Integrated Motion Presence Multi - detector

Infrared Sensing Solutions

PYT 1197L / 7901

Product Specification



IMPM: Integrated DigiPyro® and DigiPile® with Multi-Zone lens

The IMPM combines pyroelectric and thermopile technologies by integrating a DigiPyro® and a DigiPile® with a multi-zone lens in one housing allowing various forms of detection and enhancing sensitivity on a small footprint without the necessity of external optics.

The DigiPyro® within uses a dual-element pyroelectric detector in an anti-parallel format. It features superior sensor performance over a wide operating temperature range, without noticable loss of responsivity at high termperatures. The signal is converted to a digital value using Sigma-Delta and DSP techniques. It detects alternating IR-radiation at a high range.

The DigiPile® within uses a highly responsive 1-Pixel thermopile chip. The signal is converted to a digital value using Sigma-Delta and DSP techniques. It detects constant IR-radiation at medium range.

The combination of both sensing technologies allows a far-range motion detection, mid-range approaching detection, and short-range presence detection.

The data is accessed by the host system through a proprietary one-wire interface for each sensor technology to enable advanced signal analysis with application dependent detection criteria.

The IMPM has an integrated lens containing of multiple sub-lenses creating different zones of sensitivity for the DigiPyro® in a broad FOV and a central zone of sensitivity for the DigiPile® in a focused FOV. It does not require external optics e.g., a Fresnel lens, to operate.

It is recommended to protect the IMPM from changing environmental conditions e.g., with a thin film of HDPE or other IR-transparent material to enhance its sensitivity by reducing thermal noise.

The IMPM is fully RoHS compliant without the usage of any exceptions.

Features

- Combined DigiPyro® & DigiPile® detector
- Integrated Multi-Zone Lens
  - No Fresnel lens required
- Highly responsive anti-parallel dual-element Pyro with a 120 x 60° Field-of-View
- Highly responsive 1-Pixel Thermopile chip with a central 40 x 40° Field-of-View
- Integrated digitization
- Best for advanced motion detection algorithms
- Advanced presence detection possible
- Low power consumption
- Good and stable performance over wide ambient temperature range
- TO-5 metal Housing for high EMI immunity
- Fully RoHS compliant

Applications

- Energy saving applications
- Smart housing applications
- Intrusion alarms
- Horizontal mounting applications
- Following detections possible:
  - Long-range motion
  - Mid-range approaching
  - Short-range presence

Contents

1 Detector Overview **1**

2 Physical Characteristics **2**
2.1 Pinout Characteristics . . . 2
2.2 Pyroelectric characteristics . . . 3
2.3 Thermopile characteristics . . . 4

3 Optical Characteristics **5**
3.1 Lens characteristics . . . 5
3.2 Filter Properties . . . 6

4 Electrical Characteristics **7**
4.1 Absolute Maximum Ratings . . . 7
4.2 DigiPyro® electrical characteristic . . . 8
4.3 DigiPile® electrical characteristic . . . 8

5 Readout Characteristic **9**
5.1 Interface Overview DigiPyro® . . . 9
5.2 Direct Link Interface DigiPyro® . . . 9
5.3 Interface Overview DigiPile® . . . 12
5.4 Direct Link Interface DigiPile® . . . 12

6 Handling, Operation and Precautions **14**
6.1 Handling . . . 14
6.2 Operation . . . 15

7 Quality and Statements **16**

8 Packaging **17**

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

1 Detector Overview

Table 1: Overview of detector characteristics.
All data refers to an ambient temperature of 25 ± 3 °C unless specified differently.

Housing	TO-5 footprint; Height 6.8 mm; Lead Length 13.2 mm					
Aperture	4 × 5 mm with integrated multi-zone lens					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Remarks/Conditions**
Operating Voltage	V_{DD}	2.4	3.3	3.6	V	
DigiPyro®						
Amplitude	A_{PY}	1350	1750		$counts_{pp}$	
Noise	N_{PY}		3	7	$counts_{pp}$	
Field of View	FOV_{PY}		120 x 60		°	X/Y; 25 %
DigiPile®						
Amplitude	A_{TP}	650	730		$counts_{pp}$	
Noise	N_{TP}		8	14	$counts_{pp}$	
Field of View	FOV_{TP}		40 x 40		°	X/Y; 25 %; central FOV area

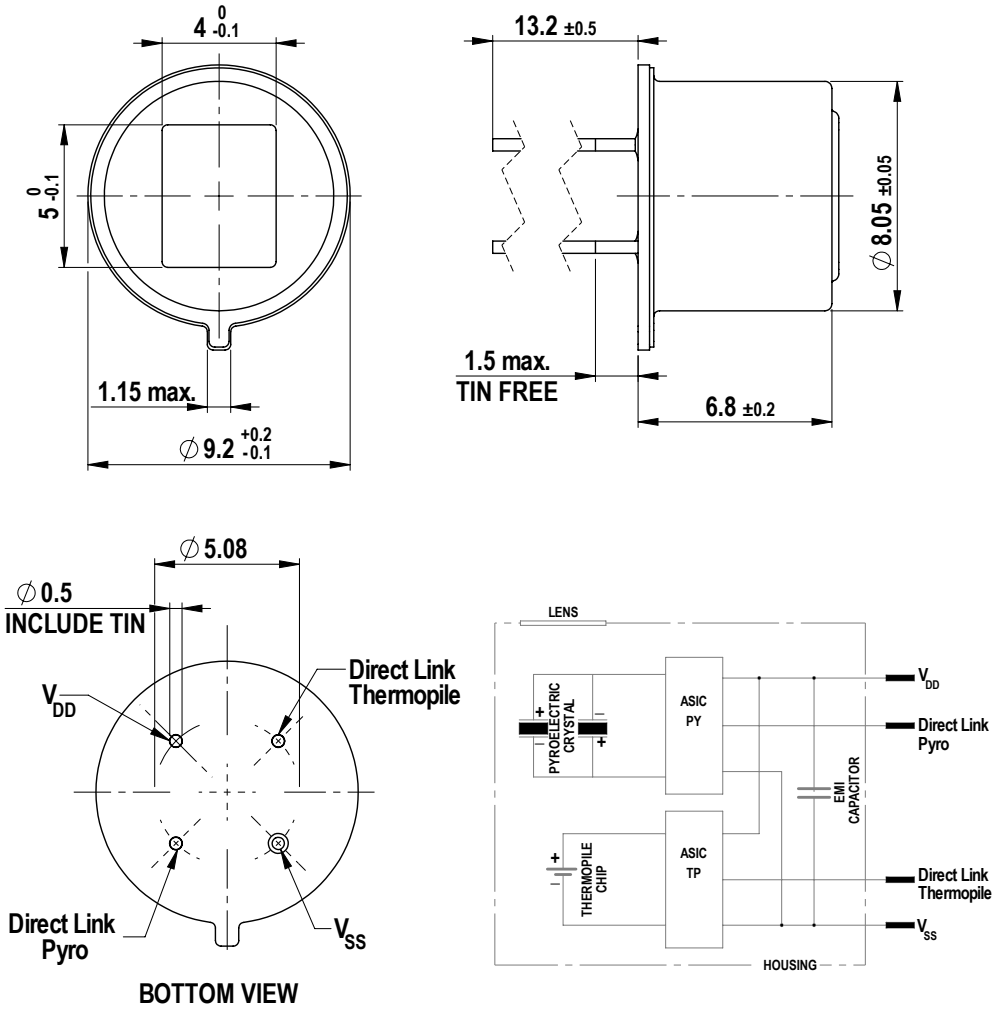
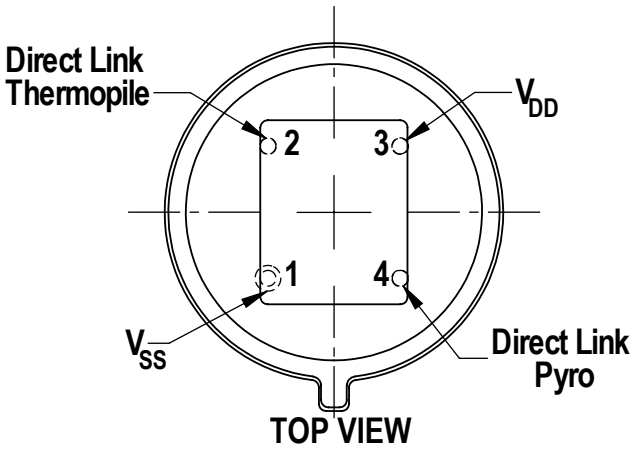


