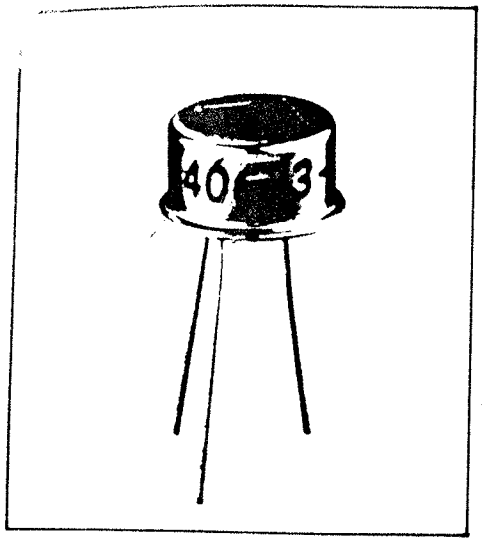
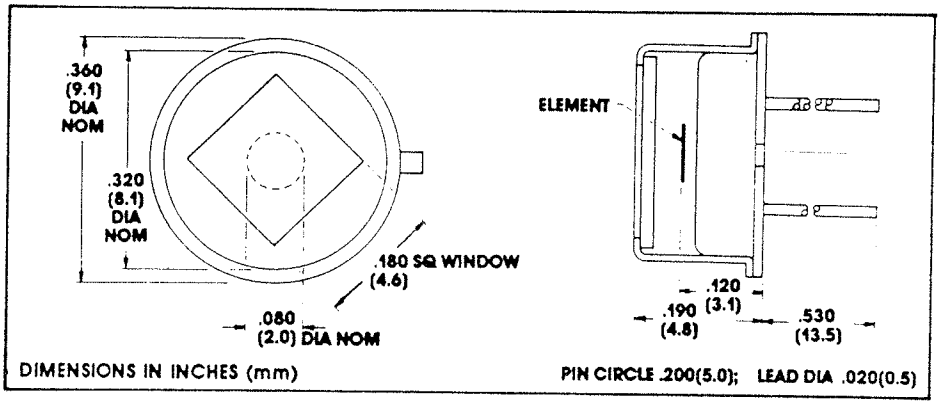


406
Single Element Pyroelectric IR Detector With Source Follower

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



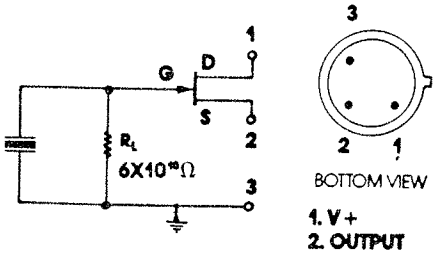
Model 406 contains a single lithium tantalate sensing element and a JFET source follower sealed into a standard TO-5 housing with optical filter.

A patented element mounting technique is used to improve thermal time constant and reduce effects of microphony.

A source resistor is needed to set the drain current and consequently the operating parameters of the JFET. A 47 KΩ or greater value resistor is recommended for connection between output (source) and ground.

Applications

- **Motion Sensing**
- **Lighting Control**
- **Intrusion Detection**
- **Industrial Control**
- **Gas Analysis**
- **Heating/AC Control**
- **Pyrometry**
- **Low-power Laser Detection**
- **Robotics**
- **Instrumentation**



