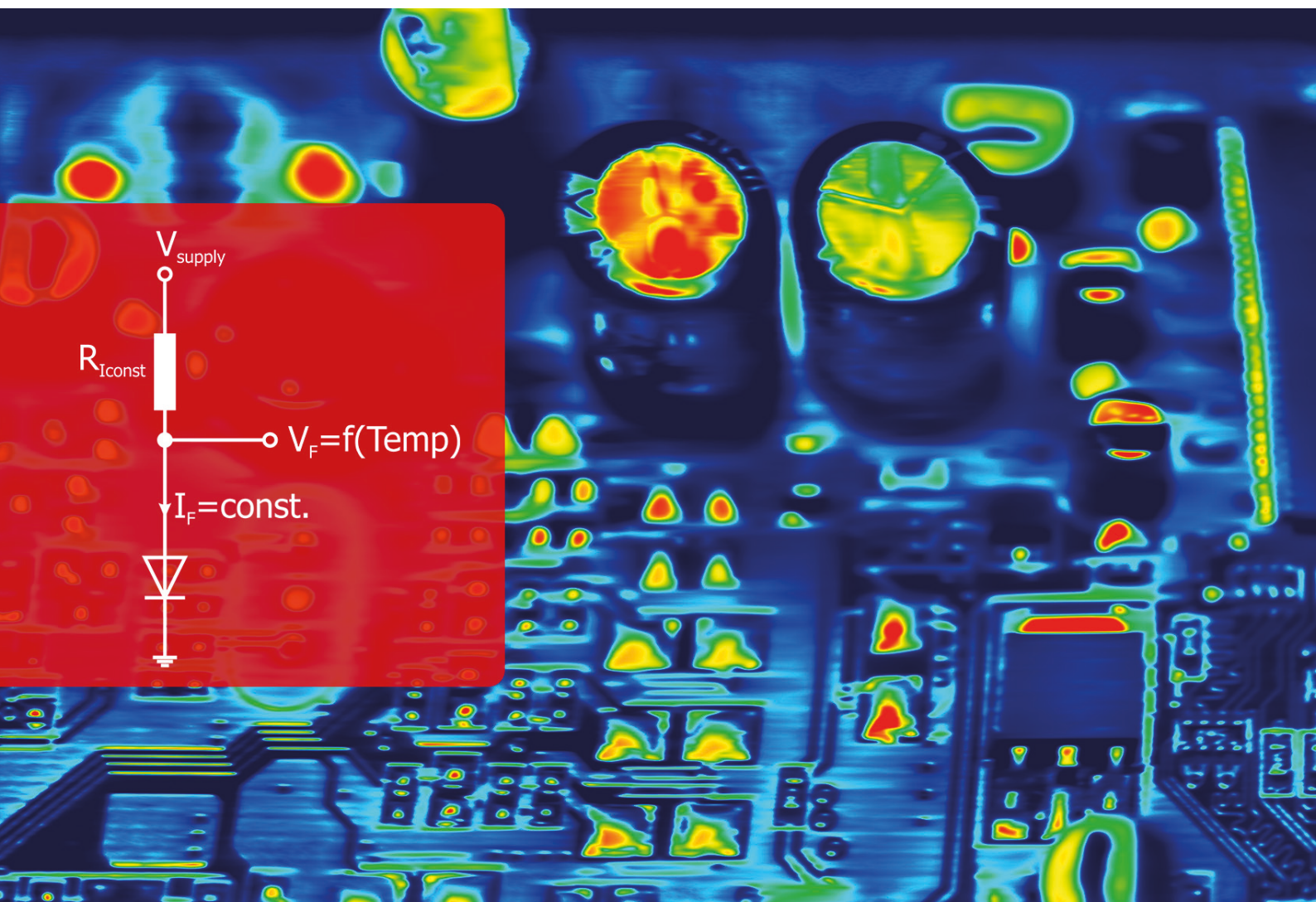




Temperature Monitoring Solutions

1. Diode

Ambient and component temperature has a decisive impact on the performance and lifetime of electronic equipment. There is hardly any system without at least one sensor to acquire temperature values and feed them back to the digital processing units or analog control circuits. This application note provides an overview of three accurate and cost-optimized solutions for a wide range of temperature sensing applications.

