



PYS 3198TC

Single-Element Pyrodetector

As Single-Element types we reference designs which combine one sensing element with a suited optical window. This makes single-Element types suitable for measurement applications.

One sensing element is placed in the center of the detector. For thermal compensation an additional element which is blinded from radiation is connected in parallel. The TO-5 Metal Housing is equipped with an optical filter window. For gas measuring applications the spectral range is narrowed to match the gas absorption in IR range. As such the detector window suits as spectral narrow band filter. Various configurations are available for detection of more common gasses.

Features and Benefits

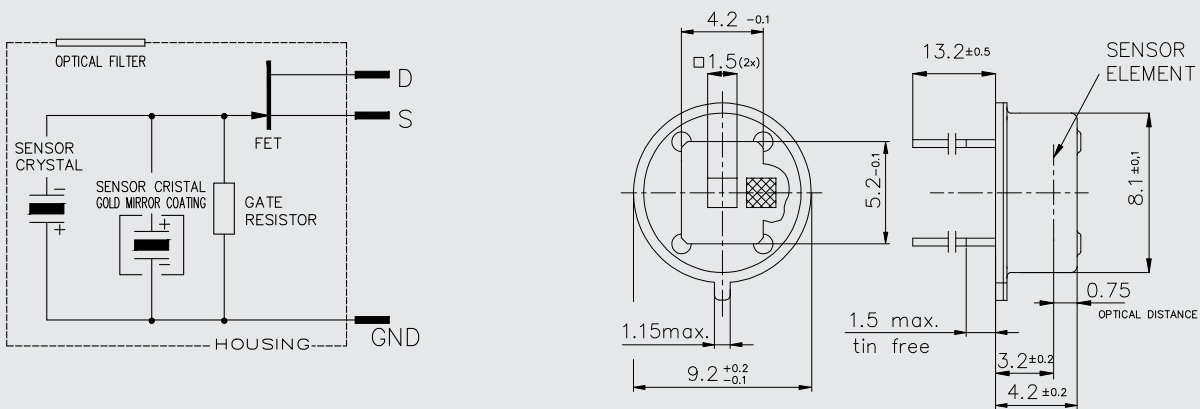
- TO-5 metal housing
- Different spectral filters available
- Suited for gas monitoring

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PSY 3198TC				
Parameter	Symbol	PYS 3198TC	Unit	Remarks
Responsivity, min.	R_{min}	2.2	kV/W	$f = 1 \text{ Hz}$
Responsivity, typ.	R	3.5	kV/W	$f = 1 \text{ Hz}$
Noise, max.	N_{max}	50	μV_{pp}	0,4...10Hz/20°C
Noise, typ.	N	15	μV_{pp}	0,4...10Hz/20°C
spec. Detectivity	D^*	17	$10^7 \text{ cm}^* \sqrt{\text{Hz/W}}$	1Hz/ 1Hz BW
Field of View, horizontal	FoV	135	°	unobstructed
Field of View, vertical		122	°	unobstructed
Source Voltage		0,2...1,5	V	47 kΩ, 20°C
Operation Voltage	V_{DD}	2-10	V	unobstructed



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Single-Element Pyrodetector

This Single-Element Pyrodetector combines one sensing element with a suited optical window. This makes single-element types suitable for measurement applications. This version of Single-Element Detector is especially resistant to EMI by means of drain resistor and source capacitor.

One sensing element is placed in the center of the detector. For thermal compensation an additional element which is blinded from radiation is connected in parallel. The TO-5 metal housing is equipped with an optical filter window. For gas measuring applications the spectral range is narrowed to match the gas absorption in IR range. As such the detector window suits as spectral narrow-band filter. Various configurations are available for detection of more common gasses.

