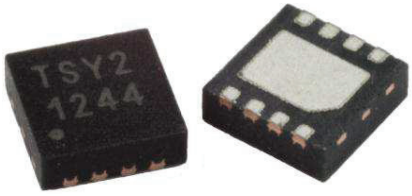


TSYS02P

Digital Temperature Sensor

SPECIFICATIONS

- **High Accuracy Temperature Sensor**
- **16 bit Resolution**
- **High Speed, low Response Time**
- **Low Power Consumption**
- **PWM Output**
- **Small TDFN8 Package**

The TSYS02P is a single chip, temperature sensor.
It provides factory calibrated data corresponding to the measured temperature.
The data is provided via PWM output.
The temperature range is -40°C ... +125°C while the resolution is 0.01°C.
The TDFN8 package provides smallest size and very fast time response.

FEATURES

High Accuracy ±0.2°C @ Temp.: -5°C … +50°C
Adjustment of high accuracy temperature range on request
Low Supply Current < 420µA (standby < 0.14µA)
PWM Output
Small IC-Package TDFN8 2.5mm x 2.5mm
Operating Temperature Range: -40°C … +125°C

APPLICATIONS

Industrial Control
Replacement of Precision RTDs, Thermistors and NTCs
Heating / Cooling Systems
HVAC

ABSOLUTE MAXIMUM RATINGS

Absolute maximum ratings are limiting values of permitted operation and should never be exceeded under the worst possible conditions either initially or consequently. If exceeded by even the smallest amount, instantaneous catastrophic failure can occur. And even if the device continues to operate satisfactorily, its life may be considerably shortened.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	VDD		-0.3		+3.6	V
Operating Temperature	Top		-40		+125	°C
Storage temperature	Tstor		-55		+150	°C
ESD rating	ESD	Human Body Model (HBM) pin to pin incl. VDD & GND	-2		+2	kV
Humidity	Hum		Non condensing			

OPERATING CONDITIONS

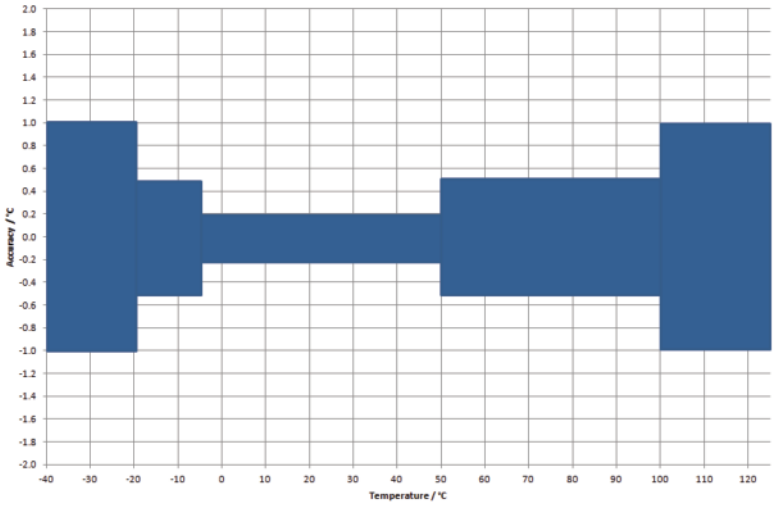
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating Supply Voltage	V_{DD}	stabilized	1.5		3.6	V
Supply Current	I_{DD}	2 sample per second		36		µA
Peak Supply Current	I_{DD}	During conversion		420		µA
Conversion Time	T_{CONV}			43		ms
Measurement Frequency	F_{MEAS}			2		Hz
PWM Period	T_{PERIOD}		7.5	8.3	9.1	ms
VDD Capacitor		Place close to the chip	100nF			

OPERATIONAL CHARACTERISTICS

If not otherwise noted, 3.3V supply voltage is applied.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Temp. Measurement Range	T_{RANG}		-40		125	°C
Accuracy 1	T_{ACC1}	-5°C < T < +50°C V_{DD} = 3.2V – 3.4V	-0.2		+0.2	°C
Accuracy 2	T_{ACC2}	-20°C < T < +100°C V_{DD} = 3.2V – 3.4V	-0.5		+0.5	°C
Accuracy 3	T_{ACC2}	-40°C < T < +125°C V_{DD} = 3.2V – 3.4V	-1.0		+1.0	°C
PSRR Power Supply Reject Ratio		V_{DD} = 2.7 – 3.6 T = 25°C, C = 100nF			0.1	°C
Temperature Resolution	T_{RES}				0.01	°C
Self Heating	SH_1	10 samples/s, 60s, still air			0.1	°C

