TSic™-201
Precise, fast response and Low-cost Temperature Sensor IC Analog 0-1 Volt

TEMPERATUR

FEUCHTE

STRÖMUNG

Product

Accuracy ±0.5℃

Measurement range -50℃.. +150℃

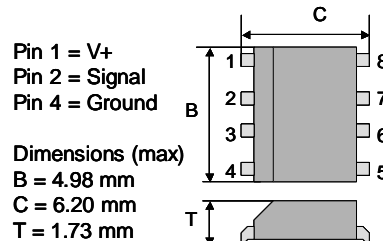**Analog 0-1 Volt signal output**

Resolution 0.1℃

The temperature sensor family TSic™ from IST are fully tested and calibrated sensors to allow absolute measurement accuracy at delivery and eliminates further calibration efforts. The temperature measurement with the TSic™ is very simple, can achieve outstanding accuracy combined with a long term stability.
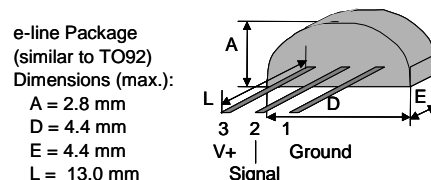
Advantages

- Different accuracy classes with 100% upward compatibility
- No calibration by customer necessary any more, absolute calibration specified
- Simple to integrate, reducing cost and time for application-development
- Robust and elementary signal transmission requires only one singal line
- Optimum solution for temperature control, thanks to fast data measurement
- Packages for standard SMD, THT or application specific assembly
- Miniaturised solutions with Bare-chip (COB, COF, CSP) or e-line package
- Very fast response time with Bare-chip (COF – Chip on Flex)
- Very small power consumption – ideal for mobile and standard applications
- Field (re-)configuration or (re-)calibration available (option for high volume customers only)
- Outstanding long term stability

Packages

- SOP8 Package (150mil, Standard SMT Technology, SOIC-8) based on IEC 191-2Q: Type 076E35 B

Pin 1 = V+
Pin 2 = Signal
Pin 4 = Ground

Dimensions (max)
B = 4.98 mm
C = 6.20 mm
T = 1.73 mm

- e-line (small THT package, TO-92 like)

e-line Package
(similar to TO92)
Dimensions (max.):
 A = 2.8 mm
 D = 4.4 mm
 E = 4.4 mm
 L = 13.0 mm

V+ | Ground
Signal

Specification

See next pages "TSic™201 Temperature Sensor Device, Specification"

IST
INNOVATIVE SENSOR TECHNOLOGY

TSic™-201
Temperature Sensor IC Specification

Features

- **Analog 0-1 Volt signal output**
- **Accuracy: ±0.5°C over a span of 80°C**
- **Resolution: 0.1°C**
- **Wide range measurement: –50° to +150°C**
- Signal update every 0.1 second (other update frequencies on request)
- Supply Voltage V+ = 3.0V to 5.5V, high accuracy operation in range V+ = 4.5V to 5.5V
- Precision temperature sensor at low cost
- Package: 8-pin SOIC or 3-pin e-line
- Low quiescent current of less than 80µA at 25°C and 3.3V to minimize self-heating and power consumption
- System-on-a-chip based on advanced mixed signal technology incorporating:
  precision temperature sensing bandgap reference with PTAT output
  digital signal processor (DSP) core
  electrically erasable (EE) memory
  digital serial interface using single wire for signal output

Package Information

- TSic™ 201 SOP8: 150mil, Standard SMT Package, SOIC, Based on IEC 191-2Q: Type 076E35 B
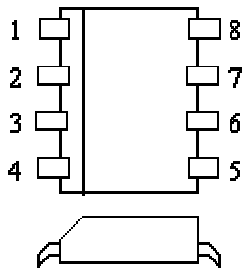
Pin No.	Name	Description
1	V+	supply voltage (3.0-5.5V)
2	Signal	Temperature output signal
4	Gnd	Ground
3, 5-8	TP/NC	Test Pin / NC Do not connect

- Other packages on customer's demand: TSic™ 201 e-line: 3 Pin THT package

Description TSic™ Series

The TSic™ series of temperature sensor ICs were specifically designed as a high-performance, cost-effective solution for temperature sensing in building automation, automotive, industrial, office automation, white goods and low power / mobile applications.

The TSic™ employs high precision bandgap reference with proportional-to-absolute-temperature (PTAT) output; low-power precision ADC; and on-chip DSP core with electrically erasable (EE) memory to precisely calibrate the output temperature signal.

TSic™ series of temperature sensor ICs offers devices with two linear analog signal output options such as standard 0~1V$_{out}$ signal (V+ = 3.0V to 5.5V) or ratiometric (10~90% V+ i.e. 0.5~4.5V$_{out}$ @ V+=5V) or the digital serial output signal to interface with µP controllers.

Output Example of TSic™ devices

		Temperature Measurement Range -50°C to 150°C or -58°F to302°F (wide range device)		
		TSic-201	**TSic-203**	**TSic-206**
Temp (°C)	**Temp (°F)**	Analog 0~1V	Analog ratiometric 10~90%	**Digital**
-50 [1]	-58	0.000	10% of V+	**0x000**
-10	14	0.200	26% of V+	**0x199**
0	32	0.250	30% of V+	**0x200**
25	77	0.375	40% of V+	**0x2FF**
60	140	0.550	54% of V+	**0x465**
125	257	0.875	80% of V+	**0x6FE**
150 [2]	302	1.000	90% of V+	**0x7FF**

[1] LT = -50, [2] HT = 150 as default values for the temperature calculation set points.

Formula for Temperature Signal [°C]:

- Analog output 0-1V:
  $T = (Sig[Volt]*(HT-LT)+LT)$ [°C]

- Ratiometric 10%-90% output:
  $T = ((Sig[V]/VDD[V])-0.1)/0.8 *(HT-LT)+LT$

- Digital output:
  $T= (Digital\_signal/2047*(HT-LT)+LT)$ [°C]

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TSic™-201
Temperature Sensor Device Specification

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	℃

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	℃
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; typ. with load: I_{V+} = 95+375/R_{load} [μA]

[3]Output signal is limited to this ambient temperature ±3℃ (with regard to calibration, offs et and gain)

[4]Recomended as close to TSic V+ and Gnd-Pins as possible.

Temperature Accuracies [5]

PARAMETER	MIN	TYP	MAX	UNITS
Wide Range Device for -50° to 150℃				
T1: +10 to 90 ℃	-0.5	±0.3	0.5	℃
T2: -20 to 110 ℃	-0.5	+0.4	0.95	℃
T3: -50 to 150 ℃	-0.5	+0.9	2.0	℃

[5] Accuracy = specification plus quantization error of 1 bit (0.1℃). This device gets calibrated at 5V. F or 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℃ span (bandgap) with the high precision temperature range of ±0.3 ℃ is shifted to another (lower or higher) temperature range.
Temperature range limits T1, T2: ±0.1℃; T3: ±3℃

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ISO 9001

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