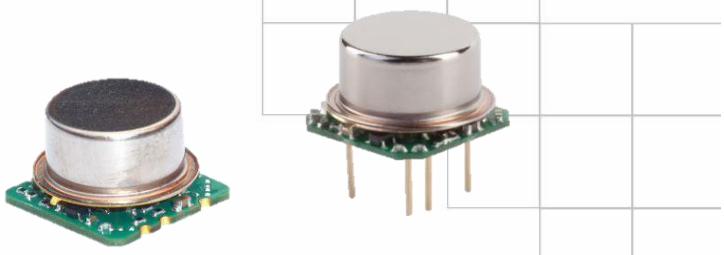
# VFOV415

## 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 | $\pm1x10^{-7}$ |
| 58 | $\pm5x10^{-8}$ |
| 38 | $\pm3x10^{-8}$ |
| 28 | $\pm2x10^{-8}$ |
| 18 | $\pm1x10^{-8}$ |
| 59 | $\pm5x10^{-9}$ |
| 39 | $\pm3x10^{-9}$ |

| Code | Supply |
|---|---|
| D | 5V ± 5% |
| E | 3.3V ± 5% |

| Code | Output |
|---|---|
| H | HCMOS |
| S | Sinewave |

| Code | Pkg |
|---|---|
| T | Thru hole |
| S | SMD |

| 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 | Per day | Per year | |
|---|---|---|---|
| A | 5ppb | 0.5ppm | ≤150MHz |
| F | 3ppb | 0.3ppm | ≤120MHz |
| B | 2ppb | 0.2ppm | |
| 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 | |

| 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 |
| | | $\pm1x10^{-7}$ | $\pm5x10^{-8}$ | $\pm3x10^{-8}$ | $\pm2x10^{-8}$ | $\pm1x10^{-8}$ | $\pm5x10^{-9}$ | $\pm3x10^{-9}$ |
| 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 |
|---|---|---|---|---|---|
| **Operating Conditions** | | | | | |
| Operating Temperature Range | See Table 1 | -40 | - | +85 | °C |
| Supply Voltage | $V_{CC}$ | 3.135<br>4.75 | 3.3<br>5.0 | 3.465<br>5.25 | Vdc |
| Power Consumption | During warm up<br>Steady state @ 25°C | -<br>- | -<br>150 | 1200<br>- | mW |
| **Frequency Stability** | | | | | |
| Frequency Range | $F_{NOM}$ | 8 | - | 150 | MHz |
| Calibration | @ 25°C, $V_C$ not connected | - | ±100 | - | ppb |
| Temperature Stability | Ref to +25°C, air flow 0.5 m/s max<br>See Table 2 for options | - | ±5 | - | ppb |
| Voltage Stability | $V_{CC}$ ±5% | - | ±2 | - | ppb |
| Aging (After 30 days) | See Table 1 for options — Per day | - | - | ±0.5 | ppb |
| | See Table 1 for options — Per year | - | - | ±0.05 | 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 | $T_A$=25°C; to within 0.1 ppm accuracy of freq. @ 15 min | 30 | 60 | - | seconds |
| **Output Parameters** | | | | | |
| HCMOS/TTL (order code H) | Load: 10MHz<br>Load: 100MHz | | 10kOhms / 15 pF<br>10kOhms / 5 pF | | |
| | $V_H$: $V_{CC}$ = 5.0V<br>$V_H$: $V_{CC}$ = 3.3V | 3.8<br>2.4 | -<br>- | -<br>- | V |
| | $V_L$ | - | - | 0.4 | V |
| Rise / Fall Times | @ 10MHz/100MHz | - | - | 10/3 | ns |
| Duty Cycle | | 45 | - | 55 | % |
| Sinewave Output (order code S) | $V_{CC}$ = 5.0V<br>$V_{CC}$ = 3.3V | +7<br>+4 | -<br>- | -<br>- | dBm |
| | $R_L$ | - | 50 | - | Ω |
| Harmonics | | - | - | -25 | dBc |
| Sub-harmonics | | | None | | |

| Phase Noise (Note 2) | Offset | 10 MHz (typ) | 100 MHz (typ) | |
|---|---|---|---|---|
| | 1 Hz | -90 | - | dBc/Hz |
| | 10 Hz | -120 | -90 | |
| | 100 Hz | -145 | -120 | |
| | 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<br>$V_{CC}$ = 3.3V | 0<br>0 | -<br>- | 4.2<br>2.8 | V |
| Tuning Range | Sufficient for 10 yrs aging;<br>Slope positive, monotonic | | ±0.3 | ±1 | - | ppm |
| Reference output | $V_{REF}$ | $V_{CC}$ = 5.0V<br>$V_{CC}$ = 3.3V | 4.1<br>2.7 | 4.2<br>2.8 | 4.3<br>2.9 | V |

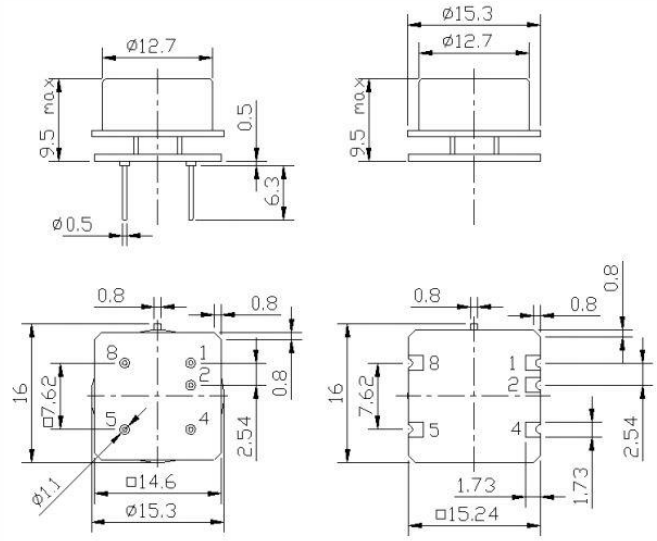
## Absolute Maximum Ratings

| | | | | | |
|---|---|---|---|---|---|
| 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. **Hand solder only – not reflow compatible** |
| Marking | Epoxy ink or laser engraved |

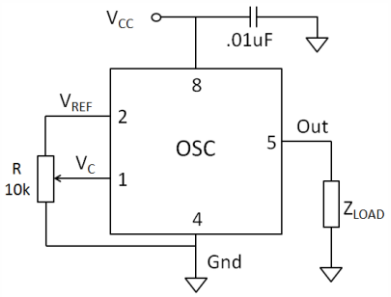
## Mechanical Specifications




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