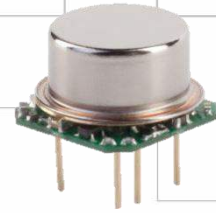


# VFOV415

## Low Power OCXO

### Features

- 8MHz to 150MHz frequency range
- Fast warm-up
- Very low power consumption
- Sinewave or HCMOS output
- Vibration resistant construction



Dimensions: 16 x 15.3 x 9.5 mm

### Description

The VFOV415 is a high stability, low power OCXO that utilizes Internal Heating Resonator (IHR) technology. The entire oven control system along with the SC resonator are housed inside of the TO-8 vacuum enclosure to reduce OCXO size, power consumption and warm-up time. Applications for this product include PLL reference for telecom systems, Portable equipment, Instrumentation/Test and Measurement, and Microwave communications.

**Table 1 - Ordering Information**

Model	Stability	Temp Range	Supply Voltage	Aging	Output	Package Type	Mech Shock	Frequency
VFOV415	— 28	E	D	C	S	T	—	xxxMxxx

Code	Stability
17	±1x10 <sup>-7</sup>
58	±5x10 <sup>-8</sup>
38	±3x10 <sup>-8</sup>
28	±2x10 <sup>-8</sup>
18	±1x10 <sup>-8</sup>
59	±5x10 <sup>-9</sup>
39	±3x10 <sup>-9</sup>

Code	Supply
D	5V ± 5%
E	3.3V ± 5%

Code	Temp Range
A	0 to 50°C
B	0 to 70°C
C	-10 to 60°C
D	-20 to 70°C
E	-30 to 70°C
G	-40 to 85°C

Code	Output
H	HCMOS
S	Sinewave

Code	Pkg
T	Thru hole
S	SMD

Code	Per day	Per year	Frequency
A	5ppb	0.5ppm	≤150MHz
F	3ppb	0.3ppm	≤120MHz
B	2ppb	0.2ppm	≤120MHz
I	1.5ppb	0.15ppm	≤50MHz
C	1ppb	0.1ppm	≤40MHz
D	0.5ppb	0.05ppm	≤20MHz
L	0.3ppb	0.03ppm	≤10MHz
G	0.2ppb	0.02ppm	≤10MHz

Code	Shock Level
blank	30G (std)
5	500G

**Table 2 - Available Frequency Stabilities vs. Operating Temperature Ranges**

Code	Temperature Range	Stability						
		17	58	38	28	18	59	39
		±1x10 <sup>-7</sup>	±5x10 <sup>-8</sup>	±3x10 <sup>-8</sup>	±2x10 <sup>-8</sup>	±1x10 <sup>-8</sup>	±5x10 <sup>-9</sup>	±3x10 <sup>-9</sup>
A	0 to 50°C	*	*	*	D	C	C	A
B	0 to 70°C	*	*	*	C	C	B	A
C	-10 to 60°C	*	*	D	C	C	B	A
D	-20 to 70°C	*	*	D	C	B	A	
E	-30 to 70°C	*	*	D	C	B	A	
G	-40 to 85°C	*	D	C	B	A	A	

### Stability Legend

- \* = Available for all frequencies
- A = ≤10 MHz
- B = ≤30 MHz
- C = ≤50 MHz
- D = ≤100 MHz

Deviations of parameters from those indicated are available to meet specific customer requirements. Consult factory.

**Part Number Example: VFOV415-28EDCST-19M200**

## Electrical Specifications

Parameter	Conditions & Remarks	Min	Typical	Max	Unit
<b>Operating Conditions</b>					
Operating Temperature Range	See Table 1	-40	-	+85	°C
Supply Voltage	V <sub>CC</sub>	3.135 4.75	3.3 5.0	3.465 5.25	Vdc
Power Consumption	During warm up Steady state @ 25°C	- -	- 150	1200 -	mW
<b>Frequency Stability</b>					
Frequency Range	F <sub>NOM</sub>	8	-	150	MHz
Calibration	@ 25°C, V <sub>C</sub> not connected	-	±100	-	ppb
Temperature Stability	Ref to +25°C, air flow 0.5 m/s max See Table 2 for options	-	±5	-	ppb
Voltage Stability	V <sub>CC</sub> ±5%	-	±2	-	ppb
Aging (After 30 days)	See Table 1 for options	Per day Per year	- -	±0.5 ±0.05	ppb ppm
Allan Deviation	1s	-	0.02	-	ppb
Retrace	30 minutes on after 24 hrs off	-	-	±20	ppb
G-Sensitivity (Note 1)	Worst axis (0 - 1kHz)	-	1*	-	ppb/g
Warmup-Up Time	T <sub>A</sub> =25°C; to within 0.1 ppm accuracy of freq. @ 15 min	30	60	-	seconds
<b>Output Parameters</b>					
HCMOS/TTL (order code H)	Load	10MHz 100MHz	10kOhms / 15 pF 10kOhms / 5 pF		
	V <sub>H</sub>	V <sub>CC</sub> = 5.0V V <sub>CC</sub> = 3.3V	3.8 2.4	- -	- -
	V <sub>L</sub>		-	-	0.4
Rise / Fall Times	@ 10MHz/100MHz	-	-	10/3	ns
Duty Cycle		45	-	55	%
Sinewave Output (order code S)		V <sub>CC</sub> = 5.0V V <sub>CC</sub> = 3.3V	+7 +4	- -	- -
	R <sub>L</sub>		-	50	-
Harmonics		-	-	-25	dBc
Sub-harmonics				None	
Phase Noise (Note 2)	Offset		10 MHz (typ)	100 MHz (typ)	
	1 Hz		-90	-	
	10 Hz		-120	-90	
	100 Hz		-145	-120	dBc/Hz
	1 kHz		-155	-145	
	10 kHz		-165	-165	
	100 kHz		-165	-165	

