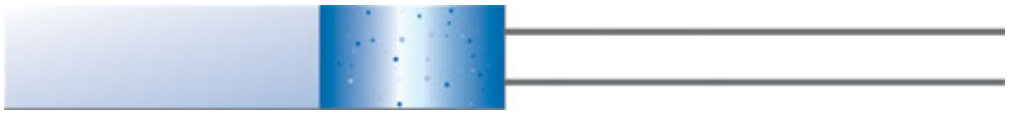
2- 3- 4- Wire RDT (Pt100 to PT1000)Temperature Measurement

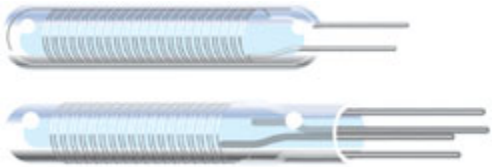
RTD Sensors

most common PT100; PT500; PT1000

- RTD: resistance temperature device
- Linear resistance change with temperature
- Positive temperature coefficient
- Wire-wound or thick film metal resistor

Over Limited Temperature Range





RTD Sensors

Advantages and disadvantages

Advantages

- Accuracy available to +/-0.1°C
- High linearity over limited temperature range; ex. -40°C to +85°C
- Wide temperature range: -250°C to 600°C (ASTM) 850°C (IEC)

Disadvantages (mostly minor)

- Limited resistance range 100Ω to 1kΩ (typically) Up to 10kΩ, Down to 10Ω available
- Low sensitivity, about +0.4Ω/°C for a 100Ω Pt100 RTD
- Requires linearization for wide range; ex. -200°C to +850°C
- Lead wire resistance may introduce significant errors
- Cost is high compared to a thermistor But Wider Temperature Range

ADS1247/48

24-Bit, Complete Temperature Measurement ADC

Features

Device Features:

- **2/4 Differential** or **3/7 Single-Ended**
- **True Bipolar** ± 2.5V or Unipolar 5V
- Max Data Rate – **2kSPS**
- **Low Noise PGA**: 40nV @ G = 128
- **50/60Hz** Simultaneous **Rejection** Mode (20SPS)

On-Chip Integration:

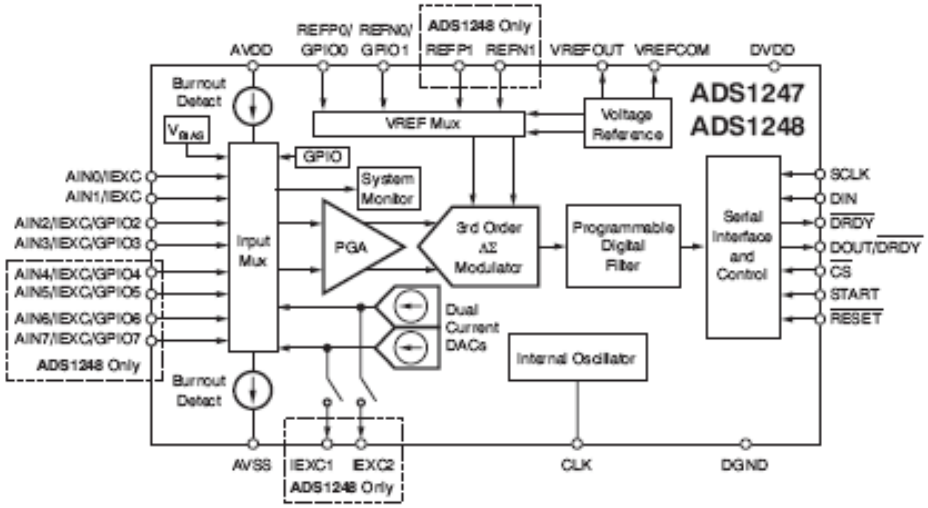
- Low Drift **Internal Reference** (10 ppm/°C Max)
- **Dual** Matched **Current DACs** (50 – 1500 µA)
- Oscillator, Temp Sensor, Burnout Detect
- 4/8 **GPIO's**
- 16-Bit version: **ADS1147/48 coming 2Q'09**

Applications

- Temperature Management
  - RTDs, Thermocouples, Thermistors
- Flow/Pressure Measurement
- Industrial Process Control

