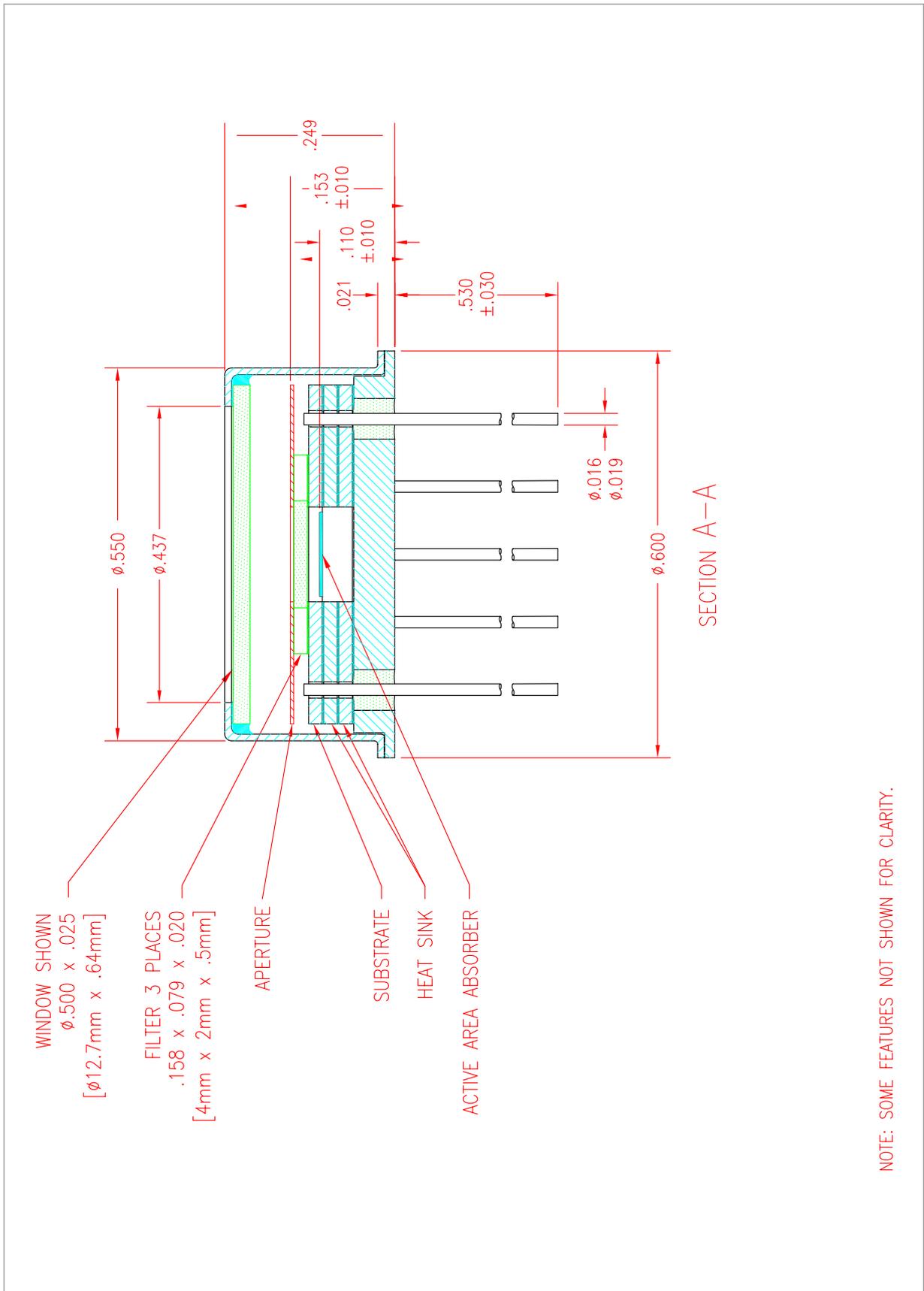
**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in cm<sup>2</sup>. (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

8577 Rev D

Update: 6/22/05

Information subject to change without notice





NOTE: SOME FEATURES NOT SHOWN FOR CLARITY.

## 2M Quad

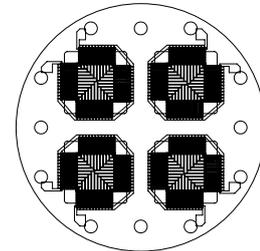
### Thin Film Based Thermopile Detector

**Features:** A four-channel thin-film thermopile in a TO-8 package. Each active area is 2mm x 2mm. offers the world's highest 4-channel sensitivity with exceptional signal-to-noise performance in a TO-8 package. Internal aperture minimizes channel-to-channel crosstalk while increasing sensitivity.

**Options:** **1)** See [Standard Windows and Filters](#) for list of optical filter options. **2)** Order this unit back-filled with Xenon and this becomes a super-high output detector with very low noise. **3)** Internal 30kΩ 5% NTC chip thermistor provides ambient package temperature measurement. See [Thermistor Options](#) p/n: MT04. See [Thermopile Configuration Table](#) for more options.

**Applications:** Gas analysis for automotive, environmental air quality, industrial sensors and medical monitoring.

**Benefit:** Extremely high output with the best signal-to-noise performance with a time constant of 85ms when encapsulated in Argon gas.



Detector circuit overlay



2M Quad

### Technical Specifications

Specifications apply at 23°C with KBr Window and Argon encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size	2 x 2			AA	mm	Hot junction size, per element.
Element Area	4			A	mm <sup>2</sup>	
Number of Junctions	48					Per element.
Number of Channels	4					Per detector package.
Output Voltage	200	250	300	V <sub>s</sub>	μV	DC, H=330μW/cm <sup>2</sup> (3)
Signal-to-Noise Ratio	12,739	19,531	30,303	SNR	√Hz	DC, SNR=V <sub>s</sub> /V <sub>n</sub>
Responsivity	15.2	18.9	22.7	R	V/W	DC, R=V <sub>s</sub> /HA (2)
Resistance	5	10	15	R	kΩ	Detector element
Temperature Coefficient of R		-36			%/°C	Best linear fit, 0° to 85°C (1)
Temperature Coefficient of R		-2			%/°C	Best fit, 0° to 85°C (1)
Noise Voltage	9.9	12.8	15.7	V <sub>n</sub>	nV/√Hz	V <sub>n</sub> <sup>2</sup> =4kTR
Noise Equivalent Power	.44	.68	1.03	NEP	nW/√Hz	DC, NEP= V <sub>n</sub> HA/V <sub>s</sub> (2)
Detectivity	1.9	3.0	4.6	D*	10 <sup>8</sup> cm <sup>2</sup> /Hz/W	DC, D*=V <sub>s</sub> /V <sub>n</sub> H√A (2)
Time Constant		85		T	ms	Chopped, -3dB point (1)
Field of View	NA			FOV	Degrees	Not Applicable
Package Type	TO-8 with 12 Pins					Standard package hole size: ∅.437"
Element Matching		5	10	M	%	M = V <sub>A</sub> -V <sub>B</sub>  /V <sub>B</sub> (2)
Element Separation		4.57			mm	Center to Center
Operating Temperature	-50		100	T <sub>a</sub>	°C	

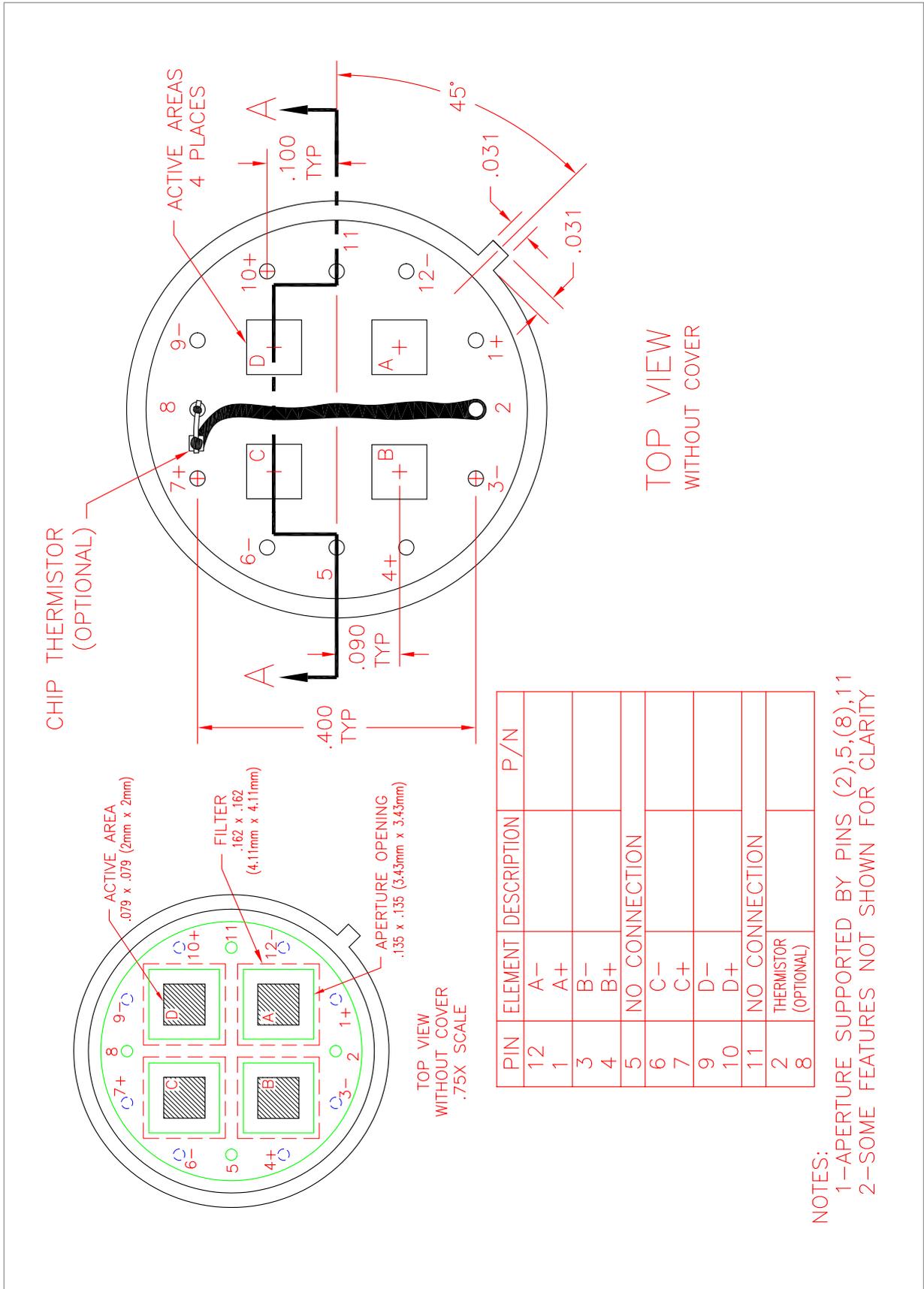
**General Specifications:** Flat spectral response from 100nm to > 100μm. Linear signal output from 10<sup>-6</sup> to 0.1W/cm<sup>2</sup>. Maximum incident radiance 0.1W/cm<sup>2</sup>, damage threshold ≥ .5W/cm<sup>2</sup>