Note 1. Lower G-sensitivity performance is available. Consult factory.

Note 2. For additional phase noise options, consult factory.

## Electrical Specifications continued

### Electronic Frequency Control (option)

Control Voltage	$V_C$	$V_{CC} = 5.0V$ $V_{CC} = 3.3V$	0 0	- -	4.2 2.8	V
Tuning Range	Sufficient for 10 yrs aging; Slope positive, monotonic		$\pm 0.3$	$\pm 1$	-	ppm
Reference output	$V_{REF}$	$V_{CC} = 5.0V$ $V_{CC} = 3.3V$	4.1 2.7	4.2 2.8	4.3 2.9	V

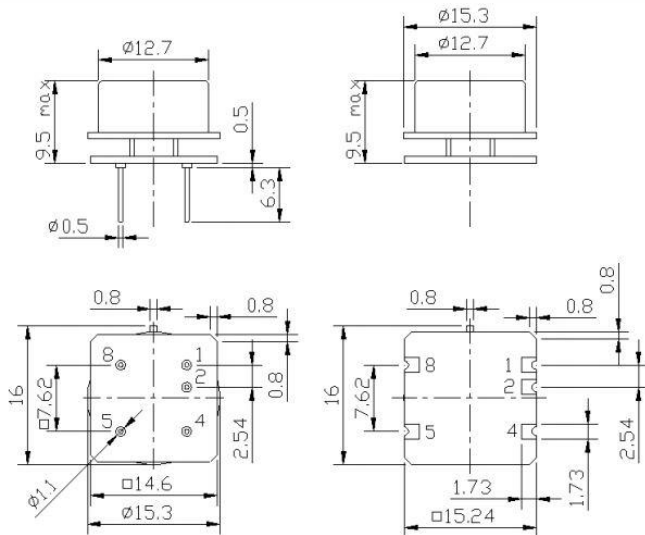
### Absolute Maximum Ratings

Supply Breakdown Voltage	$V_{CC}$	-0.5	-	$V_{CC} + 20\%$	V
Control Voltage	$V_C$	-1	-	6	V

### Mechanical and Environmental

Storage Temperature	-60°C to +85°C
Air flow	0.5 m/s max
Humidity	Non-condensing, 95%
Mechanical Shock	Per MIL-STD-202, 30g, half sine, 11 ms (500G, 1ms option "5")
Vibration	Per MIL-STD-202, 10g, swept sine to 2000Hz
Altitude	Meets all electrical specifications to 70,000 ft elevation
Soldering Conditions	260°C for 10s. <b>Hand solder only – not reflow compatible</b>
Marking	Epoxy ink or laser engraved

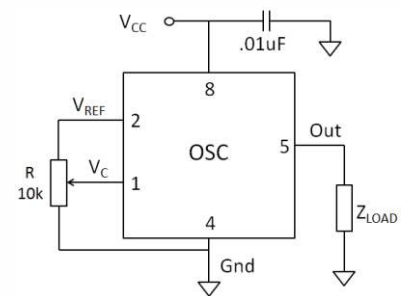
### Mechanical Specifications



All tolerances – 0.254mm (0.01")

\*\*Not reflow compatible

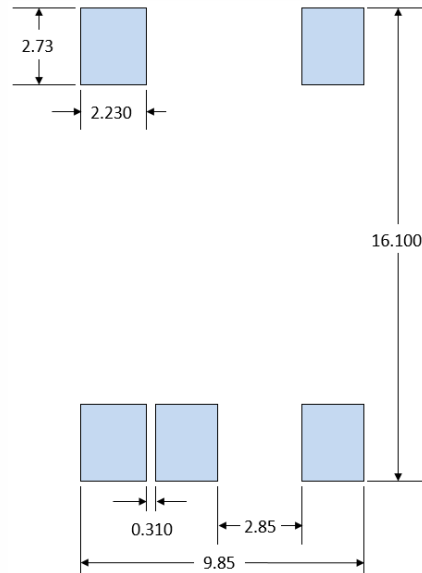
### Connection Diagram



### Pin Assignments

Pin	Connection
1	$V_C$
2	$V_{REF}$
4	Ground
5	Output
8	$V_{CC}$

## Recommended SMD Solder Pad Geometry



This product is specified for use only in standard commercial applications. Supplier disclaims all express and implied warranties and liability in connection with any use of this product in any non-commercial applications or in any application that may expose the product to conditions that are outside of the tolerances provided in its specification.