CFPT9000

SMD Temperature Compensated Crystal Oscillator (PLUTO).

A series of surface mountable 7.0x5.0mm Temperature Compensated Voltage Controlled Crystal Oscillators (TCVCXOs) for medium to high volume applications where small size and high performance are prerequisites.

Product description

The CFPT9000 uses Rakon's proprietary ASIC 'Pluto™', a single chip oscillator and analogue compensation circuit, capable of sub 0.3ppm performance over an extended temperature range. Its ability to function down to a supply voltage of 2.4V and low power consumption makes it particulary suitable for mobile applications.

Applications

- Communications
- Other

Features

- Low power consumption
- Sub 0.3ppm stability over extended temperature range
- Wide frequency range

Specifications

1.0 SPECIFICATION REFERENCES

Line	Parameter	Description
1.1	Model description	CFPT9000
1.2	RoHS compliant	Yes, part numbers with suffix 'LF' (non-RoHS version available upon request)
1.3	Package size available	7.0mm x 5.0 x 2.25 mm (see model drawing), other versions with 8 pads or 4 pads are available on request

2.0 FREQUENCY CHARACTERISTICS

Line	Parameter	Test Condition	Value	Unit
2.1	Frequency range	Frequency range available (note 1)	1.2 to 40	MHz
2.2	Frequency calibration	Initial calibration @ 25°C	±1 max	ppm
2.3	Reflow shift	Measured ≥ 60 minutes after reflow	±1 max	ppm
2.4	Frequency stability over temperature	Reference to (Fmax + Fmin)/2	±0.3 to 2.5	ppm
2.5	Temperature range	Operating temperature range over which temperature stability is measured (wider than -40 to 85°C available on request)	-40 to 85	°C
2.6	Supply voltage stability	±10% variation, reference to frequency at nominal supply voltage, typical value	±0.2	ppm
2.7	Load sensitivity	HCMOS, ACMOS: ±5pF variation, clipped sinewave / sinewave: ± 10% variation, reference to frequency at nominal load, typical value	±0.2	ppm
2.8	Long term stability	first year, ≤ 20MHz	±1 max	ppm
2.9	Long term stability	first year, > 20MHz	±2 max	ppm
2.10	Long term stability	10 years, ≤ 20MHz	±3 max	ppm
2.11	Long term stability	10 years, > 20MHz	±5 max	ppm
2.12	G-sensitivity	Gamma vector, 3-axes, 30-1500Hz (standard performance, as low as 0.2ppb/g available on request), typically less than...	2	ppb/g

3.0 POWER SUPPLY

Line	Parameter	Test Condition	Value	Unit
3.1	Supply voltage	Nominal supply voltage (±10%) to be specified as part of model code	2.4 to 6	V
3.2	Current Sinewave		8 max	mA
3.3	Current HCMOS	typically: 1+frequency(MHz)*supply(V)*{load(pF)+15}*10^{-3}mA e.g 20MHz, 5V, 15pF = 4mA		mA
3.4	Current Clipped Sinewave	typically: 1+frequency(MHz)*1.2*{load(pF) +30}*10^{-3}mA		mA

4.0 CONTROL VOLTAGE

Line	Parameter	Test Condition	Value	Unit
4.1	Control voltage range	Without reference voltage; Vs=5.0V	1.5 to 3.5	V
4.2	Control voltage range	Without reference voltage; Vs=3.3V	0.65 to 2.65	V
4.3	Frequency tuning (standard)	≤20MHz (note 3)	±5 min	ppm
4.4	Frequency tuning (standard)	>20MHz (note 3)	±7 min	ppm
4.5	Frequency tuning (custom)	Available on request (note 3)	±5 to 20	ppm
4.6	Port input impedance	Measured between control voltage and GND pin	100 min	kΩ
4.7	Linearity		1 max	%
4.8	Slope	Positive		
4.9	Modulation bandwidth		2 min	kHz

5.0 OSCILLATOR OUTPUT-CLIPPED SINEWAVE

Line	Parameter	Test Condition	Value	Unit
5.1	Output waveform	AC coupled clipped sinewave		
5.2	Output voltage level	Peak to peak voltage	0.8 min	V
5.3	Output load resistance		10	kΩ
5.4	Output load capacitance		10	pF