Key Benefits

- Ultimate Temperature Sensor Measurement Solution
- Most Flexible Front End for a Wide Range of Industrial Sensors
- High Integration Without Compromising Performance
- Scalable Solutions



EVM

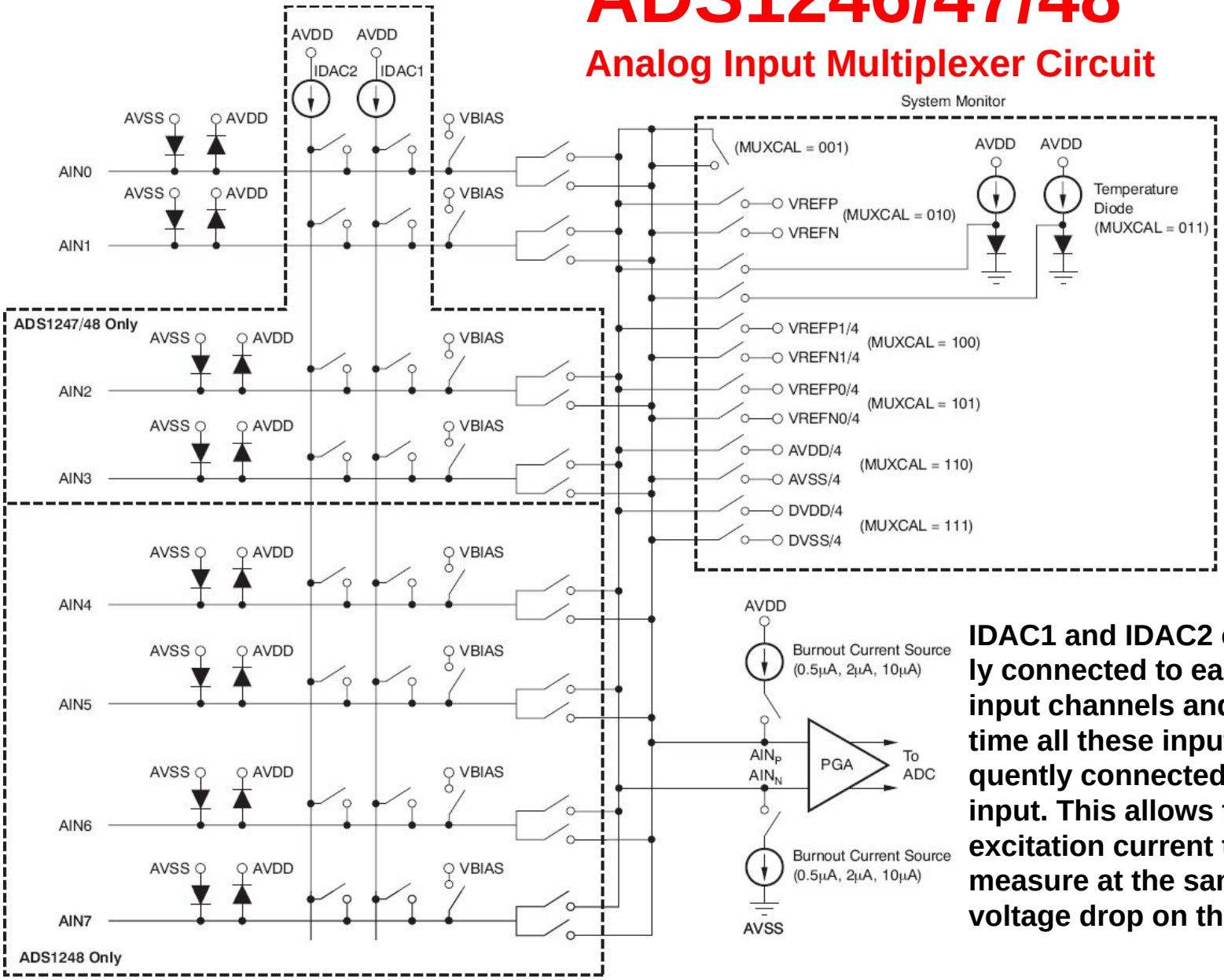
ADS1248EVM

20/28-Pin TSSOP

Texas Instruments

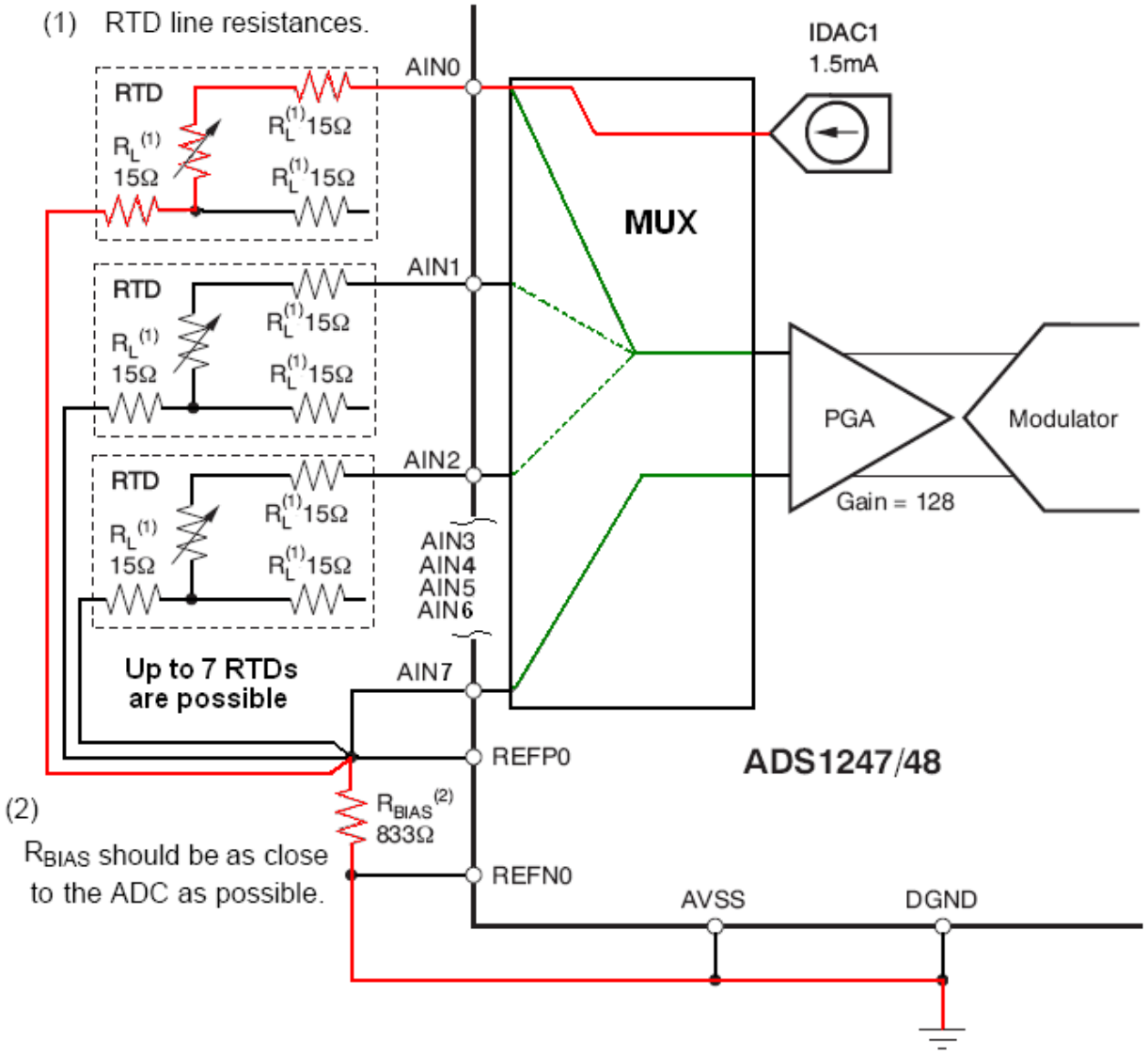
ADS1246/47/48

Analog Input Multiplexer Circuit



IDAC1 and IDAC2 can be sequentially connected to each of the eight input channels and at the same time all these inputs can be sequently connected to the PGA input. This allows to drive the excitation current to one input and measure at the same time the voltage drop on this input.

