Application Note

NOVOSENSE

Resistive Pressure Sensor NSA2860X Application Note

AN-12-0034

Author: Weijie Zhou

AN-12-0034

NOVOSENSE

Resistive Pressure Sensor NSA2860X Application Note

ABSTRACT

NSA2860X is highly integrated ASIC for resistive or voltage sensors such as resistive pressure sensors, thermocouples, RTD. Due to NSA2860X's high integration and variety of applications, this paper will introduce its hardware peripheral circuits in detail, so that users can have a targeted understanding of various typical applications.

INDEX

1.The Internal Main Module of NSA2860X

The Internal main module of NSA2860X is shown in Figure1.1.

1、External JFET or Transistor to achieve high voltage power supply

2、Provides a sensor with constant voltage and constant current driving modes.

(1) Constant voltage source: 2.45V, 3.6V two gears can be configured, temperature drift is less than 10ppm/℃.

(2) Constant current source: dual constant current source(IEXC1 and IEXC2), IEXC1 constant current source can achieve 0 to 750uA configuration. IEXC2 constant current source can achieve 0 to 700uA configuration

3、Provides a variety of output methods:

(1) Analog output: 0~1.2V,0~5V, 0~10V, 4~20mA

(2) Digital output: SPI, I2C (only supported by QFN20 package)

(3) Others: PDM, PWM

4、Proprietary OWI communication mode enables direct calibration of a three-wire sensor and a dual-line 4~20mA transmitter.

5、Supports multiple temperature measurement methods

(1) Supports built-in temperature sensor

(2) external temperature sensor, the external temperature sensor supports bridge temperature measurement, external diode, external thermistor and other methods.

6、Dual 24-bit high-precision ADC for main channel and temperature channel measurements.

7、16bit DAC output.

8、High precision 1~256X programmable instrumentation amplifier

9、1~ 8X ADC gain, and the rear stage 0~2X high precision adjustable sensitivity compensation.

10、Support IIC and SPI interface.

11、64 bytes EEPROM

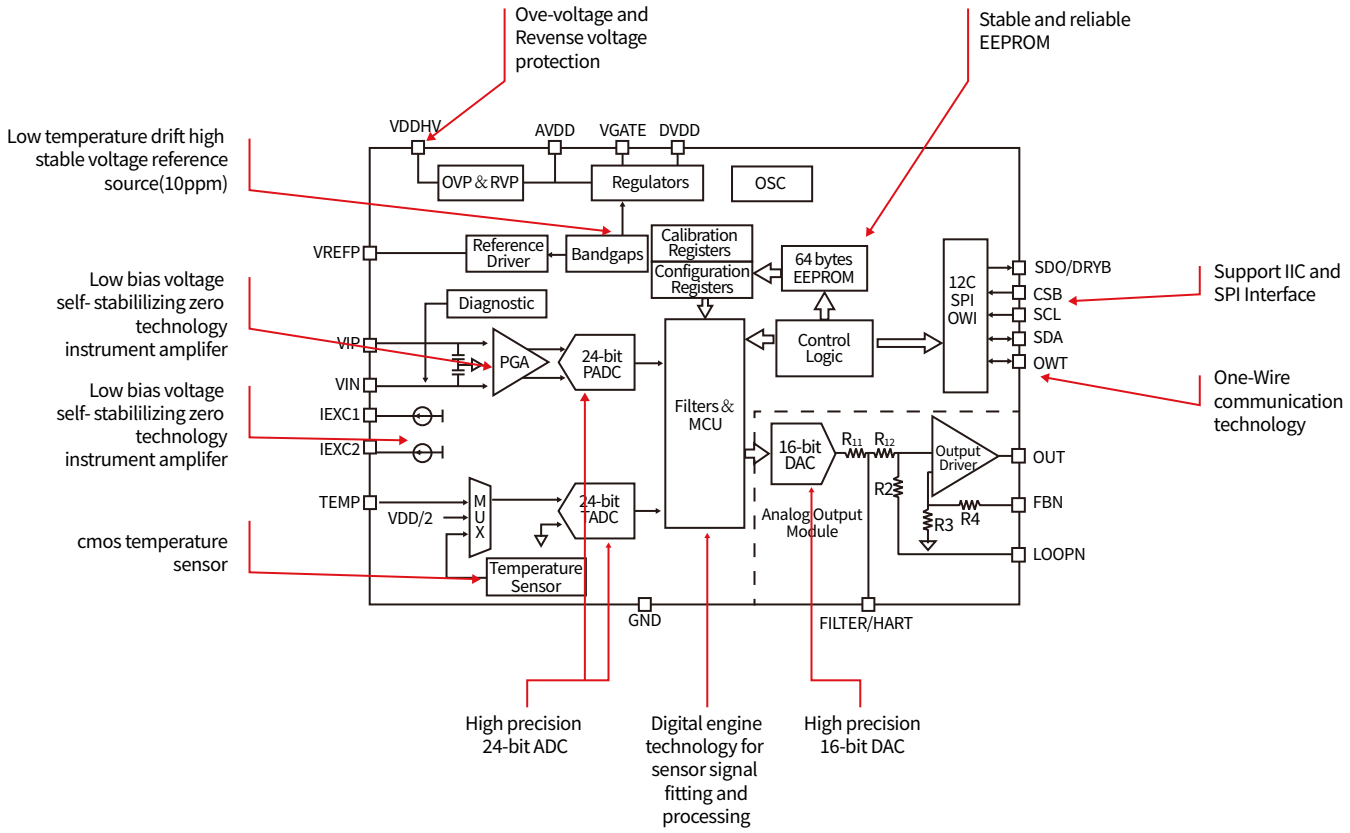

Figure 1.1 The Internal Main Module of NSA2860X

2.Function Modules

2.1.Power Supply Module

The NSA2860X integrates an external JFET controller that controls JFET or Transistor via VGATE pins to generate 5V or 3.3V low-voltage power directly from the high-voltage power supply to drive the NSA2860X or other peripherals. Figure 2.1, Figure 2 .2and Figure 2.3 respectively show VDD direct power supply, JEFT and Transistor high voltage power supply respectively, and provide device selection. The three schemes are compared as follows:

Table 2. 1 The Comparison of Power Supply Schemes

Design Scheme	Range Of Supply	Output Voltage	Advantage	Refer
Direct Supply	3V~5.5V	3V~5.5V		Refer to Figure2.1
JFET	5.5V~36V	5V/3.3V	Wider supply range	Refer to Figure2.2
Bipolar	8V~36V	5V/3.3V	Low cost	Refer to Figure2.3

