COOL EYE™ THERMOPILE ARRAY MODULES WITH INTEGRAL OPTICS FOR SAFETY AND SECURITY

TPiL 08T 2146 L3.9, TPiA 16T 4146 L3.9 Thermopile Array "Cool Eye"

Target Applications

- Presence detection
- Non-contact temperature measurement
- Temperature dependent switch for alarm or thermostatic applications
- Household appliances like microwave oven, toaster, hair dryer

Features and Benefits

- Digital SMBus interface
- Factory calibration
- Temperature signal
- Ambient temperature output signal
- Programmable emissivity
- Noise reduction filter
- Module with connector
- E2PROM configuration and data storage
- Optics included, various viewing angles
- Can be adapted to your specific requirements

Product Description

With the Cool Eye™ family Excelitas offers thermopile arrays in various configurations. All are module types on a PCB with communication interface and a 4-pin connector. For line arrays, we offer 8 elements and 16 elements in two different lens configurations, with 3.9 mm focus and 5.5 mm focus. The spatial design provides for 4 x 4 elements and comes with recommended 3.9 mm or 5.5 mm focal length optics.

The thermopile line or array modules consist of a 1 x 8, 1 x 16 or 4 x 4 element thermopile chip connected to an integrated multiplexing and signal conditioning circuit, E2PROM and microcontroller with an integrated A/D converter for signal processing and interfacing. Lenses for different field of views are available on demand. The sensor is equipped with an internal reference temperature sensor for correct target temperature determination.

The temperature accuracy by digital signal processing in combination with the numeric ambient temperature compensation algorithm outperforms any discrete solution. The sensor module provides an output signal which is representing real temperature data for each pixel.

Customer specific modifications are possible.

For the various object temperature ranges we offer the following pre-calibrated modules:

L3.9 types
- 0 ... 60° C: TPiL 08T 2146 L3.9 OAA060
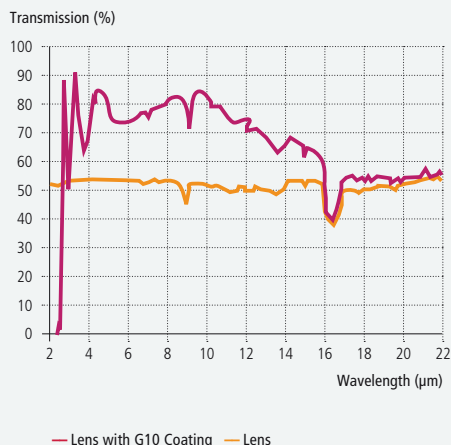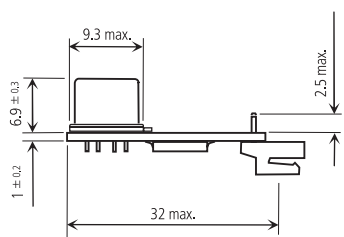- 0 ... 60° C: TPiA 16T 4146 L3.9 OAA060

L5.5 types
- 0 ... 150° C: TPiL 08T 2146 L5.5 OAA150   • 0 ... 60° C: TPiA 16T 4146 L5.5 OAA060

Customization: As the modules are always calibrated to target temperature range customized versions are available.
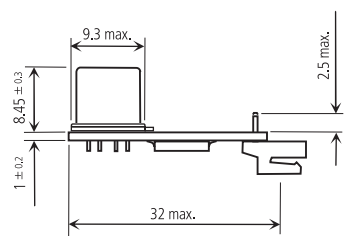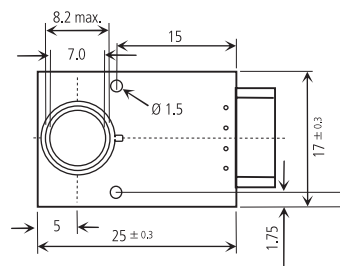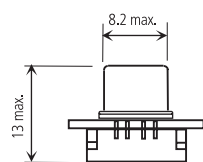
A temperature reference output is included. On request the modules can be supplied as an "OBA" version, which is calibrated but without internal temperature compensation. In this case the customer will do the temperature compensation externally with the use of the supplied reference output.
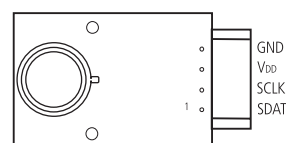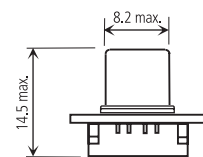
Filter

