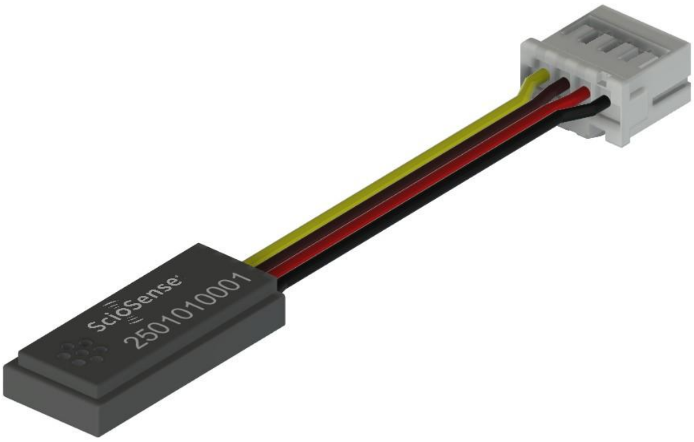

RHT1

Application Note

Design Guidelines and System-Level Integration of the RHT1 Relative Humidity and Temperature Sensor

RHT1 Application Note

Revision: 1.0

Release Date: 2026-04-14

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1 Introduction

Reliable measurement of relative humidity (RH) and temperature is essential for a wide range of applications including HVAC control, building automation, appliances, industrial monitoring and IoT devices. Accurate environmental sensing enables energy-efficient climate control, condensation prevention, comfort optimization and reliable compensation of other gas sensing elements.

The **RHT1 Relative Humidity and Temperature Sensor from Sciosense** combines a capacitive humidity sensing element with an integrated temperature sensor and signal processing electronics in a robust housing with analog voltage output. Factory calibration ensures accurate and linearized digital output over the specified operating range.

While datasheets specify sensor accuracy under standardized laboratory conditions, real-world system performance strongly depends on mechanical integration, airflow conditions, thermal coupling, and environmental influences. Improper placement or insufficient thermal isolation can introduce significant measurement deviations that exceed the intrinsic sensor accuracy.

This application note provides practical guidance for system designers to:

- Integrate the RHT1 into electronic assemblies
- Minimize measurement errors caused by thermal and mechanical influences
- Optimize power consumption and reduce self-heating effects
- Understand dynamic response behavior in real applications
- Improve long-term stability and robustness

The objective is to support engineers in achieving datasheet-level performance at system level and to enable reliable humidity and temperature measurement across a broad range of application environments.

Within the environmental sensing portfolio of Sciosense, the RHT1 is positioned as a compact and reliable relative humidity and temperature sensor for applications requiring accurate ambient monitoring with minimal system complexity.

RHT1 complements Sciosense gas sensing solutions by enabling independent environmental monitoring in multi-sensor systems, where precise humidity and temperature data are required for overall system control, logging, or environmental supervision. For applications requiring direct digital humidity and temperature compensation input to gas sensors such as ENS160 and ENS161, Sciosense offers dedicated digital RH/T solutions such as the ENS210.

The RHT1 is optimized for robust system integration, long-term stability, and ease of implementation in HVAC, appliance, industrial, and IoT applications.

2 Measurement Principles and Practical Influences

2.1 Humidity Measurement Principle

The RHT1 measures relative humidity using a capacitive sensing element. The dielectric constant of a polymer sensing layer changes as a function of absorbed water molecules. This change alters the capacitance of the sensing structure, which is measured by the integrated signal processing electronics and converted into a calibrated analog voltage output.

Relative humidity (RH) is defined as the ratio between the partial pressure of water vapor and the saturation vapor pressure at a given temperature. Since saturation vapor pressure is temperature dependent, accurate temperature measurement is essential for precise humidity calculation.

For this reason, the RHT1 integrates both a humidity sensing element and a temperature sensor within the same package. Factory calibration compensates for sensor non-linearity and temperature dependency, providing a linearized and temperature-compensated RH output over the specified operating range.

2.2 Temperature Measurement

The integrated temperature sensor measures the local temperature of the sensor package. In practice, this corresponds to the temperature of the surrounding air only if thermal coupling between the sensor and PCB is carefully managed.