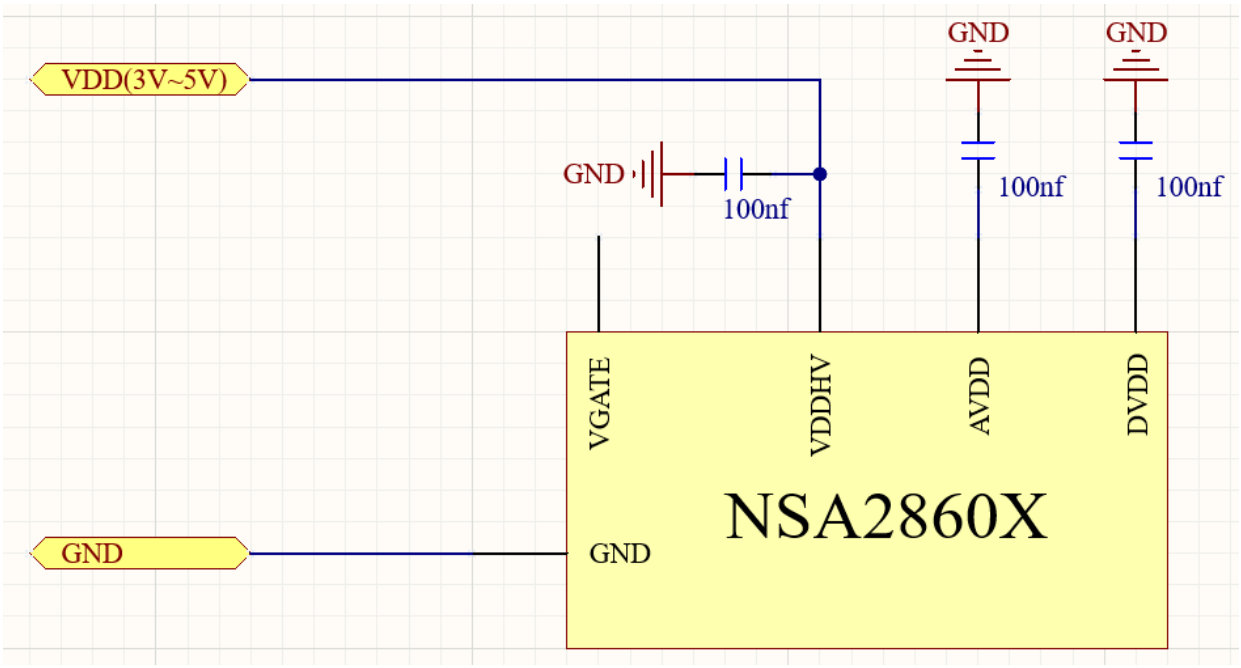

Figure 2. 1 Direct Power Supply Circuit

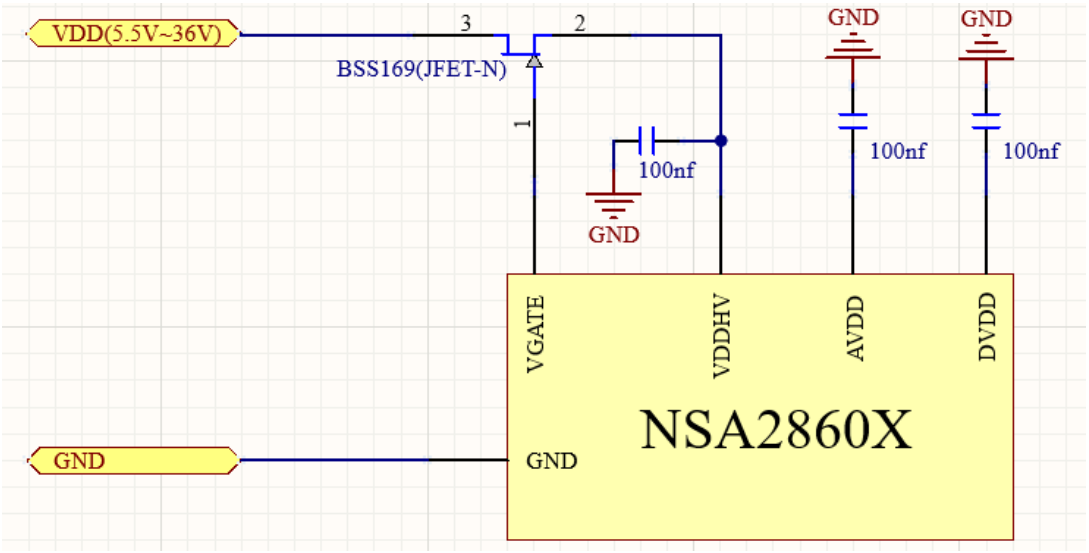

Figure 2. 2 High Voltage JFET Power Supply Circuit

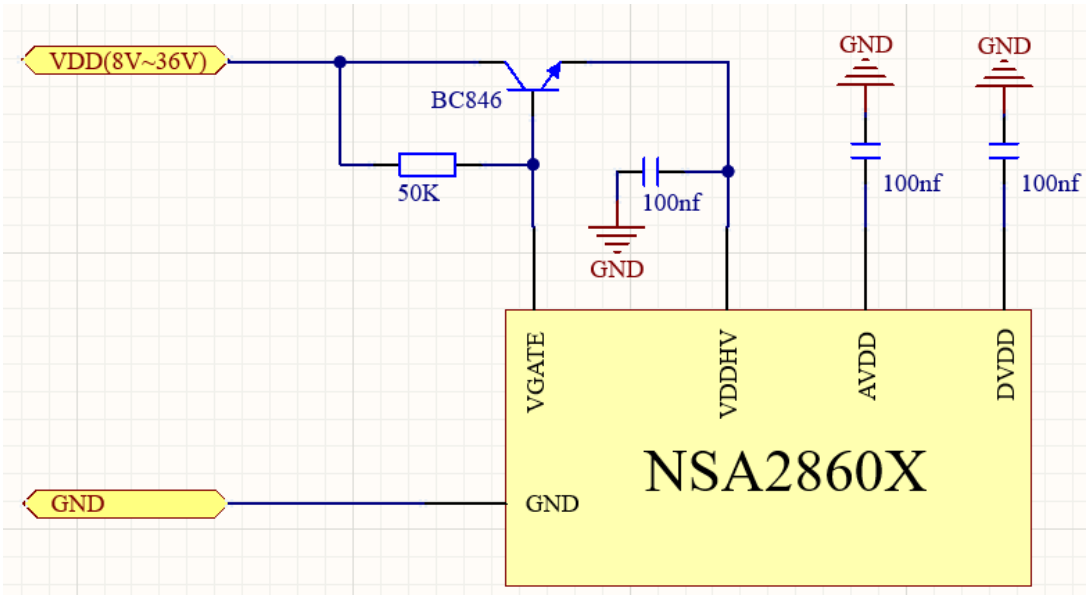

Figure 2. 3 High Voltage Transistor Power Supply Circuit

2.2.Sensor Supply Mode

NSA2860X provides three excitation modes: internal constant voltage source, internal resistance mode constant current source and external resistance mode constant current source.

As shown in figure 2.4, the power supply mode for the sensor is constant voltage source. If the sensor is powered by a constant voltage source, either internal or external, the VREFP pin needs to be connected to the power supply end of the bridge. VREFP pins can be used to provide bridge voltage or as reference source input.

If the sensor is powered by a constant current source, a maximum of two constant current source outputs can be used. Figure 2.5 is a typical application of an internal resistance mode constant current source. When the external resistance mode constant current source is used, only one constant current source output can be used. External resistance modes reduce the temperature coefficient of the constant current source by using an external reference resistor with a smaller temperature drift.

Figure2.6 is a typical application of an external resistance mode constant current source.

For the calculation of external constant current source configuration refer to the constant current source configuration tool in the single calibration software.

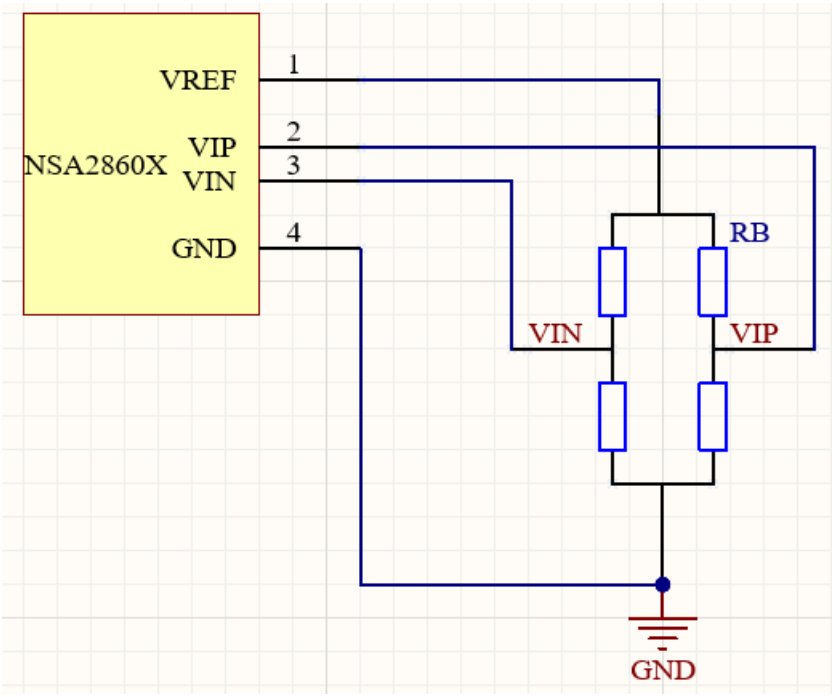

Figure 2. 4 Constant Voltage Source Excitation

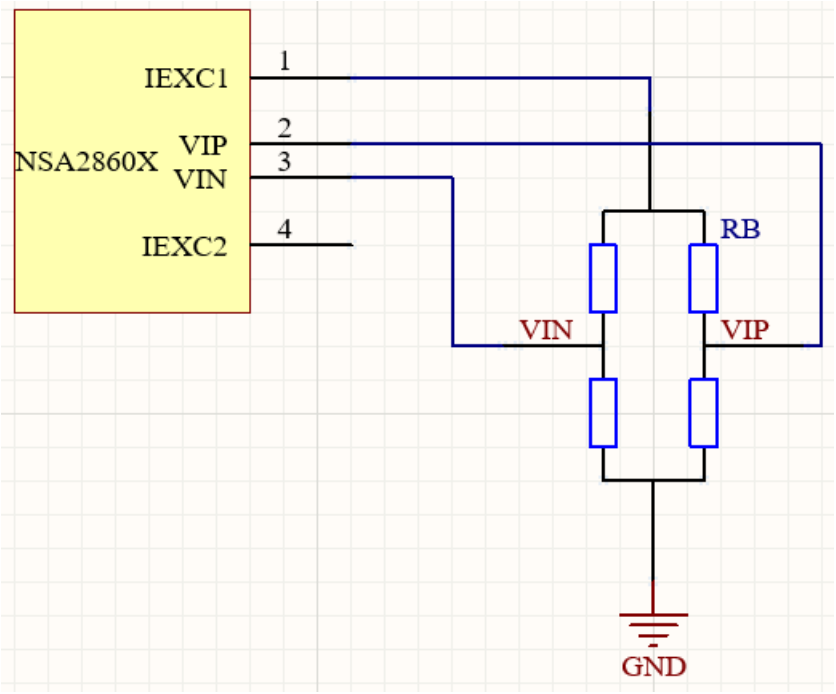

Figure 2. 5 Internal Resistance Mode Constant Current Source Excitation

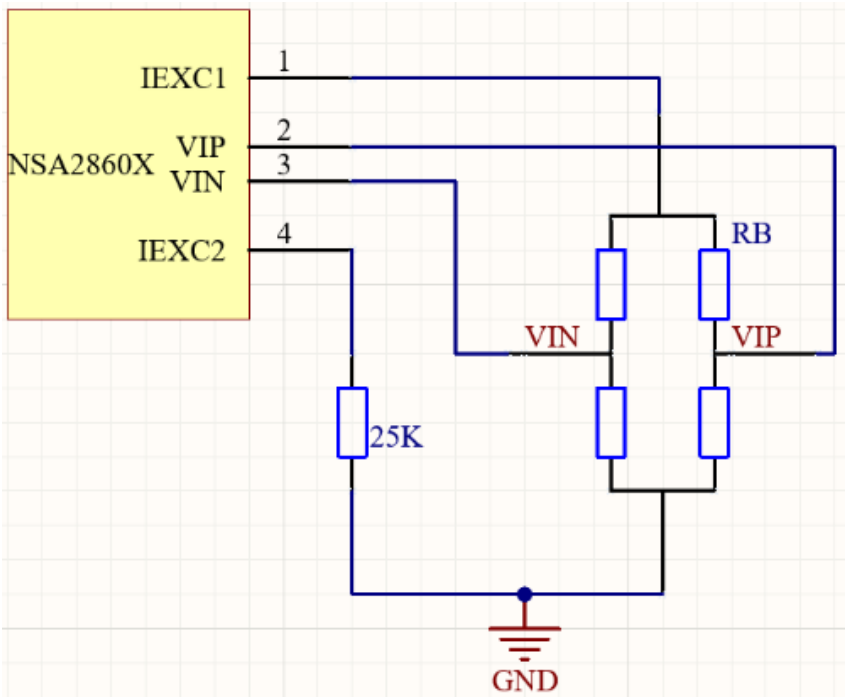

Figure 2. 6 External Resistance Mode Constant Current Source Excitation

2.3.Temperature Senor

The NSA2860X offers a built-in temperature sensor and a variety of external temperature sensor modes. Table 2.2 shows a comparison of internal and external temperature measurements.

Table 2. 2 The Comparison of Temperature Sensors

Temperature Measurement	Advantage	Disadvantage
Internal Temp	No extra peripherals required	NSA2860X and pressure sensors have temperature differences and temperature hysteresis
External Temp	Real-time reaction of pressure sensor temperature change	A small number of peripherals are required

The following mainly describes the external temperature sensor hardware application circuit:

External temperature sensors come in many forms, including the use of thermal resistors, diodes, and the sensor bridge itself. Thermal resistance is more accurate, but more expensive.

Figure 2.7 is a constant voltage source power supply. The bridge itself is used as a temperature sensor, and a low temperature drift resistance is connected in series. The resistance value is about 1/4 to 1/5 of the minimum value of the bridge resistance (for each temperature and each batch). The advantage is the most direct reaction to the temperature change of the sensor, but the sensor bridge resistance needs to have a certain temperature characteristic, greater than 1800ppm/℃. If the temperature drift is too small, the calibration of the temperature sensor will fail.

