

## FEATURES

- Ultra high input resistance, typically 20G $\Omega$ .
- Dry-contact capacitive coupling.
- Input capacitance as low as 15pF.
- Lower -3dB point typically 50mHz to meet clinical ECG requirements.
- Upper -3dB point typically 20kHz.
- Operates with bipolar power supply from  $\pm 2.4V$  to  $\pm 4.0V$ .
- 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

PS25204  
Custom package  
  
**-25°C to +75°C**

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

The PS25204 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 ( $C_{in}$ ) and boost the input resistance ( $R_{in}$ ). These techniques are used to realise a sensor with a frequency response suitable for both diagnostic and monitoring ECG applications.

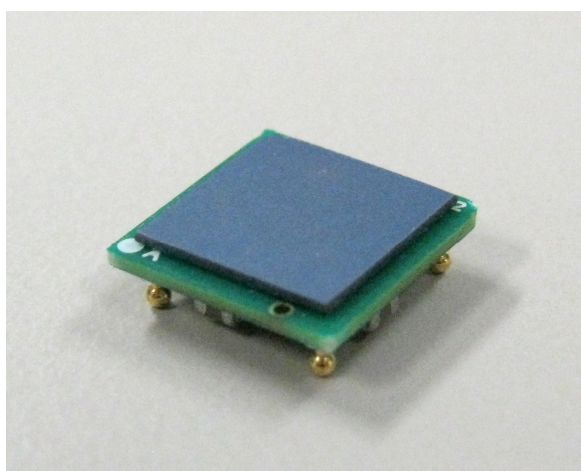


Fig. 1 PS25204

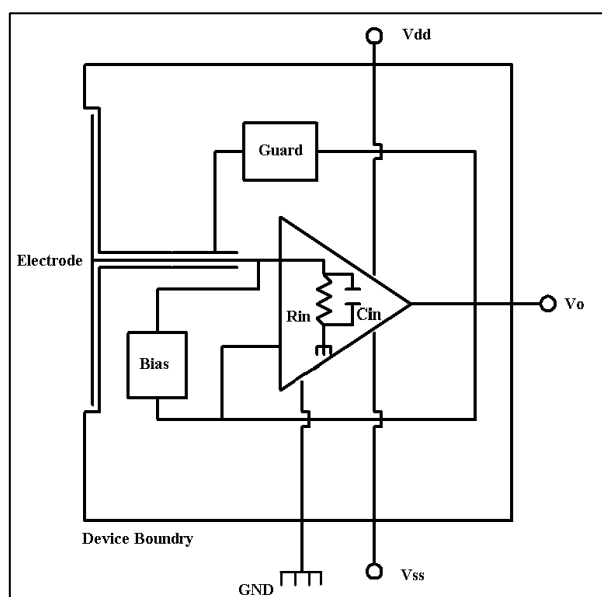


Fig. 2 Internal circuit of EPIC ECG Sensor

## ELECTRICAL CHARACTERISTICS

$T_{amb} = -25^{\circ}\text{C}$  to  $+75^{\circ}\text{C}$ ,  $V_{dd}/V_{ss} \pm 2.4\text{V}$  to  $\pm 4.0\text{V}$ . 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.

| Characteristics             | Value     |      |           | Units      | Conditions   |
|-----------------------------|-----------|------|-----------|------------|--|
|                             | Min.      | Typ. | Max.      |            |  |
| Supply voltage              | $\pm 2.4$ |      | $\pm 4.0$ | V          | Bipolar supply, Gnd=0V   |
| Supply current              | 1.5       | 2.5  | 3.5       | mA         |  |
| Effective input resistance  |           | 20   |           | G $\Omega$ |  |
| Effective input capacitance |           | 15   |           | pF         |  |
| Voltage Gain ( $A_v$ )      |           | 10   |           |            | Sensor to skin<br>Set by internal DC signal rejection network – coupling capacitor 250pF |
| Coupling capacitance        |           | 250  |           | pF         |  |
| Lower -3dB point            |           | 0.05 |           | Hz         |  |
| Upper -3dB point            |           | 20.0 |           | kHz        |  |
| Noise                       |           | tbd  |           |            |  |