Transmission (%)

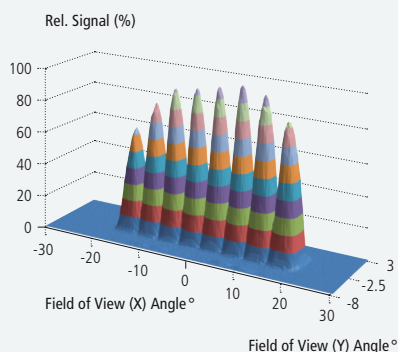

Wavelength (µm)

— Lens with G10 Coating — Lens

Dimensions TPiX YY L3.9

9.3 max.   2.5 max.   6.9 ± 0.3   1 ± 0.2   32 max.

8.2 max.   13 max.

8.2 max.   7.0   15   Ø 1.5   17 ± 0.3   5   25 ± 0.3   1.75

Dimensions TPiX YY L5.5

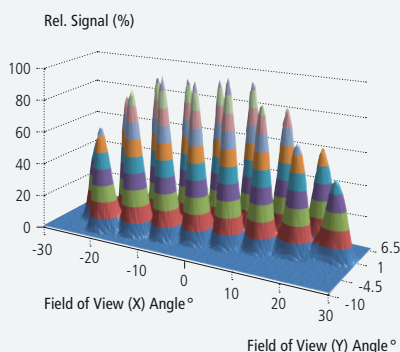9.3 max.   2.5 max.   8.45 ± 0.3   1 ± 0.2   32 max.

8.2 max.   14.5 max.

GND
VDD
SCLK
SDAT

Connection Information for all TPiX Modules

Field of View TPiL 08

Rel. Signal (%)
Field of View (X) Angle °
Field of View (Y) Angle °

NOSE POSITION   FOV (X)   TPiL 08T
1 2 3 4 5 6 7 8

Field of View TPiL 16T

Rel. Signal (%)
Field of View (X) Angle °
Field of View (Y) Angle °

NOSE POSITION   FOV (X)   TPiL16T
FOV (Y)
1 3 5 7 9 11 13 15
2 4 6 8 10 12 14 16

Field of View TPiA 16T

Rel. Signal (%)
Field of View (X) Angle °
Field of View (Y) Angle °

NOSE POSITION   FOV (X)   TPiA16T
FOV (Y)
1 5 9 13
2 6 10 14
3 7 11 15
4 8 12 16
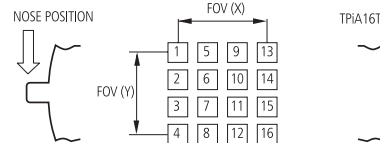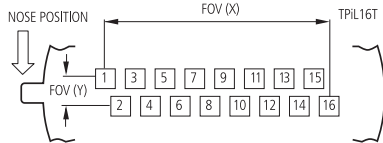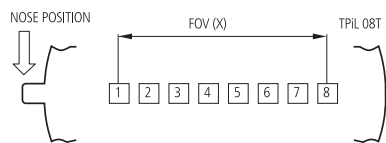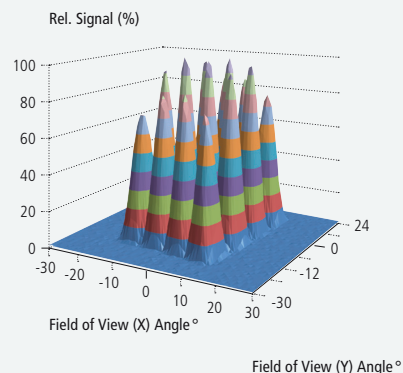
TPiL 08T 2146 L3.9, TPiL 16T 3246 L3.9 G10 – Thermopile Line, TPiA 16T 4146 L3.9 Thermopile Array "Cool Eye"

