

# Si720x スイッチ/ラッチ・ホール効果磁気式位置センサー・データシート

Silicon Labs のホール効果磁気センサー・スイッチおよびラッチの Si7201/2/3/4/5/6 ファミリーには、チョップ安定型ホール素子と、低ノイズ・アナログ・アンプ、13 ビット AD コンバータ、適応性の高いコンパレータ回路が組み込まれています。Silicon Labs の実績ある CMOS 設計技術を採用した Si720x ファミリーにはデジタル・シグナル・プロセッサが組み込まれ、温度およびオフセット・ドリフトを正確に補正します。

Si720x ファミリーは、既存のホール効果センサーと比較して業界最先端の感度を備え、より大きなエア・ギャップでより小型の磁石を使用できます。Si720x ファミリーは消費電力が極めて低く、バッテリー駆動アプリケーションの動作寿命を向上させることができます。

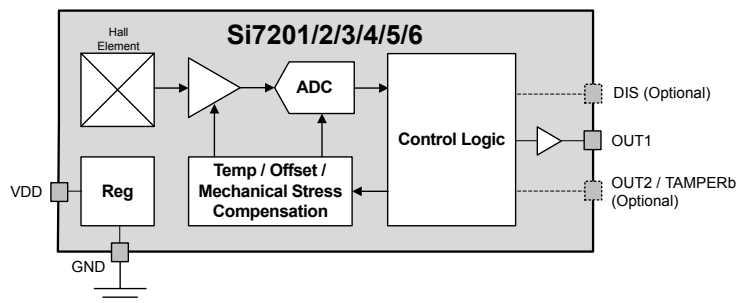
Si720x デバイスは、3 ピン SOT23、5 ピン SOT23、および TO-92 パッケージで提供されています。3 ピンの部品は、電源ピン、グランド・ピン、磁場の増加に合わせてハイまたはローに切り替わる 1 つの出力ピンで構成されます。5 ピンの部品にはさらに、無効化 (スリープ) ピンとタンパー出力ピンがあります。3 ピン・パッケージの場合、タンパー指示は高磁場でピンがゼロ磁場レベルに戻ることで生じます。

## アプリケーション :

- ・ 民生用およびセキュリティ・アプリケーションでリード・スイッチの代わりに使用
- ・ HVAC ノブ、ドア・ロック、窓、その他の機械装置の位置検出
- ・ BLDC モーター制御
- ・ カメラの手ぶれ補正、ズーム、オートフォーカス
- ・ 液面レベル検出
- ・ 制御ノブおよびセレクタ・スイッチ
- ・ 汎用機械式位置検出

## 機能

- ・ 高感度ホール効果センサー
  - ・ 最大 B<sub>OP</sub> 動作ポイント/最小磁界強度 <1.1 mT
  - ・ オムニポーラまたはユニポーラ動作
  - ・ 温度およびオフセット・ドリフト補正用統合型デジタル信号処理
- ・ 低い標準消費電流 400 nA (5 サンプル/秒時)
- ・ 感度、ヒステリシス、出力極性、サンプル・レートを選択可能
- ・ 温度範囲全体の感度ドリフト <±3%
- ・ 幅広い電源電圧
  - ・ 1.71 ~ 5.5 V
  - ・ 3.3 ~ 26.5 V
- ・ 出力オプションを選択可能
  - ・ オープンドレイン出力
  - ・ デジタル・ハイ/ロー出力
- ・ 業界標準パッケージング
  - ・ 表面実装 SOT-23 (3 または 5 ピン)
  - ・ スルーホール TO-92 (3 ピン)
  - ・ 1.4 x 1.6 mm 8 ピン DFN パッケージ (近日発売)



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## 1. Electrical Specifications

Unless otherwise specified, all min/max specifications apply over the recommended operating conditions.

**Table 1.1. Recommended Operating Conditions**

| Parameter   | Symbol   | Test Condition | Min  | Typ | Max               | Unit |
|---|----------|----------------|------|-----|-------------------|------|
| Power Supply  | $V_{DD}$ | Si7201/2/3/4   | 1.71 |     | 5.5 <sup>1</sup>  | V    |
| Power Supply  | $V_{DD}$ | Si7205/6       | 3.3  |     | 26.5              | V    |
| Temperature   | $T_A$    | I grade        | -40  |     | +125 <sup>2</sup> | °C   |
| <b>Note:</b>  |          |                |      |     |                   |      |
| 1. 3.6 V for most sensitive parts (see Chapter 5. Ordering Guide).            |          |                |      |     |                   |      |
| 2. 0-70°C for most sensitive parts (F grade) (see Chapter 5. Ordering Guide). |          |                |      |     |                   |      |

**Table 1.2. General Specifications<sup>1</sup>**

| Parameter           | Symbol   | Test Condition  | Min                 | Typ | Max                 | Unit    |
|---------------------|----------|---|---------------------|-----|---------------------|---------|
| Input Voltage High  | $V_{IH}$ | DIS pin   | $0.7 \times V_{DD}$ | -   | -                   | V       |
| Input Voltage Low   | $V_{IL}$ | DIS pin   | -                   | -   | $0.3 \times V_{DD}$ | V       |
| Input voltage Range | $V_{IN}$ | DIS pin   | 0                   |     | $V_{DD}$            | V       |
| Input Leakage       | $I_{IL}$ | DIS pin   |                     |     | 1                   | $\mu A$ |
| Output Voltage Low  | $V_{OL}$ | TAMPERb pin $I_{OL} = 3 \text{ mA}$<br>$V_{DD} > 2 \text{ V}$       |                     |     | 0.4                 | V       |
|                     |          | TAMPERb pin $I_{OL} = 2 \text{ mA}$<br>$V_{DD} > 1.71 \text{ V}$    |                     |     | 0.2                 | V       |
|                     |          | TAMPERb pin $I_{OL} = 6 \text{ mA}$<br>$V_{DD} > 2 \text{ V}$       |                     |     | 0.6                 | V       |
| Output Voltage High | $V_{OH}$ | TAMPERb pin<br>$I_{OH} = 2 \text{ mA}$<br>$V_{DD} > 2.25 \text{ V}$ | $V_{DD} - 0.4$      |     |                     | V       |

| Parameter  | Symbol              | Test Condition  | Min | Typ | Max  | Unit |    |
|--|---------------------|---|-----|-----|------|------|----|
| Current Consumption<br>Average power depends on the sample rate and percent of time spent sampling versus sleep mode or idle mode. See the ordering guide for average power calculations for specific devices. | I <sub>DD</sub>     | Sleep timer enabled average at V <sub>DD</sub> = 3.3 V and 200 msec sleep time  |     | 0.4 |      | μA   |    |
|  |                     | Sleep mode  |     | 50  |      | nA   |    |
|  |                     | V <sub>DD</sub> = 3.3 V, T = 25 °C  |     |     |      |      | nA |
|  |                     | V <sub>DD</sub> = 3.3 V, T = 70 °C  |     |     | 1000 |      | nA |
|  |                     | V <sub>DD</sub> = 5.5 V, T = 125 °C   |     |     |      | 5000 | nA |
|  |                     | Conversion in progress  |     |     |      |      | mA |
|  |                     | V <sub>DD</sub> = 1.8V  |     |     | 3.5  | 5.5  |    |
|  |                     | V <sub>DD</sub> = 3.3 V   |     |     | 5    | 6    |    |
| V <sub>DD</sub> = 5.5 V  |                     |   | 6.8 | 8.0 |      |      |    |
| Conversion in progress high voltage parts  |                     |   |     | 6.5 | 8.5  | mA   |    |
| V <sub>DD</sub> = 3.3 to 26.5 V  |                     |   |     |     |      |      |    |
| Idle mode low voltage parts  |                     |   |     | 0.6 | 1    | mA   |    |
| V <sub>DD</sub> = 1.71 to 5.5 V  |                     |   |     |     |      |      |    |
| Idle mode high voltage parts   |                     |   |     | 0.9 | 1.2  | mA   |    |
| V <sub>DD</sub> = 3.3 to 26.5 V  |                     |   |     |     |      |      |    |
| Conversion Time  | T <sub>CONV</sub>   | First conversion when waking from sleep or idle   |     | 11  |      | μs   |    |
|  |                     | Additional conversions in a burst   |     | 8.8 |      | μs   |    |
| Sample Rate  | F <sub>SAMPLE</sub> | Parts can be configured for sleep or idle between samples. Sleep is lower power, but the fastest sampling rate is 8 kHz. Idle allows sampling rate to be configured to be as high as 113 kHz. See the ordering guide for details. |     | -   |      |      |    |
| Wake Up Time   | T <sub>WAKE</sub>   | Time from V <sub>DD</sub> > 1.71 V to first measurement   |     |     | 1    | msec |    |

**Note:**

1. TAMPERb and DIS pin specifications apply when the pin is present (Si7203/4).
2. Idle time can be factory programmed from 13.2 μsec to 206 msec ±10% or set to zero in which case conversions are done every 8.8 μsec. Normally idle time is only used at higher sample speeds.
3. For high voltage parts (V<sub>DD</sub> = 26.5 V maximum), the power on ramp should be faster than 10 V per second in the start-up region from 2 to 3 V.

