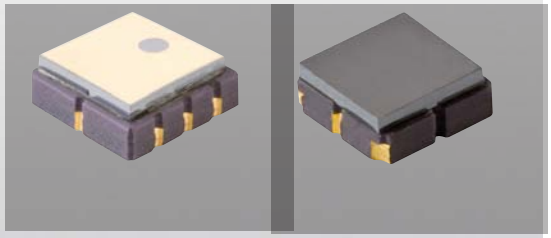
SENSORCN TECH LIMITED

New – Pyroelectric Infrared Detectors and Thermopile Sensors in SMD



Excelitas' newest SMD pyroelectric infrared detectors and SMD thermopiles are taking infrared sensing innovation to a whole new level, enabling automated, high-volume production for major sensing applications from intrusion alarm systems, to energy-saving, motion-activated light switches, and even the latest high-tech consumer devices.

Enabling Automated, High-Volume Production for Cutting-edge IR Sensing Applications

Excelitas Technologies is pleased to introduce its newest surface-mount design (SMD) Pyroelectric Infrared Detectors and Thermopile Sensors. To meet your design needs, our new SMD designs are available in both digital and analog models.

New SMD Pyroelectric Detectors. DigiPyro® is the one and only truly digital Family of Pyroelectric IR Detectors. With a legacy of continuing innovations in infrared sensing technology, and a focus on smaller and smarter digital solutions, Excelitas is now introducing a brand new SMD package to its dual-element DigiPyro® range. The new PYD 5790 is a dual-element pyro in a ceramic-type SMD package that is 5x5 mm^2 with a height of only 1.8 mm, the smallest of its kind on the market. As a basis for comparison, dual-element DigiPyro® models in TO-type housings are 4.2 mm in height. Excelitas is also offering its traditional, analog dual-element pyroelectric model in an SMD housing, the PYD 5190.

New SMD Thermopile Detectors. DigiPile™ is the revolutionary, digital Family of Thermopile Sensors, designed specifically for non-contact temperature measurement. Joining DigiPile™ models in TO-46 and TO-5 metal housings, Excelitas is introducing the TPiS 1S 1253, its newest DigiPile™ in a ceramic-type SMD package. It is 5x5 mm^2 with a height of only 1.8 mm, the smallest of its kind on the market. Excelitas is also offering its traditional, analog thermopile detector in an SMD housing, the TPiD 1S 0122. The TPiD 1S 0122 thermopile is equipped with a 100 kΩ thermistor that can serve as a temperature reference for thermopile temperature compensation to further improve accuracy. Excelitas' SMD Thermopile detectors deliver excellent thermal shock performance.

Advantages

- Surface-mount devices (SMD) well-suited for high-volume production of components on PCBs.
- Allows for automated pick-and-place and solder reflow
- Very small size and compact design of new SMD components, as compared to traditional TO-type metal housings
- SMD housings available for both pyroelectric infrared detectors and thermopiles

Applications

- Motion and Presence Detection — For Secure Homes
- Motion Sensing — Automatic Light Switching
- Presence Detection — for Display Control in Smart Consumer Electronic Devices
- Energy-Conserving Home Appliances — e.g. microwaves, IH cooktops
- Energy-conserving HVAC
- Thermometry
- Non-contact Temperature Sensing
- Gesture Recognition

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DigiPyro® – PYD 5790
Digital Pyroelectric Infrared Sensor, DigiPyro® Dual-element, In SMD

Parameter	Symbol	DigiPyro® PYD 5790	Unit	Remarks
Responsivity, min.	R_{min}	7.5	kV/W	f = 1 Hz
Responsivity, typ.	R	10	kV/W	f = 1 Hz
Match, max.	M_{max}	10	%	
Noise, max.	N_{max}	150	μV_{pp}	0.4 - 10 Hz, 20 °C
Noise, typ.	N_{typ}	60	μV_{pp}	0.4 -10 Hz, 20 °C
Field of View, vertical	FoV	79° + 33°		unobstructed
Field of View, horizontal	FoV	133°		unobstructed
Operating Voltage	V_{DD}	2.7 - 3.6	V	
Supply Current	I_{DD}	10	µA	V_{DD}=3,3V
Supply Current	I_{DDmax}	15	µA	V_{DD}=3,3V
Digital Data				
Serial Interface Update Time	$t_{REP\ min}$	2	ms	speed / interrupt
ADC Resolution		14	Bits	
Output Data Format		2 x 14	Bits	MSB first
ADC Sensitivity		6-7	µV/count	
ADC Output Offset		6500 - 9800	counts	
ADC Output Offset, typ.		8192	counts	
Temperature Reference				
Gain (temperature)		80	Counts / K	-20 °C to +80 °C
Linearity		-5 - +5	%	-20 °C to +80 °C
Filter				
Digital Filter Cut Off		10	Hz	