Figure 1: Dimensions and Connections.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

2 Physical Characteristics

2.1 Pinout Characteristics



Pin Number	Symbol	Pin Type	Description
1	V_{SS}	Power	Negative Power Supply. Should be set to the host ground.
2	Direct Link DigiPile®	Input/Output	1-wire digital interface for data readout. An external decoupling capacitor close to the pin is recommended. See technical note for details.
3	V_{DD}	Power	Positive power supply. Typical operating voltage is $3.3\mathrm{V}$.
4	Direct Link DigiPyro®	Input/Output	1-wire digital interface for data readout. An external decoupling capacitor close to the pin is recommended. See technical note for details.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

2.2 Pyroelectric characteristics

Table 3: Detailed summary of the pyroelectric characteristics.
All data refers to an ambient temperature of $25 \pm 3\,^{\circ}\mathrm{C}$ unless specified differently.

Parameter	Symbol	Min	Typ	Max	Unit	Remarks/Conditions
Amplitude	A_{PY}	1350	1750		counts_{pp}	
Noise	N_{PY}		3	7	counts_{pp}	
Element Size	A_{PY}		2.5×1		mm	dual Element; Pitch $2.25\,\mathrm{mm}$

The 100% RoHS-free material Pyro element configuration is shown in Figure 1 and features a dual-element configuration in an anti-parallel format. Its typical applications are wall mounted long-range motion detection.

The typical test setup for the measurement of Amplitude (R) is illustrated in Figure 2. The black body radiator (1) is set to $333\,\mathrm{K}$ ($600\,^{\circ}\mathrm{C}$). The signal is modulated by a rotating chopper (2) with a modulation frequency of $1\,\mathrm{Hz}$. An aperture (3) and cover plate (4) is used to adjust the radiation flux. The sensor (5) is interfaced to a signal processing chain (6).

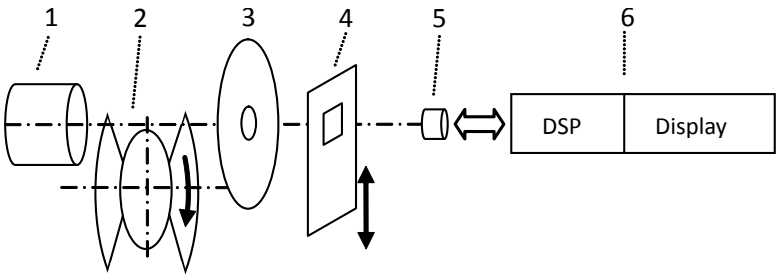


Figure 2: Test setup for the measurement of Responsivity and Match.

The Amplitude of the DigiPyro® (A_{PY}) is defined as the peak-peak value of the generated voltage difference due to the pyroelectric effect digitized by the ASIC during a sinusoidal stimulation of IR-radiation and is quantified in counts_{pp}.

Noise of the DigiPyro® (N_{PY}) is measured shut from infra-red energy after a settling time of $10\,\mathrm{min}$ at a $25 \pm 3\,^{\circ}\mathrm{C}$ ambient temperature for the duration of $600\,\mathrm{s}$. A bandpass filter in the range of $0.4\,\mathrm{Hz}$ to $10\,\mathrm{Hz}$ is applied. Noise is defined as the maximal value difference (peak-peak) that occurred during the measurement time and is quantified in counts_{pp}.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

2.3 Thermopile characteristics

Table 4: Detailed summary of the thermopile characteristics.
All data refers to an ambient temperature of $25 \pm 3\,^{\circ}\mathrm{C}$ unless specified differently.

Parameter	Symbol	Min	Typ	Max	Unit	Remarks / Conditions
Amplitude	A_{TP}	650	730		counts_{pp}	
Time constant	τ		30		ms	Additional $8\,\mathrm{Hz}$ LP Filter
Noise	N_{TP}		8	14	counts_{pp}	
Membrane Area	A_{TP}		1.08×1.08		mm	Absorber Area $0.51 \times 0.51\,\mathrm{mm}$

The same typical measurement system, as discussed in Subsection 2.2, is used to measure the Amplitude of the DigiPile® .

The Amplitude of the DigiPile® (A_{TP}) defined as the peak-peak value of the generated voltage difference due to the thermoelectric effect digitized by the ASIC during a sinusoidal stimulation of IR-radiation is quantified in counts_{pp}. The thermopile output signal $\mathrm{TP}_{\mathrm{object}}$ is not only depending on the objects temperature but also on the ambient temperature T_{ambient}.

