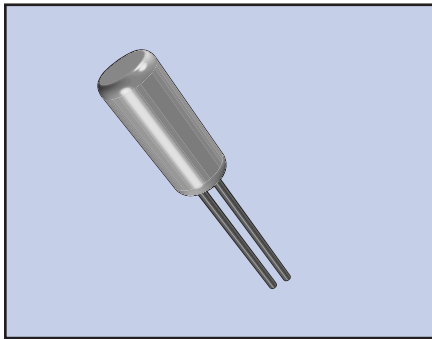




ECS tuning fork type crystals are used as a clock source in communication equipment, measuring instruments, microprocessors and other time management applications. Their low power consumption makes these crystals ideal for portable equipment.

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 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)

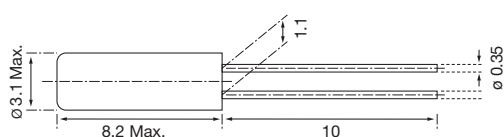


Figure 1) ECS-3X8X

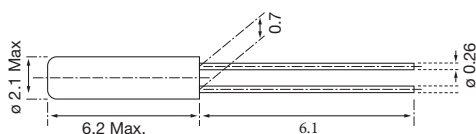


Figure 2) ECS-2X6X

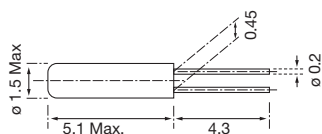
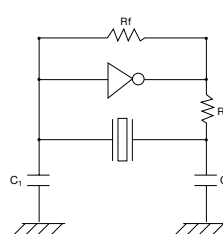


Figure 3) ECS-1X5X

RECOMMENDED OSCILLATION CIRCUIT



ELECTRICAL CHARACTERISTICS

IC: TC 4069P

R_f: 10MΩ

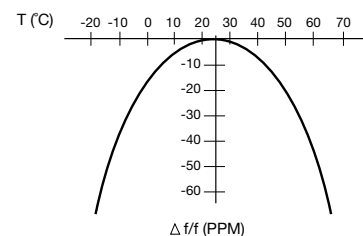
R_d: 330KΩ (As required)

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 PPM × (ΔT)²
= -0.04 PPM × (20)²
= -16.0 PPM