WILTRONICS

ABN 26 052 173 174

RPY97
DUAL ELEMENT PYROELECTRIC INFRARED DETECTOR

This is an infrared sensitive device specifically intended for battery operated passive infrared movement sensors such as intruder alarms and light switches. It has differentially connected dual elements which provide immunity from common mode signals such as those generated by variations in ambient temperature, background radiation and acoustic noise. The wide separation of the elements makes this detector compatible with most optical systems. The dual elements are combined with a single impedance converting amplifier, which is specially designed to function from low voltage supplies with low current consumption. The detector will give an output signal only when the radiation falling on the elements is unbalanced, as in a focused system. It is sealed in a low profile TO-5 can with a window optically coated to restrict the response to wavelengths greater than 6.5 μm.

QUICK REFERENCE DATA

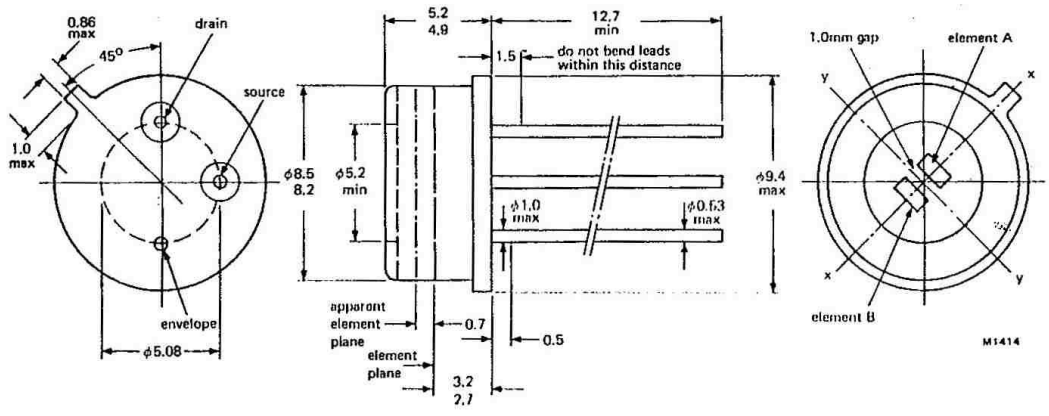
Spectral Response		6.5 ± 0.5 to >14	μm
Responsivity (10 μm, 10), each element (see circuit 1)	typ.	150	VW^{-1}
Responsivity (10 μm, 10), each element (see circuit 2)	*typ.*	*720*	VW^{-1}
Noise Equivalent Power (N.E.P.) (10 μm, 10, 1), each element	typ.	2.5×10^{-9}	$WHz^{-½}$
Noise, peak-to-peak (bandwidth 0.5 Hz to 5 Hz)	typ.	22	μV
Element dimensions, each element	nom.	2.1 X 0.9	mm
Element separation	nom.	1.0	mm
Field of View in horizontal plane (x-x)	typ.	130	degrees
Operating voltage	min.	3	V
Optimum operating frequency range		0.1 to 20	Hz

This data must be read in conjunction with GENERAL SAFETY RECOMMENDATIONS–OPTOELECTRONIC DEVICES

MECHANICAL DATA

Dimensions in mm

SOT-49H (TO-5 variant)



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PRODUCT SAFETY

Modern high technology materials have been used in the manufacture of this device to ensure high performance. Some of these materials are toxic in certain circumstances. Mechanical or electrical damage is unlikely to give rise to any hazard, but toxic vapours may be generated if the device is heated to destruction. In the United Kindom disposal of large quantities should therefore be carried out in accordance with the Deposit of Poisonous Waste Act 1972 and the Control of Pollution Act 1974, or with the latest legislation.

SOLDERING

1. When making soldered connections to the leads, a thermal shunt should be used.
2. It is essential that any mains operated soldering iron used should be both screened and earthed. Failure to observe these precautions may lead to the introduction of line voltages and possible damage to the device.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134).

Supply voltage	max.	30	V
Temperature, operating range		−40 to +70	°C
Temperature, storage range		−55 to +85	°C
Lead soldering temperature, ⩾ 6 mm from header, t_{sld} ⩽ 3 s max.		+350	°C

OPERATING CONDITIONS

	min.	max.	
Voltage (operating note 5)	3	10	V
Frequency (operating note 5)	0.1	20	Hz

OPERATING NOTES

1. The case potential must not be allowed to become positive with respect to the other two terminals.
2. It is inadvisable to operate the detector at mains related frequencies.
3. To avoid the possibility of optical microphony, the detector must be firmly mounted.
4. An increase in temperature of element A will produce a positive going signal at the output. For element B, the corresponding output will be negative going.
5. The detector will operate outside the quoted range but may have a degraded performance.
6. Before testing, due to the high sensitivity of these detectors, care must be taken to ensure that the devices are allowed to become thermally stable.