Table 1

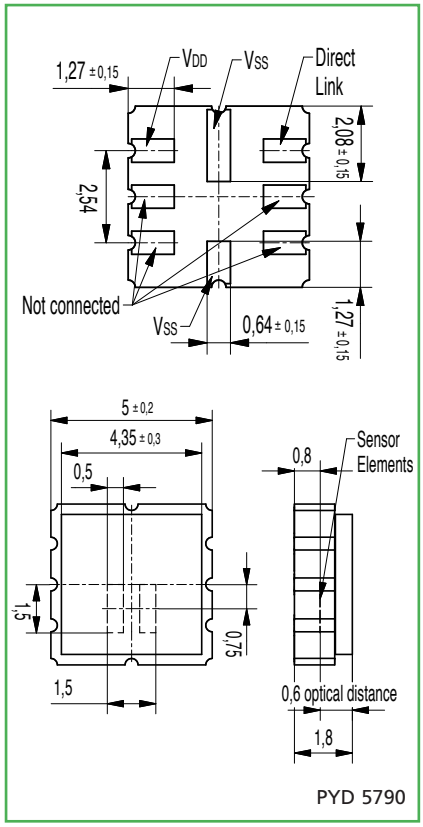


Figure 1

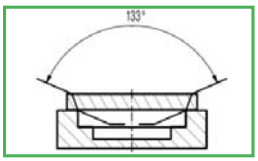


Fig 2 Field of View: Horizontal

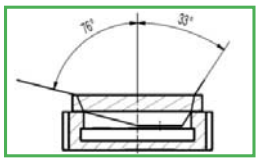


Fig 3 Field of View: Vertical

Fig 4 Field of View: Horizontal

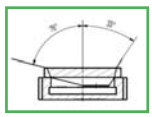


Fig 5 Field of View: Vertical

Pyroelectric Infrared Detector – PYD 5190
Proelectric Infrared Detector, Analog Dual-element, In SMD

Parameter	Symbol	PYD 5190	Unit	Remarks
Responsivity, min.	R_{min}	6.5	kV/W	f = 1 Hz
Responsivity, typ.	R	8.5	kV/W	f = 1 Hz
Match, max.	M_{max}	10	%	
Noise, Max.	N_{max}	150	μV_{pp}	0.4 - 10 Hz, 20 °C
Noise, Typ.	N_{typ}	60	μV_{pp}	0.4 - 10 Hz, 20 °C
Source Voltage		0.2 - 2.5	V	47 kΩ / 20 °C / 5 V
Field of View, vertical	FoV	76° + 33°		unobstructed
Field of View, horizontal	FoV	133°		unobstructed
Operating voltage		2.0 - 12 V	V	47 kΩ / 20 °C

Table 2

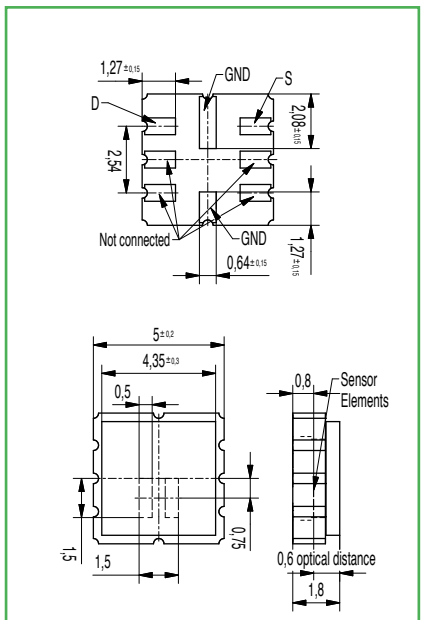
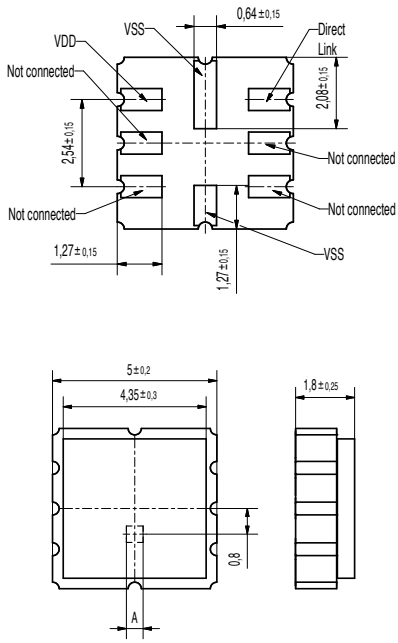