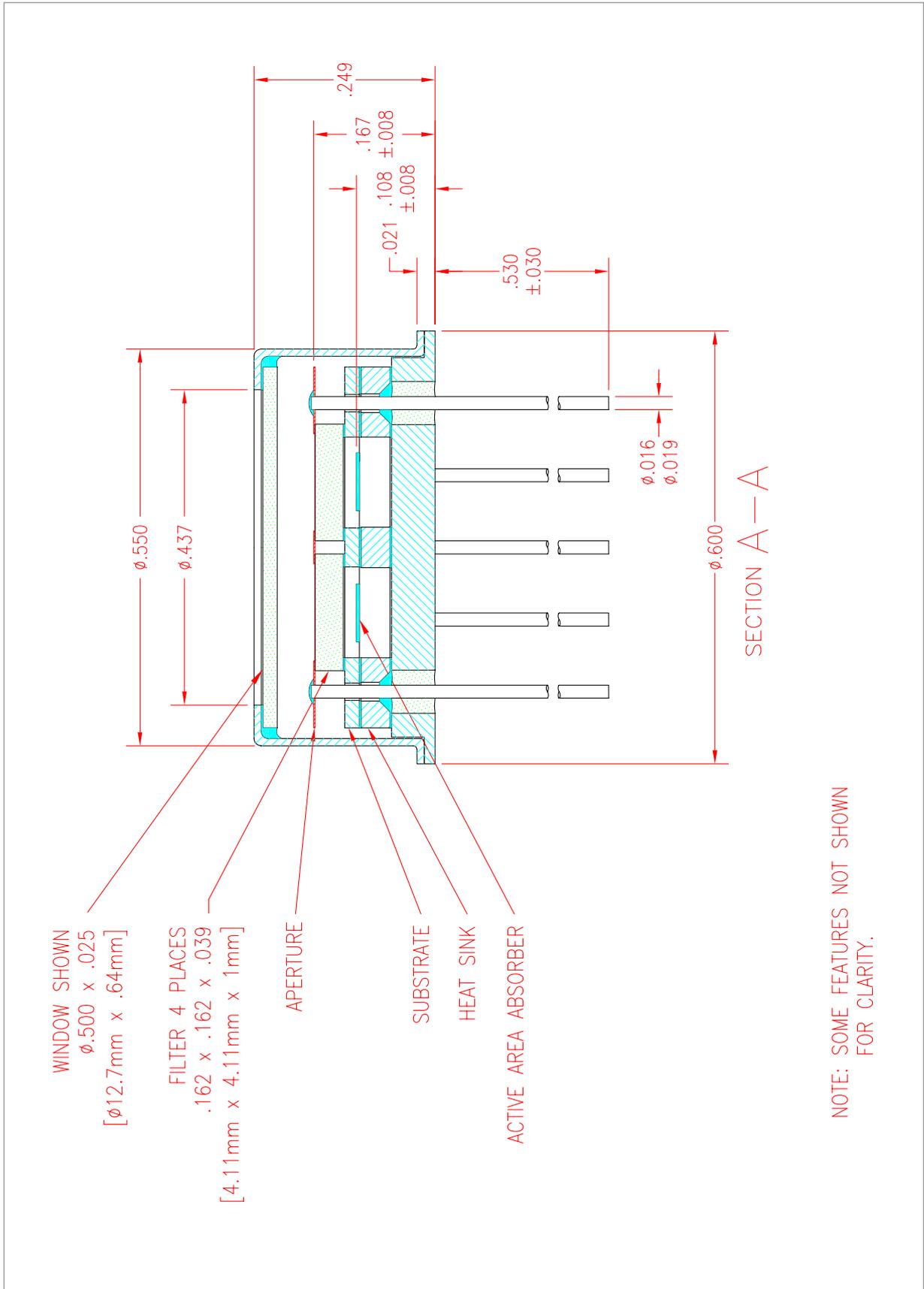
**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in cm<sup>2</sup>. (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

8513 Rev J

Update: 6/22/05

Information subject to change without notice





# 10 Channel

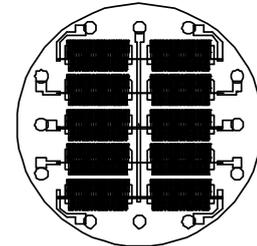
## Thin Film Based Thermopile Detector

**Features:** A ten-channel thin-film thermopile in a TO-8 package. Each active area is 3.16mm x 0.4mm and offers low noise voltage. Internal aperture minimizes channel-to-channel crosstalk while increasing sensitivity.

**Options:** 1) See [Standard Windows and Filters](#) for list of optical filter options. 2) Internal 30k $\Omega$  5% NTC chip thermistor provides ambient package temperature measurement. See [Thermistor Options](#) p/n: MT04. See [Thermopile Configuration Table](#) for more options.

**Applications:** The perfect single package choice for analyzing multiple anesthetic gases in demanding environments such as hospital operating rooms. Potential applications in non-contact temperature and spectral discrimination of materials.

**Benefit:** Ten-channel spectral differentiation for demanding applications.



Detector circuit overlay



10 Channel

## Technical Specifications

Specifications apply at 23°C with KBr Window and Argon encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size	3.16 x .4			AA	mm	Hot junction size, per element.
Element Area	1.264			A	mm <sup>2</sup>	
Number of Junctions	40					Per element.
Number of Channels	10					Per detector package.
Output Voltage	90	115	130	V <sub>s</sub>	μV	DC, H=330μW/cm <sup>2</sup> (3)
Signal-to-Noise Ratio	6,429	10,088	16,049	SNR	v/Hz	DC, SNR=V <sub>s</sub> /V <sub>n</sub>
Responsivity	21.6	27.6	31.2	R	V/W	DC, R=V <sub>s</sub> /HA (2)
Resistance	4.0	8.0	12	R	k $\Omega$	Detector element
Temperature Coefficient of R		-36			%/°C	Best linear fit, 0° to 85°C (1)
Temperature Coefficient of R		-.2			%/°C	Best fit, 0° to 85°C (1)
Noise Voltage	8.1	11.4	14.0	V <sub>n</sub>	nV/√Hz	V <sub>n</sub> <sup>2</sup> =4kTR
Noise Equivalent Power	.26	.42	.65	NEP	nW/√Hz	DC, NEP= V <sub>n</sub> HA/V <sub>s</sub> (2)
Detectivity	1.7	2.7	4.3	D*	10 <sup>8</sup> cm <sup>2</sup> /Hz/W	DC, D*=V <sub>s</sub> /V <sub>n</sub> H/A (2)
Time Constant		38		T	ms	Chopped, -3dB point (1)
Field of View	NA			FOV	Degrees	Not Applicable
Package Type	TO-8 with 12 Pins					Standard package hole size: ? .437"
Element Matching		10	20	M	%	M= V <sub>A</sub> -V <sub>B</sub>  /V <sub>B</sub> (2)
Element Separation		1.8 & 4.28			mm	Center to Center
Operating Temperature	-50		100	T <sub>a</sub>	°C	