6.0 OSCILLATOR OUTPUT-SINEWAVE

Line	Parameter	Test Condition	Value	Unit
6.1	Output waveform	AC coupled sinewave		
6.2	Output voltage level	Peak to peak voltage ≤20MHz	1 min	V
6.3	Output voltage level	Peak to peak voltage >20MHz	0.5 min	V
6.4	Output load resistance		10	kΩ
6.5	Output load capacitance		10	pF

7.0 OSCILLATOR OUTPUT-HCMOS

Line	Parameter	Test Condition	Value	Unit
7.1	Output waveform	HCMOS		
7.2	Output voltage level low		0.1 max	Vs
7.3	Output voltage level high		0.9 min	Vs
7.4	Rise and fall times	Measured with Vcc = 3.3V	8 max	ns
7.5	Rise and fall times	Measured with Vcc = 5.0V	7 max	ns
7.6	Duty cycle	Measured at 50% level	45 to 55	%
7.7	Load		15	pF

8.0 TRISTATE CONTROL-See NOTE 2

Line	Parameter	Test Condition	Value	Unit
8.1	Output enabled	Pad 8 open circuit or high	0.6 min	Vs
8.2	Tristate mode	Pad 8 low	0.2 max	Vs

9.0 PHASE NOISE

Line	Parameter	Test Condition	Value	Unit
9.1	SSB phase noise power density at 1Hz offset	Typical value for a 13MHz oscillator at 25°C	-65	dBc/Hz
9.2	SSB phase noise power density at 10Hz offset	Typical value for a 13MHz oscillator at 25°C	-95	dBc/Hz
9.3	SSB phase noise power density at 100Hz offset	Typical value for a 13MHz oscillator at 25°C	-120	dBc/Hz
9.4	SSB phase noise power density at 1kHz offset	Typical value for a 13MHz oscillator at 25°C	-135	dBc/Hz
9.5	SSB phase noise power density at 10kHz offset	Typical value for a 13MHz oscillator at 25°C	-140	dBc/Hz
9.6	SSB phase noise power density at 100kHz offset	Typical value for a 13MHz oscillator at 25°C	-145	dBc/Hz

10.0 OTHER FEATURES

Line	Parameter	Description
10.1	Reference voltage, Vref	Optional reference voltage output on pin 1 (suitable for potentiometer supply or DAC reference) - see model code builder

11.0 ENVIRONMENTAL INFORMATION

Line	Parameter	Description
11.1	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. (Shock tolerant version with 50,000G shock survivability available upon request)
11.2	Vibration	IEC 60068-2-6, test Fc. 10-60Hz 1.5mm displacement, 60-2000Hz at 10gn, 30 minutes in each of three mutually perpendicular axes at 1 octave per minute
11.3	Storage temperature	-55°C to 125°C

12.0 PIN CONNECTIONS

Line	Parameter	Description
12.1	Pin 1	Vref* (optional, see section 10 above)
12.2	Pin 2	N/C
12.3	Pin 3	Do not connect
12.4	Pin 4	GND
12.5	Pin 5	Output
12.6	Pin 6	N/C
12.7	Pin 7	N/C
12.8	Pin 8	Tri-state Control (Enable)*
12.9	Pin 9	Supply Voltage, +Vs
12.10	Pin 10	Control Voltage/Frequency Adjust, Vc* (optional)
12.11	Note	*Leave unconnected if not required/specified

13.0 MARKING

Line	Parameter	Description
13.1	Type	Laser marked
13.2	Line 1	[R X XX] Rakon, manufacturing identifier (X XX)
13.3	Line 2	[∆ 0000 YW] Pad 1 / static sensitivity identifier (∆), abbreviated part number (0000), device date code (YW)

