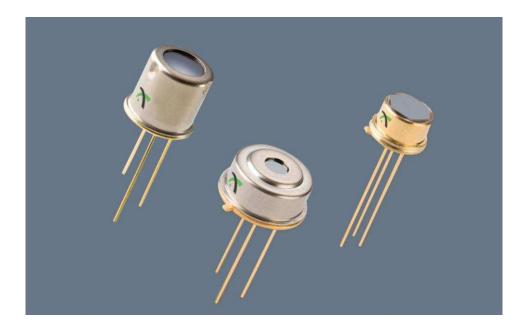


DigiPile[™] Family

Digital Thermopiles



The DigiPile[™] is a Thermopile Detector with digital output. It combines a time-proven MEMS-based sensing element with a fully integrated low noise amplifier, A/D converter and integrated ambient temperature sensor. An internal clock and control unit enable the DigiPile to open a dialogue with any outside microprocessor without the need for costly additional components.

Along with the DigiPile's more reliable digital design functionality, the move from analog to digital provides OEM designers with a number of distinct advantages including reduced PCB space requirements, improved EMI resistance, and need for fewer additional components like low offset/low noise amplifier and associated filters.

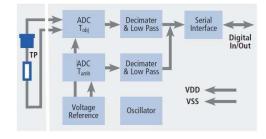
The DigiPile is specifically designed for a range of OEM applications including thermometry, pyrometry, and non-contact temperature sensing. The DigiPile will be offered in a range of housings and sensing areas with the first models from Excelitas covering the popular TO-46 and TO-5 metal housings. We are also offering a DigiPile model with a built-in lens, ideally suited to applications like forehead thermometry where a focusing system is desirable.

Key Features

- More reliable digital design functionality than with analog – all "Digi" models include Thermopile infrared Detector and proprietary digitizing circuit (ADC)
- Reduced PCB space requirements
 by up to 20%
- Integrated design no need for costly additional components like low noise amplifier and associated filters
- High signal to noise ratio based on our new thermopile chip with increased signal strength
- Improved EMI resistance
- Low operating voltage, down to 2.4V
- Low current consumption
- Range of housings and sensing areas to be offered
- Option of model with integrated lens, where a focusing system is particularly useful
- RoHS-compliant

