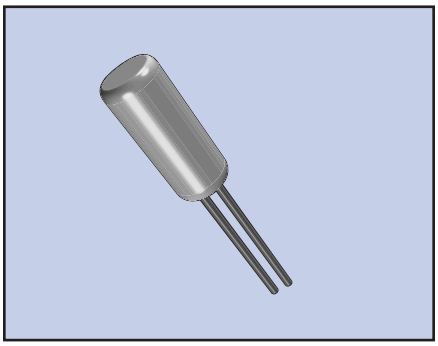
# ECS-31 SERIES LOW FREQUENCY QUARTZ CRYSTALS



The ECS-31 Series features the same characteristics as only tuning fork crystals offer. Because of their miniature size they are ideal for portable and communication equipment applications.

## FEATURES

- **Miniature size**
- **Cost effective**
- **Long term stability**
- **Excellent shock and vibration characteristics**

## PART NUMBERING GUIDE *"EXAMPLE"*

| MANUFACTURER | | FREQUENCY | | LOAD CAPACITANCE | | PACKAGE TYPE* |
|---|---|---|---|---|---|---|
| ECS | – | .400 | – | 12.5 | – | 8 |
| ECS | – | .400 | – | 12.5 | – | 13 |
| ECS | – | 2.0 | – | 12.5 | – | 14 |

** Package type examples (8=3x8, 13=2x6, 14=1x5)*

## OPERATING CONDITIONS/ELECTRICAL CHARACTERISTICS

| PARAMETERS | | 3X8 | 2X6 | 1X5 | CONDITIONS |
|---|---|---|---|---|---|
| FREQUENCY RANGE | $f_0$ | 20KHz ~ 40KHz | 30KHz ~ 150KHz | 200KHz | KHz |
| FREQUENCY TOLERANCE | $\Delta f/f_0$ | ±30 PPM | ±30 PPM | ±10,000 PPM | @ +25˚C |
| FREQUENCY VS. TEMP. CHARAC. | $\Delta f/f_0$ | See Drawing | | | -10˚C ~ +60˚C |
| TURNOVER TEMPERATURE | Tm | +25˚C typ. | | | |
| TEMPERATURE COEFFICIENT | ß | -0.034 PPM/˚C$^2$ typ. | | | Varies depending on frequency |
| OPERATING TEMP. RANGE | $T_{OPR}$ | -10 ~ +60 | | | ˚C |
| STORAGE TEMP. RANGE | $T_{STG}$ | -40 ~ +85 | | | ˚C |
| EQUIVALENT SERIES RESISTANCE | $R_1$ | 30 ~ 50 (max.) | | 10 (max.) | KΩ |
| LOAD CAPACITANCE | $C_L$ | 12.5pF typ. (Customer Specified) | | | pF |
| MOTIONAL CAPACITANCE | $C_1$ | 1 ~ 4fF typ. | | | fF |
| SHUNT CAPACITANCE | $C_0$ | 0.8 ~ 1.7pF typ. | | | pF |
| CAPACITANCE RATIO | $\tau$ | 425 ~ 800 typ. | | | |
| DRIVE LEVEL | DL | 1µW max. | | | µW |
| INSULATION RESISTANCE | IR | 500 MΩ min. | | | DC 100V±15 |
| AGING (FIRST YEAR) | $\Delta f/f_0$ | ±5 PPM max. | | | +25˚C ± 3˚C |
| SHOCK RESISTANCE | ±5 PPM max. Drop test of 3 times on a hard board from 75 cm height or shock test of 3000G x 0.3ms x 1/2 sin wave x 3 directions | | | | Conditions will vary depending on frequency |

## PACKAGE DIMENSIONS (mm)

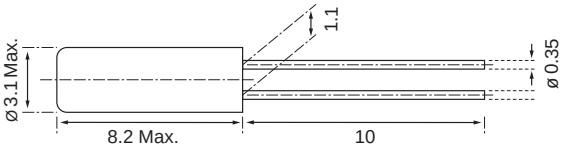



*Figure 1) ECS-31-8*

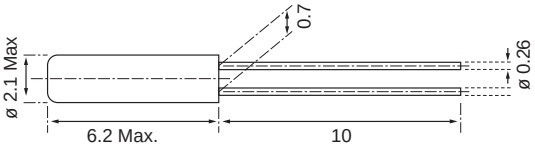



*Figure 2) ECS-31-13*

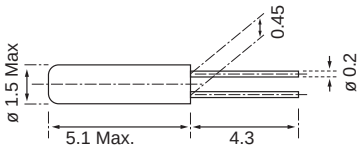
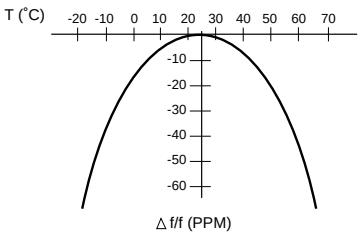



*Figure 3) ECS-31-14*

**PARABOLIC TEMPERATURE CURVE**




*To determine frequency stability, use parabolic curvature. For example: What is the stability at 45˚C?*

*1) Change in T (˚C) = 45 -25 = 20˚C*
*2) Change in frequency = -0.04 PPM x (ΔT)$^2$*
*= -0.04 PPM x (20)$^2$*
*= -16.0 PPM*