



INNOVATIVE SENSOR TECHNOLOGY



TSic™ 506F

Rapid Response, Low-Cost Temperature Sensor IC with Digital Output

Data Sheet

TSic™ 506F Features

- Low cost, precision temperature sensor
- Single-wire 11-bit digital serial signal output
- Communication range > 10 meters
- Resolution: 0.1°C
- Accuracy: $\pm 0.1^\circ\text{C}$ over span of 40°C
- Focussed measurement range: -10 to +60 °C
- Signal read-out every 0.1s (other rates available on request)
- Supply Voltage 3.0V to 5.5V
- Package: 8-pin SOIC, 3-pin e-line, Chip on Flex
- Low quiescent current to minimize self-heating and power consumption (45µA typ.)
- 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 0~1V_{out} (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



INNOVATIVE SENSOR TECHNOLOGY



TSic™ 506F

Rapid Response, Low-Cost Temperature Sensor IC with Digital Output

Data Sheet

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	30	45	80	µA
Ambient Temperature ³ Range (T _{amb})	-10		60	°C
External Capacitance between V+ and Gnd ⁴ (C _{V+})	80	100	470	nF
Output Load Capacitance (C _L)			15	nF
Output Load Resistance between signal and Gnd (or V+)	1			MΩ

¹ With supply voltage 2.7V – 3.0V 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>Focussed Range Device for -10° to 60°C</i>				
T1 +5°C to +45°C	-0.1	±0.05	0.1	°C
T2 -5°C to +5°C	-0.1	+0.1	0.2	°C
T3 +45°C to +55°C	-0.1	+0.1	0.2	°C

⁵ Accuracy = specification plus quantization error of 1 bit (0.034°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, 2σ value.

Other TSic products with customer specific calibration available on request: i.e. with special calibration where the 40°C span (bandgap) with the high precision temperature range of ±0.1 °C is shifted to another (lower or higher) temperature range.
Temperature range limits T1, T2, T3: ±0.1°C;
Measurement range limits -10°C to +60°C: ±3°C



INNOVATIVE SENSOR TECHNOLOGY



TSic™ 506F

Rapid Response, Low-Cost Temperature Sensor IC with Digital Output

Data Sheet

Output Examples for TSic™ Devices

		Temperature Measurement Range -10°C to 60°C or 14°F to 140°F (Wide Range Device)
		TSic-506
Temp (°C)	Temp (°F)	Digital
-10	14	0x000
0	32	0x124
25	77	0x3FF
60	140	0x7FF

$$\text{Temperature} = (\text{Digital Signal} / 2047 * 70 - 10)^\circ\text{C}$$

Package Information

TSic™ 506 SOP8: 150mil, Standard SMT Package, SOIC, Based on IEC 191-2Q, Type 076E35 B.
 Other packages available on demand: TSic™ 506 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”



INNOVATIVE SENSOR TECHNOLOGY

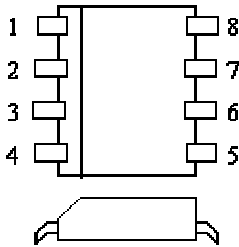


TSic™ 506F

Rapid Response, Low-Cost Temperature Sensor IC with Digital Output

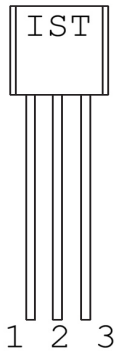
Data Sheet

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".



INNOVATIVE SENSOR TECHNOLOGY



TSic™ 506F

Rapid Response, Low-Cost Temperature Sensor IC with Digital Output

Data Sheet

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
--	--	---	---

ZMD Distribution Partners

ZMD partners with WBC for device distribution in Europe and Future Electronics / All American for North- and South America.

Germany/EMEA AVNET Memec Im Technologiepark 2-8 D-85586 Poing Phone: +49 8121 775 155 Fax: +49 8121 775 592 E-mail: juergen.dudda@wbc-europe.com Internet: www.wbc-europe.com	Other local AVNET Memec representatives on www.wbc-europe.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

For the current revision of this document and for additional product information please look at www.zmd.biz.

Characteristics and specifications are subject to change without notice. ZMD assumes no obligation regarding future manufacture unless otherwise agreed in writing. The information furnished hereby is believed to be correct and accurate. However, ZMD shall not be liable to any customer, licensee or any other third party for any damages in connection with or arising out of the furnishing, performance or use of this technical data. No obligation or liability to any customer, licensee or any other third party shall result from ZMD's rendering of technical or other services.



INNOVATIVE SENSOR TECHNOLOGY



TSic™ 506F

Rapid Response, Low-Cost Temperature Sensor IC with Digital Output

Data Sheet

Notes :