

# CFPT-9000 SMD TCXO/TCVCXOs

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## Description

- Sub 1ppm performance TCXO manufactured for us by Rakon utilising their Pluto™ ASIC technology, a single chip oscillator and analogue compensation circuit operating over an extended temperature range. Its ability to function down to a supply voltage of 2.4V and low power consumption make it particularly suitable for mobile applications

## Package Outline

- 7 x 5mm

## Standard Frequencies

- 3.2, 5, 6.4, 8, 19.2, 9.6, 12.688375, 10, 12.8, 13, 14.4, 14.85, 16.384, 16.367, 16.8, 19.2, 19.44, 19.8, 20, 24.5535, 32.768, 38.88, 40MHz

## Output Compatibility & Load

- HCMOS 15pF
- ACMOS 50pF max. (available on request, contact sales office)
- Sinewave 10kΩ // 10pF, AC-coupled
- Clipped sinewave 10kΩ // 10pF, AC-coupled

## Frequency Stability

- Temperature: see table
- Typical Supply Voltage Variation  $\pm 10\% < \pm 0.2 \text{ ppm}^*$
- Typical Load Coefficient 15pF  $\pm 5\text{pF} < \pm 0.2 \text{ ppm}^*$   
\*Dependent on frequency and output type

## Frequency Adjustment

Three options with external Voltage Control applied to Pad 10:

- A - Ageing adjustment:  $> \pm 5\text{ppm}$ , frequency  $< 20\text{MHz}$  (Standard Option)  
 $> \pm 7\text{ppm}$ , frequency  $> 20\text{MHz}$
- B - No frequency adjustment initial calibration @ 25°C  $< \pm 1.0 \text{ ppm}$
- C - High Pulling  $\pm 10\text{ppm}$  to  $\pm 50\text{ppm}$  can be available depending on frequency and stability options. Please consult our sales office
- Linearity:  $< 1\%$
- Slope: Positive
- Input resistance:  $> 100\text{k}\Omega$
- Modulation bandwidth:  $> 2\text{kHz}$
- Standard voltage control ranges:  
Without reference voltage -  $V_s = 5.0\text{V}$   $2.5\text{V} \pm 1\text{V}$   
Without reference voltage -  $V_s = 3.3\text{V}$   $1.65\text{V} \pm 1\text{V}$   
With reference voltage -  $V_c = 0\text{V}$  to  $V_{ref}$

## Storage Temperature Range

- 55 to 125°C

## Tri-State Operation

- Logic '1' ( $> 60\% V_s$ ) to Pad 8 enables output
- Logic '0' ( $< 20\% V_s$ ) to Pad 8 disables output  
When at logic '0', the output stage is disabled for all output options, but the oscillator and compensation circuit are still active (current consumption  $< 1\text{mA}$ )

## Supply Voltage

- Standard 3.3V, 5.0V ( see table)
- Supply voltages in the range 2.4 to 6.0V available to order, please contact our sales office

## Supply Current

- HCMOS Typically:  
 $1 + \text{Frequency}(\text{MHz}) * \text{Supply}(\text{V}) * \{\text{Load}(\text{pF}) + 15\} * 10^{-3} \text{ mA}$   
e.g. 20MHz, 5V, 15pF  $\approx 4\text{mA}$
- Sinewave  $< 8\text{mA}$
- Clipped Sinewave Typically:  
 $1 + \text{Frequency}(\text{MHz}) * 1.2 * \{\text{Load}(\text{pF}) + 30\} * 10^{-3} \text{ mA}$

## Ageing

- $\pm 1\text{ppm}$  maximum in first year, frequency  $< 20\text{MHz}$
- $\pm 2\text{ppm}$  maximum in first year, frequency  $> 0\text{MHz}$
- $\pm 3\text{ppm}$  maximum for 10 years (including the first year), frequency  $< 20\text{MHz}$
- $\pm 5\text{ppm}$  maximum for 10 years (including the first year), frequency  $> 20\text{MHz}$

## After Reflow

- $\pm 1\text{ppm}$  max

## Reference Voltage, Vref

- Optional reference voltage output on Pad 1, suitable for potentiometer supply or DAC reference.
  - No output (standard option)
  - 2.2V, for Min.  $V_s > 2.4\text{V}$
  - 2.7V, for Min.  $V_s > 3.0\text{V}$
  - 4.2V, for Min.  $V_s > 4.5\text{V}$
 Maximum load current (mA) =  $V_{ref}/10$

For manual frequency adjustment connect an external 50kΩ potentiometer between Pad 1 (Reference Voltage) and Pad 4 (GND) with wiper connected to Pad 10 (Voltage Control). Please specify reference voltage as part of the ordering code

## Environmental

- Vibration: IEC 60068-2-6 Test Fc Procedure B4, 10-60Hz 1.5mm displacement, 60 –2000Hz at 10gn, 30 minutes in each of three mutually perpendicular planes at 1 octave per minute
- Shock: IEC 60068-2-27 Test Ea, 1500g acceleration for 0.5ms duration, 1/2 sine pulse, 3 shocks in each direction along three mutually perpendicular planes
- Solderability: MIL-STD-202, Method 208, Category 3