Parameter	Symbol	TPiL 08 T	TPiL 16 T	TPiA 16 T	Unit	Remark
Storage temperature range			-40 … +100		°C	
Operating temperature range			-25 … +100		°C	
Supply voltage	V_{DD}		4.5 … 5.5		V	
Supply current	I_{DD}		5		mA	typ.
Field of view X / L3.9	FOV_X	50	49	30	°	Refer to FOV definitions
Field of view Y / L3.9	FOV_Y	NA	6	22	°	Refer to FOV definitions
Field of view X / L5.5	FOV_X	33	31	21	°	Refer to FOV definitions
Field of view Y / L5.5	FOV_Y	NA	3.5	14	°	Refer to FOV definitions
Digital interface type			SMBus			
Object temperature accuracy			± 1.5		K	For calibration conditions
Signal refresh time	t_{PXrefr}	250	400	400	ms	All pixels and ambient temperature

Handling and Precautions

Humidity

All our IR-detectors shall not increase noise or decrease responsivity when exposed to < = 95 % R.H. at 30° C. Operation below dew point (i.e. with condensation) might affect performance.

Hermetic seal

All our IR-detectors are sealed to pass a He-leakage test with maximum leak rate of 5×10^{-8} mbar.l.s^{-1}.

Quality

Excelitas is a QS 9000 certified manufacturer with established SPC and TQM. Detector outgoing inspections include the parameters Responsivity, Match, Offset, Noise, Gross leak (Mil Std 883 method 1014C1). Individual data are not stored, statistical details can be disclosed on request.

Handling

Electrostatic charges may destroy the detector. We recommend applying precautions necessary for ESD devices to avoid damages. Do not apply physical force to detector leads. Do not expose detector to aggressive detergents such as freon, trichloroethylene, etc.

Soldering conditions

Hand soldering and standard wave soldering process may be applied. Avoid heat exposure to the top and the window of the detector. Reflow soldering is not recommended for all TO-housing types. Our new SMD types are designed for reflow-soldering in accordance with general practices for SMD.

Typical Lead Free Reflow Profile

Temperature (°C)

Peak Temperature 235–255° C

Sparkling Zone typical 60–90 s

Reflow Zone Time above -217° typical 60–75 s

< 2.5° C

Pre-Heating Zone 2–4 min max

Time (s)
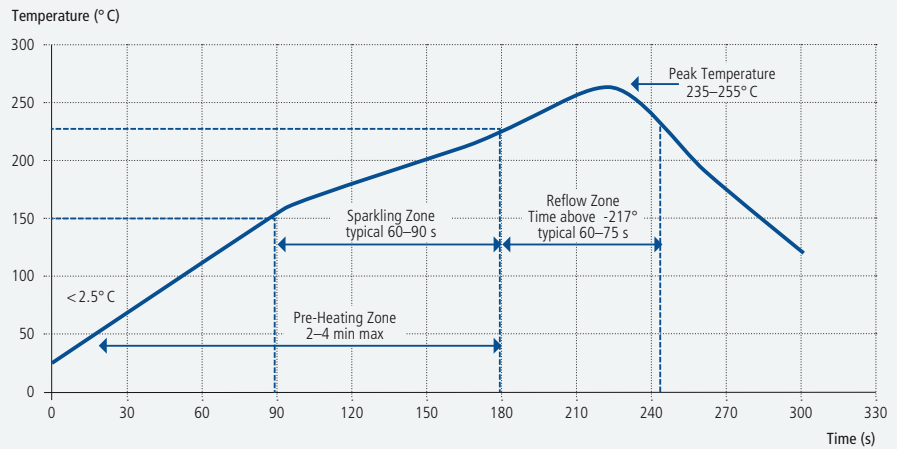
Reliability Standards

International Electrotechnical Commission (IEC) Standards

IEC 60068-2-1	Environmental testing – Part 2: Tests. Tests A: Cold
IEC 60068-2-2	Environmental testing - Part 2: Tests. Tests B: Dry heat
IEC 60068-2-78	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state
IEC 60068-2-14	Environmental testing - Part 2: Tests. Test N: Change of temperature

Joint Electron Devices Engineering (JEDEC) Standards

JESD-22	Series test methods

US Military (MIL) Standards

MIL-STD-883	Test methods and procedures for microelectronics

Reliability Standards

Excelitas' continuous reliability qualification and monitoring program ensures that all outgoing products meet quality and reliability standards. Tests are performed according to approved semiconductor device standards, such as IEC, MIL, and JDEC (see table). For detailed information please contact Excelitas.