14.0 MANUFACTURING INFORMATION

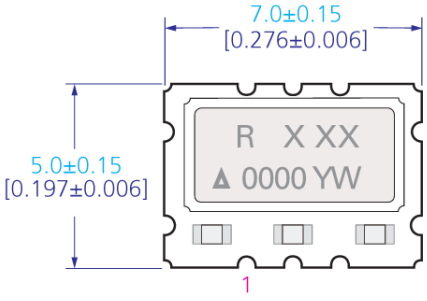
Line	Parameter	Description
14.1	Reflow Soldering	See reflow profile diagram. Solderability: MIL-STD-202, method 208, category 3
14.2	Packaging description	Quantities ≥ 100 pieces will be supplied on tape & reel

15.0 NOTES

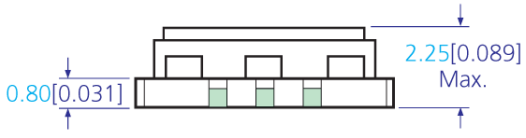
Line	Parameter	Description
15.1	Note 1	Frequency range available dependent on output type. HCMOS: 1.25-40MHz, sinewave: 10-40MHz, clipped sinewave: 10-40MHz.
15.2	Note 2	The tristate control (enable) pin has a internal 100kΩ pull up resistor which allows the pin to be left unconnected if not required. When in Tri-state mode, the output stage is disabled, but the oscillator and compensation circuit are still active (current consumption typ. ≤ 1.0mA). A version where voltage control (pad 10) is replaced with tri-state control is available upon request - please contact the sales office: sales@rakon.com
15.3	Note 3	Higher pulling may be available as a custom option depending on nominal frequency and stabililty - please contact the sales office: sales@rakon.com

Drawing Name: CFPT9000 Model Drawing

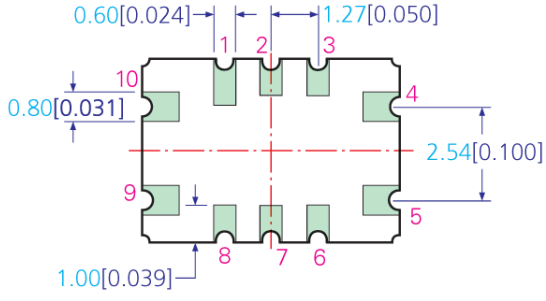
MODEL DRAWING



TOP VIEW



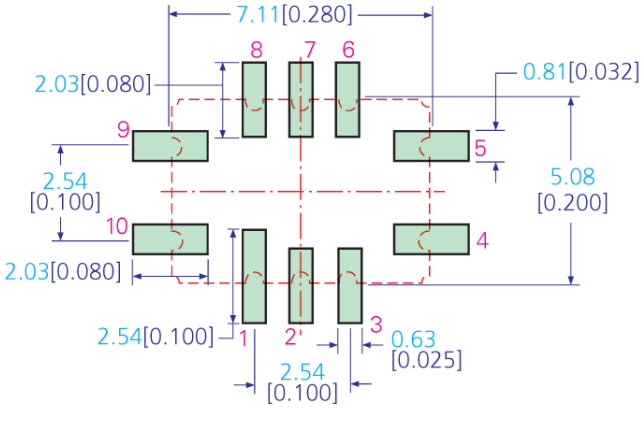
SIDE VIEW



BOTTOM VIEW

NOTE: Pin connections are detailed in the specification

RECOMMENDED PAD LAYOUT - TOP VIEW



TITLE: CFPT9000 MODEL OUTLINE DRAWING		
FILENAME: CFPT9000_MD	REVISION:	C
RELATED DRAWINGS:	DATE:	20-Jul-10
	SCALE:	5 : 1
	Millimeters [inch]	

Tolerance:
XX =±0.5
X.X =±0.2
X.XX =±0.10
X.XXX =±0.05
X° =±1.0°
Hole =±0.10

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Drawing Name: CFPT9000 Model Code Builder

MODEL CODE BUILDER

CFPT 900 X XX X X XX

PRODUCT CODE
CFPT - Pluto®, USTCXO

PACKAGE CODE
900 - 7 x 5 mm

ELECTRICAL SPECIFICATION CODE
1 - 5.0V HCMOS
3 - 5.0V Sine Wave
5 - 5.0V Clipped Sine Wave
6 - 3.3V HCMOS
7 - 3.3V Sine Wave
8 - 3.3V Clipped Sine Wave