Noise of the DigiPile® (N_{TP}) is measured shut from infra-red energy after a settling time of $10\,\mathrm{min}$ at a $25 \pm 3\,^{\circ}\mathrm{C}$ ambient temperature for the duration of $600\,\mathrm{s}$. A bandpass filter in the range of $0.4\,\mathrm{Hz}$ to $10\,\mathrm{Hz}$ is applied. Noise is defined as the maximal value difference (peak-peak) that occurred during the measurement time and is quantified in counts_{pp}.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

3 Optical Characteristics

3.1 Lens characteristics

The integrated lens with its multiple sub-lenses is splitting the FOV to create a pattern of different zones of sensitivity.
The sensitive zones for the DigiPyro® can be seen in Figure 3 in an angular plot . It spans in horizontal-direction (X) 120° and in vertical-direction (Y) of 60°. There are multiple zones in both X and Y-direction for movement detection. Pyroelectric detectors require a movement between two zones with opposite sign to generate signal. A movement between a dead zone and a zone with either signal is also creating a measurable signal.

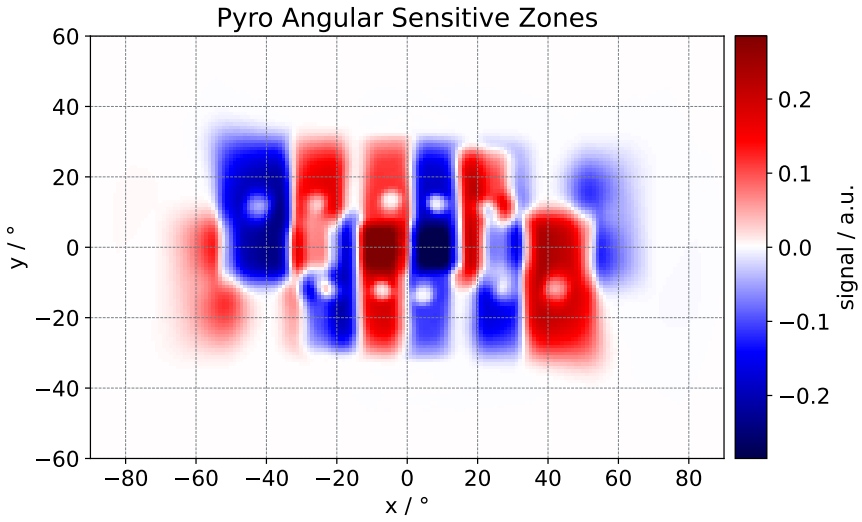


Figure 3: The angular sensitive zones of the DigiPyro® .

The sensitive zones for the DigiPile® can be seen in Figure 4 in an angular plot . The central sensitive zone spans in horizontal-direction (X) 40° and in vertical-direction (Y) 40°. This zone can be mainly used for Approaching and Presence detection. There is no change between zones required to generate a measurable signal.

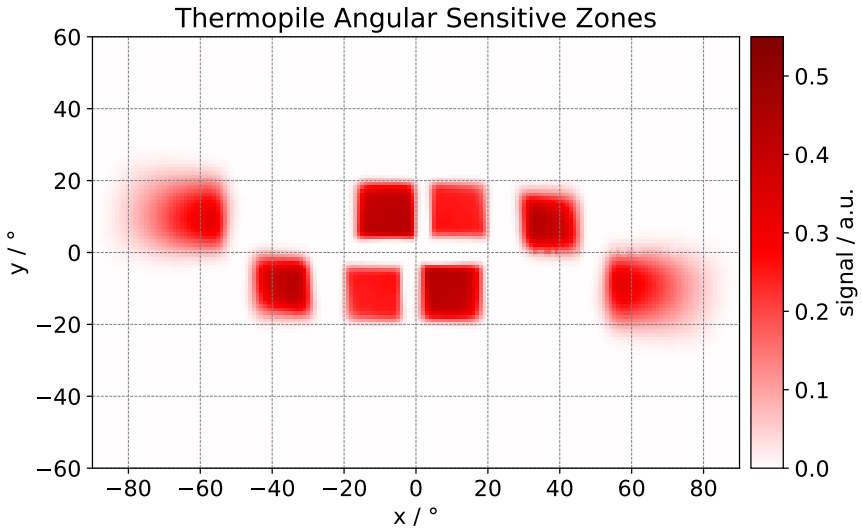


Figure 4: The angular sensitive zones of the DigiPile®

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

3.2 Filter Properties

The integrated lens is also filtering the incoming IR-radiation as seen in Figure 5 and its key specifications can be seen in Table 5.

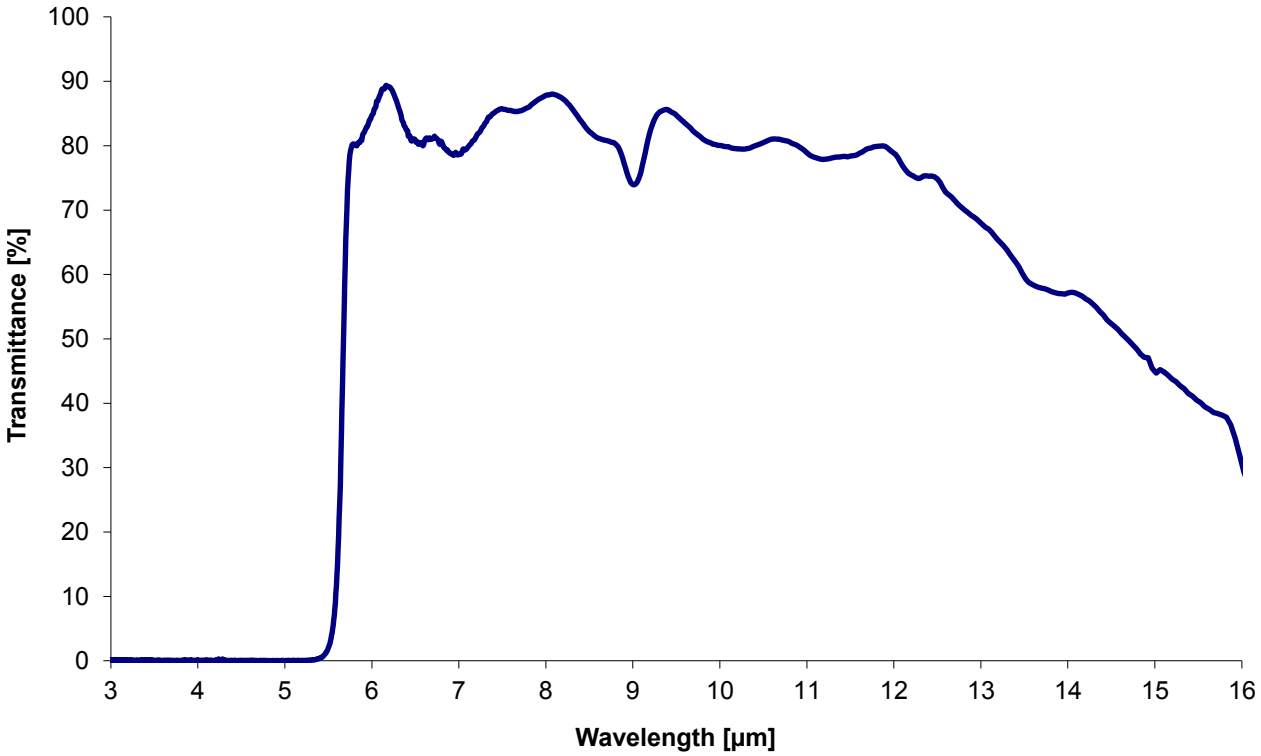


Figure 5: Filter transmittance, typical curve

Table 5: Filter Properties
All data refers to an ambient temperature of 25 ± 3 °C unless specified differently.

