

PS25251 EPIC QFN Sensor, electrophysiology, high gain

Datasheet



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

The PS25251 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.

FEATURES

- Ultra high input resistance, typically 20G Ω .
- 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 $\pm 2.4V$ to $\pm 5.5V$.
- Sensors supplied in a custom package with exposed pins for surface mount assembly.
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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.

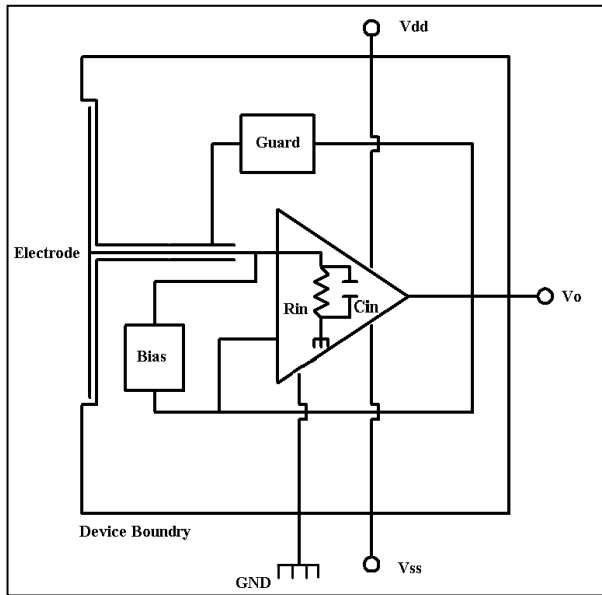


Fig. 2 Internal circuit of EPIC ECG Sensor

ELECTRICAL CHARACTERISTICS

$T_{amb} = -25^{\circ}\text{C}$ to $+75^{\circ}\text{C}$, $V_{dd}/V_{ss} \pm 2.4\text{V}$ to $\pm 5.5\text{V}$. 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.

Characteristics	Value			Units	Conditions
	Min.	Typ.	Max.		
Supply voltage	± 2.4		± 5.5	V	Bipolar supply, Gnd=0V
Supply current	0.6	2.0	3.5	mA	
Effective input resistance		20		G Ω	
Effective input capacitance		15		pF	
Primary Output Voltage Gain (A_v)	47.5	50	52.5		@1kHz
Coupling capacitance		250		pF	Sensor to skin
Guard Output voltage gain	0.95	1.0	1.05		@1kHz
Lower -3dB point		0.20		Hz	Set by internal DC signal rejection network – couplina cabacitor 250nF
Upper -3dB point	4.0			kHz	

