

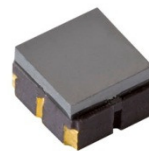
# Thermopile Detector

## TPiD 1S 0121 / 3128

Revision - Date: 2015/03/23

### Features and Benefits

- 3 x 3 mm SMD package
- Flat housing
- Thermistor included
- Tape & Reel



### Applications

- General purpose temperature monitoring
- Thermometry
- Small space applications

## 1 General Characteristics

**Table 1: Absolute Maximum Ratings**

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
T <sub>A</sub>	Ambient Temperature Range	-20		100	°C	Operation
T <sub>A</sub>	Ambient Temperature Range	-40		100	°C	Storage

## 2 Type Characteristics

### 2.1 Design Characteristics

The detector fully complies with the European RoHS environmental directives against the use of hazardous materials in electrical and electronic equipment.

**Table 2: Design Characteristics**

Parameter	Description
Package	3 x 3 mm CLCC package
Filter	Si-based interference long pass filter
Temperature reference	Thermistor 100 kΩ

Distributor



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## 2.2 Electrical Characteristics

**Table 3: Thermopile Characteristics**

Symbol	Parameter	Value	Unit	Conditions
A	Sensitive Area	0.2	mm <sup>2</sup>	Absorber area
R <sub>TP</sub>	Thermopile Resistance	85...135	kΩ	25 °C
R	Responsivity	77	V/W	500 K, 1Hz, without filter
S <sub>40</sub>	Sensitivity (T <sub>det</sub> 25 °C / T <sub>obj</sub> 40 °C)	60	μV/K	With standard filter (LWP, cut-on 5.5 μm)
S <sub>100</sub>	Sensitivity (T <sub>det</sub> 25 °C / T <sub>obj</sub> 100 °C)	80	μV/K	With standard filter (LWP, cut-on 5.5 μm)
t	Time Constant	15	ms	
V <sub>N</sub>	Noise Voltage	42	nV/√Hz	25 °C
D*	Specific Detectivity	0.8	10 <sup>8</sup> cm√Hz/W	25 °C
TC <sub>RTP</sub>	Temperature Coefficient of Resistance	0.03	%/K	
TC <sub>R</sub>	Temperature Coefficient of Responsivity	-0.05	%/K	
R <sub>25</sub>	Thermistor Base Resistance	100 ± 5	kΩ	T <sub>amb</sub> = 25 °C
β	Thermistor BETA -Value	4092	K	Defined at 25 °C / 100 °C
β	Thermistor BETA -Value Tolerance	± 0.5	%	

**Table 4: Tabulated Thermistor Data**

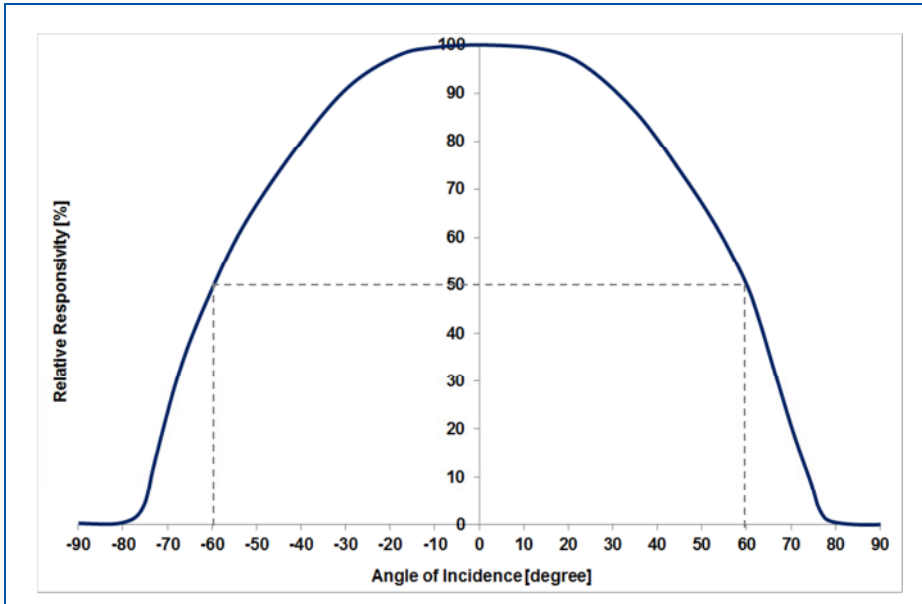
Temp.	R <sub>min</sub>	R <sub>nom</sub>	R <sub>max</sub>	Temp.	R <sub>min</sub>	R <sub>nom</sub>	R <sub>max</sub>
°C	Ω	Ω	Ω	°C	Ω	Ω	Ω
-20	901230	955110	1009670	45	40926	43188	45462
-15	681540	721680	762270	50	33593	35471	37361
-10	519600	549750	580190	55	27709	29275	30853
-5	399210	422040	445060	60	22964	24275	25597
0	309003	326423	343963	65	19118	20221	21334
5	240890	254280	267740	70	15986	16918	17858
10	189070	199440	209840	75	13425	14214	15013
15	149380	157460	165560	80	11321	11993	12673
20	118770	125100	131450	85	9585	10159	10740
25	95000	100000	105000	90	8147	8639	9137
30	76330	80400	84480	95	6950	7374	7803
35	61680	65010	68350	100	5952	6317	6688
40	50110	52850	55600	105	5115	5431	5753

