Announced June 9, 2015

MICROCHIP

PAC1921:

World's First High-Side Current/Power Sensor With 2-Wire Bus & Configurable Analog Output

Announcing the PAC1921 High-Side Current Sensor

- **Industry's first to combine a two-wire digital interface for *complete data,* with a configurable analog output (power, voltage, or current) for *immediate data***

- **Measures power, current and voltage to maximize information in prototyping, while minimizing data latency in production.**

- **All information is made available over the 2-wire digital interface; while only power, voltage, and current info is also available over the analog output**

Current Sensors

- **Current-sense amplifiers (also called current shunt amplifiers) are special-purpose amplifiers that output a voltage proportional to the current flowing in a power rail.**

- **All of Microchip's current sensors also include a digital interface compatible with I²C™, and report on power**

- **Differs from most high-side current sensors, which are 100% analog output**

Microchip's Current Sensor Portfolio

	EMC1701	EMC1702	EMC1704	PAC1710	PAC1720	PAC1921
Current Sensors	1	1	1	1	2	1
Common-Mode Voltage Range	3V-24V	3V-24V	3V-24V	0V-40V	0V-40V	0V-32V
Temperature Measurement	Ambient	Ambient 1 Remote	Ambient 3 Remotes			
Alert & Therm.	◆	◆	◆	◆	◆	
Address Select	◆	◆	◆	◆	◆	◆
Peak Shutdown Pins	◆	◆	◆			
Special Features						Configurable Analog Output
Interface	2wire/I²C™ compatible	2wire/I²C™ compatible	2wire/I²C™ compatible	2wire/I²C™ compatible	2wire/I²C™ compatible	2wire/I²C™ compatible
Package	12-pin 4x4 QFN 10-pin MSOP	12-pin 4x4 QFN	16-pin 4x4 QFN 14-pin SOIC	10-pin MSOP	10-pin MSOP	10-pin DFN

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Example Applications

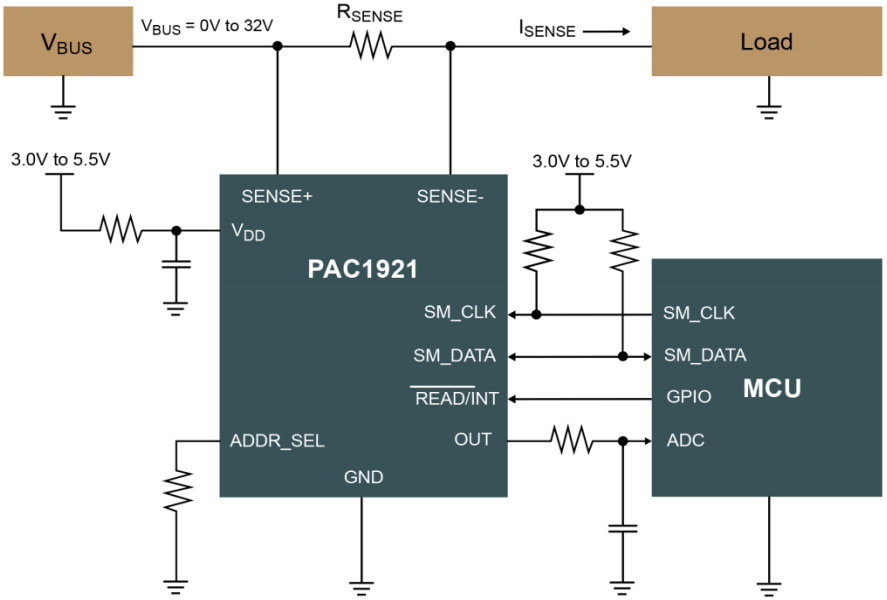
Measuring and reporting DC current, voltage, and power for a variety of applications

- Networking
- Industrial Automation
- Power Supplies
- Servers
- Power Distribution
- Computing

PAC1921 Key Features

Industry's first to combine a two-wire interface for *complete data* with a configurable analog output for *immediate data*

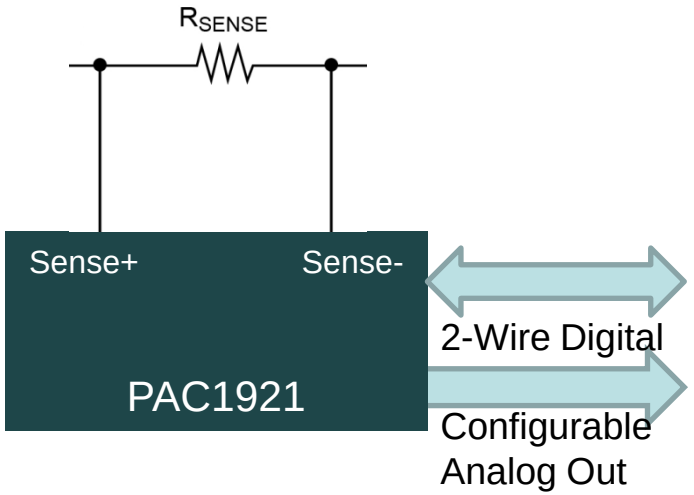
- **Power, current or voltage info over a single analog output**
- **1% power accuracy over a wide voltage range (0 - 32V)**
- **Scalable DAC to feed 1V, 1.5V, 2V, or 3V system ADCs**
- **Synchronized power readings for multiple power rails**
- **Monitors power especially well for dynamic events**