One of the simplest and lowest cost solutions features a forward biased diode (Fig. 1). The voltage drop between anode and cathode is a function of both current and temperature. Due to the silicon's physical characteristics, a diode's forward voltage will vary with temperature by a ratio of ca -1.6 mV/K (K designates the difference of two temperatures in °C). Driving the diode with a constant current will eliminate its dependency of current and turn it into a temperature sensor with an almost linear output characteristic. As self-heating of the diode will bias the measurement, it is important to keep the forward current at a minimum. A few mA will be enough to enable temperature measurement.

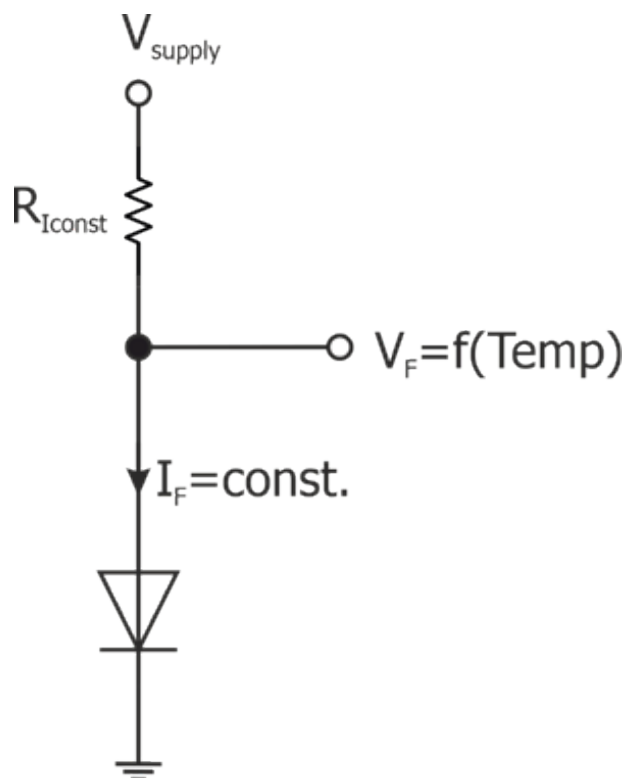


Figure 1

Almost any type of rectifier diode will do the job. Diotec offers a wide range of solutions in all commonly used packages:

[Small Signal and HV Diodes](#)

[SMD Diodes and Rectifiers](#)

2. Bipolar Junction Transistor (BJT)

Due to the conduction processes inside the pn-junction, a diode-connected BJT offers a higher accuracy than standard diodes (Fig. 2). Tying base and collector together will turn the BJT into a diode with a temperature-dependent V_{BE} .

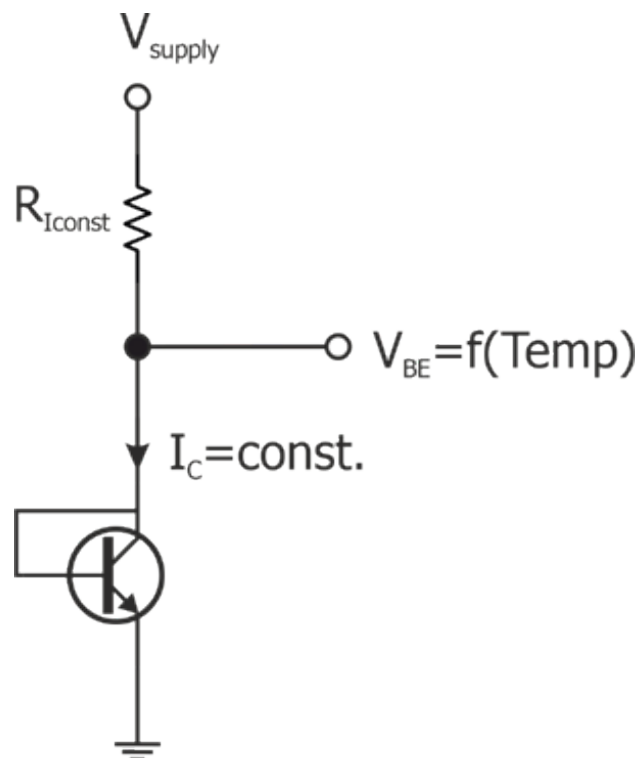


Figure 2

Check out Diotec's selection of transistors for more information.

