

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 | 32.768 | 12.5 | 8 |
| ECS | 32.768 | 12.5 | 13 |
| ECS | 32.768 | 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/°C² max. | -0.040ppm/°C² max. | -0.040ppm/°C² max. | PPM/(ΔC²) |
| 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)

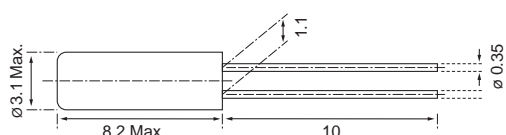


Figure 1) ECS-3X8

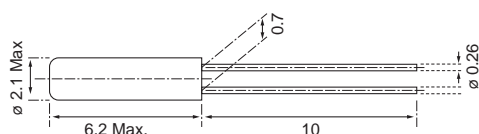


Figure 2) ECS-2X6

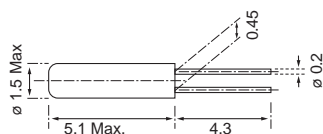
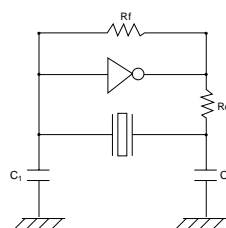


Figure 3) ECS-1X5

RECOMMENDED OSCILLATION CIRCUIT

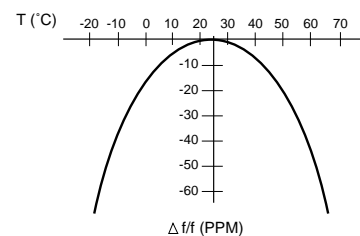


ELECTRICAL CHARACTERISTICS

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

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ECS:

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