R<sub>min</sub>: Minimum Thermistor Resistance  
R<sub>nom</sub>: Typical Thermistor Resistance  
R<sub>max</sub>: Maximum Thermistor Resistance

## 2.3 Optical Characteristics

**Table 5: Optical Characteristics**

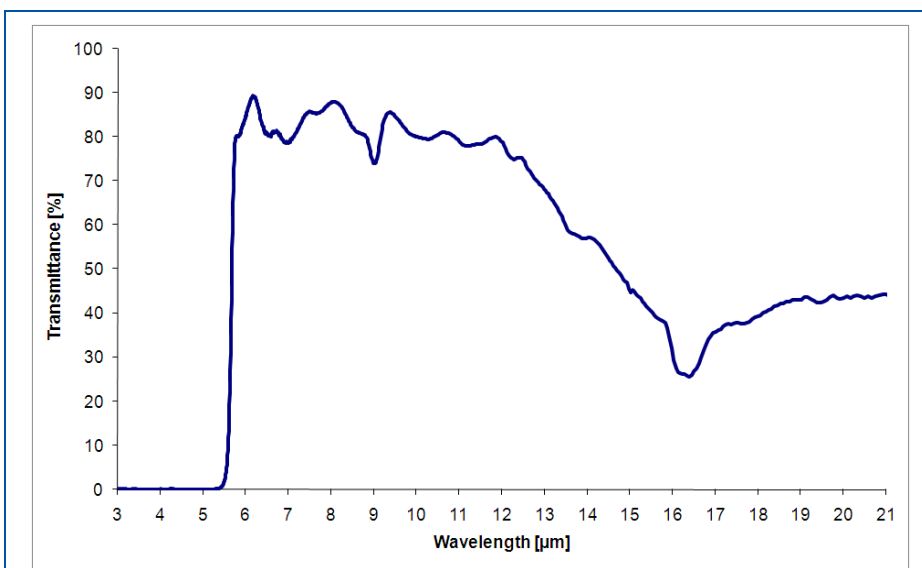
Symbol	Parameter	Min	Typ	Max	Unit	Conditions
FoV	Field of View		120		degree	At 50% target signal
	Optical Axis			+/- 10	degree	