Table 1.3. Output Pin Specifications

| Parameter                                       | Symbol      | Test Condition   | Min            | Typ | Max | Unit                 |
|---|-------------|--|----------------|-----|-----|----------------------|
| <b>Si7201/2/3/4</b>                             |             |  |                |     |     |                      |
| Output Voltage Low<br>Open Drain or Push Pull   | $V_{OL}$    | $I_{OL} = 3 \text{ mA}$<br>$V_{DD} > 2 \text{ V}$        |                |     | 0.4 | V                    |
|   |             | $I_{OL} = 2 \text{ mA}$<br>$V_{DD} > 1.71 \text{ V}$     |                |     | 0.2 | V                    |
|   |             | $I_{OL} = 6 \text{ mA}$<br>$V_{DD} > 2 \text{ V}$        |                |     | 0.6 | V                    |
| Leakage<br>Output High<br>Output Pin Open Drain | $I_{OH}$    |  |                |     | 1   | $\mu\text{A}$        |
| Output Voltage High<br>Output Pin Push Pull     | $V_{OH}$    | $I_{OH} = 2 \text{ mA}$<br>$V_{DD} > 2.25 \text{ V}$     | $V_{DD} - 0.4$ |     |     | V                    |
| Slew Rate                                       | $T_{SLEW}$  |  |                | 5   |     | $\%V_{DD}/\text{ns}$ |
| <b>Si7205/6</b>                                 |             |  |                |     |     |                      |
| Output Voltage Low                              | $V_{OL}$    | $I_{OL} = 11.4 \text{ mA}$<br>$V_{DD} > 6 \text{ V}$     |                |     | 0.4 | V                    |
| Safe Continuous Sink Current                    |             |  |                |     | 20  | mA                   |
| Leakage<br>Output High<br>Output Pin Open Drain | $I_{OH}$    |  |                |     | 1   | $\mu\text{A}$        |
| Slew Rate<br>Digital Output Mode                | $T_{SLEW}$  |  |                | 5   |     | $\%V_{DD}/\text{ns}$ |
| Output Pin Shorted to $V_{DD}$                  | $I_{SHORT}$ | $V_{DD} = 12 \text{ V}$<br>Average current as pin cycles |                | 4   |     | mA                   |

The Si7205 and Si7206 can be configured to signal the status equivalent to output high or low by modulating the power supply current. If configured in this way, the following are the specifications for the amount of current that will be drawn for the “output high” state.

**Table 1.4. I<sub>DD</sub> Signaling**

| Parameter                         | Symbol          | Test Condition         | Min | Typ | Max | Unit |
|-----------------------------------|-----------------|------------------------|-----|-----|-----|------|
| I <sub>DD</sub> Signaling Current | I <sub>DO</sub> | V <sub>DDH</sub> > 6 V | 8   | 10  | 12  | mA   |

**Table 1.5. Magnetic Sensor<sup>1</sup>**

| Parameter              | Symbol           | Test Condition   | Min | Typ  | Max           | Unit   |
|------------------------|------------------|--|-----|------|---------------|--------|
| Offset                 | B <sub>OFF</sub> | 20 mT scale<br>V <sub>DD</sub> = 1.71 to 3.6 V<br>0-70°C                 |     | ±150 | ±250          | μT     |
|                        |                  | 20 mT scale<br>V <sub>DD</sub> = 1.71 to 5.5 V<br>Full temperature range |     | ±250 | +450,<br>-350 | μT     |
| Gain Accuracy          |                  | 0-70°C   |     |      | 5             | %      |
|                        |                  | Full temperature range   |     |      | 10            | %      |
| RMS Noise <sup>2</sup> |                  | Room temp, 20 mT range, V <sub>DD</sub> = 5 V                            |     | 30   |               | μT rms |

**Note:**

1. See the [Magnetic Sensors Selector Guide](#) for operating release points. These are defined as maximum operating point and minimum release point over the operating temperature range and do not include the effect of noise.
2. For a single conversion. This can be reduced by the square root of N by filtering over N samples. See ordering guide for samples taken per measurement.

**Table 1.6. Temperature Compensation**

| Parameter                  | Symbol | Test Condition         | Min | Typ     | Max | Unit |
|----------------------------|--------|------------------------|-----|---------|-----|------|
| Bop and Brp vs Temperature |        | Flat Tempco.<br>0-70°C |     | < ±0.05 |     | %/°C |
|                            |        | Neodymium compensation |     | -0.12   |     | %/°C |
|                            |        | Ceramic compensation   |     | -0.2    |     | %/°C |

Table 1.7. Thermal Characteristics

| Parameter                            | Symbol        | Test Condition                         | Value | Unit |
|--------------------------------------|---------------|--|-------|------|
| Junction to Air Thermal Resistance   | $\theta_{JA}$ | JEDEC 4 layer board no airflow SOT23-5 | 212.8 | °C/W |
| Junction to Board Thermal Resistance | $\theta_{JB}$ | JEDEC 4 layer board no airflow SOT23-5 | 45    | °C/W |
| Junction to Air Thermal Resistance   | $\theta_{JA}$ | JEDEC 4 layer board no airflow SOT23-3 | 254.6 | °C/W |
| Junction to Board Thermal Resistance | $\theta_{JB}$ | JEDEC 4 layer board no airflow SOT23-3 | 54.8  | °C/W |

Table 1.8. Absolute Maximum Ratings<sup>1</sup>

| Parameter   | Symbol | Test Condition | Min  | Typ | Max          | Unit |
|---|--------|----------------|------|-----|--------------|------|
| Ambient Temperature Under Bias                          |        |                | -55  |     | 125          | °C   |
| Storage Temperature                                     |        |                | -65  |     | 150          | °C   |
| Si7201/2/3/4  |        |                |      |     |              |      |
| Voltage on I/O Pins                                     |        |                | -0.3 |     | $V_{DD}+0.3$ | V    |
| Voltage on $V_{DD}$ with Respect to Ground              |        |                | -0.3 |     | 6            | V    |
| ESD Tolerance   |        | HBM            |      |     | 2            | kV   |
|   |        | CDM            |      |     | 500          | V    |
| Si7205/6  |        |                |      |     |              |      |
| Voltage on Output pin <sup>2</sup>                      |        |                | -21  |     | 40           | V    |
| Voltage on $V_{DD}$ with Respect to Ground <sup>3</sup> |        |                | -21  |     | 40           | V    |
| ESD Tolerance   |        | HBM            |      |     | 8            | kV   |
|   |        | CDM            |      |     | 500          | V    |

**Notes:**

1. Absolute maximum ratings are stress ratings only, operation at or beyond these conditions is not implied and may shorten the life of the device or alter its performance.
2. The output pin can withstand EMC transients per ISO 7637-2-2-11 and Ford EMC-CS-2009.1 with a current limiting resistor of 220  $\Omega$  to a local bypass cap of 0.1  $\mu$ F and additional 22  $\Omega$  between the capacitor and ground..
3.  $V_{DD}$  can withstand automotive EMC transients per ISO 7637-2-2-11 and Ford EMC-CS-2009.1 with a current limiting resistor of 220  $\Omega$ .

## 2. Functional Description

The Si7201/2/3/4/5/6 family of Hall Effect magnetic sensors digitize the component of the magnetic field in the z axis of the device (positive field is defined as pointing into the device from the bottom). The digitized field is compared to a pre-programmed threshold and the output pin goes high or low if the threshold is crossed. The parts are normally used to detect the presence or absence of a magnet in security systems, as position sensors or for counting revolutions.