Parameter	Symbol	Min	Typ	Max	Unit	Remarks/Conditions
Average Filter Transmittance	T_A	77			%	$7.5\,\mu m < \lambda < 13.5\,\mu m$
Average Filter Transmittance	T_A			0.5	%	$\lambda < 5\,\mu m$
Cut-on Wavelength	$\lambda(5\,\%)$	5.2	5.5	5.8	µm	

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

4 Electrical Characteristics

Table 6: General electrical characterisitcs
All data refers to an ambient temperature of 25 ± 3 °C unless specified differently.

Parameter	Symbol	Min	Typ	Max	Unit	Remarks / Conditions
VDD						
Operating Voltage	V_{DD}	2.4	3.3	3.6	V	
Supply Current	I_{DD}		13.5	17.5	µA	V_{DD} =3.3 V, no load
Direct Link						
Input Low Voltage	V_{IL}			$0.2V_{DD}$	V	
Input High Voltage	V_{IH}	$0.8V_{DD}$		V_{DD} + 0.3 V	V	
Input Current	I_I	−1		1	µA	Pull Up/Down resistors at Direct Link are not applicable.
Data Clock Low Time	t_{DL}	200		2000	ns	
Data Clock High Time	t_{DH}	200		2000	ns	
Data Bit Settling Time	t_{BS}			2	µs	C_{LOAD} <10 pF
Sample Time	t_{SMPL}	2.0		14.6	ms	
Bit Time	t_{BIT}			25	µs	
It is not recommended to use a resistor in series above 500 Ω and/or decoupling capacitors larger than 50 pF.						

4.1 Absolute Maximum Ratings

Table 7: Absolute Maximum Ratings. Data applicable to operation at free-air temperature range.

Parameter	Symbol	Min	Typ	Max	Unit	Remarks/Conditions
Voltage at any pin	V_{DD}	−0.3		3.6	V	
Current into any pin	I_{pin}	−100		100	mA	
Storage Temperature		−40		85	°C	< 60 % r.H.
Operating Temperature		−40		70	°C	

Stresses beyond the limits listed in table 7 may cause permanent damage to the device. Exposure to absolute maximum ratings for long time may affect the device reliability and may lead to deterioration of any parameter.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

4.2 DigiPyro® electrical characteristic

Table 8: DigiPyro® electrical Data Direct Link.
All data refers to an ambient temperature of 25 ± 3 °C unless specified differently.

Parameter	Symbol	Min	Typ	Max	Unit	Remarks/Conditions
Data Setup Time	t_{DS}	75		200	µs	Interrupt Readout Mode
Data Setup Time	t_{DS}	110		200	µs	Forced Readout Mode
Update Time	t_{UP}	1250			µs	
Internal Clock Frequency	f_{CLK}	29	32	35	kHz	
Pyro Channel						
Resolution			14		Bits	Effective range 511 to 2^{14} – 511 counts
Sensitivity		6.0	6.5	7.1	µV/Count	
Offset		6500	8192	9800	Counts	in stable condition
LPF cutoff frequency	f_1		7		Hz	
Temperature Channel						
Resolution			14		Bits	Effective range 511 to 2^{14} – 511 counts
Sensitivity			80		counts/K	
Offset		4400	6700	9000	counts	

4.3 DigiPile® electrical characteristic

Table 9: DigiPile® electrical Data.
All data refers to an ambient temperature of 25 ± 3 °C unless specified differently.

Parameter	Symbol	Min	Typ	Max	Unit	Remarks/Conditions
Data Setup Time	t_{DS}	90		200	µs	
Update Time	t_{UP}	70			µs	
Frequency oscillator	F_{OSC}	60	70	80	kHz	
Power up time			250		ms	TP_{OBJ} and TP_{AMB} stable
Thermopile Channel						
Resolution			17		Bits	
Sensitivity ADC		0.7	0.8	0.9	µV/Count	
Offset		64 000	64 500	65 000	counts	
Temperature Channel						
Resolution			14		Bits	
Sensitivity ADC			90		counts/K	
Offset		7000	8200	9400	counts	

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

5 Readout Characteristic

5.1 Interface Overview DigiPyro®

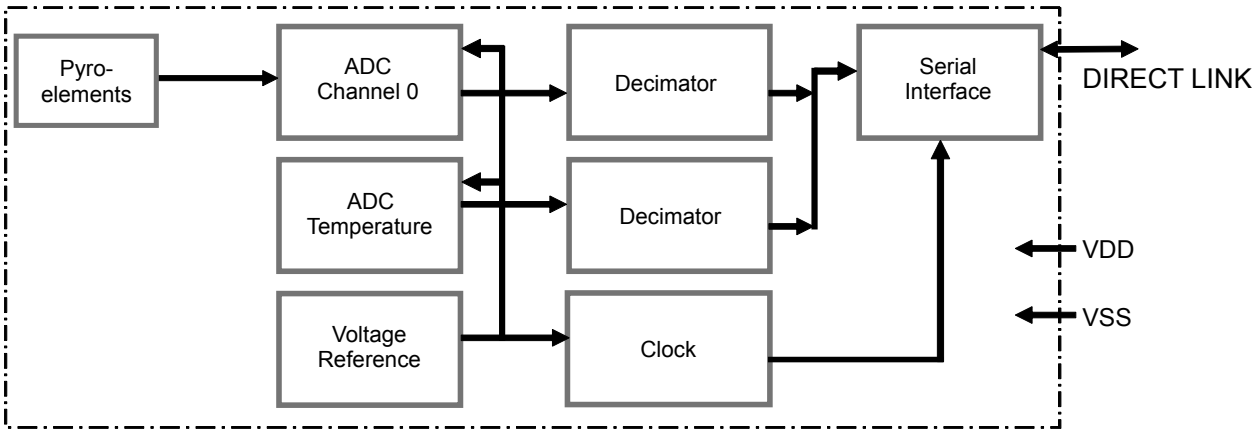


Figure 6: Block Diagram

The pyro-electric sensing elements are connected to a built-in IC, whose functions are shown in the block diagram 6. The , contains pyro-electric elements, sensitive to IR radiation, and an ASIC for the digital signal processing within the sensor package. The ASIC includes an on-chip oscillator, a voltage reference, an analog-to-digital (ADC) converter for the pyroelements and an internal temperature sensor.
A proprietary serial interface called “DIRECT LINK” is used to read the digitized data.