Figure 6

DigiPile™ – TPiS 1S 1253
Digital Thermopile Sensor, DigiPile™ in SMD

Parameter	Symbol	Min	Typ	Max	Unit	Remarks / Conditions
Operating Conditions						
Operating Voltage	V_{DD}	2.4	3.3	3.6	V	
Supply Current	I_{DD}	-	11	15	µA	V_{DD} = 3.3 V
Operating Temperature	T_o	-20		70	°C	The electrical parameters may vary from specified values in accordance with their temperature dependence.
Storage Temperature	T_s	-40		100	°C	Avoid storage in humid environment.
Thermopile Characteristics						
Sensitive Area	A		0.26		mm^2	Absorber area = 0.51 x 0.51 mm^2
Sensitivity	Δcounts / ΔT		200		counts/K	T_{obj} = 313K = 60°C, T_{amb} = 298K = 25°C
Noise			8		counts	T_{obj}= 313K (=60°C), T_{amb} = 298K (=25°C)
Time Constant	t		45		ms	
Ambient Temperature Sensor Characteristics						
Sensitivity of T_{amb}			90		counts/K	Linear for T_{amb} from 0°C to 90°C
Count @ T_{amb} = 25°C			7800		counts	
Optical Characteristics						
Field of View			~120		Degree	At 50% intensity points
Optical Axis			0	+/- 10	Degree	
Electrical Characteristics						
ADC Resolution T_{obj}			17		Bits	Max Count = 2^{17}
ADC Resolution T_{amb}			14		Bits	Max Count = 2^{14}
ADC Sensitivity of T_{obj}		0.7	0.8	0.9	µV/count	
ADC Offset T_{obj}			64500		counts	

Table 3



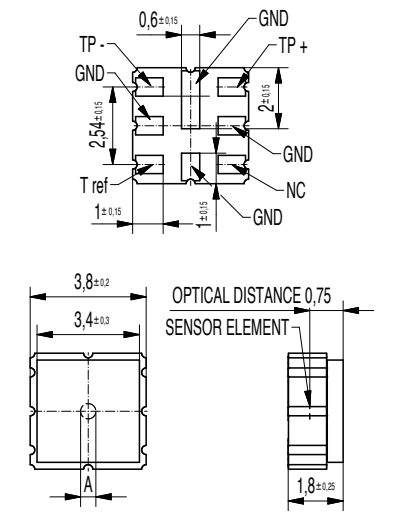
TPiS 1S 1253

Figure 7

Thermopile Detector – TPiD 1S 0122
Thermopile Detector, Analog, in SMD

Parameter	Symbol	TPiD 1S 0122	Unit	Remarks
Sensitive Area	A	0.2	mm^2	Absorber area
Thermopile Resistance	R_{TP}	85 - 135	kΩ	25 °C
Responsivity	R_{TP}	77	V/W	500 K / 1 Hz / without IR filter
Sensitivity (T_{det} 25 °C / T_{obj} 100 °C)	S_{100}	150	µV/K	0.4 - 10 Hz, 20 °C
Time Constant	t	15	ms	0.4 - 10 Hz, 20 °C
Noise voltage	V_N	42	nV/√Hz	25 °C
Specific Detectivity	D*	0.8	10^8 cm√Hz/W	25 °C
Temp. Coefficient of Resistance	TC_{RTP}	0.03	%/K	
Temp. Coefficient of Responsivity	TC_R	-0.05	%/K	
Field of View	FoV	115	Degrees	At 50% intensity points
Thermistor Resistance	R25	100	kΩ	47 kΩ / 20 °C
Thermistor BETA-value	ß	4097	K	Defined at 25 °C / 100°C

Table 4



TPiD 1S 0122

Figure 8