



- 4 differential inputs / 8 single inputs possible

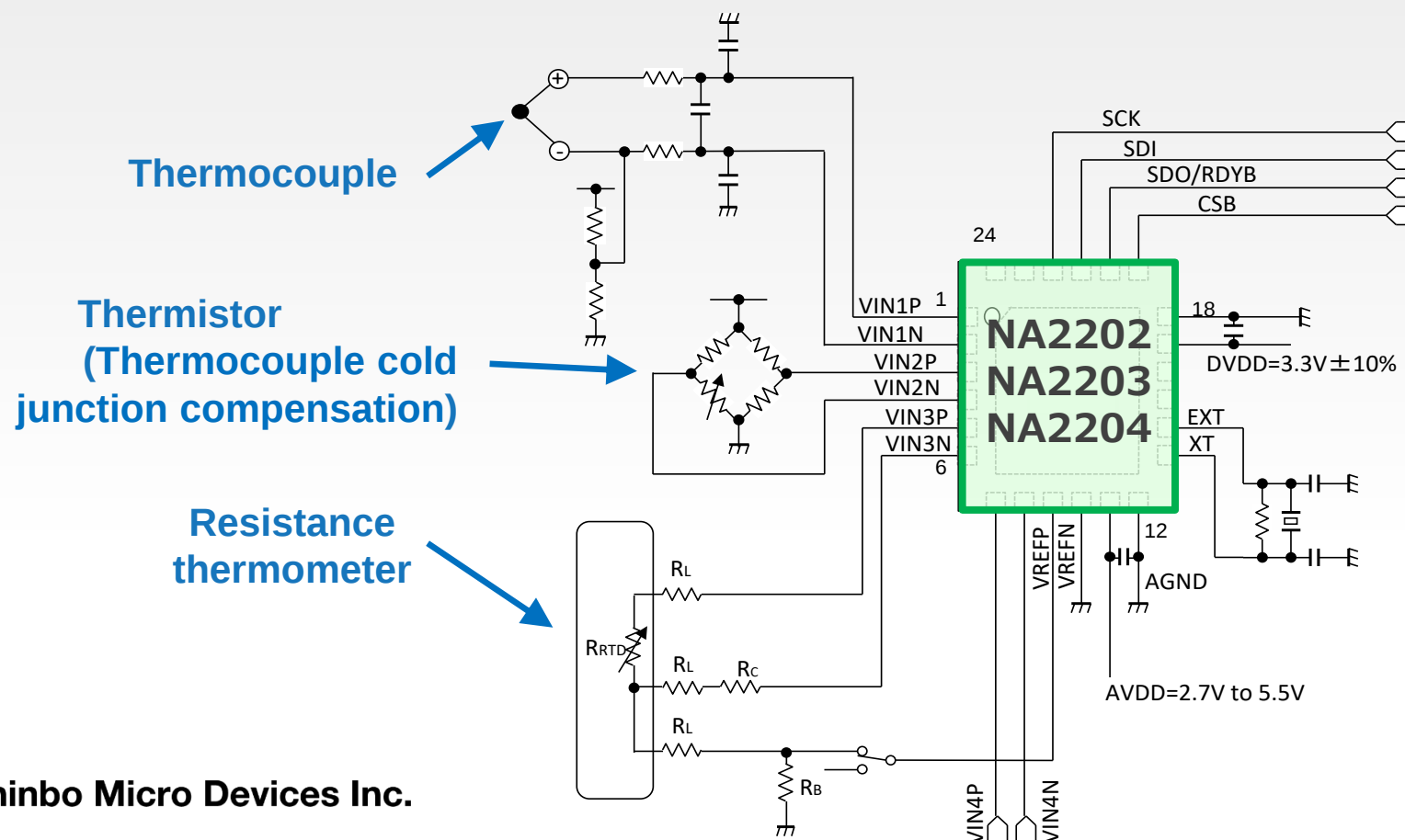
General Issue

- When customer wants to use multiple sensors in combination (e.g. thermocouple + cold junction compensation, temperature sensor + pressure sensor, etc.)