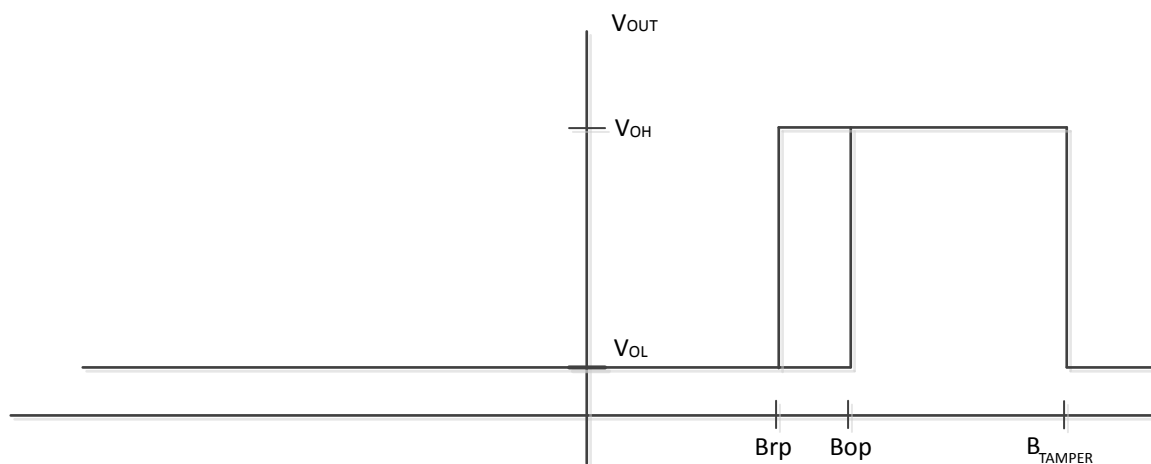
**Table 2.1. Part Ordering Guide**

| Part Number | Description   |
|-------------|---|
| Si7201      | Low voltage switches                                |
| Si7202      | Low voltage latches                                 |
| Si7203      | Low voltage switch with tamper and/or disable pins  |
| Si7204      | Low voltage latches with tamper and/or disable pins |
| Si7205      | High voltage switches                               |
| Si7206      | High voltage latches                                |

The output pin (push pull or open collector) can go high or low when the magnetic field crosses a threshold. The output pin configuration is determined by the type of part ordered.

The parts are preconfigured for the magnetic field measurement range, magnetic field operate and release points, sleep time, temperature compensation, tamper threshold and digital filtering and will wake into this mode when first powered. The specific configuration output type (open collector or push pull) are determined by the part number. See [Magnetic Sensors Selector Guide](#) for details.

Examples:



**Figure 2.1. Unipolar Switch with Tamper**



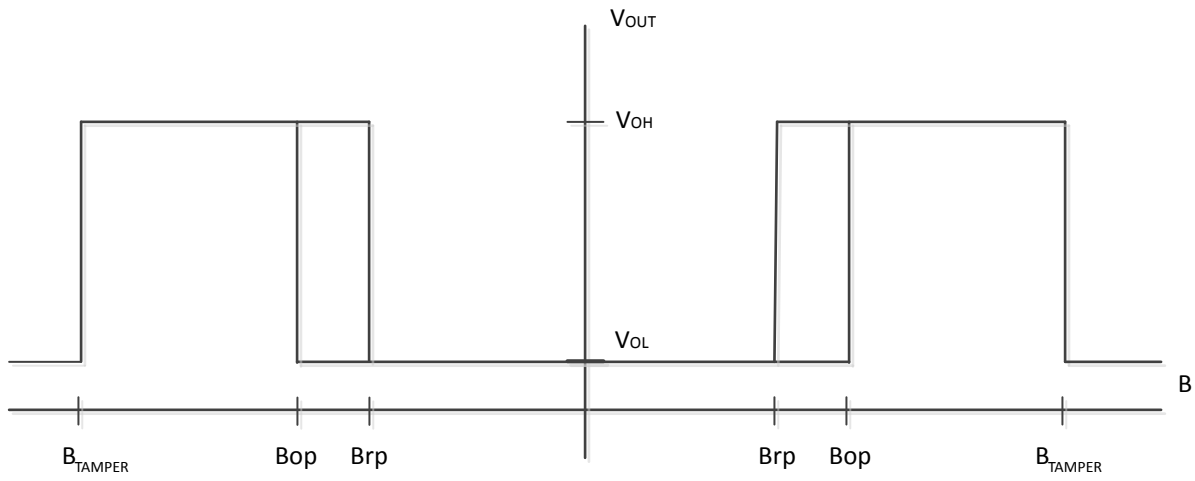


Figure 2.2. Omnipolar Swith with Tamper

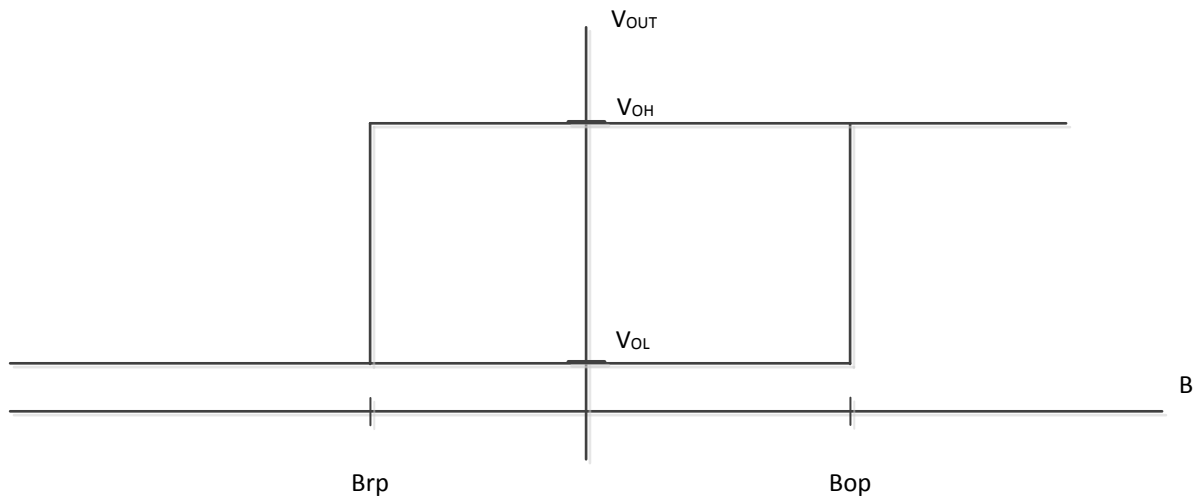


Figure 2.3. Latch

### 3. DISABLE Pin Timing

For a part that has a DISABLE pin, DISABLE high will put the part in complete sleep mode with  $I_{DD}$  typical of 50 nA. When DISABLE goes low, the part will wake and initiate a measurement. For a single measurement, this takes 11  $\mu$ sec typically. Additional measurements in a burst take 8.8  $\mu$ sec. Once the measurement (burst) is complete, the output pin status is updated and the part enters idle mode. The part will make a new measurement or measurement burst at the time-interval determined by the idle timer (typically 1 msec). The idle timer is reset when DISABLE transitions from high to low, so the time from the first measurement until the next measurement will always be the programmed idle time.

Disable low pulses can be as short as 1  $\mu$ sec. For pulses shorter than a conversion burst, the part will make one burst and then go back to sleep.

When disable returns high, a measurement in progress (if any) will complete and the part will enter sleep mode.

