

P1-30

Low Noise, Broadband Pyroelectric Detector/Op-Amp



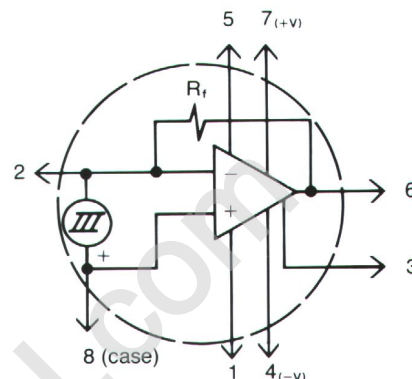
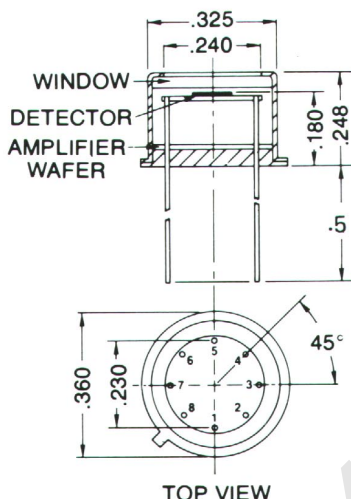
Features

- Rugged LiTaO_3 material
- 610°C Curie temperature
- $0.2\%/^\circ\text{C}$ temperature stability
- Non-hygroscopic
- Broad spectral range .001 to 1000 microns
- Low noise
- 0°C to $+70^\circ\text{C}$ operation
- Optional windows
- High performance operational amplifier
- Flat bandwidth to 3 MHz

Applications

- Laser power and energy measurement
- Non-contact temperature measurement
- Security and surveillance systems
- Process control
- X-ray calorimetry
- Gas analyzer instrumentation
- Solar instrumentation

The P1-30 series features 1, 2, 3, and 5 mm diameter pyroelectric elements with high-performance, wideband hybrid operational amplifiers packaged together in TO-5 transistor cases. With standard internal 10^8 -ohm feedback resistors they deliver high responsivity with 8 kHz flat bandwidth. The internal feedback resistor may be paralleled externally with lower resistances to 10^5 ohms to achieve wider uniform frequency response out to upper-3-dB frequencies as high as 3 MHz. Power supply noise rejection is typically -70 dB when operated from an external ± 15 Vdc source.



Performance Specifications P1-30

| CHARACTERISTICS (25°C unless otherwise noted) | | P1-31 | | P1-32 | | P1-33 | | P1-35 | | UNIT | CONDITIONS | | | | |
|---|--|-------|-----|-------|-----|-------|-----|-------|-----|------|------------|-----------|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | | | Max | | | |
| ELEMENT ONLY | | | | | | | | | | | | | | | |
| Dia | Active Diameter | | 1 | | 2 | | 3 | | 5 | mm | | | | | |
| R _i | Current Responsivity | .5 | 1 | | .25 | .5 | | .25 | .5 | .13 | .25 | μA/Watt | λ = 632.8 nm f ≥ 15 Hz | | |
| C _D | Element Capacitance | | 15 | | 24 | | 54 | | 75 | pF | | f = 1 kHz | | | |
| f _T | Thermal 3db Frequency | | 3.5 | 6 | | 1.6 | 3 | | .8 | 2 | | .5 | 1 | Hz | P _{avg} ≤ 10 mW |
| | | | | | | | | | | | | | | | |
| ELEMENT AND OP AMP | | | | | | | | | | | | | | | |
| R _V | Voltage Responsivity (See Figures 1-4) | 50 | 100 | | 25 | 50 | | 25 | 50 | | 13 | 25 | Volts/Watt | λ = 632.8 nm, f = 1 kHz | |
| NEP | Noise Equivalent Power (See Figures 1-4) | | 200 | 400 | | 400 | 800 | | 400 | 800 | | 800 | 1000 | 10 ⁻⁹ W/Hz ^{1/2} | λ = 632.8 nm, f = 1 kHz, BW = 1Hz |
| D* | Detectivity | 2.2 | 4.4 | | 2.2 | 4.4 | | 3.3 | 6.7 | | 2.8 | 5.5 | 10 ⁸ cm ² Hz ^{1/2} /Watt | λ = 632.8 nm, f = 1 kHz, BW = 1Hz | |
| f _n | Flat Frequency Response | 3M | | | 3M | | | 3M | | | 3M | | | Hz | External Feedback Resistor |
| R _S | Internal Feedback Resistor | | 1 | | 1 | | | 1 | | | 1 | | | 10 ⁸ Ohm | |
| C _i | Internal Stray Feedback Capacitance | | 0.2 | 1.0 | | 0.2 | 1.0 | | 0.2 | 1.0 | | 0.2 | 1.0 | pF | |
| R _O | Output Impedance | | 100 | | 100 | | | 100 | | | 100 | | | Ohms | |
| P _{Max Avg} | Maximum Average Power | | 50 | | 50 | | | 50 | | | 50 | | | m Watts | |
| V _{cc} | Supply Voltage | | ±15 | | ±15 | | | ±15 | | | ±15 | | | Volts | |
| I _{cc} | DC Bias Current | | 3 | 4 | | 3 | 4 | | 3 | 4 | | 3 | 4 | mA | |

Note: 1. R_i , R_V , NEP and D^* are specified at 632.8nm with windowless detector. These parameters improve 30% at 10.6 μm .
 2. If CC Black Absorbing Coating is specified R_i , R_V , NEP and D^* can improve by 20 to 40% at all wavelengths. However, this coating limits their use to frequencies $< 100 \text{ Hz}$.

