



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



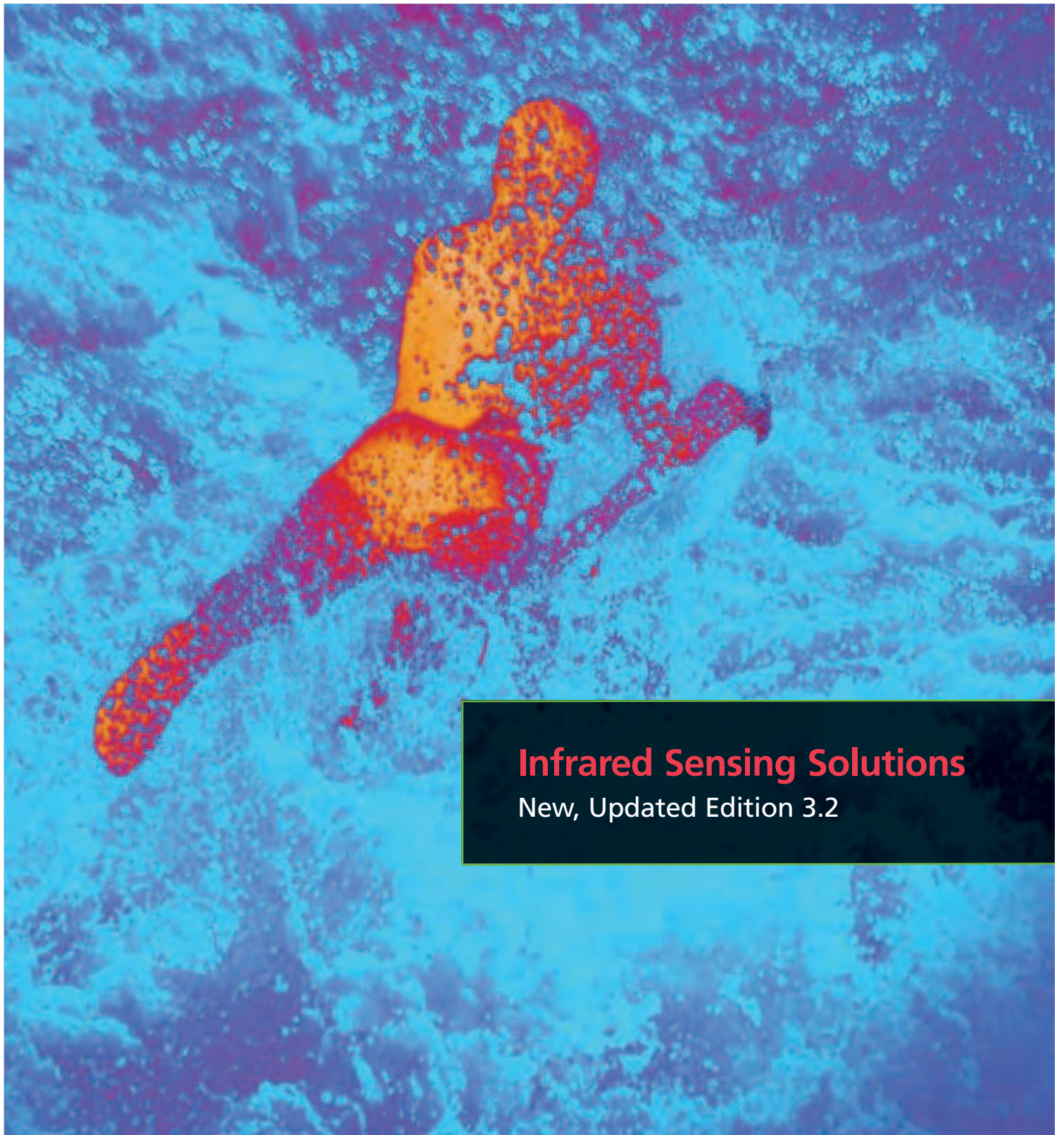
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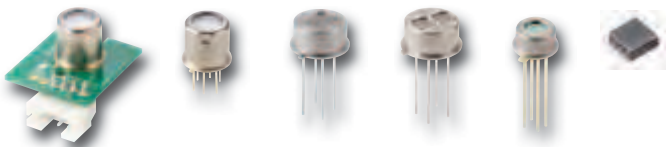
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Infrared Sensing Solutions

New, Updated Edition 3.2



For Motion and Presence Detection,
Temperature Sensing, Gas Detection
and Energy Conservation.

EXCELITAS
TECHNOLOGIES®

Infrared Sensing Technologies

For Your Cutting-edge Applications.

Excelitas' infrared sensing technologies are playing a vital role in creating a healthier, cleaner and safer tomorrow. Excelitas has gained worldwide recognition for the design and production of high-performance pyroelectric detectors, thermopile detectors and sensor modules which – every day – contribute to safeguarding homes, saving energy, and providing comfort. From motion and presence detection to gas detection, thermometry and indoor climate control applications, Excelitas' IR sensing technologies and growing IR product range are meeting your challenges. We are sensing what you need for your cutting-edge applications.

Sensing what you need – from motion sensors for secure homes to gas detection systems, indoor climate control systems and ear thermometers.

Our Infrared Sensing Solutions provide:

- Excellent performance
- Strong reliability
- Innovative features

We support our products with:

- Applications – expertise
- Suitable features and functions
- Special optical filters for gas sensing

■ **WORLDWIDE COMMITMENT TO YOUR CHALLENGES**

You can depend on Excelitas' world-class global network of production, R&D, and distribution centers including Montreal, Canada; Wiesbaden, Germany; Singapore; Batam, Indonesia; and Shenzhen, China. We have customer service hubs on each continent to ensure just-in-time delivery. We believe in forging a collaborative partnership in which we are communicating proactively with you and refining our forecasts of your requirements to better serve you.

We have the detection technologies and capabilities needed to enhance and accelerate your OEM designs. Our R&D groups are focusing on new products and capabilities for your new and emerging applications. We pride ourselves on deep applications expertise to respond to and anticipate your detection requirements. Feel confident that you can discuss your requirements with our engineers. We thrive on addressing your challenges and will always try to provide you with sincere assistance based on our know-how and experience.

■ **UNPARALLELED QUALITY**

The consistent quality of our products is the foundation for which we build our relationship with you. The global adoption of our detectors in a host of consumer products as well as medical, industrial and commercial applications is testimony to our quality commitment and to your confidence in us.

We implement cutting-edge quality assurance system and measures; SPC and reliability testing are standard procedures at Excelitas. Of course, everything begins with the quality of our raw materials. Inspection procedures transcend all processes and conclude with 100% final inspection for all major parameters. We maintain our certification to major quality and environmental standards, which are subject to regular audits. All of our factories have received certifications for ISO 9001, OHSAS 18001, NLF/ILO-OSH 2001.

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Sensing for your daily life

1 2

Home Appliances Applications

Our infrared components enable healthy and safely food processing in microwave ovens, electric cooking hobs, toasters, refrigerators and exhaust huts.



3 4 5 6

Indoor Home Comfort and Security

Our Infrared Detectors monitor presence, switch lights, control Room Air Condition Systems and trigger Intrusion Alarms, contributing to both more secure homes and energy savings.

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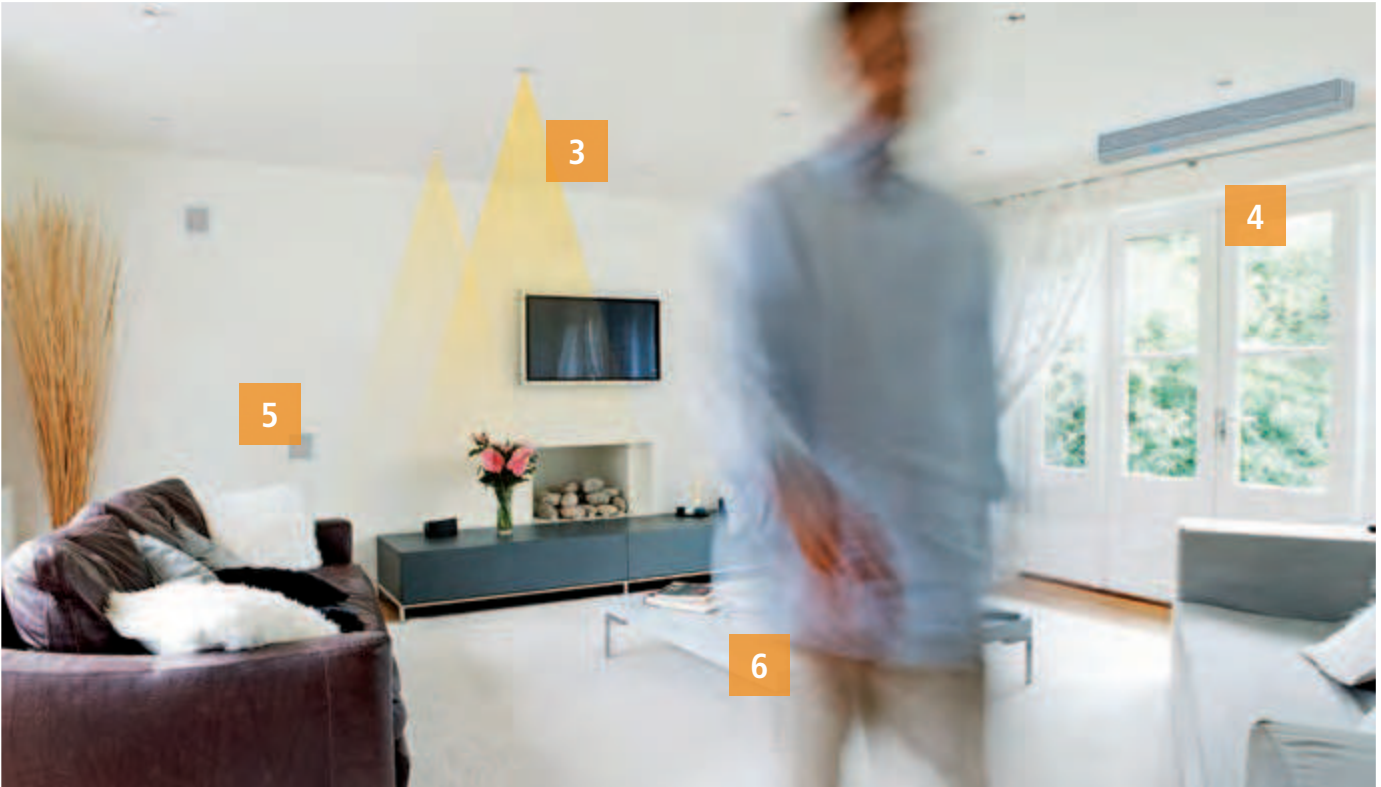
Thermometry for Healthier Families

Excelitas infrared detectors are used in popular Ear Thermometers and Forehead Thermometry. Our products are also applied in Pyrometry and non-contact measurement systems to instantly determine temperatures at a distance.

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Energy Conservation and Safety

Public places, parking lots and public buildings consume a lot of energy. Our detectors for presence detection are making environments safer, more secure and contribute to reduce energy waste and reduce carbon dioxide emissions to the environment.