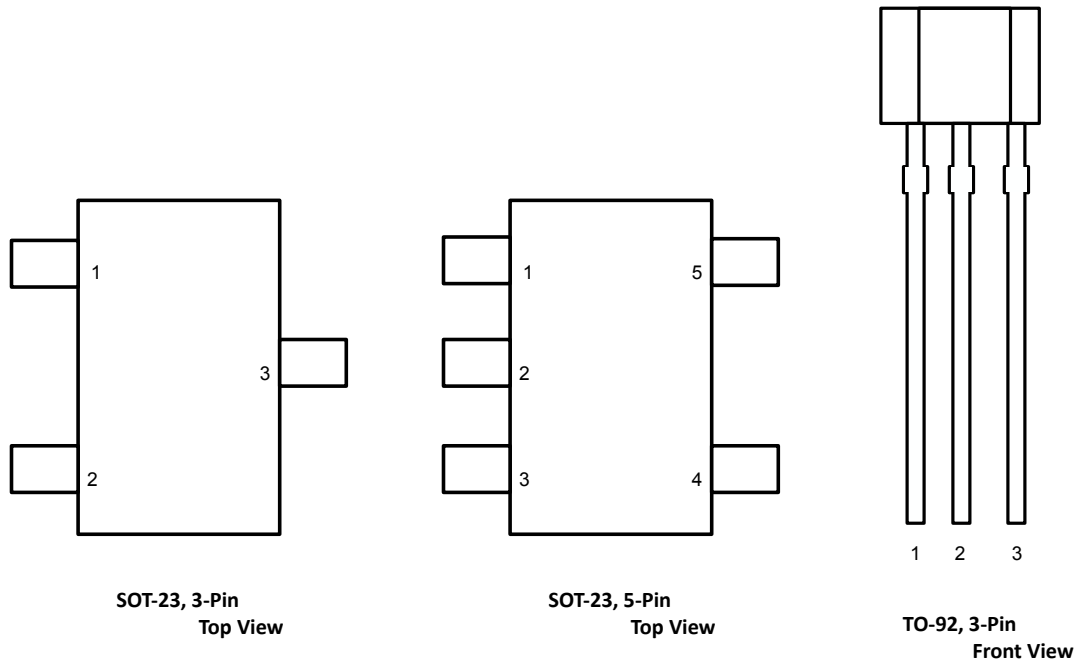
As the idle time is typically long (i.e. 1 msec) compared to the measurement time (i.e. 11  $\mu$ sec), it is possible to keep the DISABLE pin low duration short (i.e. 15  $\mu$ sec) and have a long period in the sleep state. This is an effective way to control the sample rate and power.

For example, if the part is programmed to make a single measurement at a time and is programmed with an idle time of 1 msec and DISABLE is pulsed low for 15  $\mu$ sec every 50 msec, then the average  $I_{DD}$  will be:

- 11  $\mu$ sec to wake and make a measurement at  $I_{DD}$  typical of 5.0 mA (3.3V)/(50.015 msec cycle time) = 1.0  $\mu$ A
- 4  $\mu$ sec in idle mode at typical current of 600  $\mu$ A/(50.015 msec cycle time) = 0.05  $\mu$ A
- 50 msec in sleep mode at 50 nA/(50.015 msec cycle time) = 0.05uA
- Or 1.1  $\mu$ A total

As the programmed idle time is shorter than the DISABLE low time in the example, the value of the programmed idle time does not make a difference.

## 4. Pin Description



**Figure 4.1. Si720xxx Pin Assignments**

**Note:**

The 3-pin option includes part numbers: Si7201/2/5/6.

The SOT-23 5 pin option include part numbers: Si7203/4.

**Table 4.1. Si7201/2/5/6 (SOT23 3-pin Package)**

| Pin Name | Pin Number | Description                          |
|----------|------------|--------------------------------------|
| VDD      | 1          | Power 1.71 to 5.5 V or 3.3 to 26.5 V |
| OUT1     | 2          | Switch/latch output                  |
| GND      | 3          | Ground                               |

**Table 4.2. Si7203/4/5 (SOT23 5-pin Package Excluding Si7203-B-01-IV(R))**

| Pin Name     | Pin Number | Description   |
|--------------|------------|---|
| OUT2/TAMPERb | 1          | OUT2/TAMPERb (tamper/high field indicator)  |
| GND          | 2          | Ground  |
| DIS          | 3          | Disables part (puts into sleep mode) when high. Measurement cycle will resume when pin goes low |
| VDD          | 4          | Power 1.71 to 5.5 V   |
| OUT1         | 5          | Switch/latch output   |

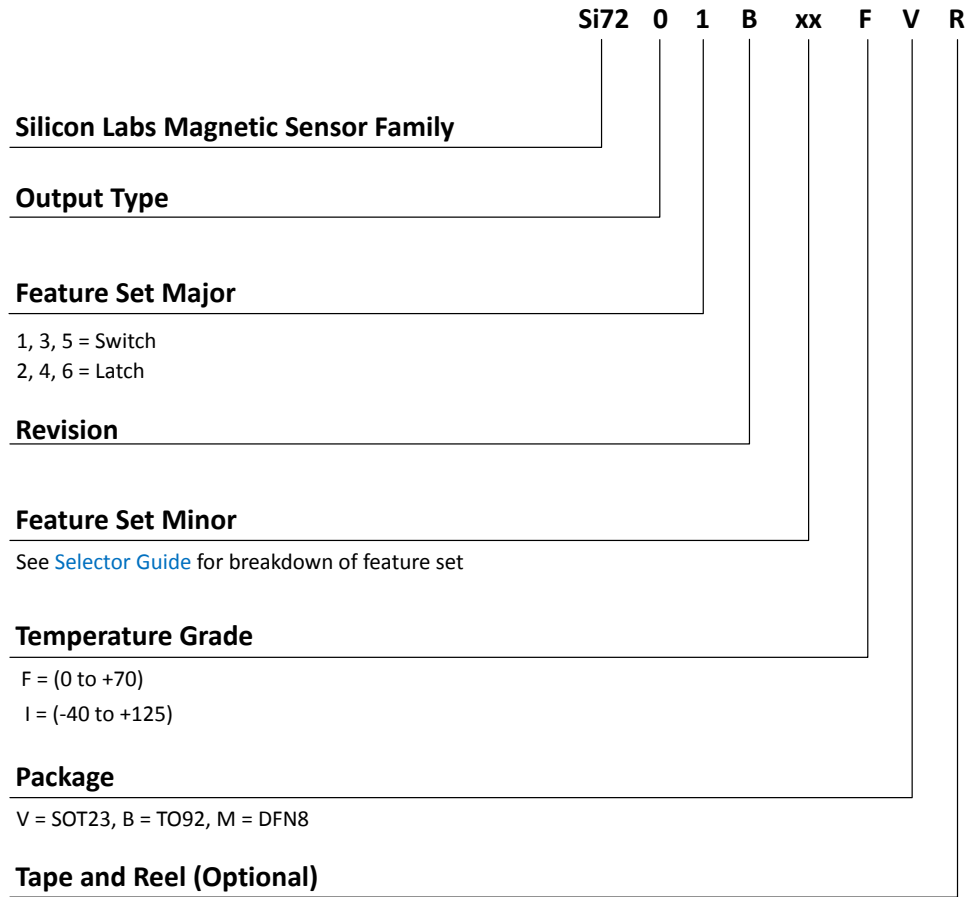
**Table 4.3. Si7203-B-01-IV(R) (SOT23 5-pin Package)**

| Pin Name | Pin Number | Description   |
|----------|------------|---|
| TAMPER   | 1          | TAMPER (tamper)   |
| GND      | 2          | Ground  |
| FLOAT    | 3          | Must be left floating for correct operation of the device |
| VDD      | 4          | Power 1.71 to 5.5 V                                       |
| OUT1     | 5          | Switch output   |

**Table 4.4. Si7201/2/5/6 (TO-92 Package)**

| Pin Name | Pin Number | Description |
|----------|------------|-------------|
| VDD      | 1          | Power       |
| GND      | 2          | Ground      |
| OUT1     | 3          | Output      |

