

# TSic™- 206

## Precise, Rapid Response, Low-Cost Temperature Sensor IC

### Feature Sheet

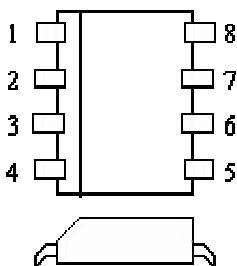
#### Features

- Low cost, precision temperature sensor
- Single-wire 11-bit digital serial signal output compatible with state-of-the-art  $\mu$ P controllers
- Communication range > 10 meters
- Resolution: 0.1°C
- Accuracy:  $\pm 0.5^\circ\text{C}$  over a span of 80°C
- Wide measurement range:  $-50$  to  $+150^\circ\text{C}$
- Signal read-out every 0.1s (other rates available on request)
- V+ supply voltage: 2.97 to 5.5V (industry standard); 3.3V or 5V ( $\pm 10\%$ ) power supplies
- Package: 8-pin SOIC
- Low quiescent current:  $< 80\mu\text{A}$  at  $25^\circ\text{C}$  with 3.3V – minimizes self-heating errors for applications such as wall-mounted thermostats
- System-on-a-chip based on advanced mixed-signal technology integrating precision temperature sensing bandgap reference with PTAT output; digital signal processor (DSP) core, and electrically erasable memory (EEPROM)

#### Package Information

TSic™ 206 SOP8: 150mil, Standard SMT Package, SOIC, Based on IEC 191-2Q, Type 076E35 B.

Other packages available on demand: TSic™ 206 e-line; 3 pin THT package; TSic™ 206 bare die or wafer level.



Pin	Name	Description
1	V+	Supply voltage (3.0-5.5V)
2	Signal	Temperature output signal
4	Gnd	Ground
3, 5-8	TP/NC	Test pin / NC Do not connect

#### Brief Description

The TSic™ temperature sensor IC family are fully tested and calibrated sensors with absolute measurement accuracy on delivery – no further calibration needed. The TSic™ combines outstanding accuracy with long term stability, yet it is very simple to use.

The TSic™ series is specifically designed for high performance, cost-effective solutions for sensing temperature in building automation, automotive, industrial, office automation, white goods and low-power/mobile applications.

TSic™ employs a high precision bandgap reference with proportional-to-absolute-temperature (PTAT) output; a low-power, precision ADC; and an on-chip DSP core with EEPROM to precisely calibrate the output temperature signal. The TSic™ series includes ICs with two linear analog signal output options, such as standard  $0\sim 1V_{\text{out}}$  ( $V_+ = 2.97V$  to  $5.5V$ ) or ratiometric ( $10\sim 90\%$  of  $V_+$ ; i.e.,  $0.5\sim 4.5V_{\text{out}}$  @  $V_+ = 5V$ ) or the digital serial output signal for interfacing with  $\mu$ P controllers.

#### Benefits

- **Several accuracy classes available with 100% upward compatibility**
- **No calibration by customer needed; absolute calibration specified**
- **Simple to integrate, reducing cost and time for application-development**
- **Fast data measurement – optimal for temperature control**
- **Packages for standard SMD, THT or application specific assembly**
- **Miniaturized solutions with Bare-Chip (for COB, COF, CSP\*) or e-line packages – very fast response time for COF**
- **Very low power consumption – ideal for mobile and standard applications**
- **Field reconfiguration/recalibration option available (high volume customers only)**
- **Outstanding long term stability**

\* COB: Chip-On-Board; COF: Chip-On-Flex; CSP: Chip Scale Packaging



INNOVATIVE SENSOR TECHNOLOGY



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## Feature Sheet

### Absolute Maximum Ratings

PARAMETER	MIN	TYP	MAX	UNITS
Supply Voltage (V <sub>+</sub> )	-0.3		6.0	V
Voltages at Analog I/O Pins (V <sub>INA</sub> , V <sub>OUTA</sub> )	-0.3		V <sub>DDA</sub> +0.3	V
Storage Temperature Range (T <sub>stor</sub> )	-50		150	°C

### Operating Conditions

PARAMETER	MIN	TYP	MAX	UNITS
Supply Voltage to Gnd (V <sub>+</sub> ) <sup>1</sup>	2.97	5.0	5.5	V
Supply Current (I <sub>v+</sub> ) @ V <sub>+</sub> = 3.3V, RT	30	45	80	µA
Ambient Temperature Range (T <sub>amb</sub> ) <sup>2</sup>	-50		150	°C
Output Load Capacitance (C <sub>L</sub> ) <sup>3</sup>		10	15	nF
External Capacitance Between V <sub>+</sub> and Gnd (C <sub>V+</sub> ) <sup>4</sup>	80	100	470	nF
Output Load Resistance (R <sub>L</sub> ) Signal to Gnd (or V <sub>+</sub> ) <sup>5</sup>	2.5	10		KΩ

- 1 With supply voltage 2.7V - 2.97V, accuracy is slightly reduced; below 2.7V, functionality is unknown.
- 2 Output signal is limited to this ambient temperature (applies to calibration, offset and gain).
- 3 When using the output as a digital output, the load capacitor C<sub>L</sub> is limited by maximum rise time for ZACwire™.
- 4 Locate as close as possible to TSic's V<sub>+</sub> and Gnd pins.
- 5 When using the output as a digital output, no pull-down resistor is allowed.

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### Temperature Accuracy

PARAMETER	MIN	TYP	MAX	UNITS
<i>Wide Range Device for -50° to 150°C</i>				
+10 to 90 °C	-0.5	±0.3	0.5	°C <sup>1</sup>
-20 to +10, 90-110°C	-0.2	+0.4	0.95	°C <sup>1</sup>
-50 to -20, 110-150°C	0	+0.9	2.0	°C <sup>1</sup>

<sup>1</sup> 2s value, plus 1 bit quantization error (0.1°C).

Available on request: TSic™ products with customer-specific special calibration which shifts the 80°C span (bandgap) with the high precision temperature range of ±0.5 °C to a lower or higher temperature range.

### Output Examples for TSic™ Devices

		Temperature Measurement Range -50°C to 150°C or -58°F to 302°F ( wide range device)		
		TSic-201	TSic-203	TSic-206
Temp (°C)	Temp (°F)	Analog 0~1V	Analog ratiometric 10~90%	Digital <sup>1</sup>
-50	-58	0.000	10	0x000
-10	14	0.200	26	0x199
0	32	0.250	30	0x200
25	77	0.375	40	0x2FF
60	140	0.550	54	0x465
125	257	0.875	80	0x6FE
150	302	1.000	90	0x7FF

<sup>1</sup> Temperature = (Digital signal / 2047 \* 200 - 50) °C