



# **TSic™- 506**

# High Resolution, High Precision, Rapid Response Temperature Sensor IC

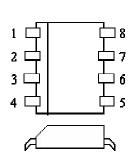
Feature Sheet

#### **Features**

- Low cost, high resolution, precision temperature sensor
- Single-wire 11-bit digital serial signal output compatible with state-of-the-art µP controllers
- Communication range > 10 meters
- Resolution: 0.034°C
- Accuracy: ±0.1°C over a span of 40°C
- Focused measurement range: -10 to +60 °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 (±10%) power supplies
- Package: 8-pin SOIC
- Low quiescent current: <80µA at 25°C with 3.3V minimizes self-heating errors for applications such as wall-mounted thermostats
- System-on-a-chip based on advanced mixedsignal technology integrating precision temperature sensing bandgap reference with proportionalto-absolute-temperature (PTAT) output, digital signal processor (DSP) core, and electrically erasable memory (EEPROM)

# **Package Information**

TSic<sup>TM</sup> 506F SOP8: 150mil, Standard SMT Package, SOIC, Based on IEC 191-2Q, Type 076E35 B. Other packages available on demand: TSic<sup>TM</sup> 506F 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<sup>™</sup> temperature sensor IC family are fully tested and calibrated sensors with absolute measurement accuracy on delivery – no further calibration needed. The TSic<sup>™</sup> 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<sup>TM</sup> 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<sup>TM</sup> series includes ICs with two linear analog signal output options, such as standard 0~1Vout (V+ = 2.97V to 5.5V) or ratiometric (10~90% of V+; i.e., 0.5~4.5Vout @ 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
- Very low power consumption ideal for mobile and standard applications
- Field reconfiguration/recalibration option available (high volume customers only)
- · Outstanding long term stability

TSic<sup>™</sup> 506 Feature Sheet, Rev. 3.4, July 18, 2005

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#### Feature Sheet

## **Absolute Maximum Ratings**

PARAMETER	MIN	TYP	MAX	UNITS
Supply Voltage (V+)	-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+) <sup>1</sup>	2.97	5.0	5.5	V
Supply Current ( $I_{V+}$ ) @ V+ = 3.3V, RT	30	45	80	μΑ
Ambient Temperature Range $(T_{amb})^2$	-10		60	°C
Output Load Capacitance $\left(C_L\right)^3$		10	15	nF
External Capacitance Between V+ 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+) <sup>5</sup>	2.5	10		ΚΩ

- 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<sup>™</sup>.
- 4 Locate as close as possible to TSic's V+ and Gnd pins.
- 5 When using the output as a digital output, no pull-down resistor is allowed.

## **Temperature Accuracy**

PARAMETER	MIN	TYP	MAX	UNITS	
Focused Range Device for -10° to 60°C					
+5 to +45 °C	-0.1	±0.05	0.1	°C 1	
-5 to +5, +45 to +55 °C	-0.1	+0.1	+0.2	°C 1	
-10 to -5, +55 to +60 °C	0	+0.15	+0.3	°C 1	

<sup>&</sup>lt;sup>1</sup> 3s value; plus 1 bit quantization error (0.034 °C).

# Output Examples for TSic<sup>™</sup> Devices

		Temperature Measurement Range -10°C to 60°C or 14°F to 140°F (F = focused range device)			
		TSic-501F TSic-503F		TSic-506F <sup>1</sup>	
Temp (°C)	Temp (°F)	Analog 0~1V	Analog Ratiometric 10~90% @ V+=5V	Digital	
≤ -10	≤14	0.000	10.00% =0.500V	0x000	
0	32	0.143	21.43% =1.072V	0x124	
25	77	0.500	50.00% =2.500V	0x3FF	
≥60	≥140	1.000	90.00% =4.500V	0x7FF	

<sup>&</sup>lt;sup>1</sup>Temperature = (Digital signal / 2047 \* 70 - 10) °C



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