Selection Guide – Infrared Sensors

Application	Model	Requirements	Feature	Comments	Page
Simple Motion Detection	PYD 1096	All in 1 electronics	Dual Element	smart DigiPyro®	12
Simple Motion Detection	PYD 1098	All in 1 electronics	Dual Element	smart DigiPyro®	13
Simple Motion Detection	PYQ 1048	All in 1 electronics	Four Element	smart DigiPyro®	13
Simple Motion Detection	PYQ 1046	All in 1 electronics	Four Element, add time & light set	smart DigiPyro®	12
Intrusion alarm	LHI 968	RF Immunity	Dual Element	analog standard	14
Intrusion alarm	PYD 1398	White Light Immune	Dual Element	analog	14
Intrusion alarm	LHI 1148	Dual channel	Four Element	analog	15
Intrusion alarm	PYD 1798	EMI protected	High End Dual	DigiPyro®	21
Intrusion alarm	PYQ 2898	Four Element "Quad"	(2+1) Channel incl.Tref	DigiPyro®	23
Motion Detection	LHI 778	low cost	Dual Element	analog	16
Motion Detection	PYQ 1748	Ceiling Mount	Dual Element	DigiPyro®	23
Motion Detection	PYD 1688	Low Power	Dual Element	DigiPyro®	24
Motion Detection	PYD 1698	Low Power	Dual Element	DigiPyro®	24
Motion Detection	PYQ 1648	Ceiling Mount, Low Power	Dual Element	DigiPyro®	25
Motion Detection	LHI 878	Standard	Dual Element	analog	16
Motion Detection	LHI 874	Standar, low profile	Dual Element	analog	17
Motion Detection	PYD 1388	RF Immunity	Dual Element	analog	16
Motion Detection	LHI 944	large Field of View	Dual Element, low profile	analog	17
Motion Detection	PYD 1394	RF Immunity, Field of View	Dual Element, low profile	analog	17
All Motion Detection	PYD 1788	RF Immunity	Dual Element	DigiPyro®	21
Presence Detection	LHI 1128	Wide field of View	Four Element, single channel	analog standard	18
Presence Detection	PYQ 1348	RF Immunity	Four Element, single channel	analog standard	18
PresenceDetection	PYQ 1398		Four Element, single channel	analog standard	18
Presence Detection	PYQ 5848	RF Immunity, Digital	Four Element,	DigiPyro®	23
PresenceDetection	PYD 5190	SMD housing	Dual Element	analog	20
Presence Detection	PYD 5790	SMD housing	Dual Element	DigiPyro®	20
Gas Detection	PYS 3798	Narrow band filter	(1+1) Channel	DigiPyro®	28
Gas Detection	PYS 3828	2 Narrow band filters	(2+1) Channel with Tref	DigiPyro®	29
Gas Detection	LHI 807 TC	Narrow band filter	Single Channel	analog	26
Gas Detection	PYS 3428 TC	2 Narrow band filters	RF protection	analog	27
Gas Detection	TPD 1T 0625	Narrow band filter	Single Channel	Thermopile	30
Gas Detection	TPD 2T 0625	2 Narrow band filters	Dual Channel	Thermopile	31
Gas Detection	TPD 1T 0223	Narrow band filters	Single Channel	small housing	34
Gas Detection	TPD 1T 0623	Narrow band filters	Single Channel	small housing	34
Non-contact Measurement	TPID 1S 0222	SMD Housing	SMD Housing	isothermal	36
Thermometry	TPID 1T 0224	high S/N ratio	round Aperture, Thermistor	isothermal	32
Thermometry	TPID 1T 0624	high S/N ratio	round Aperture, Thermistor	isothermal	32
Thermometry	TPD 1T 0122		round Aperture, Thermistor	small housing	32
Thermometry	TPID 1T 0122B	excellent Thermal shock perf.	round Aperture, Thermistor	isothermal	35
Thermometry	TPID 1T 0222B	excellent Thermal shock perf.	round Aperture, Thermistor	isothermal	35
Non-contact Measurement	TPD 1T 0226 IRA	small target area	integral optics	isothermal	33
Non-contact Measurement	TPID 1T 0226 L5.5	small target area	integral optics	isothermal	33
Non-contact Measurement	TPIS 1S 0133	integrated Signal processing	SMD Housing	fully calibrated	37
Non-contact Measurement	TPIS 1T 0134	integrated Signal processing	round Aperture	fully calibrated	42
Non-contact Measurement	TPIS 1T 0136 L5.5	integrated Signal processing	integral optics	fully calibrated	42
Non-contact Measurement	TPS 1T 0136 IRA	integrated Signal processing	integral optics	fully calibrated	42
Non-contact Measurement	TPiM 1T 0134 L5.5	integrated Signal processing	pcb w connector	fully calibrated	44
Non-contact Measurement	TPIS 1T 1252B			DigiPile	38
Non-contact Measurement	TPIS 1T 1254			DigiPile	38
Non-contact Measurement	TPIS 1T 1256 L5.5			DigiPile	38
Non-contact Measurement	TPIS 1S 1252			DigiPile	40
Non-contact Measurement	TPIS 1S 1051			DigiPile	40
Non-contact Measurement	TPM 1T 0134 P(x) M(y)	integrated Signal processing	pcb w connector	fully calibrated	44

Infrared Basics

Infrared Basics

All solid bodies when having temperatures above the absolute zero (-273 C) emit electromagnetic waves. The range of longer wave lengths beyond the visual spectrum is referenced as infrared radiation. The scientist Wilhelm Wien (1864–1928) has described the relation between a solid body's temperature and its emitting peak wave length by following equation:

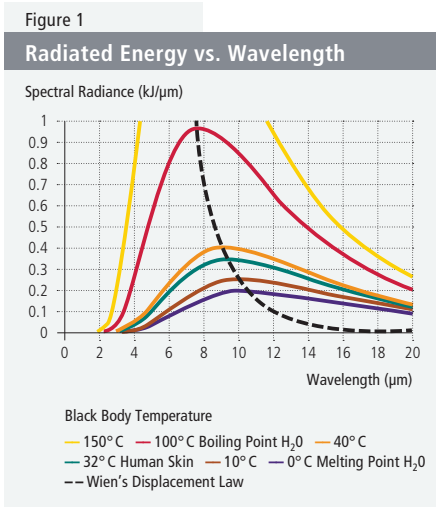
$$\lambda_{\max} = 2898 / T$$

T = Temperature in K (Kelvin)

λ = Wavelength in μm

Using this law we can calculate the specific peak emission wave length of any material or body: A human body, of a surface temperature of approx. 35°C or 308 K calculates into a peak wavelength of 9,4 μm ; a cat of 38°C temperature into 9,3 μm . According to Max Planck (1858 – 1947) the intensity curve of all emitted wave lengths for a solid body is rather broad. For our example above this means we cannot distinguish human from the cat by their infrared spectrum.

For various temperatures of an ideal black body radiator the intensity curves of radiated energy versus wave length are shown below.



A hot body of 2000 K emits a lot of energy, some in the visible light range, some in the infrared (it glows red or white-hot). A body of 500 K emits radiation in the invisible part of the spectrum, the infrared range, which we can feel, but not see.

Infrared Detectors

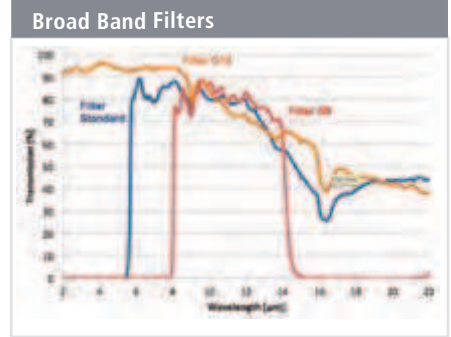
With detectors for the infrared spectrum there are two major classes by their physical principles: Photon Detectors and Thermal Detectors. Photon detectors convert radiation directly into electrons, Thermal Detectors receive radiation, transfer it to raising temperature of the sensing material which changes it's electrical property in response to the temperature rise. Photon detectors such as Photodiodes and Phototransistors range from visible to near infrared, Thermal Detectors have a broad response from below visible light up to over 100 μm . Fitted with special infrared windows as spectral filters they work in the mid to far infrared range without ambient visible light interference.

Filters for Infrared Sensors

The spectral sensitive range of the detectors is defined by a filter window. Common applications in infrared reference wavelengths from 2 to 20 μm . Infrared windows for pyrometric applications are defined for the atmospheric window 5-14 μm , which is our standard filter window. Long range pyrometers apply a sharp cut-on/cut-off window of 9-14 μm (G9) as per fig.2.

For the special application of Gas sensing by infrared absorption we offer narrow band filters to detect specific gas absorption lines. The appropriate narrow band optical filters enable detection of Carbon Monoxide, Carbon Dioxide, Natural Gas and other environmental gases, as well as some technical gases.

Figure 2



In Fig.2 we show the graph for standard infrared window and the pyrometric window "G9". As to narrow band Infrared filters, the range of available filters and specifications is given in Table 1 below:

Optical Properties

With respect to optical parameters of Detectors and Sensors, there are some interesting items to be mentioned: the optical bandwidth, transmission and blocking characteristics of the optical filter and, as major selection criteria, the sensor field of view, and performance of the detector within the field of view. The corresponding charts are given for the various sensors and types.

Table 1

Narrow Band Filters

Filter Type	Application	CWL	HPB
G1	CO	4.64 μm	180 nm
G2	CO ₂	4.26 μm	180 nm
G2.2	CO ₂	4.43 μm	60 nm
G2.5	CO ₂	4.33 μm	160 nm
G2.6	N ₂ O	4.53 μm	85 nm
G3	CO+CO ₂	4.48 μm	620 nm
G4	NO	5.3 μm	180 nm
G5	HC	3.35 μm -3.4 μm	190 nm
G5.1	HC	3.46 μm	163 nm
G5.2	HC	3.28-3.31 μm	160 nm
G5.3	HC	3.09 μm	160 nm
G5.5	HC	3.32-3.34 μm	160 nm
G5.6	HC	3.42 μm -3.451 μm	160 nm
G5.7	HC	3.30-3.32 μm	160 nm
G5.9	HC	3.375 μm -3.4 μm	190 nm
G7.1	R12	11.3 μm	200 nm
G7.2	R134a	10.27 μm	210 nm
G7.3		12.4 μm	180 nm
G20	Reference	3.95 μm	90 nm

Pyroelectric Infrared Detectors

Pyroelectric Effect

Since ancient times the pyroelectric effect has been known as a property of ferroelectric materials. It is based on a specific behavior of dielectric materials, the phenomenon of a permanent electrical polarization. When changing temperature of such materials, this polarization will increase, or decrease, we observe a charge displacement.

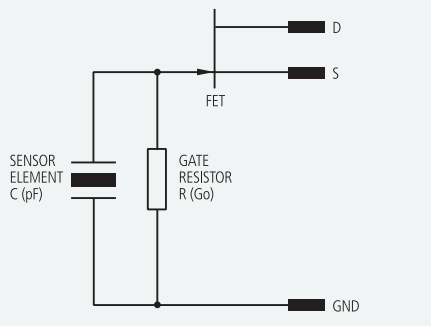
This pyroelectric effect is the basic principle for detectors that can recognize temperature variations. The characteristic value for the permanent polarization, called pyroelectric coefficient, disappears above the Curie point. The Curie temperature limits the operation temperature range for such detectors. Pyroelectric detectors do not require cooling.

Detector Design

Within our detectors, a thin slice of pyroelectric material is fitted with electrodes to form a capacitor. Incoming radiation will generate extremely low levels of thermal energy, so the pyroelectric current flow is rather small. It needs a circuit to convert this small current into a convenient signal. The traditional analog detectors apply a high ohmic resistor and a special low-leakage current FET to transform the high impedance of the detector material to a common output resistance. The pyroelectric element's capacitance and the high gate resistance of the FET form a RC circuit with a time constant of approx. 1 s., which makes the detector suitable for very low frequencies.

