aTS10

LOW-VOLTAGE ULTRA-LOW-POWER TEMPERATURE SENSOR WITH HIGH OUTPUT DRIVE

Preliminary Specification

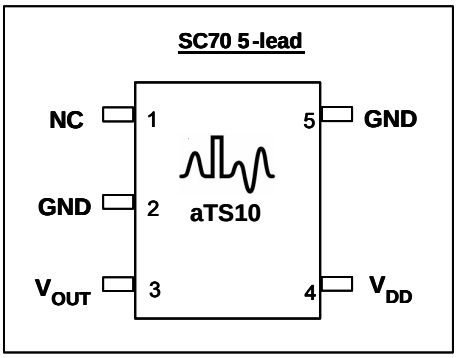
PRODUCT SPECIFICATION

General Description

The aTS10 is a high precision silicon integrated circuit temperature sensor. Improved accuracy relative to it's industry counterparts the aTS10 maintains an accuracy of ±1°C over a temperature range of –40°C to 125°C. At 25°C (room temperature) the accuracy is calibrated to typically better than ±0.5°C (V_{OUT} = 750mV). This calibration is done during probe and guaranteed on each device. The aTS10 also maintains one of the lowest power consumption requirement in the industry and therefore reduces any inaccuracies due to self-heating. The device maintains all these specifications over an operating voltage range of 2.7 to 6 volts.

With the availability within a 5-pin SC-70 package, the aTS10 has the same functionality as the aTS50 or aTS51, but in a smaller footprint.

Pin Configuration

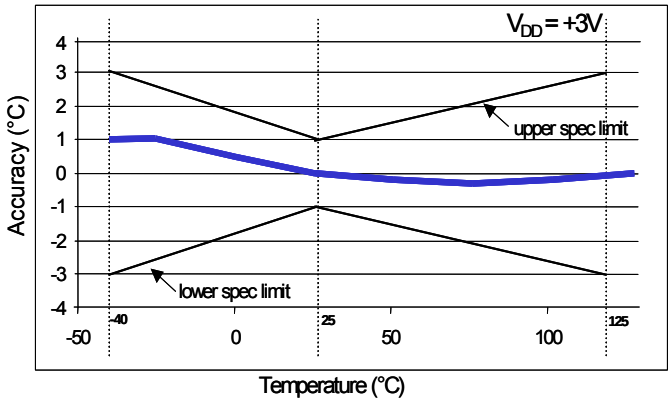


actual part marking below

Features

- Precision Calibrated to ±1°C at 25°C
- Temperature Range: -40°C to 125°C
- Low Operating Current: ≤ 15µA
- Extremely Linear Output Ramp: 10mV/°C
- Operating Voltage Range: +2.7V to +6V
- Output Ramp is Calibrated to Degrees Celsius
- Low Self Heating: 0.02°C Typical in Still Air
- Uses a Single Positive Supply
- Non-linearity: ≤ 0.8°C

Accuracy vs Temperature



Applications

- Mobile Phones
- Mobile Communications Terminals
- Computers
- Battery Management
- FAX Machines/Printers/Copiers
- Portable Medical Instruments
- HVAC, Power Supply Modules
- Disk Drives
- Automotive Control Circuits

Ordering Information

Part Number	Package	Temperature Range	Part Marking	How Supplied
aTS10F5	5-Pin SC-70	-40˚C to +125˚C	Dyw	3000 units on T&R

y – year, w - week

Absolute Maximum Ratings[1]

Parameter		Rating
Supply Voltage		+7V
Output Voltage		V_{DD} + 0.5V
Output Current		-100/+10 µA
Storage Temperature Range		-60°C to +150°C
ESD[2]	Human Body Model	2000V
	Machine Model	250V
Thermal Resistance - θ_{JA}	SC-70	331°C/W
Lead Temp	Vapor Phase (60 sec)	215°C
	Infrared (15 sec)	220°C

Notes:

1. Absolute maximum ratings are limits beyond which operation may cause permanent damage to the device. These are stress ratings only; functional operations at or above these limits is not implied.
2. Human Body Model: 100pF capacitor discharged through a 1.5kΩ resistor into each pin. Machine Model: 200pF capacitor discharged directly into each pin.
3. These specifications are guaranteed only for the test conditions listed.
4. Accuracy (expressed in °C) = Difference between calculated output voltage and measured output voltage. Calculated output voltage = 10mV/°C multiplied by device's case temperature at specified conditions of temperature, voltage and power supply.