[Small Signal Transistors](#)

3. BJT with Constant Current Source

Using a constant current source to drive the BJT will eliminate any distortions caused by voltage source variations. A simple circuit based on MMTL431A Shunt Voltage Reference (https://diotec.com/tl_files/diotec/files/pdf/datasheets/mmtl431a.pdf) and a BJT (e. g. Diotec's BC846C https://diotec.com/tl_files/diotec/files/pdf/datasheets/bc846.pdf) will provide a constant collector current I_C to drive the temperature sensing BJT.

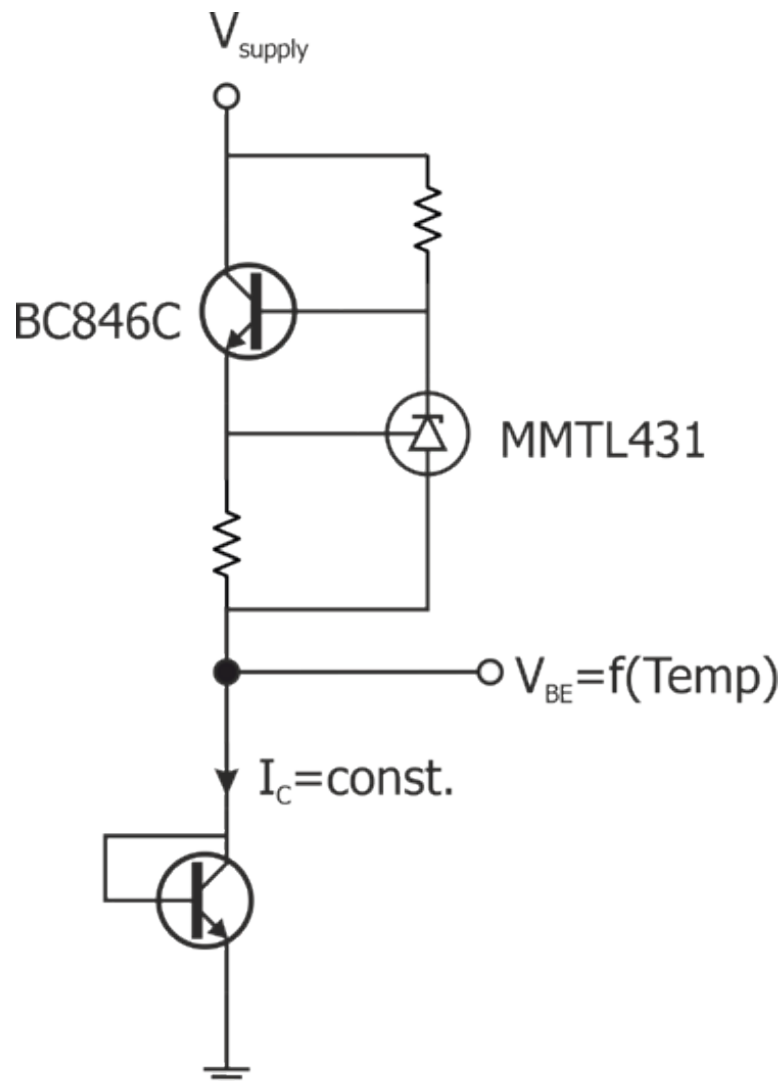


Figure 3

Check out our selection of shunt and voltage regulators for more information.

[Shunt and Voltage Regulators](#)

Disclaimer

This application note describes device proposals and shall not be considered as assured and proven solution for any circuit. No warranty or guarantee, expressed or implied is made regarding the capacity, performance or suitability of any device, circuit etc.