

# ChipCap

## The Fully Calibrated Humidity and Temperature Solution

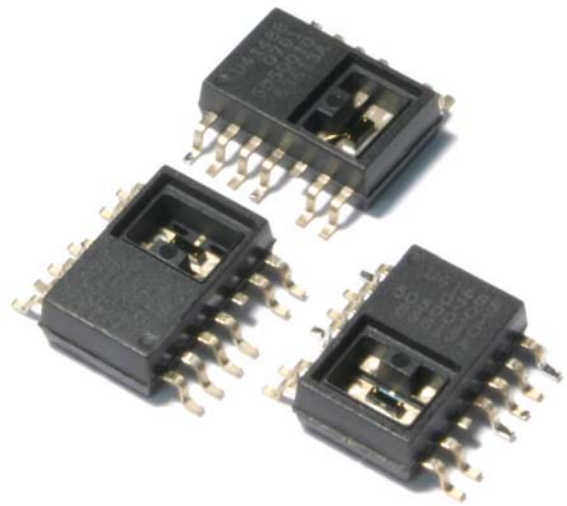
### Features

- Simultaneous relative humidity and temperature outputs
- Precision accuracy  $\pm 2\%$  RH,  $\pm 0.6^\circ\text{C}$
- Resolution 0.4% RH
- Factory selectable analog or digital outputs
- Output configurations available:
  - Voltage 0V to 1V
  - 10 to 90% of VDD
  - ZACwire™ digital output (8-bit humidity)
- Factory calibrated, ready to use
- Designed for automated assembly
- Supply voltage: 3.0V to 5.5V
- Low quiescent current: 0.5mA@5V, 25°C
- SOP 14 package

### Applications

- HVAC Controls
  - Humidistats
  - Enthalpy control
  - Indoor air quality (IAQ)
  - Humidifiers
  - Dehumidifiers

- Instrumentation
  - Portable instruments
  - Data loggers and recorders
  - Weather stations
- Medical
  - Nebulizers
  - Oxygen air
  - CPAP/Sleep apnea devices
- Automotive
  - Cabin climate control
  - Defrost control
- Appliances and white goods
- OEM assemblies available



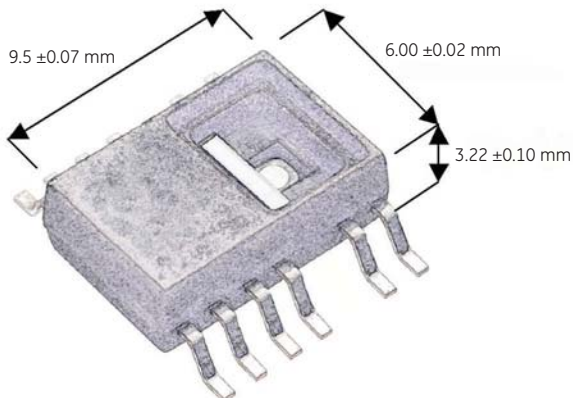
## ChipCap—The Fully Calibrated Humidity and Temperature Sensor

The ChipCap series humidity sensor by GE offers a new standard in the field of accurate relative humidity measurement. Based on a capacitive polymer sensing technology, this device offers signal conditioning and temperature compensation for a single SoC (System-on-Chip) solution. The device is very simple to use, fully tested and calibrated for accuracy on delivery—no further calibration is needed. ChipCap can be incorporated into an assembly or finished sensor to meet customer specifications. The measurement is accurate to  $\pm 2\%$  from 20% to 80% RH and  $\pm 3\%$  across the entire humidity range. Long term stability is excellent. The temperature accuracy is  $\pm 1^\circ\text{C}$  from  $0^\circ\text{C}$  to  $+70^\circ\text{C}$ . Dual outputs provide humidity and temperature as 0V to 1V, or 0.5V to 4.5V ratiometric or available with digital output (the ZACwire one-wire interface).