Recommended Operating Ratings

Symbol	Parameter	Min	Max	Units
V_{DD}	Supply Voltage	+2.7	+6	V
V_{OUT}	Output Voltage	0	V_{DD}	V
T_A	Operating Temperature Range	-40	+125	°C

Electrical Characteristics[3]

Limits apply for -40°C≤T_A≤+125°C and V_{DD}=+3.0V unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Accuracy[4]		T_A=+25°C	-1	±0.5	+1	°C
		T_A=-40°C (T_{MIN})	-3	±1	+3	°C
		T_A=+125°C (T_{MAX})	-3	±1	+3	°C
Non-linearity[5]				±0.8		°C
Supply Current - Output floating	I_{DD}	T_A=+25°C		11		
		-40°C≤T_A≤+125°C	9		15	µA
Output Sink Capability[6]	I_{OL}	+2.7V < V_{DD} < +6V	—	25		µA
Output Source Capability[6]	I_{OH}	+2.7V < V_{DD} < +6V		200		µA
Average Output Slope (Sensor Gain)	A_{OUT}			10		mV/°C
Room Temp Output Voltage	V_{OUT25}	T_A=+25°C		750		mV
Self Heating[7]		SC-70-5		0.02483		°C

Notes:

5. Non-linearity is defined as the deviation of the output-voltage-versus-temperature curve from the best-fit straight line, over the device's rated temperature range.
6. Lowest output current should be targeted; higher currents result in more self-heating of the device.
7. Max Self Heating = θ_{JA} x (V_{DD} x I_{DD}). Assumes a capacitive load.

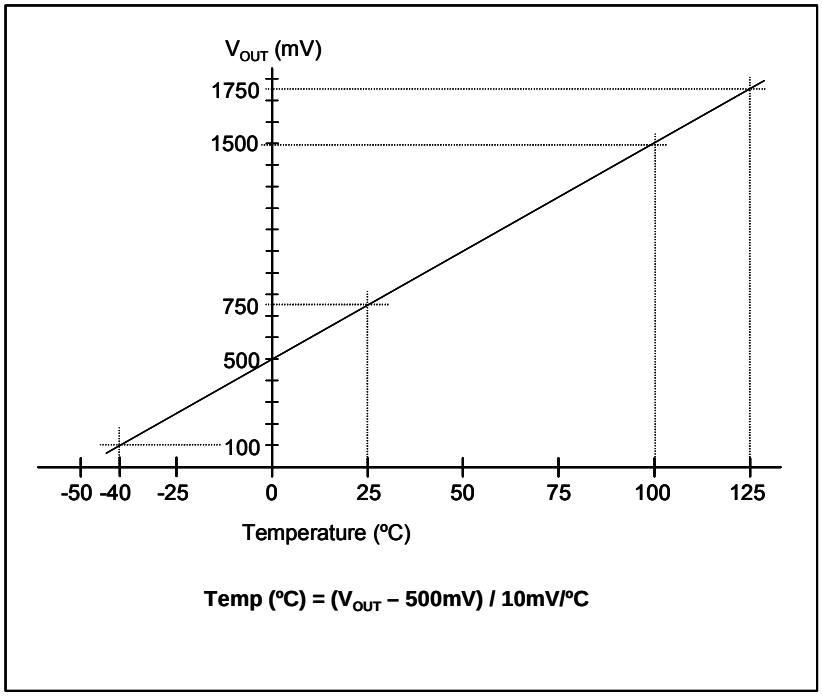


Figure 1. aTS10 Output Voltage vs. Temperature

Mounting

The aTS10 can be easily mounted by gluing or cementing it to a surface. In this case, its temperature will be within about 0.02°C of the temperature of the surface it is attached to if the ambient air temperature is almost the same as the surface temperature. If the air temperature is much higher or lower than the surface temperature, the actual temperature of the aTS10 die will be at an intermediate temperature between the surface temperature and the air temperature.

To ensure good thermal conductivity, the backside of the aTS10 die is directly attached to the GND pin. The lands and traces to the aTS10 will, of course, be part of the printed circuit board, which is the object whose temperature is being measured. These printed circuit board lands and traces will not cause the aTS10's temperature to deviate from the desired temperature.

