

APPLICATION NOTES – CRYSTALS

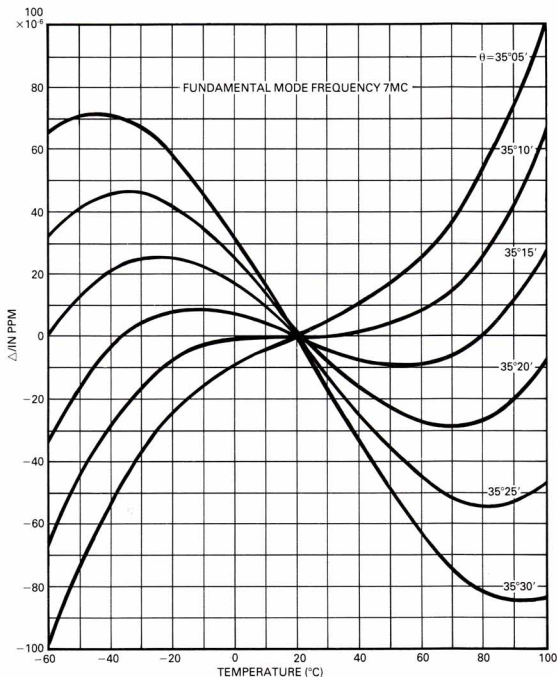


Fig. 46 Frequency-temperature-angle characteristics of plated AT-type natural quartz crystal resonators.⁴

CALIBRATION TOLERANCE.

Calibration tolerance is the maximum allowable error in frequency of a crystal at a specific temperature (usually 25 degrees C).

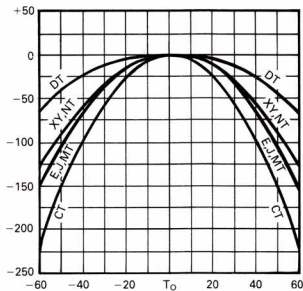
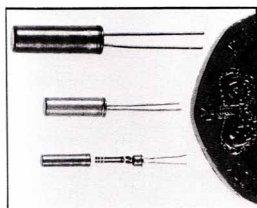


Fig. 47 Frequency-temperature characteristics of low-frequency crystal

FREQUENCY CONTROL

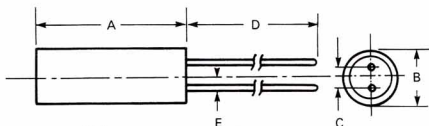
MINIATURE QUARTZ CRYSTALS

CYLINDRICAL WATCH-TYPE CRYSTALS



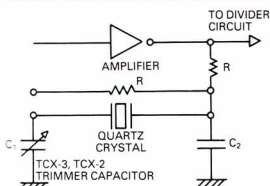
OUTLINE DRAWING

Devices are non polar



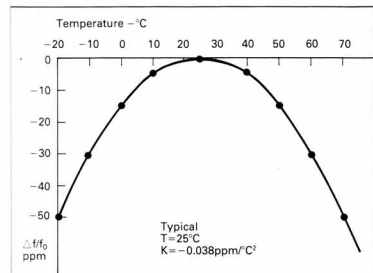
Dimension = $\frac{\text{mm}}{\text{(inches)}}$

