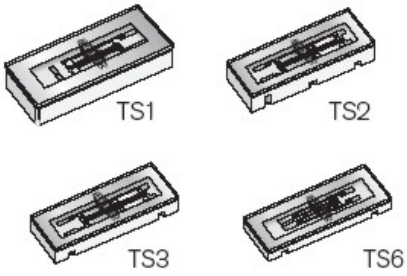
EUROQUARTZ

TS SERIES

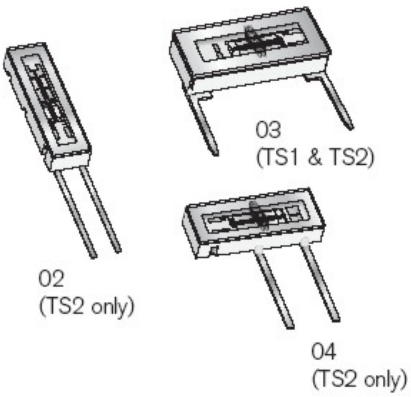
Miniature Quartz Temperature Sensors 160kHz to 350kHz

FEATURES

- **Frequency based temperature sensing**
- **High shock resistance**
- **Low ageing**



TS1 and TS2 are available with the following lead configurations:



DESCRIPTION

The TS quartz temperature sensors are tuning fork quartz crystals vibrating in a torsional mode. The crystals are designed so that their frequency is both extremely sensitive to temperature and highly linear. For example. the 172.0kHz design has a sensitivity of around +46.4ppm/°C. This high sensitivity enables the detection of fine temperature changes, the degree of which is dependant upon 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.

APPLICATIONS

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

DIMENSIONS

For detailed dimensions and lead spacing see the data sheets for CX1, CX2, CX3 and CX6 crystals

STANDARD FREQUENCIES

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

TERMINATIONS - PLATING

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

HOW TO ORDER TS TEMPERATURE SENSORS

TS2 - S - C SM1 - 262.144K, 200 / I

- TS2: TS1 = CX1 Leaded & SMD; TS2 = CX2 Leaded & SMD; TS3 = CX3 SMD only; TS6 = CX6 SMD only
- S: 'S' if special or custom design, Blank if standard
- C: Blank = glass lid; C = ceramic lid
- SM1: 02 = End Lead; 03 = Side Lead; 04 = Half Side Lead; SM1 = Gold plated *; SM2 = Solder plated; SM3 = Solder dipped; SM4 = Solder plated *; SM5 = Solder dipped *; * = Lead free
- 262.144K: Frequency K = kHz; M = MHz
- 200: Calibration Tolerance @25°C
- I: Operating Temp. Range C = -10° ~ +70°C; I = -40° ~ +85°C; M = -55° ~ +125°C; S = Customer specified

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SPECIFICATION

Specifications stated are typical at 25°C unless otherwise indicated. Tighter specifications are available. Specifications may change without notice. Please contact factory.

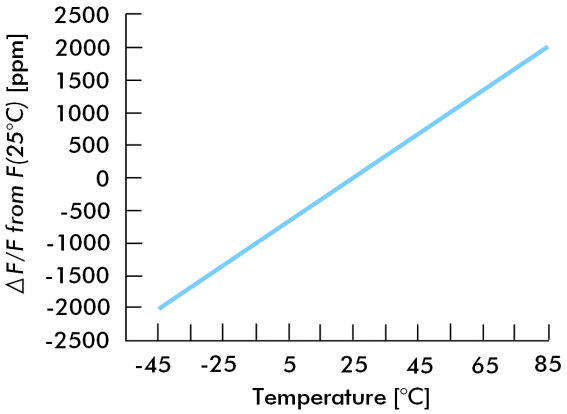
Parameters will vary according to frequency.

Standard Frequencies[1]:	**172.0kHz**	**262.144kHz**
Standard Calibration Tolerances[2]:	±20ppm (0.02%) ±500ppm (0.02%) ±1000ppm (0.02%)	±20ppm (0.02%) ±500ppm (0.02%) ±1000ppm (0.02%)
Quality Factor (Q):	170,000	130,000
Motional Capacitance C1:	0.3fF	0.3fF
Motional Resistance R1[3]:	22kΩ	15kΩ
Shunt Capacitance C0:	1.4pF	1.0pF
Shock, Survival:	5000g	
Vibration, Survival:	20g, 10~2000Hz swept sine	
Maximum Process Temp:		
Surface Mount:	260°C for 20 seconds	
Through-Hole:	175°C for 10 seconds	

1. *Other frequencies available, contact Euroquartz sales.*
2. *Other calibration tolerances available, contact Euroquartz sales.*
3. *Motional Resistance varies with temperature.*

FREQUENCY vs TEMPERATURE

262.144kHz Frequency vs. Temperature



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 mode are possible, a second order model is uaually sufficient. Taking T0=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

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