

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	$\Delta f/f_0$	$\pm 30$ PPM	$\pm 30$ PPM	$\pm 10,000$ PPM	@ +25°C
FREQUENCY VS. TEMP. CHARAC.	$\Delta f/f_0$	See Drawing			-10°C ~ +60°C
TURNOVER TEMPERATURE	$T_m$	+25°C typ.			
TEMPERATURE COEFFICIENT	$\beta$	-0.034 PPM/°C <sup>2</sup> 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.)	K $\Omega$
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	1 $\mu$ W max.			$\mu$ W
INSULATION RESISTANCE	IR	500 M $\Omega$ min.			DC 100V $\pm$ 15
AGING (FIRST YEAR)	$\Delta f/f_0$	$\pm 5$ PPM max.			+25°C $\pm$ 3°C
SHOCK RESISTANCE		$\pm 5$ 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)

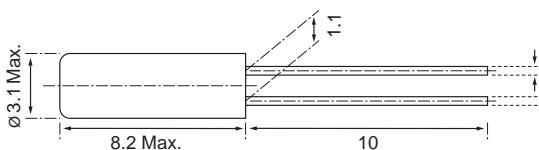


Figure 1) ECS-31-8

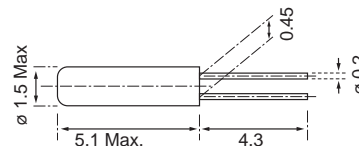


Figure 3) ECS-31-14

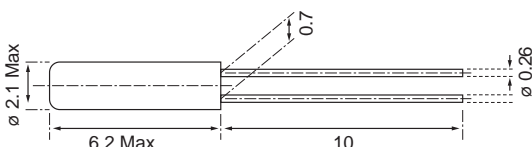
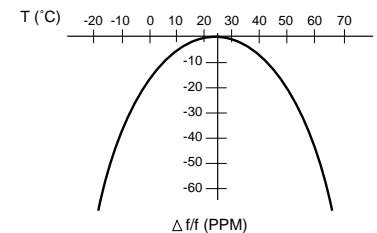


Figure 2) ECS-31-13

## 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 =  $-0.04 \text{ PPM} \times (\Delta T)^2$   
 $= -0.04 \text{ PPM} \times (20)^2$   
 $= -16.0 \text{ PPM}$