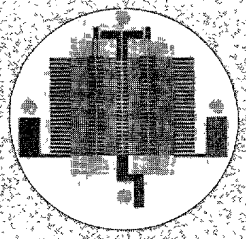


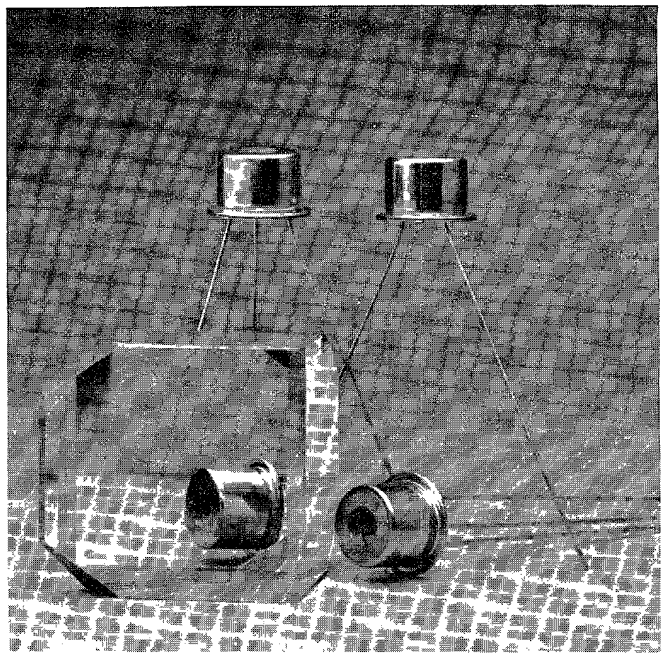
MODEL DR46 DUAL ELEMENT THERMOPILE DETECTOR

TECHNICAL DESCRIPTION

The Model DR46 detector is a multijunction dual element thermopile made of evaporated bismuth and antimony. An energy absorbing smoke black, essentially spectrally flat from the ultraviolet to the far infrared, is deposited on the active junction areas. The detection elements are hermetically sealed in a TO-8 type package under a purged atmosphere of Argon or Nitrogen, and then heat treated to insure long term stability. The final package is resistant to both mechanical and temperature shock.

The simultaneous fabrication of both elements provides extreme stability of critical parameters versus both temperature and time. The positive thermopile terminals are internally connected to a common test lead and the two negative detector terminals are connected to the TO-8 type output leads. This differential connection provides a null signal when both detector elements receive the same radiative input and an unbalance signal when one element does not receive an identical radiative input. The independent element signals may be measured with respect to the test lead. During fabrication this test lead is cut off at the header base; however, on special order this lead can remain at its full 25.4 mm length.

Thermopiles are voltage generating devices, and therefore do not require bias voltage or current for operation. Since they act as a voltage generator with a low noise series resistance, they generate no 1/f noise, but only the Johnson noise of their resistance. The very low values of noise voltage and the absence of current noise make the DR46 ideal for usage in intrusion detection systems. When used with a germanium window or filter the viewing angle can exceed 120°.



FEATURES

- LOW COST
- NO COOLING
- NO 1/F NOISE
- RUGGED
- INDEPENDENT DUAL ELEMENTS
- HERMETICALLY SEALED
- HIGH RELIABILITY
- LONG TERM STABILITY

ELECTRICAL CHARACTERISTICS: PER ELEMENT SPECIFICATIONS APPLY AT 25°C WITH KBr WINDOW

Parameter	Condition	Min.	Typ.	Max.	Symbol	Units	Comments
Resistance		9	12	15	r	KΩ	
Noise Voltage		12.2	14.1	15.7	V_n	$nV/\sqrt{Hz}$	$V^2_n = 4kTr\Delta f$
Output Voltage	DC 5Hz	170 30	210 35	250 40	V_S	μV RMSμV	$H = 325\mu W/cm^2$ $H = 146\mu W/cm^2$
Responsivity	(500K,DC,—) (500K,5,1)	21.8 8.6	26.9 10 0	32.1 11.4	R	V/W	$R = V_S/HA$ (Note 1)
NEP	(500K,DC,—) (500K,5,1)	0.4 1.1	0.5 1.4	0.7 1.8	NEP	$nW/\sqrt{Hz}$	$NEP = V_nHA/V_S$
D*	(500K,DC,—) (500K,5,1)	2.2 0.8	3.0 1.1	4.0 1 5	D*	$10^8 cm\sqrt{Hz}/W$	$D^* = V_S/V_nH\sqrt{A}$
Time Constant	Blackbody		40		τ	mS	Chopped 3dB (Note 2)
Element Matching			5	10	M	%	$M=\lvert V_A-V_B\rvert/V_B$ (Note 2)

NOTE 1: A is detector area in cm^2.
2: Parameter is not 100% tested, 90% of all units meet these specifications.

