

Telaire T3600 Series

Hydrogen Detection Sensor

Overview

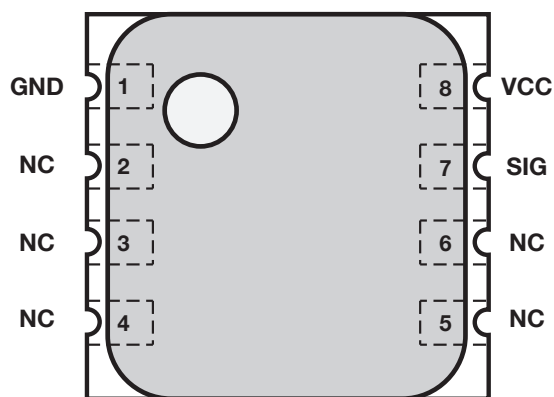
The Telaire T3600 Series is a fully calibrated hydrogen detection sensor designed for applications where battery events are a concern. The output of the sensor is a ratio metric analog output with a detection range of 0 to 16% H₂ gas concentration.

Features

- -40 to 95°C operation
- Automotive Qualified (production design)
- 16-bit analog output
- SMT package



1. Pin Description



Pin Configuration (top view)

Pin	Name	Description
1	GND	Ground
2	NC	Internal Programming Pin, do not connect
3	NC	Internal Diagnostic Pin, do not connect
4	NC	Normal Operation – High (Should be left floating internally pulled-up), Calibrate – Low
5	NC	Internal Communication, do not connect
6	NC	Internal Communication, do not connect
7	SIG	Analog signal output
8	VCC	Supply Voltage

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2. Operating Conditions

The T3600 incorporates a relative humidity (RH) sensor for enhanced accuracy. However, prolonged exposure to certain chemicals commonly found in automotive environments can degrade the sensor's accuracy over time. These chemicals, including volatile organic compounds (VOCs) present in fuels, lubricants, cleaning agents, and exhaust fumes, can contaminate the sensor's sensing element, leading to inaccurate humidity readings. Specific examples of chemicals that can damage or impair the accuracy of humidity sensors include:

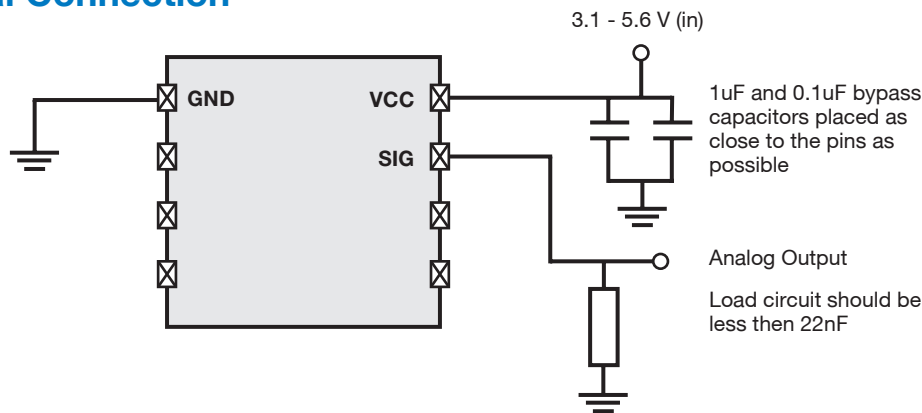
- **Gasoline and diesel fuel:** These fuels contain VOCs that can be absorbed by the sensor, leading to drift or permanent damage.
- **Engine oil and lubricants:** These fluids can leave residues on the sensor, affecting its ability to accurately measure humidity.
- **Brake fluid:** Brake fluid is highly corrosive and can permanently damage the sensor's sensing element.
- **Coolant:** Coolant can contain additives that can degrade the sensor's materials over time.
- **Cleaning agents:** Some cleaning agents contain harsh chemicals that can damage the sensor.

Other factors that can contribute to sensor poisoning include Exhaust fumes, Road dust and debris. To mitigate the risk of sensor poisoning in automotive applications, it is crucial to consider the sensor's placement and protection. Avoiding direct exposure to harsh chemicals, dust, and extreme temperatures.

