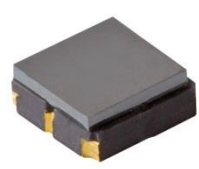


# DigiPile™ Thermopile Sensor TPiS 1S 1051 / 5028

Revision - Date: 2018/11/01



## Introduction

The DigiPile TPiS 1S 1051 is one sensor out of a new family of digital thermopile infrared sensors, brought to you from Excelitas Technologies.

It combines the time-proven MEMS state-of-the-art sensing element with a fully integrated A/D converter and an integrated ambient temperature sensor.

An internal clock and control unit enables the TPiS 1S 1051 digital output detector to open a dialog with any outside micro-processor without additional components.

The move from analogue to digital enables the DigiPile to deliver a number of ad-vantages like cost and space savings from fewer components (no external low offset / low noise amplifier is needed), significantly reduced susceptibility against environmental influences like e.g. humidity.

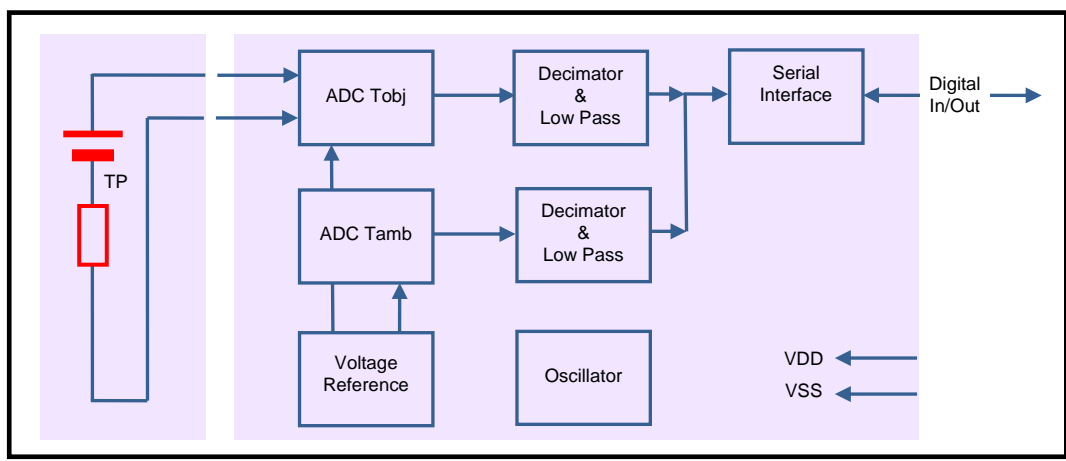
The TPiS 1S 1051 is offered in a small-sized 3.0x3.0 mm<sup>2</sup> CLCC package with a IR transmissive filter.

## Features and Benefits

- Digital Output Sensor
- 17 Bit Tobj Output “direct link”
- 14 Bit Tamb Output “direct link”
- Operating voltage down to 2.4V
- Low current consumption
- Small-sized SMD package

## Applications

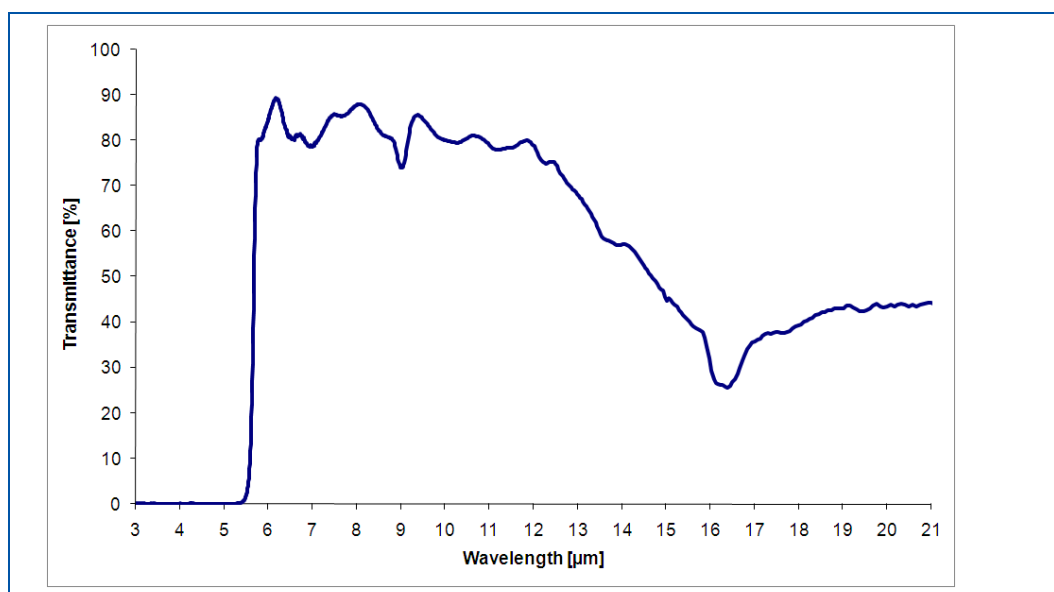
- Non-contact temperature measurements
- Thermometry



