

## Low Noise, Low Power Dissipation, 24/16-Bit $\Sigma$ - $\Delta$ ADC

### PRODUCT DESCRIPTION

The MS5194T/MS5195T is a 24-bit/16-bit ADC featured by low power dissipation, low noise, six differential input channels and it is suitable for high-precision measurement application.

The MS5194T/MS5195T integrates low noise input buffer, low noise instrumentation amplifier, internal bandgap reference with high precision, low noise and low drift, and it also could adopt external differential reference voltage. In addition, the MS5194T/MS5195T also integrates programmable excitation current source, burnout current source and bias voltage generator. The bias voltage generator could set the channel common-mode voltage to  $0.5 \times AVDD$ .

It adopts external or internal clock. The output data rate can be set from 4.17Hz to 470Hz by software. The power supply voltage ranges from 2.7V to 5.25V. The MS5194T/MS5195T is available in TSSOP24 package.



TSSOP24

### FEATURES

- RMS Noise: MS5194T: 40nV@16.7Hz
- Power Dissipation: 400uA(typ)
- Integrated Low Noise, Programmable Gain Instrumentation Amplifier
- Integrated Voltage Reference with Low Temperature Drift : 5ppm/°C
- Update Rate: 4.17Hz to 470Hz
- Integrated 50Hz/60Hz Rejection Filter
- Integrated Programmable Current Source
- Integrated Internal Clock Oscillator
- Integrated Internal Burnout Current, Excitation Current
- Integrated Bias Voltage Generator
- Power Supply Voltage: 2.7V to 5.25V
- Operating Temperature Range: -40°C to 105°C

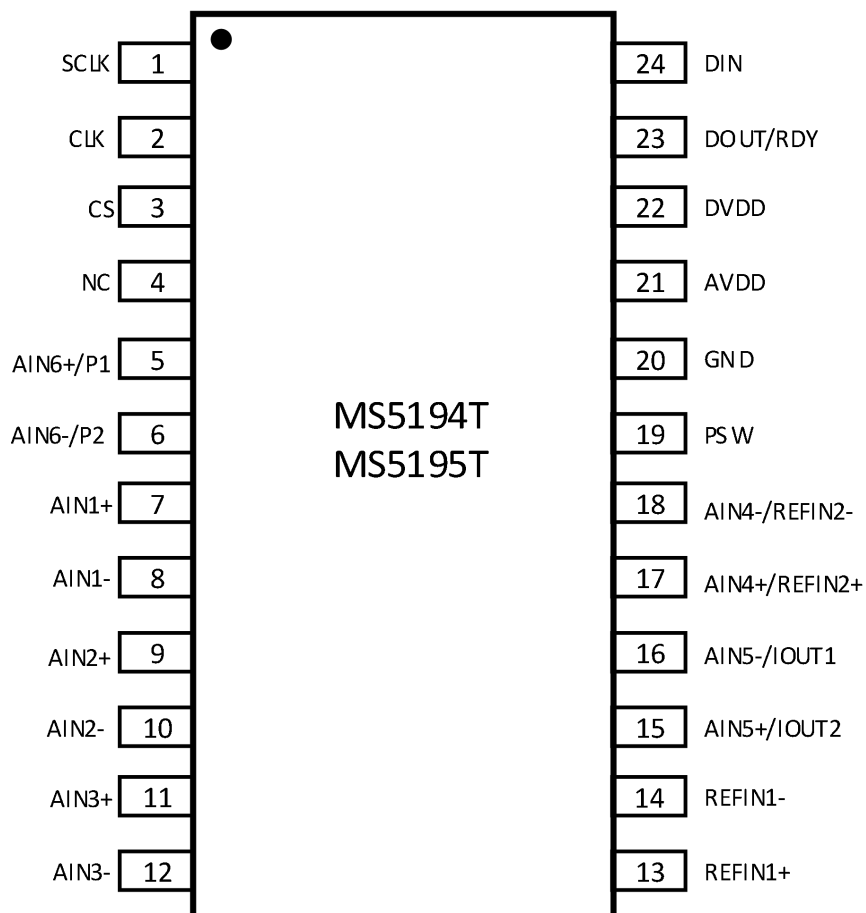
### APPLICATIONS

- Thermocouple and RTD Measurement
- Stress Detection
- Gas Analysis and Blood Analysis
- Industrial Process Control and Instrumentation
- Liquid and Gas Chromatograph
- 6-bit DVM

### PRODUCT SPECIFICATION

| Part Number | Package | Marking |
|-------------|---------|---------|
| MS5194T     | TSSOP24 | MS5194T |
| MS5195T     | TSSOP24 | MS5195T |