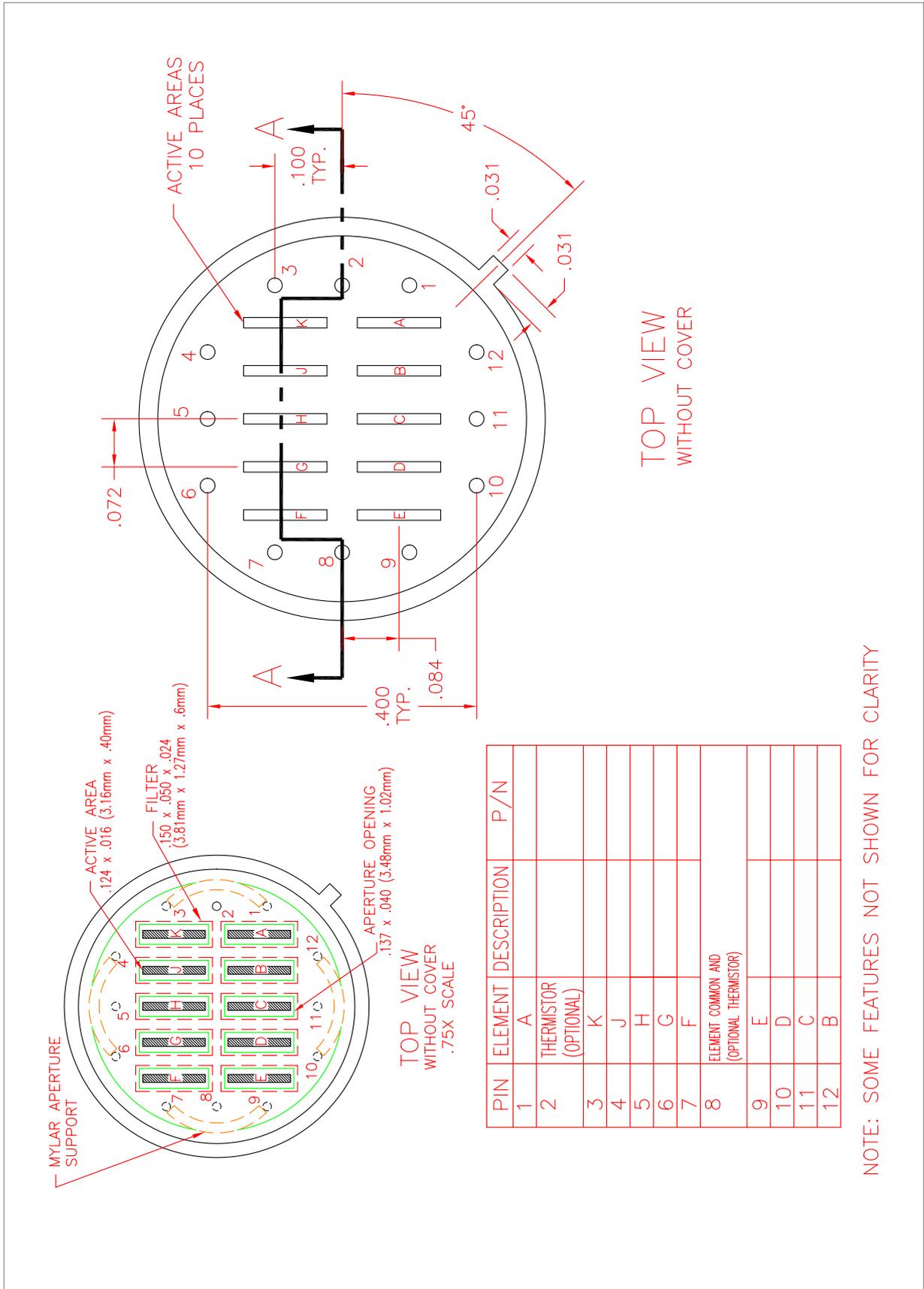
**General Specifications:** Flat spectral response from 100nm to > 100μm. Linear signal output from 10<sup>-6</sup> to 0.1W/cm<sup>2</sup>. Maximum incident radiance 0.1W/cm<sup>2</sup>, damage threshold = .5W/cm<sup>2</sup>

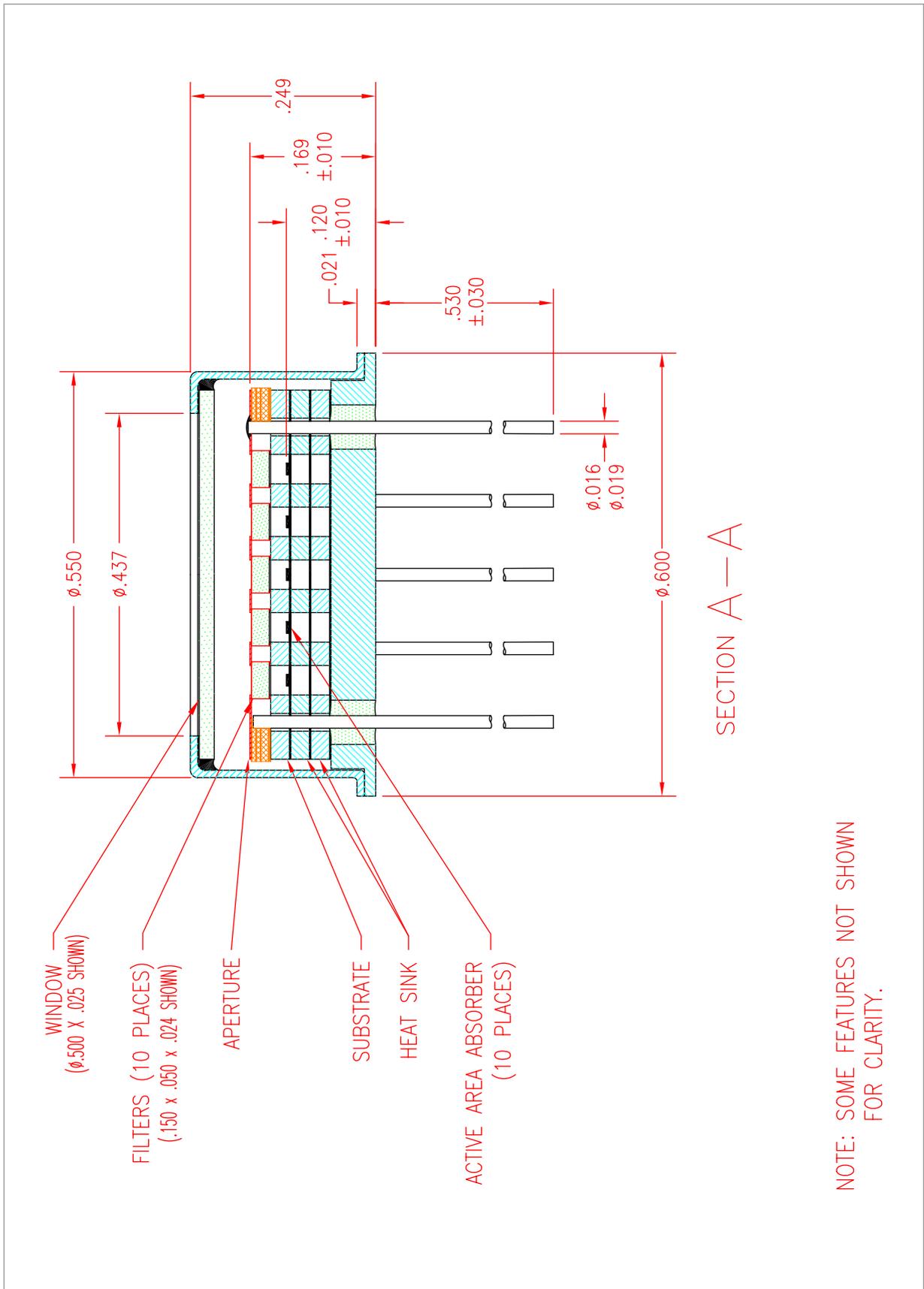
**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in cm<sup>2</sup>. (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

8514 Rev k.doc

Update: 2/9/06

Information subject to change without notice





NOTE: SOME FEATURES NOT SHOWN  
FOR CLARITY.

# T34 Compensated

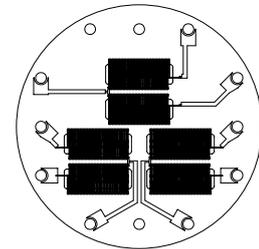
## Thin Film Based Thermopile Detector

**Features:** A three-channel compensated (6 element) thin-film thermopile in a TO-8 package. Each active area is 3.16mm x 0.4mm. Offers thermal compensation to minimize effect of sudden ambient temperature change. Internal aperture minimizes channel-to-channel crosstalk while increasing sensitivity.

**Options:** 1) See [Standard Windows and Filters](#) for list of optical filter options. 2) Internal 30kΩ 5% NTC chip thermistor provides ambient package temperature measurement. See [Thermistor Options](#) p/n: MT04. See [Thermopile Configuration Table](#) for more options.