Any temperature difference between the sensor package and ambient air directly influences the reported RH value, as relative humidity is calculated based on the measured temperature. Even small temperature offsets can therefore result in noticeable humidity deviations.

Example:

A temperature offset of +1 °C at 50 %RH can already lead to an RH error of approximately 3 %RH, depending on ambient conditions.

This highlights the importance of proper mechanical placement and thermal design.

2.3 Practical Environmental Influences

Although humidity sensing is based on a well-defined physical principle, real-world conditions introduce additional effects that must be considered at system level.

Temperature Gradients

Heat sources on the PCB (MCUs, power regulators, LEDs, RF modules) can create local temperature gradients. If the sensor is thermally coupled to these sources, the measured temperature and derived RH will deviate from the true ambient value.

Self-Heating

Power dissipation during measurement can cause slight temperature rise of the sensor itself. Continuous high-frequency measurement increases this effect. Duty cycling can significantly reduce self-heating induced error.

Airflow and Enclosure Design

Limited airflow or small vent openings can slow down response time and create measurement lag. Dead air volumes inside housings can lead to delayed humidity equilibration.

Condensation

When surface temperature drops below the dew point, condensation may occur on the sensor surface. While the sensor is designed to tolerate high humidity exposure, condensation events can temporarily affect response time and recovery behavior.

Chemical Exposure

Certain volatile organic compounds (VOCs), solvents, or aggressive cleaning agents may influence the long-term stability of polymer-based humidity sensing elements. The RHT1 integrates a protective membrane above the sensing structure to reduce the impact of particles, splashes, and airborne contaminants, thereby improving robustness in typical application environments. Nevertheless, exposure to highly aggressive chemical atmospheres should be evaluated at system level. Exposure to glues and foams should be avoided.

2.4 From Datasheet to System Accuracy

Datasheet specifications are defined under controlled laboratory conditions with defined airflow, stable temperature, and optimized PCB layout. In real applications, mechanical integration, thermal design, and enclosure geometry strongly influence achievable system accuracy.

Understanding these influences is essential to ensure that the intrinsic performance of the RHT1 is maintained at system level.

3 System Integration Guidelines

The RHT1 is delivered as a compact, pre-assembled sensing module consisting of a humidity and temperature sensing PCB integrated into a protective housing with membrane and flying leads. The module provides analog output signals for relative humidity and temperature and is designed for straightforward mechanical and electrical integration.

Proper mechanical placement and system integration are essential to ensure accurate environmental measurement.

3.1 Mechanical Placement

Since the RHT1 measures the ambient air surrounding the housing, its position within the final device strongly influences performance.

Recommended practices:

- Mount the module in a location with direct exposure to representative ambient airflow.
- Avoid placement in enclosed or stagnant air pockets.
- Keep sufficient distance from heat-generating components (power supplies, transformers, compressors, LEDs).
- Avoid mounting directly on surfaces that may be significantly warmer or colder than ambient air.

The housing should be oriented such that the membrane is not mechanically blocked. Vent openings in the system enclosure should allow unrestricted air exchange around the sensing area.

3.2 Thermal Influences

As with all humidity sensors, temperature accuracy directly affects relative humidity calculation.

To minimize thermal offset:

- Avoid routing the cable close to high-current or high-temperature components.
- Prevent conductive heat transfer from mounting brackets or metallic structures into the housing.
- Ensure that the module is not mounted directly on heat-spreading metal surfaces unless thermally decoupled.

Even small temperature deviations between module housing and ambient air can result in noticeable RH errors.

3.3 Airflow and Enclosure Design

The RHT1 housing integrates a protective membrane to allow humidity exchange while protecting the sensing element.

System designers should:

- Provide adequate ventilation openings in front of the sensing area.
- Avoid placing the membrane directly behind tight grille structures.
- Ensure that protective foams or filters do not significantly restrict airflow.
- Consider response time implications when additional external membranes or dust filters are used.

Restricted airflow increases response time and may delay detection of rapid humidity changes.