5.2 Direct Link Interface DigiPyro®

The DIRECT LINK interface is a bi-directional one wire serial interface which is used to continuously retrieve data from the sensor.

Table 10: Content of the DIRECT LINK data stream when reading sensor out.

Bit#	Description	Size[bit]	Remarks
[27:14]	PIR (CH0) ADC counts	14	Value of PIR
[13:0]	Temperature ADC counts	14	Value of internal temperature reference

Out of Range The ASIC features an out of range detection. Should the pyroelectric sensor’s signal drop below 511 countsor exceed $2^{14}-511$ $\mathrm{counts}$the input will be shorted for a duration of about 16 ms in order to discharge the sensor. Out of range conditions may occur for example during strong sensor temperature gradients of more than $1\,\mathrm{K\,min^{-1}}$.

ADC counts The data represents ADC counts after low-pass filtering and the reference temperature counts. The low-pass data and the reference temperature data is represented as 14 bit unsigned integer. We recommend to implement a band pass filter on the hostsytem for the PIR data prior to further data analysis to remove the DC (offset) component.

Timing The DIRECT LINK interface communication principle is sketched in Figure 7. It can be divided into the start condition and the data stream after it.
The start condition for any communication is indicated by a LOW to HIGH transition of the DIRECT LINK line. That

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

condition can be initiated either by the host system or the sensor. Initiating the condition with the host system is called "Forced Readout" mode. Initiating the condition with the sensor is called "Interrupt (driven) Readout" mode. The sensor will periodically initiate an "Interrupt Readout" if no "Forced Readout" is initiated by the host system. Details are described below.

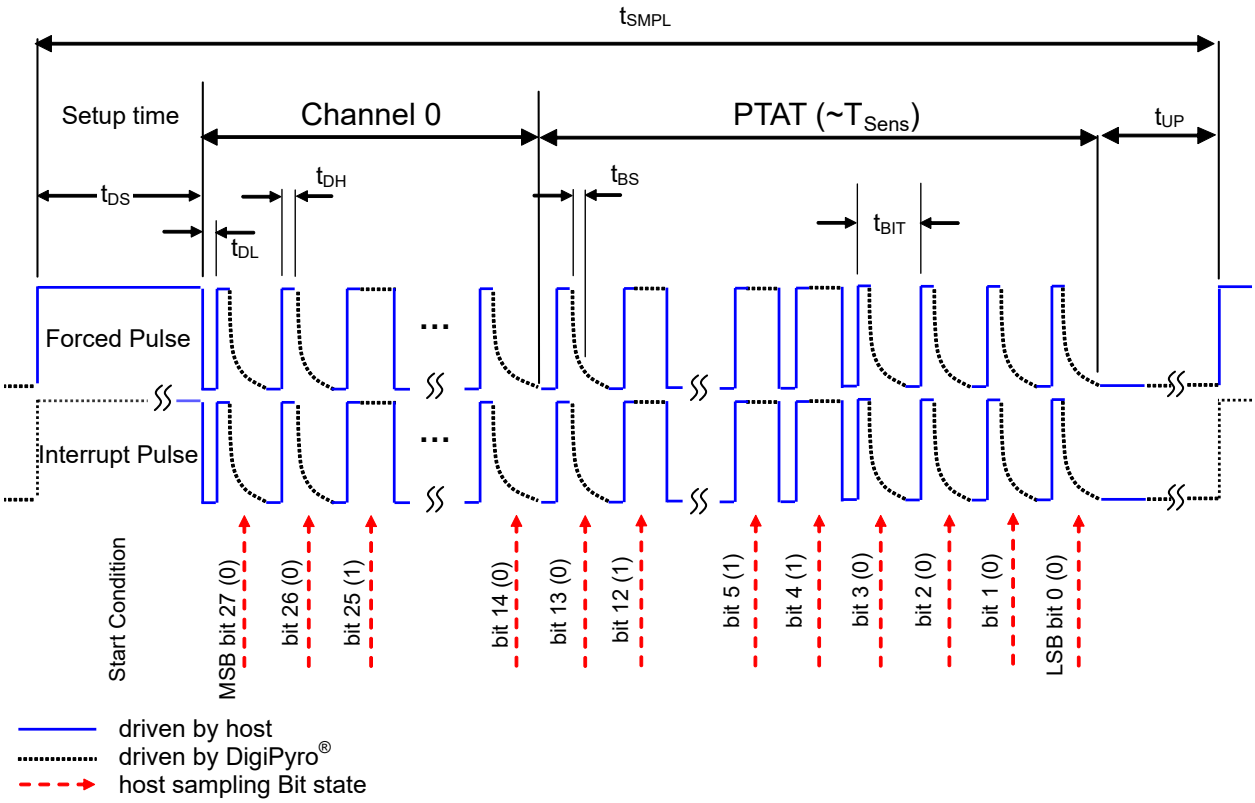


Figure 7: Data Transmission Diagram

Forced Readout The sensor is expecting the host system to initiate the communication. Forcing DIRECT LINK to HIGH for at least $t_{DS} = 90\,\mu s$ and then pulling it to LOW will start the communication. The host system can resume with the **Readout of Bits**.
If the host system is not initiating the communication for a period of longer than $t_{SMPL} = 14.6\,ms$ the sensor will pull the line HIGH to initiate the "Interrupt Readout".

Interrupt Readout The sensor will drive the line typically every $t_{SMPL} = 16\,ms$ HIGH. The host system must then pull the line to LOW in order to start the communication with the sensor. The host system can proceed to the **Readout of Bits** not sooner than $75\,\mu s$ after the Interrupt occurred and the DIRECT LINK was HIGH.
In order to recognize the interrupt by the sensor, the host system's connection to the DIRECT LINK line must have a high impedance (high Z) and be set to input.
The recommended readout mode is the "Forced Readout".