Figure 2.8 shows the diode temperature detection circuit. The advantage is that the diode is close to the sensor, which can reflect the temperature change of the sensor in real time. A triode can also be used instead of a diode, using the Vbe of the triode to detect temperature.

Figure 2.9 shows constant current source power supply, using the bridge itself as a temperature sensor. The advantage is that the most direct reaction of the sensor temperature change, but the sensor bridge resistance has a certain temperature characteristic.

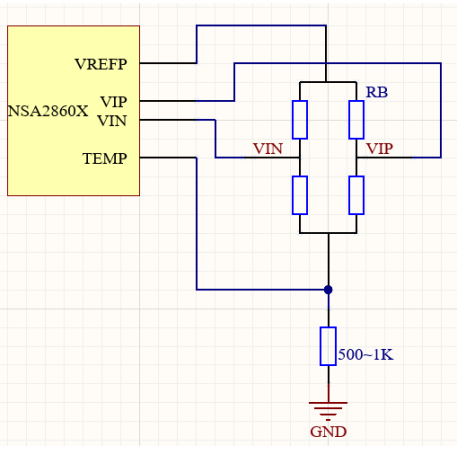

Figure 2. 7 The Bridge Itself Acts as an External Temperature Sensor

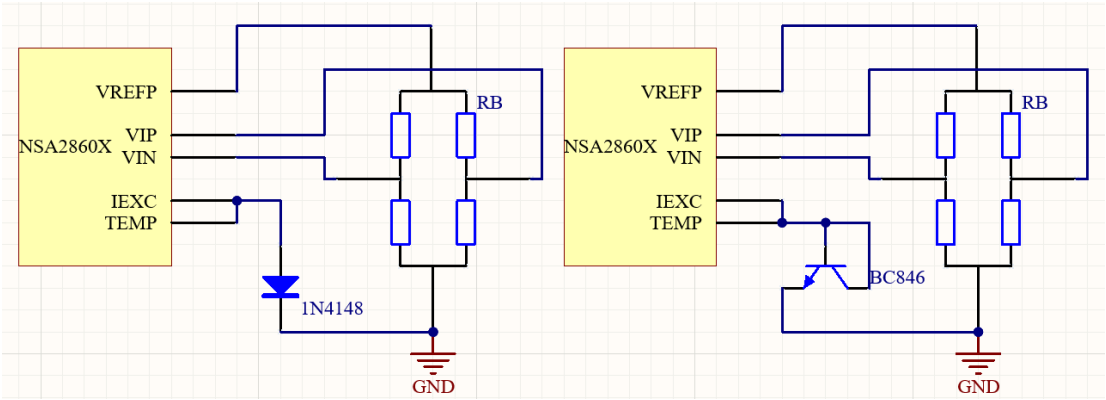

Figure 2. 8 Diode or Triode as External Temperature Sensor

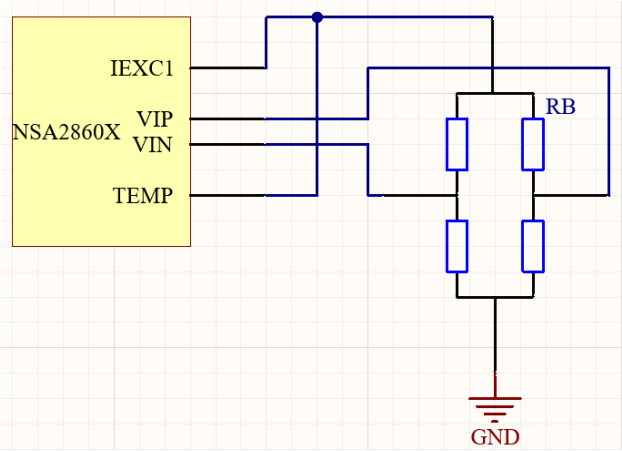

Figure 2. 9 Constant Current Source Power Supply for Sensor, Using Bridge Itself as Temperature Sensor

2.4.Output Mode

NSA2860X can flexibly support absolute voltage (0~5V, 0~3.3V, 0~1.2V), proportional voltage output (0~AVDD), 0~10V output, PDM output, PWM output, 4-20mA current output and other analog output modes. PDM and PWM output directly from the VOUT pin, without the need for peripheral circuit, the following mainly introduces the remaining several analog output mode typical hardware application circuits.

2.4.1. 4-20mA Current Output

Figure 2.10 shows the 4-20mA current output mode. The OUT pin outputs the voltage signal and adjusts the loop current through the peripheral voltage-to-current circuit. The 50ohm high precision resistor in the figure is used as the current detection feedback, so it must be a low temperature drift resistor. This 50ohm resistor directly affects the performance of the 4-20mA circuit output. The ground capacitor on the FILTER pin filters the analog signal output by the DAC, which can reduce the output noise but reduce the signal bandwidth.

The 4-20mA communication control is achieved by modulating the power supply signal, and the coupling capacitance of 22nF couplings the modulation signal from the power supply to the OWI pin of the chip. OWI signal return is by controlling OUT pin voltage, modulating current, and output digital signal.

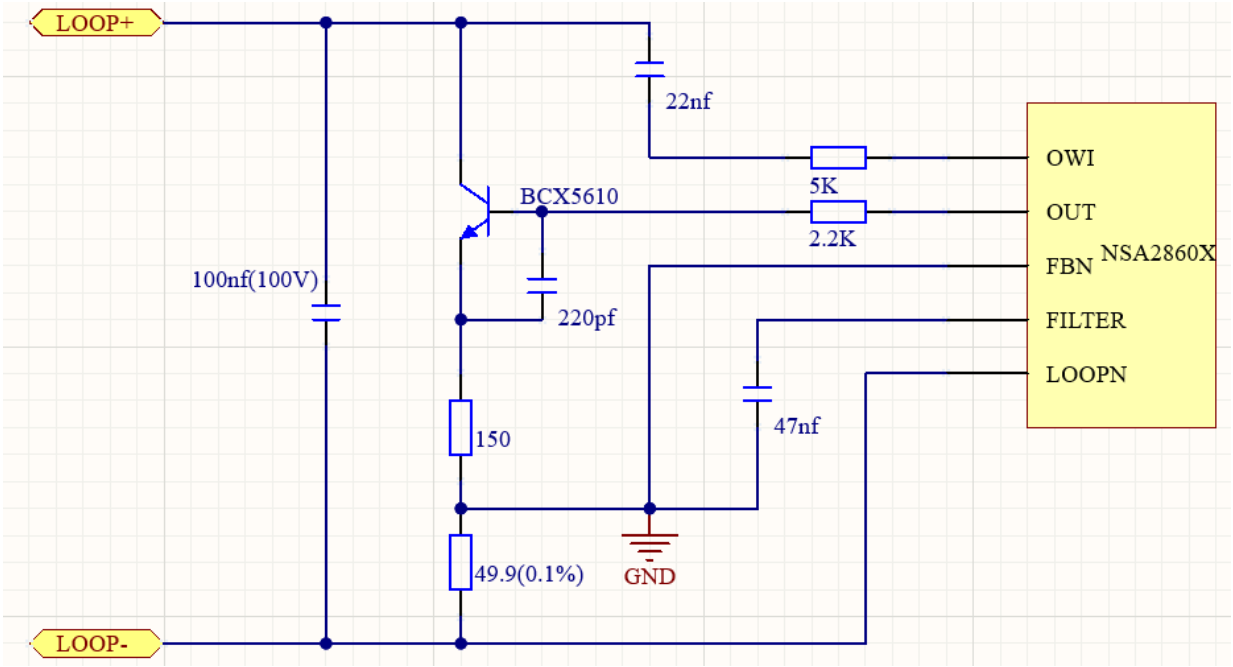

Figure 2. 10 4-20mA Current Output

2.4.2. 0-10V Voltage Output

Figure 2.11 shows the voltage output mode of 0~10V. The signal of 0~5V output by the chip OUT pin is amplified and output 0~10V through the back-end circuit. The ground capacitor on the FILTER pin filters the analog signal output by the DAC, which can reduce the output noise but reduce the signal bandwidth. The 0~10V communication control is similar to the 4~20mA communication control, which is achieved by modulating the power supply signal. The coupling capacitance of 22nF couplings the modulation signal on the power supply to the OWI pin of the chip. OWI signal return is by controlling OUT pin voltage, modulating the power supply current, output digital signal.

