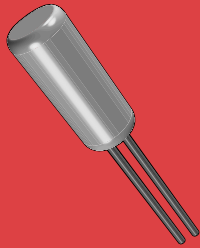# WC38, WC26, WC15

RXD

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

32.768 KHz TUNING FORK CRYSTALS

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.

PART NUMBERING GUIDE *"EXAMPLE"*

PART NUMBER		LOAD CAPACITANCE		FREQUENCY
WC26	–	6	–	32.768 KHz

OPERATING CONDITIONS/ELECTRICAL CHARACTERISTICS

PARAMETERS		WC38	WC26	WC15	UNITS
NOMINAL FREQUENCY	F_o	32.768	32.768	32.768	KHz
FREQUENCY TOLERANCE	$\Delta f/fo$	±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/(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)	$\Delta f/fo$	±3 PPM max. @ +25˚C ±3˚C			PPM
MOTIONAL CAPACITANCE	C_1	0.0035 (typ.)	0.0030 (typ.)	0.0025 (typ.)	pF

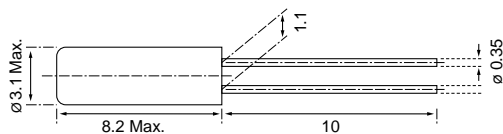*Note: Contact factory for optional load capacitance.*
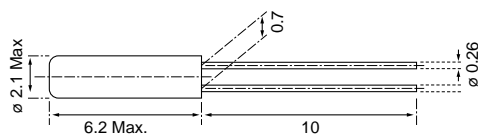
PACKAGE DIMENSIONS (mm)

Ø 3.1 Max. — 1.1 — Ø 0.35
8.2 Max. — 10
Figure 1) WC38

Ø 2.1 Max — 0.7 — Ø 0.26
6.2 Max. — 10
Figure 2) WC26
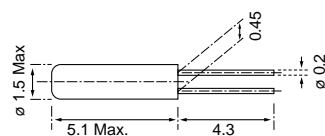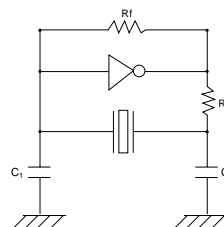
Ø 1.5 Max — 0.45 — Ø 0.2
5.1 Max. — 4.3
Figure 3) WC15

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

T (˚C) -20 -10 0 10 20 30 40 50 60 70
-10
-20
-30
-40
-50
-60
Δ f/f (PPM)
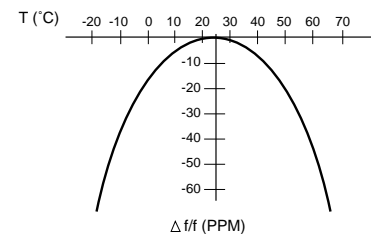
To determine frequency stability, use parabolic curvature. For example: What is the stability at 45˚C?

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