Ratio-Metric 2-Wire RTD application



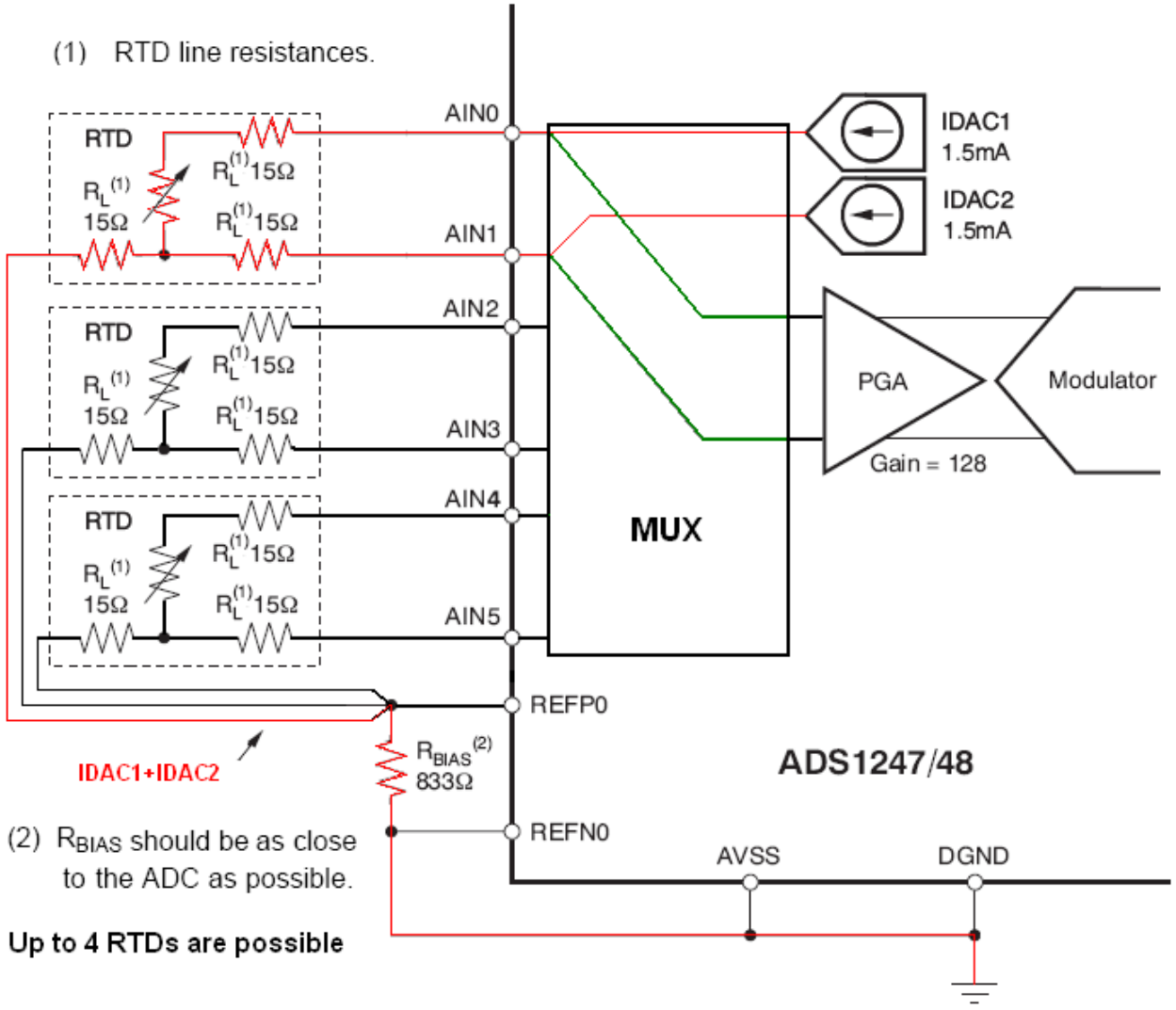
Advantage:

- Very simple RTD connection.
- IDAC generates the sensor excitation and the reference voltage.
- Noise and drift of the Ref voltage are correlated and therefore canceled.
- Only one current source no mismatch.
- Up to 7 RTDs are possible

Disadvantage:

Voltage drop across the line resistance.

