

## Product Bulletin

# AP *squared* Sensor™ Products

## “Taking Pressure Sensing to a Higher Level”

### A/C Applications



Superior pressure sensing is required for highly efficient A/C loop systems that enable reduced fuel consumption and improved emissions. TI's AP (Automotive Pressure)<sup>2</sup> sensor is the low-cost, lightweight solution for accurate and robust pressure sensing in under-hood applications such as engine load management and compressor protection. With an aluminum port fitting and automotive grade connector, its corrosion protection is second to none. A patented square sense element and conditioning electronics provide field-proven EMC tolerance and reliability, as well as above-average performance in high-noise environments. Multiple packaging configurations are available for easy integration. For those looking to optimize A/C system control, the AP<sup>2</sup> sensor design ensures high-quality, world-class performance.

### Features

Square Sense Element .....	
Flexible packaging .....	
High reliability in noisy environments, balanced circuit design .....	
Aluminum hexport .....	
Generation II or III conditioning electronics .....	
Ratiometric output .....	
Designed for under-hood environment.....	

### Benefits

Lower cost solution, lighter weight
Available in a wide range of connectors and port fittings
Ease of system integration
EMC protection to 200 V/m
2X lighter in weight
4X improvement in corrosion protection
Accuracy $\pm 1\%$ Vcc; temperature compensation
Ease of system integration, eliminates error in supply voltage fluctuations
Operating temperature range $-40^{\circ}\text{C}$ to $135^{\circ}\text{C}$ , fluid compatibility

### Applications

<i>Optimized A/C performance</i>
• High-pressure compressor protection
• Multiple stage fan control
• Low-temperature compressor operation
<i>Engine load management</i>
• Improved control around idle boost
• Reduced fuel consumption to meet C.A.F.E. standards
• Reduced emissions
<i>Diagnostics at service centers</i>

## Technical Specifications

### Operating Pressure Range

Pressure range <sup>1</sup>	100–3400 kPa
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### Performance

Accuracy	$\pm 1.0\%$ of Vcc ( $25^{\circ}\text{C}$ )
Linearity	$1.0\%$ of Vcc ( $-40^{\circ}\text{C}$ to $135^{\circ}\text{C}$ )
Temperature effect	$\pm 0.01\%$ of Vcc/ $^{\circ}\text{C}$
Total error band	$\pm 2\%$ of Vcc (0 to $100^{\circ}\text{C}$ )
	$\pm 3\%$ of Vcc ( $-40$ to $135^{\circ}\text{C}$ )

### Electrical

Supply voltage (Vcc)	4.5-5.5 Volts
Supply current <sup>2</sup>	5-6 mA maximum
Output range <sup>5</sup>	5-95% of Vcc
Output current <sup>3</sup>	5 mA maximum
Output response time (90%) <sup>4</sup>	1 ms minimum
Output ripple	0.2% of Vcc
Overvoltage protection	16.5 Vdc
Reverse voltage protection	-14 Vdc
Radiated immunity	100-200 V/m
ESD withstand	15 kV

### Durability

Cycle life	10 million cycles
Proof pressure	1.5X (5300 kPa)
Burst pressure	2.5X (8700 kPa)

### Environmental

Operating temperature	$-40$ to $135^{\circ}\text{C}$
Storage temperature	$-40$ to $150^{\circ}\text{C}$

<sup>1</sup> other ranges available

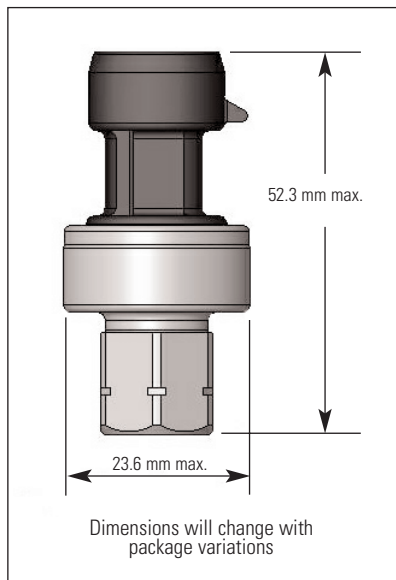
<sup>2</sup> with no load output

<sup>3</sup> max., sink or source

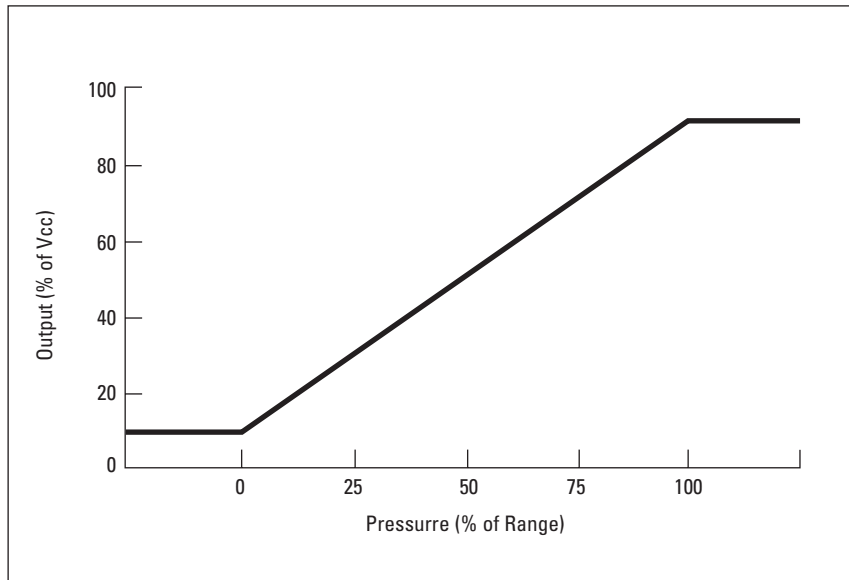
<sup>4</sup> 100% input, 0-90% response time

<sup>5</sup> can be adjusted to application need

## Dimensions



## Typical Output Characteristics



## AP Squared Flexibility

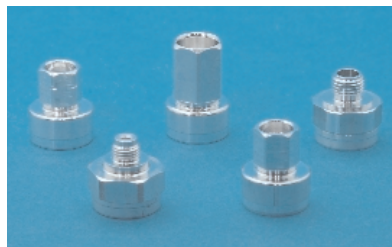
### Connectors

- TI can provide a wide range of electrical connectors (e.g., Packard, Amp, Yazaki, Framatome)



### Fluid port

- Flexible port designs to meet customer needs
- External, internal threads – English or metric
- Fluid port materials include aluminum, brass, steel, plastic



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### Diagnostic band & transfer function

- High rail and low rail values can be adjusted by circuit component population
- Transfer function changed by calibration software settings

### Size restriction

- Device diameter can be as small as 24 mm