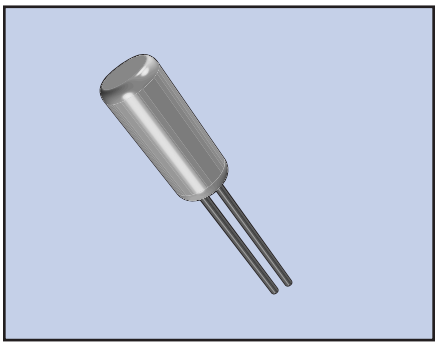
ECS-3X8, 2X6, 1X5 32.768 KHz TUNING FORK CRYSTALS



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	Fo	32.768	32.768	32.768	KHz
FREQUENCY TOLERANCE	Δf/fo	±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	ß	-0.040ppm/˚C² max.	-0.040ppm/˚C² max.	-0.040ppm/˚C² max.	PPM/(Δ˚C)
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/fo	±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)

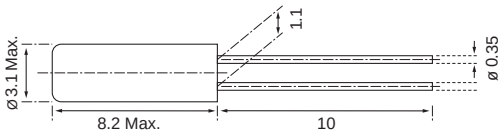


Figure 1) ECS-3X8

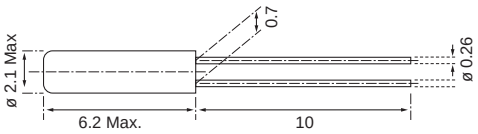


Figure 2) ECS-2X6

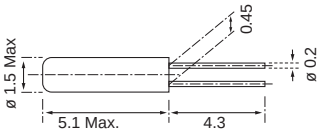
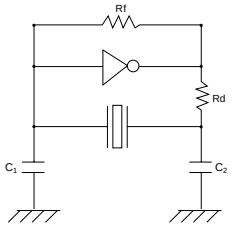


Figure 3) ECS-1X5

RECOMMENDED OSCILLATION CIRCUIT

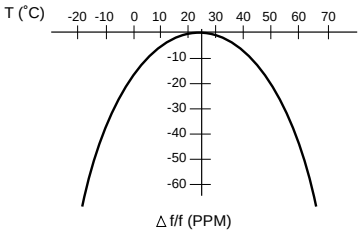


ELECTRICAL CHARACTERISTICS

IC: TC 4069P
Rf: 10MΩ
Rd: 330KΩ (As required)
C_1 = 22pF, C_2 = 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 $(\Delta T)^2$
= -0.04 PPM x $(20)^2$
= -16.0 PPM

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