Figure 3

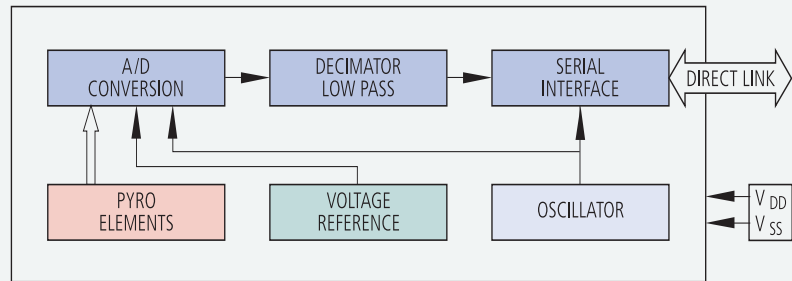
Electrical Configuration



Excelitas is the first to having introduced digital technology to Pyroelectric Detectors with its DigiPyro® family. Here, a special ADC circuit provides amplification, A/D conversion and interfacing to the outside electronics.

Figure 4

DigiPyro®



Detector Construction

The pyroelectric material is placed on a special pc-board which provides thermal and mechanical isolation for the delicate pyroelectric material and provides space for the gate resistor and the FET. The connections are made either by wire bonding or conductive bonding. The whole pc-board is placed on to a TO header and closed with a TO cap, which has the relevant optical filter window. The window possesses a special infrared transmission characteristic, selected for the detector application.

Pyro Characteristics

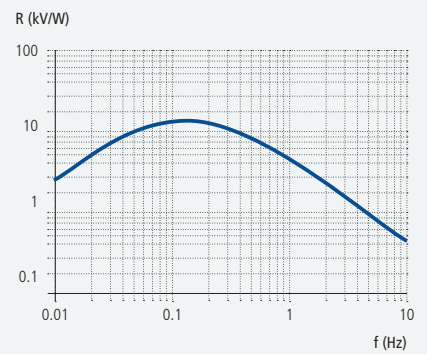
The most important electrical data of the IR-Sensor are its responsivity, balance and noise. Sometimes it is also useful to refer to NEP or D^* .

Responsivity

The responsivity shows bandpass characteristics with a maximum at approx. 0.1 Hz radiation modulation. A typical curve „responsivity versus frequency“ is indicated below as figure 5. Responsivity is measured in V/W by means of a defined black body radiator. Responsivity refers to the active sensor area and is usually tested at 1 Hz modulation frequency unless specified differently.

Figure 5

Transfer Function



Balance

The balance of a dual element detector indicates the common mode rejection also called matching between the two elements. It is an important value for the performance of dual element detectors, applied in motion applications, as it is a measure for distinction between moving and fixed objects. It can be specified either in V/W or in % of Responsivity.

Noise

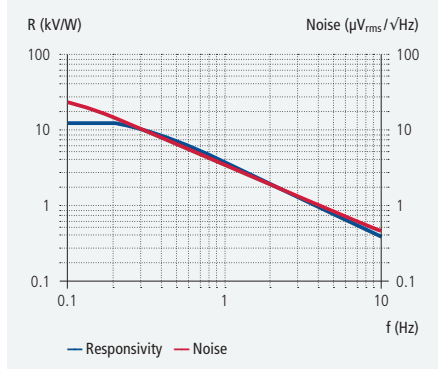
The noise of the sensor consists of three parts: The basic thermal noise of the sensing material, the (Johnson) noise of the high ohmic resistor and the input noise of the FET. The total output of these three parts is rather stable for temperatures below 40°C. Above this temperature, noise increases exponentially with temperature as can be observed with typical active electronic components. Noise is given in μV peak-to-peak or zero-peak. Similar to the dependence of responsivity on frequency, the noise values decrease with frequency from approx. 0.15 Hz to 50 Hz.

NEP, D*

The NEP value is a form of signal to noise ratio. The NEP value specifies the minimum radiation power that can be detected by the sensor, resulting in an output that just exceeds the noise. NEP refers to RMS values of signal and noise and in addition to the electrical bandwidth. The lower the NEP, the better the sensor is.

Sometimes also used for comparison of sensors, the Specific Detectivity (D^*) allows the characterization of sensing materials. It is defined as reciprocal of NEP referring to the sensor area. Details of these parameters as function of the electrical frequency are given in Figure 6.

Figure 6

Responsivity, Noise vs. Frequency**Operating conditions**

The storage and operating temperature range of the detectors is specified from -40°C up to $+85^{\circ}\text{C}$. It needs to be noted that technical data usually reference room temperature and may vary within the specified temperature range.

Digital Pyrodetectors – a New Family

Pyroelectric detectors are AC type devices and give signals upon change of received Infrared radiation. Until today, all available detectors are analogue, i.e. they provide an analogue signal output. Excelitas is the first to introduce a family of detectors which differ from previous generations by offering a digital signal output.

With the DigiPyro® family Excelitas is offering digital Detectors for all these applications and configurations.

1.1 Integrated Electronics

The DigiPyro® series integrates the first stages of circuitry into the detector housing: Amplification of the signal, then the A/D conversion, which needs a voltage reference. Following an internal 10 Hz electrical low pass filter the serial interface provides for the “direct link” communication which is a one wire bidirectional communication feature. The whole concept is running by its own internal oscillator, which determines the speed of the internal process. The direct link feature enables the user to have the host μC request the information and its resolution, so the host controls the communication speed.

1.2 From Analog to Digital

The DigiPyro series is the first pyroelectric detector family to display information in Bit form as opposed to μV signals of analogue detectors.

To give a measure for comparisons of traditional detectors to digital versions, the rule of thumb for signal levels versus bit information can be used:

- Resolution: 1 LSB \triangleq 6.5 μV
- Noise: 6 Count \triangleq 39 μV (with band-pass)
- DC Offset 8192 Counts
- Digital Range: 0 to 16383 Counts

In a typical motion electronic application the expected signal voltages range from 100 μV to 500 μV , so the digital signal may range about 100 bit-count on to the offset. The dynamic range of the digital detector comprises the range from 511 counts to 15873 counts and with this it is wider than the most application based signal levels. Outside of this range the detectors offers an Out-of-Range Reset function.

1.3 Digital Zero Signal Line

As the pyroelectric effect generates positive and negative signal amplitudes, the detector circuitry needs an electrical offset to be able to process such signals. In all analog circuitry this value is the offset voltage, which is usually subtracted after the first amplifier stage.

With DigiPyros, the amplification is included already, and the internal voltage reference provides for the required offset. As to the user this offset appears as a digital zero line at about 8000 bit-count, it may vary in series from one part to the next. To recognize the zero line of

the individual detector, the user may either use a digital band-pass or subtract the measured offset from the signal.

1.4 The Host Needs to Filter The Signal

The DigiPyro does not include any processing intelligence inside, unlike most analog Pyrodetectors the DigiPyro uses a direct communication with the hosting microcontroller without any analog hardware filtering (only the previously mentioned low-pass filter). Thus it becomes necessary to implement all necessary filtering by software filters within the hosting microprocessor of the unit.

Applications for Pyroelectric Detectors

Pyroelectric detectors had originally been designed as single element types for non-contact temperature measurement. During further research, dual element types were developed with multi-facet mirrors or Fresnel lenses entering the field of motion detection, starting as passive intrusion alarm (Burglar Alarm, PIR), followed by automatic light switches and security lights and lamps. The same concept is also applied with some automatic door openers.

Today the Environment and its protection is one of our most serious concerns. Features and instrumentation are required to measure and monitor all kinds of gas in our environment. One of the methods applied is the NDIR technique, a principle of measuring gas concentration by its absorption properties in the infrared range. Our detectors and sensors are a vital part of making our environment more safe, secure and healthy.

Most of PIR Motion detecting devices have been designed around Dual Element types, more advanced units apply Four Element “Quad” type configurations.

For Gas Sensing single element with narrow band filters are applied in single or dual channel configuration.

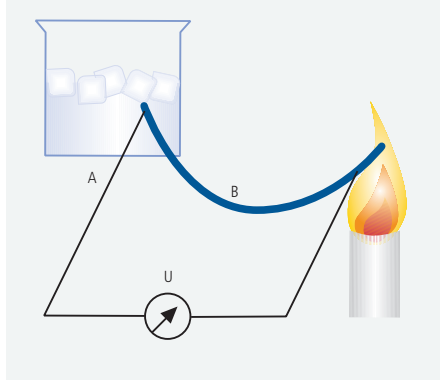
Thermopile Detectors and Sensors

The Thermoelectric Effect

The thermoelectric effect today is known as reverse to the Peltier- (or Seebeck-) effect. By applying a temperature difference to two junctions of two dissimilar materials A and B, a voltage U which is proportional to the temperature difference is observed.

Figure 7

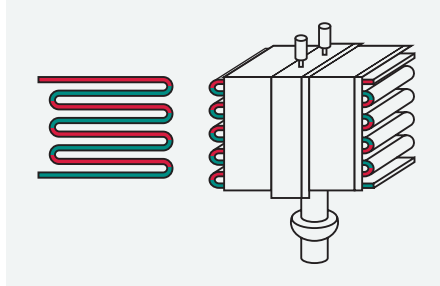
The Seebeck Effect



Leopoldo Nobili (1784 - 1835) first used the thermoelectric effect for IR radiation measurement using a "pile" of Bismuth and Antimony contacts.

Figure 8

Nobili's Thermopile



The measure of this effect is called the thermoelectric- or Seebeck- coefficient. For most conducting materials this coefficient is rather low, only few semiconductors possess rather high coefficients. Since the voltage of a single thermoelectric cell is very low, lots of such cells arranged in a series connection achieve a larger signal, making a "pile" of thermo-elements.

Excelitas Thermopile Design

Our thermopile sensors are based on the technology of Silicon Micromachining. The central part of a silicon chip is removed by an etching process, leaving on top only a 1 μm thin sandwich layer (membrane) of $\text{SiO}_2/\text{Si}_3\text{N}_4$, which has low thermal conductivity. Onto this membrane thin conductors of two different thermoelectric materials (to form thermocouples) are deposited. Both conductors have alternatively junctions in the centre of the membrane (hot junctions) and on the bulky part of the silicon substrate (cold junctions). A special IR-absorption layer covers the hot junctions creating the sensors sensitive area.

When exposed to infrared radiation, the absorbed energy leads to a temperature difference between "hot" and "cold" contacts. According to the thermoelectric coefficient of the thermocouples a signal voltage is generated.

The Thermopile Construction

The sensor chip is mounted in good thermal contact on to a TO header. A transistor cap with infrared filter is sealing the sensor chip from the environment.

Excelitas's product portfolio includes detectors of various sizes, housings and infrared windows, and integrated sensors which include electronics that provide temperature compensation and calibration to a certain measurement range.

Excelitas offers unique constructions to deal with the thermal shock, referenced as ISO-thermal types.

Advantages

Thermopile Detectors do not require any mechanical chopper to sense infrared, thus they offer simple design possibility to infrared measurements.

Thermopile Characteristics

The most important properties of the Thermopile Sensor are it's responsivity, noise, field of view response time, and for calibrated Sensors the temperature range.

Responsivity

The responsivity shows low pass characteristics with a cut off at approx. 30 Hz.

Responsivity is measured in Volt per Watt by means of a defined black body radiator. Responsivity data usually quote with respect to the active detector area, and are given without the infrared filter. The data show a responsivity value, tested at 1 Hz electrical frequency.

Noise

The noise of the detector is dominated by the Johnson noise due to the resistance of the thermopile. Noise is given as RMS value in $\text{nV}/\sqrt{\text{Hz}}$.

