TS Series
Miniature Quartz Temperature Sensor
160 kHz to 350 kHz

DESCRIPTION

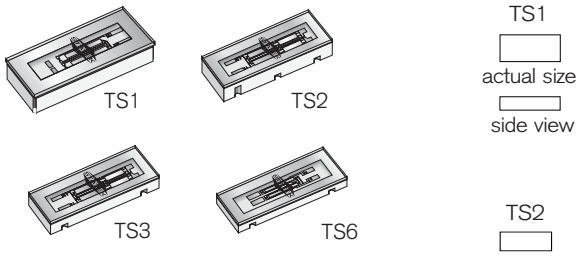
The TS Quartz Temperature Sensors are tuning-fork quartz crystals vibrating in a torsional mode. They are designed so that their frequency is both extremely sensitive to temperature and highly linear. For example, the 172.0 kHz design has a sensitivity of roughly +46.4 ppm/°C. This high sensitivity offers the ability to detect fine changes in temperature—the degree depending on the implementation. Further, this frequency-based technique has the advantage of being immune to amplitude noise in the measurement system—a feature not shared by thermocouple, thermistor, or RTD based temperature sensing techniques. Lastly, remote temperature sensing is possible by using an antenna to pick up the frequency of the EM waves emitted by the sensor.

FEATURES

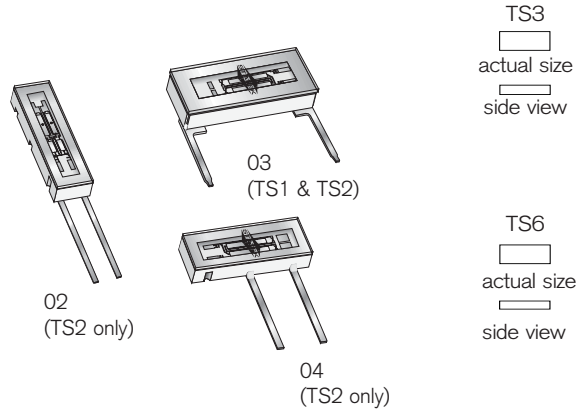
- Frequency-based sensing
- High shock resistance
- Low aging
- Designed and manufactured in the USA

APPLICATIONS

- High resolution temperature measurement
- Temperature-critical process control/monitoring
- Wireless temperature measurement
- Human health monitoring



TS1 AND TS2 AVAILABLE WITH THE FOLLOWING LEAD CONFIGURATIONS:



DIMENSIONS

For detailed dimensions and lead spacing see Statek CX1 (10121), CX1 (10101), CX2 (10134), CX2 (10138), CX3 (10104), and CX6 (10132) data sheets.

SMD TERMINATIONS

Designation	Termination
SM1	Gold Plated
SM2	Solder Plated
SM3	Solder Dipped
SM4	Solder Plated (Lead Free)
SM5	Solder Dipped (Lead Free)

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SPECIFICATIONS

Specifications are typical at 25°C unless otherwise noted. Specifications are subject to change without notice. Tighter specifications available. Please contact factory.

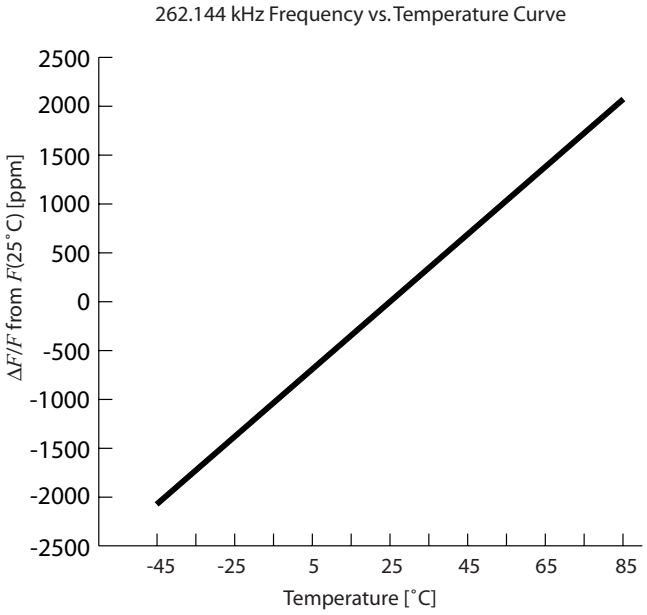
TYPICAL PARAMETERS

Parameters will vary according to frequency.

Standard Frequencies[1]	172.0 kHz	262.144 kHz
Standard Calibration Tolerances[2]	200 ppm (0.02%) 500 ppm (0.05%) 10000 ppm (1.0%)	200 ppm (0.02%) 500 ppm (0.05%) 10000 ppm (1.0%)
Quality Factor Q	170,000	130,000
Motional Capacitance C_1	0.3 fF	0.3 fF
Motional Resistance R_1[3]	22 kΩ	15 kΩ
Shunt Capacitance C_0	1.4 pF	1.0 pF
Shock, Survival	5,000 g	5,000 g
Vibration, Survival	20 g, 10-2,000 Hz swept sine	
Max Process Temperature[4]		
Surface Mount:	260°C for 20 sec.	
Thru-hole:	175°C for 10 sec.	

1. Other frequencies available. Please contact factory.
2. Other calibration tolerances available. Please contact factory.
3. Motional resistance varies with temperature.
4. For detailed information refer to Tech Note 27.

FREQUENCY VS. TEMPERATURE



STANDARD FREQUENCIES

172.0 kHz, 190.5 kHz, 262.144 kHz, 300.0 kHz, 325.0 kHz, and 350.0 kHz.

FREQUENCY-TEMPERATURE MODEL

Although the frequency-temperature characteristic of the TS sensor is nearly linear, it is not exactly so. A better model is a second-order polynomial in temperature:

$$F(T) = F(T_0)\,[1 + \alpha\,(T - T_0) + \beta\,(T - T_0)^2]$$

While higher-order polynomial models are possible, a second-order model is usually sufficient. Taking $T_0 = 25°C$, typical values for α and β are as follows:

Frequency kHz	α ppm/°C	β ppm/°C²
172.000	46.4	0.036
262.144	34.5	0.018

HOW TO ORDER TS TEMPERATURE SENSORS

TS2	S	C	SM1	–	262.144K	200	/	I
TS1 = CX1 Leaded & SMD TS2 = CX2 Leaded & SMD TS3 = CX3 SMD only TS6 = CX6 SMD only	"S" if special or custom design. Blank if Std.	Blank = Glass Lid C = Ceramic Lid	02 = End Lead 03 = Side Lead 04 = Half-Side Lead SM1 = Gold Plated SM2 = Solder Plated SM3 = Solder Dipped SM4 = Solder Plated Lead-free SM5 = Solder Dipped Lead-free		Frequency K = kHz	Calibration Tolerance @ 25°C (in ppm)		Operating Temp. Range: C = -10°C to +70°C I = -40°C to +85°C M = -55°C to +125°C S = Customer Specified

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