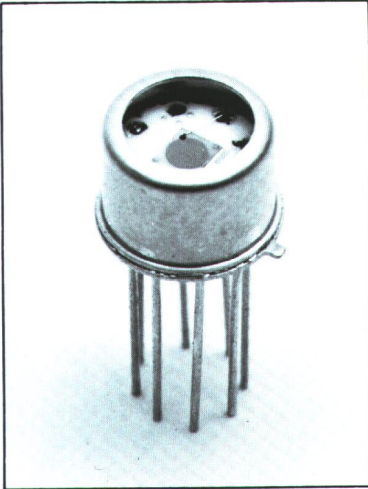


P1-40

Low Noise, Low Frequency Pyroelectric Detector/FET-Op-Amp



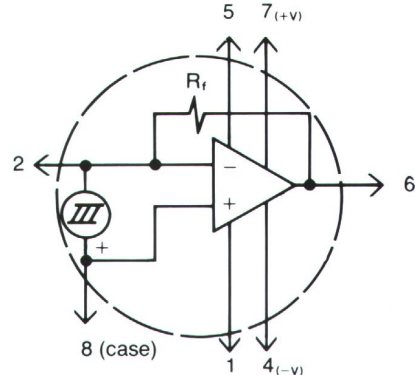
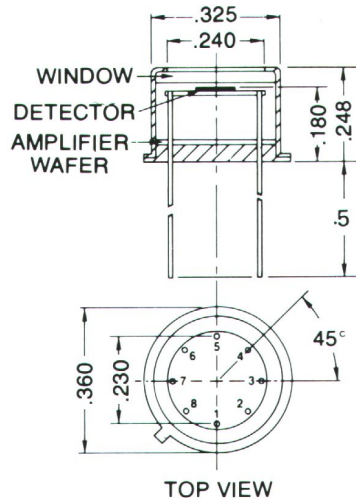
Features

- 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°C operation
- Optional windows
- Low noise FET input operational amplifier
- Flat bandwidth 1 Hz to 10 KHz

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 P1-40 series features 1, 2, 3, or 5 mm standard element sizes with low-noise hybrid FET-input op-amps in a TO-5 package, delivering superior performance from low frequencies out to the kilohertz bandwidth range. Standard internal feedback resistances of 10^{11} -ohm minimize the NEP and provide $1/f$ frequency response at all chopping frequencies above the thermal relaxation frequency of about 1 Hz. Externally paralleling the internal resistor permits wideband operation with uniform response out to a -3dB limit of 3 MHz. Power supply noise rejection is typically -70dB when operated from an external $\pm 15\text{ Vdc}$ source.



Performance Specifications P1-40

CHARACTERISTICS (25°C unless otherwise noted)		P1-41		P1-42		P1-43		P1-45		UNIT	CONDITIONS
		Min	Typ Max	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 _o	Element Capacitance	15		24		54		75		pF	f = 1 kHz
f _r	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)	1	5	.5	2.5	.5	2.5	.25	1.3	10 ⁴ Volts/Watt	λ = 632.8 nm, f = 15 Hz
NEP	Noise Equivalent Power (See Figures 1-4)	.7	5	2.0	15	4	25	10	60	10 ⁻⁹ W/Hz½	λ = 632.8 nm, f = 15 Hz, BW = 1Hz
D*	Detectivity	1.8	12.5	1.5	9	1.1	6.6	0.75	4.5	10 ⁷ cm Hz½/W	λ = 632.8 nm, f = 15 Hz BW = 1Hz
f _n	Flat Frequency Response	3M		3M		3M		3M		Hz	External Feedback Resistor
R _f	Internal Feedback Resistor	1.0		1.0		1.0		1.0		10 ¹¹ Ohms	
C _f	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	4	6	4	6	4	6	4	6	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 Hz.

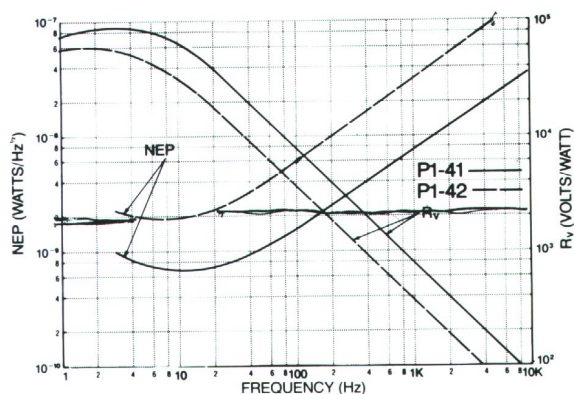


Fig. 1 Plot of typical Responsivity R_v and noise equivalent power NEP versus frequency for P1-41 and P1-42 pyroelectric detectors.