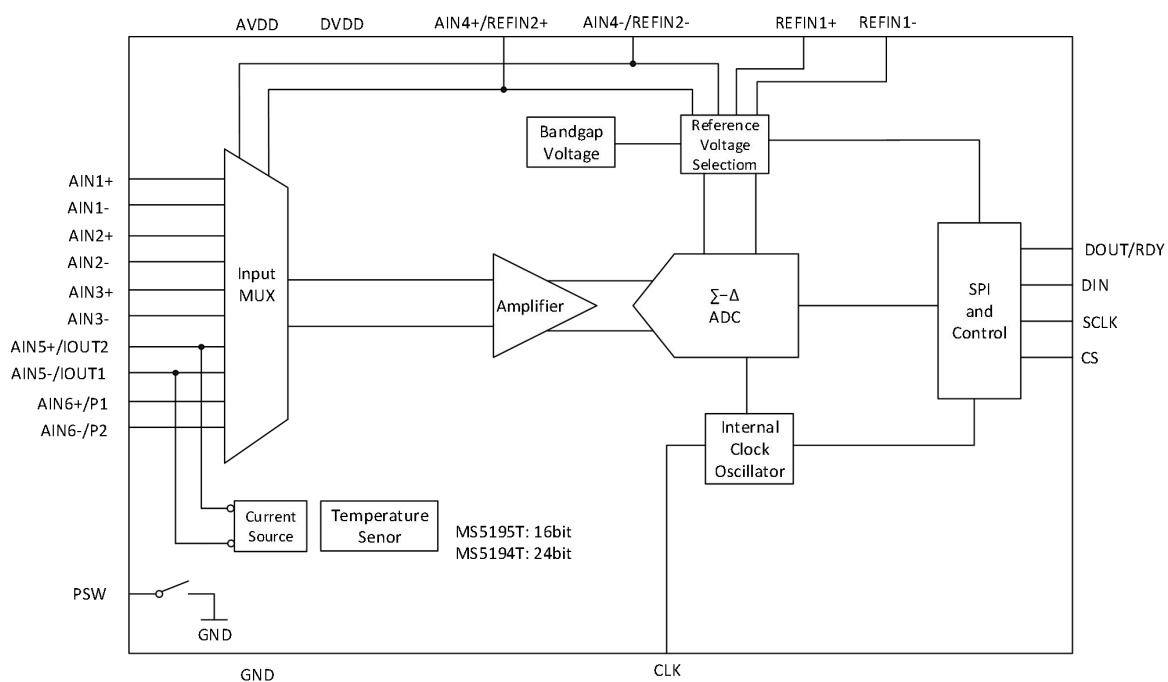
## PIN CONFIGURATION



## PIN DESCRIPTION

| Pin | Name              | Type  | Description                                                                                                 |
|-----|-------------------|-------|-------------------------------------------------------------------------------------------------------------|
| 1   | SCLK              | I     | Serial Clock Input                                                                                          |
| 2   | CLK               | I     | Clock Input/Clock Output.<br>Provide internal clock or Disable Internal Clock                               |
| 3   | CS                | I     | Chip Select Input                                                                                           |
| 4   | NC                | -     | Not Connection                                                                                              |
| 5   | AIN6+ /P1         | I/O   | Analog Channel 6 Positive Input/Digital Output Pin                                                          |
| 6   | AIN6- /P2         | I/O   | Analog Channel 6 Negative Input/Digital Output Pin                                                          |
| 7   | AIN1+             | I     | Analog Channel 1 Positive Input                                                                             |
| 8   | AIN1-             | I     | Analog Channel 1 Negative Input                                                                             |
| 9   | AIN2+             | I     | Analog Channel 2 Positive Input                                                                             |
| 10  | AIN2-             | I     | Analog Channel 2 Negative Input                                                                             |
| 11  | AIN3+             | I     | Analog Channel 3 Positive Input                                                                             |
| 12  | AIN3-             | I     | Analog Channel 3 Negative Input                                                                             |
| 13  | REFIN1+           | I     | Positive Reference Voltage 1 Input Pin                                                                      |
| 14  | REFIN1-           | I     | Negative Reference Voltage 1 Input Pin                                                                      |
| 15  | AIN5+<br>/IOUT2   | IO    | Internal Excitation Current Source Output Pin. The pin could be as positive input pin for analog channel 5. |
| 16  | AIN5-<br>/IOUT1   | IO    | Internal Excitation Current Source Output Pin. The pin could be as negative input pin for analog channel 5. |
| 17  | AIN4+<br>/REFIN2+ | I     | Positive Reference Voltage 2 Input Pin. The pin could be as positive input pin for analog channel 4.        |
| 18  | AIN4-<br>/REFIN2- | I     | Negative Reference Voltage 2 Input Pin. The pin could be as negative input pin for analog channel 4.        |
| 19  | PSW               | I     | Low-Side Power Switch to GND                                                                                |
| 20  | GND               | -     | Ground                                                                                                      |
| 21  | AVDD              | POWER | Analog Power Supply Voltage (2.7V to 5.25V)                                                                 |
| 22  | DVDD              | POWER | Digital Interface Power Pin. 2.7V to 5.25V                                                                  |
| 23  | DOUT/RDY          | O     | Serial Data Output/Data Ready Output Pin                                                                    |
| 24  | DIN               | I     | Serial Data Input                                                                                           |

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Any exceeding absolute maximum rating application causes permanent damage to device. Because long-time absolute operation state affects device reliability. Absolute ratings just conclude from a series of extreme tests. It doesn't represent chip can operate normally in these extreme conditions.

| Parameter                 | Symbol           | Range           | Unit |
|---------------------------|------------------|-----------------|------|
| Analog Power Supply       | AVDD             | -0.3 ~ +7.0     | V    |
| Digital Power Supply      | DVDD             | -0.3 ~ +7.0     | V    |
| Analog Input Voltage      | AIN              | -0.3 ~ AVDD+0.3 | V    |
| Reference Voltage         | VREFIN           | -0.3 ~ AVDD+0.3 | V    |
| Digital Input Voltage     |                  | -0.3~ DVDD+0.3  | V    |
| Digital Output Voltage    | V(LE)            | -0.3 ~ DVDD+0.3 | V    |
| Input Port Current        |                  | 10              | mA   |
| Operating Temperature     |                  | -40 ~ 105       | °C   |
| Storage Temperature       | T <sub>stg</sub> | -60 ~ 150       | °C   |
| Lead Temperature (10 sec) |                  | 260             | °C   |
| ESD (HBM)                 |                  | 4000            | V    |

## ELECTRICAL CHARACTERISTICS

AVDD=2.7V to 5.25V, DVDD=2.7V to 5.25V, GND=0V.

