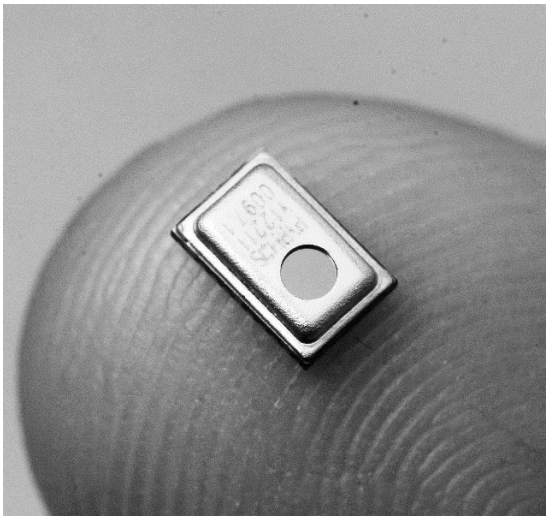
ezPyro™ SMD I²C Pyroelectric Infrared Broadband Sensors

Introduction

The Broadcom® ezPyro™ thin film digital pyroelectric IR sensor combines high-quality sensors with a high level of configurable electronic integration in a small SMD package. High sensitivity combined with fast response times ensure rapid and accurate detection of target gases. These sensors integrate a digital, current mode read-out that enables lower IR-emitter duty cycles, thereby saving significantly on system-level power consumption, while maintaining high SNR. Programmable gain and filtering offer maximum flexibility in system design. Industry-standard I²C communication enables plug-and-play connectivity to microcontrollers and allows easy tuning and calibration. These sensors are very stable over time, ensuring a long and maintenance-free operational lifespan. Various optical filter options are available.



To make it easier for customers to use their own optical bandpass filters, Broadcom provides sensors with either a 2.5-6 µm or 6-14 µm broadband filter. Optical bandpass filters can be applied in front of these broadband filters.

Sensor Characteristics	
Filter Aperture	d = 1.65 mm
Element Size	0.64 x 0.64 mm^2
SMD Package	5.65 x 3.7 x 1.55 mm
D* (typ.) [1]	2.5 x 10^8 cm√Hz/ W
NEP (typ.) [1]	2.7 x 10^{-10} W/√Hz
Time Constant	~10ms (10-20 Hz peak)
Field of View	~90°

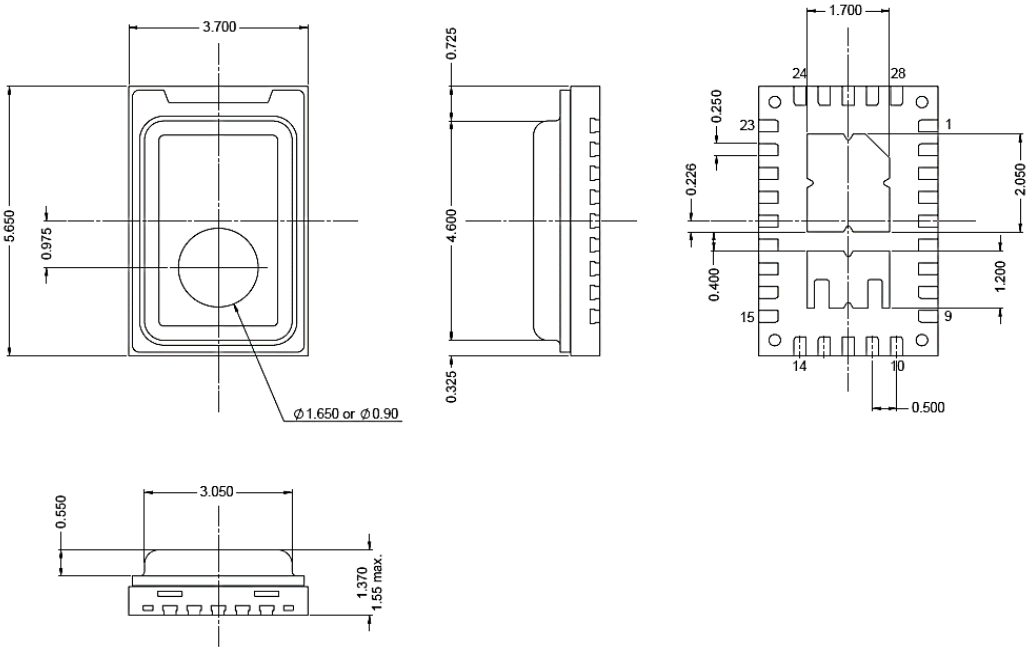
Electrical Characteristics	
Supply Voltage	1.75 to 3.6 V
Supply Current (typ.)	1 to 23 µA
Digital I/O	I²C (FM+ compatible)
ADC	15-bit ΔΣ ADC @1ksp
Operating Temperature	-40 to +85 °C
Storage Temperature	-40 to +110 °C
Sensor Readout	Current mode
Configurable	Gain / digital filtering / sampling rate / power modes

