海芯科技 AVIA Semiconductor

HX710ÿA/Bÿ

24-bit analog/digital (A/D) converter chip with digital temperature measurement output (HX710A)

24-bit analog/digital (A/D) converter chip (HX710B) with measuring (DVDD-AVDD) voltage difference

Introduction

HX710 adopts Haixin technology integrated circuit patented technology, It is a 24-bit A/D converter designed for high-precision electronic scales switch chip. Compared with other chips of the same type, this chip has It has the advantages of high integration, fast response, strong anti-interference, etc. point. Reduce the cost of the whole machine of the electronic scale, improve the efficiency of the whole machine performance and reliability.

The input LNA has a gain of 128, when the reference voltage When the voltage VREF is 5V, the corresponding full scale differential input signal The amplitude is ±20mV. The on-chip clock oscillator does not require any Any external devices. The digital temperature sensor in the HX710A chip can Directly read out the temperature in the chip, that is, in the system. HX710B can Used to detect the voltage difference by detecting (DVDD-AVDD) battery voltage.

All control signals are driven by pins, no on-chip part of the register programming. MCU only needs 2 I/O ports Implements all control of the ADC, including power-down control. Power-on The auto-reset feature simplifies the initialization process at power-on.

features

• On-chip direct temperature measurement and digital output (HX710A) • (DVDD-AVDD) voltage difference measurement (HX710B) • On-chip low-noise amplifier with a gain of 128 • On-chip clock oscillator without any external components • Power-on automatic reset circuit

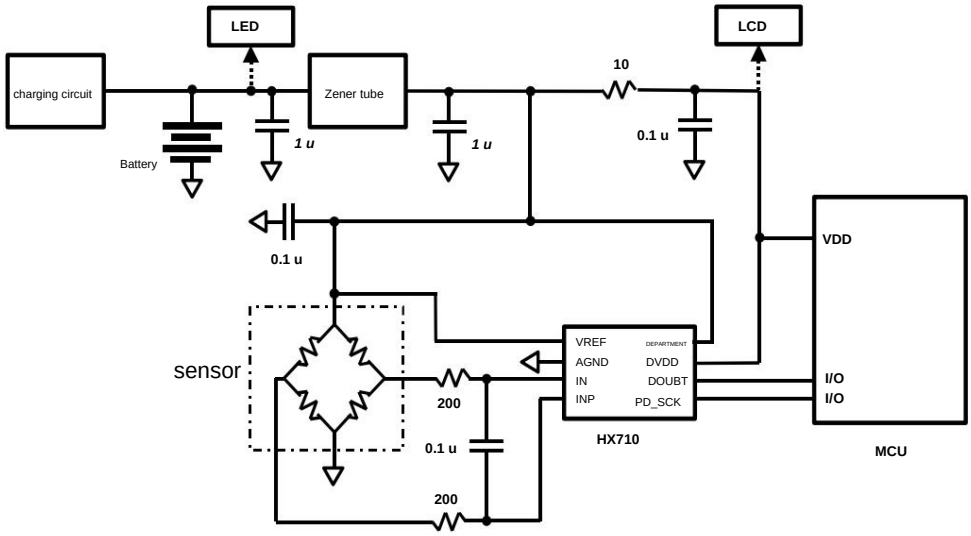
• Simple digital control and serial communication: all control is managed Pin input, on-chip registers do not need to be programmed

• Optional 10Hz and 40Hz output data rate • Synchronously suppress 50Hz and 60Hz power interference • Power consumption: Typical operating current: 1.2mA, power-off current: < 1µA

• Operating voltage range: 2.6 ~ 5.5V

• Operating temperature range: -40 ~ +85°C

• 8-pin SOP-8 or DIP-8 package



HX710 pricing scale application reference circuit diagram

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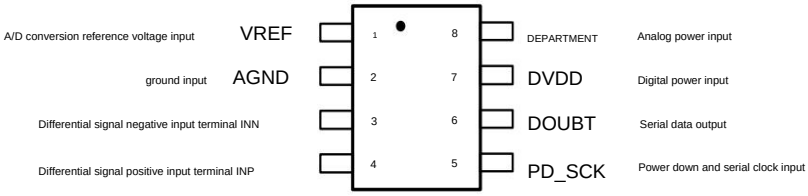
Pin description