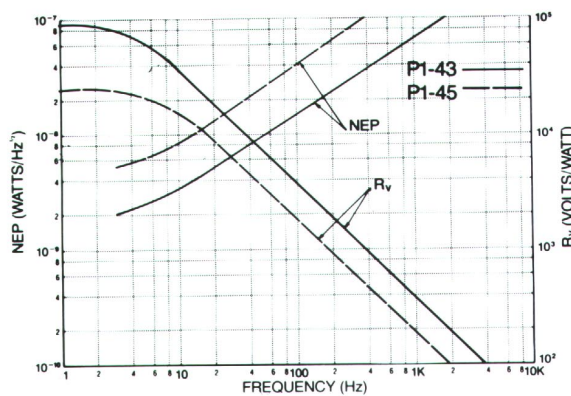


Fig. 2 Plot of typical Responsivity R_v and noise equivalent power NEP versus frequency for P1-43 and P1-45 pyroelectric detectors.

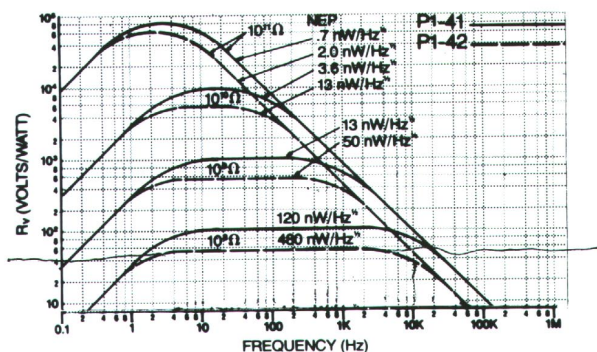


Fig. 3 Plot of typical Responsivity R_v versus frequency for P1-41 and P1-42 pyroelectric detectors with various external feedback resistors.

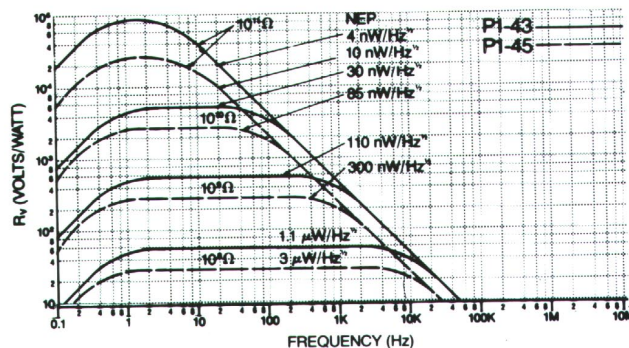
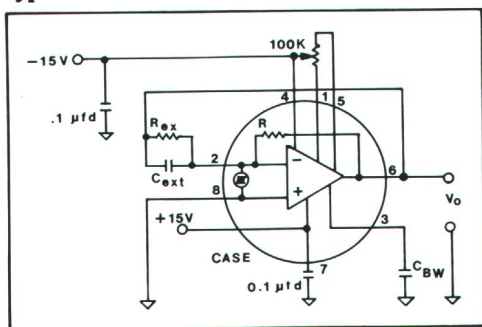


Fig. 4 Plot of typical Responsivity R_v versus frequency for P1-43 and P1-45 pyroelectric detectors with various external feedback resistors.

Typical Circuit Diagram



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

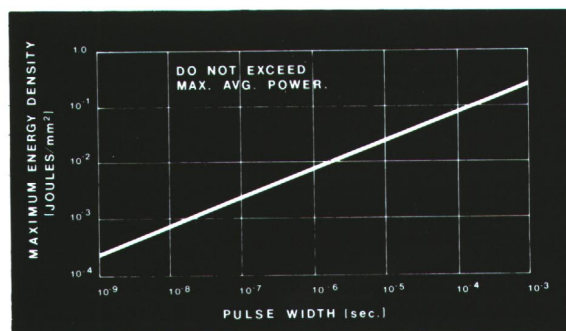


Fig. 6 Energy density damage threshold

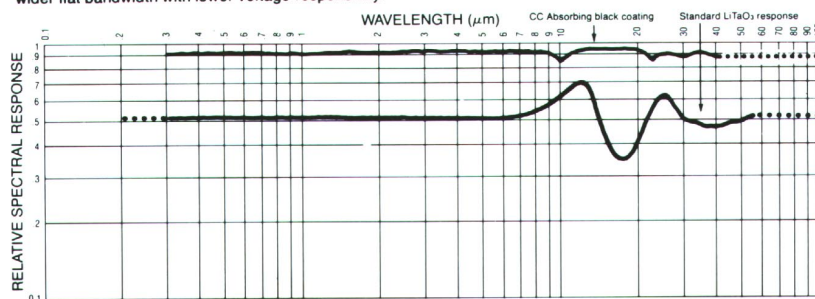


Fig. 7 Relative spectral response vs wavelength