**Applications:** Gas analysis for automotive, environmental air quality, industrial and medical monitoring.

**Benefit:** 3-channels in a TO-8 package with moderate output.



Detector circuit overlay



T34

## Technical Specifications

Specifications apply at 23°C with KBr Window and Argon encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size	3.16 x .4			AA	mm	Hot junction size, per element.
Element Area	1.264			A	mm <sup>2</sup>	
Number of Junctions	40					Per element.
Number of Channels	3 Compensated					Per detector package.
Output Voltage	90	115	130	V <sub>s</sub>	μV	DC, H=330μW/cm <sup>2</sup> (3)
Signal-to-Noise Ratio	4,545	7,099	11,404	SNR	√Hz	DC, SNR=V <sub>s</sub> /V <sub>n</sub>
Responsivity	21.6	27.6	31.2	ℳ	V/W	DC, ℳ=V <sub>s</sub> /HA (2)
Resistance	8	16	24	R	kΩ	Detector element
Temperature Coefficient of ℳ		-36			%/°C	Best linear fit, 0° to 85°C (1)
Temperature Coefficient of R		-2			%/°C	Best fit, 0° to 85°C (1)
Noise Voltage	11.4	16.2	19.8	V <sub>n</sub>	nV/√Hz	V <sub>n</sub> <sup>2</sup> =4kTR
Noise Equivalent Power	.37	.59	.92	NEP	nW/√Hz	DC, NEP= V <sub>n</sub> HA/V <sub>s</sub> (2)
Detectivity	1.2	1.9	3.1	D*	10 <sup>8</sup> cm√Hz/W	DC, D*=V <sub>s</sub> /V <sub>n</sub> H√A (2)
Time Constant		38		T	ms	Chopped, -3dB point (1)
Field of View	NA			FOV	Degrees	Not Applicable
Package Type	TO-8 with 12 Pins					Standard package hole size: Ø.437"
Element Matching		5	10	ℳ	%	ℳ = V <sub>A</sub> -V <sub>B</sub>  /V <sub>B</sub> (2)
Element Separation		NA			mm	Center to Center
Operating Temperature	-50		100	T <sub>a</sub>	°C	

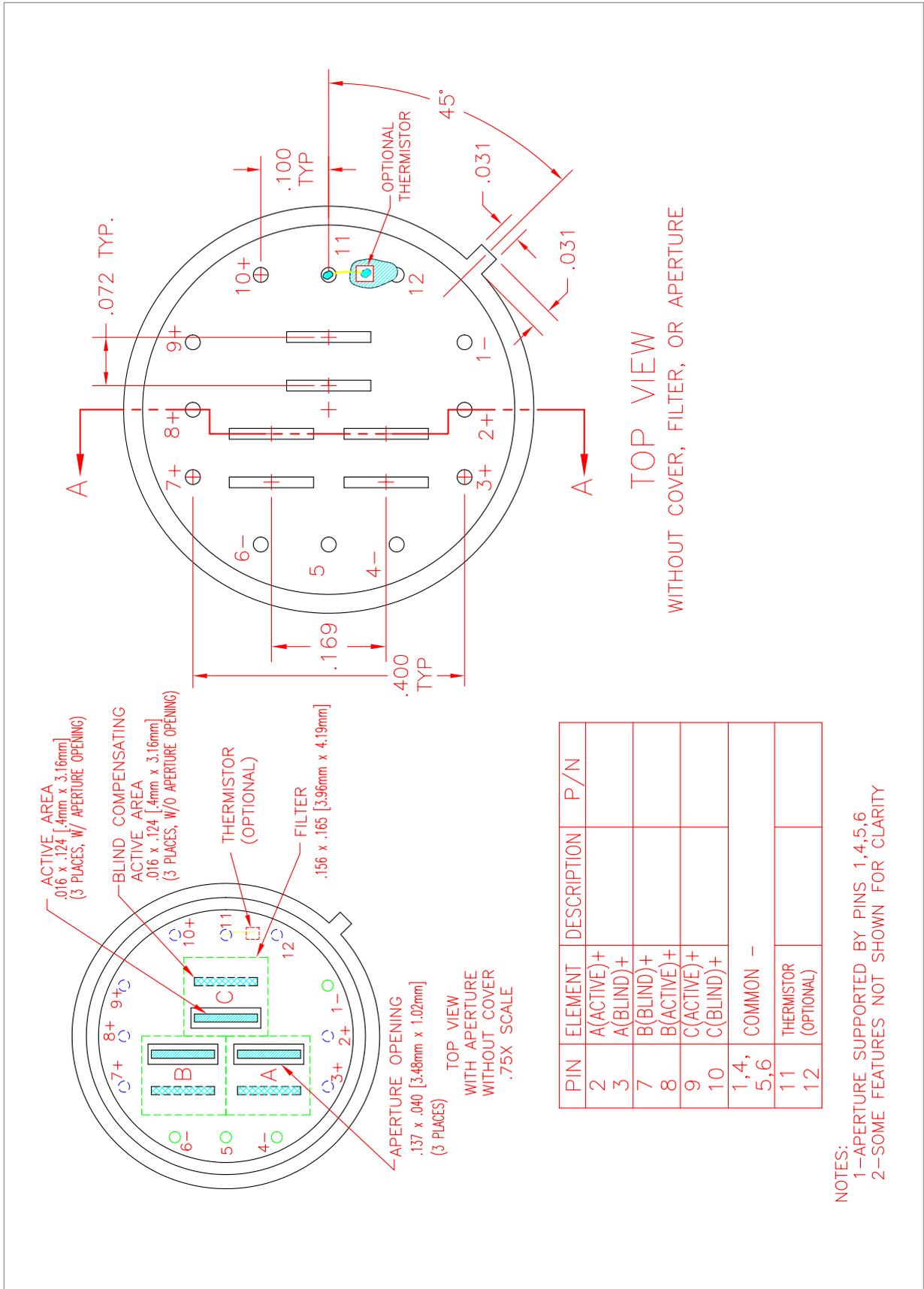
**General Specifications:** Flat spectral response from 100nm to > 100μm. Linear signal output from 10<sup>-6</sup> to 0.1W/cm<sup>2</sup>. Maximum incident radiance 0.1W/cm<sup>2</sup>, damage threshold ≥ .5W/cm<sup>2</sup>

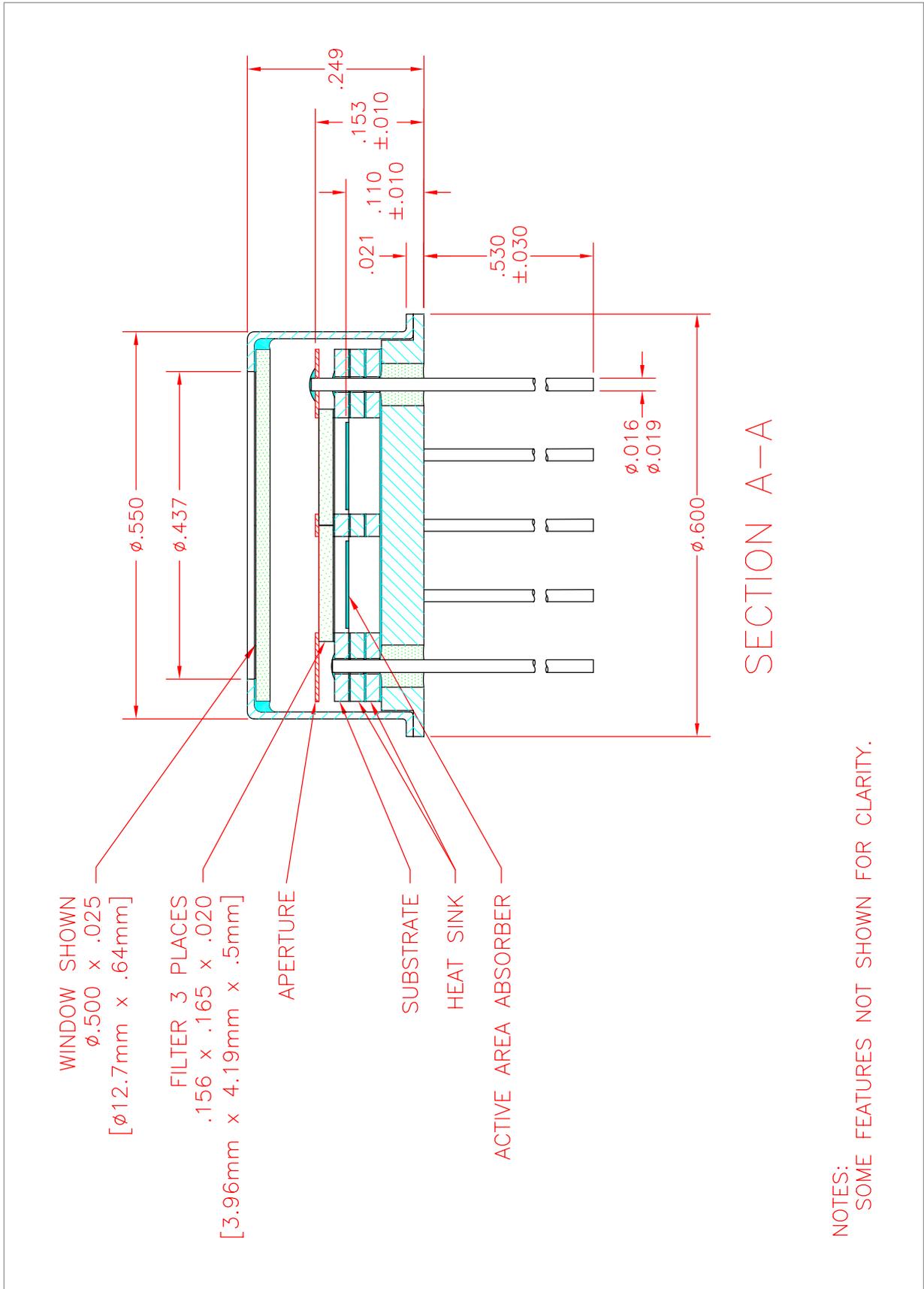
**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in cm<sup>2</sup>. (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

8511 Rev H

Update: 6/22/05

Information subject to change without notice

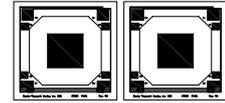




# ST60 DUAL & ST60R DUAL

## Silicon Based Thermopile Detector

**Features:** A two-channel silicon-based thermopile detector in a TO-5 package. Each small active area size is 0.61mm x 0.61mm. This is our lowest-cost and fastest time constant two-channel detector. It delivers a time constant of 18ms with Nitrogen encapsulation gas combined with a very low Temperature Coefficient of Responsivity of  $-0.04\%/^{\circ}\text{C}$ . This detector has a very short thermal shock response to ambient temperature change.