Alternatively, the aTS10 can be mounted inside a sealed-end metal tube, and can then be dipped into a bath or screwed into a threaded hole in a tank. As with any IC, the aTS10 and accompanying wiring and circuits must be kept insulated and dry to avoid leakage and corrosion. This is especially true if the circuit may operate at cold temperatures where condensation can occur. Printed-circuit coatings and varnishes such as Humiseal and epoxy paint or dips can be used to ensure that moisture cannot corrode the aTS10 or its connections.

Typical Performance Characteristics

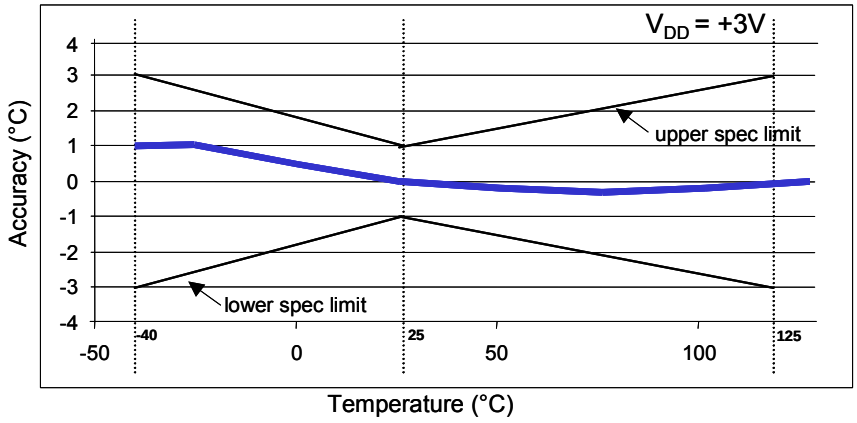


Figure 2. aTS10 Accuracy Range vs Temperature

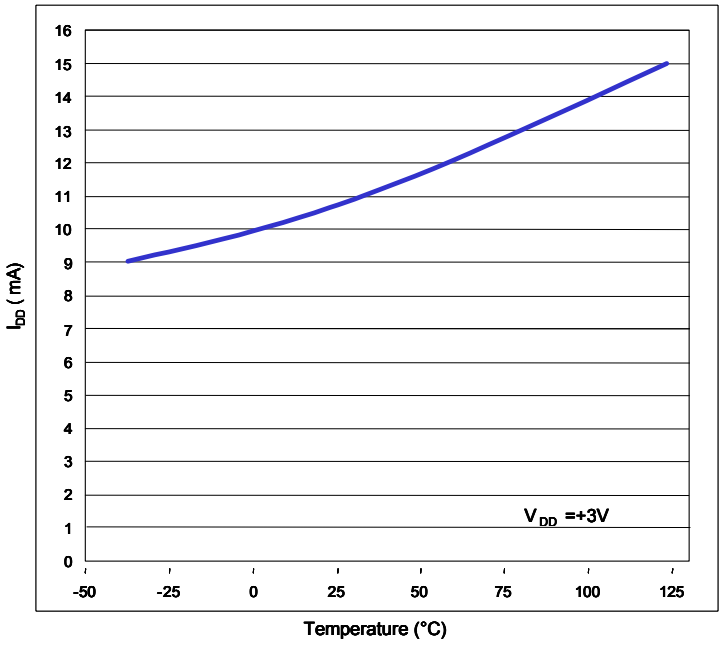


Figure 3. aTS10 Current vs Temperature

Typical Applications

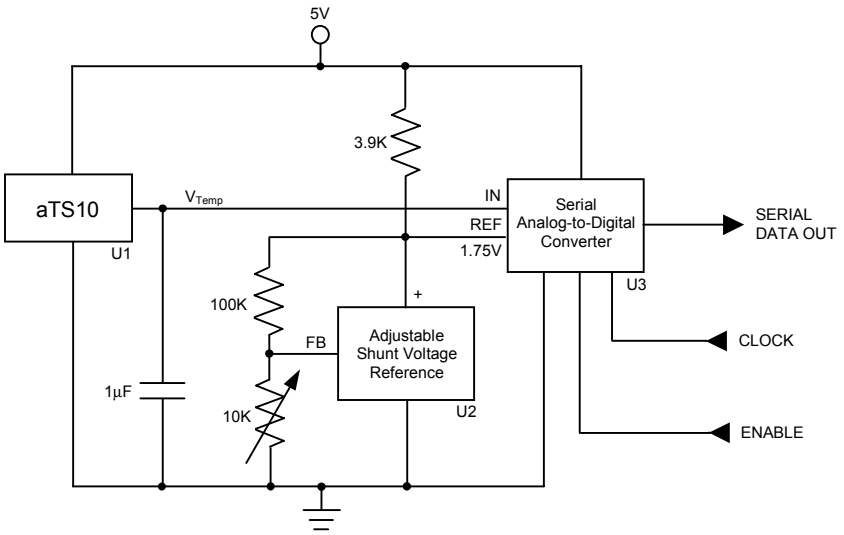


Figure 4. Serial Output Temperature to Digital Converter (Full Scale = +125˚C)

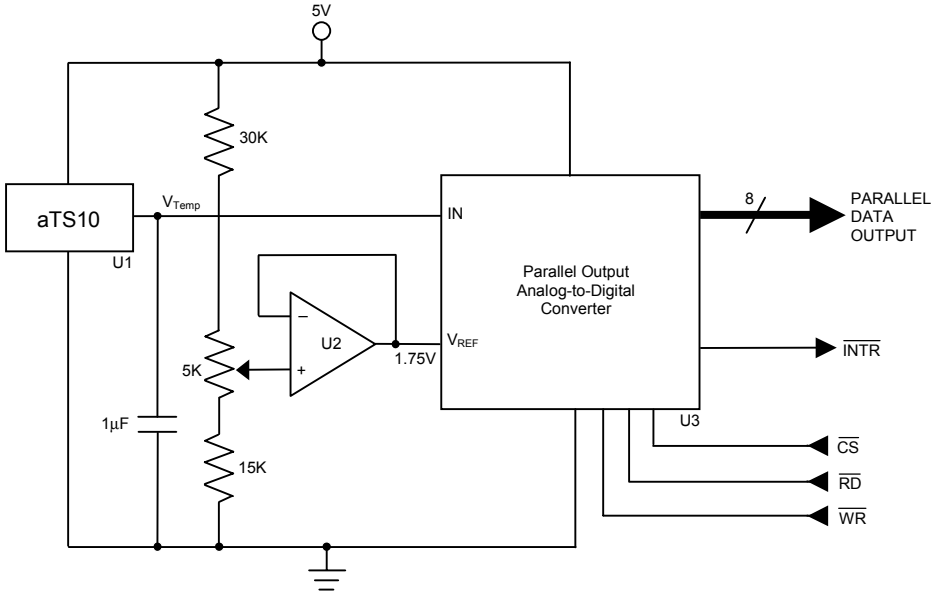


Figure 5. Parallel Output Temperature to Digital Converter (Full Scale = +125˚C)

Typical Applications (cont.)