CHARACTERISTICS (at T_{amb} = 22 °C ± 3 °C and with recommended circuit 1).

		min.	typ.	max.	
Spectral Response		6.5 ± 0.5	–	> 14	μm
Responsivity* (10 μm, 10)	note 1	95	150	–	VW^{-1}
Responsivity (10 μm, 10)	*note 5*	–	*720*	–	VW^{-1}
N.E.P. (10 μm, 10, 1)	note 1	–	2.5×10^{-9}	–	$WHz^{-½}$
*Element matching**	*note 2*	–	–	± 20	%
Noise*, peak-to-peak (bandwidth 0.5 Hz to 5 Hz)	note 4		22	50	μV
Field of View (x-x plane, total angle)	note 3	–	130	–	degrees
Quiescent current		–	10	–	μA
Element dimensions			2.1 × 0.9 nominal		mm
Element separation			1.0 nominal		mm

*These parameters are 100% tested with statistical sample quality inspection.

FET Characteristics (at T_{amb} = 22 °C ± 3 °C)

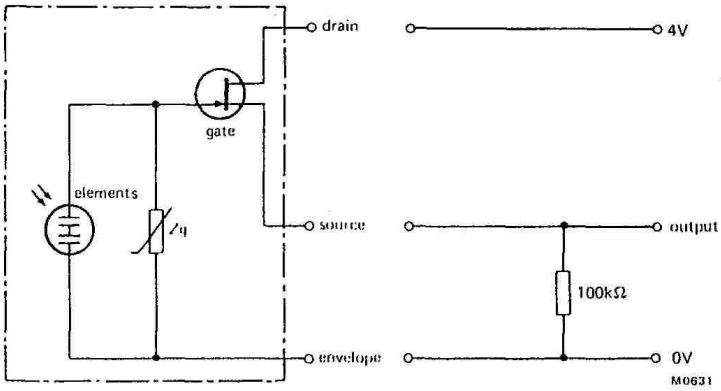
		min.	typ.	max.	
Gate-Source Cut-off Voltage I_D = 0.1 μA, V_{DS} = 6 V	$V_{(P)GS}$	−1.2	–	−0.5	V
Transfer Conductance V_{GS} = 0, V_{DS} = 6 V, f = 1.0 kHz	g_{fso}	1.3	–	–	mAV^{-1}

Notes

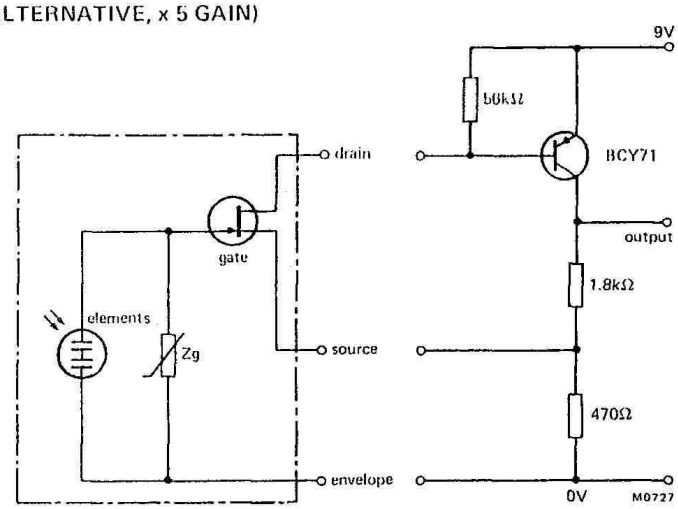
1. Each element. These characteristics apply throughout the spectral response range.
2. With both elements irradiated, the matching of the element signals is derived from:–

   $\frac{\Delta S}{½ (S_A + S_B)} \times 100$, where S_A and S_B are the signals of the two elements and ΔS is the signal with both elements irradiated.
3. Field of view to 50% of the maximum signal level.
4. Using low noise filter with 3 dB bandwidth and roll off at 12 dB per octave. Detectors tested for 1 minute under stable electrical and thermal conditions; see operating note 6.
5. The RPY97 has been specifed in conjunction with a source follower circuit with a typical gain of 0.9. For comparison with the older type dual element detectors, the alternative circuit shown on page 4 should be used. This explains the difference in responsivity levels.