Detector circuit overlay

**Options:** 1) See [Standard Windows and Filters](#) for list of optical filter options. 2) **ST60R Dual** version offers a low-cost (20% tolerance) poly-silicon resistor to be used as a PTC thermistor. 3) Internal  $30\text{k}\Omega$  5% NTC chip thermistor provides ambient package temperature measurement. See [Thermistor Options](#) p/n: DC-4005. See [Thermopile Configuration Table](#) for more options.



ST60 Dual

**Applications:** Gas analysis in handheld gas monitors for automotive exhaust, industrial/environmental leak detection and air quality monitoring.

**Benefits:** Low cost and small active area size with medium output.

## Technical Specifications

Specifications apply at  $23^{\circ}\text{C}$  with KBr Window and Nitrogen encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size	.61 x .61			AA	mm	Hot junction size, per element.
Element Area	.37			A	$\text{mm}^2$	
Number of Junctions	80					Per element.
Number of Channels	2					Per detector package.
Output Voltage	50	62	74	$V_s$	$\mu\text{V}$	DC, $H=330\mu\text{W}/\text{cm}^2$ (3)
Signal-to-Noise Ratio	1,381	1,981	2,891	SNR	$\sqrt{\text{Hz}}$	DC, $\text{SNR}=V_s/V_n$
Responsivity	40.7	50.5	60.3	$\mathcal{R}$	V/W	DC, $\mathcal{R}=V_s/HA$ (2)
Resistance	40	60	80	R	$\text{k}\Omega$	Detector element
Temperature Coefficient of $\mathcal{R}$		-.04			$\%/^{\circ}\text{C}$	Best linear fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)
Temperature Coefficient of R		.11			$\%/^{\circ}\text{C}$	Best fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)
Noise Voltage	25.6	31.3	36.2	$V_n$	$\text{nV}/\sqrt{\text{Hz}}$	$V_n^2=4\text{kTR}$
Noise Equivalent Power	.42	.62	.89	NEP	$\text{nW}/\sqrt{\text{Hz}}$	DC, $\text{NEP}=V_n HA/V_s$ (2)
Detectivity	.69	.98	1.44	$D^*$	$10^8\text{cm}^2/\text{Hz}/\text{W}$	DC, $D^*=V_s/V_n H\sqrt{A}$ (2)
Time Constant		18		$\mathcal{T}$	ms	Chopped, -3dB point (1)
Field of View	$15^{\circ}/47^{\circ}$			FOV	Degrees	See Assembly Drawings for FOV Description.
Package Type	TO-5,					Standard package hole size: (2) .046" X .046" sq. holes
Element Matching		5	10	$\mathcal{M}$	%	$\mathcal{M}=(V_A-V_B)/V_B$ (2)
Element Separation		2.08			mm	Center to Center
Operating Temperature	-50		100	$T_a$	$^{\circ}\text{C}$	
<b>ST60R</b> Thermistor Option	~24	30	~36	$R_T$	$\text{k}\Omega$	PTC Poly-Silicon resistor on detector die.
<b>ST60R</b> Thermistor Temperature Coefficient of R	.107	.11	.113		$\%/^{\circ}\text{C}$	$\Delta R/(R\Delta T)$ , Best fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)

**General Specifications:** Flat spectral response from 100nm to  $> 100\mu\text{m}$ . Linear signal output from  $10^{-6}$  to  $0.1\text{W}/\text{cm}^2$ . Maximum incident radiance  $0.1\text{W}/\text{cm}^2$ , damage threshold  $\geq .5\text{W}/\text{cm}^2$

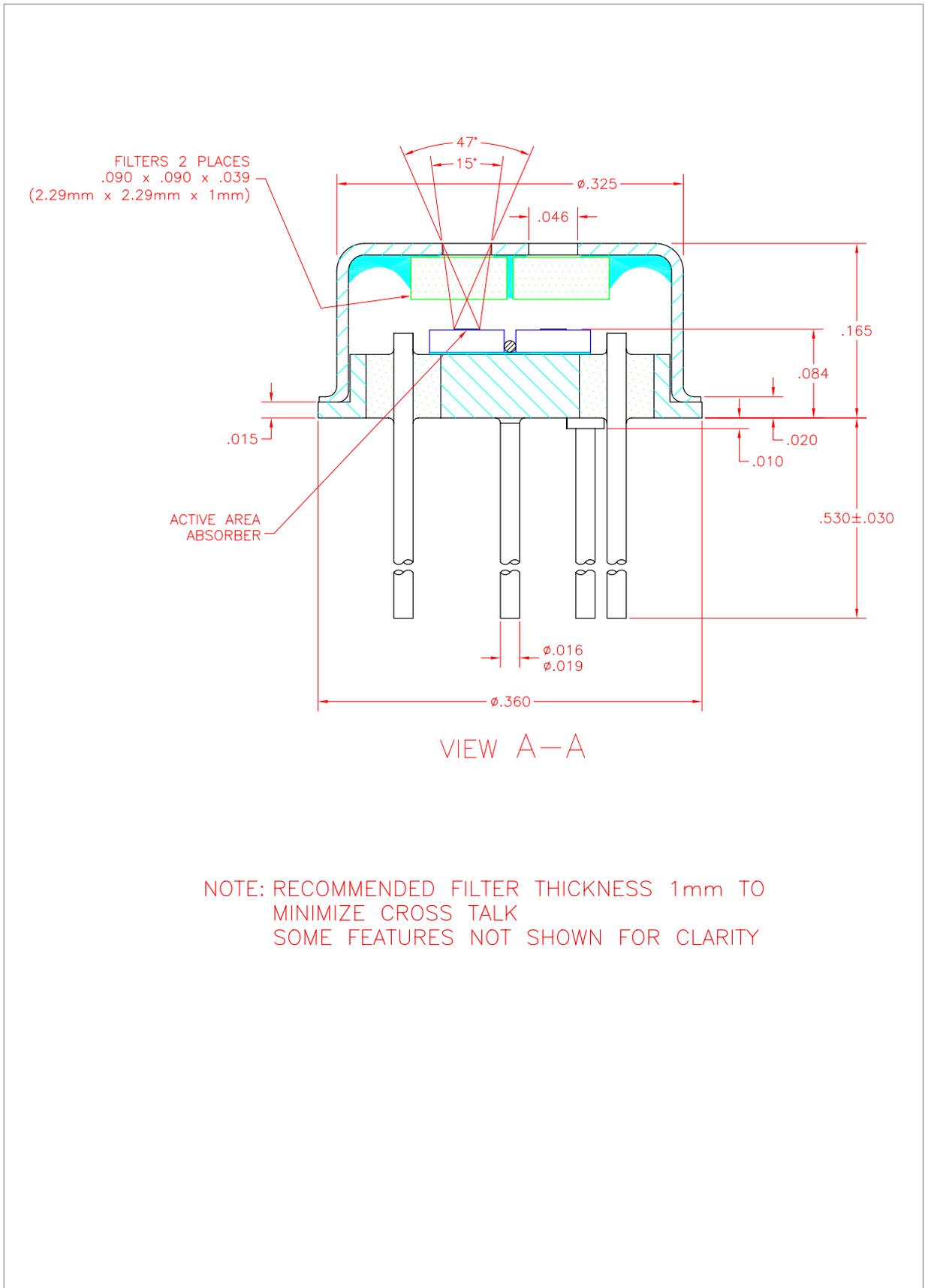
**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in  $\text{cm}^2$ . (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

8573 rev H

Update: 6/8/06

Information subject to change without notice





# ST120 DUAL

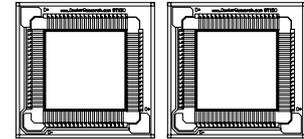
## Silicon Based Thermopile Detector

**Features:** A two-channel silicon-based thermopile in a TO-5 package. Each small active area is 1.2mm x 1.2mm. Time constant of 25ms with Nitrogen encapsulation gas. Delivers a very low Temperature Coefficient of Responsivity of  $-0.04\%/^{\circ}\text{C}$ . This detector has a very short thermal shock response to ambient temperature change.