Parameter	Min	Typ	Max	Unit
Operating Temperature Range	-40	-	95	°C
Humidity	0	-	95	%
Vibration ¹	-	5.9	-	G _{RMS}

1. Tested against Passenger/Trunk Compartment Sprung Masses.

3. Typical Connection



4. Electrical Characteristics

Parameter	Name	Min	Typ	Max	Unit
Operating Supply Voltage	V _{cc}	3.1	3.3	3.6	V _{dc}
Supply Current (Peak) ¹	I _{peak}		16	18	mA
Supply Current (Average) ²	I _{avg}		4		mA
Signal Output (Source Current)	I _{sig}			20	mA
Capacitance Load Signal Output	C _{Load}			22	nF
Signal Output (Ratio Metric)	V _{Sig}	10%		90%	V _{cc}

1. Peak current does not include I_{sig}.

2. Average current is calculated based on the percentage of time between peak and idle current.

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5. ESD Ratings

Parameter	Name	Value	Unit
ESD Capability, Human Body Model (Note 1)	ESD _{HBM}	2000	V
ESD Capability, Machine Model (Note 1)	ESD _{MM}	200	V

- ESD Human Body Model tested per EIA/JESD22-A114.
ESD Machine Model tested per EIA/JESD22-A115.
Latch up Current Rating tested per JEDEC standard: JESD78.

6. Sensor Parameters and Output Characteristics

Parameter	Name	Test Condition	Min	Typ	Max	Unit
Signal Output Resolution ¹	-	3.3Vcc	-	40	-	uVdc
Sensing Resolution	-	-	-	5	-	ppm
Sensing Output Range	H2[R]	H2 Concentration	0	-	160,000	ppm
H2 Accuracy ²	H2[acc]	0 to 80,000ppm	-8,000	-	+8,000	ppm
H2 Accuracy ²	H2[acc]	80,000ppm to 160,000ppm	-8,000	-	+8,000	ppm
H2 Response Time ³	H2[Tr]	Ideal System	-	1	3	Sec.

- Signal output resolution is calculated to be 16bit DAC resolution between 10% and 90% of Vcc.
- Under all Environmental Conditions.
- [Tr] is calculated at 63.2% of final value when subjected to a step change in environment.

Note: [Tr] does not indicate detection time. First detection of an event is related to sample rate [Sr].

7. Transfer Function

This sensor is fully calibrated. The analog output follows a linear transfer function based on Hydrogen concentration and supply voltage:

$$V_{cc} \times (a \times H + b) = V_{out}$$

	Symbol	Gas Concentration %		Gas Concentration % PPM		Output Voltage Range @ 3.3Vcc		
		Value	Unit	Value	Unit	Symbol	Value	Unit
Min	H_in,1	0	%	0	ppm	V_out,1	0.33	V
Max	H_in,2	16	%	160,000	ppm	V_out,2	2.97	V