Readout of Bits The readout procedure is started by the forced or interrupt pulse. The waits for the next LOW to HIGH transition by the host system. The host system pulls the line HIGH and releases it (high impedance Z). The will pull the line LOW for a $0\,bit$ state or keep it HIGH for a $1\,bit$ state.
The time t_{BS} which the signal needs to settle to a LOW level depends on the capacitive load (e.g. PCB design) at the DIRECT LINK pin. Hence, it is recommended to start implementing the interface with t_{BIT} close to, but shorter

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

than 25 µs to ensure proper LOW level settling. In next steps reduce t_{BIT} empirically to optimize for reliable data transmission at maximum transmission speed. It is not recommended to choose bit settling times below 2 µs.
After reading the line state by the host system, the host pulls the line again LOW to initiate the next bit readout by a LOW to HIGH transition again. The sequence will be repeated until all bits are shifted out. After the last bit of bit[0] the host controller must force DIRECT LINK pin to LOW for at least $t_{UP} > 1250$ µs and subsequently release DIRECT LINK (High Z). This minimum time is required to allow the registers to be updated with latest values before the next read operation.
It has to be considered that t_{BIT} must not exceed 25 µs to avoid data corruption. Under no circumstances DIRECT LINK may be at LOW level for longer than 25 µs, in case further bits need to be read out. It is recommended that the total time to readout one data packet should not exceed 800 µs to ensure always latest values. In "Interrupt Mode" the total readout procedure must not exceed $t_{SMPL} < 14.6$ ms.
It is allowed to cancel the readout at any position of the data stream. To terminate the readout, DIRECT LINK must be forced to LOW level and kept for at least $t_{UP} > 1250$ µs in order to ensure an update to latest values.
In order to reduce settling effects, the data packets have to be read continuously with equal sampling intervals.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

5.3 Interface Overview DigiPile®

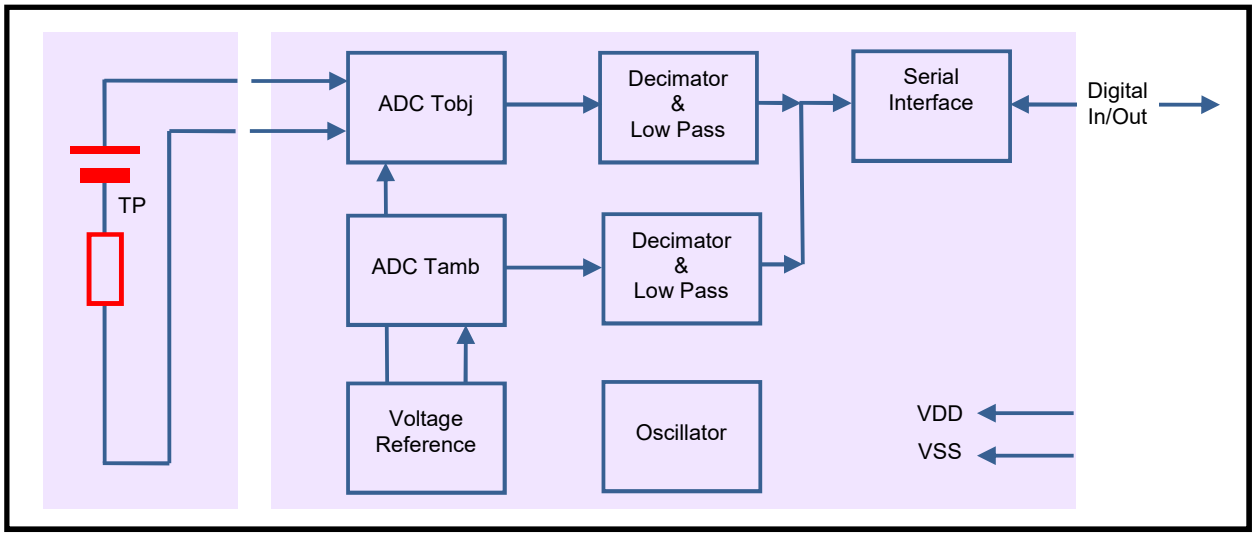


Figure 8: Block Diagram

The functional diagram 8 illustrates the functional blocks of the . The thermopile sensing element, generates a voltage, which is proportional to the IR-net-radiation. It is connected to a built-in IC,
The thermopile voltage is digitized with a high resolution and high linearity differential analog-to-digital converter. The PTAT is a linear reference sensor temperature which is proportional to the temperature change. It is digitized with a separate ADC. Both channels are low pass filtered for optimal signal-to-noise performance.
The ASIC includes an on-chip oscillator and a voltage reference to make it independent from the voltage supply.
A proprietary serial interface called “DIRECT LINK” is used to read the digitized data.

5.4 Direct Link Interface DigiPile®

The DIRECT LINK interface is a bi-directional one wire serial interface which is used to continuously retrieve data from the sensor.

Table 11: Content of the DIRECT LINK data stream when reading sensor out.

Bit#	Description	Size[bit]	Remarks
[30:14]	Thermopile ADC counts	17	Value of thermopile voltage
[13:0]	Temperature ADC counts	14	Value of internal temperature reference

ADC counts The data represents ADC counts after low-pass filtering and the reference temperature counts. The low-pass data is represented as 17 bit unsigned integer. The reference temperature data is represented as 14 bit unsigned integer.

Timing The DIRECT LINK interface communication principle is sketched in Figure 9. It can be divided into the start condition and the data stream after it.
The sensor is expecting the host system to initiate the communication. Forcing DIRECT LINK to HIGH for at least $t_{DS} = 110\,\mu\mathrm{s}$ and then pulling it to LOW will start the communication. The host system can resume with the **Readout of Bits**.
If the host system is not initiating the communication for a period of longer than $t_{SMPL} = 14.6\,\mathrm{ms}$ the sensor will pull the line HIGH. This must be avoided by continious readout to avoid unnesseceray heatup of the component.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

