

Model 404CM

High Performance Pyroelectric IR Detector with Current Mode 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 404CM consists of a single lithium tantalate sensing element and current mode amplifier sealed into a modified TO-99 transistor housing with optical filter (optional).

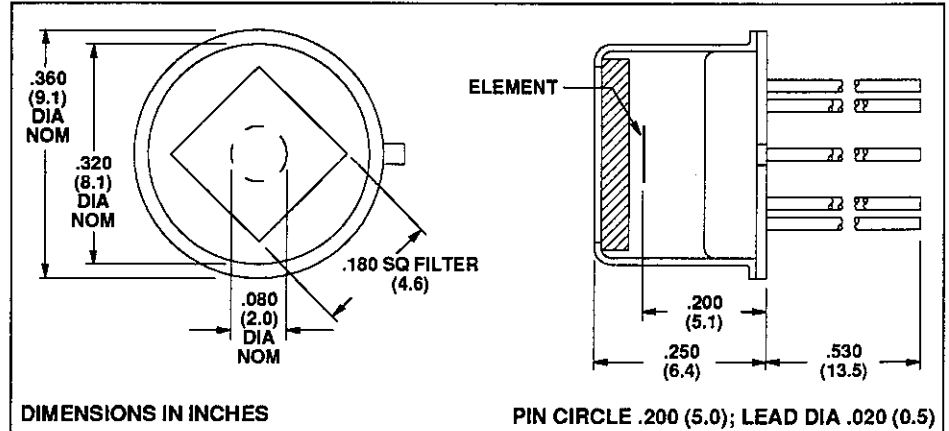
The internal circuit functions as a current-to-voltage converter and provides an exceptional high output signal.

Model 404CM has a higher value feedback resistor (R_F) which provides higher gain, improved signal to noise ratio and, consequently, a higher D^* than the Model 404 in the current mode.

Model 404CM has a spectral response of 0.0001 to 1000 μm wavelength. An optical filter may be used to select spectral response and to protect the sensing element from physical damage, drafts and electrical noise.

Applications

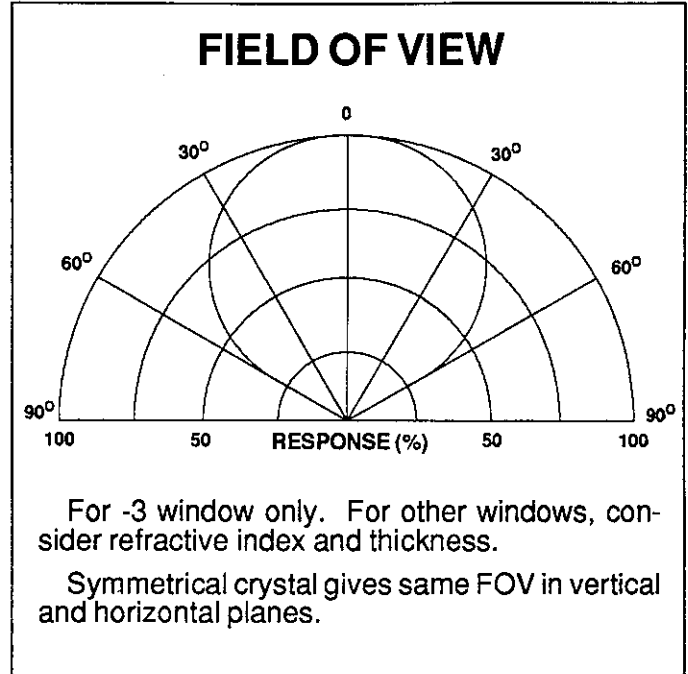
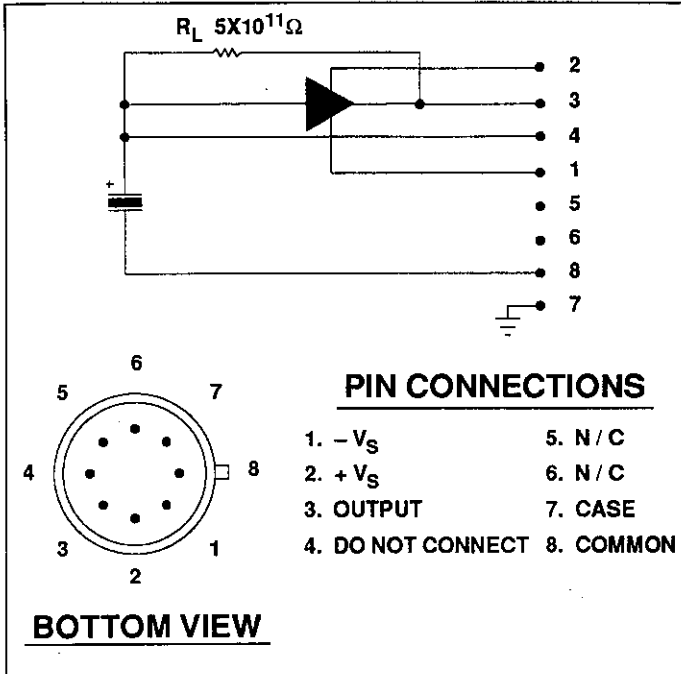
- Pyrometry
- FT Spectroscopy
- Gas Analysis
- Materials' Transmission/ Reflectance Studies
- UV Curing Instrumentation
- Total Energy Plasma Studies