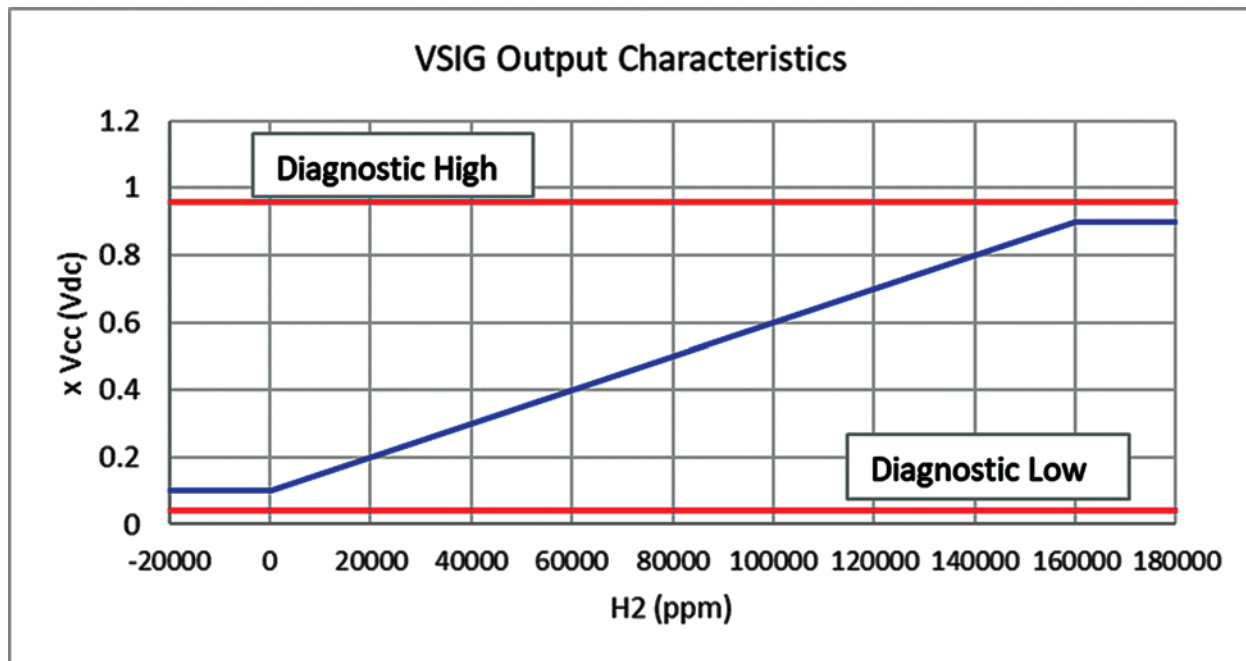
H = Hydrogen Concentration in % or PPM

Slope and Offset (PPM)		
Symbol	Value	Unit
a	0.000005	1/PPM
b	0.1	-

Slope and Offset (%)		
Symbol	Value	Unit
a	0.05	1/%
b	0.1	V

Shown as percent of Vcc vs PPM of Hydrogen

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8. Operation and Timing

Parameter	Name	Test Condition	Min	Typ	Max	Unit
Start-up Time ¹	T[s]		60	70	80	ms
Sampling Rate	T[r]			0.5		s
Measurement Time	T[m]		55	60	65	ms

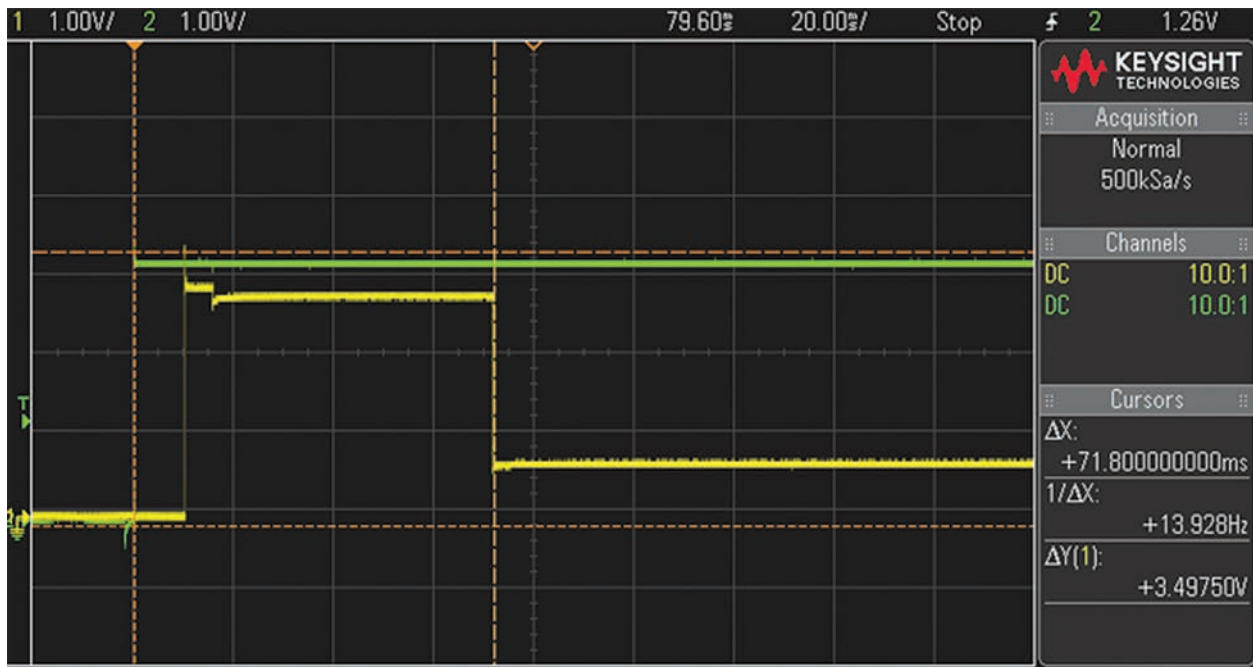
1. Default shown in typ. value, Min and Max show configurable limits. Sample Rate is defined as the “commanded” message rate.