ACCURACY



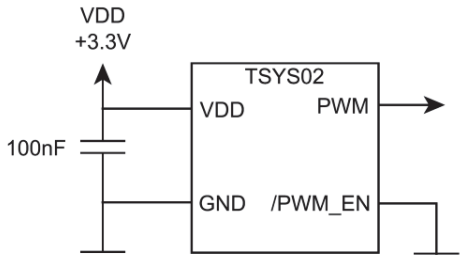
ANALOGUE TO DIGITAL CONVERTER

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Resolution				16		bit
Conversion Time	t_c			43		ms

DIGITAL OUTPUTS (PWM)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output High Voltage	VOH			VDD		V
Output Low Voltage	VOL			0		V
Output Sink Current	IOL				40	µA

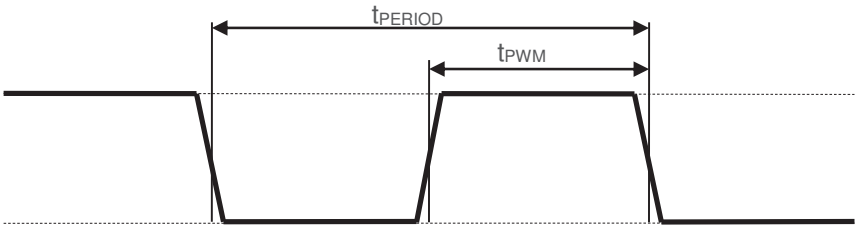
CONNECTION DIAGRAM



PIN FUNCTION TABLE

Pin	Name	Type	Function
1	VDD	Power	Supply Voltage
2	/PWM_EN	Digital Input	Enable PWM Output (0 = ON)
3	PWM	Digital Output	PWM Output
4	VSS	Power	Ground
5 – 8	NC	---	Not connected / Do not connect

PWM OUTPUT



START UP

After power-up (VDD between 1.8V and 3.6V) TSYS02P needs at most 150ms for reaching idle state. During that time PWM output is in undefined state. Afterwards, TSYS02P starts measuring and provides data on PWM output.

TEMPERATURE CALCULATION

TEMPERATURE POLYNOMAL

T / °C = t_{PWM} / t_{PERIOD} x 175.72 – 46.85

EXAMPLE

t_{PWM}: 4.15ms

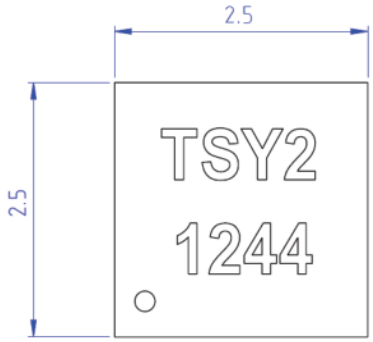
t_{PERIOD}: 8.30ms

T / °C = 4.15ms / 8.30ms x 175.72 – 46.85

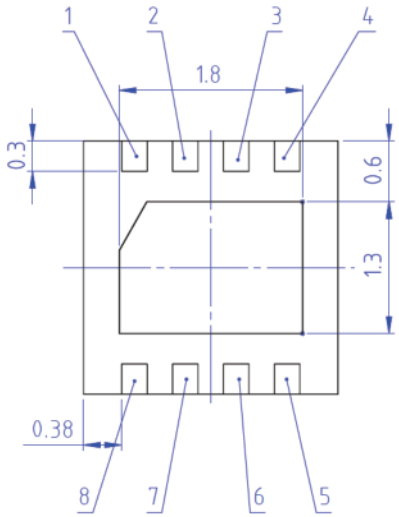
T / °C = 41.01°C

DIMENSIONS

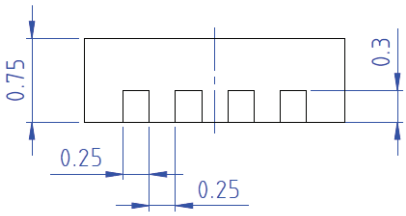
TOP VIEW



BOTTOM VIEW



SIDE VIEW



MARKING

Line	Description	Example
1	Product Name	TSY2
2	Pin 1 Dot, Date Code YYWW	1244

ORDER INFORMATION

The TSYS02 temperature sensor family compromises currently three different solutions.
Further customer specific adaptations are available on request.
Please refer to the table below for part name, description and order information.

Part Name	Description	Order Number
TSYS02D	Digital Temperature Sensor, TDFN8, I2C Interface	G-NIMO-003
TSYS02P	**Digital Temperature Sensor, TDFN8, PWM Interface**	**G-NIMO-004**
TSYS02S	Digital Temperature Sensor, TDFN8, SDM Interface	G-NIMO-005

EMC

Due to the use of these modules for OEM application no CE declaration is done. Especially line coupled disturbances like surge, burst, HF etc. cannot be removed by the module due to the small board area and low price feature. There is no protection circuit against reverse polarity or over voltage implemented. The module will be designed using capacitors for blocking and ground plane areas in order to prevent wireless coupled disturbances as good as possible.

DEFINITIONS AND DISCLAIMERS

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