3-Wire RTD connection



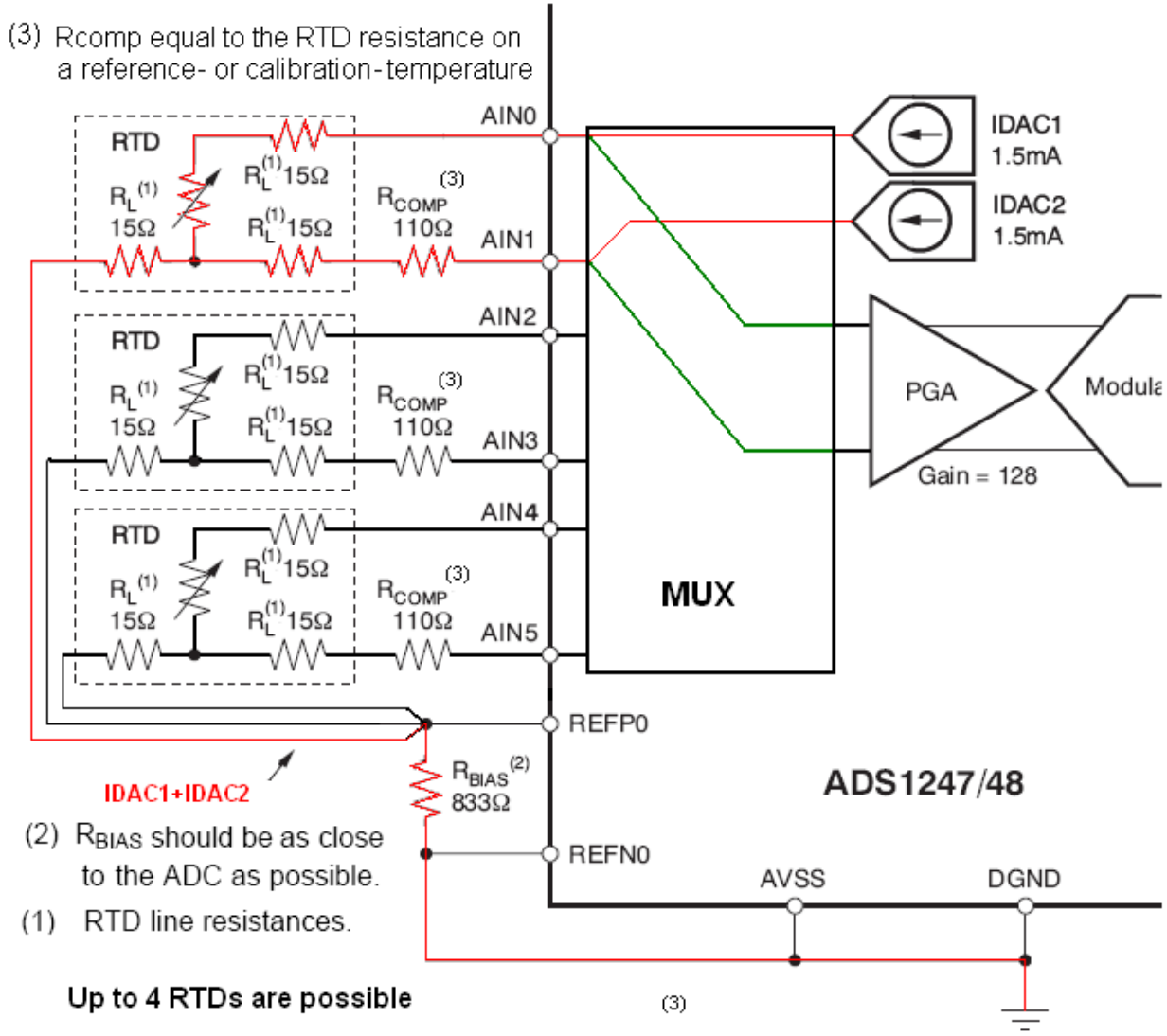
Advantage:

- IDAC generates the sensor excitation and the reference voltage.
- Noise and drift of the ref voltage are correlated and therefore canceled.
- Voltage drop across the line resistance are compensated

Disadvantage:

- Needs two current sources.
- Only IDAC current mismatch matters.