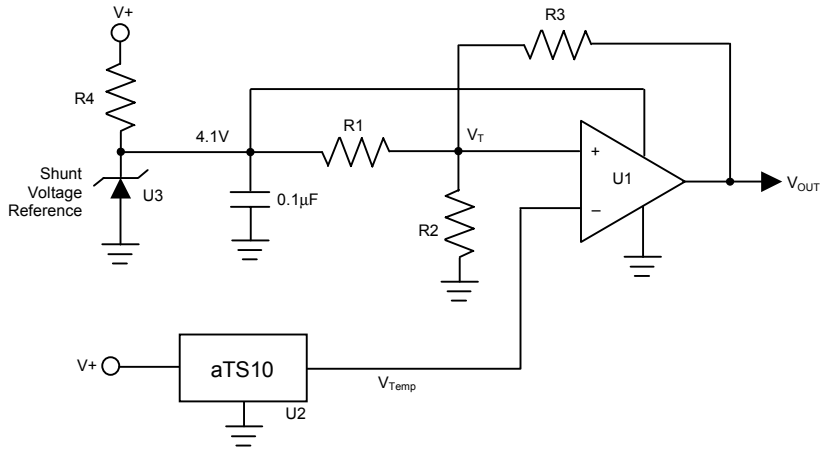
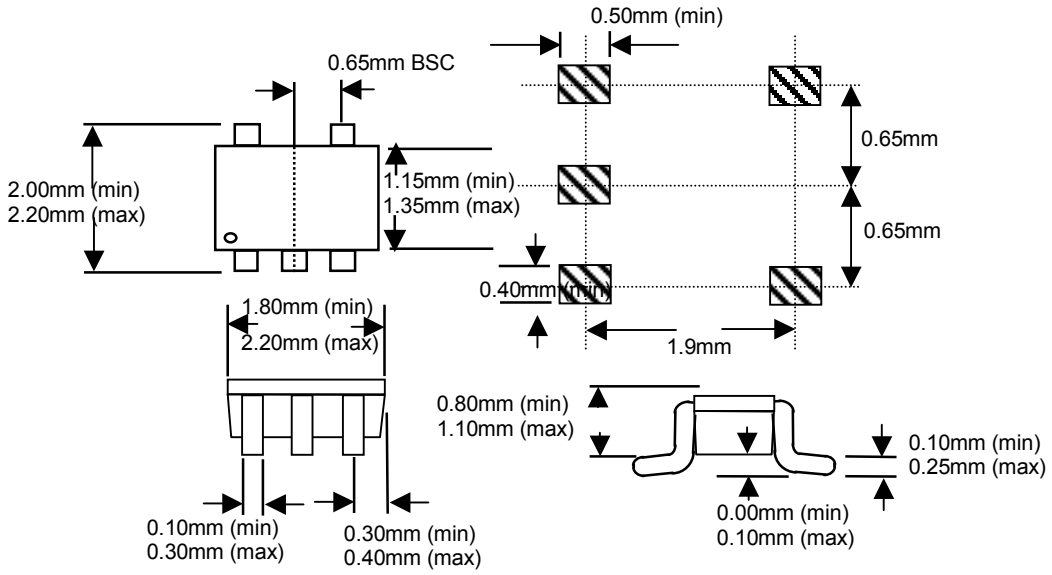
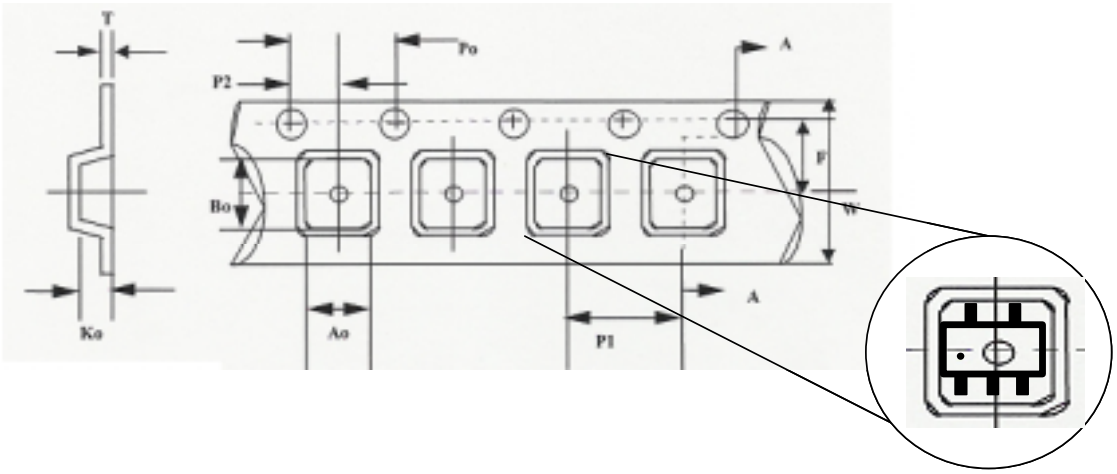


Figure 6. Thermostat/Fan Controller

SC-70-5 Package Dimensions



Tape and Reel Data



W	8.1 ± 0.20 mm
A_0	2.25 ± 0.10 mm
B_0	2.70 ± 0.10 mm
K_0	1.20 ± 0.10 mm
P_0	4.00 ± 0.10 mm
P_1	4.00 ± 0.10 mm
P_2	2.00 ± 0.05 mm
T	0.30 ± 0.05 mm
F	3.50 ± 0.05 mm

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Preliminary Specification

This classification is shown on the heading of each page of a specification for products that are either under development(design and qualification), or in the formative planning stages. Andigilog reserves the right to change or discontinue these products without notice.

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