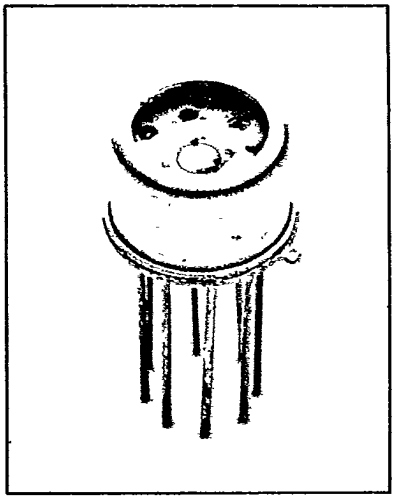


P1-40
Low Noise, Low Frequency Pyroelectric Detector/FET-Op-Amp

Molectron
DETECTOR, INCORPORATED

T-65-13

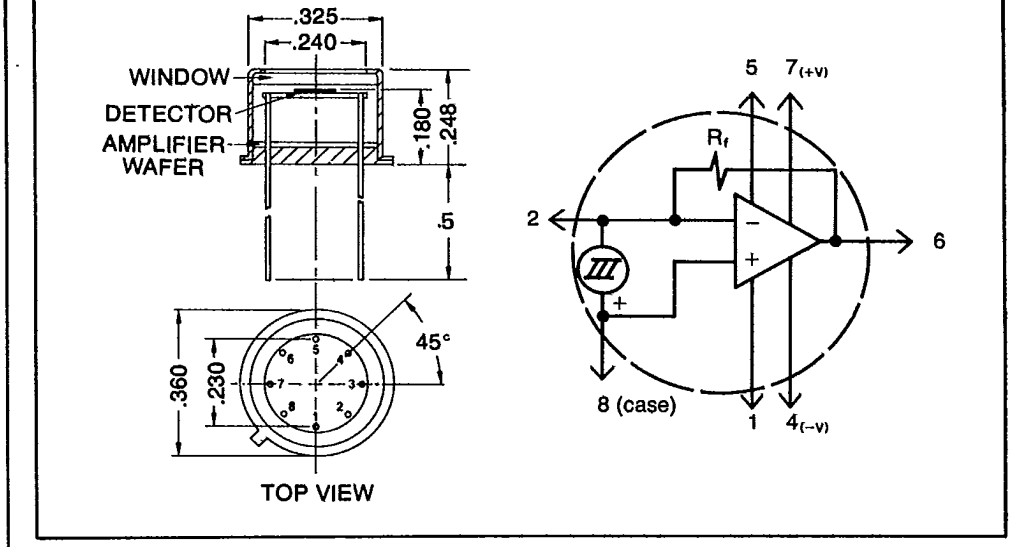
Features

- Rugged $LiTaO_3$ material
- 610°C Curie temperature
- 0.2%/°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 ±15 Vdc source.



Performance Specifications P1-40

CHARACTERISTICS (25°C unless otherwise noted)		P1-41 Min	P1-41 Typ	P1-41 Max	P1-42 Min	P1-42 Typ	P1-42 Max	P1-43 Min	P1-43 Typ	P1-43 Max	P1-45 Min	P1-45 Typ	P1-45 Max	UNIT	CONDITIONS
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	$P_{Avg} \leq 10$ 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_h	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 10.6μm.
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.

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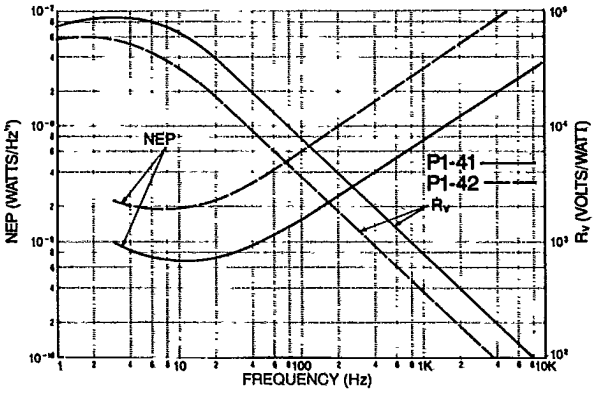


Fig. 1 Plot of typical Responsivity R_V and noise equivalent power NEP versus frequency for P1-41 and P1-42 pyroelectric detectors.