Characteristics	404CM	Test Unit	Conditions	ELTECdata Reference
Detector Type	Single			
Element Size	2.0	mm, Dia	Nominal	
Optical Bandwidth	0.0001 to 1000	μm	Without Optical Filter	101
Responsivity typ	275,000	V/W	8-14 μm @1Hz	
Responsivity typ	55,000	V/W	8-14 μm @10Hz	
NEP typ	4.5×10^{-10}	W/ $\sqrt{\text{Hz}}$	8-14 μm 1-100Hz, BW 1Hz	100
D^* typ	3.8×10^8	$\text{cm}/\sqrt{\text{Hz}/\text{W}}$	8-14 μm 1-100Hz, BW 1Hz	100
Operating Voltage min	± 5	V		
Operating Voltage max	± 15	V		
Operating Current max	5.0	mA	@ $V_S \pm 15$ V	
Offset Voltage max	0.1	V		
Output Impedance	10	Ω	$F \leq 100\text{Hz}$	
Minimum Load Resistance	1K	Ω		
Thermal Breakpoint f_t typ	0.25	Hz		102
Electrical Breakpoint f_e typ	0.011	Hz	$R_F = 5 \times 10^{11} \Omega$	102
Recommended Operating Temperature	-40 to +70	$^{\circ}\text{C}$		
Storage Temperature	-55 to +125	$^{\circ}\text{C}$	$\Delta T < 5^{\circ}\text{C}/\text{minute}$	

Characteristics at 25 $^{\circ}\text{C}$, with no filter, $V_S = \pm 10\text{VDC}$.

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



Field of View: Approximately 110° (50% power points).

Mounting: Avoid mechanical stresses on case and leads.

Soldering: Use minimum heat and use a heat sink between case and leads. Leave minimum lead length of .250 inch (6.0 mm). DO NOT MACHINE SOLDER.

Static Discharge: Protect detectors from electrostatic discharges

Thermal Shock: Temperature changes and rate of change must be kept to a minimum ($<5^\circ\text{C}/\text{min.}$) to prevent damage.

Power Polarity: Carefully note power supply polarity connections to avoid damage to internal op amp.

Output Protection: Output is short circuit protected.

Current Mode Output: Output in the current mode is inverting (negative output for positive temperature change input).

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

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

Optical Filter (Window): This Model can be used with any standard ELTEC detector window or used without a window. For more information, please refer to ELTECdata # 101.

Noise: As a resolution or lower detectivity limit, noise is not established 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 tantalum or electrolytic capacitors
- Mechanical contacts and weak solder joints
- Microphonics or vibration
- Outside thermal influences on the detector other than the desired infrared input, i.e. drafts.

All these noise sources should be considered carefully when the information signal is $<20\text{mV}$.

Power Supply: Model 404CM requires a split voltage power supply. ELTEC Model 610 Detector Controller provides a compatible power supply.

Calculations: When calculating response from basic formulae, (see ELTECdata # 100) use crystal thickness as 0.002 inch (0.05 mm) and 30pF capacitance for crystal.