SOP-8 or DIP-8 package

Pin number	name performance	describe
1	VREF Analog input A/D conversion reference voltage input (1.8VÿAVDD) AGND Ground input Ground input INN Analog input	
2	differential signal negative input INP Analog input differential	
3	signal positive input PD_SCK Digital input power-off control (active high) and Serial port	
4	clock input DOUT Digital output serial port data output	
5		
6		
7	DVDD power input digital power input (2.6 ~ 5.5V) AVDD power input analog power input (2.6 ~ 5.5V), AVDD	
8	voltage should not be higher than DVDD voltage	

Table 1 Pin Description

Main Electrical Parameters

	Conditions and instructions	Min	Typ	Max	Unit
Parameter Full-Scale Differential Input Range ÿFSRÿ	V(inp)-V(in)		±0.5(VREF/128)		IN
Input Common Mode Voltage Range		AGND+0.9		AVDD-1.3V	
VREF input voltage range		1.8		AVDD V	
Noise-free bits (Noise- Vref=Avdd=5V, Rate=10Hz			17		Bits
Free Bits) (1)	Vref=Avdd=5VÿRate=40Hz		16		Bits
output data rate			10/40		Hz
output data encoding	two's complement	800000		7FFFFF HEX	
Output Settling Time(2)			400/100		ms
Non-Linearity Error (INL) Differential Input, Input Zero Drift Compared to			±0.001		%of FS
Full-Scale Gain (Input Offset)			0.01		mV
Input noise accuracy (Noise Free Resolution)			50		nV(rms)
Temperature coefficient (Temperature input zero drift (offset drift)			±15		nV/ÿ
Drift)	gain drift		±7		ppm/ÿ
temperature sensor (effective bit: 15 bits)	Temperature measurement range	-40		+85	ÿ
	Non-linear error (-40ÿ+85ÿ) Digital		0.5		ÿ
Temperature measurement accuracy (15 bits)			20.4		LSB/ÿ
Input Common Mode Signal Rejection Ratio At DC, ÿVIN=10mV			100		dB
Power Supply Suppression Ratio (PSSR) At DC, ÿAVDD=0.1V			100		dB
voltage	AVDDÿDVDD	2.7		5.5	IN
supply current	normal work		1200		µA
	power outage		0.5		

(1) Noise-Free Bits = ln(FSR/Peak-to-Peak Noise)/ln(2).

(2) Output stabilization time refers to the time from power-on, reset or output data rate change to valid stable output data.

Table 2 Main Electrical Parameters

analog input

The analog differential input can directly interface with the bridge sensor's differential The output is connected. Since the signal output by the bridge sensor is small, In order to fully utilize the input dynamic range of the A/D converter, the The input preamp has a large gain of 128. Dang ginseng When the reference voltage VREF is 5V, the full scale corresponding to the gain The differential input voltage is ±20mV.

Power supply

The digital power supply (DVDD) voltage should be the same as the MCU chip power supply voltage The voltage is the same or not much different to ensure that the serial port data with the MCU The communication is correct.

The analog power supply (AVDD) voltage should not be higher than the digital power supply (DVDD) voltage. Can use the same number as the MCU chip Power supply, with proper isolation if needed to reduce digital voltage Interference with analog circuits.

The A/D conversion reference voltage input (VREF) should be connected to the sensor's The power supply is connected. This voltage can be taken directly from the analog power supply (AVDD). It can also be divided by AVDD through resistor and sensor supply to reduce sensor power consumption.

clock selection

The clock of the HX710 chip is controlled by the clock oscillator inside the chip Available with a typical output data rate of 10Hz or 40Hz.

Temperature measurement **(HX710A)**

The digital temperature sensor inside the HX710A chip can directly It is connected to read out the temperature in the chip, that is, in the system. its effective The (stable) number of bits is 15 . Typical temperature measurement accuracy is per Degree (°C) 20.4 readings (15 digits).

When using a digital temperature sensor, attention should be paid to the on-chip Temperature sensor, there is a large zero sum between the chip and the chip gain difference. If used to measure absolute temperature, both zero and gain need To correct. For example, the measured temperature is used to make performance compensation related to the temperature of the system. Compensation, zero and gain do not need to be corrected, as long as the line of temperature measurement Sexuality can meet the requirements.

(DVDD-AVDD) voltage difference measurement (HX710B)

HX710B can be used to measure (DVDD-AVDD) voltage Difference. If DVDD is directly connected to the battery output, and AVDD is provided by the output of the Zener tube, then the HX710B can be used for Direct measurement of battery voltage without any external components.

Serial communication

The serial communication line is composed of pins PD_SCK and DOUT, Used to output data, select output data rate and input signal Number.