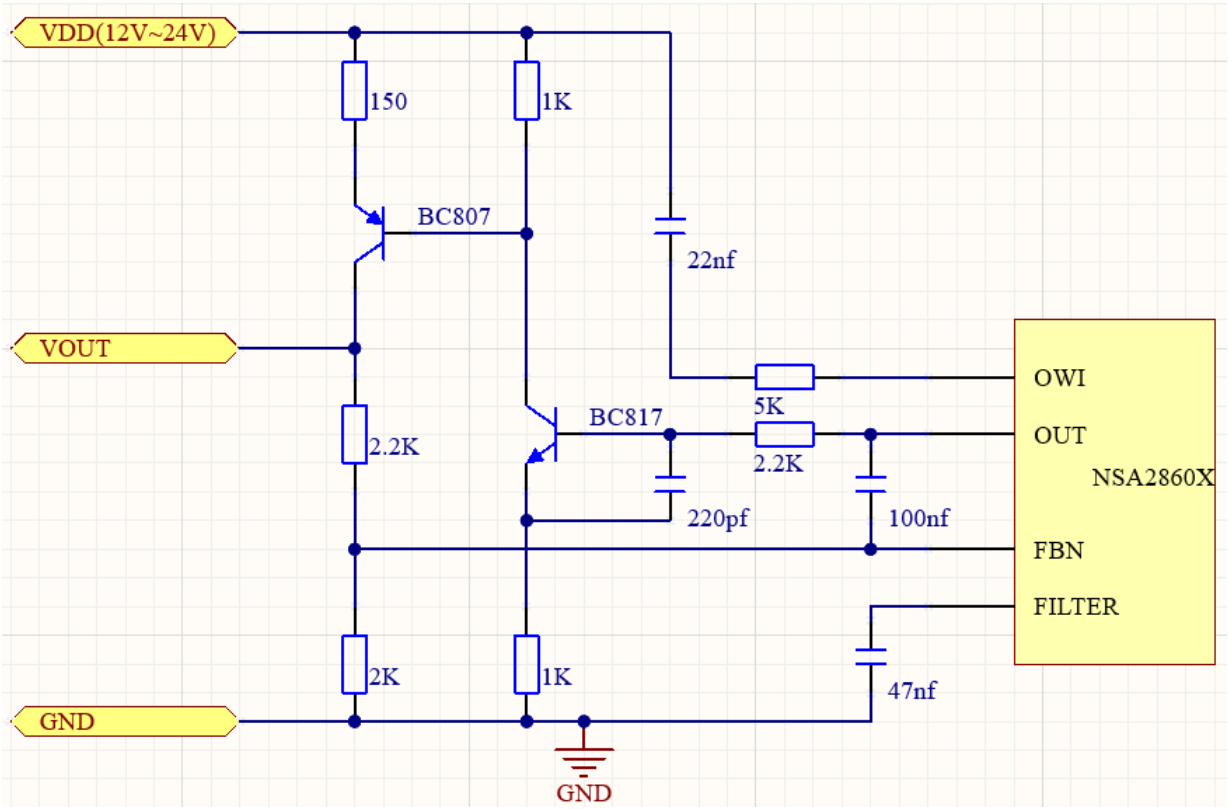

Figure 2. 11 0-10V Voltage Output

Figure 2.12 shows the 0-10V voltage output mode of an operational amplifier. The 0-5V signal output by the chip OUT pin is amplified and output 0-10V through the back-end operational amplifier circuit. The ground capacitor on the FILTER pin filters the analog signal output by the DAC to improve the output performance and reduce the signal bandwidth. The 0~10V communication control is similar to the 4~20mA communication control, which is achieved by modulating the power supply signal. The coupling capacitance of 22nF couplings the modulation signal on the power supply to the OWI pin of the chip. OWI signal return is by controlling OUT pin voltage, modulating the power supply current, output digital signal.

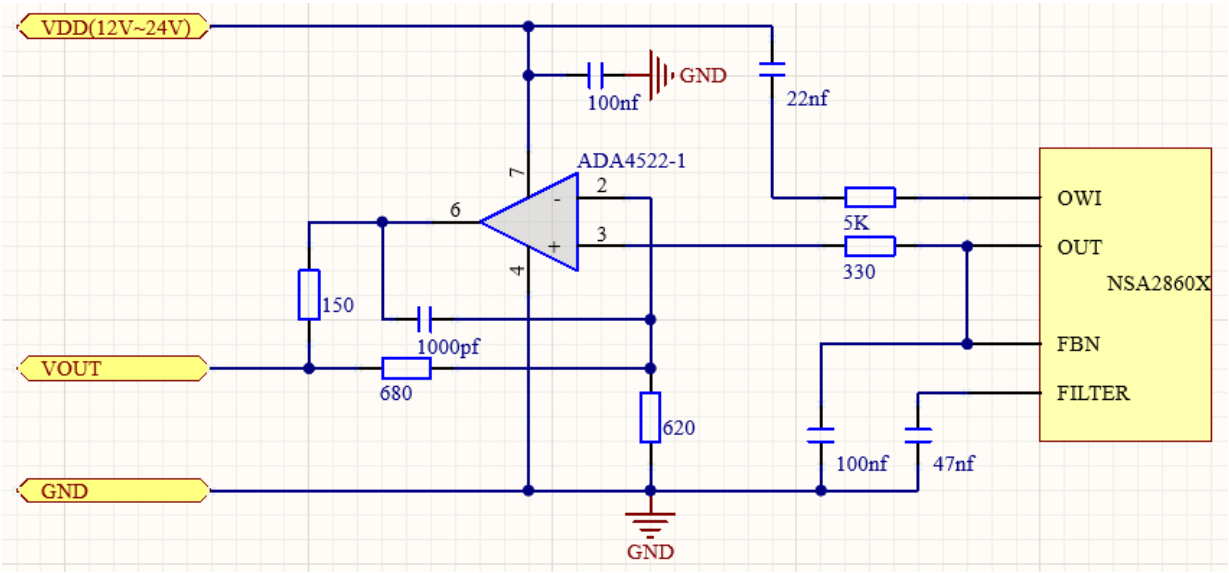

Figure 2. 12 Operating Amplifier 0-10V Voltage Output

2.4.3. 0~5V Voltage Output

Figure 2.13 is the hardware circuit diagram of 0~5V voltage output mode, which is compatible with absolute voltage (0~3.3V, 0~1.2V) output and proportional voltage output (0~AVDD) mode. Three-wire mode can realize communication control and analog output. The 100ohm and 1kohm resistors in the figure protect the pins from high voltage. The 100nF capacitor between VOUT and GND improves the noise resistance of the system and makes the output more stable.

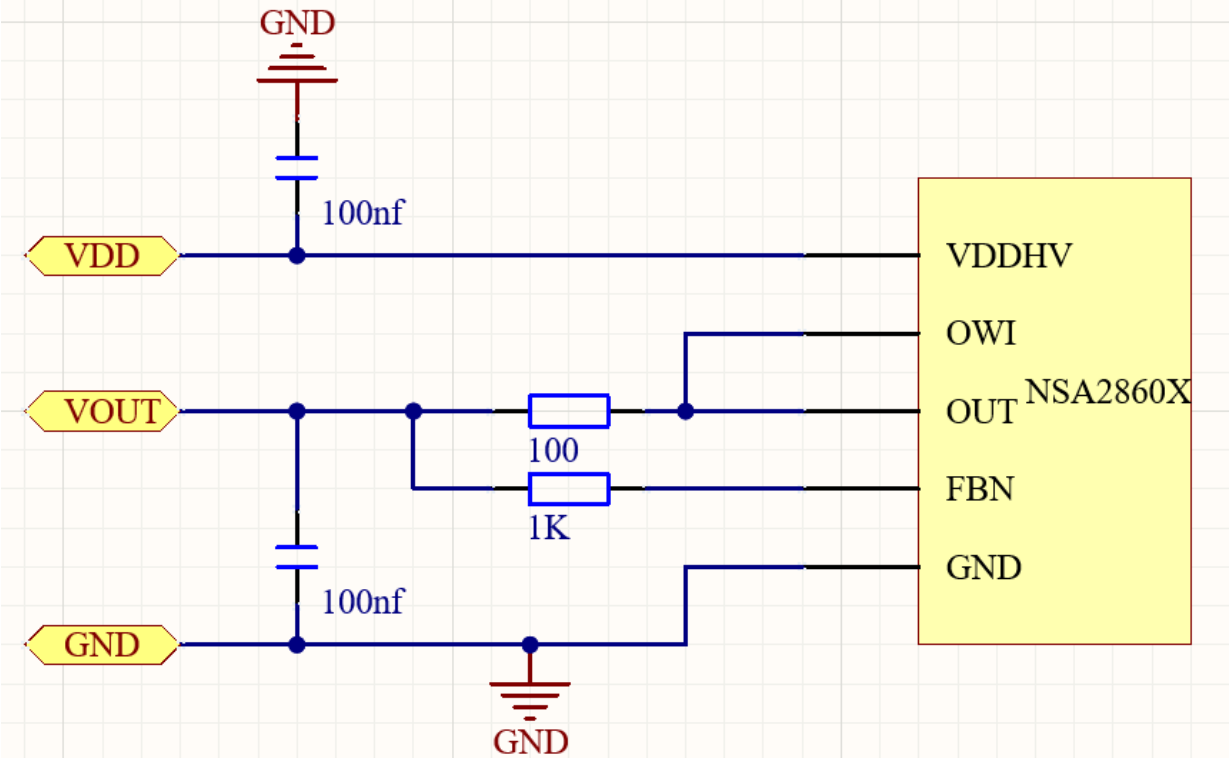

Figure 2. 13 0-5V Voltage Output

2.5.EMC Circuit Schematic

Figure 2.14 shows the complete 4-20mA typical application circuit, including the EMC protection circuit. EMC grade achieved by this circuit:

Table 2. 3 EMC Test Grades

Test Item	Standards	Level
ESD	IEC61000-4-2	±8kV contact; ±15kV air
EFT	IEC61000-4-4	±1kV Class A
Surge	IEC61000-4-5	1kV

Take the circuit in Figure 2.14 as an example to introduce the EMC protection circuit.

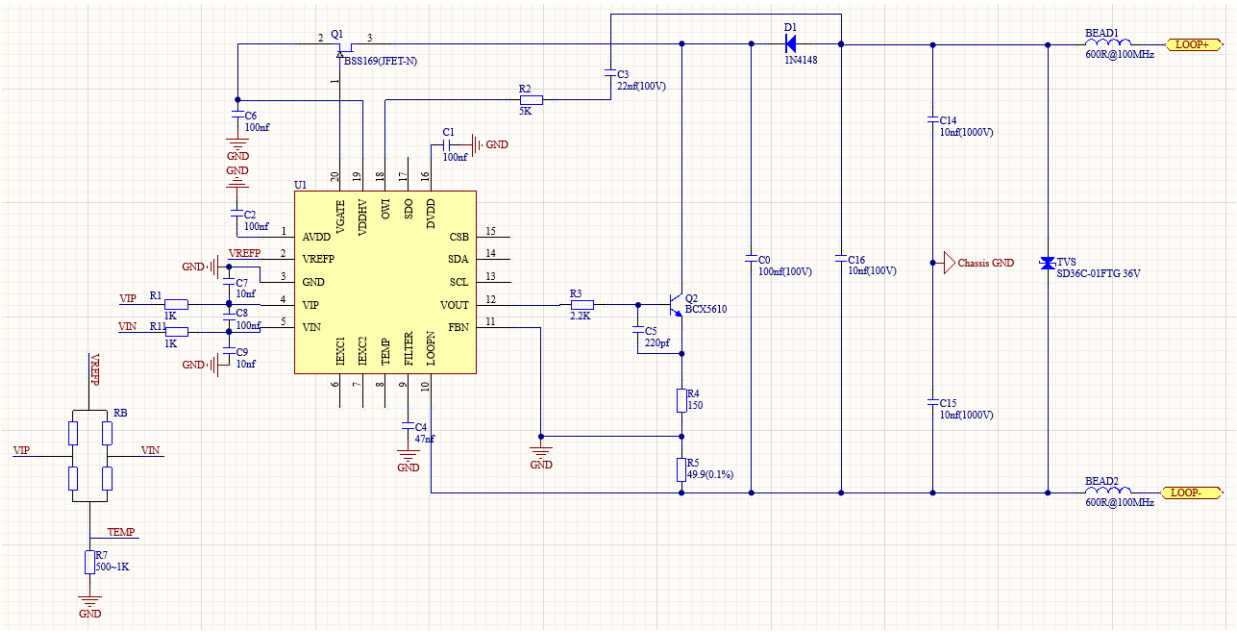

Figure 2. 14 EMC Protection Circuit

2.5.1. Power Protection

In Figure 2.14, D1 is an anti-reverse diode. The recommended model 1N4148 is required to withstand 100V reverse voltage and over 50mA forward current.
Bidirectional transient voltage suppression TVS SD36C and ceramic capacitor C16 protect ESD signals and other transient pulses from overvoltage. If the EMC environment is harsh, higher power TVS can be used.
The two magnetic beads (BEAD1 and BEAD2) on the power supply loop can inhibit the high-frequency signals coupled to the input and output lines to a certain extent. If the application environment has a relatively clear interference in a frequency band, the magnetic beads with high impedance in this band can be consciously selected. This circuit is two-wire communication, if it is three-wire communication (such as 0~10V), all the input and output lines need to be connected with a magnetic bead.