Unless otherwise noted, parameters are in whole temperature range.

| Parameter                                                                            | Condition                                             | Min       | Typ        | Max       | Unit       |
|--------------------------------------------------------------------------------------|-------------------------------------------------------|-----------|------------|-----------|------------|
| <b>ADC Channel (Chopping Enable)</b>                                                 |                                                       |           |            |           |            |
| Output Rate                                                                          |                                                       |           | 4.17-470   |           | Hz         |
| No Missing Codes Accuracy                                                            |                                                       |           | 24/16      |           | Bits       |
| Resolution                                                                           | See "Output Noise and Resolution"                     |           |            |           |            |
| Output Noise and Rate                                                                | See "Output Noise and Resolution"                     |           |            |           |            |
| Integral Nonlinearity                                                                |                                                       |           |            | ±15       | ppm of FSR |
| Offset Error                                                                         |                                                       |           | ±1         |           | uV         |
| Offset Error Temperature Drift                                                       |                                                       |           | ±10        |           | nV/°C      |
| Full-Scale Error                                                                     |                                                       |           | ±10        |           | uV         |
| Gain Temperature Drift                                                               |                                                       |           | 1          |           | ppm/°C     |
| Power Supply Rejection                                                               | AIN=1V/gain, gain>4                                   | 100       |            |           | dB         |
| <b>Analog Input</b>                                                                  |                                                       |           |            |           |            |
| Differential Input Voltage Range                                                     |                                                       |           | ±VREF/gain |           | V          |
| Common-Mode Voltage                                                                  | VCM= (AINP + AINN)/2,<br>Gain = 4 to128               | 0.5       |            |           | V          |
| Analog Minimum Input Voltage                                                         | Disable Input Buffer, Gain=1 or 2                     | GND-30mV  |            | AVDD+30mV | V          |
|                                                                                      | Enable Input Buffer, Gain=1 or 2                      | GND+100mV |            | AVDD+30mV | V          |
|                                                                                      | Enable Input Instrumentation Amplifier, Gain=4 to 128 | GND+300mV |            | AVDD-1.1  | V          |
| Analog Input Current When Buffered Mode or Enable Internal Instrumentation Amplifier | Gain = 1 or 2, Update Rate< 100 Hz                    |           |            | ±1        | nA         |
|                                                                                      | Gain = 4 to 128, Update Rate< 100 Hz                  |           |            | ±250      | pA         |
|                                                                                      | AIN3(+)/AIN3(-), Update Rate< 100 Hz                  |           |            | ±1        | nA         |

| Parameter                                                                                                          | Condition                                                 | Min | Typ            | Max  | Unit    |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----|----------------|------|---------|
| Analog Input Current<br>Temperature Drift<br>When Buffered Mode or<br>Enable Internal<br>Instrumentation Amplifier |                                                           |     | ±2             |      | pA/°C   |
| Analog Input Current<br>Relative to Voltage<br>When Disable Input Buffer                                           |                                                           |     | ±400           |      | nA/V    |
| Analog Input Current<br>Temperature Drift<br>When Disable Input Buffer                                             |                                                           |     | ±50            |      | pA/V/°C |
| Common-mode Rejection                                                                                              | DC, AIN = 1 V/gain, gain ≥ 4                              | 100 |                |      | dB      |
|                                                                                                                    | 50 ± 1 Hz,<br>60 ± 1 Hz (FS[3:0] = 1010)                  | 100 |                |      | dB      |
|                                                                                                                    | 50 ± 1 Hz (FS[3:0] = 1001),<br>60 ± 1 Hz (FS[3:0] = 1000) | 100 |                |      | dB      |
| <b>Internal Reference Voltage</b>                                                                                  |                                                           |     |                |      |         |
| Initial Resolution                                                                                                 |                                                           |     | 1.17±<br>0.01% |      | V       |
| Temperature Drift                                                                                                  |                                                           |     | 4              | 15   | ppm/°C  |
| <b>External Reference Voltage</b>                                                                                  |                                                           |     |                |      |         |
| Reference Voltage                                                                                                  |                                                           | 0.1 | 2.5            | AVDD | V       |
| Average Current,<br>Reference Voltage Input                                                                        |                                                           |     | 400            |      | nA/V    |
| Average Current<br>Temperature Drift,<br>Reference Voltage Input                                                   |                                                           |     | ±0.03          |      | nA/V/°C |
| Common-mode Rejection                                                                                              |                                                           |     | 100            |      | dB      |
| Detection Level,<br>Reference Voltage                                                                              |                                                           | 0.3 |                | 0.65 | V       |
| <b>Excitation Current Source (IEXC1, IEXC2)</b>                                                                    |                                                           |     |                |      |         |
| Output Current                                                                                                     |                                                           |     | 10/210/1000    |      | uA      |
| Initial Tolerance                                                                                                  |                                                           |     | ±5             |      | %       |
| Temperature Drift                                                                                                  |                                                           |     | 200            |      | ppm/°C  |
| Current Match                                                                                                      |                                                           |     | ±0.5           |      | %       |

| Parameter                               | Condition                 | Min      | Typ    | Max       | Unit   |
|-----------------------------------------|---------------------------|----------|--------|-----------|--------|
| Temperature Drift Match                 |                           |          | 50     |           | ppm/°C |
| Voltage Regulation                      |                           |          | 2      |           | %/V    |
| Load Regulation                         |                           |          | 0.2    |           | %/V    |
| Output Voltage                          | Output Current 10uA,210uA | GND-30mV |        | AVDD-0.65 | V      |
|                                         | Output Current 1mA        | GND-30mV |        | AVDD-1.1  | V      |
| <b>Temperature Sensor</b>               |                           |          |        |           |        |
| Accuracy                                |                           |          | ±2     |           | °C     |
| Sensitivity                             |                           |          | 0.85   |           | mV/°C  |
| <b>Bias Voltage Generator</b>           |                           |          |        |           |        |
| Bias Current                            |                           |          | AVDD/2 |           | V      |
| <b>Low-side Power Switch</b>            |                           |          |        |           |        |
| On-resistance                           |                           |          | 7      | 9         | Ω      |
| Allowable Current                       |                           |          |        | 30        | mA     |
| <b>Clock</b>                            |                           |          |        |           |        |
| Internal Clock Frequency                |                           |          | 64±3%  |           | kHz    |
| Internal Clock Duty Cycle               |                           |          | 50:50  |           | %      |
| External Clock Frequency                |                           |          | 64     |           | kHz    |
| External Clock Duty Cycle               |                           | 45:55    |        | 55:45     | %      |
| <b>Logic Input</b>                      |                           |          |        |           |        |
| CS Input Low Voltage                    | DVDD=5V                   |          |        | 0.8       | V      |
|                                         | DVDD=3V                   |          |        | 0.4       | V      |
| CS Input High Voltage                   |                           | 2.0      |        |           | V      |
| SCLK and DIN Input High-level Threshold | DVDD=5V                   | 1.4      |        | 2         | V      |
|                                         | DVDD=3V                   | 0.9      |        | 2         | V      |
| SCLK and DIN Input Low-level Threshold  | DVDD=5V                   | 0.8      |        | 1.7       | V      |
|                                         | DVDD=3V                   | 0.4      |        | 1.35      | V      |
| SCLK and DIN Input Hysteresis           | DVDD=5V                   | 0.1      |        | 0.17      | V      |
|                                         | DVDD=3V                   | 0.06     |        | 0.13      | V      |
| Input Current                           |                           |          |        | ±10       | uA     |
| Input Capacitance                       |                           |          | 10     |           | pF     |

