# BST7961

## 1. Product Overview

BST7961 is a 16-bit, 5 MSPS, based on a charge redistribution successive approximation register (SAR) analog-to-digital converter (ADC). The SAR architecture provides unmatched noise performance and linearity. The BST7961 integrates a low-power, high-speed 16-bit sampling ADC, an internal conversion clock, and an internal reference voltage buffer. At the CNV± edge, the BST7961 samples the voltage difference between the IN+ and IN- pins.

The analog input voltage swings from 0 V and 4.096 V, and 0 V and 5 The reference voltage is applied externally to the device. All conversion results are available through an LVDS self-clocked or echoed clock serial interface.

The BST7961 is available in a CQFN32 package and operates over the −55 °C to + 125°C temperature range.

BST7961 can be used in digital imaging systems , high-speed data acquisition , spectroscopy and test equipment. Its main features are as follows:

- Supply voltage: 1.8V and 5V.
- Input voltage range: 0~5V /0~4.096V.
- Charge Redistribution SAR ADC Architecture.
- 16 digits without missing codes.
- Dynamic range: ≥ 92dB (Fin=1kHz,-0.5dbFS,VREF=5V).
- Signal-to-noise ratio SNR: ≥ 91dB (Fin=1kHz,- 0.5dbFS,VREF=5V).
- Zero error: ≤ ±5.0LSB.
- Zero error temperature drift: ≤ ±2.5ppm/°C.
- Gain error: ≤ ±10LSB.
- Gain error temperature drift: ≤ ±1.0ppm/°C.
- Serial LVDS interface: self-clocked and echoed clock modes.
- Low Power Consumption:
  46.5mW (5MSPS, external reference voltage, echo clock mode).
  64.5mW (5MSPS, internal reference buffer, echo clock mode).
  46.5mW (5MSPS, external reference voltage, self-clock mode, CNV is CMOS input).
- Package: CQFN32.
- Operating temperature range: -55°C ~ + 125°C.
- Implementation standard and quality grade: GJB597B-2012 Class B.

