

# Model 441 Single Element Pyroelectric IR Detector With Internal Amplifier

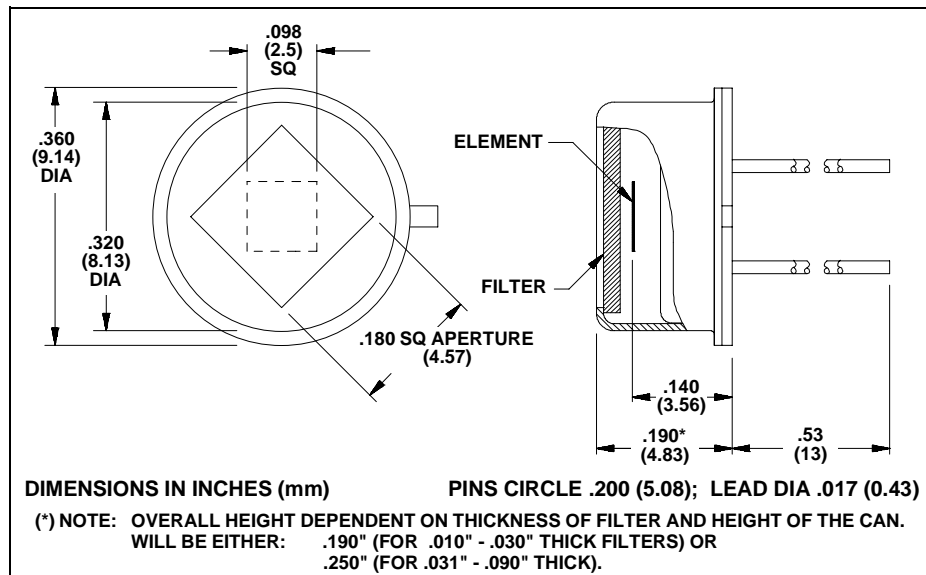


Manufactured under one or more of the following U.S. patents: 3,839,640 - 4,218,620 - 4,326,663 - 4,384,207 - 4,437,003 - 4,441,023 - 4,523,095

**Model 441** is a single element lithium tantalate high gain detector with an internal operational amplifier and precision voltage reference.

This detector offers high performance detection capability over an extended temperature range of -40 to +70°C.

The operational amplifier is operated in the current mode and provides very high responsivity with a low impedance output. The internal voltage reference sets the operating point of the amplifier and provides a stable 2.50 V reference output.



## Features

- High Sensitivity and Low Noise
- Excellent Detectivity (D\*)
- Wide Operational Temperature Range
- Immune to RFI-EMI
- Simplified External Circuitry

## Applications

- Hot Object Detection and Counting
- Industrial Control
- Motion Sensing
- Robotics
- Heating / AC Control
- Flame Detection

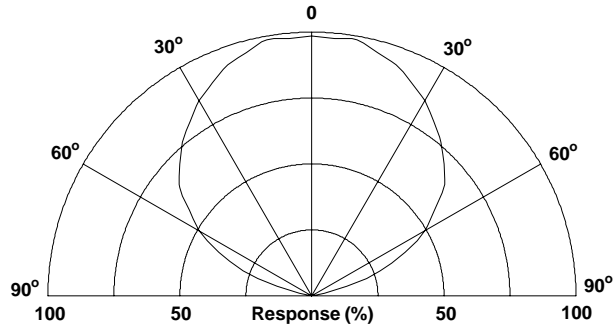
Characteristics	441	Unit	Test Conditions	ELTECdata Reference
Detector Type	Single			
Element Size	2.5 x 2.5	mm		
Optical Bandwidth	0.1 to 1,000	μm	Various Filters	101
Responsivity (typ)	87,800	V/W	8 to 14 μm, 1 Hz	
Noise (typ)	291	μVrms/√Hz	1 Hz, 1 Hz BW	
NEP (typ)	3.29 x 10 <sup>-9</sup>	W/√Hz	8 to 14 μm, 1 Hz, 1 Hz BW	100
D* (typ)	1.13 x 10 <sup>8</sup>	cm√Hz/W	8 to 14 μm, 1 Hz, 1 Hz BW	100
Operating Voltage (min) (max)	5 15	VDC	V+ to Gnd	104 (4.1.c)
Operating Current (max)	2.2	mA		104 (4.1.c)
Offset Voltage	+/- 500	mV	Referenced to Pin 3	106 Section B
Reference Voltage <sup>1</sup>	2.50 +/- .08	V	Ref to Gnd	
Thermal Breakpoint f <sub>T</sub> (typ)	0.20	Hz		102
Recommended Operating Temperature	-40 to +70	°C	Functional	
Storage Temperature	- 55 to + 125	°C	ΔT<50C°/min	
Output Load (min)	10k	Ω		
Output Protection	Short circuit protected, but DO NOT REVERSE SUPPLY POLARITY			

Characteristics at 25°C, with -3 filter, V+ = 5VDC

Data is established on a sample basis and is believed to be representative.