## 5. Ordering Guide



**Figure 5.1. Si720x Part Numbering**

Table 5.1. Switch Product Selection Guide

| OPN            | Bop max (mT) | Brp min (mT) | Bop Typ (mT) | Brp Typ (mT) | Hyst (mT) | Type             | Output type      | Full Scale (mT) | Sample frequency (Hz) | Typical Idd (uA) | Vdd Range (V) | Temperature (°C) | Package | Tamper detection (mT) | Temperature compensation (% per °C) | Digital filtering |
|----------------|--------------|--------------|--------------|--------------|-----------|------------------|------------------|-----------------|-----------------------|------------------|---------------|------------------|---------|-----------------------|-------------------------------------|-------------------|
| Si7201-B-00-FV | 1.1          | 0.2          | 0.8          | 0.4          | 0.4       | Omnipolar switch | Low (Push-Pull)  | 20              | 5                     | 0.4              | 1.7-3.6       | 0 - 70°          | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-01-FV | 1.1          | 0.2          | 0.8          | 0.4          | 0.4       | Omnipolar switch | Low (Push-Pull)  | 20              | 5                     | 0.4              | 1.7-3.6       | 0 - 70°          | SOT23-3 | 19.8                  | —                                   | —                 |
| Si7201-B-02-FV | 0.9          | 0.2          | 0.6          | 0.4          | 0.2       | Omnipolar switch | High (Push-Pull) | 20              | 5                     | 1.1              | 1.7-3.6       | 0 - 70°          | SOT23-3 | 19.8                  | 0.12%                               | 4 sample FIR      |
| Si7201-B-03-IV | 2.8          | 1.1          | 2.2          | 1.6          | 0.6       | Omnipolar switch | High (Push-Pull) | 20              | 1000                  | 56.7             | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-04-IV | 1.4          | 0.2          | 1.0          | 0.6          | 0.4       | Omnipolar switch | Low (Push-Pull)  | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-05-IV | 2.0          | 0.6          | 1.6          | 1.0          | 0.6       | Omnipolar switch | Low (Push-Pull)  | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | 19.8                  | —                                   | —                 |
| Si7201-B-06-IV | 2.0          | 0.6          | 1.6          | 1.0          | 0.6       | Omnipolar switch | Low (Open Drain) | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-07-IV | 2.0          | 0.6          | 1.6          | 1.0          | 0.6       | Omnipolar switch | Low (Open Drain) | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | 19.8                  | —                                   | —                 |
| Si7201-B-08-IV | 3.4          | 1.6          | 2.7          | 2.1          | 0.6       | Omnipolar switch | Low (Open Drain) | 20              | 1000                  | 56.7             | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |

| OPN            | Bop max (mT) | Brp min (mT) | Bop Typ (mT) | Brp Typ (mT) | Hyst (mT) | Type             | Output type      | Full Scale (mT) | Sample frequency (Hz) | Typical Idd (uA) | Vdd Range (V) | Temperature (°C) | Package | Tamper detection (mT) | Temperature compensation (% per °C) | Digital filtering |
|----------------|--------------|--------------|--------------|--------------|-----------|------------------|------------------|-----------------|-----------------------|------------------|---------------|------------------|---------|-----------------------|-------------------------------------|-------------------|
| Si7201-B-09-IB | 2.3          | 0.8          | 1.6          | 1.2          | 0.4       | Omnipolar switch | Low (push-pull)  | 20              | 20                    | 1.2              | 1.7-5.5       | -40 - 125°       | TO92    | —                     | —                                   | —                 |
| Si7201-B-10-IV | 3.7          | 1.5          | 3.0          | 2.0          | 1.0       | Omnipolar switch | Low (Open Drain) | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-11-IB | 2.8          | 1.1          | 2.2          | 1.6          | 0.6       | Omnipolar switch | High (push-pull) | 20              | 8000                  | 420.7            | 1.7-5.5       | -40 - 125°       | TO92    | —                     | —                                   | —                 |
| Si7201-B-12-IV | 3.7          | 1.5          | 3.0          | 2.0          | 1.0       | Omnipolar switch | Low (Open Drain) | 20              | 20                    | 1.2              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-20-IV | 4.9          | 2.3          | 4.0          | 3.0          | 1.0       | Omnipolar switch | Low (Open Drain) | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-21-IV | 4.9          | 2.3          | 4.0          | 3.0          | 1.0       | Omnipolar switch | Low (Open Drain) | 20              | 13.3                  | 0.9              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-22-IV | 4.9          | 2.3          | 4.0          | 3.0          | 1.0       | Omnipolar switch | Low (Open Drain) | 20              | 20                    | 1.2              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-30-IV | 7.0          | 4.1          | 6.0          | 5.0          | 1.0       | Omnipolar switch | Low (Open Drain) | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-31-IV | 7.0          | 4.1          | 6.0          | 5.0          | 1.0       | Omnipolar switch | Low (Open Drain) | 20              | 13.3                  | 0.9              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-32-IV | 7.0          | 4.1          | 6.0          | 5.0          | 1.0       | Omnipolar switch | Low (Open Drain) | 20              | 20                    | 1.2              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |

| OPN            | Bop max (mT) | Brp min (mT) | Bop Typ (mT) | Brp Typ (mT) | Hyst (mT) | Type             | Output type      | Full Scale (mT) | Sample frequency (Hz) | Typical Idd (uA) | Vdd Range (V) | Temperature (°C) | Package | Tamper detection (mT) | Temperature compensation (% per °C) | Digital filtering |
|----------------|--------------|--------------|--------------|--------------|-----------|------------------|------------------|-----------------|-----------------------|------------------|---------------|------------------|---------|-----------------------|-------------------------------------|-------------------|
| Si7201-B-40-IV | 15.0         | 9.6          | 13.2         | 11.2         | 2.0       | Omnipolar switch | Low (Open Drain) | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-41-IV | 15.0         | 9.6          | 13.2         | 11.2         | 2.0       | Omnipolar switch | Low (Open Drain) | 20              | 13.3                  | 0.9              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-80-FV | 3.4          | 1.7          | 3.0          | 2.0          | 1.0       | Omnipolar switch | Low (Push-Pull)  | 20              | 5                     | 0.4              | 1.7-3.6       | 0 - 70°          | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-81-FV | 3.4          | 1.7          | 3.0          | 2.0          | 1.0       | Omnipolar switch | Low (Push-Pull)  | 20              | 5                     | 0.4              | 1.7-3.6       | 0 - 70°          | SOT23-3 | 19.84                 | —                                   | —                 |
| Si7201-B-82-FV | 3.4          | 1.7          | 3.0          | 2.0          | 1.0       | Omnipolar switch | High (Push-Pull) | 20              | 5                     | 1.1              | 1.7-3.6       | 0 - 70°          | SOT23-3 | 19.84                 | 0.12%                               | 4 sample FIR      |
| Si7201-B-83-IV | 3.7          | 1.4          | 3.0          | 2.0          | 1.0       | Omnipolar switch | High (Push-Pull) | 20              | 1000                  | 56.7             | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-84-IV | 3.7          | 1.4          | 3.0          | 2.0          | 1.0       | Omnipolar switch | Low (Push-Pull)  | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-85-IV | 3.7          | 1.4          | 3.0          | 2.0          | 1.0       | Omnipolar switch | Low (Push-Pull)  | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | 19.84                 | —                                   | —                 |
| Si7201-B-86-IV | 3.7          | 1.4          | 3.0          | 2.0          | 1.0       | Omnipolar switch | Low (Open drain) | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| Si7201-B-87-IV | 3.7          | 1.4          | 3.0          | 2.0          | 1.0       | Omnipolar switch | Low (Open drain) | 20              | 5                     | 0.4              | 1.7-5.5       | -40 - 125°       | SOT23-3 | 19.84                 | —                                   | —                 |



| OPN                        | Bop max (mT) | Brp min (mT) | Bop Typ (mT) | Brp Typ (mT) | Hyst (mT) | Type             | Output type       | Full Scale (mT) | Sample frequency (Hz) | Typical Idd (uA) | Vdd Range (V) | Temperature (°C) | Package | Tamper detection (mT) | Temperature compensation (% per °C) | Digital filtering |
|----------------------------|--------------|--------------|--------------|--------------|-----------|------------------|-------------------|-----------------|-----------------------|------------------|---------------|------------------|---------|-----------------------|-------------------------------------|-------------------|
| Si7203-B-00-FV             | 1.1          | 0.2          | 0.8          | 0.4          | 0.4       | Omnipolar switch | High (Open Drain) | 20              | 1000                  | 412              | 1.7-3.6       | 0 - 70°          | SOT23-5 | 19.8                  | —                                   | —                 |
| Si7205-B-00-IV*            | 3.0          | 0.8          | 2.2          | 1.6          | 0.6       | Omnipolar switch | Low (Open Drain)  | 20              | 1000                  | 950              | 3.3-26.5      | -40 - 125°       | SOT23-3 | —                     | —                                   | —                 |
| <b>*Note:</b> End of life. |              |              |              |              |           |                  |                   |                 |                       |                  |               |                  |         |                       |                                     |                   |