## 2. Functional block diagram

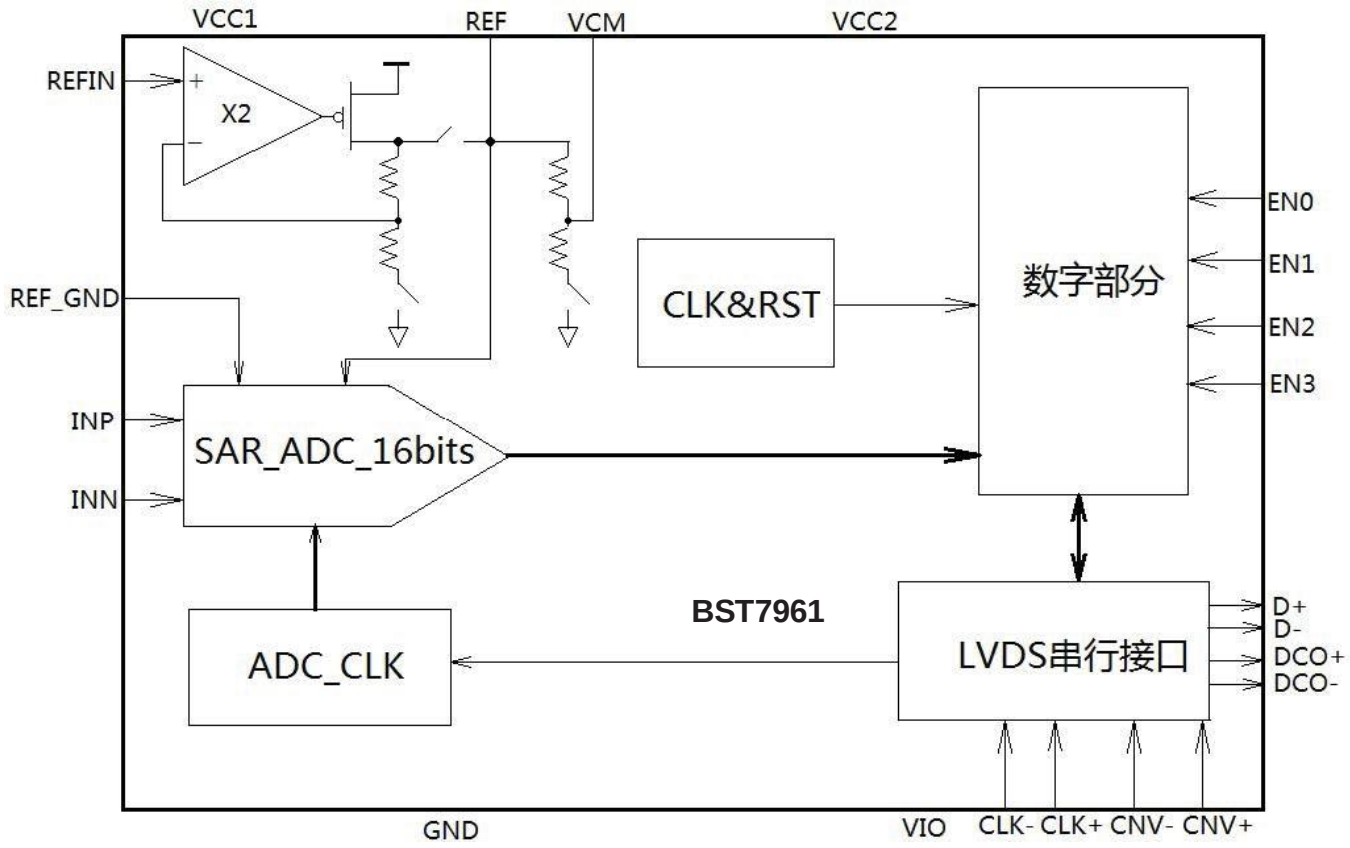


Figure 1. Functional Block Diagram

## 3. Electrical Parameters

### 3.1. Limit parameters

Unless otherwise specified, Tamb = 25 °C

| Parameter name | Symbol | Condition | Rating | Unit |
|---|---|---|---|---|
| Supply voltage | Vdd1 | | -0.3 To +6 | V |
| Supply voltage | Vdd2 | | -0.3 to +2.1 | V |
| Supply voltage | $V_{IO}$ | | -0.3 to +2.1 | V |
| Analog Input / Output | $V_{AIO1}$ | IN+ , IN- to GND | -0.3 to Vdd1 | V |
| Analog Input / Output | $V_{AIO2}$ | REF To GND | -0.3 To +6 | V |
| Analog Input / Output | $V_{AIO3}$ | VCM To GND | -0.3 To +6 | V |
| Analog Input / Output | $V_{AIO4}$ | REFIN To GND | -0.3 To +6 | V |
| Digital Input | $V_{DI}$ | Digital input to GND | -0.3 To VIO+0.3 | V |
| Digital Output | $V_{DO}$ | Digital output to GND | -0.3 To VIO+0.3 | V |
| Operating temperature | Tamb | | -40 ~+85 | °C |
| Температура хранения | $T_{stg}$ | | 65~+150 | °C |

## 3.2. Recommended conditions of use

| Parameter name | Symbol | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|---|
| Supply voltage | Vdd1 | 4.75 | 5 | 5.25 | V |
| Supply voltage | Vdd2 | 1.71 | 1.8 | 1.89 | V |
| Supply voltage | VIO | 1.71 | 1.8 | 1.89 | V |
| Reference voltage | REF | | 4.096/5 | | V |

## 3.3. Electrical Characteristics

### 3.3.1. DC Parameters1 ( Unless otherwise specified, $V_{DD1}$ = 5 V; $V_{DD2}$ = 1.8 V; $V_{IO}$ = 1.8 V; REF = 4.096 V; All regulations The grid is relative to T MIN To T MAX )