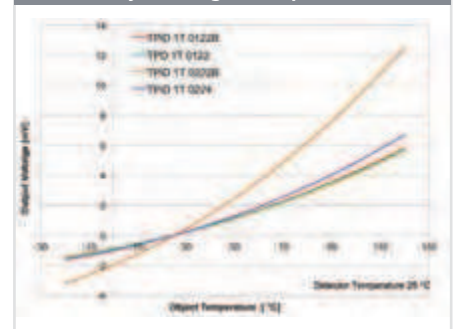
Sensitivity

The Data tables do also mention Sensitivity, as a characteristic output voltage versus target temperature at 25°C environment temperature.

The data are given with standard IR filter as per fig.2. Two are given: S(25/40) is 25°C environment, 40°C Black Body target and S(25/100), which is 25°C environment, 100°C Black Body target. Sensitivity is depending on the field of view of the detector construction. An example can be seen below for selected TPS series:

Figure 9

Sensitivity vs. Target Temperature



Thermistor Is Included

As temperature reference the thermopile detectors include a thermistor which senses the internal temperature.

For exact measurements the temperature of the detector housing (cold thermopile contacts) must be known. As a standard version 100kOhm thermistor inside the detector housing serves as the ambient temperature reference, optional 30 kOhm is available.

The dependence of the resistance on temperature can be approximated by the following equation:

$$R_T = R_R \cdot e^{B \cdot \left(\frac{1}{T} - \frac{1}{T_R} \right)}$$

R_T	NTC resistance in Ω at temperature T in K
R_R	NTC resistance in Ω at rated temperature T_R in K
T	Temperature in K
T_R	Rated temperature in K
B	B value, material-specific constant of NTC thermistor
e	Euler number (e = 2.71828)

The actual characteristic of an NTC thermistor can be roughly described by the exponential relation. This approach, however, is only suitable for describing a restricted range around the rated temperature or resistance with sufficient accuracy.

For practical applications a more precise description of the real R/T curve is required. Either more complicated approaches (e.g. the Steinhart-Hart equation) are used or the resistance/temperature relation is given in tabulated form.

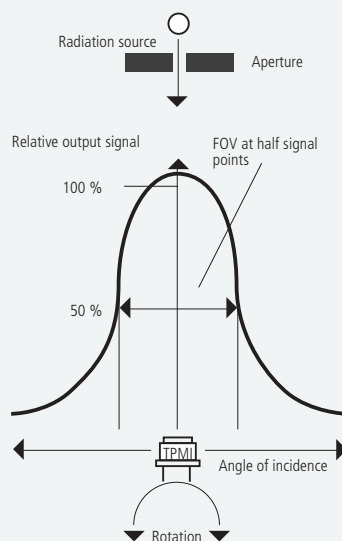
The Field of View

The most common use of thermopile detectors is non-contact temperature sensing. All target points within the field of view will contribute to the measurement signal. To meet requirements of different applications, Excelitas offers a broad range of sensors with different windows and optics.

The field of view data describe the dependence of signal from incident angles.

Figure 10

Field of View



The TPMI® family is available with different options on optical cap assemblies. We provide housing with aperture opening and filter window only, or with an infrared lens or also with integral mirror.

Such optical features define the viewing angle or as per definition the Field of View (FOV) of the sensor.

The FOV is defined as the difference of the incidence angles that allow the sensor to receive 50 % relative output signal, see also figure shown here, which is a sketch of a testing principle.

	Symbol	Parameter	Min	Typ	Max	Unit
Lens Type (L5.5)						
	FOV	Field of view		7	12	°
	OA	Optical axis		0	±3.5	°
	D:S	Distance to spot size ratio		8:1		
Integral Reflector Type (IRA)						
	FOV	Field of view		15	20	°
	OA	Optical axis		0	±2	°
Standard Aperture Type						
	FOV	Field of view		70	80	°
	OA	Optical axis		0	±10	°

Temperature Range

Excelitas offers sensors which include pre-amplification, ambient temperature compensation and calibration within a specific temperature range.

Thermopile Arrays

Further to its range of Detectors and Sensors, Excelitas offers Line Arrays and spatial arrays based on Thermopile technology.

Applications for Thermopile Sensors

Thermopile Sensors have been designed for non-contact temperature measurement. The signal of the sensor follows the radiation energy receipt by the sensor. This enables the application of measuring surface temperatures without contact.

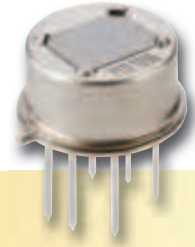
In many industrial process control units thermopile sensors are used to contactless monitor temperature or to serve as overheating protection feature.

The thermopile technology is also suited for domestic appliances such as food monitoring during automated defrosting, warming-up or cooking.

Same as our Pyrodetectors, the Thermopile Detectors with specific filter windows are used as sensing components making our environment more safe, secure and healthy.

Smart Detectors

All Electronics for Motion Detection Included



PYD 1096 – Dual-Element, Smart DigiPyro®
PYQ 1046 – Quad-Element, Smart DigiPyro®

Target Applications

- Simple motion Switches
- Auto Light Switch
- Wall Switch

Features and Benefits

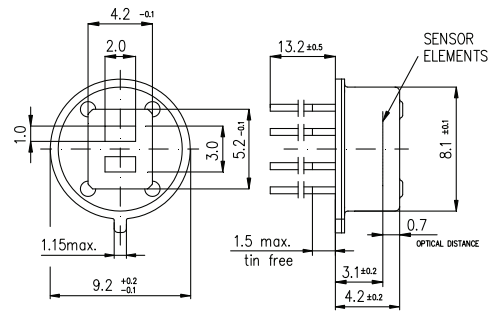
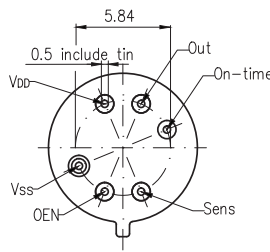
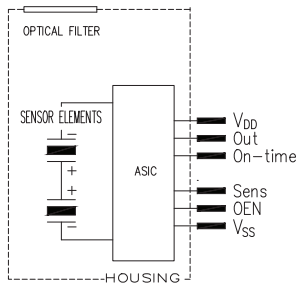
- TO-5 metal housing
- All electronics included
- Dual Element: PYD 1096
- Quad Element: PYQ 1046

Product Description

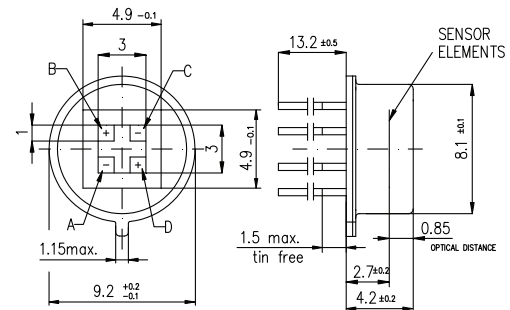
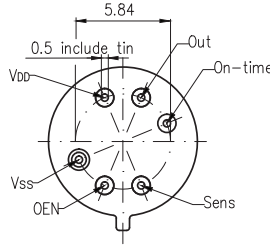
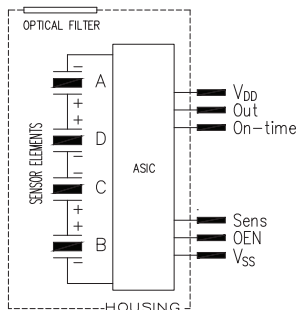
The Smart DigiPyro® family provides for a complete motion detector solution, with all electronic circuitry built-into the Detector housing. Only power supply and power-switching components need to be added to make the entire motion switch, a timer is included. The series has versions which can include ambient light level and sensitivity adjustments.

Both PYD 1096 and PYQ 1046 offer the complete setting feature of Time, Sensitivity and Light Level. For the light level input, a Photocell is to be connected externally, please refer to the application notes on this product.

PYD 1096

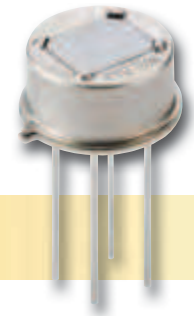


PYQ 1046



PYD 1096 and PYQ 1046

Parameter	Symbol	PYD 1096	PYQ 1046	Unit	Remarks
Responsivity, min.	R_{min}	3,3	5,4	kV/W	f = 1Hz
Responsivity, typ.	R	4,0	6,5	kV/W	f = 1Hz
Match, max.	M_{max}	10	10	%	
Field of View, horizontal	FoV	100°	95°		unobstructed
Field of View, vertical		100°	95°		unobstructed
Operating Voltage	V_{DD}	2,7...3,3	2,7...3,3	V	
Supply Current	I_{DDmax}	15	15	μA	$V_{DD} < V_R$, Outputs unloaded
Sensitivity Threshold		120...530	120...530	μV_{pp}	
Noise, max.		50	100	μV_{pp}	0,4...10Hz/20°C
On-Time		2...4194	2...4194	s	
OEN (ambient light control)		Low<0.2* V_{DD} ; High>0.8 V_{DD}	Low<0.2* V_{DD} ; High>0.8 V_{DD}	V	
Output Driving Current		1	1	μA	
Filter, Signal Processing					
Digital Filter, cut on		0,4	0,4	Hz	
Digital Filter, cut off		7	7	Hz	



Smart Detectors

Complete Motion Detection... To Make it Simple

PYD 1098 – Dual-Element, Smart DigiPyro®
PYQ 1048 – Four-Element, Smart DigiPyro®

Applications

- Simple Motion Switches
- Auto Light Switch
- Wall Switch

Features and Benefits

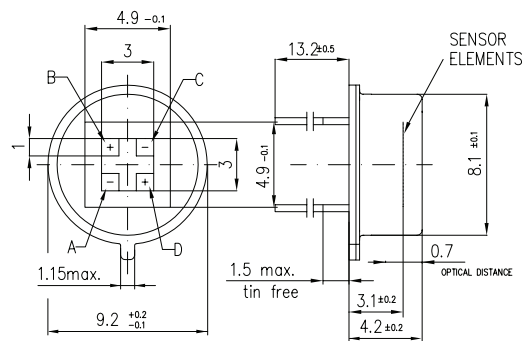
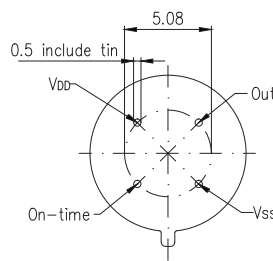
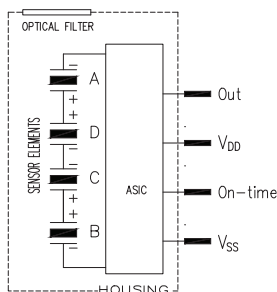
- TO-5 metal housing
- All electronics included
- Dual-Element: PYD 1098
- Quad-Element: PYQ 1048

Product Description

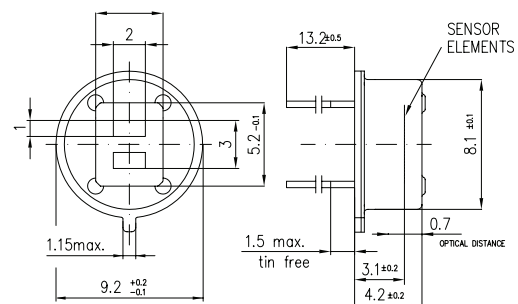
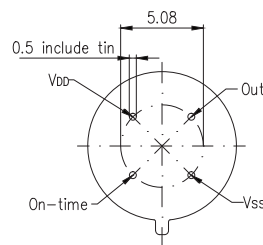
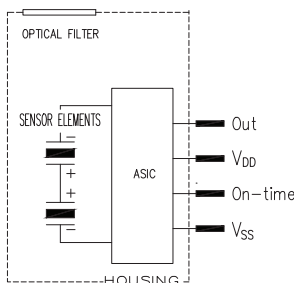
The Smart DigiPyro® family provides for a complete motion detector solution, with all electronic circuitry built-into the Detector housing. Only power supply and power-switching components need to be added to make the entire motion switch, a timer is included. The series has versions which can include ambient light level and sensitivity adjustments.