| Parameter                          |                               | Condition                    | Min               | Typ | Max              | Unit    |
|------------------------------------|-------------------------------|------------------------------|-------------------|-----|------------------|---------|
| <b>Digital Logic Output</b>        |                               |                              |                   |     |                  |         |
| Output High-level Voltage          | AVDD=3 V, ISOURCE=100 $\mu$ A |                              | DVDD-0.6          |     |                  | V       |
|                                    | AVDD=5 V, ISOURCE=200 $\mu$ A |                              | 4                 |     |                  | V       |
| Output Low-level Voltage           | AVDD=3 V, ISINK=100 $\mu$ A   |                              |                   |     | 0.4              | V       |
|                                    | AVDD=5 V, ISINK=1.6mA         |                              |                   |     | 0.4              | V       |
| Leakage Current, Floating-State    |                               |                              |                   |     | $\pm 10$         | $\mu$ A |
| Output Capacitance, Floating-State |                               |                              |                   | 10  |                  | pF      |
| <b>System Calibration</b>          |                               |                              |                   |     |                  |         |
| Full-Scale Calibration             |                               |                              |                   |     | 1.05 $\times$ FS | V       |
| Zero-Scale Calibration             |                               |                              | -1.05 $\times$ FS |     | 1.05 $\times$ FS | V       |
| <b>Power Dissipation</b>           |                               |                              |                   |     |                  |         |
| Power Supply Voltage               | AVDD                          |                              | 2.7               |     | 5.25             | V       |
|                                    | DVDD                          |                              | 2.7               |     | 5.25             | V       |
| Power Supply Current               | AVDD=3V                       | Disable Input Buffer,        |                   | 110 | 140              | $\mu$ A |
|                                    | AVDD=5V                       | External Reference           |                   | 125 | 140              |         |
|                                    | AVDD=3V                       | Enable Input Buffer, Gain= 1 |                   | 130 | 180              | $\mu$ A |
|                                    | AVDD=5V                       | or 2, External Reference     |                   | 165 | 180              |         |
|                                    | AVDD=3V                       | Gain= 4 to 128,              |                   | 300 | 400              | $\mu$ A |
|                                    | AVDD=5V                       | External Reference           |                   | 350 | 400              | $\mu$ A |
|                                    | AVDD=3V                       | Gain= 4 to 128,              |                   | 380 | 500              | $\mu$ A |
|                                    | AVDD=5V                       | Internal Reference           |                   | 440 | 500              | $\mu$ A |
| Shut-down Current                  |                               |                              |                   |     | 1                | $\mu$ A |

## OUTPUT NOISE and RESOLUTION (EXTERNAL REFERENCE)

The table below gives the output RMS noise for the MS5194T with some update rates and gain settings. The data provided are for bipolar input range and 2.5V external reference voltage source. These values are typical when the differential input voltage is 0V. It is important to note that the effective resolution is calculated from root mean square noise. These are typical values rounded to the nearest LSB.

Table 1. Output RMS Noise (uV) VS. Gain and Update Rate for the MS5194T (External 2.5V Reference Voltage)

| Update Rate | Gain=1 | Gain=2 | Gain=4 | Gain=8 | Gain=16 | Gain=32 | Gain=64 | Gain=128 |
|-------------|--------|--------|--------|--------|---------|---------|---------|----------|
| 4.17Hz      | 0.532  | 0.469  | 0.306  | 0.240  | 0.133   | 0.078   | 0.044   | 0.046    |
| 8.33Hz      | 0.856  | 0.664  | 0.415  | 0.264  | 0.191   | 0.088   | 0.415   | 0.063    |
| 16.7Hz      | 1.436  | 1.142  | 0.643  | 0.422  | 0.254   | 0.152   | 0.111   | 0.119    |
| 33.2Hz      | 1.978  | 1.871  | 0.776  | 0.474  | 0.325   | 0.214   | 0.151   | 0.150    |
| 62Hz        | 2.683  | 2.615  | 1.315  | 0.690  | 0.547   | 0.272   | 0.256   | 0.221    |
| 123Hz       | 4.101  | 3.580  | 1.735  | 0.979  | 0.507   | 0.294   | 0.210   | 0.240    |
| 242Hz       | 7.277  | 6.283  | 3.108  | 1.929  | 1.147   | 0.777   | 0.449   | 0.441    |
| 470Hz       | 8.343  | 8.739  | 3.337  | 2.073  | 1.337   | 0.891   | 0.586   | 0.589    |