Applications

- Thermometry
- Pyrometry
- Non-contact, high-precision temperature sensing





$\mathbf{DigiPile}^{\mathsf{TM}}\ \mathbf{Family}$

Digital Thermopiles

DigiPile Models

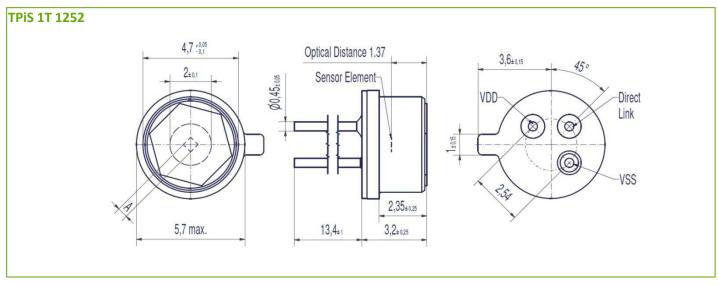
Operating Conditions VDD 2.43.6 2.43.6 2.43.6 V Supply Current Iso 1115 1115 1115 μΑ V _{CO} = 3.3 V Operating Temperature To -2070 -2070 -2070 °C ¹ Storage Temperature To -40100 -40100 °C *** Thermopile Characteristics Sensitivity Supply Current A 0.51 x 0.51 0.51 x 0.51 mm² Sensitivity Supply Current A 0.51 x 0.51 0.51 x 0.51 mm² Sensitivity Supply Current A 0.51 x 0.51 0.51 x 0.51 mm² Sensitivity Supply Current A 0.51 x 0.51 0.51 x 0.51 mm² Sensitivity Supply Current A 0.51 x 0.51 0.51 x 0.51 mm² Sensitivity of Tube 8 8 8 counts/K counts/K counts/K counts/K counts/K counts/K counts/K counts/K coun	Parameter	Symbol	TPiS 1T 1252	TPS 1T 1254	TPS 1T 1256 L5.5	Unit	Remarks / Conditions		
Supply Current I ₀₀ 1115 1115 1115 μA V ₀₀ = 3.3 V Operating Temperature T _o -2070 -2070 "C ¹ Storage Temperature T _s -40100 -40100 "C Thermopile Characteristics Sensitive Area A 0.51 x 0.51 0.51 x 0.51 mm² Sensitivity S ₄₀ 290 ° 150 ° 67 ° counts/K T _{tobs} = 313K = 40°C, T _{sens} = 298K = 25°C Sensitivity S ₂₀₀ 400 ° 200 ° 85 ° T _{tobs} = 313K = 40°C, T _{sens} = 298K = 25°C Noise 8 8 8 counts/K T _{tobs} = 313K (=40°C), T _{sens} = 298K (=25°C) Time Constant τ 45 45 ms Ambient Temperature sensor Characteristics Sensitivity of T _{sens} 90 90 counts/K Linear for T _{sens} from 0°C to 90°C Count @ T _{sens} = 25°C 7800 7800 7800 counts/K Linear for T _{sens} from 0°C to 90°C <td colspan<="" td=""><td colspan="8">Operating Conditions</td></td>	<td colspan="8">Operating Conditions</td>	Operating Conditions							
Operating Temperature To -2070 -2070 -2070 'C 1 Storage Temperature Ts -40100 -40100 "C ** Thermopile Characteristics Sensitive Area A 0.51 x 0.51 0.51 x 0.51 0.51 x 0.51 mm² Sensitivity S ₄₀ 290 ° 150 ° 67 ° counts/K T _{x00} = 313K = 40°C, T _{xm0} = 298K = 25°C Sensitivity S ₁₀₀ 400° 200° 85 ° T _{x00} = 373K = 100°C, T _{xm0} = 298K = 25°C Noise 8 8 8 counts/K T _{x00} = 373K = 100°C, T _{xm0} = 298K = 25°C Noise 8 8 8 counts T _{x00} = 373K = 100°C, T _{xm0} = 298K = 25°C Noise 8 8 8 counts T _{x00} = 373K = 100°C, T _{xm0} = 298K = 25°C Noise 8 8 8 counts/K Inear 100°C, T _{xm0} = 298K = 25°C Noise 8 8 8 counts/K Linear 100°C, T _{xm0} = 298K = 25°C Noise 8 8 8	Operating Voltage	VDD	2.43.6	2.43.6	2.43.6	V			
Storage Temperature T _S -4010 -4010 -40100 °C	Supply Current	I _{DD}	1115	1115	1115	μΑ	V _{DD} = 3.3 V		
Thermopile Characteristics	Operating Temperature	To	-2070	-2070	-2070	°C	1		
Sensitive Area A 0.51 x 0.51 0.51 x 0.51 mm²	Storage Temperature	Ts	-40100	-40100	-40100	°C			
Sensitivity	Thermopile Characteristics								
Sensitivity S ₁₀₀ 400² 200² 85³ T _{obj} = 373K = 100°C, T _{amb} = 298K = 25°C Noise 8 8 8 counts T _{obj} = 313K (=40°C), T _{amb} = 298K (=25°C) Time Constant τ 45 45 ms Ambient Temperature sensor Characteristics Sensitivity of T _{amb} 90 90 90 counts/K Linear for T _{amb} from 0°C to 90°C Count @ T _{amb} = 25°C 7800 7800 7800 counts Optical Characteristics Field of View 84 56 5 Degree At 50% intensity points Optical Axis 0 +/- 10 0 +/- 10 0 +/- 2 Degree Average Filter Transmittance T _A >75 >75 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength λ (5 %) 5.5 5.5 - μm At 25°C Electrical Characteristics ADC Resolution T _{obj} 17 Bits Max Count	Sensitive Area	А	0.51 x 0.51	0.51 x 0.51	0.51 x 0.51	mm ²			
Noise	Sensitivity	S ₄₀	290 ²	150 ²	67 ³	counts/K	T _{obj} = 313K = 40°C, T _{amb} = 298K = 25°C		