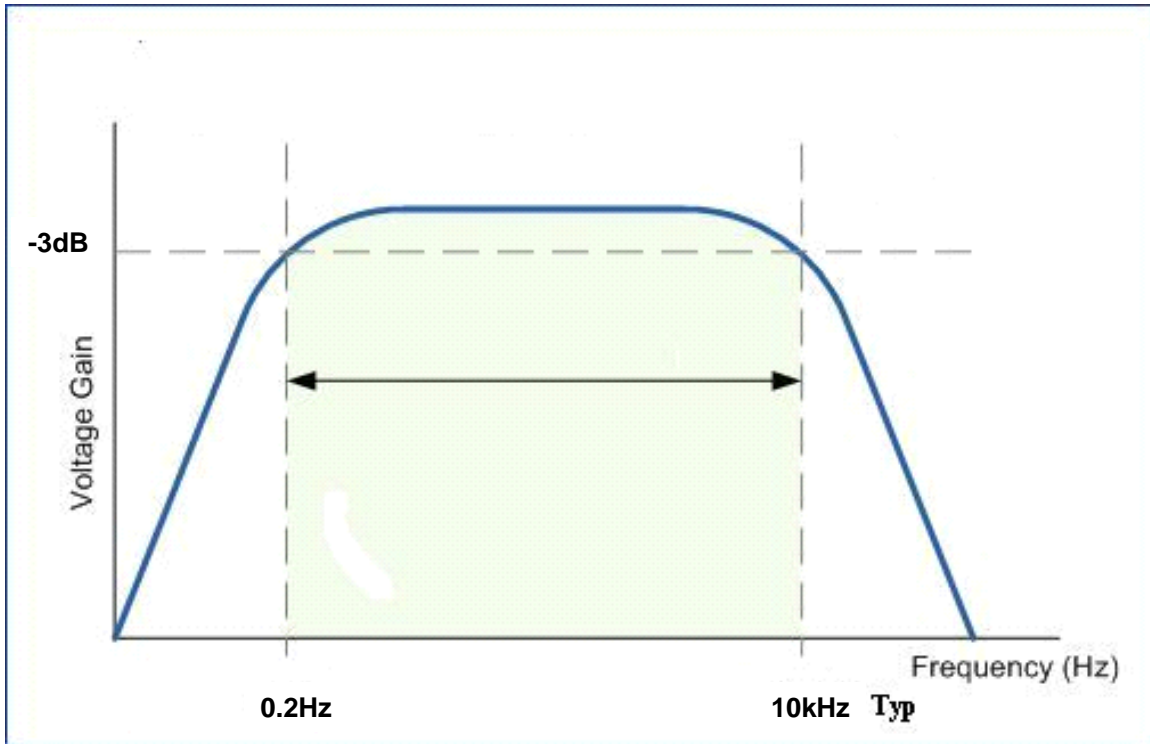


Fig. 3 Typical Bode Plot for EPIC ECG Sensor

PIN ASSIGNMENT

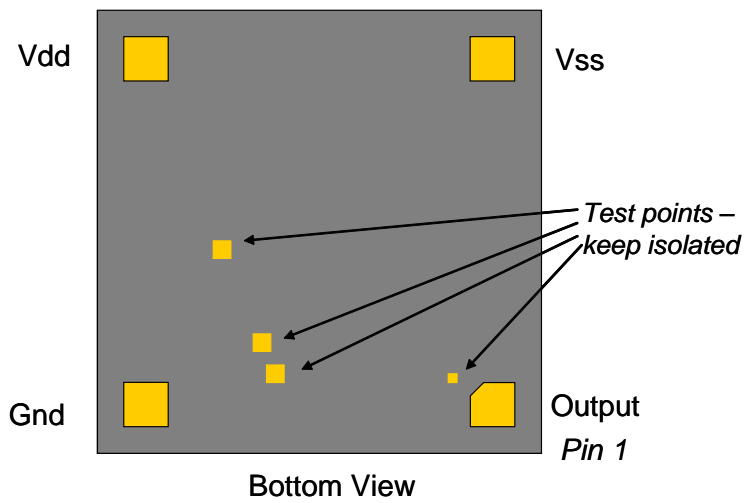


Fig. 4 Pin Assignment for the PS25251

MECHANICAL DIMENSIONS

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

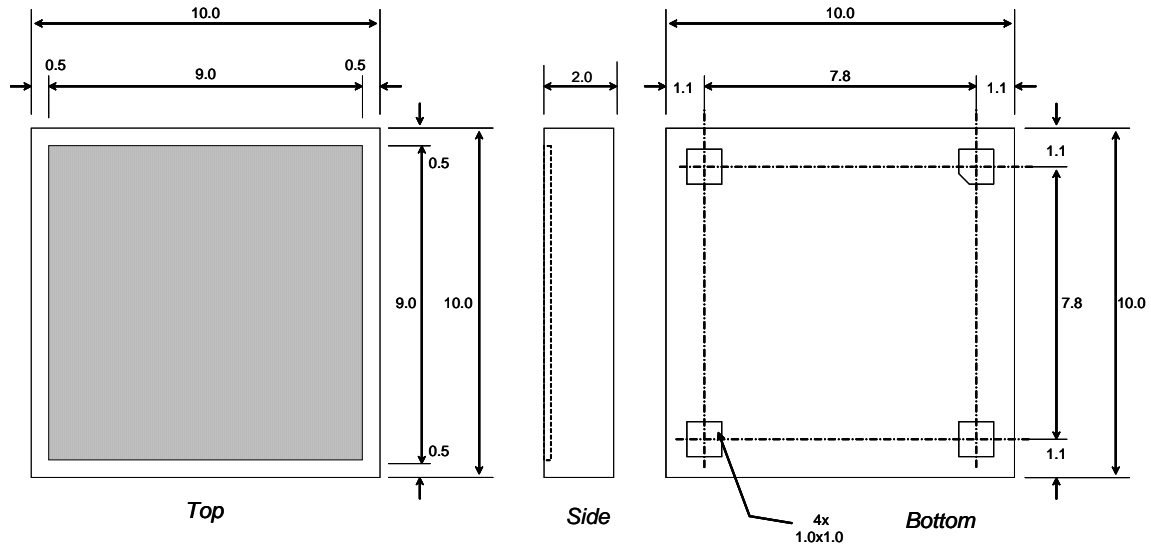


Fig. 5 Mechanical Drawing (all dimensions are nominal and in mm)

ELECTROSTATIC DISCHARGE (ESD) PROTECTION

The PS25251 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.

