



INNOVATIVE SENSOR TECHNOLOGY



TSic™ 301

Rapid Response, Low-Cost Temperature Sensor IC with Analog Voltage Output

Data Sheet

TSic™ 301 Features

- Low cost, precision temperature sensor
- Analog 0 to 1 Volt signal output
- Resolution: 0.1°C
- Accuracy: $\pm 0.3^\circ\text{C}$ over span of 80°C
- Wide measurement range: -50 to $+150^\circ\text{C}$
- Signal read-out every 0.1s (other rates available on request)
- Supply Voltage 3.0V to 5.5V; high accuracy operation in range 4.5V to 5.5V
- Package: 8-pin SOIC, 3-pin e-line, Chip on Flex
- Low quiescent current to minimize self-heating and power consumption
- System-on-chip based on advanced mixed-signal CMOS technology integrating precision temperature sensing bandgap reference with proportional-to-absolute-temperature (PTAT) output, digital signal processor (DSP) core, and electrically erasable memory (EEPROM)

TSic™ Family

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 0~1Vout (Supply voltage (V+) = 3.0V to 5.5V) or ratiometric (10~90% of supply voltage); or the digital serial output signal for interfacing with microcontrollers.

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 (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

Application Support

For TSic™ evaluation ZMD provides a special Evaluation Tool. (Ordering Code: TSic Lab Kit)

Further application support is available through the hotline: email: tsic@zmd.de

Phone: +49 351 8822-916



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Absolute Maximum Ratings

PARAMETER	MIN	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 ¹ Voltage to Gnd (V+)	3.0	5.0	5.5	V
Supply Current (I _{V+}) ² @ V+ = 3.3V, RT			200	µA
Ambient Temperature ³ Range (T _{amb})	-50		150	°C
External Capacitance between V+ and Gnd ⁴ (C _{V+})	80	100	470	NF
Output Load Resistance between signal and Gnd (or V+)	47	100		kΩ

¹ Best accuracy with supply voltage 4.5V – 5.5V. With supply voltage 3.5V – 4.5V accuracy reduced.

² Without load

³ Output signal is limited to this ambient temperature ±3°C (with regard to calibration, offset and gain)

⁴ Recommended as close to TSic V+ and Gnd-Pins as possible

Temperature Accuracy⁵

PARAMETER	MIN	TYP	MAX	UNITS
<i>Wide Range Device for -50° to 150°C</i>				
T1 +10°C to +90°C	-0.3	±0.3	0.3	°C
T2 -20°C to +110°C	-0.3	+0.3	0.95	°C
T3 -50°C to +150°C	-0.3	+0.9	2.0	°C

⁵ Accuracy = specification plus quantization error of 1 bit (0.1°C). This device gets calibrated at 5V. For applications where best accuracy at 3V is requested: ask for a customer specific 3V calibrated device. Accuracy for supply voltage within V+ = 4.5V to 5.5V, 2σvalue.

Other TSic products with customer specific calibration available on request: i.e. with special calibration where the 80°C span (bandgap) with the high precision temperature range of ±0.3 °C is shifted to another (lower or higher) temperature range.
Temperature range limits T1, T2: ±0.1°C; T3: ±3°C



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Output Examples for TSic™ Devices

		Temperature Measurement Range -50°C to 150°C or -58°F to 302°F (Wide Range Device)
		TSic-301
Temp (°C)	Temp (°F)	Analog 0~1V
-50	-58	0.000
-10	14	0.200
0	32	0.250
25	77	0.375
60	140	0.550
125	257	0.875
150	302	1.000

Lifetime for TSic™ Devices

TSic™ device lifetime is dependent upon its operating temperature.

Operating Temperature	expected Lifetime
140°C...150°C	min. 1500h
125°C...140°C	min. 3000h

Package Information

TSic™ 301 SOP8: 150mil, Standard SMT Package, SOIC, Based on IEC 191-2Q, Type 076E35 B. Other packages available on demand: TSic™ 301 e-line; 3 pin THT package; Chip on Flex.

For further information see also Technical Note:

"TSic™ Die and Package Specifications for TSic™ Temperature Sensor IC"



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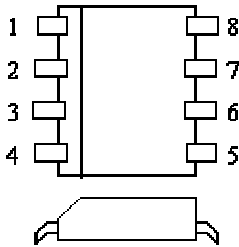


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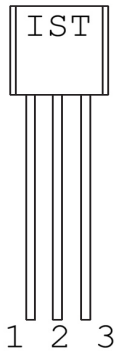
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SOP8 Package



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

E-Line Package



Pin	Name	Description
1	GND	Ground
2	Signal	Temperature output signal
4	V+	Supply Voltage (3.0-5.5V)

Related products and ordering information

For related products and ordering information see www.zmd.biz and ZMD "TSic™ Ordering Guide".



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ZMD Sales Contacts

ZMD AG Grenzstrasse 28 01109 Dresden, Germany Phone: +49 (0)351.8822.366 Fax: +49 (0)351.8822.337 E-mail: sales@zmd.de	ZMD Stuttgart Office Nord-West-Ring 34 70974 Filderstadt - Bernhausen Phone: +49 (0)711.674.517-0 Fax: +49 (0)711.674.517-99 E-mail: sales@zmd.de	ZMD America Inc. 201 Old Country Road, Suite 204 Melville, NY 11747 Phone: +1 (631) 549-2666 Fax: +1 (631) 549-2882 E-mail: mailto:sales@zmda.com	ZMD Far East Room 7A-03, No.5 Sec.5 Sinyi Rd. Taipei 11011, Taiwan Phone: +886-(0)2-8786-1593 Fax: +886-(0)2-2723-3109 E-mail: agraubner@zmdfareast.com
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ZMD Distribution Partners

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Germany/EMEA AVNET Memec GmbH Im Technologiepark 2-8 D-85586 Poing Phone: +49 8121 775 0 Fax: +49 8121 775 592 E-mail: Poing@avnet-memec.com Internet: www.avnet-memec.com	Other local AVNET Memec representatives on www.avnet-memec.com . Other ZMD representatives on www.zmd.biz .	
Germany Henskes Electronic Components GmbH Bremer Straße 7 D-30880 Laatzen (Rethen) Phone: +49 5102 938117 Fax: +49 5102 938198 E-mail: hq.senf@henskes.com Internet: www.henskes.de	Canada, North/South America Future Electronics Worldwide Corporate Headquarters 237 Hymus Blvd. Pointe-Claire, Quebec, H9R 5C7 Phone: +1 (514) 694-7710 Fax: +1 (514) 695-3707 Internet: www.futureelectronics.com	North America All American Semiconductor Inc. 230Devcon Drive San Jose CA 95112 Phone: +1 (800) 573-ASAP Fax: +48 (0) 71 788 80 13 Internet: www.allamerican.com
Japan Internix Inc. 59-10Takakura-cho Hachioji Tokyo 192-0033 Phone: +81 426 44 8786 Fax: +81 426 48 5204 E-mail: hisozaki@internix.co.jp Internet: www.internix.co.jp/	South Africa Tempe technologies 62 Oude Kaap Estate Dowerglen, South Africa Phone: +27 11 4520530 Fax: +27 11 4520543 Internet: www.tempetech.co.za	India M/s Excel Eltech India PVT Ltd. # 77 J S Tower, 11 FLOOR Opp St Patricks Church Brigade Road Bangalore - 560 025 Phone: +91 80 2 557 3582 Fax: +91 80 2 557 3609 E-mail: sales@exceleltechindia.com

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