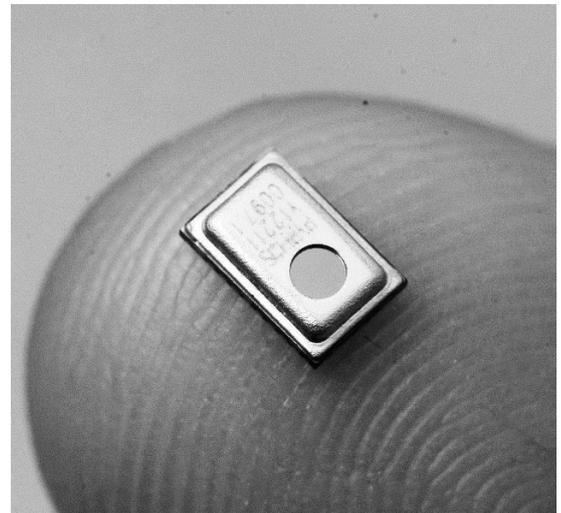


# ezPyro™ SMD I<sup>2</sup>C Pyroelectric Infrared Broadband Sensors

## 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 I<sup>2</sup>C 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 <sup>2</sup>
SMD Package	5.65 x 3.7 x 1.55 mm
D* (typ.) <sup>1</sup>	2.5 x 10 <sup>8</sup> cm√Hz/ W
NEP (typ.) <sup>1</sup>	2.7 x 10 <sup>-10</sup> W/√Hz
Time Constant	~10ms (10-20 Hz peak)
Field of View	~90°

### Electrical Characteristics

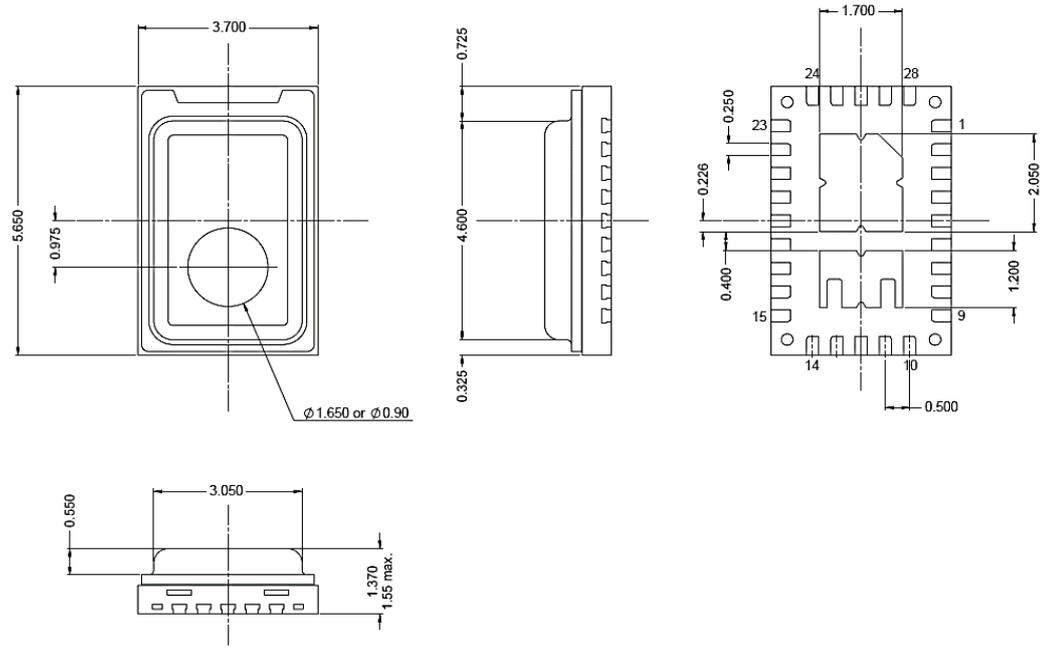
Supply Voltage	1.75 to 3.6 V
Supply Current (typ.)	1 to 23 μA
Digital I/O	I <sup>2</sup> C (FM+ compatible)
ADC	15-bit ΔΣ ADC @1ksp
Operating Temperature	-40 to +85 °C
Storage Temperature	-40 to +110 °C
Sensor Readout	Current mode
Configurable	Gain / digital filtering / sampling rate / power modes