Design Challenge 1: Providing 3 Power-Related Values on a Single Analog Output

PAC1921 Solves

- **Single DAC output uniquely provides information regarding system power consumption:**
  - Power
  - Sense voltage (current)
  - Bus voltage



- **One microcontroller's ADC can be used to characterize and validate systems**

- **2-Wire interface**
  - Multiplex analog output to be Vbus, Vsense, Power
  - Configures the analog output for sense voltage and bus voltage gain

Design Challenge 2: Accurate Measurement for High and Low Current Loads

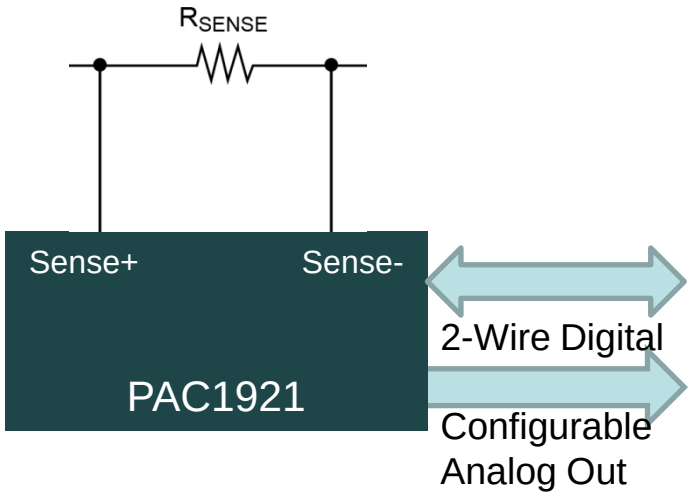
PAC1921 Solves

- **Wide dynamic range**
  - 0V – 32V measurement range
  - 1% power measurement readings
  - Gain for Vsense at 1X-128X & Vbus 1X–32X
  - Integrated second-order ΔΣ ADC
- **Power accumulation register of 39 bits**
- **Vsense & Vbus accumulation registers of 25 bits**
- **Small readings accumulated & averaged over the 2-Wire and analog interfaces**
- **No need for multiple op amps for different gains**

Design Challenge 3: One Device for Different Microcontrollers

PAC1921 Solves

- **Analog output can be used for vastly different microcontrollers and ADCs**
- **2-Wire interface configures the output for the full scale of voltages**
- **Full-scale output can be scaled for 1V, 1.5V, 2V, and 3V**
  - Microprocessor and microcontroller voltages
  - FPGAs
  - DIMM memory ICs