### Accurate, Repeatable Humidity and Temperature Measurement

ChipCap provides either analog or digital interfaces on a single, 5VDC-powered chip. The package is highly resistant to chemical vapors and other contaminants. ChipCap sensors are precalibrated and offer high interchangeability. They also fully recover from condensing environments and may be used across a wide range of both temperature and relative humidity ranges.

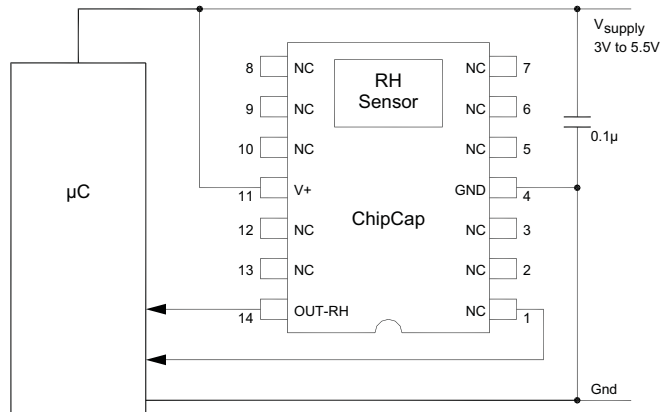
ChipCap relative humidity sensors change capacitance in direct proportion to ambient relative humidity. An internal solid-state band gap provides temperature measurement. This integral design reduces overall cost and complexity and improves reliability.



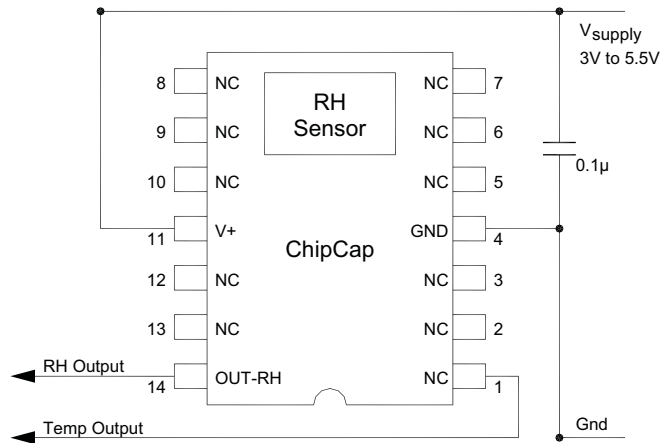
## Small, Integrated Package for Automated Assembly

ChipCap contains the entire signal conditioning circuitry on a single silicon die. The sensor and circuitry are integrated into a small footprint SoC to save board real estate. ChipCap is shipped in tube packaging for automated insertion on surface mount technology (SMT) circuit boards. Tape and reel packaging is available upon request for high volume applications.

Digital Interface



Analog Interface



#### Linear mode:

$$\%RH = V_{out} * 100$$

$$T_c = V_{out} * 200 - 50$$

#### Ratiometric mode:

$$\%RH = ((V_{out} - (0.1 * V_{supply})) / (0.8 * V_{supply})) * 100$$

$$T_c = ((V_{out} - (0.1 * V_{supply})) / (0.8 * V_{supply})) * 200 - 50$$

# ChipCap Specifications

## Relative Humidity

### RH Sensor

Planar Capacitive Polymer

### RH Range

0 to 100% RH

### RH Accuracy @ 25°C

±2% from 20% to 80%

±3% from 0% to 20% and 80% to 100%

### RH Resolution

0.4% RH

## Temperature

### Temperature Sensor

Integral band gap PTAT

### Temperature Scale

-50°C to 150°C

### Temperature Accuracy

±0.6°C at 25°C (see graph below)

### Temperature Resolution

0.2°C

## Power Supply

### Reverse Polarity Protection

12.5 VDC, 100µA (15VDC, 60s)

### Voltage Supply

3 to 5.5 VDC

### Current Supply

500 microamps @ 5 VDC, 25°C

## Outputs

### RH Voltage Output (Ratiometric)

$V_{out} = (V_{supply}/5)(0.5 + (.04 * RH))$ ; 0.5 to 4.5V ratiometric; 5VDC nom.