When the data output pin DOUT is high level, it indicates The A/D converter is not ready to output data, at this time the serial port The clock input signal PD_SCK should be low. When DOUT goes from high to After the level goes low, PD_SCK should input 25 to 27 different Wait for the clock pulse (Figure 2). where the first clock pulse The rising edge of the output will read the most significant bit of 24-bit data (MSB) until the completion of the 24th clock pulse, the 24-bit input The output data is output bit by bit from the highest bit to the lowest bit. 25th Up to 27 clock pulses are used to select the next A/D conversion See Table 3 for output data rates and input signals.

PD_SCK pulse number input	selection rate	
25	Differential signal 10	Hz temperature
26	measurement ÿHX710A)	40 Hz
26	DVDD-AVDD test Quantity (HX710B)	40 Hz
27	Differential signal 40	Hz

Table 3 Input Selection and Output Data Rate Selection

The number of input clock pulses of PD_SCK should not be less than 25 or more 27, otherwise it will cause serial communication error.

When the input signal or output data rate of the A/D converter When changing, the A/D converter needs 4 data output cycles to Can be stable. DOUT will go high after 4 data output cycles The level becomes low level, and valid data is output.

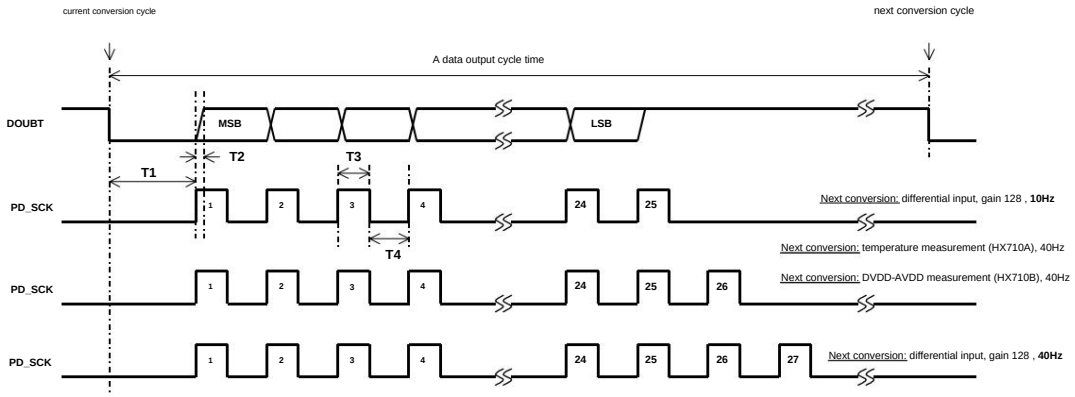


Figure 2 Data output, input channel and gain selection timing diagram

symbol	illustrate	Min Typ Max Unit			
T1	DOUT falling edge to PD_SCK pulse rising edge	0.1			µs
T2	PD_SCK pulse rising edge to DOUT data valid			0.1	µs
T3	PD_SCK positive pulse level time	0.2		50	µs
T4	PD_SCK negative pulse level time	0.2			µs

Reset and power down

When the chip is powered on, the power-on automatic reset circuit in the chip The circuit will reset the chip automatically.

The pin PD_SCK input is used to control the power off of HX710. When PD_SCK is low level, the chip is in normal working state state.

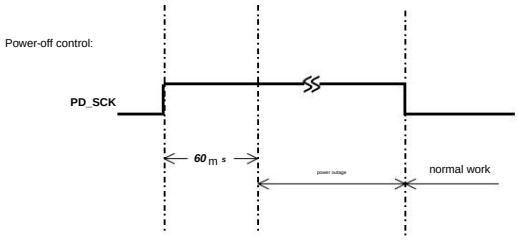


Figure 3 Power-off control

If PD_SCK goes from low to high and stays high level exceeds 60µs, HX710 enters the power-off state (Fig. three). When PD_SCK returns to low level, the chip will Re-enter normal working condition. The chip returns to positive from the power-off state After normal operation, if you want to maintain the conversion rate before power off and input signal selection, the power-down cannot be issued in the number of clock pulses The current data conversion cycle where the change occurs. Instead the clock The next data conversion cycle after the pulse number changes or later.

Chip enters normal working state from reset or power-off state After that, the A/D converter needs 4 data output cycles to stabilize Certainly. DOUT will change from high level after 4 data output cycles Change to low level, output valid data.

Applications

Figure 1 is a typical application of HX710 chip in electronic scale type scheme diagram. This solution uses a Zener tube to simultaneously give the ADC and MCU power supply, it can be used for LED display, also can be used for LCD display.