Table 5.2. 3-pin Latch Product Selection Guide

| OPN             | Brp Typ [mT] | Bop Typ [mT] | Brp min [mT] | Brp max [mT] | Bop min [mT] | Bop max [mT] | Hyst (mT) | Type  | Output Type | Output (+ field) | Sam- ples Freq (Hz) | Idd Typ | Vdd min | Vdd max | Temp Range | Pack- age |
|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------|-------|-------------|------------------|---------------------|---------|---------|---------|------------|-----------|
| Si7202-B-00-FV  | -0.4         | 0.4          | -0.7         | -0.1         | 0.1          | 0.7          | 0.8       | Latch | Push Pull   | High             | 5                   | 0.4     | 1.7     | 3.6     | 0 - 70°    | SOT23-3   |
| Si7202-B-01-IB  | -1.0         | 1.0          | -1.5         | -0.5         | 0.5          | 1.5          | 1.9       | Latch | Push Pull   | Low              | 5                   | 0.4     | 1.7     | 5.5     | -40 - 125° | TO92      |
| Si7202-B-01-IV  | -1.0         | 1.0          | -1.5         | -0.5         | 0.5          | 1.5          | 1.9       | Latch | Push Pull   | Low              | 5                   | 0.4     | 1.7     | 5.5     | -40 - 125° | SOT23-3   |
| Si7202-B-02-IV  | -5.1         | 5.1          | -6.1         | -4.3         | 4.3          | 6.1          | 10.2      | Latch | Push Pull   | High             | 5                   | 0.4     | 1.7     | 5.5     | -40 - 125° | SOT23-3   |
| Si7202-B-04-IB  | -1.0         | 1.0          | -1.5         | -0.5         | 0.5          | 1.5          | 1.9       | Latch | Push Pull   | Low              | 5                   | 0.4     | 1.7     | 5.5     | -40 - 125° | TO92      |
| Si7206-B-00-IV* | -1.0         | 1.0          | -1.5         | -0.5         | 0.5          | 1.5          | 1.9       | Latch | Open Drain  | Low              | 1000                | 950     | 3.3     | 26.5    | -40 - 125° | SOT23-3   |

\*Note: End of life.

Table 5.3. 5-pin Latch Product Selection Guide

| OPN              | Brp Typ [mT] | Bop Typ [mT] | Brp min [mT] | Brp max [mT] | Bop min [mT] | Bop max [mT] | Hyst (mT) | Pin 1      | Pin 3   | Idle/Sleep Mode | Type  | Output (+ field) | Sam- ples Freq (Hz) | Idd Typ | Vdd min | Vdd max | Temp Range | Pack- age |
|------------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------|------------|---------|-----------------|-------|------------------|---------------------|---------|---------|---------|------------|-----------|
| Si7204 - B-00-FV | -0.9         | 0.9          | -1.2         | -0.6         | 0.6          | 1.2          | 1.8       | No Connect | Disable | Idle            | Latch | High             | 1000                | -       | 1.7     | 3.6     | 0 - 70°    | SOT23 -5  |

### Additional Information

For information on the below specifications of each OPN please refer to the [Magnetic Sensors Selector Guide](#):

- Current Consumption
- Amount of digital filtering applied to the samples
- Time between measurements
- Temperature compensation

A temperature compensation can be applied to the field data to adjust for the variation in field with temperature for common magnet types.

**Note:** North pole of a magnet at the bottom of a SOT23 package, top of a DFN 8 package(coming soon) or front of a TO92 package is defined as positive field.

## 6. Package Outline

### 6.1 SOT23 3-Pin Package

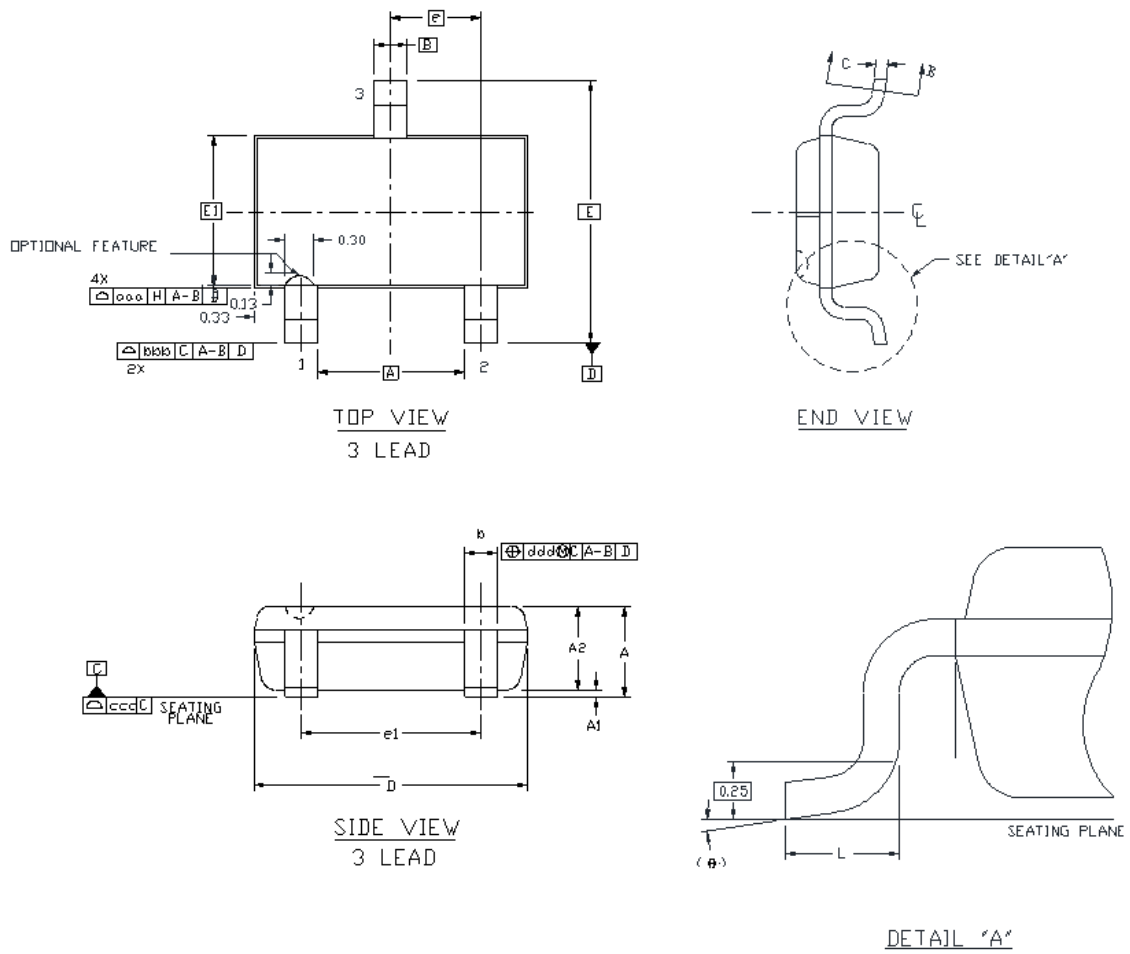


Table 6.1. SOT23 3-Pin Package Dimensions

| Dimension | Min      | Max  |
|-----------|----------|------|
| A         | --       | 1.25 |
| A1        | 0.00     | 0.10 |
| A2        | 0.85     | 1.15 |
| b         | 0.30     | 0.50 |
| c         | 0.10     | 0.20 |
| D         | 2.90 BSC |      |
| E         | 2.75 BSC |      |
| E1        | 1.60 BSC |      |
| e         | 0.95 BSC |      |
| e1        | 1.90 BSC |      |
| L         | 0.30     | 0.60 |
| $\theta$  | 0°       | 8°   |
| aaa       | 0.15     |      |
| bbb       | 0.20     |      |
| ccc       | 0.10     |      |
| ddd       | 0.20     |      |

**Note:**

1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.
3. This drawing conforms to the JEDEC Solid State Outline MO-193, Variation AB.
4. Recommended card reflow profile is per the JEDEC/IPC J-STD-020D specification for Small Body Components.