Two versions are offered: PYD 1098 Dual Element configuration and for higher spatial resolution the Quad Element with 4 square elements. Parameters as sensitivity and Light level are internally set to default values and disabled.

PYQ 1048



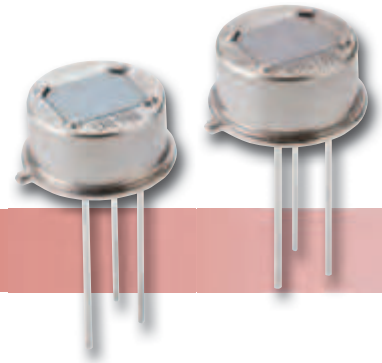
PYD 1098



PYQ 1048 and PYD 1098

Parameter	Symbol	PYQ 1048	PYD 1098	Unit	Remarks
Responsivity, min.	R_{min}	5,4	3,3	kV/W	f = 1Hz
Responsivity, typ.	R	6,5	4,0	kV/W	f = 1Hz
Match, max.	M_{max}	10	10	%	
Field of View, horizontal	FoV	105°	100°		unobstructed
Field of View, vertical		105°	100°		unobstructed
Operating Voltage	V_{DD}	2,7...3,3	2,7...3,3	V	
Supply Current	I_{DDmax}	15	15	μA	$V_{DD} < V_R$, Outputs unloaded
Sensitivity Threshold		120	120	μVp	
Noise, max.		100	50	μVpp	0,4...10Hz/20°C
On-Time		2...4194	2...4194	s	
OEN (ambient light control)		n. a.	n. a.	V	
Output Driving Current		1	1	μA	
Filter, Signal Processing					
Digital Filter, cut on		0,4	0,4	Hz	
Digital Filter, cut off		7	7	Hz	

Pyroelectric, Dual-Element Detectors For Intrusion Alarms



LHi 968, PYD 1398 – High-End Pyro

Applications

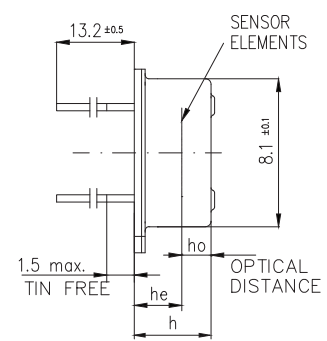
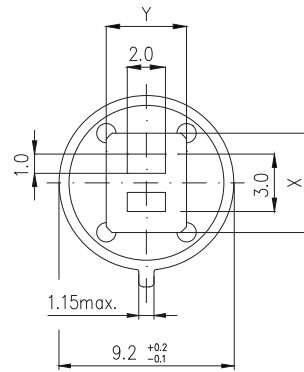
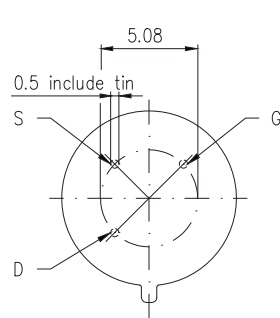
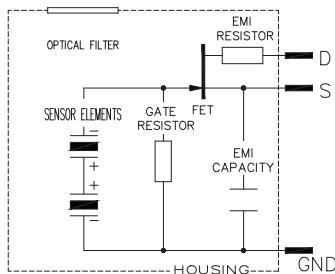
- Intrusion Alarms
- High-end Motion Sensors

Features and Benefits

- TO-5 metal housing
- Improved EMI protection
- Reduced (WLI)

Product Description

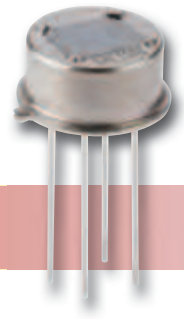
The analog LHi 968 series with Dual Element configuration is performance-proven top of the line product in high-end applications. The LHi 968 design provides for a reduced sensitivity to EMI and excellent White Light Immunity (WLI). PYD 1398 offers a higher level of RF immunity and is optionally available with grading for lower white light sensitivity.



LHi 968 and PYD 1398

Parameter	Symbol	LHi 968	PYD 1398	Unit	Remarks
Responsivity, min.	R_{min}	3,3	3,3	kV/W	$f = 1 \text{ Hz}$
Responsivity, typ.	R	4	4	kV/W	$f = 1 \text{ Hz}$
Match, max.	M_{max}	10	10	%	
Noise, max.	N_{max}	50	50	μV_{pp}	0,4...10Hz/20°C
Noise, typ.	N	20	20	μV_{pp}	0,4...10Hz/20°C
spec. Detectivity	D^*	19	19	$10^7 \text{ cm}^* \sqrt{\text{Hz/W}}$	1Hz / 1Hz BW/20°C
Field of View, horizontal	FoV	100°	100°		unobstructed
Field of View, vertical		100°	100°		unobstructed
Source Voltage		0,2...1,5	0,2...1,5	V	47 kΩ, 20°C, VDD=10V
Operating Voltage		2,0...10	2,0...10	V	47 kΩ, 20°C
EMI performance		**	**		
White Light performance		**	***		Excelitas test set up
Height	h	4,2	4,2	mm	
Optical Element Location	he / ho	2,6 / 0,95	2,6 / 0,95	mm	
Filter Size	$X \times Y$	5,2 x 4,2	5,2 x 4,2	mm ²	

Pyroelectric, Four-Element Detectors For Intrusion Alarms



LHi 1148 – High-End, Dual-Channel Pyrodetectors

Applications

- Intrusion Alarms
- Dual-Channel Systems
- High-end Motion Sensors

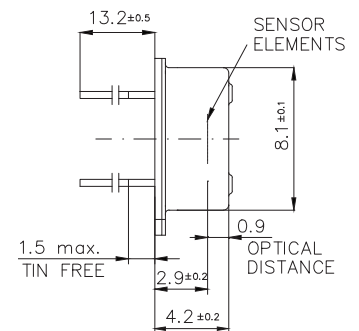
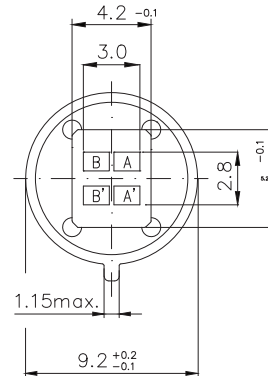
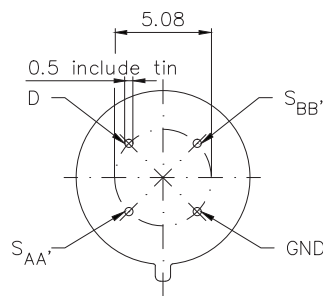
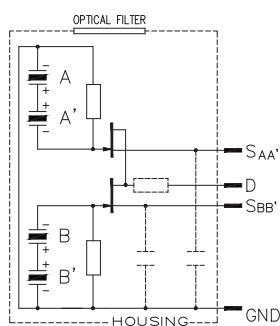
Features and Benefits

- TO-5 metal housing
- Dual Channel
- Optional Reverse/Equal Polarity
- Optional Element Configurations
- RF Protection Option

Product Description

The LHi 1148 series with four element “Quad” configuration offers two independent dual element signals with opposite polarity. This enables separate signal processing option for the two channels to reduce common-mode RF influence and thermal effects.

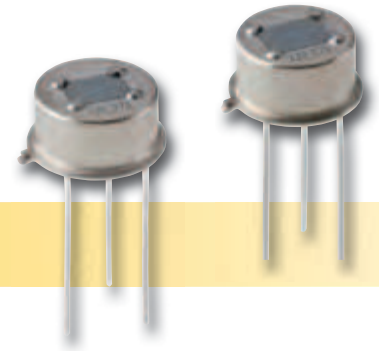
For Ceiling-mount applications, we offer – as an option – a similar version, with dual-element pairs arranged in a diagonal geometrical arrangement and with a square-type window. This enables presence detection without any preference to direction. The series further includes various options as for element spacing and polarity arrangement. Details available on request.



LHi 1148

Parameter	Symbol	LHi 1148	Unit	Remarks
Responsivity, min.	R_{min}	3,5	kV/W	$f = 1 \text{ Hz}$
Responsivity, typ.	R	4,5	kV/W	$f = 1 \text{ Hz}$
Match, max.	M_{max}	15	%	
Noise, max.	N_{max}	75	μV_{pp}	0,4...10Hz/20°C
Noise, typ.	N	30	μV_{pp}	0,4...10Hz/20°C
spec. Detectivity	D^*	16	$10^7 \text{ cm}^2 \cdot \sqrt{\text{Hz/W}}$	1Hz/ 1Hz BW/20°C
Field of View, horizontal	FoV	110°		unobstructed
Field of View, vertical		70°		unobstructed
Source Voltage		0,2...1,5	V	47 kΩ, 20°C, VDD=10V
Operating Voltage		2,0...10	V	47 kΩ, 20°C

Pyroelectric, Dual-Element Detectors For Motion Sensing



LHi 778 – Low-Cost Pyro
LHi 878, PYD 1388 – Standard Pyro

Applications

- Auto Light Switch
- Wall Switch
- Auto Lamps

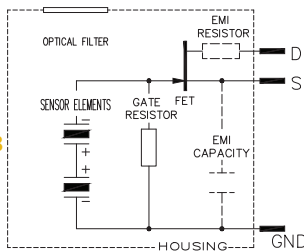
Features and Benefits

- TO-5 metal housing
- Different window sizes
- Additional EMI protection with PYD 1388

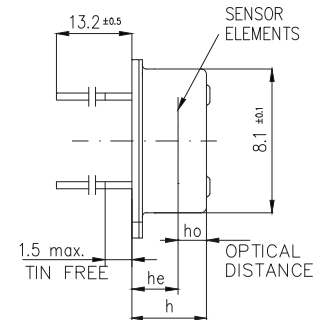
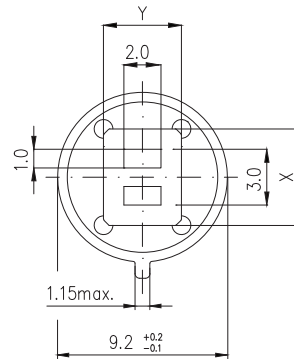
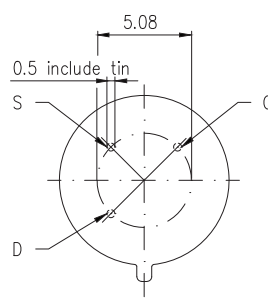
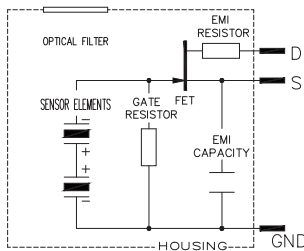
Product Description

This Dual Element detector family offers standard TO-5 housings with different window sizes. Whereas LHi 778 is designed to meet low cost and having small optical window, LHi 878 offers standard window size. PYD1388 has same dimensions and provides for additional EMI protection as option.