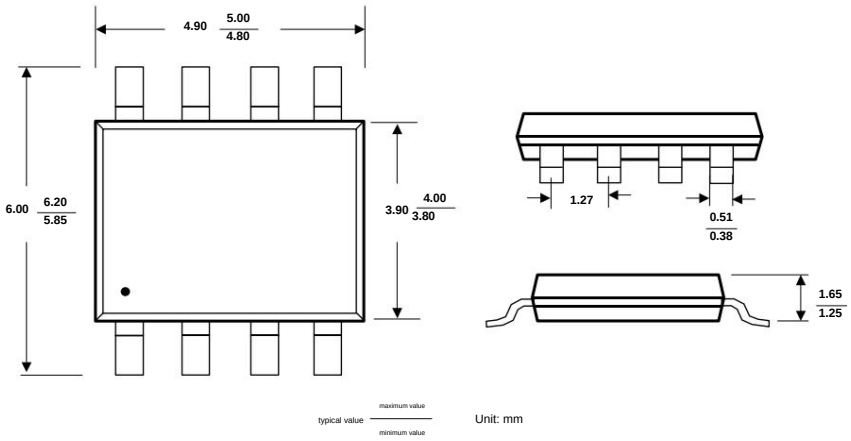
Reference Driver (Assembly)

```
/*---------------------------------------------- ------------------ Called in ASM: can be called in C: extern unsigned long
ReadAD(void);                   LCALL ReadAD


                                unsigned long data;
                                data=ReadAD();


----------------------------------------------------------------------*/
PUBLIC              ReadAD
HX710ROM            segment code
rush                HX710ROM

sbit                ADDO = P1.5;
sbit                ADSK = P0.0;

/*---------------------------------------------- -- OUT: R4, R5, R6, R7 R7=>LSB If called in C, R4,
  R5, R6, R7 cannot be modified.
  ---------------------------------------------- -*/ ReadAD:


      CLR     ADSC          //Enable AD (PD_SCK set low)
      SETB ADDO             //51CPU quasi-bidirectional I/0 input enable//
      JB      ADDO,$        judging whether the AD conversion is over, if it is not over, wait or start reading
      MOV     R4, #24
ShiftOut:
      SETB ADSK             //PD_SCK set high (send pulse)
      NOP
      CLR     ADSC          //PD_SCK low //
      MOV     C,ADDO        read data (one bit at a time) // shift
      XCHON   A,R7          in data
      RLC A
      XCHON   A,R7
      XCHON   A,R6
      RLC A
      XCHON   A,R6
      XCHON   A,R5
      RLC A
      XCHON   A,R5
      DJNZ R4,ShiftOut      //Judge whether to move into 24BIT
      SETB ADSK
      NOP
      CLR     ADSC
      RIGHT
      END
```

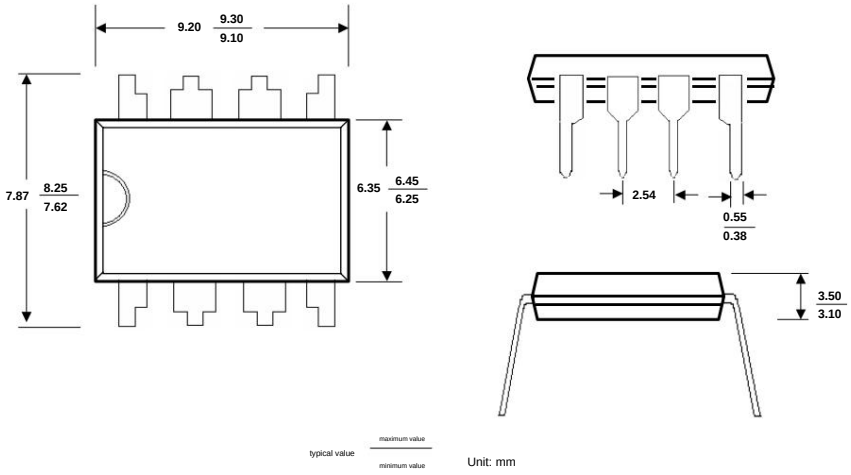
Reference Driver (C)

```
sbit ADDO = P1^5; sbit
ADSK = P0^0; unsigned
long ReadCount(void){ unsigned long
  Count; unsigned char i;

  ADDO=1;                //Non-51 class MCU, omit this line
  ADSK=0;
  Count=0;
  while(ADDO); for
  (i=0;i<24;i++){
    ADSK=1;
    Count=Count<<1;
    ADSK=0;
    if(ADDO) Count++; }

  ADSK=1;
  Count=Count^0x800000;
  ADSK=0;
  return(Count); }
```

package size



SOP-8L package



DIP-8 package