

# 用于多传感器可穿戴设备、光学心率监测和生物传感 且具有 FIFO 的 AFE44S30 超小型集成式 AFE

## 1 特性

- 支持多达 24 个相位的信号采集
- 在每个相位内均可实现灵活的 8 个 LED、4 个 PD 分配
- 从不同的传感器以不同的数据速率同时采集信号
- 精确、连续的心率监测：
  - 在 16 $\mu$ A PD 电流下系统 SNR 高达 108dB
  - 以低电流在可穿戴设备上持续运行，其典型值为：LED 为 15 $\mu$ A，接收器为 20 $\mu$ A
- 发送器：
  - 支持共阳极 LED 配置
  - 8 位可编程 LED 电流，可调范围为 25mA 至 250mA
  - 可点亮两个并联 LED 且具有独立的每相位电流控制功能的模式
  - 每相位可编程 LED 导通时间
  - 同时支持 8 个 LED，适用于 SpO<sub>2</sub>、HRM 或多波长 HRM
- 接收器：
  - 支持 4 路时分多路复用光电二极管输入
  - 2 个并行接收器（两组 TIA/滤波器）
  - 每个 TIA 输入端具有单独的环境失调电压消减 DAC，具有 8 位的每相位控制功能和高达 255 $\mu$ A 的可调范围
  - 每个 TIA 输入端具有单独的 LED 失调电压消减 DAC，具有 5 位的每相位控制功能和 15.5 $\mu$ A 的范围
  - 接近 100dB 的环境抑制，频率高达 10Hz
  - 具有可编程带宽的噪声滤波功能
  - 跨阻增益：3.7k $\Omega$  至 1M $\Omega$
- 支持外部时钟和内部振荡器模式
- 可选择以与系统主时钟同步的方式获取数据
- 自动环境、LED 直流消除
- 采样深度为 128 的 FIFO
- SPI 接口
- 2.6mm x 2.1mm DSBGA 封装，0.4mm 间距
- 电源：Rx: 1.7V-1.9V（LDO 旁路）；1.9V-3.6V（LDO 启用），Tx: 3V-5.5V，IO: 1.7-3.6V

## 2 应用

- 用于可穿戴设备和耳戴式设备的光学心率监测 (HRM)
- 心率变异分析 (HRV)
- 脉动式血氧计 (SpO<sub>2</sub>) 测量

## 3 说明

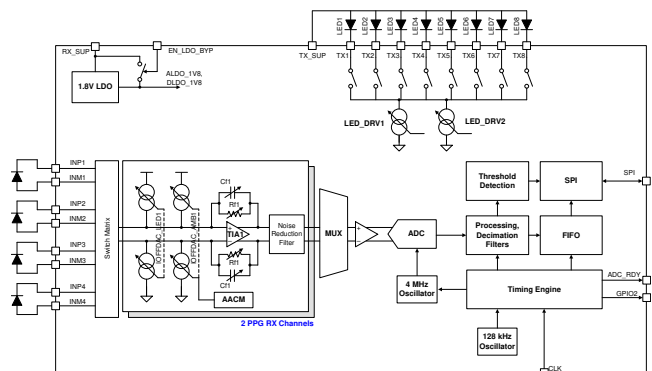
AFE44S30 是一款模拟前端，面向光学生物传感应用，例如心率监测 (HRM) 和周围毛细血管氧饱和度 (SpO<sub>2</sub>) 测量。该器件支持多达八个可切换发光二极管 (LED) 和四个光电二极管。可以定义多达 24 个信号相位，并且能够以同步方式从每个相位获取信号。光电二极管的电流通过跨阻放大器 (TIA) 转换为电压，并使用模数转换器 (ADC) 进行数字化。ADC 代码可存储在 128 样本的先入先出 (FIFO) 块中。可以使用 SPI 接口对 FIFO 进行读取。这款 AFE 还配有带 8 位电流控制的全集成 LED 驱动器。该器件具有宽动态范围的发送和接收电路，有助于检测超小信号电平。

### 器件信息(1)

器件型号	封装	封装尺寸 (标称值)
AFE44S30	DSBGA (30)	2.60mm x 2.10mm

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。

### 简化原理图



## 4 器件和文档支持

### 4.1 接收文档更新通知

要接收文档更新通知，请导航至 [ti.com](http://ti.com) 上的器件产品文件夹。单击右上角的通知我进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

### 4.2 支持资源

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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### 4.3 商标

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### 4.4 静电放电警告



ESD 可能会损坏该集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理措施和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

### 4.5 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

## 5 机械、封装和可订购信息

以下页面包含机械、封装和可订购信息。这些信息是指定器件的最新可用数据。数据如有变更，恕不另行通知，且不会对此文档进行修订。如需获取此数据表的浏览器版本，请查阅左侧的导航栏。

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
AFE44S30YZR	ACTIVE	DSBGA	YZ	30	3000	TBD	Call TI	Call TI	-40 to 85	AFE44S30	Samples
AFE44S30YZT	ACTIVE	DSBGA	YZ	30	250	TBD	Call TI	Call TI	-40 to 85	AFE44S30	Samples

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBsolete:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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