Increasing sample rate will increase average current consumption.

During power up the Output Signal pin is high-Z until the first conversion is completed. The First conversion occurs at 10ms after power-up and will be invalid until the first commanded measurement is made at approximately 72ms. Once a commanded measurement is made the output will go to the proper voltage level.

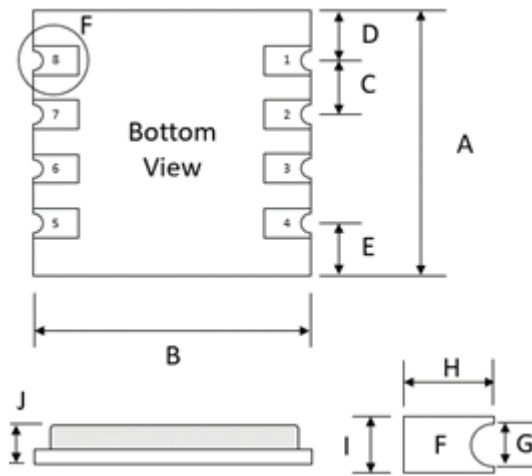
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9. Typical Power-Up Profile

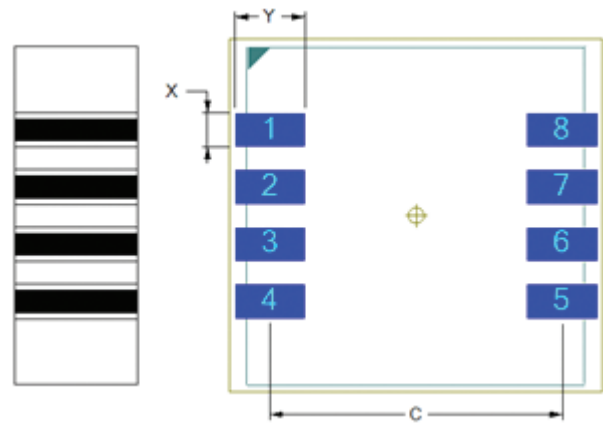


Sample Rate is the duty cycle of commanded measurements. At the specified sample rate, the sensor will be commanded to make a measurement. The measurements take the specified measurement time to complete. During the measurements, maximum power will be consumed. When the sensor is not making measurements, the signal output is held at its last value and the part goes into an idle mode consuming minimum power.