LHi 778, 878



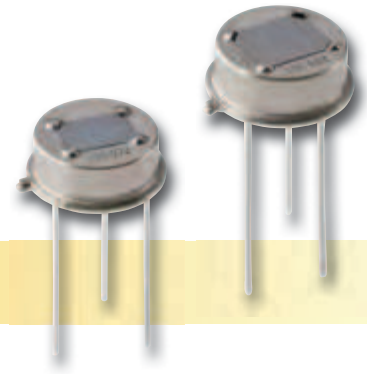
PYD 1388



LHi 778, LHi 878 and PYD 1388

Parameter	Symbol	LHi 778	LHi 878	PYD 1388	Unit	Remarks
Responsivity, min.	R _{min}	3,3	3,3	3,3	kV/W	f = 1 Hz
Responsivity, typ.	R	4,2	4,2	4,2	kV/W	f = 1 Hz
Match, max.	M _{max}	10	10	10	%	
Noise, max.	N _{max}	50	50	50	μV _{pp}	0,4...10Hz/20°C
Noise, typ.	N	35	25	20	μV _{pp}	0,4...10Hz/20°C
Field of View, horizontal	FoV	71°	95°	95°		unobstructed
Field of View, vertical		71°	87°	87°		unobstructed
Source Voltage		0,2...1,55	0,2...1,55	0,2...1,55	V	47 kΩ, 20°C, VDD=10V
Operating Voltage		2,0...10	2,0...10	2,0...10	V	47 kΩ, 20°C
EMI performance			*	*		
Height	h	4,2	4,2	4,2	mm	
Optical Element Location	he / ho	3,2 / 0,75	3,2 / 0,75	3,2 / 0,75	mm	
Filter Size	X/Y	4 x 3	4,6 x 3,4	4,6 x 3,4	mm ²	

Pyroelectric, Dual-Element Detectors For Motion Sensing



LHi 874, LHi 944, PYD 1394 – Low-Profile Pyro

Target Applications

- Auto Light Switch
- Wall Switch
- Auto Lamps with 180°FOV w. 2 Detectors

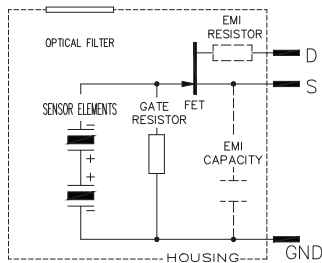
Features and Benefits

- TO-39 metal housing
- Different window sizes
- EMI protection option

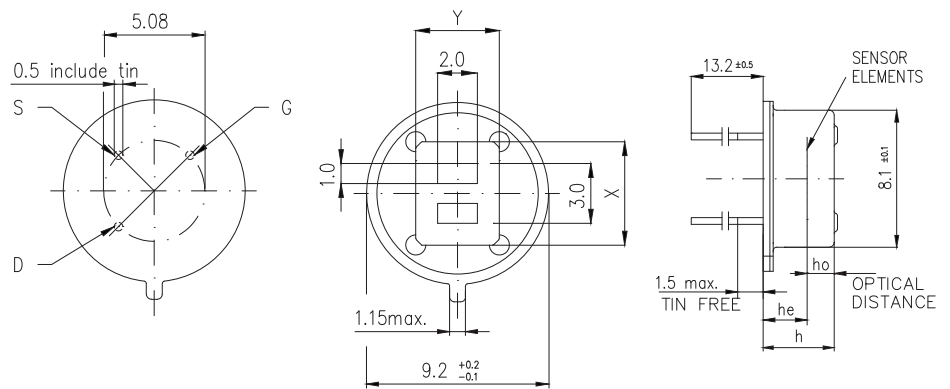
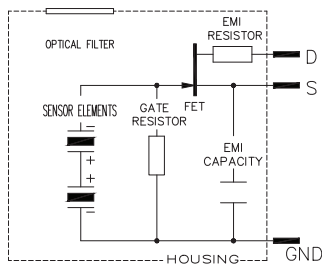
Product Description

These Low-Profile TO-39 detectors are very well suited for use as two detectors arranged at an angle so as to enable a 180 degree view. The LHi 874 offers a standard window size, whereas the LHi 944 model offers a large window with greater Field Of View. The PYD 1394 has same dimensions and provides for additional EMI protection.

LHi 874, 944



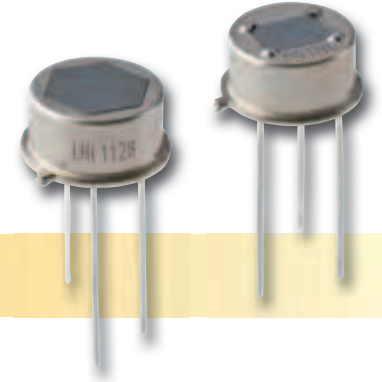
PYD 1394



LHi 874, LHi 944 and PYD 1394

Parameter	Symbol	LHi 874	LHi 944	PYD 1394	Unit	Remarks
Responsivity, min.	R_{min}	3,3	3,3	3,3	kV/W	f = 1 Hz
Responsivity, typ.	R	4,2	4,2	4,2	kV/W	f = 1 Hz
Match, max.	M_{max}	10	10	10	%	
Noise, max.	N_{max}	50	50	50	μV_{pp}	0,4...10Hz/20°C
Noise, typ.	N	25	20	20	μV_{pp}	0,4...10Hz/20°C
spec. Detectivity	D^*	19	21	21	$10^7 cm^* \sqrt{Hz/W}$	1Hz/ 1Hz BW
Field of View, horizontal	FoV	95°	110°	110°		unobstructed
Field of View, vertical		87°	110°	110°		unobstructed
Source Voltage		0,2...1,55	0,2...1,55	0,2...1,55	V	47 kΩ, 20°C, VDD=10V
Operating Voltage		2,0...10	2,0...10	2,0...10	V	47 kΩ, 20°C
EMI performance		*	*	**		
Height	h	3,2	3,2	3,2	mm	
Optical Element Location	he /ho	2,2 / 0,75	2,2 / 0,75	2,2 / 0,75	mm	
Filter Size	X x Y	4,6 x 3,4	5,2 x 4,2	5,2 x 4,2	mm ²	

Pyroelectric Four-Element Detectors For Ceiling-Mount



LHi 1128, PYQ 1398, PYQ 1348 – Single-Output Quad Pyro

Target Applications

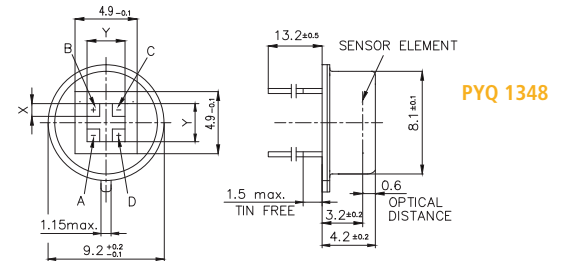
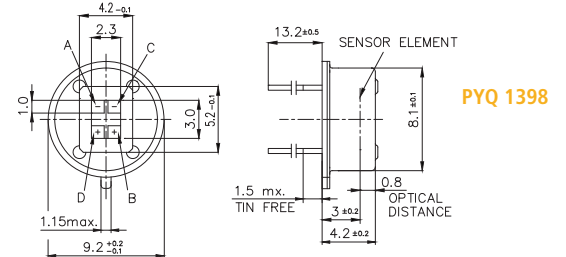
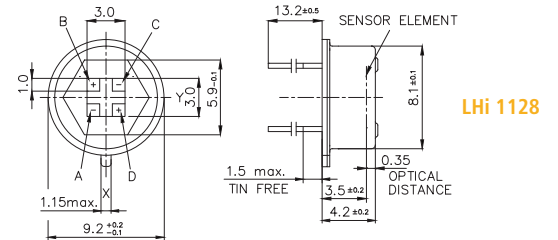
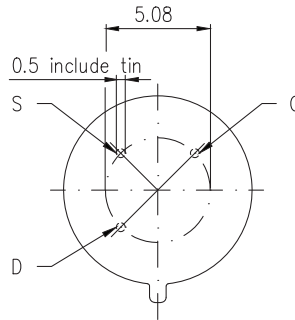
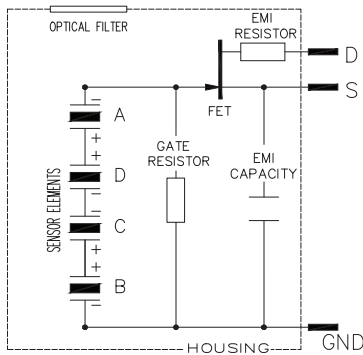
- Ceiling-Mount Alarms
- Ceiling-Mount Light Switch

Features and Benefits

- TO-5 metal housing
- Different window sizes
- Single Channel output

Product Description

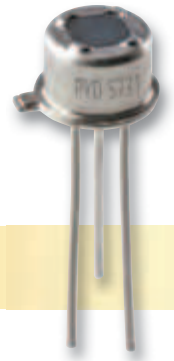
This series of four element "Quad" Detectors provides all four elements connected to one common output. This configuration enables specific applications in ceiling-mount location when applied with suitable lens or mirror optics designs. Different window options are provided: Large window or standard rectangular window size. Various element polarities available upon request. For better EMI protection, the built-in capacitor option is available. For small fresnellens applications a smaller element configuration is provided.



LHi 1128, PYQ 1398 and PYQ 1348

Parameter	Symbol	LHi 1128	PYQ 1398	PYQ 1348	Small Element Option	Unit	Remarks
Responsivity, min.	R_{min}	5,4	5,4	5,4	8,4	kV/W	f = 1 Hz
Responsivity, typ.	R	6,5	6,5	6,5	10,1	kV/W	f = 1 Hz
Match, max.	M_{max}	10	15	15	15	%	
Noise, max.	N_{max}	100	100	100	125	μV_{pp}	0,4...10Hz/20°C
Noise, typ.	N	30	40	40	50	μV_{pp}	0,4...10Hz/20°C
spec. Detectivity	D^*	8	14	14	17	$10^7 cm^* \sqrt{Hz/W}$	1Hz/ 1Hz BW
Field of View, horizontal	FoV	156°	103°	124°	129°		unobstructed
Field of View, vertical		125°	97°	124°	129°		unobstructed
Source Voltage		0,2...1,55	0,2...1,55	0,2...1,55	0,2...1,55	V	47 kΩ, 20°C, VDD=10V
Operating Voltage		2,0...10	2,0...10	2,0...10	2,0...10	V	47 kΩ, 20°C
EMI performance	**	**	**	**	**		
Element size/spacing		1 x 1/1	1 x 1/1	1 x 1/1	0,8 x 0,8/0,8	mm/mm ²	

Miniaturized, Dual-Element Pyrodetectors For Motion Sensing



PYD 5731 – DigiPyro® in TO-46 Housing

Applications

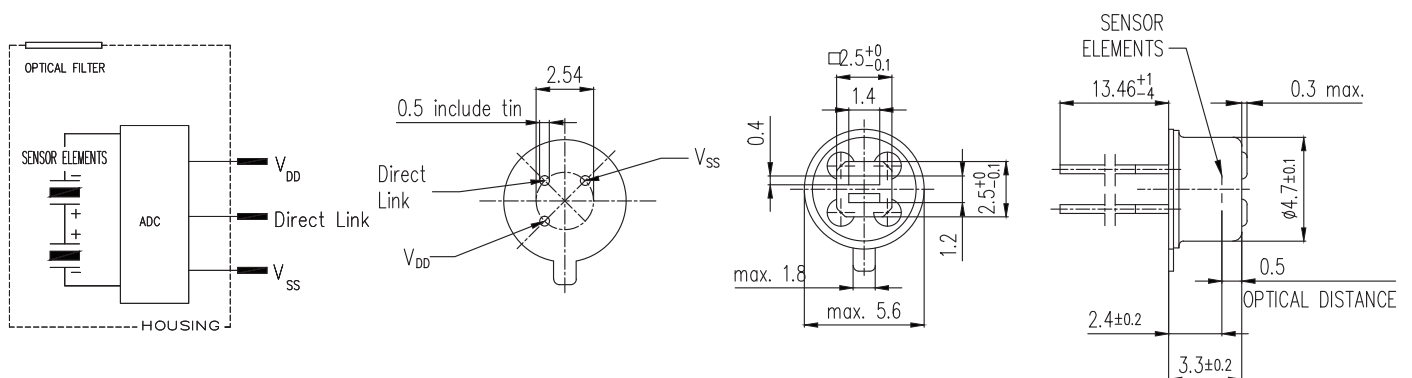
- Automatic Light Switch
- Wall Switches

Features and Benefits

- TO-46 metal housing
- Temperature reference output included
- DigiPyro® with Direct Link Interface

Product Description

This Pyrodetector features a miniaturized Dual Element Pyro in TO-46 housing. Furthermore, with the PYD 5731 Excelitas extends the emerging DigiPyro® family to miniaturized detector designs. The PYD 5731 offers the same Direct Link interface as the regular PYD 1798 DigiPyro, for output of Dual Element Pyro and additional temperature reference output. The small housing in connection with a reduced element size and spacing will enable customers to reduce the size of their optics and design smaller motion detection units.