Time Constant τ 45 45 45 ms Ambient Temperature sensor Characteristics Sensitivity of T _{amb} 90 90 90 counts/K Linear for T _{amb} from 0°C to 90°C Count @ T _{amb} = 25°C 7800 7800 7800 counts Optical Characteristics Field of View 84 56 5 Degree At 50% intensity points Optical Axis 0+/-10 0+/-10 0+/-2 Degree Average Filter Transmittance T A >75 >75 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength λ (5%) 5.5 5.5 - μm At 25°C 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} 0.70.9 0.70.9 μ/count ADC Offset T _{obj} 64500 64500 64500 counts Input Low Voltage V _{II} 0.2 V _{DD} 0.8 V _{DD} 0.8 V _{DD} V	Sensitivity	S ₁₀₀	400 ²	200 ²	85 ³		T _{obj} = 373K = 100°C, T _{amb} = 298K = 25°C		
Ambient Temperature sensor Characteristics 90 90 90 counts/K Linear for T _{amb} from 0°C to 90°C Count @ T _{amb} = 25°C 7800 7800 7800 counts Optical Characteristics Field of View 84 56 5 Degree At 50% intensity points Optical Axis 0 +/- 10 0 +/- 10 0 +/- 2 Degree Average Filter Transmittance T _A >75 >75 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength λ (5 %) 5.5 5.5 - μm At 25°C Electrical Characteristics ADC Resolution T _{obj} 17 Bits Max Count = 2 ¹⁷ ADC Resolution T _{obj} 0.70.9 0.70.9 0.70.9 μV/count ADC Sensitivity of T _{obj} 0.70.9 0.70.9 0.70.9 μV/count ADC Offset T _{obj} 64500 64500 64500 counts Input Low Voltage V _{IL} 0.2 V _{ob} 0.2 V _{ob} 0.8 V _{ob} 0.8 V _{ob} 0.8 V _{ob} </td <td>Noise</td> <td></td> <td>8</td> <td>8</td> <td>8</td> <td>counts</td> <td>T_{obj} = 313K (=40°C), T_{amb} = 298K (=25°C)</td>	Noise		8	8	8	counts	T _{obj} = 313K (=40°C), T _{amb} = 298K (=25°C)		
Sensitivity of T _{amb} 90 90 90 counts/K Linear for T _{amb} from 0°C to 90°C Count @ T _{amb} = 25°C 7800 7800 7800 counts Optical Characteristics Field of View 84 56 5 Degree At 50% intensity points Optical Axis 0 +/- 10 0 +/- 10 0 +/- 2 Degree Average Filter Transmittance T _A >75 >75 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength λ (5 %) 5.5 5.5 - μm At 25°C 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} 0.70.9 0.70.9 0.70.9 μV/count ADC Offset T _{obj} 64500 64500 64500 counts Input Low Voltage V _{IH} 0.8 V _{oD} 0.8 V _{oD} 0.8 V _{oD} V	Time Constant	τ	45	45	45	ms			
Count @ T _{amb} = 25°C 7800 7800 7800 counts Optical Characteristics Field of View 84 56 5 Degree At 50% intensity points Optical Axis 0 +/- 10 0 +/- 10 0 +/- 2 Degree Average Filter Transmittance T _A >75 >75 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength λ (5 %) 5.5 5.5 - μm At 25°C 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} 0.70.9 0.70.9 μV/count ADC Offset T _{obj} 64500 64500 64500 counts Input Low Voltage V _{IL} 0.2 V _{DD} 0.2 V _{DD} V Input High Voltage V _{IH} 0.8 V _{DD} 0.8 V _{DD} 0.8 V _{DD} V	Ambient Temperature sensor Characteristics								
Optical Characteristics Field of View 84 56 5 Degree At 50% intensity points Optical Axis 0 +/- 10 0 +/- 10 0 +/- 2 Degree Average Filter Transmittance TA >75 >75 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength λ (5 %) 5.5 5.5 - μm At 25°C Electrical Characteristics ADC Resolution Tobj 17 Bits Max Count = 2 ¹⁷ ADC Resolution Tamb 14 Bits Max Count = 2 ¹⁴ ADC Sensitivity of Tobj 0.70.9 0.70.9 μV/count ADC Offset Tobj 64500 64500 64500 counts Input Low Voltage ViL 0.2 VpD 0.2 VpD 0.2 VpD V Input High Voltage ViH 0.8 VpD 0.8 VpD 0.8 VpD V	Sensitivity of T _{amb}		90	90	90	counts/K	Linear for T _{amb} from 0°C to 90°C		