**Figure 1 Typical FoV Curve**

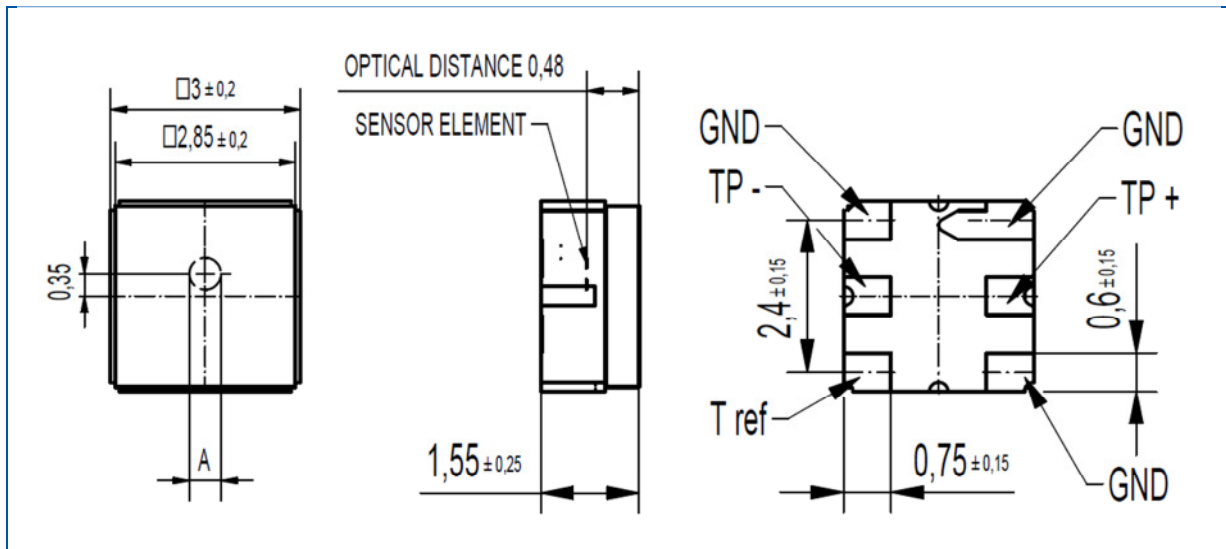
**Table 6: Filter Parameters**

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
T <sub>A</sub>	Average Transmittance	70	> 77		%	Wavelength Range from 7.5 μm to 13.5 μm
T <sub>A</sub>	Average Transmittance			< 0.5	%	Wavelength Range < 5 μm
λ (5 %)	Cut on Wavelength	5.2	5.5	5.8	μm	At 25 °C



**Figure 1 Typical Filter Transmission Curve**

## 2.4 Mechanical Drawing


**Figure 2 Mechanical drawing of detector TPiD 1S 0121 / 3128**

## 2.5 Packaging

### General Information

The Excelitas Technologies Tape and Reel packing system protects the product from mechanical and electrical damage and is designed for automatic pick-and-place equipment.

The Tape and Reel packing system consists of a Carrier Tape sealed with a protective Cover Tape to hold the devices in place. The devices are loaded with leads down, into the carrier pockets. The tape is wound onto a plastic reel for Labeling and Packing for shipment. The conductive Carrier Tape, and antistatic coated transparent Cover Tape and Reel provide ESD protection.

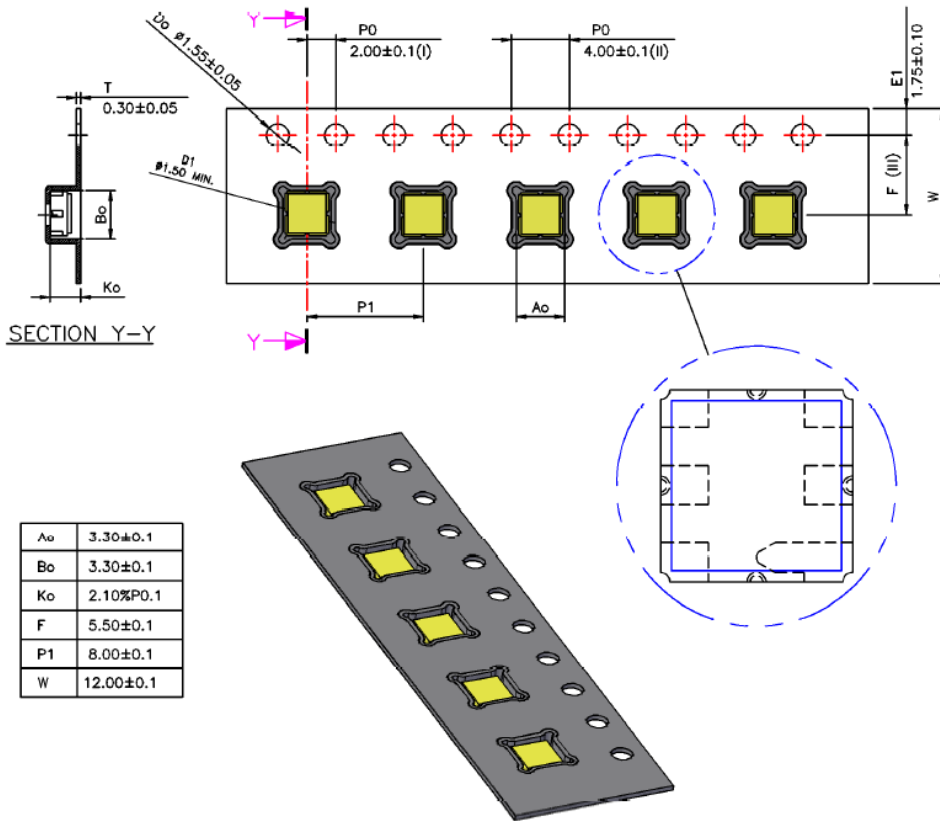
Information Labels, ESD Labels and Barcode Labels (if required) are placed on each reel. Single reels of components are inserted into moisture barrier bags and then into boxes before shipping.