3.4 Electrical Integration

The RHT1 provides:

- Supply voltage: 3.3 V – 5 V
- Analog voltage output – Temperature
- Analog voltage output – Relative Humidity
- Ground

The module is equipped with a 4-wire cable (standard length 10 cm) terminated with a TE Connectivity 917688 series 4-pin housing. Custom cable lengths are available upon request.

Integration recommendations:

- Use a stable and low-noise supply voltage.
- Ensure proper grounding between module and host system.
- Route analog output lines away from high-frequency switching signals.
- If long cable extensions are used, consider shielding or twisted pair wiring to minimize noise pickup.

Careful signal routing helps preserve output stability and measurement accuracy.

3.5 Mounting Considerations

- Avoid mechanical stress on the housing.
- Ensure that sealing materials do not cover the membrane.
- If installed in high-humidity environments, ensure that condensation can drain away and does not accumulate on the sensing surface.
- Avoid exposure to glue, foam or other sources of VOC outgassing.

4 Achieving System-Level Accuracy

The specified accuracy of the RHT1 refers to controlled laboratory conditions. In real-world systems, overall measurement performance depends on mechanical integration, thermal environment, electrical signal processing, and host system ADC performance.

This chapter outlines how to achieve datasheet-level performance at system level.

4.1 Temperature Offset and its Impact on RH

Relative humidity is temperature dependent. Any temperature deviation between the sensor and the actual ambient air directly affects the calculated RH value.

Even small temperature offsets can introduce noticeable humidity errors.

Example:

At 25 °C and 50 %RH:

- A temperature offset of +1 °C
- Can lead to approximately 2–3 %RH measurement deviation

This effect becomes more pronounced at higher humidity levels.

Therefore:

- Minimize thermal coupling to heat sources
- Avoid mounting near warm surfaces
- Ensure adequate airflow

Accurate temperature measurement is the foundation for accurate humidity measurement.

4.2 Analog Output Interpretation

The RHT1 provides analog voltage outputs proportional to:

- Relative Humidity
- Temperature

System accuracy therefore depends not only on the sensor module but also on the host system's analog-to-digital conversion.

Key considerations:

- ADC resolution
- ADC reference stability
- Noise performance
- Supply voltage stability

If the ADC reference is derived from the same supply used for the sensor output scaling, supply variations may cancel out. If separate references are used, supply tolerance directly impacts measurement accuracy.

4.3 ADC Resolution and Effective Measurement Resolution

The effective system resolution depends on the ADC bit depth.

Example:

Assume a 0–3.3 V RH output range and a 12-bit ADC:

- 3.3 V / (4096 – 1) ≈ 0.8 mV per step

If the RH scaling corresponds to 0–100 %RH across 0–3.3 V:

- 1 LSB ≈ 0.024 %RH

In practice, noise and reference tolerance will dominate before quantization limits are reached. Therefore, ADC stability and filtering are typically more critical than pure resolution.

4.4 Noise and Signal Filtering

Analog outputs may be influenced by:

- Power supply ripple
- Switching regulators
- Long cable routing
- EMI sources

To improve signal stability:

- Use proper grounding

- Avoid routing signal wires parallel to switching lines
- Consider low-pass filtering in the host system if fast response is not required

Filtering improves signal stability but increases response time.

4.5 System-Level Error Budget

Total system accuracy can be approximated as the combination of:

- Sensor intrinsic accuracy
- Temperature offset error contribution
- ADC quantization error
- ADC reference tolerance
- Electrical noise

In many applications, integration-induced errors exceed intrinsic sensor tolerance. Careful mechanical and electrical design ensures that the RHT1 performance is fully utilized.

5 Dynamic Behavior and Response Time

The dynamic response of the RHT1 is primarily determined by the underlying humidity sensing element and its thermal coupling to the surrounding air. As the RHT1 integrates the ENS210 internally, the intrinsic sensor response characteristics are comparable to those specified for that device.

However, the effective response time at module level additionally depends on housing design, protective membrane, airflow conditions, and installation environment.

5.1 Humidity Response Time

Humidity response time is commonly characterized by the τ_{63} value (time required to reach 63 % of a step change).