Field of View 84 56 5 Degree At 50% intensity points Optical Axis 0 +/- 10 0 +/- 10 0 +/- 2 Degree Average Filter Transmittance T_A >75 >75 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength λ (5 %) 5.5 5.5 - μm At 25°C Electrical Characteristics ADC Resolution T_{abb} 17 Bits Max Count = 2 ¹⁷ ADC Resolution T_{amb} 14 Bits Max Count = 2 ¹⁴ ADC Sensitivity of T_{obj} 0.70.9 0.70.9 0.70.9 μV/count ADC Offset T_{obj} 64500 64500 counts Input Low Voltage V_{IL} 0.2 V_{DD} 0.2 V_{DD} 0.2 V_{DD} V Input High Voltage V_{IL} 0.8 V_{DD} 0.8 V_{DD} 0.8 V_{DD} V	Count @ T _{amb} = 25°C		7800	7800	7800	counts			
Optical Axis 0 +/- 10 0 +/- 10 0 +/- 2 Degree Average Filter Transmittance T_A >75 >75 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength λ (5 %) 5.5 5.5 - μm At 25°C 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} 0.70.9 0.70.9 μV/count ADC Offset T_{obj} 64500 64500 counts Input Low Voltage V_{IL} 0.2 V_{DD} 0.2 V_{DD} V Input High Voltage V_{IH} 0.8 V_{DD} 0.8 V_{DD} 0.8 V_{DD} V	Optical Characteristics								
Average Filter Transmittance T_A >75 >75 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength $λ$ (5 %) 5.5 5.5 - μm At 25°C 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} 0.70.9 0.70.9 μν/count ADC Offset T_{obj} 64500 64500 64500 counts Input Low Voltage V_{IL} 0.2 V_{DD} 0.2 V_{DD} 0.2 V_{DD} 0.8 V_{DD} 0.9 V_{DD	Field of View		84	56	5	Degree	At 50% intensity points		
Transmittance I_A >/5 >/5 50 % Wavelength Range from 7.5 μm to 13.5 μm Cut on Wavelength λ (5 %) 5.5 5.5 - μm At 25°C 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} 0.70.9 0.70.9 μV/count ADC Offset T_{obj} 64500 64500 counts Input Low Voltage V_{IL} 0.2 V_{DD} 0.2 V_{DD} 0.2 V_{DD} V Input High Voltage V_{IH} 0.8 V_{DD} 0.8 V_{DD} 0.8 V_{DD} 0.8 V_{DD} V	Optical Axis		0 +/- 10	0 +/- 10	0 +/- 2	Degree			
Electrical Characteristics ADC Resolution T_{obj} ADC Resolution T_{amb} ADC Resolution T_{amb} 14 Bits Max Count = 2^{17} ADC Sensitivity of T_{obj} 0.70.9 0.70.9 0.70.9 0.70.9 0.70.9 0.70.9 Vult Input Low Voltage V _{IL} 0.2 V _{DD} 0.2 V _{DD} 0.8 V _{DD} V Input High Voltage V _{IH} 0.8 V _{DD} 0.8 V _{DD} 0.8 V _{DD} V	-	T _A	>75	>75	50	%	Wavelength Range from 7.5 μm to 13.5 μm		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Cut on Wavelength	λ (5 %)	5.5	5.5	-	μm	At 25°C		
ADC Resolution T_{amb}	Electrical Characteristics								
ADC Sensitivity of T _{obj} 0.70.9 0.70.9 μV/count ADC Offset T _{obj} 64500 64500 counts Input Low Voltage V _{IL} 0.2 V _{DD} 0.2 V _{DD} 0.2 V _{DD} V Input High Voltage V _{IH} 0.8 V _{DD} 0.8 V _{DD} 0.8 V _{DD} V	ADC Resolution T _{obj}			17		Bits	Max Count = 2 ¹⁷		
ADC Offset T _{obj} 64500 64500 counts Input Low Voltage V _{IL} 0.2 V _{DD} 0.2 V _{DD} 0.2 V _{DD} V Input High Voltage V _{IH} 0.8 V _{DD} 0.8 V _{DD} 0.8 V _{DD} V	ADC Resolution T _{amb}			14		Bits	Max Count = 2 ¹⁴		
Input Low Voltage V _{IL} 0.2 V _{DD} 0.2 V _{DD} 0.2 V _{DD} V Input High Voltage V _{IH} 0.8 V _{DD} 0.8 V _{DD} 0.8 V _{DD} V	ADC Sensitivity of T _{obj}		0.70.9	0.70.9	0.70.9	μV/count			
Input High Voltage V _{IH} 0.8 V _{DD} 0.8 V _{DD} 0.8 V _{DD} V	ADC Offset T _{obj}		64500	64500	64500	counts			
	Input Low Voltage	V _{IL}	0.2 V _{DD}	0.2 V _{DD}	0.2 V _{DD}	V			
	Input High Voltage	V _{IH}	0.8 V _{DD}	0.8 V _{DD}	0.8 V _{DD}	V			
Pull Down Current 200 200 μ A Direct link pin to V_{DD}	Pull Down Current		200	200	200	μА	Direct link pin to V _{DD}		
Pull Up Current 130 130 130 μA Direct link pin to V_{SS}	Pull Up Current		130	130	130	μА	Direct link pin to V _{SS}		
LPF Cut-Off Frequency 8 8 8 Hz	LPF Cut-Off Frequency		8	8	8	Hz			