6.2 SOT23-5 5-Pin Package

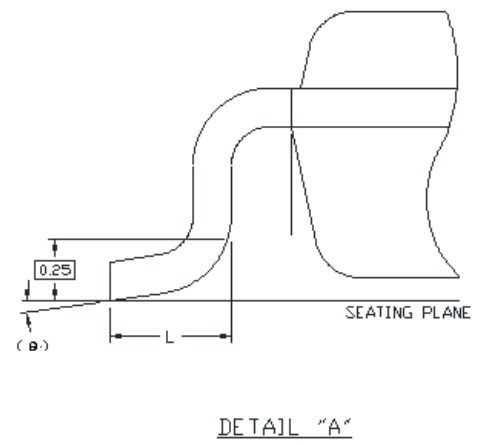
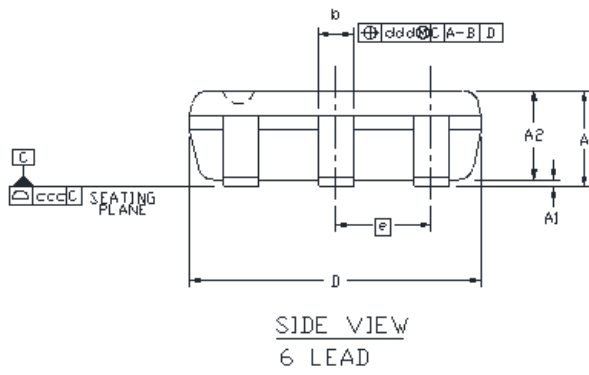
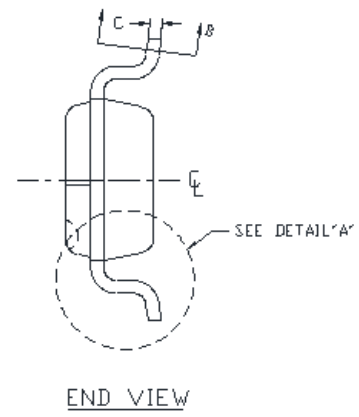
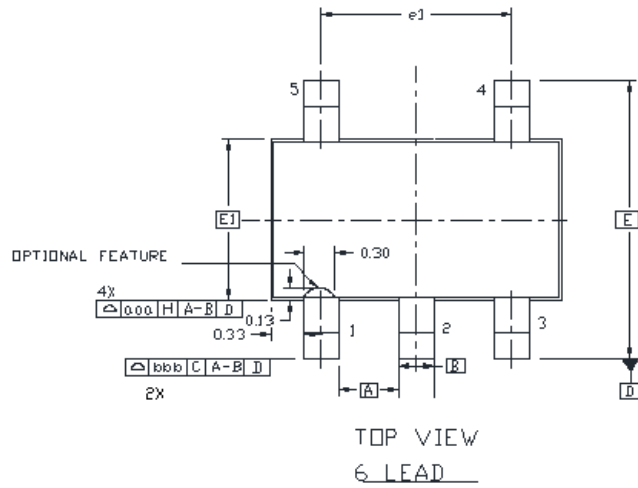


Table 6.2. SOT23-5 5-Pin Package Dimensions

| Dimension   | Min      | Max  |
|---|----------|------|
| A   | --       | 1.25 |
| A1  | 0.00     | 0.10 |
| A2  | 0.85     | 1.15 |
| b   | 0.30     | 0.50 |
| c   | 0.10     | 0.20 |
| D   | 2.90 BSC |      |
| E   | 2.75 BSC |      |
| E1  | 1.60 BSC |      |
| e   | 0.95 BSC |      |
| e1  | 1.90 BSC |      |
| L   | 0.30     | 0.60 |
| L2  | 0.25 BSC |      |
| $\theta$  | 0°       | 8°   |
| aaa   | 0.15     |      |
| bbb   | 0.20     |      |
| ccc   | 0.10     |      |
| ddd   | 0.20     |      |
| <b>Note:</b>  |          |      |
| 1. All dimensions shown are in millimeters (mm) unless otherwise noted.                                     |          |      |
| 2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.   |          |      |
| 3. This drawing conforms to the JEDEC Solid State Outline MO-193, Variation AB.                             |          |      |
| 4. Recommended card reflow profile is per the JEDEC/IPC J-STD-020D specification for Small Body Components. |          |      |



6.3 TO92S 3-Pin Package

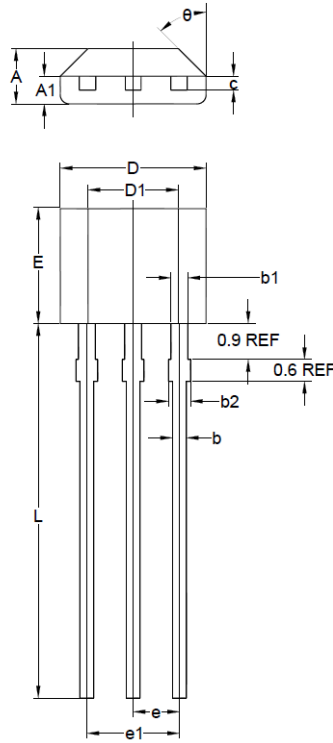


Table 6.3. TO92S 3-Pin Package Dimensions

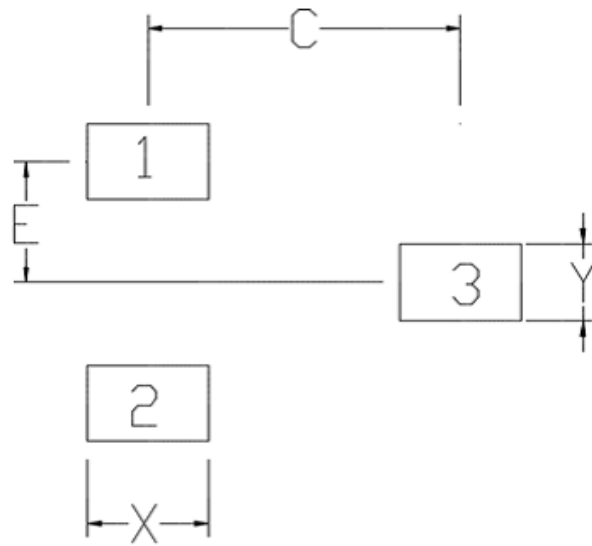
| Dimension | Min      | Max   |
|-----------|----------|-------|
| A         | 1.42     | 1.62  |
| A1        | 0.66     | 0.86  |
| b         | 0.33     | 0.48  |
| b1        | 0.40     | 0.51  |
| b2        | 0        | 0.76  |
| c         | 0.33     | 0.51  |
| D         | 3.90     | 4.10  |
| D1        | 2.28     | 2.68  |
| E         | 3.05     | 3.25  |
| e         | 1.27 TYP |       |
| e1        | 2.44     | 2.46  |
| L         | 15.10    | 15.50 |
| $\theta$  | 45° TYP  |       |

Notes:

1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. Dimensioning and Tolerancing per ANSI Y14.5M-1994.

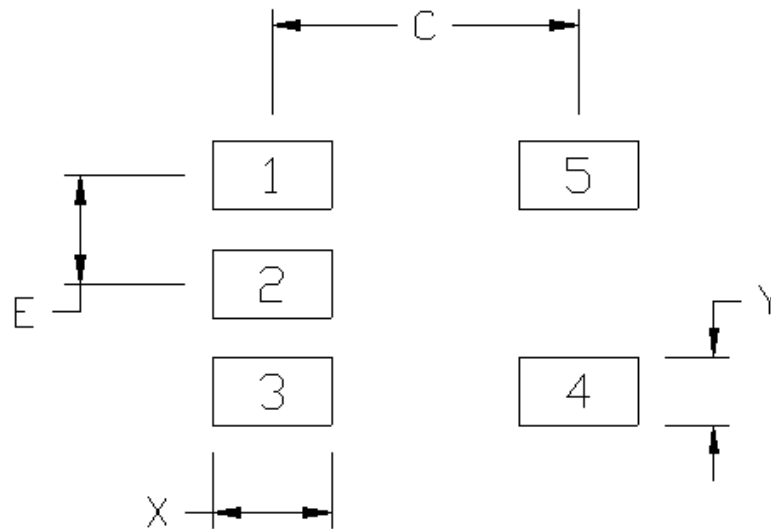
## 7. Land Patterns

### 7.1 SOT23 3-Pin PCB Land Pattern



| Dimension | (mm) |
|-----------|------|
| C         | 2.70 |
| E         | 0.95 |
| X         | 1.05 |
| Y         | 0.60 |

## 7.2 SOT23-5 5-Pin PCB Land Pattern



| Dimension | (mm) |
|-----------|------|
| C         | 2.70 |
| E         | 0.95 |
| X         | 1.05 |
| Y         | 0.60 |

**Note:****General**

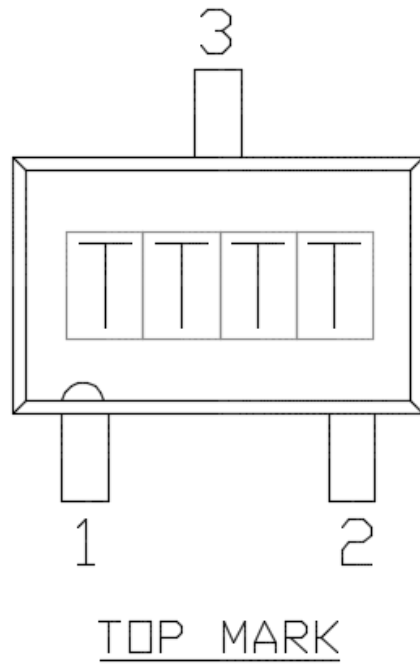
1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. Dimensioning and Tolerancing is per the ANSI Y14.5M-1994 specification.
3. This Land Pattern Design is based on the IPC-7351 guidelines.
4. All dimensions shown are at Maximum Material Condition (MMC). Least Material Condition (LMC) is calculated based on a Fabrication Allowance of 0.05 mm.