Under controlled airflow conditions, the intrinsic sensing element exhibits a fast response to humidity changes (~3s for an RH step of 20 % at 25°C). In practical applications, the following factors influence the effective response:

- Air velocity at the sensing surface
- Size and geometry of ventilation openings
- Additional protective filters or membranes
- Mounting position within the enclosure

Restricted airflow increases equilibration time and may introduce measurement lag during rapid humidity transitions.

5.2 Temperature Response Time

The temperature sensor measures the local temperature of the module. Its dynamic behavior depends on:

- Thermal mass of the housing
- Thermal coupling to mounting structures
- Airflow velocity

If the module is thermally coupled to a large structure, temperature changes may appear slower than actual ambient air changes.

5.3 Influence of Protective Membrane

The RHT1 housing includes a protective membrane to improve robustness against particles and contaminants. While the membrane enables humidity diffusion, it introduces a small diffusion barrier that may slightly increase response time compared to a bare sensing element.

In typical HVAC and appliance applications, this effect is negligible. In applications requiring extremely fast humidity detection, system-level validation is recommended.

5.4 Practical Design Considerations

To optimize response time:

- Ensure unobstructed airflow across the membrane
- Avoid placing the module behind dense grille structures
- Do not cover the sensing area with adhesive labels or sealing materials
- Minimize additional filtering elements unless required by the application

6 Condensation and Dew Point Considerations

Humidity sensors measure relative humidity in non-condensing environments. When the sensor surface temperature drops below the ambient dew point, condensation may form on the membrane and sensing structure.

This is a physical phenomenon and not specific to the RHT1.

6.1 Dew Point and Surface Temperature

Condensation occurs when:

$$T_{surface} \leq T_{dewpoint}$$

In practical systems, condensation can occur due to:

- Rapid cooling of the enclosure
- Outdoor-to-indoor transitions
- Cold air drafts
- Mounting near cooling elements or metal structures
- High humidity environments combined with temperature gradients

Even if ambient air is within the specified RH range, local surface cooling can create condensation conditions.

6.2 Impact of Condensation on Measurement

If liquid water forms on the membrane or sensing area:

- Humidity readings may temporarily saturate
- Response time may increase
- Recovery may require evaporation of condensed moisture

In most indoor HVAC and appliance applications, occasional high-humidity exposure does not lead to permanent degradation. However, continuous condensation or prolonged water exposure should be avoided.

6.3 Design Recommendations to Reduce Condensation Risk

System-level design can significantly reduce condensation events:

- Avoid mounting on cold metal surfaces
- Prevent direct exposure to very cold airflow
- Ensure sufficient ventilation around the sensing area
- Avoid placing the module in zones with strong temperature gradients
- Design enclosure geometry to prevent water accumulation

In applications with frequent condensation cycles, system-level mitigation strategies such as airflow control or optimized placement should be considered.

6.4 Operation at High Humidity

The RHT1 is designed for operation across a wide humidity range. Short-term exposure to high relative humidity levels (>80 %RH) is typically uncritical.

However, continuous operation at extremely high humidity (close to saturation) may:

- Increase response time
- Affect long-term drift characteristics

Applications involving near-saturation environments should be validated under realistic operating conditions.

7 Long-Term Stability and Lifetime

Humidity sensing elements are subject to gradual aging effects caused by environmental exposure, material diffusion processes, and long-term electrical stress. Understanding these effects is essential when designing systems with multi-year operational lifetimes.

The RHT1 is specified for a 10-year lifetime under typical operating conditions. The specified long-term drift is ≤ 0.25 %RH per year, expressed as a linearized average over the expected product lifetime.

7.1 Understanding Drift Specification

The stated drift value represents an averaged value over the full operational lifetime. In practice, humidity sensors typically exhibit non-linear aging behavior:

- A larger drift may occur during the initial period of operation (logarithmic behavior)
- Drift typically stabilizes over time
- Long-term changes tend to follow a gradual and predictable trend

This behavior is characteristic of polymer-based capacitive humidity sensing technologies and is not unique to the RHT1.

For most HVAC, appliance, and building automation applications, the resulting long-term deviation remains well within acceptable system tolerances.

