TPL640 Thermography Module

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Contactless temperature measurements are applied in several fields of science, technology and production. It is used to measure temperatures reactionless, on movable parts or in danger zones.
To find hot spots or measure different points (temperature profile) on movable parts it is necessary to use an expensive IR- camera. The high acquisition costs are an avoid an application of IR- systems!

The solution is a line array with 64 pixels. Used in a complete device with intelligent electronic and IR-optic it is possible to record a temperature profile of any part with linear or rotate movements. By the easy assembling without any cooling and mechanical choppers it is possible to build up a cost- effective sensor module which is able to rise up the temperature process control in any fields of application.

This 64- pixel line thermopile array detects infrared radiation. By an Ag- black broad band absorber layer the incoming radiation will be changed into heat. By the “Seebeck”- effect the heating up status turns to an analog voltage. The output voltage of a thermopile is proportional to the temperature difference between the active (hot junction) and the passive (cold junction) parts of the thermocouples. To determine the real temperature the reference temperature of the cold junction is required. This is measured by a thermistor which is thermally connected to the passive area. By a special algorithm based on the Stefan-Boltzmann-Law it is possible to get the real temperature of the measured object.
Each pixel with such important parameters like sensitivity and specific detectivity are top values in comparison to other similar products on the market.

The advantage of this new module is its unique universality. The TPL640 Thermography Module consists of three separate modules.

1. Line array in a high precision packaging

For the high accuracy applications it is necessary to have an accurate position of the line array.
This is assured by the special construction of the bathtub header and the automatic production process.
The result of these methods is that the pins on the lid have a tolerance to the sensitive element to ±0.025mm.
A helium leak sealed assembly with lid and soldered Germanium window gives a wide range of sensitivity from 2-16µm.
Backfilling with Xenon or retained vacuum leads to a low cross-over and a maximum of sensitivity. The vacuum is controlled by an integrated sensor and can be recovered by an internal evacuation system.
In combination with dispersive elements like gratings it is also possible to use this module for spectroscopy.

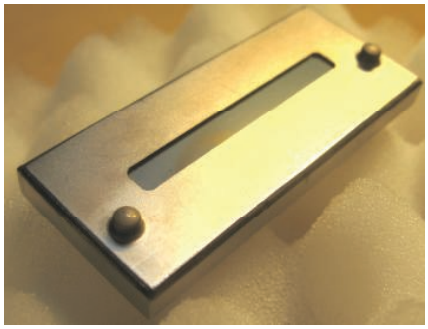

Figure 1 Sensor Element TPL640

2. Interchangeable objectives

Actually there are two standard objectives:
1st: coated 3-5µm: 2.5/32 FOV27°
2nd: coated 8-12µm: 2.4/60 FOV15°
Both optics have a manual focus from 0.25m – 25m and it is feasible to narrow the band width by an easy changeable 1”- filter at the front of the objective. So it is possible to fit the wavelength to special applications like in steel and glass processes.
With the assistance of an additional green pilot line laser (<1mW) it is achievable to make an exact adjustment in the fields of application.

Figure 2 IR- Optic: left 3-5µm, right 8-12µm

3. Electronic unit

The voltage output will be gained by a programmable low noise amplifier. The microcontroller chip is responsible for the processing and conditioning of the analog signals. These signals are used to calculate the absolute object temperature with an internal algorithm. The communication of the module with a PC takes place with a serial interface like RS232 and it’s possible to fit other interfaces to customized demands.
The software displays the actual values as absolute temperatures and false colors. It is possible to program threshold values to find out hot spots.
Furthermore an easy graphical indication and record of the values which communicate by a digital interface with the microcontroller board is given by a special software implementation.

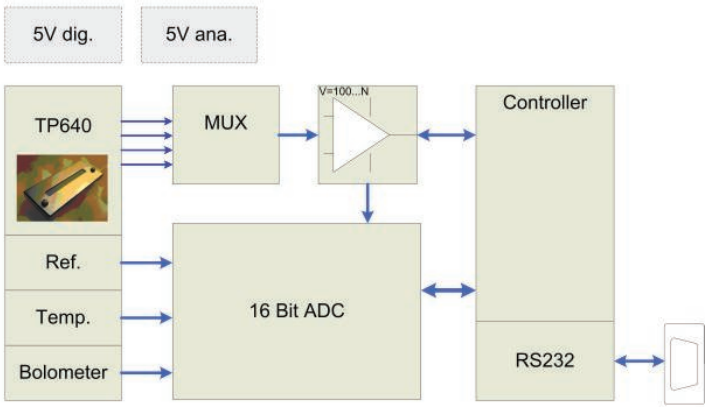

Figure 3 Block diagram

4. Complete Module

The module has the size of a common compact camera. It is very robust for the industrial environmental conditions and easy to mount into any position of your application.

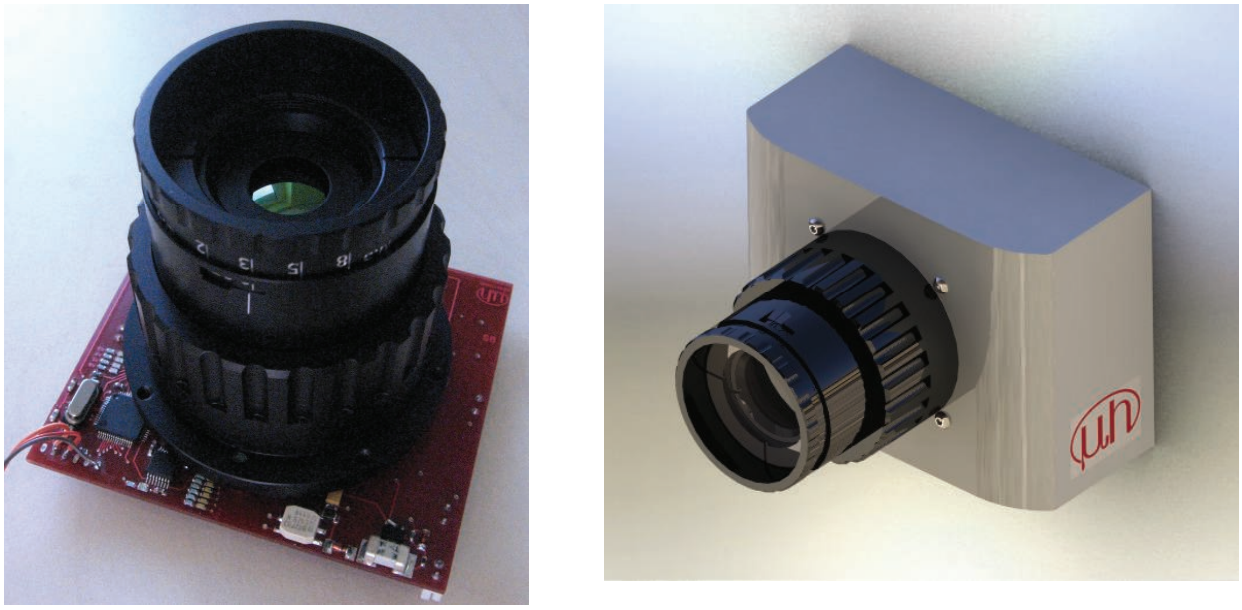

Figure 4 OEM-Module with 3-5µm optic (left: without housing; right: with housing)