

### FEATURES

- Low profile
- Long term stability
- Industry standard footprint
- Excellent shock resistance
- Excellent environmental characteristics
- Tape and Reel (3,000 pcs)

### SMD TUNING FORK CRYSTAL

Housing for the SMDBWCR crystal is made from the same thermoplastic that is industry standard for integrated circuits. This ruggedized molded package is excellent for SMD applications.

### PART NUMBERING GUIDE “EXAMPLE”

PART NUMBER	FREQUENCY
SMDBWCR	32.768 KHz

### OPERATING CONDITIONS/ELECTRICAL CHARACTERISTICS

PARAMETERS		SMDBWCR	UNITS
NOMINAL FREQUENCY	F <sub>0</sub>	32.768	KHz
LOAD CAPACITANCE	C <sub>L</sub>	12.5 Standard (6.0 Optional)	pF
DRIVE LEVEL	D <sub>L</sub>	1 max.	μW
CALIBRATION TOLERANCE	@ 25°C	±20	PPM
EQUIVALENT SERIES RESISTANCE	R <sub>1</sub>	50 max.	KΩ
TEMPERATURE COEFFICIENT		-0.040 PPM/°C <sup>2</sup> max.	PPM/(ΔC)
OPERATING TEMPERATURE RANGE	T <sub>OPR</sub>	-10 ~ +60	°C
MAX. OPERATING TEMPERATURE RANGE		-40 ~ +85	°C
Q FACTOR	Q	50,000 min.	
TURNOVER TEMPERATURE	T <sub>0</sub>	+25 ± 5	°C
STORAGE TEMPERATURE RANGE	T <sub>STG</sub>	-55 ~ +125	°C
INSULATION RESISTANCE	IR	500MΩ min./ DC 100V	MΩ
SHUNT CAPACITANCE	C <sub>0</sub>	1.35 typical	pF
MOTIONAL CAPACITANCE	C <sub>1</sub>	0.003 pF typical	pF
AGING (FIRST YEAR)	Δf/f <sub>0</sub>	±3 PPM max. @ +25°C	PPM

### PACKAGE DIMENSIONS (mm)

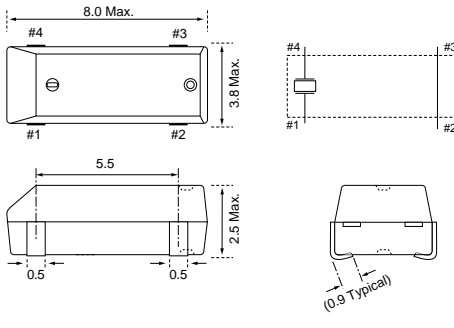


Figure 1) SMDBWCR - Top, Side and End views with pin connections

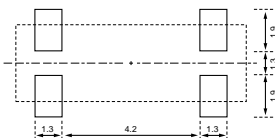
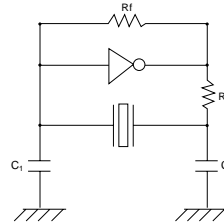


Figure 3) SMDBWCR Land Pattern - Top view

### RECOMMENDED OSCILLATION CIRCUIT

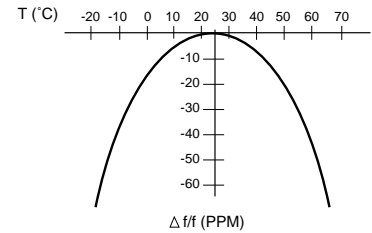


### ELECTRICAL CHARACTERISTICS

- IC: TC 4069P  
 Rf: 10MΩ  
 Rd: 330KΩ (As required)  
 C<sub>1</sub> = 22pF, C<sub>2</sub> = 22pF  
 V<sub>DD</sub> = 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)<sup>2</sup>  
 = -0.04 PPM x (20)<sup>2</sup>  
 = -16.0 PPM