**Card Assembly**

1. A No-Clean, Type-3 solder paste is recommended.
2. The recommended card reflow profile is per the JEDEC/IPC J-STD-020D specification for Small Body Components.

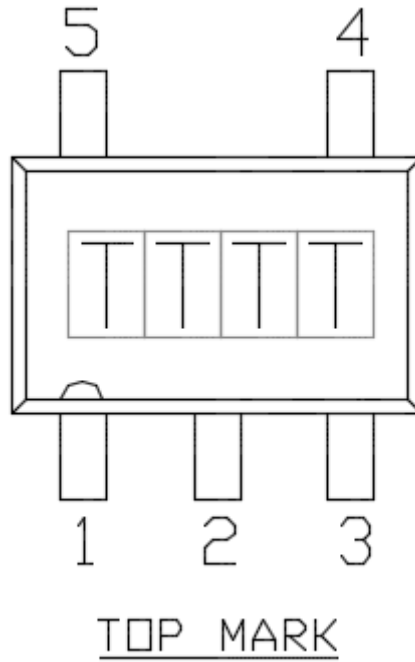
## 8. Top Marking

### 8.1 SOT23 3-Pin Top Marking



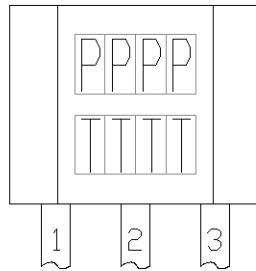
**Note:** TTTT is a manufacturing code.

### 8.2 SOT23-5 5-Pin Top Marking



**Note:** TTTT is a manufacturing code.

### 8.3 TO92 Top Marking



**Note:** TTTT is a manufacturing code. PPPP is 72xx.

## 9. Revision History

### Revision 1.4

May, 2020

- Added EOL note for Si7205/06 in the Ordering Guide (200324717 End of Life Notification for High Voltage Si72xx Devices).

### Revision 1.3

October, 2019

- Updated Chapter 5. [Ordering Guide](#) with newly released part numbers.
  - Si7203-B-01-IV
- Added specific pinout for newly release Si7203-B-01-IV

### Revision 1.2

July, 2019

- Updated Chapter 5. [Ordering Guide](#) with newly released part numbers.
  - Si7201-B-1x
  - Si7201-B-2x
  - Si7201-B-3x
  - Si7201-B-4x
  - Si7201-B-8x
  - Si7201-B-9x
- Updated wording on frontpage to clarify package types and switch vs latch

### Revision 1.1

March, 2019

- Removed all mention of AEC-Q100 qualification in product description and feature list.

### Revision 1.0

July 2018

- Updated power numbers to be consistent with production test limits.
- Added more detailed part characteristics to the ordering guide.
- Updated detailed description to be clearer and more accurate.

### Revision 0.92

October 4, 2017

- Added new part number to Chapter 5. [Ordering Guide](#) (Si7202-B-01-IV(R)).

### Revision 0.91

August 7, 2017

- Added new part number to Chapter 5. [Ordering Guide](#) (Si7201-B-08-IV(R)).

### Revision 0.9

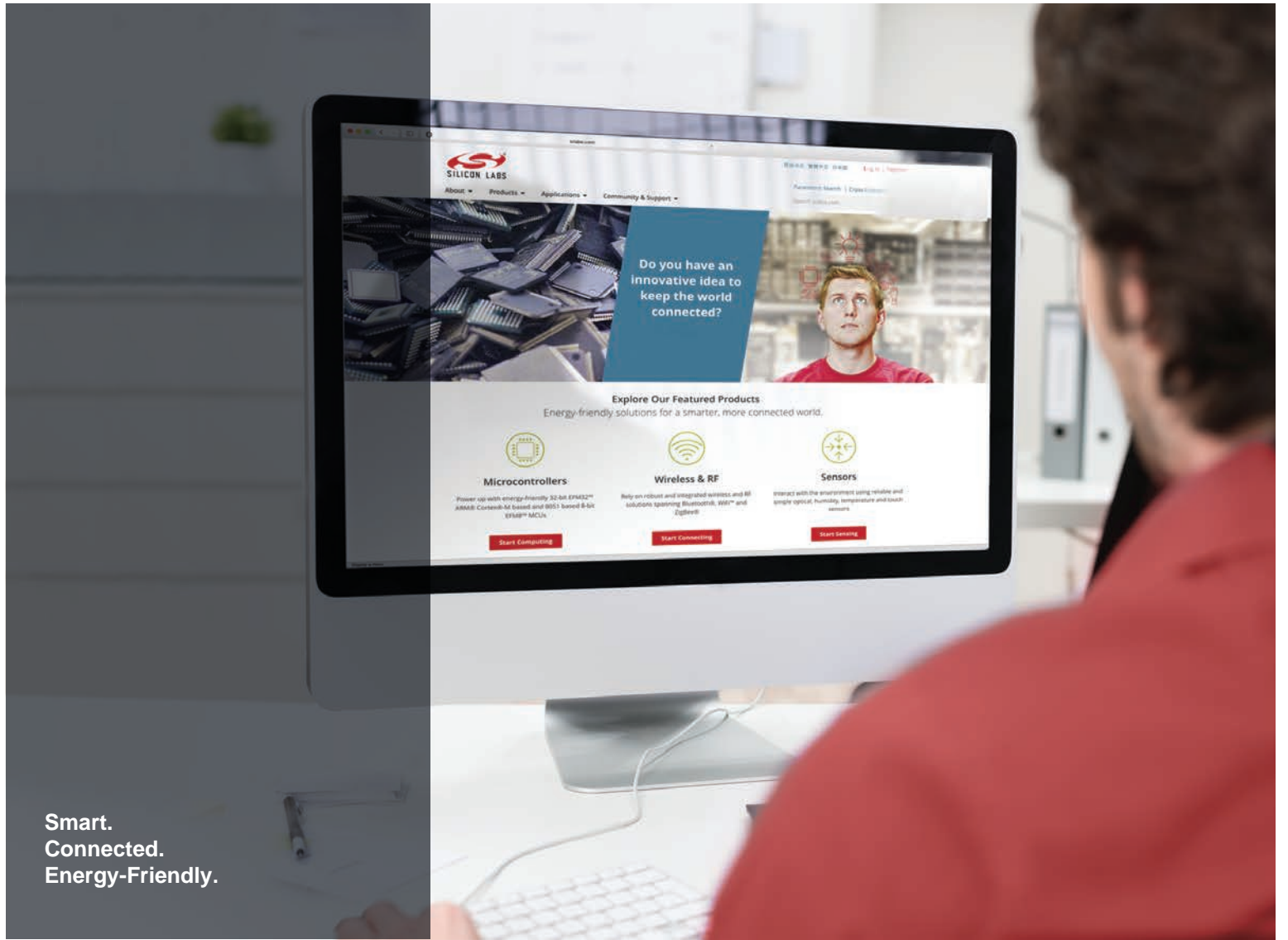
June 30, 2017

- Updated Chapter 1. [Electrical Specifications](#) .
- Updated Chapter 5. [Ordering Guide](#).
- Minor typo corrections.

**Revision 0.1**

February 1, 2016

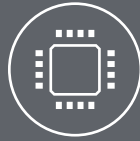
- Initial release.



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