PS25201B
EPIC Ultra High Impedance ECG Sensor
Advance Information

Data Sheet 291497 issue 4

FEATURES

- Ultra high input resistance, typically 20GΩ.
- Dry-contact capacitive coupling.
- Input capacitance as low as 15pF.
- Lower -3dB point typically 200mHz.
- Upper -3dB point typically 10kHz.
- Operates with bipolar power supply from ±2.4V to ±5.5V.
- Sensors supplied in a custom package with exposed pins for surface mount assembly.

APPLICATIONS

- Contact ECG signal detection for:
  - Non-critical patient monitoring equipment.
  - Emergency response diagnostics.
  - Lifestyle sports and health products.
  - Suitable for long-term and remote monitoring.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS25201B</td>
<td>Custom package</td>
<td>-25°C to +75°C</td>
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</table>

Plessey Semiconductors Electric Potential Integrated Circuit (EPIC) product line targets a range of applications.

The PS25201B is an ultra high impedance solid state ECG (electrocardiograph) sensor. It can be used as a dry contact ECG sensor without the need for potentially dangerous low impedance circuits across the heart. The resolution available is as good as or better than conventional wet electrodes.

The device uses active feedback techniques to both lower the effective input capacitance of the sensing element (Cin) and boost the input resistance (Rin). These techniques are used to realise a sensor with a frequency response suitable for both diagnostic and monitoring ECG applications.

Fig. 1 PS25201B - Top and Bottom

Fig. 2 Internal circuit of EPIC ECG Sensor
ELECTRICAL CHARACTERISTICS

\( T_{\text{amb}} = -25^\circ\text{C} \text{ to } +75^\circ\text{C}, V_{\text{dd}}/V_{\text{ss}} \pm 2.4\text{V to } \pm 5.5\text{V} \). The electrical characteristics are guaranteed by either production test or by design and characterisation. They apply within the specified ambient temperature and supply voltage unless otherwise stated.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>±2.4</td>
<td>±5.5</td>
<td>V</td>
</tr>
<tr>
<td>Supply current</td>
<td>0.6</td>
<td>2.5</td>
<td>3.5 mA</td>
</tr>
<tr>
<td>Effective input resistance</td>
<td>20</td>
<td>GΩ</td>
<td></td>
</tr>
<tr>
<td>Effective input capacitance</td>
<td>15</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Voltage Gain (Av)</td>
<td>47.5</td>
<td>50</td>
<td>52.5 @1kHz</td>
</tr>
<tr>
<td>Coupling capacitance</td>
<td>250</td>
<td>pF</td>
<td>Sensor to skin</td>
</tr>
<tr>
<td>Lower -3dB point</td>
<td>0.20</td>
<td>Hz</td>
<td>Set by internal DC signal rejection network – coupling capacitor 250pF</td>
</tr>
<tr>
<td>Upper -3dB point</td>
<td>4.0</td>
<td>kHz</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 3 Typical Bode Plot for EPIC ECG Sensor
PIN ASSIGNMENT

Output Pin 1

Bottom View

Output
Pin 1

Bottom View

Output
Pin 1

Top View

Bottom View

Output
Pin 1

Top View

Bottom View

Output
Pin 1

MECHANICAL DIMENSIONS

The package diagram is shown below. It is recommended that a solder pad 1.6mm diameter be defined for the mounting of the sensor pins.

Fig. 5 Mechanical Drawing (all dimensions are nominal and in mm)
ELECTROSTATIC DISCHARGE (ESD) PROTECTION

The PS25201B is manufactured using a high performance analog CMOS process. As for all CMOS components, it is essential that conventional ESD protection protocols be applied for the handling of this device.

PATENTS

This component and many of the associated applications are covered by the following international patents:

- 602 32 911.6-08 (DE)
- AU2007228660
- CA2646411
- CN200780026584.8
- EP1451595 (CH)
- EP1451595 (ES)
- EP1451595 (FR)
- EP1451595 (IE)
- EP1451595 (IT)
- EP1451595 (NL)
- EP2002273
- EP2047284
- EP2174416
- GB1118970.1
- JP2009-500908
- JP4391823
- TW097126903
- TW1308066
- US12/293872
- US12/374359
- US12/669615
- US13/020890
- US13/163988
- US7885700
APPLICATION OF THE ECG SENSOR

Because of the large coupling capacitance to the body (around 250pF) the EPIC sensor’s internal electrometer can be used in differential mode to recover true surface potential ECG signals from the surface of the skin. A typical ECG signal at the surface of the skin is 1mV p-p.

![Application of the ECG Sensor Diagram](image)

**Fig. 7** Differential measurement of body (skin) surface potential to produce ECG trace

![ECG Signal Comparison](image)

**Fig. 8** Comparison of two vectors from a pair of EPIC sensors (top) and two conventional Ag/AgCl electrodes (bottom)
For further information about this and other products, please visit:
www.plesseysemiconductors.com