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



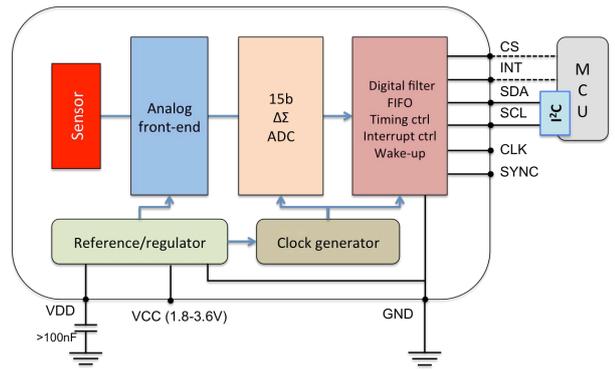
## Signal Filtering & Power Modes

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)
	Off	1	2	4	8			180	90	45	22.5	
<b>Normal Power Mode</b>	Off	1	2	4	8	600	250	180	90	45	22.5	1000
<b>Low Power Mode</b>	Off	0.17	0.33	0.66	1.3	100	42	30	15	7.5	3.75	166

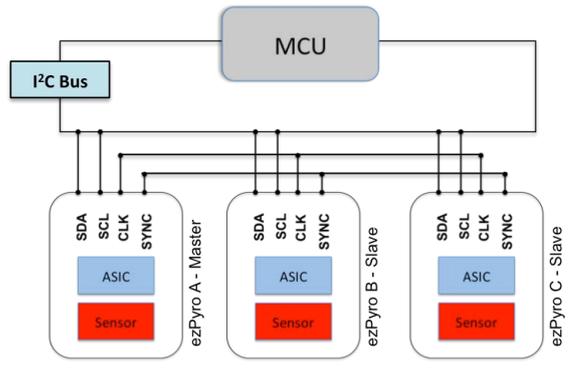
	Mode	Description	Typical Current Consumption (1.8 V, room temperature)
<b>Power consumption</b>	Normal Power Mode	Normal power consumption, 1 kHz max. sample rate	22 $\mu$ A
	Low Power Mode	Low power consumption, 166 Hz max. sample rate	3.5 $\mu$ A
<b>Operational state</b>	Normal Operation Mode	Sensor signal readout over I <sup>2</sup> C	22 $\mu$ A
	Sleep Mode	Hardware interrupt on infrared trigger	21 $\mu$ A (Normal), 3.5 $\mu$ A (Low)
	Power Down Mode	Sensor is disabled	1.1 $\mu$ A