DEXTER RESEARCH CENTER, INC.
7300 Huron River Drive/Dexter, Michigan 48130/(313) 426-3921/Telex: 757075

PHYSICAL CHARACTERISTICS

Number of Junctions:	50 per element
2 Element Total·	100
2 Sensitive Areas:	4 mm X 0.6 mm each
Separation:	1.4 mm along 0.6 mm dimension
Package:	TO-8 type with 3 leads
Window Materials:	KBr or Ge substrate
Encapsulating Gas.	Argon or Nitrogen
Field of View:	120° with Ge, 80° with KBr

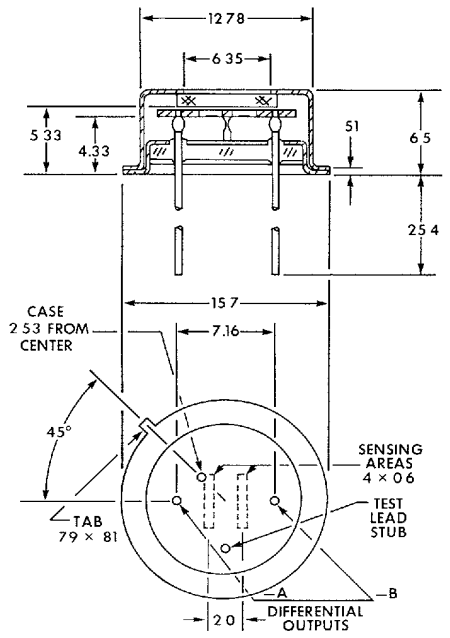
OPERATING CONDITION

Temperature Range:	−50°C to +85°C
Maximum Incidence:	0.1 Watts/cm^2
Spectral Response:	Flat from UV to far IR
Signal Output:	Linear from 10^{-6} to 10^{-1} Watts/cm^2

RECOMMENDED WINDOW MATERIALS

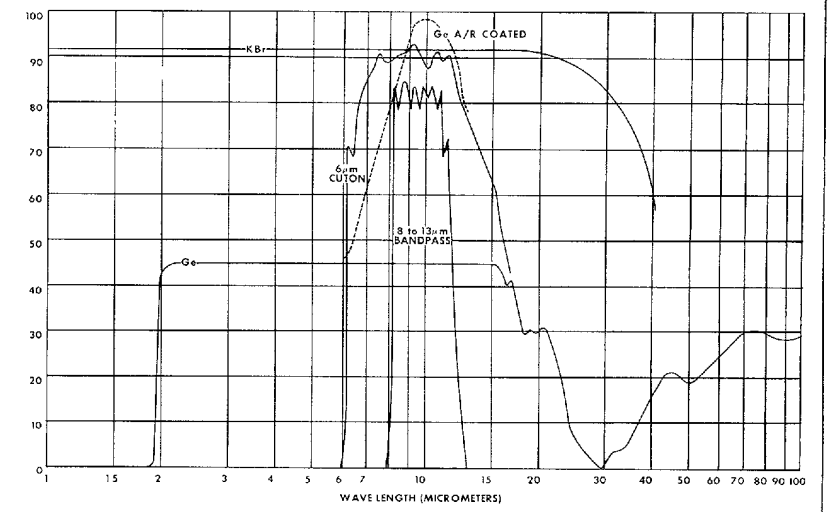
Low Cost.	KBr
Reject Visible·	Ge
Improved Response:	6 μm Cuton
Outdoor.	8 to 13 μm Band Pass

DETECTOR DIMENSIONS

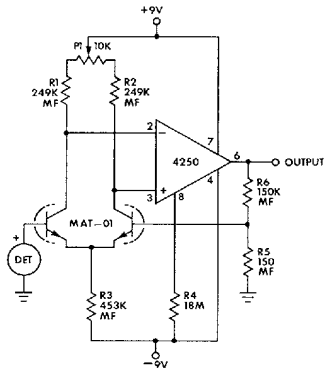


BASE VIEW Dimensions in millimeters

TYPICAL TRANSMISSION OF FIVE WINDOW MATERIALS FOR 1MM THICKNESS

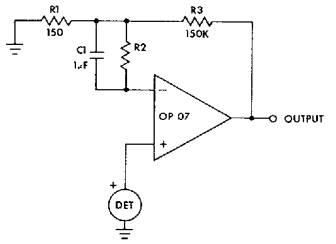


MICRO POWER AMPLIFIER



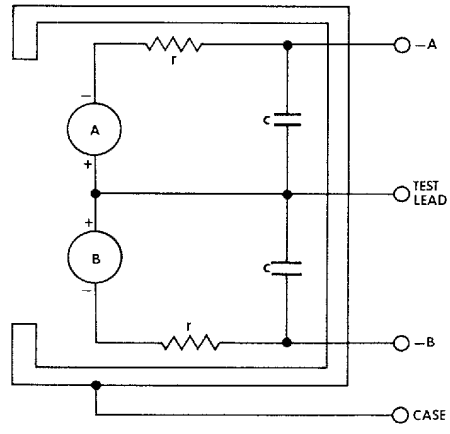
MAT-01 AVAILABLE FROM PRECISION MONOLITHICS INC
MF REPRESENTS METAL FILM RESISTOR

COMMON AMPLIFIER



R2 IS SELECTED TO MATCH DETECTOR RESISTANCE
OP-07 AVAILABLE FROM PRECISION MONOLITHICS INC

EQUIVALENT CIRCUIT



r IS DETECTOR RESISTANCE
c IS THERMAL CAPACITANCE