Table 2. Effective Resolution (Bits) VS. Gain and Update Rate for the MS5194T (External 2.5V Reference Voltage)

| Update Rate | Gain=1   | Gain=2   | Gain=4    | Gain=8   | Gain=16   | Gain=32  | Gain=64  | Gain=128 |
|-------------|----------|----------|-----------|----------|-----------|----------|----------|----------|
| 4.17Hz      | 23(20.5) | 22(19.5) | 22.5(20)  | 22.5(20) | 22(19.5)  | 22(19.5) | 21.5(19) | 20.5(18) |
| 8.33Hz      | 22(19.5) | 21.5(19) | 22(19.5)  | 22(19.5) | 21.5(19)  | 21.5(19) | 21(18.5) | 20(17.5) |
| 16.7Hz      | 21.5(19) | 20.5(18) | 21.5(19)  | 21(18.5) | 21(18.5)  | 21(18.5) | 20(17.5) | 19(16.5) |
| 33.2Hz      | 21(18.5) | 20(17.5) | 21(18.5)  | 20.5(18) | 20.5(18)  | 20.5(18) | 19.5(17) | 18.5(16) |
| 62Hz        | 20.5(18) | 19.5(17) | 20.5(18)  | 20(17.5) | 19.5(17)  | 19.5(17) | 19(16.5) | 18(15.5) |
| 123Hz       | 20(17.5) | 19(16.5) | 20(17.5v) | 19.5(17) | 19(16.5v) | 19(16.5) | 18.5(16) | 17.5(15) |
| 242Hz       | 18.5(16) | 18(15.5) | 18.5(16)  | 18(15.5) | 18(15.5)  | 18.5(16) | 18(15.5) | 17(14.5) |
| 470Hz       | 18.5(16) | 18(15.5) | 18.5(16)  | 18(15.5) | 18(15.5)  | 18.5(16) | 17.5(15) | 16.5(14) |

## OUTPUT NOISE and RESOLUTION (INTERNAL REFERENCE)

The table below gives the output RMS noise for the MS5194T with some update rates and gain settings. The data provided are for bipolar input range and 1.17V internal reference voltage source. These values are typical when the differential input voltage is 0V. It is important to note that the effective resolution is calculated from root mean square noise. These are typical values rounded to the nearest LSB.

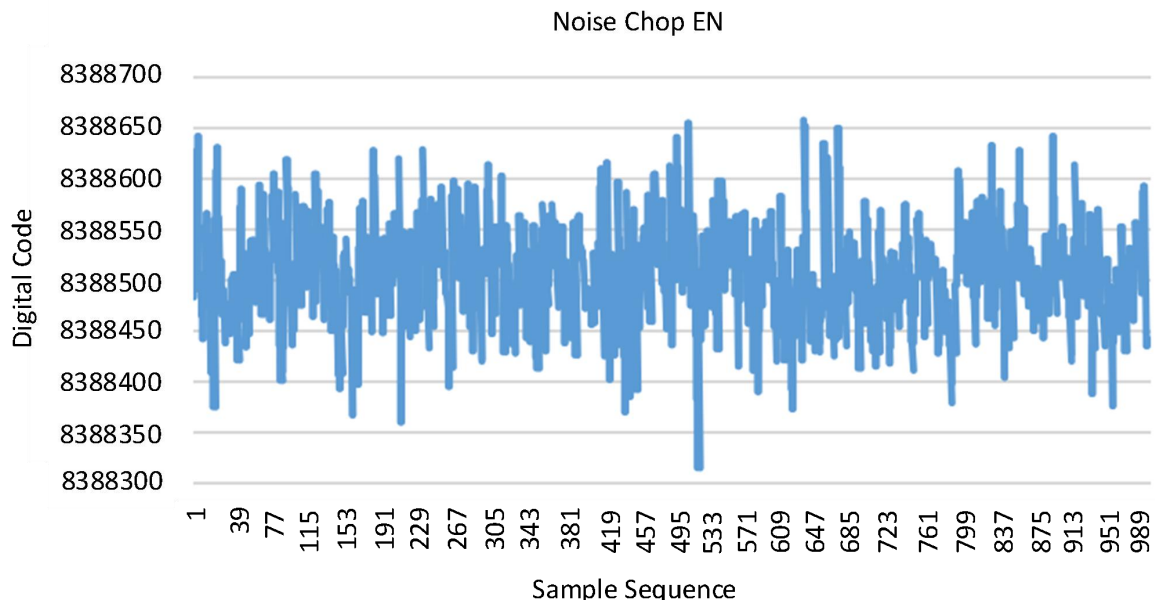
Table 3. Output RMS Noise (uV) VS. Gain and Update Rate for the MS5194T (Internal Reference Voltage)

| Update Rate | Gain=1 | Gain=2 | Gain=4 | Gain=8 | Gain=16 | Gain=32 | Gain=64 | Gain=128 |
|-------------|--------|--------|--------|--------|---------|---------|---------|----------|
| 4.17Hz      | 0.614  | 0.486  | 0.289  | 0.194  | 0.109   | 0.069   | 0.045   | 0.046    |
| 8.33Hz      | 0.827  | 0.795  | 0.342  | 0.243  | 0.173   | 0.081   | 0.342   | 0.064    |
| 16.7Hz      | 1.179  | 1.138  | 0.572  | 0.322  | 0.249   | 0.130   | 0.100   | 0.099    |
| 33.2Hz      | 2.244  | 1.771  | 0.827  | 0.443  | 0.325   | 0.178   | 0.129   | 0.131    |
| 62Hz        | 3.180  | 2.663  | 0.990  | 0.684  | 0.487   | 0.248   | 0.184   | 0.215    |
| 123Hz       | 5.019  | 3.648  | 1.704  | 1.018  | 0.759   | 0.376   | 0.272   | 0.262    |
| 242Hz       | 7.274  | 7.896  | 2.762  | 1.527  | 0.868   | 0.555   | 0.409   | 0.390    |
| 470Hz       | 9.078  | 8.366  | 3.210  | 2.140  | 1.330   | 0.763   | 0.705   | 0.503    |