Features and Benefits

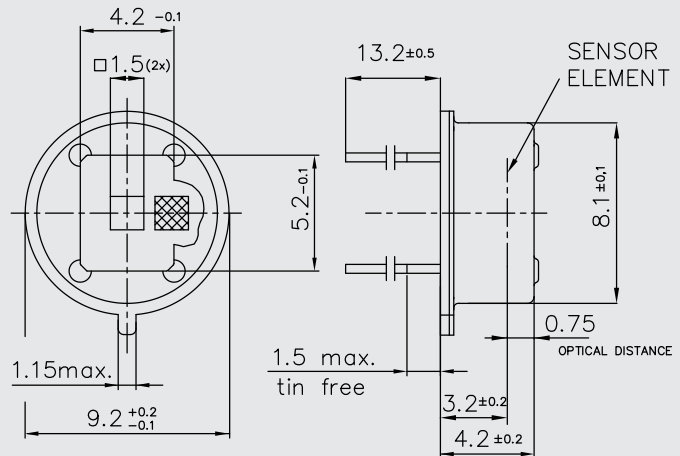
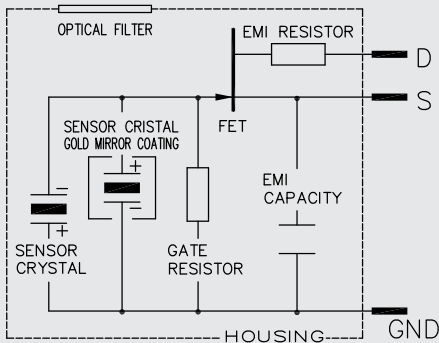
- TO-5 metal housing
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Field of View, horizontal	FoV	135	°	unobstructed
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Operation Voltage	V_{DD}	2-10	V	unobstructed



PYS 3428TC

Dual-Channel Pyrodetector

This Single-Element, Dual-Channel Pyrodetector includes two single elements thermally compensated. Each output is optically associated with its own optical window within the TO-5 metal housing. They form individual output signals, thus the name "Dual-Channel".

For gas measuring applications the spectral range is narrowed to match the gas absorption in IR range. Usually one channel is used as reference channel suited with a bandwidth which shows no gas absorption. The second channel serves as the gas sensing output. Various filter selections are available to detect the most prominent gasses.

Features and Benefits

- TO-5 metal housing
- Different spectral filters available
- EMI protection
- Suited for gas monitoring

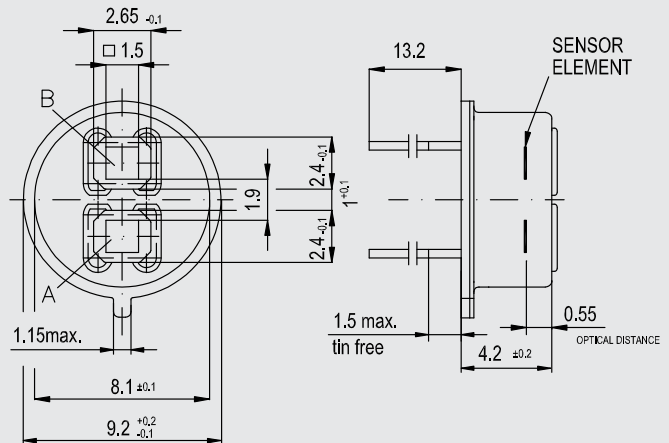
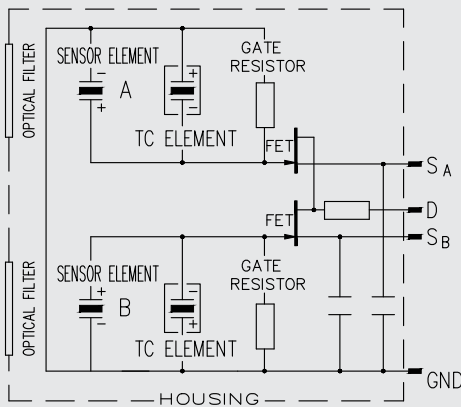
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Parameter	Symbol	PYS 3428TC	Unit	Remarks
Responsivity, min.	R_{min}	2.2	kV/W	f = 1 Hz
Responsivity, typ.	R	3.5	kV/W	f = 1 Hz
Noise, max.	N_{max}	50	μV_{pp}	0,4...10Hz/20°C
Noise, typ.	N	15	μV_{pp}	0,4...10Hz/20°C
spec. Detectivity	D^*	17	$10^7 cm^* \sqrt{Hz/W}$	1Hz/ 1Hz BW
Field of View, horizontal	FoV	77	°	unobstructed
Field of View, vertical		77	°	unobstructed
Source Voltage		0,2...1,5	V	47 kΩ, 20°C
Operation Voltage	V_{DD}	2-10	V	unobstructed

Handling

Infrared Sensors are Optical devices and require careful handling in production. As to mechanical recommendations:

- Avoid dropping the devices on the production flow.
- Avoid physical force to detector leads, do not bend leads unless necessary.
- Ensure leads are not damaged when manipulating them.