COLPITTS OSCILLATOR CIRCUIT

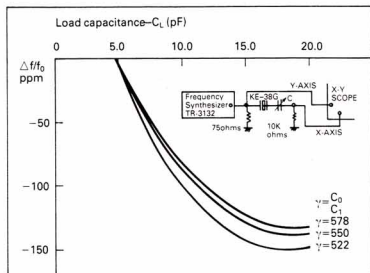


	IQKF-38G	IQKF-26	IQKF-15S
A	$\frac{8.0^{+0.3}_{-0.1}}{(.315)}$	$\frac{6.0^{+0.2}_{-0.15}}{(.236)}$	$\frac{5.0 \text{ max.}}{(.197) \text{ max.}}$
B	$\frac{\varnothing 3.0 \pm 0.08}{(.118) \text{ DIA}}$	$\frac{\varnothing 1.95 \pm 0.1}{(.007) \text{ DIA}}$	$\frac{\varnothing 1.50 \text{ max.}}{(.059) \text{ max.}}$
C	$\frac{1.1 \pm 0.2}{(.043)}$	$\frac{0.7 \pm 0.2}{(.028)}$	$\frac{0.5 \pm 0.1}{(.020)}$
D	$\frac{10.0 \pm 1.0}{(.394)}$	$\frac{7.0 \pm 1.0}{(.276)}$	$\frac{6.0 \pm 1.0}{(.236)}$
E	$\frac{\varnothing 0.3 \pm 0.07}{(.012) \text{ DIA}}$	$\frac{\varnothing 0.2 \pm 0.06}{(.008) \text{ DIA}}$	$\frac{\varnothing 0.15 \pm 0.07}{(0.006) \text{ DIA}}$

TEMPERATURE FREQUENCY CURVE (KF-38G, KF-26, KF-15S)



TURNABILITY CURVE (KF-38G)



PRICES IQKF 38G is IQD stock number A103A.
See stock list for prices.

FREQUENCY CONTROL

MINIATURE QUARTZ CRYSTALS

SPECIFICATIONS

PARAMETERS		IQKF-38G	IQKF-26	IQKF-15S
Oscillation frequency: (25°C)	f	32.768kHz ± 20ppm		
Turnover temperature:	T	25°C ± 5°C		
Parabolic curvature constant:	K	-0.038ppm/°C² Nominal		
Quality factor:	Q	120,000 Typical	110,000 Typical	60,000 Typical
Series resistance:	R _x	35kΩ max	35kΩ max	50kΩ max.
Shunt capacitance:	C ₀	1.5pF Typical	1.2pF Typical	1. pF Typical
Drive level:	-	1 μW max.		
Ageing 1st year:	Δf/f	± 3ppm max.		± 5ppm max.
Operating temperature range:	-	-30°C to +75°C		-10°C to +60°C
Capacitance ratio:	C ₀ /C ₁	560 Typical	540 Typical	450 Typical
Insulation resistance:	I.R.	500MΩ min. at 100V DC		

ENVIRONMENTAL CHARACTERISTICS (Ref-MIL STD-887 MIL-STD-202)

PARAMETERS	CONDITIONS	REQUIREMENTS
Storage temperature	-30°C to +85°C	
Shock resistance (Drop)	75cm, drop to an oak block three times	After one hour at room conditions $\frac{\Delta f}{f_0} < \pm 5\text{ppm}$
Vibration	20 min. in each of the X, Y and Z axis (1 hour total), 10G, 30 to 200Hz	
Resistance to soldering heat	Solder dip terminals no closer than 1.0mm from the case for 5 sec. ± 0.5 sec. 270°C ± 5°C solder pot	
Solderability	Same as above but for 3 sec. ± 0.5 sec. 250°C ± 5°C solder pot	Leads shall be 95% covered with fresh solder
Resistance to solvent	Dip in freon or alcohol 5 min.	No electrical or mechanical damage
Hermeticity	Helium leak detector	≤ 1 × 10 ⁻⁸ atm-cc/sec.
Terminal strength	0.5kg pull 30 sec. in lead axis A ± 90° bend 1mm Min. from seal	No electrical or mechanical damage
Humidity steady state	500 hours at 65°C, 90 to 98% R.H.	After two hours at room conditions $\frac{\Delta f}{f_0} < \pm 5\text{ppm}$ and no visual or other damage
High temperature test	500 hours soak at +85°C	
Temperature cycling	*15 cycles, 10 min. at 0°C, 10 min. at 100°C	

FREQUENCY SYNTHESIZER RADIO KF-38 SERIES

TYPE	IQKF-38J	IQKF-38X	IQKF 38L	IQKF 38M	IQKF 38U	IQKF 38Z
Oscillation freq.	32kHz	45kHz	50kHz	90kHz	100kHz	150kHz

FREQUENCY CONTROL

TUNING FORK CRYSTALS FOR WATCHES

MODELS: SW-100/150/200

The SW-series are cylindrical crystal units for watches, designed and manufactured by the top watch manufacturer in Japan. Their extremely small sizes are of advantage not only for watches but also for other space saving electronic designs.