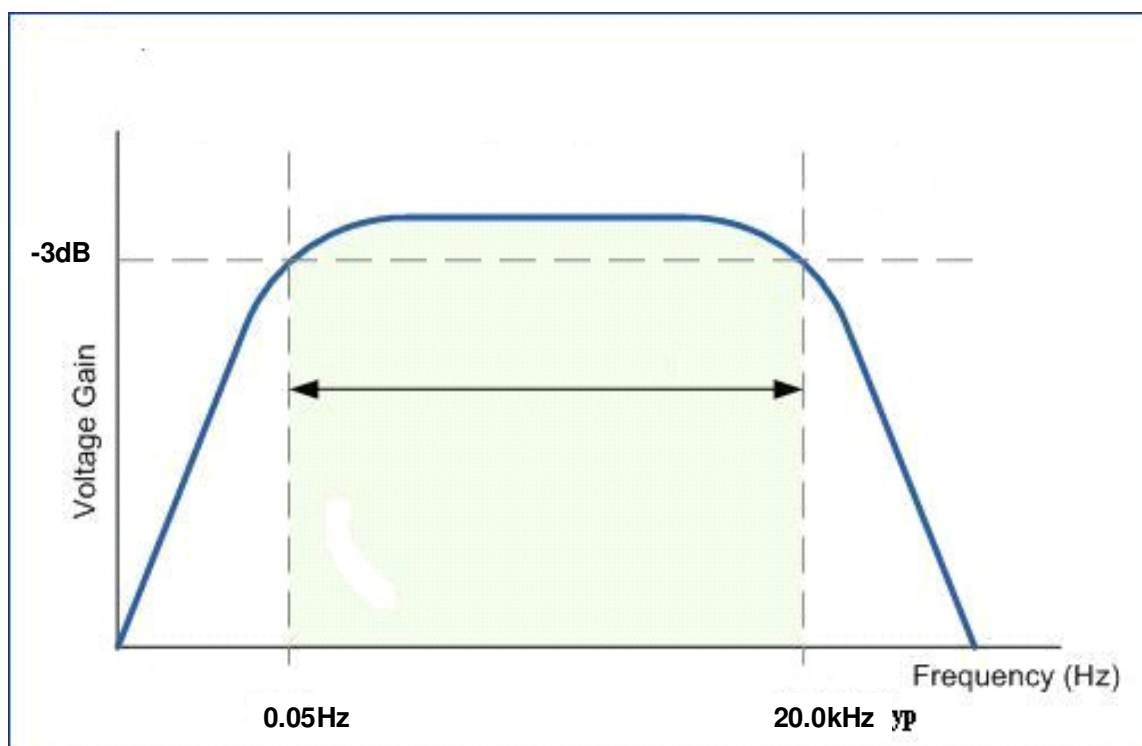


Fig. 3 Typical Bode Plot for EPIC ECG Sensor

## PIN ASSIGNMENT

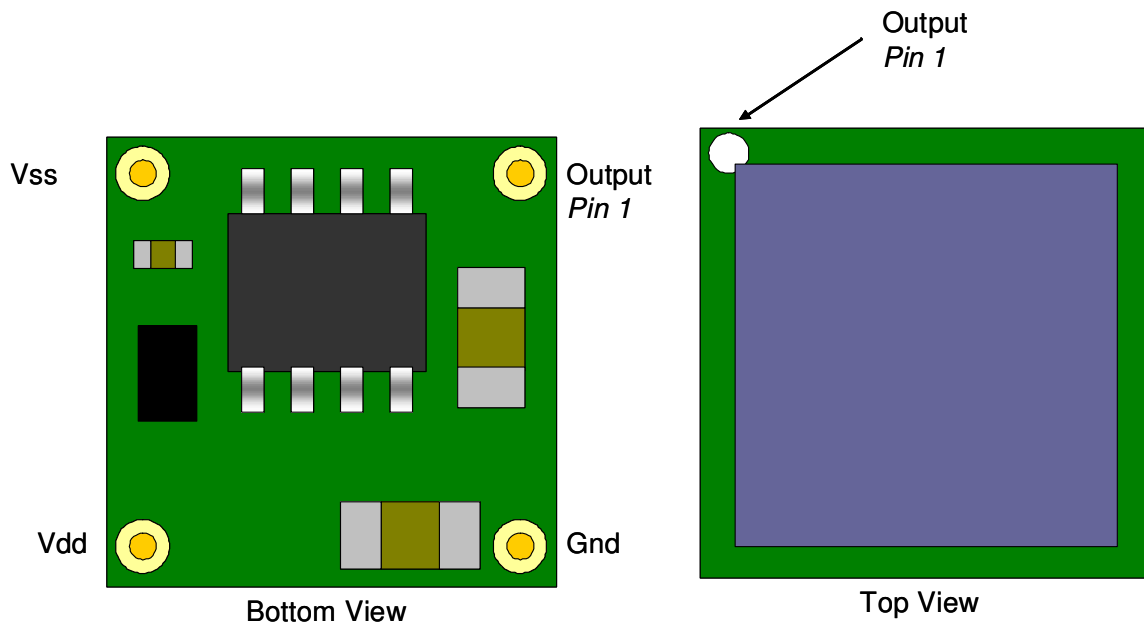


Fig. 4 Pin Assignment for the PS25204

## MECHANICAL DIMENSIONS

A preliminary