Electrostatic discharges may destroy the detectors. It is recommended to apply the standard precautions for ESD sensitive devices to prevent potential damage.

The detector windows are optical filters with multi-layer coatings.

- Avoid touching the detector window. To clean windows, use only ethyl alcohol with a cotton swab.
- Do not expose Detectors to chemical fluids such as Freon, Trichloroethylene and other aggressive detergents.

Environmental Conditions

With the construction of metal can and spectral window inserted into the can by a special durable epoxy, the detectors are sealed and tested for long-term enclosure. The detector will pass He-leakage test with maximum leakage rate specification of 5×10^{-8} mbar ls-1. Detectors shall not increase noise or change responsivity when exposed to maximum of 95% relative humidity at 30°C.

- Avoid long-term storage at high humidity with high temperatures.

As IR detectors are optical sensors, avoid condensation effects on the detector. Operation below dew points may affect the performance.

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 JEDEC (see table). For detailed information please contact Excelitas.

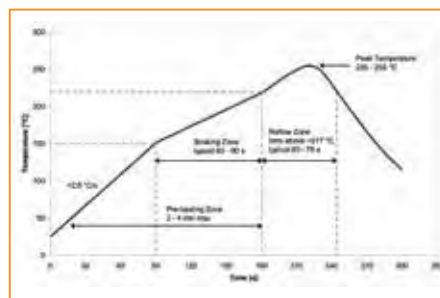
Quality and Reliability Standards

Excelitas strives to meet applicable quality and reliability standards. We are certified ISO 9001:2015 and operate at established SPC and TQM. We are proud to operate under Environmental Management System according to ISO 14001:2015 and the Occupational Safety and Health Management System according to OHSAS 18001: 2007.

All devices employing PCB assemblies are manufactured according IPC-A-610 class 2 guidelines.

Excelitas Thermal Infrared Sensor product line is certified for ANSI/ESD S.20:2014.

In case of questions please feel free to contact us for the latest update on our current certificates and forms. Our continuous qualification and reliability program ensures that all products meet the specified performance criteria.



As to outgoing inspection, all devices have to pass 100% testing of major parameters and gross leak in acc. to MIL Std. 883 m 1014C1. Due to high-volume production individual data are not protocolled or stored, statistical data are kept for reference.

Soldering of SMD Devices

The TPiD 1S and TPiS 1S series are lead-free components and fully comply 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.

The device meets MSL1 at 245 °C according to JEDEC standard.

Soldering Conditions

For the soldering of the detectors within PCBs, the typically applied and recommended process is wave soldering. During the automatic wave solder process we strongly advise to restrict preheating to avoid heat exposure through the detector window, if necessary apply a protection cap. When the detector is directly exposed to the radiation of such heaters the detector shall be protected from that heat. Manual soldering is also possible when maintaining similar temperature profiles.

Reflow soldering is not possible for TO housing versions of our detectors. For our range of SMD housing detectors please reference the recommended solder profile.

Generally Applied IR Windows

Material used for filters and windows must be transparent in the wavelength of interest. Glass for example is generally not suited to sense the temperature of human skin since it absorbs wavelengths above 4µm. Common materials with a broad transmission range are Germanium and Silicon for the filter windows of IR Sensors. For outside protection only few materials are suitable. Among many plastics, only PP or HD-PE can be used as protection or as fresnel structured optics for presence and motion detection.

Detecting Gases

In the early days of the mining industry, the common method for gas detection was to take a bird in a cage along.

Canary birds were well known as an early warning system for toxic gases. If the bird went unconscious, it was high time to get out. Today electronic sensors have replaced the ancient system.