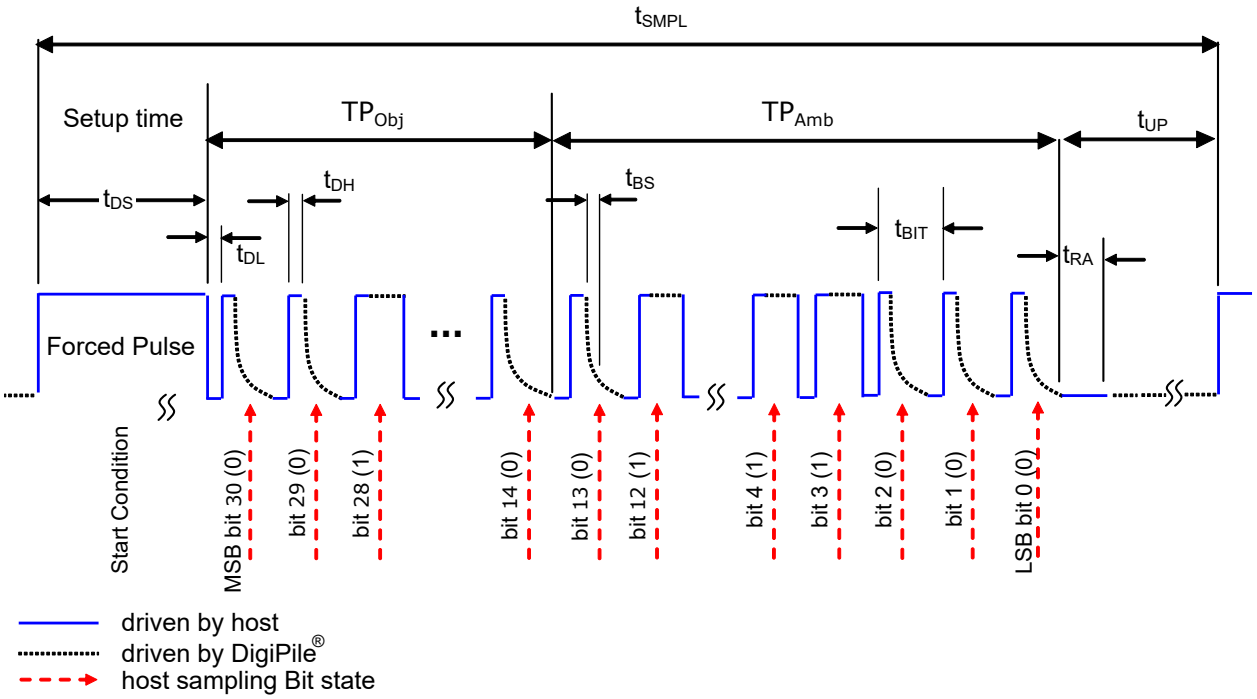


Figure 9: Data Transmission Diagram

Readout of Bits The readout procedure is started by the forced pulse. The waits for the next LOW to HIGH transition by the host system. The host system pulls the line HIGH and releases it (high impedance Z). The will pull the line LOW for a 0 bit state or keep it HIGH for a 1 bit state.

The time t_{BS} which the signal needs to settle to a LOW level depends on the capacitive load (e.g. PCB design) at the DIRECT LINK pin. Hence, it is recommended to start implementing the interface with t_{BIT} close to, but shorter than 25 µs to ensure proper LOW level settling. In next steps reduce t_{BIT} empirically to optimize for reliable data transmission at maximum transmission speed.

After reading the line state by the host system, the host pulls the line again LOW to initiate the next bit readout by a LOW to HIGH transition again. The sequence will be repeated until all bits are shifted out. After the last bit of bit[0] the host controller must force DIRECT LINK pin to LOW for at least $t_{UP} = 70$ µs and subsequently release DIRECT LINK (High Z).

It has to be considered that t_{BIT} must not exceed 25 µs to avoid data corruption. Under no circumstances DIRECT LINK may be at LOW level for longer than 25 µs . It is recommended that the total time to readout one data packet should not exceed 800 µs to ensure always latest values.

In order to reduce settling effects, the data packets have to be read continuously with equal sampling intervals.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

6 Handling, Operation and Precautions

6.1 Handling

Shelf Life The product can be stored for 12 months before usage at $-10\,^{\circ}\mathrm{C}..40\,^{\circ}\mathrm{C}$ (<60 % r.H. at $40\,^{\circ}\mathrm{C}$ non condensing).

Storage Avoid storage under high humidity and/or high ambient temperature environments.

ESD The ASIC was designed to withstand a discharge of up to $1.6\,\mathrm{kV}$ through a $1.5\,\mathrm{k\Omega}$ resistor in series according to the test method MIL-STD-883D / 3015. Handle the detectors as ESD sensitive devices and protect them from electrostatic discharges. Working areas should be conductive and grounded. When handling detectors, operators shall be grounded.

Mechanical Avoid mechanical stress on the Housing and especially on the leads. Be careful when cutting or bending leads to avoid damage. Do not bend leads less than 5 mm from their base. Do not drop detectors on the floor.

Cleanliness Avoid touching the detector window. To clean windows, use only ethyl alcohol with a cotton swab when necessary. Do not expose detectors to aggressive detergents such as Freon, trichloroethylene, etc.

Soldering Conditions For the soldering of the detectors within PCBs, the typically applied and recommended process is wave soldering. The recommended soldering temperature shall not exceed $285\,^{\circ}\mathrm{C}$ with a maximum exposure time of 5 seconds. During the automatic wave solder process we strongly advise to restrict preheating when the detector is directly exposed to the radiation of such heaters. In this case, the detector should be protected from the heat.
Manual soldering is also possible when maintaining similar temperature profiles.
Re-flow soldering is not possible due to the high temperature profiles of the process.
Temperatures higher than recommended may affect its performance. Any soldering process should be qualified to avoid damage to the sensor.

Soldering For the soldering of the detectors within PCBs, the typically applied and recommended process is wave soldering. The recommended soldering temperature shall not exceed $300\,^{\circ}\mathrm{C}$ with a maximum exposure time of $5\,\mathrm{s}$.
Other soldering processes are also possible when maintaining similar temperature profiles. Temperatures higher than recommended may affect its performance. Any soldering process should be qualified to avoid damage to the sensor.
For highest accuracy and best temperature compensation, it is recommended to keep a small gap ($1\,\mathrm{mm}$) between the PCB and sensor base plate.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

6.2 Operation

Position In order to obtain the highest possible performance it is possible to operate the sensor without a (protecting) front window. To measure an accurate temperature no window between the sensor and the object must be used. Excelitas measurement values are only valid when the bare sensor is exposed to the object.
As the device is equipped with a highly sensitive infra-red detector, it is sensitive to any source of heat, direct or indirect. For a proper temperature measurement the device must be at the same temperature as the ambient. Sudden temperature changes will directly affect the behaviour of the sensor's performance.
This device is equipped with a highly sensitive ADC and integrated circuits. Common rules of electronics integration apply. We recommend to place strong EMI sources far apart and/or to shield those.

Humidity The operation below the dew point may affect the performance.

Temperature Strong temperature gradients may affect the sensor's performance. Before taking a reading, during testing, and / or operation the unit has to become thermally stable (due to its nature as a thermal detector and the high sensitivity of the device).
All data is specified at room temperature. When operating at other temperatures within the specified operating range, parameters may vary. The detectors might operate outside the quoted range but may have degraded performance.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

7 Quality and Statements

Quality Excelitas Technologies is a ISO 9001:2015 certified manufacturer with established SPC and TQM. Detector out-going inspections include the parameters responsivity, offset, noise, gross leak. Due to high level mass production, individual data is not stored.
Excelitas Technologies is certified for it's Environmental Management System according to ISO 14001:2015 and for the Occupational Safety and Health Management System according to ISO 45001:2018.
All devices employing PCB assemblies are manufactured according IPC-A-610 class 2 guidelines.
The infra-red detection product line is certified for ANSI/ESD S.20.20:2014.