package diagram is shown below. This is certain to change and so should only be used for illustration purposes.

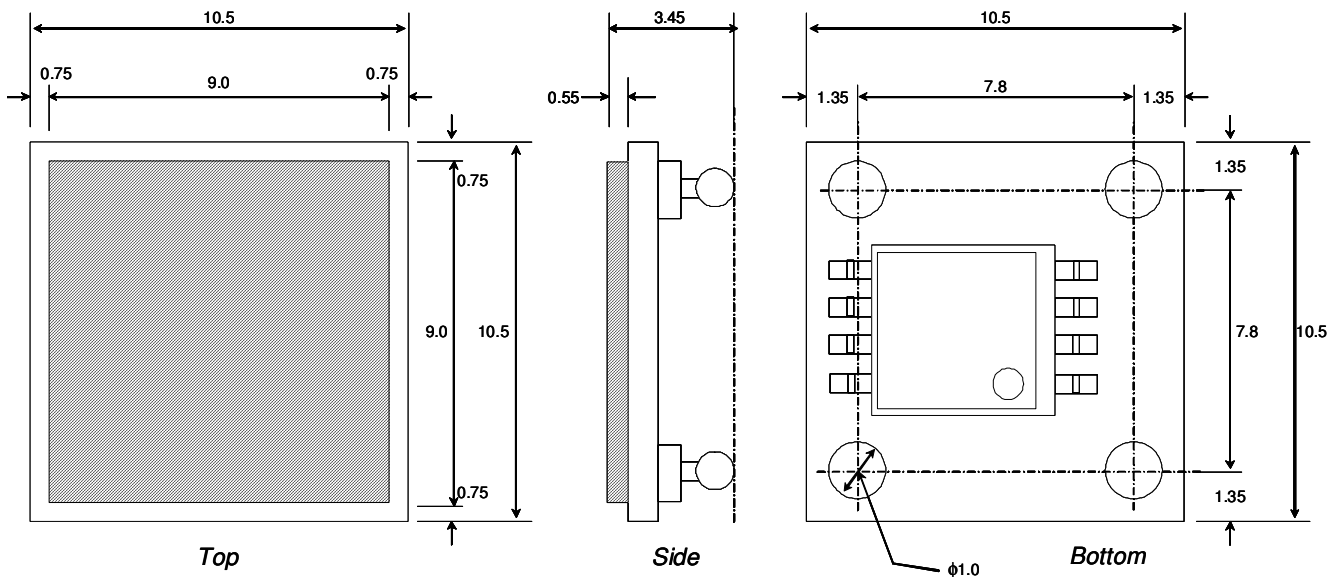


Fig. 5 Mechanical Drawing (all dimensions are nominal and in mm)

