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: 0.034ºC
- Accuracy: ±0.1ºC over a span of 40ºC
- Focused measurement range: –10 to +60 ºC
- 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 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™ 506F SOP8: 150mil, Standard SMT Package, SOIC, Based on IEC 191-2Q, Type 076E35 B.

Other packages available on demand: TSic™ 506F e-line; 3 pin THT package.
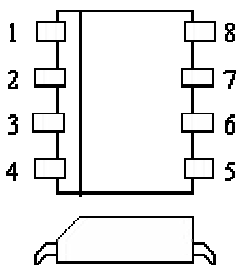
Pin	Name	Description
1	V+	Supply voltage (3.0-5.5V)
2	Signal	Temperature output signal
4	Gnd	Ground
3, 5-8	TP/NC	Test pin / NC Do not connect

Brief Description

The TSic™ 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 (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 µP 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]	-10		60	°C
Output Load Capacitance (C_L)[3]		10	15	nF
External Capacitance Between V+ and Gnd (C_{V+})[4]	80	100	470	nF
Output Load Resistance (R_L) Signal to Gnd (or V+)[5]	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_L is limited by maximum rise time for ZACwire™.

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]

1 3s value; plus 1 bit quantization error (0.034 °C).

Output Examples for TSic™ 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[1]
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

[1] Temperature = (Digital signal / 2047 * 70 - 10) °C