



CFPT-9000 Series

ISSUE 10 ; 3 FEBRUARY 2006

Recommended for New Designs

Delivery Options

- Please contact our sales office for current leadtimes

Description

- A series of surface mountable $7.0 \times 5.0\text{mm}$ temperature compensated voltage controlled crystal oscillators (TCVCXOs) for medium to high volume applications where small size and high performance are pre-requisites. This oscillator uses RAKON's latest custom ASIC "Pluto", a single chip oscillator and analogue compensation circuit, capable of sub 1 ppm performance 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

RoHS compliance

- Parts with the suffix 'LF' on the ordering code and part number are fully compliant with the European Union directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Note: The RoHS compliant parts are suitable for assembly using both Lead-free solders (see Lead-free Reflow soldering profile) and Tin / Lead solders (see Tin / Lead Reflow soldering profile).

Standard Frequencies

- 3.2, 5.0, 6.4, 8.192, 9.6, 12.688375, 10.0, 12.8, 13.0, 14.4, 14.85, 16.384, 16.367, 16.8, 19.2, 19.44, 19.8, 20.0, 24.5535, 32.768, 38.88, 40.0MHz

Output Waveform

- Square HCMOS 15pF load
- Square AC MOS 50pF max. load (available on request, contact sales office)
- Sinewave $10\text{k}\Omega // 10\text{pF}$, AC-coupled
- Clipped sinewave $10\text{k}\Omega // 10\text{pF}$, AC-coupled

Supply Voltage

- Operating range 2.4 to 6.0V, see table

Current Consumption

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

Package Outline

- $7.0 \times 5.0 \times 2.0\text{mm}$ SMD Ceramic Carrier

Ageing

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

Frequency Stability

- Temperature: see table
- Typical Supply Voltage Variation $\pm 10\% \leq \pm 0.2 \text{ ppm}^*$
- Typical Load Coefficient $15\text{pF} \pm 5\text{pF} \leq \pm 0.2 \text{ ppm}^*$

*Dependent on frequency and output type

Frequency Adjustment

- Three options with external Voltage Control applied to pad 10:

A - Ageing adjustment: $\geq \pm 5\text{ppm}$, frequency $\leq 20\text{MHz}$
(Standard Option)

$\geq \pm 7\text{ppm}$, frequency $> 20\text{MHz}$

B - No frequency adjustment initial calibration @ 25°C
 $\leq \pm 1.0 \text{ ppm}$

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 $\leq 1\%$
- Slope Positive
- Input resistance $> 100\text{k}\Omega$
- Modulation bandwidth $> 2\text{kHz}$
- Standard voltage control ranges:
Without reference voltage - $V_s = 5.0\text{V} \pm 1\text{V}$
Without reference voltage - $V_s = 3.3\text{V} \pm 1.65\text{V}$
With reference voltage - $V_c = 0\text{V}$ to V_{ref}

Reference Voltage, V_{ref}

- Optional reference voltage output on pad 1, suitable for potentiometer supply or DAC reference.

1. No output (standard option)
2. 2.2V, for Min. $V_s > 2.4\text{V}$
3. 2.7V, for Min. $V_s > 3.0\text{V}$
4. 4.2V, for Min. $V_s > 4.5\text{V}$

Maximum load current (mA) = $V_{\text{ref}}/10$

For manual frequency adjustment connect an external $50\text{k}\Omega$ 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

Tri-state

- Pad 8 open circuit or >0.6Vs output enabled
- < 0.2Vs Tri-state
- When Tri-stated, the output stage is disabled for all output options, but the oscillator and compensation circuit are still active (current consumption <1mA)

Storage Temperature Range

- -55 to 125°C

Environmental Specification

- 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 axes at 1 octave per minute
- Shock: IEC 60068-2-27 Test Ea, 1500gn acceleration for 0.5ms duration, half sine pulse, 3 shocks in each direction along three mutually perpendicular axes
- Soldering: SMD product suitable for Convection Reflow soldering. See recommended reflow profiles
- Solderability: MIL-STD-202, Method 208, Category 3
- Marking: Laser Marked

Marking Includes

- RAKON
- Manufacturing identifier (xx)
- Pad 1 / Static sensitivity identifier (Triangle)
- Part Number (Four digits)
- Device date code (YW)

RAKON xx
Δ 0000YW

Minimum Order Information Required

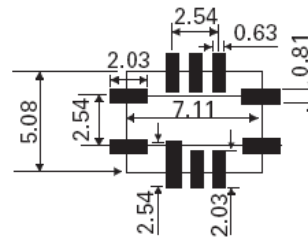
- Frequency + Model Number + Frequency Stability Vs Operating Temperature Range Code + Reference Voltage Code + Frequency Adjustment Code + RoHS compliance code 'LF'

OR

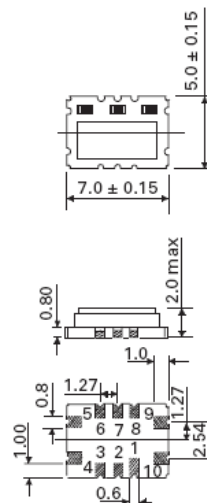
- Discrete part number for repeat orders (Discrete part numbers suitable for Lead-free soldering include the RoHS compliance code 'LF' as a suffix, e.g. E2747LF)

Please supply full information for non-standard options, if required.