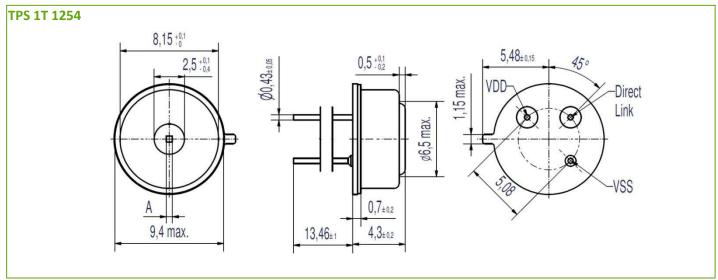
¹The electrical parameters may vary from specified values accordance with their temperature dependence.

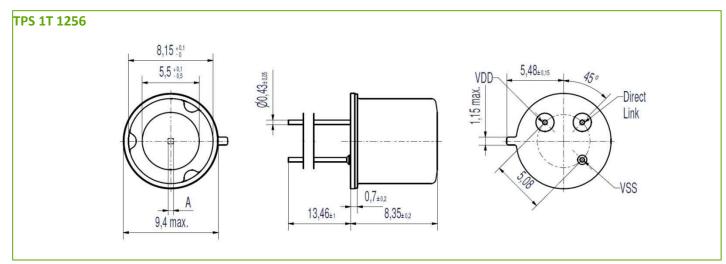
 $^{^2}$ With standard filter (LWP, cut-on 5.5 μ m)

³ Uncoated lens

Physical Configuration



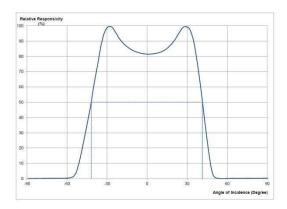




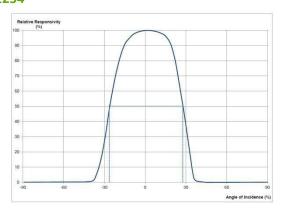
DigiPile[™] Family

Digital Thermopiles

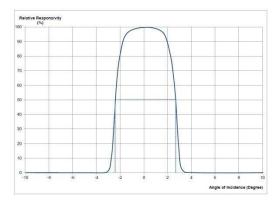
TPIS 1T 1252



TPS 1T 1254



TPS 1T 1256



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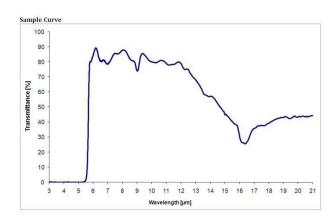
Telephone: (+49) 611 492 430 Fax: (+49) 611 492 165 Asia Headquarters Excelitas Technologies Bldg.4, Lane 67, Li Bing Rd

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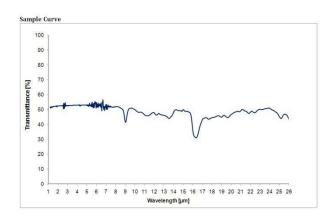
Fax: +86 (21) 50791316

Filter Identifier

Cut-on wavelength (CWL)	5.5 μm
Cut-on tolerance range	± 0.3 μm
Average Transmittance from 7.5μm to 13.5μm	> 70 %
Average Transmittance from visual to 5μm	< 0.5 %
Substrate material	Silicon



Substrate material	Silicon, uncoated





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