Our Solution

- Process multiple sensors with one AFE!

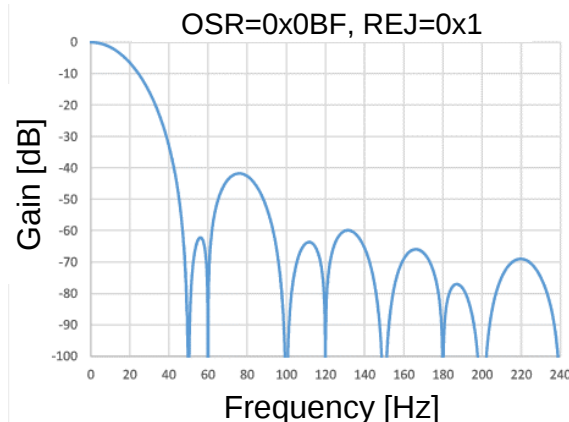
Connection example with temperature sensor



50Hz, 60Hz rejection

Reject commercial power frequency noise

Remove 50Hz*n, 60Hz*n frequency components (n is an integer greater than or equal to 1) The figure below shows the case of FOSC=1228.8kHz.



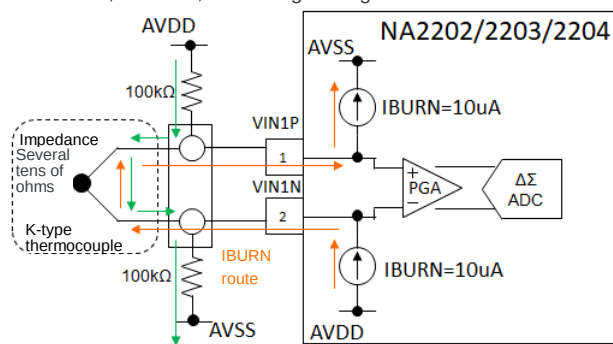
50Hz, 60Hz rejection when using built-in OSC (FOSC=1228.8kHz±3%)

OSR [9:0]	0x09F	0x0BF	0x0BF	0x17F	0x2FF	0x3BF
REJ [1:0]	0x0	0x0	0x1	0x1	0x1	0x0
Oversampling rate	10240	12288	12288	24576	49152	61440
Data rate during continuous conversion 1/Tadc [sps]	60.0	50.0	50.0	25.0	12.5	10.0
50Hz±1Hz Attenuation amount [dB]	-36.8	-77.6	-64.0	-66.2	-74.5	-80.1
50Hz±2Hz Attenuation amount [dB]	-34.7	-68.4	-57.2	-59.9	-70.6	-73.4
60Hz±1Hz Attenuation amount [dB]	-79.5	-44.2	-56.3	-62.8	-73.9	-82.7
60Hz±2Hz Attenuation amount [dB]	-71.2	-43.1	-53.1	-61.0	-70.6	-77.1

Disconnection detection function

Detect disconnection of sensors (thermocouples, etc.)

AVDD=5V, AVSS=0V, Assuming PGA gain of 32x



■ When there is no disconnection IBURN does not flow to 100kΩ

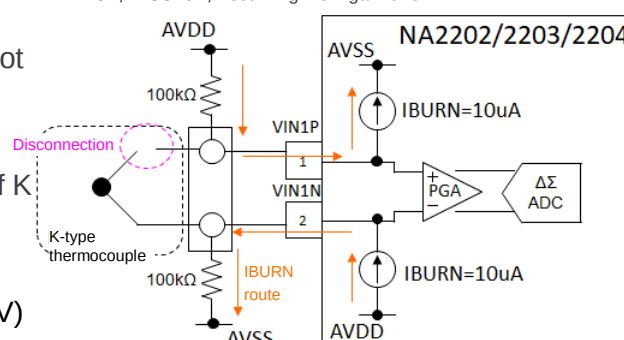
Thermoelectromotive force of K type thermocouple