**ELECTROSTATIC DISCHARGE (ESD) PROTECTION**

The PS25204 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) | EP2174416     |
| AU2007228660         | GB1118970.1   |
| CA2646411            | JP2009-500908 |
| CN200780026584.8     | JP4391823     |
| EP1451595 (CH)       | TW097126903   |
| EP1451595 (ES)       | TW1308066     |
| EP1451595 (FR)       | US12/293872   |
| EP1451595 (IE)       | US12/374359   |
| EP1451595 (IT)       | US12/669615   |
| EP1451595 (NL)       | US13/020890   |
| EP2002273            | US13/163988   |
| EP2047284            | 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.

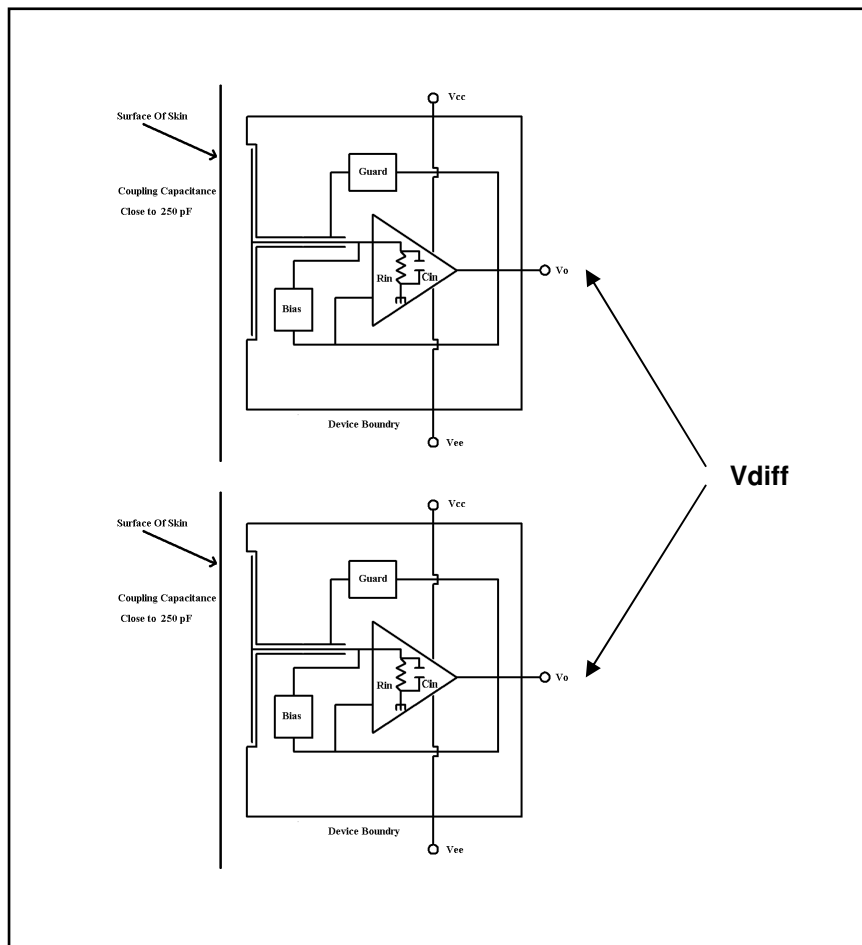


Fig. 7 Differential measurement of body (skin) surface potential to produce ECG trace



Fig. 8 Comparison of two vectors from a pair of EPIC sensors (top) and two conventional Ag/AgCl electrodes (bottom)

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