Solder pad layout



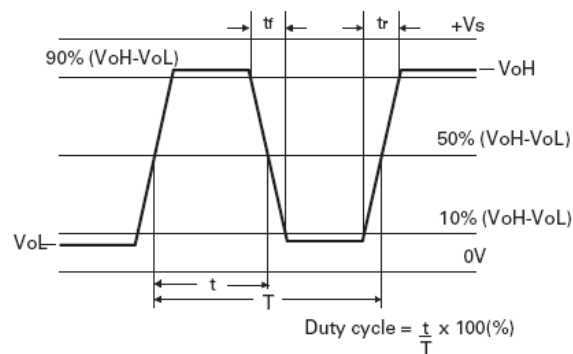
Outline in mm



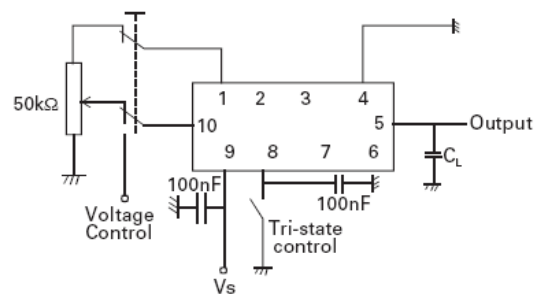
Pad Connections

1. V_{ref}
 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.

Output Waveform - HCMOS



Test Circuit





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 when measured in test circuit

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 \pm 10%	Square HCMOS 15pF	VoH \geq 90% Vs VoL \leq 10% Vs	8ns	8ns	45/55%	CFPT-9006
1.25 to 40.0MHz	5.0V \pm 10%	Square HCMOS 15pF	VoH \geq 90% Vs VoL \leq 10% Vs	7ns	7ns	45/55%	CFPT-9001
10.0 to 40.0MHz	3.3V \pm 10%	Sine 10k Ω //10pF	\leq 20MHz \geq 1 Vpk-pk $>$ 20MHz \geq 0.5Vpk-pk	-	-	-	CFPT-9007
10.0 to 40.0MHz	5.0V \pm 10%	Sine 10k Ω //10pF	\leq 20MHz \geq 1 Vpk-pk $>$ 20MHz \geq 0.5Vpk-pk	-	-	-	CFPT-9003
10.0 to 40.0MHz	3.3V \pm 10%	Clipped Sinewave 10k Ω //10pF	Vpk-pk \geq 0.8V	-	-	-	CFPT-9008
10.0 to 40.0MHz	5.0V \pm 10%	Clipped Sinewave 10k Ω //10pF	Vpk-pk \geq 0.8V	-	-	-	CFPT-9005

Frequency Stability Available Over Operating Temperature Ranges

Operating Temperature Ranges	Frequency Stabilities Vs Operating Temperature Range					
	\pm 0.3ppm	\pm 0.5ppm	\pm 1.0ppm	\pm 1.5ppm	\pm 2.0ppm	\pm 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

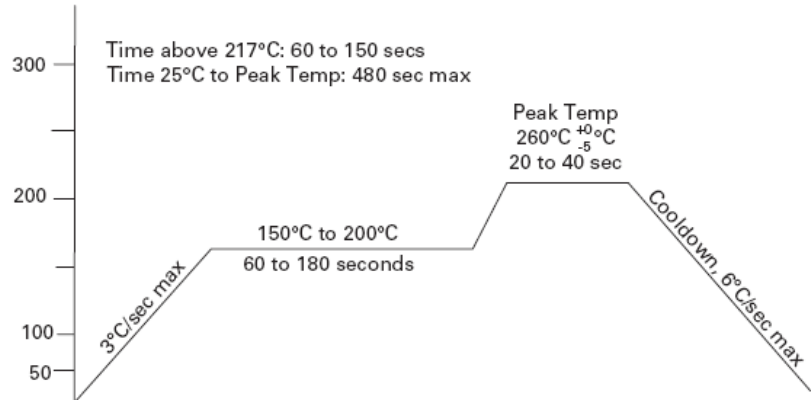
Ordering Example

Frequency	10.0MHz
Model Number	CFPT-9001
Frequency Stability Vs Operating Temperature Code	CX
Reference Voltage Code	1
Frequency Adjustment Code	A
Lead-Free Version	LF

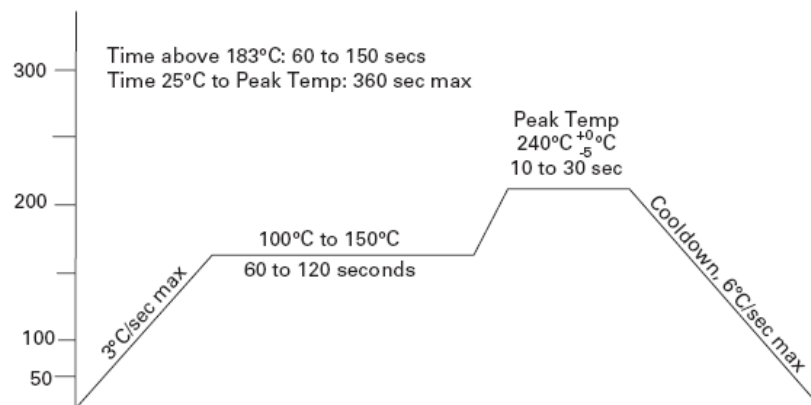
(For reference voltage and frequency adjustment codes see main text)

Note* Codes may not be available for all frequencies.

Lead Free Reflow Soldering Profile *



Tin / Lead Reflow Soldering Profile *



*Note: These profiles were used during the qualification testing of the product and therefore represent worst case conditions. They are not recommended for use by the customer in the actual assembly of these parts.