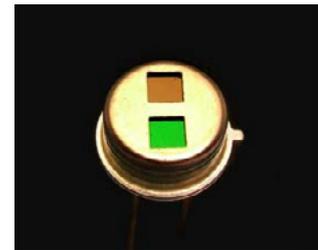
**Options:** 1) See [Standard Windows and Filters](#) for list of optical filter options. 2) Internal  $30\text{k}\Omega$  5% NTC chip thermistor provides ambient package temperature measurement. See [Thermistor Options](#) p/n: DC-4005. 3) Internal aperture precisely defines active area for applications with FOV and/or spot size requirements. See [Aperture Options](#) for available sizes. See [Thermopile Configuration Table](#) for more options.

**Applications:** Excellent for gas analysis, fire suppression, non-contact temperature, and horizon sensor.

**Benefit:** Low cost with high output.



Detector circuit overlay



ST120 DUAL

## Technical Specifications

Specifications apply at  $23^{\circ}\text{C}$  with KBr Window and Nitrogen encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size		1.2 x 1.2		AA	mm	Hot junction size, per element.
Element Area		1.44		A	$\text{mm}^2$	
Number of Junctions		80				Per element.
Number of Channels		2				Per detector package.
Output Voltage		165		$V_s$	$\mu\text{V}$	DC, $H=330\mu\text{W}/\text{cm}^2$ (3)
Signal-to-Noise Ratio		4,301		SNR	$\sqrt{\text{Hz}}$	DC, $\text{SNR}=V_s/V_n$
Responsivity		34.7		$\mathcal{R}$	V/W	DC, $\mathcal{R}=V_s/HA$ (2)
Resistance		90		R	$\text{k}\Omega$	Detector element
Temperature Coefficient of $\mathcal{R}$		-.04			$\%/^{\circ}\text{C}$	Best linear fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)
Temperature Coefficient of R		.02			$\%/^{\circ}\text{C}$	Best fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)
Noise Voltage		38.4		$V_n$	$\text{nV}/\sqrt{\text{Hz}}$	$V_n^2=4\text{kTR}$
Noise Equivalent Power		1.10		NEP	$\text{nW}/\sqrt{\text{Hz}}$	DC, $\text{NEP}=V_n H A V_s$ (2)
Detectivity		1.09		$D^*$	$10^8\text{cm}\sqrt{\text{Hz}}/\text{W}$	DC, $D^*=V_s/V_n H\sqrt{A}$ (2)
Time Constant		25		$\mathcal{T}$	ms	Chopped, -3dB point (1)
Field of View		$27^{\circ}/77^{\circ}$		FOV	Degrees	See Assembly Drawings for FOV Description.
Package Type		TO-5				Standard package hole size: $.090^{\circ} \times .090^{\circ}$
Element Matching		25		$\mathcal{M}$	%	$\mathcal{M}=(V_A-V_B)/V_B$ (2)
Element Separation		3.30			mm	Center to Center
Operating Temperature	-50		125	$T_a$	$^{\circ}\text{C}$	

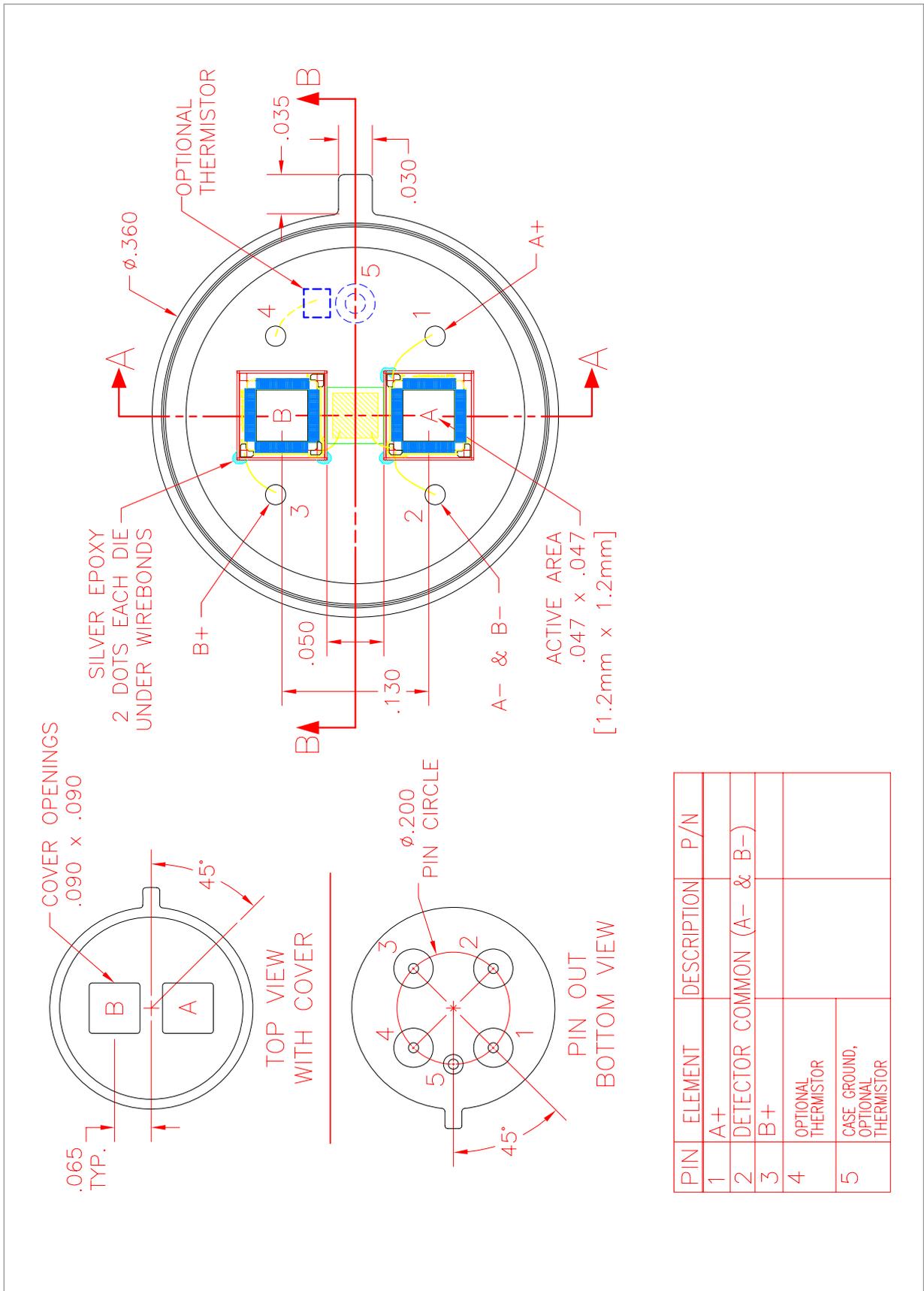
**General Specifications:** Flat spectral response from 100nm to  $> 100\mu\text{m}$ . Linear signal output from  $10^{-6}$  to  $0.1\text{W}/\text{cm}^2$ . Maximum incident radiance  $0.1\text{W}/\text{cm}^2$ , damage threshold  $\geq .5\text{W}/\text{cm}^2$

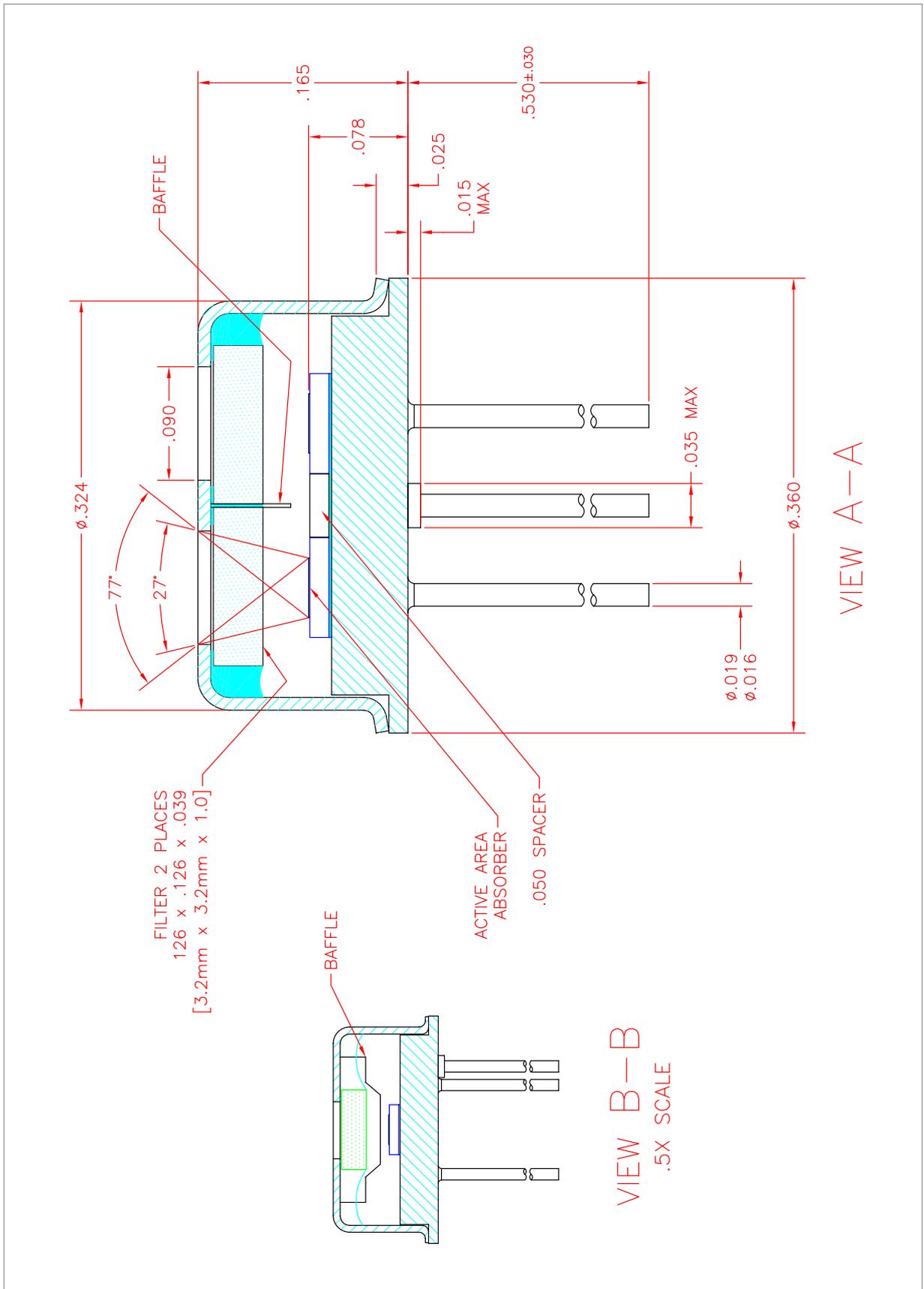
**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in  $\text{cm}^2$ . (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