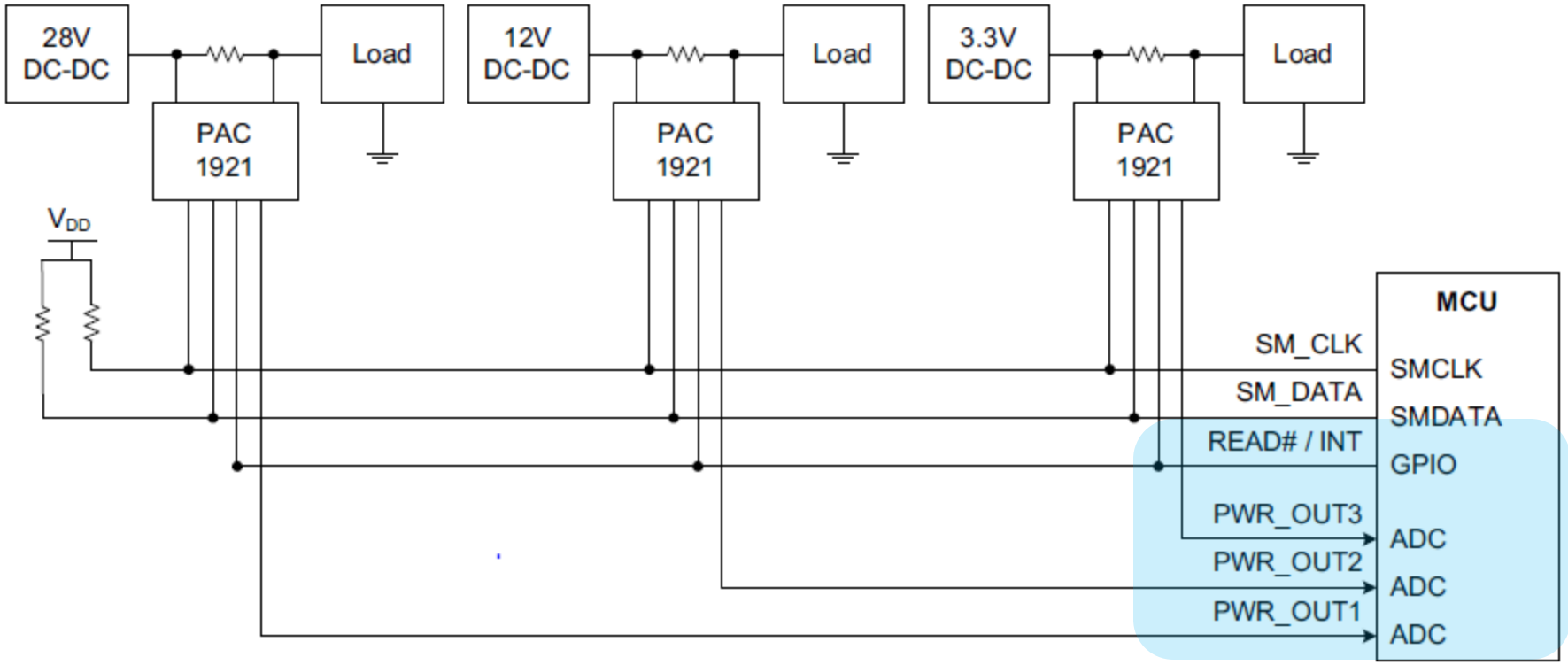


Flexible

Design Challenge 4: Coordination of Multiple Measurements

PAC1921 Solves

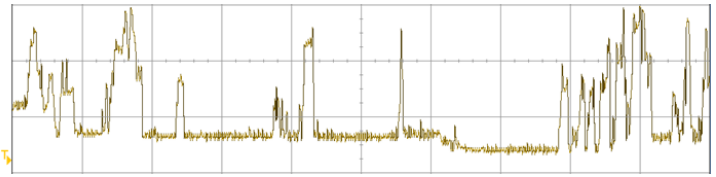
- **Synchronize Measurements with the READ/INT pin**



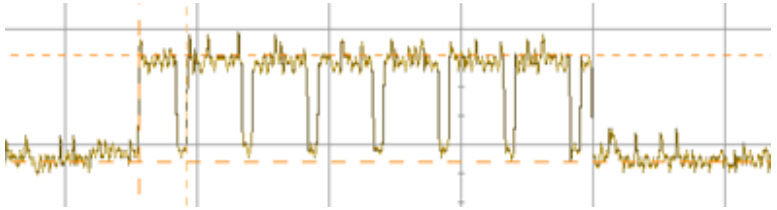
Design Challenge 5: Measuring Power in the Real World

PAC1921 Solves

- **Sampling intervals that are too short can miss dynamic power events:**
  - Accessing hard drive