10. Mechanical



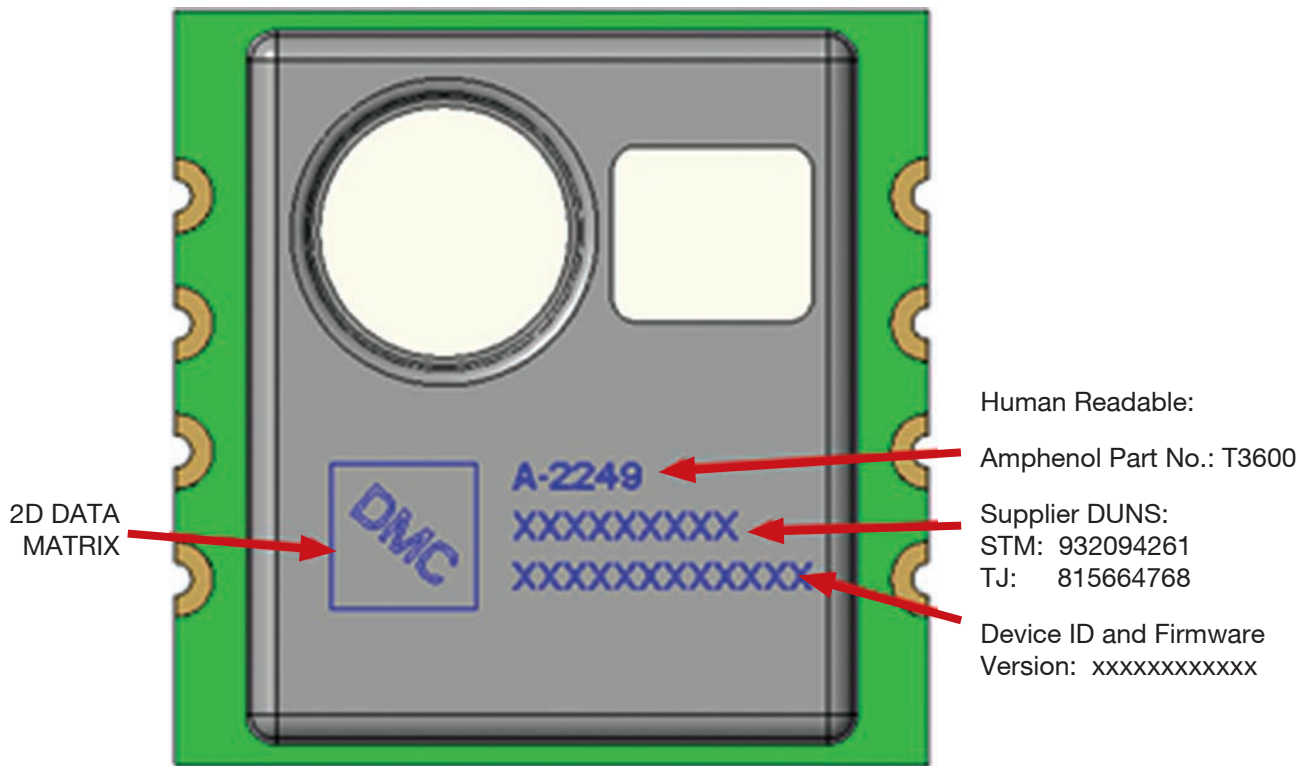
Symbol	Min. (mm)	Typ. (mm)	Max. (mm)
A	-	15	-
B	-	15	-
C	-	2.54	-
D	-	3.69	-
E	-	3.69	-
F	-	-	-
G	-	0.66	-
H	-	2.54	-
I	-	1.53	-
J	-	-	5.0