TEMPERATURE STABILITY CODE

Frequency Stability vs Operaiting Temperature Range

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

* Code may not be available for all frequency

REFERENCE VOLTAGE CODE
1 - No output (standard option)
2 - 2.2V, for Min. Vs > 2.4V
3 - 2.7V, for Min. Vs > 3.0V
4 - 4.2V, for Min. Vs > 4.0V
Note: Maximum load current (mA) = Vref/10

FREQUENCY ADJUSTMENT CODE
A - Ageing adjustment (sandard option):
≧ ±5ppm, frequency ≦ 20MHz
≧ ±7ppm, frequency > 20MHz
B - No frequency adjustment initial calibration
@ 25°C ≦ ±1.0ppm
C - High pulling ±10ppm to ±20ppm can be available depending on frequency and stability options. Please consult our sales officer

RoHS CODE
LF - RoHS compliant

TITLE: CFPT9000 MODEL CODE BUILDER
FILENAME: CFPT9000_MC
RELATED DRAWINGS:

REVISION: A
DATE: 25-Feb-11
SCALE: NTS
Millimeters [inch]

Tolerance:
XX =±0.5
X.X =±0.2
X.XX =±0.10
X.XXX =±0.05
X° =±1.0°
Hole =±0.10

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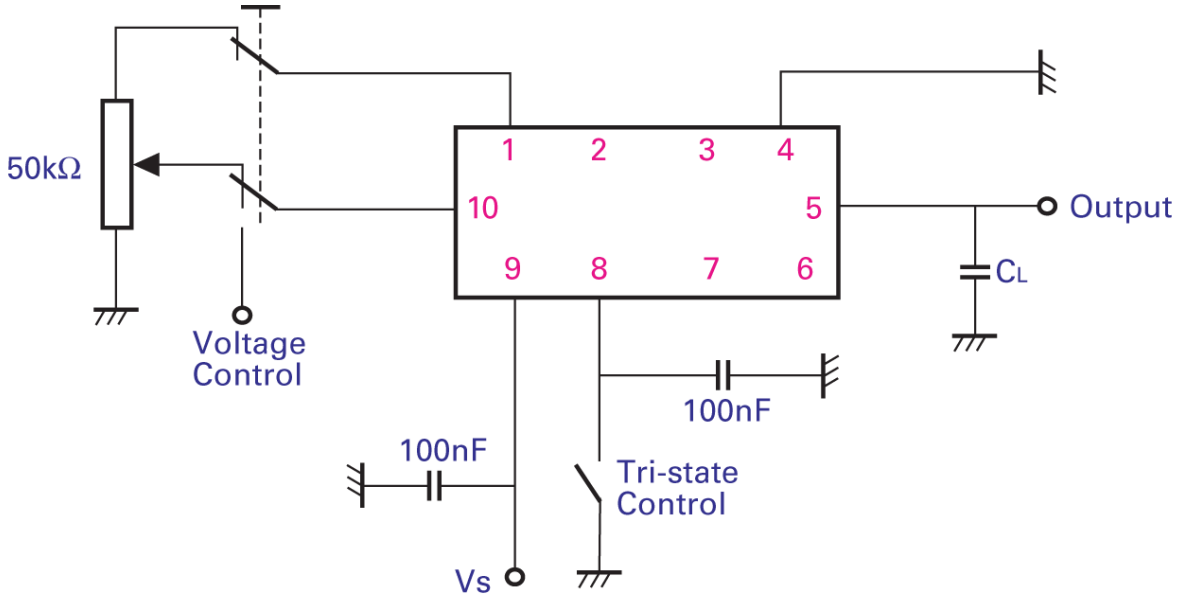
Drawing Name: CFPT9000 Series Test Circuit



TITLE: CFPT9000 SERIES TEST CIRCUIT

FILENAME: CFPT9000_TC

RELATED DRAWINGS:

REVISION: A

DATE: 12-Mar-10

SCALE: NTS

Millimetres [inch]