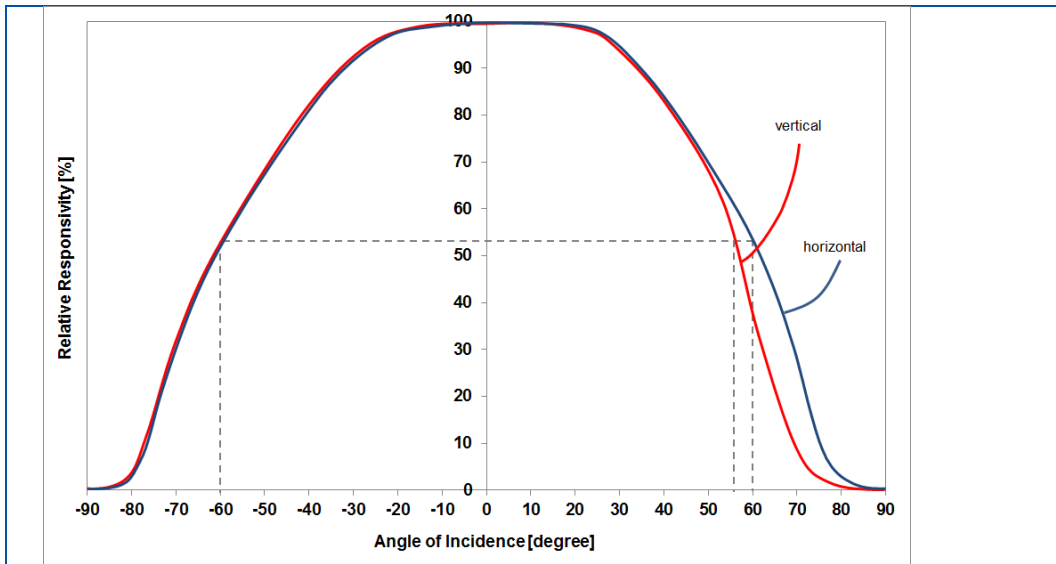
## 1 Technical Data

Parameter	Symbol	Min	Typ	Max	Unit	Remarks / Conditions
<b>Operating Conditions</b>						
Operating Voltage	$V_{DD}$	2.4	3.3	3.6	V	
Supply Current	$I_{DD}$	-	11	15	$\mu A$	$V_{DD} = 3.3 V$
Operating Temperature	$T_o$	-20		70	$^{\circ}C$	The electrical parameters may vary from specified values accordance with their temperature dependence.
Storage Temperature	$T_s$	-40		100	$^{\circ}C$	Avoid storage in humid environment.
<b>Thermopile Characteristics</b>						
Sensitive Area	A		0.15		$mm^2$	
Sensitivity of TP	$\Delta counts / \Delta T$		210		counts/K	$T_{obj} = 40^{\circ}C, T_{amb} = 25^{\circ}C$
Sensitivity of TP	$\Delta counts / \Delta T$		280		counts/K	$T_{obj} = 100^{\circ}C, T_{amb} = 25^{\circ}C$
Noise of TP			8		counts	$T_{obj} = 40^{\circ}C, T_{amb} = 25^{\circ}C$
Time Constant	$\tau$		15		ms	
<b>Ambient Temperature sensor Characteristics</b>						
Sensitivity of $T_{amb}$			90		counts/K	Linear for $T_{amb}$ from $0^{\circ}C$ to $90^{\circ}C$
Count @ $T_{amb} = 25^{\circ}C$		7000	8200	9400	counts	
Noise of ambient sensor			5	16	counts	$T_{amb} = 298K (=25^{\circ}C)$
<b>Optical Characteristics</b>						
Field of View			$\sim 120$		Degree	At 50% intensity points
Optical Axis			0	$\pm 10$	Degree	
Average Filter Transmittance	$T_A$	75	$> 77$		%	Wavelength Range from $7.5 \mu m$ to $13.5 \mu m$
Average Filter Transmittance	$T_A$			$< 0.5$	%	Wavelength Range $< 5 \mu m$
Cut on Wavelength	$\lambda (5\%)$	5.2	5.5	5.8	$\mu m$	At $25^{\circ}C$
<b>Electrical Characteristics</b>						
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	$\mu V/count$	
ADC Offset $T_{obj}$		64000	64500	65000	counts	
Input Low Voltage	$V_{IL}$			$0.2 V_{DD}$	V	
Input High Voltage	$V_{IH}$	$0.8 V_{DD}$			V	
Pull Down Current			200		$\mu A$	Direct link pin to $V_{DD}$
Pull Up / Down Current			130		$\mu A$	Direct link pin to $V_{SS}$
LPF Cut-Off Frequency			8		Hz	