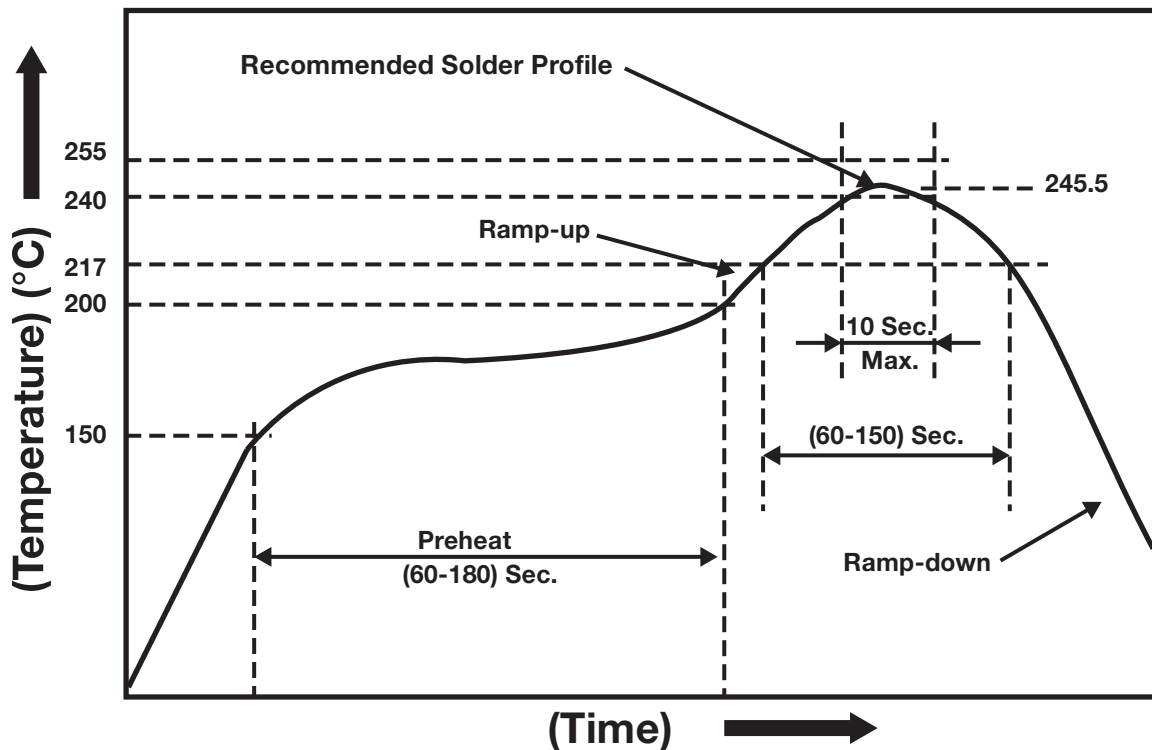
Dimensions	
Land Space C	13.00
Land X	1.5
Land Y	3.10
Silkscreen R1	9.25
Silkscreen R2	15.20
Courtyard V1	16.60
Courtyard V2	15.70