1) Measured without filter @ 500K, 10 Hz, room temperature

Order Information

Part Number	Marking	Filter	Filter Bandwidth	Package Size
AFBR-S6EPY12121B	Y12121	2.2 µm Long Pass	2.5 - 6 µm	Sensor on a breakout PCB
AFBR-S6EPY12121R	Y12121	2.2 µm Long Pass	2.5 - 6 µm	800 pcs on 7-in. tape and reel
AFBR-S6EPY12111B	Y12111	5.0 µm Long Pass	5 - 14 µm	Sensor on a breakout PCB
AFBR-S6EPY12111R	Y12111	5.0 µm Long Pass	5 - 14 µm	800 pcs on 7-in. tape and reel

Package Information



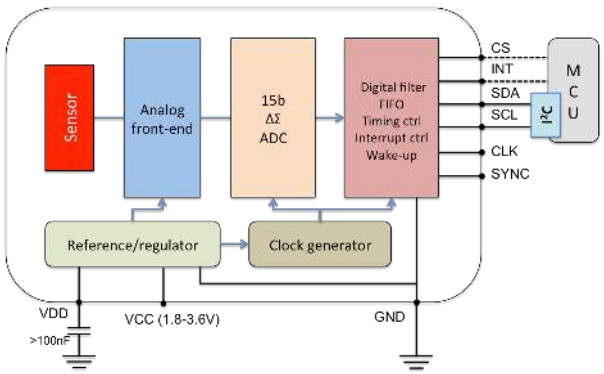
Signal Filtering & Power Modes

Power Mode (base sample rate)	High Pass Filter – Analog (Hz)					Fixed Analog Low Pass Filter (Hz)	Fixed Digital Low Pass Filter (Hz)	Digital Low Pass Filter (Hz)				Max ADC Sampling Rate (sps)
Normal Power Mode	Off	1	2	4	8	600	250	180	90	45	22.5	1000
Low Power Mode	Off	0.17	0.33	0.66	1.3	100	42	30	15	7.5	3.75	166

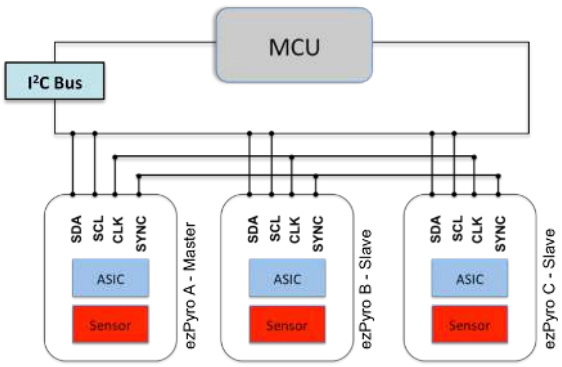
	Mode	Description	Typical Current Consumption (1.8 V, room temperature)
Power consumption	Normal Power Mode	Normal power consumption, 1 kHz max. sample rate	22 µA
	Low Power Mode	Low power consumption, 166 Hz max. sample rate	3.5 µA
Operational state	Normal Operation Mode	Sensor signal readout over I²C	22 µA
	Sleep Mode	Hardware interrupt on infrared trigger	21 µA (Normal), 3.5 µA (Low)
	Power Down Mode	Sensor is disabled	1.1 µA