2.5.2.Input Filtering

C7, C8, C9, R1, R11 constitute a chip to simulate the front-end input filtering and improve the anti-RF interference ability of the system input. The filter should be placed close to the chip as far as possible. If the bridge is connected close to the chip input, R1 and R11 can also be removed, and the bridge resistance and C7, C8 and C9 constitute the front-end filter.
C14 and C15 are the capacitors of two connected shells, used to suppress external noise interference, which usually requires a certain high voltage isolation ability. This circuit chooses the capacitor of 10nF with a resistance of 1KV, and the package is 1206.

3.Typical Application Circuit

3.1.Typical Application of 4-20mA

3.1.1. JFET high voltage power supply, constant voltage source power supply of sensor, using bridge resistance as external temperature sensor

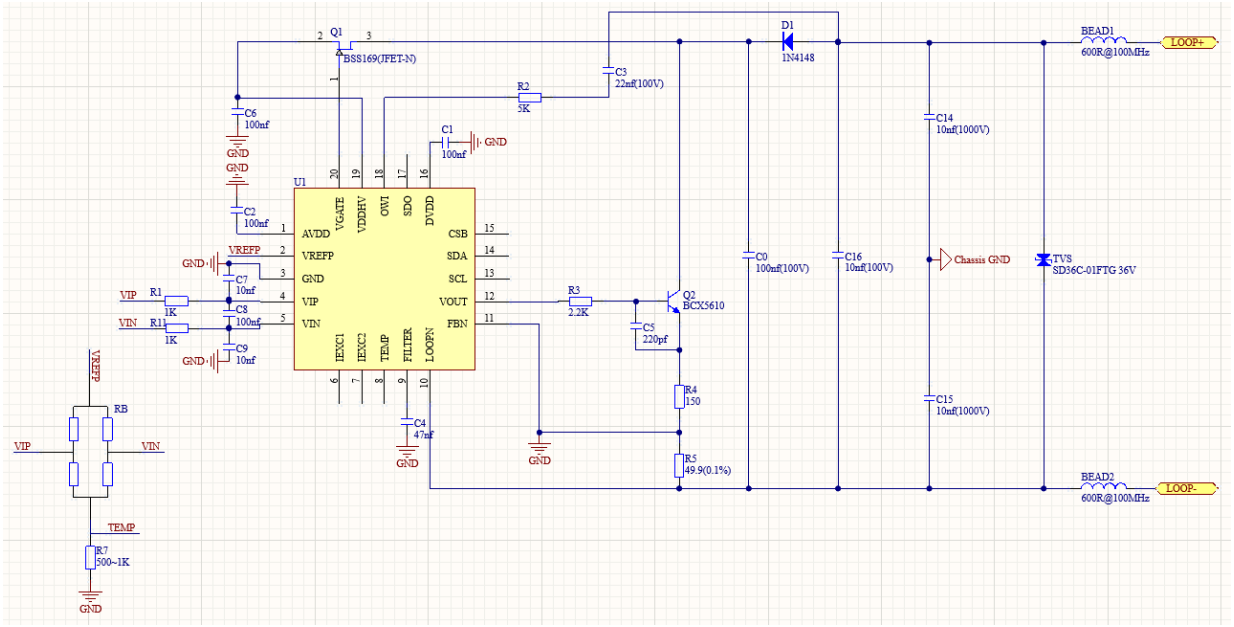

Figure 3. 1 4-20mA Typical Application-1

Table 3.1 4-20mA Typical Application-1 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	600ohm(100MHz)
BEAD2	Inductor	0603	600ohm(100MHz)
C0	Cap	0603	100nf(100V)
C1	Cap	0603	100nf
C2	Cap	0603	100nf
C3	Cap	0603	22nF(100V)
C4	Cap	0603	47nf
C5	Cap	0603	220pf
C6	Cap	0603	100nf
C7	Cap	0603	10nf
C8	Cap	0603	100pf
C9	Cap	0603	10nf
C14	Cap	1206	10nf(1000V)
C15	Cap	1206	10nf(1000V)
C16	Cap	0603	10nf(100V)
D1	1N4148	SOD323	
Q1	BSS169N(JFET-N)	SOT23	
Q2	BCX5610	SOT89	
R1	Res	0603	1K
R2	Res	0603	5K
R3	Res	0603	2.2K
R4	Res	0603	150
R5	Res	0603	49.9(0.1%)
R7	Res	0603	500~1K
R11	Res	0603	1K
RB	Resistor Bridge		
TVS	SD36C-01FTG	SOD323	36V
U1	NSA2860X	NSA2860X_QFN20	

3.1.2.Bipolar high voltage power supply, sensor constant voltage source power supply, use triode as external temperature sensor

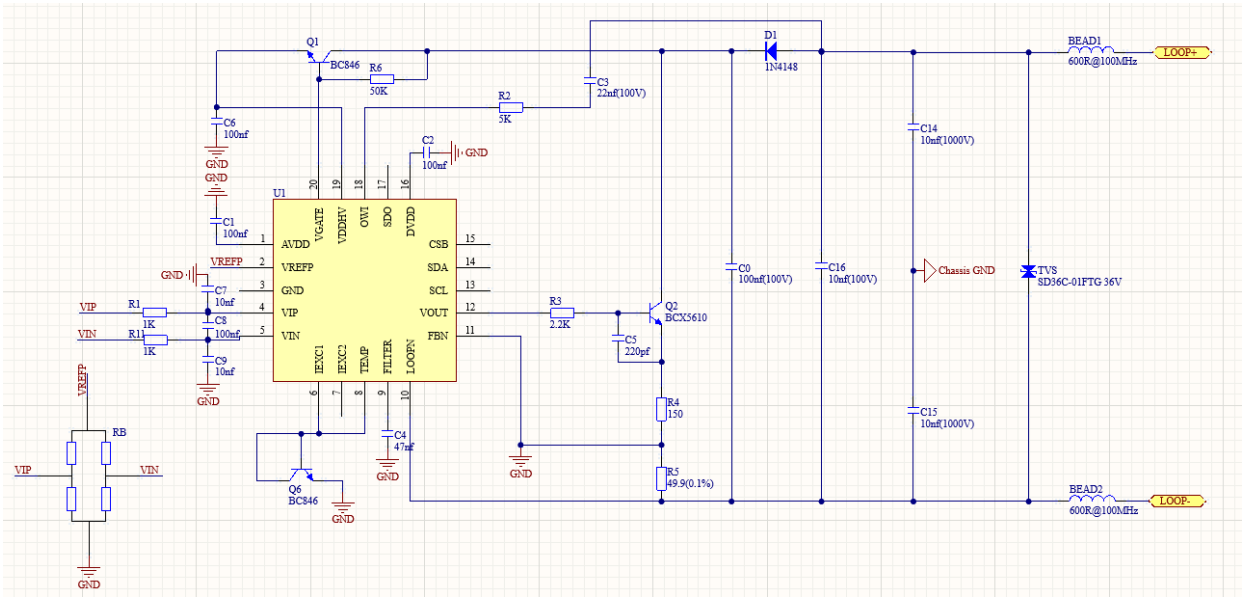

Figure 3.2 4-20mA Typical Application-2

Table 3.2 4-20mA Typical Application-2 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	600ohm(100MHz)
BEAD2	Inductor	0603	600ohm(100MHz)
C0	Cap	0603	100nf(100V)
C1	Cap	0603	100nf
C2	Cap	0603	100nf
C3	Cap	0603	22nF(100V)
C4	Cap	0603	47nf
C5	Cap	0603	220pf
C6	Cap	0603	100nf
C7	Cap	0603	10nf
C8	Cap	0603	100pf
C9	Cap	0603	10nf
C14	Cap	1206	10nf(1000V)
C15	Cap	1206	10nf(1000V)
C16	Cap	0603	10nf(100V)
D1	1N4148	SOD323	
Q1	BC846	SOT23	
Q2	BCX5610	SOT89	
Q6	BC846	SOT23	
R1	Res	0603	1K
R2	Res	0603	5K
R3	Res	0603	2.2K
R4	Res	0603	150
R5	Res	0603	49.9(0.1%)
R6	Res	0603	50K
R11	Res	0603	1K
RB	Resistor Bridge		
TVS	SD36C-01FTG	SOD323	36V
U1	NSA2860X	NSA2860X_QFN20	

3.1.3.JEFT high-voltage power supply, constant current source power supply of the sensor, bridge resistance as the external temperature sensor

