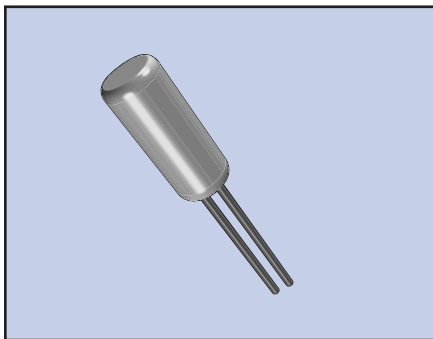




ECS tuning fork type crystals are used as a clock source in communication equipment, measuring instruments, microprocessors and other time management applications. Their low power consumption makes these crystals ideal for portable equipment.

FEATURES

- Cost effective
- Tight tolerance
- Long term stability
- Excellent resistance and environmental characteristics

PART NUMBERING GUIDE "EXAMPLE"

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

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

OPERATING CONDITIONS/ELECTRICAL CHARACTERISTICS

PARAMETERS		ECS-3X8	ECS-2X6	ECS-1X5	UNITS
NOMINAL FREQUENCY	F ₀	32.768	32.768	32.768	KHz
FREQUENCY TOLERANCE	Δf/f ₀	±20	±20	±20	PPM
LOAD CAPACITANCE (typ.)	C _L	12.5	12.5	8.0	pF
DRIVE LEVEL (max.)	D _L	1	1	1	μW
RESISTANCE AT SERIES RESONANCE	R ₁	35 (max.)	35 (max.)	40 (max.)	KΩ
Q-FACTOR	Q	90,000 (typ.)	70,000 (typ.)	80,000 (typ.)	
TURNOVER TEMPERATURE	T _M	+25 ±5	+25 ±5	+25 ±5	°C
TEMPERATURE COEFFICIENT	β	-0.040ppm/°C ² max.	-0.040ppm/°C ² max.	-0.040ppm/°C ² max.	PPM/(ΔC°)
SHUNT CAPACITANCE	C ₀	1.60 (typ.)	1.35 (typ.)	1.00 (typ.)	pF
CAPACITANCE RATIO		460 (typ.)	450 (typ.)	400 (typ.)	
OPERATING TEMP. RANGE	T _{OPR}		-10~+60		°C
STORAGE TEMP. RANGE	T _{STG}		-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 ₀	±3 PPM max. @ +25°C ±3°C			PPM
MOTIONAL CAPACITANCE	C ₁	0.0035 (typ.)	0.0030 (typ.)	0.0025 (typ.)	pF

Note: Contact factory for optional load capacitance.

PACKAGE DIMENSIONS (mm)

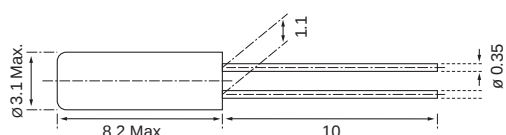


Figure 1) ECS-3X8

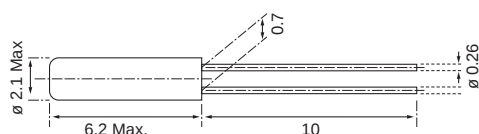


Figure 2) ECS-2X6

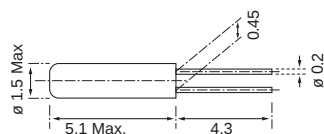
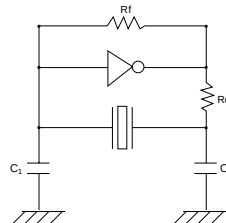


Figure 3) ECS-1X5

RECOMMENDED OSCILLATION CIRCUIT

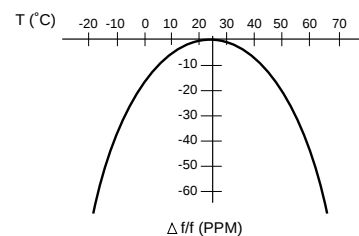


ELECTRICAL CHARACTERISTICS

IC: TC 4069P
Rf: 10MΩ
Rd: 330KΩ (As required)
C₁ = 22pF, C₂ = 22pF
V_{DD} = 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 = $-0.04 \text{ PPM} \times (\Delta T)^2$
 $= -0.04 \text{ PPM} \times (20)^2$
 $= -16.0 \text{ PPM}$