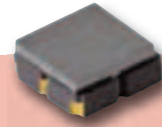


PYD 5731

Main Parameter	Symbol	PYD 5731	Unit	Remarks
Responsivity, min.	R_{min}	8,5	kV/W	$f = 1 \text{ Hz}$
Responsivity, typ.	R_{typ}	11	kV/W	$f = 1 \text{ Hz}$
Match, max.	M_{max}	10	%	
Noise, max.	n_{max}	180	μV_{pp}	0,4...10Hz/ 20°C
Noise, typ.	n_{typ}	70	μV_{pp}	0,4...10Hz/ 20°C
Field of View, horizontal	FoV	99°		unobstr.
Field of View, vertical		88°		unobstr.
Operating Voltage	V_{DD}	2,7...3,6	V	
Supply Current	I_{DD} / I_{DDmax}	10 / 15	μA	$V_{DD} = 3,3\text{V}$
Digital Data				
Sample Time	t_{SMPL}	2	ms	min.
ADC Resolution		14	Bits	max. Count = 2^{14}
Output Data Format		2 x 14	Bits	
ADC Sensitivity		6...7,1	$\mu\text{V}/\text{count}$	
ADC Output Offset		6500...9800	counts	
ADC Output Offset	typ.	8192	counts	
Temperature Reference				
Gain (Temperature)	typ.	80	Counts/K	-20°C to +80°C
Linearity		-5...+5	%	-20°C to +80°C
Filter				
Digital Filter Cut off		10	Hz	refer to Application Note

SMD Dual-Element Pyro And DigiPyro®

For Simple Motion Sensing



PYD 5190 – small Dual Element
PYD 5790 – small Dual Element DigiPyro®

Target Applications

- Energy conservation in TV and Monitors
- Mobile phone power on

Features and Benefits

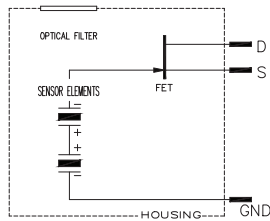
- MSL 1
- SMD housing
- Analog FET output
- DigiPyro with Direct Link Interface
- Especial designed Fresnel lens available

Product Description

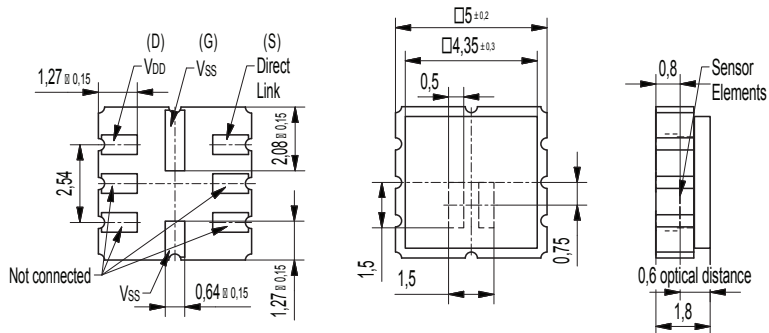
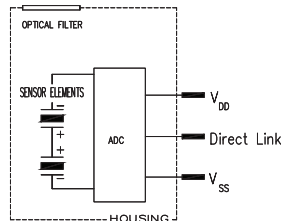
The PYD 5190 features a tiny Dual Element Pyro in SMD form. Furthermore, with the PYD 5790 Excelitas extends the emerging DigiPyro® family to the SMD form factor. Both types are fit with a small pyroelectric elements of 0,7x1,5 mm size. As to the different dimensions of elements and housing, the SMD line is not designed for 1to1 replacement of TO housing versions. Whereas PYD 5190 offers standard FET analog output, PYD 5790 offers the Direct Link interface same as the PYD 1798 DigiPyro.

The small dimensions of the smd housing in connection with a reduced element size and spacing will enable customers to reduce the optical design and smaller motion detection for new applications.

PYD 5190

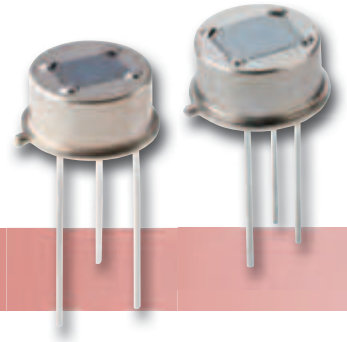


PYD 5790



PYD 5190 and PYD 5790

Main Parameter	Symbol	PYD 5790	PYD 5190	Unit	Remarks
Responsivity, min.	R_{min}	5,5	5,5	kV/W	$f = 1 \text{ Hz}$
Responsivity, typ.	R	10	8,5	kV/W	$f = 1 \text{ Hz}$
Match, max.	M_{max}	10	10	%	
Noise	N_{max}	200	200	μV_{pp}	0,4...10Hz/20°C
	N_{typ}	80	80	μV_{pp}	
Field of View, horizontal	FoV	133°	133°		unobstr.
Field of View, vertical		(76+33)°	(76+33)°		non symmetric, unobstr.
Source voltage		-	0,2 ... 1,55	V	47 K Ω , 20°C, $V_{DD}=10\text{V}$
Operating Voltage	V_{DD}	2,7...3,6	2,0...10	V	20°C
Supply Current	I_{DD}	10		μA	$V_{DD} = 3,3\text{V}$
	I_{DDmax}	15		μA	$V_{DD} = 3,3\text{V}$
Digital Data					
Sample Time	t_{SMPL}	2	-	ms	min.
ADC Resolution		14	-	Bits	max. Count = $2^{14}-1$
Output Data Format		2 x 14	-	Bits	
ADC Sensitivity		6...7,1	-	$\mu\text{V}/\text{count}$	
ADC Output Offset		6500 - 9800	-	counts	
ADC Output Offset, typ.		8192	-	counts	
Temperature Reference					
Gain (Temperature)	typ	80	-	Counts/K	-20°C to +80°C
Linearity		-5...+5	-	%	-20°C to +80°C
Filter, Signal Processing					
Digital Filter, cut off		10	-	Hz	



Digital, Dual-Element Pyros For Motion Sensing

PYD 1788, PYD 1798 – DigiPyro®

Target Applications

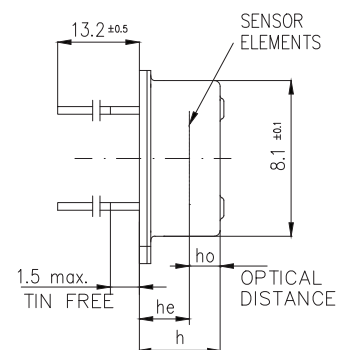
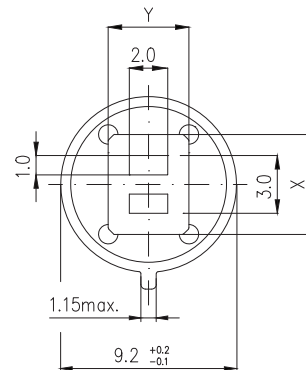
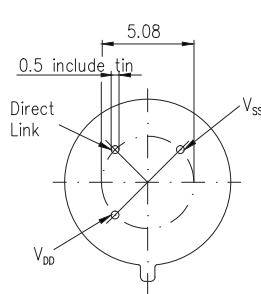
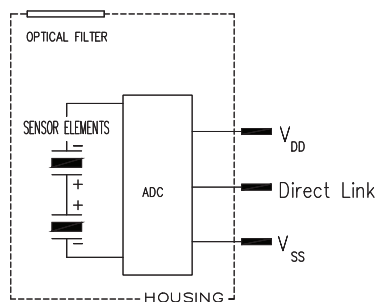
- Passive Intrusion Alarms
- Auto Light Switch
- Auto Lamps

Features and Benefits

- TO-5 metal housing
- Digital Direct Link
- Different window sizes
- Excellent EMI protection

Product Description

The DigiPyro® detector range in TO-5 housing includes many Dual-Element types, some with different window sizes. The element configurations are identical, along with the internal electronic circuits. The PYD 1788 is the lower-cost version with standard size window, while PYD 1798 offers better White-Light-Immunity (WLI) performance and Field of View. Both the PYD 1788 and PYD1798 models include a built-in temperature reference. The Output signals are communicated in one digital bit stream of 2x14 bit, output via a single wire "Direct Link" connection to a suitable host microprocessor. With PYD 1784 we also offer an electrically equivalent to PYD1788, but in TO39 housing.



PYD 1798 and PYD 1788						
Parameter	Symbol	PYD 1798	PYD 1788	Unit	Remarks	
Responsivity, min.	R_{min}	3,3	3,3	kV/W	f = 1 Hz	
Responsivity, typ.	R	4	4	kV/W	f = 1 Hz	
Match, max.	M_{max}	10	10	%		
Noise	N, N_{max}	20/78	20/78	μV_{pp}		
Field of View, vertical	FoV	110°	95°		unobstructed	
Field of View, horizontal	FoV	110°	90°		unobstructed	
WLI		***	**		Excelitas test set up	
Height	h	4,2	4,2	mm		
Optical Element Location	he/ho	3,1 / 0,7	3,1 / 0,7	mm		
Filter Size	X / Y	5,2 / 4,2	4,6 / 3,4	mm ²		
Digital Data						
Operating Voltage	V_{DD}	2,7...3,6	2,7...3,6	V		
Supply Current	I_{DD}	10	10	μA	$V_{DD}=3,3V$	
	I_{DDmax}	15	15	μA	$V_{DD}=3,3V$	
Sample Time	t_{SMPL}	2	2	ms	min.	
ADC Resolution		14	14	Bits		
Output Data Format		2 x 14	2 x 14	Bits	MSB first	
ADC Sensitivity		6...7,1	6...7,1	$\mu V/count$		
ADC Output Offset		6500...9800	6500...9800	counts		
ADC Output Offset, typ.		8192	8192	counts		

Digital Pyrodetector

For Ceiling Mount Applications

PYQ 1748 - low cost (1+1) Output Quad *DigiPyro*®

Target Applications

- Intrusion Alarm
- Ceiling Mount Motion Detection

Features and Benefits

- 4 Sensing Elements
- Single Output
- Low Cost

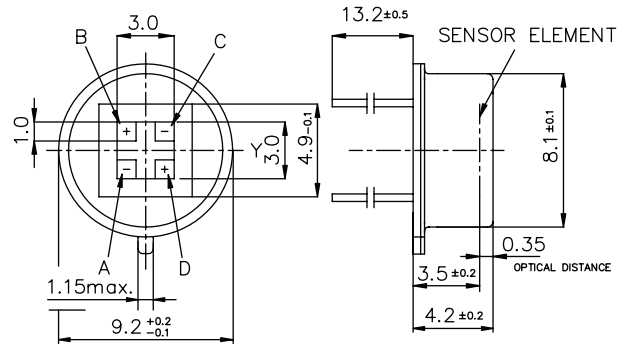
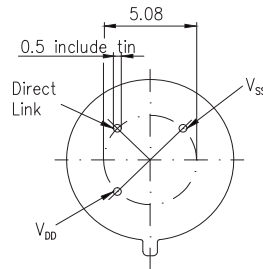
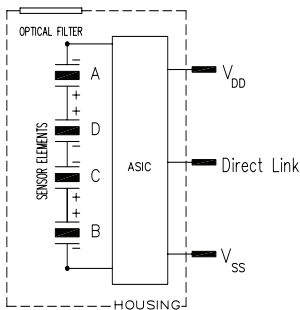
Product Description

The PYQ 1748 includes a Quad design pyroelectric element, A/D converter and the digital signal processor, built into a TO-5 housing.