## Circuit Diagrams

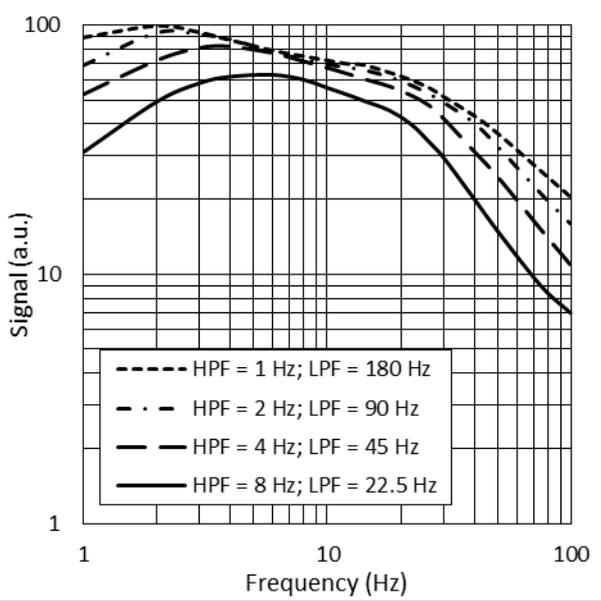
**Single Device Block Diagram**



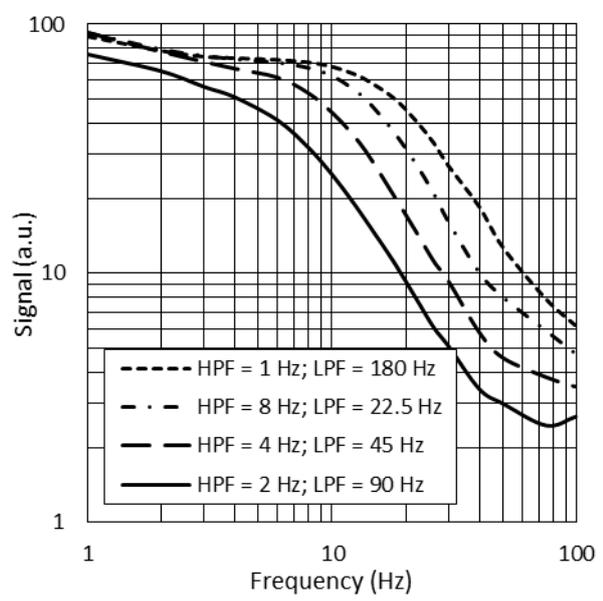
**Three Devices with Synchronized Sampling**