7.2 Factors Influencing Long-Term Stability

Long-term stability depends on environmental and application-specific factors, including:

- Continuous exposure to high humidity levels
- Chemical contaminants or aggressive atmospheres
- Repeated condensation cycles
- Mechanical stress or vibration
- Operating temperature extremes

Stable environmental conditions and proper mechanical integration support long-term measurement consistency.

7.3 Storage and Handling Considerations

To maintain specified performance:

- Store modules in a dry, controlled environment
- Avoid prolonged exposure to high humidity before installation
- Follow recommended handling conditions if applicable

After extended storage in dry conditions, a short stabilization period in ambient humidity may be required for optimal accuracy.

7.4 System-Level Implications

For applications requiring multi-year accuracy stability:

- Design mechanical integration to minimize environmental stress
- Validate performance under realistic long-term operating conditions

In typical environmental monitoring applications, the intrinsic stability of the RHT1 supports reliable operation throughout the specified lifetime.

8 Electrical Interface and Output Scaling

The RHT1 provides analog voltage outputs for relative humidity and temperature. Both outputs are ratiometric to the supply voltage (V_{DD}), meaning that the output voltage scales proportionally with the applied supply voltage.

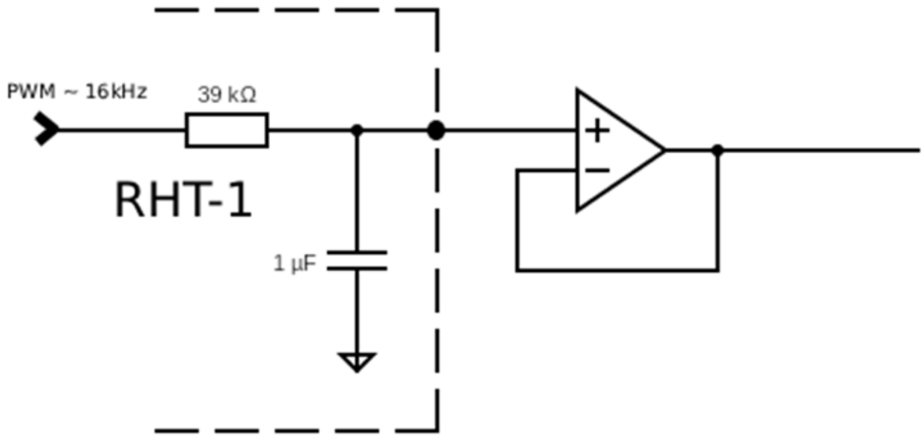
Before conversion into voltage signals, the internal sensing element performs:

- Linearization of the physical measurement
- Temperature compensation (for RH calculation)
- Compensation for supply voltage variation

This allows the physical quantity to be described using a linear equation.

8.1 Electrical connection

The RHT1's PWM-based output is inherently load-sensitive due to the interaction between the filter and the load. A voltage follower (or similar buffering circuit) is essential to decouple the load from the filter, ensuring accurate, stable output voltage across varying load conditions.



8.2 Ratiometric Output Principle

The output voltages are defined as follows:

- **Humidity output (V_{RH}):** 19.7 % to 73.7 % of V_{DD}
- **Temperature output (V_T):** 10 % to 90 % of V_{DD}

Because the outputs are ratiometric:

$$\frac{V_{RH}}{V_{DD}} \text{ and } \frac{V_T}{V_{DD}}$$

are independent of absolute supply voltage.

This enables supply-tolerant system design when the ADC reference is derived from the same V_{DD}.

8.3 Relative Humidity Transfer Function

The humidity output can be described by the generic linear equation:

$$RH = -\frac{19.7}{0.54} + \frac{100}{0.54} \cdot \frac{V_{RH}}{V_{DD}}$$

the equation simplifies to:

$$RH = -36.48 + 185.19 \cdot \frac{V_{RH}}{V_{DD}}$$

This equation allows direct computation of relative humidity from the measured voltage ratio.