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10. Marking



11. Reflow Profile



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12. Packaging

Tape and Reel Details

13" Standard Reel Size

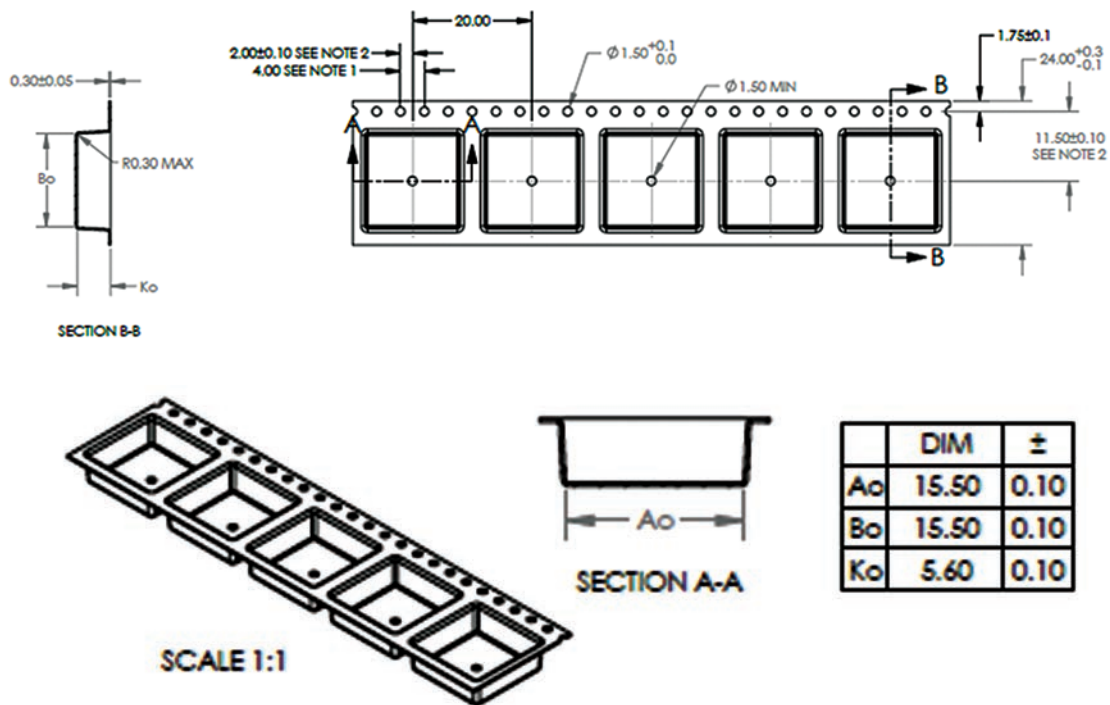
24mm Reel width

500pcs/reel

Pocket Tape Dimensions

Part Size* (mm)	A = 15.00	B = 15.00	K = 5.00
Pocket Size* (mm)	A0 = 15.50	B0 = 15.50	K0 = 5.60
Carrier Tape Material	0.30mm Static Dissipative Tri-laminate Polystyrene - Black		
Tape Width - W (mm)	24		
Pocket Pitch - P (mm)	20		

* Dimensions listed are nominal.

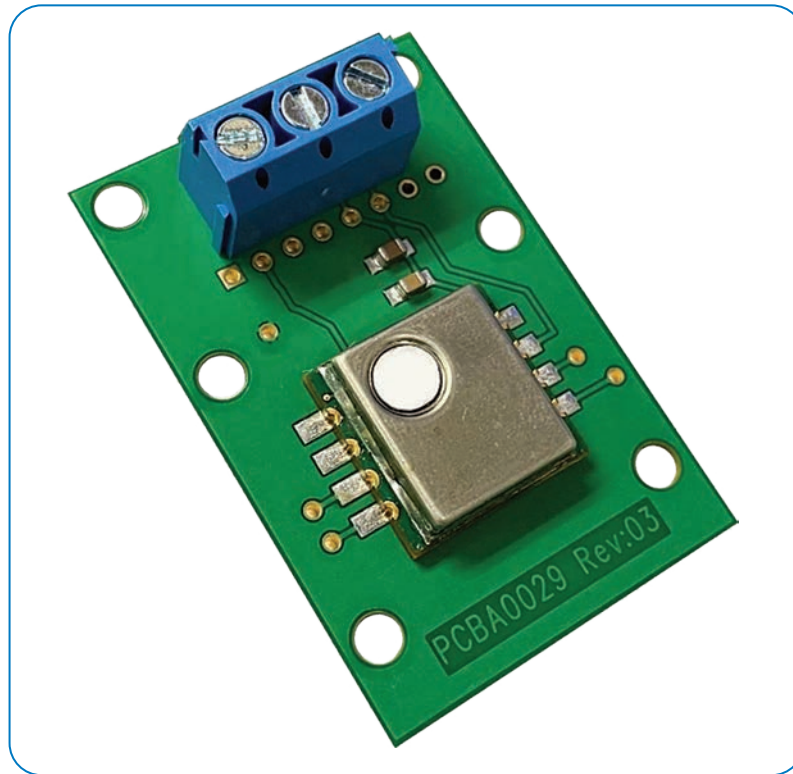


Notes:

1. 10 Sprocket hole pitch cumulative tolerance ± 0.2 .
2. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.
3. A0 and B0 are measured on a plane at a distance "R" above the bottom of the pocket.

Telaire T3600-TB Surface H2 Sensor Test Board

Please contact your local Amphenol Sensor's representative for more information.



Disclaimer:

This sensor has been tested and approved for use only in specific applications and environments as determined by Amphenol. Any use of this sensor outside of these approved applications and environments has not been evaluated by Amphenol and may result in unpredictable performance or failure. Amphenol does not accept any responsibility, liability, or warranty for sensors used in applications that have not been fully reviewed and explicitly approved in writing by Amphenol. It is the sole responsibility of the user to ensure suitability for their specific use case.

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