### RH Voltage Output (Linear, 0-1V)

$V_{out} = 0.01(RH)$

### RH Digital Output

Manchester 8-bit encoded

### Temperature Voltage Output (Ratiometric)

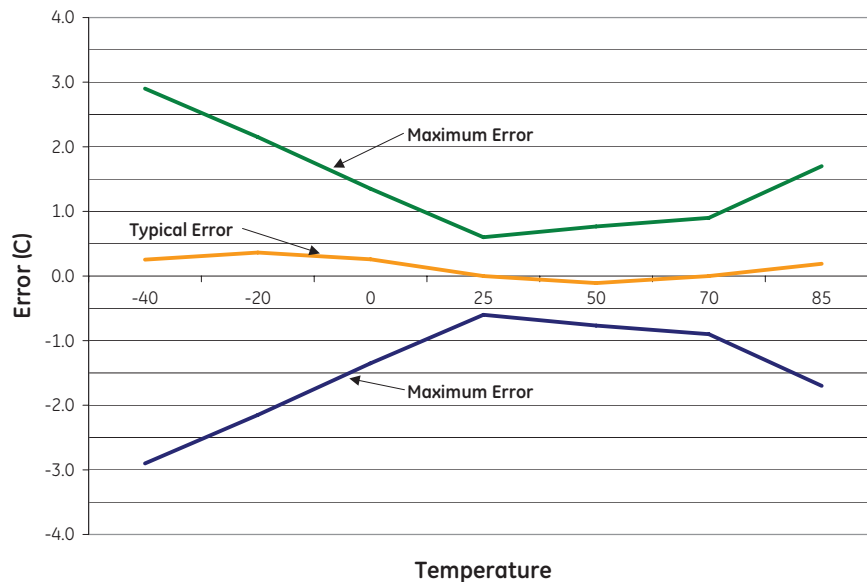
$V_{out} = (V_{supply}/5)(1.5 + (.02 * T^{\circ}C))$ ; 0.5 to 4.5V ratiometric; 5VDC nom.

### Temperature Voltage Output (Linear)

$V_{out} = (0.005T^{\circ}C) + 0.25$

### Temperature Digital Output

Manchester 10-bit encoded



## Environmental

### Operating Temperature Range

-40°C to 85°C

### Operating RH Range

0 to 100 % RH, non-condensing

## Packaging

### Packaging

SOP-14, SMD

### Soldering

IR Solder Reflow, 260°C, 10 sec

### Pin Connection

4 Pin; +V, Gnd, RHout, Tout

## Ordering Information

Model	Part Description
ChipCap-L	ChipCap RH and Temperature Sensor, 0-1VDC Linear Output
ChipCap-R	ChipCap RH and Temperature Sensor, 0.5- 4.5VDC Ratiometric Output (5VDC Nominal)
ChipCap-D	ChipCap RH and Temperature Sensor, Digital Output



Absolute Maximum Ratings					
Symbol	Parameter	Min.	Max.	Units	Notes
Vdd	DC Supply Voltage	-0.3	6	V	
Vio	Voltage at all Analog and Digital I/O pins	-0.3	Vdd + 0.3	V	
Ta	Ambient Temperature (operation)	-50 -40	150 85	°C °C	ASIC RH Sensor
Tstrg	Storage Temperature	-55	150	°C	
Tj	Junction Temperature	-55	160	°C	

Recommended Operation Conditions						
Symbol	Parameter	Min.	Type	Max.	Units	Notes
Vdd	Analog DC Supply	3	5	5.5	V	
Idd	Supply Current		550		µA	25°C
Vss	Analog Ground		0.0		V	
To	Ambient Temperature	-40	27	85	°C	
Cvdd	External Capacitance between Vdd and Vss	100	220	470	nF	
C <sub>LD</sub>	Digital Output Load (only capacitive, no resistive)			100	pF	
C <sub>LA</sub>	Analog Output Load Capacitance			5	nF	
R <sub>LA</sub>	Analog Output Load Resistance	5			KΩ	



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920-426B