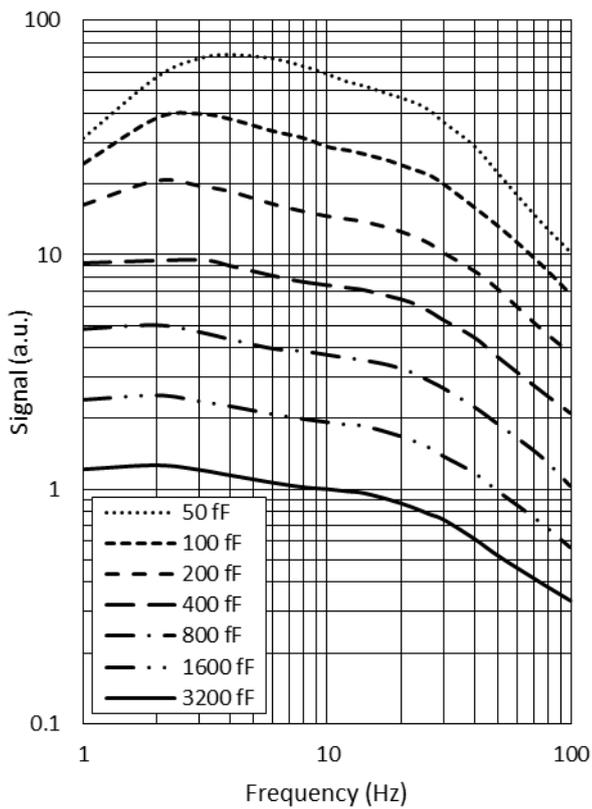
## Infrared Frequency Characteristics



Typical Frequency Response in Normal Power Mode



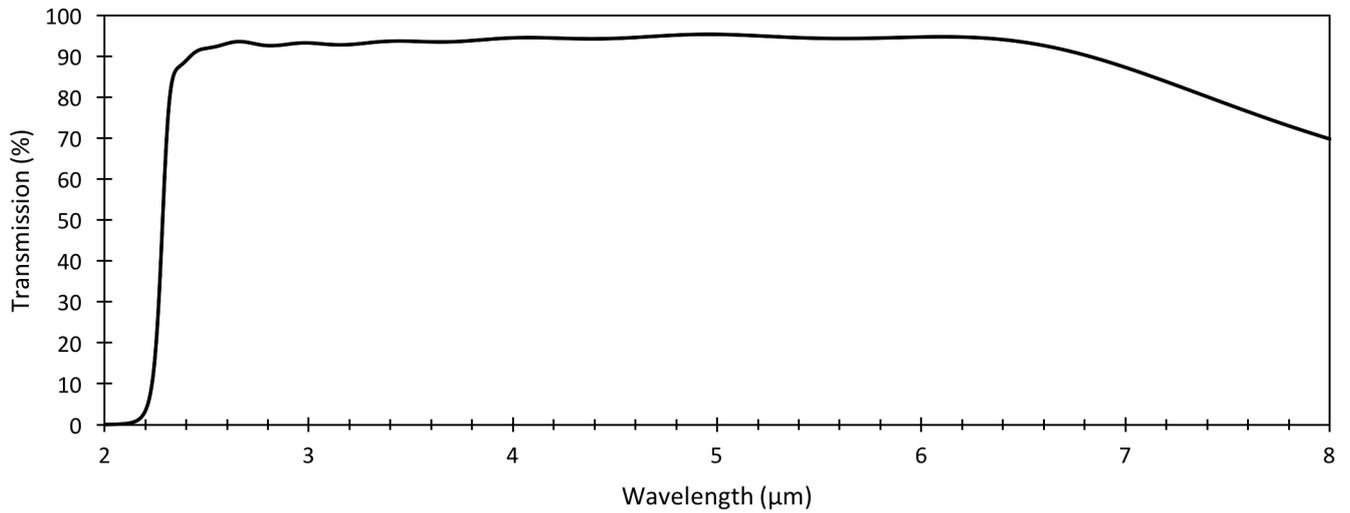
Typical Frequency Response in Low Power Mode



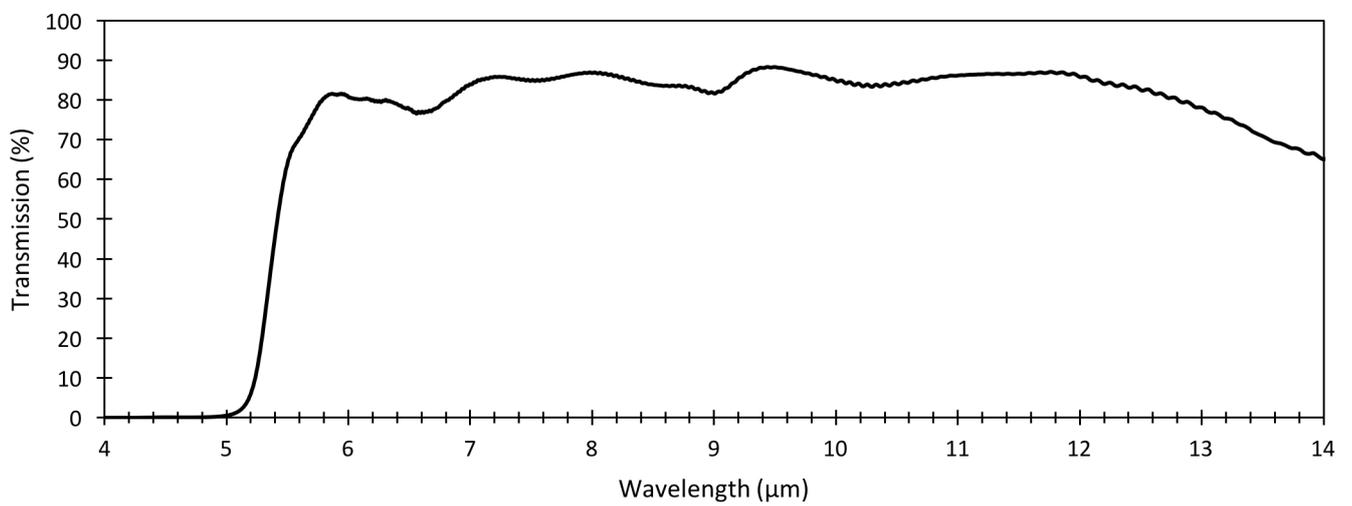
Typical Frequency Response at Different Gain Settings

## Filter Transmission Profiles

### Typical 2.2 $\mu\text{m}$ LP Filter Transmission



### Typical 5.0 $\mu\text{m}$ LP Filter Transmission



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AFBR-S6EPYSMD-BB-DS100