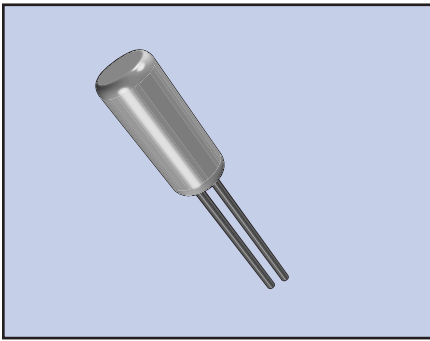


# ECS-3X8X, 2X6X, 1X5X 32.768 KHz TUNING FORK



ECS tuning fork type crystals are used as a clock source in communication equipment, measuring instruments, microprocessors and other time management applications. Their low power consumption makes these crystals ideal for portable equipment.

## FEATURES

- Cost effective
- Tight tolerance
- Long term stability
- Excellent resistance and environmental characteristics
- PbFree/RoHS Compliant

## PART NUMBERING GUIDE "EXAMPLE"

MANUFACTURER	FREQUENCY	LOAD CAPACITANCE	PACKAGE TYPE*
ECS	.327	12.5	8X
ECS	.327	12.5	13X
ECS	.327	8	14X

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

## OPERATING CONDITIONS/ELECTRICAL CHARACTERISTICS

PARAMETERS		ECS-3X8X	ECS-2X6X	ECS-1X5X	UNITS
NOMINAL FREQUENCY	F <sub>0</sub>	32.768	32.768	32.768	KHz
FREQUENCY TOLERANCE	Δf/f <sub>0</sub>	±20	±20	±20	PPM
LOAD CAPACITANCE (typ.)	C <sub>L</sub>	12.5	12.5	8.0	pF
DRIVE LEVEL (max.)	D <sub>L</sub>	1	1	1	μW
RESISTANCE AT SERIES RESONANCE	R <sub>1</sub>	35 (max.)	35 (max.)	40 (max.)	KΩ
Q-FACTOR	Q	90,000 (typ.)	70,000 (typ.)	80,000 (typ.)	
TURNOVER TEMPERATURE	T <sub>M</sub>	+25 ±5	+25 ±5	+25 ±5	°C
TEMPERATURE COEFFICIENT	β	-0.040ppm/°C <sup>2</sup> max.	-0.040ppm/°C <sup>2</sup> max.	-0.040ppm/°C <sup>2</sup> max.	PPM/(ΔC <sup>2</sup> )
SHUNT CAPACITANCE	C <sub>0</sub>	1.60 (typ.)	1.35 (typ.)	1.00 (typ.)	pF
CAPACITANCE RATIO		460 (typ.)	450 (typ.)	400 (typ.)	
OPERATING TEMP. RANGE	T <sub>OPR</sub>		-10~+60		°C
STORAGE TEMP. RANGE	T <sub>STG</sub>		-40~+85		°C
SHOCK RESISTANCE		Drop test 3 times on hard wooden board from height of 75cm / ±5 PPM max.			PPM
INSULATION RESISTANCE	IR	500MΩ min./DC100V			MΩ
AGING (FIRST YEAR)	Δf/f <sub>0</sub>	±3 PPM max. @ +25°C ±3°C			PPM
MOTIONAL CAPACITANCE	C <sub>1</sub>	0.0035 (typ.)	0.0030 (typ.)	0.0025 (typ.)	pF

Note: Contact factory for optional load capacitance.

## PACKAGE DIMENSIONS (mm)

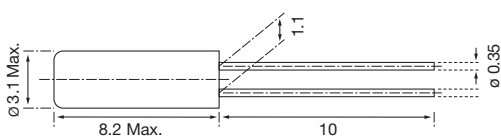


Figure 1) ECS-3X8X

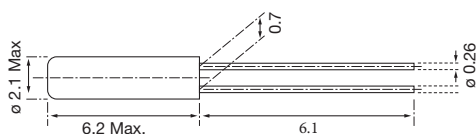


Figure 2) ECS-2X6X

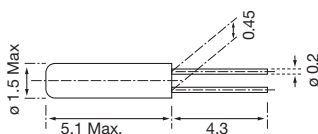
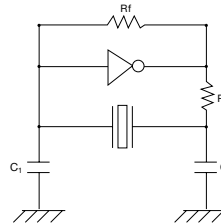


Figure 3) ECS-1X5X

## RECOMMENDED OSCILLATION CIRCUIT

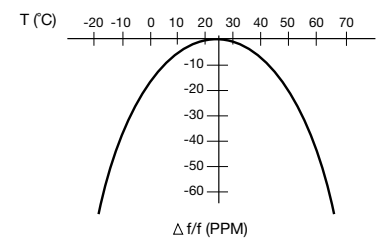


## ELECTRICAL CHARACTERISTICS

IC: TC 4069P  
 R<sub>f</sub>: 10MΩ  
 R<sub>d</sub>: 330KΩ (As required)  
 C<sub>1</sub> = 22pF, C<sub>2</sub> = 22pF  
 V<sub>DD</sub> = 3.0V

In this circuit, low drive level with a maximum of 1μW is recommended. If excessive drive is applied, irregular oscillation or quartz element fractures may occur.

## 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 × (ΔT)<sup>2</sup> = -0.04 PPM × (20)<sup>2</sup> = -16.0 PPM