

## CFPT-9000 Series

ISSUE 9 ; 3 MARCH 2005

### 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 (TCVXOs) for medium to high volume applications where small size and high performance are pre-requisites. This oscillator uses C-MAC'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 ACMOS 50pF max. load (available on request, contact sales office)
- Sinewave 10k $\Omega$  // 10pF, AC-coupled
- Clipped sinewave 10k $\Omega$  // 10pF, 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, frequency  $\leq 20\text{MHz}$
- $\pm 5\text{ppm}$  maximum for 10 years, 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 15pF  $\pm 5\text{pF} \leq \pm 0.2 \text{ ppm}^*$

\*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 @  $25^\circ\text{C}$   
 $\leq \pm 1.0 \text{ ppm}$

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 -  $V_s = 5.0\text{V}$   $2.5\text{V} \pm 1\text{V}$   
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  $V_{\text{ref}}$

#### Reference Voltage, $V_{\text{ref}}$

- 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 50k $\Omega$  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

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### 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

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

CMAC xx  
△ 0000 YW

### Minimum Order Information Required

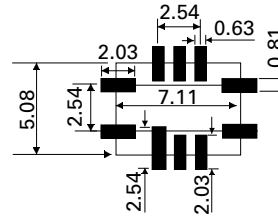
- Frequency + Model Number + Frequency Stability Vs Operating Temperature Range Code + Reference Voltage Code + Frequency Adjustment Code + RoHS compliance code 'LF'

OR

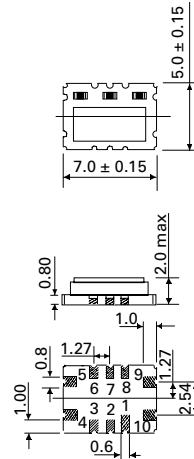
- Discrete part number for repeat orders (Discrete part numbers suitable for Lead-free soldering include the RoHS compliance code 'LF' as a suffix, e.g. E2747LF)

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

### Solder pad layout



### Outline in mm

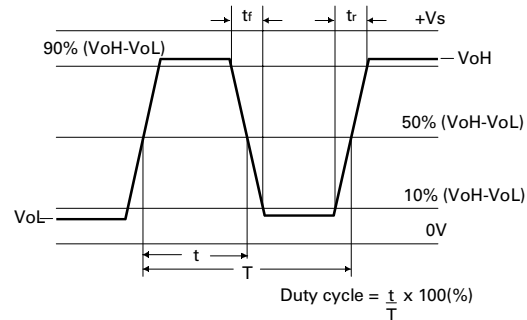


### Pad Connections

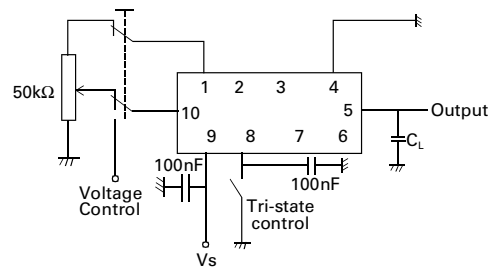
1. V ref
  2. N/C
  3. DC Coupled Output (do not connect)
  4. GND
  5. Output
  6. N/C
  7. N/C
  8. Tri-state Control (Enable)\*
  9. +Vs
  10. Voltage Control\*
- \*leave unconnected if not required.

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### 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 $\Omega$ //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 $\Omega$ //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 $\Omega$ //10pF	Vpk-pk $\geq$ 0.8V	-	-	-	CFPT-9008
10.0 to 40.0MHz	5.0V $\pm$ 10%	Clipped Sinewave 10k $\Omega$ //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

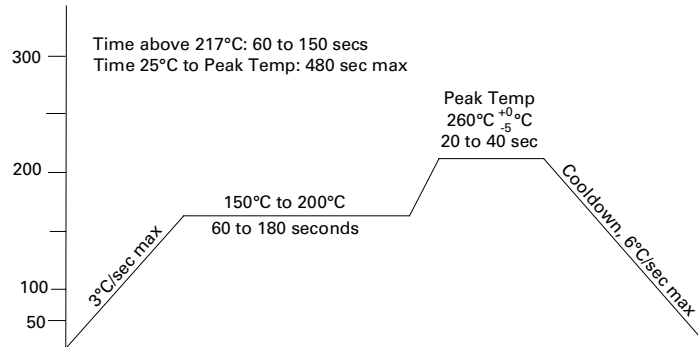
#### Ordering Example

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

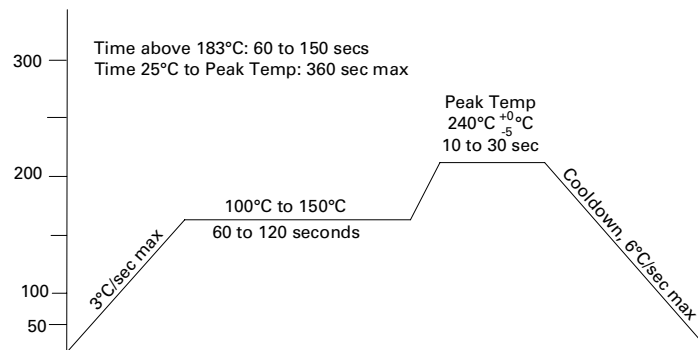
( For reference voltage and frequency adjustment codes see main text)

Note\* Codes may not be available for all frequencies.

#### Lead Free Reflow Soldering Profile \*



#### Tin / Lead Reflow Soldering Profile \*



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\*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.