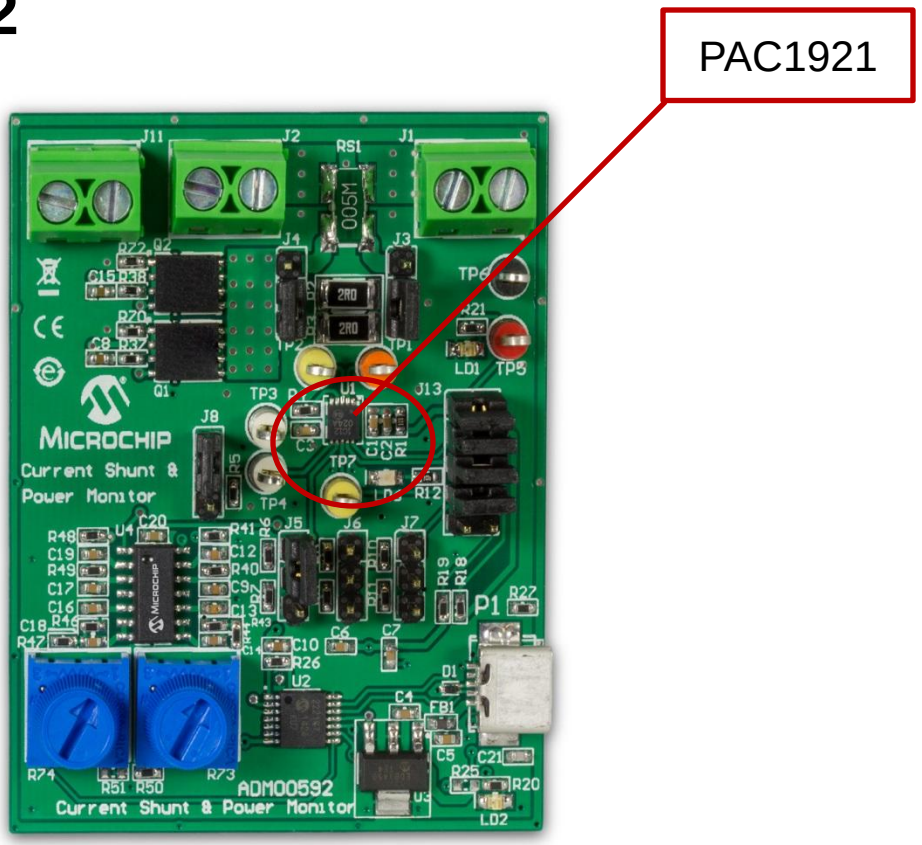
  - Playing MP3



- **The PAC1921 sample integration period for power consumption will capture changing events**
  - 0.9 ms to 1s (11-bit resolution)
  - 2.7 ms to 2.9s (14-bit resolution)

PAC1921 Evaluation Board

- **Part # ADM00592**
- **$64.99**
- **Available Now**



PAC1921 High-Side Power and Current Monitor Evaluation Board (Part # ADM00592)

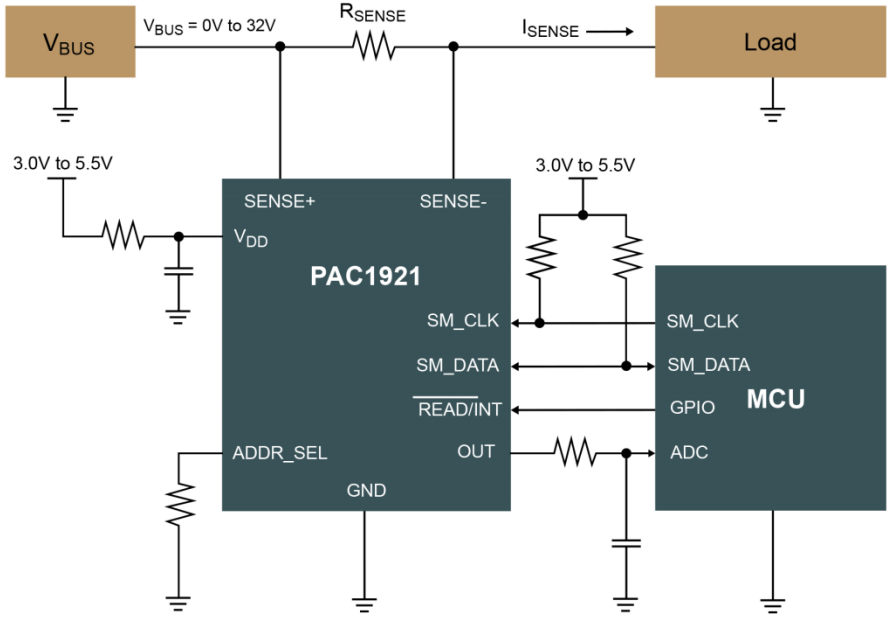
Available Now

- **Product Page** http://www.microchip.com/PAC1921
- **Package** **3x3 mm VDFN**
- **Price** **$1.18 each in 5K volumes**

PAC1921 Summary

Industry's first to combine a two wire interface for *complete data* with a configurable (power, voltage, or current) analog output for *immediate data*

- **Power, current or voltage information over a single analog output**
- **1% power accuracy over wide voltage range (0 - 32V)**
- **Scales output DAC to feed 1V, 1.5V, 2V, or 3V system ADCs**
- **Synchronizes power measurements for multiple power rails**
- **Monitors power well for dynamic events (up to 2.9s sample interval)**



Backup

PAC1921
Features, Benefits, Results

Features → Benefits → Results

1	2-wire high-side current sensor with analog output	- Low latency for data - Digital data available on the SMBus	- Quickly configured analog information - Complete data availability
2	Analog Output can report power, current, or voltage	Multiple data types available on the analog output	- Device can serve as a single diagnostic analog output - Only one analog trace for development
3	39 bits of power consumption data	More power consumption data captured	Longer integration periods (over 2 sec)
4	Integrate pin can synchronize readings on multiple power buses	Multiple readings can be captured simultaneously	Ensures readings represent the same sample data
5	Current measurement has 128 gain levels	Can measure high and low current load events	Can use one current sensor for a wide range of measurement
6	Output voltage can be set to 1, 1.5, 2, or 3 volts	Device can be used for different full-scale ADC voltages	Device can be used for a processor, FPGA, and microcontroller interface
7	Device goes into a low-power sleep mode after 1.2 sec	Device cannot continue to draw power when in static mode	5 microamps of power consumption in sleep