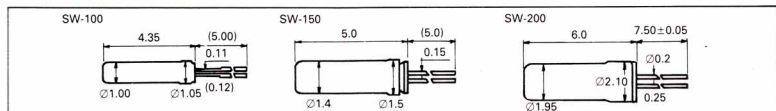
FEATURES

- Ultra-Miniature size (1×4, 1.5×5, 2.0×6mm, nominal)
- Superb ageing characteristics (1ppm/year)
- Photolithography technology
- Excellent anti-shock holding
- Easy-to-install lead (lead configuration and width)

SPECIFICATIONS

Type	SW-100	SW-150	SW-200
Nominal Frequency (25°C)	32.768kHz ±20ppm		
Turnover Temperature	23°C ±5°C		
Parabolic Curvature Constant	-0.035ppm/°C ²		
Quality Factor	50,000 typical	70,000 typical	80,000 typical
Series Resistance	45k ohm typical	30k ohm typical	25k ohm typical
Motional Capacitance	2.1fF typical		2.02fF
Shunt Capacitance	0.9pF typical	0.86pF typical	
Capacitance Ratio	425 typical	350 typical	425 typical
Drive Level	1.0μW max.		
Ageing (First year)	3ppm typical	1ppm typical	
Motional Inductance	11.000H		11.700H
Operating Temperature Range	-10°C to +60°C		
Storage Temperature Range	-30°C to +70°C		
Random Drop	±5ppm	±3ppm	
Load Capacitance	typical 12.5pF		

DIMENSIONS (in mm)



FREQUENCY CONTROL

ULTRA-HIGH STABILITY GT-CUT CRYSTALS

SGT-series

SGT-460 .. (5×10mm) .. 1.0–1.2MHz
SGT-388 .. (4×9mm) .. 1.2–1.7MHz
SGT-308 .. (3×8mm) .. 1.7–2.7MHz

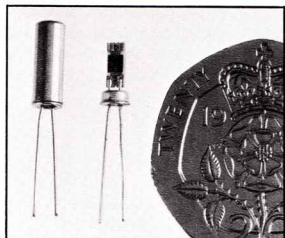
The SGT-series are ultra-miniature crystal units in GT-cut developed by high precision photolithography technology. It provides you with extra-high stability in wide temperature range and in ageing.

FEATURES

- **Very High Stability** (± 5 ppm in -30 to $+70^{\circ}\text{C}$)
By a combination of oscillation mode and cut angle (GT-cut), SGT-series units guarantee extra-high temperature stability of ± 5 ppm in the wide temperature range of -30°C to $+70^{\circ}\text{C}$.
- **World Smallest Size**
Monolithic configuration of the oscillating part and holding part of the crystal, by means of a high precision photolithography process, has made it possible to develop extra-miniature package.
- **Excellent Anti-Shock Characteristics**
The Monolithic Oscillator/holder provides very high shock proof feature.
- **Superb Ageing Stability** (1ppm per year)
By polished crystal surface.

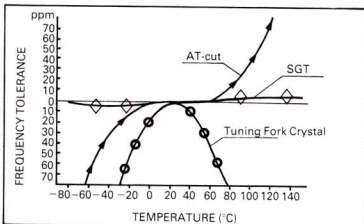
TYPICAL APPLICATIONS

Computer-controlled equipment,
Facsimiles, Radio communications
equipment such as Wireless navigation
equipment, Mobile telephones, Pagers,
Test equipment, etc.



STANDARD FREQUENCIES

1.0MHz	1.8432MHz
1.048576MHz	1.92MHz
1.2MHz	2.0MHz
1.28MHz	2.097152MHz
1.536MHz	2.1MHz
1.6MHz	2.112MHz



FREQUENCY CONTROL

IQD