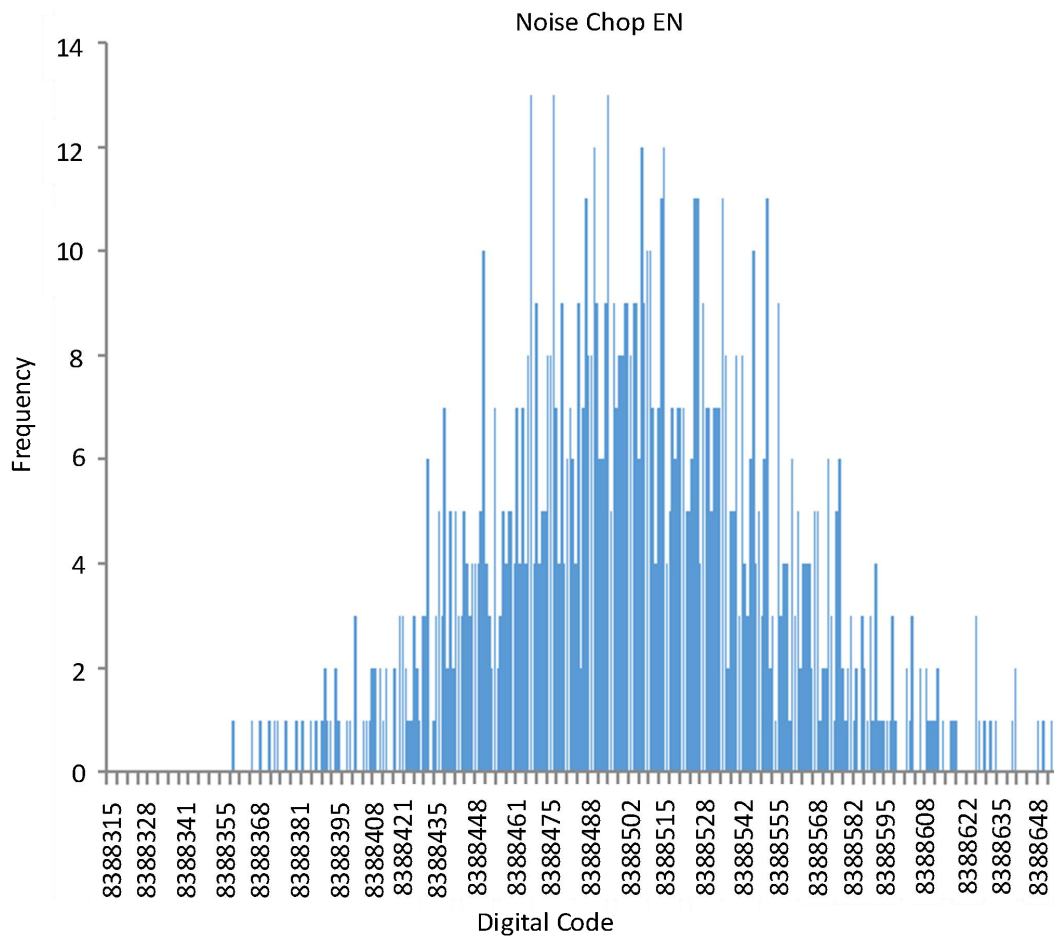
Table 4. Effective Resolution (Bits) VS. Gain and Update Rate for the MS5194T (Internal Reference Voltage)

| Update Rate | Gain=1 | Gain=2 | Gain=4 | Gain=8 | Gain=16 | Gain=32 | Gain=64 | Gain=128 |
|-------------|--------|--------|--------|--------|---------|---------|---------|----------|
| 4.17Hz      | 21.6   | 20.9   | 20.7   | 20.2   | 20.1    | 19.7    | 19.3    | 18.3     |
| 8.33Hz      | 21.1   | 20.2   | 20.4   | 19.9   | 19.4    | 19.5    | 16.4    | 17.8     |
| 16.7Hz      | 20.6   | 19.7   | 19.7   | 19.5   | 18.9    | 18.8    | 18.2    | 17.2     |
| 33.2Hz      | 19.7   | 19.0   | 19.1   | 19.0   | 18.5    | 18.4    | 17.8    | 16.8     |
| 62Hz        | 19.2   | 18.5   | 18.9   | 18.4   | 17.9    | 17.9    | 17.3    | 16.1     |
| 123Hz       | 18.5   | 18.0   | 18.1   | 17.8   | 17.3    | 17.3    | 16.7    | 15.8     |
| 242Hz       | 18.0   | 16.9   | 17.4   | 17.3   | 17.1    | 16.7    | 16.2    | 15.2     |
| 470Hz       | 17.7   | 16.8   | 17.2   | 16.8   | 16.5    | 16.3    | 15.4    | 14.9     |