Package This IR-detector is sealed to pass a He-leakage test with maximum leak rate of $1 \times 10^{-8}\,\mathrm{mbar\,L\,s^{-1}}$.

Traceability The marking of the detector includes the principal type, a 4-digit number that represents the Excelitas identification number, and a 4-digit date code. The date code consists of the production year and week with the format "YYWW". The marking is printed on the top of the detector.

Safety Modern high-tech materials are applied in the production of our pyro-electric detectors. Some of these materials are sensitive to high temperature exposure or to specific forms of stress. Our parts are compliant with environmental regulations such as RoHS 2011/65/EU without exceptions. For details please contact our local representatives. We recommend to always check your local regulations. Disposal shall only be carried out in accordance with the latest legislation and directives. In Europe, WEEE directives must be followed.
The leads of these detectors have been pre-tinned with lead free tin process and may be applied through lead-free solder processes. As such the detectors will enable the design of RoHS compliant products.

Liability Policy The contents of this document are subject to change. The details of this document are valid by the specified revision date. Excelitas reserves the right to change at any time total or part of the content of this specifications without individual notification. Customers should consult with Excelitas Technologies' representatives to ensure updated specifications before ordering.
Customers considering the use of Excelitas Technologies devices in applications where failure may cause personal injury or property damage, or where extremely high levels of reliability are demanded, are requested to discuss their concerns with Excelitas Technologies representatives before such use.
The Company's responsibility for damages will be limited to the repair or replacement of defective product. As with any semiconductor device, pyroelectric sensors, thermopile sensors or modules have a certain inherent rate of failure. To protect against injury, damage or loss from such failures, customers are advised to incorporate appropriate safety design measures into their product.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

8 Packaging

The Excelitas Technologies tube packaging system protects the product from mechanical and electrical damage and is designed for manual unloading. Figure 10 shows the basic outline.
The system consists of tubes which are protected against ESD (5). The devices are loaded sequentially and fixed with stoppers (4). Up to 50 parts are filled into one tube. In total up to 20 tubes are placed in one paper box (3) filled with protective sponges (8,9,10).
Information labels, ESD labels and bar-code Labels (7) are placed on the box. The label (7) contains the following Information:

- Producer = Excelitas Technologies
- Origin
- Product Name
- Full BAU (unique identification) number
- Batch Number
- Packaging Date

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430

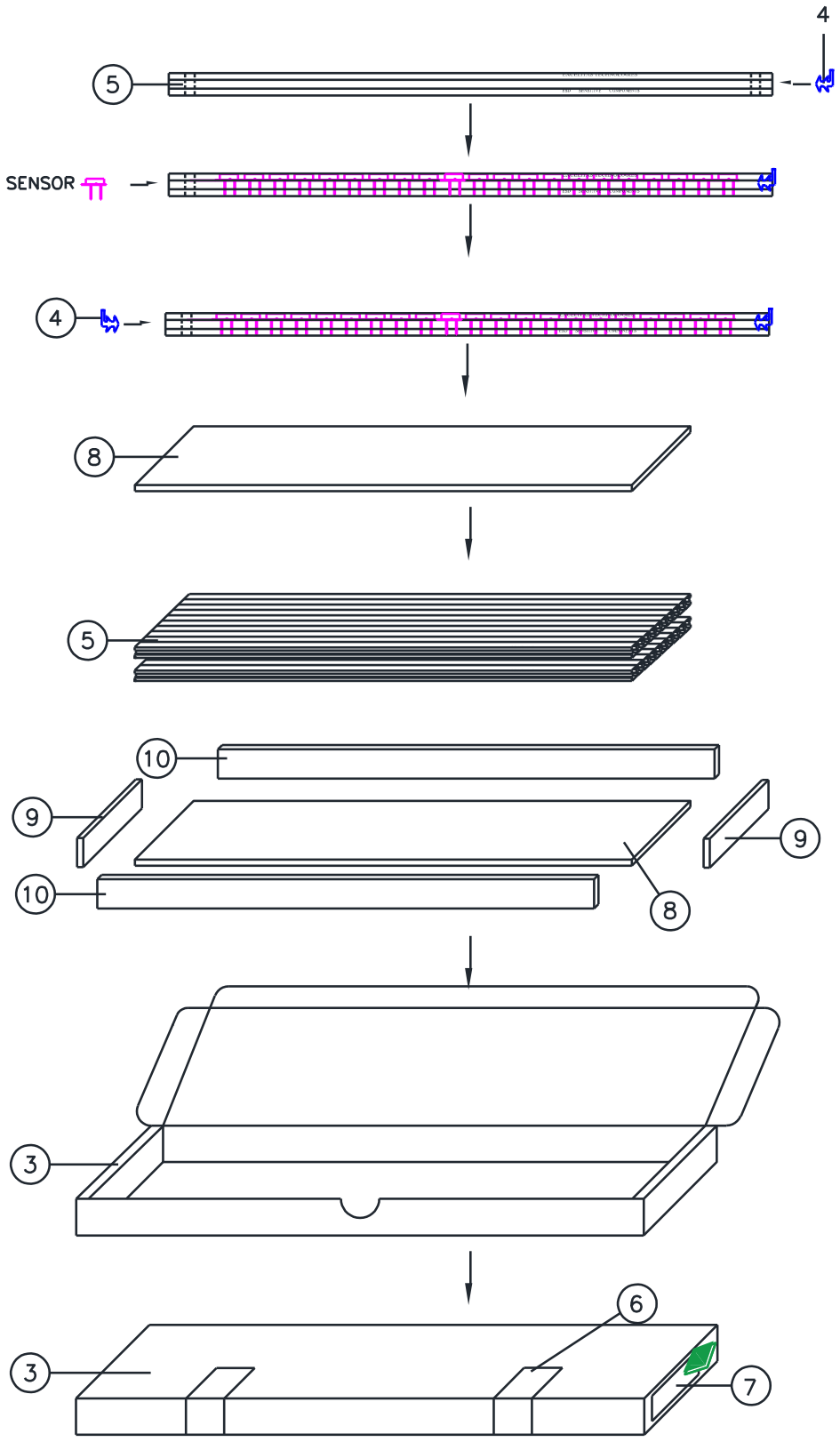


Figure 10: Information about the packaging of sensors.

Excelitas Technologies GmbH & Co. KG
Wenzel-Jaksch-Str. 31
65199 Wiesbaden Germany
Tel.: +49 (0)611 492 430