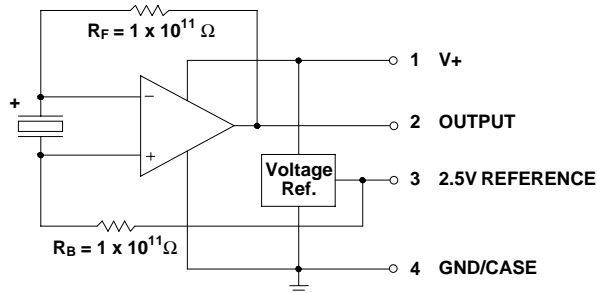
<sup>1</sup>The internal reference voltage is accessible on Pin 3. This voltage is used to bias the internal amplifier. Offset voltage is referred to this point. This voltage provides a low drift reference to allow for direct DC coupling of a subsequent comparator or A/D converter. The recommended maximum load on this pin is 100 μA (source only) to maintain electrical and thermal stability. Current loads greater than 100 μA may adversely affect performance; however, the output is short circuit protected.

## FIELD OF VIEW

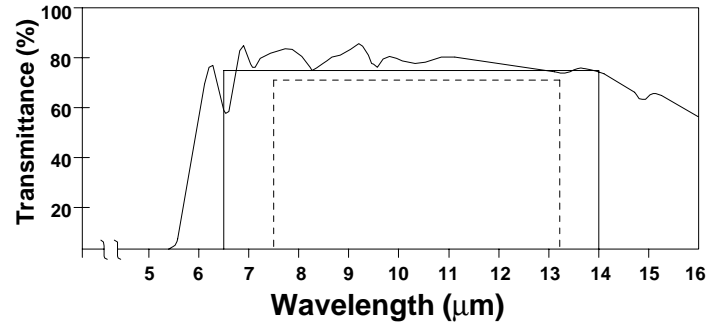


For -3 filter only. For other filters, consider refractive index and thickness.

Symmetrical crystal gives same FOV in vertical and horizontal planes.



## Transmission Characteristics of -3 Filter (HP7)

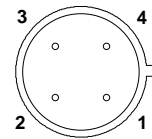


75% Transmission Average

70% Transmission Absolute

Transmission below cutoff is <1%

For information on other standard filters available, refer to ELTECdata #101.



BOTTOM VIEW

### PIN DESIGNATIONS

1. V+
2. OUTPUT
3. 2.5V REFERENCE
4. GND/CASE

For best results, the following precautions and recommendations should be observed. (See ELTECdata #101):

**Mounting:** Avoid mechanical stresses on case and leads.

**Soldering:** Detectors must be hand soldered to minimize the chance of destroying the internal components. Avoid machine or hot air soldering. Leave a minimum lead length of .250 inch (6.35mm). When soldering to detector leads, use a heat sink between the case and leads. Beware that the new RoHS compliant solders require a higher soldering temperature making heat sinking the detector extremely important.

**Static Discharge:** Protect detectors from electro-static charges.

**Thermal Shock:** Temperature changes and rate of change must be kept to a minimum (<50C<sup>o</sup>/min.) to prevent damage.

**Optical Design:** Use of a detector with a filter in an optical system may require consideration of the image displacement toward the filter. This displacement (s) caused by the insertion of a planoparallel plate (filter thickness = t; refractive index = N) is given by  $s = (t/N)(N-1)$ .

**Noise:** As a resolution or lower information limit, noise is established not only by the detector. Other noise sources are:

- Radiated and conducted RF signals
- Subsequent amplification or signal conditioning stages
- Power supply noise
- Components, such as high value resistors and capacitors (tantalum and aluminum electrolytic)
- Mechanical contacts and weak solder joints
- Shock and vibration excited microphonics
- Outside thermal influences on the detector other than the desired infrared input, i.e. drafts

All of these noise sources should be considered carefully when the information signal is <20mV.

**Light Leakage:** Slight sensitivity to visible light leaking through the glass-to-metal seal on the base may be observed.

**NOTICE:** The information provided herein is believed to be reliable. However, ELTEC Instruments, Inc. assumes no responsibility for inaccuracies or omissions. Due to industry components being incorporated into ELTEC's devices and ELTEC continually striving for product improvement, specifications may change without notice.

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