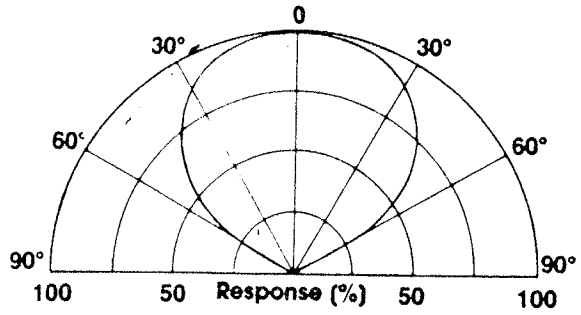
BOTTOM VIEW

1. V+
2. OUTPUT
3. GND/CASE

Characteristics		406	Unit	Test Conditions	ELTECdata Reference
Detector Type		Single	—		
Element Size		2.0	mm, DIA	nominal	
Optical Bandwidth		1.5 to 1000	μm	Various Windows	101
Responsivity	min typ max	3000 3600 4200	V/W	8 to 14μm@1Hz	
Noise	typ max	10 20	$\mu V/\sqrt{Hz}$	1.0Hz p-p (1 minute)	
NEP	typ max	7.0×10^{-10} 1.7×10^{-9}	$W/\sqrt{Hz}$	8-14μm @1Hz, BW 1Hz	100
D*	min typ	1.0×10^{8} 2.5×10^{8}	$cm\sqrt{Hz}/W$	8-14μm @1Hz, BW 1Hz	100
Operating Voltage	min max	3 15	V	V_D to Gnd	104 (4.1.c)
Operating Current	min max	0.1 40	μA		104 (4.1.c)
Offset Voltage	min max	0.2 0.8	V	R_S = 22KΩ	104 Fig. 4
Offset Voltage	min max	0.3 1.2	V	R_S = 100KΩ	104 Fig. 4
Output Impedance	max	20	KΩ		
Thermal Breakpoint f_T	typ	0.25	Hz		102
Electrical Breakpoint f_e	typ	0.08	Hz	$R_L = 6 \times 10^{10}\Omega$	102
Recommended Operating Temp.		-10 + 50	°C		
Responsivity vs. Temperature	max	+0.2	%/°C	Unity Gain Circuit	104 (3.5)
Pressure Sensitivity	max	200	μV/mbar	Step Response	
Microphony	max	50	μV/g	10-1000Hz	104 (3.9)
Package Sealing	max	10^{-8}	cm^3/sec	Helium	
Storage Temperature		-55 + 125	°C	ΔT<5°C/minute	

Characteristics at 25°C, with -3 Window, V_D = 5 VDC, R_S = 100KΩ unless otherwise stated.
Data is established on a sample basis and is believed to be representative.

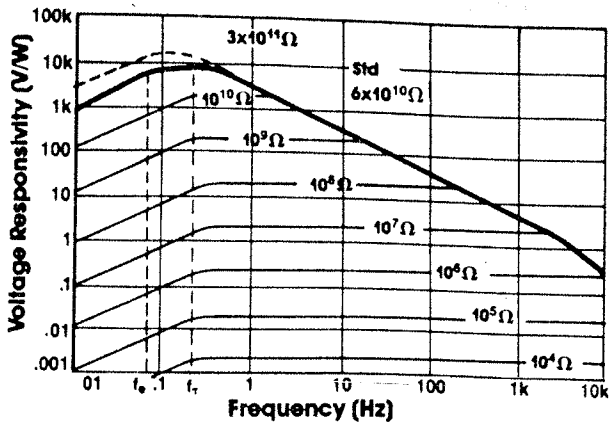
FIELD OF VIEW



For -3 window only. For other windows, consider refractive index and thickness.

Symmetrical crystal gives same FOV in vertical and horizontal planes.

FREQUENCY RESPONSE



The voltage response of this detector is dependent on the pulse rate or equivalent frequency of input. The frequency response of the detector can be linearized by using a lower value resistor, but at the expense of lower responsivity and a lower D*. Load resistor values other than the standard $6X10^{10}\Omega$ can be specified.

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

Mounting: Avoid mechanical stresses on case and leads.

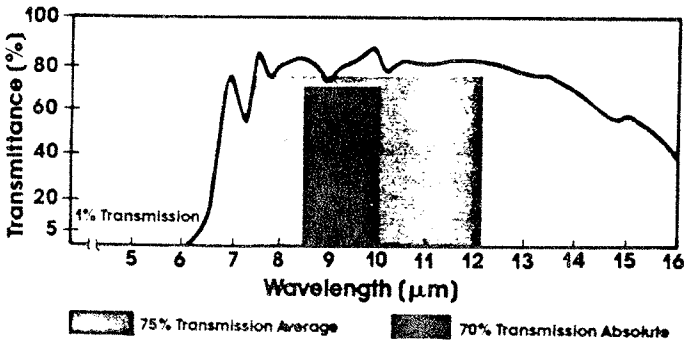
Soldering: Use minimum heat and heat sink between case and leads. Leave minimum lead length of .250 inch (6.0mm.) DO NOT MACHINE SOLDER.

Static Discharge: Protect detectors from electrostatic charges.

Thermal Shock: Temperature changes and rate of change must be kept to a minimum (<5°C/min.) to prevent damage.

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

Transmission Characteristics of -3 Window (HP7)



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

Noise, as resolution or lower information limit, 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 <1mV.

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 $s = (t/N)(N-1)$.

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