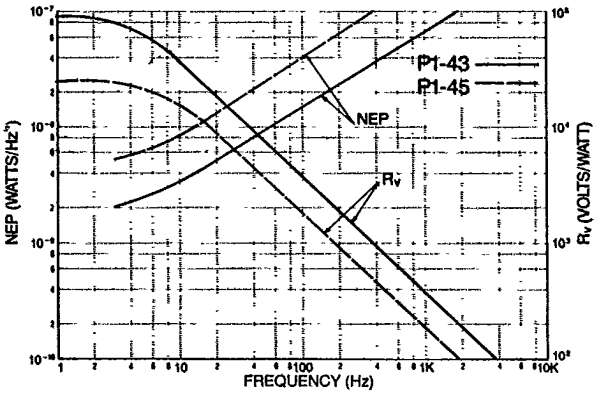


Fig. 2 Plot of typical Responsivity R_V and noise equivalent power NEP versus frequency for P1-43 and P1-45 pyroelectric detectors.

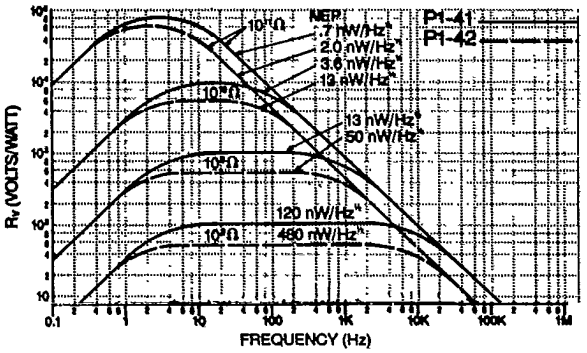


Fig. 3 Plot of typical Responsivity R_V versus frequency for P1-41 and P1-42 pyroelectric detectors with various external feedback resistors.

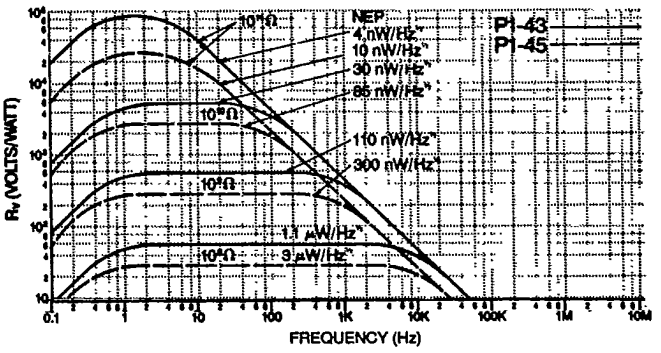
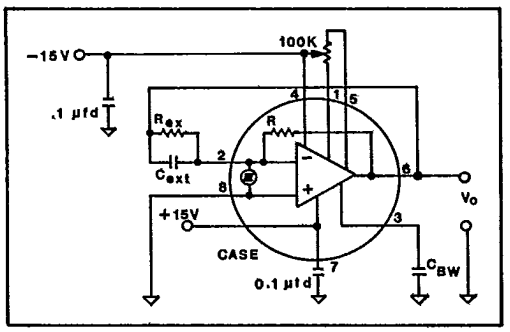


Fig. 4 Plot of typical Responsivity R_V versus frequency for P1-43 and P1-45 pyroelectric detectors with various external feedback resistors.

Typical Circuit Diagram



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

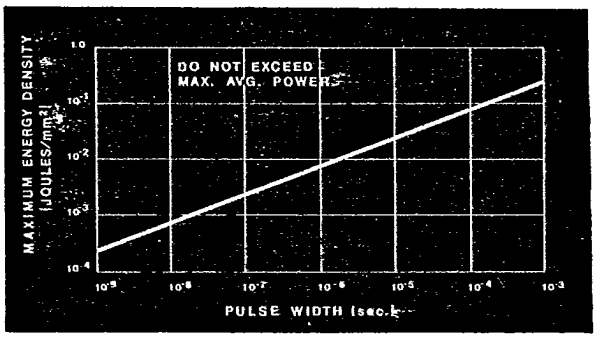


Fig. 6 Energy density damage threshold

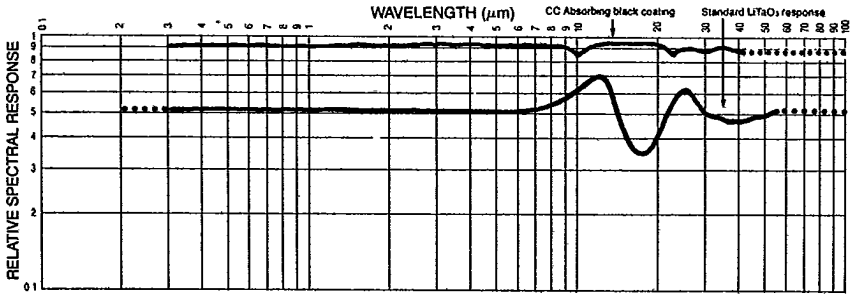


Fig. 7. Relative spectral response vs wavelength