$$VIN1P - VIN1N = -(\text{a few mV}) \sim +(\text{a few mV})$$

ADC output is within normal range

Thermocouple bias current = $(5V - 0V) / (100k\Omega + \text{several tens of } \Omega + 100k\Omega) \approx 25\mu A$
 $\rightarrow$ VIN1P, VIN1N bias voltage is approximately 2.5V

AVDD=5V, AVSS=0V, Assuming PGA gain of 32x



■ When there is a disconnection IBURN flows to 100kΩ

$$VIN1P = AVDD - 10\mu A * 100k\Omega = 4V$$

$$VIN1N = AVSS + 10\mu A * 100k\Omega = 1V$$

$$VIN1P - VIN1N = 3V$$

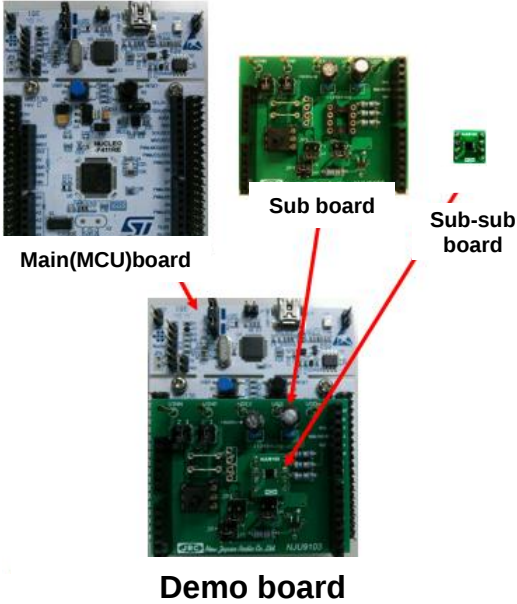
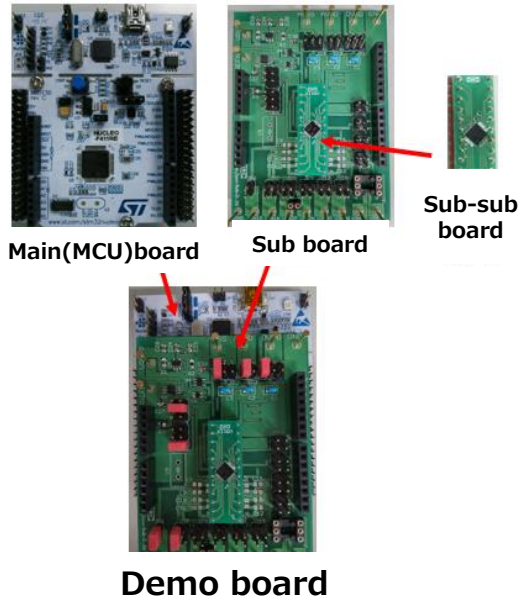
ADC output sticks to full scale so disconnection can be detected

NA2202/NA2203/NA2204

Analog Front End with High precision
16/20/24-Bit Delta Sigma
A-D Converter



Evaluation board list

NJU9103	NA2202/NA2203/NA2204
 Main(MCU)board Sub board Sub-sub board Demo board	 Main(MCU)board Sub board Sub-sub board Demo board