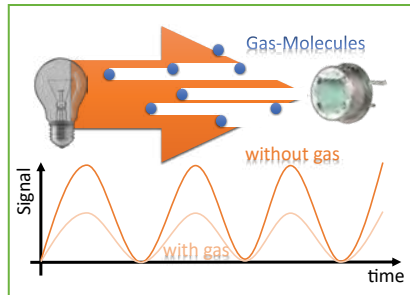


The now applied NDIR principle requires a combination of Thermal Radiation Source and Infrared Sensor. The selection of source strongly depends on spectral range. For range below 5µm popular incandescent miniature lamps can be applied, for long-range thermal sources are required.

When designing NDIR-based gas sensors the selection of available Detectors is split between Pyrodetectors and Thermopile Sensors. Since NDIR usually applies modulated sources to prevent overheating, the engineer has the choice of preference. Both sensor principles can be called equally suitable when fit with the narrow band window necessary for the specific gas absorption.

Special Application Detectors for Gas Sensing

Environmental protection is one of our most serious concerns. Features and instrumentation are required to measure and monitor all kinds of gas in

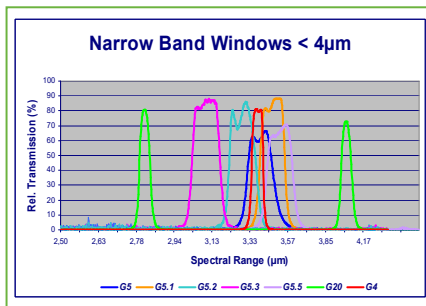


our environment. One of the methods applied is the NDIR technique, a principle of measuring gas concentration by its absorption properties in the infrared range.

Filters for Gas Sensors

The spectral sensitive range of the detectors is defined by a filter window. Common applications in infrared reference wavelengths from 2 to 20 µm. Long-range pyrometers apply a sharp cut-on/cut-off window of 9-14µm (G9) .

Excelitas offers single-channel detectors with such windows as well as Dual-Channel Detectors. When choosing Dual-Channel, typically one channel works as reference fit with a window that will have



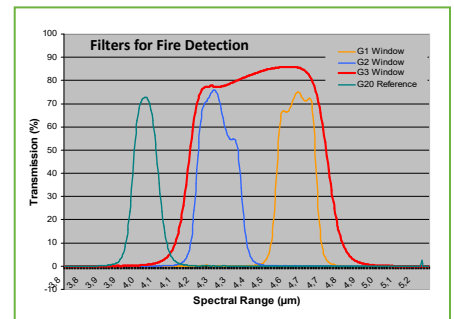
no gas absorption band (G20). For sensing one specific gas by infrared absorption we offer narrow-band filters to detect specific gas absorption lines. The appropriate narrow band optical filters enable detection of Carbon Monoxide,

Carbon Dioxide, Natural Gas and other environmental gases, as well as some technical gases. Please see the range of available filters and specifications.

Fire Detection

Since the exhaust of fire is mainly a hot emission of CO and CO₂, the infrared sensor may also be used for fire detection when fit with a suitable filter.

Our Detectors are applied in single- or dual-channel configurations. With the suited specific narrow-band spectral window our detectors and sensors are a vital part of making our environment more safe, secure and healthy.



Narrow Bands Filter Table

Filter type	Application	CWL	HPB
G1	CO	4.64µm	180nm
G2	CO ₂	4.26µm	180nm
G2.2	CO ₂	4.43µm	60nm
G2.5	CO ₂	4.33µm	160 nm
G2.6	N ₂ O	4.53µm	85nm
G3	CO+CO ₂	4.48µm	620nm
G4	NO	5.3µm	180nm
G5	HC	3.35µm-3,4µm	190nm
G5.1	HC	3.46µm	163nm
G5.2	HC	3,28-3,31µm	160nm
G5.3	HC	3.09µm	160nm
G5.5	HC	3,32-3,34µm	160nm
G5.6	HC	3.42µm-3,451µm	160nm
G5.7	HC	3,30-3,32µm	160nm
G5.9	HC	3.375µm-3,4µm	190nm
G7.1	R12	11.3µm	200nm
G7.2	R134a	10.27µm	210nm
G7.3		12.4µm	180nm
G20	Reference	3,95µm	90nm

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