Comparison of Current Thermopile Types to New Names and Features

Comparison Table					
	Current Type	**New Type**		**Remark**	**Page**
Detectors	TPS 535	TPD 1T 0515		Equivalent	28 ■
	TPS 735	TPD 1T 0625		Equivalent	28 ■
	TPS 2734	TPD 2T 0625		Equivalent	29 ■
	TPS 334	TPD 1T 0214		Equivalent	30 ■
	TPS 534	TPD 1T 0514		Equivalent	30 ■
	TPS 734	TPD 1T 0624		Equivalent	30 ■
	TPS 336 IRA	TPD 1T 0216	IRA	Equivalent	31 ■
	TPS 334 L5.5	TPD 1T 0216	L5.5	Equivalent	31 ■
	TPS 333	TPD 333		Unchanged	32 ■
	TPS 733	TPD 733		Unchanged	32 ■
	TPS 230	TPD 230		Unchanged	35 ■
	TPS 232	TPD 232		Unchanged	35 ■
	TPS 23B	TPiD 23B		Unchanged	34 ■
	TPS 33B	TPiD 33B		Unchanged	34 ■
	TPS 23S	TPiD 1S 0121		Isothermal unchanged	33 ■
Sensors	a2TPMI 23x	TPS 1T 0136	L5.5	Equivalent	36 ■
	a2TPMI 23x	TPS 1T 0136	IRA	Equivalent	36 ■
	a2TPMI 33x	TPS 1T 0236	L5.5	Equivalent	36 ■
	a2TPMI 33x	TPS 1T 0236	IRA	Equivalent	36 ■
	a2TPMI 23S	TPiS 1S 0133		SMD, Isothermal	38 ■
	a2TPMI 23S FOV60	TPiS 1S 0133	FM	SMD, Isothermal	38 ■
Modules	a2TPMI 23x L5.5 Px	TPM 1T 0136	L5.5	Equivalent	40 ■
	a2TPMI 33x Px MLx	TPM 1T 0234	M(y)	Equivalent	40 ■
Arrays	dTPLM 08A	TPL 8T 2146	L5.5	Unchanged	42 ■
	dTPLM 16A	TPL 16T 3246	L5.5	Unchanged	42 ■
	dTPAM 16A	TPA 16T 4146	L3.9	Unchanged	42 ■

Comparison of Analog to Digital Pyrodetectors

Selection Guide								
Digital Version		**Analog Version**		**Market / Application**			**Features**	
Type Name	**Page**	**Type Name**	**Page**	**Automatic Light Switch**	**Burglar Alarm**	**Gas Detection**	**Window Size (mm²)**	**Package**
PYD 1998	19 ◻	LHi 968	12 ◻	+	++	o	4.2 x 5.2	TO-5
PYD 1988	19 ◻	LHi 878	14 ◻	++	+	o	3.4 x 4.6	TO-5
PYD 1978	19 ◻	LHi 778	14 ◻	++	+	o	3.0 x 4.0	TO-5
PYQ 2898	20 ◻	LHi 1148, LHi 1128	13 / 16 ◻	+	++	o	4.2 x 5.2	TO-5
PYQ 5868	21 ◻	PYQ 1488	13 ◻	++	+	o	Hex	TO-5
PYQ 3828	-	PYS 3228, LHi 814	25 ◻	o	o	++	2.5 x 2.5	TO-5
PYS 3798	27 ◻	LHi 807	24 ◻	o	o	++	4.2 x 5.2	TO-5
PYD 5731	18 ◻	PYD 5131	17 ◻	++	+	o		TO-46
PYD 1096	22 ◻	Not applicable	-	++	o	o	4.2 x 5.2	TO-5
PYQ 1098	23 ◻	Not applicable	-	++	o	o	4.2 x 5.2	TO-5

+ Suited, ++ Best suited

About Excelitas Technologies

Excelitas Technologies is a global technology leader focused on delivering innovative, customized solutions to meet the lighting, detection and other high-performance technology needs of OEM customers.

From aerospace and defense applications to medical lighting, analytical instrumentation, clinical diagnostics, industrial, and safety and security applications, Excelitas Technologies is committed to enabling our customers' success in their specialty end-markets. Excelitas Technologies has approximately 3,000 employees in North America, Europe and Asia, serving customers across the world.

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