## 2 Filter Characteristics

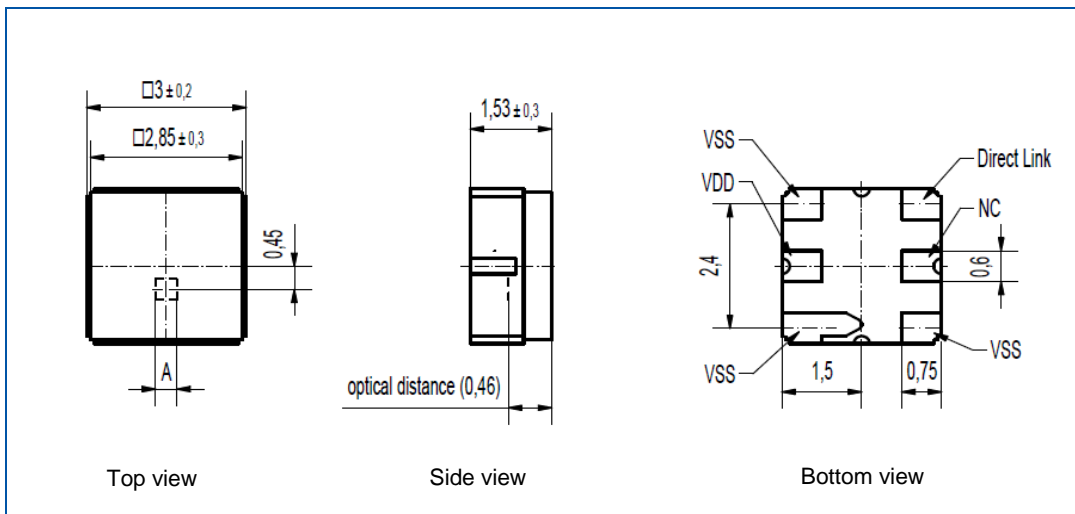


**Figure 1**  
Typical filter transmission curve

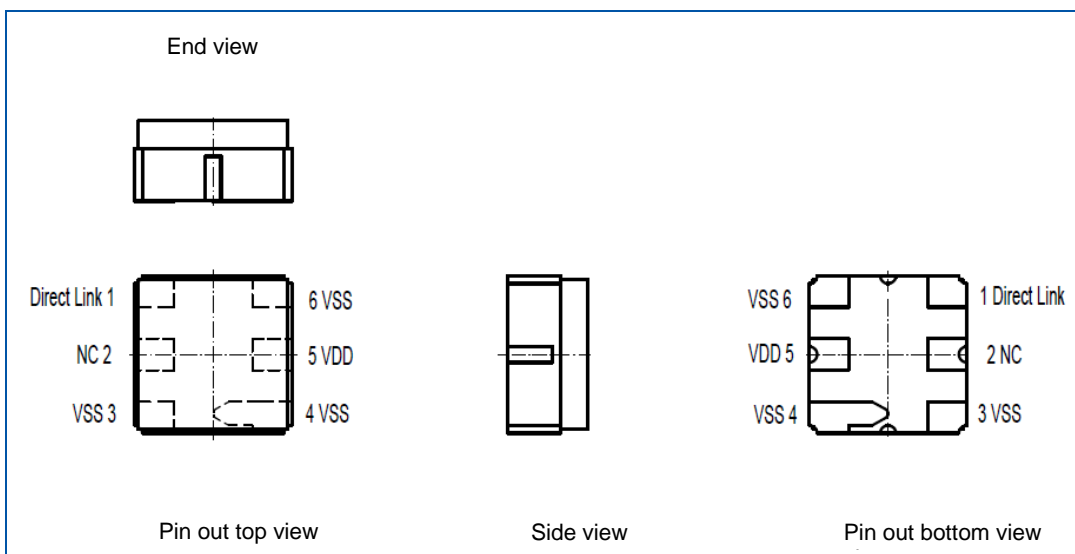


**Figure 2**  
Typical FoV

### 3 Physical Configuration



**Figure 3**  
Mechanical dimensions  
All dimensions are in mm.  
  
Housing: CLCC package with infrared transmissive filter

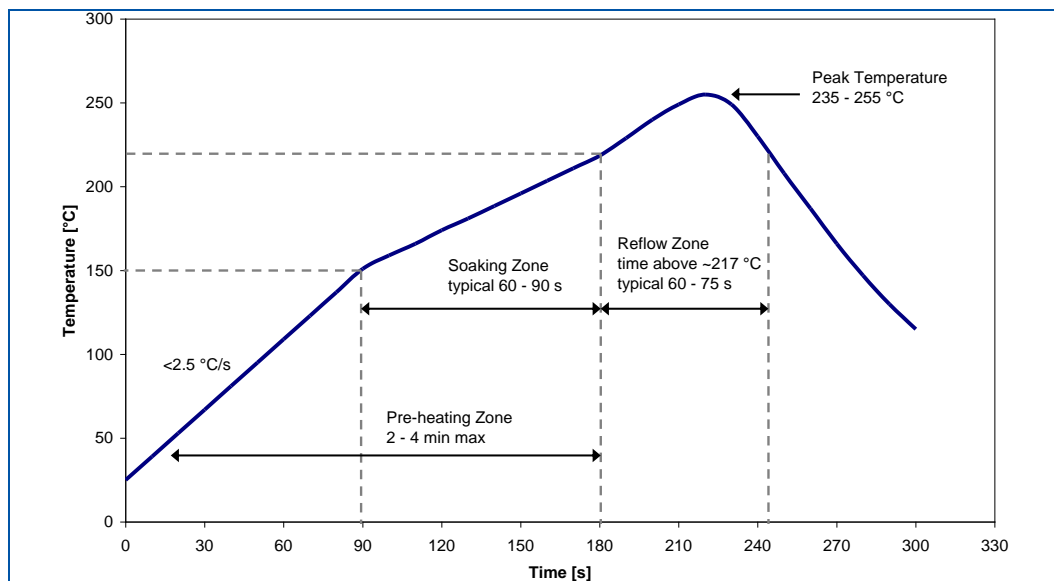


**Figure 4**  
Pin out.  
  
Housing: CLCC package with infrared transmissive filter

### 3.1 Soldering

The detector TPiS 1S 1051 is a lead-free component and fully complies with the RoHS regulations, especially with existing roadmaps of lead-free soldering. Reflow soldering is recommended. A typical lead free reflow profile is shown in figure 4. Specific reflow soldering parameters depend on the solder alloy used.

This device has a moisture sensitivity level of 1 (MSL 1). However, storage at high humidity conditions should be avoided.



**Figure 5**  
Typical lead free  
solder profile

### 3.2 Handling Requirements

Stresses above the absolute maximum ratings may cause damages to the device. Do not expose the detector to aggressive detergents such as Freon, Trichloroethylene, etc. Windows may be cleaned with alcohol and cotton swab.

## 4 Quality Statement

Excelitas Technologies is an ISO 9001 certified manufacturer. All devices employing PCB assemblies are manufactured according to IPC-A-610 guidelines.

### 4.1 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 specification 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, 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.

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