

TSic™- 306

High Precision, Rapid Response, Low Cost Temperature Sensor IC

Feature Sheet

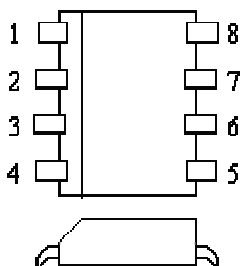
Features

- Low cost, precision temperature sensor
- Single-wire 11-bit digital serial signal output compatible with state-of-the-art μ P controllers
- Communication range > 10 meters
- Resolution: 0.1°C
- Accuracy: $\pm 0.3^\circ\text{C}$ 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°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 proportional-to-absolute-temperature (PTAT) output, digital signal processor (DSP) core, and electrically erasable memory (EEPROM)

Package Information

TSic™ 306 SOP8: 150mil, Standard SMT Package, SOIC, Based on IEC 191-2Q, Type 076E35 B.

Other packages available on demand: TSic™ 306 e-line; 3 pin THT package.



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 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 $0\sim 1V_{\text{out}}$ ($V_+ = 2.97\text{V}$ to 5.5V) or ratiometric ($10\sim 90\%$ of V_+ ; i.e., $0.5\sim 4.5V_{\text{out}}$ @ $V_+ = 5\text{V}$) or the digital serial output signal for interfacing with μ 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**
- **Very low power consumption – ideal for mobile and standard applications**
- **Field reconfiguration/recalibration option available (high volume customers only)**
- **Outstanding long term stability**



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Absolute Maximum Ratings

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

Operating Conditions

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

- With supply voltage 2.7V - 2.97V, accuracy is slightly reduced; below 2.7V, functionality is unknown.
- Output signal is limited to this ambient temperature (applies to calibration, offset and gain).
- Locate as close as possible to TSic's V+ and Gnd pins.

For further information:

ZMD America, Inc.
201 Old Country Road, Suite 204
Melville, NY 11747, USA
Phone +01 (631) 549-2666
Fax +01 (631) 549-2882

sales@zmda.com
www.zmd.biz

ZMD AG
Grenzstrasse 28
01109 Dresden, Germany
Tel.: +49 (0)351.8822.366
Fax: +49 (0)351.8822.337

sales@zmd.de
www.zmd.biz

ZMD Far East
Taipei World Center
Sinyi Road, Sec. 5, Suite 7A-03
Taipei 110, Taiwan
Phone +886 (2) 8786 1592
Fax +886 (2) 2723 3109

sales@zmd.de
www.zmd.biz



Temperature Accuracy

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

¹ 2σ value, plus quantization error of 1 bit (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 ±0.3 °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-301	TSic-303	TSic-306
Temp (°C)	Temp (°F)	Analog 0~1V	Analog ratiometric 10~90%	Digital
-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

$$\text{Temperature} = (\text{Digital signal}/2047 * 200 - 50) \text{ °C}$$



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