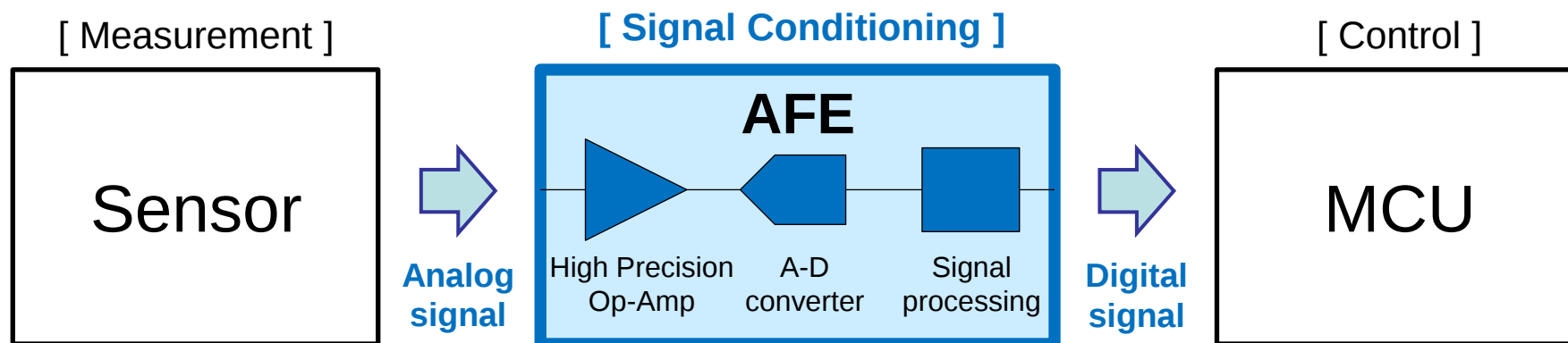
It is available for rent, so please ask our sales staff.

The MCU board is the same as NUCLEO-F411RE (manufactured by STMicroelectronics).

<https://www.st.com/en/development-tools/stsw-link009.html>

Driver installation required.

AFE converts “sensor signals” into “signals that can be processed by MCU”