8664 Rev NC

Update: 7/20/06

Information subject to change without notice





# ST120 QUAD

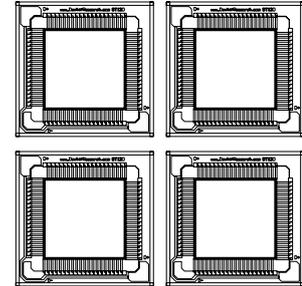
## Silicon Based Thermopile Detector

**Features:** A four-channel silicon-based thermopile in a TO-5 package. Each small active area is 1.2mm x 1.2mm. Time constant of 25ms with Nitrogen encapsulation gas. Delivers a very low Temperature Coefficient of Responsivity of  $-0.04\%/^{\circ}\text{C}$ . This detector has a very short thermal shock response to ambient temperature change.

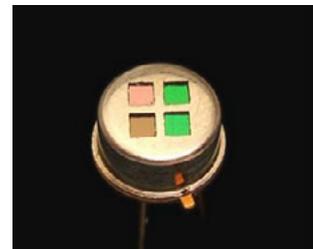
**Options:** 1) See [Standard Windows and Filters](#) for list of optical filter options. 2) Internal  $30\text{k}\Omega$  5% NTC chip thermistor provides ambient package temperature measurement. See [Thermistor Options](#) p/n: DC-4005. 3) Internal aperture precisely defines active area for applications with FOV and/or spot size requirements. See [Aperture Options](#) for available sizes. See [Thermopile Configuration Table](#) for more options.

**Applications:** Excellent for gas analysis, position sensor, and horizon sensor.

**Benefit:** Low cost with high output.



Detector circuit overlay



ST120 DUAL

## Technical Specifications

Specifications apply at  $23^{\circ}\text{C}$  with KBr Window and Nitrogen encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size		1.2 x 1.2		AA	mm	Hot junction size, per element.
Element Area		1.44		A	$\text{mm}^2$	
Number of Junctions		80				Per element.
Number of Channels		4				Per detector package.
Output Voltage		140		$V_s$	$\mu\text{V}$	DC, $H=330\mu\text{W}/\text{cm}^2$ (3)
Signal-to-Noise Ratio		3,649		SNR	$\sqrt{\text{Hz}}$	DC, $\text{SNR}=V_s/V_n$
Responsivity		29.5		$\mathcal{R}$	$\text{V}/\text{W}$	DC, $\mathcal{R}=V_s/HA$ (2)
Resistance		90		R	$\text{k}\Omega$	Detector element
Temperature Coefficient of $\mathcal{R}$		-.04			$\%/^{\circ}\text{C}$	Best linear fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)
Temperature Coefficient of R		.02			$\%/^{\circ}\text{C}$	Best fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)
Noise Voltage		38.4		$V_n$	$\text{nV}/\sqrt{\text{Hz}}$	$V_n^2=4\text{kTR}$
Noise Equivalent Power		1.30		NEP	$\text{nW}/\sqrt{\text{Hz}}$	DC, $\text{NEP}=V_n HA/V_s$ (2)
Detectivity		0.92		$D^*$	$10^6\text{cm}^2/\sqrt{\text{Hz}}/\text{W}$	DC, $D^*=V_s/V_n H\sqrt{A}$ (2)
Time Constant		25		$\mathcal{T}$	ms	Chopped, -3dB point (1)
Field of View		$9^{\circ}/63^{\circ}$		FOV	Degrees	See Assembly Drawings for FOV Description.
Package Type		TO-5				Standard package hole size: $.060" \times .060"$
Element Matching		25		$\mathcal{M}$	%	$\mathcal{M}=(V_A-V_B)/V_B$ (2)
Element Separation		2.08			mm	Center to Center
Operating Temperature	-50		125	$T_a$	$^{\circ}\text{C}$	

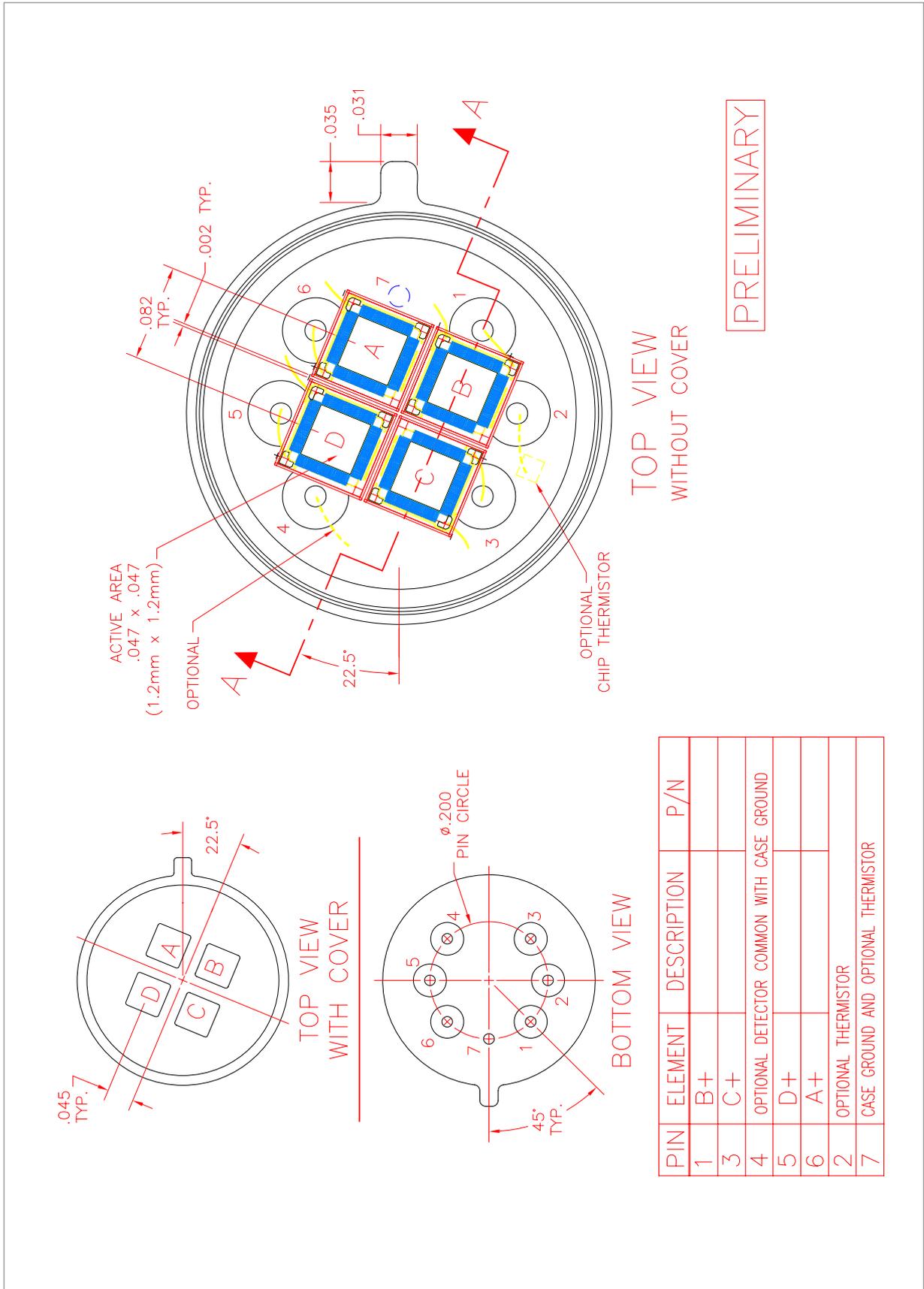
**General Specifications:** Flat spectral response from 100nm to  $> 100\mu\text{m}$ . Linear signal output from  $10^{-6}$  to  $0.1\text{W}/\text{cm}^2$ . Maximum incident radiance  $0.1\text{W}/\text{cm}^2$ , damage threshold  $\geq .5\text{W}/\text{cm}^2$

**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in  $\text{cm}^2$ . (3) Test Conditions: 500K Blackbody source; Detector active surface 10cm from 0.6513cm Diameter Blackbody Aperture.