Circuit Diagrams

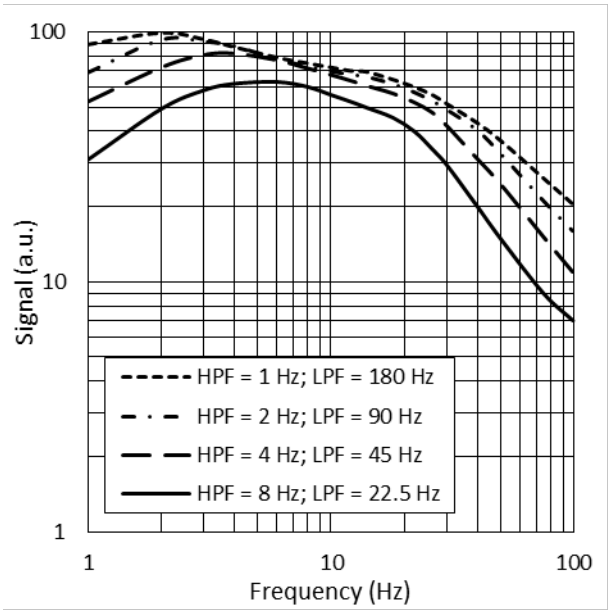
Single Device Block Diagram



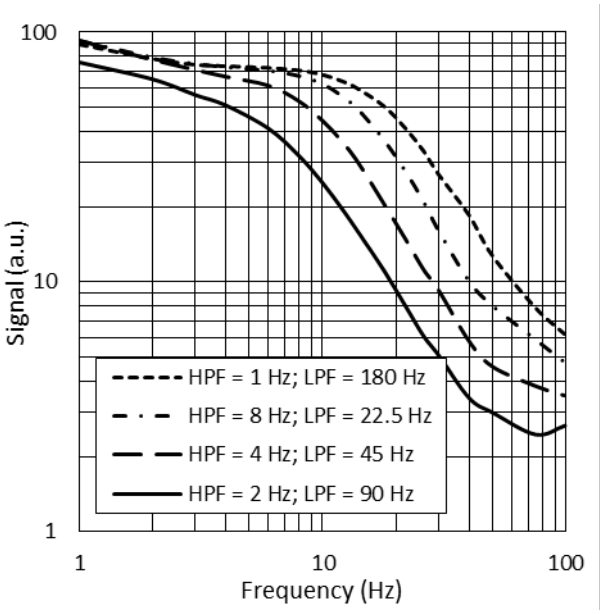
Three Devices with Synchronized Sampling