■ AFE comparison table

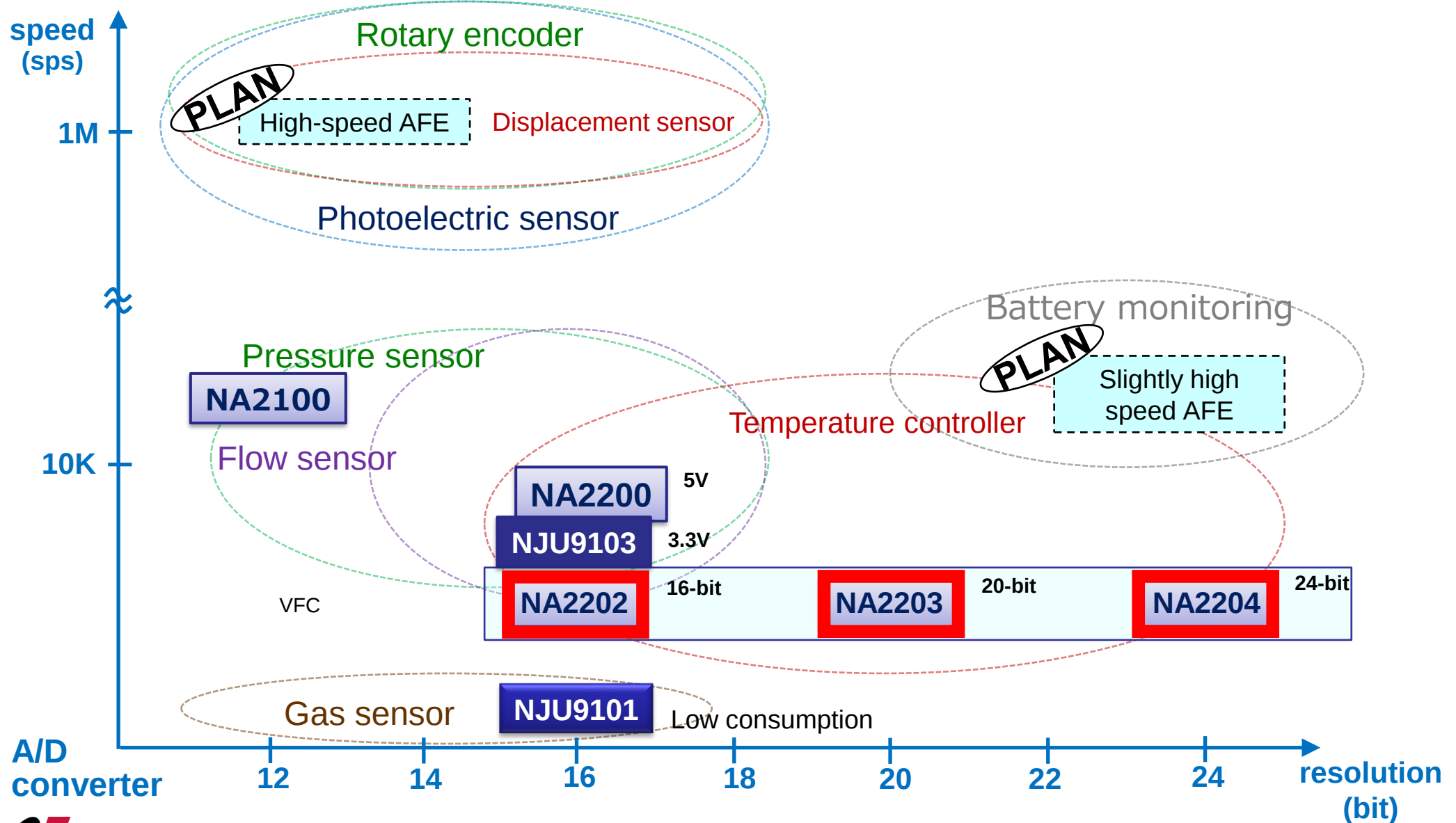
Item \ Product name	NJU9101	NJU9103	NA2200	NA2202/03/04
Function	Low consumption	Built-in high gain PGA		Built-in high precision PGA
Target application	Gas detector	Pressure sensor		Temperature controller
Operating power supply voltage	+2.4V to +3.6V	+2.7V to +3.6V	+2.7V to +5.5V	+2.7V to +5.5V, $\pm 2.5V$
Input method	Dual	Differential 1ch	Differential 2ch	Differential 4ch Negative voltage input
A-D converter	16-bit			16-bit/20-bit/24-bit
PGA	64times	512times		128times
excitation current source	—	—	2 system(0.1mA, 0.25mA, 0.5mA, 1mA)	
Package size	EQFN24-LE: 4.0mm × 4.0mm	ESON8-V1: 2.3mm × 2.3mm SSOP8: 3.5mm × 6.4mm	SSOP16-BD: 5.0mm × 6.4mm	QFN4040-24-NB: 4.0mm × 4.0mm

NA2202/NA2203/NA2204

Analog Front End with High precision
16/20/24-Bit Delta Sigma
A-D Converter



AFE positioning map of Nisshinbo Micro Devices



ORDER INFORMATION

Product Name	Package	Quantity per reel (pcs/reel)	RoHS	Halogen Free
NA2202NBAE2S	QFN4040-24-NB	1000	✓	✓
NA2203NBAE2S	QFN4040-24-NB	1000	✓	✓
NA2204NBAE2S	QFN4040-24-NB	1000	✓	✓

■ PRODUCT NAME INFORMATION

NA220x aa c dd e

Composition	Item	Description
x		2:16-bit, 3:20-bit, 4:24-bit
aa	Package Code	Indicates the package. Refer to the order information.
c	Version	Product version A: Specified value
dd	Packing	Insert direction. Refer to the packing specifications.
e	Grade	Indicates the quality grade. S:Consumer

e : Quality grade

e	Applications	Operating Temperature Range	Test Temperature
S	General-purpose and Consumer application	-40°C to 125°C	25°C



Nisshinbo Micro Devices Inc.