8.4 Practical Implementation Example

If the ADC reference voltage equals V_{DD}, the ratio simplifies to:

$$\frac{ADC_{RH}}{ADC_{max}}$$

Example (12-bit ADC, $V_{ref} = V_{DD}$):

$$RH = -36.48 + 185.19 \cdot \frac{ADC_{RH}}{4095}$$

This eliminates the need to measure V_{DD} separately.

8.5 Lookup Table RH (VDD = 5 V)

For systems operating at V_{DD} = 5 V, the humidity output can alternatively be interpreted using a lookup table.

Example values:

RH (%)	V_{RH} (mV)
10	1255
20	1525
50	2335
80	3145
100	3685

The full table is provided in the datasheet for detailed mapping.

Lookup tables may be preferred in low-power microcontrollers without floating-point capability.

8.6 System Design Implications

When using the analog output:

- Ensure ADC reference stability
- Prefer ratiometric measurement (V_{ref} = V_{DD})
- Avoid noise on supply lines
- Use proper grounding

Ratiometric operation significantly reduces supply-induced measurement error.

8.7 Temperature Transfer Function

The temperature output voltage V_T is also ratiometric to the supply voltage V_{DD}.

The temperature in degrees Celsius can be calculated using:

$$T[°C] = -66.875 + 218.75 \cdot \frac{V_T}{V_{DD}}$$

This equation represents the linear relationship between the normalized output voltage and the physical temperature.

The alternative form shown in the datasheet:

$$T[°C] = -45 - \frac{17.5}{0.8} + \frac{175}{0.8} \cdot \frac{V_T}{V_{DD}}$$

is mathematically equivalent and reflects the scaling of the 10 % - 90 % output span (0.8 × V_{DD}).

Temperature in Degrees Fahrenheit

For applications requiring °F:

$$T[°F] = -88.375 + 393.75 \cdot \frac{V_T}{V_{DD}}$$

Again, this equation is derived from the ratiometric 10 % - 90 % output range.

8.8 Practical Implementation Example (°C)

If the ADC reference equals V_{DD}, the ratio simplifies to:

$$\frac{ADC_T}{ADC_{max}}$$

Example (12-bit ADC, V_{ref} = V_{DD}):

$$T[°C] = -66.875 + 218.75 \cdot \frac{ADC_T}{4095}$$

This allows direct conversion without explicitly measuring the supply voltage.

8.9 Lookup Table T (VDD = 5 V)

For systems operating at 5 V supply, the output voltage corresponds to the following example values:

T (°C)	V_T (mV)
10	1757
20	2100
50	2669
75	3243
100	3814

The complete lookup table is provided in the datasheet.

Lookup tables may be advantageous for microcontrollers without floating-point support or when deterministic integer arithmetic is preferred.

8.10 Design Recommendations for Temperature Output

To ensure accurate temperature measurement:

- Use ratiometric ADC configuration ($V_{ref} = V_{DD}$) when possible
- Minimize noise coupling into the analog output lines
- Avoid supply ripple from switching regulators
- Consider simple low-pass filtering if application dynamics allow

Because temperature directly influences calculated relative humidity, preserving temperature accuracy is critical for overall system performance.

9 Application Examples

The RHT1 is suitable for a wide range of environmental monitoring applications requiring reliable humidity and temperature measurement with straightforward analog integration. The following examples highlight typical integration scenarios.

9.1 HVAC and Building Automation

In HVAC systems, humidity and temperature measurements are used for:

- Climate control
- Energy-efficient ventilation
- Condensation prevention
- Mold risk reduction

- Enthalpy-based control strategies

When integrating the RHT1 in HVAC systems:

- Ensure representative airflow exposure
- Avoid installation near heating coils or cold metal surfaces
- Prevent condensation accumulation
- Route analog signals away from high-power switching circuits

The ratiometric analog output simplifies integration into existing control units with ADC inputs, especially in legacy analog-based architectures.

9.2 Bathroom Fans and Moisture Control Systems

Humidity-based activation of bathroom fans is a common application.

Key integration considerations:

- Avoid placement directly above steam outlets
- Ensure adequate airflow without direct water exposure
- Consider response time vs. filtering trade-offs
- Validate behavior during rapid humidity spikes

In these systems, proper placement is often more critical than intrinsic sensor accuracy.