3-Wire RTD with compensation



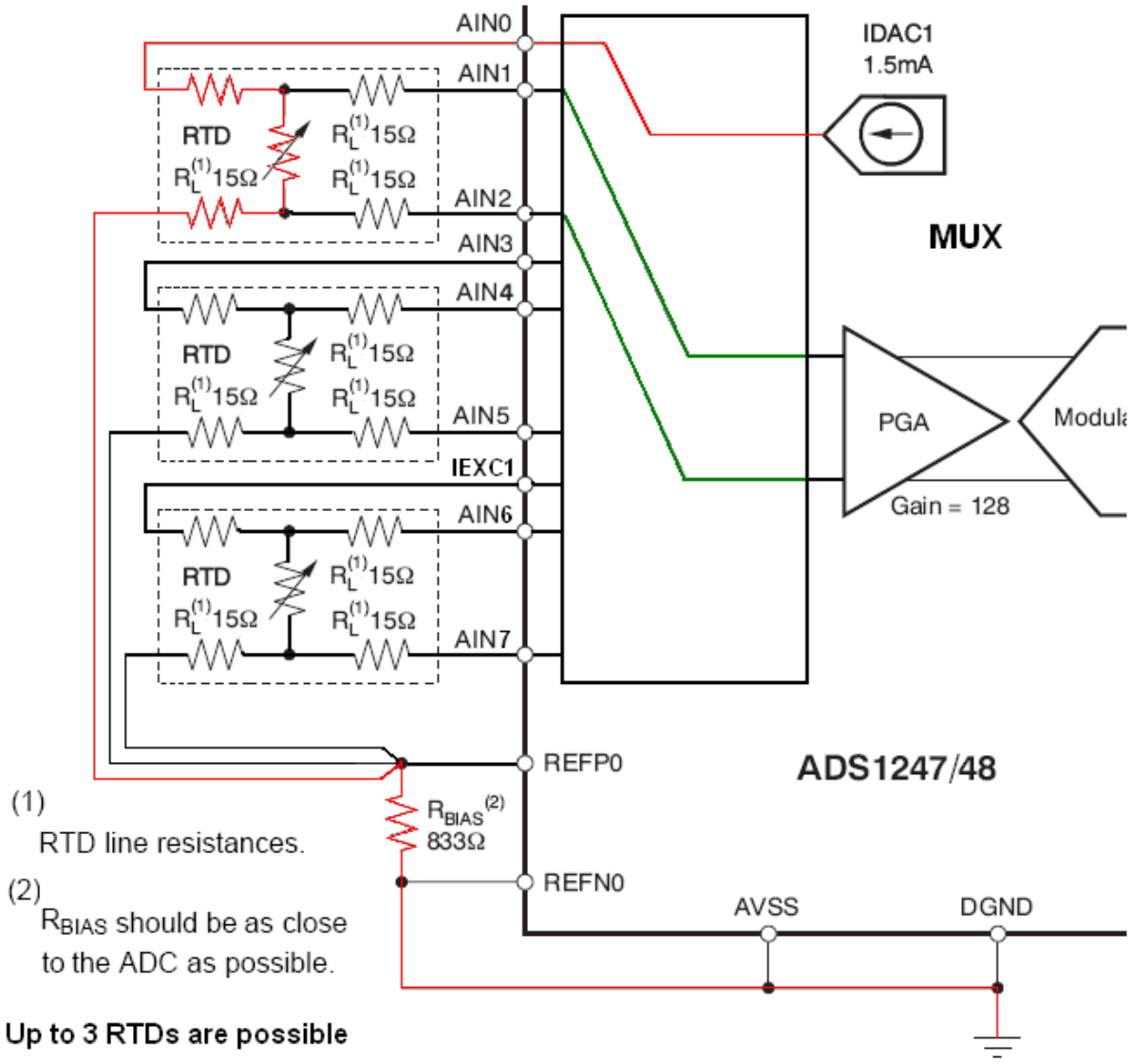
Advantage:

- IDAC generates the sensor excitation and the reference voltage.
- Noise and drift of the Ref voltage are correlated and therefore canceled.
- Voltage drop across the line resistance are compensated.
- Allows complete utilization of the input range, no offset caused by the RTD itself.

Disadvantage:

- Needs two current sources.
- Only IDAC current mismatch matters.

4-Wire RTD



Advantage:

- IDAC generates the sensor excitation and the reference voltage.
- Noise and drift of the Ref voltage are correlated and therefore canceled.
- Voltage drop across the line resistance are compensated.
- No IDAC current mismatch because only one current path is needed.

Disadvantage:

- Four connections are used for every sensor.
- Up to 3 RTDs are possible