Excelitas Technologies' tape and reel specifications are in conformance with the EIA Standard 481 "Taping of Surface-Mount Components for Automatic Placement."

### Carrier Tape

Figure 3 shows the basic outline and dimension labels of the carrier tape. Typically, the carrier tape is constructed from conductive Polystyrene (IV). The uniform film thickness T is 0.3 mm.

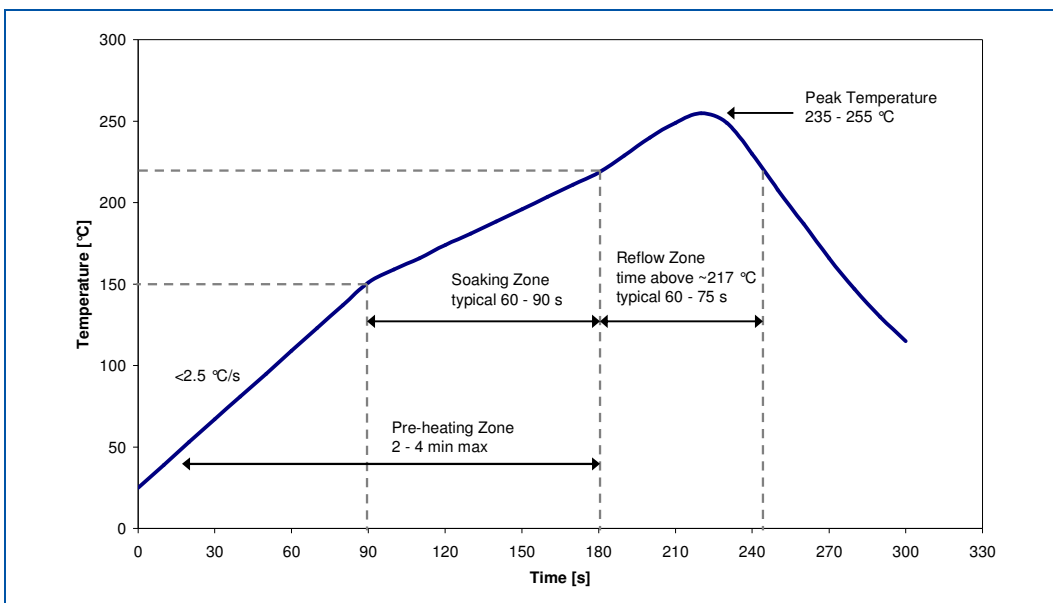
Device size	A0	B0	K0	F	P1	W	PO	D0	E1
[mm <sup>2</sup> ]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
3.0x3.0	3.3 ± 0.1	3.3 ± 0.1	2.1 ± 0.1	5.5 ± 0.05	8 ± 0.1	12 ± 0.1	2 ± 0.1	Ø 1.55 ± 0.05	1.75 ± 0.1



**Figure 3 Carrier Tape for 3.0x3.0 mm SMD packages**

## 2.6 Soldering

The detector TPiD 1S 0121 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 2. Specific reflow soldering parameters depend on the solder alloy used.



**Figure 4 Typical Lead Free Reflow Profile**

## 2.7 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.

## 3 Quality Statement

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

### 3.1 Liability Policy

The contents of this document are subject to change without notice and customers should consult with Excelitas Technologies sales representatives before ordering. Customers considering the use of Excelitas Technologies thermopile 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 sales 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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