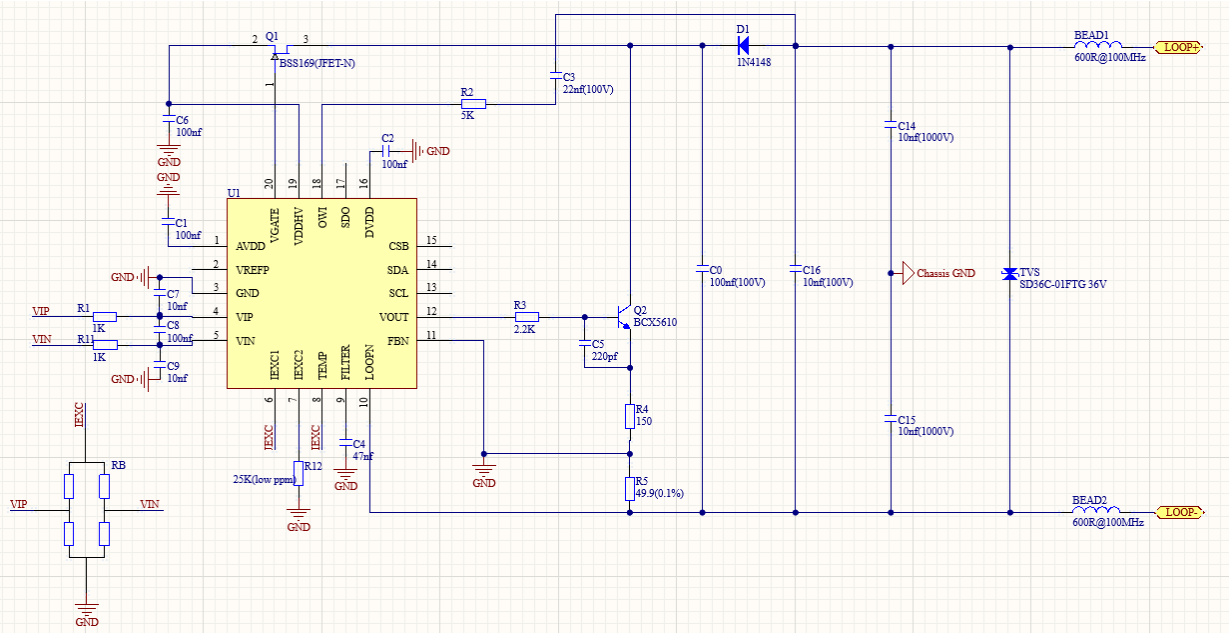

Figure 3.3 4-20mA Typical Application-3

Table 3.3 4-20mA Typical Application-3 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	600ohm(100MHz)
BEAD2	Inductor	0603	600ohm(100MHz)
C0	Cap	0603	100nf(100V)
C1	Cap	0603	100nf
C2	Cap	0603	100nf
C3	Cap	0603	22nF(100V)
C4	Cap	0603	47nf
C5	Cap	0603	220pf
C6	Cap	0603	10nf
C7	Cap	0603	10nf
C8	Cap	0603	100pf
C9	Cap	0603	10nf
C14	Cap	1206	10nf(1000V)
C15	Cap	1206	10nf(1000V)
C16	Cap	0603	10nf(100V)
D1	1N4148	SOD323	
Q1	BSS169N(JFET-N)	SOT23	
Q2	BCX5610	SOT89	
R1	Res	0603	1K
R2	Res	0603	5K
R3	Res	0603	2.2K
R4	Res	0603	150
R5	Res	0603	49.9(0.1%)
R11	Res	0603	1K
R12	Res	0603	25K(low ppm)
RB	Resistor Bridge		
TVS	SD36C-01FTG	SOD323	36V
U1	NSA2860X	NSA2860X_QFN20	

3.1.4.Three-wire 4-20mA circuit, JEFT high-voltage power supply, constant voltage source power supply of sensor, using triode as external temperature sensor

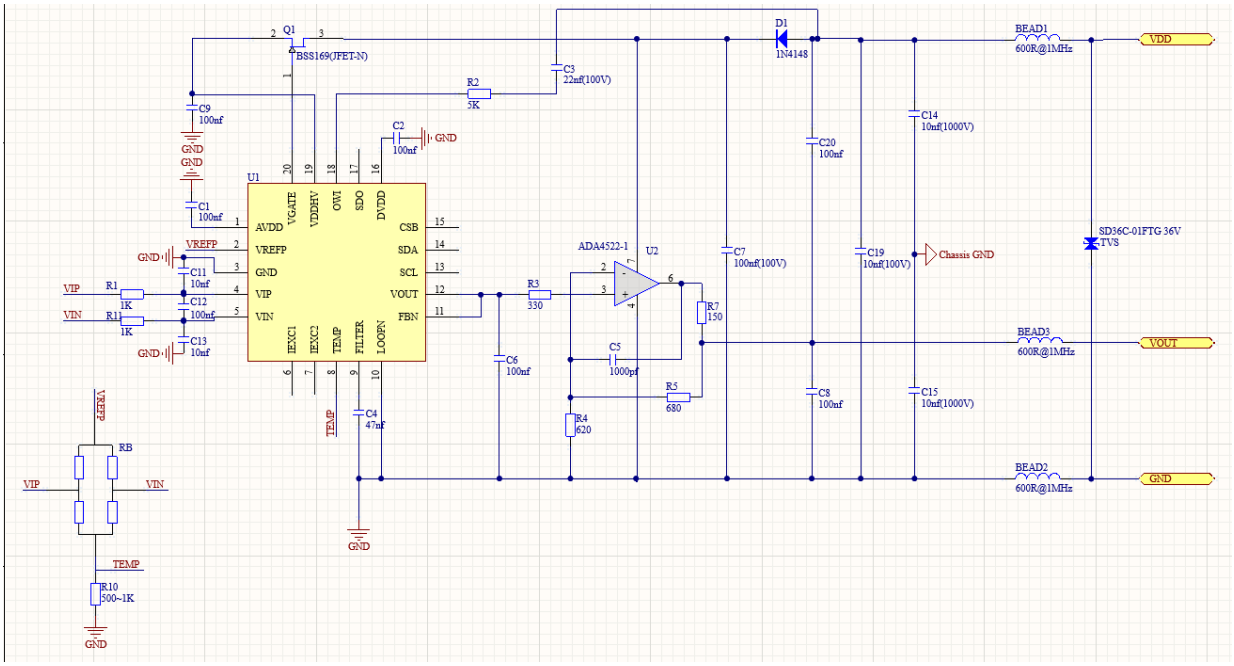

Figure 3.4 4-20mA Typical Application-4

Table 3.4 4-20mA Typical Application-4 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	600ohm(100MHz)
BEAD2	Inductor	0603	600ohm(100MHz)
BEAD3	Inductor	0603	600ohm(100MHz)
C1	Cap	0603	100nf
C2	Cap	0603	100nf
C3	Cap	0603	22nF(100V)
C4	Cap	0603	47nf
C5	Cap	0603	220pf
C6	Cap	0603	10nf
C7	Cap	0603	10nf
C8	Cap	0603	100pf
C9	Cap	0603	10nf
C10	Cap	0603	220pf
C14	Cap	1206	10nf(1000V)
C15	Cap	1206	10nf(1000V)
C16	Cap	0603	10nf(100V)
C17	Cap	0603	100nF
C18	Cap	0603	0.1uF
C21	Cap	0603	100nf
D1	1N4148	SOD323	
Q1	BSS169N(JFET-N)	SOT23	
Q2	BCX5610	SOT89	
Q3	BC846	SOT23	

Designator	Comment	Footprint	Value
R1	Res	0603	1K
R2	Res	0603	5K
R3	Res	0603	250K
R4	Res	0603	250K
R5	Res	0603	50K
R11	Res	0603	1K
R13	Res	0603	2.2K
R14	Res	0603	150
R15	Res	0603	50(0.1%)
R16	Res	0603	50K
RB	Resistor Bridge		
TVS	SD36C-01FTG	SOD323	36V
U1	NSA2860X	NSA2860X_QFN20	
U2	ADA4638-1	SOIC8	

3.2.0-10V Typical Application

3.2.1.JEFT high-voltage power supply, constant voltage source power supply of sensor, bridge resistance as external temperature sensor

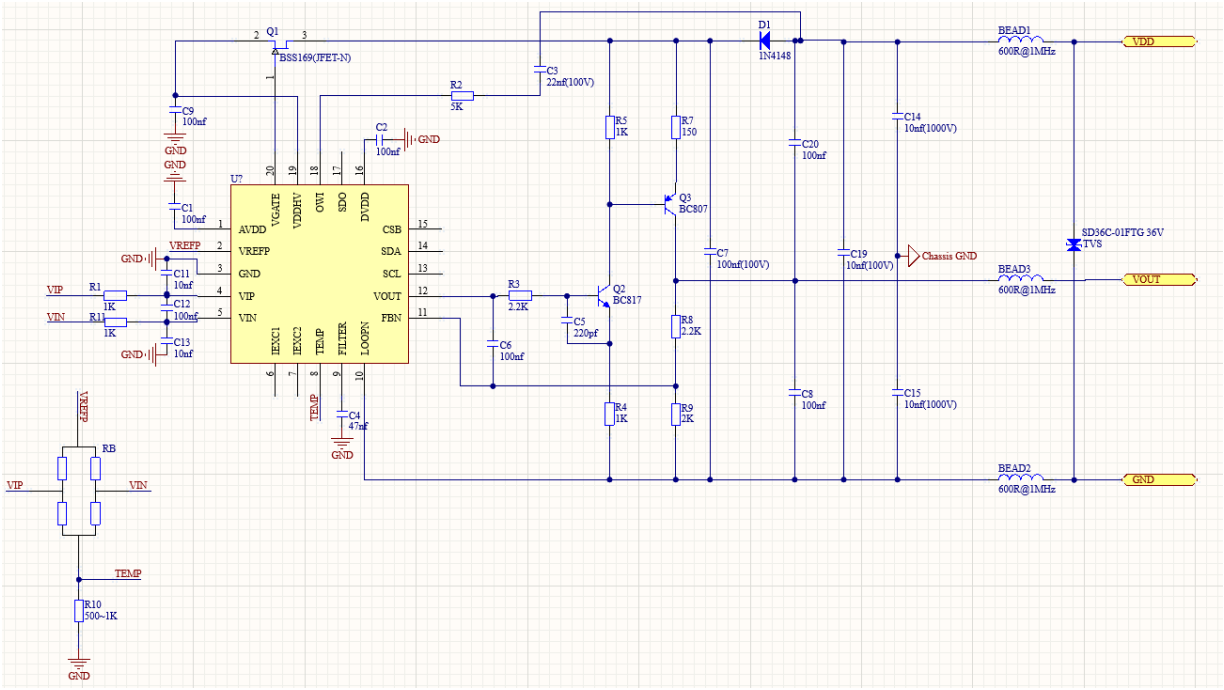

Figure 3.5 0-10V Typical Application-1

Table 3.5 0-10V Typical Application-1 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	600ohm(100MHz)
BEAD2	Inductor	0603	600ohm(100MHz)
BEAD3	Inductor	0603	600ohm(100MHz)
C1	Cap	0603	100nf
C2	Cap	0603	100nf
C3	Cap	0603	22nF(100V)
C4	Cap	0603	47nf
C5	Cap	0603	220pf
C6	Cap	0603	100nf
C7	Cap	0603	10nf(100V)
C8	Cap	0603	100pf
C9	Cap	0603	100nf
C11	Cap	0603	10nf
C12	Cap	0603	100nf
C13	Cap	0603	10nf
C14	Cap	1206	10nf(1000V)
C15	Cap	1206	10nf(1000V)
C19	Cap	0603	10nf(100V)
C20	Cap	0603	100nf
D1	1N4148	SOD323	
Q1	BSS169N(JFET-N)	SOT23	
Q2	BC817	SOT23	
Q3	BC807	SOT23	