CIRCUIT 1 (RECOMMENDED)



CIRCUIT 2 (ALTERNATIVE, x 5 GAIN)



DEFINITIONS

1. Responsivity VW^{-1}
   This is the ratio of the r.m.s. signal in volts to the r.m.s. value of the incident, chopped radiant power. The published values of responsivity are qualified by figures in brackets, for example (10 μm, 10). The 10 μm denotes the wavelength of the infrared radiation generating the signal voltage, while the 10 indicates that the radiation is chopped at a frequency of 10 Hz.

2. Noise Equivalent Power (N.E.P.) $WHz^{\frac{1}{2}}$
   This is the r.m.s. value of the incident, chopped radiant power necessary to produce an r.m.s. signal to r.m.s. noise ratio of unity. The r.m.s. noise refers to the value calculated for unit square root bandwidth $VHz^{\frac{1}{2}}$. As with responsivity the relevant test conditions must be specified, for example (10 μm, 10, 1). The 10 μm is the wavelength of the incident radiation, 10 is the chopping frequency in Hz, and 1 is the bandwidth in Hz.

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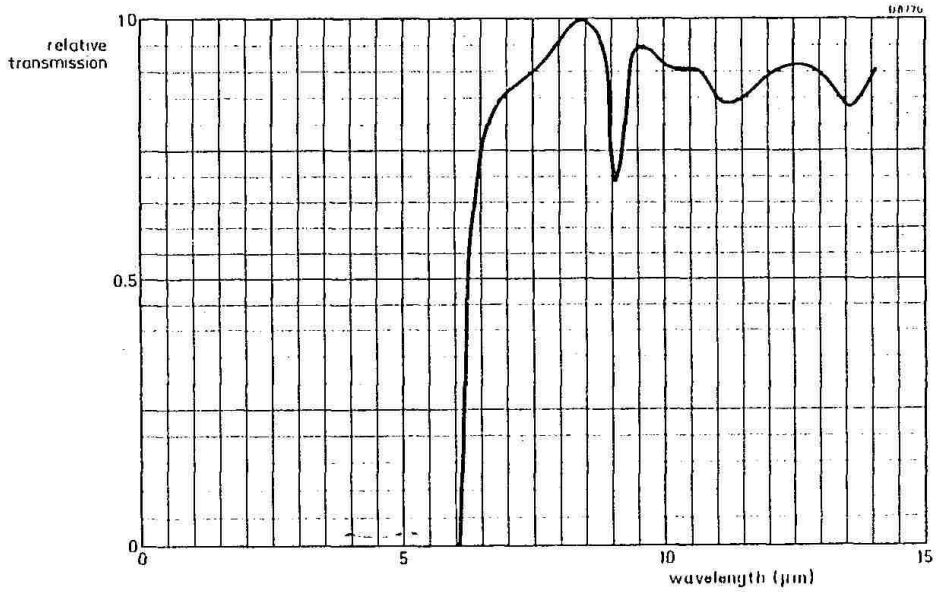
MECHANICAL AND ENVIRONMENTAL STANDARDS

As part of the Quality Assurance programme, the detectors are assessed at regular intervals against the requirements of the following IEC standards. The frequency of testing and the limits and conditions for the pre- and post-test measurements are based on those stipulated for the CECC 50 000 series of approved transistors.

	Test		Severity	Duration	Note
IEC 68-2-3	Ca	Damp Heat, steady state	+40 °C, 95% RH	168 hours	1
68-2-20	Ta	Solderability	+235 °C, 1.5 mm from header	5 seconds	1
68-2 21	Ub	Lead Fatigue	4 cycles		1
68-2-1	Aa	Low Temperature Storage	−55 °C	2000 hours	2
68-2-2	Ba	High Temperature Storage	+85 °C	2000 hours	2
68-2-14	Nb	Change of Temperature	−55 °C to +85 °C	10 cycles	2
68-2-6	Fc (B4)	Vibration, swept frequency	125 Hz to 2 kHz 196 ms^{-2}	2 h in each orientation	2
68-2-7	Ga	Acceleration, steady state	196000 ms^{-2}	60 seconds	2
68-2-27	Ea	Shock	14700 ms^{-2}	3 pulses 6 orientations	2
68 2 20	Tb	Resistance to Solder Heat	+350 °C, 6 mm from header	3 seconds	3

Notes

1. The detectors are checked on a production batch release principle at approximately weekly intervals. This is equivalent to Group B.
2. The detectors are checked at quarterly intervals. This is equivalent to Group C.
3. This is an annual check.



Typical normalized window transmission characteristic

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