9.3 Appliances (White Goods)

Typical use cases include:

- Refrigerators
- Laundry dryers
- Dehumidifiers
- Cooker hoods

In appliance environments:

- Temperature gradients can be significant
- Condensation cycles may occur
- Vibration and mechanical stress should be considered

Mechanical decoupling and thoughtful placement inside the appliance housing improve long-term measurement stability.

9.4 Industrial Environmental Monitoring

For industrial indoor monitoring:

- Ensure protection against dust accumulation
- Avoid continuous exposure to aggressive solvents
- Provide sufficient ventilation

- Consider periodic validation in critical control systems

The analog output enables simple integration into PLC-based control architectures.

9.5 IoT and Embedded Control Units

In compact embedded systems:

- Power stability is essential for low-noise output
- ADC resolution should match required system accuracy
- Cable routing should avoid RF modules and switching converters

The wide supply range (3.3–5 V) allows flexible integration into typical embedded platforms.

10 Integration Checklist

The following checklist summarizes the key recommendations for successful system integration of the RHT1 module.

Mechanical Integration

- ✓ Mount the module in a location representative of ambient air conditions
- ✓ Avoid placement near heat sources (power electronics, transformers, compressors, LEDs)
- ✓ Prevent direct contact with cold metal surfaces
- ✓ Ensure ventilation openings are not obstructed
- ✓ Do not cover the membrane with adhesives, foams, or labels
- ✓ Avoid stagnant air pockets inside the enclosure

Thermal Considerations

- ✓ Minimize temperature gradients around the module
- ✓ Avoid mounting on thermally conductive structures
- ✓ Ensure airflow supports accurate ambient temperature measurement
- ✓ Validate system-level temperature offset in final design

Condensation Awareness

- ✓ Avoid installation locations prone to persistent condensation
- ✓ Prevent water accumulation on the sensing surface
- ✓ Consider enclosure geometry to reduce dew point risk
- ✓ Validate performance in high-humidity operating conditions

Chemical Exposure Considerations

- ✓ Avoid placing the module in direct contact with outgassing materials such as adhesives, sealants, foams, or coatings
- ✓ Be aware that volatile organic compounds (VOCs) may influence long-term sensor stability
- ✓ Avoid enclosed spaces where outgassing substances can accumulate around the sensor
- ✓ Prefer low-emission or qualified materials in proximity to the sensing area
- ✓ Validate performance in applications involving solvents, cleaning agents, or chemically active environments

Electrical Integration

- ✓ Use stable and low-noise supply voltage (3.3–5 V)
- ✓ Prefer ratiometric ADC configuration ($V_{ref} = V_{DD}$)
- ✓ Route analog signal lines away from switching regulators or RF circuits
- ✓ Use proper grounding between module and host system
- ✓ Consider shielding or twisted pair wiring for extended cable lengths

Firmware Implementation

- ✓ Apply the linear transfer functions from the datasheet
- ✓ Ensure sufficient ADC resolution for required system accuracy

- ✓ Implement optional signal filtering if response time allows
- ✓ Validate full-scale and offset behavior in the final system

Validation and Qualification

- ✓ Perform system-level accuracy verification
- ✓ Test response behavior under realistic airflow conditions
- ✓ Evaluate performance during temperature transitions
- ✓ Validate operation in high humidity environments
- ✓ Consider long-term drift in high-precision applications

Conclusion

The RHT1 module enables reliable and straightforward humidity and temperature measurement in a wide range of environmental monitoring applications. By following proper mechanical placement, thermal design, and electrical integration practices, system designers can achieve performance that closely reflects the intrinsic accuracy and long-term stability specified for the device.

Careful system-level validation ensures that the benefits of the integrated sensing and signal conditioning architecture are fully realized in the final application.

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12 Revision information

Table 1: Revision history

Revision	Date	Comment	Page
1.0	2026-04-14	Initial release	All

Notes:

1. Page and figure numbers for the previous version may differ from page and figure numbers in the current revision.
2. Correction of typographical errors is not explicitly mentioned.

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