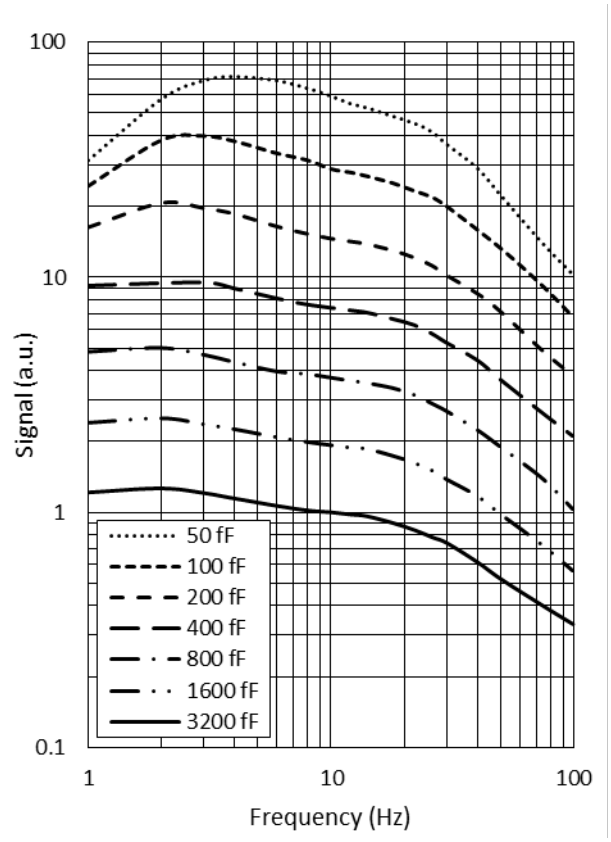
Infrared Frequency Characteristics



Typical Frequency Response in Normal Power Mode



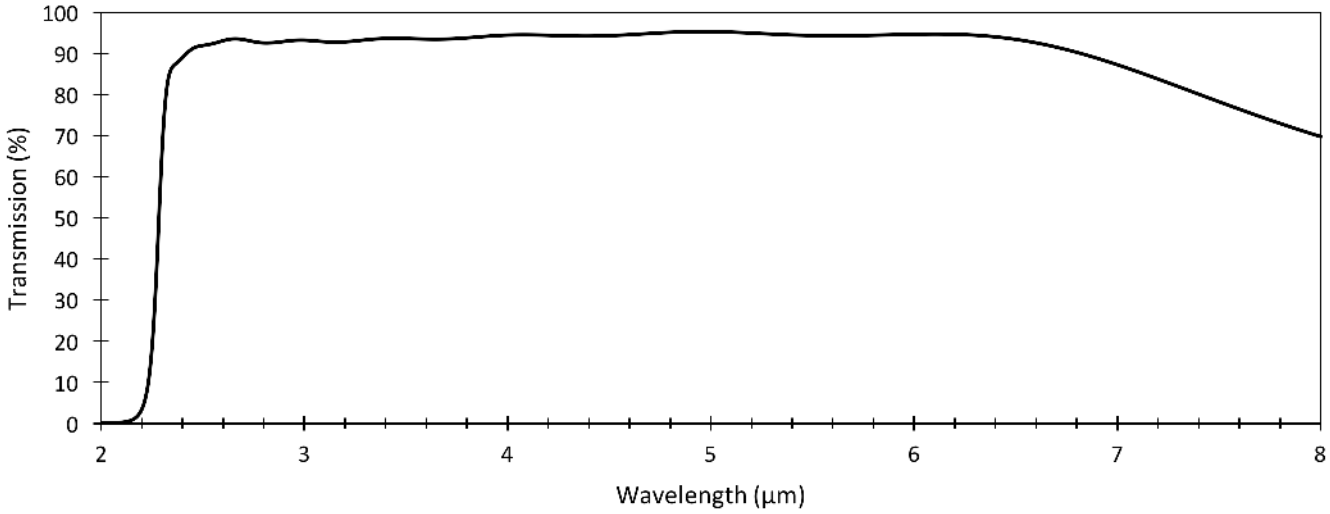
Typical Frequency Response in Low Power Mode



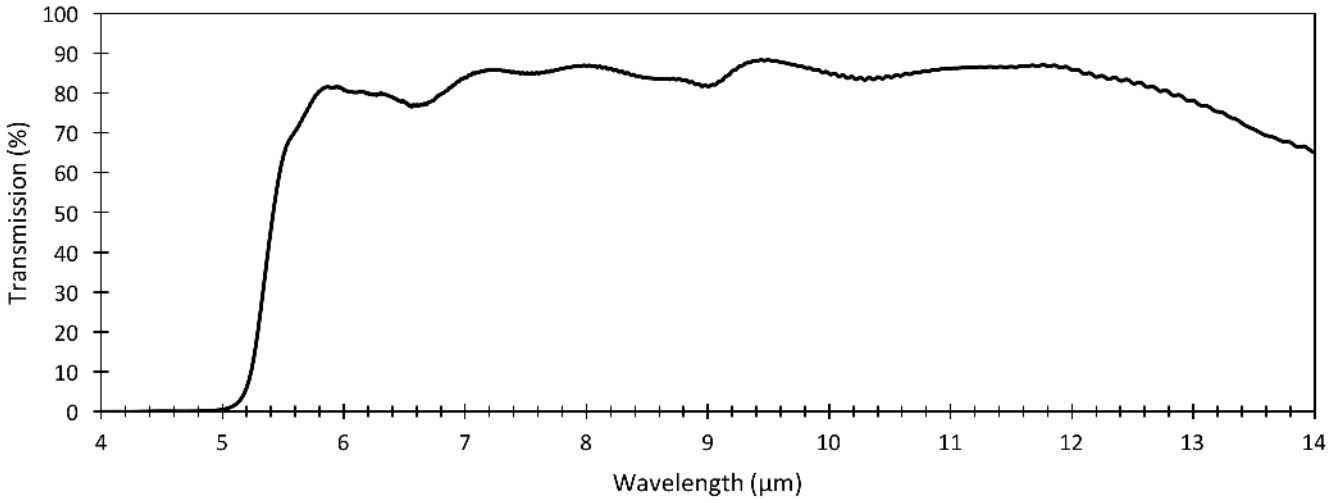
Typical Frequency Response at Different Gain Settings

Filter Transmission Profiles

Typical 2.2 µm LP Filter Transmission



Typical 5.0 µm LP Filter Transmission



AFBR-S6EPYSMD-BB-DS100