Designator	Comment	Footprint	Value
R1	Res	0603	1K
R2	Res	0603	5K
R3	Res	0603	2.2K
R4	Res	0603	1K
R5	Res	0603	1K
R7	Res	0603	150
R8	Res	0603	2.2K
R9	Res	0603	2K
R10	Res	0603	500~1K
R11	Res	0603	1K
RB	Resistor Bridge		
TVS	SD36C-01FTG	SOD323	36V
U1	NSA2860X	NSA2860X_QFN20	

3.2.2.JEFT high voltage power supply, constant voltage source power supply of sensor, using triode as external temperature sensor

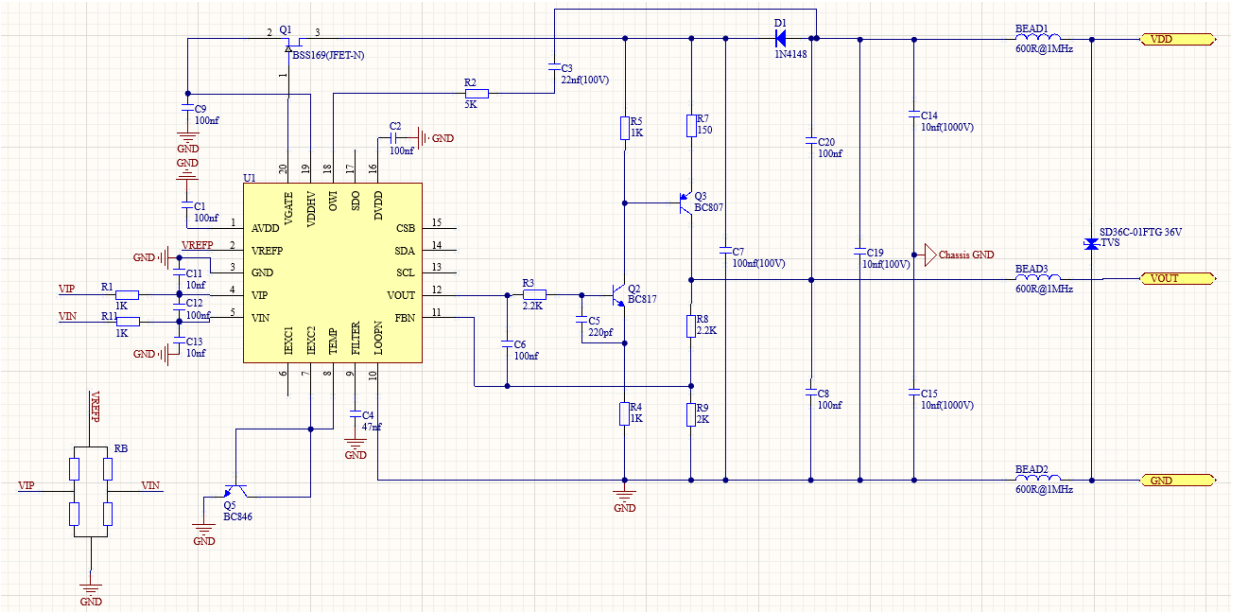

Figure 3.6 0-10V Typical Application-2

Table 3.6 0-10V Typical Application-2 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	600ohm(1MHz)
BEAD2	Inductor	0603	600ohm(1MHz)
BEAD3	Inductor	0603	600ohm(1MHz)
C1	Cap	0603	100nf
C2	Cap	0603	100nf
C3	Cap	0603	22nF(100V)
C4	Cap	0603	47nf
C5	Cap	0603	220pf
C6	Cap	0603	100nf
C7	Cap	0603	100nf(100V)
C8	Cap	0603	100nf
C9	Cap	0603	100nf
C11	Cap	0603	10nf
C12	Cap	0603	100nf
C13	Cap	0603	10nf
C14	Cap	1206	10nf(1000V)
C15	Cap	1206	10nf(1000V)
C19	Cap	0603	10nf(100V)
C20	Cap	0603	100nf
D1	1N4148	SOD323	
Q1	BSS169N(JFET-N)	SOD23	
Q2	BC817	SOD23	
Q3	BC807	SOD23	
Q5	BC846	SOD23	

Designator	Comment	Footprint	Value
R1	Res	0603	1K
R2	Res	0603	5K
R3	Res	0603	2.2K
R4	Res	0603	1K
R5	Res	0603	1K
R7	Res	0603	150
R8	Res	0603	2.2K
R9	Res	0603	2K
R11	Res	0603	1K
RB	Resistor Bridge		
TVS	SD36C-01FTG	SOD323	36V
U1	NSA2860X	NSA2860X_QFN20	

3.2.3.Bipolar high voltage power supply, sensor constant current source power supply, use bridge resistance as external temperature sensor

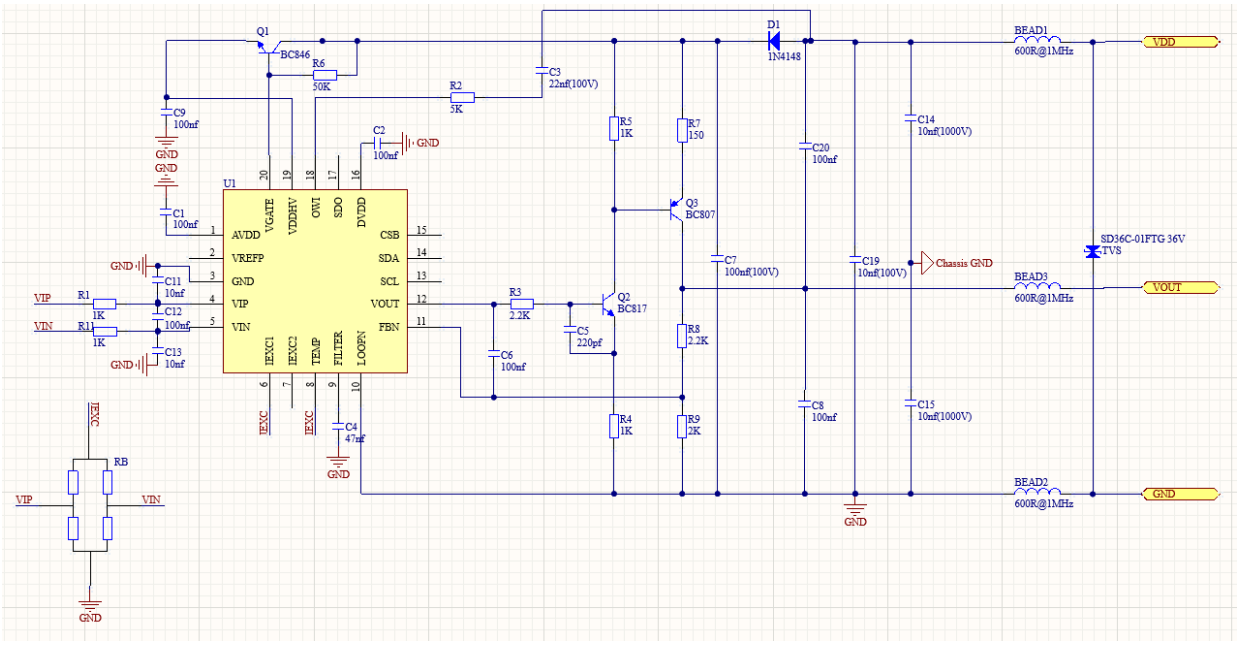

Figure 3.7 0-10V Typical Application-3

Table 3.7 0-10V Typical Application-3 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	600ohm(1MHz)
BEAD2	Inductor	0603	600ohm(1MHz)
BEAD3	Inductor	0603	600ohm(1MHz)
C1	Cap	0603	100nf
C2	Cap	0603	100nf
C3	Cap	0603	22nF(100V)
C4	Cap	0603	47nf
C5	Cap	0603	220pf
C6	Cap	0603	100nf
C7	Cap	0603	100nf(100V)
C8	Cap	0603	100nf
C9	Cap	0603	100nf
C11	Cap	0603	10nf
C12	Cap	0603	100nf
C13	Cap	0603	10nf
C14	Cap	1206	10nf(1000V)
C15	Cap	1206	10nf(1000V)
C19	Cap	0603	10nf(100V)
C20	Cap	0603	100nf
D1	1N4148	SOD323	
Q1	BC846	SOD23	
Q2	BC817	SOD23	
Q3	BC807	SOD23	

Designator	Comment	Footprint	Value
R1	Res	0603	1K
R2	Res	0603	5K
R3	Res	0603	2.2K
R4	Res	0603	1K
R5	Res	0603	1K
R6	Res	0603	50K
R7	Res	0603	150
R8	Res	0603	2.2K
R9	Res	0603	2K
R11	Res	0603	1K
RB	Resistor Bridge		
TVS	SD36C-01FTG	SOD323	36V
U1	NSA2860X	NSA2860X_QFN20	

0-10V op-amp output circuit, JEFT high-voltage power supply, constant voltage source power supply of sensor, bridge resistance as external temperature sensor

