API
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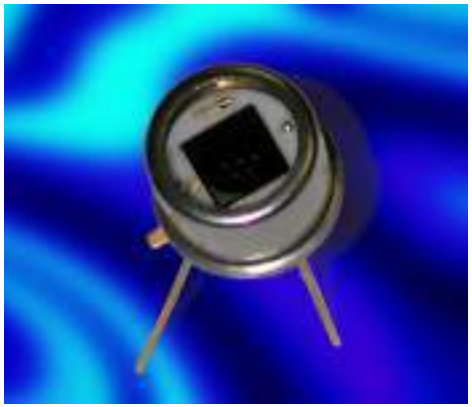

SD138-11-31-211

Silicon PIN Dual Photodiode Sandwich Detector for Color Temperature Sensing Application

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Optoelectronic Solutions

SD138-11-31-211

- Si PIN Photodiode Sandwich Dual Detector
  - 2 silicon PIN photodiodes vertically integrated in a hermetic TO-5 package.
  - The top photodiode absorbs a portion of the light and the remaining light is transmitted to the bottom photodiode.
  - The current ratio of the two photodiodes is used to remotely determine and monitor the color temperature of an object.

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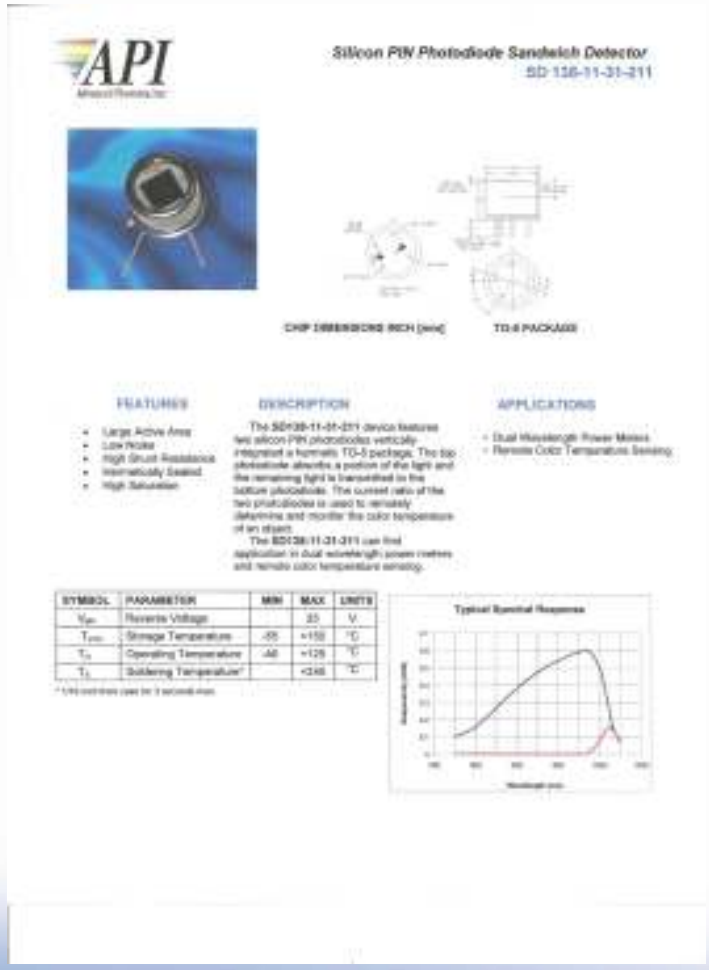

- Applications
  - Dual Wavelength Power Meters
  - Remote Color Temperature Sensing
- Features
  - Large Active Area
  - Low Noise
  - High Shunt Resistance
  - Hermetically Sealed
  - High Saturation

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* The wider the separation between the 2 different detector wavelengths, the result will be a weaker temperature function ratio.

- Characteristics
  - Top detector @ 950nm
    - R = .60A/W typical
    - Range = 300-1100nm
  - Bottom detector @ 1050nm
    - R = .155A/W typical
    - Range = 950-1100nm
- Benefits
  - Space Savings
    - 2 detectors in one TO-5 Can
  - Small wavelength separation for better temperature function ratio*

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- How does it work?
  - Infrared Thermometer
    - All I/R thermometers measure the temperature of an object without physical contact
    - Every object emits radiant energy and the intensity of this radiation is a function of its temperature
    - All I/R thermometers use a instrument called a “blackbody” as its source of calibration
    - “Blackbody” is a perfect radiator – it radiates the maximum amount of I/R energy that any object can emit at any temperature or wavelength
    - Every other hot object emits less energy than a “blackbody” does at the same temperature and the object is said to have an emissivity characteristic.
    - Emissivity is a simple ratio of how the hot object emits energy compared to the perfect “blackbody”