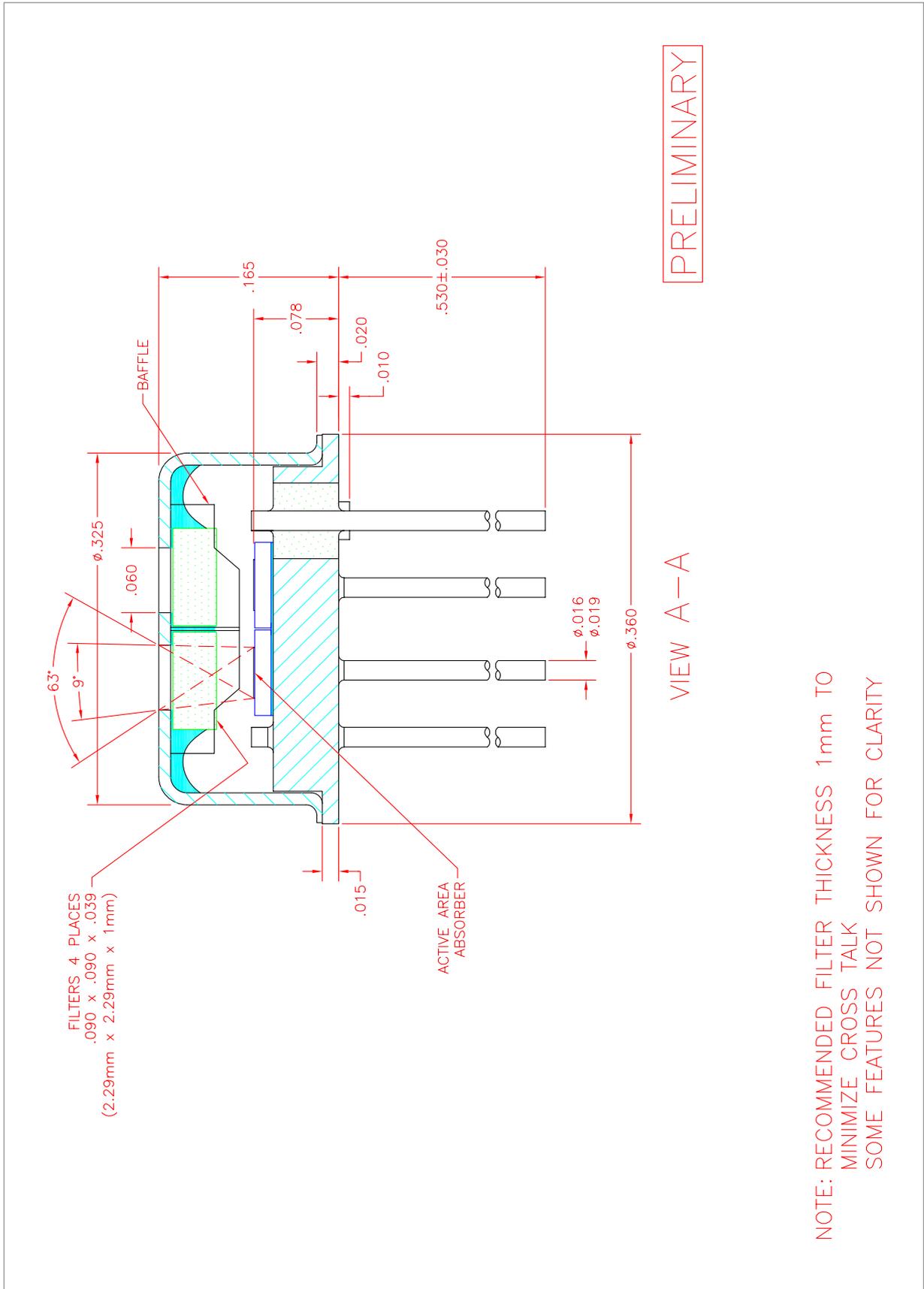
8665 Rev NC

Update: 7/20/06

Information subject to change without notice



PRELIMINARY



**NOTE: RECOMMENDED FILTER THICKNESS 1mm TO  
 MINIMIZE CROSS TALK  
 SOME FEATURES NOT SHOWN FOR CLARITY**

# ST150 QUAD & ST150R QUAD

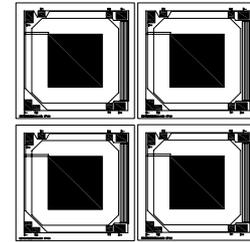
## Silicon Based Thermopile Detector

**Features:** A four-channel silicon-based thermopile detector in a TO-8 package. Each active area size is 1.5mm x 1.5mm. Affordable four-channel design with strong output and a very low Temperature Coefficient of Responsivity of  $-0.04\%/^{\circ}\text{C}$ . This detector has a very short thermal shock response to ambient temperature change.

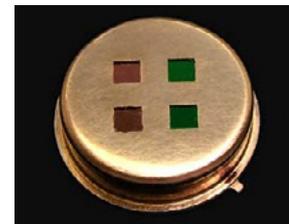
**Options:** 1) See [Standard Windows and Filters](#) for list of optical filter options. 2) **ST150R Quad** version offers a low-cost (20% tolerance) poly-silicon resistor to be used as a PTC thermistor. 3) Internal  $30\text{k}\Omega$  5% NTC chip thermistor provides ambient package temperature measurement. See [Thermistor Options](#) p/n: DC-4005. See [Thermopile Configuration Table](#) for more options.

**Applications:** Gas analysis for automotive exhaust and laser targeting.

**Benefits:** Low price and reasonably high output with moderate signal-to-noise ratio.



Detector circuit overlay



ST150 Quad

## Technical Specifications

Specifications apply at  $23^{\circ}\text{C}$  with KBr Window and Nitrogen encapsulating gas

Parameter	Min	Typical	Max	Symbol	Units	Comments
Active Area size	1.5 x 1.5			AA	mm	Hot junction size, per element.
Element Area	2.25			A	$\text{mm}^2$	
Number of Junctions	120					Per element.
Number of Channels	4					Per detector package.
Output Voltage	180	230	280	$V_s$	$\mu\text{V}$	DC, $H=330\mu\text{W}/\text{cm}^2$ (3)
Signal-to-Noise Ratio	4,688	6,571	8,946	SNR	$\sqrt{\text{Hz}}$	DC, $\text{SNR}=V_s/V_n$
Responsivity	24.2	31.0	37.7	$\mathcal{R}$	V/W	DC, $\mathcal{R}=V_s/HA$ (2)
Resistance	60	90	120	R	$\text{k}\Omega$	Detector element
Temperature Coefficient of $\mathcal{R}$		-.04			$\%/^{\circ}\text{C}$	Best linear fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)
Temperature Coefficient of R		.11			$\%/^{\circ}\text{C}$	Best fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)
Noise Voltage	31.3	35.0	38.4	$V_n$	$\text{nV}/\sqrt{\text{Hz}}$	$V_n^2=4\text{kTR}$
Noise Equivalent Power	.83	1.13	1.58	NEP	$\text{nW}/\sqrt{\text{Hz}}$	DC, $\text{NEP}=V_n H/V_s$ (2)
Detectivity	.95	1.3	1.8	$D^*$	$10^8\text{cm}\sqrt{\text{Hz}}/\text{W}$	DC, $D^*=V_s/V_n H\sqrt{A}$ (2)
Time Constant		38		$\mathcal{T}$	ms	Chopped, -3dB point (1)
Field of View	$27^{\circ}/99^{\circ}$			FOV	Degrees	See Assembly Drawings for FOV Description.
Package Type	TO-8					Standard package hole size: (4) .090 X .090 sq. holes
Element Matching	10	15	25	$\mathcal{M}$	%	$\mathcal{M}=\frac{ V_A-V_B }{V_B}$ (2)
Element Separation		3.30			mm	Center to Center
Operating Temperature	-50		100	$T_a$	$^{\circ}\text{C}$	
<b>ST150R Thermistor Option</b>	55	75	95	$R_T$	$\text{k}\Omega$	PTC Poly-Silicon resistor on detector die.
<b>ST150R Thermistor Temperature Coefficient of R</b>	.107	.11	.113		$\%/^{\circ}\text{C}$	$\Delta R/(R\Delta T)$ , Best fit, $0^{\circ}$ to $85^{\circ}\text{C}$ (1)

**General Specifications:** Flat spectral response from  $100\text{nm}$  to  $> 100\mu\text{m}$ . Linear signal output from  $10^{-6}$  to  $0.1\text{W}/\text{cm}^2$ . Maximum incident radiance  $0.1\text{W}/\text{cm}^2$ , damage threshold  $\geq .5\text{W}/\text{cm}^2$

**Notes:** (1) Parameter is not 100% tested. 90% of all units meet these specifications. (2) A is detector area in  $\text{cm}^2$ . (3) Test Conditions: 500K Blackbody source; Detector active surface  $10\text{cm}$  from  $0.6513\text{cm}$  Diameter Blackbody Aperture.

8574 rev M

Update: 6/8/06

Information subject to change without notice