## Marking Includes

- Factory code + Manufacturing identifier (xx) + Pad 1 / Static sensitivity identifier (Triangle) + Part Number (Four digits) + Date Code

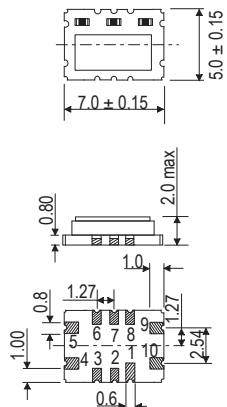
## Packaging

- Bulk or Tape & Reel

## Minimum Order Information Required

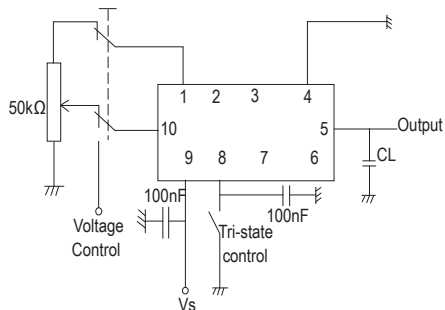
- Frequency + Model Number + Frequency Stability vs Operating Temperature Range Code + Reference Voltage Code + Frequency Adjustment Code

### Outline (mm)

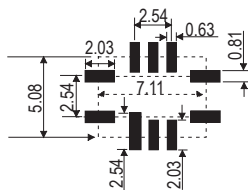


- Pad Connections
1. V<sub>ref</sub>
  2. N/C
  3. DC Coupled Output (do not connect)
  4. GND
  5. Output
  6. N/C
  7. N/C
  8. Tri-state Control (Enable)\*
  9. +Vs
  10. Voltage Control\*
- \*leave unconnected if not required.

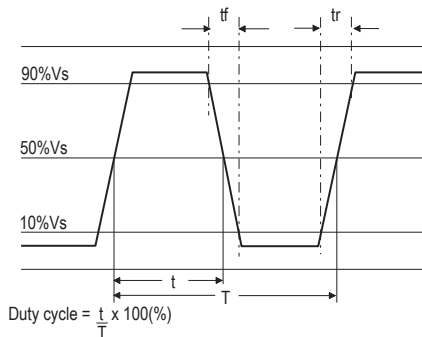
### Test Circuit



### Solder pad layout



### Output Waveform



### Phase Noise (typical figures)

Frequency	Frequency offset from carrier: 10Hz	Frequency offset from carrier: 100Hz	Frequency offset from carrier: 1kHz	Frequency offset from carrier: 10kHz	Frequency offset from carrier: 100kHz
13.0MHz	-95 dBc/Hz	-120 dBc/Hz	-135 dBc/Hz	-140 dBc/Hz	-145 dBc/Hz

### Electrical Specification - limiting values

Frequency Range	Supply Voltage	Output Voltage	Output Levels	Rise Time (tr)	Fall Time (tf)	Duty Cycle	Model Number
1.25 to 40.0MHz	3.3V ±10%	HCMOS 15pF	VoH > 90% Vs VoL < 10% Vs	8ns	8ns	45/55%	CFPT-9006
1.25 to 40.0MHz	5.0V ±10%	HCMOS 15pF	VoH > 90% Vs VoL < 10% Vs	7ns	7ns	45/55%	CFPT-9001
10.0 to 40.0MHz	3.3V ±10%	Sine 10kΩ/10pF	< 20MHz > 1 Vpk-pk > 20MHz > 0.5Vpk-pk	-	-	-	CFPT-9007
10.0 to 40.0MHz	5.0V ±10%	Sine 10kΩ/10pF	< 20MHz > 1 Vpk-pk > 20MHz > 0.5Vpk-pk	-	-	-	CFPT-9003
10.0 to 40.0MHz	3.3V ±10%	Clipped Sinewave 10kΩ/10pF	Vpk-pk > 0.8V	-	-	-	CFPT-9008
10.0 to 40.0MHz	5.0V ±10%	Clipped Sinewave 10kΩ/10pF	Vpk-pk > 0.8V	-	-	-	CFPT-9005

### Frequency Stabilities over Operating Temperature Range

Operating Temperature Ranges	Frequency Stabilities v Operating Temperature Range					
	±0.3ppm	±0.5ppm	±1.0ppm	±1.5ppm	±2.0ppm	±2.5ppm
0 to 50°C	Code AP	Code EP	Code FP	Code CP	Code GP	Code HP
0 to 70°C	Code AC*	Code EC	Code FC	Code CC	Code GC	Code HC
-20 to 70°C	Code AS*	Code ES	Code FS	Code CS	Code GS	Code HS
-30 to 75°C	Code AU*	Code EU*	Code FU	Code CU	Code GU	Code HU
-40 to 85°C	Code AX*	Code EX*	Code FX	Code CX	Code GX	Code HX

Ordering Example 10.0MHz    CFPT-9001    CX 1 A LF

Frequency \_\_\_\_\_

Model Number \_\_\_\_\_

Frequency Stability vs Operating Temperature Code \_\_\_\_\_

Reference Voltage Code \_\_\_\_\_

Frequency Adjustment Code \_\_\_\_\_

Lead-Free Version \_\_\_\_\_

(For reference voltage and frequency adjustment codes see main text)

Note \*Codes may not be available for all frequencies

TCXOs