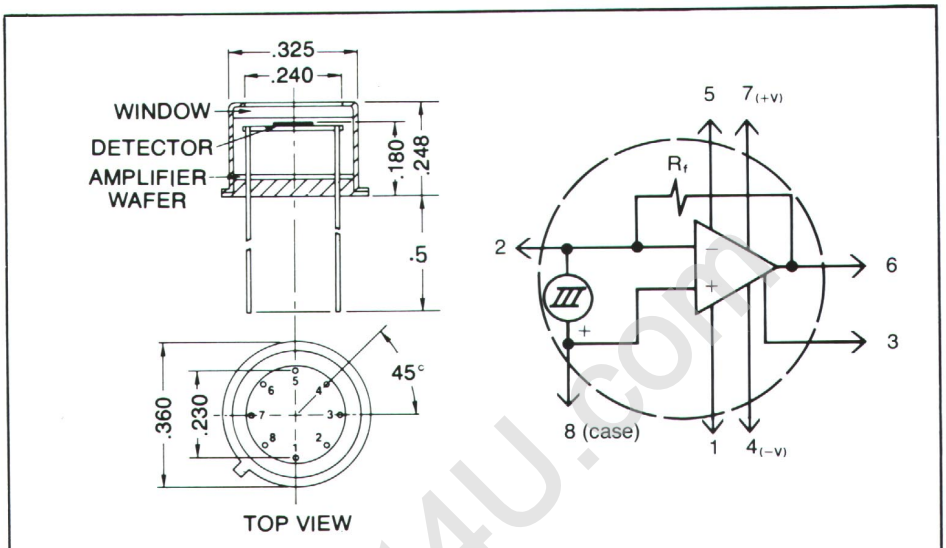
P1-30
Low Noise, Broadband Pyroelectric Detector/Op-Amp

Molectron
DETECTOR, INCORPORATED



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
- 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 Min	P1-31 Typ	P1-31 Max	P1-32 Min	P1-32 Typ	P1-32 Max	P1-33 Min	P1-33 Typ	P1-33 Max	P1-35 Min	P1-35 Typ	P1-35 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)	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/ Hz½	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		10^5 cm Hz½/Watt	λ = 632.8 nm, f=1 kHz, BW=1Hz
f_h	Flat Frequency Response	3M			3M			3M			3M			Hz	External Feedback Resistor
R_S	Internal Feedback Resistor		1			1			1			1		10^8 Ohm	
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		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 10.6μm.**
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.

QD-4.13 A

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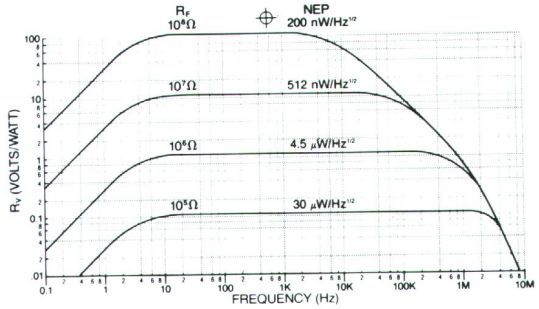


Fig. 1 Plot of typical Responsivity R_V versus Frequency for P1-31 Pyroelectric Detectors with various external feedback resistors.

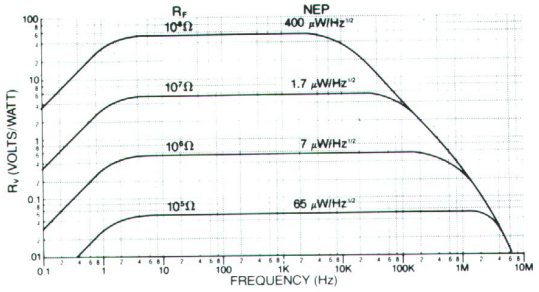


Fig. 2 Plot of typical Responsivity R_V versus Frequency for P1-32 Pyroelectric Detectors with various external feedback resistors.

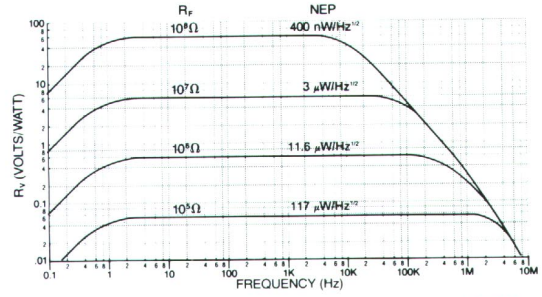


Fig. 3 Plot of typical Responsivity R_V versus Frequency for P1-33 Pyroelectric Detectors with various external feedback resistors.

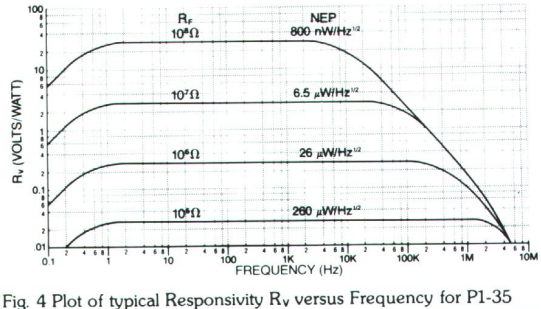


Fig. 4 Plot of typical Responsivity R_V versus Frequency for P1-35 Pyroelectric Detectors with various external feedback resistors.

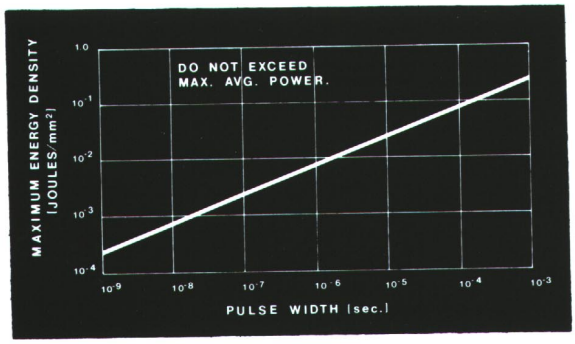
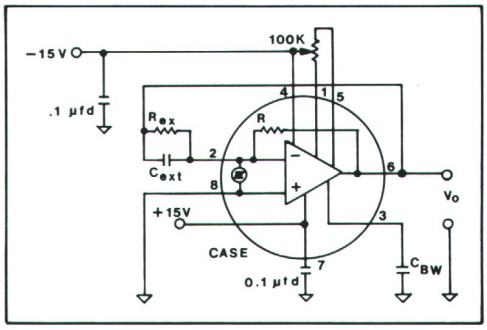


Fig. 5 Relative spectral response vs wavelength

Typical Circuit Diagram



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

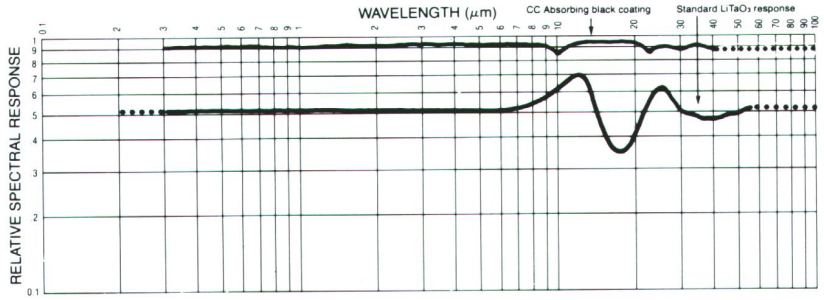


Fig. 6 Relative spectral response vs wavelength