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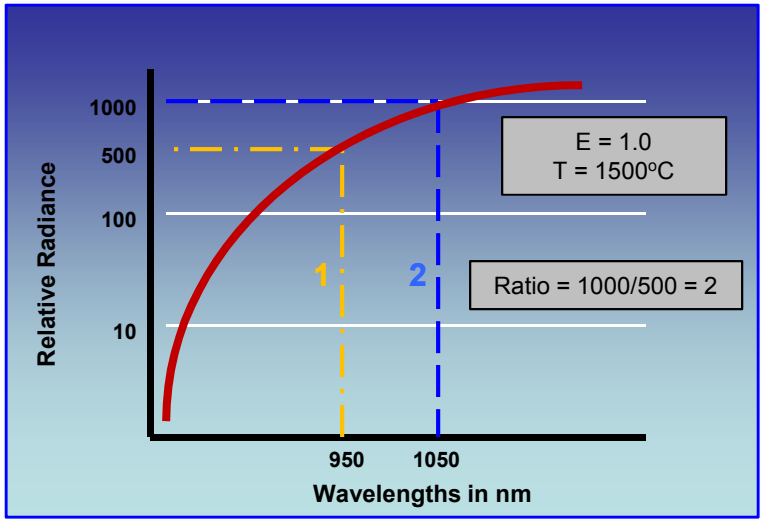

E = Emissivity is a simple ratio of how the hot object emits energy compared to the perfect "blackbody"

- 2 Color Pyrometer
  - A 2 color pyrometer consists of 2 brightness pyrometers
  - Uses 2 detectors at different wavelengths with both detectors seeing the same hot target
  - Example (see top chart):
    - Detector 1 gives output of 500 mA (relative radiance)
    - Detector 2 (different wavelength) gives output of 1000 mA (relative radiance)
    - Since this is a ratio thermometer, we divide 1000 mA by 500 mA and get a ratio of 2.
    - Instrument, in this particular case, is calibrated to read 1500C when it sees ratio of 2.

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- Summary
  - Device has 2 Si PIN PDs in one TO-5 can
  - 2 detectors of different wavelength focused on same hot object
  - Ratio of the different currents of the 2 detectors is calculated
  - “Blackbody” standard used for baseline comparison
  - Instrument is calibrated to read a certain temperature based on calculated ratio

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Silicon PIN Photodiode Sandwich Detector

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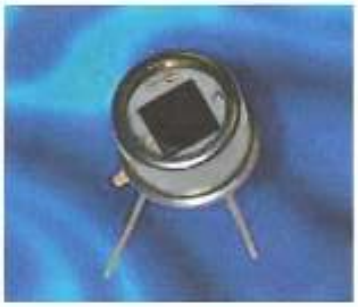
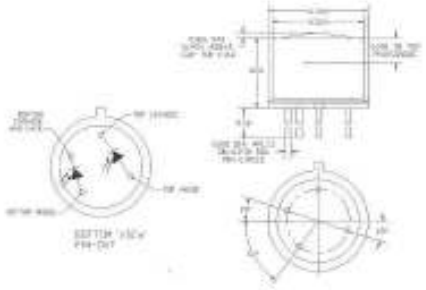




CHIP DIMENSIONS INCH [mm]

TO-5 PACKAGE

FEATURES

- Large Active Area
- Low Noise
- High Shunt Resistance
- Hermetically Sealed
- High Saturation

DESCRIPTION

The **SD138-11-31-211** device features two silicon PIN photodiodes vertically integrated a hermetic TO-5 package. The top photodiode absorbs a portion of the light and the remaining light is transmitted to the bottom photodiode. The current ratio of the two photodiodes is used to remotely determine and monitor the color temperature of an object.

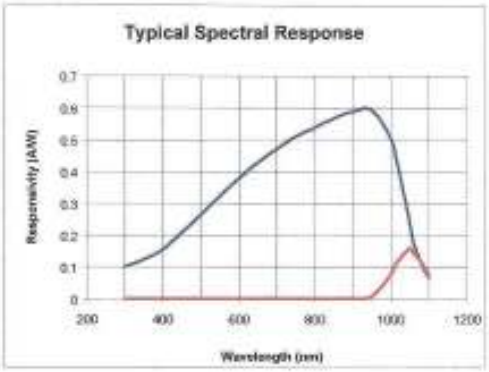
The **SD138-11-31-211** can find application in dual wavelength power meters and remote color temperature sensing.

APPLICATIONS

- Dual Wavelength Power Meters
- Remote Color Temperature Sensing

SYMBOL	PARAMETER	MIN	MAX	UNITS
V_{BR}	Reverse Voltage		25	V
T_{STG}	Storage Temperature	-55	+150	°C
T_O	Operating Temperature	-40	+125	°C
T_S	Soldering Temperature*		+240	°C

* 1/16 inch from case for 3 seconds max.



Optoelectronic Solutions

ELECTRO-OPTICAL CHARACTERISTICS OF TOP AND BOTTOM PHOTODIODES

@ + 23°C AND VOLTS BIAS UNLESS OTHERWISE SPECIFIED

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Active Area Diameter (Top)			3.5		mm
Active Area Diameter (Bottom)			3.1		mm
Spectral Range of (Top)			300 to 1100		nm
Spectral Range of (Bottom)			950 to 1100		nm
Shunt Resistance	Bias: 10mV	50	200		MΩ
Responsivity	Wavelength = 950 nm	0.50	0.60		A/W
Reak NEP (Bottom)	Wavelength = 1050	0.135	0.155		A/W
Peak NEP (Top)	Wavelength = 950		12	25	fw/√Hz
Peak NEP (Bottom)	Wavelength = 1050		45	100	fw/√Hz
Capacitance			290	305	pF
Operating Temperature		-55		+100	°C
Storage Temperature		-55		+100	°C

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