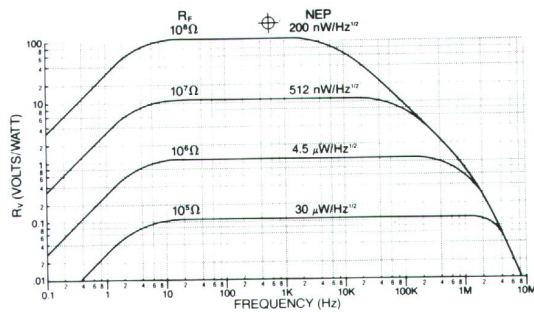


Fig. 1 Plot of typical Responsivity R_V versus Frequency for P1-31 Pyroelectric Detectors with various external feedback resistors.

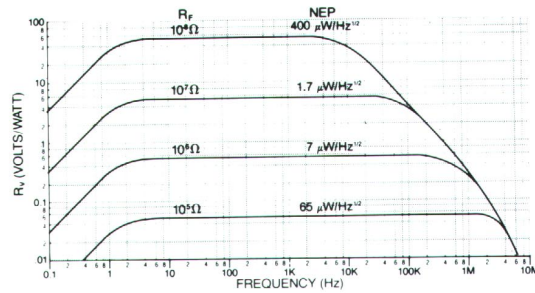


Fig. 2 Plot of typical Responsivity R_V versus Frequency for P1-32 Pyroelectric Detectors with various external feedback resistors.

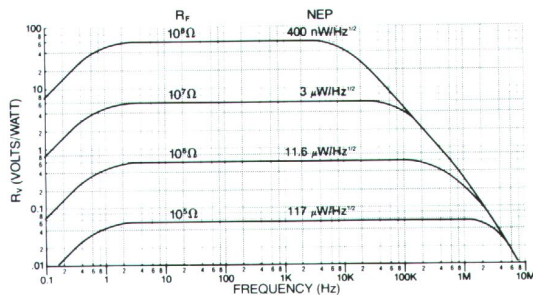


Fig. 3 Plot of typical Responsivity R_V versus Frequency for P1-33 Pyroelectric Detectors with various external feedback resistors.

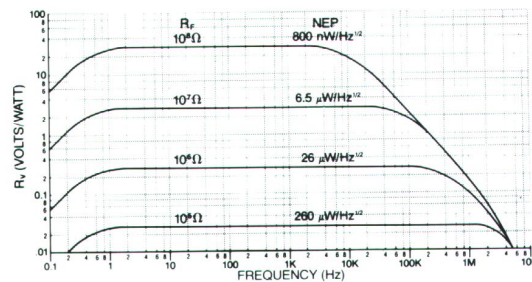
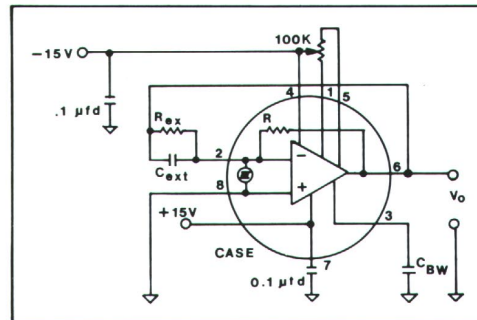


Fig. 4 Plot of typical Responsivity R_V versus Frequency for P1-35 Pyroelectric Detectors with various external feedback resistors.

Typical Circuit Diagram



- Notes: 1. All grounds as short as possible.
2. Offset adjust optional for $R_{T(tot)} \leq 10^9$ ohms.
3. $R_{(EXT)}$ is an optional external resistor used to achieve wider flat bandwidth with lower voltage responsivity.

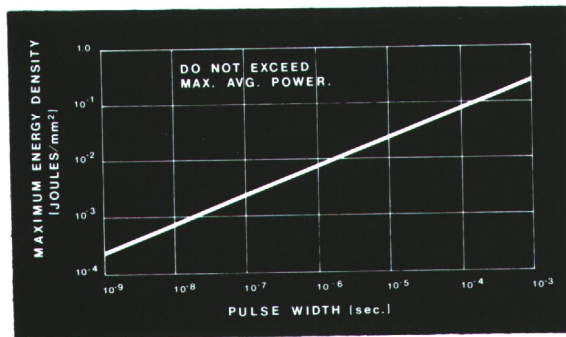


Fig. 5 Relative spectral response vs wavelength

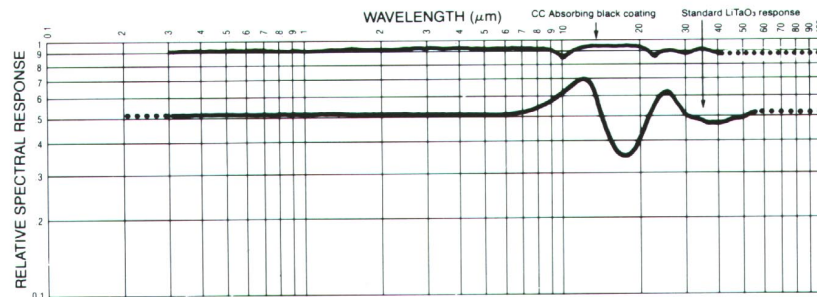


Fig. 6 Relative spectral response vs wavelength