| Parameter name | Symbol | Test conditions | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|---|---|
| Resolution | | | | 16 | | Bit |
| **Analog Input** | | | | | | |
| Voltage range | $V_{AIN}$ | $V_{IN+}$ to $V_{IN-}$ | $-V_{REF}$ | | $+V_{REF}$ | V |
| Working input voltage range | $V_{IN}$ | $V_{IN+}$ , $V_{IN-}$ to GND | - 0.1 | | $+V_{REF}$ +0.1 + | V |
| Common mode input range | $V_{ICM}$ | | $V_{REF}$ /2-0.05 | $V_{REF}$ /2 | $V_{REF}$ / 2+0.05 | V |
| Common Mode Rejection Ratio | CMRR | fIN = 500kHz | | 70 | | dB |
| Input leakage current | $I_{leak}$ | Collection phase | | 60 | | nA |
| **Conversion rate** | | | | | | |
| Conversion rate | $f_{conv}$ | | 0 | | 5 | MSPS |
| Conversion cycle | $T_{conv}$ | | 200 | | | ns |
| **Reference Voltage Buffer** | | | | | | |
| REFIN Input voltage range Wai | | | 2.042 | 2.048 | 2.054 | V |
| REF Output voltage range | | EN3~EN0=XX01<br>Or EN3~EN0=XX10 | 4.086 | 4.096 | 4.106 | V |
| Voltage Regulation | | VDD1 = 5V ±5%,<br>VDD2 = 1.8V ±5% | | ±20 | | μV |
| Gain Drift | | | - 25 | ±4 | +25 | ppm/°C |
| **External reference voltage source** | | | | | | |
| Voltage range | REFIN | EN1~EN0=01 | | 2.048 | | V |
| | REFIN | EN1~EN0=10 | | 4.096 | | V |
| | REFIN | EN1~EN0=01 | | 5 | | V |
| Current consumption | | 5MSPS, $V_{REF}$ =4.096V | | 1.05 | 1.11 | mA |
| | | 5MSPS,$V_{REF}$ =5V | | 1.36 | 1.43 | mA |
| **VCM Pinout** | | | | | | |
| VCM Output | | | | $V_{REF}$ /2 | | V |
| VCM error | | | - 0.01 | | +0.01 | V |
| Output Impedance | | | | 5.1 | | kΩ |
| **LVDS I/O** | | | | | | |
| Differential output voltage | VOD | R L =100Ω | 245 | 290 | 454 | mV |
| Common mode output voltage | V OCM | R L =100Ω | 980 | 1130 | 1375 | V |
| Differential input voltage | V ID | | 100 | | 650 | mV |
| Common mode input voltage | V ICM | | 800 | | 1575 | mV |
| Static operating current | Idd | | | | | |
| Converting working current | Iconv | | | | | |
| Sleep current | Isleep | | | | | |
| Shutdown current | Ioff | | | | | |

### 3.3.2. C parameter 2 (Unless otherwise specified, $V_{DD1}$ = 5 $V_{DD2}$ = 1.8 V; $V_{IO}$ = 1.8 V; REF = 4.096 V or5V; all specifications are relative to TMIN To T MAX

| Parameter name | Symbol | Test conditions | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|---|---|
| No missing codes | $R_{NM}$ | | 16 | | | Bit |
| Integral nonlinearity error | INL | | - 0.55 | ±0.2 | +0.55 | LSB |
| Differential nonlinearity error | DNL | | - 0.25 | ±0.14 | +0.25 | LSB |
| Zero-level error | $ERR_{ZERO}$ | | - 2.5 | | +2.5 | LSB |
| Zero-scale error drift | | | - 0.25 | ±0.01 | +0.25 | ppm/°C |
| Gain Error | $ERR_{GAIN}$ | | - 2.5 | | +2.5 | LSB |
| Gain Error Drift | | | - 0.5 | ±0.005 | +0.5 | ppm/°C |
| Power supply sensitivity | PSRR | VDD1 = 5V ±5% | | ±0.25 | | LSB |
| | | VDD2 = 1.8V ±5% | | ±0. 5 | | LSB |

AC Parameters ( Unless otherwise specified, $V_{DD1}$ = 5 $V_{DD2}$ = 1.8 V IO = 1.8 V; REF = 4.096 V or 5V; all specifications are relative to TMIN To T MAX

| Parameter name | Symbol | Test conditions | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|---|---|
| Dynamic Range1 | | $f_{IN}$ =1kHz,- 0.5dbFS, $V_{REF}$ =5V | 95 | 96 | | dB |
| Signal-to-Noise Ratio 1 | | | 94.5 | 95.5 | | dB |
| Spurious Free Dynamic Range1 | | | | 118 | | dB |
| Total Harmonic Distortion 1 | | | | - 116 | | dB |
| SNR 1 | | | 94 | 95 | | dB |
| Dynamic Range 2 | | $f_{IN}$ =1kHz,- 0.5dbFS, $V_{REF}$ =4.096V | 94 | 95 | | |
| Signal-to-Noise Ratio 2 | | | 93.5 | 94.5 | | |
| Spurious Free Dynamic Range2 | | | | 114 | | |
| Total Harmonic Distortion 2 | | | | - 112 | | |
| SNR2 | | | 93 | 94 | | dB |
| -3dB Input bandwidth | | | | 28 | | MHz |
| Oversampling Dynamic Range | | OSR=256,$V_{REF}$ =5V | | 115 | | dB |