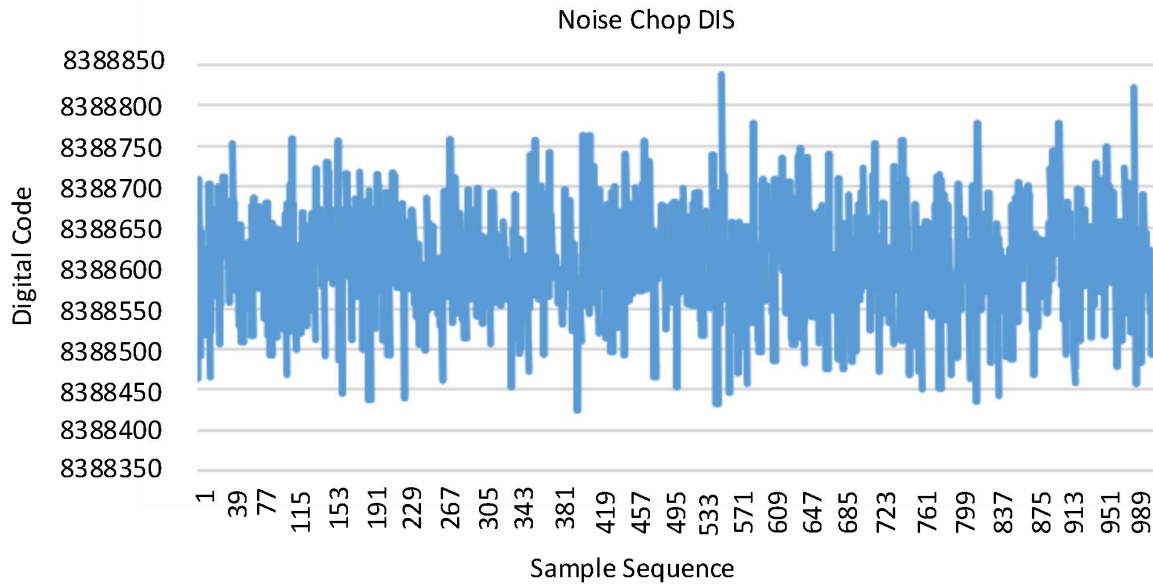
## TYPICAL CHARACTERISTICS CURVES



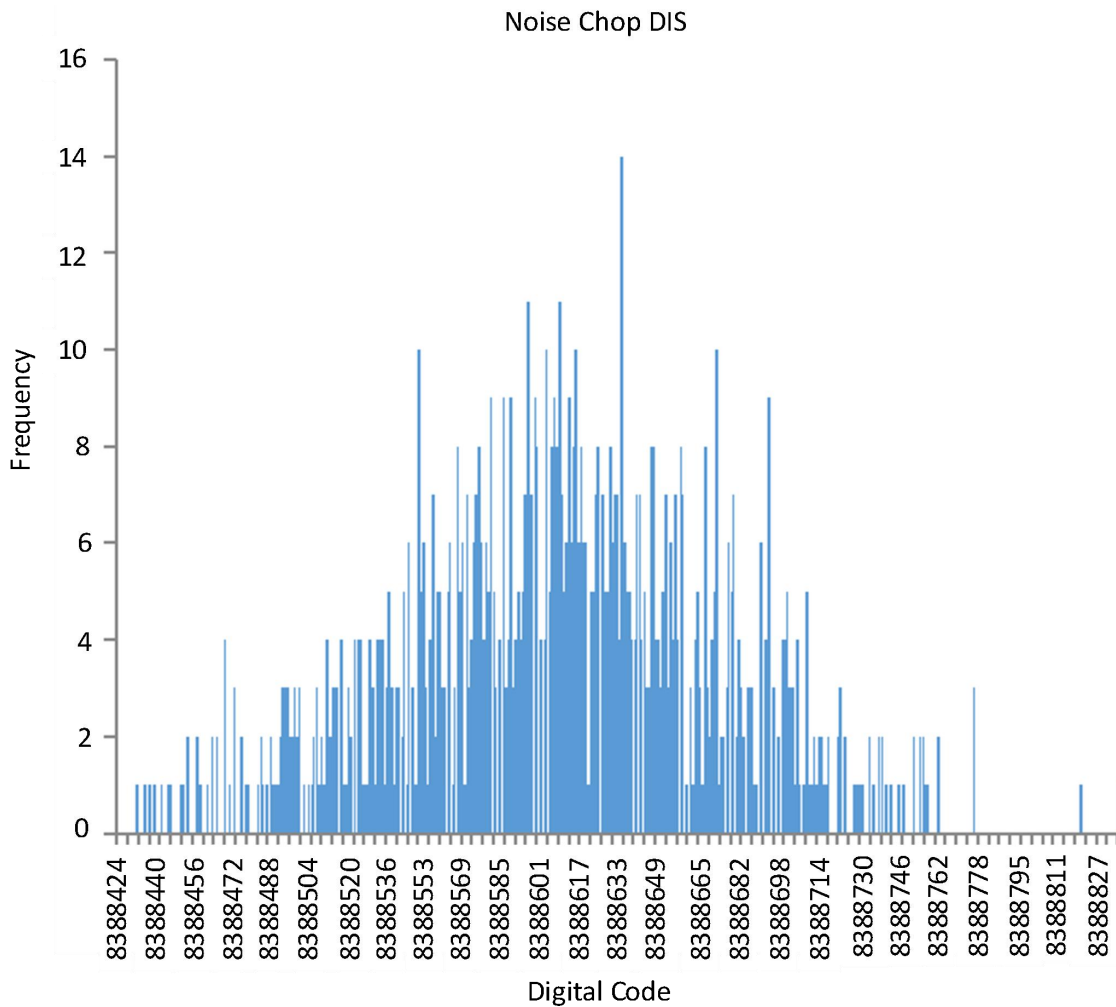
MS5194T Noise (AVDD=4V, Internal Reference, Gain = 64, Update Rate= 16.7 Hz, Chop Enable)



MS5194T Noise Distribution Histogram  
(AVDD=4V, Internal Reference, Gain= 64, Update Rate= 16.7Hz, Chop Enable)



MS5194TNoise (AVDD=4V, Internal Reference, Gain=64, Update Rate= 16.7Hz, Chop Disable)