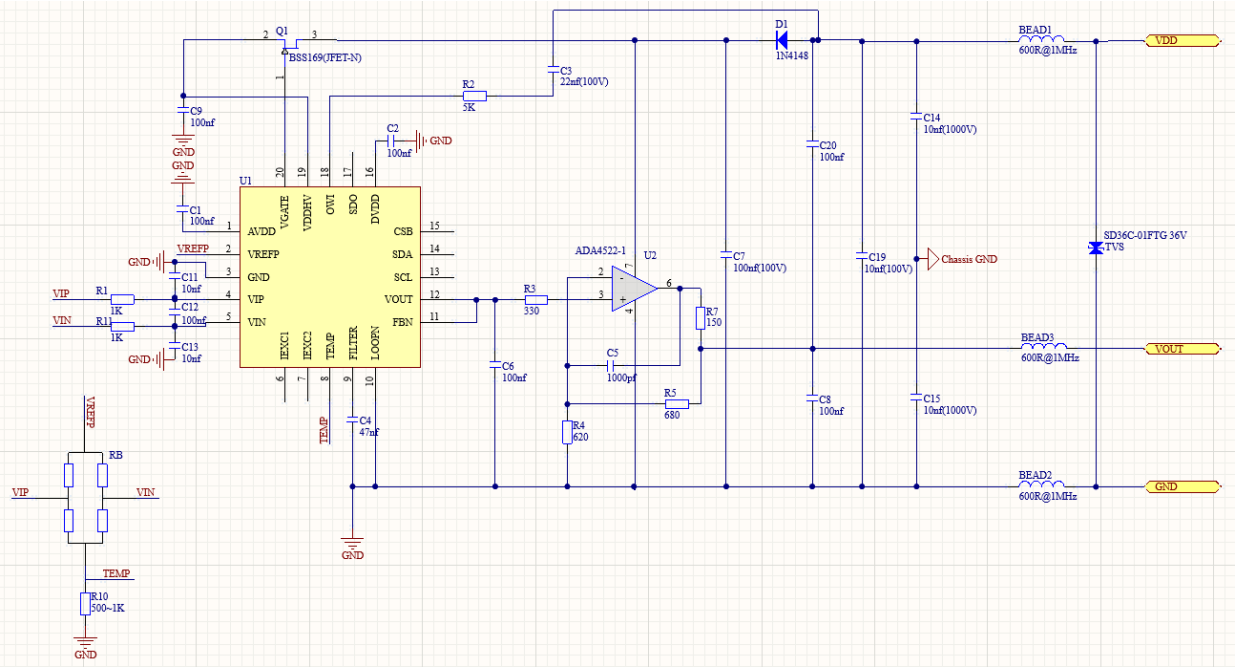

Figure 3.8 0-10V Typical Application-4

Table 3.8 0-10V Typical Application-4 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	600ohm(1MHz)
BEAD2	Inductor	0603	600ohm(1MHz)
BEAD3	Inductor	0603	600ohm(1MHz)
C1	Cap	0603	100nf
C2	Cap	0603	100nf
C3	Cap	0603	22nF(100V)
C4	Cap	0603	47nf
C5	Cap	0603	1000pf
C6	Cap	0603	100nf
C7	Cap	0603	100nf(100V)
C8	Cap	0603	100nf
C9	Cap	0603	100nf
C11	Cap	0603	10nf
C12	Cap	0603	100nf
C13	Cap	0603	10nf
C14	Cap	1206	10nf(1000V)
C15	Cap	1206	10nf(1000V)
C19	Cap	0603	10nf(100V)
C20	Cap	0603	100nf
D1	1N4148	SOD323	
Q1	BSS169N(JFET-N)	SOD23	

Designator	Comment	Footprint	Value
R1	Res	0603	1K
R2	Res	0603	5K
R3	Res	0603	330
R4	Res	0603	620
R5	Res	0603	680
R7	Res	0603	150
R10	Res	0603	500~1K
R11	Res	0603	1K
RB	Resistor Bridge		
TVS	SD36C-01FTG	SOD323	36V
U1	NSA2860X	NSA2860X_QFN20	
U2	ADA4522-1	MSOP	

3.3.0-5V Typical Application

3.3.1.Constant voltage source power supply ,internal temperature sensor

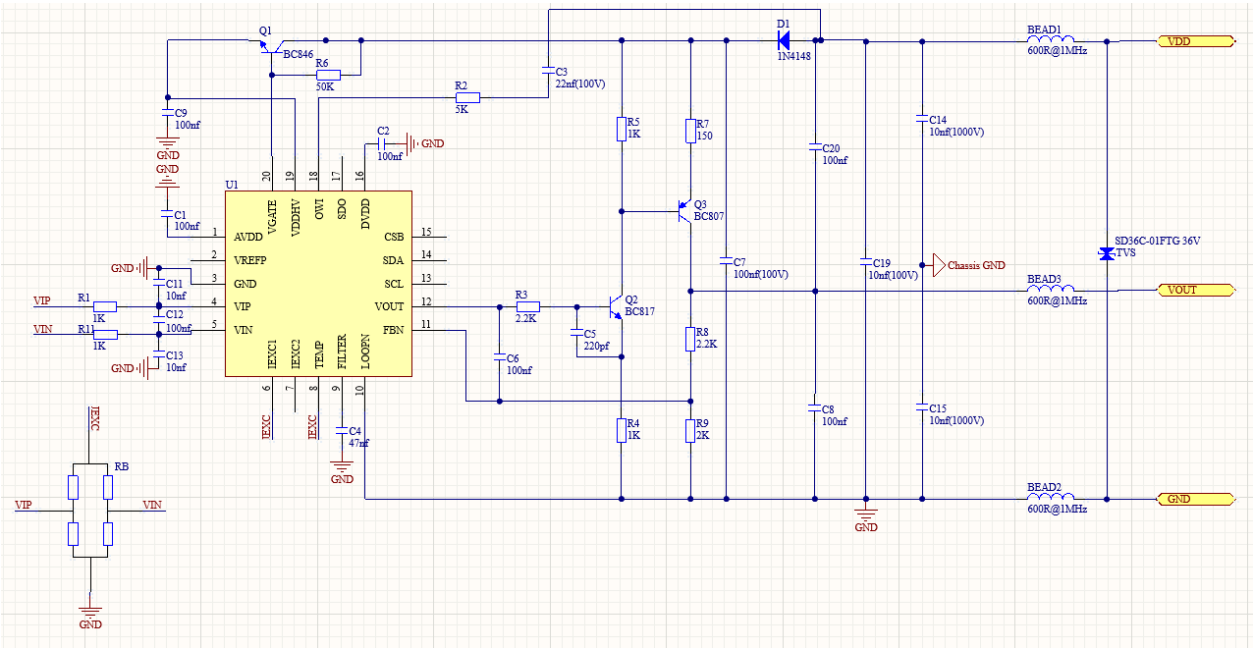

Figure 3.9 0-5V Typical Application-1

Table 3.9 0-5V Typical Application-1 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	600ohm(100MHz)
BEAD2	Inductor	0603	600ohm(100MHz)
BEAD3	Inductor	0603	600ohm(100MHz)
C2	Cap	0603	100nf
C3	Cap	0603	100nf
C4	Cap	0603	100nf
C5	Cap	0603	10nf
C6	Cap	0603	100nf
C7	Cap	0603	10nf
C8	Cap	0603	100nf
C13	Cap	1206	10nf(1000V)
C14	Cap	1206	10nf(1000V)
R1	Res	0603	1K
R2	Res	0603	100
R3	Res	0603	1K
R11	Res	0603	1K
U1	NSA2860X	NSA2860X_QFN20	
ZD1	SD05C-01FTG		5.1V
ZD2	SD05C-01FTG		5.1V
RB	Register Bridge		

3.3.2.High voltage power Supply 0-5V output circuit, constant voltage source power supply sensor, internal temperature sensor

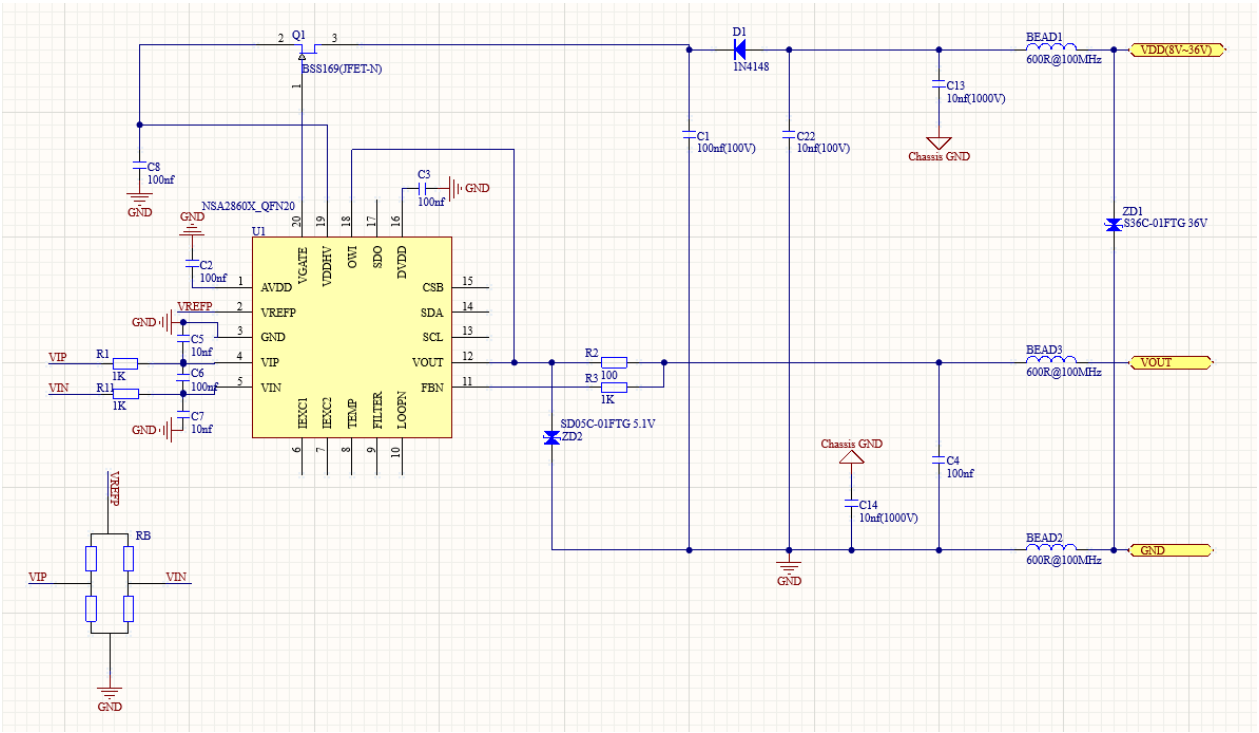

Figure 3.10 0-5V Typical Application-2

Table 3.10 0-5V Typical Application-2 Material List

Designator	Comment	Footprint	Value
BEAD1	Inductor	0603	
BEAD2	Inductor	0603	600ohm(100MHz)
BEAD3	Inductor	0603	600ohm(100MHz)
C1	Cap	0603	100nf(100V)
C2	Cap	0603	100nf
C3	Cap	0603	100nf
C4	Cap	0603	100nf
C5	Cap	0603	10nf
C6	Cap	0603	100nf
C7	Cap	0603	10nf
C8	Cap	0603	100nf
C13	Cap	1206	10nf(1000V)
C14	Cap	1206	10nf(1000V)
C22	Cap	0603	10nf(100V)
D1	1N4148	SOD323	
Q1	BSS169N(JFET-N)	SOT23	
R1	Res	0603	1K
R2	Res	0603	100
R3	Res	0603	1K
R11	Res	0603	1K
RB	Resistor Bridge		
U1	NSA2860X	NSA2860X_QFN20	
ZD1	SD36C-01FTG	SOD323	36V
ZD2	SD36C-01FTG	SOD323	5.1V

4.Revision History

Revision	Description	Author	Date
1.0	Initial Version	Weijie Zhou	2023/09/15

Sales Contact: sales@novosns.com; Further Information: www.novosns.com