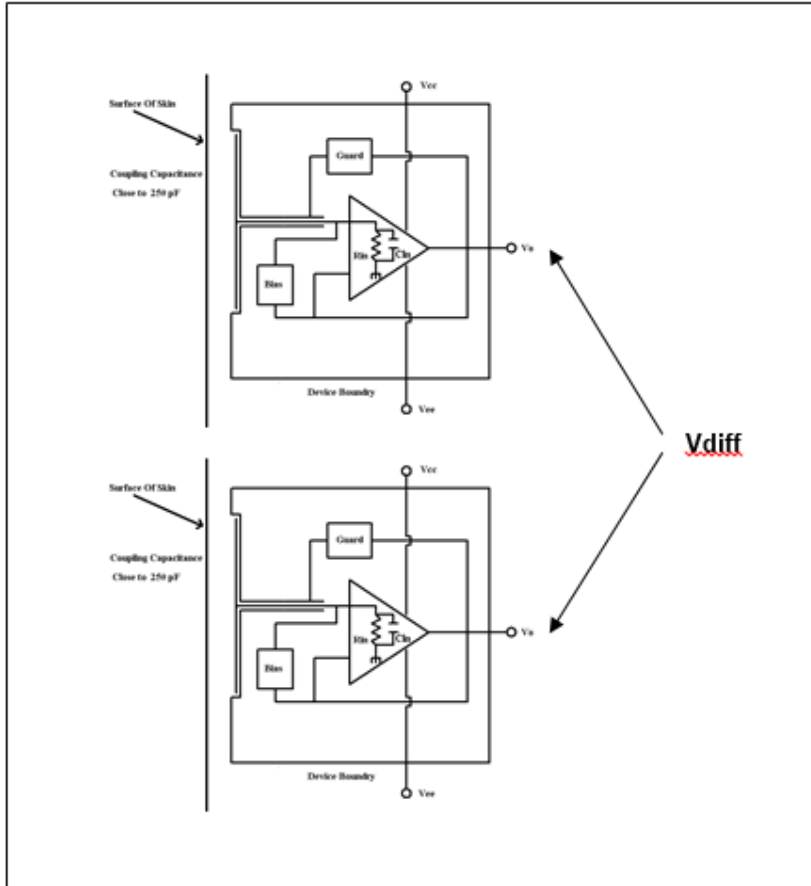


Fig. 7 Differential measurement of body (skin) surface potential to produce ECG trace

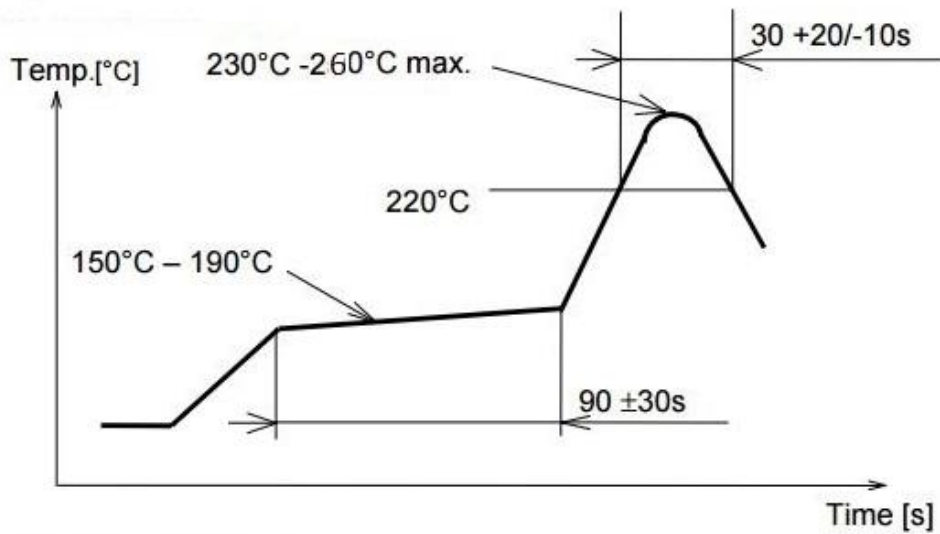


Fig. 8 Comparison of two vectors from a pair of EPIC sensors (top) and two conventional Ag/AgCl electrodes (bottom)

Soldering

Care should be taken during soldering as the device pads are delicate. A suitable low temperature re-flow paste should be used and the temperature profile shown below should be adhered to.

FOR LEADFREE SOLDER



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