All four sensing elements are electrically connected in series and transmitted in digital signal format to one output.

Geometrically the polarity of the elements has been arranged across and therefor represent the best configuration for ceiling mount applications.

The PYQ 1748 signal transmission provides 2x14 bit and is identical to PYD 1788 and includes the signal from the sensing elements plus internal temperature reference as second batch of bit information.

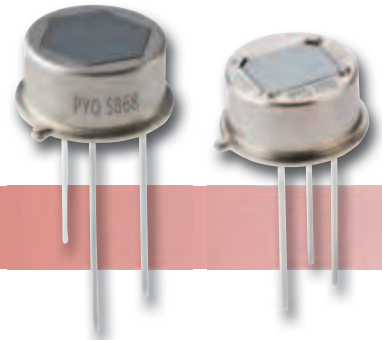


PYQ 1748

Main Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Responsivity	R	5,4	6,5		kV/W	f = 1 Hz
Match	M		5	10	%	
Noise	N		30	140	μV _{pp}	
Field of View, vertical	FoV _v		95°			unobstructed
Field of View, horizontal	FoV _h		95°			unobstructed
Operation Data						
Operating Voltage	V _{DD}	2,7	3,3	3,6	V	
Supply Current	I _{DD}		10	15	μA	V _{DD} = 3,3V, no load
ADC Data						
ADC Resolution,	Channel 1+1		14		Bits	For each channel, MSB first
PIR ADC Sensitivity		6,0	6,5	7,1	μV/Count	
ADC Output Offset		6500	8192	9800	Counts	
Sample Time	t _{SMP}	2			ms	

Digital Pyrodetector

Digital Pyrodetector Quad designs



PYQ 5868, PYQ 5848, PYQ 2898 (2+1) Channel Quad Element *DigiPyro*®

Target Applications

- Intrusion Alarms
- Ceiling-Mount Sensors

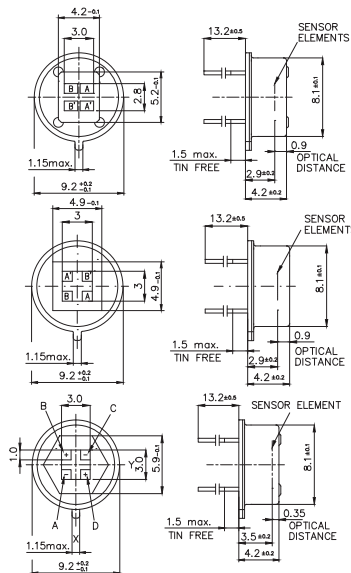
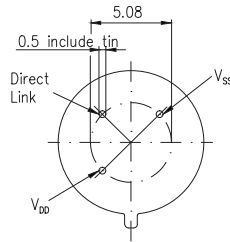
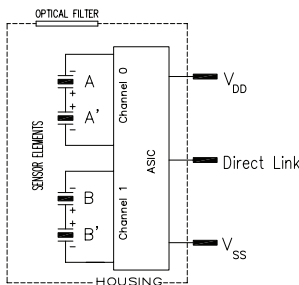
Features and Benefits

- DigiPyro Concept
- Two independent sensing channels
- Integrated temperature reference

Product Description

This PYQ family features 3 different „Quad“ configurations, which is the polarity, spacing and arrangement of the four sensing elements. All versions have in common the dual output channels which always combine two sensing elements in series connection to one channel output. In addition, a temperature reference output is provided, making the total output bit stream as 3x14 bit.

All types are offered only in TO-5 metal housing. Depending on element spacing and window size, the 3 versions offer different field of view. Custom variations of element designs are also possible.



PYQ 2898

PYQ 5848

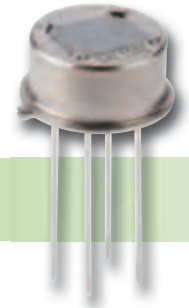
PYQ 5868

PYQ 2898, PYQ 5848 and PYQ 5868

Main Parameter	Symbol	PYQ 2898	PYQ 5848	PYQ 5868	Unit	Remarks
Responsivity	R	4,5	8	8	kV/W	f = 1 Hz
Responsivity, min	R _{min}	3,5	6	6	%	
Match	M	10	10	10	%	
Noise	N	30	40	40	V	
Noise, max	N _{max}	100	100	100	µA	
Field of View, vertical	FoV _v	100°	95°	115°		unobstructed
Field of View, horizontal	FoV _h	65°	95°	100°		unobstructed
Operation Data for all		Min	Typ	Max		
Operating Voltage	V _{DD}	2,5		3,6	V	
Supply Current	I _{DD}		10	18	µA	V _{DD} = 3,3V, no load
ADC Data						
ADC Resolution,	Channel 2+1		3x 14		Bits	For each channel, MSB first
PIR ADC Sensitivity		6,0	6,5	7,1	µV/Count	
ADC Output Offset		7000	8192	9200	Counts	
Sample Time	t _{SMP}	2			ms	

Digital Pyrodetector

For Battery Operated Applications



PYD 1688, PYD 1698 – Low Power *DigiPyro*®

Target Applications

- Intrusion Alarm, wireless
- Battery operated Motion Detection

Features and Benefits

- Wake up/ Sleep Mode
- Low power consumption
- Band pass included
- Pulse count option

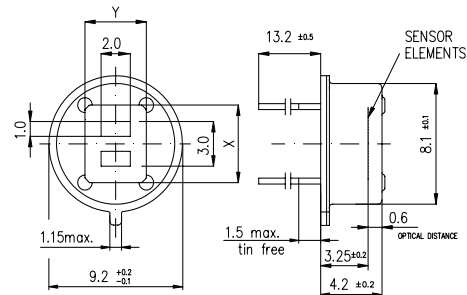
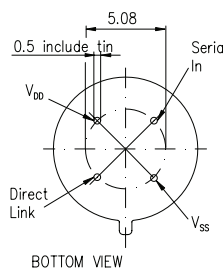
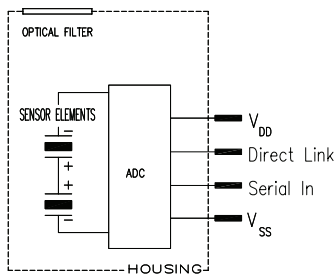
Product Description

The LowPower DigiPyro® is our latest introduction addressing the requirements of further reduced power consumption. With its further reduced current requirement at 3V supply the PYD 16 series offers new programmable features: The Wake-up/Sleep mode enables to save unit power, making it ideal for battery operated motion detection applications.

Continuous motion sensing, signal processing and event/motion detection is handled by the Low-Power DigiPyro while the hosting microcontroller can be set into a power saving mode. Only upon detection of a motion per its programmed settings, the LowPower DigiPyro signals the microcontroller to wake up.

Further options are selectable pulse count and electrical band pass.

The PYD 1688 /PYD 1698 include Dual Element Pyroelectric Detector design and the digital signal processor, all built into a TO-5 housing..



PYD 1688 and PYD 1698

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Responsivity		3,3	4,0		kV/W	f = 1 Hz
Match			10		%	
Noise			20	78	µV _{pp}	
Field of View, vertical		PYD 1688: 95°	PYD 1698: 110°			unobstructed
Field of View, horizontal		PYD 1688: 90°	PYD 1698: 110°			unobstructed
Mechanical Data						
Window size x		PYD 1688: 4,6	PYD 1698: 5,2		mm	
Window size y		PYD 1688: 3,4	PYD 1698: 4,2		mm	
Operation Data						
Operating Voltage	V _{DD}	2,5	3,3	3,6	V	
Supply Current	I _{DD}		3		µA	V _{DD} = 3,3V, no load
ADC Data						
ADC Resolution			14		Bits	Max Count = 2 ¹⁴ - 1
PIR ADC Sensitivity			6,5			µV/Count
Output Range				2 ¹⁴ - 511	Counts	
LPF cutoff frequency	f ₁		7		Hz	
HPF cutoff frequency	f ₂		0,44		Hz	

Digital 4-Element Pyrodetector

For Battery Operated Applications

PYQ 1648 – Low Power *DigiPyro*®, Quad Element Design

Target Applications

- G Intrusion Alarm
- Ceiling Mount Motion Detection

Features and Benefits

- 4 Sensing Elements
- Single Output
- Pulse count option
- Low current consumption

Product Description

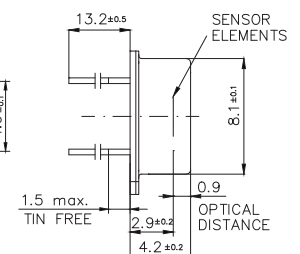
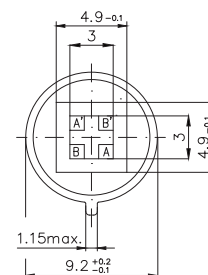
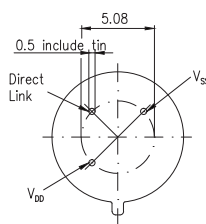
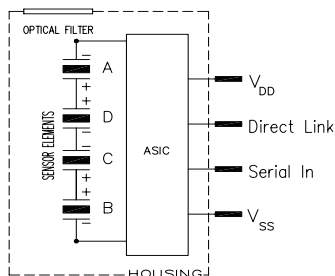
The LowPower *DigiPyro*® family has been developed for use in both residential and commercial products for applications of less power consumption.

This new PYQ series offers the same electrical configuration as PYD 16.. series, but includes four elements in Quad design pyroelectric element, all connected in series. This series offers a number of new programmable features:

The Wake-up/Sleep Mode enables to save unit power. All motion sensing, signal processing and event/motion detection is continuously processed by the LowPower *DigiPyro* while the host microcontroller can be set into power saving (Sleep-) mode. Upon detection of a motion per programmed settings, the LowPower *DigiPyro* will sent a signal to the microcontroller to wake up and request the motion data.

Further options are selectable pulse count and electrical band pass.

The complete configuration with the sensing elements and digital signal processor is included in a TO-5 housing.



PYQ 1648							
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks	
Responsivity		5,4	6,5		kV/W	f = 1 Hz	
Match			5	10	%		
Noise			30	140	μV _{pp}		
Field of View, vertical			95°			unobstructed	
Field of View, horizontal			95°			unobstructed	
Operation Data							
Operating Voltage	V _{DD}	2,5	3,3	3,6	V		
Supply Current	I _{DD}		3		μA	V _{DD} = 3,3V, no load	
Input Low Voltage	V _{SIL}			0,2V _{DD}	V		
Input High Voltage	V _{SIH}	0,8V _{DD}			V		
ADC Data							
ADC Resolution			14		Bits	Max Count = 2 ¹⁴ - 1	
PIR ADC Sensitivity			6,5			μV/Count	
Output Range				2 ¹⁴ - 511	Counts		
LPF cutoff frequency	f ₁		7		Hz		
HPF cutoff frequency	f ₂		0,44		Hz		