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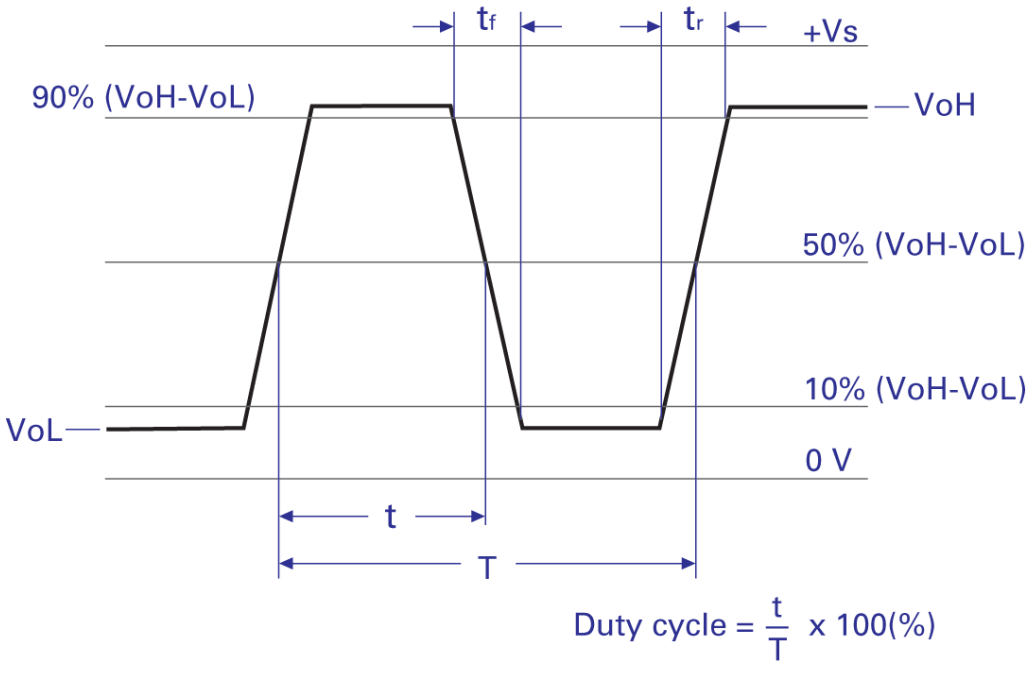
Drawing Name: CFPT9050 Output Waveform Chart