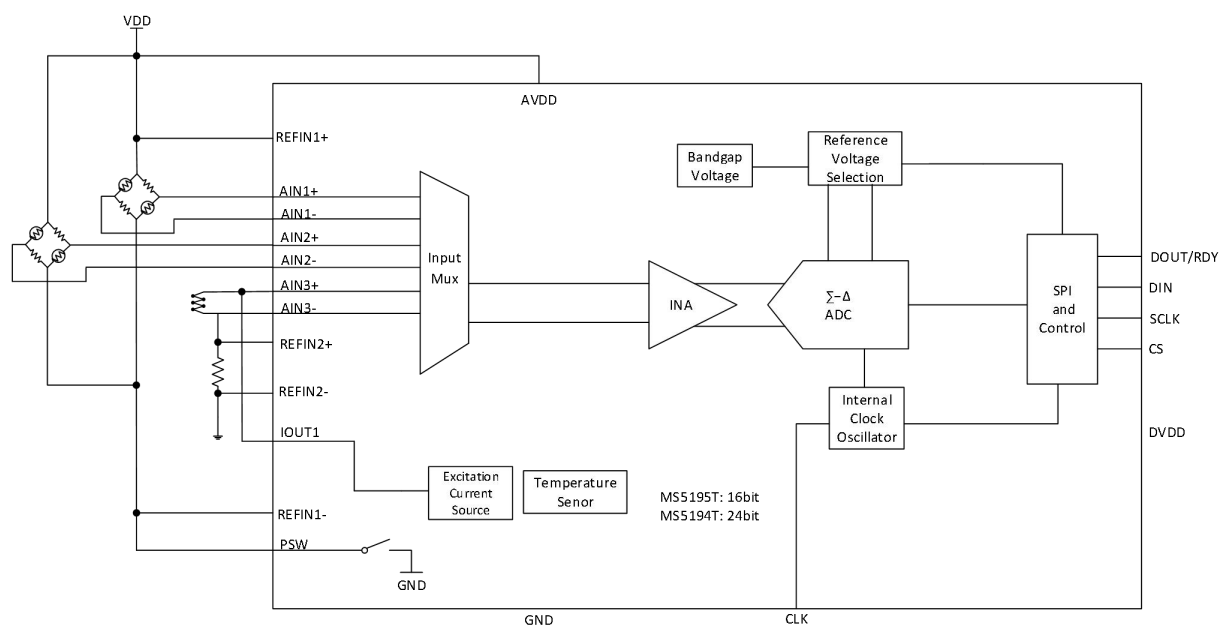


MS5194T Noise Distribution Histogram

(AVDD=4V, Internal Reference= 2.048, Gain=64, Update Rate= 4.17 Hz, Chop Disable)

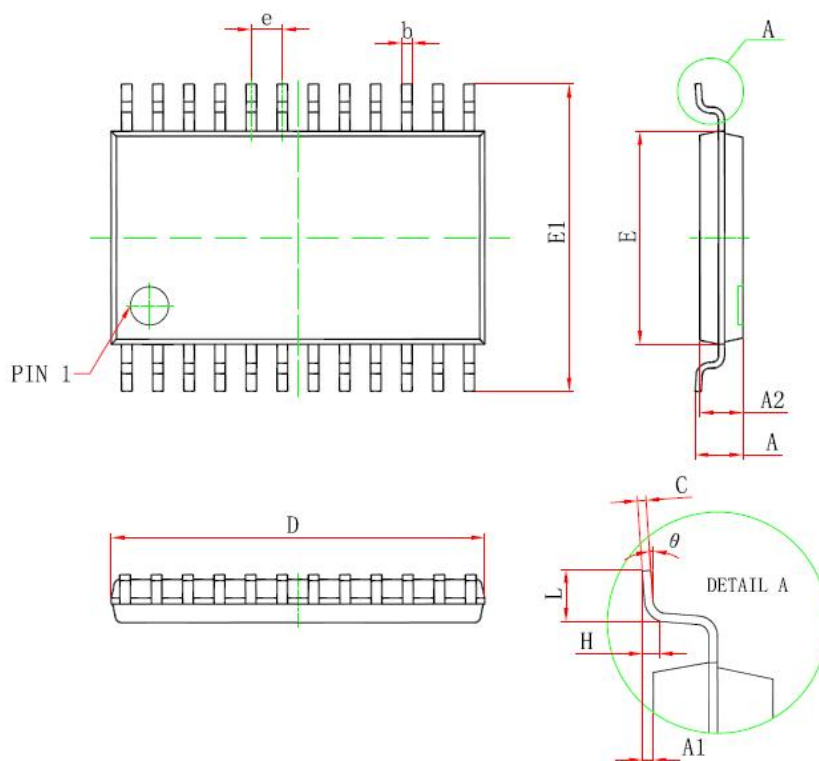
## TYPICAL APPLICATION DIAGRAM

The figure is a typical application diagram for the MS5194T/MS5195T.



# PACKAGE OUTLINE DIMENSIONS

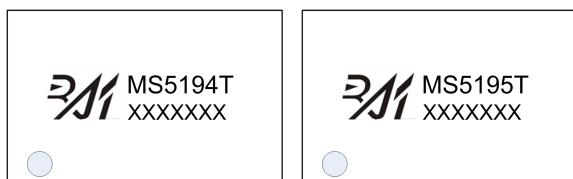
## TSSOP24



| Symbol | Dimensions in Millimeters |       |
|--------|---------------------------|-------|
|        | Min                       | Max   |
| D      | 7.700                     | 7.900 |
| E      | 4.300                     | 4.500 |
| b      | 0.190                     | 0.300 |
| c      | 0.090                     | 0.200 |
| E1     | 6.250                     | 6.550 |
| A      | -                         | 1.20  |
| A2     | 0.800                     | 1.000 |
| A1     | 0.050                     | 0.150 |
| e      | 0.65(BSC)                 |       |
| L      | 0.500                     | 0.700 |
| H      | 0.25(TYP)                 |       |
| θ      | 1°                        | 7°    |

## MARKING and PACKAGING SPECIFICATIONS

### 1. Marking Drawing Description



Product Name: MS5194T, MS5195T

Product Code: XXXXXXX

### 2. Marking Drawing Demand

Laser printing, contents in the middle, font type Arial.

### 3. Packaging Specifications

| Device  | Package | Piece/Reel | Reel/Box | Piece/Box | Box/Carton | Piece/Carton |
|---------|---------|------------|----------|-----------|------------|--------------|
| MS5194T | TSSOP24 | 3000       | 1        | 3000      | 8          | 24000        |
| MS5195T | TSSOP24 | 3000       | 1        | 3000      | 8          | 24000        |

**STATEMENT**

- All Revision Rights of Datasheets Reserved for Ruimeng. Don't release additional notice.  
Customer should get latest version information and verify the integrity before placing order.
- When using Ruimeng products to design and produce, purchaser has the responsibility to observe safety standard and adopt corresponding precautions, in order to avoid personal injury and property loss caused by potential failure risk.
- The process of improving product is endless. And our company would sincerely provide more excellent product for customer.

**MOS CIRCUIT OPERATION PRECAUTIONS**

Static electricity can be generated in many places. The following precautions can be taken to effectively prevent the damage of MOS circuit caused by electrostatic discharge:

1. The operator shall ground through the anti-static wristband.
2. The equipment shell must be grounded.
3. The tools used in the assembly process must be grounded.
4. Must use conductor packaging or anti-static materials packaging or transportation.



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