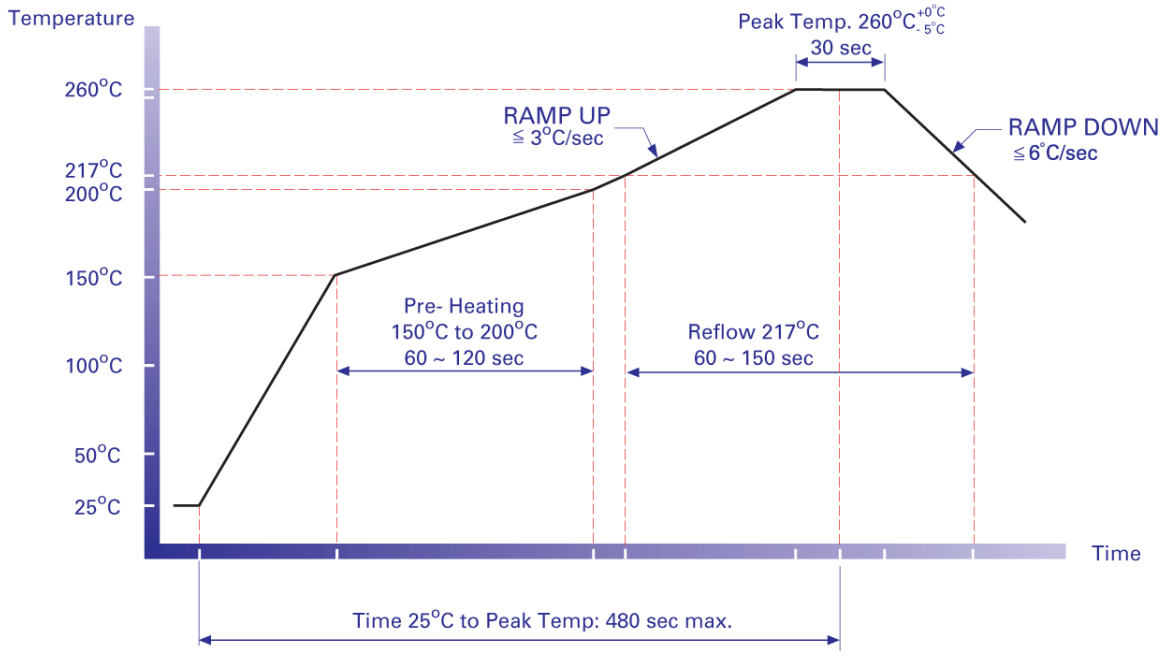


TITLE: CFPT9050 SERIES OUTPUT WAVEFORM - HCMOS		
FILENAME: CFPT9050_OW	REVISION: A	
RELATED DRAWINGS:	DATE: 19-Jul-10	
	SCALE: 5 : 1	
	Millimeters [inch]	

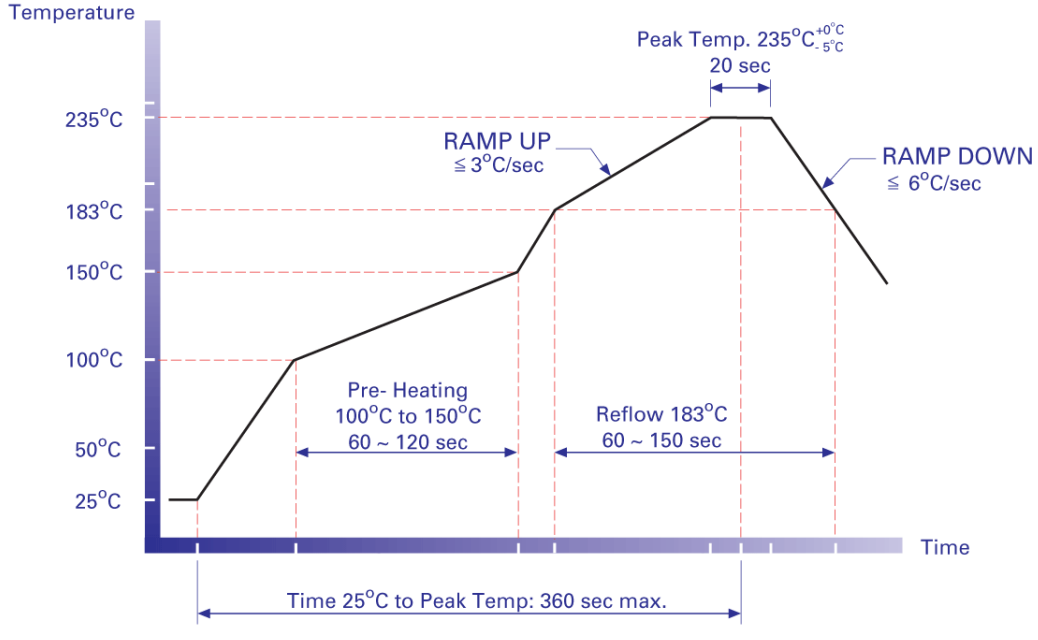
Tolerance:
XX =±0.5
X.X =±0.2
X.XX =±0.10
X.XXX =±0.05
X° =±1.0°
Hole =±0.10

Drawing Name: CFPT9000 Series Reflow Profile

Pb-Free Reflow Soldering Profile *



Sn-Pb Eutectic 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.

TITLE: CFPT9000 SERIES REFLOW PROFILE		
FILENAME: CFPT9000_RF	REVISION: B	
RELATED DRAWINGS:	DATE: 08-Sep-10	
	SCALE: NTS	
	Millimeters [inch]	

Tolerance:
XX =±0.5
X.X =±0.2
X.XX =±0.10
X.XXX =±0.05
X° =±1.0°
Hole =±0.10

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